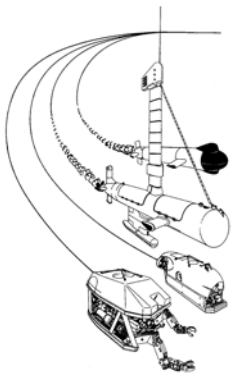
TRAILBLAZER

A MINE COUNTERMEASURE SYSTEM



I.S.E.

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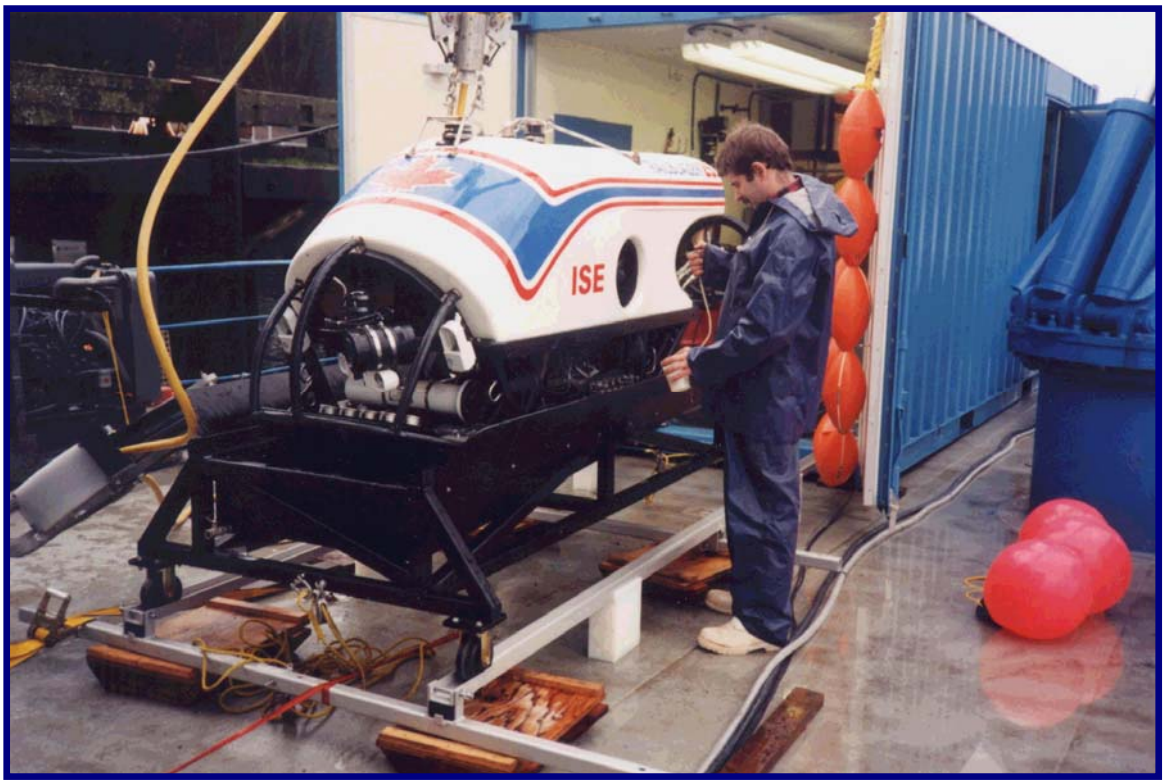
Once launched the vehicle is maneuvered on the surface using a portable control unit “Belly Pack”.

Once submerged the vehicle is piloted from the console. Consoles are standard 19” rack. Displays include video, touch screen graphics, diagnostics, Imagenex colour & gray scale sonar and Track point II positioning and Offshore tracking display.

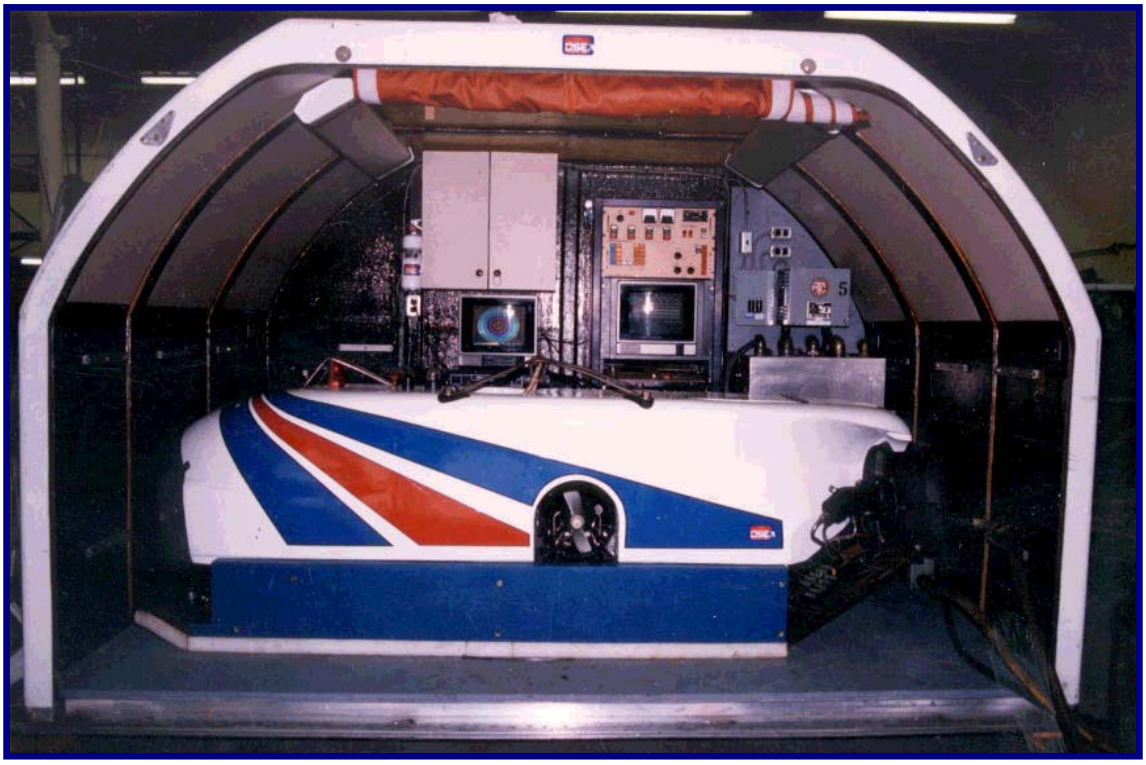
The Trailblazer vehicle, winch and console can all be stored in a 20ft standard container for shipping. In fact for most operations the winch is never removed form the container.



The Trailblazer sits in a drip tray which is extracted from the container on rails. The height of the tray is convenient for conducting pre and post dive inspections as well as maintenance. The Trailblazer is equipped with a wide angle 517 camera and colour T.V. camera with remote focus and zoom. Lighting is provided by 4,250 watt R.O.S. lights.

The vehicle is hoisted from the deck using any type of crane hooked to the latch/probe. The latch/probe is used for launch and recovery.

TRAIL BLAZER 30



FUNCTIONING CAPABILITY

The vehicle as described is capable of operating to depths of 1275 feet. With its tether cable, it can achieve 6 knots coaxial velocity and can carry 4, 22 kg explosive charges. It is fitted with a 675 KHZ Mesotech scanning sonar and a Silicone Intensified Target Camera. A 3 function rate controlled, retractable manipulator provides a cable cutting or retrieval capability.

TRAIL BLAZER is electro-hydraulically powered through its tether and has a continuous endurance.

The vehicle has 4 thrusters which provide mobility in 3 axis.

The TRAIL BLAZER is a tethered, high speed, remotely operated vehicle. It is capable of operating to depths of 500 meters in tidal currents, while carrying out a variety of military, industrial, scientific or mine countermeasure mission.

TrailBlazer 30

The system has executed trials under operational conditions and has proven its effectiveness in the location, identification and disposal of underwater objects.

The design criteria used in developing a system most suited to the MCM roles envisioned include the following;

- High power propulsion system to allow ease of maneuvering in strong tidal currents and to reduce overall mission time.

- Power supplied from the surface gives it the ability to carry out missions for extended periods of time.

- Low magnetic and acoustic signatures.

- Provision for both sonar and T.V. systems which allow for rapid identification of underwater objects.

- High payload carrying capabilities allow the transport of a number of mine disposal charges.

- User friendly and easy operation.

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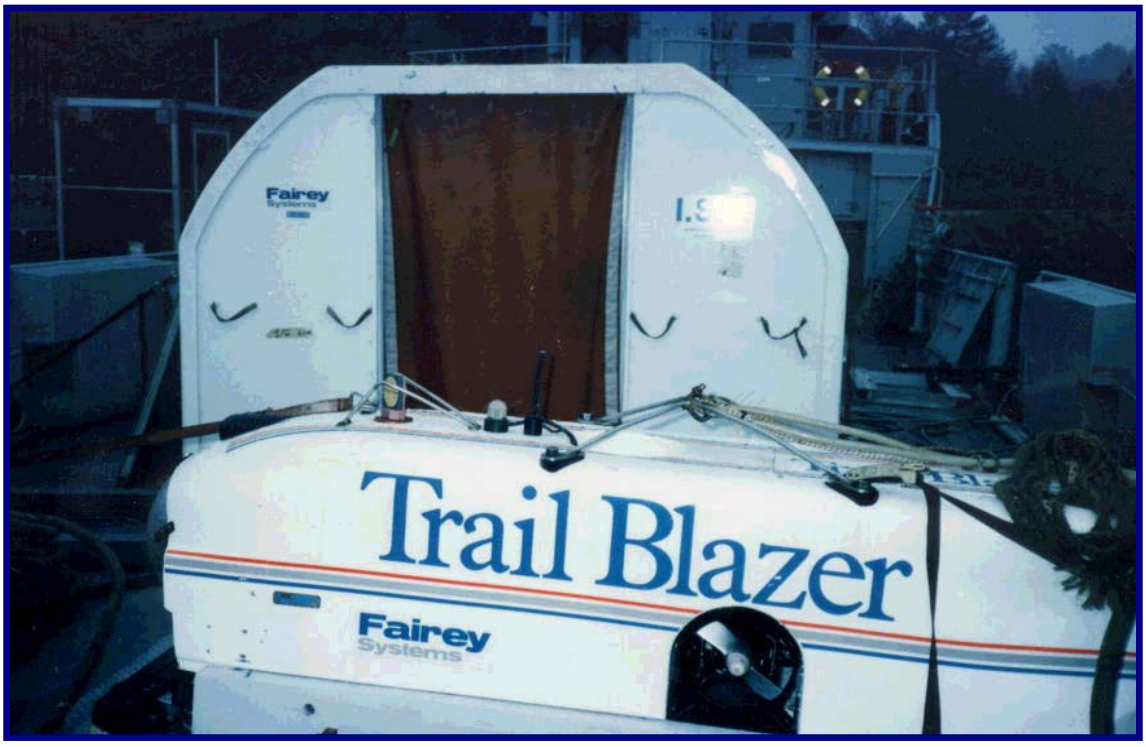
A standard airfreight container can be used as the systems combat information centre. This container also provides for vehicle storage and shipping. When used in this configuration, it provides rapid deployment and fast mobilization anywhere in the world.



The vehicle can be flown by the belly pack or by the console.

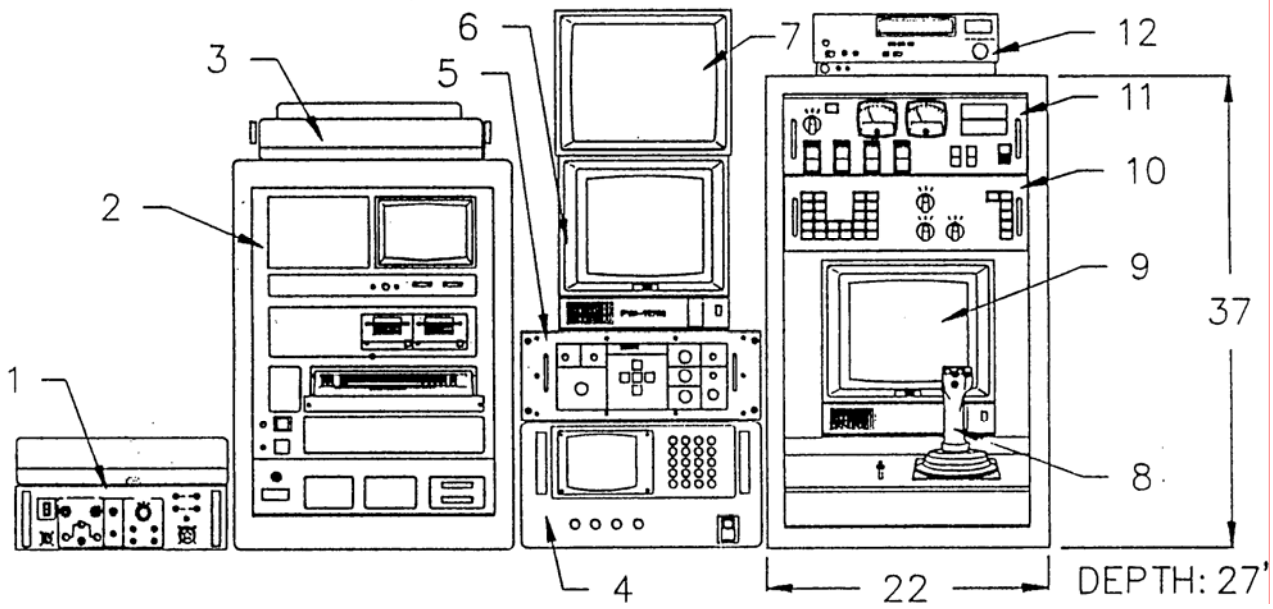
The belly pack is used when the vehicle is on the surface. It enables the pilot to maneuver the ROV as required during launch and recovery. It can also be used to fly the vehicle from a remote location when minehunting.

During "Ocean Safari" TRAIL BLAZER was flown on the surface with the belly pack for 9 miles. This was the length of the "Q" route.

This eliminates the need to recover the vehicle when moving from contact to contact.

The console is used during all subsea operations.

1.	Side Scan Interface	O.R.E.
2.	Navigation System	Quibit Trac IV
3.	Navigation Plotter	Qubit
4.	Vehicle Tracking	O.R.E.
5.	Vehicle Sonar	Mesotech
6.	Sonar Monitor	Sony
7.	Navigation T.V.	Sony
8.	Pilot Joystick	I.S.E.
9.	Pilot's T.V.	I.S.E.
10.	Telemetry Tray	R.M.S.
11.	Power Tray	I.S.E.
12.	V.C.R.	Panasonic



The vehicle consists of a 6061-T6 anodized aluminum frame and FRP encased buoyancy pack. The frame supports the power pack, thrusters, vehicle telemetry can, camera pan and tilt unit, control and servo packs, manipulator and the foam pack. The foam pack which supports the lift bar and sonar is easily removable to gain access to the mechanical components. Access to the vehicle telemetry can is through a hatch in the top of the foam pack.

TRAIL BLAZER WITH FOAM PACK REMOVED

Once the system is on location and the container is lifted onto the ship, only two hours are needed before the TRAIL BLAZER can become fully operational.

CONSOLE SUITE INSIDE OF SHIPPING CONTAINER

TRAIL BLAZER has been air freighted over 120,000 miles and transported more than 25,000miles by truck. It has successfully completed 17 demonstrations in 9

countries. TRAIL BLAZER has been ranged at the Land Magnetic Ranges in Australia and England.

The United States Navy leased the TRAIL BLAZER system for 4 exercises in 1987.

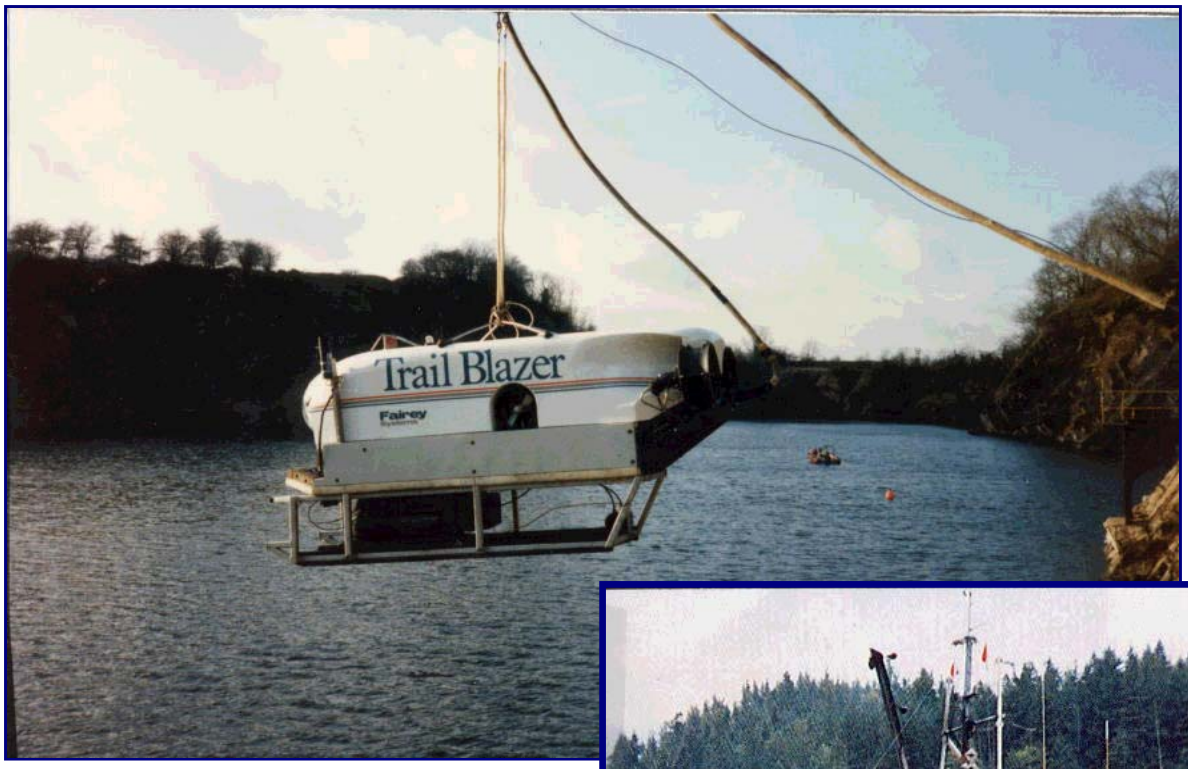
TRAIL BLAZER has accumulated over 425 hours time in the water. This includes a bottom search operation where the system operated for over 140 hours in 8 days without a major malfunction.

TRAIL BLAZER IN BRAZIL

TRAIL BLAZER's first demonstration was at Weymouth, England. There it successfully located and identified a mine and a bomb. This demonstration was for A.R.E. and NATO personnel. Upon completion TRAIL BLAZER was taken to the land magnetic range for ranging.

IN Denmark, TRAIL BLAZER located and inspected a mine from a mine layer.

In Canada, TRAIL BLAZER was demonstrated to the Royal Australian Navy and the Defence Research Establishment Pacific.



TRAIL BLAZER WITH WEAPONS RACK

In Charleston, SC the demonstration was for COMINEWARCOM, COMINERON TWO, EOD and U.S. Coast Guard personnel.

During this demonstration, several bottom mines were located and identified. The ordnance capability, or weapons module was demonstrated for the first time. This allows TRAIL BLAZER to carry and deploy a subsea charge. Once the charge is deployed and the vehicle recovered the charge can be deployed acoustically.

The U.S. Navy demonstrations at Mine Squadron Two were extended at WQAEC's request. They requested assistance in recovering two evaluation mines. The EOD divers were not able to recover the mine because of the water depth and excess current. The divers spend three unsuccessful days trying to secure these mines. TRAIL BLAZER accompished this task in less than one hour.

TRAIL BLAZER ON THE LCU-125. PAPA DUCK

A Tee handle with a snap hook was inserted into the manipulator. A line was attached to the snap hook and hand tended from the surface. TRAIL BLAZER attached the snap hook to the mooring line on the anchor of the mine. The tee handle was released and the vehicle recovered. The mines were then recovered by the ship's crew

The Brazilian Navy requested the system to conduct a bottom search to locate a heavy weight torpedo. This torpedo was lost during a test firing. About 160 hours were spent in the water in eight days with a crew of 3. The vehicle was launched and recovered in sea states up to and including 6. TRAIL BLAZER was “live boated” on the surface from location to location.

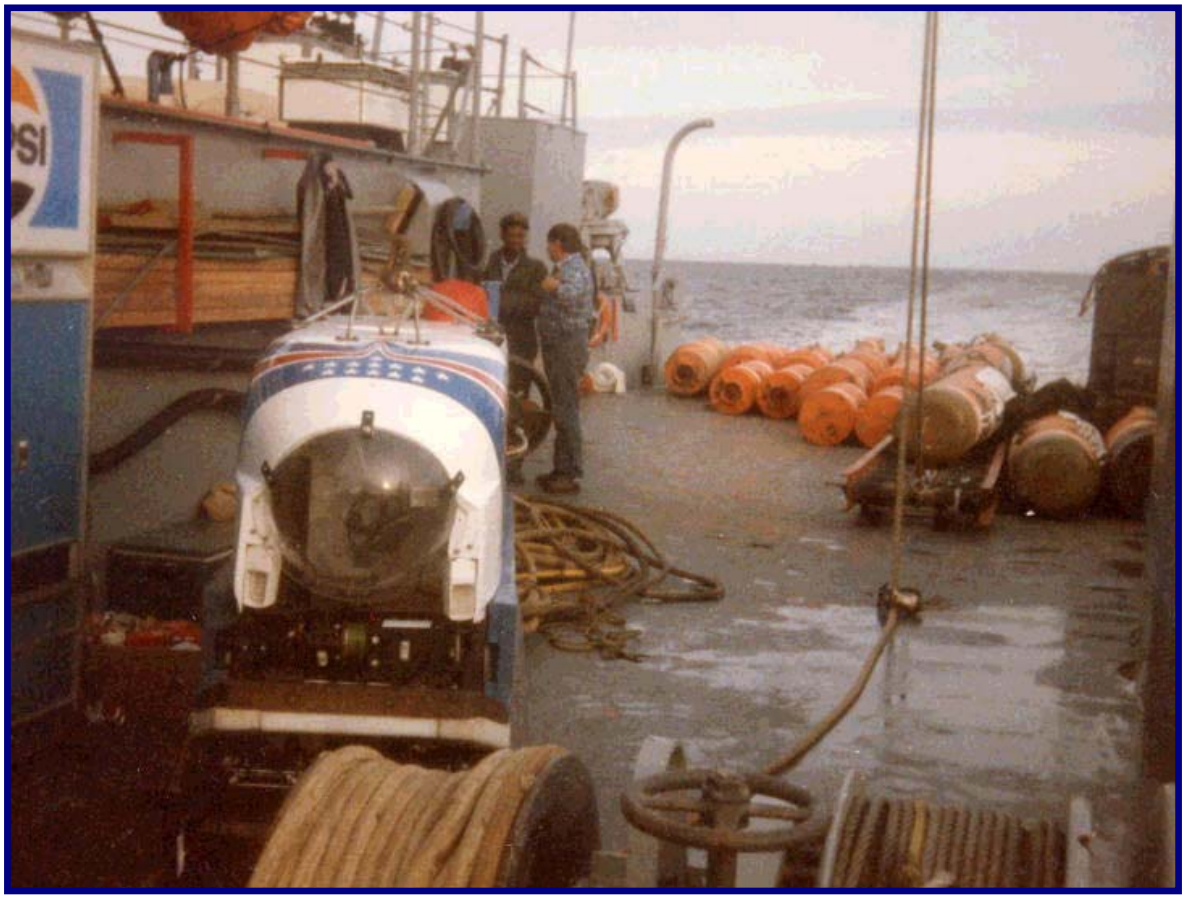
This operation was classified.

DOCKSIDE FROM THE N.Oc ALMIRANTE CAMERA

Prior to going to sea, the system was demonstrated to senior naval officials.

The next demonstration was for Weapons Quality Evaluation Centre. This invitation was extended because of the recovery experience in Charleston, SC. The system was operated from the Range Survey Boat 1 and took place in the Gulf stream off Fort Lauderdale, Florida.

TRAIL BLAZER recovered 16 instrumented moored mines. The water depth was from 125 to 450 feet. The mines were moored about 75 feet from the surface. This operation was completed in four days.



MINE RECOVERY OPERATION

TRAIL BLAZER recovered two mines that did not deploy properly. These mines were still attached to their anchors and lying on the ocean floor. During this operation, a number of para packs and shrouds were also recovered.

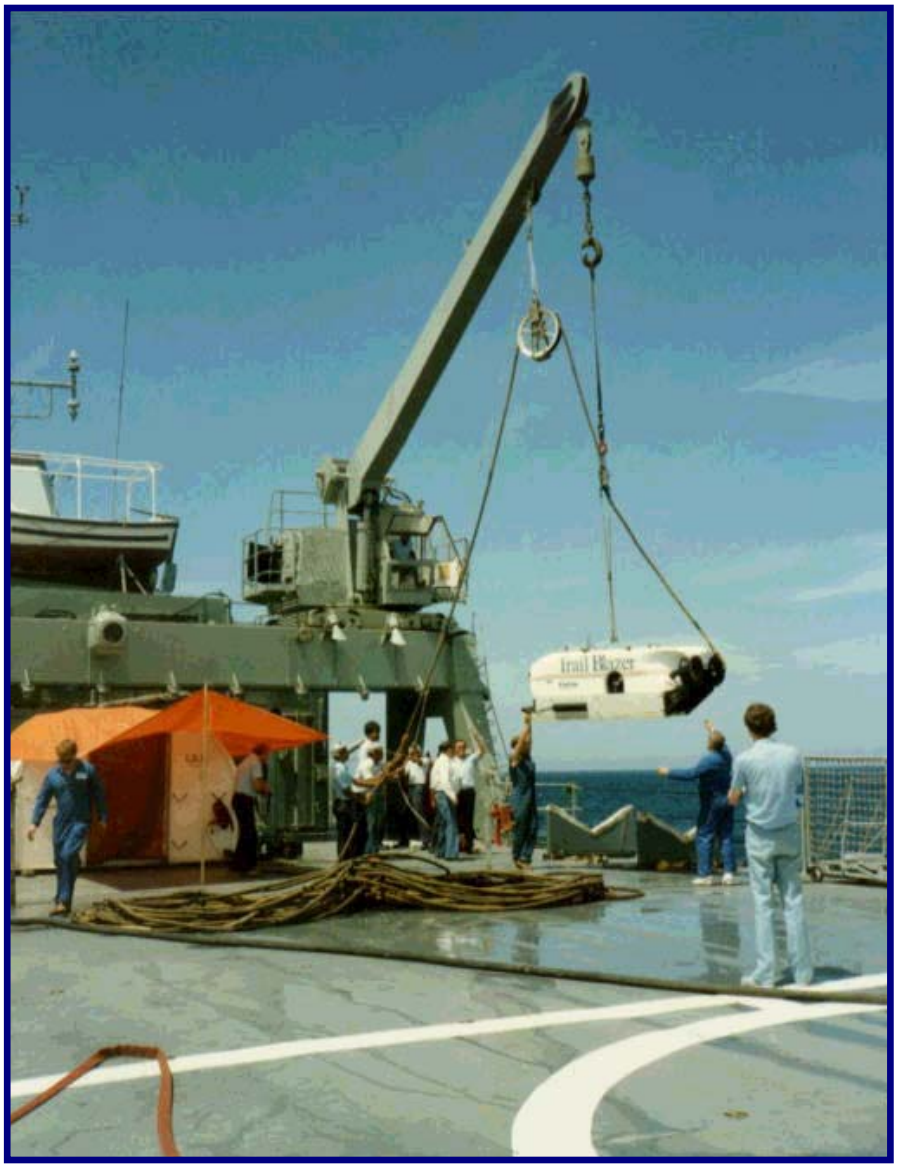
The system went back to England to be demonstrated at Stoney Cove. This demo was for the press and various trade magazines. Included were;

Jane's Defense Weekly	Flight International
The Times	The Engineer
Underwater Systems Design	BBC Tomorrow's World
International Defense Weekly	I.T.N. Film Crew
Guardian	Central TV
Financial Times	Members of Parliament

TRAIL BLAZER AND CREW

During this operation, TRAIL BLAZER was operated from a torpedo recovery boat.

The next demonstration took place in Muscat, Oman at the request of the Oman Navy. TRAIL BLAZER located and inspected mine-like objects. It was complicated due the littler of metal fish traps on the sea floor. Both the floating and bottom mine-like objects were located and inspected in one afternoon.



LAUNCH FROM THE "AL MUNASSIR"

TRAIL BLAZER was operated from the helicopter flight deck of the "Al Munassir". This ship can carry 8 tanks or 550 tons of equipment.

Please note the wide range of ships the TRAIL BLAZER has operated from. The system can be used from a vessel of opportunity.

TRAIL BLAZER was sent to Perth, Australia where it was demonstrated against mine-like objects. This was done for the Australian Minister of Defence and senior naval officers.

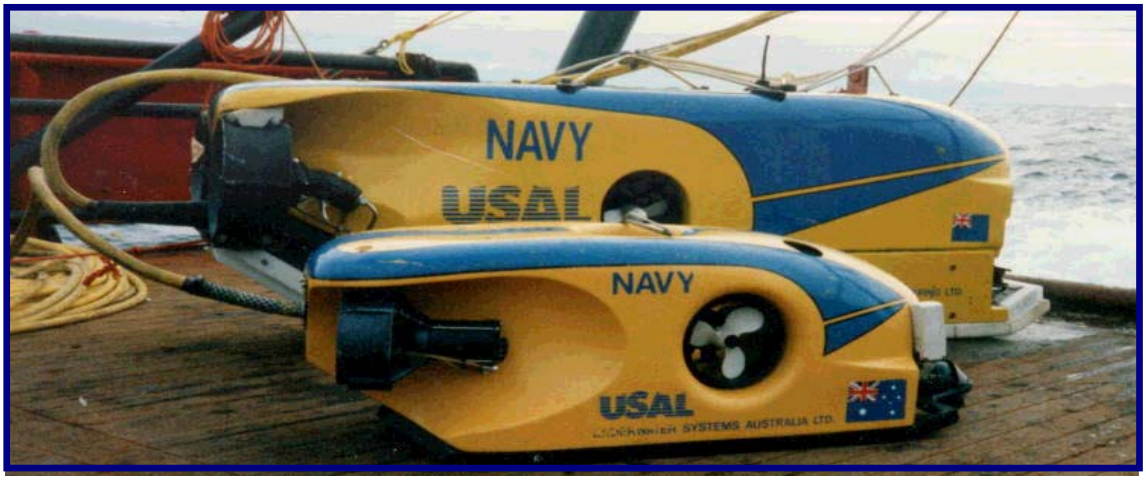
TRAIL BLAZER AT THE LAND MAGNETIC RANGE

TRAIL BLAZER was also tested at the Land Magnetic Range in Kingswood, New South Wales.

The system went back to England where once again it was tested at the Land Magnetic Range.

Underwater Systems Australia Ltd. (USAL) requested TRAIL BLAZER for testing and evaluation. From September 1986 through February 1987, USAL and ISE conducted demonstrations for various navies. The MINI-TRAIL BLAZER was also introduced.

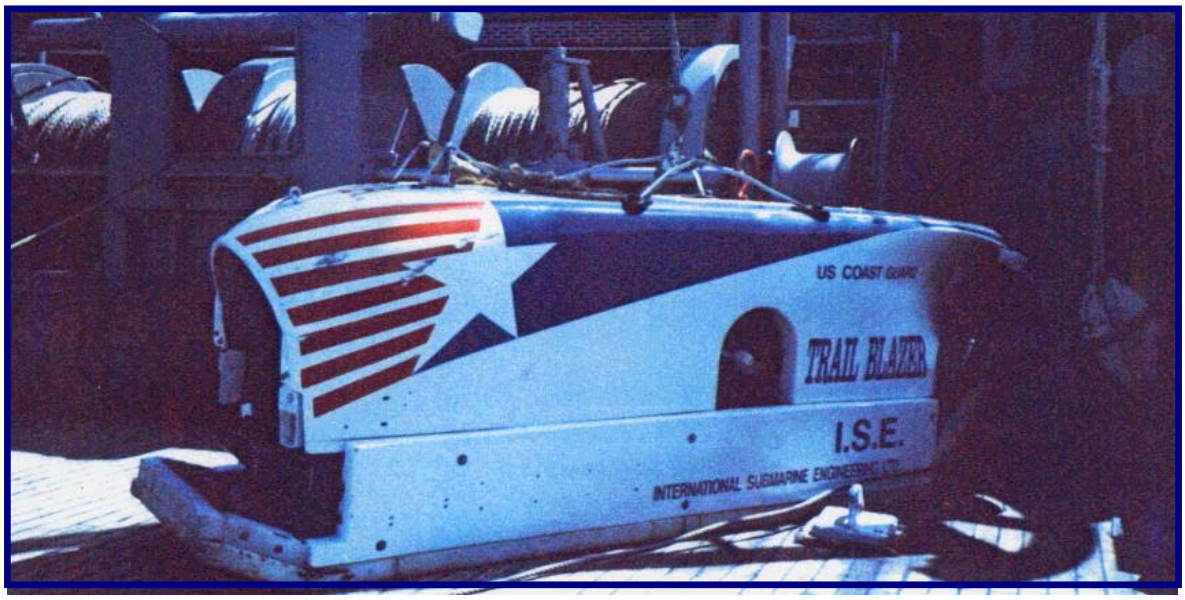
TRAIL BLAZER & MINI-TRAIL BLAZER MILITARY ATTACHES



One TRAIL BLAZER demonstration in Perth consisted of Military attaches form the following countries:

USA	UK	Indonesia	France	Thailand
India	Japan	Canada	Holland	S. Korea
RRC China	Malaysia	Israel	Germany	New Zealand

In April 1987, ISE received its first contract from US Navy Mine Squadron Two. This contract, which included one week ROV training, leased the TRAIL BLAZER system and a TYPE 10 HYSUB for use during operation “Solid Shield”.



TRAIL BLAZER ON THE MSO INFLICT

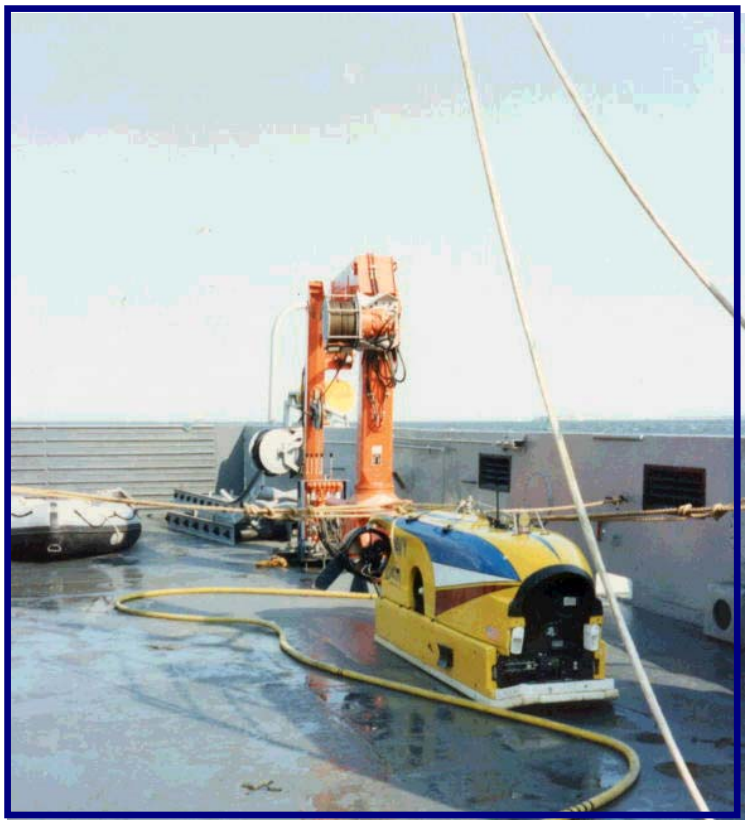
ROVS COMBAT INFORMATION CENTRE

The US Navy personnel were trained in launch and recovery, console and belly pack operations, sonar operation, night operation and maintenance.

Mine Squadron Two leased TRAIL BLAZER to work as a recovery vehicle during a “Junk Exercise”. Using the vehicles sonar while conducting bottom searches aided in clearing a practice mine field.

Mine sweeping boats were also used during this exercise. They would locate a target with their sonar, then by radio “talk” the TRAIL BLAZER pilot into position.

When visual I.D. was made, EOD personnel would dive to the contact and secure it with a line. The line would then be passed to the ships crew for recovery.



RECOVERED WITH MANIPULATOR

LCU – 125 Papa Duck

The vehicle’s sonar located objects that were buried under the sand. It located a buried turtle at 45 metres and a helmet shell at 50 metres. The TRAIL BLAZER recovered the “snake eye fins” with its manipulator. The vehicle worked and recovered objects when it was too rough for the divers to safely enter the water. The divers were not in ant danger while working near the vehicle.

JULY 1987

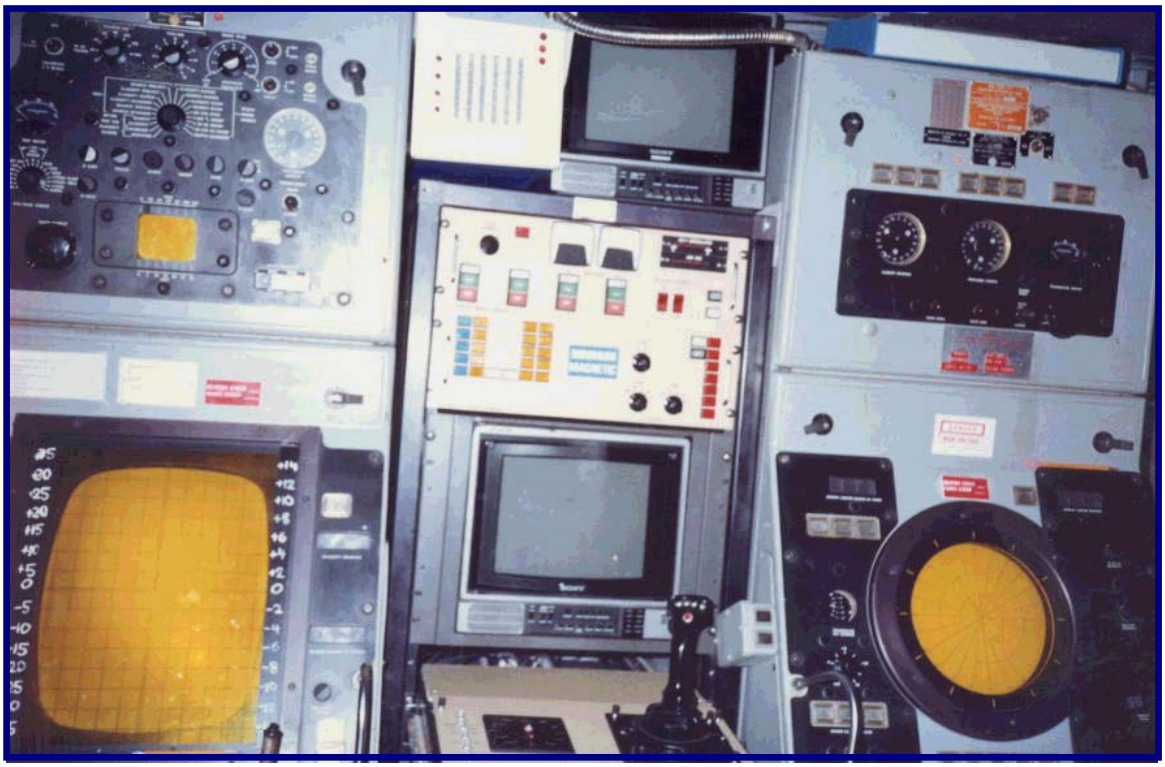
LAUNCH WITH THE STARBOARD QUARTER CRANE

The next operation was aboard the MSO Illusive. Operation “Deep Sweep” was to search for bottom contacts in 800 feet of water.

TRAIL BLAZER ON THE SURFACE

"Ocean Safari" was conducted from Mayport, Florida. The ROV console and power distribution unit were removed from the shipping container and installed in the ship's combat information centre or CIC. The console was mounted between the search and classified sonar's.

The umbilical was run through the bullnose of the ship and tended from the focsle. The "belly pack" was operated from the bridge. This allowed the ROV operator to keep in contact with the officer of the deck.



TRAIL BLAZER CONSOLE IN THE CIC OF THE USS ADROIT

The vehicle was launched from the fan-tail and flown with the "belly pack" to a position 150 feet ahead of the ship. At this station, the vehicle was flown on the surface while the ship mine-hunted. When a target was located with the ship's sonar, the "bellypack" operator would position the TRAIL BLAZER between the ship and the contact. The ROV pilot, located in CIC, would take control of the vehicle and dive. The sonarman would search the area and locate the diving vehicle. The ROV pilot would see both the vehicle and target on the ship's sonar. By watching the ship's sonar, he would fly the vehicle to the contact.

The average time to accomplish this was 2 / 12 minutes; nine out of nine mines were located in the first 30 hours of a two week operation.

TRAIL BLAZER took part in “Ocean Venture – 88” in Key West, Florida.

Once again, the US Coast Guard offered the challenge of operating from a craft of opportunity. TRAIL BLAZER operated from the USCGC SHEAR WATER (WSES 3).

“OCEAN VENTURE – 88”

KEY WEST, FLORIDA USCGC SHEARWATER (WSES 3)

The following statistics were accumulated during the “Ocean Safari” exercise by LTJG Josh Gray, Special Evolution’s OOD.

Speeds attained by the TRAIL BLAZER and the MSO in the “Q” Route” while mine-hunting averaged 3.25 kts. This speed was average over 5 days in various currents and sea states. Allowing TRAIL BLAZER to remain in the water during mine-hunting eliminates the need to launch and recover after each target is prosecuted. In August, TRAIL BLAZER remained in the water for the entire 9 miles of the “Q” Route.

A VIEW OF TRAIL BLAZER FROM THE BRIDGE OR “BELLY PACK” LOCATION

The average time to visually confirm a mine after diving was 2 minutes and 45 seconds. The fastest was 45 seconds. This was average over 9 mines.

The US Navy has determined, that TRAIL BLAZER is the only remotely operated vehicle capable of carrying a MK. 57, mod. 0 mine neutralization charge. This charge has been approved by the US Navy.

The family of mine countermeasure vehicles include;

TRAIL BLAZER

Length 262 cm
Width 56 cm
Height 85 cm

Weight 775 kg including 100 kg lead ballast
Power 30 HP electric motor

CYCLOPS

Length 215 cm
Width 56 cm
Height 85 cm

Weight 535 kg including 65kg lead ballast
Power 20HP electric motor

ORION

Length 193 cm
Width 56 cm
Height 85 cm

Weight 340 kg including 45kg lead ballast
Power 10HP electric motor

MINI TRAIL BLAZER

Length 152 cm
Width 50 cm
Height 50 cm

Weight 340 kg including 45kg lead ballast
Power 4, 5/8HP thrusters

TYPICAL TRAILBLAZER OPERATIONS

a) Trailblazer 30 conducted dockside demonstrations during the “Oceans 88” convention.
b) Trailblazer operated for the US Coast Guard Surface Effect ship SHEARWATER (WSES 3). First sidescan sonar was towed from the platform. Trailblazer then identified all mine-like objects.
c) Trailblazer 30 conducted mine countermeasures from the MSO Affray. During this exercise, the vehicle, along with the ship’s sonar, identified 8 out of the 10 mines located in the Q route.
d) Exercise “Agile Knight”. Operated from US Coast Guard Buoy Tender Sorrel. The Sorrel did not have a sonar system, however, the Trailblazer was used to clear the Groton inner harbour during the exercise. The ROV was then transferred to the MSO Affray to do harbour breakout to conclude the exercise.
e) Trailblazer participated in the Ocean Safari exercise. The Trailblazer was operated from the MSO USS ADROIT.
f) Trailblazer 30 was used during Deep Sweep operations. Conducted a search of an area for deep mines placed by a submarine during a MRCI certification. During this operation, Trailblazer was “live-boated” from the USS Illusive and operated to depths of 900 feet.
g) Trailblazer used by the USN by COMINERON TWO to assist in identification and recovery of all “mine-like” contact in the exercise mine fields at Charleston. During this operation, Trailblazer 30 was operated from the LCU 125 used for mine recover by COMINEDIV 125.
h) Participated in SOLID SHIELD – 87 and operated from the MSO USS Inflict. Conducted Q-route surveys, mine hunting for breakout operations, and sonar contact verification. During this operation, Trailblazer was live-boated from the MSO USS Adriot and the TYPE 10 from the MSO USS INFLICT.
The Trailblazer 30 was handled in the following fashion;
   - The operations console was housed in a standard shipping container on the fan-tail.
   - The ROV was launched from the port quarter using the ships quarter crane.
   - The ROV tether was lead through the ship’s bullnose.
   - The ROV steamed in formation ahead of the MSO at speeds up to 5 ½ knots.

   When the ship gained sonar contact on a mine-like object, the ROV was positioned the contacts relative bearing and dived to gain contact. The ships AN/SQQ-14 sonar was able to gain contact on the ROV and the ROV was steered in a beam-rider fashion until the ROV operator gained sonar contact. The ROV was then steered to the contact using its own sonar until visual contact was gained on the ROV TV. After each contact was identified, the ROV was surfaced and continued to steam in formation with the MSO during Minehunting mines.

   The Trailblazer 10 was handled in a similar fashion except the ROV console was located in the CIC rather than a module. The TYPE 10 was able to classify all targets assigned. At the “wash up” it was concluded that the larger ROV,

Trailblazer 30 was the preferred approach because of faster classification and the ability to carry large or multiple charges.

i) Trailblazer 30 conducted minehunting operations in Perth, Australia against both moored and bottom mines.
j) Trailblazer 30 conducted minehunting operations for both the OMAN Navy in Muscat, Oman. Conducted operations against both moored and bottom mines. These operations were in an area of heavy concentration of metal fish traps. However, the MESOTECH 971 sonar was capable of distinguishing between the fish traps and the mines.
k) Conducted mine countermeasures operations for the Norwegian Navy. During the operation Trailblazer, without outside assistance, located a mine that the Norwegian Navy had lost and had been searching for over the past six months.
l) Conducted MCM operations for the Royal Navy in the UK in conjunction with Fairey Hydraulics.
m) Searched for a lost torpedo for the Brazilian Navy off the coast of Brazil using an oceanographic vessel as the mothership. Results were classified.
n) Weymouth, England. Conducted Magnetic Ranging of the Trailblazer in the presence of personnel from the Admiralty Research Establishment.
o) Trailblazer MCM operations for the Australian Minister of Defence and Senior Naval Officers. Located and identified mine-like objects and demonstrated inspection and recovery capabilities.
p) Conducted mine inspection and recovery operations for the US Navy Weapons Quality Assurance Engineering Center, Yorktown, Virginia at the Navy's range at Port Everglades. Recovered the 16 of 20 moored mines that did deploy, and video tapes two mines which broke up on impact after launch from an A-6. In addition, recovered several parachute packs and shrouds thereby permitting WQAEWC to determine that the parachute release mechanisms had been malfunctioning. These mines were instrumented and results showed Trailblazer would not have detonated mines.
q) Conducted MCM operations from LCU in Charleston for COMINEWARCOM, COMINERON TWO, and EOD personnel. Located and identified several bottom mines. These operations were extended at the request of WQAEC to recover two evaluation mines that the EOD divers had not been able to recover two evaluation mines that the EOD divers had not been able to recover because of depth and excess current.
r) Conducted MCM operations for the Danish Navy. Located and inspected a mine that had been dropped by a mine layer.
s) Weymouth, England. Located and identified a mine and a bomb for Admiralty Research Establishment. Also ranged the Trailblazer, and it met NATO standards for operations aboard the HUNT class minesweeper.

MISSION

On June 4, 1985, at the Naval Surface Weapons Command, Ft. Lauderdale, Florida (305) 764-6289, Bill Herman and Doug Hernandez met with Mr. Ron Duke, Weapons Quality Engineering Center, Naval Weapons Station Yorktown, and other personnel (list enclosed) involved with the test that is to be conducted. ISE will demonstrate its capabilities to recover the mines dropped in this exercise. The mines will have real arming mechanisms, but no explosive. The mines are moored type similar to the ones recovered by ISE in Charleston S.C. There will be a Dukane pinger on the anchor and on the mine itself. These pingers will operate at 43 K.H. and 37 K.H. ISE will use a Honeywell Hydro Star tracking system along with the Mesotech Color sonar to find the mine itself. Prior to ISE's recovery the exact location of each mine will have been plotted by side scan sonar. The water depth will range from 150° to 485° and the mines will be moored approximately 75' from the surface. The Trailblazer will need to find the mines and attach a ¼" dia. steel braded cable to it for recovery. The steel cable weighs approximately 2oz per ft. and is quite flexible. This cable could be hand tended from the surface or be on a spool attached to the vehicle. It is expected that ISE recover 8 mine per day more if possible, workday 10-12 hours.
On some mine, they would like to find the distance from the ship to mine and ship to anchor.
The mine should be dropped it a square guide 4 mine per line and 5 line. The distance between mine and 500 yard, distance between lines is 1000 yards.
The ship will operate from the R.S.B.-1 (Range Survey Boat 1). It will have ample deck space for our containers and umbilical. The shop will provide 70 K.V.A. at 400 3-phase poser in Delta Connection. There is a crane on board. The mine is neutral in water an 2,300 lbs. In air, the anchor weighs 800 lbs. The drop will be made approximately 3 miles off Ft. Lauderdale, FL the bottom is sandy with a 3° slope some coral heads may be in the area. Water temperature is expected to be between 80°-88° F. Expected current is from .8 knots to 2 knots. If a mine does not deploy properly, it is very important to recover the mine, anchor, para-pack, and any other item to determine why the mine did not function. I will provide sketches or pictures of attaching points for the mine anchor. At this time it is not known if Canadian citizens will be allowed on this demo

RECOVERY

The recovery was conducted for the weapons Quality Engineering center, Naval Weapons Station, Yorktown, Virginia. ISE's vehicle Trailblazer was used in this demonstration.
The procedure was to attach a steel wire line to the object of recovery. We used a snap hook welded on to a "T" handle that fit into the manipulator jaw.
The Mesotech 971-color sonar was used to find anchors of the mines. Once the anchors were located the vehicle was flown up in the mooring line to the mine. We attached the recovery line to the mooring line just below the mine. Once this was accomplished the vehicle was secured and the mine recovered.
The shortest time it took to locate a mine and attach a line to it, was 11 minutes, this was accomplished twice.

RECOVERY TIME TABLE

Recovery time	Number of Mines
Less than 20 min	4
Less than 1 hour	4
Less than 1 ½ hour	5
Longest 3 hr and 27 min	1

Trailblazer recovered 14 mines in a four-day period and operated with minimal down time. The total time in the water was 25 hours and 22 minutes.

DIVE LOG

July 2, 1985

Pre-Operation Dock Side Testing.

11:35 Hrs	Vehicle in water operating by belly pack and console.
12:48 Hrs	Vehicle on deck
	Post dive checks complete

July 3, 1985

Depart N.W.S.C. @ 0700 Hrs.

Dive #1

09:55 Hrs	Vehicle in water, conducting search
10:44 Hrs	Locate mine and inspect, attach line for mine recovery
	Dive to bottom to inspect mine.
11:01 Hrs	Locate para pack, grab with manipulator and start recovery
11:13 Hrs	Vehicle on deck

Dive #2

12:15 Hrs	Prepare to launch
12:20 Hrs	Vehicle in water
12:36 Hrs	Locate mine, inspect
12:44 Hrs	Vehicle on to secure
12:46 Hrs	Dive vehicle to bottom to inspect anchor
12:57 Hrs	On bottom
13:06 Hrs	On surface
13:08 Hrs	On deck

Dive #3

13:59 Hrs	Vehicle in water
14:04 Hrs	Located mine and attached recovery line
14:07 Hrs	Vehicle on bottom
14:16 Hrs	Locate para pack and recover
14:20 Hrs	Vehicle on deck

Dive #4

15:05 Hrs	Vehicle in water, conducting search
16:29 Hrs	Located shroud, but unable to locate mine
16:35 Hrs	Start recovery
16:38 Hrs	Vehicle on deck
17:00 Hrs	Secure operations for the day, E.T.S.
	Dockside in 18:00 Hrs

July 4, 1985

07:00 Hrs	Depart. N.W.S.C., conduct pre-dive checks, install Honeywell beacon, and Dukane Hydrophone
08:30 Hrs	Lower Hydrophone pole and secure

Dive #5

08:42 Hrs	Vehicle in water
08:53 Hrs	Lost ships power restart system and continue
09:07 Hrs	Locate anchor
09:14 Hrs	Locate mine, and inspect
09:18 Hrs	Attach recovery line and release cable
09:20 Hrs	Locate parapack, conduct area search
09:49 Hrs	Recover chute, start vehicle recovery
09:53 Hrs	Vehicle on deck

Dive #6

10:26 Hrs	Vehicle in water
10:29 Hrs	On bottom conducting search for mine not located with side scan sonar
10:50 Hrs	End of search, start recovery
10:51 Hrs	Umbilical tangled on sonar dome of ship
11:10 Hrs	Umbilical free
11:13 Hrs	Vehicle on deck

Dive #7

12:17 Hrs	Vehicle in water
12:32 Hrs	Lost main power. Recover vehicle
12:46 Hrs	Vehicle on deck

Dive #8

12:59 Hrs	Vehicle in water
13:18 Hrs	Lost power. Recover vehicle
13:27 Hrs	Vehicle on deck having electrician change ships 60 AMP breaker to 100 AMP

Dive #9

17:23 Hrs	Vehicle in water, have 300' of ¼ "SS cable floated by 36" floats. Cannot dive vehicle because of floats. Recover to remove floats.
18:07 Hrs.	On deck re-install Dukane and remove floats

Dive #10

18:23 Hrs	Vehicle in water, start search locate target, but it is out of range of ROV surface to move ship
19:19 Hrs	Recover vehicle, on deck

Dive #11

19:46 Hrs	Vehicle in water diving
19:58 Hrs	Vehicle depth *93.6 ft; water depth 160
20:02 Hrs	Vehicle at anchor
20:04 Hrs	Pick up sonar target. 41:5 ft. lost target, back on bottom to start up mine anchor
20:13 Hrs	Flying up cable
20:17 Hrs	Hook line on cable. Recover vehicle.
20:25 Hrs	Vehicle on deck to recover mine. During recovery of the mine, the snap hook came off the mooring cable.

Dive #12

20:50 Hrs	Vehicle in water to recover last mine
20:53 Hrs	Vehicle on bottom
20:56 Hrs	Located anchor
21:10 Hrs	Hooking on target
21:11 Hrs	Hooked wire rope on cable coming to surface
21:20 Hrs	Vehicle on deck. During recovery, the snap hook came off of the mooring line again. This is the second time.

Dive #13

21:50 Hrs	Vehicle back in water again to recover mine
21:56 Hrs	Vehicle on bottom
22:03 Hrs	At mine again, hooking up cable
23:06 Hrs	Release cable after
23:13 Hrs	Vehicle on deck. Secure operations. Depart location at dock side approximately 25:15 hrs

July 5, 1985

04:00 Hrs	Depart N.W.S.C. arrive location, complete pre-dive

Dive #14 (Target #12)

06:45 Hrs	Vehicle in water
06:48 Hrs	Vehicle on bottom
07:02 Hrs	Off bottom buoy line fowled
07:13 Hrs	Search for target at moored depth
07:19 Hrs	Locate cable and mine
07:24 Hrs	Attach cable and release hook

07:32 Hrs Vehicle on surface to recover

Dive #15 (Target #11)
08:37 Hrs Vehicle in water
09:05 Hrs On cable
09:09 Hrs On anchor
09:14 Hrs Off bottom
09:17 Hrs On surface to recover.

Dive #16
11:50 Hrs Vehicle in water
14:27 Hrs Located target on bottom
14:56 Hrs Extended buoy line for bottom recovery
15:13 Hrs Connected recovery line
15:14 Hrs Left bottom
15:17 Hrs Vehicle on surface to recover

Dive #17 (Target #15)
20:25 Hrs Vehicle in water
20:33 Hrs Locate mine and attach line
20:39 Hrs On surface.

Dive #18 (Target #14)
21:20 Hrs Vehicle in water
21:28 Hrs Locate mine and attach line
21:30 Hrs Off mine and surface
21:33 Hrs Vehicle on deck.

Dive #19 (Target #13)
22:24 Hrs Vehicle in water
22:27 Hrs Mine contact
22:33 Hrs Attach line and surface
22:36 Hrs Vehicle on deck.

Dive #20 (Target #19)
23:44 Hrs Vehicle in water
23:47 Hrs Locate mine
23:50 Hrs Attached line and surface
23:58 Hrs Surface to clear buoy
00:35 Hrs Buoy cleared dive
00:44 Hrs Vehicle located mine
00:48 Hrs Attached line to mine
00:50 Hrs Surface to recover vehicle.

Dive #21 (Target #20)

01:51 Hrs	Vehicle in water
01:56 Hrs	Locate mine
01:59 Hrs	Attached line and surface
02:03 Hrs	Vehicle on deck.

Dive #22

04:29 Hrs	Vehicle in water
04:30 Hrs	Found nose faring
04:45 Hrs	Pulled off bottom
04:48 Hrs	Back off bottom
05:10 Hrs	Pulled off bottom
05:12 Hrs	Back on bottom
05:30 Hrs	Locate para pack
05:45 Hrs	Buoy on bottom, surface to put 2 buoys on.
06:10 Hrs	Move ship to west and continued search
07:05 Hrs	Move ship to west and continued search
07:20 Hrs	Continued searching
07:45 Hrs	Continued searching
08:00 Hrs	Abort search The area above was searched in an X and Y direction. It is concluded that the pinger has fallen off the mine upon impact.

Dive #23 (at this point all floating mines have been recovered)

10:15 Hrs	Vehicle in water
10:20 Hrs	Pick up strong target
10:25 Hrs	Located mine. The mine is still attached to the anchor and is standing vertical. Inspect mine from all angles. Attempt to hook into bomb lug but can not put snap hook onto it.
11:13 Hrs	Wrap the cable around the mine twice and attach snap hook to its own cable.
11:20 Hrs	Recover vehicle and mine

Dive #24

13:05 Hrs	Vehicle in water
13:20 Hrs	Cannot go to bottom
13:20 Hrs	Surface and try again
13:30 Hrs	Abort and surface

Dive #25

16:16 Hrs	Vehicle in water
16:22 Hrs	Dive full thrust to bottom. Cannot reach bottom, because of short tether and strong current.
16:38 Hrs	Surface
16:41 Hrs	Recover and secure
16:50 Hrs	Secure vehicle. Depart location for N.W.S.C.

All correspondence should be addressed to:
THE SECRETARY OF DEFENCE,
PRIVATE BAG, WELLINGTON, N.Z.

Telephone 726 499

Telex: NZ 3513

In reply please quote:

DEFENCE HEADQUARTERS
WELLINGTON, N.Z.

25 July 1986

Mr J.R. McFarlane
International Submarine Engineering Ltd
2601 Murray Street
Port Moody
British Columbia V3H 1X1
CANADA

Dear Mr McFarlane,

A belated note of thanks for the time you took from your busy schedule to brief and talk to us during our visit to Port Moody.

We were most impressed at what we saw at ISE, particularly the motivation and the clear philosophy of "we can do it". From our point of view the whole visit to Canada was a success. The itinerary was a demanding one, but made totally worthwhile by the wealth of information we received, face to face contact and, of course, the opportunity to see some of your beautiful country.

Once again thank you - it was a pleasure meeting you.

Kind regards

Kit Davis.

DEPARTMENT OF THE NAVY
NAVAL WEAPONS STATION
YORKTOWN, VIRGINIA 23691

8550/2
3031
August 8, 1985

International Submarine Engineering LTD.
2601 Murray Street
Port Moody, B.C. Canada V3H 1X1

Gentlemen:

The Weapons Quality Engineering Center, Naval Weapons Station, Yorktown, Virginia, acknowledges your participation in our In-water Reliability Evaluation during the period of July 1-6, 1985.

The Remotely Operated Vehicle (ROV) demonstration was not only informative but also very helpful in assisting us to complete the evaluation in a reasonable time frame.

J. P. LAMB
Director
Acting
Weapons Quality Engineering Center
By direction of
the Commanding Officer

MACDONALD DETTWILER

SPACE AND DEFENCE

MACDONALD DETTWILER
13800 COMMERCE PARKWAY
RICHMOND, BRITISH COLUMBIA
CANADA V6V 2J3

TELEFAX NO: (604) 278-4716
TELEX: 04-355599
TELEPHONE: (604) 278-3411

FACSIMILE COVER SHEET

DATE: April 19, 1996 TOTAL NUMBER OF PAGES: 1

TO: INTERNATIONAL SUBMARINE ENGINEERING FAX NO.: 942-7577

ATTN: Mr. Mike Macdonald cc: Dr. John MacDonald (MDA)
Jim McFarlane (ISE)

MDA REF: F6-BTCAISE-05456

FROM: Byron Sheppard

SUBJECT: MIN Payload Subcontract

Dear Mike,

This is to formally thank you and everyone on your team for the excellent work performed by ISE on the MCDV program. The MTE Payload has met all its requirements with flying colors including finishing ahead of schedule!

Considering the differing products and cultures between MDA and ISE, I think we can be very proud of the excellent working relationship established on this program. I am especially pleased with the integrity, professionalism and commitment to the customer shown by ISE throughout the contract.

I believe your personal leadership had a large part in this. While I know you will be the last to take the credit for this, I think credit should be given where credit is due.

I would also like to thank ISE for the cooperation and assistance being given to us from a marketing perspective in the USA. This is a further example of the cooperation between our two companies and I look forward to doing more business with you in the future.

Sincerely,

MACDONALD, DETTWILER AND ASSOCIATES LTD.

B Sheppard

Byron Sheppard
MCDV Project Manager

BJS:lpr

Awa Bahry H. M. BALFOUR LVO
Commander
Sultan of Oman's Navy
P. O. Box 1723
CPO Seeb

Tel: 615000

نواء بحري/ه . م . بلفور و سام الفيلق الفيكتوري
قائد
بحرية سلطان عمان
ص.ب ١٧٢٣
مكتب البريد المركزي السيب

OS.353/1

Mr P Methold Esq
Regional Manager
Fairey Marine Ltd

23 April 1986

Dear Patrick,

Many thanks for a very useful demonstration of the Trail Blazer equipment. Although you had difficulties with awkward targets I thought it went off very well and gave us an excellent feel for the ROV's capabilities and potential. To be your journey was very well worthwhile and I am most grateful for all the effort and time that was spent setting it up.

Being wise after the event, I would suggest that a demonstration of the tactical use of the equipment would help get across how the ROV might be employed.

To see is to believe and I feel we have a much better understanding of the value of such a ROV and how we might be able to put it to good use in the Sultanate.

Again please thank the others in the team, particularly the two Jims for taking so much trouble to answer all our questions.

Yours sincerely,

Translation of letter CA-F-01-007 from DACM

Director - President of ISE

Dear Sir, RJ, december, 11th, 1985

The Navy Directory for Weapons and Communications (Diretoria de Armamento e Comunicações da Marinha) thanks you for ISE precious cooperation, regarding the participation of the submarine vehicle "Trail Blazer", during operation carried out by the Brazilian Navy last October.

I emphasize the efficient performance of the vehicle, that has become possible the execution during 10 days, of a detailed bottom search within a 4x4 nautical miles area.

Sincerely

V.A.B.M

VICE-ADMIRAL - DIRECTOR

MINISTÉRIO DA MARINHA

IG/23 DIRETORIA DE ARMAMENTO E COMUNICAÇÕES DA MARINHA
CA-F-01-007

RIO DE JANEIRO, RJ.
Em 11 de dezembro de 1985.

Diretor Presidente da I.S.E. - INTERNATIONAL SUBMA—
RINE ENGINEERING LTD
2601 Murray Street
Port Moody, B.C. - V3H 1X1 Canada

Prezado Senhor,

A Diretoria de Armamento e Comunicações da Marinha a-
gradece a valiosa cooperação prestada pela I.S.E., através da partici
pação do veículo móvel submarino "TRAIL BLAZER", em operação realiza-
da pela Marinha do Brasil no mês de outubro próximo passado.

Ressalto o desempenho eficiente do referido veículo ,
fato que possibilitou a execução, durante 10 dias, de uma busca deta-
lhada no fundo do mar, em área com as dimensões de 4 x 5 milhas.

Atenciosamente,

VICTOR ALBERICO BOISSON MORAES
Vice-Almirante
Diretor

DIRETORIA DE ARMAMENTO E COMUNICAÇÕES DA MARINHA
Rua 1º de março nº 118 - 19º andar
CEP 20.010
Rio de Janeiro - RJ

United States Coast Guard

5000
June 13, 1988

I.S.E. Gulf Incorporated
5635 Northwest Central Drive, Suite 123
Houston, TX 77092
Attn: Mr. Douglas A. Hernandez

Dear Mr. Hernandez:

I would like to take this opportunity to thank you for sending copies of the videotape taken aboard SHEARWATER during "Ocean Venture - 88." The footage has already proven to be an effective way to demonstrate the capabilities of Surface Effect Ships for Mine Countermeasures when outfitted with a system such as the TRAILBLAZER.

Your complementary remarks concerning the crew are sincerely apreciated and have been passed along to everyone onboard. We thoroughly enjoyed the opportunity to work with you and your system, and would welcome you back at any time.

Please feel free to contact me at any time if I can be of any assistance.

Sincerely,

G. A. RUSSELL JR.

25 Aug 87

MEMORANDUM

From: LTJG Gray, Special Evolutions OOD
To: Commanding Officer
Via: Executive Officer

Subj: ROV OBSERVATIONS

1. The following statistics are based on raw data accumulated from 20 Aug-25 Aug 1987.

Transit Speed	Comment
a) 600 yds or less - 1.65 kts	valid, operated in various currents and sea states
b) 600 yds or more - 3.23 kts	
Average time to visual confirm after dive:	
a) Mine - 2 min 45 sec	
b) Other - 7 min.	
Average launch time: 2.2 min	After shaft has stopped
Average recovery time: 3.9 min	
Average # of dives/hr = 2.12	In mine environment.
Average # of mines/hr = .607	Does not take into account that mines were previously prosecuted at condition IIM

Very Respectfully,

John G. Gray
LTJG, USNR

Copy to:
All Officers