



# UNMANNED MCM INTEGRATED SYSTEMS

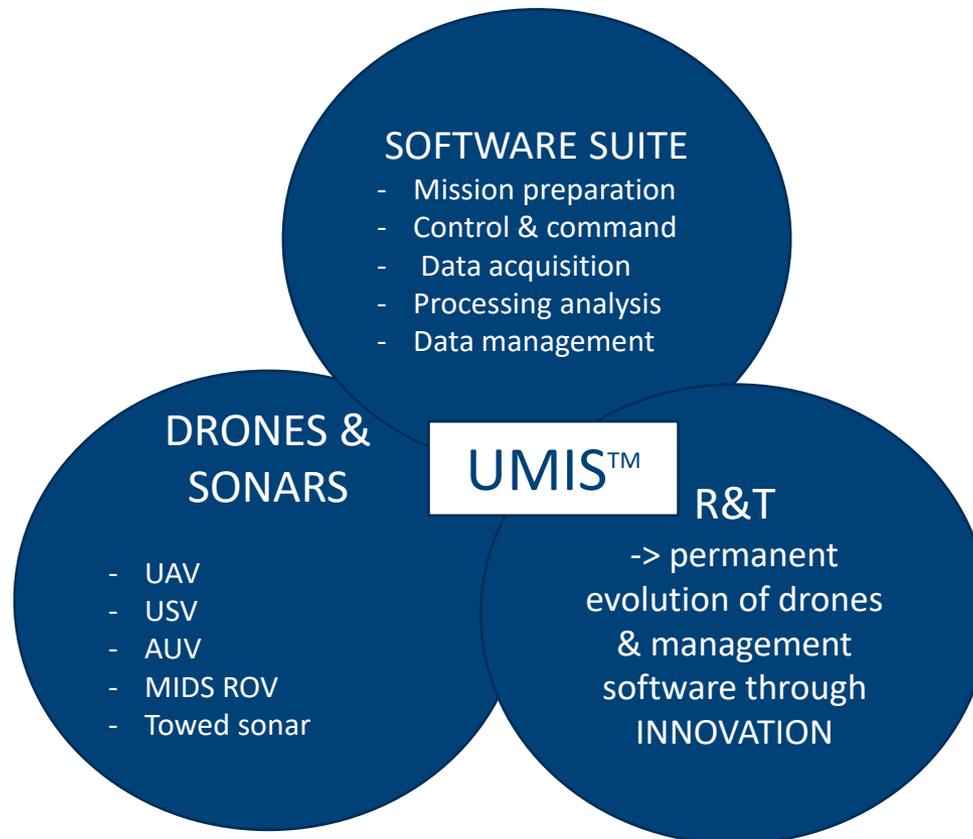
TODAY AND FOR THE FUTURE

UMIS™

FULLY INTEGRATED COLLABORATIVE SYSTEM



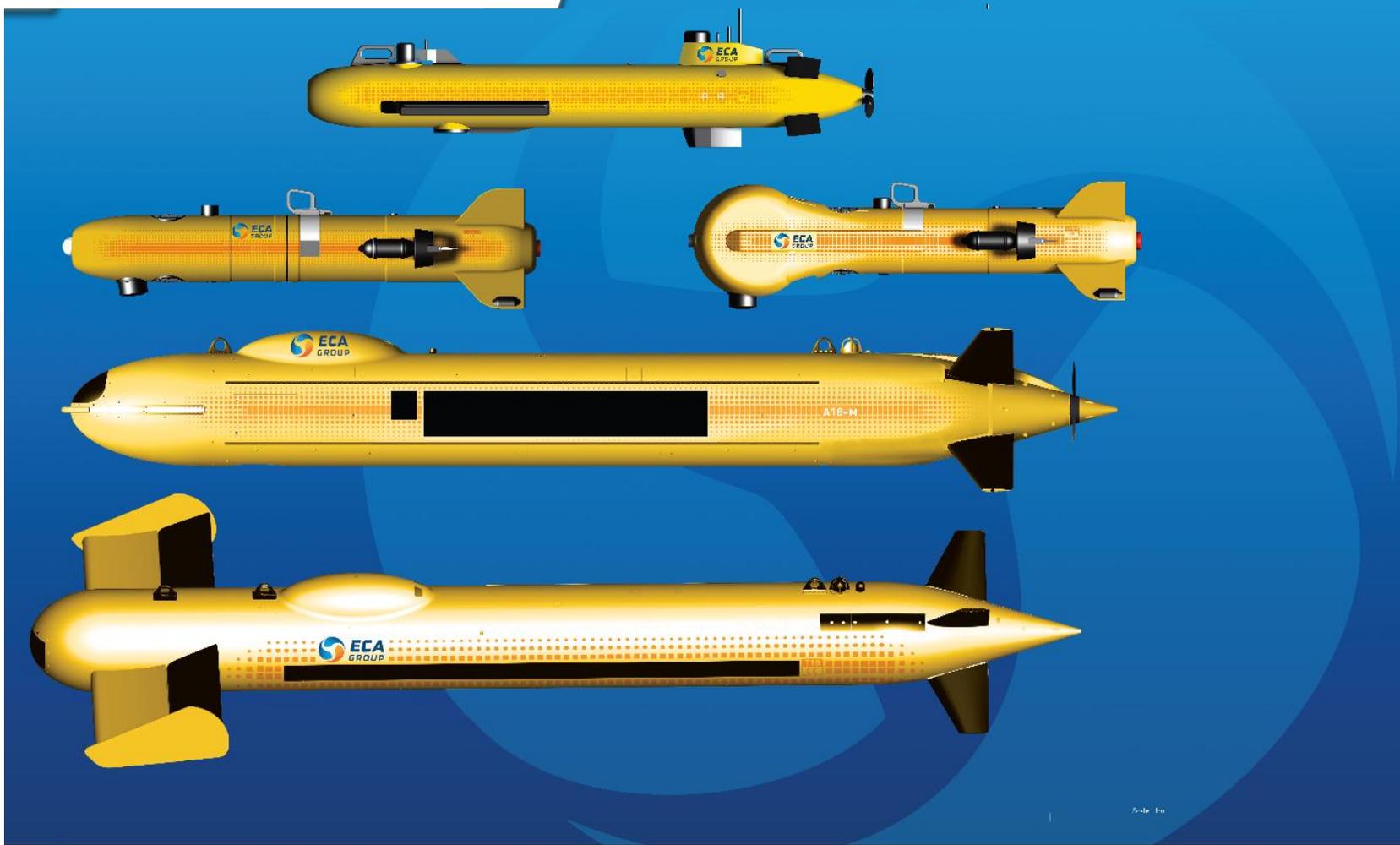
# A STAND-OFF SOLUTION FOR MCM MISSIONS





# UMIS™ - MCM TURNKEY SOLUTIONS

  Awarded by Belgian & Netherlands Navies for NATO MCM missions 



## REDUCING DOWNTIME



# 1/3 FOCUS ON LATEST INNOVATIONS

USV INSPECTOR 125



## INSPECTOR 125

- Designed on a sea proven basis V2NG SAR crafts for SNSM
- Operated and deployed from a ship or the shore
- Air-transportable
- High carrying capacity ( up to 3 tons of payload)
- Reconfiguration capacity with adapted LARS systems: towed sonar, mid-size AUV, MIDS ROVs
- Launch and recover in rough seas
- Towing capacity for mine-sweeping system
- Fully integrated into UMIS™ system



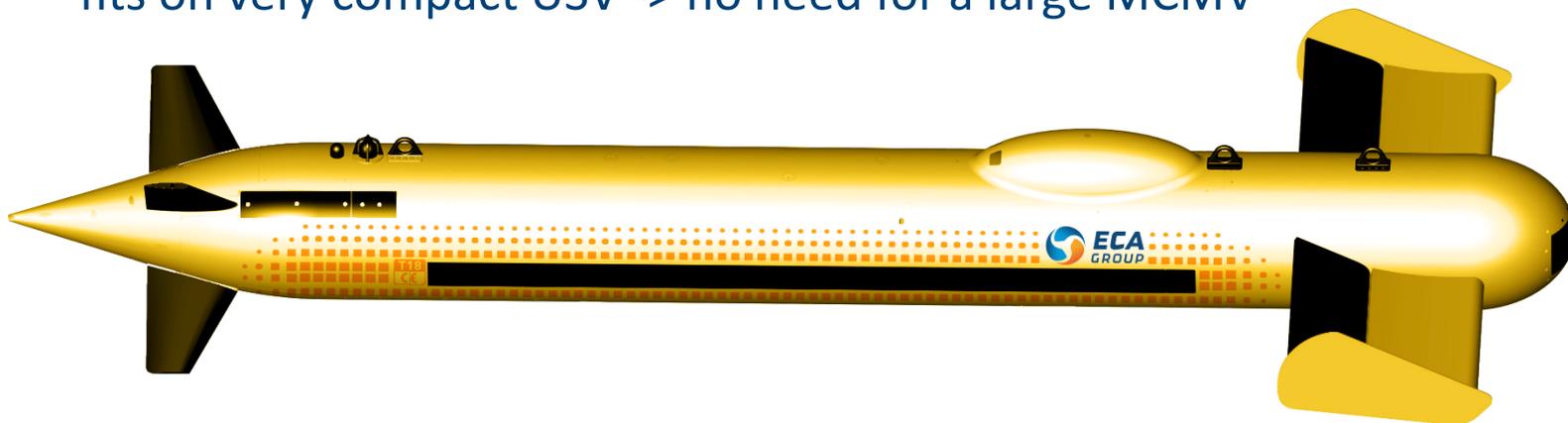
# 2/3 FOCUS ON LATEST INNOVATIONS

TOWED SONAR T18 BASED ON THE A18-M AUV



## A TOWED SONAR DERIVED FROM THE AUV

- Same launching and recovery system ( LARS) for deployment from USV
- Shared logistics & reduced reconfiguration time of the USV
- Self-powered
- **Smaller and lighter towing cable for:**
  - └ Outstanding navigation performance at high sea speeds
  - └ Smaller cable reduces winch on the carrier boat -> the boat's engines -> fits on very compact USV -> no need for a large MCMV



# 3/3 FOCUS ON LATEST INNOVATIONS

OCTOPODA MCMV RANGE



## STAND-OFF MINE WARFARE SOLUTION INTEGRATING NAVAL DRONES

- ■ A complete system integrating several type of drones collaborating within the same mission: detection, identification, neutralisation
- ■ Integrated launch and recovery systems that are effective even in high sea states
- ■ Reduces the crew onboard
- ■ Operators stay outside the mine field

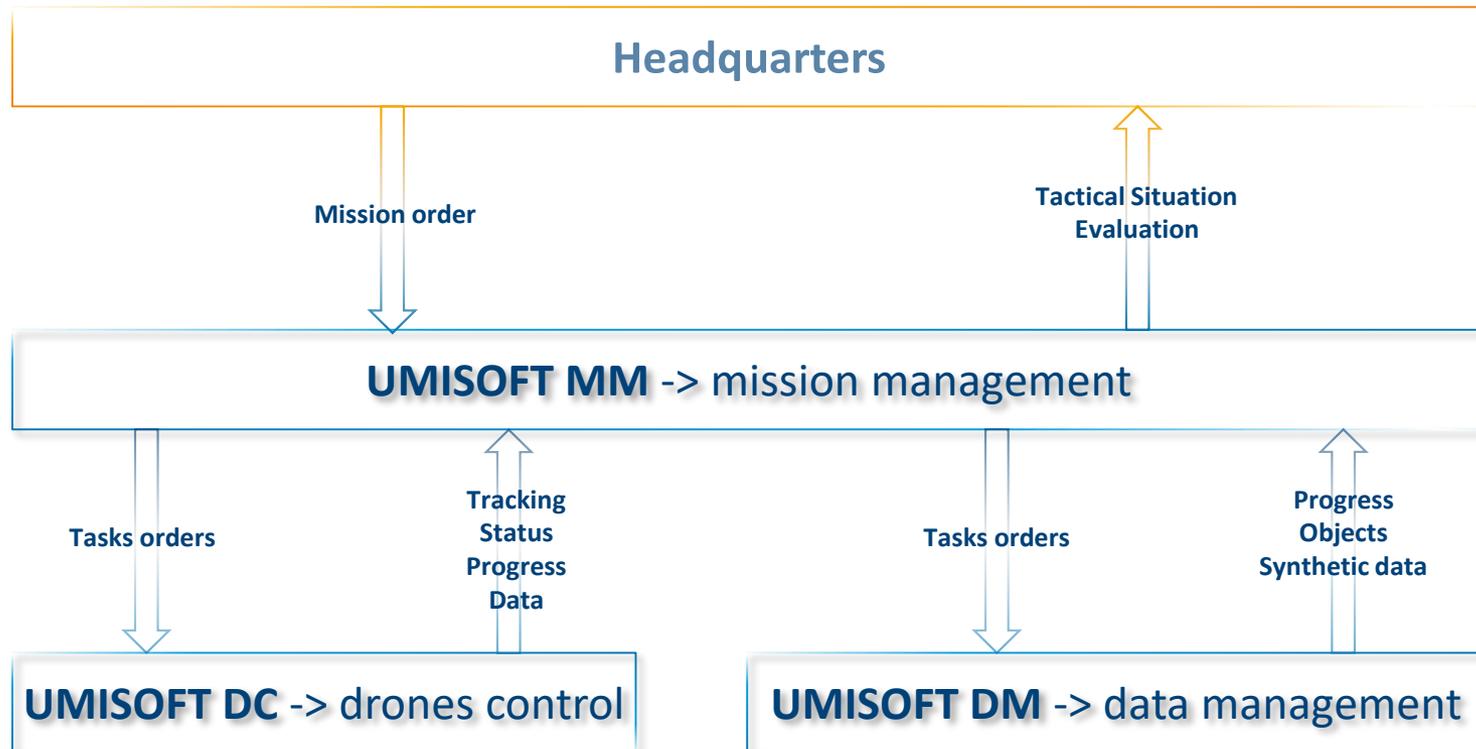


# HOW TO MANAGE THE MISSION?

A COMPREHENSIVE SOFTWARE SUITE FOR MISSION OPTIMISATION

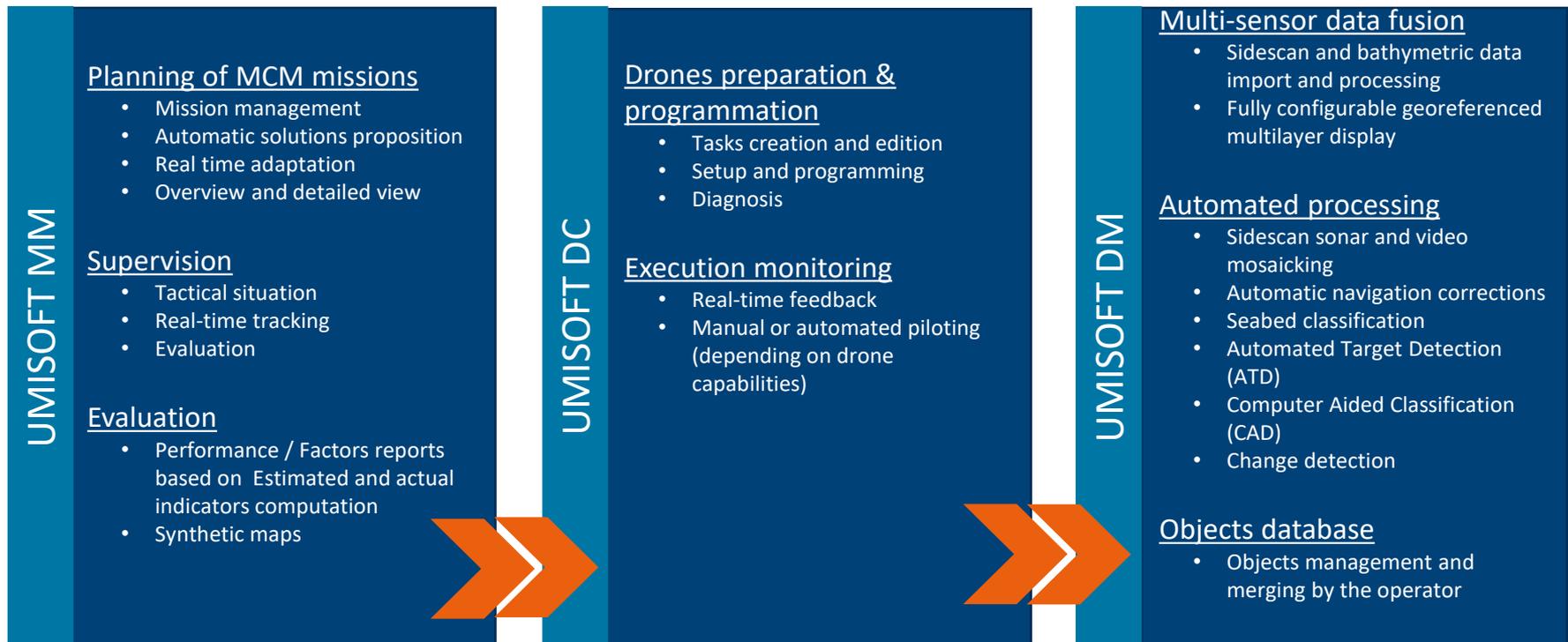


## ALL IN ONE: MISSION MANAGEMENT – DRONES CONTROL – DATA MANAGEMENT



## MISSION DRIVEN SOLUTION

### FROM MISSION MANAGEMENT TO DATA MANAGEMENT



# ATD & UNMANNED SYSTEM

ASSISTED CLASSIFICATION



## **DATA MANAGEMENT TOOL WITH ASSISTED CLASSIFICATION MODULE**

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- ■ **Automatic Target Detection**
  
- ■ **Aided Classification Tools for Operators**
  - └ Automeasure module
  - └ Simulating view module

ATD



D:\64-A18\20190417\_FONDS\XTF\_SAS\2019-04-17T09-39-12.03950.88309-25813.xtf  
 Size 2585 x 1500  
 Channel 1 - Pings [0-1499]  
 Range = 155.07m

**Detection**

Echo Threshold (%)

Shadow Threshold (%)

Min Shadow Area (m²)

Min Echo Length (m)

Min Shadow Length (m)

Max E/S Distance (m)

**Active area**

Nb Pings Per Tile

Ping Overlap

Inner Channel Clip (%)

Outer Channel Clip (%)

**Histogram**

Min threshold 10.0 dB

Max threshold 60.0 dB

**TVG**

None

**Downsampling**

Down-sampling Factor

Minimum  Maximum

Average  Skip

**Preview**

Channel  1  2

Line  ✓

**Processing**

Max objects per tile

Channel 1  Channel 2

**Results**

Show outlines

Max E/S Area Ratio

Max S/E Ping Ratio

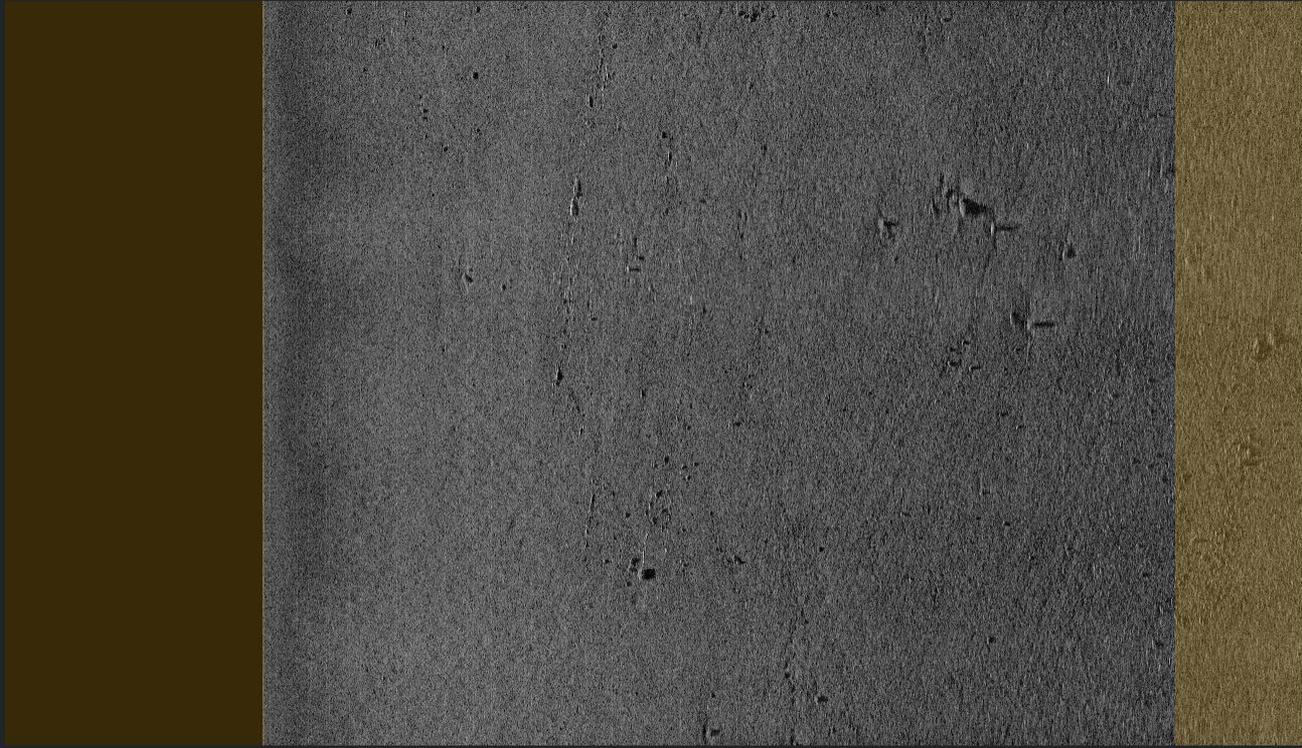
Max Shadow Pings

**Import/Export**

Vehicle

A9-M

A18-M





ATD

D:\64-A18\20190417\_FONDS\XTF\_SAS\2019-04-17T09-39-12.03950.88309-25813.xtf  
Size 2585 x 1500  
Channel 1 - Pings [0-1499]  
Range = 155.07m

**Detection**

Echo Threshold (%) 3  
Shadow Threshold (%) 7  
Min Shadow Area (m<sup>2</sup>) 1.00  
Min Echo Length (m) 0.30  
Min Shadow Length (m) 1.00  
Max E/S Distance (m) 0.60

**Active area**

Nb Pings Per Tile 1500  
Ping Overlap 20  
Inner Channel Clip (%) 20  
Outer Channel Clip (%) 10

**Histogram**

Min threshold 10.0 dB  
Max threshold 60.0 dB

**TVG**

None

**Downsampling**

Down-sampling Factor 2  
 Minimum  Maximum  
 Average  Skip

**Preview**

Channel  1  2  
Line 2019-04-17T09-39-12.03950.88

**Processing**

Max objects per tile 50  
 Channel 1  Channel 2

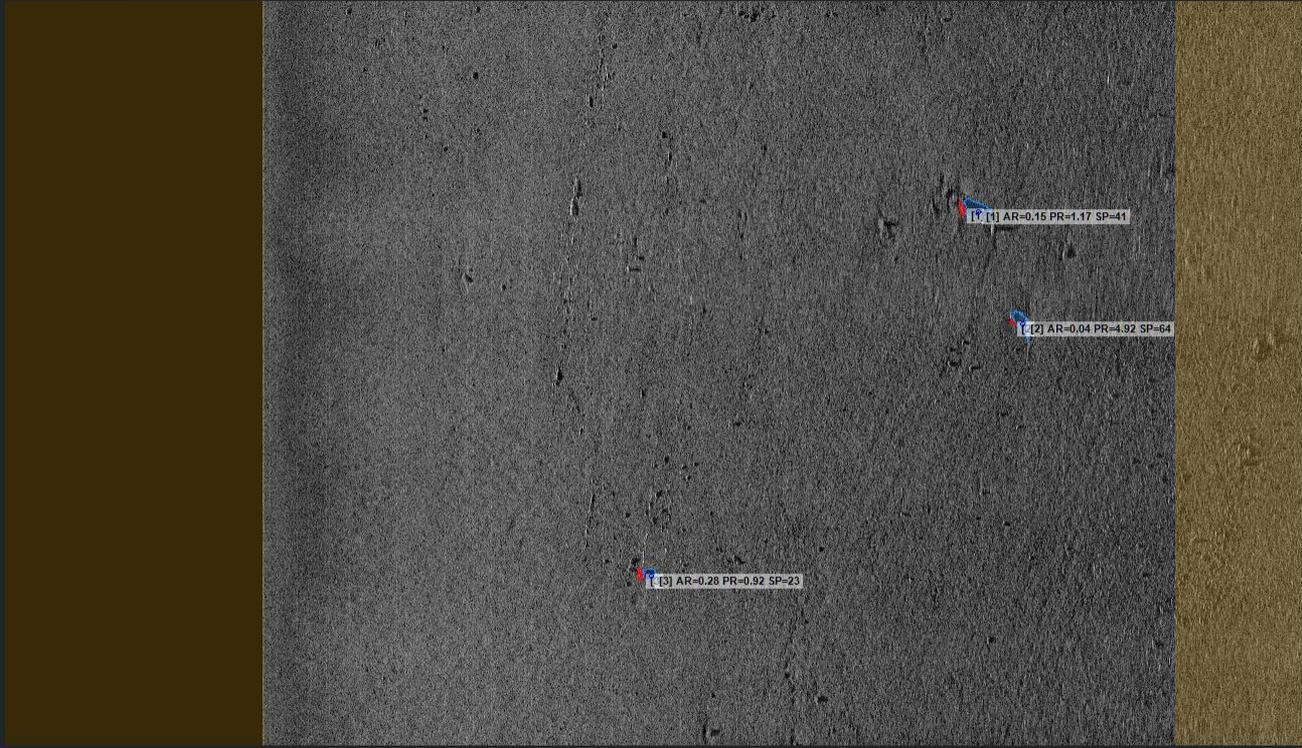
**Results**

Show outlines  
 Max E/S Area Ratio 1.0  
 Max S/E Ping Ratio 5.0  
 Max Shadow Pings 50

**Import/Export**

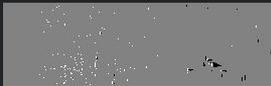
Vehicle  
 A9-M  
 A18-M

Import... Export...



[1] AR=0.15 PR=1.17 SP=41  
[2] AR=0.04 PR=4.92 SP=64  
[3] AR=0.28 PR=0.92 SP=23

Navigation icons: Play, Stop, Previous, Next, Home, Refresh, Full Screen, Download





**ATD**

**ECA GROUP**

D:\64-A19\20190417\_FONDS\XTF\_SAS\2019-04-17T09-39-12.03950.88309-25813.xtf  
Size 2585 x 1500  
Channel 1 - Pings [0-1499]  
Range = 155.07m

**Detection**

Echo Threshold (%) 3  
Shadow Threshold (%) 7  
Min Shadow Area (m<sup>2</sup>) 1.00  
Min Echo Length (m) 0.30  
Min Shadow Length (m) 1.00  
Max E/S Distance (m) 0.60

**Active area**

Nb Pings Per Tile 1500  
Ping Overlap 20  
Inner Channel Clip (%) 20  
Outer Channel Clip (%) 10

**Histogram**

Min threshold 10.0 dB  
Max threshold 60.0 dB

**TVG**

None

**Downsampling**

Down-sampling Factor 2  
 Minimum  Maximum  
 Average  Skip

**Preview**

Channel  1  2  
Line 2019-04-17T09-39-12.03950.88

**Processing**

Max objects per tile 50  
 Channel 1  Channel 2

**Results**

Show outlines  
 Max E/S Area Ratio 1.0  
 Max S/E Ping Ratio 5.0  
 Max Shadow Pings 50

**Import/Export**

Vehicle  
 A9-M  
 A18-M

Import... Export...

Navigation controls: Play, Stop, Previous, Next, Home, Full Screen, Refresh

ZOOM ON THE SUSPECTED MAN MADE OBJECT



The screenshot displays the ECA ATD software interface. The main window shows a sonar scan with a detected object highlighted in red and blue. The object is labeled with the text: [9] [3] AR=0.28 PR=0.92 SP=23. The interface includes a left sidebar with various settings and a bottom control bar with navigation icons.

**Detection**

- Echo Threshold (%) 3
- Shadow Threshold (%) 7
- Min Shadow Area (m²) 1.00
- Min Echo Length (m) 0.30
- Min Shadow Length (m) 1.00
- Max E/S Distance (m) 0.60

**Active area**

- Nb Pings Per Tile 1500
- Ping Overlap 20
- Inner Channel Clip (%) 20
- Outer Channel Clip (%) 10

**Histogram**

- Min threshold 10.0 dB
- Max threshold 60.0 dB

**TVG**

- None

**Downsampling**

- Down-sampling Factor 2
- Minimum  Average  Maximum  Skip

**Preview**

- Channel 1  2
- Line 2019-04-17T09-39-12,03950,88

**Processing**

- Max objects per tile 50
- Channel 1  Channel 2

**Results**

- Show outlines
- Max E/S Area Ratio 1.0
- Max S/E Ping Ratio 5.0
- Max Shadow Pings 50

**Import/Export**

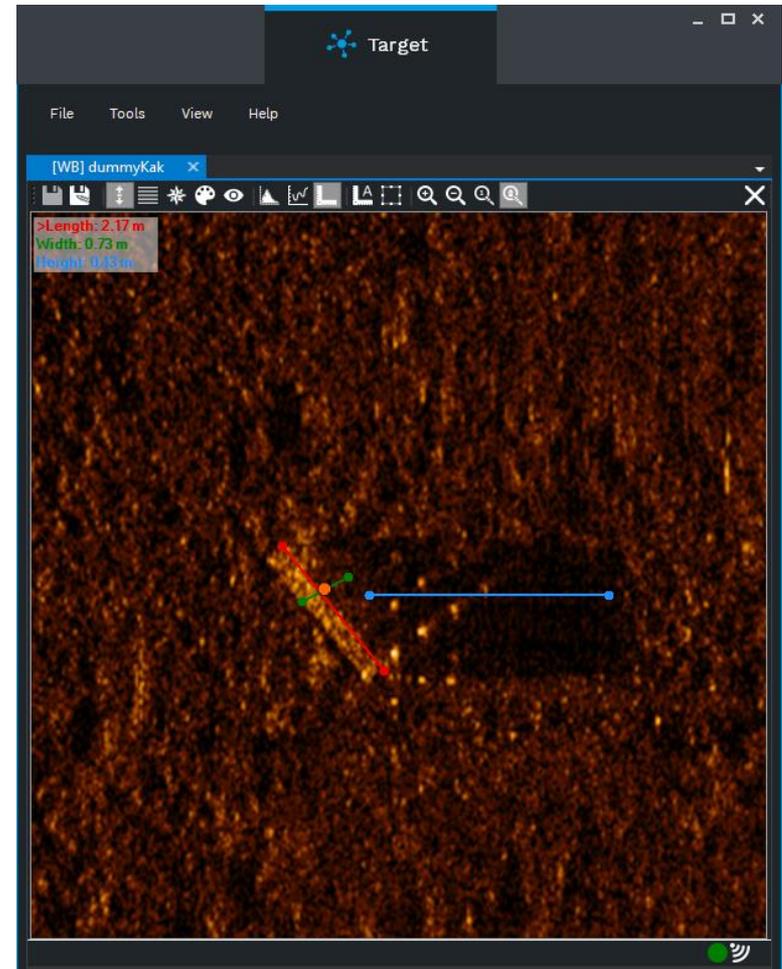
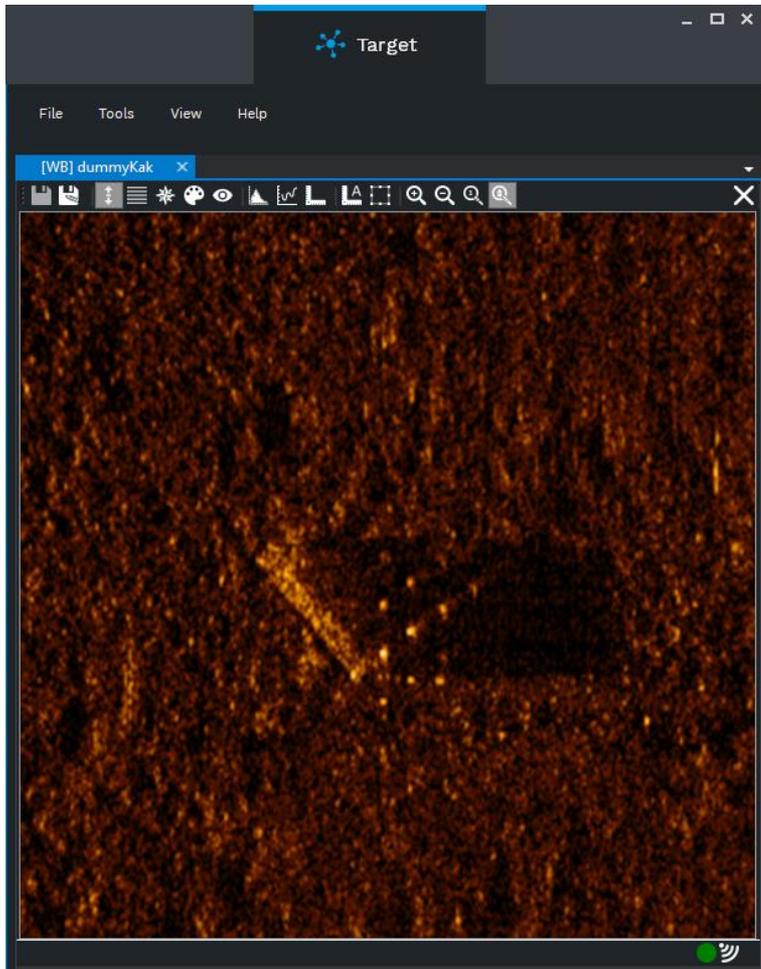
- Vehicle:  A9-M  A18-M
- Import... Export...

RED : ECHO

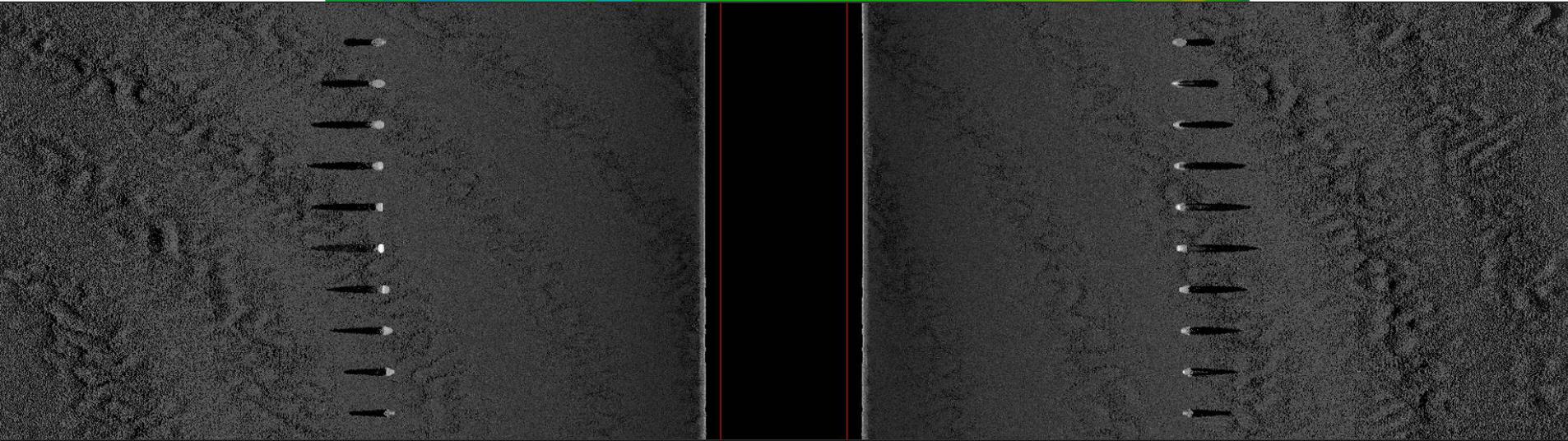
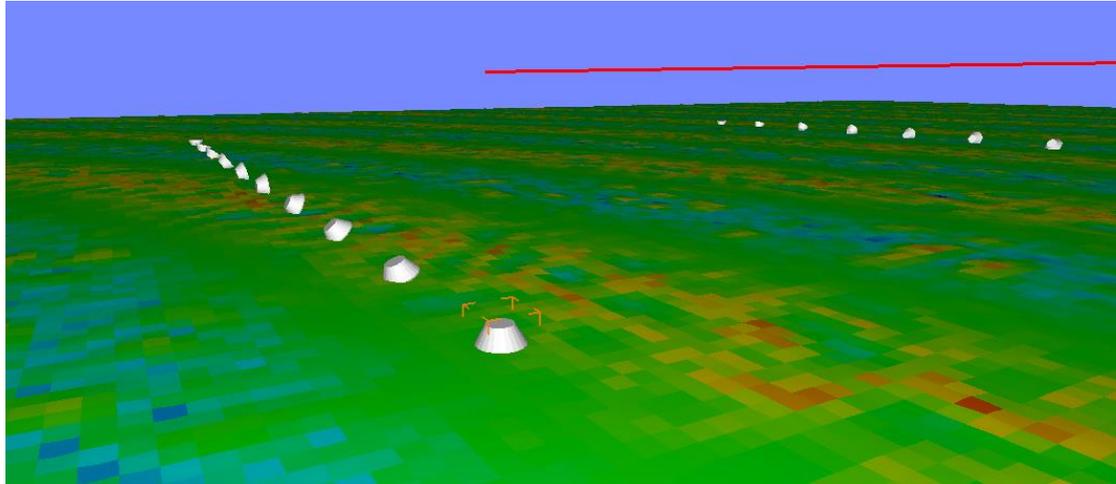
BLUE: SHADOW

## **AUTOMATIC DETECTION ALGORITHMS ARE DUPLICATED IN THE SAME WAY ON THE SURFACE AS WELL AS ON BOARD – WHICH BRING TO THE OPERATOR :**

- ■ **Easy and aided detection in the case of towed sonar use ( surface mode)**
- ■ **Accelerated transmission of qualified data (radio link crypted transmission)**
- ■ **Capability to process data inside the AUV in real-time (embedded mode)**
- ■ **To calibrate and train the ATD on surface and download it into unmanned systems ( UUVs) during data aquisition of a new seabed**
  - └ Reduces false-alerts,
  - └ Avoids missing an object
  - └ Better targeting of known threats



An automatic measurement algorithm is used to determine the dimensions of the contact and prioritize the detected contacts. - Cylinder mine



For aided classification different modules for analysis and comprehension of contact signature depending on its environment.



## MANY ADVANTAGES FOR MCM OPERATORS

### ■ Easy access

- └ Rich tactical situation for better understanding
- └ MCM optimized mission management
- └ Automatic proposition of scenario & comparison tools
- └ Distributed contextual data

### ■ Open architecture

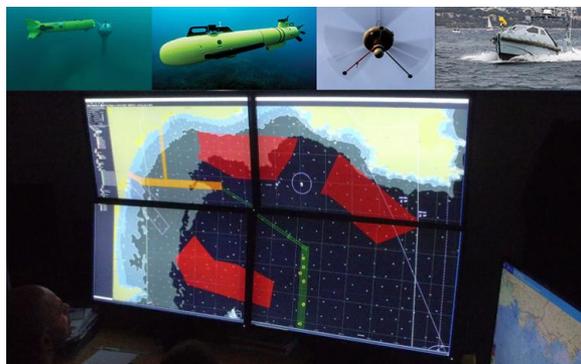
- └ Easy interfaced with ECA Group and third-party drones
- └ Use of standards (S57, S63, AML, MIL-STD 2525C, WMS/WFS, etc.)

### ■ Configurability

- └ Automatic registration & description of drones
- └ Option-based model to be adapted according operator's needs

### Performance

- └ Time saving thanks to the creation, optimization and parallelization of tasks
- └ Proposition of targeted solutions for more efficiency



### ■ Integration

- └ Shared services & data
- └ Complete management of the operational cycle

### ■ Scalability

- └ Unlimited number of connected drones: USV, AUV, ROV, UAV
- └ Unlimited number of client modules
- └ Virtually unlimited storage

### ■ Real-Time

- └ Dynamic tactical display
- └ Event handling and schedule update

### ■ Cybersecurity

- └ Client authentication
- └ Encrypted communications

Interfaces with vessel

- CMS
- C4I
- IBMS
- IPMS

Preparation  
Planning  
Execution

Preparation

Planning

Mission  
execution

Post processing

MCM Data  
integration

Supervision

Stand OFF  
MCM



Development  
and system  
integration skills

Mission  
supervision

Strategic and tactical  
solutions



## TOOLBOX BENEFITS

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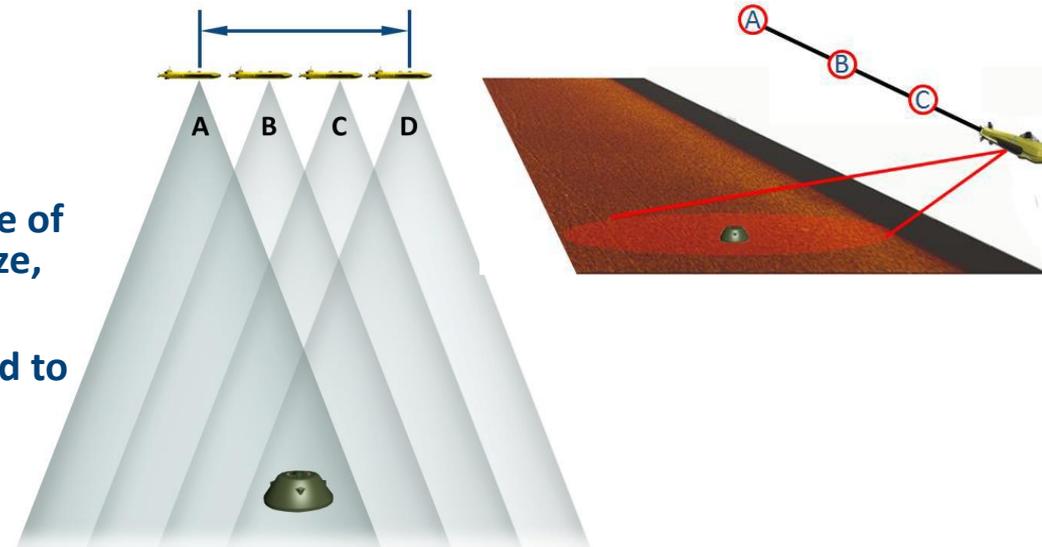
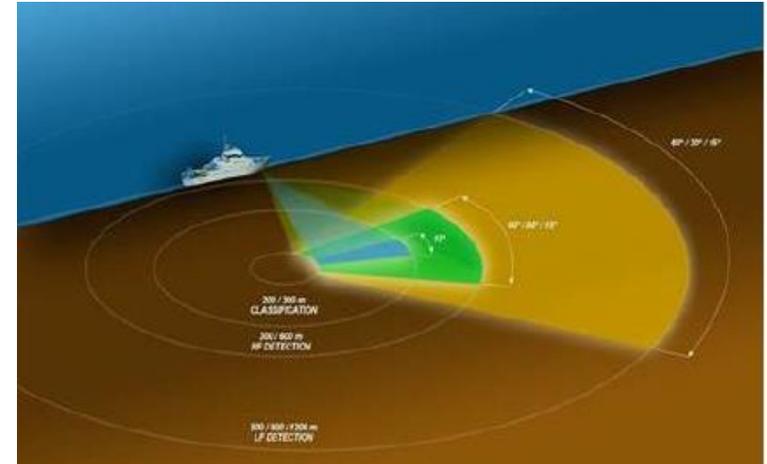
- ■ FASTER AND SAFER OPERATIONS
- ■ CAN BE INTEGRATED INTO EXISTING SYSTEMS OR AS A STAND ALONE SOLUTION
- ■ DEPLOYABLE FROM NON DEDICATED SHIPS
- ■ CAN BE CONTAINERISED TO BE AIR-TRANSPORTABLE & DEPLOYABLE FROM SHORE OR NON DEDICATED SHIPS
- ■ MODULAR, ADAPTABLE AND SCALABLE CONFIGURATIONS
- ■ REDUCED COSTS OF OWNERSHIP: COMMON SPARES, TOOLS...

# UNMANNED SYSTEMS OF THE FUTURE



## BENEFITS OF SYNTHETIC APERTURE SONAR(SAS)

- A possible mine appears as only an unresolved echo on a detection sonar screen
- If the echo persists over several pings it is declared a mine-like echo (MILEC).
- The next step is to bring the MCMV within range of the classification sonar,
- Need to go around the MILEC to catch a favorable aspect due to lack of resolution.
- This is a very slow process which requires highly trained personnel.
- A SAS makes an ultra-high resolution image of the seabed in a single pass informing on size, shape, shadow and highlight structure.
- This is both effective and fast, ideally suited to AUVs.



## BENEFITS OF CSAS AND UW LIDAR

- After positive classification as a mine-like contact (MILCO), ID is the next logical step.
- ID is performed today as in the past, with ROVs. It is too slow for the SAS and currently the bottleneck!
- Future systems will automate the collection of ID data using AUVs (DCLI AUVs).
- Relocation is much faster and more reliable using the high performance navigation of the AUV & SAS image.
- ID sensors which offer standoff (e.g. >4m) are key.

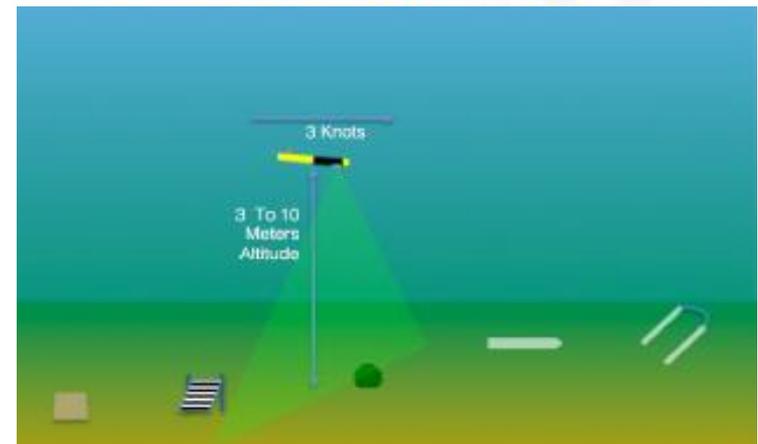
The SAS can be used again at close range to collect/fuse multiple aspects (CSAS).

Long range optical sensors is the enabling technology.

Chemical explosive detection is also very useful

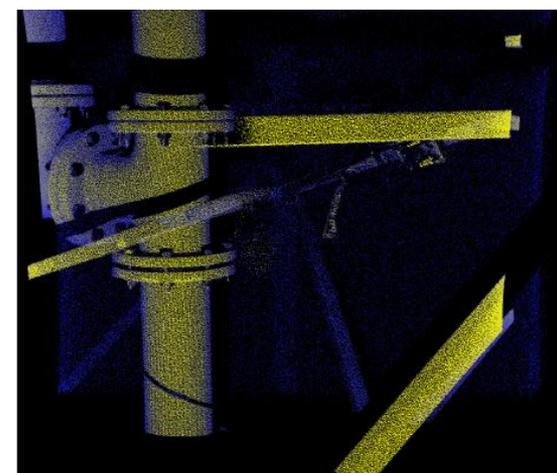
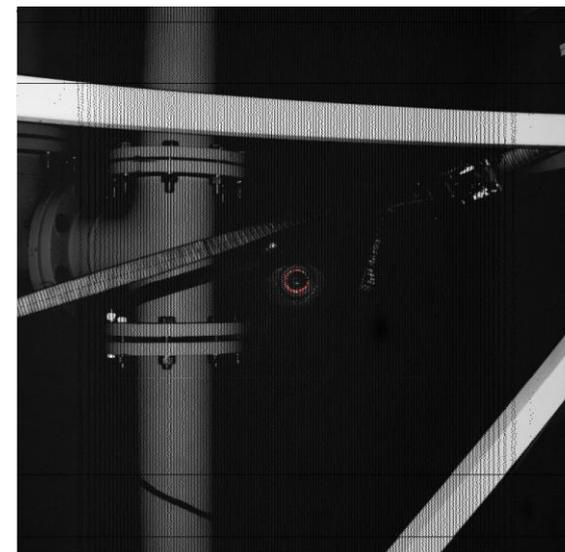


CSAS image from NSWC, USA



## BENEFITS OF UW LIDAR

- Blue-green laser illumination is optimal due to seawater absorption spectrum.
- A variety of products exist driven by commercial markets.
- Both imagery and 3D point cloud depth information are provided.
- Limiting optical backscatter in turbid waters is key
- Range gated cameras
- Time of flight lidar
- Scanned laser (rotating mirror)
- Streak Tube Imaging Lidar (STIL from Arete)



Courtesy 3D at depth

## WHAT UMS OF THE FUTURE COULD BRING

- ■ **Tools will be multi-mission ( classification and identification)**
- ■ **Improved communication with UUVs for near real-time data acquisition and analysis**
- ■ **The mission is fully automated**
- ■ **The mission time is reduced**
- ■ **The gathered data is more precise**
- ■ **The operator gets more assistance for decision making**