Dronamics Optimizes its Cargo UAV with Ansys Simulation

"Dronamics Ltd. uses Ansys fluids and structural simulation to improve the design, development and optimization of its unmanned aerial vehicle's (UAV's) aerodynamics and mechanical structures. Because the UAV is intended for a relatively unexplored, cargo-carrying application, multiple design changes are needed to account for and exploit the lack of a pilot cabin and life support system. We found conventional design tools to be extremely expensive and time-consuming. With Ansys simulation software, obtained through the Ansys Startup Program, we saw a drastic reduction in the project cost and timeline for our UAV design."

Martin Emilov Zahariev
MEng / Dronamics Ltd.

To build a truly optimized logistics network is to design next-generation, unmanned cargo airplanes with great improved fuel efficiency. For us, developing and optimizing a UAV design requires an iterative design and optimization process, both of which can be tackled quicker and more cost-effectively using engineering simulation techniques.

/ Company Description

At Dronamics, we seek to democratize airfreight and lower the cost of shipping in emerging markets. To achieve this, we are developing a new type of cargo airplane — small, unmanned and extremely fuel-efficient. It can transport 350 kg over 2,500 km, for a cost that is more than 50% lower than other airplanes.

/ Challenges

The main business challenge is finding an affordable solution — not a particular technology — that lowers development costs and shortens design iteration cycles. Using computer-aided engineering (CAE) tools allowed us to create multiple design iterations of our UAV's aerodynamics and internal structure, in just a fraction of the time and cost if we'd used conventional design methodology. This allowed us to keep the plane's cost down for our customers.

/ Technology Used

- Ansys Fluent
- Ansys Mechanical
- Ansys Composites PrepPost
- Ansys Workbench

/ Engineering Solution

The integration between the CFD and FEA modules in Ansys workbench was one of the most valuable features that helped us speed up the process.

- For the optimization of the aerodynamics of the UAV, we used Ansys Fluent computational fluid dynamics (CFD) software, which includes 3D incompressible transient CFD simulations with sliding meshes and complex turbulence modeling capabilities.

- For the optimization of the internal structure, we used Ansys Mechanical for finite element analysis (FEA) and Ansys Composite PrepPost for analysis of our composite material (carbon fiber).

- The integration of our CFD and FEA models in Ansys Workbench was invaluable in speeding up our process.

/ Benefits

The ability to link and automate the different types of simulation drastically improved the flow and speed of the design process. Ansys simulation reduced development and optimization time by approximately 60% and cut design time by almost half.
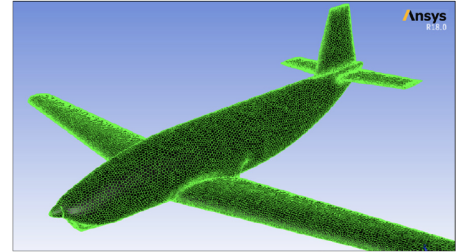
Polyhedral Mesh of the Black Swan UAV.
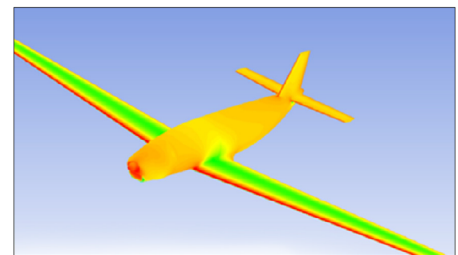
Pressure Distribution of the Black Swan UAV.