MCMV

Mine CounterMeasure Vessel

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The 55 metre Mine Counter Measure Vessels (MCMV) have proven to be state of the art.

The vessels have proven their capabilities in national and international assignments.

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1 EXECUTIVE SUMMARY

Two state-of-the-art former Royal Norwegian Navy (RNoN) Mine Counter-Measure Vessels (MCMV) are available for sale. Both vessels are now demilitarised, privately owned and released for sale, for civil or naval use.

The vessels have very few hours of operation, as an example, "Minehunter I" has only about 500 running hours, and has mostly been docked at Haakonsvern naval base (Bergen, Norway).

Due to the Norwegian government's reductions of the defense budget, RNoN saw no other solution than laying up the two vessels and "cannibalise" them, i.e. demount certain parts and components to be used on the sister vessels in operation. Hence, the vessels will need partial outfitting to be fully operational. Depending on the intended usage, an upgrade in the range of 8-12 MUSD for each vessel is needed.

The vessels can be acquired as-is or fully operational, upgraded to 2010 standard. (Excluding weapon systems).

The vessels are designed with full protection against NBC weapons in accordance with NATO fortified castle standard.

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2 BACKGROUND

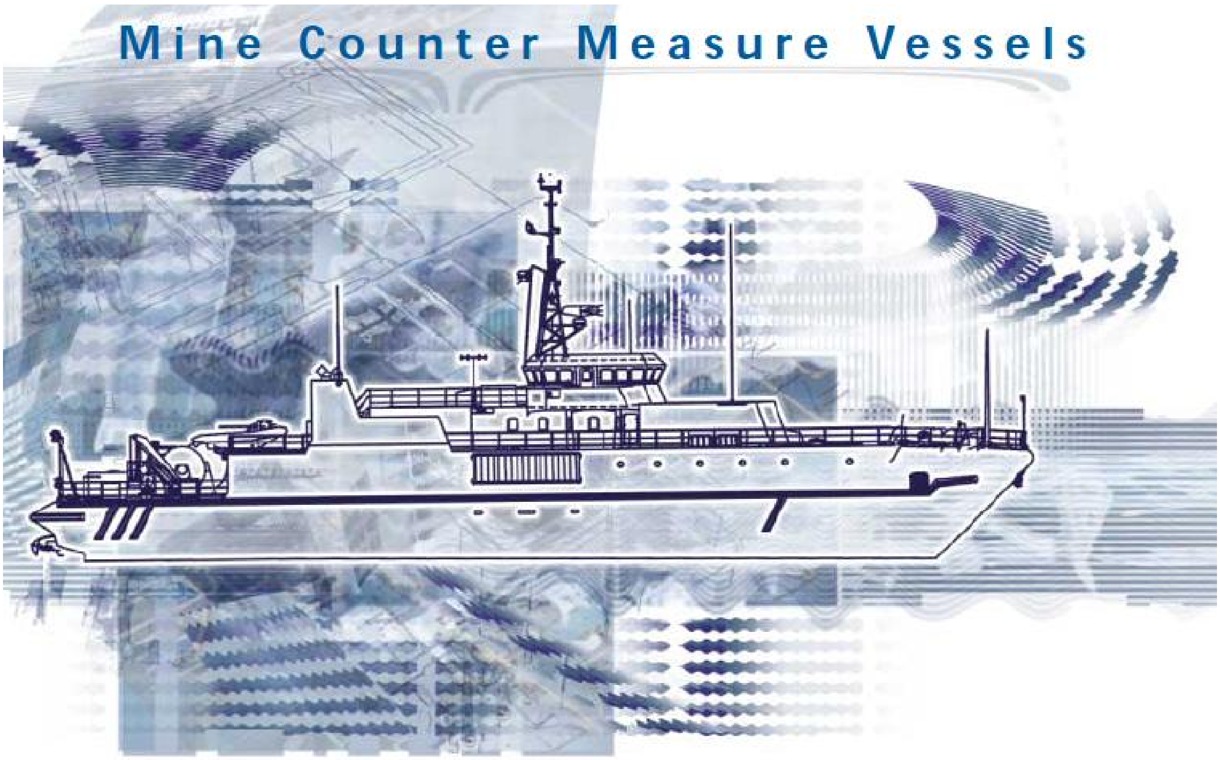
The Royal Norwegian Navy (RNoN) has several decades of mine countermeasure experience both nationally and internationally, in war as well as in peace.

When the RNoN in 1984 decided to replace the old AMS 60 class minesweepers and the prototype minehunter HNoMS Tana, the project was greatly enhanced by experience gained from both home and NATO.

A minehunter based on the Surface Effect Ship (SES) principle was selected in 1987.RNoN contracted 9 vessels in 1994 and was the first navy to have an operational class of SES vessels.

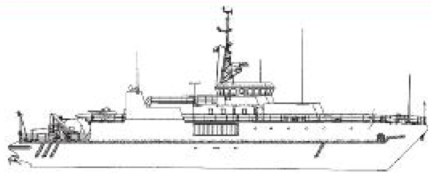
3 VESSEL CHARACTERISTIC

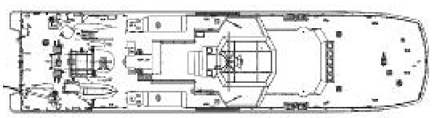
3.1 General

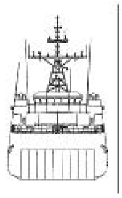


Characteristics

Hull	FRP Sandwich
Length o.a	55,20 m
Beam	13.5 m
Draught	on cushion 0.9 m
	off cushion 2.2 m
Displacement	390 tons
Propulsion	Water jet engines 2x1400 kW MTU 396
	Lift-fan engines 2x750 kW MTU 396
Range	1500+ nautical miles
Speed	Transit speed 20+ knots
Missiles	Manpad SAM
Gun	1x20 mm, 2x12,7 mm
Command and control	Kongsberg MICOS
Sonar	Thomson Marconi Sonar 2023N
Crew	20 to 50, based on operational requirements



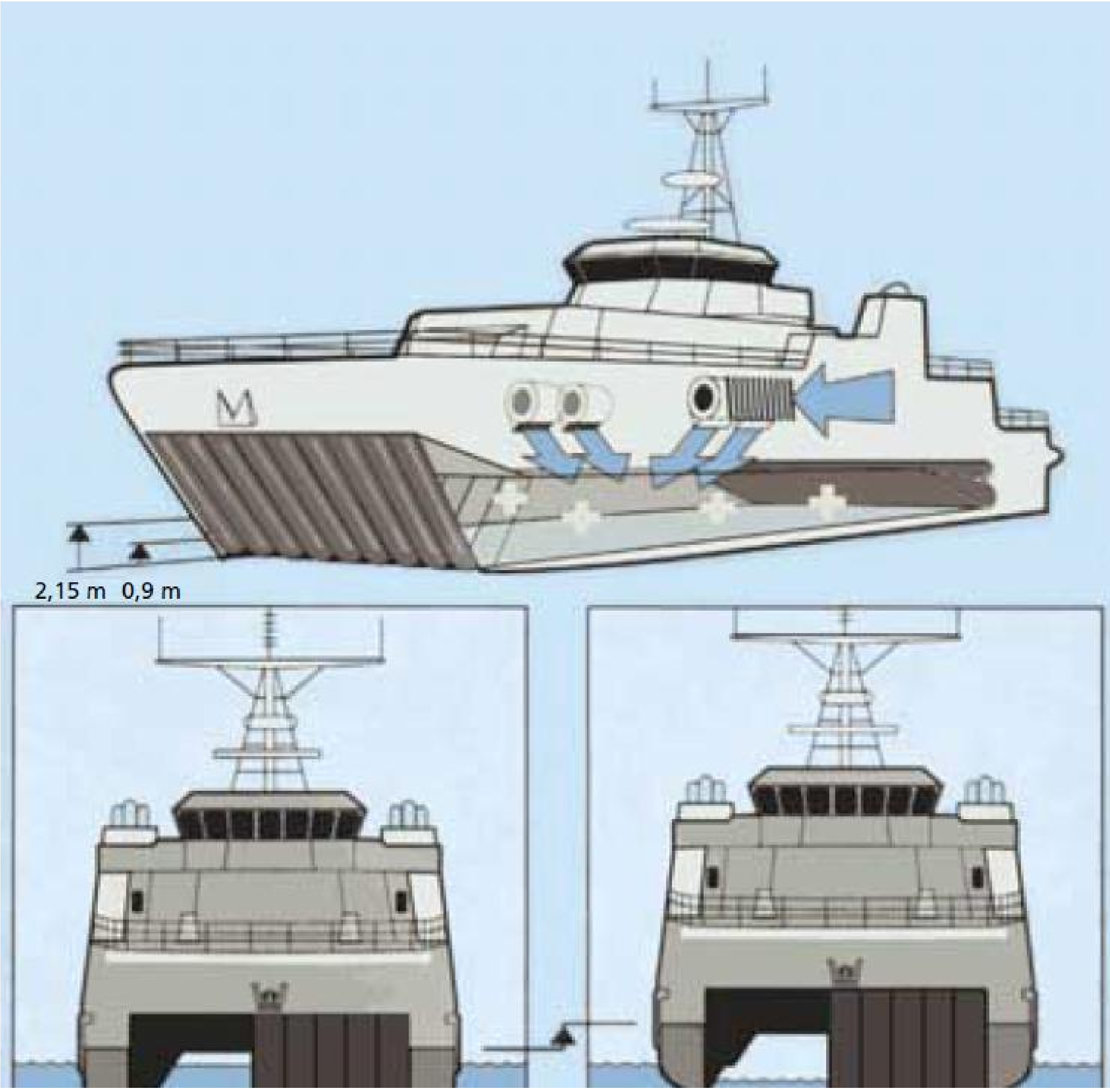




3.2 The Surface Effect Ship (SES) principle

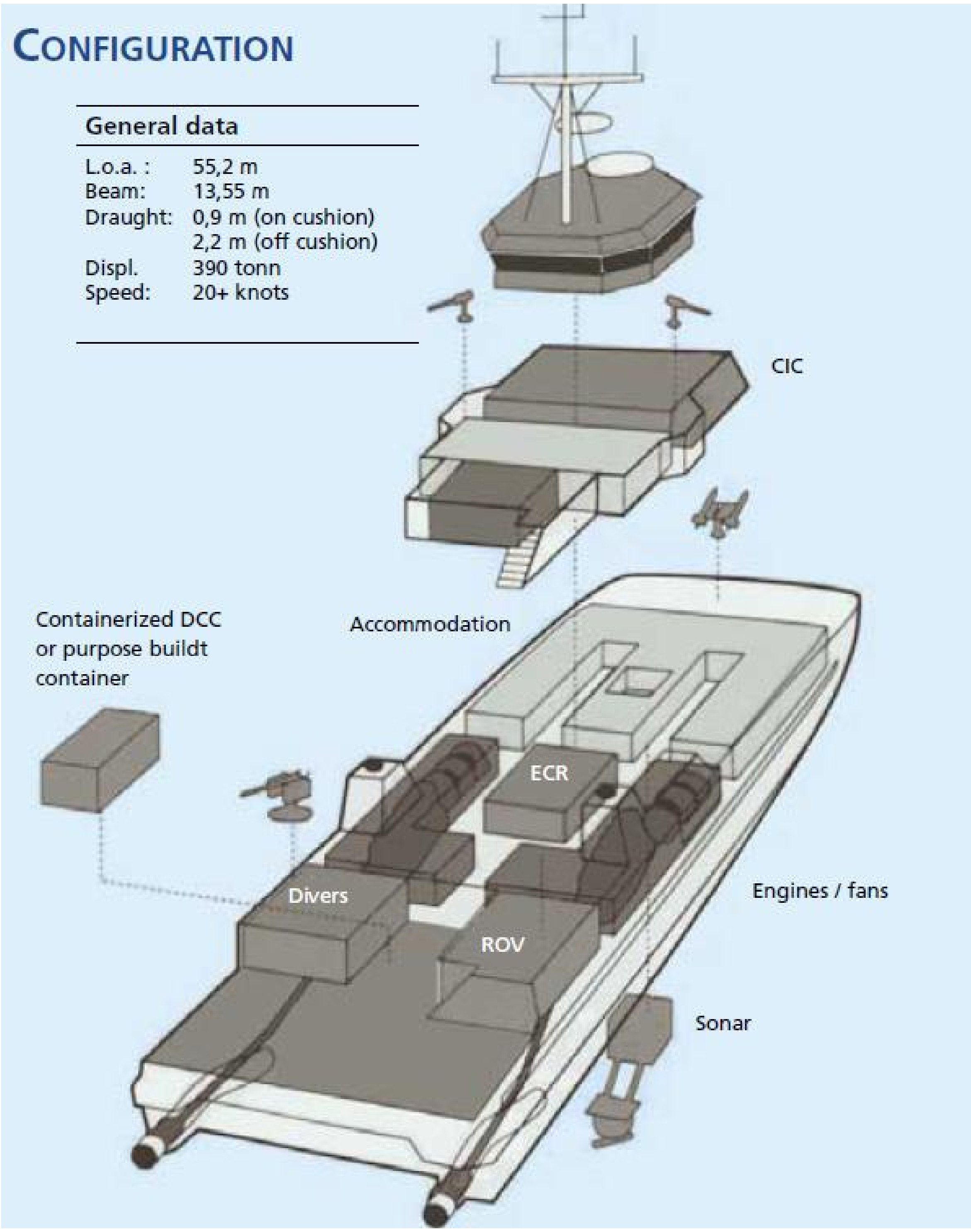
Centrifugal fans increase the pressure between the hulls and the bow- and stern seals by up to 600 millimeters water column, lifting the vessel 1,5 meters. The wetted area is thus reduced by 65%, and the speed potential is greatly increased due to reduced water resistance.

The vessel beam ensures good stability. The air cushion between the side hulls reduces wave-induced motions considerably compared to ordinary catamarans.

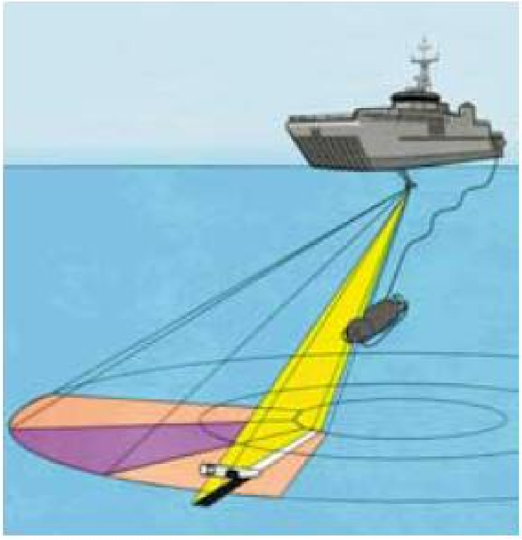


3.3 Naval ship design

The naval architects classical challenge is to optimize the operational performance, survivability and cost. The SES offers a unique combination of the three.



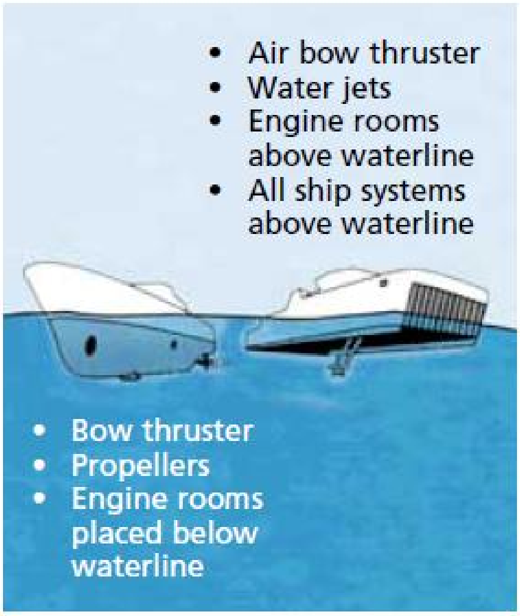
3.4 *Operational performance - MINEHUNTER EFFICIENCY*



The mine hunters built for (RNoN) were equipped with two independent sonar systems. This configuration improves probability of detection and classification of sea mines in waters with difficult sonar and bottom conditions. The solution also improves redundancy and thereby safety in mined areas.

Due to the improved seakeeping capabilities of the SES, there is a great reduction in the hazards involved in deploying divers and/or remotely operated vehicles. This is especially relevant in adverse weather conditions.

The vessel is free to manoeuver the Remotely Operated Vehicle (ROV) without risk of entangling the umbilical.



The vessel is equipped with a spacious area for both remotely operated vehicles and clearance diving teams. The vessel is equipped with a containerised decompression chamber on the aft deck.

It is important that the sonar antenna functions in an environment with little or no possible disturbance from other sources.

While the monohull has a tendency to create turbulence in the water close to the hull mounted sonar; the SES concept offers better sonar conditions below the air cushion.

The sonar antenna on the SES is located 2 meters below the surface while the vessel is operated on-cushion.

During transit, the sonar device is retracted to a position above the waterline. In this position, maintenance and repairs can be carried out onboard.

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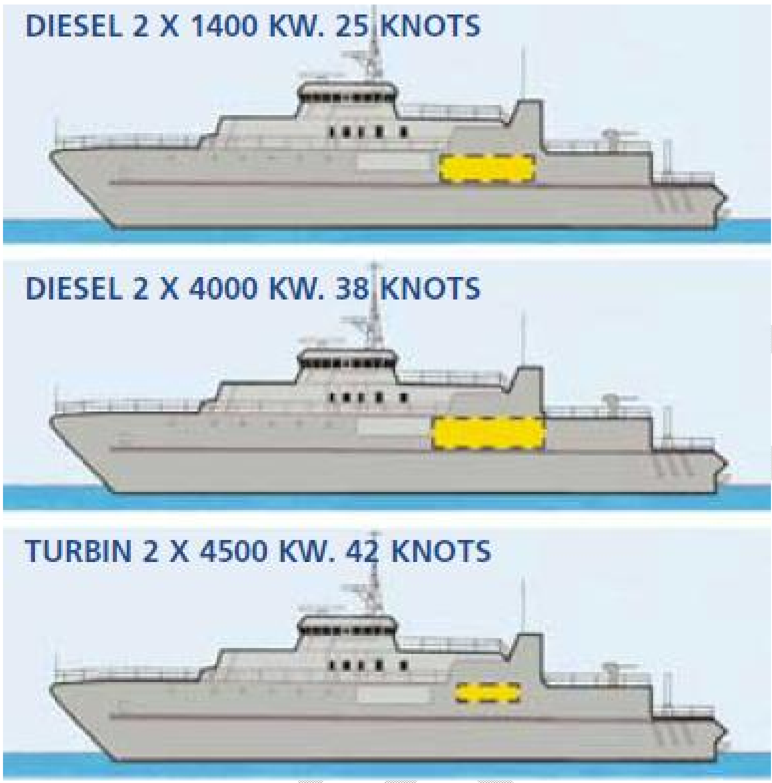
3.5 Operational performance - SPEED

For the SES where 75% of the displacement is “ airborne, the water resistance has been reduced considerably when compared to both monohulls and conventional catamarans.

With comparable main machinery, the MCMV´s transit speed is increased, which ultimately reduces costs.



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3.6 Operational performance - MANOEUVRABILITY

The manoeuvrability of the SES is superior to any monohull due to the long distance between the two hulls, giving a large turning moment from the waterjets.

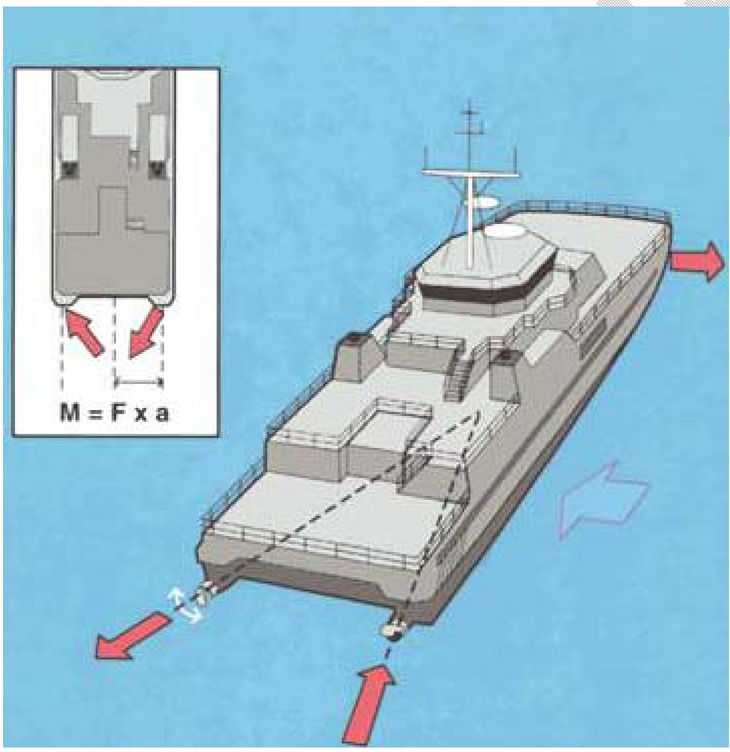
When positioning the vessel there is a risk of disturbing often-marginal sonar conditions. In order to maintain sonar conditions; purpose built waterjets have been developed.

Bow thrusters powered by the air cushion reduce the power required from waterjets. The result is a highly manoeuvrable vessel, which does not develop acoustic noise or turbulence in proximity of the sonar antenna.

The vessel is equipped with a dynamic positioning system, which is fully integrated into the tactical system. This permits the operator to allow computers to take care of navigation and manoeuvring tasks, while he focuses on the threat from sea mines.

The vessel is normally sailed along a pre-planned track automatically calculated to give optimum percentage clearance. During this process the external forces from wind and current are calculated in order to manoeuvre the vessel using as little engine-power as possible. This Minimum Power Heading" function improves safety even more.

Manoeuvring when classifying and identifying mines is performed in a similar way.



3.7 Operational performance - SEAKEEPING

The air cushion between the two hulls causes different and much smoother wave-induced motions compared to the conventional catamaran hull.

Hull acceleration and amplitudes are more advantageous with the SES. There is also a significant difference in the maximum roll angle between the two concepts.

In Sea State 3 the SES has an average roll angle of approx. 2-3°, which is hardly noticeable, whereas a monohull of the same length has a roll angle of more than 10°.

Conclusion

Prior to the of choice of hull concept for the Norwegian MCMV’ s, the Norwegian Institute of Technology carried out a comparative study of monohulls versus SES concepts.

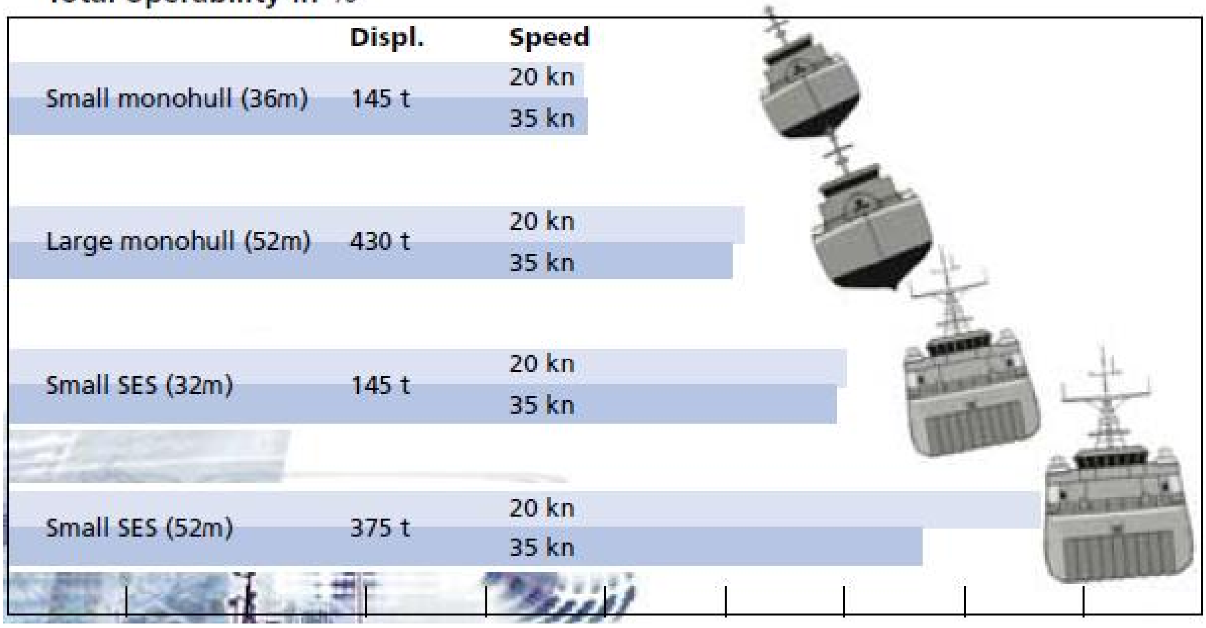
It was concluded that after one year in North Sea weather conditions, a 430 ton monohull vessel was operational only 60% of the time, when compared to a 375 ton SES vessel.

Naval reports based on experience from international operations and exercises have to a great extent confirmed this.

Seakeeping criteria, acceptable levels of ship motions.

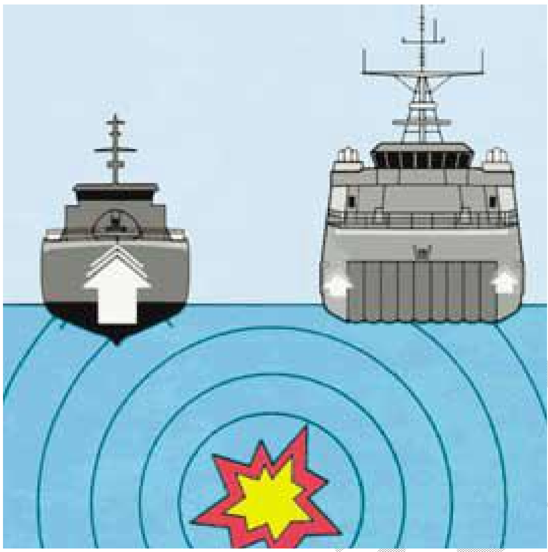
Criteria	Position	Criteria value
Vertical acceleration, bow	FP	6.5 m/s^2 RMS
Vertical acceleration, COG:	COG	2.75 m/s^2 RMS
Pitch motion:		2.0 deg RMS
Roll Motion		4.0 deg RMS
Slamming probability:	Wet deck for SES. Bow for monohull	0.03
Green water, Bow:	Bow	0.05

Total operability in %



3.8 Operational performance - SURVIVABILITY

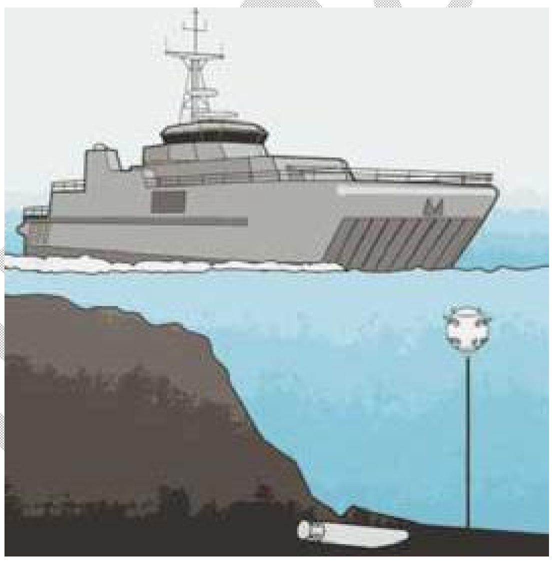
SHOCK LOADS



The impacts from shock loads are directly proportional to the wetted area. Sea trials have shown that the SES receives less shock from underwater explosions than traditional solutions.

An average of the measurements during the Sea Trials showed velocity levels 50% below the STANAG curve.

Given the same distance to the charge, the SES MCMV can receive impact from an underwater explosion with a charge weight four times greater than for a monohull vessel before the measured shock levels onboard will equal the STANAG design shock spectrum.



SHALLOW DRAUGHT

The MCMV is raised to a draught of less than one metre when operating " on-cushion" . This feature offers significant advantages such as operating in shallow waters, which are not accessible for displacement vessels.

The likelihood of grounding is also reduced. Furthermore, a reduced draught means less vulnerability due to less exposed areas.

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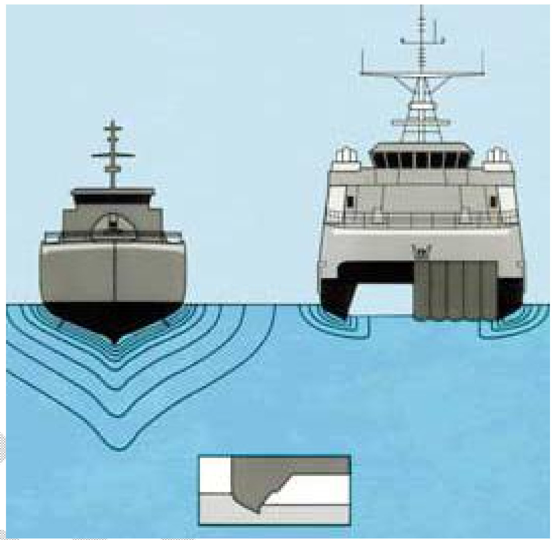
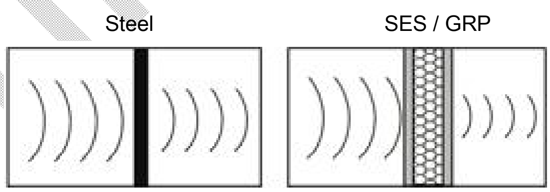
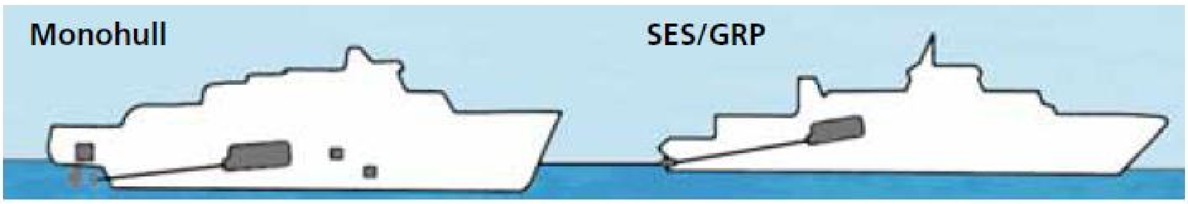
3.9 Operational performance - SIGNATURES

Low signatures are vital for the survivability of an MCMV.
The SES concept boosts performance advantageous in all areas and hence becomes the most efficient MCMV available.



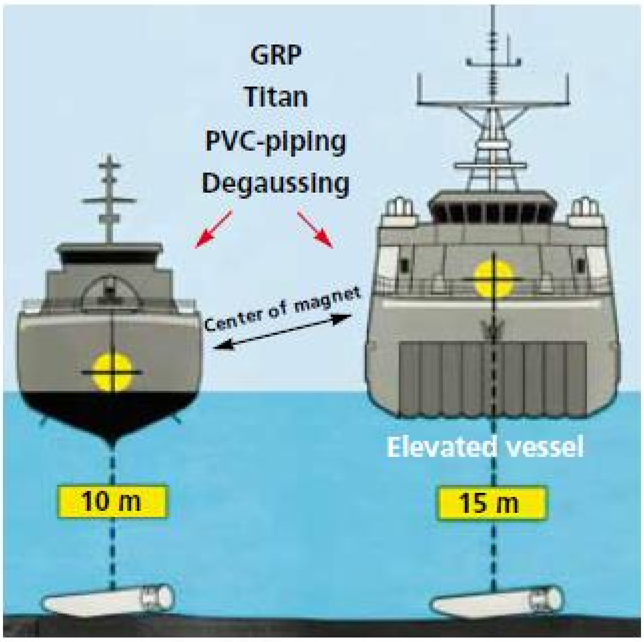




Noise contributers:	Countermeasures:
On-board noise →	Equipment elevated in the ship
→	Reduced wetted surface
→	GRP- noise insulation
Hydrodynamic noise →	Reduced wetted surface
Propeller noise →	Water jet

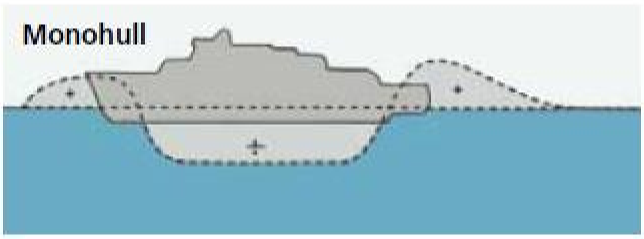
MAGNETIC SIGNATURE

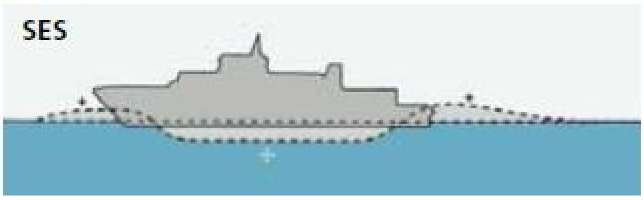
The major problem of the MCMV design is the magnetic signature. Each component and system is designed to meet stringent requirements, including the use of degaussing systems.
The signature of the vessel is improved by increasing the distance from the vessel's magnetic centre and any mine. Thus, the main machinery of the SES MCMV is located on the main deck.



PRESSURE SIGNATURE

Since the pressure signature is dependent on displacement and wave pattern, the pressure signature of the SES MCMV is reduced due to the low displacement compared to the actual size of the vessel.





Monohull:
Lpp 52m Beam: 13m Weight 1000 t.
SES:
Lpp 52m Beam: 13m Weight 375 t.

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4 WEAPON SYSTEM

Originally the vessels were equipped with the following weapon systems. These are no longer onboard.

- **Surface-to-air missile system**
  Sadral twin launcher supplied by MBDA (formerly Matra Bae Dynamics) and armed with the Mistral missile. The Mistral missile was fitted with a 3 to 5 micron infrared and ultraviolet seeker head, a 3kg warhead with impact and laser proximity fuses and SNPE rocket motors. The missile had a range of 4km and approaches the target at a speed of Mach 2.6.
- **Surface-to-air missile system**
  The ships were also armed with one or two 20mm Rheinmetall guns and two 12.7mm machine guns.

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5 MINE WARFARE SYSTEMS

5.1 MINESWEEPING

- The minesweepers were equipped with traditional Oropesa mechanic sweep, a Kongsberg Defence & Aerospace (KDA) Agate (Air Gun and Transducer Equipment) acoustic minesweeping system, and Elma magnetic sweepers.
- AGATE generates the acoustic signature of any ship in order to trigger acoustic mines. It uses airguns to generate low frequency sound and transducers to generate the medium and high frequency sections of the noise signature. Minesweeper mini torpedoes can be carried.
- The minehunters were equipped with two Pluto remotely operated mine disposal vehicles supplied by Gaymarine in Turate, Italy and by Gayrobot in Balerna, Switzerland. The vehicles are stored in the hangar at the aft deck and are launched by two hydraulically operated cranes. A data link between the host ship and the submersible vehicle is via an umbilical cable.
- The vehicle carries sensor equipment selected for the operation, for example a colour camera with black and white low light-level modes, search sonar, scanning sonar and measuring systems for minehunting and mine identification. The electronic package can provide automatic depth, course and speed control and the vehicle's maximum speed is up to 4kt.
- The control console on the ship is equipped with a monitor that displays the camera and sonar image and data from the submersible, including the depth and compass bearing. The displayed data can be recorded for mission analysis.

5.2 MINESNIPING

- Alongside the HUGIN programme, Kongsberg and the Norwegian Defence Research Establishment are developing the Minesniper low-cost mine disposal system for the vessels. Minesniper is a remotely controlled submersible vehicle which is 2m long and weighs about 30kg. It is controlled via a fibre-optic tether and can be fitted with either shaped charge or semi-armour-piercing warheads. Minesniper has a maximum range of 4,000m and a maximum speed of 6kt

5.3 MINEHUNTING AND SONAR SYSTEMS

- The vessels were equipped with the hull-mounted TSM 2023 minehunting sonar supplied by SATSA (consortium between Simrad Albatross and Thales Underwater Systems (formerly Thomson Marconi Sonar). The sonar is used for mine detection and classification.
- In detection mode the sonar is electronically steerable through 360° and covers a bearing of 90°. In classification mode the sonar uses three different frequencies for shadow analysis. The sonar operator uses two TSM 2023 consoles, one for detection and one for classification.
- The minesweepers were fitted with SA 950 hull-mounted sonar supplied by Kongsberg Simrad Subsea AS based at Horten.
- The SA950 is an active sector scanning sonar operating at high frequency (95kHz), with high-resolution multi-beam mode for detection of moored and bottom mines. The echoes from the 32 beams are displayed on a high-resolution colour monitor.

- In March 2007, Thales Underwater Systems was awarded a contract for the replacement of the hull-mounted sonar and the TSM2022 mk3 N the vessels.
    - TSM2022 mk3 N is a modular system which can perform mine avoidance functions while minesweeping as well as minehunting and route survey. The real-time synthetic aperture sonar has a route survey mode with high track resolution. Thales was contracted to supply the TSM2061 mkIII command and control MCM software package.
- The vessels were equipped with two Thales (formerly Racal) navigation radars operating at I-band and a Trimble positioning system with an integrated satellite global positioning system.

5.4 HUGIN mine reconnaissance system

- The Royal Norwegian Navy is undertaking a programme to develop the HUGIN mine reconnaissance system (MRS), to be deployed on the vessels
- The system includes the HUGIN 1000 autonomous underwater vehicle (AUV), developed by the Norwegian Defence Research Establishment (FFI) and Kongsberg Maritime. The first HUGIN 1000 was delivered to the RNoN in February 2004. It is based on HUGIN AUVs in commercial use for offshore oil and gas surveying, one of which was deployed aboard KNM Karmoy in 2002/03. A second HUGIN 1000 was ordered in June 2005 and was delivered in January 2007.
- HUGIN 1000 has an operating depth down to 1,000m and has an advanced Kalman filter-based aided inertial navigation system (AINS). The AUV can carry payload sensors including synthetic aperture sonar (SAS) or side-scan sonar, multibeam echo sounder, sub-bottom profiler, conductivity, temperature and depth (CTD) sensor and volume search sonar.
- A full-capability production model of the HUGIN 1000 will include a high-resolution interferometer SAS sonar system.

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6 Remotely Operated Vehicle (ROV) and other civil use

- The vessels will be very well suited as ROV platforms/mother ships, for all kinds of underwater work that will require divers or ROV operations.
- The vessels have moon pool for ROV and divers and also Dynamic Positioning class DP2
- Seabed mapping – Hydro Acoustics
- Assistance vessel in connection with submarine cable laying
- Monitoring of submarine cables, pipelines and bottom structures.
- The vessel type is designed to be fully protected against NBC warfare agent and is probably the only of its kind that can perform the search for toxic waste, mines etc in connection with subsea pipes and cables.

7 PICTURES


M340