

AIR ACCIDENTS CAUSED BY ATC ERRORS

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The work of air traffic controller is very demanding on the perception and situation awareness. Higher workloads can produce errors which can result in fatal accident. This article describes some air accidents caused by errors in ATC.

K e y w o r d s: Air traffic controller, accident investigation, situation awareness, mid air collision

1 INTRODUCTION

Air Transport is constantly growing field of human activity. More and more people want to travel with aircraft and with this is associated higher number of aircrafts in air at one time. From this resulting a higher workload on air traffic controllers and due to it, there is a higher probability of errors and mistakes. Here is short list of, in my opinion, the most important accident which occurred due to errors in ATC.

2 LIST OF ACCIDENTS

2.1 Pennsylvania-Central Airlines flight 410

On 13th June 1947 Douglas DC-4 (C-54-DO) flew on its short scheduled flight from Pittsburgh to Washington. The plane took off at 17:24 and flew at 7 000 ft. At 18:03 a pilot obtains a clearance to descend to destination airport. During approach airplane hits Lookout Rock ridge in the Blue Ridge Mountains at an altitude of about 1425 ft at a distance of 13 km from Charles Town.

During an investigation, the commission concluded that the cause of the accident was descending below the minimum safe altitude in the area, apparently under the clouds because of the pilot's wish to have visual contact with the ground. Pilot obtained a clearance to descend below minimum safe altitude from the ATC.

2.2 Aeroflot 376 and Aeroflot 381

On the 5th October 1952 at 16:02 there was a mid-air collision of Il-12 and Douglas TS-62 (DC-3).

The Aeroflot flight 376 took off from Minsk airport and flew on the route of scheduled flight to Leningrad (St. Petersburg today). The collision with the same operators plane TS-62 occurred when crew of TS-62 has been taking off and the crew of Il-12 has been approaching in the opposite direction of TS-62 (on an opposite course). Crew of Il-12 obtained a clearance to descend to altitude 1 200 m and a pilot of TS-62 obtained a clearance to climb to altitude 2 700 m. ATC was asked by a Il-12 pilot, if he is really cleared to descend when there is an aircraft on opposite course. He obtained a reply from ATC that he has both aircraft on surveillance radar and everything will be fine. Wreckage of TS-62 was found about 25 km south-west from the airport near the town Skvorits. Il-12 crashed about 1 200 m north-east

from TS-62. Right wing of Il-12 and part of TS-62s right wing was found north from Skvorits.

The negligence of air traffic controller was determined as a cause of an accident.

2.3 Prinair 277

At 17:15, 5th March 1969 the aircraft de Havilland DH-114 Heron 2D took off to its flight from Saint Thomas to San Juan (Puerto Rico). Flight was under IFR conditions. The aircraft was not equipped with radar transponder neither distance measuring equipment (DME). At 17:32 pilot contacted San Juan with information that the aircraft flew in 4 000 ft. Air traffic controller, who was in training, answer with information about radar contact 3 miles east from Isla Verde; followed by instructions for approach and request to stay in 4 000 ft. But the actual position of aircraft was different – aircraft was about 3 miles east of intersection Fajardo instead of Isla Verde, which distance is 10 miles. At 17:33 the clearance to descend to 3 000 ft was obtained. At 17:38 there was a contact with trees and the aircraft crashed. The wreckage was found on the hillock of Sierra de Luquillo at an altitude about 2 400 ft.

Final NTSB report contains the following information:

First contact with the trees was at altitude about 3 000 ft. Point of impact and its altitude was affected by uncontrolled flight with one wing damaged whose parts were never found. The cause of an accident was wrong awareness about the position of the aircraft by air traffic controller, and its vectoring on final approach under minimal safe altitude. Although the air traffic controller was under control of senior training instructor, even the instructor did not recognize the wrong position of the aircraft. This situation was noticed only by coordinator in separate room, but he did not interfered into this situation.

Several safety recommendations revealed from this accident, such as the revision of approach routes to San Juan including procedures for aircraft without radar transponders and distance measure equipment (DME).

2.4 USAF – reg. 64-0641 (Lockheed C-141A Starlifter)

On 21st March 1975 U.S Air Force plane obtain a clearance to descend from flight level 370 to altitude of 15 000 ft during its flight from Tokyo to Tacoma McChord airport . When they came under the Seattle Center, the crew reported altitude 10 000 ft (they obtain a

clearance to 10 000 ft before). Air traffic controller incorrectly evaluate from what aircraft is this message and send a clearance to descend and maintain 5 000 ft assuming that he was talking to another aircraft – A-6 Intruder. About 60 miles from its destination, the C-141 airplane starts its descent under the minimal safe altitude. The airplane crash to ridge of Mt. Constance in Olympic National park, only 150 ft under the top of this mountain in altitude 7 743 ft.

2.5 Aeroflot CCCP-46349

On 20th November 1975 there was a crash of Antonov An-24B. The aircraft was on its route from Rostov on Don to Charkov at altitude of 4 800 meters. In Barvenko area the crew obtained a clearance to descent to altitude 2 400 meters. The crew announced reaching this altitude and obtain another clearance to altitude of 1 200 meters. In 19:35 was reported an atmospheric pressure but there was a mistake – air traffic controller announced 7 5 7 instead of 7 3 7. Crew confirmed 7 5 7. Next, there was another clearance to altitude 400 meters on crew's discretion. At about 15 km from destination there was another clearance to descent to altitude of 300 meters. At 19:38 Air traffic controller lost radar contact with the airplane. The wreckage was found about 12 km from the airport. At the time of impact the altitude of flight was 220 meters. Radio altimeter sent a warning 50 meters above the first barrier but the crew did not react.

As it is mentioned above, there was a failure of air traffic controller because of wrong value of atmospheric pressure which he reported to the crew (7 5 7 instead of 7 3 7). Thanks to this information a barometric altimeter showed wrong values and this led to the crash.

2.6 Jet Avia N12MK

On 7th January 1977 at 17:00 LOC there was a crash of Learjet 24B into the mountain at an altitude about 9 700 ft. The flight crew misinterpreted an ATC clearance and after take off, they flew on course of runway direct into the mountain instead of flying on departure route. Conclusions from this accident were that crew wrongly interpreted an ATC clearance and that air traffic controller did not react on unchanging course of flight and let the plane crash into a mountain.

2.7 Lufthansa LH527

On 26th July 1979 a Lufthansa Company cargo airplane Boeing B707-330C was dispatched on Rio de Janeiro airport. This airplane took off at 21:27 and followed the instruction of air traffic controller. The airplane should turn right to VOR Caxias and climb to altitude 2 000 ft. Air traffic controller from APPROACH request to increase speed, the flight crew increase speed to 304 knots, so they exceeded a speed limit in TMA which was set to 250 knots under a flight level 100. Flight continues still in straight course towards mountains. Air

traffic controller was busy in another part of his radar so he did not watch the trajectory of flight LH527. When he turned his attention again on flight LH527 request turn right heading 140 and increase rate of climb. At this time, GPWS sounded in the cabin. The plane hit the top of trees at position nose up, bank to the left. Plane continues its flight for 800 meters until crashed into terrain.

The cause of this accident was loss of situation awareness by air traffic controller. When the controller refocused to Lufthansa flight it was too late to make some corrective action. Contributory factor was also acceptance incomplete instructions for take off and that crew did not want further information and fly over a minute without demanding complete instructions.

2.8 Aero Trasporti Italiani 12

On 14th September 1979 at 00:47 an air accident was reported near the Sarroch in Italy. During the NDB approach to the Cagliari airport pilot announced "Missed Approach" and started turning to pass a thunderstorm which was on an approach route. During this maneuver crashed into Conca d'Oru at altitude of 610 meters. System ILS was inoperative during the approach.

Possible cause of this accident was pilot error together with a small cooperation of air traffic controller.

2.9 Saudi Arabian Airlines SVA763; Kazakhstan Airlines KZA1907

One of the most tragic air accident occurred on 12th November 1996 over India, when there was a midair collision between two aircrafts – Saudi Arabian Airlines Boeing B747-168B on flight from Delhi to Dradhan and Kazakhstan Airlines Ilyushin Il-76TD on flight from Shymkent to Delhi.

Flight SVA763 took off from Delhi airport at 18:32 LOC. At the same time, flight KZA1907 started its descent to lower flight level to initiate its approach phase to Delhi airport. Both flights were under control of one air traffic controller. Flight KZA obtain a clearance to descent to altitude 15 000 ft. On the same route in the opposite direction climb a flight SVA with clearance to altitude 14 000 ft. At 18:40 flight KZA reported reaching altitude 15 000 ft, in fact they were at altitude 14 500 and they continue its descent. At this time they obtain information from air traffic controller about traffic at 12 o'clock 1 000 ft lower. This information was without response from the flight KZA. Air traffic controller tried to contact crew of the SVA flight but they also did not answer.

During the investigation of this accident became clear that the cause of this accident was poor knowledge of English language of the Kazakhstan Airlines crew, when captain was not sure to what altitude should he descend and instead of maintaining altitude 15 000 ft continued descending under altitude 14 000. At this moment was noticed by navigator that he is under cleared altitude so he started to climb again through altitude

14 000 where Boeing B747 was flying. Inadequate equipment of air traffic controller also played its role. Air traffic controller has only visualization from primary radar so he can not see in what altitude both aircrafts were, what speed they were flying etc. He had only information about their position. If the ATC center was equipped with secondary radar, controller would have more information about both flights and could prevent the accident. Accident could be prevented also by using TCAS in both aircrafts.

2.10 DHL611; Bashkirian Airlines 2937

1st July 2002, 23:35 – there was a midair collision between Bashkirian Airlines flight 2937 from Moscow to Barcelona and flight DHL611 from Milano to Brussels. Both aircrafts were flying at flight level 360 and both were under control of Swiss ATC private company Skyguide. Air traffic controller has two separate areas under his control and due to heavy workload he did not recognize that two aircrafts were on collision course. He noticed that less than one minute before accident and contacted a crew of Russian airplane with a request to descend 1 000 ft lower. When the crew of Russian aircraft started to descend, they obtain a TCAS warning with request to climb. Russian crew continued with descending as ATC requested. TCAS was activated also in DHL aircraft with request to descend. Both aircraft were descending. As the Russian aircraft approached, TCAS of flight 611 requested steeper and steeper rate of descent. Just before the collision, the rate of descent varied between 2 500 and 3 000 ft/min.

Air traffic controller still requested descending and gave wrong information about DHL aircraft position. The collision occurred at altitude about 34 890 ft.

The investigation of this accident shows these main factors leading to the event:

- Air traffic controller did not have fully functional background – the primary system was maintained, and he has to control traffic over two areas at the same time.
- Crew of Russian aircraft obeyed the request from air traffic controller, who gave order to descend in conflict with TCAS request – climb. This resulted in situation that both aircraft were descending.
- After the descend request for the Russian aircraft, air traffic controller left his workplace and focused on the situation in another sector, so he did not hear that the DHL aircraft also started to descend.

Based on investigation of this accident, several measures related to the use of TCAS and communication between crew and air traffic controllers in emergency situation were adopted.

2.11 GOL1907; Embraer Legacy 600 N600XL

29th September 2006 above the Brazilian rainforest there was a midair collision between GOL Transportes Aéreos Boeing B737-800 which flew from

Manaus to Rio de Janeiro and an Embraer Legacy which flew from São José dos Campos to Manaus. The flight of Embraer was planned with altitude profile first FL370, then after VOR Brasilia descend to FL360 and finally after fix TEREX climb to FL380. But crew of Embraer obtained misleading interpretation of ATC Clearance:

ATC: „November Six Zero Zero X-ray Lima, ATC clearance to Eduardo Gomes, flight level three seven zero direct Poços de Caldas, squawk transponder code four five seven four, after take-off perform Oren departure.” [4]

Of which the crew inferred that FL 370 will be for the whole flight. After take off and then at 15:51 after handover to the next station of ATC – Brasilia Center there was next communication:

N600XL: Brasilia, November six hundred X-ray Lima, flight level three seven zero, good afternoon.

ATC: November six zero zero X-ray Lima, squawk ident, radar surveillance. [4]

N600XL: Roger.

So the crew of Embraer continued in previous altitude. This was the last communication between Embraer and ATC. At 15:55 Embraer flew over VOR Brasilia and continued north-west on UZ6 route at FL370. At 16:02 air traffic controller lost information from secondary radar (radar stopped receiving information from mode C). There were no attempt to contact crew of Embraer between 15:51 and 16:26. Between 16:26 to 16:34 air traffic controller try to contact Embraer but unsuccessfully. Four minutes later signal on primary radar disappeared. At 16:53 there was an unsuccessful attempt to handover to Amazonic Center and in three minutes happen nearly head-on collision with GOL Boeing B737. Boeing with destroyed wing crashed into rainforest, Embraer was able to continue and landed on Brazilian military base. Until that, they even did not know, what happened.

Main cause of this accident was wrong interpretation of the ATC clearance and further inactivity from the site of ATC. This was evaluating as a systematic error of conception of Brazilian ATC. As a contributory cause was fact, that TCAS on board of Embraer was in mode STANDBY instead of TA/RA. That is why there was no TCAS warning before the crash.

CONCLUSION

The above list of air accidents shows that air traffic controllers could play an important role during crisis situation, which could result in fatal accident. Air traffic controllers can contribute to creation of accident by misinterpreting the requirement on aircraft crew, wrong awareness about the situation in the air, insufficient attention given to the whole area over which he has control – focusing only on one part etc. In history its role also played inadequate equipment on ATC stations – such as slow implementation of secondary surveillance radar. Despite considerable modernization, decisions still

depend on humans as individuals, who, by its nature, can product errors. So it is still necessary to develop more sophisticated systems with the possibility of more control and prediction of consequences of individual decisions, both on aircraft board and on ATC stations.

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