Coral Partners
a technology development company

A Discussion Of Risk & Requirements In Marine Operations

By Tim McGuinness, Ph.D. – May 17, 2017

The world we live in is full of risk. As Dick Chaney said: "I am not worried about what I know I don't know, but what I don't know that I don't know" So most of the time, we minimize risk with knowledge, with data.

So, the question is what is the best way to gather data to minimize risk in a marine environment so hostile to humans?

Let's talk about risk centers in the marine world. We have onshore, nearshore, and offshore. We have surface, water column, and seabed. We have stationary, and moving targets. We have calm, and wildly turbulent environments.

Yet ironically, we have similar issues in the air.

The marine industry's approach to data gathering has been as many as there are sand pebbles on the beach, though more recently has started to concentrate on robotic platforms to gather data, since human data gathering is so restricted and restrictive underwater.

Let's look at some typical risk areas and where data gathering is critical (this is by no means comprehensive).

Ports and Shipping – inspections of: vessel hull; port infrastructure; port seafloor debris accumulation; channel hazards; marinas; navigable waterways, locks and canals, recovery support, etc.

Security – chemical, biological, radiological detection at dock; incoming vessel wake detection; suspect monitoring; seafloor incursion policing; etc.

Pipeline & Submarine Cables – inspections for: post storm; environmental & leak detection; pipe coatings and metal integrity; 3D mapping; ultraprecise location; flow metering; etc.

Seafloor, Lake & River Bottom Mapping – rapid remapping post storms in shallow waters; more frequent or post flood remapping of rivers; lake and reservoir bottom mapping, etc.

Environmental – precise monitoring of environmental water conditions; coral reefs; habitats; aquaculture at sea; fisheries; pipe outflows; etc.

Industry & Infrastructure – inspections of: bridges, dams, power plants; industrial plants; logging industry; etc.

Science – geological inspections; biological support; oceanographic support; etc.

All of these present specific challenges to technological solutions. Industry has developed a number of different purpose designed solutions to allow for each of these to some degree or other, though most are so specific to their mission as to be unusable for others.

In most cases the technologies that have been deployed fall into three main types: diver actuated sensors, shipboard actuated sensors, and ROV or AUV actuated sensors. Obviously divers are very limited and unsuitable for most of the potential environments for simply data gathering. Ship-based is fine in some cases but severely limited. So, it falls on the robots to perform most of this work.

Indeed, there have been revolutionary products and systems created in the last decade, but with most the function follows the form – meaning they are inherently limited by their design decisions, and this limits the type of work or data gathering they can perform.

To be most useful for the broadest possible range of applications, the platform must have certain characteristics: maximum stability in the most conditions; the most ability to deploy a vast range of instruments / sensors allowing at-sea configuration for each mission or task; extreme maneuverability to adapt to the local conditions; suitability in high sea or water currents; provide real-time data for immediate decision-making; receive and preserve data in evidence quality or original form suitably archived (provide a chain of custody); adapt to the latest control technologies and data analysis tools.

Currently, the deployed technologies fall into three main groups: AUV- Autonomous Underwater Vehicles (essentially Underwater Drones); ROTVs; and ROVs. AUVs must be programmed for their mission and deployed with limited useful time, where the operator knows very little until the AUV returns – they are typically very limited in their sensors and have high operational risk of loss or collision. ROTVs are very limited towed devices with limited control, limited sensors, and a host of issues. ROVs come in three basic forms: Box (Cage-style); Torpedo (like AUVs); and the Nova Ray underwater flier; The Box or Cage style ROVs are not operable well under tow – a bit like a dragged brick, and while offering sensor flexibility have limited maneuverability in limited current, plus tether (umbilical drag is a massive problem for them). Torpedo designs have their limitations as well (acting like underwater blimps), including stability in all axis, limited sensors, very poor maneuverability.

This is where the Nova Ray excels. By providing the unique arcuate wing design stabilizing the craft in all axis, coupled with far superior maneuverability both in free-flight and under tow, it provides anywhere from a 5x to 10x multiplier in the real-time data gathering needed to mitigate risks more rapidly and with far higher ROI. Nova Ray can be quickly adapted to almost any current or future suitable sensor, while operating under pilot control gathering data in perfect stability. The drift. Pitch, roll, and oscillation issues that confront other devices are eliminated by Nova Ray’s design.

The result is that Nova Rays can perform a vastly greater number of applications, collect more true legal quality data; perform faster at sea covering more distance; is more easily deployed and recovered using much smaller more cost effective vessels; is fully maneuverable from surface to depth; is adaptable in the middle of a mission based on encountered situations; and can even be deployed in a swarm pattern to cover a far greater swath of area using multiple Nova Rays simultaneously from a single vessel.

Coral Partners LLC.
8317 NE 162nd Place, Kenmore, WA 98028
+1•425•803•8172
Contact@CoralPartnersLLC.com
www.CoralPartnersLLC.com