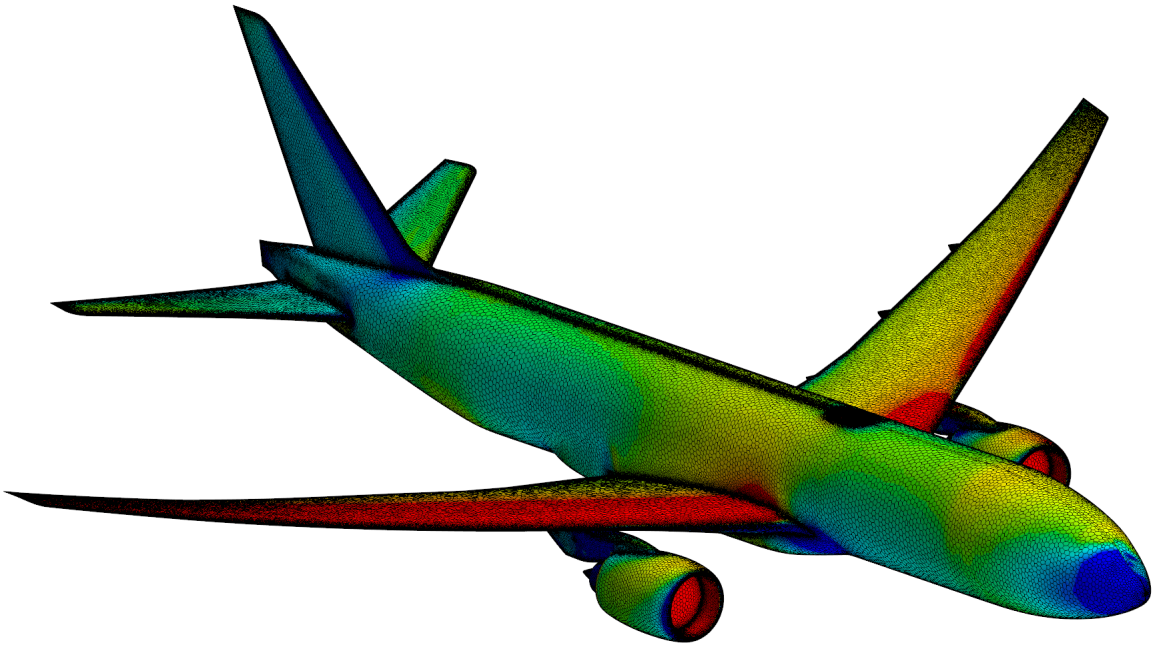
NIMBIX
CASE STUDY

Aero Xpertise leverages Nimbix Cloud to help Gogo provide in-flight internet and optimal aircraft aerodynamics



"The CFD simulations I run are crucial to understanding aircraft aerodynamics, performance and safety. With tens of millions of data points, they used to take up to 12 hours on my in-house cluster. I would set up a simulation and let it run overnight and hope it would be finished when I got up in the morning. With Nimbix, I can stack up several jobs, go to lunch, and they're done when I get back. The speed, scalability, and efficiency of the Nimbix Cloud have made a big difference in my work."

Will de Jong
Independent Aerospace Engineering Consultant,
Aero Xpertise LLC

NIMBIX
CASE STUDY

INTRODUCTION

Independent aerospace engineering consultant Will de Jong is the owner of Aero Xpertise LLC and specializes in applying computational fluid dynamics (CFD) to solve aerodynamic design problems. He has partnered with Aeromechanical Solutions LLC (AMS) on over 200 projects and performed thousands of CFD simulations to solve complex design issues for numerous airline satellite communications (satcom) and special mission aircraft developers.

One of these clients was satcom provider Gogo, which provides next-generation in-flight connectivity solutions for commercial airliners. Gogo needed to mount its 2Ku satellite antennas and radomes on a wide variety of aircraft, without sacrificing the aircrafts' aerodynamics, performance, or safety. Radomes—the weatherproof enclosures that protect the radio antennas and are effectively transparent to radio waves—are installed on the outside of the aircraft, which means their shape and placement can affect the aerodynamic loads on the structure of the plane.

de Jong had to perform CFD simulations to test designs that accounted for all the changing variables. With each one requiring 20 to 40 million data points to model the airplane, not to mention a tight schedule for the client, de Jong needed the computing power and resources of an HPC partner like Nimbix.

CHALLENGES

Prior to seeking a high performance computing (HPC) partner, de Jong ran CFD simulations using his in-house computer cluster. Each simulation took between eight to 12 hours to complete, and without the infrastructure necessary to run simulations in parallel, de Jong was limited in how much he could accomplish in a day. The only way to speed things up was to use fewer data points, which lowered the accuracy of the results. To get the precision he needed, therefore, he spent more time waiting on simulations to finish, leaving less time to analyze and post-process the results.

To keep up with the workload and clients' demanding schedules, de Jong needed more computing power. However, expanding his in-house cluster would require significant infrastructure upgrades for both power and air conditioning to accommodate more machines. He found it difficult to justify the investments required to expand his cluster, especially when it wouldn't be in use all the time.

That's when de Jong started looking at HPC providers. After trying one cloud-based solution he found the system too labor intensive, and the pricing structure didn't work well for his type of work. He then discovered the flexibility, ease of use, and simple pricing structure of the Nimbix Cloud and has used it continuously for several years.

TECHNOLOGY USED

de Jong runs CFD simulations to test aerodynamic designs and the effect of changes on performance. He uses Siemens STAR-CCM+ software with power-on-demand licensing and the Nimbix Cloud, saving time by running simulations faster and running three or four jobs in parallel. The ability to handle larger simulations and run them in parallel creates an efficiency that translates to both a cost and time advantage in his work.

Most of de Jong's work is with airliner satcom companies like Gogo and with special mission aircraft developers. For both groups, he uses CFD to answer critical questions like how the shape and placement of radomes change the aerodynamic loads on the aircraft structure. This allows him to help his customers improve their designs, answering questions such as where to place the antennas for minimum drag, optimal takeoff performance, and maximum fuel economy. And since each airline flies more than one type of aircraft, radomes have to be designed and optimized for all the different airframes.

ENGINEERING SOLUTION

By outsourcing HPC to Nimbix, de Jong significantly accelerated his simulations, reducing typical processing times from 12 hours to under two hours. He can also run simulations in parallel. Because of the Nimbix computing resources, he's able to improve mesh fidelity and resolve the detailed physics of the airflows, which provides higher confidence in the results, while running more simulations with faster turnaround times. As a result, de Jong has been able to provide these solutions for Gogo:

- Run simulations to evaluate different conditions on baseline aircraft, then run them again with the modification installed.
- Influence the performance of the aircraft, determining where to place antennas for minimum drag and maximum fuel economy.
- Run simulations for any aircraft, allowing airlines to install satcom radomes on any carrier and any aircraft model.

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BENEFITS

de Jong leverages the computing resources of the Nimbix Cloud to run CFD simulations faster and in parallel, dropping simulation turnaround time by up to 83 percent. Since the Star CCM+ license is calculated per hour, this in turn reduces the licensing cost.

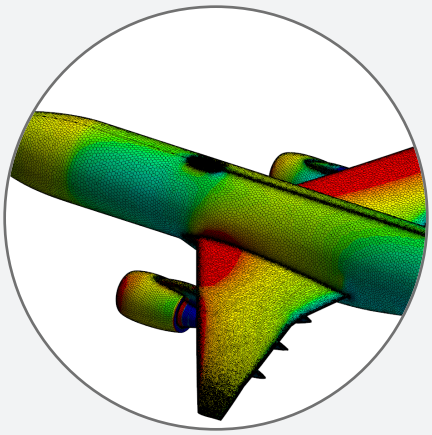
The additional computing power allows him to increase mesh sizes while still running simulations in a reasonable amount of time. More data points translate to more confidence in the results of the simulations, and shorter simulation times allow him to evaluate additional conditions and provide more data to his clients.

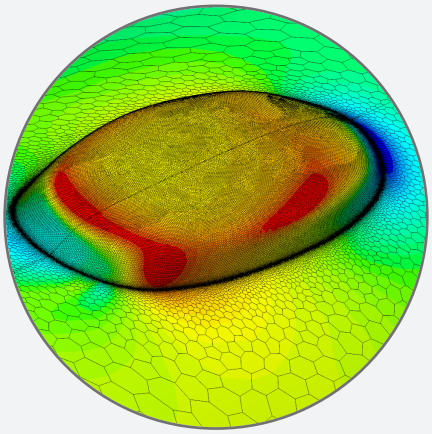
The cost and time efficiency of Nimbix HPC has a direct effect on de Jong's business and his customers. "It's more efficient to run larger simulations and run jobs in parallel," says de Jong. "Frankly, it's less expensive to pay Nimbix for the additional horsepower because with the lower licensing cost, it ends up reducing the total cost of a simulation. I can lower my prices to my customers, which helps both Aero Xpertise and my customers stay competitive."

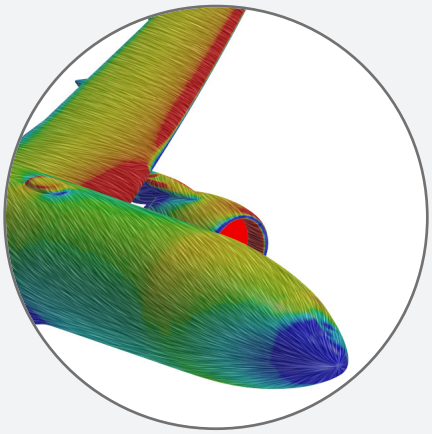
COMPANY DESCRIPTION

Will de Jong, independent aerospace engineering consultant, runs Aero Xpertise LLC and specializes in applied computational fluid dynamics. de Jong uses commercially available CFD codes to solve real world problems in aerodynamic design and aircraft certification. With a background in aircraft performance, flight test data analysis, flight test instrumentation, and wind tunnel testing, he has the experience to set up CFD simulations that provide useful data to other contractors and designers.

From 2014, de Jong has partnered with colleague David Lednicer and his company, Aeromechanical Solutions LLC on over 200 projects, including the CFD simulations for the Gogo satcom radomes, used to provide connectivity and in-flight internet service on commercial airline flights.







Using the Nimbix Cloud, Aero Xpertise ran CFD simulations used to design Gogo's 2Ku low profile satellite radome installations.