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# Piper

### Aircraft manufacturer uses NX CAD and Teamcenter to develop wing that increases fuel payload by 35 percent

**Product**

NX, Teamcenter

**Business challenges**

Minimize the weight of the wings

Increase aircraft range and fuel payload

Perform a clean-sheet wing design

**Keys to success**

Use NX CAD and the digital twin to reduce costs and time needed to design and assemble the M600

Use Teamcenter and the digital thread to track hundreds of parts and know exactly what is in each aircraft

Leverage visualization capabilities of NX CAD 3D to reduce problems downstream

**Results**

Increased fuel payload by 35 percent

Met market demand for enhanced aircraft capabilities

Improved the flying range of the M600 by 40 percent

Increased useful load capacity by 29 percent

## Siemens PLM Software solutions help Piper meet market demand for greater flying range

**Employing a clean-sheet wing design**

Piper Aircraft Inc. (Piper) is the only general aviation manufacturer to offer a complete line of aircraft, from rugged, reliable trainers to high-performance turboprops. Since its founding in 1937, it has produced more than 130,000 airplanes. The company offers aviators around the world efficient and reliable single- and twin-engine aircraft. Piper employs about 950 people and is headquartered in Vero Beach, Florida. It builds airplanes to order so there is no inventory backup. Piper's revenues grew 23 percent in 2017.
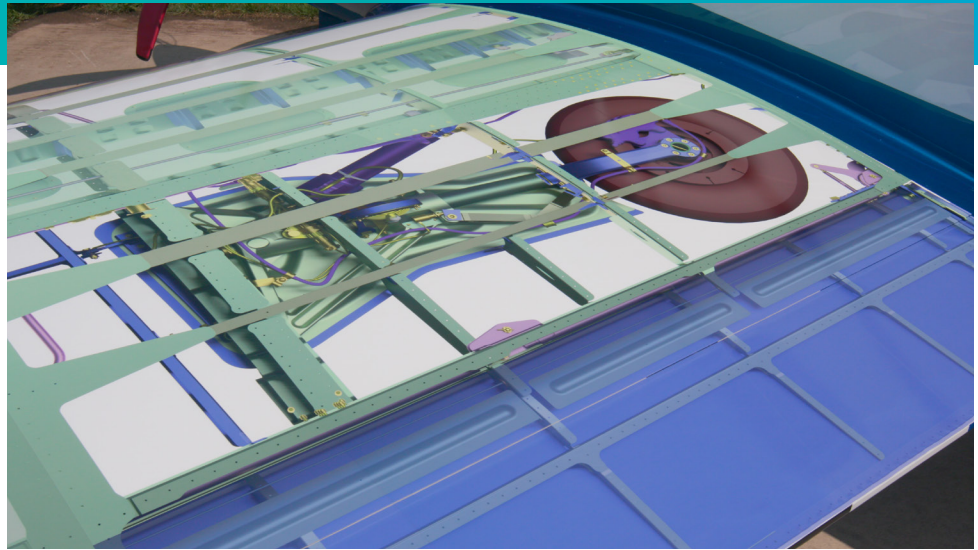
Piper's customers and dealers asked for an aircraft with more fuel payload and additional range. To achieve this goal, the company set out to evolve the M500 to the M600 by using a clean-sheet wing design that would enable them to enhance the aircraft's capabilities and meet market demand.

A clean-sheet design allows Piper to start from scratch with a project. The customer brings its concept and requirements, and Piper converts those ideas into a working prototype. In the case of the wing for the M600, the firm considered marketing requirements, the shape of the wing, fuel recommendations, size of the structure, systems content, electrical system needs, style of wing tips, etc.

The single-engine Piper M600 is designed for owners who want extra range and speed at moderate cost. The new clean-sheet wing is at the heart of the changes to the Piper M600, providing strong aero-dynamics that help aviators go farther and faster.

"The main technical challenge we faced was meeting weight requirements because there wasn't a lot of extra weight allowance from the M500 to the M600," says Mike Rushworth, who is the lead engineer in the Piper structural group and served in the same capacity on the wing design. "So sizing the structure and keeping the weight down was a major problem for us."

To meet these challenges, Piper relied on product lifecycle management (PLM) specialist Siemens PLM Software's NX™ software for computer-aided design (CAD) and Teamcenter® software. The Siemens PLM Software tools helped Piper re-use parts data, manage enterprise data, knowledge and intellectual property, and improve production efficiency and regulatory compliance.

The new wing helped increase range and payload. The M600 can carry 260 gallons of fuel, 35 percent more than the M500, which can hold 170 gallons of useable capacity. As a result, the M600 has a range of 1,658 nautical miles (NM), 40 percent more than the M500, which has a range of 1,000 NM. Additionally, the new wing

provided better payload capability, increasing the useful load from 1,698 pounds in the M500 to 2,400 pounds in the M600, a 29 percent increase.

"We did the initial structural wing layout in NX, positioning ribs, spars, flaps, etc.," says Rushworth. "From the initial layout we developed detailed models. We knew going into the build we wouldn't have any problems because we knew all our clearances, edge distances and fasteners: It was all laid out in the CAD.



"Using NX CAD speeds up the design process, especially when you can visualize it in 3D. You can design it more accurately and precisely, and that reduces assembly time. It makes it a lot easier when you know how the aircraft is going to fit together when it gets out on the factory floor. You don't see as many problems downstream when you design using 3D CAD."

Teamcenter and the digital thread also played a significant role in the development of the M600: "Teamcenter allows us to keep track of all of the parts in the aircraft," says Rushworth. "We know exactly where each part is in the design process, whether it is in only the layout or in the finished detailed. It helps us build unique aircraft every time, but we always know what the first aircraft configuration build was.

"By knowing what parts are in each aircraft, it makes it a lot easier on manufacturing downstream because they can see our models the same time we can so they see what is coming, and they can take our solid model and develop tools. It gives manufacturing a big overview on what is happening."

## Solutions/Services

NX CAD
www.siemens.com/nx

Teamcenter
www.siemens.com/teamcenter

## Customer's primary business

Piper Aircraft Inc., founded in 1937, is the only general aviation manufacturer to offer a complete line of aircraft, from rugged, reliable trainers to high-performance turboprops. Headquartered in Vero Beach, Florida, Piper offers aviators around the world efficient and reliable single- and twin-engine aircraft.
www.piper.com

## Customer location

Vero Beach, Florida
United States

Using the advanced CAD technology of NX and the digital twin has enabled Piper to decrease aircraft costs: "You can bring costs out of the airplane because NX CAD allows you to identify weight savings," notes Rushworth.

"Just imagine how long it would take if you are drawing a wing rib on the board instead of using NX, and how quickly you can make changes in NX."

Using Teamcenter and the digital thread enables Piper to organize all the parts, design the build assembly, etc. It connects all the departments, including design,

manufacturing, supply chain and parts. Everyone in the organization that needs access to the aircraft information can use Teamcenter.

"It also helps with the supply chain," says Rushworth. "Suppliers can send us 3D models and we can put them into our models and see if there are any problems straight away. There's no question NX and Teamcenter improve accuracy and speed up the process."

Ultimately, The Siemens PLM Software tools enable Piper to maximize productivity and achieve program goals.

## *"Teamcenter allows us to keep track of all of the parts in the aircraft."*

Mike Rushworth
Lead Engineer, Structures Group
Piper Aircraft Inc.