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A MODULAR PLATFORM FOR INTRUSIVE DIAGNOSTICS AND TPS TESTING IN THE ONR-UTA ARC-JET FACILITY

By

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Abstract

This work presents the challenges, design and its methodology, and successful experimental implementation of a modular insertion platform for intrusive diagnostics and Thermal Protection Systems (TPS) testing in the ONR-UTA Arc-Heated Wind Tunnel "Leste" facility. The harsh conditions typical of arc-heated facilities (hypersonic, high-enthalpy, chemically-reacting, long duration exposure) as well as time of travel requirements of certain calorimeters and other installed instrumentation, present several challenges to the design of insertion platforms. A detailed analysis of the aerothermal loads and resulting thermal management solutions as well as details of the system dynamics and controls are discussed and integrated in the design process. Specific design solutions for modular platform and its ancillary instrumentation have been first identified and then developed. The resulting platform features a multi-axis translating carriage and actively-cooled insertion arms for continuous arc-jet operation. It is capable of hosting a variety of intrusive test articles. This platform has been manufactured, integrated, and successfully tested in the ONR-UTA arc-jet "Leste" facility.