# ACCESS ALL OCEANS

ALL OCEANS Engineering of Aberdeen, Scotland went public in February 2016 with the fact that they were developing a new small ROV. They didn't say how big it was, but they did qualify it as reinforcing the Company's position at the forefront of Fly-out ROV systems and technology. They added that it would also be available as a surface deployed system.

However, it is the inspiration behind the project that makes it another ground breaking development for this committed underwater engineering business.

The Law of the Seas, developed by the UN over many decades, is opening up access to all of our oceans and to anyone with an interest. This presents near limitless opportunities, some of which are already known, and no doubt there are many more as yet unknown.

This inspired All Oceans to ask some fundamental questions;

- What are the defining capabilities of an ROV system suited to first step exploration and discovery?

These are simply; DEPLOY / LOCATE / OBSERVE / SAMPLE / RECOVER.
So a "capable system" is much more than just an ROV.

- With the capabilities defined, how small can an all depth ROV access system be?

The question is not what size a system needs to be, but how small can it be.

The reason is that small systems don't need big support vessels or bags of power. Smaller means lighter so easier and less expensive to move around the world. Going small also means reduced capital cost and ongoing operational costs.

All Oceans were fortunate in that they didn't need to ask about any technical challenges, because they already have the capability in deep system design and manufacture across ROVs, Launch and Recovery Systems (LARS) and Tether Management Systems (TMS).

The project was initiated more than 3 years ago and All Oceans now have many of the elements built and tested. The MAC-ROV is a further ground breaking product, as are all of the options for its deployment and the integration of powerful observation, sampling and recovery capabilities.

The MAC-ROV makes ACCESS to ALL OCEANS a reality for more people and more vessels. Check out the following link for the developed inspiration behind it all;
http://www.subseauk.com/documents/presentations/brian%20abel%20-%20all%20oceans%202016.pdf

# Introducing the
# MAC-ROV

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| **Depth Rating** | 300m / 1,500m / 3,000m / 4,500m / 6,000m<br>1,000ft / 5,000ft / 10,000ft / 15,000ft / 20,000ft |
| **Dimensions** | 508mm (20”) cube |
| **Weight in Air** | 90 kg (200 Lbs) |
| **Thrusters** | Eight (8) Centreless and foul proof props. Brushless DC, fluid filled and pressure balanced motors, all magnetic coupled so no shaft seals. |
| **Thruster Configuration** | 4 horizontal. Vectored 45$^{o}$ for equal thrust in all lateral directions.<br>4 vertical. For tilt, roll, vertical trim and lifting. |
| **Bollard Thrust** | 23.2 kg (50 lbs), fore and aft.<br>23.2 kg (50 lbs), port and starboard (lateral).<br>17.2 kg (38 lbs), up and down. |
| **Movement and Speed** | 6 Degrees of Freedom (DoF) for complete control in space.<br>3.0 Knots all lateral directions. 2.0 knots vertical. |
| **Cameras** | 1 x 4k forward facing.<br>3 x HD 1080p (2 x forward facing, 1 x rear facing). |
| **Lighting** | Front; 2 x 1,700 Lumen, camera tracking, variable intensity (0 – 100%).<br>Rear; 2 x 1,700 Lumen, camera tracking, variable intensity (0 – 100%). |


***MAC-ROV Systems*** available in a variety of configurations and packages

- Simple portable surface packages, tether deployed to 300m. LARS at customer discretion.

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  | Gross weight | 150kg |
  | Peak Power | 5kw, 3ph, 380/440vac, 50/60Hz |

- System as “separates” 1500m - 6000m. Configured and fully functional in a one trip 20 foot ISO container. Separates to be removed from the container and configured on site to suit. The separate units being the MAC-ROV and TMS, LARS, Umbilical Winch, Rack packed controls and interconnects.
- The same separates fully integrated and functional in a 20 foot DNV 2.7-1 Container. 3m reach telescopic LARS, mid location air conditioned 2 man control room with window on LARS, end location Umbilical Winch, power unit and small workshop.

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  | Gross weight (excluding container) | 5000kg |
  | Peak Power | 25kw, 3ph, 380 / 440vac, 50/60Hz |

## ***MAC-ROV Fly-out Systems***

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| Depth rating | 1500 / 3000m / 4500 / 6000m<br>5,000ft / 10,000ft / 15,000ft / 20,000ft |
| TMS Excursion | 100m / 200m / 300m<br>325ft / 650ft / 1,000ft |

## ***Flexibility***

The LARS is the same for all systems (1500m – 6000m) with the only thing changing being the length of the umbilical. Safe working load rated for 1 Tonne in water payload at full depth (6:1 factor of safety). Double redundancy system capable of recovering 2 tonne (3:1 factor of safety) payload at half speed.

Operated in the surface deployed mode, the MAC-ROV can be used to survey and access a dive area before deploying a larger submersible, such as a trencher or mining machine. The MAC-ROV and TMS can then be moved over to the big submersible to operate as a Fly-out and alternate between deployment modes.

## ***SHUTTLE Systems***

A Shuttle system can deliver all of the qualifying requirements that make an access all depths and capable ROV system viable in a small and affordable package. The concept is the key to getting around the need for a big ROV system and guessing what size and power of ROV relative to the tools that it may have to carry.

Obviously a small ROV can't carry the big tools needed for sample taking and recovery, but who says it has to? Put these tools on a Shuttle with thrusters so that it is manoeuvrable. Land the shuttle for the heavy jobs and use a Fly-out ROV to observe the landing and all Shuttle based operations.

All Oceans qualified the "Shuttle" concept as applied to underwater operations early in 2016. In the same way that a space shuttle can carry a multitude of payloads a great distance, a Subsea Shuttle can be loaded up to avoid multiple trips to depth. Deployment and Recovery takes up a lot of vessel time and uses a lot of power. In effect all transit time to and from depth is non-productive and puts running hours on equipment for no return.

A big benefit is that Shuttle payloads can be tailored to suit customer needs. Payloads for loose item and biological sampling would be a manipulator type tool; geological sampling from precise locations would use a rock coring type tool, both of which are available with the Shuttle operating in "Lander" mode.

A MAC-ROV Fly-out package would automatically commandeer payload space on the Shuttle as the primary observation tool. When keeping an eye on the Shuttle it would be providing "buddy" support. Whilst close inspection of thermal vents, wrecks and the like, it would be performing higher risk "scouting" support allowing the Shuttle to stand back and away from such risks. Obviously it is better to snag and possibly lose the MAC-ROV and its tether cable, than to lose or damage the Shuttle and the main umbilical cable.

A Shuttle would typically have powerful and downward facing wide scan and bathymetric sonars to acoustically observe the terrain and environment from a safe height above the seabed allowing big areas to be surveyed quickly. Any anomalies found in this way can be "cherry picked" and scheduled for closer visual inspection efficiently and to suit weather conditions.

In reality, a shuttle would have several operating modes;

- Suspended Survey Mode — Wide scan and bathymetric survey; **Topography and Anomaly survey**
- Suspended Observation Mode — On-board cameras and MAC-ROV Fly-out; **Anomaly Identification**
- Lander Mode — Sampling; Biological / Mineral / Artefacts; **Evidence Recovery**