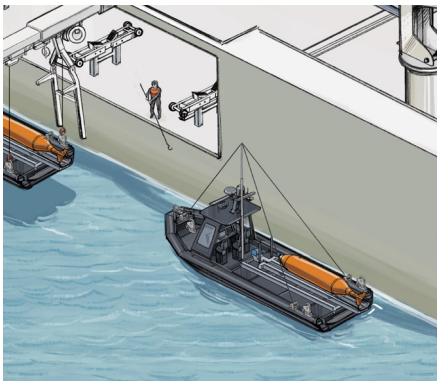
HENRIKSEN

SOLUS USV RECOVERY

SOLUS is a complete recovery system for unmanned surface vessels. Consisting of a telescopic pole made to extend both a painter, and lifting line up to the operator on the mothership. Who connects the USV to the painter and lifting drums, to then simply lift the USV out of the water.

- **Works with existing davits**
- **Light construction**
- **Easy to mount**
- **Unmatched price to performance**



MADE FOR USV

The H.Henriksen SOLUS system is not just merely a concept, but a trialed and tested system. Proven reliable and effective.

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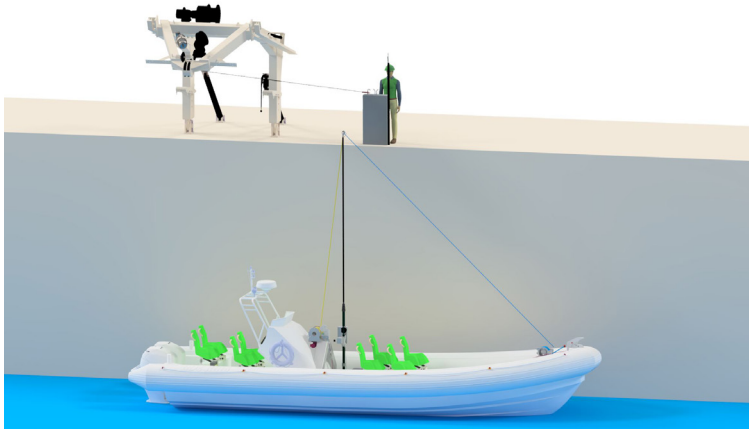
SOLUS USV RECOVERY

SOLUS achieves a practical and safe way to launch and recover USV's without the use of advanced and expensive robotic lifting systems. The SOLUS system fulfills all safety regulation in accordance with *SOLAS*, thus enables the system also to lift a manned USV. The system is easy to mount on most USV's, easy to use, and requires few operators. The system is proven reliable in operation with low maintenance costs, and safe operation in sea state 4+.

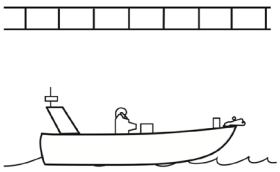


**Pictured: USV extending SOLUS pole, ready for recovery*

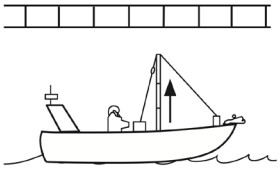
One of SOLUS's greatest advantages is that the system works universally, meaning; The mothership can recover all SOLUS equipped USV's, with the same davit system used for regular lifting operations. This eliminates the need for several large and bulky cradles, which was previously required to accommodate different sized vessels.

RECOVERY PROCEDURE

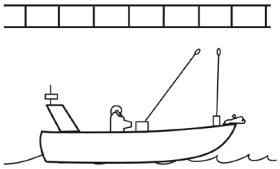
1. USV approaches the ship, recovery starts



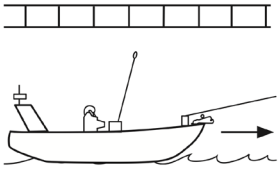
2. Telescopic pole hoisted with the lifting/painter lines



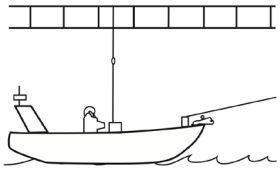
3. Crew cathes the lifting/painter lines, telescopic pole lowers



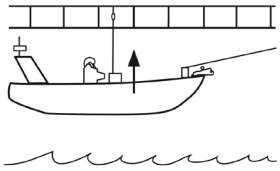
4. Crew connects the painter line, USV slowes down to get towed by the painter drum



5. Crew connects the lifting line (lifting lines at dual point davits) to the davit fall line(s)



6. USV lifted and placed in the crib, recovery completed



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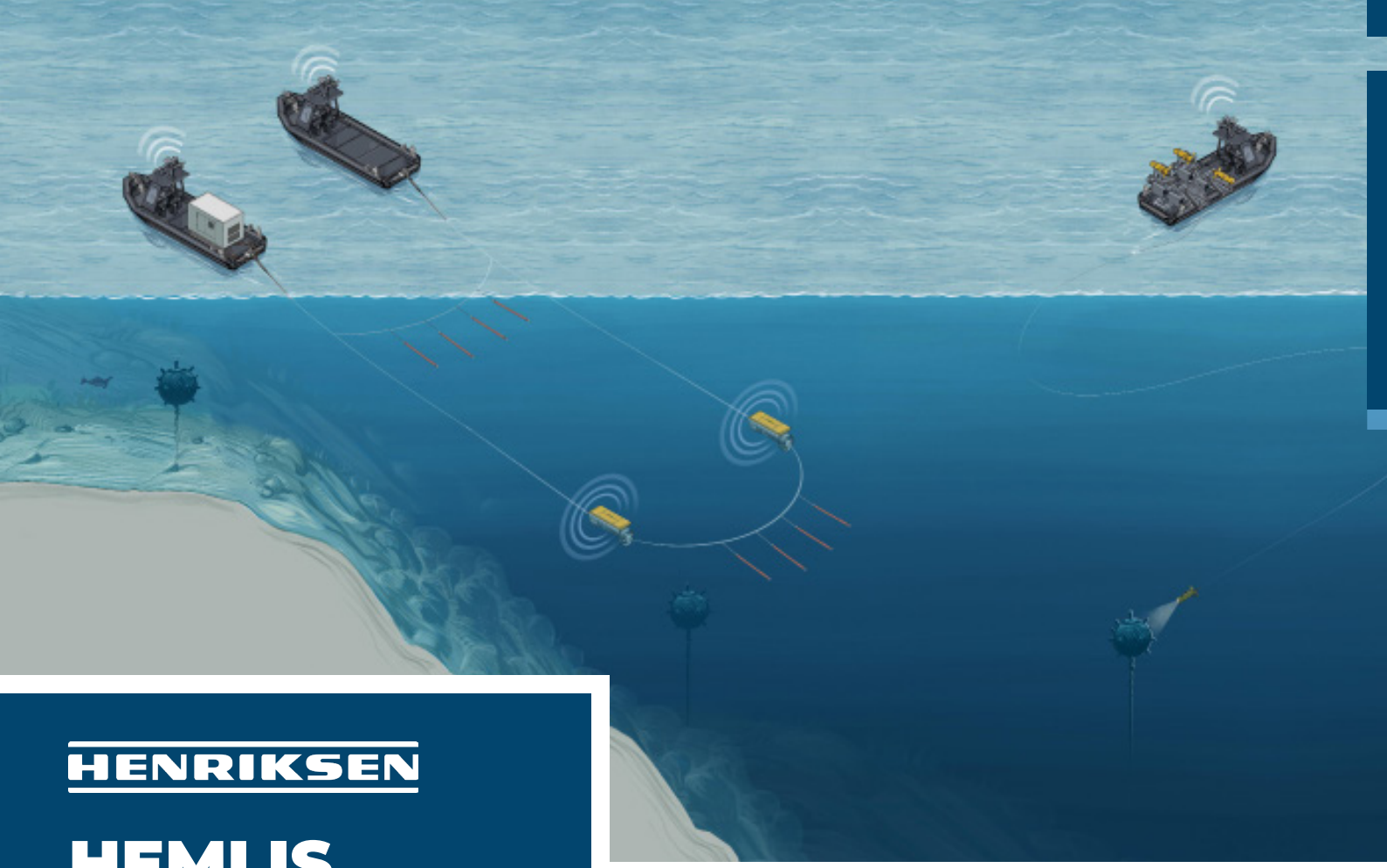
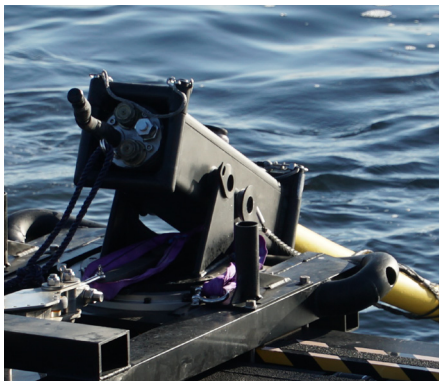


HENRIKSEN

HEMLIS LIGHT-WEIGHT MINESWEEP SYSTEMS

H.Henriksen offers a wide range of highly customizable MCM sweep solutions. Made for the safest operation possible. Allowing operators to stay away from dangerous areas, and work fully remotely from a mothership or on land.

- **Intended for USV operations**
- **Safe, operator free minesweeps**
- **Turn-key, customizable solutions**
- **Lightweight**



USV READY

Our HEMLIS systems are ready for use in conjuction with USV's or others small vessels. With the onboard powerpack to both power, and remotely manage the entire system.

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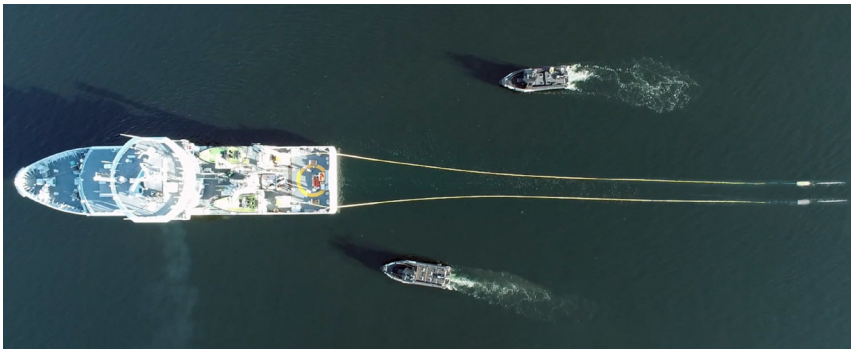
MINESWEEP SYSTEMS

HEMLIS combines accoustic, magentic, and UEP in one lightweight package. With full remote control, 'on the fly' adjustments to various critical parameters. Leading to more effective, and efficient sweeps. Our minesweep systems offers unmatched flexiblity and allows for a wide range of different configurations and setups. This lets us tailor-make the perfect solution, for any situation.

Some common configurations include:

- **Twin USV - Closed loop**
- **Single USV - Straight tail**
- **Single vessel - Closed loop or straight tail**
- **Mothership, or land based deployment**



**Pictured: HEMLIS deployment from mothership, being picked up by two USV's*

One of our main priorities and challenges developing HEMLIS, was to keep the system lightweight.

Once finished, the new system allowed the Norwegian Navy to cut down several tonnes of weight, compared to their exisiting MCM system.

Having a lightweight MCM system offers several advantages, and new possibilites as compared to traditional systems. For example, operation from smaller boats, using less resources. More flexible mounting solutions, even to light USV's, thus vastly reducing operator risk during sweeps. Easier to repair and install upgrades during the systems lifecycle.

The entire system is managed and powered by our innovative lightweight powerpack. Our powerpack generally contains a diesel generator, and a range of management systems and sensors. But can be fully customized to fit your needs.

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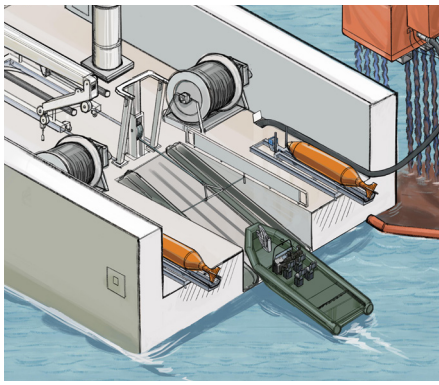
AUV LAUNCH & RECOVERY

The H.Henriksen AUV L&R ramp is one of the lightest and most versatile solutions avaliable on the market. Supporting both L&R from larger, taller mother ships, or compact USV's Proven reliable in various rough conditions all over the world.

- **Light and compact**
- **Works well in rough seas**
- **Fully remote operation**
- **Single or dual stage**



USV READY

The H.Henriksen AUV launch and recovery system is light enough to easily fit on small USV's. Allowing for completely unmanned access to dangerous areas even further away.

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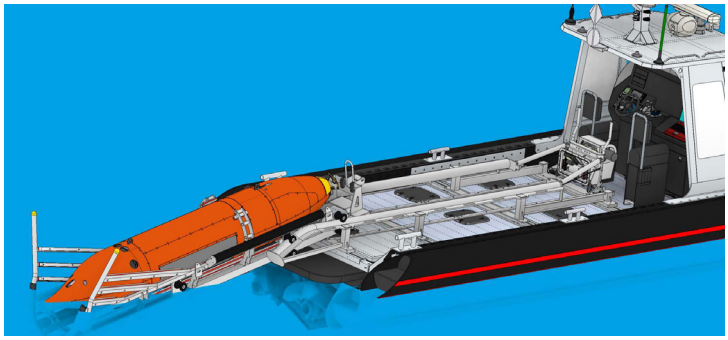
AUV LAUNCH & RECOVERY

The H.Henriksen AUV LARS was developed for dedicated use on smaller boats such as an unmanned surface vehicle (USV). Optimized for low weight, low centre of gravity and to reduce hydrodynamic drag when extended into the water. By using the smallest boat capable of carrying the AUV and its launch system, the user benefits from lower operating costs, combined with the increased manouverability that smaller boats provide.

- **Easy mounting on small boats**
- **Remote operated L&R nose hook**
- **Low centre of gravity**
- **Rapid launch, and recovery**

**Pictured: USV recovering the 780kg and 5.5m long HUGIN*



A key feature of the system is the use of a radio or AUV controlled hook, that is fitted into the nose of the AUV, or whichever vehicle is being deployed.

The Launch System can be adapted to fit a wide range of different vessels, and can pick-up or launch any AUV that has been equipped with the remotely operated nose hook.

Launch operations see the system's stinger extended over the stern of the boat with the AUV carried on its bed. The stinger is then tilted into position, with its end just barely extending into the water. The operator then remotely opens the AUV's nose hook, which releases the retaining line and enables the AUV to slide down into the water and start its mission.

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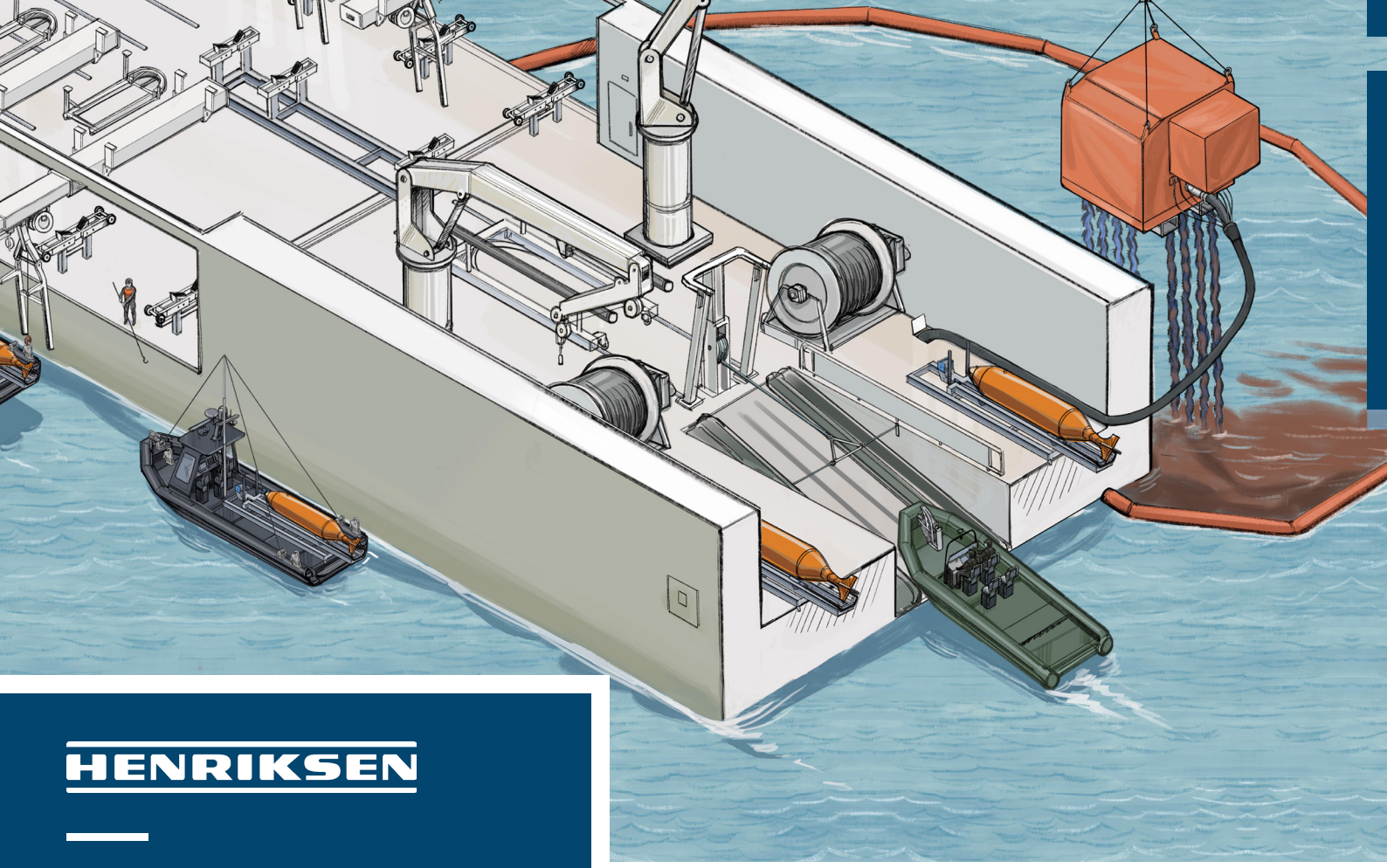

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USV LAUNCH & RECOVERY

H.Henriksen offers several USV launch and recovery systems, such as our capture claw's, and cradle ramp system's. These systems are already proven, safe and reliable solutions on manned missions. But can easily be adapted for USV operation.

- **Unmatched flexibilty in operation**
- **Infinitely customizable**
- **Quick and reliable**
- **Fits almost any boat**

USV READY

Our USV L&R systems are made to solve the long standing problem of how to quickly and safely dock USV's. The capture claw systems also failsafe as a painter hook, if the docking ramp becomes unavaliable

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USV LAUNCH & RECOVERY

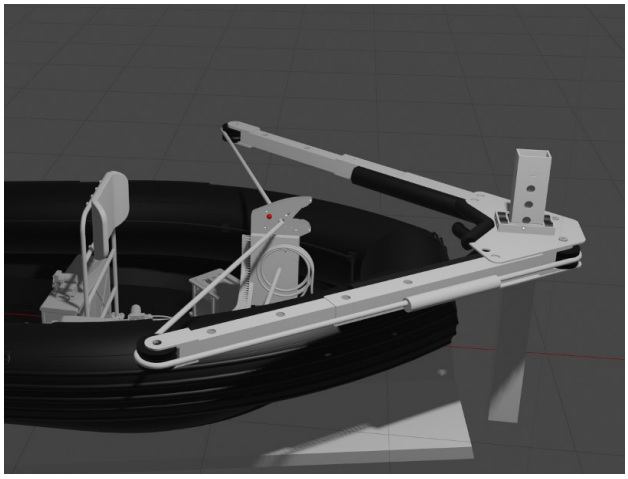
USV's are quickly becoming the go-to solution for a wide range of different, often dangerous missions. Greatly reducing operator risk. However, a long standing problem with USV deployment, was the launch and recovery process. H.Henriksen has developed several solutions to this exact problem. Helping make USV missions even safer and easier to deal with. Offering unmatched speed and safety to the often troublesome docking process.

We are proud to offer a wide range of docking solutions, that can all be customized to fit your exact requirements.

Our solutions are based on 3 main areas:

- **Stern mounted docking ramps**
- **Standalone L&R cradles, made to be winched up or down by the side of the mothership**
- **Tiltable dual stage docking ramps, for smaller vessels**

**Pictured: Cradle ramp being lifted onto mothership after capturing USV*



One of the main factors making our docking solutions so versatile, is the use of our H.Henriksen Capture Claw. This claw lets operators dock or attach to almost any ship. Even ships not intended for USV docking. By simply using the Capture Claw as a painter hook. The Capture Claw is DNV approved as a painter hook. Allowing for safe recovery even if the planned dock becomes unavaliable.

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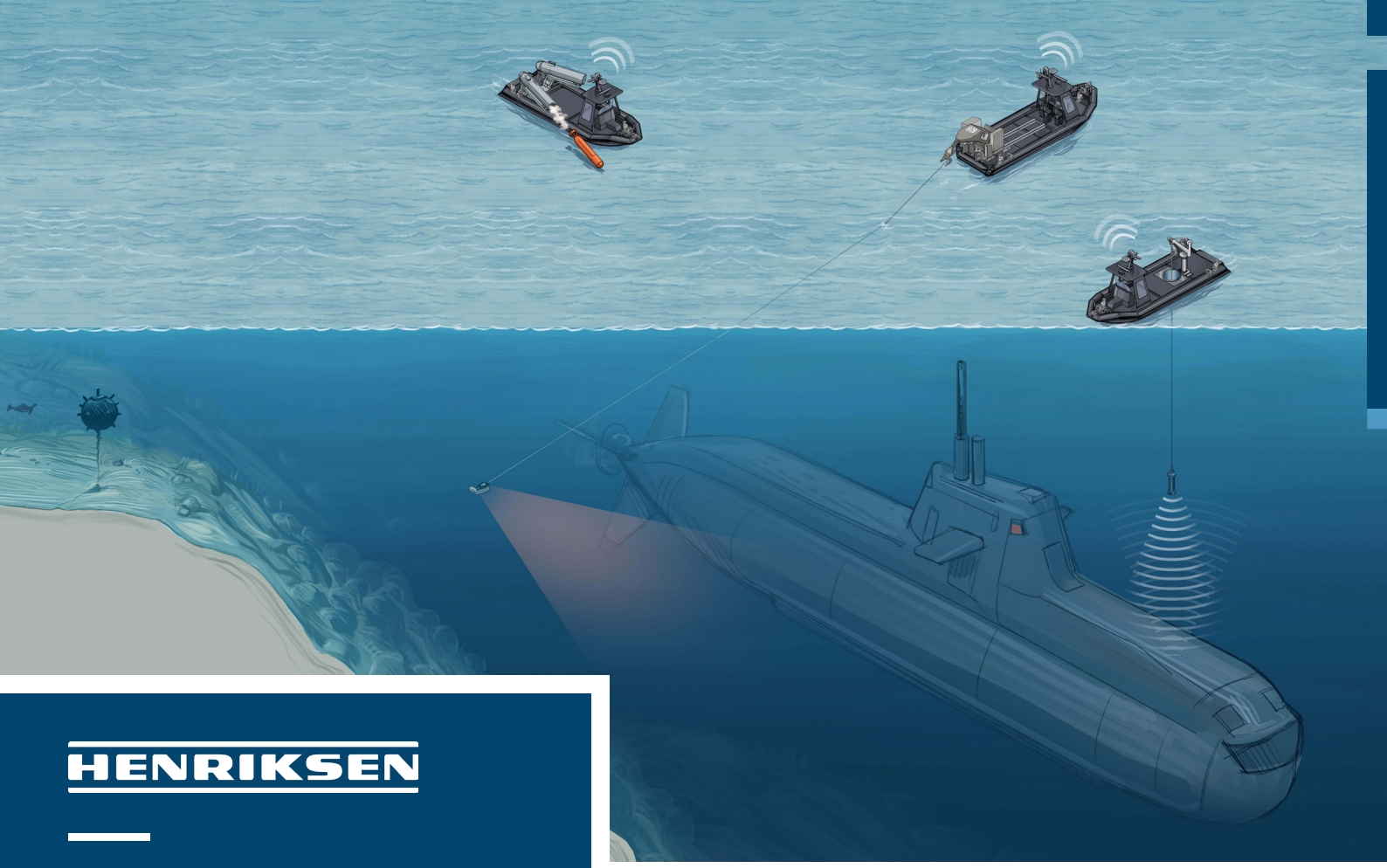

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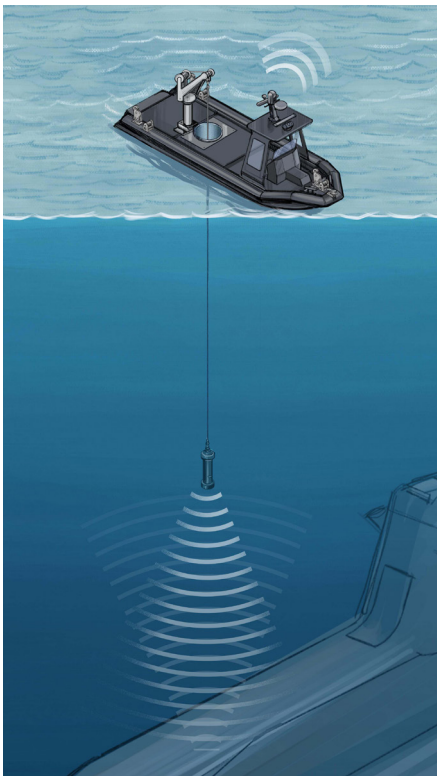
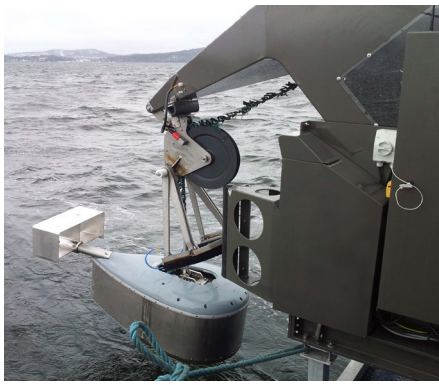
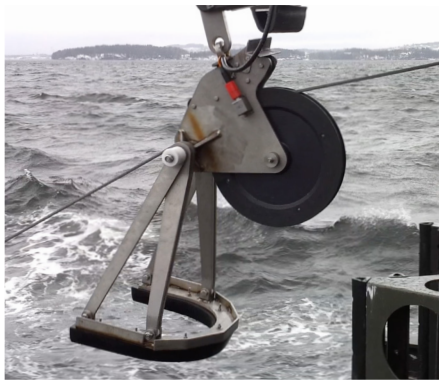
ANTI SUBMARINE WARFARE

H.Henriksen ASW efforts are based on various deployments of sonar detection, combined with innovative winch solutions. Highly customizable to work with a wide range of different sonars and various sized boats.

- **Highly customizable**
- **Suitable for USV operation**
- **Adaptive winch systems**
- **Lightweight construction**







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USV READY

Our sonar systems are suitable for USV operations. Offering full remote control, and light weight construction to fit even small USV's.

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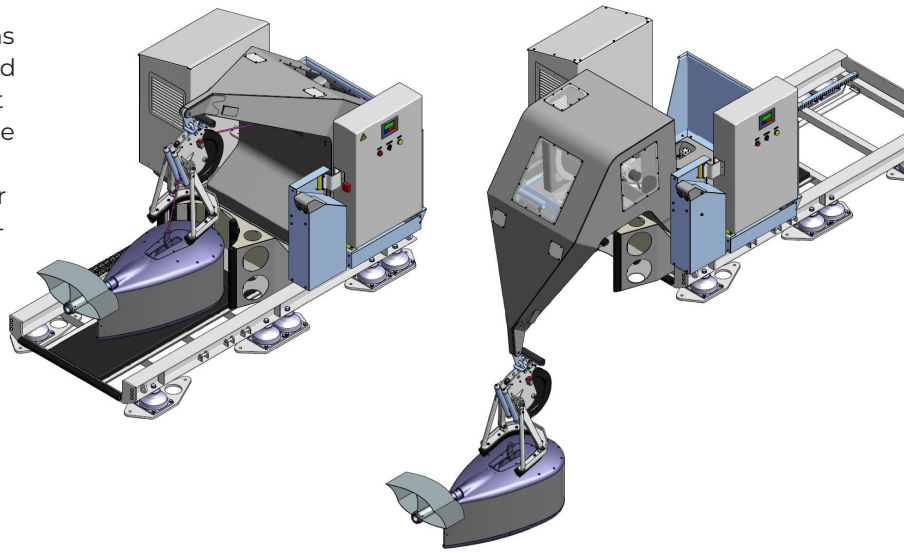
ANTI SUBMARINE WARFARE

Henriksen have a series of crane and winch systems for towed sonars that enables remote or unmanned operations. The system can actively winch in or out during operation to ensure stable conditions for the sonar. The machine is compact in design and can be accommodated in a container-based system for easy logistics. The system is suitable for USV operations as thus greatly reducing cost and risk for the sonar operator.



- **Auto organizing wire spool**
- **Partially automated operation**
- **Low electromagnetic interference**
- **Automatic sonar depth adjustment to hold set distance from seabed**

Henriksen makes customized winches for deploying towed arrays. The winches in conjunction with a depressor systems can be used for unmanned operations and is well suited for deployment, retrieval and operation from USV's.

Henriksen is also working on winches for dipping sonar made for USV operations. A dipping sonar winch with active heave control will drastically reduce operational cost for many dipping sonars operation without the reduction of operational capability.

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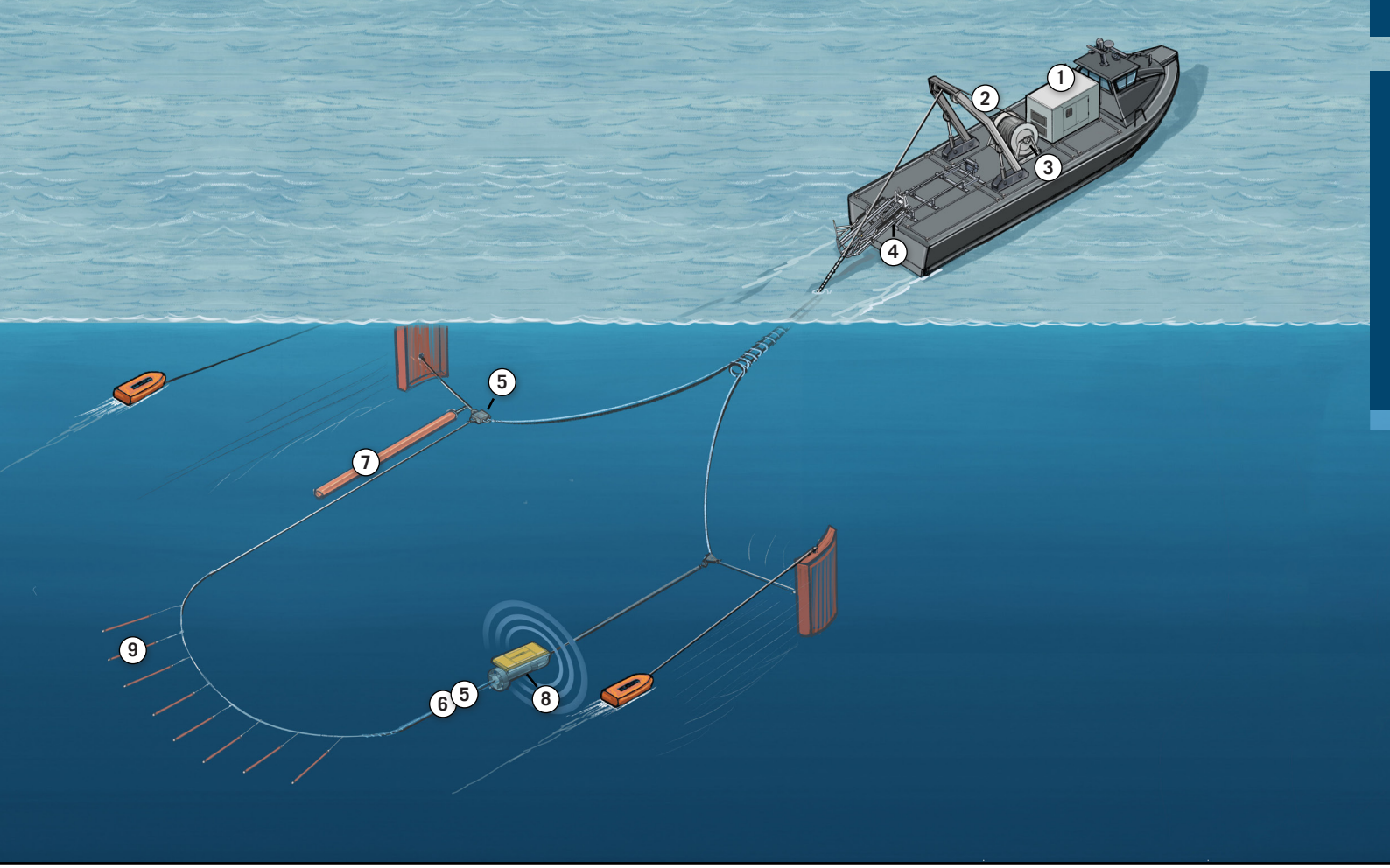


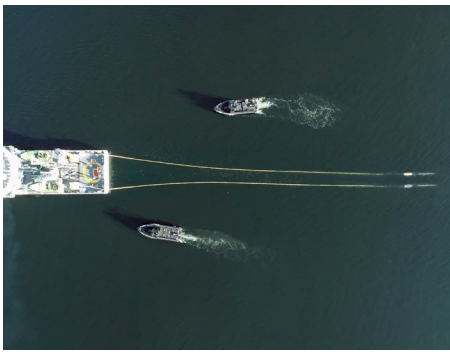
HENRIKSEN

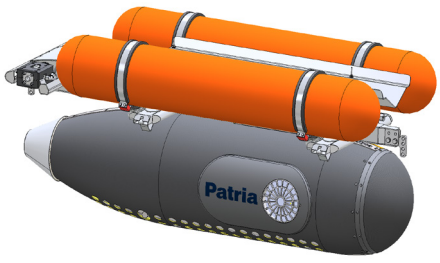
DECK AND SWEEP EQUIPMENT

Mine sweep systems require a wide range of different components, who all need to perform their function perfectly without fault.

We build many of these components in house, and are able to engineer, machine, assemble, and test to fit your required specifications.

1. HEMLIS PowerPack
2. Umbilical clamp
3. Winch
4. Sweep L&R frame
5. Achilles
6. Quick release electrical lug
7. UEP Anode
8. Acoustic source frame
9. R2 Buoy





USV READY

All Henriksen sweep and deck equipment is made with low magnetic interference, marine proof, and lightweight materials. Ideal for USV operation.

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DECK & SWEEP EQUIPMENT

HEMLIS Powerpack

The heart of the sweep system. Standalone, self-powered, light-weight and remote operated.

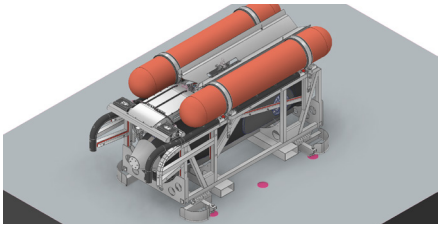
Umbilical clamp

Clamp for the umulical cable(s), avaliable as single or double clamp.

Winch

Lightweight winch systems, fully customtizable for your application.

Sweep L&R frame



Automated launch and recovery system for the acoustic source. Also secures the source for transit.

Achilles

Mechanical part of the Weak Link system, offering repeated breaka-way's in a safe manner.

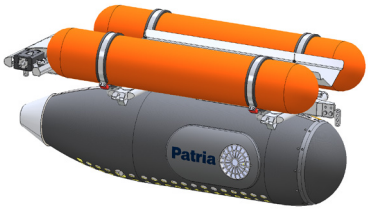
Quick release electrical lug

Electrical part of the Weak Link system.

UEP Anode

UEP Anode for towing. Lightweight, and easy to connect and replace

Acoustic source frame



Mounting for acoustic sources and UPS anode. Rests stable a few meters under water when towed.

R2 Buoy

Robust and slim buoys with mini-mal drag, ideal for mine sweeps.

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