Department of the Navy SBIR/STTR Transition Program

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NAVAIR 2017-718

Topic # N10B-T050
MULTI SCALE MODEL OF PIN-REINFORCED FOAM CORES
Materials Research & Design

WHO

SYSCOM: NAVAIR

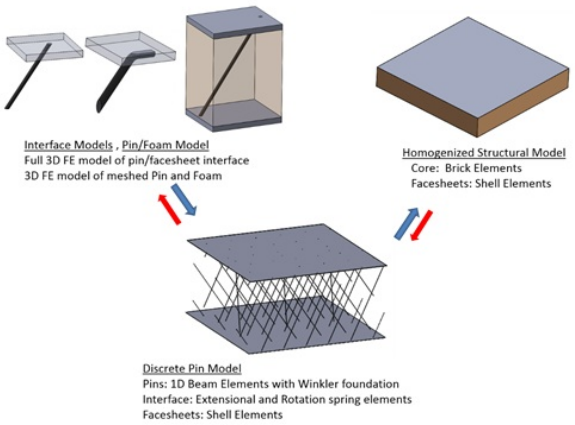
Sponsoring Program: PMA-299, PMA-261

Transition Target: Future Vertical Lift

TPOC:
(301)342-9351

Other transition opportunities: The successful development of a multi-scale model for pin-reinforced foam cores will be of direct interest to material fabricators and material integrators which currently utilize honeycomb structures.

Notes: Sequential Multi-Scale Model of Pin-Reinforced Foam Core for Use in Lightweight Composite Sandwich Structures



WHAT

Operational Need and Improvement: Lightweight, structurally efficient military aircraft employ components that rely heavily on honeycomb sandwiches due to their high stiffness-and strength-to-weight ratio. However, honeycomb sandwiches are difficult to fabricate over complex contours and are prone to water ingress resulting in performance degradation. The honeycomb material is difficult to shape, which limits the aerodynamic efficiency of the aircraft structures. Furthermore honeycomb properties are uniform so the weight of the structure is controlled by peak loads and critical locations. Both of these issues (shape and weight) can be addressed by developing a multi-scale material model capable of efficiently designing sandwich structures that employ pin-reinforced foam core.

Specifications Required: Innovative high fidelity modeling tool is sought that can be used to design structures with pin-reinforced foam cores, specifically X-Cor™ and K-Cor™, thus reducing the reliance of testing based point designs for structures made of these material.

Technology Developed: A high fidelity modeling tool is developed for X-Cor™ and K-Cor™ that can be used for constructing engineered structures meeting critical design parameters.

Warfighter Value: The value for developing an accurate multi-scale model for pin-reinforced foam cores lies in giving confidence in the design of advanced aircraft structures with high strength-to-weight ratio requirements. The alternative may result in the unnecessary trial and error approach which will likely require multiple rounds of fabrication and experimentation tasks

WHEN

Contract Number: N68335-17-C-0066 **Ending on:** April 20, 2019

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Multi Scale Model – Theoretical and Design Tool Development	Low	Successful Correlation with Available Data	2	November 2017
Multi Scale Model - Design Tool Optimization	Low	Apply multi-scale model to variety of foam core materials and successfully correlate with newly measured data	3	January 2018
Synergistic Multi Scale Model – Design Tool	Med	Data is automatically passed between the scales in a back and forth (two way) manner	4	April 2019

HOW

Projected Business Model: MR&D's anticipated business model for the developed multi-scale material model will be to work with material fabricators currently developing pin-reinforced foam cores in order to assist them in producing optimized foam structures capable of meeting their customer's needs.

Company Objectives: Although MR&D is not the owner of the material that is being evaluated with the developed multi-scale material model, the framework for such a tool would be of interest to any material fabricator looking to develop lightweight composite sandwich structures.

Potential Commercial Applications: Lightweight composite sandwich structures would be of direct interest to manufacturers of commercial air- and rotorcraft. The successful development and demonstration of a multi-scale material model will directly benefit such applications by providing a powerful tool capable of efficiently designing materials to meet operational design requirements.

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