Polymer-Based Additive Manufacturing Guidelines for Aircraft Design and Certification

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ABSTRACT

A standardized qualification framework and database for advanced materials, such as additively manufactured materials, is critical to the design and insertion of these materials in aerospace or other applications. Leveraging the experience and lessons learned from the National Center for Advanced Material Performance (NCAMP) and the Composite Materials Handbook – 17 (CMH-17) qualification databases, a new qualification program for polymer additive materials has been developed utilizing several currently available standards and test methods as well as modifying existing methods to adapt to the unique nature of AM.

The applicability of several mechanical test methods to polymer additively manufactured (AM) materials has been evaluated throughout this program. Many of the mechanical test methods required for qualification are currently not available for polymer AM materials. An overview of the background research on processing and test method trial results will be presented.

As part of this collaborative research effort in conjunction with America Makes, new material and process specifications have been developed to fit the unique needs of polymer AM materials. A summary of qualification results for the selected material and process, Stratatsys ULTEM 9085 manufactured on a Fortus 900MC machine, along with a review of the framework documents, specifications and recommended test plan for polymer additive materials, will also be presented.