

National Transportation Safety Board

Office of Research and Engineering

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DCA22LA069

FLIGHT DATA RECORDER

Specialist's Factual Report

October 12, 2023

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A. ACCIDENT

Location: Hayden, Colorado
Date: January 22, 2022
Time: 1158 mountain standard time (MST)
Airplane: Airbus A320-232, JetBlue Airways, N760JB

B. FLIGHT DATA RECORDER SPECIALIST

Specialist Kyle Garner
Sr. Aerospace Engineer - Recorder Specialist
National Transportation Safety Board (NTSB)

C. FEDERAL CARRIAGE REQUIREMENTS

The accident airplane was manufactured in 2008 and was operating such that it was required to be equipped with a flight data recorder (FDR) that recorded, at a minimum, 88 parameters, as cited in 14 CFR Part 121.344(f).

D. DETAILS OF THE INVESTIGATION

An FDR group was not convened.

1.1 FDR Description

The NTSB received an electronic file, downloaded by the operator, containing FDR data from the accident airplane.

The FDR recording contained approximately 27 hours of data. The accident flight was the last flight of the recording; however, the file did not contain the entirety of the accident flight. The data in the file ended after the accident occurred, but before the airplane landed at Denver International Airport (DEN). It was determined that the file was truncated by the operator before it was sent to the NTSB¹, and it was not a result of equipment failure.

¹ The reason for the truncation is unknown, however, the operator did provide Digital ACMS¹ Recorder (DAR) data for the entirety of the accident flight. Due to the complexities of decoding DAR data and because the accident-relevant data was captured by the FDR, only the truncated FDR data is discussed in this report.

The cockpit voice recorder (CVR)² was sent to the NTSB for review and captured the entirety of the accident flight, including the landing at DEN. The CVR recording ended at 12:57:11 MST.

The parameters evaluated for the purpose of this report appeared to be in accordance with federal FDR carriage requirements.

1.1.1 Engineering Unit Conversions

The engineering unit conversions used for the data contained in this report are based on documentation from the aircraft manufacturer. 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=+).³

Table 1 lists the FDR parameters verified and provided in this report. Additionally, Table 2 describes the unit abbreviations used in this report.

1.2 Time Correlation

Timing of the FDR data is measured in subframe reference number (SRN), where each SRN equals one elapsed second. Correlation of the FDR data from SRN to the event local time, MST, was established by using the recorded coordinated universal time (UTC) Hours, UTC Minutes, and UTC Seconds and then applying an additional 6 hours offset to change UTC to MST.

Accordingly, the time offset for the event flight data from SRN to local MST is the following:

$$\text{FDR local time (MST)} = \text{FDR SRN} - 52194$$

For the remainder of this report, all time is given in MST unless otherwise noted.

E. FIGURE AND TABULAR DATA

Figures 1 to 5 contain selected FDR data recorded during the event on January 22, 2022. The corresponding tabular data used to create Figures 1 to 5 and the

² For more information about the CVR, refer to the *Cockpit Voice Recorder - Specialist's Factual Report*, which is in the docket for this accident.

³ 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 = +, Left Aileron Trailing Edge Down = -, Right Aileron Trailing Edge Up = +, Pitch Up = +, Elevator Trailing Edge Up = +, Right Rudder = +.

parameters listed, but not plotted, in Table 1 are provided in electronic comma-separated value (CSV) format as attachment 1 to this report.

The 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.

Figure 1 is a plot of relevant parameters, from 11:56:30 to 11:58:00 MST, of the accident flight's takeoff from Yampa Valley Regional Airport (HDN). Figures 2 to 5 are plots showing basic, pitch-related, roll-related, and autopilot/autothrust-related parameters for two minutes of the accident takeoff from 11:56:30 to 11:58:30 MST, respectively.

For this flight, the captain, seated in the left seat, was the pilot flying (PF) and the first officer, seated in the right seat, was the pilot monitoring (PM).

The data show the following:

- The left (PF) sidestick indicated forward (nose-down) deflection as the airplane accelerated down the runway at HDN. There was no deflection of the right (PM) sidestick, in any direction, during the takeoff roll.
- At 11:57:17, the left (PF) sidestick transitioned from forward (nose-down) deflection to rearward (nose-up) deflection. The computed airspeed was about 94 knots.
- The left (PF) sidestick continued rearward (nose-up) deflection to a maximum of about 6 deg four seconds later, 11:57:21, before returning to a neutral position one second later, 11:57:22. During this time, pitch was a maximum of about 2 deg nose-up.
- At 11:57:22, the nose landing gear indicated not compressed for one second.
- At 11:57:23, the left (PF) sidestick again deflected rearward (nose-up). The computed airspeed was about 118 knots. Pitch began to increase.
- At 11:57:26, vertical acceleration reached 1.15g, the peak for the duration of the takeoff roll.
- At 11:57:29, all three landing gears indicated not compressed and radio altitude began to increase.
- At 11:57:31, the left (PF) sidestick began to deflect to the right. Roll indicated positive (right roll) shortly thereafter.

- At 11:57:43, as the airplane continued to climb, TCAS indicated traffic advisory (TA) most dangerous⁴.

The data show the airplane continued to climb to an altitude of 38,000 feet MSL. The data in the FDR file ended at 12:32:24 before the airplane landed at DEN.

Submitted by:

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⁴ The term "TA most dangerous" is sourced from the parameter definitions provided by the aircraft manufacturer and is not an expression of opinion by the NTSB.

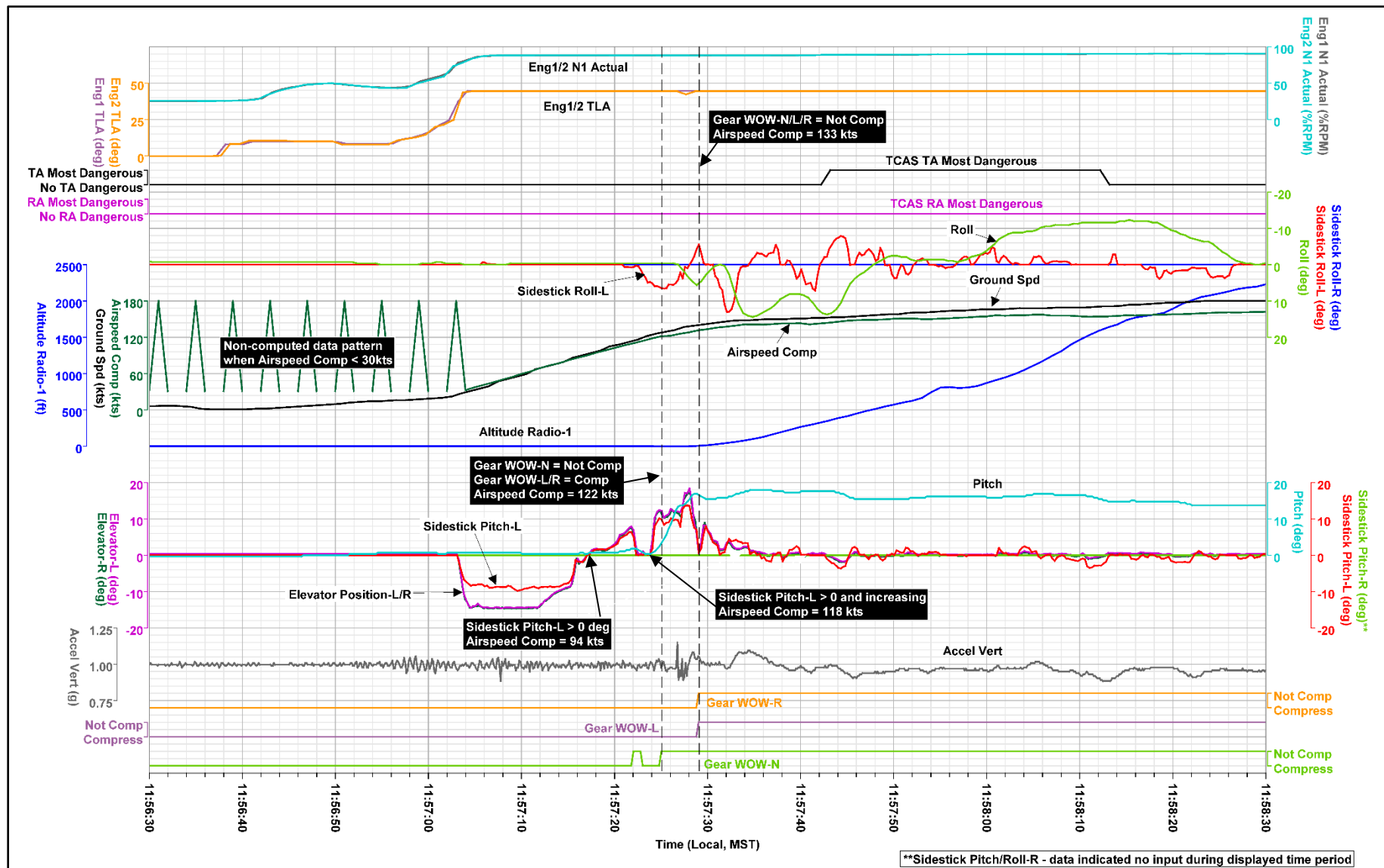


Figure 1. Plot of relevant parameters for accident flight takeoff from HDN.

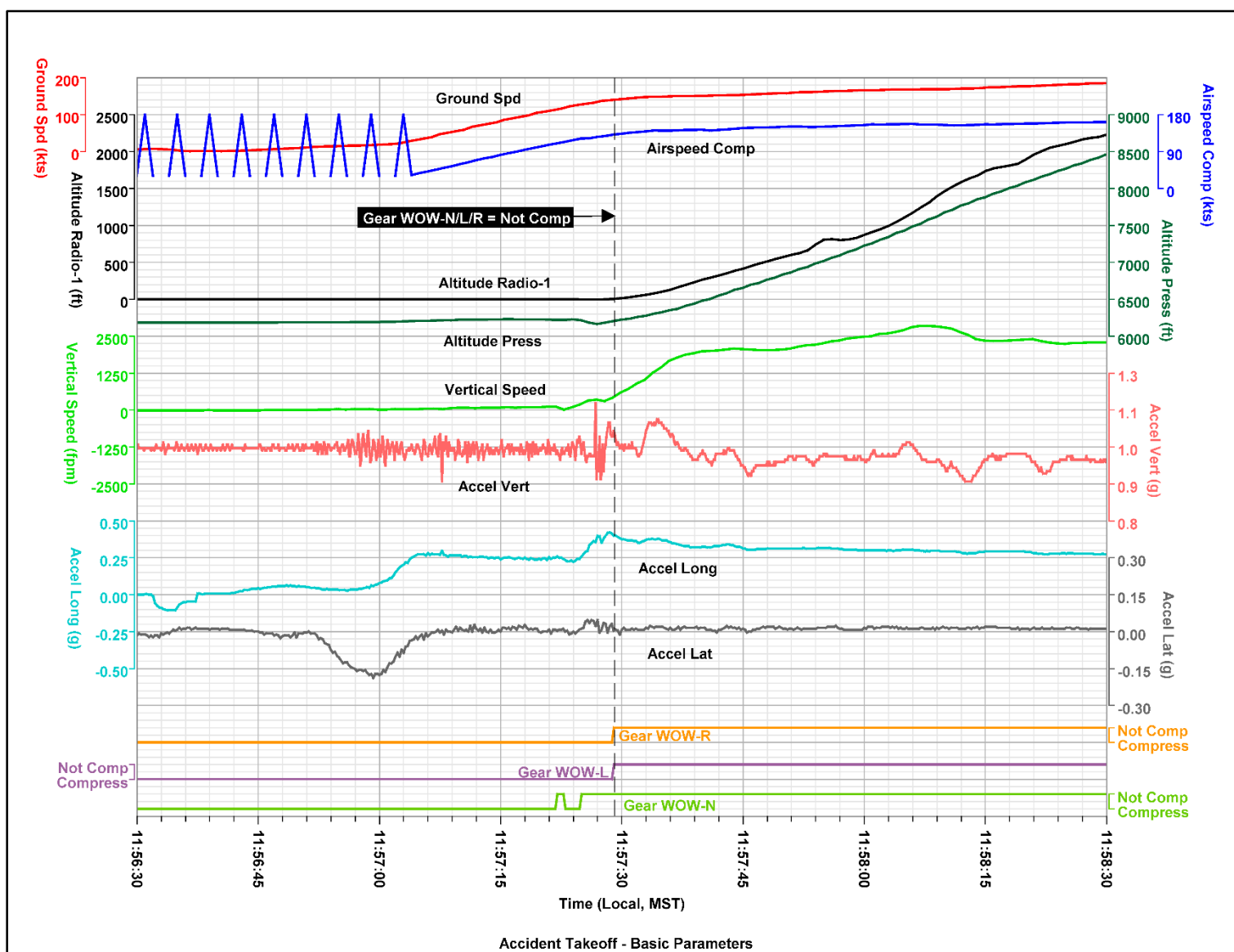


Figure 2. Basic parameters for accident flight takeoff.

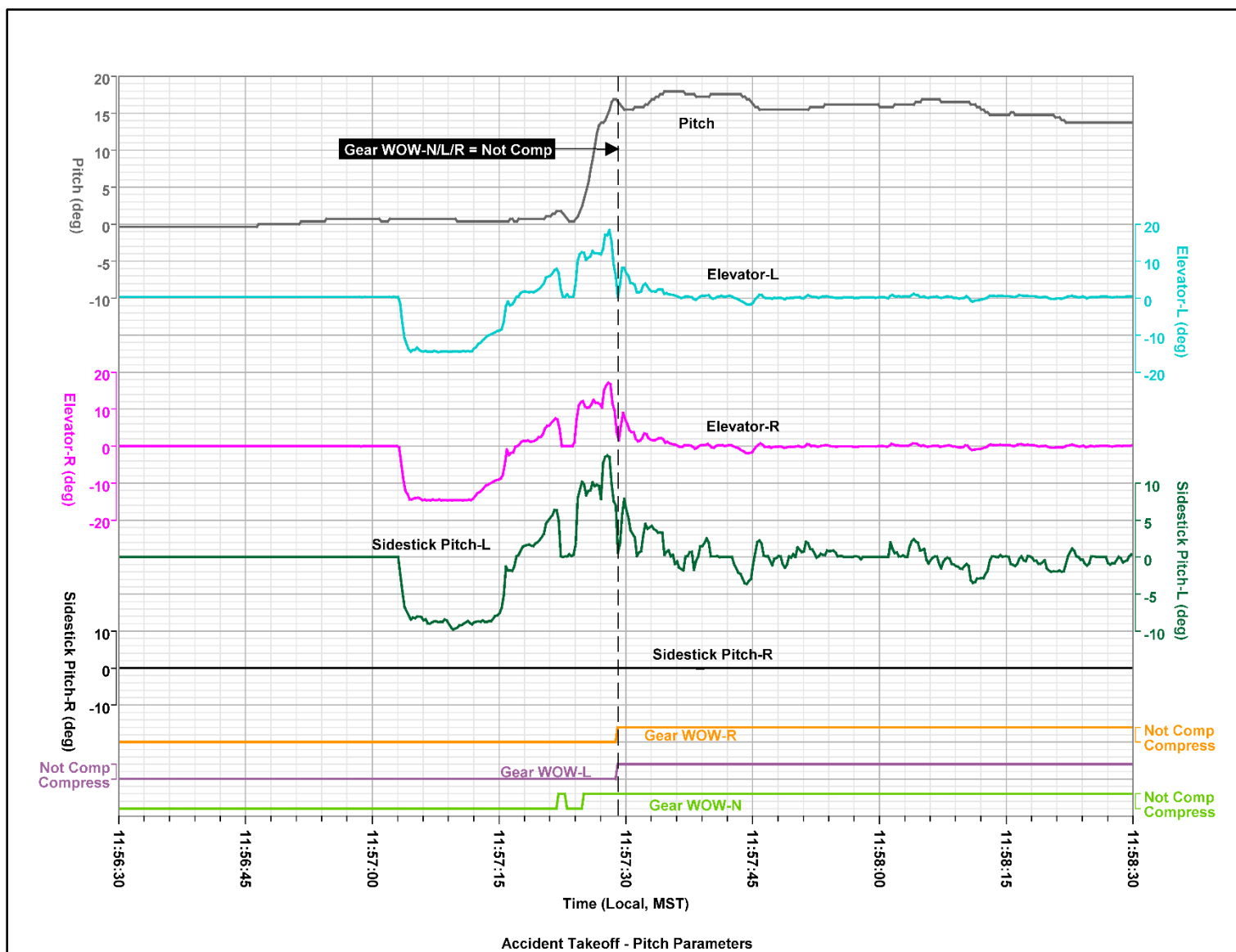


Figure 3. Pitch-related parameters for accident flight takeoff.

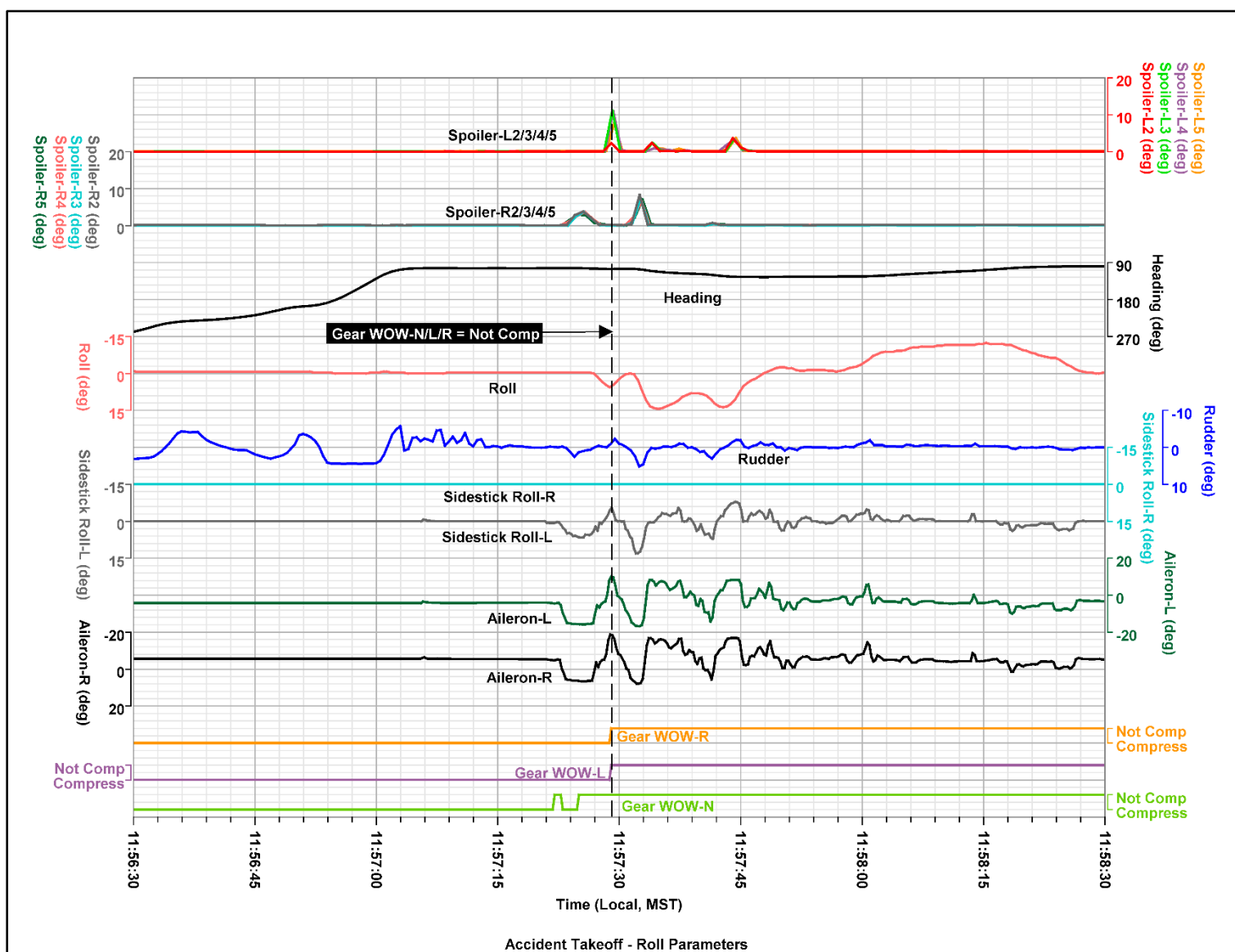


Figure 4. Roll-related parameters for accident flight takeoff.

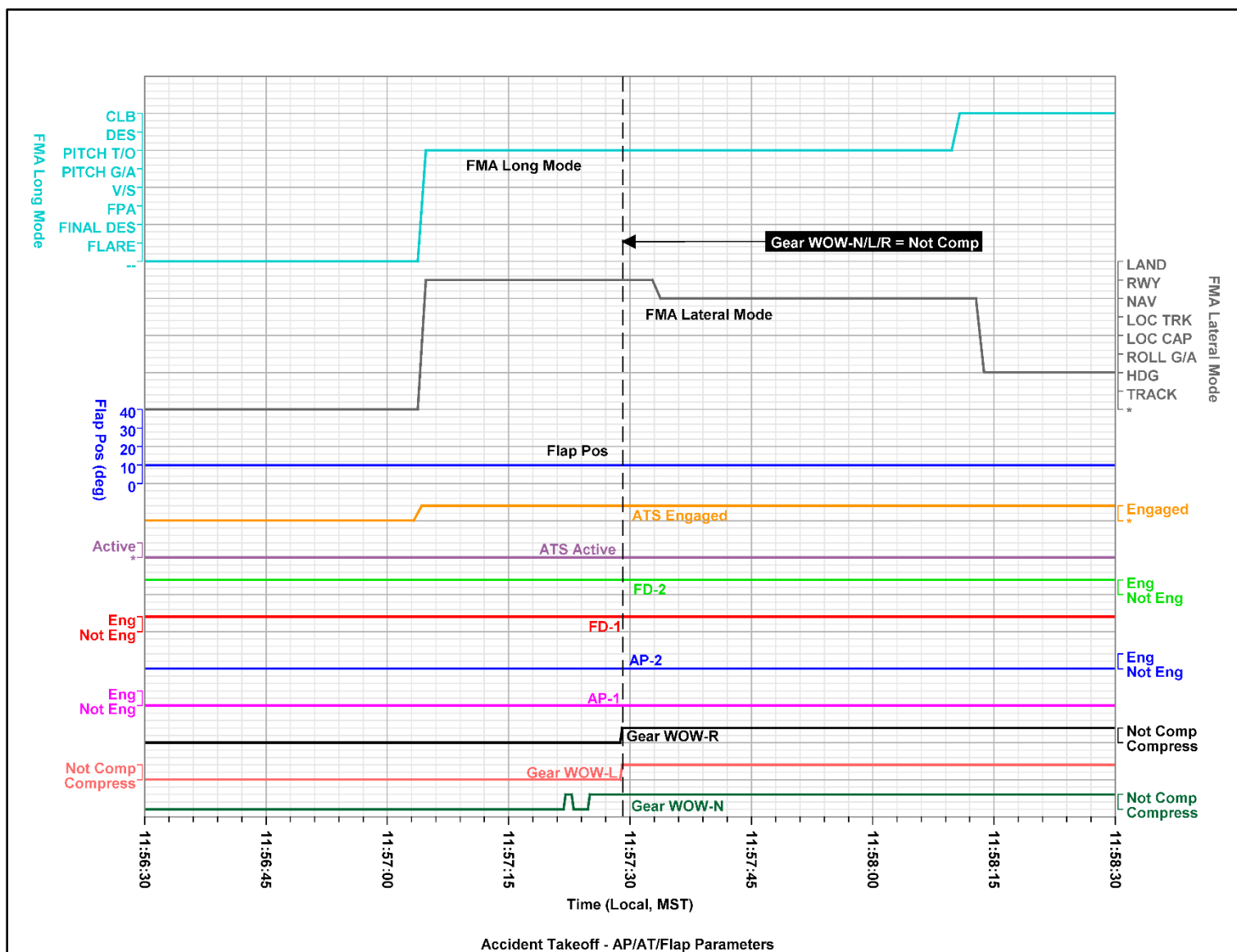


Figure 5. Autopilot and autothrust-related parameters for accident flight takeoff.

APPENDIX A. VERIFIED AND PROVIDED PARAMETERS

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

Table 1. Verified and provided FDR parameters.

Plot/Table Labels	Parameter Names	Units
Accel Lat	Lateral Acceleration	g
Accel Long	Longitudinal Acceleration	g
Accel Vert	Vertical/Normal Acceleration	g
Aileron-L	Aileron Position-Left	deg
Aileron-R	Aileron Position-Right	deg
Airspeed Comp	Computed Airspeed	kts
Altitude Press	Pressure Altitude	ft
Altitude Radio-1	Radio Altitude	ft
AP-1	Autopilot Engaged-1	
AP-2	Autopilot Engaged-2	
ATS Active	Autothrust System Active	
ATS Engaged	Autothrust System Engaged	
Elevator-L	Elevator Position-Left	deg
Elevator-R	Elevator Position-Right	deg
Eng1 N1 Actual	Engine 1 N1 Actual	%RPM
Eng2 N1 Actual	Engine 2 N1 Actual	%RPM
Eng1 TLA	Engine 1 Throttle Lever Angle	deg
Eng2 TLA	Engine 2 Throttle Lever Angle	deg
FD-1	Flight Director Engaged-1	
FD-2	Flight Director Engaged-2	
Flap Pos	Flap Position	deg
FMA Lateral Mode	Flight Mode Annunciator Lateral Mode	
FMA Long Mode	Flight Mode Annunciator Longitudinal Mode	
Gear WOW-L	Gear Weight-on-Wheels-Left	
Gear WOW-N	Gear Weight-on-Wheels-Nose	
Gear WOW-R	Gear Weight-on-Wheels-Right	
Ground Spd	Ground Speed	kts
Heading	Heading	deg
Key VHF-1	VHF Keying-1	
Key VHF-2	VHF Keying-2	
Key VHF-3	VHF Keying-3	
Pitch	Pitch	deg
Roll	Roll	deg
Rudder	Rudder Position	deg
Sidestick Pitch-L	Sidestick Position Pitch-Left	deg
Sidestick Pitch-R	Sidestick Position Pitch-Right	deg
Sidestick Roll-L	Sidestick Position Roll-Left	deg
Sidestick Roll-R	Sidestick Position Roll-Right	deg
Spoiler-L1 Out	Spoiler Out-Left 1	
Spoiler-L2	Spoiler Position-Left 2	deg
Spoiler-L3	Spoiler Position-Left 3	deg
Spoiler-L4	Spoiler Position-Left 4	deg

Plot/Table Labels	Parameter Names	Units
Spoiler-L5	Spoiler Position-Left 5	deg
Spoiler-R1 Out	Spoiler Out-Right 1	
Spoiler-R2	Spoiler Position-Right 2	deg
Spoiler-R3	Spoiler Position-Right 3	deg
Spoiler-R4	Spoiler Position-Right 4	deg
Spoiler-R5	Spoiler Position-Right 5	deg
TCAS Crew Selection	Traffic Collision Avoidance System Crew Selection	
TCAS TA Most Dangerous	Traffic Collision Avoidance System Traffic Advisory Most Dangerous	
TCAS RA Most Dangerous	Traffic Collision Avoidance System Resolution Advisory Most Dangerous	
TCAS TA Only	Traffic Collision Avoidance System Traffic Advisory Only	
Time UTC Hrs (spr 00)	Coordinated Universal Time Hours	hrs
Time UTC-Min	Coordinated Universal Time Minutes	min
Time UTC-Sec	Coordinated Universal Time Seconds	sec
Vertical Speed	Vertical Speed	fpm

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.

Note: Parameters with a blank unit description in Table 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 2. Unit abbreviations.

Unit Abbreviations	Descriptions
%RPM	percent revolutions per minute
deg	degrees
ft	feet
fpm	feet per minute
g	unit of gravitation acceleration
hrs	hours
kts	knots
min	minutes
sec	seconds