

APPENDIX C

Flight Simulator Evaluation

C.1. General

An evaluation of the final stages of the approach and landing was carried out in a B757 flight simulator of Britannia Airways at Luton Airport, UK. The objectives were to assess the visual aspects of the landing using a selection of parameters established from the DFDR data. In particular, the aim was to evaluate the visual perspective of the runway following a loss of runway lighting, below 150 feet agl, and thereby to attempt to gain a better understanding of the actions of the crew.

C.2. Part 1 of the flight simulator evaluation

The simulator was frozen in a number of pre-selected height and attitude positions derived from the DFDR data so that an observation of the visual aspect presented to the crew could be assessed. The points selected were those considered to be of most interest. Visual aspects were examined with landing lights on, with runway lights on, and with runway lights off in some cases. Weather conditions were reproduced by using a visibility of 3,000 metres and with rain selected. The results are represented in Table 1 below.

Table 1

Height AGL (feet)	Time to touchdown (seg)	Control Column Position (% of travel)	Pitch (° + = Nose up)	Aspect	
				Runway lights on	Runway lights off
130	7	Central	+1	Normal	N/A
125	6.25	FWD 75%	+2	Normal	High with limited view of touchdown area
105	4.5	FWD 15%	-4.5	Nose down, but landing possible	High with good view of touchdown area
50	2.25	Central	-2.5	Nose down, flare required to land	High with good view of touchdown area

Notes: The simulation of rain was felt to be unrepresentative. Painted runway markings became the major reference in the absence of runway lights.

C.3. Part 2 of the flight simulator evaluation

The second part of the assessment used real time simulation to evaluate the likely actions and responses of the crew. Known facts and data were used to fly a similar profile to that of the accident. Observations as a result of this were:

1. After autopilot disconnect the aircraft became high on the approach. As a result the commander would probably have checked his flight instruments.
2. The glideslope indication on the Primary Flight Display is easily seen and would be likely to have influenced the actions of the commander.
3. The commander's input of full nose down elevator was probably in response to his seeing the glideslope pointer at full scale fly down.
4. The commander was looking in when he put in the nose down elevator.
5. The commander looked out again. If there were no runway lights the touchdown area would be clearly seen in the landing lights and he would appear high. If the runway lights were on the aircraft was still in a position from which it could have been landed successfully.
6. It may not have been obvious to the commander that there were no runway lights because part of the picture would have appeared normal.
7. The commander was probably unaware of having put in a large nose down elevator input.
8. It was more difficult to assess the landing flare with no runway lights because the visual segment was too short.

C.4. Conclusions of the flight simulator evaluation

It was possible to draw some further conclusions from the evaluation:

- There was an incomplete transition to visual flight after the decision to land. This was in accordance with company Standard Operating Procedures.
- The 4 second period from 100 feet to touchdown formed part of the landing phase after the decision to land had been made. Reversing this decision would have required positive decisive action.
- A pilot's attention would normally be focused on the landing when below 50 feet.
- The first officer did not look out much, if at all during the landing phase.
- If the runway lights remained on the commander should have had sufficient visual cues to land successfully or decide to go-around.
- The circumstances of the accident are consistent with the runway lights extinguishing between touchdown –6.5 sec and touchdown 5 sec while the commander's attention was on his flight instruments.