

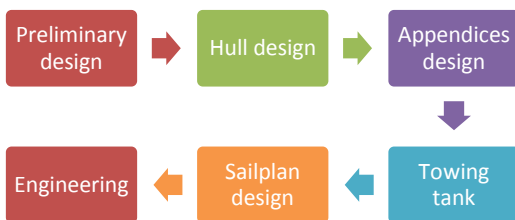


While the size of newly built yachts is constantly increasing, cost-effective production of high-performance vessels can be achieved by using virtual prototyping to assess alternative design solutions. Moreover, performance can be greatly enhanced by an integrated design approach that considers the mutual interaction among the various components of the boat through the automated integration of 3D design tools, FEM/FEA and CFD Rans tools.

SMAR Azure pioneers a **SMART DESIGN** approach to quickly develop and test alternative design configurations.

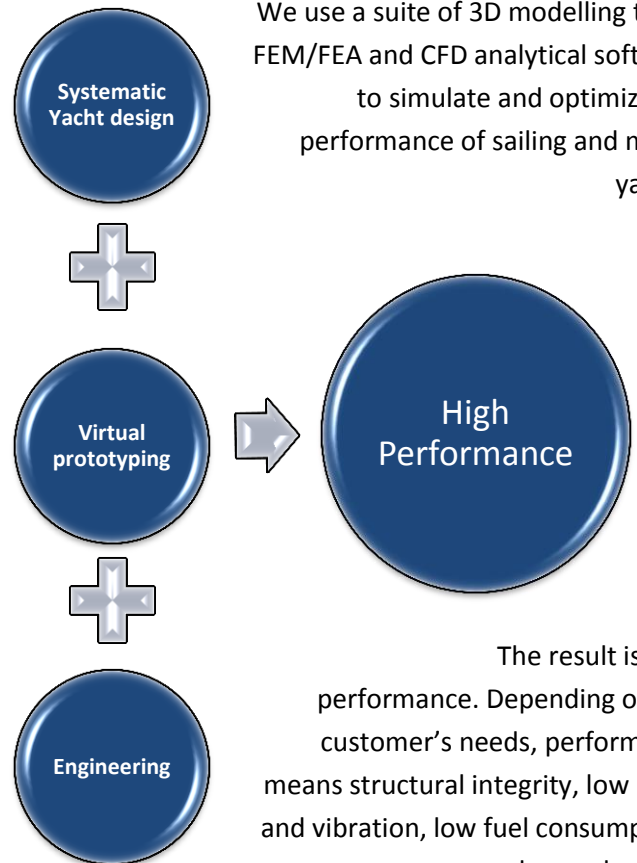
SMAR Azure offers expert professional services to help sail, rig and yacht designers move effortlessly through the phases of concept development, final design, and engineering. Our proprietary sail-rig-boat design technology is used in conjunction with MIDAS NFX (FEM/FEA) and advanced CFD-Ranse. Our R&D team has a proven track record in the design, aerodynamics, structural and aero elastic analysis of sailing yachts and their components.

Traditional design flow comprises the phases of *design-prototyping and testing* using towing tanks and wind tunnels.



Different components (hulls, sailplan, rig etc.) are normally designed and tested separately.

## SMART Design



We use a suite of 3D modelling tools, FEM/FEA and CFD analytical software to simulate and optimize the performance of sailing and motor yachts.

The result is high performance. Depending on the customer's needs, performance means structural integrity, low noise and vibration, low fuel consumption, speed or endurance.

SMAR Azure builds accurate virtual models by simulating performance under different conditions and quickly comparing multiple design alternatives in order to find optimal solutions before prototype construction. Expensive physical tests are only pursued to answer very specific and clearly defined questions.

## SMART design:

### Better

- Yachts are designed using an integrated approach
- Mutual influences are taken into full account
- Explore an unlimited number of alternatives
- Design flaws are identified and assessed in advance

### Faster

- Automated and serial simulation of alternative design configurations
- As a result, quick learning about what works and what doesn't
- Physical prototypes optimized before being tested

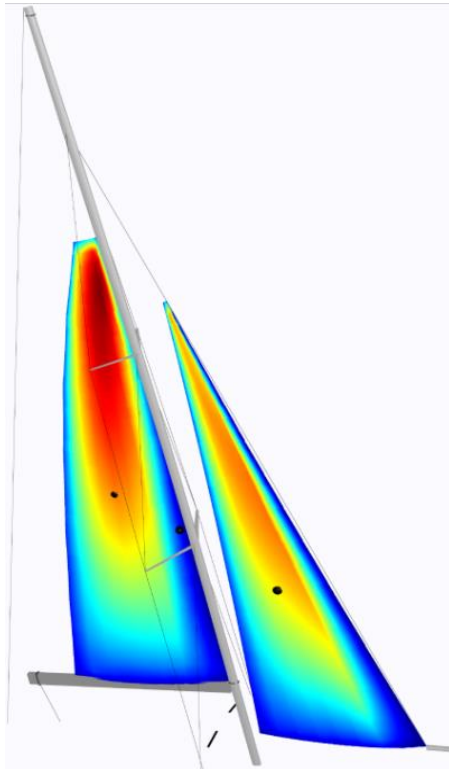
### Lower-Cost

- CPU usage main cost item
- Yet, the ever increasing computing power means that simulations procedures are becoming faster and cheaper
- The number of expensive prototypes is greatly reduced

## OUR SERVICES AT A GLANCE

### Rig and Sail-Plan Design

Optimal sail-plans and rig-plans are developed through an automated evaluation of sail coefficients in a variety of sailing/trimming conditions and by varying the sail's geometry.



### Sail & Fiber Layout Optimization

Using our integrated sail design and analysis technology, optimal sail shapes can be achieved in both upwind and downwind conditions. What is even more, our engineers design fiber layouts that are light, flexible and capable of holding the desired shape.

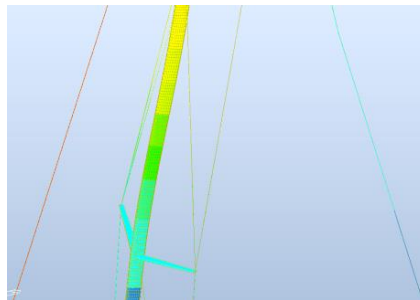
### Boat Performance Analysis

SMAR Azure can provide yacht designers with the matrices of the sail's coefficients ready to be used by commercial and custom Velocity Prediction Programs

### Rig Analysis

Taking into account dock tuning conditions and sailing loads on rigs, SMAR Azure can measure:

- Rig global strength, by assessing:
  - Strength of running and standing rigging
  - Stress in the mast tube
- Chain-plates loads
- Rig Natural Frequencies



If needed, SMAR Azure can also:

- Analyse the impact of dynamic loads, including compliance with the RINA guidelines for Sailing Rigs certification, under MCA LY3 code;
- Design and analyse Gaff rig and Multi-mast rig configurations

### Shaft Alignment

The propulsion shaft of a ship transfers engine power to the propeller. Several bearings support the shaft and connect it to the hull structure.

The loads applied on the shaft beam are:

- Hydrodynamic forces and moments produced by the propeller
  - Weight of the propeller and shaft
- FEM/FEA of the shaft calculates its linear and angular deformations in order to avoid shaft misalignment.

### Yacht Fluid-Structural Interaction

Accurate **CFD** calculation of the hydro/aero forces acting on yachts and relative deformation, via advanced structural (**FEA**) and fluid-structural analysis (**FSI**).

The result is high performance, which could mean structural integrity, low noise, low fuel consumption, speed or endurance, depending on the customer needs.



### About SMAR Azure Ltd

**UK-based** and founded over 10 years ago by Dr Sabrina Malpede and Dr Alessandro Rosiello, SMAR Azure has grown substantially over the years in terms of its team of dedicated professionals, yachting-specific technology and product portfolio. Our R&D team comprises three **expert software developers** and three **specialists in CFD and FEM/FEA**. Our products and services have been chosen by **over 200 clients in 28 countries** and across various segments of the marine industry

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