**Structural Integrity Considerations for Additive Manufacturing and**

**Importance of “Lessons Learned”**

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**Abstract**

Over the past several decades Aerospace industry has accumulated a very significant experience in qualification and certification (Q&C) of advanced manufacturing processes and process-intensive material (PIM) technologies across a broad range of material types and processes. This experience has shown that Q&C considerations for high criticality application of such materials where structural integrity consideration play a key role have presented some of the most significant challenges.

Metal additive manufacturing (AM) is a good example of PIMs and is still a relatively new technology, with very limited full-scale production and field experience in Aviation. However, the rapidly expanding use of AM, heading towards the safety-critical applications, prompts fatigue and damage tolerance (F&DT) considerations, both to ensure product safety and to meet certification requirements. Most of the current “lessons learned” for AM are based on either academic R&D, or industry development work (the latter typically being proprietary). While such work is very important and helps with identification of AM-specific properties and attributes, and the means of addressing them in the context of Q&C, it cannot replace decades of production and field experience for more conventional forms of structural alloys, e.g. castings, wrought products, powder metallurgy etc. Thus, examining some of the relevant lessons learned for such legacy alloy systems can help with shaping the appropriate F&DT framework for metal AM materials. Some of these considerations, illustrated by specific examples, will be discussed in this presentation.