SIGNIFICANT
SMALL SHIPS OF 2021

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THE ORC PILOT BOAT

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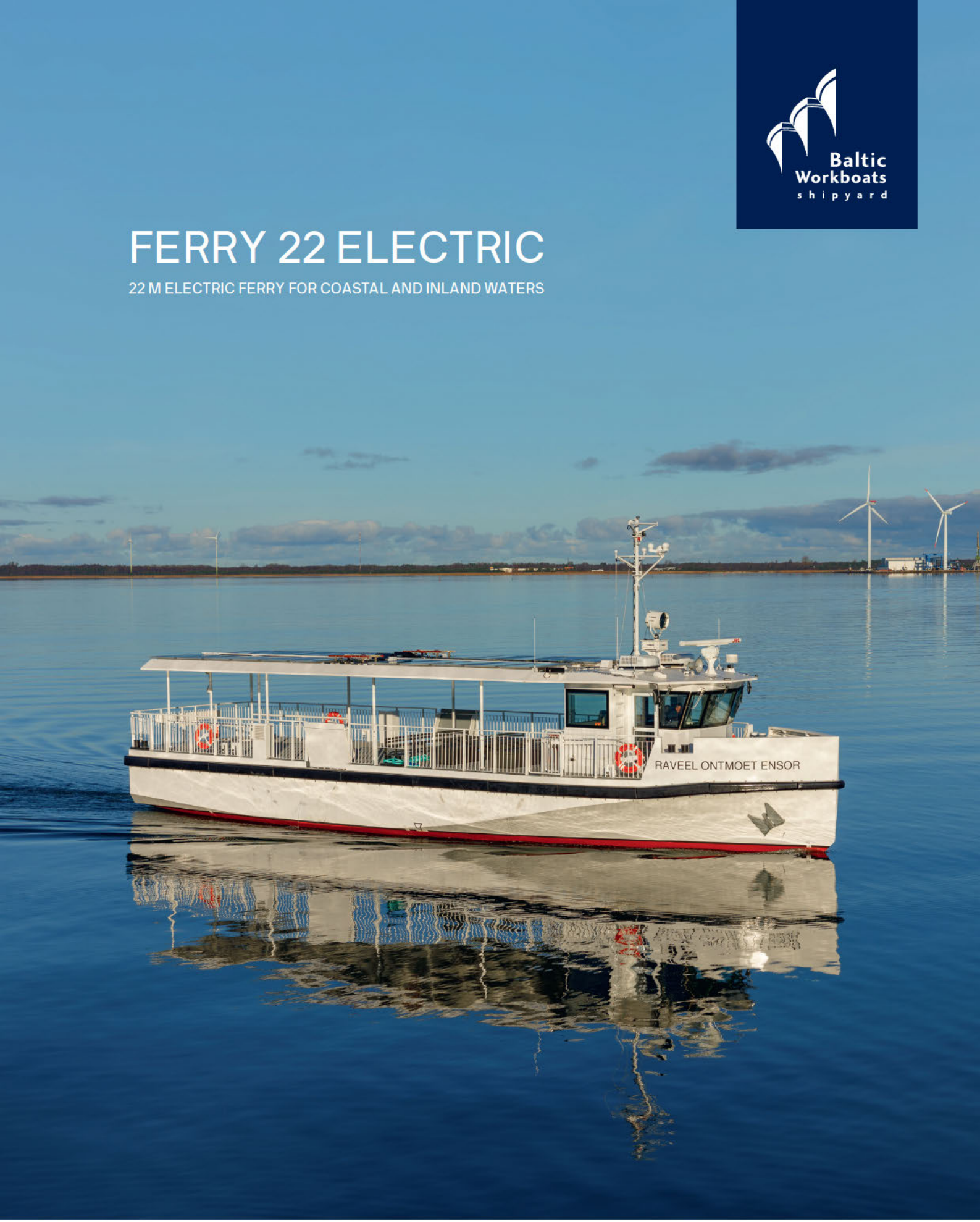
Baltic Workboats shipyard

FERRY 22 ELECTRIC

22 M ELECTRIC FERRY FOR COASTAL AND INLAND WATERS



MORE INFORMATION AND SEATRIALS:

www.bwb.ee sales@bwb.ee

BELGICA – Oceanographic research ship with green credentials

Builder: ..... **Freire Shipyard**
Designer: ..... **Kongsberg Maritime (basic design) / Freire Shipyard (detail design)**
Vessel's name: ..... ***Belgica***
Owner/operator: ..... **Belgian Science Policy Office (BELSPO)**
Country: ..... **Belgium**
Flag: ..... **Belgium**
Total number of sister ships already completed: **0**
Total number of sister ships still on order: **0**
Contract date: ..... **June 2018**
Delivery date: ..... **December 2021**

RV *Belgica* is an oceanographic research vessel built by Freire Shipyard and delivered to the Belgian Science Policy Office (BELSPO). The silent and ice-strengthened ship was designed to act as a multipurpose platform, performing various research disciplines, and is equipped with state-of-the-art scientific equipment.

The vessel has been designed as a 'green ship', with extremely low emissions due to the treatment of the exhaust gases from ship's diesel-electric propulsion plant, thus meeting IMO Tier III requirements. Its exploration area covers the North Sea, far beyond the Arctic Circle; the Atlantic Ocean, as far as West Africa; the Mediterranean; and the Black Sea.

RV *Belgica* is tasked with monitoring the quality of the North Sea by constantly collecting data related to the biological, chemical, physical, geological and hydrodynamic processes which occur. Freire Shipyard says: "The vessel's capabilities include mapping and analyses of the full water column [including fauna], sea floor and subsurface up to 5,000m water depth, besides being a platform for the use of existing large European marine research infrastructures, such as AUVs, ROVs, UAVs, seismic systems, sediment coring and rock drill devices."

Scientific equipment includes: multibeam echo sounders for shallow and deeper waters; a Kongsberg Simrad parametric sub-bottom profiler system; an omnidirectional acoustic fish-finding sonar; and vessel-mounted Ocean Surveyor ADCPs, supplied by Teledyne.

TECHNICAL PARTICULARS

Length, oa 71.4m
Length, bp 68.73m
Breadth, moulded 16.8m
Depth, moulded 8.7m
Gross tonnage 3,691tonnes
Displacement 3,883tonnes
Design, draught 4.8m
Design, deadweight 1,074tonnes
Lightweight 2,809tonnes
Deck space (total) ..... 310m^2

Service speed ..... 12.5 knots
Max speed ..... 13.1knots+
Bollard pull 30tonnes
Range 3,876nm

Propulsion
Main engine(s):
Number of engines 2
Make ..... Indar
Model AZP-900-Z/8
Output of each engine ... 1,200 kW@maximum 176rpm

Propeller(s):
Number of propellers 2
Make ..... Kongsberg
Model ..... FPP/58/5-B/P/S + thrust bearing
Diameter 3,300mm
Material ..... NiAlBr
Number of blades 5
Speed 169rpm
Fixed/controllable pitch ..... Fixed
Open/nozzled ..... Open

Deck machinery and bridge electronics
Crane(s):
Number of cranes 3
Make ..... MELCAL (Ibercisa)
Model/capacity
- 1 x telescopic foldable crane, aft: HLRM 230-4SL 8tonnes@16.1m (sea state 4)
- 1 x knuckle boom mid crane: HR 120-16-2BJ 4tonnes@16 m (sea state 4)
- 1 x telescopic foldable crane, fore: HLRM 50-6S 1.5tonnes@16 m (sea state 3)

Winch(es):
Number of winches 9
Make ..... Ibercisa
Model/capacity
- Electric CTD winch: MO-E/45/5000-8,18: 2.9tonnes @ 1st layer
- Electric CTD winch: MO-E/45/5000-8,18: 2.9tonnes@1st layer
- Electric multifunctional winch: MO-E/90/5000-12: 9tonnes@1st layer
- Electric hydrographic winch: MO-E/55/5000-13,72: 5.2tonnes@1st layer
- Electric net drum winch – bottom: TR-E/250/10: 40.4tonnes@1st layer
- Electric net sounder winch - net probe: MO-E/55/5000-11: 4.2tonnes@1st layer
- Electric fishing trawl winch: MAI-E/2x132/5000-26: 40.2tonnes@1st layer
- Electric net drum winch – Upper: TR-E/200/2x8: 30.2tonnes @ 1st layer
- Electric Gilson winch: MAX-LC/E/60/150-22: 10.5tonnes@1st layer
- Piston corer deployment system) MO-H/2x50/2/2000-11: 15m piston corer

Bridge electronics:
Radar(s) ..... Sperry Marine Vision Master FT X-Band
Sperry Marine Vision Master FT S-Band
Autopilot ..... Sperry Marine Navipilot 4000-Track
GMDSS ..... Sailor A4
GPS ..... 2 x SAAB R5 Supreme DGNSS NAV System Mk II
Engine monitoring system .... Rolls-Royce ACON Alarm & Monitoring System
Fire detection system... Autronica AUTROSAFE 4
Other communication systems ..... SAAB R5 Supreme AIS system
Danelec voyage data recorder
Skipper ESN200 navigational echo sounder
Unilux Hansa V WM- D magnetic compass

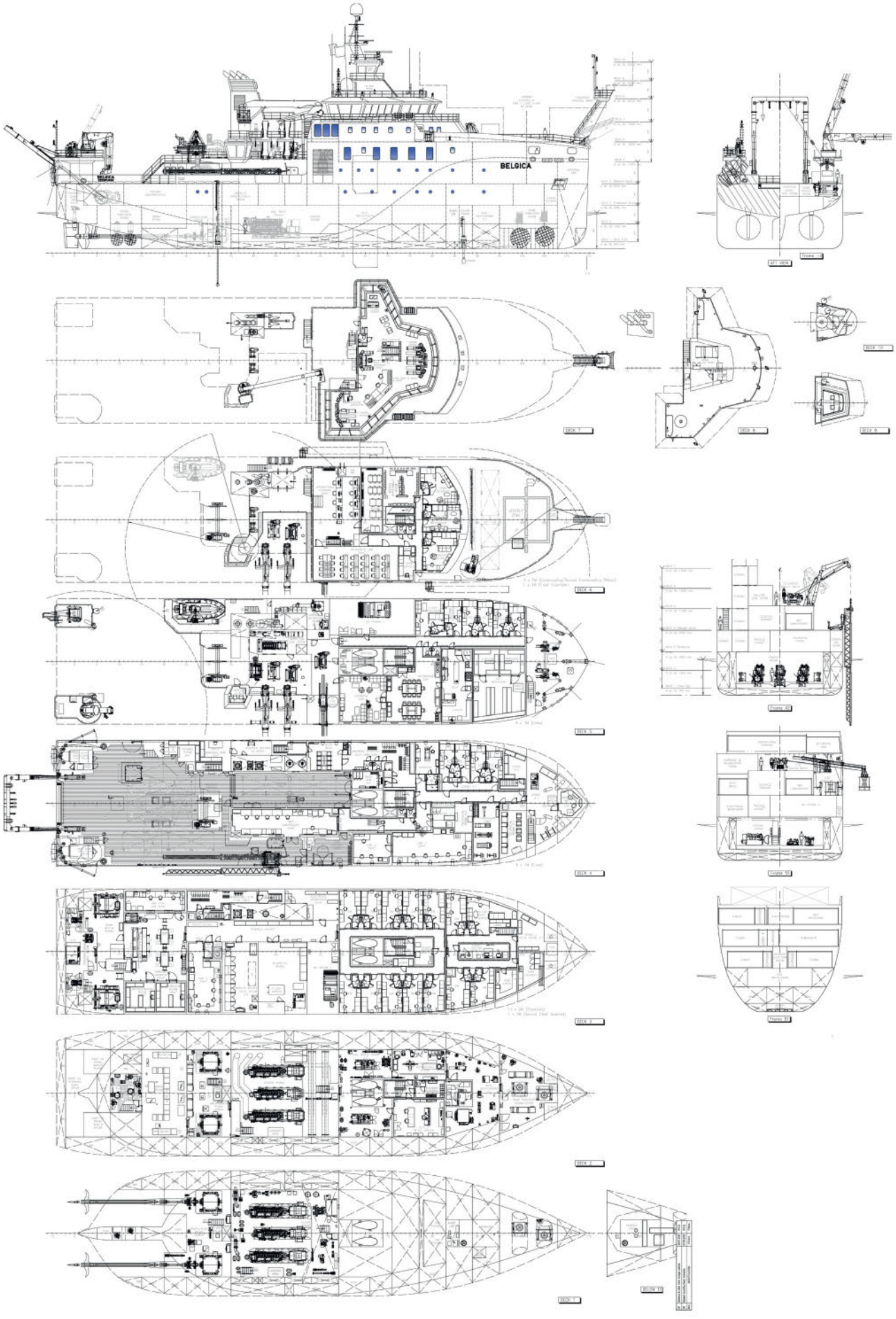
Onboard capacities:
Fuel oil 273,000litres
Fresh water 53,000litres
Sullage ..... 28,000litres (grey water)
Ballast water 626,000litres

Complement:
Number of crew 12
Number of passengers 28
Number of cabins 27

Classification
Classification society ..... DNV
Notations ..... ✠1A, ICE (1C), SPS, EO, DYNPOS(AUTR), COMF-C(2)/V(2), BWM-T, TMON, Silent R, NAUT-AW

Other important international regulations complied with ..... IMO Polar Code

BELGICA



BJØRG PAULINE – Hybrid LNG-/battery-powered wellboat

Builder:	**Tersan Shipyard**
Designer:	**NSK Ship Design**
Vessel's name:	***Bjørg Pauline***
Owner/operator:	**Nordlaks AS**
Country:	**Norway**
Flag:	**Norway**
Total number of sister ships already completed:	**2**
Total number of sister ships still on order:	**0**
Contract date:	**January 2019**
Delivery date:	**January 2021**

Running on a hybrid LNG/battery propulsive system,the fish carrier *Bjørg Pauline* is the first in a series of three such vessels, and one of the largest live wellboats that Turkey's Tersan Shipyard has built so far. The vessel was delivered early last year (slightly delayed, due to COVID-19 restrictions) to Norwegian salmon farmer Norlaks, which is using the vessel to service the Havfarm – a ship-shaped, 430m-long moored fish farm platform off the coast of Norway.

The 85.5m x 19m vessel has gained attention thanks to its propulsion system and technologically advanced fish-handling systems. Two LNG tanks, supplied by MAN Cryo, are located on deck, and the ship also carries four fuel conditioning system units.

Tersan Shipyard says: "The use of gas engines gives *Bjørg Pauline* a 30% reduction in CO_2 emissions compared to a traditional diesel engine. The use of LNG will also provide 90% reduction in NOx emissions." The Orca battery energy storage system (ESS) was supplied by Corvus Energy, and has a capacity of 678kWh, granting the vessel an added layer of 'green' redundancy. The battery pack can be shore-charged.

The vessel features a cargo hold capacity of 4,300m³, and has a payload capacity for up to 600tonnes of live fish – mainly comprising salmon and rainbow trout. It is equipped with a mechanical fish treatment system, supplied by Faroese company Sea Farm Innovations, which removes sea lice from the fish. *Bjørg Pauline* has also been provided with a special connector system to help the vessel to connect to the Havfarm. Additional onboard equipment includes: a Cflow fish-handling system; a reverse osmosis fresh water treatment plant, supplied by Norwater; a Hyde ballast water treatment system; and Triplex cranes.

The Rolls-Royce Bergen engines drive the Kongsberg propellers via Kongsberg 650GHC gearboxes. Palfinger has furnished the vessel with a rescue boat, to assist the crew in recovering man overboard (MOB) casualties.

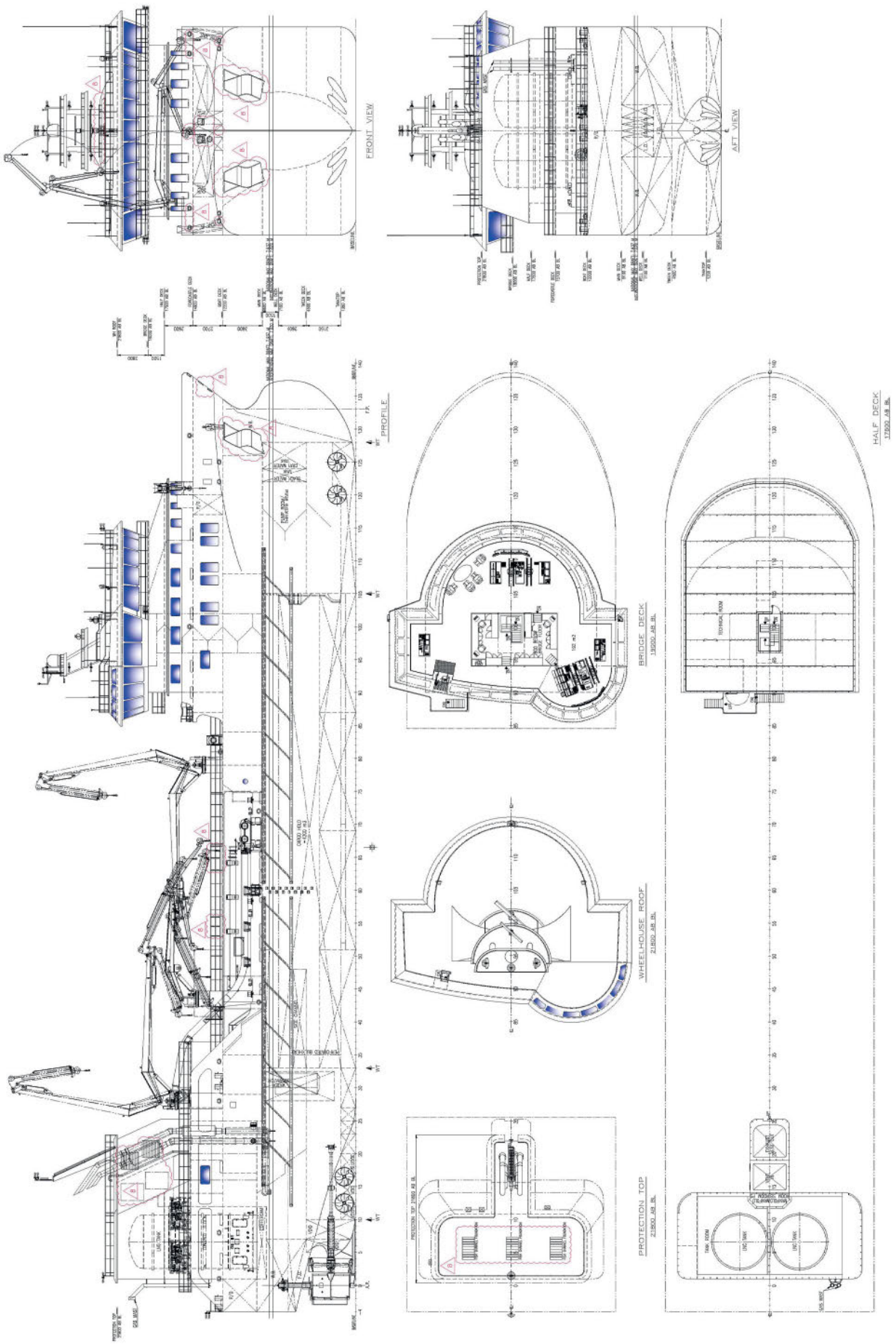
TECHNICAL PARTICULARS

Length, oa	85.54m
Length, bp	79.8m
Breadth, moulded	19m
Depth, moulded	8.6m
Gross tonnage	<3,000tonnes
Design, draught	7.93m
Propulsion	
Main engine(s):	
Number of engines	4 (LNG engines)
Make	Rolls-Royce Bergen
Model	2 x C26-33L8A 2 x C26-33L6A
Output of each engine	2 x 1,940kW 2 x 1,460kW
Propeller(s):	
Number of propellers	1
Make	Rolls-Royce
Rating	3,000kW
Fixed/controllable pitch	Controllable
Open/nozzled	Nozzled
Deck machinery	
Crane(s):	
Number of cranes	5
Make	Palfinger
Bridge electronics (make/model):	
Radar(s)	Furuno
Autopilot	Furuno
GMDSS	Furuno
Onboard capacities:	
Fuel oil	46,000litres
Fresh water	94,000litres
Ballast water	1,340,000litres + 575,000litres
Other capacities	2 x 130m³ LNG tank capacity
Complement:	
Number of crew	12
Number of passengers	0
Number of cabins	10

Other significant or special items of equipment:
- DP system
- Advanced live fish-handling and treatment technology

Classification	
Classification society	DNV
Notations	+1A,- Live Fish Carrier- R0, E0, Gas Fuelled, TMON, Battery (Safety)

BJØRG PAULINE



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CP 329 – Self-righting SAR craft designed for zero water ingress

Builder:	**Vittoria Shipyard**
Designer:	**Vittoria Shipyard**
Vessel's name:	***CP 329***
Owner/operator:	**Italian Coast Guard**
Country:	**Italy**
Flag:	**Italy**
Total number of sister ships already completed:	**3**
Total number of sister ships still on order:	**1**
Contract date:	**2018**
Delivery date:	**2021**

CP 329 is a self-righting search and rescue (SAR) boat, built by Vittoria Shipyard and delivered, alongside three sisters (*CP 330-332*), to the Italian Coast Guard's Port Authority Corps in 2021. The fifth sister in the series will be delivered in 2022.

Featuring draughts of just under 1m, the vessels have been designed for a continuous maximum speed of more than 35knots, and can accommodate up to 200 survivors/casualties. Intended to negotiate harsh weather conditions, the vessel can safely operate at wind force 5 on the Beaufort scale and sea state 4, and up to the limits of the coastline with shallow depths, as well as in the presence of breakers and/or undertow.

The unit is classified C (Malta Cross) for rescue and maritime police. The geometries and the distribution of the weights on board enable self-righting via hydrostatic force, and the vessel is designed to prevent water ingress to the exhaust pipelines, as well as to the superstructure and the hull, during this process. Special care was also taken to ensure that fuel oil and other onboard liquids do not leak if the boat capsizes.

CP 329 was also tested to withstand a freefall from 3m onto the water, and side impacts at 7knots when travelling with four crew members. Vittoria Shipyard comments: "The vessel is unsinkable...the watertight subdivision meets the IACS standards of stability requirements at intact and flooding states."

TECHNICAL PARTICULARS

Length, oa	20.1m
Length, bp	17.5m
Breadth, moulded	4.5m
Depth, moulded	2.11m
Gross tonnage	45tonnes
Displacement	34tonnes (approx.)
Design, draught	1m
Design, deadweight	7.4tonnes
Lightweight	26.6tonnes
Deck space (total)	45m^2
Deck capacity	1tonne/m^2
Service speed	30knots@85% MCR
Max speed	>35knots@100% MCR
Bollard pull	2tonnes
Range	>600nm

Propulsion
Main engine(s):

Number of engines	2
Make	MTU
Model	8V2000M84L
Output of each engine	895kW

Gearbox(es):

Number of gearboxes	2
Make	ZF
Model	ZF 665
Output speed	1,750rpm

Waterjet(s):

Number of waterjets	2
Make	Kamewa (Kongsberg)
Model	S40-3/CA

Deck machinery
Crane(s):

Number of cranes	2
Make	CNV
Capacities/SWL	180kg

Winch(es):

Number of winches	2
Make	Lewmar
Model	EVO 40
Capacities	795kg

Bridge electronics

Radar(s)	1 x Furuno FAR 2218 (12kW)
Autopilot	1 x Simrad AP70 MK2
GMDSS	1 x Furuno HF-SSB FS1575; 3 x VHF/FM Elman RTV 1077E; 1 x VHF/AM Elman RTV 2095
GPS	1 x Furuno DGPS GP170
Gyro	1 x Furuno Satellite Compass SC50
Chart plotter	1 x Furuno Navnet 3D TZT2BB
Engine monitoring system	MTU
Fire detection system	1 x San Giorgio Sein CAL10252

Other communication systems
- 1 x UHF Elman RTU 8113;
- 1 x Direction Finder Rho Theta RT500M;
- 1 x Navtex Furuno NX700A;
- 1 x Satcom Cobham FB-150

Onboard capacities:

Fuel oil	7,700litres
Fresh water	200litres
Grey/black water	200litres
Bilge	100litres

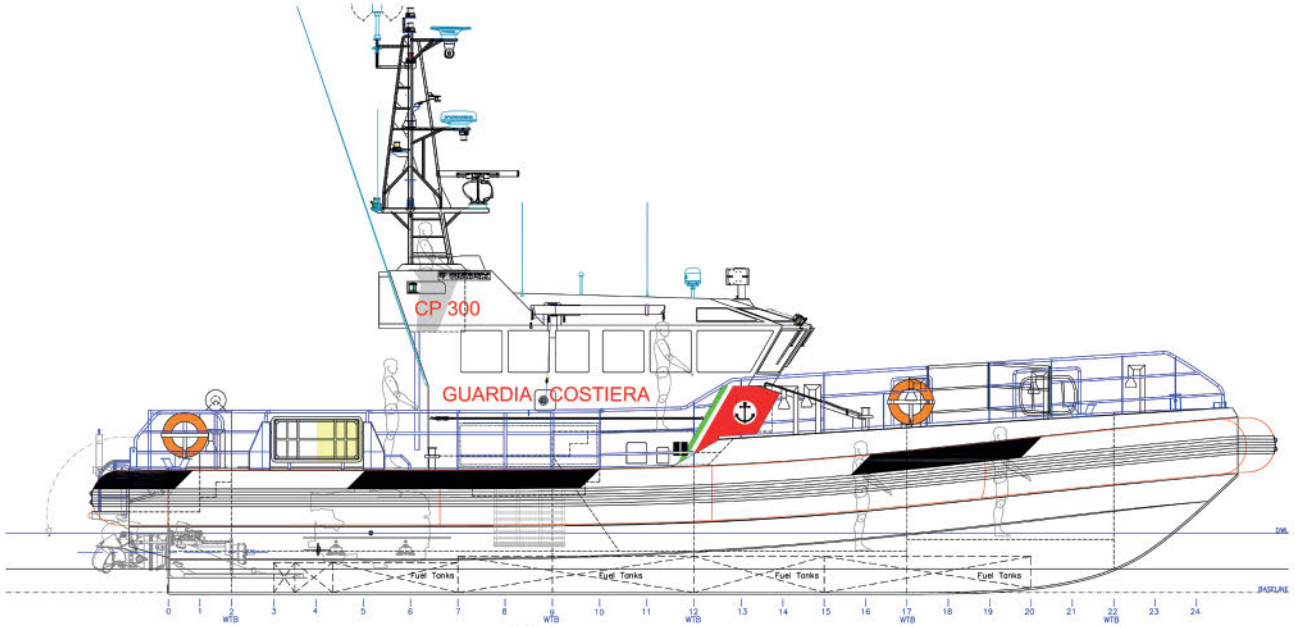
Complement:

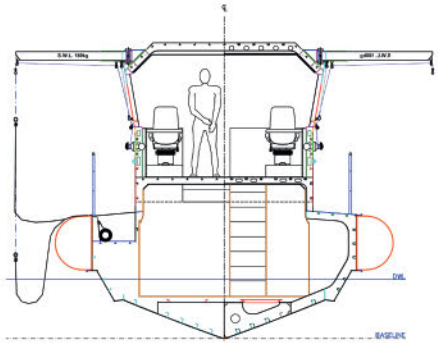
Number of crew	5
Number of passengers	200
Number of cabins	1

Classification

Notations	CP ✠ Rescue & Maritime Police - Special Navigation, Selfright, Unsink

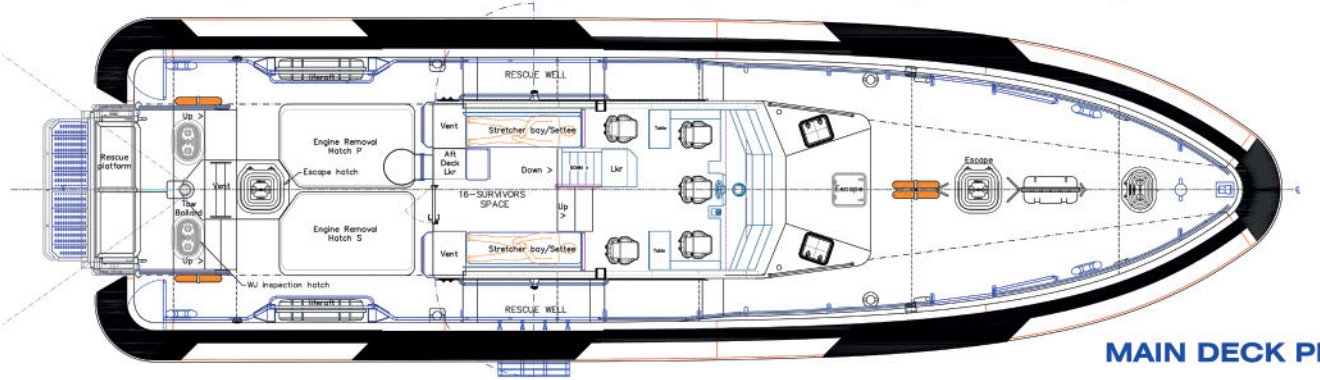
Other important international regulations complied with ..... Special RINA Rules for the Italian Coast Guard



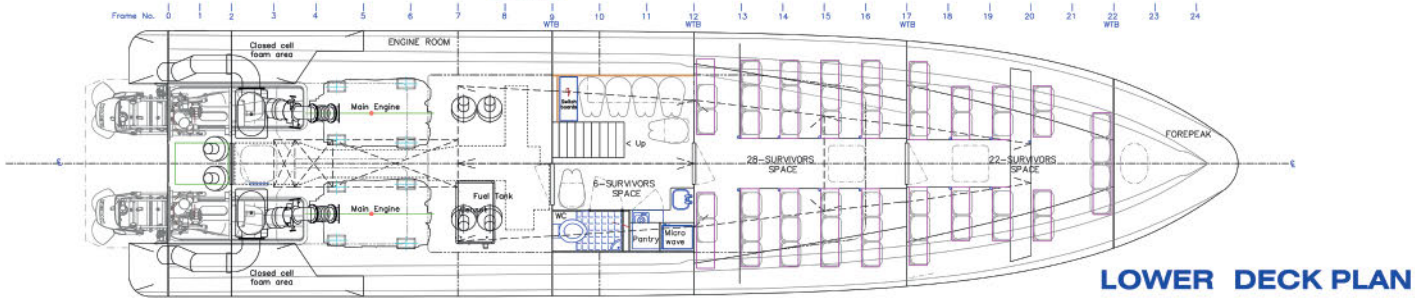


TYPICAL SECTION

OUTBOARD PROFILE



MAIN DECK PLAN



LOWER DECK PLAN

CP 329

CWIND PIONEER – SES technology adopted for crew transfers

Builder:	**Wight Shipyard Company**
Designer:	**ESNA**
Vessel's name:	***CWind Pioneer***
Owner/operator:	**CWind**
Country:	**UK**
Flag:	**UK**
Total number of sister ships already completed:	**0**
Total number of sister ships still on order:	**0**
Contract date:	**Unspecified**
Delivery date:	**February 2021**

CWind Pioneer earns its place here for being the world's first hybrid surface effect ship (SES) designed specifically as a crew transfer vessel (CTV). Built at Wight Shipyard Co on the Isle of Wight, the boat was developed in response to the industry-wide push to develop and deploy innovative technologies that reduce CO_2 emissions, while also servicing windfarms located further offshore in a cost-effective manner.

CWind Pioneer utilises a hybrid diesel-battery power system. Transits between the port and the wind farm are conducted under diesel power, while in-harbour manoeuvres and loitering on stand-by are powered by batteries alone. This facilitates a reduction in diesel engine hours and optimises diesel engine efficiency, helping to minimise CO_2 emissions throughout the working day.

The surface effect hullform and heave compensation technology enable the CTV to operate at speeds exceeding 43.5knots, and to transit and transfer safely in sea states in excess of 1.8m Hs, while minimising motion and acceleration through its air cushion motion control system. This has resulted in a smoother, more comfortable CTV experience for the offshore technician 'passengers' and crew. The main engines can also be declutched from the waterjets and used to charge the batteries.

CWind has calculated that, at a speed of 43.5knots, *CWind Pioneer* is 20%+ more fuel efficient than conventional CTVs running at 24knots, on a mile-for-mile basis. For a typical windfarm situated 30nm from port, this translates to an annual reduction of more than 110tonnes of CO_2 per vessel if using the hybrid SES.

The high transit speed of the vessel also means that wind farms previously serviceable only by expensive service operation vessels (SOVs) can be reached by the SES CTV within 60 minutes, giving wind farm owners and operators more low-cost, low-carbon options when determining their transfer strategy.

The twin catamaran hulls are built in marine-grade aluminium, and the superstructure is manufactured in composites. The cushion is bounded by deep segments at the bow and a multi lobe bag skirt at the stern. Forward-mounted centrifugal fans feed the air cushion, supporting approximately 80% of the vessel weight.

Additionally, as *CWind Pioneer* was produced during the COVID-19 pandemic of 2020, special attention was also paid to the personal safety of the technician complement. To aid social distancing, Plexiglas divisions were incorporated all around the seats in the passenger cabin.

TECHNICAL PARTICULARS

Length, oa	22m
Breadth, moulded	8.9m
Design, draught	0.5m (on cushion) 1.9m (off cushion)
Deck space (total)	30m^2
Deck capacity	1.5tonnes/m^2
Service speed	38knots
Max speed	43knots
Propulsion	
Main engine(s):	
Number of engines	2
Make	Scania
Model	DI 16
Output of each engine	809kW
Gearbox(es):	
Number of gearboxes	2
Make	ZF
Model	ZF
Waterjet(s):	
Number of waterjets	2
Make	Rolls-Royce KaMeWa
Model	S50-3/CA
Onboard capacities:	
Fuel oil	14,000litres
Fresh water	400litres
Sullage	400litres
Complement:	
Number of crew	3
Number of passengers	24
Number of cabins	0
Classification	
Classification society	BV
Notations	✠ HULL ● MACH Wind Farms Service Ship - SO, Sea area 2 (2.5m Hs), ELECTRIC HYBRID (PM, ZE), MCA HS-OSC, Cat. 1

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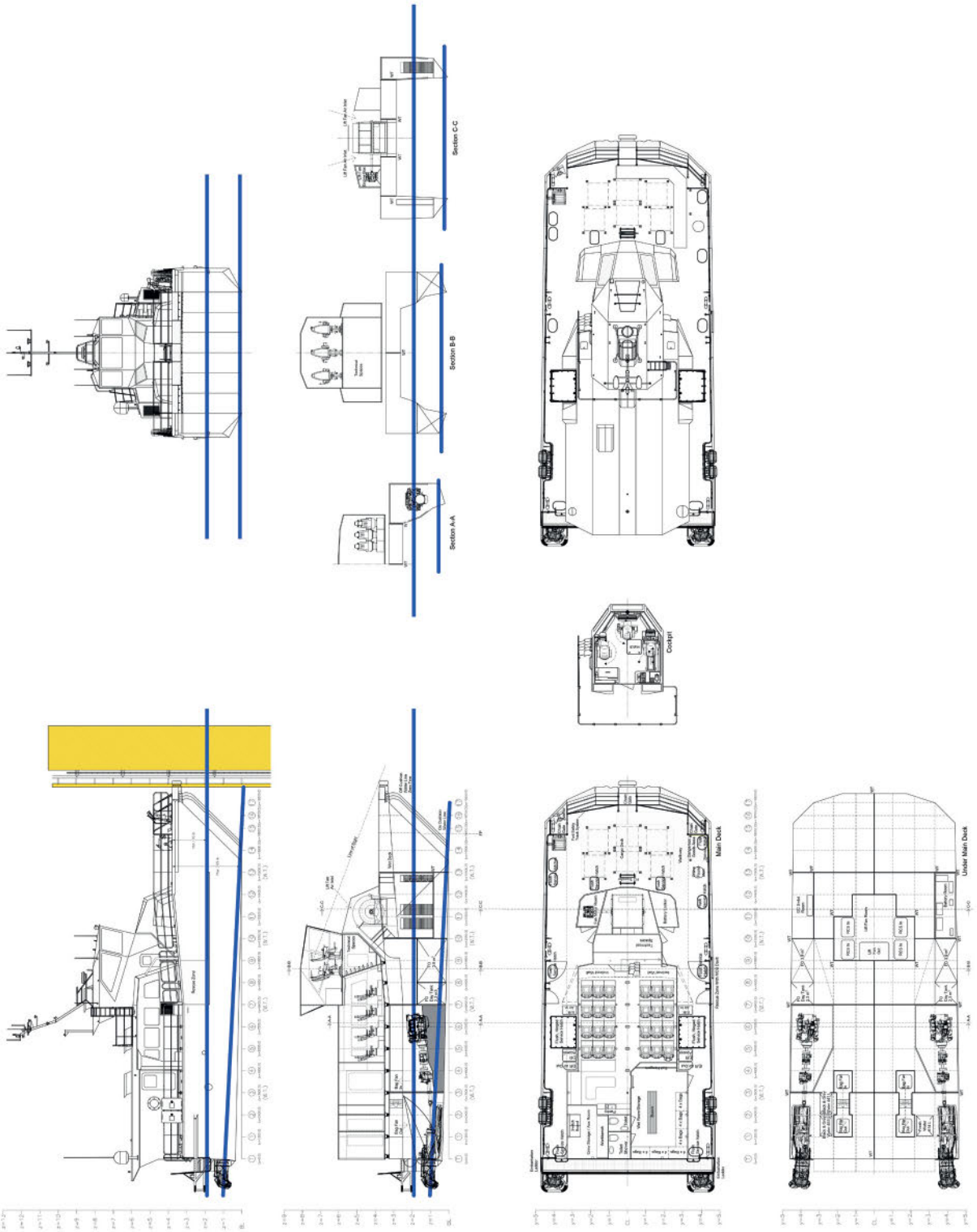
Significant Small Ships of 2021

The Royal Institution of Naval Architects

CWIND PIONEER



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HÄGGLUNDS

GROTTE – First carbon-neutral, all-electric ferry in Molslinjen's fleet

Builder:	**Hvide Sande**
Designer:	**OSK-ShipTech**
Vessel's name:	***Grotte***
Owner/operator:	**Molslinjen**
Country:	**Denmark**
Flag:	**Denmark**
Total number of sister ships already completed:	**2**
Total number of sister ships still on order:	**0**
Contract date:	**December 2019**
Delivery date:	**September 2021**

Grotte is an electrical ro-pax ferry, physically similar to its two sister vessels built in 1998 – only deploying a fully electrical powertrain. The three ferries now operate on the crossing between the island of Fanø and Esbjerg in the southern part of Denmark, transporting close to 2 million passengers and 470,000 cars annually. Operating on sustainable electricity sourced from the Danish wind turbine parks, *Grotte* is the first carbon-neutral vessel in owner Molslinjen's fleet.

The vessel is a classic double-ended island ferry. OSK-ShipTech says: "Cars and lorries are parked on the ro-ro deck where pedestrians are not allowed, due to the very limited time in harbour. The thousands of tourists visiting Fanø on foot or with their bikes, are boarded via a separate passenger ramp to the platform deck, where they can park their bike and leave their luggage."

From the platform deck, stairs provide access to the accommodation deck, which features large windows for optimal brightness and more than 200 seats. The ferry has a crossing time of only 12 minutes, conducted purely using a Corvis Orca battery bank. "The charging power is 2,600kW for only eight minutes of charging time," says OSK-ShipTech. The DC Grid connecting the batteries and the e-motor has been supplied by Danfoss Drives, allowing an extension of the battery bank in the future if requested.

The ferry mooring system is automatic when the ferry ramp is engaged to the shore ramp. The Zinus charger is also fully automatic and connects to the ferry in only 20 seconds. The battery is charged on every port stay in Esbjerg, and a minor harbour generator is fitted for safety reasons, in case of power failure onshore.

The ferry is fitted with a 375kW twin-screw rudder propeller from Schottel in each end, for enhanced manoeuvrability in all weather conditions. "The entire propulsion system, from the battery bank to the e-motor operating the rudder propeller, is connected to a fully automatic power/battery management system, leaving only the manoeuvring handle for the navigator to operate," OSK-ShipTech says.

TECHNICAL PARTICULARS

Length, oa	49.9m
Length, bp	48m
Breadth, moulded	13.8m
Depth, moulded	3.6m
Gross tonnage	925tonnes
Displacement	780tonnes
Design, draught	2.4m
Design, deadweight	265tonnes
Lightweight	515tonnes
Deck capacity (tonnes/m^2)	1.5tonnes/m^2
Service speed	11.4knots@82% MCR

Propulsion

Main engine(s):

Number of engines	2 (e-motors)
Make	Danfoss Editron
Model	EM-PMI540-T2000-1700
Output of each engine	375kW@1,800rpm

GRID system	Danfoss Vacon
Battery system	Corvus Orca (2 x 553kWh)
Shore charger	Zinus Telescopic (2,600kW)
Harbour generator	Scania GASI16 (450kW)

Propeller(s):

Number of propellers	2
Make	Schottel
Model	STP 190
Diameter	1,300mm
Number of blades	3
Speed	445rpm
Fixed/controllable pitch	Fixed
Open/nozzled	Open
Special adaptations	Twin screw propeller

Bridge electronics (make/model):

Radar(s)	Furuno Radar 12kW X-bånd FAR-2218-BB/DC/PM
GMDSS	FM-8900S
GPS	Furuno D-GPS GP-170
Gyro	Simrad GC 80
Chart plotter	MaxSea
Engine monitoring system	Deif PMS/Vest EL
Fire detection system	Survitec/Autronica
Other communication systems	Vingtor

Onboard capacities:

Fuel oil	2,700litres
Fresh water	10,800litres
Sullage	10,800litres
Ballast water (heel)	28,000litres

Complement:

Number of crew	4
Number of passengers	302
Number of cabins	0

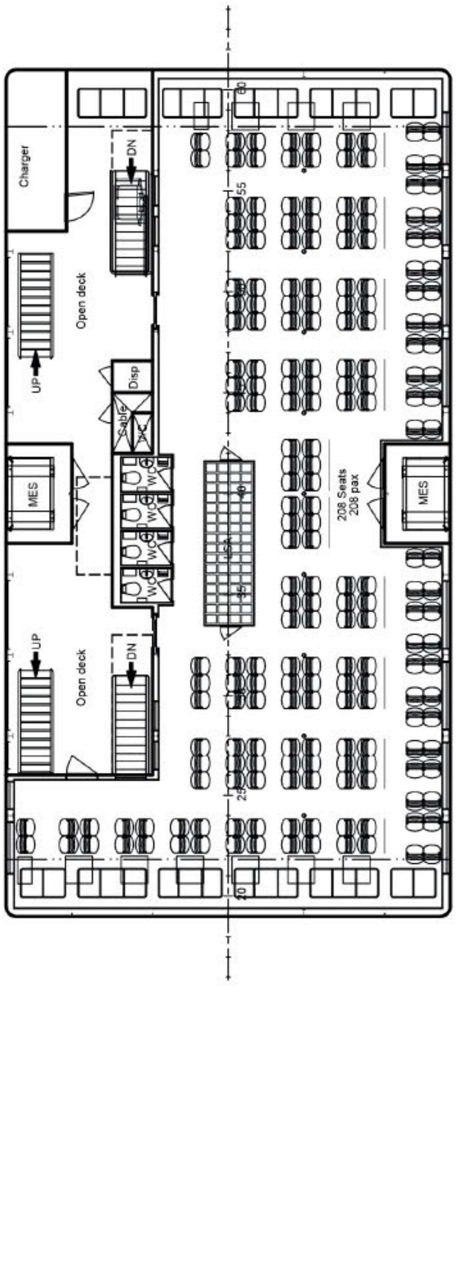
Vehicles:

Number of vehicle decks	1
Total lane length	160m
Number of cars	23
Number of trucks/trailers	4

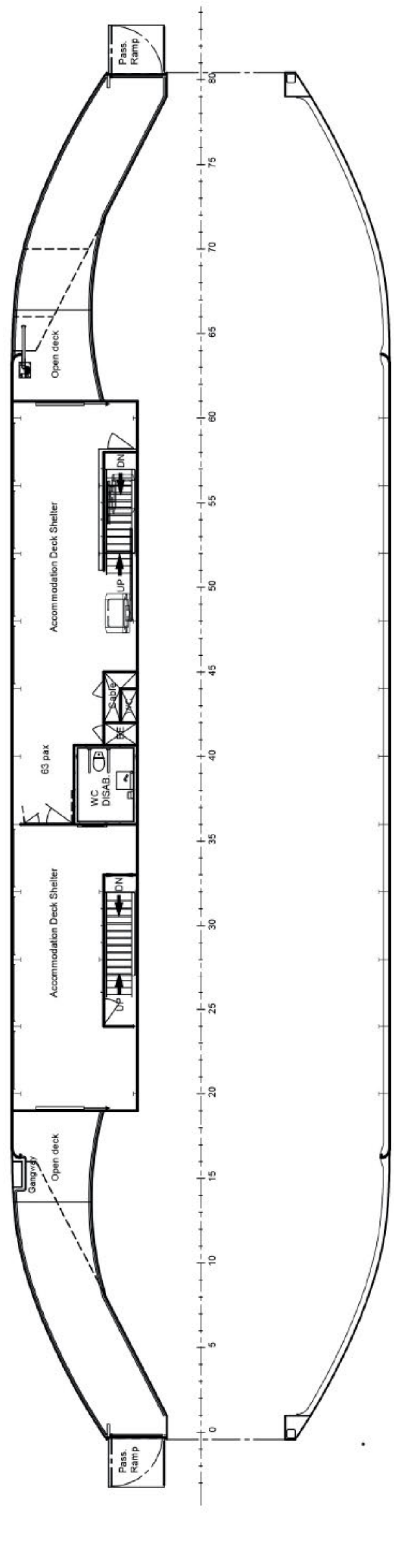
Classification

Classification society	Bureau Veritas
Notations	+ Hull + Mach Ro-Ro Passenger Ship, Coastal Area, AUT-UMS, IceE 1C (Hull), Battery System

Other important international regulations complied with: Danish Maritime Authority regulation for ferries in Area D



PASSENGER ACCOMMODATION DECK



PLATFORM DECK

HERMES – Firefighting tug for the Port of Aarhus

Builder:	**Uzmar**
Designer:	**Robert Allan Ltd**
Vessel's name:	***Hermes***
Owner/operator:	**Port of Aarhus**
Country:	**Denmark**
Flag:	**Demark**
Total number of sister ships already completed:	**0**
Total number of sister ships still on order:	**0**
Contract date:	**May 2020**
Delivery date:	**September 2021**

In 2020, Denmark's largest container port, Aarhus, invested approximately DKK45 million (roughly US$6.8 million) into acquiring a newbuild that would prove far more eco-friendly, efficient and powerful than the vessel it is replacing.

According to builder Uzmar: "The port cited strength, precision and environmental sustainability as key reasons behind its decision to replace the 40-year-old *Hermes*, which retired once its replacement arrived." The newbuild features a bollard pull of 65tonnes, compared to the outgoing vessels' rating of 20tonnes.

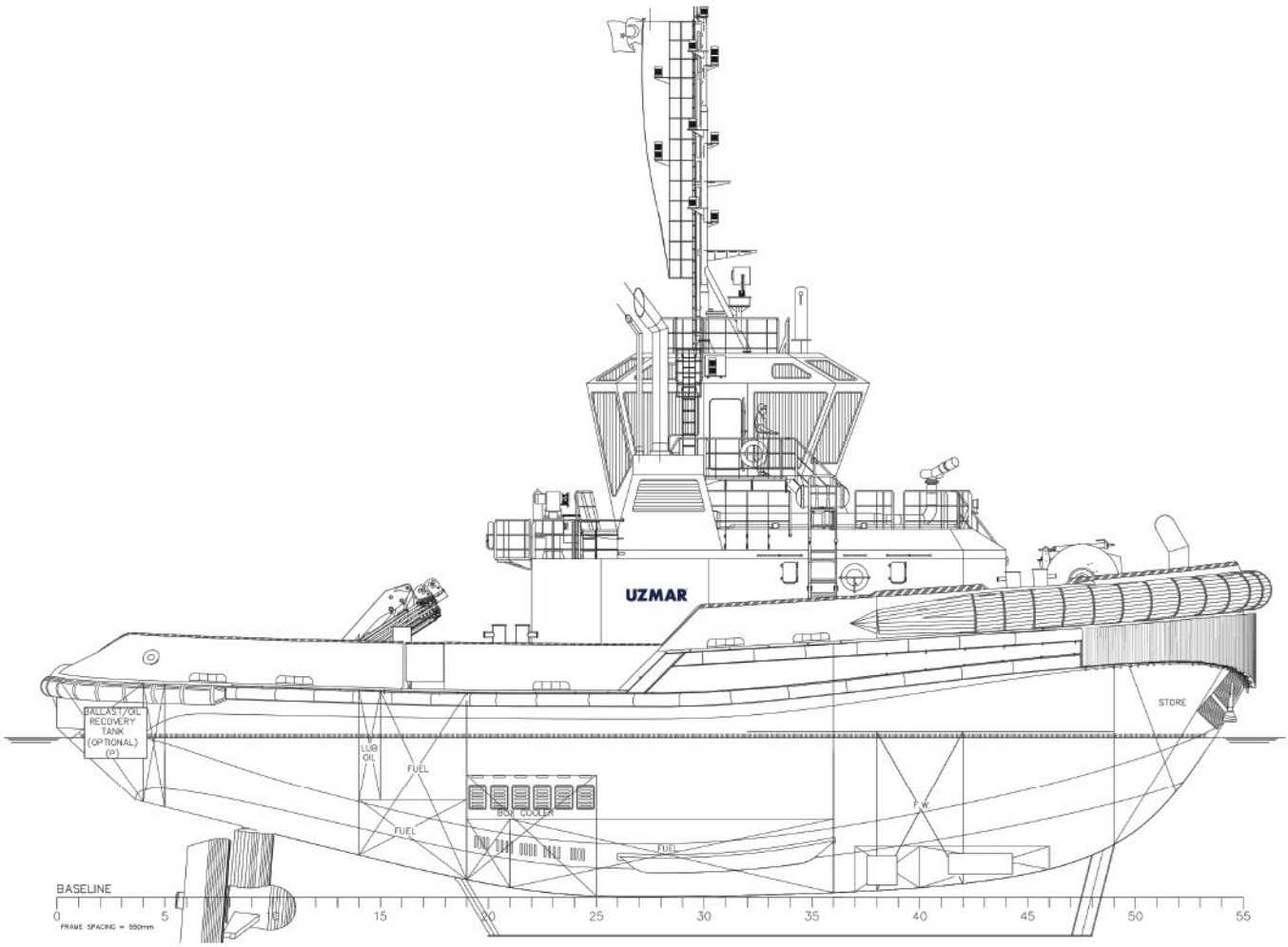
The 2021 version of *Hermes* was designed by Robert Allan Ltd (RAL), with whom Uzmar has a long-running relationship. The new vessel has been awarded the Young Ice 1 class notation by Bureau Veritas. The tug is equipped with a fire-fighting system, which will enable the Port of Aarhus to support East Jutland's firefighting department from the water side.

Hermes is powered by a pair of Cummins QSK60 engines, which have been developed to be compliant with IMO Tier II emissions requirements. Each engine generates 2,013kW. The engines drive two Schottel RudderPropeller (SRP 430-type) azimuth thrusters, turning fixed-pitch propellers. Uzmar says: "There is an additional driveshaft linking the port and starboard thruster units for Schottel's Sydrive-M mechanical hybrid innovation. This allows one engine to be shut down when the tug is not assisting a ship, while the other engine provides power to both thruster units."

As harbour tugs tend to spend considerable time running at low load levels between docks, this arrangement is expected to result in significantly reduced emission and fuel costs – and should, over time, also lead to reduced maintenance costs.

TECHNICAL PARTICULARS

Length, oa	30.25m
Breadth, moulded	11.75m
Depth, moulded	5.28m
Gross tonnage	463tonnes
Displacement	812.9mt
Design, draught	4.1m
Design, deadweight	167tonnes
Lightweight	645.6tonnes
Service speed	10knots@85 % MCR
Max speed	13.7knots
Bollard pull (tonnes)	65tonnes
Propulsion	
Main engine(s):	
Number of engines	2
Make	Cummins
Model	QSK60M
Output of each engine	2,013kW@1,800rpm
Propeller(s):	
Number of propellers	2
Make	Schottel
Model	SRP 430 FP + Sydrive-M
Diameter	2,800mm
Material	NiAlBr
Number of blades	4
Speed	1,800rpm (input speed) / 265rpm (prop. speed)
Fixed/controllable pitch	Fixed
Open/nozzled	Nozzled
Genset(s):	
Number of generators	2
Make	Cummins
Model	QSBM7 – B7
Power	119kW
Voltage	400V
Frequency	50Hz
External firefighting pump:	
Number of pumps	1
Make	FFS
Model	DFP 150X250 XPH
Capacity	600m^3
Speed	1,800rpm
Deck machinery	
Crane(s):	
Number of cranes	1
Make	Palfinger
Model	PK11001(M)B
Capacities/SWL	2,090kg@2m 700kg@9.8m
Winch(es):	
Number of winches	2
Make	Ibercisa
Model	MR-MAN/H/110/2/110-88/22-D/1 (fwd. winch)/ MR-H/110/2;/110-88-1 (aft winch)
Capacities	180tonnes brake load
Bridge electronics (make/model):	
Radar(s)	Furuno X-band ARPA radar
Autopilot	Simrad AP70 Mk2
GMDSS	Furuno
GPS	Furuno GPA-017S
Gyro	Tokyo-Keiki
Chart plotter	MaxSea TimeZero Pro (w' Olorin 19" display)
Engine monitoring system	MCS
Fire detection system	Aksis Fire
Onboard capacities:	
Fuel oil	83,300litres
Fresh water	11,900litres
Sullage	5,900litres
Ballast water	11,500litres
Foam	16,600litres
Complement:	
Number of crew	5
Number of passengers	0
Number of cabins	5
Classification	
Classification society	Bureau Veritas
Notations	I ✠Hull, ✠Mach, Tug, AUT-UMS, Unrestricted Navigation, Young Ice 1


UZMAR
BALLAST/OIL RECOVERY TANK (OPTIONAL) (P)
LUB OIL
FUEL
FUEL
FUEL
BOW COOLER
F.W
STORE
BASELINE
0
5
10
15
20
25
30
35
40
45
50
55
FRAME SPACING = 550mm

HYDROBINGO – Japanese passenger vessel using H2ICE for propulsion

Builder:	**Tsuneishi Facilities & Craft**
Designer:	**Tsuneishi Facilities & Craft**
Vessel's name:	***HydroBingo***
Owner/operator:	**JPNH2YDRO CO**
Country:	**Japan**
Flag:	**Japan**
Total number of sister ships already completed:	**0**
Total number of sister ships still on order:	**0**
Contract date:	**August 2019**
Delivery date:	**July 2021**

In 2021, the Tokuyuma Port ferry terminal in Shūnan City, Japan welcomed its first ever eco-ferry, in the form of *HydroBingo*. As its name suggests, the 80-passenger ferry has incorporated hydrogen into its powertrain, in line with the country's dedicated crackdown on emissions, and has been hailed as the first commercial passenger vessel to be equipped with hydrogen internal combustion engines (H2ICE) in both sides.

HydroBingo was brought to market by the JPNH2YDRO initiative, a 50/50 joint venture comprising shipowner Compagnie Maritime Belge (CMB) Group and Hiroshima-based small boatbuilder Tsuneishi Facilities & Craft. Built in aluminium at Tsuneishi's Uraski Craft Factory in Onomichi, Hiroshima, the ferry is owned by JPNH2YDRO and will utilise Tokuyuma as its home port until at least March 2022 while undertaking journeys in Japan's Inland Sea.

Tsuneishi had wanted to continue its commitment to producing eco-friendly vessels, though, at the time the contract was signed, ships deploying electric propulsion were capable of about six hours of sailing time at about 4knots. Given the required speed of about 20knots, the high loads typical of passenger ships and the relatively slow development of suitable, high-power electric motors, the builder decided to opt for H2ICE.

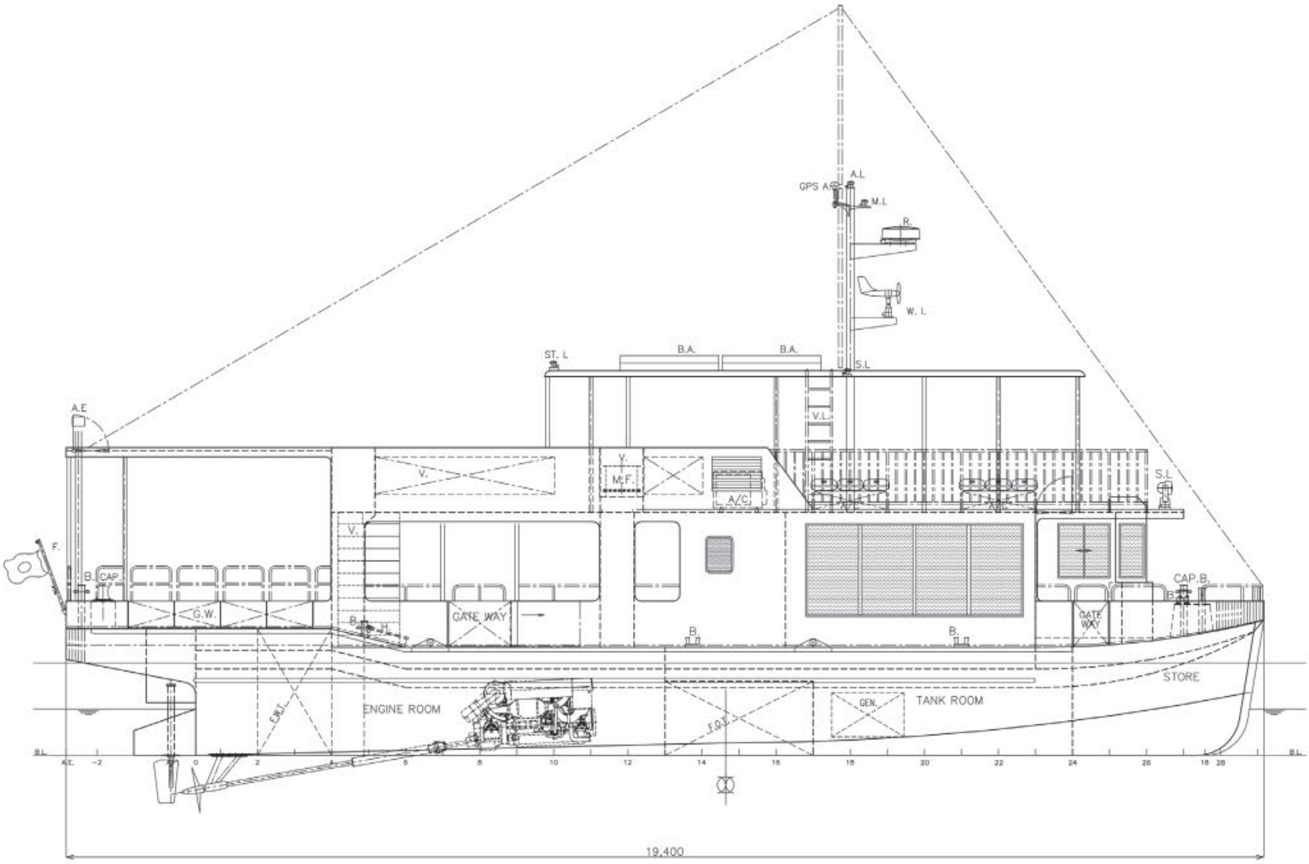
CMB Group's CMB.TECH division supplied the ferry's two H2ICE dual-fuel (diesel/hydrogen) combustion engines, each of which generates 441kW of power, plus the associated hydrogen supply lines. The ship's hydrogen stock is supplied locally by the chemical firm Tokuyuma Group. While the dual-fuel nature of the engines means that emission-free trips are still a goal to work towards, CMB Group has calculated that *HydroBingo* can slash its CO_2 emissions by 50% compared to a similarly sized diesel ferry.

As onboard hydrogen storage was going to be something of a challenge, *HydroBingo*'s stern was fitted with a mobile hydrogen trailer with the capacity to store up to 100kg of hydrogen at 350bar – sufficient for an autonomy of five to six hours. The hydrogen is fed to the engines via a double-walled pipeline.

The engine room is equipped with a ventilation system, fire alarms and hydrogen-detection sensors to ensure safety. In addition, to handle the hydrogen, the aft deck where the hydrogen tank trailer is installed has been made an explosion-proof zone. An explosion-proof wall has been installed between the explosion-proof compartment and the passenger compartment.

TECHNICAL PARTICULARS

Length, oa	19.4m
Length, bp	17.33m
Breadth, moulded	5.4m
Depth, moulded	1.75m
Gross tonnage	33tonnes
Design, draught	0.75m
Service speed	23knots
Max speed	26knots
Range	85nm (85% MCO, hydrogen-diesel dual fuel mode)
Propulsion	
Main engine(s):	
Number of engines	2
Make	CMB.TECH
Model	HyPenta D13-1000
Output of each engine	441kW
Gearbox(es):	
Number of gearboxes	2
Make	ZF Friedrichshafen
Model	ZF500-1A
Output speed	1,049rpm
Propeller(s):	
Number of propellers	2
Make	Nakashima Propeller Co.
Diameter	750mm
Material	CAC703 (Al-Br)
Number of blades	5
Speed	1,049rpm
Fixed/controllable pitch	Fixed
Open/nozzled	Open
Capstan(s):	
Number of capstans	3 (2 x hydraulic, 1 x electric)
Capacities	2 x 500kg 1 x 500kg
Bridge electronics (make/model):	
Radar(s)	JMA-3334
GPS	JLR-4350
Fire detection system	
Heat detector	
Hydrogen gas detection system	
Diffusion-type flammable gas detector	
Onboard capacities:	
Fuel oil	5,000litres
Fresh water	1,600litres
Hydrogen	200litres×12, 35MPa(102kg)
Complement:	
Number of crew	2
Number of passengers	80
Number of cabins	21
Other significant or special items of equipment:	
Hydrogen-diesel dual-fuel engine	
Hydrogen fuel unit	
Classification	Japan Craft Inspection Organization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A/C
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CAP.
G.W.
GATE WAY
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GATE WAY
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STORE
ENGINE ROOM
GEN.
TANK ROOM
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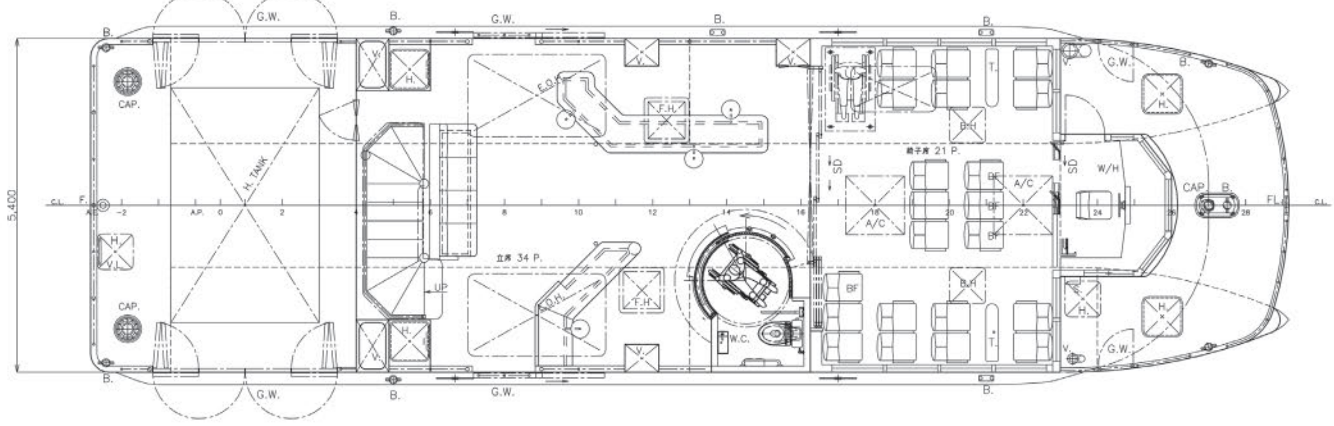
B.L.
19,400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G.W.
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CAP.
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5,400
C.L.
C.L.
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34 P.
UP
F.H.
W.C.
BF
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B.H
T.
T.
CAP.
B.
G.W.
B.
G.W.
B.

KAI SHIUAN 8 – Fast ferry for choppy Taiwanese waters, with low rate of fuel consumption

Builder:	**Glow Marine**
Designer:	**CoCo Yachts**
Vessel's name:	***Kai Shiuan 8***
Owner/operator:	**Kai Shiuan**
Country:	**Taiwan**
Flag:	**Taiwan**
Total number of sister ships already completed:	**0**
Total number of sister ships still on order:	**0**
Contract date:	**Not specified**
Delivery date:	**May 2021**

Built by Singapore's Glow Marine, and delivered to Taiwanese passenger services operator Kai Shiuan, this Coastal Cruiser 388-class vessel was based on CoCo Yachts' Coastal Cruiser 300 series, albeit modified for a twin-engine propulsion arrangement in each engine room. The hulls have been modified to create space for the four engines, and the vessel features a new Z bow, created to reduce vertical accelerations in head seas.

For *Kai Shiuan 8*, the owner requested high speed, low fuel consumption and maximum utility of space within a maximum volume of 500gt. The vessel also had to be fully compliant with national and China Register rules, and not just the more familiar IMO /HSC2000 rules – constituting one of the biggest challenges for CoCo Yachts, especially with regard to meeting stability rules (both intact and damaged) without adding too much weight to the newbuild. CoCo Yachts says: "This was actually the biggest challenge, as the rules are not really written for aluminium High Speed Code-type vessels." This was particularly important given the rough, high waves and high wind speeds commonly encountered in Taiwan's waters. The propulsion system comprises four MTU main engines, powering four Kamewa 56-4 waterjets via ZF3050 gearboxes.

Added to that, lockdowns in Singapore due to COVID-19 led to a longer-than-usual turnaround time, and resulted in a rather challenging environment, as CoCo Yachts recalls: "It was a bit strange building as the owner was not able to visit, so a process of online meetings and reporting with pictures was implemented to keep the owner informed."

It was worth the wait, though, especially as sea trials saw *Kai Shiuan 8* achieve speeds in excess of 40knots – faster than was contractually agreed. The interior arrangement includes LED light strips and West Mekan seats with leather upholstery, for passenger comfort. The vessel has also been configured to welcome wheelchair users onboard.

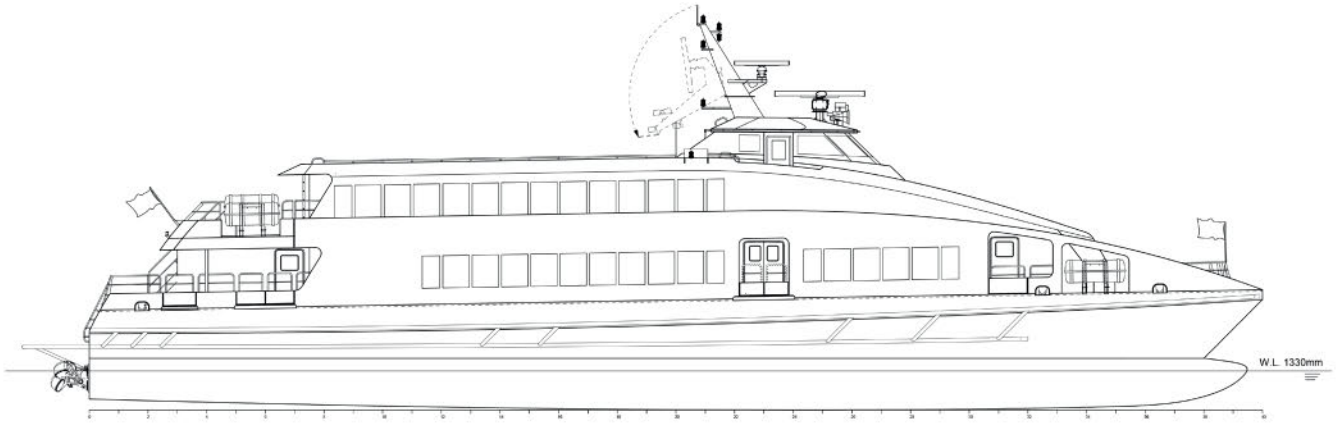
Coco Yachts adds: "The water around Taiwan can be quite rough, with high waves and high wind speeds. Although not required, we have designed the vessel to operate in waves up to 4m. We may have spent a bit extra on material [and weight], but we're very happy we did. The vessel runs very well in bigger waves, with minimum speed loss."

TECHNICAL PARTICULARS

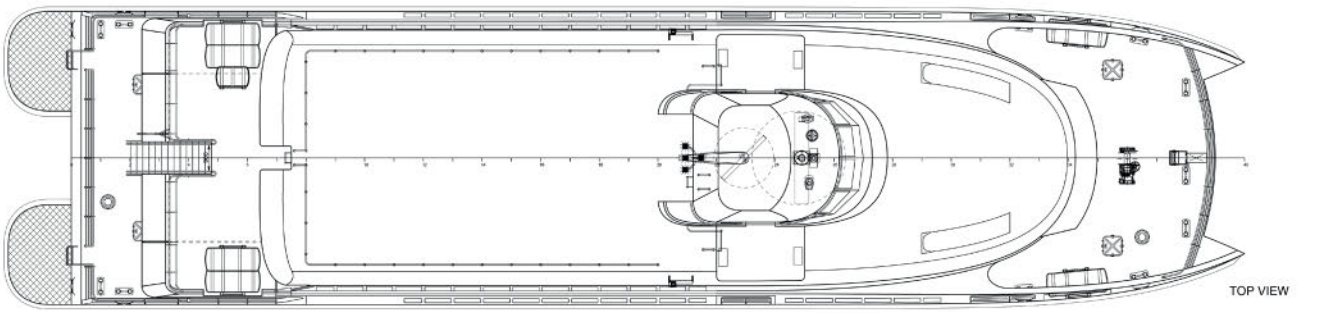
Length, oa	42.3m
Breadth, moulded	10m
Depth, moulded	3.7m
Gross tonnage	499tonnes
Design, draught	1.3m
Design, deadweight	45.5tonnes
Service speed	35knots@85% MCR
Max speed	40knots
Propulsion	
Main engine(s):	
Number of engines	4
Make	MTU
Model	12V 2000 M86
Gearbox(es):	
Number of gearboxes	4
Make	ZF
Model	3050
Waterjet(s):	
Number of waterjets	4
Make	Kongsberg
Model	S63-4
Onboard capacities:	
Fuel oil	12,000litres
Fresh water	1,000litres
Sullage	1,000litres
Complement:	
Number of crew	8
Number of passengers	388
Number of cabins	0
Classification	
Classification society	China Register / Bureau Veritas
Notations	I ❄ Hull • Mach, Light Ship, Passenger Craft, Sea Area 2


HISTORY
+
SERVICE
+
SUPPORT
+
TECHNOLOGY
+
DEALERS
CONNECTION.
IT'S WHERE THE REAL POWER LIVES.
JOHN DEERE

KAI SHIUAN 8

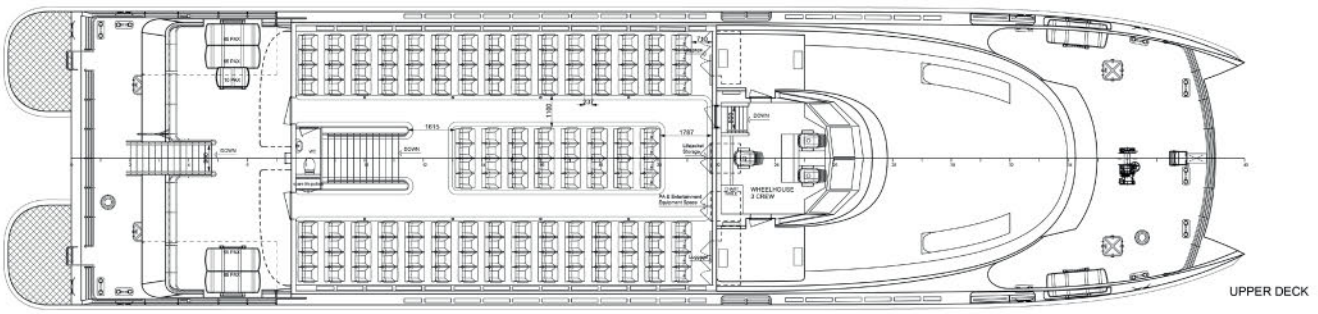


PROFILE VIEW



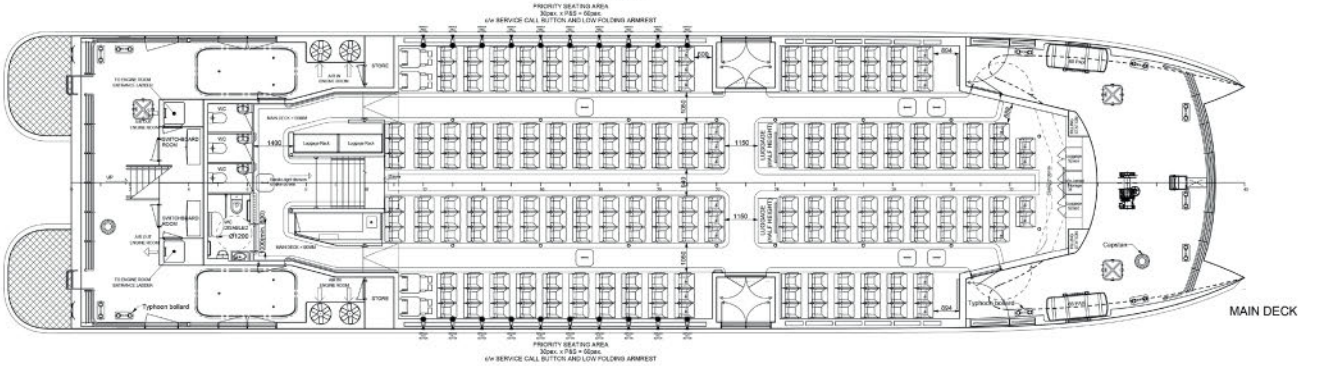
TOP VIEW

152 ECONOMY SEATS



UPPER DECK

232 ECONOMY SEATS
4 WHEELCHAIRS



MAIN DECK

KALLISTA HELEN – Aquaculture vessel with an innovative salmon delousing system

Builder: ..... **Ferguson Marine**
Designer: ..... **Macduff Ship Design**
Vessel's name: ..... ***Kallista Helen***
Owner/operator: **Inverlussa Marine Services**
Country: ..... **Scotland**
Flag: ..... **UK**
Total number of sister ships already completed: **0**
Total number of sister ships still on order: **0**
Contract date: ..... **October 2018**
Delivery date: ..... **May 2021**

Kallista Helen is a purpose-built aquaculture and thermolicing vessel, and the fifth, and most innovative, Macduff design delivered to Inverlussa so far. Central to the vessel is its Thermolicer system, designed and engineered by ScaleAQ and the first of its kind to be constructed in Scotland. This method enables the delousing of up to 120tonnes of fish per hour.

The system allows for high levels of fish welfare and, as the process only utilises seawater, no chemicals are pumped into the sea. The Thermolicer is enclosed in a dedicated shelter deck to shield it from the elements. In turn, this provides a safer working environment for the crew, as well as better operational efficiency and improved seaworthiness. Additionally, it provides a large area on the top deck for cargo and equipment – namely, three HS Marine AK 40 cranes. These 40tonnem cranes have a max outreach of 15.1m and can all work simultaneously without any restrictions.

The systems and machinery onboard have a high peak electrical load, resulting in a large engine room that spans over half the length of the hull. Propulsion is derived from twin Cat C32 main engines, paired with two ZF W2450 reverse reduction gearboxes. The shafts are connected to twin fixed-pitched 1,500mm propellers, which are combined with low-drag nozzles. The vessel is also fitted with high lift rudders and a 250kW hydraulic bow thruster, for enhanced manoeuvrability when working in and around the salmon farm.

Two Cat C32 generators are also installed, providing 860kW each. These are used to power the thermolicing equipment, including the heating elements used to warm and maintain the temperature of the 22,000litres of seawater contained in the fish treatment system. The pumps used to bring the fish on board to begin the treatment are large vacuum pumps, as these are relatively gentle on the fish and offer a high degree of fish welfare. Smaller Cat C4.4 auxiliary engines are also used to power the ship's systems when the main generators are not in use.

Forward below deck sit four cabins with bathroom facilities. On the main deck, a galley/mess/lounge area sits alongside the large dry locker. Accommodation on the fo'c'sle deck comprises two single cabins with a bathroom, an A/C and electronics space as well as a dedicated control room for the thermolicing equipment. The large wheelhouse offers a 360° view, and in particular over the aft deck area, thanks to the floor-to-ceiling windows. From here, aft control positions have been arranged port and starboard to allow for greater flexibility.

TECHNICAL PARTICULARS

Length, oa 26.25m
Length, bp 23.37m
Breadth, moulded 12m
Depth, moulded 3.5m
Gross tonnage 176tonnes
Displacement 350tonnes
Design, draught 2.6m
Design, deadweight 160tonnes
Lightweight 350tonnes
Deck space ..... 208m^2 (main deck)
Service speed (– % MCR output) 10knots
Max speed 12knots
Bollard pull (tonnes) 15tonnes

Propulsion
Main engine(s):
Number of engines 2
Make ..... Caterpillar
Model C32
Output of each engine 492kW

Gearbox(es):
Number of gearboxes 2
Make ..... ZF
Model W2450
Output speed 357rpm

Propeller(s):
Number of propellers 2
Make ..... Kort Propulsion
Model ..... Kaplan
Diameter 1,450mm
Material ..... NiBrAl
Number of blades 4
Fixed/controllable pitch ..... Fixed
Open/nozzled ..... Nozzled

Deck machinery
Crane(s):
Number of cranes 3
Make ..... HS Marine
Model AK40 LE4
Capacities/SWL ..... 1.48tonnes@15.09m

Bridge electronics (make/model):
Radar(s) ..... Furuno
Autopilot ..... Navitron
GPS ..... Furuno
Chart plotter ..... Olex

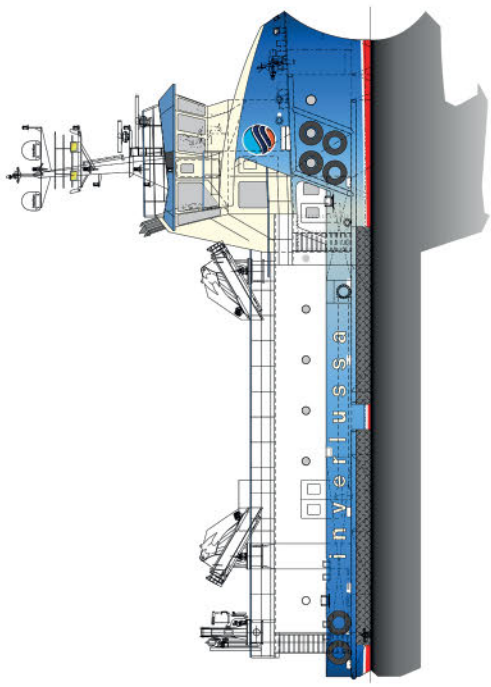
Onboard capacities:
Fuel oil 52,000litres
Fresh water 41,000litres
Sullage 6,000litres
Ballast water 95,000litres

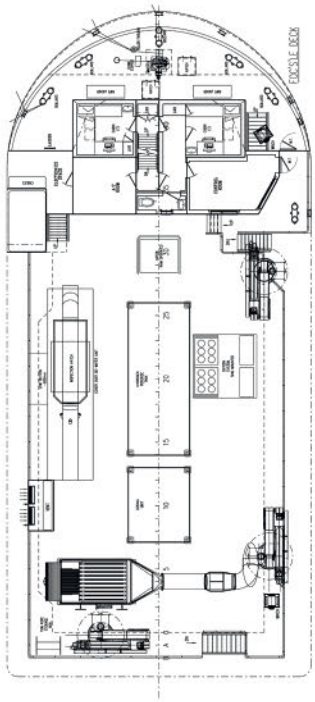
Complement:
Number of crew 12
Number of passengers 0
Number of cabins 6

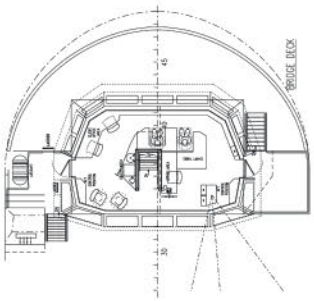
Other significant or special items of equipment ..... ScaleAQ Thermolicer system

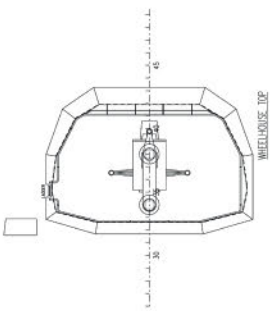
Classification
Classification society ..... MCA
Notations ..... Cat 1: 150 miles offshore

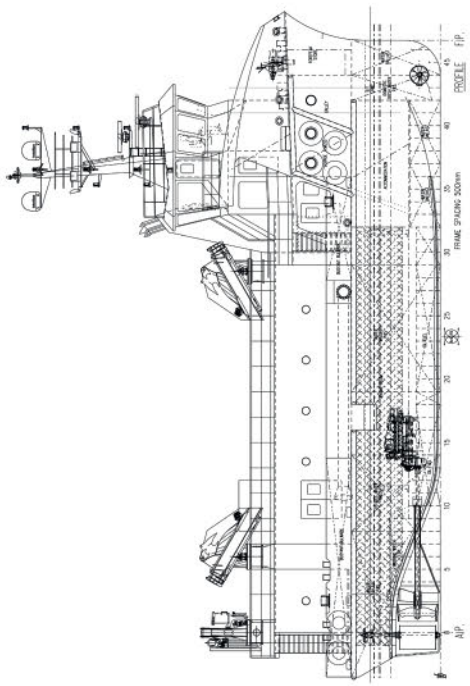
KALLISTA HELEN

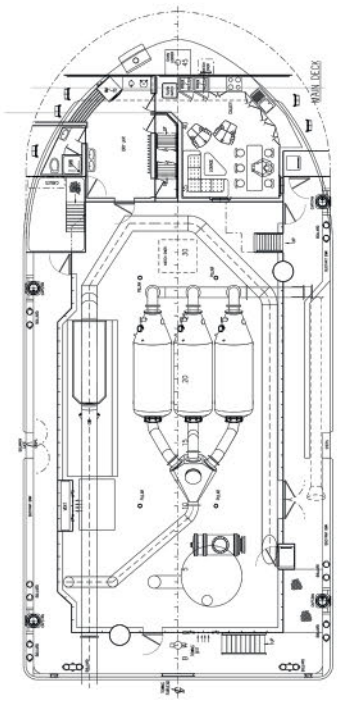


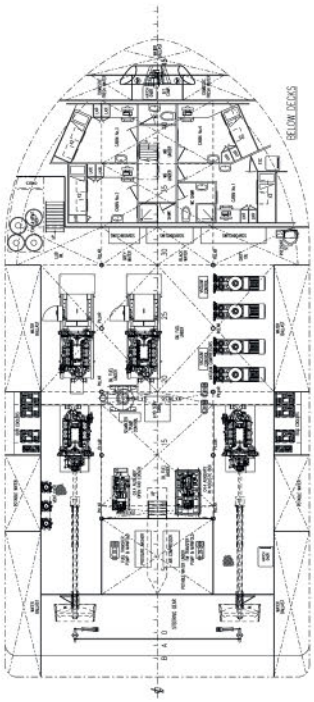












MANTARAY – Custom-built, fuel-efficient, self-righting pilot boat

Builder:	**Hart Marine**
Designer:	**Pantocarene**
Vessel's name:	***Mantaray***
Owner/operator:	**Port of Townsville**
Country:	**Australia**
Total number of sister ships already completed:	**1**
Total number of sister ships still on order:	**0**
Contract date:	**Not specified**
Delivery date:	**March 2021**

Mantaray is a custom-built ORC173 Pilot Boat, constructed by Hart Marine for the Port of Townsville, docked at Bowen, Queensland, Australia. The ORC173 Pilot Boat is designed by French naval architect Pantocarene, which has spent over 30 years researching and developing a refined and unique beak bow hull form, reducing slamming, vertical acceleration and fatigue of pilots, which improves the boat's wave-piercing ability and reduces drag, thereby boosting fuel efficiency.

The boat's self-righting design has been developed and refined "over 25 years, through tank testing, full-scale modelling and customer feedback," says Hart Marine. The Port of Townsville wanted its users to be able to adapt to each pilot boat easily from a fleet management point of view, and required a vessel that could sustain longer runs and stay anchored in between transfers, with the option for pilots to rest on day berths.

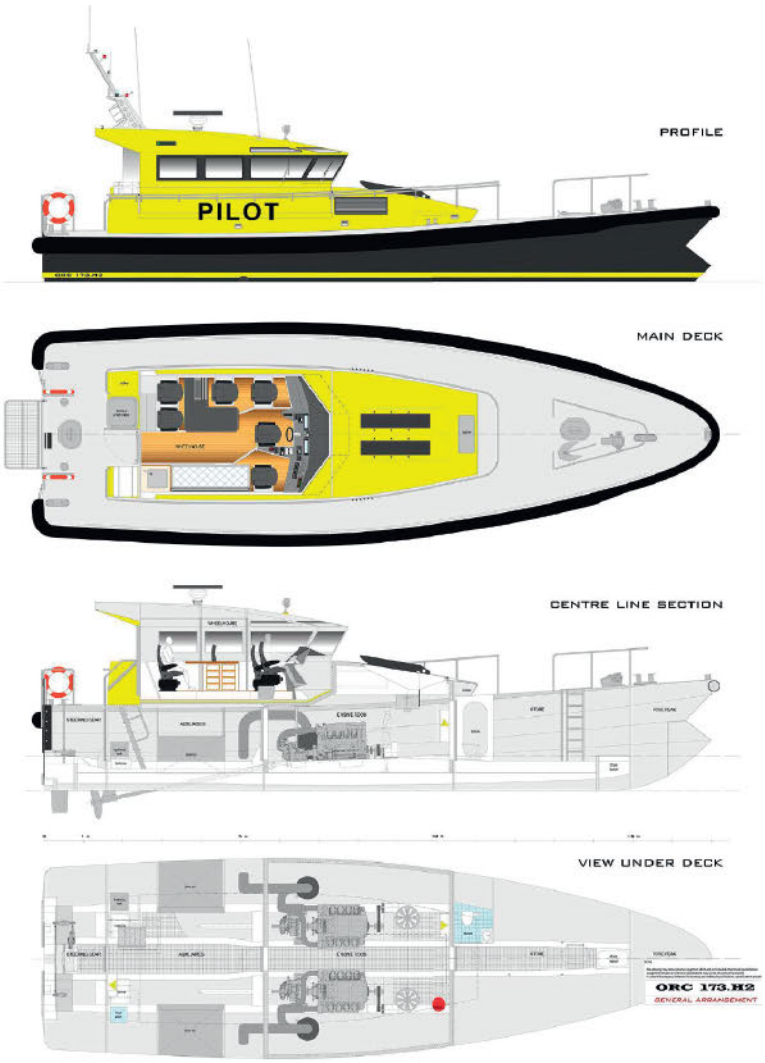
The vessel's engine package includes the Yanmar 6HY diesel engine, which offers low-emission output to meet IMO Tier II regulations. Hart Marine elaborates: "The purpose-built Yanmar 6HY engine suits a wide range of applications, especially those that require high throttle over long periods, and is the perfect power solution for daily workboats." It also offers a fairly significant service interval of 500 hours.

Mantaray can operate in 'Express' mode, available when the Quickshift marine transmissions are combined are with the EC300 Power Commander system. "This offers slow speed troll through the first 30° of lever travel at idle, then engine RPM control through the second 30°," the builder adds. Bennett supplied the vessel's trim tab systems, designed to handle extreme conditions. The Premier BXT trim tab kits feature dual-acting, solid stainless steel actuators and 7gauge (4.7mm) stainless-steel heavy duty trim planes, all driven by two compact dual-acting hydraulic power units that produce 1,100kg of force apiece.

TECHNICAL PARTICULARS

Length, oa	17.1m
Length, bp	16.57m
Breadth, moulded	5.24m
Depth, moulded	2.15m
Displacement	25tonnes
Design, draught	2m
Design, deadweight	25tonnes
Lightweight	22tonnes
Max speed	28knots
Bollard pull (tonnes)	1.3tonnes
Range (nautical miles)	300nm
Propulsion	
Main engine(s):	
Number of engines	2
Make	Yanmar
Model	6HYM-WET
Output of each engine	478kW
Gearbox(es):	
Number of gearboxes	2
Make	Twin Disc
Model	MGX5126A ratio2.04: 1 close coupled
Output speed	25knots
Propeller(s):	
Number of propellers	2
Make	VEEM
Diameter	787mm
Material	Bronze
Number of blades	5
Fixed/controllable pitch	Fixed
Open/nozzled	Open
Winch(es):	
Number of winches	1
Make	Maxwell
Model	12RC
Bridge electronics:	
Radar(s)	Furuno Radar Radome DRP4D-NXT
Autopilot	Furuno Nav Pilot 711
GMDSS	ICOM 506
GPS	Furuno GP-330B antenna
Chart plotter	Furuno 16"
Engine monitoring system	Yanmar
Fire detection system	Statex Fire System
Other communication systems	Furuno
Onboard capacities:	
Fuel oil	1,500litres
Fresh water	150litres
Sullage	120litres
Complement:	
Number of crew	2
Number of passengers	4

MANTARAY

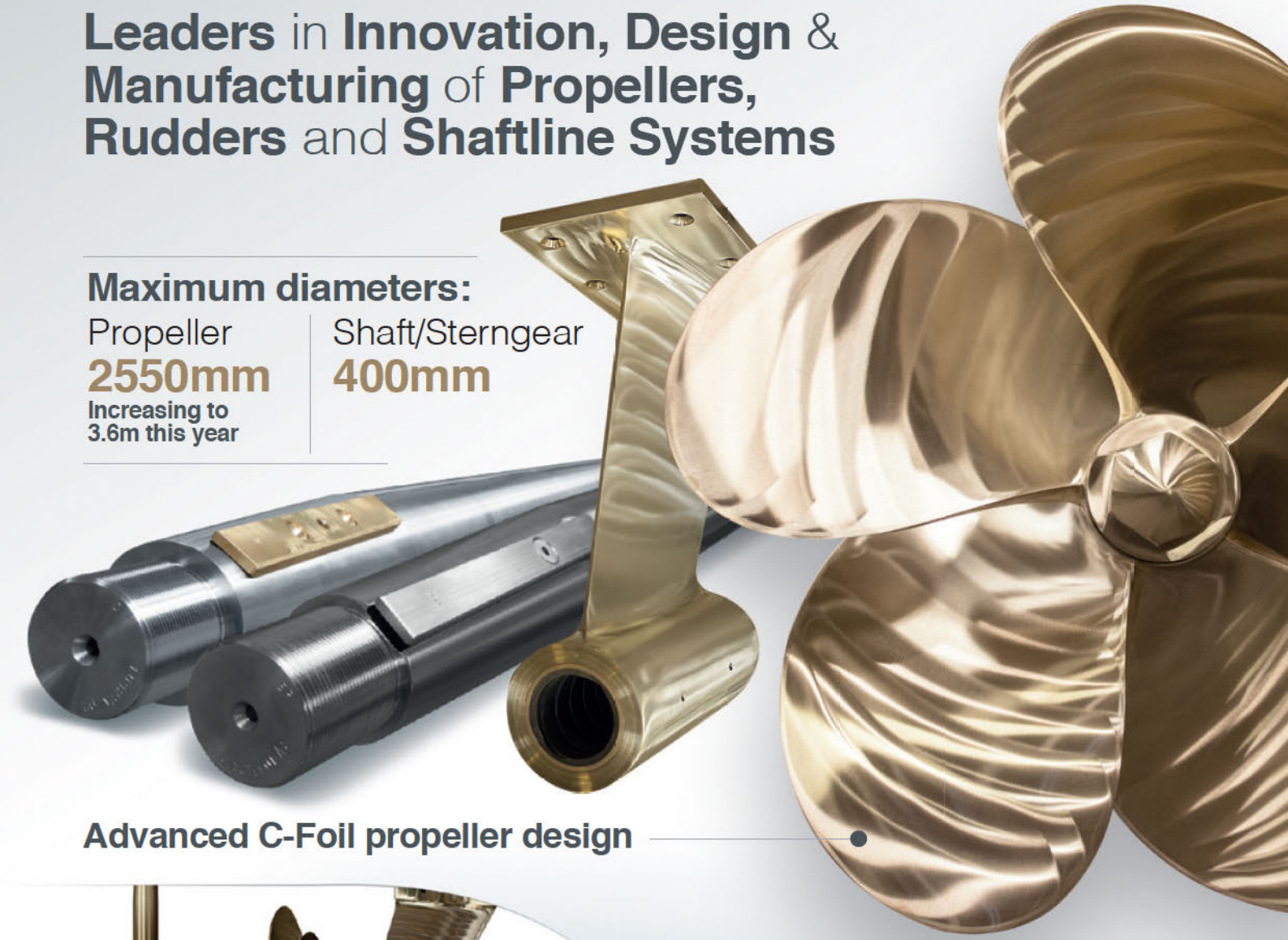

PROFILE
PILOT
MAIN DECK
CENTRE LINE SECTION
VIEW UNDER DECK
ORC 173.H2
GENERAL ARRANGEMENT

TEIGNBRIDGE

Leaders in **Innovation, Design** & **Manufacturing** of **Propellers, Rudders** and **Shaftline Systems**

Maximum diameters:

Propeller	Shaft/Sterngear
2550mm	**400mm**
Increasing to 3.6m this year	



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MED TEGMINE – Italian tug with innovative winch arrangement

Builder:	**Damen Shipyards Group**
Designer:	**Damen Shipyards Group**
Vessel's name:	***MED Tegmine***
Owner/operator:	**MedTug**
Country:	**Italy**
Flag:	**Italy**
Total number of sister ships already completed:	**4**
Total number of sister ships still on order:	**8**
Contract date:	**May 2021**
Delivery date:	**November 2021**

One of the notable features about the new compact, multi-purpose Damen ASD Tug 2312 class is that the vessel's winch is integrated into the superstructure. As well as offering a spacious, safe and clutter-free deck, the central positioning means the vessel can, with just one winch, conduct towing operations both fore and aft.

Additionally, with only one winch installed, Damen managed to ensure that the vessel remained compact. Meanwhile, the sheltered location is intended to not only protect the crew from the elements but to minimise maintenance requirements. The towing winch is situated midships, inside the open deckhouse, and can be used for towing services over the bow or over the stern. It comprises a hydraulically driven double drum winch, featuring pulling capability up to 35tonnes and a speed of up to 40m/minute on second layer. The winch also has a brake holding force of 175tonnes.

The ASD Tug 2312 features Damen Safety Glass: shatter-proof glazing that offers protection to persons on board in the event of a towing line snapping. The builder says: "Beneath the waterline, the Damen Twin Fin improves directional stability in both sailing directions, making the vessel very predictable when sailing aft, but also in front of a ship."

The tug is also sustainable, having been fitted with the Damen's in-house developed, fully certified Marine NOx reduction system, bringing the vessel into compliance with IMO Tier III requirements.

TECHNICAL PARTICULARS

Length, oa	22.81m
Breadth, oa	12.03m
Depth at sides	4.4m
Gross tonnage	262tonnes
Displacement	485tonnes
Design, draught	5.5m
Design, deadweight	100tonnes
Deck space, total	90m^2
Deck capacity	20tonnes
Max speed	13.1knots
Bollard pull	70.1tonnes (ahead) 65.2tonnes (astern)

Propulsion

Main engine(s):	
Number of engines	2
Make	Caterpillar
Model	3512C TA HD/D
Output of each engine	3,804bkW@1,800rpm
Propeller(s):	
Number of propellers	2
Make	Kongsberg Maritime
Model	US205
Diameter	2,800mm
Material	NiAlBr
Number of blades	3
Fixed/controllable pitch	Fixed
Open/nozzled	Nozzled

Deck machinery

Winch(es):	
Number of winches	1
Make	Damen Marine Components
Other deck machinery/equipment:	Firefighting system 2,400m^3 (FiFi 1)

Bridge electronics (make/model):

Radar	Furuno FAR 1518-BB
Autopilot	Simrad AP-70
GMDSS	A1
GPS/ Satellite compass	Simrad GN 70/ HS80A
Engine monitoring system	Praxis Automation

Other communication systems

Electronic chart system	Max Sea TZ professional
Magnetic compass	Cassens & Plath Reflecta 11
Echo sounder	Skipper EMES60
Firefighting radio (UHF)	Sailor 3965 UHF
VHF radio telephone	2x Cobham Sailor 6222 (one with DSC)
VHF hand-held transceivers	2x Jotron Tron TR-30
AIS	Furuno FA-170
Navtex	Furuno NX-700B
EPIRB	Jotron Tron-60S
SART	Jotron Tron SART20
Remote monitoring	Ready for Damen Triton

Onboard capacities:

Fuel oil	78,400litres
Fresh water	7,800litres
Sewage	5,100litres
Dirty oil	1,500litres
Lubrication oil	1,500litres
Bilge water	3,000litres
Foam	6,100litres
Urea	3,000litres

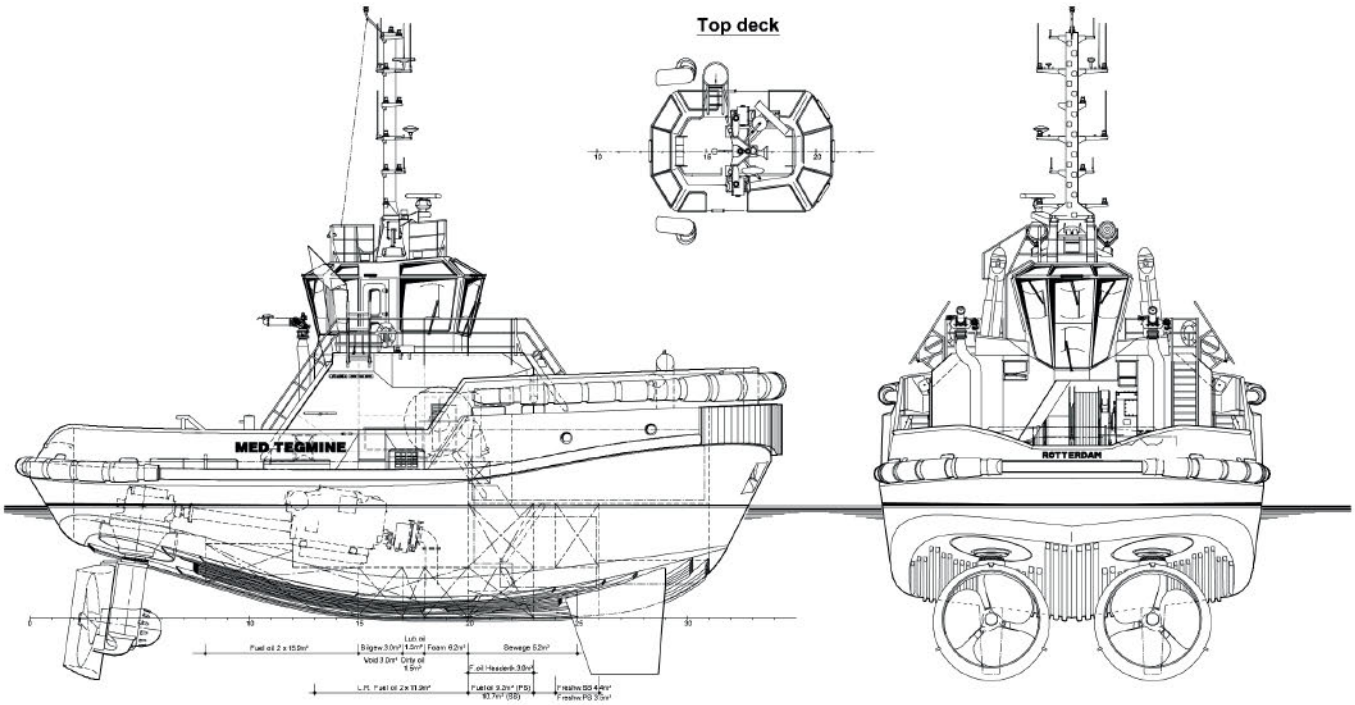
Complement:

Number of crew	>6
Number of passengers	0
Number of cabins	1 x captain cabin, single 1 x chief engineer's cabin, single 2 x crew cabins, double

Classification

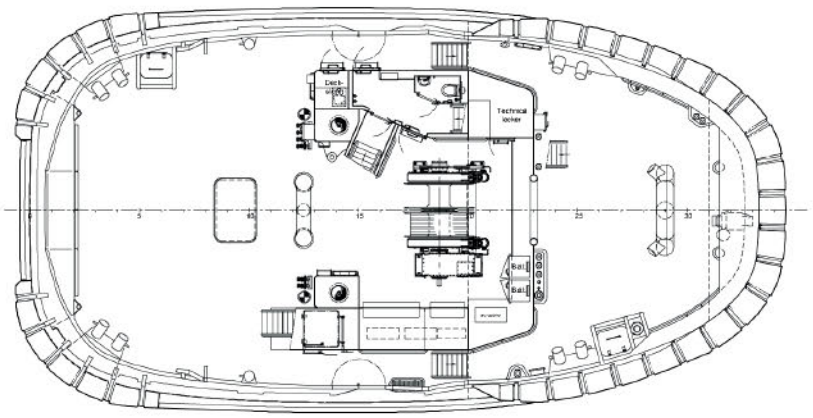
Classification society	Bureau Veritas
Notations	+HULL • MACH Tug (Bollard pull = 70 t) Unrestricted Navigation AUT UMS Inwater Survey COMF-NOISE 3, COMF-VIB 3 Fire Fighting Ship 1

MED TEGMINE



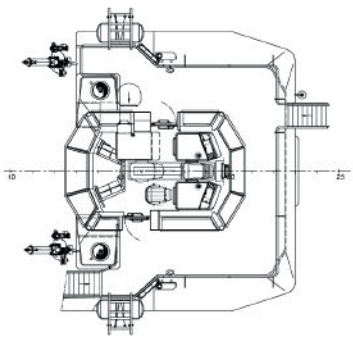
Top deck

Main deck

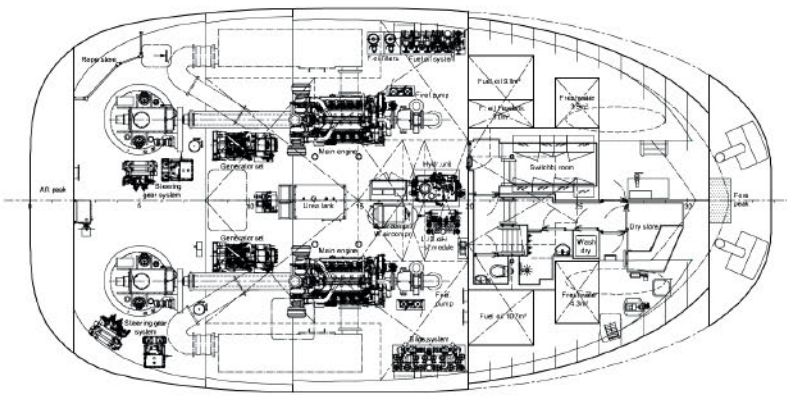


Forecastle deck

Bridge deck

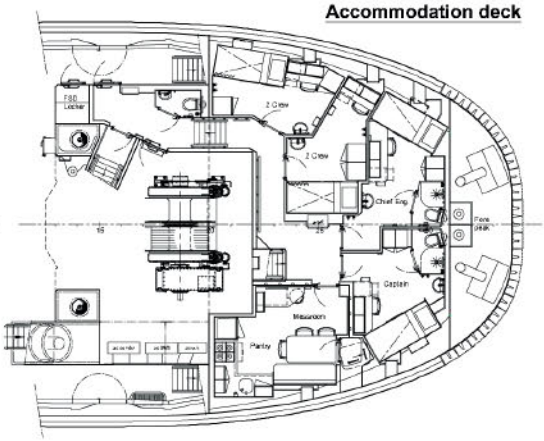


Below Main deck



Lower deck

Accommodation deck



MHO APOLLO / MHO ASGARD – Hybrid-electric CTV twins for Hornsea Two

Builder:	**AFAI**
Designer:	**Incat Crowther**
Vessel's name:	***MHO Asgard / MHO Apollo***
Owner/operator:	**MHO-Co**
Country:	**Denmark**
Flag:	**Denmark**
Total number of sister ships already completed:	**0**
Total number of sister ships still on order:	**0**
Contract date:	**April 2020**
Delivery date:	**September 2021**

2021 saw Danish crew transfer vessel (CTV) operator MHO-Co take delivery of two large hybrid catamarans, ordered to provide support services to the 1.4GW Hornsea Two wind farm in the North Sea. Christened *MHO Asgard* and *MHO Apollo*, the twins were designed by Incat Crowther and constructed, in aluminium, by AFAI Southern Shipyard, China.

As Mik Henriksen, CEO and founder of MHO-Co, put it at the time of the joint delivery: "Designing and building hybrid CTVs is a huge step in the environmental direction, and I am proud that we have found partners who share our vision for sustainable development in the offshore industry." The twins will serve Hornsea Two on behalf of Danish energy major Ørsted.

Each of the new Incat Crowther 35-class vessels is powered by an advanced propulsion system, developed in collaboration with Volvo Penta and Danfoss. The system incorporates two Volvo Penta D13 pure diesel engines, each rated 515kW at 2,250rpm, plus two Danfoss EM-PMI diesel-electric drivetrains, rated 550kW at 2,250rpm apiece.

Incat Crowther adds: "The generators used for the diesel-electric propulsion train are Volvo Penta D8-MH units, each rated 230kW at 1,900rpm. A further three of these units are located in the hulls amidship, alongside a Volvo Penta D5 used as a harbour generator". Volvo Penta also supplied each CTV's set of four IPS 30 propulsion units.

A battery energy storage system, supplied by Corvus Energy, allows *MHO Asgard* and *MHO Apollo* to switch to zero-emission, all-electric mode for up to eight hours. Alternatively, the batteries can provide extra kick to the vessels' diesel-powered transits, enabling a top speed of 25knots. "The flexibility is enhanced by the use of multiple modular generators, meaning power generation can be optimised for the operational profile," Incat Crowther says.

A saloon on the main deck features 24 suspended seats, lockers, a pantry and a separate mess. The main deck also offers additional technician rest spaces, plus a large wet room with lockers and showers.

During the design process, Incat Crowther worked closely with MHO-Co to maximise onboard space. As a result, each boat features a sizeable foredeck offering sufficient space for multiple tie-downs, a deck crane and a moon pool.

For safe ship-to-turbine transfers, MHO-Co selected a Z-Bridge bring-to-work (B2W) system for each vessel. This motion-compensated access system weighs 25tonnes and can be deployed safely in conditions with wind speeds of 20m per second. Its elevator can handle six persons, or 1tonne of cargo, though Z-Bridge says that the elevator could be upgraded for "special cargo lifts up to 3tonnes".

TECHNICAL PARTICULARS

Length, oa	34.4m
Breadth, moulded	11m
Depth, moulded	4.15m
Displacement	140tonnes
Design, draught	1.45m
Design, deadweight	66tonnes
Lightweight	132tonnes
Deck capacity	2tonnes/m^2
Service speed	25knots
Bollard pull (tonnes)	17tonnes

Propulsion

Main engine(s):

Number of engines	4
Make	Volvo Penta (2) / Danfoss (2)
Model	D13 (2) / EM-PMI (2)
Output of each engine	515kW@2,250rpm /550kW@2,250rpm

Gearbox(es):

Number of gearboxes	4

Propeller(s):

Number of propellers	4
Make	Volvo
Model	IPS 30
Number of blades	6

Bridge electronics (make/model):

Radar(s)	Furuno FAR-1518-BB ARPA radar / Transas NR4000 / Furuno DRS-4D-NXT / TRANSAS NR4001
Autopilot	Raytheon Anschütz Pilot Star NX
GPS	Furuno GP-170
Gyro	Furuno SC-130

Onboard capacities:

Fuel oil	62,000litres (+ 5,000litre day tanks)
Fresh water	3,500litres
Sullage	2,500litres

Complement:

Number of crew	8
Number of passengers	24
Number of cabins	8

Classification

Classification society	DNV
Notations	DNV 1A1 HSLC, R1 Windfarm Service 1

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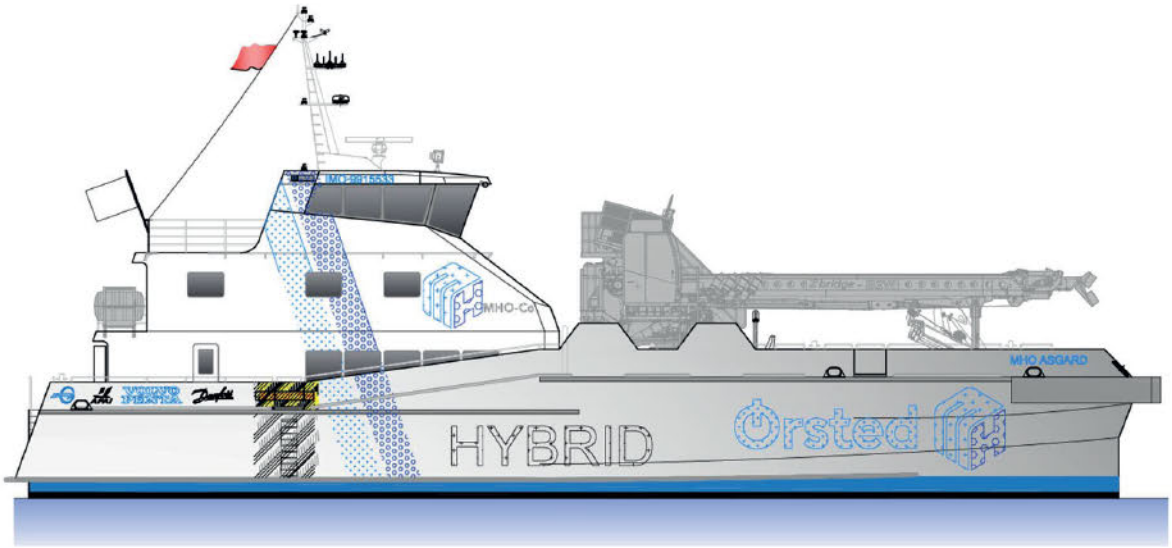
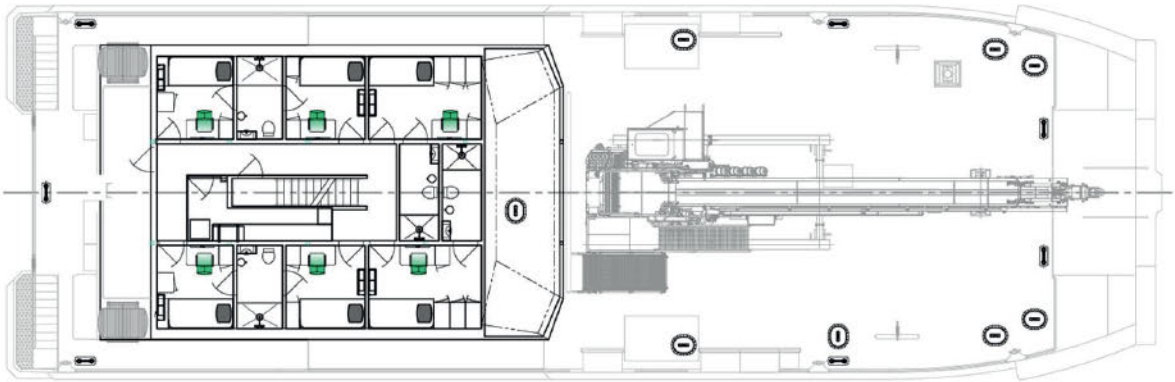
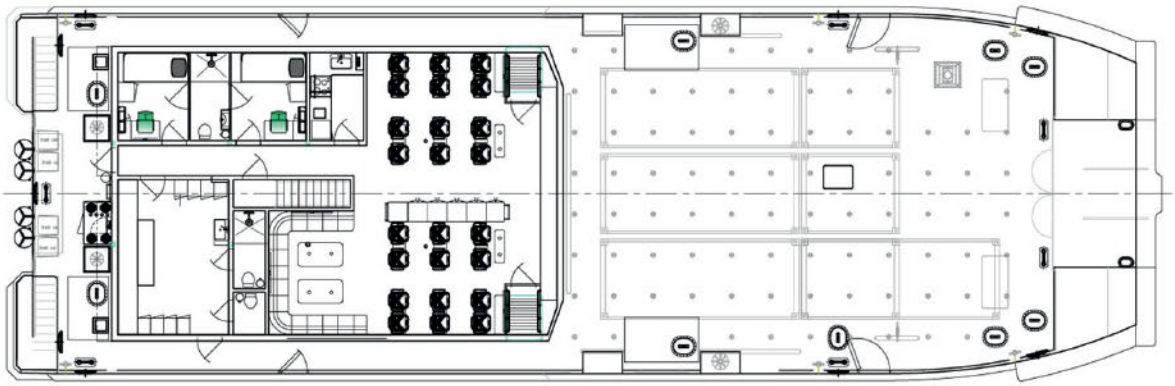
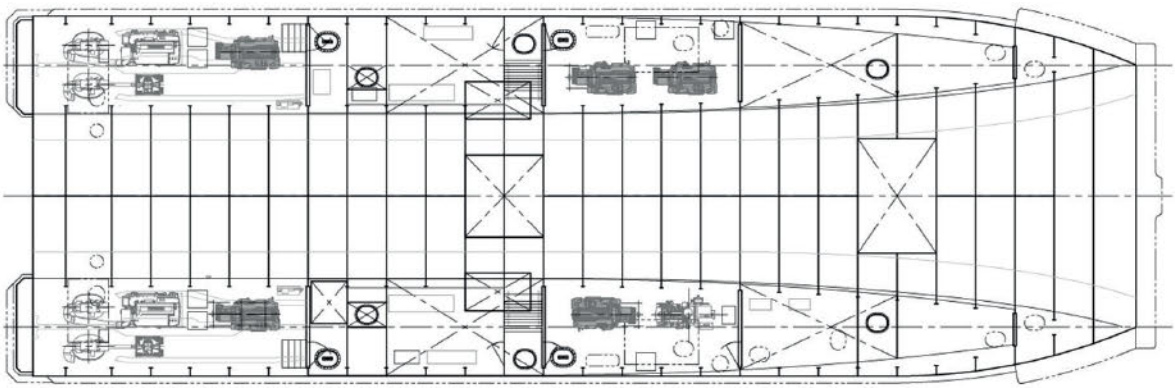
MHO APOLLO / MHO ASGARD









Building on the success of the award-winning MHO Apollo, US Offshore and MHO-Co have developed the next generation of hybrid CTVs.

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PACIFIC GUARDIAN – State-of-the-art pilot boat with long-range capacity

Builder: ..... **Ocean Pacific Marine**
Designer: ..... **Camarc Design, UK**
Vessel's name: ..... ***Pacific Guardian***
Owner/operator: .... **Pacific Pilotage Authority, Canada**
Country: ..... **Canada**
Flag: ..... **Canada**
Total number of sister ships already completed: **0**
Total number of sister ships still on order: **0**
Contract date: ..... **October 2019**
Delivery date: ..... **October 2021**

Pacific Guardian is the latest vessel to join the Pacific Pilotage Authority's pilot vessel fleet, which already includes two 19m and two 22m Camarc-designed vessels operating in BC, Canadian waters. Built by Ocean Pacific Marine of Vancouver Island, the new all-aluminium vessel is fitted with MAN 12v engines, combined with Hamilton waterjets, which propel the efficient hull up to maximum speeds of 34knots, and cruising speeds of 28knots.

Given the area of operations and extended pilotage routes, *Pacific Guardian* is also fitted with increased-capacity transit tanks, which extend the range to more than 400nm at cruising speed when required. This latest vessel for the PPA incorporates Camarc's Refined Hull design, formulated for enhanced fuel efficiency and comfort. Camarc says: "An extensive tank testing, trials and proven vessel programme has introduced some 9% efficiency savings and 10% reduced slamming accelerations over the already efficient and comfortable Camarc hulls." An IMO Tier III-compliant SCR system was installed to further reduce harmful emissions, while the resilient wheelhouse and targeted acoustic material system have limited noise levels to 65dBA, as well as curbing vibrations, for improved personnel comfort. The wheelhouse can also be removed to facilitate engine removal if required.

The bonded wrap-around window system minimises structural mullions and maximises all-round visibility, to assist safe pilotage operations. *Pacific Guardian* is also protected by Camarc's Popsure fender system, a common feature on Camarc boats, which features a large foam section, for optimal impact absorption, and a tough external HDPE pipe, which deals with abrasion and protects the foam system. "Custom sections are also fitted in way of the boarding area, to extend the deck," Camarc says. Additionally, for *Pacific Guardian*, tyres were added and integrated in to the Popsure fender in the boarding area, to provide the feel and geometry requested by the crews and pilots during boarding operations.

Both an aft man overboard (MOB scoop and a side MOB davit were designed and installed to facilitate rescue operations. The aft hydraulic scoop can be used to lift an MOB from the water to deck, and is designed to lower and raise around the waterjets, whereas the side davit can be used alongside a winch as an alternative MOB rescue option depending on the situation and conditions.

A Humphree adjustable interceptor ride control system was fitted to both optimise trim through the speed range for efficiency, and to reduce roll and pitch motions when underway at speed.

TECHNICAL PARTICULARS

Length, oa 19.96m
Length, wl 17.6m
Breadth, moulded 5.6m
Depth, moulded 2.6m
Displacement 37.5tonnes
Design, draught 1.1m
Lightweight 32tonnes
Service speed ..... 28knots@85% MCR
Max speed ..... 34knots@100% MCR
Range (nautical miles) ..... 400+nm@25knots

Propulsion
Main engine(s):
- Number of engines 2
- Make ..... MAN
- Model ..... D2862 – LE447 (IMO Tier III)
- Output of each engine ..... 735kw@1,800rpm

Gearbox(es):
- Number of gearboxes 2
- Make ..... ZF
- Model 3050

Waterjet(s):
- Number of waterjets 2
- Make ..... Hamilton
- Model HM521

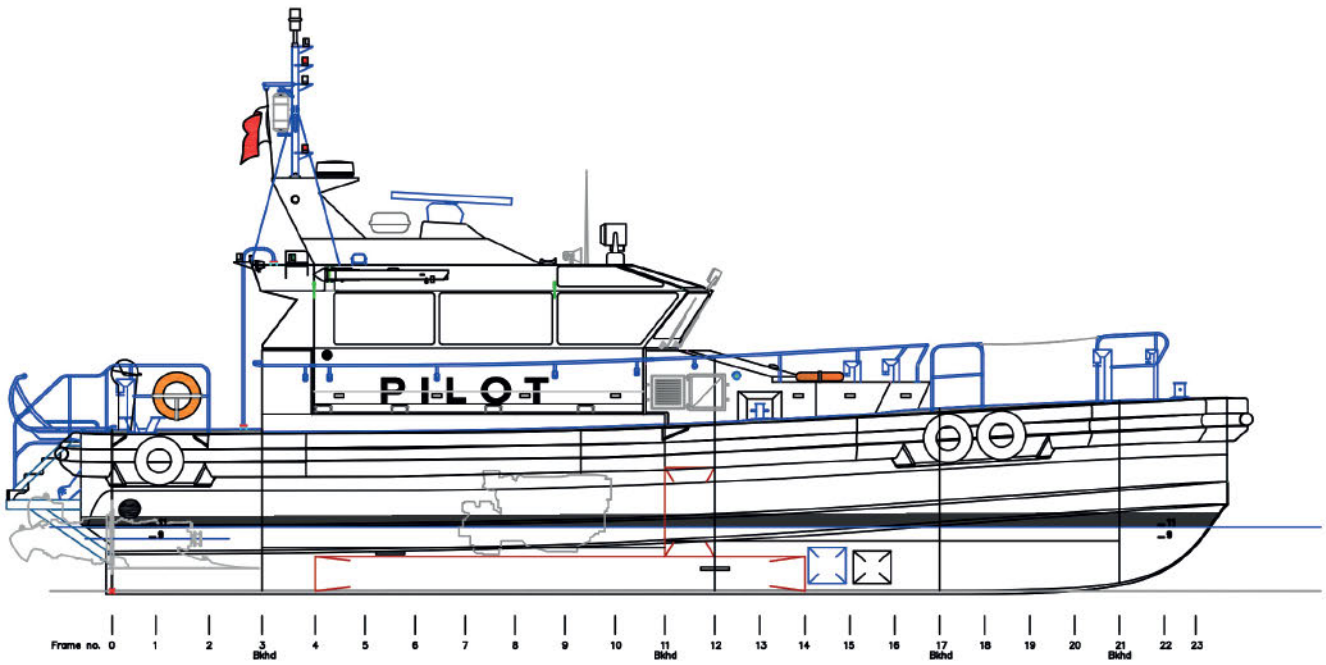
Onboard capacities:
- Fuel oil 5,000litres
- Fresh water 250litres
- Sullage 250litres

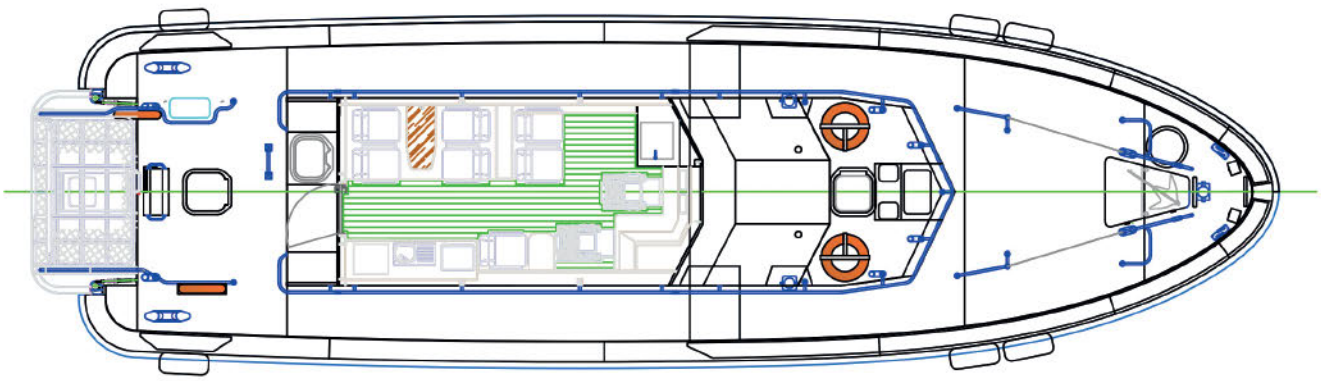
Complement:
- Number of crew 3
- Number of pilots 7
- Number of cabins 0

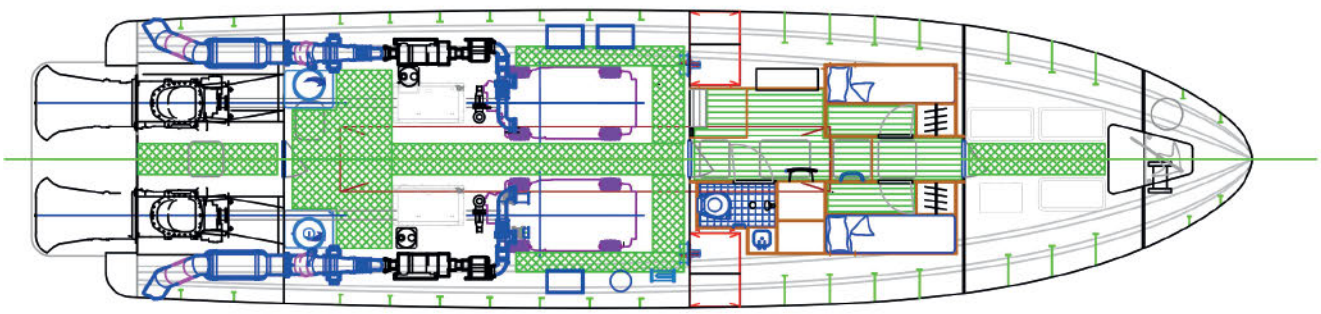
Other significant or special items of equipment:
- Camarc refined hull
- IMO Tier III SCR emissions system
- Camarc Popsure fender and integrated tyres
- Resilient wheelhouse
- Aft rescue cradle & side rescue davit
- Humphree Interceptor Ride Control

Classification
Classification society ..... Lloyd's Register
Notations ..... +100A1 SSC, Pilot, Mono, G3, MCH
Other important international regulations complied with: ..... Designed and built to comply with the regulations of Transport Canada: Home Trade III / Near Coastal Class 2

PACIFIC GUARDIAN







RAGING BULL – Innovative fishing boat that punched through COVID restrictions

Builder: **Dongara Marine**
Designer: **Southerly Designs**
Vessel's name: ***Raging Bull***
Owner/operator: **Andrew and Sue Dening**
Country: **Australia**
Flag: **N/A (Australian domestic commercial vessel)**
Total number of sister ships already completed: **0**
Total number of sister ships still on order: **0**
Contract date: **August 2020**
Delivery date: **September 2021**

Raging Bull, a completely new design from Southerly Designs, also happened to be Dongara Marine's first new vessel built for a client outside its home state of Western Australia. Designed and built for an experienced commercial fisherman in the South Australian lobster fishery, and customised to his preferences, the vessel an aluminium monohull topped by a single-level wheelhouse – a common arrangement for boats built for the South Australian fishery.

The propulsive arrangement also differentiates Raging Bull from most previous Dongara-built fishing boats. Whereas twin-screw propulsion predominates for its local customers, *Raging Bull*'s owner opted for a single MTU diesel engine and fixed propeller system. The owner also specified and supplied the vessel's electronics package, which was also accommodated through the custom build approach.

As with Dongara Marine's recent deliveries to the Western Australian lobster fishery, the boat's superstructure was manufactured from composites, using resin-infused moulding techniques to deliver a high standard of finish, as well as lightweight capabilities and noise, vibration, and thermal insulation. Composites have also helped to keep the centre of gravity low, thus improving seakeeping, Dongara says.

While many boats in the South Australian (and Western Australian) lobster fisheries are equipped for day operations only, *Raging Bull*'s design and fitout enables longer duration operations. In addition to the helm station, galley and mess in the wheelhouse, onboard accommodation for three crew is provided to AMSA NSCV AL 36-72 survey standards, enabling up to three days at sea. This includes two berths in a forward cabin and an owner/master's cabin, with queen-sized berth, beneath the wheelhouse.

As a side note, Dongara adds that the project coincided with some of the most severe aspects of the COVID pandemic in Australia, with widespread lockdowns and international and state border closures put in place. The major market for Australian lobster – China – was also severely restricted at the same time, resulting in revenues for fishermen being slashed. Given these challenging circumstances, an important aspect of the project was that the owner decided to proceed at all. "Only able to visit the shipyard once during the build due to border closures, the owner placed his trust in Dongara Marine's management and staff to specify and implement all the details that would normally be derived through face-to-face consultation," the builder says.

TECHNICAL PARTICULARS

Length, oa 17.84m
Length, bp 17.75m
Breadth, moulded 5.4m
Depth, moulded 1.8m
Displacement 33.1tonnes
Design, draught 1.65m
Design, deadweight 3.5tonnes
Lightweight 20.3tonnes
Deck space (aft deck) ..... 40m^2 (approx.)
Deck capacity ..... 0.7tonnes/m^2
Service speed ..... 18.5knots@75% MCR
Max speed 22.5knots
Range ..... 590nm (approx.)

Propulsion
Main engine(s):
Number of engines 1
Make ..... MTU
Model 8V 2000 M72
Output of each engine 720kW
Gearbox(es):
Number of gearboxes 1
Make ..... Twin Disc
Model MGX5146A

Propeller(s):
Number of propellers 1
Make ..... VEEM
Fixed/controllable pitch ..... Fixed
Open/nozzled ..... Open

Winch(es):
Number of winches 1
Make ..... M3 Engineering
Model ..... Custom lobster pot hauler
Capacities ..... 23" inch warping head
Other deck machinery/equipment: ..... Lobster pot tipper

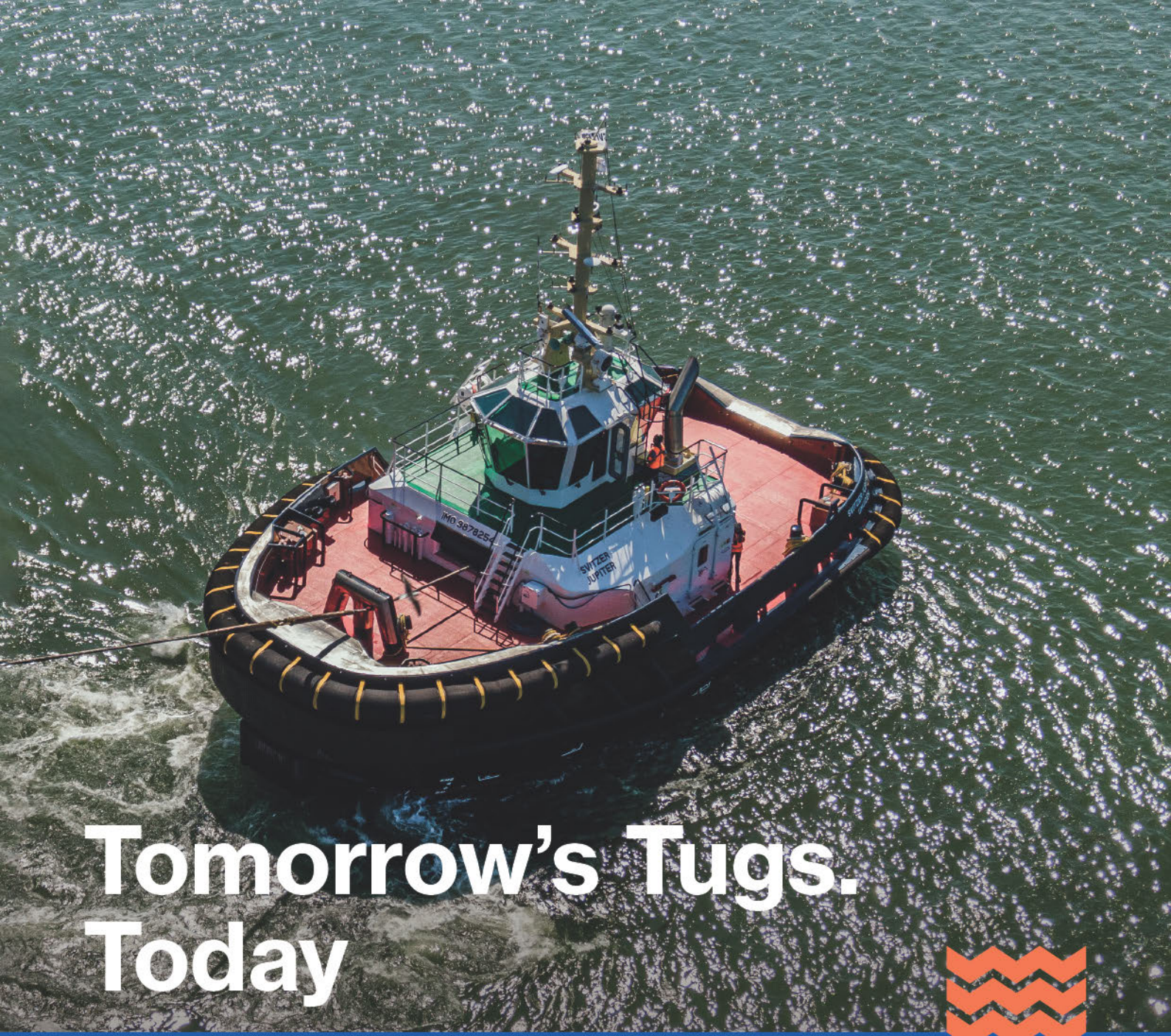
Bridge electronics (make/model):
Radar(s) ..... Furuno DRS6A-NXT
Autopilot ..... Simrad AP70
GPS ..... Furuno GP-39
Gyro ..... Furuno SCX-21 satellite compass
Chart plotter ..... TimeZero Professional V4
Engine monitoring system ..... MTU
Fire detection system ..... Mitchell & Brown Fire Services
Other communication systems ..... Simrad RS40B VHF Radio

Onboard capacities:
Fuel oil 4,000litres
Fresh water 400litres
Sullage 400litres
Other capacities
Live fish holds: 1,800litres

Complement:
Number of crew ..... 2 (typically operational)
>3 (36-72 hours at sea)
>6 (<12 hours at sea)
Survey: ..... up to 3 (36 to 72 hours at sea)
or up to 6 (<12 hours)
Number of passengers 0
Number of cabins 2

Classification
Classification society ..... Australian Maritime Safety Authority (AMSA) (survey approved)
Notations ..... AMSA National Standards for Commercial Vessels 3B

Other important international regulations complied with ..... Structure in accordance with Lloyd's Register SSC



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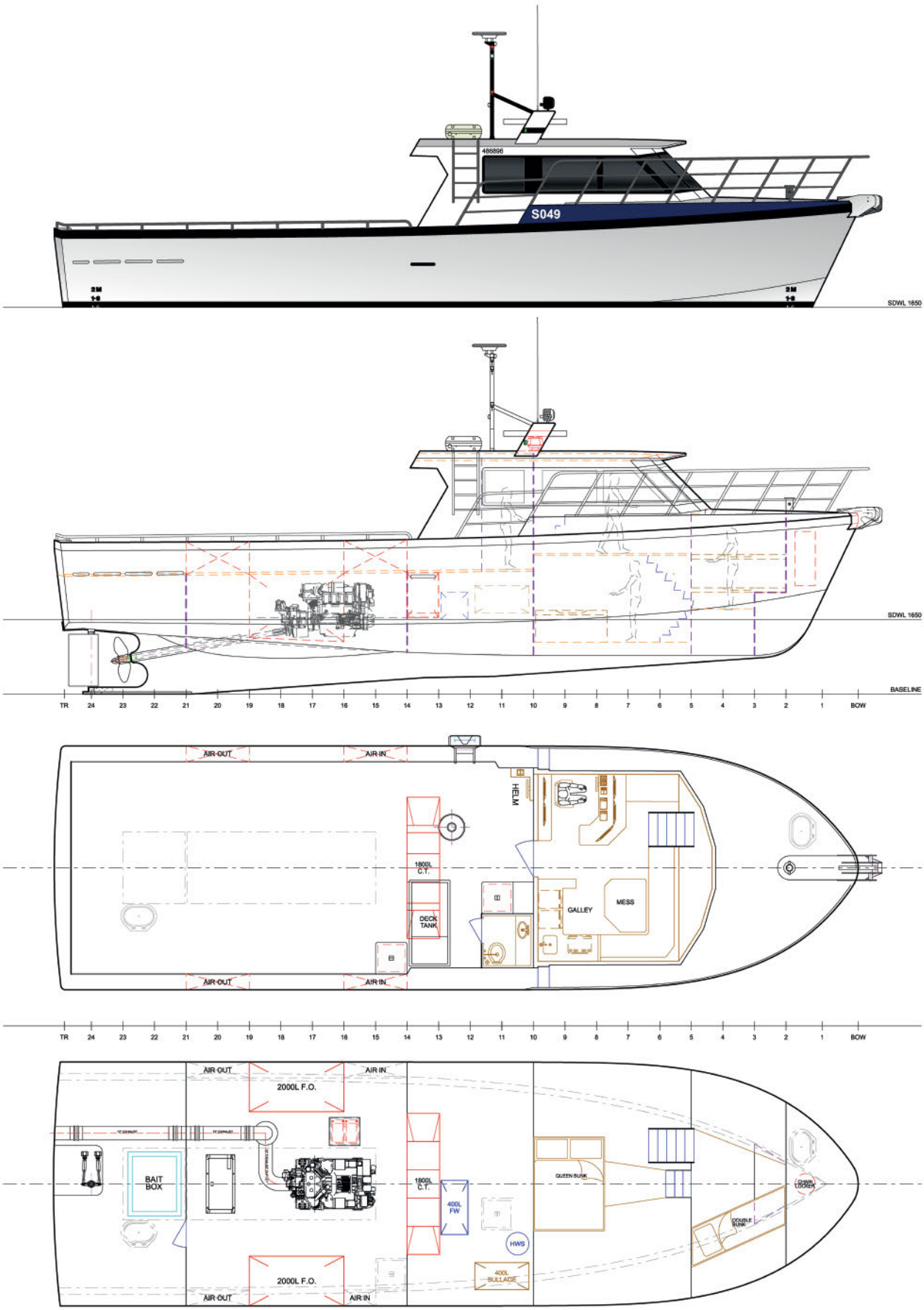
RAGING BULL


S049
SDWL 1650
SDWL 1650
BASELINE
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AIR OUT
AIR IN
HELM
1800L C.T.
DECK TANK
GALLEY
MESS
AIR OUT
AIR IN
TR 24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 BOW
AIR OUT
AIR IN
2000L F.O.
BAIT BOX
1800L C.T.
400L FW
HWS
400L SULLAGE
QUEEN BUNK
DOUBLE BUNK
2000L F.O.
AIR OUT
AIR IN

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Staten Island Ferry

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Significant Small Ship of 2021

Photos Courtesy of
Eastern Shipbuilding Group

better to build · better to operate

RAVEEL ONTMOET ENSOR – Debutante in Baltic Workboats' Ferry 22 Electric class

Builder: ..... **Baltic Workboats**
Designer: ..... **Baltic Workboats**
Vessel's name: ..... **Ferry 22 Electric (model name) / *Raveel Ontmoet Ensor* (customer name)**
Owner/operator: ..... **DAB Vloot**
Country: ..... **Belgium**
Flag: ..... **Belgium**
Total number of sister ships already completed: **1**
Total number of sister ships still on order: **0**
Contract date: ..... **January 2019**
Delivery date: ..... **May 2021**

The first unit in Baltic Workboats' Ferry 22 Electric class, *Raveel Ontmoet Ensor*, is a modern, green ferry designed and built for service on inland waterways. Fashioned from marine-grade aluminium, the vessel's powertrain is fully electric.

The powertrain comprises a Danfoss Editron EM-PMI300-T310 50kW electric propulsion motor, while Corvus Energy supplied the energy storage system, which has a total battery capacity of 158kWh.

This set-up enables the Ferry 22 Electric to achieve a maximum speed of 16km per hour (8.6knots) and cruising speed of 14km per hour (7.55knots). The range at cruising speed, without charging, is 65km (35nm).

For enhanced manoeuvring in tight river and port areas, the vessel has been fitted with a Side-Power 550 bow thruster, and, for the operator's convenience, Baltic Workboats also developed an in-house automatic charger for the vessel. The builder says: "The pantograph for the charger has been supplied by Stemmann-Technik, and connects to the vessel's contacts automatically by a single button push at the helmsman position."

Furthermore, *Raveel Ontmoet Ensor*'s auxiliary energy needs are partly met by a spread of solar panels, installed on the passenger area roof. An array of 20 x 330W Victron solar panels has resulted in a total output of 6.6kW.

The Ferry 22 Electric is designed to carry 100 passengers and 40 bicycles, and five wheelchair spaces have also been factored in. Two hydraulically operated ramps on the ship's sides are intended to facilitate the boarding process, granting easy access to passengers with bicycles, wheelchairs and baby strollers.

TECHNICAL PARTICULARS

Length, oa 22.3m
Breadth, moulded 6m
Depth, moulded 2.9m
Gross tonnage 131tonnes
Displacement 50tonnes
Design, draught 1.2m
Lightweight 39tonnes
Service speed 7.55knots
Max speed 8.6knots
Range 35nm

Propulsion
- Number of engines 1
- Make ..... Danfoss
- Model EM-PMI300-T310
- Output of each engine 50kW

Propeller(s):
- Number of propellers 1
- Make ..... CJR
- Model ..... Nautica
- Number of blades 5
- Fixed/controllable pitch ..... Fixed
- Open/nozzled ..... Open

Bridge electronics (make/model):
- Radar(s) ..... JRC JMA-610
- GMDSS ..... Sailor RT6222 VHF/ DSC
- GPS ..... JRC JLR-21
- Chart plotter ..... JRC JMA-610 monitor
- Engine monitoring system ..... BWB IAMCS/ Danfoss
- Fire detection system ..... Consilium Salwico Cargo

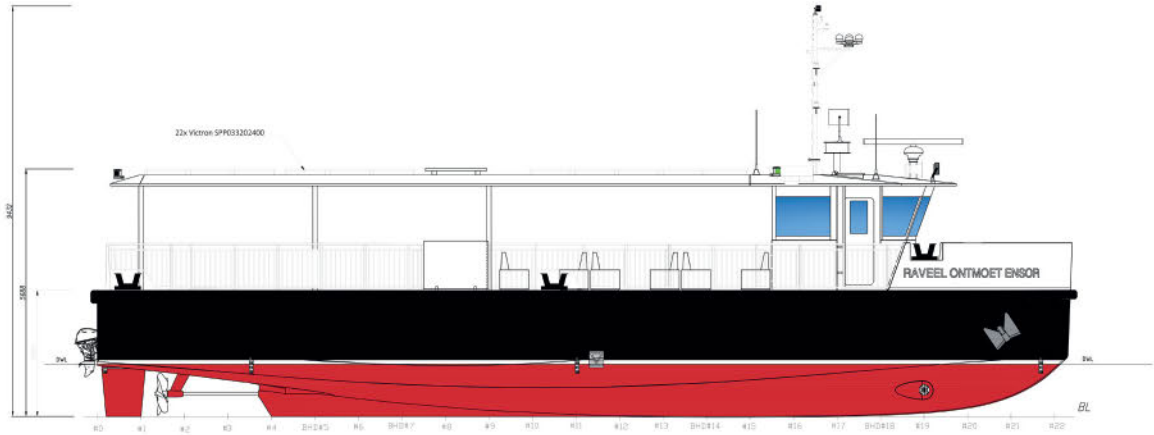
Onboard capacities:
- Fuel oil 500litres
- Fresh water 500litres
- Sullage 750litres
- Bilge water 500litres

Complement:
- Number of crew 2
- Number of passengers ..... 100 passengers (incl. 5 wheelchair spots + 40 bicycles)
- Number of cabins 0

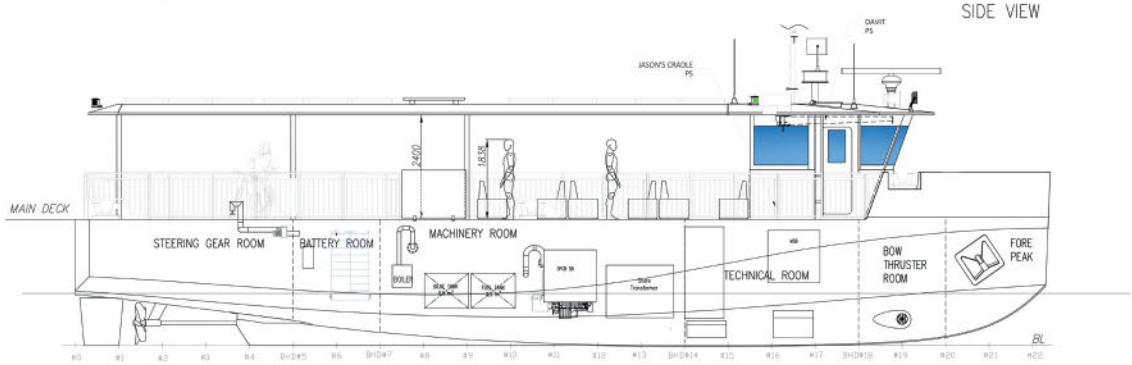
Other significant or special items of equipment
- 7kW of solar panels for auxiliary energy needs
- 158 kWh Corvus Li-ion battery bank

Classification
- Classification society ..... Lloyd's Register
- Notations ..... +100A1 SSC Passenger Mono Zone 1, LMC, UMS

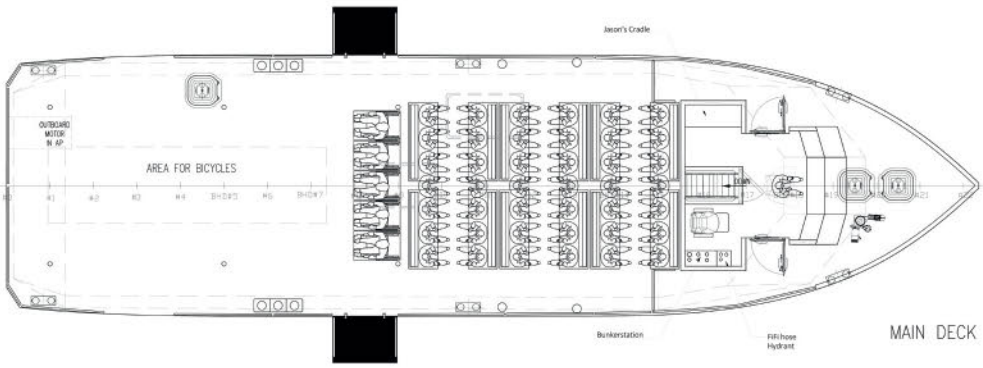
RAVEEL ONTMOET ENSOR



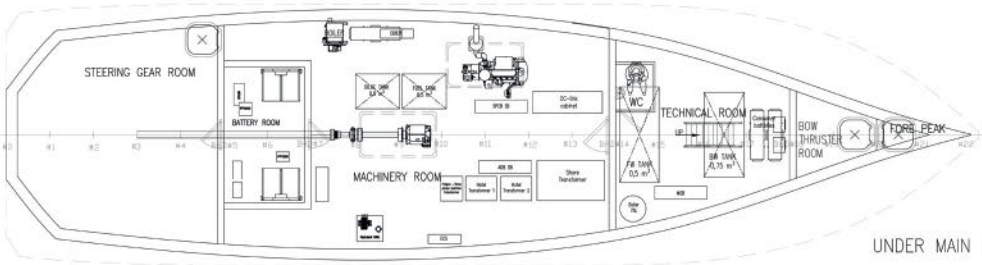
SIDE VIEW



SIDE CUT VIEW



MAIN DECK



UNDER MAIN DECK

RIBCRAFT 9.0M PRO HYBRID – RIB with a low carbon footprint

Builder:	**Ribcraft**
Designer:	**Ribcraft**
Vessel's name:	**Ribcraft 9.0m PRO Hybrid**
Owner/operator:	**Confidential**
Country:	**Confidential**
Flag:	**Confidential**
Total number of sister ships already completed:	**0**
Total number of sister ships still on order:	**0**
Contract date:	**2020**
Delivery date:	**2021**

UK manufacturer Ribcraft developed the new Ribcraft 9.0m PRO Hybrid to reduce its carbon footprint and the overall impact of its RIB operations on the environment. The company says: "It is the first of its kind in the world to feature new technology which switches seamlessly between an electric motor and a diesel engine."

The RIB is powered by twin Volvo Penta D4-270A diesel engines, paired with twin Transfluid hybrid HM560 modules. The craft itself is a Ribcraft 9.0m PRO enclosed GRP wheelhouse design, featuring the company's signature reinforced deep-V hull and multi-chambered, heavy-duty Hypalon tubes. Six shock mitigation seats, manufactured by Ullman Dynamics, provide increased comfort to the crew, and other features include reinforced glazed windows with a full wiper system, a rooftop access hatch and a complete interior lighting system.

The hybrid system architecture incorporates a clutch and transmission, enabling the vessel to operate in an electric-only mode for completely emission-free and silent running. Alternatively, it can run in engine-only mode, in which the diesel propels the vessel while also charging the batteries. Thirdly, it can be operated in combination 'booster' mode, with the battery-driven electric motor and diesel engine both driving the shaft, for maximum thrust for manoeuvring. Ribcraft says: "The three operational modes enable the boat operator to use a smaller, less expensive and economical diesel engine that yields substantial savings in fuel consumptions and longer maintenance intervals for the diesel engine without sacrificing performance."

The arrangement also provides more flexibility for boats operating in and out of environmentally protected areas , while delivering improved working conditions for the crew, who no longer have to put up with diesel fumes or significant noise levels when operating in electric mode. "The DNV-approved lithium battery can be charged from a shore power connection," Ribcraft adds.

TECHNICAL PARTICULARS

Length, oa	9m
Length, bp	3m
Breadth, moulded	2.3m
Depth, moulded	0.6m
Gross tonnage	4tonnes
Displacement	5.5tonnes
Design, draught	0.75m
Design, deadweight	2tonnes
Lightweight	3.5tonnes
Deck space (total)	9.4m²
Deck capacity	0.1tonnes/m²
Service speed	10knots
Max speed	40knots
Bollard pull (tonnes)	5tonnes
Range	150nm@40knots (hybrid mode) 20nm@10knots (electric mode)

Propulsion

Main engine(s):

Number of engines	2
Make	Volvo Penta diesel engine Transfluid hybrid system
Model	2 x Volvo Penta D4-270A 2 x Transfluid HM560
Batteries	2 x LiFePO4, 9.6kWh
Output of each engine	200kW@3,500rpm

Gearbox(es):

Number of gearboxes	1
Make	Sterndrive DPH transmission

Propeller(s):

Number of propellers	4
Make	Volvo Penta
Model	H7
Diameter	355mm
Material	Stainless steel
Number of blades	4
Speed	3,500rpm

Bridge electronics:

Radar(s)	Raymarine Quantum Q24D Doppler 18" radar
Chart plotter	Raymarine Axiom 12" PRO-S multi-function display with integrated high CHIRP conical sonar
Engine monitoring system	Volvo Penta monitoring system with glass cockpit multi-function display Transfluid Hybrid MPCB R5 management system with display and software
Other communication systems	VHF radio

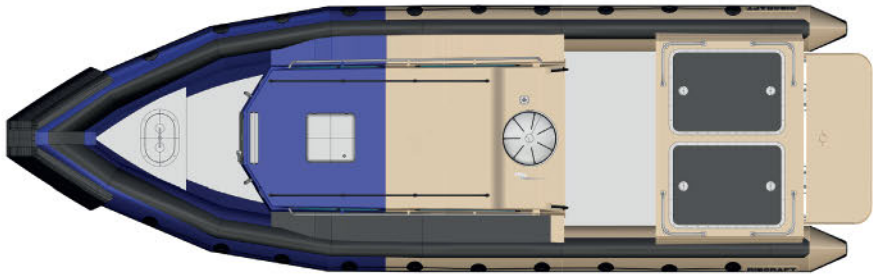
Onboard capacities:

Fuel oil	600litres
Other capacities	Battery pack

Complement:

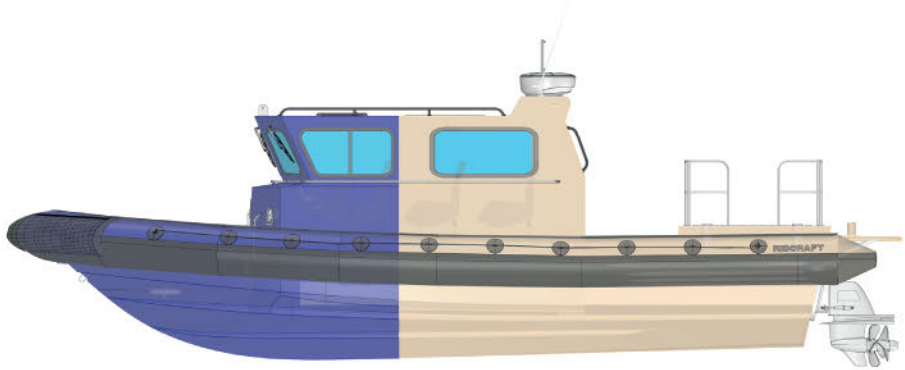
Number of crew	2
Number of passengers	4
Number of cabins	1
Classification society	DNV

RIBCRAFT 9m

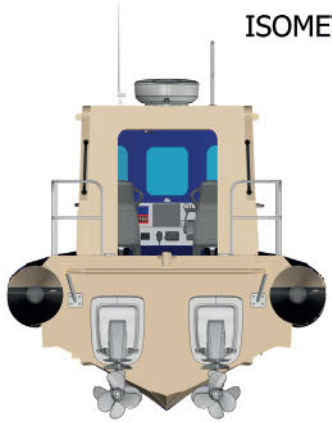


AERIAL VIEW

ISOMETRIC VIEW



PORTSIDE VIEW



TRANSOM VIEW

BOW VIEW

SEA CHANGE – Hydrogen-fuelled ferry keeping California clean

Builder:	**All American Marine**
Designer:	**Incat Crowther**
Vessel's name:	***Sea Change***
Owner/operator:	**SWITCH Maritime**
Country:	**US**
Flag:	**US**
Total number of sister ships already completed:	**0**
Total number of sister ships still on order:	**0**
Contract date:	**October 2017**
Delivery date:	**January 2022**

Sea Change has been hailed as the world's first commercial vessel powered entirely by hydrogen fuel cells and batteries. Launched in Q3 2021 and approved for operations by the US Coast Guard in October, and having entered service in January 2022, the zero-emissions, electric-drive ferry will operate in the California Bay Area, and is expected to play a role in lowering harmful air pollution in this zone.

The Incat Crowther 22-class ferry is also intended to serve as a "pathway to commercialisation...for hydrogen fuel cell marine technologies", the vessel's Washington-based builder, All American Marine, has stated.

The project was funded by private firm SWITCH, which seeks to foster decarbonisation across the US maritime sector. The development of *Sea Change* was also assisted by a US$3 million grant from the California Air Resources Board. SWITCH has pledged to build up a carbon-free ferry fleet, with more build projects planned for 2022.

The 22.1m x 7.5m vessel has been fitted with hydrogen fuel cells provided by Zero Emissions Industries. This includes 360kW of Cummins fuel cells and Hexagon hydrogen storage tanks, the latter located on the ferry's upper deck. XALT, meanwhile, provided the vessel's battery power, while BAE Systems supplied the ferry's dual electric motors.

The vessel can be fuelled directly from a hydrogen truck, and received its first supply of hydrogen in November 2021. The hydrogen is produced in California, using an electrolyser powered by solar energy – thus making the production process green-friendly, and minimising the amount of truck mileage required to top up the vessel.

The design for *Sea Change* was provided by Incat Crowther. The propulsion technology was integrated into the vessel's structure, while the hullform was optimised for reduced resistance. The design includes bow ramps and side loading gates, and the vessel can be accessed by wheelchair users. The elevated nature of the wheelhouse grants crew a clear view of the bow during loading operations.

According to reports, the electricity produced by the onboard hydrogen is sufficient to guarantee a range of up to 300nm and a service speed of approximately 20knots.

As such, the vessel could be well placed to compete commercially with equivalent-sized, diesel-powered passenger ferries.

Perhaps the last word should go to SWITCH CEO Pace Ralli, who commented in November 2021: "[The US] is more committed than ever to making the transition to a carbon-free economy. Hydrogen will play a major role in that future, and major players in the maritime industry are ready to decarbonise."

TECHNICAL PARTICULARS

Length, oa	22.1m
Breadth, moulded	7.5m
Depth, moulded	2.9m
Design, draught	1.1 m
Lightweight	14.75tonnes
Service speed	20knots
Max speed	24knots
Range	300nm
Propulsion	
Main engine(s)	
Number of engines	2 x electric motors
Make	BAE
Output of each engine	300kW
Propeller(s)	
Number of propellers	2
Hydrogen/hybrid System	
Storage tanks	Hexagon Purus
Storage capacity	220kg@3600psi
Fuel cell	Cummins 360kW
Batteries	XALT 100kWh lithium-ion
Onboard capacities	
Fresh water	378litres
Sullage	378litres
Complement	
Number of crew	2
Number of passengers	84
Number of cabins	0
Classification	
Classification society	US Coast Guard
Notations	Subchapter "T"

ESNA is a Naval Architect office specialized on Surface Effect Ship (SES) and solutions for low and zero emission.
The SES is partly lifted out of the water by an air cushion.
This allows very energy economic speeds of 40 knots and more.

ESNA

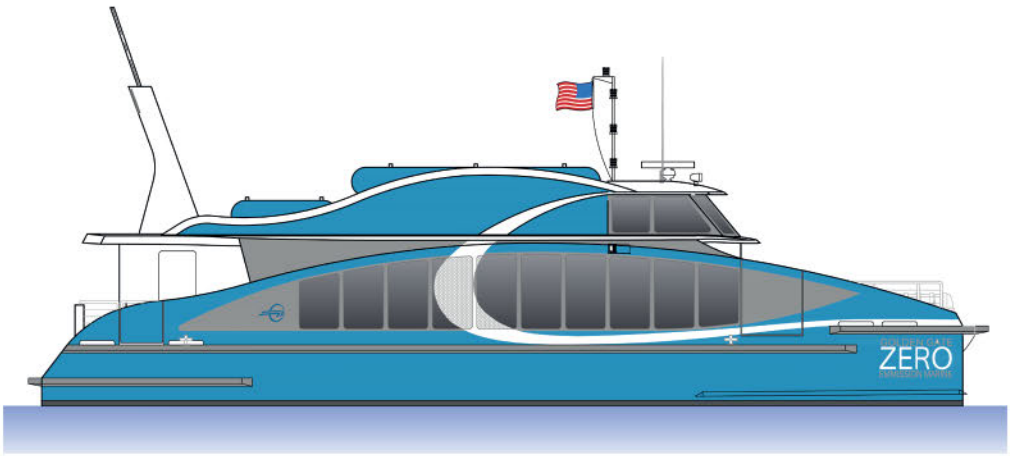
ESNA congratulates CWind and Wight Shipyard with CWind Pioneer and the inclusion as one of RINA's

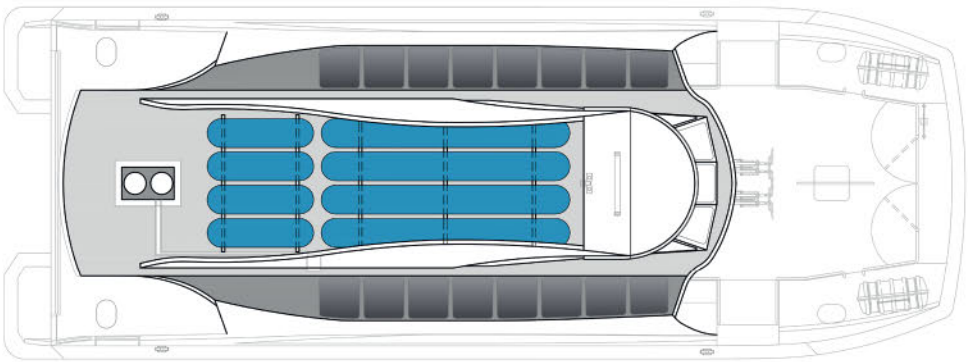
Significant Small Ships of 2021

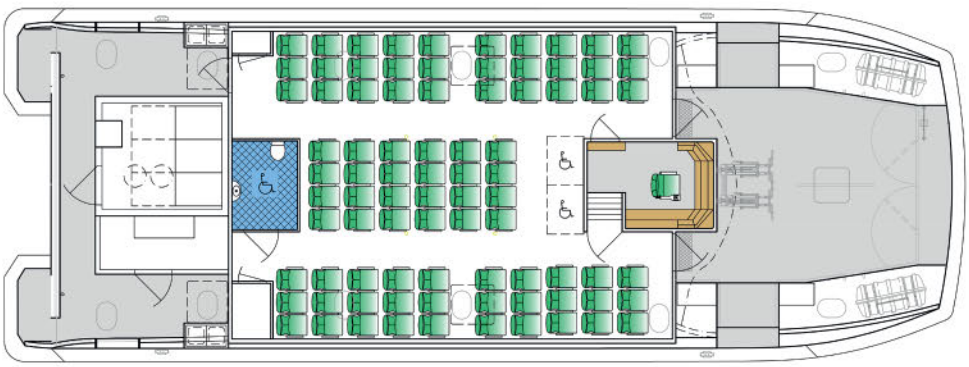
- ESNA started to work with CWind in 2018 to develop the CWind Pioneer, the world's first diesel-electric Surface Effect Ship.
- All air cushion systems on this vessel are electric.
- The fans and motion damping system are delivered by ESNA.

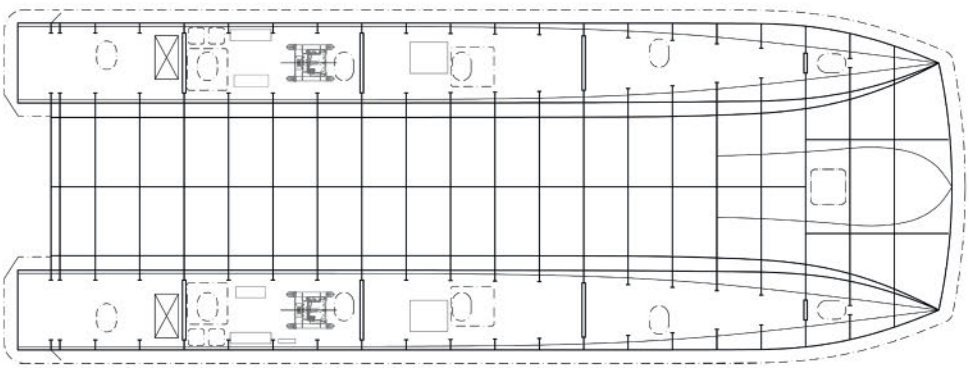
www.esna.no

SEA CHANGE









SELENE – Compact icebreaking tug maintaining low gross tonnage

Builder:	**Sanmar Shipyards**
Designer:	**Robert Allan Ltd.**
Vessel's name:	***Selene***
Owner/operator:	**Alfons Hakåns AS**
Country:	**Estonia**
Flag:	**Estonia**
Total number of sister ships already completed:	**1**
Total number of sister ships still on order:	**0**
Contract date:	**July 2018**
Delivery date:	**April 2021**

Selene is the debutante in Robert Allan Limited's TundRA 3200 class, whose development was based on the Canadian naval architect's proven TundRA Series of Azimuth Stern Drive (ASD) icebreaking tugs. The vessel was built by Sanmar Shipyards in Turkey for Finland-headquartered tugboat owner Alfons Håkans, and, upon delivery in April, was the first of a new pair of tugs for this client – *Selene*'s sister being *Helios*.

Both tugs were specifically designed for year-round service in the Baltic Sea and, in particular, the Northern part of the Gulf of Bothnia – a region prone to heavy ice coverage in wintertime, typically for a duration of three months. The hullform features a round bilge, and the bow is suitable for operations in ice. Similarly, the boat's hull structure has been designed to meet and exceed Ice Class 1AS requirements, while keeping gross tonnage below the 500tonne mark.

Selene was designed for multiple tasks, including escort duties, sea towing, ice management and ship assist duties. The tug also has the capability to carry extra provisions of fresh water to visiting merchant ships, and can store up to 25tonnes of deck cargo in two 20' containers.

The main towing equipment comprises a forward escort/towing double drum winch with escort staple. An aft towing post is fitted with tow bitts and a towing line reel, and the tug is equipped with fittings for towing barges alongside. Special attention was paid to ensuring the tug's capabilities.

Deck machinery includes a Rolls-Royce hydraulic double drum escort winch and one hydraulic vertical anchor windlass at the bow. The escort winch is spooled with a high-performance synthetic towline on each drum. Also, a towing hook is provided on the aft deck. A dry and heated rope store is arranged under the winch with safe access from the forecastle deck and from the lower accommodation deck.

Selene is protected by a 1m-diameter, cylindrical bow fender at the forecastle deck level, with W-block fenders below. An 800m-diamater cylindrical fender is used stern, with a D-fender installed along the sheer lines at the main deck.

TECHNICAL PARTICULARS

Length, oa	31.5m
Breadth, moulded	12m
Depth, moulded	5.8m
Gross tonnage	497tonnes
Displacement	931tonnes
Design, draught	4.6m
Design, deadweight	190tonnes
Lightweight	725tonnes
Deck space	368m^2
Service speed	10knots (economical speed)
Max speed	14knots
Bollard pull	66tonnes (ahead) / 63tonnes (astern)
Range	5,040nm@10knots / 1,620nm@13.5knots

Propulsion

Main engine(s):

Number of engines	2
Make	Caterpillar
Model	3516C
Output of each engine	2,000kW

Propeller(s):

Number of propellers	2
Make	Rolls-Royce
Model	US255
Diameter	2,600mm
Material	NiAlBr
Number of blades	4
Speed	246rpm (nominal)
Fixed/controllable pitch	Controllable
Open/nozzled	Nozzled
Special adaptations	Complies with ICE 1A FS class notation

Deck machinery

Crane(s):

Number of cranes	1
Make	Palfinger
Model	PK18500M
Capacities/SWL	SWL 810kg@14.4m / SWL 600kg@16.5m

Winch(es):

Number of winches	1
Make	Rolls-Royce
Model	ETWH 2000/800
Capacities	Forward escort/towing double drum winch with escort staple

Other deck machinery/equipment

- Aft towing staple with towing line reel
- Tug is equipped with fittings necessary for side-to-side towing.

Bridge electronics

Radar(s)	Furuno
Autopilot	EMRI
GMDSS	Furuno
GPS	Saab (DGPS)

Onboard capacities

Fuel oil	121m^3
Fresh water	16m^3
Sewage	8.4m^3
Fresh water cargo	103m^3
Oily water	5.6m^3
Lube oil	7.1m^3
Hydraulic oil	2.5m^3
Fuel overflow	4.4m^3
Sludge	3.6m^3

Complement

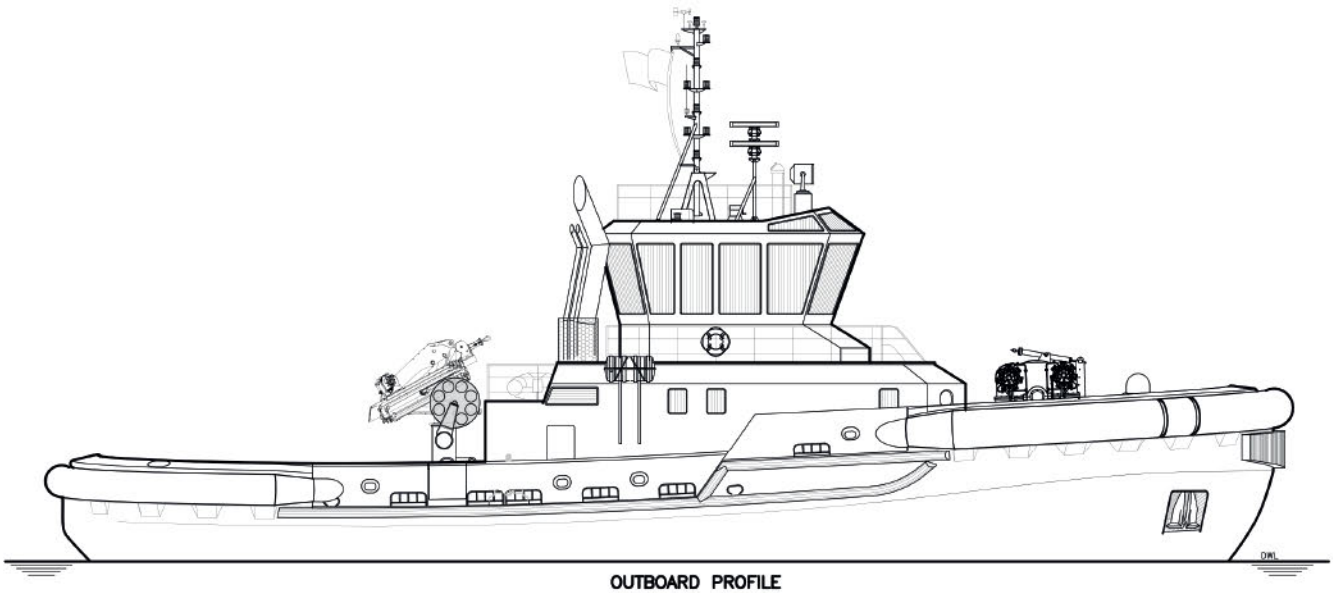
Number of crew	7
Number of passengers	0
Number of cabins	5

Classification

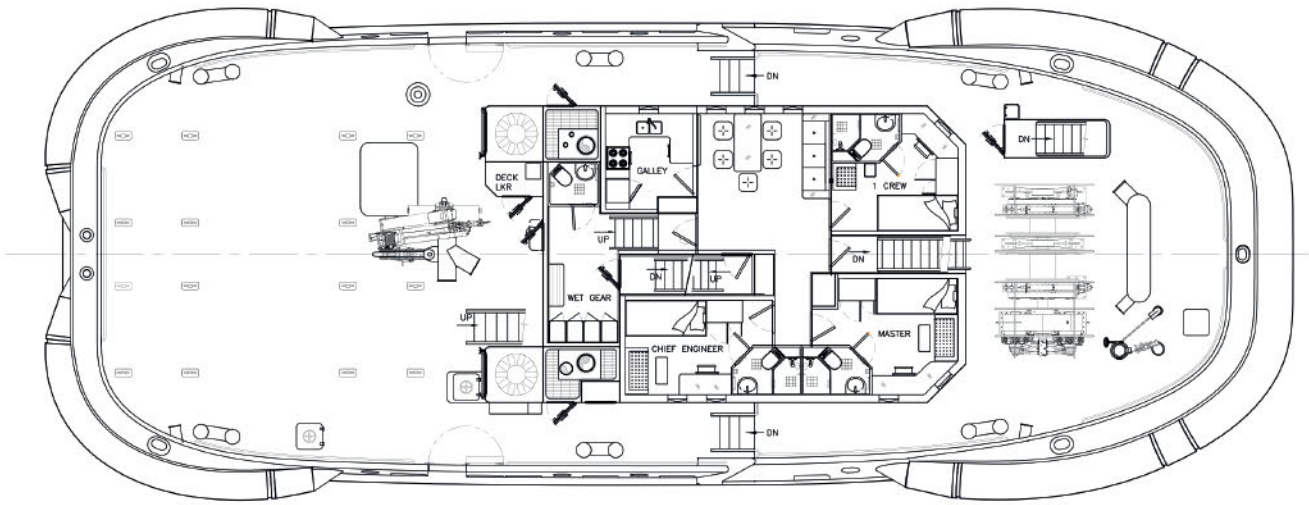
Classification society	Bureau Veritas
Notations	✠ Hull, ✠ Mach, Escort Tug, Green Passport – EU, ✠ AUT-UMS, Baltic Service, Inwater Survey, Ice Class: 1A, AVM-DPS

Other important international regulations complied with: IMO Tier II

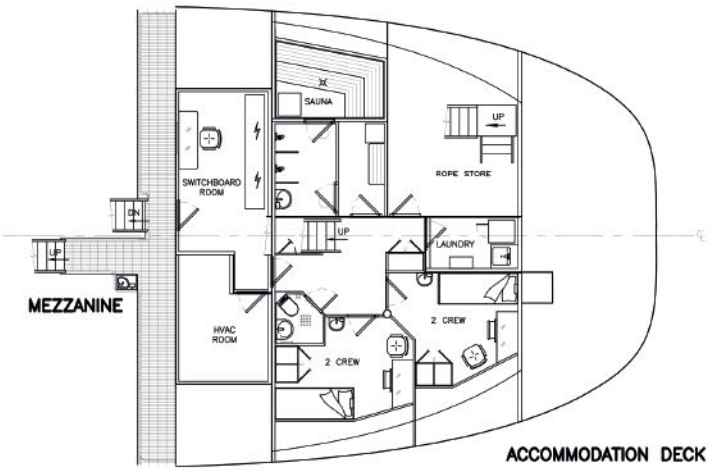
Designed for IMO Tier II, with consideration given to the potential future fit of an SCR system complying with IMO Tier III requirements



OUTBOARD PROFILE



MAIN DECK



MEZZANINE

ACCOMMODATION DECK

SSG MICHAEL H. OLLIS – First in NYC DOT's trio of modern, high-pax-capacity ferries

Builder:	**Eastern Shipbuilding Group**
Designer:	**Elliott Bay Design Group**
Vessel's name:	***SSG Michael H. Ollis***
Owner/operator:	**New York City Department of Transportation, Staten Island Ferry**
Country:	**US**
Flag:	**US**
Total number of sister ships already completed:	**0**
Total number of sister ships still on order:	**2**
Contract date:	**March 2017**
Delivery date:	**September 2021**

SSG Michael H. Ollis is the first of three 97.5m passenger ferries to enter service for Staten Island Ferries, operated by the New York City Department of Transportation (NYC DOT). The trio comprises the new Ollis class, named after war hero, and Staten Island native, Army Staff Sergeant Michael Ollis, who served three tours of duty during Operation Enduring Freedom, and was tragically killed at the age of 24 by a suicide bomber in Afghanistan. The vessel's name is thus intended to serve as a tribute to all wounded soldiers and their families.

The vessel provides service between Staten Island and Lower Manhattan in New York, transporting passengers, free of charge, along the 22-minute route. The Ollis class was designed by Elliott Bay Design Group of Seattle, Washington and built by Eastern Shipbuilding Group of Panama City, Florida. These double-ended ferries have the capacity for up to 4,500 passengers and 15 crew, and passenger-focused enhancements include: a large snack bar; heated decks, to eliminate ice and snow build-up; multiple USB charging outlets; and unobstructed skyline views around the circumference of the bridge deck. The vessels' aluminium bench seating was designed to emulate the look and feel of the wooden benches aboard *John F. Kennedy*, the oldest operating ferry in NYC DOT's fleet.

Ferries operating in New York Harbor have always been able to serve in a first responder role in times of emergency, such as the evacuation of Lower Manhattan during 9/11, and the Ollis class will continue in that tradition. To enhance its emergency response capabilities, *SSG Michael H. Ollis* is fitted with four rescue boats, anchors and capstans at each end, plus side doors at amidships. The amidships doors allow vessel-to-vessel side transfers, or pier-to-vessel side transfers, in addition to current end-to-end transfer capabilities that are currently part of the Staten Island Ferry standard safety procedures.

The vessels meet USCG 46 CFR Subchapter H certification requirements for operation on protected water routes, and are certified to meet ABS' Standards for Building and Classing Steel Vessels for Service on Rivers and Intracoastal Waterways. Two additional vessels of this design, *Sandy Ground* and *Dorothy Day*, will join the Staten Island Ferry fleet in 2022.

TECHNICAL PARTICULARS

Length, oa	97.54m
Length, bp	93.67m
Breadth, moulded	21.34m
Depth, moulded	6.3m
Gross tonnage	5,919tonnes(ITC) / 4,669tonnes (GRT)
Displacement	3,440tonnes
Design, draught	4.11m
Lightweight	2,591tonnes
Service speed	16.3knots
Max speed	17knots

Propulsion
Main engine(s):

Number of engines	4
Make	Electro-Motive Diesel (EMD)
Model	12ME23B
Output of each engine	1,861kW

Gearbox(es):

Number of gearboxes	2
Make	Reintjes
Model	DUP 3000 P
Output speed	750rpm

Propeller(s):

Number of propellers	2
Make	Voith Schneider
Model	36 RV6 ECS/285-2
Diameter	3,600mm orbit diameter / 2,850mm blade length
Material	Stainless steel
Number of blades	6
Fixed/controllable pitch	Controllable
Open/nozzled	Open
Special adaptations	VSP

Winch(es):

Number of winches	2 (anchor winches)
Make	Coastal Marine
Model	1A17-150X1-135-00
Capacities	6.8tonnes@30fpm

Other deck machinery/equipment:
2 x Coastal Marine mooring capstans, 5.44tonne line pull
4 x 4.9m rescue boats (Willard Marine Sea Force 490) with 18.6kW motors

Bridge electronics

Radar(s)	4 x Furuno XN20AF
GPS	Furuno GP170D
Chart plotter	Transas NS4000
Engine monitoring system	Electronic Marine Systems PMS9000
Fire detection system	Hiller Marine / Siemens Cerberus Pro

Other communication systems: Vingtor SPA-V2 PA/GA System

Onboard capacities

Fuel oil	140,000litres
Fresh water	77,800litres
Sewage	16,000litres
Ballast water	318,000litres
Lube Oil	2,700litres
Urea	12,000litres

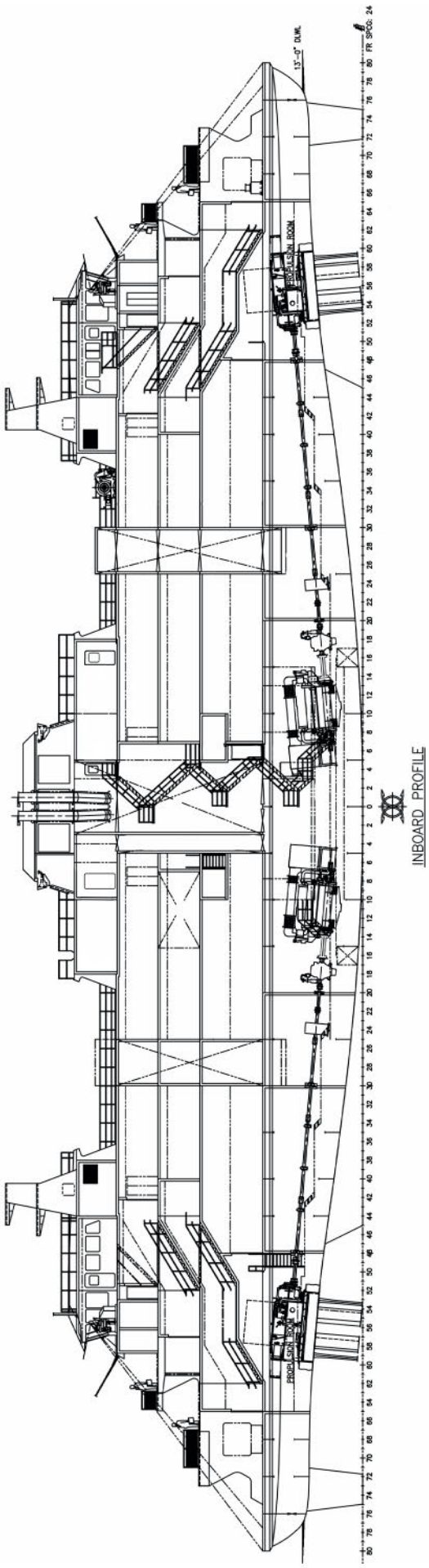
Complement

Number of crew	15
Number of passengers	4,500
Number of cabins	0

Classification

Classification society	ABS
Notations	USCG Subchapter H ✠ A1, Passenger Vessel, ✠ AMS, River Service

SSG MICHAEL H. OLLIS



SURVIVOR 1 – Remote-control rescue craft for offshore wind farms

Builder:	**Manor Marine**
Designer:	**Chartwell Marine**
Vessel's name:	***Survivor 1***
Owner/operator:	**ZELIM**
Country:	**UK**
Flag:	**N/A**
Total number of sister ships already completed:	**0**
Total number of sister ships still on order:	**0**
Contract date:	**N/A**
Delivery date:	**Q3-Q4 2022 anticipated**

2021 saw the launch of *Survivor 1*, the prototype of the forthcoming search and rescue (SAR) Survivor craft series. The concept, developed jointly by offshore SAR services provider Zelim and naval architect Chartwell Marine, is for a remotely operated rescue vessel, capable of providing on-site safety coverage for wind turbine technicians, and instant, close-range response.

The Survivor would be fitted within a launch and recovery cradle and attached to a structural connection ring affixed to the wind turbine. In the event of an accident – for instance, a technician or SOV crew member falling off the turbine or overboard, or a helicopter hitting the water – the SAR craft would be deployed into the water via a 25m free fall. Elaborating on the concept, Zelim and Chartwell Marine said: "Lifeboats can take several hours to reach the site of the emergency, and even rescue helicopters can take well over an hour."

Built in aluminium, *Survivor 1* has a range of more than 100nm and can operate in significant wave heights of 4.5m – a factor verified, via model testing, by naval architect Seaspeed Marine Consulting. A pilot inside a control station, located outside of the offshore environment, controls the Survivor remotely. The craft employs twin waterjets, driven by either a hydrotreated vegetable oil (HVO)-fuelled diesel internal combustion engine, or by an electric motor, depending on the operator's preference. These waterjets activate prior to contact with the water, to prevent the craft from drifting backwards into the turbine.

With no rescue personnel physically on board, the Survivor is dependent on an innovative rescue conveyor system, located at the bow, to recover man overboard (MOB) casualties from the water. This feature was designed by Zelim, Chartwell Marine, Engineered Marine Systems, Seaspeed Marine Consulting and Saviour Medical. The rescue conveyor is similar to an upwards-moving, step-free travelator: when the casualty makes contact with the conveyor, he/she is carried up diagonally and onto the craft. This spares the casualty from having to physically clamber aboard the Survivor, which may not be possible if he/she has sustained an injury or concussion, or is rapidly losing body heat.

Survivor 1 can recover at least 12 persons in a single SAR mission. The air-conditioned cabin offers folding seating for 12 persons, plus space for two stretchers. Other accessible features include easy-to-open door handles and a helicopter pick-up zone.

Two sets of free fall tests were conducted at QinetiQ's Ocean Basin pool in Haslar, near Portsmouth, UK, allowing the partners to assess the craft's free-running performance in sea state 6, as well as the use of the rescue conveyor. With these complete, the next step will be to install a Survivor at an active offshore turbine array, most likely to happen in 2022.

TECHNICAL PARTICULARS

Length, oa	11.1m
Length, bp	9.42m
Breadth, moulded	4.5m (incl. fenders)
Depth, moulded	1.675m
Displacement	10tonnes (departure)
Design, draught	0.795m
Design, deadweight	1.5tonnes approx. (subject to payload & POB)
Lightweight	9.64tonnes
Deck space (total)	6m^2 (minimum)
Service speed	16knots (after casualty recovery, back to safety)
Max speed	25knots+ (transit/search operations)
Range	100nm (approx.)

Propulsion
Main engine(s):

Number of engines	2
Make	Bukh
Model	VGT400
Output of each engine	298kW

Gearbox(es):

Number of gearboxes	2
Make	ZF
Model	280-1 (parallel offset)

Waterjets

Number of waterjets	2
Make	Hamilton
Model	HJX27

Other deck machinery/equipment
ZELIM-patented conveyor rescue system for casualty recovery operations, installed at bow

Onboard capacities

Fuel oil	600litres+
Other capacities	Hydraulic tank (size TBC)

Complement

Number of crew	0
Number of passengers	Up to 12 POB max (rescued casualties)
Number of cabins	1

Other significant or special items of equipment
- Remote control & monitoring equipment
- Client-developed search and rescue equipment

Classification

Classification society	Lloyd's Register

Other important international regulations complied with: Workboat Code Ed.2 – Cat 1

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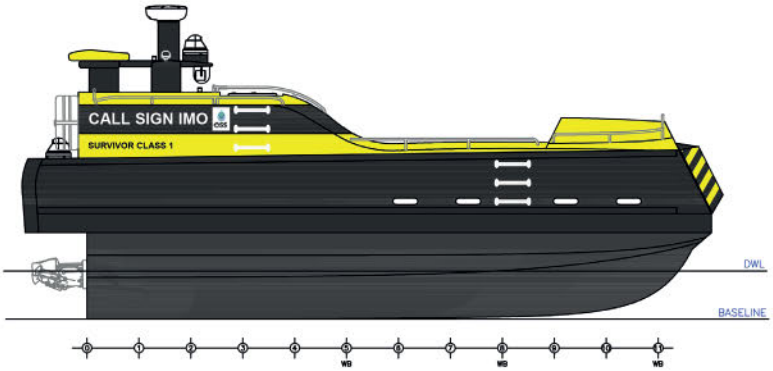
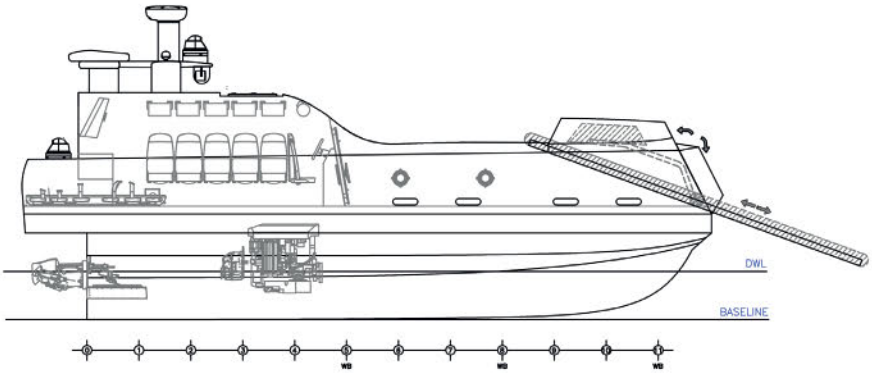
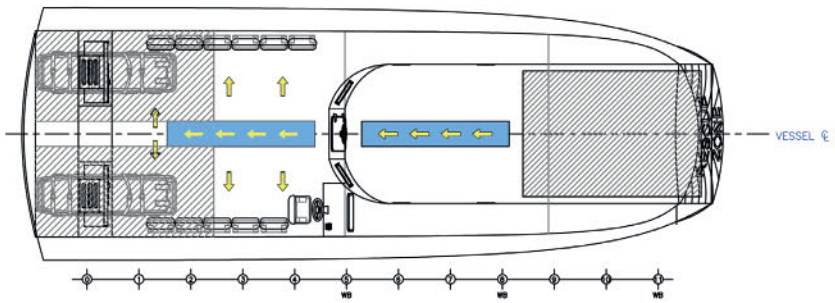
SURVIVOR 1



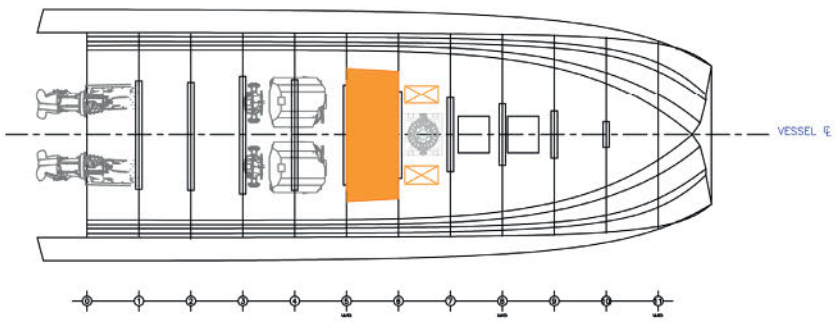
PROFILE VIEW
EXTERIOR



PROFILE VIEW
INTERIOR



MAIN DECK



BELOW DECK

ROBERT ALLAN

www.ral.ca

RAmpage 6000-ZM | Koc Al Zour

SWR-120 – Customisable RIB class for SAR, patrol and workboat duties

Builder: **S-Ribs Custom Boatbuilding**
Designer: **S-Ribs Custom Boatbuilding**
Vessel's name: ***SWR-120 00074***
Owner/operator: **Russian Marine Rescue Service**
Country: **Russian Federation**
Flag: **Russian Federation**
Total number of sister ships already completed: **5**
Total number of sister ships still on order: **2**
Contract date: **September 2020**
Delivery date: **March 2021**

The SWR-120 is a multi-purpose, heavy-duty, high-speed planing boat for operation in coastal sea areas (or in open sea environments, as a daughter craft), as well as in lakes and rivers in any climate zone. Depending on the equipment installed, the boat can be customised for search and rescue (SAR) and patrol work, but can also operate as a workboat, a pilot boat, a crew tender craft, a dive support boat or a hydrographic survey vessel. The SWR-120's structure and systems were designed to meet ISO Small Craft certification and Bureau Veritas HSC classification rules.

An aluminum deep-V hull bottom shape, with a moderate transom deadrise with wide bow lines, was selected for optimal seakeeping ability, especially in heavy seas. S-Ribs says that the prismatic hull shape also provides a more stable deck surface for crew moving around the superstructure. By removing steps and other 'obstacles' from the deck, the crew can safely and promptly engage in operations, move equipment along the deck and undertake MOB rescues.

A wide hull beam of 3.3m gives the SWR-120 good payload capacity, plus more space inside and outside for systems and special equipment – as well as more cabin space. With a moderate draught of 800mm and waterjets, the boat can transit in shallow waters close to the shore. It is supported by a wide range of equipment, including a rigid fender, a hydraulic crane, a safety rail, an aft rescue platform, a quick-release hook and a battery charger, among others. The boat has also been designed to be self-righting.

Thanks to a diesel fuel capacity of 1,600litres, the vessel has a range of 380nm. A fresh/hot water supply, combined with a fully stocked galley, enables the SWR-120 to operate for lengthy periods before requiring a return to shore.

TECHNICAL PARTICULARS

Length, oa 11.99m
Length, bp 11.73m
Breadth, moulded 3.6m
Depth, moulded 2.37m
Gross tonnage 12.2tonnes
Displacement ..... 11.9tonnes (in salt water)
Design, draught 0.8m
Design, deadweight 3tonnes
Lightweight 9.2tonnes
Deck space (total) ..... ~30m^2
Service speed 36-38knots
Max speed 42knots
Bollard pull (tonnes) 2.5tonnes
Range 380nm

Propulsion
Main engine(s):
Number of engines 2
Make ..... Cummins
Model QSB6.7M
Output of each engine 357kw

Waterjet(s):
Number of waterjets 2
Make ..... Alamarin-Jet
Model AJ-340

Crane(s):
Number of cranes 1
Make ..... HIAB
Model ..... T-CLX 018-2
Capacities/SWL 1mt

Other deck machinery/equipment
- Semi-electrically operated aft rescue/divers platform
- Harken safety rail system

Bridge electronics
Radar(s) ..... Raymarine RD418D
GPS ..... Raymarine C125
Chart plotter ..... Raymarine C125
Engine monitoring system ..... Raymarine C125
Fire detection system ..... S-Ribs Custom Boatbuilding

Other communication systems
- Cobham Sailor 6281 AIS
- Sailor 6391 Navtex System

Onboard capacities
Fuel oil 1,600litres
Fresh water 300litres
Sullage 150litres

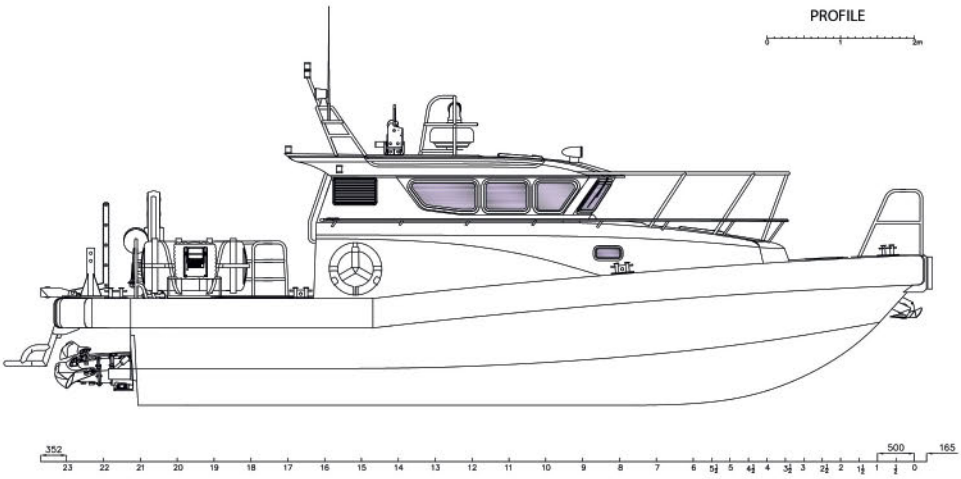
Complement
Number of crew 2
Number of passengers 10
Number of cabins 2

Other significant or special items of equipment
- H. Henriksen one-point quick release hook system
- Manntek fuel-filling dry break coupling for quick refuelling

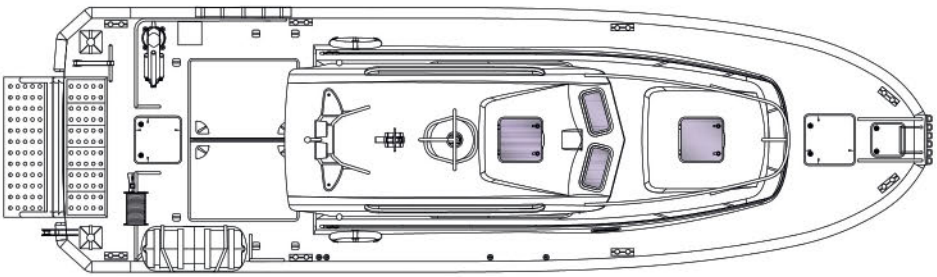
Classification
Notations
- Local small craft rules for boats up to 20m
- Systems and structures are designed to meet HSC MACO rules

SWR-120

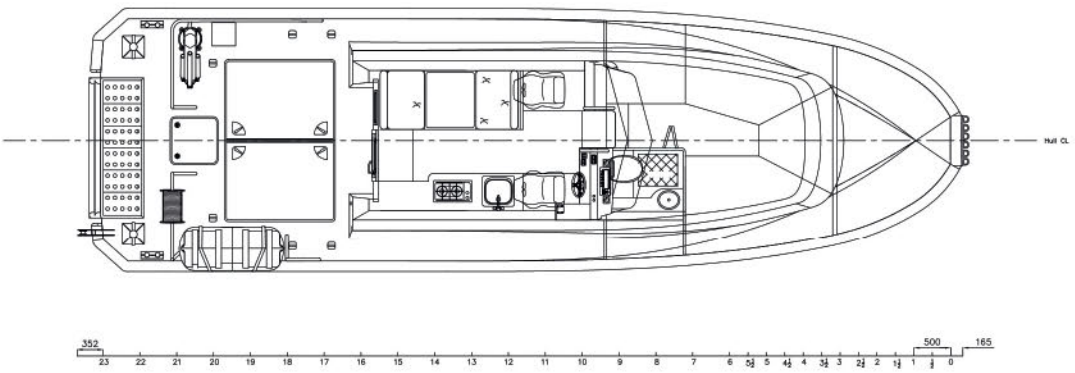
PROFILE



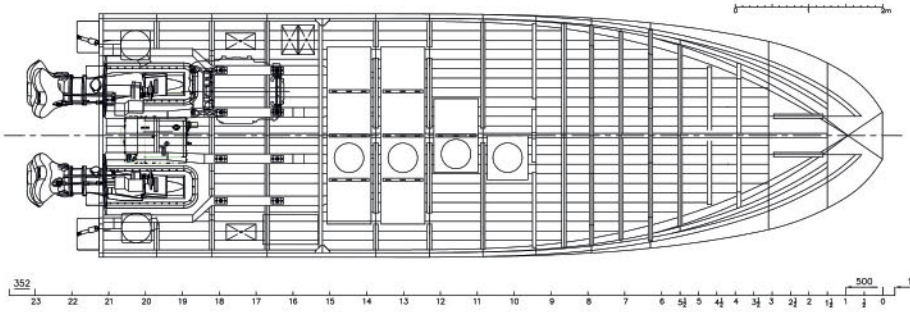
TOP VIEW



ACCOMODATION PLAN



BIGLE PLAN



TARAJOQ – Ice-class vessel furthering research in Greenland

Builder:	**Balenciaga Shipyard**
Designer:	**Skipsteknisk**
Vessel's name:	***Tarajoq***
Owner/operator:	**Grønland Naturinstitut**
Country:	**Greenland**
Flag:	**Denmark**
Total number of sister ships already completed:	**0**
Total number of sister ships still on order:	**0**
Contract date:	**2019**
Delivery date:	**2021**

The compact oceanographic vessel *Tarajoq* was designed by Norwegian firm Skipsteknisk, to the specs of its ST-336 class, and will conduct research in Greenlandic waters. Fully capable of operating in ice, the newbuild has replaced the veteran oceanographic vessel *Pâmiut*, which was operational between 1974-2019, and is able to provide superior capacity in its scientific facilities and onboard teaching space. *Tarajoq* can also carry out trawling work at greater depths than its predecessor.

The vessel features a wet and fish laboratory, connected to a refrigerator; a dry laboratory; and a chemistry and sample analysis laboratory, all of which are located on the main deck. It also features an IT/computer space, a meeting room and an observation zone on the government bridge, allowing scientists to carry out work on arctic meteorology. Warehouses and holds for storing scientific and fishing equipment are located below the main deck.

The MAN engine package for *Tarajoq* was selected to comply with DNV's Silent F notation, for the comfort of the onboard scientists. To manoeuvre, the ship utilises a Brunvoll retractable propeller at the bow, rated 850kW, and another aft, rated 1,200kW. In addition to providing *Tarajoq*'s firefighting system, Survitec Group delivered five life rafts to the vessel, each featuring the capacity for 20 persons, or 16 in polar conditions, as the rafts would then be mandated to drinking water and additional food to ensure the survival of their occupants.

TECHNICAL PARTICULARS

Length, oa	61.4m
Length, bp	53.4m
Breadth, moulded	16m
Depth, moulded	8.8m
Design, draught	6.4m
Design, deadweight	715tonnes
Service speed	12knots
Bollard pull (tonnes)	40tonnes

Propulsion
Main engine(s):

Number of engines	1
Make	MAN
Model	8L27/38
Output of each engine	2,920kW

Gearbox(es):

Number of gearboxes	1
Make	Renk
Model	RSVL-850 PTO/PTI/PTH

Propeller(s):

Number of propellers	1
Make	MAN
Diameter	3,800mm
Material	NiAlBr
Number of blades	5
Speed	144.3
Fixed/controllable pitch	Controllable
Open/nozzled	Open

Deck machinery and bridge electronics
Crane(s):

Number of cranes	2
Make	MELCAL
Model	1 x JI170 knuckle boom type 1 x JL50 knuckle boom type
Capacities/SWL	6tonnes@16.5m / 2tonnes@12m

Other deck machinery/equipment:
- 1 x electric auxiliary winch of 7tonnes Model MAX-C/E/45/50-22
- 2 x electric trawl winches with wire capacity of 4,200m for Ø 26mm. Model MAI-E/250/4200-26
- 2 x electric Gilson winches with wire capacity 100m for Ø30mm. Model MAX-L/E/75/100-30
- 6 x electric sweepline winches with capacity of 12tonnes. Model MAX-M/E/55/0,6m³
- 1 x electric cod-end winch with a capacity of 10tonnes. Model MAX-C/E/40/80-30
- 2 x electric retriever winches for Gilson wires, capacity 1tonne. Model MAX-C/E/4/60-12
- 2 x hydraulic back-strop rope winches with capacity of 1tonnes. Model P15
- 1 x electric net sounder winch with capacity of 4tonnes for a cable 5,000m Ø 11mm. Model MCS-E/30/5000-11
- 1 x electric net drum with capacity of 25tonnes, approx 20m³, core diameter. Model TR-E/2x90/2x10
- 1 x electric multipurpose winch with capacity of 16tonnes, inner layer for a cable 5,000m Ø 16mm. Model MO-E/90/5000-16
- 1 x electric hydrographic winch (CTD) with capacity of 10tonnes inner layer for a cable 3,000m Ø 10mm. Model MOE/45/3000-10
- 1 x electric drop keel winch with a capacity of 7tonnes inner layer for a cable of 60m Ø 24mm. Model MAX-C/E/10/60-24
- 1 x stern A-frame, stepless stroke hydraulic operated for SWL 10tonnes.

Onboard capacities:

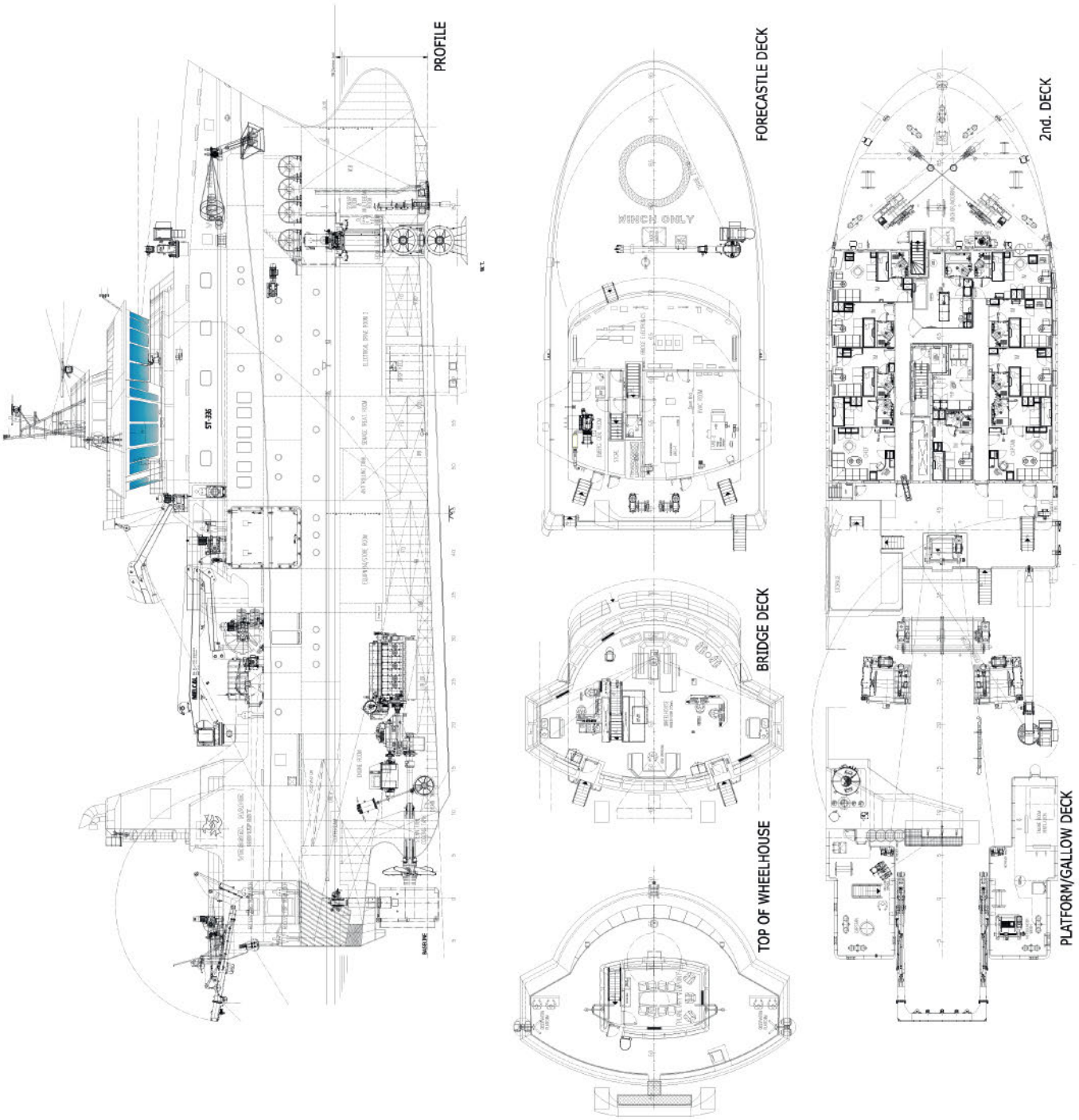
Fuel oil	475,000litres
Fresh water	100,000litres
Ballast water	400,000litres

Complement

Passengers	32

Classification

Classification society	DNV
Notations	DNV +1A, Ice (1B), E0, TMON, SILENT (F), SPS, Stern Trawler Hull


PROFILE
FORECASTLE DECK
2nd. DECK
BRIDGE DECK
TOP OF WHEELHOUSE
PLATFORM/GALLOW DECK

VAMPIRE – Modular RIB to deploy "everything from drones to quad bikes"

Builder:	**Ring Powercraft**
Designer:	**Ring Powercraft**
Vessel's name:	***Vampire***
Owner/operator:	**N/A**
Country:	**UK**
Flag:	**N/A**
Total number of sister ships already completed:	**0**
Total number of sister ships still on order:	**0**
Contract date:	**N/A**
Delivery date:	**N/A**

Launched in 2021 as a prototype by UK boatbuilder Ring Powercraft, the Vampire has big ambitions for a compact RIB – most crucially, to serve as a modular "rapid deployment transporter" for professional, commercial and recreational operators alike. The Vampire's open aft deck has been designed to accommodate a moveable quick-release track mounting system that can be used to deploy and recover "everything from drones to quad bikes", Ring explains.

The first variant in the Vampire class is the V1050, which was produced to "demonstrate proof of concept and our move to modular boats", Ring adds. The V1050 is intended for leisure users, while the VT1050 (where the additional 'T' stands for 'tactical') is aimed at military and police users. This variant can carry up to five persons and two jet skis.

A larger VT-1250 variant, measuring 3.5m x 3.3m and providing room for up to eight persons, will be launched in the future.

The modular nature of the Vampire means it can be repurposed within minutes, enabling it to handle various missions. For example, it can switch from a deployment/retrieval craft to a crew transfer or resupply boat. During its 2021 sea trials, the debut Vampire model carried a pair of Tactical Watercraft (TWC) units provided by Golden Arrow Marine, though this payload could equally comprise two tenders, two quad bikes or a pair of ROVs, depending on the end user's mission. The RIB can also be configured with high-power winches to pull the TWC units on board when they pull up to the aft.

Customers are able to specify single- or twin-waterjet configurations. Running on a single waterjet, the VT1050 can achieve a speed of 35knots. The debut Vampire has also been fitted with Ullman Dynamics' motorbike-style Steering Bar System; by twisting the grip on the bar, the coxswain can keep both hands on the bars, enabling him/her to maintain full control of the RIB while simultaneously throttling, adjusting speed and even bracing for potentially dangerous impacts.

Ullman Dynamics also supplied the RIB's shock-mitigating seats, while Seadek's shock-mitigating flooring is intended to protect standing crew from the effects of slamming at high speeds – every feature playing a role in countering the harmful effects of exposure to whole body vibration (WBV). The RIB's Hypalon tubes, meanwhile, were provided by Henshaw Inflatables, and Simrad's electronic systems have been installed in the cockpit. Barrus supplied the Yanmar diesel engine and Vanclaes Trailers provided the Vampire's jet ski loading rack.

TECHNICAL PARTICULARS

Length, oa	11m
Breadth, moulded	3m
Depth, moulded	0.7m
Gross tonnage	2.7tonnes
Design, deadweight	2tonnes
Deck space (total)	14m²
Deck capacity	To meet operational requirements
Service speed	To meet operational requirements
Max speed	To meet operational requirements

Propulsion

Main engine(s):	
Number of engines	1
Make	Yanmar
Model	8LV
Output of engine	272kW

Gearbox(es):

Number of gearboxes	1
Make	ZF220

Waterjet(s):

Number of waterjets	1
Make	AlamarinJet
Model	AJ285

Winch(es):

Number of winches	2
Make	To meet operational requirements
Model	To meet operational requirements
Capacities	To meet operational requirements

Other deck machinery/equipment: Tactical Watercraft (provided by Golden Arrow Marine)

Bridge electronics

Autopilot	AlamarinJet
GPS	Simrad

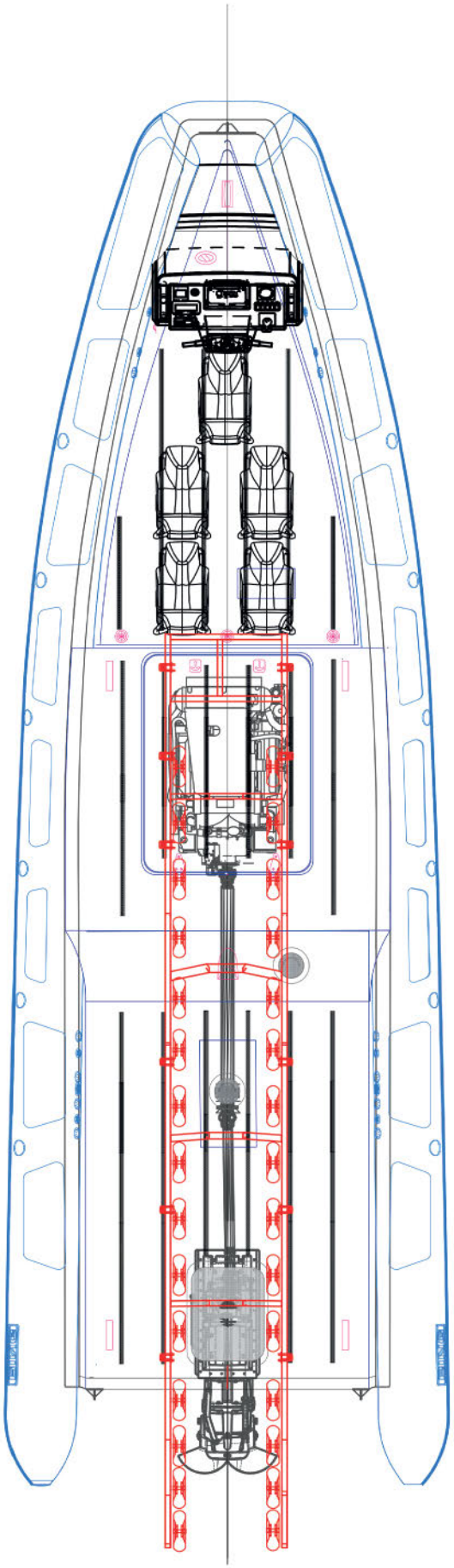
Onboard capacities:

Fuel oil	To meet operational requirements
Fresh water	To meet operational requirements
Ballast water	To meet operational requirements

Complement:

Number of crew	To meet operational requirements
Number of passengers	To meet operational requirements
Number of cabins	0

VAMPIRE



YARA BIRKELAND – All-electric, autonomous coastal container ship

Image: Knut Brevik Andersen, Wilhelmsen Ships Service

Builder:	**VARD**
Designer:	**Marin Teknikk**
Vessel's name:	***Yara Birkeland***
Owner/operator:	**Yara**
Country:	**Norway**
Flag:	**Norway**
Total number of sister ships already completed:	**0**
Total number of sister ships still on order:	**0**
Contract date:	**2018**
Delivery date:	**December 2020**

Yara Birkeland so narrowly missed inclusion in *Significant Small Ships of 2020*, but we're delighted to welcome it to this year's edition, as it prepares to enter full commercial operation in 2022.

The VARD-built vessel has been hailed as the world's first electric and autonomous container ship. Designed by Marin Teknikk, and developed in collaboration with the Kongsberg Group, the vessel was developed with financial support from Enova, a state enterprise owned by Norway's Ministry of Climate and Environment. The ship will be tasked with transporting mineral fertiliser between Porsgrunn and Brevik in Norway, and will contribute to significant cuts in emissions during these journeys.

The ship will be operated from Massterly's monitoring and operations centre in Horten. Massterly is a joint venture between Kongsberg and Wilhelmsen. "Norway is a major maritime nation, and other countries look to Norway for green solutions at sea," comments Geir Håøy, Kongsberg Group CEO. "*Yara Birkeland* is the result of the extensive knowledge and experience we have available in the Norwegian maritime cluster and industry. The project demonstrates how we have developed world-leading innovation that contributes to the green transition and provides great export opportunities for Norwegian technology and industry."

The vessel is essential a 120teu, open-top container ship, solely fuelled by battery power and prepared for autonomous and unmanned operation – though, until her shipboard autonomous systems are refined, she will initially sail with three crew during her two-year trial period. *Yara Birkeland* is expected to reduce NOx and CO_2 emissions by reducing diesel-powered truck transport by around 40,000 journeys per year – thereby both meeting the UN's sustainability goals and improving road safety and traffic congestion.

TECHNICAL PARTICULARS

Length, oa 80m
Length, bp 72.4m
Breadth, moulded 14.8m
Depth, moulded 4m
Gross tonnage 2,889tonnes
Design, draught 3.3-6.3m
Design, deadweight 3,400tonnes
Service speed 8knots
Max speed 13knots
Range ..... 60nm (approx.)

Propulsion
Main engine(s):
Number of engines ..... 8 x battery compartments
4 x three-phase-induction motors
Make ..... Leclanché high-energy lithium-ion battery system
Siemens motors
Outputs ..... 900kW (thruster)
700kW (tunnel thruster)
6.7MWh (total battery capacity)

Propeller(s):
Number of propellers ..... 2 x azimuth pods + 2 x tunnel thrusters
Make ..... Brunvoll

Deck machinery
Winch(es):
Number of winches 8
Make ..... MacGregor

Other deck machinery/equipment: ..... 2x MacGregor automatic mooring robots

Bridge electronics:
Radar(s) ..... Sperry X- and S-band
Autopilot ..... KM PosCon
GMDSS ..... GMDSS A2 (Cobham Sailor, Navtex, AC Antennas, Comrod antennas)
GPS ..... KM DPSi4 & SeaPath 380
Gyro ..... KM MGC R2
Chart plotter ..... KM K-Bridge
Engine monitoring system ..... KM K-Chief
Fire detection system ..... Autronica
Other communication systems ..... KM Mobile BroadBand Radio and 4G

Complement:
Number of crew ..... 3 (in initial operation) / 0 (with full autonomy)
Number of passengers 0
Number of cabins 0

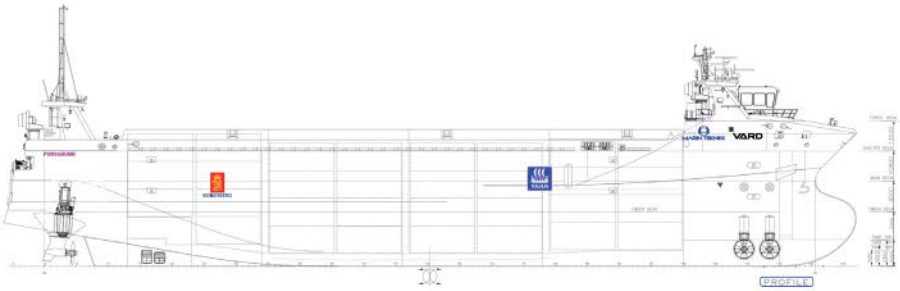
Other significant or special items of equipment: ..... Systems and sensors from KM and sub-suppliers enabling the vessel for unmanned operation supported from an onshore remote pperation centre

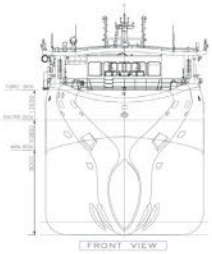
Capacities
Containers 120teu
Ballast water ..... Fixed ballast design

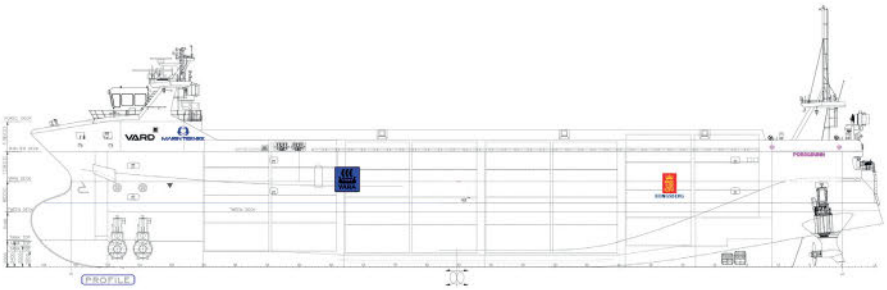
Classification
Classification society ..... DNV
Notations ..... ✠1A Container ship BIS Battery(Power) Hatchcoverless Ice(C) RP(2, 50%) R3(nor)

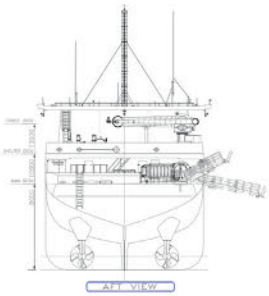
Other important international regulations complied with ..... NMA RSV 12-2020 "Guidance in connection with the construction or installation of automated functionality aimed at performing unmanned or partially unmanned operations"

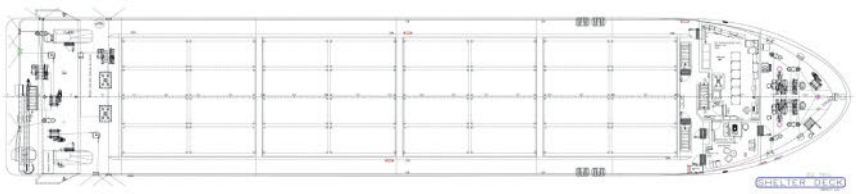
YARA BIRKELAND

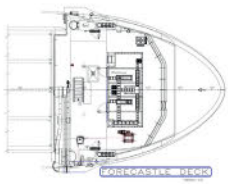


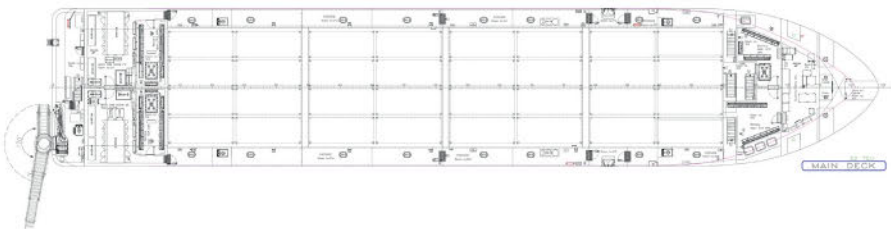


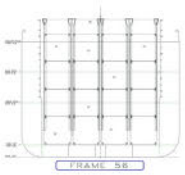


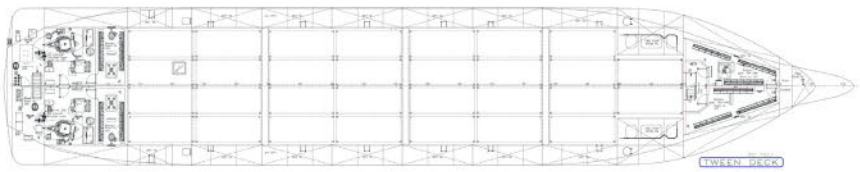


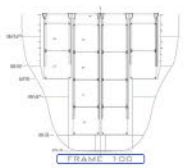


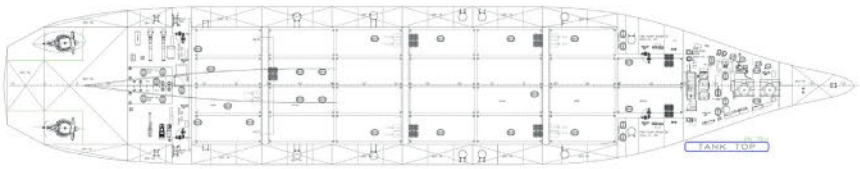












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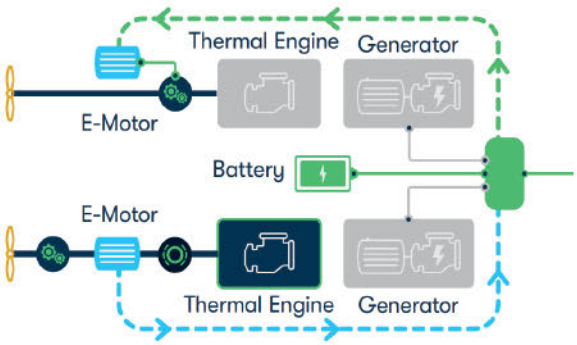

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