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Airbus Focuses More Closely on Flight 447 Pitot Tube Problems

Questions arise regarding device's design and Air France's maintenance procedures

John Loughmiller, Contributing Editor -- Design News, June 8, 2009

Information has surfaced regarding a problem with the sensors used to provide air-speed indications to the crew of doomed **Air France Flight 447**. The devices, called **pitot tubes**, have a history of not performing properly in icing conditions and their replacement was recommended by **Airbus** months before the crash of the Air France airplane.

The pitot tubes have heating elements included in their design and normally these elements are sufficient to keep the inlets of the tubes free of ice. However, the pitot tube used on the Airbus A330-200 may have a design flaw that allows it to become encrusted with ice during encounters with heavy freezing precipitation.

A British newspaper, ***The Telegraph***, reported in its June 6 edition that **Air France** had not followed the Airbus recommendation to replace air-speed sensors on the doomed Flight 447 airplane, according to French crash investigators. Degraded air-speed indications from the sensors are therefore an area of very high interest as the investigation unfolds.

In another development, a telemetry transcript was leaked to the BBC. The unnamed source claimed it was a copy of the automated reports received from Flight 447 just before all communications were lost. The unverified information indicates the first fault report sent during the minutes prior to loss of all telemetry indicated an autopilot disconnect. The A/P disconnect could have been a manual action taken by the pilots or it could have been commanded by the computers. On automated airliners, computer-generated A/P disconnects occur when something is at variance with expected inputs from sensors, or if there's a conflict between two sensors delivering the same or similar data. The list showed the pilot's and co-pilot's airspeed indications disagreed.

Data that followed indicated a stream of cautions and warnings culminating in a loss of cabin pressurization that is common at the start of an in-flight breakup.

Because of the additional messages regarding failures and a degraded flight control system, there's also interest in looking at the consequences of a lightning discharge entering the aircraft via the radome.

An airliner has to demonstrate protection of the occupants, electronics and fuel tanks from lightning strikes in order to be certified for flight by both European and U.S. authorities. Investigators are concerned about what would happen if lightning bypassed this protection by striking the aircraft on the radome. An aircraft is vulnerable in this area because the radar signal would be attenuated if protective measures were included for the radome.

If a lightning strike occurred at the radome, the energy would search for an exit path and electrical cables eventually leading to devices outside the cabin and cockpit area may provide the path. The damage done to electrical buses and computers by a strike cannot be modeled well because there are so many variables. It's generally conceded however that once the enormous energy of a lightning strike is inside an airliner, bad things are likely to happen.

In another development, debris and bodies have been found. The debris included seats that were traced to Flight 447 via their serial numbers. Now that the crash site has been located, there's at least a small chance that the cockpit voice recorder and flight data recorder may be found. It will be dicey however, since the water depth at the crash site would put the black box's underwater sonar pingers at the extreme limits of their range.

*Contributing Editor John Loughmiller is an Electronics Engineer specializing in Single Channel Per Carrier communications systems and control logic system design for automated communications devices. He's also a 4,500 hour commercial pilot, flight instructor, aircraft owner and is a Lead Safety Team Representative for the **Federal Aviation Administration**.*

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