

## GENERAL INFORMATION

Occurrence:	2007096
Classification:	Serious incident
Date and time <sup>1</sup> :	27 September 2007, 15.55 hours
Location of occurrence:	Amsterdam Schiphol Airport (EHAM)
Aircraft registration:	B-2428
Aircraft model:	Boeing 747-412F
Type of aircraft:	4-engine cargo aircraft
Type of flight:	Commercial cargo flight
Phase of operation:	Landing
Damage to aircraft:	Bottom of the right outboard engine plating damaged
Flight crew:	Three
Passengers:	None
Injuries:	None
Other damage:	None
Lighting conditions:	Daylight

## SUMMARY

The right outboard engine of the aircraft touched the ground during landing. As a result of this the bottom of this engine was damaged.

## FACTUAL INFORMATION

### *The flight and the occurrence*

The aircraft performed a cargo flight from Shanghai Pudong International Airport, China (ZSPD), to Manchester Airport (EGCC) in the United Kingdom with a planned stop-over at Amsterdam Schiphol Airport. During the flight, three crew members were on board, a captain, a first officer and a third pilot to relieve the others during the flight. The captain was the pilot flying during the flight from Shanghai to Schiphol. The flight departed with a 50 minutes delay from Shanghai. Working hours were proportionally divided between the crew members during the flight.

Up till the landing at Schiphol the flight was uneventful. Runway 36R was in use as the landing runway. The weather conditions at the airport were good, the runway was dry and there was a north easterly wind (with gusts) of approximately 25 knots, which resulted in a light cross wind from the right. The final portion of the approach was flown manually. According to the crew, the approach was stable with only a slight drop of the right wing during the flare, which was

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<sup>1</sup> All times in this report are local times unless otherwise specified.

immediately corrected by the captain. None of the crew members noticed anything which indicated contact of the right outboard engine with the ground. According to the crew members the remainder of the landing and the rollout of the aircraft went without any problems. After this, the aircraft taxied to its parking position where it arrived at 16.04 hours. According to the crew, no vehicles or obstacles were encountered that could possibly have caused any damage to the aircraft during taxiing.

Loading the cargo at Schiphol for the next flight did not raise any problems. One of the crew members carried out a visual inspection of the aircraft before the next flight. According to him engine 4 did not show any particularities. Neither did he see any obstacles around the aircraft that could have caused the damage when taxiing out. The only observation he made was that two navigation lights did not work. The maintenance manager on duty did not report any damage of any nature whatsoever to the pilots. The aircraft departed for its next flight to Manchester at 18.35 hours. The flight did not encounter any problems.

After the landing at Manchester, maintenance personnel discovered damage to the bottom of the right outboard engine plating. The British Air Accidents Investigation Branch (AAIB) was informed about this by the airport authorities and they started an investigation.



*Figure 1: damage to the bottom of engine 4*

## **INVESTIGATION AND ANALYSIS**

The data of the flight data recorder (FDR) was read out and analysed by AAIB investigators but they did not find any proof that the damage to engine 4 had occurred in the United Kingdom. They did, however, find FDR values that indicated that roll angle limits were exceeded during the previous landing at Schiphol. The Dutch Safety Board was informed and it was agreed that the Board would take over the investigation.

Due to the time that had elapsed between the date of the occurrence and the date on which the Dutch Safety Board was informed, an investigation of the aircraft was not performed nor did the Board interview the crew. The Board, however, asked the crew to provide written statements. All data that could be found on the FDR has been examined and analysed and Schiphol airport was

asked to check the runway for any traces that may have been left behind. This last activity did not provide any evidence.

The aircraft was equipped with four Pratt & Whitney PW4056 engines. Information from the Boeing 747-400 training manual indicates the pitch and roll limits for ground contact for an aircraft equipped with these engines in a graph. This graph is based on a normal landing situation with the landing gears on the ground and the shock absorbers compressed.

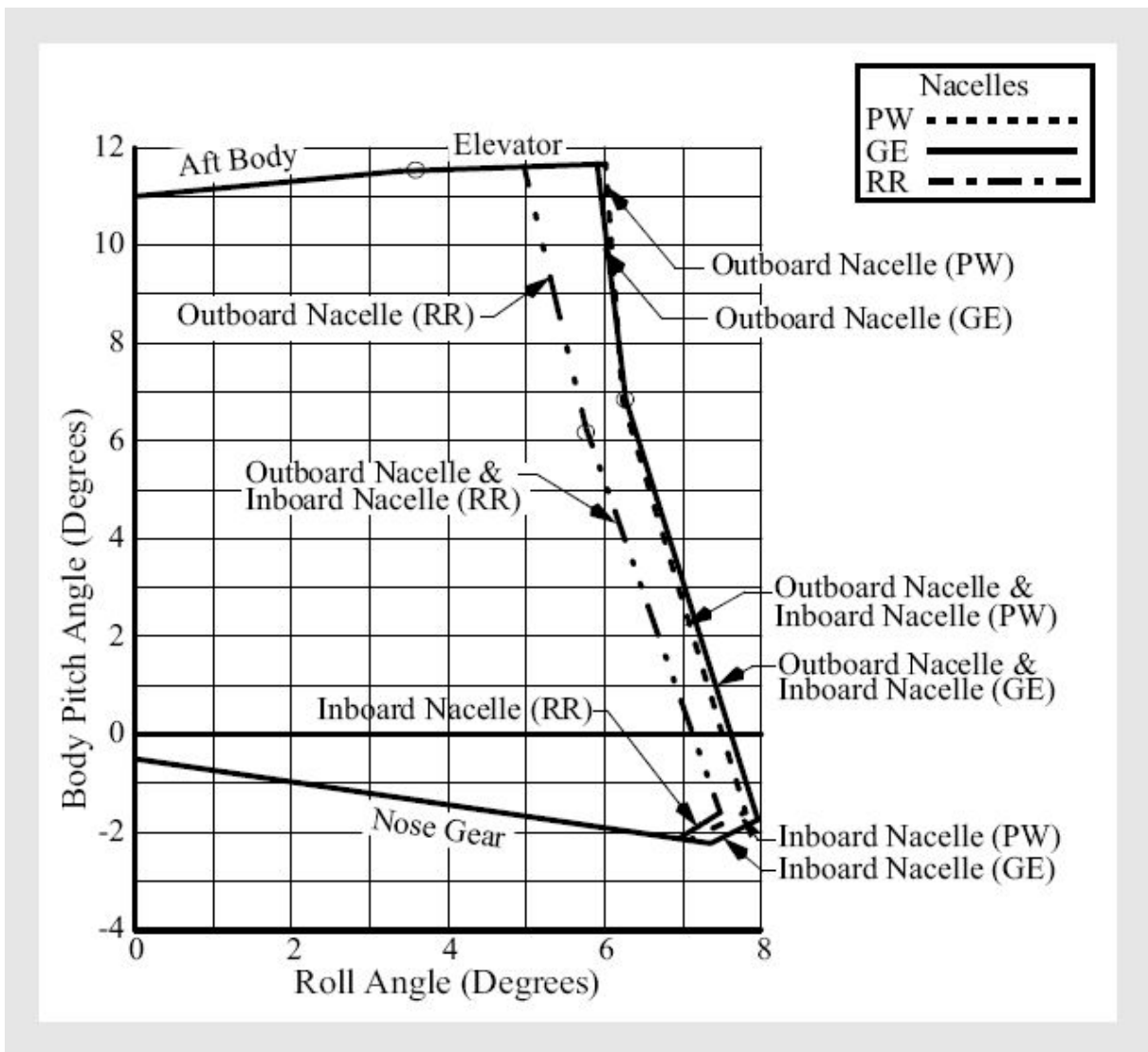


Figure 2: ground contact angles – normal landing (PW = Pratt & Whitney engines)

The following data emerged as well as other data from the analysis of the FDR. Up to approximately 13 seconds before the landing at Schiphol, the wind recorded on the FDR was 034 degrees with a speed of approximately 25 knots. As from this moment, the wind started to shift to 329 degrees while the wind speed dropped to 15 knots. Just before the landing, the aircraft started to roll to the right with a roll angle up to 9 degrees as a result of steering inputs of the pilot. Immediately after the main wheels touched the ground, the roll angle reached a maximum of 13 degrees with a pitch of 7 degrees nose up.

Although it has not been investigated whether all parameters for the conditions of a 'normal' landing situation were met, based on figure 2 it is probable that the right engine touched the runway immediately after the landing. The data of all other landings that were available on the FDR showed pitch and roll values that remained within the limits of figure 2. It is unclear why the damage was not observed by the maintenance crew or during the inspection by one of the crew members prior to the next flight.

## **CONCLUSIONS**

In view of the FDR analysis, the damage found in Manchester to the plating of engine 4 was most probably caused during the landing at Schiphol. It is unclear why during the visual inspections of the aircraft the damage was not discovered.

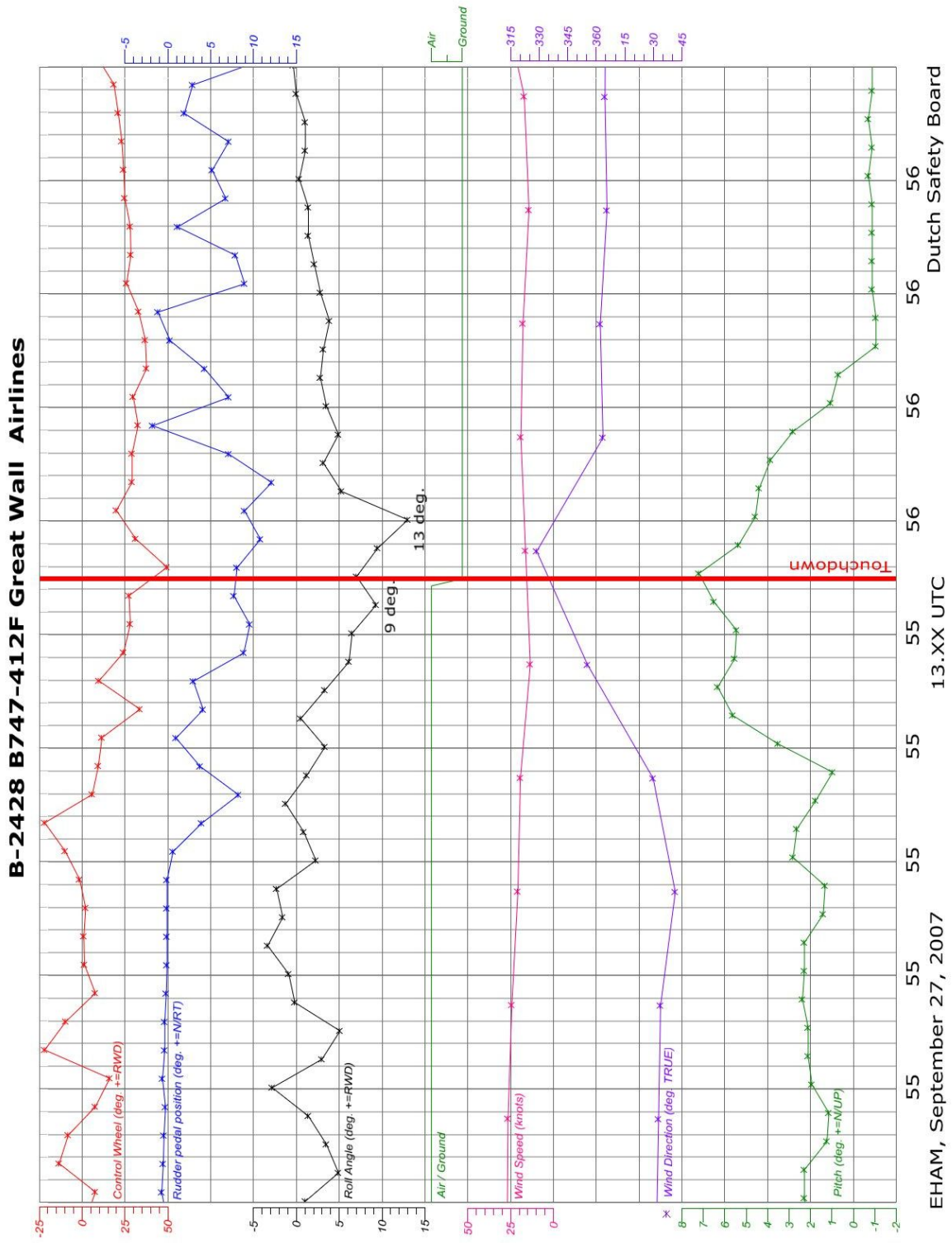


Figure 3: relevant FDR parameters