Alliant Engineering LLC

STRETCHING THE BOUNDARIES OF AIRCRAFT DEVELOPMENT WITH SOLIDWORKS SOFTWARE

Using SolidWorks software, Alliant introduced a revolutionary innovation in powered parachute design, introducing the first load-bearing composite fuselage on the Paracraft powered parachute.

- Shortened design cycles
- Minimized prototype development costs
- Innovated the first load-bearing composite fuselage
- Validated landing gear dressings for the largest plane ever built

Alliant Engineering provides turnkey product development, engineering, and analysis services to leading aerospace, automotive, and medical manufacturers. The company worked on the development of powered parachutes, unique aircraft that utilize parachutes and a powered vehicle, which are now marketed by Fantom Aerosports. Powered parachutes are ideal for applications that require low-level, relatively slow flight. The National Aeronautics and Space Administration (NASA) and the Federal Emergency Management Agency (FEMA) used the Alliant-designed Paracraft extensively, flying over 100 missions, to search for debris from the space shuttle *Columbia*, which broke up on re-entry.

When Co-Owner and President Jim Medsker founded Alliant Engineering in 1997, he knew that his company would need robust, integrated product design and analysis tools to support the company's goal of becoming the premier product development and engineering firm serving the aerospace, automotive, and medical industries. Before establishing Alliant Engineering, Medsker had used several different CAD systems and analysis packages, including use of the beta version of SolidWorks® 3D CAD software in 1996.

"We diligently assessed every CAD system available and took a chance on SolidWorks as one of its first beta sites," Medsker recalls. "That turned out to be a good decision because SolidWorks has really shined for us. I had used SolidWorks analysis packages in the past, and we soon added SolidWorks Simulation software because it is one of the most efficient finite element analysis (FEA) packages, is easy to use, and interfaces well with SolidWorks. Since then, the integration has become virtually seamless."

Alliant uses SolidWorks Simulation Premium software for linear, buckling, nonlinear, fatigue, and frequency analysis.

SolidWorks

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Jim Medsker, Co-Owner and President

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The first load-bearing composite fuselage

When Alliant Engineering sought to revolutionize the powered parachute market through the design of the first load-bearing composite fuselage, the company used SolidWorks Simulation software to support this important innovation.

"Before we designed the Paracraft, the fuselages for all powered parachutes consisted of aluminum tube structures, sometimes with a decorative skin draped over the tubular supports," Medsker recalls. "Weight is the critical factor in designing flying machines, and we undertook the challenge of developing a tubeless, stress-skin composite design that replaced aluminum tubes as the primary structural component.

"We wanted to produce an attractive, innovative design that had never been done before," he adds. "When dealing with a load-bearing structure involving a complex shape, you have to have a powerful FEA tool. You may be able to use hand calculations for simple designs involving tubes or cantilever beams, but producing a load-bearing body with a complex surface represents the most difficult problem we ever faced. It's safe to say that the Paracraft would not exist without SolidWorks Simulation."

Winning the race to market

Using SolidWorks software, Alliant engineers were able to optimize the Paracraft design for weight and strength under continuous loads of 10 Gs. They validated all of the Paracraft components, including the body, crumple zones, chute arms, safety cable areas, and loading struts. The software helped Alliant complete the Paracraft design in just six months and become the first development team to bring the aircraft's innovative structural body to market.

"Time-to-market was the key element in the successful launch of the Paracraft," Medsker explains. "SolidWorks Simulation saved us a lot of time and money because we were able to minimize physical testing. Because it is integrated with SolidWorks Standard, there was no need to import files or rebuild models. The integration is seamless — just another menu pick — which gave us an edge over our competition and enabled us to achieve this major leap forward in the industry in a relatively short amount of time."

The largest plane ever built

SolidWorks Simulation also enabled Alliant Engineering to accomplish another breakthrough in aviation as a result of its work on the landing gear dressings for the Airbus A380. At 1.5 million pounds and with capacity to carry over 550 passengers, the Airbus A380 is the largest commercial airliner ever built.

"We used a combination of high-end SolidWorks Simulation Premium and integrated SolidWorks Simulation software to develop the 250 brackets that hold the hydraulic, braking, and steering lines in place on the A380's 22-wheel landing carriage," Medsker says. "We conducted numerous analyses, ranging from linear static up to fatigue, with crash landing loads of up to 20 Gs.

"Analysis has become an increasingly larger part of our business," he notes. "Without SolidWorks Simulation software, some of our projects would be virtually impossible to complete."

SolidWorks

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