

Aviators IG Interesting News #9 – Mid-air Collision At Germany

#AviatorsIGFunFact: Boeing B777X uses foldable wingtips and GE9X engines.

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A Tupolev-Tu-154M operated by Bashkirian Airlines with the flight number of 2937 departed from Moscow Domodedovo International Airport, Russia to the destination of Barcelona–El Prat Airport, Spain. Bashkirian Airlines Flight 2937 departed Domodedovo International Airport at 1848 (UTC) with 60 passengers and 9 crew members onboard the chartered flight.

A Boeing 757-23APF operated by DHL with the flight number of 611 departed from Bahrain International Airport, Bahrain to the destination of Brussels Airport, Belgium with a stopover at Orio al Serio International Airport, Italy. DHL Flight 611 departed Orio al Serio International Airport at 2106 (UTC) had 2 crew members onboard the cargo aircraft.

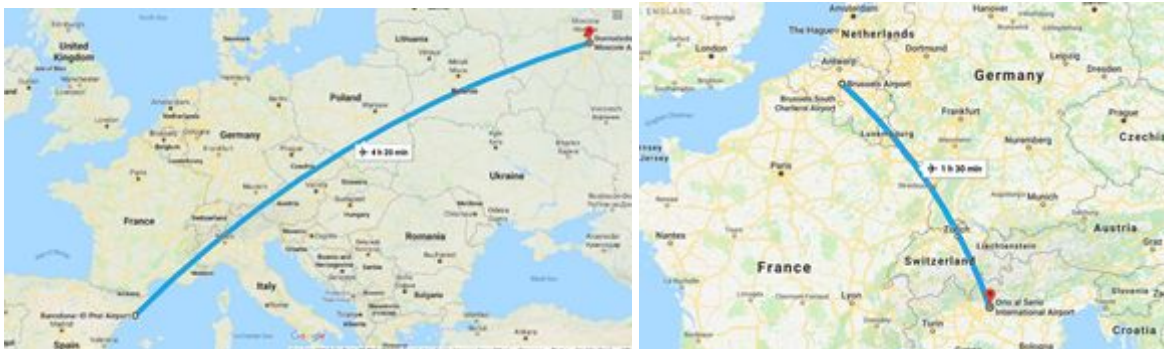


Figure 1 (Left): Bashkirian Airlines Flight 2937 operating route.

Figure 2 (Right): DHL Flight 611 operating route.

Managing Zurich Air Traffic Control Centre was an air navigation service provider called Skyguide. Skyguide air traffic controller manages and monitor the airspace over Switzerland and Germany airspace. Maintenance work on air navigation was being carried out during the night shift, thus various communication and warning system in the Zurich Air Traffic Control Centre was not in operation. At Zurich Air Traffic Control Centre, the airspace at night was less congested as compared to the day.

Due to less workload, various Skyguide air traffic controllers decide to take a break, leaving just Peter Nielsen, a single air traffic controller on duty. Peter Nielsen was solely responsible for all passing and approaching air traffic. DHL Flight 611 contacted Zurich Air Traffic Control at 2121 (UTC) and requested to climb to 36,000 feet (FL360). Peter Nielsen then gave the clearance permission to DHL Flight 611 for further climbing.

Peter Nielsen then had to switch from passing traffic radar station (radar for DHL Flight 611 and Bashkirian Airlines Flight 2937) to approach traffic radar station as a delayed Airbus A320 plane (radar for AEF Flight 1135) is approaching Friedrichshafen Airport, Germany at 2125 (UTC). Peter Nielsen is required to contact Friedrichshafen Airport for the upcoming arrival plane. However, he was unable to contact the airport due to the maintenance work carried out by a group of technicians.

Peter Nielsen had to switch from approach traffic radar station back to passing traffic radar station as Bashkirian Airlines Flight 2937 pilots was instructed by Munich Radar to change over to Zurich Air Traffic Control on 128.050 MHz and reported cruising at FL360 at 2129 (UTC). Peter Nielsen acknowledged the Bashkirian Airlines Flight 2937 pilots about the plane altitude just before the AEF Flight 1135 radioed in for Instrument Landing System (ILS) approach in Friedrichshafen Airport.

Peter Nielsen then switched back to the approach traffic radar station as he tried to contact the airport again and again, but to no avail. Searching for alternatives, Peter Nielsen requested the AEF Flight 1135 pilots to contact Friedrichshafen Airport directly. AEF Flight 1135 pilots acknowledged that Peter Nielsen had difficulty contacting Friedrichshafen Airport thus agreed on the given solution.

At 2134 (UTC), both Bashkirian Airlines Flight 2937 and DHL Flight 611 Traffic Advisory and Collision Avoidance System (TCAS) were being triggered. Initially, TCAS audio alarms and callouts was sounded to alert potential traffic. The two planes were 25 km apart, travelling at the same altitude, to the same spot, closing in at the rate of more than the speed of sound ($> \text{Mach } 1$). The ground-based optical collision warning system for air traffic control centre had been switched off for maintenance hence, Peter Nielsen was not alerted to the pending collision.



Figure 3 (Left): Bashkirian Airlines Flight 2937 (Aircraft type: Tupolev-Tu-154M, Reg.no: RA-85816)



Figure 4 (Right): DHL Flight 611 (Aircraft type: Boeing 757-23APF, Reg.no: A9C-DHL)

When Peter Nielsen switched back to the passing traffic radar station, he realised he had an urgent problem as both planes under his control were travelling at the same altitude to the same spot. He immediately tells the Bashkirian Airlines Flight 2937 pilots to descent (Decrease In Altitude) instantly due to crossing traffic. However, the TCAS on Bashkirian Airlines Flight 2937 informed the pilots to climb, while the TCAS on DHL Flight 611 informed the pilots to descent.

Bashkirian Airlines Flight 2937 pilots were confused about the conflicting instructions given by the Peter Nielsen and the Traffic Advisory and Collision Avoidance System. At the same time, Peter Nielsen repeated his instruction again for the Bashkirian Airlines Flight 2937 pilots to descent to 35,000 feet (FL350). Bashkirian Airlines Flight 2937 pilots then decided to follow Peter Nielsen instruction, ignoring the TCAS instruction.

After Bashkirian Airlines Flight 2937 descent to FL350, Peter Nielsen inform Bashkirian Airlines Flight 2937 pilots that DHL Flight 611 were at 36,000 feet and was at their “2 o’clock position”. In actual fact, Peter Nielsen had given an inaccurate information to the Bashkirian Airlines Flight 2937 pilots as DHL Flight 611 was at their “10 o’clock position” rather than “2 o’clock position”. Peter Nielsen then switched back to the approach traffic radar station, as the passing traffic radar station shown the Bashkirian Airlines Flight 2937 were at FL350, while the DHL Flight 611 were at FL360, a 1000 feet apart, which indicates clear of conflict.

Bashkirian Airlines Flight 2937 pilots were unable to use visual flight rules to spot DHL Flight 611 as they used Peter Nielsen’s inaccurate information. Moreover, both planes TCAS were still in the armed mode, alerting both planes were in a conflict. This is due to the Bashkirian Airlines Flight 2937 pilots choose to follow Peter Nielsen’s instruction to descent to FL350, while the DHL Flight 611 followed TCAS instruction to descent. Now, both planes were just about 5 km apart, descending to the same spot at 1300 km/hr. Eventually, the Bashkirian Airlines Flight 2937 saw DHL Flight 611, while the DHL Flight 611 also saw Bashkirian Airlines Flight 2937, but it was all too late.



Figure 5: The re-enactment of the collision between Bashkirian Airlines Flight 2937 and DHL Flight 611 by Air Crash Investigation (Mayday) Documentary Film Season 2 Episode 4.

Both aircrafts collided at 2135 (UTC) at an altitude of 34,890 feet (10,634 m), with the DHL Flight 611 (Boeing 757-23APF) vertical stabiliser slicing completely through the Bashkirian Airlines Flight 2937 (Tupolev-Tu-154M) fuselage. Immediately, Bashkirian Airlines Flight 2937 broke up into several pieces in mid-air due to explosive decompression, while DHL Flight 611 lost its vertical stabiliser, gradually spiralling towards the ground.

All 69 passengers and crew members aboard Bashkirian Airlines Flight 2937 and the 2 crew members of DHL Flight 611 were killed in the fateful mid-air collision, while the wreckage parts of both airplanes scattered an area over 350 km². After 3 years of investigation process for the accident, the German Federal Bureau of Aircraft Accident Investigation published the accident report in the year 2004, which includes factual information, analysis, conclusion and safety recommendation.



Figure 6 (Left): Wreckage on DHL Flight 611 (Boeing 757-23APF) Right Engine

Figure 7 (Right): Wreckage on Bashkirian Airlines Flight 2937 (Tupolev-Tu-154M) Rear Fuselage

The causes of the accident as follows:

1. Imminent separation was not noticed in time by air traffic controller.
2. Bashkirian Airlines Flight 2937 followed air traffic controller instruction to descend. This manoeuvre was performed contrary to the Traffic Advisory and Collision Avoidance System (TCAS) - Resolution Advisories (RA).
3. Regulations concerning TCAS published by ICAO were not standardise throughout all national aviation authorities and airline operators.
4. Management of the air navigation services did not ensure that all stations were staffed by air traffic controllers during night shift and tolerated using just one air traffic controller during low traffic flow.

Photo Sources:

Figure 3 [Konstantin von Wedelstaedt] (1998, July 25). Collided mid-air with a DHL Boeing 757 over Germany on July 1, 2002. Retrieved May 23, 2018 from <http://www.airliners.net/photo/Bashkirian-Airlines/Tupolev-Tu-154M/0062723/L>

Figure 4 [Torsten Maiwald] (1996, August 04). A9C-DHL, the Boeing 757 involved in the accident, at Brussels Airport in August 1996. Retrieved May 23, 2018 from <http://www.airliners.net/photo/DHL-SNAS-Aviation/Boeing-757-23APF/211222/L>

Figure 5 and Figure 6 [German Federal Bureau of Aircraft Accident Investigation] (2001 July). Boeing 757-23APF Right Engine and Tupolev-Tu-154M Rear Fuselage Section. Retrieved June 03, 2018 from http://www.bfu-web.de/EN/Publications/Investigation%20Report/2002/Report_02_AX001-1-2_Ueberlingen_Report.pdf?__blob=publicationFile

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