

AMODS

Mission

The goal of the Autonomous Mobile On-orbit Diagnostic System (AMODS) project is to assure the ability to provide the physical on-orbit interaction needed to generate diagnostic data. AMODS employs a modular, CubeSat style design approach to overcome traditional cost and technological hurdles.

Overview

AMODS embraces a multiple CubeSat system: 1) several “repair” CubeSats (RSats) with manipulable arms designed to latch onto a host satellite and maneuver, image, and potentially repair various components; and 2) one self-propelled transport CubeSat (BRICSat), a “space tug” with the ability to distribute RSats across a constellation of on-orbit client satellites. The projected cost of an AMODS deployment is less than \$150,000 per BRICSat and \$25,000 per RSat.

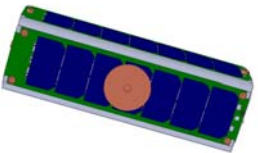
Notionally, one BRICSat will be launched with multiple RSats (RSat-1,2,3, etc). Once on orbit, RSat-1 will grapple BRICSat and be transferred to its host satellite, where it will latch on and use its manipulators for locomotion. Thereinafter, BRICSat will return to the depot, and transfer RSat-2 and later RSat-3 to their respective hosts. The RSats will remain on their hosts, monitoring the satellites, visually documenting any features of interest and performing diagnostic and repair tasks as needed.

RSat Platform



RSat is a 3U (10 x 10 x 33 cm) cube satellite with two 60 cm, seven degree of freedom robotic arms fitted with manipulators. It is intended to operate in constant contact with a host spacecraft. The robotic arms provide access to any external surface of the host. The manipulators will grip to the host satellite and also function as tools. RSat will be equipped with a suite of equipment including a camera to diagnose any on-orbit failures and, in some cases, other instruments as may be required to perform minor on-orbit repairs or maintenance. RSat provides ground controllers with the continued opportunity to physically interact with their spacecraft as if it was on the ground.

BRICSat Platform



BRICSat is also a 3U CubeSat. Equipped with its own propulsion system, it functions as a completely independent spacecraft. It is a complement to RSat and provides the only propulsive force to the RSat platform in the form of both long term, sustained ΔV for travel between spacecraft (cold gas thruster), and quick pulses (electric propulsion) to allow for proximity operations. A cup-cone magnetic docking system will be built-in to BRICSat and include power and data pass-throughs to electrically link BRICSat and RSat and also allow for them to share power. BRICSat defrays the cost of expensive attitude control, rendezvous and propulsion systems across multiple RSats.

Current Missions

- May 2015:* Launch of BRICSat-P Prototype. Validated “in transit” propulsion system.
- March 2017:* Launch of BRICSat-D Demonstrator. It will conduct additional thruster evaluations and demonstrate the use of an (internally mounted) RSat arm motor.
- Fall 2017:* Launch of RSat-P Prototype. A project demonstration, it will prove RSat’s on-orbit suitability, capability, and accuracy.
- Fall 2018:* Launch of MBSE combines the BRICSat and RSat concepts for the first time. It will validate the AMODS notional mission by demonstrating combined, interactive, and rendezvous capabilities.

Team

Conceived by a midshipman, and made up wholly of undergraduate students, the AMODS boasts a staff of 70 Midshipmen. Helmed by 2/C Edward Hanlon, 2/C Morgan Lange and 2/C Ben Keegan, AMODS is developing innovative advancements with respect to propulsion and navigation of small satellites. To the best of their knowledge, RSat represents the first time space robotic arms have been installed on such a small platform.

Recent developments in AMODS project

At <http://usnatrident.blogspot.com/2017/06/usna-mids-graduates-receive-secnav.html>

Monday, June 5, 2017

USNA Mids, Graduates Receive SECNAV Innovation Award

A team of Naval Academy midshipmen and recent graduates were awarded the Secretary of the Navy's Innovation Scholar Award today at the Pentagon for their research project entitled Autonomous Mobile On-Orbit Diagnostic System (AMODS).



The goal of AMODS is to employ a small satellite platform to provide both new and legacy spacecraft with cost effective on-orbit assessment and repair services. It has the potential to instigate a paradigm shift in respect of how the DoD and the space industry as a whole develops and operates space assets.

The AMODS team includes Ensigns Edward Hanlon, Benjamin Keegan and Morgan Lange, MIDN 1/C Jacob Pittman, and MIDN 2/C Gavin Roser and Dakota Wenberg.