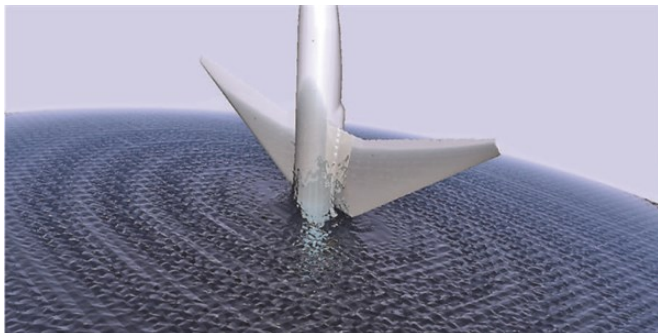


Mathematician theorizes what happened to MH370

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The plight of Malaysia Airlines flight 370 (MH370) is one of the biggest mysteries in aviation history, but an interdisciplinary research team led by a Texas A&M University at Qatar math professor has theorized the ill-fated plane plunged vertically into the southern Indian Ocean in March 2014.

The researchers' computer simulations lead to the forensic assertion that a 90-degree nosedive explains the lack of debris or spilled oil in the water near where the plane is presumed to have crashed. The research was the cover story in the April 2015 issue of *Notices of the American Mathematical Society*.

Dr. Goong Chen is an applied mathematician who teaches and researches at Texas A&M at Qatar and Texas A&M University's main campus in College Station, Texas, USA. He led the interdisciplinary team of collaborators from Texas A&M, Penn State, Virginia Tech, MIT and the Qatar Environment and Energy Research Institute (QEERI) in simulating and modeling what might have happened to the plane. His research is supported by the QNRF National Priority Research Project Grant #5-674-1-114.

The researchers used applied mathematics and computational fluid dynamics to conduct numerical simulations on the RAAD Supercomputer at Texas A&M at Qatar of a Boeing 777 plunging into the ocean, a so-called "water entry" problem in [applied mathematics](#) and aerospace engineering. The team simulated five different scenarios, including a gliding water entry similar to the one Capt. Chesley B. "Sully" Sullenberger skillfully performed when US Airways flight 1549 landed in the middle of New York City's Hudson River, a feat that's referred to as "the miracle on the Hudson."

Chen said based on all available evidence—especially the lack of floating debris or oil spills near the area of the presumed crash—the mostly likely theory is that the plane entered the water at a vertical or steep angle.

In any rescue and recovery effort of airplane crashes in water, the search for floating debris and oil is key. For example, for the disaster of Air France's flight 447 on 1 June 2009, 3,500 pieces of floating debris have been recovered.

So, Chen wondered, why has there been no debris found at all so far for MH370?

The fluid dynamic simulations indicate, for a vertical water entry of the plane, that there would be no large bending moment, which is what happens when an external force, or moment, is applied to a structural element (such as a plane), which then causes the fuselage to buckle and break up. As the vertical water-entry is the smoothest with only small bending moment in contrast with other angles of entry, the aircraft is less likely to experience "global failure," or break up on entry near the ocean surface, which would explain the lack of debris or oil near the presumed crash site.

Based also on the suggestions of other aviation experts, Chen said in such a situation the wings would have broken off almost immediately and,

along with other heavy debris, would have sunk to the bottom of the ocean, leaving little or no trace to be spotted.

"The true final moments of MH370 are likely to remain a mystery until someday when its black box is finally recovered and decoded," Chen said. "But forensics strongly supports that MH370 plunged into the ocean in a nosedive."

Provided by Texas A&M University

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