

TRACK 1: STRUCTURES AND ADDITIVE MANUFACTURING

“OPTIMIZING AIRCRAFT STRUCTURES FOR THE LIFE CYCLE: THE SPECIAL CASE OF COMPOSITES”

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ABSTRACT

The main objective of this paper is to present a model that combines economic and environmental assessment tools to support composite material selection for aircraft structures in the early phases of design. The presentation will further show the application of the tool for an aircraft elevator.

An integrated life cycle cost (LCC) and life cycle assessment (LCA) methodology was used as part of the sustainable design approach for the laminate stacking sequence design. The model considers the use of carbon fiber reinforce plastic prepreg and processed via hand layup-autoclave, but it can accommodate other materials and processes as well. The model was applied to a cargo aircraft elevator case study by comparing six different laminate configurations and two different carbon fiber prepreg materials across aircraft’s entire life cycle.

The results show that the combination of LCA with LCC is a worthwhile approach for comparing different laminate configurations in terms of cost and environmental impact to support composite laminate stacking design by providing the best trade-off between cost and environment. Significant reductions in life cycle cost and environmental impact can be obtained without loss of structural performance by mapping the design space and deciding based on the most relevant trade-offs.

BIOGRAPHY OF SPEAKER



Michael Ong is a researcher in Prof Arlindo Silva’s research group at the Singapore University of Technology & Design. His research is about improving the design and lifecycle analysis process of Aerospace Composite Structures.

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