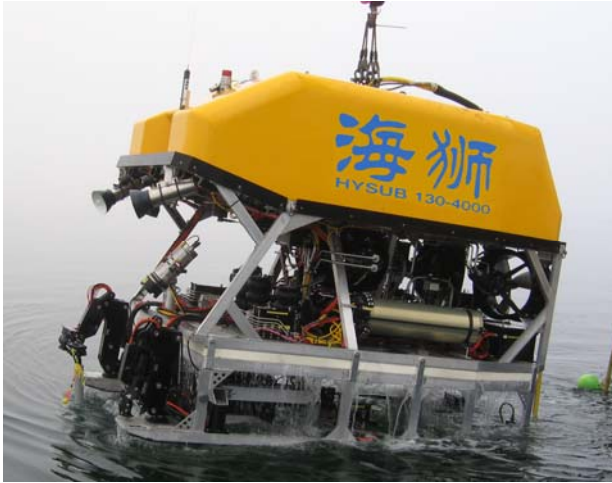


International Submarine Engineering Limited

## ***CORPORATE PROFILE***



**International Submarine Engineering Ltd.**

1734 Broadway Street, Port Coquitlam, British Columbia, V3C 2M8 Canada

T: +1.604.942.5223

F: +1.604.942.7577

W: [www.ise.bc.ca](http://www.ise.bc.ca)

E: [auv@ise.bc.ca](mailto:auv@ise.bc.ca)

## ISE CORPORATE BACKGROUND

International Submarine Engineering Ltd. (ISE) was formed in August 1974 to develop and sell Remotely Operated Vehicles (ROVs). At that time, the offshore service industry supported subsea oil and gas activities with manned diving spreads and manned submersibles. Both of these systems require large support ships for their operation. In the early 1970s the introduction of high-density electronics and the significant rise in the cost of support ships presented the opportunity to develop and sell a smaller, high-endurance unmanned vehicle.

Over the past 35 years, our achievements have been recognized with awards from many international oceanographic agencies. We have delivered more than 210 underwater vehicles and 400 robotic manipulators. ISE and our staff have received various awards from international bodies such as IEEE. Most recently, ISE received the Marine Technology Society Compass Industrial Award. ISE's founder, Dr. James McFarlane, was also presented with the MTS Compass Distinguished Achievement Award for Outstanding Contributions to the Advancement of the Science and Engineering of Oceanography and Marine Technology. In 2009, ISE was inducted into the Offshore Energy Center Hall of Fame and was also named as one of Canada's top 40 defence companies.

There have been many 'firsts' and records for ISE: the semi-submersible Autonomous Underwater Vehicle (AUV) DOLPHIN in 1981 developed for military applications; the first AUV survey ever done in 1982; followed by the longest AUV mission under the ice with THESEUS in 1998. At 1.27 metres in diameter and 10.7 metres in length, THESEUS is still the world's largest AUV.

ISE currently designs and manufactures ROVs, AUVs, manned submersibles, semi-submersibles, autonomous and remotely operated surface vehicles, robotic manipulators and software control systems.

### Remotely Operated Vehicles

ROVs form a core element of ISE's business. We have designed and built ROVs for commercial, scientific and military applications. Some of our most notable vehicles are the Ventana, operated by the Monterey Bay Aquarium Research Institute, the Canadian Remotely Operated Platform for Ocean Sciences, or ROPOS ROV (pictured), and more recently the HYSUB 130HP ROV for Guangzhou Marine Geological Survey (GMGS), a division of China's Ministry of Land and Resources.

ISE built one of the world's first ROVs. This vehicle was launched in April of 1975 and delivered in October of the same year. In 1976 ISE's first pipeline support vehicle worked in the North Sea off the coast of Scotland on the observation of ballasting on the Piper Alpha pipeline.



Figure 1: ROPOS ROV.

### Autonomous Underwater Vehicles



Figure 2: ISE ARCS AUV.

Our first AUV was the Autonomous and Remote Controlled Submarine (ARCS), shown in Figure 2. We began developing ARCS in late 1981 with the Canadian Hydrographic Service (CHS). It was designed to conduct surveys in the high Arctic. ARCS was the third underwater vehicle to operate autonomously and conducted the very first AUV survey in 1982.

In the 1990s it was modified and used for a variety of development trials to validate new designs. These included navigation algorithms, mine countermeasures surveys, long range mission development and fuel cell trials. ARCS was also used to develop an iceberg mapping and profiling system and to evaluate new AUV sensors including a mass spectrometer. In 2002 ARCS was retired following 18 years of operations and over 800 missions.

For ISE, the flagship AUV project of the 1990s was Theseus (Figure 3). It was designed to lay fibre-optic cables in the Arctic for the Canadian and US navies. Theseus was deployed to the Arctic for trials in 1995 with cable laying missions taking place in 1996. Until very recently, Theseus was the largest AUV in operation and held the record for the longest AUV mission – 460 kilometres, all of which was under ice.

Theseus is capable of deploying fibre optic cable. It housed a toroidal dispenser that contained 220 kilometres of cable that was deployed under the Arctic ice. Theseus is also equipped with a sophisticated obstacle avoidance system. Theseus is owned by Canada's Department of National Defence. It is stored at ISE's facilities and is available for charter.



Figure 3: Theseus Under the Arctic Ice.

In 2002, we started development of a smaller AUV known as Explorer, based on the successful designs of our earlier vehicles. The prototype vehicle was developed and tested in 2003 and sold to the French oceanographic agency, Ifremer in 2004.



Figure 4: The University of Bremen's Explorer AUV working with Ifremer.

The Explorer AUV has been well received by the scientific community around the globe. Recently we have delivered a second Explorer AUV to Ifremer in France, one to Memorial University of Newfoundland in Canada and one 5,000 metre vehicle to the University of Bremen in Germany. We also built an Explorer for the National Oceanic and Atmospheric Agency in the USA. That vehicle is jointly operated by the University of Southern Mississippi and the University of Mississippi. Figure 4 shows the University of Bremen's Explorer off the coast of France in 2008.

Most recently, we delivered two 5,000 metre Explorer AUVs to Natural Resources Canada. They were completed in September 2009 and have recently been deployed to the Canadian Arctic to conduct seabed surveys supporting Canada's submission under article 76 of the United Nations Convention on the Law of the Sea. In April 2010, one of these vehicles completed a 10 day mission in the Arctic at depths to 3160 metres, travelling a total distance of 1100 kilometres under the ice without being removed from the water. This distance is further than that travelled continuously by any other AUV. It also recorded the very first seabed survey by an AUV underneath Arctic ice.



Figure 5: ISE AUV Workshop.

An important aspect of this latest Explorer AUV delivery is the continued support ISE is providing to the client, including on site operational support during the Arctic deployment. Figure 5 shows our AUV workshop with two Explorer AUVs (left), the larger Theseus AUV, and ARCS (on the right).

In 2007 ISE began work on the Swimmer project for Cybernetix S.A. of Marseille, France and Total. We designed a hybrid AUV system for work in deep oil fields. It comprises a shuttle AUV that carries and deploys a lightweight ROV. We will receive a contract to produce the prototype system in the near future.

## Innovative Solutions

In order to ensure that our products feature the most up to date designs and technology, we place special value in research and development. We combine our development work with partnerships involving universities, government agencies and specialist companies. Since 1984 we have developed hydrodynamic models, vehicle controllers and positioning algorithms, mission specific sensors, power sources and vehicles. It is this experience that allows us to develop innovative solutions for new requirements. Our current research and development activities are centered on extending AUV autonomy and developing prototype platforms with intervention capabilities.

We enjoy creating innovative solutions for underwater applications. In addition to our core products of ROVs and AUVs we have also developed robotic products and been heavily involved in new concepts and designs. Some of the developments are:

- RMS – the Remote Minehunting System, a combination of semi-submersible and towfish with interchangeable sensor arrays.
- SmartPump™ – an autonomous gas station for refuelling passenger cars for the Shell Oil Company.
- Vulcan Submersible – an eight passenger rated to 400 metres depth as shown in Figure 6.
- PRMS – the Pressurized Rescue Module System for US Navy Submarine emergency evacuation.
- SPDM Testbed Manipulator – Canadian Space Agency astronaut robotic arm manipulator training station.



Figure 6: Vulcan Submersible.

## Customer Base

Since ISE was formed we have built strong and lasting relationships with many different organizations around the world. We prefer to develop long lasting relationships with our suppliers, partners and customers. Table 1 lists some of our clients.

Organization:	Location:	Organization:	Location:
AT & T Ltd	USA	Monterey Bay Aquarium Research Institute (MBARI)	USA
Bedford Institute of Oceanography	Canada	Memorial University of Newfoundland	Canada
Bremen University, MARUM	Germany	NASA	USA
British Oceanics	UK	Nordex Willco AS	Norway
CGG Veritas	France	Ocean Works of Asia	Japan
C and C Technologies	USA	Oceaneering International Ltd	USA
Cybernetix SA	France	Shin Nippon Kaiji	Japan
Department of National Defence	Canada	Shell Oil Products Ltd	USA
Department of Defense	USA	Southwest Research Institute	USA
Det Norske Veritas	Norway	French Ministry of Defence	France
DCN International and DCNS	France	Fugro Chance Inc.	USA
Société ECA SA	France	University of New Brunswick	Canada
Ifremer	France	University of Southern Mississippi	USA
Institute of Ocean Sciences	Canada	US DoD (DARPA)	USA
JAMSTEC	Japan	UK Ministry of Defence	UK
John Hopkins University (APL)	USA	US Navy	USA

Table 1: Some of ISE's Clients.

## Quality Assurance



Figure 7: ISO 9001:2008 Certificate.

ISE's AUV Quality Assurance (QA) program is certified under ISO 9001:2008. The program has evolved since it was introduced over 25 years ago. It began as a Canadian government requirement to meet NATO AQAP standards for military projects. In 1994 we adopted the ISO model for QA programs and achieved initial certification at the first attempt in 1996.

We are audited annually by SAI-Global, an international ISO certification organization. We attained ISO 9001:2000 accreditation in May 2003 and in 2009 we successfully updated our accreditation to the latest ISO 9001:2008 standard. Figure 7 shows our most recent ISO 9001:2008 compliance certificate.

Every project benefits from a tailored QA program encompassing all components and procedures. Our internal processes are evaluated regularly. Also, our key suppliers are involved with our QA program. The overall focus of the company QA program continues to be in improving the level of customer satisfaction and lowering the cost of doing so.