Autonomous Underwater Vehicles Capability and Trends

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Positive Control vs Auto-Programmed

- "**Unmanned**" (or Uninhabited)

  generally refers to vehicles that are always under positive control (by data link, co-axial / optic fibre cable, WiFi, satellite, etc).

- "**Autonomous**"

  generally refers to vehicles that conduct pre-programmed tasks and are not in continuous communication with a controller.

- Exceptions and customs…
  - US often refer to both as *Unmanned*
  - UK and Academia often refer to both as *Autonomous*
  - Commercial use "*Remotely Operated*" (to emphasise paid operator)

Strategic AUV / UUV Employment

Home & Away operations**…**

- **Break Out** (Around own critical / sensitive infrastructure - High end UUVs)
- **Break In** (Deployed / Amphib – Low end AUVs / single shot / disposable)

- **Block Out** (Autonomous Maritime Asset Protection / Robot UUVs / CIED)
- **Block In** (High end AUVs – Sub Launch / XLUUVs / Mining / Intervention)

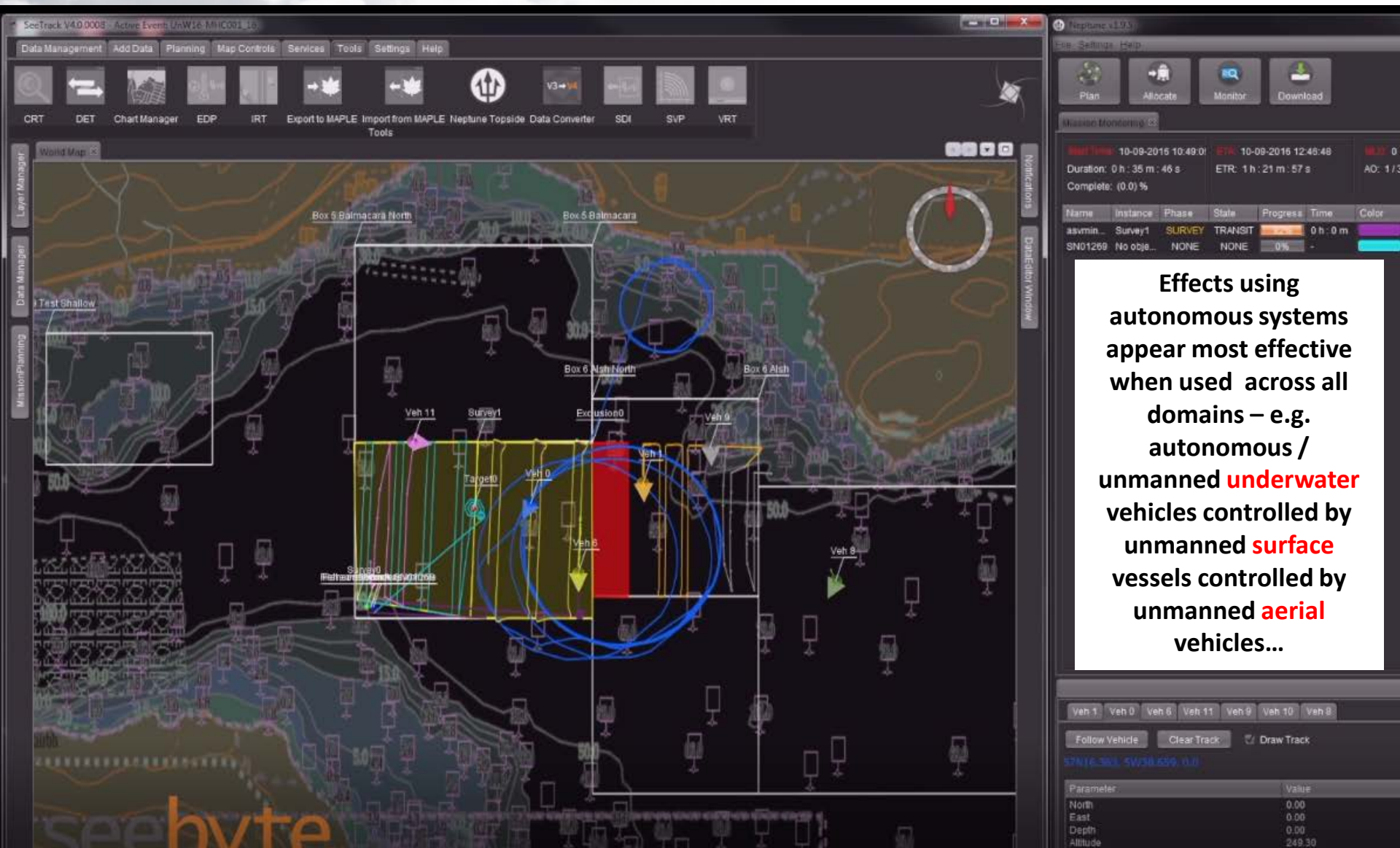
- **Surveillance** (Persistent AUVs for surveillance / attribution – wave gliders)
- Servicing (Large UUVs for industrial off-shore tasks – in water docking)

Pending combination, provides:

Deterrence, Sea Control, Sea Denial, Power Projection or Force Protection

Trending… multi domain / multi-national massively increasing rate of effort…

Diagram: **7** x AUVs controlled by **2** x USVs data linked through **1** x UAV



Effects using autonomous systems appear most effective when used across all domains – e.g. autonomous / unmanned underwater vehicles controlled by unmanned surface vessels controlled by unmanned aerial vehicles…

The greatest recent development in autonomous **underwater** systems are…

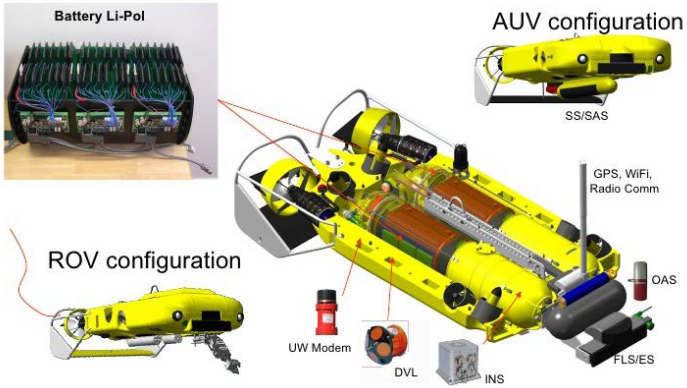




Break Out

Key features:

- Operate in stronger currents / greater depths
- Continuous operations / real time feed
- Hunt and dispose with one vehicle
- Reconfigurable
- Manipulation arms
- Recoverable charges
- ROV and AUV mode



Break In

Key features:

- Clandestine
- Unmanned Surface Vessel (or Helo) launched
- Less risk if lost, captured or destroyed

Block Out / Counter - Trends

Waterside Rapid Deployment Security System

Robot Divers

Stanford University Ocean-One

Z-Boats
SOF / Riverine operations with above & below water sensors & cameras

Sea Wasp – CIED / EOD UUV

Surveillance

(wave gliders, AUV-UAV combinations, etc)

NAVY

Questions?