



Non-Traditional MDA Solutions

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Strategic Vision for Maritime Awareness

Energy



**Building a Sustainable
Maritime Ecosystem**



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Maritime Awareness



**Detecting Illicit Maritime
Activities**



Why we formed ThayerMahan

20th

- Capital Intensive
- Large Capital Ships
- High Profile
- Centralized, Fixed
- Carriers/Battleships/Submarines
- Command and Control
- Manpower Intensive
- Intrusive
- Blue Water
- Energy Intensive

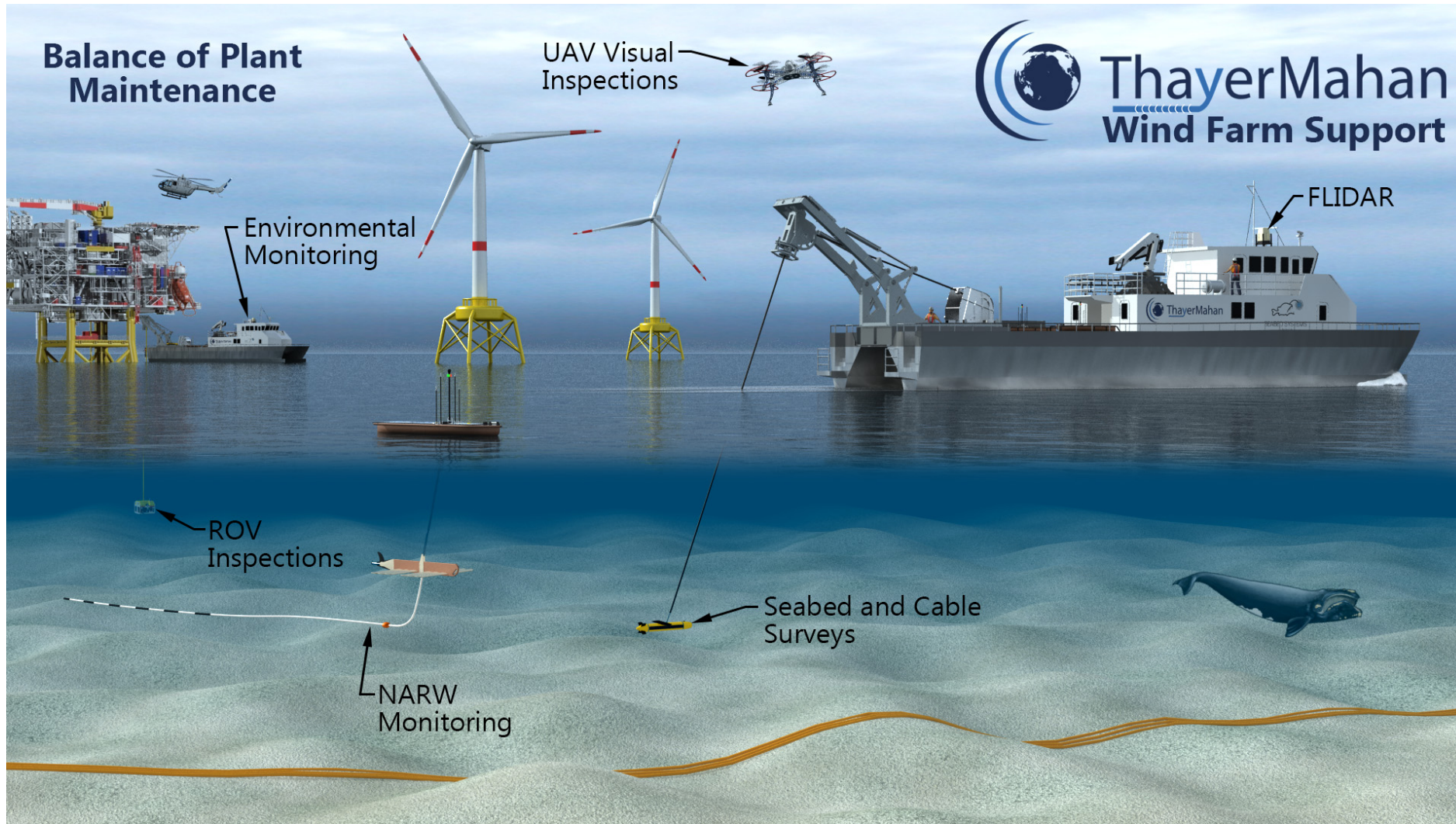
21st

- Highly Scalable
- Distributed, Digital, Connected Forces
- Low Profile
- Distributed, Agile
- UUVs/AUVs
- Constructive Autonomy
- Manpower Light
- Non-Intrusive
- Blue Water or Gray Zone
- Energy Independent



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Coexisting in the maritime domain



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The role of autonomy

At sea

- Vessel/vehicle operation
- Missions
 - Environmental characterization
 - Vessel or other activity localization
 - *Target identification*
 - *Object recognition*

Ashore

- Data archiving
- Data integration
 - Presentation (COP)
 - Pattern of life development
 - Change detection
 - Environmental characterization
- Data sharing

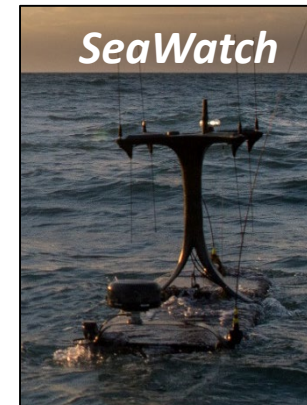
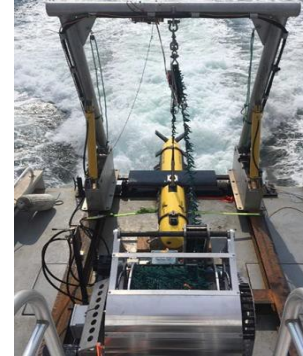


Coast Guard mission applicability

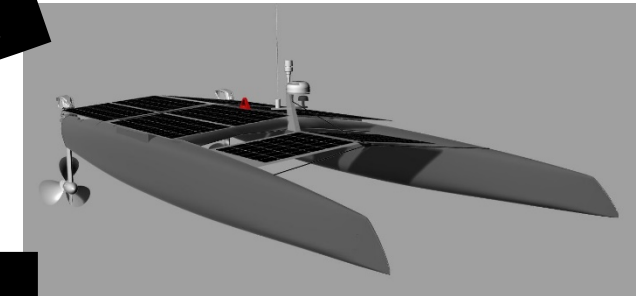
District 7 – Example

1. Marine Environmental Protection
2. Port and Coastal Security
3. Aids to Navigation
4. Search and Rescue
5. Living Marine Resources - Fisheries
6. Migrant Interdiction
7. Drug Interdiction
8. Other Law Enforcement – foreign fishing law enforcement

SeaScout®
SEABED MAPPING & INTELLIGENCE



GOAL – Use Autonomous Systems to increase efficiency and effectiveness of deployable maritime assets



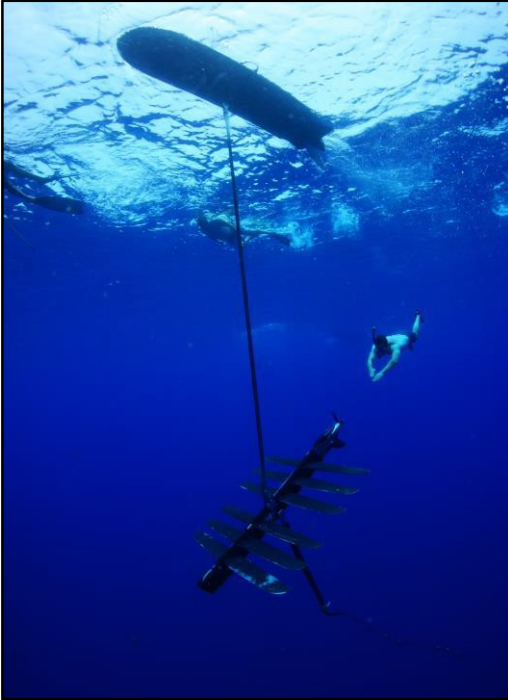
ThayerCat (2020)

24/7 Op Center Monitoring



Technology Portfolio

Persistent Surveillance Systems

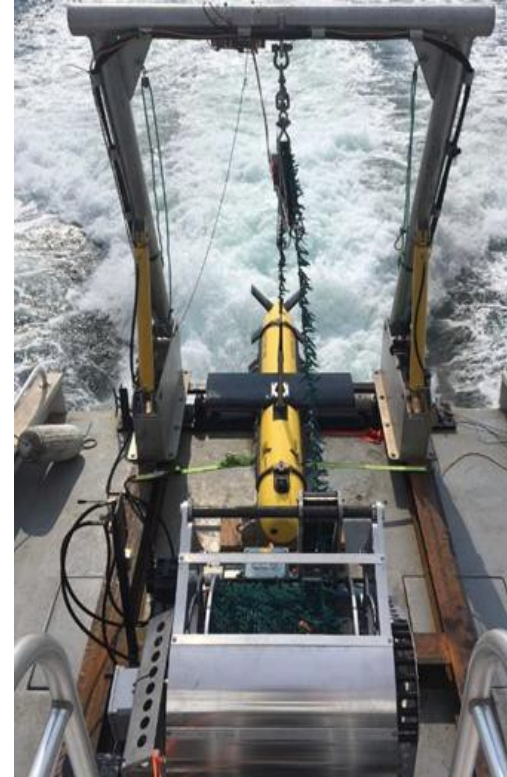


Outpost

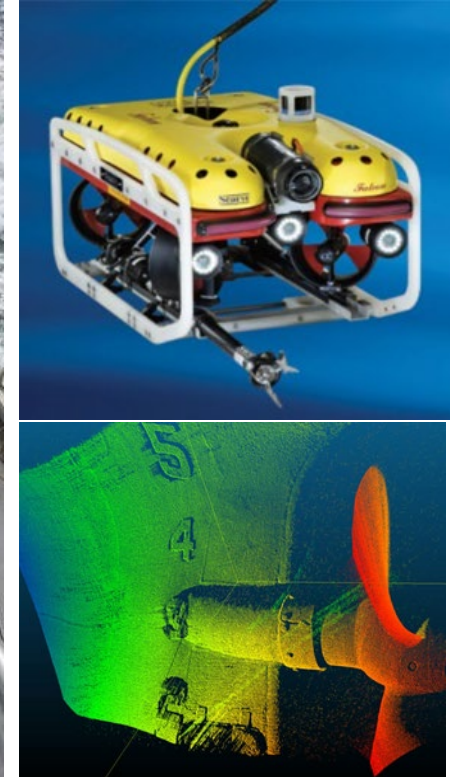


SeaWatch

Port Security and Seabed Systems



SeaScout

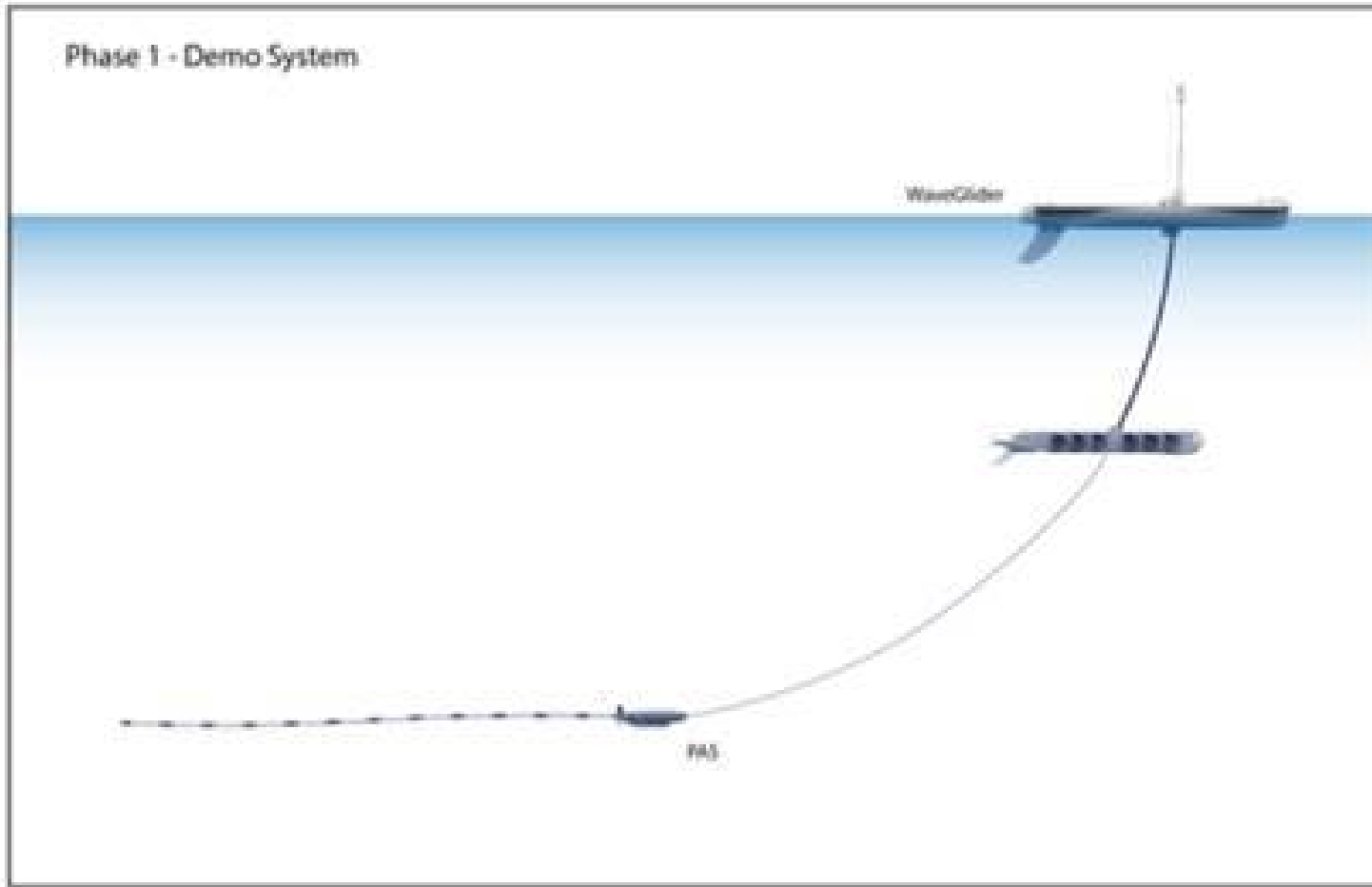


SeaVision



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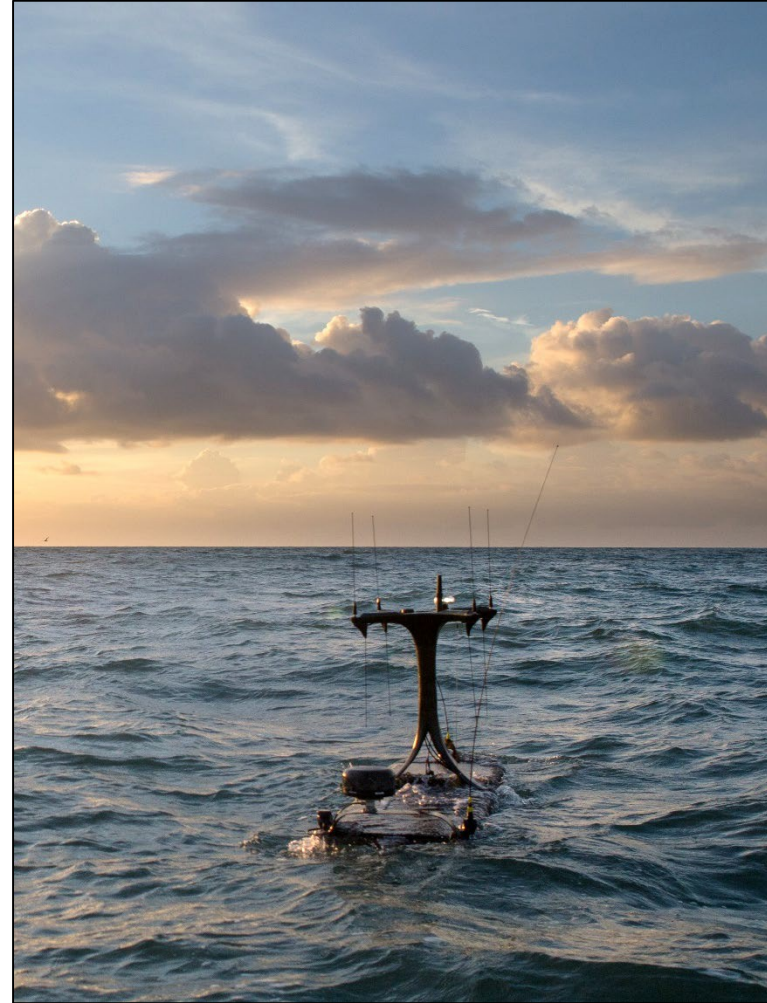
Outpost mobile persistent acoustic sensor



- Proven in government applications
- Energy harvesting 24/7 sustainable
- High gain and localization
- Autonomous detection
- Ships and mammals
- Acoustic pollution
- Endurance 90+ days
- Near real-time reporting
- No moorings – **eliminates NARW entanglement threat**



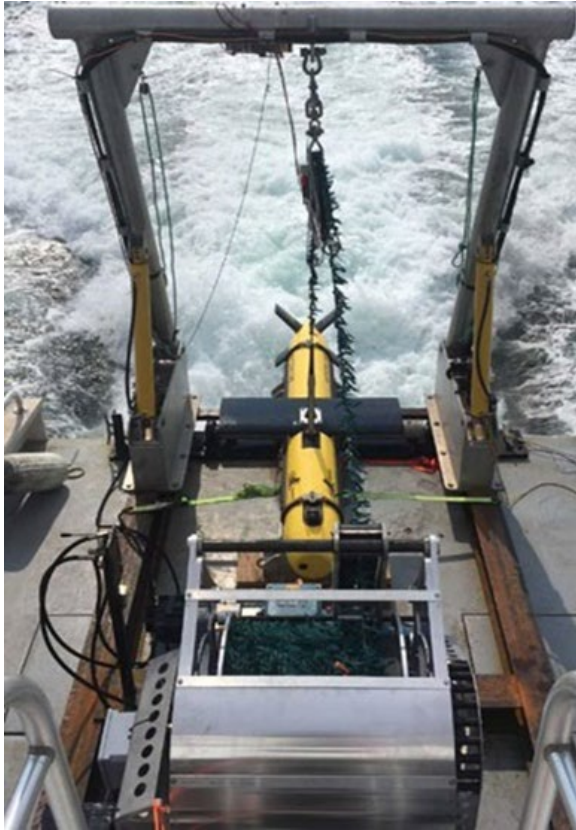
SeaWatch – Offshore Electronic Monitoring



***SeaWatch* integrates unique, mission proven technologies into a single system designed to augment existing interdiction and safety capabilities**

- At sea communications intercept/relay system
- Autonomous, long endurance vehicle building off common platform expertise
- HF/VHF spectrum with operator enabled frequency scanning
- Direction Finding (DF) and audio recordings provided in real-time
- Mission Sets: Law enforcement, counter drug/trafficking operations, security, site awareness, early indicator/warning threat assessment

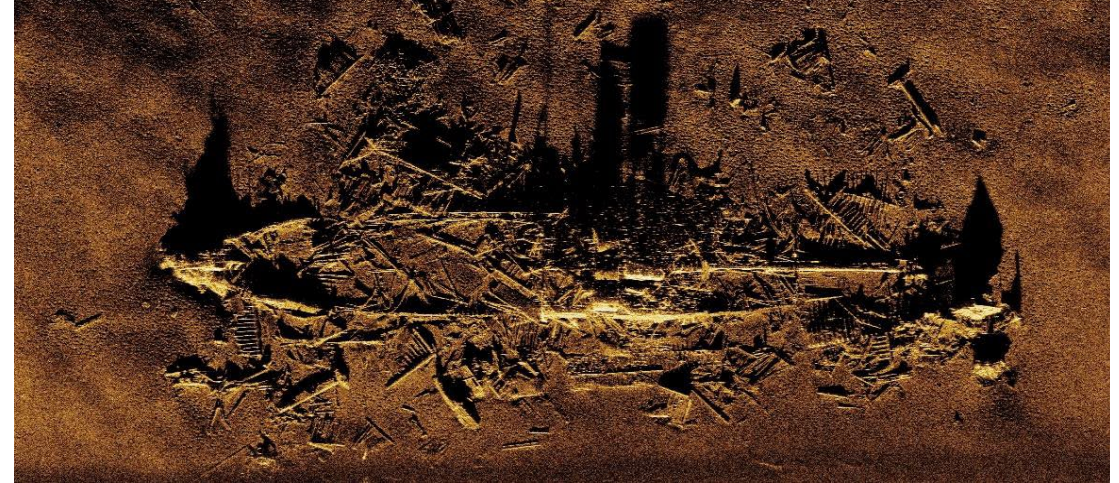
SeaScout bottom survey system



Actively stabilized towfish, smart winch, communications suite, and synthetic aperture sonar payload

- Survey speed up to 8kts
- 4km²/hr Area Coverage Rate
- 3cm x 3cm Resolution @ 200m
- Bathymetry Vertical Accuracy 10cm
- Real-time beamforming, georeferencing, mosaicking, and digital terrain modeling
- Data collection rate of 30MB/sec
- Operated in depth or altitude modes and includes automated bottom avoidance capabilities
- Mission Sets: Mapping/navigation, environmental assessment, infrastructure assessment, security/seabed threat monitoring

Quality seabed Imaging provides transparency with government and fishing community

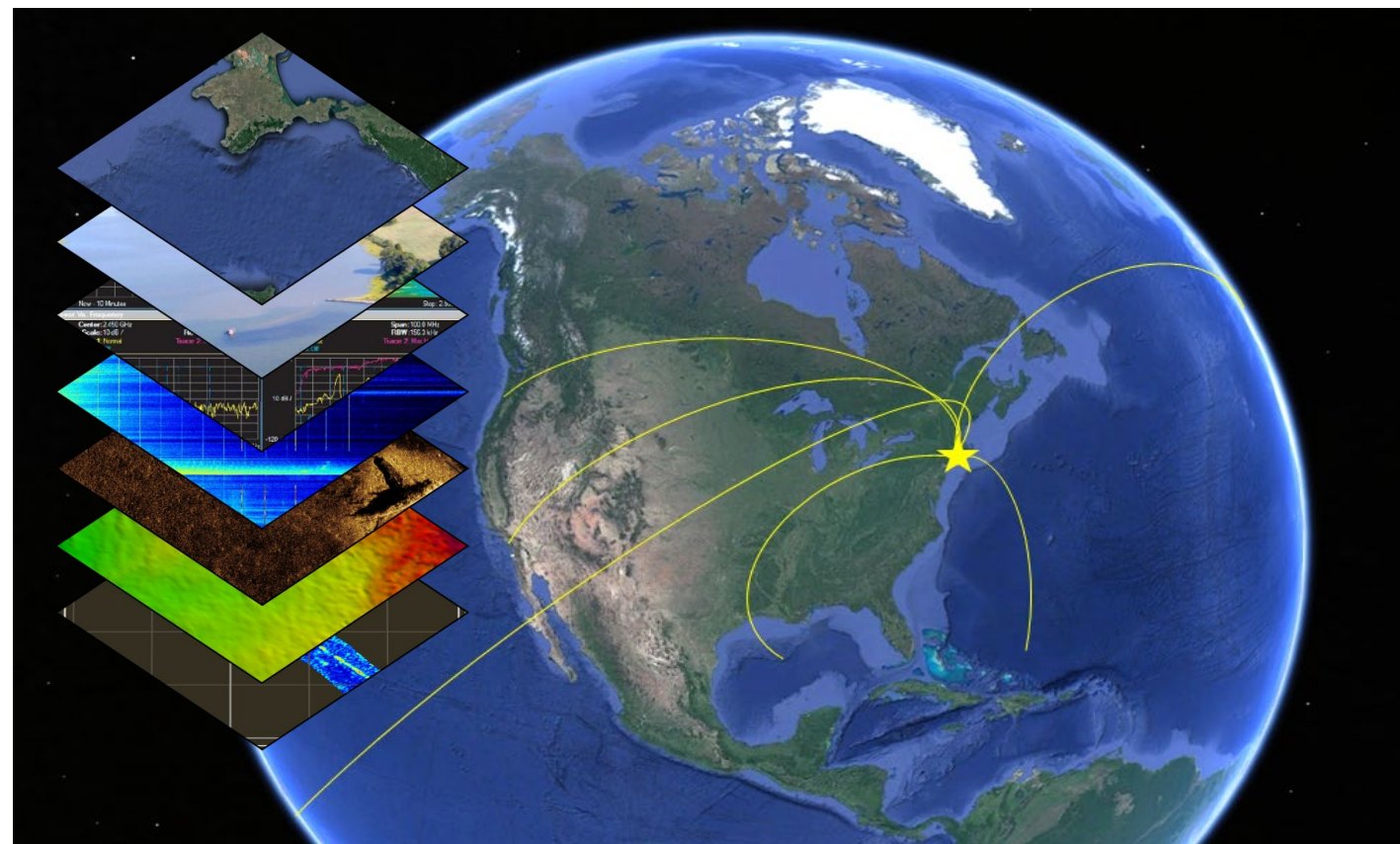
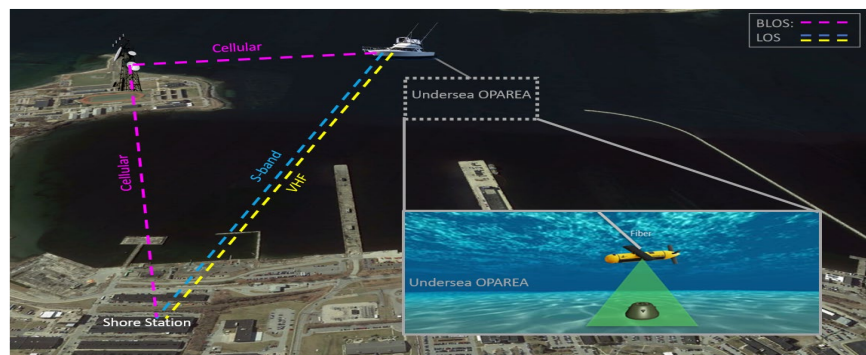
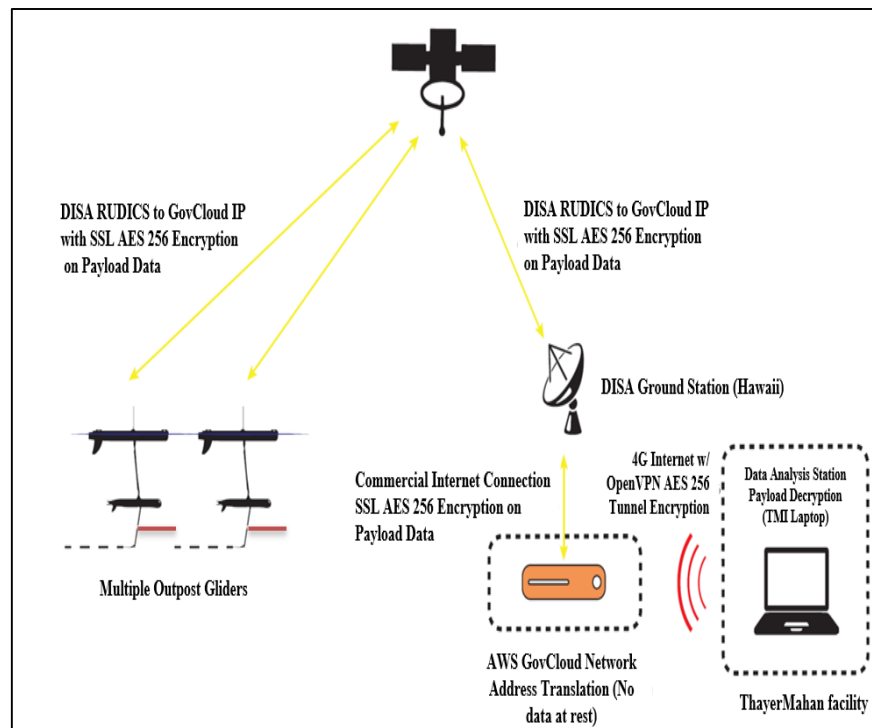


24/7 Maritime Domain Awareness



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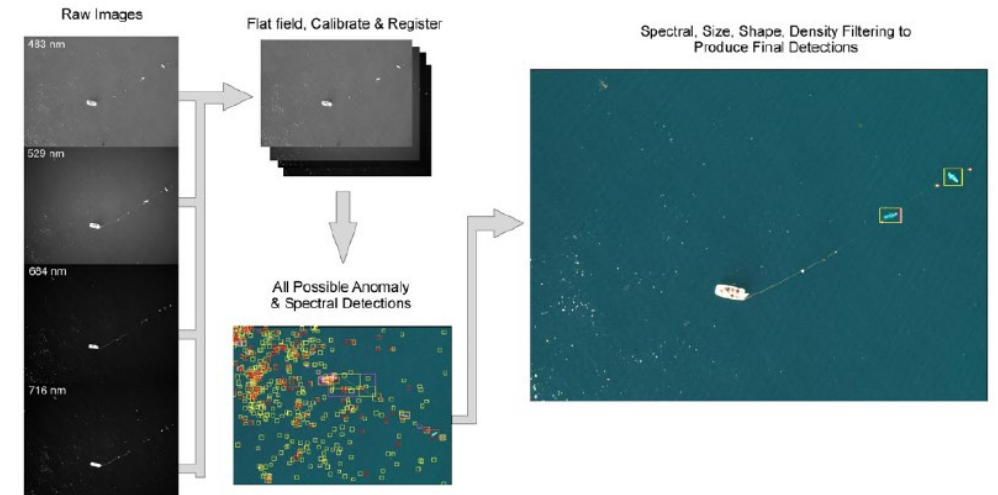
Managing data – on and under the sea



ThayerMahan services include the option of “raw” data collection and dissemination to analysis and visualization across multiple domains. Redundant connectivity, uninterruptable power, and cloud-based architecture ensures the customer retains access and awareness as required.

Emerging Tech - *Hyperspectral Imaging*

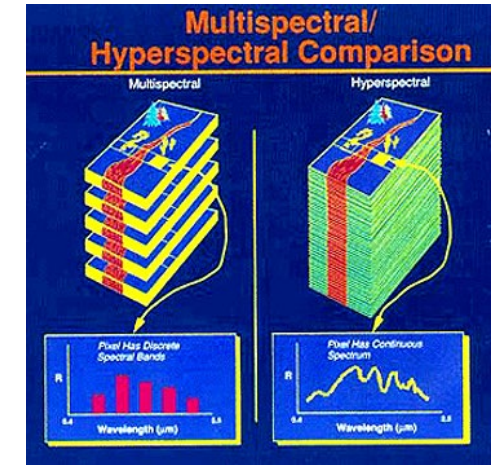
- Reflective sensing technique that uses reflected sun-light to illuminate and measure reflective & absorptive indices to generate spectral signatures (chemical “fingerprints”)
- Promising work in marine sea-life detection
- Utilization in combination with UAS provides real time, accurate, and unmanned solution



Detection of sharks via aerial spectral imaging using camera and processing program (Source: *An Innovative Method for Obtaining High Detection Rates of Sharks on Ocean Beaches* by Cardno)

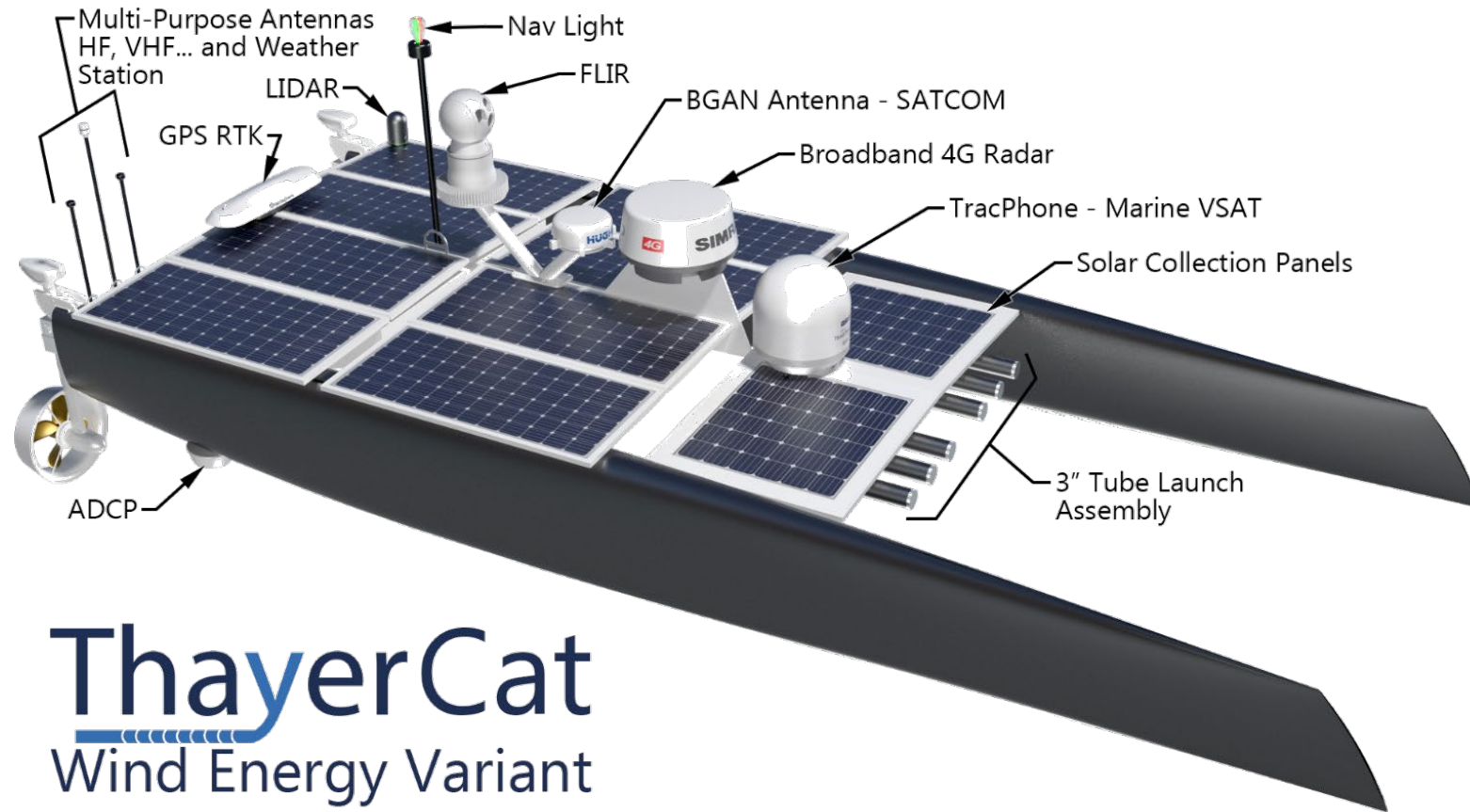


UAS equipped with Hyperspectral Imager (Source: Headwall Inc)



Multispectral versus Hyperspectral Imaging 13 (Source: Wikipedia)

Emerging Technologies

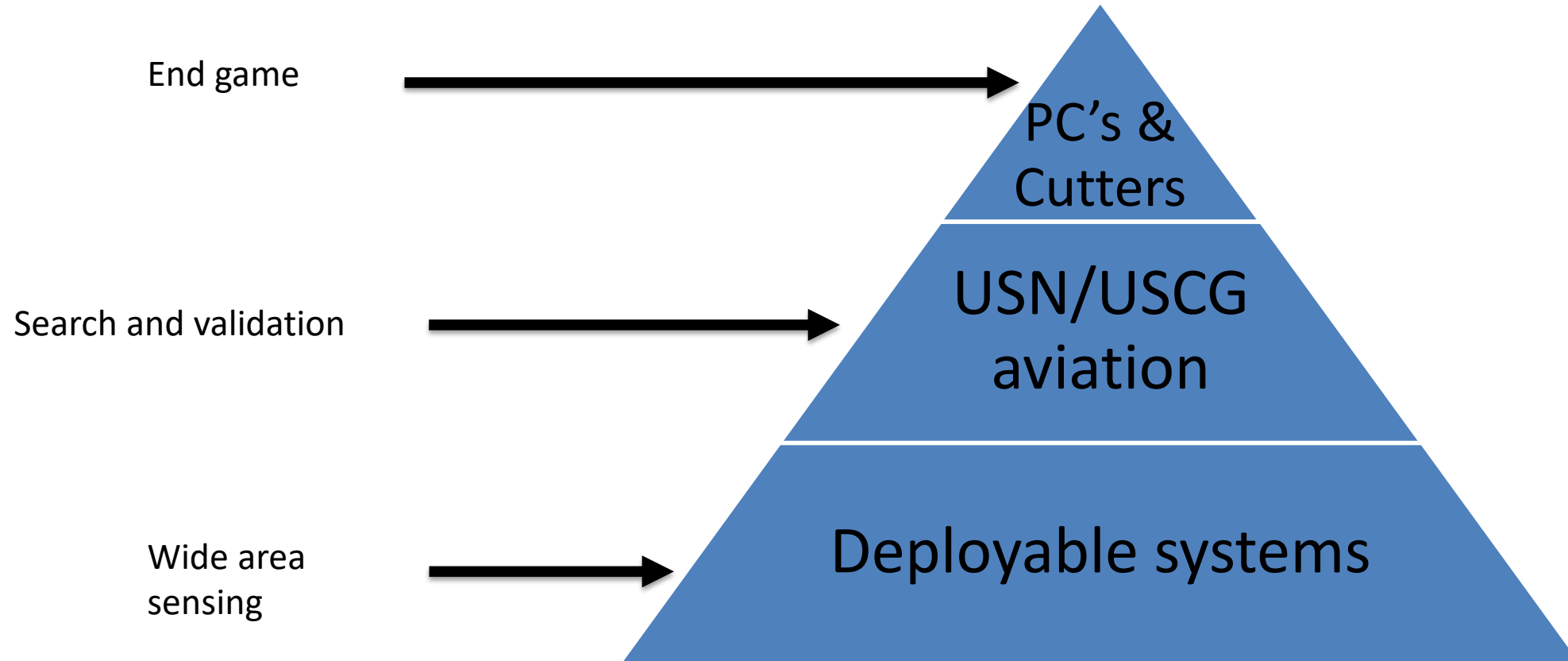


ThayerCat
Wind Energy Variant



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How we *think* we fit in Navy/USCG strategy

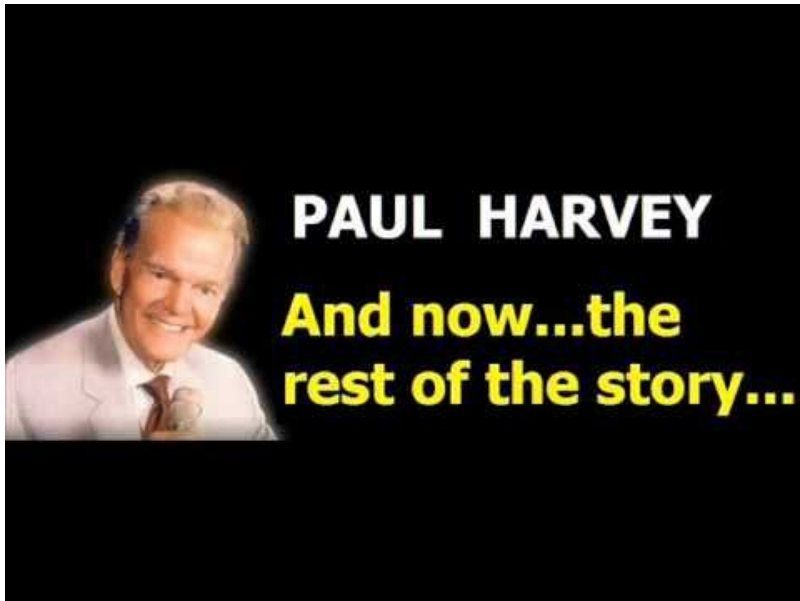


Foundation for an asset-constrained strategy



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And Now – The Rest of the Story!



The ThayerMahan Chronicle



Mike – "Hey Rich, let's go Fishing!"
Rich – "Sounds Good!"

2015

Drop it All!

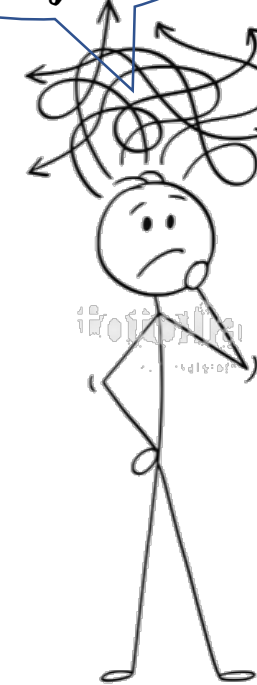


Oh yeah!



Mike – "Let's drop everything and go change the 100 year old paradigm about Maritime Strategy!"
Rich – "You mean like Alfred Thayer Mahan did a century ago?"
Oh Yeah!"

Mike –
"This shouldn't be too hard – right?"



Barriers to Entry:

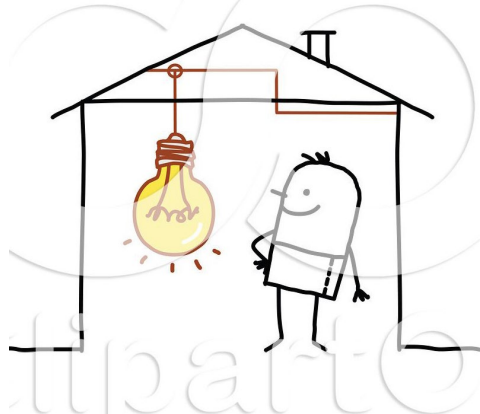
- ✓ Big Government
- ✓ Big Defense
- ✓ Big Primes
- ✓ Raise VC Funds
- ✓ Gov't Compliance
- ✓ Gov't Accounting
- ✓ Disrupt 100 years of Naval Thought
- ✓ Gain Rapid Tech acceptance
- ✓ Protect IP
- ✓

Rich – "Oh yeah?"

2016

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Rejection on All Fronts!



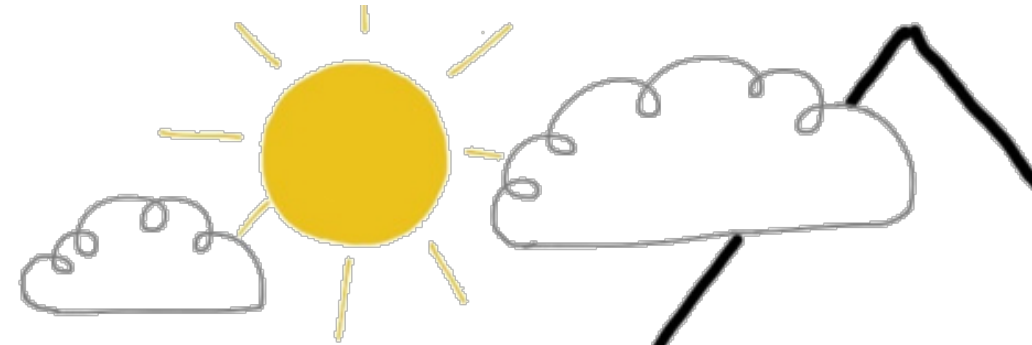
- ✓ Two guys
- ✓ A Garage
- ✓ An Idea

2017



ONR – "This thing will never work!"
US Patent Office – "We are rejecting your patent for **OBVIOUSNESS!**"
VC Funding – "The US Gov't is your primary market – forget it!"

Gaining Traction!



Start up Funding Secured
Patents Approved
Test Demonstrations Successful
Scaling of Capabilities
Big Prime Acceptance and Partnering
SeaBed Systems Group – SeaScout

DCAA/DCMA Audits
Facilities Clearance
Building Staff

Rich – "Oh yeah!"

2018

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Operations Center Opens 24/7 Watchstanding



USSOUTHCOM Contract

- ✓ Sensor Fence Op
- ✓ Counter Drug Mission

ONR Contract

- ✓ Unmanned Systems Development and Testing
- ✓ 5 Years/\$19.4M

Technology Commercialization

- ✓ Offshore Wind Energy
- ✓ Offshore Oil & Gas
- ✓ Science and Environmental
- ✓ 11 Patents/34 employees
- ✓ **Whiteboard to Wet - 6 mos.**

Mike - "Happy Now?"



Custom Tailored Solutions

- ✓ TurnKey
- ✓ Autonomous
- ✓ Search-As-A-Service
- ✓ Multi-Mission
- ✓ Multi-Sensor
- ✓ Data Curation
- ✓ Data Management
- ✓ Leverage Capital Assets



Rich - "Oh yeah!"

2019

And now you know the rest
of the story!

The Big Takeaways

- ❑ The challenges and risks in today's maritime environment cannot be solved in traditional ways using traditional technologies
- ❑ Maritime Domain Awareness must be addressed and maintained using automation, AI and connected/distributed low-cost systems
- ❑ Disruptive innovation must be fostered by collaboration by/between Industry, Finance, Academia, Science and government customers
- ❑ There is a place in the search for maritime solutions for small business and entrepreneurs – this path must be made easier and fostered at the highest levels of government
- ❑ Never before has maritime transparency been more essential to mitigating maritime risks.
- ❑ ThayerMahan is here to serve many Coast Guard missions by providing low-cost, autonomous, multi-sensor solutions. Let us be your extra eyes and ears in the oceans!

www.thayermahan.com



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