

Nondestructive Evaluation of the J-2X Direct Metal Laser Sintered Gas Generator Discharge Duct

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The J-2X program at NASA's Marshall Space Flight Center (MSFC) procured a direct metal laser sintered (DMLS) gas generator discharge duct from Pratt & Whitney Rocketdyne and Morris Technologies for a test program that would evaluate the material properties and durability of the duct in an engine-like environment. DMLS technology was pursued as a manufacturing alternative to traditional techniques, which used off nominal practices to manufacture the gas generator duct's 180 degree turn geometry. MSFC's Nondestructive Evaluation (NDE) Team performed radiographic, ultrasonic, computed tomographic, and fluorescent penetrant examinations of the duct. Results from the NDE examinations reveal some shallow porosity but no major defects in the as-manufactured material. NDE examinations were also performed after hot-fire testing the gas generator duct and yielded similar results pre and post-test and showed no flaw growth or development.

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