National Aeronautics and Space Administration

Marshall Space Flight Center
Propulsion Test Laboratory

Engineering Solutions for Space Science and Exploration

LOX/Methane Technology Demonstrator Test at TS115.

Thermal Protection System Material Test at the Hot Gas Test Facility.

Aluminum Lithium Test Article (ALTA) Structural Test at the Cryostructural Test Facility.

Space Shuttle Scale Model Acoustic Test at TS116.

Pad Abort Demonstrator Test at TS116.

Marshall's Propulsion Test Lab

The Propulsion Test Branch (ET10) possesses the infrastructure, facilities, and expertise required to conduct component, scale model, and system-level propulsion tests of hardware at any technology readiness level. Each test stand provides unique capabilities, allowing the flexibility to test a wide range of experimental, developmental, and flight-ready hardware with minimal buildup.

Test Stand (TS) 115, is used for testing small to medium scale combustion devices, subscale engine systems, chamber and nozzle material tests.

TS116 provides the ability to test high pressure engine systems, injectors, preburners, turbopumps, combustion chambers, igniters, seals, bearings, valves, engine subsystems, and small solids with little facility modification.

The Solid Propulsion Test Facility (SPTF) was designed to support simulation of reusable solid rocket motor (RSRM) combustion environments and provides the ability to test solids up to 100,000 lbf vertically and 172,000 lbf horizontally. This facility also has the capability to test Hydrogen Peroxide (H2O2) test articles.

Solid Rocket Motor Material Test at SPTF.

The Cryostructural Test Facility is ideal for evaluating the structural integrity of tanks and other propulsion components under a variety of conditions using compression, sheer, and tension loads.

The Hydrogen Cold Flow Facility is designed for low pressure (≤ 50 psig) flow tests of hydrogen engine and subsystem components.

The Solar-Thermal Test Facility is capable providing 1 MW/m^2 solar power in a high vacuum environment.

The Environmental Test Facility, TS300, is capable of simulating ascent launch profiles and deep space vacuum for cryogenic fluid management. Testing includes loading cryofuels and managing in-space, full-scale propulsion systems, cryogenic subsystems, superinsulated LH_2 tanks.

The Hot Gas Test Facility is a hydrogen/air combustion-driven environmental test facility capable of generating flow speeds up to Mach 4, convective heating rates from 4 to 50 Btu/ft^2-s, and radiant heating rates up to 30 Btu/ft^2-s in a 16-in × 16-in × 40-in test section.

The Hyperthermal Test Facility is built around a high-powered gas discharge device that produces a steady high-enthalpy flow for use in a variety of R&D testing applications. The 1.5 MW input power and multiple test sections allow for heating rates of up to 15,000 Btu/ft^2-s in a variety of flow environments.

High-pressure gas, liquid propellants and inerts are readily available and include, but are not limited to, hydrogen, methane, oxygen, nitrogen, helium, RP-1, De-Ionized water, and Trielhylaluminum/ Triethylborane (TEA/TEB).

Propulsion Capabilities

Facility	Propellant in psig												
	LH_2	LOX	RP-1	Methane CH_4	LN_2	LHe	LHydro-carbons	GH_2	GHe	GN_2	GOX	Missile Grade Air	High-Pressure H_2O
Test stand 116	6,000–8,500	5,300	2,700	6,000				4,000	4,100	4,200		3,300	4,800
								10,000		8,000			
								15,000		10,000			
Test stand 115	1,500	3,000		3,000				3,800	4,100	4,200	2,400		3,000
Test stand 300	Off load from trailers					Off load from trailers		4,000	4,200	4,200		3,300	
Solid propulsion test facility										4,200		3,300	
Test cells				2,200*				2,200	4,100	4,200	2,400	3,300	
Cryostructural test facility	50/100 (storage)							3,100	4,100	4,200		3,300	
Hydrogen cold flow facility	50						750	3,100	4,100	1,500	2,400	500	
Hot gas and Hyperthermal								3,100		4,200		3,300	

* Available via k-bottles

Key Benefits

- High speed data acquisition systems can record at up to 200,000 samples per second. High speed visible and thermal imaging can record up to 18,600 frames per second. Capabilities for both low and high speed color infrared video.
- Full life-cycle testing and evaluation capabilities from materials development and proof-of-concept articles up to qualification of integrated systems are available.
- Budget analysis and risk management are available in-house.
- Workforce and facility flexibility meet customer needs.

For more information, contact nicholas.i.case@nasa.gov

National Aeronautics and Space Administration

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

www.nasa.gov

NP-2021-03-06-MSFC