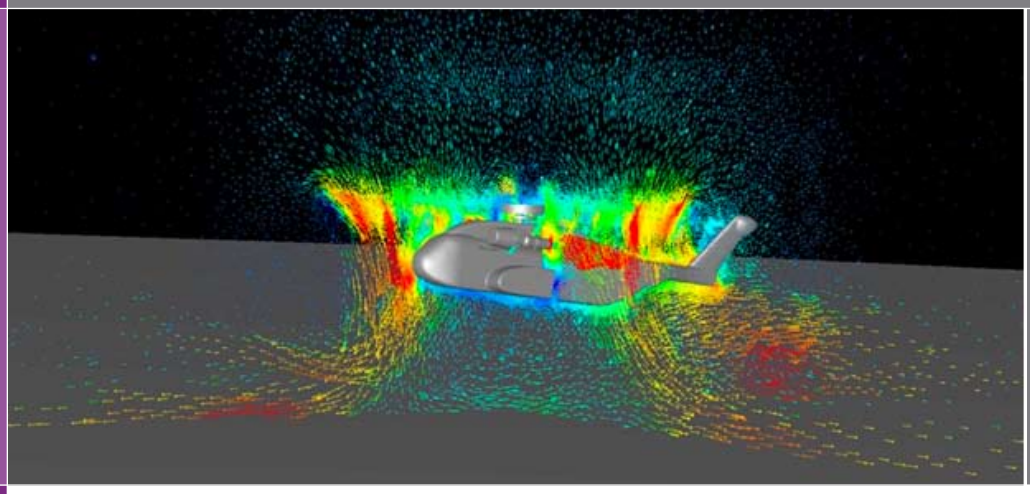
SIKORSKY AIRCRAFT

SUCCESS STORY



# With SGI® Altix® XE, Computational Fluid Dynamics (CFD) Studies Take Flight at Sikorsky Aircraft

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*– Mike Kazlauskas, Propulsion Engineer, Sikorsky Aircraft*

For America's military helicopters, the world is a hostile place indeed. Along with the perils of battle, today's helicopters must operate in an unforgiving physical environment that can shorten the lifespan of these vital aircraft. Flying day and night through blistering desert summers and bitterly cold winters, blinding sand storms, and inhospitable terrain, large aircraft such as the U.S. Marine Corps' "SUPER STALLION™" heavy lift helicopter have steadfastly managed to serve the military for years.

Recently, the Marine Corps chose Sikorsky Aircraft Corporation, a business unit of United Technologies Corp., to develop the next generation of this helicopter. In 2006, Sikorsky was awarded the development contract for the CH-53K helicopter, which will replace the SUPER STALLION cargo and personnel aircraft, first put into service in the early 1960's.

To help accelerate the propulsion system and airflow design studies, Sikorsky chose a powerful SGI® Altix® XE cluster.

## Larger, More Complex Simulations

The 48-core, 48GB Altix XE cluster was installed in October of 2006. It gave the propulsion engineering group a dedicated resource for the CH-53K helicopter project – and a platform to run larger, more complex airflow simulations. As a result, the team spends less time waiting and more time working. For instance, models that once required up to four days to complete are now finished in a few hours on the SGI solution.

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The CFD studies are part of a $3 billion system design and demonstration (SDD) contract, with Sikorsky working toward delivery of the first production aircraft in 2015. The Sikorsky CH-53K helicopter is not just a larger version of the SUPER STALLION. The new helicopter will be designed with increased capability and fly a range of missions including heavy-lift operations, military transport, vertical replenishment and onboard delivery, humanitarian aid and disaster relief. Sikorsky is also evaluating new technologies that include an all-digital cockpit, high-efficiency rotor blades with anhedral tips, a low-maintenance elastometric rotorhead, upgraded engines, a cargo rail locking system, and enhancements designed to extend service life.

## Simulating 'Hot and High' Conditions

Sikorsky engineers face unique challenges with the CH-53K helicopter. The new aircraft must be able to carry a cargo load of 27,000 pounds for up to 110 nautical miles – all at an altitude of 3,000 feet in temperatures surpassing 90 degrees Fahrenheit. Because these "hot and high" conditions can quickly erode a helicopter's ability to carry cargo for long distances, the aerodynamics of the aircraft itself become even more crucial.

"We're focusing on propulsion now," added Kazlauskas, who said the propulsion engineering team is currently studying such vehicle design factors as exhaust gas reingestion, engine bay cooling, avionics cooling and environmental control systems. Those factors have an impact on a range of variables, including reliability, capacity, and cargo and crew safety.

For Sikorsky, the new Altix XE cluster amounts to doing more in less time.

## CFD Simulations Fly on SGI Altix XE

Sikorsky's turnkey, factory-integrated SGI cluster uses a SGI Altix XE240 head node with two Dual-Core Intel® Xeon® processors to direct job submissions and administration, and a second storage node with approximately 2.5TB of disk capacity. Another 10 Altix XE210 nodes are reserved for computational work, dedicating 40 Intel Xeon processor cores and 40GB of memory (or RAM) to drive sophisticated CFD software.

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A 24-port InfiniBand switch enables high-performance MPI communications, and a 24-port Gigabit Ethernet switch streamlines NFS traffic. The system runs USE® Linux® Enterprise Server 9.

"The InfiniBand interconnect is extremely fast, and that has given us very good performance," said Kazlauskas. "In working with SGI, we found that for this application, using Serial ATA drives on NFS is very efficient for CFD."

The SGI Altix XE server and cluster platform offers superior performance and energy efficiency at a breakthrough price point. Unlike other cluster offerings, SGI Altix XE combines the advanced Dual- and Quad-Core Intel Xeon processor architecture delivered in a fully factory integrated cluster solution and backed by SGI's industry-leading service and support. The Altix XE platform delivers leading density without sacrificing performance or functionality.

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