

# IMR AUV and USV project

- IMR have order two AUV Munin+ to be delivered in October 2021 and two USV Sounder to be delivered mid-2022 from Kongsberg Maritime
- To be used mainly in coastal waters.
- AUV Munin to be used for video mapping of seafloor biological resources such as plants, snow crabs, corals etc, and also to map «gost fishing» nets, traps etc! Multibeam echosounder and sub-bottom profiler to be used for hydrographic and geological mapping.
- USV Sounder to be used for stock assessment, and fitted for future installation of multibeam echosounder and sub bottom profiler



# Procurement of two AUV Munin and two USV Sounder for Institute of Marine Research

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# AUV Munin+



## WEIGHT AND DIMENSIONS

- Overall length 300-400 cm depending on configuration
- Vehicle outer diameter 34 cm
- Weight in air: < 300 kg

## MAXIMUM OPERATING DEPTH

- 1500 m standard (600 m version optional)

## VEHICLE SPEED

- Up to 4.5 knots

## ENERGY

- Internal 5 kWh standard
- Exchangeable 5 kWh lithium ion battery modules

## ENDURANCE

- 12-24 hours

## COMMUNICATONS

- cNODE acoustic command and data link
- Wi-Fi
- Iridium

## AVAILABLE PAYLOAD SENSORS

- HISAS 2040 interferometric synthetic aperture sonar
- Tailored version of EM 2040<sup>®</sup> multibeam echo sounder, 200-400 kHz 1°x1° beam width, swath 120°
- EdgeTech dual frequency side scan sonar
- EdgeTech sub-bottom profiler 4-24 kHz (option)
- NBOS conductivity and temperature (CT) sensor
- Still image camera (option)

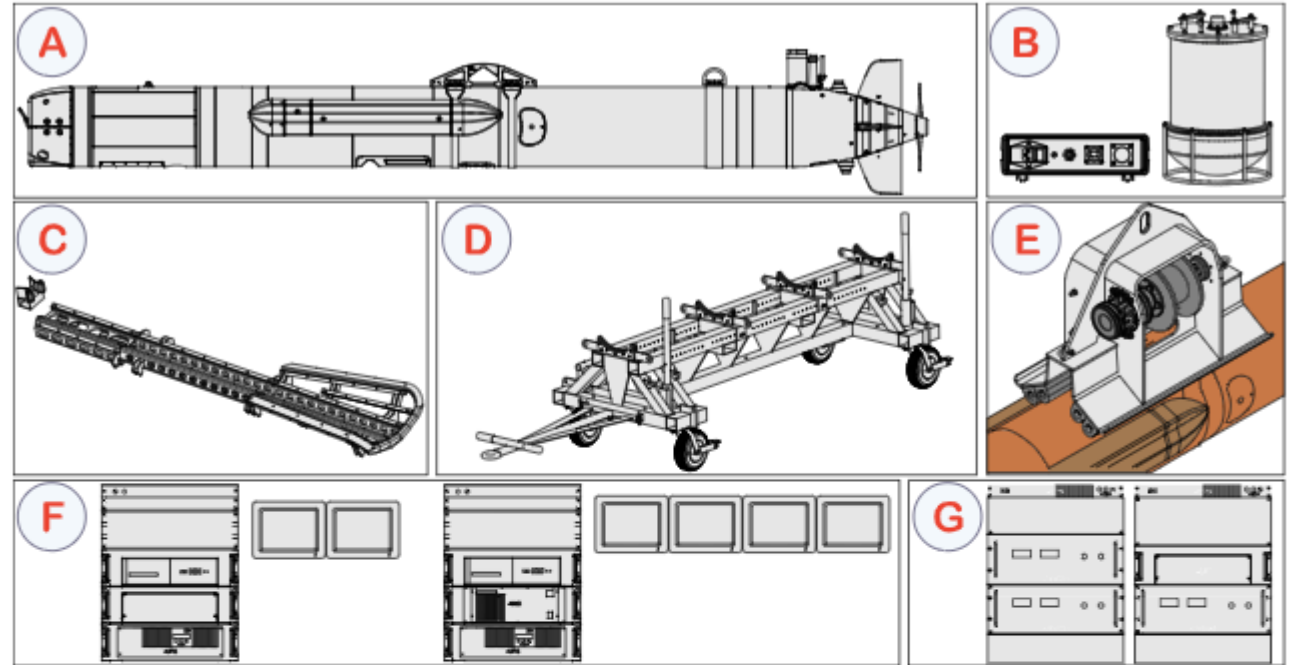
## LAUNCH AND RECOVERY SYSTEM

- Mini stinger (ramp) solution
- Crane mounted electric or hydraulic lifting saddle
- MUNIN<sup>®</sup> adapter for existing HUGIN<sup>®</sup> stingers.



# Challenges AUV Munin+ (1)

How to prepare a number of vessels, own RVs, charter vessels and vessels of opportunity for the use of the Munin+ AUVs, with LARS (stinger or crane), command and control system, post mission analysis system, charging station?

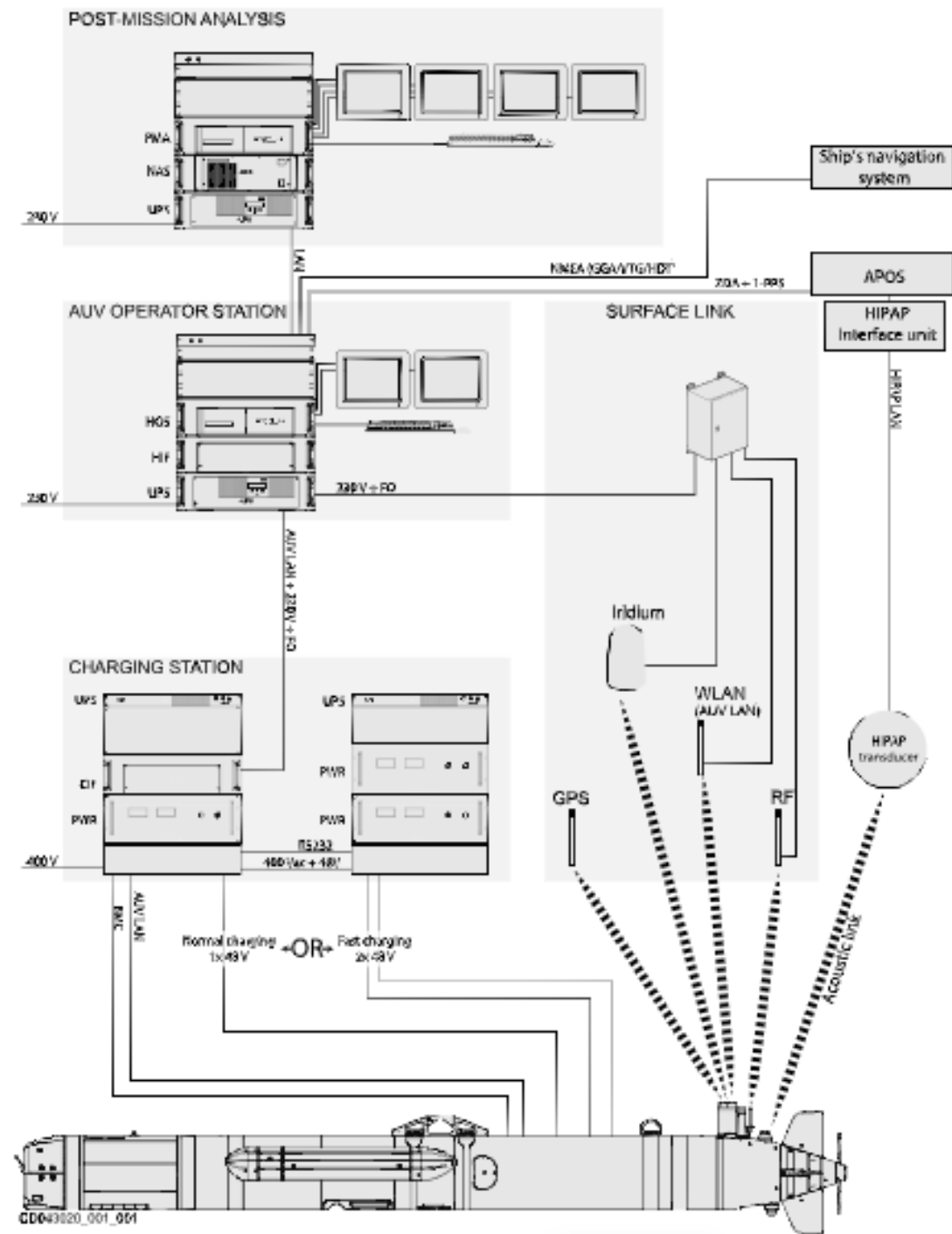


- A** MUNIN+ Topside system
- B** HiPAP 351P-MGC portable acoustic link and positioning system.
- C** A MUNIN+ Stinger frame to mount on the HUGIN Stinger so that the Stinger can be used to launch and recover the MUNIN+.
- D** AUV cart
- E** A Launch and recovery saddle to be used with a crane as alternative launch and recovery system for the AUV.
- F** Portable operation and post-mission analysis equipment integrated into the host vessel operational environment.
- G** Portable fast charging equipment



# Challenges AUV Munin+ (2)

How to connect to vessel's electrical power, position data, radio communication and USBL communication?





# USV Sounder



[www.kongsberg.com/no/maritime/products/marine-robotics/autonomous-surface-vehicles/sounder-unmanned-surface-vehicle/](http://www.kongsberg.com/no/maritime/products/marine-robotics/autonomous-surface-vehicles/sounder-unmanned-surface-vehicle/)

# USV Souder Technical specifications

- Length 8m
- Beam 2.2m
- Height 2.3/4.4m (mast down/up)
- Draft 0.7m
- Weight 4,200kg – ready to operate
- Propulsion 125hp Steyr diesel engine with fixed pitch propeller
- Speed 12 knots (max)
- Endurance 10 days @ 4 knots
- Payload power > 4 kW @ 4 knots
- Control K-MATE autonomy engine for direct, supervised and Autonomous operation
- Communication Maritime Broadband Radio/Iridium VSAT
- IMR payload:
  - EK 80 wide band echo sounders
  - CTD
  - ADCP
  - Fitted for EM2040 Multibeam Echosounder and TOPAS 120 SBP

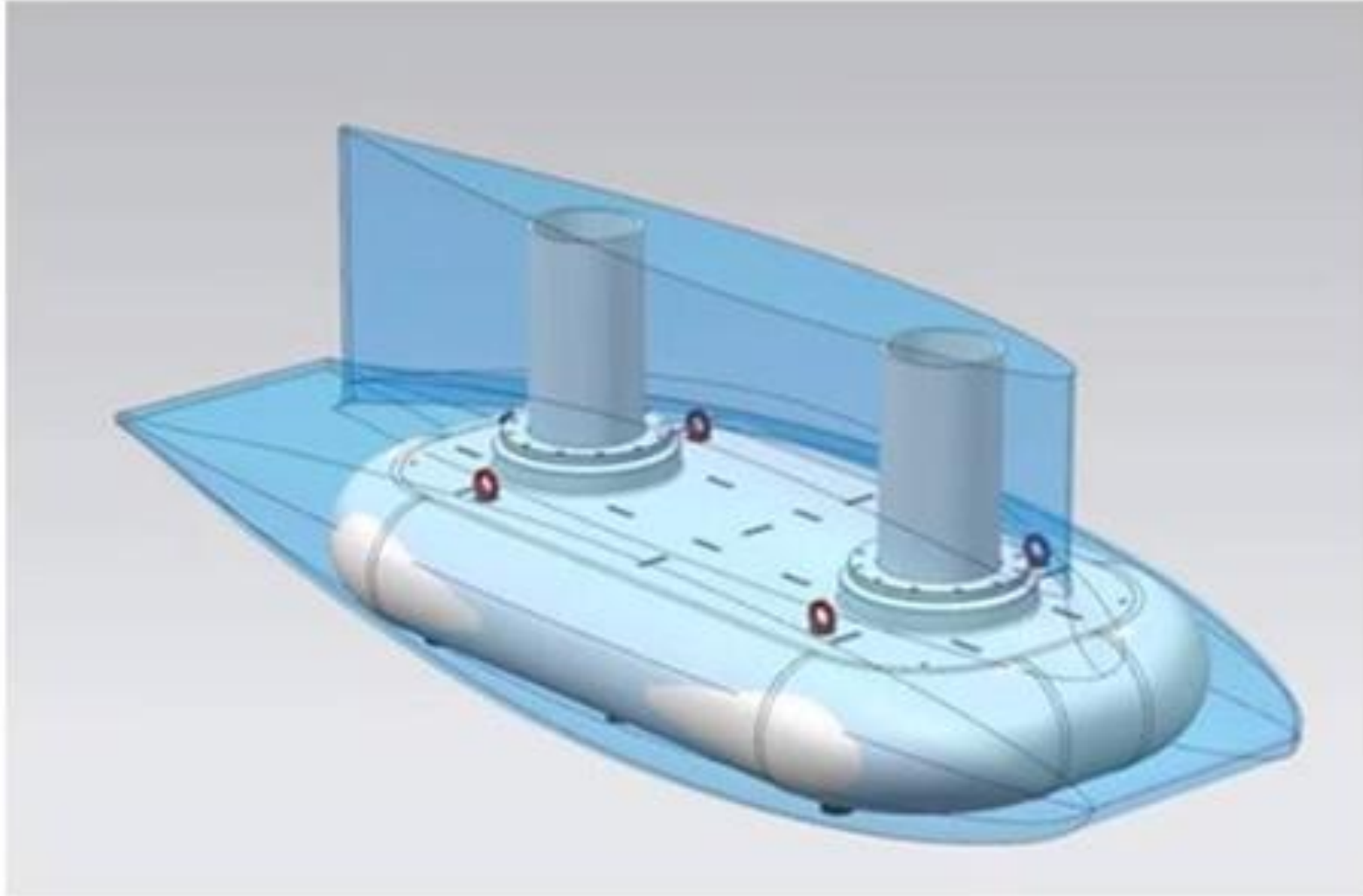


# Main challenges USV Sounder

- Gondola design with regards to:
  - Hydrodynamic shape
  - Bubble sweep down
  - EMI/EMC
- Handling in port and towing
- Operations in coastal areas
  - Lots of small islands, reefs and othe
  - Dark most of the time in winter
  - Lots of commercial traffic and pleasure crafts
  - Rules and regulations for operation of remote controlled surface vehicles
  - Training and certification for USV operators
  - Cost of extra crew on a non-permanent basis
- Integration of USV Command, Control and Communication systems with vessel systems







Draft gondola design

# Command, Control and Communication (C3) container(s)

- Currently looking in to building one or more 10' C3 containers that can serve both AUV Minun+, USV Sounder and new coastal ROV with the necessary connectors to ship systems, and maybe own GPS, VHF radio etc

