CASE STUDY

FLY HIGH WITH OPTIMIZATION

OPTIMIZING CAMCOPTER® S-100 DESIGN AT SCHIEBEL WITH ALTAIR SOLUTIONS

Background Information

Unmanned aerial systems (UAS) are a rapidly evolving technology and used for a variety of civil and military purposes. Due to their ability to maneuver with precision and map inaccessible and geographically difficult terrain, areas of application include maritime patrol, fire and emission monitoring, supply line surveillance, airborne laser scanning, as well as aerial cinematography. To ensure airworthiness, UAS manufacturers rely on advanced simulation and manufacturing techniques to create efficient designs.

About the Customer

Headquartered in Vienna, Austria, Schiebel Group is a manufacturer of UAS who has built an international reputation for manufacturing reliable and mature products for both defense and humanitarian sectors. To achieve precise designs and a reliable performance of its technologically advanced products, Schiebel uses a variety of high-end manufacturing technologies, such as metal additive manufacturing (AM) and advanced simulation solutions to develop and build its CAMCOPTER® S-100.

Since 2020, an in-house metal 3D printer enables Schiebel to manufacture landing gear brackets and titanium parts for the S-100 rotor engine, featuring maximum durability and power output with smallest possible weight and size. To fully leverage the advantages of AM, Schiebel uses Altair solutions, in particular topology optimization for light weighting, structural simulation for certification, thermofluidic dynamics for heat exchanger design and internal flow optimization, multibody simulation, as well as a solution in the Altair Partner Alliance (APA) for thermal stress simulation.

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Schiebel also offers customers additional services including design, optimization, printing, and post-processing with EN9100 certification.

Their Challenge

As an aerial system which is active throughout Europe and operates with diverse payloads for different missions, the S-100 has to cover distances of up to 160 km, flying for more than 8 hours. This requires a reliable, robust vehicle architecture and fuel supply. In addition to functionality requirements and to offer its demanding customers best-in-class vehicles, Schiebel wants its S-100 to be as light as possible to increase the vehicle's reach.

Along with high performance targets, Schiebel also has to make sure that its products are compliant with several national regulations. To this aim, the company has already worked with the European Union Aviation Safety Agency (EASA) who recently created a light UAS operator certificate (LUC), which includes guidelines on safe operation, control systems reliability, and a permit to fly. Striving to be awarded with this airworthiness certification, Schiebel needed hardware and software to enable the company to achieve a certifiable system that meets most of the requirements in various countries. To meet these demanding development goals and allow Schiebel to take the S-100 of today into the future, the company needed a multidisciplinary design approach.

Our Solution

To ensure a perfectly tuned architecture and a lightweight design while increasing stiffness and strength at the same time, Schiebel used Altair solutions in combination with 3D printing. The engineers performed a whole range of simulations, especially to optimize the design of additively manufactured engine parts. Using Altair's topology optimization structural design tool, Schiebel reduced the weight significantly while maintaining a high stiffness level and therefore achieved a robust design. Subsequently, the system was evaluated by laminar and turbulent flow simulation as well as conjugate heat transfer simulation using Altair CFD™. Contacts, Nonlinear Finite Elements (NLFE) and complex dynamic systems were then modeled with Altair® MotionView® and Altair® MotionSolve®.

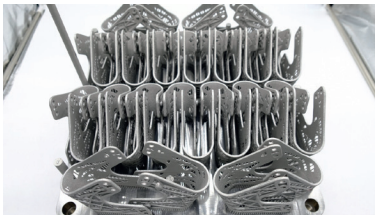
Schiebel also took advantage of their access to APA solutions and applied tools such as Amphyon to simulate the AM process, including pre-deforming the parts to achieve the required accuracy. Amphyon was also applied for a thermal stress simulation, allowing the engineers to identify thermal hotspots and simulate the strength of the support structure.

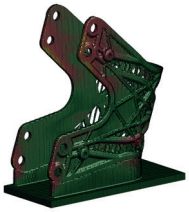
Results

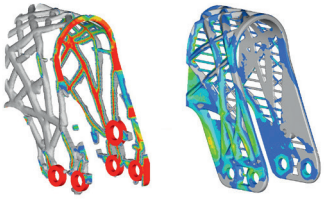
Thanks to the Altair solutions, Schiebel was able to develop and manufacture engine parts with an optimized, bionic structure and an exceptional product design, providing its customers with a reliable, lightweight air vehicle. The combined use of additive manufacturing and simulation driven design also reduced the component weight by up to 50% while increasing stiffness and strength by also 50%. Another major benefit of this simulation approach is the reduction in printing costs, as Amphyon's simulations identify issues that might arise during printing before they occur, thus avoiding additional print jobs due to manufacturing defects.

"Altair solutions helped us create a topologically optimized engine part for our CAMCOPTER® S-100 and an efficient design that meets all demands. Using simulation enabled us to leverage the full potential of additive manufacturing and allowed us to accelerate our time to market. Thanks to Altair's technology expertise and support, we are able to realize significant time and cost savings and offer our customers exceptional cost-benefit ratio," said Dominik Kohl, head of additive manufacturing at Schiebel.

To learn more, please visit altair.com







TOP: Thanks to Altair's multidisciplinary approach, Schiebel was able to develop and manufacture structural parts with an optimized, bionic structure. **MIDDLE:** APA solution Amphyon enabled Schiebel to simulate the AM process and to achieve the required accuracy of the new bracket. **BOTTOM:** Topology optimization followed by a detailed stress analysis with Altair® OptiStruct® enabled Schiebel to significantly reduce weight while achieving a robust design.