

Advanced Mine Detection

using

Aerial Drone Magnetic Gradiometry

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CEO, Ph.D. Geophysics



Aerial Drone Magnetic Solutions

Land- and Naval Mine Detection

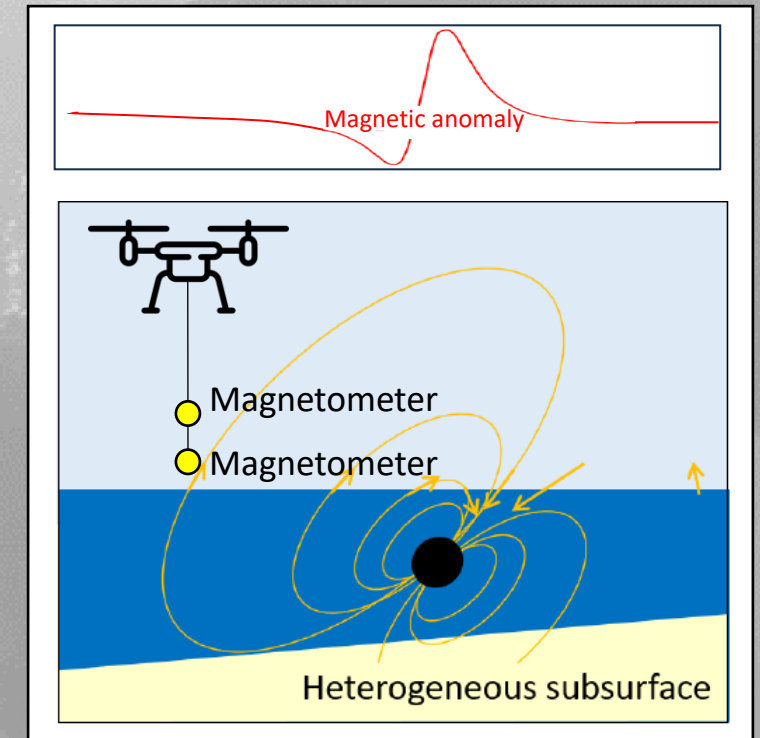
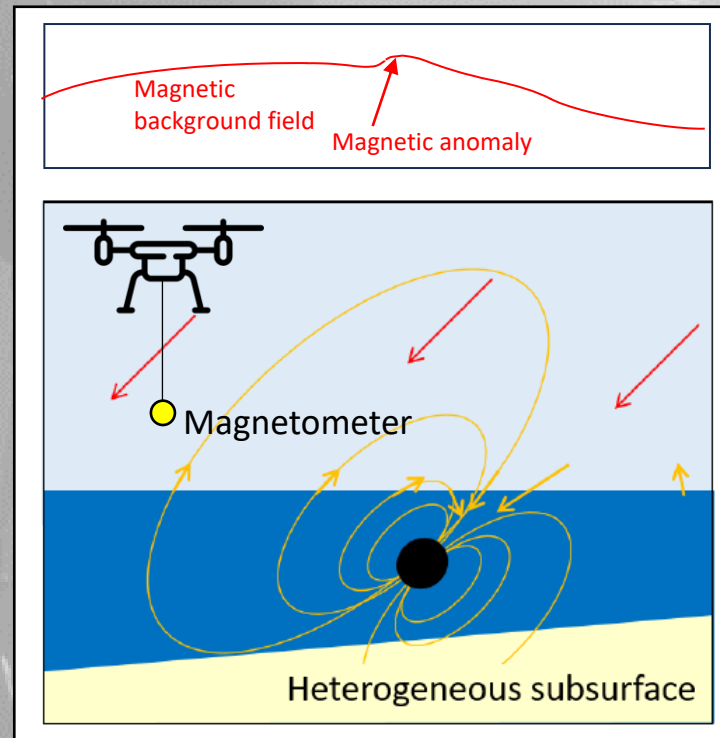
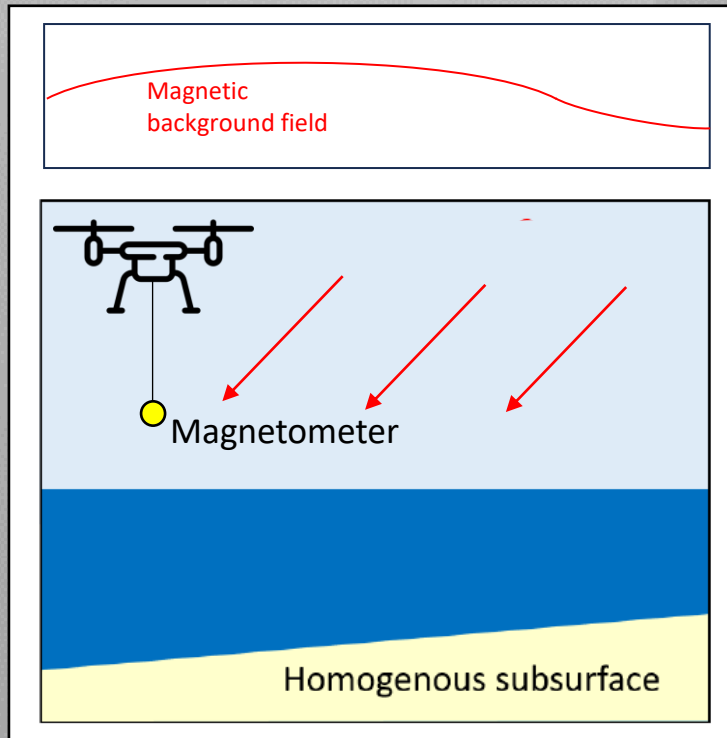
Anti-Submarine Warfare (ASW)

Subsea Surveillance

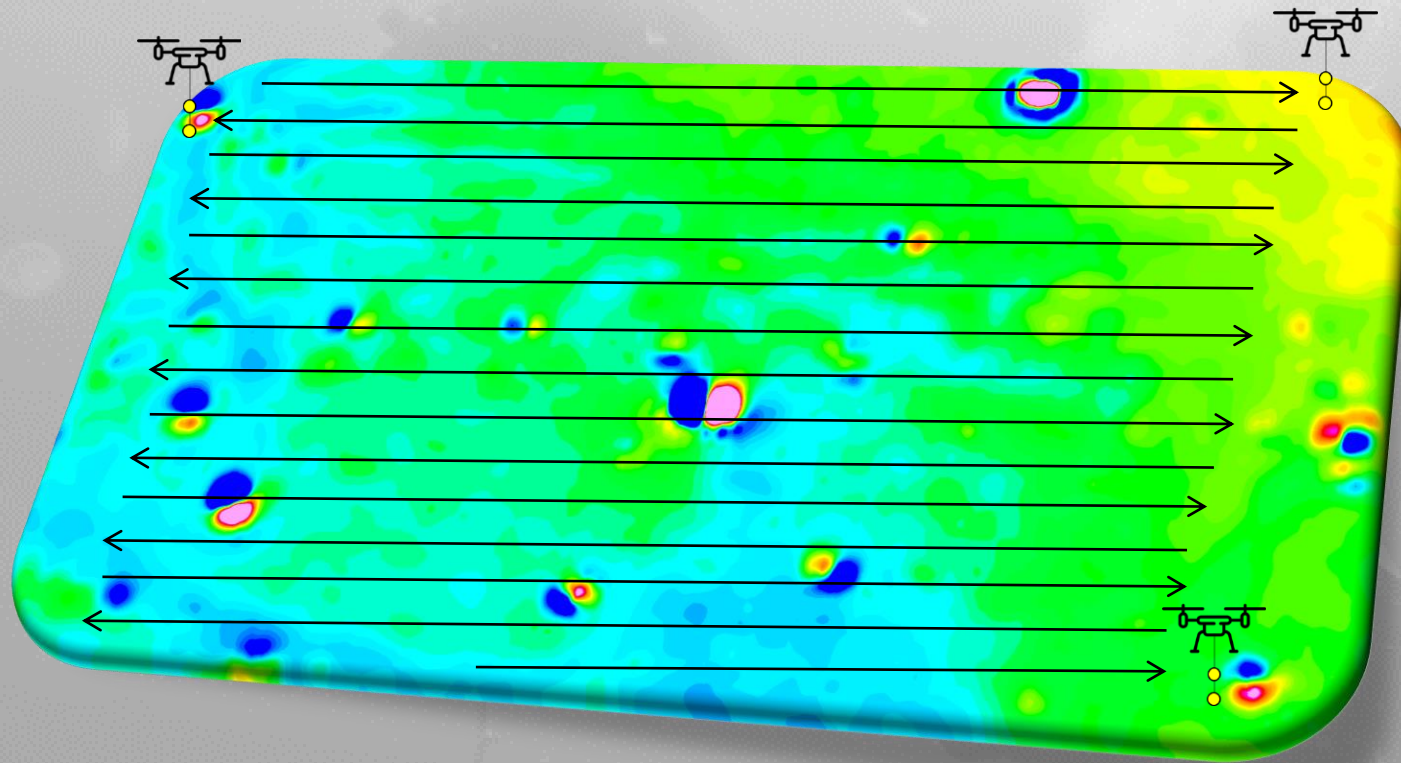


Magnetic Gradiometry?

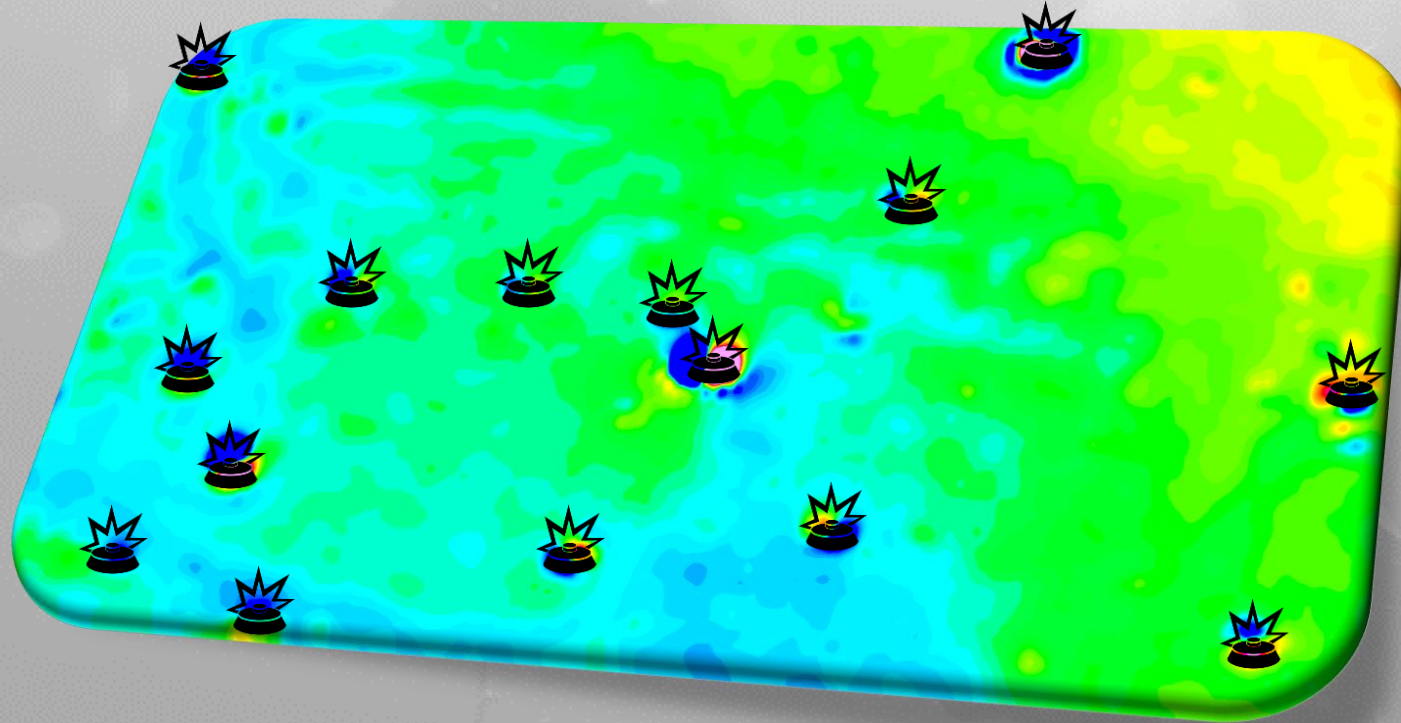
Magnetic Gradiometry highlights anomalies in Earth's magnetic field



Drone Magnetic Gradiometry

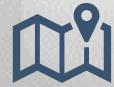


Drone Magnetic Gradiometry



Drone Magnetic Gradiometry

Advantages to
UAV/Conventional Methods



Fast areal coverage (8 ha/hour) and easy deployment



Complete coverage: Beaches, rivers, surf zones, deeper waters, and low-visibility waters



Drifting / Moored / Bottom mines



Rocks versus mines



High positional accuracy



Real-time data



Man-power saving & Cost-efficient



Safe

Drone Magnetic Gradiometry

Advantages to
UAV/Conventional Methods



Ice-covered areas

Drone Magnetic Gradiometry

*Critical System
Parameters*

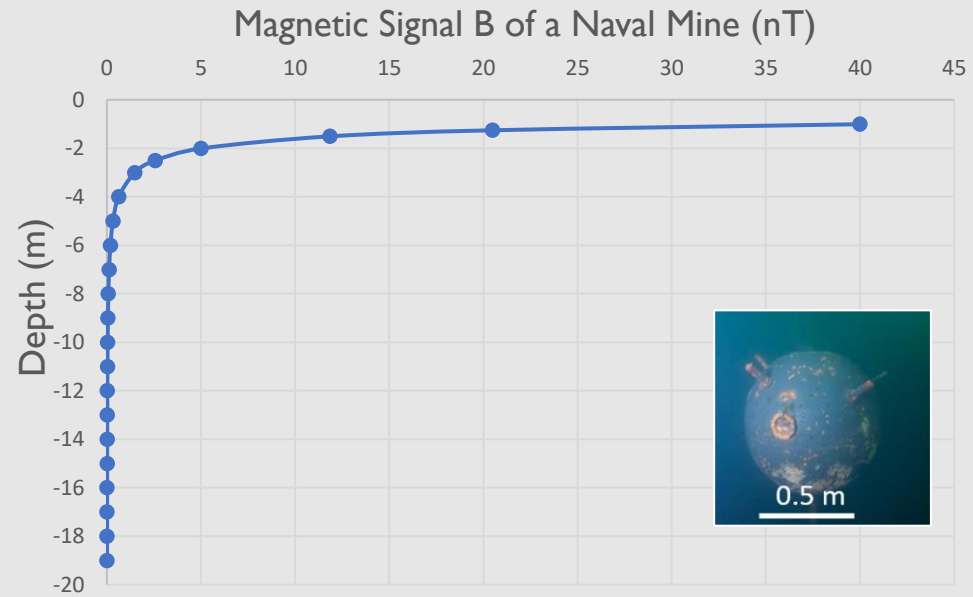
- ❖ System noise level
- ❖ System positioning accuracy

Drone Magnetic Gradiometry

System
Noise Level

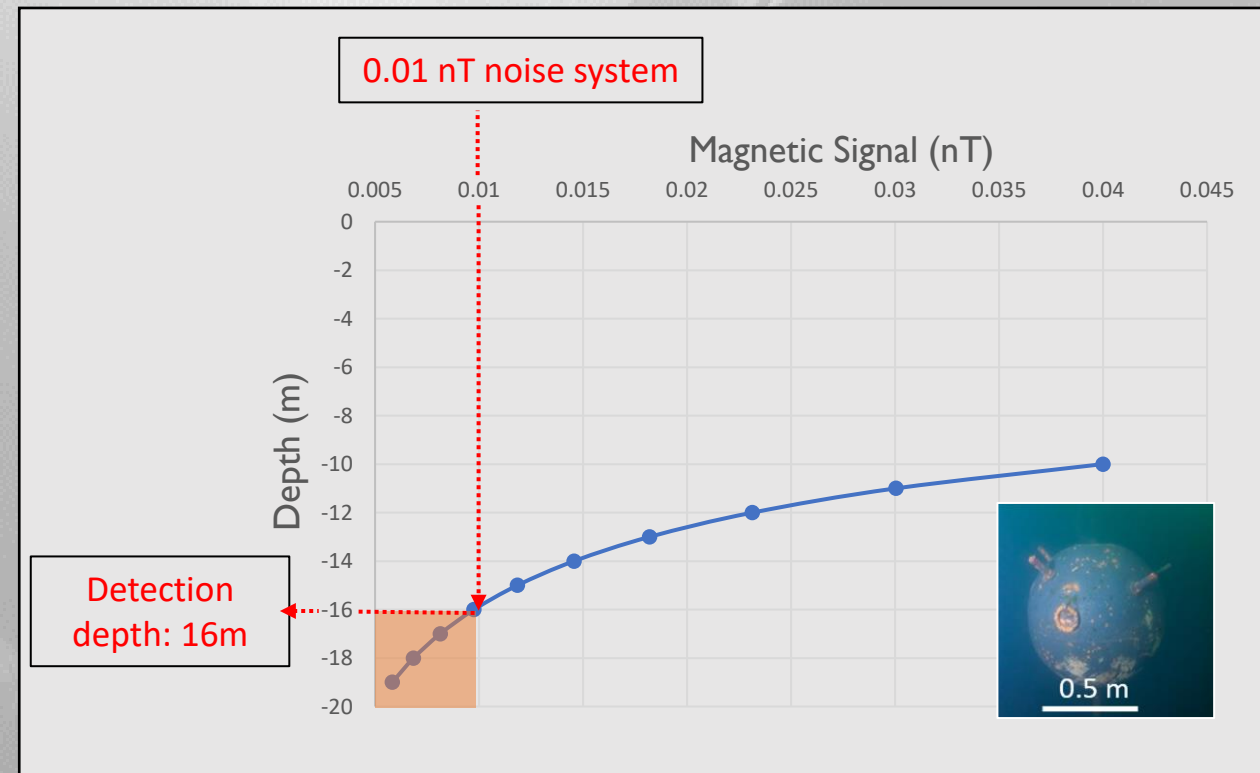
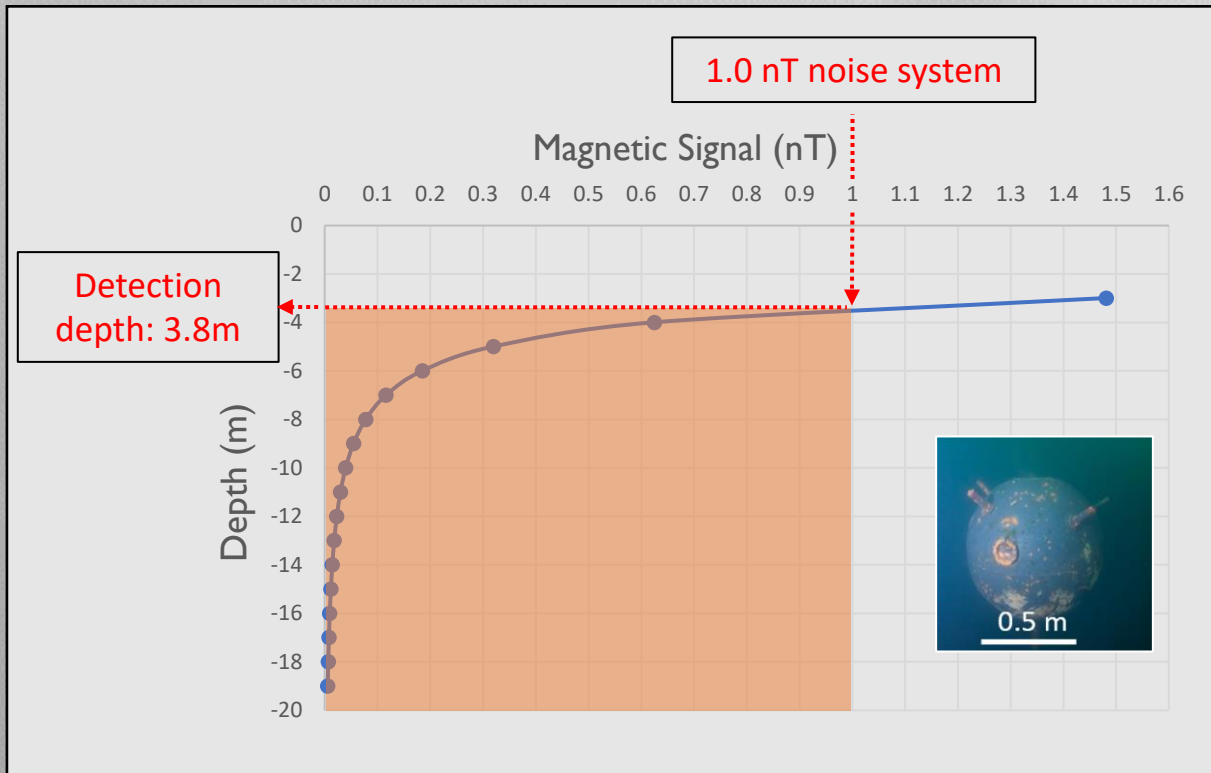
$$B = \frac{\mu_0}{4\pi r^3} (3(\hat{r} \cdot m)\hat{r} - m)$$

A red circle highlights the $4\pi r^3$ term in the denominator, with a red arrow pointing upwards from below it.



Drone Magnetic Gradiometry

System
Noise Level

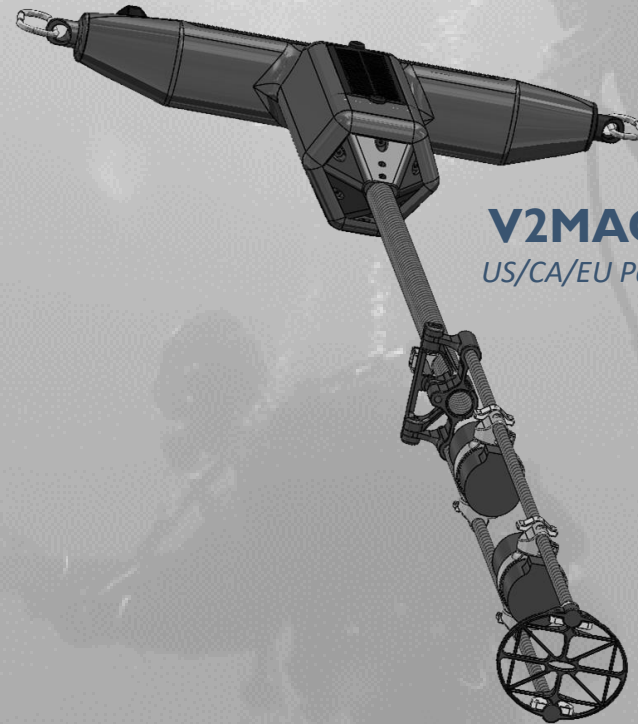


Magnetic Gradiometry

Magnetic UAV Solution **V2MAG™ NOA** Military Ed.



Military UAV magnetic turnkey solution
with unrivaled UXO / mine detection
capabilities, real-time data, and
computer-assisted target analysis





V2MAG™
US/CA/EU Patented

Magnetic Gradiometry

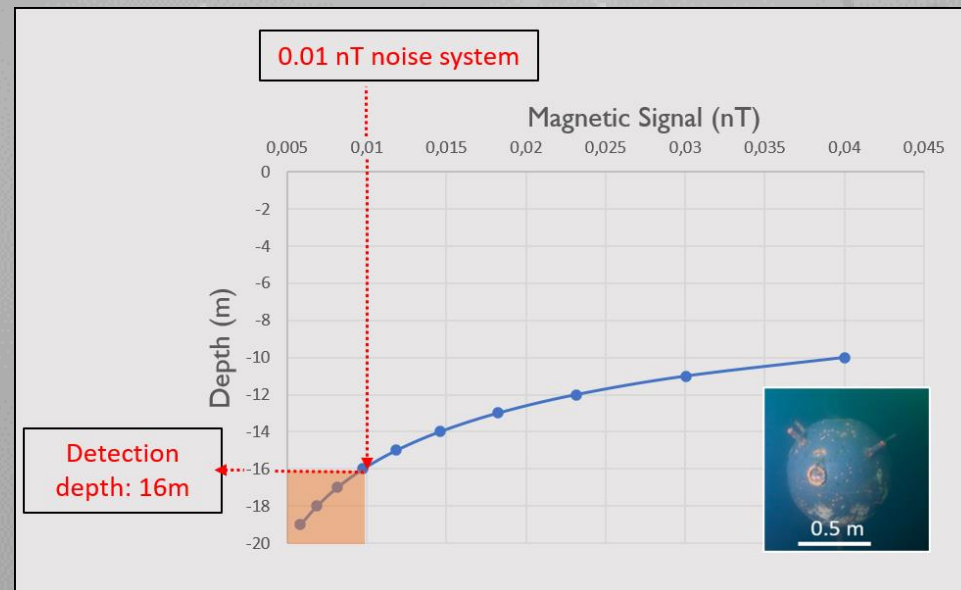
Magnetic UAV Solution

V2MAG™ NOA Military Ed.

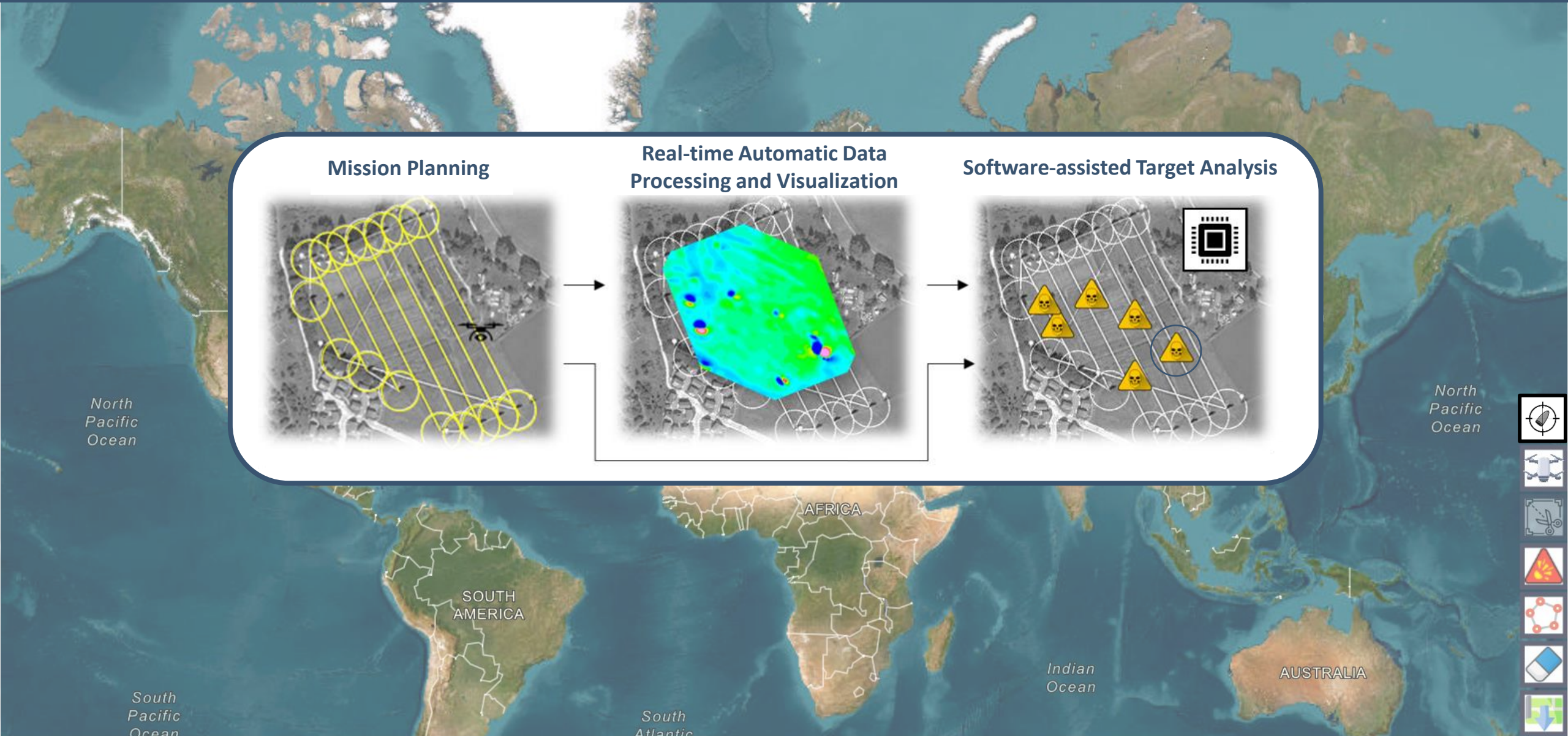


Military UAV magnetic turnkey solution with unrivaled UXO / mine detection capabilities, real-time data, and computer-assisted target analysis

- ✓ Vertical Gradiometry solution
- ✓ Two top-quality Quantum Magnetometers
- ✓ Real-time cm-level (5-8 cm) 3D positioning
- ✓ GPS jamming/spoofing resistance
- ✓ Drone agnostic (minimum 5 kg payload capacity)
- ✓ Weather resistant (wind and rain)
- ✓ Minimum noise system (0.01 nT in raw data)



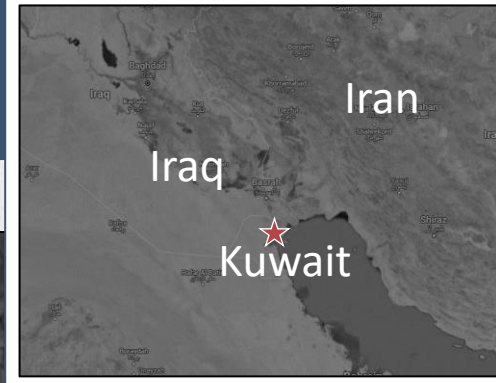
UMagMission™ End-to-End Operation Software



V2MAG™



Commercial Track Record





*Sold to European
Defense 2024*



*Operated by Ukrainian STSS
for land- and naval mine
detection*



Oleksii Reznikov
@oleksiireznikov

The Ministry of Defense of Denmark has provided 6 drones for mine scanning as part of their aid package for Ukraine. These drones are used for non-technical inspection of territories, including water bodies, for explosive ordnance. It is the latest innovative approach to inspecting territories.

I'm grateful to our Danish friends and especially to my colleagues

[@mfMorten](#) and [@troelslundp](#)!



2:46 PM · Jul 14, 2023 · 535.9K Views

V2MAG™



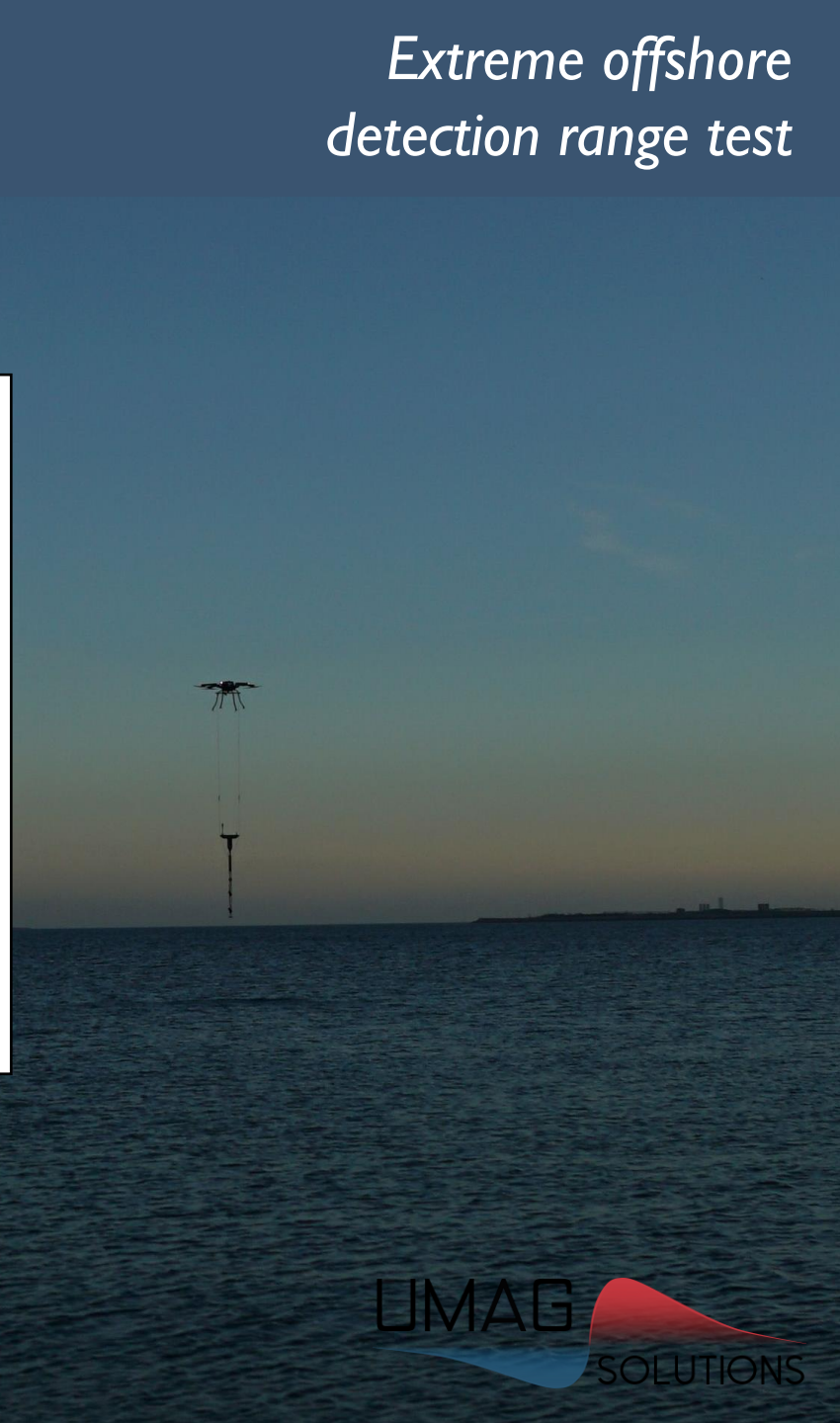
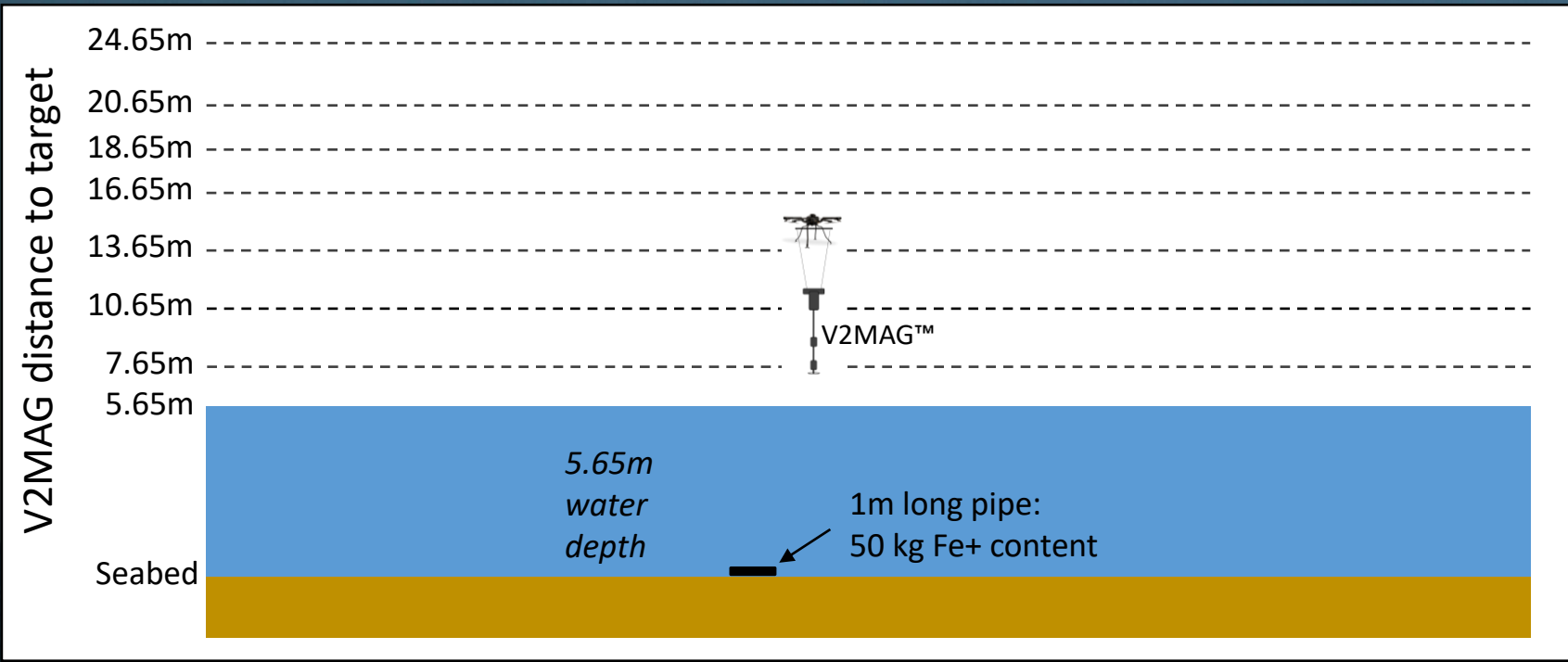
*Extreme offshore
detection range test*



V2MAG™



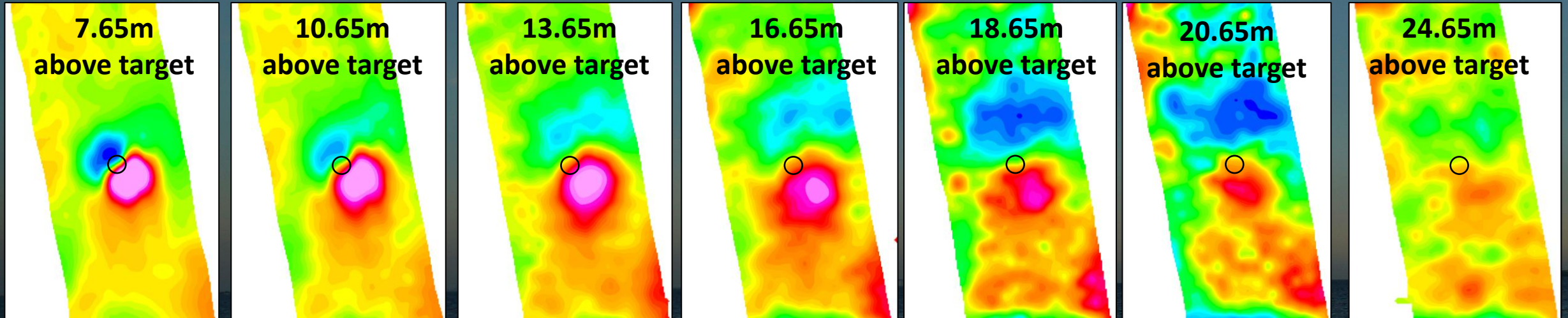
Extreme offshore
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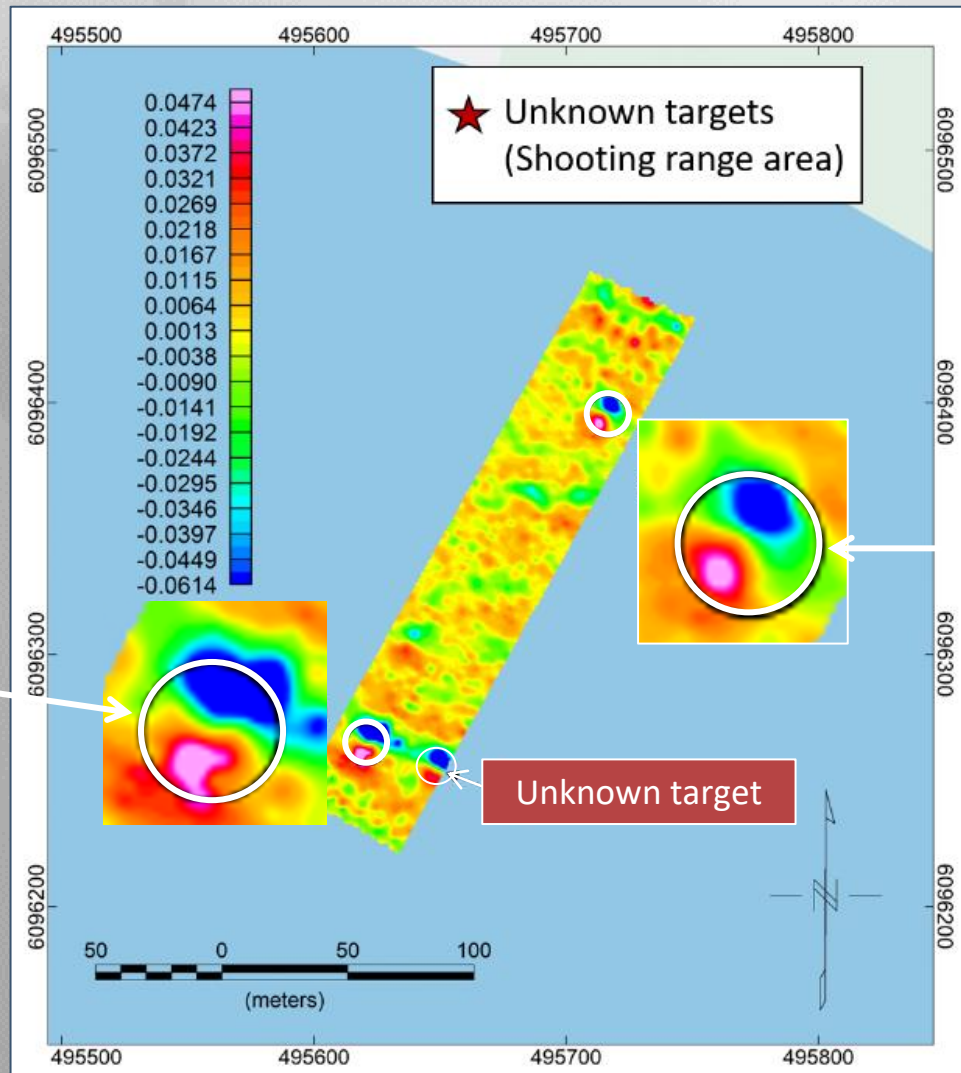
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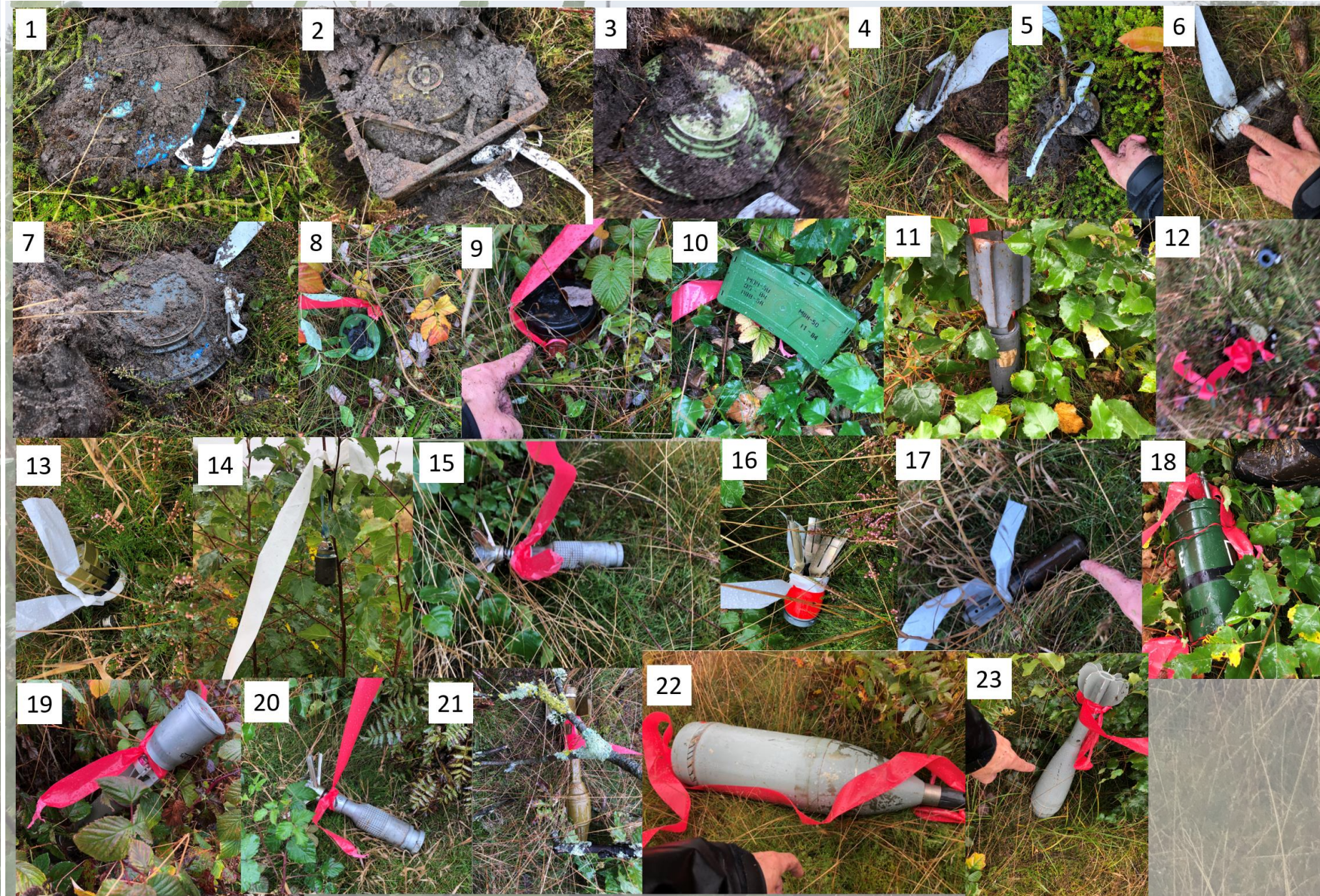


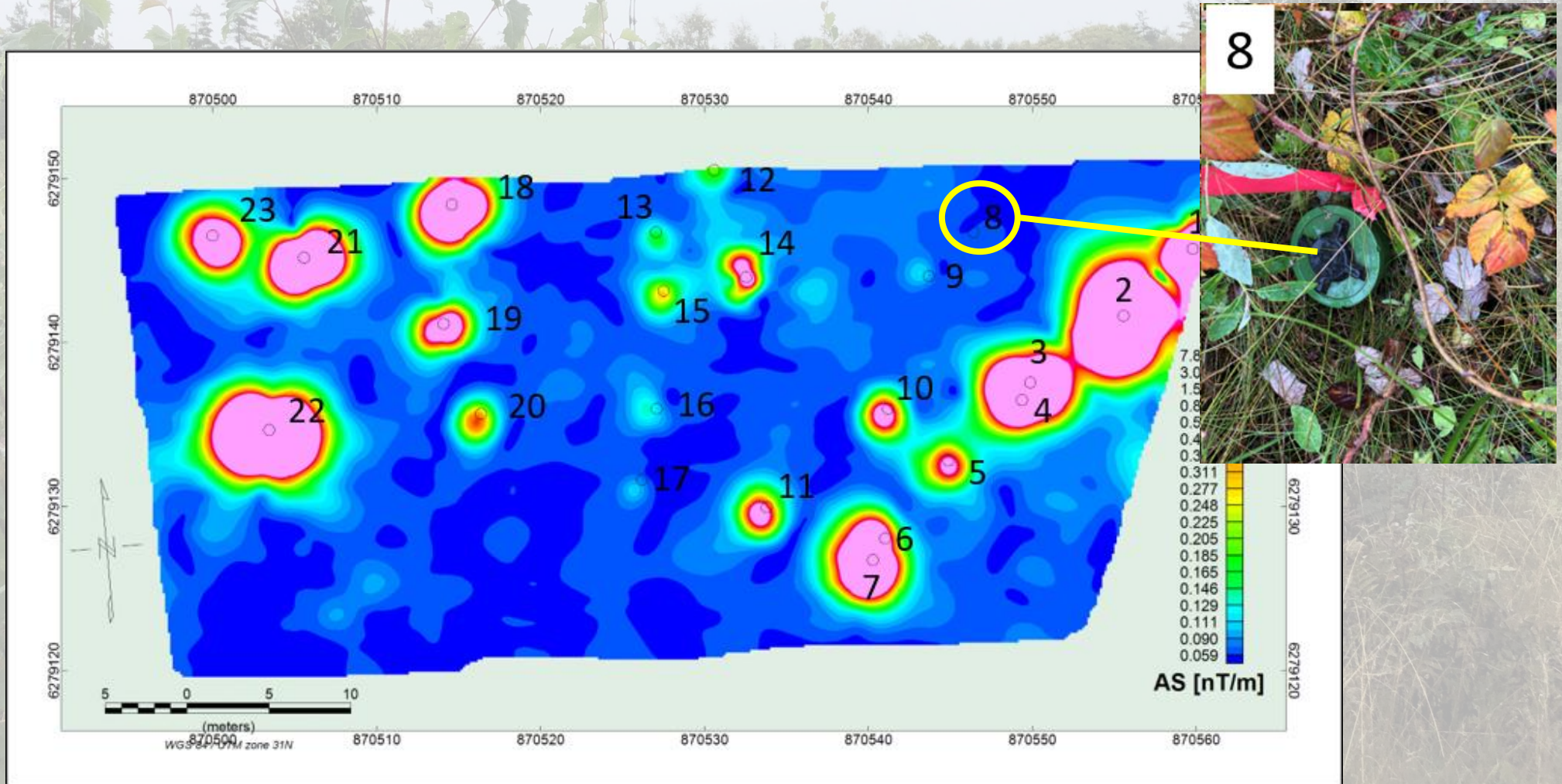
*Extreme offshore
detection range test*









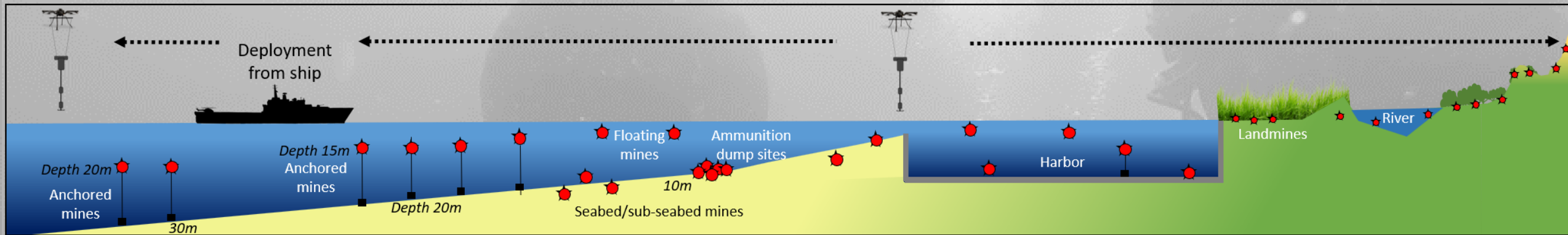


Survey altitude 2m above terrain (lower sensor-to-ground distance)

V2MAG™



One Solution for Onshore & Offshore Mine Detection





Thank You

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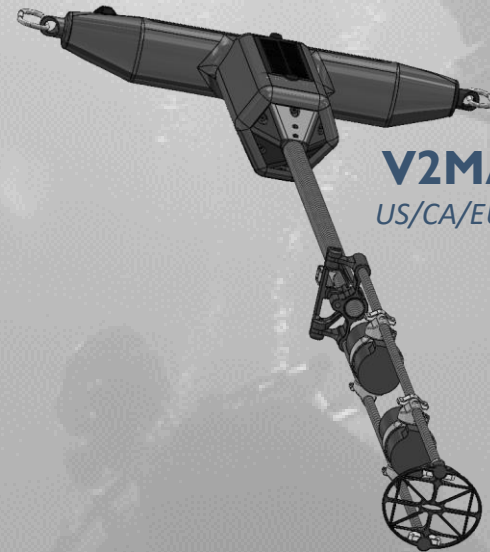
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ada@umagsolutions.com

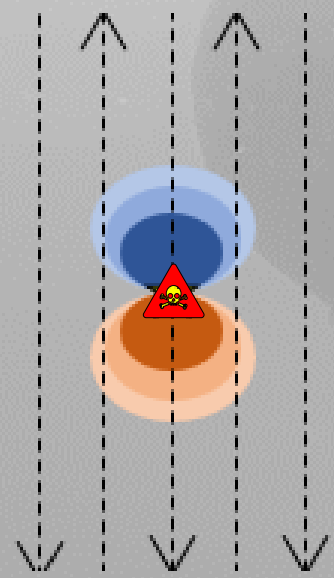
UMAG 
SOLUTIONS

Drone Magnetic Gradiometry

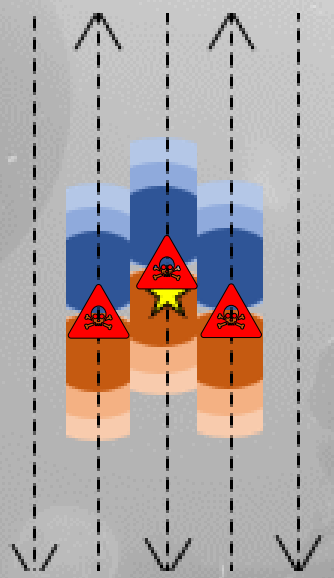
System Positioning Accuracy

- > Flight path
- ★ True target position
- ▲ Target analysis

High precision and high accuracy



Low precision but ok accuracy



Low precision and low accuracy

