

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

December 22, 2020

Flight Data Recorder

Specialists' Factual Report
By Cassandra Johnson and Michael Portman

The Vehicle Recorder Division received flight data recorder (FDR) data files for engine failure events occurring on Airbus A220 aircraft in the following four cases:

- **ENG19IA029**
 - Perrigny-sur-Armançon, France, July 25, 2019
 - Airbus A220-300, HB-JCM, Swiss International Air Lines
- **ENG19IA034**
 - Côte-d'Or, France, September 16, 2019
 - Airbus A220-300, HB-JCA, Swiss International Air Lines
- **ENG20LA001**
 - West Flanders Province, Belgium, October 15, 2019
 - Airbus A220-300, HB-JCC, Swiss International Air Lines
- **ENG20LA015**
 - Bordeaux, France, February 12, 2020
 - Airbus A220-300, YL-AAU, airBaltic

Basic parameters (pressure altitude, airspeed, etc.) as well as select engine parameters are provided in this report. All figures and tabular data in this report are provided in Coordinated Universal Time (UTC). 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. Table A-1 lists the FDR parameters verified and provided as well as unit and discrete abbreviations used in this report.

The tabular data used to create the 24 figures, including Latitude, Longitude, Time GMT Hours, Time GMT Minutes, and Time GMT Seconds, are provided in electronic comma separated value (.csv) format as attachments to this report.

Table 1. Airbus A220 Engine Events Plot and Tabular Overview.

NTSB Case Number	Approximate FDR Total Time	Duration of Event Flight	Figure Numbers	Tabular Attachment Number
ENG19IA029	71 hours	50 minutes	1-6	1
ENG19IA034	72 hours	51 minutes	7-12	2
ENG20LA001	71 hours	1 hour 9 minutes	13-18	3
ENG20LA015	71 hours	3 hours 43 minutes	19-24	4

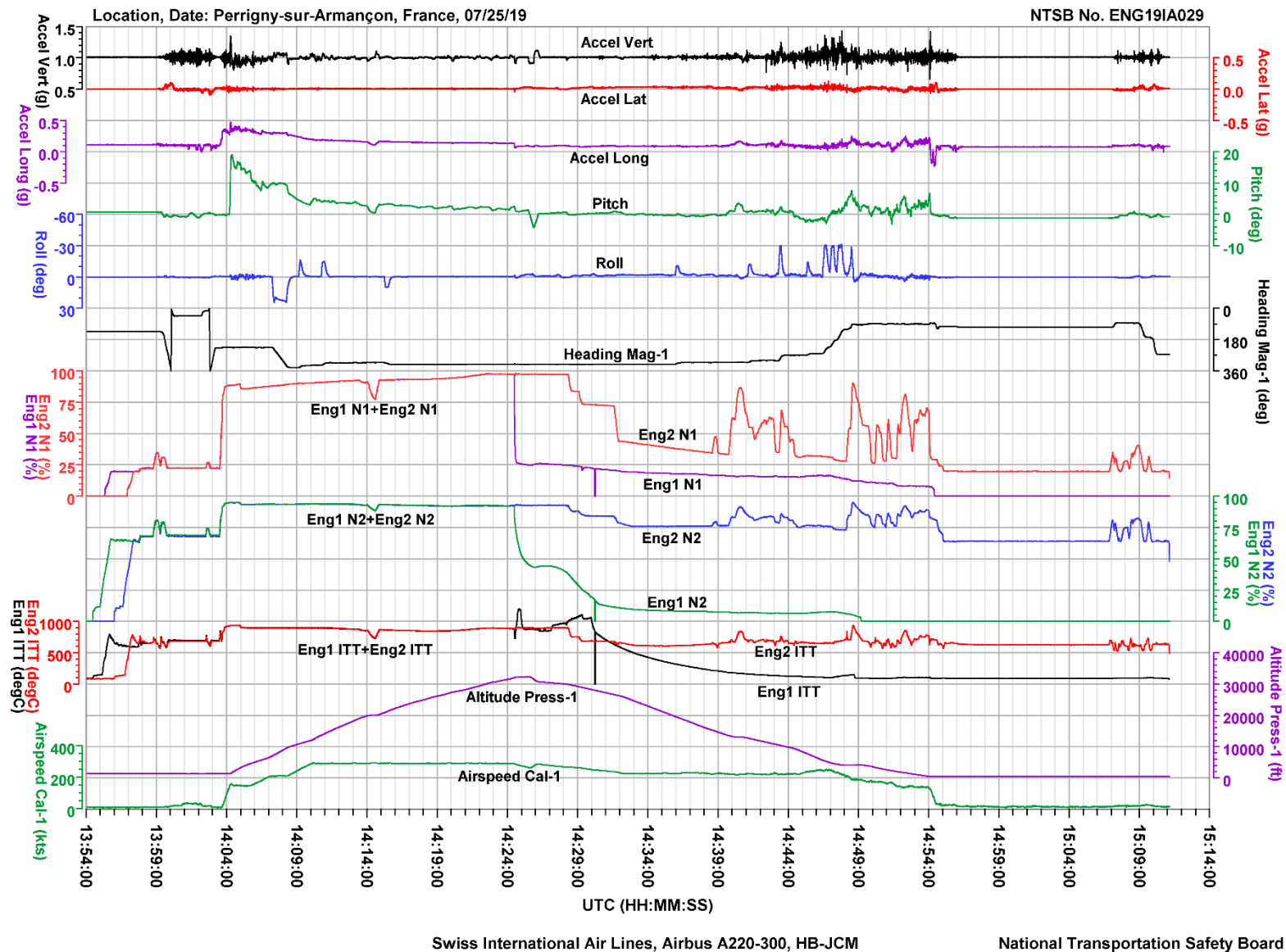


Figure 1. Plot of Basic Parameters for the Entire Flight.

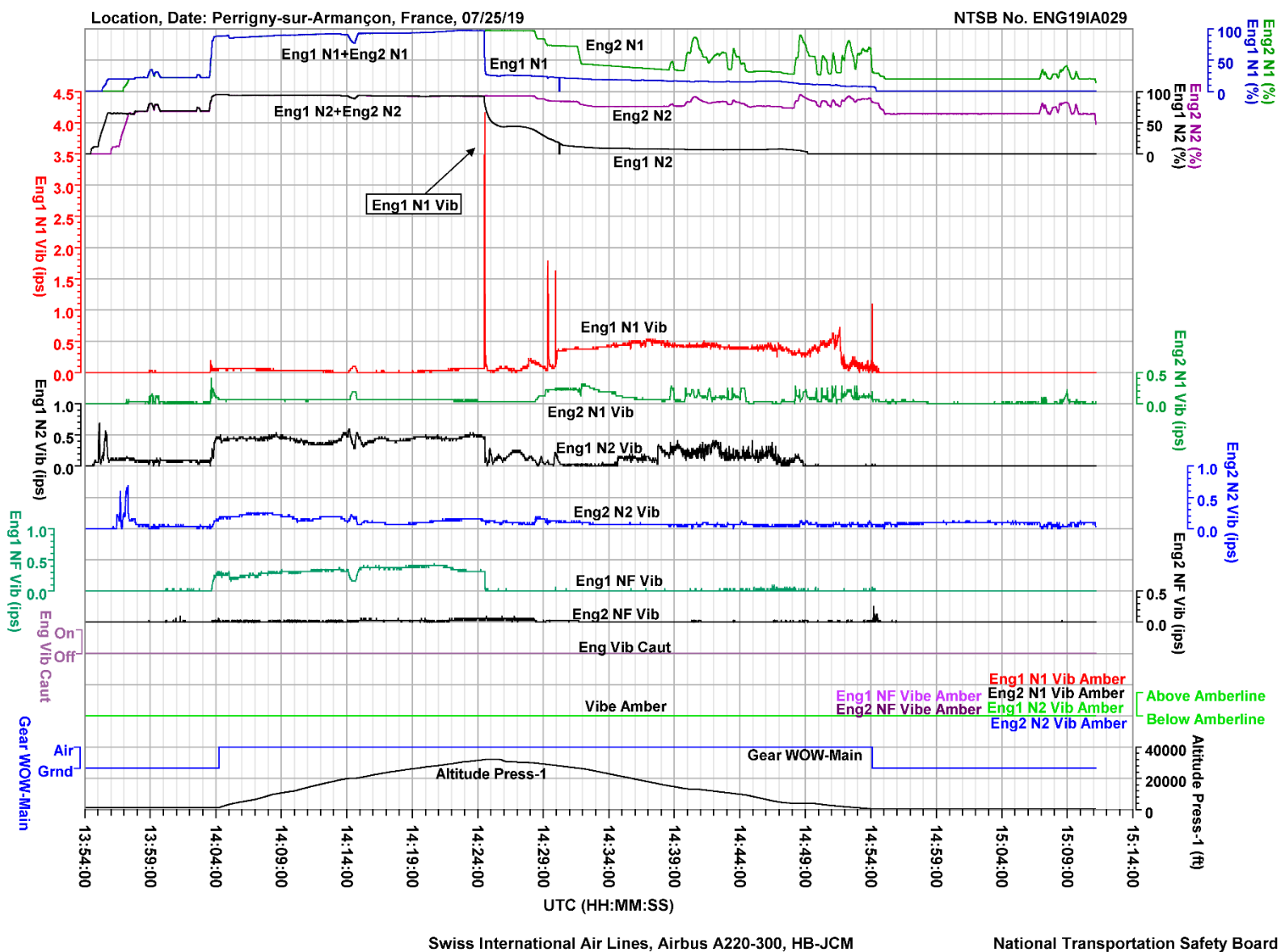


Figure 2. Plot of Select Engine Parameters for the Entire Flight.

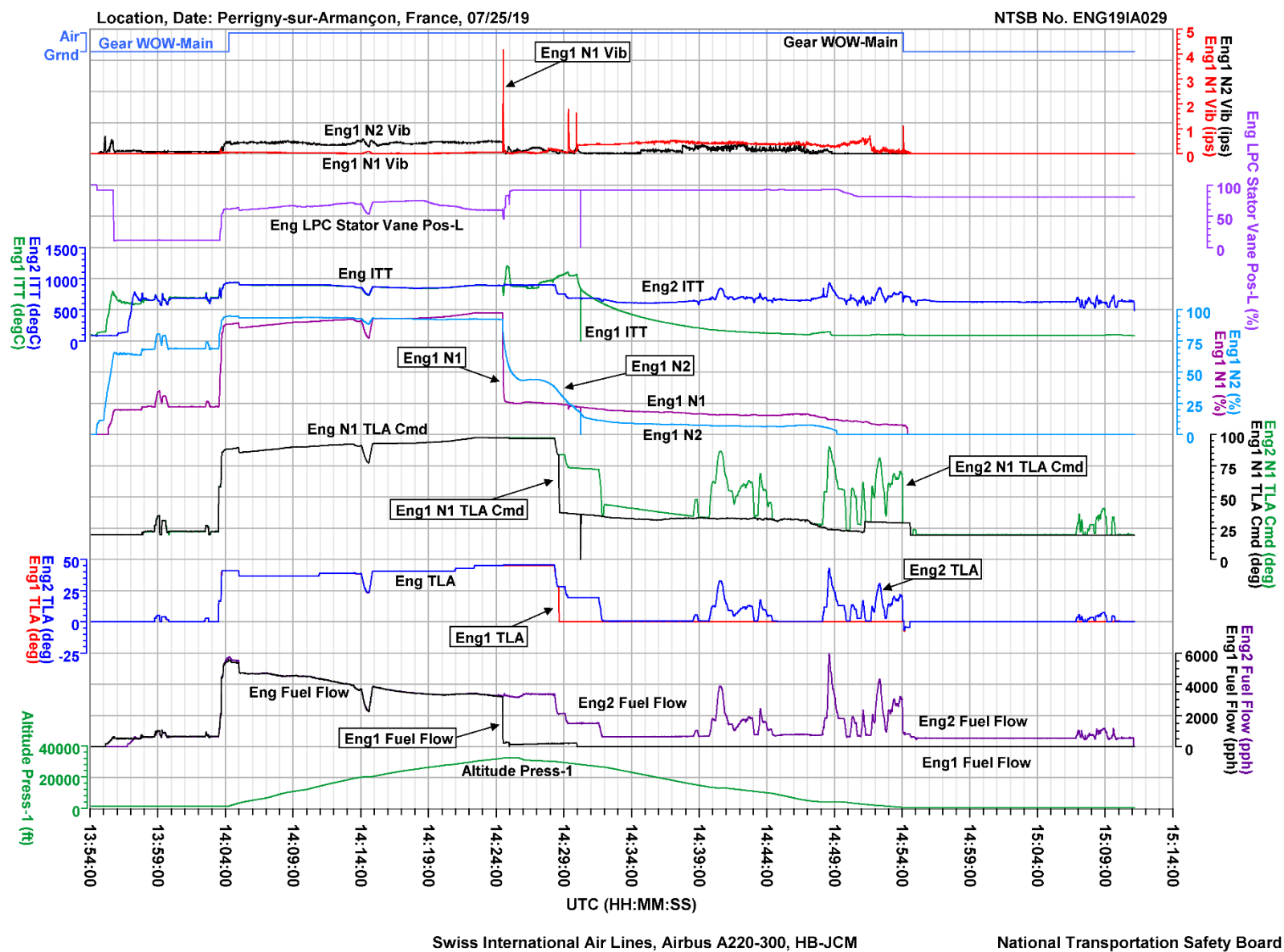


Figure 3. Plot of Additional Select Engine Parameters for the Entire Flight.

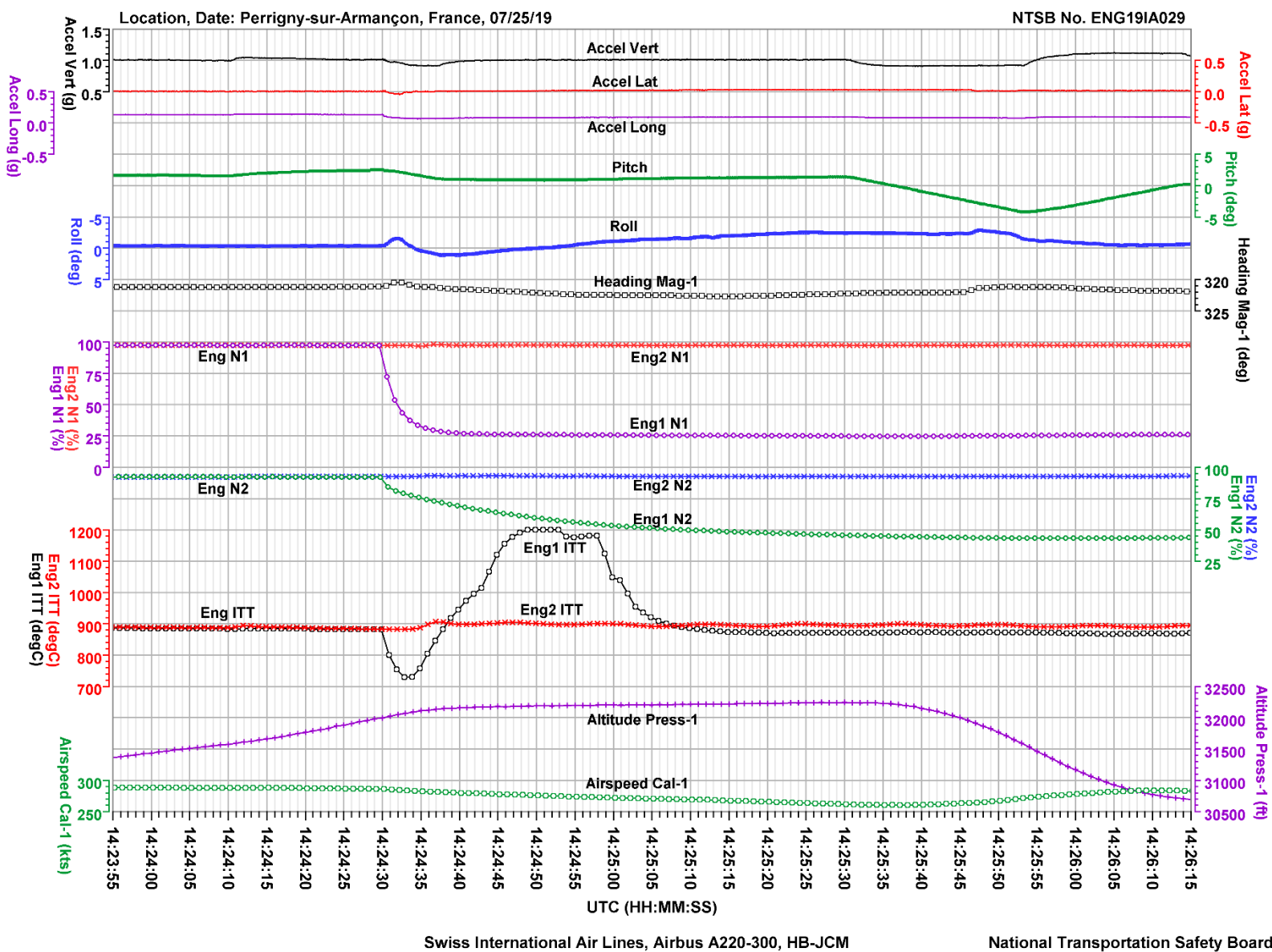
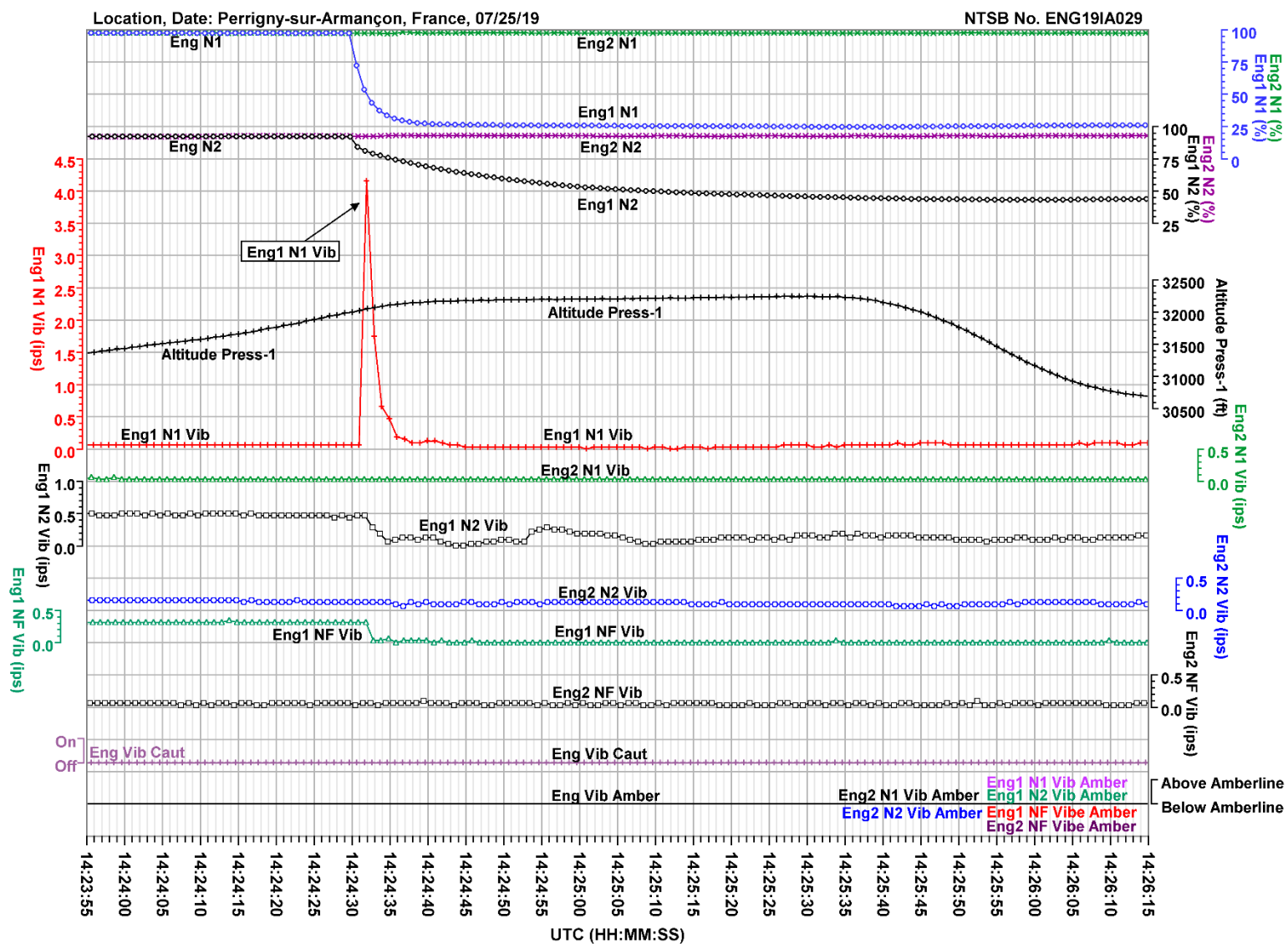


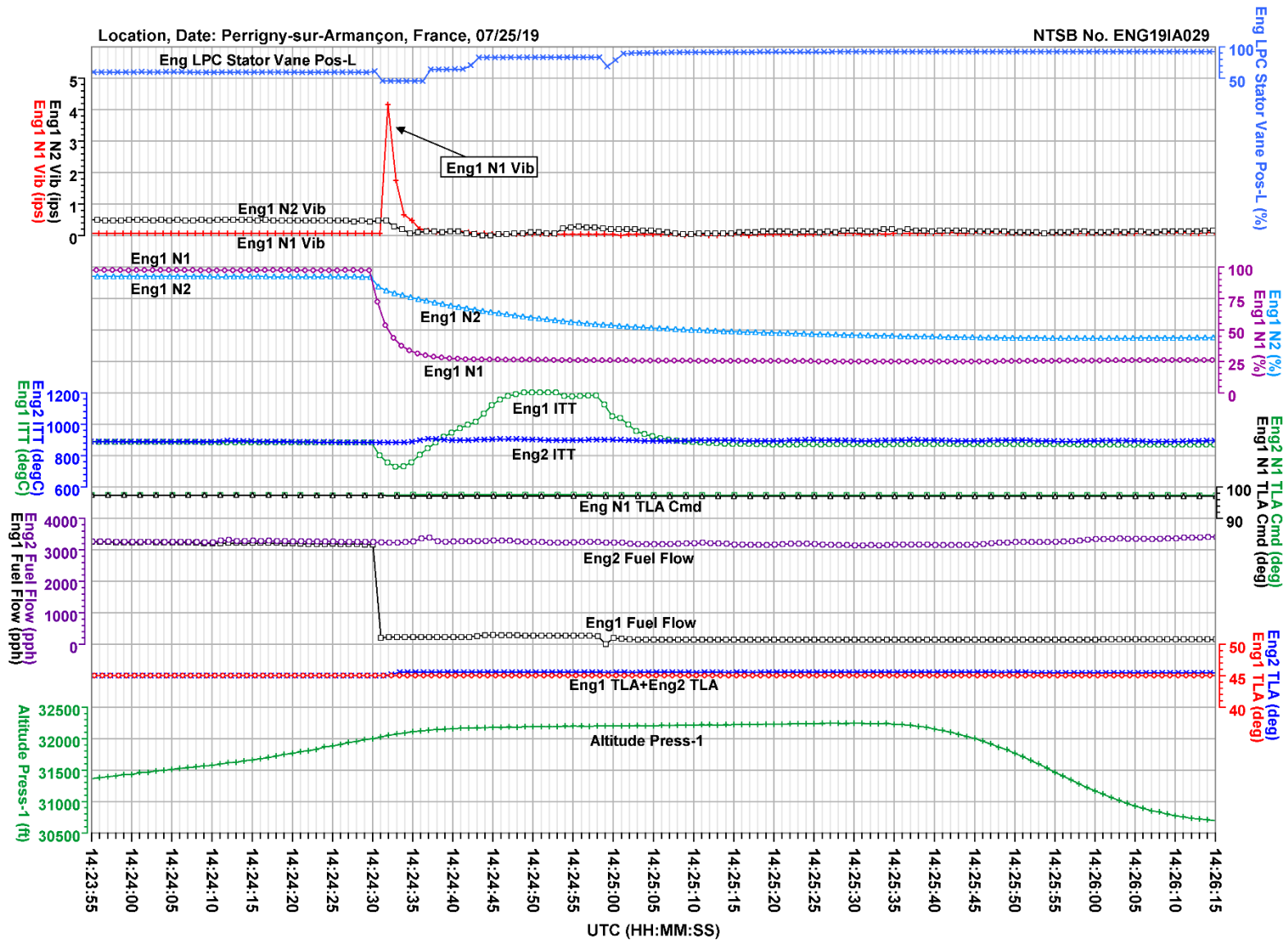
Figure 4. Plot of Basic Parameters Detailing the Engine Event.



Swiss International Air Lines, Airbus A220-300, HB-JCM

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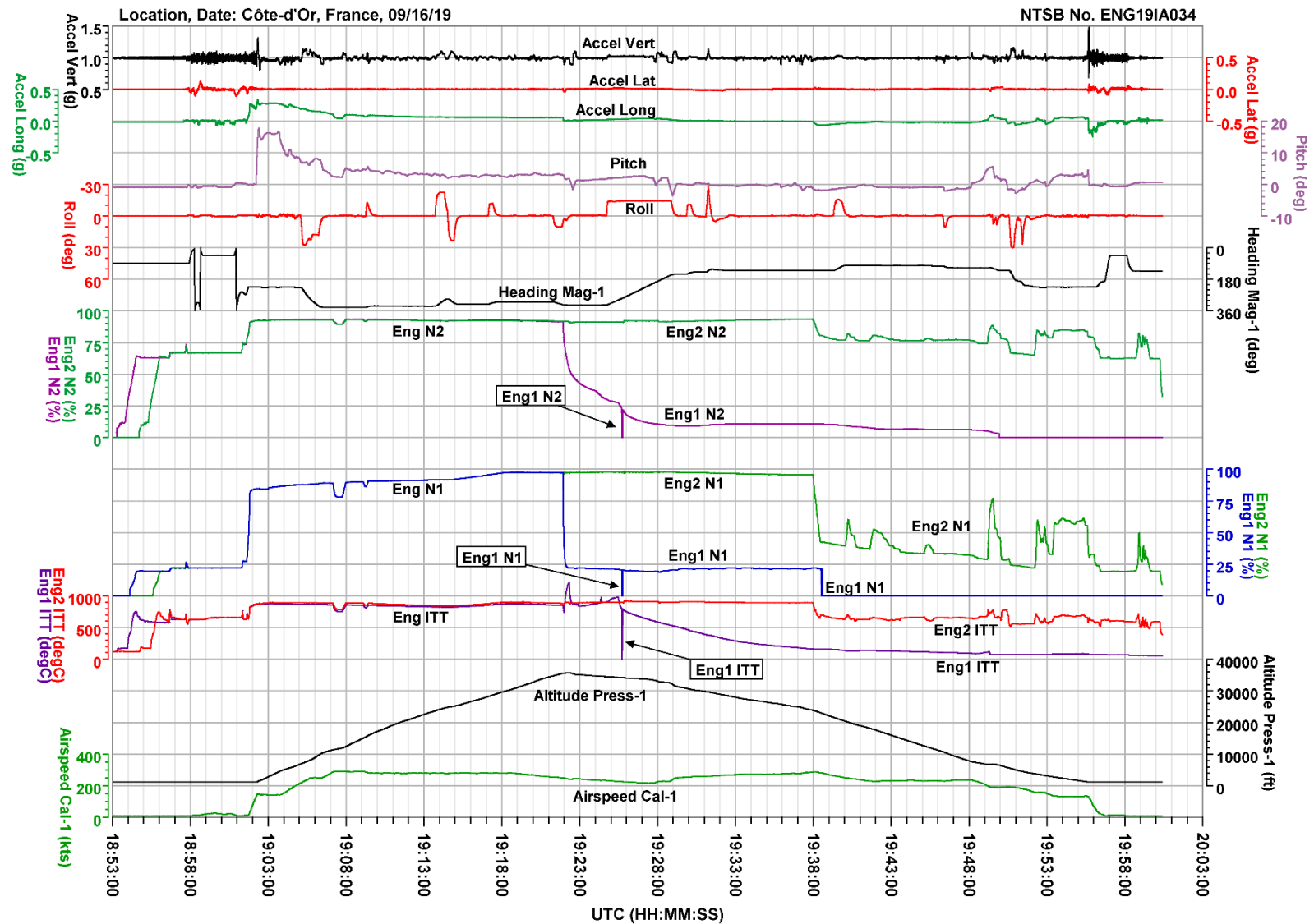
Figure 5. Plot of Select Engine Parameters Detailing the Engine Event.



Swiss International Air Lines, Airbus A220-300, HB-JCM

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Figure 6. Plot of Additional Select Engine Parameters Detailing the Engine Event.



Swiss International Air Lines, Airbus A220-300, HB-JCA

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Figure 7. Plot of Basic Parameters for the Entire Flight.

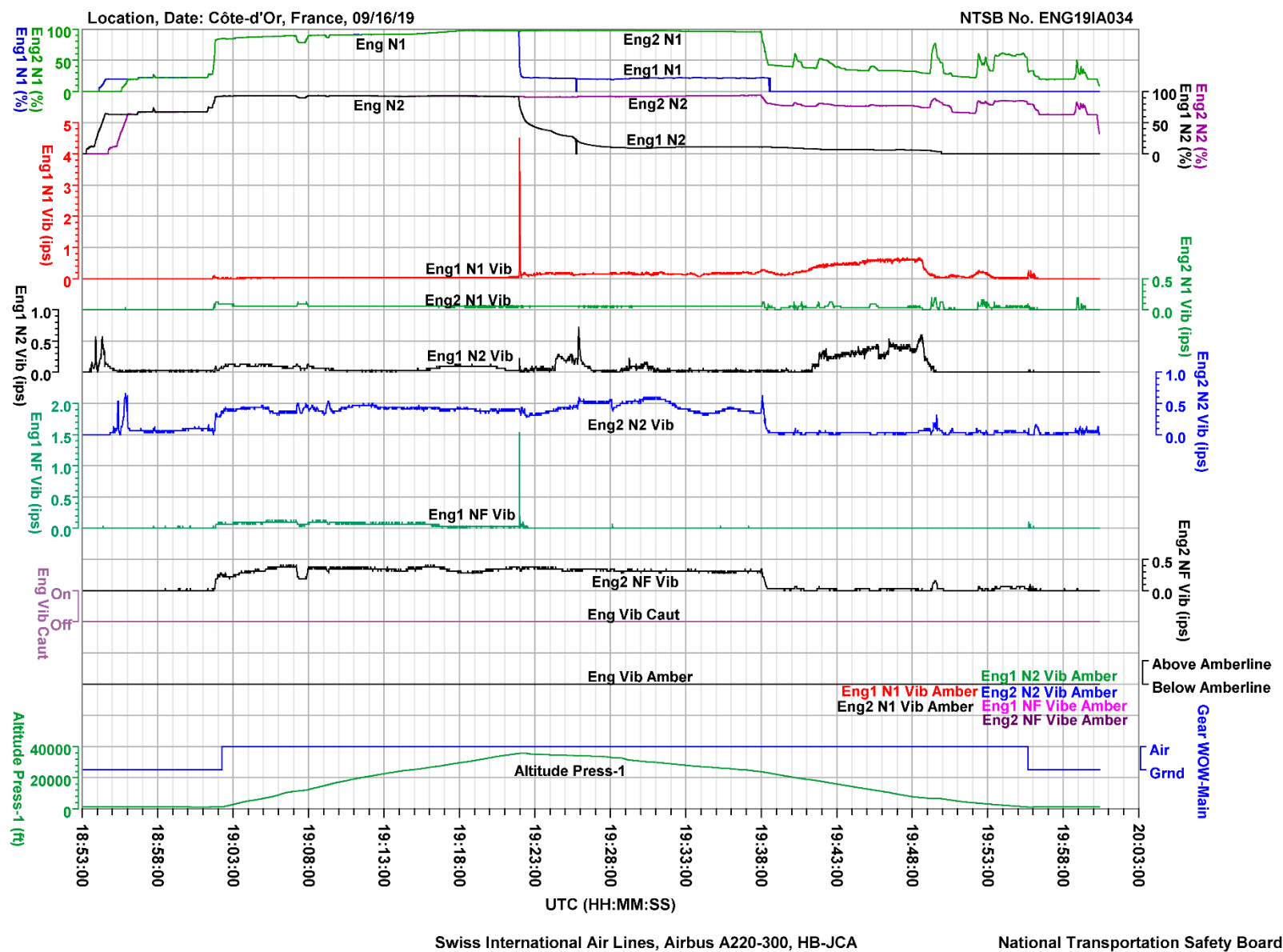
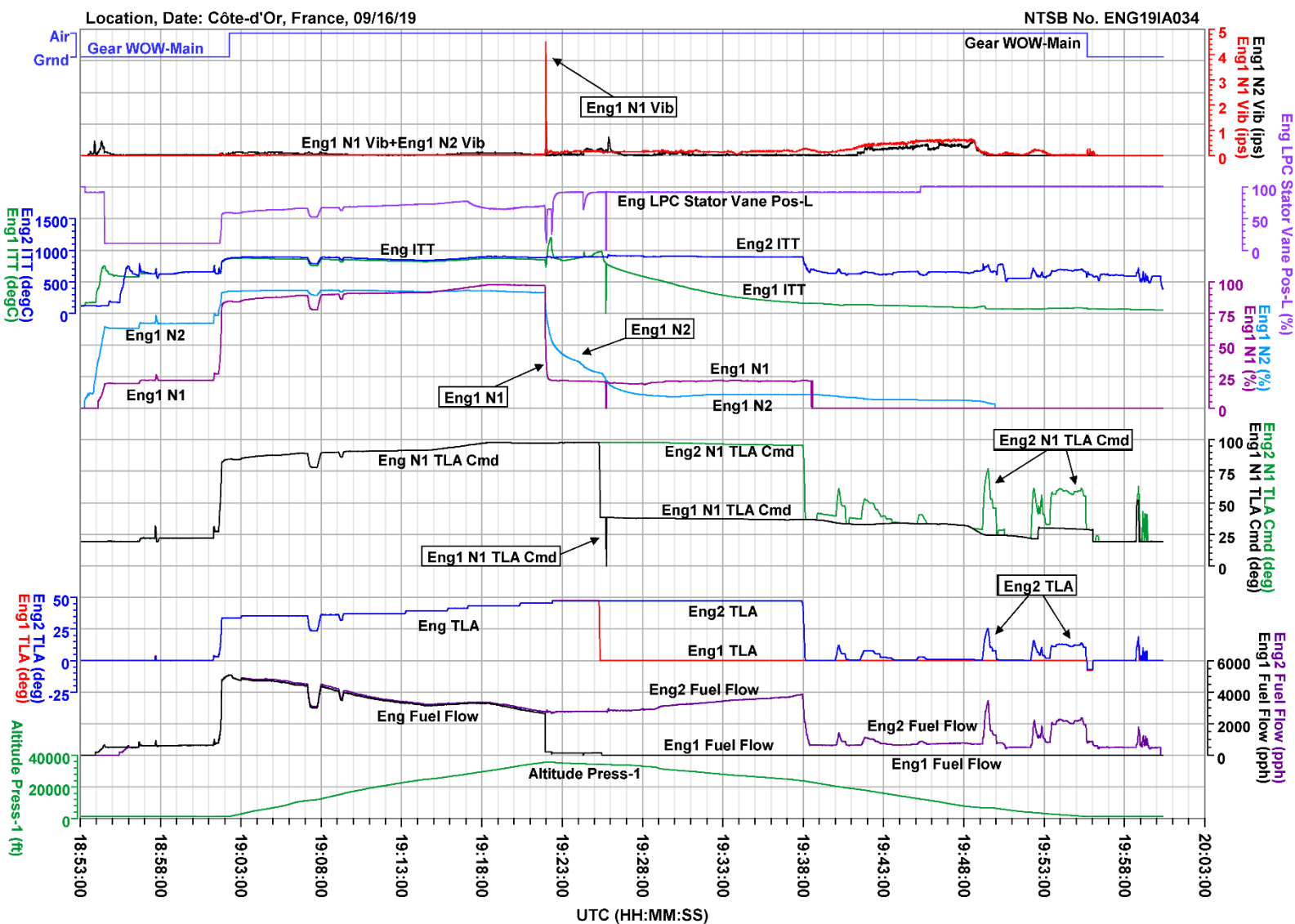


Figure 8. Plot of Select Engine Parameters for the Entire Flight.



Swiss International Air Lines, Airbus A220-300, HB-JCA

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Figure 9. Plot of Additional Select Engine Parameters for the Entire Flight.

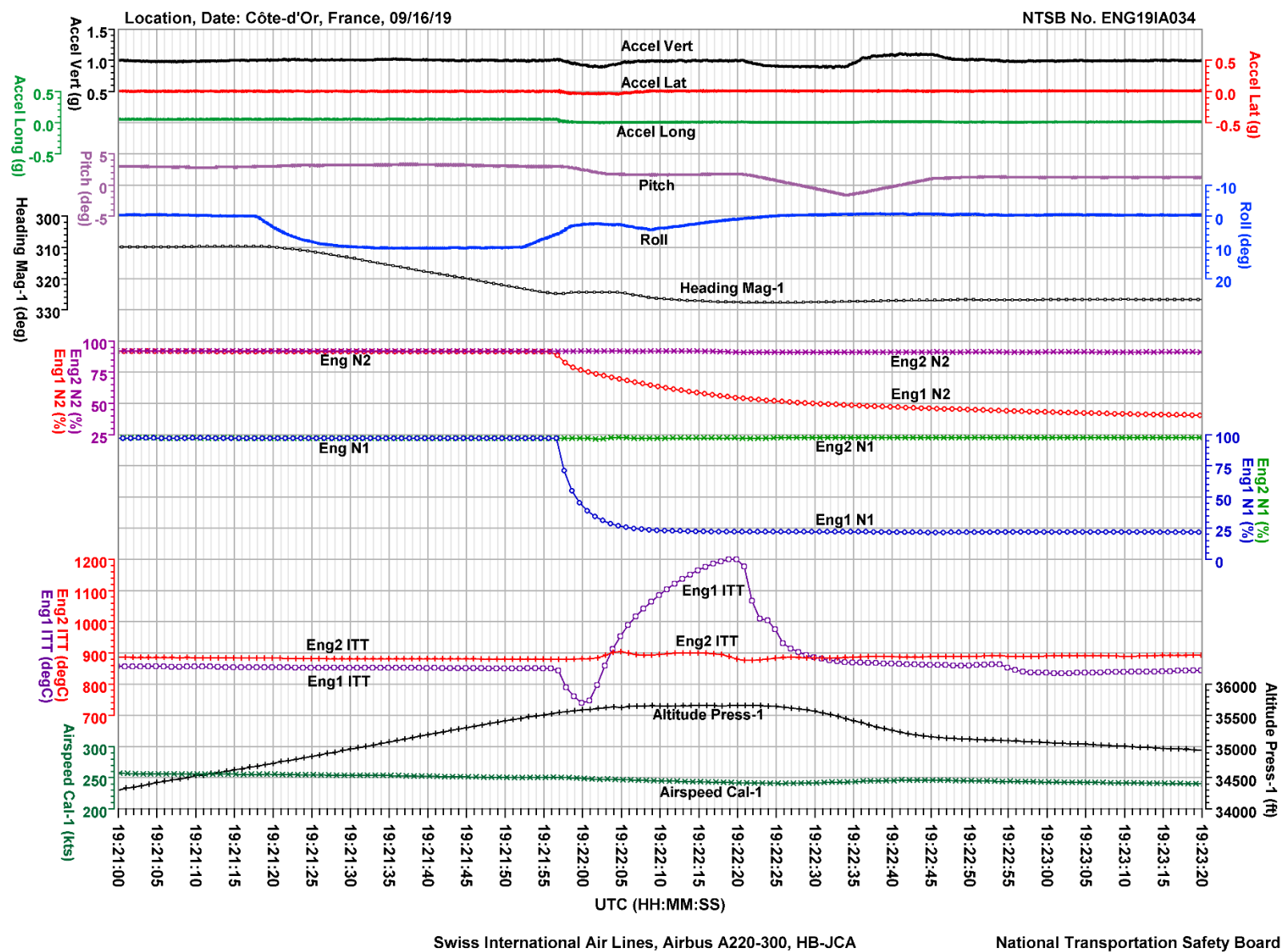


Figure 10. Plot of Basic Parameters Detailing the Engine Event.

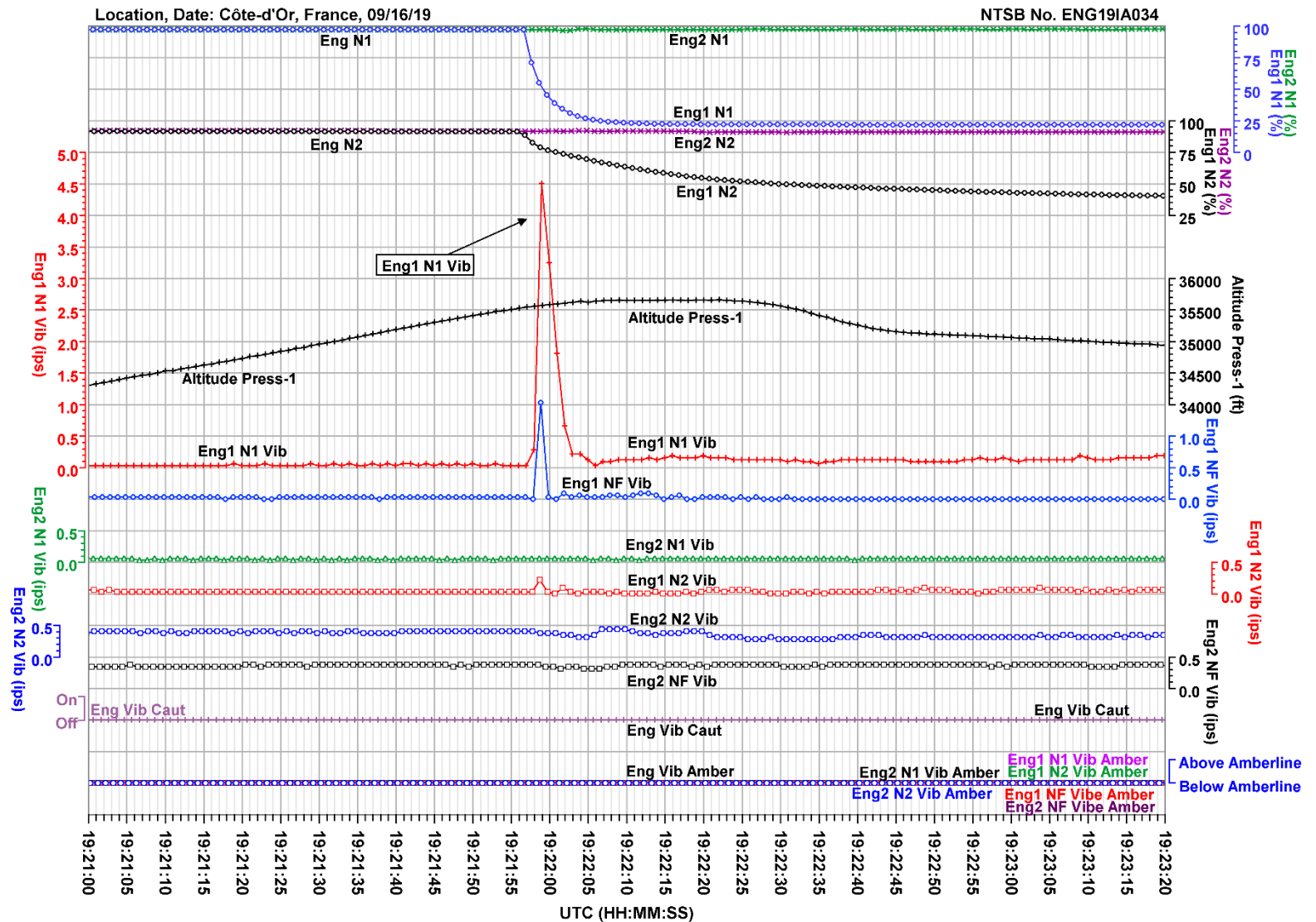


Figure 11. Plot of Select Engine Parameters Detailing the Engine Event.

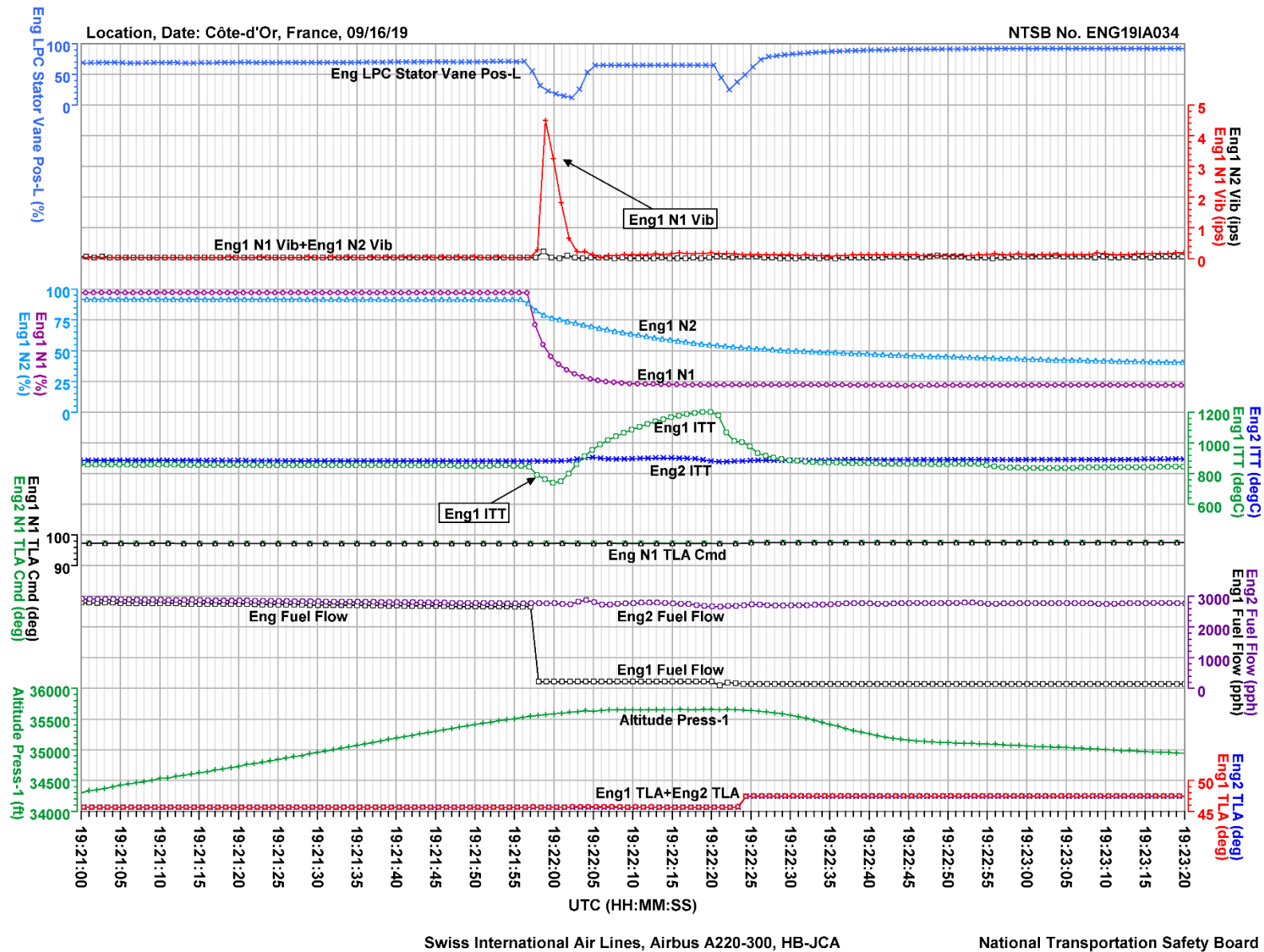
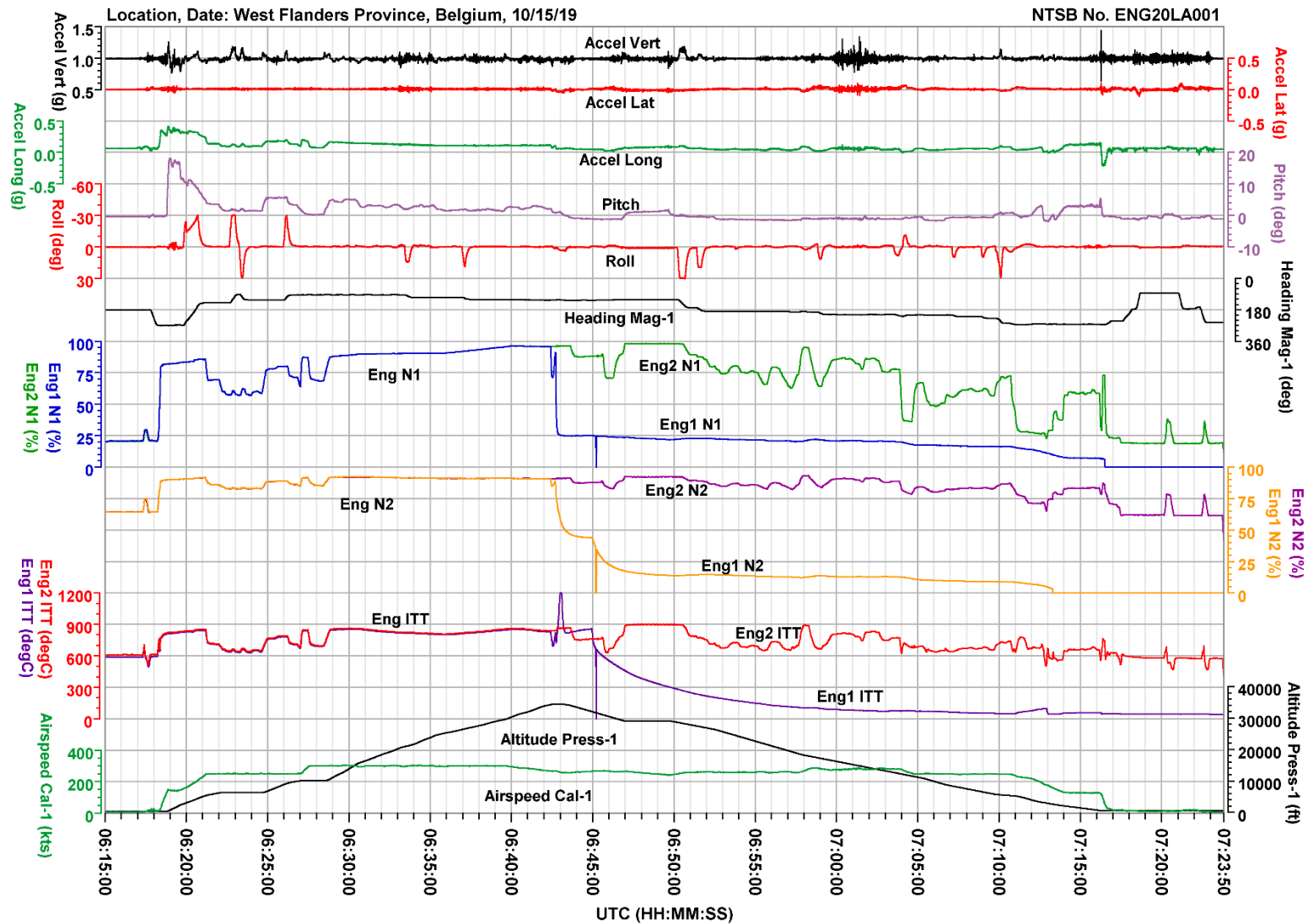


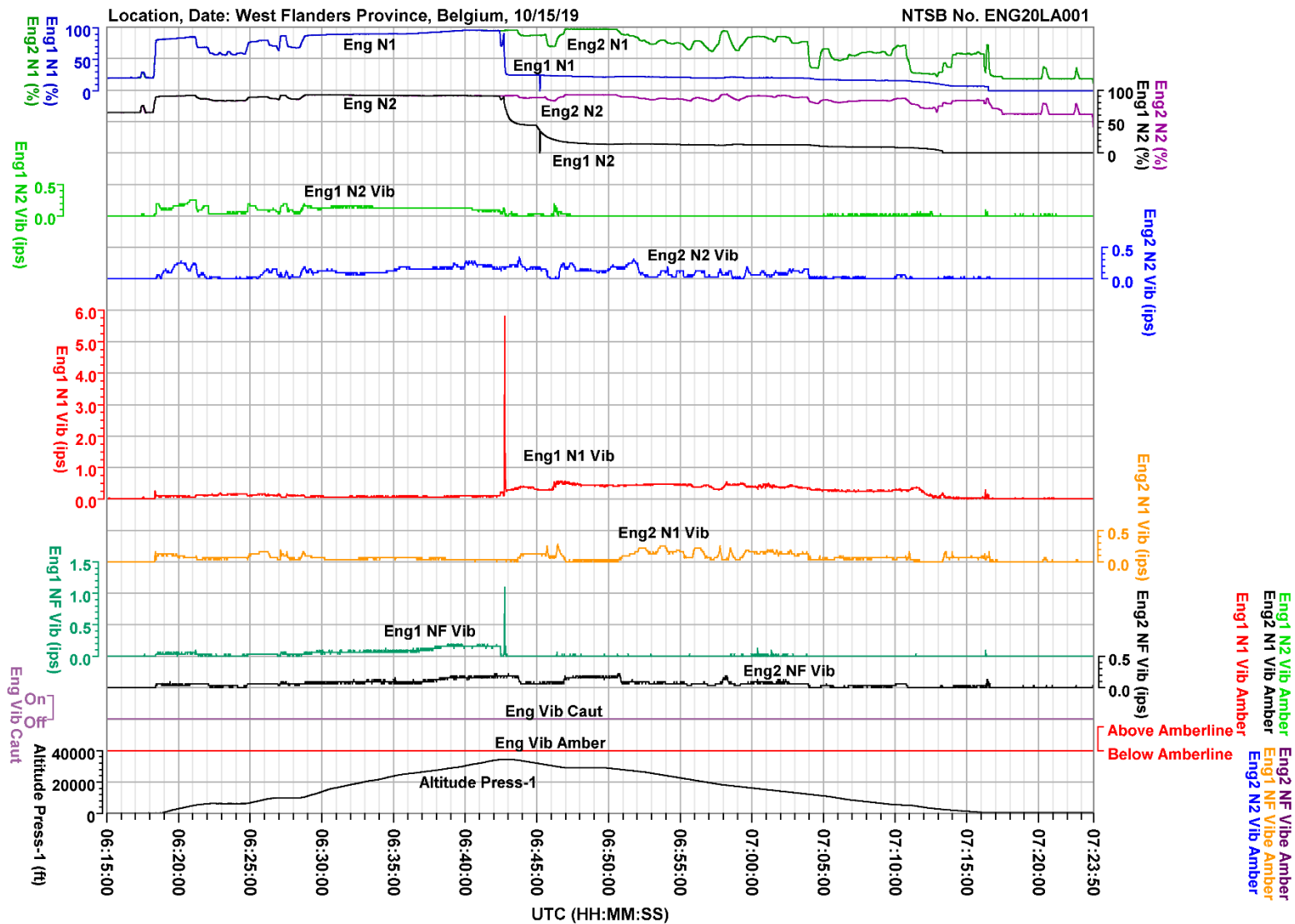
Figure 12. Plot of Additional Select Engine Parameters Detailing the Engine Event.



Swiss International Air Lines, Airbus A220-300, HB-JCC

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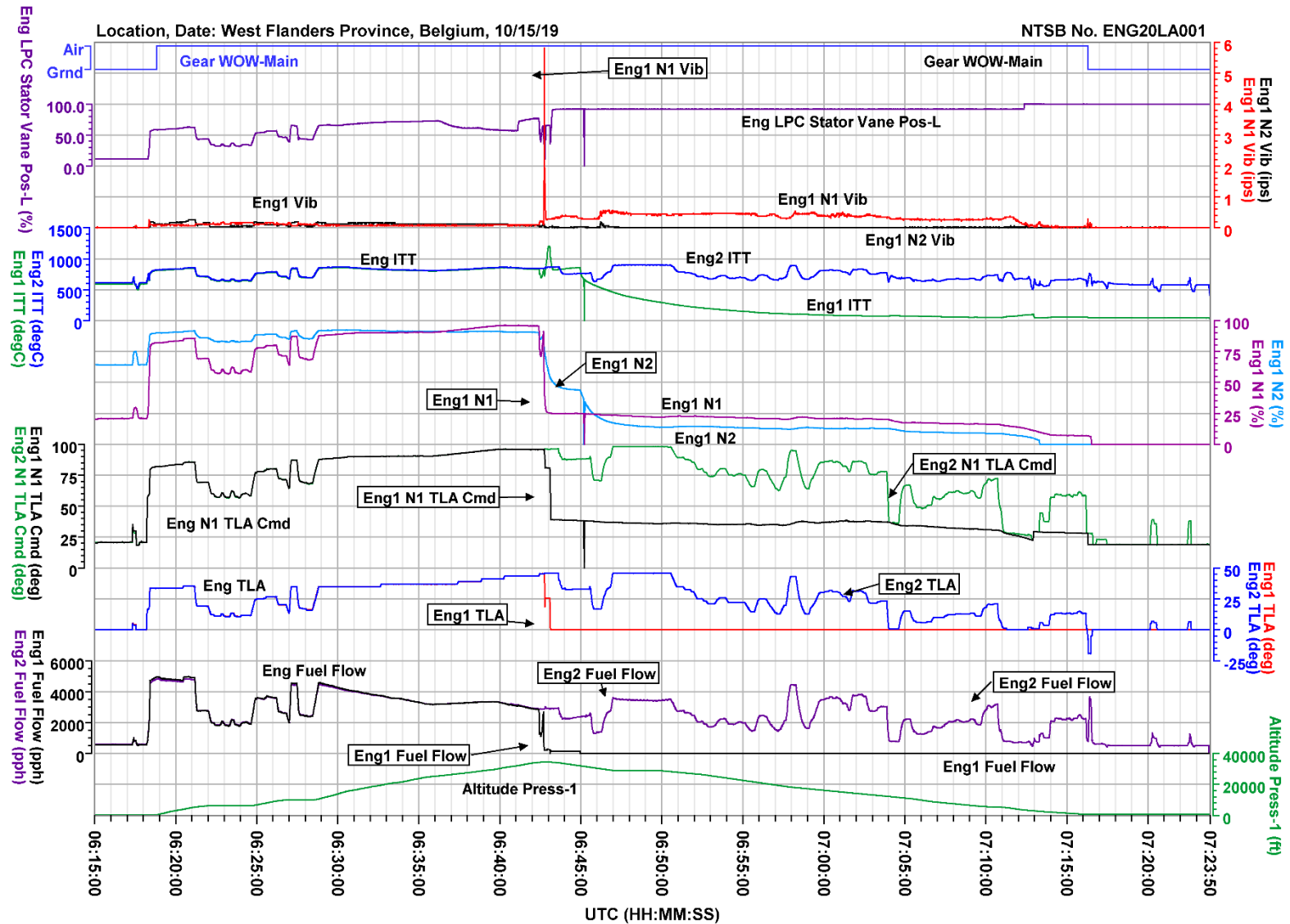
Figure 13. Plot of Basic Parameters for the Entire Flight.



Swiss International Air Lines, Airbus A220-300, HB-JCC

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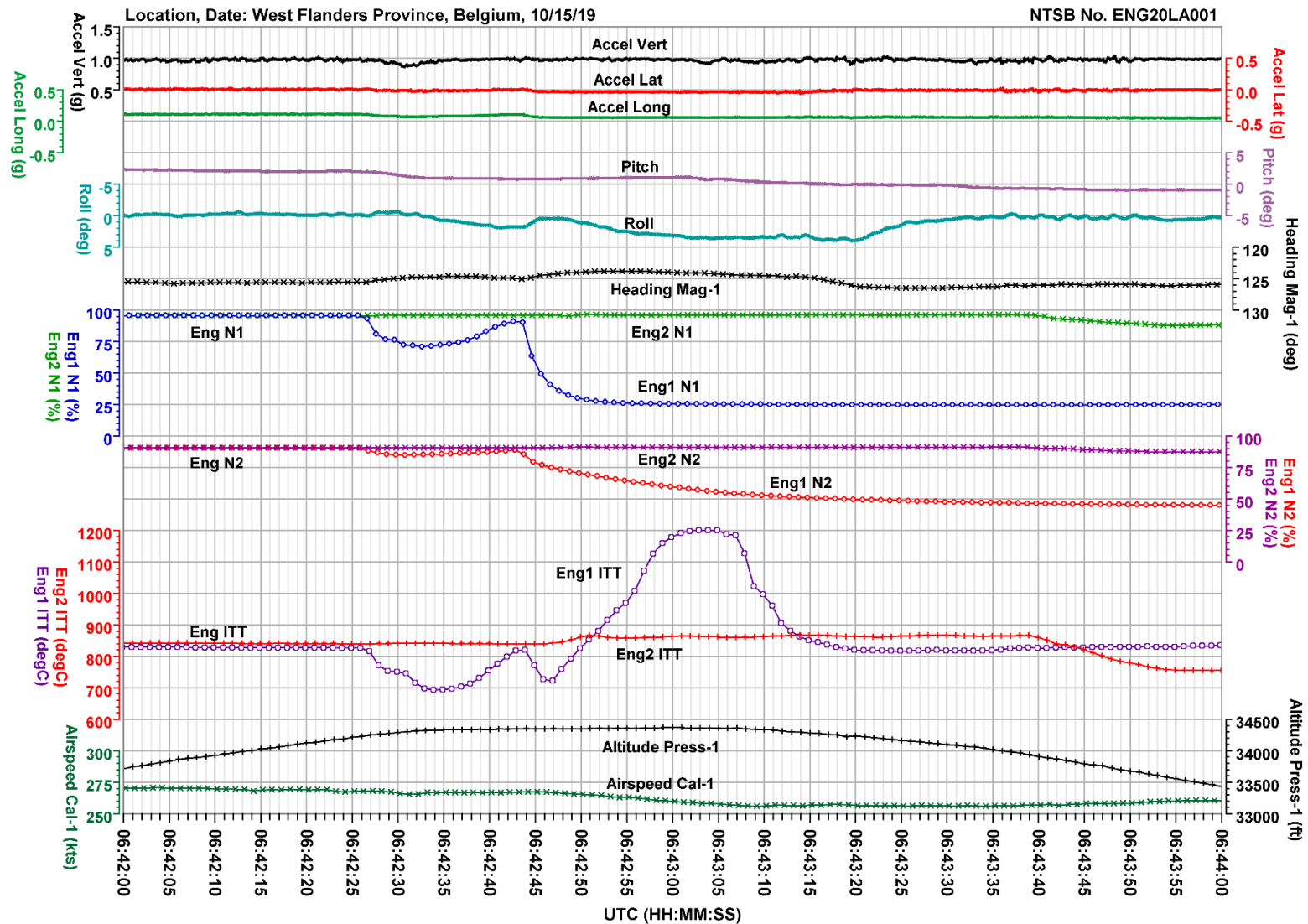
Figure 14. Plot of Select Engine Parameters for the Entire Flight.



Swiss International Air Lines, Airbus A220-300, HB-JCC

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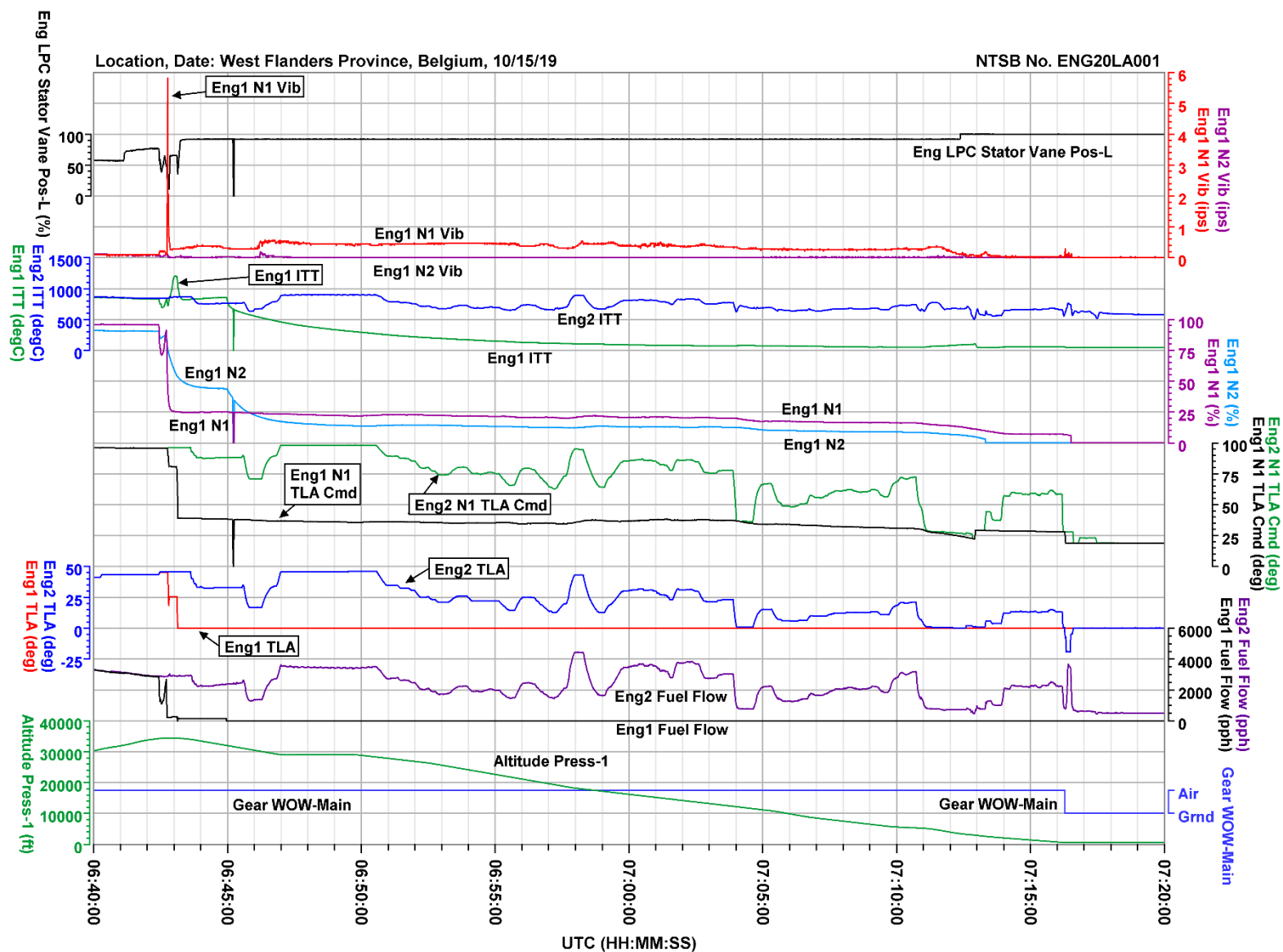
Figure 15. Plot of Additional Select Engine Parameters for the Entire Flight.



Swiss International Air Lines, Airbus A220-300, HB-JCC

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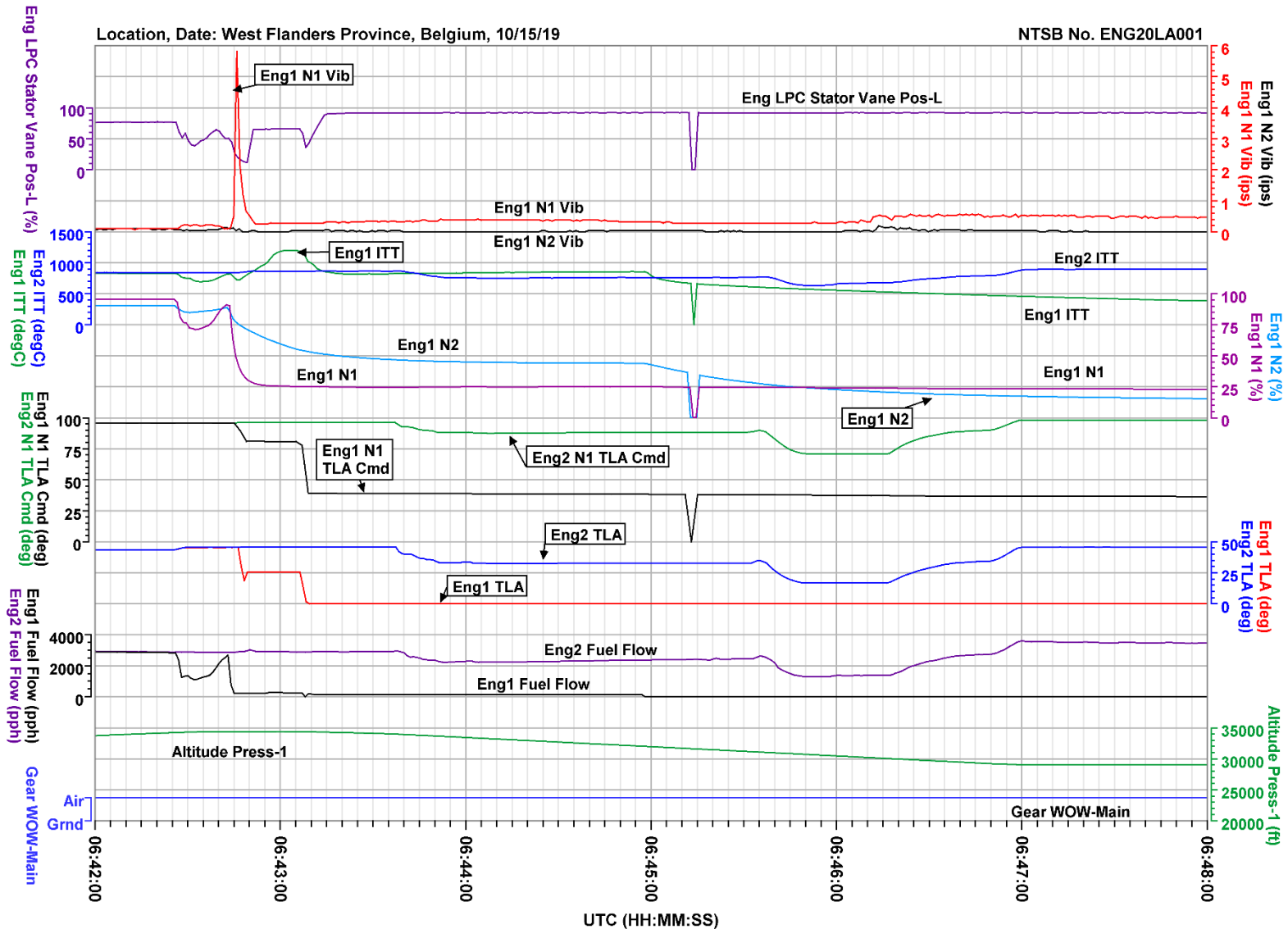
Figure 16. Plot of Basic Parameters Detailing the Engine Event.



Swiss International Air Lines, Airbus A220-300, HB-JCC

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Figure 17. Plot of Additional Select Engine Parameters Detailing the Event Through Landing.



Swiss International Air Lines, Airbus A220-300, HB-JCC

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Figure 18. Plot of Additional Select Engine Parameters Detailing the Engine Event.

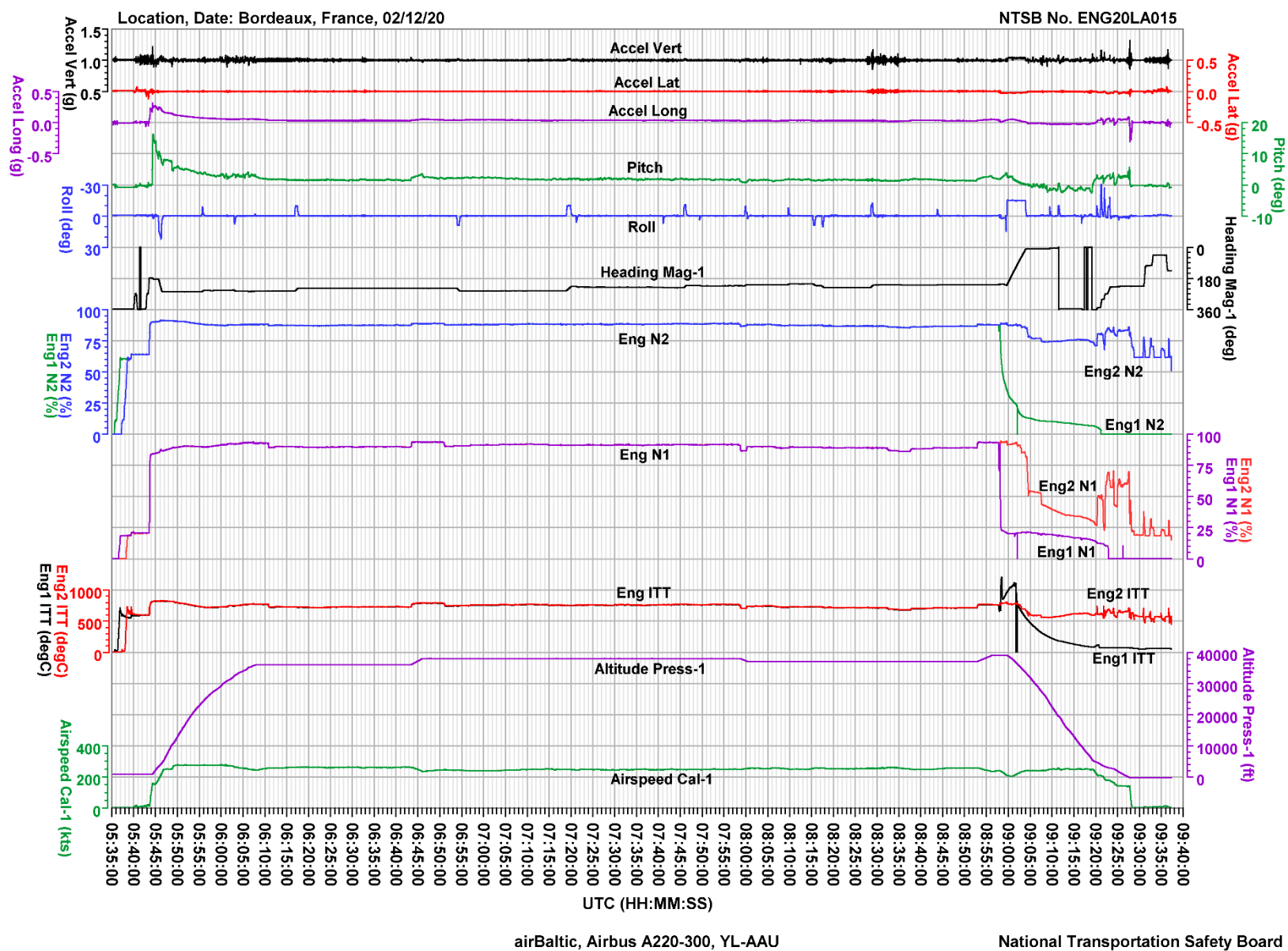


Figure 19. Plot of Basic Parameters for the Entire Flight.



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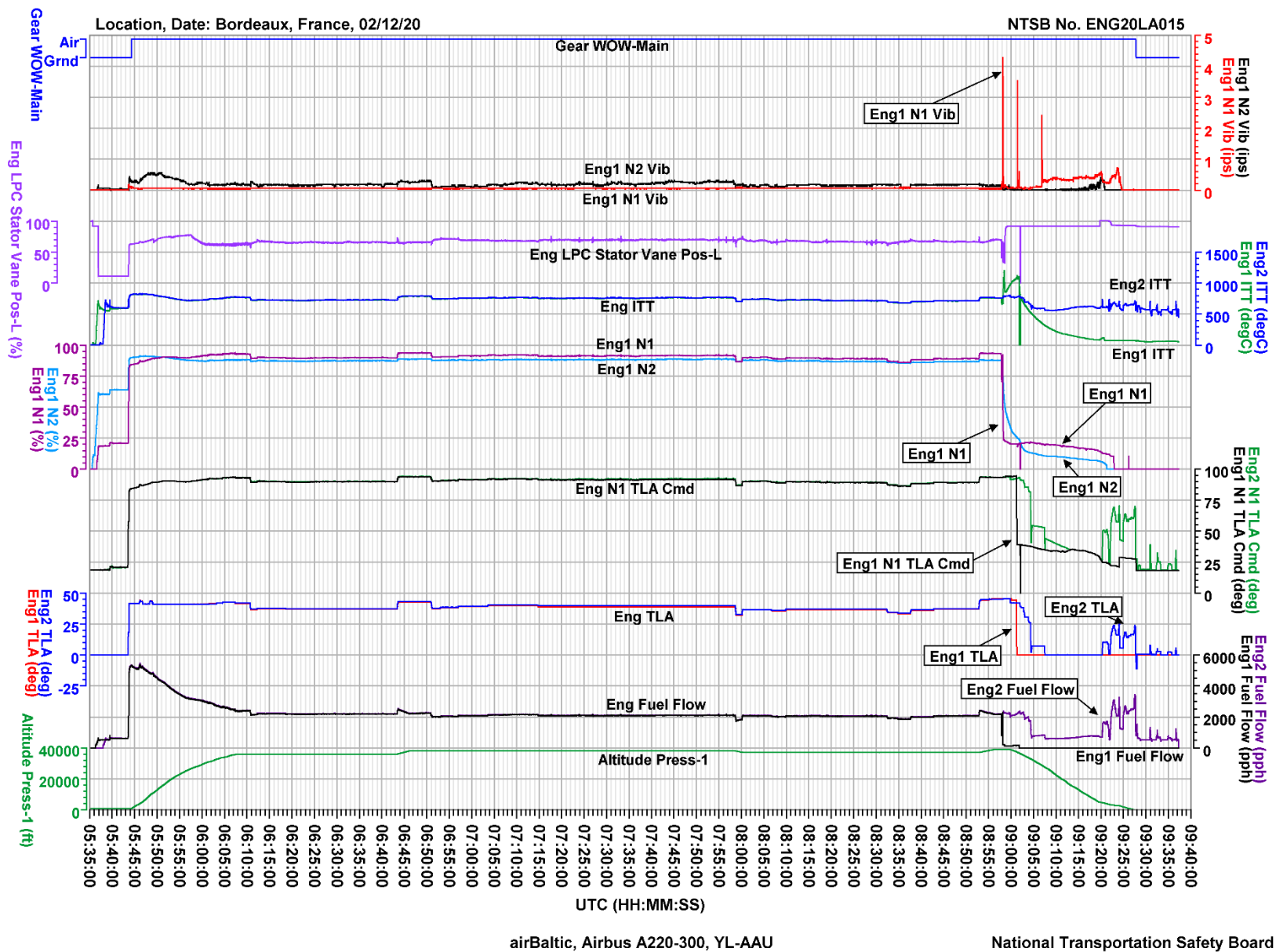
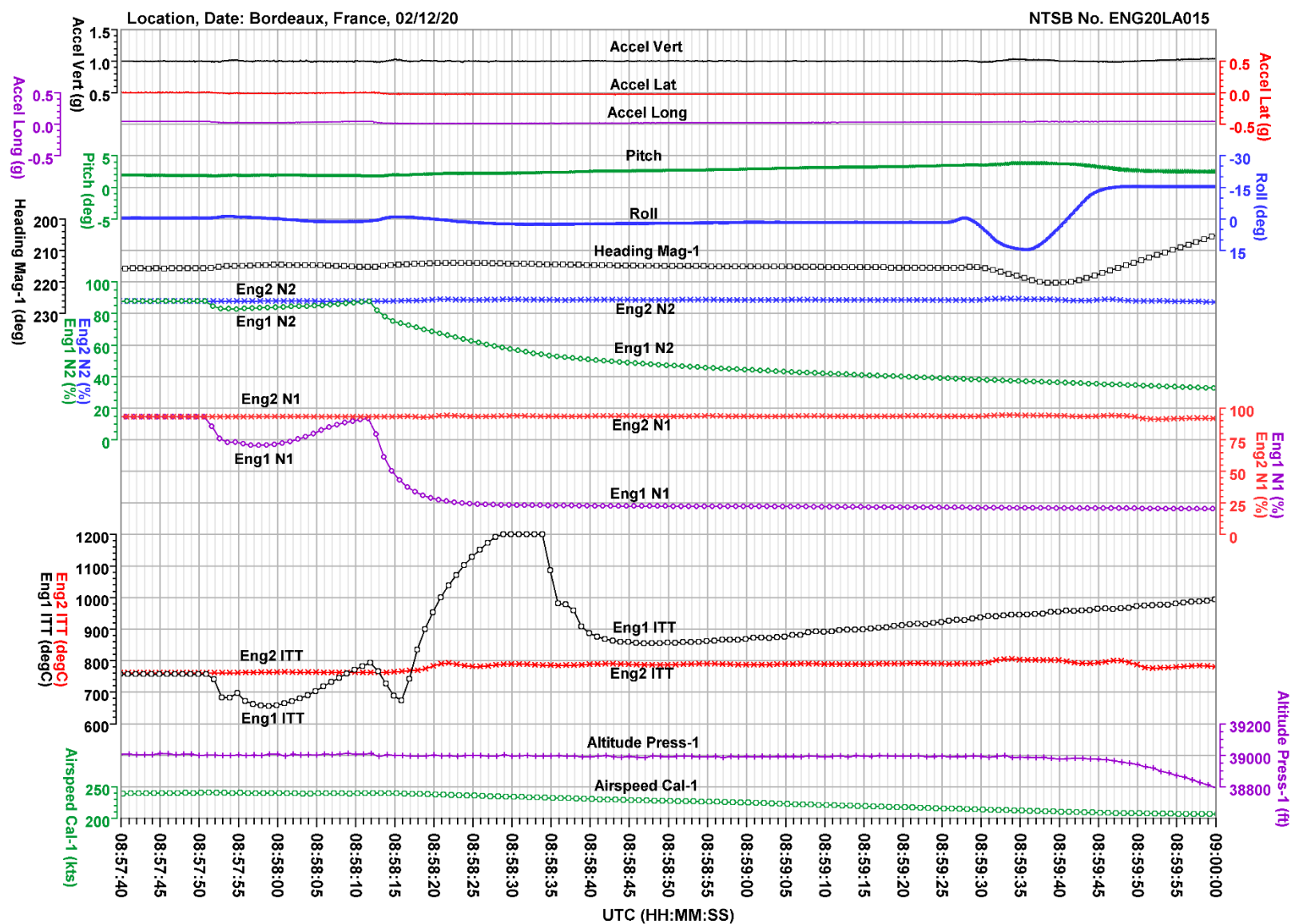


Figure 21. Plot of Additional Select Engine Parameters for the Entire Flight.



airBaltic, Airbus A220-300, YL-AAU

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Figure 22. Plot of Basic Parameters Detailing the Engine Event.

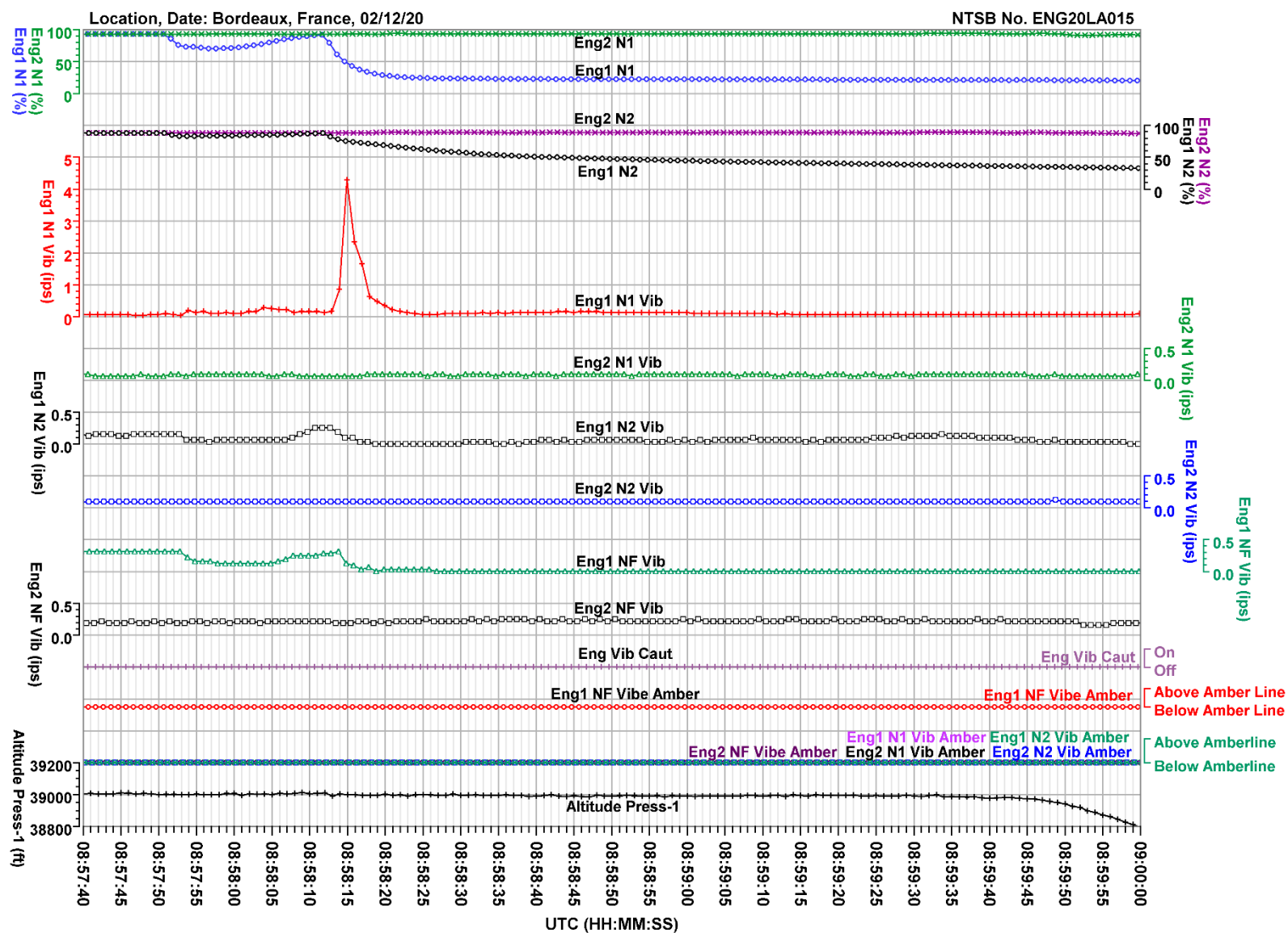
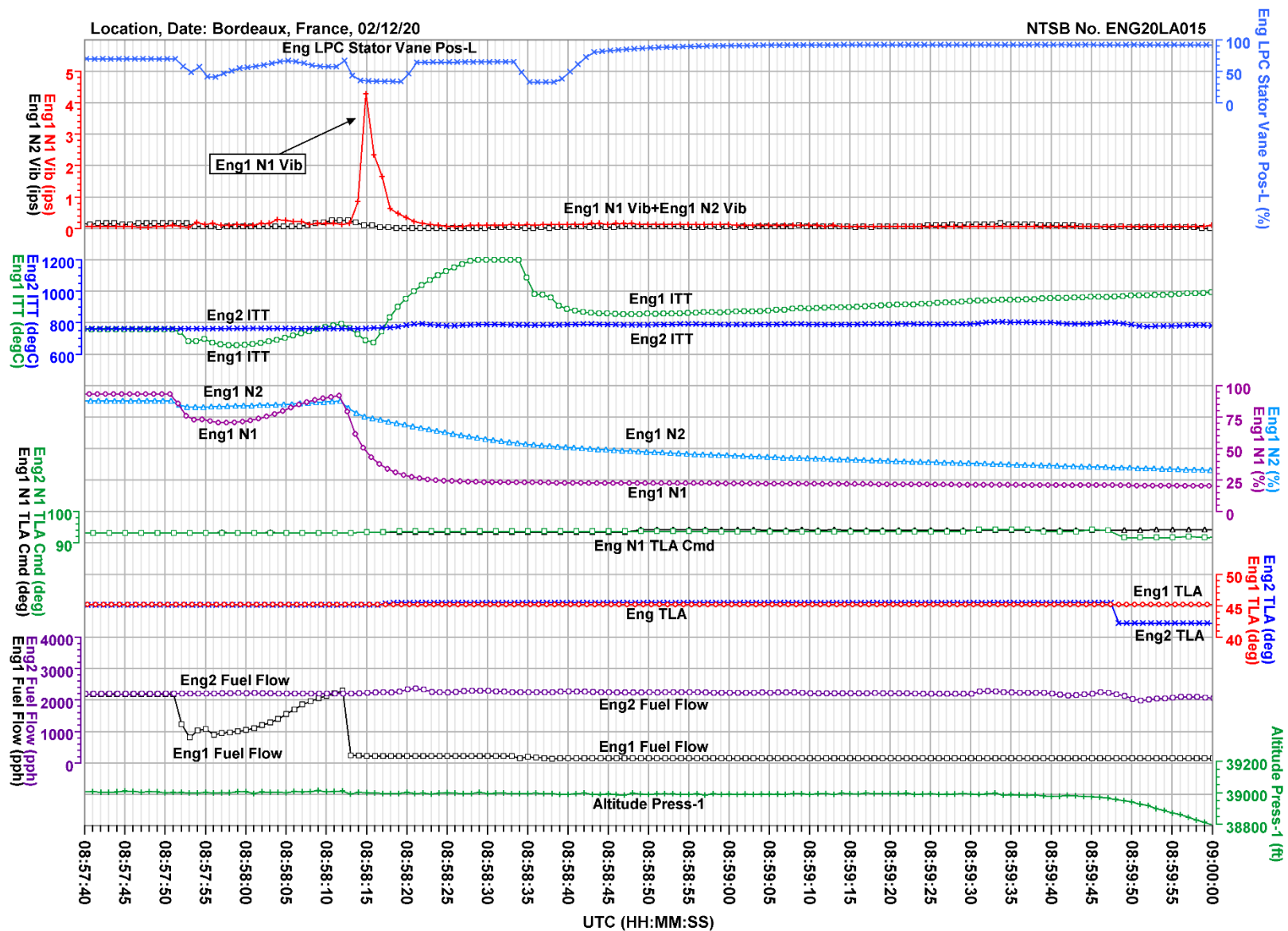


Figure 23. Plot of Select Engine Parameters Detailing the Engine Event.



airBaltic, Airbus A220-300, YL-AAU

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Figure 24. Plot of Additional Select Engine Parameters Detailing the Engine Event.

APPENDIX A

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

Table A-2. Verified and provided FDR parameters.

Plot/Table Labels	Parameter Names and Units
Accel Lat (g)	Lateral Acceleration (g)
Accel Long (g)	Longitudinal Acceleration (g)
Accel Vert (g)	Vertical Acceleration (g)
Airspeed Cal-1 (kts)	Calibrated Airspeed (knots)
Altitude Press-1 (ft)	Pressure Altitude (feet)
Eng LPC Stator Vane Pos-L (%)	Engine Low Pressure Compressor Stator Vane Position-Left (%)
Eng Vib Caut	Engine Vibration Caution (discrete)
Eng# Fuel Flow (pph)	Engine # Fuel Flow (pounds per hour)
Eng# ITT (degC)	Engine # Inter-Turbine Temperature (degrees Celsius)
Eng# N1 (%)	Engine # N1 (%)
Eng# N1 TLA Cmd (deg)	Engine # N1 Thrust Lever Angle Command (degrees)
Eng# N1 Vib (ips)	Engine # N1 Vibration (inches per second)
Eng# N1 Vib Amber	Engine # N1 Vibration Amber (discrete)
Eng# N2 (%)	Engine # N2 (%)
Eng# N2 Vib (ips)	Engine # N2 Vibration (inches per second)
Eng# N2 Vib Amber	Engine # N2 Vibration Amber (discrete)
Eng# NF Vib (ips)	Engine # Fan Vibration (inches per second)
Eng# NF Vibe Amber	Engine # Fan Vibration Amber (discrete)
Eng# TLA (deg)	Engine # Thrust Lever Angle (degrees)
Gear WOW-Main	Gear Weight On Wheels-Main (discrete)
Heading Mag-1 (deg)	Magnetic Heading (degrees)
Latitude FMS1 (deg)	Latitude Position (degrees)
Longitude FMS1 (deg)	Longitude Position (degrees)
Pitch (deg)	Pitch Angle (degrees)
Roll (deg)	Roll Angle (degrees)
Time UTC-Hr	Universal Coordinated Time (UTC) – Hours
Time UTC-Min	UTC Time – Minutes
Time UTC-Sec	UTC Time – Seconds

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: 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.

NOTE: For this aircraft, there are 2 engines. In the data plots and tabular data, the '#' ranges from 1 to 2.