3DEXPERIENCE®

WHY CHOOSE SOLIDWORKS FLOW SIMULATION?

White Paper

DASSAULT SYSTÈMES
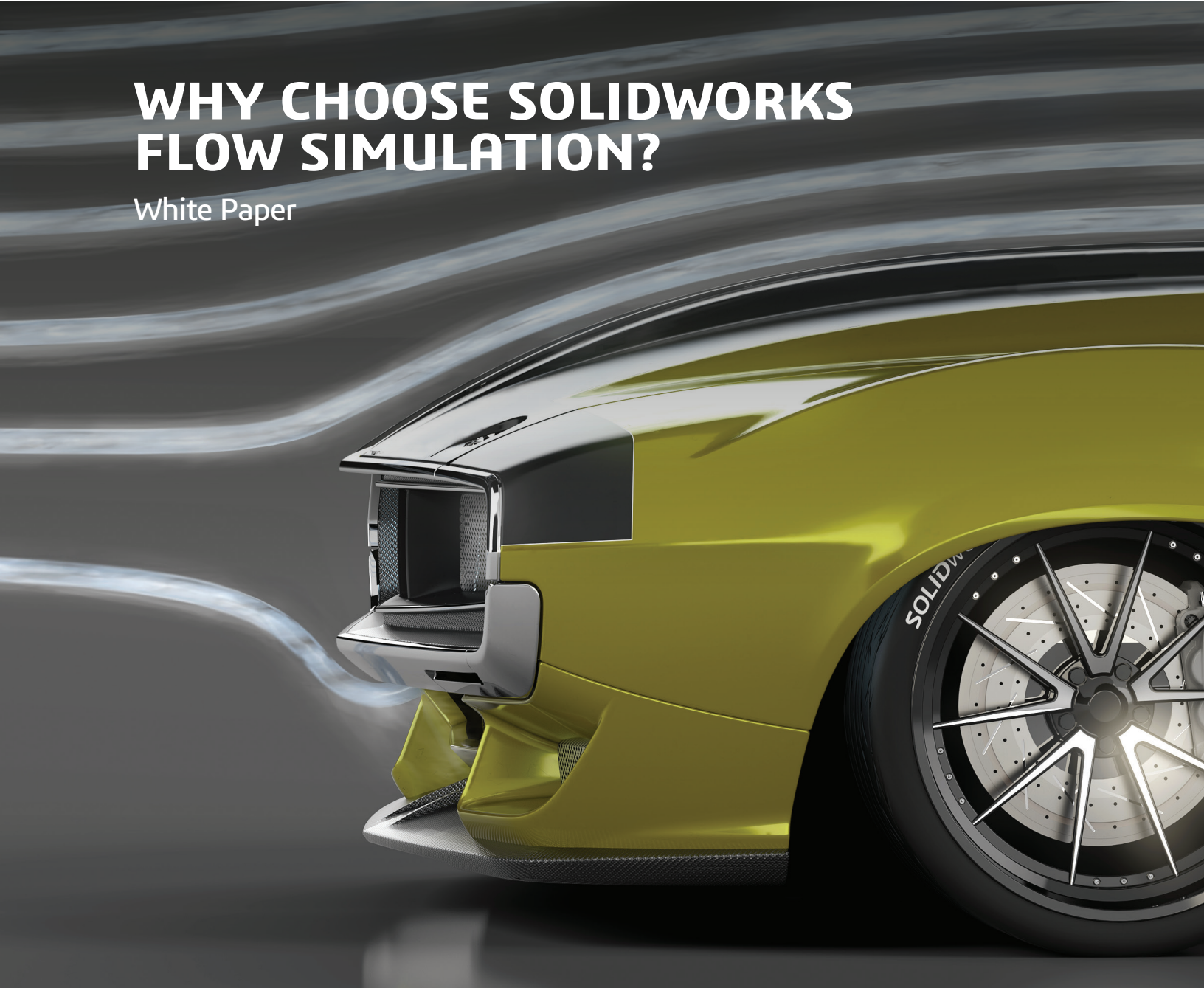
OVERVIEW

SOLIDWORKS® Flow Simulation software makes it easier and faster to determine the impact of liquid or gas flow on your product designs before any parts are made. Unmatched in the industry, this suite of easy-to-use tools takes all of the complexity, difficulty and guesswork out of the user experience. It leverages intelligent technology, that is built into the SOLIDWORKS platform, to accelerate innovation and development.

A CASE IN POINT

Aerovelo leverages this technology to make seemingly impossible feats, such as human-powered flight and human-powered land speeds of nearly 100 miles per hour, possible. The company combines athletics, aerodynamic design, and advanced structure and materials technologies to develop innovative human-powered vehicles. The goal: surpass known limits and shatter world records in an effort to raise public interest in science, technology, and environmentally conscious engineering.

Aerovelo has depended upon SOLIDWORKS Professional and SOLIDWORKS Flow Simulation to help it invent, design, and build human-powered bikes, helicopters, and ornithopters—and take them into the record books. Following successful development of its record-setting, human-powered helicopter and the world's first successful orinthopter, a device that flies by flapping its wings, the company turned its attention to high-speed success on land. Aerovelo leveraged SOLIDWORKS Flow Simulation Computational Fluid Dynamics (CFD) analysis software to take its record-setting Eta speed bike to a new level.

"With SOLIDWORKS Flow Simulation, we gained important insights and developed key innovations that helped us make a huge leap in terms of fairing aerodynamics," says Cameron Robertson, Aerovelo's co-founder. "We used SOLIDWORKS Flow Simulation pressure profiles to pursue our aerodynamic strategy. Laminar flow is definitely better for performance than turbulent flow, and we want as much laminar flow as possible. However, creating a fairing shape that achieves an extended run of natural laminar flow is a very delicate and finesse-oriented design task, for which SOLIDWORKS Flow Simulation software helped."

Using SOLIDWORKS design and CFD analysis tools to improve the performance of its Eta speed bike, Aerovelo broke the previous human-powered speed record of 133.78 km/hr (83.13 mph) in 2015. Since then, the company has refined and improved the bike design, which has allowed Aerovelo to break its own record four more times, culminating in an astounding run at 144.17 km/hr (89.59 mph) in 2016. "With the help of SOLIDWORKS computational tools, we've come close to 90 mph and should be able to reach at least 92 mph after refinements," Robertson says.

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– Cameron Robertson,
Vice President/Structures, Aerovelo
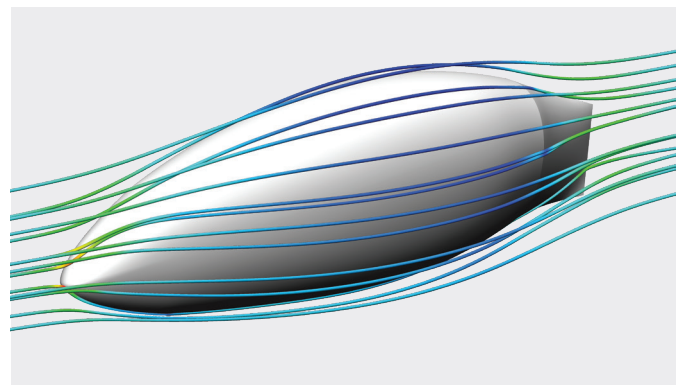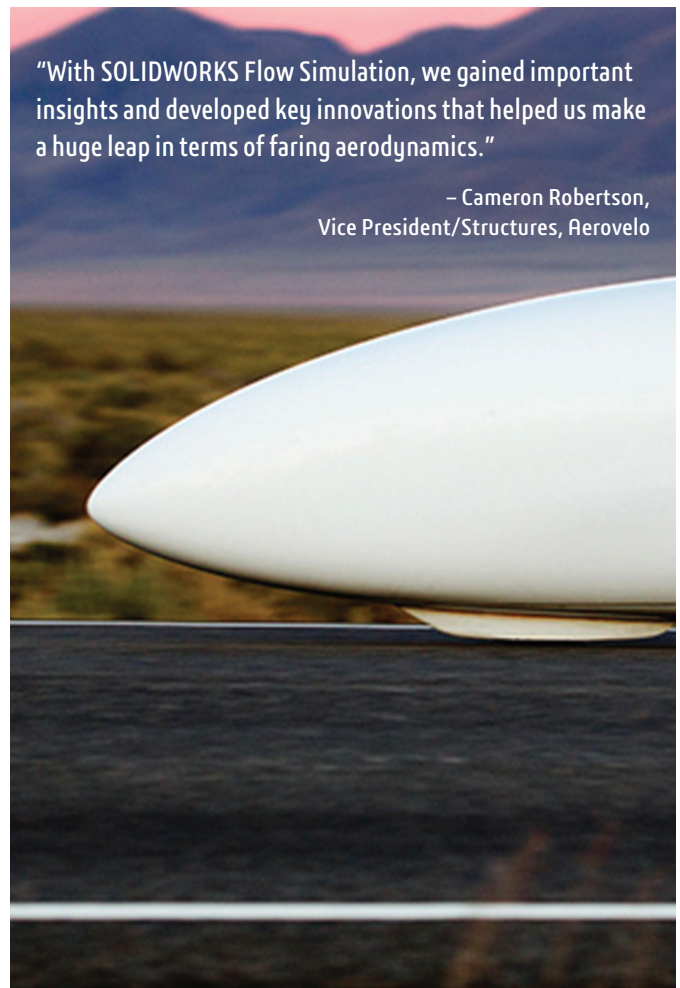
THE SOLIDWORKS FLOW ADVANTAGE

With SOLIDWORKS Flow Simulation, designers, engineers and analysts can simulate liquid and gas flow in real-world conditions, efficiently analyzing the effects of fluid flow, heat transfer, and related forces on immersed or surrounding components. The system lets users easily simulate fluid flow, heat transfer, and fluid forces, which are critical to the success of the design, at the earliest stages of the design processes. It can also process multiple "what if" scenarios to aid in optimizing designs quickly. As a result, users can develop peak-performing designs more quickly, easily and accurately than ever before.

SOLIDWORKS Flow Simulation incorporates seven key technologies for Concurrent Computational Fluid Dynamics (CFD) that deliver outstanding benefits in terms of accuracy, efficiency, flexibility, and speed.

- **Flow Simulation is fully embedded within SOLIDWORKS** so there's no translation step necessary, and no accompanying loss of geometrical fidelity. Users don't need to create complex fluid region definitions. Design and CFD models stay in sync, reducing re-synchronization effort and the potential for errors. And since it's integrated with SOLIDWORKS, the learning cycle is shorter too.

- **Flow Simulation includes Automated Boundary Meshing** ,which means no manual meshing time, and expertise in CFD is not required. Execution time is dramatically reduced without sacrificing accuracy.

- **Multivariate "What if?" Analysis** makes it easy to optimize designs quickly. Technical insights provided by CFD result in better technical decisions.

- **Built-in Solution Convergence** reduces the number of re-runs needed due to lack of convergence, and eliminates CFD specialist tweaks (such as model modifications) that would've been needed to attain it. Short run times enable staging of multiple variant scenarios.
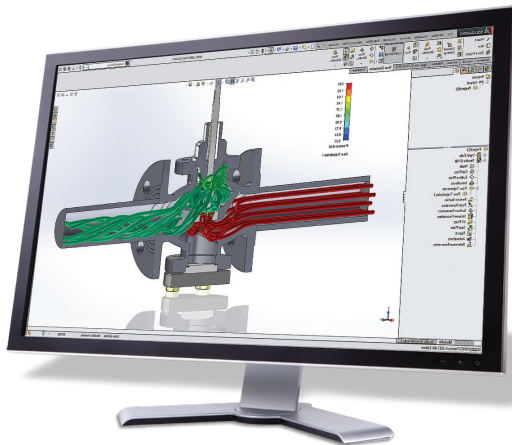
- **Flow Simulation's exclusive Turbulence Model** means that laminar, transitional, and turbulent flow regimes are automatically determined with no need to specify flow characteristics. The ability to directly model flow regimes eliminates the need for a CFD specialist. The turbulence model also offers shorter setup times and increased model accuracy compared to traditional approaches.

- **Flow Simulation's Wall Function for Boundary Layers** provides accurate simulations, including near-wall boundary condition effects. This function reduces the trial and error associated with near-wall setup when utilizing traditional CFD approaches.

- **Flow Simulation's Intuitive Interface** reduces setup times, delivers comprehensive results analysis and best-in-class visualization capabilities.
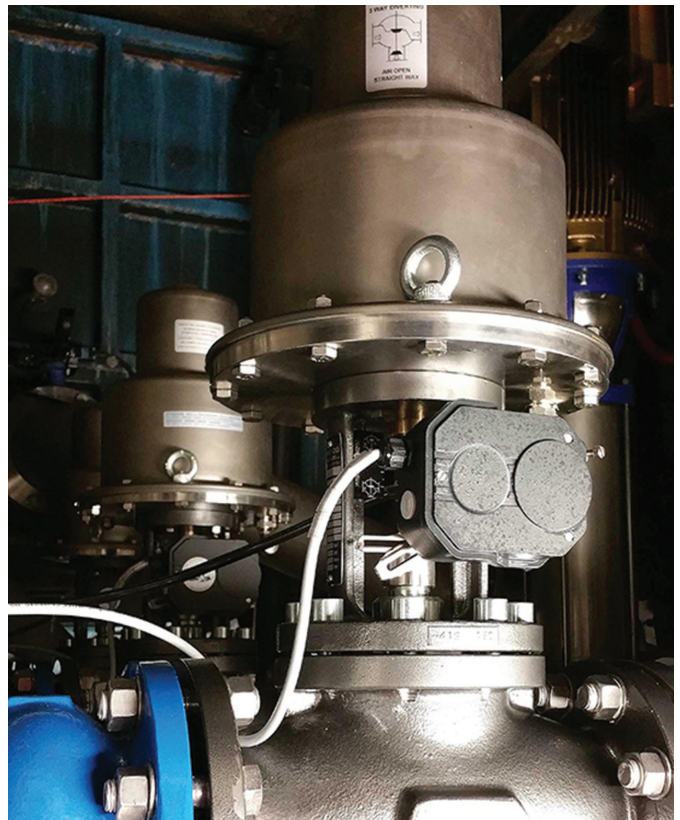
> "In just a few minutes, our engineers can use SOLIDWORKS Flow Simulation to calculate anything they need with an accuracy of 98 percent. This enables us to improve product performance."
>
> – Paolo Palestro,
> Sales Manager, Burocco Industrial Valves

AVAILABLE ADD-ON MODULES FOR FLOW SIMULATION

HVAC Module

This module offers additional simulation capabilities for advanced radiation and ASHRAE thermal comfort analysis.

Electronic Cooling Module

This module offers electronic virtual models and an extensive materials library for electronics cooling simulation.
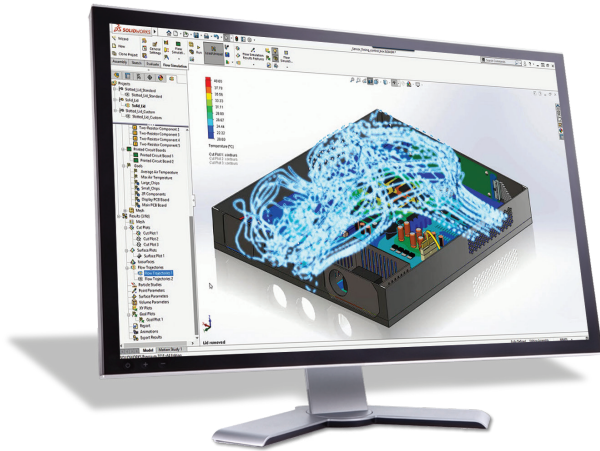

To learn more about SOLIDWORKS Flow Simulation solutions, visit www.solidworks.com/flow or contact your local authorized SOLIDWORKS reseller.

SOLIDWORKS systems requirements are posted on the SOLIDWORKS website at www.solidworks.com/systemrequirements.

"The birth-to-use time is what Falcon Pursuit is concerned about because we're dealing with designers who want answers overnight. And our birth-to-result time is shorter in SOLIDWORKS than anything else we have tried—and we have used a lot of the simulation programs out there. Those very first results that I presented were spot on. So, it's nice to know that you have, not only the gold standard in Flow but, a way of working through to an actual solution that an engineer can see. What we're finding is that Flow Simulation is the preferred tool because it can be matched to real world performance better than most wind tunnel work."

– Jay White,
CTO, Falcon Pursuit
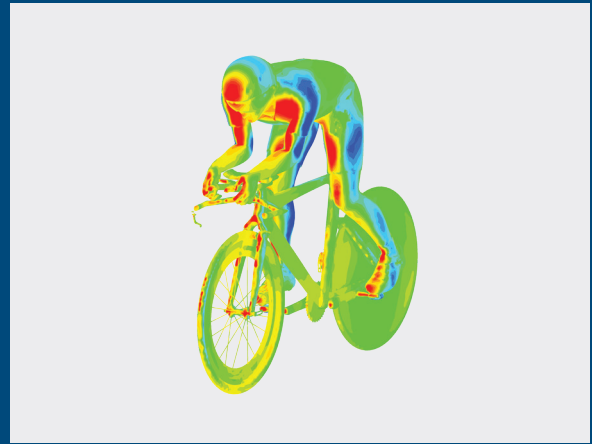
Dassault Systèmes is a catalyst for human progress. Since 1981, the company has pioneered virtual worlds to improve real life for consumers, patients and citizens.

With Dassault Systèmes' **3DEXPERIENCE** platform, 370 000 customers of all sizes, in all industries, can collaborate, imagine and create sustainable innovations that drive meaningful impact.

For more information, visit: **www.3ds.com**
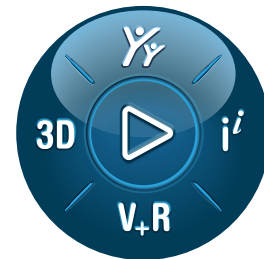
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