National Aeronautics and Space Administration

Marshall Space Flight Center
Propulsion Systems Research and Development Labs

Engineering Solutions for Space Science and Exploration

Propulsion Research and Development Laboratory

The Propulsion Research and Development Laboratory,

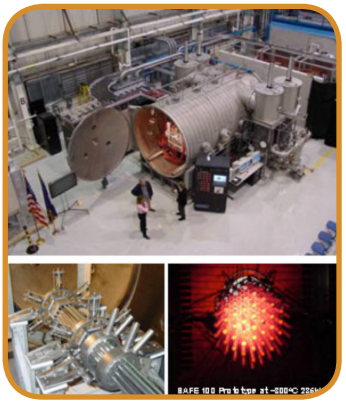
opened in July 2004, is a 600-foot long and 108,000-square-foot facility housing 26 world class labs and support areas ranging in size from 360 to 10,000 square feet each. More than 66,000 square feet of usable space is available for large-scale and small-scale experiments for advanced propulsion research. 12-foot-wide corridors and oversized doors allow large equipment and experiments to be moved easily from one room to another. High-bay areas reaching as high as 55 feet and equipped with 5 to 15-ton bridge cranes also provide the necessary space for large experiments. A dedicated 7.5 to 10 megawatt electrical substation allows the laboratory to conduct high-power experiments. Laboratory areas are equipped with specialized test hardware & diagnostics, experimental chambers and equipment to rapidly evolve concepts to testable configurations. Engineers and Researchers use these facilities to conduct state-of-the-art prototyping and experimental activities investigating a wide range of technologies including nuclear thermal and electric propulsion, pulsed high power system for plasma/fusion propulsion, cryogenic fluid management and launch/in-space vehicle systems.

Nuclear Simulations

Plasma Propulsion

Cryogenic Systems

Early Flight Fission Test Facilities (EFF-TF)



EFF-TF

The EFF-TF located in building 4655, uses non-nuclear tesing methodology to evaluate nuclear power systems technology through prototype development and system level investigations. Work is conducted utilizing coop¬erative efforts with DOE labs, industry, universities, and other NASA centers.

- Risk mitigation & resolution of key issues through hardware testing.
- Enables maximum benefit from non-nuclear testing. Helps minimize cost, schedule, and risk associated with required nuclear testing (e.g. resolve thermal-hydraulic issues prior to first nuclear test).
- Experimentally validates thermal and stress predictions. Enables rapid design iterations early in the program.
- Enables margin and failure testing.
- Enables early, significant, hardware-based milestones.
- Enables testing to rapidly and affordably assess the viability of proposed concepts.
- Accommodate wide range of concepts and power levels including gas cooled, pumped liquid metal, heat pipe, etc. ranging from 10's of watts to 100's of kilowatts

Component Development Area

The Component Development Area (CDA), in MSFC Building 4656, provides a unique propulsion system component technology advancement, hardware assessment, anomaly investigation, trouble-shooting, and repair capability, primarily focused on reliability, operability, and safety of valves.

- Rapid turn-around testing and evaluation
- High risk technology assessment and development
- Hardware investigations, inspections, anomaly trouble-shooting
- Real-time valve modification and assessment
- Multiple fluids, high pressure, cryogenic and high temperatures
- Environmental chamber, two blast-proof test cells, hydrostatic test chamber
- High and low speed data acquisition, Labview controls and data acquisition
- Helium mass spectrometer for leak detection, acoustic leak testing
- Equipment – tubing fabrication, machinery, hydraulic test equipment, cleanroom, welding equipment, lifting/handling capability, hand tools, power tools, measurement/inspection equipment
- Proximity to Valve and Component Shop, and Test Areas

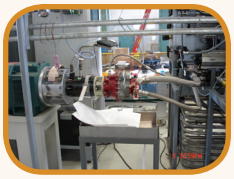
Thrust Vector Control Lab

The Thrust Vector Control Test Laboratory provides unique capabilities to test TVC or other control mechanism components and systems. The Lab is also responsible for anomaly investigations, technology advancement and system/component modeling. The lab hosts capability to complete Development, Qualification and Acceptance Testing of TVC systems and components.

- Hydraulic/Electric Actuator Testing
  - Inertial Load Simulators capable of testing actuators with 63 kip rated load
  - Linear Load Bench-static/dynamic load up to 100 kip
  - Flexible Testing Capabilities for a Wide Range of Actuator Sizes
  - Variable Flow Hydraulic Power Supply Provides Flow up to 500 gpm at 3,200 psi
  - 300 volt, 90 kW Variable Electric Power Supply capable of delivering up to 300 amps for EMA/EHA testing
  - 300 volt, 11 Amp, 1.1 Amp Hours Li-Ion Battery Modules for EMA/EHA testing
- Data Acquisition and Control System
  - Actuator Control System
  - Avionics System Testing
  - Host to 3rd Party Actuator Controllers
  - High-Speed Data Collection
  - Flexible System Built with National Instruments Hardware and LabView Software


Control Room/ Indoor Test Cell


Thruster Solenoid Valve Test


Hydraulic Pump Automatic Acceptance Test Stand


Electro Hydrostatic Actuator


Servo-valve Flow Bench


Inertial Load Simulator

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

National Aeronautics and Space Administration

George C. Marshall Space Flight Center
Huntsville, AL 35812
www.nasa.gov/marshall

www.nasa.gov

FL-2013-09-099-MSFC
G–28367i