

TKMS



ARCIMS MODULAR USV SYSTEM

The Next Level of Multi-Mission Intelligence



Your Maritime Powerhouse

ARCIMS

MARITIME AUTONOMOUS MISSION SYSTEM

- ARCIMS is an operationally proven Maritime Autonomous Mission System recently procured by the UK MOD
- A military specification Uncrewed Surface Vehicle (USV) with reconfigurable Mission Modules to deliver MCM and hydrographic operations, ASW, maritime security and force protection
- Supplied as a portable stand-alone Mission System or fully integrated with mother ship
- Certified for uncrewed and crewed operations
- Integrates with other Maritime Autonomous Systems for increased operational capability and adaptation to new roles



CONTENT

01	Key Features
03	1. Platform
05	2. Operation
07	3. Mission Modules
13	4. Systems of Systems
15	5. Portable Systems Enable Rapid Insertion into Theatre
17	6. C3 with Autonomous Capability
19	Service and Support
21	Technical Specifications
22	Operational Benefits

KEY FEATURES

1. ARCIMS Platform – a common platform design for multiple mission roles.

Using “in-theatre” proven technology ARCIMS counters a wide range of threats in a flexible and affordable package.

The common platform enables both uncrewed and crewed operations. It meets key design drivers for MCM and other operations including high tow performance, manoeuvrability and stability. The compact platform is optimised to provide a large deck space and payload capacity to host a range of reconfigurable mission modules.

The 11m platform can be deployed and operated from either a mother ship or a shore side base station.

2. ARCIMS Operation – reduced operator workload through uncrewed operations

ARCIMS Mission Systems reduce operator demands on the “Dull, Dangerous and Dirty” activities, enabling personnel to focus on achieving key objectives and results.

Uncrewed MCM removes the man from the minefield using safety approved systems.

Automatic Target Recognition (ATR) reduces labour intensive Post Mission Analysis.

Multiple USVs increase tempo further. They can be fitted with different mission modules to perform simultaneous operations.

3. ARCIMS mission modules

ARCIMS is capable of fulfilling a range of naval applications with reconfigurable mission modules including:

- ♦ Minesweeping
- ♦ Mine Hunting and Mine Disposal
- ♦ Coastal Surveillance and ASW
- ♦ Hydrography
- ♦ Maritime Security and Force Protection
- ♦ Diver support and other crewed operations

4. ARCIMS System of Systems

TKMS ATLAS UK System of Systems (SoS) approach offers significant interoperability benefits.

Leading track record of sea based operations of maritime SoS, including ARCIMS, SeaOtter, third party UUVs and towed sonars, and the SeaFox mine disposal system.

5. ARCIMS portable systems enable rapid insertion into theatre

Rapid insertion into theatre is made possible with the ARCIMS containerised portable system.

Complete Mission Systems are transportable by road, sea and air.

USV transported on a flatbed trailer without the need for a police escort.

The C3 and supporting equipment are packaged within 20ft ISO containers for portability.

Containerised C3 shore station includes power generation and requires no external services. This can be rapidly set to work in any location and within challenging environments.

6. ARCIMS command, control and communications with autonomous capability

Offers end-to-end workflow that leads the operator through the planning, execution, evaluation and reporting stages of a mission.

Safe and robust control validated through 10 years of development and testing.

Open architecture and standardised interfacing enables configuration of mission specific software and third party sub-systems.

Intuitive operator interface with real-time situational awareness using USV on-board sensing.

ARCIMS delivers high levels of autonomy including:

- ♦ Remotely programmable combined influence minesweeping payloads
- ♦ Launch, recovery and control of off-board sensors including towed sonars, UUVs and ROVs

ARCIMS PLATFORM

1. A COMMON PLATFORM DESIGN FOR MULTIPLE MISSION ROLES

ARCIMS platform meets key performance criteria for uncrewed maritime mission roles. It offers a “toolbox” of modular payloads enabling the platform to be reconfigured for minesweeping, mine hunting, mine disposal and other uncrewed and crewed operations.

There is a growing trend to utilise USVs to perform the dull, dangerous and dirty operations conventionally undertaken from crewed naval ships.

The goal for TKMS ATLAS UK has been to offer customers a modular USV system that counters a wide range of threats in a flexible and affordable package.

Multi Role Platform

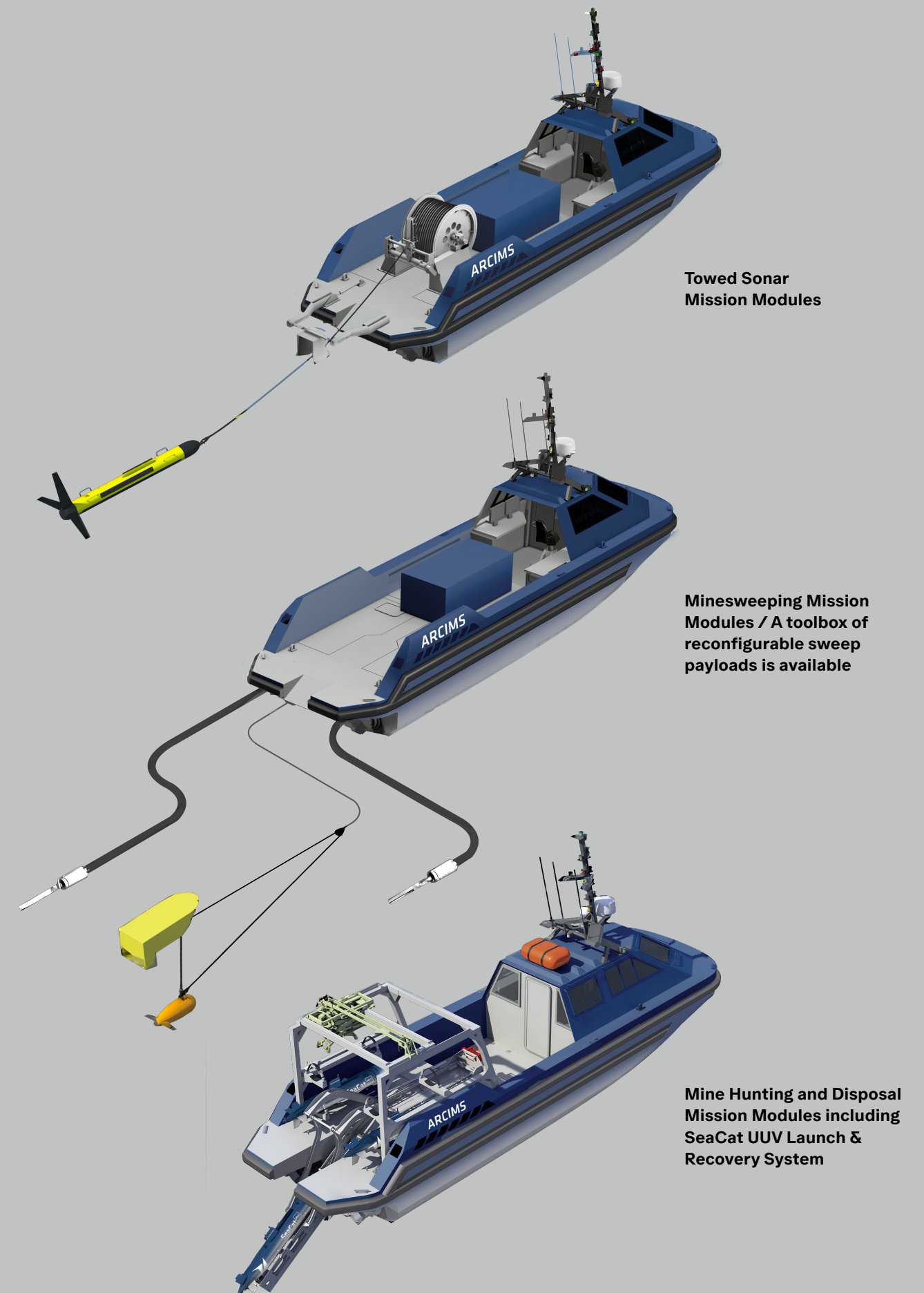
Specifically designed to provide a large open deck space with a 4 tonne payload capacity enables a range of existing and future mission modules to be installed.

Towing, Manoeuvring and Stability

ARCIMS high tow performance across a wide speed range assists minesweeping and towed sonar operations. The cathedral hull design maximises straight line stability during controlled sweeping and provides a stable platform for the deployment and recovery of off-board systems. With a top speed of over 40 knots ARCIMS can transit to and from the operational area quickly.

Standard and Bespoke Design

ARCIMS is based on a standard platform size and this can be scaled and adapted to meet specific customer requirements.



2. REDUCED OPERATOR WORKLOAD THROUGH UNCREWED OPERATIONS

ARCIMS Mission Systems reduce operator demands on “Dull, Dangerous and Dirty” activities, enabling personnel to focus on achieving key objectives and results. Uncrewed MCM removes the man from the minefield using safety approved systems. Autonomy reduces labour intensive mission planning, execution and analysis. Multiple USVs increase tempo further, and can be fitted with different mission modules to perform simultaneous operations.

Uncrewed and crewed operations

ARCIMS is primarily designed as an autonomous vehicle enabling uncrewed operations with minimal remote operator intervention. This significantly improves safety by removing the man from the danger area, such as a minefield, an area of contamination, or simply a high sea state.

ARCIMS wheelhouse includes helm controls enabling optional crewed operation, not available from some USVs. Alternatively, the wheelhouse can be configured for accommodating a full crew, including seating and multiple workstations for mission planning, operation and post mission analysis. An example is RNMB Hazard, operated by the Royal Navy Maritime Autonomous Systems Trials Team (MASTT), which enables launch and recovery of mine hunting UUVs and ROVs.

Reduced operator workload

Automation in mission planning, execution and post mission analysis reduces the operator workload and still allows total user command and control.

Military specification and certification

ARCIMS has been designed and qualified to meet military specification and performance including explosive shock, EMC and low signature levels.

The platform is certified by the MCA in accordance with the Code of Practice for the Safety of Small Commercial Motor Vessels, meeting SCV and MGN280 requirements (Category 2).

ARCIMS is fitted with COLREG compliant lights and shapes for towing and minesweeping operations as well as SOLAS compliant life saving equipment for crewed operation.



Optional Wheelhouse Layout for Crewed Operations



Wheelhouse Minimal Layout for USV

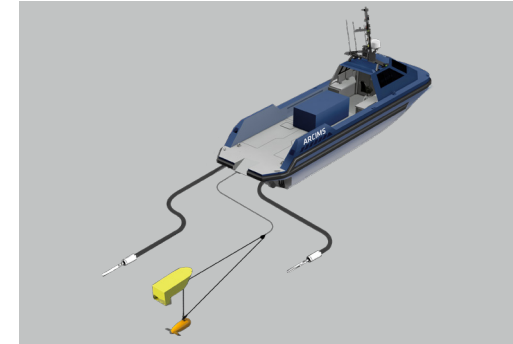
3. COMBINED INFLUENCE SWEEP

The ARCIMS Sweep Mission Module enables combined influence high tempo MCM operations. A “toolbox” of sweeping equipment deliver MSM and TSM sweeping to counter the most sophisticated modern mine threats.

TKMS ATLAS UK is currently supplying an uncrewed minesweeping capability to the Royal Navy (RN) using our latest advanced sweep payloads and autonomy. This builds upon our proven ARCIMS Sweep Mission System, with two systems currently in-service with an overseas navy.

Our proven in-service equipment is the next generation solution for safe sweeping operations, offering rapid response, improved operational effectiveness and reduced through life cost.

It is a modular system fully integrated with the ARCIMS platform and can also be simply installed on third party platforms.



Modularity and Flexibility

A toolbox of modular sweep payloads easily fit to the ARCIMS platform. These are configured to overcome specific threat assessments and operational requirements.



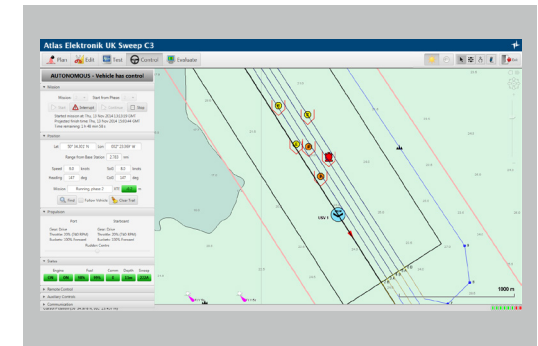
High Tempo

High tempo operations are achieved with the combined influence sweep equipment that can be towed from either a single or multiple ARCIMS platforms.



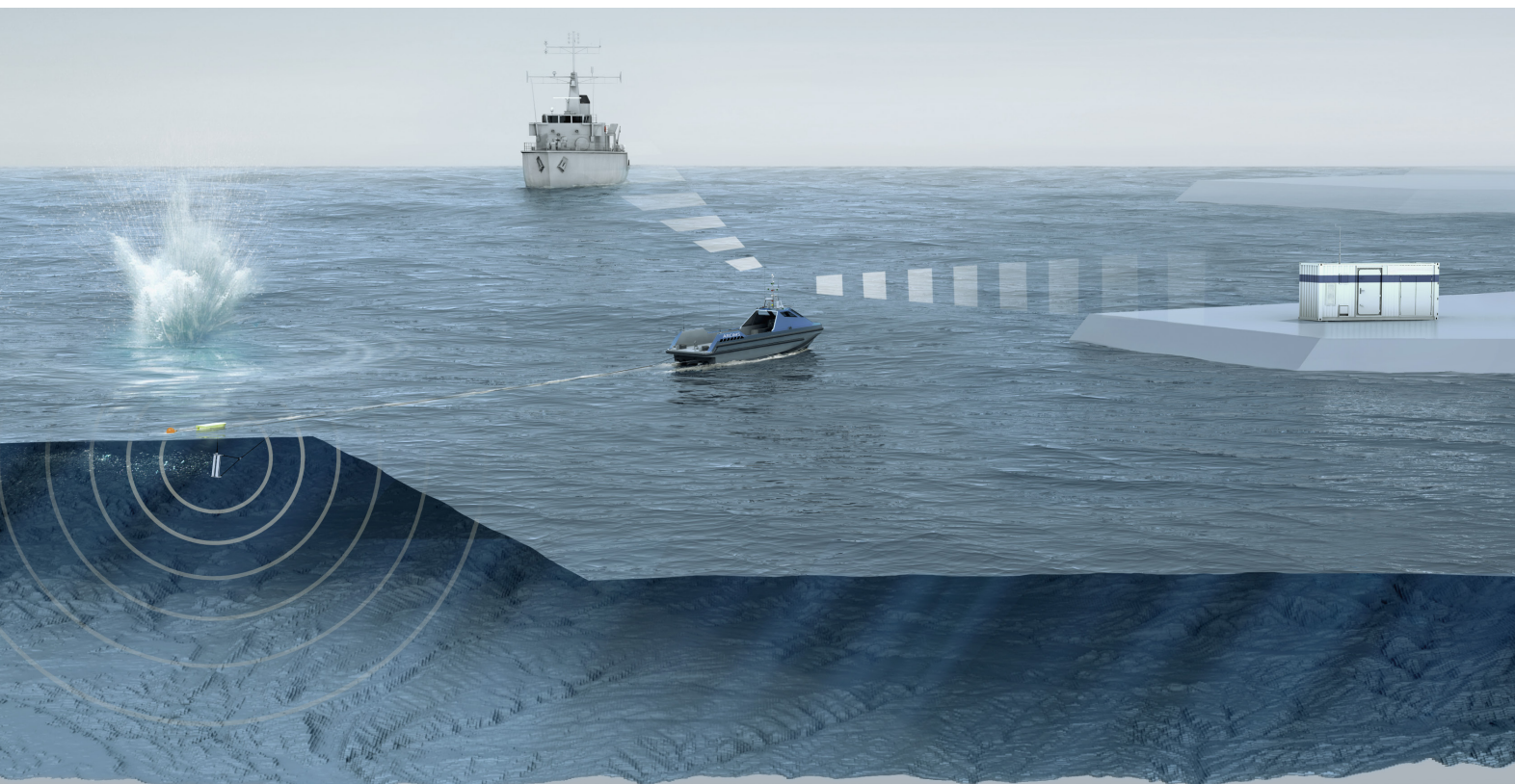
Safety

Removes the “man from the minefield” using approved safety systems to ensure safe operations.



Tactical Decision Aids

Sweep TDAs provide the MCM commander with the tools to conduct effective uncrewed minesweeping operations.



ARCIMS Modular USV System



Power Generation Module

TKMS ATLAS UK has designed a high power, lightweight, multi-function PGM to support multiple sweep payloads that is neatly packaged within a fully qualified cabinet for military use.

“This sophisticated equipment with a range of capabilities will enable our Armed Forces to undertake mine clearance in challenging environments.”

PHILLIP DUNNE
UK Defence Minister

ARCIMS MISSION MODULES

3. MINE HUNTING AND DISPOSAL

We provide the complete sensor to shooter solution from mine detection through to neutralisation and disposal. ARCIMS mission modules include launch and recovery of off board UUVs, mine disposal systems and towed sonars to deliver high tempo operations using advanced sonar technology.

ARCIMS has been designed to accommodate a range of payloads, supplied by TKMS ATLAS UK and third parties, to provide flexible end-to-end solutions to suit specific customer needs. A toolbox of advanced towed sonars, UUVs and mine disposal systems enables ARCIMS to perform mine hunting in a range of environmental conditions whilst reducing the overall engagement time, including mission planning, execution and analysis.

UUV and ROV
Launch And Recovery System (LARS)
ARCIMS LARS provides rapid deployment and recovery of small/medium UUVs, ROVs and mine disposal systems including the SeaCat UUV, SeaFox MDS and third party systems such as the REMUS 600 UUV. The UUV pick and place LARS enables single or multiple UUV stowage options.

Towed Sonars
TKMS ATLAS UK has teamed with industry to integrate high performance mine hunting towed sonar systems with ARCIMS. As system integrators, we can supply full system packages, including customer specified payloads, to meet particular performance and budget requirements.

Uncrewed and Automated Operations
Uncrewed operations are achieved through the automated deployment and recovery of off-board vehicles. Sensor data is uploaded to ARCIMS and seamlessly transmitted to the remote C3 station, either on board a mother ship or shore side.

Alternatively, ARCIMS can be crewed for semi-automated launch and recovery of off board payloads. The wheelhouse, fitted with workstations, provides a comfortable environment for the performing command, control and communications.

Mission Planning and Analysis
The Mission Planning toolset enables autonomous missions to be planned and executed for specific mine hunting operations. Classiphi post mission analysis software enables processing of sensor data from a range of uncrewed systems.

Detection, Localisation, Classification
Rapidly achieved by operating multiple UUVs simultaneously or towed sonar. Post mission data is uploaded to the ARCIMS platform enabling high tempo operations.

Post mission data is uploaded to the ARCIMS platform enabling high tempo operations. This data is immediately available to either the on-board or remote operator.

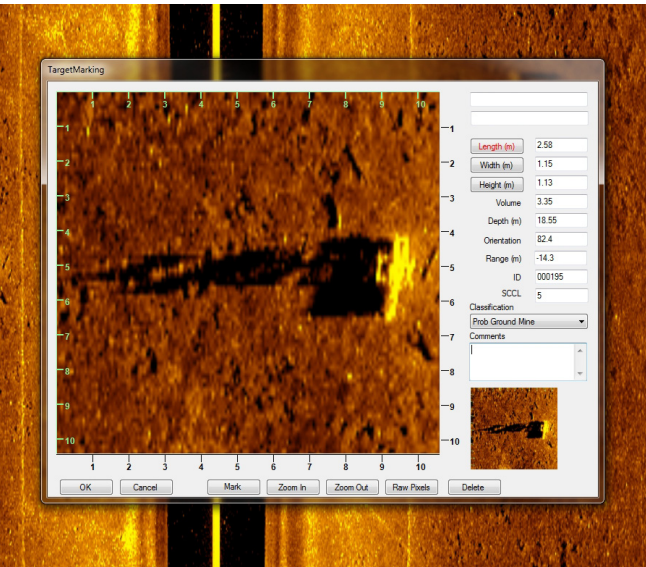
Relocation, Identification, Disposal
Mine identification and disposal is achieved using the proven TKMS ATLAS UK SeaFox or an inspection ROV.

Both can be fitted with the Cobra detachable disposable head to provides a cost effective solution for mine disposal where the vehicle is recovered.

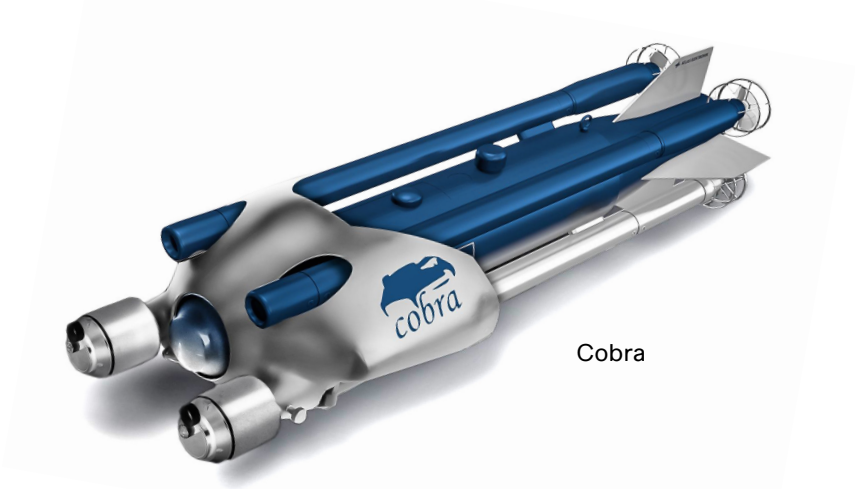
Tactical Decision Aids
REMORA (Risk Evaluation and MCM Obstacle Route finding Aid) provides the MCM Commander an optimal route and mine risk assessment, and is specifically designed for the use with uncrewed systems. Third party TDAs can also be incorporated within the module to meet specific customer requirements.



RNMB Hazard delivered to Royal Navy Maritime Autonomous Systems Trials Team (MASTT)



Target Marking



Cobra

3. EXPANDING THE CAPABILITY OF UNCREWED MARITIME SYSTEMS

The ultimate goal for TKMS ATLAS UK has been to offer customers a modular USV system that counters a wide range of threats in a flexible and affordable package.

Following the delivery of in-service solutions for minesweeping and mine hunting, we continue to develop new solutions for expanding the capability and flexibility of ARCIMS as a multi-role system.

Hydrography

ARCIMS can deliver an increased hydrographic capability above that currently achieved using conventional vessels and techniques, through a combination of modern hull mounted sensors, towed sensors and off-board underwater vehicles. The navigational accuracy requirements of IHO standards is met using modern sensors and processing techniques.

The ARCIMS USV can replace conventional Survey Motor Boats, deployed from Survey ships, to deliver remote rapid environmental assessment (REA) and military data gathering (MDG) and reduced operator workload. In addition much of the same equipment can be used for mine hunting operations.

Coastal Surveillance and ASW

ARCIMS offers a flexible and affordable capability for maintaining sea lines of defence within your territorial waters. With the increasing threat of asymmetric warfare, nations are seeking cost effective solutions for protecting their territorial waters and strategic coastal assets and infrastructure.

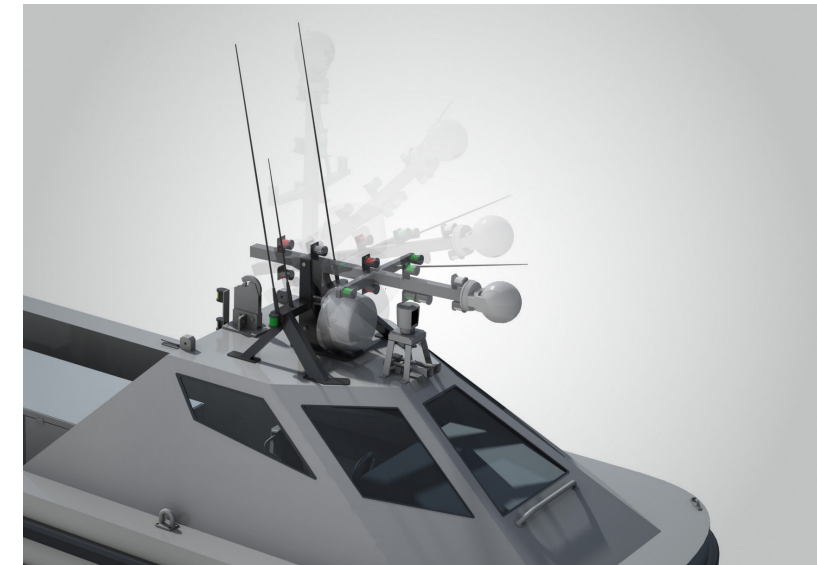
ARCIMS deployed active or passive sonar systems provide an underwater surveillance capability at significantly lower cost than traditional platforms.

The platform can deploy towed active and passive arrays, dipping sonar or sonobuoy systems, from both TKMS ATLAS UK and other suppliers.

The sensor fit can be selected to meet the end-user needs and deliver effective target detection within challenging littoral environments. Surveillance solutions are offered for monitoring the presence of underwater targets, including submarines, midget submarines, diver delivery vehicles, AUVs and divers.



ARCIMS Mission Modules



Multi-sensors

Maritime Security and Force Protection

ARCIMS is equipped with above water sensing equipment including radar, electro-optic cameras and other sensor types capable of automatic target detection and tracking. Real time situational awareness and ISTAR data is presented to the remote operator who is able to respond to automatic alerts or visual contacts presented at the display console. Under remote control, the high speed, highly manoeuvrable platform is used to interrogate or intercept potential threats.

This highly agile vessel, with a top speed of +40 knots, coupled with high performance sensing and imagery, delivers an effective system to aid maritime security and force protection applications.

Onboard multi-sensors provide long range high resolution images to remote platform for Intelligence, Surveillance, Target Acquisition and Reconnaissance ISTAR.

ARCIMS

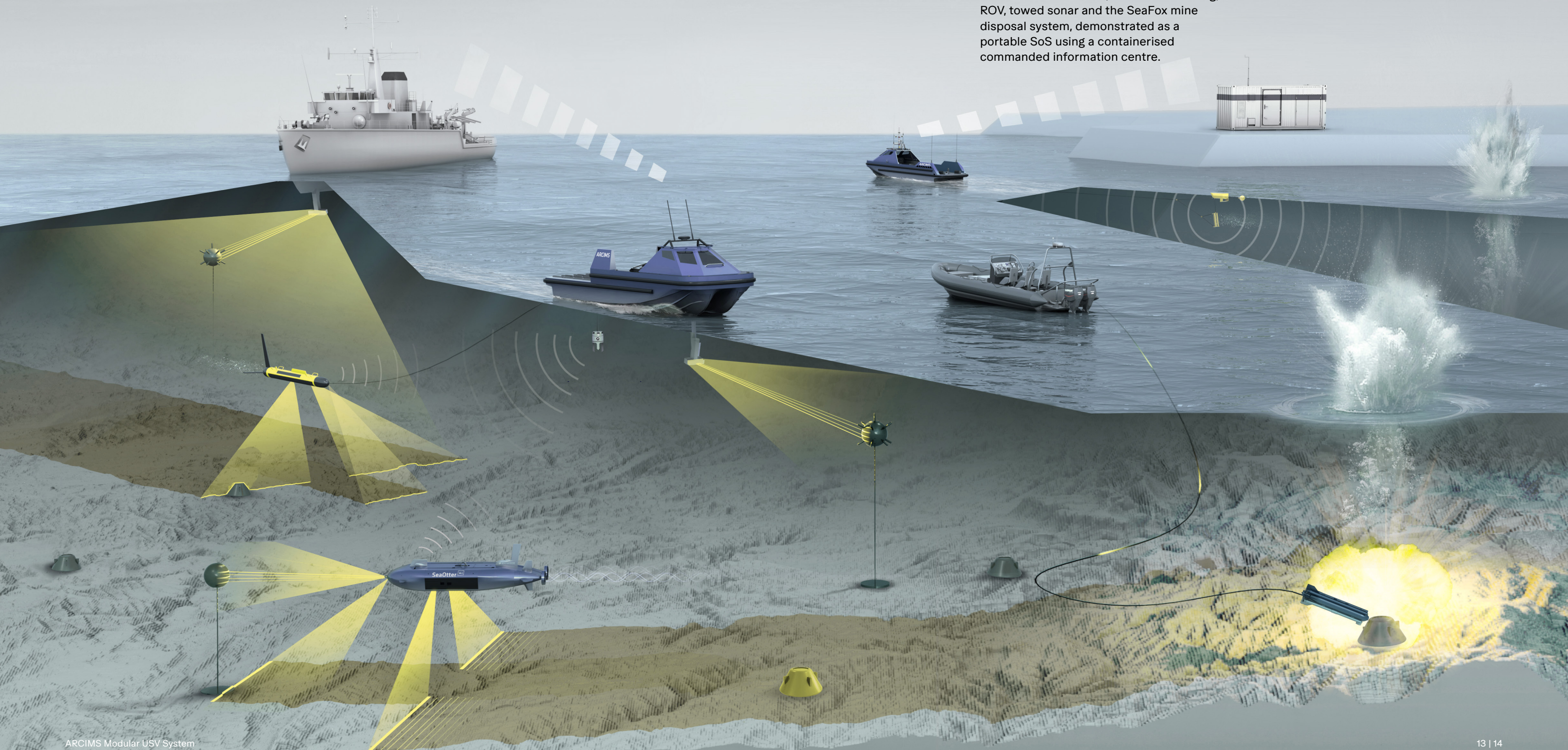
4. SYSTEM OF SYSTEMS AN INTEGRATED UXV CAPABILITY

From the outset, TKMS ATLAS UK has applied a System of Systems (SoS) approach to the development of our maritime autonomous systems. This offers greater interoperability between uncrewed systems and crewed platforms, increasing the effective military capability in an efficient and cost effective manner.

As a Systems Integrator, we have a leading track record in the development, integration and sea based operations of maritime SoS. This has included the operation of the multi role ARCIMS USV with the SeaOtter UUV, UUVs with docking, ROV, towed sonar and the SeaFox mine disposal system, demonstrated as a portable SoS using a containerised commanded information centre.

Our modular approach provides the customer with the flexibility to create a SoS to achieve their specific goals and to modify the capability for different operational roles. An initial ARCIMS capability can easily be expanded to integrate other uncrewed systems at a later date.

We adopt widely supported interface standards to ease integration between TKMS ATLAS UK and third party systems.



5. PORTABLE SYSTEMS ENABLE RAPID INSERTION INTO THEATRE

ARCIMS offers significant benefits to MCM and other naval concepts of operation. This compact and modular system enables rapid insertion of equipment into theatre, and offers a new way of thinking towards MCM planning and readiness.

ARCIMS offers the flexibility to rapidly deploy MCM and other naval capabilities using various forms of transportation and military assets, with less dependency on specialised MCMV platforms.

Road, Air and Sea Transportation

The ARCIMS USV platform and mission modules can be loaded directly onto low loaders for road transportation without a police escort.

ARCIMS is designed for A400M air transportation. This enables the complete capability to be transported by road, sea and air for rapid insertion into theatre.

Containerised Systems

The ARCIMS Portable version incorporates an ISO containerised C3 office with integral power generation enabling the shore side system to be set to work in remote locations without the dependency on external power services or local infrastructure.

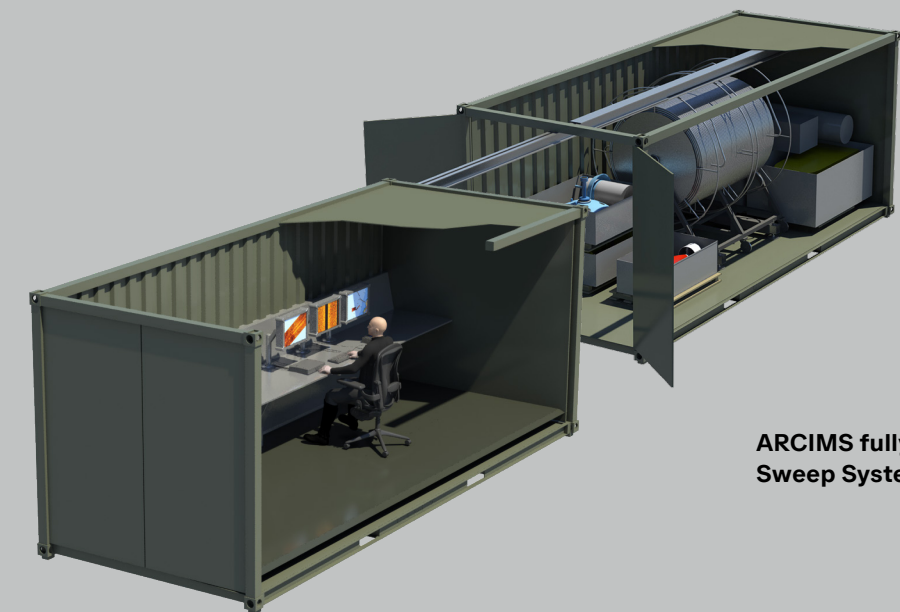
Operations from a Mothership

TKMS ATLAS UK has partnered with industry to develop a solution for the deployment, operation and recovery of ARCIMS from various sized mother ships.

As System Integrator, TKMS ATLAS UK is able to manage the complete ship integration aspects including design, build and installation support. We can also offer a containerised system where a standalone temporary ship fit is required.



ARCIMS can be simply transported into theatre using a containerised method



ARCIMS fully containerised Sweep System

6. C3 WITH AUTONOMOUS CAPABILITY

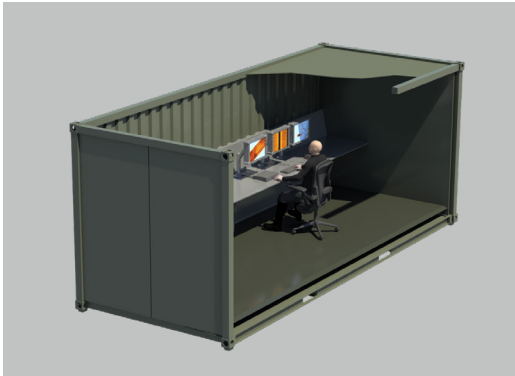
The ARCIMS C3 System offers an integrated end-to-end workflow that leads the operator through the planning, execution, analysis and reporting stages of a mission.

Integrated or Stand Alone Solutions
ARCIMS C3 can be operated from a ship or a shore side control station. The shipborne C3 can be fully integrated with the ship's Command Management System (CMS) and hosted on a common console. Alternatively, it can be installed on a ship as a stand alone system offering a more portable solution.

The C3 is also available as a shore side portable system.

This has been supplied to an existing customer as a low cost containerised solution, enabling remote operations from a well found port, without the need for any external power services or infrastructure.

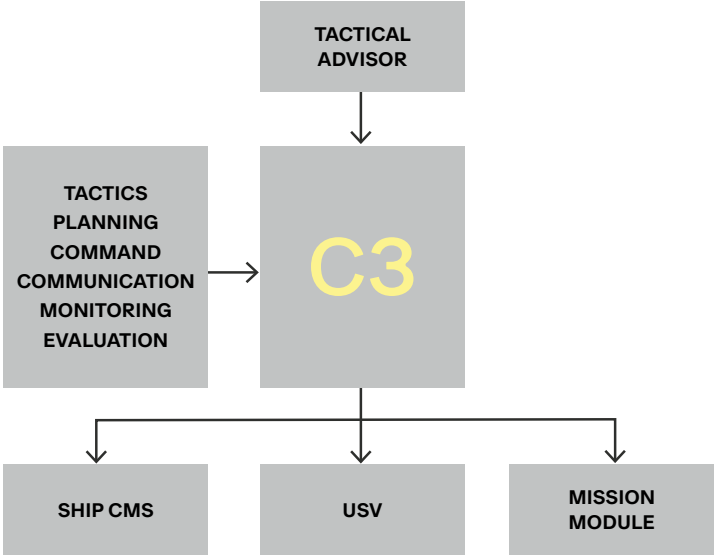
A hand held console is also supplied as a second means of remote operation. This is particularly useful when controlling the USV at short range during USV deployment and recovery operations.



C3 Containerised Office for Portability



C3 Integrated with Mothership Command Management System, such as the TKMS ATLAS UK IMCMS



Intuitive Operator Interface
Our Human Machine Interface (HMI) is intuitive and easy to use, with operator training sessions taking new users from zero knowledge of the system through to confidently planning and executing missions within only a few hours.

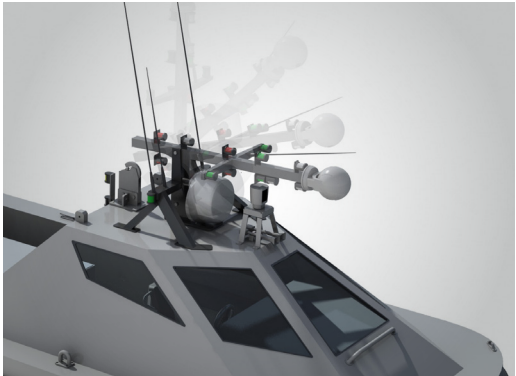
Situational Awareness
The HMI operates seamlessly with the high data rate communications infrastructure and on-board sensors to provide real-time situational awareness and control of the USV including the avoidance of obstacles.

Open Systems Architecture
The open systems architecture enables mission module software to be configured with the core C3 applications to provide a complete integrated and modular solution. Third party sub-systems are easily integrated through the use of standardised software and hardware interfaces.

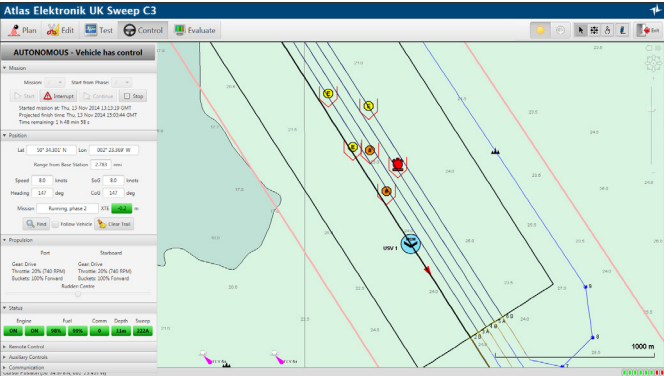
Remote and Autonomous Control
ARCIMS has several modes of navigational control, including manual, remote and autonomous. The combination of the ARCIMS jet drive propulsion and refined autonomy engine deliver highly accurate control and track following with minimal track offset, imperative for mine sweeping and towed sonar operations.

On board sensors enable object detection to aid autonomous navigation and collision avoidance in accordance with COLREGs.

Safe and Robust Control
Maritime safety is assured through the Mission Termination System (MTS) and Boat Safety Unit (BSU). These safety features have been developed and rigorously tested through over 10 years of research, demonstrator and military supply programmes.



Retractable mast with multiple sensors for automatic object detection and situational awareness



ARCIMS SERVICES AND SUPPORT VALUE FOR MONEY, MEETING THE NEEDS AND REQUIREMENTS OF OUR CUSTOMERS WHILE EXCEEDING THEIR EXPECTATIONS



To complement our world leading ARCIMS products TKMS ATLAS UK Services and Support specialists work with our customers to deliver tailored Support solutions based on customer needs which are designed to be flexible and adaptable to meet change.

TKMS ATLAS UK Services and Support is made up of three teams, comprising of experienced technical and support staff, namely:

- ♦ Integrated Logistics Support (ILS)
- ♦ Customer Support and Field Service Engineering
- ♦ In-Service Support Management

Organisation

The three teams are co-located and are thus able to provide dynamic coordinated end-to-end Services and Support in implementing customer specific support solutions, using the latest industry standard software tools. We offer the customer a single point of contact for all ARCIMS support-related matters.

The support team is responsible for:

- ♦ Leading ILS studies, including:
 - AR&M
 - Training needs analysis
 - Spares modelling
 - Life cycle costing
- ♦ Documentation, technical publications
- ♦ Delivery of formal training packages
- ♦ Product safety and environmental management
- ♦ Security accreditation
- ♦ Manpower and human factors
- ♦ CLS management
- ♦ Post Design Services (PDS) including:
 - Technical helpdesk
 - On-site support engineer
 - Design authority services
 - Provisioning of spares
 - Surveys, repairs and overhaul
 - Obsolescence management
 - Configuration management

TKMS ATLAS UK can build upon sound relationships already established and exploit common support arrangements.

TECHNICAL SPECIFICATIONS

Mine hunting Payloads

- ♦ SeaCat UUV
- ♦ SeaFox Mine Disposal System
- ♦ Cobra expendable charge for Mine Disposal Systems
- ♦ Third Party small/medium UUVs
- ♦ Third Party ROVs and Towed Sonar

Minesweeping Payloads

- ♦ Power Generation Module (PGM)
- ♦ Towed Magnetic Sweep
- ♦ Towed Acoustic Sweep
- ♦ Towed Electric Sweep

Hydrographic Meteorological & Oceanographic

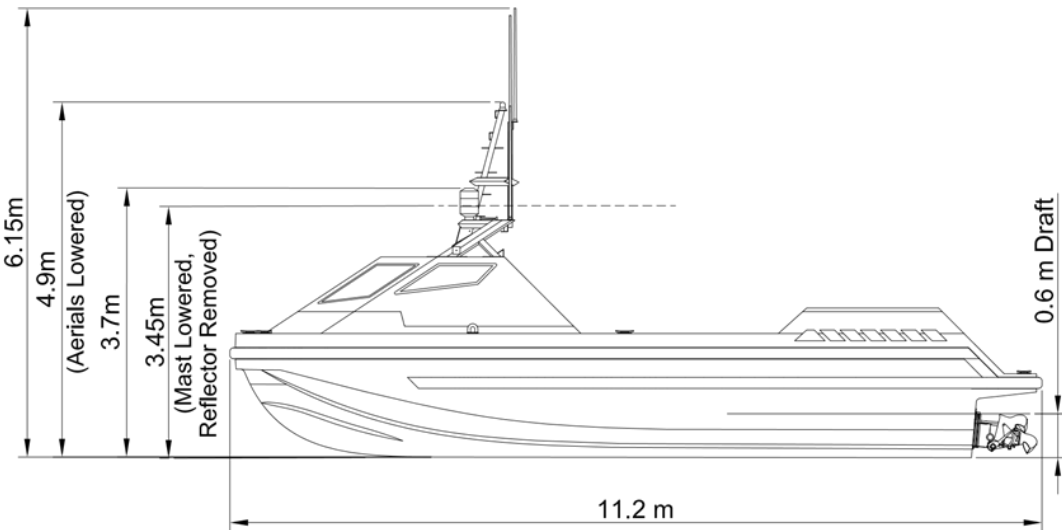
- ♦ Hull mounted Multi Beam Echo Sounders (MBES)
- ♦ Towed Synthetic Aperture Sonar (SAS)
- ♦ Towed Side Scan Sonars
- ♦ SeaCat UUV
- ♦ Third Party small/medium UUVs

Platform Characteristics

Length	11.2m
Beam	3.4m
Draft	0.6m
Mass	6500kg light ship
Payload capacity	up to 4000kg
Propulsion	twin engine with water-jet
Speed	> 40 knots
Towing speed	6 to 15 knots (typical)

Coastal Surveillance Payloads

- ♦ Active and Passive Sonars



OPERATIONAL BENEFITS

Performance

- ♦ World leading MCM capability from a small platform
- ♦ Advanced mission planning and analysis tools
- ♦ Launch and Recovery of multiple off-board systems
- ♦ Automated control and handling of heavy payloads
- ♦ High levels of automation
- ♦ Reliable command, control and communications
- ♦ Proven safety features
- ♦ Highly manoeuvrable platform designed for towing operations
- ♦ Shock resistant platform and mission modules
- ♦ Low signature
- ♦ Military specification
- ♦ Stand alone or integrated operations

Physical characteristics

- ♦ Lightweight, compact and scalable platform
- ♦ Lightweight mission modules
- ♦ Road, sea and air transportable
- ♦ Multi-role platform with reconfigurable mission modules

Supportability

- ♦ Reliable and proven mission systems
- ♦ Minimal maintenance
- ♦ Minimal training requirement
- ♦ Full ILS support

GERMAN ROOTS & A GLOBAL FOOTPRINT

We are a maritime high-technology enterprise with German roots and a global footprint.

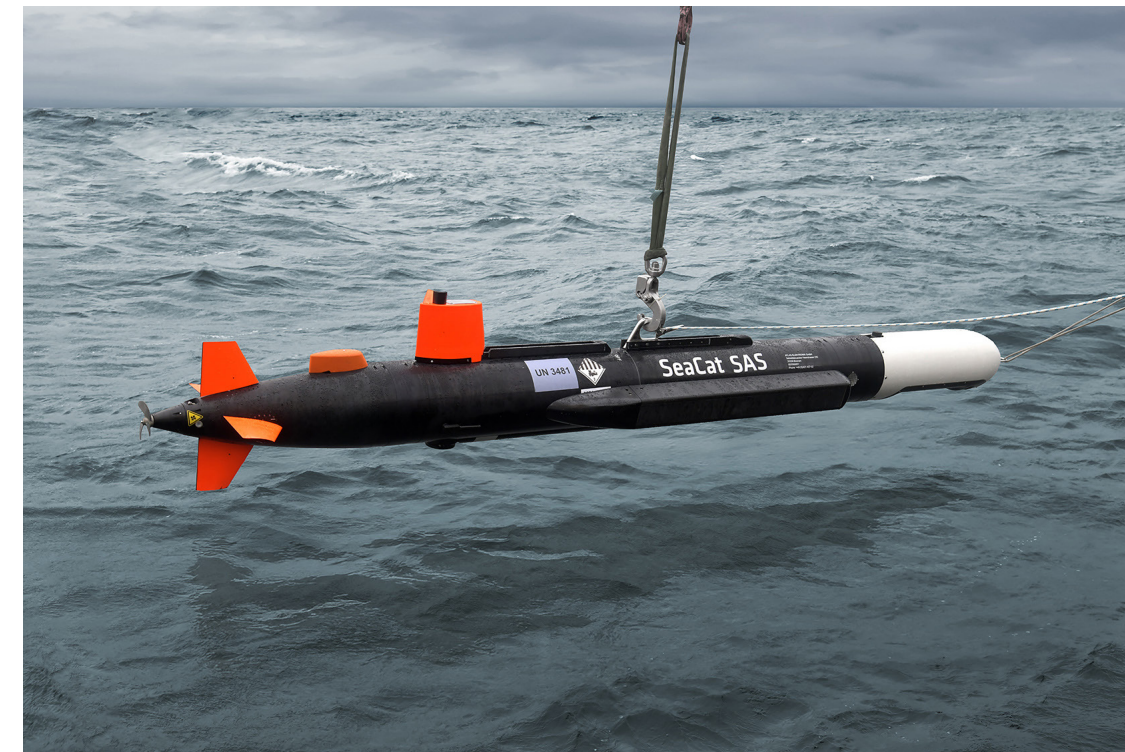
The know-how and expertise of our skilled workforce in the fields of hydroacoustics, sensor engineering and information technology have made us the preferred supplier to numerous navies and civilian customers worldwide.



SeaFox® is a fibre-optic guided, one shot mine disposal vehicle



ARCIMS – the Next Level of Multi-Mission Intelligence



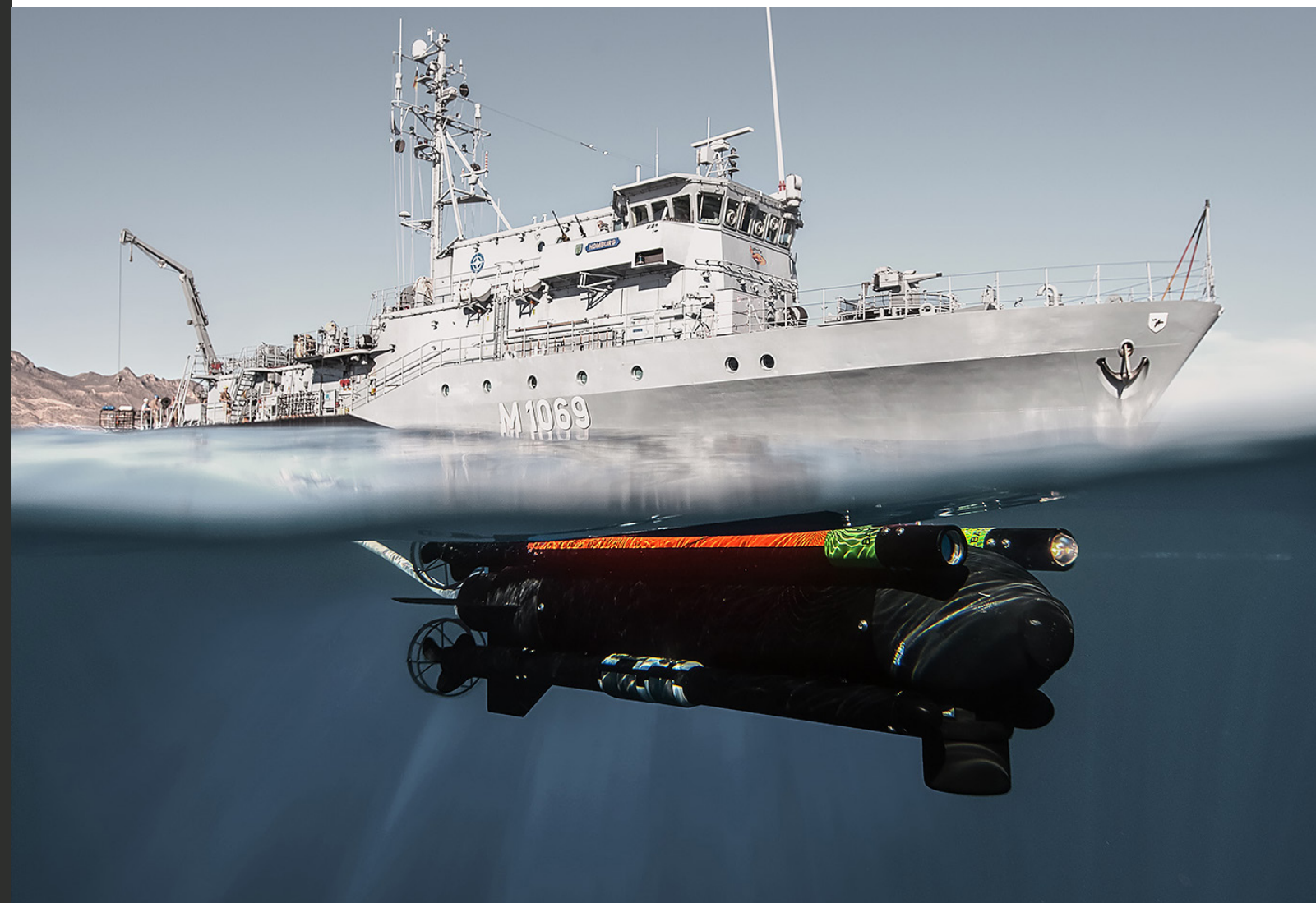
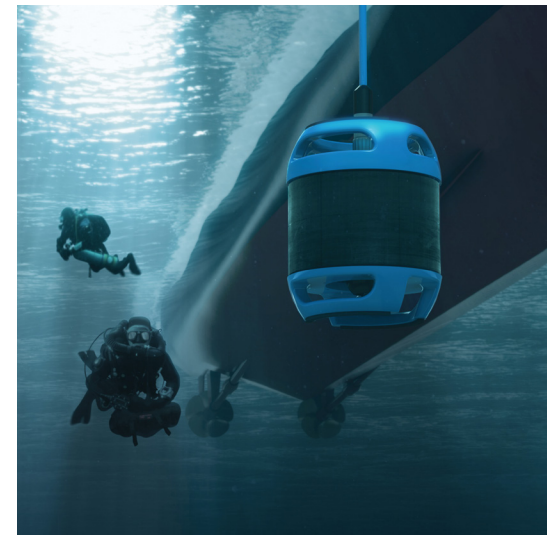
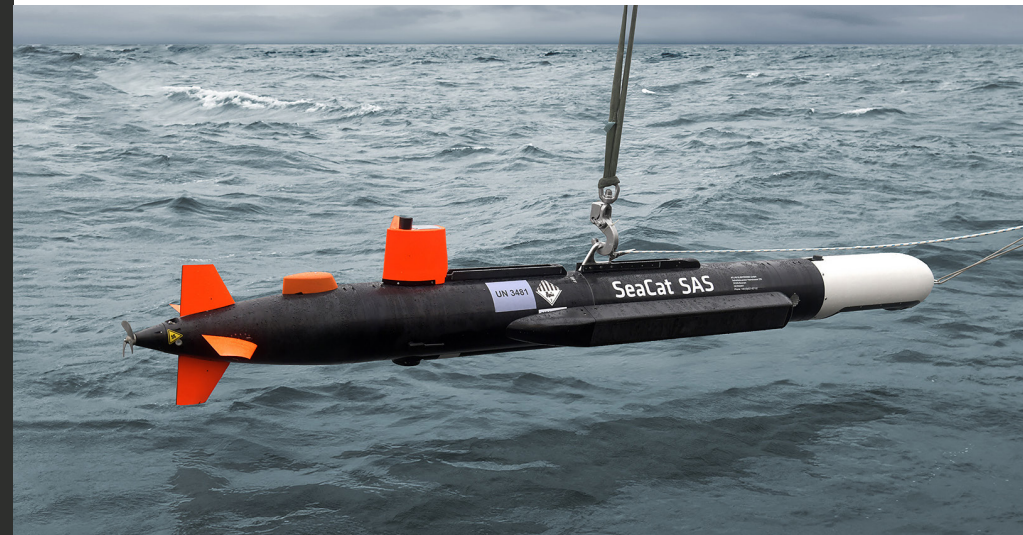
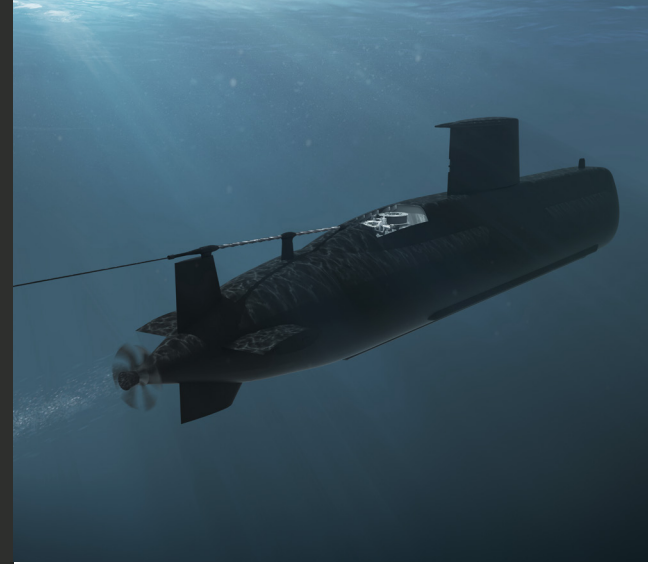
SeaCat is a vehicle of moderate size, which means that payload capabilities have to be adapted optimally to specific purposes

TKMS

NAVAL ELECTRONIC SYSTEMS

Thanks to our high-level know-how in naval electronic systems, we are the leading supplier to numerous navies and civilian customers worldwide.

Our diverse product portfolio ranges from sonars and sensors to command and control systems for submarines and surface vessels, mine countermeasure systems, unmanned underwater vehicles, and radio and communication systems.



TKMS ATLAS UK Ltd.
Dorset Innovation Park
Winfrith Newburgh
Dorchester DT2 8ZB
United Kingdom

enquiries@uk.tkmsgroup.com

www.tkmsgroup.com