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Death in the Atlantic

The Last Four Minutes of Air France Flight 447

By Gerald Trautetter

Part 2: Minute One: The Sensors Fail

It's hard to imagine a more precarious situation, even for pilots with nerves of steel: Flying through a violent thunderstorm that shakes the entire plane as the master warning lamp starts blinking on the instrument panel in front of you. An earsplitting alarm rings out, and a whole series of error messages suddenly flash up on the flight motor.

The crew immediately recognized that the three airspeed indicators all gave different readings. "A situation like that goes well a hundred times and badly once," says Arnoux, who flies an Airbus A320 himself.



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Graphic: The last four minutes of Air France flight 447.

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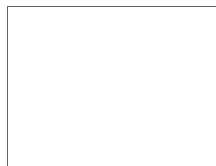


Photo Gallery: The Final Minutes of Flight 447

5 Photos

The responsible pilot now had very little time to choose the correct flight angle and the correct engine thrust. This is the only way he could be certain to keep flying on a stable course and maintain steady airflow across the wings if he didn't know the plane's actual speed. The co-pilot must therefore look up the two safe values in a table in the relevant handbook -- at least that's the theory.

"In practice, the plane is shaken about so badly that you have difficulty finding the right page in the handbook, let alone being able to decipher what it says," says Arnoux. "In situations like that, mistakes are impossible to rule out."

Danger of Icing Up

Aerospace experts have long known how dangerous it can be if the airspeed indicators fail because the pitot tubes ice up. In 1998, for example, a Lufthansa Airbus circling over Frankfurt Airport lost its airspeed indicator, and a potential tragedy was only averted when the ice melted as the plane descended. At the time, German air accident investigators at the German Federal Bureau of Aircraft Accident Investigation (BFU) in Braunschweig demanded that the specifications of the pitot tubes be changed to enable "unrestricted flight in severely icy conditions."

As early as 2005, the French aerospace company Thales, which manufactures the pitot tubes used on flight AF 447, set up a project group called Adeline to search for new technical solutions to the problem. According to a Thales document, loss of the airspeed indicators "could cause aircraft crashes, especially in cases in which the sensors ice up."

Aircraft manufacturer Airbus was well aware of the shortcomings of the Thales pitot tubes. An internal list kept by the airline manufacturer shows there were nine incidents involving them between May and October 2008 alone.

More than two months before the Air France crash, the issue had been raised at a meeting between Airbus and the European Aviation Safety Agency. However, the EASA decided against banning the particularly error-prone pitot tubes made by Thales.

In fact, the problem with the airspeed indicators lies far deeper. To this day, the relevant licensing bodies still only test pitot tubes down to temperatures of minus 40 degrees Celsius (minus 40 degrees Fahrenheit) and an altitude of about 9,000 meters (30,000 feet). These completely antiquated specifications date back to 1947 -- before the introduction of jet planes.

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What's more, most of the incidents of recent years, including that involving the ill-fated flight AF 447, occurred at altitudes above 10,000 meters (33,000 feet).

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03/10/2010 from rd2gosoon: GPS For airspeed?

GPS will give earth-centric velocity, but not airspeed. The INS may or may not give airspeed, but usually give earth-centric velocity, BUT, INS (all I know of) also give wind speed and direction, but this info is derived from the [...] more...

03/10/2010 from parkermorris: Can't be Pitot Tubes... Can It?

I still bear the scar that I received after grabbing a heated pitot tube on an American Eagle Jetstream 31 (J31) aircraft shortly after it had landed from a 30 minutes flight. I find it so incredible that this advanced Air France [...] more...

03/02/2010 from jjfllys:

Measuring speed by GPS would give you groundspeed which at this altitude is wildly different from the indicated airspeed that you would see on the gauges. Pitot tubes measure the impact pressure of the air, and since air is less [...] more...

03/02/2010 from netshade:

---Quote (Originally by schwammy)--- "To this day, the relevant licensing bodies still only test pitot tubes down to temperatures of minus 40 degrees Celsius (minus 40 degrees Fahrenheit)..." I'm pretty sure that -40F and [...] more...

03/01/2010 from dougf: Of Pitot Tubes and Temps...

Bukahaka: Good question on heated pitot tubes, I know that military aircraft (F-111 and the F-15 among others) heat their pitot tubes to 400F to prevent just such icing problems. Does the Airbus in question have heated pitot [...] more...

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