Pipistrel

Constructing lightweight eco-friendly aircraft with CATIA PLM Express

Overview

■ **Challenge**
Pipistrel needed to constantly innovate to produce the fastest, yet most fuel-efficient lightweight aircraft on the market

■ **Solution**
The award-winning company uses CATIA PLM Express and its Composites module for all airplane body design, replacing manual trial-and-error methods with highly precise 3D designs

■ **Benefits**
Development of Pipistrel's new four-seater aircraft, designed entirely with CATIA, has been shortened by 25%

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Tine Tomazic
Research & Development
Pipistrel

Renowned innovator of lightweight aircraft

Founded over 22 years ago, Slovenia-based Pipistrel designs and manufactures the widest range of advanced light aircrafts in the world. It produces five different families of planes that range from gliders, motor gliders to high efficiency cruising airplanes. It is the only company in the world that produces light aircraft with electric propulsion.

Unlike companies that engage in mass production, Pipistrel prefers a more exclusive approach with built-to-order products that provide customers with the very best flying experience. Pipistrel is the two-time winner of the prestigious NASA award in 2007 and 2008 for the most efficient light plane on the market.

Pipistrel planes are eco-friendly due to their low drag and lowest possible fuel consumption. They are also versatile. Pipistrel aircraft are used for a variety of activities such as scientific studies and for national park surveillance, and can land even on rough surfaces. "It's all about aerodynamics and energy efficiency," said Tine Tomazic, Research & Development, Pipistrel. "We must constantly innovate and come up with the most lightweight and fastest aircraft on the market."

Composites provide superior aerodynamic qualities

Composite materials provide Pipistrel with endless possibilities when shaping its planes. "Composites enable us to design an airplane that we can shape exactly to our specifications to achieve the best possible aerodynamics," said Tomazic. CATIA Composites was just the tool Pipistrel needed to handle composite design with the precision required for light and fast aircraft.

"CATIA is the only software that is able to produce a shape on the airplane such as the exterior shape of the wings or fuselage or tail, with the precision and smoothness we require because 1/100th of a millimeter, in aerodynamics, really matters," said Tomazic. "CATIA's precision is very important to us as is its ability to adjust a design at will. Once

you create a certain shape, you will always have to correct it, to modify it to the cm, mm, or hundredths of a mm. CATIA enables us to approach our designs with confidence. We can see the history and the future, which is crucial when making modifications," said Tomazic.

CATIA helps designers assemble components together to determine how thick the wall of a part will be. "Because a composite part is always made of plies with a complex shape, sometimes having many bends and corners makes it difficult to estimate how large this part will actually be. CATIA allows us to do this," said Tomazic.

Before CATIA, one of Pipistrel's biggest challenges was blending a surface between two adjacent parts, one sharp like the wings and the other round, like the fuselage. The traditional solution was to produce the wings and the fuselage separately and then join them by hand. It was too complex to draw so designers had to do it without drawings using a trial-and-error method. "Now we can do the most complex designs on screen in 3D," said Tomazic. "For the first time, we are able to do everything, thanks to CATIA."

Using CATIA has had a positive impact on Pipistrel's business. The company is currently designing its first four-seater aircraft that will travel at 400 km/hour entirely with CATIA.

"Whereas all the airplanes that can achieve this speed require at least a 300 horsepower engine, our calculations show that we can do this with a much smaller 200 hp engine. It's a dramatic improvement with respect to weight, noise and fuel consumption and we will be able to construct it with confidence thanks to CATIA," said Tomazic. And Pipistrel can complete the plane quickly, reducing cycle time by at least 25 percent. "It would not be possible to create all the models and have the parts cut with our machines with such precision without CATIA," said Tomazic.

Expanding the use of CATIA

CATIA will soon handle Pipistrel's entire material database, previously managed by a third-party solution. Pipistrel also plans to use CATIA's analysis capabilities to test new materials and to analyze their strengths and behaviors. "We believe that CATIA is more powerful than what we're using today, which is why we want to transfer all our measured data from our current solution to CATIA," said Tomazic.

Pipistrel will fully integrate CATIA into its ERP system. "We have already included CATIA data in our ERP system and we are now in the process of incorporating specific composite information including lay-up plans, material properties and production data such as temperature treatment graphs, resin samples, etc.," said Tomazic.

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