

Investigation Report

AX002-0/05
November 2010

Identification

Type of occurrence:	Serious Incident
Date:	23 April 2005
Location:	Stuttgart
Aircraft:	Commercial Aircraft
Manufacturer / Type:	Boeing / B737-800
Injuries to persons:	One person slightly injured
Damage:	Major damage to aircraft
Other damage:	None
Information source:	Investigation by BFU

The team leader of the loading group of the Flughafen Stuttgart GmbH (FSG) noticed that the aircraft was unusually tail-heavy, informed the ramp agent and asked him to check his loading instruction again. The ramp agent was informed by the office staff that everything was all right and he therefore had no further reservations.

As the aircraft started taxiing to the runway, the team leader, who was still concerned about the noticeable tail-heaviness of the airplane, observed that the nose gear wheels were drifting outwards in the curves because, in his opinion, they did not have the necessary ground contact, and informed the airside duty manager. Because the airside duty manager could no longer see the aircraft from his position he thought it had already started. He had no way of contacting the crew by radio.

Factual information

History of the flight

The Boeing B737-800 of a Turkish airline arrived on 23 April 2005 with 189 passengers and seven crew members on board from Hurgada, Egypt, and should have arrived initially in Stuttgart, via Düsseldorf. According to a short term flight plan modification, the aircraft landed first in Stuttgart. 100 passengers debarked and luggage was unloaded.

The other 89 passengers sitting in rows 18-32 in sector B and approximately 1,860 kg luggage, which were stored in the rear hold (three), remained on board the airplane. During the time on the ground, a new load and trim sheet was prepared by the operations agent of Stuttgart Ground, for the continuing flight to Düsseldorf. He handed all the necessary documents to the ramp agent of Airport Ground Service GmbH (AGS), who was to forward them to the pilot in command (PIC).

Meanwhile, the aircraft taxied from the parking position 44, via taxiway S, to runway 25.

At about 0747 hrs¹ the crew received take-off clearance. Shortly after the airplane had started the take-off run, the aircraft pitched backwards and the tail struck the runway. The pilot in command immediately aborted take-off. The airplane pitched back onto the nose gear, rolled out and came to a standstill on taxiway E. From there it was towed to parking position 35. The passengers disembarked via the stairways.

During the occurrence a flight attendant was slightly injured and the aircraft severely damaged.

During analysis of the cockpit voice recorder it could be gathered that the crew had encountered a similar

¹ Unless otherwise specified, all times are indicated in local time

event on a previous flight. They were aware that the passengers should have been moved.

Personnel information

Both pilots held valid licences and ratings in order to conduct the flight.

The pilot in command, age 55, had a total flight experience of about 12,000 hours, approximately 3,000 hours of which were on Boeing B737. Flight time of the last 90 days was 200 hours and 4 hours within the last 24 hours prior to the incident. He had a 36-hour rest period prior to the flight.

The second pilot, age 46, had a total flight experience of about 5,200 flight hours, approximately 3,000 hours of which were on Boeing B737. Flight time of the last 90 days was 180 hours and 4 hours within the last 24 hours prior to the incident. He had a 96-hour rest period prior to the flight.

There were no medical restrictions.

Aircraft information

The Boeing B737-800 is a twin engine aircraft with 189 seats. The airplane with the MSN 30478 was put into service on 16 November 2001. It was duly certificated.

According to the computer load sheet the airplane was occupied by 89 passengers. 42 of them were to be seated in section "A" (rows 1 to 15) and 47 in section "B" (rows 16 to 33). The entire luggage, approximately 1,860 kg, was in cargo compartment three.

Take-off weight was 54,223 kg. The middle aerodynamic cord (MACTOW) was 18.3%. It was therefore purely arithmetically within limits. Stabilizer take-off (STABTO) was +6.51°.

The aircraft was registered by the Turkish civil aviation authority and operated by a Turkish operator.



Damage on the lower side of the fuselage



Detail View

Meteorological information

At the time of the incident visibility was more than 10 km, the cloud base was above 5,000 ft. A light wind was blowing from a western direction. Temperature was 4°C and dewpoint 1°C. There were no specific weather phenomena.

Communication

Radio communications were held in English. There were no communication problems.

Aerodrome information

The airport reference point of Stuttgart Airport is 1,276 ft. The airport has a 3,345-meter long and 45-meter wide runway with the directions 074°/254°. The two parallel taxiways "S" and "N" lead to runway 25 and end in taxiway "A".

Flight recorders

The Flight Data Recorder (FDR) and Cockpit Voice Recorder (CVR) were seized and read out at the Federal Bureau of Aircraft Accident Investigation (BFU) in Braunschweig.

The FDR was a Honeywell SSFDR, P/N 980-4700-042, S/N 07822, with 970 parameters. The CVR was also a Honeywell SSCVR, P/N 980-6022-001, S/N 04652, with a recording time of two hours.

A transcription of the CVR data was prepared and with the help of an interpreter the Turkish translated into German.

FDR data did not provide any information for the investigation.

Additional information

The BFU has notice of two similar cases of incorrect loading of Turkish airplanes in the past:

- On 24 July 2000, the tail of an Airbus A300-600 of the Turkish Airline Alfa Air struck the runway surface at take-off in Muenster-Osnabrueck due to incorrect loading.
- On 29 November 2002, a Boeing B737 of Pegasus Airline suffered a tail strike at Dortmund Airport due to tail-heavy loading.

Wreckage and Impact Information

The tail strike caused severe structural damage in the aft fuselage area.

Analysis

Due to the remaining luggage of 1,860 kg in hold three it would have been necessary to move passengers from sector B to sector A. According to the load sheet, 42 passengers should have sat in sector A. The flight attendant realised the unusual seating arrangement and reported it to the PIC who did not see any need for action.

The unusual loading and seating caused extreme tail heaviness and resulted in an unusual spatial position of the aircraft at the parking ramp. The nose landing gear was fully rebound and had hardly any ground contact. The crew did not realise that, as a result, the wheels drifted outward in the curves.

The behaviour of the crew indicates lacking situational awareness and shortcomings in the operational handling of the airplane type.

Only the loadmaster noticed the unusual position of the airplane and told different people about his concerns. Had the loadmaster's concerns been heeded it would have been possible to stop the aircraft even without direct radio communications.

The ramp agent should have become heedful and checked whether the passengers had been moved to the new seats according to his calculations.

The team leader could not stop the airplane in time due to lack of effective communication options.

The BFU is of the opinion that a direct radio communication between team leader and tower, ground or ramp control on a respective air radio frequency is missing so that in safety-related situations a fast connection between parties concerned is possible.

The team leader does not have an unobstructed view of the whole operational airport area. In emergency situations this may result in the fact that necessary measures are not initiated in time.

Conclusions

- Both pilots held the necessary licences and ratings required for the conduct of the flight.
- The airplane was properly certificated and maintained in accordance with existing regulations and approved procedures.
- Contrary to the actual loading of the aircraft, the load and trim sheet showed that take-off weight and centre of gravity were within the permitted tolerance.
- Because of the remaining passengers on board for the destination Düsseldorf which were seated in the rear part of the aircraft, and the luggage stored in the aft cargo compartment, the centre of gravity was now beyond the permitted tolerance.
- Despite sufficient advices concerning the extreme heavy tail loading of the aircraft, the crew did not recognise the situation.
- The view the team leader had was obstructed and he therefore assumed the aircraft had already started.
- The team leader did not have communications options available to him to contact the crew directly. Therefore, it was not possible to stop the aircraft in time.

Findings

The cause of the tail strike was the extreme tail-heavy aircraft balance, caused by the remaining passengers and their luggage in the aft part of the aircraft.

A contributory factor was the insufficient situational awareness of all persons involved, except for the load master.

Safety Recommendation

According to the results of the investigation, the BFU has issued the following safety recommendations.

Recommendation n°: 03/2006

By agreement with the Deutsche Flugsicherung GmbH (DFS) the Stuttgart airport shall establish a radio communication with the corresponding frequencies between the traffic supervisor on duty and the tower, the ground and the ramp control, in order to prevent direct danger.

Recommendation n°: 04/2006

The Stuttgart GmbH shall implement actions, enabling the visibility of the traffic control over the whole asset.

Recommendation n°: 07/2005

The Luftfahrt-Bundesamt shall perform increased inspection of the aircraft loading of Turkish airline companies.

Recommendation n°: 08/2005

The Turkish aviation authorities shall order an examination of the crews within the concerned Turkish airline company, concerning the operational knowledge of aircrafts, especially concerning the loading and if necessary a special training to improve the awareness of situations.

Implemented Safety Recommendations

Stuttgart Airport has already implemented Safety Recommendations 03/2006 and 04/2006.

Safety Recommendation 07/2005 was implemented by the Luftfahrt Bundesamt.

The BFU does not have any information concerning Safety Recommendation 08/2005 which was addressed to the Turkish Civil Aviation Authority.

Investigator in charge Müller