NATIONAL TRANSPORTATION SAFETY BOARD
Vehicle Recorder Division
Washington, D.C. 20594

October 31, 2011

Flight Data Recorder - 10

Group Chairman's Factual Report Addendum 1
By Greg Smith

1. EVENT SUMMARY

Location: Jackson Hole, Wyoming
Date: December 29, 2010
Aircraft: B-757-200, N668AA
Operator: American Airlines, Flight 2253
NTSB Number: DCA11IA015

On March 31, 2011, American Airlines reported to the NTSB that the incident airplane experienced an auto speed brake system failure upon touchdown at the San Francisco (SFO) international airport. According to American Airlines, the auto speed brake system failed to automatically deploy the speed brake lever upon touchdown resulting in the flight crew having to manually extend the speed brake lever to deploy to the ground spoilers. The airplane was re-located from SFO to American's maintenance facility based at the Tulsa, Oklahoma International Airport to troubleshoot the auto speed brake control system and the air/ground sensing system. According to American Airlines, no anomalies were discovered within the air/ground sensing system. American Airlines replaced the speed brake mechanism (structural assembly containing the auto speed brake actuator, no-back clutch, switches and wiring) to address the maintenance discrepancy. The airplane was then put back into revenue service. The flight data recorder (FDR) was removed prior to the troubleshooting and maintenance activities and sent to the Safety Board's Vehicle Recorder Division for readout and analysis.

2. DETAILS OF FLIGHT DATA RECORDER INVESTIGATION

The Safety Board's Vehicle Recorder Division received the following FDR:

      Recorder Manufacturer/Model: **L-3/Fairchild FA2100 256 wps**
      Recorder Serial Number: **000107260**

2.1. L-3/Fairchild FA2100 Description

This model FDR records airplane flight information in a digital format using solid-state flash memory as the recording medium. The FA2100 can receive data in the ARINC 573/717/747 configurations and can record a minimum of 25 hours of flight data. It is configured to record 256 12-bit words of digital information every second. Each grouping of 256 words (each second) is called a subframe. Each subframe has a unique 12-bit synchronization (sync) word identifying it as either subframe 1, 2, 3, or 4. The sync word is the first word in each subframe. The data stream is "in sync" when successive sync words

appear at proper 256-word intervals. Each data parameter (e.g. altitude, heading, airspeed) has a specifically assigned word number within the subframe.

2.1.1. Recorder Condition

The recorder was in good condition and the data were extracted normally from the recorder.

2.1.2. Recording Description

The FDR recording contained approximately 14.2 hours of flight data[1]. Timing of the FDR data is measured in subframe reference number (SRN), where each SRN equals one elapsed second. The event flight was the third flight of the recording and its duration was approximately 3 hours and 30 minutes.

2.1.3. Engineering Units Conversions

The engineering units conversions used for the data contained in this report are based on documentation from the aircraft manufacturer as referenced by the operator. Where applicable, the conversions have been changed to ensure that the parameters conform to the NTSB's standard sign convention that climbing right turns are positive (CRT=+).[2]

Appendix A lists the FDR parameters verified and provided in this report.

2.2. Time Correlation

No time correlation was applied to the data in this report. All times referenced are SRN.

2.3. FDR Plots and Corresponding Tabular Data

The following four figures contain FDR data recorded on March 31, 2011. The figures show data for the parameters listed in Appendix A for the 20 seconds surrounding each touchdown captured on the recorder. Figures one and two show the speed brake handle starting to move toward the deployed position (about 80 degrees) less than one second after touchdown. Figures three and four show the speed brake handle starting to move toward the deployed position three to four seconds after touchdown, about the same time as the thrust reversers completed their transition to deployed.

The corresponding tabular data used to create these four plots are provided in electronic (*.csv[3]) format as Attachment 1 to this addendum. Attachment 1 is a compressed (zipped) archive containing four CSV files.

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[1] The FDR was replaced before the first flight of the day on March 31, 2011, so the FDR downloaded only captured four flights on that day.
[2] CRT=+ means that for any parameter recorded that indicates a climb or a right turn, the sign for that value is positive. Also, for any parameter recorded that indicates an action or deflection, if it induces a climb or right turn, the value is positive. Examples: Right Roll = +, Pitch Up = +, Elevator Trailing Edge Up = +, Right Rudder = +.
[3] Comma Separated Value format.

Figure 1. First landing of recording.

American Airlines, Boeing 757-200, N668AA

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NTSB No. DCA11IA015

Speed Brake Handle Movement - Landing 1

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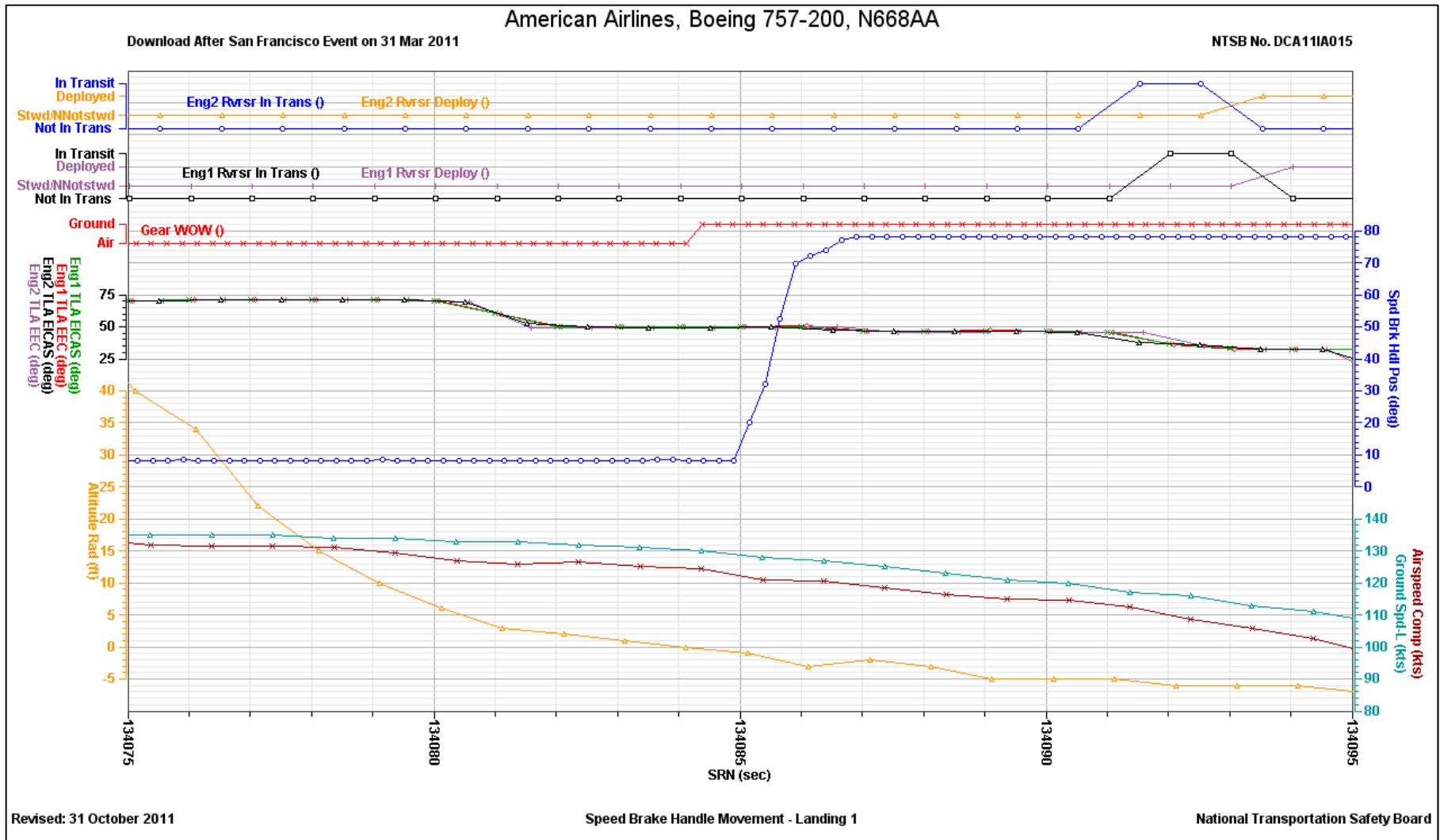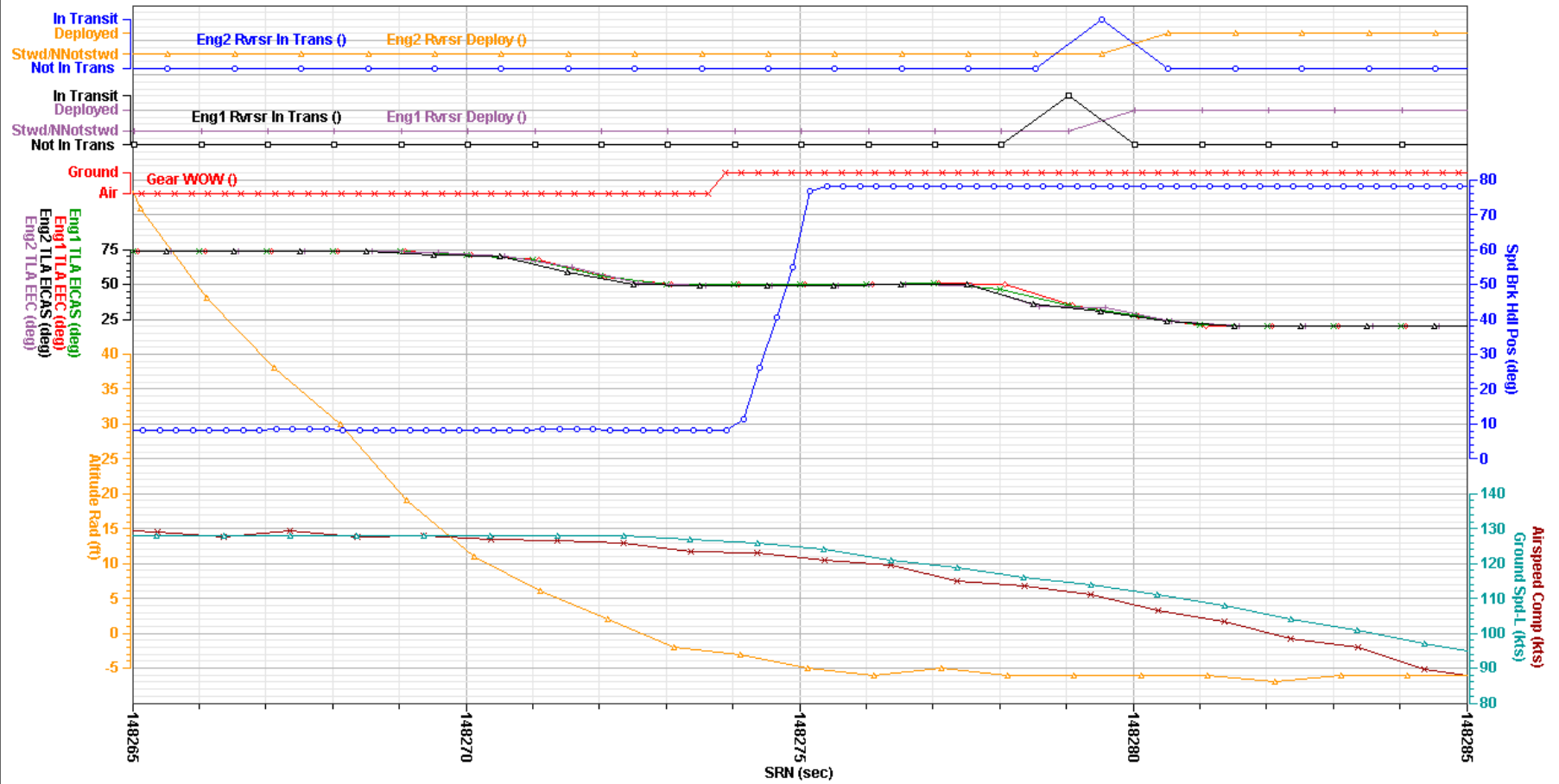
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Figure 2. Second landing of the recording.

American Airlines, Boeing 757-200, N668AA

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Eng2 Rvrsr In Trans ()   Eng2 Rvrsr Deploy ()

Eng1 Rvrsr In Trans ()   Eng1 Rvrsr Deploy ()

Gear WOW ()

In Transit / Deployed / Stwd/NNotstwd / Not In Trans

Ground / Air

Spd Brk Hdl Pos (deg)

Eng1 TLA EICAS (deg)
Eng1 TLA EEC (deg)
Eng2 TLA EICAS (deg)
Eng2 TLA EEC (deg)

Altitude Rad (ft)

Airspeed Comp (kts)
Ground Spd-L (kts)

SRN (sec)

148265   148270   148275   148280   148285

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DCA11IA015
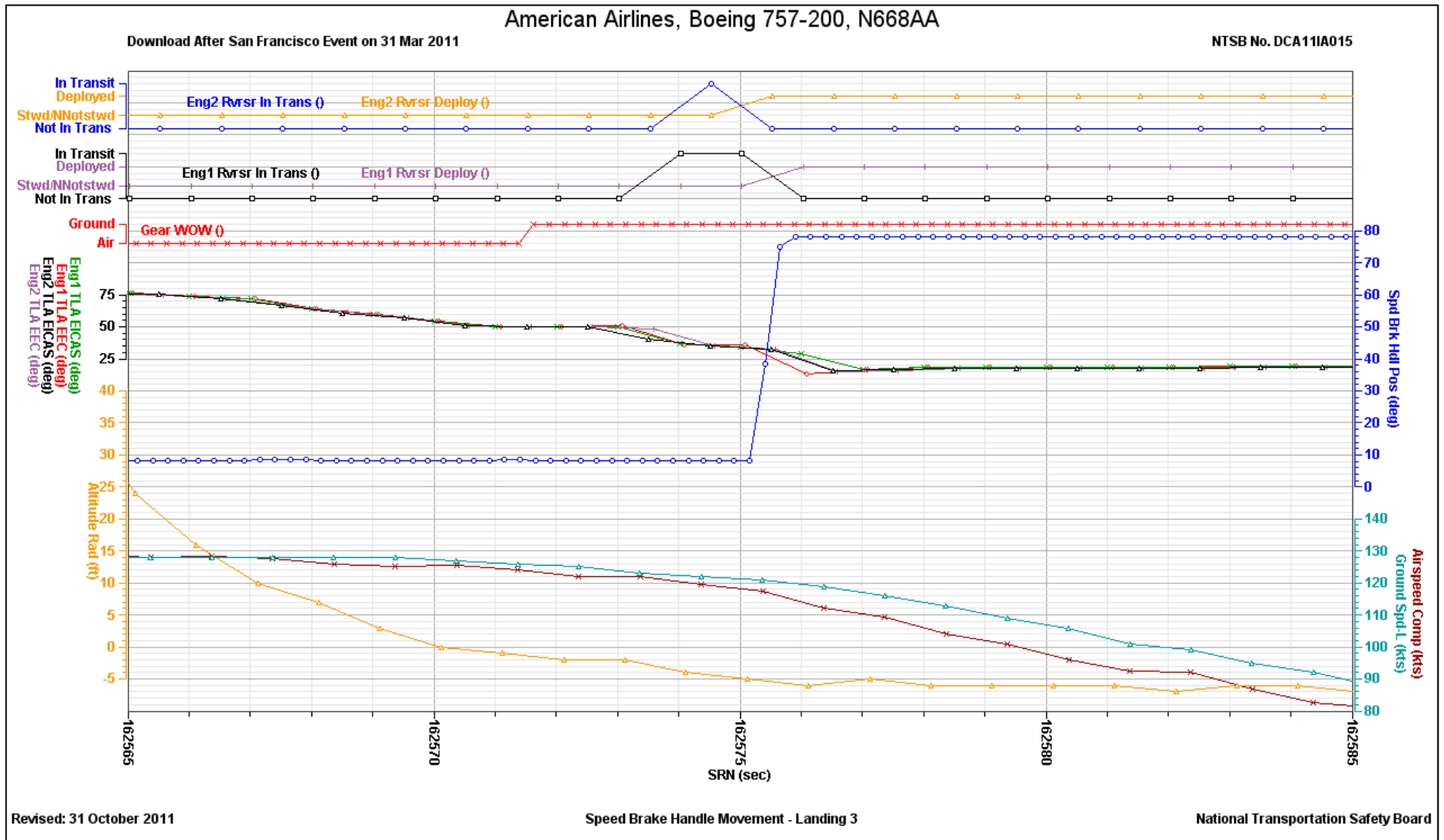FDR Factual Report, Addendum 1 page 10-4

Figure 3. Third landing of the recording.

American Airlines, Boeing 757-200, N668AA

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Eng2 Rvrsr In Trans ()   Eng2 Rvrsr Deploy ()

Eng1 Rvrsr In Trans ()   Eng1 Rvrsr Deploy ()

Gear WOW ()

SRN (sec)

Revised: 31 October 2011

Speed Brake Handle Movement - Landing 3

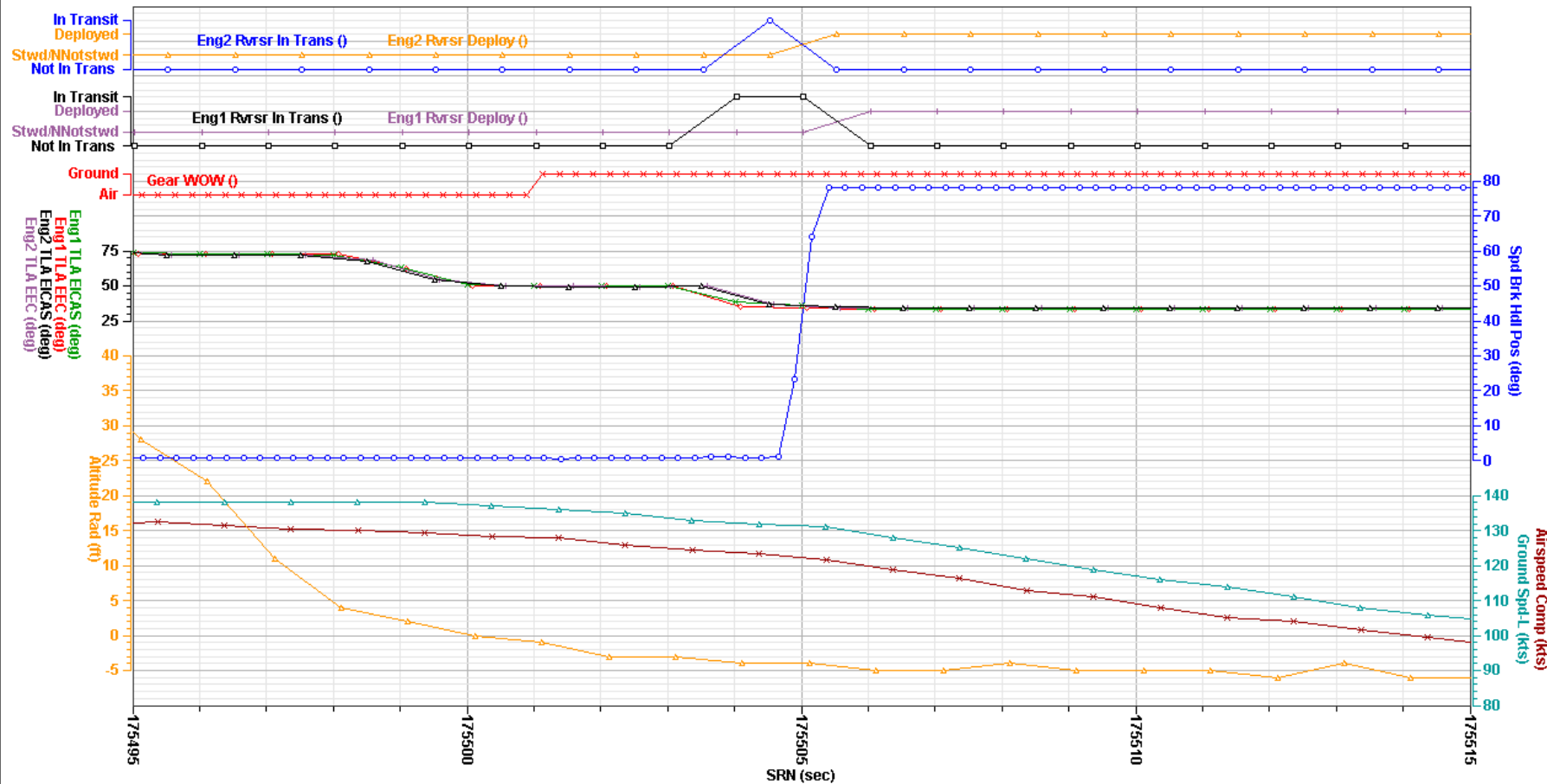National Transportation Safety Board

Figure 4. Fourth landing of the recording.

American Airlines, Boeing 757-200, N668AA

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Eng2 Rvrsr In Trans ()   Eng2 Rvrsr Deploy ()

Eng1 Rvrsr In Trans ()   Eng1 Rvrsr Deploy ()

Gear WOW ()

SRN (sec)

APPENDIX A

This appendix describes the parameters provided and verified in this report. Table A-1 lists the parameters and table A-2 describes the unit abbreviations used in this report.

Table A-1. Verified and provided FDR parameters.

Parameter Name	Parameter Description
1. Airspeed Comp (kts)	Computed Airspeed
2. Altitude Rad (ft)	Radio Altitude
3. Gear – WOW (discrete)	Aircraft Air/Ground Indication
4. Eng1 Rvrsr Deploy (discrete)	Left Engine Thrust Reverser Fully Deployed
5. Eng2 Rvrsr Deploy (discrete)	Right Engine Thrust Reverser Fully Deployed
6. Eng1 Rvrsr In Trans (discrete)	Left Engine Thrust Reverser In Transit
7. Eng2 Rvrsr In Trans (discrete)	Right Engine Thrust Reverser In Transit
8. Ground Spd-L (kts)	Ground Speed
9. Spd Brk Hdl Pos (deg)	Speed Brake Handle Position
10. Eng1 TLA EEC (deg)	Left Engine Throttle Lever Angle – EEC Source
11. Eng1 TLA EICAS (deg)	Left Engine Throttle Lever Angle – EICAS Source
12. Eng2 TLA EEC (deg)	Right Engine Throttle Lever Angle – EEC Source
13. Eng2 TLA EICAS (deg)	Right Engine Throttle Lever Angle – EICAS Source

NOTE: This FDR records pressure altitude, which is based on a standard altimeter setting of 29.92 inches of mercury (in Hg). The pressure altitude information presented in the FDR plots and in the electronic data has not been corrected for the local altimeter setting at the time of the event.

Table A-2. Unit abbreviations.

Units Abbreviation	Description
deg	degrees
kts	knots
discrete	discrete
ft	feet

NOTE: For parameters with a unit description of discrete, a discrete is typically a 1-bit parameter that is either a 0 state or a 1 state where each state is uniquely defined for each parameter.