NATIONAL TRANSPORTATION SAFETY BOARD
Vehicle Recorder Division

April 24, 2020

Cockpit Display – Recorded Flight Data

Specialist's Factual Report
By Kyle Garner

1. EVENT SUMMARY

Location: Elizabethton, Tennessee
Date: August 15, 2019
Aircraft: Cessna Citation Latitude 680A
Registration: N8JR
Operator: JRM Air, LLC
NTSB Number: ERA19FA248

On August 15, 2019, about 15:37 eastern daylight time (EDT), a Textron Aviation Inc. Cessna Citation Latitude 680A, registration N8JR, was destroyed during a runway excursion after landing at Elizabethton Municipal Airport (0A9), Elizabethton, Tennessee. The flight originated at Statesville Regional Airport (SVH), Statesville, North Carolina. The airline transport-rated pilot and copilot were not injured. The three passengers sustained minor injuries. The airplane was registered to JRM Air LLC and operated under the provisions of Title 14 *Code of Federal Regulations (CFR)* Part 91 as a business flight. Day, visual meteorological conditions prevailed, and no flight plan was filed.

2. RECORDED FLIGHT DATA GROUP

A recorded flight data group was not convened.

3. DETAILS OF INVESTIGATION

The National Transportation Safety Board (NTSB) Vehicle Recorder Division received the following device:

Recorder Manufacturer/Model: **Garmin G5000 SD Card**
Recorder Serial Number: **N/A**

3.1. Garmin G5000 SD Data Card Description

The Garmin G5000 Integrated Flight Deck is a collection of multiple avionics units which include flight displays, air data computers, attitude/heading reference system (AHRS), communications and other systems. A typical installation includes a primary flight display (PFD) and a multi-function display (MFD). Each display includes two SD card slots, an upper and a lower slot. The lower SD card slot is used by the system for software updates and various databases.

Depending on the display unit software, the aircraft can include a data logging feature. The data logging feature must be enabled by the aircraft operator. If the data logging feature is available and enabled, an SD card must be installed in the upper slot of the MFD. Depending on the airframe and engine combination as many as 64 parameters can be stored at a rate of one sample per second (1Hz). According to the manufacturer of the display unit, one flight hour can be stored in approximately 2 MB. The SD card typically used is 2 GB in size and can store over 1,000 flight hours.

3.1.1. Data Recovery

The SD card was in good condition and the data were extracted normally.

3.1.2. Data Description

The G5000 SD card received stores flight data in individual flight logs. The SD card contained approximately 1,500 log files. The accident flight recording was identified as the last log stored on the card and was approximately 45 minutes in duration.

3.1.3. Engineering Units Conversions

The flight log data stored in the individual files was converted to engineering units by the display unit, thus, no further conversions were required.

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

3.2. Time Correlation

The G5000 records time with the first data sample based on the unit's internal clock. This clock is set and updated by the unit and is based on Universal Coordinated Time (UTC) GPS time. The internal logic of the G5000 also converts UTC GPS time to local time, EDT, which is recorded in the data file. Therefore, this report uses EDT time as recorded on the SD card.

3.3. Plots and Corresponding Tabular Data

The following five figures contain data recorded during the August 15, 2019, event. These figures are configured such that right turns are indicated by the trace moving toward the bottom of the page, left turns towards the top of the page, and nose up attitudes towards the top of the page.

Figures 1 and 2 are a map overlay created in Google Earth of the approach flight path for the accident flight into 0A9. Weather and atmospheric conditions in the overlay are not representative of conditions at the time of the flight.

Figure 3 is a graphical presentation of basic flight parameters including airspeed, altitude MSL, and vertical speed recovered from the G5000 for the entire accident flight. The data show the accident flight departed SVH at approximately 15:19:56 and the initial touchdown at 0A9 was at approximately 15:37:49. The last recorded data was at 15:38:27, 38 seconds after the initial touchdown.

Figure 4 is a graphical presentation of engine parameters recovered from the G5000 for the entire accident flight. Vertical speed and altitude MSL are also depicted on the figure for reference.

Figure 5 is a graphical presentation of basic flight parameters during the approach to 0A9. The data begins at 15:35:00 at an altitude MSL of approximately 5,000 feet and an indicated airspeed of 203 knots. At the initial touchdown at 15:37:49, the recorded ground speed was 131 knots, indicated airspeed was 125 knots, the wind was 245 deg at approximately 3 knots, and vertical speed was approximately -321 fpm. A maximum vertical acceleration of 4g was recorded at 15:38:14, 25 seconds after the initial touchdown. The plot then ends at 15:38:30, two seconds after the final recorded data point.

The corresponding tabular data used to create Figures 1-5 are provided in a compressed electronic (*.csv[1]) format as Attachment 1 to this report.
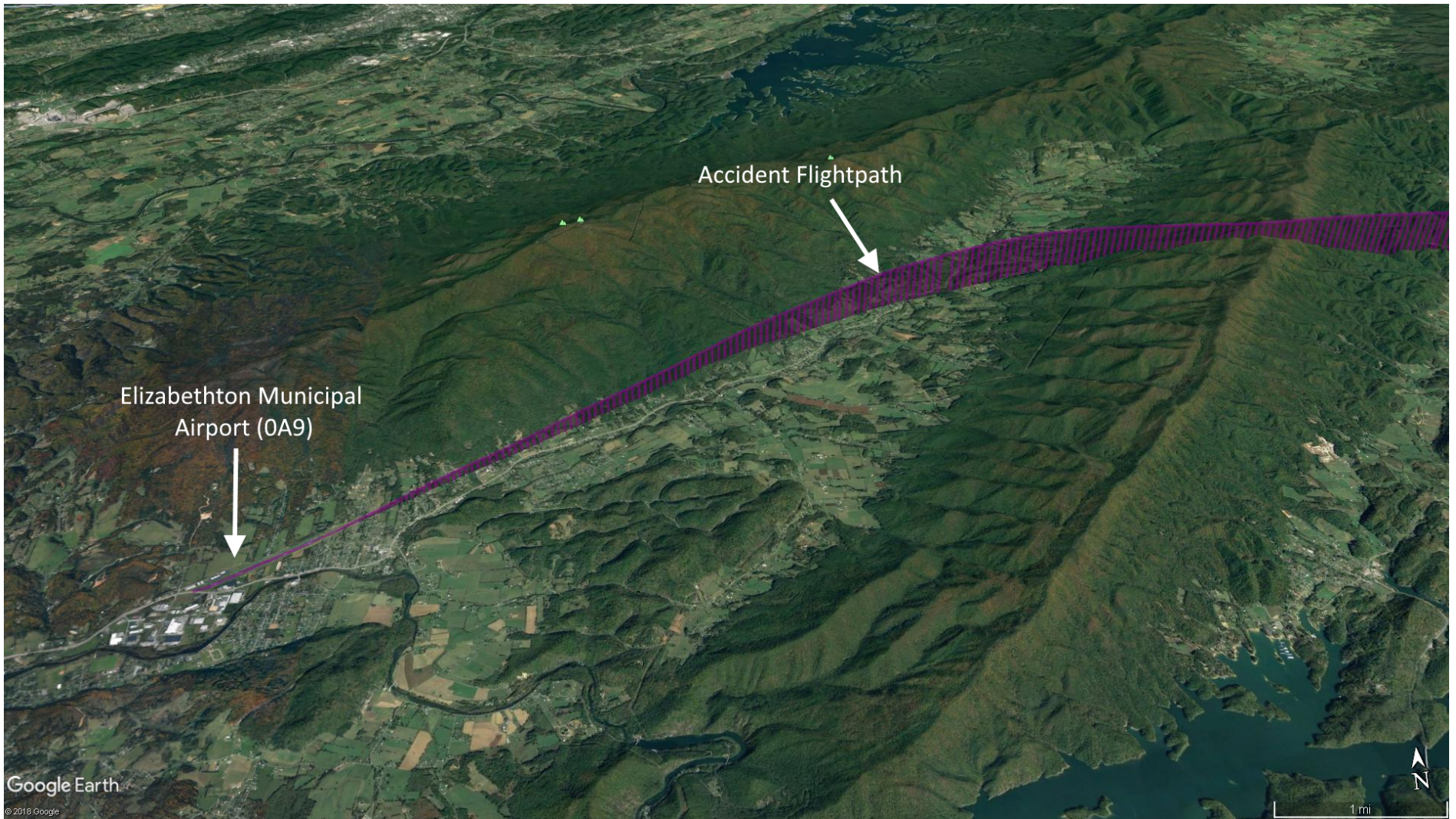
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[1] Comma Separated Value format.

Figure 1. Google Earth Overview of Accident Flight Approach to 0A9.

Text labels visible in the image:
- Accident Flightpath
- Elizabethton Municipal Airport (0A9)
- Last Recorded Data
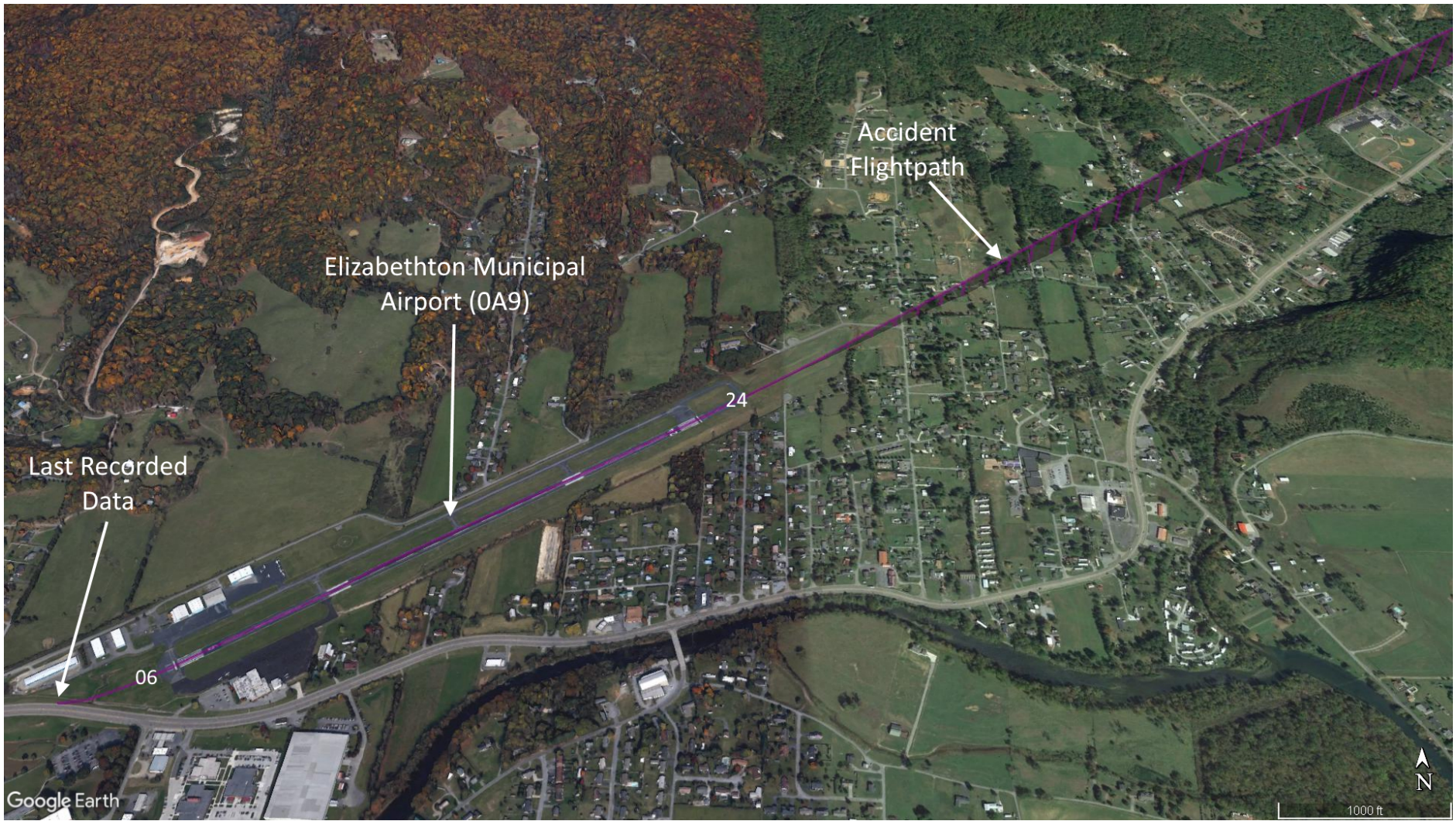- 24
- 06
- Google Earth
- N
- 1000 ft

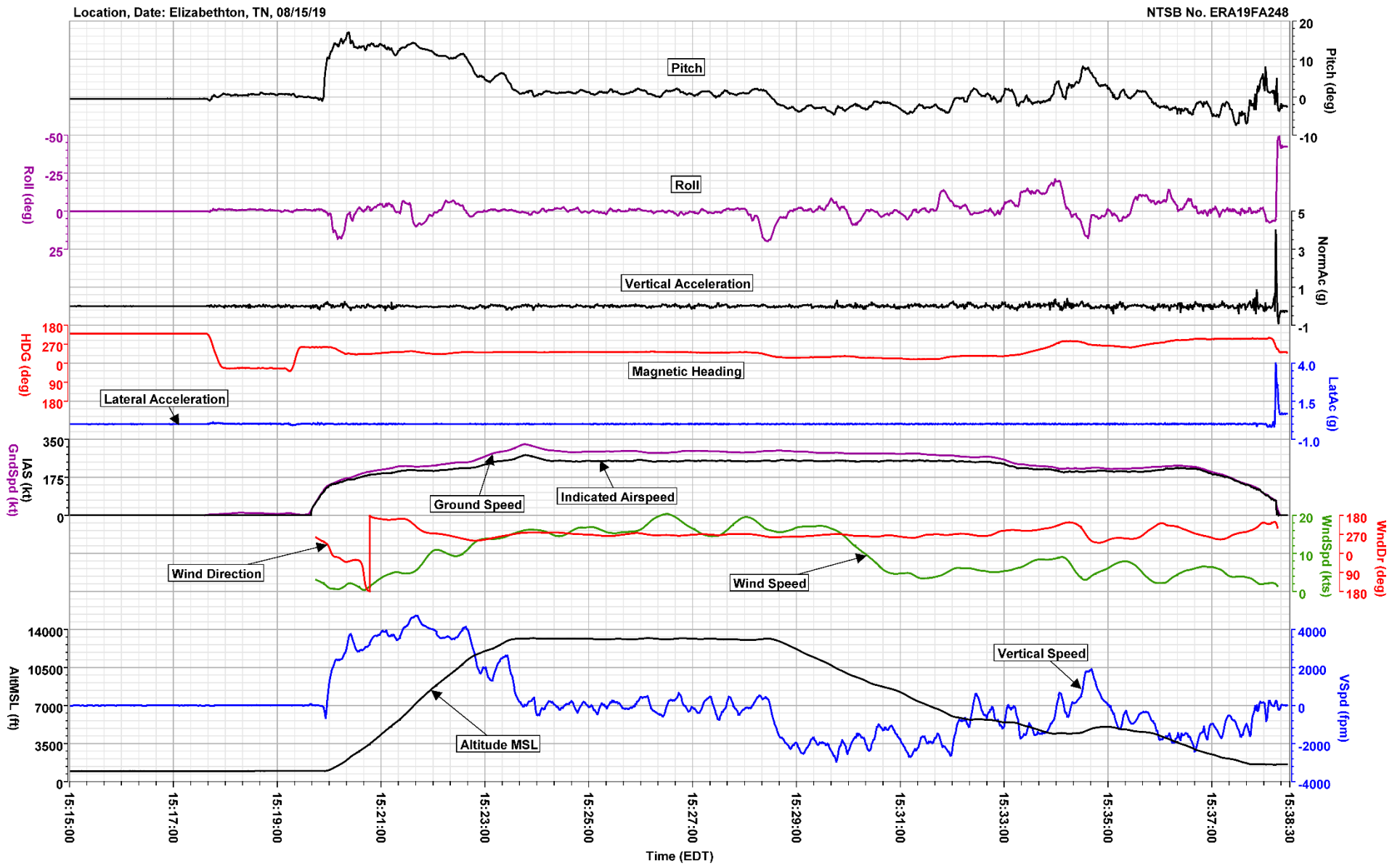**Figure 2.** Google Earth Overview of Accident Flight Approach to 0A9.

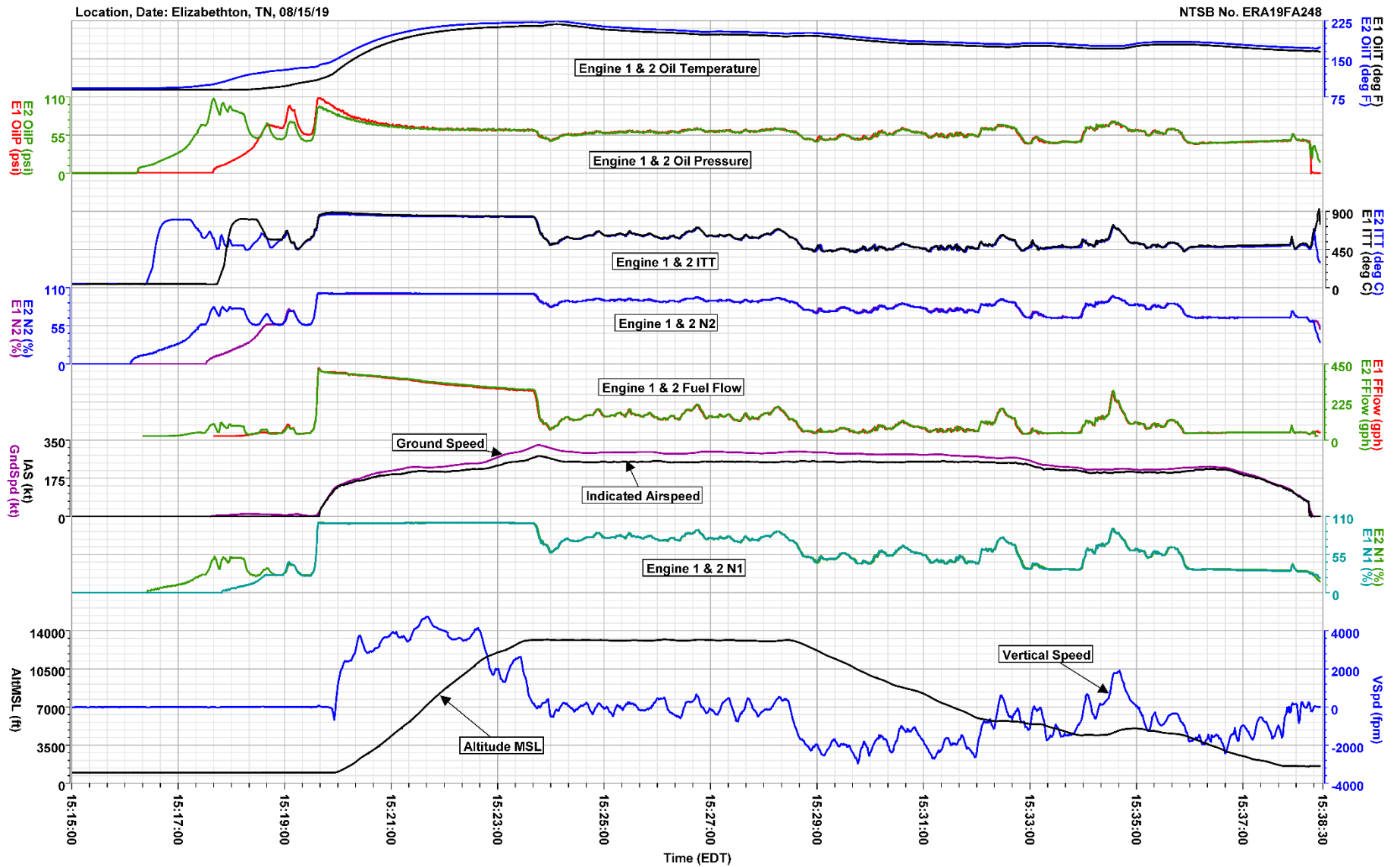**Figure 3.** Basic Parameters for Full Accident Flight.

Figure 4. Engine Parameters for Full Accident Flight.
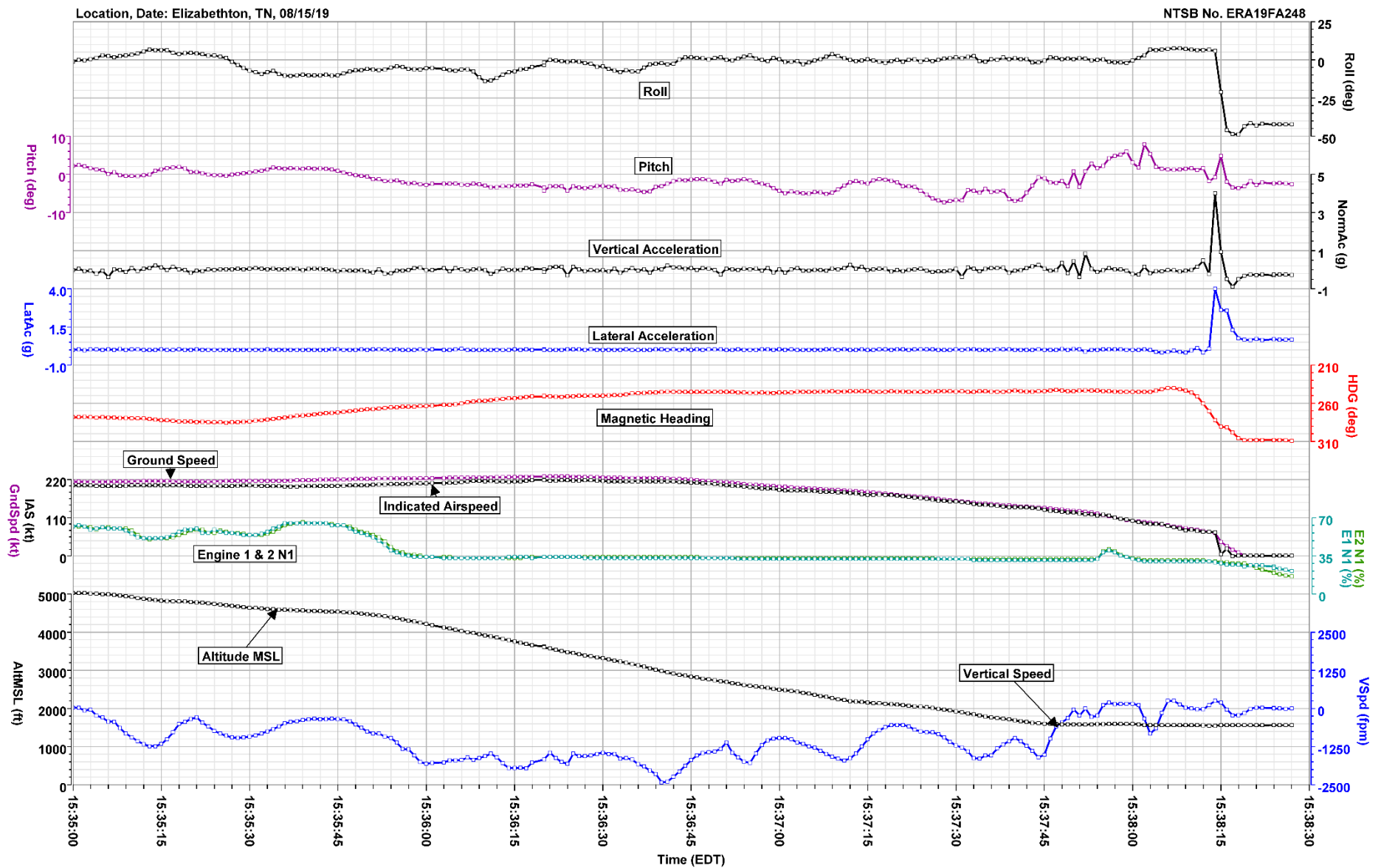
Figure 5. Basic Parameters for Accident Flight Approach into 0A9.

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 parameters.

Parameter Name	Parameter Description	Units
AfcsOn	Automatic Flight Control System On	-
AltMSL	Altitude Mean Sea Level	ft
E1 FFlow	Left Engine Fuel Flow	gph
E2 FFlow	Right Engine Fuel Flow	gph
E1 ITT	Left Engine Interstage Turbine Temperature	degC
E2 ITT	Right Engine Interstage Turbine Temperature	degC
E1 N1	Left Engine N1 Speed	%
E2 N1	Right Engine N1 Speed	%
E1 N2	Left Engine N2 Speed	%
E2 N2	Right Engine N2 Speed	%
E1 OilP	Left Engine Oil Pressure	psi
E2 OilP	Right Engine Oil Pressure	psi
E1 OilT	Left Engine Oil Temperature	degF
E2 OilT	Right Engine Oil Temperature	degF
GndSpd	Ground Speed	kts
HDG	Magnetic Heading	deg
IAS	Indicated Airspeed	kts
LatAc	Lateral Acceleration	g
Latitude	Latitude	deg
Longitude	Longitude	deg
NormAc	Vertical Acceleration	g
Pitch	Pitch	deg
PitchC	Autopilot Pitch Command	deg
PitchM	Autopilot Pitch Mode	-
Roll	Roll	deg
RollC	Autopilot Roll Command	deg
RollM	Autopilot Roll Mode	-
VSpd	Vertical Speed	fpm
Wind Direction	Wind Direction	deg
Wind Spd	Wind Speed	kts

Table A-2. Unit abbreviations.

Units Abbreviation	Description
%	percent
degC	degrees Celsius
degF	degrees Fahrenheit
fpm	feet per minute
ft	feet
g	gravitational acceleration
gph	gallons per hour
kts	knots
MSL	mean sea level
psi	pounds per square inch

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.