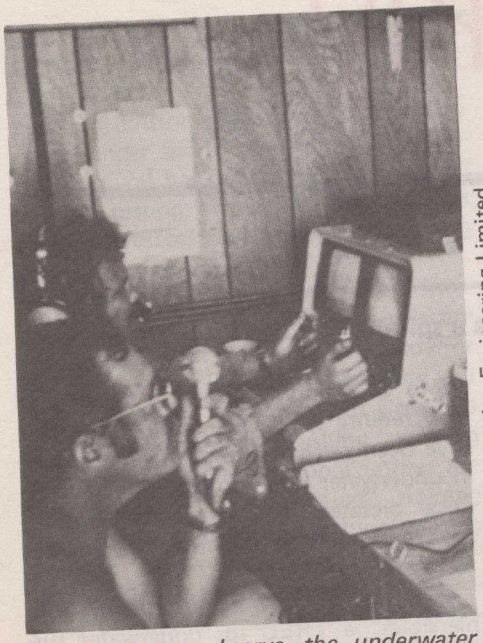


International Submarine Engineering Limited

Operators can observe the underwater scene conveyed by the unmanned submersible's camera from the safety and comfort of their on-board cabin.

case of TROV, its mechanical arm is operated by remote control.

In the competitive business world where cost cuts are always welcome, these submersibles can often pay for themselves many times over during their life-span. They also have the added benefit of sparing divers needless risks during dangerous underwater operations, whether fighting a raging undersea blowout, filming killer whales, or recovering unexploded torpedoes.

Recently, International Submarine Engineering embarked on a program to manufacture more sophisticated mechanical arms for its TROV; the arms are versatile and capable of force feed-back, a process which allows the controller up top to feel how much pressure is being applied. This ensures precision control, so that valves are not torn off or torpedoes crushed by the brawny machines. A tactile arm which acts like an extension of the operator's arm at the end of over 1 000 metres of cable adds whole new dimensions to the use of these underwater systems. To nurture this development, the National Research Council of Canada is providing financial aid to the company.

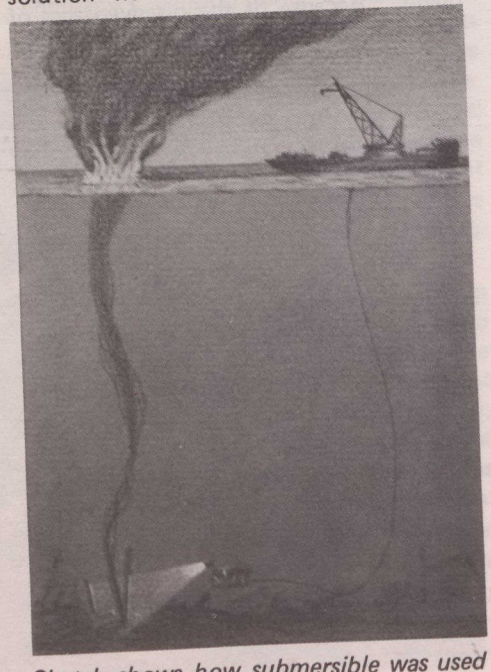
A case in point

The use of unmanned submersibles became known during the oil industry's worst disaster, the catastrophic blowout at the offshore oil well, Ixtoc 1, owned by Mexico's national oil company, Pemex. The crew had been drilling 4 000 metres below the seabed in the Gulf of Mexico when it encountered complications and began pulling up the kilometres of pipe attached to the drill. Just before extraction was complete, oil started to ooze out of the pipe, the incredible pent-up pressure of oil and gas burst through, and a torrent of grey-brown crude began gushing out at a rate of 30 000 barrels a day.

Normally, a blowout preventer, a 13-metre stack of high pressure hydraulic rams on the ocean floor, is actuated, cutting through the drill pipe and sealing the blowout. That is what the drill crew tried, but it was not the drill pipe that now rested in the blowout preventer. It was the drill collar instead, a heavy gauge steel pipe used to add extra weight to the drill bit. This prevented the rams from sealing the flow.

Eventually the accumulating gas ignited on one of the hot motors on the platform, and the fire that raged for months was set. The drilling platform buckled from the intense heat, sending kilometres of pipe and equipment tumbling onto the blowout site and the disabled blowout preventer on the ocean floor.

An international emergency task force, assembled to cap the flow, determined that it would be too dangerous to send down divers to examine the situation. The outflowing oil was creating a tremendous vortex, made more dangerous by reduced visibility and the tangle of debris now lying around the well-head. Their solution was to use an unmanned submersible, and a TREC, manufactured by ISE and owned by a Houston firm, was quickly delivered to the scene.



John Bianchi, NRC

Sketch shows how submersible was used in Ixtoc 1 blowout.

The Canadian-made submersible was soon launched on its way, flights ablaze, camera searching, following a grid pattern controlled from above *via* cable. After 14 hours of criss-crossing and threading through the debris, the well head and the blowout preventer stack came into view. Video inspection revealed that the blowout preventer was still intact and repairable. Then, the TREC inadvertently manoeuvered too close to the surging oil, was caught up instantly in the vortex and shot to the surface. Though damaged, the TREC was repaired and returned to the scene and used as a beacon for divers to locate the well and cap it. After many months of attempts and failures, the blowout at Ixtoc 1 was finally under control. Unmanned submersibles had proved their worth.

(Article by Sadiq Hasnain in Science Dimension, *1981/6.)*

Canada-Bahrain educational pact

Trade minister Ed Lumley has announced the signing of an agreement to cover future co-operation in the field of education between Canada and Bahrain.

The agreement was developed by the Canadian Commercial Corporation (CCC) on behalf of the Ontario Educational Services Corporation (OESC), a government agency which facilitates the provision of educational resources. The educational services procurement agreement was signed by Canadian Ambassador to Kuwait Ian Wood representing CCC, Ontario Minister of Education Bette Stephenson on behalf of OESC and Minister of Education Ali Fakhro for Bahrain.

The areas of co-operation included under the agreement are: teacher training, curriculum development, the provision of contract faculty and the development of an institutional support system for Bahrain.

This represents the first procurement services agreement to be developed by CCC to provide educational services from Canada. The CCC is a federal Crown corporation which contracts with foreign governments and international agencies on behalf of Canadian suppliers of goods and services. Last year, CCC achieved sales of over $400 million involving 550 Canadian firms and more than 50 foreign customers.