N852
MINE WARFARE BRANCH

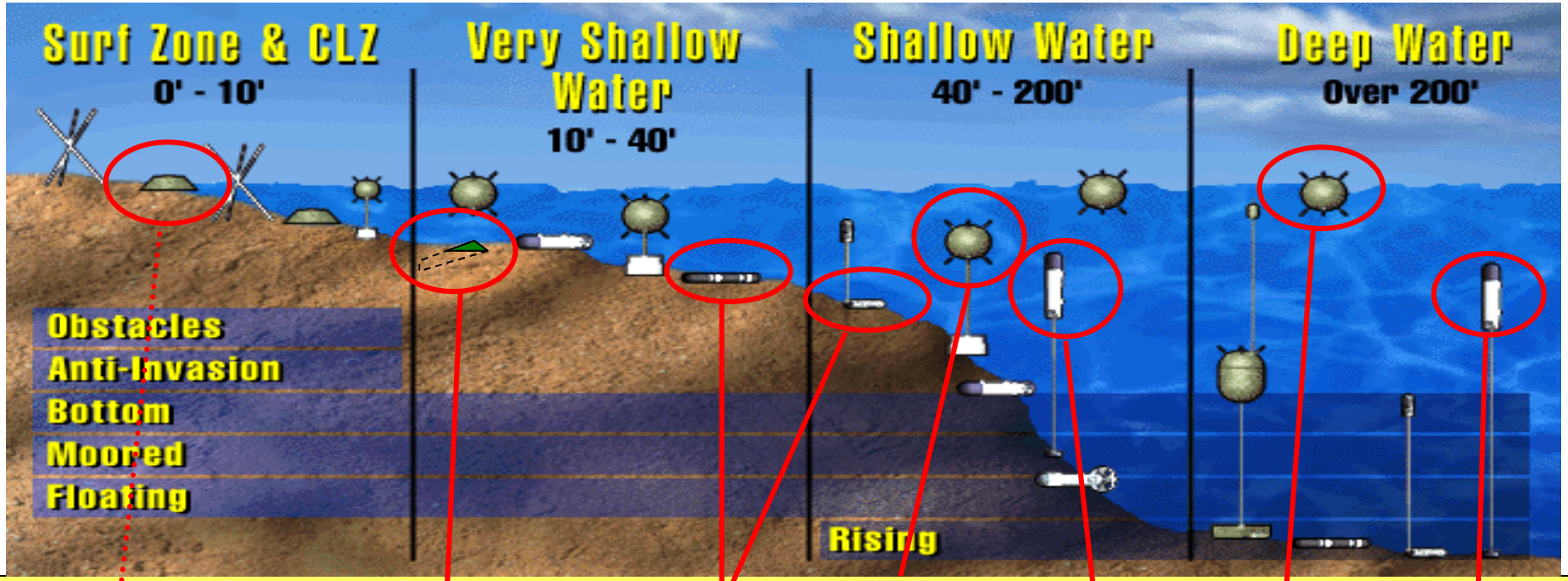
CAPT Mark Rios

Branch Head

Agenda

- Mine Threat to Access and Maneuver
- The Transition from Dedicated to LCS-based MCM
- MCM Mission Package Program Overview
- Near Future Challenges
- Summary

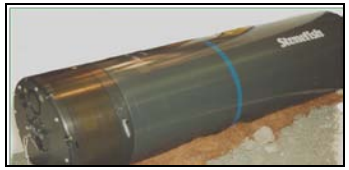
The Threat to Assured Access



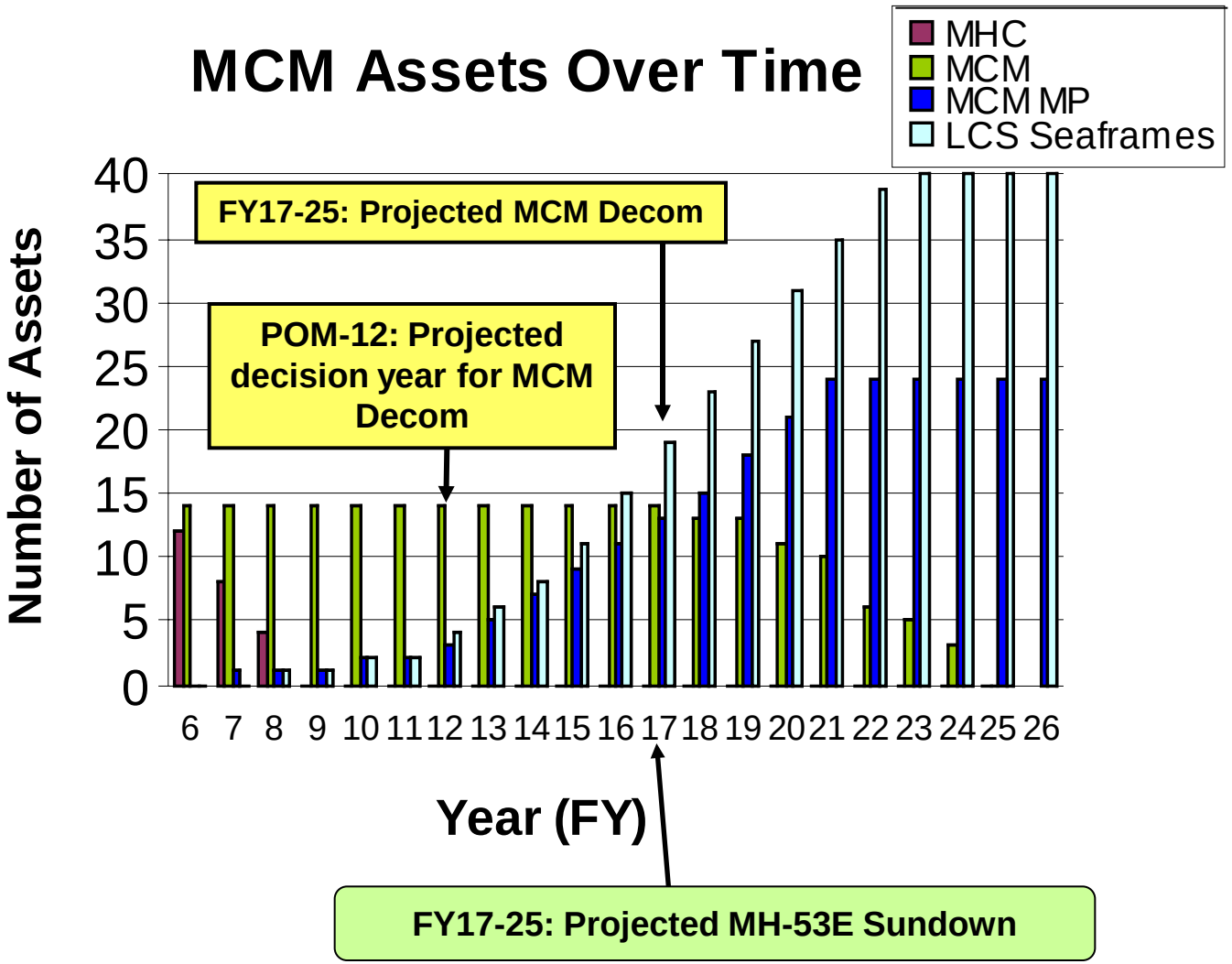
Anti-Invasion | Buried/Partially Buried | Bottom Influence | Moored Contact | Moored Influence | Floating Contact | Rising Influence

- The real goal of a minefield is Sea Denial, NOT the damage or destruction of a specific ship.
- The Sea is a maneuver area. Navy goal is to assure Access, support STOM/OMFTS, NOT counter every mine.

- Over 300 Mine Types
- Over 50 Countries Possess
- Low Cost but High effects
- Simple to Deploy
- Asymmetric 3



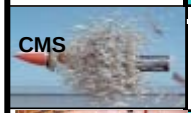
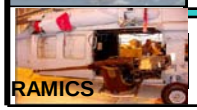
Transition to LCS-based MCM



Changes Since Last ExWar Conference

- New MIW systems installed in USS SENTRY
  - HF Wide Band Sonar successfully installed and tested in USS SENTRY
  - Expendable Mine Neutralization System (EMNS) installed also.
- COBRA Blk I Milestone C
  - Integrated in VTUAV
- Downselect of ABS Counter Mine System from 3 to 2 designs
- Tested RAMICS from a tower. Helo testing early next year.
- ALMNDS Contractor Testing
- ARVCOP, which is a part of ABS, successfully tested in AAV

MCM Package System Status

MCM Package Program	ACAT	Programmatics	Testing	Contractor	IOC
 AQS-20A	2	In Low Rate Initial Production	✓ TECHEVAL on MH-60S completed • OPEVAL w/ MH-60S Jun 10 – Aug 10	Raytheon	2011
 AMNS	2	In Low Rate Initial Production	✓ MS C Approval Jan 08 • DT Live Fire Ground Testing Jul 09	Raytheon	2011
 ALMDS	2	In Low Rate Initial Production	✓ Commenced WSIT CT on MH-60S Apr 08 • Commenced TECHEVAL 1st Qtr Fy11	Northrop Grumman	2012
 COBRA	3	Milestone C: Jan 09	✓ Started Performance Validation (MH-53E) • Integration flight tests on VTUAV Dec 09	Northrop Grumman	2012
 OASIS	2	Milestone C: 3QFY10	✓ Re-design PDR 12 Jun 08 • MH-53E OA 3rd Qtr FY10	ITT Corp	2013
 RMS	1C	In Low Rate Initial Production	✓ OP assessment completed on DDG-96 Sep 08 • Reliability Growth Program Ongoing	Lockheed Martin	2013
 US3	3	Milestone B: 4QFY11	✓ Sweep Gear integration test on USV Jul 08 • End to End US3/USV/MP test Oct 08	TBD	2015
 UUV LFBB	TBD	Milestone B: 2QFY10	• CDD pending N8 approval	TBD	2015
 CMS	3	Milestone C: FY14 Neutralizer final decision Fy12	✓ SD&D Contract awarded 24 Jul 08 • Preliminary Design ReviewOct2009	Boeing	2017
 RAMICS	2	Milestone C: 4QFY10	✓ MH-60 S Captive Carriage & Jettison Oct 08 • MH-605 Gun fire test 3rd QTR FY10	Northrop Grumman	2017

MCM Coverage in 2018

Minefield Detection and Neutralization

Assault Breaching System

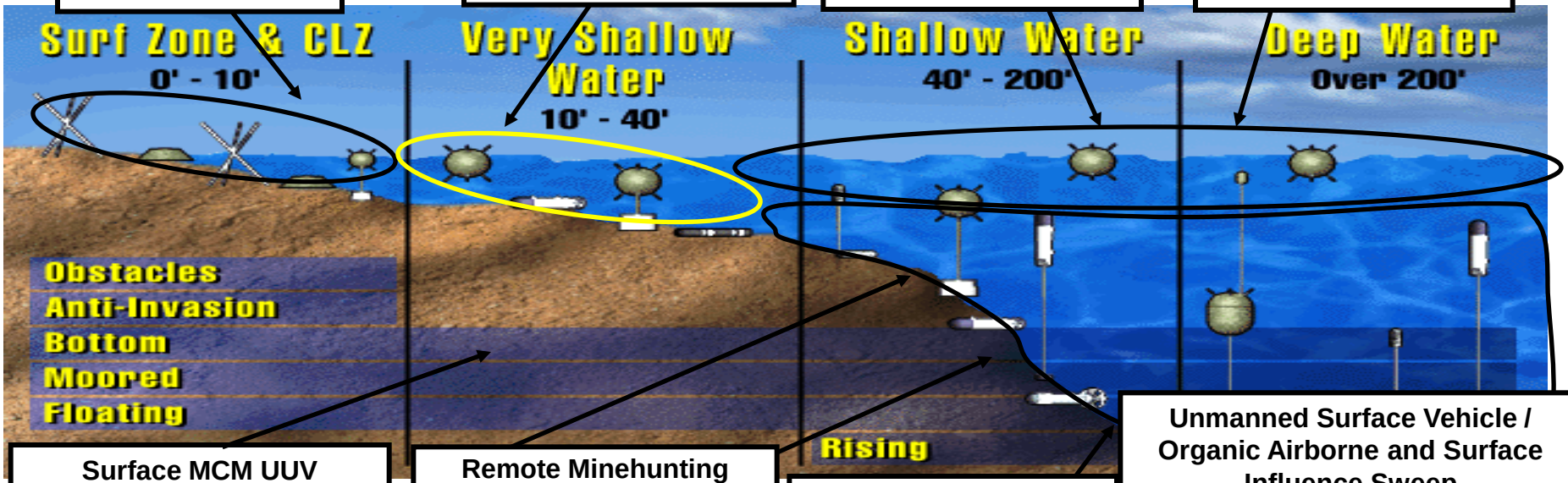
EOD Mobile Unit ONE

Laser (Hunt)

Airborne Laser Mine Detection System

Super-cavitating Projectiles (Kill)

Rapid Airborne Mine Clearance System



Surface MCM UUV and Low Frequency Broadband

Buried Mine Detection

Remote Minehunting System & MH-60S AN/AQS20A

Sonar (Hunt)

Airborne Mine Neutralization System

Propelled explosive charges (Kill)

Unmanned Surface Vehicle / Organic Airborne and Surface Influence Sweep

Magnetic Acoustic Influence Sweep

Near Future MCM Challenges

All of our programs face inherent challenges:

- **Sensor and Processing False Alarms**
  - ❖ High False Alarms mean longer PMA & higher False Classification by PMA Operator

- **LIDAR Performance**
  - ❖ Environmental compensations difficult – affected by surface effects and water turbidity

- **Computer Aided Detection(CAD)/Classification(CAC) Improvements**
  - ❖ Potential for real-time algorithms in the OAMCM Common Console
  - ❖ Fast and accurate CAD/CAC capability needed on OPMA

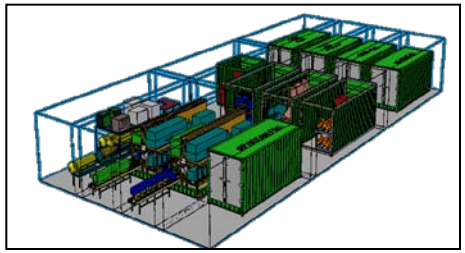
- **Reliability**
  - ❖ System Reliability needs to meet requirements
    - Operational Availability (Ao)
    - Mean Time Between Operational Mission Failure (MTBOMF)
  - ❖ All Subsystem Components (CSTRS, Common Console, Tow Cable, etc.) need improvement

- **Plan for Obsolescence**
  - ❖ Require modular, open architecture systems that are supportable long term

- **Opportunities for Industry:**
  - ❖ UUV power generation / endurance
  - ❖ Not just Unmanned Systems but…Fully Autonomous Systems
  - ❖ Info Sharing and Cueing between Unmanned Systems

Summary

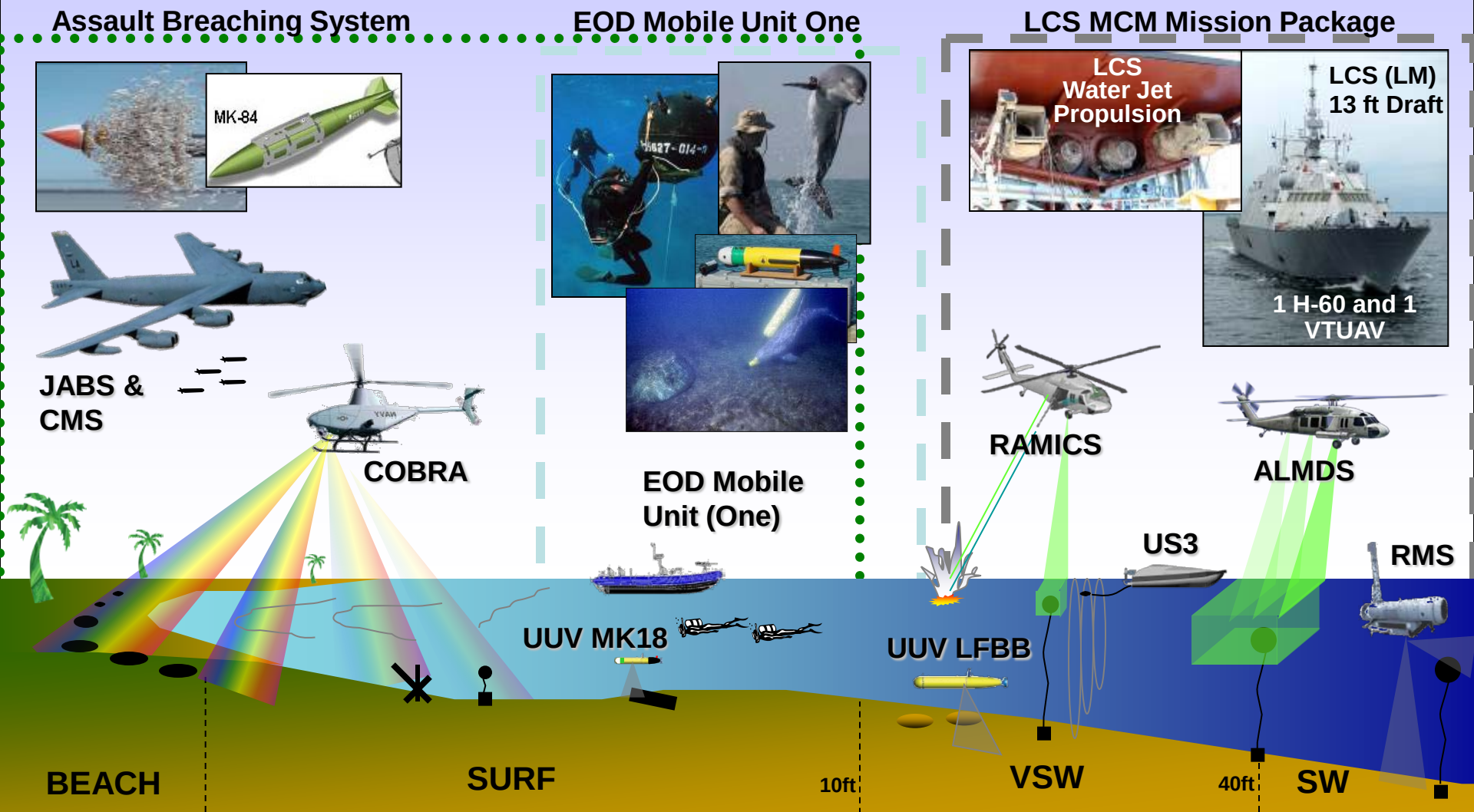
- The mine threat is real and not getting easier.
- The transition to LCS-based MCM is challenging.
- MCM Mission Package programs making steady progress and in the hands of Sailors now.
- Making wise investments to reduce false alarms, manpower demand, and improve reliability.
- Need solutions from Industry to meet system Initial Operational Capability of future systems.



BACK-UP

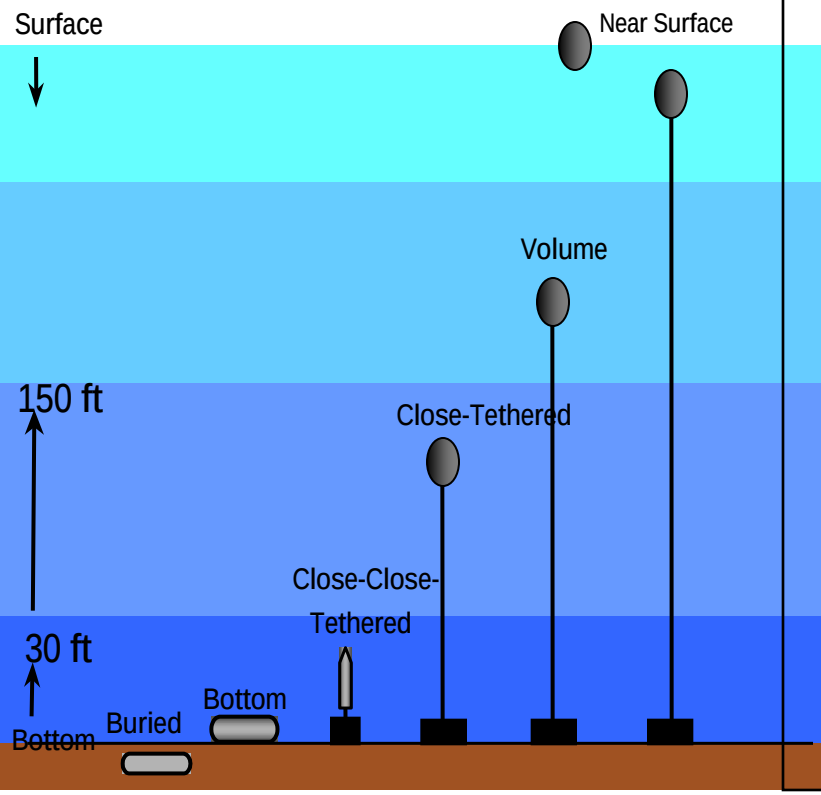
Shallow Water to Beach Zone

Developing Solutions to Support OMFTS and STOM



LCS MCM Mission Package
System Coverage

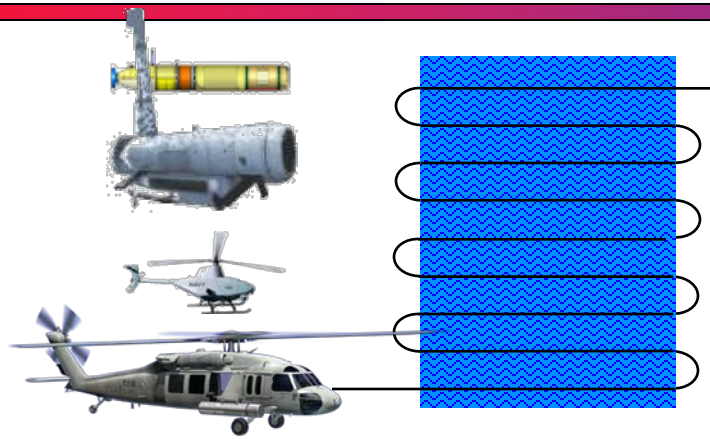
	Detect		Engage	
	Battlespace Preparation	Minehunting (Detect/Classify/ Identify)	Neutralize	Sweep
Beach Surf Zone	VTUAV+ COBRA	VTUAV+ COBRA	ABS, EOD Mobile Unit 1	
Near surface & floating		ALMDS	RAMICS	
Volume and bottom mines		AQS-20	AMNS	OASIS US3
		AQS-20	AMNS	OASIS US3
	SMCM UUV	AQS-20	AMNS	OASIS
Buried	LFBB			



* **NOTE : Depth Coverages Vary with System and Mine Type**

False Alarms Lengthen Kill Chain

Develop Search Mission Plan
- MEDAL
- MPS



MH-60S
-ALMDS
RMS
- AQS-20A
UUV LFBB
COBRA

Sortie Data Collection

False Alarms

Post Mission Analysis

False Classification

Contact List

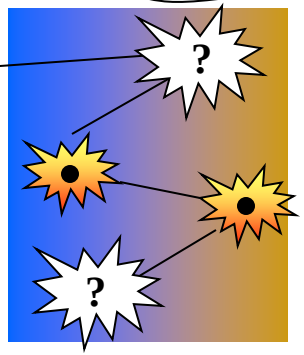
False Calls

Detection

Develop Neutralization Mission Plan

False Calls in Mission Plan

MH-60S
- AMNS
-RAMICS
ABS



NMLOs

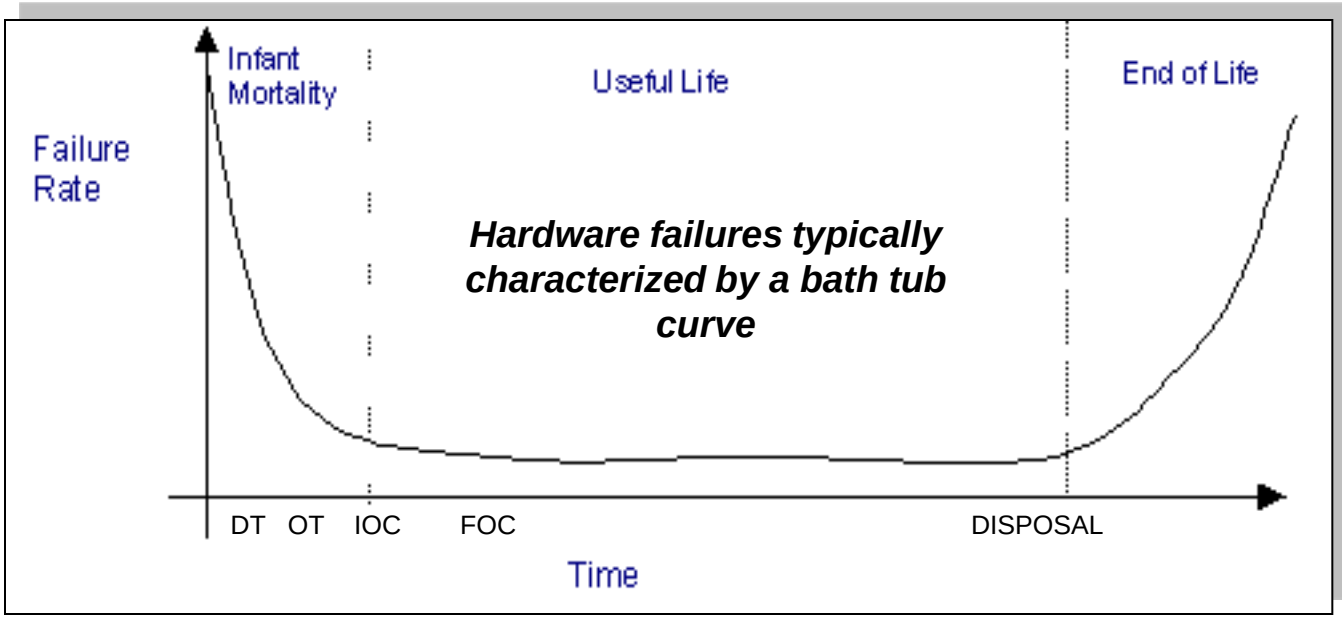
MH-60S
- OASIS
- US3

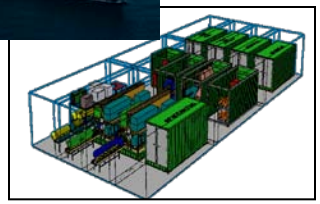
Neutralization → **Sweep**

Reliability

$$Ao = \frac{Uptime}{Uptime + Downtime} = \frac{MTBF}{MTBF + (MTTR + MLDT)}$$

Mean Time to Repair & Mean Logistics Delay Time:
Number of systems on LCS and O to D level maintenance philosophy





MCM Mission Package

2 RMMV	1 AMNS
3 AQS-20A	1 US3
1 ALMDS	1 COBRA
1 OASIS	1 VTUAV
1 RAMICS	1 MH-60S

All MCO timelines are driven by required MTBF, so we must improve upon reliability to meet the requirements and increase useful life!