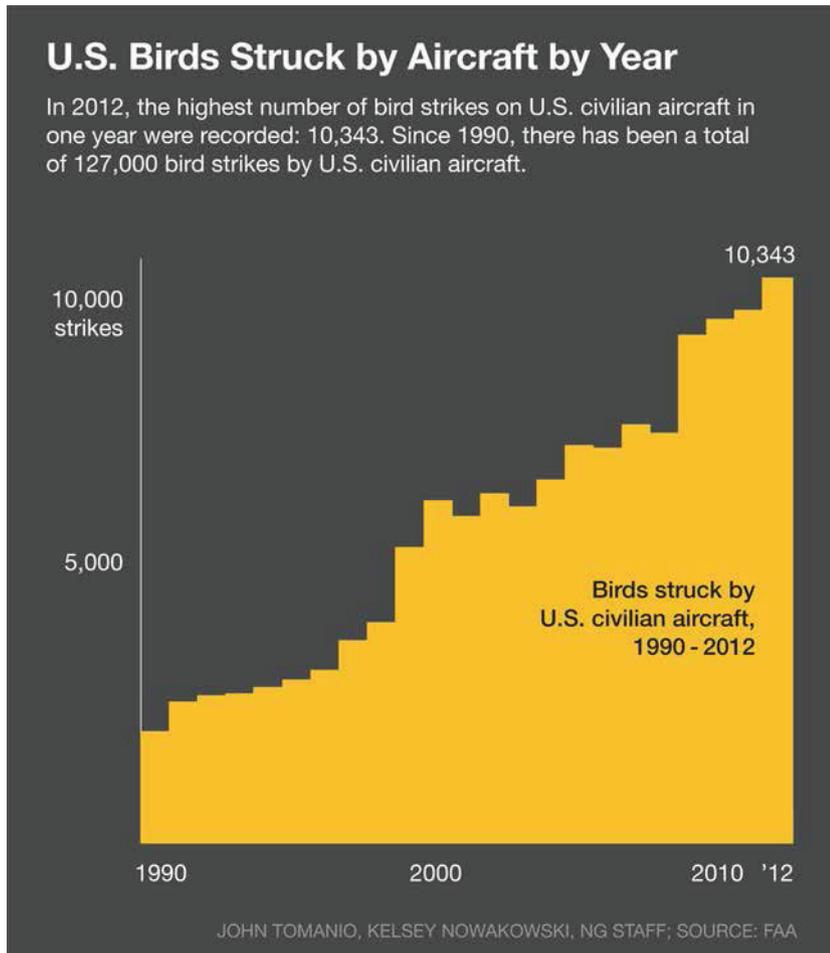


# AS THE TURBINE TURNS...

By Dr. Lee S. Langston, Professor Emeritus of Mechanical Engineering, University of Connecticut

## Avian Avoidance and Aviation

As many of us in the aircraft gas turbine industry know, birds in flight and operating jet engines do not always get along together (1).



**Figure 1** U.S. Birds Struck by Aircraft by Year -John Tomanio, Kelsey Nowakowski, NG Staff; Source: FAA

An unforgettable example of such an incompatibility was the remarkable "Miracle on the Hudson". On January 15, 2009, US Airways Flight 1549, an Airbus 320 with 150 passengers, was taking off from New York's La Guardia Airport, bound for Charlotte, North Carolina. About 3 minutes from take off at about 2800 ft. altitude, it struck a flock of migratory (not resident) Canada geese, just northeast of the Hudson River's George Washington Bridge.

Both of the A320's CFM International CFM 56 engines ingested several of the geese (which can weigh up to 14 pounds (6.5 kg)). The ingested geese not only damaged engine fans, but also impacted high and low pressure compressors, combustors and turbines, causing a near-total loss of thrust in both engines.

The crew, led by Capt. Chesley B. "Sully" Sullenberger, then glided the crippled A320 onto the Hudson River, successfully ditching the aircraft with no loss of life. (Passengers around the world can now have confidence that in an emergency water landing, an aircraft can float for a critically important length of time!)

In a recent interview for National Geographic Daily News (2), Sullenberger says, "What happened to us, could happen again tomorrow."

### Birdstrike Panel

At TURBO EXPO '13 in San Antonio last June, Dr. Aspi Wadia of GE Aviation and I co-chaired a three-hour panel, "Jet Engine Bird Ingestion - Current Issues and Ways Forward".

Our lead-off panelist was Capt. Paul Eschenfelder, a retired Delta Airlines pilot, now with Embry-Riddle Aeronautical University, who gave an overall review of recent birdstrike accidents around the world. He went over gaps in birdstrike mitigation regulations and emphasized the lack of a systematic approach to this problem. Example: You are a pilot of an airliner, with 300 passengers sitting behind you, all waiting for you to take off. The control tower informs you are clear to take off - and adds the general warning there are birds at the end of the runway. What do you do?

Capt. Eschenfelder's example is buttressed by a similar recent remark by Capt. Sullenberger (2) on such a general warning: "But that's like saying, 'Be careful out there!' It's not useful. It's not effective."

Panelist John Dalton, who is a Technical Fellow in Airplane Safety Engineering for Boeing gave the airframe OEM history and view of the birdstrike problem. He discussed Boeing's birdstrike design

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requirements and the company's flight crew guidance on strategies for prevention of birdstrike events.

Les McVey, the panel member representing an engine OEM perspective, is GE Aviation's Flight Safety Investigator. He pointed out the view of an engine acting as a giant vacuum cleaner, sucking in birds willy nilly, is a popular misconception. Bird ingestion occurs when there is a bird - engine flight path alignment. McVey reviewed GE's birdstrike history and the tests necessary to meet regulatory engine performance requirements.

The panel's fourth member was Dr. Nicholas Carter who is Director of Finance for the World Birdstrike Association (WBA). Carter explained the role of the WBA, which is the international body that represents all states and countries in issues related to bird hazards at airfields and airports.

Professor Emeritus Edwin Herricks from the University of Illinois (Urbana) was the fifth and last panel member. Herricks works with the US Federal Aviation Administration (FAA) on bird detection at airports. He reviewed the state of avian radars at airports and the use of other bird surveillance technologies. His general view was that current avian radar systems still pick up too much noise to accurately assess possible birdstrike dangers. He expresses this same view in the recent National Geographic article (2). In the latter, an Israeli birdstrike researcher, Yossi Leshem, voiced a more positive view on the use of avian radar.

In summary, both Co-Chair Wadia and I felt that the panel gave the IGTI audience a good overview of the current state of dealing with jet engine bird ingestion. Unfortunately neither FAA regulatory personnel nor airport wildlife control experts were able to participate as panel members.

## A Different Approach (?)

As a non-expert on birdstrike issues I am struck by the level of activity devoted to this important problem. As the FAA data presented in Fig. 1 shows, on the order of 10,000 birdstrikes currently occur in the US each year, with the data indicating a continued increase.

My impression from our panel is that approaches to solve birdstrike issues are rather fragmented. OEMs are intent on meeting regulatory requirements and other

participants are focused in their particular areas of expertise.

What might be called for is an approach that uses an avian behavioral trait, or a mechanism or device that makes birds want to stay away from an aircraft — or at least avoid the airspace around an airport. A tangential example of this approach has occurred at the two lakes we have at the Storrs campus of the University of Connecticut. For years, these small lakes have been populated by large flocks of Canada geese that foul the lakes and the lake shores. Recently, thin barely visible wires have been strung near the shores, about 1-2 feet above water level. The result is that the geese have disappeared, presumably not wanting to run the risk of hitting the wires, on landing or takeoff.

I could envision a call for proposals for such inventive birdstrike solutions from DOD's Defense Advanced Research Project Agency (DARPA). DARPA, responsible for funding projects that resulted in GPS systems, the Internet and many other far-out ideas, certainly has a track record that might yield a new approach to the avoidance of aviation birdstrikes. ❖

## References

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**Lee Langston** is former editor of the *ASME Journal of Engineering for Gas Turbines and Power* and has served on the ASME IGTI Board as both Chair and Treasurer.