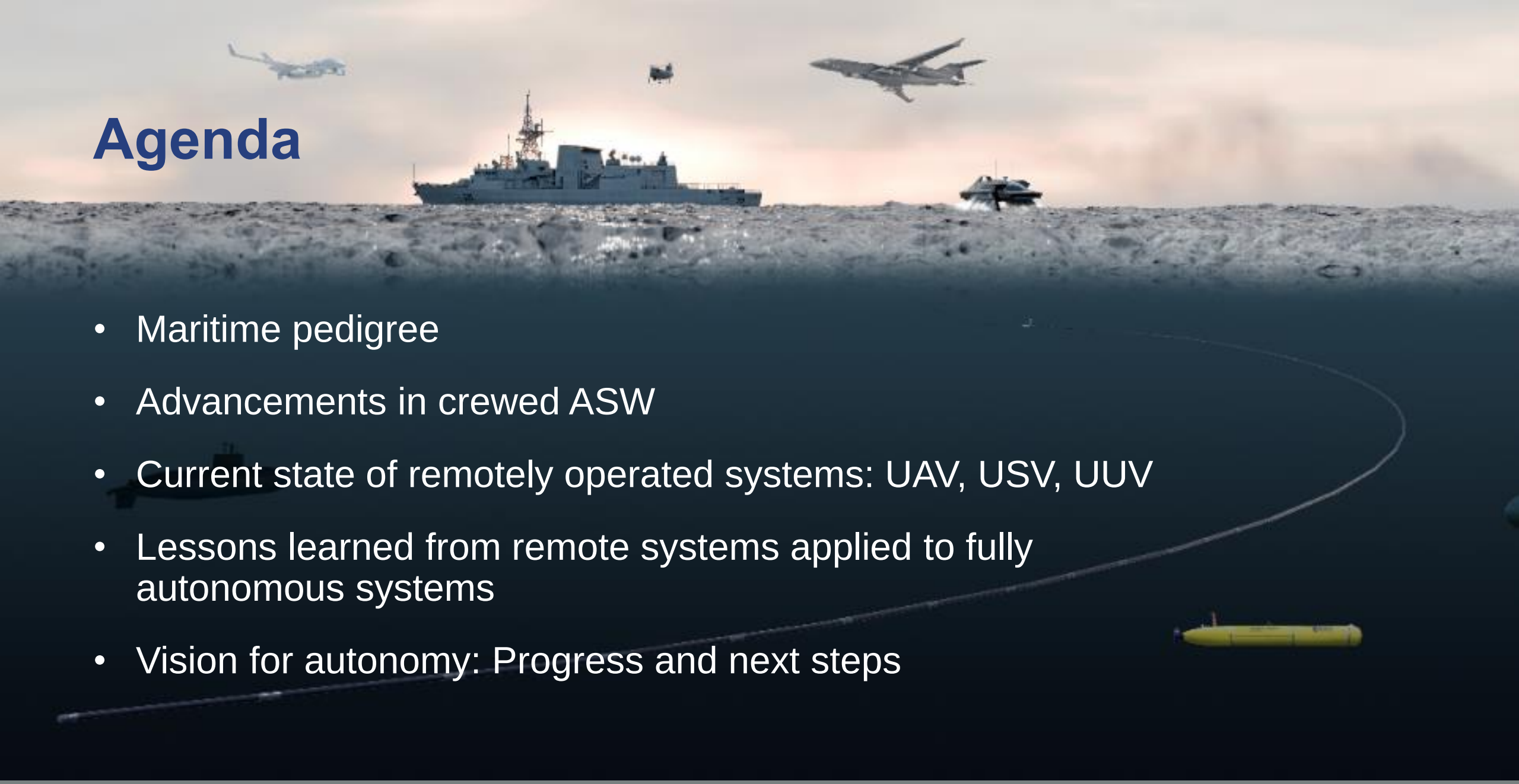
Augmenting Multi-Domain Crewed Operations with Autonomous Systems

CNE 2024

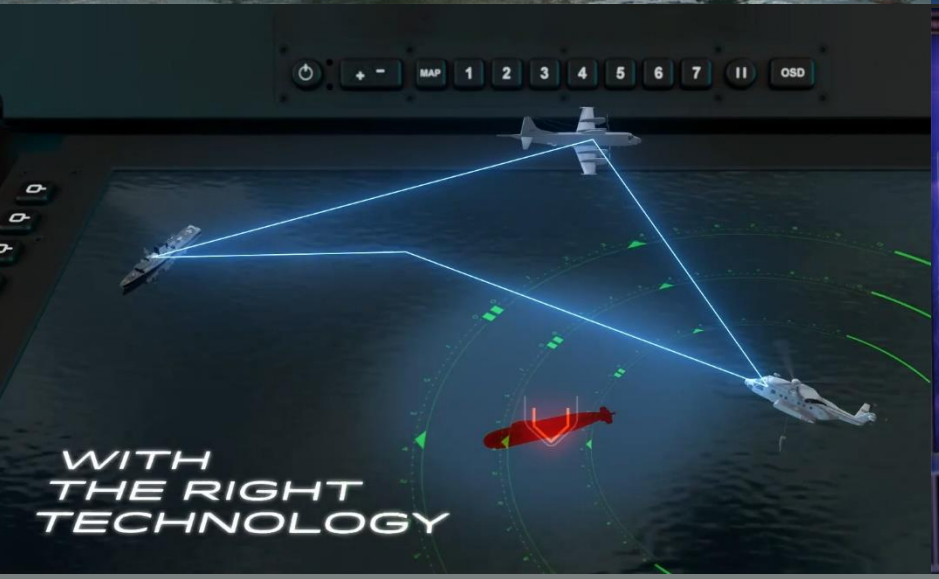
Pat Thauberger

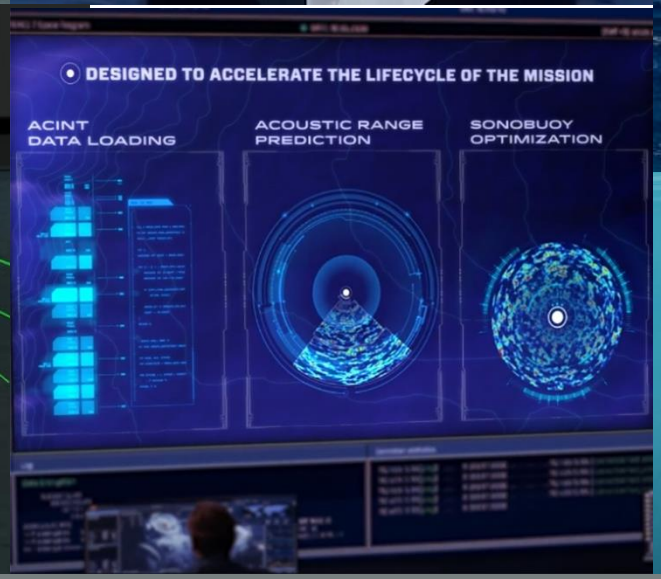
Alan Marjoribanks

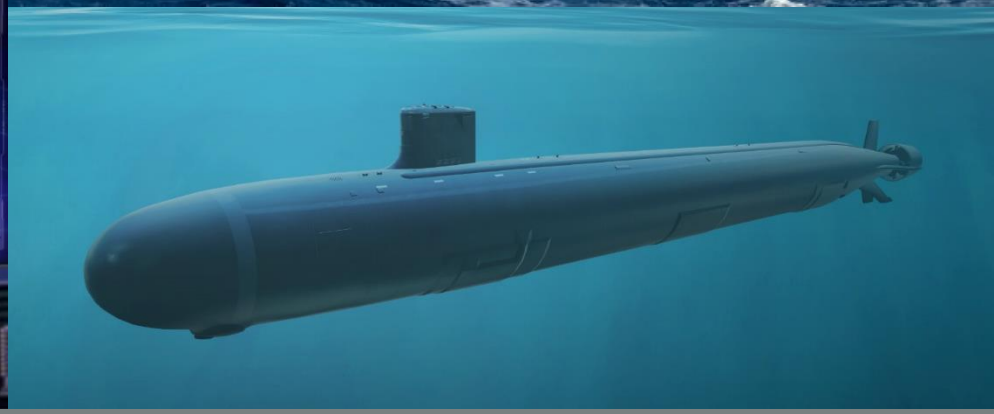
Agenda



- Maritime pedigree
- Advancements in crewed ASW
- Current state of remotely operated systems: UAV, USV, UUV
- Lessons learned from remote systems applied to fully autonomous systems
- Vision for autonomy: Progress and next steps







Challenges of the Changing Character of Conflict

Setting the scene

- Locations
- Increase in threats
  - Wider range of threat types
  - Wider range of target types
- Scale up to achieve optimised combat mass
- Availability of the war fighter
- Defence budgets

US Coast Guard / CENTCOM released photo of weapons seized aboard an Iranian dhow on February 15 2024. The seizure included UUV and USV components. The annotations, highlighting possible UUV parts, have been added.

China's new stealth sub built for a Taiwan blockade

China's Type-039C submarine features new angled sail design to reduce active sonar detectability in Taiwan Strait's shallow waters

By GABRIEL HONRADA
NOVEMBER 27, 2023

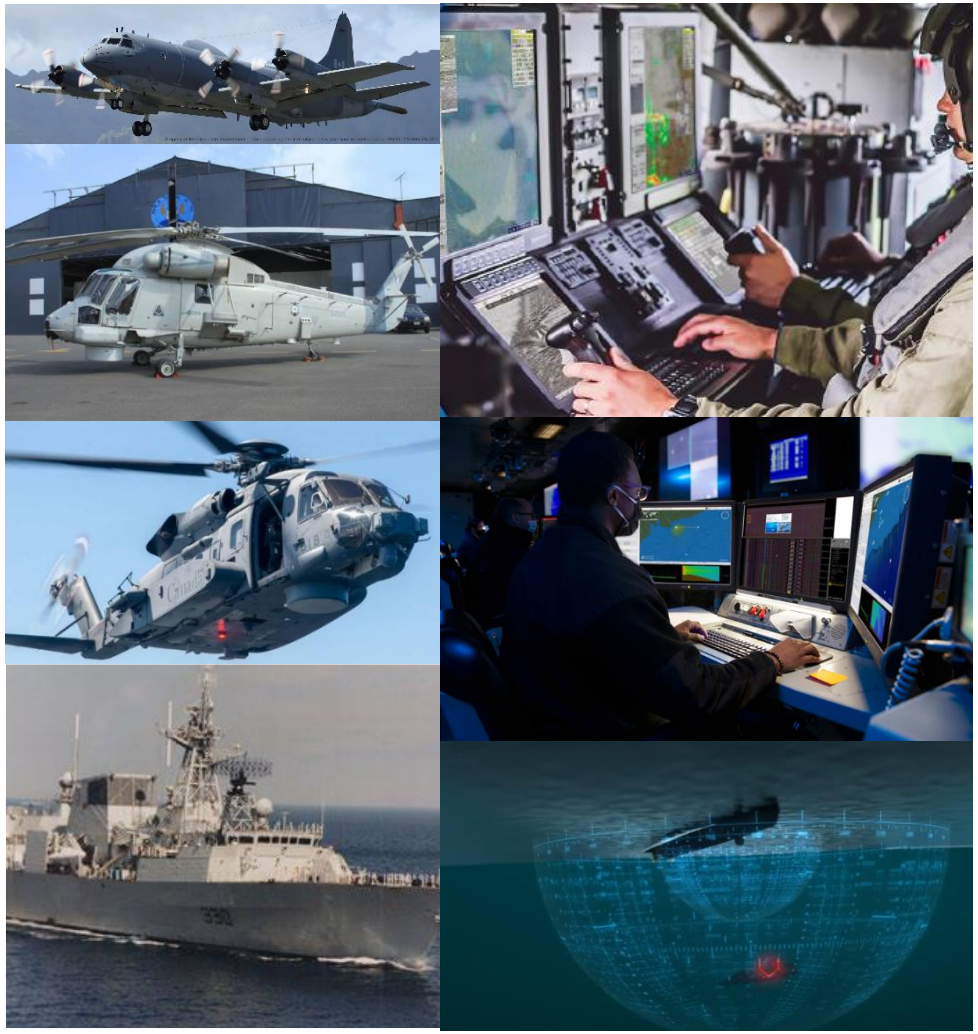
Russian Submarine 'Pops Up' Off The US Coast; Military Expert Says Deployment Resembles Soviet-Style Tactics

By **Sakshi Tiwari** - March 9, 2023

A world leader in ASW

Shipborne and Airborne

- 75+ years protecting NATO and their allies
- Across all platform domains
- Crewed and uncrewed
- Hull mounted sonar
- Towed array sonar
- Acoustic intelligence management



ASW advancements in crewed platforms

- Processing capacity increases
- Advanced workstations with HD screens
- Optimising the UI, designed by operators
- Digital training environments

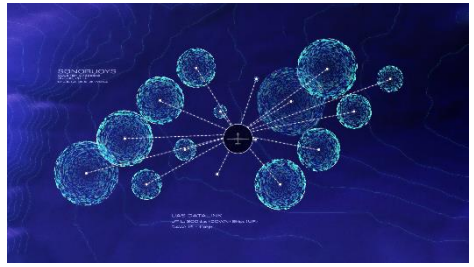
Application of automation for ASW

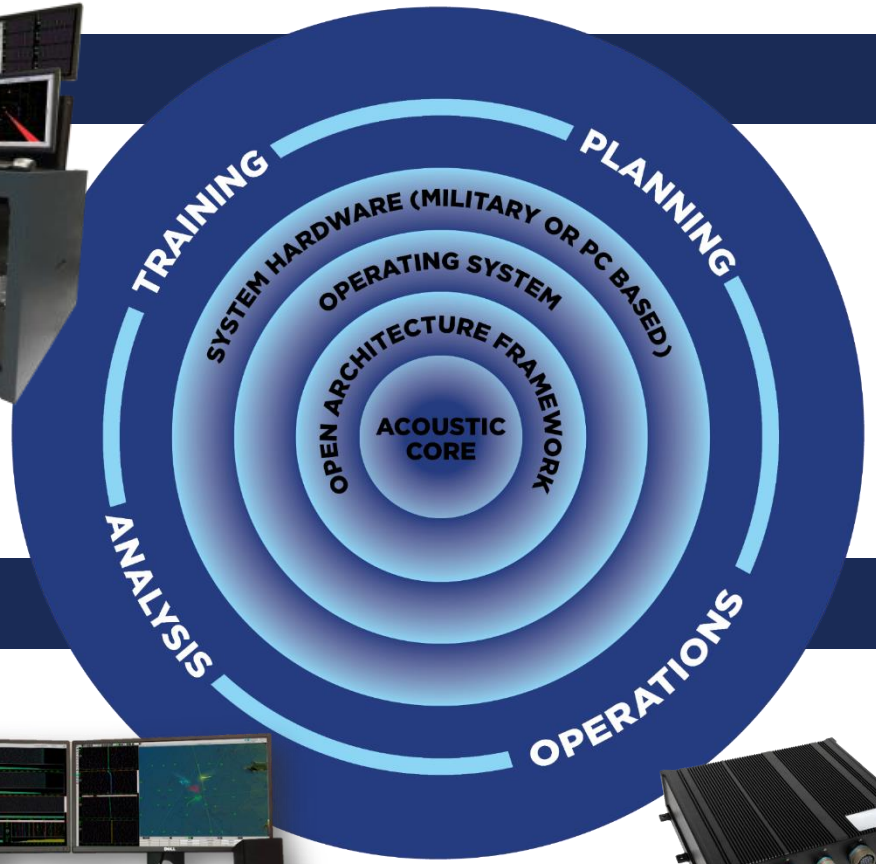
T502/ACT

- Target, Ocean & Scenario simulation
- Hi-fidelity
- Interactive training

Acoustic Range Prediction

- Sensor optimization tools





L-ARIES

- Fast data replay
- Data analysis and archiving
- Acoustic Intelligence Extraction

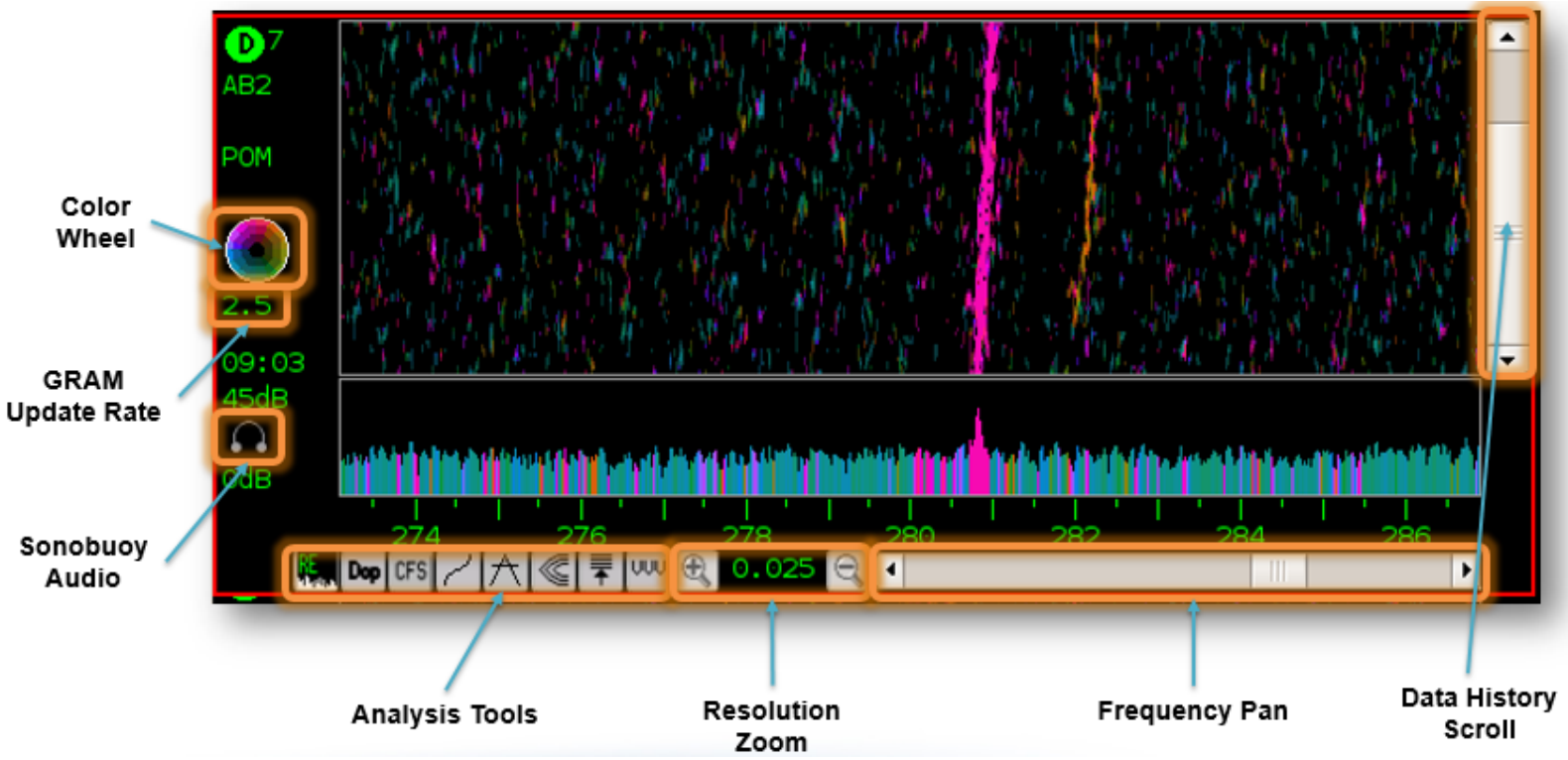
UYS-505/506

- Ruggedized mission systems
- Integrated sonobuoy processing
- Aircraft integration

UYS-506 Sonobuoy Processor

Class Leader in Airborne ASW

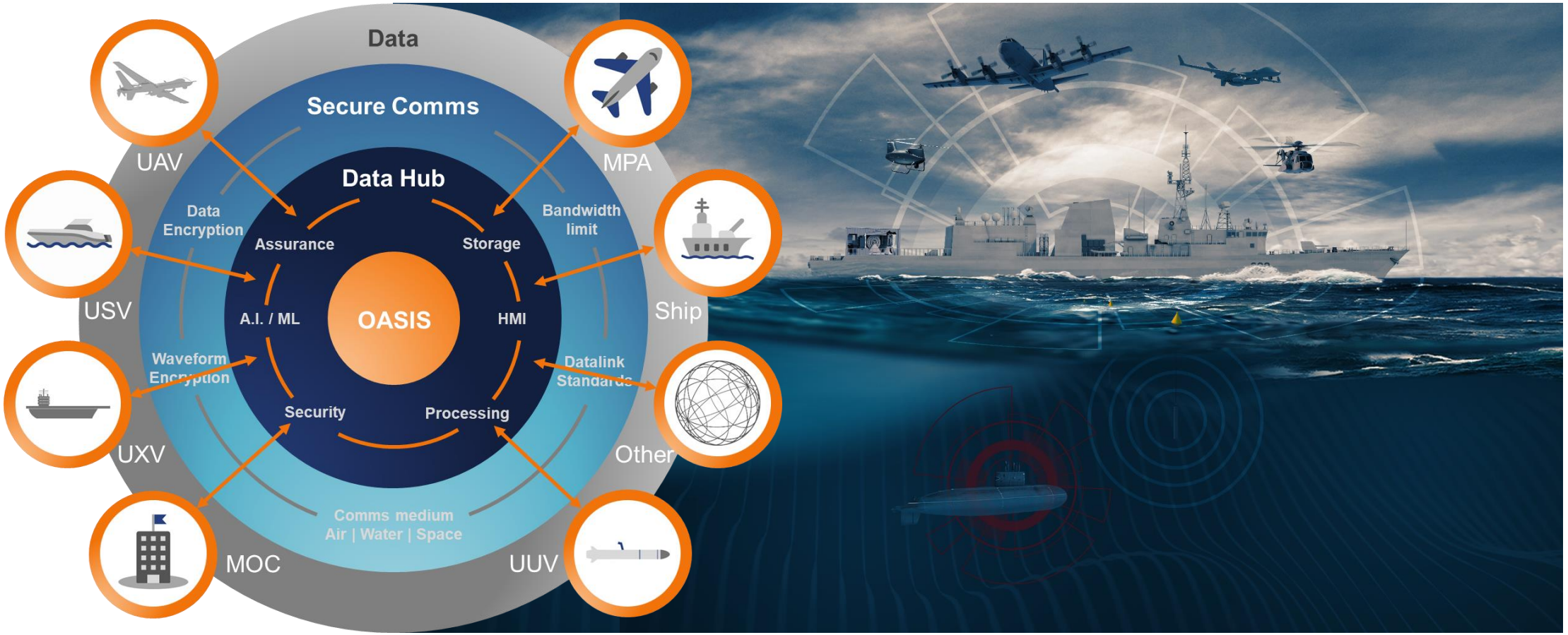
- Operator Machine Interface:
  - Designed by operators, for operators
- Intuitive context-sensitive controls
- Brings automation concepts for workload management
- Multi-layer tactical display to maximise situational awareness



Current state of remotely operated systems

- Uncrewed vehicle role in the ASW mission
- Autonomy maturity of the platform
  - Remotely operated vs fully autonomous
  - Maturity of autonomy
- Uncrewed platform accreditation challenges
- Increasing mass vs exquisite platforms
- Deployment and persistence

Distributed ASW



Developing uncrewed systems

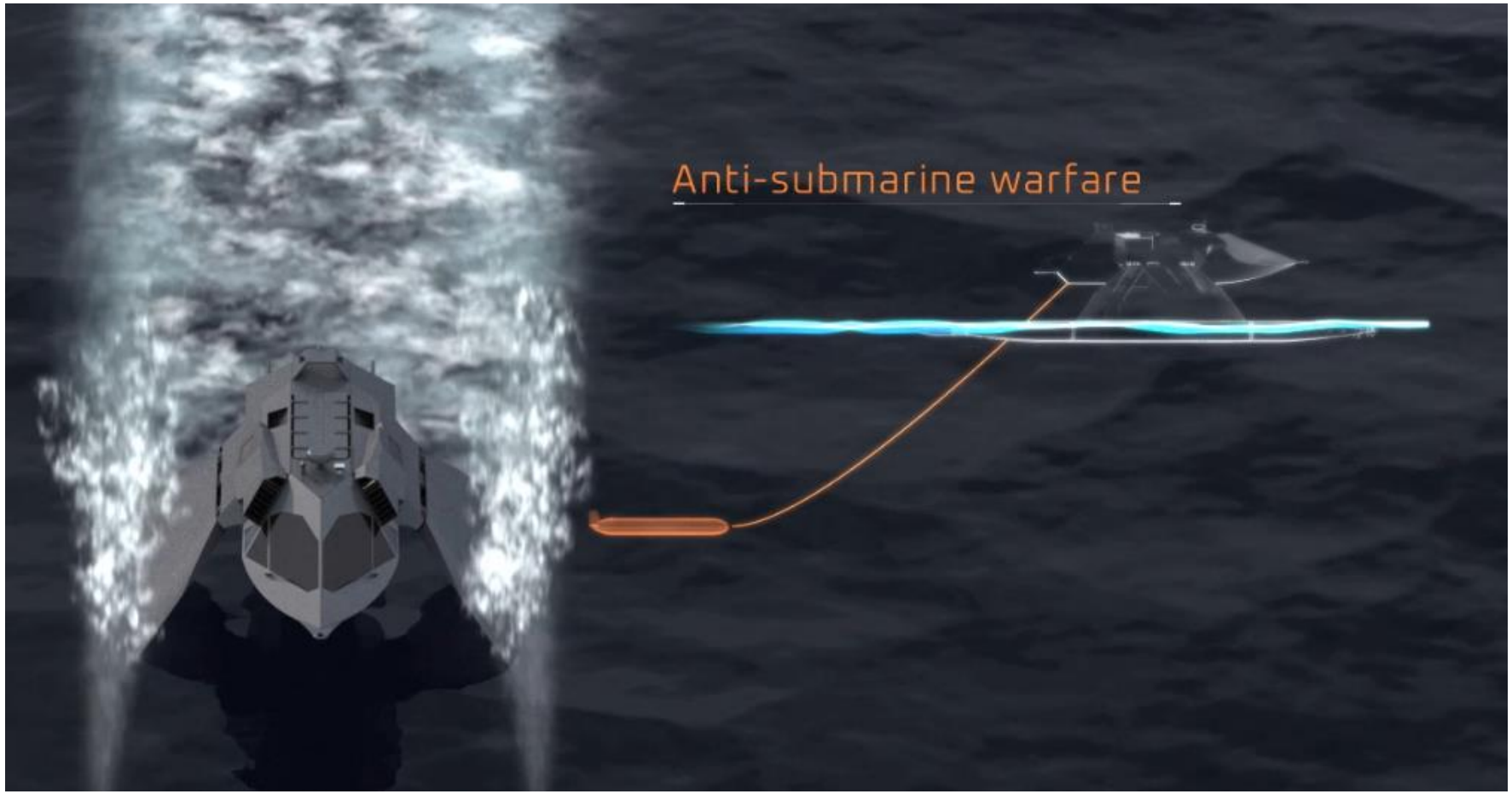
- Remotely piloted and autonomous
- Multi role
- Multi payloads and sensors
- Modular
- 20+ years experience
- Experimentation through to in-service

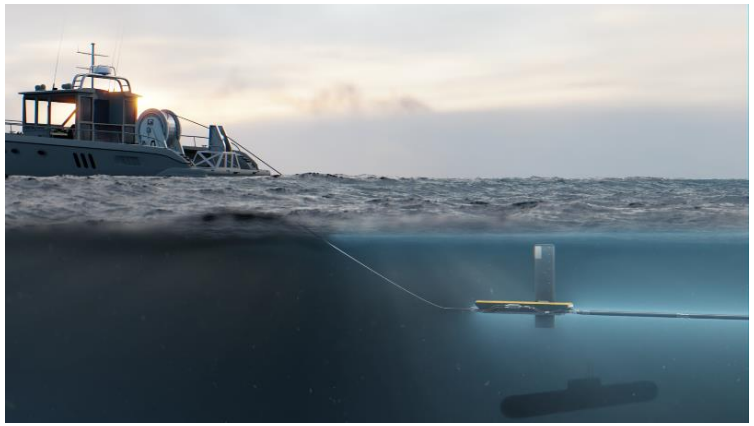
Remotely operated ASW (TRL 8/9)

MQ-9B SeaGuardian Demonstrates Maritime Capabilities Over Southern California Waters

General Atomics Aeronautical Systems, Inc. (GA-ASI) concluded a set of maritime test flights over the sea-lanes off the coast of Southern California on September 11th, using the MQ-9B SeaGuardian® Remotely Piloted Aircraft System (RPAS).

USV ASW operations (TRL 6/7)





UUV ASW operations

- Experimentations:
  - Sonars
  - Towed arrays
  - Novel sensors
- Range vs endurance
- Full autonomy needed
- Airborne / surface deployment

UAV ASW autonomous operations

- Limited operator control
- Demonstrating sonic processing
  - Laboratory
  - Flight trials
- Reducing human operators
- Pathway to increased autonomy

Lessons learned from remote systems

To be applied to fully autonomous systems

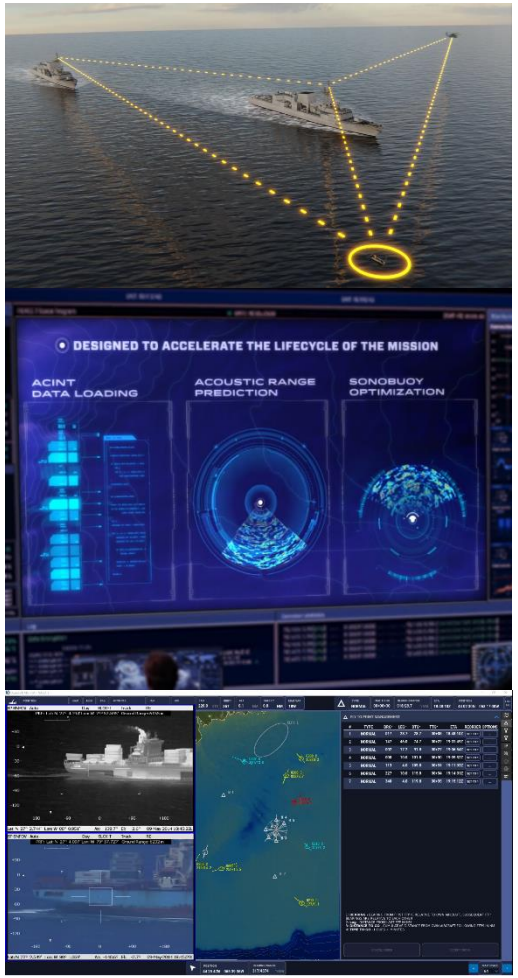
Technical challenges

- Predictability of autonomy
- Deployment
- Bandwidth (comms)
- Platform endurance with payload capacity (sonobuoys)
- Integration with existing/wider crewed systems
- Scaling to increase combat mass
- Accreditation

Operational challenges

- SQEP (Suitably Qualified and Experience Person) availability
  - Remotely operated requires more resources (time/people/facilities)
- Situational awareness
- Training – adapting skills
- Complex mix of threats – type + volume
- Mixing crewed and uncrewed platform operations

Vision for autonomy: Progress and next steps



- Expanding autonomous systems on crewed and uncrewed platforms
- Close integration between uncrewed air platform and the ASW (detection) system
  - Plan: Determining the most effective search patterns
  - Deploy: Informing the most effective route to deploy sonobuoys
  - Detect: Automatically find/identify threat
  - Track: Determine next steps to stay ahead of threat
  - Throughout mission the system can adapt according to real-time intel
- Introduce some of the R+D work/testing/experimentation on the system and on the platforms (A.I. etc.)

Summary

- RPAS ASW going into service
- ASW autonomy to assist operators increasing
- ASW autonomous platforms in development
  - Challenges:
    - Deployment
    - Endurance
    - Predictability
    - Scaling for mass

Thank you

Alan (Marj) Marjoribanks

Pat Thauberger