NASA Turbulent Flow Duct (TFD)

Mission: The Turbulent Flow Duct is designed to produce high enthalpy supersonic turbulent flow over the surface of a wall-mounted panel in the constant-area section of a duct.

View of the TFD test section

Location: NASA Ames Research Center, Moffett Field CA 94035-1000, USA

Type of tunnel: Huels (Linde) arc heater facility.

Test gas	Air, N_2	**Test duration (min)**	≤ 30
Nozzle exit (mm)	51x229	**Test article type**	Flat plate
Input power (MW)	12	**Test article size (mm)**	203x254 or 203x508
Bulk enthalpy (MJ/kg)	3 - 9.5	**Surface pressure (kPa)**	2-15.2
Shear Stress (Pa) - estimate	50 - 720	**Heating rate (kW/m^2)**	23-681

Instrumentation:

- Hot wall temperature: thermocouples, IR thermography and radiometry
- Pressure: static
- Cold wall heat flux: Gardon gauges

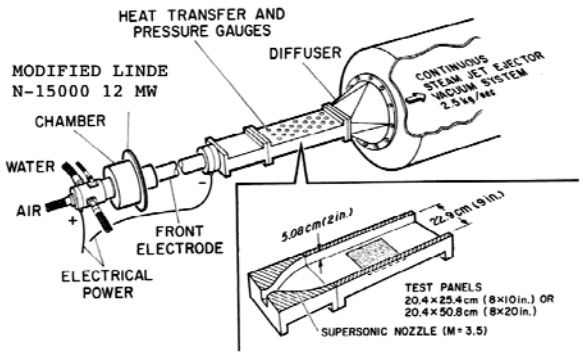
Turbulent flow duct test model prior to (left) and after testing (right).

References:

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.

Covington, M.A.; and Vojvodich, N.S.: "Turbulent Flow Studies in Two Arc-Heated Duct Facilities." J. Spacecraft and Rockets, vol. 9, no. 6, June 1972, pp. 441-447.

Alunni, A.L.; Olson, M.W.; Gökçen, T.; and Skokova, K.A.:"Comparisons of Surface Roughness in Laminar and Turbulent Environments for Orion Thermal Protection System." In *42nd AIAA Thermophysics Conference*, AIAA 2011-3776, June 2011, Honolulu, HI



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