



The new vessel for the Spanish Institute of Oceanography (IEO-CSIC)

Jordi Sorribas (CSIC)

R.V. Odón de Buen



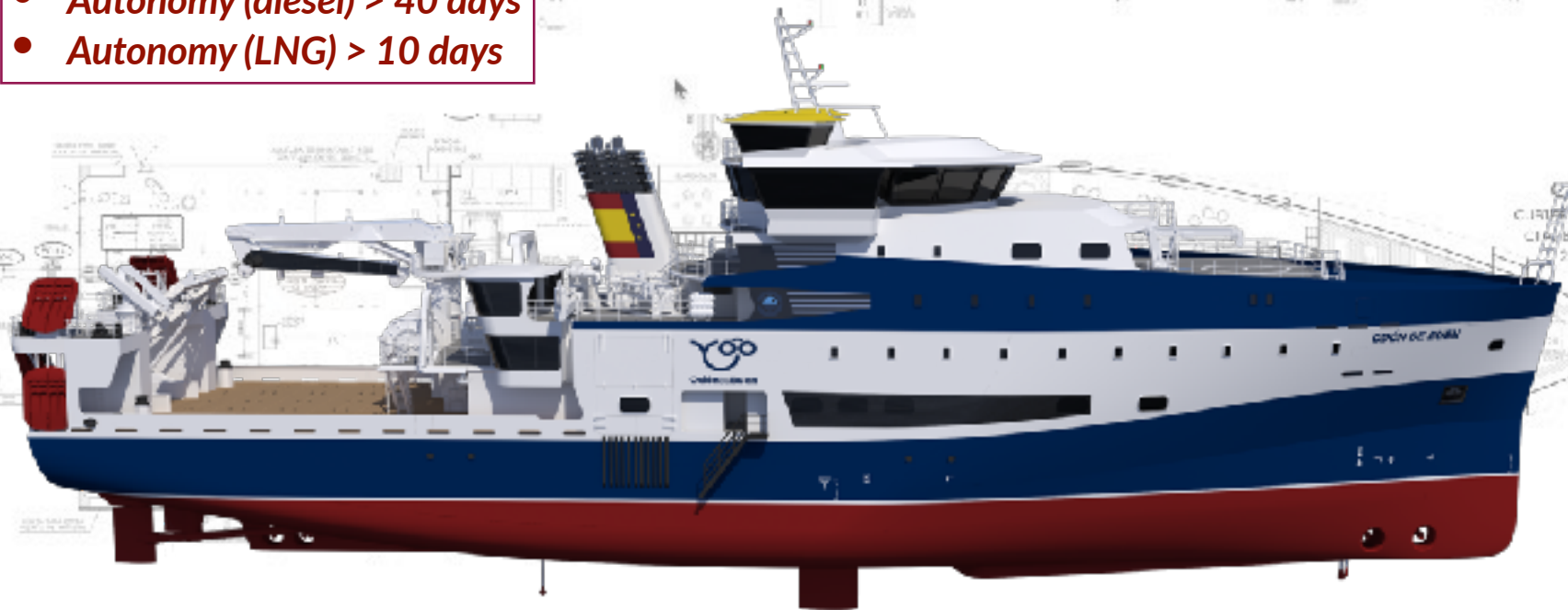
October 17-19, 2023

Main's & General Disposition

- *Total length: 84.3 m*
- *Beam: 17.80 m*
- *Main deck at 8.4 m*
- *Maximum design draft: 6.54 m*
- *20 Crew & 38 Scientist/Technicians*

- *2x INDAR 1700 kW electric motors*
- *2 x Main Diesel Generator Sets: Wärtsilä 1200 kW*
- *2 x Diesel-LNG dual groups Main Generators: Wärtsilä 960 kW*
- *2x Line of shafts with fixed pitch propeller of 5 blades and diameter of 3200 mm.*
- *4x Transverse propellers (2 stern and 2 fixed pitch bow with electric motor)*

- *Maximum speed 14.5 knots*
- *Autonomy (diesel) > 40 days*
- *Autonomy (LNG) > 10 days*



Class Notation

LR Class Notation:

⊗100A1 'Oceanographic and Fishing Research', Ice Class PC7, *IWS, LA
⊗LMC, PSMR, UMS, NAV1, IBS, PCAC(1,1), ECO(GW, NO_x3), OPS, DP(AA),
LFPF(GF, NG), BWTS/* Descriptive Note: ShipRight(SCM, IHM)



DP2



DNV-GL SILENT-R

POLAR CLASS PC7

CLEANSHIP SUPER

Decks and Outdoor workspaces

- *Main Deck: 360 m²*
- *2 x Winches Deck*

Up to 12 ISO 20 Containers

Free space at starboard side for 25 m coring



Always onboard ...

A-frames and Cranes

- *Aft A-frame with aux winches: 30 ton*
- *Davit for coring operations: 20 ton*
- *Side davit for hydrographic operations: 5 ton*
- *CTD davit: 5 ton*
- *Davit for trawling operations: 1.5 ton*
- *Piston corer Lars: 0.75 ton*
- *Deck handling crane STB: 2.5 ton, 18.5 m*
- *Main deck handling crane PS: 12 ton, 16 m*
- *Deck handling crane: 1.8 ton, 14 m*

Winches

- *2x Drag winches*
- *2x Net Drums*
- *2x Mesh winches*
- *2x Lanting winches*
- *CTD winch*
- *Net probe winch*
- *Hydrographic winch*
- *Coring winch*
- *Multipurpose winch*
- *Optical cable winch*
- *1x Longline hauler*

Fisheries

- *Auxiliary fishing gear*
- *Automatic triage system, associated with scales*
- *Ichthyometer system + automatic scale*
- *Fish database*
- *Pelagic fishing gear & gates*
- *Demersal fishing gear & gates*
- *Benthic fishing gear*
- *Jigger system for marking, with hoppers, tables and tanks on deck*
- *Cufes system*

Always onboard ...

Acoustics

- *Hydrographic echosounder*
- *Biomass evaluation echosounder*
- *2x high frequency omnidirectional echosounder*
- *Fishing nets sonar*
- *Deep water multi-beam echosounder*
- *Midwater multi-beam echosounder*
- *High resolution bottom profiler*
- *Multi-beam biological echosounder*
- *Pre-processing consoles and hydrographic data storage units*
- *Frequency synchronisation unit*
- *SVP Plus Deep Sea*
- *Multi-beam bathymetry processing software and biological echosounder*
- *Seismic profile processing software*
- *Post-processing software for biological echosounder*

Underway

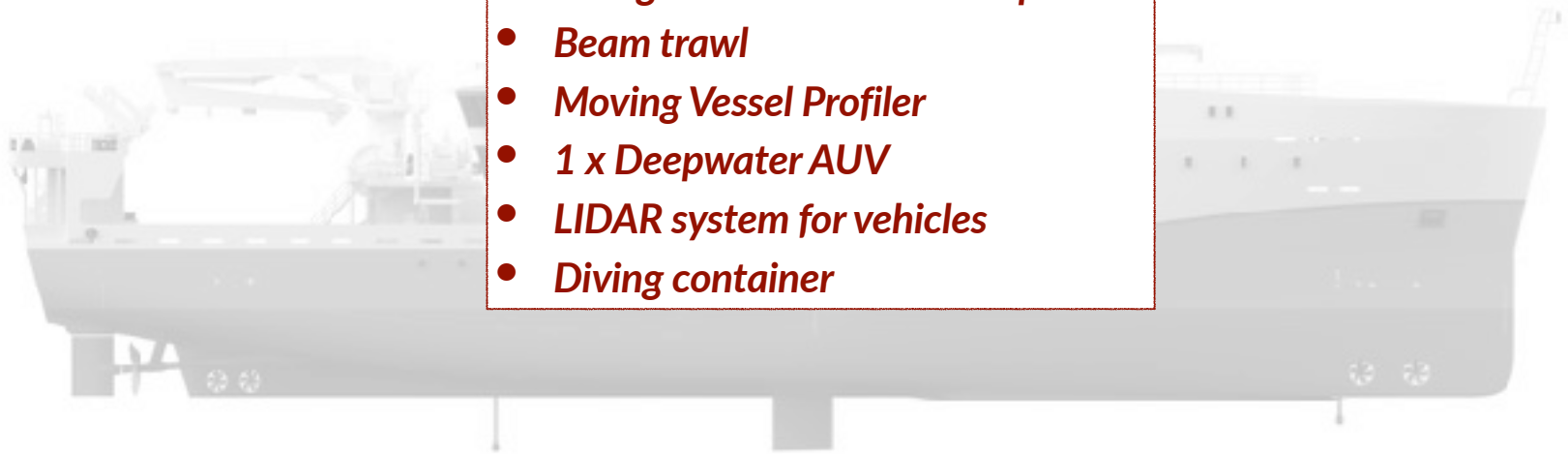
- *Position, speed, motion, time and heading system*
- *High precision hydro-acoustic position reference system*
- *Ferrybox*
- *Scientific weather station*
- *pCO₂ measurement system*
- *2x ADCP*
- *Gravimeter*
- *Post processing workstations*
- *Integration / planning / navigation software*

Labs

- *Balances*
- *Magnifying glasses and microscopes*
- *Salinometer*
- *Centrifuges*
- *Spectrofluorimeter*
- *Cytometer*
- *Spectrophotometer*

Supplied as an offer upgrade

- *Sampler Networks*
- *Hipap compatible transponder set*
- *Dredges and Sediment Samplers*
- *Beam trawl*
- *Moving Vessel Profiler*
- *1 x Deepwater AUV*
- *LIDAR system for vehicles*
- *Diving container*



From start to last IRSO

Tender Publication

Review & rewrite Specs

09-2020

12-2020

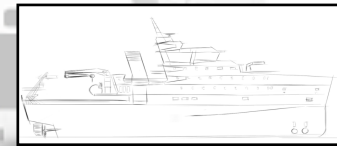


Reception of two Offers

03-2021


Signature of Contract

12-2021



Last IRSO

10-2022

Start of detailed engineering, review and fine-tune specs

01-2022



Keel Laying

06-2022

Tank Tests



05-2022

Start of cutting steel



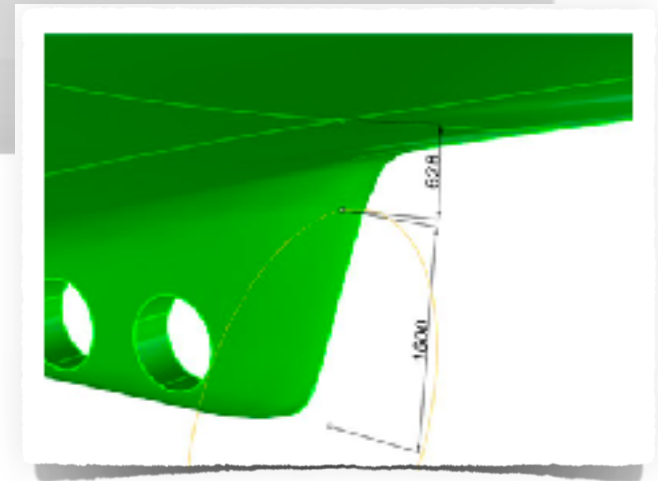
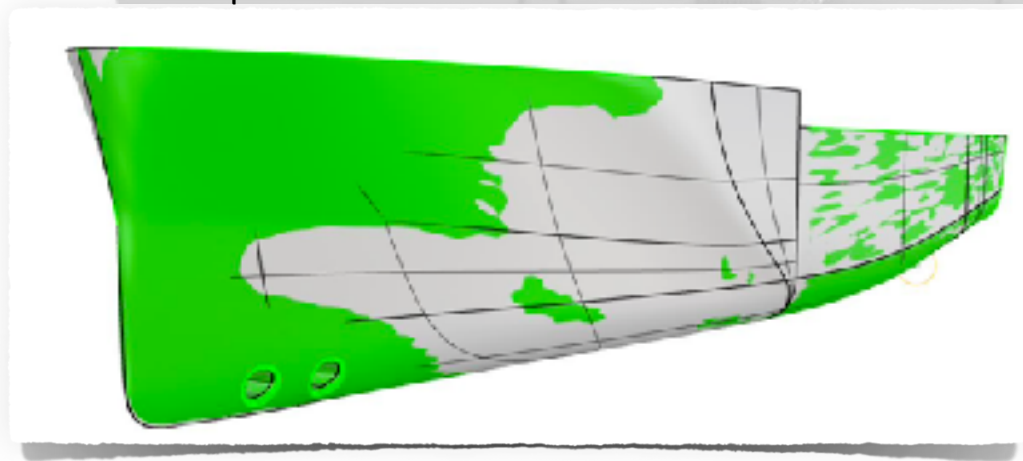
Hull shape optimisation

An **optimisation** of the ship's shapes has been carried out under the conditions of draft and displacement (4,195 tons at 4.9m) with the **aim of reducing drag** and improving as much as possible the performance of the hull for the design of the propeller..

The **shapes of the bow and stern have been redefined**. In the bow, the **volume of the fan has been slightly increased to reduce the pitching of the boat**, as well as the submerged volume; while at the stern the **separation between propeller and hull has been increased to reduce pressure pulses** due to blade passage in the hull.

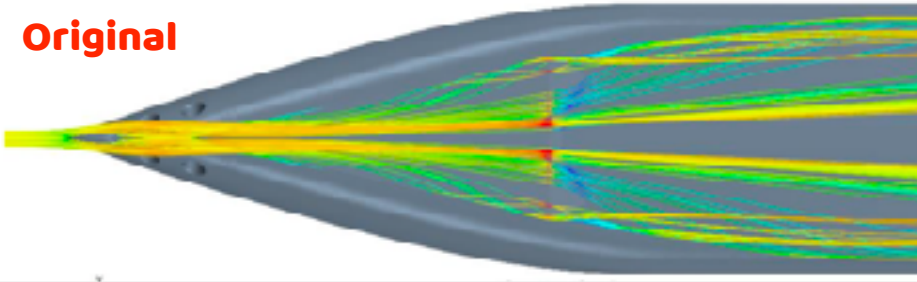
The **pressure pulses in the stern area** due to the blade passage with the new stern shapes are generally **reduced by around 15%**

The redesign of the hull has allowed the **resistance to advance to be reduced by around 10%** for the contractual speed

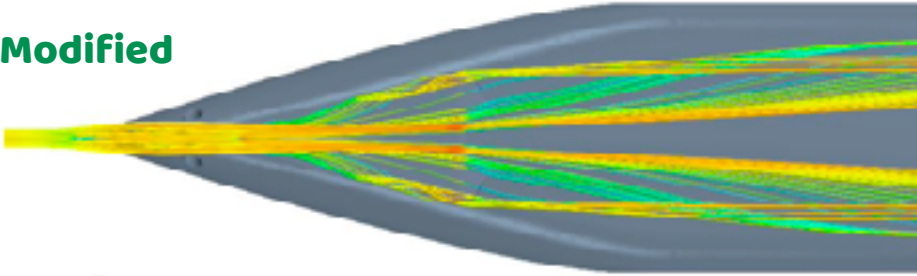


Gondola shape optimisation

Original



Modified



Gondola border polishing



17 x 8 m

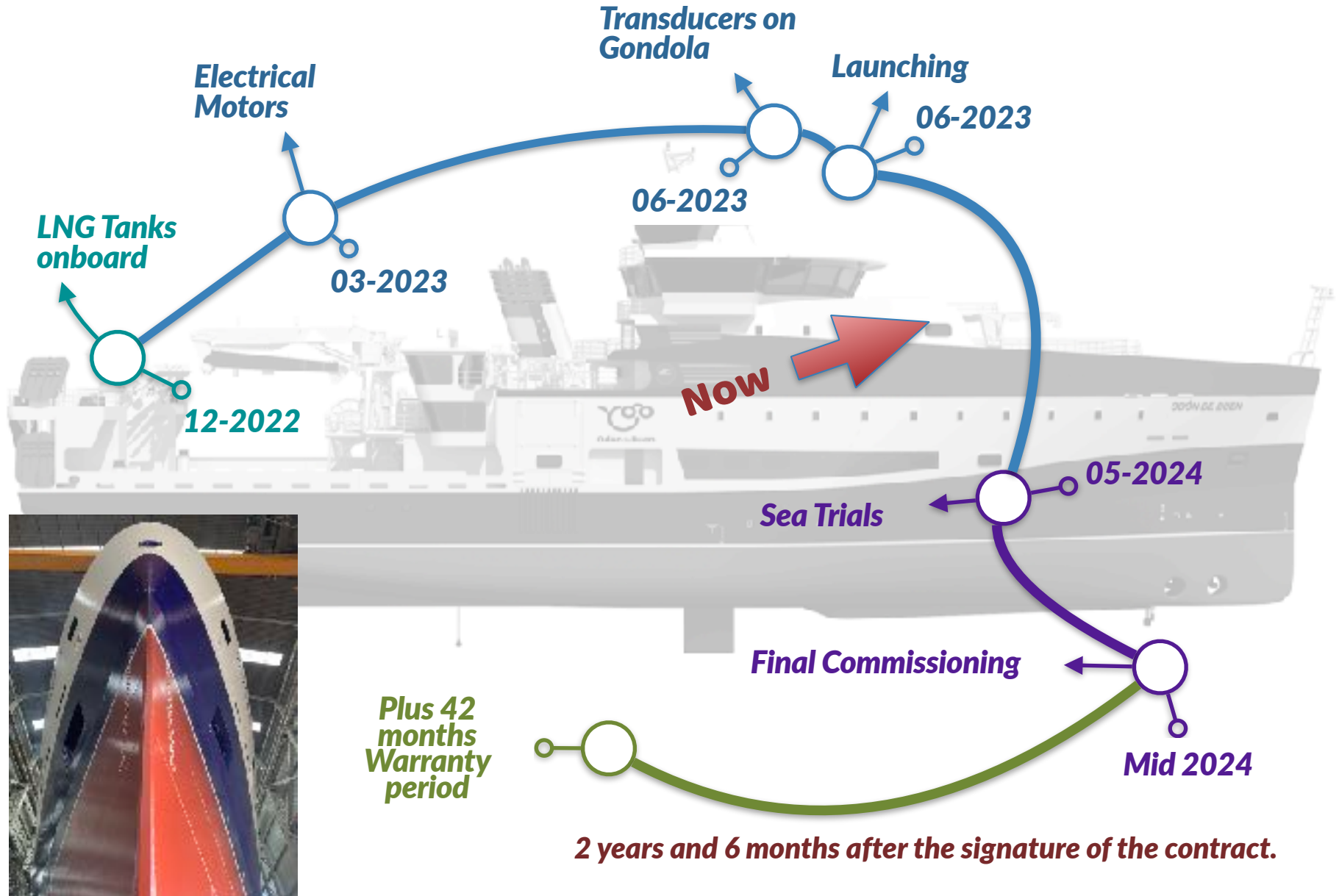


Keel Laying Ceremony

15 October 2022



Work done & Expected Milestones



Tanks and TCS



December 2022



Tank Connection
Space (TCS)



Risk Assessment

LNG System

Risks Associated with LNG Motorization

ARMON

V-140

OCEANOGRAPHIC AND FISHING RESEARCH VESSEL

IMO: 9962914



Risk Assessment for onboard LNG system RBC-2 Terms of Reference (ToR)

January 2024



Altum
Altum, Ingeniería y Servicios, S.L.

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altum@altum-marina.com

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Name	Personal Attendance Record	
	Company	Title/Position
Rubén Sabino Alonso	Armon Vigo	Project manager
Eusebio Moimenta Calvete	Armon Vigo	Electrical Manager
Antonio Segura Cuatrecasas	Spain's flag	Flag surveyor
Jordi Sanjaume Cuatrecasas	UTM-CRUC	Shipowner representative
David Santos Orden	Altum Ingeniería Services S.L.	Naval architect/External consultant
Pedro Gilarter Montes	Altum Ingeniería Services S.L.	Naval architect/External consultant
Richard Guzmán	Cryonorm Systems BV	Project manager
Román Elvira	Wärtsilä Ibérica	Project manager
Miguel Sanchez Suarez	Lloyd's Register	MAHIN ISM
Ignacio Hinoja Cuatrecasas	Lloyd's Register	Vigo Office
José María González	Lloyd's Register	Lead Specialist/Design Approval Project/Coordinator/Observer in HAZOP and HAZOP workshops
Paul Berber	Lloyd's Register	Lead specialist, Subject Matter Expert of piping aspect.

LNG-Diesel // Electrical

march 2023

Generators

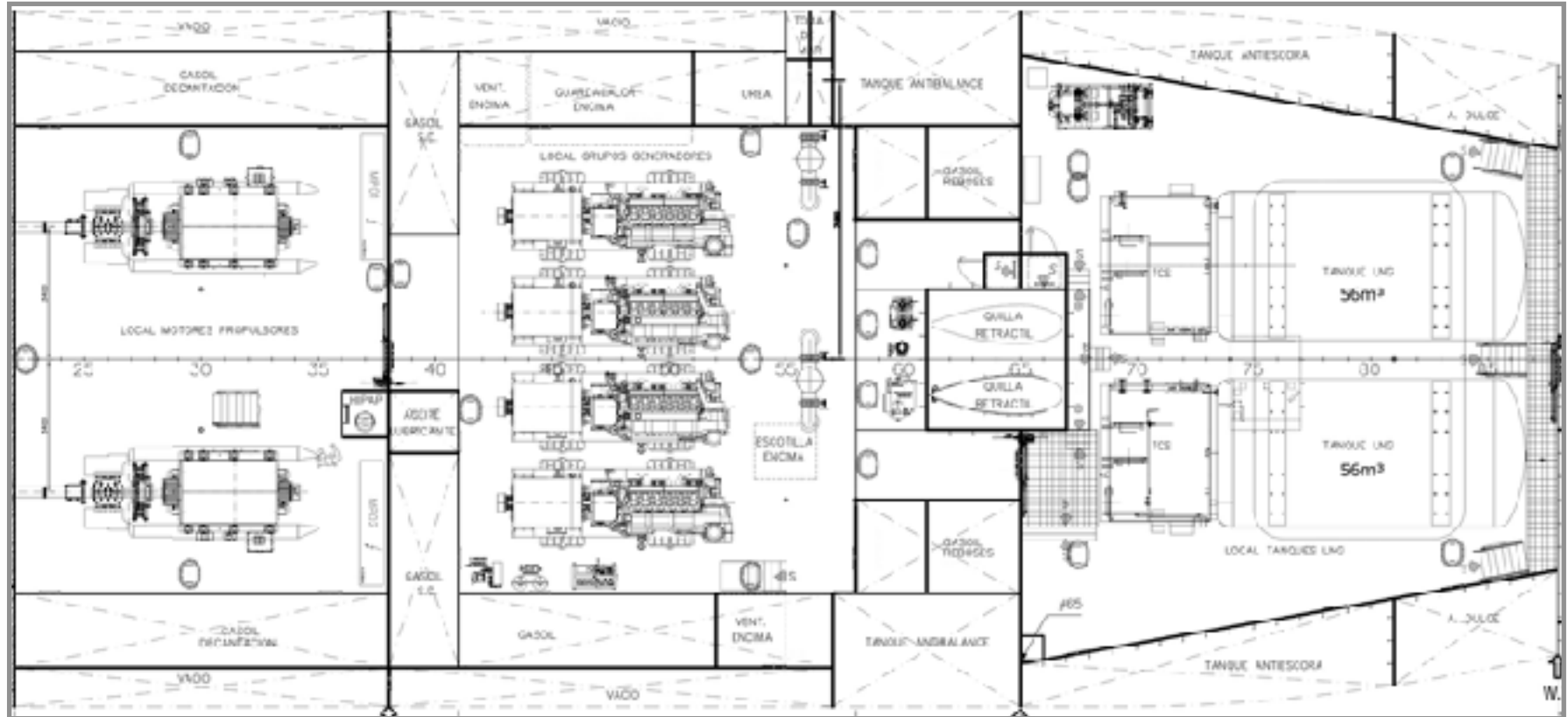


LNG feeding system



Propulsion engines

LNG-Diesel // Electrical



LNG-Diesel // Electrical



Drive motor variator panels



Silent-blocks



**Electrical connections at main
generators**



Control room

Main propeller



No. Axle lines 2

Power (MCR) 1,700KW

Propeller speed 155 rpm

Axle line length 13,700 mm

Drive shaft diameter 360/340/300 mm

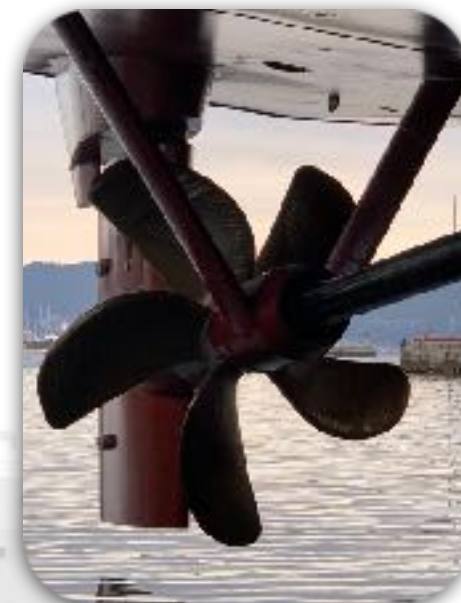
Propeller Diameter 3,200 mm

No. of blades 5

Blade manufacturing tolerance ISO 484-2 Class I

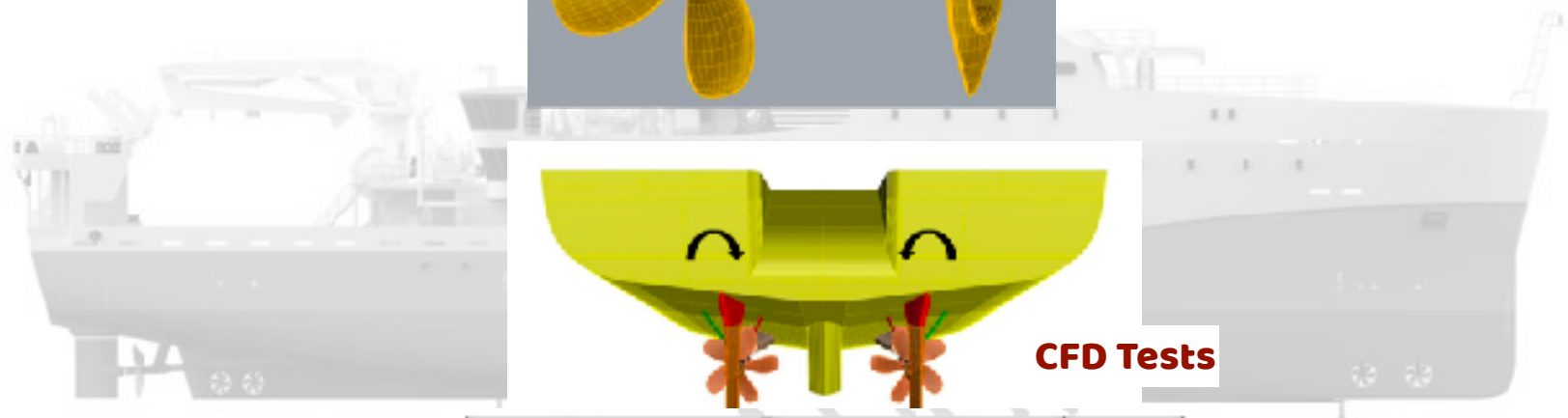
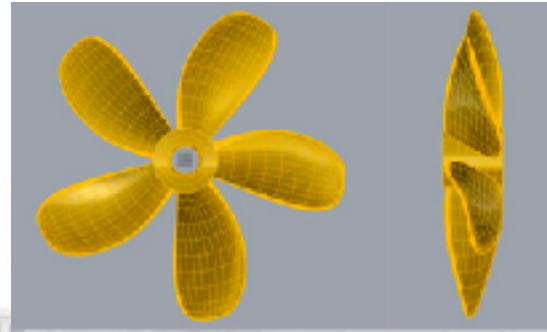
Propeller Material NiAlBr

Propeller Weight 4,000 kg

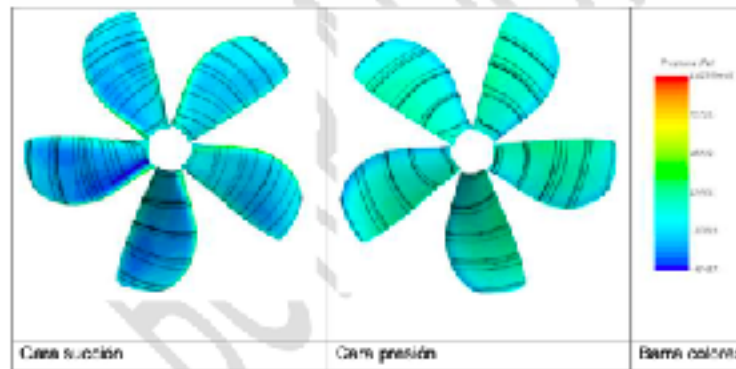


Main propeller

No cavitation is detected at any of the speed regimes corresponding to the operational profile of the vessel



CFD Tests



Transverse propellers

Elastic well installation

E-Motor: Asynchronous

Power: 350 kW

Speed : 1470 rpm

Type : Fixed Pitch Propeller

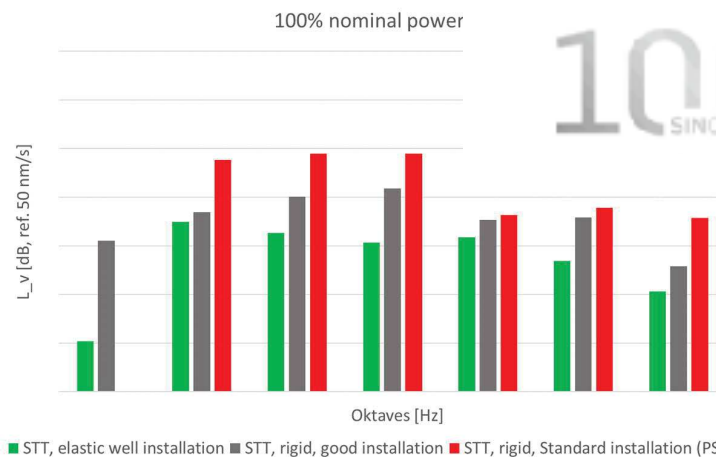
Diam: 1240 mm

N° blades: four

Material : CuAl10Fe5Ni5-C-GS

RPM :479 rpm

Tip. speed : 31 m/s



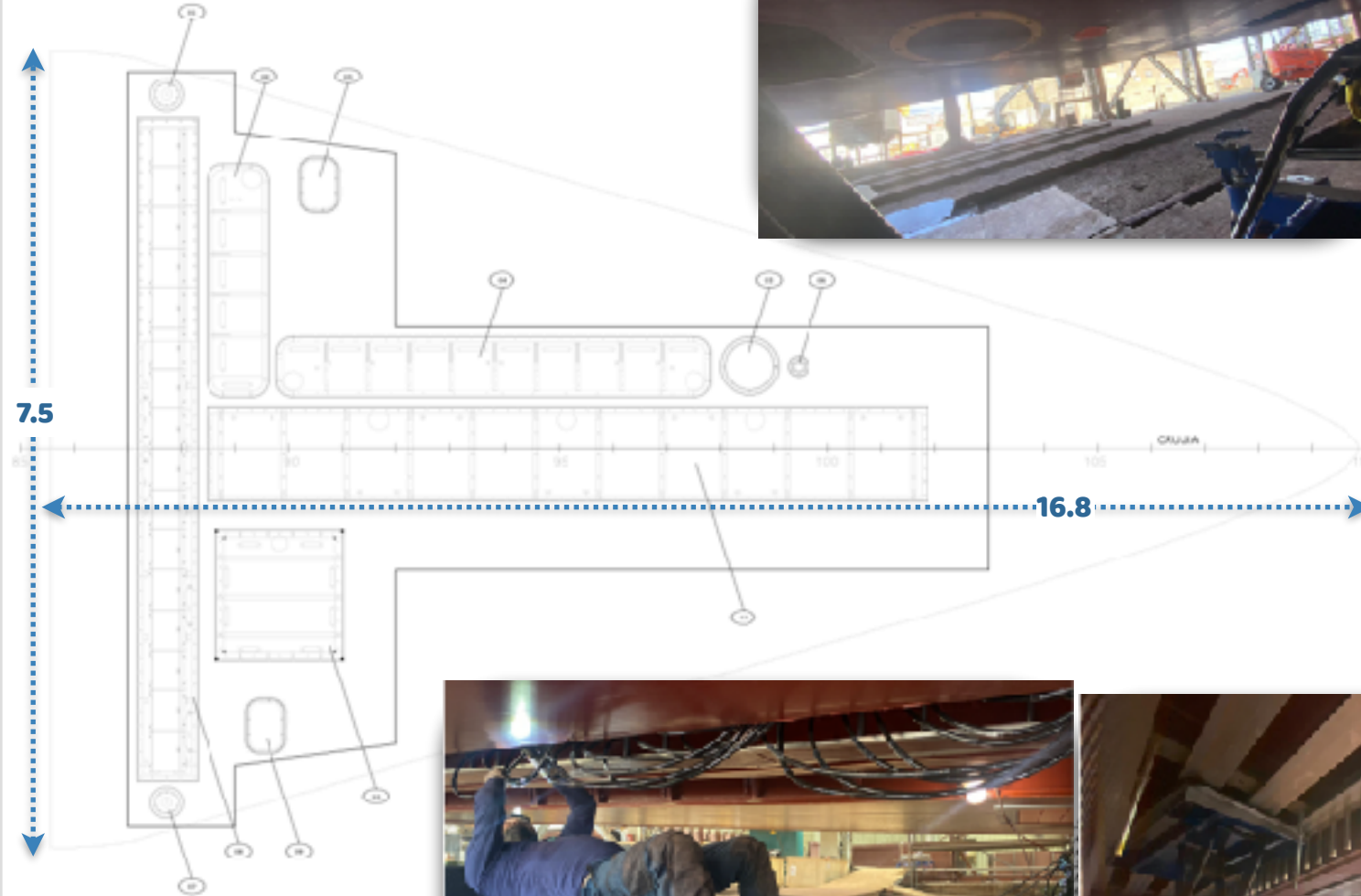
100
SINCE 1921



STT elastic well installation



Gondola



HYDROPHONE
EM712 RX
EM712TX
EA600
EM124 RX
TOPAS PS18
EM124 TX

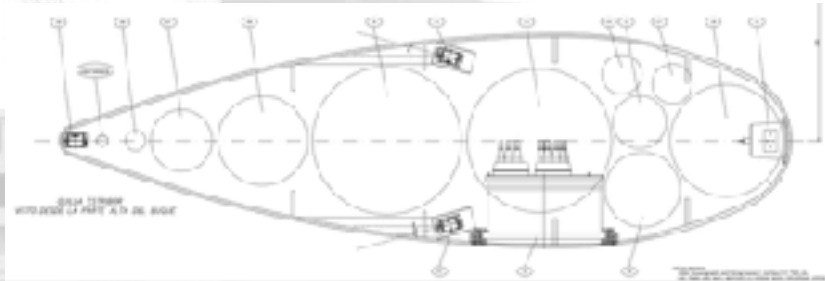
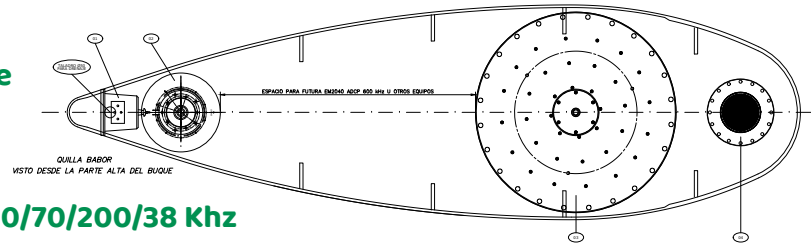


1 Wet & 1 Dry Keel

Drop Keels

Digital Camera + Focus
Hydrophone for Radiated Noise
ADCP 38 KHz
ADCP 150 KHz

Net monitoring sensors
Sound Speed Sensor
Hydrophone for Radiated Noise
ADCP 150 KHz
Zenithal Biological Multibeam
Lateral Biological Multibeam
Biological echo sounder 333/120/70/200/38 KHz
Digital Camera + Focus



Hull construction process ...

Block construction process

shipyard slipway: 120 long, 18 wide and 16.50 m high



Launching Ceremony

5 jul 2023



Hull construction process ...

Block construction process

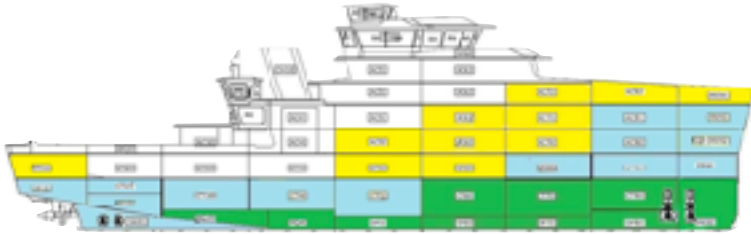


Sept 2023



Hull construction process ...

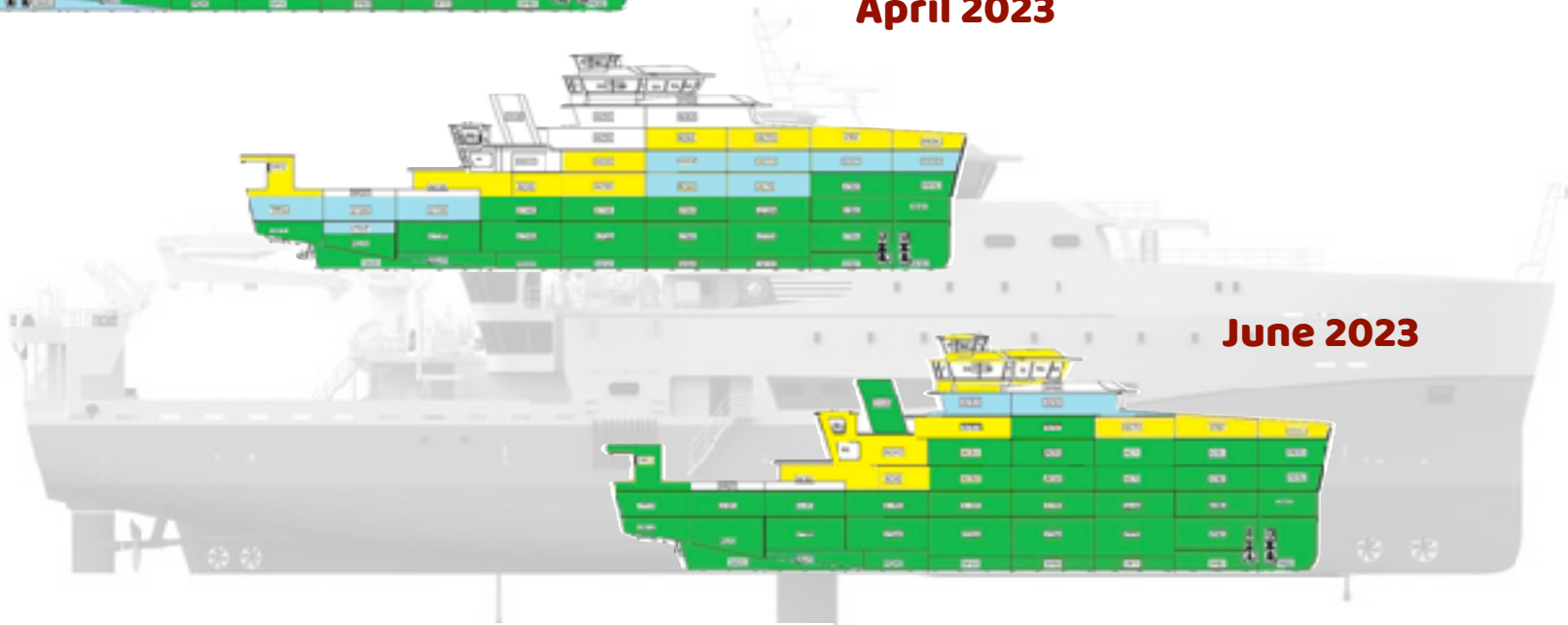
January 2023



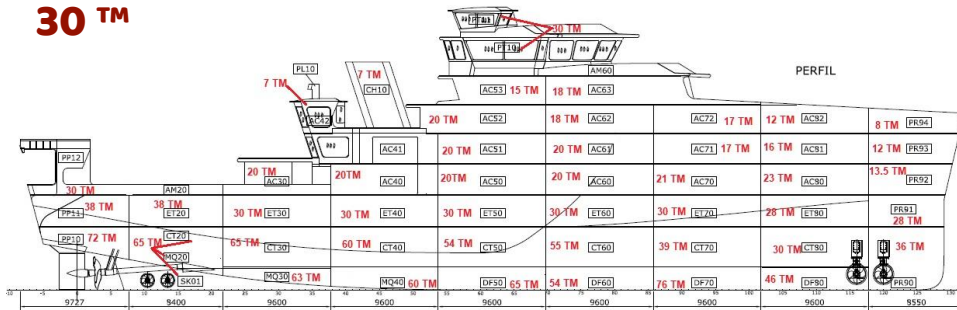
April 2023



June 2023



30 TM



October 2023



How she looks like now ...

October 2023



Spaces



Labs insulation (walls & floor) with rock wool

Spaces



Stern

Bridge

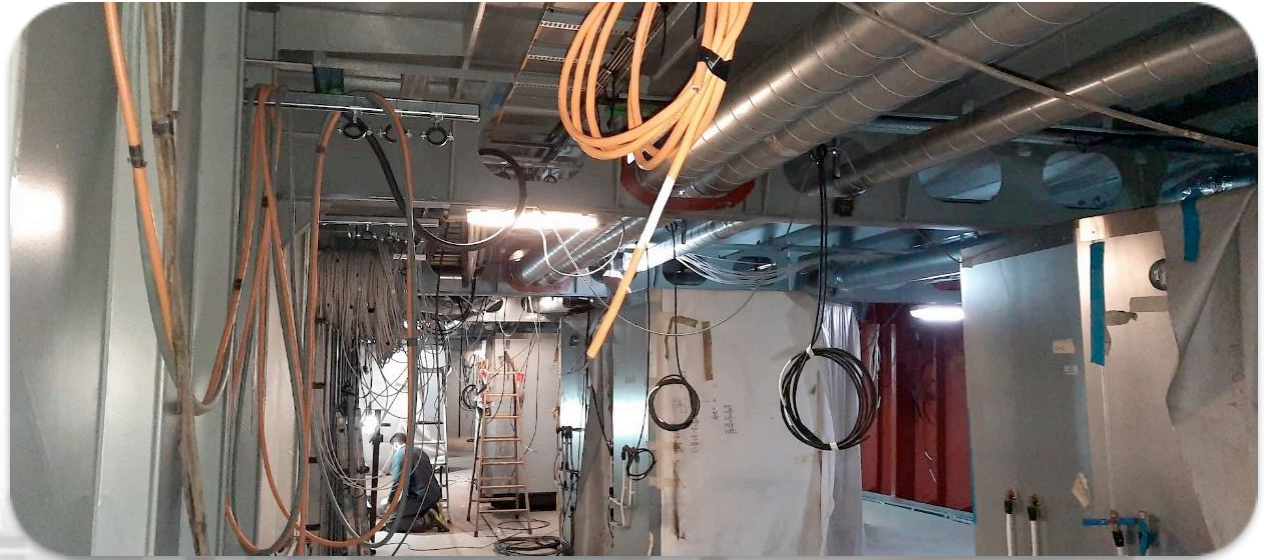


Bow

Cabling



**Main wiring trunk
(from labs deck to
bridge)**



Electrical and comm cabling in labs and cabins



Gondola cabling

Pipes



fire fighting system & tanks vents



sanitary pipes



Clima System

General Services



Water treatment system



Clima control boards

Lot of work to do ...

- **Electronics**
 - **Bridge**
 - **Scientific systems**
 - **Comms ...**
 - **Winches and cranes**
 - **Scientific Equipment (latest acquisitions)**
 - **Labs and work spaces**
 - **Accommodation (nov mock-up)**
 - ...
- 

Crew

July / August 2024

- **Vessel commissioned. Cadiz**

March-April 2024

- **(X2) Captain, 1st & 2nd Officer, Chief Engineer, Boatswain**

June-July 2024

- **Shipyard Sea Tests & Acceptance**

July / August 2024

- **X2 full crew (20)**

September / December 2024

- **Sea Trials. Crew Training**
- **Sea Trials. Technical capabilities trials**

Early / mid 2025

- **Survey trials (scenario's tests)**





Programa Operativo Pluri-regional de España 2014-2020

Ref: ICTS-2019-05-IED-4

