



LIONHEART

A NEW BREED OF J-CLASS FOR A NEW ERA OF J-CLASS RACING



L·I·O·N·H·E·A·R·T

A NEW BREED OF J-CLASS FOR A NEW ERA OF J-CLASS RACING

SHE IS THE LARGEST SUPER-J EVER TO BE LAUNCHED WITH OPTIMISED DESIGN FOR ACHIEVING LINE HONOURS



a history of excellence

The most advanced and most powerful thoroughbred sailing yachts of their day, the J-Class was adopted for the America's Cup competition in 1928. The Class itself dates back to the turn of the century when the Universal Rule was adopted. This used a yacht's various dimensions to calculate an equivalent rating in feet so vessels of varying lengths and sail size could compete against one another without the need to make allowances for time or distance sailed.

Thomas Sopwith (Sopwith Aviation Company) funded, organised and helmed the yachts Endeavour in 1934 (nearly winning) and Endeavour II in 1937.



Only 10 J-Class yachts were designed and built during the 1930's. Several yachts of closely related dimensions, mostly 23-Metre International Rule boats, were converted after their construction to meet the rating rules of the J-Class but only the purpose-built Cup yachts could compete in the America's Cup.

Laying the Keel of Endeavour II in 1936. The men are ladling lead that will go into the 90-ton keel.



J-Class yachts required enormous crews and, despite expert attention to their technical details, still broke an astonishing number of masts. While they were in most regards the most advanced and most powerful thoroughbred sailing yachts ever to have been built, the glorious J's proved too extravagant for their own good and most had limited sailing careers outside of the America's Cup - RANGER, whose 1937 cost was upwards of \$500,000, was laid-up at the end of her debut season and never sailed again.

“J-Class - the most advanced and most powerful thoroughbred sailing yachts of their day”

The J-Class Yachts

Name			Built	Owner	Designer	Builder	AC Role	LWL	LOA	Disp. (tons)	SA	Disposition
Enterprise	US		1930	Aldrich Syndicate	W. Starling Burgess	Herreshoff Mfg. Co.	1930 Defender	80	120	128	7583	scrapped 1935
Whirlwind	US		1930	Whirlwind Syndicate	L. Francis Herreshoff	George Lawley and Son, Boston		86	130		7335	scrapped 1935
Yankee	US	J 2	1930	Yankee Syndicate	Frank Paine	George Lawley and Son, Boston		84	126	148	7288	scrapped 1941
Weetamoe	US		1930	Morgan syndicate	Clinton Crane	Herreshoff Mfg. Co.		83	125.5		7550	scrapped 1937
Rainbow	US	J 4	1934	Harold S. "Mike" Vanderbilt	W. Starling Burgess	Herreshoff Mfg. Co.	1934 Defender	82	127.7	141	7535	scrapped 1940
Ranger	US	J 5	1937	Harold S. "Mike" Vanderbilt	W. Starling Burgess and Olin Stephens II	Bath Iron Works	1937 Defender	87	135.5	166	7546	laid-up 1937; scrapped 1941
Shamrock V	UK	J K3	1930	Sir Thomas Lipton	Charles Nicholson	Camper & Nicholson	1930 Challenger	81.1	119.8	134	7540	restored
Endeavour	UK	J K4	1934	T.O.M. Sopwith	Charles Nicholson	Camper & Nicholson	1934 Challenger	83.3	129.8	143	7561	restored
Endeavour II	UK	J K6	1936	T.O.M. Sopwith	Charles Nicholson	Camper & Nicholson	1937 Challenger	87	135.8	162	7543	laid-up 1938
Velsheda		J K7	1932	W.L. Stephenson (US)	Charles Nicholson	Camper & Nicholson		83				survives
Other Yachts												
Vanitie	US		1914		William Gardner							scrapped 1938
Resolute	US		1914		Nathaniel G. Herreshoff		1920 Defender	74'11"	106'4"		8775	scrapped 1939
White Heather II	UK		1907	W.L. Stephenson (US)	Fife							
23M yachts												
Cambria	UK	K4	1927	Sir William Berry	William Fife III			80	135			survives
Astra	UK	K2	1928	Sir Mortimer Singer	Charles E. Nicholson	Camper & Nicholson						survives
Candida	UK	K8	1932	Hermann Andreae	Charles E. Nicholson	Camper & Nicholson						survives
Britannia	UK	K1	1893	HRH Prince of Wales	George L. Watson	Henderson's on Clyde		87'10"	148'0"		10,317	stripped and scuttled 1936



Ranger c.1937

"Of the ten built in the 1930s, only three J-Class yachts have survived"

J-Class revival

One of the key drivers of the J-Class revival was the decision of the J-Class Association to allow aluminium to be used as a hull construction material. This reinforced the renewed interest among owners to build J-Class yachts.

Of the ten built in the 1930s, only three have survived: ENDEAVOUR, VELSHEDA and SHAMROCK V. The RANGER that sails today is a replica built to the original line drawings in steel and launched in 2003. This leaves ten J-Class designs that have never been built.



Endeavour sailing to windward in the Solent near Cowes Isle of Wight

"Our office carried out a performance analysis of the existing J's as well as the designs that were allowed to be built under the new J-Class Association rules," explains Hoek Design, the naval architects behind LIONHEART. "We analysed the line honours and handicap of all the yachts and modelled them in our software in such a way that we could predict performance. A specific handicap system was developed by the J-Class Association for these yachts in order to enable smaller and larger steel and aluminium J's to race against each other. This analysis gave us a great deal of insight into the performance differences between these yachts."



Velsheda the 1933 J-Class yacht in the Solent

The best five performing yachts were then further analysed with computational fluid dynamic software in order to gain greater insight into the differences. The series of yachts originally designed for the RANGER project in 1936 proved to be very good performance-wise but some were better suited to light air conditions whilst others performed best with heavy air.

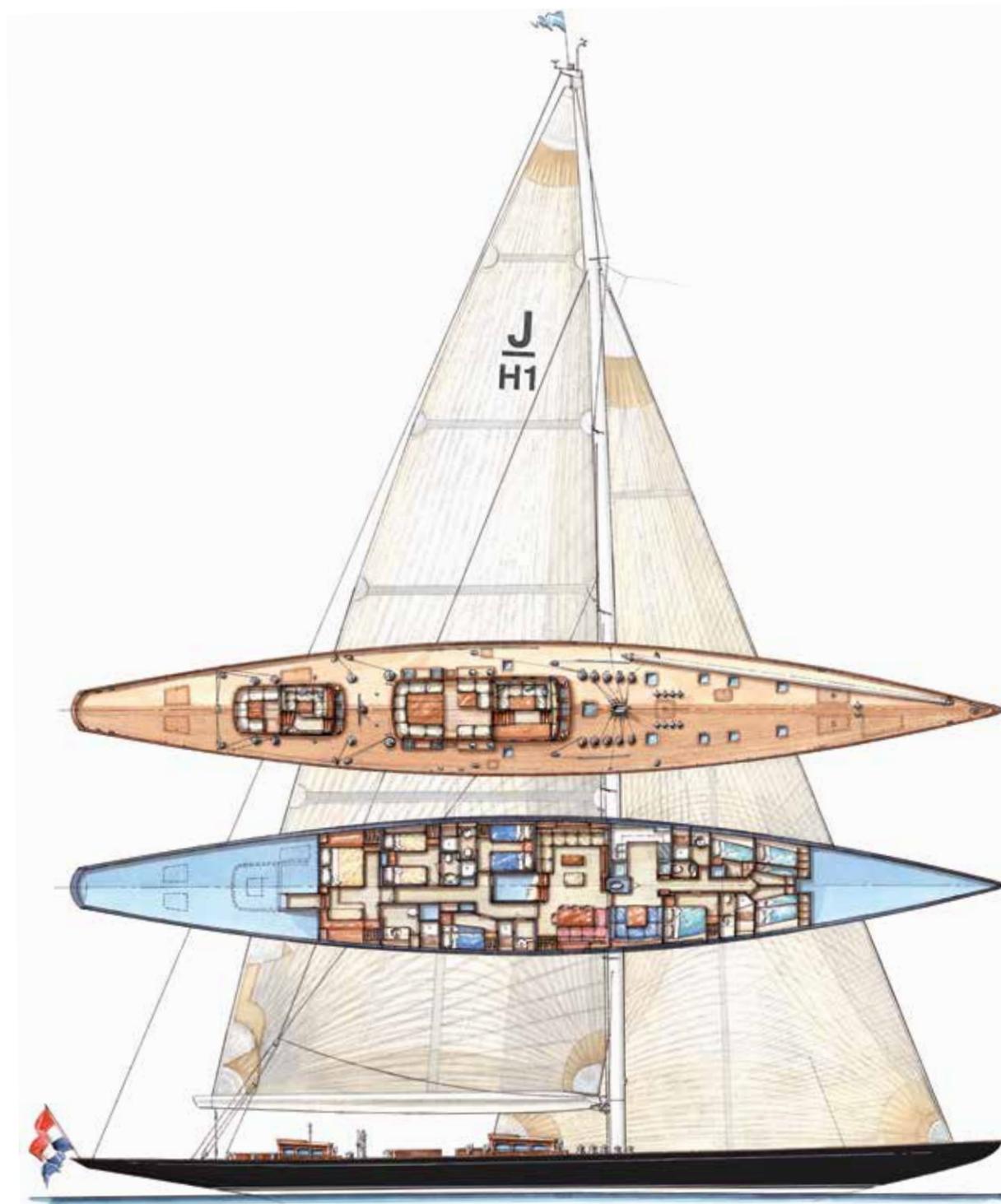
Opposite page
Shamrock



Based on a never-before-built alternate design by Starling Burgess and Olin Stephens II, considered for 1937's America's Cup defender RANGER, LIONHEART is the first of a new breed of aluminium J-Class yacht based on the latest research of Hoek Design and built at the Bloemsma Aluminiumbouw yard with Claassen Shipyards BV. The longest J-Class ever built, tremendous 17-metre overhangs on a LOA of 44-metres have created a "Super-J" with a maximum waterline length

Lionheart a new era of J-Class yachting

"We extensively optimised LIONHEART's structure using 3D structural modelling techniques with finite element software programmes," explains Hoek Design. "The complete hull structure was analysed for stiffness and torsion, and her stiffness compared to the steel original. The weight of the hull structure was also further optimised, while the hull was developed in high tensile Alustar plating and extrusion materials to provide even greater stiffness. We carried out extensive research into the mast position, and sail area vs. handicap in order to create a yacht that would perform to her best on the race course."



“Lionheart is designed for cruising as well as racing”



The cruising option

LIONHEART is designed for cruising as well as racing, and is therefore being built to MCA classification and as such will be one of the few J-Class yachts available for charter - the majority never having been built to class. Her deck layout shows two small deckhouses with sleek and low profiles as well as two small cockpit areas.

The privacy concept that Hoek Design created for renowned projects such as ADELE, BOREAS and the upcoming ATHOS was also further developed for LIONHEART to offer an owner's stateroom with a private deckhouse and private cockpit. She also has three guest suites, four crew cabins and a lounge area.





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project data

General

Type	J-Class sloop
Naval architects	Hoek Design Naval Architects B.V.
Yard	Claasen Shipyards B.V.
Class approval	ABS A1-CYS and MCA LY-2, restricted to 60 miles offshore
Interior designers	Hoek Design Naval Architects B.V.

Principal dimensions

Length hull over all	43.40 m
Length on design waterline	26.52 m
Max. beam at deck	6.27 m
Max. beam	6.55 m
Draft on design waterline	4.57 m
Displacement half load (approx.)	185 tonnes
Mast above design waterline	52.65 m

Keel and rudder

Keel type	Aluminium keel integrated in the construction
Rudder type	Integrated long keel with hung type rudder

Rigging

Type	Fractional cutter rigged sloop
Mast	
Type	Keel stepped
I approx.	41.66 m
J approx.	15.32 m
P approx.	47.53 m
E approx.	18.50 m
Half chainplate width	2.81 m
Mast spreader angle	7.0 degrees

Steering system

Type	Cable / rod steering, Edson, JP3 o.e.
Autopilot	Simrad o.e.
Hydraulic steering	Custom by yard

Propulsion installation

Main engine type	Volvo D9-MH, 313kW @ 2200 rpm
Reduction gear	MG- 5082 SC
Propeller installation	Hundested VP-5 controllable pitch propeller
Propeller diameter	950 mm
Bowthruster	Hydraulic, swing retractable 70hp

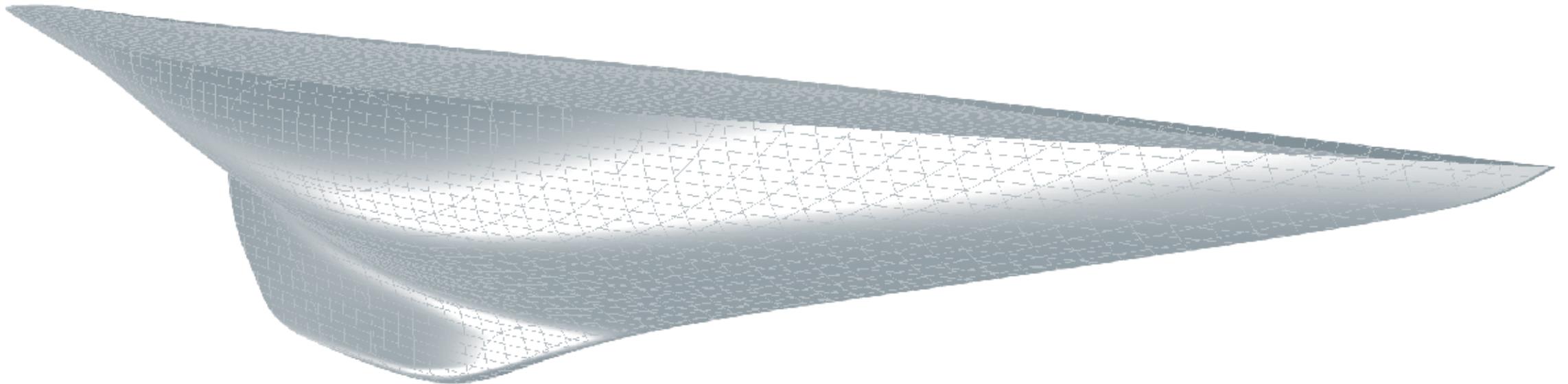
Electrical installations

Battery types	2V gel batteries, Victron
Battery bank	Service 12x 2V, 1500Ah 2x Generator start 24V, 50Ah Main engine start 24V, 50Ah Radio/emergency, 24V, 200Ah 2x Interior illumination, 24V, 200Ah Victron 2x Kohler 33 EFOZD 1x ASEA shore power converter, 25 kW
Battery chargers	
Generators	
Shore connection	

Tank capacities

Fuel	2x 3725 Ltr.
Fresh water	1x 1650 Ltr, 1x 1300 Ltr.
Black/grey water	1x 775 Ltr, 1x 500 Ltr.
Hydraulic oil	1x 480 Ltr.
Sludge oil	1x 775 Ltr.
Lubricant oil	1x 480 Ltr.

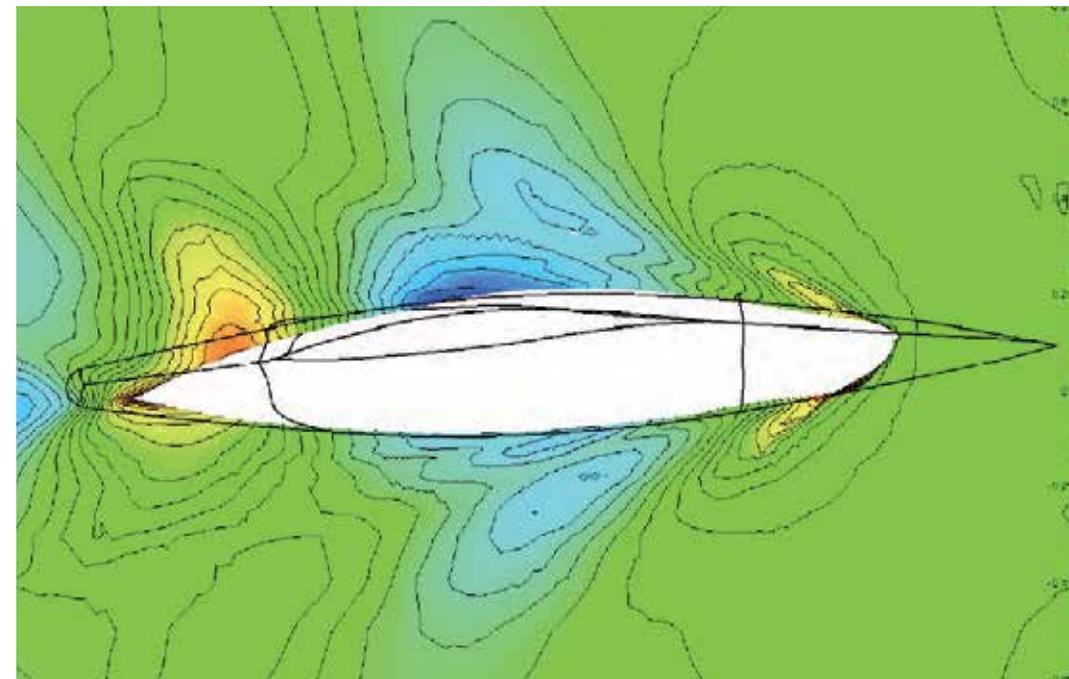
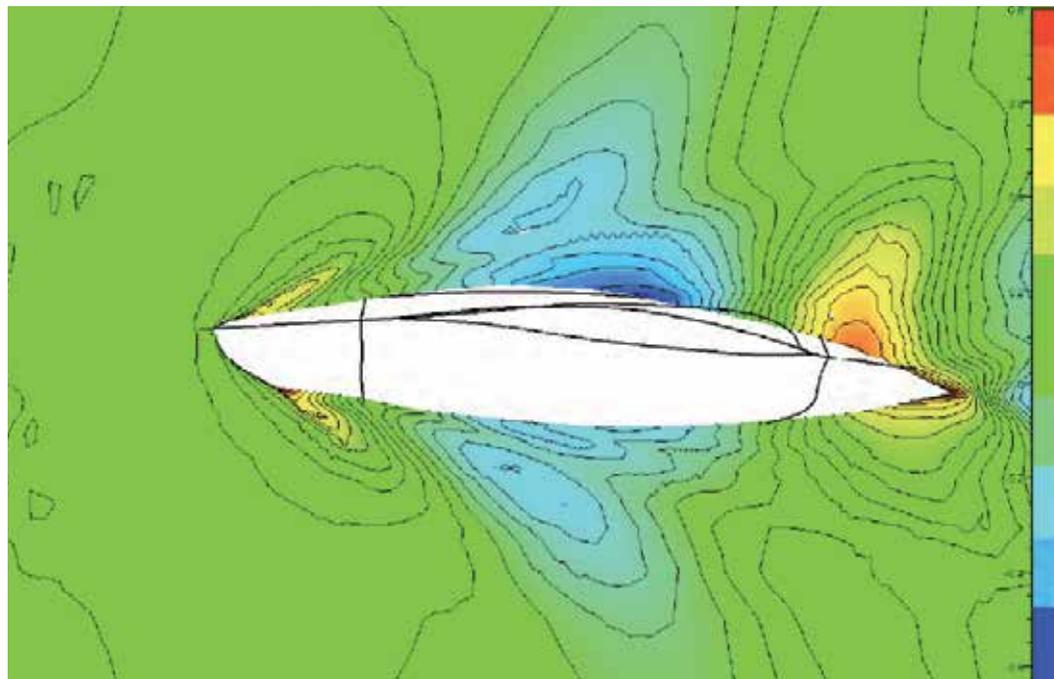
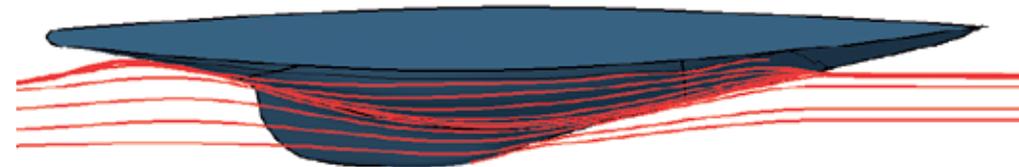
“Lionheart: the first
J-boat...to be built
in aluminium”



a new wave

When asked by the Owner of the LIONHEART Project to work on a new J-Class yacht, Hoek Design were not only thrilled but obviously very keen to do analytical research and create tools that would enable them to predict correct performance for these very specific yachts with long keels and long overhangs. They started to develop a Velocity Prediction Programme specifically for J-Class yachts together with Piet van Oossanen (of

America's Cup wing keel, fame). A VPP programme was developed that was calibrated using tank test data of a 6-metre long test model as well as wind tunnel data gathered at the Wolfson Unit in Southampton. This newly developed software is also capable of calculating rudder angles in a design stage as well as performance in waves. This very sophisticated software package was then used to analyse the performance of all the previously built J-Class yachts as well as the ten yachts that



were designed but never built.

The team started to analyse the performance of the so called "Super-Js" with the longest waterline length as history already showed these to be the fastest boats on line honours. Their performance was compared with an identical sail plan in order to take that out of the equation in the comparison. The results of the VPP showed a very clear optimal design being a RANGER F.

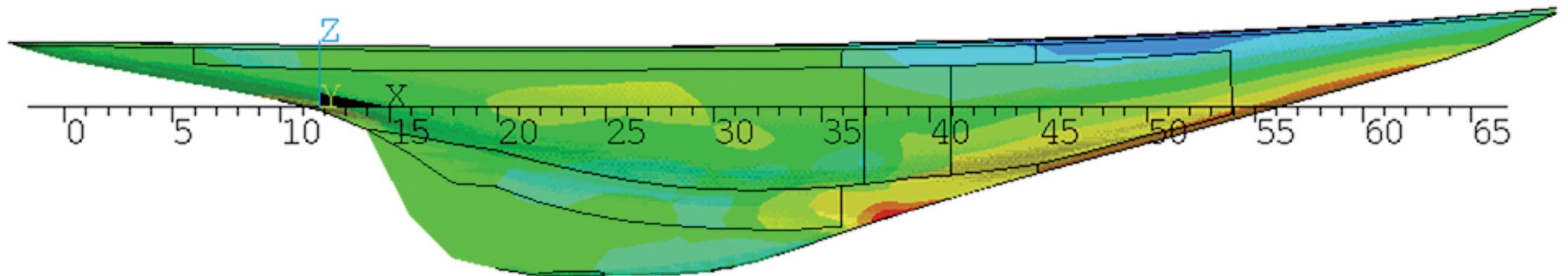
The five best boats were then taken out of the VPP research and analysed with so-called CFD (Computational Fluid Dynamics) software. With this software the resistance and lift force upwind could be calculated more accurately together with the performance downwind. These results confirmed

what the team had already found in the VPP research, proving that the RANGER F design was one of the top three yachts in terms of overall performance.

This design was then selected as the hull lines for the LIONHEART Project.

Negotiations were then started between Hoek Design, the Owner and Sparkman & Stephens to acquire the building rights for the design as S&S owned the intellectual property rights for it. The J-Class Association was notified that LIONHEART would be built according to these lines.

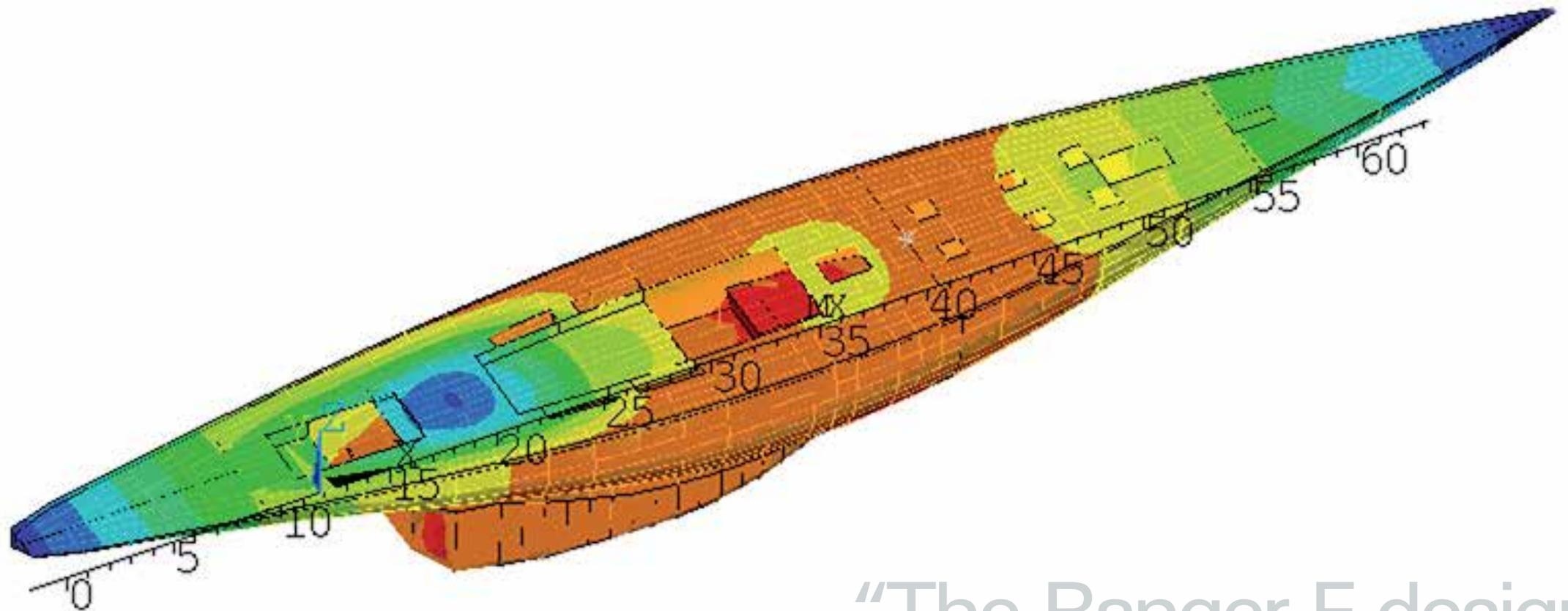
“The team started to analyse the performance of the so called “Super-Js”



a new wave

The complete design was then optimised for performance both on handicap and line honours and varied mast position, ballast ratios, righting moments, sail plan and mast rake to determine the optimal geometry of the sail plan.

The next step was to determine the optimal construction method in aluminium. LIONHEART would be the first J-boat together with ENDEAVOUR II to be built in aluminium. All other previous J-class yachts were built in steel and steel has a much higher elasticity modulus compared to aluminium. From experience with large classic yachts such as ADELE, ERICA, MARIE and ATHOS Hoek Design knew that longitudinal stiffness in aluminium hulls with long overhangs is an issue to consider seriously. They designed the structure to the minimum requirements of Lloyds and ABS and then built a so-called 3D finite element model of the structure and applied all the loads on the model including hogging and sagging loads, mast loads, standing and running rigging. They then improved and tweaked the structure in such a way that an optimal stiff yacht resulted comparable to her steel sister.



This research is crucial to the construction and will prove invaluable when LIONHEART starts racing. Her structure is designed on longitudinal frames and large longitudinal structures in the bottom of the hull and the deck in order to keep the boat as stiff as possible. The team accepted a penalty in hull weight in order to gain upwind performance that is not penalised under the handicap system of the JCA.

Great attention was also paid to the below decks furler designed to ease both racing and cruising tremendously and make the foredeck work for the crew safer, easier and faster.

“The Ranger F design was one of the top three yachts in terms of overall performance”



“Lionheart is the first of a new breed of aluminium J-Class yacht to be built based on the latest research of Hoek Design”



Mast, boom, rigging & sail technology

Another large research project was done in the development of the spars, sails and running rigging. The longitudinal hull construction gave the Hoek Design team a possibility to increase the runner loads in order to have a head stay with the least amount of head stay sag possible. Tenders were sent to various spar manufacturers and an analysis was done to obtain the stiffest and lightest mast.

The mast was built at Hall Spars in the USA mainly because it is constructed out of two pieces and cured in an autoclave. Mast and boom are built of High Modulus carbon fibres with carbon spreaders.

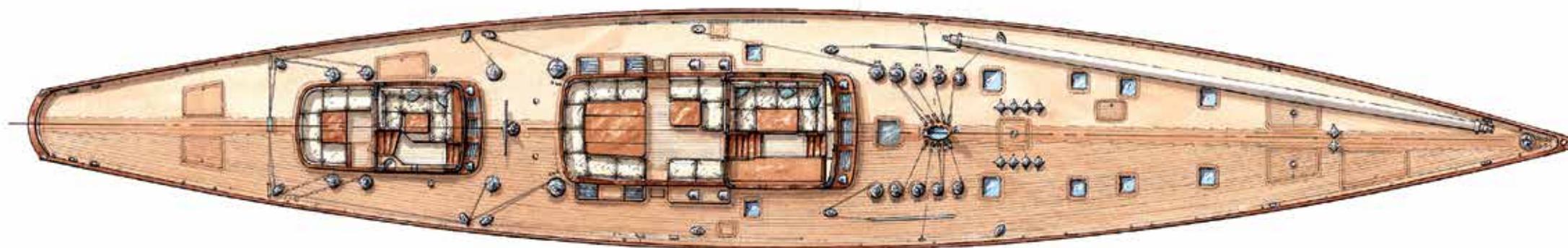
The standing rigging was built by Future Fibres in Spain with PBO fibre rigging. The photos of the spars and boom show that they are built in clear coat carbon adding to the aggressive performance look that the owner of the yacht intended to have.



The sail plan is designed with a below decks furler for the head sail that will be used both for cruising and for racing. A removable inner forestay with a manual furler for the stay sail will enable easy cruising with a Yankee staysail configuration. The cruising sails are carbon spectra from North Sails, the racing sails will be 3DL carbon.

optimum performance

“The deck layout was extensively optimised and tweaked so racing would be the primary goal whilst an optimal layout for cruising was also created”



Deck layout

The design of the deck layout is where LIONHEART stands out against any other J-Class yachts. She is designed as an Optimal High Performance racing yacht able to race under the rules of the J-Class Association and designed to the maximum performance limit under these rules.

For racing reasons there is a centre of command between the aft deckhouse and the centre cockpit where helmsman, tactician, main and Genoa trimmers are at a hands distance from each other and can therefore control the yacht without having to shout. The main sail traveller is hydraulically operated below decks and can be tweaked from the main sheet winch positions. The runners can be handled from the aft cockpit where tailors and trimmers will be in the cockpit, protected and safe. During racing the tables in the cockpits will be removed and the centre cockpit will be used as a store area for Genoa's and spinnakers.

The dual purpose, racing and cruising, is obvious and the deck layout has also been designed to be able to cruise in comfort. The aft deckhouse is connected to the aft Owner's cabin and has a private Owner's cockpit. The centre cockpit has a large dining table and can have a bimini when cruising. The forward deckhouse has a settee that gives visibility when seated inside. The deck layout was extensively optimised and tweaked so racing would be the primary goal whilst an optimal layout for cruising was also created. The carbon Harken winch package, carbon steering wheel, black hull, clear coat carbon spars and 3DL carbon racing sails give the yacht an ultimate racing appeal whilst the interior and deck layout is also completely designed for luxury cruising and charter. LIONHEART is one of the very few J-Class yachts to be built to MCA standards.

modern classic



Interior design

The interior was completely designed by Hoek Design. The privacy concept of large classically styled cruising yachts such as ADELE, ERICA, MARIE and ATHOS was also created in LIONHEART with an aft Owner's deckhouse and private cockpit. Three further guest cabins and a large open plan saloon with formal dining give guests ample space and feeling of luxury. Crew quarters are forward of the mast and separated by a watertight bulkhead with a watertight door. Four crew cabins, a crew mess and galley are integrated in the forward part of the yacht.

The interior styling is classic but not over detailed. The teak interior is detailed with waterfall margins between all wall and floors, a dado rail at the 90cm level and a cornice detail between ceiling and walls. Above the dado rail the interior could be painted white in all the cabins if the new Owners wish to do so.

The galley was designed with the use of a professional galley designer and Sub Zero fridges, drawer fridges and professional equipment were selected.

Engine room

Unique in a J-Class yacht, the engine room of LIONHEART has full headroom and is below the floor of the saloon. Access is possible from the aft corridor in the interior. A Volvo main engine of 313 KW is driving a Hunsted controllable pitch propeller. The yacht is equipped with a hydraulic bow thruster of 70 Hp, two Kohler 33 KW generators, an Asea shore power converter and all technical installations normally found on superyachts of this size. Hem water makers, air-conditioning systems etc. are installed to the highest standards.

An elaborate specification is available upon request.















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