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Fatal mistakes of aircraft builders, changed aviation forever

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Aviation is such an essential and irreplaceable system today. Just open www.planefinder.net and look at the total amount of planes in the sky. Every second there are approximately eight thousand aircraft in flight, carrying one – two million passengers. Five hundred planes are landing and taking off and about twenty-two thousand people are eating fish at ten kilometers altitude. According to statistics, flying is the safest kind of transport. The average death rate equals 0.6 – 0.7 passengers per 160 million kilometers. It is about twice as safe as traveling by train and six times safer than car transportation. Although airplane accidents still occur, their amount has become less than, for example, forty years ago. Each accident has an influence to further improving of air transport. Some of them changed aviation a little bit, as they were connected with a human factor, however the majority of accidents set a development path for the building of aircraft. It sounds horrible, but in other words every disaster makes the next aircraft produced safer. Let's refer to history and remember the most significant accidents which have made the world of aviation as we now see it.

On 10 January 1954, British Overseas Airways Corporation Flight 781, a de Havilland DH 106 "Comet" suffered an explosive decompression at altitude over the Mediterranean Sea, killing everyone on the board. The DH 106 "Comet" was the first commercially produced jetliner in the world. Its features were an aerodynamically clean design with four turbojet engines built into the wings, a pressurized fuselage, and large square windows. At that time engineers didn't know exactly what would happen at such a high altitude with so large of an aircraft, because it had never been done before. They made a fatal decision to create large square

windows similar to those usually used in non-jet planes. As a result, metal fatigue was occurring in their corners and the aircraft was doomed to be destroyed. Since then designers avoid the use of sharp-cornered elements in airplane structures and now all jetliners have rounded windows to prevent the extension of metal fatigue.

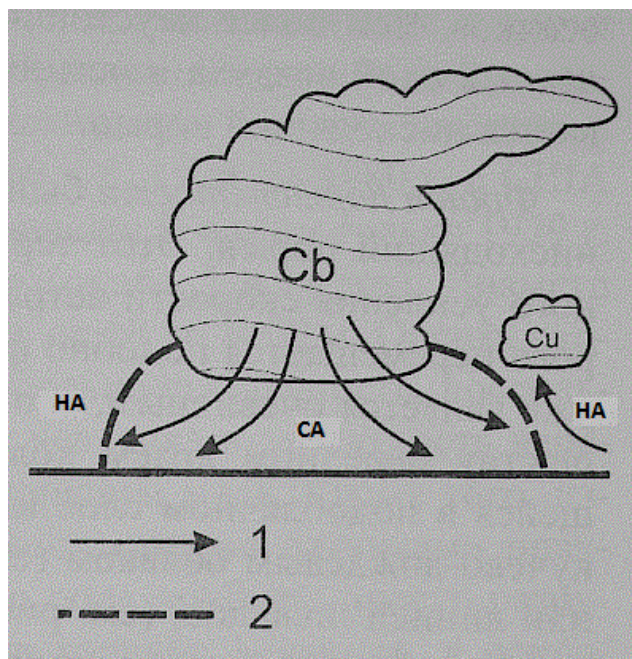


Fig.1. Downburst under cumulonimbus cloud: 1 – the direction of air motion, 2 - gust front, HA – hot air, CA – cold air

The next awful accident took place on August 2, 1985 with a Lockheed L-1011 from Delta Air Lines. The plane crashed on approach to Dallas-Fort Worth International Airport during a thunderstorm. The pilots were expecting trouble from the weather and were trying to take every necessary action to pass this turbulent area, but they didn't notice one essential thing – a microburst. A microburst is a very localized column of sinking air. The scale and suddenness of a microburst makes it a notorious danger to aircraft, particularly those at low altitude which are taking off or landing. In 1985 nobody knew about its influence on aircrafts and there weren't any systems which could predict this invisible murderer. L-1011 became the first victim of a microburst. After the tragedy, seven years of research was conducted to develop a special radar which is able to detect microbursts. Now all aviation systems are equipped with this device.

Of course it's necessary to develop reliable aircrafts, but it's also mandatory to provide high quality of air traffic control. On August 31, 1986 flight 498, a McDonnell-Douglas DC-9 was flying to Los Angeles. At the same time a small private plane was going to Big Bear City.

At one point their routes crossed. The DC-9 is a large aircraft, equipped with a special system to make itself visible to other flying objects and to prevent some accidents. The name of the system is TCAS - traffic collision avoidance system. However, in those times small private planes didn't have this same device. As a result the little plane wasn't detected by either the DC-9 or the airport air traffic control systems, and a collision happened. Of course, after the accident all aircraft were equipped with TCAS and regulations for private plane flights were strengthened.

A lot of movies were dedicated to aviation accidents. "The final destination" movie is among them. The first part of the film is based on a plane which blew up in the sky. The idea of this accident was taken from a real catastrophe that happened on July 17, 1996. Trans World Airlines Flight 800, a Boeing 747, exploded and crashed into the Atlantic Ocean 12 minutes after taking off from John F. Kennedy International Airport, killing 230 people. There were two fatal reasons which caused the accident. First, a fuel vaporization and oxygen mixture in the center wing tank happened because the tank wasn't full of fuel. Secondly, it was a total mistake for designers to place signal wires from fuel level sensors and high voltage supply wires into the same line. As a result of these factors, fuel mixture in the center tank was ignited and the aircraft instantly exploded. Furthermore, three more air catastrophes happened due to the first described reason. Because of this, it was a necessity to develop some system to prevent accumulation of a very dangerous fuel mixture in a tank. The solution, called an inerting system was invented in 2003 and since that time a lot of aircraft have been equipped with this. According to this technology, empty spaces in the fuel tanks are filled up by a non-reactive chemical gas, thereby preventing possible ignitions. The second reason the Boeing exploded was just a limited failure that happened with this model of aircraft.

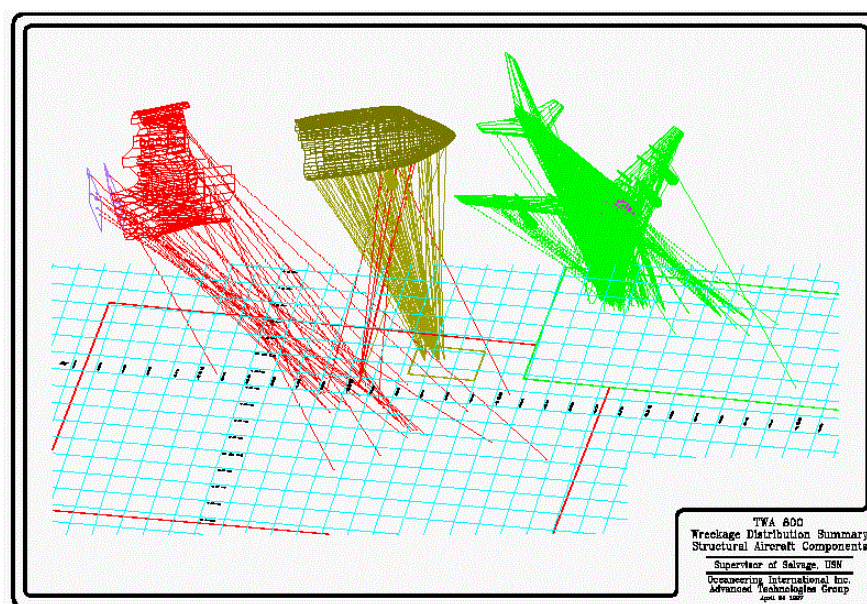


Fig. 2. Plan of fragments distribution of Boeing 747: the point of explosion is marked by red color

In conclusion I would like to say that we've considered just four examples of when mistakes from aircraft builders determined the path of aviation development. While in the global history there have been and will continue to be many other fatal cases, these will continue to contribute to the improvement of aerospace engineering. According to a statistic, the current number of air accidents has decreased compared with 30 – 40 years ago. If you look at the recent catastrophes you can see that the majority of them happened due to a human factor or violation of procedure rather than design mistakes. And today our comfort and relevant safety in the sky is a result of thousands human lives. Think about it!

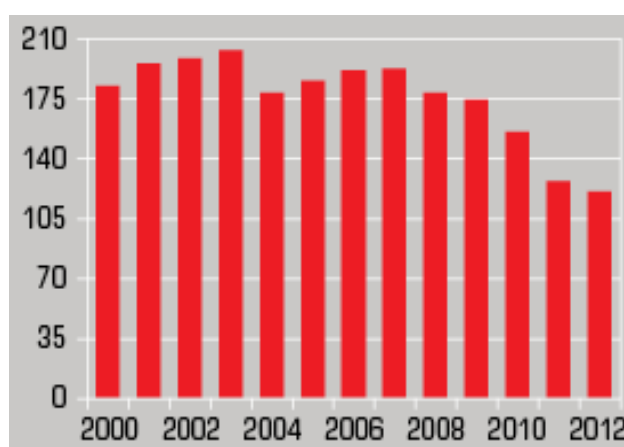


Fig. 3. Statistic of aviation accidents from 2000 till 2012 years

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