LAUNCH VEHICLE DYNAMICS AND CONTROL

Advanced Dynamics

Marshall Space Flight Center maintains a critical national capability in the analysis of launch vehicle flight dynamics and flight certification of GN&C algorithms. MSFC analysts are experts in the areas of flexible-body dynamics, control-structure interaction, thrust vector control, sloshing, propellant dynamics, and advanced statistical methods. Marshall’s modeling and simulation expertise has supported manned spaceflight for over 50 years.

Guidance, Navigation, and Control

Marshall’s unparalleled capability in launch vehicle guidance, navigation, and control stems from its rich heritage in developing, integrating, and testing launch vehicle GN&C systems dating back to the early Mercury-Redstone and Saturn vehicles. The Marshall team is continuously developing novel methods for design, including advanced statistical methods, filter optimization, Monte Carlo analysis, and other third parties to provide cubesat expertise and simulation capabilities.

CUBESAT INTEGRATION AND TESTING

Small Projects Rapid Integration & Test Environment

The Small Projects Rapid Integration & Test Environment (SPRITE) Lab at Marshall Space Flight Center aids in the development and verification of cubesat software in a real-time simulation. Engineers at SPRITE partner with universities and other third parties to provide cubesat expertise and simulation capabilities.

FLIGHT ROBOTICS LAB

Flight Robotics Laboratory Overview

The Flight Robotics Lab (FRL) at Marshall Space Flight Center provides a full scale, integrated simulation capability for the development of the design, development, integration, validation, and operation of orbital space vehicles.

ROBOTIC LANDER TEST BED

Mighty Eagle Warm Gas Test Article

The Mighty Eagle Warm Gas Test Article (WGTA) is a robotic lander testbed based at the Marshall Space Flight Center that is used to iteratively test algorithms and systems that could be implemented in future space programs. Originally designed and built in 2010 to support risk reduction of the International Lunar Network program, the vehicle has been adapted for additional testing of optical Autonomous Rendezvous and Capture technology as well as Hazard Avoidance software using an off-the-shelf stereo camera system.

SPRITE has a modular, layered design that evolved from the Fast, Affordable, Science & Technology Satellite (FASTSAT). A portable version of SPRITE’s hardware-in-the-loop simulation capability has been developed. It is in the form of a small suitcase and can thus be taken to the customer’s location. In addition, the SPRITE’s hardware can be customized to meet the customer’s flight computer hardware interfaces.