Most people are used to flying, and few of us think about the many factors that affect an aircraft’s performance. We spend hours in the air experiencing a smooth ride with minimal turbulence. For the engineers and designers responsible for creating these aircraft, however, an immense amount of work goes into ensuring that flying is as safe and smooth as possible, with optimal speed and efficiency.

It is critical that engineers assess an aircraft’s performance at every stage from takeoff to landing, including its behavior on the ground, while gaining altitude, cruising and descending. Engineers assess how the aircraft will react to wind gusts at high speeds, for example, or the effects of drag on the landing gear. As aircraft are designed to be faster and more efficient, designers and engineers must also anticipate how they will perform at higher speeds and with lighter weights.

To certify a new aircraft, the manufacturer has to demonstrate that it can fly safely in its entire flight envelope. The aircraft has to be tested for as many as 100,000 distinct configurations. Traditional Computational Fluid Dynamic (CFD) methods can cover only a fraction of these. For the vast majority of configurations physical testing, particularly expensive and time-consuming wind tunnel tests, is still the only option.

SIMULIA fluids solutions include Lattice Boltzmann solvers for unsteady simulations providing a true breakthrough in this field. For the first time it is possible to expand the use of CFD to the entire flight envelope, potentially replacing thousands of wind tunnel tests for high-lift configurations, high-speed buffet, and many other configurations requiring unsteady simulations. Lattice Boltzmann-based CFD methods are many times faster than traditional unsteady CFD methodologies, allowing the expanded use of high fidelity CFD methodologies in early development stages. Compared to physical testing, these highly efficient simulation solutions enable significant cost savings and risk reductions.
Using SIMULIA fluids solutions, engineers can feel confident in the real-world performance of an aircraft before it ever enters the flight test phase, the most expensive phase of aircraft development. Almost every major new aircraft program over the past two decades has encountered significant delays during flight test, often due to unexpected aerodynamic effects that were not discovered during wind tunnel testing. SIMULIA fluids solutions help reduce the risk of unexpected delays by predicting complex physics prior to flight testing, including those involved in take-off, landing and climb performance, stall characteristics, stability and control, maneuverability, ground handling characteristics, and high-speed buffet.

SIMULIA fluids solutions offer a complete portfolio of appropriate fidelity computational fluid dynamics methodologies, including Navier-Stokes based solvers for cruise conditions in addition to Lattice Boltzmann based methods for unsteady flows. These solutions are in the process of becoming fully integrated with the 3DEXPERIENCE platform, and are currently available on the SIMULIA Cloud for easy access without the need for hardware. Companies of any size can benefit from using comprehensive simulation technology without making a major investment.

As the aerospace and defense industry continues to grow, air travel is predicted to double in the next 15 years. New companies are challenging the big corporations that have dominated the industry for decades. Regardless of size, companies have to constantly improve and leverage the best tools to remain competitive. SIMULIA fluids solutions and the 3DEXPERIENCE platform offer solutions that cover every aspect of an aircraft and its movement, continuously striving and meeting industry requirements to help our customers reach their full business potential.