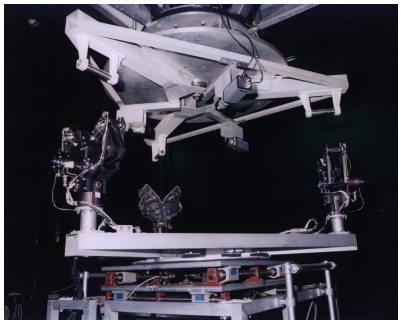
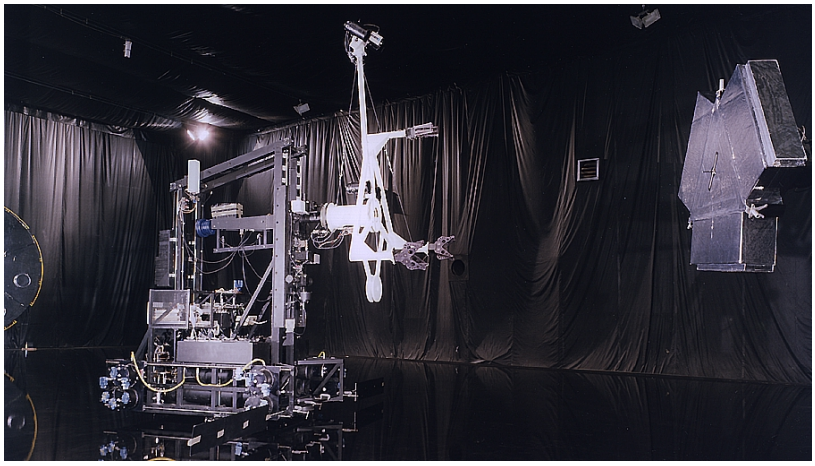
Technology Opportunity

Avionics Systems Simulation at Marshall Space Flight Center



Marshall Space Flight Center (MSFC) has developed a unique avionics simulation capability by integrating several existing MSFC avionics testbeds. The NASA Federal Laboratory Review Task Force has declared this simulation system the best throughout the world for the aerospace community. The unique capability to unite Marshall's avionics simulation laboratories to perform extensive end-to-end avionics system testing in an environment not previously available makes this a "world-class" facility.

MSFC's avionics simulation capability is fully operational and is being used to support several advanced initiatives such as the X–33 program, the International Space Station, and the Automatic Rendezvous and Capture program.



Potential Commercial Uses

In addition to the NASA programs supported by MSFC's avionics simulation capability, commercial applications include the automotive and trucking industries, flight simulation, space commercialization, and the commercial aircraft industry.

Benefits

Testing with commercial applications include: test suspension hardware for the automotive industry, pilot training and hardware testing for flight simulation, and automatic landing simulation for commercial aircraft using one of the most advanced global positioning system simulation capabilities in the country.

The Technology

Recent developments in high-speed, high-bandwidth fiber-optic networks have allowed Marshall to "tie" three avionics laboratories together. These fiber-optic capabilities allow MSFC to test an avionics system in a mission environment that includes prelaunch operations, launch, orbital maneuvers, rendezvous, docking/berthing, and landing.

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George C. Marshall Space Flight Center

Marshall Avionics System Testbed (Launch Vehicle Development)

Three laboratories make up the Marshall Avionics System Testbed, bridging the gap between technology development and implementation.

The Vehicle Simulation Laboratory provides a tool for the demonstration of such advanced vehicle avionics technologies as flight computers; navigation systems; fault-tolerant components; autonomous guidance, navigation, and control algorithms; automated software generation; and verification and validation products.

The Engine Simulation Laboratory consists of high-fidelity, real-time simulations of rocket engine systems with models of high-frequency pumps, combustion devices, propellant lines, actuators, valves, and sensors.

The Actuator Test Laboratory, operated by the MSFC Propulsion Laboratory, is used in the design, development, and testing of actuation systems, ranging from small solenoids to large thrust vector control actuators.

Flight Robotics Laboratory (Orbital Operations, Rendevous, and Docking)

The Flight Robotics Laboratory (FRL) was developed to provide a single lab in which avionics and robotic hardware and software could be tested in a full 6-degree-of-freedom, closed-loop simulation. The facility is centered around a 44-foot by 86-foot precision air bearing floor—the largest of its kind. The Air Bearing Spacecraft Simulator, used on the air bearing floor, will hold a 400-pound payload and is capable of 6-degree-of-freedom motion. Overhead, the Dynamic Overhead Target Simulator is capable of holding a 1000-pound payload, with an 8-degree-of-freedom motion. A computer system allows the overhead payload to act as either a target or the rendezvous vehicle.

The FRL also has one of the most advanced global positioning simulation systems in the country. This device provides navigation data to the simulation vehicles, as if they were separate, moving vehicles in Earth orbit.

Contact Dynamics Simulation Laboratory (Docking Mechanisms)

The Contact Dynamics Simulation Laboratory (CDSL) allows engineers to simulate how a docking or berthing mechanism would behave in Earth orbit under a variety of conditions. Simulations in the CDSL reveal the stress a device will experience once in space through the use of force and torque data recorded on the system's SGI Challenge X/L simulation computer.

Contacts

Technology Transfer
Mail Code CD30
NASA/MSFC
Marshall Space Flight Center, AL 35812

Additional information about MSFC's Technology Transfer Program is available on the World-Wide Web:

www.nasasolutions.com

Key Words

Avionics Systems Simulation
Robotics/Autonomous Systems
Technology Transfer