

AEROSPACE AND DEFENSE

Lisa Airplanes

Lisa Airplanes chooses Simcenter Femap and Simcenter Nastran to certify its new two-seater plane, the Akoya

Product

Simcenter

Business challenges

Assess behavior of aircraft structures and critical parts

Reduce the number of physical prototypes and flight tests

Obtain certification from international authorities to deliver first orders

Keys to success

Agile process combining numerical calculations and physical tests on 1:3 scale models

Rapid adoption of the software by non-specialist users

Compatibility of the Simcenter Femap pre-processor with the main CAD software (easy exchange with subcontractors)

Results

Simulated and documented around 200 use case scenarios in a few months

Reduced overall cycle time calculations and tests by 2 weeks

Optimized the thickness of many components to reduce aircraft weight by 15 percent

A robust and proven FEA pre- and postprocessing solution, accessible to businesses of all sizes

Lisa Airplanes: inventing a new way to travel

In France's Savoie region at the heart of the French Alps, a team of enthusiasts has embarked on an ambitious, far-sighted project: creating an all-terrain recreational aircraft that can take off and land as close as possible to its points of departure and arrival, whether on land, water or snow. A plane that is concurrently high-performance, comfortable, attractive and easy to fly. One with an innovative design that

rewrites the traditional codes of the aeronautics rulebook, no less.

This is how the Lisa Airplanes company came about back in 2004, with the ambition of revolutionizing recreational aviation and inventing a new way to travel.

To advance its vision, Lisa Airplanes set aside all preconceptions to start afresh and devise a genuinely innovative plane. "We started with a sheet of blank paper," recalls Benoit Senellart, one of the three founders of Lisa Airplanes. "We were disappointed by the light aviation offering which, in our eyes, was lacking in terms of innovation. In fact, it was by observing racing yachts, in particular the Hydroptère, a sailing hydro-



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Founder
Lisa Airplanes



foil, that the idea came to a head: if a boat can fly, why can't a plane use this technology to take off from water?"

Akoya: innovation at the heart of French design and elegance

Hence the concept: fitting the plane with ailerons that lift the fuselage off the water, but without compromising its in-flight performance. This concept would lead to one of the Akoya's most striking innovations: seafoils. It would take hundreds of configurations and tests to develop a wing

profile that created virtually no drag during the flight phase. In 2011, the prototype accomplished its maiden flight over Lake Bourget, making it the first seaplane in the world to take off from water using this technology.

But the team from Lisa Airplanes didn't stop there: they wanted to extend the versatility concept to snowy terrain. While the idea seemed perfectly natural to Lisa's founders, it represented a steep challenge for its engineers. The fitting of skis to the

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Technical Director
Lisa Airplanes



landing gear had to be done without altering the plane's other capacities, and without requiring any additional handling operation for its owner. From the very first sketches, a ski-wheel combination, dubbed ski-in, was designed, allowing the Akoya to go from a hard surface to a snow-covered surface in all conditions.

The crowning achievement came when the team of engineers devised an ingenious system of folding wings, allowing the plane to be stored in a reduced space.

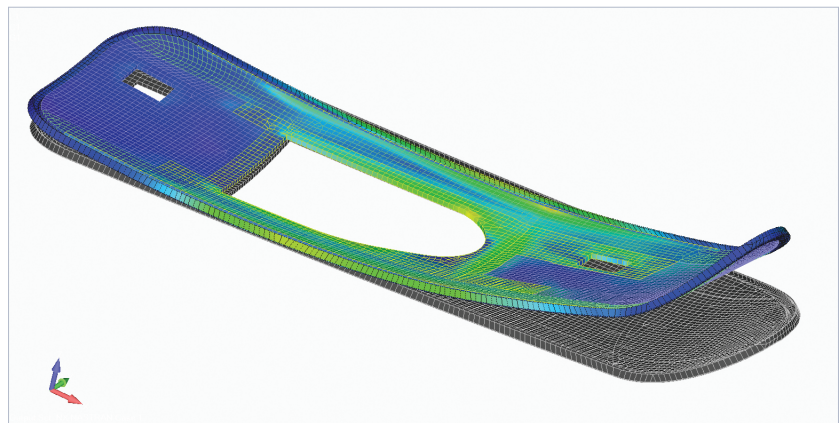
Representing 10 years of research and development, the Akoya is the very essence of technological innovation. Its singular design is the perfect embodiment of French elegance, and has already won over flying enthusiasts from around the world.

2004-2017: From the initial concept through to certification using Simcenter Femap and Simcenter Nastran

For the Akoya, currently being certified and just a few months away from its production roll-out, Lisa Airplanes chose Simcenter™ Femap™ software for simulation from Siemens Digital Industries Software.

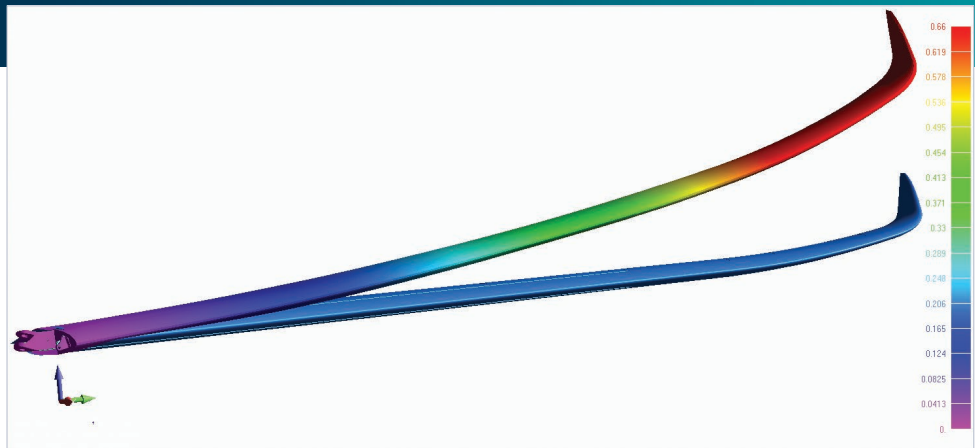
The challenge is considerable: obtaining certification within a very short time frame to be able to launch serial production and deliver the first orders.

"The Akoya falls within the Light Sport Aircraft (LSA) category created in the U.S. in 2005 and more recently adopted in Europe. Senellart explains: "This category lies between ultra-light aviation (ULM) and general aviation. Unlike ULMs which are approved, LSA planes must be certified in Europe by the European Aviation Safety Agency (EASA) via a more detailed, more complex procedure than that of approval."



“We successfully developed a method that allows us to implement extremely short cycles: two weeks between the model’s development in Simcenter Femap and the physical tests on a 1:3 scale model. Agility is the key to success.”

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“Proceeding from the pre-serial prototype to the certified plane involves a substantial amount of documentation work,” explains Hussein Harb, who recently joined the Lisa Airplanes team as Technical Director. “This requires an astute combination of physical trials and mathematical calculations to produce the requisite elements of proof sought by the certification authorities. Also, the use of composite materials requires real expertise in structural sizing and the manufacture of parts.”

For this aspect, the Lisa engineers drew on their solid experience in simulations on composite parts. All the parts that make up the Akoya’s primary structure were tested via static tests up to their breaking point to ensure that their manufacture was compliant with the calculations, and that each part’s mass and resistance were optimal. For its part, the in-flight test campaign served to finalize the development, open the plane’s flight envelope, and build on all of the data needed for the aircraft’s certification by the authorities.

The process used by the Lisa engineers in Simcenter Femap is illustrated by the ski-in assembly, located below the plane in the landing gear. The initial preprocessing step involves defining the model in terms of finite elements, load cases and constraints. The 3D CAD model is imported directly into Simcenter Femap, which offers tools to simplify and clean the geometry. For the simulation run, the Lisa team uses Simcenter™ Nastran® software, widely recognized and used in the aeronautics sector and more specifically in light

aviation. For postprocessing, Simcenter Femap offers a broad range of results processing tools to quickly and effectively understand the behavior of the analyzed system and easily generate the simulation reports.

The development and optimization iterations are carried out in Simcenter Femap. Once the parameters have been adjusted, the model is forwarded to the CAD team, which makes the necessary modifications to the initial design.

“To size the plane, we have 200 flight cases to study and document,” says Harb. “If we were to apply overly generous safety margins and oversize the parts, this would burden the plane and compromise its performance. The optimization tools available in Simcenter Femap allow us to adjust the thickness of the parts, make iterations, interactively display the results and find the best configuration. With Simcenter Femap, we only add material where it’s needed.”

SIGMEO, a Siemens Digital Industries Software Solution Partner and France’s leading distributor of the Simcenter Femap and Simcenter Nastran software solutions, provided support for their implementation at Lisa Airplanes. Director Thierry Boudrier sums up the solution’s main advantages: “Simcenter Femap is a pre- and post-processing tool that can be considered as universal since it accepts numerous CAD model formats as input, and interfaces with the market’s main solvers on input and output. Its competitive price and ease

Solutions/Services

Simcenter Femap
siemens.com/simcenter-femap

Simcenter Nastran
siemens.com/simcenter-nastran

Customer's primary business

Lisa Airplanes was primarily established to create leisure aircraft. To develop its brand, the company decided to mix genres to create its own label just like the great fashion couturiers and design aircraft that are not only aesthetically pleasing but also truly unique.

Despite the company's relative youth, it has managed to make its mark in the sector as an avant-garde company that has transcended the traditional boundaries of aviation. It has already marked the history of aviation in 2011 with the inaugural flight of a seaplane that took off using a system of hydrofoils.
<http://lisa-airplanes.com/en>

Customer location

Le Bourget du lac
France

Solution Partner

SIGMEO
www.sigmeo.fr

of use make it an affordable solution for users seeking to benefit from a robust, proven solution."

Plans for the future Akoya: first step towards sustainable aviation

The certification phase represents a crucial step for the Akoya. "Our aggressive delivery schedule means we have to work quickly," explains Senellart. "The Simcenter Femap solution is easy to use, and was very rapidly adopted by our users, even those who are non-specialists. We successfully developed a method that allows us to implement extremely short cycles: two weeks between the model's development in Simcenter Femap and the physical tests on a 1:3 scale model. Agility is the key to success."

Today, Lisa Airplanes claims a special place in the aeronautics universe. Its offer equally addresses aviation enthusiasts and

fans of exciting leisure activities with a strong desire for freedom. Its customers come from all around the world, including North America and Asia, where the Chinese market is in full expansion. The company also seeks to broaden its customer base in Europe.

Aware of the environmental issues inherent in aeronautics, Lisa Airplanes develops a sustainable mobility approach via its research and development center. It thus seeks to offer light aircraft that are environmentally friendly. Work is already underway to reduce the Akoya's energy requirements to the minimum. The company now plans to develop a range of electric aircraft by building on the experience acquired with the Simcenter Femap solution and all of the data resulting from the certification phase.

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