

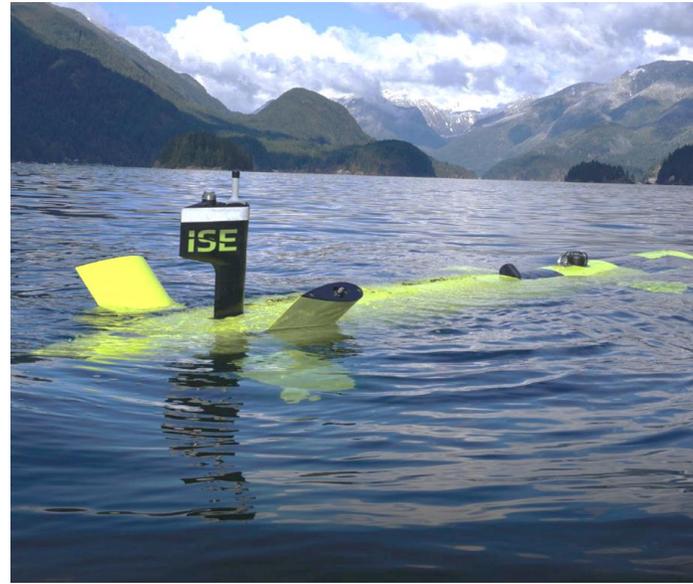


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## Corporate Profile



Remotely Operated Vehicles  
Autonomous Underwater Vehicles  
Human Occupied Vehicles  
Robotic Systems



### ABOUT US

**International Submarine Engineering Ltd. (ISE)**, is a high technology company engaged in the development and manufacture of undersea vehicles, computer control systems, and robotics. Since ISE was formed in 1974, we have been a market leader in the areas of underwater vehicles and industrial robotics. We have delivered more than 210 underwater vehicles and 400 robotic manipulators to customers around the world, many of whom we maintain a strong and lasting relationship with.

ISE and our staff have received various awards from international bodies such as IEEE. 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 first commercial ROV in the North Sea in 1975; the first manipulator on a commercial ROV in 1976; the ROV TREC ends divers performing walking inspections of pipelines in the Gulf of Mexico in 1979; the first subsea blowout inspection on the Ixtoc-1 in 1979; the first 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 meters in diameter and 10.7 meters in length, THESEUS is still the world's largest AUV.

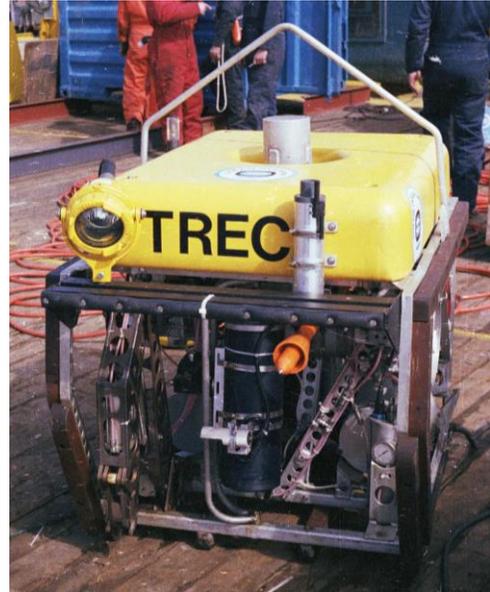
ISE currently designs and manufactures ROVs, AUVs, HOVs, semi-submersibles, autonomous and remotely operated surface vehicles, robotic manipulators and software control systems. Our decades of experience in all areas of industrial robotics means that we are highly qualified to meet all customer needs.

### REMOTELY OPERATED VEHICLES (ROVs)

ISE was initially formed to develop and sell Remotely Operated Vehicles (ROVs). By the early 1980s, ISE had become one of three leaders in ROV development and our vehicles were in use worldwide. These vehicles have been used for a variety of tasks ranging from shallow water underwater inspection to deep water intervention.

ISE's ROV product lines form one of the core elements of its overall business structure. We have designed and built ROVs for commercial, scientific and military applications. Our ROV's are delivered in standard or custom configurations to meet our customer's requirements from 5 to 600HP and up to 6000 meters of depth.

ISE designed and manufactured one of the world's first commercial ROV systems for the Department of Inland Waters, Canada. This vehicle was launched in April of 1975 and delivered in October of the same year and was responsible for discovering Canadian and US warships in the Great Lakes from the battles of 1812. 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. It was also in 1976 when ISE manipulators were installed on these early ROV's for the first time broadly expanding the capabilities of these early systems. By 1979 ROV's were beginning to receive greater acceptance in the offshore oil and gas sector that was reinforced by the ROV TREC replacing divers for performing pipeline inspections. In 1979 there was also the offshore blowout at Itx-1 in the Gulf of Mexico, again it was an ISE TREC that performed the first ever BOP remote intervention.



## ISE Corporate Profile

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Since these early development and manufacturing efforts, ISE ROV's have matured into well-developed, capable, and robust commercial products. High bandwidth data communications via fiber optic cable was first accomplished in 1987 and this was one of the first ROV systems to completely rely on fiber for video and data transmission. Increased data transmission capability has allowed the use of sensors requiring extraordinary high-volume throughput such as 3 CCD HD broadcast quality video signals. The other benefit realized from the development of fiber optic umbilical cables was a reduction in the overall size of the cable that reduced drag and enhanced vehicle manoeuvrability.

ISE has developed numerous scientific ROV's that must have diverse capabilities to meet the broad ranging requirements of user groups from various scientific disciplines; biologists, chemists, geologists and oceanographers as examples. Some examples of our most notable scientific ROV's are:

### **HYSUB 40 (ROPOS)**

ROPOS was built in 1985. Its uses include scientific research on and near the ocean floor, to depths of 5000 meters. ROPOS is currently operated by the Canadian Scientific Submersible Facility (CSSF), in Sydney, BC.



**HYSUB 40 (ROPOS)**

### HYSUB 40 (Ventana)

Ventana was delivered to the Monterey Bay Aquarium Research Institute in 1987. Since then, it has completed over 2500 dives and is still in service today.



HYSUB 40 (Ventana)

### HYSUB 50

The first HYSUB 50 was built in 1986. Since then several more vehicles have been built, typically to serve as drill rig support vehicles. Customers for these vehicles include Shin Nippon and Oceaneering International.

### HYSUB 250

The HYSUB 250 is a 250 HP oil field work vehicle that was built in 1986.

### HYSUB 150

The first HYSUB 150 was built in 1988. A total of five units have been built. HYSUB 150 vehicles are typically used for cable retrieval and burial.

Customers for these 150 HP vehicles include the US Navy and consortiums headed by AT&T.

### HYSUB 25 (TrailBlazer)

TrailBlazer was built in the 1990s to perform a mine countermeasures role. It has performed operations for the US Navy, the US Coast Guard, and the Canadian Navy.

### HYSUB 50 (DSIS)

Deep Seabed Intervention System (DSIS) is an advanced ROV, A-frame, cage, and winch system. This vehicle was sold to Canada's Department of Defence in 1998. It has been used at the Swiss Air 111 Crash site.

### HYSUB 75 (Hyper Dolphin)

HYSUB 75 was delivered to JAMSTEC Japan, in 1998. It is used to perform scientific missions to 3000 m depths. The vehicle is supplied with advanced HDTV video equipment and plasma flat screen displays.



HYSUB 150



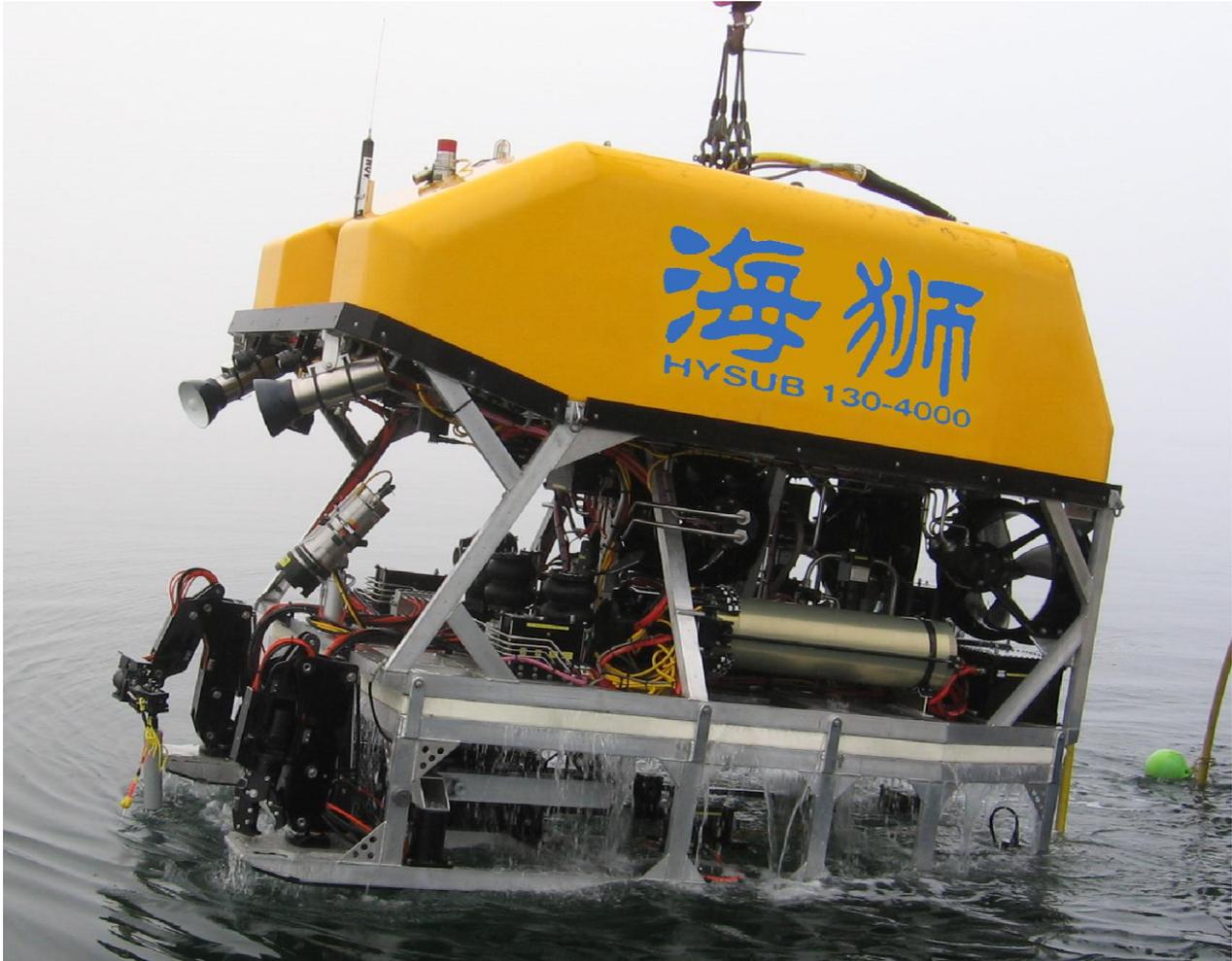
HYSUB 25 - Trailblazer



HYSUB 75 - Hyper Dolphin

### HYSUB 130

HYSUB 130 is a 4000-meter marine science vehicle delivered to Guangzhou Marine Geology Survey (GMGS) in 2009. The ROV contains a uniquely designed Hydrate Recovery Pressure Vessel (HRPV). This provides the capability to perform hydrate survey, geological survey, and assist in reaching greater depths for mineral exploration.



HYSUB 130

ROVs are not just dedicated to the subsea market they also can have land-based operations and ISE has developed and manufactured innovative solutions to customer requirements. Mining is a costly and invasive operation and to ensure the most efficient operation an ROV was developed to mine the ore vein directly eliminating the extensive removal of overburden associated with some traditional mining operations.

### AUTONOMOUS UNDERWATER VEHICLES (AUVs)

#### ARCS (Autonomous and Remote Controlled Submarine)

ISE's first AUV was the Autonomous and Remote Controlled Submarine (ARCS), shown below. The development of the vehicle began in late 1981 for the Canadian Hydrographic Service (CHS). It was designed to conduct surveys in the high Arctic. Until recently, we considered ARCS to be the third AUV built after the University of Washington SPURV program and the Ifremer l'Epaulard. However, ARCS was actually the very first AUV to operate in a completely autonomous manner, as the other two were always tethered, either physically or acoustically. ARCS was the first AUV to conduct a hydrographic survey in 1983.

During ARCS' operational lifespan it was modified and used for a variety of development trials to validate new designs and test the integration of new sensors. 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.



ARCS



THESEUS AUV

#### Theseus AUV

In the mid 1990's ISE designed, manufactured and operated the AUV Theseus for the Canadian and US Navies. It was designed to lay 220 kilometer fiber-optic cables in the Arctic under the Polar ice cap. 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 kilometers, all of which was under ice.

Theseus was retired after the final mission in 1996. It is still owned by Defence Research and Development Canada and is stored at ISE.

#### Sea Squirt

In 1988, ISE provided the design assistance and materials that enabled the Massachusetts Institute of Technology to assemble a small AUV known as Sea Squirt. This AUV is the progenitor of MIT's Odyssey class of AUVs.



Sea Squirt

### Explorer AUV



The University of Bremen's Explorer off the coast of France in 2008, working with Ifremer

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

The Explorer AUV has been well received by the scientific community around the globe. It is recognized as a capable, stable and reliable survey platform configurable to carry a myriad of payload sensors. Explorer is available in various configurations, with depth ratings to 6000 meters, and endurance options up to 85 hours. Successes within the scientific community and the flexibility of the platform have led to Explorer being well received by commercial survey companies.

Explorer is now in use around the world, with owners including Ifremer (2 vehicles), the University of Bremen, the National Oceanic and Atmospheric Agency (NOAA), Memorial University of Newfoundland, Japan Coast Guard and Fukada Salvage and Marine Works Co., Ltd.



ISE Explorer AUV performs sea trials near Burrard Inlet, Vancouver, BC

## ISE Corporate Profile

In September 2009, ISE delivered two 5,000 meter Explorer AUVs to Natural Resources Canada. In 2010 and 2011, they were 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.



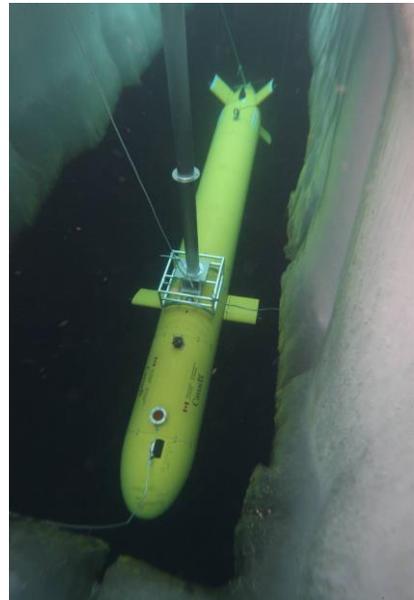
In April 2010, one of these vehicles completed a 10-day mission in the Arctic at depths to 3160 meters, travelling a total distance of 1100 kilometers under the ice without being recovered from the water. This distance is further than that travelled continuously by any other conventionally powered AUV. It also recorded the very first seabed survey by an AUV underneath Arctic ice.

Pictured left, is the ISE Arctic Explorer being launched through an ice hole during the 2010 Arctic deployment.

This was followed up by the 2011 Arctic deployment, conducted aboard the Canadian Coast Guard icebreaker the Louis St. Laurent. The AUV conducted a successful 115 km survey to depths of over 3000 m at 88.5° North.

An important aspect of this latest Explorer AUV delivery is the continued operational and logistical support ISE provides to the client. In the case of the NRCan AUV's this included onsite support during the Arctic deployments.

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 electric inspection and intervention ROV.



### SEMI-SUBMERSIBLES

#### Dolphin

In the early 1980s, we developed the Dolphin semi-submersible. It was built as a stable platform for offshore hydrographic survey and mine countermeasures. Since 1982, we have built thirteen of these vehicles for the CHS, the US Navy, Boeing North American, and the Canadian Navy. Dolphin has evolved into the Dorado minehunting semi-submersible vehicle and is equipped with our Aurora Towfish sensor platform.



**DOLPHIN**

#### Dorado

The Dorado semi-submersible is the successor to Dolphin. In 2000, successful towing trials were conducted at speeds of 10 knots and depths of 200 metres. Since then, twelve operational trials have been conducted in the United States, France, Italy, and Canada.



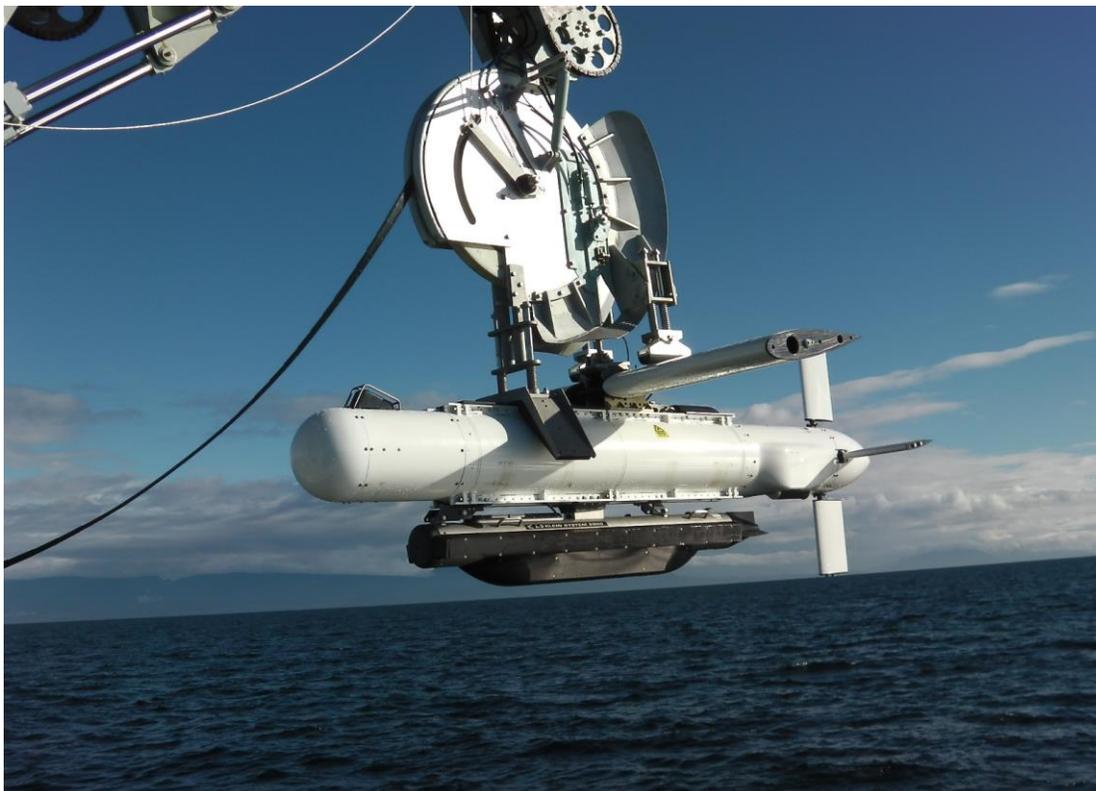
**DORADO**

### Aurora Towfish

Aurora is an actively stabilized towed vehicle that carries mine countermeasure sonars. It is deployed from a semi-submersible and helps to reduce scope, enhance line following, and shorten turns.



AURORA TOWFISH - RENDITION



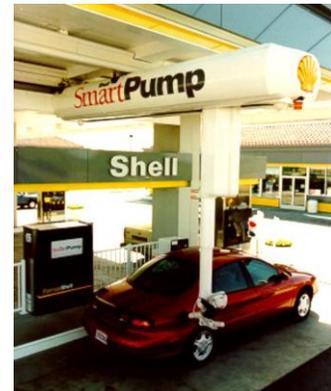
AURORA TOWFISH AT SEA

## INNOVATIVE SOLUTIONS

ISE strives to ensure our products feature the most up to date designs and technology. We place special value in research and development and combine our development work with partnerships involving universities, government agencies and specialist companies. ISE has developed and engineered products ranging from vehicle controllers with custom positioning algorithms, mission specific sensors, power sources and vehicles operated on both land and sea. 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 as shown in photo on previous page.
- SmartPump™ – a gas station for refueling passenger cars for the Shell Oil Company.
- Vulcan Private Submarine – a ten passenger American Bureau of Shipping certified submersible rated to 365 meters. (2)
- PRMS – the Pressurized Rescue Module System for US Navy Submarine emergency evacuation. (3)
- SPDM Testbed Manipulator – Canadian Space Agency astronaut robotic arm manipulator training station.



Smart Pump



Vulcan Private Submarine



SPDM Testbed Manipulator



Pressurized Rescue Module System (PRMS)

# ISE Corporate Profile

## 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.

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

## QUALITY ASSURANCE

ISE's AUV Quality Assurance (QA) program is certified under ISO 9001:2015. 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 and have been successful in updating our accreditation to the latest ISO 9001: 2015 in 2017.

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.



## IN SUMMARY

International Submarine Engineering Ltd has proven to be a solid business partner with customers and suppliers alike for over 40 years. The breadth of collective expertise and experience in subsea system development supports a North American and international underwater industry that will benefit from ISE's performance for years to come.

