# Composite Design & Analysis

The design of composite structures involves the definition of the ply angles, numbers of plies, and stacking sequence for the given laminate. Given the large number of potential variables, designs are usually limited to standard sets of design configurations based on experience and available test data. There is potential for laminated composite structures that have increased performance and reduced weight by utilizing mathematical optimization methods that can find the best combination of variables for a given application. Altair HyperWorks technology combined with Altair ProductDesign expertise can help your organization design composite structures efficiently whether you are designing a new component or converting a metal part to a composite design.
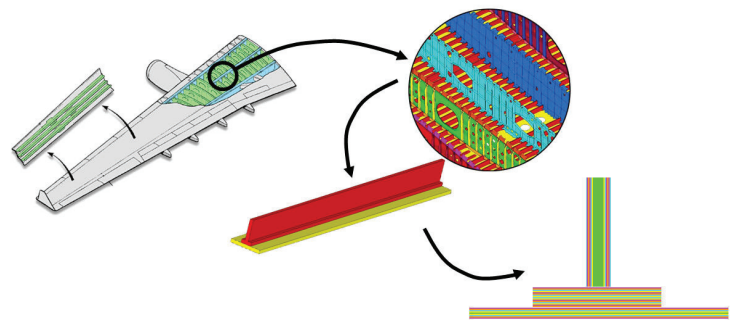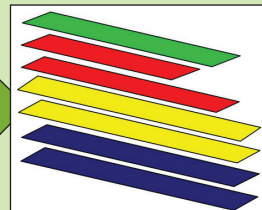
Optimization Driven Design Process
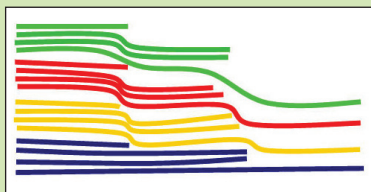
Ply Shape Optimization

Ply Shape Thickness Optimization

Ply Order Optimization

Optimized Design

When combined with Altair ProductDesign's approach to optimizing composite components, HyperWorks' optimization technology, OptiStruct, offers unique capabilities to improve product performance while minimizing manufacturing time and cost:

- Topology Optimization for Concept Design Synthesis
- Ply Shape Optimization to identify ideal ply drop-off zones
- Ply Thickness Optimization to determine minimum thickness for each ply shape
- Ply Order Optimization to define Stacking Sequence

To improve composite designs, these phases can be considered independently depending on where you are in the overall design process or they can be integrated to realize maximum benefit.

Altair ProductDesign's optimization driven process using OptiStruct ensures that design performance criteria and manufacturing constraints are maintained from concept through to final design.

Benefits

The composite optimization design process facilitated by Altair HyperWorks technology and followed by Altair ProductDesign has the following benefits:

- Cuts development time and cost by providing high performance designs in the initial stages of the product development process
- Reduces product design time by eliminating the "trial and error" process of typical design iterations
- Automates calculation of the number of plies needed for each ply fiber orientation
- Automates composite laminate stacking sequence determination
- Automates incorporation of manufacturing constraints and Ply Book Rules for certified designs
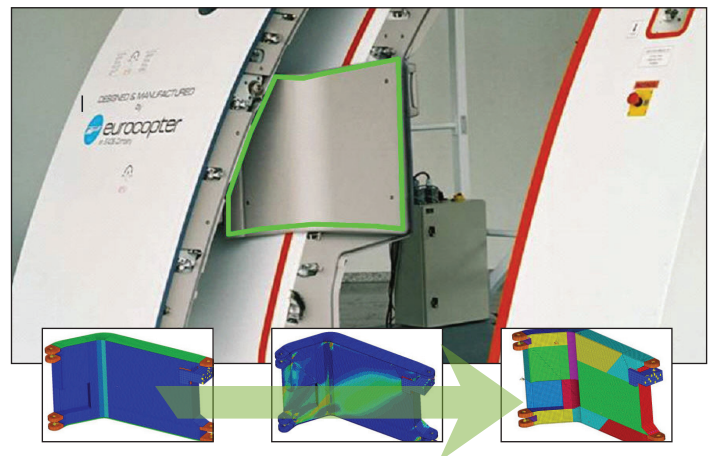

Image Courtesy of Eurocopter

Composites Conversions

Image Courtesy of Lola Cars

In order to reduce weight, many companies are switching to composites from metals. The design process for composites is very different than for metals and hence, many companies struggle with realizing the full benefits of composites structures. Altair ProductDesign has extensive experience helping companies develop optimized designs of parts converted from metals to composites which balance performance, weight, cost and manufacturability.
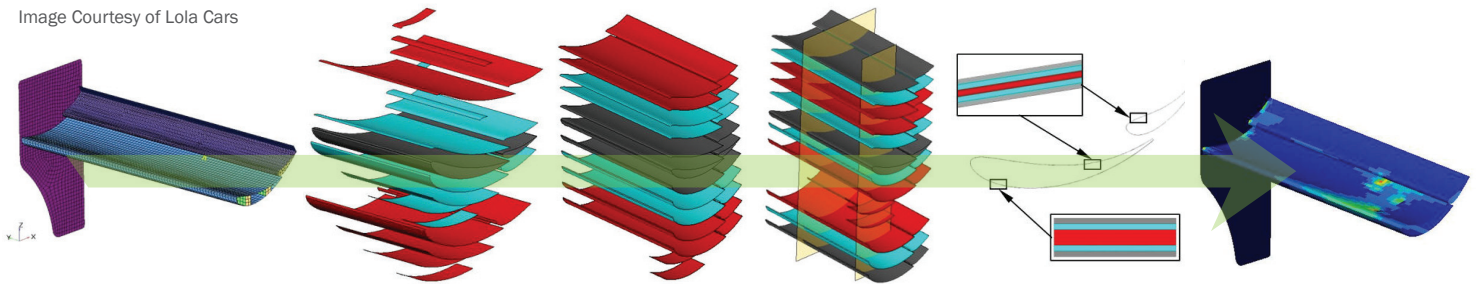
Impact Simulation

As composites make their way into primary structure, designers have to be increasingly aware of the performance of these structures under adverse conditions. Altair ProductDesign has extensive experience in using the leading simulation codes for assessing the performance of composite structures under dynamic and high velocity impact events. From bird strike, ditching, and ballistic impact of aerospace structures to crash performance of automotive vehicles, Altair ProductDesign has the technology and expertise to help you design better composite structures in all types of loading conditions.

Image Courtesy of Daimler

Complete **Program Partner**

Altair Engineering and Altair ProductDesign provide support from concept to launch. For more than two decades, we have helped companies around the world to bring innovative products to market in an efficient manner. We can manage entire programs as well as provide targeted assistance from inception to manufacturing. As a full program partner, we have a strong history in successfully combining technology with subjective evaluation, objective benchmarking, industrial design, design studies, target setting, and design and engineering release activities.