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The technical magazine for those involved in the design, construction and refit of superyachts

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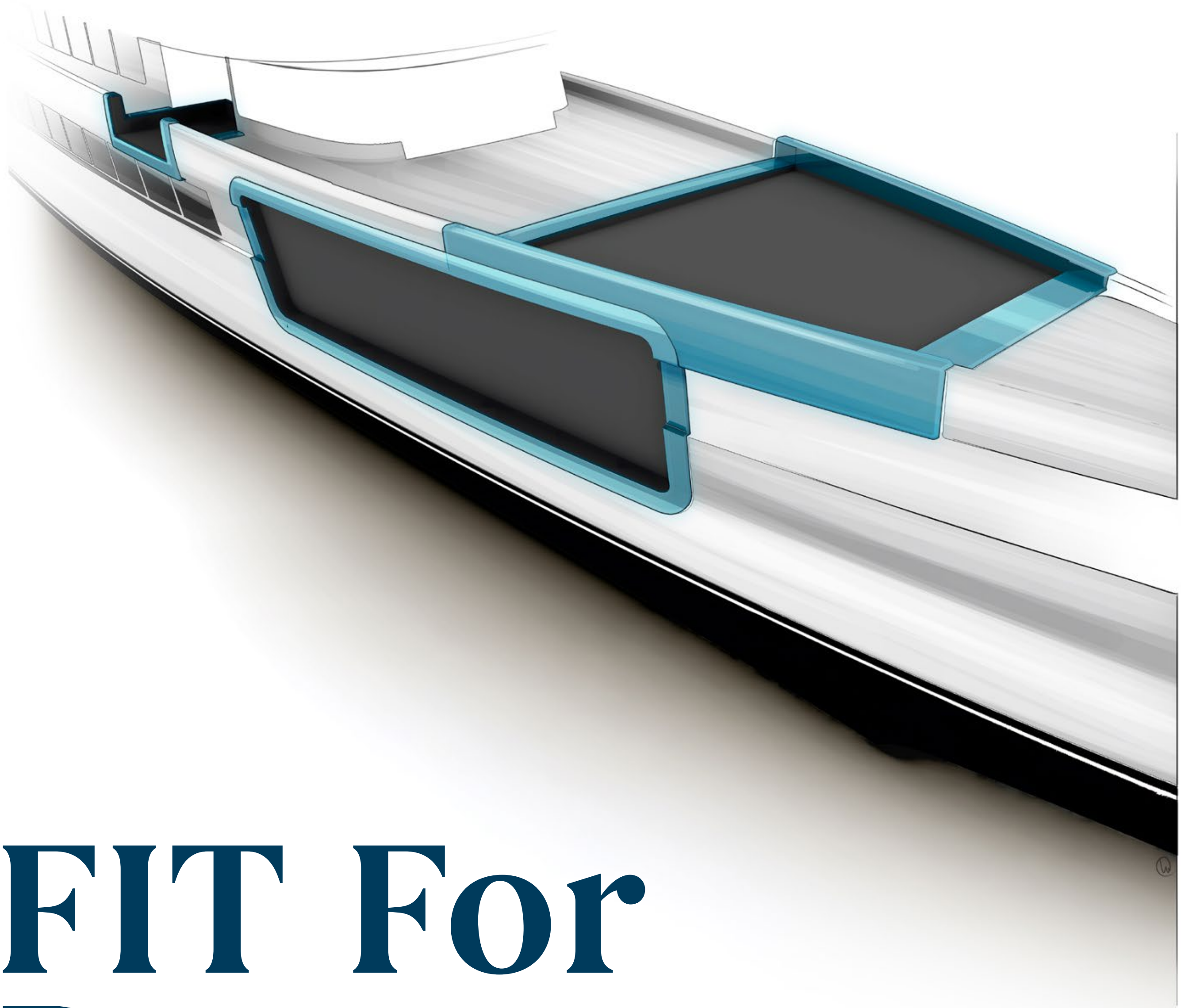


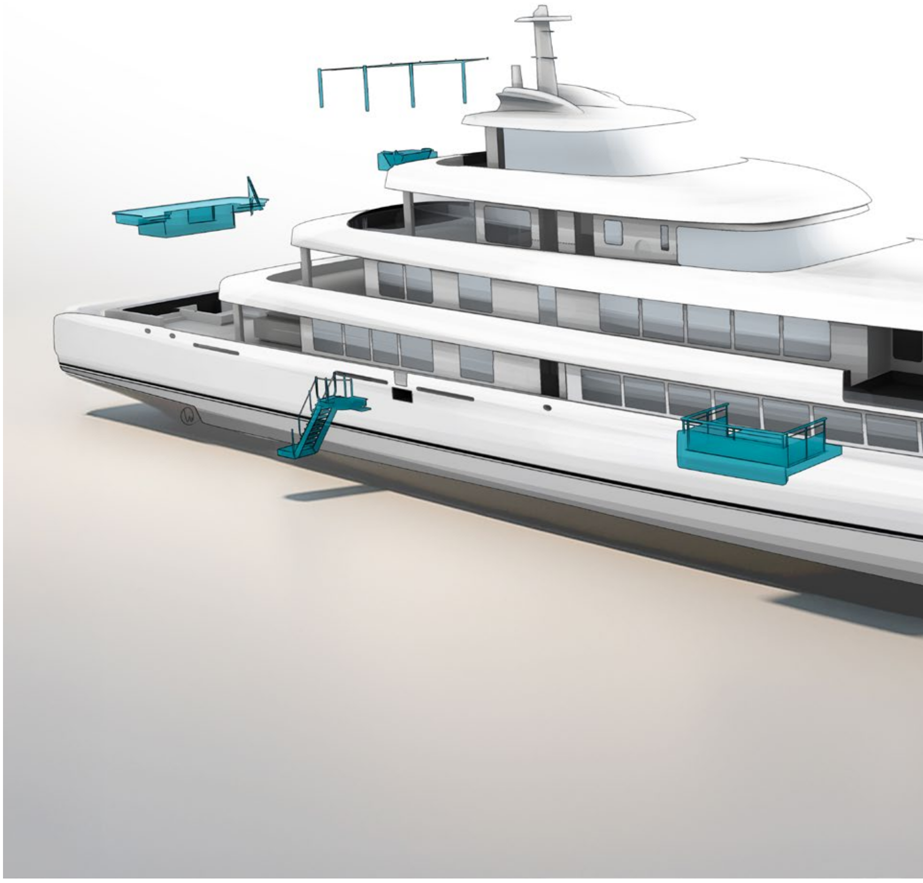
FIT For Purpose

Sea Level is a firm of naval architects and engineers based in Amsterdam specialising in what it calls ‘Feature Integration Technology‘ or FIT – devising tailor-made solutions to best implement custom features into the complex structures and systems of superyachts. Managing Director and partner Jeroen van der Knaap explains further.

BY JEROEN VAN DER KNAAP

Right: Integrating custom elements into the hull structure – garages, heli-decks, pools, boarding ladders, balconies –creates technical challenges that have to be resolved early in the design phase.

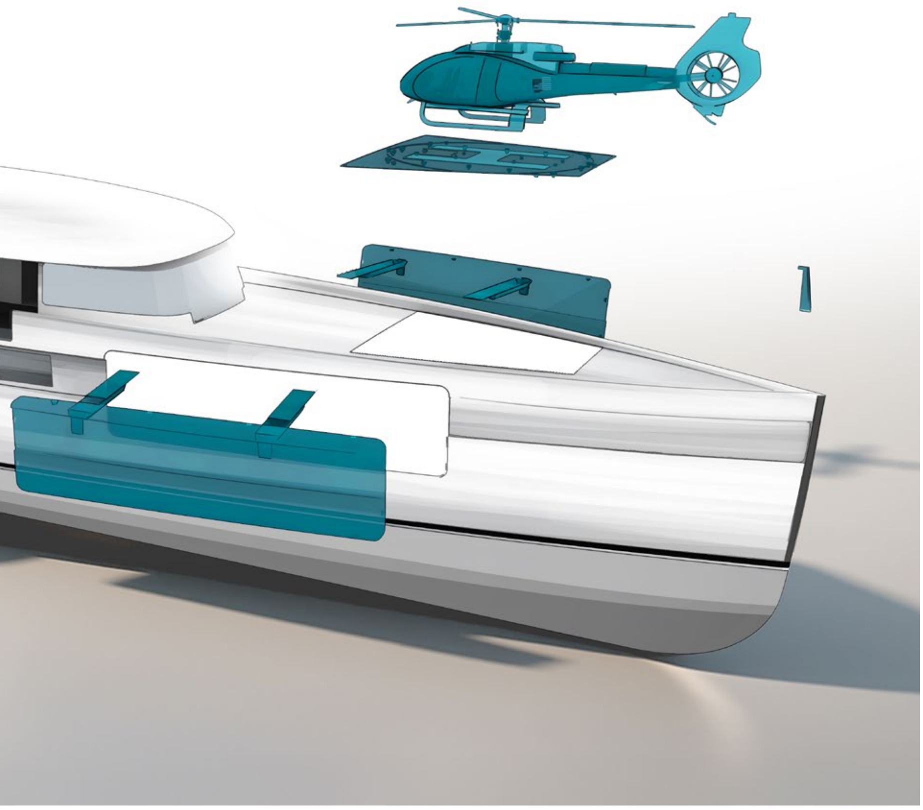
Jeroen van der Knaap



The superyacht industry is always on the move. While the sector is occasionally labelled as 'traditional', the trends we've seen over the years tell a story of dramatic change and innovation. Admittedly, these trends evolve a little more slowly than, say, in the automotive world. But that's hardly surprising, as it takes considerably more time to build a superyacht – especially a full-custom project – than to manufacture a luxury car.

It is equally clear that yacht designs are becoming increasingly complex. One key factor is the way we're constantly challenged to integrate ever more – and ever larger – tenders and toys on yachts. Whereas tenders once sat visibly on deck or neatly tucked into a superstructure recess, today they're expected to disappear into the yacht, hidden behind garage doors. And then there are the heli-decks, the pools with jet streams, multiple Jacuzzis spread across different decks, expansive beach clubs, private owner's balconies. All these amenities, and more, have become the norm.

Incorporating so many special features – and to get them right first time – requires focus and expertise throughout the development process. This is where Feature Integration Technology (FIT) comes in. But what exactly does FIT involve, and why is it so important to include it from the very start of a superyacht project?



SEA LEVEL (2)

SPECIAL FEATURES

Feature Integration is a specialisation focused on designing practical interfaces that allow intended features to be seamlessly incorporated into the yacht's structure in exactly the way they're meant to function. So what, exactly, is a special feature? They are the individual items on the owner's wish list, brought to life by the designer, which shape the overall onboard experience, enhancing enjoyment, comfort, usability and safety for owners and guests. Apart from tenders and toys, they include deck cranes, side terraces, folding bulwarks, passerelles, boarding ladders, provision doors/platforms, sun awnings, exterior showers, and tender handling systems.

Off-the-shelf in only a few cases, they mostly involve one-off solutions and even recurring features are likely to demand custom answers.

These bespoke features inevitably disrupt the organised, continuous structure of a large yacht, as each requires openings or penetrations to make room for installation. When drawing up a general arrangement, naval architects design the hull and develop the construction plan based on a set of structural calculations. This forms the backbone of the yacht – the keel, frames, web frames, girders, longitudinals, bulkheads, decks, and so on. Together with the shell plating, this framework represents a closed system that ensures the structural integrity of the vessel.

Integrating new elements into this framework creates technical challenges that have to be resolved. First and foremost, the structural integrity of the yacht must be maintained, which means solutions have to safeguard both strength and watertightness. It's crucial to address this as early as possible as both Class and Flag authorities need to give their approval before going ahead. Planning for local modifications also involves performing local strength calculations to ensure continuity in both structural strength and stiffness.

At this early stage, we also consider how the feature will connect to the ship's internal systems. What services need to be routed to it? Will electrical connections or hydraulics be required? How will the feature be installed – from the outside in, or the inside out? Will there be access for the installer?

Finally, we start thinking about accessibility during the design phase for service, maintenance, repairs and eventual replacement of components. For example, will the painters still be able to gain access once the yacht is built? This phase is also the right moment to consider how the crew will interact with the vessel later on. With this in mind, we carefully assess the functionality, handling, safety and logistics in relation to each feature. »

LOVE ME TENDER

Let's take the example of a tender garage on an 80-metre motoryacht. The tenders and toys are stored behind large shell doors and the crew must be able to roll them out to the edge of the deck, directly beneath the overhead cranes. Practical and safety considerations mean keeping the deck free of obstacles. Once the hull doors are open, the tender is hoisted out. This means it is crucial to know the tender's design right from the start, as the weight and centre of gravity determine the exact position of the lifting points.

Usually, there are only a few centimetres of overhead clearance in the garage. And if the tender garage is located forward, the crane tracks may need to run perpendicular to the ship's side shell, which misaligns with the ship's customary longitudinal and transverse structure. The overhead cranes must be positioned to function smoothly, which means the entire structure beneath the foredeck has to be able to accommodate them. The height of the crane rails is another balancing act: they need to be strong enough, but not so bulky they interfere with the garage ceiling and the hoisting clearance.

Naturally, the hull door must swing open far enough to allow the crane rails – and the hoisted tender – to move well clear of the yacht. We work closely with the yard and the owner's team to determine exactly how the tender is meant to reach the swim platform, where guests will be waiting, and how the craft will return to the tender garage afterwards. If this logistics flow requires any additional provisions, we can make arrangements to ensure everything functions as intended.

It is becoming increasingly common to have to accommodate as many as three different fuel types for tenders and toys: diesel, petrol and lithium-ion batteries (expect more as alternative fuels come online). This makes designing a tender garage arrangement even more complex, especially as rules and regulations in this area are still evolving. Increasingly we're required to include fireproof partition walls for proper separation.

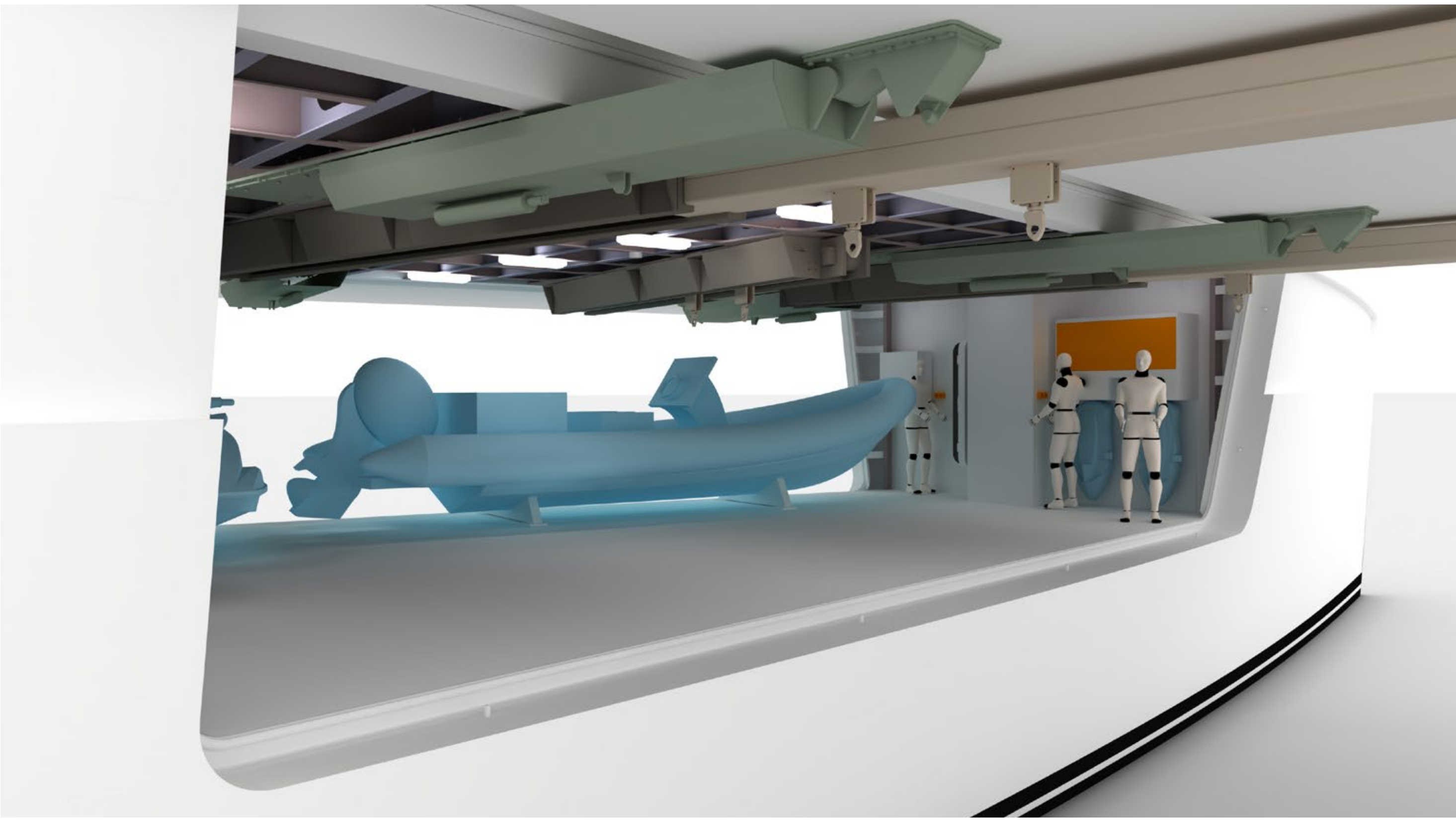
In this particular example, the tender garage is located in the bow, directly above the crew quarters. The escape route for the crew needs to run from the deck below the tender garage out to an external deck. In this case, that means the escape route must pass through the tender garage itself, which brings its own set of challenges and regulatory demands in terms of insulation and watertight integrity. To resolve this issue, we created a stairwell that runs through the tender garage, allowing the crew to move safely and securely from the lower deck to the foredeck. »

SEA LEVEL (3)

Left: There is usually only a few centimetres of overhead clearance in the tender garage.

Facing page, bottom: Bastiën Ligthart (right), Sea Level's founding partner and technical director. on site at the Leapher shipyard in the Netherlands.

Top: Functionality, safety, ergonomics and logistics all have to be integrated into the design.



First and foremost, structural integrity must be maintained, which means solutions have to safeguard both strength and watertightness.

FIT FOR REFIT

FIT applies both to new builds and refits. For the latter, we're often asked to get involved when deck cranes need to be adapted for lifting tenders or MOBs. When an owner asks for a bigger tender, for example, this typically means more weight and less room for crew when launching and retrieving. Furthermore, is a heavier-duty crane required? Does the deck structure need reinforcing and, if so, what will that entail? Will we have to start ripping out interior spaces?

We visualise the proposed setup and check feasibility from all angles. In addition, our database includes a wide range of deck cranes and simplified FIT models of tenders and toys, allowing us to test the new handling setup early on. We also assess the crane's lifting capacity (SWL, reach, etc.), its foundations and the existing ship structure. Should upgrades be needed, we propose the right modifications and handle potential communications with Class and Flag authorities to get plan approval before the work begins. In short, everything is geared towards avoiding hiccups and delays during construction.

LEADING BY LOOKING AHEAD

Every scenario – right down to drainage, lighting, and the exact placement of control panels – should be carefully analysed during the design phase. Input from captains is helpful at this stage, as they can provide insight into everyday use, functionality, safety, ergonomics and logistics. When designing something like a tender garage, we consult closely with the crew to determine the best locations for control panels, remotes and safety equipment. To help them make fast and well-informed decisions, we also create detailed 3D visualisations of the onboard situation that include sightlines and all relevant geometry of the yacht, tenders and toys, within a single model.

It is equally important that all disciplines involved in shaping the final design of the yacht engage in regular detailed consultations from the early stages of a project. While each discipline at the yard has its own responsibilities, integrating special features requires cross-disciplinary communication.

This is where FIT helps prevent costly surprises or hold-ups further along the line, making life easier for the yard. And last but certainly not least, it ensures that owners, guests and crew can enjoy a safe, comfortable and enjoyable onboard experience.