

# Status Report

## Identification

Type of Occurrence:	Serious incident
Date:	3 November 2011
Location:	Munich
Aircraft:	Transport aircraft
Manufacturer / Model:	Boeing / B 777-300 ER
Injuries to Persons:	None
Damage:	No damage to aircraft
Other Damage:	Crop damage
Information Source:	Investigation by BFU
State File Number:	BFU EX010-11

## Factual Information

Shortly after touchdown, the airplane veered off the runway and came to a stop next to it.

## History of the Flight

The crew had taken over the airplane on the morning of 3 November 2011 in Munich and conducted a flight to Manchester. On the subsequent return flight to Munich 143 passengers, 13 flight attendants and two pilots were aboard.

According to crew statements the copilot was initially Pilot Flying (PF) during the flight Manchester - Munich. When it became apparent that the weather in Munich would be below the values under which the copilot was allowed to perform the landing, the Pilot in Command (PIC) became PF and the copilot Pilot Monitoring (PM). During the approach briefing the crew had decided to perform an automatic approach and landing.

At 12:00:43 hrs the crew received the approach clearance to runway 08R „... DESCEND 5000 FEET CLEARED ILS 08 RIGHT“.

At the time of the approach Munich Airport operated on all-weather operations CAT I.

At 12:08:47 hrs the crew received landing clearance „...130 DEGREES 7 KNOTS RUNWAY 08 RIGHT CLEARED TO LAND“.

When the B 777 was about 30 ft above the runway it slowly banked to the left. The airplane touched down first with its left main landing gear. The Flight Data Recorder (FDR) showed that at that moment the autopilot changed to Rollout Mode.

The calculated touch-down point was about 490 m after the threshold. In the further course of events the airplane moved towards the left side of the runway and veered off in the area of taxiway B4. At that time the autopilot was disengaged. The airplane moved for about 400 m in a slightly curved right turn north of runway 08R over grass. In the area of taxiway B6 the airplane moved back onto the runway and crossed it with a heading of 120°. The airplane came to a stop south of the runway in the grass.

About two minutes afterwards the fire brigade had reached the airplane. With the help of two stairs from the fire brigade the passengers were evacuated. All passengers and crew members were uninjured.

The crew stated that during the approach and the landing no system warnings had been indicated. The PIC stated he had tried to initiate a go-around procedure by pushing the TOGA levers when the airplane began to veer to the left, but the airplane did not respond. At the same time he retracted the ground spoilers which had automatically been deployed at the time of the touch down.

The read-out of the FDR data showed the following: (Appendix 1).

Until 11:09:00 UTC the approach occurred without incidents. Between 11:09:02 UTC (altitude about 110 ft) and 11:09:10 UTC (altitude about 30 ft) the three parallel working localizer antennas aboard the airplane recorded signals which showed an irregular beam deviation. From 11:09:10 UTC on signals were recorded which showed an

increasing beam deviation from the extended centre line or runway centre line, respectively, towards the right.

The airplane began to roll to the left and at 11:09:16 UTC reached a maximum bank angle of 3.5° when it touched down with its left main landing gear. At the time the autopilot was still engaged; the approach mode changed into rollout mode.

Because the autopilot generated control inputs to minimise the lateral beam deviation the airplane turned left.

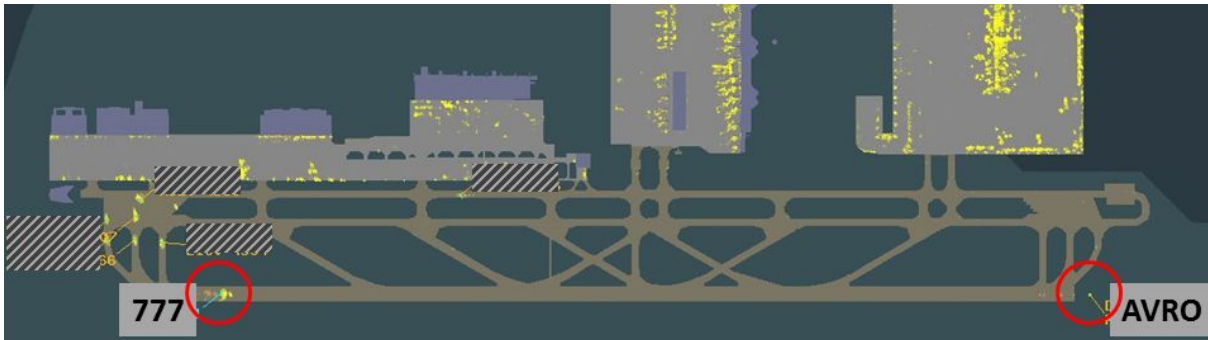
At 11:09:22 UTC both pilots pushed down on the right rudder pedals - the PIC with 23 lbs and the co-pilot with 41 lbs - and over-steered the autopilot which disengaged immediately afterwards.

At 11:09:28 UTC the airplane reached the largest lateral deviation from the runway centre line.

Between 11:09:14 UTC and 11:09:24 UTC the ground spoiler deployed for about 5 seconds and retraced again.

The FDR did not show any indications for the initiation of a go-around procedure. However, the Cockpit Voice Recorder (CVR) recorded at the time of the touch down the PIC's command "ok, flaps 20" together with several sounds which indicate the clicking of the TOGA lever and the movement of the speedbrake handle.

At 12:07:53 hrs as the B 777 was about 2.9 NM prior to the runway 08R, one aircraft each was at the CAT II/III holding position of taxiways B1, B2 and B3 and two aircraft were farther north of them. An additional airplane taxied on taxiway S towards the west. An airplane (BAe AVRO) taxied at the same time over the High Speed Taxiway B4 onto the runway and started the take-off run about 20 seconds later. At that time the B 777 was about 2.1 NM prior to the runway in an altitude of about 700 ft AGL. At 12:09:09 hrs the B 777 crossed the threshold of runway 08R in an altitude of 40 ft. Six seconds later the BAe AVRO left the end of the runway in an altitude of about 380 ft. At 12:09:29 hrs the BAe AVRO overflew the ILS localizer antenna of runway 08R in 740 ft.



Position of the AVRO at the time the B 777 touched down

Air Traffic Control

## Personnel Information

### Pilot in Command (PIC)

Sex:	male
Age	45 years
Seat	left seat
License:	Air Transport Pilot's Licence (ATPL) issued by the civil aviation authority Singapore on 21 April 1993 valid until 30 September 2012
Ratings:	B 747, B 777 PIC since 21 October 2004 Line Instructor Pilot (LIP) since 29 May 2010
In the company since	23 January 1992
Last line check:	13 January 2011
Last base check	21 June 2011
Last recurrent training:	20 October 2011
Last medical:	13 September 2011
Total flying experience:	12,416 hours
Flying experience on the type:	4,712 hours

Flight time 24 hours  
before the occurrence: approx. 3 hours  
Flight time in the  
last 90 days: 219 hours  
Initial CRM training: 18 March 2005  
Recurrent CRM training: 6 May 2010  
Last day of duty: 29 - 30 October 2011

### Co-pilot

Sex: male  
Age: 35 years  
Seat: right seat

License: Air Transport Pilot's Licence (ATPL)  
issued by the civil aviation authority Singapore  
on 1 February 2008  
valid until 29 February 2012

Ratings: B 777  
In the company since 5 September 2002  
Last line check: 19 January 2011  
Last base check 8 August 2011  
Last recurrent training: 22 November 2010  
Last medical: 21 January 2011  
Total flying experience: 3,681 hours  
Flying experience  
on the type: 3,681 hours  
Flight time 24 hours  
before the occurrence: approx. 3 hours  
Flight time in the  
last 90 days: 182 hours  
Initial CRM training: 16 June 2006  
Recurrent CRM: 7 December 2009  
Last day of duty: 14 October 2011

### Approach Controller (Feeder)

Sex: male  
Age 37 years

Licenses / Ratings: Arrival controller and area controller including Flight Information Service  
Held an instructor rating and on the day of the occurrence a trainee was present

In the company since: January 1999

### Director

Sex: female  
Age 33 years

Licenses / Ratings: Arrival controller and area controller including Flight Information Service  
Held an instructor rating and on the day of the occurrence a trainee was present

In the company since: June 1990

### Tower Controller

Sex: male  
Age 26 years

Licenses / Ratings: Aerodrome controller with radar including Flight Information Service

In the company since: January 2010

### Aircraft Information

Type: B 777-300 ER

Manufacturer: Boeing Commercial Airplane Group, Seattle, Washington, USA.

Year of Manufacture: 2008  
Manufacturer's serial number: 34582  
Engines: two General Electric GE90-115B/2-115BL  
Maximum take-off weight: 351,534 kg  
Maximum landing weight: 251,291 kg  
Landing weight at the time: 210,300 kg  
Airframe operating hours: 5539 hours 25 minutes

There are no occurrence-related entries in the technical logbook.

The airplane was certified for CAT IIIB approaches with a Runway Visibility Range (RVR) of 100 m and a Decision Height (DH) of 20 ft.

There were no restrictions concerning the airplane's equipment.

The last auto-land was conducted on 26 October 2011 in Singapore.

The airplane is subject to regular maintenance procedures; the last C-check was on 28 November 2010.

## Meteorological Information

The crew had received two aviation routine weather reports (METAR) via the Air Traffic Information Service (ATIS) Munich. Information W of 10:30 UTC and Information X of 10:50 UTC.

There was a slight wind coming from an easterly direction with 8 kt; visibility was 2 km; light mist. The cloud base was at 300 ft; some clouds drifted down to 200 ft. Temperature and dewpoint were 4°C. Barometric air pressure was 1,011 hPa. No significant weather changes were to be expected.

## Aids to Navigation

For the approach to runway 08R an Instrument Landing System (ILS), a Distance Measuring Equipment (DME), a Non-Directional Beacon (NDB) and an Omnidirec-

tional Radio Beacon (VOR) were available. The ILS used the frequency 109.3 MHz with the identifier IMSE and had a glide slope of 3°. The ILS glide slope transmitter (GP) was a GP 422 dual-frequency system manufactured by Thales.

The ILS localizer (LOC) was a LOC 421 dual-frequency system manufactured by Thales. The system had been installed in May 2010. The location of the antenna had been changed to about 650 m farther east of the old location which means 1,000 m from the end of runway 08R. Initial survey took place between 8 and 12 May 2010. On 31 May 2010 technical clearance of CAT I occurred. Technical clearance of CAT II and CAT III occurred on 28 July 2010 and operational clearance occurred on 3 August 2010.

On 20 October 2011 the Aeronautical Information Publication (AIP) published these changes on the aerodrome chart. On the pages AD 2 EDDM 1-9 Radio Navigation and Landing Aids still showed the old location for the antenna.

The last calibration took place on 17 May 2011. The calibration record was made available to the BFU.

## Communications

Radio communications were initially conducted on frequency 118.825 Mhz, Munich Director, and later with frequency 120.5 Mhz, Munich Tower. Communications were recorded; a transcript was made available to the BFU.

## Airport Information

Munich Airport is located 28.5 km north-east of Munich city at an elevation of 1,487 ft MSL. It has two parallel 4,000-meter long runways each with a width of 60 m. Their true bearings are 082° and 262°, respectively. The lateral distance between the two runways is 2,280 m.

Runway 08R has a grooved concrete surface. At the time of the landing, the runway was dry and braking action good.

## Flight Recorders

FDR and CVR were dis-assembled in the presence of the BFU and transported to Braunschweig for read-out.

The FDR was a Honeywell Solid State Flight Data Recorder (SSFDR), P/N 980-4700-042; S/N 14429. It can record 1,312 parameters.

The CVR is also a Honeywell Solid State Cockpit Voice Recorder (SSCVR). It has 5 recording channels; 3 x 30 minutes and 2 x 120 minutes.

## Wreckage and Impact Information

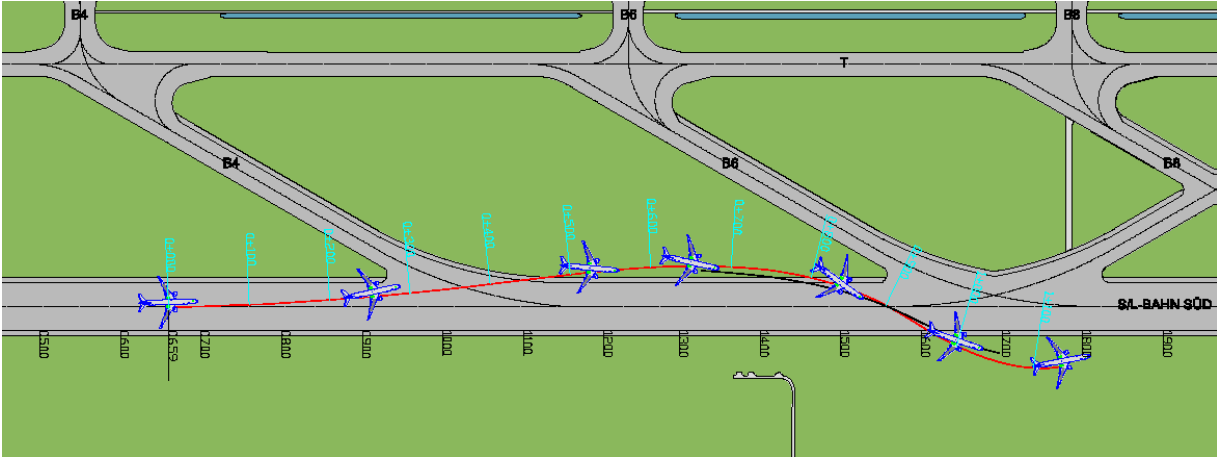


Location of the aircraft after coming to a standstill

The tyre traces were measured and drawn into an aerodrome chart.

The first visible traces were determined about 659 m after the beginning of the runway. About 1,100 m after the beginning of the runway the airplane left the runway at taxiway B4 and moved over grass. After about 1,300 m the airplane reached with about 40 m the largest lateral deviation to the north of the runway centre line. The airplane turned 46° to the right and crossed the runway between 1,450 m and 1,620 m with a heading of 121°. The maximum lateral deviation towards the south

was reached at 1,740 m with about 60 m from the runway centre line. The airplane came to a stop in the grass after about 1,780 m.



Aircraft path

Graphic: Airport Munich

There were no damages on the airplane safe for some grass and dirt on the right engine and the landing gear. The tyres tracks were up to 15 cm deep.



Right main landing gear

Photo BFU



Dirt on the right engine

Photo BFU



Aircraft path in landing direction

Aircraft path opposite to the landing direction

Photos BFU

## Fire

There was no fire.

## Organisational and Management Information

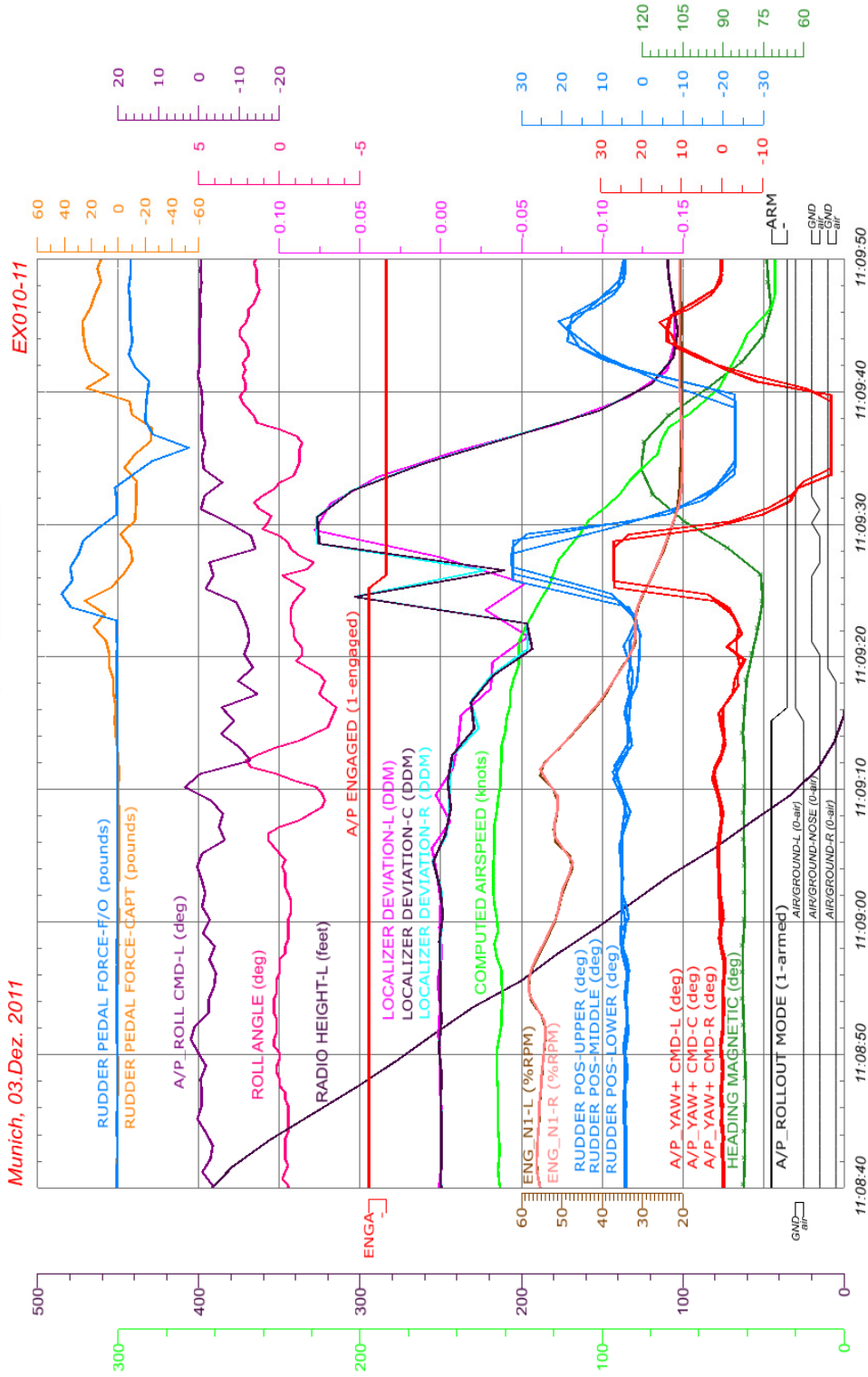
The placement of the ILS occurred in accordance with the „Richtlinie für die Aufstellung von ILS- Anlagen“ (Guideline for the installation of ILS equipment) dated 1 July 2008, it corresponds with ICAO Annex 10 Chapter 3 (SPECIFICATIONS FOR RADIO NAVIGATION AIDS).

ILS equipment is subject to regular checks either through flight survey or surface survey.

Investigator in charge: Müller  
Assistance: Ritschel, Himmler, Blanke  
Field Investigation: Müller, Nehmsch

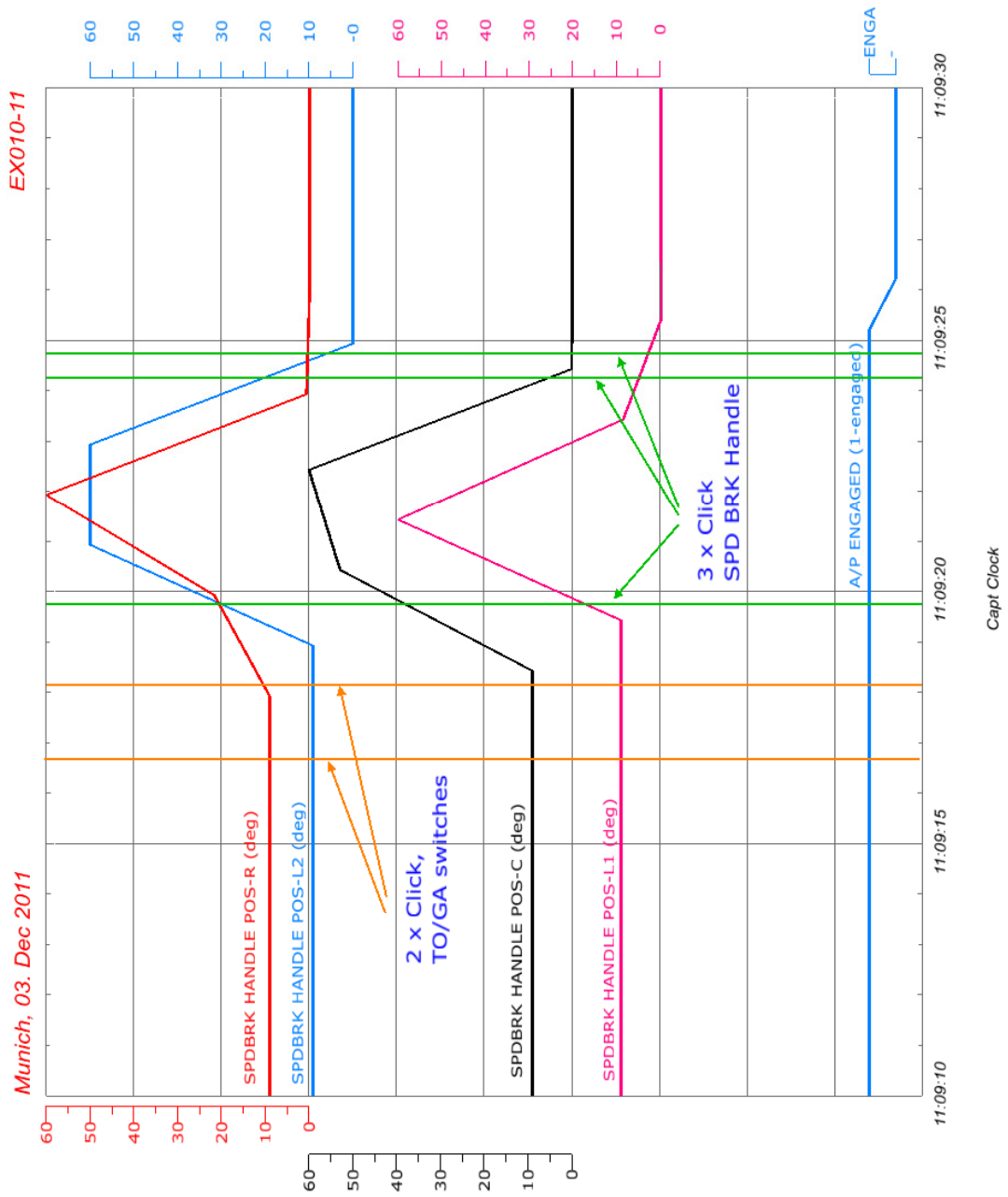
Appendix 1

B 777 Runway Excursion



BFU Germany

# B 777 Runway Excursion



This investigation is conducted in accordance with the regulation (EU) No. 996/2010 of the European Parliament and of the Council of 20 October 2010 on the investigation and prevention of accidents and incidents in civil aviation and the Federal German Law relating to the investigation of accidents and incidents associated with the operation of civil aircraft (Flugunfall-Untersuchungs-Gesetz - FIUUG) of 26 August 1998.

The sole objective of the investigation is to prevent future accidents and incidents. The investigation does not seek to ascertain blame or apportion legal liability for any claims that may arise. This document is a translation of the German Investigation Report. Although every effort was made for the translation to be accurate, in the event of any discrepancies the original German document is the authentic version.

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