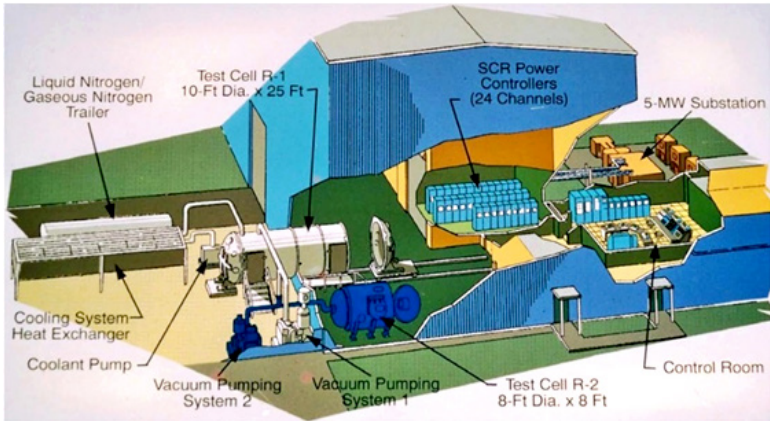
Radiant Heat Test Facility (RHTF)

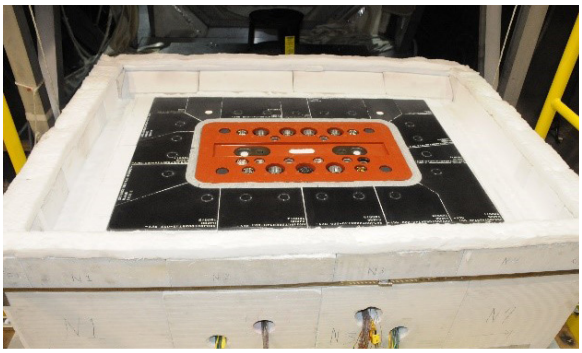
The Johnson Space Center constructed the Radiant Heat Test Facility (RHTF) in 1975 to perform development and certification tests for the Orbiter thermal protection system (TPS). This facility has been maintained continuously to the present time to support NASA test programs such as the Aerobraking Flight Experiment and X-33, and more recently, evaluation and development of TPS systems for the Orion and Commercial Crew vehicles. Two test chambers, R1 and R2, are equipped with vacuum pumps and heater assemblies to produce a variable pressure profile and heat fluxes for simulating atmospheric re-entry conditions. The facility is currently enhancing the capability to test ablative TPS materials and also integrating test fixtures to induce mechanical loads onto test specimens simultaneously with the heating phase of the test.



Layout of Radiant Heat Test Facility (RHTF) with Major Systems

R1 Test Cell

Test Cell R1 is the larger chamber (10ft diameter) and has a heater assembly with heater surface area measuring 74" x 110". The heater assembly can accommodate flat test panels and can also be configured into a curved contour to follow the moldline of external surfaces on the space vehicle. The heater assembly is capable of providing a uniform heat flux over the test panel surface area or generate variable heat fluxes utilizing up to 22 independently controlled heater zones. Total power available to the R1 heater assembly is up to 5 Megawatts. This chamber has tested the full-scale model of the Orbiter nose-cap assembly and large substructures of the external features on the Orion TPS system.

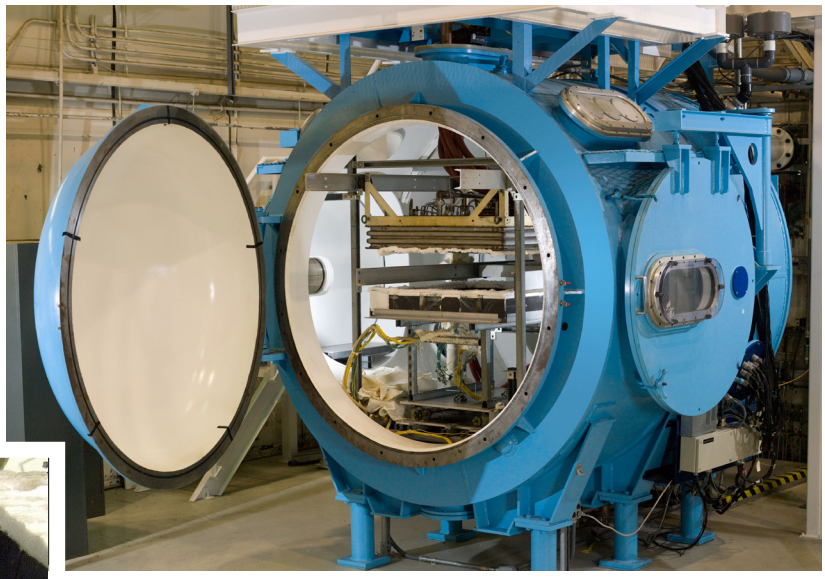


(Top) Orion External Fluid Interface Panel Tested in R1

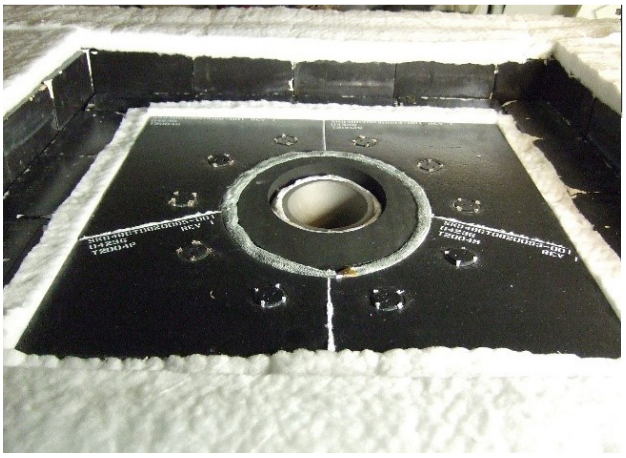
(Bottom) R1 with End Bell Open

R2 Test Cell

The R2 Test Cell is an 8ft diameter chamber and contains a heater assembly with a flat heater surface area of 26” x 30” utilizing a single controller to produce a uniform heat flux. This smaller chamber is ideal for quick turnaround, TPS material evaluation, and material characterization test programs. All Orbiter TPS tile materials have been tested in R2 and the thermal response of the majority of external features on the Orion TPS backshell have been evaluated in R2 in recent years.



R2 Chamber with Test Panel Installed



Orion Thruster with Scarfed Nozzle Tested in R2

Test Cell Parameters

	R1 Test Cell	R2 Test Cell
Chamber Dimensions	10' x 18'	92" x 92"
Article Size	74" x 110"	26" x 30"
Gas	Air, N2	
Pressure Range	0.1 - 760 torr	
Temperature Range	300 ºF - 3200 ºF	
Radiative Heating Rate	0 to 90 BTU/ft^2*sec Entry Profile 22 Zones	0 to 90 BTU/ft^2*sec Entry Profile 1 Zone
Test Article Type	Flat, Radically Curved	Flat, Small Curvature
Heater Power	1 - 5 MW	

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JSC Engineering Directorate
jsc-ea-partnerships@mail.nasa.gov

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