

Under the knife While under sea

Telerobotics tested at NASA site

BY ERIC MCGUINNESS

Surgeon Mehran Anvari put just a few stitches in a latex pad yesterday, but Canadian astronaut Dave Williams called it a major step toward using portable robots to save lives in isolated communities or in space.

Williams said the technology also could let specialists in major medical centres treat patients on distant battlefields or disaster scenes.

Anvari, who has performed 22 telerobotic operations on Patients 400 kilometres away in North Bay from a base at St. Joseph's Hospital in Hamilton, used a new, portable prototype system yesterday to stitch a simulated patient aboard the undersea laboratory Aquarius off Key Largo, Florida.

The six-hour experiment was part of the April 3-20 NEMO 9 project, a joint effort of the U.S. space agency NASA, the Canadian Space Agency, the U.S. National Oceanic and Atmospheric Administration (NOAA) and McMaster University's Centre for Minimal Access Surgery (CMAS) at St. Joseph's Healthcare. NEMO is short for NASA Extreme Environment Mission Operations.

Mission leader Williams said Anvari made a big breakthrough by overcoming a one-second delay between his movements and those of the robot arms 2,000 kilometres away and 19 metres underwater.

He said a lag of 400 milliseconds (four-tenths of a second) was considered to be the "absolute wall" in the 1990s.

"It was thought to be impossible to do telerobotic surgery directly with a delay of more than 400 milliseconds."

Williams, an emergency physician who flew aboard the space shuttle Columbia in 1998, called the technology "incredibly impressive," saying, "It can change the face of the way we do medicine."

'It was thought to be impossible to do telerobotic surgery directly with a delay of more than 400 milliseconds.'

DAVE WILLIAMS

Anvari had hoped to try a delay of two seconds — the time it would take signals to reach the moon or be relayed via two satellites from overseas, but electronic glitches put jitters in the robot arms and one locked up when a part came loose.

The team plans to send the faulty arm to the surface for repairs, then try again tomorrow, when the plan is to use the same tool to pick up moon rocks.

Anvari's director of CMAS and chief scientific officer for NEMO 9 whose crew includes American astronauts Nicole Stott and Ron Garan, two University of North Carolina engineering experts and Dr. Tim Broderick of the University of Cincinnati.

Broderick helped assemble the robot and hang it from two upper bunks in a sleeping chamber yesterday. He sat on one of the lower bunks, locking and unlocking the robot arms and inserting tools in them as fish swam past a port-hole in the background.

For live webcam views from Aquarius, go to NOAA's Underwater Research Centre website at www.uncw.edu/nurc.

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NEEMO 9

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physicians with an unprecedented opportunity to test new medical technologies and state-of-the-art remote medical techniques in real-time and real-life situations. Someday, these capabilities could have important applications in supporting human exploration of the Moon and Mars."

There have been eight NEEMO (NASA Extreme Environment Mission Operations) missions to date. NEEMO 9 (April 3 - 20) is a joint project involving the Centre for Minimal Access Surgery at McMaster University, the Canadian Space Agency, the National Aeronautics and Space Administration (NASA) and the National Oceanic and Atmospheric Agency (NOAA).

Guided by Dr. Anvari and others, Williams and his crew will conduct experiments using the latest remote medical technologies and techniques.

In the surgical simulations involving telerobotting, Dr. Anvari, based in Hamilton, will use two-way high-speed telecommunication links to direct crewmembers in the underwater habitat to perform complex medical procedures. Another simulation involves telerobotics and virtual-reality technology, where Dr. Anvari will perform surgical procedures from Hamilton on a mock patient inside Aquarius over 2,000 kilometres away.

Dr. Julian Dobranowski will lead a team looking at confirmation of clinical diagnosis with x-rays. They'll be looking at digital x-ray simulation and validation, as well as ultrasound validation. One of the experiments on NEEMO 9 will demonstrate the capability of sending digital radiographs

from an extreme isolated environment to a teaching hospital for interpretation. Dr. Anthony Adili will demonstrate that an emergency treatment of a bone fracture can be accomplished by a non-physician or a non-specialist aided by telerobotting, and demonstrate emergency treatment of joint injuries using ultrasound and arthroscopic telerobotting.

One of the drawbacks of telerobotics is the delay that current telecommunications provide, combine this delay with stressors similar to battlefield or prolonged space flight and the brain's normal activity will change. Geoffrey Hall will evaluate the changes in normal brain activity during different tasks, latencies and stressors.

Canada can play a leading role in telerobotic surgery because its advanced space robotics technology, telecommunications capability, and visionary medical expertise have come together in a unique way. Telerobotic surgery may change the future of medical care by providing advanced surgical procedures to rural communities, extending the reach that city-based teaching hospitals have to more remote areas of the country.

"Since its inception in 1999, the Centre for Minimal Access Surgery has developed techniques to overcome some of the challenges faced by physicians in isolated communities," said Dr. Anvari. "We will test the latest techniques in an extreme environment on

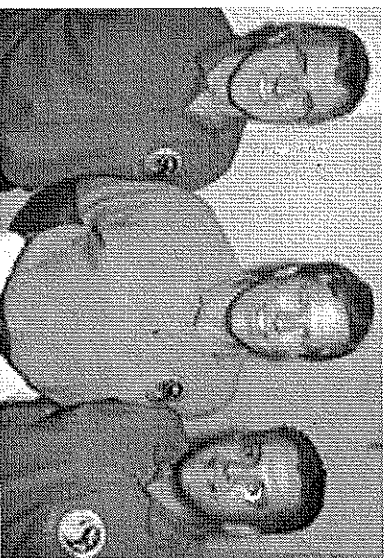
the NEEMO 9 mission. This work will have a major impact on current research and the development of new technologies, including new robotic and surgical platforms which can be used on Earth and beyond."

Education and Inspiration

One hundred and fifty local Grade 6 students were involved in a one-hour interactive outreach event designed to explore the educational aspects of the NEEMO 9 mission.

Students from Hillfield-Strathallan, St. Brigid and Bennetto schools, were connected via satellite to the NEEMO 9 aquanauts at their Aquarius habitat located 5.6 km off the coast Key Largo, Florida. This event was also broadcast via satellite to 21 Canadian schools through Canarie, Inc, an Ottawa-based Internet development organization.

More details on the education event in the next issue of Connections....



At left, Commander Dave Williams, in centre mission director Bill Todd, at right Dr. Mehran Anvari.



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