NASA Ames Aerodynamic Heating Facility (AHF)

Stagnation point test of PICA thermal protection material in the AHF facility.

Mission: The Aerodynamic Heating Facility is designed to match heating rates of Earth or planetary hypersonic entry to enable the selection, validation and qualification of thermal protection systems (TPS) and materials.

Location: NASA Ames Research Center, Moffett Field, CA, United States.

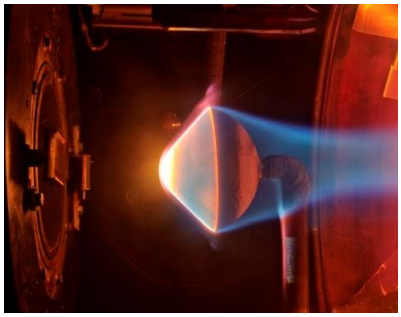
Type of tunnel: Huels and constricted arc heater facility.

Test gas	**Air, N_2, O_2**	**Test duration (min)**	**≤ 30**	
Nozzle exit (mm) With 25.4 and 38.1 mm throats	Conical (θ/2=8°), Ø 178, 305, 457, 610, 762, 914	**Test article type**	Stagnation point	Wedge
Nozzle exit (mm) with 57.1 mm throat	Conical (θ/2=15°), Ø 127,191,254,381,508,635,762,889,1016	**Test article type**	Stagnation point	Wedge
Input power (MW)	10 and 20	**Test article size (mm)**	< Ø 350	660X660
Bulk enthalpy (MJ/kg)	2-33	**Surface pressure, kPa**	0.5-45	0.1
Flow rates (kg/s)	0.05-0.7	**Heating rate (kW/m^2)***	90 - 9000	0.6-250

*Cold wall fully catalytic surface on a 102-mm Ø sphere

Instrumentation:

- Hot wall temperature: thermocouples, IR pyrometry and radiometry
- Pressure: Pitot/static
- Cold wall heat flux: calorimetric probes of Gardon and slug types and null-point calorimetry
- Optical diagnostics: optical emission spectroscopy (OES), laser induced fluorescence (LIF)

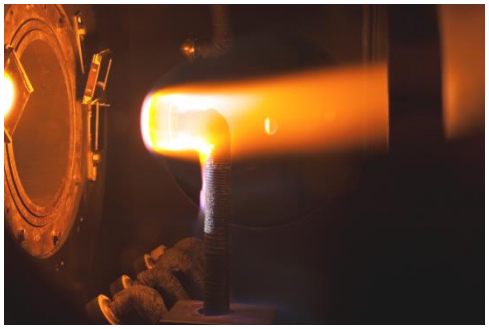


Full scale SPRITE capsule geometry at simulated entry conditions

References:

Grinstead, J.H., Harris, C.L., Yeung, D., Scott, G.P., Porter, B.J., Graube, P., and Greenberg, R.B., "Next-generation Laser-induced Fluorescence Diagnostic Systems for NASA Arc Jet Facilities," *In 47th AIAA Aerospace Sciences Meeting Including The New Horizons Forum and Aerospace Exposition*, AIAA 2009-1521, January 2009, Orlando, FL.

Terrazas-Salinas, I., et. al., "Test Planning Guide for NASA Ames Research Center Arc Jet Complex and Range Complex," Document A029-9701-XM3 Rev.C., April 2009.



AHF stagnation point test samples, calorimetric and pitot probes.

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