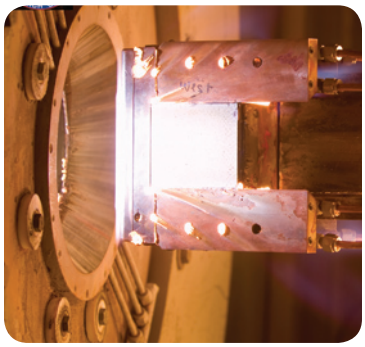
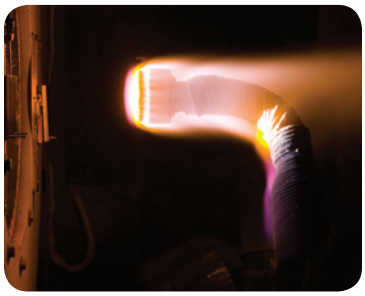
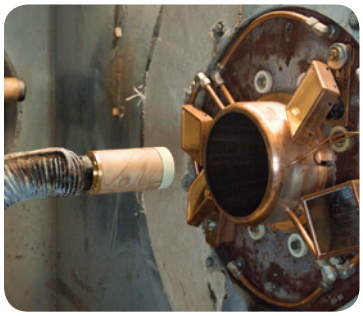
National Aeronautics and Space Administration

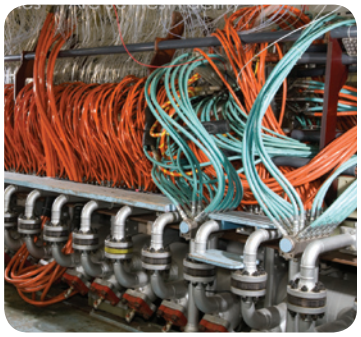
NASA AMES RESEARCH CENTER:
THE ARC JET COMPLEX

A Part of NASA's Strategic Capabilities Assets Program









The NASA Ames Arc Jet Complex is the Nation's highest-powered arc-heated wind tunnel. Its unique capabilities enable the development and testing of thermal protection system (TPS) concepts and materials from the initial stages of design to the sustaining engineering of operational vehicles. Each test section provides a wide range of test environments appropriate to the heating, pressure, and energy regime experienced by high-velocity entry vehicles at high altitude. Every TPS material flown by NASA has been tested in the Ames Arc Jet Complex.

Four individual test facilities, supported by common electrical, vacuum, and cooling systems, comprise the Arc Jet Complex. Premixed air, heated to extreme temperature by a high-power DC discharge, expands through user-selected conical, semi-elliptical, and channel nozzles to hypersonic velocities with enthalpies similar to those experienced by the entry vehicle.

Models having up to a 36-inch diameter can be tested in stagnation or panel configurations for performance screening and thermal response assessment. The Arc Jet Complex data system records facility engineering data as well as a full range of embedded and exterior sensor measurements from thermocouples, pressure probes, optical pyrometry, and advanced imaging techniques.

FACILITY BENEFITS

- Hypersonic flow over test article
- Heating, pressure, and enthalpy tunable for simulated heating profile
- Sustained test duration, allowing full development of material response
- Test articles of various configurations (up to a 36-inch diameter)
- Multiple tests per day

FACILITY APPLICATIONS

- TPS material screening and qualification tests
- Thermal response model validation
- Heating profiles for entry and ascent heating simulation
- TPS instrumentation design development test and evaluation (DDT&E) and calibration

INSTRUMENTATION AND DATA SYSTEMS

Facility data	Current, mass flow, voltage, chamber pressure
Recorded instruments	Thermocouples, pressures, optical pyrometers
Imaging	HD video, infrared
Hardware data channels	96 (Analog)
Data rate	60 Hz

FACILITY CHARACTERISTICS

Test Section	Gas	Power (MW)	Nozzle Exit (inches)	Mach Number	Enthalpy (btu/lb)	Pressure (atm)	Heating* (btu^2/sec)
AHF	Air N_2	20	12, 18, 24, 30, 36	4-12	500 to 14,000	0.005 to 0.125, 0.001	20 to 225, 0.05 to 22
AHF/Huels	Air N_2	20	12, 18, 24, 30, 36	4-12	1,500 to 4,500	0.02 to 0.3	20 to 225
IHF	Air	60	6,13, 21, 30, 41 Semi-elliptical 8 x 32	5-7	3,000 to 20,000	0.010 to 1.2 0.0001 to 0.02	50 to 1500, 0.5 to 45
PTF	Air	20	Semi-elliptical 4 x 17	5.5	3,000 to 15,000	0.0006 to 0.05	0.5 to 30
Turbulent Flow Duct (2 x 9)	Air N_2	12	Channel 2 x 9	3.5	1,300 to 4,000	0.02 to 0.15	2 to 60

* Heating rate is a cold-wall, fully catalytic value on a 4-inch diameter hemisphere

CONTACT INFORMATION

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