

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

December 19, 2003

## Flight Data Recorder

### Specialist's Factual Report

NTSB Number:  
**NYC03MA183**

#### **A. ACCIDENT**

Location: Yarmouth, MA  
Date: August 26, 20013  
Aircraft: Beech B1900D, N240CJ  
Operator: Colgan Airways, Flight 9446

#### **B. GROUP**

No flight data recorder (FDR) group was formed for this incident.

#### **C. SUMMARY**

The accident airplane was on a non-revenue positioning flight following maintenance when the crew declared an emergency shortly after departing Hyannis Airport. The airplane struck the water during the attempted return. Both pilots, the only occupants, were fatalities and the airplane was destroyed.

#### **D. DETAILS OF INVESTIGATION**

On August 27, 2003, the NTSB Vehicle Recorder Division received the FDR, a L3COM (aka) Fairchild Model F1000 flight data recorder (s/n 00505). Although, impact forces heavily damaged the recorder (see Figures 1 and 2), the memory module was undamaged. The memory module was removed (see Figure 3) and installed in the NTSB's F1000 laboratory recorder. The data were then down loaded using the Safety Board's analysis system.



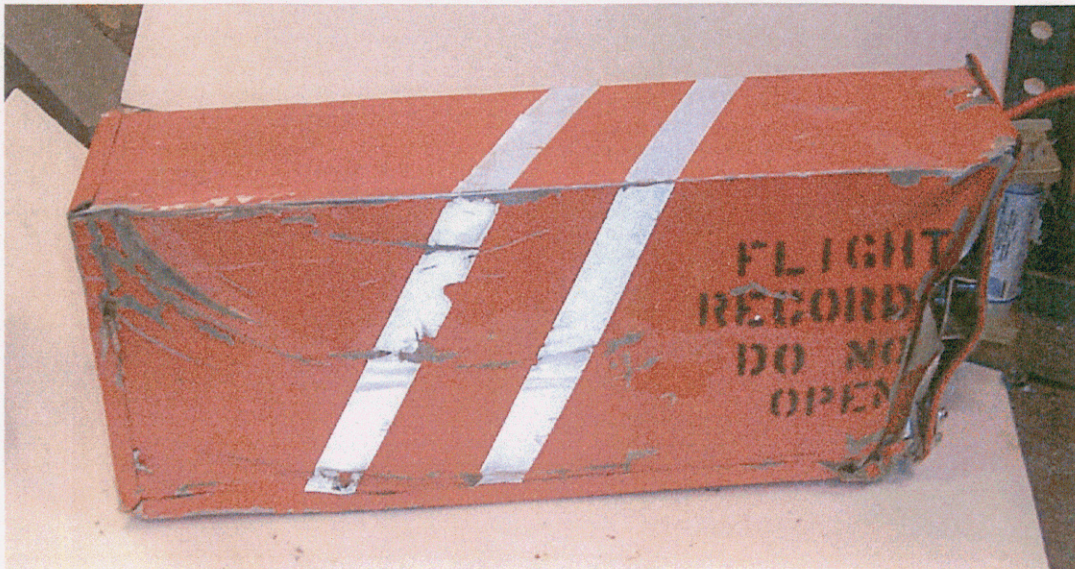


Figure 1, FDR Side View

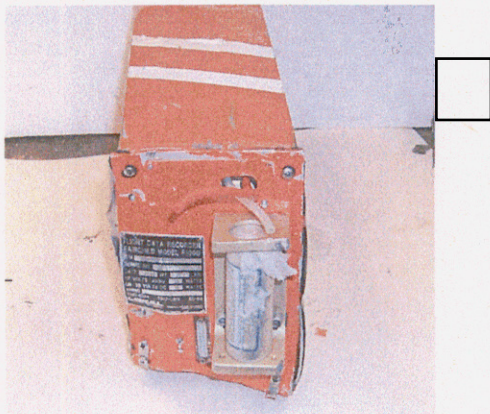


Figure 2, FDR Front View

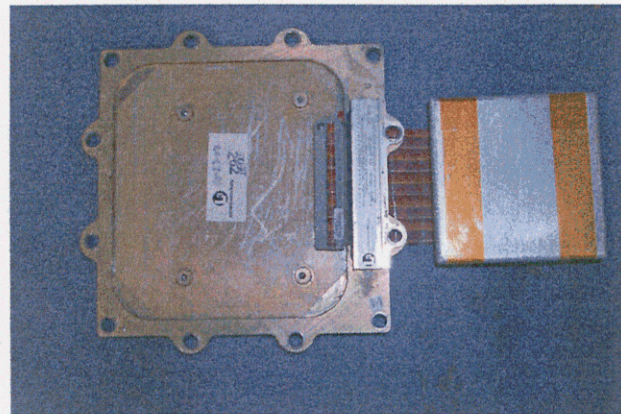


Figure 3, Memory Module and Top of Crash Survivable Storage Unit

### Recorder Description

This model FDR records airplane flight information in a digital format using solid-state Flash Memory as the recording medium. The FDR was configured to record 64, 12-bit words of digital information every second. Each grouping of 64 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 64-word intervals. Each data parameter (e.g. altitude, heading, airspeed) has a specifically assigned word number within the subframe.

### Engineering Units Conversions

The engineering units conversions used for the data contained in this report are based on documentation from the operator and/or manufacturer. Where applicable, changes to the conversions have been made to ensure the parameters conform to the



Safety Board's standard sign convention, climbing right turns are positive (CRT=+)<sup>1</sup>. The data contained in this report have not been corrected to account for airplane specific data anomalies. With the exception of parameter "Pitch Trim Control", which was know to be out of calibration, and "Pitch Control Position" the documented conversion algorithms decode the parameter as expected.

### Pitch Control Inputs

The FDR pitch control position sensor is located just forward of the control column. However, the conversion algorithm used to convert the recorded values to engineering units is based on the elevator position versus sensor output. Because the elevator position sensor is not located on the elevator increases the possibility that inconsistencies between actual and recorded elevator position can occur.

Based on FDR data from other Beech 1900D airplanes, the elevator position values recorded by the accident airplane appear to be larger than expected.

### Pitch Trim Control

The values for parameter "Pitch Trim Control" recorded during the accident flight were out of calibration. This resulted from maintenance conducted on the pitch trim system prior to the accident flight. The maintenance involved the removal of the pitch trim control cables, which affected the FDR pitch trim sensor that is attached to the control cable (see figure 1). As a result of this maintenance, the FDR system was listed as inoperative in the maintenance log and carried as a Master Minimum Equipment List (MMEL) item. The FDR pitch trim sensor was to be recalibrated at the destination airport.

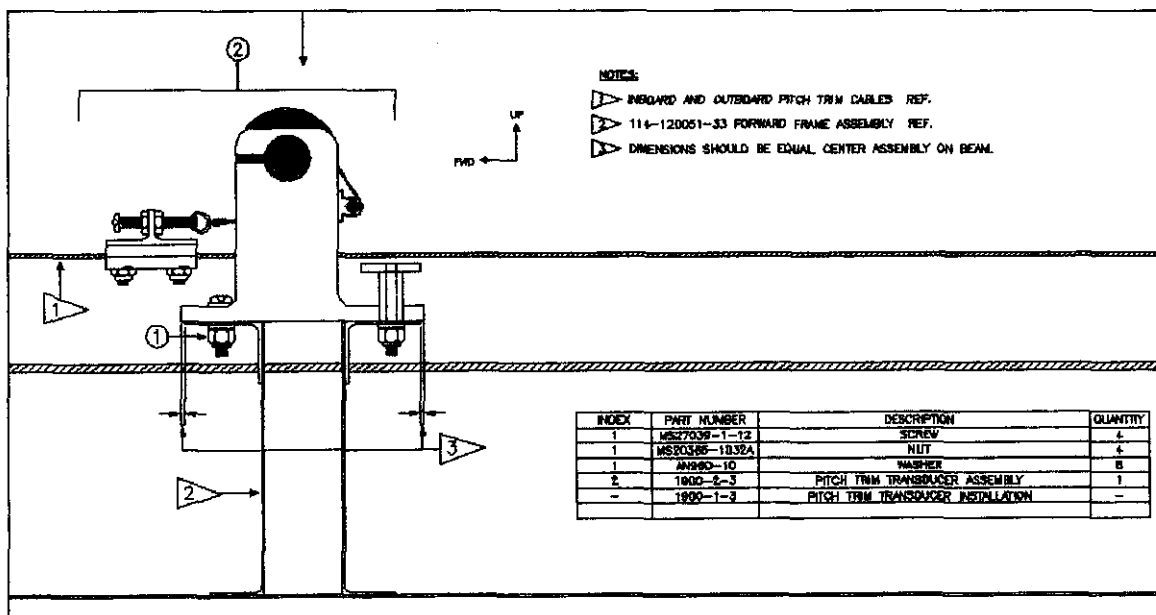


Figure 4, FDR Pitch Trim Sensor

<sup>1</sup> CRT=+ means that for any parameter recorded that indicates a climb or a right turn, the sign for that value is positive. Also any parameter recorded that is indicating an action or deflection, if it induces a climb or right turn, the value is positive. Examples: Right Roll = +, Left Aileron Trailing Edge Down = +, Right Aileron Trailing Edge Up = +, Pitch Up = +, Elevator Trailing Edge Up = +.

## Pressure Altitude and Airspeed

The FDR receives pneumatic pressure directly from the copilots pitot static system. Pressure transducers in the FDR convert the pressures to the electronic signals that are recorded on the FDR as altitude and airspeed. The FDR pressure transducers used to sense altitude and airspeed are not corrected for instrumentation or position error; and therefore, may differ from values displayed to the crew and transmitted by the mode-C transponder. In addition, the "Pressure Altitude" conversion algorithm used to convert the recoded values to engineering units is based on a standard altimeter setting of 29.92 inches of mercury (in Hg). The altitude values presented in the FDR plots and in the electronic data have not been corrected for the local altimeter setting at the time of the accident.

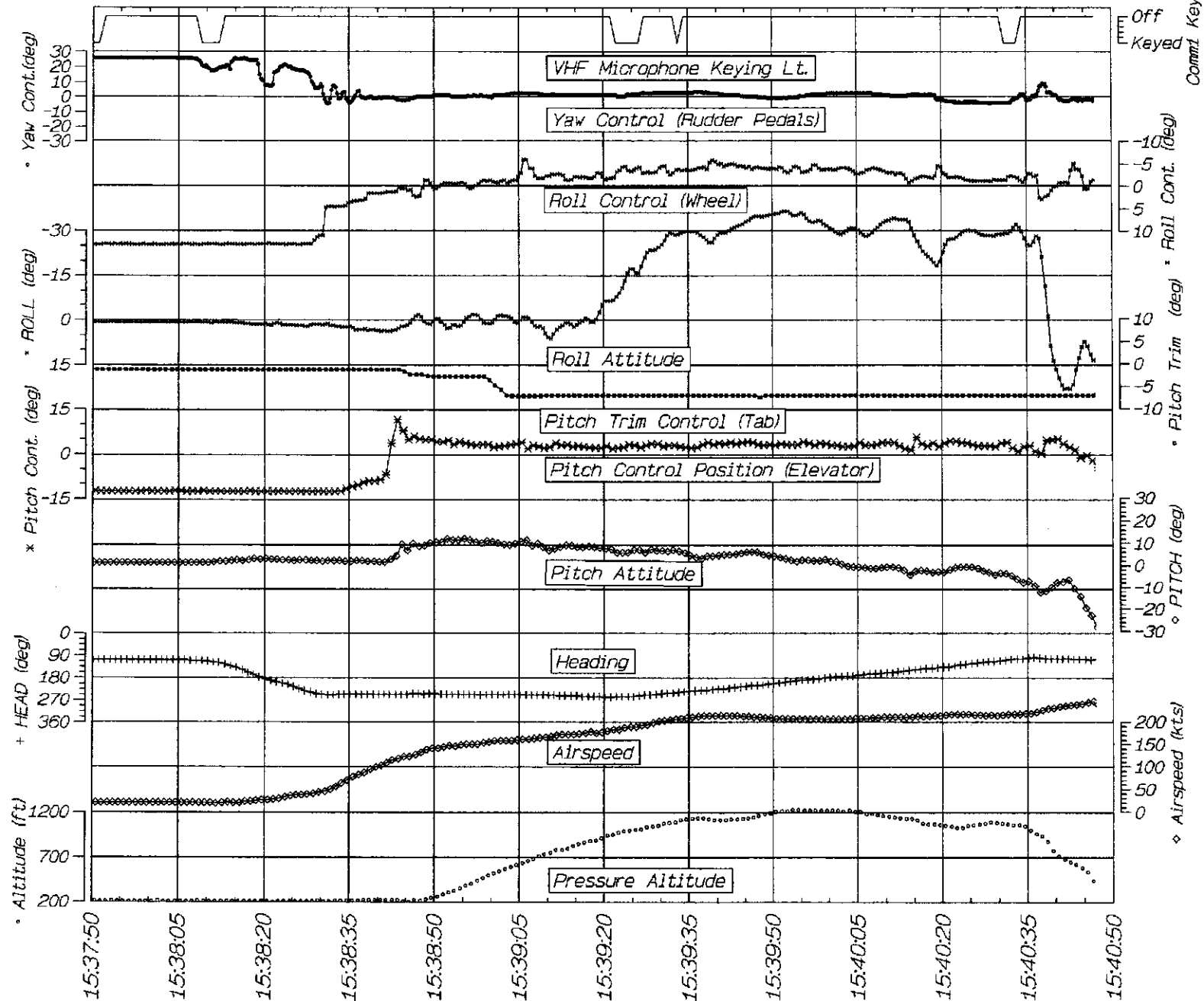
## Data Plots

The following plot contains information recorded during the accident flight commencing with takeoff roll at Hyannis Airport and ending when the airplane impacted the water. Parameters selected for plotting are those pertinent to the fact conditions and circumstances surrounding this accident. The table below lists the parameter name; plot label, axis abbreviation and units. The plots are configured such that left turns are indicated by the trace moving toward the top of the page, right toward the bottom. The parameters "Altitude", "Airspeed", "Heading", "Pitch" and "Roll" are on both plots for reference purposes.

Parameter	Plot Label	Axis Abbreviation (units)
Time: Subframe Ref. Correlated to ATC Radar Local Time, 24hr. Clock	Not Applicable	Local Time (Hr:Min:Sec)
Pressure Altitude (FDR Sensor)	Pressure Altitude	Altitude (ft)
Airspeed (FDR Sensor)	Airspeed	Airspeed (kts)
Heading (Magnetic)	Heading	HEAD (deg)
Pitch Attitude	Pitch Attitude	PITCH (deg)
Roll Attitude	Roll Attitude	ROLL (deg)
Left VHF Radio Manual Transmitter Keying	VHF MICROPHONE KEYING LT.	Comm1 Keying
Propeller RPM of Each Engine	Propeller Speed Left	Prop Spd Eng 1 (RPM)
	Propeller Speed Right	Prop Spd Eng 2 (RPM)
Torque Each Engine	Engine Torque Left	Torque Eng 1 (ft/lbs)
	Engine Torque Right	Torque Eng 2 (ft/lbs)
Vertical Acceleration	Vertical Acceleration	Vert Accel (g)
Longitudinal Acceleration	Longitudinal Acceleration	Long Accel (g)
Lateral Acceleration	Lateral Acceleration	Lat Accel (g)
Pitch Control (Elevator)	Pitch Control Position (Elevator)	Pitch Cont. (deg)
Pitch Trim Tab Position	Pitch Trim Control Position (Tab)	Pitch Trim (deg)
Roll Control (Wheel)	Roll Control (Wheel)	Roll Cont. (deg)
Yaw Control (Rudder Pedals)	Yaw Control (Rudder Pedals)	Yaw Cont. (deg)
Flap Position	Flap Position	Flaps (Up, Appr, Down)

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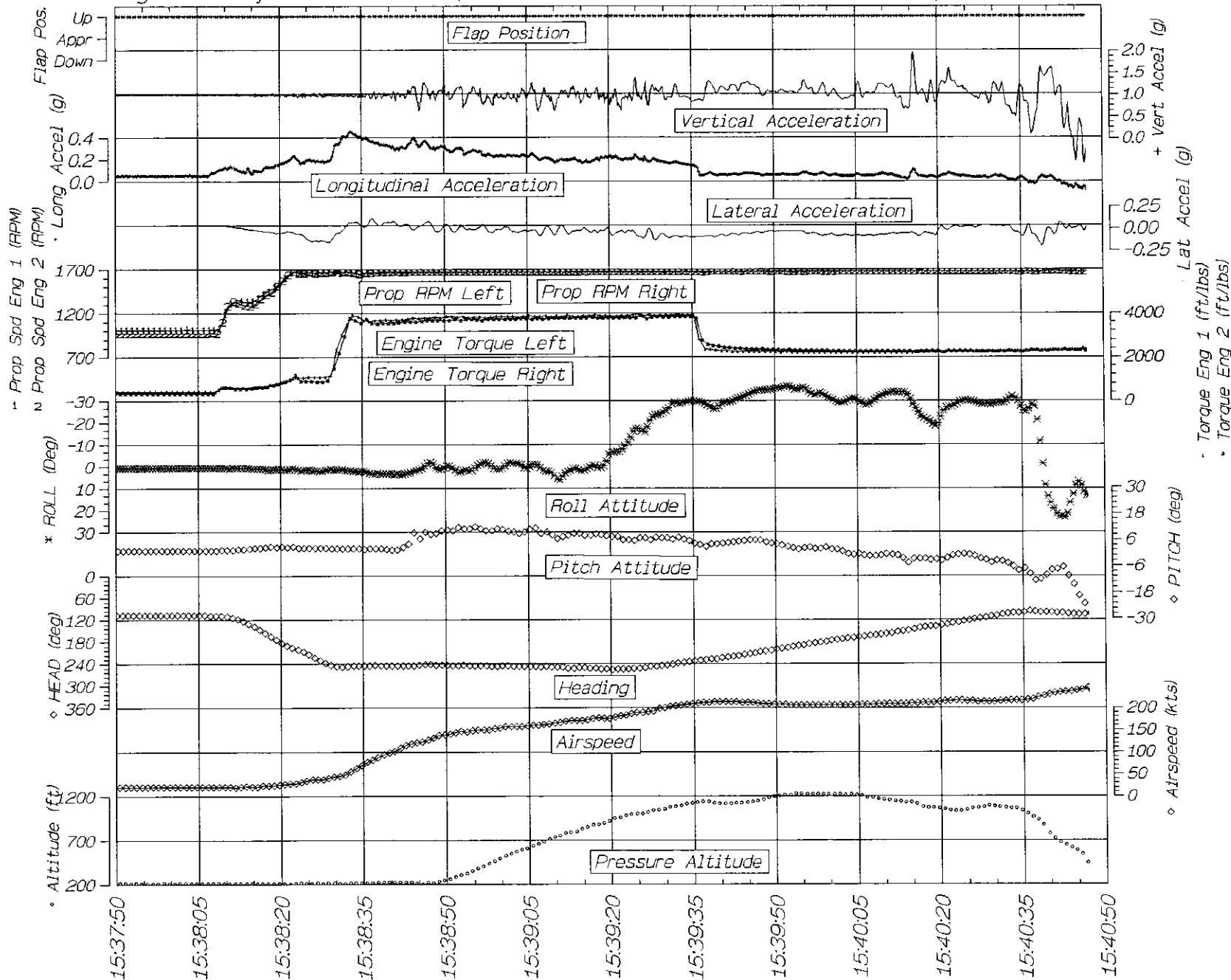
Revised: December 19, 2003

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### **FDR Correlation to Local Time**

The FDR subframe reference number (elapsed seconds) was converted to local time by a correlation of the FDR and Air Traffic Control (ATC) radar altitude time histories established by the Aircraft Performance Group (see Aircraft Performance Study for more details). The correlation to local time expressed as seconds past midnight is as follows:

$$\text{Local Time (ATC}_{\text{radar}}\text{) sec.} = \text{FDR (Subframe Ref.}_{\text{seconds}}\text{)} - 294826 \text{ sec.}$$

### **Tabular Data**

Attachment I is a tabular listing of the data used to create the plot included above. Timing of the data is to the nearest second, referred to as FDR Subframe Reference Number (SRN). Attachment I is only available in electronic format as a comma delimited (aka) comma separated variable (CRV) file.


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