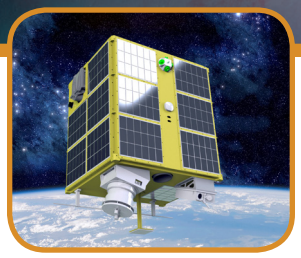
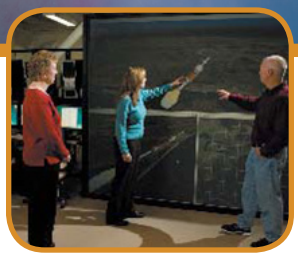
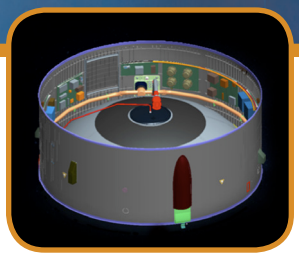
National Aeronautics and Space Administration

Marshall Space Flight Center
Space Systems


Engineering Solutions for Space Science and Exploration

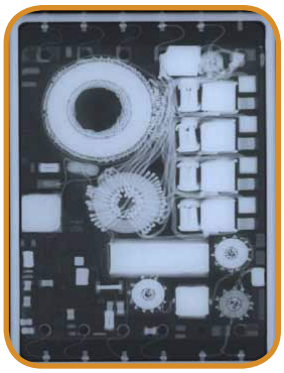
Marshall's Space Systems

offers a strong variety of capabilities in the areas of flight and ground software, avionics, electrical fabrication, and engineering design across a wide range of projects. Providing vital support for NASA missions of all complexities and sizes, Marshall offers over 50 years of expertise in the design, development, testing, and evaluation of space systems (from avionics to payloads) and has forged partnerships with other NASA Centers, Department of Defense, European Space Agency, industry, and academia.

Space Systems performs mechanical design, analysis, and fabrication for human space flight programs, science investigations, and exploration initiatives across the product life cycle. For example, the team played a vital role in the systems design, analysis, and testing of the Environmental Control and Life Support Systems (ECLSS) for the International Space Station (ISS). The team made critical air revitalization and water recovery developments for ECLSS and conducted technology testing and flight systems engineering support that has allowed crewmembers to safely live and work on board the orbiting laboratory during its 10 years of continuous operations.

Microgravity Science Glovebox (MSG) experiment on the ISS.

Developing hardware and software for NASA's missions is the Space Systems team's first goal; however, they have collaborated with other technical organizations. For instance, the Fast, Affordable, Science and Technology SATellite (FASTSAT) microsatellite was developed largely by MSFC's Space Systems in collaboration with the Department of Defense Space Test Program, the Von Braun Center for Science and Innovation, Dynetics, and other NASA Centers. This project established Marshall Space Systems' expertise in the production of small, affordable satellites to enable a broad range of responsive missions and rapid access to space with multiple payloads and ride share options.



EEE parts failure analysis.

Marshall's Space Systems team developed world-class facilities for the development and testing of avionics including the Systems Integration Laboratory (SIL) and the Systems Integration Test Facility (SITF). These groundbreaking facilities allow engineers to test software with hardware in the loop to fully simulate the integration of systems in virtual space (prior to hardware manufacturing and test flight) and create an end-to-end simulation environment (real time/non-real time) in support of the entire project life cycle, including requirements development and analysis, as well as early prototyping, testing and verification. These unique capabilities ensure that software and hardware integrate seamlessly before vehicle manufacturing and assembly. The SIL/SITF has supported the space shuttle and is being used to develop the next generation of launch vehicles.

Capabilities

Systems Engineering and Integration

> Value-added solutions to a broad spectrum of challenges, from initial concept trade studies through sustaining engineering.

> Manage interfaces; develop and evaluate ground integration, operations, and maintenance; sustaining engineering; supportability; and logistics planning.

Flight and Ground Software

> Manage software requirements development, processes and planning, and formal verification activities.

> Design and develop flight software and testing facilities and provide insight for external software development.

Avionics Design

> Full-cycle, conceptualization-to-finished-product development of electronic control systems, data systems, and flight instrumentation products

> Research, engineering, design, and development of instrumentation and advanced sensors, electronics circuits, imaging and video systems, radio frequency systems, computer controlled subsystems, and advanced optics.

Systems Development, Integration, and Test

> Conceptual design, detailed design, development, test, integration and operations of science instrument experiments, racks, payloads, systems, and subsystems.

> Requirements definition, conceptual design, detailed design, development, test, integration, launch, and mission operations.

Mechanical Design, Analysis, and Fabrication

> Design, integration, and delivery of structural, mechanical, and fluid systems designs for human space flight programs, science investigations, and exploration initiatives.

> Fabrication and assembly capabilities for research, development, testing, and flight hardware.

Electrical Integration and Fabrication

> Design, analysis, evaluation, and test of power systems and power electronics and integration hardware including cables and circuit protection, printed circuit board schematic layout and thermal analysis, and EEE parts failure analysis.

> Analysis and test support for electromagnetic environmental effects (E3) including electromagnetic interference (EMI) and electromagnetic compatibility (EMC).

Key Benefits

> Full life cycle design, development, testing, and integration of electronic control systems, data systems, and flight instrumentation systems products.

> World-class facilities for testing flight software with hardware in the loop to validate products prior to manufacturing and flight.

> An experienced cadre of discipline and systems engineers to assist with integration on all sizes of projects.

> Proven delivery of high-value products for long-term space research.

For more information, please visit www.nasa.gov/centers/marshall/about/business.html

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