

From the sea to the stars: The NEEMO Project

Barracudas, their prehistoric, menacing teeth glinting in the Atlantic-filtered sunlight, circle beneath a 40-foot-wide yellow life-support buoy. Above them, four divers don their wet suits and air tanks on the deck of a small boat bobbing in the waves off the coast of Key Largo, Fla. The divers splash into the water one by one, then begin a descent of about 60 feet to their home for the next week – the undersea laboratory known as Aquarius.

The divers are not oceanographers but rather Johnson Space Center members of the NASA Extreme Environment Mission Operations (NEEMO) team. They are about to become “aquanauts” and use the laboratory owned by NASA’s sister agency, the National Oceanographic and Atmospheric Administration, to simulate life on the International Space Station.

“Living underwater is the closest parallel to living in space in that they are both extreme environments,” said NEEMO Project Lead Bill Todd.

Todd is a United Space Alliance space shuttle simulation supervisor veteran of 17 years and a member of the first NEEMO aquanaut crew in 2001. He believes strongly in the potential benefits of the project.

“The time frame for missions involves long periods of time away from normal environments and families,” he said. “Communication with others is not always immediate. Because of the fact that in both environments one cannot readily come home, repairs or replacements must be able to be made on the spot, if necessary.”

The NEEMO missions are a cooperative project of NASA, NOAA, the National Undersea Research Center (NURC) and the University of North Carolina at Wilmington (UNCW). The missions utilize Aquarius, the only undersea research laboratory in the world, which is owned by NOAA and managed by UNCW.

The 45-foot-long, 13-foot-diameter laboratory is situated next to deep coral reefs about three miles off Key Largo in the Florida Keys National Marine Sanctuary. Aquarius provides life support systems that allow scientists to live and work in reasonably comfortable quarters.

‘It was a real mission’

Although the aquanauts are only 60 feet underwater, that depth effectively isolates them from the surface. After their mission, Aquarius residents must undergo a deliberate 15-hour decompression process in which their bodies reacclimate to the lower atmospheric pressure on the surface. Without this readjustment period, nitrogen bubbles from their bloodstream could collect in their joints and cause a very painful and life-threatening condition known as “the bends.”

This degree of isolation makes NEEMO training different from other types of training available at JSC.

“Aquarius wasn’t a simulation,” said Astronaut Scott Kelly, who commanded the last NEEMO mission of 2002, and who also piloted STS-103 in 1999. “It was a real mission designed to train us for certain aspects of spaceflight with an extra element of realism you would never get in a simulation. There were real risks involved.”

Living arrangements add another degree of realism to a NEEMO mission. “Living in very confined quarters adds dynamics between individuals and makes it similar to spaceflight,” Kelly said. “The best part is the people you work with; the worst part is being away from your home and family – just like flying in space.”

The training provided by a NEEMO mission can be so beneficial to astronauts that NEEMO may soon be considered “graduate-level” training and leadership experience for first-time astronauts and commanders.

Support from the ground

Four separate crews of aquanauts made their way to Aquarius this year and last year for a combined total of 29 days of life and work inside and outside the undersea lab. As with spaceflight missions, the crews required support from a team on solid ground.

A small core NASA surface support team – Project Lead Todd, Mission Leads Monika Schultz and Marc Reagan, Operations Planner Michelle Lucas and Medical Officer Dan Fitzpatrick – worked out of a NURC-provided condo on the Key Largo marina. The condo provided bunk space for crews and support team members and was next door to the research center’s logistics and communications facility – essentially its Mission Control.

To speak with crews in Aquarius, support team members would go next door and use “undersea to ground” communications loops and wireless data channels similar to those that connect Mission Control to the space shuttle and station. Additional support teams from the Astronaut Office and Space and Life Sciences Directorate gave support as needed.

Similarities to space missions spill into scientific research and educational outreach. NASA’s NEEMO crewmembers conducted human physiology research, remote medicine, and human factors and habitability studies and worked with oceanographic researchers to collect data on the state of coral reefs in the area.

They also practiced space-walking techniques using tools and tethers similar to those used on orbit. And they helped reach out to students through interactive distance learning events, cooperative efforts of JSC’s Distance Learning Outpost and NASA Ames Research Center’s Quest Web project. Aquanauts even answered news reporters’ questions as an analog to interviews and news conferences routinely conducted on spaceflights.

Future missions in the planning stage also are expected to expand participation of

JSC’s Exploration Planning and Operations Center control room, simulating the interactions between astronauts and control rooms.

“We’ve learned in the past year what we really can get out of this facility,” said Schultz, who is the expeditionary training manager in the Astronaut Office, “and we’ve learned it really is the best analog for a true mission.” ❖

To learn more about NEEMO and view the NEEMO 4 Distance Learning Outpost event, visit <http://quest.arc.nasa.gov/projects/space/aquarius/2002/index.html>.



NASA JSC 200236934

A NEEMO mission takes lots of teamwork. The team pictured here is (L-R): Astronaut Scott Kelly, Space Station Support Scientist Jessica Meir, instructor Paul Masaki, Flight Director Paul Hill, Astronaut Rex J. Walheim and instructor Mark Hulsbeck. Kelly, Meir, Hill and Walheim were the crewmembers of NEEMO 4.



NASA JSC 200236931

A sea turtle explores the sea floor near the Aquarius Underwater Research Facility off the coast of Key Largo, Fla.

The NEEMO Missions

NEEMO 1

When: Six days, October 2001

Who: Project Lead Bill Todd and Astronauts Mike Lopez-Alegria, Mike Gernhardt and Dave Williams

NEEMO 2

When: Nine days, May 2002

Who: Astronauts Mike Fincke, Dan Tani and Suni Williams, and NASA Station Training Lead and Surface Support Team Lead Marc Reagan

NEEMO 3

When: Nine days, July 2002

Who: Astronauts Jeff Williams, Danny Olivas and Greg Chamitoff, and Human Systems Engineer Jonathon Dory

NEEMO 4

When: Five days, September 2002

Who: Astronauts Rex Walheim and Scott Kelly, Space Station Support Scientist Jessica Meir and NASA Flight Director Paul Hill

NASA JSC 200236932

Background image: Astronaut Rex Walheim (right) and Space Station Support Scientist Jessica Meir (center) follow the lead of an instructor as they team to inflate a surface signal device during an underwater exercise.

Cooperative Education Students take NASA to the classroom

By Julie Burt

With the help of JSC Cooperative Education Students (co-ops), Humble High School students saw the past and the future of NASA last month.

The co-ops shared Apollo-era space relics with the students and they also shared stories of their JSC work experience. Although they are college students, co-ops still contribute in significant ways that benefit the future of the space program.

As the co-ops spoke, the word “pyrotechnics” brought a gleam to the eye of several students. Also, many young women sat in awe of the female NASA employees, who talked about their work on the Cyclogometer on the International Space Station or their efforts to help design space suits that astronauts may use on future missions.

This event was part of the High School Outreach Program, which is orchestrated each spring and fall by the co-ops at JSC. The co-ops meet during their free time to plan and prepare for the outreach activities.



NASA JSC 2002e47188 Photo by David DeHoyos

“I volunteered for this activity because, even though Houston’s nickname is ‘Space City,’ so few people in Houston know of the opportunities at Johnson Space Center,” said Alicia Baker, a co-op in the Fund Management Division, Resources and Fund Control Group.

“I graduated from a high school 50 miles from JSC,” she said, “and I never knew I could work or research here. I want to make sure other Houston area high school students know.”

All of the high school students had the opportunity to look at and touch some of the space helmets from the Apollo era. They were then challenged to pick up a quarter off their desks using an EVA glove. They saw some of the space food that the astronauts eat, and a few were able to try on an astronaut space suit.

For more information on the co-op program, go to: <http://coop.jsc.nasa.gov>

“We all dream about one day going back to the Moon or onwards to Mars; outreach provides us the opportunity to share our ambitions and enthusiasm for space with the community, getting the spirit of exploration revived.

– Jayleen Guttromson, an Aeronautical and Astronautical Engineering major at Purdue University who works in the Crew and Thermal Systems Division

“The High School Outreach program brings the co-ops together and helps us appreciate the potential we have as college students to make an impact on someone who is exactly where we were a few years ago.

– Kelly Halacka, a senior at Case Western Reserve University who works in the Biomedical Systems Division

University of Houston co-op leads recruiting effort

Reynaldo Guerra, a senior in Mechanical Engineering at the University of Houston, goes beyond the call of duty to help students like him.

Guerra arranges and leads tours of Johnson Space Center each fall for students from his university who are interested in the co-op program. He started the tours in 1999. They have developed into what Co-op Program Manager Bob Musgrove calls the recruiting effort for University of Houston students.

So what made Guerra, the first in his family to attend college and a student very involved with both classes and extracurricular activities, begin this crusade to bring University of Houston students to see JSC?

“I was frustrated because I was the only engineering co-op from the University of Houston,” he said. “There are some extraordinary minds at the University of Houston. I felt NASA and UH were mutually missing out on some valuable opportunities. I was, and still am, frustrated with the level of interest in the space program, especially here in the Houston area.”

Guerra said he hopes that his work will help remind locals of the treasure in their neighborhood. “Maybe because NASA is in Houston’s back yard Houstonians are immune to the truly amazing work that we do here,” he said. “I see the tours as an opportunity to open the eyes of Houstonians, 40 pair at a time. Hey, every little bit helps!”

Thanks to Guerra’s efforts, three engineering students have been hired by JSC. One of them even led the University of Houston tour of JSC one semester while Guerra was back at school. ❖

Read more about Guerra at
<http://coop.jsc.nasa.gov/biography/bios/guerrar.htm>

Above:
A Humble High School student tries on a helmet during the co-ops’ visit.
Right: Another HHS student tries on a glove.



NASA JSC 2002e47176 Photo by David DeHoyos



Reynaldo Guerra, right, leads a tour of Building 9 for University of Houston students.

NASA JSC 2002e47336 Photo by James Blair

On the beat

By Kendra Ceule

Photos by Bill Stafford



JSC SECURITY BIKE PATROL

For the past couple of months, JSC employees may have noticed security guards riding around the Center on bicycles. They are part of the new JSC Bike Patrol, which is the newest of JSC Security's efforts to keep employees safe.

Although the patrol is new – it was launched on Oct. 13 – its worth is already being established. One bike patroller was able to help save a life on site, largely because he was on a bike instead of in a car.

"I was a long way away from where a car could have gotten to it," said Officer Robert Smith, who arrived at the scene in time to revive the individual with CPR and an AED device. "We were actually able to save her life, so I was real pleased with that."

The bike patrol also benefits Center employees in less dramatic ways. Other functions of the patrol include traffic monitoring and responding to incidents around the Center.

One reason the patrol was established, said Chief Rick Hewitt, was so that security officers would be able to better interact with employees.

"The officers are able to be more active in the community," said Hewitt, "and they seem more approachable than officers in cars might."

Currently, the patrol employs two full-time and two part-time officers. Smith encourages employees to get to know the bike patrollers.

"Don't be afraid to stop us and ask questions," he said. "That's what we're there for."



Thanks to the recent addition of a bike patrol to JSC Security, guards on bicycles can now be seen patrolling the campus. JSC Bike Patrollers Fred Taylor, left, and Robert Smith make the rounds at the Center. Bike patrollers perform many of the same jobs that security officers in cars do, such as traffic duties, parking-lot monitoring, badge checking and responding to incidents around JSC.

NASA JSC 2002e44099



NASA JSC 2002e44103

Smith discusses safety issues with IMPASS Safety and Quality Assurance Manager Carl Matthews.



NASA JSC 2002e 44108

Taylor, left, and Smith bike through JSC on their daily rounds.

SPACE CENTER Roundup

The *Roundup* is an official publication of the National Aeronautics and Space Administration, Johnson Space Center, Houston, Texas, and is published by the Public Affairs Office for all space center employees. The *Roundup* office is in Bldg. 2, Rm.166A. The mail code is AP121. Visit our Web site at: www.jsc.nasa.gov/roundup/weekly/
For distribution questions or to suggest a story idea, please call (281) 244-6397 or send an e-mail to roundup@ems.jsc.nasa.gov.

Editor Kendra Ceule
Senior Editor Melissa Davis

PRSR STD
U.S. POSTAGE
PAID
WEBSTER, TX
Permit No. G27