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TECHNOLOGICAL TRAJECTORIES FOR COMPACT UNDERWATER VEHICLES: INNOVATIONS AND FUTURE SCENARIOS

Enrico PITZALIS, M.Sc., FS Eng

DRASS Sales & Marketing Manager

www.DRASS.tech

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TECHNOLOGICAL TRAJECTORIES FOR COMPACT UNDERWATER VEHICLES: INNOVATIONS AND FUTURE SCENARIOS

INTRODUCTION

Exploring the future of stealth SDVs towards 2030, the potential technical advantages of **synergizing manned and unmanned platforms**, and the impact of emerging technologies on **compact submarine** design and operations.

The goal is to define innovative scenarios and cutting-edge solutions for the next generation of underwater operations.

SUMMARY

- Advancing Swimmer Delivery Vehicles Towards 2030
- Synergizing Manned and Large Unmanned Platforms
- Integrating Emerging Technologies into Compact Submarine Design
- Q&A, closure

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DRASS HISTORY

100 YEARS OF EXPERIENCE

Founded in **1927**, DRASS has delivered over 600 hyperbaric systems and is a world leader in **compact submarines, hyperbaric, and diving technologies**.

Today, DRASS stands at the forefront of **subsea** and **hyperbaric innovation**, globally recognized for its **pioneering contributions.**

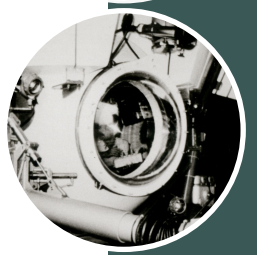
MIDGET SUBMARINES & SWIMMER DELIVERY VEHICLES

From 70s to TODAY

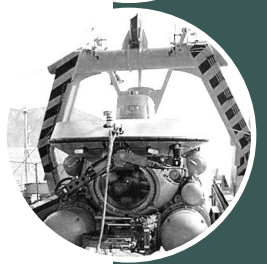



ATMOSPHERIC DIVING SUIT
World diving record 1937 - Roberto Galeazzi

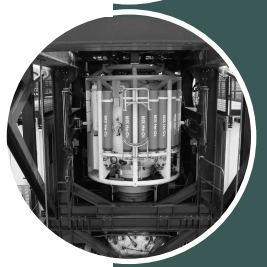
SWIMMER DELIVERY VEHICLES ROYAL NAVY SPECIAL FORCES
Alexandria Bay, Egypt, 1941 - Sergio Pucciarini



SELF PROPELLED SUBSEA CAPSULE
Subsea Oil Services 1978 - Sergio Carlini



DEEP SUBMERGENCE RESCUE VEHICLE
Italian Navy, 1998



DEEP DIVING SYSTEMS
From 70s to TODAY

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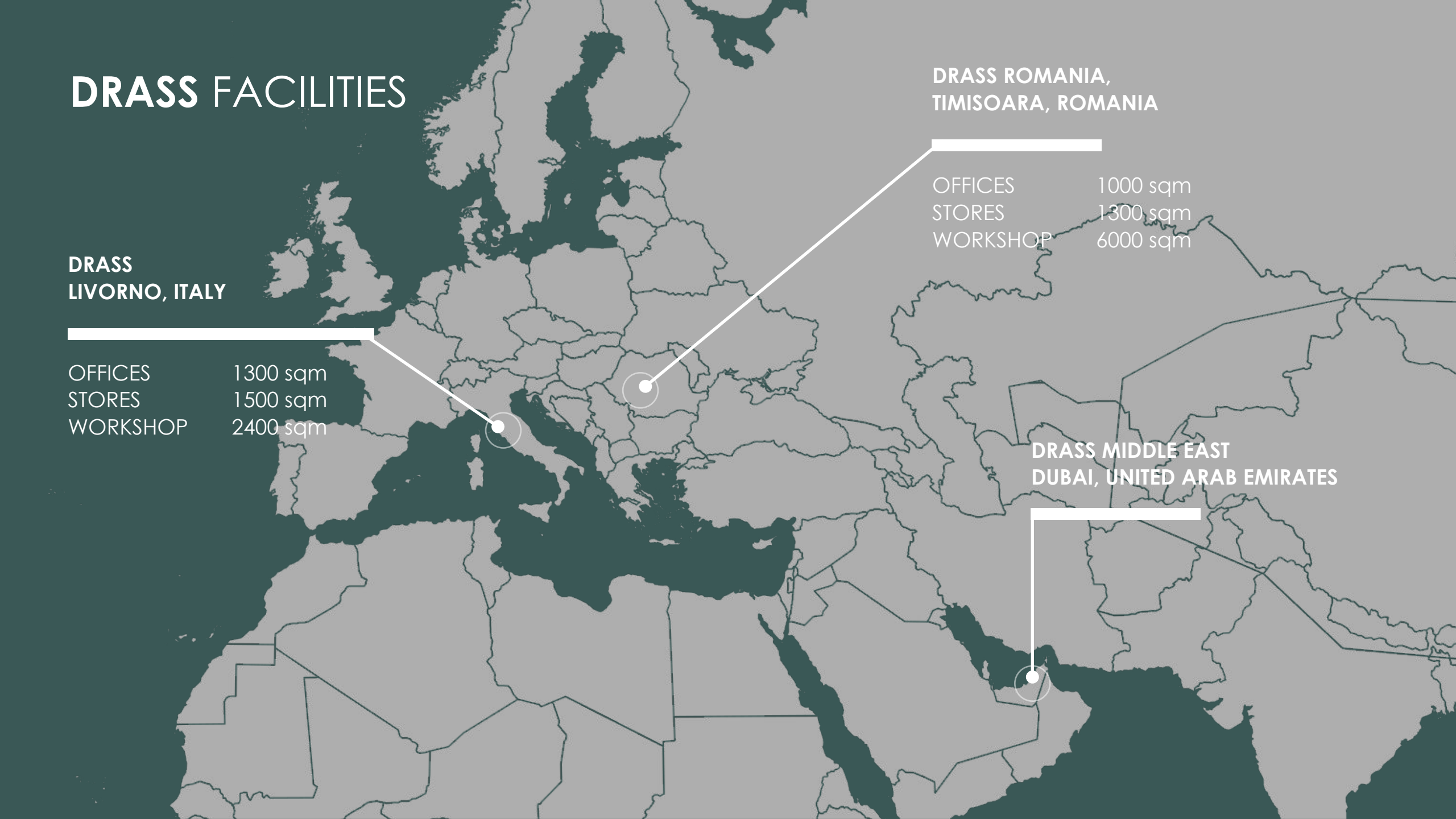
DRASS FACILITIES



DRASS ROMANIA,
TIMISOARA, ROMANIA

OFFICES	1000 sqm
STORES	1300 sqm
WORKSHOP	6000 sqm

DRASS
LIVORNO, ITALY

OFFICES	1300 sqm
STORES	1500 sqm
WORKSHOP	2400 sqm

DRASS MIDDLE EAST
DUBAI, UNITED ARAB EMIRATES

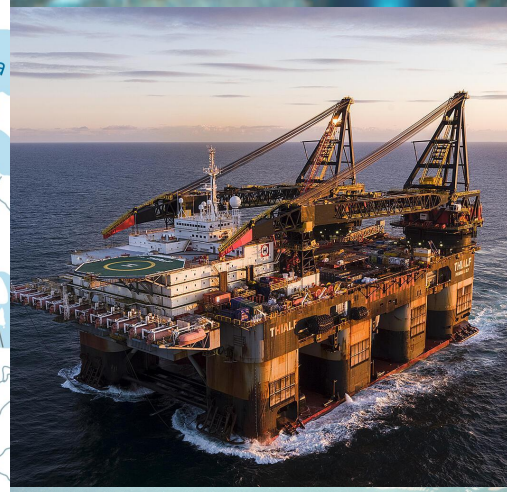
UNDERWATER SCENARIO

The scenario primarily revolves around **shallow and very shallow waters**, where surface vessels are increasingly vulnerable due to the expanding range and capability of surface-to-surface and air-to-surface threats.

In contrast, the **underwater fleet** plays a key role in **deterrence**, protecting national waters by keeping adversaries away.

Submarines, **swimmer delivery vehicles**, and **unmanned underwater vehicles** provide a discreet and highly effective means of deterrence.

80% of the Baltic Sea is shallower than 100 meters



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ADVANCING SWIMMER DELIVERY VEHICLES TOWARDS 2030

DS-CLASS

The safe operation of **coastal facilities** and **offshore structures** is crucial for nations with significant commercial interests in the **oil and gas sector**, the **fishing industry**, and **maritime trade.**

Ensuring their security is a strategic priority.

Stealth SDVs play a vital role in this context, enabling **special forces** to covertly reach and secure these installations in the event of terrorist threats or hostile incursions.

Additionally, SDVs can be **deployed** from submarines or surface vessels to carry out covert missions, such as mining enemy assets or engaging targets within their territorial waters.

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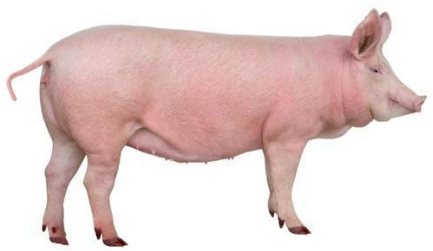
SDV DS8
SWIMMER DELIVERY VEHICLES

Engineered for precision and discretion, the SDV transports **commandos** or combat divers along with their **operational equipment** from base to target and safely back, ensuring mission success in hostile environments.

The Italian tradition of SDVs, known as **'maiali**,' is propelled into the future through the integration of **cutting-edge technologies**.



Maiale *(noun, masculine)*
(Lat. maiālis)

Domestic mammal belonging to the Suidae family, raised for its meat, fat, and skin.

*Nautical (historical) – Type of **small submarine** or underwater vehicle used during World War II by the Italian Navy.*

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DS-CLASS SDV
CONCEPT OF OPERATIONS

Deployment from motherships—whether submarines or surface vessels—for infiltration and precision strikes on **strategic targets using advanced effectors**

Intelligence and gathering of communication information

Strategic placement of neutral bottom mines in shallow waters and harbor entrances

Deployment as an **attack** vehicle configured with **mini torpedo** launch tubes

Anti-terrorism and **Anti-Piracy** operations

Deployment of small **UUV** for covert sabotage missions

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HULL STRUCTURE

- **Reinforced GRP Hull structure**
- Aluminum Pressure Containers

POWER AND ELECTRIC PLANT

- **Lithium-Ion Battery packs**
- Full redundancy

PROPULSION PLANT

- Pressure resistant brushless electric motor
- **Autopilot**

COMMAND & SURVEILLANCE

- Double masts (periscope and communications)
- **Augmented reality optronic mast**

AUXILIARY PLANT

- Full electric craft
- **X-Rudders** and thrusters

OUTFITTING

- Two cabins (pilots & combatants)
- **Reconfigurable cabins**

ARMAMENT

- Reconfigurable payloads
- Gear containers
- **2x mini torpedo launching tubes**

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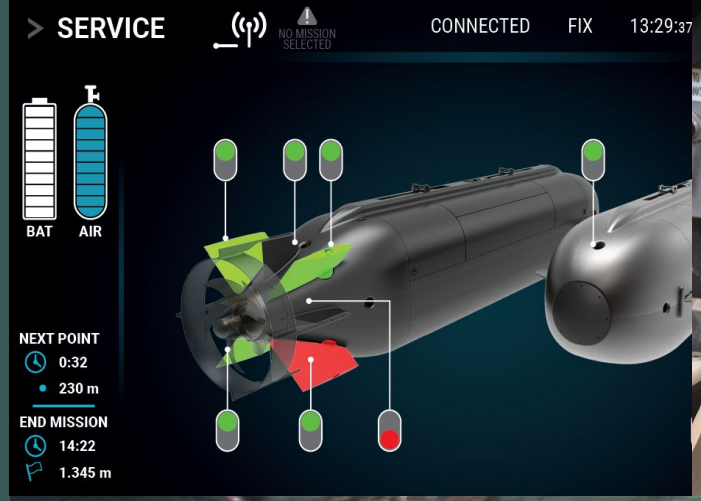
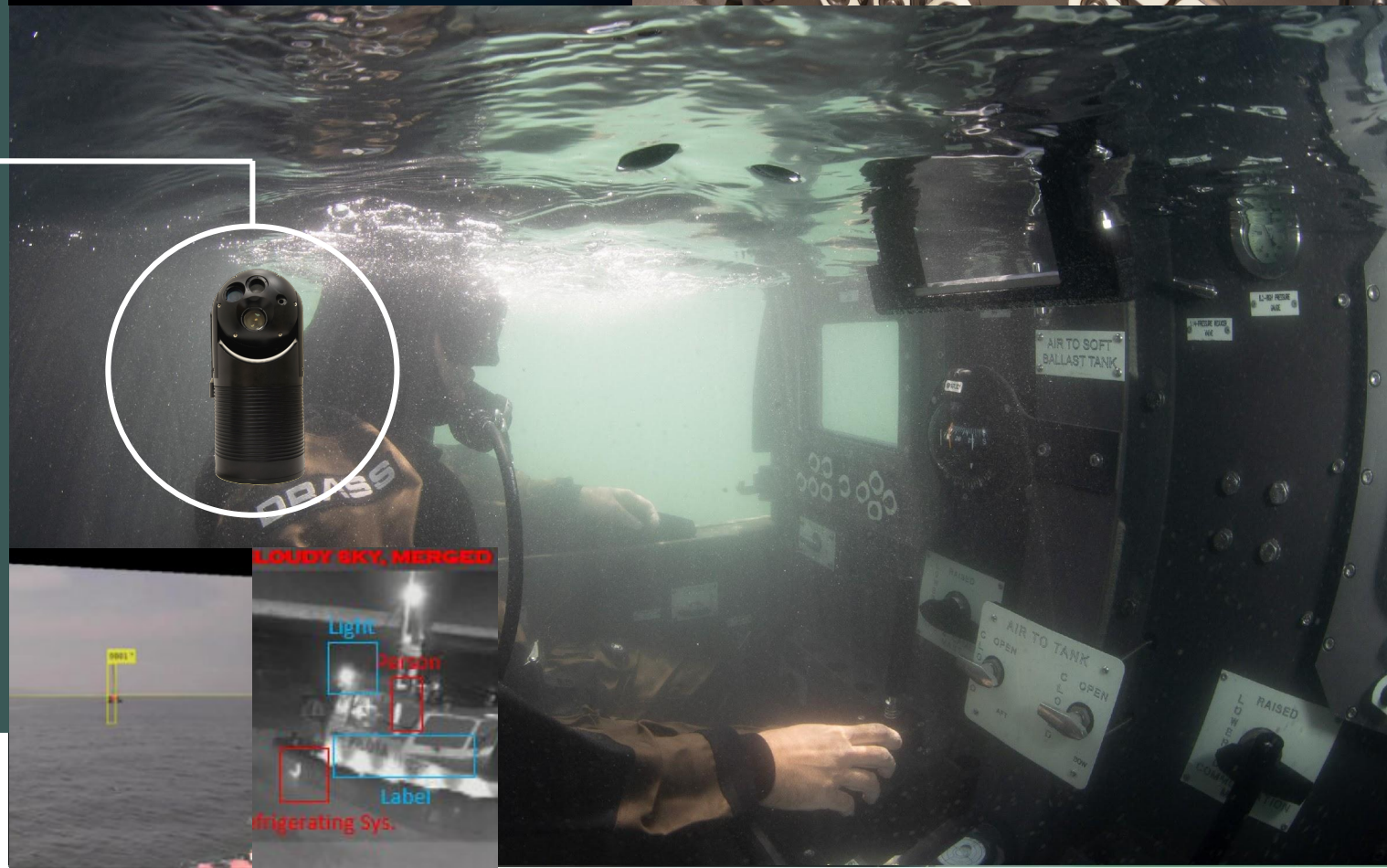
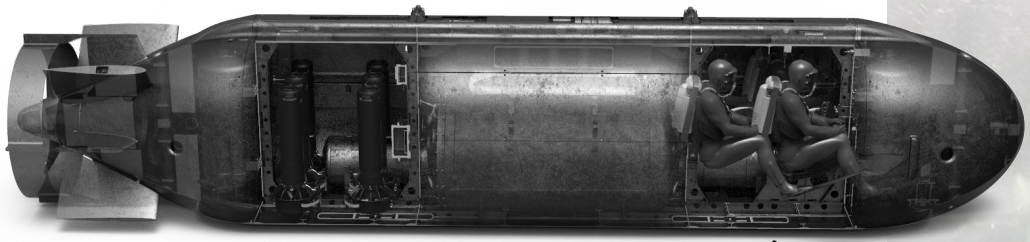




RECONFIGURABLE CABINS – PAYLOADS

MISSION SET-UP

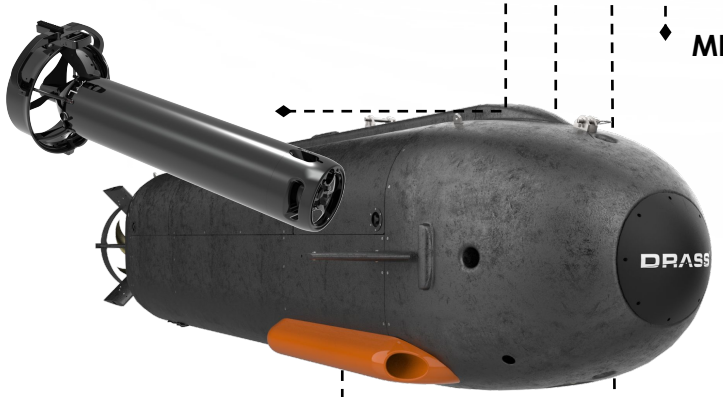
EXAMPLES
OF POSSIBLE
PAYLOAD



DIVER PROPULSION VEHICLES

MINES

MINI TORPEDO TUBES



MINI AUV

ROV

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LAUNCH EXCERCISE OF MINI TORPEDOS FROM DS8

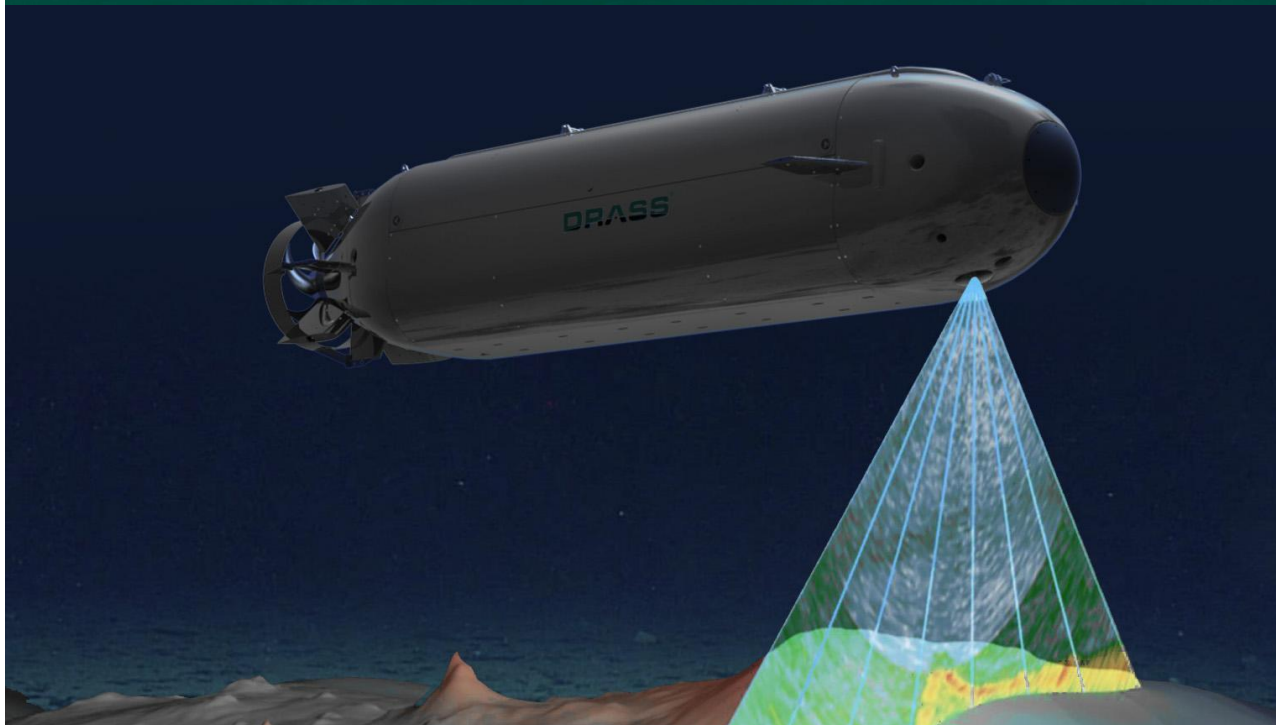
SYNERGIZING MANNED AND LARGE UNMANNED PLATFORMS

UNMANNED

DRASS RONDA LUUV LARGE UNDERWATER UNMANNED VEHICLE

The DRASS RONDA LUUV focuses its development strategy on creating a **multi-mission autonomous vehicle** that is scalable in both size and performance, offering high modularity and **reconfigurable payloads** for underwater warfare scenarios.

Building on the SDV DS design, it represents a forward-looking solution, where advanced technology supports activities, such as **patrolling**, **bottom scanning**, and **mapping**.



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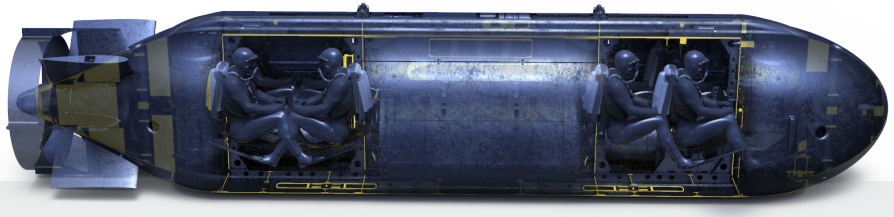
FROM SDV TO LUUV

~~**DS**-SDV~~



The DS SDVs are typically used for operational depths of up to **50 meters** below sea level, for human philological limits.

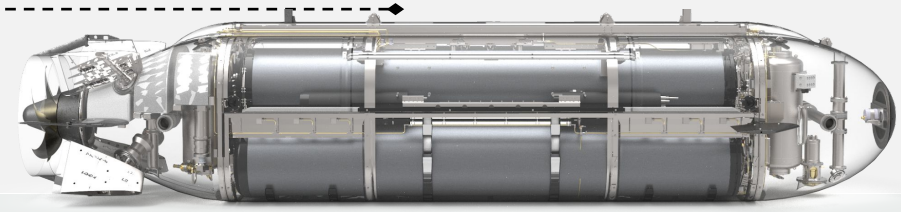
The DS SDVs can be transported by a submarine, without the need for a dry shelter, to depths of up to **100 meters** below sea level.

The internal layout of the DS SDVs has been optimized to enhance crew comfort and modularity. The stern cabin of the DS is reconfigurable to accommodate a **variety of payload configurations**.

DS Command & Control System together with DS Communication skills allow the craft to operate autonomously.

DS maneuverability has been enhanced with the installation of X-type rudders and transverse/vertical thruster pairs.

RONDA LUUV



The LUUV's operational depth is immediately increased to **100 meters** below sea level,

Synergy with manned platform.
The XD (Extra Deep) version of the craft is currently under development.

Synergy with manned platform.
In the LUUV the DS cabins becomes a payload bay

Synergy with manned platform.

Synergy with manned platform.

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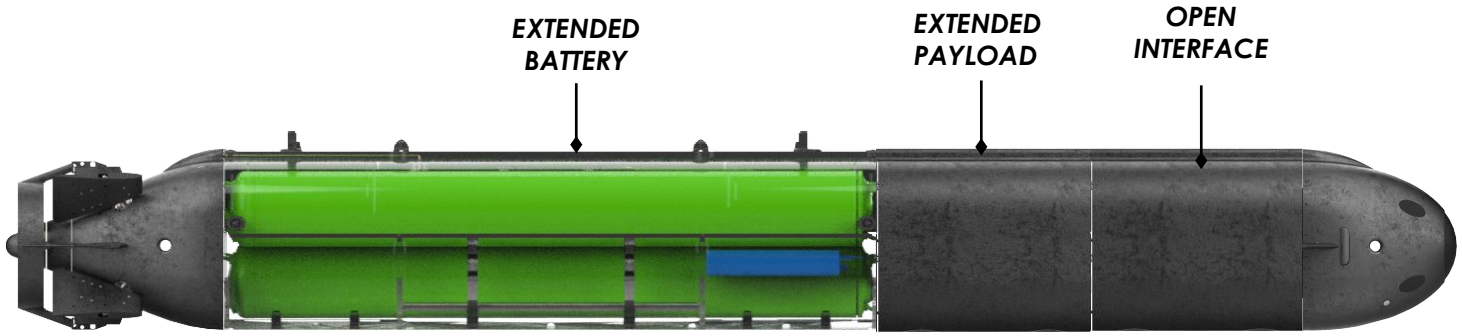
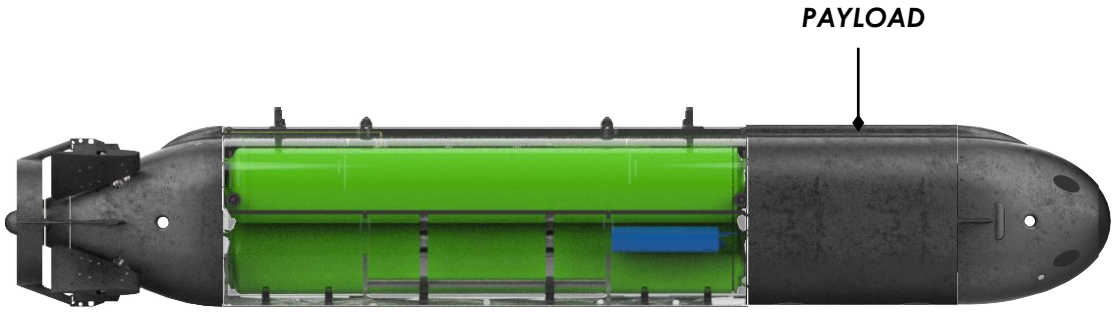
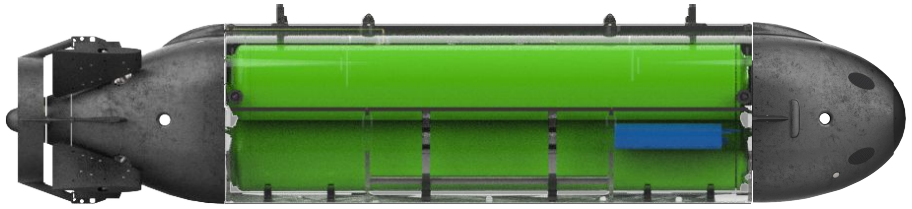
A MULTI-MISSION LUUV







MODULARITY AT IT'S CORE

Being the vehicle scalable in dimensions and performances, with multiple payload configurations, it can be used in many different scenarios and operations.

- **Open interface**
- **Sonar**
- **Supplementary battery**
- **Neutral Mines**
- **Mini - Torpedos**

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LUUV - FUTURE UPGRADES

ACTUAL EQIP. & CAPABILITIES		UPCOMING UPGRADES
01	Equipped with proven lithium batteries	**300% OF ADDITIONAL CAPACITY** The application of new batter technologies will improve capacity
02	Able to inspect up to 200 meters depth areas	**INCREASE OF OPERATING DOMAIN** Higher operating depth design achievable with advancements in pressure compensated batteries and high-pressure vessel development
03	Able to patrol underwater pipelines and cable	**INCREASE OF OPERATING RANGE AND DATA COLLECTION** *Application of Micro AUVs deployment*
04	Able to patrol and surveil pipelines and cables	**INCREASE DETERRENCE & ATTACK SKILLS** *Application of High deterrence effectors*
05	Able to patrol and surveil pipelines and cables	**INCREASE AVAILABLE MISSIONS PORTFOLIO** *Application of High performance Optronic System with AI videoprocessing*
06	Equipped with a Standard Payload Module	**INCREASE AVAILABLE MISSIONS INTEROPERABILITY** *Standardization, modularity and interoperability of different payload suites*

INTEGRATING EMERGING TECHNOLOGIES INTO COMPACT SUBMARINE DESIGN

DRASS DGK COMPACT SUBMARINE

INTRODUCTION

Italian-crafted COMPACT submarine DGK represents the pinnacle of novel sophistication in submarine technology today.

Integrating the latest high-tech innovation, DGK excels in stealth, adaptability, and multi-mission capability.

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DGK vs MIDGET

The DGK is equipped with advanced systems for complex operations, while midget submarines are limited to simpler, specialized missions due to space and system constraints.

TYPES OF MISSIONS	MIDGET	DGK
Special Forces Operations	YES	YES
Mine Laying Operations	YES	YES
Maritime and Underwater Situational Awareness	NO	YES
Support to **Naval** or **Land** Operations	NO	YES
Anti-Ship or **Anti-Submarine** Operations	NO	YES
Seabed Warfare Operations	NO	YES
Advanced ISR Missions	NO	YES

BREAKDOWN STRUCTURE

HULL STRUCTURE
- GRP hydrodynamic hull structure
- Flanged sections
- High strength pressure vessel steel type P690

POWER AND ELECTRIC PLANT
- Lithium-Ion battery packs
- Full redundancy
- Reliable power generating set

PROPULSION PLANT
- Pressure resistant brushless electric motor

COMMAND & SURVEILLANCE
- **Optronic Mast**, RWR
- Passive sonar, Forward Looking Sonar with 3D scan
- Intercept Passive Sonar
- Augmented reality AI system
- Integrated Platform Management System and Combat Management System
- Multi-purpose console

ADDITIONAL FEATURES
- X-Rudders
- Propeller Boss Vortex Diffuser
- Exit Trunk for deployment of special forces
- Reconfigurable Ballast Tank for extended mission
- Fully electric sail

OUTFITTING
- Reconfigurable cabins and living spaces
- Dedicated payload bay

ARMAMENT
- Up to 4 x 533 wire-guided torpedoes (2x on the bow, 2x on the side)
- 6 x mini torpedo
- Reconfigurable payloads
- Multipurpose reconfigurable payload bay

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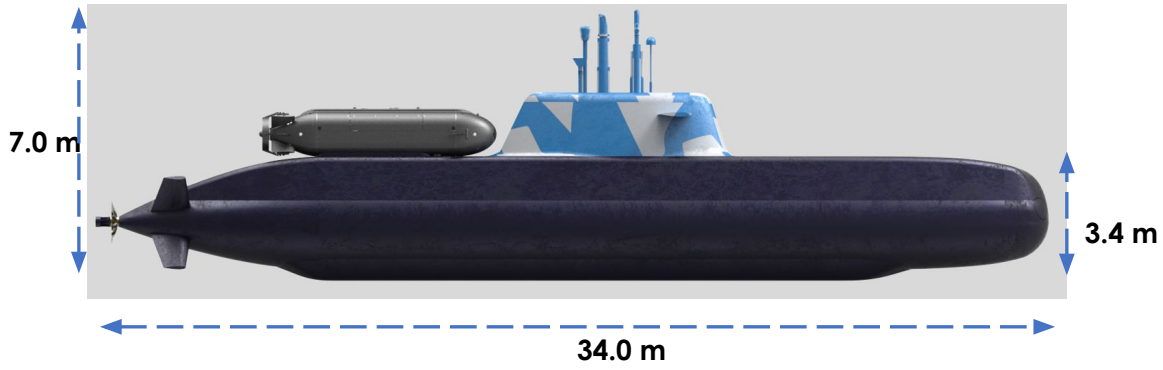
DGK OPERATIONAL PHILOSOPHY

The operational philosophy of the **compact** DGK is based on a submarine that excels in both **conventional** and **midget** missions.

While maintaining a **minimal size**



- **Improved agility & flexibility**
- **Enhanced stealth**
- **Wide Operational Capabilities**
- **Ability to operate in shallow waters**

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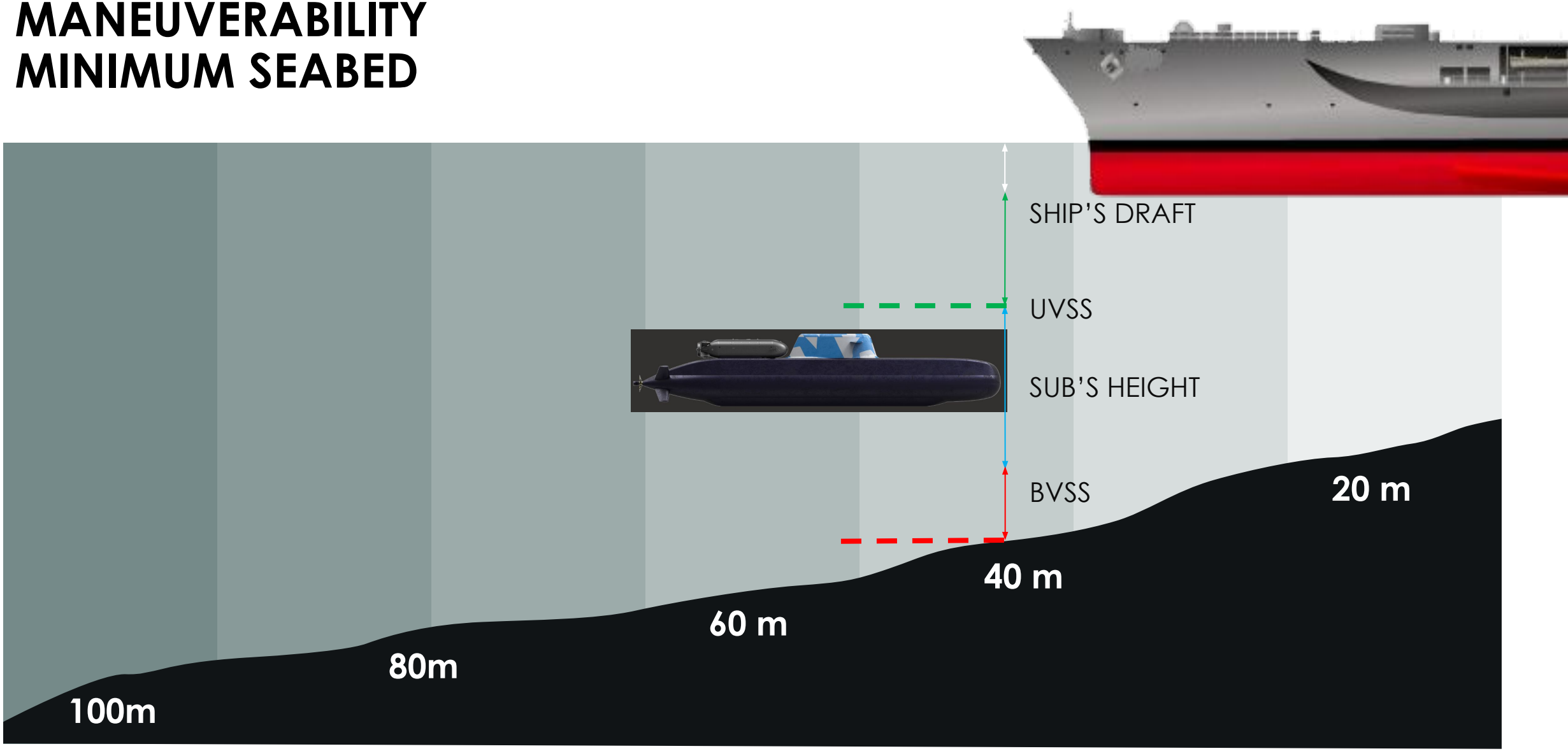
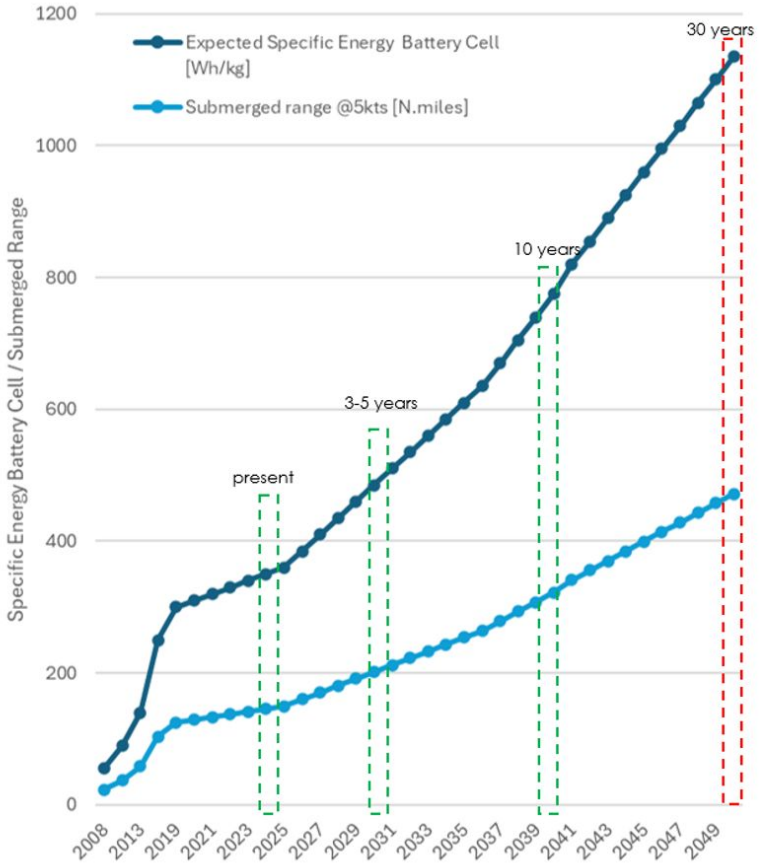
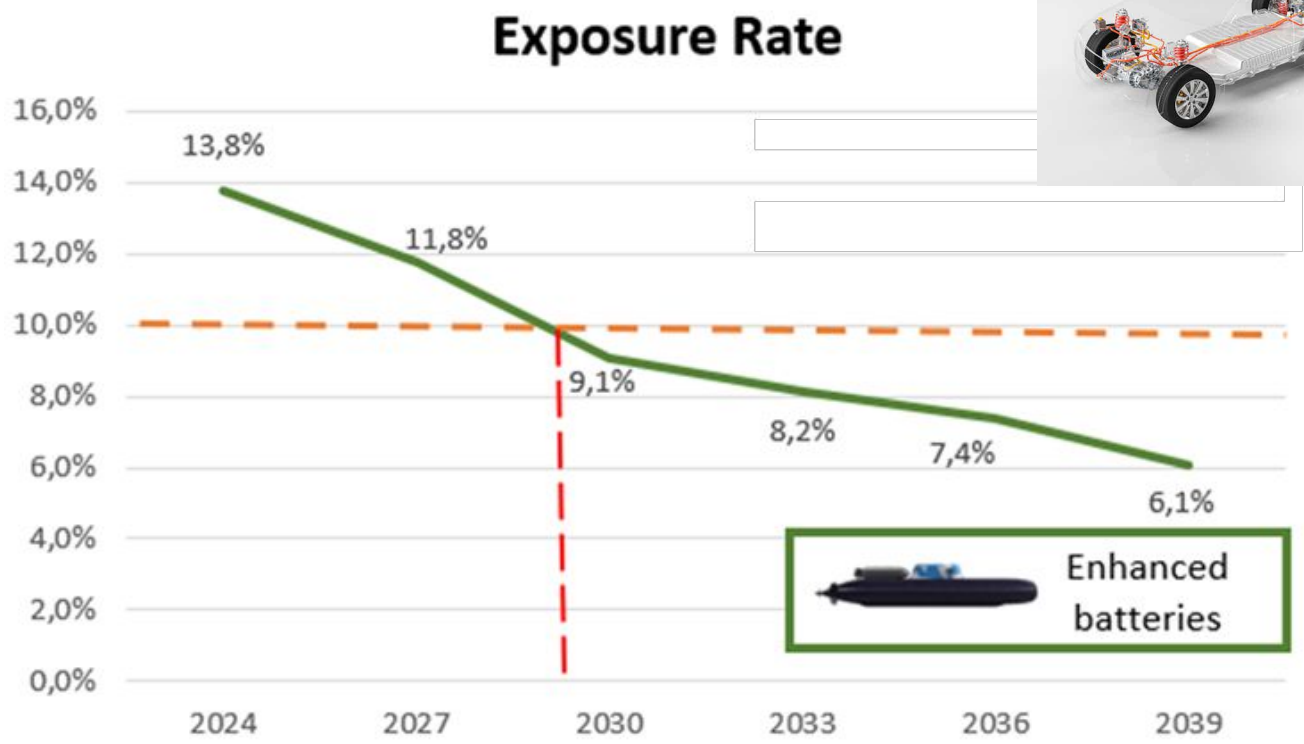
MANEUVERABILITY
MINIMUM SEABED



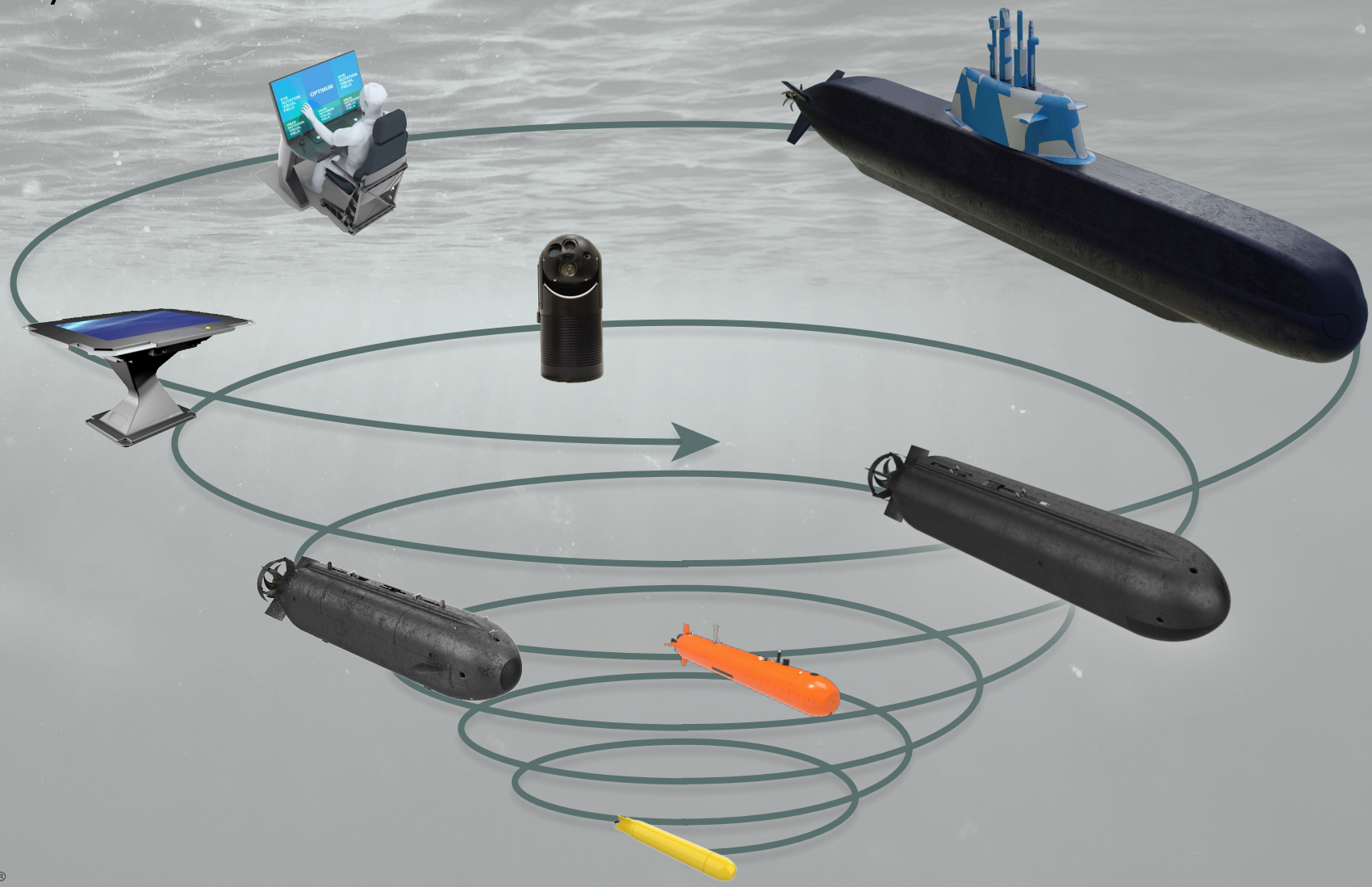
EVOLUTION OF BATTERIES IN NEAR FUTURE

The foreseen capacity growth of **modern batteries** offers an estimate of future capabilities that will exceed today's **modern AIP systems**, thanks to the synergy with automotive industry.





Technology advances in a **dynamic spiral**, where simple components continuously **evolve**, **integrate**, and **interconnect**, forming increasingly **complex** systems.



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QUESTIONS?

THANK YOU

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