

# Technology Opportunity

Technology Transfer &amp; Partnership Office

TOP3-00223

## Plum Brook Facilities Sandusky, Ohio

### Facility Description

**The Space Power Facility (SPF)** is the world's largest environmental simulation chamber measuring 100 ft in diameter by 122 ft high. This facility was designed to test nuclear and nonnuclear space hardware in a simulated space and or planetary environment.

**The Spacecraft Propulsion Facility (B-2)** is a one-of-a-kind facility capable of testing full-scale, upper-stage launch vehicles and rocket engines under simulated high-altitude conditions. The engine or vehicle can be exposed for indefinite periods to low ambient pressures, low background temperatures, and dynamic solar heating that simulate the environment the hardware will encounter during orbital or interplanetary travel.

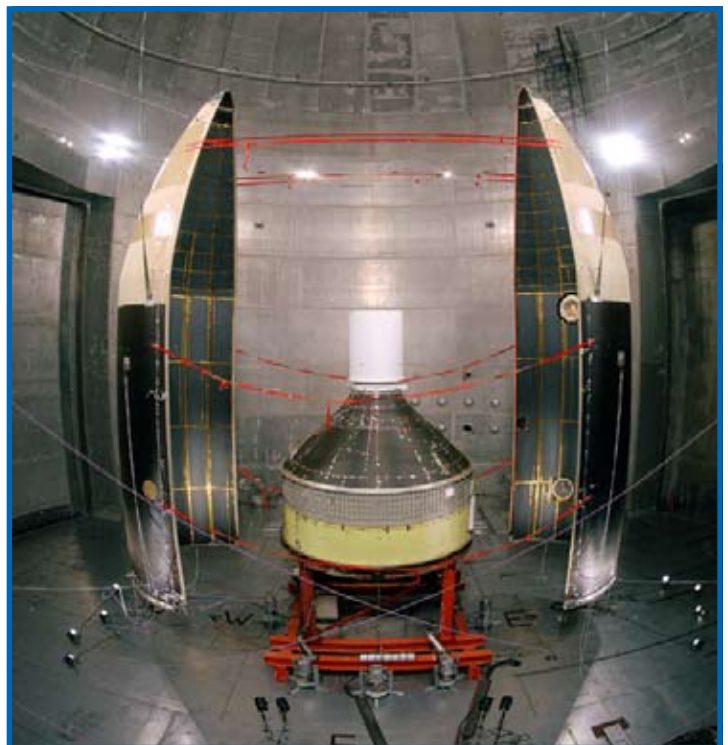
**The Cryogenic Propellant Tank Facility (K-Site)** is a space environment test chamber essential in the development of advanced insulation systems and on-orbit fluid transfer techniques for flight weight cryogenic fuel tanks and insulation systems. The facility is 25 ft in diameter and has a 20-ft-diameter door allowing large-scale liquid hydrogen (LH<sub>2</sub>) experiments to be conducted safely.

**The Hypersonic Tunnel Facility (HTF)** was originally designed to test nuclear thermal rocket nozzles. HTF is a hypersonic (Mach 5, 6, and 7) blowdown, nonvitrated freejet and direct-connect facility that tests large-scale hypersonic air-breathing propulsion systems. This facility contains a large "stand-alone" experimental infrastructure that can be readily reconfigured to test a variety of ground test applications including high-energy, high-risk testing.

**The Cryogenic Components Laboratory (CCL)** is part of the Cryogenic Test Complex. It is capable of small-scale testing of components such as bearings, seals, and related equipment under cryogenic operating conditions. The CCL also provides capabilities for the densification and conditioning of cryogenic propellants. All test activities at the CCL are conducted from a 7500-sq-ft remote-control room equipped with programmable logic controllers and a high-speed data acquisition system.

### Facility Benefits

- Features four unique, world-class facilities
- Remote test installation site
- Large amount of acreage for diversity in testing
- Provides safe, cost-effective, responsive, and reliable performance of research testing
- Accommodates NASA, private industry, and other government research and development programs for space-flight hardware.
- Highly qualified staff of technicians, engineers, and operators
- Established history of high customer satisfaction



*Boeing Delta IV payload fairing test.*

## NASA Programs and Projects Previously Supported

- Mars exploration rover airbag landing system
- International Space Station radiator deployment
- High-energy experiments
- Rocket-fairing separation tests
- Integrated System Test of an Air-Breathing Rocket (ISTAR) Direct Connect Combustion Rig
- High-altitude balloon payloads

## Non-NASA Programs and Projects Supported

- European Space Agency Mars Lander System
- European Space Agency Ariane 5 Fairing Separation
- Ion Engine Development
- Extended Expendable Launch Vehicle (EELV) Payload Fairing Separation

## Contacts

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Technology Transfer & Partnership Office

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<http://technology.grc.nasa.gov>

## Facility Testing Information

<http://facilities.grc.nasa.gov>

## Aero Facility Test Capabilities

HTF Hypersonic	
Test Section free-jet Mach Number	5, 6, 7
Simulated Altitude, ft	68,000 to 120,000
Test Section Reynolds Number/per ft	$0.97 \times 10^6$ to $2.3 \times 10^6$
Dynamic Pressure, lbf/ft <sup>2</sup>	300 to 2200
Test Section Total Temperature, °R	Ambient to 3900
High-Pressure Gas Storage, scf	GN <sub>2</sub> : 675,000 at 45,000 psi GO <sub>2</sub> : 386,000 at 22,000 psi
Fuels	Gaseous H <sub>2</sub> ; Liquid Hydrocarbon (jet fuels); Natural gas
Other capabilities	Direct-Connect Testing at SLS to Mach 7 Conditions

## Space Facility Test Capabilities

	SPF	B-2	K-Site
Dimensions (diameter by length)	100 by 122 ft	35 by 55 ft	25 ft diameter
Vacuum system	(10) 52-in. cryopumps (16) 48-in. ODP	(32) 48-in. ODP	(4) 35-in. ODP
No load pressure, torr	$1 \times 10^{-6}$	$5 \times 10^{-7}$	$5 \times 10^{-7}$
Pumping speed liter/sec, air	1,300,000	350,000	150,000

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