

**Current Test Capabilities of NASA Langley's
Arc-Heated Scramjet Test Facility**

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ABSTRACT

The Arc-Heated Scramjet Test Facility at NASA Langley Research Center has demonstrated itself repeatedly as a key contributor to fundamental hypersonic research and scramjet engine technology development in the Mach 4.7 to 8 range. Since its inception in the 1970's, the facility has hosted numerous scramjet engine configurations that explored the performance and operability of airframe-integrated hydrogen-fueled scramjet flow path concepts, successfully maturing both analysis tools and design technique and methodology for hypersonic propulsion. Contributions to major programs include extensive tests of the hydrogen-fueled NASP and Hyper-X scramjet engines, and the hydrocarbon-fueled HIFiRE Flight 2 scramjet flow path, in addition to fundamental in-house research. The facility capabilities have expanded to include direct-connect flow path support, gaseous hydrocarbon fuels, dynamic trajectory simulation and extension of flight simulation down to Mach 2.2. The low-Mach upgrades include increased air flow rate and controls capability and two new low-Mach nozzles (Mach 2.2 and 3.5). The facility recently completed verification of the new operational range through successful envelope expansion tests with the Mach 2.2 nozzle. With these new modifications, the operating envelope for the facility is now Mach 2.2 – 8.0(+), with a demonstrated dynamic pressure simulation of 2000 psf at the low end, and margin available for even more. Lastly, a continuous run time of over 5 minutes has been demonstrated, indicating that run time is limited only by test hardware or back-pressure requirements. This paper will provide a detailed description of these previously unreported upgrades and expanded simulation capabilities.

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