



Alliance Spacesystems Delivers Robotic Arm for DARPA's "FRIEND" Technology Demonstration

Robotic arm technology would provide help with geosynchronous satellite repair, repositioning, debris removal and more.

October 20, 2007 -- Alliance Spacesystems, Pasadena, CA

<http://alliancespacesystems.com/>, has delivered the Engineering Development Unit (EDU) of a robotic arm to demonstrate the "front end" of a possible future satellite that could one day conduct repairs or repositionings of military and commercial satellites in Earth-orbit. The task funded and led by the Defense Advanced Research Projects Agency (DARPA) with the Naval Research Laboratory (NRL) acting as an agent on its behalf, builds upon Alliance Spacesystems' expertise from the development of various robotic arms for Mars landers and rovers.

DARPA's Front-end Robotics Enabling Near-term Demonstration (FRIEND) program <http://www.darpa.mil/tto/Programs/friend.htm> offers the potential for spacecraft salvage, repair, rescue, reposition, de-orbit and retirement, and debris removal. The program goal is to develop, demonstrate and fly technologies designed to increase the survivability and operational effectiveness of geosynchronous orbit-based military and commercial spacecraft.

NRL's FRIEND system provides the hand-eye function and coordination for the potential servicing spacecraft. FRIEND combines detailed stereo photogrammetric imaging with robotic multi-degree-of-freedom manipulators. Alliance Spacesystems is providing the robotics and associated control electronics to enable FRIEND to autonomously grapple satellites, including those that are not outfitted with custom interfaces. With 7 degrees-of-freedom, the arm will allow highly agile positioning of grappling devices or other tools. The Alliance-built arm will be part of a spacecraft payload that could be flight-tested later this decade.

According to DARPA, a FRIEND-equipped spacecraft could help give new life to geosynchronous-orbit satellites that are still operating but have expended their position-control fuel. It would also allow reboosting of such spacecraft into new, useful orbits. Other potential uses could include on-orbit satellite repair or technology upgrades using robotic systems, or moving non-operating satellites into controlled reentry trajectories

Under terms of the contract with NRL, Alliance Spacesystems is designing and manufacturing a robotic arm EDU and a flight arm and electronics, including first-level control algorithms. The arm would eventually be equipped with end effectors such as an adapter-ring clamp or bolt-hole gripper. The EDU electronics for the system were



developed for Alliance Spacesystems by Broad Reach Engineering of Boulder, CO
<http://www.broad-reach.net/main.html>.

Alliance Spacesystems' work on FRENDA represents the first inroad by a U.S. company into the growing field of highly capable robotic space arms for on-orbit servicing of satellites; in the past, arms for the Space Shuttle, Space Station and Orbital Express mission have been Canadian-built.

"We're proud to be leading the way in developing new capabilities for space robotics in the United States" said René Fradet, president and CEO of Alliance. The small firm has provided robotic arms for four NASA-Mars spacecraft, including the Spirit and Opportunity rovers still operating on Mars. Mars Phoenix, a lander launched August 4 of this year, carries an Alliance Spacesystems robotic arm, and another is in development for NASA's Mars Science Laboratory, scheduled for a 2009 launch.

Alliance Spacesystems LLC, provides customers with world-class aerospace engineering expertise in a small, customer-focused business environment. The company is a leading provider of mechanical systems engineering, custom design and fabrication in composites structures, robotics and mechanisms, and mechanical analyses for systems operating in extreme environments. Alliance Spacesystems' innovative products are in use on interplanetary spacecraft, telecommunications and scientific satellites and in many challenging terrestrial applications.

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