

**SIEMENS**



Siemens PLM Software

# PLM solutions for the aerospace industry

When you only have one chance to get it right

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# Smarter decisions, better products



The challenge today, whether it's a commercial program or a government contract, is to deliver a product that meets all the technical and performance requirements at cost and on schedule.

The aerospace industry is expected to experience continued growth in most segments for the foreseeable future. Commercial airlines continue to purchase new aircraft to lower the cost-per-seat-mile cost. The challenge today, whether it's a commercial program or a government contract, is to deliver a product that meets all the technical and performance requirements at cost and on schedule. This challenges OEMs and their suppliers to continuously transform their extended supply chains to optimize total productivity while maintaining a highly dynamic and virtual work force.

With this in mind, the unique value of Siemens PLM Software is the ability to:

- Fully integrate technical, performance, cost and schedule requirements into a single work pack with full traceability to customer requirements throughout the entire lifecycle – concept to retirement

- Plan and execute to the plan, with full configuration management of not only designs and documents but all program management artifacts
- Virtually “verify” technical, production and in-service performance prior to committing to hardware
- Seamlessly and securely share knowledge and best practices across a total value chain
- Capture best practices and lessons learned that can be leveraged to create new and better product families
- Establish a single master source of all data and 3D images that can be used to define today's most complex aerospace platforms and synchronize a global virtual network of designers, developers, manufacturing engineers, production specialists and service/support teams

Siemens PLM Software solutions include industry best practices that enable aerospace companies to manage entire product lifecycles.

# Delivering consistent program execution excellence



Too often, programs experience high design change rates as the product first enters production then again when the product enters test and finally when the product enters service.

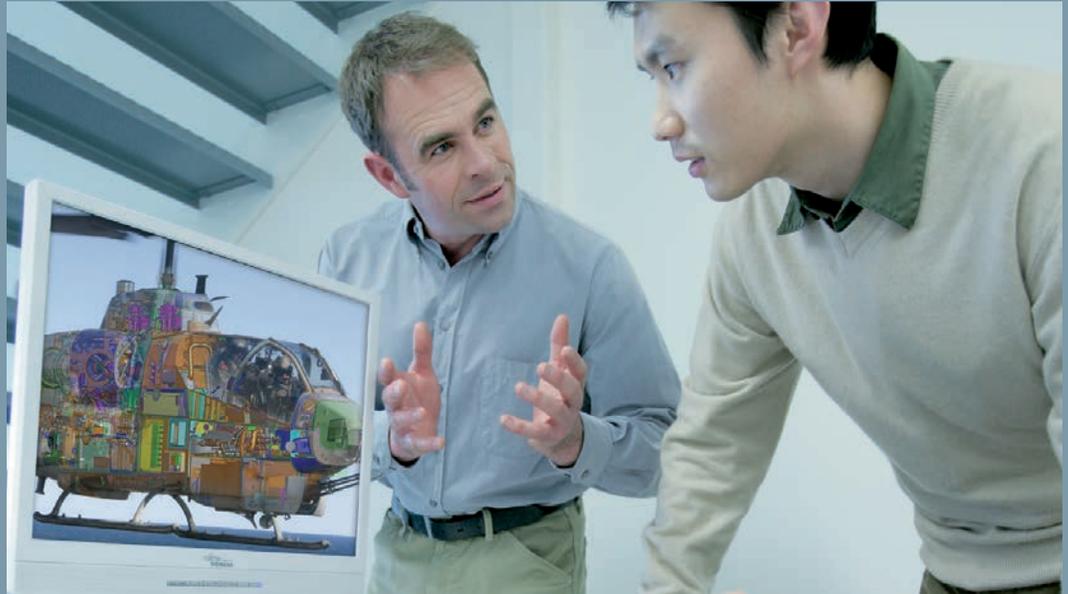
Program execution excellence on every program is the elusive goal for every aerospace and defense organization. For the first time, Siemens PLM Software integrates the entire set of requirements and provides traceability from program statement of work (SOW) to schedule to bid to actual performance in a single easy-to-use tool.

But planning and executing to the plan is not sufficient. Too often, programs experience high design change rates as the product first enters production then again when the product enters test and finally when the product enters service. Siemens PLM Software has the tools to significantly reduce these late changes by virtually verifying technical and performance requirements with NX™ CAE software to ensure that the product not only passes the testing but meets all the technical requirements.

Virtual verification of production is accomplished through Siemens PLM Software's Tecnomatix® software with both plant and process simulation and complete ergonomic assessments. Not only does Tecnomatix support the assembly of a product; for determining maintenance labor requirements Tecnomatix also supports optimized disassembly sequencing. Plant simulation provides the information necessary to assess learning curve impacts on tooling and production ramp-rate, allowing you to optimize your return on investment.

Siemens PLM Software also completely supports design anywhere, build anywhere and service anywhere in a seamless, secure, synchronized 24x7 collaboration environment across the entire lifecycle.

# Integrated technical, cost and schedule requirements



The ability to coordinate and synchronize a dispersed and diverse lifecycle environment is the key to future competitiveness and long-term success.

Only by fully integrating technical, cost and schedule requirements into a single work package is the engineer presented with the complete picture with all of these requirements traceable to the customer SOW, specification, bid and contract. To revise the program work content, a single change to the SOW propagates throughout all program management artifacts to eliminate the need to separately update the schedule, estimate and work package. The Siemens Integrated Program Planning and Execution solution supports integrated master plan (IMP) milestones, significant accomplishments and exit criteria, and integrates the supporting activities into the integrated master schedule (IMS).

By completing a workflow, say to complete and review a structural analysis, the schedule is automatically updated so no more "I forgot to report that complete". Earned Value Management System (EVMS) earnings are computed based on the earnings method used and exported to third-party EVMS software for standard reporting.



For mastering complexity and globalization, OEMs rely on a partner network and global supply chain to develop, manufacture, assemble and test their products. The ability to coordinate and synchronize a dispersed and diverse lifecycle environment is the key to future competitiveness and long-term success. Siemens PLM software provides access to a single source of managed requirements to totally define and maintain

the most complex product structure. Siemens PLM supplier relationship management provides for integrating technical, cost and schedule requirements across the entire supply chain. In turn, this up-to-date and highly accurate product definition can be used by all members of an extended supply chain at every stage in a complete lifecycle.



# Full requirements traceability throughout the product lifecycle

## Consistent program execution excellence

Delivering the right product the first time can provide a competitive edge that is crucial to the success of programs, as well as determining a program's ultimate success or failure. Many of Siemens PLM Software's aerospace customers have established new program launch records by leveraging embedded templates that accelerate implementation, improve team-related skill building and reflect tried and trusted best practices for avoiding predictable delays and potential risks. Siemens PLM Software adopts a partnership approach for complex system implementation to ensure that common goals and shared objectives are in place to drive each program to meet or exceed established expectations.

Siemens PLM Software provides strong configuration management of elements in a program's lifecycle, whether it's requirements, models, analyses, process planning, bills-of-materials tooling, or technical publication to ensure that all remain consistent and aligned – a key element for consistent program execution excellence. Requirements traceability through the lifecycle is the cornerstone of our requirements management capability. Even the answer to "Why are we doing this?" can be answered simply by following the trace links. The ability to do this during development is important, but even more important is the ability to answer that same question 10, 15, 20 years later when the personnel that made the decisions are no longer on the program. Knowledge capture through the traceability of requirements provides for continued program execution excellence.

## Configuration-driven service and support sustainability

The aerospace industry is now pushing sustainability to new heights with lifecycles that can span 100 years and performance metrics that drive continuous improvements in availability, maintainability, reliability and overhaul cycle reduction. Siemens PLM Software enables OEMs to seamlessly track product "DNA" from concept development to

manufacturing, assembly and test and finally through to the complete operating cycle. With continuous configuration management and real-time field feedback, companies can implement engineering improvements and design enhancements faster and more efficiently, as well as synchronize the supply chain so that parts are available at the right place at the right time.

Siemens PLM Software maintains not only the engineering bill-of-materials, but the manufacturing bill-of-materials as well as the as-maintained bill-of-materials. Only by maintaining these three are you assured that the product in-service is correct and up to date. Determining the impacted in-service units for service instructions to the field via either technical service orders or service bulletins is as easy as a simple query.

*With continuous configuration management and real-time field feedback, companies can implement engineering improvements and design enhancements faster and more efficiently...*

# Virtual “verification” of technical, production and in-service requirements

Siemens PLM Software provides not only excellent pre- and postprocessing CAE capabilities, but also sound analysis solvers for structural, thermal and fluid flow providing the ability to verify performance early in the design cycle.

## **A complete solution portfolio**

Siemens PLM Software’s solutions portfolio provides a comprehensive suite of tightly integrated modules that help you seamlessly and securely manage all phases of a product lifecycle that extends from detailed design and engineering to manufacturing, final assembly and testing. These solutions include managing such crucial functions as:

### *Systems engineering*

- System architecture
- Logical and functional system representations
- Requirements management
- Reliability engineering
- System simulation

### *Product engineering*

- Knowledge management – standard work, best practice
- Mechanical design
- Electromechanical design
- Software and embedded system management
- Mechanical and electromechanical simulation
- Modeling and analysis simulation
- Configuration management
- Simulation data management
- Mechatronics process management
- Engineering change management
- Engineering process optimization

### *Manufacturing planning and process*

- Bill-of-materials
- Part planning and validation management
- Assembly planning and validation
- Bill-of-process management
- CAM/CNC optimization
- Plant design and optimization management
- Process management

### *Supply chain management*

- Supply chain synchronization
- Supplier relationship management
- Supplier contractual compliance management

### *Program management*

- Integrated requirements
- Program change management
- Configuration management
- Project management optimization
- Reporting and analytics

### *Service lifecycle management*

- Technical publications
- Service instructions
- Seamless, secure fleet performance
- Health management
- Performance-based logistics management
- Upgrade/modernization management
- Maintenance and service planning
- Logistics planning

With this unique industry capability, Siemens PLM Software provides not only excellent pre- and postprocessing CAE capabilities but sound analysis solvers for structural, thermal and fluid flow providing the ability to verify performance early in the design cycle.

Our ability to use design models and information early in the design cycle as an input into a plant or process simulation allows the designer and manufacturing

engineer to verify that the design, process and plant are capable of meeting the production ramp-rate at the intended design-to-unit-production-cost (DTUPC). This truly enables cost to move from being a dependent output to becoming an independent variable like any other requirement.





## Program execution excellence – customer achievements

A prerequisite for launching a major new product is the creation of a secure global, collaboration network that functions across every stage of a product lifecycle from concept definition through product retirement.

One of our OEM customers launched a new general aviation aircraft model in record time with a tightly integrated digital product development environment. The OEM achieved a 17 percent overall reduction in its launch cycle and a proportional reduction in its development costs.

### Increase profitable growth

The real reason for implementing Siemens PLM solutions is improved financial results. After implementing these solutions, one major aerospace OEM raised its revenue by 32.6 percent and increased EBITDA by 19.6 percent and its EBITDA per employee by 4.1 percent.

### Extend lifecycles

A prerequisite for launching a major new product is the creation of a secure global, collaboration network that functions across every stage of a product lifecycle from concept definition through product retirement. An international coalition selected Teamcenter® software from Siemens PLM Software to

establish a global collaboration network that includes forty sites in Europe, ninety-six sites in the Americas and four in Asia. This deployment is the largest and most successful example of secure global collaboration in the aerospace industry; it is expected to last for 100 years.

### Re-use best practices

Re-using best practices can enable design and manufacturing teams to benefit from lessons learned, as well as minimize risk and accelerate the development of new and more advanced products. Aerospace OEMs have used our PLM systems to reduce their core engineering development cycle from 60 months to 42 months, and in some instances 24 months.

# Transforming your process of innovation

## Reduce build costs

One of the aerospace industry's key challenges is to reduce the cycle time and cost for manufacturing, assembly and accepting testing. One major OEM optimized its total production operations by digitally simulating all workflows and production operation before a single part was made. This revolutionary advance will enable the OEM to reduce overall total assembly time by 67 percent and ramp up its production rates from one aircraft delivered per month to one aircraft delivered every work day.

The successful launch of a new product is strongly dependent on a variety of factors including:

- Achieving a significant breakthrough across a combination of critical performance metrics
- Integrating a key set of global tier one partners
- Implementing a manufacturing strategy that incorporates today's most advanced technology
- Adopting a service and support plan that can deliver world-class service anywhere, anytime

## Detailed design

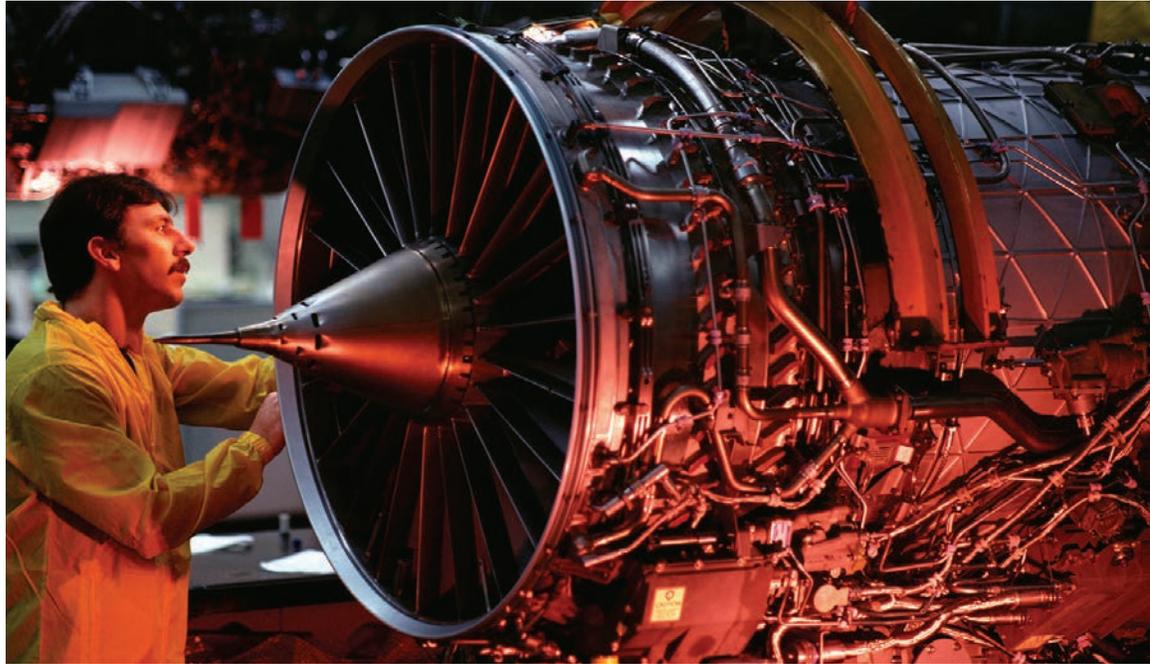
The Sukhoi Superjet 100 commenced at the design office of Sukhoi Civil Aircraft, CSJC and the first aircraft flew in May, 2008. Key program suppliers are located in Europe and the United States. The project's PLM-driven extended enterprise platform integrated and coordinated design, manufacturing and final assembly sites. It also managed the multi-CAD solutions that were used by suppliers in a single master file. The Sukhoi Superjet 100 program is further testimony to the importance of establishing a seamless environment for providing knowledge to participating partners and suppliers from concept development through detailed design, assembly, testing and certification.

*One major OEM optimized its total production operations by digitally simulating all workflows and production operation before a single part was made.*

## Transforming processes

During 2001, an international coalition of the world's leading aircraft and engine developers established a PLM-driven virtual global network to design, launch, produce and sustain a fleet of thousands of advanced aircraft. The success of this program depended on the successful development of a family of advanced aircraft that would exhibit superior performance and reflect a recurring competitive price and a total operational cost that could be linked to an ever-increasing and challenging set of performance-based logistics metrics.

The global coalition of partners and suppliers designed, built and are currently testing three models of this family of advanced aircraft. The highly secure, virtual global network that supports this enterprise now includes 140 worldwide sites. More than 6,000 users currently access this network, which is expected to support a workload of up to 20,000 users once the network reaches its full rate of production. In addition, the network provides full ITAR compliance as it handles approximately 70,000 secure communications per week as well as 28,000 annual product changes. This global virtual enterprise is the first of its kind to cover all phases of the aerospace lifecycle; it is projected to have a lifespan of 100 years. This PLM-driven environment is transforming the way future global aerospace programs will be managed.



## Solutions for aerospace program management

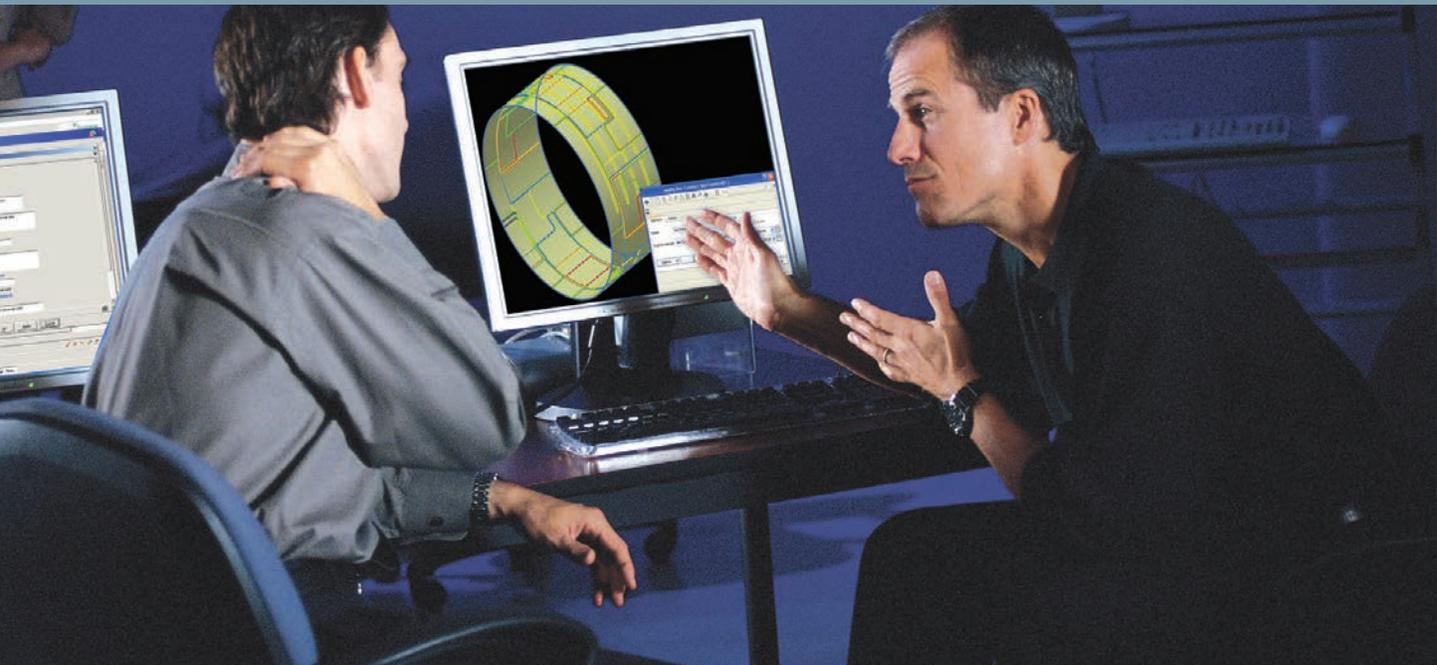
Aerospace leaders and their customers are embracing new concepts to integrate today's program infrastructure and provide integrated program teams (IPTs) with the ability to share program information in real time on a global basis.

Today's aerospace products and programs are extremely complex. Program managers are faced with the pressures of budget, scope, risk and schedule with global partnerships. The need to integrate program requirements across a vast network of partners is essential for program success. Siemens PLM Supplier Relationship management is key to that success.

Aerospace leaders and their customers are embracing new concepts to integrate today's program infrastructure and provide integrated program teams (IPTs) with the ability to share program information in real time on a global basis. For this to be successful, systems engineering must be part of an overall program management strategy coupled with product management technology.

Siemens PLM Software provides the following capabilities:

- Seamless integrated program planning and execution environment
- Knowledge visualization to support executive dashboards, collaboration, reporting, reviews, "at-a-glance" program evaluation and the ability to present earned value metrics
- Knowledge integration to support a single and secure environment that provides all program participants with entitled access to program/product information
- Knowledge management to ensure that all members of complex program teams and their partners have the appropriate training, certification and technology expertise



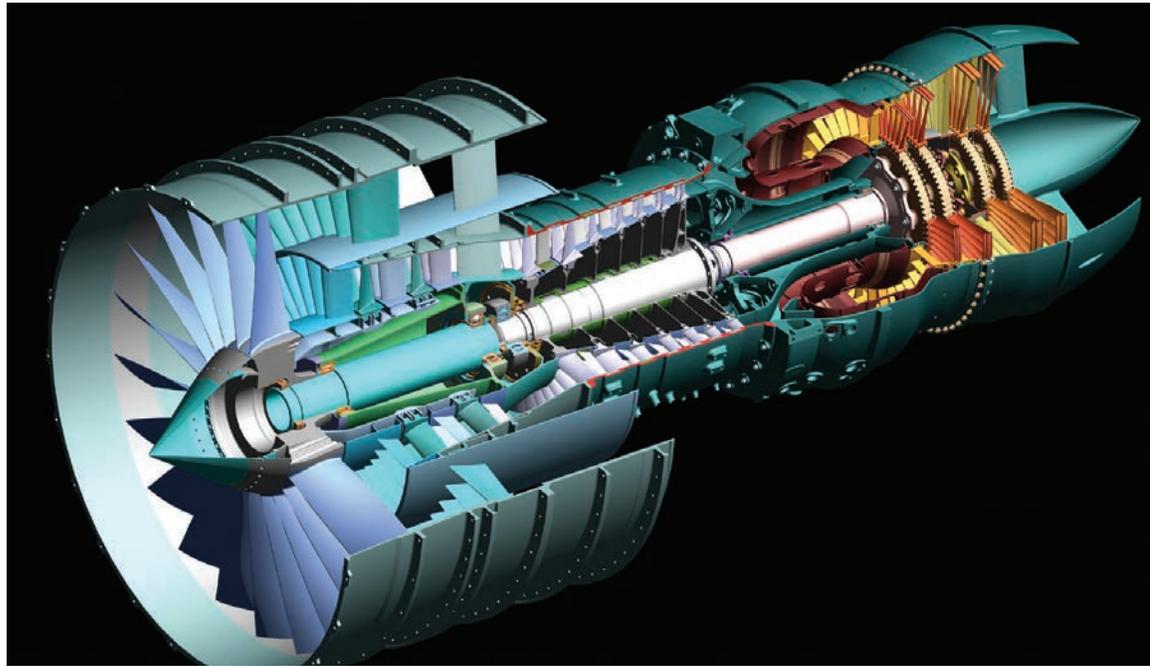
## Optimize concept development and detailed design

The Siemens PLM Software solutions portfolio uniquely integrates project management, systems engineering, requirements management, configuration and change management with digital simulation to optimize concept development and detailed design.

To optimize the design it is necessary to have all the requirements prior to commencing the design and the ability to perform analyses early in the design cycle. NX CAE supports model re-use and first-order analyses by the designer to eliminate the repetitive designer-analyst cycle in the early concept design.

Product development organizations in aerospace and defense companies must be able to seamlessly integrate entire design teams so they can develop complex, innovative products and get them to market before the competition. In a global market, design teams face new challenges as they integrate technology, processes and people to provide real-time access to the ever-changing design characteristics of new systems.

Siemens PLM Software helps companies synchronize data and processes across a complex value chain that includes development, manufacturing partners and the entire supply chain. These solutions facilitate integrated digital environments that enable all participants to work in a multi-CAD environment in which complex product structures can be fully shared. Siemens PLM Software's NX CAD product can import robust design information from other CAD systems via JT™ data and manipulate that design model/data as if it were native NX data. The ability to allow partners to design in their native CAD and easily and simply integrate their designs into the system design is a core NX CAD capability. No longer is it necessary to dictate the supplier or partner CAD system resulting in lower cost and reduced design cycle times.



## Adapting to meet challenges

Even though they participate in a complex global supply chain comprised of diverse suppliers and partners, aerospace and defense manufacturers are required to respond quickly to changing program and production schedules.

Prime contractors often compete on new programs that require them to accept lifecycle performance agreements, which place a premium on logistics support planning. In addition, even though they participate in a complex global supply chain comprised of diverse suppliers and partners, aerospace and defense manufacturers are required to respond quickly to changing program and production schedules.

You must be able to adapt to these challenges in order to realize sustainable profit and growth. This requires you to find program management solutions that provide:

- Integrated program management
- Virtual environments to synchronize global design and development, and speed development cycles
- Supply chain management capabilities to deliver the development and production phases on schedule
- Faster production ramp-up
- Virtual prototyping capable of minimizing physical models, assembly error and design rework



## A collaborative business environment

As a technology partner, Siemens PLM Software creates a seamless, collaborative business environment that allows you to:

- Create information once and maintain it at its source while enabling all users to access and utilize the data throughout its lifecycle
- Manage systems that ensure timely and accurate configuration control
- Comply with import and export control regulations
- Ensure adherence to security processes and procedures
- Have a method for contract data requirements list (CDRL) and subcontractor data requirements list (SDRL) delivery
- Environmental compliance
- Guarantee adherence to government infrastructure and data standards

Siemens PLM Software product lifecycle management solutions provide a full range of capabilities for not only regulatory compliance but consistent program execution excellence resulting in increased competitive advantage, revenue and profits.

## About Siemens PLM Software

Siemens PLM Software, a business unit of the Siemens Industry Automation Division, is a world-leading provider of product lifecycle management (PLM) software, systems and services with nine million licensed seats and 77,000 customers worldwide. Headquartered in Plano, Texas, Siemens PLM Software helps thousands of companies make great products by optimizing their lifecycle processes, from planning and development through manufacturing and support. Our HD-PLM vision is to give everyone involved in making a product the information they need, when they need it, to make the smartest decision. For more information on Siemens PLM Software products and services, visit [www.siemens.com/plm](http://www.siemens.com/plm).

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