Bundesstelle für
Flugunfalluntersuchung

Investigation Report

EX001-1/2/06
March 2009

Identification

Type of Occurrence:	Serious Incident
Date:	12 January 2006
Location:	Frankfurt/Main
Aircraft:	1) Transport Aircraft
	2) Transport Aircraft
Manufacturer / Model:	1) Airbus / A320-214
	2) Boeing / B747-200B
Injuries to Persons:	None
Damage:	Aircraft not damaged
Other Damage:	None
Source of Information:	Investigation by BFU

Factual Information

History of the flight

The B747-200B (B747) cargo aircraft arrived from Beijing and landed at 19:07 hrs [1] on runway 07R at Frankfurt. During the landing roll, at 19:08 hrs the crew received an instruction from Air Traffic Control (ATC): „...taxi Golf and hold short of runway 07L". The crew replied: "Taxi Golf and Hotel ah hold short of runway 07L..." The controller repeated the instruction: "Yes on Golf hold short of runway 07L". The crew replied: "On Golf ah cross runway 07L". According to the crew, at this time the B747 was on taxiway G, south of taxiway C.

Immediately afterwards at 19:08 hrs, the controller issued landing clearance to an Airbus A320-214 (A320) on final approach to runway 07L. The A320 had a crew of six and 114 passengers from Dublin (Ireland) to Frankfurt on board.

The A320 crew stated that the aircraft touched down about 1,000 ft after the runway threshold. Reverse thrust and wheel brakes (autobrake low) were used to decelerate the aircraft. When decelerating through a speed of about 100 kt the crew observed that a B747 entered and crossed the runway.

The ground radar recording showed that at the time of the crossing, the distance between the two aircraft had been about 800 m.

The crew of the A320 stated that they had increased braking and the aircraft decelerated to a very slow speed. At 19:11:00 hrs the crew reported the incident to the tower controller: "... just be advised we had an aircraft cross the runway right to left ahead of us".

The A320 left runway 07L via taxiway G.

Personnel information

A320 flight crew

The pilot-in-command had a total flight time of about 6,722 hours, of which about 1,215 hours were on type. He occupied the right-hand seat in the cockpit.

The 41 year-old pilot in the left-hand seat held an Air Transport Pilot's Licence (ATPL-A)) issued by the Irish Civil Aviation Authority. His total flight time was about 12,780 hours, of which about 27 hours were on type. He was flying under supervision at the time of the incident.

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

B747 flight crew

The 48 year-old pilot-in-command held an Air Transport Pilot's Licence (ATPL(A)) issued by the Chinese Civil Aviation Authority with a Type Rating for B747, B747-4. He had a total flight time of about 12,640 of which about 7,305 hours were on type.

The 43 year-old co-pilot held a Commercial Pilot's Licence. His total flight time was about 6,848 hours.

Tower controller

The tower controller held an ATC Aerodrome Control Licence including radar and Flight Information Service (FIS) ratings.

Aircraft information

Airbus A320

The aircraft was registered in the Republic of Ireland.

Manufacturer:	Airbus Industries
Type:	A320-214
MSN:	1443
Year of Manufacture:	2000
Total Flight Time:	12,060 hours

Boeing B747

This aircraft had been converted to cargo configuration and was registered in China.

Manufacturer:	Boeing-Company
Type:	B747-200B
Type Series:	747-2J6B
MSN:	23071
Total Flight Time:	73,428 hours

Meteorological information

The incident occurred at night.

At the time of the incident, the official Frankfurt ATIS airport weather Oscar was given at 18:50 as:

Cloud:	1-2 oktas at 250 ft
Wind:	070°/ 6 kt
Visibility:	4,800 m
Temperature:	1 °C
QNH:	1,033 hPa

The ATIS broadcast described the runway condition as "wet – braking action good".

The weather in the Frankfurt Control Zone (CTR) consisted of Instrument Meteorological Conditions (IMC).

Radio communications

Radio communications were conducted in the English language. A recording was available for evaluation.

Aerodrome information

Frankfurt Airport has two parallel 4,000 m x 60 m runways oriented 069°/ 249°. A further runway is 4,000 m x 45 m and orientated 179°. This runway 18 is for departures only. At the time of the incident, runways 07L and 07R were in use.

At the time of the incident, approaches were conducted in accordance with CAT I conditions. The taxiway stop bars were not switched on.

Taxiway G joins Runway 07L about 2,600 m after the Runway threshold. The Taxiway intersects the south side of Runway 07L/25R at an angle of about 56° (see drawing).

Flight recorders

Flight Data Recorder (FDR) and Cockpit-Voice-Recorder (CVR) data was not available for evaluation from either aircraft.

Ground Control Radar data was available for evaluation.

Organisational and management information

Frankfurt's Air Traffic Control Tower was equipped with an Airport Surface Movement Radar (ASMR). The ASMR was in operation at the time of the incident. The ASMR was equipped with several warning functions, including Runway Incursion Monitoring (RIM). This function is intended to give the controller a visual warning (RIM-Alert) on the radar screen as well as an acoustic warning, if an aircraft or vehicle is about to cross a runway where an aircraft has been given take-off clearance or is on approach. The RIM-Alert function can be activated or de-activated by the controller. At the time of the incident, this function was de-activated in accordance with a valid instruction given in the current Standard Operating Procedure (BAO).

Analysis

Operational factors

A320 operation

The A320 crew stated that the aircraft touched down at around the 1,000-ft point, i.e. at a normal distance from the runway threshold, and its speed was decreased using a combination of reverse thrust and wheel brakes which was in accordance with normal operational procedure. At the time when the A320 crew observed the other aircraft crossing the runway, there was sufficient distance left for the A320 crew to decelerate the aircraft even further by using extra braking action.

B747 operation

When the B747 crew first received taxi instructions from the controller, they read it back correctly. However, when the controller instructed: "Yes on Golf hold short of runway 07L", the crew did not understand that this was a repetition of the first instruction, but interpreted it as clearance to cross runway 07L. Their comprehension matched their expectation, that they would be cleared to taxi further to the northern apron, and they therefore responded: "On Golf ah cross runway 07L."

The clearance to the A320 crew to land on runway 07L the controller issued immediately afterwards inferred that the landing would take place within a few minutes. It is the opinion of the BFU that the B747 crew was not aware of the discrepancy between their perceived clearance to cross runway 07L and the simultaneously issued landing clearance to the A320, because they never enquired further. It cannot be ruled out that at this time the crew was occupied with other tasks and therefore distracted and not in any position to consciously listen in on the radio communications concerning the landing clearance.

Air traffic control

The controller repeated the instruction because of the read-back error by the B747 crew. The crew then responded: "On Golf äh cross runway 07L", which was then misunderstood by the controller, who interpreted the response, in-line with his expectation, as confirmation of the instruction to hold before the runway. He then turned his attention to the approaching A320 to issue landing clearance.

The controller had not noticed the B747 crossing the Runway.

Communication

In the opinion of the BFU, the communication errors between the B747 crew and ATC should be classified as misunderstandings, read-back or hear-back errors.

Local conditions

Visibility

It was night and Instrument Flight Meteorological conditions prevailed at the time of the incident. Visibility was 4,800 m, which allowed for visual contact between the aircraft.

From the point of view of the A320 crew, the B747 was ahead and slightly to the right of their longitudinal axis when the B747 entered the runway.

When the B747 entered the runway it was on taxiway G, which intersects the runway at an angle of about 56°. At the time of touch down and during landing roll, the A320 was about 124° to the left of the Boeing's longitudinal axis; in other words, to the left rear. This area cannot be seen by the co-pilot in the right-hand seat, and is very difficult to see for the pilot-in-command in the left-hand seat.

Runway condition

At the time of the incident the runway was rain-wet. However, the water did not significantly degrade braking action.

Aircraft involved

In comparison with the A320, the B747 is considerably heavier. This resulted in a longer landing roll for the B747 and required use of one of the rear fast exit taxiways. The A320 landed on the parallel runway and needed considerably less distance for its landing roll as the B747. This particular combination of two aircraft accounted for the fact that the crossing of the runway occurred in a less critical area as it would have been the case in any other imaginable combination.

Defences

The tower controller was not aware that the B747 had taxied into the safety area and crossed the runway. The Ground Radar RIM function was de-activated due to a series of frequent false alarms.

A reliable system would have given the controller a timely optical and acoustic warning of the imminent runway incursion.

Conclusion

This serious incident occurred because of a misunderstanding in communications between the Tower and the B747 crew, as a result of which the B747 crossed the runway on which another aircraft had been cleared to land.

Safety Recommendation

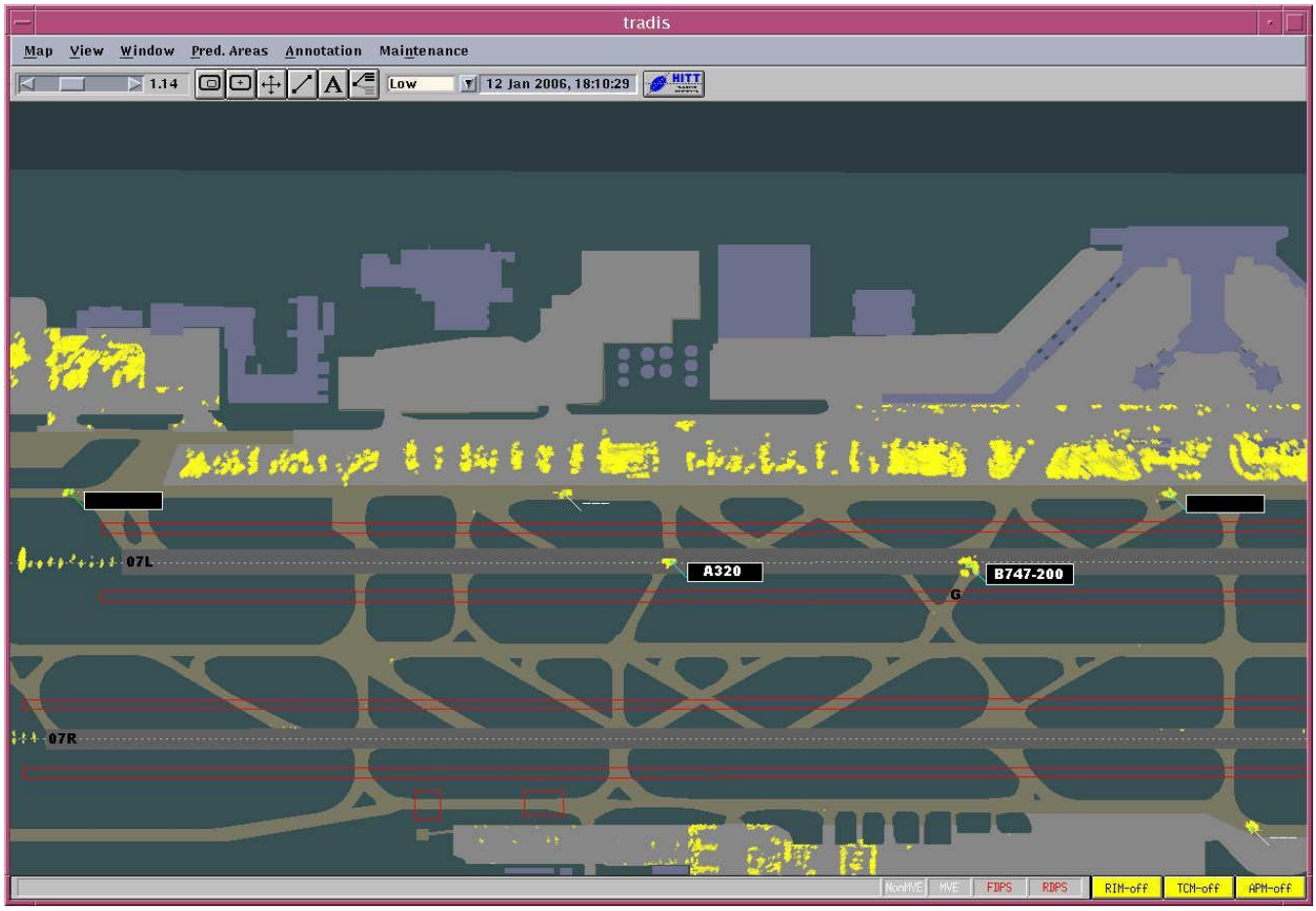
Following this serious incident and other similar occurrences, the BFU has issued the following safety recommendation:

Recommendation 03/2007

The Deutsche Flugsicherung GmbH (DFS) air traffic control company should ensure that airport ground movement monitoring systems equipped with conflict recognition and alarm functions, give reliable warnings.

Investigator-in-charge Friedemann

Assistance Reuß



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