

Universitat Politècnica de Catalunya

*Communication skills-1- 16th December 2016*

**ABSTRACT**

*Md Tariqul Islam*

*Krupesh Beekannahalli Shivaprakash*

*Arturo Acosta*

Aircraft has always been a safe mode of transport compare to any other mode available. But disasters sometimes do happen which not only comes with great prices but change flying forever. Three of such incidents that shook the aviation industry and the impact it had on the modern day flying will be discussed.

### **Incident-1**

On July 1 2002, the trip of a lifetime turns into the worst civilian plane crash in German history. A Russian Bashkirian Airlines Flight 2937, on a flight from Moscow to Barcelona collided in mid-air with a DHL Flight 611(flying from Bergamo Italy to Brussels) over the southern German town of Uberlingen. There were 69 passengers and crew on the Russian plane and 2 crew members on the DHL plane, all killed in the accident.

Both the aircraft were flying at 36000 feet inside the German border and the airspace was controlled from Zurich. In the Traffic control room, there was only one controller, Peter Nielsen, handling the airspace. He was alone responsible for the safe crossing of these two aircraft and also to guide a third aircraft in the same airspace for landing. When the two aircraft was just 25 Km apart, the on board traffic collision avoidance system (TCAS) sounded an alarm in both the aircraft notifying them that there is traffic close by at the same altitude. It tells the DHL plane to descend and the Russian plane to climb in order to maintain safe distances between the two aircraft to avoid the collision. Almost immediately, realizing the danger, the traffic controller contacted the Russian aircraft and instructed the pilot to descend to 35000 feet to avoid collision. Having instructed the pilot, controller believed he avoided the danger and went back to the other work station where he was guiding a third aircraft to land. Confused with two opposite instruction from TCAS and ground controller, the Russian pilot decided to follow the controller and started to descend. While the pilot in the DHL aircraft followed the TCAS instruction and was descending as well. Both the planes now are descending towards the same spot at a rate of 1300 kilometres per hour, faster than speed of sound. At 21:35:32, the aircrafts collided with each other at 34890 feet at a right angle with DHL planes vertical stabilizer slicing through the Russian plane's fuselage.

An investigation was carried out to find how two modern jetliners could possibly be in exactly the same spot at exactly the same time. It has been found that, if only TCAS command were carried out by both the pilots, there would have been no collision. The TCAS is programmed to assume that the crew will give it the priority over ground controller. But in the flight manual (Pilot's operational Bible) of the Russian Plane reveals that the orders from ground traffic controller always have higher priority. It describes the TCAS as an "additional aid". This ambiguity lead Russian plane to give precedence to controller's instruction over TCAS instruction and descended while DHL plane listened to TCAS and descended as well leading to a catastrophe up in the air. It was a mixture of pilot error and miscommunication with the ground controller that lead to this catastrophic disaster. In November 2003, International Civil Aviation Organization (ICAO) made amendment on the regulations and made it clear that the TCAS advisories should always take precedence over ground control instructions and by doing so made sure that

such incident never repeats in the near future ever again.

A Russian architect, Vitaly Kaloyev, traumatised by the loss of his wife and two children on flight 2937, held accountable the ground controller for their deaths. On February 2004, he stabbed Nielson with a knife to death, at his home near Zurich.

## **Incident-2**

Though it is well known that "Maintenance is terribly important" but sad to know, in aerospace 53 % of the structural failures are due to maintenance errors. Aloha airline flight 243 is a most memorable example for this. Aloha Airlines Flight 243 was a scheduled Aloha Airlines flight between Hilo and Honolulu in Hawaii. On April 28, 1988, a Boeing 737-297 serving the flight suffered extensive damage after an explosive decompression in flight at around 36000 feet height. 35 square feet of the fuselage roof directly above the first-class compartment ruptured with a "whooshing" sound and one of the flight attendant was thrown to ground. Passengers were exposed to extreme weather. There was a huge chaos; passengers were hopeless of safe landing.

The heroic pilots were successful in safe landing at Kahului Airport on Maui. Sixty-one of the 90 passengers aboard Flight 243 were treated for injuries, mostly bruises and cuts from the debris and the rippling winds. All on-board people were saved except the one who was blown off. It was proposed initially the fuselage failed as intended and opened a ten-inch square vent. As the cabin air escaped at over 700 mph, flight attendant C.B. Lansing became wedged in the vent instead of being immediately thrown clear of the aircraft. The blockage would have immediately created a pressure spike in the escaping air, producing a fluid hammer effect, which tore the jet apart.

The investigation determined that weather had no role in this accident. It was noticed that, owing to its short flights, the plane was over its maximum flight cycles. The quality of inspection and maintenance programs were deficient. The National Transportation Safety Board determines that the probable cause of this accident was the failure of the Aloha Airlines maintenance program to detect the presence of significant dis-bonding and fatigue damage which ultimately led to failure of the lap joint and the separation of the fuselage upper lobe. Contributing to the accident was the failure of Aloha Airlines management to supervise properly its maintenance force; failure in inspection of all the lap joints; and the lack of a complete terminating action after the discovery of early production difficulties in cold bond lap joint which resulted in low bond durability, corrosion, and premature fatigue cracking.

In response, the FAA (Federal Aviation Administration) began the National Aging Aircraft Research Program in 1991, which tightened inspection and maintenance requirements for high-use and high-cycle aircraft. This had a huge influence on aviation sector. Maintenance standards were significantly improved. The epoxy bonding in lap joints were upgraded to hot bonded doublers which are corrosion resistant and can overcome fatigue failure. Thus, the Aloha Airlines Flight 243 was successful not only in saving the people on-board but also created new milestones in aviation maintenance.

### **Incident-3**

Northwest Airlines flight 85 departed from the American city of Detroit on October 9, 2002, to Narita, Japan, as a final destination. Halfway crossing the Bering Sea the airplane experienced some technical difficulties. Right in the middle of the sea there's an area called "black spot", in which no communication can be established between the plane and any control center located in mainland. At this moment the pilots experienced a failure with the airplane's hydraulics power control system.

At 35,000 feet, 2 hours off Detroit and 6 to go to Narita International Airport, the back lower rudder of the Boeing 747-400 malfunctioned. It steered 17 degree to the left and locked there for the rest of the flight, causing an abrupt curve of almost 40 degree on the plane's trajectory. The pilot team was able to manoeuvre the airplane to a safe emergency landing in the American city of Anchorage, Alaska. Fortunately no passenger or crew member was harmed.

Once the airplane arrived to Alaska, National Transportation Safety Board launched an investigation of the incident. Investigation of the malfunction showed that a component of the hydraulics system failed due to a probable cause of metal fatigue, although this was never proven. Further investigation showed this was the first Boeing 747-400 built ever, so it was used by the company, Boeing, on many test flights before it was sold to the airline. Records showed this particular aircraft flew over 55,000 hours for testing and made more than 7,000 take-offs and landings. A single take-off and landing can exert a lot more stress to the airplane itself and all of its components than the very time it is on the air. The specific piece that failed was specifically designed with particular metallurgical characteristics, considering these long 14-15 hour flights, extreme conditions, and take-off and landing stresses, to be able to endure for over 30,000 years, so the exact cause of failure is still unknown to researchers. After performing several and thorough test on the failed part, lab specialists came to see this part suffered no crack, imperfections, fatigue, or wearing out.

Furthermore, 4 years later an Air France cargo plane failed because of the same piece, which then led to Boeing installing a safety measure in the hydraulics power control system. Alongside this additional safety device, Boeing decided letting know all airlines of the occurred incidents for them to perform extensive and thorough maintenance of this piece. This last precaution was due to the piece's location, which isn't easily seen because of it being enclosed in a metal casing.

All these 3 incidents are just few of many that happened in past years. From each of these accidents, lessons are learned and mistakes were rectified which makes modern day flying much safer than it ever was.