

DOCKET NO. **SA - 510**

EXHIBIT NO. **13X - K**

**NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.**

Flight Data Recorder Study
Boeing 737 Uncommanded Upsets

NATIONAL TRANSPORTATION SAFETY BOARD
Office of Research and Engineering
Washington, D.C.

November 9, 1995

Flight Data Recorder Study - Boeing 737 Uncommanded Upsets

A. ACCIDENT DCA-94-MA-076

Location : Aliquippa, Pennsylvania
Date : September 8, 1994
Time : 1904 Eastern Daylight Time
Aircraft : Boeing 737-300, N513AU

B. GROUP IDENTIFICATION

Not applicable

C. SUMMARY

On September 8, 1994 at 1904 Eastern Daylight Time, USAir Flight 427, a Boeing 737-3B7, N513AU, crashed while maneuvering to land at Pittsburgh International Airport, Pittsburgh, Pennsylvania. The airplane was being operated on an instrument flight rules (IFR) flight plan under the provisions of Title 14, code of Federal Regulation (CFR), Part 121, on a regularly scheduled flight from Chicago O'Hare International Airport, Chicago, Illinois, to Pittsburgh. The airplane was destroyed by impact forces and fire near Aliquippa, Pennsylvania. All 132 persons on board the airplane were fatally injured.

D. DETAILS OF INVESTIGATION

The attached data plots represent Flight Data Recorder (FDR) and Quick Access Recorder (QAR) information gathered by the NTSB as a result of this accident. The data are from selected Boeing 737 events that the NTSB has investigated since September 8, 1994. The majority of the events contained within this report were as the result of uncommanded control surface movement. It should be noted, that the events are still under investigation.

1. Uncommanded Roll Events

The events described as uncommanded rolls are as follows:

1. Date : June 26, 1995

- | | | | |
|----|----------|---|---|
| | Location | : | Washington National Airport, District of Columbia |
| | Aircraft | : | USAir Inc., Boeing 737-300, N392US |
| 2. | Date | : | July 18, 1995 |
| | Location | : | Ormond Beach, Florida |
| | Aircraft | : | USAir Inc., Boeing 737-300, N390US |
| 3. | Date | : | July 25, 1995 |
| | Location | : | Richmond, Virginia |
| | Aircraft | : | USAir Inc., Boeing 737-400, N448US |
| 4. | Date | : | August 30, 1995 |
| | Location | : | Cleveland, Ohio |
| | Aircraft | : | Continental Airlines, Boeing 737-300, N325CA |

Additional uncommanded roll events were reported to the NTSB but were not selected for inclusion to this report. For a complete listing of Boeing 737 events, please refer to Exhibit 13X-C, List of Boeing 737 Events from 1992 to November 1995.

2. Uncommanded Yaw or Rudder Events

The following data refer to events reported as uncommanded yaw or rudder movement:

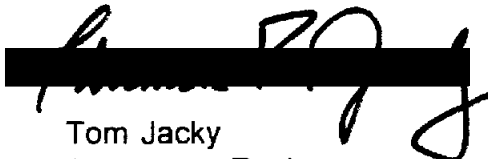
- | | | | |
|----|----------|---|--|
| 5. | Date | : | March 29, 1995 |
| | Location | : | Enroute from Ontario to San Jose, California |
| | Aircraft | : | Southwest Airlines, Boeing 737-300, N673AA |
| 6. | Date | : | May 5, 1995 |
| | Location | : | Dublin, Republic of Ireland |
| | Aircraft | : | Aer Lingus, Boeing 737-400 |
| 7. | Date | : | July 25, 1995 |
| | Location | : | Mexico City, Mexico |
| | Aircraft | : | Continental Airlines, Boeing 737-300, N14341 |
| 8. | Date | : | August 17, 1995 |
| | Location | : | Phoenix, Arizona |
| | Aircraft | : | USAir Inc, Boeing 737-400, N434US |

Additional uncommanded rudder surface movement events have been reported to the NTSB but not selected for inclusion to this report. Please refer to Exhibit 13X-C for additional details.

3. Uncommanded Pitch Event

The following event regards an uncommanded pitch event reported to the NTSB:

9. Date : September 12, 1995
 Location : Dallas-Ft. Worth International Airport, Texas
 Aircraft : USAir Inc., Boeing 737-200, N280AU


Tom Jacky
Aerospace Engineer

Attachments

1. FDR Data Plots from June 26, 1995 USAir 737-300 Event
2. FDR Data Plots from July 18, 1995 USAir 737-300 Event
3. FDR Data Plots from July 25, 1995 USAir 737-400 Event
4. FDR Data Plots from August 30, 1995 Continental 737-300 Event
5. FDR Data Plots from March 29, 1995 Southwest 737-300 Event
6. FDR Data Plots from May 5, 1995 Aer Lingus 737-400 Event
7. FDR Data Plots from July 25, 1995 Continental 737-300 Event
8. FDR Data Plots from August 17, 1995 USAir 737-400 Event
9. FDR Data Plots from September 12, 1995 USAir -200 Event

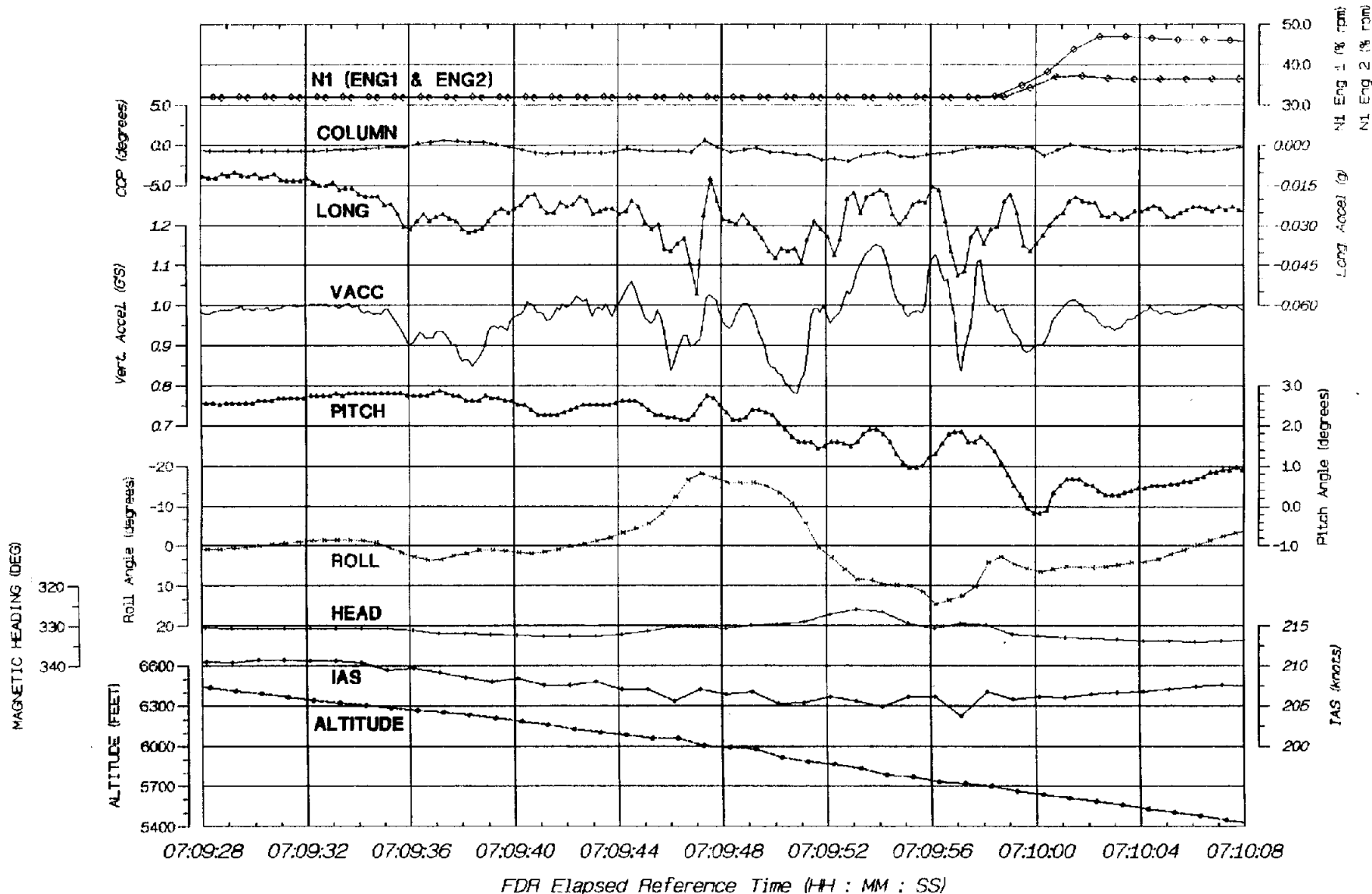
ATTACHMENT 1

FDR Data Plots from June 26, 1995 USAir 737-300 Event

USAir Flight 2301

Approach to DCA - 6/26/94

NTSB # : DCA-94-MA-076



FDR Data - plot 1

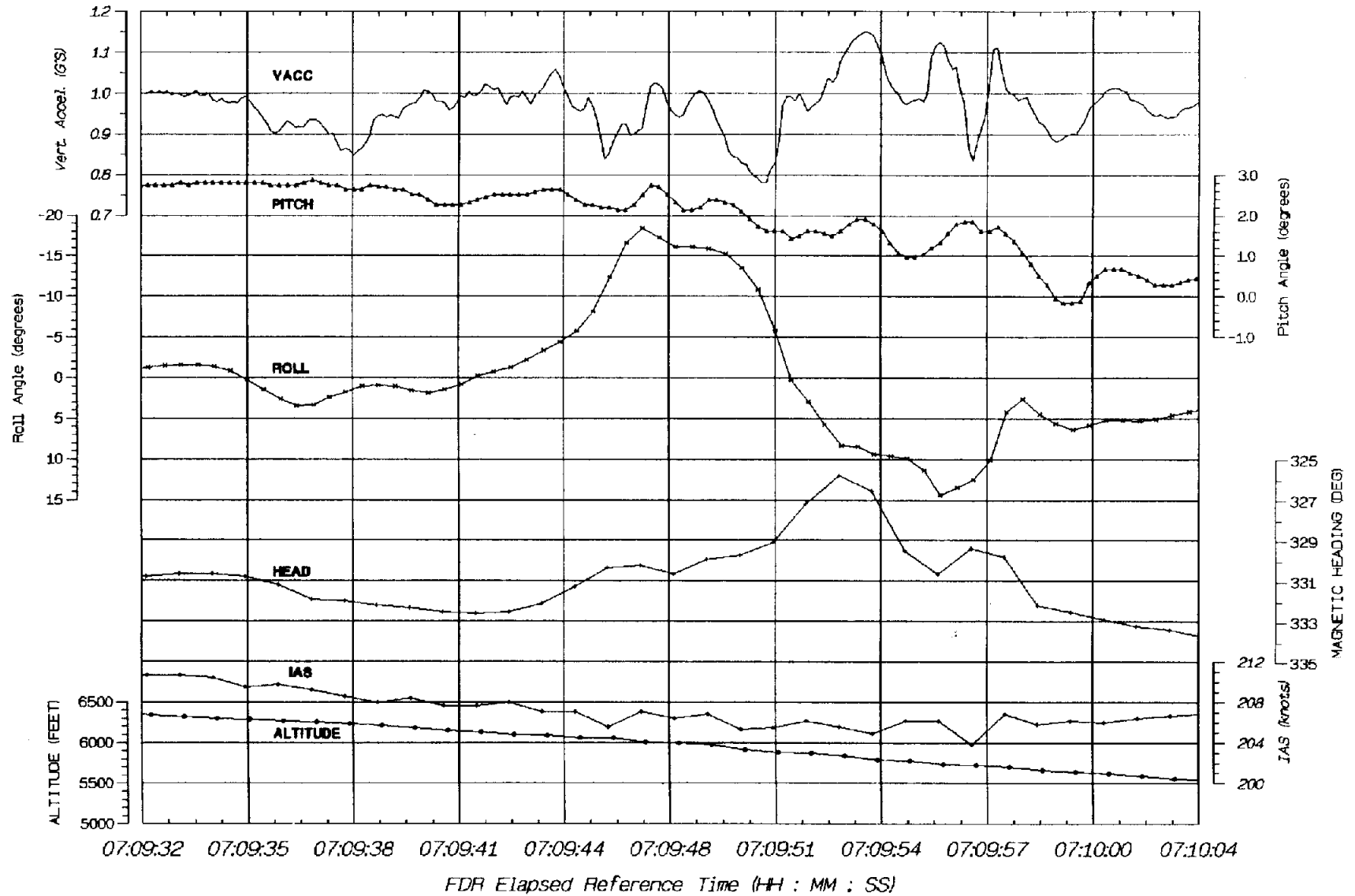
Revised: November 12, 1995

NTSB Flight Recorder Laboratory

USAir Flight 2301

Approach to DCA - 6/26/94

NTSB # : DCA-94-MA-076



FDR Data - Plot 3

Revised: November 12, 1995

NTSB Flight Recorder Laboratory

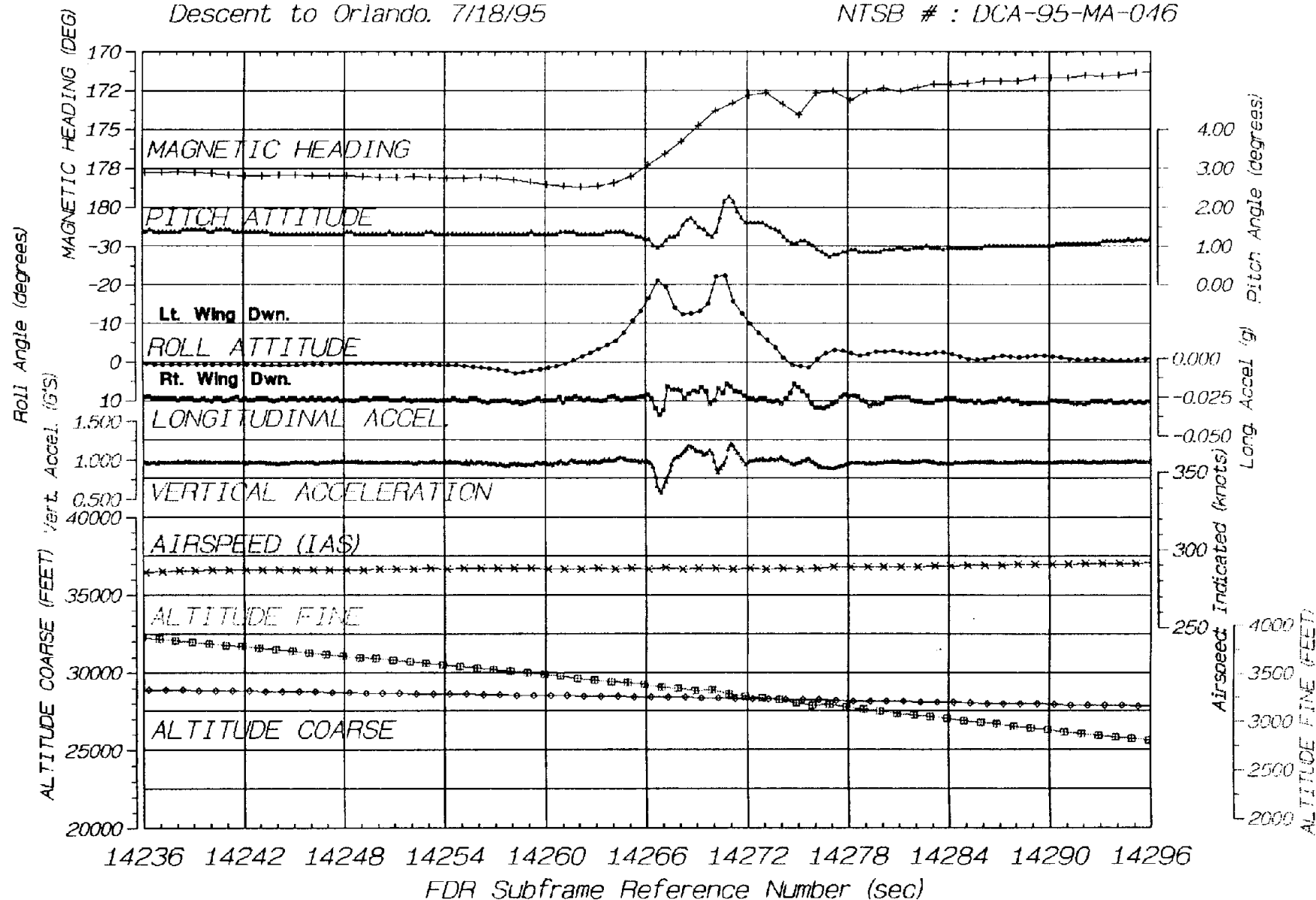
ATTACHMENT 2

FDR Data Plots from July 18, 1995 USAir 737-300 Event

N390US Uncommanded Roll - USAir Flight 855

Descent to Orlando, 7/18/95

NTSB # : DCA-95-MA-046



Preliminary Data - plot1

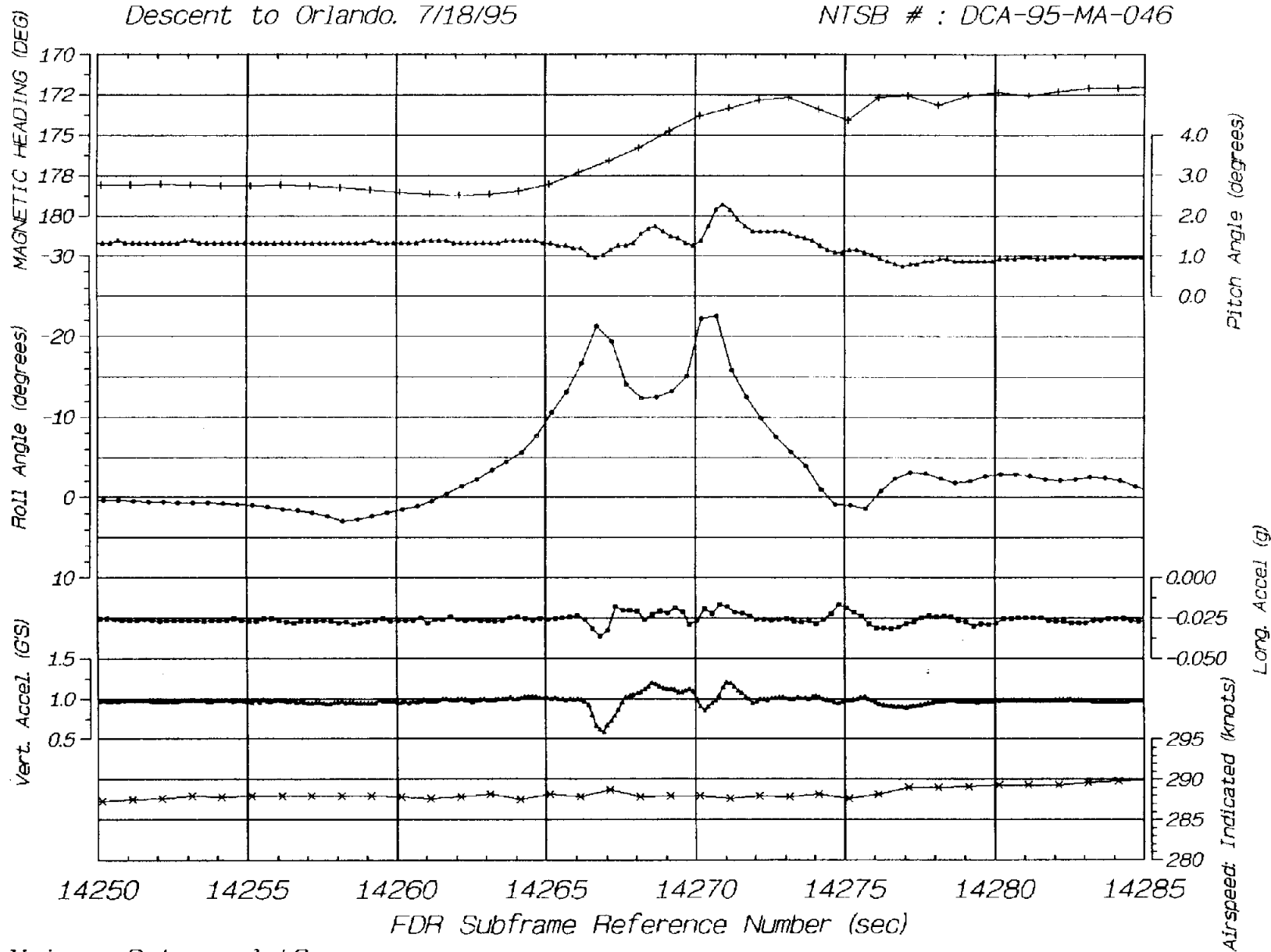
Revised: July 20, 1995

NTSB Flight Recorder Laboratory

N390US Uncommanded Roll - USAir Flight 855

Descent to Orlando. 7/18/95

NTSB # : DCA-95-MA-046



Preliminary Data - plot3

Revised: November 12, 1995

NTSB Flight Recorder Laboratory

b

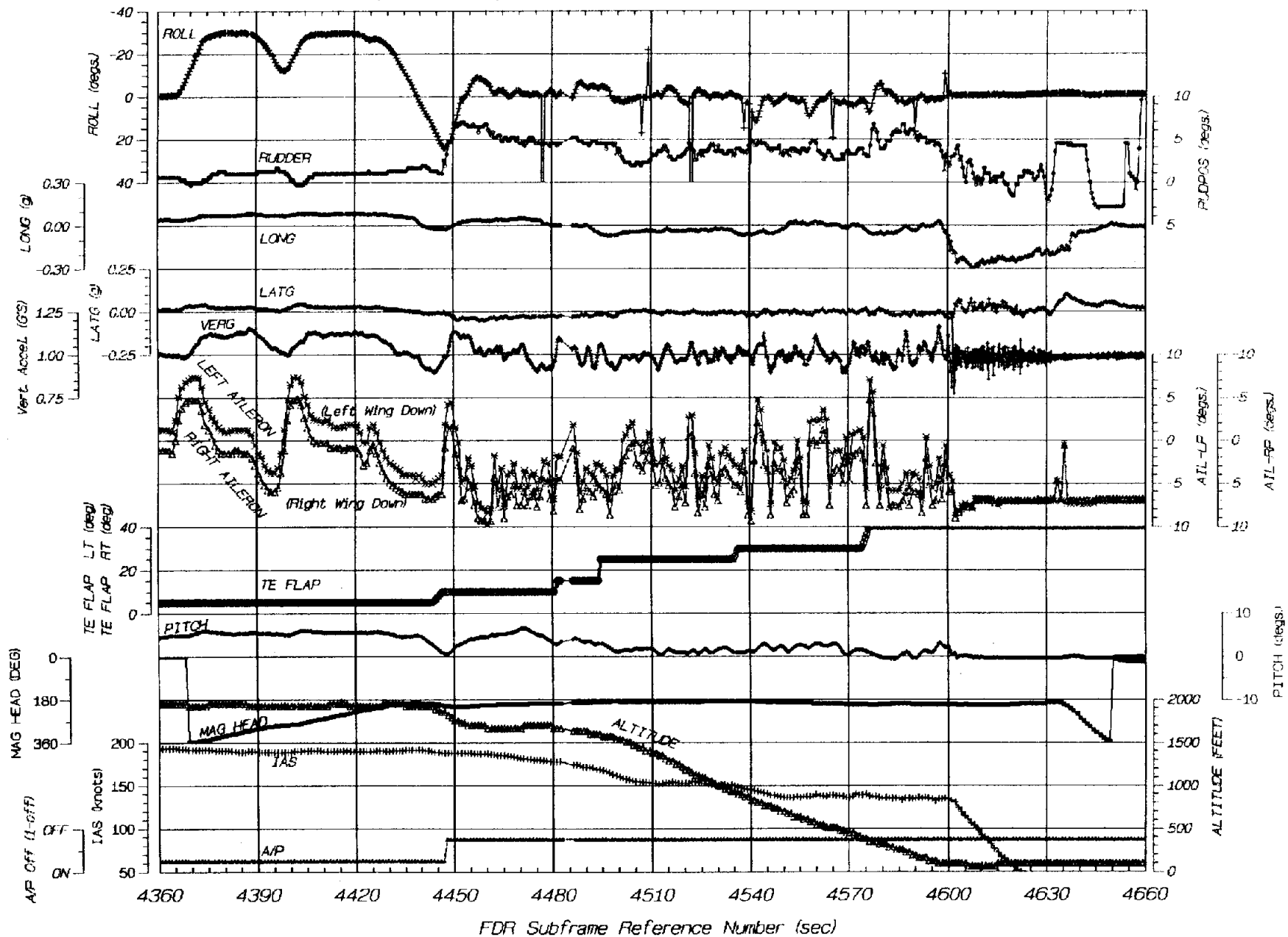
ATTACHMENT 3

FDR Data Plots from July 25, 1995 USAir 737-400 Event

USAIR FLIGHT 299, B-737-400

Uncommanded Roll, 7/25/95, N448US

DCA-95-MI-048



Plot 2

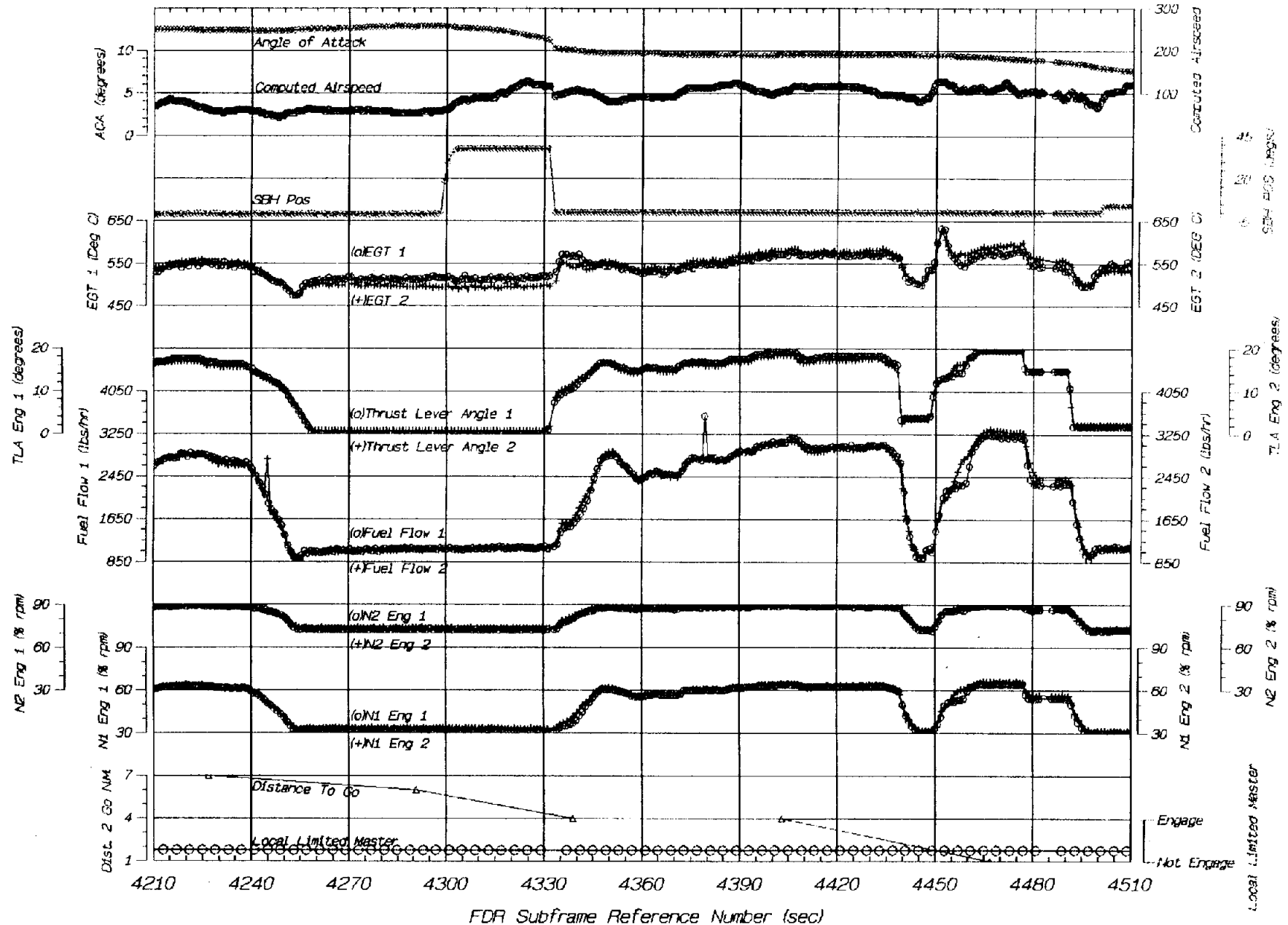
Revised: September 27, 1995

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USAIR FLIGHT 299, B-737-400

Uncommanded Roll, 7/25/95, N448US

DCA-95-MI-048



Plot 3

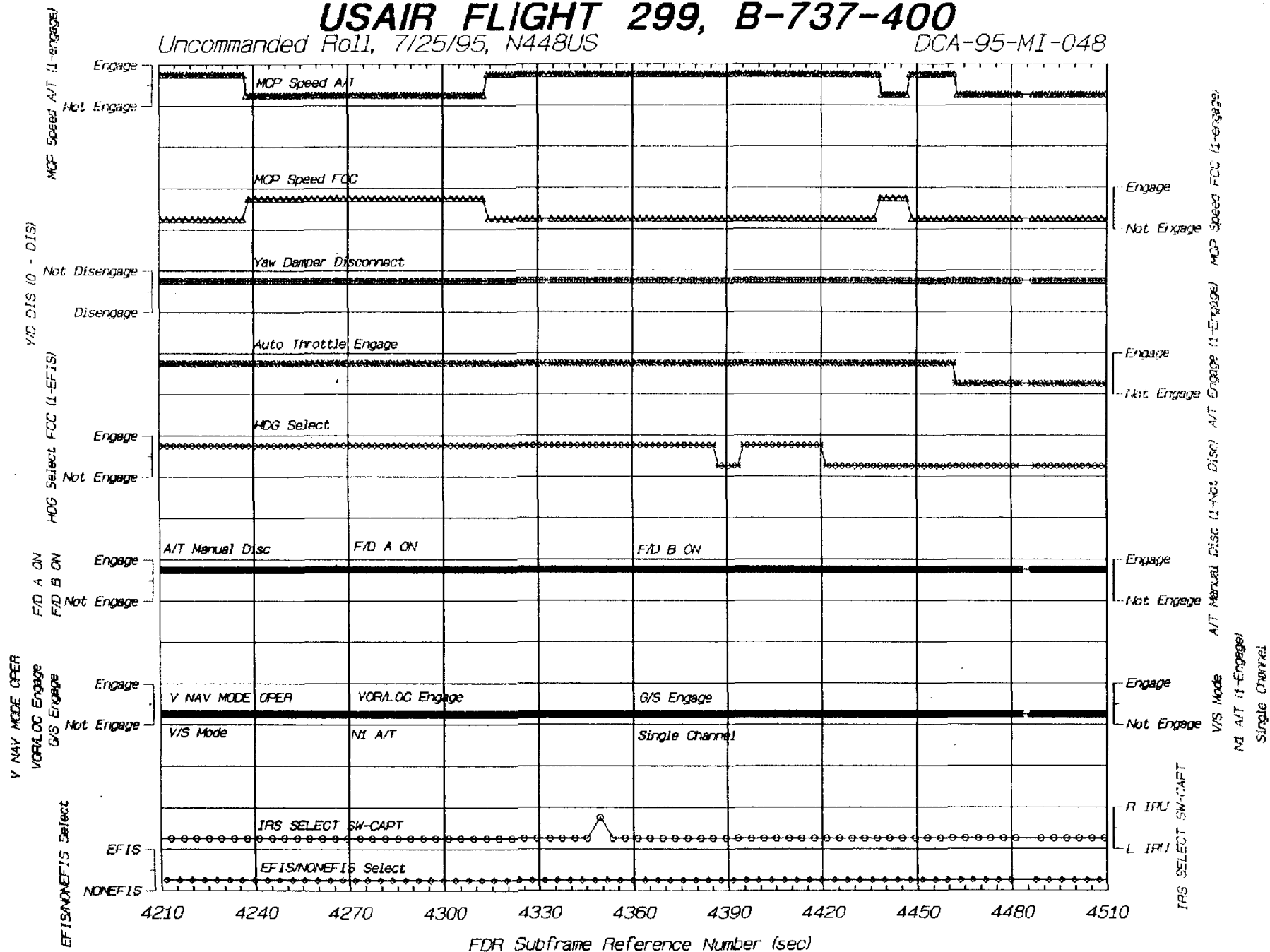
Revised: September 27, 1995

National Transportation Safety Board

USAIR FLIGHT 299, B-737-400

Uncommanded Roll, 7/25/95, N448US

DCA-95-MI-048

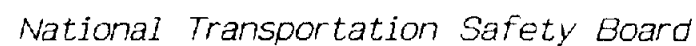


Plot 4

Revised: September 27, 1995

National Transportation Safety Board

DCA-95-MI-048

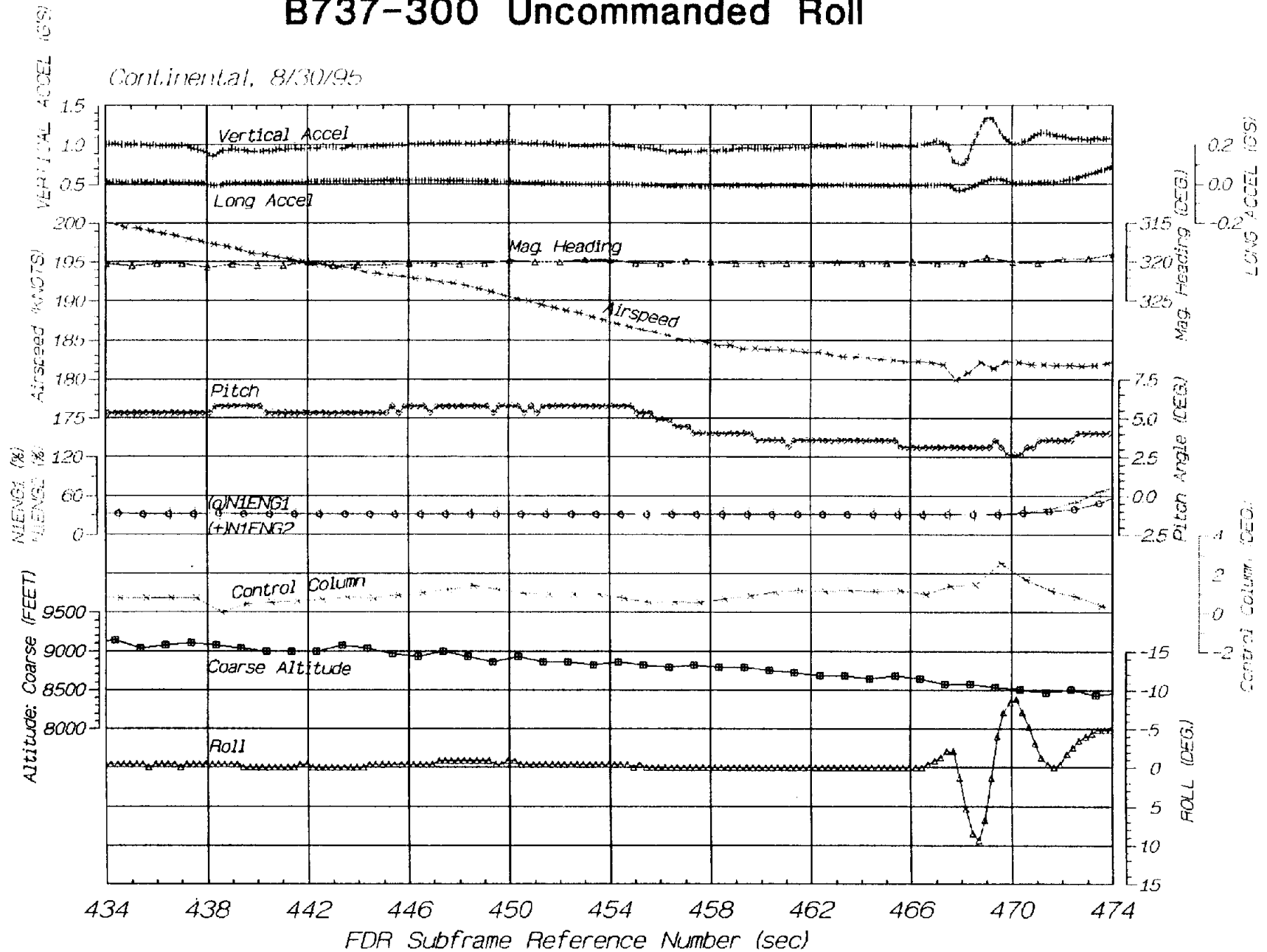


ATTACHMENT 4

FDR Data Plots from August 30, 1995 Continental 737 Event

B737-300 Uncommanded Roll

Continental, 8/30/95



PL13

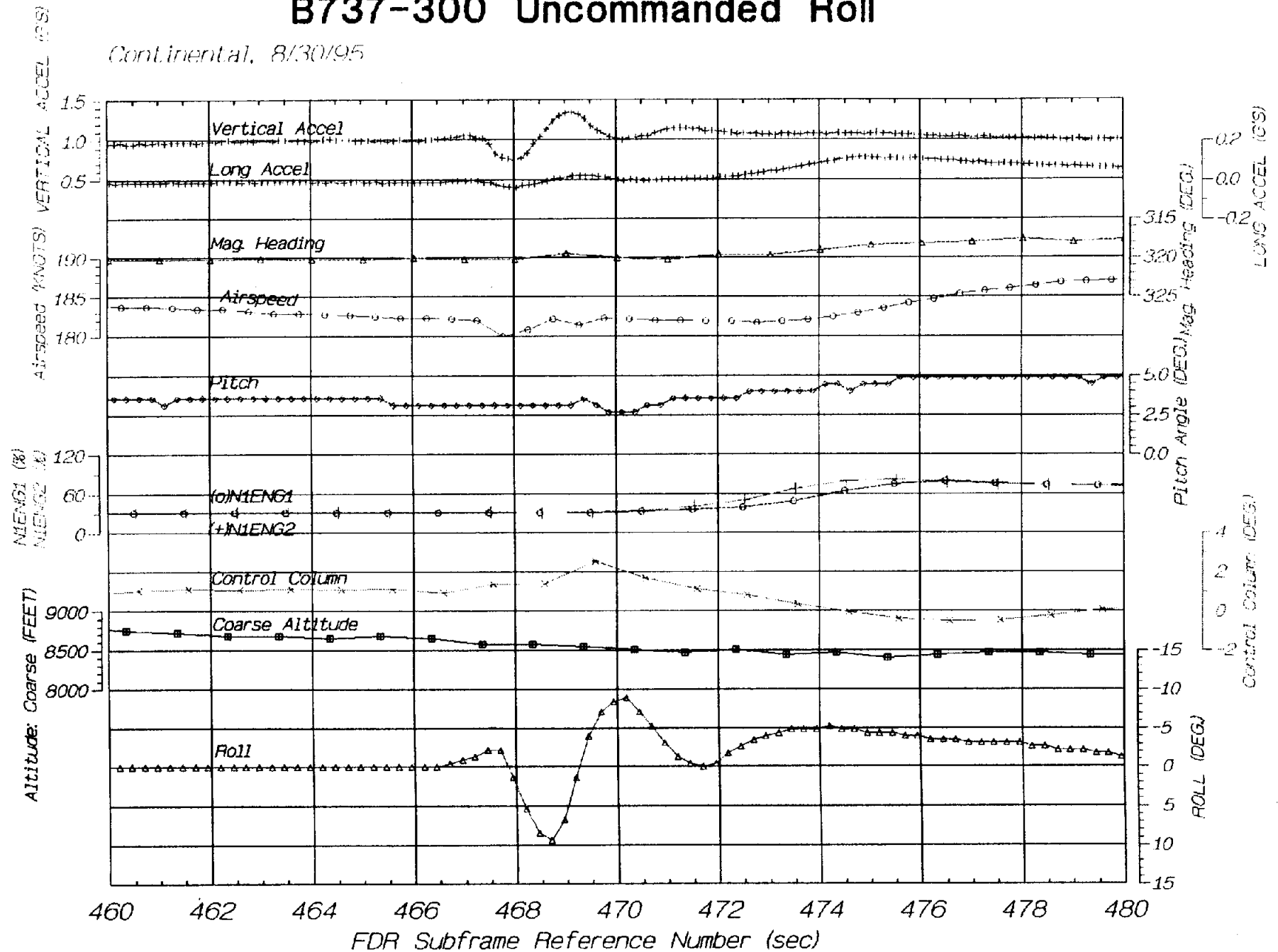
Revised: September 11, 1995

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B737-300 Uncommanded Roll

Continental, 8/30/95



plt1
Revised: September 11, 1995

National Transportation Safety Board

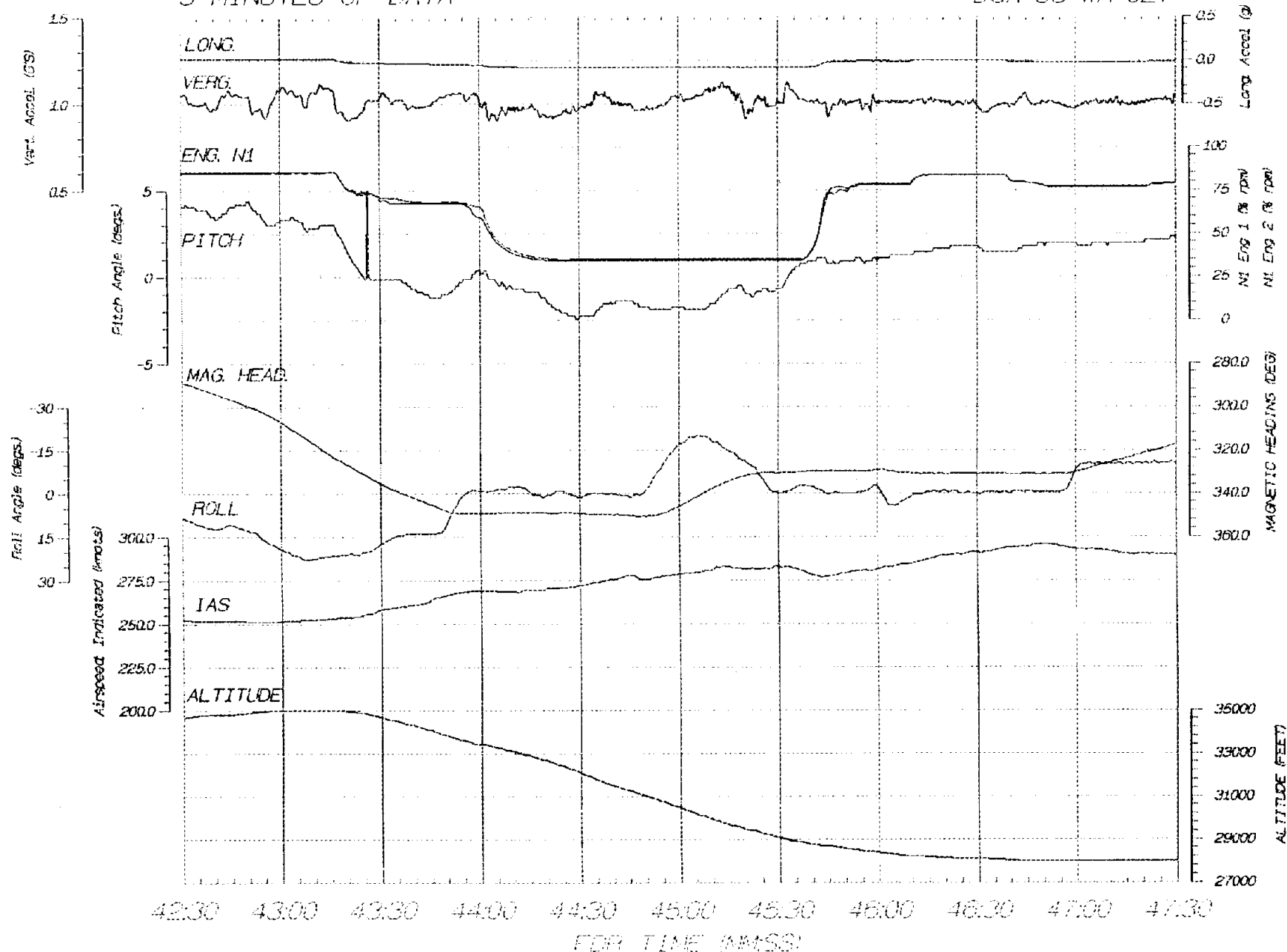
ATTACHMENT 5

FDR Data Plots from March 29, 1995 Southwest 737-300 Event

SOUTHWEST AIRLINES FLIGHT 1181

5 MINUTES OF DATA

DCA-95-WA-027



Preliminary Data

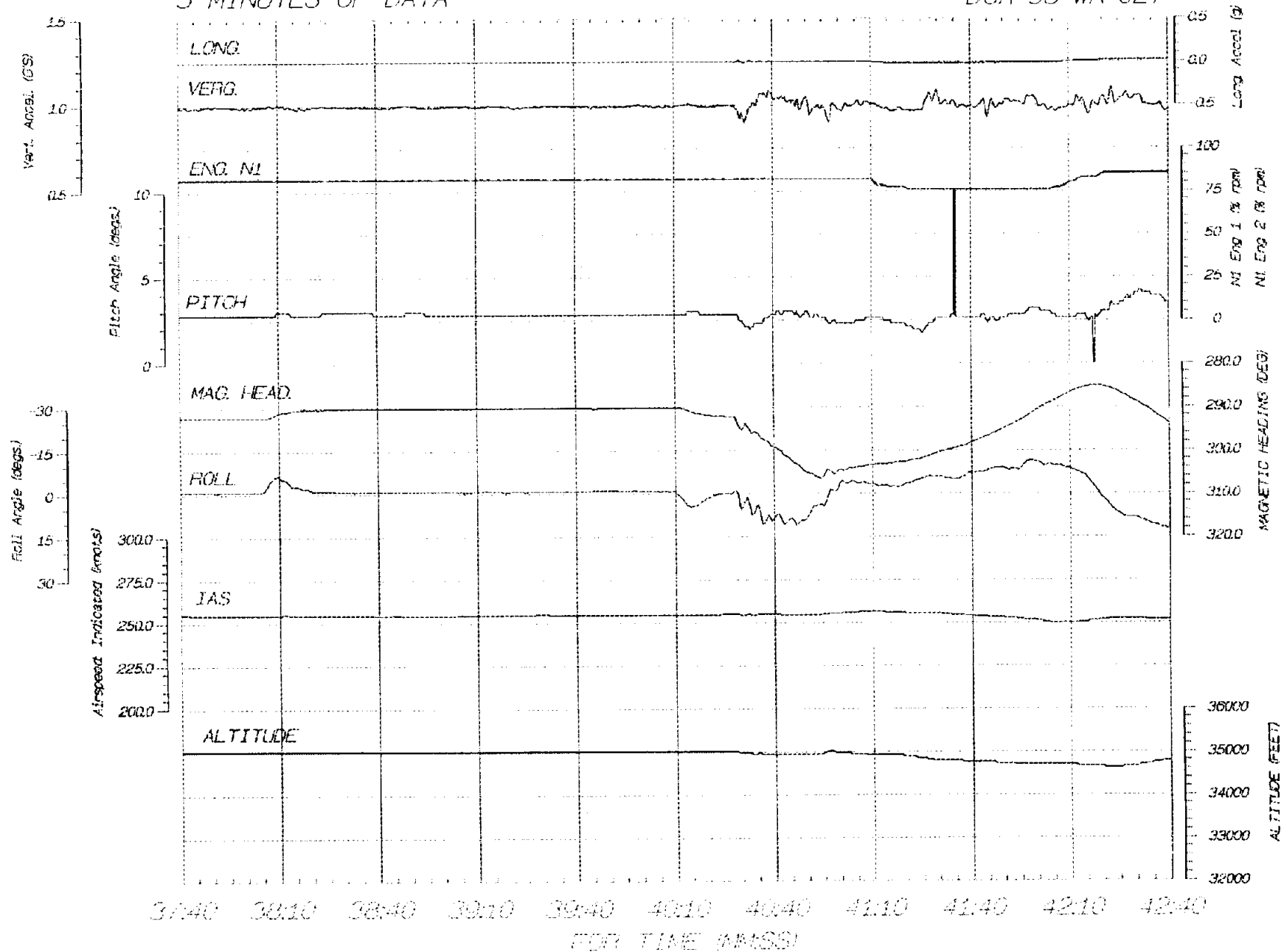
Revised: April 03, 1995

NTSB/VPD/PLT2

SOUTHWEST AIRLINES FLIGHT 1181

5 MINUTES OF DATA

DCA-95-WA-027



Preliminary Data

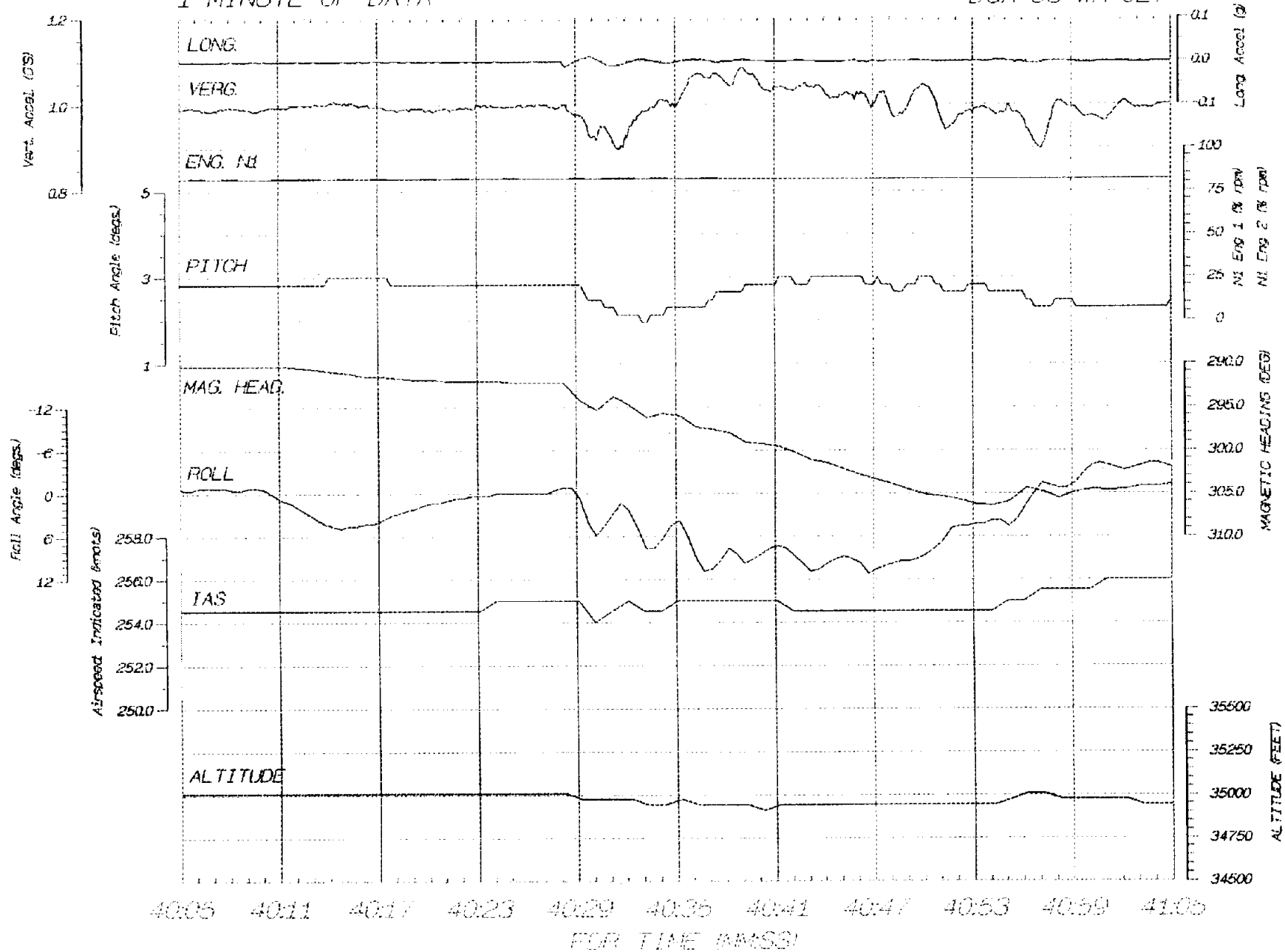
Revised: April 03, 1995

NTSB/VPD/PL 11

SOUTHWEST AIRLINES FLIGHT 1181

1 MINUTE OF DATA

DCA-95-WA-027



Preliminary Data

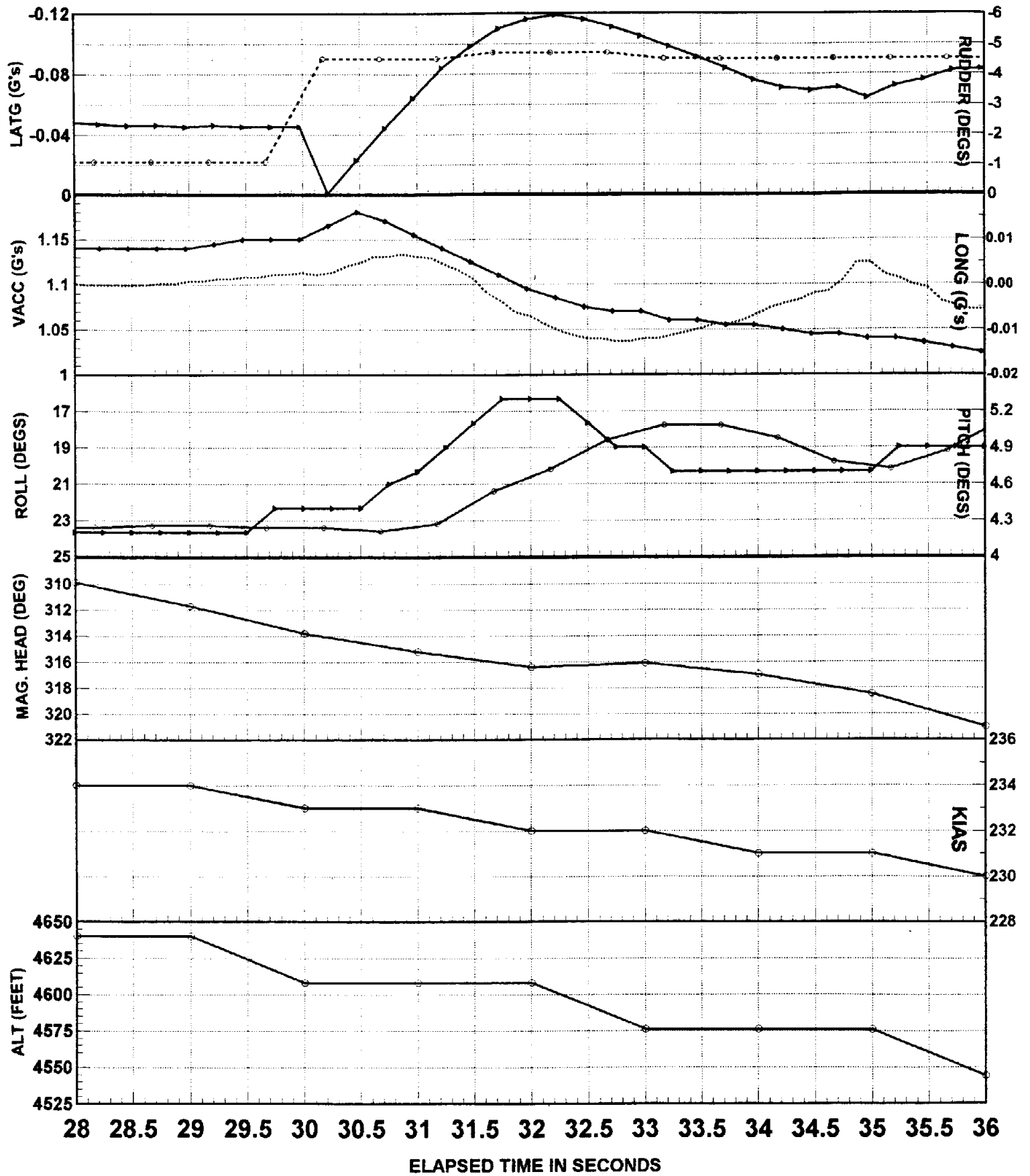
Revised: April 03, 1995

NTSB/VPD/PLT3

ATTACHMENT 6

FDR Data Plots from May 5, 1995 Aer Lingus 737-400 Event

Air Lingus B-737-400 Rudder Movement May 1995

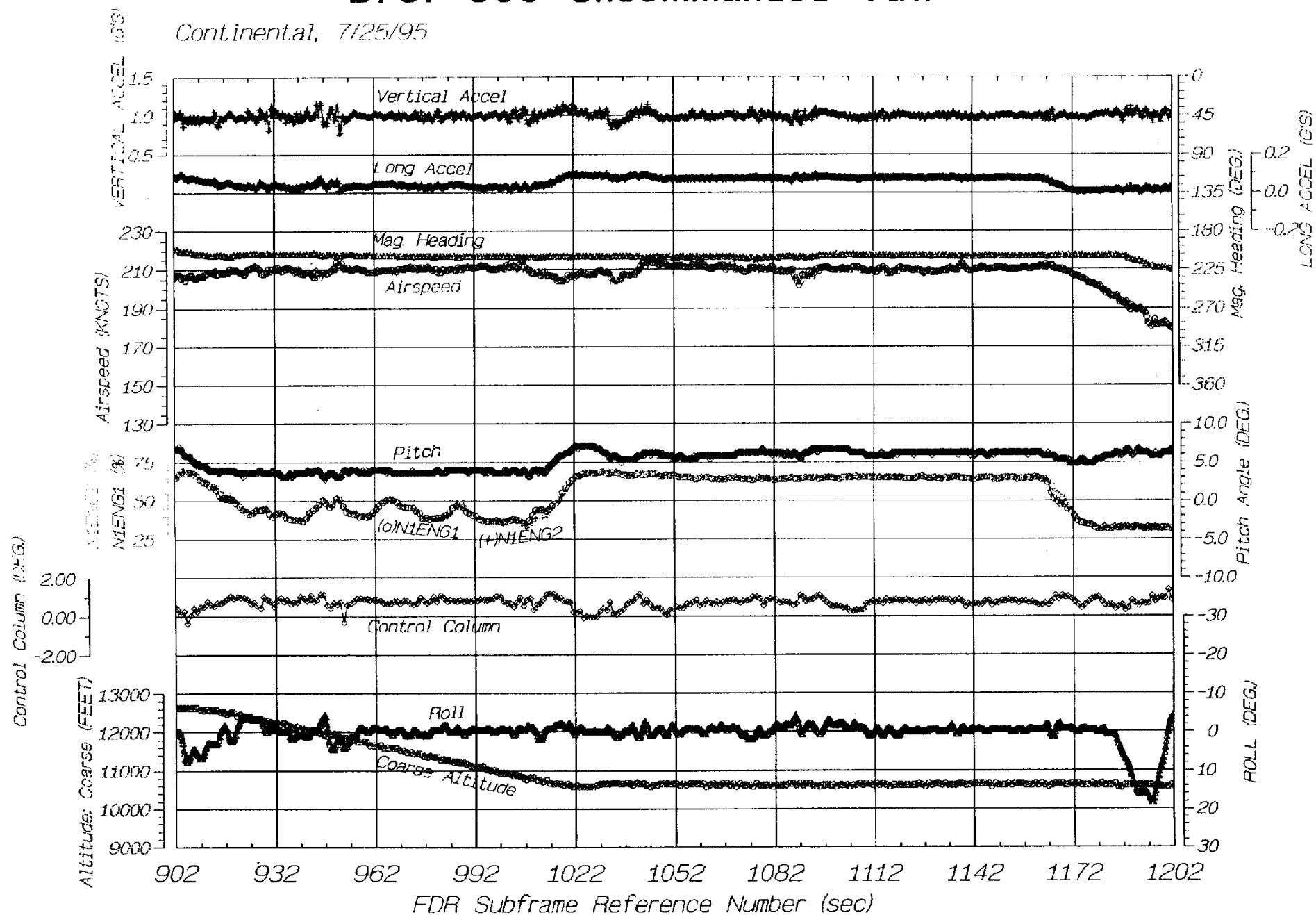


ATTACHMENT 7

FDR Data Plots from July 25, 1995 Continental 737-300 Event

B737-300 Uncommanded Yaw

Continental, 7/25/95



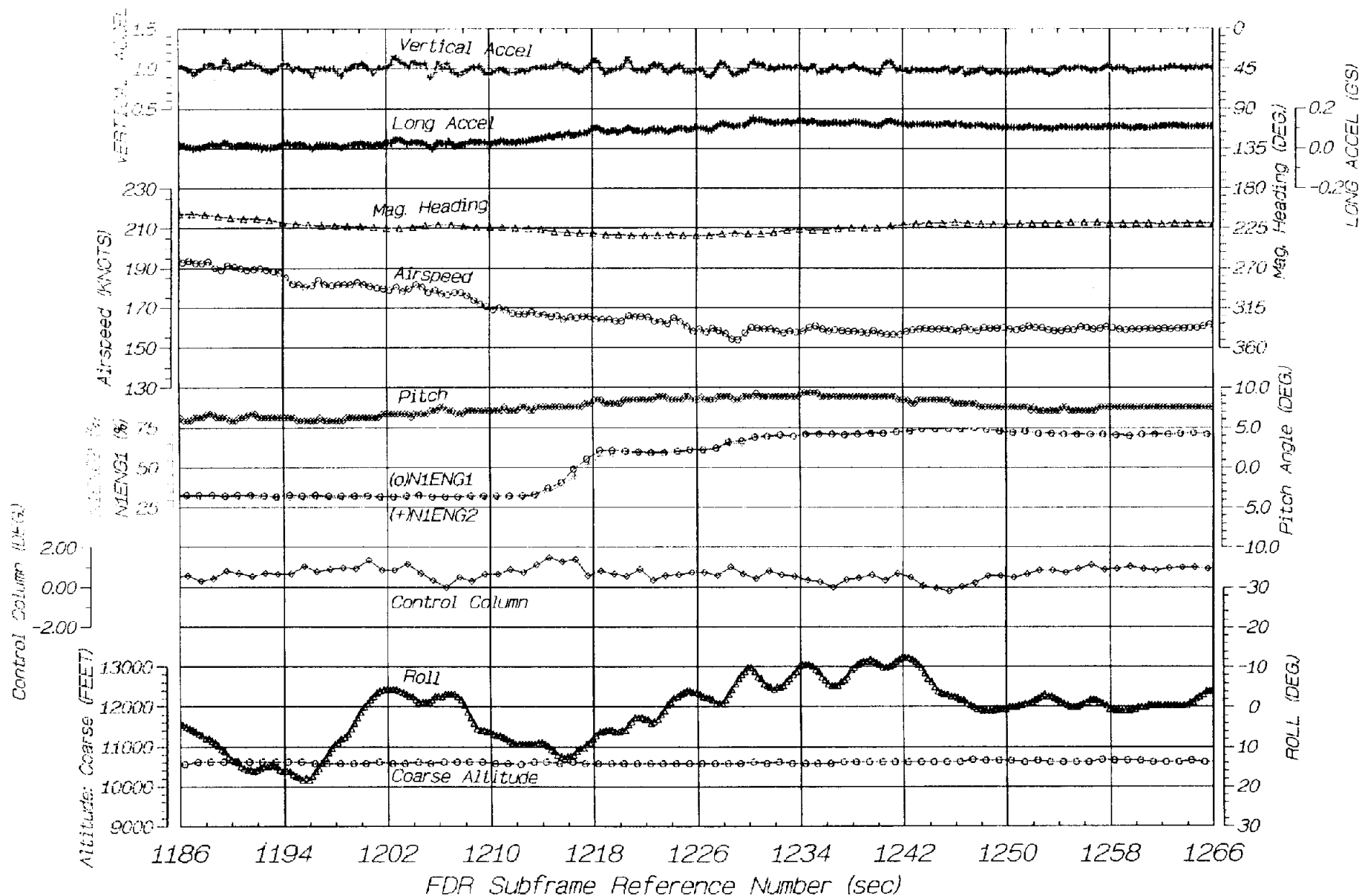
plot2

Revised: October 13, 1995

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B737-300 Uncommanded Yaw

Continental, 7/25/95



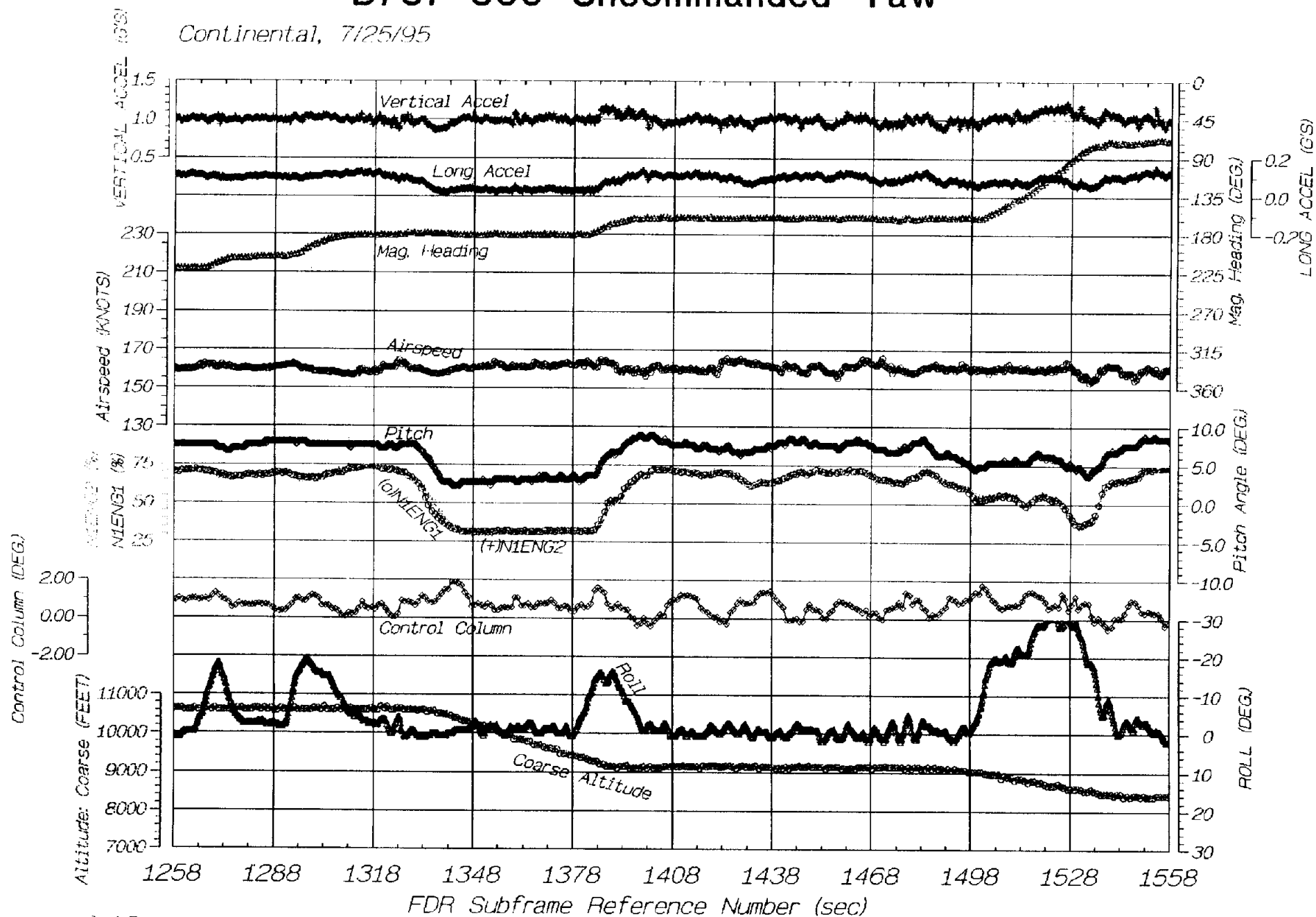
plot1

Revised: October 13, 1995

National Transportation Safety Board

B737-300 Uncommanded Yaw

Continental, 7/25/95



plot3

Revised: October 13, 1995

National Transportation Safety Board

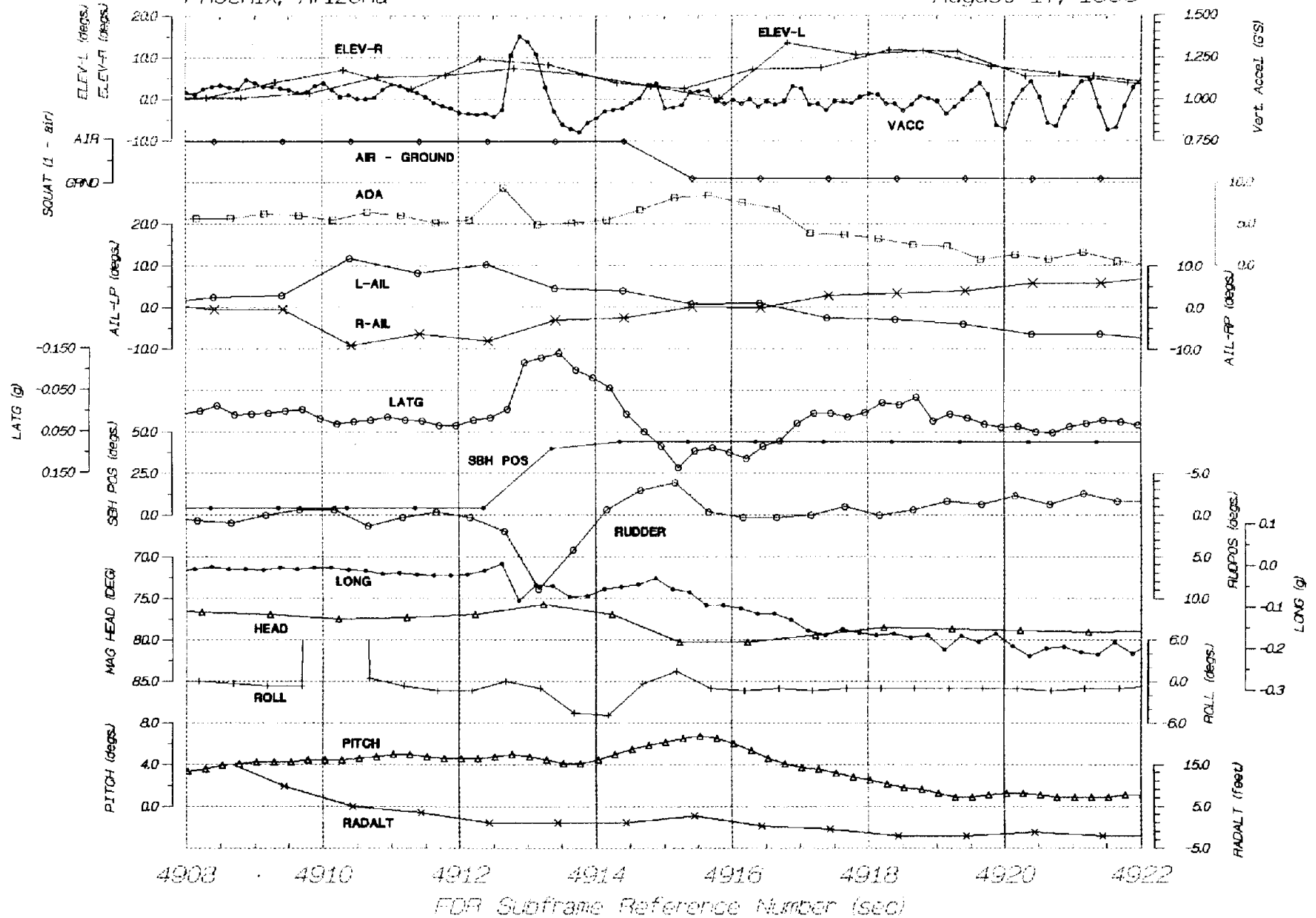
ATTACHMENT 8

FDR Data Plots from August 17, 1995 USAir 737-400 Event

USAIR 737 Event

Phoenix, Arizona

August 17, 1995



Preliminary Data

Revised: August 21, 1995

NTSB Flight Recorder Lab

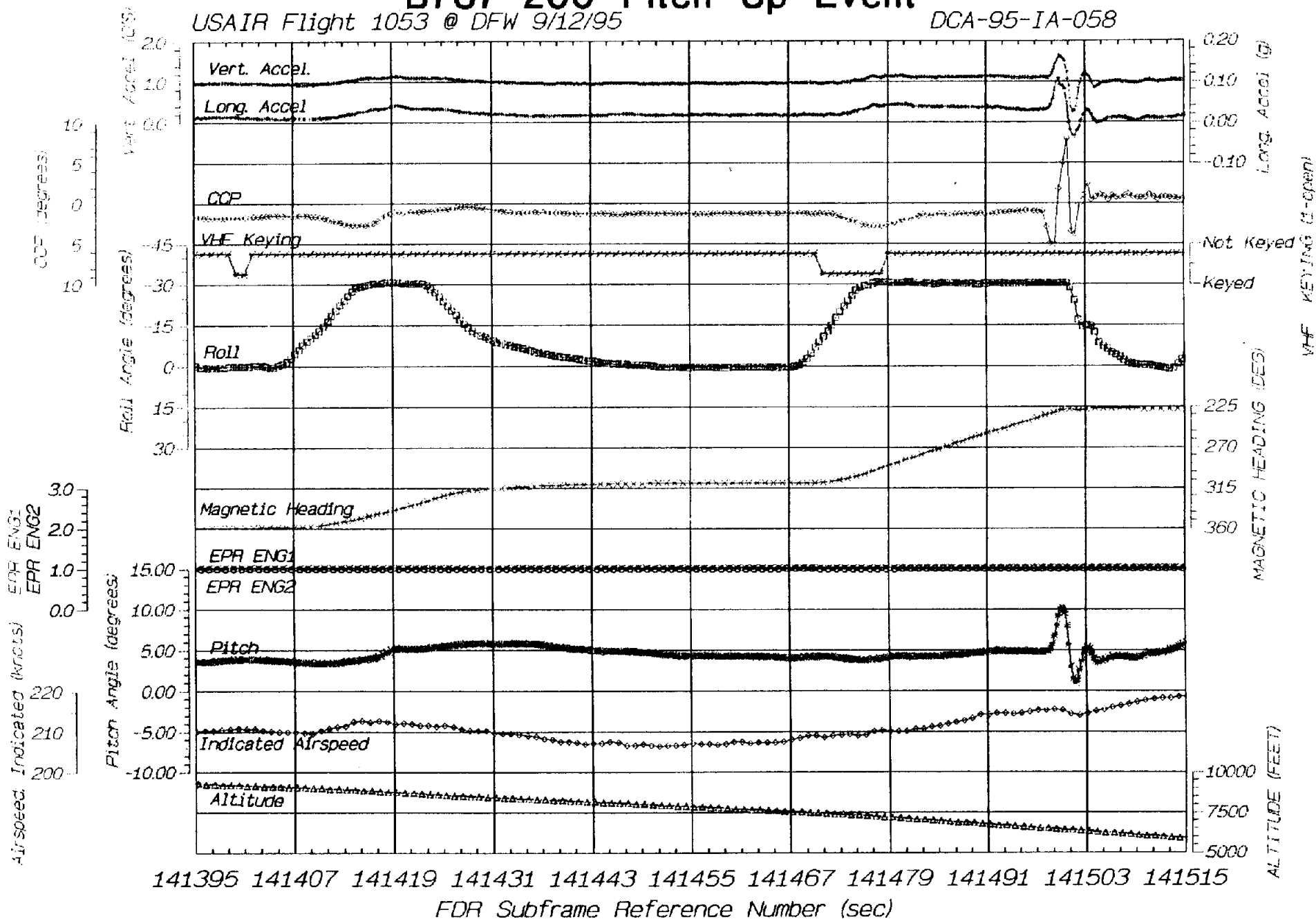
ATTACHMENT 9

FDR Data Plots from September 12, 1995 USAir 737-200 Event

B737-200 Pitch Up Event

USAIR Flight 1053 @ DFW 9/12/95

DCA-95-IA-058



Preliminary Data, Plot1

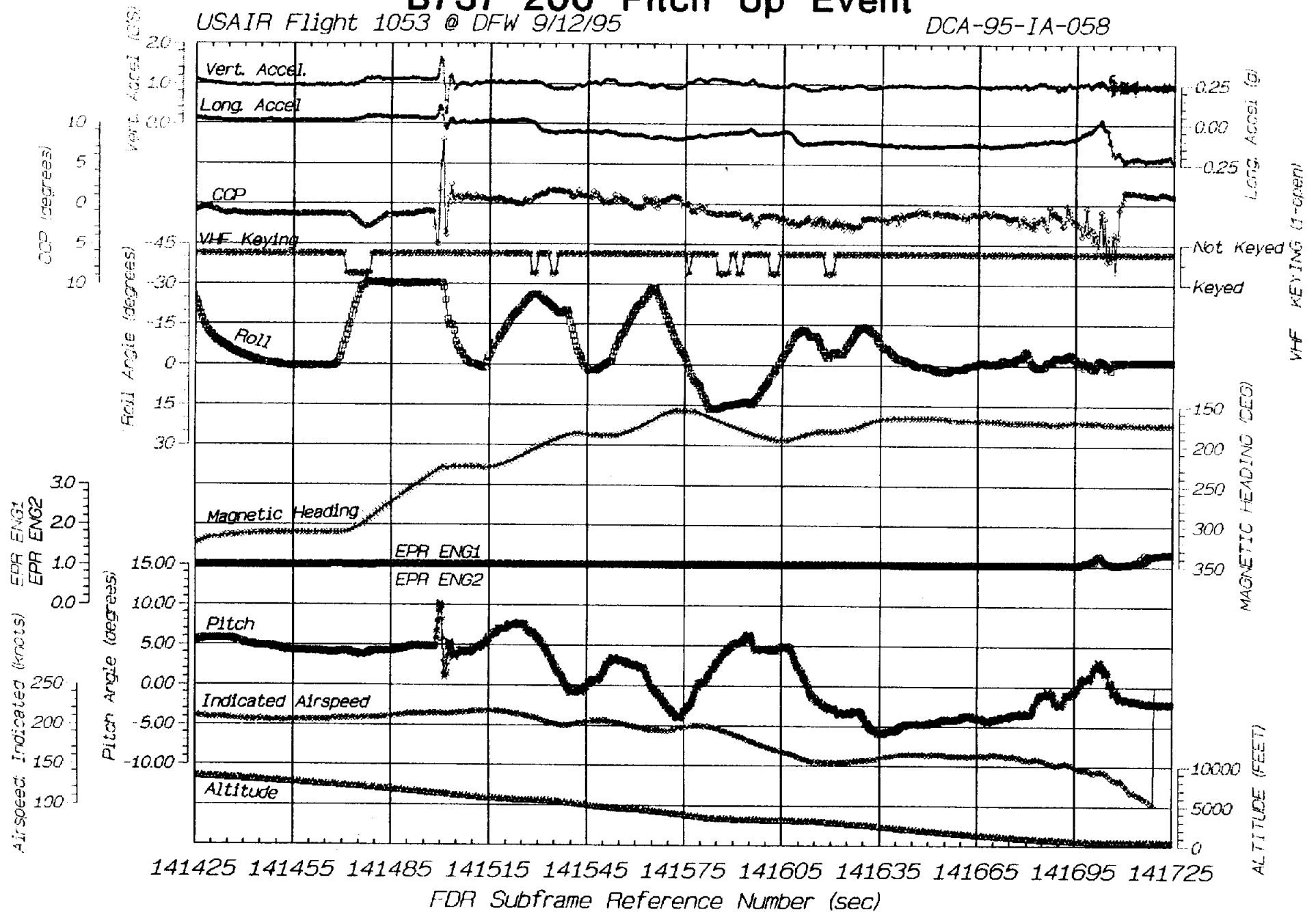
Revised: September 20, 1995

National Transportation Safety Board

B737-200 Pitch Up Event

USAIR Flight 1053 @ DFW 9/12/95

DCA-95-IA-058



Preliminary Data, Plot3

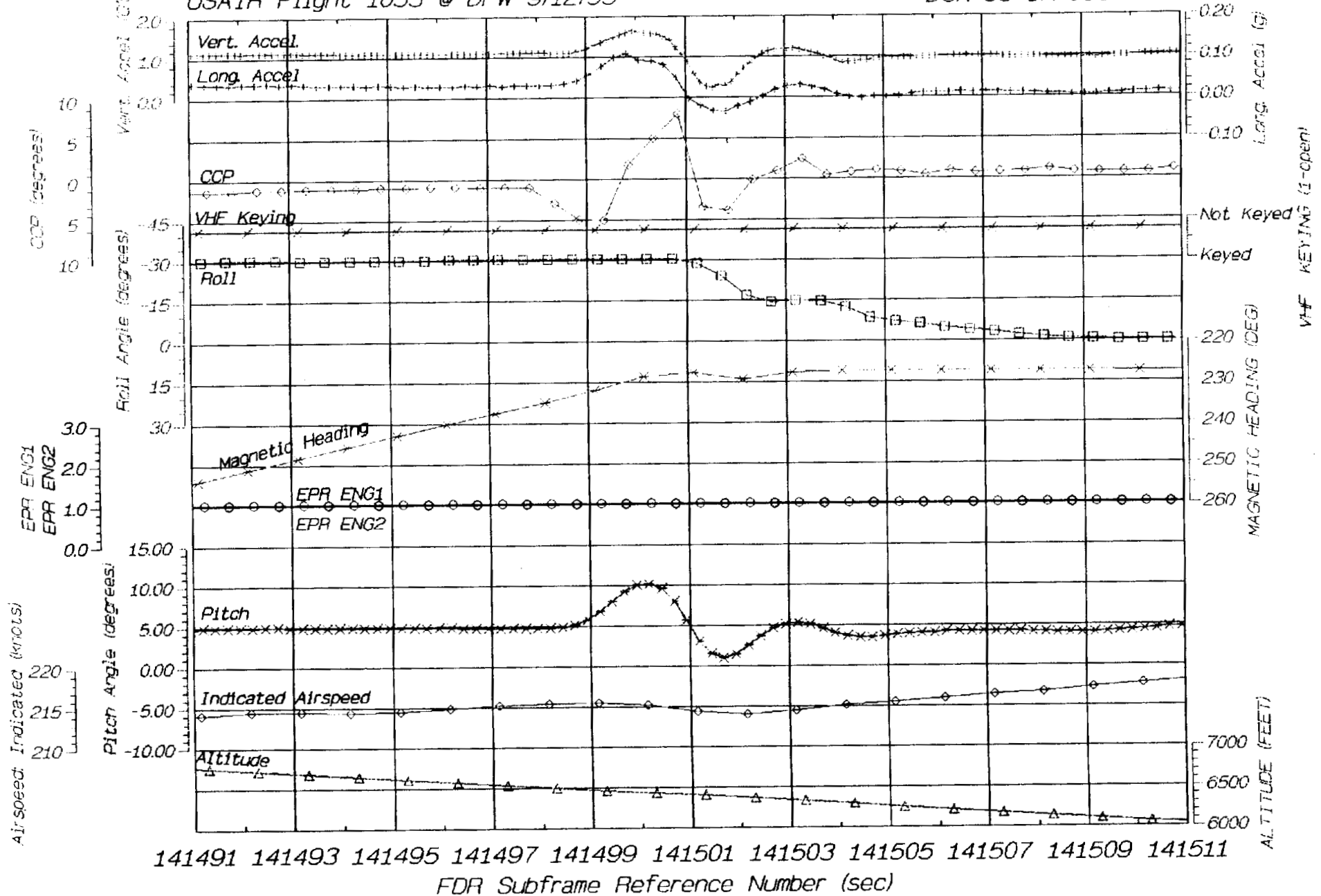
Revised: September 20, 1995

National Transportation Safety Board

B737-200 Pitch Up Event

USAIR Flight 1053 @ DFW 9/12/95

DCA-95-IA-058



Preliminary Data, Plot2

Revised: September 20, 1995

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