

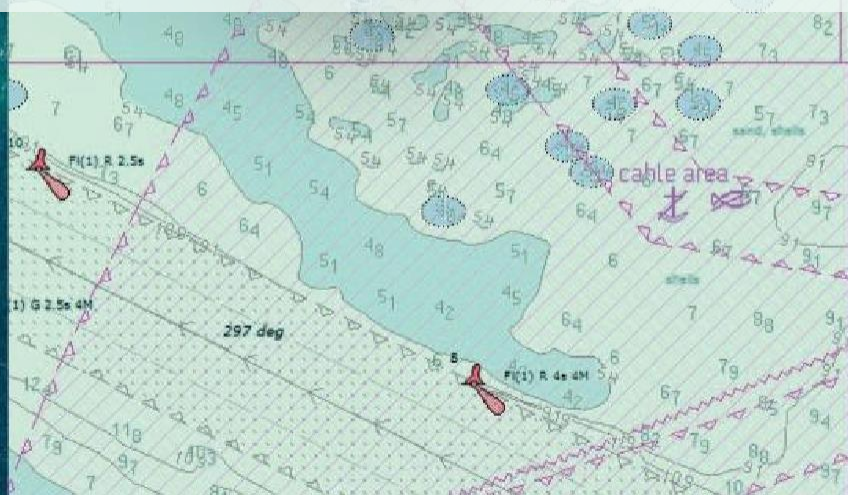


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From mission requirements to hydrographic capability: engineering the survey suite for the Italian Navy's new hydrographic vessel Quirinale



ITALIAN HYDROGRAPHIC INSTITUTE

Lieutenant Commander
Silvio GENTILI

Forum for the Exchange of Mutual Multibeam Experience (FEMME) - Genoa, 30 September 2026



The Strategic Context – Replacing a Legend

- **The Legacy:** Replacing Nave Magnaghi (in service since 1975);
- **The Gap:** Transitioning from traditional charting to complex underwater situational awareness;
- **The Goal:** A scalable platform for the "Wider Mediterranean" and Arctic frontier.





Engineering Methodology – Capability-Driven Design

- **Paradigm shift:** From “Selecting Sensors” to “Defining Architecture”;
- **Structured Analysis:** Requirements translated into technical specifications based on performance, interoperability, and sustainability;
- **Systems Engineering:** Integration of acoustics, positioning, and data processing.

Scenario-Based Design

- **Defining the Mission:** Using operational scenarios to evaluate configurations.
- **Key Scenarios:**
 - Nautical Charting & Marine Scientific Research;
 - Environmental Monitoring & Climate Change;
 - Maritime Security & Seabed Infrastructure Awareness.





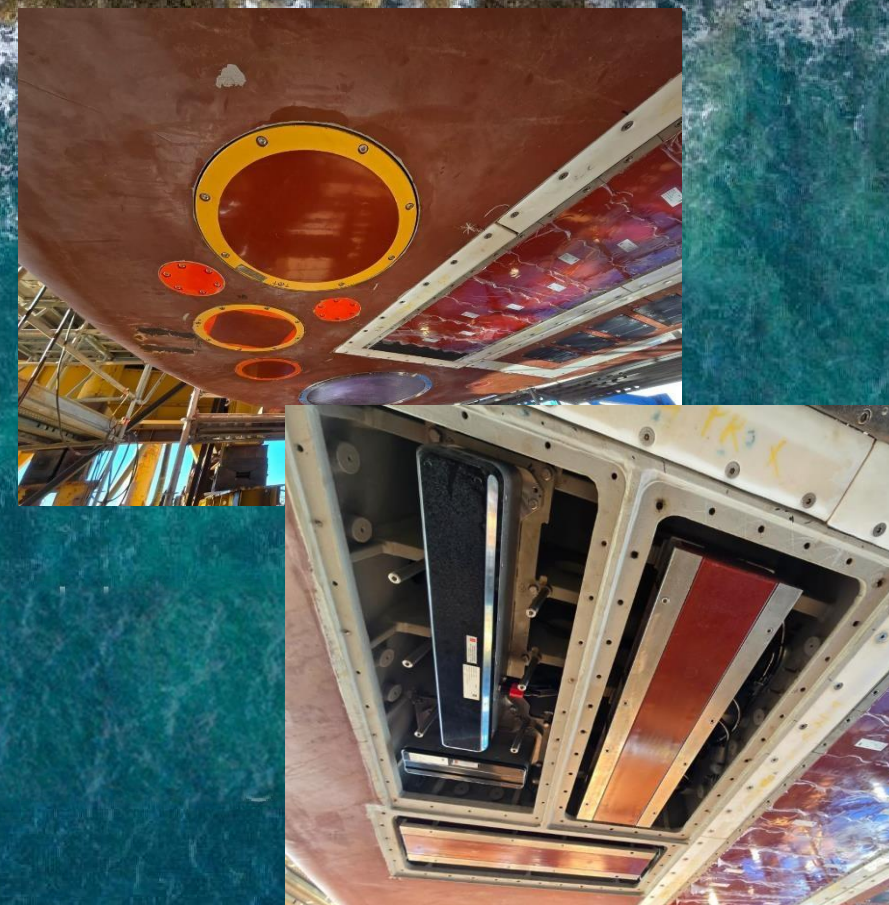
The Platform – Robustness and Versatility

- **Dimensions:** Length 110 m, Beam 20 m, Displacement 6,200 t;
- **Propulsion:** Integrated Full Electric Propulsion (IFEP) + Azimuthal Thrusters;
- **Maneuverability:** Dynamic Positioning IMO Class 2 (DP2);
- **Extreme Environments:** Ice Class 1C & Winterization down to -16°C.



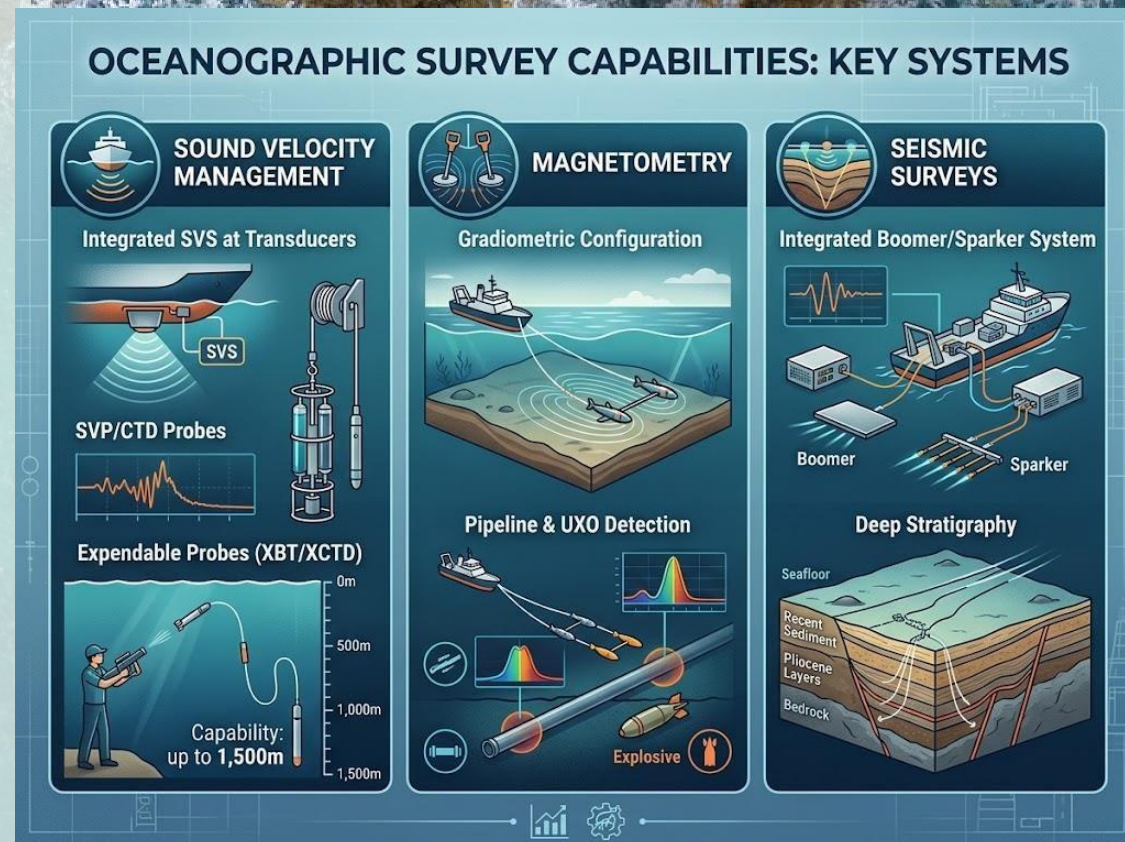
Acoustic Suite – Bathymetric and Stratigraphic Excellence

- **MBES Deep Water:** 12 kHz frequency, reach up to 10,000m (EM124);
- **MBES Medium/Shallow:** High-resolution dual-head configuration (EM2040 & 712);
- **Sub Bottom Profiler (SBP):** 2-9 kHz range for sub-bottom imaging up to 100m penetration (SBP 120);
- **Side Scan Sonar (SSS):** Towed high-resolution imagery and object detection



Sound velocity measure, Geophysics and Towed Systems

- **Sound Velocity Management:** Integrated SVS at transducers, SVP/CTD probes and expendable probes (XBT/XCTD) up to 1,500 m;
- **Magnetometry:** Gradiometric configuration for pipeline and UXO detection;
- **Seismic Surveys:** Integrated Boomer/Sparker system for deep stratigraphy.





Positioning and Navigation

- **Integrated Navigation (INAV):** Fiber Optic Gyros (FOG) with 100 Hz data rate;
- **Precision Positioning:** Military GNSS/GPS-PPS (SAASM) and DGPS.



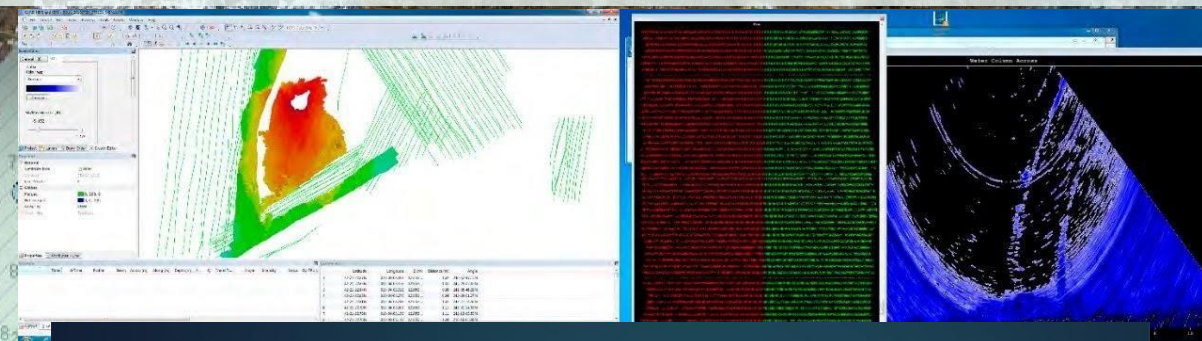
The Unmanned Revolution – Extending the Reach

- **AUV (e.g., HUGIN):** 3,000 m depth, modular payload (SAS, MBES, SBP);
- **ROV (Work Class):** up to 3,000 m depth, equipped with dual manipulators;
- **USV:** Autonomous survey capability for very shallow waters;
- **Scalability:** Containerized LARS for future technology insertion.



Data-Centric Architecture

- **INS-IDROGRAFICA:**
Dedicated high-speed internal networking system;
- **Storage & Computing:**
Minimum 350 TB redundant servers;
- **Software Suite:** CARIS Hips & SIPS, ArcGIS, QPS Qimera and QGIS.



SCALABLE HYDROGRAPHIC DATA SOLUTIONS STORAGE, PROCESSING & ANALYSIS



Trade-offs and Decision-Making

- **Complexity vs. Sustainability:** Balancing cutting-edge sensors with long-term maintenance costs;
- **Acoustic Silence:** Choice of IFEP propulsion for sensor performance;
- **Flexibility:** "Deployable" assets vs. fixed installations for future-proofing;
- **Human Factor:** 140 berths for large scientific teams and Navy crews.



Project timeline

Nov 2009: Definition of the Operational Requirement (E.O.) by the Navy General Staff

Feb 2024: Completion of the Critical Design Review (CDR)

Jan 2026: Official Vessel Launch ("*Varo*")

2013: Conclusion of Preliminary Trade-off and configuration studies

Dec 2023: First Steel Cutting (Milestone: T0+10)

June 2026: Scheduled Delivery to the Italian Navy at La Spezia

July 2021: Official Publication of the Tender Notice for the new unit

Feb 2023: Contract Operability date (**T0**) with Fincantieri

2027: Expected Entry into Operational Service, replacing Nave *Magnaghi*

The Future of Italian Hydrography

- **ITS QUIRINALE:** A Strategic Multi-Purpose Asset;
- **National Capability:** Ensuring Seabed Infrastructure Awareness;
- **Global Impact:** Leading Marine Research and Climate Monitoring.



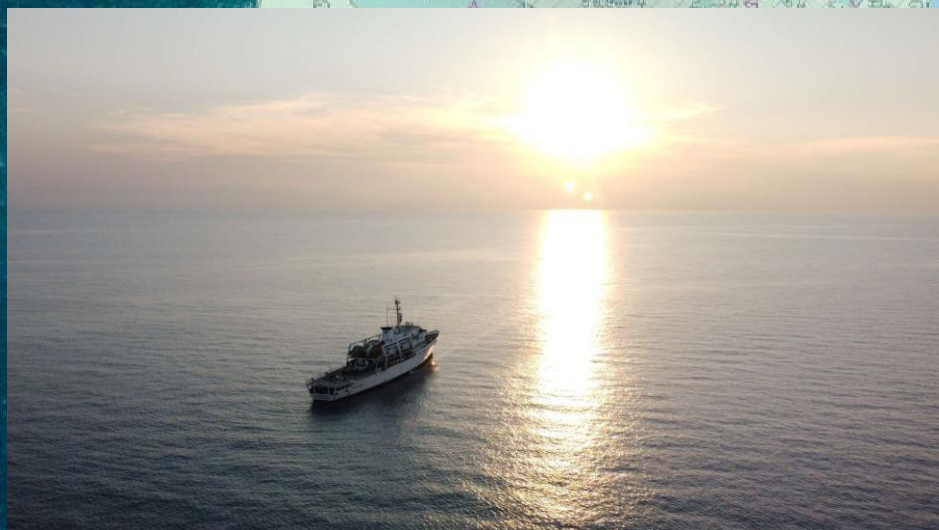


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