

Composites Affordability Initiative: Making Composites More Affordable



Airframe Producers Cooperate on Software to Reduce Composite Manufacturing Costs

Background: Leading U.S. airframe producers are collaborating through the Composites Affordability Initiative (CAI) to develop software that lowers the cost of composite manufacturing. This effort involves government and industry partners aiming to enable design engineers to fully leverage the benefits of composite materials. A significant challenge identified is the lack of tools for designers in the early concept stage to assess the cost impact of their decisions. CAI members are developing a software package based on the SEER-MFG™ tool that allows designers to quickly evaluate the costs of different composite materials and manufacturing processes.

"Giving engineers the ability to select the most affordable materials and processes early in the design process will have a major impact on making composites more affordable," said Joe Falque, Cost Analyst for Boeing.

CAI members include Lockheed Martin, Northrop Grumman, Boeing Phantom Works, General Electric Aircraft Engine Division, the U.S. Air Force Materials Lab, and the U.S. Naval Air Warfare Center. The initiative aims to create "composites-friendly" designs, simulation tools, and manufacturing processes, leading to significant cost reductions in aerospace structures. The initial focus is on manned fixed-wing strike fighter aircraft, but it will extend to all aerospace structures, including ground vehicles and spacecraft.

Making Smart Decisions Early

One key objective is to enable designers to make cost-effective decisions early in the program. Composite manufacturing is more complex and less familiar to designers than traditional metalworking processes. Designers often lack timely cost feedback, which can lead to costly mistakes. The CAI software tool aims to provide accurate cost estimates in minutes, guiding designers to the most affordable choices throughout the design process. Initially, Boeing developed a proprietary cost tool that demonstrated the concept's potential. This tool was then adapted and expanded within the CAI framework, incorporating the latest composite manufacturing techniques.

Selecting and Customizing the Tool

The CAI team evaluated various software packages and chose the SEER-MFG tool from Galorath Incorporated for its robust estimation and analysis capabilities.

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It also supports composite manufacturing and traditional metalworking processes, facilitating trade-offs between them. The tool's user-friendly interface displays estimates and allows easy updates as new data becomes available.

Customization Process

CAI engineers worked with Galorath to develop models of proprietary composite processes, sharing these models across the initiative. This collaborative approach was unprecedented in the typically secretive aerospace industry. For example, Boeing's stitched resin film infusion (RFI) process, which reduces wing weight and cost, was incorporated into the SEER-MFG tool. Each company's process models were encapsulated as plugins, allowing easy updates and customization.

Results

Results from SEER-MFG have shown significant cost reductions in composite structures. Engineers using the tool at Boeing have reported accurate and insightful cost estimates, preventing costly design mistakes. The CAI tool has over 25 process models (with more to be added) and has received positive feedback from engineers. The long-term goal is to integrate the cost estimation model with CAD packages like CATIA and Unigraphics, making cost estimates readily available during design. SEER-MFG will serve as the cost engine for a comprehensive model that includes all expenses related to composite structures' life cycle.