

NATIONAL TRANSPORTATION SAFETY BOARD

Vehicle Recorder Division

Washington, D.C. 20594

November 8, 2019

Cockpit Displays – Recorded Flight Data

Specialist's Factual Report by Kyle Garner

1. EVENT

Location: Uvalde, Texas
Date: November 3, 2018
Aircraft: Bell 206B
Registration: N417WT
Operator: W T Byler Co Inc
NTSB Number: CEN19FA024

On November 3, 2018, about 23:50 central daylight time (CDT), a Bell 206B helicopter, N417WT, impacted terrain near Uvalde, Texas. The airline transport rated pilot and two passengers were fatally injured, and the helicopter was destroyed. The helicopter was registered to and operated by W T Byler company, Inc. under the provisions of Title 14 *Code of Federal Regulations (CFR)* Part 91 as a personal flight. The flight departed a private ranch about 23:40 CDT en route to San Antonio.

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 electronic devices:

Device 1:	Chelton Integrated Display Unit (IDU) III
Device 1 Serial Number:	40557
Device 2:	Chelton IDU-III
Device 2 Serial Number:	40558

3.1. Chelton Device Description

The IDU-III is a flight/navigation instrumentation system that provides information to a pilot via computer generated screens shown on panel-mounted hardware. The displays can be configured as either a primary flight display (PFD), showing only information critical to flight, or a multifunction display (MFD) capable of showing a variety of system, navigation and weather information screens.

Each IDU contains two internally mounted flash memory devices (PCMCIA format) capable of logging flight data that can be removed from the unit for download. The data logging files contain recordings of flight and, if enabled, engine parameters at one second intervals of up to five hours each from the previous five operations of the system. Additionally, every five seconds the IDU snapshots two binary files: (a) external parameters received by the IDU in an "ac.dat" file and (b)

internal menu parameters indicating how the system was being operated in the “settings.dat” file. The recording begins after the pilot acknowledges the installed database dates by pressing a button on the IDU bezel and after internal diagnostics verify primary sensors are available.

Each time a parameter is recorded a Coordinated Universal Time (UTC) timestamp followed by three lines of comma delimited ASCII text data are written, where the first line contains flight parameters, the second line contains engine #1 parameters, and the third line contains engine #2 parameters (if equipped). A list of available parameters and engineering units are provided in Table 1.

Table 1 – Potential Recorded Parameters

First Line (Flight)	Second Line (Engine #1)*	Third Line (Engine #2)*
Latitude, deg	N1, rpm	N1, rpm
Longitude, deg	Fuel Flow, gph	Fuel Flow, gph
MSL Altitude, ft	Aux 1	Aux 1
Pitch Angle, deg	Left Fuel, gal	-
Bank Angle, deg	Right Fuel, gal	-
Magnetic Heading, deg	Fuel Pressure, psi	Fuel Pressure, psi
Magnetic Track, deg	Aux 5	Aux 5
IAS, kts	Oil Temperature, degF	Oil Temperature, degF
TAS, kts	Oil Pressure, psi	Oil Pressure, psi
Ground Speed, kts	Volts, V	Volts, V
VSI, fpm	EGT #1, degF	EGT #1, degF
Glidepath, deg	CHT #1, degF	CHT #1, degF
G-force, g	EGT #2, degF	EGT #2, degF
Wind Speed, kts	CHT #2, degF	CHT #2, degF
Magnetic Wind Direction, deg	EGT #3, degF	EGT #3, degF
OAT, degF	CHT #3, degF	CHT #3, degF
Density Altitude, ft	EGT #4, degF	EGT #4, degF
Fuel Totalizer Qty, gal	CHT #4, degF	CHT #4, degF
	EGT #5, degF	EGT #5, degF
	CHT #5, degF	CHT #5, degF
	EGT #6, degF	EGT #6, degF
	CHT #6, degF	CHT #6, degF
	Aux Temp #1, degF	Aux Temp #1, degF
	Aux Temp #2, degF	Aux Temp #2, degF
	Induction Temperature, degF	Induction Temperature, degF

**According to the Chelton EFIS Installation Guide¹, engine parameters are currently not recorded in certified installations.*

3.1.1. Chelton Data Recovery

Upon arrival at the Vehicle Recorder Division, an exterior examination revealed the devices had sustained minor impact damage during the event. The extent of the damage to both devices is shown in Figures 1 and 2.

Each unit contained two PCMCIA cards, which were removed from the unit. One card from each unit contained the flight log, “ac.dat,” and “settings.dat” files. These files were copied off the card using a PCMCIA card reader.

¹ Chelton Flight Systems EFIS-SV Installation Guide, 64-000038 Revision C.



Figure 1. Photo of damaged device #1 (S/N 40557)



Figure 2. Photo of damaged device #2 (S/N 40558)

3.1.2. IDU Data Description

Each IDU flight log recording contained records of five power cycles corresponding to the last five flights. Data from both IDUs were compared and confirmed to contain the same data; as such, only the data from IDU serial number 40557 are used in this report.

3.1.3. IDU Engineering Units Conversions

The IDU records information in engineering units; therefore, no conversions were necessary.

Table A-1 in Appendix A lists the IDU parameters verified and provided in this report.

3.1.4. IDU Settings Data

With assistance from the manufacturer, the “ac.dat” and “settings.dat” files containing data from the final five seconds of the accident flight were decoded. Values pertinent to this investigation from IDU serial number 40557 include:

- Altimeter setting was 30.05 inHg;
- Above Ground Level (AGL) altitude used by the terrain awareness warning system (TAWS) was 140 feet (ft);
- Altitude indicated on the IDU was 1538 ft; and
- TAWS & Helicopter TAWS (HTAWS) Low Altitude alerts were set to “inhibit”

The IDU records barometric altitude as it is indicated on the IDU, which is based on the altimeter setting set by the pilot.

3.2. Time Correlation

Each IDU record contains a GPS date and timestamp recorded in UTC. The data was converted to local time, CDT, by subtracting five hours. Therefore, for the rest of this report all times are referenced as CDT.

3.3. Plots and Tabular Data

Figures 3 to 6 contain IDU data during the November 3, 2018 event. There were no engine parameters recorded by the IDU.

These plots 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.

Figure 3 is a Google Earth presentation of the track of the accident flight generated from latitude and longitude data recorded on the IDU. The accident helicopter departed from a private ranch near Uvalde, Texas at about 23:41:58 CDT. The weather, season, and lighting conditions in Google Earth are not representative of the conditions at the time of the accident.

Figure 4 is a Google Earth presentation of the final data point recorded by the IDU. The last data point was recorded at 23:47:02 CDT, approximately 5 minutes after departure from the private ranch, at an indicated altitude of 1538 ft, ground speed of 61 knots (kts), and a vertical speed of -60 feet per minute (fpm).

Figure 5 is a graphical presentation of flight parameters including indicated airspeed, indicated altitude, and vertical speed recovered from the IDU for the entire accident flight. The time interval is 23:41:45 CDT to 23:47:05 CDT.

Figure 6 is a graphical presentation of flight parameters including indicated airspeed, indicated altitude, and vertical speed recovered from the IDU for the final minute of the accident flight recording. The time interval is 23:46:05 CDT to 23:47:05 CDT.

The corresponding tabular data used to create figures 2 to 6 are provided in electronic .csv format as attachment 1 to this report.



Figure 3. Overview of IDU GPS Data for Accident Flight

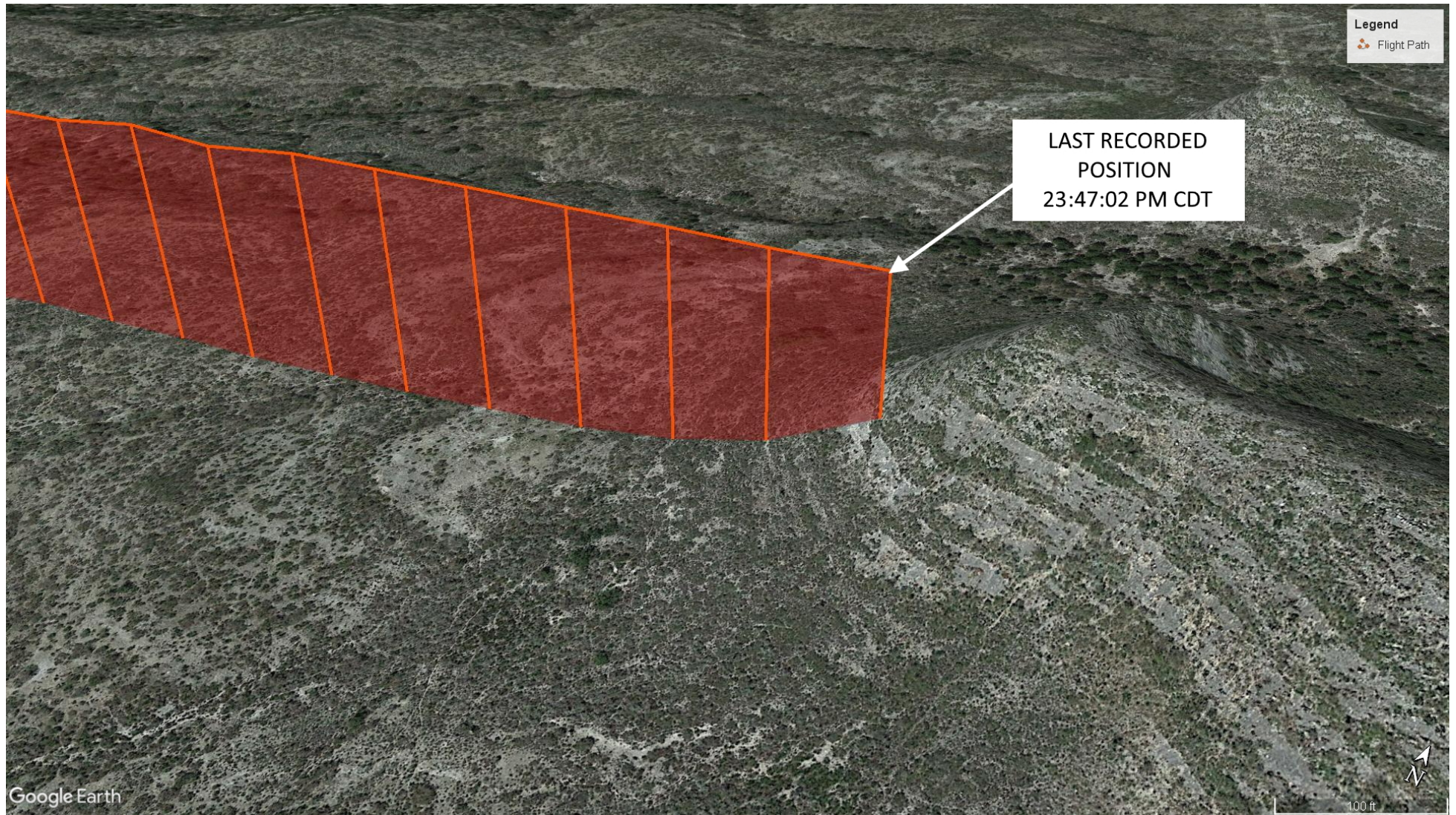


Figure 4. Last Recorded Position of IDU GPS Data for Accident Flight

Full Accident Flight

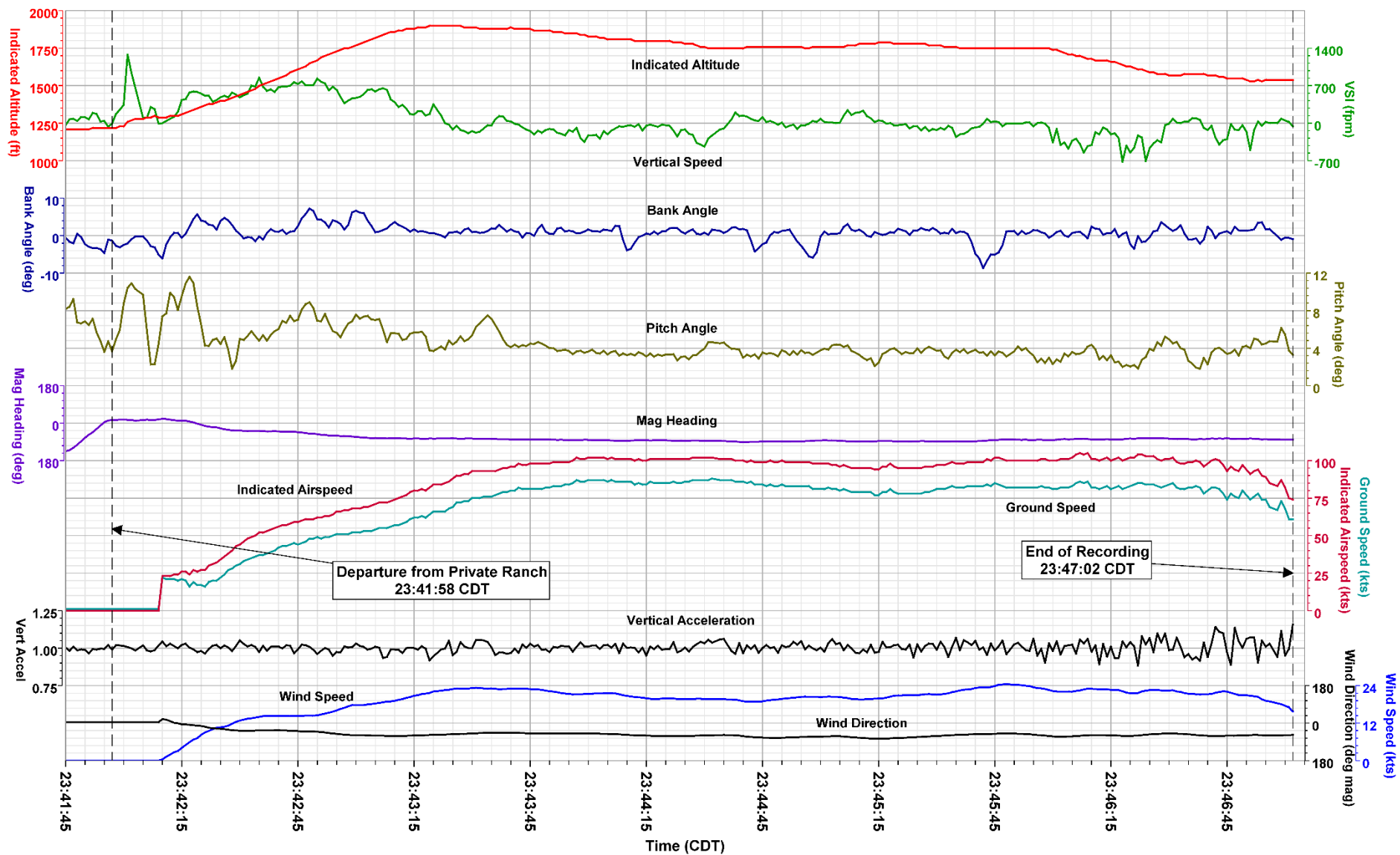


Figure 5. Plot of IDU Parameters for Full Accident Flight

Last Minute of Accident Flight Recording

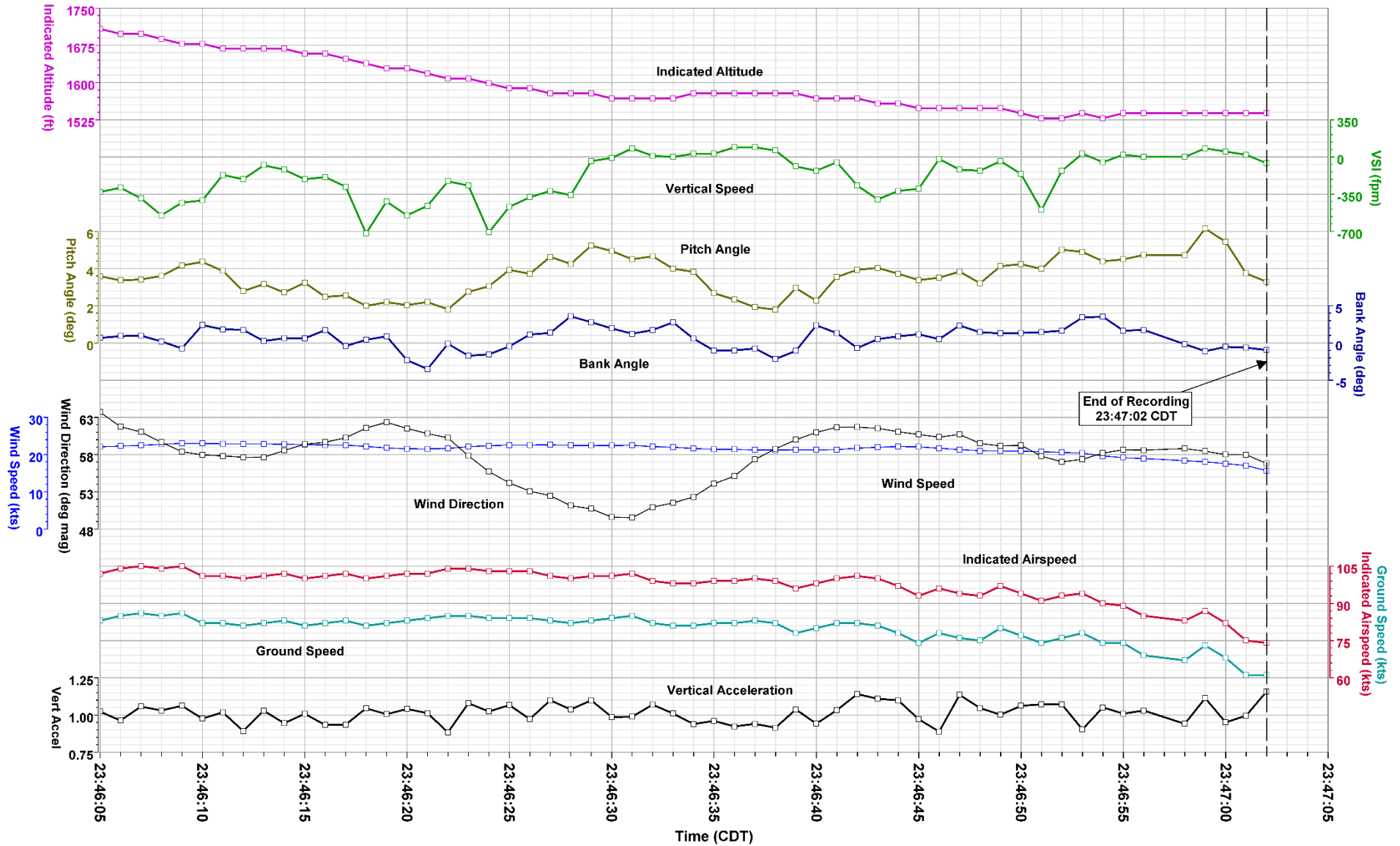


Figure 6. Plot of IDU Parameters for Last Minute of Accident Flight Recording

Appendix A – List of Verified Parameters

This appendix describes the parameters provided and verified in this report. Table A-1 lists the plot/table labels, parameter names, and units. Additionally, Table A-2 describes the unit and discrete abbreviations used in this report.

Table A-1. Verified and provided parameters.

Plot/Table Labels	Parameter Names	Units
Bank Angle	Bank Angle	deg
Ground Speed	Ground Speed	kts
Indicated Airspeed	Indicated Airspeed	kts
Indicated Altitude	Indicated Altitude	ft
Latitude	Latitude	deg
Longitude	Longitude	deg
Mag Heading	Magnetic Heading	deg
Pitch Angle	Pitch Angle	deg
Time (CDT)	Local central daylight time	hh:mm:ss
Vert Accel	Vertical Acceleration	g
VSI	Vertical Speed	fpm
Wind Direction	Wind Direction	deg
Wind Speed	Wind Speed	kts

NOTE: Parameters with a blank unit description in Table A-1 are discretes. 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.

Table A-2. Unit and discrete abbreviations.

Unit and Discrete Abbreviations	Descriptions
deg	degrees
CDT	central daylight time
ft	feet
fpm	feet per minute
g	gravitational constant
hh	hours
kts	knots
mm	minutes
ss	seconds