Unmanned Maritime Systems Update

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Presented on behalf of

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PMS406 Unmanned Maritime Systems

PEO USC Portfolio

LCS delivers mission-focused capability to the Fleet


LCS 1 Variant

LCS 2 Variant


SUW Mission Pkg


ASW Mission Pkg


MCM Mission Pkg


Comms


Software


Fire Scout


MH-60 Helo


In-Service Support (Ships & Mission Packages)


LCS Training

Frigate (FFG(X))


Hammerhead


QUICKSTRIKE


MH-53 AMCM


ALMDS


COBRA


MCM 1 Ship Systems


AMNS


BARRACUDA


MIW C2

International Small Combatants


KNIFEFISH


LUSV


XLUUV/AUP

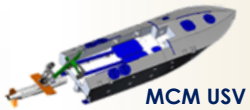

MUSV


LDUUV


RAZORBACK


GHOST FLEET


MHUs


MCM USV


UISS


AN/AQS-20

PMS 501
PMS 525
PMS 406
PMS 495
PMS 515
PMS 505
PMS 420
PROGRAM EXECUTIVE OFFICE UNMANNED AND SMALL COMBATANTS
ACCELERATE · INNOVATE · DELIVER
PEO USC

PEO USC SUMMARY
(ACAT or Equivalent)
3 – ACAT I
4 – ACAT II
3 – ACAT III
0 – ACAT IV
7 – Pre-ACAT
9 – Non-ACAT/Other

Evolution in Military Technology

Analog → Digital → Information → Collaboration → Machine Missions

Sailor Does Everything	Machine Does Some Things	Machine Does Most Things	Sailor and Machine Do Things Together	Sailors Give Machines Orders To Execute
Digits	Bytes	Megabytes	Gigabytes	Terabytes → Petabytes
Trust Yourself	Trust Others	Use Machines	Rely On Machines	Trust Machines

Yesterday ····· Today ····· Tomorrow

Unmanned Maritime Systems

Unmanned Surface Warfare

PROTOTYPES

LARGE USV

MEDIUM USV

Unmanned Expeditionary Warfare

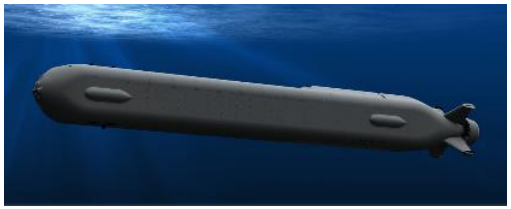
MINE COUNTERMEASURES USV

MINEHUNTING USV

KNIFEFISH

Unmanned Undersea Warfare

SNAKEHEAD LDUUV



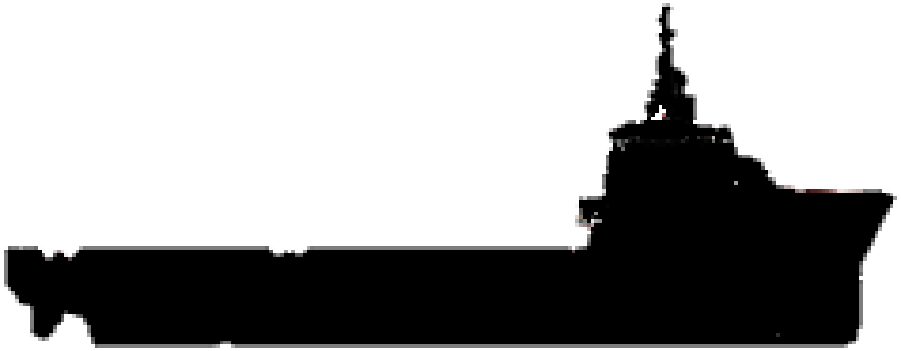
ORCA XLUUV

RAZORBACK

Unmanned Surface Warfare



Prototypes
- Experimentation
- Research and Development
- Operator Learning



Large USV (LUSV)
- Strike
- Anti Surface Warfare
- FY24 Delivery

Medium USV (MUSV)
- Information Operations
- FY22 Delivery

Unmanned Expeditionary Warfare

Mine Countermesures USV (MCM USV)





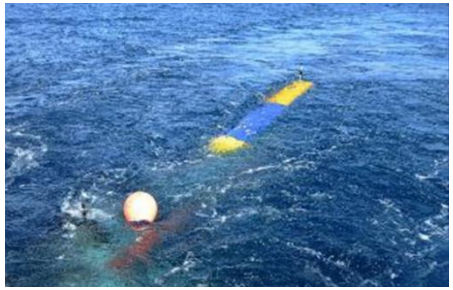

- **Mine Countermeasures**
  - Sweep
  - Hunt
  - Neutralize
- **FY20 Low Rate Initial Production**

- **MCM Mission Package**
- **Littoral Combat Ship**
- **48 craft inventory requirement**

- **Vessel of Opportunity (VOO)**
- **Modular MCM Force**

Unmanned Expeditionary Warfare

Knifefish Unmanned Undersea Vehicle



- Bottom, Buried Mine Countermeasures
- FY19 Low Rate Initial Production

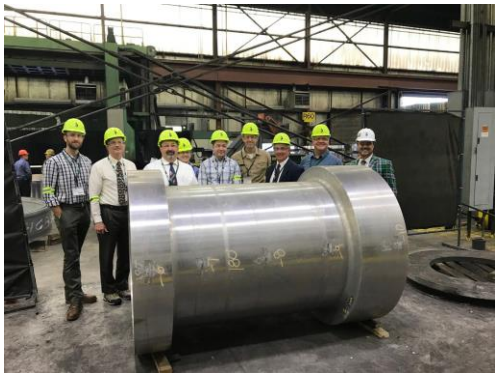

- MCM Mission Package
- Littoral Combat Ship
- 30 system inventory requirement


- Vessel of Opportunity (VOO)
- Modular MCM Force

Unmanned Undersea Warfare

Orca XLUUV

- Pier launched
- Large Payload Delivery
- 5 units deliver FY21-22



Snakehead LDUUV

- Submarine Large Ocean Interface deployed
- Extended Sensing
- Large Payloads
- FY21 Delivery

Razorback UUV

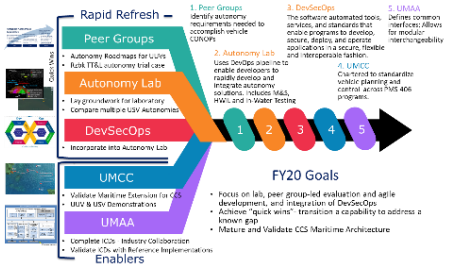
- Submarine Launch and Recovery
- Extended Sensing
- 9 units deliver FY19-FY20

Littoral Combat Ship Interface Control Document (ICD)

- **The ICD defines the standard interfaces between the ship and the mission packages**
  - Hardware oriented; mechanical and electrical requirements
  - Sea, aviation, weapon, and support type modules and stations
  - Invokes Interface Design Specifications (IDS) covering software data interface
- **Requirements for total mission package loadout, e.g.,**
  - Max electrical power
  - Max heat rejection load
  - Max fresh water
  - Max hazmat storage
- **Requirements for individual modules and stations , e.g. for Support Type 1**
  - Module max length, width, height
  - Module max mass
  - Station max 440 VAC 60 Hz 3 phase power

Core Technology Standardization

- **Li Ion Battery Certification**
  - Propagation Resistant Architecture
  - Detection
  - Mitigation



- **Accelerating Autonomy**
  - Unmanned Maritime Autonomy Architecture (UMAA)
  - Autonomy Lab

- **Command, Control, Communications**
  - Common Control System (CCS)
  - Shipboard and shore based control

- **Payloads**
  - Payload Integration Group (PIG)
  - R&D payload transition

UUV Systems Vision
Enhanced, Efficient Capabilities

Current
Near/Mid
Mid/Far

Key Enablers
- Endurance
- Autonomy & Precision Navigation
- Command, Control, & Communications
- Payloads & Sensors
- Platform Integration (L&R, etc.)

Extra Large (Pier Launch) (Dia. >84in)
- Experimentation, Autonomy, Payloads, Endurance
- ONR Innovative Naval Prototype
- CONOPS Development, MIW, Payload Integration
- ORCA
- Strike Capability, Payload Integration, MCM, ASW, EW, ISR, MIW, ASUW
- XLUUV Future Capabilities

Large (Surface or Submarine Launch) (Dia. >21in and ≤84in)
- Experimentation, Autonomy, Payloads, Endurance
- ONR Innovative Naval Prototype
- CONOPS Development, IPOE, ISR
- SNAKEHEAD Ph1 Vehicle
- Extended Range IPOE, Payload Integration, Extended Range ISR, ASW, EW, ASUW
- SNAKEHEAD INC 1

Medium (Surface or Submarine Launch) (Dia. >10in and ≤21in)
- MIW / IPOE, Battlespace Awareness, IPOE
- Mk18 Mod 2 (Kingfish)
- LBS-AUV
- Battlespace Awareness, Buried & Volume Mine Hunting
- LBS-G
- Knifefish
- Battlespace Awareness, MIW / IPOE
- LBS-AUV(S) RAZORBACK
- Near Real-Time Mission Analysis, Improved Capabilities & Sensors
- P3I, Future Blocks/Mods

Small (Man Portable) (Surface or Submarine Launch) (Dia. >3in and ≤10in)
- MIW / IPOE
- Mk18 Mod 1 (Swordfish)
- Battlespace Awareness, IPOE
- IVER
- Battlespace Awareness, IPOE
- Sandshark

Efficient, Executable Progression of Capabilities through Various UUV Systems

USV Systems Vision

Enhanced, Efficient Capabilities

Current
Near/Mid
Mid/Far

Large
(Class 4;
Length >50m)

Technology Maturation, CONOPs, & Payloads
ISR
SUW
Strike
EW
Large USV
TBD Hull Form(s)
Ghost Fleet Overlord LUSV
ASUW
ASUW

Key Enablers
Endurance
Autonomy & Precision Navigation
Command, Control, & Communications
Payloads & Sensors
Platform Integration (L&R, etc.)

Medium
(Class 3; Length
>12m and ≤50m)

ASW
· Autonomy
· Multi-Mission
MDUSV/ Sea Hunter (SH 1)
ASW
ISR
Comm Relay
MUSV
Counter Swarm
Sea Hunter (SH 2)
EW
ISR
Medium USV
TBD Hull Form(s)

Small
(Class 2; Length
>7m and ≤12m)

Mine Hunt
MHU 1-4
w/ AN/AQS-24
Mine Sweep & Mine Hunt
USV w/ Sweep Payload
USV w/ Hunt Payload
Mine Neutralization
USV w/ Mine Neutralization Payload
Mine Sweep
Mine Hunt
Mine Neut.
ISR
ASW
Counter Piracy
MCM USV
Comm Relay
Armed Coastal Patrol

Very Small
(Class 1;
Length ≤7m)

ISR
Comm Relay
GARC Optionally Manned
ISR
ADARO/MUSCL
ISR
TBD
Armed Escort
Comm Relay

Efficient, Executable Progression of Capabilities onto Common USV Hull Forms

Work to Do

- Where will we base the fleet(s) of UxVs?
- What infrastructure is needed?
- How/where will we forward deploy them?
- What transportation infrastructure is needed?
- What is the Unmanned manning scheme?
- How/where will we test them?
- How do you test endurance, reliability and autonomy?
- What policy is needed?
- How will we support them?
- What training infrastructure is required?

Department of Navy Battery Development and Safety Program

Challenges:

- Newer weapons systems require significantly more power, advanced batteries, and energy storage.
- Advanced battery safety issues aboard ship and airplanes result in significantly more expensive batteries vs industry.
- Safety issues hamper/limit deployment of critical combat systems.
- Lack of Naval battery standards, policy, ownership, enforcement across PEOs and programs is costing DON millions of dollars

Vision:

DON Established the Navy Battery Development and Safety Enterprise in October of 2019 IOT -

- Provide rapid, safe, and effective deployment of batteries and battery systems to support enhanced lethality of weapons systems.
- Reduce the cost of battery design, development, implementation, and lifecycle support through standards and enforcement.
- Coordinate advanced energy storage/battery research and development across the DON

Added Capability:

- Coordination across the SYSCOMs/PEOs/Labs in R&D, testing, etc.
- Increased certification throughput and technical review
- Bridge energy storage gaps in systems integration
- Enforcement of standards in energy storage
- Monitor performance and effectiveness of fielding of advanced battery solutions to the DON.

Expected Advantages:

- Reduce future energy storage costs to DoN by up to $100M annually
- Improved intra-service and partner nation energy storage commonality
- Investigate Domestic Manufacturing policy advantages

Return on Investment:

- $96K – Year to date cost avoidance
- Expanded capabilities in DT&E - 2 site certifications comp/ 8 in progress

Increased deployment and speed-to-fleet of combat systems requiring advanced high energy batteries, standardizing battery technologies, and systems to reduce overall life cycle cost.

Points of Contact & Questions

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