Flight Robotics Laboratory

Purpose:

To provide a full scale, integrated simulation capability for the support of the design, development, integration, validation, and operation of orbital space vehicle systems.

The Flight Robotics Laboratory (FRL) is built on developed technologies such as air bearing floors, servo drive overhead robotic simulators, precision targets, gimbals, 6-Degrees of Freedom (DOF) mobility units, and manipulator and visual system evaluation facilities. The facility is centered around a 44 foot by 86 foot precision air bearing floor, the largest of its kind. A mobility base called the Air Bearing Spacecraft Simulator (ABSS) is used on the air bearing floor and is capable of 6 DOF motion. The ABSS will hold a 400 pound payload. An 8 DOF overhead gantry, called the Dynamic Overhead Target Simulator (DOTS) provides a 1000 pound payload capability for simulating relative motion with respect to a fixed target on the facility floor. A computer system provides inverse kinematics and allows the gantry to act as a target or as the 6 DOF rendezvous vehicle. The target reaction dynamics are simulated through force / torque feedback from sensors mounted at the payload interface. A raised floor area houses the Manipulator Systems Facility (MSF). For the evaluation and development of robotic manipulators including end effectors.

The FRL also provides a dual RF output, Global Positioning System (GPS) Satellite Radio Frequency (RF) simulator that operates in real time, in closed loop fashion with GPS receiver hardware in the loop. When connected to this simulator, two GPS receivers will provide navigation data as if they were on separate, moving vehicles in Earth orbit, viewing a real GPS constellation.

The FRL is a versatile test facility in that both open and closed loop system testing can be accomplished in either a digital or hardware-in-the-loop mode. It is presently being used to simulate the docking conditions of an automated rendezvous and capture system (AR&C) for the AR&C program. In this application, iterative computer interactions provide guidance and control data allowing the proper positioning of the docking sensor relative to a target pattern for closed loop control. Simulation control commands also drive a solar simulation for proper orbital lighting conditions. The dynamic model also drives graphic representation of the simulation and displays dynamic data in real time on Silicon Graphics terminals.

Point-of-Contact:

Fred Roe / ED19
(256) 544-3512
fred.roe@msfc.nasa.gov