Stress Free Temperature Testing and Residual Stress Calculations on Out-of-Autoclave Composites

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Future launch vehicles will require the incorporation large composite parts that will make up primary and secondary components of the vehicle. NASA has explored the feasibility of manufacturing these large components using Out-of-Autoclave impregnated carbon fiber composite systems through many composites development projects. Most recently, the Composites for Exploration Project has been looking at the development of a 10 meter diameter fairing structure, similar in size to what will be required for a heavy launch vehicle. The development of new material systems requires the investigation of the material properties and the stress in the parts. Residual stress is an important factor to incorporate when modeling the stresses that a part is undergoing. Testing was performed to verify the stress free temperature with two-ply asymmetric panels. A comparison was done between three newly developed out of autoclave IM7/Bismalieimide (BMI) systems. This paper presents the testing results and the analysis performed to determine the residual stress of the materials.