Australian Government
Australian Transport Safety Bureau

ATSB TRANSPORT SAFETY INVESTIGATION REPORT

Aviation Occurrence Investigation – AO-2008-007

Preliminary

Hard landing – Darwin Airport, NT

7 February 2008

VH-NXE

Boeing Company 717 - 200

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Jeppesen aeronautical charts (Figure 1)
Google Earth (Figure 2)
Boeing Commercial aircraft (Figure 3)
National Jet Systems (Figure 4)

Abstract

On 7 February 2008, a Boeing Company 717–200 aircraft, registered VH-NXE, was being operated on a scheduled passenger service from Cairns, Qld, via Nhulunbuy (Gove) to Darwin, NT, with six crew and 88 passengers. During an ILS approach to runway 29 at Darwin Airport, the aircraft touched down on the runway at a high rate of descent which resulted in a hard landing. The aircraft then bounced before settling onto the runway. The crew completed the landing rollout and taxied the aircraft to the terminal without further incident.

The investigation is continuing.

THE AUSTRALIAN TRANSPORT SAFETY BUREAU

The Australian Transport Safety Bureau (ATSB) is an operationally independent multi-modal bureau within the Australian Government Department of Infrastructure, Transport, Regional Development and Local Government. ATSB investigations are independent of regulatory, operator or other external organisations.

The ATSB is responsible for investigating accidents and other transport safety matters involving civil aviation, marine and rail operations in Australia that fall within Commonwealth jurisdiction, as well as participating in overseas investigations involving Australian registered aircraft and ships. A primary concern is the safety of commercial transport, with particular regard to fare-paying passenger operations.

The ATSB performs its functions in accordance with the provisions of the *Transport Safety Investigation Act 2003* and Regulations and, where applicable, relevant international agreements.

Purpose of safety investigations

The object of a safety investigation is to enhance safety. To reduce safety-related risk, ATSB investigations determine and communicate the safety factors related to the transport safety matter being investigated.

It is not the object of an investigation to determine blame or liability. However, an investigation report must include factual material of sufficient weight to support the analysis and findings. At all times the ATSB endeavours to balance the use of material that could imply adverse comment with the need to properly explain what happened, and why, in a fair and unbiased manner.

Developing safety action

Central to the ATSB's investigation of transport safety matters is the early identification of safety issues in the transport environment. The ATSB prefers to encourage the relevant organisation(s) to proactively initiate safety action rather than release formal recommendations. However, depending on the level of risk associated with a safety issue and the extent of corrective action undertaken by the relevant organisation, a recommendation may be issued either during or at the end of an investigation.

The ATSB has decided that when safety recommendations are issued, they will focus on clearly describing the safety issue of concern, rather than providing instructions or opinions on the method of corrective action. As with equivalent overseas organisations, the ATSB has no power to implement its recommendations. It is a matter for the body to which an ATSB recommendation is directed (for example the relevant regulator in consultation with industry) to assess the costs and benefits of any particular means of addressing a safety issue.

#About ATSB investigation reports: How investigation reports are organised and definitions of terms used in ATSB reports, such as safety factor, contributing safety factor and safety issue, are provided on the ATSB web site www.atsb.gov.au.

FACTUAL INFORMATION

The information contained in this preliminary report is derived from initial investigation of the occurrence. Readers are cautioned that there is the possibility that new evidence may become available that alters the circumstances as depicted in the report.

Sequence of events

On 7 February 2008, a Boeing Company 717–200 (717) aircraft, registered VH-NXE, was being operated on a scheduled passenger service from Cairns, Qld, via Nhulunbuy (Gove) to Darwin, NT, with six crew and 88 passengers. During an ILS[1] approach (Figure 1) and visual landing to runway 29 at Darwin Airport, the aircraft was subject to a hard landing. The aircraft then bounced before the crew were able to complete the landing roll and taxi the aircraft to the terminal.

The flight crew consisted of the pilot in command and copilot. The copilot was the handling pilot for the descent, approach and landing at Darwin and the pilot in command was the monitoring pilot. The crew had received a weather briefing prior to the departure from Cairns, informing them that there were showers and thunderstorms in the Darwin area for their arrival.

Air traffic control (ATC) cleared the crew to conduct the Darwin runway 29 ILS approach. The monitoring pilot stated that the runway was in sight prior to flying over the Howard Springs non-directional beacon (NDB).

Information from the aircraft's flight data recorder (FDR) indicated that the aircraft flew over the Howard Springs NDB at about 3,000 ft above mean sea level (AMSL), with a computed air speed of 221 knots at 2111:47 Central Standard Time[2].

The aircraft was configured for landing at the outer marker[3], where the handling pilot disconnected the autopilot and the approach was flown manually by reference to the ILS and visual reference with the runway lighting.

During the approach and landing, the aircraft autothrottle remained engaged.

At approximately 700 ft AMSL, the aircraft entered a rain shower. The monitoring pilot switched on the windscreen wipers and, as both pilots stated that they could see the runway lighting and PAPI[4], the approach was continued.

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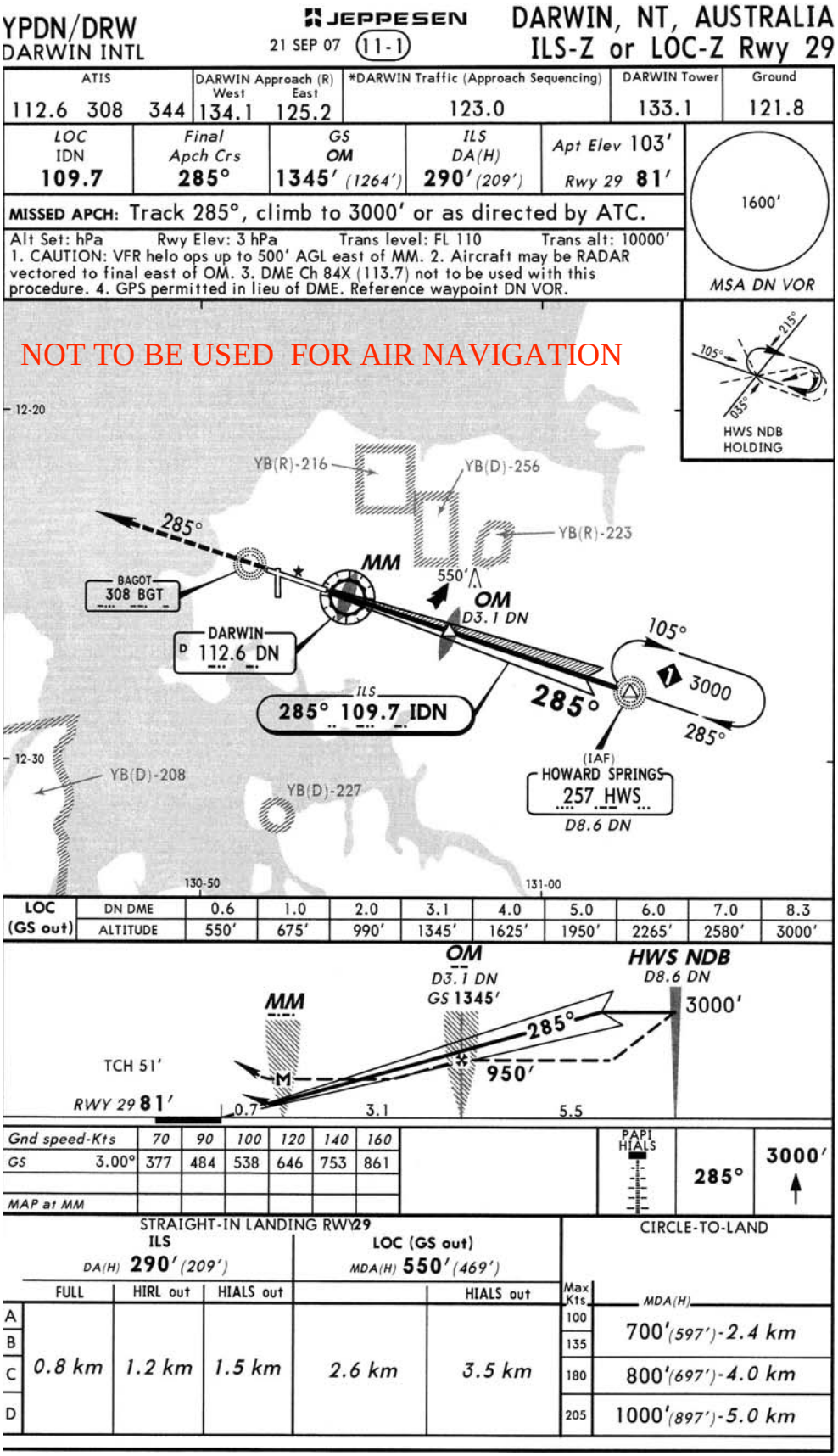
1 The instrument landing system (ILS) is a ground-based navigation aid. An ILS instrument approach provides lateral and vertical guidance to the runway. The aircraft was equipped with two ILS receivers that displayed the deviation from localiser and glideslope radio beams.

2 The 24-hour clock is used in this report to describe the local time of day, Central Standard Time (CST), as particular events occurred. Central Standard Time was Coordinated Universal Time (UTC) + 9.5 hours.

3 The outer marker is a ground based navigation aid associated with the ILS.

4 The precision approach path indicator (PAPI) is a ground based light system which provides visual approach slope guidance to the crew during an approach.

Figure 1: Darwin Runway 29 ILS approach chart



The FDR information at Appendix A displays the aircraft's flight path parameters from a radio altitude of 180 ft to after touchdown.

At approximately 30 ft radio altitude, the FDR recorded a rate of descent of approximately 1,000 ft/min at the same time as an abrupt control column nose up command was applied. The copilot recalled hearing the synthesised calls of radio altitude from the aircraft's radar altimeter.

At 2114:50, the aircraft touched down with a rate of descent of about 1,000 ft/min, which resulted in a hard impact with the runway prior to the 300 m runway markings (Figure 2). The aircraft then bounced before settling onto the runway. The crew completed the landing rollout and taxied the aircraft to the terminal.

There were no reported injuries to passengers and crew.

Figure 2: Darwin Runway 29 touchdown markings and environs

Aircraft information

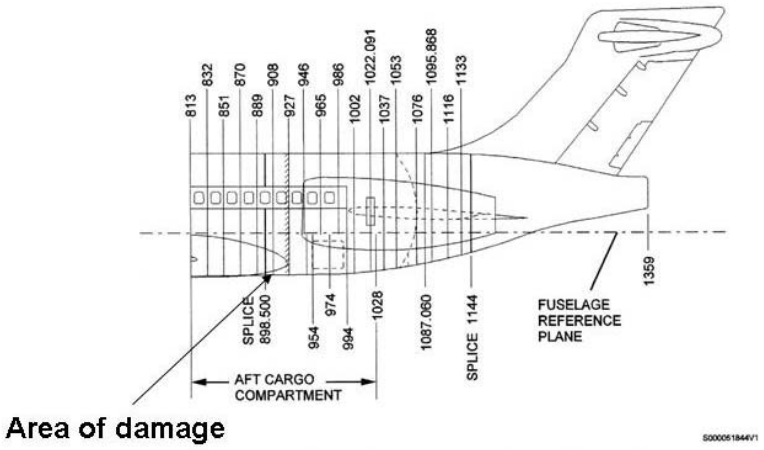
Aircraft data

Aircraft model	Boeing 717-200
Serial number	55063
Date of manufacture	September 2000
Certificate of Registration	Valid, issued 20 June 2007
Certificate of Airworthiness	Valid, issued 25 July 2005
Total airframe hours and cycles	19,090.41 hours, 14,560 cycles

Aircraft damage

Damage to the aircraft included several creases to the skin on the fuselage above the wing area and underneath the fuselage behind the wing (Figures 3 and 4). Several longerons[5] in the rear cargo area were damaged. The left main landing gear and the outer left main tyre were also damaged.

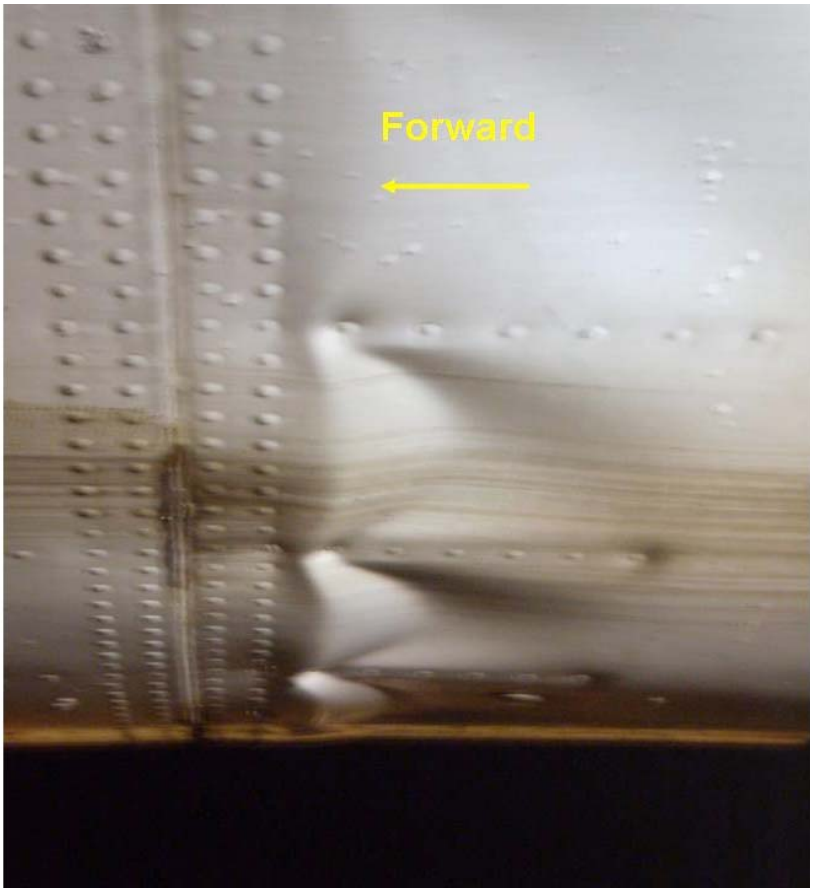
Figure 3: Aircraft dimensions showing area of damage



FUSELAGE NUMBERING ARRANGEMENT (AFT)
Figure 204 / 06-11-00-990-804

5 Longerons are longitudinal members which give the airframe its shape and provide a basis for the skin.

Figure 4: Damage on the underside of aircraft



Flight recorders

The aircraft flight data recorder (FDR) cockpit voice recorder (CVR) and quick access recorder (QAR) were recovered and sent to the Australian Transport Safety Bureau's (ATSB) recorder facility in Canberra for downloading and data analysis. Data from the cockpit voice recorder for the incident flight had been over-written and therefore was not available to the investigation.

Personnel information

The pilot in command held an airline transport pilot licence, was type rated on the 717 aircraft, held a current medical certificate, and had 8,466 hours total flight experience, including 1,947 hours on the 717 aircraft.

The copilot held an airline transport pilot licence, was type rated on the 717 aircraft, held a current medical certificate, and had 7,500 hours total flight experience, with 400 hours on the 717 aircraft.

Meteorological information

Aerodrome forecasts

The Bureau of Meteorology (BoM) issued a terminal aerodrome forecast (TAF) for Darwin Airport at 1802 on 7 February 2008 with a local time validity period from 1830. The forecast indicated wind from 280 degrees true at 12 kts, visibility greater than 10 km, rain showers, with 1 to 3 oktas[6] of cloud at 1,500 ft above the aerodrome level. Further, from 2330, the wind was forecast 060 degrees true at 15 kts gusting to 35 kts, visibility 1,000m in rain and 5 to 7 oktas of cloud at 1,000ft for periods of 30 minutes or more, but less than 1 hour (tempo period).

The BoM issued an amended terminal aerodrome forecast for Darwin at 2057, with a validity period that extended beyond the aircraft's planned arrival time at Darwin. The main difference was that the tempo period commenced at 2200.

The Darwin trend type forecast (TTF) issued at 2102 indicated that, at the aircraft's estimated time of arrival, the wind would be 210 degrees true at 7 to 9 kts, the visibility would be 10 km, with 3 to 4 oktas of cloud at 1,600 ft. The forecast also noted that for periods of 30 minutes or more, but less than 1 hour, the wind would be 090 degrees true at 15 kts gusting to 35 kts, the visibility would be 1,000m in rain, with 5 to 7 oktas of cloud at 1,000ft.

Actual weather information

The BoM automatic weather station data for Darwin Airport provided weather information every 1 minute. Figure 5 provides the wind direction and speed immediately prior to and after the time of landing.

Figure 5: Tabular wind data

Time	Wind direction degrees magnetic	Wind speed Kts	Comment
21:12	211	7	
21:13	216	8	
21:14	216	9	
21:15	213	8	Time of landing
21:16	191	8	
21:17	184	7	
21:18	188	8	

6 Unit of sky area equal to one-eighth of total sky visible to celestial horizon

The FDR recorded a wind of 168 to 183 degrees magnetic at 9 to 11 kts from a radio altitude of 180 ft to landing.

Provision of weather information to the flight crew

At the time the aircraft was approaching Darwin, the Darwin Airport automatic terminal information service (ATIS), identified as 'KILO' advised pilots to expect a visual approach for runway 29, the wind being 210 degrees magnetic at 10 kts, visibility greater than 10 km, and cloud 1 to 2 oktas at 2,000 ft.

When the aircraft was approximately 8 NM from the runway threshold, ATC advised the crew that the cloud base was 1,000 ft, with the visibility being reduced in rain.

ATC cleared the crew to land on runway 29 when the aircraft was approximately 2 NM from the runway 29 threshold. ATC also advised the crew that the crew of a previous aircraft had reported the runway threshold was wet.

Communications

The transmissions between the air traffic controllers and the crew during the aircraft's descent and approach to Darwin Airport were recorded by ground-based automatic voice-recording equipment. The quality of those recorded transmissions was good.

Further investigation

The investigation is continuing and will include examination of:

- flight crew operating procedures
- operator crew training
- analysis of recorded data
- analysis of weather

APPENDIX A : FLIGHT RECORDER DATA