Fast Paced, Low Cost Projects at MSFC

Lisa Watson-Morgan, Ph.D., Raymond Clinton, Ph.D.

What does an orbiting microsatellite, a robotic lander and a ruggedized camera and telescope have in common? They are all fast paced, low cost projects managed by Marshall Space Flight Center (MSFC) teamed with successful industry partners. MSFC has long been synonymous with human space flight large propulsion programs, engineering acumen and risk intolerance. However, there is a growing portfolio/product line within MSFC that focuses on these smaller, fast paced projects. While launching anything into space is expensive, using a managed risk posture, holding to schedule and keeping costs low by stopping at 'good enough' were key elements to their success. Risk is defined as the possibility of loss or failure per Merriam Webster. The National Aeronautics and Space Administration (NASA) defines risk using procedural requirement 8705.4 and establishes 'classes' to discern the acceptable risk per a project. It states a Class D risk has a medium to significant risk of not achieving mission success. MSFC, along with industry partners, has created a niche in Class D efforts. How did the big, cautious MSFC succeed on these projects that embodied the antithesis of its heritage in human space flight? A key factor toward these successful projects was innovative industry partners such as Dynetics Corporation, University of Alabama in Huntsville (UAHuntsville), Johns Hopkins Applied Physics Laboratory (JHU APL), Teledyne Brown Engineering (TBE), Von Braun Center for Science and Innovation (VCSI), SAIC, and Jacobs.

Fast Affordable Satellite Technology (FastSat HSV01) is a low earth orbit microsatellite that houses six instruments with the primary scientific objective of earth observation and technology demonstration. The team was comprised of Dynetics, UAHuntsvile, SAIC, Goddard Space Flight Center (GSFC) and VCSI with the United States Air Force Space Test Program as the customer. The team completed design, development, manufacturing, environmental test and integration in one year. FastSat HSV01 also deployed a Poly Picosatellite Orbital Deployer (PPOD) for a separate nano-satellite class spacecraft (Cubesat: Nano Sail Demonstration) in partnership with Ames Research Center.

The Robotic lunar lander is a MSFC JHU APL partnership that led to the development of a flexible architecture for landers to support robotic missions to a wide range of lunar and asteroid destinations. The team started with the goal of meeting NASA agency directives that led to the creation of a test bed focusing on GN&C and software to demonstrate the descent and landing on any airless body for the final 30 to 60 meters. The team created a complex technology demonstration as well as Guidance Control and Navigation (GN&C) algorithms providing autonomous control of the lander. The team uses a green propellant of 90% hydrogen peroxide and has completed 18 successful test flights.

The International Space Station (ISS) SERVIR Environmental Research and Visualization System (ISERV) is a technology demonstration payload to assist the SERVIR project with environmental monitoring for disaster relief and humanitarian efforts. The ISERV project was a partnership with TBE. The ISERV payload consists of a commercial off the shelf camera, telescope, and MSFC developed power distribution box and interfaces on ISS with the Window Observational Research Facility in the US Lab.

MSFC has identified three key areas that enabled the low cost mission success to include culture, partnering, and cost/schedule control. This paper will briefly discuss these three Class D efforts, FastSat HSV-01, the Robotic Lunar Lander and the ISERV camera system, the lessons learned, their successes and challenges.