

Unmanned Surface Vehicles (USVs)

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Unmanned



Optionally Unmanned



Minimally Manned



Kongsberg/ Rolls Royce/ Yara



Kongsberg/ Rolls Royce/ Finferries



Wartsila/ Folgefonn



NYK

Conversion to Optionally Unmanned

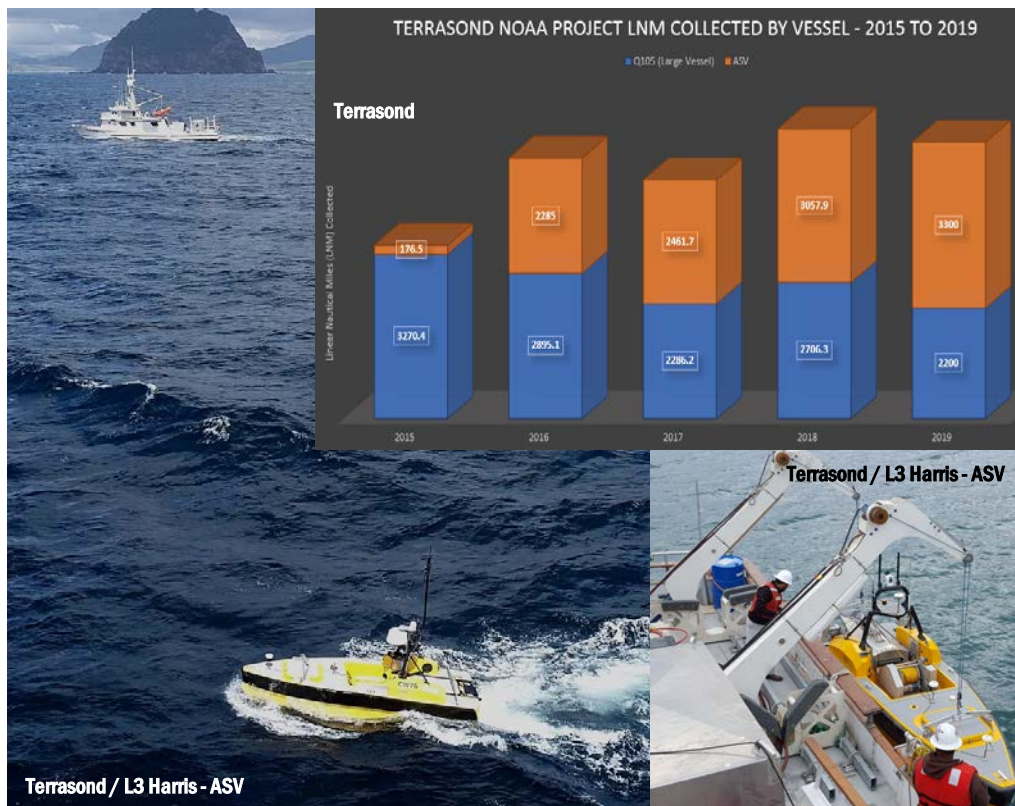
Example Conversion Vendors:

- Dynautics
- Kongsberg Maritime
- L3 Harris / ASV Global
- LSA Autonomy
- Sea Machines
- Sea Robotics



Ideal Bridge Aid for Manned Vessels!

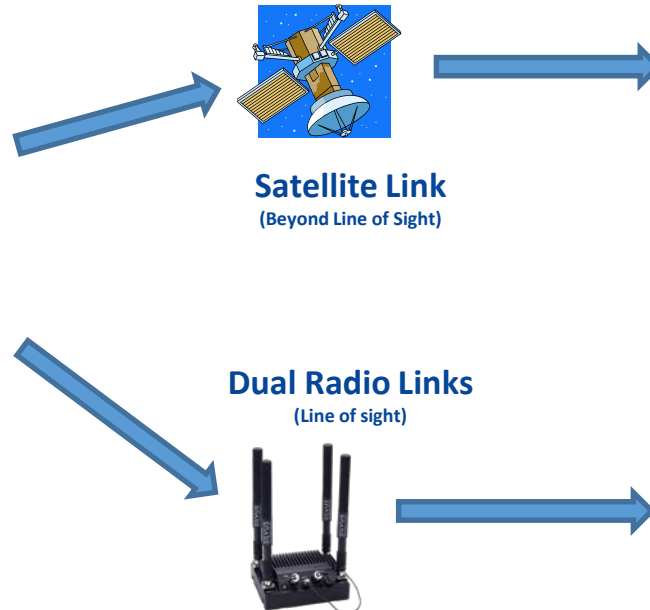
Force Multiplier Examples



Line of Sight (LOS) vs Beyond Line of Sight (BLOS)

- Waypoint Navigation / Collision Avoidance
- Payload Deployment

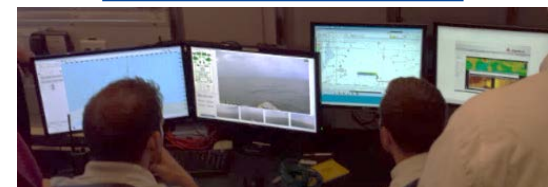
- Supervise & Control ASV Movements
- Control Payload, Monitor Data



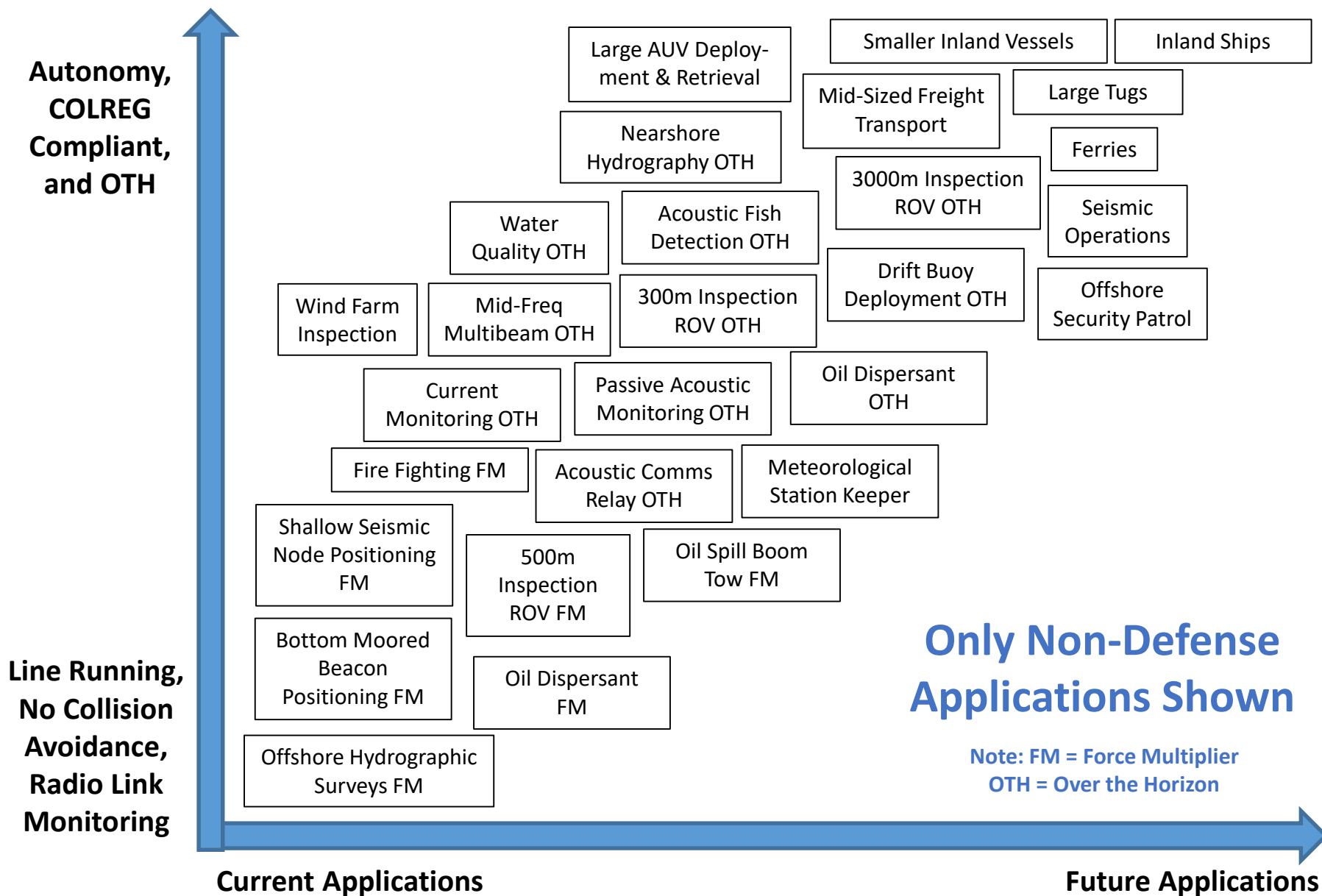
Shore Based Monitoring



Offshore Based Monitoring

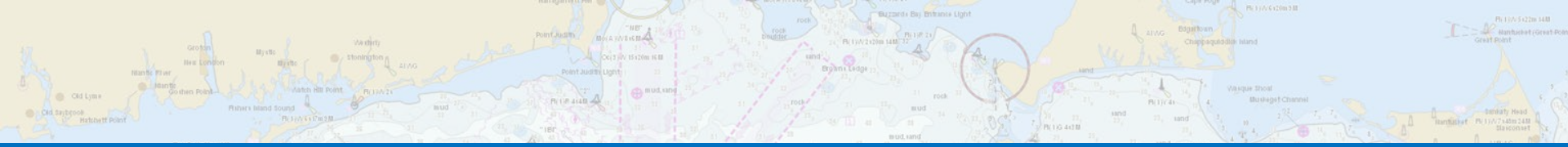


Spectrum of USV Applications (non-Defense)



Observations / Concerns Going Forward

- USV autonomous navigation is ITAR controlled = Industry constraint
- Autonomy has not been perfected, you must supervise
 - Rope in props, kid in kayak, spray on camera, piling, thieves...
- Inland / nearshore operations much more challenging
- For large USVs with complex payloads, start minimally manned
- Regulations are evolving / undermines investment “Proper Lookout”
- A cheap USV can be very expensive to operate
- Batteries, wind, solar, and waves generally don’t cut it, go with diesel
- Do not expect that a USV will work like a calculator from Walgreens
- Buy one USV, have the supplier debug, then buy more of same
- Satcoms is a weak link (Starlink, OneWeb, Telesat, Amazon, LeoSat)
- Small USV launch & retrieval from mothership is non-trivial
- Start with simple applications & benign routes
- Don’t confuse great USV graphics with years of USV experience
- Make sure USV manufacturer has extensive maritime experience
- US is now far behind Scandinavia / Huge & long lasting market lost



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