



L A T E R A L

NAVAL ARCHITECTS

VOLUME 4

How can engineering
enable design innovation?

Ask **new questions.**



DESIGNED BY **DE BASTO DESIGNS**

WELCOME TO LATERAL

Lateral Naval Architects is a leading supplier of naval architecture and engineering services to the superyacht industry. With engineering at the core, our unique focus is on meaningful innovation; striving to meet the needs of today's superyacht owners and to shape the Yachts of the future.

Our projects span a diverse spectrum of both size and complexity. Lateral has delivered creative engineering and consultancy for of the world's most advanced, innovative and iconic yachts.

We do not limit our engineering creativity to that developed within our own organisation. Lateral recognises that innovation benefits from collaboration, engaging with a wide range of talented partners to develop knowledge, deliver insight and bring ideas to life.

Our creativity is underpinned by carefully focused research and development to keep our knowledge at the cutting edge of technology, regulation and best practice. We actively engage in leveraging a broad spectrum of technologies from across the marine industry to deliver technical innovation to our projects. We believe that meaningful innovation goes beyond searching for new solutions and starts with asking the right questions.



These questions may challenge existing paradigms and in doing so will drive solutions that are not always obvious.

Alongside the delivery of a broad scope of services, from concept engineering and naval architecture through to detailed engineering for production, Lateral is also developing the next generation of technical platforms. Via the application of meaningful innovation these platforms will offer the industry's designers and shipyards ever greater freedom and flexibility to create superyachts that meet the demands of a shifting demographic of superyacht owners.

Ours is a company where expert knowledge and insight is applied to exceptional projects. Our 50 multinational and multidiscipline staff are a showcase for 21st century collaboration and team work. As our greatest asset, everyone recognises that our reputation is based on the quality of that which we deliver, and we strive as a team to provide total flexibility of approach, service and resource.

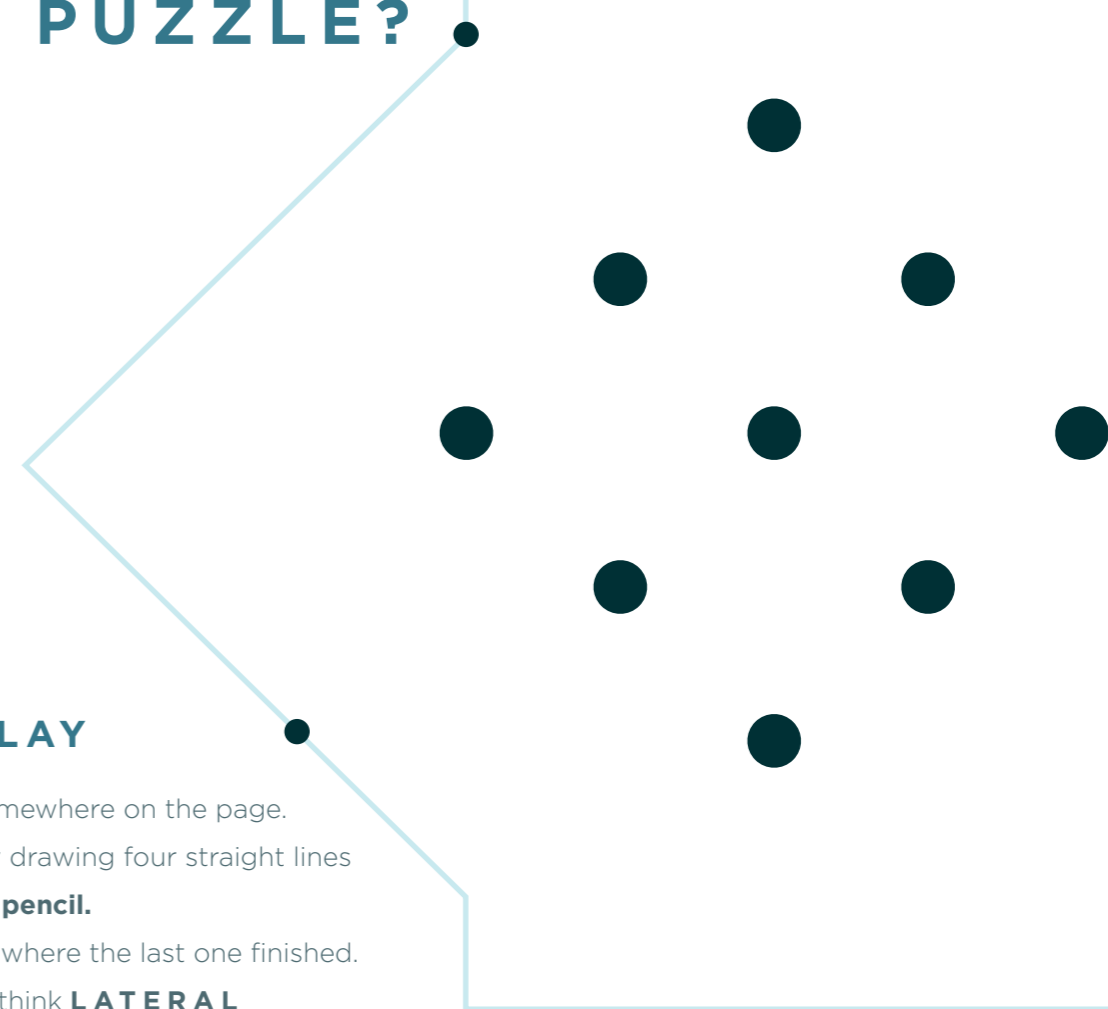
In the pages that follow we invite you to explore our company, its people, services and projects. If you have a question, perhaps a new question, please don't hesitate to get in touch; it is these questions that inspire us.



JAMES ROY
Managing Director



CAN YOU SOLVE THE 9 DOT PUZZLE?



HOW TO PLAY

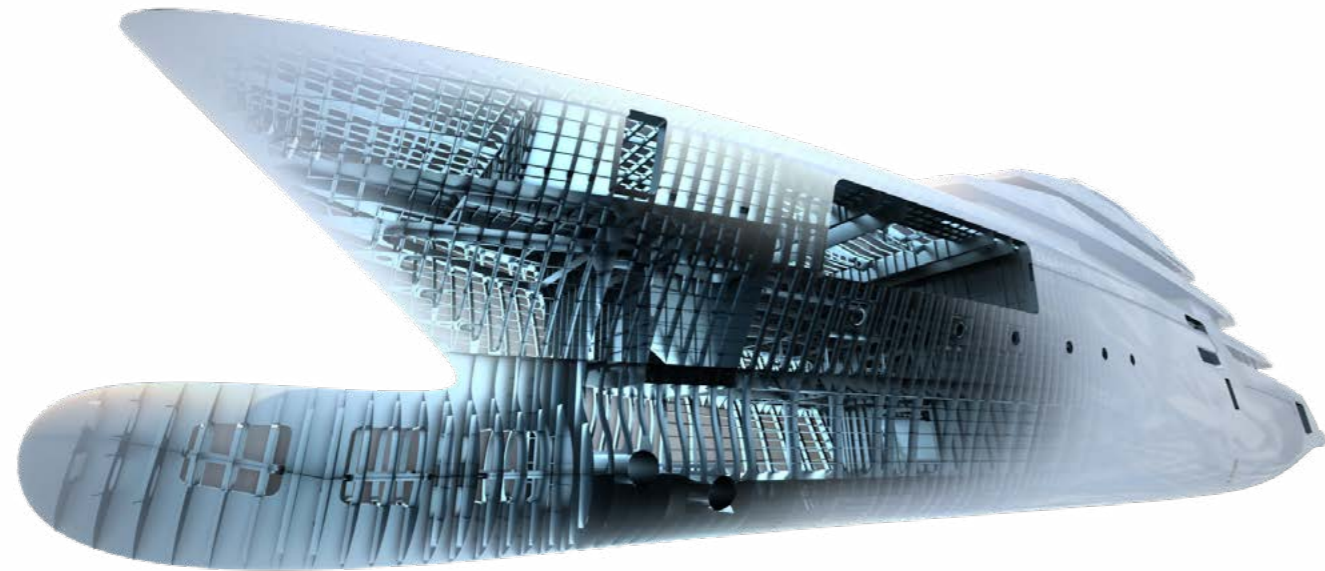
Place your pencil somewhere on the page.
Connect the dots by drawing four straight lines
without lifting your pencil.
Each line must start where the last one finished.
To solve the puzzle, think **LATERAL**

WHO WE ARE

Lateral Naval Architects provides complete engineering expertise to the superyacht industry, from project conception to delivery, operation and refit.

Our core competence is engineering, but our unique focus is on meaningful innovation, to enable superyachts that meet the demands of today's owners and those of the future.

We believe that meaningful innovation starts with asking new questions.



WHAT WE DO

We deliver in-depth naval architecture and engineering services across the following disciplines;

- Naval Architecture
- Structural Engineering
- Mechanical and Systems Engineering
- Outfit Engineering

Our creativity is the application of these skills to the complete spectrum of design, build, commissioning and refit in the lifecycle of a yacht;

- Concept Design
- Contract Level Design
- Classification Level Design
- Detailed Production Engineering
- Yard Support, Commissioning and Trials
- Engineering for Refit, Repair or Conversion

We collaborate and engage with customers in all segments of the industry ecosystem including;

- Yacht Owners
- Shipyards
- Designers and Stylists
- Consultants
- Yacht Brokerage/Management Companies
- Other Naval Architects
- Legal Practices and Insurance Companies
- Equipment and Material Suppliers

Lateral is actively delivering services to an international client base.



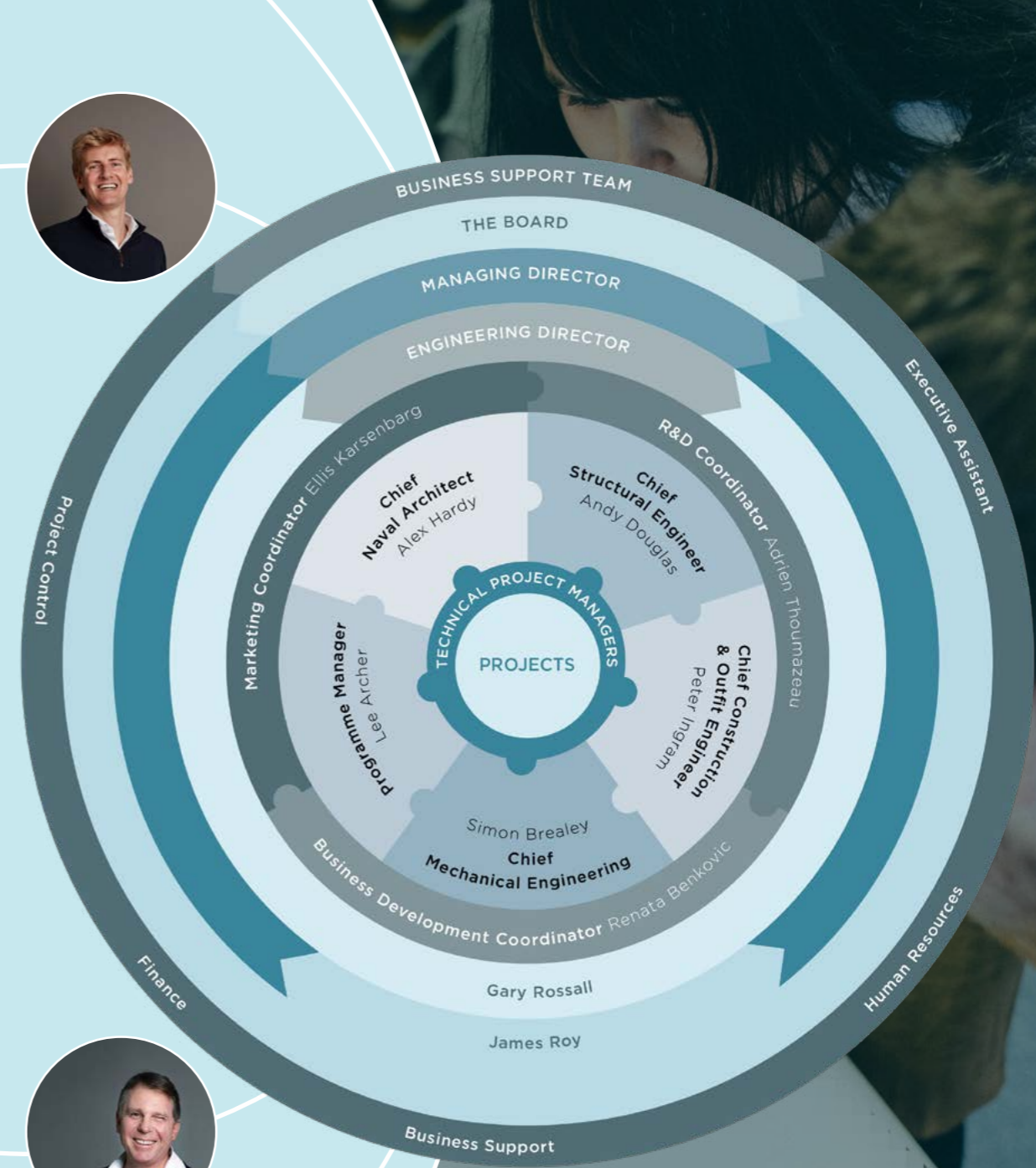
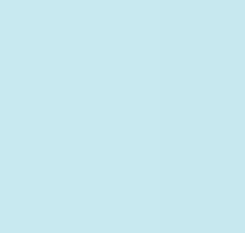
LATERAL PEOPLE

Lateral is a company where expert knowledge and insight is applied to exceptional projects. Our organisational structure is built around focusing the application of this knowledge on our projects. We are a project focused company.

The working structure of Lateral is best represented by a series of concentric circles, at the centre of which are our projects. People within each concentric circle provide knowledge, expertise, management and support inwardly to the people in the next adjacent circle. Challenges, issues and problems are only passed outwards.

Support goes inwards, totally focused on the project.

In this way those closest to delivering our work are supported the most, and our projects remain at the focal point of our delivery.





How can heritage inspire us to
cultivate something evolved?

Ask **new questions.**



DESIGNED BY **BANNENBERG & ROWELL**

SUPERMARINE
SPITFIRE XIVc



01
NAVAL ARCHITECTURE

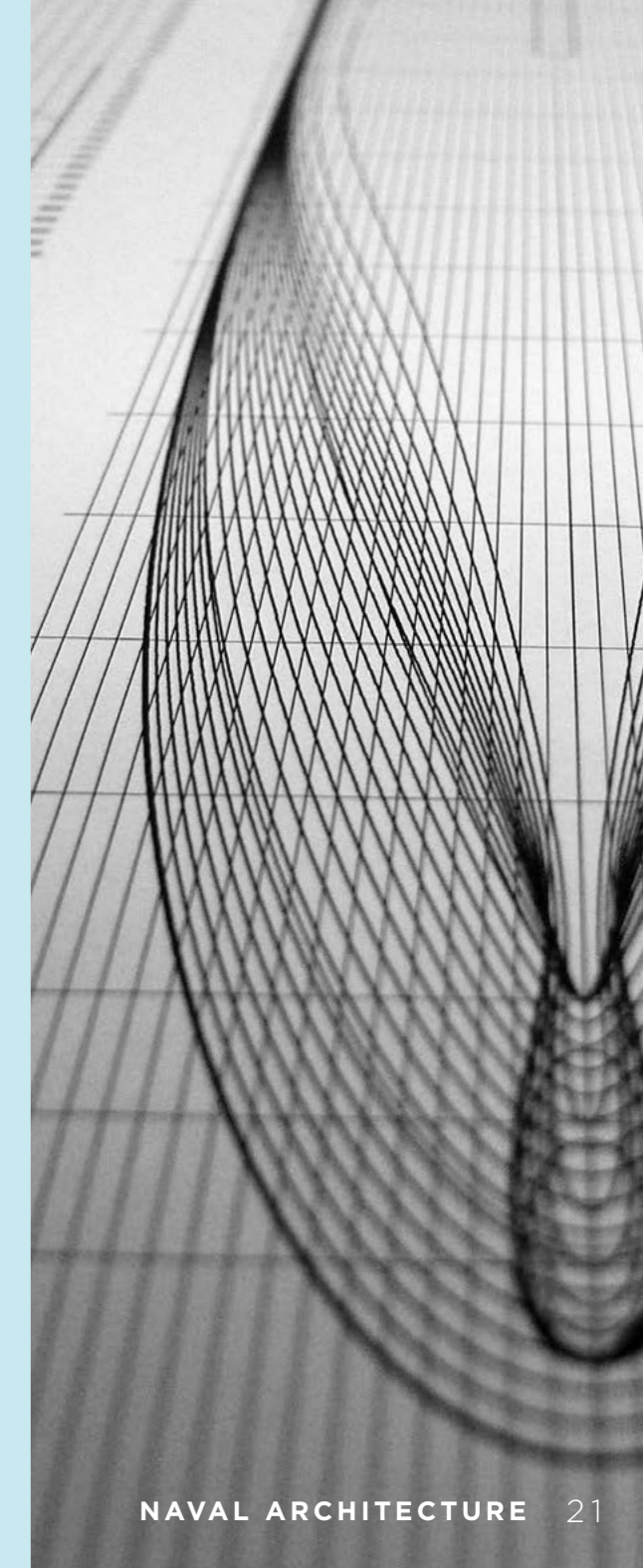


With our **extensive experience** in the field of naval architecture

Lateral is a leader in the field. A portfolio of in-service designs covering all hull form types, speed regimes, propulsion systems and construction materials demonstrates our expertise.

The scope of our **naval architecture** service includes

- Concept Design Development
- Specification Writing
- Hull-form Design and Development
- Computational Fluid Dynamics
- Performance Predictions
- Propulsion System Design
- Sea-keeping Analysis
- Hydrodynamic Model Testing
- Manoeuvring Simulations
- Weight Engineering
- Stability Analysis
- Aerodynamic Wind Tunnel Testing
- Loadline and Other Statutory Calculations



The breadth and scope of our naval architecture **enables us to deliver**

insightful naval architecture/engineering at any and all stages of a project: from early concept and feasibility studies, contract and Class level design to detailed production engineering, commissioning and refit.

Working across all stages of design, production, commissioning and refit, we can advise the correct level of scope and project structure to deliver maximum added value, whilst mimising technical risk and engineering cost.

We have an established reputation as **a leader**

in the field of **hull form development** and we marry our breadth of experience in the private yacht, commercial and naval markets **to deliver designs** tailored for good sea-keeping ability, low resistance, high propulsive efficiency and exceptional range.

Our team's **portfolio**

extends far beyond conventional monohulls and covers the development of specialist hull forms such as catamarans, SWATHs, hydrofoils and air cushioned vessels.

Additionally, with **our background**

in configuring conventional, unusual and high-tech propulsion systems with the integration of stabilisation and dynamic positioning systems, we can provide high level capability for even the most demanding yacht owners.

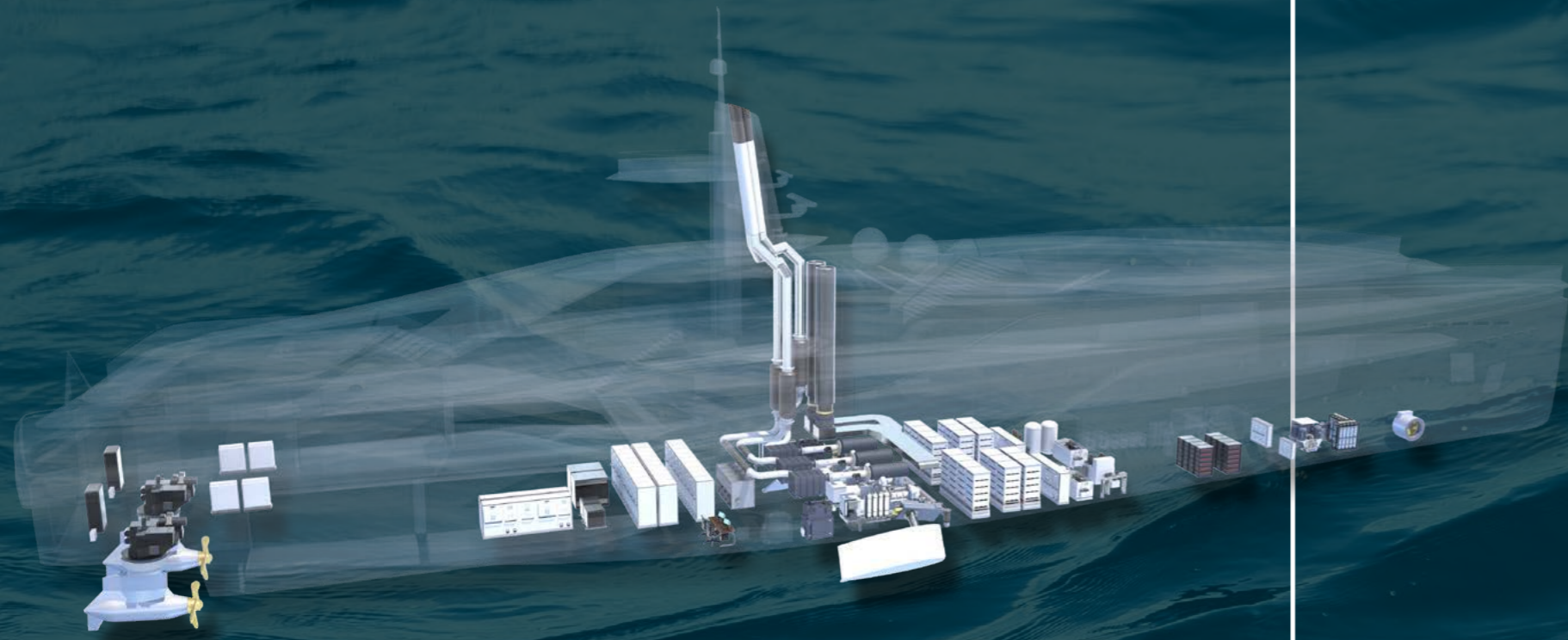


We thrive on **challenges**

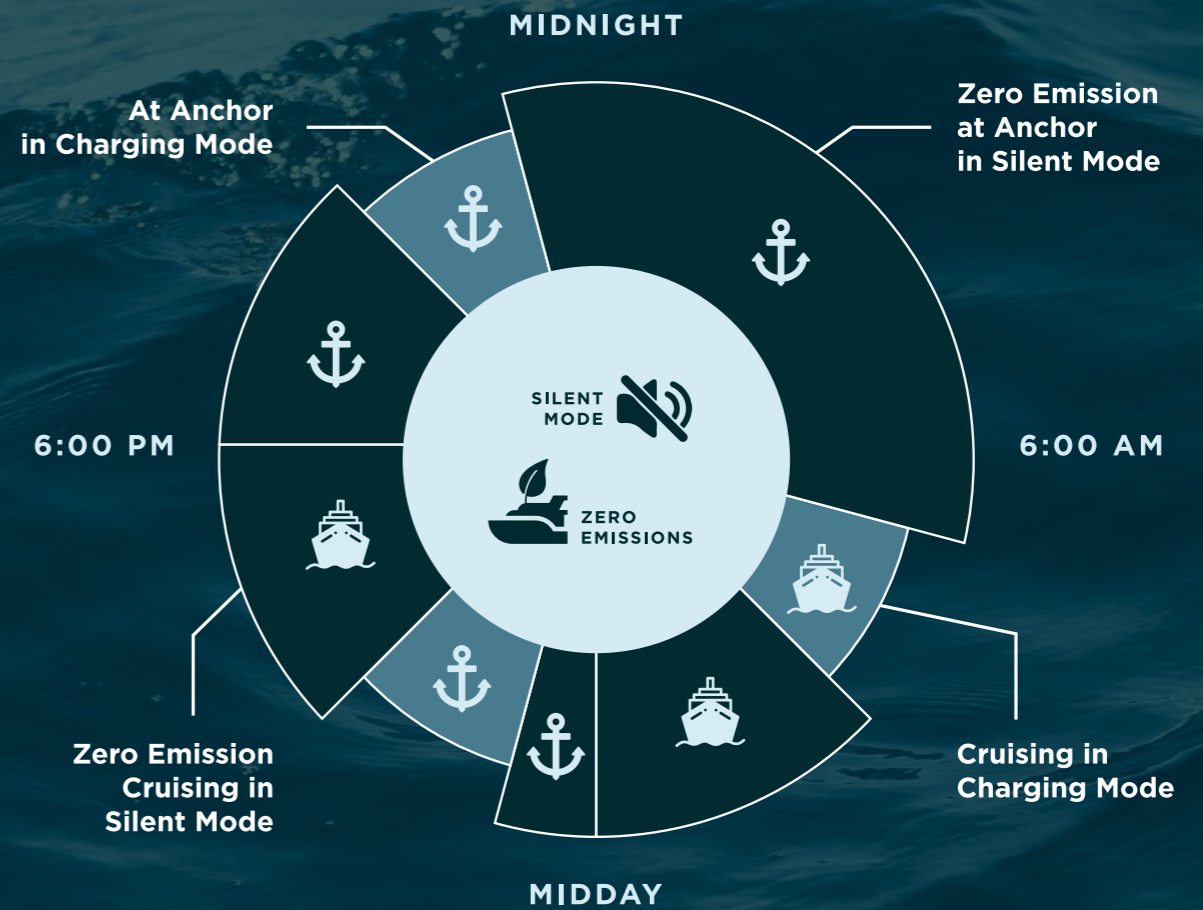
brought to us by the industry's leading designers, stylists and shipyards.

Our goal is to help **deliver their visionary design** intent through our knowledge of the modern regulatory framework, major flag authorities and class societies.



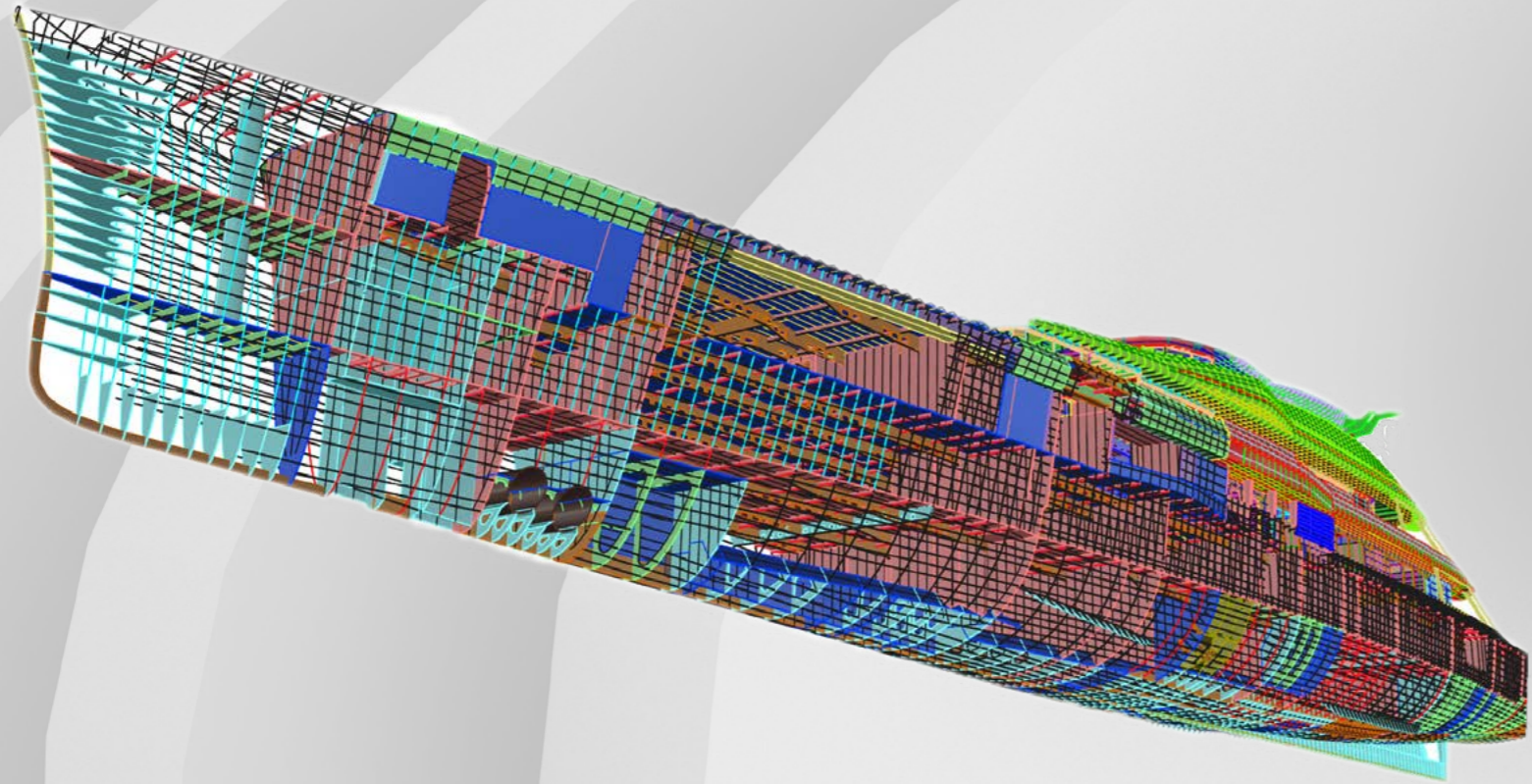


75% OF A DAY ON-BOARD IS SPENT IN **ZERO EMISSION & SILENT MODE**



ELECTRIC HYBRID

SILENT \ LOCALLY EMISSION FREE \ COMPACT \ FUTURE PROOF



02
STRUCTURAL ENGINEERING

Lateral specialises in the design of structures in steel, aluminium and composite.

With over 30 years' experience in developing structural designs for yachts and specialised vessels, our team utilises its extensive knowledge base to deliver practical and pragmatic designs that are fit for purpose, efficient to build and with excellent attention to detail.

Lateral's **structural design** services include

- Concept and feasibility studies
- Advice on material specifications
- Design to Class and management of Class approval
- First principles calculations
- Load prediction
- Finite Element Analysis
- Local and global structural optimisation
- 3D solid and surface modelling
- Mould and plant design
- Laminate schedules
- Production design drawings
- Weight engineering and control
- Engineering audits, consultancy and troubleshooting
- Design to small craft codes
- Refit and repair
- On-site build and engineering support



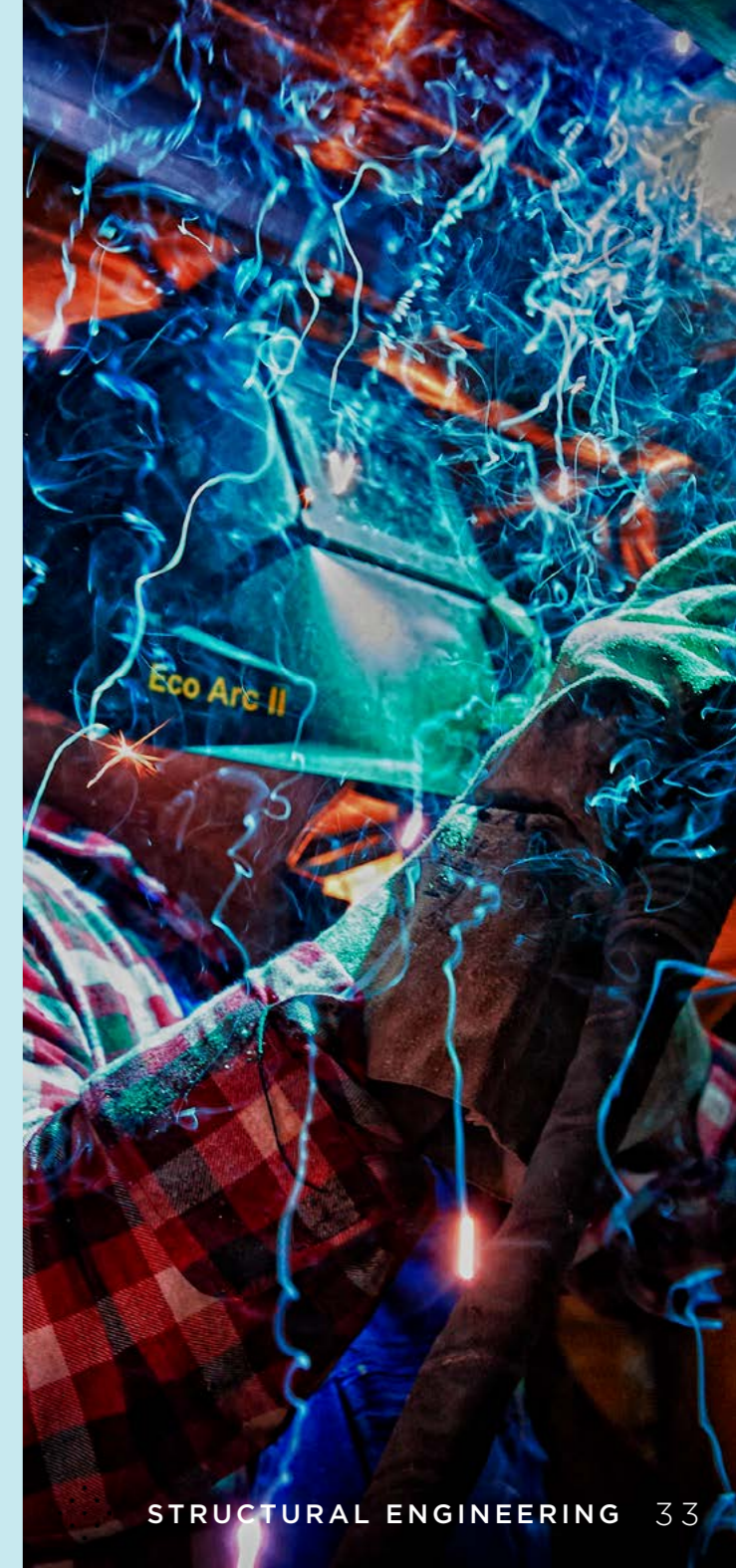
Our **structural design** experience ranges

from small composite production designs to large steel and aluminium sail and motor yachts that are dominated by complex global loads. Married with our knowledge in the design of high-speed commercial and naval craft we are leaders in the field of lightweight and robust aluminium structures.

Having worked with all the major **classification societies**

Lateral brings significant depth of knowledge and ability to gain full Class approvals in the most efficient and effective manner.

With each Class society having its own nuances Lateral has the insight required to engage Class in educated debate at the appropriate junctions to ensure design is not encumbered with redundant, heavy and expensive features.



With many naval architecture offices and smaller shipyards choosing to subcontract structural design services, we often find ourselves **providing specialist structural engineering** to a wide ranging client base, often including our competitors in other disciplines. For larger shipyards we can offer a pool of

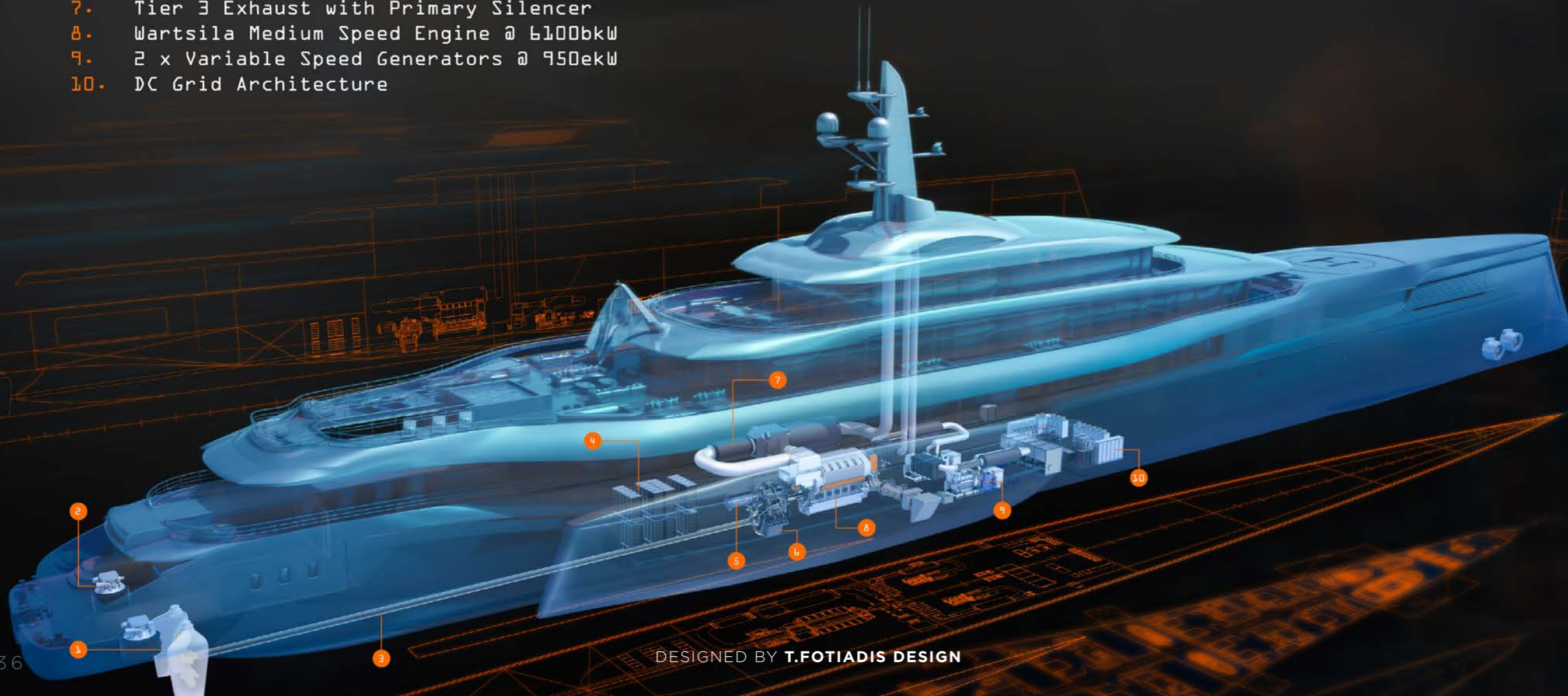
flexible resource
available to work
in-yard, as demand
requires.



Whether engaged as a **single source structural designer** or acting to reinforce

a client's existing team Lateral provides a skilled, **flexible and scalable service** enabling our clients to confidently bid, execute and deliver the most challenging and complex projects.

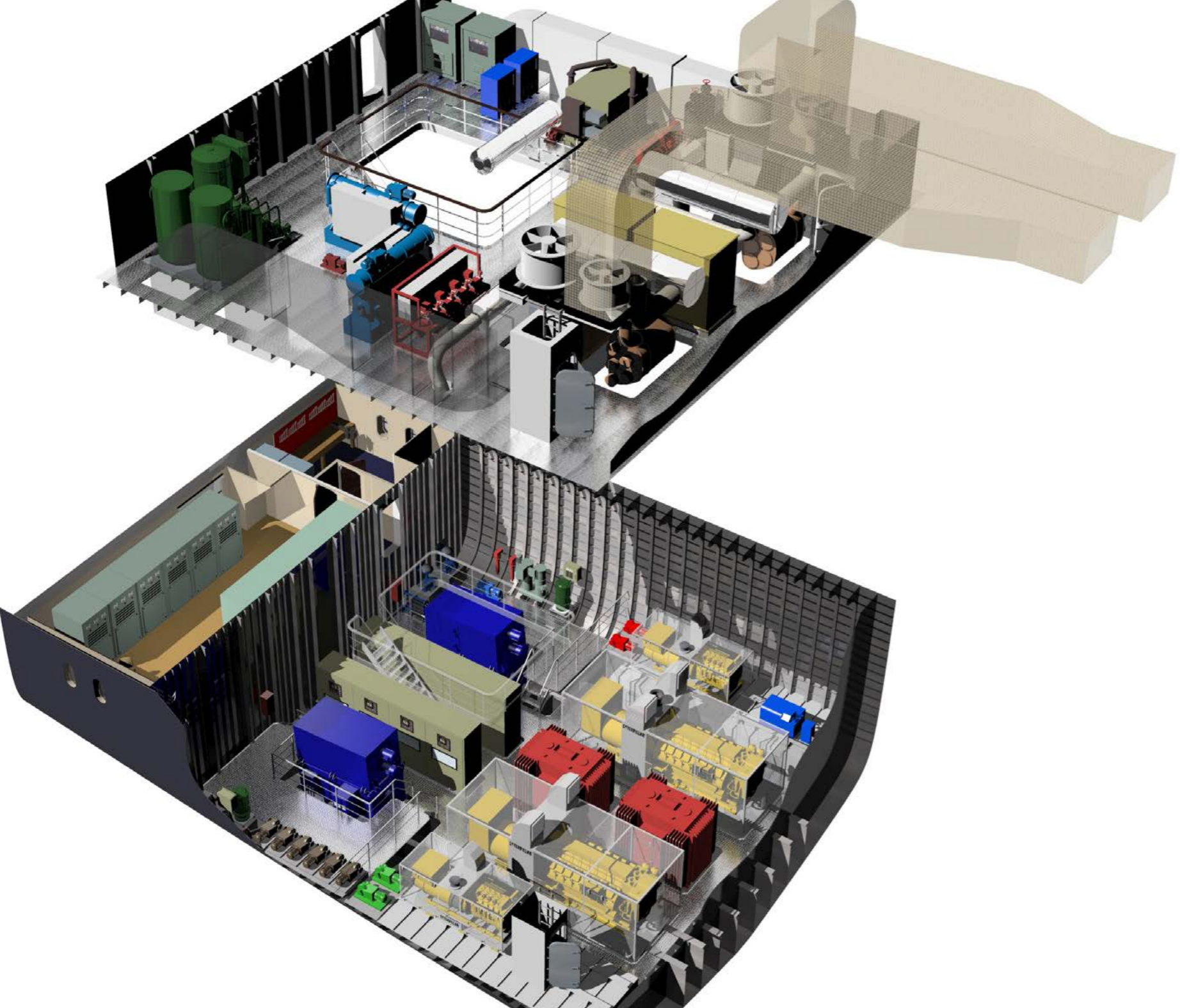
1. Wartsila Gate Rudder
2. 2 x Pump Jet 360° Thrusters @ 350kW
3. Single Shaft Propeller
4. Energy Storage System
5. EPM Motor @ 1000kW
6. PTI/PTO Gear Box
7. Tier 3 Exhaust with Primary Silencer
8. Wartsila Medium Speed Engine @ 6100kW
9. 2 x Variable Speed Generators @ 950kW
10. DC Grid Architecture



How many hulls
**are the right
number of hulls?**

Ask **new questions.**

DESIGNED BY T.FOTIADIS DESIGN



03
MECHANICAL SYSTEM ENGINEERING

Lateral delivers comprehensive breadth and depth of

capability in the field of mechanical and systems engineering.

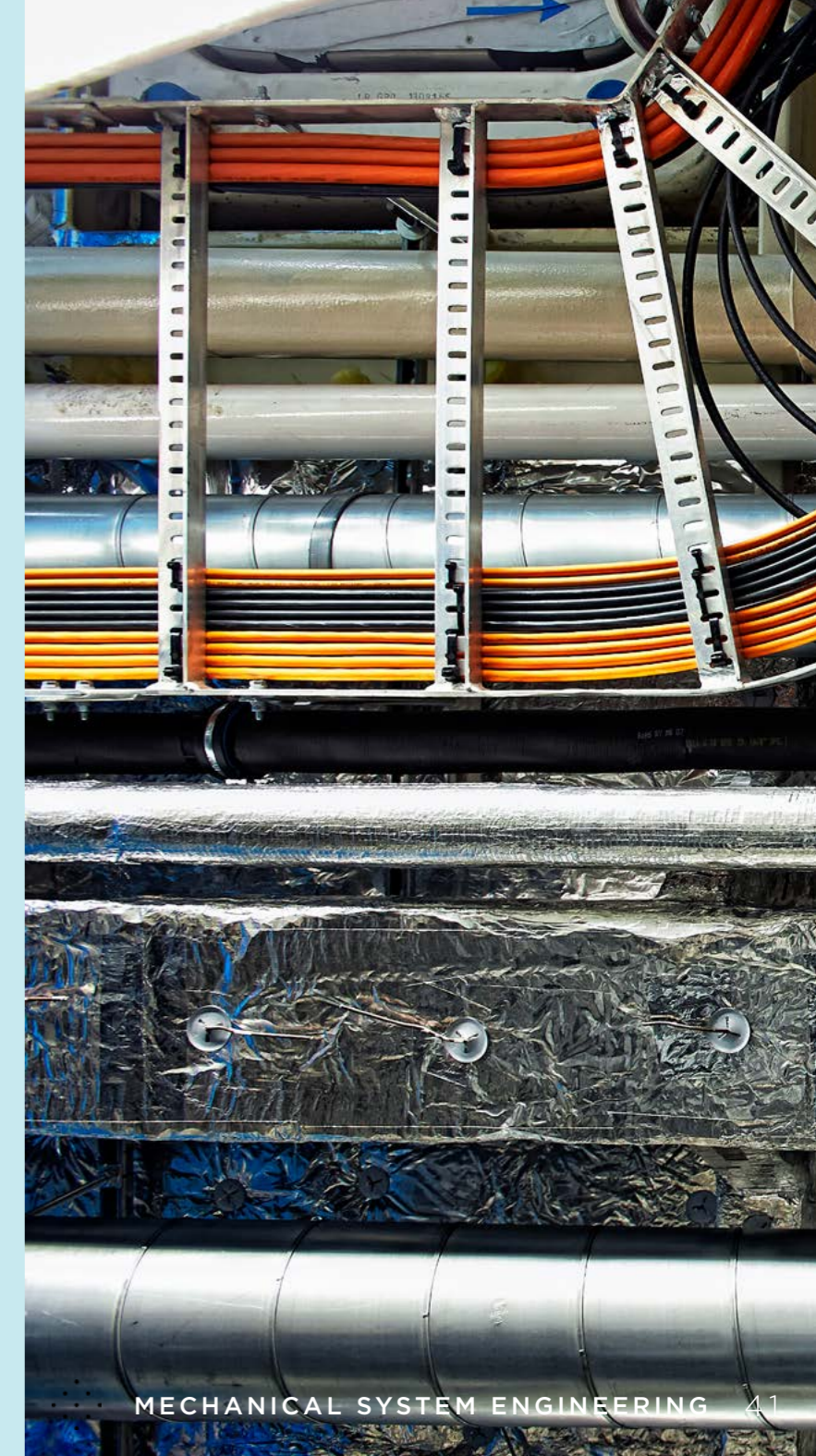
We undertake whole vessel engineering **from concept to detailed production design**

Simplicity

We believe that complex technology need not be arranged in a complex manner and we strive for **simplicity of design** where possible.

Integration

We integrate engineering across all disciplines assuring the most efficient use of space. We develop systems holistically to ensure spatial and energy efficiency.

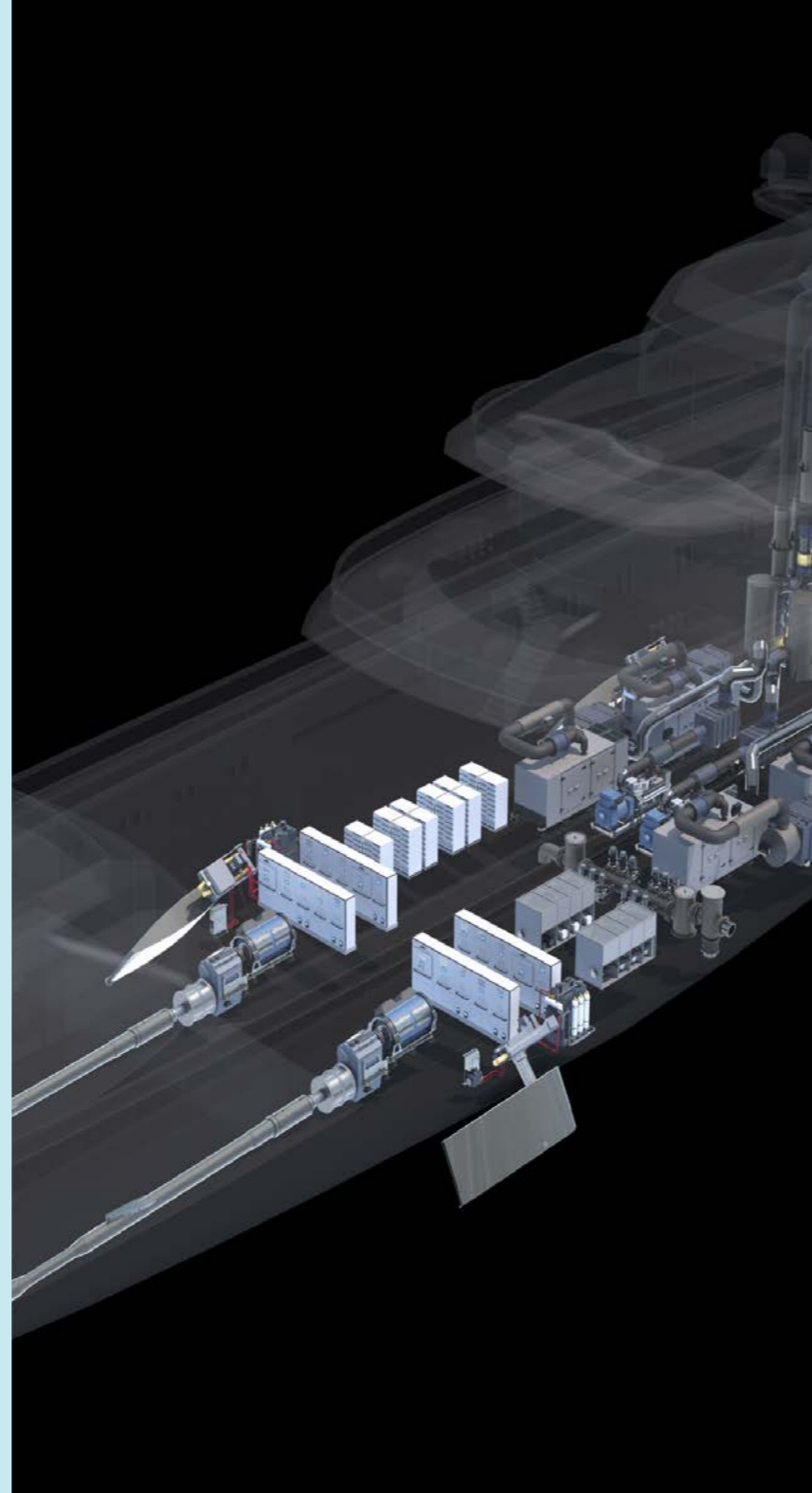


● Installation

We bring our extensive experience in production engineering to bear from inception, ensuring our designs are developed with a focus on **efficient** production and installation.

● Operation

We bring practical knowledge of in-service operation to ensure that our designs are **easy to operate** and service throughout their life.



Lateral has particular expertise in the design

of propulsion systems, where we keep pace with the rapidly expanding spectrum of new technologies and range of possible alternatives. **Our portfolio includes**

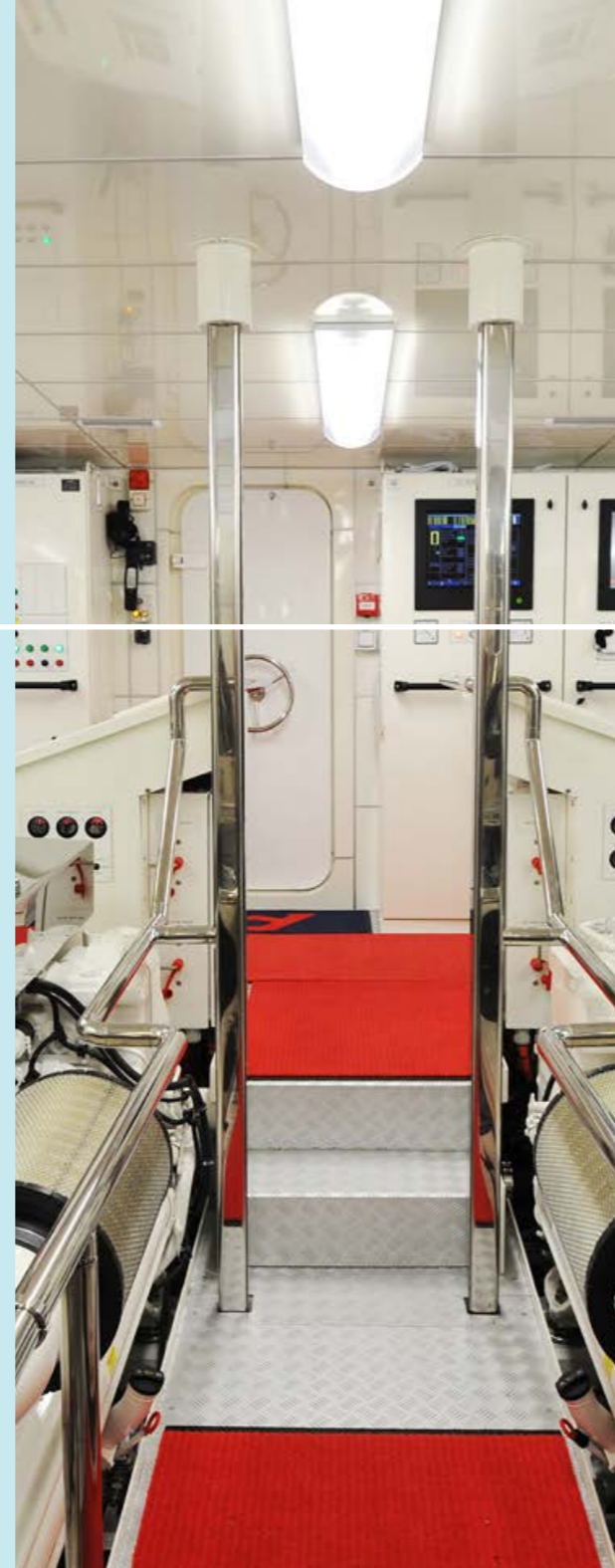
- Conventional Diesel Mechanical
- Diesel Electric
- Hybrid - Combined Diesel and/or Electric (CODAE/CODOE)
- Combined Gas and/or Diesel (COGAD/COGOD)
- Combined Diesel and Diesel (CODAD)
- Combined Gas and Gas (COGAG)
- Water jet and Prop/Jet Hybrid
- FPP and CPP Systems
- Podded Drive Systems
- Proprietary Novel Drive Systems



We can **guide the selection** and configuration

of the optimum propulsion system to achieve any range of required system performance criteria, be it efficiency, flexibility, noise and vibration or any combination of parameters.

Having worked with the industry's leading and most innovative suppliers we develop our designs with input from multiple stakeholders to deliver the most effective, best value and lowest risk design possible.



In **addition** to the development of main propulsion systems

and associated machinery space arrangements, **we plan and lay out all auxiliary machinery spaces:** from providing support and guidance to designers and stylists in early stage space planning to preparation of final spatial arrangements for production.



Lateral's capability covers development of the full suite

of auxiliary system schematics utilising either accepted standard system arrangement philosophy, or challenging the status quo through novel arrangements tailored for energy conservation, zero discharge, integration of new technology or to increase operational effectiveness, ease of maintenance and redundancy.



The breadth and depth of **experience within our team**

extends beyond desk-based design and engineering to providing build support during installation, commissioning assistance and in service consultancy.



DESIGNED BY **YACHT ISLAND DESIGN**



04
OUTFIT ENGINEERING

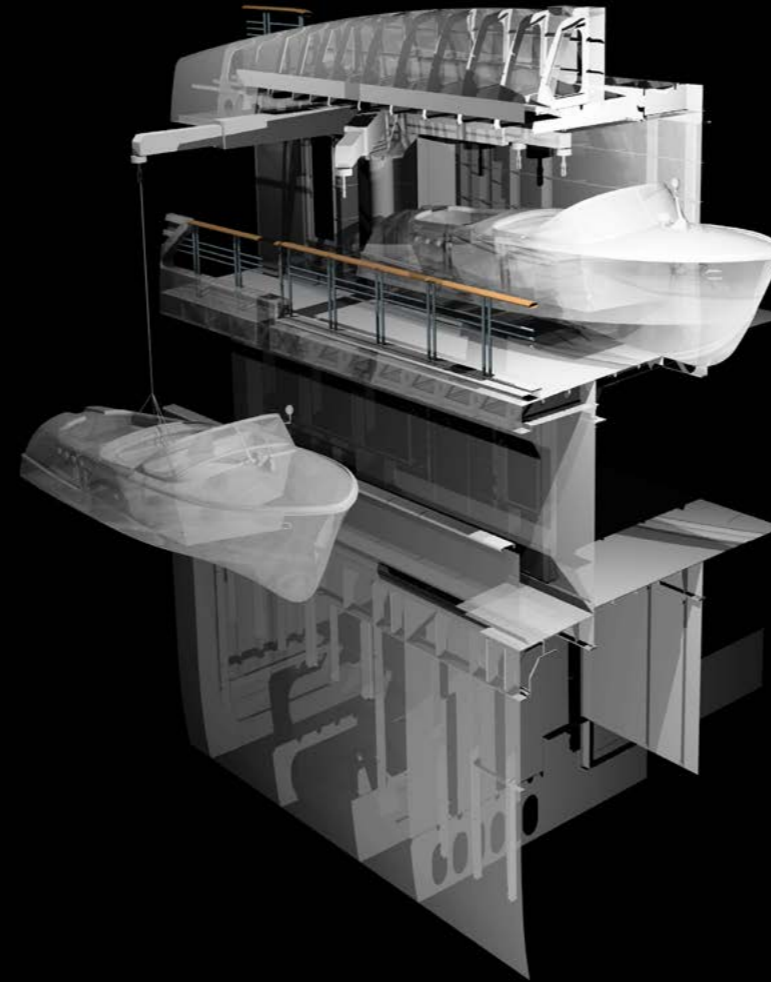
The **exterior outfit engineering** of a modern yacht

is a specialist domain demanding a high degree of multi-discipline experience, understanding of the yacht's overall aesthetic and style, as well as unfaltering attention to detail.

The overall **design vision**

created by the designer/stylist will incorporate a multitude of fine details, many of which must be embodied within the **visual appearance and integration** of the exterior outfit necessary for the safe and practical operation of the yacht.

To achieve this, items of equipment must either be hidden, customised / restyled, or be of a completely bespoke design.



- At Lateral **we work closely** with the designer

to understand the overall visual design intent and interface with the shipyard's nominated and preferred suppliers to assure integration with other disciplines, develop customised or bespoke equipment and ultimately achieve the aesthetic goals. This is done whilst ensuring practicality is maintained for production, operation and maintenance.

The scope of our work in this field **is diverse**

and typically ranges from feasibility studies for novel and complex features, detailed development of anchoring and mooring systems, concealment systems for lifeboats, life rafts, deck cranes and other ancillary equipment through to the fine production detailing for hand rails, window bonding systems and machinery ventilation louvers.



All such features can involve the **co-ordination of information**

from multiple subcontractors, influence other engineering facets as well as have regulatory consequences. Our multi-disciplinary team brings its breadth of knowledge, communication and design management skills together to ensure that a practical and integrated design is delivered.







05
CONCEPT DESIGN

- **Concept Design** is the embryonic stage of a yacht project

that crucial phase when designers, naval architects, builders, and engineers come together to lay the foundation for the owner's vision.



- **Lateral's** contribution during this phase

is to close the gap between what is conceivable and what is achievable, to provide innovative, yet practical and feasible engineering solutions without compromising concept intent.

We ask **new questions**

not only because we are inquisitive, but also because we realise that it's often the question that drives the answer.

By asking new questions and by **investigating** all angles,

Lateral gets to the core of daring design. Embracing challenges from designers, we apply insight and knowledge to turn a concept into a reality.

Lateral undertakes complete vessel **engineering**

from the early concept phase through to detailed production design. With our keen understanding of spatial, layout and arrangement requirements of all technical spaces, we direct our insight of the functional to the stylistic elements intended by the designer.

With our expertise in modern regulatory frameworks such as SOLAS, Red Ensign Group Codes (previously LY3 & PYC), MARPOL, Polar etc., we afford the designer minimum design restraint while maintaining compliance.





Is a battery powered yacht
feasible today?

Ask **new questions.**

DESIGNED BY **PININFARINA**





DESIGNED BY **SINOT YACHT ARCHITECTURE AND DESIGN**

Lateral fosters **innovation.**

When concept designs are based on new or novel technology, engineering and naval architecture, we bring our extensive experience from other marine markets to bear, allowing us to cross-fertilise ideas and technology.



06
CLASS LEVEL DESIGN

Having worked with all the major **Classification societies**


Lateral brings significant **depth of knowledge** in achieving full class approvals in the most efficient and effective manner.

With each society having its own particular nuances, we have the **insight required to engage** class in educated debate at the appropriate junctions to ensure that designs are not encumbered with redundant, heavy and expensive features.



When **designs do not fit** within an existing regulatory framework,

we ask new questions and derive new answers to achieve compliance based on equivalent levels of safety.



What if your mission is to
explore the World?

Ask **new questions**

When appropriate,
we integrate a **high level**

of production-ready detailing into our class level designs, enabling rapid progression into production engineering and ultimately saving the shipyard and client valuable time and cost.

Our team **devotes substantial resources** to monitoring and proactively

involving ourselves in the on-going development of the regulatory bodies such as SOLAS, MARPOL, Red Ensign Group Codes (previously LY3 & PYC), POLAR, and more. Each code has implications for design and build, each is complex, and in some instances, regulations are in conflict with others as new rules are cropping up.



As part of our monitoring process, **we maintain close links**

with the major classification societies and participate in numerous working groups to **stay ahead of anticipated future regulation.**

We undertake **carefully planned research** into the impact of new regulations, which enables us to have an intimate understanding ahead of actual implementation. Lateral makes this knowledge base available to its clients. Additionally, we openly share the results of our research with the wider industry.

The result of this focus is that Lateral has **exceptional depth of expertise**

in meeting the demands and requirements imposed by the wide spectrum of continually evolving and often confusing regulation.

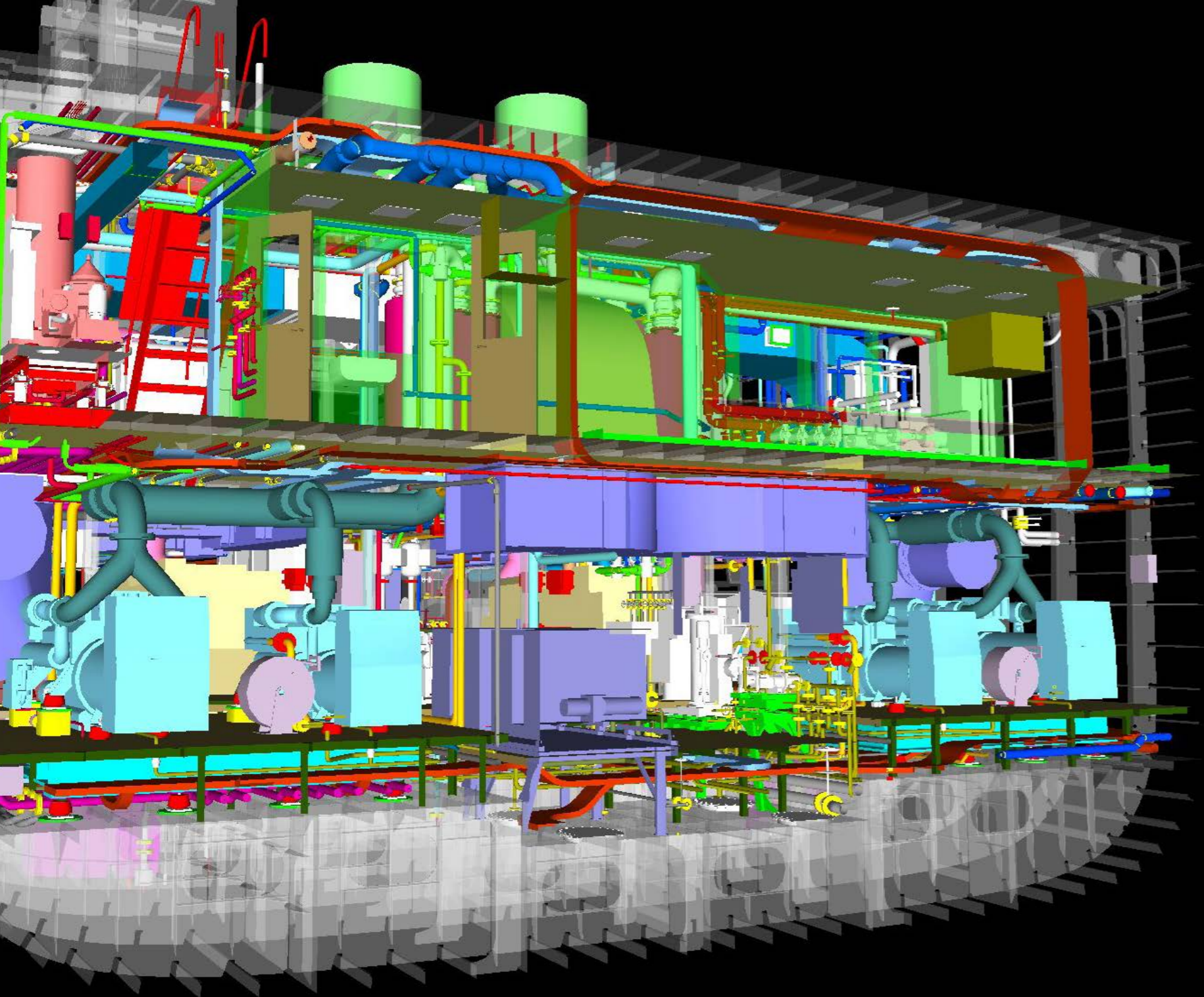
When coupled with our production-focused engineering, our continually **updated body of knowledge** enables us to offer single-source engineering for the development of pragmatic naval architecture, structural, mechanical and outfit design to meet the most exacting regulatory standards.



How does a North Sea solution apply to a superyacht?

Ask new questions.

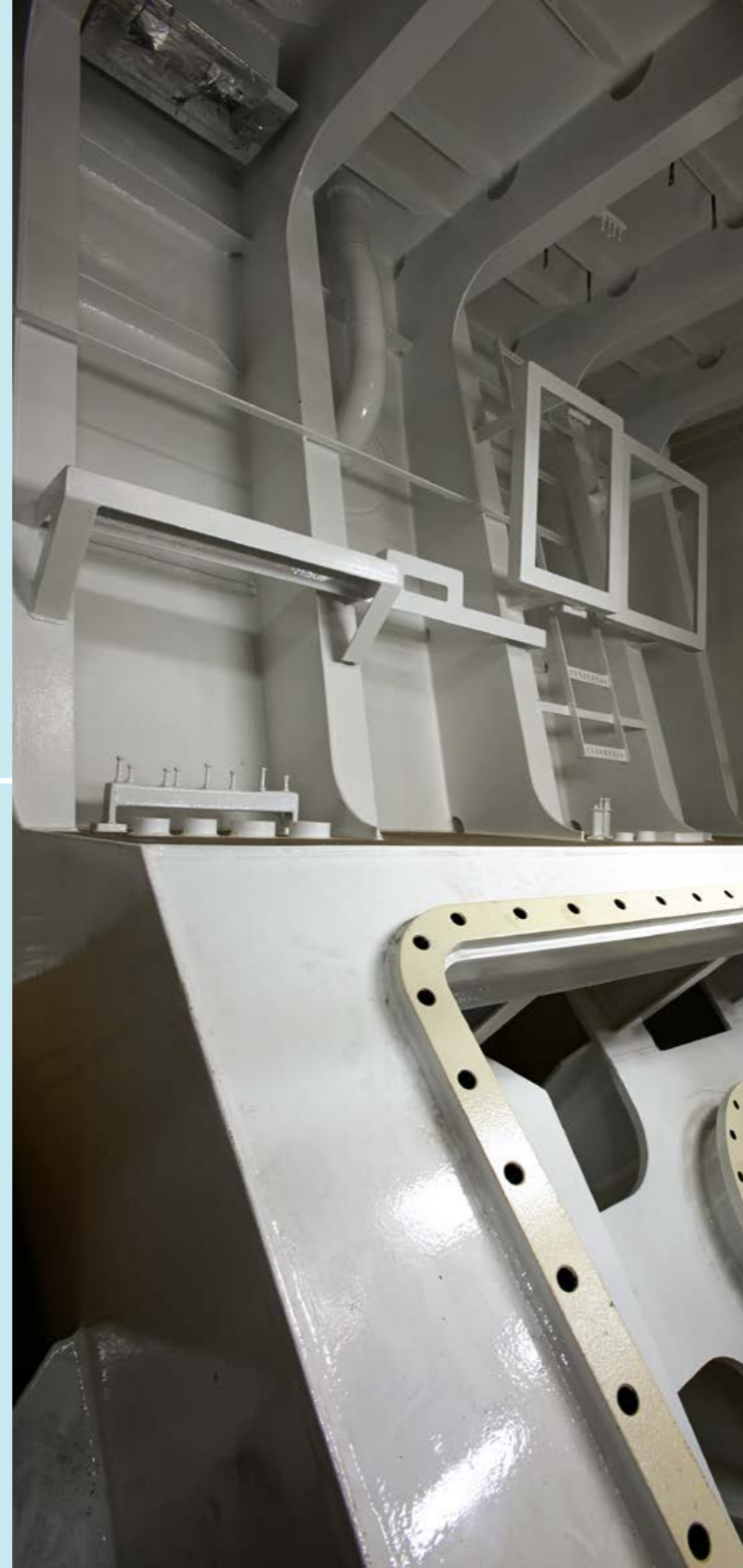




07
DETAIL DESIGN

Lateral offers a **comprehensive suite** of production engineering services.

We believe in developing intelligent production designs that are practical and production friendly. We incorporate a **high degree of detail**, ensuring greater efficiency through the full integration of engineering.



Large yachts are complex vessels with **highly integrated systems**.

To achieve our aims we use a structured yet flexible approach that is tailored to the specific needs of each project, shipyard and anticipated build schedule.

We believe that preparation is the key to success, whether detailing a design from our own office or one from a third party. The result is a series of key phases that underpin the **detail design process**:

Technical Review

Having an intimate understanding of the technical status of all aspects of a design before commencing production engineering is vital. When detailing third party designs, we undertake a full technical review of the plans provided; identifying areas of potential risk, design performance, non-compliance, best practice and clarity.

Working with the project team and the shipyard we focus on achieving a solid underpinning on which to begin the actual production work.



Build Strategy and Standards

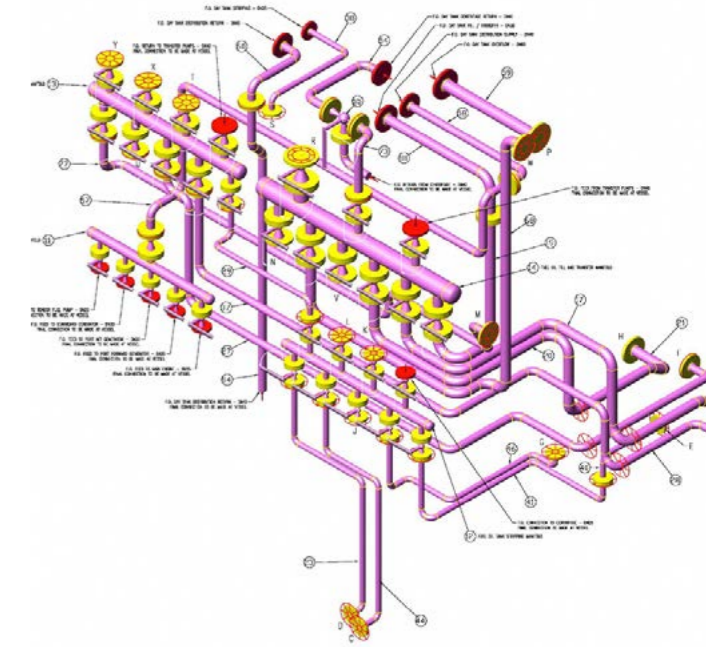
Lateral works closely with each shipyard to develop a clear understanding of their production facilities, standards, processes and philosophies, thereby ensuring that details employed in the design are **appropriately aligned**.

Where a **unitised construction process** is to be used we plan in detail with the shipyard appropriate unit breaks and construction sequencing that are optimised both for the yard's facilities and the yacht's arrangement.

Design Evolution

Turning a Class level design into one suitable to start production engineering can involve **significant levels of expertise**.

At Lateral we add significant value in this area by integrating the build strategy and standards, together with practical and construction- friendly details, within the design. This work is at the core of our expertise and lays the foundations for executing the production engineering.





Planning

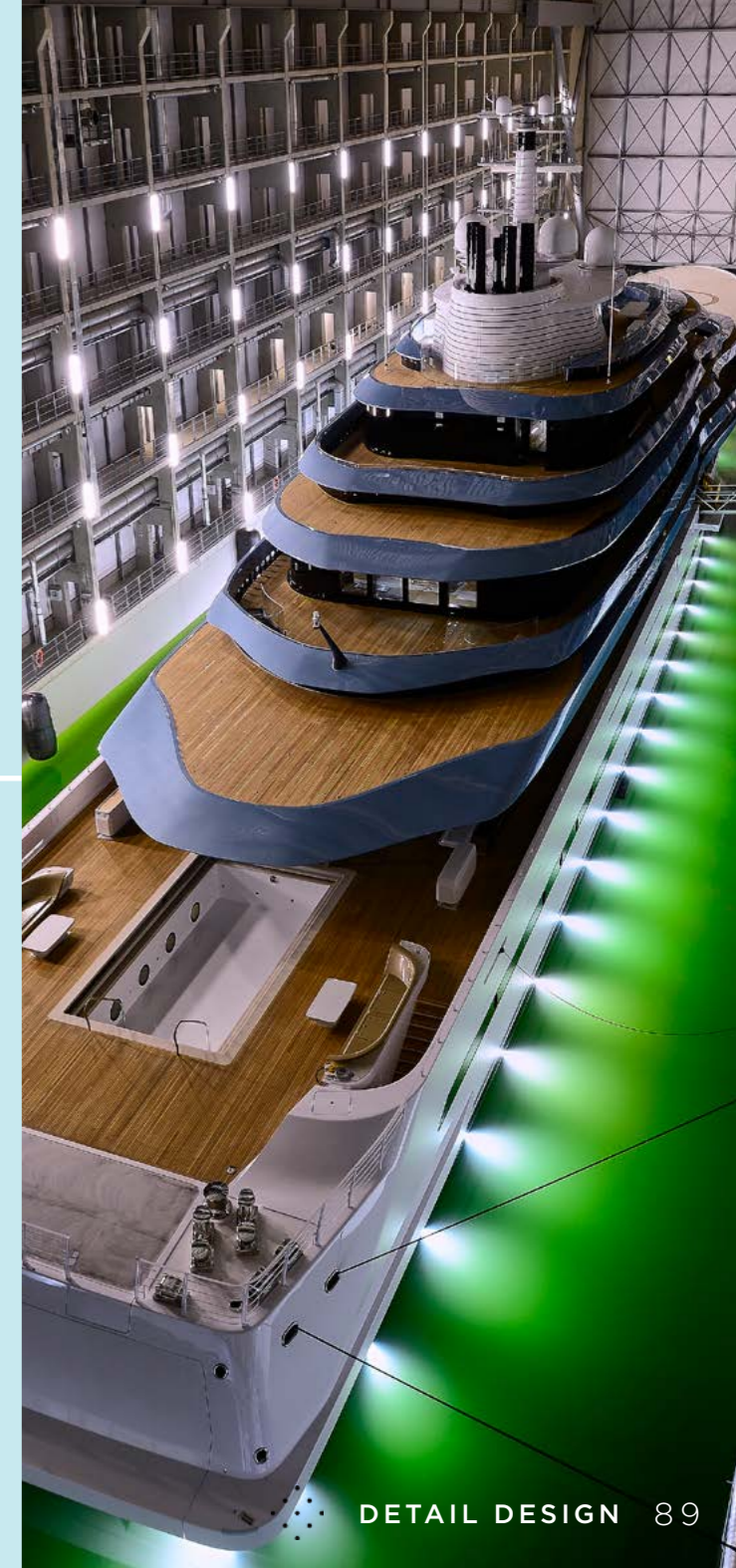
All of our preparation and the resulting engineering is encapsulated within a single cohesive plan, carefully managed in conjunction with the shipyard's master-build schedule, key milestones and resource constraints.

Concurrent to this **preparation** the process

of executing the engineering is initiated and coordinated using the software ShipConstructor, used in conjunction with other leading software applications. With these tools we produce the final production deliverables, followed up by comprehensive on-site technical support to the shipyard.

Our production **engineering capability**

linked with our experience in pre-contract design, class level design and technical build support enables us to offer **single-source engineering** responsibility for all naval architecture, structural, mechanical and outfit aspects of design, from concept to execution.





08
CONSULTANCY SERVICES

In addition to new build design and engineering

Lateral provides a wide range of **consultancy services.**



Owner's Technical Representative

Utilising our multi disciplined experience **we represent the client at every stage** of a project helping to protect the interests of the owner.

Plan Approval

With experience of all major classification societies and flag authorities, we offer a complete plan approval service ensuring that **projects are effectively managed** through the classification process and every engineering detail is appropriately scrutinised.

Structural Analysis and Audits

Our extensive skill in the design of marine structures enables us to offer a complete structural analysis, design and auditing service.

From load prediction and structural analysis to fatigue assessments; we work in steel, aluminium and advanced composites.

Motion Predictions and Stabilisation Studies

With a strong background in the design of hull forms that offer good seakeeping ability, we have the tools and knowledge to make accurate motion predictions and assess the impact of proposed motion control systems from roll fins to stabilisation tanks and T-Foils.

Machinery Retrofit Feasibility Studies

Lateral can act on behalf of our clients who wish to extend the capability of their existing vessel.

Whether improving motions through the retro fitting of fin stabilisers or improving manoeuvrability through fitting additional thrusters, we have the practical experience to ensure the correct machinery is selected and installed appropriately.

Weight Verification Studies and Monitoring

Members of our team have extensive background and experience in the design of lightweight high speed craft enabling us to lead in the design of lightweight vessels, which coupled with our comprehensive database of as-built weights, gives us the capability to engineer and verify minimum weight solutions.

Performance Predictions and Model Testing

Utilising our comprehensive model test database we are able to conduct performance predictions utilising proven data. Results can be further verified by algorithms developed in house whilst Computational Fluid Dynamics (CFD) analysis is available for optimisation studies.

Additionally, we offer a full range of model test support services covering resistance and propulsion, wake surveys, seakeeping and manoeuvring tests.



Proof of Concept Studies

Working from initial concept sketches, we have the ability to provide solid engineering foundations to any designer's concepts, allowing more accurate shipyard quotations and workable solutions from the early concept stage.



Energy Efficiency Studies

With soaring bunker prices, environmental legislation and social pressure, there is an increasing need to save energy and **strive for efficiency**. Employing skills from all engineering disciplines Lateral can evaluate every aspect of a yacht's design and operation to identify energy use and **set strategies for improvement**.

Factory Acceptance Trials

Accepting ownership of complex items of equipment can be a daunting task. Lateral can act on behalf of the yard, owners or suppliers to ensure that equipment meets its specification before leaving the factory.

Manoeuvring Simulations and Onboard Simulator

Lateral has been involved in developing the world's **leading state of the art** PC based ship manoeuvring simulator 'BMT PC Rembrandt' which is utilised to assess and optimise the manoeuvring and DP characteristics of new and existing designs.

Additionally, the tool is installed on board for real time manoeuvring simulation training by the yacht's crew.

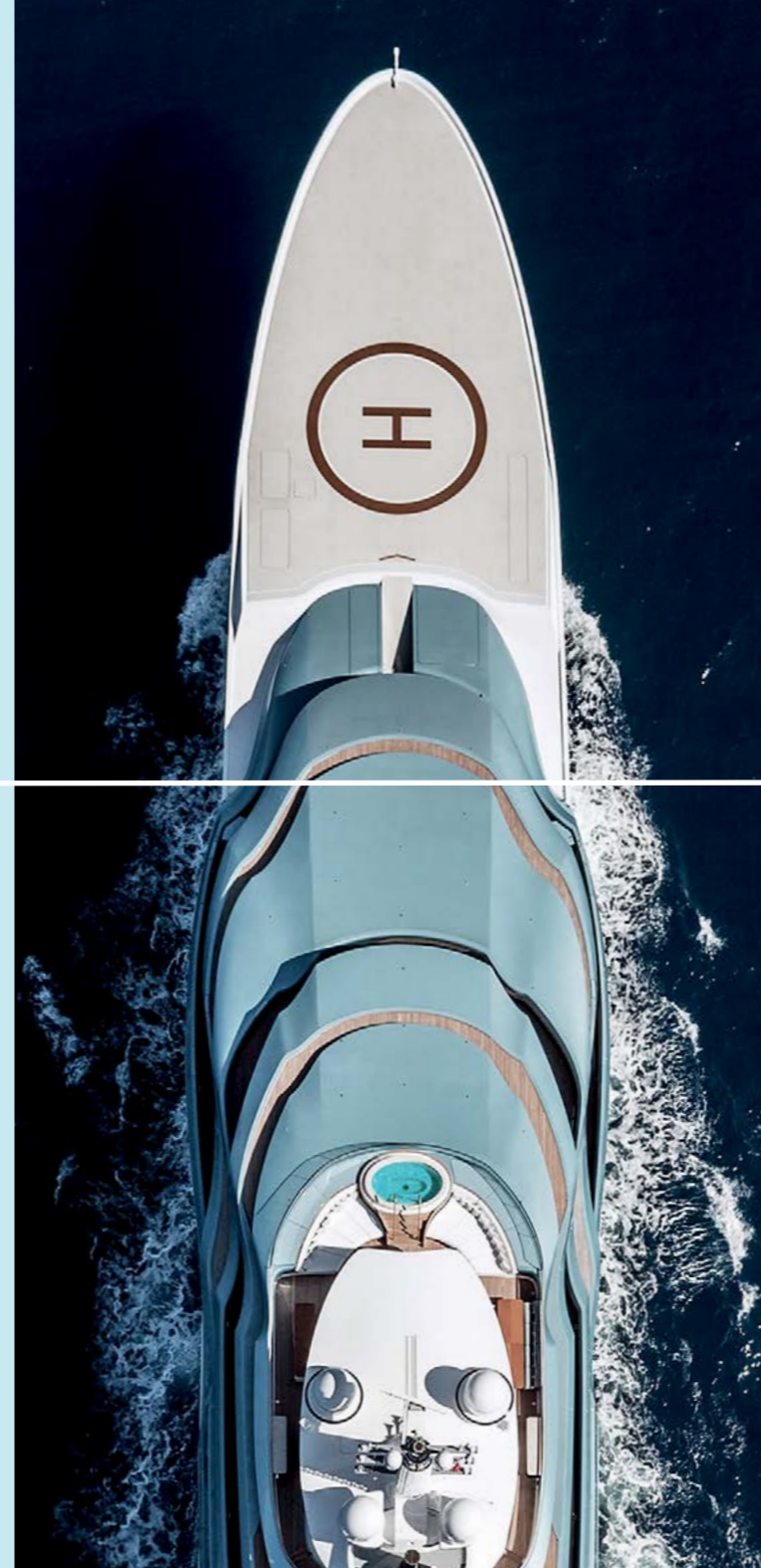


Inclining Experiments and Stability Books

Lateral provides a **comprehensive stability analysis** service, from preliminary intact/damaged analysis and optimisation of compartmentation, to the undertaking of inclining experiments and preparation of final onboard stability information.

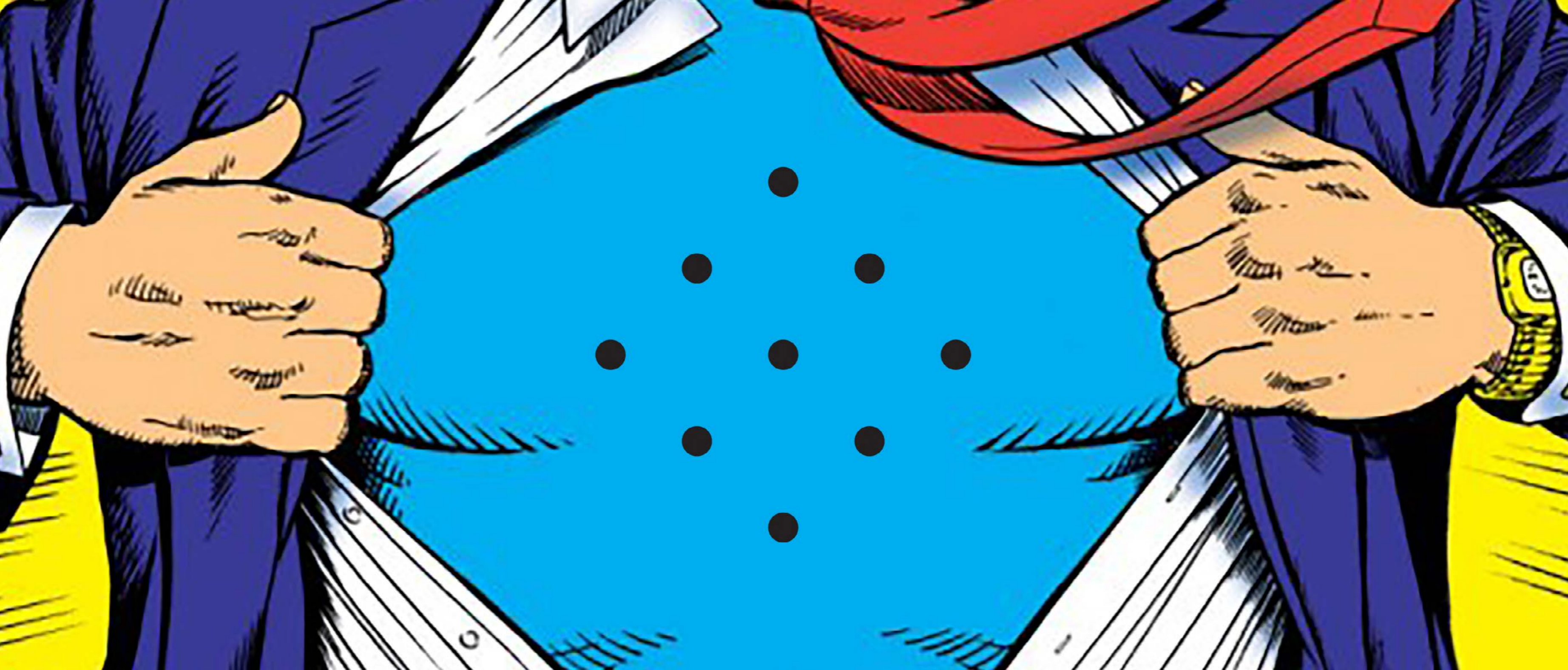
Wind Tunnel Testing

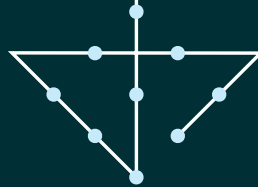
Lateral has direct access to three large wind tunnels undertaking a broad spectrum of **aerodynamic studies**.



Sea Trials

Conducting sea trials is a critical part of any project and Lateral can ensure these are conducted under the right conditions representing the interests of the yard, owner or machinery suppliers.





Engineering is a search for answers.
Innovation is a new answer to an old question.
L A T E R A L is an answer to a new question.
Ask **new questions.**

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WWW.LATERAL.ENGINEERING