DEVELOPMENTS USING A RECONFIGURABLE TOOLING SYSTEM FOR COMPOSITE REPLACEMENT COMPONENTS

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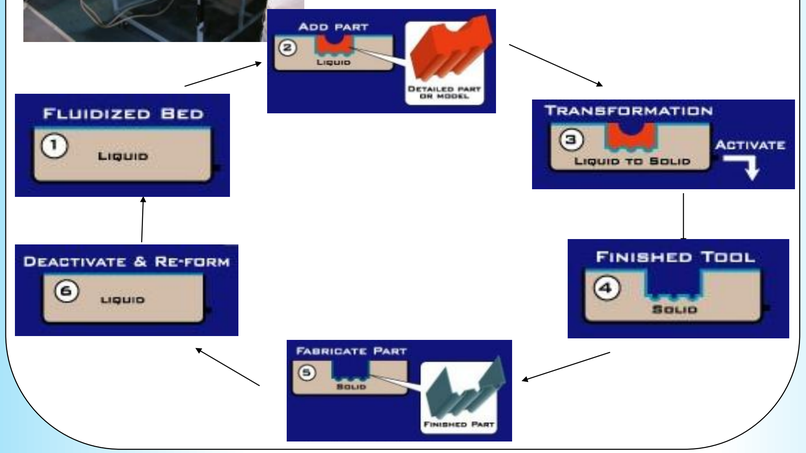
PROGRAM OVERVIEW

- ♦Improved System Design
  - New Tooling Design
- ♦Candidate parts for repair
  - HMMWV hatch door
  - Aircraft Parts
- ♦Develop repair strategies
  - Develop repair procedures
  - Carry out and prove out repair on candidate parts
- ♦Technology transitions
  - Transition expertise to Nevada Schools
  - Army and Navy programs
  - Joint publication on repair approaches

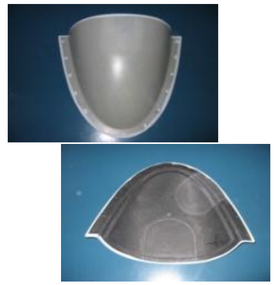
RECONFIGURABLE TOOLING OVERVIEW

This is a reconfigurable tooling that allows rapid creation of complex geometry molds used in prototyping and manufacturing of composites.

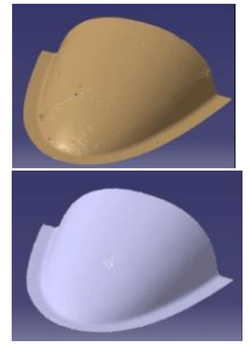


TOOLING CONCEPT

Original Part

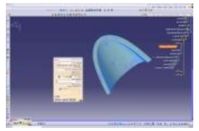


Scan



Point cloud processing result in the CATIA surface mode

Flat Pattern creation



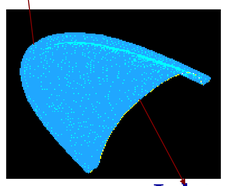
Producibility study results in ply-to-ply flat patterns

INFUSION SIMULATION - LIMS

Fundamental Problem Data

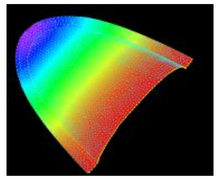
- ♦Preform: carbon fibers, Kxx=1.99 x 10-11m2, Kyy=1.83 x 10-12m2,Vf=50%.
- ♦Distribution media: Roxford, K=7 x 10-9m2, h=1.3 mm, Vf= 10%.
- ♦Resin viscosity is 0.35 Pa.s.
- ♦Injection pressure of 100 kPa.

Vent

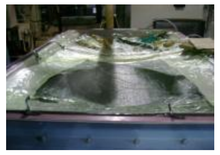


Inlet

Filling time 1320s = 22 min



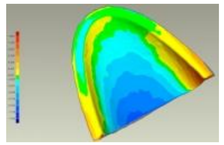
INFUSION AND RESULTS



Layup and Infusion Infusion time = 25 min

Stiffness of part is critical for replication

Final Part



Results show good dimensional fit between original and composite part

CANDIDATE PARTS FOR REPLACEMENT

Aircraft Cowling Cover

New design tool to make large parts like HMMWV Hatch Door

HMMWV Hatch Door

SUMMARY

Conclusion

The tool is cost efficient for repair, prototyping ; because the same mold can be reused for multiple shapes, saves space, time and money.

Future Work

- ♦Include other variations of the infusion scheme in LIMS
- ♦Transition of technology to Army depots

ACKNOWLEDGEMENTS

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