

METHODOLOGY FOR TPS TESTING IN THE OFF-STAGNATION REGION

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The objective of the project is the development of a methodology to duplicate the heat flux to the wall found outside the stagnation region in a space vehicle during the reentry, into heat flux to a probe in a high enthalpy facility on ground. The project has applications for TPS design: sizing, study of the catalytic jump, gaps and steps in between tiles.

The work is divided in two parts. In the first one, a test methodology is developed. A parameter has been found to relate the conditions in flight to the conditions in ground test. This parameter has been tested in CFD simulations with different conditions: NEQ, cNEQ, FF and LTE. Especially, good results were obtained in NEQ and cNEQ when static pressure and total enthalpy are the same in flight and in ground test.

The second part is dedicated to experimental work. New hardware has been designed, manufactured and tested using the Plasmatron. The tests validated the design and demonstrated the capacity of the new hardware of giving reliable results.

Together, the methodology and the new hardware, provide new means of testing in the off-stagnation region that are of great importance for TPS design.

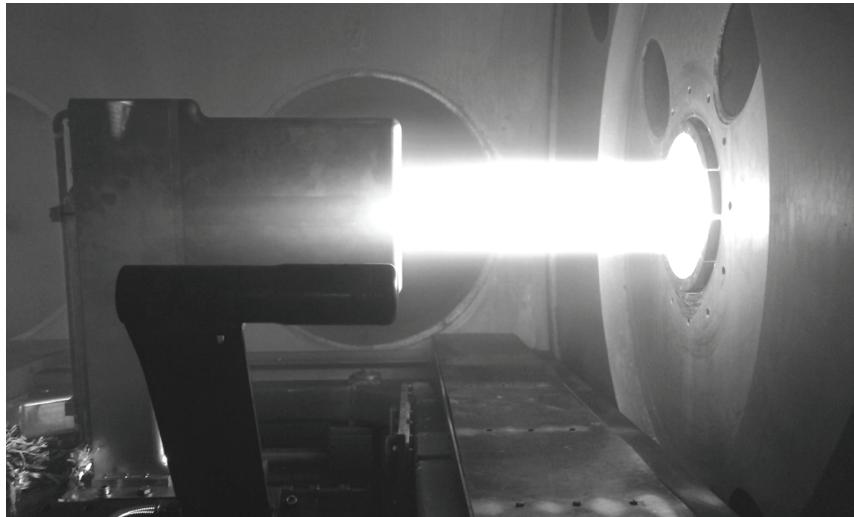


Figure 1: Testing of the new hardware in the Plasmatron