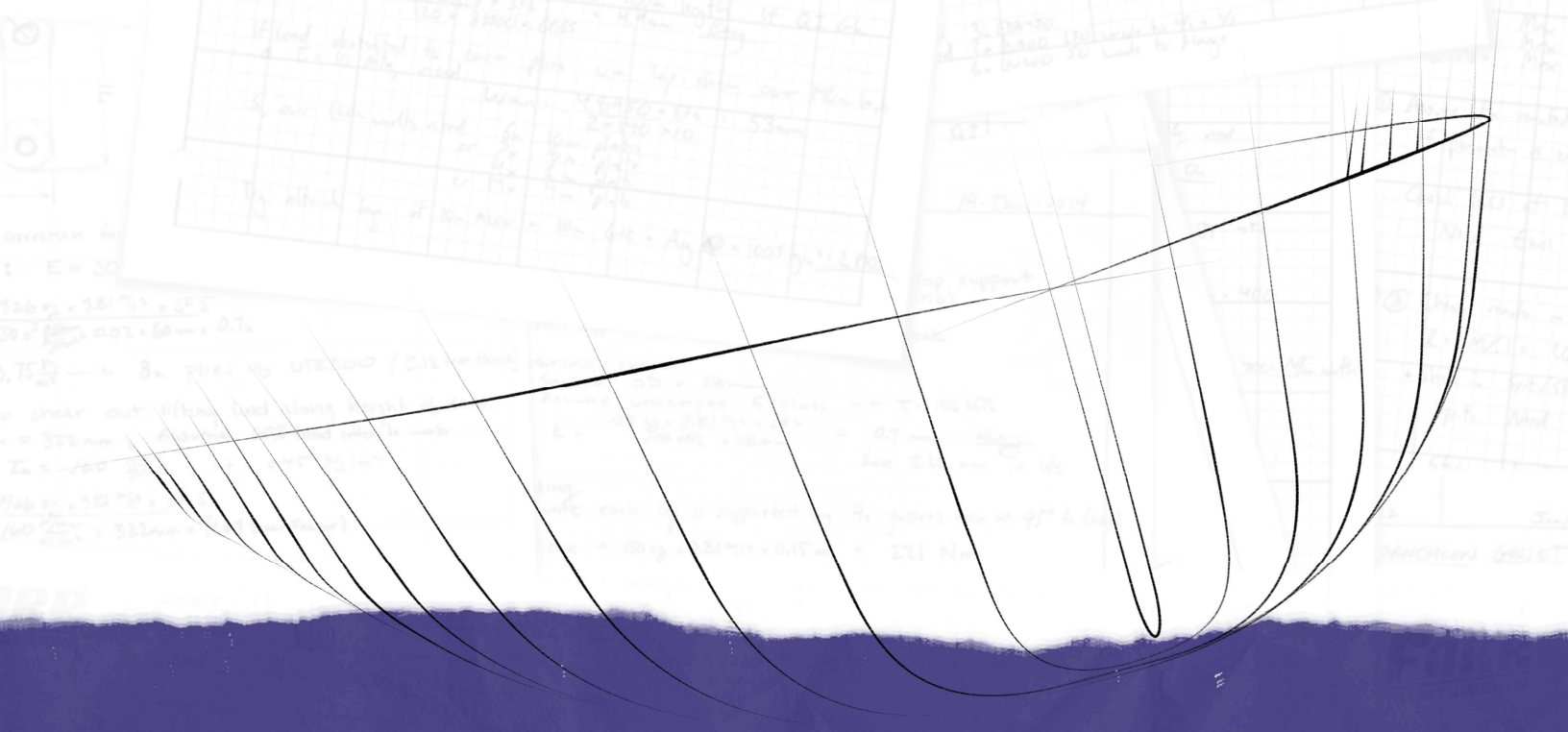
# X2



FARR®
YACHT DESIGN

30 ft. DOUBLE HANDED RACING YACHT

**Designer Comments**

# #857 – Farr X2
# 30ft Double Handed Racing Yacht

## Introduction

With the surge in interest in double handed sailing around the world coupled with the new "normal" of COVID related social distancing we see great potential for a next generation of 30ft offshore racing yacht. After months of design and detailed interviews and discussions with sailors around the world we are proud to present the new Farr X2 for your consideration.

This design embodies Farr Yacht Design's deep understanding of race winning crewed, single and double handed offshore racing yachts, and our many years producing high level grand-prix and production racer and cruiser designs. The Farr X2 is the product of extensive design development utilizing the most advanced design toolset in the world, including FYD's proprietary IDEOS platform. The design is positioned to provide exceptional performance in a wide range of conditions; able to perform in both the toughest offshore races and weekend club races all while being rewarding to sail by both Corinthian crews and professionals.

At 30 feet the Farr X2 is designed to provide exceptional performance at an affordable price point. The boat is constructed from vacuum consolidated vinylester/E-glass with PVC foam cores and engineered to be robust enough for the most demanding offshore races in the world. The sail plan, deck layout and interior have all been optimized for short-handed sailing; ergonomically designed to maximize crew efficiency in maneuvers and sail changes while keeping the Farr DNA of a beautifully balanced helm and dynamic sailing experience.

## Background

Double handed racing has had a large presence in the European racing market with class in the Fastnet and Middle Sea Races, the Trans Quadra and other high profile events. The recent addition of the mixed offshore racing class for the 2024 Olympics has brought a new level of focus on this type of racing and we are seeing more and more double handed events added in the United States and throughout Australasia.

A diverse range of boats compete in this space, typically around 30 – 35' feet in length and with IRC ratings around 1.07. Some of the European production manufacturers have produced ~ Cruiser/Racer style boats in this size range that provide more cruising amenities and fit-out but resulting in substantially heavier total weight albeit with a lower IRC rating. In reviewing the market we feel there is a growing need for a boat that is performance focused. Rather than sacrifice performance for the expense and weight of more internal fit-out we have focused our energies on a high performance solution driven around speed and racing functionality for shorthanded offshore sailing. This will of course increase handicaps in IRC but our analysis and experience in high performance one design classes (Farr 30, Farr 40, Farr 280) makes it clear that the Farr X2 can easily sail to her rating.

## 30ft Double Handed Racing Yacht

## Farr X2 Principal Characteristics

| | |
|---|---|
| **Length Hull** | 9.2 m / 30'1" |
| **LOA** | 10.8 m / 35'4 " |
| **Beam** | 3.15 m / 10'3" |
| **Draft** | 2.1 m / 6'8" |
| **Displacement [Measurement]** | 2,500 kg / 5,512lbs |
| **Ballast** | 1000 kg / 2,205lbs |
| **Water Ballast** | 250L |
| **Hull/Deck Construction** | Vacuum Consolidated E-Glass /Vinylester / PVC Core |
| **ISO Category** | A-4, B-6 |
| **Motor** | Volvo Penta D1 - 13 |
| | |
| **Headsail Area** | 26.6 m2 / 307 ft^2 |
| **Mainsail Area** | 34.0 m2 / 366 ft^2 |
| **Asymmetric Spinnaker** | 105.0 m2 / 1130 ft^2 |
| **Code 0 Area** | 49.0 m2 / 612 ft^2 |
| | |
| **Projected IRC TCC** | 1.075 |

## Hull Form

To be an all-around performer the Farr X2 is built upon a very low drag hull form that can be driven efficiently by a reasonable sail plan even in light air but has sufficient form stability and ballast ratio to achieve exceptional performance in moderate to strong breezes. The hull form is developed from FYD's race boat development projects and draws on lessons from the extensive computational fluid dynamics studies we have undertaken.

The hull shape maximizes its effective length relative to its rating without adding extra drag at low speeds. This is reflected in the long forward overhang and aggressive shaping of the knuckle act to make the boat's rated length as short as possible, while engaging as effective waterline length once crew is aboard and the boat is underway. The hull features a narrow beam waterline and low wetted surface underbody shape.

In developing this design we explored a range of hull styles including full "scow" hull forms. The scow style works very well in races with large reaching and running components but can suffer significantly in light air and in upwind conditions with a sea way. Our objective with the X2 is to develop a hull form that can be competitive across as wide a range of conditions and we have stepped back from the scow with a finer bow entry but still with sufficient fore-body volume to provide dynamic lift at speed and without inducing a significant added resistance penalty in waves.

In short handed sailing the crew weight contribution boat trim and stability is limited compared to a full crew. Reflecting this we have focused on developing a hull that will automatically respond with favorable trim characteristics as boat speeds increase.

When sailing in short-handed mode the boat utilizes 250L of water ballast per side to provide additional righting moment. The tank location has been carefully tailored to maximize its stability contributions without providing adverse trim characteristics.

The hull incorporates a number of signature aesthetic features that give the boat a unique character. The reversed stem, topside chamfer and convex sheer line result in a sleek profile that gives the impression of forward speed even at rest and draw comparison to FYD's other high level Grand Prix designs. Forward of maximum beam the chamfer feature arcs aggressively down to the lower stem to reduce windage as well as visual heft of the forward topsides. The lower edge of the chamfer feature then creates an interesting break in hull reflections and also works well in concert with the deck features.

## Sail plan

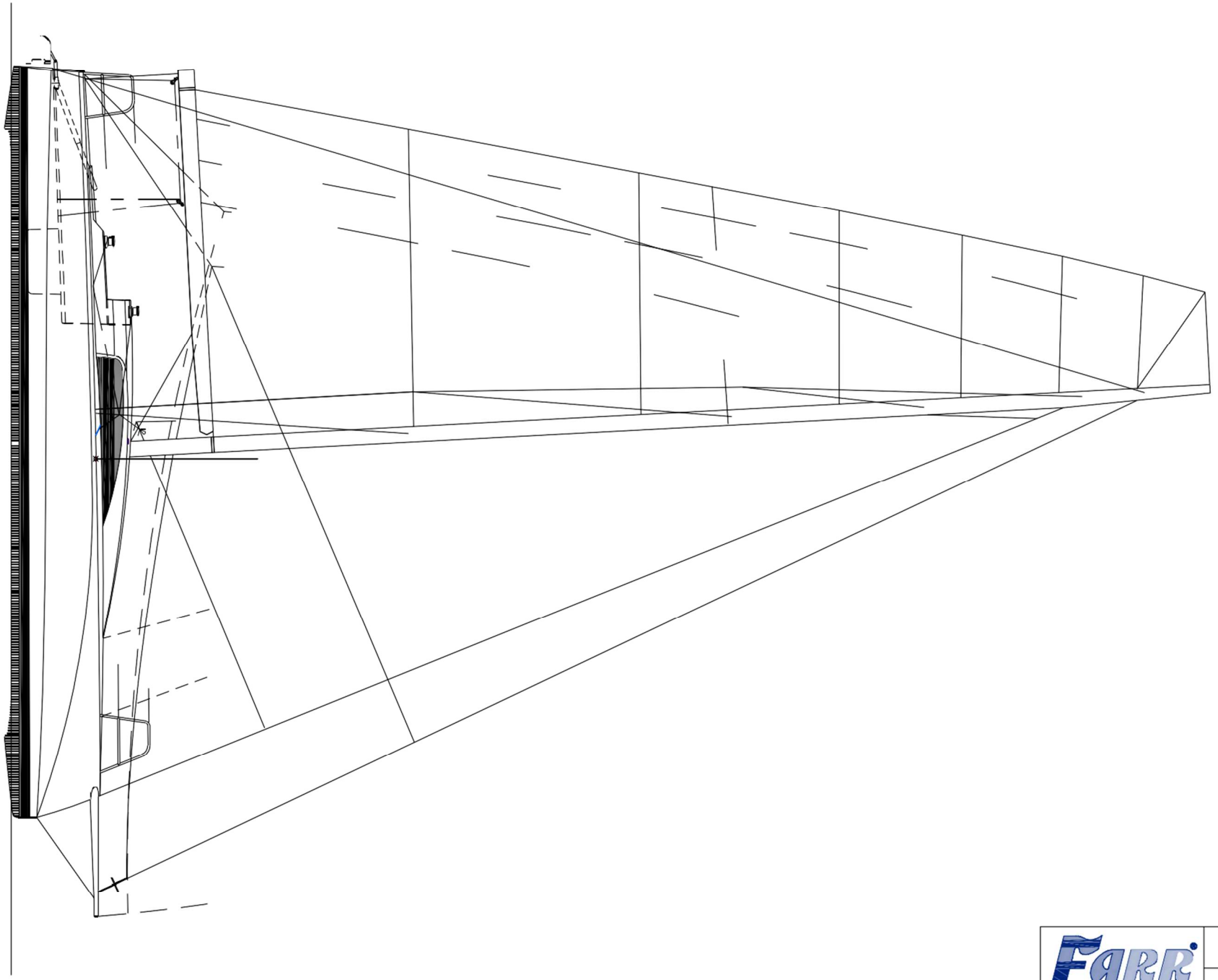
The sail plan proportions have been developed to provide sufficient light air performance and dynamic acceleration without incurring an excessive rating penalty under the major handicap systems. The deck-stepped mast is positioned well aft to maximize the fore triangle area and allow for the efficient use of staysails and double headed reaching sail plans. Foresails are on furlers to allow efficient sail power changes when short-handed. The selected dimensions are appropriate for all around sailing incorporating twin topmast running backstays and a modern efficient square headed mainsail. The rig reflects a 2 spreader layout carbon fiber rig with 23 degree swept spreaders and a cathedral stay arrangement. Mast tube construction utilizes intermediate modulus carbon, while the standing rigging is dyform wire. The boat features a generous gennaker flown from a fixed bowsprit and a separate Code 0 tack and hoist to permit efficient sail changes when short-handed. Option for a gennaker sheet outrigger is made for races where permitted.

## Deck Geometry and Layout

With a focus on shorthanded offshore ability we have focused on developing a deck layout that is flexible and ergonomic. The deck house geometry is designed to deflect green water away from the cockpit while the cockpit coaming design is tailored to keep the crew above the deck and away from green water. The scalloped shaped deckhouse permits the use of transverse jib tracks for most angles with in-haulers utilized for tight upwind work to reduce sheeting angles. With a focus on crew protection we have opted for a sheltered companionway with overhang that provides some shelter for the crew on deck in wet conditions.

Deck hardware placement has been designed to insure that all core controls are at hand when shorthanded. Care has been taken to allow for multiple cross sheeting arrangements using the 4 winches. The water ballast scoop/drain and transfer controls are all actuated on deck without requiring someone to go below.

A central cockpit locker is included and sized for life-raft stowage and rapid deployment.



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X2 by FARR

PRO/UO SA/L FL' A/V



DESIGN #: 857

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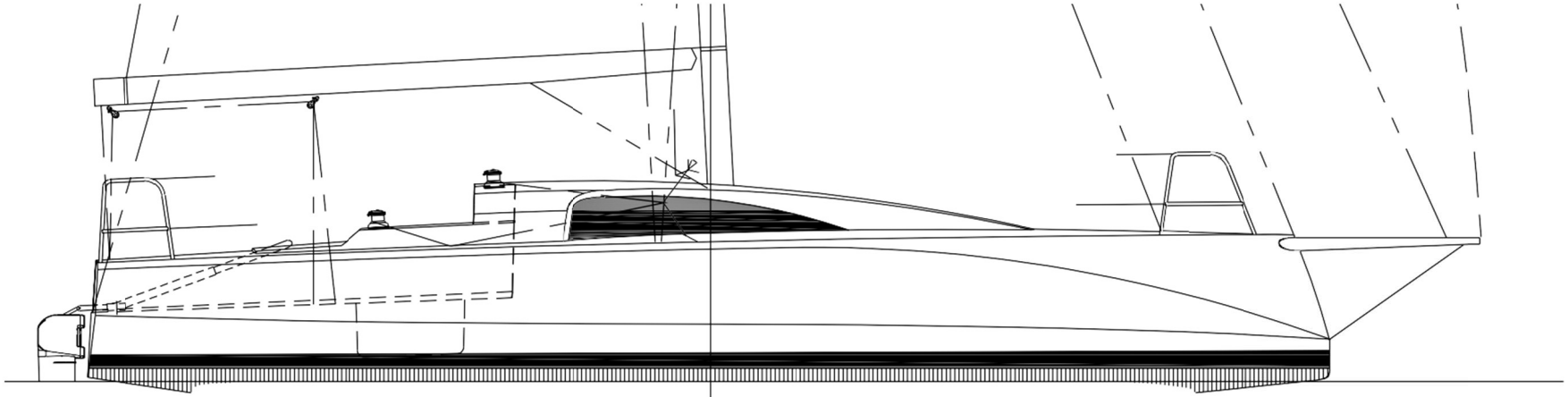

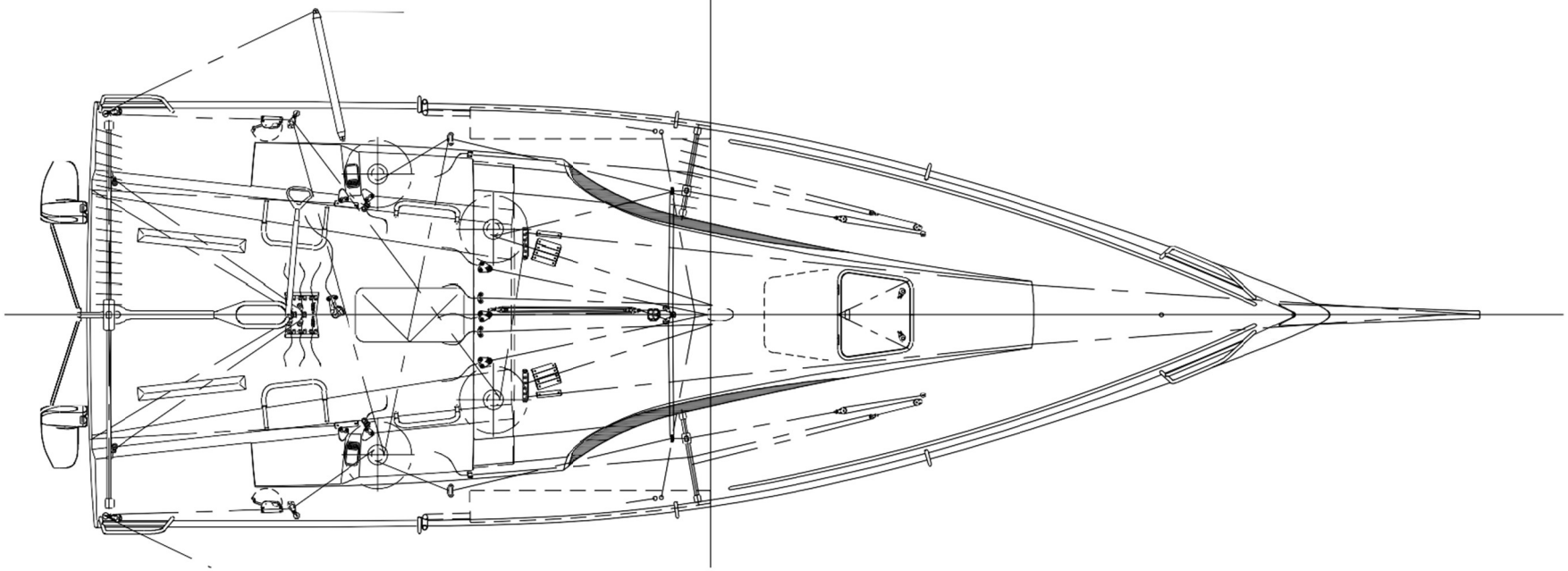

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PROMO DECK LAYOUT

| | | | |
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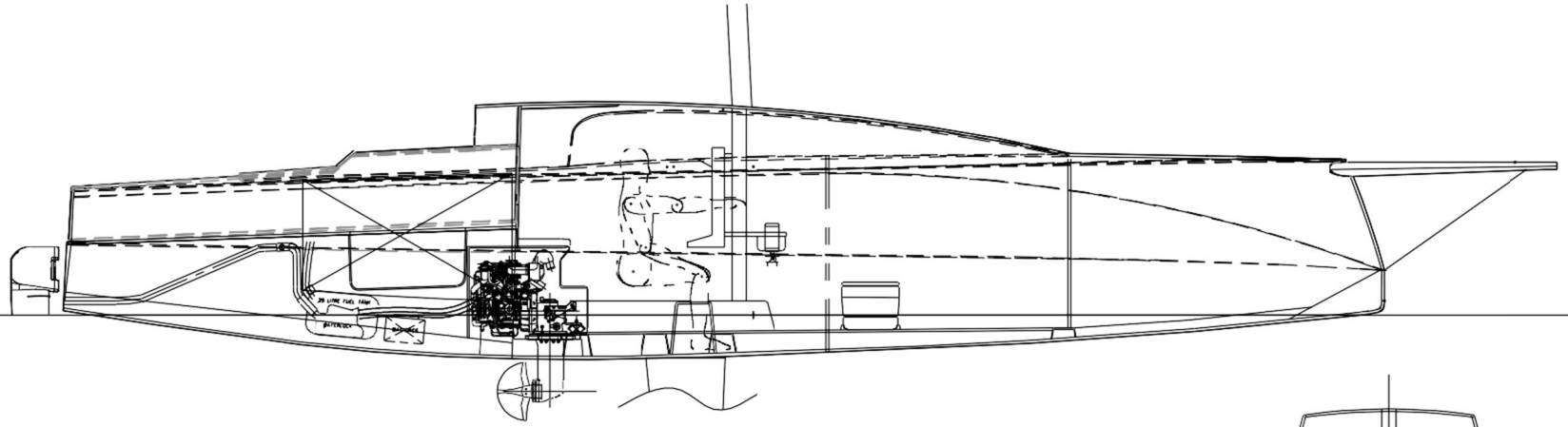
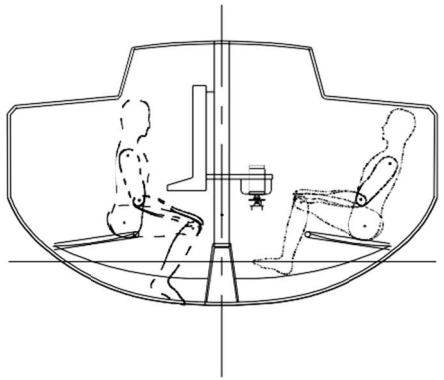
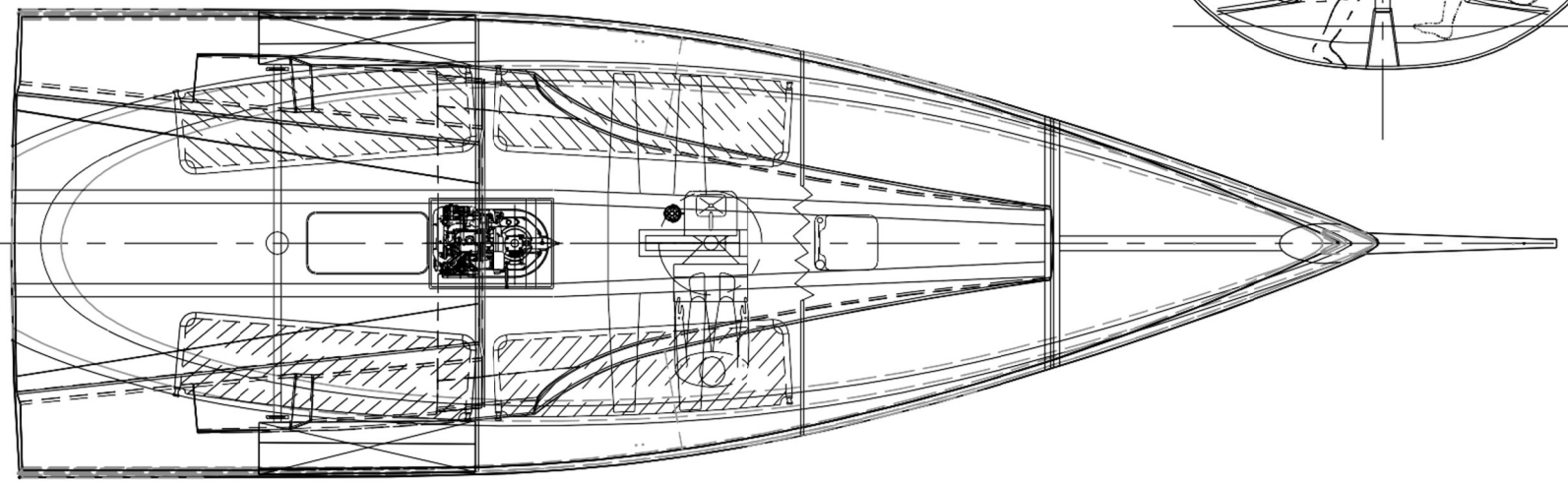
| COPYRIGHT DATE © FARR YACHT DESIGN LTD | 2020 | DESIGN #: | 857 |
| SCALE: | NOT TO SCALE | DRAWING #: | 1402 |







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INTERIOR LAYOUT



DESIGN #: 857

SCALE: NOT TO SCALE

DRAWING #: 1402

## Interior Arrangement

The interior arrangement is optimized for offshore sailing. It features pipe berths port and starboard in main compartment and an innovative rotating navigation station/galley allowing all navigation to be completed while seated to weather. A hand pump sink and gimballed jet-boil single burner our mounted opposite from the navigation station. Aft quarter berths are positioned to allow for crew weight aft or weekends away. An integrated chemical toilet is forward of the mast with a transverse privacy curtain. Soft hanging lockers are included for light-weight gear stowage.

## Appendages

The design features a T-keel plan form with a lead bulb while the fin construction uses a cast iron internal spar with e-glass skins for the foil surface. This arrangement combines a low-vcg ballast package with a moderate IRC handicap. The fin uses a quick socket connection with two bolts to permit easy assembly of the ballast package.

The bulb shape is a development of FYD's computational fluid dynamics (CFD) based research program offering low drag in a wide variety of wind conditions. Draft has been set at 2.10 m which provides a low center of gravity and plenty of upwind lift without incurring the rating penalty associated with significantly deeper drafts. The selection of keel fin area is a balance between optimizing for low drag and the requirements for extra lift when accelerating from low speeds and when sailing the boat in an upwind "high mode".

The boat features twin, transom hung rudders manufactured in carbon / epoxy out of a custom CNC milled aluminum tool. Rudder toe-in can be adjusted with threaded rod connections in the steering linkages. The foil sections for both the keel and rudder are custom developed proprietary sections designed to make the boat easy to sail in a straight line, maneuver at the dock or in tight corners around the race course and give the boat wider groove.

## Construction

The Farr X2 is constructed from vacuum consolidated Vinylester E-Glass with PVC foam cores with a gel-coat finish. Critical high load areas feature unidirectional reinforcements. The boat is engineered to exceed ISO Category A construction requirements and built for the rigors of offshore sailing.

The Farr X2 has been designed and built with a focus on the environment. The design and construction processes have been tracked with the 11$^{th}$ Hour Racing Marine 360 software to provide a formalized understanding of the Farr X2's impact. We are committed to full transparency in reporting our sustainability metrics. Sustainable and environmentally favorable materials and processes are being used in the construction wherever possible.

## Performance vs Handicap

We anticipate the Farr X2 will compete under a range of rating and handicapping systems including IRC, ORCi, ORR and local PHRF/PHS systems. Our primary focus has been on developing a performance driven design that is a sailor's boat and uses the latest in design thinking to maximize performance and

enjoyment. We have completed trial ratings under IRC and ORCi to explore the handicap positioning of the vessel.

## IRC design trial

*Estimated Trial Based on FYD IRC Models as refined by trial certificates.*

# FYD ESTIMATED TRIAL

| ***Boat:*** | | ***Stability*** | |
|---|---|---|---|
| Name: | **TRIAL FARR X2** | SSS Number: | 17 |
| Sail Number: | NA | STIX: | N/A |
| Cert No | | AVS: | N/A |
| **TCC:** | **1.075 2020** | ISO/IRC Design Category: | N/A |
| **Crew No.:** | **7 (595 kg)** | WS Plan Review: | |

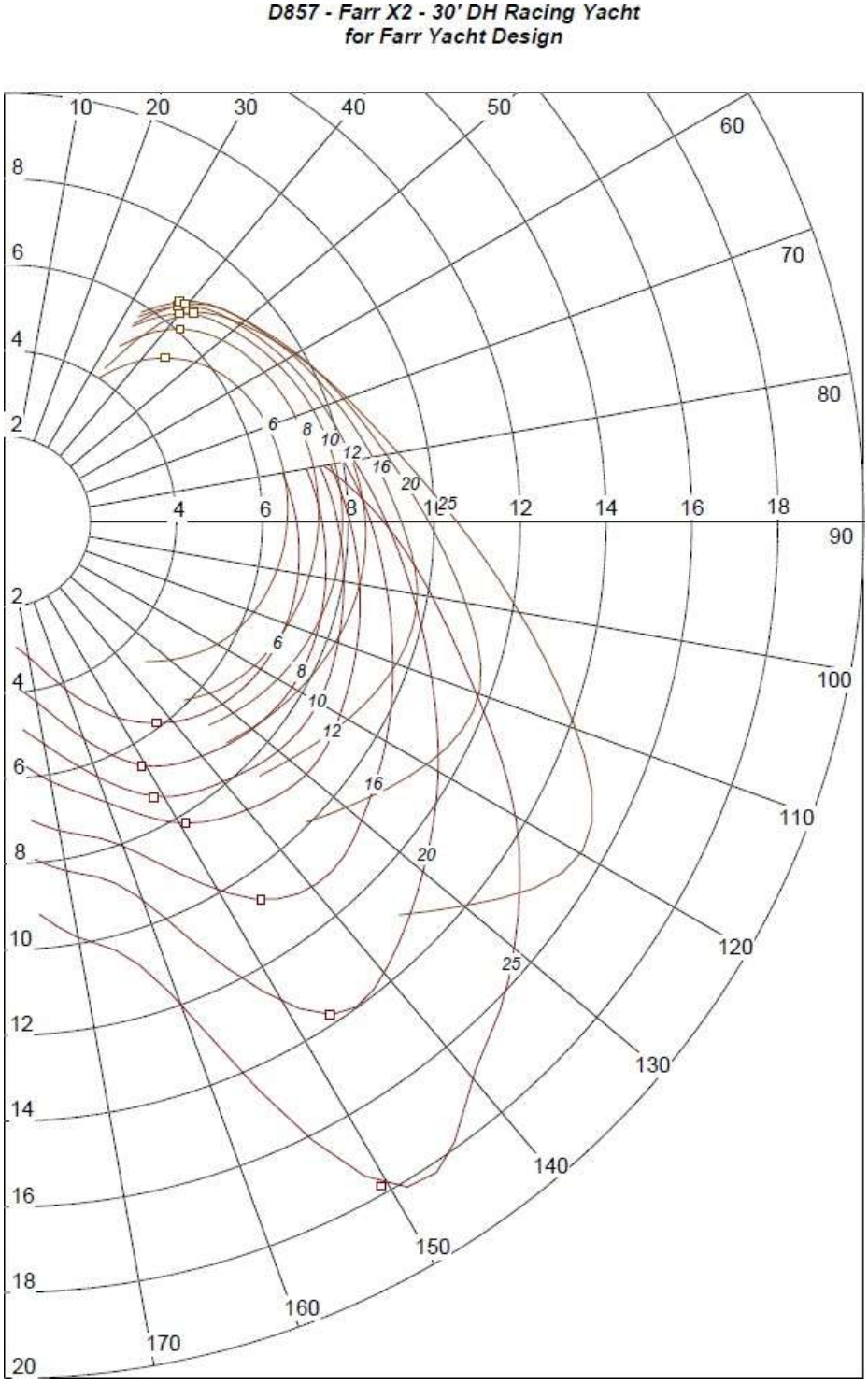
| ***General Details*** | | | | | |
|---|---|---|---|---|---|
| Design: | FARR X2 2.10 WB | Series Date: | 2020 | Hull Factor: | 11.9 |
| Type: | Bermudian Sloop | Age Date: | 2020 | Rig Factor: | 1.008 |
| Issue: | Design trial FYD EST | | | | |
| Notes: | Water ballast list angle 4.1 deg | | | | |
| Notes: | | | | | |

| ***Hull*** | | ***Overhangs*** | | ***Rig & Mainsail*** | | ***Headsail*** | | ***Mizzen*** | | ***Spinnaker*** | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LH: | 9.20 | BO: | 0.32 | P: | 12.20 | HSA: | 26.6 | PY: | 0.00 | SPA: | 103.82 |
| LWP: | 8.63 | x: | 0.28 | E: | 4.25 | HLUmax | 11.95 | EY: | 0.00 | STL: | 5.60 |
| Hull Beam: | 3.15 | h: | 0.06 | J: | 4.14 | *HLU*:* | *11.95* | LLY: | 0.00 | | |
| Boat Weight: | 2500 | SO: | 0.25 | FL: | 12.68 | *HLP*:* | *4.34* | LPY: | 0.00 | *SLE*:* | *12.78* |
| DLR: | 127 | y: | 0.03 | MUW: | 1.49 | *HHW*:* | *2.26* | | | *SLU*:* | *14.86* |
| Draft: | 2.1 | | | MTW: | 2.03 | *HTW*:* | *1.15* | | | *SF*:* | *9.49* |
| Bulb weight: | 775 | | | MHW: | 2.91 | *HUW*:* | *0.58* | | | *SHW*:* | *9.05* |

** For information only*

| ***Detail*** | | |
|---|---|---|
| Low vcg iron+fairings+bulb keel | No Spinnaker TCC: | 1.049 |
| No wing keel | Multiple headsails permitted | |
| Inboard engine : Weight 134kg | Maximum number of spinnakers carried: | 2 |
| 2 blade folding/feathering propeller | Bowsprit only, NO poles | |
| Internal ballast 0 kg | 2 Spreader/Jumper (sets) | |
| Weight includes batteries, excludes cushions | 1 Aft Rigging (Sets) | |
| World Sailing OSR compliant lifelines fitted | Carbon Mast | Wire standing rigging |
| Manual power only for running rigging | HSA=0.0625*HLU*(4*HLP+6*HHW+3*HTW+2*HUW+0.09) | |
| 250kg water ballast per side | SPA=((SLU+SLE)/2)*((SFL+(4*SHW))/5)*0.83 | |
| Mast foot/forestay not adjusted while racing | | |

## Performance



## Current Research Knowledge Base

As part of our base design package we utilize all of our accumulated experience and leverage all of our prior research results and methods that are relevant to this design. This includes previous Computation Fluid Dynamics studies, tank tests, wind tunnel tests, VPP development, weather studies, rule research etc. We are continually investing in our design tool capabilities and knowledge base to provide our clients with the most optimized and refined designs possible.

We have focused significant resources to analyzing 23 hulls in the 40' size range exploring a wide variety of hull style concepts including variations in volume distribution, beam and detailed hull form features the results of which are directly applicable to the development of this design. Additionally we have been working on developing a better understanding of performance in waves, dynamic handling and transitional planning behavior and this has resulted directly in a more nuanced understanding of the effects of waterline ending fullness on effective length and added resistance/sea keeping for any given set of sailing conditions. The results of this work have directly influenced the Volvo Ocean 65 and Farr 280 hull form developments amongst others.

We have long-term collaborative relationships with both academic [Steven's Institute, Wolfson Unit, Auckland University etc.] and industry consultants [KND Sailing Performance, Southbay Simulations, Fluid Engineering Solutions, Teton, Clay Oliver, Brian Maskew, Hannes Renzsch …] that we partner with to complete both targeted and general yacht research projects. This investment insures our tools and systems are state-of-the-art and allow us to produce the most accurate performance simulations possible at cost effective rates. These external resources are enhanced by our own internally developed IDEOS system that includes hull surface morphing software, complex automated configuration systems, and our custom developed VPP's with some of the most advanced and diverse modelling capabilities in the industry. As you are aware we operate our own dedicated high-performance computing cluster utilizing state-of-the-art simulation software including high-order free-surface panel methods and high fidelity 3D Volume of Fluid RANS solvers [OpenFOAM, Fine/Marine] that have been refined and customized to work for our specific yacht design problems.

## IDEOS


We are proud to be announce the availability of our **IDEOS I**ntegrated **D**esign space **E**xploration and **O**ptimization **S**ystem. IDEOS is the product of 20 years of continuous development focused at producing the fastest most refined racing yacht designs.

Yacht design has always been a balance between artistry and science and technology. The rapid development of computational technology over the last few decades has had a dramatic impact on racing yacht design allowing significantly more detailed analysis of aero and hydrodynamics that enable us to capture small design differences and to predict performance to an unprecedented level of accuracy. Reflecting these developments we have continually invested in the refinement and expansion of our design tools to maintain our technological advantage and to be able to offer our clients access to a level of capability previously only available in America's Cup level programs.

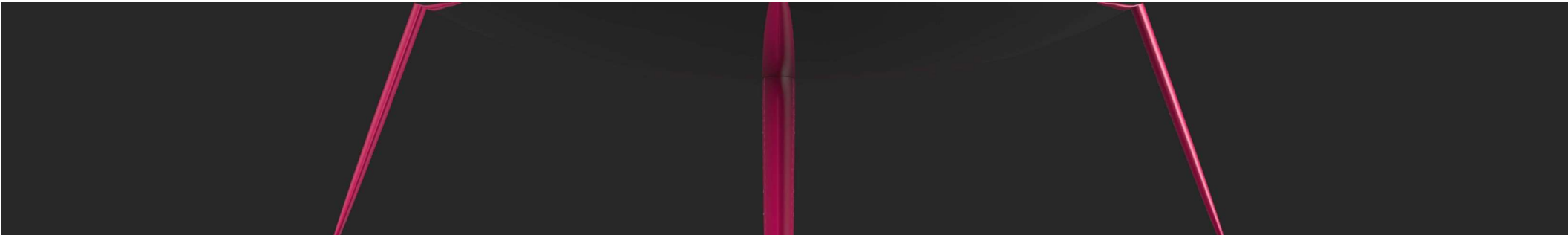
Historically, short design cycles and small research budgets have limited the amount of design space exploration that can occur. In the past we would develop a base design concept and then build a small

number of variants which would be manually configured and analyzed. This process relied on the designers experience and intuition to limit avenues of research to areas of the biggest potential often leaving a large portion of the design space unexplored.

The exponential increase in computing power, the availability of open source tools and the ability to access on-demand High Performance Computing resources has changed the equation. By leveraging these developments and integrating our proprietary computational tool suite under a common automation framework we are now able to evaluate thousands of candidate designs, compare their performance potential and identify fruitful design avenues with an exceptional level of accuracy.

The IDEOS is our umbrella framework that automates the creation and evaluation of thousands of candidate designs. This allows the detailed exploration of the design space and the rapid identification of optimal design alternatives. The underlying system facilities information transfer to a series of component tools in an automated fashion minimizing manual intervention and reducing potential sources of error.

Unlike other optimization systems that are purely focused on racing performance IDEOS has a much broader range of application. We utilized the system to explore production boat development where we are searching for optimal designs that meet not just performance targets, but have strict cost implications, and specific interior space requirements. We can now visualize trade-offs between displacement, sail area, beam, bulb weight, and material and labor costs relative to performance and rating systems.



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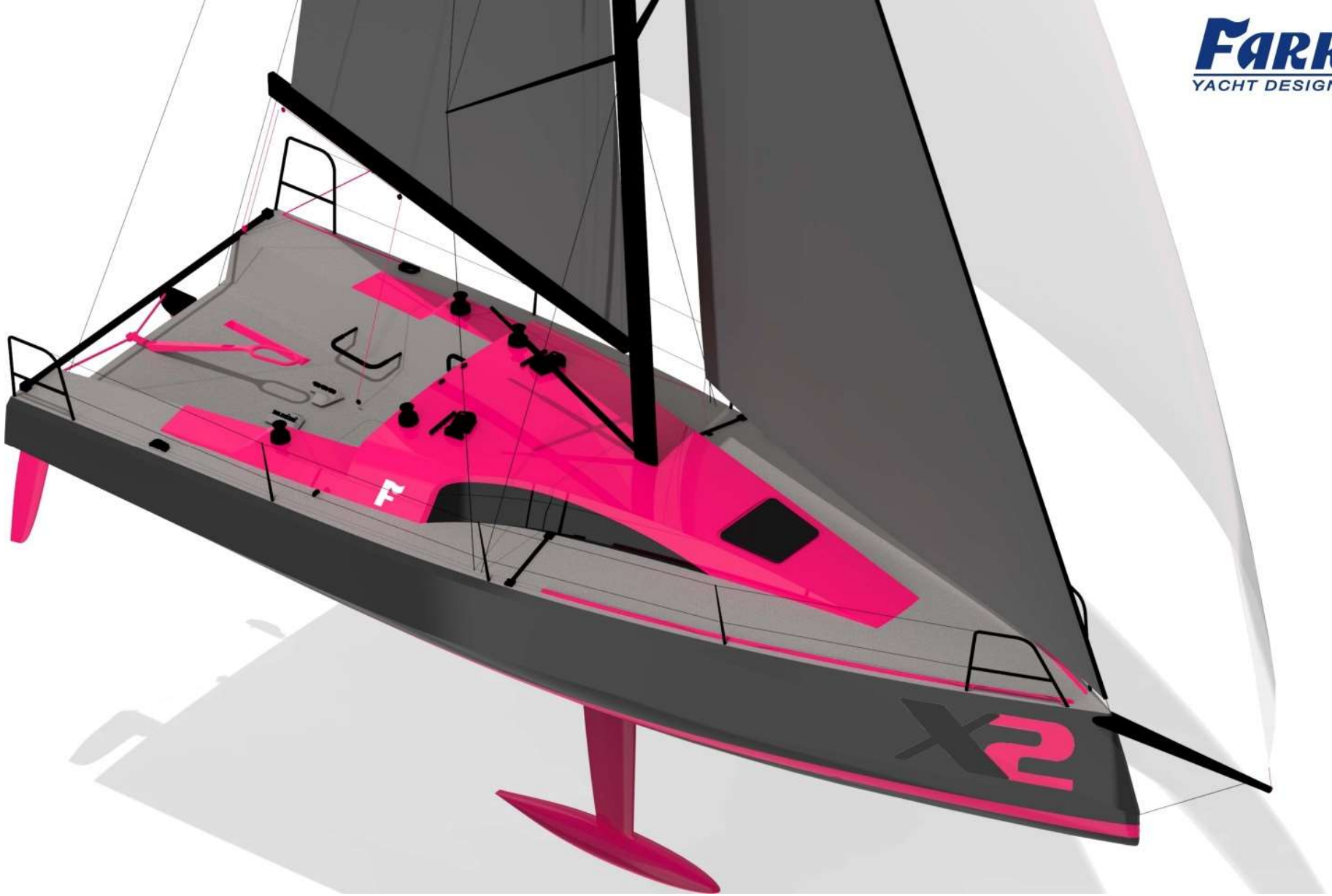
**857 - FARR X2 - PROFILE**

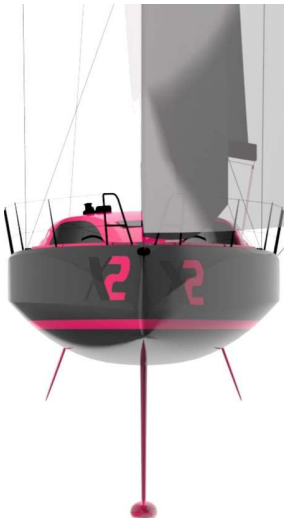



857 - FARR X2 - AFT ISO DN



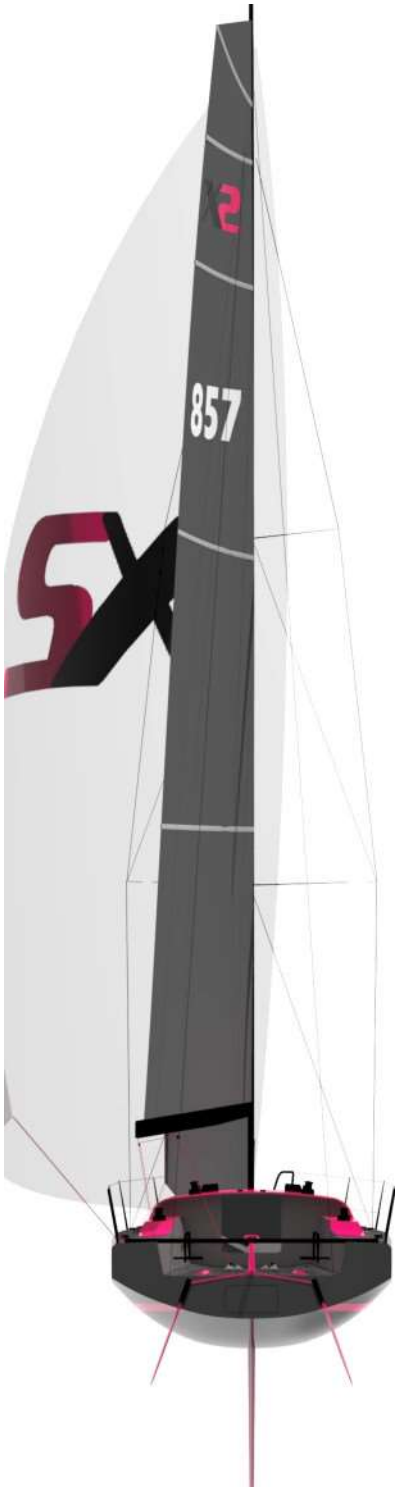



857 - FARR X2 - FWD ISO DN



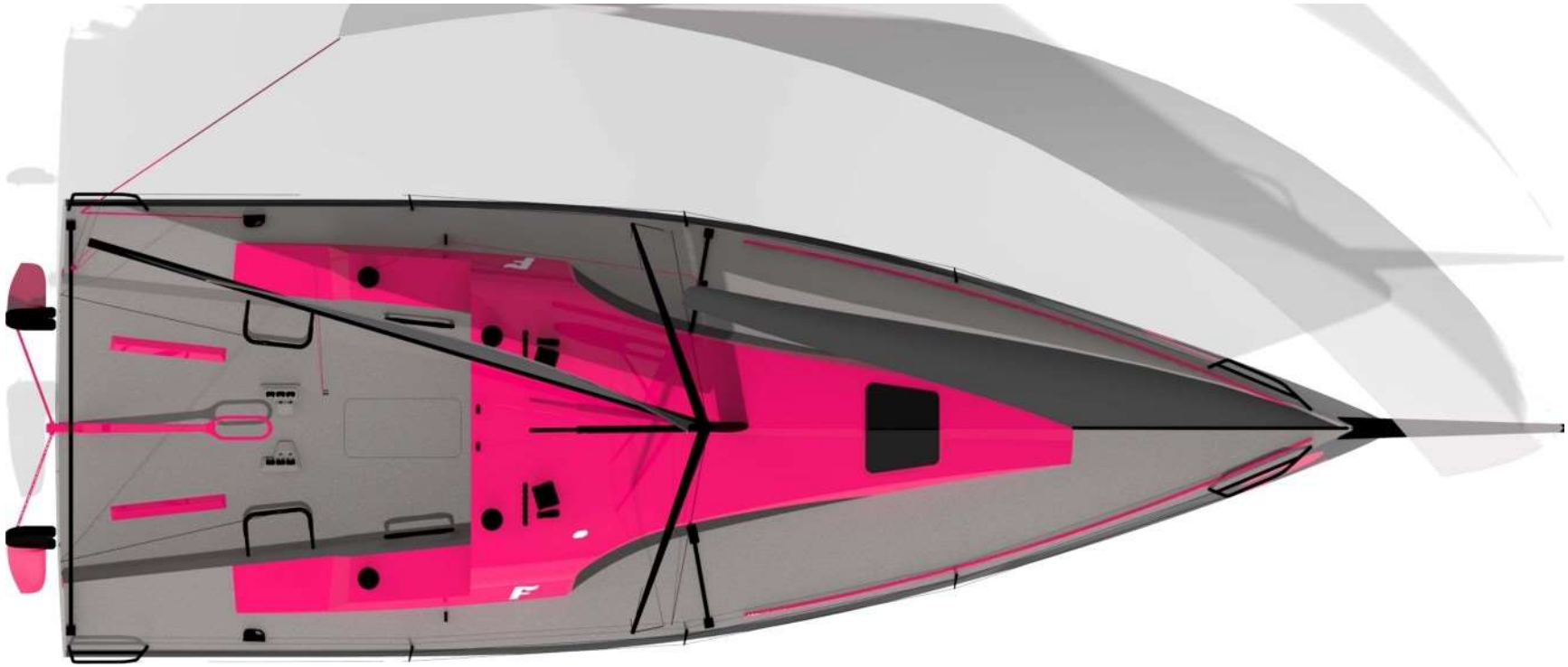


857 - FARR X2 - FRONT






857 - FARR X2 - AFT





857 - FARR X2 - PLAN

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