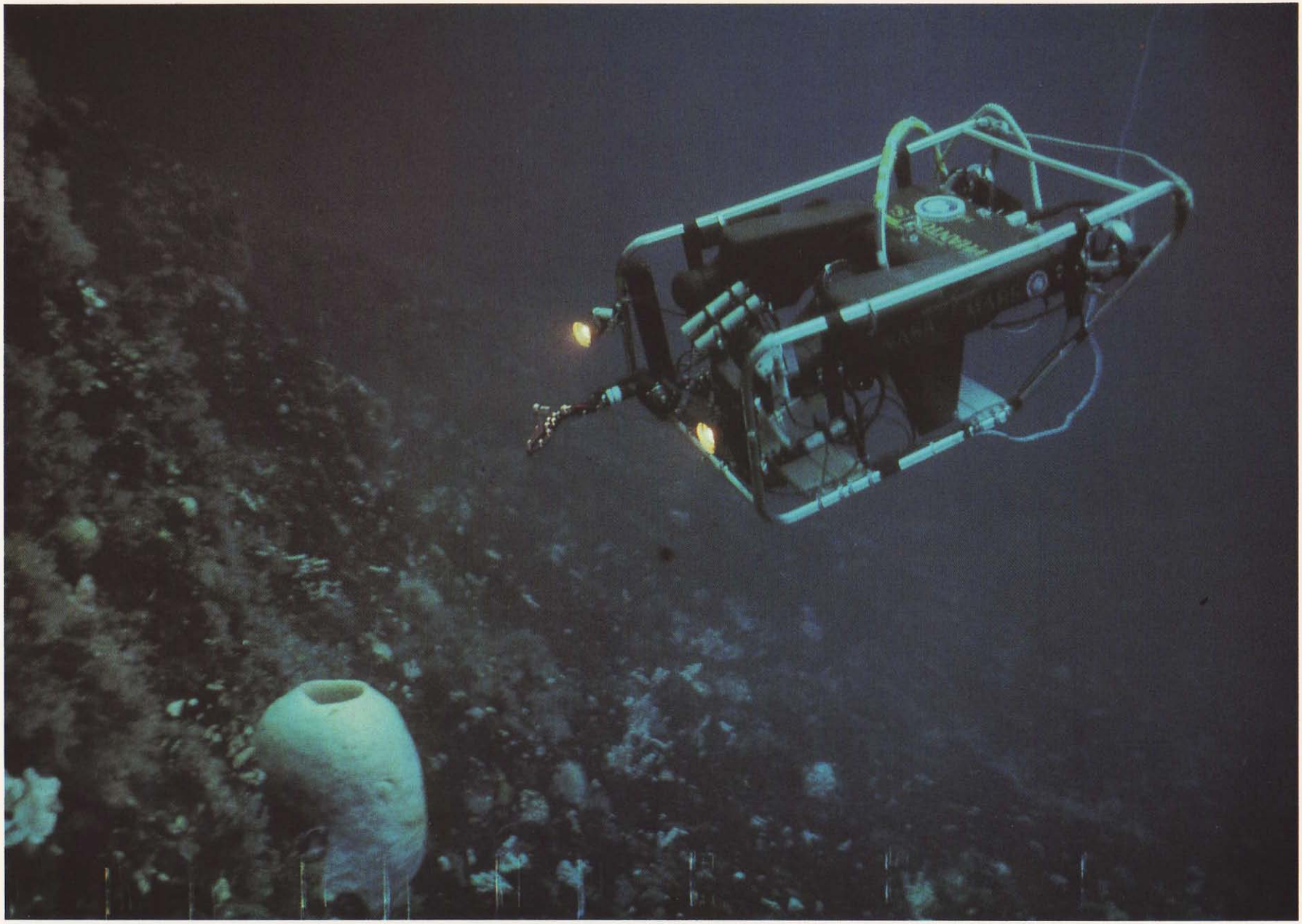
To Mars via Antarctica



National Aeronautics and Space Administration

To Mars via Antarctica

Antarctica, like Mars, has remote and hostile locations that are difficult for humans to explore but can be reached by sophisticated robots. One NASA activity now underway, the Antarctic Space Analog Program (ASAP), is using Antarctica as a test bed for space technologies, equipment and procedures that may be used to explore the Moon and Mars.

Jointly sponsored by NASA and the National Science Foundation (NSF), the ASAP is an ongoing program that uses Antarctica ("the last place on Earth") to take some of the first steps toward the further exploration of Mars. Those steps emphasize the development of technologies for robotic exploration and human support in isolated and harsh environments.

NASA scientists spent October and November 1993 in Antarctica, testing "telepresence technology" which may be used in the future to explore Mars. The telepresence technology — "giving the sense of being in a place physically distant from one's actual location" — allows scientists on land to use hand and head movements to point the cameras on the underwater vehicle, which they steer by remote control, much like future scientists will need to control robots on the surface of Mars from their laboratories on Earth.

The team used a modified mini-submarine — a "Telepresence Controlled Remotely Operated Vehicle" (TROV) named "Mars One" — to explore areas as deep as 244 meters below the surface of McMurdo Sound, near Ross Island, Antarctica.

The expedition concentrated on steering the TROV not from the icy shore in Antarctica but from California, 10,000 kilometers away. At NASA's Ames Research Center, Mt. View, California, a second team of scientists was able to control the TROV from an "intelligent mechanisms" laboratory. The Ames researchers drove the TROV by computer, both directly and by linking it to an underwater "virtual reality" terrain model of McMurdo Sound, which resulted in an experience somewhat like piloting an aircraft in a sophisticated video game. The TROV sent back stereo television images and digital data via a 305-meter-long tether containing fiber optic cables as well as electrical power lines. At Ames, special stereo goggles and a "virtual reality" helmet gave researchers enhanced depth perception as they explored the underwater environment.

The TROV also has a manipulator arm to collect biological specimens from the depths of the Antarctic Sea. This enabled samples to be collected in Antarctica by scientists who never left California.

Future expeditions will yield valuable data on Antarctic aquatic life as well as demonstrate the capabilities of virtual reality in controlling remote vehicles. They serve as prototypes for the future exploration of other worlds.

These expeditions are of interest to NASA's Mission From Planet Earth (MFPE), which is a comprehensive long-term program of robotic and, ultimately, human exploration and development of the solar system. MFPE will encompass a wide range of activities, including scientific exploration of the planets, astronomical observations from the Moon, commercial development of space, and eventually human outposts beyond Earth.

Fast Facts

TROV — "Mars One"	
Length	1.5 meters
Width	84 centimeters
Height	58 centimeters
Weight	59 kilograms
Speed	3 knots
Payload Instrument	10 kilograms
Normal Operating Depth	305 meters
Lights (2 tungsten halogen)	250 watts
Tether	305 meters
Color	metallic red
Builder	Deep Ocean Engineering, Inc.

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