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NASA and Texas Tech to Develop New Spacecraft Systems

LUBBOCK -- Faced with the challenging task of shuttling humans to the moon and later to Mars, NASA has tapped Texas Tech University computer scientists as it develops more dynamic and fluid software systems for its new Crew Exploration Vehicle.

Beginning in January, NASA's guidance, navigation and control engineers will work with Texas Tech scientists as they develop the Abort Executive for the vehicle. This prototype environment will predict the ability of the capsule to determine abort strategies should something misfire aboard the vehicle.

The system will be built using a declarative language called SequenceL developed at Texas Tech University.

Recent NASA workshops have indicated that current software development practices and computer languages – even with evolutionary changes – may not be rapid or dependable enough for future missions, Cooke said. This is especially true as the agency girds for its new call to send men to moon again and later to Mars.

The SequenceL effort, already underway with members of Johnson Space Center's Guidance, Navigation and Control organization, is developing the requirements for a Shuttle Abort Flight Management that would kick in should a problem occur during take-off. The program would provide astronauts emergency options based on the ship's velocity and loft, including possible landing locations.

NASA is devising new methods to develop prototypes and system requirements that would be easier to translate and require less coding. This would allow programmers to create and deploy new systems more rapidly – something that could be necessary as unexpected complications or exploration opportunities arise during exploration.

The project will continue from January through June 2006. It is led by Howard Hu, chief engineer for the Crew Exploration Vehicle's Guidance, Navigation and Control at Johnson Space Center, and Texas Tech computer science faculty, including Dr. Daniel Cooke and Dr. J. Nelson Rushton. Robert Watson, a Ph.D. candidate at Texas Tech's Abilene campus, will relocate to Houston for the six-month period.

The SequenceL language, created by Cooke, is part of a declarative language framework that can be used to encompass other software. It will be used to demonstrate

the flight management system's behavior in simulations before NASA commits to building costly prototypes and onboard software. This should result in fewer errors while reducing development costs, Cooke said.

In related research, an A-Prolog language, created by Texas Tech computer science professor Dr. Michael Gelfond in collaboration with Houston-based space operations company United Space Alliance, is a system that quickly finds work-around plans in response to even multiple failures of the shuttle's Reaction Control System. It can be used in a similar fashion for other types of onboard systems.

A Concrete State Machine Language, developed by Rushton, is a language to tie A-Prolog and SequenceL into existing onboard systems. If this succeeds, it will result in a more general, integrated and formal approach to the implementation of different types of system, including guidance and life support, Cooke said.

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