Abstract

Fabrication and Testing of Low Cost 2D Carbon-Carbon Nozzle Extensions at NASA/MSFC

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Subscale liquid engine tests were conducted at NASA/MSFC using a 1.2 Klbf engine with liquid oxygen (LOX) and gaseous hydrogen. Testing was performed for mainstage durations ranging from 10 to 160 seconds at a chamber pressure of 550 psia and a mixture ratio of 5.7. Operating the engine in this manner demonstrated a new and affordable test capability for evaluating subscale nozzles by exposing them to long duration tests.

A series of 2D C-C nozzle extensions were manufactured, oxidation protection applied and then tested on a liquid engine test facility at NASA/MSFC. The C-C nozzle extensions had oxidation protection applied using three very distinct methods with a wide range of costs and process times: SiC via Polymer Impregnation & Pyrolysis (PIP), Air Plasma Spray (APS) and Melt Infiltration. The tested extensions were about 6” long with an exit plane ID of about 6.6”.

The test results, material properties and performance of the 2D C-C extensions and attachment features will be discussed.