



SIEMENS



Siemens PLM Software

# Specialized engineering solutions for aerospace

Optimizing product development for the aerospace industry

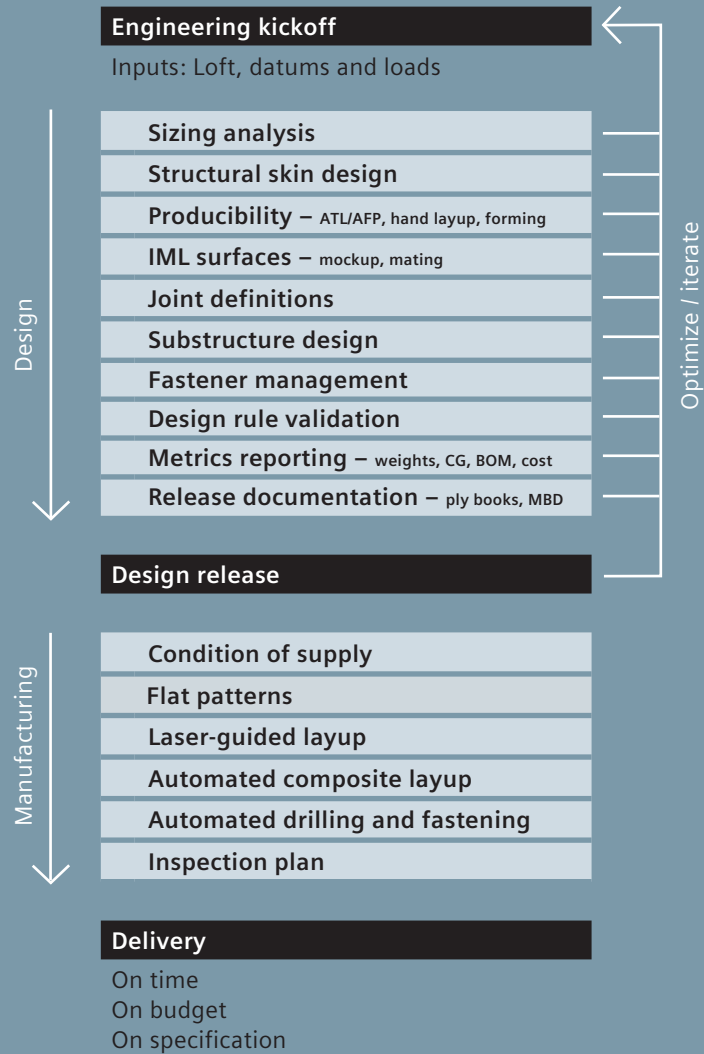
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# Addressing the entire aerostructures development process

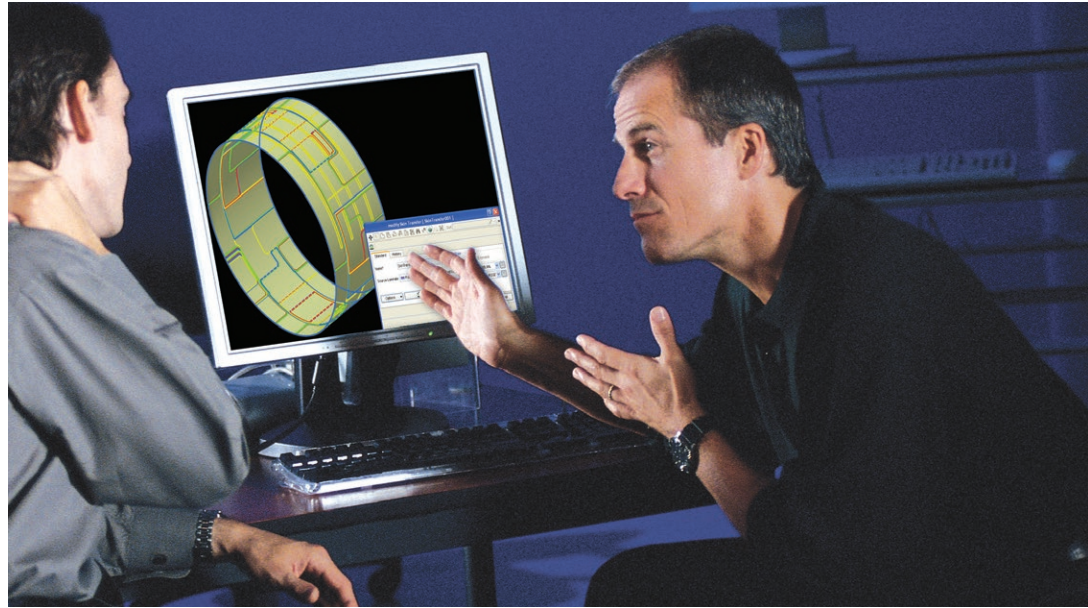
## Conquering aerospace-specific challenges

Developing highly engineered aerospace assemblies presents substantial challenges. Global competition and volatility in fuel prices leave OEMs and suppliers grappling with how to decrease their operating and total lifecycle costs. Many are adopting the use of advanced composite materials, but this presents an additional layer of complexity since composite structure and assembly definitions are intertwined in numerous, complicated ways.

Aerospace-specific software and services from Siemens PLM Software streamline the design-to-manufacturing process and help efficiently engineer these complex and integrated systems.



# The aerostructures development solution



Even with the most robust CAD systems, engineers aren't seeing the whole picture. Valuable aerospace-specific information is not readily available during the design process and often results in educated guesses rather than fully informed decisions.

Production-proven software from Siemens PLM Software customizes the CAD system to meet the specific needs of the aerospace engineer and allows better decisions earlier in the process. This unique capability, along with world-class consulting services and partnerships with industry leaders, applies deep domain expertise and process knowledge to deliver comprehensive solutions and effective risk management specific to aircraft development.

Siemens PLM Software offers the first truly complete aerostructures development solution. This enables a seamless workflow that spans analysis, design, manufacturing, assembly and quality planning. It captures design intent, manages complex design and assembly relationships, automatically propagates changes throughout the design and validates the design. By addressing key steps in the aerostructures development process, Siemens PLM Software solutions enable engineers to optimize parts and assemblies with a model-based, integrated approach.

The result is better performing aircraft delivered on time and on budget.

# Fast and flawless

## Many needs. One solution.

- **Business, military and commercial aircraft**  
Industry-leading solutions for optimized, on-budget wing, fuselage, substructure and engine design.
- **Helicopters/rotorcraft**  
World-class fuselage and rotor design capabilities for some of the most challenging designs.
- **Unmanned aerial vehicles**  
Best practices for modern airframe design are applied to this new and growing industry.
- **Space**  
Leading-edge capabilities for the design and manufacture of launch vehicles and satellite structures.

Global competition demands that aerospace companies respond with fast, flawless and cost competitive product development. However, this becomes increasingly difficult with the addition of innovative material technologies, such as fiber-reinforced composites, that require the support of advanced tools and processes. To meet these challenges, leading companies are using aerospace-specific solutions from Siemens PLM Software. These solutions are increasing quality while dramatically decreasing time-to-market.

The inevitable changes that come in the early stages of aircraft development are also more easily accommodated with Siemens PLM Software products. By reducing the complexity of change and identifying its impact, engineers have a transparent view into the consequences of decisions, which ultimately instills more confidence in their designs. And since Siemens PLM Software creates product definitions that can be more quickly verified, more design

iterations can be performed. The end product is what every aerospace manufacturing engineer strives for – better designs that weigh less and ultimately cost less.

These optimized aerospace designs not only help to improve the efficiency of manufacturing processes such as composite layup, fiber placement, tool design, airframe hole drilling, automated fastener installation and first article inspection, but also dramatically decrease initial manufacturing costs.

Siemens PLM Software provides a total aerospace-specific software solution that simply keeps our customers more competitive and one step ahead in an increasingly global playing field.



# The part-specific approach

## Solutions from Siemens PLM Software are proven in production to:

- Reduce composite part and assembly design cycles by 50 percent
- Reduce engineering change orders by 30 percent
- Reduce scrap material by as much as 80 percent
- Reduce time to develop quality plans by 90 percent
- Deliver first article parts built to specification on time and within budget

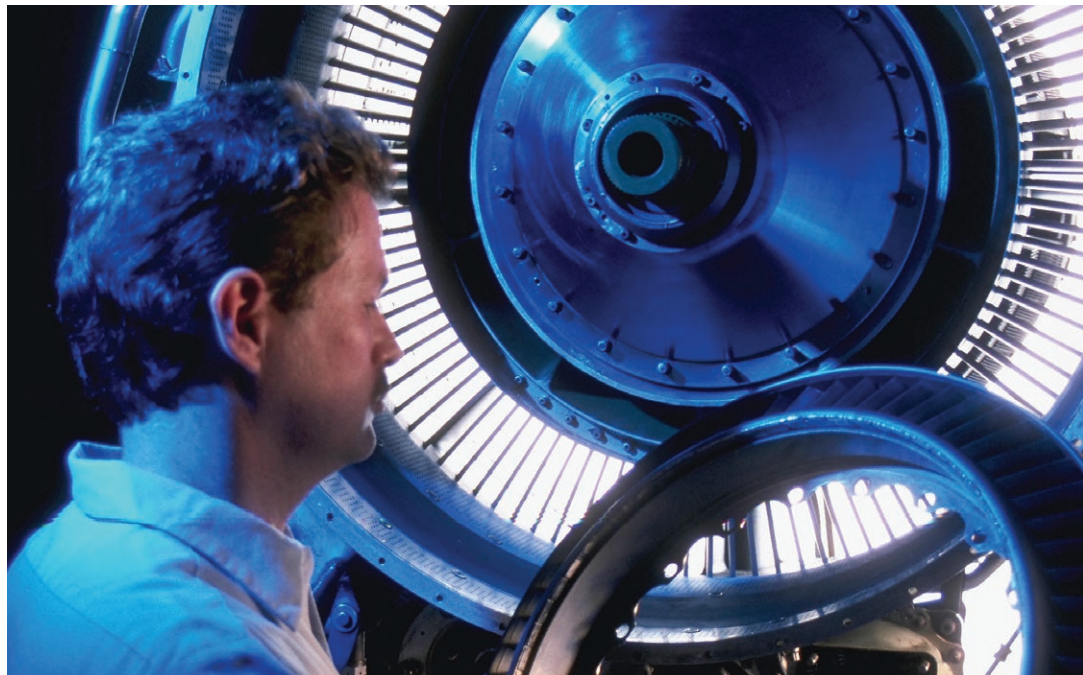
Siemens PLM Software solutions enable part-specific design approaches for each section of the aircraft – including the primary and secondary structure, fuselage, wings, interiors, nacelles and engines. These major structural sections undergo extensive analysis and design iterations to carefully consider each section’s unique weight implications. The Fibersim™ portfolio of composites engineering software from Siemens PLM Software features tight integration with the best-in-class CAE systems, providing bi-directional updates between design and analysis while taking the specific manufacturing constraints into consideration.

In addition, the underlying substructure in these major sections requires effective management of the entire assembly and careful attention to the cascading effect of changes throughout the section. The Syncrofit™ portfolio of software from

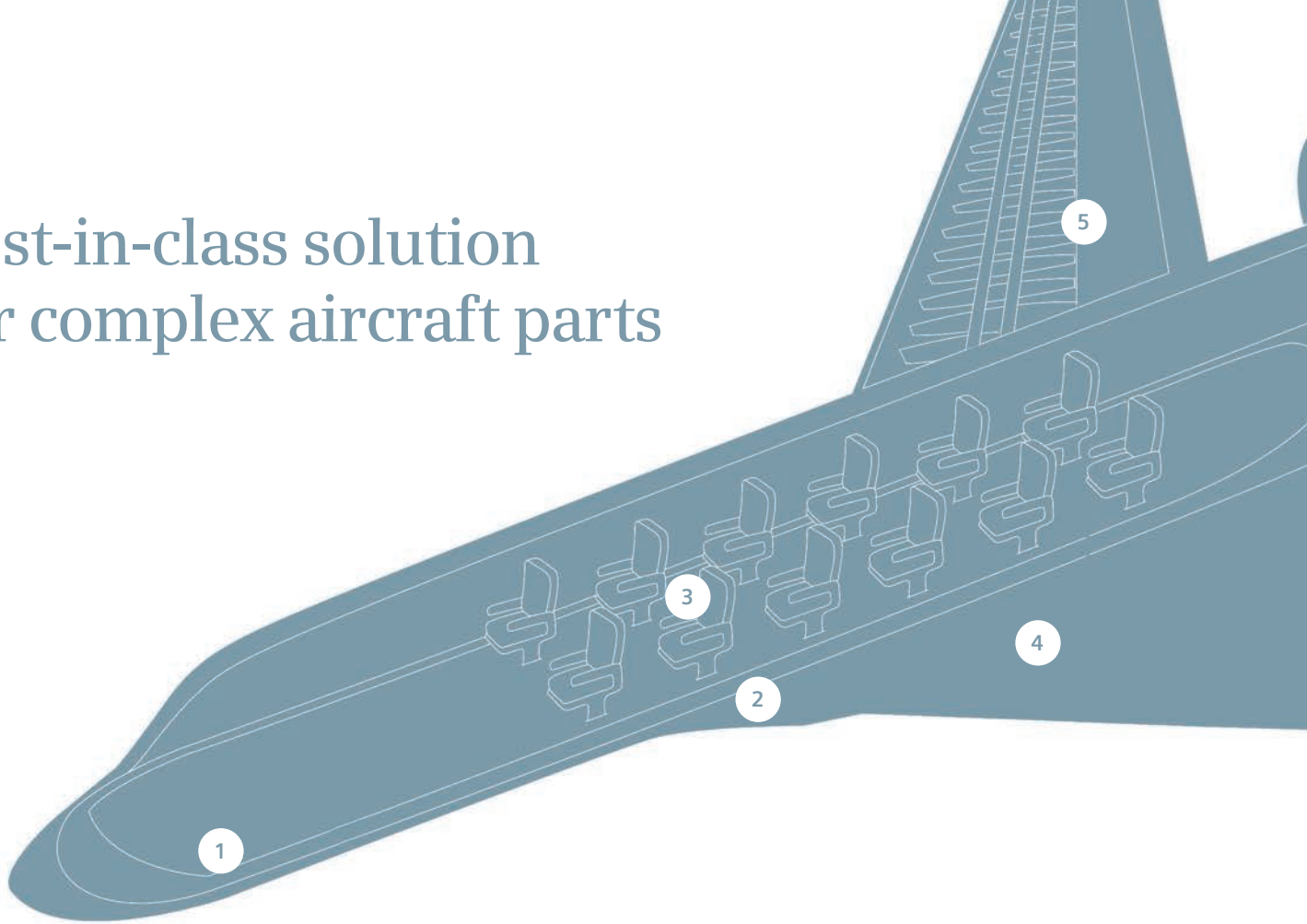
Siemens PLM Software provides the designer with confidence that each and every joint and fastener is being monitored and updated throughout the iterative process.

Finally, the aircraft’s propulsion system, including the engine itself and the surrounding nacelle structure, is among the most highly engineered systems in the aircraft. Fibersim provides advanced ply development capability specifically tailored to developing composite turbine blades and nacelle structures, while ensuring strict adherence to fiber deviation requirements.

*Siemens PLM Software products provide powerful methodologies that make designing and manufacturing high quality composite aircraft fuselages, airframe internal structures and engine components faster and less expensive. Part-specific design approaches make the complex challenges associated with composite aerostructure development more tractable and they lessen overall risk.*



# Best-in-class solution for complex aircraft parts



## 1. Fuselage

**Challenge:** Design composite fuselage, substructure and fastened joints with advanced manufacturing processes such as automated fiber placement, drilling and fastening.

**Solution:** Syncrofit simplifies fuselage design and distributes responsibilities to various team members, allowing optimized design and complex interaction management. Engineers are able to easily understand the impact of changes and propagate them throughout the assembly.

## 2. Secondary structure (fairings, etc.)

**Challenge:** Quickly develop manufacturable designs and unambiguous supplier build-to packages for monolithic panels and sandwich structures.

**Solution:** Fibersim part-specific design methodologies coupled with Syncrofit supply capabilities enable rapid secondary structure development that can be efficiently handed to manufacturing or the supply chain.

## 3. Interior

**Challenge:** Develop complex aircraft seating designs while efficiently managing all critical components of structure and associated hardware.

**Solution:** The Mastertrim portfolio of software from Siemens PLM Software provides engineers with a CAD-integrated solution to automatically develop seat patterns and complete bills of materials for aircraft seats.

## 4. Wing

**Challenge:** Create an iterative process between design and analysis to optimize the wing structure and ensure manufacturability.

**Solution:** Fibersim rules-driven, structure-based design capabilities allow for bi-directional updates between design and analysis with a comprehensive view of the wing structure.



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#### 5. Primary structure

**Challenge:** Leverage the potential for part consolidation with advanced composite substructure that utilizes the latest advancements in manufacturing.

**Solution:** Syncrofit joint and fastener management capabilities in conjunction with Fibersim advanced design and manufacturing simulations provide the tools to confidently develop integrated structures.

#### 6. Engine

**Challenge:** Generate ply shapes to fill the mold volume of turbine blade laminates while ensuring precise fiber orientations.

**Solution:** Fibersim breakthrough volume fill capabilities and fiber deviation analysis allows engineers to rapidly generate designs to meet any specifications.

#### 7. Nacelle

**Challenge:** Use composite part definitions to analyze and optimize nacelle structures.

**Solution:** Fibersim best-in-class integration with analysis tools enables bi-directional data flow between analysis and design, rapidly iterating optimized nacelle design concepts with all the data necessary for manufacturing.

## Comprehensive suite of software tools

**Siemens PLM Software gives engineers the tools to excel.**

Fibersim, Syncrofit, Mastertrim and custom consulting services together effectively manage the aerostructures product development process to deliver optimized parts and assemblies.

#### Fibersim

From conception, laminate definition and ply creation to simulation, performance optimization, flat pattern generation, documentation and manufacturing, Fibersim addresses the entire composites engineering process.

#### Syncrofit

When designing and manufacturing complex assemblies and large aerostructures, Syncrofit provides a CAD-integrated software solution that authors and manages assembly interfaces as well as the hundreds of thousands of fasteners that are typical in an airframe.

#### Mastertrim

Mastertrim streamlines the design and manufacture of innovative seat systems and interior components.

### **About Siemens PLM Software**

Siemens PLM Software, a business unit of the Siemens Digital Factory Division, is a leading global provider of product lifecycle management (PLM) and manufacturing operations management (MOM) software, systems and services with over nine million licensed seats and more than 77,000 customers worldwide. Headquartered in Plano, Texas, Siemens PLM Software works collaboratively with its customers to provide industry software solutions that help companies everywhere achieve a sustainable competitive advantage by making real the innovations that matter. For more information on Siemens PLM Software products and services, visit [www.siemens.com/plm](http://www.siemens.com/plm).

### **Siemens PLM Software**

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