

## Aviators IG Interesting News #14 – Mixed Signals

### **Brief Summary**

**Birgenair Flight 301** was a flight chartered by Turkish-managed [Birgenair](#) partner Alas Nacionales from Puerto Plata in the Dominican Republic to Frankfurt, Germany, via Gander, Canada, and Berlin, Germany. On 6 February 1996, the 757-200 operating the route crashed shortly after take-off from Puerto Plata's Gregorio Luperón International Airport. All 189 people on board died. The cause was pilot error after receiving incorrect airspeed information from one of the pitot tubes, which investigators believe was blocked by a wasp nest built inside it. The aircraft had been sitting unused for two days without the pitot tube covers in place. With 189 fatalities, Flight 301 is the deadliest aviation accident involving a Boeing 757, as well as the deadliest to occur in the Dominican Republic

### **Description**

The aircraft was a Boeing 757-225 originally delivered to Eastern Air Lines in February 1985 and registered as N516EA. After Eastern's bankruptcy and subsequent liquidation in 1991, the aircraft was stored at the Mojave Air and Space Port for more than a year. It was purchased by Aeronautics Leasing in April 1992, and then leased to Canadian airline Nationair in May 1992, and stayed with the airline until its demise the following year. It was leased again by the same lessor in July 1993 to Birgenair and then sub-leased to International Caribbean Airways in December 1994, and Birgenair operated the airframe until it crashed. The crew consisted of 11 Turks and 2 Dominicans. The captain was Ahmet Erdem (61), one of Birgenair's most senior pilots, with 24,750 flight hours (including 1,875 hours in the Boeing 757) under his belt. The first officer was Aykut Gergin (34). He had 3,500 hours of flying experience, including 71 hours in the Boeing 757. The relief pilot was Muhlis Evrenesoğlu (51). He had 15,000 flight hours (including 121 hours in the Boeing 757) to his credit.

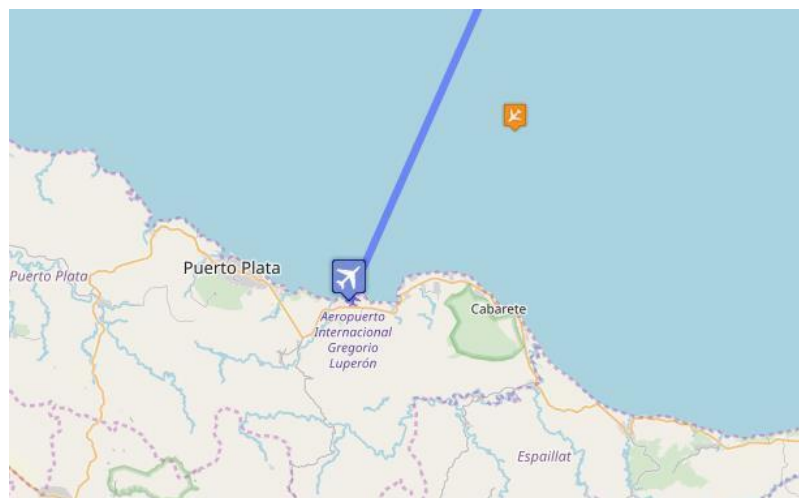
The passengers consisted mainly of Germans, along with nine Poles including two Members of the Parliament, Zbigniew Gorzelańczyk of the Democratic Left Alliance, and Marek Wielgus of the Nonpartisan Bloc for Support of Reforms (BBWR). Most of the passengers had booked Caribbean package holidays with Öger Tours; Birgenair held 10% of Öger Tours.



*Figure 1: The B757 aircraft involved in the incident (TC-GEN)*

During takeoff roll at 23:42 AST (03:42 UTC), the captain found that his airspeed indicator (ASI) was malfunctioning but he chose not to abort the takeoff. The co-pilot's ASI was functional, though subsequent warning indicators would cause the aircrew to question its veracity as well.

As the plane was climbing through 4,700 feet (1,400 m), the captain's ASI read 350 knots (650 km/h). The autopilot, which was taking its airspeed information from the same equipment that was providing faulty readings to the captain's ASI, increased the pitch-up attitude and reduced power in order to lower the plane's airspeed. The co-pilot's ASI was giving a correct reading of 200 knots (370 km/h) and decreasing, yet the aircraft started to give multiple contradictory visible and audible warnings that it was flying too fast, including rudder ratio, Mach airspeed, and overspeed.



*Figure 1.1: The approximate location of the crash and its intended flight route*

The autopilot reached the limits of its programming and disengaged. After checking the circuit breakers for the source of the warnings, the crew reduced thrust to lower the speed of the plane. This action immediately triggered the 757's stick-shaker stall alert, warning the confused pilots that the aircraft was flying dangerously slow, just seconds after the indicators had warned them that the speed was too high. The co-pilot and the relief pilot both seemed to recognise the approaching stall and tried to tell the captain, but did not intervene directly, possibly out of deference to the captain's age and experience.

The captain attempted to recover from the stall by increasing the plane's thrust to full, but as the aircraft was still in a nose up attitude, the engines were prevented from receiving adequate airflow required to match the increase in thrust. The left engine flamed out, causing the right engine, which was still at full power, to throw the aircraft into a spin. Moments later, the plane inverted. At 23:47 AST, the Ground Proximity Warning System sounded an audible warning, and eight seconds later the plane crashed into the Atlantic Ocean. All 176 passengers and thirteen crew members died on impact.

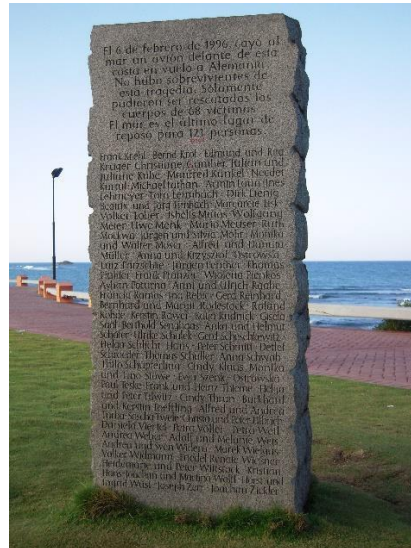


Figure 2: A memorial created to remember the victims of the crash

### **Investigations**

The Dominican Republic government's *Dirección General de Aeronáutica Civil* (DGAC) investigated the accident and determined the probable cause to be the crew's failure to recognize the activation of the stick shaker as a warning of imminent entrance to the stall, and the failure of the crew to execute the procedures for recovery from the onset of loss of control.

Investigations later showed that the plane was travelling at 220 knots (410 km/h; 250 mph) at the time of the accident. The investigation concluded that one of the three pitot tubes, used to measure airspeed, was blocked.



Figure 3: Pitot tubes on a B757, like the ones involved with the crash

None of the pitot tubes were ever recovered so investigators were unable to determine for certain what caused the blockage. Investigators believe that the most likely culprit was the black and yellow mud dauber, a type of solitary sphecid wasp well known to Dominican pilots, which tends to establish its nest in artificial, cylindrical structures, or make its own cylindrical nest out of mud. According to the final report, section 2.3 - "Aircraft maintenance factors", the aircraft had not flown in 20 days, however, this was not the duration for which pitots remained uncovered but was evidently enough time to allow the wasps the opportunity to construct nests in the tubes. According to Cetin Birgen, president and CEO of Birgenair, the pitot covers were removed two days before the accident in order to conduct an engine test run.

The investigation noted several other factors and suggested changes. They reconfirmed that the pilots should have followed existing procedures and aborted the takeoff when they found that their airspeed indicators were already in significant disagreement as the plane accelerated down the runway. Results from a few simulations with experienced pilots found that the combination of the overspeed warning horn and underspeed stick shaker while in flight was an overly confusing contradictory set of messages for many pilots; the FAA issued a directive that pilot training would now include a blocked pitot tube scenario. The FAA research had also revealed that the situation also led to multiple other contradictory warning sounds and warning lights that increased the demands on the pilot to fly the plane. The FAA asked Boeing to change some of those warnings, as well as add a new warning to tell both pilots that their instruments disagree, add the ability for the pilots to silence troublesome alarms, and to modify the system so that the pilots can choose which pitot tube the autopilot uses for airspeed readings.

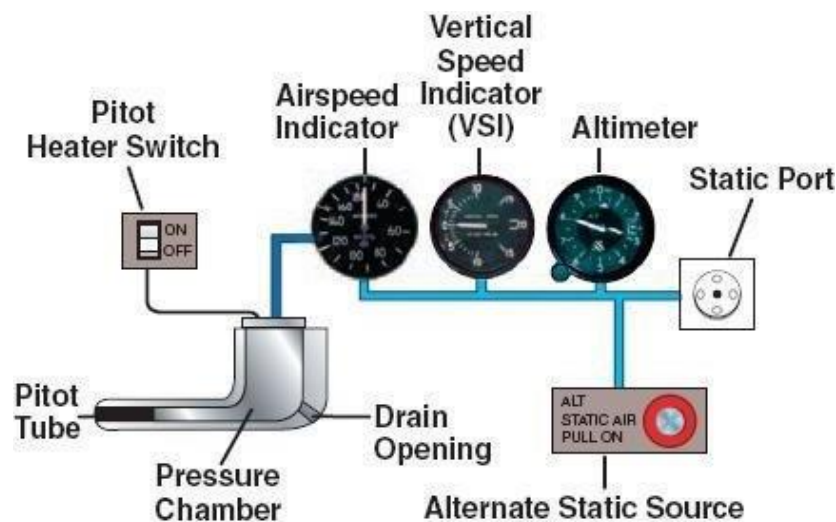


Figure 5: A brief explanation of how the pitot tube works

### **Aftermath of the incident**

Shortly after the crash of flight 301, the airline's overall image and profits became heavily damaged, and some of its planes were grounded at the same time. Birgenair went bankrupt in October of the same year as there were concerns about safety after the accident, causing a decline in passenger numbers. The crash and ensuing negative publicity both contributed to Birgenair's bankruptcy.

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Article written by Yew Cheng Yi (Publicity and Head of Training of Republic

Polytechnic Aviators IG) [18004796@myrp.edu.sg](mailto:18004796@myrp.edu.sg)

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