



FIRST INTERNATIONAL CONFERENCE OF
CHEMICAL AND CONVENTIONAL MUNITIONS DUMPED AT SEA

Marine Towed Array Surveys of Ostrich Bay, Lake Erie and Puerto Rico.

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Marine Towed Array (MTA) Initial Design Criteria

- Survey in shallow water - 15 ft (5 m)
- Maximum platform depth – 30 ft (10 m)
- Operate up to Sea State Level 1
- Survey at speeds between 2 and 5 knots
- Utilize both magnetic and electro-magnetic detection systems
- Target detection down to 60 mm mortars

Surface Vessel

- Required stability (triple float pontoon)
- Adequate length and deck area(30 by 8.5 ft)
- Easily customizable (nice flat wooden deck)
- Sufficient towing power (140 HP O/B)



Sensor Platform

- Various considerations
 - Towed sled design
 - Rigidly fixed sensors on a single platform
 - Towed platform with an above water GPS antenna
 - Submerged platform towed with either a rigid boom or flexible tow cable



Sensor Platform

- Integrated Cs Mags and TD EM
- Stern planes controlled by rotary actuators
- Sensor interface pressure vessel for ancillary electronics (IMU, temp, comms, CPU diagnostics, depth, mag compass)
- Diagnostic data recorded with sensor data

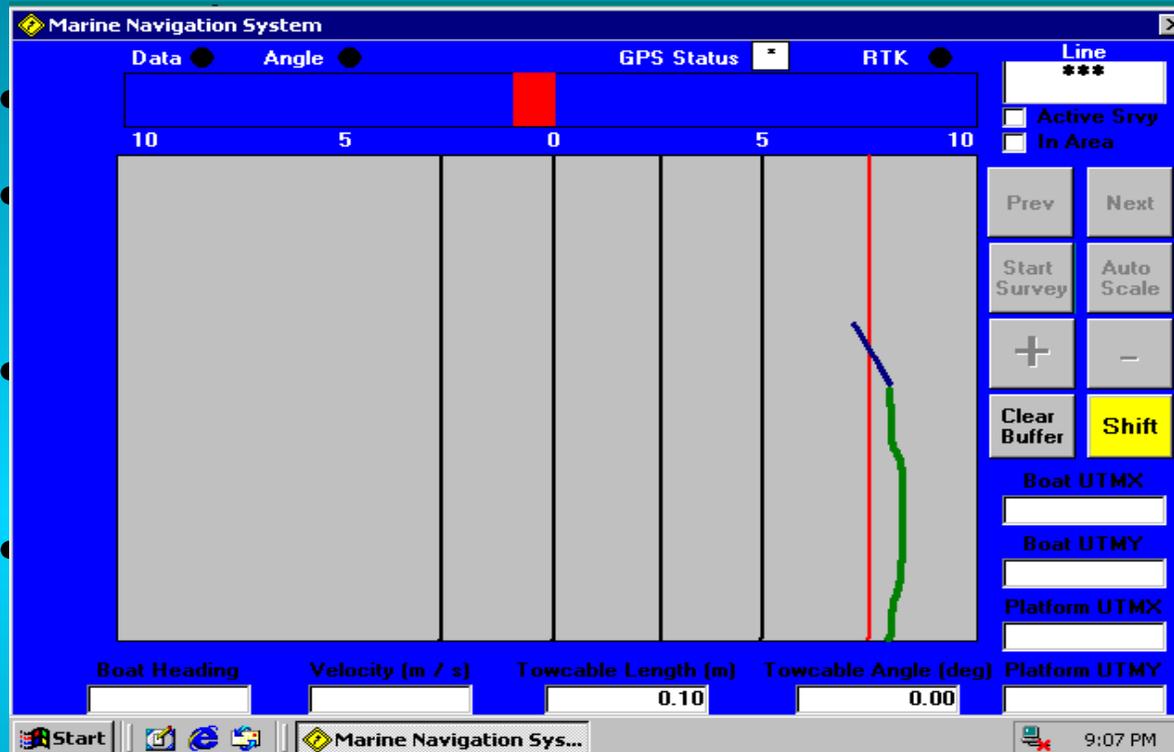


Tow Cable

- Two different tow lengths(16 & 22 m) to facilitate different depth requirements
- Integral Kevlar strain member (WL=500 kg)
- Capable of carrying power(28 Vdc/20A) and signals(14 TSPs, RS-422)
- Safety weak link in case of platform snags
- Specially designed tow point with tow cable angle encoder, interface, and primary GPS antenna



GPS and Navigation



- Real time navigation system showing vessel, tow cable angle and platform positions with left/right steering indication

Data Acquisition Hardware

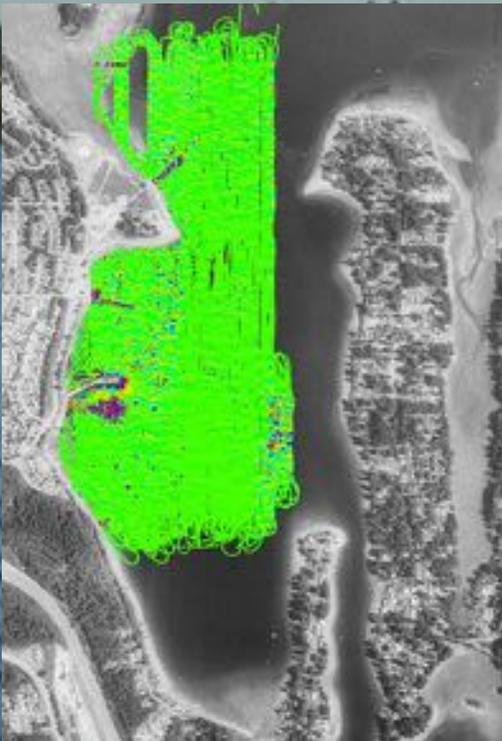


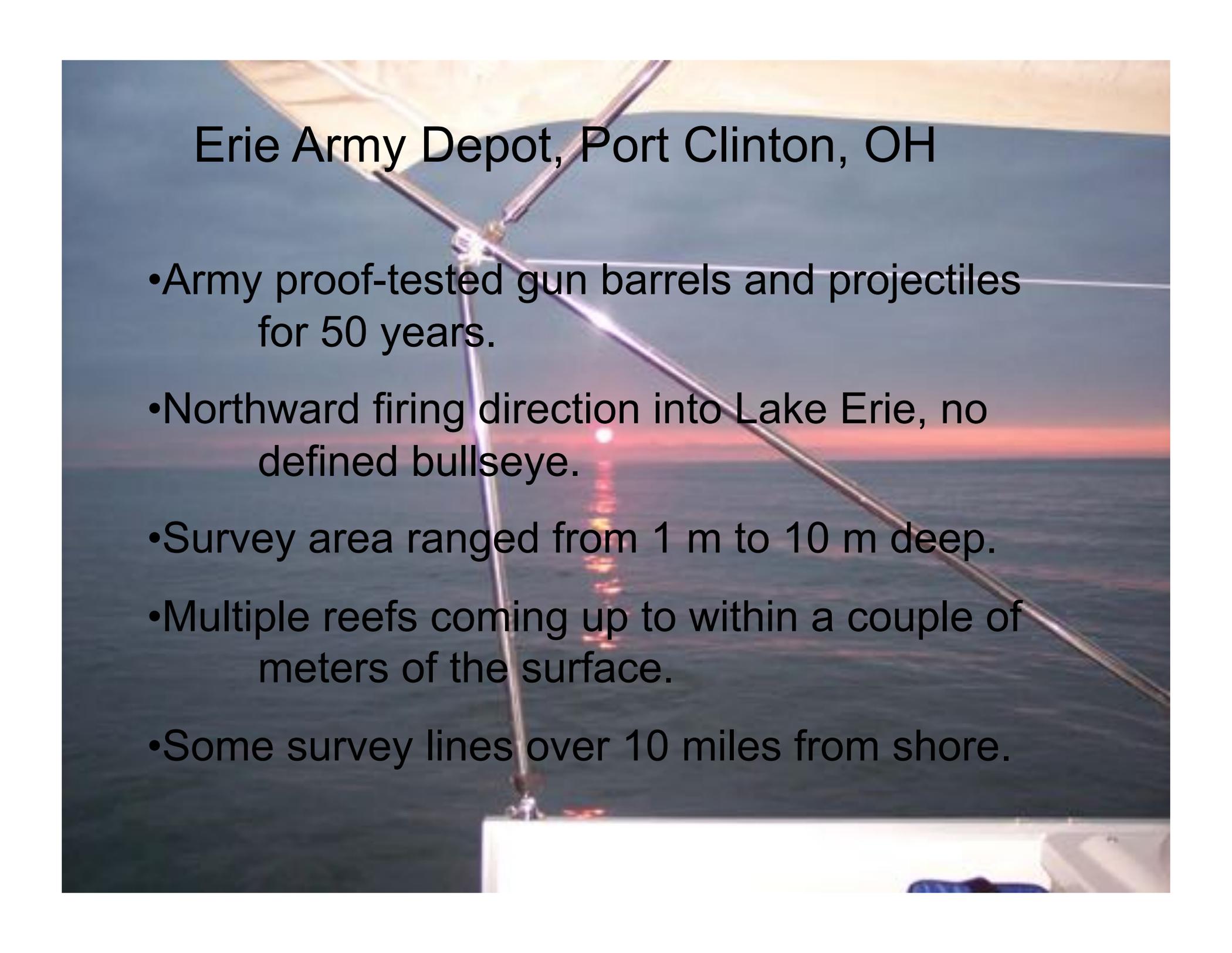
Platform Autopilot

- Platform depth and attitude controlled by two rear control fins
- Control fins positioned by rotary actuators
- Actuators' positions commanded by autopilot software at 15x per second
- Autopilot software utilizes inputs from IMU, depth pressure transducer, platform sonar altimeter, platform magnetic compass and topside GPS derived velocity
- Altitude control mode, depth control mode and **emergency rise mode**

Ostrich Bay, Washington State

- Mobilization/Demobilization
- Operational Logistics
- Data Analysis





Erie Army Depot, Port Clinton, OH

- Army proof-tested gun barrels and projectiles for 50 years.
- Northward firing direction into Lake Erie, no defined bullseye.
- Survey area ranged from 1 m to 10 m deep.
- Multiple reefs coming up to within a couple of meters of the surface.
- Some survey lines over 10 miles from shore.

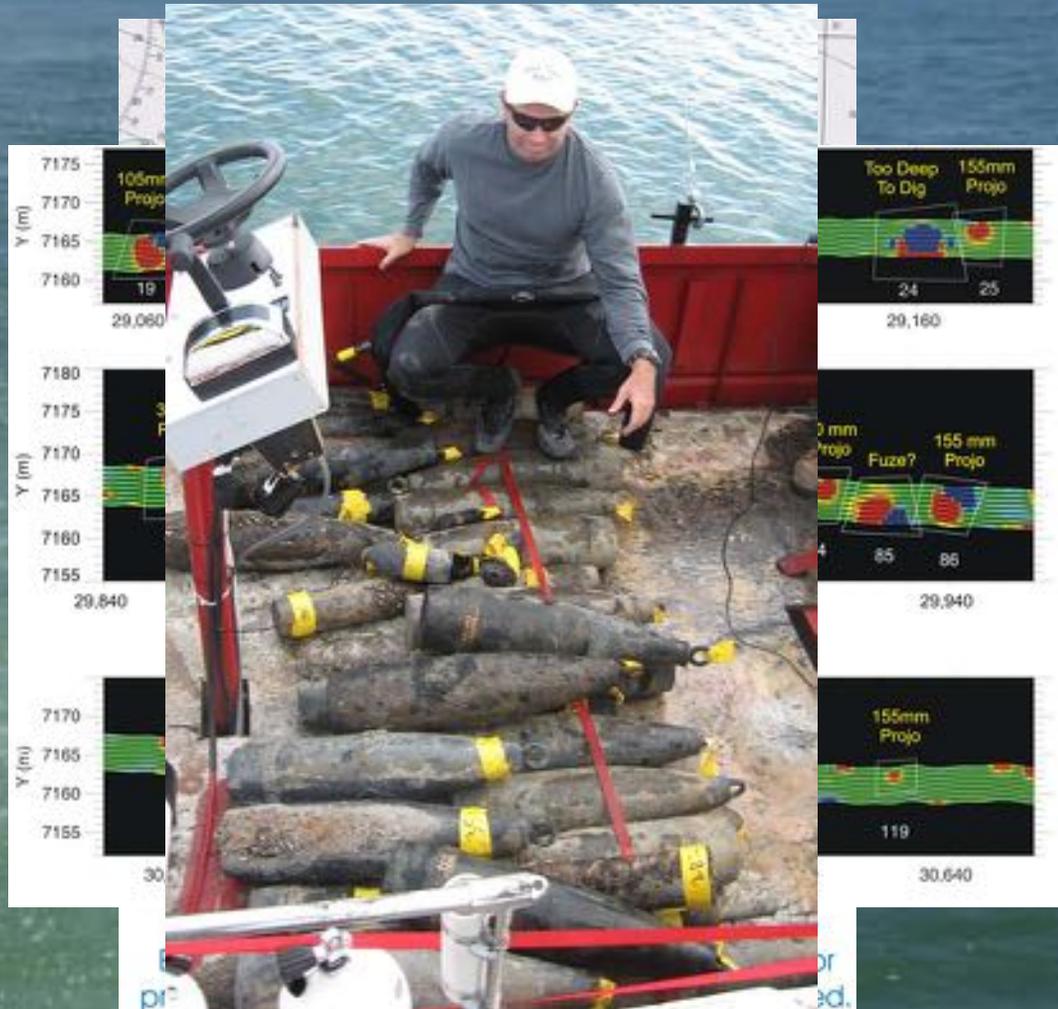
Erie Army Depot, Port Clinton, OH

- Weather conditions, wind, rain, and waves.
- Long distance for RTK communications link.
- Long ferry times,
up to ~2 hours.
- Shallow reefs.
- Low flying traffic.
- Investigations



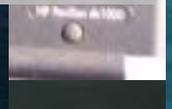
Erie Army Depot, Port Clinton, OH

- Data Collection
 - Transects
- Data Analysis
 - Dig list
 - Est. >400K
- Target Retrieval
 - 225 targets



Vieques Island, Puerto Rico

- Mob/Demob
- Survey Logistics
- Onsite Repairs
- Bathymetry
- Sea States



Vieques Island, Puerto Rico

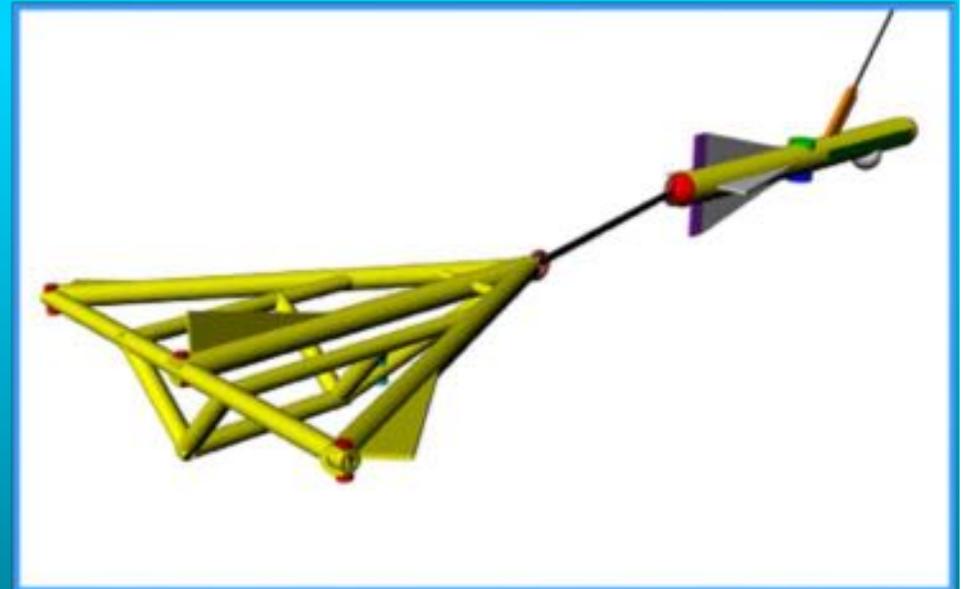
- Data Collection
 - Shallow Areas
 - Deeper Areas
- Total Coverage



Current Projects

Deep Water Munitions Detection System

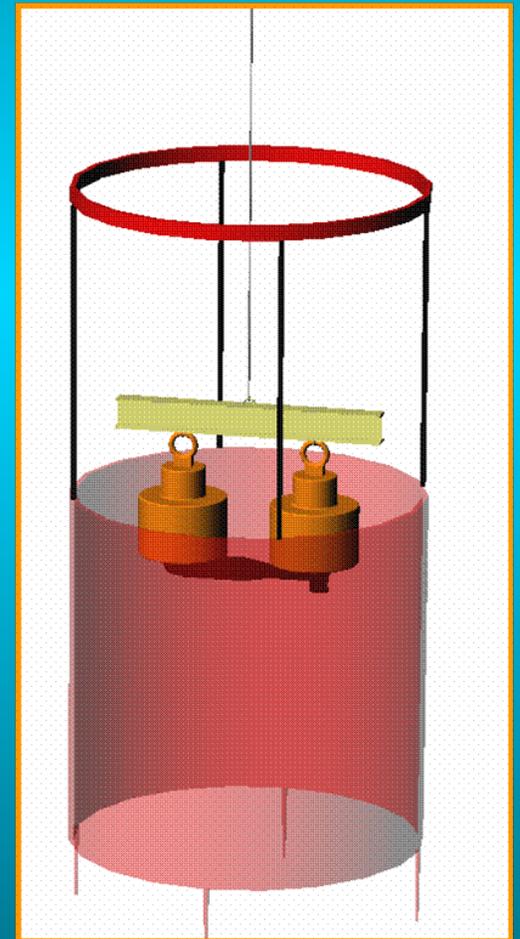
- Navigational Fish consisting of SS Sonar, INS, DVL, Video, depth sensor & GPS.
- Sensor Fish housing 3 Cesium mags, sonar altimeter, P&R sensors.
- 100 feet operational depth.



Current Projects

Shallow Water UXO Retrieval System

- No divers required for UXO retrieval.
- Remotely controlled and operated.
- Video confirmation of UXO type.
- 15 feet operational depth.



A View From Below



Thank You, Questions?