# Considerations for an ASW frigate launched unmanned surface vehicle for ASW

Ing. Paul Dröge MA - Commander RNLN

# The Fourth Battle of the Atlantic

*With 'more activity from Russian submarines than we've seen since the days of the Cold War,' an improved European force posture becomes vital for the U.S. Navy and NATO.*

By Vice Admiral James Foggo III, U.S. Navy, and Alarik Fritz

June 2016 | Proceedings | Vol. 142/6/1,360

ARTICLE VIEW ISSUE

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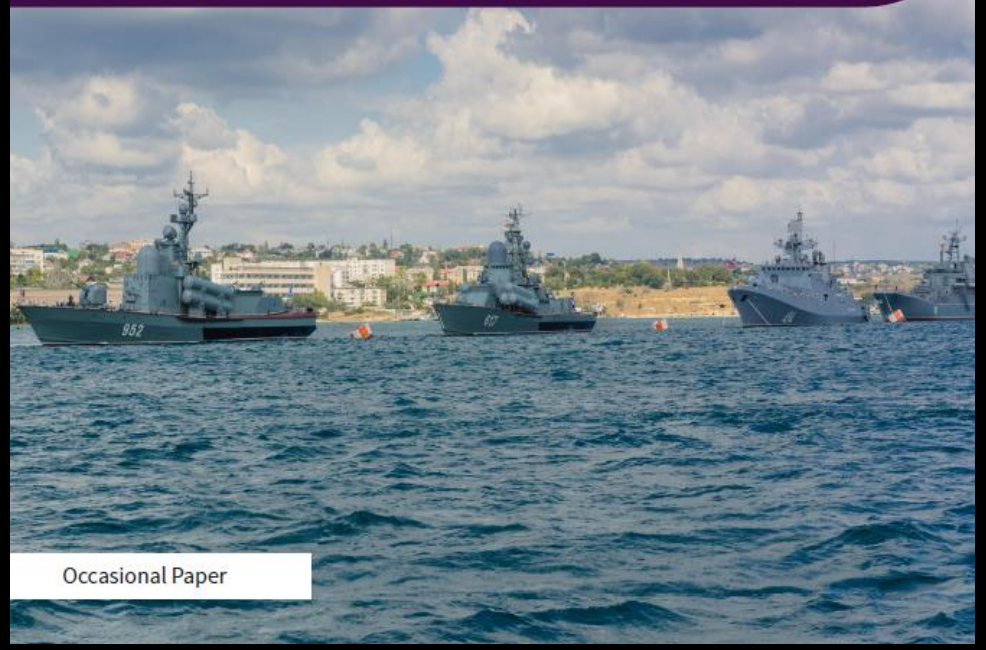
Occasional Paper

# An Asymmetric Approach to the Use of NATO's Maritime Forces in Competing with Russia

Sidharth Kaushal and René Balletta



Occasional Paper

The Hague Centre for Strategic Studies

# Maritime Security in a Time of Renewed Interstate Competition

Navigating the Royal Netherlands Navy through the Geopolitical and Technological Challenges and Threats in the Euro-Atlantic and Indo-Pacific Regions

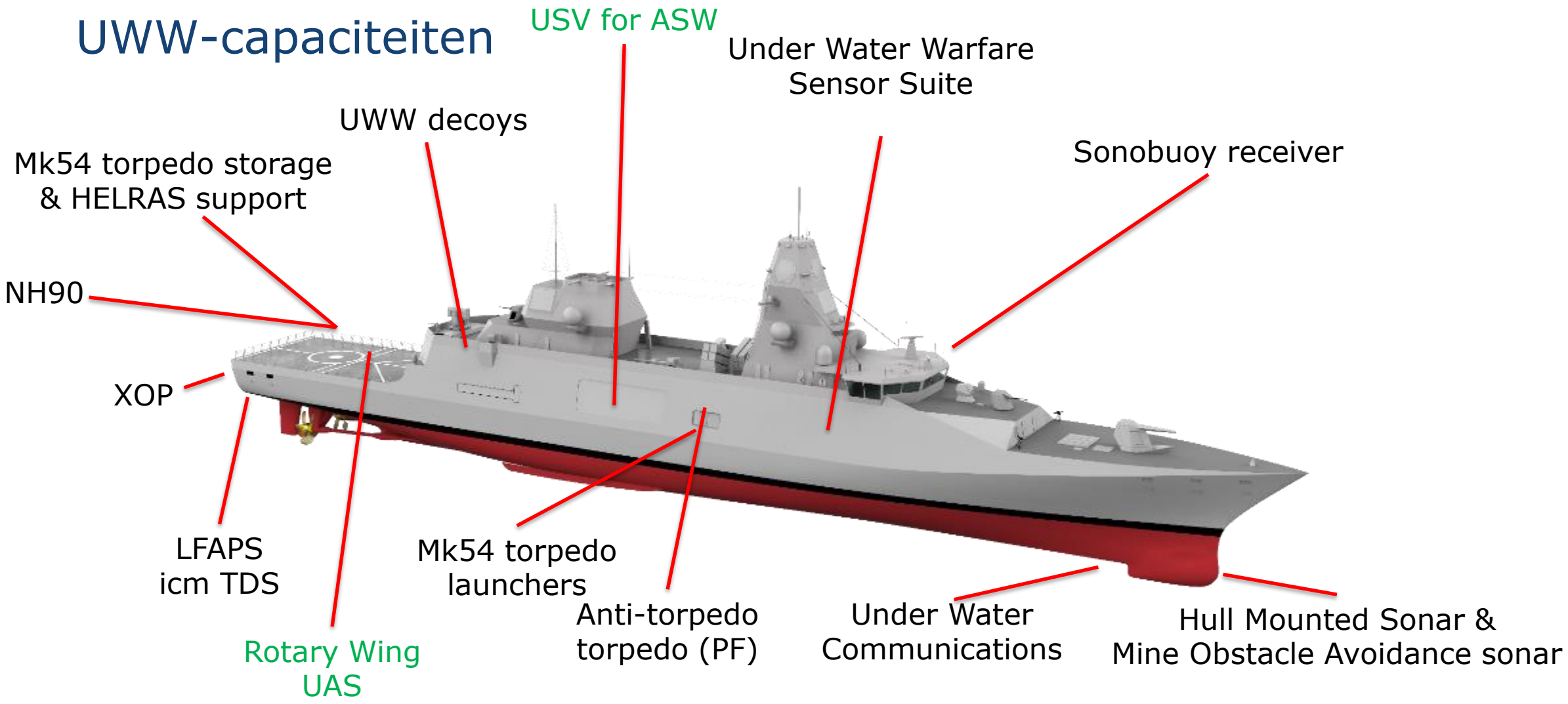
Paul van Hooft, Davis Ellison and Frederik Mertens

January 2024

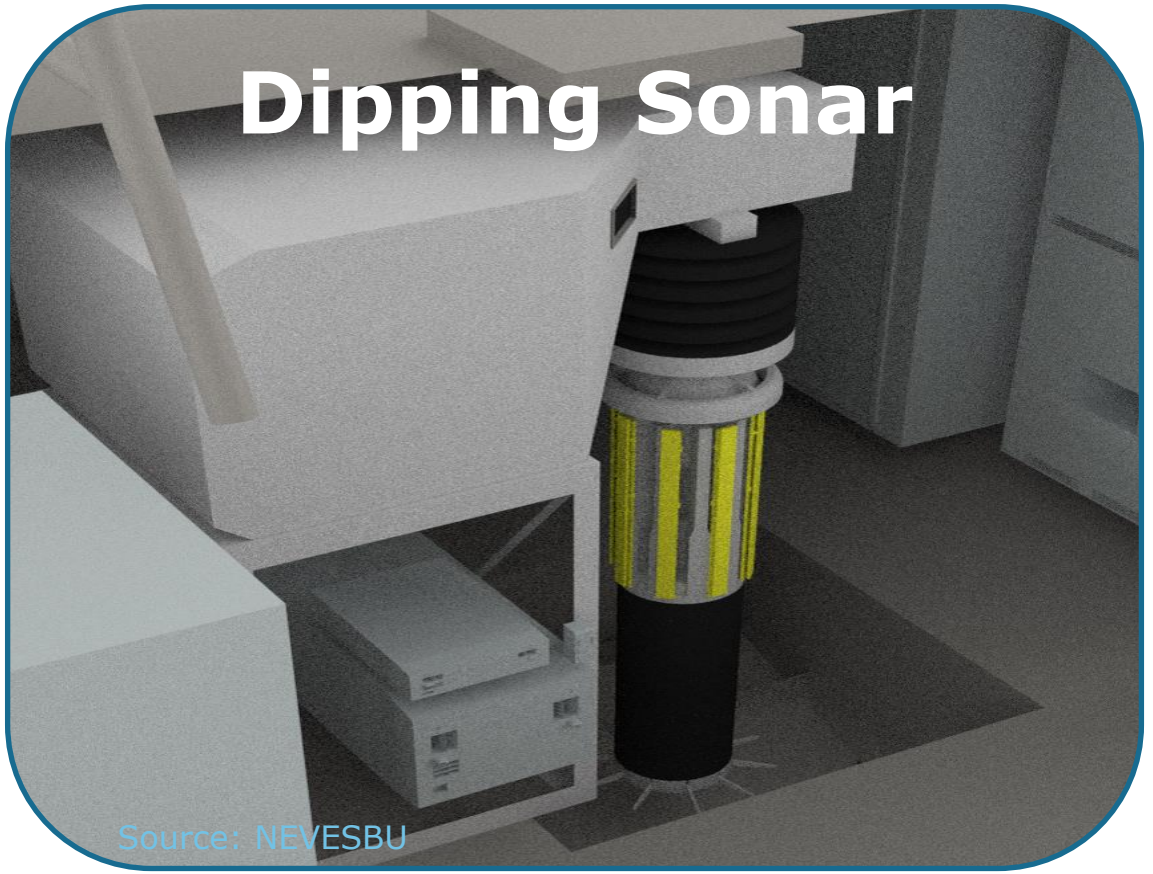
# ASW Sensor & Payload study

- 3 Research & Enginering agencies
  - Science & Literature reviews
  - Operational Research & Analysis
  - Modelling & Simulation
  - Design & Engineering
- >20 reports, memo’s and slide packs

# UWW-capaciteiten



# Dipping versus Towed sonar

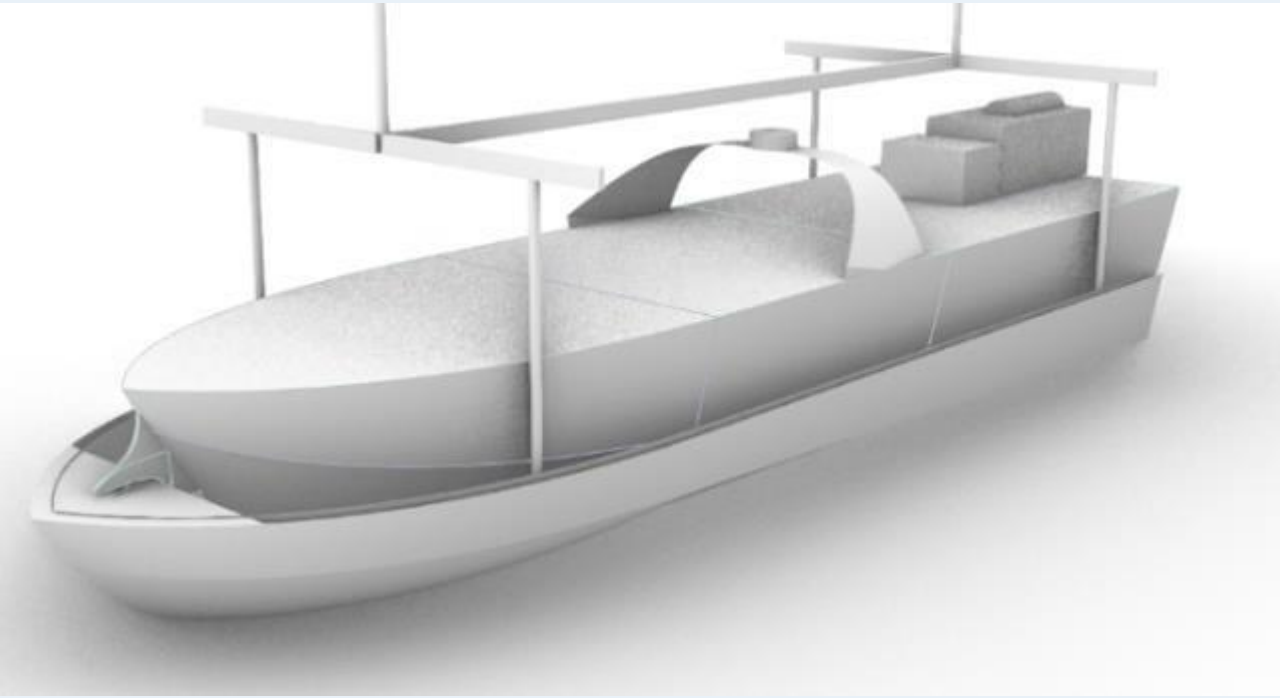
# STARTING POINTS

## Requirements

- The UDSB shall be able to carry and functionally operate a dipping sonar

- Minimum top speed: 20 knots
- Minimum endurance: 96 hours
- Minimum sea state: 5

- Redundancy on propulsion



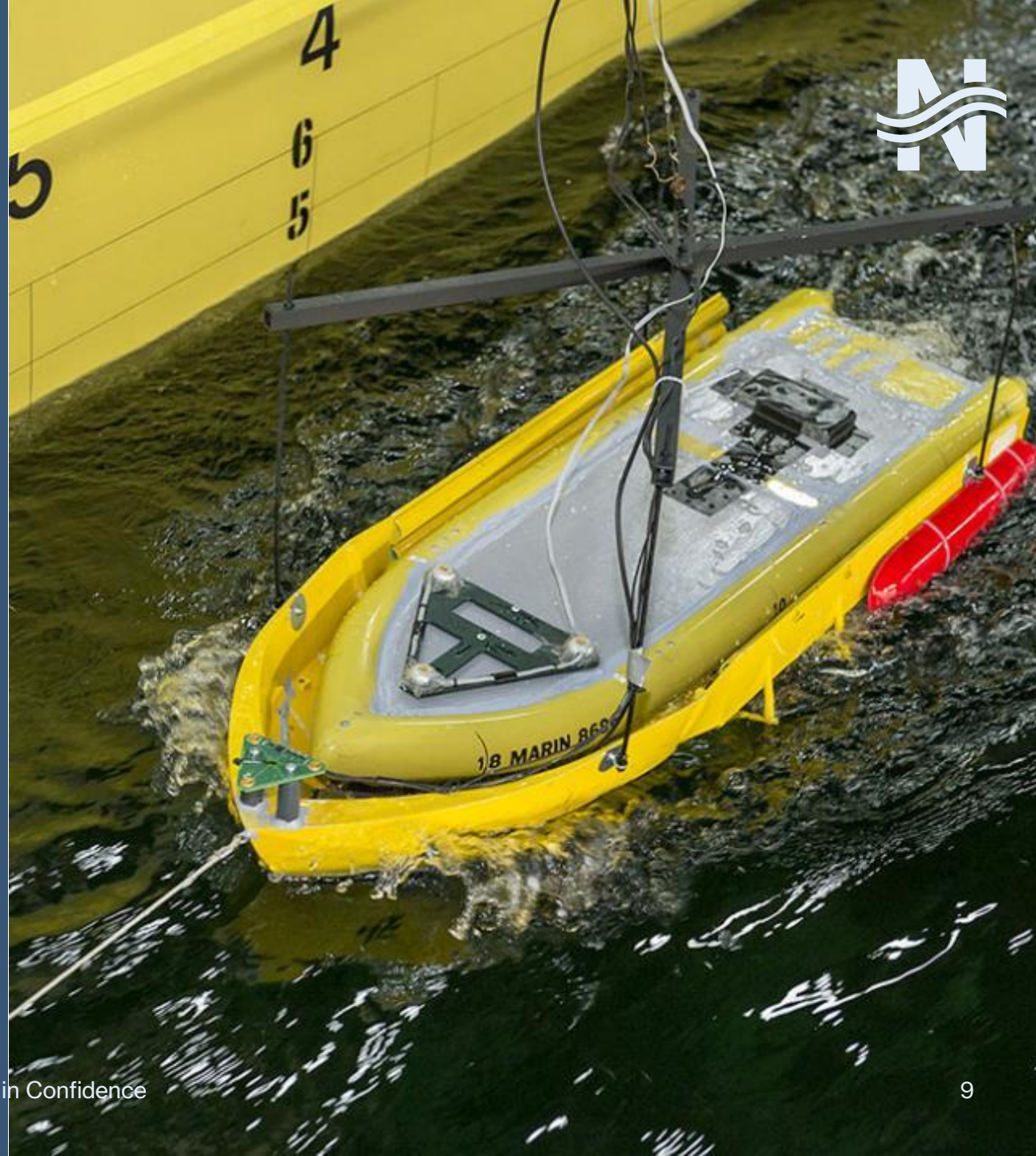
# STARTING POINTS

## ASWF integration

- Environmentals (low temperatures!)

- Maximum weight: 12 ton
- Maximum space: L: 14,4 m
  B: 5,2 m
  H: 5,7 m

- Launch and Recovery system (LARS)



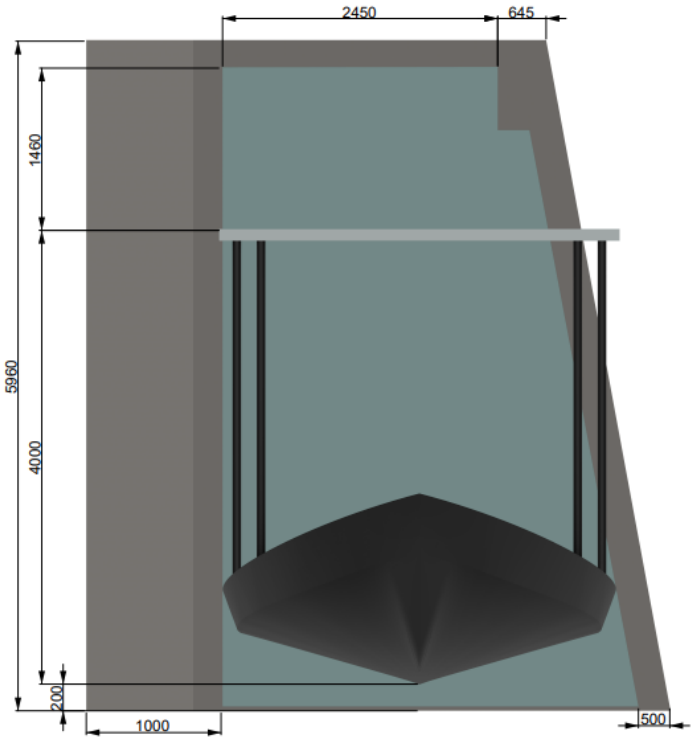
# DETAILING OF REQUIREMENTS

## Available space

- Subtractions for manoeuvring during hoisting

- 12 x 3,5 x 4,7m (LxBxH)
- Estimated weight: 2 ton

- UDSB:
  - Maximum weight: 10 ton
  - Maximum space: L: 11,5 m
    B: 2,5 m
    H: 4,0 m

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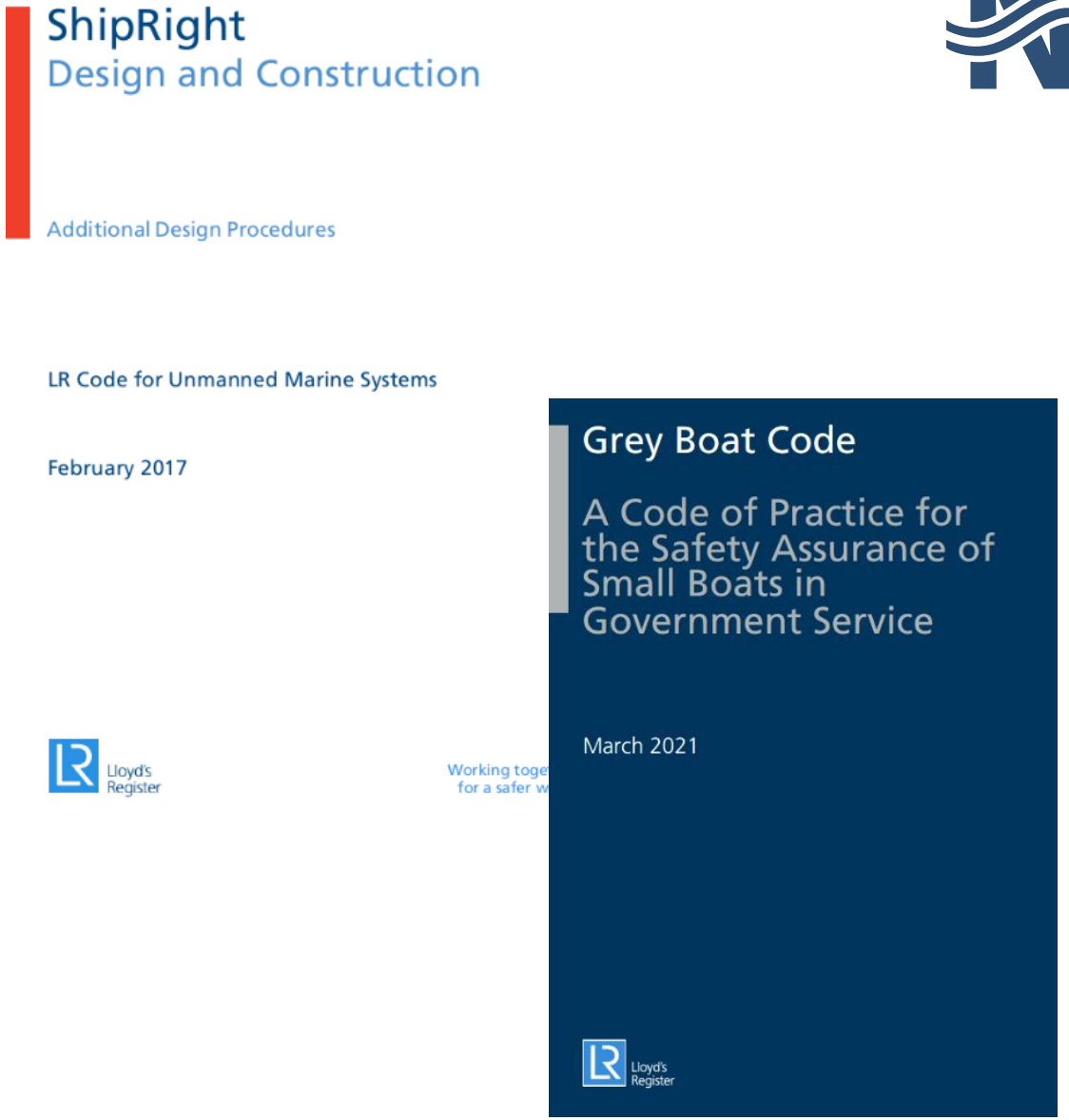
# DETAILING OF REQUIREMENTS

## Rules and regulations

- Goal-based regulation:
  - Lloyd's Register code for Unmanned Marine Systems

- Solution-based regulation:
  - Lloyd's Register Grey Boat Code



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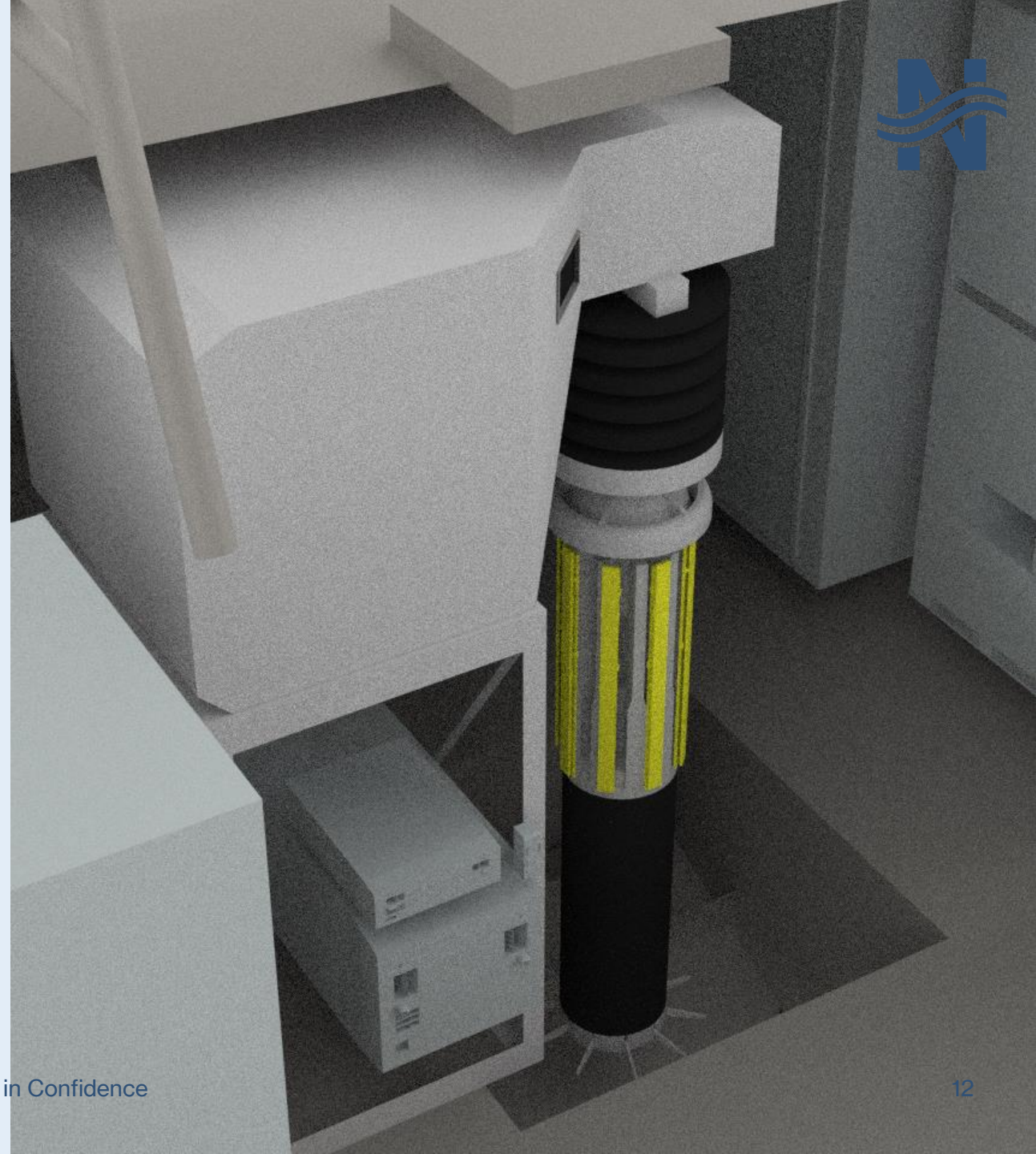
# BASIS OF DESIGN

## Dipping sonar

- Moonpool
  - Sonar orientation according to supplier preference
  - Sonar is protected against environment
  - Less impact of pitch movements

- Similarity to intended use is key!



# BASIS OF DESIGN

## System identification

- Create system breakdown

- Define components for each system
  - De-icing system as part of 3000
  - Processing cabinets as part of 4100

| SWBS-numbering | Systems |
|---|---|
| 0000 | UDSB |
| 1000 | Structure |
| 2000 | Propulsion and manoeuvring systems |
| 3000 | Electrical systems |
| 4100 | Command and control systems |
| 4200 | Navigation systems |
| 4400 | Communication Systems |
| 4600 | Underwater surveillance systems |
| 5000 | Auxiliary sytems |
| 5550 | Fire extinguishing systems |

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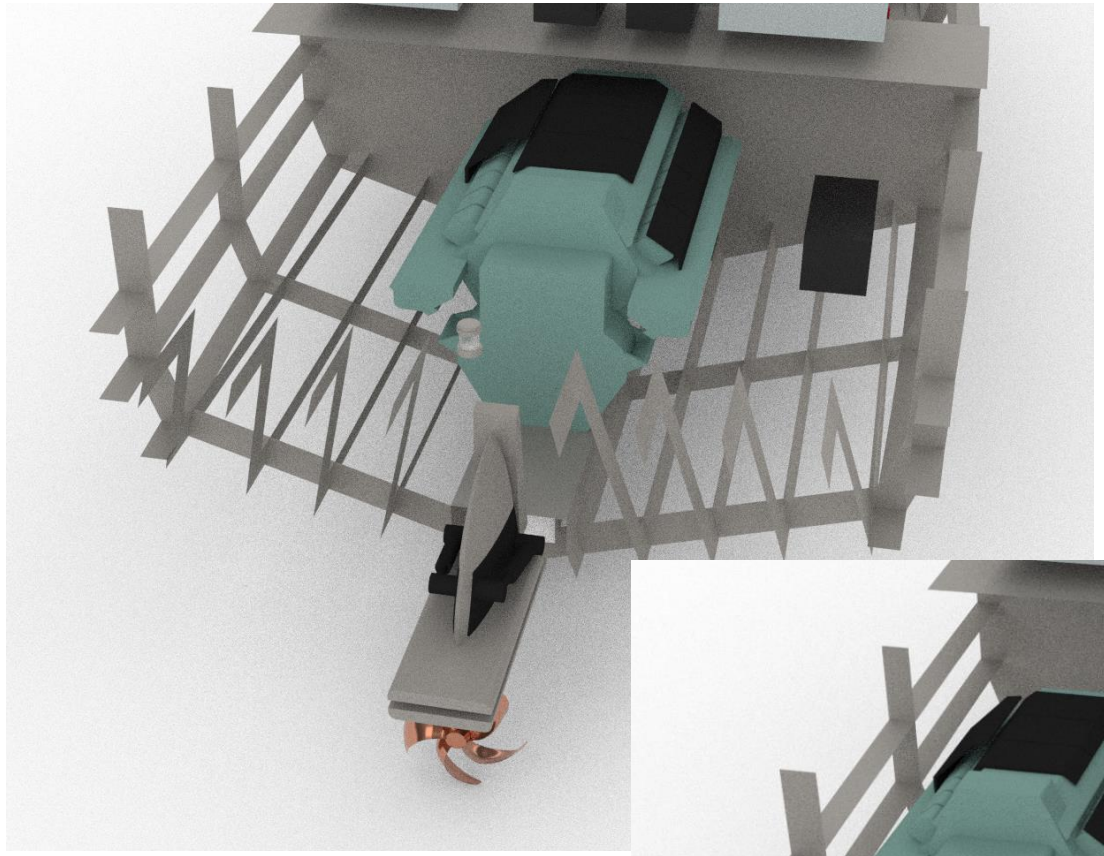
# BASIS OF DESIGN

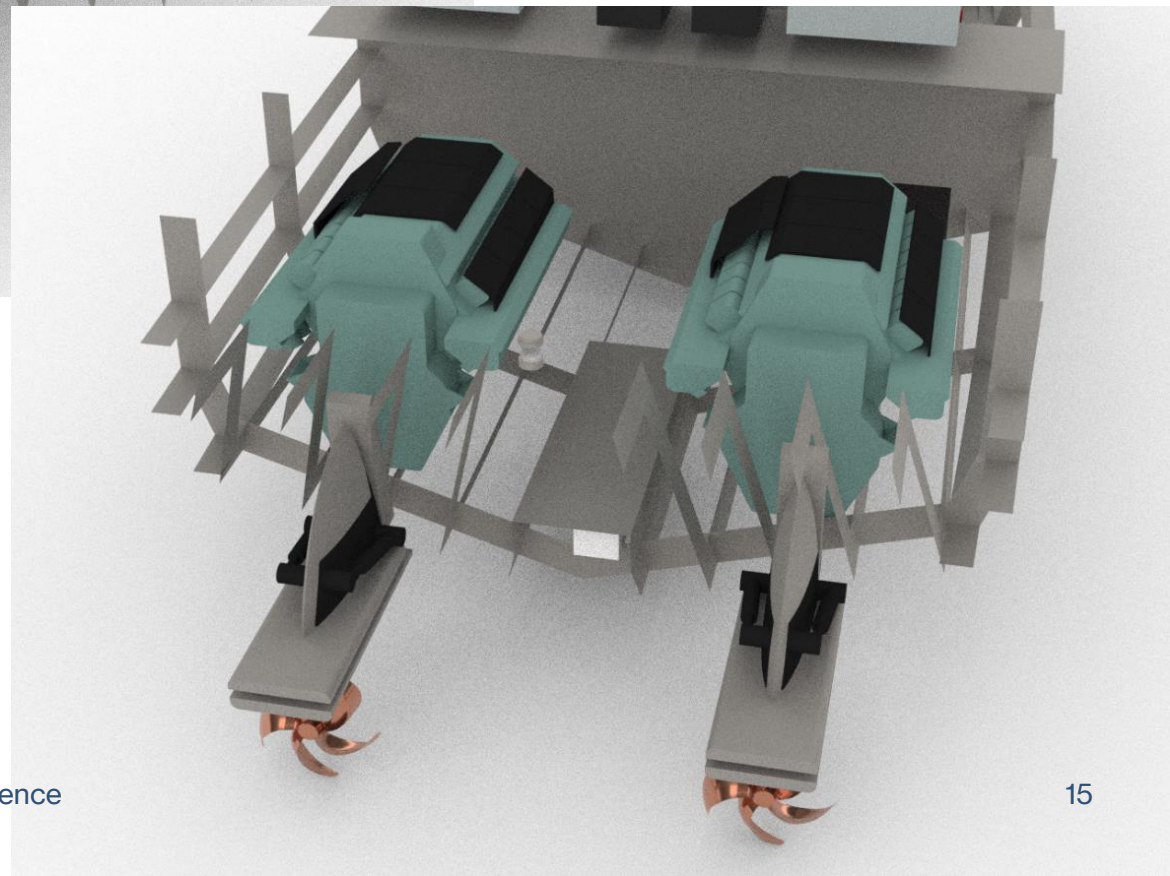
## Hull shape

- Hull optimization not part of concept design
- Reference hull shape for fast results
- Scaled to meet dimension criteria

# ENGINE LAYOUT

- Power take-off
- Limited maintenance space
- Aft deck removable
- Redundancy is required, but limited possible

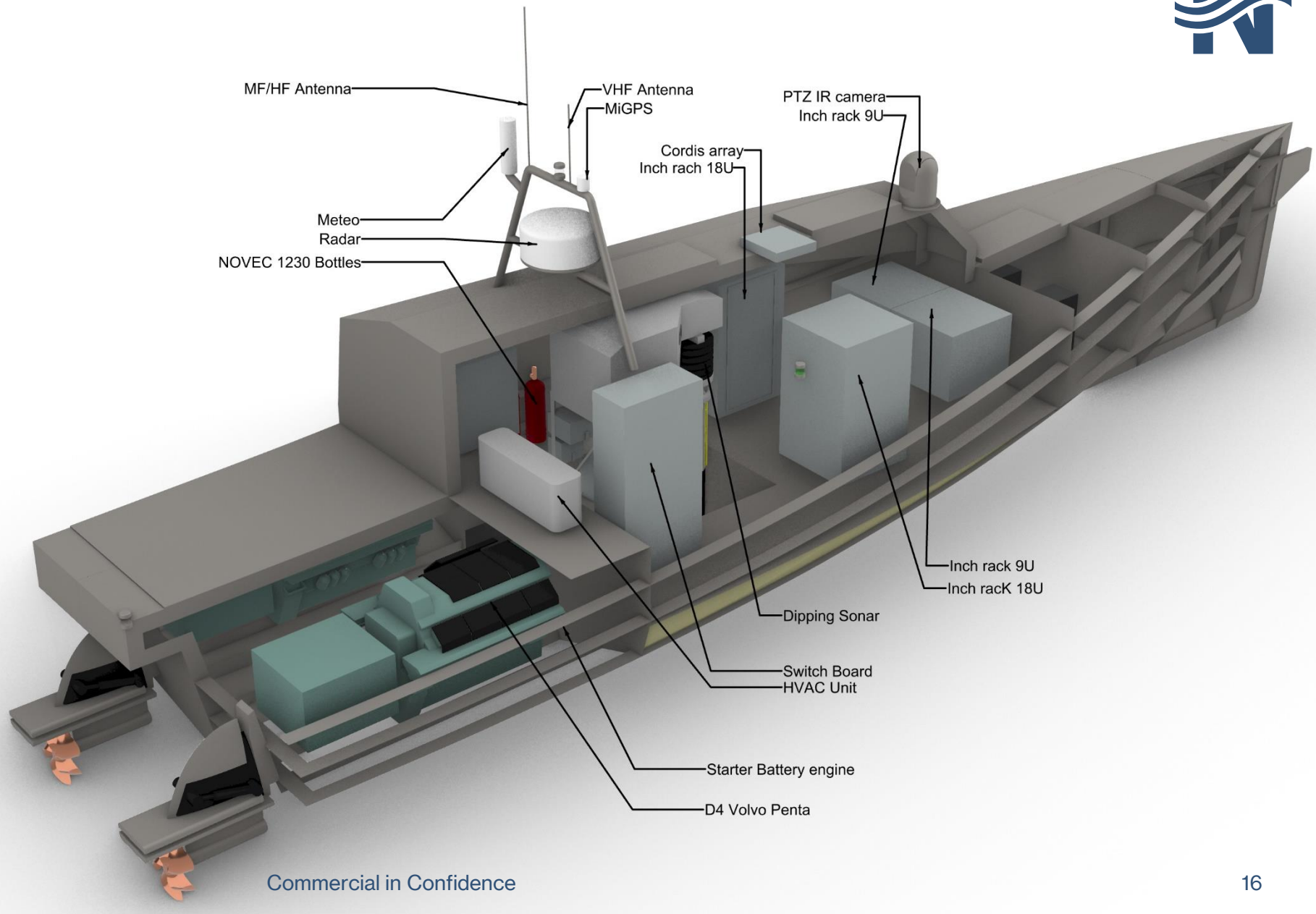




# FINAL CONCEPT

## Principals

- Length = 11,2 m
- Breadth = 2,5 m
- Height = 4,3 m mast up
  2,6 m mast down
- Displacement = 9,2 ton
- Speed = 20 knots



# Sonar wet-end motion & Motion Compensation

Horizontal & vertical motion influence sonar performance

- Horizontal drift influences processing
  - Dynamic Positioning required?

- Doppler spread
  - Accept it
  - Lower stiffness hoist cable
  - Heave compensation
  - Advance processing
  - Combination of above

# Way ahead?

Continue design USV

Automation detect, classification & tracking

ASWF & USV Teaming

Mission Autonomy

Launch & Recovery

USV – Sonar interaction

# Takeaways

Concept design takaways:

- 12 meter frigate launched USV with active sonar is feasible
- Challenging CONOPS – 20 kts - SS5 North Atlantic is doable
- But, more engineering required for first of class