



SIEMENS DIGITAL INDUSTRIES SOFTWARE

Fortifying the aerospace supply chain

Overcoming cost pressures and competition in today's manufacturing environment

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Industry trends

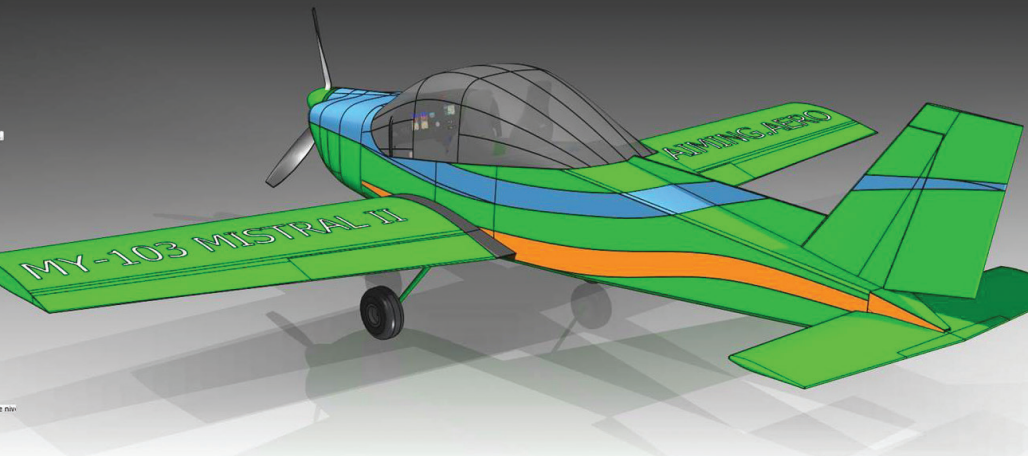
Major trends impacting aerospace supply chain manufacturers include:

- Cost squeeze by OEM and Tier One customers
- Increasing product complexity
- Need to prove compliance with industry regulations

Aerospace supply chain manufacturers are under great pressure to deliver components and subsystems faster and cheaper. An increase in product complexity caused by product diversification and customization to meet end-user requirements compounds matters further. Together these pressures are flattening existing revenue streams and eroding profit margins.

Supply chain manufacturers are currently being squeezed by original equipment manufacturers (OEMs) and Tier One customers. Funding for programs has continued to decline, resulting in fewer and smaller programs being awarded for development. To address this, manufacturers must bring products to market more quickly and stay ahead of their competition while reducing the cost of product development. Software tools can enable faster product development while maintaining performance and reliability and integrating electromechanical design efforts.

More than a decade ago, Tier Two and Three suppliers almost exclusively received contracts for parts. But today, OEMs are outsourcing larger systems to prime and Tier One contractors. A good chunk of the complexity in these systems is making its way down the supply chain. These contracts demand a broader range of engineering skill sets (mechanical, electrical, electronic, systems) and entail more process complexity. Today's software can also address these complexity issues by enabling a faster and more efficient product development process, using catalog parts where possible to reduce costs and actively enabling mechanical and electrical engineers to collaborate on designs. Configuration software can even make product customization as easy as clicking a button.



Finally, the number of regulations aerospace supply chain suppliers must comply with is on the increase and the cost of noncompliance can be huge. Fail to meet compliance and the company is hit with costly penalties. Safety, noise and emissions regulations are especially stringent. Smaller companies are especially at risk with compliance as they often do not have a range of specialists that know all the regulations. The answer is to implement software solutions that enable requirements to be documented, linked to product designs and tracked throughout the product development process.

By converting from conventional manufacturing to digitalization, manufacturers can reduce the need for physical prototypes and eliminate disconnected systems, paper-based work instructions and silos of information. They can achieve efficient smart manufacturing with better integration of planning and production and apply new manufacturing technologies. They can also design unique products that have a lower total cost of ownership, perform better and can command higher prices.

Solid Edge® software, which is part of the Xcelerator portfolio, the comprehensive and integrated portfolio of software and services from Siemens Digital Industries Software, enables manufacturers to respond to major trends that are impacting the aerospace supply chain industry.



Leveraging software to support innovation

To respond to these trends and succeed in competitive global markets, manufacturers will benefit from improving performance in key process areas.

Collaborate with suppliers and customers:

- Manufacturers need to share design data in a controlled way while protecting intellectual property (IP)
- Faster and controlled communication of design intent with suppliers and customers reduces errors and speeds product development
- Xcelerator Share supports collaboration around design data in multiple formats. This cloud-based collaboration solution closely integrates with Solid Edge

Manage design data and projects:

- Data that is created and consumed throughout the product lifecycle, including engineering changes, needs to be managed efficiently to achieve fast and accurate project completion
- Scalable data and process management capabilities can provide easy retrieval of data and track engineering changes
- Solid Edge includes built-in revision and release management capabilities for efficient data management and provides a growth path to Teamcenter® software for comprehensive product lifecycle management (PLM)

Satisfy customer requirements:

- Ensuring that products meet end-user requirements and comply with industry regulations is essential for profitability
- Linking customer requirements to 3D computer-aided design (CAD) models and design projects makes them

easily accessible to everyone involved in product development

- Solid Edge Requirements Management software enables the user to capture and track customer requirements and relevant industry standards

Create 2D drawings:

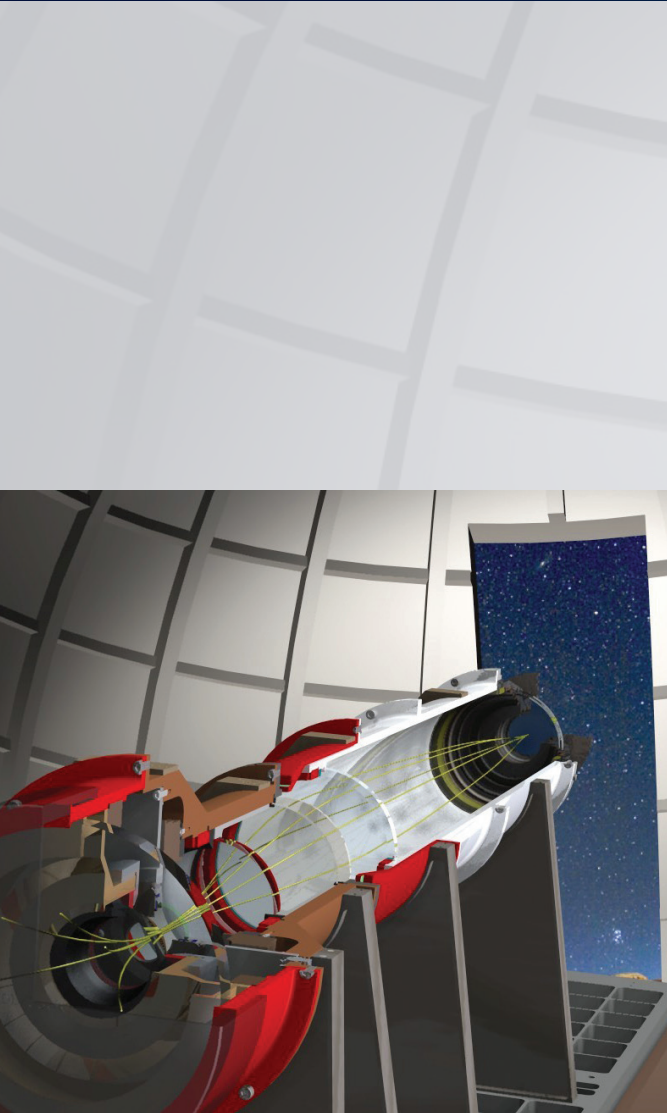
- Many manufacturers still need to provide 2D drawings to communicate with suppliers and manufacturing
- Intelligent 2D schematics are especially necessary for electrical wiring, piping and piping and instrumentation diagram (P&ID) needs
- Solid Edge enables you to create 2D drawings quickly and easily from 3D part and assembly models

Design mechanical components:

- Designers and engineers are under pressure to produce complex component designs quickly and accurately
- The 3D CAD models are often supplied in third-party CAD formats
- Solid Edge, with unique synchronous technology, is comprehensive, proven 3D CAD software that enables fast and efficient design. It can be used in conjunction with data supplied in third-party CAD formats by directly opening 3D models in common CAD formats

Develop sheet metal enclosures:

- Sheet metal components, including cabinets, enclosures and brackets, should be designed quickly and be easy to manufacture
- Streamlining sheet metal design and manufacturing speeds design and reduces scrap and rework



- Solid Edge includes capabilities that enable rapid design of sheet metal components and the creation of accurate flat patterns that simplify and speed manufacturing

Design mechanical assemblies quickly and accurately:

- Designing components in the context of an assembly to ensure fit and function can speed the product development process and reduce costs
- Using Solid Edge streamlines and simplifies the process of finding 3D models of off-the-shelf catalog components using integrated, cloud-based catalogs
- The software helps you quickly and easily create and manage even the largest assemblies without lags or crashes

Re-use existing design data:

- Designing new, unnecessary parts can be expensive
- Being able to rapidly find and re-use similar and identical parts can preclude reinventing new ones
- Solid Edge Shape Search, a 3D search engine that identifies similar parts based on geometry, launches within Solid Edge with a single click, providing tailored results using customizable filters and settings

Create model-based definitions (MBD):

- Publishing complete 3D technical data packages that include comprehensive product manufacturing information (PMI) can improve communication and reduce manufacturing errors
- MBD efforts can reduce the need to create and manage 2D drawings while communicating the correct information for manufacturing and inspection

- Solid Edge Model Based Definition may be used to publish product information using 3D PDFs based on company-specific templates

Design wiring schematics and wire harnesses:

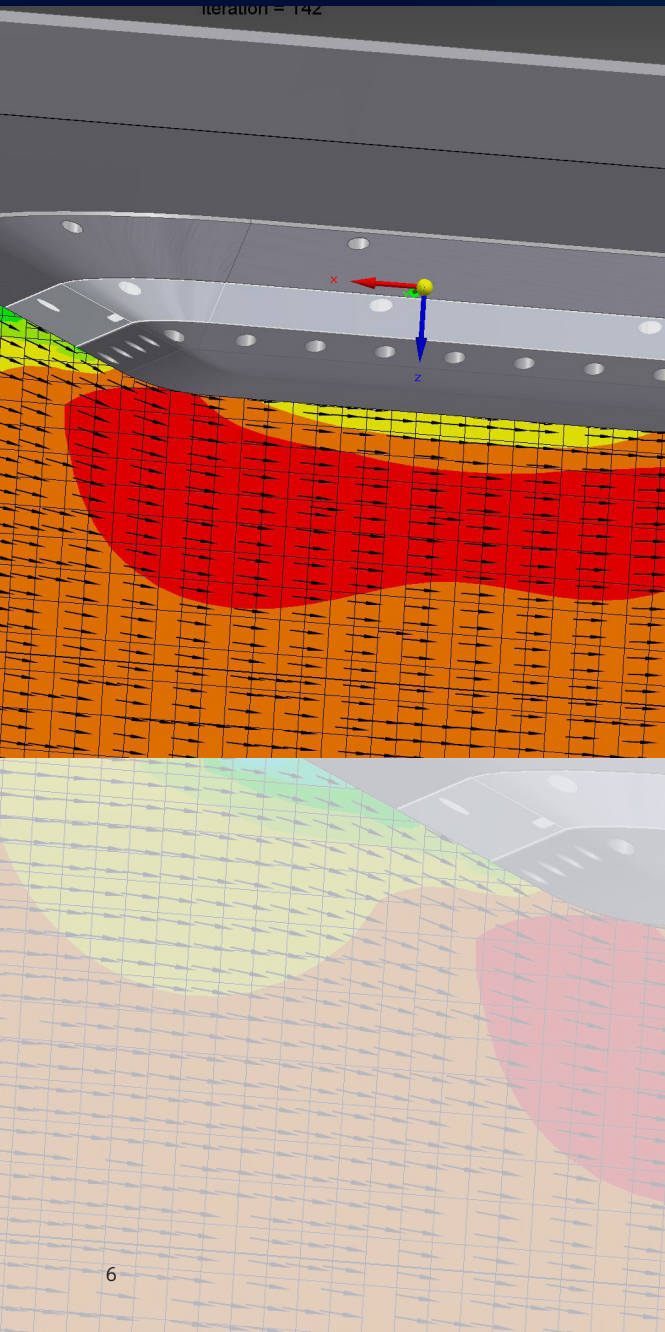
- Creating 2D wiring schematics for electrical circuits and wire harnesses can be a challenge for manufacturers of products that include electrical components and their associated wiring
- A seamless co-design mechanical CAD/electrical CAD (MCAD/ECAD) environment such as Solid Edge can be used to avoid late-stage design changes
- Solid Edge Wiring and Harness Design software enables the fast creation of data-driven wiring schematics and wire harness designs and includes validation of electrical circuits with simulation and design rule checking

Route electrical wiring in 3D:

- Electrical wiring in complex designs must meet compliance specifications as well as system performance within mechanical constraints
- Virtual prototypes can be used to optimize wire routing and determine accurate wire lengths
- Solid Edge Electrical Routing automatically routes wiring in complex assemblies while synchronizing wiring schematic and wire harness design intent using a unique connected mode between MCAD/ECAD environments



Leveraging software to support innovation



Analyze structural performance:

- Identifying potential problems prior to manufacturing minimizes costs
- Integrated structural analysis tools that include static, dynamic, vibration and fatigue analysis can help make sure mechanical components and assemblies will perform as required
- Solid Edge Simulation enables you to simulate vibration levels during product operation to make certain designs successfully overcome resonance

Analyze aerodynamics and fluid flow:

- Ensuring products perform as required in areas involving aerodynamics and cooling can result in a drop in costs and time-to-delivery as designers optimize products and identify and resolve problems before manufacturing
- Integrated computational fluid dynamics (CFD) solutions like Simcenter® FLOEFD® for Solid Edge software can enable you to optimize products before manufacturing using integrated analysis of fluid flow performance
- Using Simcenter FLOEFD for Solid Edge facilitates rapid and accurate fluid flow and heat transfer analysis without the need for CFD experts

Manufacture accurately and efficiently:

- Create toolpaths that are efficient and produce high-quality parts while reducing errors and rework in manufacturing
- Creating toolpaths that are associative to a CAD model can result in faster implementation of design changes
- Solid Edge CAM Pro enables you to create accurate and efficient 2.5-, 3- and 5-axis milling and turning processes and works with CAD models from a variety of sources

Prepare components for 3D printing:

- Using additive manufacturing (AM) techniques can minimize the need to stockpile spare parts
- Manufacturing small volume parts efficiently can significantly reduce tooling costs
- Solid Edge enables you to create world-class products using the latest additive manufacturing and 3D printing techniques. It provides access to a cloud-based bureau for quoting and manufacturing of parts in a variety of materials

Maximize utilization rates for sheet and plate materials:

- Maximizing use of sheet materials while minimizing scrap provides a high return-on-investment (ROI)
- Solid Edge 2D Nesting can be used to optimize layouts for the two-dimensional cutting of fabrication materials using a highly efficient nesting algorithm
- Solid Edge CAM Pro 2.5 axis can be used to create instructions for cutting machines

Create clear technical documentation:

- Aerospace components should be manufactured, installed, used and maintained correctly to ensure performance and reliability
- Clear technical documentation can help end users operate and maintain products correctly, and explicit assembly instructions that provide 3D imagery can ensure products are manufactured correctly
- Solid Edge Technical Publications can be used to create documentation that includes 3D graphics to effectively communicate installation, operation and maintenance procedures

Create attractive visualizations for sales and marketing:

- Attractive marketing materials and catalogs can clearly demonstrate new innovations and the use of the latest design technology to prospective customers
- Design visualization techniques, such as augmented reality (AR), bring ideas to life
- KeyShot capabilities launched directly from Solid Edge can help you create high-quality renderings, animations and interactive visuals. Solid Edge also provides AR capabilities

Meet future needs for product development solutions:

- Providing maximum licensing flexibility so the user can mix and match CAD options, simplifying licensing, billing and support to effectively lower cost of ownership
- Flexible licensing schemes let users meet current needs with a straightforward growth path to meeting future requirements
- The Siemens Mechanical Design bundle lets companies maximize their design capabilities while achieving a balance of performance and cost to meet their needs

The Solid Edge portfolio provides a powerful, comprehensive and accessible solution for product development and manufacturing that enables aerospace supply chain manufacturers to speed their time-to-market for new products and deliver high quality, customized products on-time and on-budget.

Benefits of using Solid Edge

Solid Edge offers an on ramp to digitalization, enabling manufacturers to create a comprehensive digital twin of their products and includes solutions for mechanical design, electrical design, simulation, manufacturing and technical publications. It also includes solutions for managing all the technical data that is created and consumed when supporting the comprehensive digital twin. It facilitates collaboration both within manufacturing companies and with external resources, including suppliers and customers.

The cornerstone of the Solid Edge portfolio is its market-leading CAD application. Developed from the ground up to be an open and extensible tool, Solid Edge with synchronous technology provides the freedom to design naturally and iteratively, whether you are working on a new design or editing existing parts, assemblies or products. That's because synchronous technology contains built-in intelligence that interprets design intent regardless of where the design originated.

At the heart of the Solid Edge portfolio is Siemens Parasolid® software, the most widely used computer-aided geometric modeling kernel in the industry. Using Parasolid enables you to create and modify digital 3D models and delivers complete 3D model compatibility between product development applications such as design, simulation and manufacturing.

Aerospace manufacturers achieved the following benefits using Solid Edge:

- Saved \$60,000 by manufacturing custom-made parts and tools locally
- Realized faster response to project requests, greater customer satisfaction
- Optimized numerical control (NC) toolpaths for shorter machining time while reducing wear
- Achieved highly accurate weight calculation based on virtual prototype
- Made sure products work as designed, with quality ascertained before production
- Realized easier, faster and more accurate simulations

To learn more about how Solid Edge enables the aerospace manufacturing supply chain to be successful, please visit <https://solidedge.siemens.com/en/industries/aerospace-supply-chain-software/>



About Siemens Digital Industries Software

Siemens Digital Industries Software is driving transformation to enable a digital enterprise where engineering, manufacturing and electronics design meet tomorrow. Xcelerator, the comprehensive and integrated portfolio of software and services from Siemens Digital Industries Software, helps companies of all sizes create and leverage a comprehensive digital twin that provides organizations with new insights, opportunities and levels of automation to drive innovation. For more information on Siemens Digital Industries Software products and services, visit siemens.com/software or follow us on [LinkedIn](#), [Twitter](#), [Facebook](#) and [Instagram](#). Siemens Digital Industries Software – Where today meets tomorrow.

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