

Space Rats test technology in the desert

By Joanne Hale



RATS took over the barren terrain of Flagstaff, Ariz., recently as Johnson Space Center engineers embarked on one of their latest missions – Desert Research and Technology Studies (RATS) 2003.

Under the guidance of Senior Project Engineer Joe Kosmo of the Crew and Thermal Systems Division, team members from JSC and Glenn Research Center coordinated and conducted a series of robotic, rover and advanced spacesuit interactive tests in remote locations in Arizona. These field tests enabled the teams to try out surface exploration tasks that could be performed on another planet someday.

The technologies involved in the two-week test were the Extravehicular activity Robotic Assistant (ERA), the Science, Crew and Operations Utility Testbed (SCOUT), the Science Trailer and two advanced spacesuit configurations. Below, the engineering teams describe their role in Desert RATS 2003.

Boudreaux: the Extravehicular activity Robotic Assistant

The ERA project team has developed a fully autonomous mobile robotic testbed for exploring astronaut-robot interaction. During an excursion on a planetary surface, the six-foot-tall, 400-pound robot named Boudreaux could hold a conversation with an astronaut using natural language and speech synthesis technology.

Boudreaux travels at one meter per second and is fully equipped with dual differential Global Positioning System (GPS) units, a laser range finder, an inertial measurement unit with compass, two pan-tilt platforms with color cameras and a robotic arm with three-fingered hand.

The astronaut can command the robot into several autonomous modes. Boudreaux can perform tasks such as tracking, following an astronaut or other mobile agent, performing a solo scouting mission, mapping terrain and collecting science data over a search pattern. It can also deploy payloads such as science instruments, solar panels and power lines.

During the Desert RATS 2003 field tests at Meteor Crater, Ariz., Boudreaux successfully performed an autonomous science collection task by pulling a spectroradiometer instrument along a specified search pattern. Boudreaux also pulled a geology trailer for the astronaut, facilitating the on-site analysis and curation of rock samples, and provided camera pan-tilt control and video feedback from Meteor Crater to JSC via satellite.

Submitted by the ERA team: Kimberly Tyree, Nathan Howard, Robert Hirsh and technical lead Jeffrey Graham of Titan.

SCOUT: the Science, Crew and Operations Utility Testbed

SCOUT is a technology- and power-rich crewed utility vehicle testbed that draws several existing Engineering Directorate activities into one common program. It is a multipurpose rover that will support the development and demonstration of various technologies, operations and mission concepts.

The three-year SCOUT program recently completed its first field test at Meteor Crater. To serve as the vehicle for SCOUT, the team used a modified 1-G Apollo Lunar Rover Trainer. The rover was obtained by JSC from the U.S. Geological Survey Organization in Flagstaff, Ariz., and was modified to include a hybrid battery/fuel cell power system and advanced technologies including GPS and laser obstacle detection. Numerous test drives were completed, including a night illumination study, and two space-suited drivers took turns evaluating rover handling and ergonomics during analog science missions.

SCOUT provides young engineers with hands-on experience in systems and operations, while fulfilling JSC's role as Lead for Human Exploration and Robotic/Human Interaction. It also fosters cooperative development and Space Act agreements with other government agencies, industry and academia.

Submitted by the SCOUT team: Bill Studak, Tom Simon, Kerri McCurdy, Kris Romig, Rafael Jimenez, Keith Blizzard, Jen Rochlis, Dave Fletcher, Warren Tyree, Chip Kroll, Steve Hoffman, Richard Pedersen, Mike Ruiz and Dave Saley.

In this March 11, 1971, photo, Apollo 15 Commander David R. Scott (left) and Lunar Module Pilot James B. Irwin ride in the Lunar Roving Vehicle trainer called 'Grover' during a simulation of lunar surface extravehicular activity in the Taos, N.M., area. This rover was obtained from the U.S. Geological Survey Organization in Flagstaff, Ariz., for use in the recent field testing at Meteor Crater.

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Science trailer, a roving geological field lab, is able to crawl over football-sized rocks with ease. The trailer is being pulled by Boudreaux, a six-foot tall, 400-pound robot.

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Members of the SCOUT team with the 1-G Apollo Lunar Rover Trainer, Mike Ruiz, Kerri McCurdy, Tom Simon and Keith Blizzard. Sitting are Kris Romig, Bill Studak and Rafael Jimenez.

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