

# DESIGN AND FABRICATION OF VARTM FABRICATED SKIN PANELS WITH INTEGRATED HOLLOW STIFFENERS

Pit Schulze, John Tierney, Dirk Heider, and J.W. Gillespie, Jr.

University of Delaware . Center for Composite Materials .

## MOTIVATION

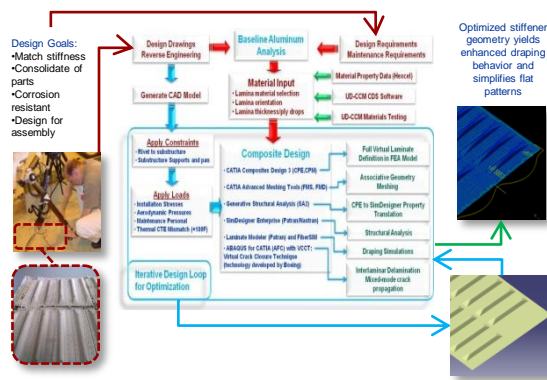
- ◆ Provide design and fabrication methodology for cost-effective body part replacement on aging aluminum aircraft panels



- ◆ Design for matching stiffness response, weight reduction, parts consolidation and increased corrosion resistance
- ◆ Develop processing approach to integrate hollow stiffeners matching the baseline geometry
- ◆ Evaluate VARTM-fabrication of composite replacement for aluminum wing skin panel

## DESIGN AND OPTIMIZATION

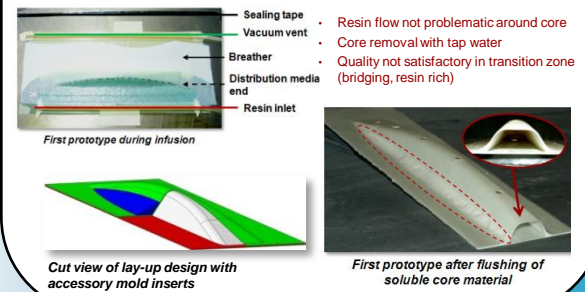
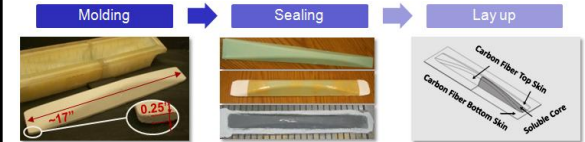
- ◆ Reverse engineered geometry of existing part
- ◆ Design and optimization of composite part in CAD/FEA environment to match response



Optimized stiffener geometry yields enhanced draping behavior and simplifies flat patterns

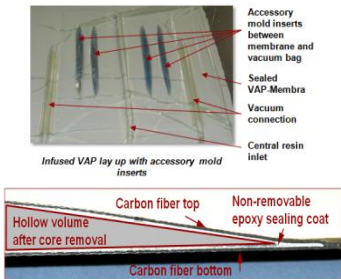
## SUB-SCALE PROTOTYPE

- ◆ Preparation of water-soluble core material

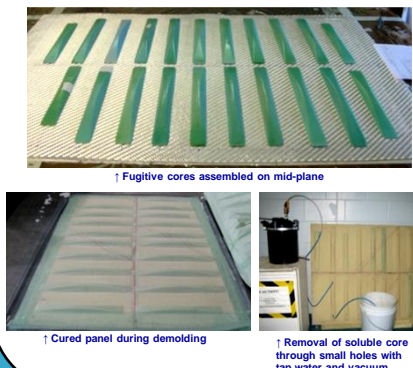


## SUB-SCALE OPTIMIZATION

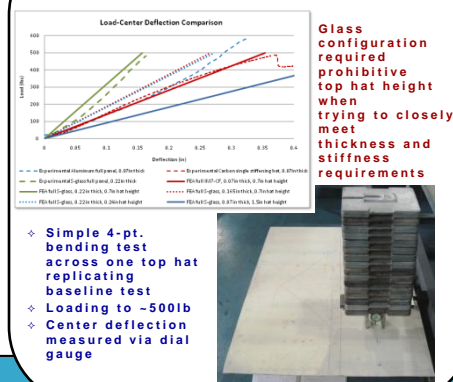
- ◆ Introduction of inserts to ensure proper compression in transition zone
- ◆ Infusion via VAP-process with optimized distribution media placement
- ◆ Non-soluble core sealer



## FULL-SCALE PROTOTYPE



## FULL-SCALE EVALUATION



## CONCLUSIONS

- ◆ VARTM-infusion of single component hollow-stiffened composite panel proven in full-scale prototype
- ◆ Water-soluble core material introduces biggest processing challenges, especially reliable sealing against resin uptake
- ◆ Foundation for efficient VARTM-based composite replacement of aging aluminum aircraft panels

## ACKNOWLEDGEMENTS

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