

ADVANCED INTEGRATED COMPOSITE TAILCONE PROJECT OVERVIEW AND DEMONSTRATION STRUCTURE*

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Abstract

The ADVITAC (Advanced Integrated Tail Cone) project deals with the development, design and manufacture of a composite tail cone. The innovation relates to both the integration of the Auxiliary Power Unit (APU) and relevant issues of acoustic and thermal performance, as well as to structure functionality and the associated mechanical and electrical properties.

The manufacture of the composite component is based on automated dry fibre tow placement and resin infusion, a merging of technologies that has the attractive features of accurate control of fibre orientation combined with the low cost of liquid moulding processes. The high in-plane properties of components manufactured using this technology are further enhanced in the through thickness direction via the local utilisation of tufting in critical areas of the component (e.g. stiffeners).

The required electrical functionality of the tail cone is to be accomplished via the use of appropriate nanocomposites, either as carbon nanotubes added to the matrix resin prior to infusion or as buckypapers incorporated on the outer surface of the laminate. The development of hybrid buckypaper incorporating both nanofibres and nanoclays is the basis for the enhanced of the thermal resistance of the structure, whilst computer simulation is used to evaluate and optimise the acoustic performance of the integrated component. The combination of the various technologies involved in the project presents unique synergy opportunities in the context of manufacture. These are further enhanced by the integration of on-line monitoring technologies based on fibre optic sensors capable of following resin flow and cure as well as measuring the multiaxial state of strain during operation.

The developments in this project and the associated design efforts are targeted at achieving a significant weight reduction of the structure of the tail cone, combined with lower process costs.

Keywords Tailcone; APU integration; dry fiber placement; Acoustic; Air inlet; Exhaust.