



FARR[®]
YACHT DESIGN

ENGINEERING THE VO65 – DESIGN, PRODUCTION & SERVICE

FARR 280 DESIGN & DEVELOPMENT

BAYVIEW YACHT CLUB | February 15, 2017
PRESENTED BY CHRIS COCHRAN, FARR YACHT DESIGN

WHAT WILL I DISCUSS TONIGHT?

- Introduction
- Description of Farr Yacht Design, with a brief history
- Description of our design process, and the tools we use
- Background of the Farr 280 , and how we developed the design
- Description of the Farr 280 build process
- Short Break
- Background of the Volvo Ocean 65 (VO65)
- How the VO65 was built by multiple boatyards
- Discussion on our role during the 2014-15 Volvo Ocean Race
- Description of other projects we have going on at FYD
- Q & A

INTRODUCTION

- Senior Design Engineer at Farr Yacht Design
- Originally from this area
- Grew up sailing on a Tartan-10 (“Reynardine”)
- Primary raced on Beneteau 38 (“XS”)
- Actively raced in the DRYA from 1996 – 2004
- Developed strong interest in Yacht Design while in high school
- Worked at UK Sailmakers during high school & college
- Studied Naval Architecture and Marine Engineering at University of Michigan, Obtaining my BSE in 2003, and my MSE in 2004



WHAT IS MY EXPERIENCE?

- First yacht design job: Internship at Sparkman & Stephens, in 2003
- First full-time job: Naval Architect at Morrelli & Melvin, from 2004-2005
- Joined Farr Yacht Design in 2005, as a Design Engineer, and have been there since
- Responsibilities include Composite Engineering, production planning and design team management
- Notable projects include...

WHAT DESIGNS HAVE I WORKED ON?



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WHAT EXACTLY DOES FYD DO?

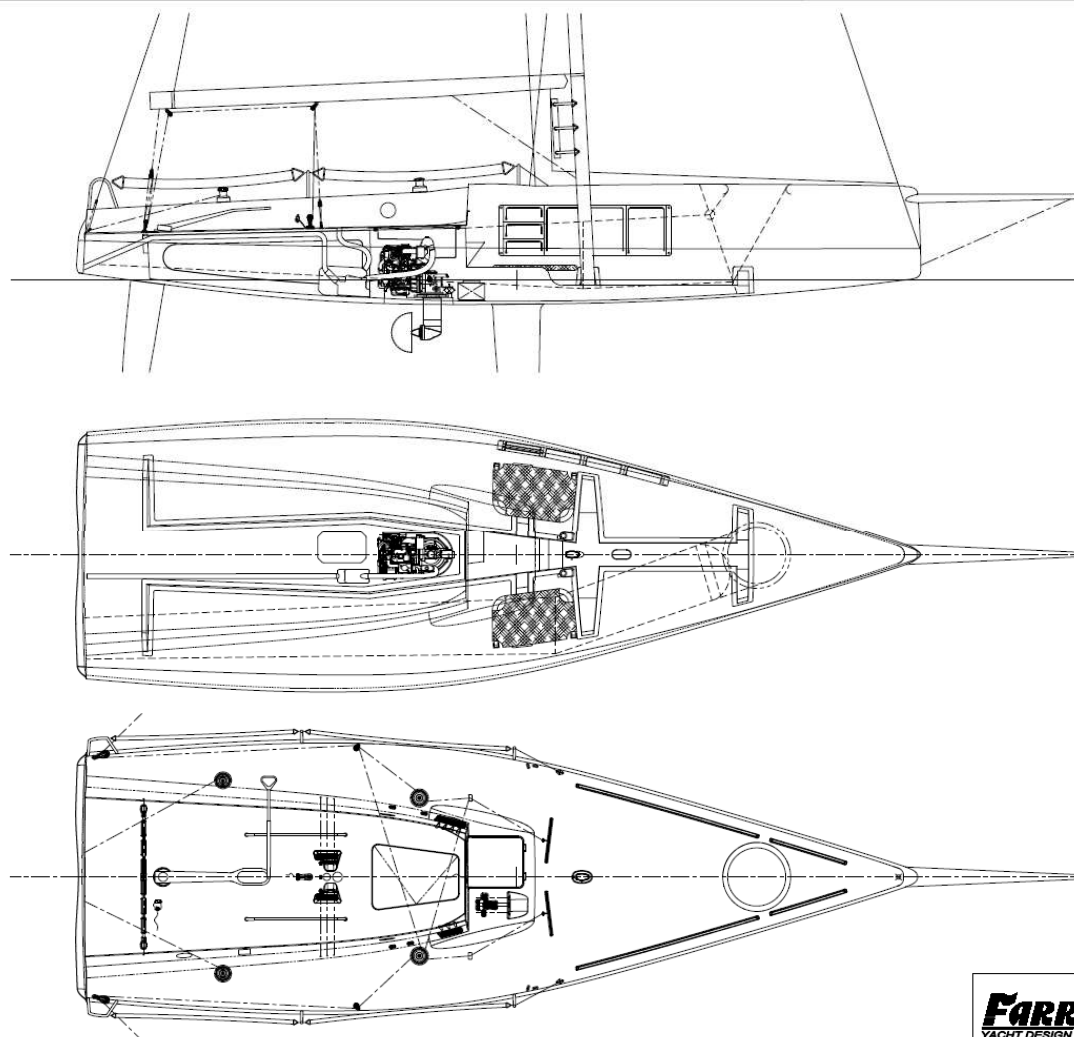
- Farr Yacht Design is a Design & Engineering office
- We also have a brokerage arm, Farr Yacht Sales
- Despite popular belief, we do not actually build boats
- Boat builders and individuals will commission us to design a boat
- So, what exactly does a design office do?

FIRST, WE DEVELOP A BASIC NAVAL ARCHITECTURE PACKAGE



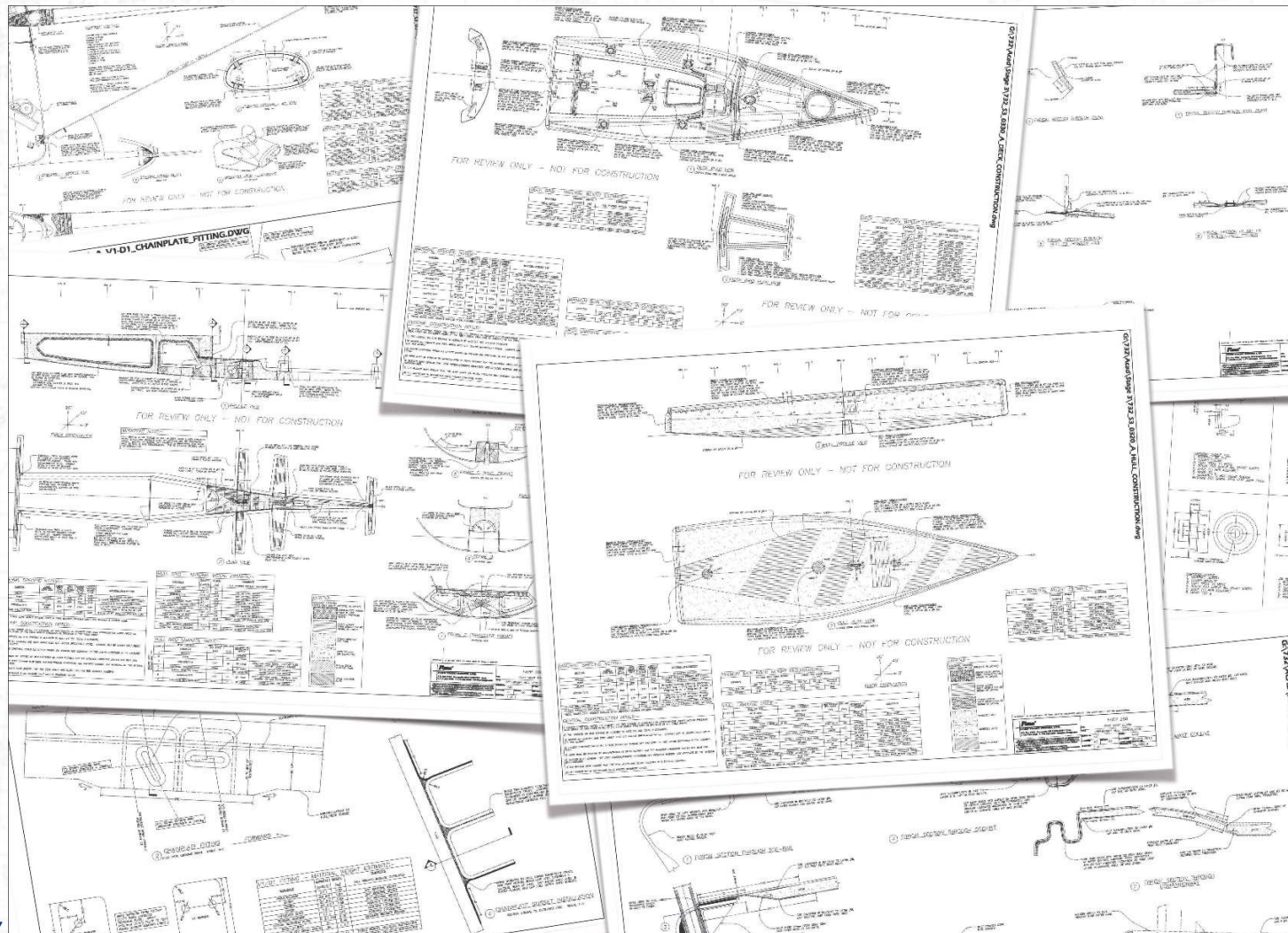
... USUALLY WITH A DECK & INTERIOR LAYOUT

COPYRIGHT



FARR YACHT DESIGN	28' ONE DESIGN RACER	
	SCALE	NOT TO SCALE
	DESIGN NO.	732
	DATE	SEPTEMBER 18, 2013

... OFTEN WITH STRUCTURAL ENGINEERING



IRR
DESIGN

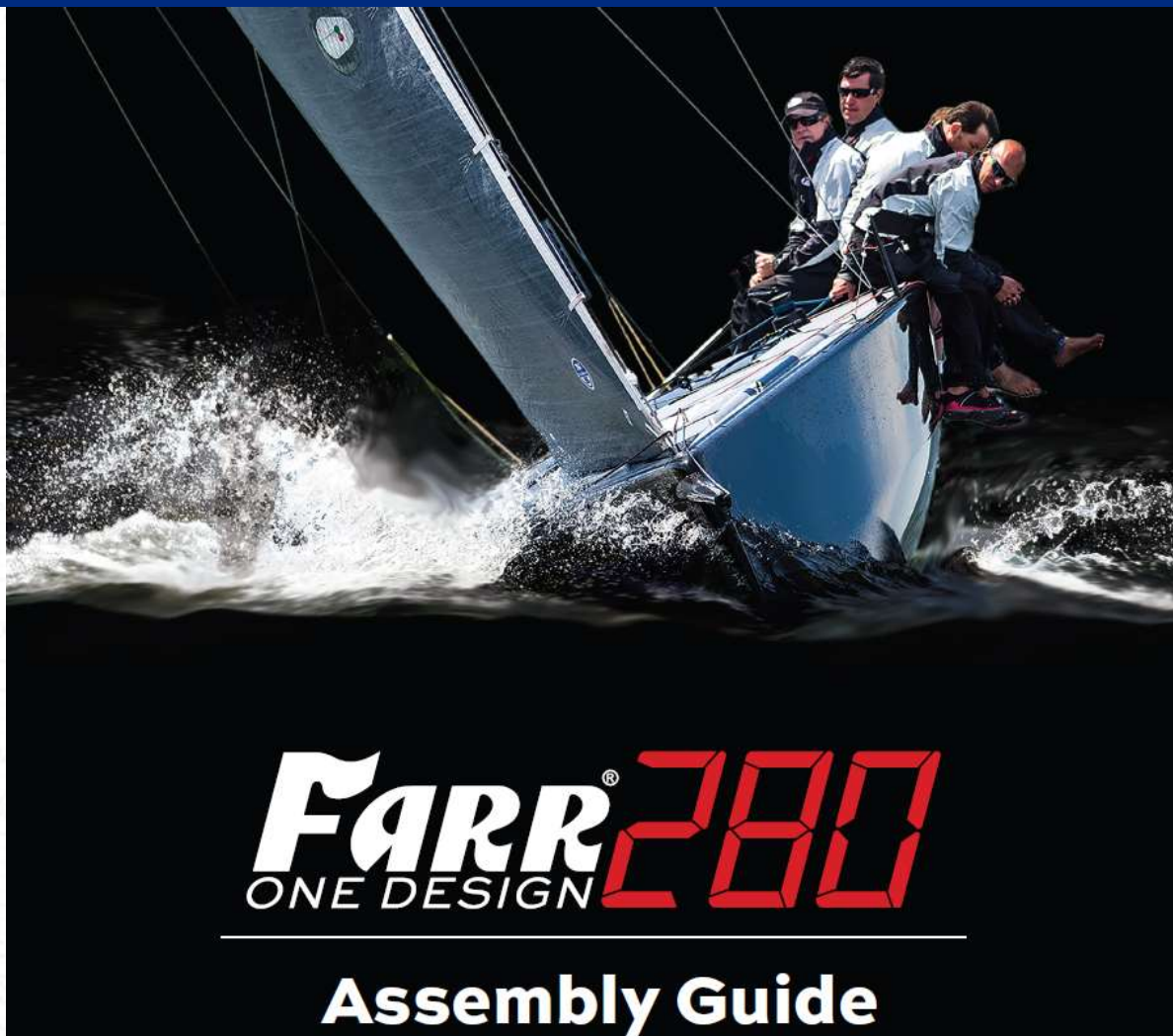
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IRR
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Design # 214 Date
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... AND OTHER IMPORTANT STUFF

FARR
YACHT DESIGN



HOW IS A BOAT DESIGNED AT FYD?



- Each areas of a yacht impacts other areas in various ways
- An iterative process is required in order to create a cohesive design
- Multiple design loops occur in succession, as the design is refined
- Farr Yacht Design utilizes a 4-Stage design process
- A 5th stage is reserved for post-design support

HOW IS A BOAT DESIGNED AT FYD?

Stage 1 Design Brief

- Develop/Understand the goals for the project
- Identify the Competition
- Identify previous designs to build on
- Finalize the design schedule
- Begin sorting out the design

HOW IS A BOAT DESIGNED AT FYD?

Stage 1
Design Brief

Stage 2
Concept
Development

- Develop weight estimate
- 1st shot at hull, deck, interior & structure layout
- Create basic set of drawings, for quotation
- Create a Bill of Materials for deck gear & composite materials
- Obtain trial handicap ratings
- Solicit client feedback & builder input

HOW IS A BOAT DESIGNED AT FYD?



- Incorporate client & builder feedback
- Update design parameters based on Stage 2
- Refine deck layout, interior layout & systems
- Complete a detailed weight estimate, tracking nearly every component in the boat
- Create a full set of detailed design drawings
- Get final sign-off from client

HOW IS A BOAT DESIGNED AT FYD?



- Perform Final Naval Architecture loop
- Create final hull & deck geometry
- Update layout & construction drawings to match final geometry
- Complete final weight estimate
- Create final VPP and rating analysis

HOW IS A BOAT DESIGNED AT FYD?



- Optimization to rating rules
- New keels, new rudders
- Sailplan modifications
- Structural modifications as required
- Repairs

WHAT DESIGN TOOLS ARE USED AT FYD?

fastShip



PTC
creo™



PTC® Creo®
Simulate™



CompoSIDE

FARR®
YACHT DESIGN

FARR
YACHT DESIGN

WHAT IS THE FARR 280?

- Sub 30' Racing Keelboat
- Strict one-design
- Easily trailerable
- Fun to sail
- Has grand-prix style systems
- Optimized for inshore racing
- Offshore capable
- Offered at a great value



HOW DID THE FARR 280 COME TO BE?

Wanted a modern version of the Farr/Mumm 30



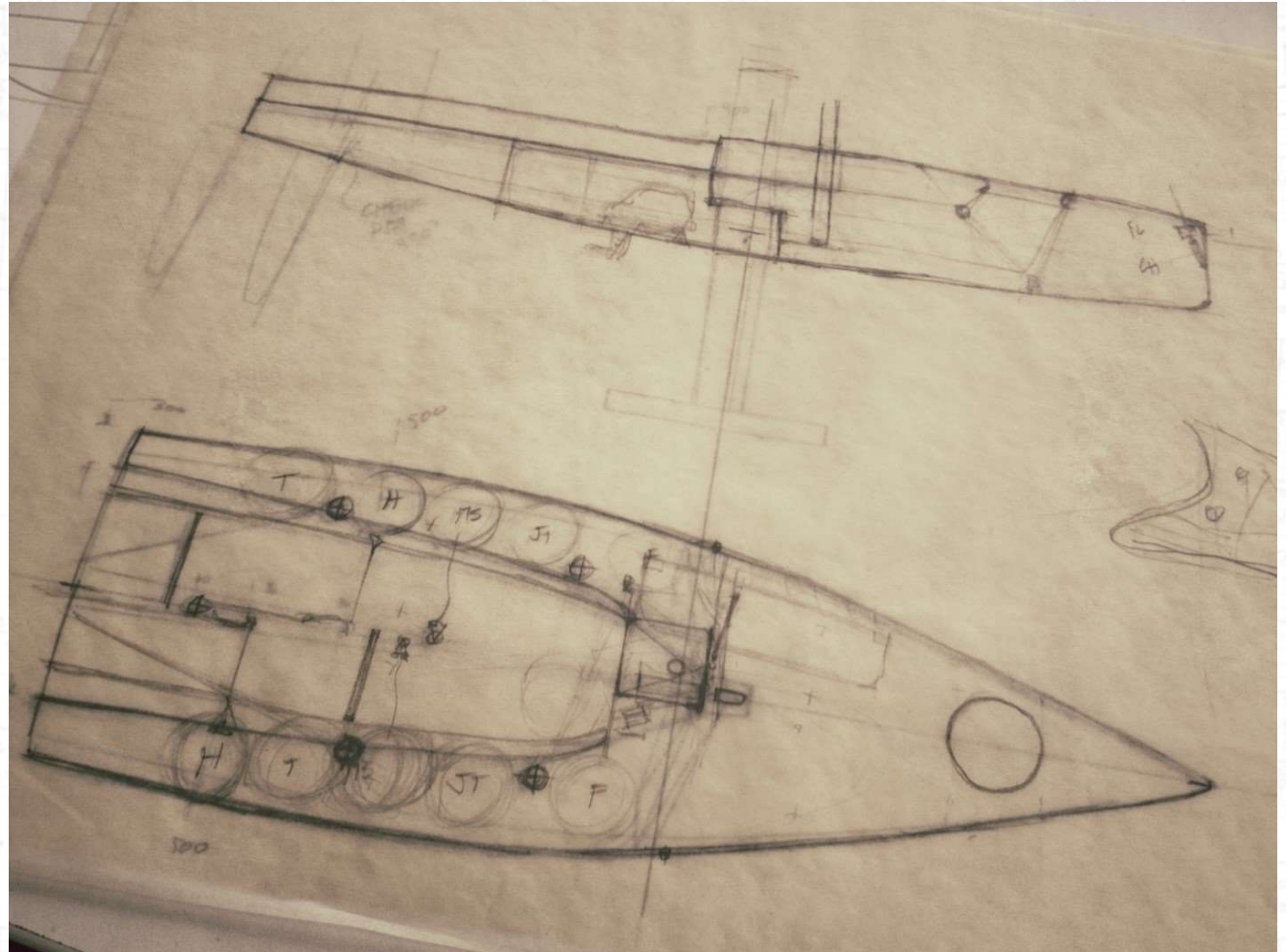
HOW DID THE FARR 280 COME TO BE?

Incorporating the features of a modern TP 52



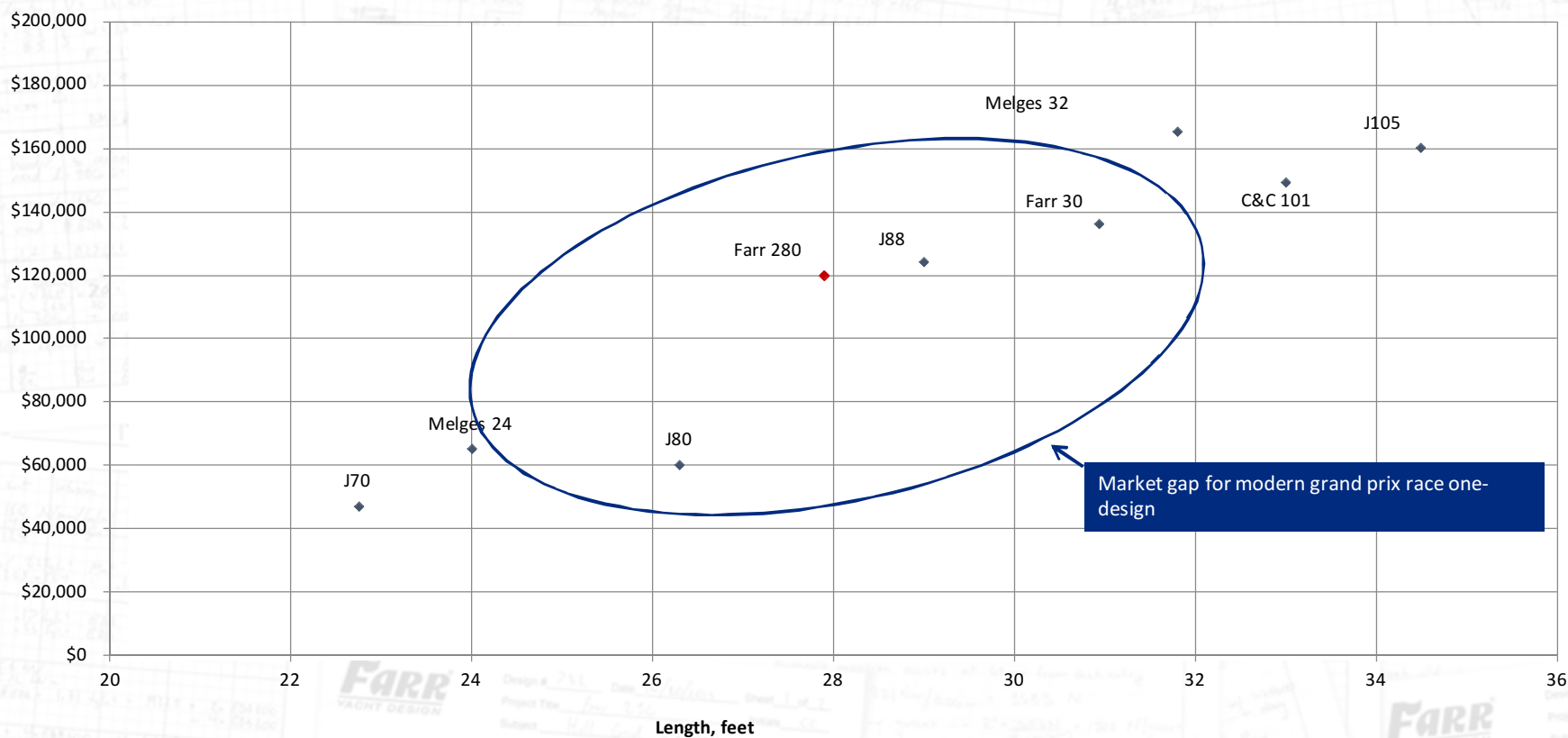
HOW DID THE FARR 280 COME TO BE?

- The concept of the boat was developed by the FYD team
- We would be the client, for a change
- We started by sketching our interpretation of what we thought the boat should be.
- Initial sizing was just under 30' LOA



HOW DID THE FARR 280 COME TO BE?

Base Price vs Boat Length



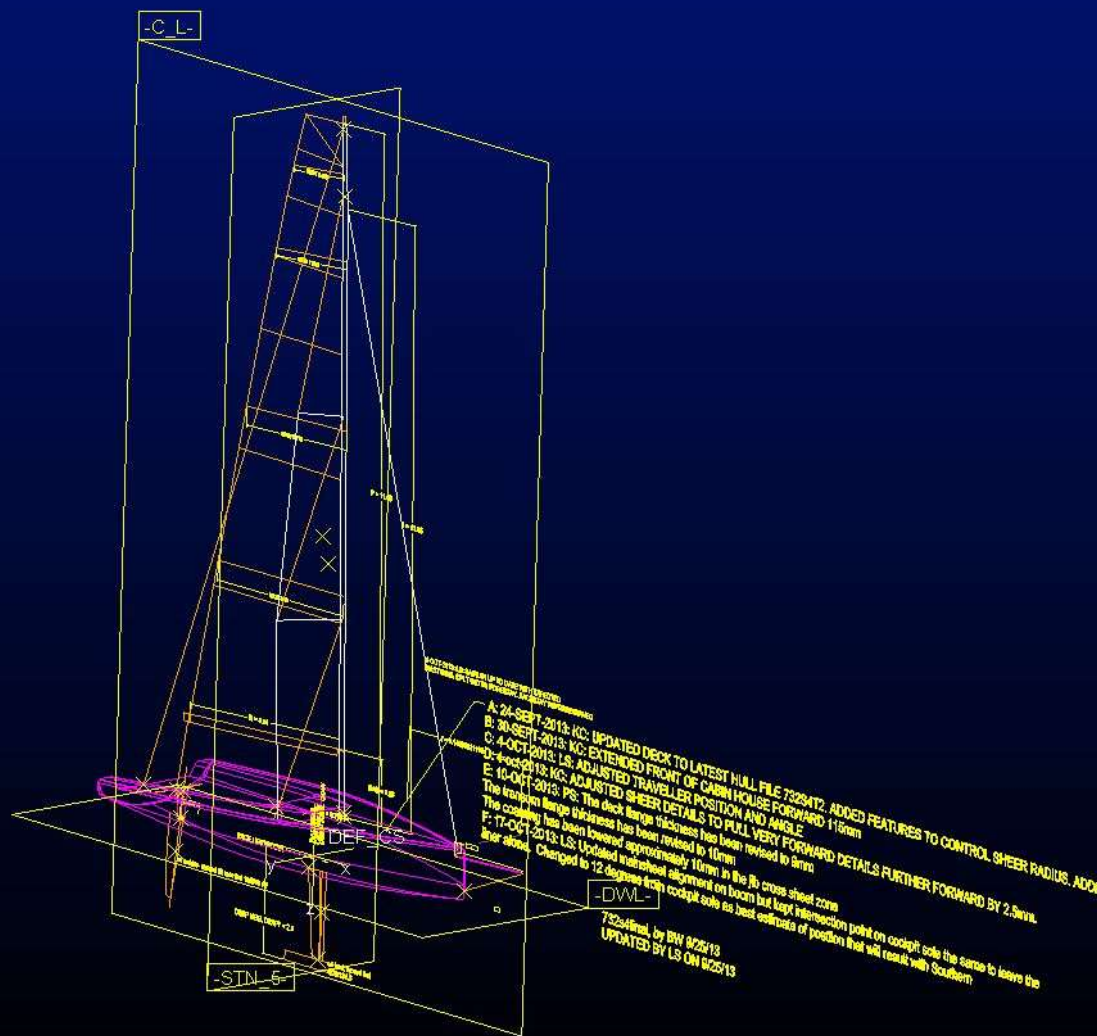
Market gap for modern grand prix race one-design

WHAT WERE THE CORE FEATURES WE WANTED?

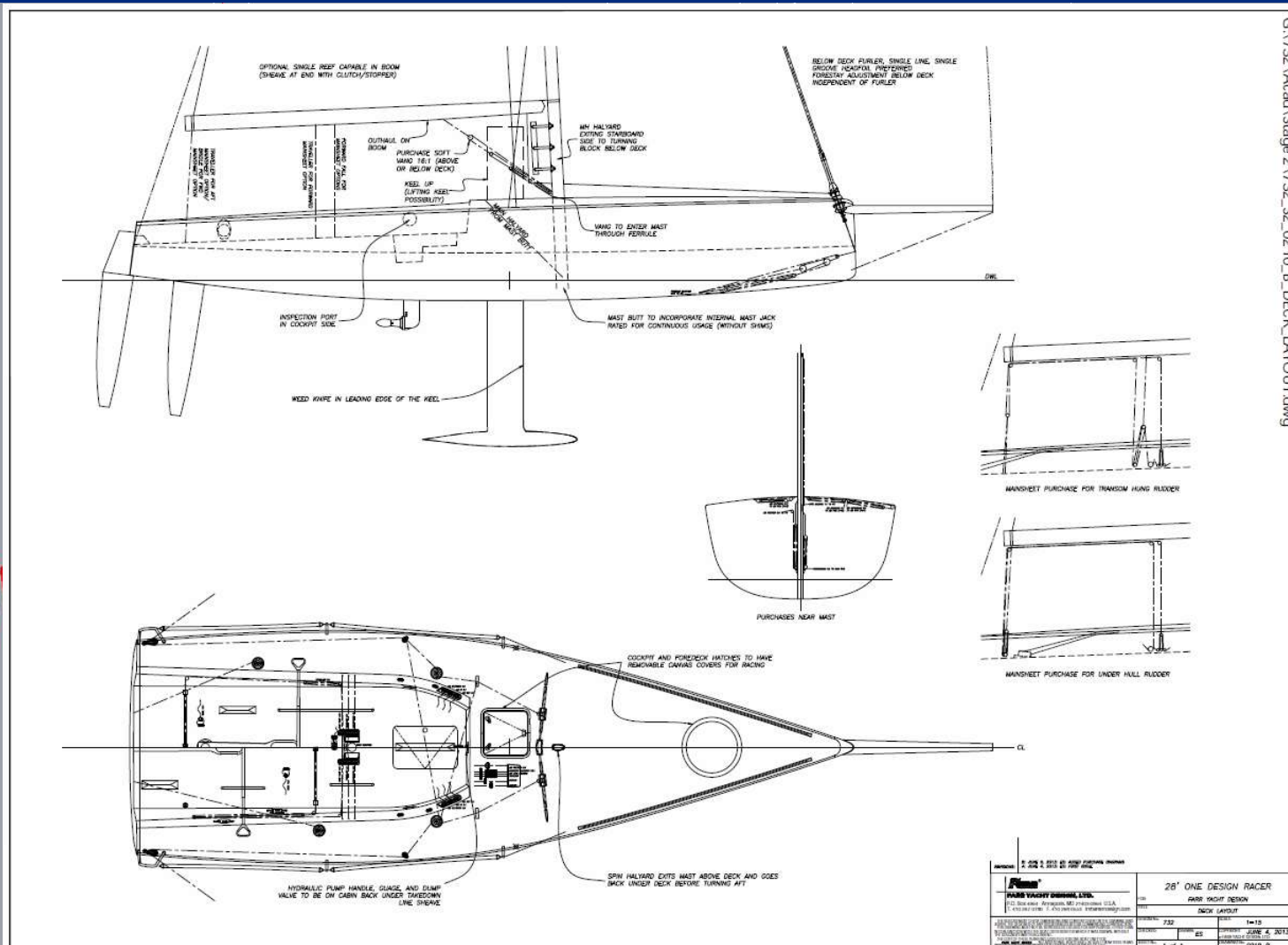
Certain “grand-prix” features the boat HAD to have:

- Hydraulic Mast Jack, adjustable while racing
- Adjustable forestay, to complement the active mast jack
- Spinnaker take-down system
- Retractable fore-deck hatch
- Clean looking deck – under-deck lines.
- Integrated water management
- Composite “features”
- Not compromised to beat a rating rule
- Certified one-design, out of the box
- At least as fast as the boat it is replacing
- Affordable

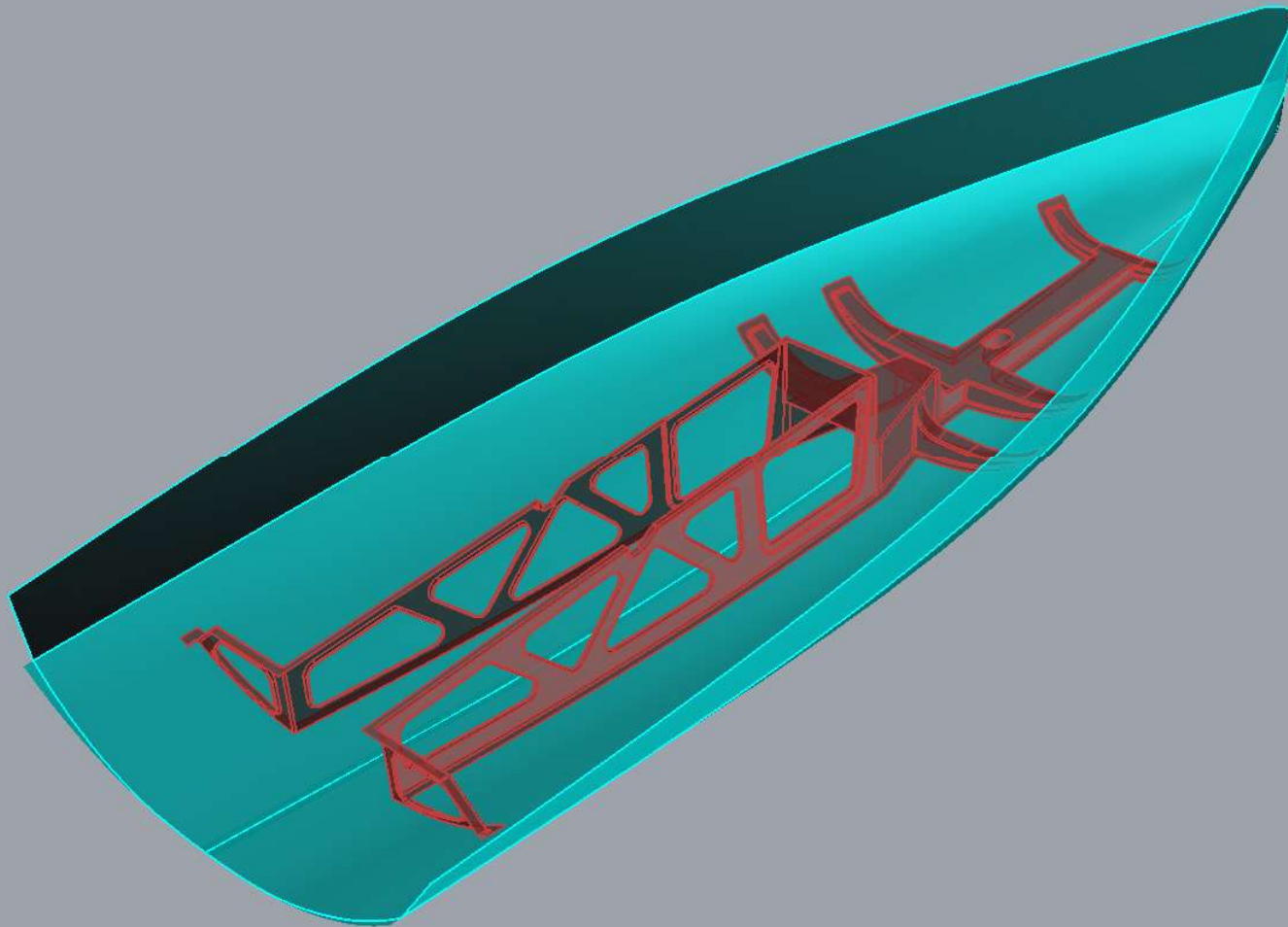
HOW DID WE GO FROM A SKETCH TO DESIGN?



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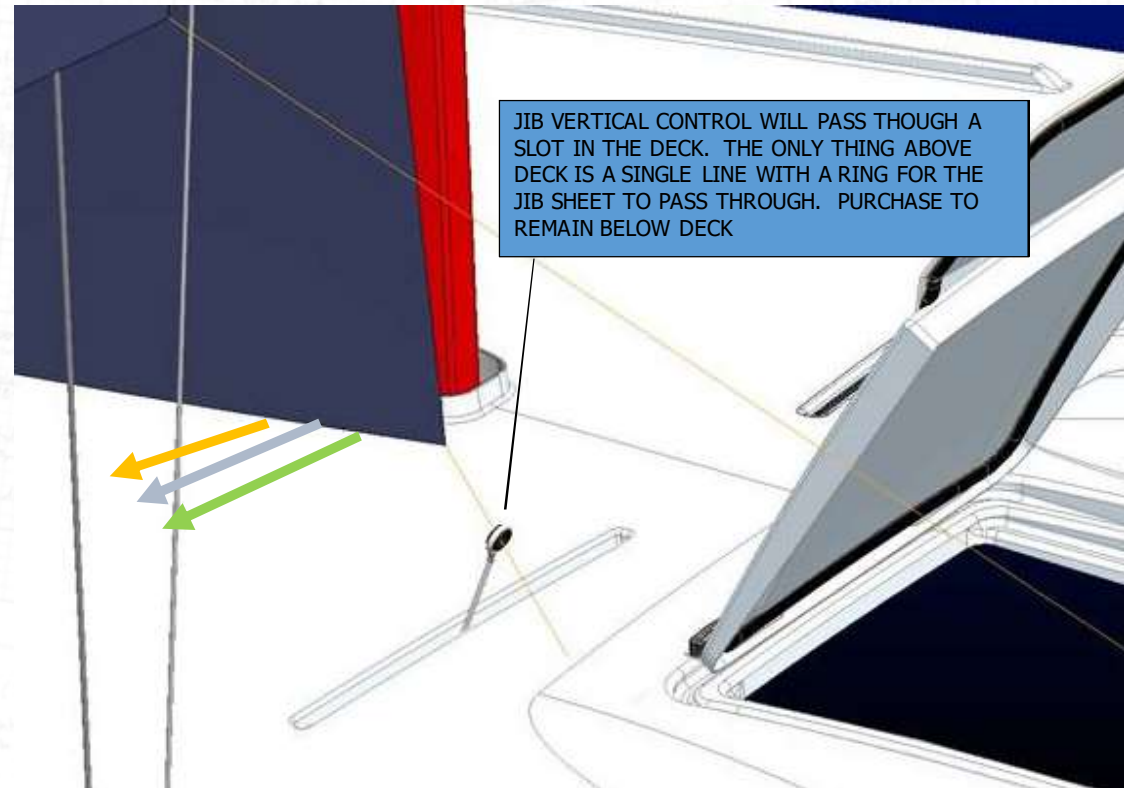
HOW DID WE GO FROM A SKETCH TO A DESIGN?



HOW DID THE DESIGN EVOLVE IN STAGE 3?

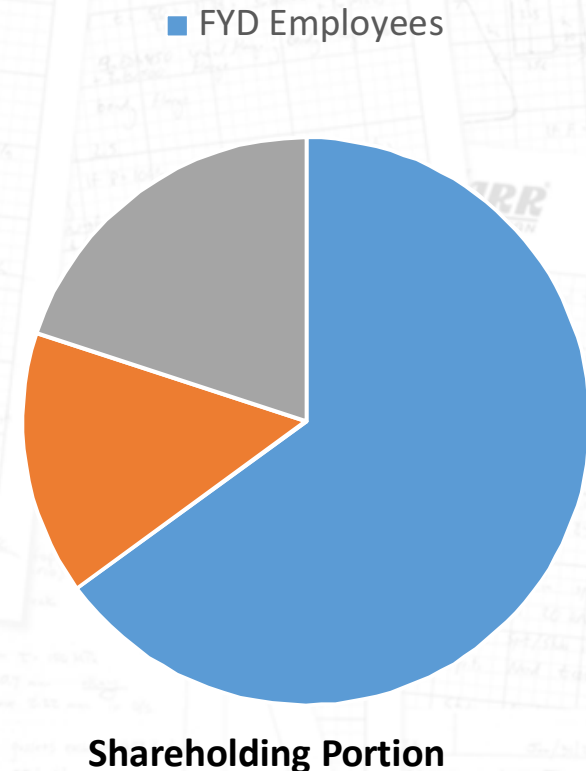
Focused on refining details:

- Foredeck hatch
- Jib track vs. slot
- Forestay & Jib Halyard linkage
- Off-center companionway
- Bowsprit attachment



MOST IMPORTANTLY, FUNDING WAS SECURED IN STAGE 3

- FYD is the client and responsible for funding
- Decided to create an investment group
 - Farr 280 Investment Group
 - Developed a Prospectus
 - Approached potential investors, who would become Shareholders
 - Investment group would market and promote the boat, own the tooling and pay the builder
 - The builder would pay the suppliers
- Final makeup is 65% Employees, a testament to our commitment to the success of the 280



SELECTED BUILD PARTNERS IN STAGE 3

HARKEN

PREMIER
COMPOSITE TECHNOLOGIES



Southern Spars

SO WHAT IS THE FINAL CONFIGURATION?

- 28.6' LOA
- 26.3' LWL
- 9.42' Beam
- 6.89' Draft
- 3525 lbs Disp. (empty)
- 3800 lbs Disp. (sailing)
- Upwind SA: 566 ft²
- Downwind SA: 1500 ft²
- D/L ratio: 93 (sailing)
- SA/D Up/Down: 31 / 83
- Crew: 5x to 6x
- PHRF 54, IRC 1.093



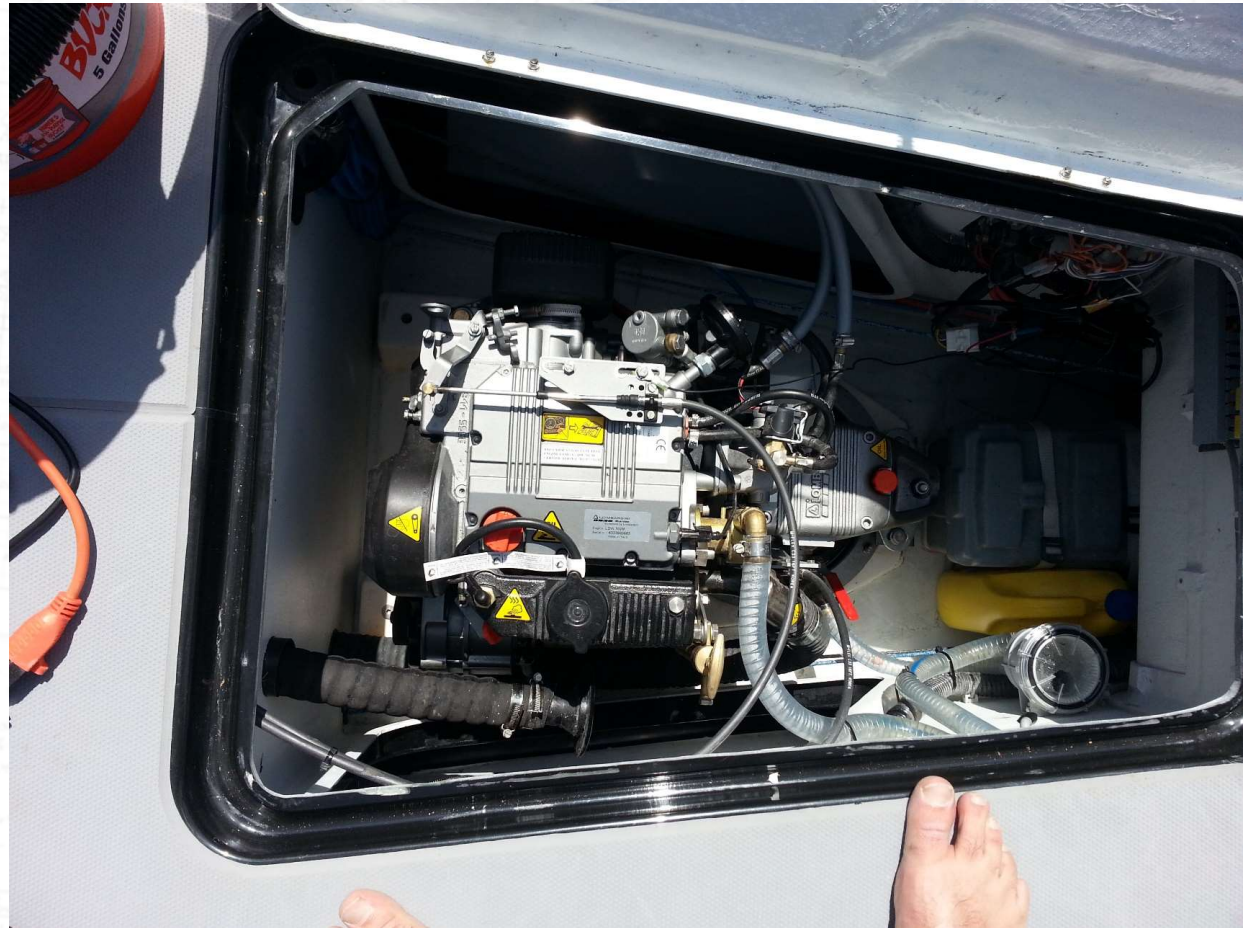
LET'S LOOK AT SOME OF THE FEATURES

- 2-piece carbon rig
- Internal hydraulic mast jack
- Hydraulic forestay
- Below-deck chainplates
- Carbon bowsprit, easily removable
- Sliding foredeck hatch, with take-down system



LET'S LOOK AT SOME OF THE FEATURES

- Fixed keel, easily removable
- Lightweight 20hp inboard diesel
- Access to engine via removable bin in cockpit
- Integrated bilge pump system
- Composite tiller, pushpit, pulpit & stanchions, with carbon finish



WHAT ELSE ABOUT THE BOAT IS UNIQUE?

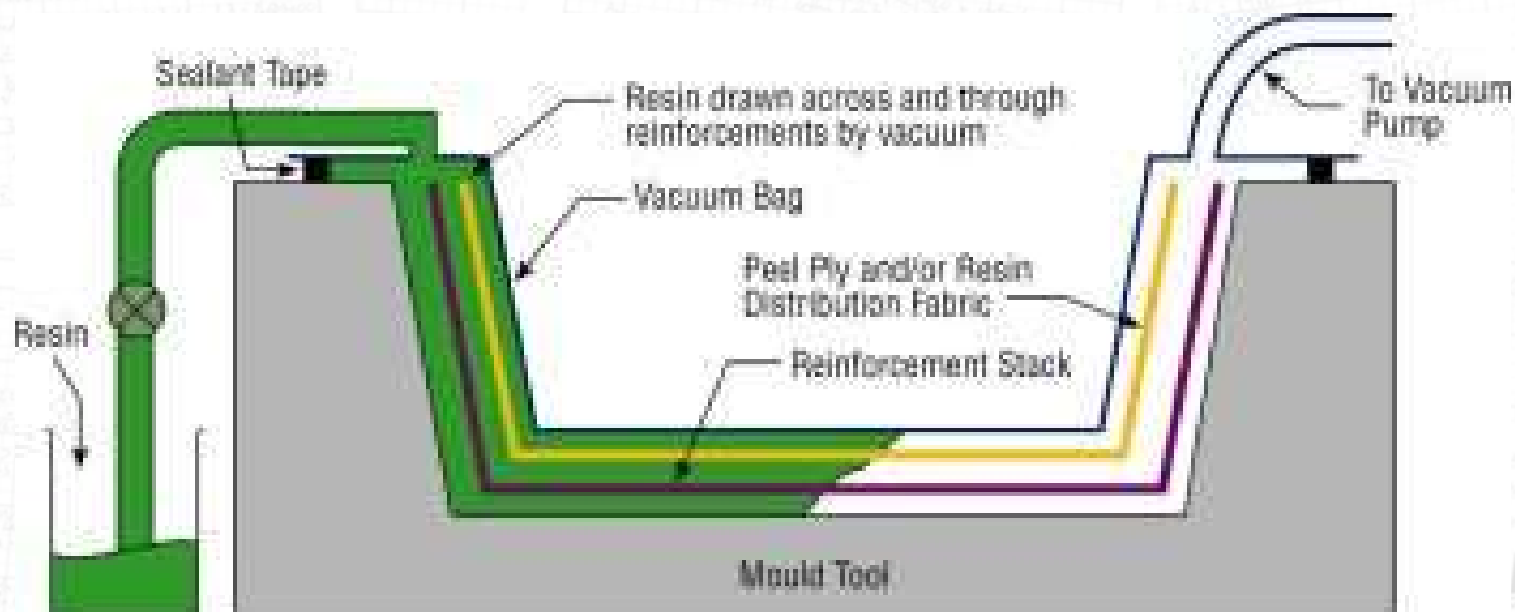
- The boat is optimized for production:
 - ... by specifying cost-effective materials and processes
 - ... by limiting the amount of internal structure in the boat
 - ... by making the structure easy to locate and install
 - ... by designing the boat so hardware and fittings are self-locating
- Envisioned from the beginning as a strict one-design
 - The Farr 280 is a builder-certified one-design
 - Rigorous manufacturing controls and pre-delivery check measurements
 - Every boat has a measurement certificate guaranteeing compliance

ENOUGH ABOUT THE DESIGN, HOW IS IT BUILT?

- The Farr 280 is built using composite construction
- Materials primarily consist of:
 - E-glass fiber with high-quality epoxy resin
 - Corecell foam core
- All parts laminated in a female mould
- Most parts have gelcoat finish, some is clear coat
- Tooling all produced by CNC – nothing by hand
- Major parts are laminated using vacuum infusion, producing light-weight structures with high fiber-to-resin ratios

WHAT IS 'VACUUM INFUSION' ANYWAY?

- Dry stack of fiber & core materials is applied to the mould
- Materials are covered with a vacuum bag, and all air is extracted
- Resin is pulled in by the vacuum, fully saturating the part
- Resulting part is nearly free of voids



FARR 280 BOAT #2 DISCUSSION

- Boat #1 was a learning experience for all involved
- As designers, FYD learned things about sailing Boat #1 that we wanted to address for future builds
- As builders, PCT learned things during construction of Boat #1 that they wanted to address for future builds
- FYD would spend time on-site during construction of Boat #2, to work with the builder on improving the product

FARR 280 BOAT #2 CONSTRUCTION

In April 2014, I spent nearly 3 weeks at Premier Composites, in Dubai

The time spent in Dubai was of great value:

- Only opportunity to work with the actual builders
- Able to gain a better understanding of their challenges
- Able to educate them on why various areas were designed/engineered a certain way
- Openly discuss construction sequences, details, etc...
- Witness the lamination of key components of Boat #2

A close-up, low-angle shot of a sailboat's hull and sail as it cuts through the water. The sail is white with a blue stripe near the top. The hull is white and has a red oval sticker that reads "Quantum Key West RACE WEEK 2016" and "JANUARY'S BEST ... IN KEY WEST!". The water is dark blue and splashing around the hull. The text "END OF FIRST HALF" is overlaid in large white letters.

END OF FIRST HALF

