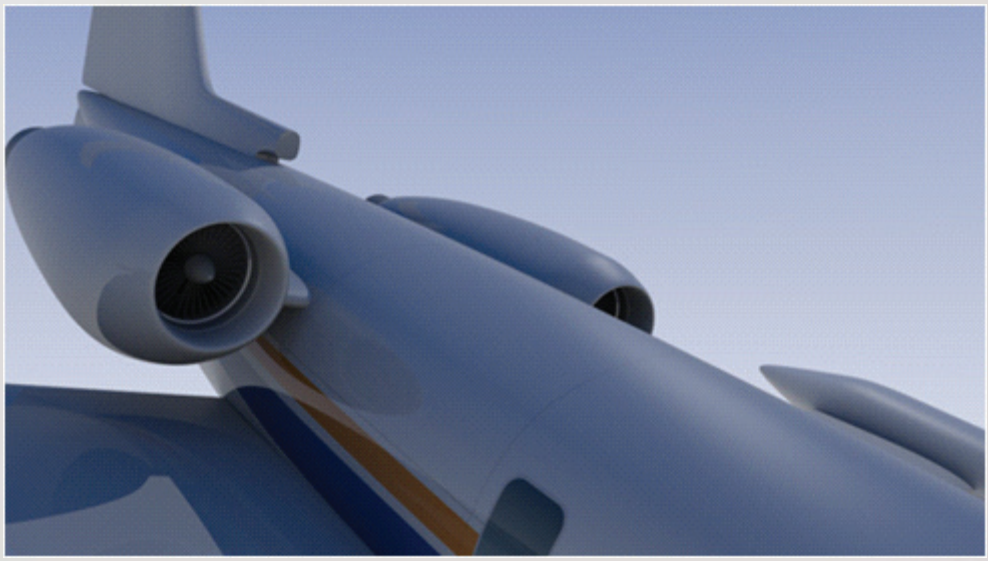
THE UNIVERSITY OF TEXAS AT AUSTIN
TEXAS ADVANCED COMPUTING CENTER TACC

Safe Travels

New computational system simulates metal fatigue on aircraft

If a crack is detected in an aircraft structure, does the problem affect only one plane, or is the failure systemic to the aircraft model or part? With lives on the line, officials from the Federal Aviation Administration (FAA) must decide whether to institute a new inspection regime or ground the fleet.

Until recently, the FAA did not have much information to go on when making this decision for small airplanes or the general aviation fleet. To address this issue, Harry Millwater at The University of Texas at San Antonio developed a structural integrity software tool called SMART (SMall Aircraft Risk Technology).



The metal fatigue simulation tool developed by Harry Millwater applies to general aviation, a category that includes all flights other than military, scheduled airline, and regular cargo flights. The majority of the world's air traffic falls into this category. [Aircraft renderings generated by Andrew Orton, UTSA.]

Millwater approached the Texas Advanced Computing Center (TACC) about "parallelizing" the code—making it capable of running simultaneously on multiple processing cores—and speeding up the code's performance so it could become a real-world tool. With TACC's help, Millwater was able to make his code run 188 times faster by efficiently distributing the calculations onto 256 processors (or the equivalent of more than 100 PCs).

"Something that took a couple of hours for analysis now took 42 seconds. You can't beat that," Millwater said.

In August 2010, the software tool entered the FAA's operational workflow. "This research project is a great step in our efforts to develop guidance for fatigue management," said Felix Abali, FAA program manager. "The system will be used by FAA certification engineers to assess and manage real-time, small airplane structural safety."

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