June 14, 2013

Aircraft Performance Study

I. ACCIDENT

Description:	Landing Overrun
Location:	Key West International Airport (KEYW), Key West, Florida
Date:	October 31, 2011
Time:	1940 Eastern Daylight Time (EDT)
Aircraft:	Israel Aerospace Industries Gulfstream G150, N480JJ
Operator:	Hendrick Motorsports
NTSB Number:	ERA12FA056

II. AIRCRAFT PERFORMANCE GROUP

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1.0 INTRODUCTION

On October 31, 2011, at about 1940 eastern daylight time (EDT), an Israel Aerospace Industries Gulfstream G150, N480JJ, went off the departure end of runway 27 during landing roll out at Key West International Airport (KEYW), Key West, Florida. The nose landing gear collapsed and the airframe sustained structural damage. Visual meteorological conditions prevailed and an instrument flight rules (IFR) flight plan was filed. The certificated airline transport rated pilot-in-command (PIC), airline transport rated co-pilot, and one passenger

reported minor injuries. One passenger sustained serious injuries. The flight departed from Witham Field Airport (SUA) Stuart, Florida at 1900 EDT. The flight was conducted under the provisions of Title 14 *Code of Federal Regulations* Part 91 as a personal flight.

Examination of the crash site revealed the airplane departed the runway, crossed a 600 foot overrun, impacted the far side of a ditch, crossed a dirt road, cleared another ditch, and came to a stop about 820 feet from the departure end of runway 27.

The factual evidence considered herein includes Cockpit Voice Recorder (CVR) transcript data, NTSB CVR sound spectrum findings, Enhanced Ground Proximity Warning System (EGPWS) data, Digital Engine Electronic Control (DEEC) data from each engine, airplane configuration (flap, gear, weight, center of gravity), airplane deceleration device test and hardware findings, and airplane aerodynamic and engine model data. The expected airplane stopping performance was calculated for 76 scenarios using first principles methods.

The correlation of available EGPWS, CVR, DEEC, and G150 aircraft performance data show that N480JJ main gear touchdown occurred approximately 1,650 feet past the runway 27 approach threshold (about 3,150 feet of runway remaining) at a ground speed near 119 knots. Airplane performance calculations confirm that the crew management of engine forward and reverse thrust during the event precluded a stop on the improved surface, with or without spoilers deployed, unless actual wheel braking capability significantly exceeded the level expected from a committed emergency wheel brake application (without blowing main gear tires).

An evaluation of alternate deceleration device configurations indicates that the airplane could likely be stopped or slowed to a safe taxi speed in 3,150 feet or less by deploying spoilers and using emergency wheel brake and emergency reverse thrust procedures. This scenario assumes ground spoilers are deployed within 1.5 seconds after main gear touchdown, a 9-second lag between main gear touchdown and initial emergency wheel brake application (with sustained but metered brake pressure to avoid blown main gear tires), and both engines spool up to maximum reverse thrust at the 50 percent N1 limit within 12 seconds after main gear touchdown (with maximum reverse thrust sustained until the airplane stops or slows to a safe taxi speed). Finally, the G150 simulation data indicate that N480JJ main gear wheel brakes had to be applied and working (to some degree, unless an unidentified failure occurred), whether or not ground spoilers were deployed, in order to match portions of the ground speed time history extracted from the CVR sound spectrum work.

2.0 FACTUAL EVIDENCE

A subset of the available factual evidence is described in this section.

2.1 Airport and Runway Information

A general airport overview diagram for KEYW and detailed runway 9/27 characteristics are provided in Attachment 1. Runway 27 is grooved and was reported to be bare and dry at the time of the overrun.

2.2 Gulfstream G150 Three-View Drawing and General Specifications

A simplified three-view drawing and general airplane specifications for the Israel Aerospace Industries Gulfstream G150 are included in Attachment 2.

2.3 Aircraft Weight and Balance

The estimated N480JJ takeoff and landing weight and balance data are documented in Attachment 3. The approach and reference landing speed for an estimated landing weight of 17,800 pounds is 117 knots.

2.4 Photographs

The accident airplane ground track is documented in part by the tire rubber and tire rut witness marks recorded in Images 1–3 on the following pages.

2.5 Weather

The reported surface weather conditions near time of arrival were based on the Aviation Routine Weather Report (METAR) for October 31, 2011 at 2353Z.

METAR KEYW 312353Z 36012G17KT 10SM BKN010 BKN014 BKN050 26/23 A2996 RMK AO2 SLP144 T02560233 10283 20256 53012=

2.6 FDR Data

The airplane was not equipped with a Flight Data Recorder (FDR).

Image 1: View of departure end of runway 27 (looking west) with N480JJ in the background (near image center). NTSB photograph.

Image 2: Nose and main landing gear witness marks (ground rutting) near terrain elevation change (due to dirt road) and location of nose landing gear. NTSB photograph.

Image 3: Left rear side view of airplane (N480JJ) at rest. FAA photograph.

2.7 Honeywell Digital Electronic Engine Control (DEEC) Data

The available data from the left and right engine DEECs (see the Non-Volatile Memory Devices Factual Report) are presented in a series of plots in Attachment 4. The first plot shows the accident flight overview. From top to bottom, the sequence of parameters on the vertical axes is: pressure altitude, Mach number, landing gear Weight On Wheels (WOW) indication, engine Power Lever Angle (PLA), engine thrust reverser position (stowed or deployed), engine low pressure spool (N1) percent speed, engine high pressure spool (N2) percent speed, engine Inter-Turbine Temperature (ITT), and computer control mode for the left and right engine as a function of the respective DEEC time counter. The left and right engine DEEC time counters are independent and were not specifically time aligned. Parameter values correspond to a range of possible numeric or position values, as indicated by the legend for each parameter. Subsequent plots in Attachment 4 progressively narrow the time range presented to focus attention on the DEEC data detail in the proximity of short final approach and the overrun event.

2.8 Cockpit Voice Recorder (CVR) Data

The available CVR transcript data are documented in the CVR Group Chairman's Factual Report. The audio portion of the Video/Audio Study describes the CVR sound spectrum work to estimate nose wheel ground speed during the landing rollout on the improved (hard runway) surface. Both of these documents are available on the NTSB public docket for this investigation. The CVR-based nose wheel ground speed profile is plotted for comparison to calculated landing performance data for each airplane deceleration device scenario evaluated.

A subset of CVR transcript events related to aircraft landing performance is summarized in Table 1 for convenient reference. The time alignment between the DEEC data and the CVR data was defined by synchronizing the right engine DEEC data event corresponding to weight on wheels with the "CAM: [sound of thump, similar to touchdown]" CVR event. An overlay plot of a subset of the CVR transcript events with the left and right engine DEEC data is shown in Attachment 5.

Table 1: Subset of CVR Transcript

DEEC Time	CVR Time	Event Source	Event Content
Seconds	HH:MM:SS.S		
4866.2	19:41:28.7	EGPWS:	five hundred.
4870.6	19:41:33.1	HOT-1:	I don't like this man. I'm too fast.
4872.0	19:41:34.5	HOT-2:	[laughter] naw.
4873.0	19:41:35.5	HOT-1:	or I feel like I'm fast.
4874.1	19:41:36.6	HOT-2:	no you're good. you're right on speed.
4875.8	19:41:38.3	EGPWS:	three hundred.
4882.0	19:41:44.5	EGPWS:	two hundred.
4886.5	19:41:49.0	HOT-2:	I wouldn't want to be doin' in a G-five.
4889.8	19:41:52.3	EGPWS:	fifty.
4890.6	19:41:53.1	EGPWS:	forty.
4891.5	19:41:54.0	HOT-2:	aaaannd. there's ref.
4891.5	19:41:54.0	EGPWS:	thirty.

DEEC Time	CVR Time	Event Source	Event Content
4892.8	19:41:55.3	EGPWS:	twenty.
4893.3	19:41:55.8	HOT-1:	and I'm I'm long here.
4894.5	19:41:57.0	EGPWS:	ten.
4898.0	19:42:00.5	CAM:	[sound of thump, similar to touchdown]
4899.3	19:42:01.8	CAM:	[sound of clicks, similar to landing gear handle solenoid weight on wheels]
4900.1	19:42:02.6	HOT-2:	ahh you're one ten.
4900.4	19:42:02.9	CAM:	[sound of changed background noise, similar to nosewheel on runway]
4901.5	19:42:04.0	CAM:	[sound of rattle/thump from external source]
4904.9	19:42:07.4	HOT-2:	you're gonna have to get hard on the brakes.
4905.7	19:42:08.2	HOT-1:	yep. I'm on 'em. they're not goin'.
4908.0	19:42:10.5	HOT-1:	I'm goin' around. I'm goin' around.
4912.3	19:42:14.8	HOT-2:	no it's too late now. you can't go around now.
4917.2	19:42:19.7	CAM:	[momentary decrease in sound, similar to aircraft not touching ground]

2.9 Enhanced Ground Proximity Warning System (EGPWS) Data

The Non-Volatile Memory Devices Factual Report describes a landing record documented by the Honeywell MK V EGPWS for the accident flight. A landing record is expected when the EGPWS terrain clearance is less than 50 feet with the aircraft in a valid landing configuration. According to a Honeywell EGPWS specialist, the latitude and longitude position stored in the EGPWS landing record (N24.55622°, W81.75233°) should correspond to the position where the airplane crossed through 50 feet above ground level (agl) during short final approach.[1]

The aircraft position from the EGPWS landing record was plotted in Google Earth. The landing record position is nearly coincident with the runway 27 approach threshold, as shown by the orange circular symbol in Attachment 6. The latitude/longitude position uncertainty of 0.0110 nautical miles equates to a distance uncertainty of about 66.8 feet.

3.0 TECHNICAL METHODS

The technical methods used in this study are described in this section.

3.1 Estimated Touchdown Location

Touchdown location was estimated based on available EGPWS and CVR data. The absolute position of the airplane was assumed to be defined by the EGPWS latitude and longitude associated with the “EGPWS: fifty.” event recorded on the CVR. A range of assumed constant ground speeds was used together with the time elapsed between the CVR “EGPWS: fifty.” event and the “CAM: [sound of thump, similar to touchdown]” event to estimate the distance traveled from the arrival threshold to main landing gear touchdown (the air distance). The estimated touchdown location results are shown in Attachment 7 for constant assumed ground speed values of 114, 117, and 119 knots.

[1] According to Honeywell, a landing record will be recorded when [Landing Gear is down *or* Envelope Modulation Mode 5 Gear Override is true] *and* [the EGPWS system is in Approach mode *or* Landing Flaps selected] *and* [Terrain Clearance Valid] *and* [Terrain Clearance less than 50 feet]. This should occur within 1 second of the EGPWS 50 foot callout, if that callout is in the configured options (as it was for N480JJ).

3.2 Calculated Landing Performance

In general, airplane landing performance depends on time of arrival conditions; airplane energy state, configuration, and path; landing technique; deceleration device configuration and schedules; and runway surface conditions. The actual time of arrival conditions include the runway elevation, barometric pressure, temperature, steady winds, wind gusts, and precipitation. The airplane energy state is a function of the weight, approach speed, configuration (landing gear and high-lift devices), steady winds, wind gusts, thrust, and airplane flight path.

Aircraft landing performance calculations generally require access to airplane proprietary aerodynamic data (as a function of slat, flap, landing gear, and spoiler configuration), engine thrust data (forward/reverse setting and schedule), and equivalent wheel brake configuration (maximum manual braking, variable brake application, emergency braking, anti-skid braking inoperative, or autobrake setting, as applicable). Simulated flight crew control inputs are based on recorded data when available, trained procedures and planned landing technique, and/or witness statements. The reported runway condition (dry, wet, or contaminant type and depth) or equivalent braking action (good, medium, or poor) is typically specified or assumed to estimate expected airplane stopping capability.

For the accident landing, no factual evidence exists to confirm that ground spoilers were deployed during the landing rollout, the DEEC data provides only coarse resolution for engine N1 parameters, and crew witness statements indicate that normal wheel braking was not available and that emergency wheel braking[2] was never attempted. The consequent aerodynamic, engine thrust, and wheel braking uncertainty of the actual airplane deceleration device configuration during the accident landing rollout resulted in a table of simulation scenarios that were evaluated to quantify or at least bound the expected airplane stopping performance capability for the event conditions.

3.2.1 Estimated Engine Thrust

Turbofan engine thrust is generally a function of altitude, temperature, airspeed, and engine low spool (N1) percent speed. The coarse resolution of DEEC data for the left and right engine N1 values resulted in three estimates of engine N1 to bound the possible ranges of engine forward and reverse thrust at each time step.

The first engine N1 estimate assumed maximum forward thrust N1 values and minimum reverse thrust N1 values for each engine at each available time sample. This engine thrust estimate reflects the post-main gear touchdown maximum airplane energy state at each time step during the landing rollout.

The midpoint forward and reverse thrust N1 values for each engine at each available time sample were used to construct the second engine N1 estimate, which approximates the post-main gear touchdown mean airplane energy state at each time step during the rollout.

The third engine N1 estimate assumed minimum forward thrust N1 values and maximum reverse thrust N1 values for each engine at each available time sample. This engine thrust estimate models the post-main gear touchdown minimum airplane energy state at each time step during the landing rollout.

[2] The emergency brakes operate through actuation of the emergency/parking brake handle. The pilot is required to subtly manipulate the brake handle to modulate the brake pressure (from a compressed-gas accumulator) to no more than the 400 psi application recommended by the emergency procedure. If the emergency brake pressure exceeds 400 psi, the likely result is failure of all of the main wheel tires due to lack of antiskid protection. The airplane braking coefficient for this condition is equivalent to the calculation used for antiskid inoperative braking.

3.2.2 Required Aerodynamic, Engine, and Wheel Brake Data

Israel Aerospace Industries (IAI) provided confidential and proprietary G150 aerodynamic and engine thrust data to enable the NTSB to construct a limited envelope G150 landing performance model for the accident conditions. Aerodynamic data were provided for flaps 20 and flaps 40, with and without ground spoilers deployed, with landing gear deployed, for airplane high-speed ground roll operations. For modeling purposes, IAI equated wheel brake configuration to non-dimensional airplane braking coefficient as a function of braking effort. The airplane braking coefficient specified for the maximum manual, anti-skid inoperative, emergency brake application, and no wheel braking configurations were 0.41, 0.22, 0.22, and 0.02, respectively.

Airplane stopping distance was calculated using the first principles conservation of energy method. The trim conditions define the initial airplane energy state. At each integration time step, energy added to the system (e.g., forward engine thrust acting through an incremental distance) or energy dissipated from the system (e.g., aerodynamic drag, wheel braking retarding force, or engine reverse thrust acting through an incremental distance) was used to update the airplane state.

3.2.3 Deceleration Device Configuration Schedules

Prior to simulating specific stopping or takeoff/go around (TOGA) scenarios, the aircraft performance group members defined time schedules relative to main gear WOW for an average crew to accomplish actions required to decelerate or accelerate the aircraft. These actions included automatic ground spoiler deployment, nose gear touchdown, initial wheel brake application attempt, time to recognize and react to a non-normal wheel brake situation, time increment to command reverse thrust, delta time for thrust reverser deployment, time increment for engine spool up to 50 percent engine N1 in reverse, and as applicable, flap transition to takeoff flap and engine spool up to takeoff thrust.

One normal landing scenario, two non-normal wheel brake stopping scenarios, and one TOGA scenario in response to a non-normal wheel brake stopping scenario were considered. The simulation schedule for a normal landing with reverse thrust is defined in Table 2.

Table 2: Normal Landing with Reverse Thrust

Event	Time (Seconds)	Elapsed Time (Seconds)
Main gear WOW	0.0	0.0
Full ground spoiler deployment (relative to WOW)	1.5	1.5
Nose gear touchdown (relative to WOW)	2.0	2.0
Nominal wheel brake command (relative to WOW)	3.0	3.0
Delta time to command reverse thrust	3.0 to 4.0	7.0
Delta time for full T/R deployment	3.0	10.0
Delta time for engine spool up to 50 percent N1	2.2	12.2
Elapsed time from WOW to full deceleration device configuration		12.2

Identical reverse thrust time increments are used, as applicable, for the two non-normal wheel brake stopping scenarios and for the no wheel braking scenarios. The schedule for an emergency wheel brake application in response to no wheel brakes available is shown in Table 3. Similarly, Table 4 defines the simulation schedule for a stopping scenario with the wheel brake anti-skid system inoperative. The schedule used to model a TOGA scenario in response to a non-normal wheel brake stopping attempt is shown in Table 5.

Table 3: No Wheel Brakes, Emergency Brake Application Scenario

Event	Time (Seconds)	Elapsed Time (Seconds)
Main gear WOW	0.0	0.0
Full ground spoiler deployment (relative to WOW)	1.5	1.5
Nose gear touchdown (relative to WOW)	2.0	2.0
Nominal wheel brake command (relative to WOW)	3.0	3.0
Delta time to recognize no wheel brakes available	3.0	6.0
Delta time to formulate alternate plan and take action	2.0 to 3.0	9.0
Elapsed time from WOW to emergency brake application		9.0

Table 4: Anti-Skid System Inoperative, Stopping Scenario

Event	Time (Seconds)	Elapsed Time (Seconds)
Main gear WOW	0.0	0.0
Full ground spoiler deployment (relative to WOW)	1.5	1.5
Nose gear touchdown (relative to WOW)	2.0	2.0
Nominal wheel brake command (relative to WOW)	3.0	3.0
Delta time to recognize anti-skid system inoperative	4.0	7.0
Delta time to formulate alternate plan and take action	2.0 to 3.0	10.0
Elapsed time from WOW to metered brake application		10.0

Table 5: No Wheel Brakes, TOGA Scenario

Event	Time (Seconds)	Elapsed Time (Seconds)
Main gear WOW	0.0	0.0
Full ground spoiler deployment (relative to WOW)	1.5	1.5
Nose gear touchdown (relative to WOW)	2.0	2.0
Nominal wheel brake command (relative to WOW)	3.0	3.0
Delta time to recognize no wheel brakes available	3.0	6.0
Delta time to formulate alternate plan and TOGA action	3.0	9.0
Add power and call for F20	1.0	10.0
Engine spool up time	5.0	15.0
Flap transition time (in parallel with engine spool up)	5.0 to 8.0	18.0
Elapsed time from WOW to takeoff configuration		15.0 to 18.0

3.2.4 Event Stopping Scenario Modeling

A total of 48 simulation scenarios were used to model the accident event conditions based on available DEEC data for left and right engine N1. These scenarios resulted from the evaluation of two ground spoiler configurations (deployed or stowed), four wheel braking configurations (maximum manual, anti-skid system inoperative, emergency brake application, and no wheel braking), two throttle push assumptions (no change to spoiler deployment or wheel brake application schedule during throttle push or spoilers stowed and wheel brakes released during throttle push) and three left and right engine N1 settings (maximum energy state via maximum forward N1 and minimum reverse N1, mean energy state by means of midpoint forward and reverse N1, and minimum energy state via minimum forward N1 and maximum reverse N1). The product of these ground spoiler, wheel braking, throttle push, and engine N1 options yields 2 x 4 x 2 x 3 = 48 simulation scenarios, which correspond to Cases 1–114 (not inclusive) in Table 6.

Table 6: Simulation Scenarios Evaluated to Quantify G150 Stopping or TO/GA Performance Capability

Case	Ground Spoilers	Mu Airplane	Wheel Braking	Wheel Brake Release & Stow Spoilers	Reverse Thrust	Engine N1 Level
1	Deployed	0.41	Maximum Manual	0	Event T/R	MAX Fwd / MIN Rev. (Most Conservative)
2	Stowed	0.41	Maximum Manual	0	Event T/R	MAX Fwd / MIN Rev. (Most Conservative)
3	Deployed	0.41	Maximum Manual	1	Event T/R	MAX Fwd / MIN Rev. (Most Conservative)
4	Stowed	0.41	Maximum Manual	1	Event T/R	MAX Fwd / MIN Rev. (Most Conservative)
11	Deployed	0.22	A/S Inoperative	0	Event T/R	MAX Fwd / MIN Rev. (Most Conservative)
12	Stowed	0.22	A/S Inoperative	0	Event T/R	MAX Fwd / MIN Rev. (Most Conservative)
13	Deployed	0.22	A/S Inoperative	1	Event T/R	MAX Fwd / MIN Rev. (Most Conservative)
14	Stowed	0.22	A/S Inoperative	1	Event T/R	MAX Fwd / MIN Rev. (Most Conservative)
21	Deployed	0.22	Emergency	0	Event T/R	MAX Fwd / MIN Rev. (Most Conservative)
22	Stowed	0.22	Emergency	0	Event T/R	MAX Fwd / MIN Rev. (Most Conservative)
23	Deployed	0.22	Emergency	1	Event T/R	MAX Fwd / MIN Rev. (Most Conservative)
24	Stowed	0.22	Emergency	1	Event T/R	MAX Fwd / MIN Rev. (Most Conservative)
31	Deployed	0.02	None	0	Event T/R	MAX Fwd / MIN Rev. (Most Conservative)
32	Stowed	0.02	None	0	Event T/R	MAX Fwd / MIN Rev. (Most Conservative)
33	Deployed	0.02	None	1	Event T/R	MAX Fwd / MIN Rev. (Most Conservative)
34	Stowed	0.02	None	1	Event T/R	MAX Fwd / MIN Rev. (Most Conservative)
41	Deployed	0.41	Maximum Manual	0	Event T/R	Mean Event Thrust
42	Stowed	0.41	Maximum Manual	0	Event T/R	Mean Event Thrust
43	Deployed	0.41	Maximum Manual	1	Event T/R	Mean Event Thrust
44	Stowed	0.41	Maximum Manual	1	Event T/R	Mean Event Thrust
51	Deployed	0.22	A/S Inoperative	0	Event T/R	Mean Event Thrust
52	Stowed	0.22	A/S Inoperative	0	Event T/R	Mean Event Thrust
53	Deployed	0.22	A/S Inoperative	1	Event T/R	Mean Event Thrust
54	Stowed	0.22	A/S Inoperative	1	Event T/R	Mean Event Thrust
61	Deployed	0.22	Emergency	0	Event T/R	Mean Event Thrust
62	Stowed	0.22	Emergency	0	Event T/R	Mean Event Thrust
63	Deployed	0.22	Emergency	1	Event T/R	Mean Event Thrust
64	Stowed	0.22	Emergency	1	Event T/R	Mean Event Thrust
71	Deployed	0.02	None	0	Event T/R	Mean Event Thrust
72	Stowed	0.02	None	0	Event T/R	Mean Event Thrust
73	Deployed	0.02	None	1	Event T/R	Mean Event Thrust
74	Stowed	0.02	None	1	Event T/R	Mean Event Thrust
81	Deployed	0.41	Maximum Manual	0	Event T/R	MIN Fwd / MAX Rev. (Least Conservative)
82	Stowed	0.41	Maximum Manual	0	Event T/R	MIN Fwd / MAX Rev. (Least Conservative)
83	Deployed	0.41	Maximum Manual	1	Event T/R	MIN Fwd / MAX Rev. (Least Conservative)
84	Stowed	0.41	Maximum Manual	1	Event T/R	MIN Fwd / MAX Rev. (Least Conservative)
91	Deployed	0.22	A/S Inoperative	0	Event T/R	MIN Fwd / MAX Rev. (Least Conservative)
92	Stowed	0.22	A/S Inoperative	0	Event T/R	MIN Fwd / MAX Rev. (Least Conservative)
93	Deployed	0.22	A/S Inoperative	1	Event T/R	MIN Fwd / MAX Rev. (Least Conservative)
94	Stowed	0.22	A/S Inoperative	1	Event T/R	MIN Fwd / MAX Rev. (Least Conservative)

Table 6 (Continued): Simulation Scenarios Evaluated to Quantify G150 Stopping or TO/GA Performance Capability

Case	Ground Spoilers	Mu Airplane	Wheel Braking	Wheel Brake Release & Stow Spoilers	Reverse Thrust	Engine N1 Level
101	Deployed	0.22	Emergency	0	Event T/R	MIN Fwd / MAX Rev. (Least Conservative)
102	Stowed	0.22	Emergency	0	Event T/R	MIN Fwd / MAX Rev. (Least Conservative)
103	Deployed	0.22	Emergency	1	Event T/R	MIN Fwd / MAX Rev. (Least Conservative)
104	Stowed	0.22	Emergency	1	Event T/R	MIN Fwd / MAX Rev. (Least Conservative)
111	Deployed	0.02	None	0	Event T/R	MIN Fwd / MAX Rev. (Least Conservative)
112	Stowed	0.02	None	0	Event T/R	MIN Fwd / MAX Rev. (Least Conservative)
113	Deployed	0.02	None	1	Event T/R	MIN Fwd / MAX Rev. (Least Conservative)
114	Stowed	0.02	None	1	Event T/R	MIN Fwd / MAX Rev. (Least Conservative)
121	Deployed	0.41	Maximum Manual	0	Emergency T/R	Emergency (Stow at 0 knots)
122	Stowed	0.41	Maximum Manual	0	Emergency T/R	Emergency (Stow at 0 knots)
131	Deployed	0.22	A/S Inoperative	0	Emergency T/R	Emergency (Stow at 0 knots)
132	Stowed	0.22	A/S Inoperative	0	Emergency T/R	Emergency (Stow at 0 knots)
141	Deployed	0.22	Emergency	0	Emergency T/R	Emergency (Stow at 0 knots)
142	Stowed	0.22	Emergency	0	Emergency T/R	Emergency (Stow at 0 knots)
151	Deployed	0.02	None	0	Emergency T/R	Emergency (Stow at 0 knots)
152	Stowed	0.02	None	0	Emergency T/R	Emergency (Stow at 0 knots)
161	Deployed	0.41	Maximum Manual	0	Nominal T/R	Nominal (Stow at 70 knots)
162	Stowed	0.41	Maximum Manual	0	Nominal T/R	Nominal (Stow at 70 knots)
171	Deployed	0.22	A/S Inoperative	0	Nominal T/R	Nominal (Stow at 70 knots)
172	Stowed	0.22	A/S Inoperative	0	Nominal T/R	Nominal (Stow at 70 knots)
181	Deployed	0.22	Emergency	0	Nominal T/R	Nominal (Stow at 70 knots)
182	Stowed	0.22	Emergency	0	Nominal T/R	Nominal (Stow at 70 knots)
191	Deployed	0.02	None	0	Nominal T/R	Nominal (Stow at 70 knots)
192	Stowed	0.02	None	0	Nominal T/R	Nominal (Stow at 70 knots)
201	Deployed	0.41	Maximum Manual	0	No T/R	Flight/Ground Idle
202	Stowed	0.41	Maximum Manual	0	No T/R	Flight/Ground Idle
211	Deployed	0.22	A/S Inoperative	0	No T/R	Flight/Ground Idle
212	Stowed	0.22	A/S Inoperative	0	No T/R	Flight/Ground Idle
221	Deployed	0.22	Emergency	0	No T/R	Flight/Ground Idle
222	Stowed	0.22	Emergency	0	No T/R	Flight/Ground Idle
231	Deployed	0.02	None	0	No T/R	Flight/Ground Idle
232	Stowed	0.02	None	0	No T/R	Flight/Ground Idle
241	Deployed	0.02	None	0	No T/R -> TOGA	TOGA Thrust (Flaps 40 to 20)
242	Stowed	0.02	None	0	No T/R -> TOGA	TOGA Thrust (Flaps 40 to 20)
251	Deployed	0.02	None	0	No T/R -> TOGA	TOGA Thrust (Remain at Flaps 40)
252	Stowed	0.02	None	0	No T/R -> TOGA	TOGA Thrust (Remain at Flaps 40)

The equivalent braking friction coefficient for an anti-skid system inoperative or emergency wheel braking scenario is reduced by about one-half for the G150 (assuming no braked main gear tires are blown) compared to the performance that could be extracted from a dry runway using maximum manual braking with the anti-skid system operative.

3.2.5 Alternate Stopping or TO/GA Scenario Modeling

A total of 24 alternate simulation stopping scenarios were used to evaluate airplane stopping performance capability in the accident event conditions assuming alternate airplane energy management procedures. These alternate flight control input scenarios resulted from two ground spoiler configurations (deployed or stowed), four wheel braking configurations (maximum manual, anti-skid system inoperative, emergency brake application, and no wheel braking), and three left and right engine N1 settings (maximum reverse thrust maintained to a complete stop, maximum reverse thrust maintained to 70 knots airspeed, and no reverse thrust but flight/ground idle forward thrust). The product of these ground spoiler, wheel braking, and engine N1 options yields 2 x 4 x 3 = 24 simulation scenarios, identified by Cases 121–232 (not inclusive) in Table 6.

In addition, four TOGA scenarios were evaluated. The first two scenarios (Cases 241–242) estimate airplane acceleration capability assuming the flaps transition from 40 to 20 degrees, accounting for ground spoilers deployed (or stowed) between main gear touchdown and TOGA. The third and fourth scenarios (Cases 251–252) estimate airplane acceleration capability assuming a flaps 40 takeoff (which is not an approved takeoff configuration for the G150), accounting for ground spoilers deployed (or stowed) between main gear touchdown and TOGA. The TOGA simulation scenarios did not model airplane rotation or the climb segment to 35 feet agl.

3.2.6 Initial Conditions

The airplane landing weight for all simulation scenarios was assumed to be 17,800 pounds with zero head/tail wind, temperature 26°C, altimeter 29.96 inches Hg, and zero percent runway slope. The landing distance available was 4,801 feet. The air distance was assumed to be 1,575 feet for an initial main landing gear touchdown ground speed of 114 knots and 1,650 feet for an initial main landing gear touchdown ground speed of 119 knots.

3.2.7 Validation of NTSB G150 Limited Envelope Landing Performance Model

Israel Aerospace Industries calculated the G150 stopping performance for the simulation scenarios shown in Table 6 to independently validate the NTSB simulation model. A comparison of the NTSB and IAI results is available in Attachment 8 for an assumed initial main gear touchdown ground speed of 114 knots and a constant air distance of 1,575 feet. The NTSB and IAI simulation results generally agree within about ±3 percent total landing distance (air distance plus transition distance for full deceleration device configuration plus stopping distance) for 72 of the 76 scenarios evaluated.

Larger calculated stopping distance differences exist for cases 191-192 and 231-232, likely due to a difference in scenario total integration time. For these cases, forward idle engine thrust matches the retarding forces due to aerodynamic drag and rolling friction coefficient (with no main gear wheel braking) at a non-zero speed between 17 and 21 knots. As a result, the airplane will continue to roll out or taxi unless wheel brakes are applied or the engine(s) are shut down.

4.0 RESULTS

The simulation scenario results for the 76 cases defined in Table 6 are summarized in expanded tables in Attachments 9 and 10 for assumed main gear touchdown ground speeds of 114 knots and 119 knots, respectively. These summary tables include the assumed touchdown ground speed and air distance in addition to the calculated ground roll distance, total landing distance, runway distance remaining (negative values represent an overrun), and overrun speed (positive values indicate an overrun). Note that runway 27 has a hard surface runway safety area that extends approximately 600 feet beyond the departure threshold to minimize airplane occupant injuries and airplane structural damage.

The plotted data in Attachments 9 and 10 depict the calculated stopping distance parameters[3] for two simulation cases per page (with and without ground spoilers deployed) together with the calculated nose wheel ground speed profile from the CVR sound spectrum work (see Video/Audio Study), a subset of CVR transcript events, and a subset of the event DEEC data. These plots provide visibility to the simulation setup for each case and enable direct comparison between simulation results and the available accident data. From top to bottom, the sequence of parameters on the vertical axes on each plot is: calculated ground speed, calculated ground roll distance, engine N1, engine N1 mapping (DEEC data), engine PLA (DEEC data), engine thrust model (simulation discrete), reverse thrust model (simulation discrete), ground spoiler (simulation discrete), airplane braking coefficient, wheel brake level (simulation discrete), and time delay to apply wheel brakes as a function of reference time in seconds. The 119 knot initial main gear touchdown ground speed results in Attachment 10 generally compare more favorably with the CVR-based nose wheel ground speed profile than the 114 knot ground speed results in Attachment 9.

The Video/Audio Study indicated that the average airplane ground speed as the aircraft traveled from the runway 27 approach threshold toward main gear touchdown was about 119 knots. Based on the CVR sound spectrum work, the airplane ground speed had decreased to about 114 knots when the nose wheel touched down on the runway (with about 2,770 feet of runway remaining, calculated by integrating the CVR-based nose wheel ground speed time history).

The correlation of available EGPWS, CVR, DEEC, and G150 aircraft performance data from Attachment 10 shows that N480JJ main gear touchdown occurred approximately 1,650 feet past the runway 27 approach threshold (about 3,150 feet of runway remaining) at a ground speed near 119 knots. The CVR evidence indicated that nose gear touchdown occurred about 2.4 seconds later at 114 knots (with about 2,680 feet of runway remaining, based on the distance traveled over 2.4 seconds, assuming an average ground speed of 116.5 knots between main gear and nose gear touchdown).

Airplane performance calculations confirm that the crew management of engine forward and reverse thrust during the event (see Attachment 10, Cases 1–114) precluded a stop on the improved surface, with or without spoilers deployed, unless actual wheel braking capability significantly exceeded the level expected from a committed emergency wheel brake application (without blowing main gear tires). In fact, periods of sustained maximum manual wheel brake inputs would be required to stop the airplane on the runway based on the event engine PLA history recorded by the left and right engine DEEC.

[3] Smooth transitions were used to model simulation lift, drag, and thrust transients over a finite time period to account for more realistic spoiler deployment/retraction, flap retraction, and engine thrust spool up/down effects. Confidential and proprietary Gulfstream Aerospace Corporation and/or IAI aerodynamic lift, drag, and engine thrust data are not available for public release.

An evaluation of alternate deceleration device configurations (see Attachment 10, Cases 121–232) indicates that the airplane could likely be stopped or slowed to a safe taxi speed in 3,150 feet or less by deploying spoilers and using emergency wheel brake and emergency reverse thrust procedures. This scenario (see Attachment 10, Case 141) assumes ground spoilers are deployed within 1.5 seconds after main gear touchdown, a 9-second lag between main gear touchdown and initial emergency wheel brake application (with sustained but metered brake pressure to avoid blown main gear tires), and both engines spool up to maximum reverse thrust at the 50 percent N1 limit within about 12 seconds after main gear touchdown (with maximum reverse thrust sustained until the airplane stops or slows to a safe taxi speed). With less aggressive engine reverse thrust (nominal reverser stowage schedule or no reverser deployment) or an additional one second time delay before emergency or anti-skid inoperative wheel brake application, the airplane would be expected to stop within the confines of the 600-foot Runway Safety Area (RSA) at the departure end of runway 27 (see Attachment 10, Cases 131, 171, 181, 211, and 221). The TOGA scenarios indicate that the aircraft could accelerate to a speed five to eight knots faster than the flaps 40 approach and landing reference speed of 117 knots prior to the runway 27 departure threshold (see Attachment 10, Cases 241–252).

Aircraft performance calculations using the engine forward and reverse thrust levels documented by the DEEC suggest that the PIC report that "the brakes were not working" may be consistent with the significantly reduced deceleration expected with spoilers stowed and maximum (or less aggressive) manual wheel brake inputs (see annotated plot in Attachment 10 showing simulation Cases 3-4 and note that the "red" ground speed line at the top of the plot falls within the "purple" CVR sound spectrum uncertainty bands). As a result, the PIC statement that "he realized he did not have any brakes" and the passenger perception that "he did not feel any braking action" do not necessarily conflict with the NTSB Systems Group findings that the airbrake and wheel brake systems were fully functional.

Finally, performance calculations indicate that the airplane could not decelerate as quickly as the event aircraft did (based on the CVR sound spectrum nose wheel ground speed profile) unless some level of wheel braking (or some undetermined failure) occurred to provide a retarding force in addition to the forces available from engine reverse thrust and ground spoilers. In short, the crew-reported no wheel brakes scenario is inconsistent with the CVR-based airplane ground speed evidence, particularly after the time period that forward thrust is added in response to the PIC throttle push (see for example, simulation Cases 31-34 in Attachment 10).

5.0 ATTACHMENTS

Attachment 1: Airport Information

Attachment 2: Airplane Three-View Drawing and Specifications

Attachment 3: Enhanced Ground Proximity Warning System (EGPWS) Data

Attachment 4: Digital Electronic Engine Controller (DEEC) Data

Attachment 5: DEEC Data with CVR Event Subset Overlay

Attachment 6: Estimated Aircraft Weight and Balance

Attachment 7: Estimated Main Gear Touchdown Location

Attachment 8: Comparison of NTSB and IAI Performance Calculations (114 knots)

Attachment 9: Calculated Landing Performance Data (114 knots touchdown ground speed)

Attachment 10: Calculated Landing Performance Data (119 knots touchdown ground speed)

Attachment 1: Airport Information

SE-3, 30 JUN 2011 to 28 JUL 2011

SE-3, 30 JUN 2011 to 28 JUL 2011

Rpt Date:05/11/2012

Airport Detail for KEYW

Report : APT002

KEY WEST INTL

KEY WEST

AL# :606

State: FLORIDA
Country: UNITED STATES
Phone : (305)296-7223
Category: AIRPORT
FAR Part 139: Yes

Magnetic Variation/Year: W 4 2000
Site Nbr: 03263.
Sectional Chart: MIAMI
Survey Code: 8

Weather Station: N
Control Tower: Y
Control Zone: Y
Control Zone Operational: P

Coordinates
Latitude: N 24° 33' 22.0000"
Longitude: W 081° 45' 34.4000"
Field Elevation: 2.8
Elipsoid Elevation:
Horz Datum: NAD83
Vert Datum: NAVD88

Office
Flight Inspection: ATL
Procedure Development: 110
Region Code: SO

Auto Weather
Weather Source: ASOS
Location: KEYW
Type: 3
Frequency: 119.650
Service A: Y

Altimeter

Type	Primary	Airport ID	Field Alt Source	Latitude	Longitude	Start	End
L	Yes	KEYW	ASOS	N 24° 33' 22.0000"	W 081° 45' 34.4000"		

Runway List

09 A 27 A

Runway Detail

Landing Strip

Surface: ASPH G Width: 100 Physical Length: 4801

Rwy Number: 09
Status: A Survey: 8
Markings: NPI-G

Threshold
Latitude: N 24° 33' 21.7924"
Longitude: W 081° 46' 00.3647"
Elevation: 2.7
Elipsoid Elev: -67.9 S
Horz. Datum: NAD83
Vert. Datum: NAVD88

Displaced Threshold
Latitude:
Longitude:
Elevation:
Elipsoid Elev:
Horz. Datum: NAD83
Vert. Datum: NAVD88

Landing Length: 4801
FI RWY Length: 4801
FI RWY Height: 2.5
Tdz Elevation: 2.8
True Bearing: 89.38
Ft Disp Th:
Gradient: 0.0%
RVR Touchdown:
RVR MidPoint:
RVR Rollout:
Rail: No

RWY Survey: ANAPC 03/24/1999 NGS

KEYW09

VGSI Lights Type: VASI-4L
Owner:F Pilot Cntl Freq: 118.200
Th Cross Ht: 34
High Angle:
Com.Date: 12/12/2006
Com.Angle: 3.00
DWB Elev:
DWB Thres:
Ref Pt Lat: N 24° 33' 21.8600"
Ref Pt Long: W 081° 45' 53.3400"
Ref Pt Elev: 2.7
Ref PtThres: 648.1

Lights Config	Len	Owner	Com Dt	Pilot Cntl
REIL		F	07/17/1979	118.200
MIRL		F		118.200

Rwy Number: 27
Status: A Survey: 8
Markings: NPI-G

Threshold
Latitude: N 24° 33' 22.2957"
Longitude: W 081° 45' 08.3659"
Elevation: 2.5
Elipsoid Elev: -68.1 S
Horz. Datum: NAD83
Vert. Datum: NAVD88

Displaced Threshold
Latitude:
Longitude:
Elevation:
Elipsoid Elev:
Horz. Datum: NAD83
Vert. Datum: NAVD88

Landing Length: 4801
FI RWY Length: 4801
FI RWY Height: 2.7
Tdz Elevation: 2.8
True Bearing: 269.39
Ft Disp Th:
Gradient: 0.0%
RVR Touchdown:
RVR MidPoint:
RVR Rollout:
Rail: No

RWY Survey: ANAPC 03/24/1999 NGS

KEYW27

VGSI Lights Type: VASI-4L
Owner:F Pilot Cntl Freq: 118.200
Th Cross Ht: 34
High Angle:
Com.Date: 04/27/2011
Com.Angle: 3.00
DWB Elev:
DWB Thres:
Ref Pt Lat: N 24° 33' 22.2300"
Ref Pt Long: W 081° 45' 15.3800"
Ref Pt Elev: 2.6
Ref PtThres: 647.5

Lights Config	Len	Owner	Com Dt	Pilot Cntl
REIL		F		118.200
MIRL		F		118.200

Assoc. Fac: **Assoc. Fac:**

Remarks

Topic	Priority	Date	Remark
SURVEY	1	11/05/99	NGS 405 SURVEY DATED 03/24/99
AWOS/ASOS	2	07/13/00	ASOS (305) 292-4046
NFDD	3	11/04/04	RWY 09/27 MKG TYPE-COND MODIFIED PER NFDD #208 DTD 10/27/04.
VGSI-1	4	06/07/06	VGSI DATA RWY 09/27 PER ARPT MGR.

GPS Procedures

Procedure

Control	Description	Proc Type	Amendment	Runway	Status	Owner
18633	RNAV (GPS) RWY 27	PROC/S	ORIG	27	A	B
18739	RNAV (GPS) RWY 9	PROC/S	1	09	A	B

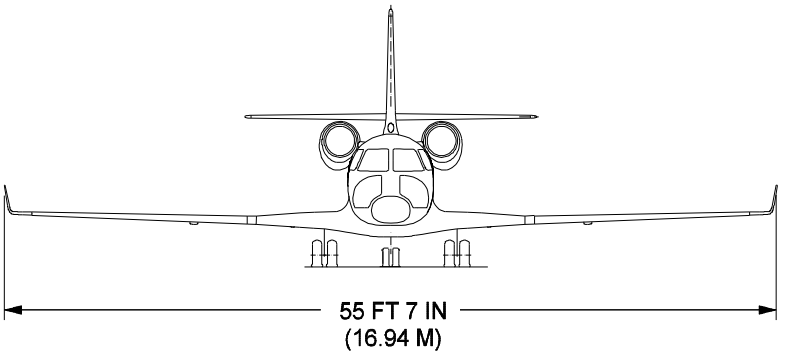
SIAPS

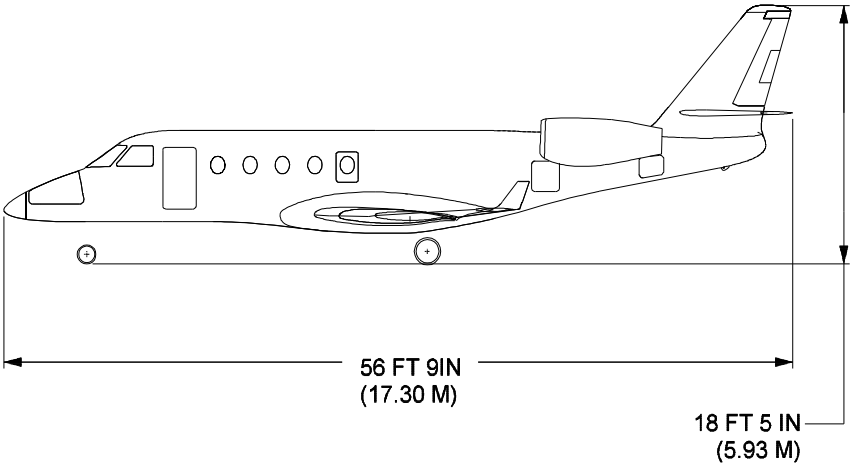
Nav Ident	Nav Type	Description	Amendment	Type
FIS	NDB/H	NDB OR GPS-A	15B	B

Attachment 2: Airplane Three-View Drawing & Specifications

Aircraft Dimensions

GAC





Specifications Data

AFM Section I / FSI

PERFORMANCE

Mmo *(Maximum Mach Number)*	.85 Mi
Maximum Cruise Altitude	45,000 ft / 13,716 m
Maximum Direct Crosswind Component Demonstrated Dry Runway *(not a limiting value for takeoff/landing)*	28 kts

WEIGHT CAPACITIES

Maximum Takeoff Weight	26,100 lb / 11,838 kg
Maximum Landing Weight	21,700 lb / 9,842 kg
Maximum Zero Fuel Weight	17,500 lb / 7,937 kg
Maximum Fuel Weight	10,300 lb / 4,672 kg
Maximum Landing Weight	21,700 lb / 9,842 kg
Maximum Takeoff Weight	26,100 lb / 11,838 kg
Maximum Ramp Weight	26,250 lb / 11,906 kg
Minimum Flight Weight	13,200 lb / 5,988 kg

BAGGAGE COMPARTMENT WEIGHT

Maximum Floor Loading / Capacity	105 lb/ft^2 / 1,100 lb

DESIGN STANDARDS

Engines *(2)*	TFE-731-40AR
Rated Takeoff Thrust *(Each)*	4,420 lb (w/wo APR)
Passengers *(Typical Outfitting)*	6 - 9 passengers

INTERIOR

Cabin Length	17 ft 8 in / 5.4 m
Cabin Height	5 ft 9 in / 1.75 m
Cabin Width	5 ft 9 in / 1.75 m
Cabin Volume	465 cu ft / 13.17 cu m
Total Baggage Volume	80 cu ft / 2.27 cu m
External	55 cu ft / 1.56 cu m
Internal	25 cu ft / 0.71 cu m

EXTERIOR

Length	56 ft 9 in / 17.30 m
Height	18 ft 5 in / 5.93 m
Wingspan	55 ft 7 in / 16.94 m

FUEL DATA

Useable Fuel:

Total Useable Fuel Volume	1,537.3 US gal / 5,819 ltr
Total Useable Fuel Weight *(@ 6.7 lb / US gal)*	10,300 lb / 4,672 kg

Maximum Unbalance:

Maximum Lateral Unbalance *(Takeoff)*	400 lb / 136 kg
Maximum Lateral Unbalance *(Cruise and Landing)*	600 lb / 272 kg

Fuel Tank Temperature Limitations (Indicated):	**Min: / Max:**
Jet A	-39°C / 61°C
Jet A-1	-46°C / 61°C
JP-8	-49°C / 61°C
Jet B	-49°C / (see note)
JP-4	-57°C / (see note)
JP-5	-45°C / 61°C

NOTE: Use of Jet B or JP-4 is altitude limited per fuel tank temperature. See **Maximum Fuel Tank Temperature Vs. Altitude**, for Jet B and JP-4 graph, page EF-5.

AIRSPEED LIMITATIONS

NOTE: Maximum normal operation speeds (V_{MO}/M_{MO}) may not be deliberately exceeded in any regime of flight (climb, cruise or descent) except where a higher speed is specifically authorized for flight test.

Normal Operation (*autopilot engaged or Mach trim operative):*

Sea Level to 8,000 ft	310 KIAS
8,000 ft to 12,000 ft	310 - 330 KIAS
12,000 ft to 29,260 ft	330 KIAS
Above 29,260 ft	0.85 Mi

With autopilot disengaged AND Mach trim becoming inoperative in flight:

Sea Level to 8,000 ft	310 KIAS
8,000 ft to 12,000 ft	310 - 330 KIAS
12,000 ft to 24,770 ft	330 KIAS
Above 24,770 ft	0.78 Mi

MANUEVERING SPEED (VA)

Full application of rudder and/or aileron controls is limited to speeds below V_A:

Altitude (ft)	**V_A (KIAS/M_i)**
Sea Level – 20,000	272 to 287
20,000 – 29,300	287 to 330
Above 29,300	0.85

OIL PRESSURE LIMITS

Engine Start	Indicating within 10 sec after lightoff
Idle *(oil temperature below 30°)*	50 to 150 psi
Idle *(oil temperature above 30°)*	62 to 83 psi
Takeoff, Climb and Cruise	62 to 83 psi
Transient	100 psi max *(3 minutes max)*

OIL TEMPERATURE

NOTE: At temperatures below -40°C for extended periods, preheat engine before attempting start. During cold oil temperature starts, oil pressure may exceed maximum allowable transients.

Starting *(minimum continuous operation)*	See ***NOTE*** above.
Up to 30,000 ft	30°C to 127°C
Above 30,000 ft	30°C to 140°C
Transient	149°C *(2 min all operational altitudes)*

HYDRAULIC SYSTEM

HYD PUMP PRESS LOW Message	On at 1500 ±100 psi
Pressure Relief Valve Operation *(psi)*	Open @ 3650, fully closed @ 3200

BLEED AIR SYSTEM

Maximum Cabin Differential Pressure	8.9 psi
Maximum Cabin Differential Pressure For T/O and Landing	-0.2 psi
Bleed Switching Valve (BSV)	Switches if pressure <21.5 psi

MINIMUM CONTROL SPEED / AIR (V_{MCA})

Flaps 0°, 12° and 20°	91 KIAS

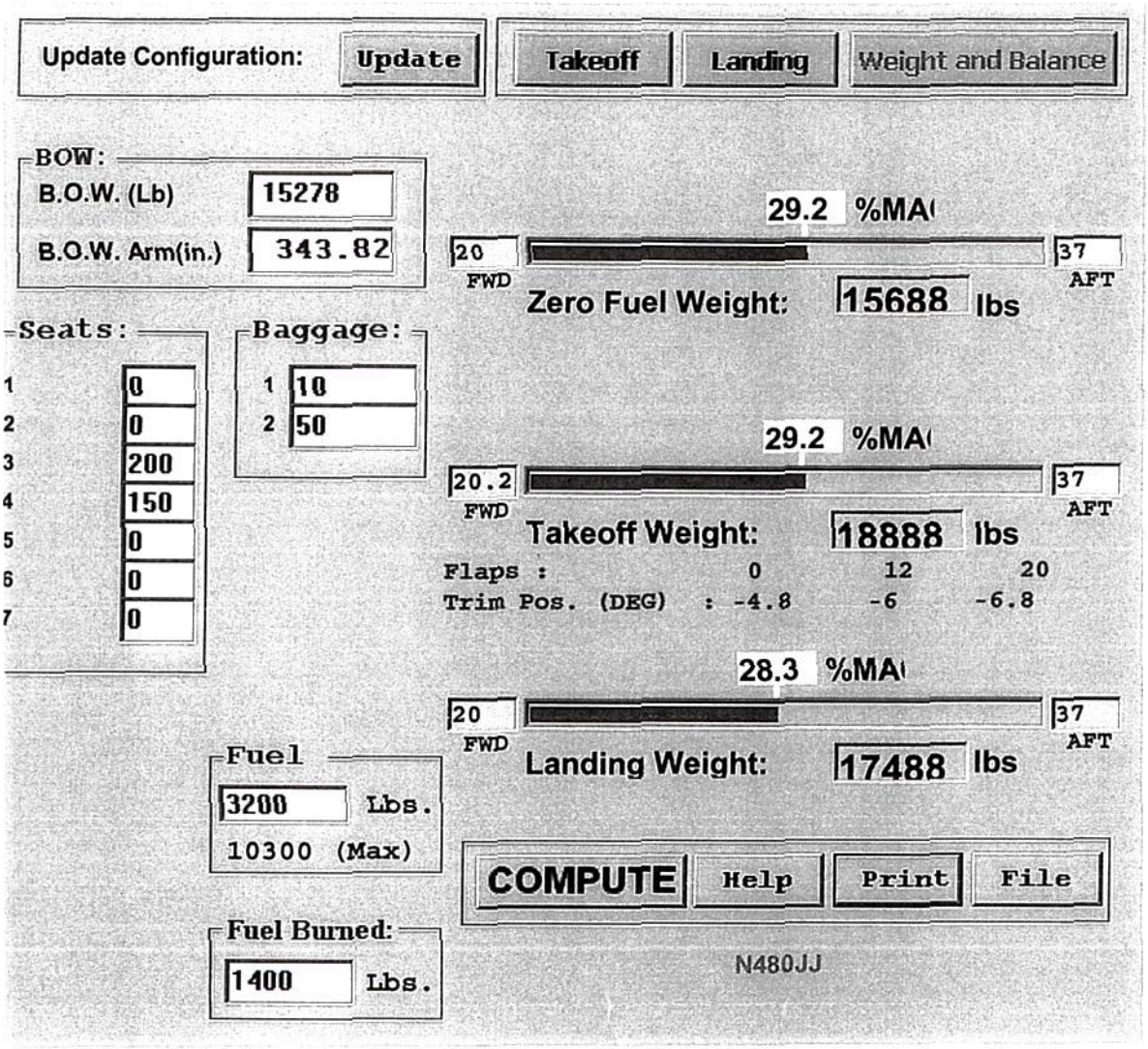
MINIMUM CONTROL SPEED / GROUND (V_{MCG})

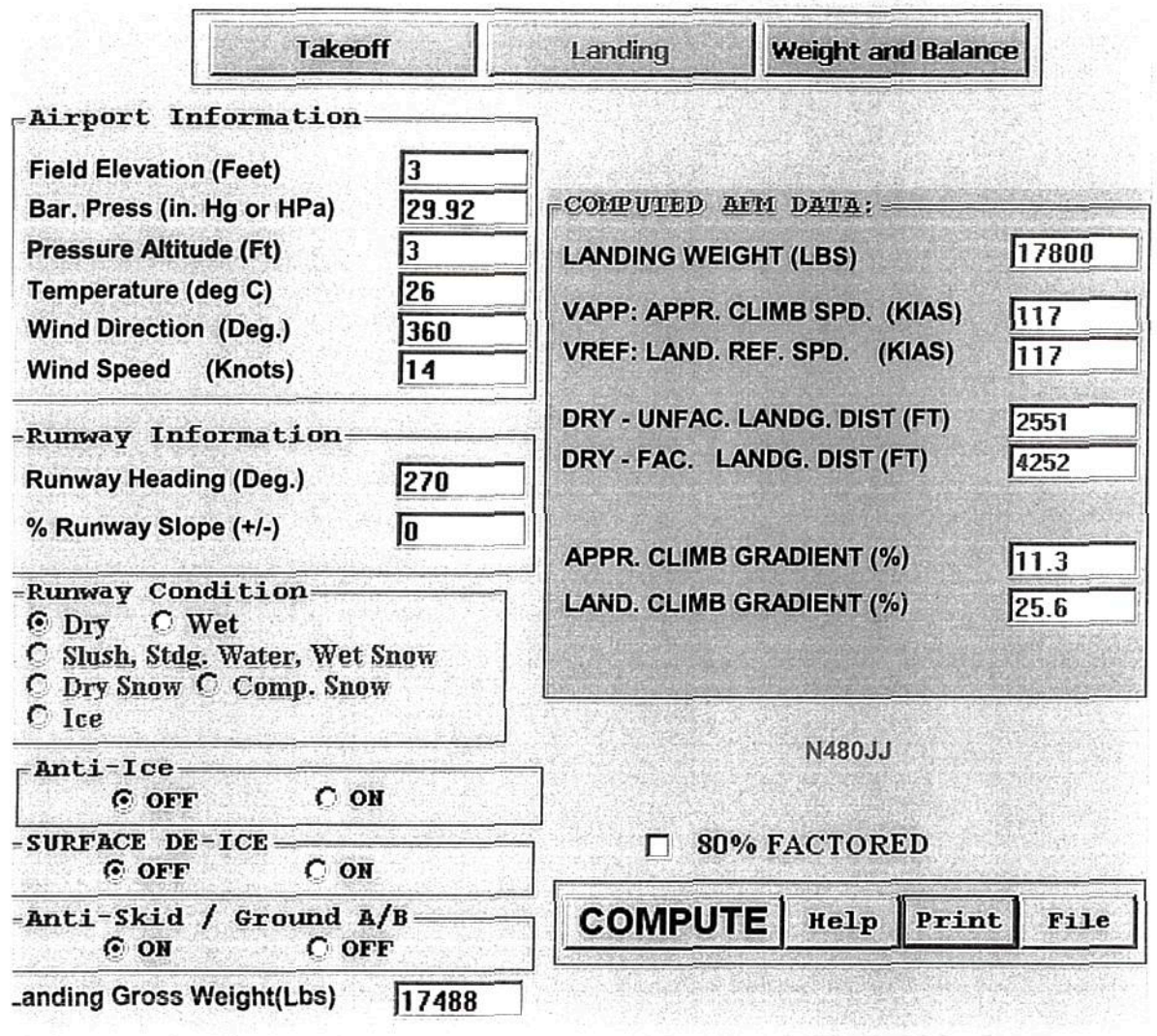
Flaps 0°, 12° and 20°	103 KIAS

SLATS / FLAPS / GEAR LIMITATIONS

Slats	250 KIAS
Flaps 12°	250 KIAS
Flaps 20°	225 KIAS
Flaps 40°	180 KIAS
Landing Gear Extension	180 KIAS
Maximum Tire Groundspeed	182 KTS

Attachment 3: Estimated Airplane Weight & Balance


Update Configuration:
Update
Takeoff
Landing
Weight and Balance
BOW:
B.O.W. (Lb)
15278
B.O.W. Arm(in.)
343.82
29.2 %MA
20
FWD
37
AFT
Zero Fuel Weight:
15688
lbs
Seats:
1
0
2
0
3
200
4
150
5
0
6
0
7
0
Baggage:
1
10
2
50
29.2 %MA
20.2
FWD
37
AFT
Takeoff Weight:
18888
lbs
Flaps :
0
12
20
Trim Pos. (DEG) :
-4.8
-6
-6.8
28.3 %MA
20
FWD
37
AFT
Landing Weight:
17488
lbs
Fuel
3200
Lbs.
10300 (Max)
COMPUTE
Help
Print
File
Fuel Burned:
1400
Lbs.
N480JJ


Takeoff
Landing
Weight and Balance
Airport Information
Field Elevation (Feet) 3
Bar. Press (in. Hg or HPa) 29.92
Pressure Altitude (Ft) 3
Temperature (deg C) 26
Wind Direction (Deg.) 360
Wind Speed (Knots) 14
Runway Information
Runway Heading (Deg.) 270
% Runway Slope (+/-) 0
Runway Condition
Dry Wet
Slush, Stdg. Water, Wet Snow
Dry Snow Comp. Snow
Ice
Anti-Ice
OFF ON
SURFACE DE-ICE
OFF ON
Anti-Skid / Ground A/B
ON OFF
anding Gross Weight(Lbs) 17488
COMPUTED AFM DATA:
LANDING WEIGHT (LBS) 17800
VAPP: APPR. CLIMB SPD. (KIAS) 117
VREF: LAND. REF. SPD. (KIAS) 117
DRY - UNFAC. LANDG. DIST (FT) 2551
DRY - FAC. LANDG. DIST (FT) 4252
APPR. CLIMB GRADIENT (%) 11.3
LAND. CLIMB GRADIENT (%) 25.6
N480JJ
80% FACTORED
COMPUTE
Help
Print
File

Attachment 4: Digital Electronic Engine Controller (DEEC) Data

HENDRICK MOTORSPORTS GULFSTREAM G150 LANDING OVERRUN, OCTOBER 31, 2011 [ENGINE DATA]
RUNWAY 27, KEY WEST INTERNATIONAL AIRPORT (KEYW), KEY WEST, FLORIDA

AltitudeL, 0=<_2000,1=2000-4000,2=4000-6000,3=6000-9000,4=9000-12000,5=12000-15000,6=15000-25000
AltitudeR, 0=<_2000,1=2000-4000,2=4000-6000,3=6000-9000,4=9000-12000,5=12000-15000,6=15000-25000
AltitudeL AltitudeR

MachL, 0=<_0.15,1=0.15-0.30,2=0.30-0.50,3=>_0.50
MachR, 0=<_0.15,1=0.15-0.30,2=0.30-0.50,3=>_0.50
MachL MachR

Eng1GearWOW, 0=Air,1=Ground
Eng2GearWOW, 0=Air,1=Ground
Eng1GearWOW Eng2GearWOW

Eng1PLA, 0=<Idle,1=Idle-40,2=40-60,3=60-Max_Cruise,4=Max_Cruise-Max_Climb,5=Max_Climb-T/O,6=>T/O
Eng2PLA, 0=<Idle,1=Idle-40,2=40-60,3=60-Max_Cruise,4=Max_Cruise-Max_Climb,5=Max_Climb-T/O,6=>T/O
Eng1PLA Eng2PLA

Eng1TR, 0=Stowed,1=Deployed
Eng2TR, 0=Stowed,1=Deployed
Eng1TR Eng2TR

Eng1N1, 0=<_20,1=20-30,2=30-40,3=40-50,4=50-55,5=55-60,6=60-65,7=65-70,8=70-75,9=75-80,10=80-85,11=85-90,12=90-95,13=95-101
Eng2N1, 0=<_20,1=20-30,2=30-40,3=40-50,4=50-55,5=55-60,6=60-65,7=65-70,8=70-75,9=75-80,10=80-85,11=85-90,12=90-95,13=95-101
Eng1N1 Eng2N1

Eng1N2, 0=<_50,1=50-60,2=60-70,3=70-80,4=80-90,5=90-101,6=101+
Eng2N2, 0=<_50,1=50-60,2=60-70,3=70-80,4=80-90,5=90-101,6=101+
Eng1N2 Eng2N2

Eng1ITT, 0=<_400,1=400-(Max-300),2=(Max-300)-(Max-200),3=_(Max-200)-(Max-100),4=(Max-100)-(Max-50),5=(Max-50)-(Max+10),6=Max+10
Eng2ITT, 0=<_400,1=400-(Max-300),2=(Max-300)-(Max-200),3=_(Max-200)-(Max-100),4=(Max-100)-(Max-50),5=(Max-50)-(Max+10),6=Max+10
Eng1ITT Eng2ITT

Eng1ComputerMode, 0=N1_Err<-100,1=N1_Err>100,2=AM_ABS(N1_Err)_<100
Eng2ComputerMode, 0=N1_Err<-100,1=N1_Err>100,2=AM_ABS(N1_Err)_<100
Eng1ComputerMode Eng2ComputerMode

2400 2600 2800 3000 3200 3400 3600 3800 4000 4200 4400 4600 4800 5000 5200

REFERENCE TIME (SECONDS)

NATIONAL TRANSPORTATION SAFETY BOARD

HENDRICK MOTORSPORTS GULFSTREAM G150 LANDING OVERRUN, OCTOBER 31, 2011 [ENGINE DATA]
RUNWAY 27, KEY WEST INTERNATIONAL AIRPORT (KEYW), KEY WEST, FLORIDA

AltitudeL, 0=<_2000,1=2000-4000,2=4000-6000,3=6000-9000,4=9000-12000,5=12000-15000,6=15000-25000
AltitudeR, 0=<_2000,1=2000-4000,2=4000-6000,3=6000-9000,4=9000-12000,5=12000-15000,6=15000-25000

AltitudeL
AltitudeR

MachL, 0=<_0.15,1=0.15-0.30,2=0.30-0.50,3=>_0.50
MachR, 0=<_0.15,1=0.15-0.30,2=0.30-0.50,3=>_0.50

MachL
MachR

Eng1GearWOW, 0=Air,1=Ground
Eng2GearWOW, 0=Air,1=Ground

Eng1GearWOW
Eng2GearWOW

Eng1PLA, 0=<Idle,1=Idle-40,2=40-60,3=60-Max_Cruise,4=Max_Cruise-Max_Climb,5=Max_Climb-T/O,6=>T/O
Eng2PLA, 0=<Idle,1=Idle-40,2=40-60,3=60-Max_Cruise,4=Max_Cruise-Max_Climb,5=Max_Climb-T/O,6=>T/O

Eng1PLA
Eng2PLA

Eng1TR, 0=Stowed,1=Deployed
Eng2TR, 0=Stowed,1=Deployed

Eng1TR
Eng2TR

Eng1N1, 0=<_20,1=20-30,2=30-40,3=40-50,4=50-55,5=55-60,6=60-65,7=65-70,8=70-75,9=75-80,10=80-85,11=85-90,12=90-95,13=95-101
Eng2N1, 0=<_20,1=20-30,2=30-40,3=40-50,4=50-55,5=55-60,6=60-65,7=65-70,8=70-75,9=75-80,10=80-85,11=85-90,12=90-95,13=95-101

Eng1N1
Eng2N1

Eng1N2, 0=<_50,1=50-60,2=60-70,3=70-80,4=80-90,5=90-101,6=101+
Eng2N2, 0=<_50,1=50-60,2=60-70,3=70-80,4=80-90,5=90-101,6=101+

Eng1N2
Eng2N2

Eng1ITT, 0=<_400,1=400-(Max-300),2=(Max-300)-(Max-200),3=_(Max-200)-(Max-100),4=(Max-100)-(Max-50),5=(Max-50)-(Max+10),6=Max+10
Eng2ITT, 0=<_400,1=400-(Max-300),2=(Max-300)-(Max-200),3=_(Max-200)-(Max-100),4=(Max-100)-(Max-50),5=(Max-50)-(Max+10),6=Max+10

Eng1ITT
Eng2ITT

Eng1ComputerMode, 0=N1_Err<-100,1=N1_Err>100,2=AM_ABS(N1_Err)_<100
Eng2ComputerMode, 0=N1_Err<-100,1=N1_Err>100,2=AM_ABS(N1_Err)_<100

Eng1ComputerMode
Eng2ComputerMode

4580 4600 4620 4640 4660 4680 4700 4720 4740 4760 4780 4800 4820 4840 4860 4880 4900 4920 4940 4960 4980 5000 5020

REFERENCE TIME (SECONDS)

NATIONAL TRANSPORTATION SAFETY BOARD

HENDRICK MOTORSPORTS GULFSTREAM G150 LANDING OVERRUN, OCTOBER 31, 2011 [ENGINE DATA]
RUNWAY 27, KEY WEST INTERNATIONAL AIRPORT (KEYW), KEY WEST, FLORIDA

AltitudeL, 0=<_2000,1=2000-4000,2=4000-6000,3=6000-9000,4=9000-12000,5=12000-15000,6=15000-25000
AltitudeR, 0=<_2000,1=2000-4000,2=4000-6000,3=6000-9000,4=9000-12000,5=12000-15000,6=15000-25000
AltitudeL
AltitudeR

MachL, 0=<_0.15,1=0.15-0.30,2=0.30-0.50,3=>_0.50
MachR, 0=<_0.15,1=0.15-0.30,2=0.30-0.50,3=>_0.50
MachL
MachR

Eng1GearWOW, 0=Air,1=Ground
Eng2GearWOW, 0=Air,1=Ground
Eng1GearWOW
Eng2GearWOW

Eng1PLA, 0=<Idle,1=Idle-40,2=40-60,3=60-Max_Cruise,4=Max_Cruise-Max_Climb,5=Max_Climb-T/O,6=>T/O
Eng2PLA, 0=<Idle,1=Idle-40,2=40-60,3=60-Max_Cruise,4=Max_Cruise-Max_Climb,5=Max_Climb-T/O,6=>T/O
Eng1PLA
Eng2PLA

Eng1TR, 0=Stowed,1=Deployed
Eng2TR, 0=Stowed,1=Deployed
Eng1TR
Eng2TR

Eng1N1, 0=<_20,1=20-30,2=30-40,3=40-50,4=50-55,5=55-60,6=60-65,7=65-70,8=70-75,9=75-80,10=80-85,11=85-90,12=90-95,13=95-101
Eng2N1, 0=<_20,1=20-30,2=30-40,3=40-50,4=50-55,5=55-60,6=60-65,7=65-70,8=70-75,9=75-80,10=80-85,11=85-90,12=90-95,13=95-101
Eng1N1
Eng2N1

Eng1N2, 0=<_50,1=50-60,2=60-70,3=70-80,4=80-90,5=90-101,6=101+
Eng2N2, 0=<_50,1=50-60,2=60-70,3=70-80,4=80-90,5=90-101,6=101+
Eng1N2
Eng2N2

Eng1ITT, 0=<_400,1=400-(Max-300),2=(Max-300)-(Max-200),3=_(Max-200)-(Max-100),4=(Max-100)-(Max-50),5=(Max-50)-(Max+10),6=Max+10
Eng2ITT, 0=<_400,1=400-(Max-300),2=(Max-300)-(Max-200),3=_(Max-200)-(Max-100),4=(Max-100)-(Max-50),5=(Max-50)-(Max+10),6=Max+10
Eng1ITT
Eng2ITT

Eng1ComputerMode, 0=N1_Err<-100,1=N1_Err>100,2=AM_ABS(N1_Err)_<100
Eng2ComputerMode, 0=N1_Err<-100,1=N1_Err>100,2=AM_ABS(N1_Err)_<100
Eng1ComputerMode
Eng2ComputerMode

4840 4850 4860 4870 4880 4890 4900 4910 4920 4930 4940 4950 4960 4970 4980 4990 5000 5010 5020

REFERENCE TIME (SECONDS)

NATIONAL TRANSPORTATION SAFETY BOARD

HENDRICK MOTORSPORTS GULFSTREAM G150 LANDING OVERRUN, OCTOBER 31, 2011 [ENGINE DATA]
RUNWAY 27, KEY WEST INTERNATIONAL AIRPORT (KEYW), KEY WEST, FLORIDA

AltitudeL, 0=<_2000,1=2000-4000,2=4000-6000,3=6000-9000,4=9000-12000,5=12000-15000,6=15000-25000
AltitudeR, 0=<_2000,1=2000-4000,2=4000-6000,3=6000-9000,4=9000-12000,5=12000-15000,6=15000-25000

AltitudeL
AltitudeR

MachL, 0=<_0.15,1=0.15-0.30,2=0.30-0.50,3=>_0.50
MachR, 0=<_0.15,1=0.15-0.30,2=0.30-0.50,3=>_0.50

MachL
MachR

Eng1GearWOW, 0=Air,1=Ground
Eng2GearWOW, 0=Air,1=Ground

Eng1GearWOW
Eng2GearWOW

Eng1PLA, 0=<Idle,1=Idle-40,2=40-60,3=60-Max_Cruise,4=Max_Cruise-Max_Climb,5=Max_Climb-T/O,6=>T/O
Eng2PLA, 0=<Idle,1=Idle-40,2=40-60,3=60-Max_Cruise,4=Max_Cruise-Max_Climb,5=Max_Climb-T/O,6=>T/O

Eng1PLA
Eng2PLA

Eng1TR, 0=Stowed,1=Deployed
Eng2TR, 0=Stowed,1=Deployed

Eng1TR
Eng2TR

Eng1N1, 0=<_20,1=20-30,2=30-40,3=40-50,4=50-55,5=55-60,6=60-65,7=65-70,8=70-75,9=75-80,10=80-85,11=85-90,12=90-95,13=95-101
Eng2N1, 0=<_20,1=20-30,2=30-40,3=40-50,4=50-55,5=55-60,6=60-65,7=65-70,8=70-75,9=75-80,10=80-85,11=85-90,12=90-95,13=95-101

Eng1N1
Eng2N1

Eng1N2, 0=<_50,1=50-60,2=60-70,3=70-80,4=80-90,5=90-101,6=101+
Eng2N2, 0=<_50,1=50-60,2=60-70,3=70-80,4=80-90,5=90-101,6=101+

Eng1N2
Eng2N2

Eng1ITT, 0=<_400,1=400-(Max-300),2=(Max-300)-(Max-200),3=_(Max-200)-(Max-100),4=(Max-100)-(Max-50),5=(Max-50)-(Max+10),6=Max+10
Eng2ITT, 0=<_400,1=400-(Max-300),2=(Max-300)-(Max-200),3=_(Max-200)-(Max-100),4=(Max-100)-(Max-50),5=(Max-50)-(Max+10),6=Max+10

Eng1ITT
Eng2ITT

Eng1ComputerMode, 0=N1_Err<-100,1=N1_Err>100,2=AM_ABS(N1_Err)_<100
Eng2ComputerMode, 0=N1_Err<-100,1=N1_Err>100,2=AM_ABS(N1_Err)_<100

Eng1ComputerMode
Eng2ComputerMode

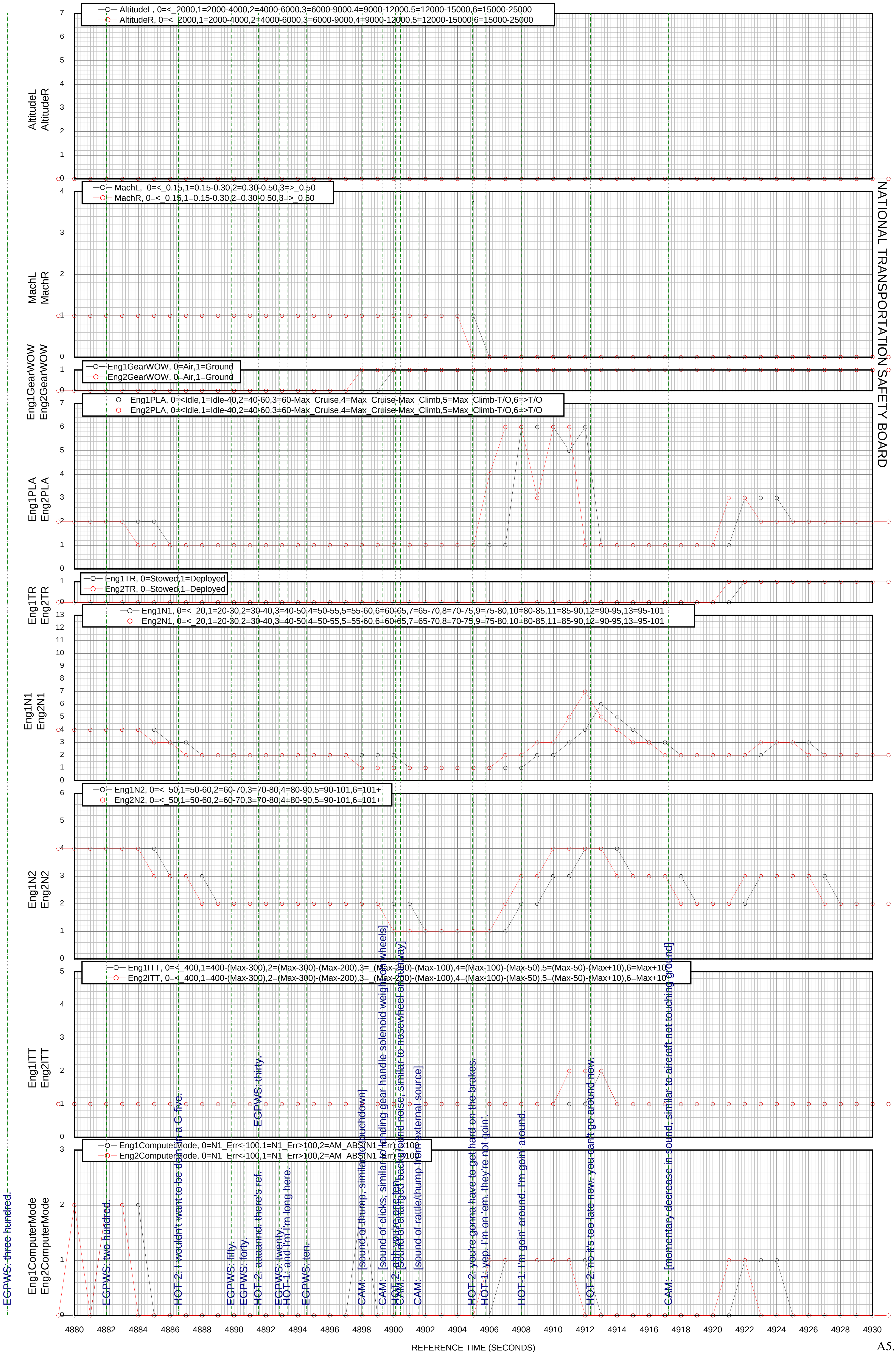
4860 4865 4870 4875 4880 4885 4890 4895 4900 4905 4910 4915 4920 4925 4930 4935 4940 4945 4950 4955 4960

REFERENCE TIME (SECONDS)

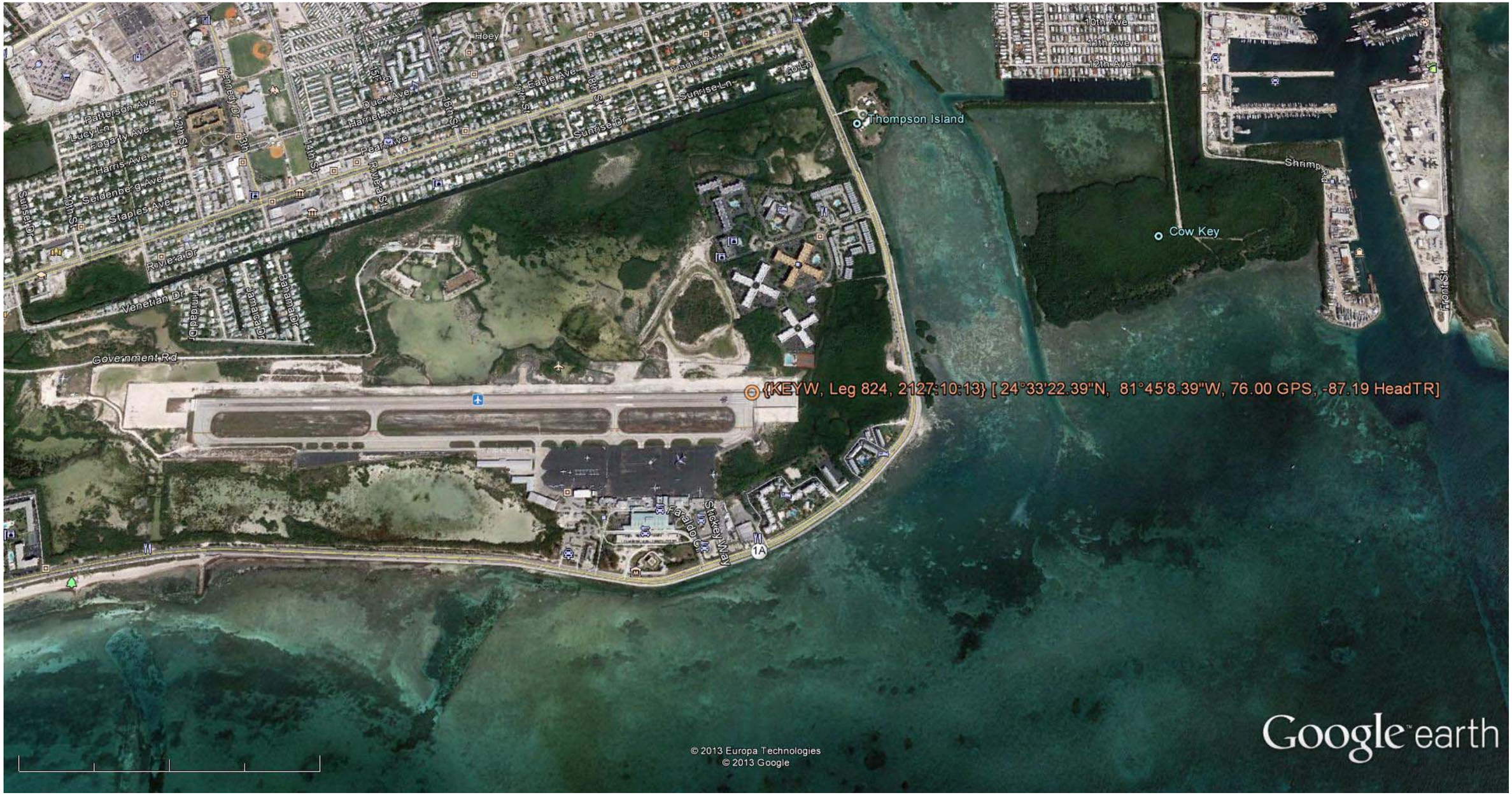
NATIONAL TRANSPORTATION SAFETY BOARD

Attachment 5: DEEC Data with CVR Event Subset Overlay

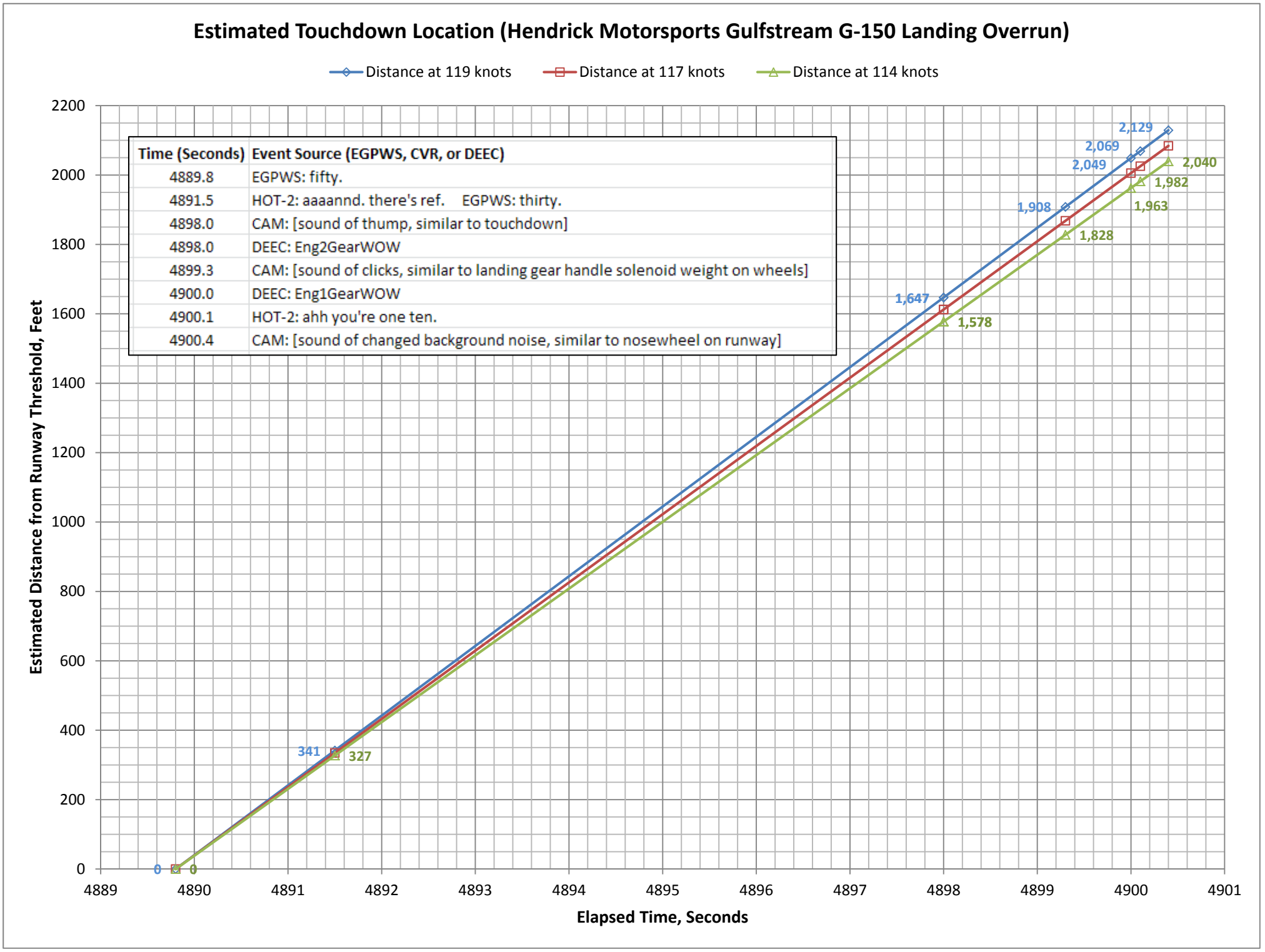
HENDRICK MOTORSPORTS GULFSTREAM G150 LANDING OVERRUN, OCTOBER 31, 2011 [ENGINE DATA]
RUNWAY 27, KEY WEST INTERNATIONAL AIRPORT (KEYW), KEY WEST, FLORIDA



Attachment 6: Enhanced Ground Proximity Warning System (EGPWS) Data


Hoey
Patterson Ave
Lucy Ln
Fogarty Ave
Harris Ave
Seidenberg Ave
Staples Ave
Riviera Dr
Venetian Dr
Trinidad Dr
Jamaica Dr
Bahama Dr
Government Rd
Duck Ave
Harriet Ave
Pearl Ave
Eagle Ave
Sunrise Ln
Sunrise Dr
Thompson Island
Cow Key
10th Ave
11th Ave
12th Ave
Shrimp Rd
Front St
{KEYW, Leg 824, 2127:10:13} [24°33'22.39"N, 81°45'8.39"W, 76.00 GPS, -87.19 HeadTR]
Parado Cir
Stickey Way
1A
© 2013 Europa Technologies
© 2013 Google
Google earth
Google earth
miles
km
1
2

Attachment 7: Estimated Touchdown Location


Estimated Touchdown Location (Hendrick Motorsports Gulfstream G-150 Landing Overrun)
Distance at 119 knots
Distance at 117 knots
Distance at 114 knots
Time (Seconds) | Event Source (EGPWS, CVR, or DEEC)
4889.8 | EGPWS: fifty.
4891.5 | HOT-2: aaaannd. there's ref. EGPWS: thirty.
4898.0 | CAM: [sound of thump, similar to touchdown]
4898.0 | DEEC: Eng2GearWOW
4899.3 | CAM: [sound of clicks, similar to landing gear handle solenoid weight on wheels]
4900.0 | DEEC: Eng1GearWOW
4900.1 | HOT-2: ahh you're one ten.
4900.4 | CAM: [sound of changed background noise, similar to nosewheel on runway]
Estimated Distance from Runway Threshold, Feet
Elapsed Time, Seconds
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2200
4889
4890
4891
4892
4893
4894
4895
4896
4897
4898
4899
4900
4901
0
0
341
327
1,647
1,578
1,908
1,828
2,129
2,069
2,049
1,963
2,040
1,982

Attachment 8: Comparison of NTSB and IAI Calculated Landing Performance (114 knots)

G150 landing overrun, NTSB cases calculated by IAI

Dec. 6,2012

Hendrick Motorsports Gulfstream G150 landing overrun; Key West, FL; October 31, 2011														
Weight:			17800 lb											
Wind:			0.0 kts (+ Headwind, - Tailwind)											
Temp	26.0 C													
Runway Slope			0.0 percent	(ii)	Wheel Brake Release & Stow spoilers							NTSB	IAI	Diff %
	Ground	MU	Wheel		Reverse		Touchdown					Dist		
Case	Spoilers		Braking	(ii)	Thrust	Engine N1 Level	Vc	Air	Ground	Total		Remaining		
							(Kts)	(Ft)	(Ft)	(Ft)		(Ft)		
1	Deployed	0.41	Maximum Manua	0	Event T/I	MAX Fwd/MIN Rev	114	1575	1985	3560		1241	1178	-1.8%
2	Stowed	0.41	Maximum Manua	0	Event T/I	MAX Fwd/MIN Rev	114	1575	2761	4336		465	337	-3.0%
3	Deployed	0.41	Maximum Manua	1	Event T/I	MAX Fwd/MIN Rev	114	1575	2793	4368		433	362	-1.6%
4	Stowed	0.41	Maximum Manua	1	Event T/I	MAX Fwd/MIN Rev	114	1575	3621	5196		-395	-522	-2.4%
11	Deployed	0.22	A/S Inoperati	0	Event T/I	MAX Fwd/MIN Rev	114	1575	3876	5451		-650	-710	-1.1%
12	Stowed	0.22	A/S Inoperati	0	Event T/I	MAX Fwd/MIN Rev	114	1575	4957	6532		-1731	-1841	-1.7%
13	Deployed	0.22	A/S Inoperati	1	Event T/I	MAX Fwd/MIN Rev	114	1575	4455	6030		-1229	-1297	-1.1%
14	Stowed	0.22	A/S Inoperati	1	Event T/I	MAX Fwd/MIN Rev	114	1575	5324	6899		-2098	-2197	-1.4%
21	Deployed	0.22	Emergency	0	Event T/I	MAX Fwd/MIN Rev	114	1575	3778	5353		-552	-613	-1.1%
22	Stowed	0.22	Emergency	0	Event T/I	MAX Fwd/MIN Rev	114	1575	4865	6440		-1639	-1751	-1.7%
23	Deployed	0.22	Emergency	1	Event T/I	MAX Fwd/MIN Rev	114	1575	4455	6030		-1229	-1297	-1.1%
24	Stowed	0.22	Emergency	1	Event T/I	MAX Fwd/MIN Rev	114	1575	5324	6899		-2098	-2200	-1.5%
31	Deployed	0.02	None	0	Event T/I	MAX Fwd/MIN Rev	114	1575	8212	9787		-4986	-5034	-0.5%
32	Stowed	0.02	None	0	Event T/I	MAX Fwd/MIN Rev	114	1575	10110	11685		-6884	-6956	-0.6%
33	Deployed	0.02	None	1	Event T/I	MAX Fwd/MIN Rev	114	1575	8467	10042		-5241	-5305	-0.6%
34	Stowed	0.02	None	1	Event T/I	MAX Fwd/MIN Rev	114	1575	10110	11685		-6884	-6959	-0.6%
41	Deployed	0.41	Maximum Manua	0	Event T/I	Mean Event Thrus	114	1575	1952	3527		1274	1243	-0.9%
42	Stowed	0.41	Maximum Manua	0	Event T/I	Mean Event Thrus	114	1575	2683	4258		543	481	-1.5%
43	Deployed	0.41	Maximum Manua	1	Event T/I	Mean Event Thrus	114	1575	2725	4300		502	468	-0.8%
44	Stowed	0.41	Maximum Manua	1	Event T/I	Mean Event Thrus	114	1575	3502	5077		-276	-341	-1.3%
51	Deployed	0.22	A/S Inoperati	0	Event T/I	Mean Event Thrus	114	1575	3752	5327		-526	-551	-0.5%
52	Stowed	0.22	A/S Inoperati	0	Event T/I	Mean Event Thrus	114	1575	4739	6314		-1513	-1553	-0.6%
53	Deployed	0.22	A/S Inoperati	1	Event T/I	Mean Event Thrus	114	1575	4314	5889		-1088	-1117	-0.5%
54	Stowed	0.22	A/S Inoperati	1	Event T/I	Mean Event Thrus	114	1575	5091	6666		-1865	-1900	-0.5%
61	Deployed	0.22	Emergency	0	Event T/I	Mean Event Thrus	114	1575	3657	5232		-431	-455	-0.5%
62	Stowed	0.22	Emergency	0	Event T/I	Mean Event Thrus	114	1575	4651	6226		-1425	-1466	-0.7%
63	Deployed	0.22	Emergency	1	Event T/I	Mean Event Thrus	114	1575	4314	5889		-1088	-1117	-0.5%
64	Stowed	0.22	Emergency	1	Event T/I	Mean Event Thrus	114	1575	5091	6666		-1865	-1905	-0.6%
71	Deployed	0.02	None	0	Event T/I	Mean Event Thrus	114	1575	7698	9273		-4472	-4332	1.5%
72	Stowed	0.02	None	0	Event T/I	Mean Event Thrus	114	1575	9407	10982		-6181	-5990	1.7%
73	Deployed	0.02	None	1	Event T/I	Mean Event Thrus	114	1575	7948	9523		-4722	-4609	1.2%
74	Stowed	0.02	None	1	Event T/I	Mean Event Thrus	114	1575	9407	10982		-6181	-5991	1.7%
81	Deployed	0.41	Maximum Manua	0	Event T/I	MIN Fwd/MAX Rev	114	1575	1932	3507		1295	1298	0.1%
82	Stowed	0.41	Maximum Manua	0	Event T/I	MIN Fwd/MAX Rev	114	1575	2633	4208		593	601	0.2%
83	Deployed	0.41	Maximum Manua	1	Event T/I	MIN Fwd/MAX Rev	114	1575	2677	4252		549	563	0.3%
84	Stowed	0.41	Maximum Manua	1	Event T/I	MIN Fwd/MAX Rev	114	1575	3422	4997		-196	-189	0.1%
91	Deployed	0.22	A/S Inoperati	0	Event T/I	MIN Fwd/MAX Rev	114	1575	3663	5238		-437	-412	0.5%
92	Stowed	0.22	A/S Inoperati	0	Event T/I	MIN Fwd/MAX Rev	114	1575	4580	6155		-1354	-1312	0.7%
93	Deployed	0.22	A/S Inoperati	1	Event T/I	MIN Fwd/MAX Rev	114	1575	4209	5784		-983	-960	0.4%
94	Stowed	0.22	A/S Inoperati	1	Event T/I	MIN Fwd/MAX Rev	114	1575	4919	6494		-1693	-1650	0.7%
101	Deployed	0.22	Emergency	0	Event T/I	MIN Fwd/MAX Rev	114	1575	3569	5144		-343	-319	0.5%
102	Stowed	0.22	Emergency	0	Event T/I	MIN Fwd/MAX Rev	114	1575	4496	6071		-1270	-1227	0.7%
103	Deployed	0.22	Emergency	1	Event T/I	MIN Fwd/MAX Rev	114	1575	4209	5784		-983	-960	0.4%
104	Stowed	0.22	Emergency	1	Event T/I	MIN Fwd/MAX Rev	114	1575	4919	6494		-1693	-1656	0.6%
111	Deployed	0.02	None	0	Event T/I	MIN Fwd/MAX Rev	114	1575	7175	8750		-3949	-3728	2.5%
112	Stowed	0.02	None	0	Event T/I	MIN Fwd/MAX Rev	114	1575	8675	10250		-5449	-5159	2.8%
113	Deployed	0.02	None	1	Event T/I	MIN Fwd/MAX Rev	114	1575	7415	8990		-4189	-3991	2.2%
114	Stowed	0.02	None	1	Event T/I	MIN Fwd/MAX Rev	114	1575	8675	10250		-5449	-5162	2.8%

Hendrick Motorsports Gulfstream G150 landing overrun; Key West, FL; October 31, 2011

Weight:			17800 lb											
Wind:			0.0 kts (+ Headwind, - Tailwind)											
Temp	26.0 C													
Runway Slope			0.0 percent	(ii)	Wheel Brake Release & Stow spoiilers							NTSB	IAI	Diff %
	Ground	MU	Wheel		Reverse		Touchdown					Dist		
Case	Spoilers		Braking	(ii)	Thrust	Engine N1 Level	Vc	Air	Ground	Total		Remaining		
							(Kts)	(Ft)	(Ft)	(Ft)		(Ft)		
121	Deployed	0.41	Maximum Manua	0	Emergency	Emergency (Stow	114	1575	1807	3382		1419	1388	-0.9%
122	Stowed	0.41	Maximum Manua	0	Emergency	Emergency (Stow	114	1575	2325	3900		901	854	-1.2%
131	Deployed	0.22	A/S Inoperati	0	Emergency	Emergency (Stow	114	1575	3042	4617		185	208	0.5%
132	Stowed	0.22	A/S Inoperati	0	Emergency	Emergency (Stow	114	1575	3575	5150		-349	-287	1.2%
141	Deployed	0.22	Emergency	0	Emergency	Emergency (Stow	114	1575	2967	4542		260	326	1.5%
142	Stowed	0.22	Emergency	0	Emergency	Emergency (Stow	114	1575	3515	5090		-289	-174	2.3%
151	Deployed	0.02	None	0	Emergency	Emergency (Stow	114	1575	5165	6740		-1939	-1720	3.2%
152	Stowed	0.02	None	0	Emergency	Emergency (Stow	114	1575	6054	7629		-2828	-2553	3.6%
161	Deployed	0.41	Maximum Manua	0	Nominal T	Nominal (Stow at	114	1575	1843	3418		1383	1324	-1.7%
162	Stowed	0.41	Maximum Manua	0	Nominal T	Nominal (Stow at	114	1575	2413	3988		814	746	-1.7%
171	Deployed	0.22	A/S Inoperati	0	Nominal T	Nominal (Stow at	114	1575	3251	4826		-25	-47	-0.5%
172	Stowed	0.22	A/S Inoperati	0	Nominal T	Nominal (Stow at	114	1575	3838	5413		-612	-465	2.7%
181	Deployed	0.22	Emergency	0	Nominal T	Nominal (Stow at	114	1575	3176	4751		50	68	0.4%
182	Stowed	0.22	Emergency	0	Nominal T	Nominal (Stow at	114	1575	3777	5352		-551	-506	0.8%
191	Deployed	0.02	None	0	Nominal T	Nominal (Stow at	114	1575	19573	21148		-16347	-10919	25.7%
192	Stowed	0.02	None	0	Nominal T	Nominal (Stow at	114	1575	23538	25113		-20312	-13397	27.5%
201	Deployed	0.41	Maximum Manua	0	No T/R	Flight/Ground Id	114	1575	1843	3418		1383	1322.0	-1.8%
202	Stowed	0.41	Maximum Manua	0	No T/R	Flight/Ground Id	114	1575	2430	4005		796	679	-2.9%
211	Deployed	0.22	A/S Inoperati	0	No T/R	Flight/Ground Id	114	1575	3414	4989		-188	-266	-1.6%
212	Stowed	0.22	A/S Inoperati	0	No T/R	Flight/Ground Id	114	1575	4253	5828		-1027	-1043	-0.3%
221	Deployed	0.22	Emergency	0	No T/R	Flight/Ground Id	114	1575	3318	4893		-92	-166	-1.5%
222	Stowed	0.22	Emergency	0	No T/R	Flight/Ground Id	114	1575	4163	5738		-937	-1074	-2.4%
231	Deployed	0.02	None	0	No T/R	Flight/Ground Id	114	1575	20527	22102		-17301	-12354	22.4%
232	Stowed	0.02	None	0	No T/R	Flight/Ground Id	114	1575	25574	27149		-22348	-17224	18.9%
241	Deployed	0.02	None	0	No T/R ->	TOGA Thrust	114	1575	3815	5390		-589	-591	0.3% (*)
242	Stowed	0.02	None	0	No T/R ->	TOGA Thrust	114	1575	3766	5341		-540	-534	-1.1% (*)
						(*)	up to lift-off							
							Until 35' height should be added 593 feet air distance							

Attachment 9: Calculated Landing Performance (114 knots)

Calculations based on an assumed initial touchdown ground speed of 114 knots.

Hendrick Motorsports Gulfstream G150 landing overrun; Key West, FL; October 31, 2011

Weight: 17800 lb
Wind: 0.0 kts (+ Headwind, - Tailwind)
Temperature: 26.0 C
Altimeter: 29.96 in. Hg
Runway Slope: 0.0 percent

Case	Ground Spoilers	Mu Airplane	Wheel Braking	Wheel Brake Release & Stow Spoilers	Reverse Thrust	Engine N1 Level	Touchdown Ground Speed (Kts)	Air Distance (Ft)	Ground Distance (Ft)	Total Distance (Ft)	Distance Remaining (Ft)	Spoiler Delay (Sec)	Wheel Brake Delay (Sec)	Overrun Speed (Kts)	Overrun Time (Sec)	Ground Roll Time (Sec)	Final Speed (Kts)
1	Deployed	0.41	Maximum Manual	0	Event T/R	MAX Fwd/MIN Rev (Most Conservative)	114.0	1575.0	2010.2	3585.2	1215.8	1.5	3.0	---	---	19.7	0.2
2	Stowed	0.41	Maximum Manual	0	Event T/R	MAX Fwd/MIN Rev (Most Conservative)	114.0	1575.0	2762.7	4337.7	463.3	---	3.0	---	---	24.4	0.5
3	Deployed	0.41	Maximum Manual	1	Event T/R	MAX Fwd/MIN Rev (Most Conservative)	114.0	1575.0	2825.7	4400.7	400.3	1.5	3.0	---	---	25.5	0.5
4	Stowed	0.41	Maximum Manual	1	Event T/R	MAX Fwd/MIN Rev (Most Conservative)	114.0	1575.0	3622.2	5197.2	-396.2	---	3.0	56.6	4919.4	21.4	0.3
11	Deployed	0.22	A/S Inoperative	0	Event T/R	MAX Fwd/MIN Rev (Most Conservative)	114.0	1575.0	3905.5	5480.5	-679.5	1.5	10.0	58.6	4919.4	21.4	0.4
12	Stowed	0.22	A/S Inoperative	0	Event T/R	MAX Fwd/MIN Rev (Most Conservative)	114.0	1575.0	4960.8	6535.8	-1734.8	---	10.0	86.8	4917.0	19.0	0.2
13	Deployed	0.22	A/S Inoperative	1	Event T/R	MAX Fwd/MIN Rev (Most Conservative)	114.0	1575.0	4494.9	6069.9	-1268.9	1.5	10.0	81.1	4917.4	19.4	0.4
14	Stowed	0.22	A/S Inoperative	1	Event T/R	MAX Fwd/MIN Rev (Most Conservative)	114.0	1575.0	5327.1	6902.1	-2101.1	---	10.0	94.6	4916.5	18.5	0.4
21	Deployed	0.22	Emergency	0	Event T/R	MAX Fwd/MIN Rev (Most Conservative)	114.0	1575.0	3807.6	5382.6	-581.6	1.5	9.0	54.5	4919.9	21.9	0.4
22	Stowed	0.22	Emergency	0	Event T/R	MAX Fwd/MIN Rev (Most Conservative)	114.0	1575.0	4868.3	6443.3	-1642.3	---	9.0	84.8	4917.2	19.2	0.4
23	Deployed	0.22	Emergency	1	Event T/R	MAX Fwd/MIN Rev (Most Conservative)	114.0	1575.0	4494.9	6069.9	-1268.9	1.5	9.0	81.1	4917.4	19.4	0.4
24	Stowed	0.22	Emergency	1	Event T/R	MAX Fwd/MIN Rev (Most Conservative)	114.0	1575.0	5327.1	6902.1	-2101.1	---	9.0	94.6	4916.5	18.5	0.4
31	Deployed	0.02	None	0	Event T/R	MAX Fwd/MIN Rev (Most Conservative)	114.0	1575.0	8337.5	9912.5	-5111.5	1.5	---	90.9	4917.4	19.4	0.1
32	Stowed	0.02	None	0	Event T/R	MAX Fwd/MIN Rev (Most Conservative)	114.0	1575.0	10207.1	11782.1	-6981.1	---	---	101.5	4916.4	18.4	0.1
33	Deployed	0.02	None	1	Event T/R	MAX Fwd/MIN Rev (Most Conservative)	114.0	1575.0	8594.2	10169.2	-5368.2	1.5	---	94.9	4917.1	19.1	0.1
34	Stowed	0.02	None	1	Event T/R	MAX Fwd/MIN Rev (Most Conservative)	114.0	1575.0	10207.1	11782.1	-6981.1	---	---	101.5	4916.4	18.4	0.1
41	Deployed	0.41	Maximum Manual	0	Event T/R	Mean Event Thrust	114.0	1575.0	1976.4	3551.4	1249.6	1.5	3.0	---	---	19.2	0.3
42	Stowed	0.41	Maximum Manual	0	Event T/R	Mean Event Thrust	114.0	1575.0	2684.7	4259.7	541.3	---	3.0	---	---	23.7	0.6
43	Deployed	0.41	Maximum Manual	1	Event T/R	Mean Event Thrust	114.0	1575.0	2755.7	4330.7	470.3	1.5	3.0	---	---	24.9	0.6
44	Stowed	0.41	Maximum Manual	1	Event T/R	Mean Event Thrust	114.0	1575.0	3503.4	5078.4	-277.4	---	3.0	48.7	4919.9	21.9	0.6
51	Deployed	0.22	A/S Inoperative	0	Event T/R	Mean Event Thrust	114.0	1575.0	3782.0	5357.0	-556.0	1.5	10.0	53.9	4919.8	21.8	0.2
52	Stowed	0.22	A/S Inoperative	0	Event T/R	Mean Event Thrust	114.0	1575.0	4742.3	6317.3	-1516.3	---	10.0	83.2	4917.2	19.2	0.3
53	Deployed	0.22	A/S Inoperative	1	Event T/R	Mean Event Thrust	114.0	1575.0	4353.1	5928.1	-1127.1	1.5	10.0	77.6	4917.6	19.6	0.3
54	Stowed	0.22	A/S Inoperative	1	Event T/R	Mean Event Thrust	114.0	1575.0	5094.8	6669.8	-1868.8	---	10.0	91.4	4916.7	18.7	0.3
61	Deployed	0.22	Emergency	0	Event T/R	Mean Event Thrust	114.0	1575.0	3686.4	5261.4	-460.4	1.5	9.0	49.4	4920.4	22.4	0.2
62	Stowed	0.22	Emergency	0	Event T/R	Mean Event Thrust	114.0	1575.0	4654.1	6229.1	-1428.1	---	9.0	81.0	4917.4	19.4	0.1
63	Deployed	0.22	Emergency	1	Event T/R	Mean Event Thrust	114.0	1575.0	4353.1	5928.1	-1127.1	1.5	9.0	77.6	4917.6	19.6	0.3
64	Stowed	0.22	Emergency	1	Event T/R	Mean Event Thrust	114.0	1575.0	5094.8	6669.8	-1868.8	---	9.0	91.4	4916.7	18.7	0.3
71	Deployed	0.02	None	0	Event T/R	Mean Event Thrust	114.0	1575.0	7821.2	9396.2	-4595.2	1.5	---	88.3	4917.6	19.6	0.1
72	Stowed	0.02	None	0	Event T/R	Mean Event Thrust	114.0	1575.0	9504.0	11079.0	-6278.0	---	---	99.1	4916.5	18.5	0.1
73	Deployed	0.02	None	1	Event T/R	Mean Event Thrust	114.0	1575.0	8071.9	9646.9	-4845.9	1.5	---	92.4	4917.2	19.2	0.1
74	Stowed	0.02	None	1	Event T/R	Mean Event Thrust	114.0	1575.0	9504.0	11079.0	-6278.0	---	---	99.1	4916.5	18.5	0.1
81	Deployed	0.41	Maximum Manual	0	Event T/R	MIN Fwd/MAX Rev (Least Conservative)	114.0	1575.0	1954.8	3529.8	1271.2	1.5	3.0	---	---	18.8	0.6
82	Stowed	0.41	Maximum Manual	0	Event T/R	MIN Fwd/MAX Rev (Least Conservative)	114.0	1575.0	2634.8	4209.8	591.2	---	3.0	---	---	23.2	0.3
83	Deployed	0.41	Maximum Manual	1	Event T/R	MIN Fwd/MAX Rev (Least Conservative)	114.0	1575.0	2707.5	4282.5	518.5	1.5	3.0	---	---	24.5	0.5
84	Stowed	0.41	Maximum Manual	1	Event T/R	MIN Fwd/MAX Rev (Least Conservative)	114.0	1575.0	3423.4	4998.4	-197.4	---	3.0	41.9	4920.4	22.4	0.5
91	Deployed	0.22	A/S Inoperative	0	Event T/R	MIN Fwd/MAX Rev (Least Conservative)	114.0	1575.0	3692.3	5267.3	-466.3	1.5	10.0	50.3	4920.1	22.1	0.4
92	Stowed	0.22	A/S Inoperative	0	Event T/R	MIN Fwd/MAX Rev (Least Conservative)	114.0	1575.0	4583.7	6158.7	-1357.7	---	10.0	80.3	4917.4	19.4	0.2
93	Deployed	0.22	A/S Inoperative	1	Event T/R	MIN Fwd/MAX Rev (Least Conservative)	114.0	1575.0	4247.2	5822.2	-1021.2	1.5	10.0	74.8	4917.8	19.8	0.3
94	Stowed	0.22	A/S Inoperative	1	Event T/R	MIN Fwd/MAX Rev (Least Conservative)	114.0	1575.0	4922.4	6497.4	-1696.4	---	10.0	88.9	4916.8	18.8	0.2
101	Deployed	0.22	Emergency	0	Event T/R	MIN Fwd/MAX Rev (Least Conservative)	114.0	1575.0	3598.9	5173.9	-372.9	1.5	9.0	45.3	4920.8	22.8	0.4
102	Stowed	0.22	Emergency	0	Event T/R	MIN Fwd/MAX Rev (Least Conservative)	114.0	1575.0	4499.4	6074.4	-1273.4	---	9.0	78.0	4917.6	19.6	0.2
103	Deployed	0.22	Emergency	1	Event T/R	MIN Fwd/MAX Rev (Least Conservative)	114.0	1575.0	4247.2	5822.2	-1021.2	1.5	9.0	74.8	4917.8	19.8	0.3
104	Stowed	0.22	Emergency	1	Event T/R	MIN Fwd/MAX Rev (Least Conservative)	114.0	1575.0	4922.4	6497.4	-1696.4	---	9.0	88.9	4916.8	18.8	0.2
111	Deployed	0.02	None	0	Event T/R	MIN Fwd/MAX Rev (Least Conservative)	114.0	1575.0	7286.8	8861.8	-4060.8	1.5	---	86.2	4917.7	19.7	0.1
112	Stowed	0.02	None	0	Event T/R	MIN Fwd/MAX Rev (Least Conservative)	114.0	1575.0	8756.7	10331.7	-5530.7	---	---	97.1	4916.6	18.6	0.1
113	Deployed	0.02	None	1	Event T/R	MIN Fwd/MAX Rev (Least Conservative)	114.0	1575.0	7527.9	9102.9	-4301.9	1.5	---	90.2	4917.4	19.4	0.1
114	Stowed	0.02	None	1	Event T/R	MIN Fwd/MAX Rev (Least Conservative)	114.0	1575.0	8756.7	10331.7	-5530.7	---	---	97.1	4916.6	18.6	0.1

Hendrick Motorsports Gulfstream G150 landing overrun; Key West, FL; October 31, 2011

Weight: 17800 lb
Wind: 0.0 kts (+ Headwind, - Tailwind)
Temperature: 26.0 C
Altimeter: 29.96 in. Hg
Runway Slope: 0.0 percent

Case	Ground Spoilers	Mu Airplane	Wheel Braking	Wheel Brake Release & Stow Spoilers	Reverse Thrust	Engine N1 Level	Touchdown Ground Speed (Kts)	Air Distance (Ft)	Ground Distance (Ft)	Total Distance (Ft)	Distance Remaining (Ft)	Spoiler Delay (Sec)	Wheel Brake Delay (Sec)	Overrun Speed (Kts)	Overrun Time (Sec)	Ground Roll Time (Sec)	Final Speed (Kts)
121	Deployed	0.41	Maximum Manual	0	Emergency T/R	Emergency (Stow at 0 kts)	114.0	1575.0	1826.0	3401.0	1400.0	1.5	3.0	---	---	16.4	0.3
122	Stowed	0.41	Maximum Manual	0	Emergency T/R	Emergency (Stow at 0 kts)	114.0	1575.0	2326.2	3901.2	899.8	---	3.0	---	---	19.6	0.1
131	Deployed	0.22	A/S Inoperative	0	Emergency T/R	Emergency (Stow at 0 kts)	114.0	1575.0	3067.6	4642.6	158.4	1.5	10.0	---	---	27.2	0.5
132	Stowed	0.22	A/S Inoperative	0	Emergency T/R	Emergency (Stow at 0 kts)	114.0	1575.0	3579.4	5154.4	-353.4	---	10.0	45.4	4919.6	21.6	0.3
141	Deployed	0.22	Emergency	0	Emergency T/R	Emergency (Stow at 0 kts)	114.0	1575.0	2992.6	4567.6	233.4	1.5	9.0	---	---	26.8	0.4
142	Stowed	0.22	Emergency	0	Emergency T/R	Emergency (Stow at 0 kts)	114.0	1575.0	3519.0	5094.0	-293.0	---	9.0	41.5	4920.1	22.1	0.3
151	Deployed	0.02	None	0	Emergency T/R	Emergency (Stow at 0 kts)	114.0	1575.0	5256.6	6831.6	-2030.6	1.5	---	63.1	4919.3	21.3	0.1
152	Stowed	0.02	None	0	Emergency T/R	Emergency (Stow at 0 kts)	114.0	1575.0	6115.0	7690.0	-2889.0	---	---	75.5	4917.8	19.8	0.1
161	Deployed	0.41	Maximum Manual	0	Nominal T/R	Nominal (Stow at 70 kts)	114.0	1575.0	1861.1	3436.1	1364.9	1.5	3.0	---	---	17.2	0.7
162	Stowed	0.41	Maximum Manual	0	Nominal T/R	Nominal (Stow at 70 kts)	114.0	1575.0	2412.5	3987.5	813.5	---	3.0	---	---	21.0	0.1
171	Deployed	0.22	A/S Inoperative	0	Nominal T/R	Nominal (Stow at 70 kts)	114.0	1575.0	3272.8	4847.8	-46.8	1.5	10.0	14.2	4925.5	27.5	0.2
172	Stowed	0.22	A/S Inoperative	0	Nominal T/R	Nominal (Stow at 70 kts)	114.0	1575.0	3837.6	5412.6	-611.6	---	10.0	51.5	4919.4	21.4	0.3
181	Deployed	0.22	Emergency	0	Nominal T/R	Nominal (Stow at 70 kts)	114.0	1575.0	3197.4	4772.4	28.6	1.5	9.0	---	---	30.7	0.4
182	Stowed	0.22	Emergency	0	Nominal T/R	Nominal (Stow at 70 kts)	114.0	1575.0	3777.2	5352.2	-551.2	---	9.0	49.0	4919.8	21.8	0.3
191	Deployed	0.02	None	0	Nominal T/R	Nominal (Stow at 70 kts)	114.0	1575.0	19601.8	21176.8	-16375.8	1.5	---	65.5	4919.3	21.3	17.0
192	Stowed	0.02	None	0	Nominal T/R	Nominal (Stow at 70 kts)	114.0	1575.0	23537.3	25112.3	-20311.3	---	---	75.5	4917.8	19.8	20.8
201	Deployed	0.41	Maximum Manual	0	No T/R	Flight/Ground Idle	114.0	1575.0	1861.3	3436.3	1364.7	1.5	3.0	---	---	17.2	0.7
202	Stowed	0.41	Maximum Manual	0	No T/R	Flight/Ground Idle	114.0	1575.0	2430.0	4005.0	796.0	---	3.0	---	---	21.2	0.2
211	Deployed	0.22	A/S Inoperative	0	No T/R	Flight/Ground Idle	114.0	1575.0	3440.3	5015.3	-214.3	1.5	10.0	31.1	4922.4	24.4	0.3
212	Stowed	0.22	A/S Inoperative	0	No T/R	Flight/Ground Idle	114.0	1575.0	4252.5	5827.5	-1026.5	---	10.0	66.0	4918.3	20.3	0.2
221	Deployed	0.22	Emergency	0	No T/R	Flight/Ground Idle	114.0	1575.0	3343.8	4918.8	-117.8	1.5	9.0	22.9	4923.9	25.9	0.3
222	Stowed	0.22	Emergency	0	No T/R	Flight/Ground Idle	114.0	1575.0	4162.9	5737.9	-936.9	---	9.0	63.3	4918.6	20.6	0.3
231	Deployed	0.02	None	0	No T/R	Flight/Ground Idle	114.0	1575.0	20572.4	22147.4	-17346.4	1.5	---	76.8	4918.4	20.4	17.1
232	Stowed	0.02	None	0	No T/R	Flight/Ground Idle	114.0	1575.0	25574.1	27149.1	-22348.1	---	---	87.8	4917.2	19.2	21.1
241	Deployed	0.02	None	0	No T/R ->TOGA	TOGA Thrust (Flaps 40 to 20)	114.0	1575.0	3790.7	5365.7	-564.7	1.5	---	125.6	4916.6	18.6	140.0
242	Stowed	0.02	None	0	No T/R ->TOGA	TOGA Thrust (Flaps 40 to 20)	114.0	1575.0	3725.5	5300.5	-499.5	---	---	127.3	4916.0	18.0	140.0
251	Deployed	0.02	None	0	No T/R ->TOGA	TOGA Thrust (Remain at Flaps 40)	114.0	1575.0	3929.5	5504.5	-703.5	1.5	---	124.2	4916.6	18.6	139.9
252	Stowed	0.02	None	0	No T/R ->TOGA	TOGA Thrust (Remain at Flaps 40)	114.0	1575.0	3844.7	5419.7	-618.7	---	---	126.2	4916.0	18.0	139.8

HENDRICK MOTORSPORTS GULFSTREAM G150 (N480JJ), [SIMULATION DATA, CASES 1-2, MAXIMUM MANUAL WHEEL BRAKING]

DRY RUNWAY LANDING OVERRUN, KEY WEST, FLORIDA; OCTOBER 31, 2011 [EVENT ENGINE N1, MAXIMUM FORWARD, MINIMUM REVERSE (MOST CONSERVATIVE)]

AIR DISTANCE	1,575 FEET
TOUCHDOWN SPEED	114 KNOTS
WEIGHT	17,800 LB
FLAPS	40
GEAR	DOWN
HEAD/TAIL WIND (+/-)	0 KNOTS
TEMPERATURE	26 C
PRESSURE	29.96 in. Hg
RUNWAY SLOPE	0 PERCENT

GROUND SPEED (KNOTS)

GROUND ROLL DISTANCE (FEET)

ENGINE N1 (PERCENT)

ENGINE N1 MAPPING (DEEC DATA)

ENGINE PLA (DEEC DATA)

ENGINE THRUST MODEL

REVERSE THRUST MODEL

SPOILER

MU AIRPLANE (NONDIMEN)

WHEEL BRAKE LEVEL

TIME DELAY TO APPLY WHEEL BRAKES (SECONDS)

REFERENCE TIME (SECONDS)

NATIONAL TRANSPORTATION SAFETY BOARD

HENDRICK MOTORSPORTS GULFSTREAM G150 (N480JJ), [SIMULATION DATA, CASES 3-4, MAXIMUM MANUAL WHEEL BRAKING]

DRY RUNWAY LANDING OVERRUN, KEY WEST, FLORIDA; OCTOBER 31, 2011 [EVENT ENGINE N1, MAXIMUM FORWARD, MINIMUM REVERSE (MOST CONSERVATIVE)]

AIR DISTANCE	1,575 FEET
TOUCHDOWN SPEED	114 KNOTS
WEIGHT	17,800 LB
FLAPS	40
GEAR	DOWN
HEAD/TAIL WIND (+/-)	0 KNOTS
TEMPERATURE	26 C
PRESSURE	29.96 in. Hg
RUNWAY SLOPE	0 PERCENT

GROUND SPEED (KNOTS)

GROUND ROLL DISTANCE (FEET)

ENGINE N1 (PERCENT)

ENGINE N1 MAPPING (DEEC DATA)

ENGINE PLA (DEEC DATA)

ENGINE THRUST MODEL

REVERSE THRUST MODEL

SPOILER

MU AIRPLANE (NONDIMEN)

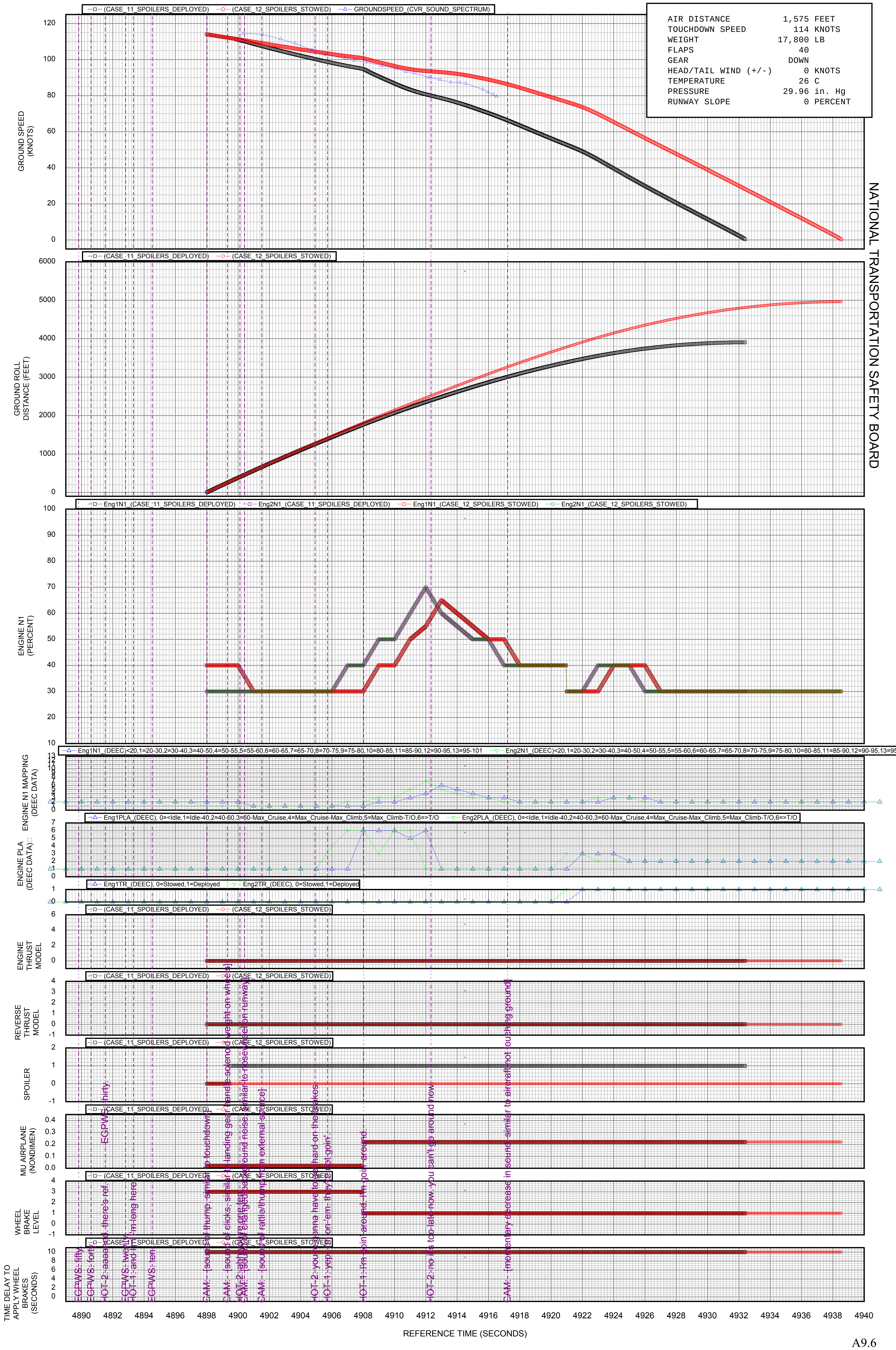
WHEEL BRAKE LEVEL

TIME DELAY TO APPLY WHEEL BRAKES (SECONDS)

REFERENCE TIME (SECONDS)

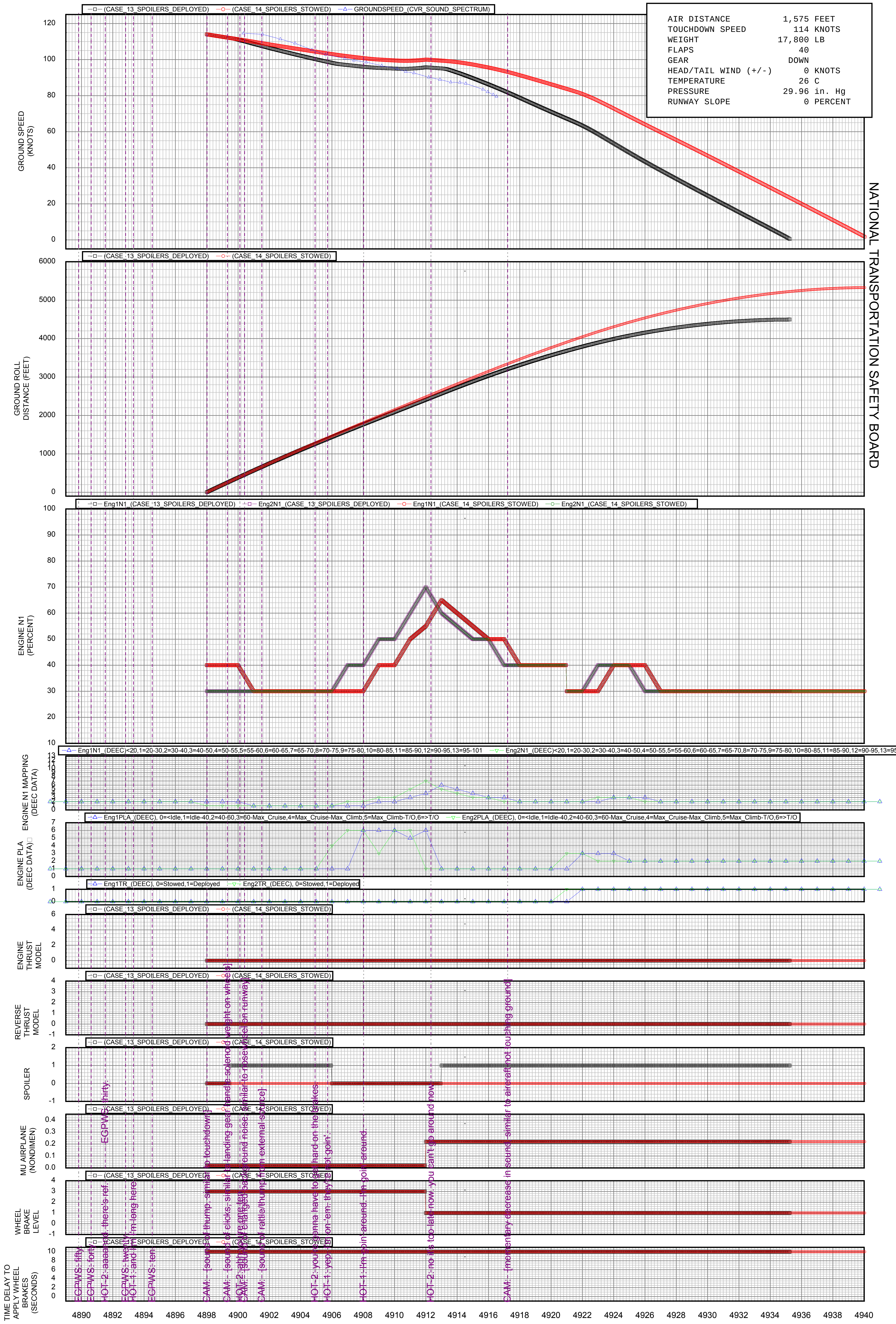
NATIONAL TRANSPORTATION SAFETY BOARD

HENDRICK MOTORSPORTS GULFSTREAM G150 (N480JJ), [SIMULATION DATA, CASES 11-12, ANTI-SKID INOPERATIVE WHEEL BRAKING]
DRY RUNWAY LANDING OVERRUN, KEY WEST, FLORIDA; OCTOBER 31, 2011 [EVENT ENGINE N1, MAXIMUM FORWARD, MINIMUM REVERSE (MOST CONSERVATIVE)]

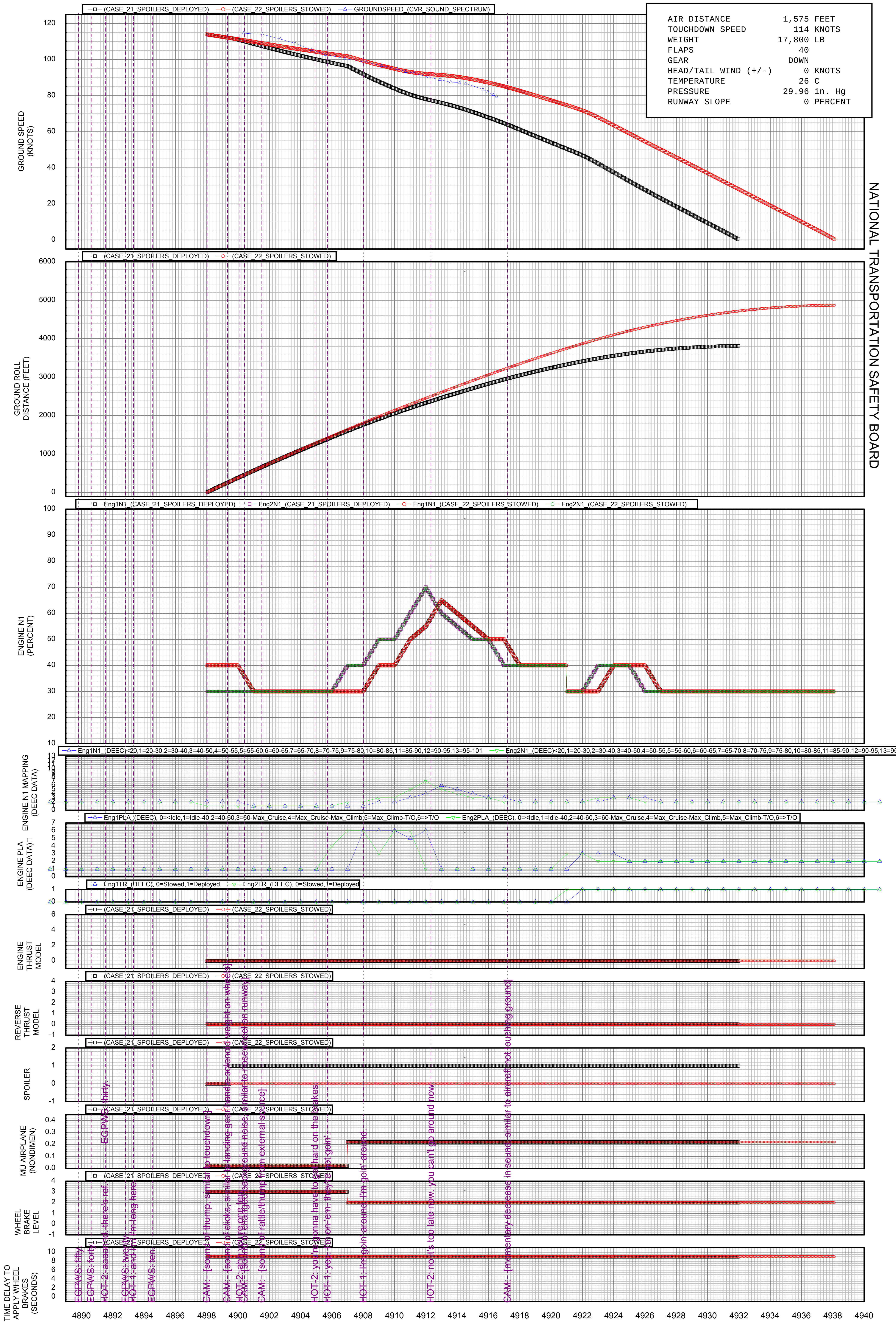


(CASE_11_SPOILERS_DEPLOYED)
(CASE_12_SPOILERS_STOWED)
GROUNDSPEED_(CVR_SOUND_SPECTRUM)
AIR DISTANCE 1,575 FEET
TOUCHDOWN SPEED 114 KNOTS
WEIGHT 17,800 LB
FLAPS 40
GEAR DOWN
HEAD/TAIL WIND (+/-) 0 KNOTS
TEMPERATURE 26 C
PRESSURE 29.96 in. Hg
RUNWAY SLOPE 0 PERCENT
GROUND SPEED (KNOTS)
GROUND ROLL DISTANCE (FEET)
Eng1N1_(CASE_11_SPOILERS_DEPLOYED)
Eng2N1_(CASE_11_SPOILERS_DEPLOYED)
Eng1N1_(CASE_12_SPOILERS_STOWED)
Eng2N1_(CASE_12_SPOILERS_STOWED)
ENGINE N1 (PERCENT)
Eng1N1_(DEEC)<20,1=20-30,2=30-40,3=40-50,4=50-55,5=55-60,6=60-65,7=65-70,8=70-75,9=75-80,10=80-85,11=85-90,12=90-95,13=95-101
Eng2N1_(DEEC)<20,1=20-30,2=30-40,3=40-50,4=50-55,5=55-60,6=60-65,7=65-70,8=70-75,9=75-80,10=80-85,11=85-90,12=90-95,13=95-1
ENGINE N1 MAPPING (DEEC DATA)
Eng1PLA_(DEEC), 0=<Idle,1=Idle-40,2=40-60,3=60-Max_Cruise,4=Max_Cruise-Max_Climb,5=Max_Climb-T/O,6=>T/O
Eng2PLA_(DEEC), 0=<Idle,1=Idle-40,2=40-60,3=60-Max_Cruise,4=Max_Cruise-Max_Climb,5=Max_Climb-T/O,6=>T/O
ENGINE PLA (DEEC DATA)
Eng1TR_(DEEC), 0=Stowed,1=Deployed
Eng2TR_(DEEC), 0=Stowed,1=Deployed
ENGINE THRUST MODEL
REVERSE THRUST MODEL
SPOILER
MU AIRPLANE (NONDIMEN)
WHEEL BRAKE LEVEL
TIME DELAY TO APPLY WHEEL BRAKES (SECONDS)
EGPWS: fifty.
EGPWS: forty.
EGPWS: thirty.
HOT-2: aaaand. there's ref.
EGPWS: twenty.
HOT-1: and I'm long here.
EGPWS: ten.
CAM: [sound of thump, similar to touchdown]
CAM: [sound of clicks, similar to landing gear handle solenoid weight on wheels]
HOT-2: ahh you're one ten.
CAM: [sound of changed background noise, similar to nosewheel on runway]
CAM: [sound of rattle/thump from external source]
HOT-2: you're gonna have to get hard on the brakes.
HOT-1: yep I'm on 'em. they're not goin'.
HOT-1: I'm goin around. I'm goin around.
HOT-2: no it's too late now. you can't go around now.
CAM: [momentary decrease in sound, similar to aircraft not touching ground]
REFERENCE TIME (SECONDS)
NATIONAL TRANSPORTATION SAFETY BOARD

HENDRICK MOTORSPORTS GULFSTREAM G150 (N480JJ), [SIMULATION DATA, CASES 13-14, ANTI-SKID INOPERATIVE WHEEL BRAKING]
DRY RUNWAY LANDING OVERRUN, KEY WEST, FLORIDA; OCTOBER 31, 2011 [EVENT ENGINE N1, MAXIMUM FORWARD, MINIMUM REVERSE (MOST CONSERVATIVE)]

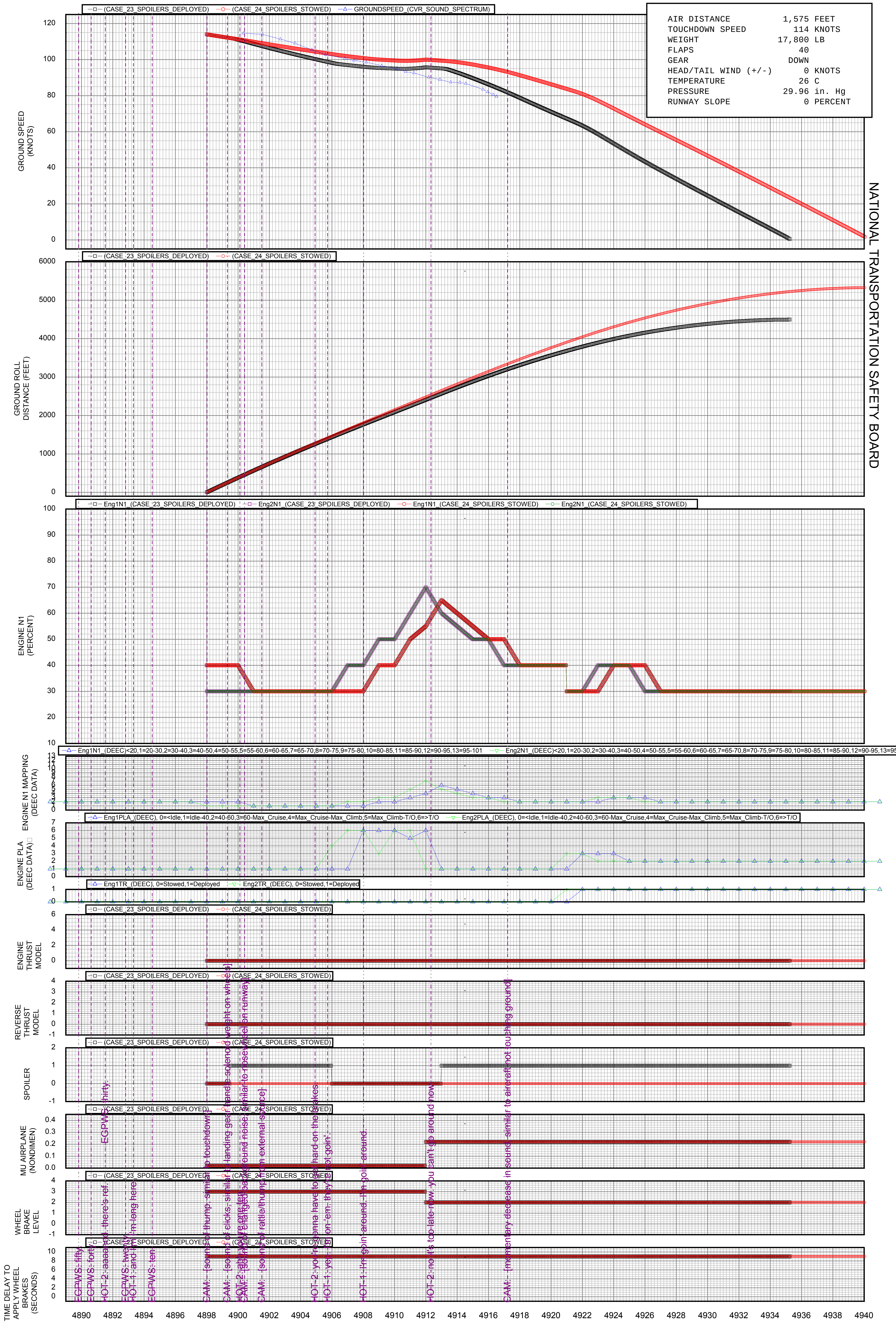


HENDRICK MOTORSPORTS GULFSTREAM G150 (N480JJ), [SIMULATION DATA, CASES 21-22, EMERGENCY WHEEL BRAKING]
DRY RUNWAY LANDING OVERRUN, KEY WEST, FLORIDA; OCTOBER 31, 2011 [EVENT ENGINE N1, MAXIMUM FORWARD, MINIMUM REVERSE (MOST CONSERVATIVE)]



(CASE_21_SPOILERS_DEPLOYED)
(CASE_22_SPOILERS_STOWED)
GROUNDSPEED_(CVR_SOUND_SPECTRUM)
AIR DISTANCE 1,575 FEET
TOUCHDOWN SPEED 114 KNOTS
WEIGHT 17,800 LB
FLAPS 40
GEAR DOWN
HEAD/TAIL WIND (+/-) 0 KNOTS
TEMPERATURE 26 C
PRESSURE 29.96 in. Hg
RUNWAY SLOPE 0 PERCENT
GROUND SPEED (KNOTS)
GROUND ROLL DISTANCE (FEET)
NATIONAL TRANSPORTATION SAFETY BOARD
Eng1N1_(CASE_21_SPOILERS_DEPLOYED)
Eng2N1_(CASE_21_SPOILERS_DEPLOYED)
Eng1N1_(CASE_22_SPOILERS_STOWED)
Eng2N1_(CASE_22_SPOILERS_STOWED)
ENGINE N1 (PERCENT)
Eng1N1_(DEEC)<20,1=20-30,2=30-40,3=40-50,4=50-55,5=55-60,6=60-65,7=65-70,8=70-75,9=75-80,10=80-85,11=85-90,12=90-95,13=95-101
Eng2N1_(DEEC)<20,1=20-30,2=30-40,3=40-50,4=50-55,5=55-60,6=60-65,7=65-70,8=70-75,9=75-80,10=80-85,11=85-90,12=90-95,13=95-1
ENGINE N1 MAPPING (DEEC DATA)
Eng1PLA_(DEEC), 0=<Idle,1=Idle-40,2=40-60,3=60-Max_Cruise,4=Max_Cruise-Max_Climb,5=Max_Climb-T/O,6=>T/O
Eng2PLA_(DEEC), 0=<Idle,1=Idle-40,2=40-60,3=60-Max_Cruise,4=Max_Cruise-Max_Climb,5=Max_Climb-T/O,6=>T/O
ENGINE PLA (DEEC DATA)
Eng1TR_(DEEC), 0=Stowed,1=Deployed
Eng2TR_(DEEC), 0=Stowed,1=Deployed
ENGINE THRUST MODEL
REVERSE THRUST MODEL
SPOILER
MU AIRPLANE (NONDIMEN)
WHEEL BRAKE LEVEL
TIME DELAY TO APPLY WHEEL BRAKES (SECONDS)
EGPWS: fifty.
EGPWS: forty.
EGPWS: thirty.
HOT-2: aaaand. there's ref.
EGPWS: twenty.
HOT-1: and I'm long here.
EGPWS: ten.
CAM: [sound of thump, similar to touchdown]
CAM: [sound of clicks, similar to landing gear handle solenoid weight on wheels]
HOT-2: ah you're one ten.
CAM: [sound of changed background noise, similar to nosewheel on runway]
CAM: [sound of rattle/thump from external source]
HOT-2: you're gonna have to get hard on the brakes.
HOT-1: yep. I'm on 'em. they're not goin'.
HOT-1: I'm goin' around. I'm goin' around.
HOT-2: no it's too late now. you can't go around now.
CAM: [momentary decrease in sound, similar to aircraft not touching ground]
REFERENCE TIME (SECONDS)

HENDRICK MOTORSPORTS GULFSTREAM G150 (N480JJ), [SIMULATION DATA, CASES 23-24, EMERGENCY WHEEL BRAKING]
DRY RUNWAY LANDING OVERRUN, KEY WEST, FLORIDA; OCTOBER 31, 2011 [EVENT ENGINE N1, MAXIMUM FORWARD, MINIMUM REVERSE (MOST CONSERVATIVE)]



(CASE_23_SPOILERS_DEPLOYED)
(CASE_24_SPOILERS_STOWED)
GROUNDSPEED_(CVR_SOUND_SPECTRUM)
GROUND SPEED (KNOTS)
AIR DISTANCE 1,575 FEET
TOUCHDOWN SPEED 114 KNOTS
WEIGHT 17,800 LB
FLAPS 40
GEAR DOWN
HEAD/TAIL WIND (+/-) 0 KNOTS
TEMPERATURE 26 C
PRESSURE 29.96 in. Hg
RUNWAY SLOPE 0 PERCENT
GROUND ROLL DISTANCE (FEET)
Eng1N1_(CASE_23_SPOILERS_DEPLOYED)
Eng2N1_(CASE_23_SPOILERS_DEPLOYED)
Eng1N1_(CASE_24_SPOILERS_STOWED)
Eng2N1_(CASE_24_SPOILERS_STOWED)
ENGINE N1 (PERCENT)
Eng1N1_(DEEC)<20,1=20-30,2=30-40,3=40-50,4=50-55,5=55-60,6=60-65,7=65-70,8=70-75,9=75-80,10=80-85,11=85-90,12=90-95,13=95-101
Eng2N1_(DEEC)<20,1=20-30,2=30-40,3=40-50,4=50-55,5=55-60,6=60-65,7=65-70,8=70-75,9=75-80,10=80-85,11=85-90,12=90-95,13=95-1
ENGINE N1 MAPPING (DEEC DATA)
Eng1PLA_(DEEC), 0=<Idle,1=Idle-40,2=40-60,3=60-Max_Cruise,4=Max_Cruise-Max_Climb,5=Max_Climb-T/O,6=>T/O
Eng2PLA_(DEEC), 0=<Idle,1=Idle-40,2=40-60,3=60-Max_Cruise,4=Max_Cruise-Max_Climb,5=Max_Climb-T/O,6=>T/O
ENGINE PLA (DEEC DATA)
Eng1TR_(DEEC), 0=Stowed,1=Deployed
Eng2TR_(DEEC), 0=Stowed,1=Deployed
ENGINE THRUST MODEL
REVERSE THRUST MODEL
SPOILER
MU AIRPLANE (NONDIMEN)
WHEEL BRAKE LEVEL
TIME DELAY TO APPLY WHEEL BRAKES (SECONDS)
EGPWS: fifty.
EGPWS: forty.
HOT-2: aaaand. there's ref.
EGPWS: thirty.
EGPWS: twenty.
HOT-1: and I'm long here.
EGPWS: ten.
CAM: [sound of thump, similar to touchdown]
CAM: [sound of clicks, similar to landing gear handle solenoid weight on wheels]
HOT-2: ah you're one ten.
CAM: [sound of changed background noise, similar to nosewheel on runway]
CAM: [sound of rattle/thump from external source]
HOT-2: you're gonna have to get hard on the brakes.
HOT-1: yep. I'm on 'em. they're not goin'.
HOT-1: I'm goin around. I'm goin around.
HOT-2: no it's too late now. you can't go around now.
CAM: [momentary decrease in sound, similar to aircraft not touching ground]
4890 4892 4894 4896 4898 4900 4902 4904 4906 4908 4910 4912 4914 4916 4918 4920 4922 4924 4926 4928 4930 4932 4934 4936 4938 4940
REFERENCE TIME (SECONDS)
NATIONAL TRANSPORTATION SAFETY BOARD

HENDRICK MOTORSPORTS GULFSTREAM G150 (N480JJ), [SIMULATION DATA, CASES 31-32, NO WHEEL BRAKING]

DRY RUNWAY LANDING OVERRUN, KEY WEST, FLORIDA; OCTOBER 31, 2011 [EVENT ENGINE N1, MAXIMUM FORWARD, MINIMUM REVERSE (MOST CONSERVATIVE)]

AIR DISTANCE	1,575 FEET
TOUCHDOWN SPEED	114 KNOTS
WEIGHT	17,800 LB
FLAPS	40
GEAR	DOWN
HEAD/TAIL WIND (+/-)	0 KNOTS
TEMPERATURE	26 C
PRESSURE	29.96 in. Hg
RUNWAY SLOPE	0 PERCENT

GROUND SPEED (KNOTS)

GROUND ROLL DISTANCE (FEET)

ENGINE N1 (PERCENT)

ENGINE N1 MAPPING (DEEC DATA)

ENGINE PLA (DEEC DATA)

ENGINE THRUST MODEL

REVERSE THRUST MODEL

SPOILER

MU AIRPLANE (NONDIMEN)

WHEEL BRAKE LEVEL

TIME DELAY TO APPLY WHEEL BRAKES (SECONDS)

REFERENCE TIME (SECONDS)

NATIONAL TRANSPORTATION SAFETY BOARD

HENDRICK MOTORSPORTS GULFSTREAM G150 (N480JJ), [SIMULATION DATA, CASES 33-34, NO WHEEL BRAKING]

DRY RUNWAY LANDING OVERRUN, KEY WEST, FLORIDA; OCTOBER 31, 2011 [EVENT ENGINE N1, MAXIMUM FORWARD, MINIMUM REVERSE (MOST CONSERVATIVE)]

AIR DISTANCE	1,575 FEET
TOUCHDOWN SPEED	114 KNOTS
WEIGHT	17,800 LB
FLAPS	40
GEAR	DOWN
HEAD/TAIL WIND (+/-)	0 KNOTS
TEMPERATURE	26 C
PRESSURE	29.96 in. Hg
RUNWAY SLOPE	0 PERCENT

GROUND SPEED (KNOTS)

GROUND ROLL DISTANCE (FEET)

ENGINE N1 (PERCENT)

ENGINE N1 MAPPING (DEEC DATA)

ENGINE PLA (DEEC DATA)

ENGINE THRUST MODEL

REVERSE THRUST MODEL

SPOILER

MU AIRPLANE (NONDIMEN)

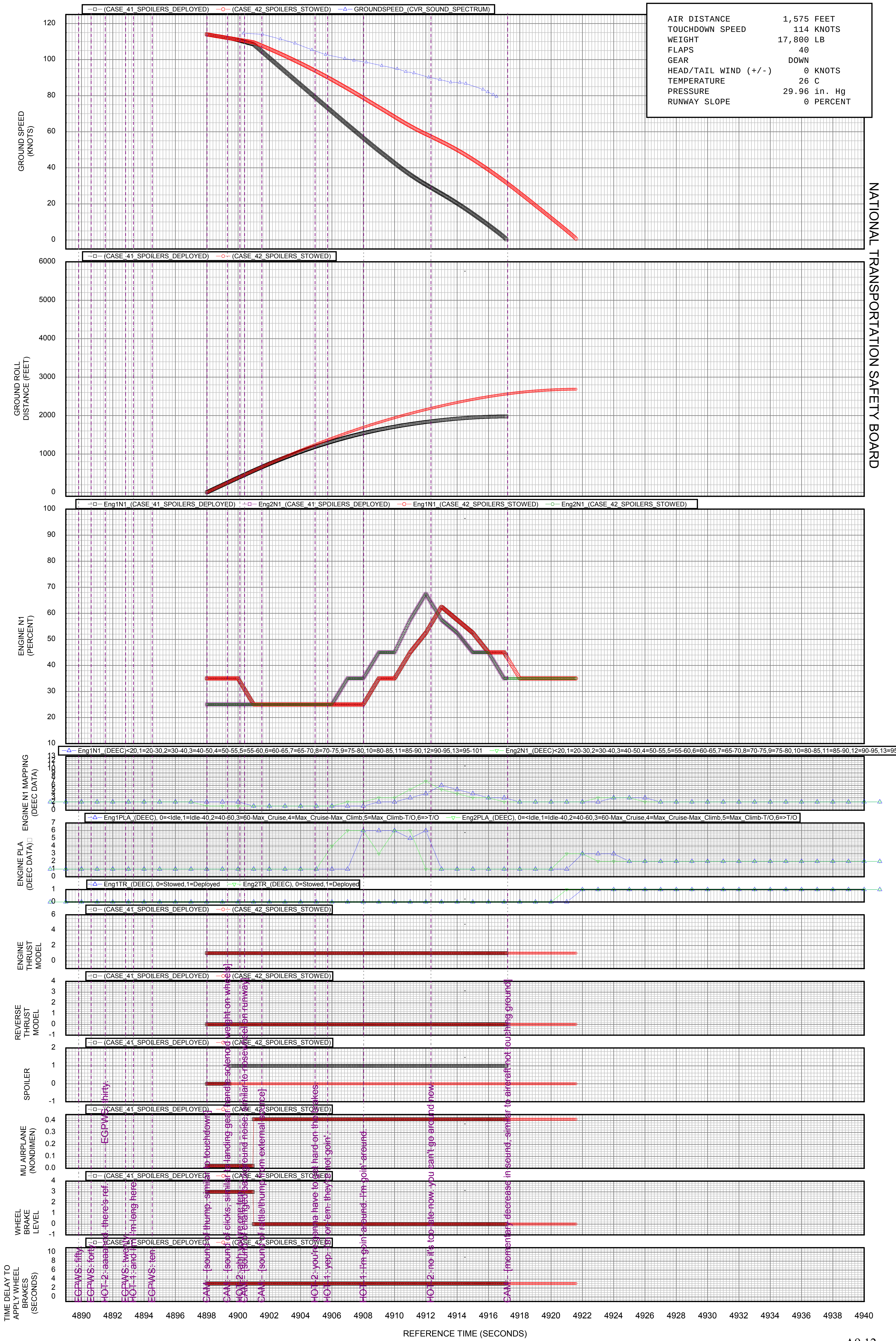
WHEEL BRAKE LEVEL

TIME DELAY TO APPLY WHEEL BRAKES (SECONDS)

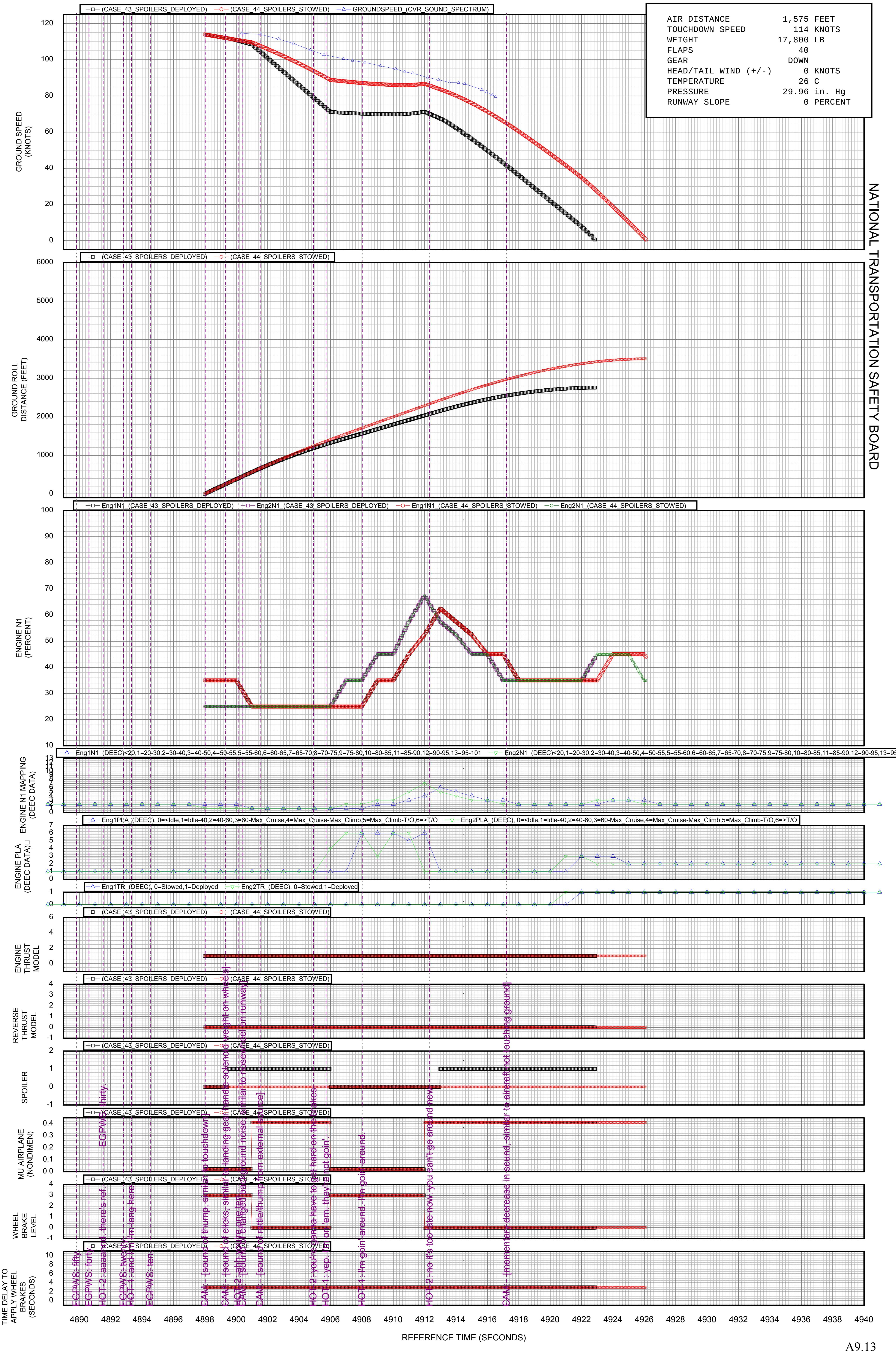
REFERENCE TIME (SECONDS)

NATIONAL TRANSPORTATION SAFETY BOARD

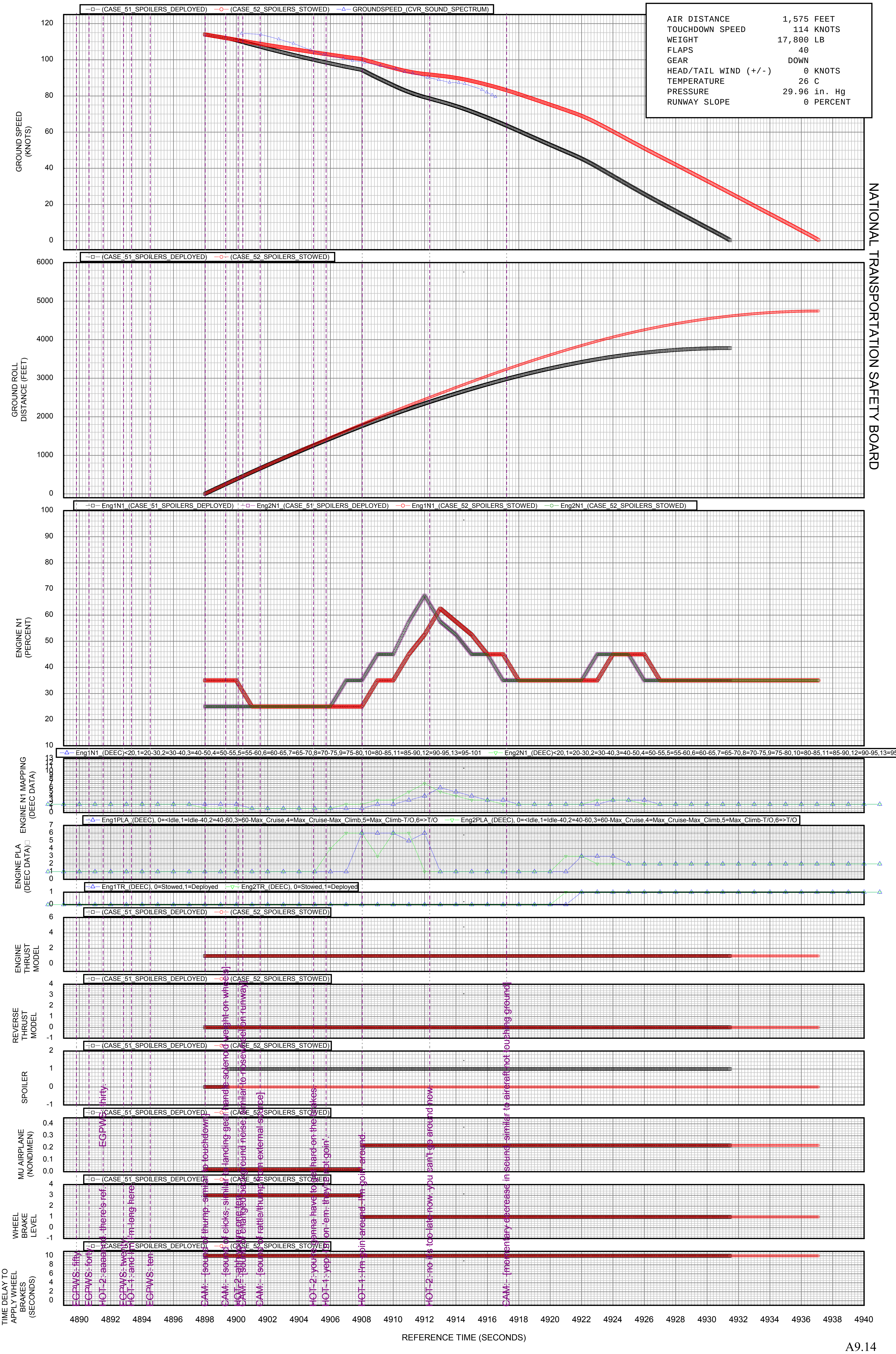
HENDRICK MOTORSPORTS GULFSTREAM G150 (N480JJ), [SIMULATION DATA, CASES 41-42, MAXIMUM MANUAL WHEEL BRAKING]
DRY RUNWAY LANDING OVERRUN, KEY WEST, FLORIDA; OCTOBER 31, 2011 [EVENT ENGINE N1, MEAN FORWARD THRUST, MEAN REVERSE THRUST]



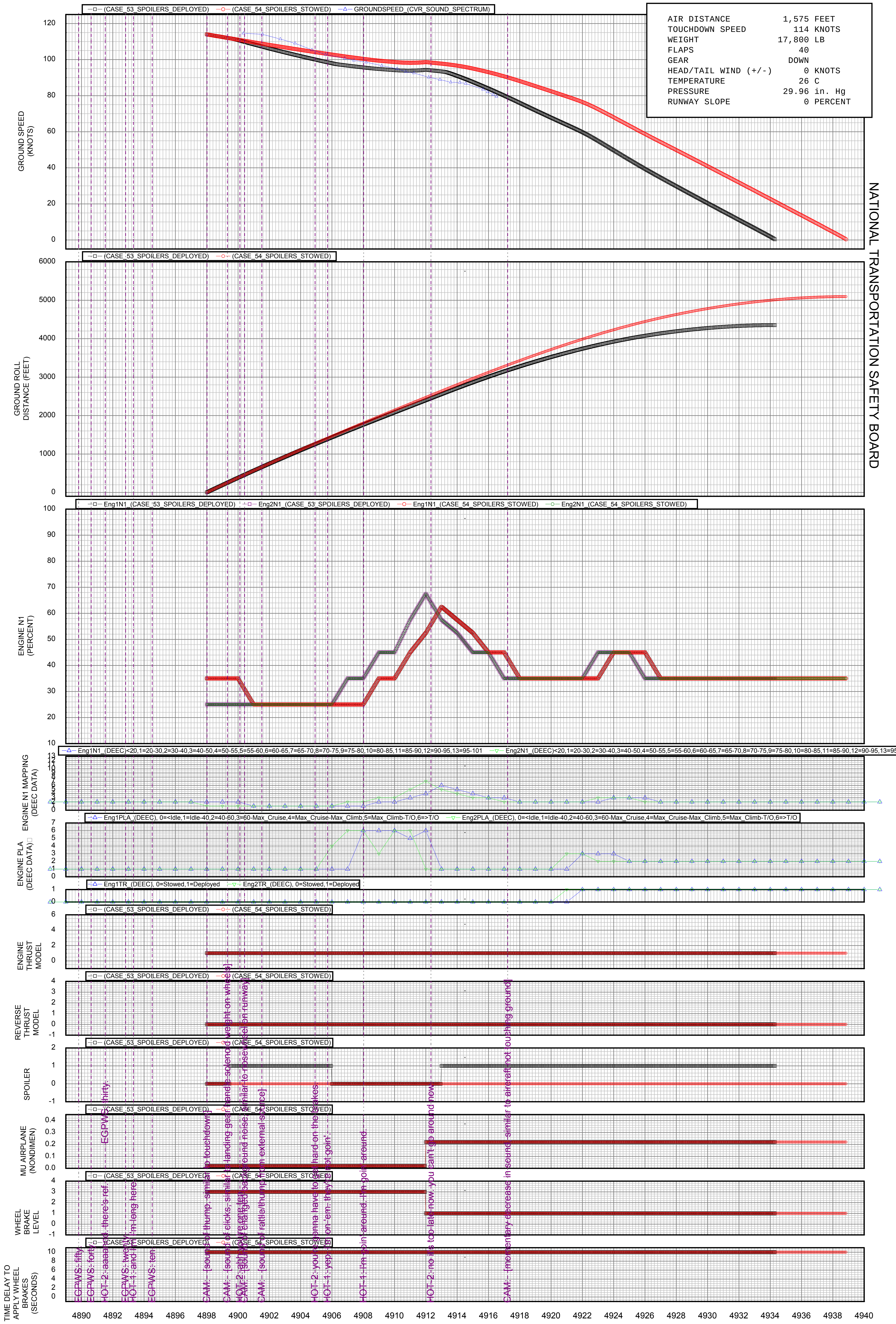
HENDRICK MOTORSPORTS GULFSTREAM G150 (N480JJ), [SIMULATION DATA, CASES 43-44, MAXIMUM MANUAL WHEEL BRAKING]
DRY RUNWAY LANDING OVERRUN, KEY WEST, FLORIDA; OCTOBER 31, 2011 [EVENT ENGINE N1, MEAN FORWARD THRUST, MEAN REVERSE THRUST]



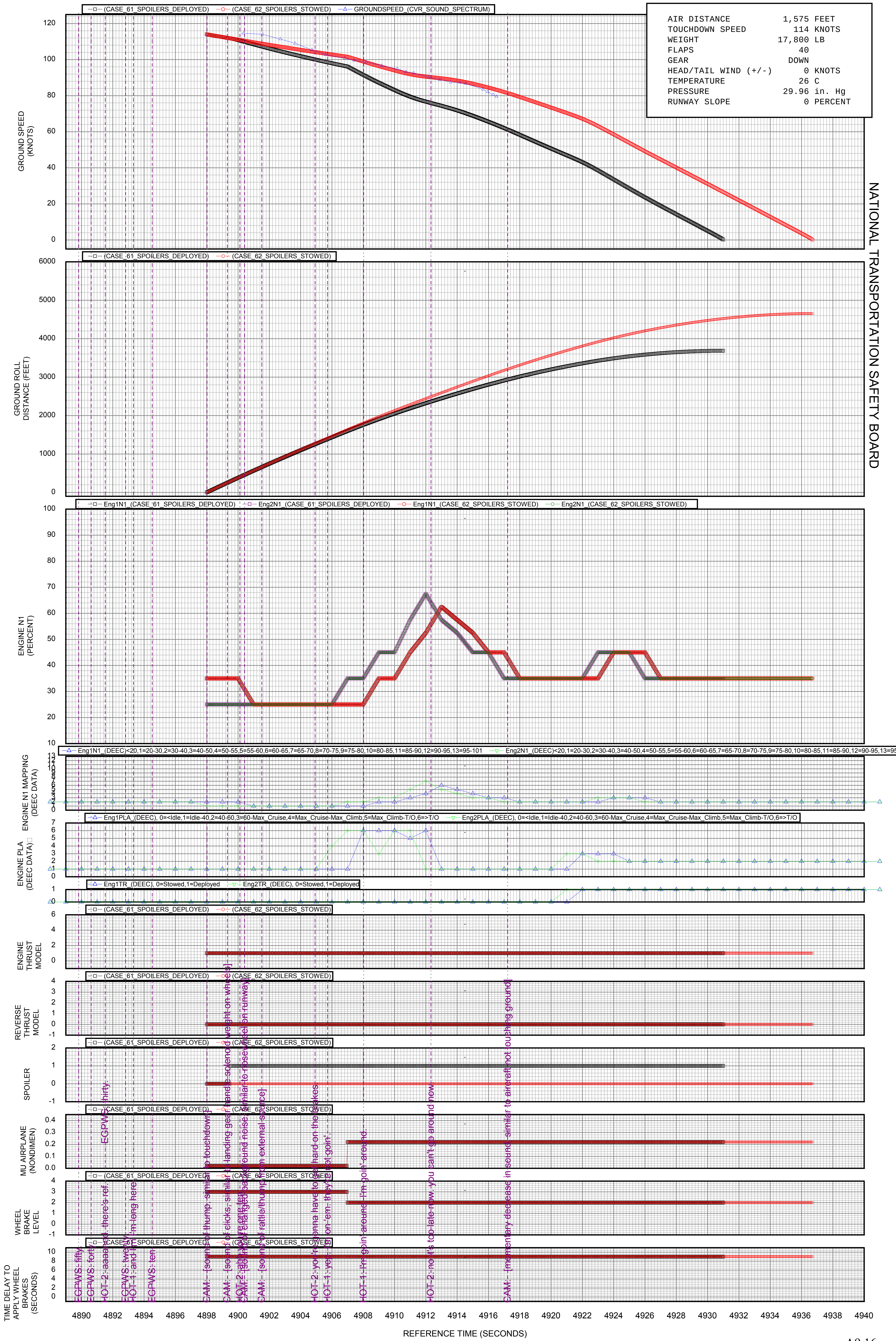
HENDRICK MOTORSPORTS GULFSTREAM G150 (N480JJ), [SIMULATION DATA, CASES 51-52, ANTI-SKID INOPERATIVE WHEEL BRAKING]
DRY RUNWAY LANDING OVERRUN, KEY WEST, FLORIDA; OCTOBER 31, 2011 [EVENT ENGINE N1, MEAN FORWARD THRUST, MEAN REVERSE THRUST]



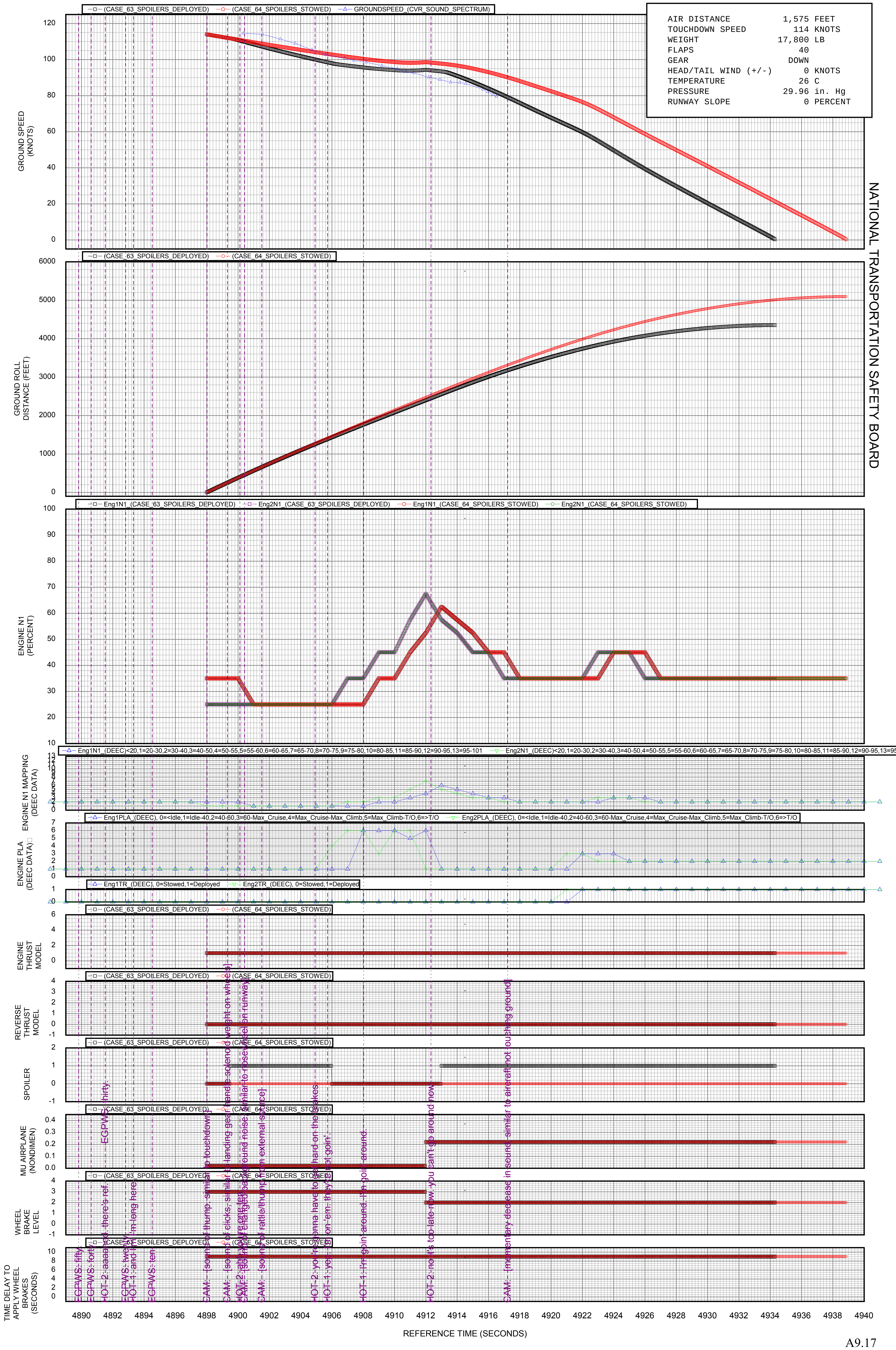
HENDRICK MOTORSPORTS GULFSTREAM G150 (N480JJ), [SIMULATION DATA, CASES 53-54, ANTI-SKID INOPERATIVE WHEEL BRAKING]
DRY RUNWAY LANDING OVERRUN, KEY WEST, FLORIDA; OCTOBER 31, 2011 [EVENT ENGINE N1, MEAN FORWARD THRUST, MEAN REVERSE THRUST]



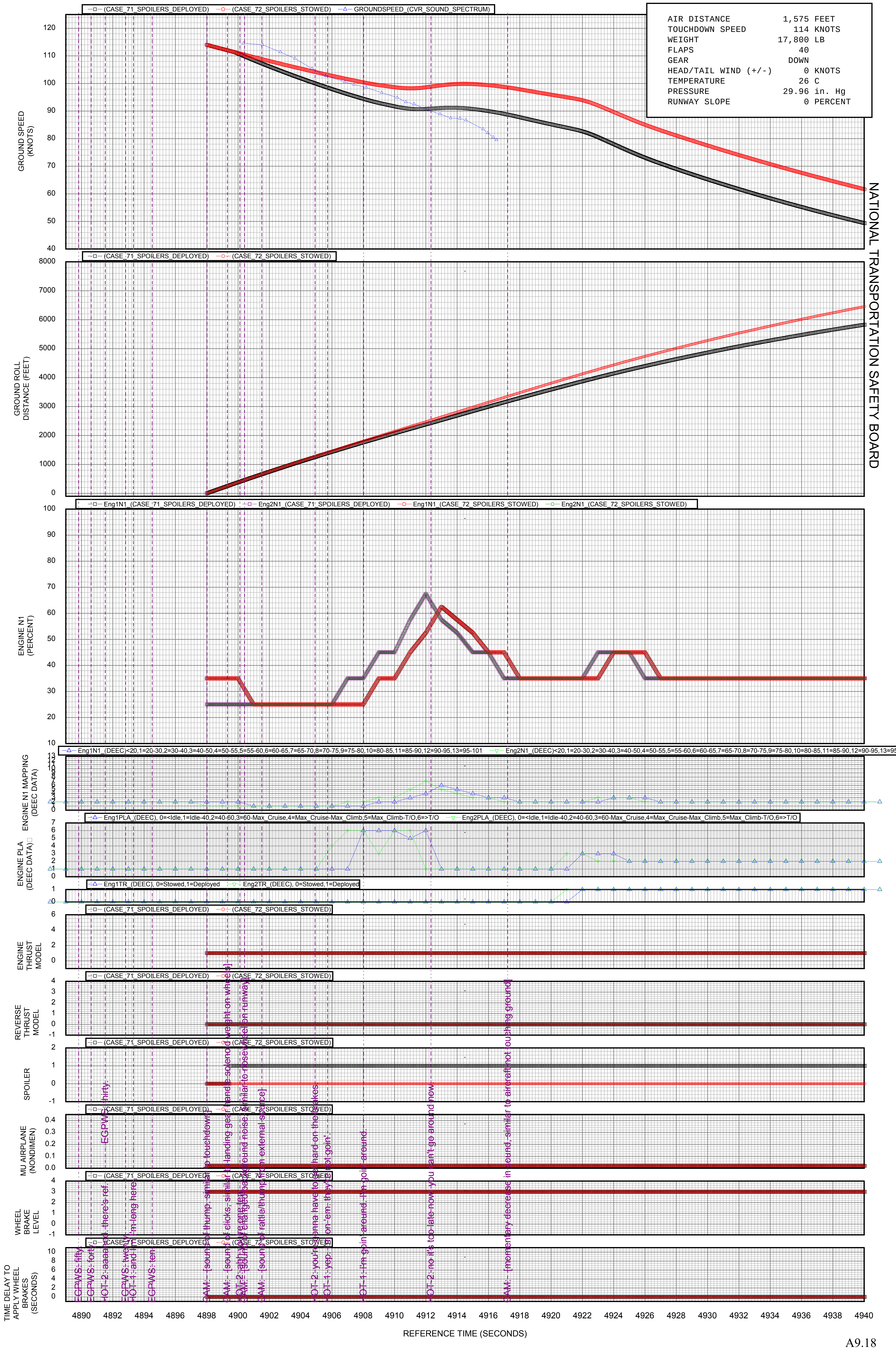
HENDRICK MOTORSPORTS GULFSTREAM G150 (N480JJ), [SIMULATION DATA, CASES 61-62, EMERGENCY WHEEL BRAKING]
DRY RUNWAY LANDING OVERRUN, KEY WEST, FLORIDA; OCTOBER 31, 2011 [EVENT ENGINE N1, MEAN FORWARD THRUST, MEAN REVERSE THRUST]



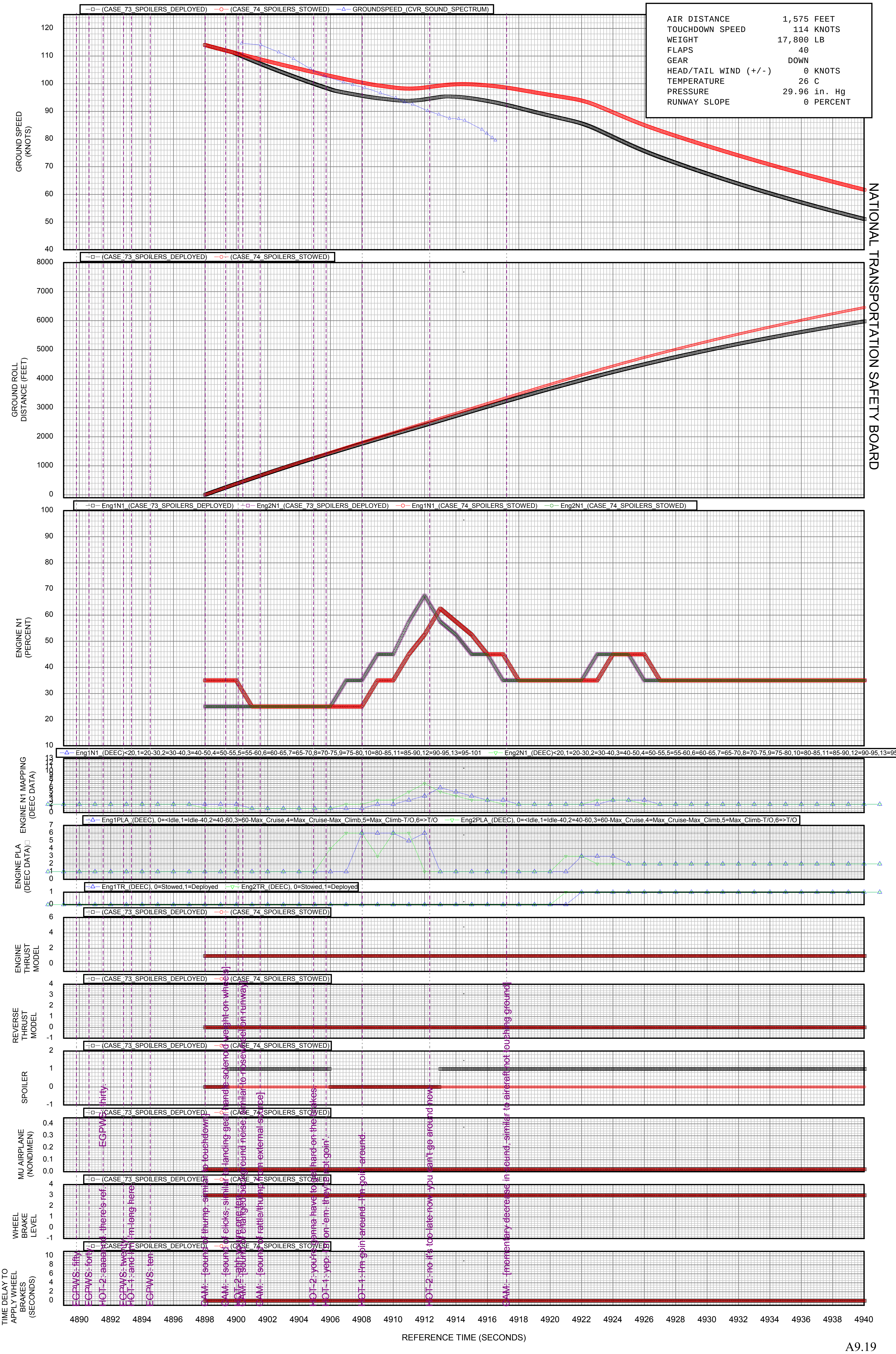
HENDRICK MOTORSPORTS GULFSTREAM G150 (N480JJ), [SIMULATION DATA, CASES 63-64, EMERGENCY WHEEL BRAKING]
DRY RUNWAY LANDING OVERRUN, KEY WEST, FLORIDA; OCTOBER 31, 2011 [EVENT ENGINE N1, MEAN FORWARD THRUST, MEAN REVERSE THRUST]



HENDRICK MOTORSPORTS GULFSTREAM G150 (N480JJ), [SIMULATION DATA, CASES 71-72, NO WHEEL BRAKING]
DRY RUNWAY LANDING OVERRUN, KEY WEST, FLORIDA; OCTOBER 31, 2011 [EVENT ENGINE N1, MEAN FORWARD THRUST, MEAN REVERSE THRUST]



HENDRICK MOTORSPORTS GULFSTREAM G150 (N480JJ), [SIMULATION DATA, CASES 73-74, NO WHEEL BRAKING]
DRY RUNWAY LANDING OVERRUN, KEY WEST, FLORIDA; OCTOBER 31, 2011 [EVENT ENGINE N1, MEAN FORWARD THRUST, MEAN REVERSE THRUST]



HENDRICK MOTORSPORTS GULFSTREAM G150 (N480JJ), [SIMULATION DATA, CASES 81-82, MAXIMUM MANUAL WHEEL BRAKING]

DRY RUNWAY LANDING OVERRUN, KEY WEST, FLORIDA; OCTOBER 31, 2011 [EVENT ENGINE N1, MINIMUM FORWARD, MAXIMUM REVERSE (LEAST CONSERVATIVE)]

AIR DISTANCE	1,575 FEET
TOUCHDOWN SPEED	114 KNOTS
WEIGHT	17,800 LB
FLAPS	40
GEAR	DOWN
HEAD/TAIL WIND (+/-)	0 KNOTS
TEMPERATURE	26 C
PRESSURE	29.96 in. Hg
RUNWAY SLOPE	0 PERCENT

NATIONAL TRANSPORTATION SAFETY BOARD

GROUND SPEED (KNOTS)

GROUND ROLL DISTANCE (FEET)

ENGINE N1 (PERCENT)

ENGINE N1 MAPPING (DEEC DATA)

ENGINE PLA (DEEC DATA)

ENGINE THRUST MODEL

REVERSE THRUST MODEL

SPOILER

MU AIRPLANE (NONDIMEN)

WHEEL BRAKE LEVEL

TIME DELAY TO APPLY WHEEL BRAKES (SECONDS)

REFERENCE TIME (SECONDS)

HENDRICK MOTORSPORTS GULFSTREAM G150 (N480JJ), [SIMULATION DATA, CASES 83-84, MAXIMUM MANUAL WHEEL BRAKING]

DRY RUNWAY LANDING OVERRUN, KEY WEST, FLORIDA; OCTOBER 31, 2011 [EVENT ENGINE N1, MINIMUM FORWARD, MAXIMUM REVERSE (LEAST CONSERVATIVE)]

AIR DISTANCE	1,575 FEET
TOUCHDOWN SPEED	114 KNOTS
WEIGHT	17,800 LB
FLAPS	40
GEAR	DOWN
HEAD/TAIL WIND (+/-)	0 KNOTS
TEMPERATURE	26 C
PRESSURE	29.96 in. Hg
RUNWAY SLOPE	0 PERCENT

NATIONAL TRANSPORTATION SAFETY BOARD

GROUND SPEED (KNOTS)

GROUND ROLL DISTANCE (FEET)

ENGINE N1 (PERCENT)

ENGINE N1 MAPPING (DEEC DATA)

ENGINE PLA (DEEC DATA)

ENGINE THRUST MODEL

REVERSE THRUST MODEL

SPOILER

MU AIRPLANE (NONDIMEN)

WHEEL BRAKE LEVEL

TIME DELAY TO APPLY WHEEL BRAKES (SECONDS)

REFERENCE TIME (SECONDS)

HENDRICK MOTORSPORTS GULFSTREAM G150 (N480JJ), [SIMULATION DATA, CASES 91-92, ANTI-SKID INOPERATIVE WHEEL BRAKING]

DRY RUNWAY LANDING OVERRUN, KEY WEST, FLORIDA; OCTOBER 31, 2011 [EVENT ENGINE N1, MINIMUM FORWARD, MAXIMUM REVERSE (LEAST CONSERVATIVE)]

AIR DISTANCE	1,575 FEET
TOUCHDOWN SPEED	114 KNOTS
WEIGHT	17,800 LB
FLAPS	40
GEAR	DOWN
HEAD/TAIL WIND (+/-)	0 KNOTS
TEMPERATURE	26 C
PRESSURE	29.96 in. Hg
RUNWAY SLOPE	0 PERCENT

GROUND SPEED (KNOTS)

GROUND ROLL DISTANCE (FEET)

ENGINE N1 (PERCENT)

ENGINE N1 MAPPING (DEEC DATA)

ENGINE PLA (DEEC DATA)

ENGINE THRUST MODEL

REVERSE THRUST MODEL

SPOILER

MU AIRPLANE (NONDIMEN)

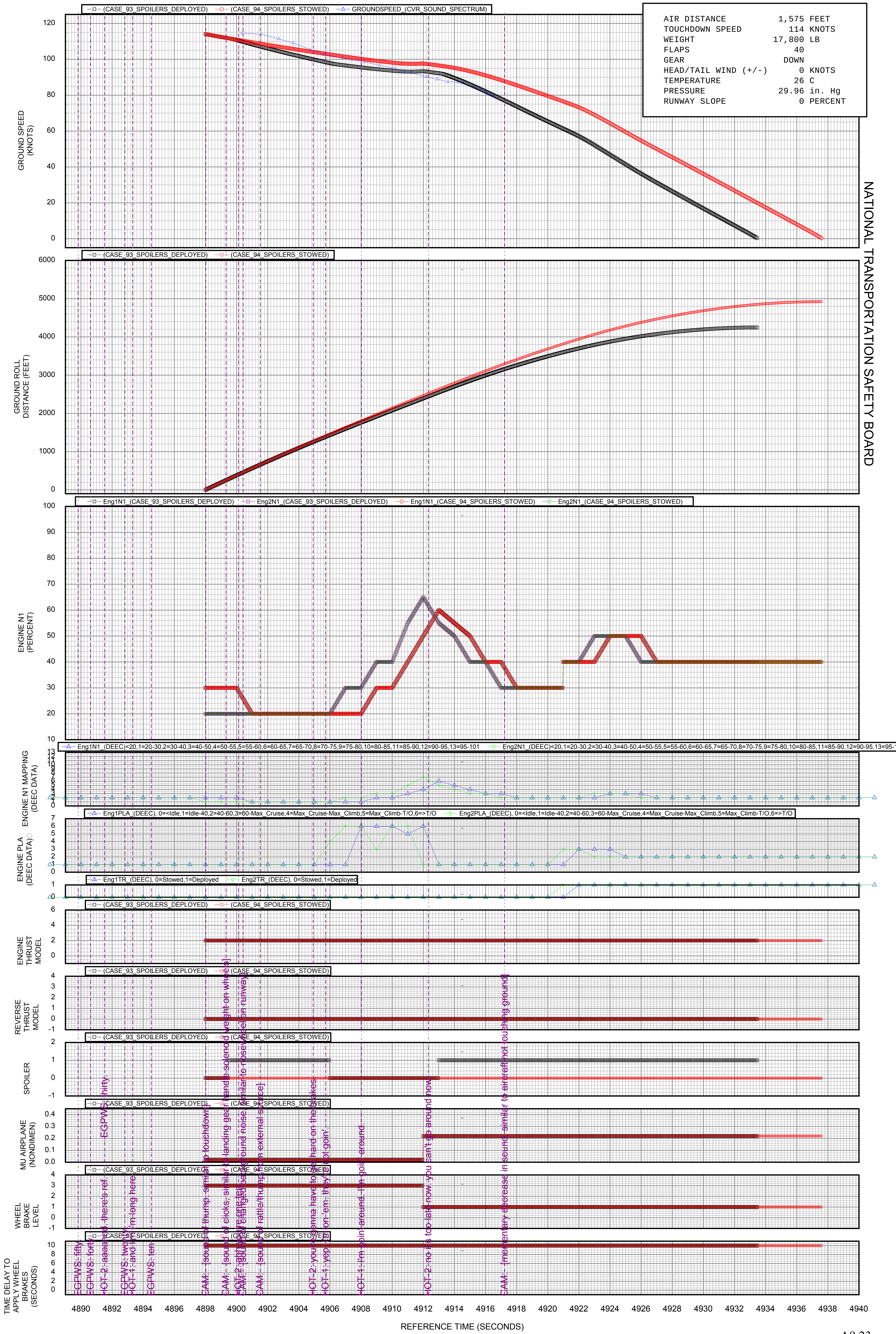
WHEEL BRAKE LEVEL

TIME DELAY TO APPLY WHEEL BRAKES (SECONDS)

REFERENCE TIME (SECONDS)

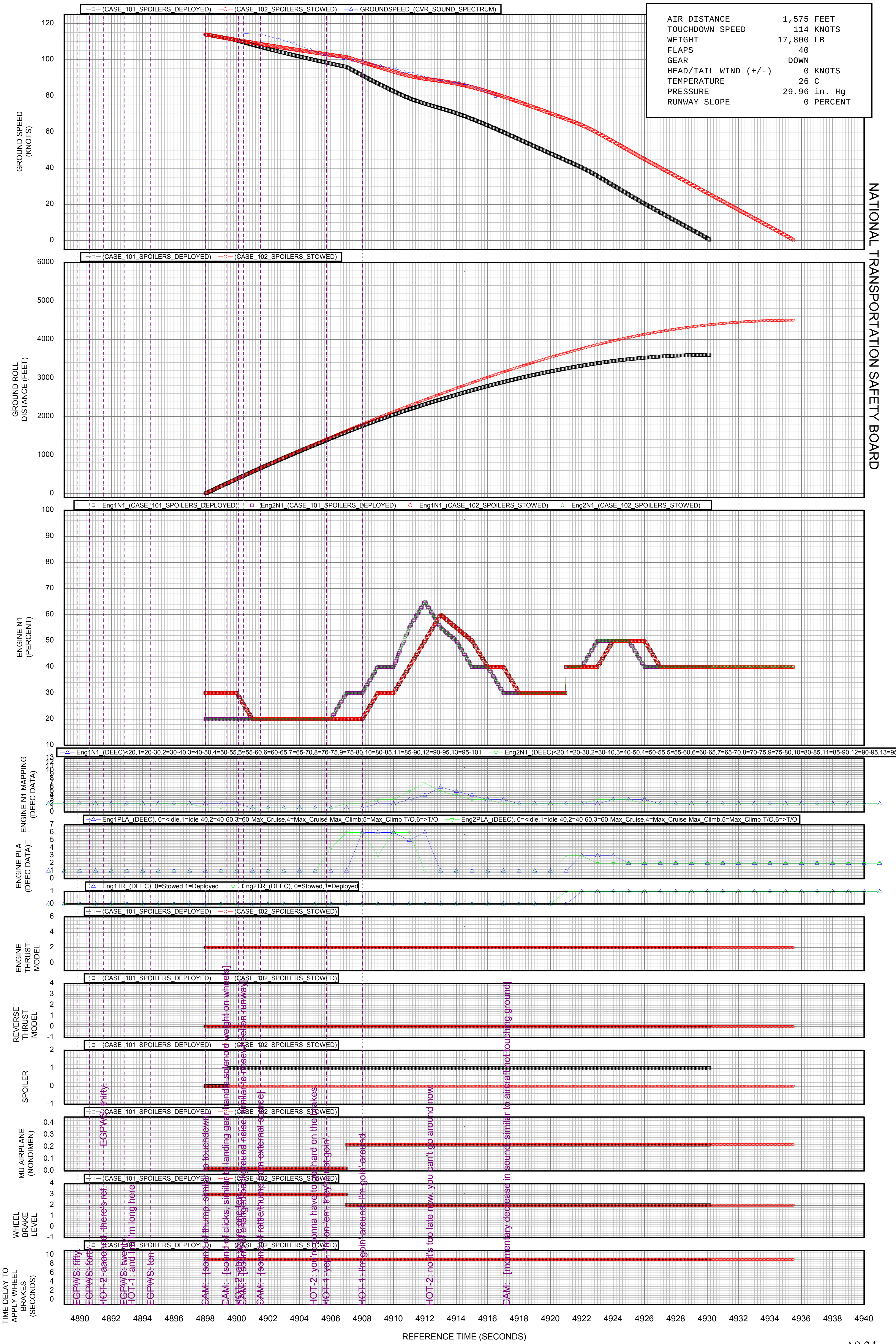
NATIONAL TRANSPORTATION SAFETY BOARD

HENDRICK MOTORSPORTS GULFSTREAM G150 (N480JJ), [SIMULATION DATA, CASES 93-94, ANTI-SKID INOPERATIVE WHEEL BRAKING]
DRY RUNWAY LANDING OVERRUN, KEY WEST, FLORIDA; OCTOBER 31, 2011 [EVENT ENGINE N1, MINIMUM FORWARD, MAXIMUM REVERSE (LEAST CONSERVATIVE)]



(CASE_93_SPOILERS_DEPLOYED)
(CASE_94_SPOILERS_STOWED)
GROUNDSPEED_(CVR_SOUND_SPECTRUM)
AIR DISTANCE 1,575 FEET
TOUCHDOWN SPEED 114 KNOTS
WEIGHT 17,800 LB
FLAPS 40
GEAR DOWN
HEAD/TAIL WIND (+/-) 0 KNOTS
TEMPERATURE 26 C
PRESSURE 29.96 in. Hg
RUNWAY SLOPE 0 PERCENT
NATIONAL TRANSPORTATION SAFETY BOARD
GROUND SPEED (KNOTS)
GROUND ROLL DISTANCE (FEET)
Eng1N1_(CASE_93_SPOILERS_DEPLOYED)
Eng2N1_(CASE_93_SPOILERS_DEPLOYED)
Eng1N1_(CASE_94_SPOILERS_STOWED)
Eng2N1_(CASE_94_SPOILERS_STOWED)
ENGINE N1 (PERCENT)
Eng1N1_(DEEC)<20,1=20-30,2=30-40,3=40-50,4=50-55,5=55-60,6=60-65,7=65-70,8=70-75,9=75-80,10=80-85,11=85-90,12=90-95,13=95-101
Eng2N1_(DEEC)<20,1=20-30,2=30-40,3=40-50,4=50-55,5=55-60,6=60-65,7=65-70,8=70-75,9=75-80,10=80-85,11=85-90,12=90-95,13=95-1
ENGINE N1 MAPPING (DEEC DATA)
Eng1PLA_(DEEC), 0=<Idle,1=Idle-40,2=40-60,3=60-Max_Cruise,4=Max_Cruise-Max_Climb,5=Max_Climb-T/O,6=>T/O
Eng2PLA_(DEEC), 0=<Idle,1=Idle-40,2=40-60,3=60-Max_Cruise,4=Max_Cruise-Max_Climb,5=Max_Climb-T/O,6=>T/O
ENGINE PLA (DEEC DATA)
Eng1TR_(DEEC), 0=Stowed,1=Deployed
Eng2TR_(DEEC), 0=Stowed,1=Deployed
ENGINE THRUST MODEL
REVERSE THRUST MODEL
SPOILER
MU AIRPLANE (NONDIMEN)
WHEEL BRAKE LEVEL
TIME DELAY TO APPLY WHEEL BRAKES (SECONDS)
EGPWS: fifty.
EGPWS: forty.
HOT-2: aaaand. there's ref.
EGPWS: thirty.
EGPWS: twenty.
HOT-1: and I'm long here.
EGPWS: ten.
CAM: [sound of thump, similar to touchdown]
CAM: [sound of clicks, similar to landing gear handle solenoid weight on wheels]
HOT-2: ahh you're one ten.
CAM: [sound of changed background noise, similar to nosewheel on runway]
CAM: [sound of rattle/thump from external source]
HOT-2: you're gonna have to get hard on the brakes.
HOT-1: yep I'm on 'em. they're not goin'.
HOT-1: I'm goin around. I'm goin around.
HOT-2: no it's too late now. you can't go around now.
CAM: [momentary decrease in sound, similar to aircraft not touching ground]
4890 4892 4894 4896 4898 4900 4902 4904 4906 4908 4910 4912 4914 4916 4918 4920 4922 4924 4926 4928 4930 4932 4934 4936 4938 4940
REFERENCE TIME (SECONDS)

HENDRICK MOTORSPORTS GULFSTREAM G150 (N480JJ), [SIMULATION DATA, CASES 101-102, EMERGENCY WHEEL BRAKING]
DRY RUNWAY LANDING OVERRUN, KEY WEST, FLORIDA; OCTOBER 31, 2011 [EVENT ENGINE N1, MINIMUM FORWARD, MAXIMUM REVERSE (LEAST CONSERVATIVE)]



(CASE_101_SPOILERS_DEPLOYED)
(CASE_102_SPOILERS_STOWED)
GROUNDSPEED_(CVR_SOUND_SPECTRUM)
AIR DISTANCE 1,575 FEET
TOUCHDOWN SPEED 114 KNOTS
WEIGHT 17,800 LB
FLAPS 40
GEAR DOWN
HEAD/TAIL WIND (+/-) 0 KNOTS
TEMPERATURE 26 C
PRESSURE 29.96 in. Hg
RUNWAY SLOPE 0 PERCENT
NATIONAL TRANSPORTATION SAFETY BOARD
GROUND SPEED (KNOTS)
GROUND ROLL DISTANCE (FEET)
Eng1N1_(CASE_101_SPOILERS_DEPLOYED)
Eng2N1_(CASE_101_SPOILERS_DEPLOYED)
Eng1N1_(CASE_102_SPOILERS_STOWED)
Eng2N1_(CASE_102_SPOILERS_STOWED)
ENGINE N1 (PERCENT)
Eng1N1_(DEEC)<20,1=20-30,2=30-40,3=40-50,4=50-55,5=55-60,6=60-65,7=65-70,8=70-75,9=75-80,10=80-85,11=85-90,12=90-95,13=95-101
Eng2N1_(DEEC)<20,1=20-30,2=30-40,3=40-50,4=50-55,5=55-60,6=60-65,7=65-70,8=70-75,9=75-80,10=80-85,11=85-90,12=90-95,13=95-1
ENGINE N1 MAPPING (DEEC DATA)
Eng1PLA_(DEEC), 0=<Idle,1=Idle-40,2=40-60,3=60-Max_Cruise,4=Max_Cruise-Max_Climb,5=Max_Climb-T/O,6=>T/O
Eng2PLA_(DEEC), 0=<Idle,1=Idle-40,2=40-60,3=60-Max_Cruise,4=Max_Cruise-Max_Climb,5=Max_Climb-T/O,6=>T/O
ENGINE PLA (DEEC DATA)
Eng1TR_(DEEC), 0=Stowed,1=Deployed
Eng2TR_(DEEC), 0=Stowed,1=Deployed
ENGINE THRUST MODEL
REVERSE THRUST MODEL
SPOILER
MU AIRPLANE (NONDIMEN)
WHEEL BRAKE LEVEL
TIME DELAY TO APPLY WHEEL BRAKES (SECONDS)
EGPWS: fifty.
EGPWS: forty.
EGPWS: thirty.
HOT-2: aaaand. there's ref.
EGPWS: twenty.
HOT-1: and I'm I'm long here.
EGPWS: ten.
CAM: [sound of thump, similar to touchdown]
CAM: [sound of clicks, similar to landing gear handle solenoid weight on wheels]
HOT-2: ah you're one ten.
CAM: [sound of changed background noise, similar to nosewheel on runway]
CAM: [sound of rattle/thump from external source]
HOT-2: you're gonna have to get hard on the brakes.
HOT-1: yep. I'm on 'em. they're not goin'.
HOT-1: I'm goin' around. I'm goin' around.
HOT-2: no it's too late now. you can't go around now.
CAM: [momentary decrease in sound, similar to aircraft not touching ground]
REFERENCE TIME (SECONDS)

HENDRICK MOTORSPORTS GULFSTREAM G150 (N480JJ), [SIMULATION DATA, CASES 103-104, EMERGENCY WHEEL BRAKING]

DRY RUNWAY LANDING OVERRUN, KEY WEST, FLORIDA; OCTOBER 31, 2011 [EVENT ENGINE N1, MINIMUM FORWARD, MAXIMUM REVERSE (LEAST CONSERVATIVE)]

AIR DISTANCE	1,575 FEET
TOUCHDOWN SPEED	114 KNOTS
WEIGHT	17,800 LB
FLAPS	40
GEAR	DOWN
HEAD/TAIL WIND (+/-)	0 KNOTS
TEMPERATURE	26 C
PRESSURE	29.96 in. Hg
RUNWAY SLOPE	0 PERCENT

GROUND SPEED (KNOTS)

GROUND ROLL DISTANCE (FEET)

ENGINE N1 (PERCENT)

ENGINE N1 MAPPING (DEEC DATA)

ENGINE PLA (DEEC DATA)

ENGINE THRUST MODEL

REVERSE THRUST MODEL

SPOILER

MU AIRPLANE (NONDIMEN)

WHEEL BRAKE LEVEL

TIME DELAY TO APPLY WHEEL BRAKES (SECONDS)

REFERENCE TIME (SECONDS)

NATIONAL TRANSPORTATION SAFETY BOARD

HENDRICK MOTORSPORTS GULFSTREAM G150 (N480JJ), [SIMULATION DATA, CASES 111-112, NO WHEEL BRAKING]

DRY RUNWAY LANDING OVERRUN, KEY WEST, FLORIDA; OCTOBER 31, 2011 [EVENT ENGINE N1, MINIMUM FORWARD, MAXIMUM REVERSE (LEAST CONSERVATIVE)]

AIR DISTANCE	1,575 FEET
TOUCHDOWN SPEED	114 KNOTS
WEIGHT	17,800 LB
FLAPS	40
GEAR	DOWN
HEAD/TAIL WIND (+/-)	0 KNOTS
TEMPERATURE	26 C
PRESSURE	29.96 in. Hg
RUNWAY SLOPE	0 PERCENT

GROUND SPEED (KNOTS)

GROUND ROLL DISTANCE (FEET)

ENGINE N1 (PERCENT)

ENGINE N1 MAPPING (DEEC DATA)

ENGINE PLA (DEEC DATA)

ENGINE THRUST MODEL

REVERSE THRUST MODEL

SPOILER

MU AIRPLANE (NONDIMEN)

WHEEL BRAKE LEVEL

TIME DELAY TO APPLY WHEEL BRAKES (SECONDS)

REFERENCE TIME (SECONDS)

NATIONAL TRANSPORTATION SAFETY BOARD

HENDRICK MOTORSPORTS GULFSTREAM G150 (N480JJ), [SIMULATION DATA, CASES 113-114, NO WHEEL BRAKING]

DRY RUNWAY LANDING OVERRUN, KEY WEST, FLORIDA; OCTOBER 31, 2011 [EVENT ENGINE N1, MINIMUM FORWARD, MAXIMUM REVERSE (LEAST CONSERVATIVE)]

AIR DISTANCE	1,575 FEET
TOUCHDOWN SPEED	114 KNOTS
WEIGHT	17,800 LB
FLAPS	40
GEAR	DOWN
HEAD/TAIL WIND (+/-)	0 KNOTS
TEMPERATURE	26 C
PRESSURE	29.96 in. Hg
RUNWAY SLOPE	0 PERCENT

GROUND SPEED (KNOTS)

GROUND ROLL DISTANCE (FEET)

ENGINE N1 (PERCENT)

ENGINE N1 MAPPING (DEEC DATA)

ENGINE PLA (DEEC DATA)

ENGINE THRUST MODEL

REVERSE THRUST MODEL

SPOILER

MU AIRPLANE (NONDIMEN)

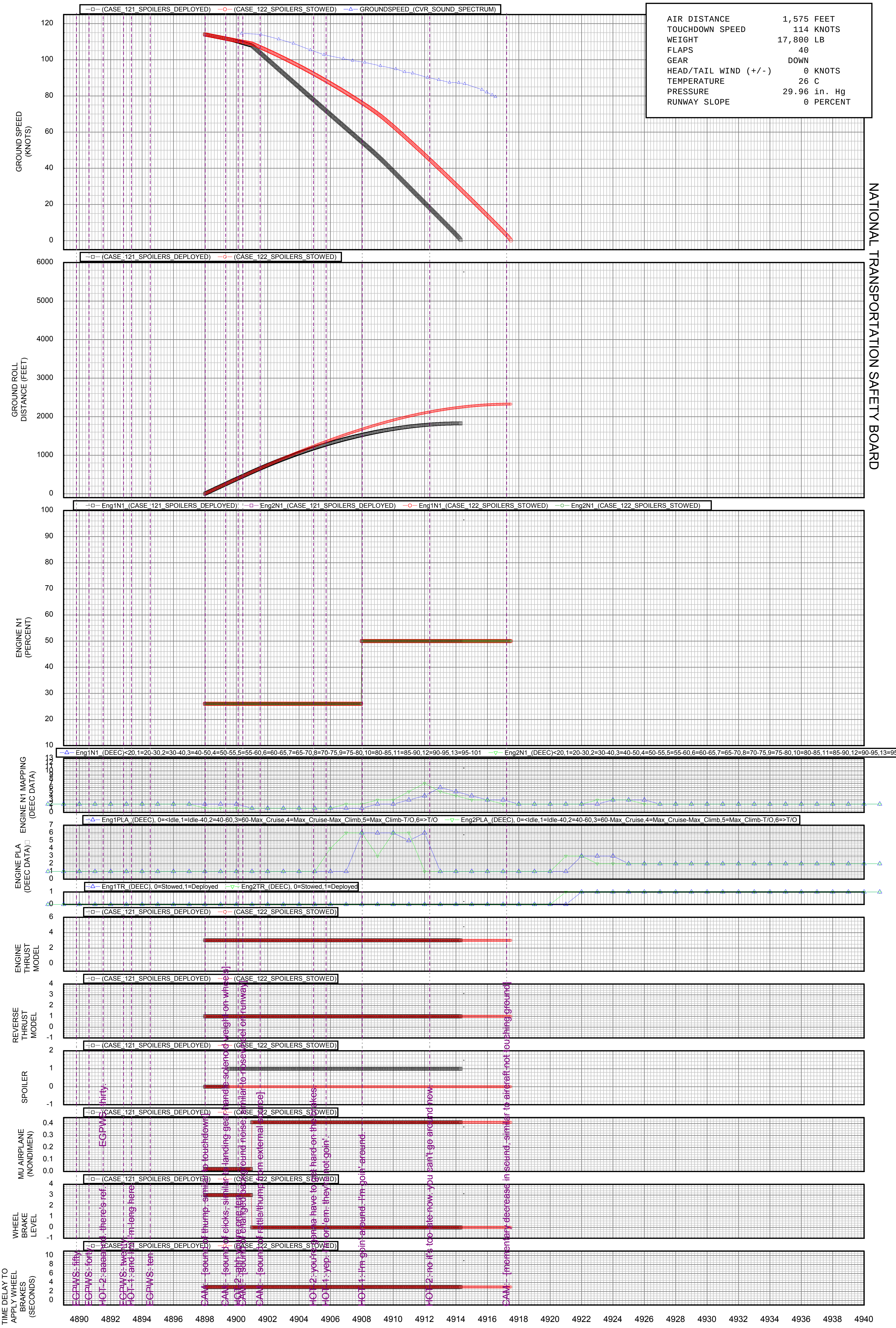
WHEEL BRAKE LEVEL

TIME DELAY TO APPLY WHEEL BRAKES (SECONDS)

REFERENCE TIME (SECONDS)

NATIONAL TRANSPORTATION SAFETY BOARD

HENDRICK MOTORSPORTS GULFSTREAM G150 (N480JJ), [SIMULATION DATA, CASES 121-122, MAXIMUM MANUAL WHEEL BRAKING]
DRY RUNWAY LANDING OVERRUN, KEY WEST, FLORIDA; OCTOBER 31, 2011 [EMERGENCY REVERSE THRUST, ENGINE N1=50 PERCENT TO 0 KNOTS GROUND SPEED]



(CASE_121_SPOILERS_DEPLOYED)
(CASE_122_SPOILERS_STOWED)
GROUNDSPEED_(CVR_SOUND_SPECTRUM)
AIR DISTANCE 1,575 FEET
TOUCHDOWN SPEED 114 KNOTS
WEIGHT 17,800 LB
FLAPS 40
GEAR DOWN
HEAD/TAIL WIND (+/-) 0 KNOTS
TEMPERATURE 26 C
PRESSURE 29.96 in. Hg
RUNWAY SLOPE 0 PERCENT
NATIONAL TRANSPORTATION SAFETY BOARD
GROUND SPEED (KNOTS)
GROUND ROLL DISTANCE (FEET)
Eng1N1_(CASE_121_SPOILERS_DEPLOYED)
Eng2N1_(CASE_121_SPOILERS_DEPLOYED)
Eng1N1_(CASE_122_SPOILERS_STOWED)
Eng2N1_(CASE_122_SPOILERS_STOWED)
ENGINE N1 (PERCENT)
Eng1N1_(DEEC)<20,1=20-30,2=30-40,3=40-50,4=50-55,5=55-60,6=60-65,7=65-70,8=70-75,9=75-80,10=80-85,11=85-90,12=90-95,13=95-101
Eng2N1_(DEEC)<20,1=20-30,2=30-40,3=40-50,4=50-55,5=55-60,6=60-65,7=65-70,8=70-75,9=75-80,10=80-85,11=85-90,12=90-95,13=95-1
ENGINE N1 MAPPING (DEEC DATA)
Eng1PLA_(DEEC), 0=<Idle,1=Idle-40,2=40-60,3=60-Max_Cruise,4=Max_Cruise-Max_Climb,5=Max_Climb-T/O,6=>T/O
Eng2PLA_(DEEC), 0=<Idle,1=Idle-40,2=40-60,3=60-Max_Cruise,4=Max_Cruise-Max_Climb,5=Max_Climb-T/O,6=>T/O
ENGINE PLA (DEEC DATA)
Eng1TR_(DEEC), 0=Stowed,1=Deployed
Eng2TR_(DEEC), 0=Stowed,1=Deployed
ENGINE THRUST MODEL
REVERSE THRUST MODEL
SPOILER
MU AIRPLANE (NONDIMEN)
WHEEL BRAKE LEVEL
TIME DELAY TO APPLY WHEEL BRAKES (SECONDS)
EGPWS: fifty.
EGPWS: forty.
EGPWS: thirty.
HOT-2: aaaand. there's ref.
EGPWS: twenty.
HOT-1: and I'm- I'm long here.
EGPWS: ten.
CAM: [sound of thump, similar to touchdown]
CAM: [sound of clicks, similar to landing gear handle solenoid weight on wheels]
HOT-2: ahh you're one ten.
CAM: [sound of changed background noise, similar to nosewheel on runway]
CAM: [sound of rattle/thump from external source]
HOT-2: you're gonna have to get hard on the brakes.
HOT-1: yep. I'm on 'em. they're not goin'.
HOT-1: I'm goin' around. I'm goin' around.
HOT-2: no it's too late now. you can't go around now.
CAM: [momentary decrease in sound, similar to aircraft not touching ground]
REFERENCE TIME (SECONDS)

HENDRICK MOTORSPORTS GULFSTREAM G150 (N480JJ), [SIMULATION DATA, CASES 131-132, ANTI-SKID INOPERATIVE WHEEL BRAKING]

DRY RUNWAY LANDING OVERRUN, KEY WEST, FLORIDA; OCTOBER 31, 2011 [EMERGENCY REVERSE THRUST, ENGINE N1=50 PERCENT TO 0 KNOTS GROUND SPEED]

AIR DISTANCE	1,575 FEET
TOUCHDOWN SPEED	114 KNOTS
WEIGHT	17,800 LB
FLAPS	40
GEAR	DOWN
HEAD/TAIL WIND (+/-)	0 KNOTS
TEMPERATURE	26 C
PRESSURE	29.96 in. Hg
RUNWAY SLOPE	0 PERCENT

GROUND SPEED (KNOTS)

GROUND ROLL DISTANCE (FEET)

ENGINE N1 (PERCENT)

ENGINE N1 MAPPING (DEEC DATA)

ENGINE PLA (DEEC DATA)

ENGINE THRUST MODEL

REVERSE THRUST MODEL

SPOILER

MU AIRPLANE (NONDIMEN)

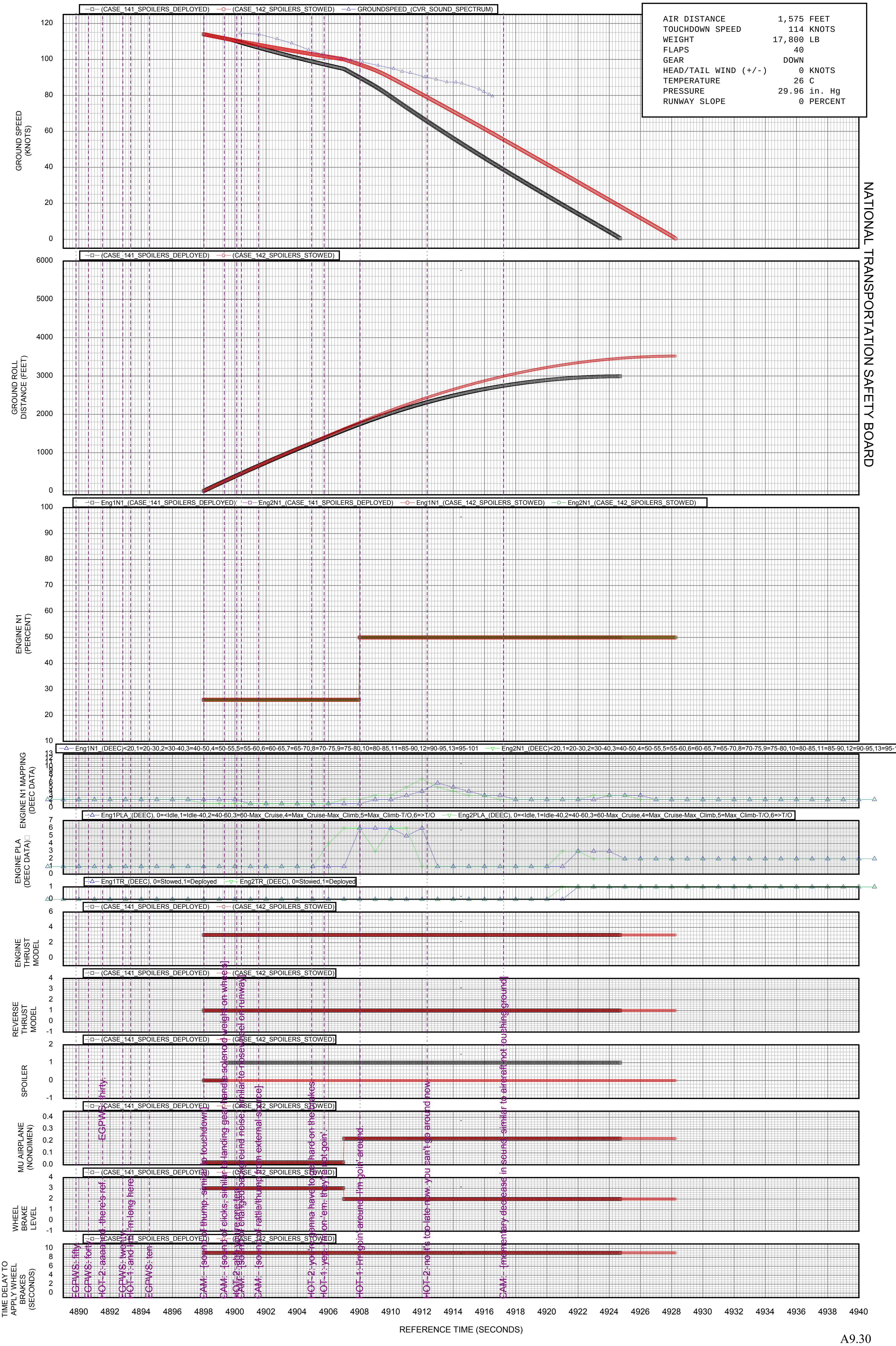
WHEEL BRAKE LEVEL

TIME DELAY TO APPLY WHEEL BRAKES (SECONDS)

REFERENCE TIME (SECONDS)

NATIONAL TRANSPORTATION SAFETY BOARD

HENDRICK MOTORSPORTS GULFSTREAM G150 (N480JJ), [SIMULATION DATA, CASES 141-142, EMERGENCY WHEEL BRAKING]
DRY RUNWAY LANDING OVERRUN, KEY WEST, FLORIDA; OCTOBER 31, 2011 [EMERGENCY REVERSE THRUST, ENGINE N1=50 PERCENT TO 0 KNOTS GROUND SPEED]



(CASE_141_SPOILERS_DEPLOYED)
(CASE_142_SPOILERS_STOWED)
GROUNDSPEED_(CVR_SOUND_SPECTRUM)
AIR DISTANCE 1,575 FEET
TOUCHDOWN SPEED 114 KNOTS
WEIGHT 17,800 LB
FLAPS 40
GEAR DOWN
HEAD/TAIL WIND (+/-) 0 KNOTS
TEMPERATURE 26 C
PRESSURE 29.96 in. Hg
RUNWAY SLOPE 0 PERCENT
GROUND SPEED (KNOTS)
GROUND ROLL DISTANCE (FEET)
Eng1N1_(CASE_141_SPOILERS_DEPLOYED)
Eng2N1_(CASE_141_SPOILERS_DEPLOYED)
Eng1N1_(CASE_142_SPOILERS_STOWED)
Eng2N1_(CASE_142_SPOILERS_STOWED)
ENGINE N1 (PERCENT)
Eng1N1_(DEEC)<20,1=20-30,2=30-40,3=40-50,4=50-55,5=55-60,6=60-65,7=65-70,8=70-75,9=75-80,10=80-85,11=85-90,12=90-95,13=95-101
Eng2N1_(DEEC)<20,1=20-30,2=30-40,3=40-50,4=50-55,5=55-60,6=60-65,7=65-70,8=70-75,9=75-80,10=80-85,11=85-90,12=90-95,13=95-1
ENGINE N1 MAPPING (DEEC DATA)
Eng1PLA_(DEEC), 0=<Idle,1=Idle-40,2=40-60,3=60-Max_Cruise,4=Max_Cruise-Max_Climb,5=Max_Climb-T/O,6=>T/O
Eng2PLA_(DEEC), 0=<Idle,1=Idle-40,2=40-60,3=60-Max_Cruise,4=Max_Cruise-Max_Climb,5=Max_Climb-T/O,6=>T/O
ENGINE PLA (DEEC DATA)
Eng1TR_(DEEC), 0=Stowed,1=Deployed
Eng2TR_(DEEC), 0=Stowed,1=Deployed
ENGINE THRUST MODEL
REVERSE THRUST MODEL
SPOILER
MU AIRPLANE (NONDIMEN)
WHEEL BRAKE LEVEL
TIME DELAY TO APPLY WHEEL BRAKES (SECONDS)
EGPWS: fifty.
EGPWS: forty.
HOT-2: aaaand. there's ref.
EGPWS: thirty.
EGPWS: twenty.
HOT-1: and I'm long here.
EGPWS: ten.
CAM: [sound of thump, similar to touchdown]
CAM: [sound of clicks, similar to landing gear handle solenoid weight on wheels]
HOT-2: ah you're one ten.
CAM: [sound of changed background noise, similar to nosewheel on runway]
CAM: [sound of rattle/thump from external source]
HOT-2: you're gonna have to get hard on the brakes.
HOT-1: yep. I'm on 'em. they're not goin'.
HOT-1: I'm goin' around. I'm goin' around.
HOT-2: no it's too late now. you can't go around now.
CAM: [momentary decrease in sound, similar to aircraft not touching ground]
4890 4892 4894 4896 4898 4900 4902 4904 4906 4908 4910 4912 4914 4916 4918 4920 4922 4924 4926 4928 4930 4932 4934 4936 4938 4940
REFERENCE TIME (SECONDS)
NATIONAL TRANSPORTATION SAFETY BOARD

HENDRICK MOTORSPORTS GULFSTREAM G150 (N480JJ), [SIMULATION DATA, CASES 151-152, NO WHEEL BRAKING]

DRY RUNWAY LANDING OVERRUN, KEY WEST, FLORIDA; OCTOBER 31, 2011 [EMERGENCY REVERSE THRUST, ENGINE N1=50 PERCENT TO 0 KNOTS GROUND SPEED]

AIR DISTANCE	1,575 FEET
TOUCHDOWN SPEED	114 KNOTS
WEIGHT	17,800 LB
FLAPS	40
GEAR	DOWN
HEAD/TAIL WIND (+/-)	0 KNOTS
TEMPERATURE	26 C
PRESSURE	29.96 in. Hg
RUNWAY SLOPE	0 PERCENT

GROUND SPEED (KNOTS)

GROUND ROLL DISTANCE (FEET)

ENGINE N1 (PERCENT)

ENGINE N1 MAPPING (DEEC DATA)

ENGINE PLA (DEEC DATA)

ENGINE THRUST MODEL

REVERSE THRUST MODEL

SPOILER

MU AIRPLANE (NONDIMEN)

WHEEL BRAKE LEVEL

TIME DELAY TO APPLY WHEEL BRAKES (SECONDS)

REFERENCE TIME (SECONDS)

NATIONAL TRANSPORTATION SAFETY BOARD

HENDRICK MOTORSPORTS GULFSTREAM G150 (N480JJ), [SIMULATION DATA, CASES 161-162, MAXIMUM MANUAL WHEEL BRAKING]

DRY RUNWAY LANDING OVERRUN, KEY WEST, FLORIDA; OCTOBER 31, 2011 [NOMINAL REVERSE THRUST, ENGINE N1=50 PERCENT TO 70 KNOTS GROUND SPEED]

AIR DISTANCE	1,575 FEET
TOUCHDOWN SPEED	114 KNOTS
WEIGHT	17,800 LB
FLAPS	40
GEAR	DOWN
HEAD/TAIL WIND (+/-)	0 KNOTS
TEMPERATURE	26 C
PRESSURE	29.96 in. Hg
RUNWAY SLOPE	0 PERCENT

GROUND SPEED (KNOTS)

GROUND ROLL DISTANCE (FEET)

ENGINE N1 (PERCENT)

ENGINE N1 MAPPING (DEEC DATA)

ENGINE PLA (DEEC DATA)

ENGINE THRUST MODEL

REVERSE THRUST MODEL

SPOILER

MU AIRPLANE (NONDIMEN)

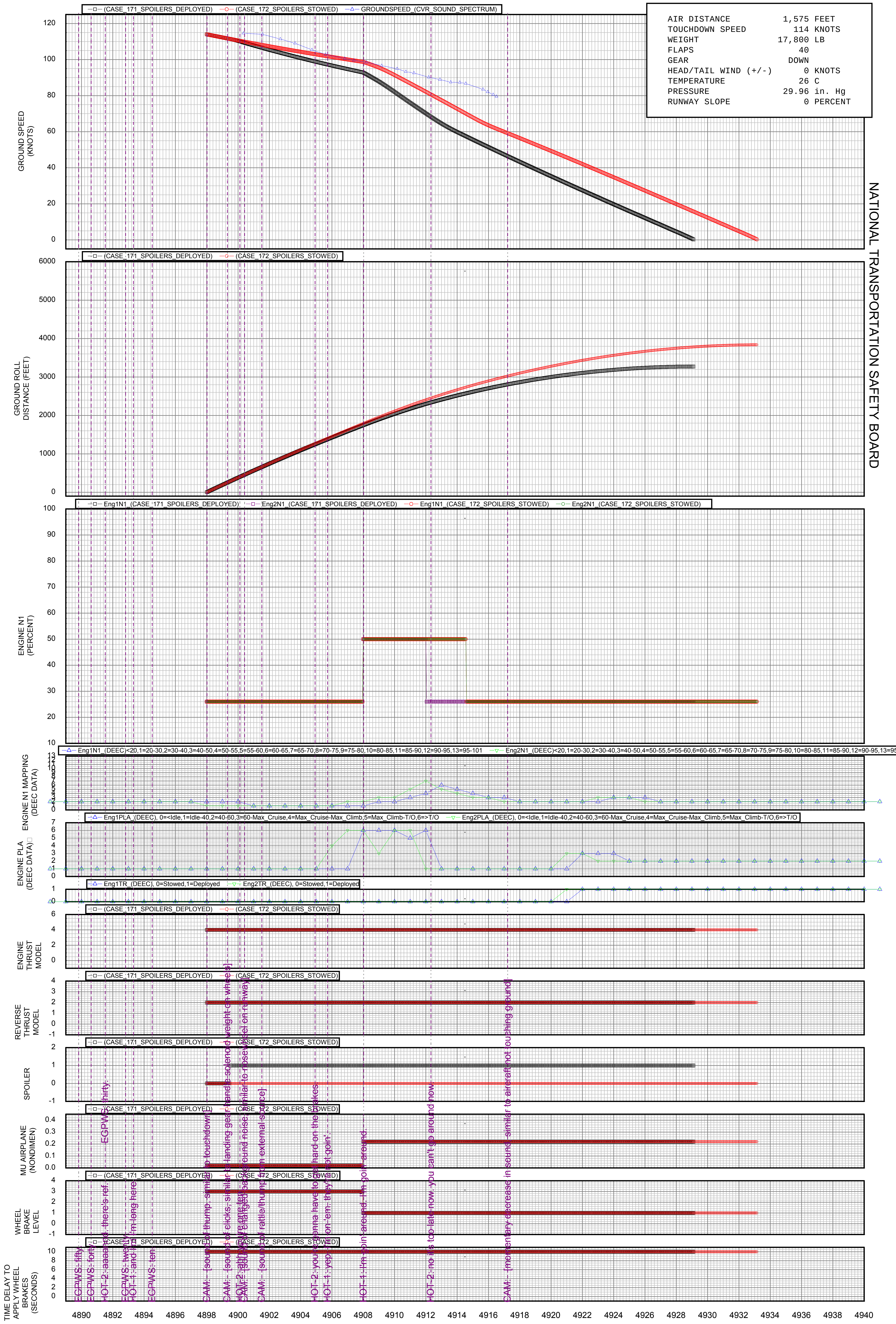
WHEEL BRAKE LEVEL

TIME DELAY TO APPLY WHEEL BRAKES (SECONDS)

REFERENCE TIME (SECONDS)

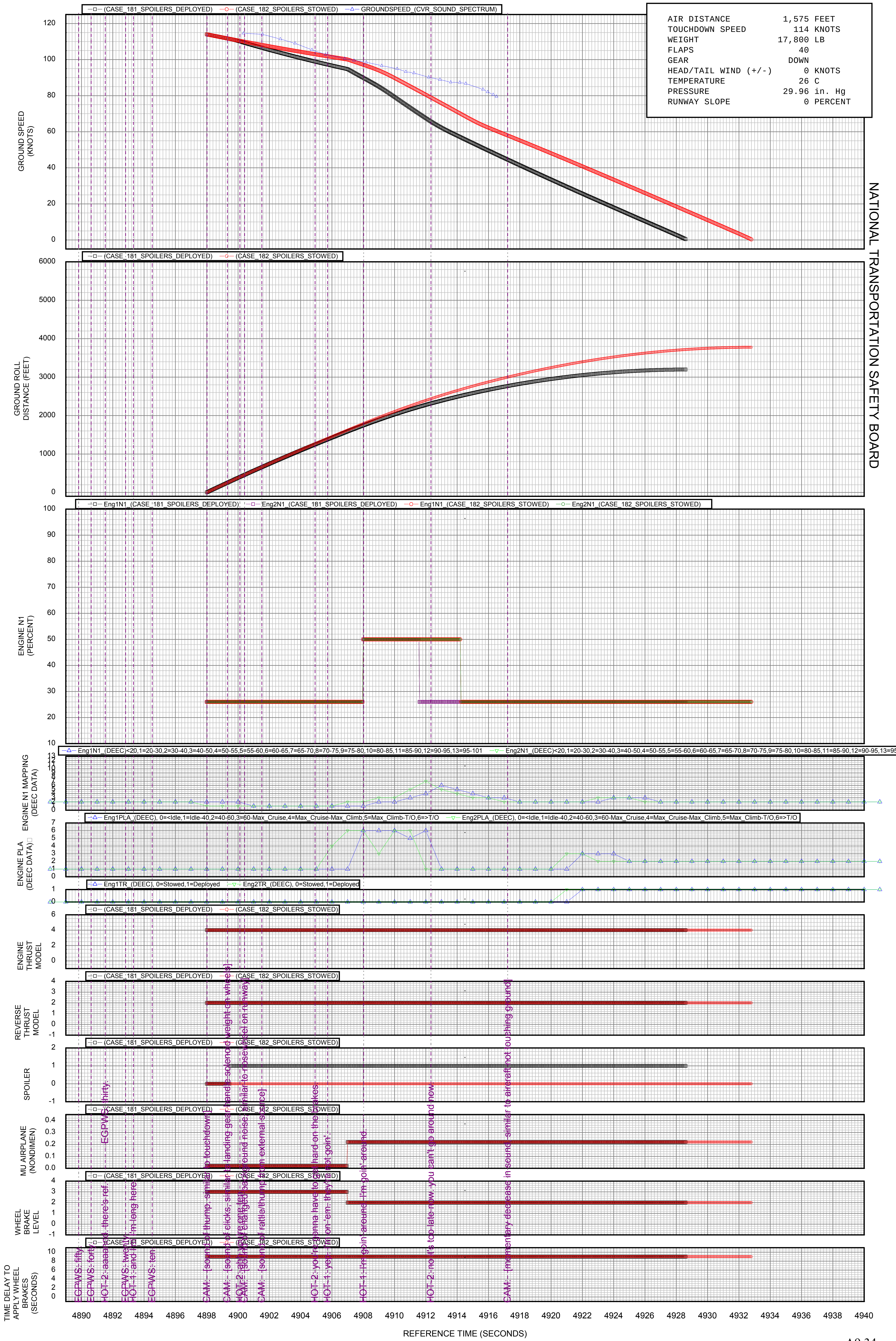
NATIONAL TRANSPORTATION SAFETY BOARD

HENDRICK MOTORSPORTS GULFSTREAM G150 (N480JJ), [SIMULATION DATA, CASES 171-172, ANTI-SKID INOPERATIVE WHEEL BRAKING]
DRY RUNWAY LANDING OVERRUN, KEY WEST, FLORIDA; OCTOBER 31, 2011 [NOMINAL REVERSE THRUST, ENGINE N1=50 PERCENT TO 70 KNOTS GROUND SPEED]



(CASE_171_SPOILERS_DEPLOYED)
(CASE_172_SPOILERS_STOWED)
GROUNDSPEED_(CVR_SOUND_SPECTRUM)
AIR DISTANCE 1,575 FEET
TOUCHDOWN SPEED 114 KNOTS
WEIGHT 17,800 LB
FLAPS 40
GEAR DOWN
HEAD/TAIL WIND (+/-) 0 KNOTS
TEMPERATURE 26 C
PRESSURE 29.96 in. Hg
RUNWAY SLOPE 0 PERCENT
GROUND SPEED (KNOTS)
GROUND ROLL DISTANCE (FEET)
Eng1N1_(CASE_171_SPOILERS_DEPLOYED)
Eng2N1_(CASE_171_SPOILERS_DEPLOYED)
Eng1N1_(CASE_172_SPOILERS_STOWED)
Eng2N1_(CASE_172_SPOILERS_STOWED)
ENGINE N1 (PERCENT)
Eng1N1_(DEEC)<20,1=20-30,2=30-40,3=40-50,4=50-55,5=55-60,6=60-65,7=65-70,8=70-75,9=75-80,10=80-85,11=85-90,12=90-95,13=95-101
Eng2N1_(DEEC)<20,1=20-30,2=30-40,3=40-50,4=50-55,5=55-60,6=60-65,7=65-70,8=70-75,9=75-80,10=80-85,11=85-90,12=90-95,13=95-1
ENGINE N1 MAPPING (DEEC DATA)
Eng1PLA_(DEEC), 0=<Idle,1=Idle-40,2=40-60,3=60-Max_Cruise,4=Max_Cruise-Max_Climb,5=Max_Climb-T/O,6=>T/O
Eng2PLA_(DEEC), 0=<Idle,1=Idle-40,2=40-60,3=60-Max_Cruise,4=Max_Cruise-Max_Climb,5=Max_Climb-T/O,6=>T/O
ENGINE PLA (DEEC DATA)
Eng1TR_(DEEC), 0=Stowed,1=Deployed
Eng2TR_(DEEC), 0=Stowed,1=Deployed
ENGINE THRUST MODEL
REVERSE THRUST MODEL
SPOILER
MU AIRPLANE (NONDIMEN)
WHEEL BRAKE LEVEL
TIME DELAY TO APPLY WHEEL BRAKES (SECONDS)
EGPWS: fifty.
EGPWS: forty.
HOT-2: aaaand. there's ref.
EGPWS: thirty.
EGPWS: twenty.
HOT-1: and I'm I'm long here.
EGPWS: ten.
CAM: [sound of thump, similar to touchdown]
CAM: [sound of clicks, similar to landing gear handle solenoid weight on wheels]
HOT-2: ahh you're one ten
CAM: [sound of changed background noise, similar to nosewheel on runway]
CAM: [sound of rattle/thump from external source]
HOT-2: you're gonna have to get hard on the brakes.
HOT-1: yep I'm on 'em. they're not goin'.
HOT-1: I'm goin' around. I'm goin' around.
HOT-2: no it's too late now. you can't go around now.
CAM: [momentary decrease in sound, similar to aircraft not touching ground]
REFERENCE TIME (SECONDS)
NATIONAL TRANSPORTATION SAFETY BOARD

HENDRICK MOTORSPORTS GULFSTREAM G150 (N480JJ), [SIMULATION DATA, CASES 181-182, EMERGENCY WHEEL BRAKING]
DRY RUNWAY LANDING OVERRUN, KEY WEST, FLORIDA; OCTOBER 31, 2011 [NOMINAL REVERSE THRUST, ENGINE N1=50 PERCENT TO 70 KNOTS GROUND SPEED]



(CASE_181_SPOILERS_DEPLOYED)
(CASE_182_SPOILERS_STOWED)
GROUNDSPEED_(CVR_SOUND_SPECTRUM)
AIR DISTANCE 1,575 FEET
TOUCHDOWN SPEED 114 KNOTS
WEIGHT 17,800 LB
FLAPS 40
GEAR DOWN
HEAD/TAIL WIND (+/-) 0 KNOTS
TEMPERATURE 26 C
PRESSURE 29.96 in. Hg
RUNWAY SLOPE 0 PERCENT
GROUND SPEED (KNOTS)
GROUND ROLL DISTANCE (FEET)
Eng1N1_(CASE_181_SPOILERS_DEPLOYED)
Eng2N1_(CASE_181_SPOILERS_DEPLOYED)
Eng1N1_(CASE_182_SPOILERS_STOWED)
Eng2N1_(CASE_182_SPOILERS_STOWED)
ENGINE N1 (PERCENT)
Eng1N1_(DEEC)<20,1=20-30,2=30-40,3=40-50,4=50-55,5=55-60,6=60-65,7=65-70,8=70-75,9=75-80,10=80-85,11=85-90,12=90-95,13=95-101
Eng2N1_(DEEC)<20,1=20-30,2=30-40,3=40-50,4=50-55,5=55-60,6=60-65,7=65-70,8=70-75,9=75-80,10=80-85,11=85-90,12=90-95,13=95-1
ENGINE N1 MAPPING (DEEC DATA)
Eng1PLA_(DEEC), 0=<Idle,1=Idle-40,2=40-60,3=60-Max_Cruise,4=Max_Cruise-Max_Climb,5=Max_Climb-T/O,6=>T/O
Eng2PLA_(DEEC), 0=<Idle,1=Idle-40,2=40-60,3=60-Max_Cruise,4=Max_Cruise-Max_Climb,5=Max_Climb-T/O,6=>T/O
ENGINE PLA (DEEC DATA)
Eng1TR_(DEEC), 0=Stowed,1=Deployed
Eng2TR_(DEEC), 0=Stowed,1=Deployed
ENGINE THRUST MODEL
REVERSE THRUST MODEL
SPOILER
MU AIRPLANE (NONDIMEN)
WHEEL BRAKE LEVEL
TIME DELAY TO APPLY WHEEL BRAKES (SECONDS)
EGPWS: fifty.
EGPWS: forty.
EGPWS: thirty.
HOT-2: aaaand. there's ref.
EGPWS: twenty.
HOT-1: and I'm long here.
EGPWS: ten.
CAM: [sound of thump, similar to touchdown]
CAM: [sound of clicks, similar to landing gear handle solenoid weight on wheels]
HOT-2: ah you're one ten.
CAM: [sound of changed background noise, similar to nosewheel on runway]
CAM: [sound of rattle/thump from external source]
HOT-2: you're gonna have to get hard on the brakes.
HOT-1: yep. I'm on 'em. they're not goin'.
HOT-1: I'm goin' around. I'm goin' around.
HOT-2: no it's too late now. you can't go around now.
CAM: [momentary decrease in sound, similar to aircraft not touching ground]
4890 4892 4894 4896 4898 4900 4902 4904 4906 4908 4910 4912 4914 4916 4918 4920 4922 4924 4926 4928 4930 4932 4934 4936 4938 4940
REFERENCE TIME (SECONDS)

NATIONAL TRANSPORTATION SAFETY BOARD

HENDRICK MOTORSPORTS GULFSTREAM G150 (N480JJ), [SIMULATION DATA, CASES 191-192, NO WHEEL BRAKING]

DRY RUNWAY LANDING OVERRUN, KEY WEST, FLORIDA; OCTOBER 31, 2011 [NOMINAL REVERSE THRUST, ENGINE N1=50 PERCENT TO 70 KNOTS GROUND SPEED]

AIR DISTANCE	1,575 FEET
TOUCHDOWN SPEED	114 KNOTS
WEIGHT	17,800 LB
FLAPS	40
GEAR	DOWN
HEAD/TAIL WIND (+/-)	0 KNOTS
TEMPERATURE	26 C
PRESSURE	29.96 in. Hg
RUNWAY SLOPE	0 PERCENT

GROUND SPEED (KNOTS)

GROUND ROLL DISTANCE (FEET)

ENGINE N1 (PERCENT)

ENGINE N1 MAPPING (DEEC DATA)

ENGINE PLA (DEEC DATA)

ENGINE THRUST MODEL

REVERSE THRUST MODEL

SPOILER

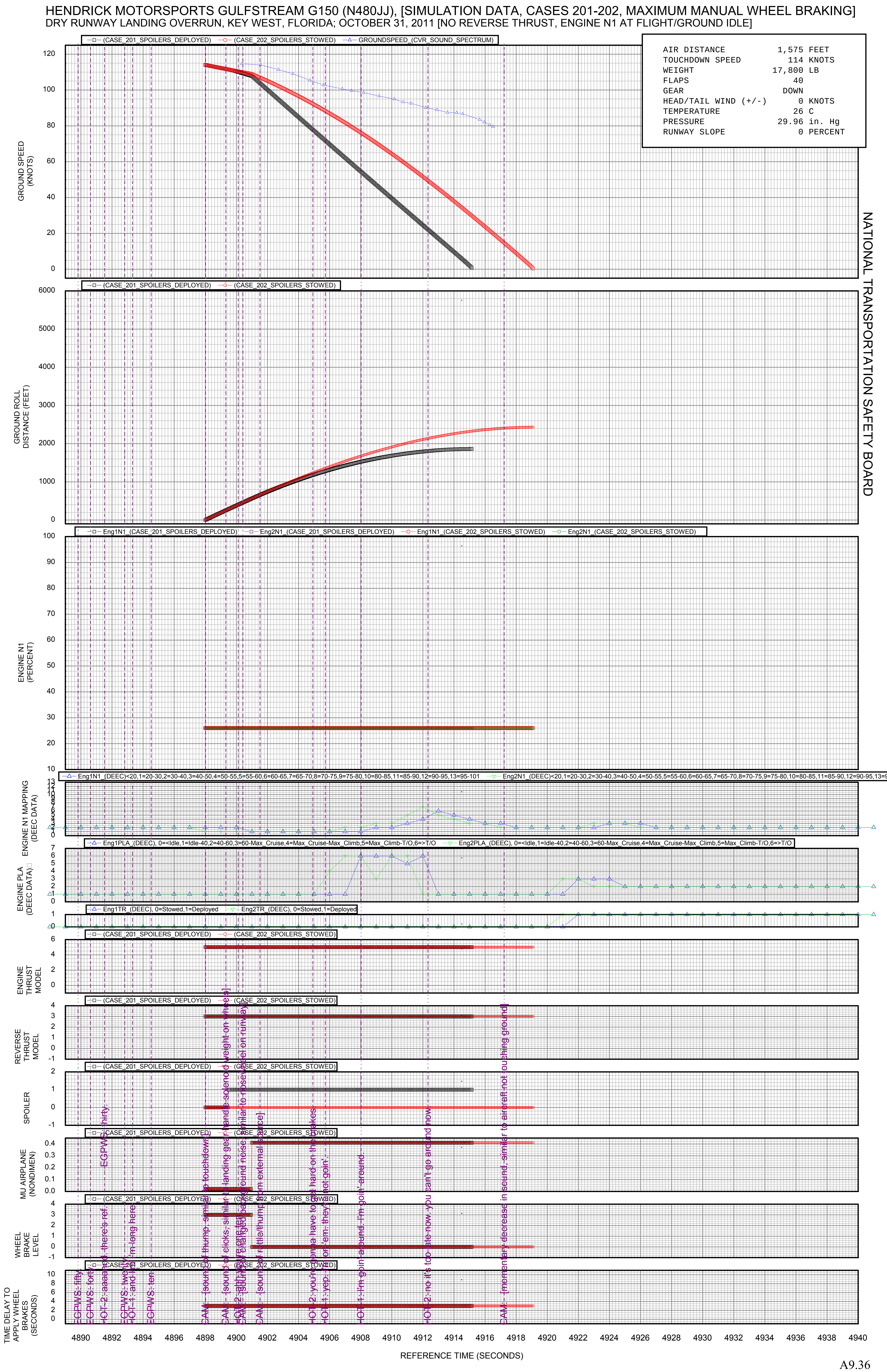
MU AIRPLANE (NONDIMEN)

WHEEL BRAKE LEVEL

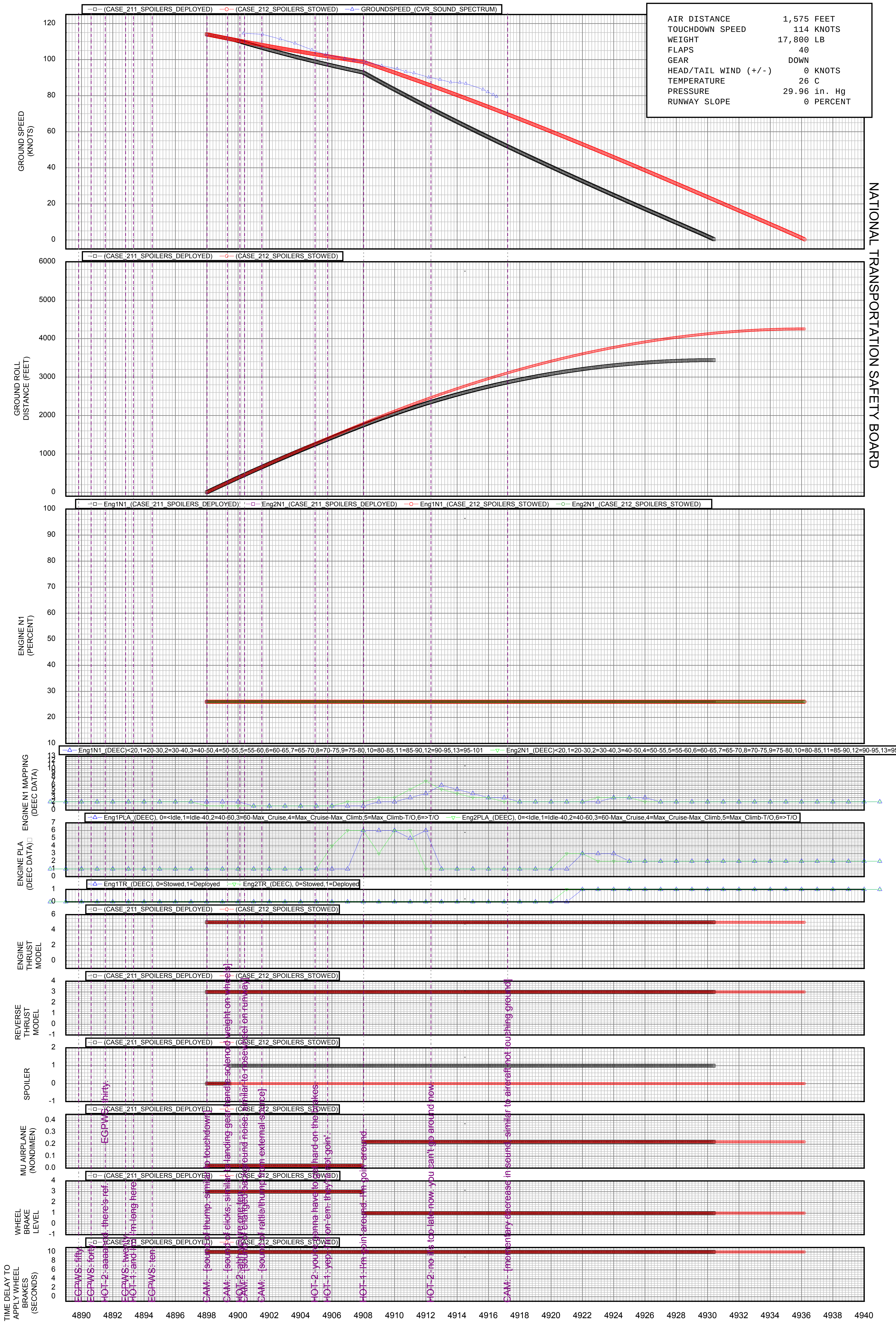
TIME DELAY TO APPLY WHEEL BRAKES (SECONDS)

REFERENCE TIME (SECONDS)

NATIONAL TRANSPORTATION SAFETY BOARD

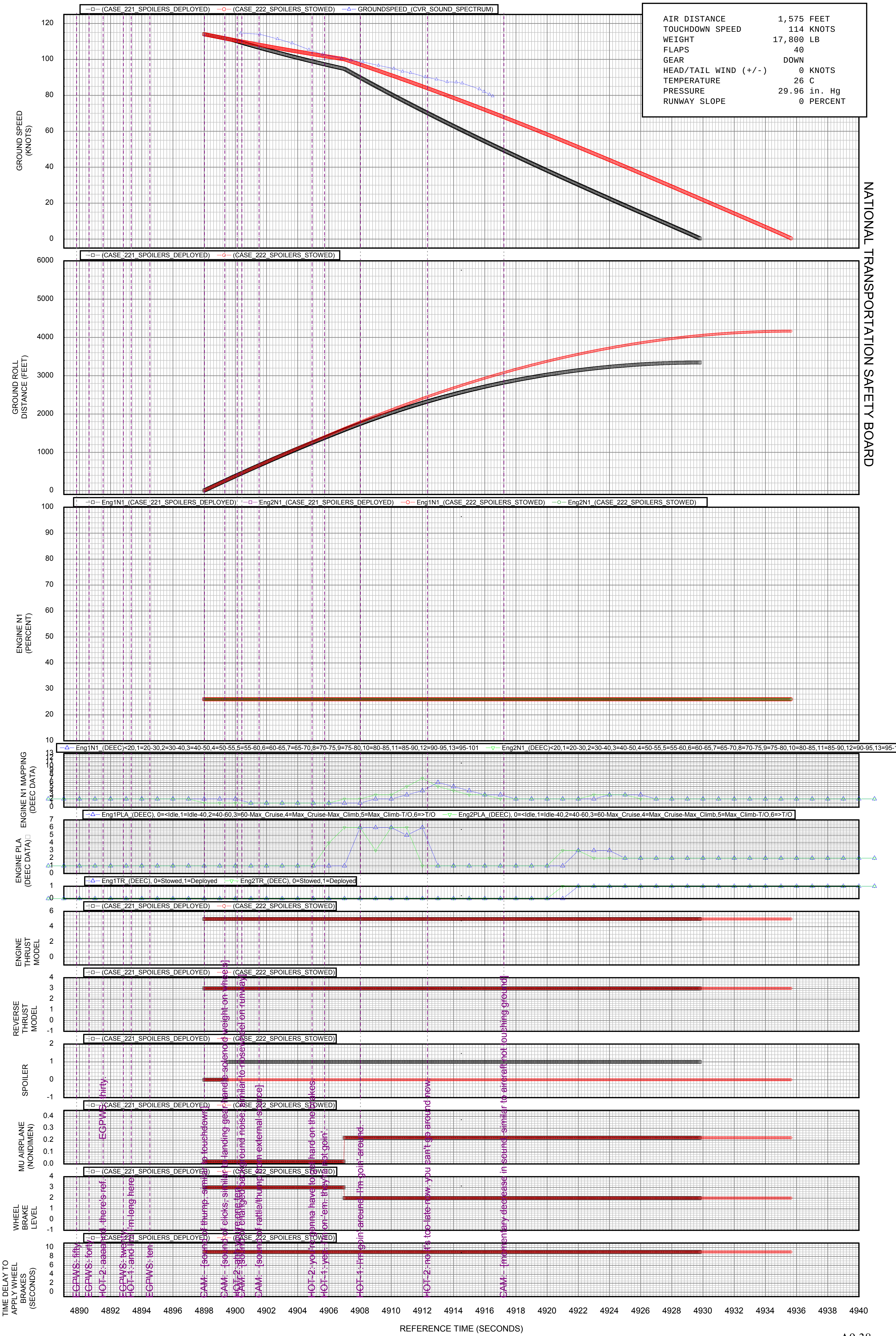

HENDRICK MOTORSPORTS GULFSTREAM G150 (N480JJ), [SIMULATION DATA, CASES 201-202, MAXIMUM MANUAL WHEEL BRAKING]
DRY RUNWAY LANDING OVERRUN, KEY WEST, FLORIDA; OCTOBER 31, 2011 [NO REVERSE THRUST, ENGINE N1 AT FLIGHT/GROUND IDLE]
AIR DISTANCE 1,575 FEET
TOUCHDOWN SPEED 114 KNOTS
WEIGHT 17,800 LB
FLAPS 40
GEAR DOWN
HEAD/TAIL WIND (+/-) 0 KNOTS
TEMPERATURE 26 C
PRESSURE 29.96 in. Hg
RUNWAY SLOPE 0 PERCENT
(CASE_201_SPOILERS_DEPLOYED)
(CASE_202_SPOILERS_STOWED)
GROUNDSPEED_(CVR_SOUND_SPECTRUM)
GROUND SPEED (KNOTS)
GROUND ROLL DISTANCE (FEET)
Eng1N1_(CASE_201_SPOILERS_DEPLOYED)
Eng2N1_(CASE_201_SPOILERS_DEPLOYED)
Eng1N1_(CASE_202_SPOILERS_STOWED)
Eng2N1_(CASE_202_SPOILERS_STOWED)
ENGINE N1 (PERCENT)
Eng1N1_(DEEC)<20,1=20-30,2=30-40,3=40-50,4=50-55,5=55-60,6=60-65,7=65-70,8=70-75,9=75-80,10=80-85,11=85-90,12=90-95,13=95-101
Eng2N1_(DEEC)<20,1=20-30,2=30-40,3=40-50,4=50-55,5=55-60,6=60-65,7=65-70,8=70-75,9=75-80,10=80-85,11=85-90,12=90-95,13=95-
ENGINE N1 MAPPING (DEEC DATA)
Eng1PLA_(DEEC), 0=<Idle,1=Idle-40,2=40-60,3=60-Max_Cruise,4=Max_Cruise-Max_Climb,5=Max_Climb-T/O,6=>T/O
Eng2PLA_(DEEC), 0=<Idle,1=Idle-40,2=40-60,3=60-Max_Cruise,4=Max_Cruise-Max_Climb,5=Max_Climb-T/O,6=>T/O
ENGINE PLA (DEEC DATA)
Eng1TR_(DEEC), 0=Stowed,1=Deployed
Eng2TR_(DEEC), 0=Stowed,1=Deployed
ENGINE THRUST MODEL
REVERSE THRUST MODEL
SPOILER
MU AIRPLANE (NONDIMEN)
WHEEL BRAKE LEVEL
TIME DELAY TO APPLY WHEEL BRAKES (SECONDS)
EGPWS: fifty.
EGPWS: forty.
HOT-2: aaaand, there's ref.
EGPWS: thirty.
EGPWS: twenty.
HOT-1: and I'm long here.
EGPWS: ten.
CAM: [sound of thump, similar to touchdown]
CAM: [sound of clicks, similar to landing gear handle solenoid weight on wheels]
HOT-2: ahh you're one ten.
CAM: [sound of changed background noise, similar to nosewheel on runway]
CAM: [sound of rattle/thump from external source]
HOT-2: you're gonna have to get hard on the brakes.
HOT-1: yep. I'm on 'em. they're not goin'.
HOT-1: I'm goin' around. I'm goin' around.
HOT-2: no it's too late now. you can't go around now.
CAM: [momentary decrease in sound, similar to aircraft not touching ground]
REFERENCE TIME (SECONDS)
NATIONAL TRANSPORTATION SAFETY BOARD

HENDRICK MOTORSPORTS GULFSTREAM G150 (N480JJ), [SIMULATION DATA, CASES 211-212, ANTI-SKID INOPERATIVE WHEEL BRAKING]
DRY RUNWAY LANDING OVERRUN, KEY WEST, FLORIDA; OCTOBER 31, 2011 [NO REVERSE THRUST, ENGINE N1 AT FLIGHT/GROUND IDLE]



(CASE_211_SPOILERS_DEPLOYED)
(CASE_212_SPOILERS_STOWED)
GROUNDSPEED_(CVR_SOUND_SPECTRUM)
AIR DISTANCE 1,575 FEET
TOUCHDOWN SPEED 114 KNOTS
WEIGHT 17,800 LB
FLAPS 40
GEAR DOWN
HEAD/TAIL WIND (+/-) 0 KNOTS
TEMPERATURE 26 C
PRESSURE 29.96 in. Hg
RUNWAY SLOPE 0 PERCENT
GROUND SPEED (KNOTS)
GROUND ROLL DISTANCE (FEET)
Eng1N1_(CASE_211_SPOILERS_DEPLOYED)
Eng2N1_(CASE_211_SPOILERS_DEPLOYED)
Eng1N1_(CASE_212_SPOILERS_STOWED)
Eng2N1_(CASE_212_SPOILERS_STOWED)
ENGINE N1 (PERCENT)
Eng1N1_(DEEC)<20,1=20-30,2=30-40,3=40-50,4=50-55,5=55-60,6=60-65,7=65-70,8=70-75,9=75-80,10=80-85,11=85-90,12=90-95,13=95-101
Eng2N1_(DEEC)<20,1=20-30,2=30-40,3=40-50,4=50-55,5=55-60,6=60-65,7=65-70,8=70-75,9=75-80,10=80-85,11=85-90,12=90-95,13=95-
ENGINE N1 MAPPING (DEEC DATA)
Eng1PLA_(DEEC), 0=<Idle,1=Idle-40,2=40-60,3=60-Max_Cruise,4=Max_Cruise-Max_Climb,5=Max_Climb-T/O,6=>T/O
Eng2PLA_(DEEC), 0=<Idle,1=Idle-40,2=40-60,3=60-Max_Cruise,4=Max_Cruise-Max_Climb,5=Max_Climb-T/O,6=>T/O
ENGINE PLA (DEEC DATA)
Eng1TR_(DEEC), 0=Stowed,1=Deployed
Eng2TR_(DEEC), 0=Stowed,1=Deployed
ENGINE THRUST MODEL
REVERSE THRUST MODEL
SPOILER
MU AIRPLANE (NONDIMEN)
WHEEL BRAKE LEVEL
TIME DELAY TO APPLY WHEEL BRAKES (SECONDS)
EGPWS: fifty.
EGPWS: forty.
EGPWS: thirty.
HOT-2: aaaand, there's ref.
EGPWS: twenty.
HOT-1: and I'm long here.
EGPWS: ten.
CAM: [sound of thump, similar to touchdown]
CAM: [sound of clicks, similar to landing gear handle solenoid weight on wheels]
HOT-2: ahh you're one ten.
CAM: [sound of changed background noise, similar to nosewheel on runway]
CAM: [sound of rattle/thump from external source]
HOT-2: you're gonna have to get hard on the brakes.
HOT-1: yep I'm on 'em. they're not goin'.
HOT-1: I'm goin around. I'm goin around.
HOT-2: no it's too late now. you can't go around now.
CAM: [momentary decrease in sound, similar to aircraft not touching ground]
REFERENCE TIME (SECONDS)
NATIONAL TRANSPORTATION SAFETY BOARD

HENDRICK MOTORSPORTS GULFSTREAM G150 (N480JJ), [SIMULATION DATA, CASES 221-222, EMERGENCY WHEEL BRAKING]
DRY RUNWAY LANDING OVERRUN, KEY WEST, FLORIDA; OCTOBER 31, 2011 [NO REVERSE THRUST, ENGINE N1 AT FLIGHT/GROUND IDLE]



HENDRICK MOTORSPORTS GULFSTREAM G150 (N480JJ), [SIMULATION DATA, CASES 231-232, NO WHEEL BRAKING]

DRY RUNWAY LANDING OVERRUN, KEY WEST, FLORIDA; OCTOBER 31, 2011 [NO REVERSE THRUST, ENGINE N1 AT FLIGHT/GROUND IDLE]

AIR DISTANCE	1,575 FEET
TOUCHDOWN SPEED	114 KNOTS
WEIGHT	17,800 LB
FLAPS	40
GEAR	DOWN
HEAD/TAIL WIND (+/-)	0 KNOTS
TEMPERATURE	26 C
PRESSURE	29.96 in. Hg
RUNWAY SLOPE	0 PERCENT

GROUND SPEED (KNOTS)

GROUND ROLL DISTANCE (FEET)

ENGINE N1 (PERCENT)

ENGINE N1 MAPPING (DEEC DATA)

ENGINE PLA (DEEC DATA)

ENGINE THRUST MODEL

REVERSE THRUST MODEL

SPOILER

MU AIRPLANE (NONDIMEN)

WHEEL BRAKE LEVEL

TIME DELAY TO APPLY WHEEL BRAKES (SECONDS)

REFERENCE TIME (SECONDS)

NATIONAL TRANSPORTATION SAFETY BOARD

HENDRICK MOTORSPORTS GULFSTREAM G150 (N480JJ), [SIMULATION DATA, CASES 241-242, NO WHEEL BRAKING, FLAPS 20 TAKEOFF]

DRY RUNWAY LANDING OVERRUN, KEY WEST, FLORIDA; OCTOBER 31, 2011 [NO REVERSE THRUST, ENGINE N1 AT FLIGHT/GROUND IDLE]

AIR DISTANCE	1,575 FEET
TOUCHDOWN SPEED	114 KNOTS
WEIGHT	17,800 LB
FLAPS	40 (to 20)
GEAR	DOWN
HEAD/TAIL WIND (+/-)	0 KNOTS
TEMPERATURE	26 C
PRESSURE	29.96 in. Hg
RUNWAY SLOPE	0 PERCENT

NATIONAL TRANSPORTATION SAFETY BOARD

GROUND SPEED (KNOTS)

GROUND ROLL DISTANCE (FEET)

ENGINE N1 (PERCENT)

ENGINE N1 MAPPING (DEEC DATA)

ENGINE PLA (DEEC DATA)

ENGINE THRUST MODEL

REVERSE THRUST MODEL

SPOILER

MU AIRPLANE (NONDIMEN)

WHEEL BRAKE LEVEL

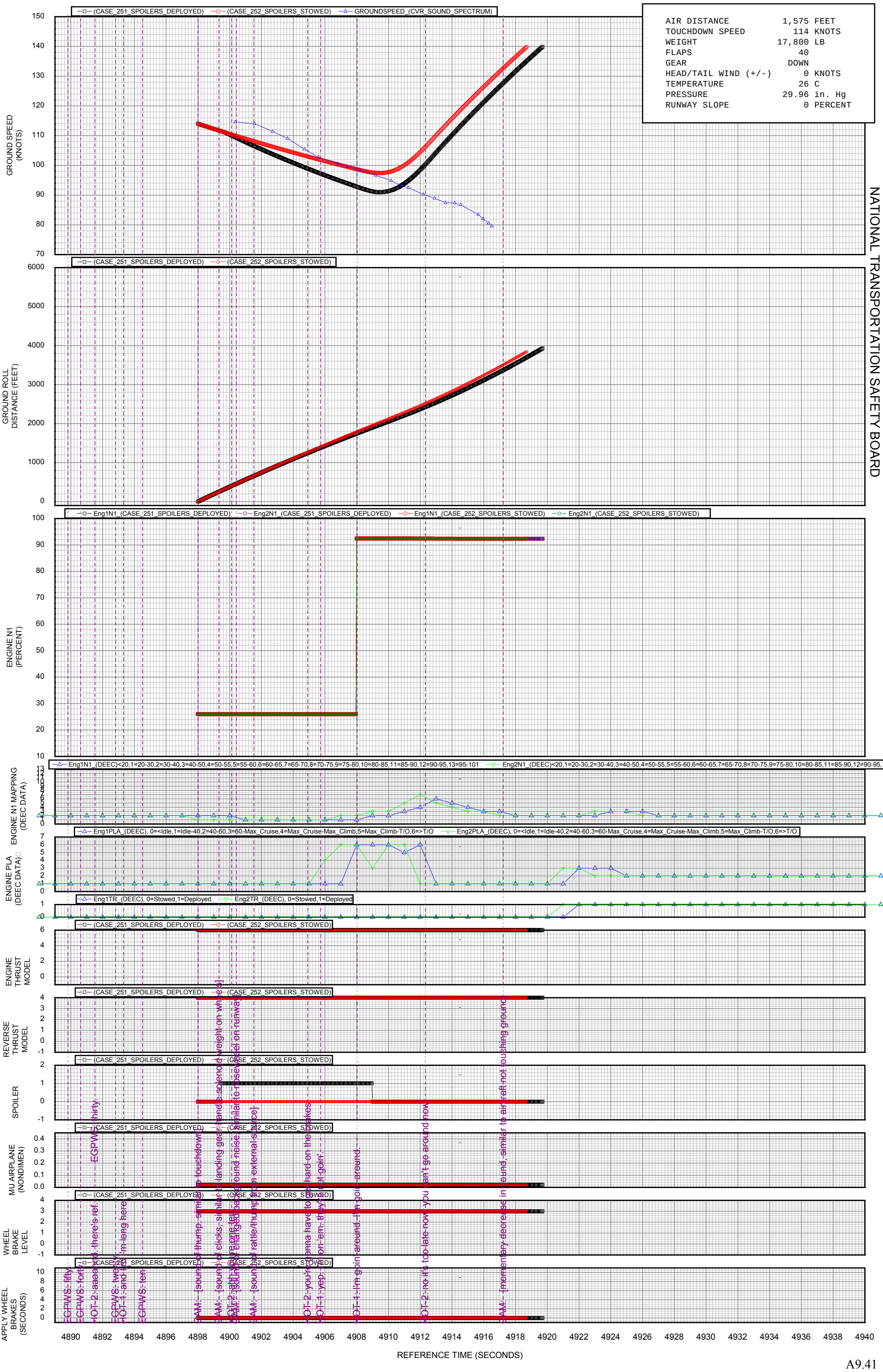
TIME DELAY TO APPLY WHEEL BRAKES (SECONDS)

REFERENCE TIME (SECONDS)

HENDRICK MOTORSPORTS GULFSTREAM G150 (N480JJ), [SIMULATION DATA, CASES 251-252, NO WHEEL BRAKING, FLAPS 40 TAKEOFF]

DRY RUNWAY LANDING OVERRUN, KEY WEST, FLORIDA; OCTOBER 31, 2011 [NO REVERSE THRUST, ENGINE N1 AT FLIGHT/GROUND IDLE]

AIR DISTANCE	1,575 FEET
TOUCHDOWN SPEED	114 KNOTS
WEIGHT	17,800 LB
FLAPS	40
GEAR	DOWN
HEAD/TAIL WIND (+/-)	0 KNOTS
TEMPERATURE	26 C
PRESSURE	29.96 in. Hg
RUNWAY SLOPE	0 PERCENT



NATIONAL TRANSPORTATION SAFETY BOARD

Attachment 10: Calculated Landing Performance (119 knots)

Calculations based on an assumed initial touchdown ground speed of 119 knots.

Hendrick Motorsports Gulfstream G150 landing overrun; Key West, FL; October 31, 2011

Weight: 17800 lb
Wind: 0.0 kts (+ Headwind, - Tailwind)
Temperature: 26.0 C
Altimeter: 29.96 in. Hg
Runway Slope: 0.0 percent

Case	Ground Spoilers	Mu Airplane	Wheel Braking	Wheel Brake Release & Stow Spoilers	Reverse Thrust	Engine N1 Level	Touchdown Ground Speed (Kts)	Air Distance (Ft)	Ground Distance (Ft)	Total Distance (Ft)	Distance Remaining (Ft)	Spoiler Delay (Sec)	Wheel Brake Delay (Sec)	Overrun Speed (Kts)	Overrun Time (Sec)	Ground Roll Time (Sec)	Final Speed (Kts)
1	Deployed	0.41	Maximum Manual	0	Event T/R	MAX Fwd/MIN Rev (Most Conservative)	119.0	1650.0	2157.9	3807.9	993.1	1.5	3.0	---	---	20.3	0.4
2	Stowed	0.41	Maximum Manual	0	Event T/R	MAX Fwd/MIN Rev (Most Conservative)	119.0	1650.0	3087.3	4737.3	63.7	---	3.0	---	---	25.7	0.6
3	Deployed	0.41	Maximum Manual	1	Event T/R	MAX Fwd/MIN Rev (Most Conservative)	119.0	1650.0	3006.0	4656.0	145.0	1.5	3.0	---	---	25.9	0.6
4	Stowed	0.41	Maximum Manual	1	Event T/R	MAX Fwd/MIN Rev (Most Conservative)	119.0	1650.0	3946.7	5596.7	-795.7	---	3.0	76.5	4917.0	19.0	0.6
11	Deployed	0.22	A/S Inoperative	0	Event T/R	MAX Fwd/MIN Rev (Most Conservative)	119.0	1650.0	4084.7	5734.7	-933.7	1.5	10.0	68.0	4917.5	19.5	0.4
12	Stowed	0.22	A/S Inoperative	0	Event T/R	MAX Fwd/MIN Rev (Most Conservative)	119.0	1650.0	5274.1	6924.1	-2123.1	---	10.0	93.7	4915.7	17.7	0.3
13	Deployed	0.22	A/S Inoperative	1	Event T/R	MAX Fwd/MIN Rev (Most Conservative)	119.0	1650.0	4687.6	6337.6	-1536.6	1.5	10.0	88.8	4916.1	18.1	0.4
14	Stowed	0.22	A/S Inoperative	1	Event T/R	MAX Fwd/MIN Rev (Most Conservative)	119.0	1650.0	5617.9	7267.9	-2466.9	---	10.0	100.2	4915.4	17.4	0.4
21	Deployed	0.22	Emergency	0	Event T/R	MAX Fwd/MIN Rev (Most Conservative)	119.0	1650.0	3987.8	5637.8	-836.8	1.5	9.0	64.2	4917.9	19.9	0.2
22	Stowed	0.22	Emergency	0	Event T/R	MAX Fwd/MIN Rev (Most Conservative)	119.0	1650.0	5188.4	6838.4	-2037.4	---	9.0	92.0	4915.8	17.8	0.4
23	Deployed	0.22	Emergency	1	Event T/R	MAX Fwd/MIN Rev (Most Conservative)	119.0	1650.0	4687.6	6337.6	-1536.6	1.5	9.0	88.8	4916.1	18.1	0.4
24	Stowed	0.22	Emergency	1	Event T/R	MAX Fwd/MIN Rev (Most Conservative)	119.0	1650.0	5617.9	7267.9	-2466.9	---	9.0	100.2	4915.4	17.4	0.4
31	Deployed	0.02	None	0	Event T/R	MAX Fwd/MIN Rev (Most Conservative)	119.0	1650.0	8573.3	10223.3	-5422.3	1.5	---	94.3	4916.2	18.2	0.1
32	Stowed	0.02	None	0	Event T/R	MAX Fwd/MIN Rev (Most Conservative)	119.0	1650.0	10535.2	12185.2	-7384.2	---	---	104.7	4915.3	17.3	0.1
33	Deployed	0.02	None	1	Event T/R	MAX Fwd/MIN Rev (Most Conservative)	119.0	1650.0	8843.0	10493.0	-5692.0	1.5	---	98.6	4915.9	17.9	0.1
34	Stowed	0.02	None	1	Event T/R	MAX Fwd/MIN Rev (Most Conservative)	119.0	1650.0	10535.2	12185.2	-7384.2	---	---	104.7	4915.3	17.3	0.1
41	Deployed	0.41	Maximum Manual	0	Event T/R	Mean Event Thrust	119.0	1650.0	2121.1	3771.1	1029.9	1.5	3.0	---	---	19.8	0.3
42	Stowed	0.41	Maximum Manual	0	Event T/R	Mean Event Thrust	119.0	1650.0	2995.4	4645.4	155.6	---	3.0	---	---	25.0	0.6
43	Deployed	0.41	Maximum Manual	1	Event T/R	Mean Event Thrust	119.0	1650.0	2933.0	4583.0	218.0	1.5	3.0	---	---	25.4	0.7
44	Stowed	0.41	Maximum Manual	1	Event T/R	Mean Event Thrust	119.0	1650.0	3814.0	5464.0	-663.0	---	3.0	71.6	4917.3	19.3	0.1
51	Deployed	0.22	A/S Inoperative	0	Event T/R	Mean Event Thrust	119.0	1650.0	3958.6	5608.6	-807.6	1.5	10.0	64.3	4917.8	19.8	0.3
52	Stowed	0.22	A/S Inoperative	0	Event T/R	Mean Event Thrust	119.0	1650.0	5042.0	6692.0	-1891.0	---	10.0	90.8	4915.8	17.8	0.4
53	Deployed	0.22	A/S Inoperative	1	Event T/R	Mean Event Thrust	119.0	1650.0	4543.4	6193.4	-1392.4	1.5	10.0	85.8	4916.3	18.3	0.3
54	Stowed	0.22	A/S Inoperative	1	Event T/R	Mean Event Thrust	119.0	1650.0	5374.0	7024.0	-2223.0	---	10.0	97.7	4915.5	17.5	0.5
61	Deployed	0.22	Emergency	0	Event T/R	Mean Event Thrust	119.0	1650.0	3863.9	5513.9	-712.9	1.5	9.0	60.2	4918.2	20.2	0.4
62	Stowed	0.22	Emergency	0	Event T/R	Mean Event Thrust	119.0	1650.0	4960.3	6610.3	-1809.3	---	9.0	89.0	4916.0	18.0	0.3
63	Deployed	0.22	Emergency	1	Event T/R	Mean Event Thrust	119.0	1650.0	4543.4	6193.4	-1392.4	1.5	9.0	85.8	4916.3	18.3	0.3
64	Stowed	0.22	Emergency	1	Event T/R	Mean Event Thrust	119.0	1650.0	5374.0	7024.0	-2223.0	---	9.0	97.7	4915.5	17.5	0.5
71	Deployed	0.02	None	0	Event T/R	Mean Event Thrust	119.0	1650.0	8056.6	9706.6	-4905.6	1.5	---	92.0	4916.4	18.4	0.1
72	Stowed	0.02	None	0	Event T/R	Mean Event Thrust	119.0	1650.0	9830.1	11480.1	-6679.1	---	---	102.6	4915.4	17.4	0.1
73	Deployed	0.02	None	1	Event T/R	Mean Event Thrust	119.0	1650.0	8320.5	9970.5	-5169.5	1.5	---	96.3	4916.1	18.1	0.1
74	Stowed	0.02	None	1	Event T/R	Mean Event Thrust	119.0	1650.0	9830.1	11480.1	-6679.1	---	---	102.6	4915.4	17.4	0.1
81	Deployed	0.41	Maximum Manual	0	Event T/R	MIN Fwd/MAX Rev (Least Conservative)	119.0	1650.0	2097.1	3747.1	1053.9	1.5	3.0	---	---	19.4	0.6
82	Stowed	0.41	Maximum Manual	0	Event T/R	MIN Fwd/MAX Rev (Least Conservative)	119.0	1650.0	2935.9	4585.9	215.1	---	3.0	---	---	24.5	0.6
83	Deployed	0.41	Maximum Manual	1	Event T/R	MIN Fwd/MAX Rev (Least Conservative)	119.0	1650.0	2882.7	4532.7	268.3	1.5	3.0	---	---	25.0	0.8
84	Stowed	0.41	Maximum Manual	1	Event T/R	MIN Fwd/MAX Rev (Least Conservative)	119.0	1650.0	3724.3	5374.3	-573.3	---	3.0	67.7	4917.5	19.5	0.7
91	Deployed	0.22	A/S Inoperative	0	Event T/R	MIN Fwd/MAX Rev (Least Conservative)	119.0	1650.0	3866.6	5516.6	-715.6	1.5	10.0	61.3	4918.0	20.0	0.5
92	Stowed	0.22	A/S Inoperative	0	Event T/R	MIN Fwd/MAX Rev (Least Conservative)	119.0	1650.0	4872.4	6522.4	-1721.4	---	10.0	88.5	4915.9	17.9	0.4
93	Deployed	0.22	A/S Inoperative	1	Event T/R	MIN Fwd/MAX Rev (Least Conservative)	119.0	1650.0	4435.1	6085.1	-1284.1	1.5	10.0	83.5	4916.4	18.4	0.3
94	Stowed	0.22	A/S Inoperative	1	Event T/R	MIN Fwd/MAX Rev (Least Conservative)	119.0	1650.0	5191.6	6841.6	-2040.6	---	10.0	95.6	4915.6	17.6	0.5
101	Deployed	0.22	Emergency	0	Event T/R	MIN Fwd/MAX Rev (Least Conservative)	119.0	1650.0	3774.0	5424.0	-623.0	1.5	9.0	57.1	4918.4	20.4	0.2
102	Stowed	0.22	Emergency	0	Event T/R	MIN Fwd/MAX Rev (Least Conservative)	119.0	1650.0	4794.2	6444.2	-1643.2	---	9.0	86.7	4916.1	18.1	0.3
103	Deployed	0.22	Emergency	1	Event T/R	MIN Fwd/MAX Rev (Least Conservative)	119.0	1650.0	4435.1	6085.1	-1284.1	1.5	9.0	83.5	4916.4	18.4	0.3
104	Stowed	0.22	Emergency	1	Event T/R	MIN Fwd/MAX Rev (Least Conservative)	119.0	1650.0	5191.6	6841.6	-2040.6	---	9.0	95.6	4915.6	17.6	0.5
111	Deployed	0.02	None	0	Event T/R	MIN Fwd/MAX Rev (Least Conservative)	119.0	1650.0	7518.2	9168.2	-4367.2	1.5	---	90.1	4916.5	18.5	0.1
112	Stowed	0.02	None	0	Event T/R	MIN Fwd/MAX Rev (Least Conservative)	119.0	1650.0	9072.4	10722.4	-5921.4	---	---	101.0	4915.5	17.5	0.1
113	Deployed	0.02	None	1	Event T/R	MIN Fwd/MAX Rev (Least Conservative)	119.0	1650.0	7772.3	9422.3	-4621.3	1.5	---	94.4	4916.2	18.2	0.1
114	Stowed	0.02	None	1	Event T/R	MIN Fwd/MAX Rev (Least Conservative)	119.0	1650.0	9072.4	10722.4	-5921.4	---	---	101.0	4915.5	17.5	0.1

Hendrick Motorsports Gulfstream G150 landing overrun; Key West, FL; October 31, 2011

Weight: 17800 lb
Wind: 0.0 kts (+ Headwind, - Tailwind)
Temperature: 26.0 C
Altimeter: 29.96 in. Hg
Runway Slope: 0.0 percent

Case	Ground Spoilers	Mu Airplane	Wheel Braking	Wheel Brake Release & Stow Spoilers	Reverse Thrust	Engine N1 Level	Touchdown Ground Speed (Kts)	Air Distance (Ft)	Ground Distance (Ft)	Total Distance (Ft)	Distance Remaining (Ft)	Spoiler Delay (Sec)	Wheel Brake Delay (Sec)	Overrun Speed (Kts)	Overrun Time (Sec)	Ground Roll Time (Sec)	Final Speed (Kts)
121	Deployed	0.41	Maximum Manual	0	Emergency T/R	Emergency (Stow at 0 kts)	119.0	1650.0	1951.1	3601.1	1199.9	1.5	3.0	---	---	16.9	0.1
122	Stowed	0.41	Maximum Manual	0	Emergency T/R	Emergency (Stow at 0 kts)	119.0	1650.0	2559.8	4209.8	591.2	---	3.0	---	---	20.6	0.6
131	Deployed	0.22	A/S Inoperative	0	Emergency T/R	Emergency (Stow at 0 kts)	119.0	1650.0	3221.5	4871.5	-70.5	1.5	10.0	20.4	4921.8	23.8	0.2
132	Stowed	0.22	A/S Inoperative	0	Emergency T/R	Emergency (Stow at 0 kts)	119.0	1650.0	3800.5	5450.5	-649.5	---	10.0	61.4	4917.2	19.2	0.4
141	Deployed	0.22	Emergency	0	Emergency T/R	Emergency (Stow at 0 kts)	119.0	1650.0	3146.7	4796.7	4.3	1.5	9.0	---	---	27.3	0.3
142	Stowed	0.22	Emergency	0	Emergency T/R	Emergency (Stow at 0 kts)	119.0	1650.0	3744.4	5394.4	-593.4	---	9.0	58.7	4917.5	19.5	0.3
151	Deployed	0.02	None	0	Emergency T/R	Emergency (Stow at 0 kts)	119.0	1650.0	5479.3	7129.3	-2328.3	1.5	---	69.4	4917.6	19.6	0.2
152	Stowed	0.02	None	0	Emergency T/R	Emergency (Stow at 0 kts)	119.0	1650.0	6404.7	8054.7	-3253.7	---	---	81.8	4916.3	18.3	0.1
161	Deployed	0.41	Maximum Manual	0	Nominal T/R	Nominal (Stow at 70 kts)	119.0	1650.0	1993.5	3643.5	1157.5	1.5	3.0	---	---	17.8	0.5
162	Stowed	0.41	Maximum Manual	0	Nominal T/R	Nominal (Stow at 70 kts)	119.0	1650.0	2634.2	4284.2	516.8	---	3.0	---	---	21.9	0.4
171	Deployed	0.22	A/S Inoperative	0	Nominal T/R	Nominal (Stow at 70 kts)	119.0	1650.0	3427.3	5077.3	-276.3	1.5	10.0	35.4	4920.5	22.5	0.3
172	Stowed	0.22	A/S Inoperative	0	Nominal T/R	Nominal (Stow at 70 kts)	119.0	1650.0	4058.9	5708.9	-907.9	---	10.0	62.3	4917.2	19.2	0.3
181	Deployed	0.22	Emergency	0	Nominal T/R	Nominal (Stow at 70 kts)	119.0	1650.0	3350.9	5000.9	-199.9	1.5	9.0	30.1	4921.4	23.4	0.3
182	Stowed	0.22	Emergency	0	Nominal T/R	Nominal (Stow at 70 kts)	119.0	1650.0	4002.2	5652.2	-851.2	---	9.0	60.4	4917.4	19.4	0.2
191	Deployed	0.02	None	0	Nominal T/R	Nominal (Stow at 70 kts)	119.0	1650.0	19802.5	21452.5	-16651.5	1.5	---	69.4	4917.6	19.6	17.0
192	Stowed	0.02	None	0	Nominal T/R	Nominal (Stow at 70 kts)	119.0	1650.0	23783.4	25433.4	-20632.4	---	---	81.8	4916.3	18.3	20.8
201	Deployed	0.41	Maximum Manual	0	No T/R	Flight/Ground Idle	119.0	1650.0	1993.7	3643.7	1157.3	1.5	3.0	---	---	17.8	0.5
202	Stowed	0.41	Maximum Manual	0	No T/R	Flight/Ground Idle	119.0	1650.0	2695.5	4345.5	455.5	---	3.0	---	---	22.4	0.6
211	Deployed	0.22	A/S Inoperative	0	No T/R	Flight/Ground Idle	119.0	1650.0	3619.3	5269.3	-468.3	1.5	10.0	46.6	4919.2	21.2	0.2
212	Stowed	0.22	A/S Inoperative	0	No T/R	Flight/Ground Idle	119.0	1650.0	4548.8	6198.8	-1397.8	---	10.0	76.4	4916.5	18.5	0.3
221	Deployed	0.22	Emergency	0	No T/R	Flight/Ground Idle	119.0	1650.0	3522.8	5172.8	-371.8	1.5	9.0	41.1	4920.0	22.0	0.3
222	Stowed	0.22	Emergency	0	No T/R	Flight/Ground Idle	119.0	1650.0	4464.3	6114.3	-1313.3	---	9.0	74.2	4916.7	18.7	0.4
231	Deployed	0.02	None	0	No T/R	Flight/Ground Idle	119.0	1650.0	20868.6	22518.6	-17717.6	1.5	---	81.1	4917.0	19.0	17.1
232	Stowed	0.02	None	0	No T/R	Flight/Ground Idle	119.0	1650.0	26013.5	27663.5	-22862.5	---	---	92.3	4915.9	17.9	21.1
241	Deployed	0.02	None	0	No T/R ->TOGA	TOGA Thrust (Flaps 40 to 20)	119.0	1650.0	3805.5	5455.5	-654.5	1.5	---	122.8	4915.7	17.7	139.9
242	Stowed	0.02	None	0	No T/R ->TOGA	TOGA Thrust (Flaps 40 to 20)	119.0	1650.0	3723.5	5373.5	-572.5	---	---	125.1	4915.1	17.1	139.7
251	Deployed	0.02	None	0	No T/R ->TOGA	TOGA Thrust (Remain at Flaps 40)	119.0	1650.0	3934.5	5584.5	-783.5	1.5	---	122.2	4915.7	17.7	139.8
252	Stowed	0.02	None	0	No T/R ->TOGA	TOGA Thrust (Remain at Flaps 40)	119.0	1650.0	3844.7	5494.7	-693.7	---	---	124.4	4915.1	17.1	139.9

HENDRICK MOTORSPORTS GULFSTREAM G150 (N480JJ), [SIMULATION DATA, CASES 1-2, MAXIMUM MANUAL WHEEL BRAKING]

DRY RUNWAY LANDING OVERRUN, KEY WEST, FLORIDA; OCTOBER 31, 2011 [EVENT ENGINE N1, MAXIMUM FORWARD, MINIMUM REVERSE (MOST CONSERVATIVE)]

AIR DISTANCE	1,650 FEET
TOUCHDOWN SPEED	119 KNOTS
WEIGHT	17,800 LB
FLAPS	40
GEAR	DOWN
HEAD/TAIL WIND (+/-)	0 KNOTS
TEMPERATURE	26 C
PRESSURE	29.96 in. Hg
RUNWAY SLOPE	0 PERCENT

GROUND SPEED (KNOTS)

GROUND ROLL DISTANCE (FEET)

ENGINE N1 (PERCENT)

ENGINE N1 MAPPING (DEEC DATA)

ENGINE PLA (DEEC DATA)

ENGINE THRUST MODEL

REVERSE THRUST MODEL

SPOILER

MU AIRPLANE (NONDIMEN)

WHEEL BRAKE LEVEL

TIME DELAY TO APPLY WHEEL BRAKES (SECONDS)

REFERENCE TIME (SECONDS)

NATIONAL TRANSPORTATION SAFETY BOARD

HENDRICK MOTORSPORTS GULFSTREAM G150 (N480JJ), [SIMULATION DATA, CASES 3-4, MAXIMUM MANUAL WHEEL BRAKING]

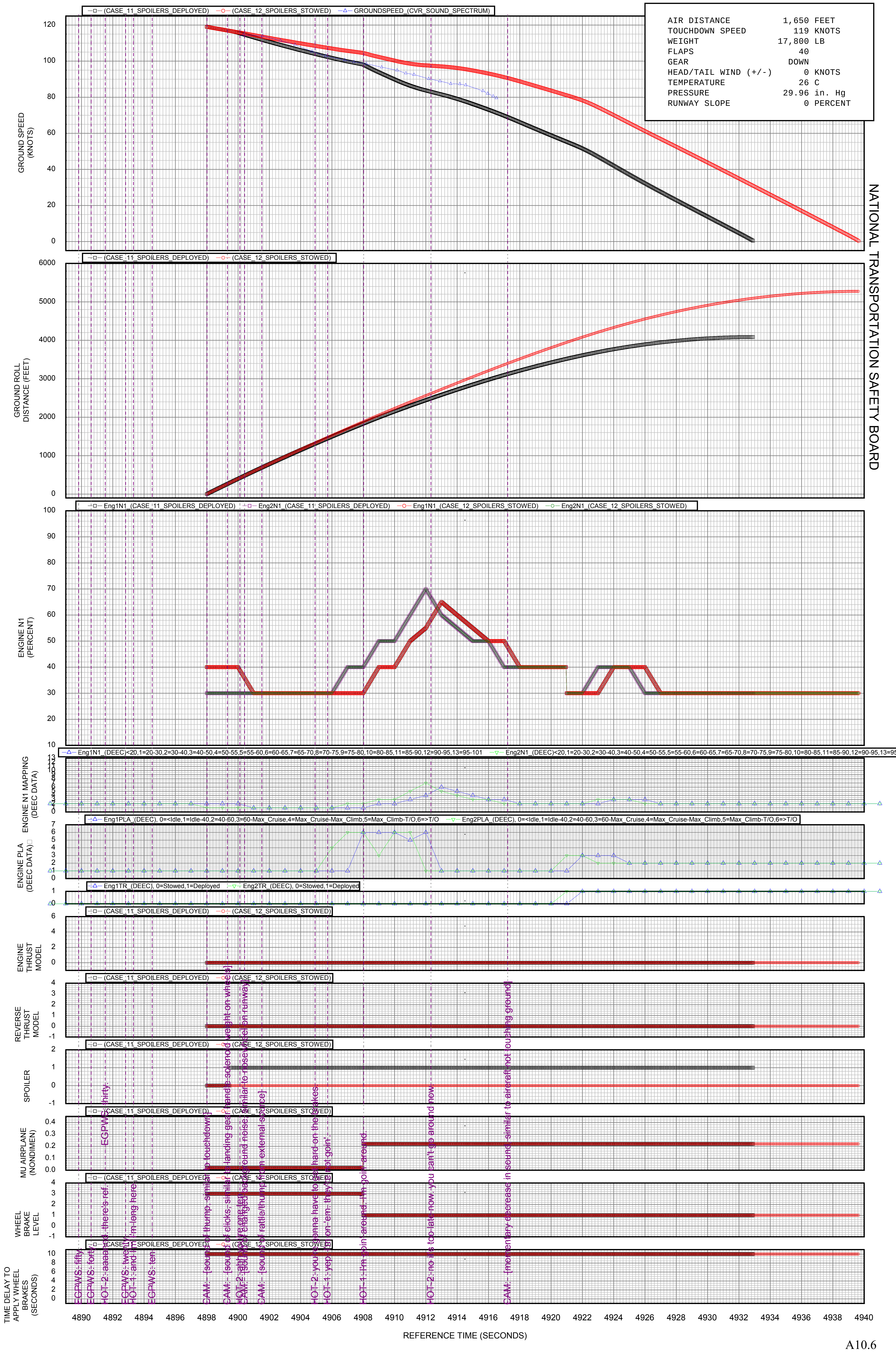
DRY RUNWAY LANDING OVERRUN, KEY WEST, FLORIDA; OCTOBER 31, 2011 [EVENT ENGINE N1, MAXIMUM FORWARD, MINIMUM REVERSE (MOST CONSERVATIVE)]

AIR DISTANCE	1,650 FEET
TOUCHDOWN SPEED	119 KNOTS
WEIGHT	17,800 LB
FLAPS	40
GEAR	DOWN
HEAD/TAIL WIND (+/-)	0 KNOTS
TEMPERATURE	26 C
PRESSURE	29.96 in. Hg
RUNWAY SLOPE	0 PERCENT

NATIONAL TRANSPORTATION SAFETY BOARD

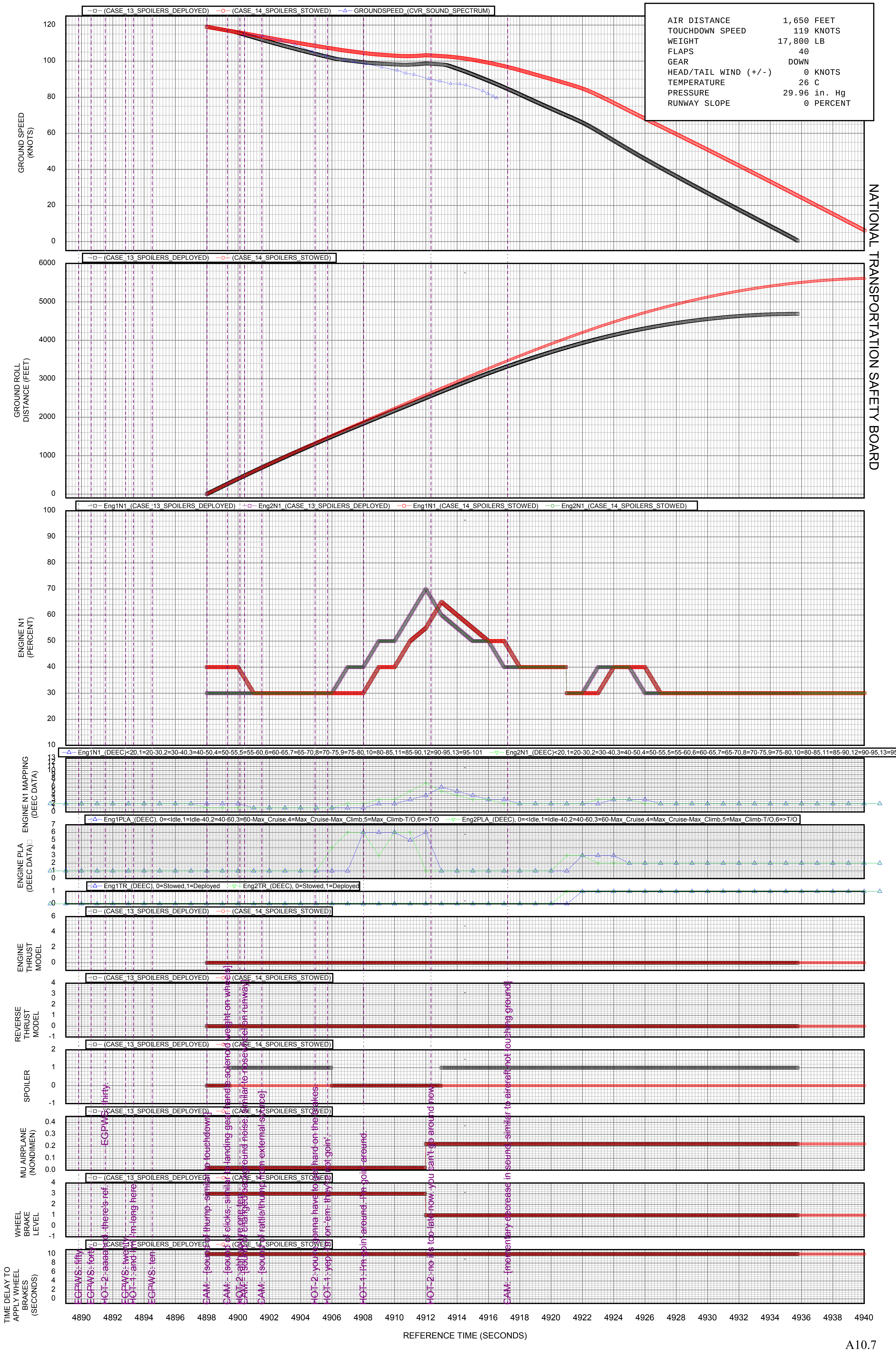
REFERENCE TIME (SECONDS)

HENDRICK MOTORSPORTS GULFSTREAM G150 (N480JJ), [SIMULATION DATA, CASES 11-12, ANTI-SKID INOPERATIVE WHEEL BRAKING]
DRY RUNWAY LANDING OVERRUN, KEY WEST, FLORIDA; OCTOBER 31, 2011 [EVENT ENGINE N1, MAXIMUM FORWARD, MINIMUM REVERSE (MOST CONSERVATIVE)]



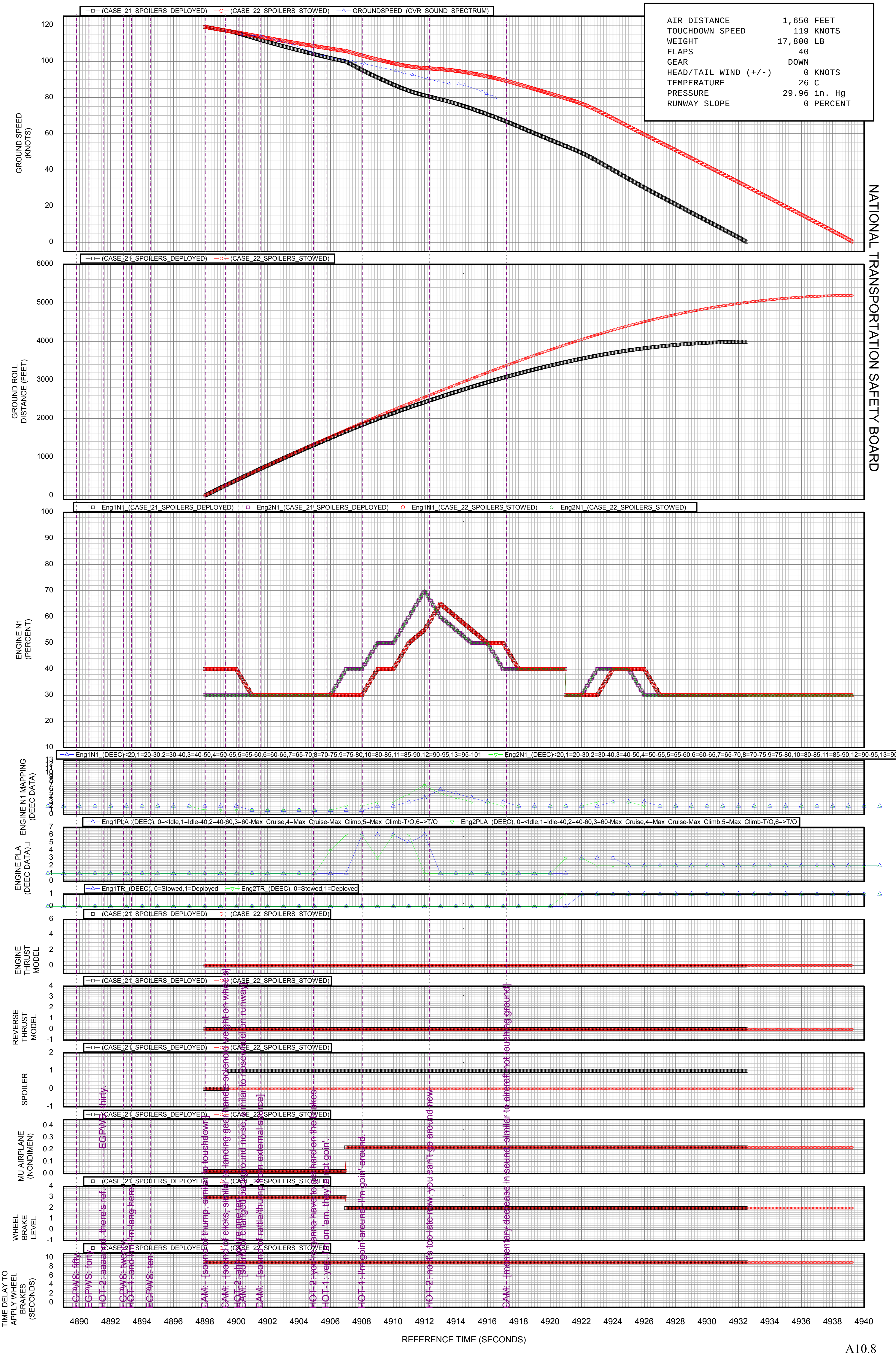
AIR DISTANCE 1,650 FEET
TOUCHDOWN SPEED 119 KNOTS
WEIGHT 17,800 LB
FLAPS 40
GEAR DOWN
HEAD/TAIL WIND (+/-) 0 KNOTS
TEMPERATURE 26 C
PRESSURE 29.96 in. Hg
RUNWAY SLOPE 0 PERCENT
NATIONAL TRANSPORTATION SAFETY BOARD
(CASE_11_SPOILERS_DEPLOYED)
(CASE_12_SPOILERS_STOWED)
GROUNDSPEED_(CVR_SOUND_SPECTRUM)
GROUND SPEED (KNOTS)
GROUND ROLL DISTANCE (FEET)
Eng1N1_(CASE_11_SPOILERS_DEPLOYED)
Eng2N1_(CASE_11_SPOILERS_DEPLOYED)
Eng1N1_(CASE_12_SPOILERS_STOWED)
Eng2N1_(CASE_12_SPOILERS_STOWED)
ENGINE N1 (PERCENT)
Eng1N1_(DEEC)<20,1=20-30,2=30-40,3=40-50,4=50-55,5=55-60,6=60-65,7=65-70,8=70-75,9=75-80,10=80-85,11=85-90,12=90-95,13=95-101
Eng2N1_(DEEC)<20,1=20-30,2=30-40,3=40-50,4=50-55,5=55-60,6=60-65,7=65-70,8=70-75,9=75-80,10=80-85,11=85-90,12=90-95,13=95-1
ENGINE N1 MAPPING (DEEC DATA)
Eng1PLA_(DEEC), 0=<Idle,1=Idle-40,2=40-60,3=60-Max_Cruise,4=Max_Cruise-Max_Climb,5=Max_Climb-T/O,6=>T/O
Eng2PLA_(DEEC), 0=<Idle,1=Idle-40,2=40-60,3=60-Max_Cruise,4=Max_Cruise-Max_Climb,5=Max_Climb-T/O,6=>T/O
ENGINE PLA (DEEC DATA)
Eng1TR_(DEEC), 0=Stowed,1=Deployed
Eng2TR_(DEEC), 0=Stowed,1=Deployed
ENGINE THRUST MODEL
REVERSE THRUST MODEL
SPOILER
MU AIRPLANE (NONDIMEN)
WHEEL BRAKE LEVEL
TIME DELAY TO APPLY WHEEL BRAKES (SECONDS)
EGPWS: fifty.
EGPWS: forty.
HOT-2: aaaand. there's ref.
EGPWS: thirty.
EGPWS: twenty.
HOT-1: and I'm- I'm long here.
EGPWS: ten.
CAM: [sound of thump, similar to touchdown]
CAM: [sound of clicks, similar to landing gear handle solenoid weight on wheels]
HOT-2: ahh you're one ten.
CAM: [sound of changed background noise, similar to nosewheel on runway]
CAM: [sound of rattle/thump from external source]
HOT-2: you're gonna have to get hard on the brakes.
HOT-1: yep I'm on 'em. they're not goin'.
HOT-1: I'm goin' around. I'm goin' around.
HOT-2: no it's too late now. you can't go around now.
CAM: [momentary decrease in sound, similar to aircraft not touching ground]
REFERENCE TIME (SECONDS)

HENDRICK MOTORSPORTS GULFSTREAM G150 (N480JJ), [SIMULATION DATA, CASES 13-14, ANTI-SKID INOPERATIVE WHEEL BRAKING]
DRY RUNWAY LANDING OVERRUN, KEY WEST, FLORIDA; OCTOBER 31, 2011 [EVENT ENGINE N1, MAXIMUM FORWARD, MINIMUM REVERSE (MOST CONSERVATIVE)]



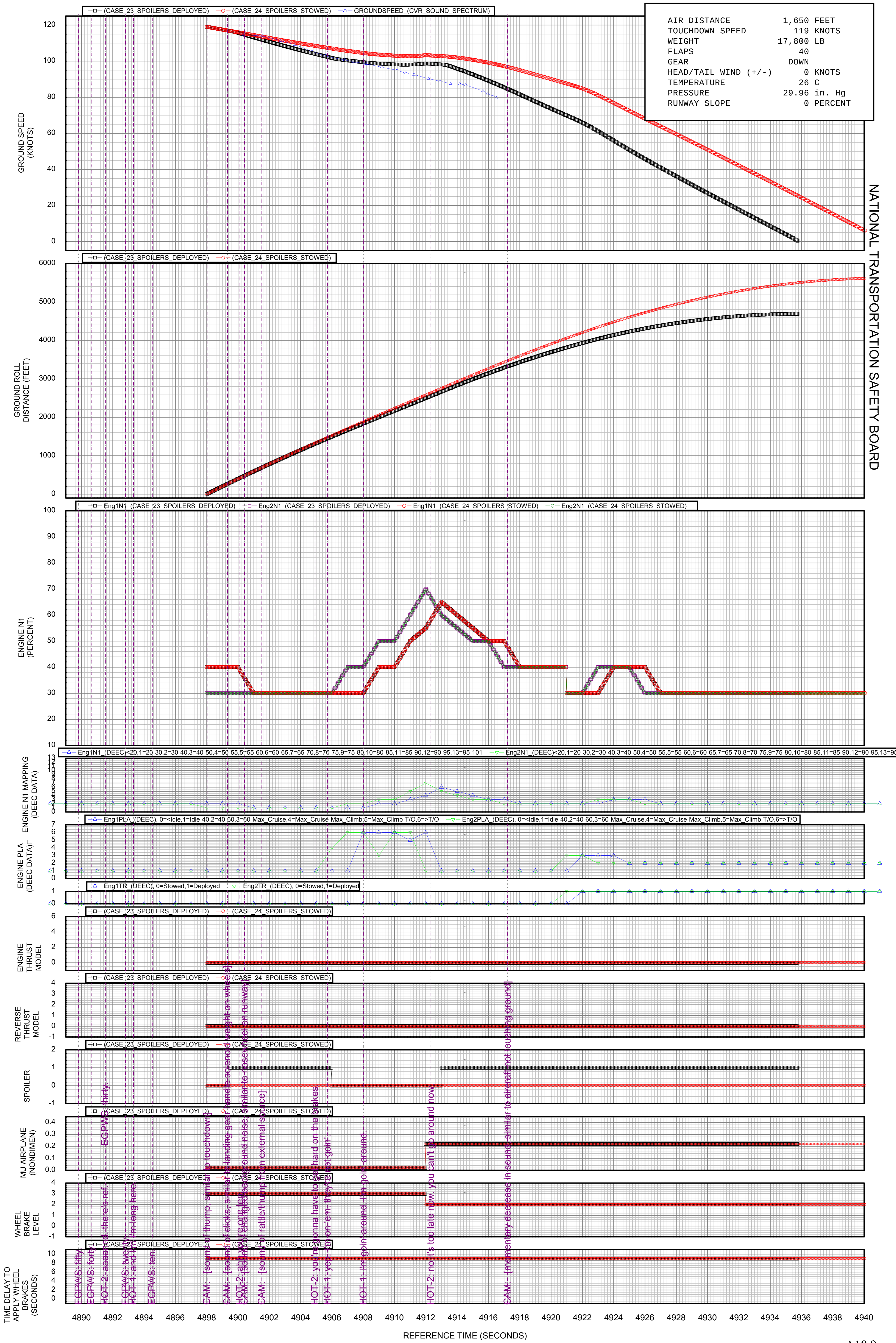
(CASE_13_SPOILERS_DEPLOYED)
(CASE_14_SPOILERS_STOWED)
GROUNDSPEED_(CVR_SOUND_SPECTRUM)
AIR DISTANCE 1,650 FEET
TOUCHDOWN SPEED 119 KNOTS
WEIGHT 17,800 LB
FLAPS 40
GEAR DOWN
HEAD/TAIL WIND (+/-) 0 KNOTS
TEMPERATURE 26 C
PRESSURE 29.96 in. Hg
RUNWAY SLOPE 0 PERCENT
GROUND SPEED (KNOTS)
GROUND ROLL DISTANCE (FEET)
Eng1N1_(CASE_13_SPOILERS_DEPLOYED)
Eng2N1_(CASE_13_SPOILERS_DEPLOYED)
Eng1N1_(CASE_14_SPOILERS_STOWED)
Eng2N1_(CASE_14_SPOILERS_STOWED)
ENGINE N1 (PERCENT)
Eng1N1_(DEEC)<20,1=20-30,2=30-40,3=40-50,4=50-55,5=55-60,6=60-65,7=65-70,8=70-75,9=75-80,10=80-85,11=85-90,12=90-95,13=95-101
Eng2N1_(DEEC)<20,1=20-30,2=30-40,3=40-50,4=50-55,5=55-60,6=60-65,7=65-70,8=70-75,9=75-80,10=80-85,11=85-90,12=90-95,13=95-1
ENGINE N1 MAPPING (DEEC DATA)
Eng1PLA_(DEEC), 0=<Idle,1=Idle-40,2=40-60,3=60-Max_Cruise,4=Max_Cruise-Max_Climb,5=Max_Climb-T/O,6=>T/O
Eng2PLA_(DEEC), 0=<Idle,1=Idle-40,2=40-60,3=60-Max_Cruise,4=Max_Cruise-Max_Climb,5=Max_Climb-T/O,6=>T/O
ENGINE PLA (DEEC DATA)
Eng1TR_(DEEC), 0=Stowed,1=Deployed
Eng2TR_(DEEC), 0=Stowed,1=Deployed
ENGINE THRUST MODEL
REVERSE THRUST MODEL
SPOILER
MU AIRPLANE (NONDIMEN)
WHEEL BRAKE LEVEL
TIME DELAY TO APPLY WHEEL BRAKES (SECONDS)
EGPWS: fifty.
EGPWS: forty.
HOT-2: aaaand. there's ref.
EGPWS: thirty.
EGPWS: twenty.
HOT-1: and I'm- I'm long here.
EGPWS: ten.
CAM: [sound of thump, similar to touchdown]
CAM: [sound of clicks, similar to landing gear handle solenoid weight on wheels]
HOT-2: ahh you're one ten.
CAM: [sound of changed background noise, similar to nosewheel on runway]
CAM: [sound of rattle/thump from external source]
HOT-2: you're gonna have to get hard on the brakes.
HOT-1: yep. I'm on 'em. they're not goin'.
HOT-1: I'm goin' around. I'm goin' around.
HOT-2: no it's too late now. you can't go around now.
CAM: [momentary decrease in sound, similar to aircraft not touching ground]
4890 4892 4894 4896 4898 4900 4902 4904 4906 4908 4910 4912 4914 4916 4918 4920 4922 4924 4926 4928 4930 4932 4934 4936 4938 4940
REFERENCE TIME (SECONDS)
NATIONAL TRANSPORTATION SAFETY BOARD

HENDRICK MOTORSPORTS GULFSTREAM G150 (N480JJ), [SIMULATION DATA, CASES 21-22, EMERGENCY WHEEL BRAKING]
DRY RUNWAY LANDING OVERRUN, KEY WEST, FLORIDA; OCTOBER 31, 2011 [EVENT ENGINE N1, MAXIMUM FORWARD, MINIMUM REVERSE (MOST CONSERVATIVE)]



(CASE_21_SPOILERS_DEPLOYED)
(CASE_22_SPOILERS_STOWED)
GROUNDSPEED_(CVR_SOUND_SPECTRUM)
AIR DISTANCE 1,650 FEET
TOUCHDOWN SPEED 119 KNOTS
WEIGHT 17,800 LB
FLAPS 40
GEAR DOWN
HEAD/TAIL WIND (+/-) 0 KNOTS
TEMPERATURE 26 C
PRESSURE 29.96 in. Hg
RUNWAY SLOPE 0 PERCENT
GROUND SPEED (KNOTS)
GROUND ROLL DISTANCE (FEET)
Eng1N1_(CASE_21_SPOILERS_DEPLOYED)
Eng2N1_(CASE_21_SPOILERS_DEPLOYED)
Eng1N1_(CASE_22_SPOILERS_STOWED)
Eng2N1_(CASE_22_SPOILERS_STOWED)
ENGINE N1 (PERCENT)
Eng1N1_(DEEC)<20,1=20-30,2=30-40,3=40-50,4=50-55,5=55-60,6=60-65,7=65-70,8=70-75,9=75-80,10=80-85,11=85-90,12=90-95,13=95-101
Eng2N1_(DEEC)<20,1=20-30,2=30-40,3=40-50,4=50-55,5=55-60,6=60-65,7=65-70,8=70-75,9=75-80,10=80-85,11=85-90,12=90-95,13=95-1
ENGINE N1 MAPPING (DEEC DATA)
Eng1PLA_(DEEC), 0=<Idle,1=Idle-40,2=40-60,3=60-Max_Cruise,4=Max_Cruise-Max_Climb,5=Max_Climb-T/O,6=>T/O
Eng2PLA_(DEEC), 0=<Idle,1=Idle-40,2=40-60,3=60-Max_Cruise,4=Max_Cruise-Max_Climb,5=Max_Climb-T/O,6=>T/O
ENGINE PLA (DEEC DATA)
Eng1TR_(DEEC), 0=Stowed,1=Deployed
Eng2TR_(DEEC), 0=Stowed,1=Deployed
ENGINE THRUST MODEL
REVERSE THRUST MODEL
SPOILER
MU AIRPLANE (NONDIMEN)
WHEEL BRAKE LEVEL
TIME DELAY TO APPLY WHEEL BRAKES (SECONDS)
EGPWS: fifty.
EGPWS: forty.
HOT-2: aaaand, there's ref.
EGPWS: thirty.
EGPWS: twenty.
HOT-1: and I'm I'm long here.
EGPWS: ten.
CAM: [sound of thump, similar to touchdown]
CAM: [sound of clicks, similar to landing gear handle solenoid weight on wheels]
HOT-2: ah you're one ten.
CAM: [sound of changed background noise, similar to nosewheel on runway]
CAM: [sound of rattle/thump from external source]
HOT-2: you're gonna have to get hard on the brakes.
HOT-1: yep. I'm on 'em. they're not goin'.
HOT-1: I'm goin' around. I'm goin' around.
HOT-2: no it's too late now. you can't go around now.
CAM: [momentary decrease in sound, similar to aircraft not touching ground]
REFERENCE TIME (SECONDS)
NATIONAL TRANSPORTATION SAFETY BOARD

HENDRICK MOTORSPORTS GULFSTREAM G150 (N480JJ), [SIMULATION DATA, CASES 23-24, EMERGENCY WHEEL BRAKING]
DRY RUNWAY LANDING OVERRUN, KEY WEST, FLORIDA; OCTOBER 31, 2011 [EVENT ENGINE N1, MAXIMUM FORWARD, MINIMUM REVERSE (MOST CONSERVATIVE)]



(CASE_23_SPOILERS_DEPLOYED)
(CASE_24_SPOILERS_STOWED)
GROUNDSPEED_(CVR_SOUND_SPECTRUM)
AIR DISTANCE 1,650 FEET
TOUCHDOWN SPEED 119 KNOTS
WEIGHT 17,800 LB
FLAPS 40
GEAR DOWN
HEAD/TAIL WIND (+/-) 0 KNOTS
TEMPERATURE 26 C
PRESSURE 29.96 in. Hg
RUNWAY SLOPE 0 PERCENT
GROUND SPEED (KNOTS)
GROUND ROLL DISTANCE (FEET)
Eng1N1_(CASE_23_SPOILERS_DEPLOYED)
Eng2N1_(CASE_23_SPOILERS_DEPLOYED)
Eng1N1_(CASE_24_SPOILERS_STOWED)
Eng2N1_(CASE_24_SPOILERS_STOWED)
ENGINE N1 (PERCENT)
Eng1N1_(DEEC)<20,1=20-30,2=30-40,3=40-50,4=50-55,5=55-60,6=60-65,7=65-70,8=70-75,9=75-80,10=80-85,11=85-90,12=90-95,13=95-101
Eng2N1_(DEEC)<20,1=20-30,2=30-40,3=40-50,4=50-55,5=55-60,6=60-65,7=65-70,8=70-75,9=75-80,10=80-85,11=85-90,12=90-95,13=95-
ENGINE N1 MAPPING (DEEC DATA)
Eng1PLA_(DEEC), 0=<Idle,1=Idle-40,2=40-60,3=60-Max_Cruise,4=Max_Cruise-Max_Climb,5=Max_Climb-T/O,6=>T/O
Eng2PLA_(DEEC), 0=<Idle,1=Idle-40,2=40-60,3=60-Max_Cruise,4=Max_Cruise-Max_Climb,5=Max_Climb-T/O,6=>T/O
ENGINE PLA (DEEC DATA)
Eng1TR_(DEEC), 0=Stowed,1=Deployed
Eng2TR_(DEEC), 0=Stowed,1=Deployed
ENGINE THRUST MODEL
REVERSE THRUST MODEL
SPOILER
MU AIRPLANE (NONDIMEN)
WHEEL BRAKE LEVEL
TIME DELAY TO APPLY WHEEL BRAKES (SECONDS)
EGPWS: fifty.
EGPWS: forty.
HOT-2: aaaand, there's ref.
EGPWS: thirty.
EGPWS: twenty.
EGPWS: ten.
CAM: [sound of thump, similar to touchdown]
CAM: [sound of clicks, similar to landing gear handle solenoid weight on wheels]
CAM: [sound of changed background noise, similar to nosewheel on runway]
CAM: [sound of rattle/thump from external source]
HOT-2: you're gonna have to get hard on the brakes.
HOT-1: I'm goin' around. I'm goin' around.
HOT-2: no it's too late now. you can't go around now.
CAM: [momentary decrease in sound, similar to aircraft not touching ground]
4890 4892 4894 4896 4898 4900 4902 4904 4906 4908 4910 4912 4914 4916 4918 4920 4922 4924 4926 4928 4930 4932 4934 4936 4938 4940
REFERENCE TIME (SECONDS)
NATIONAL TRANSPORTATION SAFETY BOARD

HENDRICK MOTORSPORTS GULFSTREAM G150 (N480JJ), [SIMULATION DATA, CASES 31-32, NO WHEEL BRAKING]

DRY RUNWAY LANDING OVERRUN, KEY WEST, FLORIDA; OCTOBER 31, 2011 [EVENT ENGINE N1, MAXIMUM FORWARD, MINIMUM REVERSE (MOST CONSERVATIVE)]

AIR DISTANCE	1,650 FEET
TOUCHDOWN SPEED	119 KNOTS
WEIGHT	17,800 LB
FLAPS	40
GEAR	DOWN
HEAD/TAIL WIND (+/-)	0 KNOTS
TEMPERATURE	26 C
PRESSURE	29.96 in. Hg
RUNWAY SLOPE	0 PERCENT

GROUND SPEED (KNOTS)

GROUND ROLL DISTANCE (FEET)

ENGINE N1 (PERCENT)

ENGINE N1 MAPPING (DEEC DATA)

ENGINE PLA (DEEC DATA)

ENGINE THRUST MODEL

REVERSE THRUST MODEL

SPOILER

MU AIRPLANE (NONDIMEN)

WHEEL BRAKE LEVEL

TIME DELAY TO APPLY WHEEL BRAKES (SECONDS)

REFERENCE TIME (SECONDS)

NATIONAL TRANSPORTATION SAFETY BOARD

HENDRICK MOTORSPORTS GULFSTREAM G150 (N480JJ), [SIMULATION DATA, CASES 33-34, NO WHEEL BRAKING]

DRY RUNWAY LANDING OVERRUN, KEY WEST, FLORIDA; OCTOBER 31, 2011 [EVENT ENGINE N1, MAXIMUM FORWARD, MINIMUM REVERSE (MOST CONSERVATIVE)]

AIR DISTANCE	1,650 FEET
TOUCHDOWN SPEED	119 KNOTS
WEIGHT	17,800 LB
FLAPS	40
GEAR	DOWN
HEAD/TAIL WIND (+/-)	0 KNOTS
TEMPERATURE	26 C
PRESSURE	29.96 in. Hg
RUNWAY SLOPE	0 PERCENT

GROUND SPEED (KNOTS)

GROUND ROLL DISTANCE (FEET)

ENGINE N1 (PERCENT)

ENGINE N1 MAPPING (DEEC DATA)

ENGINE PLA (DEEC DATA)

ENGINE THRUST MODEL

REVERSE THRUST MODEL

SPOILER

MU AIRPLANE (NONDIMEN)

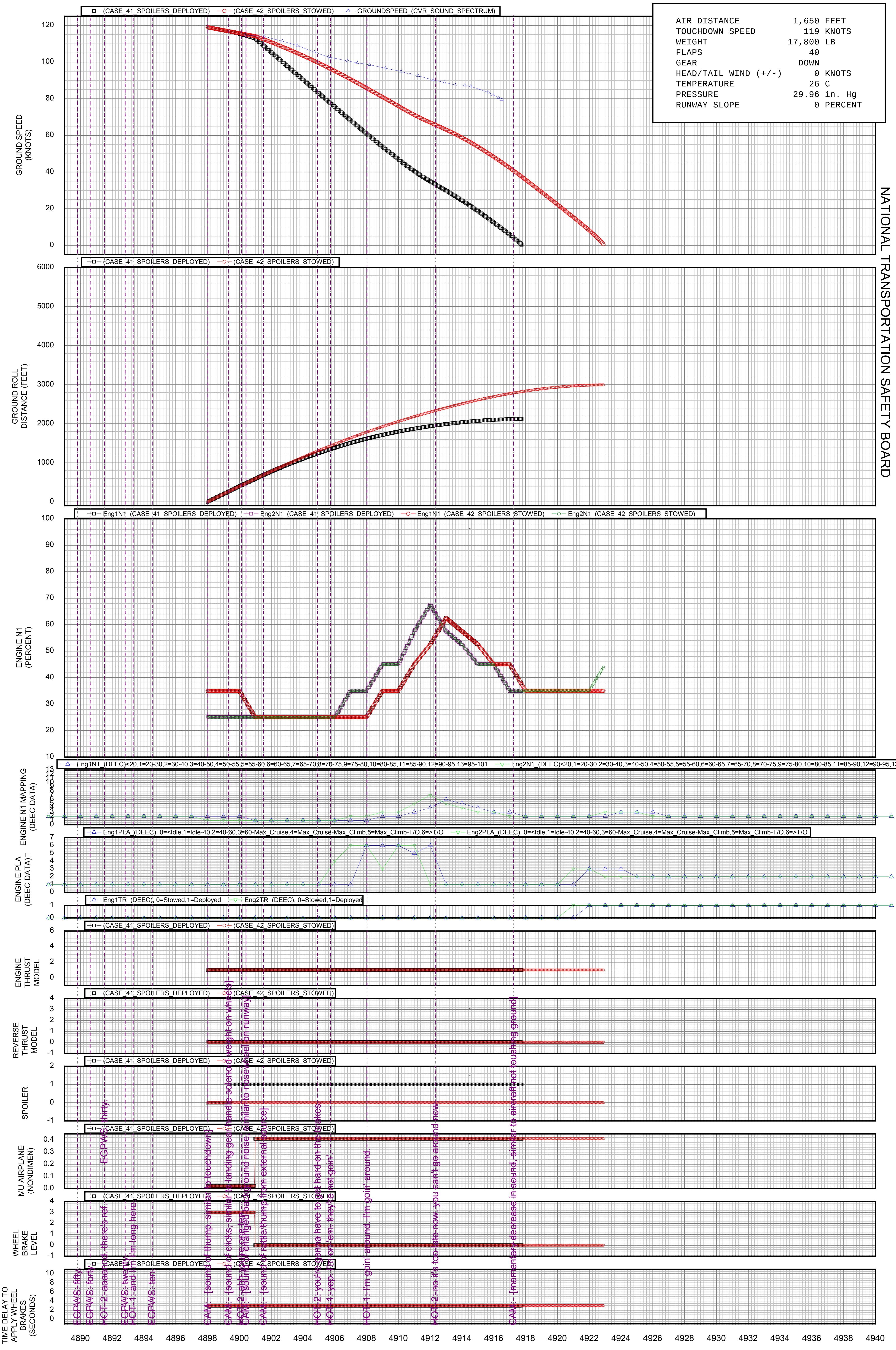
WHEEL BRAKE LEVEL

TIME DELAY TO APPLY WHEEL BRAKES (SECONDS)

REFERENCE TIME (SECONDS)

NATIONAL TRANSPORTATION SAFETY BOARD

HENDRICK MOTORSPORTS GULFSTREAM G150 (N480JJ), [SIMULATION DATA, CASES 41-42, MAXIMUM MANUAL WHEEL BRAKING]
DRY RUNWAY LANDING OVERRUN, KEY WEST, FLORIDA; OCTOBER 31, 2011 [EVENT ENGINE N1, MEAN FORWARD THRUST, MEAN REVERSE THRUST]



AIR DISTANCE 1,650 FEET
TOUCHDOWN SPEED 119 KNOTS
WEIGHT 17,800 LB
FLAPS 40
GEAR DOWN
HEAD/TAIL WIND (+/-) 0 KNOTS
TEMPERATURE 26 C
PRESSURE 29.96 in. Hg
RUNWAY SLOPE 0 PERCENT
(CASE_41_SPOILERS_DEPLOYED)
(CASE_42_SPOILERS_STOWED)
GROUNDSPEED_(CVR_SOUND_SPECTRUM)
GROUND SPEED (KNOTS)
GROUND ROLL DISTANCE (FEET)
Eng1N1_(CASE_41_SPOILERS_DEPLOYED)
Eng2N1_(CASE_41_SPOILERS_DEPLOYED)
Eng1N1_(CASE_42_SPOILERS_STOWED)
Eng2N1_(CASE_42_SPOILERS_STOWED)
ENGINE N1 (PERCENT)
Eng1N1_(DEEC)<20,1=20-30,2=30-40,3=40-50,4=50-55,5=55-60,6=60-65,7=65-70,8=70-75,9=75-80,10=80-85,11=85-90,12=90-95,13=95-101
Eng2N1_(DEEC)<20,1=20-30,2=30-40,3=40-50,4=50-55,5=55-60,6=60-65,7=65-70,8=70-75,9=75-80,10=80-85,11=85-90,12=90-95,13=95-1
ENGINE N1 MAPPING (DEEC DATA)
Eng1PLA_(DEEC), 0=<Idle,1=Idle-40,2=40-60,3=60-Max_Cruise,4=Max_Cruise-Max_Climb,5=Max_Climb-T/O,6=>T/O
Eng2PLA_(DEEC), 0=<Idle,1=Idle-40,2=40-60,3=60-Max_Cruise,4=Max_Cruise-Max_Climb,5=Max_Climb-T/O,6=>T/O
ENGINE PLA (DEEC DATA)
Eng1TR_(DEEC), 0=Stowed,1=Deployed
Eng2TR_(DEEC), 0=Stowed,1=Deployed
ENGINE THRUST MODEL
REVERSE THRUST MODEL
SPOILER
MU AIRPLANE (NONDIMEN)
WHEEL BRAKE LEVEL
TIME DELAY TO APPLY WHEEL BRAKES (SECONDS)
EGPWS: fifty.
EGPWS: forty.
HOT-2: aaaand. there's ref.
EGPWS: thirty.
EGPWS: twenty.
HOT-1: and I'm long here.
EGPWS: ten.
CAM: [sound of thump, similar to touchdown]
CAM: [sound of clicks, similar to landing gear handle solenoid weight on wheels]
HOT-2: ahh you're one ten.
CAM: [sound of changed background noise, similar to nosewheel on runway]
CAM: [sound of rattle/thump from external source]
HOT-2: you're gonna have to get hard on the brakes.
HOT-1: yep. I'm on 'em. they're not goin'.
HOT-1: I'm goin' around. I'm goin' around.
HOT-2: no it's too late now. you can't go around now.
CAM: [momentary decrease in sound, similar to aircraft not touching ground]
4890 4892 4894 4896 4898 4900 4902 4904 4906 4908 4910 4912 4914 4916 4918 4920 4922 4924 4926 4928 4930 4932 4934 4936 4938 4940
REFERENCE TIME (SECONDS)

NATIONAL TRANSPORTATION SAFETY BOARD

HENDRICK MOTORSPORTS GULFSTREAM G150 (N480JJ), [SIMULATION DATA, CASES 43-44, MAXIMUM MANUAL WHEEL BRAKING]

DRY RUNWAY LANDING OVERRUN, KEY WEST, FLORIDA; OCTOBER 31, 2011 [EVENT ENGINE N1, MEAN FORWARD THRUST, MEAN REVERSE THRUST]

AIR DISTANCE	1,650 FEET
TOUCHDOWN SPEED	119 KNOTS
WEIGHT	17,800 LB
FLAPS	40
GEAR	DOWN
HEAD/TAIL WIND (+/-)	0 KNOTS
TEMPERATURE	26 C
PRESSURE	29.96 in. Hg
RUNWAY SLOPE	0 PERCENT

GROUND SPEED (KNOTS)

GROUND ROLL DISTANCE (FEET)

ENGINE N1 (PERCENT)

ENGINE N1 MAPPING (DEEC DATA)

ENGINE PLA (DEEC DATA)

ENGINE THRUST MODEL

REVERSE THRUST MODEL

SPOILER

MU AIRPLANE (NONDIMEN)

WHEEL BRAKE LEVEL

TIME DELAY TO APPLY WHEEL BRAKES (SECONDS)

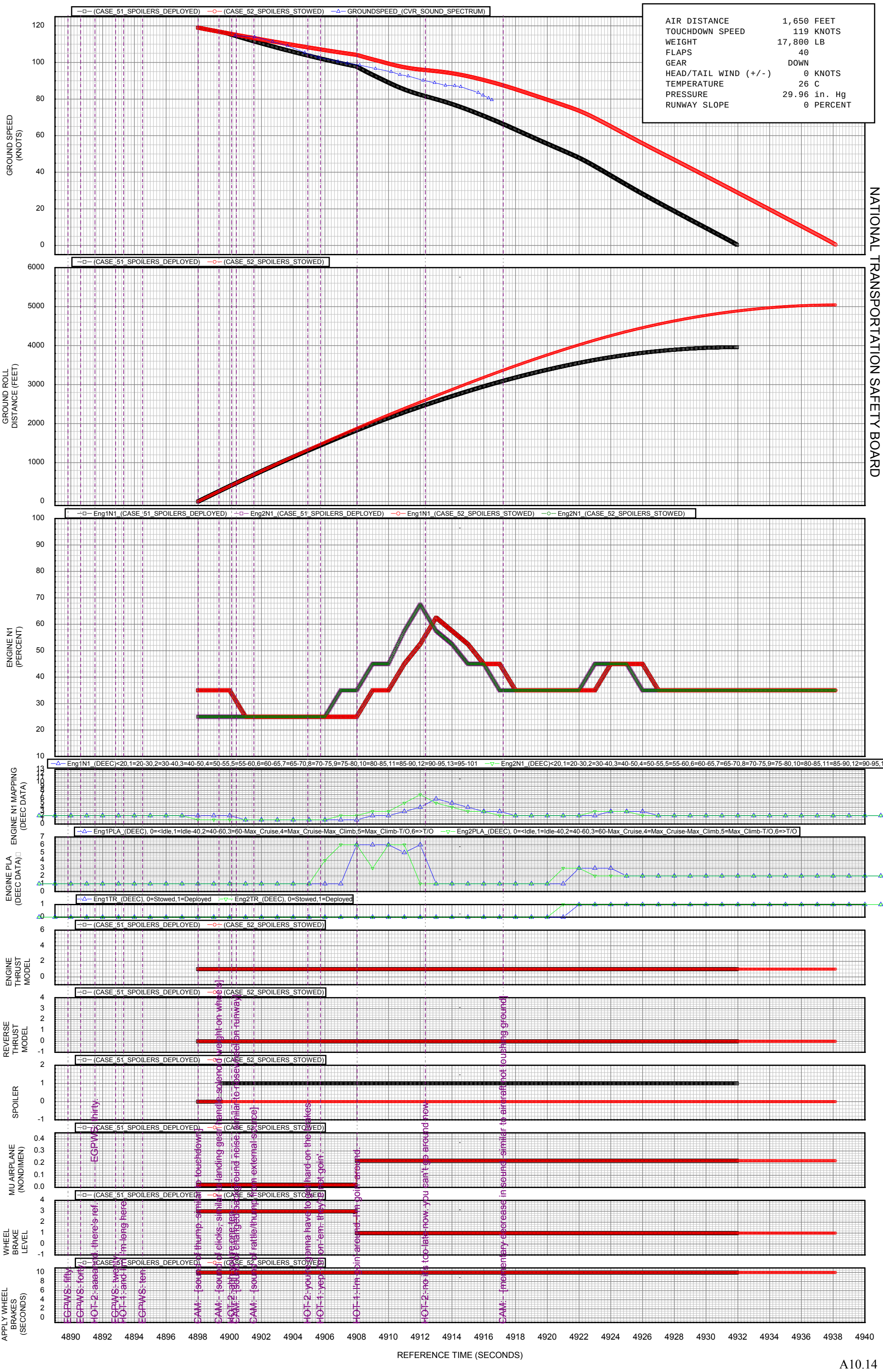
REFERENCE TIME (SECONDS)

NATIONAL TRANSPORTATION SAFETY BOARD

HENDRICK MOTORSPORTS GULFSTREAM G150 (N480JJ), [SIMULATION DATA, CASES 51-52, ANTI-SKID INOPERATIVE WHEEL BRAKING]

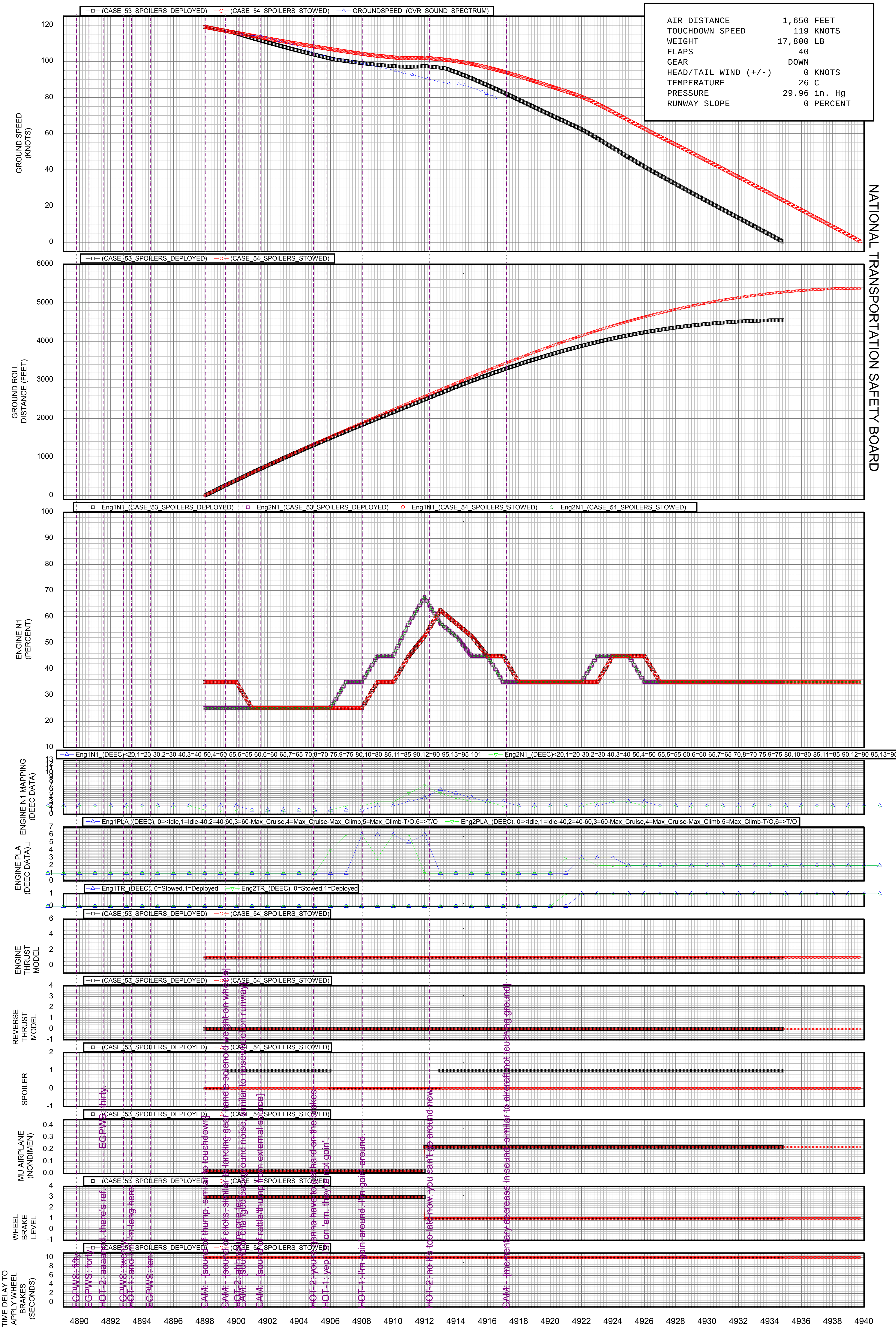
DRY RUNWAY LANDING OVERRUN, KEY WEST, FLORIDA; OCTOBER 31, 2011 [EVENT ENGINE N1, MEAN FORWARD THRUST, MEAN REVERSE THRUST]

AIR DISTANCE	1,650 FEET
TOUCHDOWN SPEED	119 KNOTS
WEIGHT	17,800 LB
FLAPS	40
GEAR	DOWN
HEAD/TAIL WIND (+/-)	0 KNOTS
TEMPERATURE	26 C
PRESSURE	29.96 in. Hg
RUNWAY SLOPE	0 PERCENT



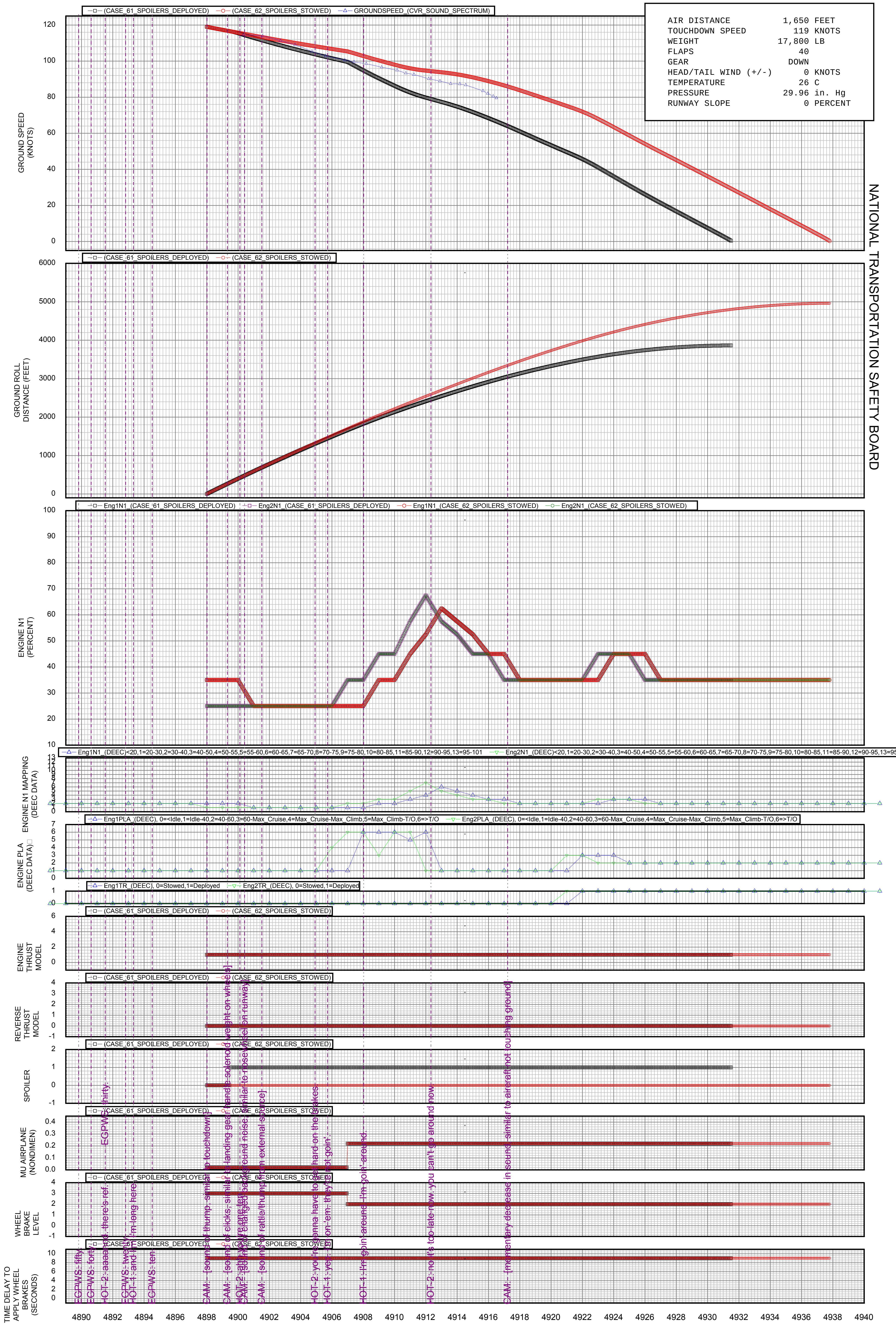
HENDRICK MOTORSPORTS GULFSTREAM G150 (N480JJ), [SIMULATION DATA, CASES 53-54, ANTI-SKID INOPERATIVE WHEEL BRAKING]
DRY RUNWAY LANDING OVERRUN, KEY WEST, FLORIDA; OCTOBER 31, 2011 [EVENT ENGINE N1, MEAN FORWARD THRUST, MEAN REVERSE THRUST]

AIR DISTANCE	1,650 FEET
TOUCHDOWN SPEED	119 KNOTS
WEIGHT	17,800 LB
FLAPS	40
GEAR	DOWN
HEAD/TAIL WIND (+/-)	0 KNOTS
TEMPERATURE	26 C
PRESSURE	29.96 in. Hg
RUNWAY SLOPE	0 PERCENT

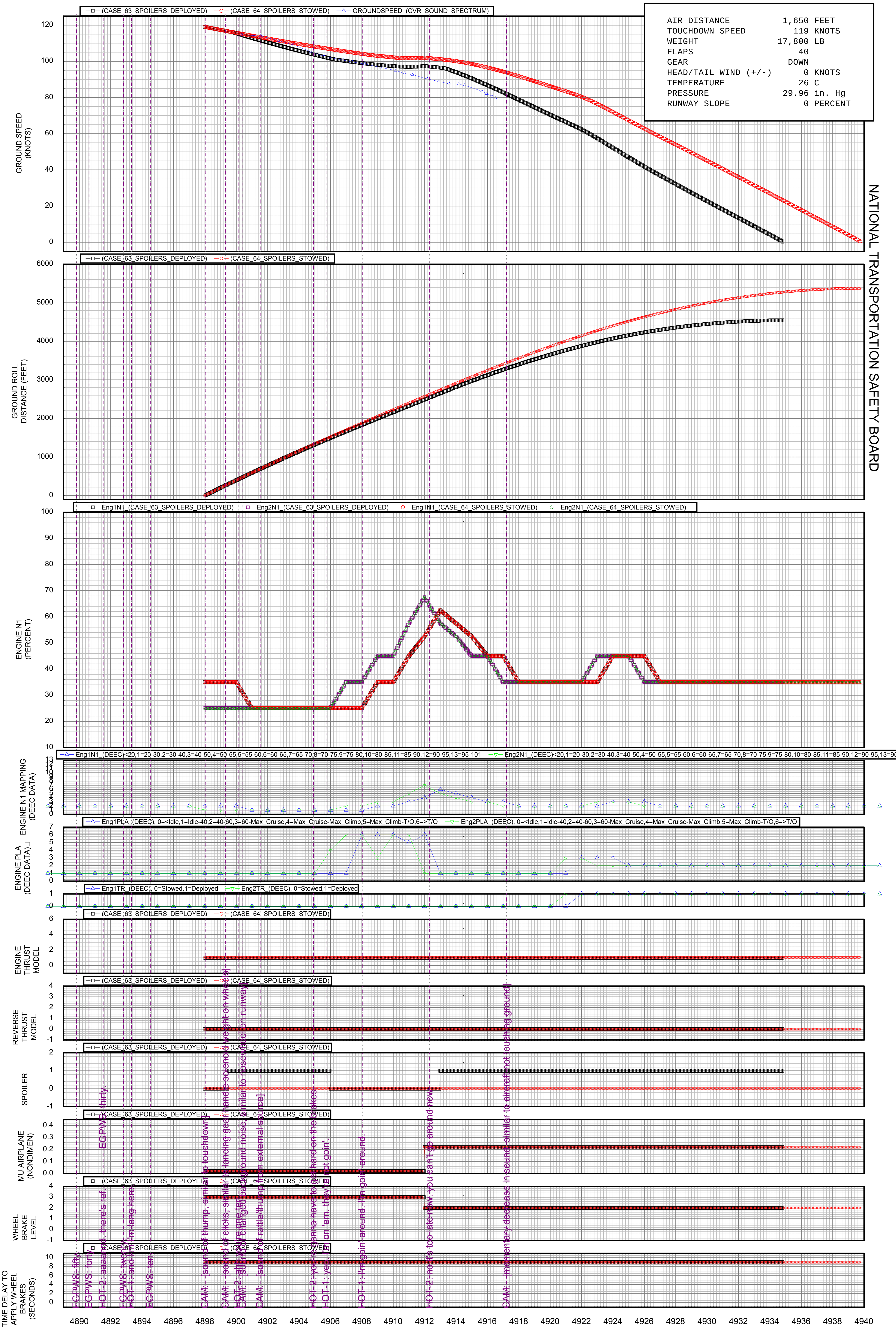


(CASE_53_SPOILERS_DEPLOYED)
(CASE_54_SPOILERS_STOWED)
GROUNDSPEED_(CVR_SOUND_SPECTRUM)
GROUND SPEED (KNOTS)
GROUND ROLL DISTANCE (FEET)
Eng1N1_(CASE_53_SPOILERS_DEPLOYED)
Eng2N1_(CASE_53_SPOILERS_DEPLOYED)
Eng1N1_(CASE_54_SPOILERS_STOWED)
Eng2N1_(CASE_54_SPOILERS_STOWED)
ENGINE N1 (PERCENT)
Eng1N1_(DEEC)<20,1=20-30,2=30-40,3=40-50,4=50-55,5=55-60,6=60-65,7=65-70,8=70-75,9=75-80,10=80-85,11=85-90,12=90-95,13=95-101
Eng2N1_(DEEC)<20,1=20-30,2=30-40,3=40-50,4=50-55,5=55-60,6=60-65,7=65-70,8=70-75,9=75-80,10=80-85,11=85-90,12=90-95,13=95-1
ENGINE N1 MAPPING (DEEC DATA)
Eng1PLA_(DEEC), 0=<Idle,1=Idle-40,2=40-60,3=60-Max_Cruise,4=Max_Cruise-Max_Climb,5=Max_Climb-T/O,6=>T/O
Eng2PLA_(DEEC), 0=<Idle,1=Idle-40,2=40-60,3=60-Max_Cruise,4=Max_Cruise-Max_Climb,5=Max_Climb-T/O,6=>T/O
ENGINE PLA (DEEC DATA)
Eng1TR_(DEEC), 0=Stowed,1=Deployed
Eng2TR_(DEEC), 0=Stowed,1=Deployed
ENGINE THRUST MODEL
REVERSE THRUST MODEL
SPOILER
MU AIRPLANE (NONDIMEN)
WHEEL BRAKE LEVEL
TIME DELAY TO APPLY WHEEL BRAKES (SECONDS)
EGPWS: fifty.
EGPWS: forty.
HOT-2: aaaand. there's ref.
EGPWS: thirty.
EGPWS: twenty.
HOT-1: and I'm long here.
EGPWS: ten.
CAM: [sound of thump, similar to touchdown]
CAM: [sound of clicks, similar to landing gear handle solenoid weight on wheels]
HOT-2: ahh you're one ten.
CAM: [sound of changed background noise, similar to nosewheel on runway]
CAM: [sound of rattle/thump from external source]
HOT-2: you're gonna have to get hard on the brakes.
HOT-1: yep I'm on 'em. they're not goin'.
HOT-1: I'm goin around. I'm goin around.
HOT-2: no it's too late now. you can't go around now.
CAM: [momentary decrease in sound, similar to aircraft not touching ground]
REFERENCE TIME (SECONDS)
NATIONAL TRANSPORTATION SAFETY BOARD

HENDRICK MOTORSPORTS GULFSTREAM G150 (N480JJ), [SIMULATION DATA, CASES 61-62, EMERGENCY WHEEL BRAKING]
DRY RUNWAY LANDING OVERRUN, KEY WEST, FLORIDA; OCTOBER 31, 2011 [EVENT ENGINE N1, MEAN FORWARD THRUST, MEAN REVERSE THRUST]



HENDRICK MOTORSPORTS GULFSTREAM G150 (N480JJ), [SIMULATION DATA, CASES 63-64, EMERGENCY WHEEL BRAKING]
DRY RUNWAY LANDING OVERRUN, KEY WEST, FLORIDA; OCTOBER 31, 2011 [EVENT ENGINE N1, MEAN FORWARD THRUST, MEAN REVERSE THRUST]



HENDRICK MOTORSPORTS GULFSTREAM G150 (N480JJ), [SIMULATION DATA, CASES 71-72, NO WHEEL BRAKING]

DRY RUNWAY LANDING OVERRUN, KEY WEST, FLORIDA; OCTOBER 31, 2011 [EVENT ENGINE N1, MEAN FORWARD THRUST, MEAN REVERSE THRUST]

AIR DISTANCE	1,650 FEET
TOUCHDOWN SPEED	119 KNOTS
WEIGHT	17,800 LB
FLAPS	40
GEAR	DOWN
HEAD/TAIL WIND (+/-)	0 KNOTS
TEMPERATURE	26 C
PRESSURE	29.96 in. Hg
RUNWAY SLOPE	0 PERCENT

GROUND SPEED (KNOTS) — (CASE_71_SPOILERS_DEPLOYED) (CASE_72_SPOILERS_STOWED) GROUNDSPEED_(CVR_SOUND_SPECTRUM)

GROUND ROLL DISTANCE (FEET) — (CASE_71_SPOILERS_DEPLOYED) (CASE_72_SPOILERS_STOWED)

ENGINE N1 (PERCENT) — Eng1N1_(CASE_71_SPOILERS_DEPLOYED) Eng2N1_(CASE_71_SPOILERS_DEPLOYED) Eng1N1_(CASE_72_SPOILERS_STOWED) Eng2N1_(CASE_72_SPOILERS_STOWED)

ENGINE N1 MAPPING (DEEC DATA) — Eng1N1_(DEEC)<20,1=20-30,2=30-40,3=40-50,4=50-55,5=55-60,6=60-65,7=65-70,8=70-75,9=75-80,10=80-85,11=85-90,12=90-95,13=95-101 Eng2N1_(DEEC)<20,1=20-30,2=30-40,3=40-50,4=50-55,5=55-60,6=60-65,7=65-70,8=70-75,9=75-80,10=80-85,11=85-90,12=90-95,13=95-101

ENGINE PLA (DEEC DATA) — Eng1PLA_(DEEC), 0=<Idle,1=Idle-40,2=40-60,3=60-Max_Cruise,4=Max_Cruise-Max_Climb,5=Max_Climb-T/O,6=>T/O Eng2PLA_(DEEC), 0=<Idle,1=Idle-40,2=40-60,3=60-Max_Cruise,4=Max_Cruise-Max_Climb,5=Max_Climb-T/O,6=>T/O

Eng1TR_(DEEC), 0=Stowed,1=Deployed Eng2TR_(DEEC), 0=Stowed,1=Deployed

ENGINE THRUST MODEL — (CASE_71_SPOILERS_DEPLOYED) (CASE_72_SPOILERS_STOWED)

REVERSE THRUST MODEL — (CASE_71_SPOILERS_DEPLOYED) (CASE_72_SPOILERS_STOWED)

SPOILER — (CASE_71_SPOILERS_DEPLOYED) (CASE_72_SPOILERS_STOWED)

MU AIRPLANE (NONDIMEN) — (CASE_71_SPOILERS_DEPLOYED) (CASE_72_SPOILERS_STOWED)

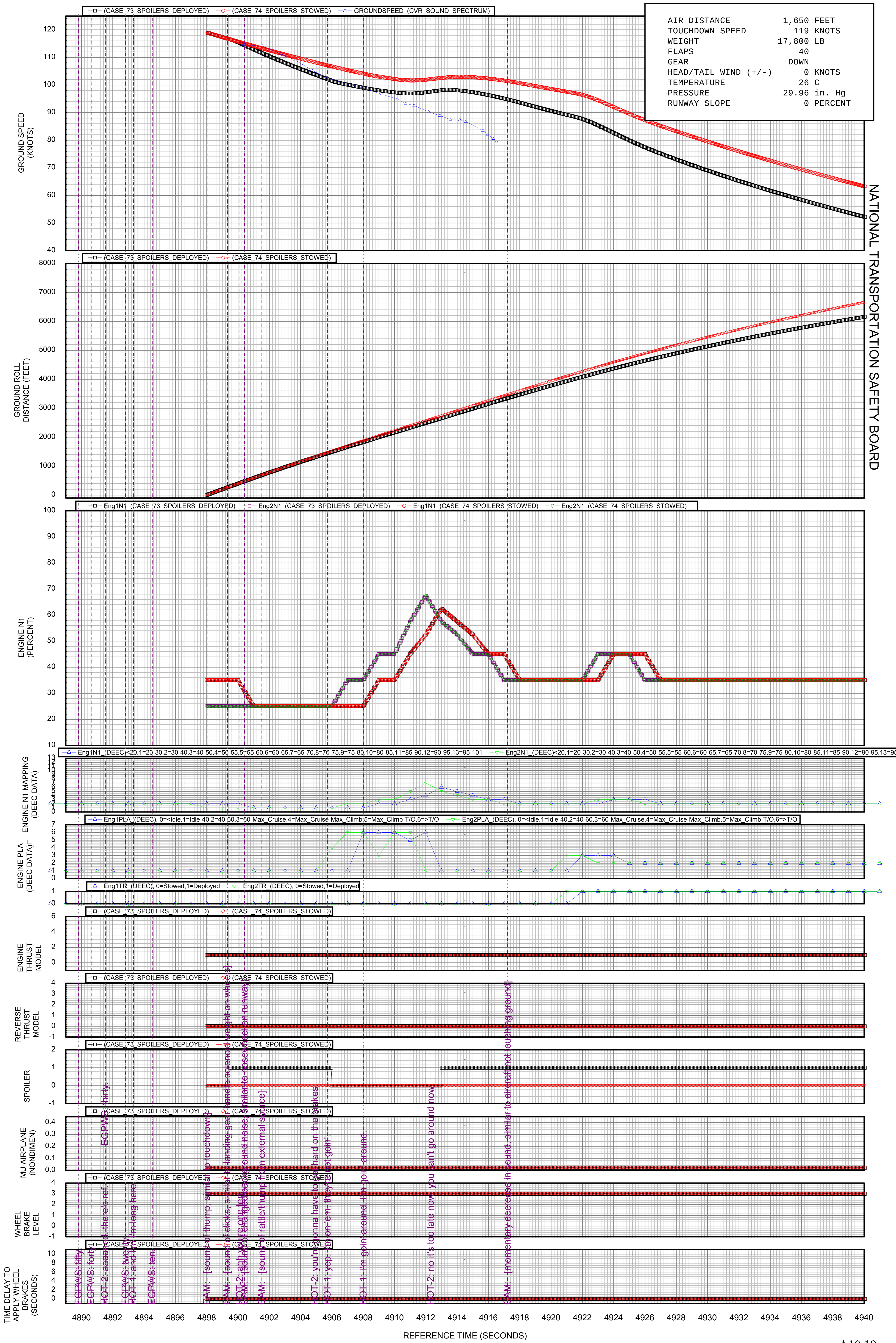
WHEEL BRAKE LEVEL — (CASE_71_SPOILERS_DEPLOYED) (CASE_72_SPOILERS_STOWED)

TIME DELAY TO APPLY WHEEL BRAKES (SECONDS) — (CASE_71_SPOILERS_DEPLOYED) (CASE_72_SPOILERS_STOWED)

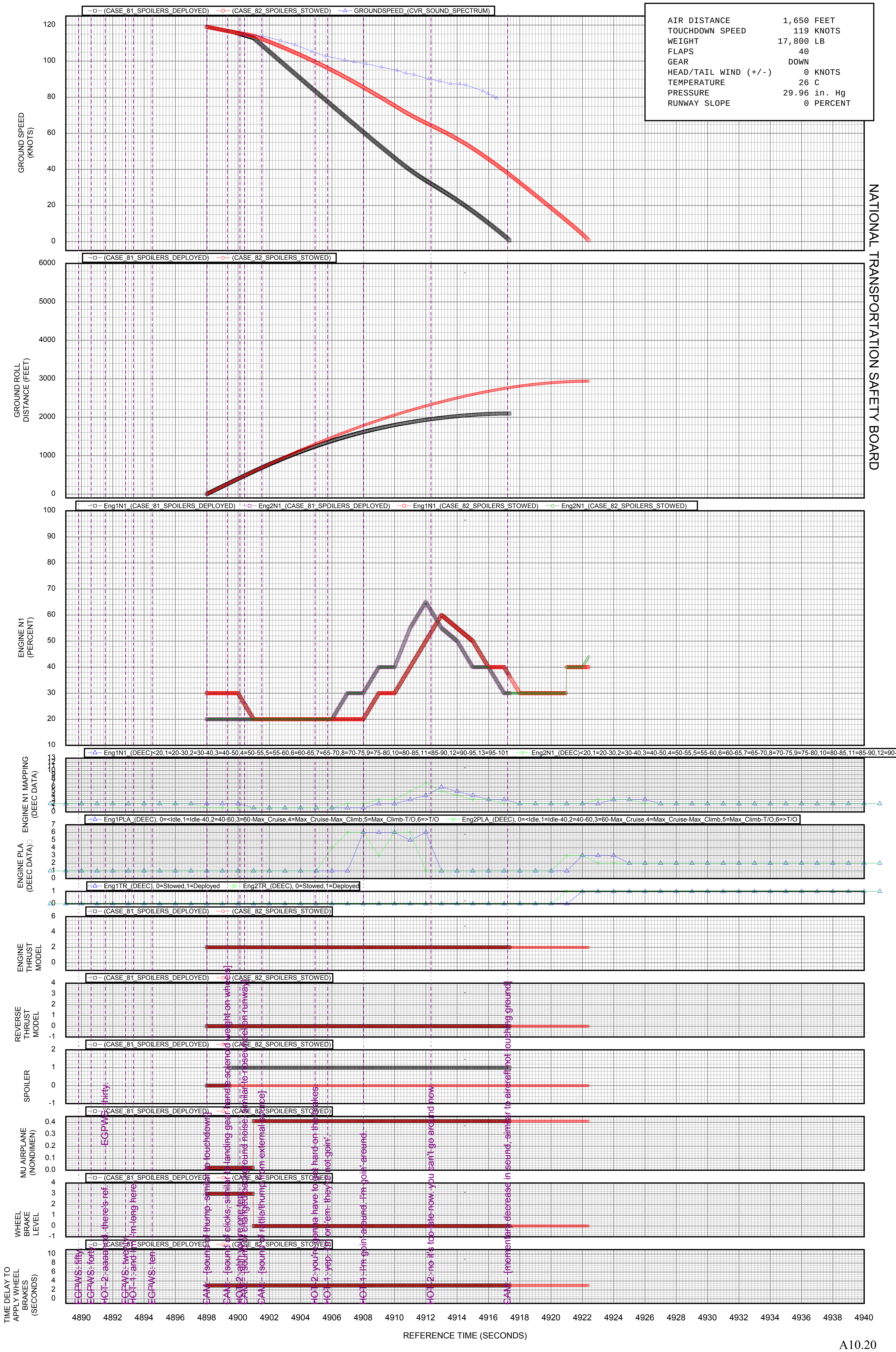
REFERENCE TIME (SECONDS)

NATIONAL TRANSPORTATION SAFETY BOARD

HENDRICK MOTORSPORTS GULFSTREAM G150 (N480JJ), [SIMULATION DATA, CASES 73-74, NO WHEEL BRAKING]
DRY RUNWAY LANDING OVERRUN, KEY WEST, FLORIDA; OCTOBER 31, 2011 [EVENT ENGINE N1, MEAN FORWARD THRUST, MEAN REVERSE THRUST]

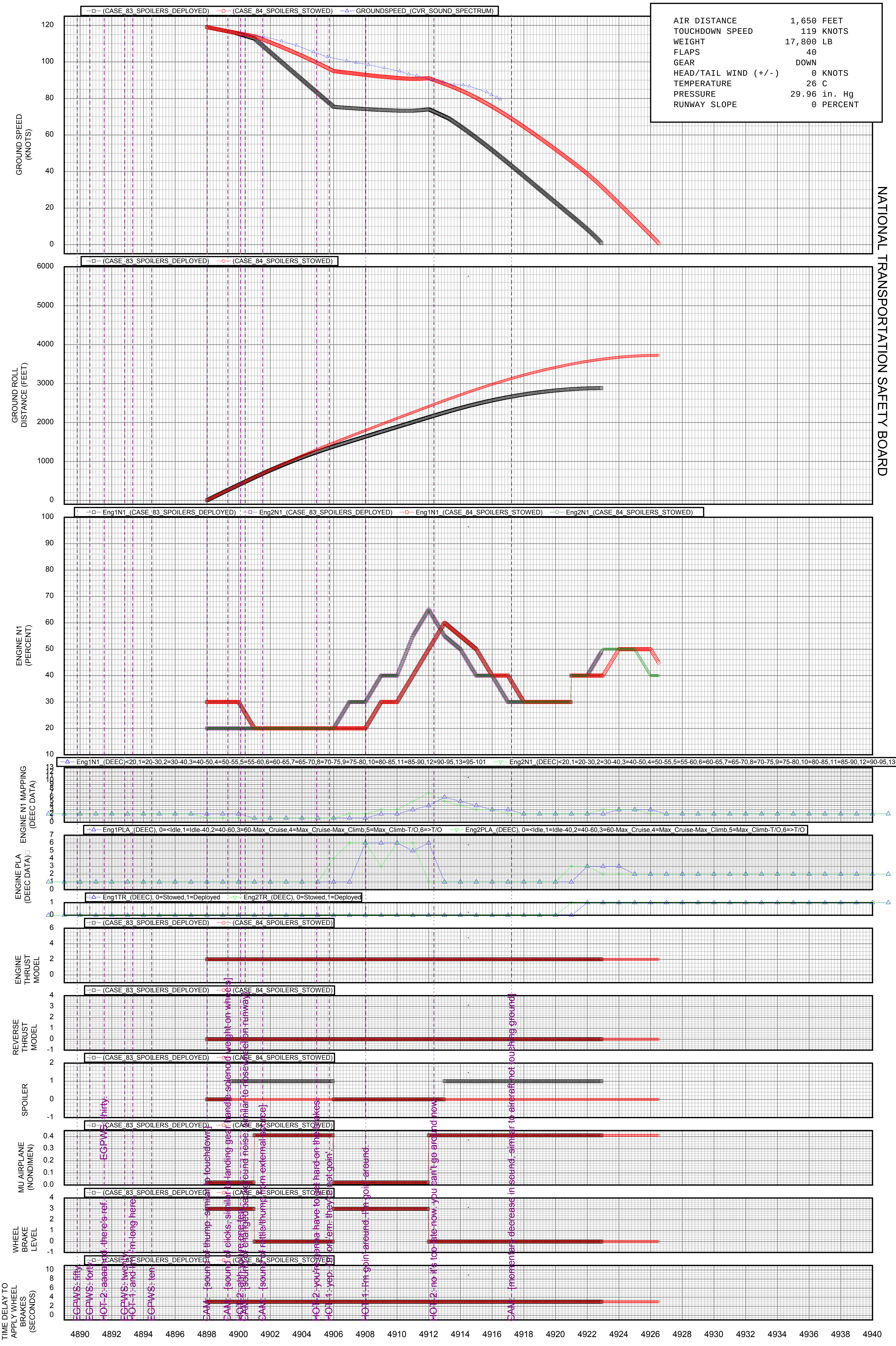


HENDRICK MOTORSPORTS GULFSTREAM G150 (N480JJ), [SIMULATION DATA, CASES 81-82, MAXIMUM MANUAL WHEEL BRAKING]
DRY RUNWAY LANDING OVERRUN, KEY WEST, FLORIDA; OCTOBER 31, 2011 [EVENT ENGINE N1, MINIMUM FORWARD, MAXIMUM REVERSE (LEAST CONSERVATIVE)]



(CASE_81_SPOILERS_DEPLOYED)
(CASE_82_SPOILERS_STOWED)
GROUNDSPEED_(CVR_SOUND_SPECTRUM)
AIR DISTANCE 1,650 FEET
TOUCHDOWN SPEED 119 KNOTS
WEIGHT 17,800 LB
FLAPS 40
GEAR DOWN
HEAD/TAIL WIND (+/-) 0 KNOTS
TEMPERATURE 26 C
PRESSURE 29.96 in. Hg
RUNWAY SLOPE 0 PERCENT
GROUND SPEED (KNOTS)
GROUND ROLL DISTANCE (FEET)
Eng1N1_(CASE_81_SPOILERS_DEPLOYED)
Eng2N1_(CASE_81_SPOILERS_DEPLOYED)
Eng1N1_(CASE_82_SPOILERS_STOWED)
Eng2N1_(CASE_82_SPOILERS_STOWED)
ENGINE N1 (PERCENT)
Eng1N1_(DEEC)<20,1=20-30,2=30-40,3=40-50,4=50-55,5=55-60,6=60-65,7=65-70,8=70-75,9=75-80,10=80-85,11=85-90,12=90-95,13=95-101
Eng2N1_(DEEC)<20,1=20-30,2=30-40,3=40-50,4=50-55,5=55-60,6=60-65,7=65-70,8=70-75,9=75-80,10=80-85,11=85-90,12=90-95
ENGINE N1 MAPPING (DEEC DATA)
Eng1PLA_(DEEC), 0=<Idle,1=Idle-40,2=40-60,3=60-Max_Cruise,4=Max_Cruise-Max_Climb,5=Max_Climb-T/O,6=>T/O
Eng2PLA_(DEEC), 0=<Idle,1=Idle-40,2=40-60,3=60-Max_Cruise,4=Max_Cruise-Max_Climb,5=Max_Climb-T/O,6=>T/O
ENGINE PLA (DEEC DATA)
Eng1TR_(DEEC), 0=Stowed,1=Deployed
Eng2TR_(DEEC), 0=Stowed,1=Deployed
ENGINE THRUST MODEL
REVERSE THRUST MODEL
SPOILER
MU AIRPLANE (NONDIMEN)
WHEEL BRAKE LEVEL
TIME DELAY TO APPLY WHEEL BRAKES (SECONDS)
EGPWS: fifty.
EGPWS: forty.
HOT-2: aaaand, there's ref.
EGPWS: thirty.
EGPWS: twenty.
HOT-1: and I'm I'm long here.
EGPWS: ten.
CAM: [sound of thump, similar to touchdown]
CAM: [sound of clicks, similar to landing gear handle solenoid weight on wheels]
CAM: [sound of changed background noise, similar to nosewheel on runway]
CAM: [sound of rattle/thump from external source]
HOT-2: you're gonna have to get hard on the brakes.
HOT-1: yep. I'm on 'em. they're not goin'.
HOT-1: I'm goin' around. I'm goin' around.
HOT-2: no it's too late now. you can't go around now.
CAM: [momentary decrease in sound, similar to aircraft not touching ground]
REFERENCE TIME (SECONDS)
NATIONAL TRANSPORTATION SAFETY BOARD

HENDRICK MOTORSPORTS GULFSTREAM G150 (N480JJ), [SIMULATION DATA, CASES 83-84, MAXIMUM MANUAL WHEEL BRAKING]
DRY RUNWAY LANDING OVERRUN, KEY WEST, FLORIDA; OCTOBER 31, 2011 [EVENT ENGINE N1, MINIMUM FORWARD, MAXIMUM REVERSE (LEAST CONSERVATIVE)]



(CASE_83_SPOILERS_DEPLOYED)
(CASE_84_SPOILERS_STOWED)
GROUNDSPEED_(CVR_SOUND_SPECTRUM)
AIR DISTANCE 1,650 FEET
TOUCHDOWN SPEED 119 KNOTS
WEIGHT 17,800 LB
FLAPS 40
GEAR DOWN
HEAD/TAIL WIND (+/-) 0 KNOTS
TEMPERATURE 26 C
PRESSURE 29.96 in. Hg
RUNWAY SLOPE 0 PERCENT
GROUND SPEED (KNOTS)
GROUND ROLL DISTANCE (FEET)
Eng1N1_(CASE_83_SPOILERS_DEPLOYED)
Eng2N1_(CASE_83_SPOILERS_DEPLOYED)
Eng1N1_(CASE_84_SPOILERS_STOWED)
Eng2N1_(CASE_84_SPOILERS_STOWED)
ENGINE N1 (PERCENT)
Eng1N1_(DEEC)<20,1=20-30,2=30-40,3=40-50,4=50-55,5=55-60,6=60-65,7=65-70,8=70-75,9=75-80,10=80-85,11=85-90,12=90-95,13=95-101
Eng2N1_(DEEC)<20,1=20-30,2=30-40,3=40-50,4=50-55,5=55-60,6=60-65,7=65-70,8=70-75,9=75-80,10=80-85,11=85-90,12=90-95,13=95-1
ENGINE N1 MAPPING (DEEC DATA)
Eng1PLA_(DEEC), 0=<Idle,1=Idle-40,2=40-60,3=60-Max_Cruise,4=Max_Cruise-Max_Climb,5=Max_Climb-T/O,6=>T/O
Eng2PLA_(DEEC), 0=<Idle,1=Idle-40,2=40-60,3=60-Max_Cruise,4=Max_Cruise-Max_Climb,5=Max_Climb-T/O,6=>T/O
ENGINE PLA (DEEC DATA)
Eng1TR_(DEEC), 0=Stowed,1=Deployed
Eng2TR_(DEEC), 0=Stowed,1=Deployed
ENGINE THRUST MODEL
REVERSE THRUST MODEL
SPOILER
MU AIRPLANE (NONDIMEN)
WHEEL BRAKE LEVEL
TIME DELAY TO APPLY WHEEL BRAKES (SECONDS)
EGPWS: fifty.
EGPWS: forty.
HOT-2: aaaand, there's ref.
EGPWS: thirty.
EGPWS: twenty.
EGPWS: ten.
CAM: [sound of thump, similar to touchdown]
CAM: [sound of clicks, similar to landing gear handle solenoid weight on wheels]
CAM: [sound of rattle/thump from external source]
HOT-2: you're gonna have to get hard on the brakes.
HOT-1: yep. I'm on 'em. they're not goin'.
HOT-1: I'm goin' around. I'm goin' around.
HOT-2: no it's too late now. you can't go around now.
CAM: [momentary decrease in sound, similar to aircraft not touching ground]
REFERENCE TIME (SECONDS)

NATIONAL TRANSPORTATION SAFETY BOARD

HENDRICK MOTORSPORTS GULFSTREAM G150 (N480JJ), [SIMULATION DATA, CASES 91-92, ANTI-SKID INOPERATIVE WHEEL BRAKING]

DRY RUNWAY LANDING OVERRUN, KEY WEST, FLORIDA; OCTOBER 31, 2011 [EVENT ENGINE N1, MINIMUM FORWARD, MAXIMUM REVERSE (LEAST CONSERVATIVE)]

AIR DISTANCE	1,650 FEET
TOUCHDOWN SPEED	119 KNOTS
WEIGHT	17,800 LB
FLAPS	40
GEAR	DOWN
HEAD/TAIL WIND (+/-)	0 KNOTS
TEMPERATURE	26 C
PRESSURE	29.96 in. Hg
RUNWAY SLOPE	0 PERCENT

GROUND SPEED (KNOTS)

GROUND ROLL DISTANCE (FEET)

ENGINE N1 (PERCENT)

ENGINE N1 MAPPING (DEEC DATA)

ENGINE PLA (DEEC DATA)

ENGINE THRUST MODEL

REVERSE THRUST MODEL

SPOILER

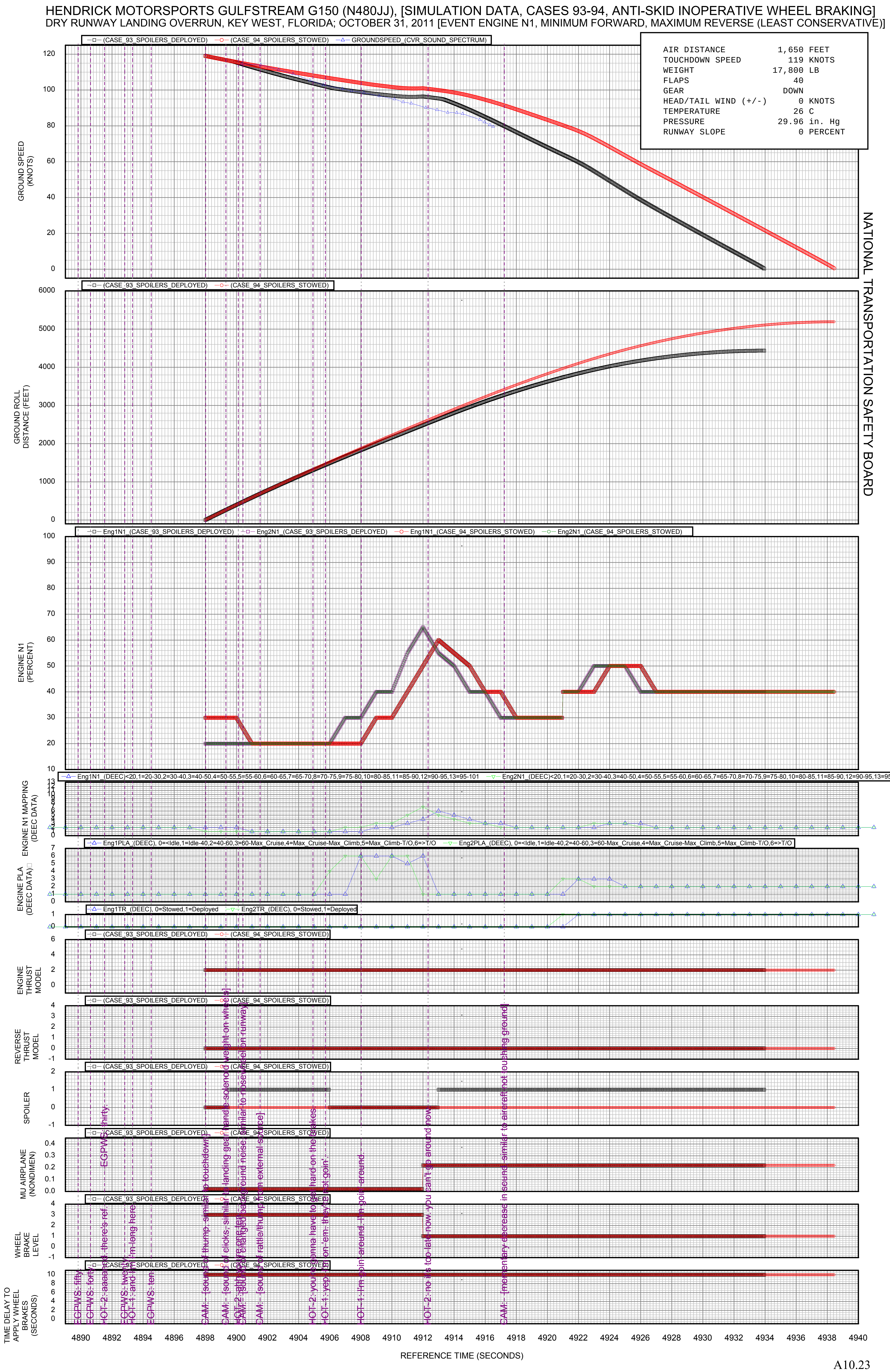
MU AIRPLANE (NONDIMEN)

WHEEL BRAKE LEVEL

TIME DELAY TO APPLY WHEEL BRAKES (SECONDS)

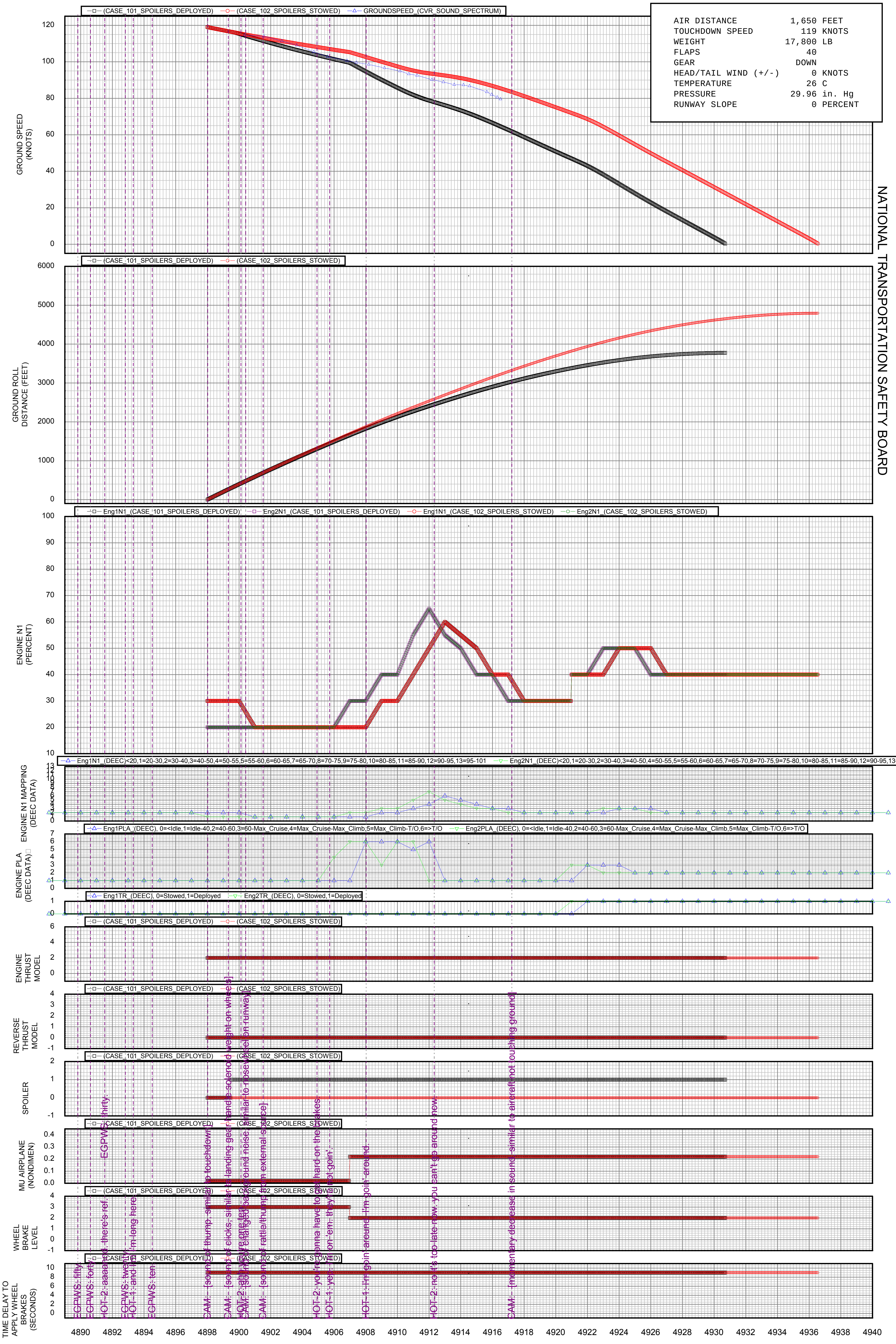
REFERENCE TIME (SECONDS)

NATIONAL TRANSPORTATION SAFETY BOARD



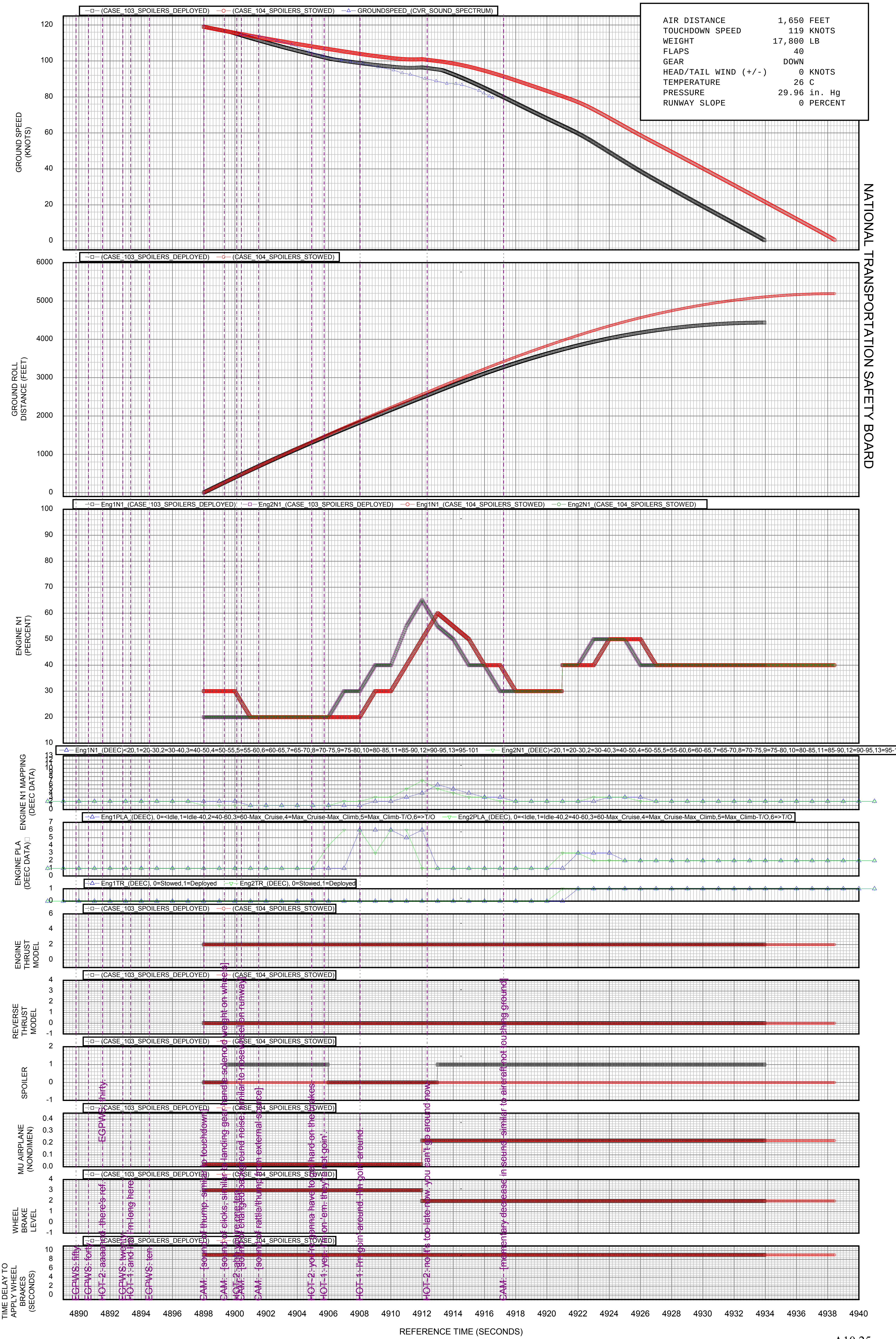
HENDRICK MOTORSPORTS GULFSTREAM G150 (N480JJ), [SIMULATION DATA, CASES 93-94, ANTI-SKID INOPERATIVE WHEEL BRAKING]
DRY RUNWAY LANDING OVERRUN, KEY WEST, FLORIDA; OCTOBER 31, 2011 [EVENT ENGINE N1, MINIMUM FORWARD, MAXIMUM REVERSE (LEAST CONSERVATIVE)]
AIR DISTANCE 1,650 FEET
TOUCHDOWN SPEED 119 KNOTS
WEIGHT 17,800 LB
FLAPS 40
GEAR DOWN
HEAD/TAIL WIND (+/-) 0 KNOTS
TEMPERATURE 26 C
PRESSURE 29.96 in. Hg
RUNWAY SLOPE 0 PERCENT
(CASE_93_SPOILERS_DEPLOYED)
(CASE_94_SPOILERS_STOWED)
GROUNDSPEED_(CVR_SOUND_SPECTRUM)
GROUND SPEED (KNOTS)
GROUND ROLL DISTANCE (FEET)
Eng1N1_(CASE_93_SPOILERS_DEPLOYED)
Eng2N1_(CASE_93_SPOILERS_DEPLOYED)
Eng1N1_(CASE_94_SPOILERS_STOWED)
Eng2N1_(CASE_94_SPOILERS_STOWED)
ENGINE N1 (PERCENT)
Eng1N1_(DEEC)<20,1=20-30,2=30-40,3=40-50,4=50-55,5=55-60,6=60-65,7=65-70,8=70-75,9=75-80,10=80-85,11=85-90,12=90-95,13=95-101
Eng2N1_(DEEC)<20,1=20-30,2=30-40,3=40-50,4=50-55,5=55-60,6=60-65,7=65-70,8=70-75,9=75-80,10=80-85,11=85-90,12=90-95,13=95-
ENGINE N1 MAPPING (DEEC DATA)
Eng1PLA_(DEEC), 0=<Idle,1=Idle-40,2=40-60,3=60-Max_Cruise,4=Max_Cruise-Max_Climb,5=Max_Climb-T/O,6=>T/O
Eng2PLA_(DEEC), 0=<Idle,1=Idle-40,2=40-60,3=60-Max_Cruise,4=Max_Cruise-Max_Climb,5=Max_Climb-T/O,6=>T/O
ENGINE PLA (DEEC DATA)
Eng1TR_(DEEC), 0=Stowed,1=Deployed
Eng2TR_(DEEC), 0=Stowed,1=Deployed
ENGINE THRUST MODEL
REVERSE THRUST MODEL
SPOILER
MU AIRPLANE (NONDIMEN)
WHEEL BRAKE LEVEL
TIME DELAY TO APPLY WHEEL BRAKES (SECONDS)
EGPWS: fifty.
EGPWS: forty.
HOT-2: aaaand, there's ref.
EGPWS: thirty.
EGPWS: twenty.
HOT-1: and I'm long here.
EGPWS: ten.
CAM: [sound of thump, similar to touchdown]
CAM: [sound of clicks, similar to landing gear handle solenoid weight on wheels]
HOT-2: ahh you're one ten.
CAM: [sound of changed background noise, similar to nosewheel on runway]
CAM: [sound of rattle/thump from external source]
HOT-2: you're gonna have to get hard on the brakes.
HOT-1: yep I'm on 'em. they're not goin'.
HOT-1: I'm goin' around. I'm goin' around.
HOT-2: no it's too late now. you can't go around now.
CAM: [momentary decrease in sound, similar to aircraft not touching ground]
REFERENCE TIME (SECONDS)
NATIONAL TRANSPORTATION SAFETY BOARD

HENDRICK MOTORSPORTS GULFSTREAM G150 (N480JJ), [SIMULATION DATA, CASES 101-102, EMERGENCY WHEEL BRAKING]
DRY RUNWAY LANDING OVERRUN, KEY WEST, FLORIDA; OCTOBER 31, 2011 [EVENT ENGINE N1, MINIMUM FORWARD, MAXIMUM REVERSE (LEAST CONSERVATIVE)]



AIR DISTANCE 1,650 FEET
TOUCHDOWN SPEED 119 KNOTS
WEIGHT 17,800 LB
FLAPS 40
GEAR DOWN
HEAD/TAIL WIND (+/-) 0 KNOTS
TEMPERATURE 26 C
PRESSURE 29.96 in. Hg
RUNWAY SLOPE 0 PERCENT
(CASE_101_SPOILERS_DEPLOYED)
(CASE_102_SPOILERS_STOWED)
GROUNDSPEED_(CVR_SOUND_SPECTRUM)
GROUND SPEED (KNOTS)
GROUND ROLL DISTANCE (FEET)
Eng1N1_(CASE_101_SPOILERS_DEPLOYED)
Eng2N1_(CASE_101_SPOILERS_DEPLOYED)
Eng1N1_(CASE_102_SPOILERS_STOWED)
Eng2N1_(CASE_102_SPOILERS_STOWED)
ENGINE N1 (PERCENT)
Eng1N1_(DEEC)<20,1=20-30,2=30-40,3=40-50,4=50-55,5=55-60,6=60-65,7=65-70,8=70-75,9=75-80,10=80-85,11=85-90,12=90-95,13=95-101
Eng2N1_(DEEC)<20,1=20-30,2=30-40,3=40-50,4=50-55,5=55-60,6=60-65,7=65-70,8=70-75,9=75-80,10=80-85,11=85-90,12=90-95,13=95-1
ENGINE N1 MAPPING (DEEC DATA)
Eng1PLA_(DEEC), 0=<Idle,1=Idle-40,2=40-60,3=60-Max_Cruise,4=Max_Cruise-Max_Climb,5=Max_Climb-T/O,6=>T/O
Eng2PLA_(DEEC), 0=<Idle,1=Idle-40,2=40-60,3=60-Max_Cruise,4=Max_Cruise-Max_Climb,5=Max_Climb-T/O,6=>T/O
ENGINE PLA (DEEC DATA)
Eng1TR_(DEEC), 0=Stowed,1=Deployed
Eng2TR_(DEEC), 0=Stowed,1=Deployed
ENGINE THRUST MODEL
REVERSE THRUST MODEL
SPOILER
MU AIRPLANE (NONDIMEN)
WHEEL BRAKE LEVEL
TIME DELAY TO APPLY WHEEL BRAKES (SECONDS)
EGPWS: fifty.
EGPWS: forty.
HOT-2: aaaand, there's ref.
EGPWS: thirty.
EGPWS: twenty.
HOT-1: and I'm long here.
EGPWS: ten.
CAM: [sound of thump, similar to touchdown]
CAM: [sound of clicks, similar to landing gear handle solenoid weight on wheels]
HOT-2: ah, you're one ten.
CAM: [sound of changed background noise, similar to nosewheel on runway]
CAM: [sound of rattle/thump from external source]
HOT-2: you're gonna have to get hard on the brakes.
HOT-1: yep. I'm on 'em. they're not goin'.
HOT-1: I'm goin' around. I'm goin' around.
HOT-2: no it's too late now. you can't go around now.
CAM: [momentary decrease in sound, similar to aircraft not touching ground]
REFERENCE TIME (SECONDS)
NATIONAL TRANSPORTATION SAFETY BOARD

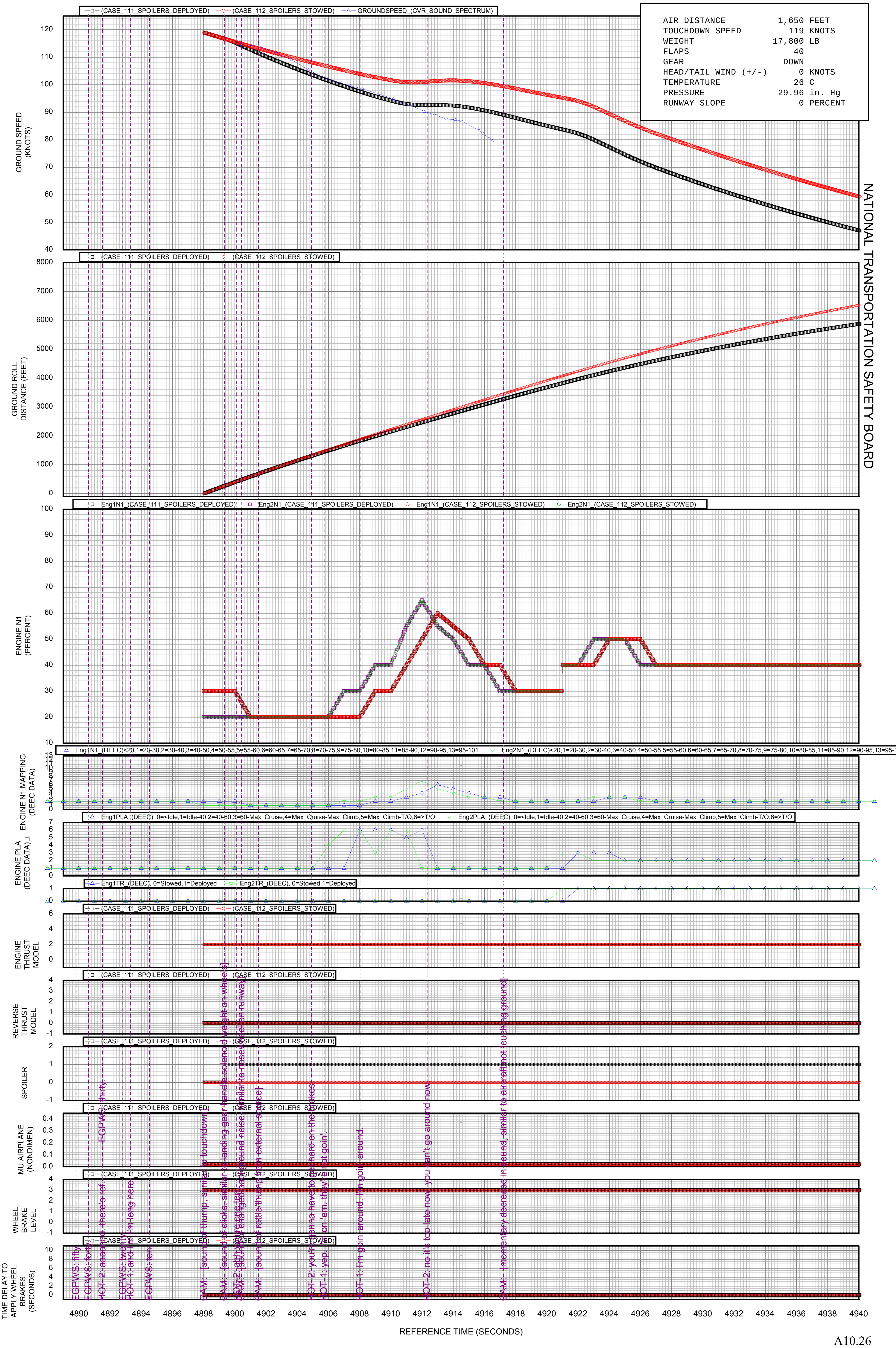
HENDRICK MOTORSPORTS GULFSTREAM G150 (N480JJ), [SIMULATION DATA, CASES 103-104, EMERGENCY WHEEL BRAKING]
DRY RUNWAY LANDING OVERRUN, KEY WEST, FLORIDA; OCTOBER 31, 2011 [EVENT ENGINE N1, MINIMUM FORWARD, MAXIMUM REVERSE (LEAST CONSERVATIVE)]



(CASE_103_SPOILERS_DEPLOYED)
(CASE_104_SPOILERS_STOWED)
GROUNDSPEED_(CVR_SOUND_SPECTRUM)
AIR DISTANCE 1,650 FEET
TOUCHDOWN SPEED 119 KNOTS
WEIGHT 17,800 LB
FLAPS 40
GEAR DOWN
HEAD/TAIL WIND (+/-) 0 KNOTS
TEMPERATURE 26 C
PRESSURE 29.96 in. Hg
RUNWAY SLOPE 0 PERCENT
GROUND SPEED (KNOTS)
GROUND ROLL DISTANCE (FEET)
Eng1N1_(CASE_103_SPOILERS_DEPLOYED)
Eng2N1_(CASE_103_SPOILERS_DEPLOYED)
Eng1N1_(CASE_104_SPOILERS_STOWED)
Eng2N1_(CASE_104_SPOILERS_STOWED)
ENGINE N1 (PERCENT)
Eng1N1_(DEEC)<20,1=20-30,2=30-40,3=40-50,4=50-55,5=55-60,6=60-65,7=65-70,8=70-75,9=75-80,10=80-85,11=85-90,12=90-95,13=95-101
Eng2N1_(DEEC)<20,1=20-30,2=30-40,3=40-50,4=50-55,5=55-60,6=60-65,7=65-70,8=70-75,9=75-80,10=80-85,11=85-90,12=90-95,13=95-
ENGINE N1 MAPPING (DEEC DATA)
Eng1PLA_(DEEC), 0=<Idle,1=Idle-40,2=40-60,3=60-Max_Cruise,4=Max_Cruise-Max_Climb,5=Max_Climb-T/O,6=>T/O
Eng2PLA_(DEEC), 0=<Idle,1=Idle-40,2=40-60,3=60-Max_Cruise,4=Max_Cruise-Max_Climb,5=Max_Climb-T/O,6=>T/O
ENGINE PLA (DEEC DATA)
Eng1TR_(DEEC), 0=Stowed,1=Deployed
Eng2TR_(DEEC), 0=Stowed,1=Deployed
ENGINE THRUST MODEL
REVERSE THRUST MODEL
SPOILER
MU AIRPLANE (NONDIMEN)
WHEEL BRAKE LEVEL
TIME DELAY TO APPLY WHEEL BRAKES (SECONDS)
EGPWS: fifty.
EGPWS: forty.
HOT-2: aaaand, there's ref.
EGPWS: thirty.
EGPWS: twenty.
HOT-1: and I'm long here.
EGPWS: ten.
CAM: [sound of thump, similar to touchdown]
CAM: [sound of clicks, similar to landing gear handle solenoid weight on wheels]
HOT-2: ah you're one ten.
CAM: [sound of changed background noise, similar to nosewheel on runway]
CAM: [sound of rattle/thump from external source]
HOT-2: you're gonna have to get hard on the brakes.
HOT-1: yep. I'm on 'em. they're not goin'.
HOT-1: I'm goin' around. I'm goin' around.
HOT-2: no it's too late now. you can't go around now.
CAM: [momentary decrease in sound, similar to aircraft not touching ground]
4890 4892 4894 4896 4898 4900 4902 4904 4906 4908 4910 4912 4914 4916 4918 4920 4922 4924 4926 4928 4930 4932 4934 4936 4938 4940
REFERENCE TIME (SECONDS)
NATIONAL TRANSPORTATION SAFETY BOARD

HENDRICK MOTORSPORTS GULFSTREAM G150 (N480JJ), [SIMULATION DATA, CASES 111-112, NO WHEEL BRAKING]
DRY RUNWAY LANDING OVERRUN, KEY WEST, FLORIDA; OCTOBER 31, 2011 [EVENT ENGINE N1, MINIMUM FORWARD, MAXIMUM REVERSE (LEAST CONSERVATIVE)]

AIR DISTANCE	1,650 FEET
TOUCHDOWN SPEED	119 KNOTS
WEIGHT	17,800 LB
FLAPS	40
GEAR	DOWN
HEAD/TAIL WIND (+/-)	0 KNOTS
TEMPERATURE	26 C
PRESSURE	29.96 in. Hg
RUNWAY SLOPE	0 PERCENT



(CASE_111_SPOILERS_DEPLOYED)
(CASE_112_SPOILERS_STOWED)
GROUNDSPEED_(CVR_SOUND_SPECTRUM)
GROUND SPEED (KNOTS)
GROUND ROLL DISTANCE (FEET)
Eng1N1_(CASE_111_SPOILERS_DEPLOYED)
Eng2N1_(CASE_111_SPOILERS_DEPLOYED)
Eng1N1_(CASE_112_SPOILERS_STOWED)
Eng2N1_(CASE_112_SPOILERS_STOWED)
ENGINE N1 (PERCENT)
Eng1N1_(DEEC)<20,1=20-30,2=30-40,3=40-50,4=50-55,5=55-60,6=60-65,7=65-70,8=70-75,9=75-80,10=80-85,11=85-90,12=90-95,13=95-101
Eng2N1_(DEEC)<20,1=20-30,2=30-40,3=40-50,4=50-55,5=55-60,6=60-65,7=65-70,8=70-75,9=75-80,10=80-85,11=85-90,12=90-95,13=95-1
ENGINE N1 MAPPING (DEEC DATA)
Eng1PLA_(DEEC), 0=<Idle,1=Idle-40,2=40-60,3=60-Max_Cruise,4=Max_Cruise-Max_Climb,5=Max_Climb-T/O,6=>T/O
Eng2PLA_(DEEC), 0=<Idle,1=Idle-40,2=40-60,3=60-Max_Cruise,4=Max_Cruise-Max_Climb,5=Max_Climb-T/O,6=>T/O
ENGINE PLA (DEEC DATA)
Eng1TR_(DEEC), 0=Stowed,1=Deployed
Eng2TR_(DEEC), 0=Stowed,1=Deployed
ENGINE THRUST MODEL
REVERSE THRUST MODEL
SPOILER
MU AIRPLANE (NONDIMEN)
WHEEL BRAKE LEVEL
TIME DELAY TO APPLY WHEEL BRAKES (SECONDS)
EGPWS: fifty.
EGPWS: forty.
EGPWS: thirty.
HOT-2: aaaand, there's ref.
EGPWS: twenty.
HOT-1: and I'm long here.
EGPWS: ten.
CAM: [sound of thump, similar to touchdown]
CAM: [sound of clicks, similar to landing gear handle solenoid weight on wheels]
HOT-2: ahh you're one ten.
CAM: [sound of changed background noise, similar to nosewheel on runway]
CAM: [sound of rattle/thump from external source]
HOT-2: you're gonna have to get hard on the brakes.
HOT-1: yep. I'm on 'em. they're not goin'.
HOT-1: I'm goin' around. I'm goin' around.
HOT-2: no it's too late now. you can't go around now.
CAM: [momentary decrease in sound, similar to aircraft not touching ground]
REFERENCE TIME (SECONDS)
NATIONAL TRANSPORTATION SAFETY BOARD

HENDRICK MOTORSPORTS GULFSTREAM G150 (N480JJ), [SIMULATION DATA, CASES 113-114, NO WHEEL BRAKING]

DRY RUNWAY LANDING OVERRUN, KEY WEST, FLORIDA; OCTOBER 31, 2011 [EVENT ENGINE N1, MINIMUM FORWARD, MAXIMUM REVERSE (LEAST CONSERVATIVE)]

AIR DISTANCE	1,650 FEET
TOUCHDOWN SPEED	119 KNOTS
WEIGHT	17,800 LB
FLAPS	40
GEAR	DOWN
HEAD/TAIL WIND (+/-)	0 KNOTS
TEMPERATURE	26 C
PRESSURE	29.96 in. Hg
RUNWAY SLOPE	0 PERCENT

GROUND SPEED (KNOTS)

GROUND ROLL DISTANCE (FEET)

ENGINE N1 (PERCENT)

ENGINE N1 MAPPING (DEEC DATA)

ENGINE PLA (DEEC DATA)

ENGINE THRUST MODEL

REVERSE THRUST MODEL

SPOILER

MU AIRPLANE (NONDIMEN)

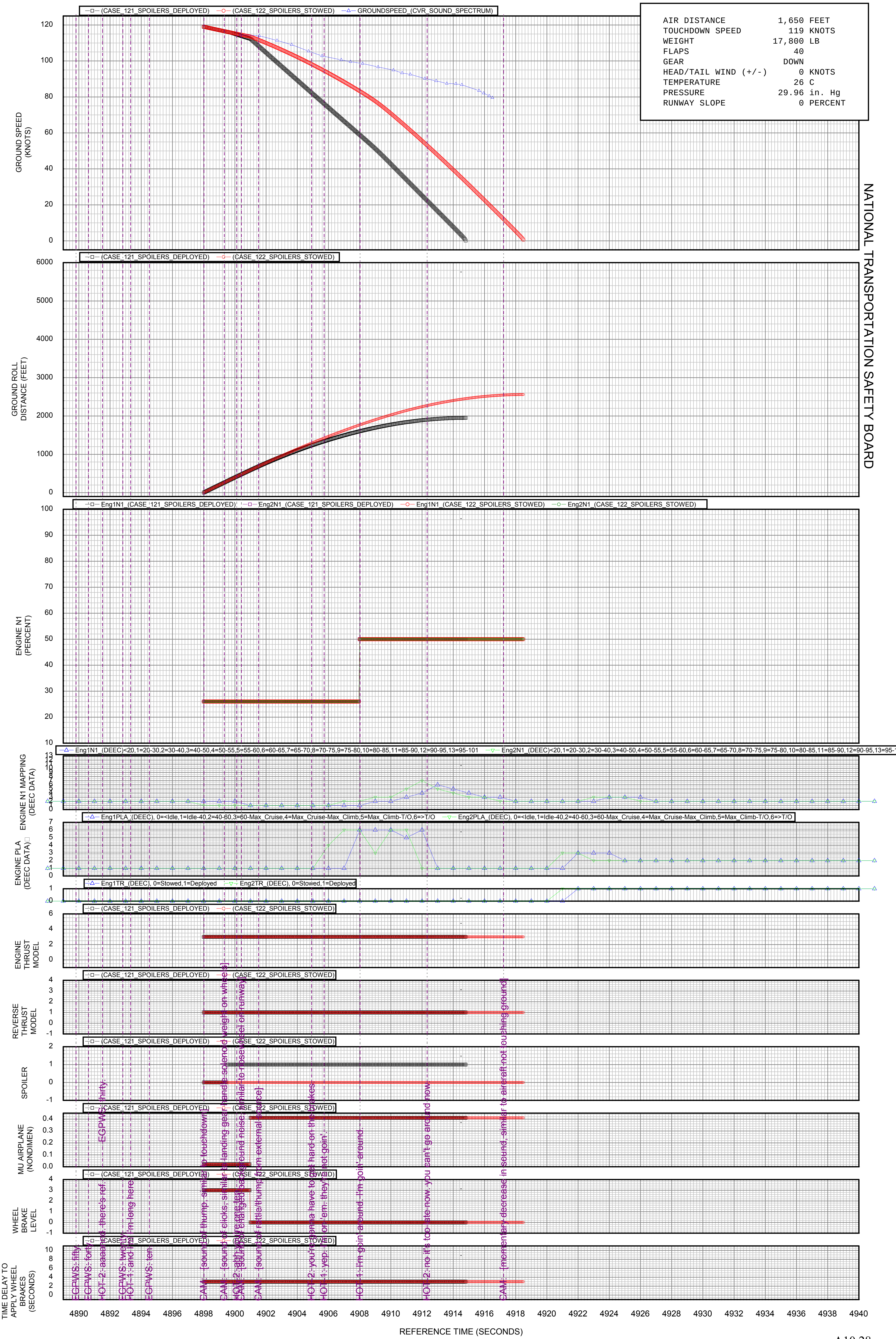
WHEEL BRAKE LEVEL

TIME DELAY TO APPLY WHEEL BRAKES (SECONDS)

REFERENCE TIME (SECONDS)

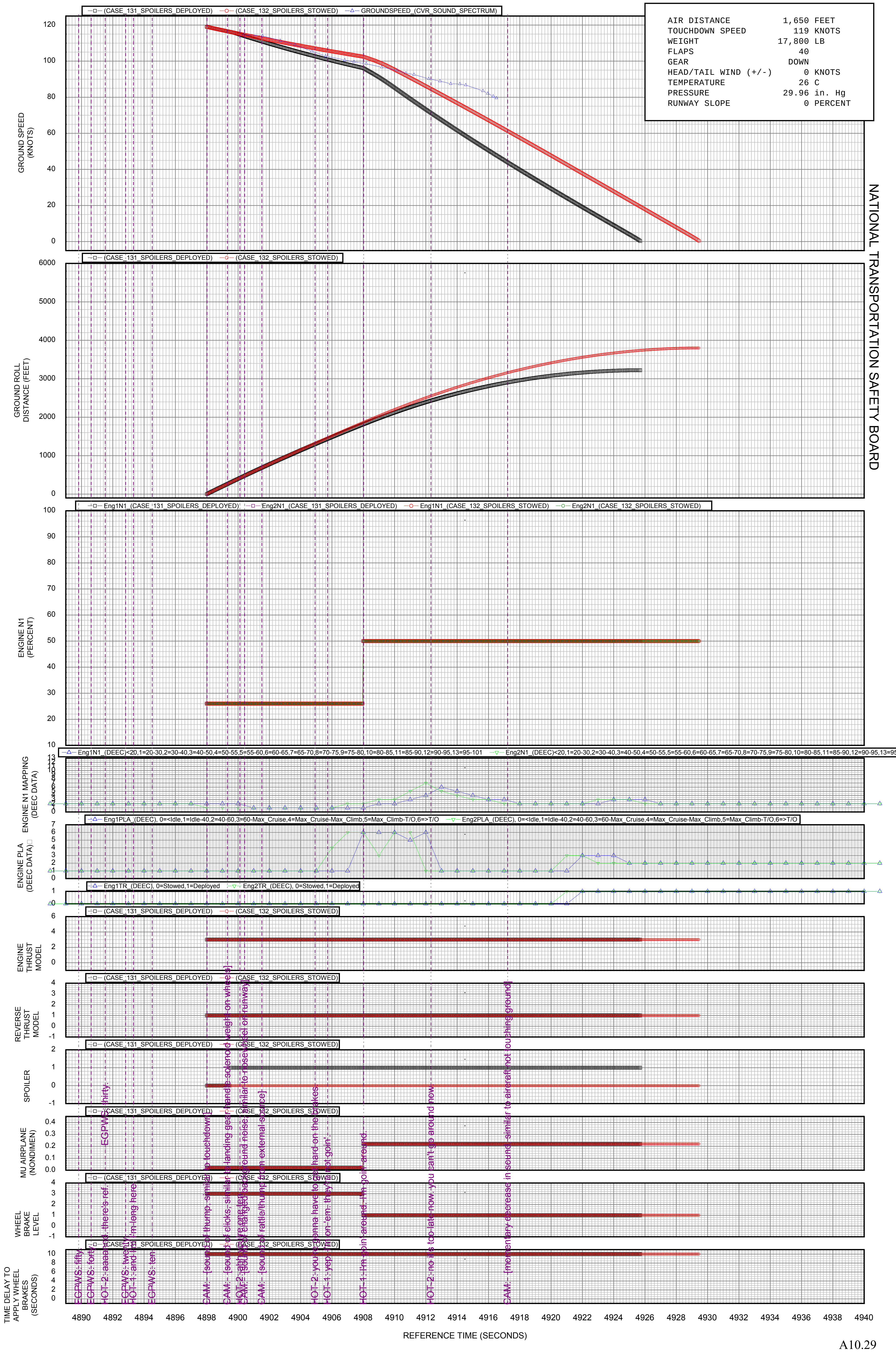
NATIONAL TRANSPORTATION SAFETY BOARD

HENDRICK MOTORSPORTS GULFSTREAM G150 (N480JJ), [SIMULATION DATA, CASES 121-122, MAXIMUM MANUAL WHEEL BRAKING]
DRY RUNWAY LANDING OVERRUN, KEY WEST, FLORIDA; OCTOBER 31, 2011 [EMERGENCY REVERSE THRUST, ENGINE N1=50 PERCENT TO 0 KNOTS GROUND SPEED]



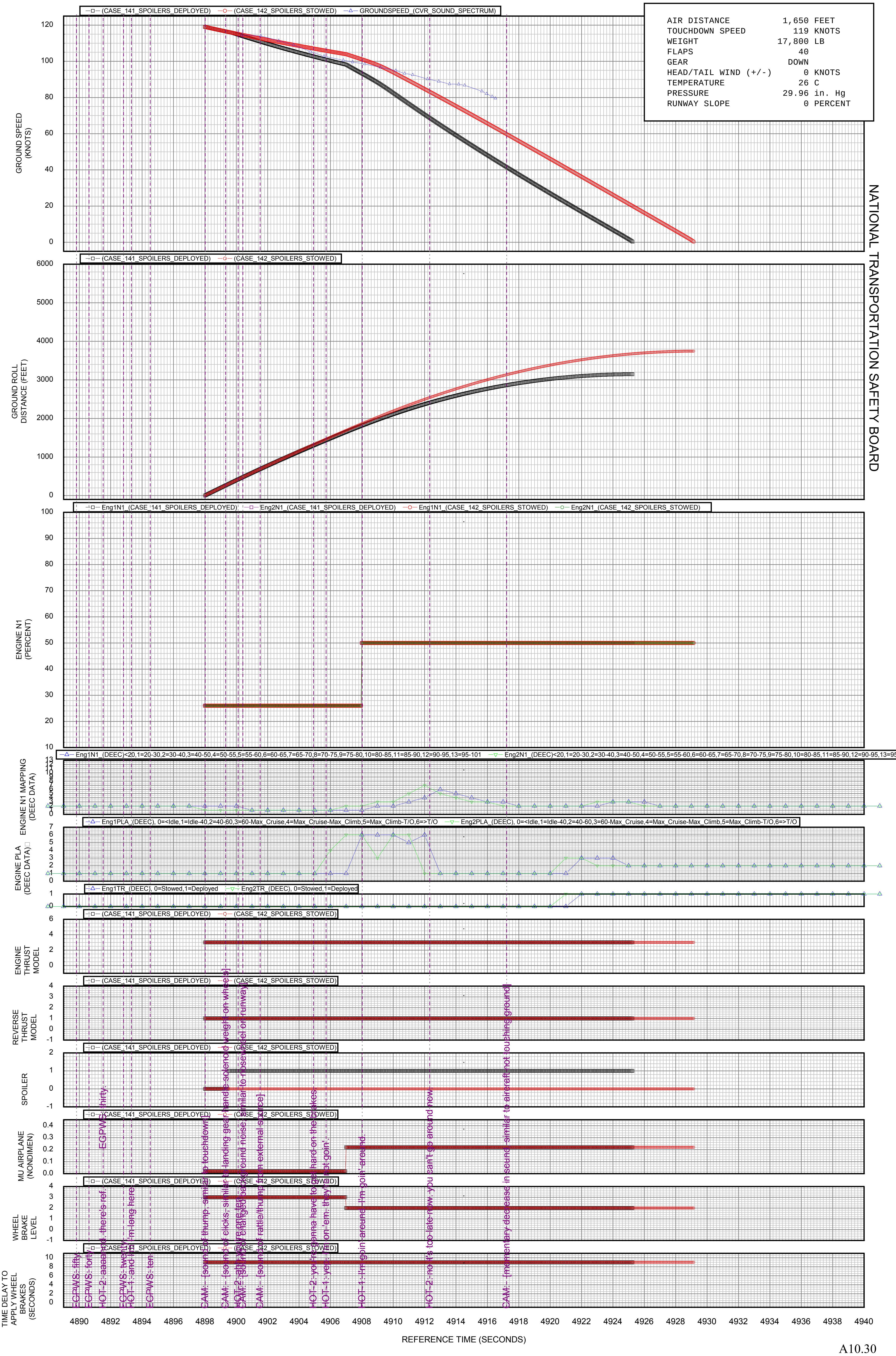
(CASE_121_SPOILERS_DEPLOYED)
(CASE_122_SPOILERS_STOWED)
GROUNDSPEED_(CVR_SOUND_SPECTRUM)
AIR DISTANCE 1,650 FEET
TOUCHDOWN SPEED 119 KNOTS
WEIGHT 17,800 LB
FLAPS 40
GEAR DOWN
HEAD/TAIL WIND (+/-) 0 KNOTS
TEMPERATURE 26 C
PRESSURE 29.96 in. Hg
RUNWAY SLOPE 0 PERCENT
GROUND SPEED (KNOTS)
GROUND ROLL DISTANCE (FEET)
Eng1N1_(CASE_121_SPOILERS_DEPLOYED)
Eng2N1_(CASE_121_SPOILERS_DEPLOYED)
Eng1N1_(CASE_122_SPOILERS_STOWED)
Eng2N1_(CASE_122_SPOILERS_STOWED)
ENGINE N1 (PERCENT)
Eng1N1_(DEEC)<20,1=20-30,2=30-40,3=40-50,4=50-55,5=55-60,6=60-65,7=65-70,8=70-75,9=75-80,10=80-85,11=85-90,12=90-95,13=95-101
Eng2N1_(DEEC)<20,1=20-30,2=30-40,3=40-50,4=50-55,5=55-60,6=60-65,7=65-70,8=70-75,9=75-80,10=80-85,11=85-90,12=90-95,13=95-1
ENGINE N1 MAPPING (DEEC DATA)
Eng1PLA_(DEEC), 0=<Idle,1=Idle-40,2=40-60,3=60-Max_Cruise,4=Max_Cruise-Max_Climb,5=Max_Climb-T/O,6=>T/O
Eng2PLA_(DEEC), 0=<Idle,1=Idle-40,2=40-60,3=60-Max_Cruise,4=Max_Cruise-Max_Climb,5=Max_Climb-T/O,6=>T/O
ENGINE PLA (DEEC DATA)
Eng1TR_(DEEC), 0=Stowed,1=Deployed
Eng2TR_(DEEC), 0=Stowed,1=Deployed
ENGINE THRUST MODEL
REVERSE THRUST MODEL
SPOILER
MU AIRPLANE (NONDIMEN)
WHEEL BRAKE LEVEL
TIME DELAY TO APPLY WHEEL BRAKES (SECONDS)
EGPWS: fifty.
EGPWS: forty.
HOT-2: aaaand. there's ref.
EGPWS: thirty.
EGPWS: twenty.
HOT-1: and I'm long here.
EGPWS: ten.
CAM: [sound of thump, similar to touchdown]
CAM: [sound of clicks, similar to landing gear handle solenoid weight on wheels]
HOT-2: ahh you're one ten.
CAM: [sound of changed background noise, similar to nosewheel on runway]
CAM: [sound of rattle/thump from external source]
HOT-2: you're gonna have to get hard on the brakes.
HOT-1: yep. I'm on 'em. they're not goin'.
HOT-1: I'm goin' around. I'm goin' around.
HOT-2: no it's too late now. you can't go around now.
CAM: [momentary decrease in sound, similar to aircraft not touching ground]
4890 4892 4894 4896 4898 4900 4902 4904 4906 4908 4910 4912 4914 4916 4918 4920 4922 4924 4926 4928 4930 4932 4934 4936 4938 4940
REFERENCE TIME (SECONDS)
NATIONAL TRANSPORTATION SAFETY BOARD

HENDRICK MOTORSPORTS GULFSTREAM G150 (N480JJ), [SIMULATION DATA, CASES 131-132, ANTI-SKID INOPERATIVE WHEEL BRAKING]
DRY RUNWAY LANDING OVERRUN, KEY WEST, FLORIDA; OCTOBER 31, 2011 [EMERGENCY REVERSE THRUST, ENGINE N1=50 PERCENT TO 0 KNOTS GROUND SPEED]



AIR DISTANCE 1,650 FEET
TOUCHDOWN SPEED 119 KNOTS
WEIGHT 17,800 LB
FLAPS 40
GEAR DOWN
HEAD/TAIL WIND (+/-) 0 KNOTS
TEMPERATURE 26 C
PRESSURE 29.96 in. Hg
RUNWAY SLOPE 0 PERCENT
NATIONAL TRANSPORTATION SAFETY BOARD
(CASE_131_SPOILERS_DEPLOYED)
(CASE_132_SPOILERS_STOWED)
GROUNDSPEED_(CVR_SOUND_SPECTRUM)
GROUND SPEED (KNOTS)
GROUND ROLL DISTANCE (FEET)
Eng1N1_(CASE_131_SPOILERS_DEPLOYED)
Eng2N1_(CASE_131_SPOILERS_DEPLOYED)
Eng1N1_(CASE_132_SPOILERS_STOWED)
Eng2N1_(CASE_132_SPOILERS_STOWED)
ENGINE N1 (PERCENT)
Eng1N1_(DEEC)<20,1=20-30,2=30-40,3=40-50,4=50-55,5=55-60,6=60-65,7=65-70,8=70-75,9=75-80,10=80-85,11=85-90,12=90-95,13=95-101
Eng2N1_(DEEC)<20,1=20-30,2=30-40,3=40-50,4=50-55,5=55-60,6=60-65,7=65-70,8=70-75,9=75-80,10=80-85,11=85-90,12=90-95,13=95-1
ENGINE N1 MAPPING (DEEC DATA)
Eng1PLA_(DEEC), 0=<Idle,1=Idle-40,2=40-60,3=60-Max_Cruise,4=Max_Cruise-Max_Climb,5=Max_Climb-T/O,6=>T/O
Eng2PLA_(DEEC), 0=<Idle,1=Idle-40,2=40-60,3=60-Max_Cruise,4=Max_Cruise-Max_Climb,5=Max_Climb-T/O,6=>T/O
ENGINE PLA (DEEC DATA)
Eng1TR_(DEEC), 0=Stowed,1=Deployed
Eng2TR_(DEEC), 0=Stowed,1=Deployed
ENGINE THRUST MODEL
REVERSE THRUST MODEL
SPOILER
MU AIRPLANE (NONDIMEN)
WHEEL BRAKE LEVEL
TIME DELAY TO APPLY WHEEL BRAKES (SECONDS)
EGPWS: fifty.
EGPWS: forty.
EGPWS: thirty.
HOT-2: aaaand. there's ref.
EGPWS: twenty.
HOT-1: and I'm long here.
EGPWS: ten.
CAM: [sound of thump, similar to touchdown]
CAM: [sound of clicks, similar to landing gear handle solenoid weight on wheels]
HOT-2: ahh you're one ten.
CAM: [sound of changed background noise, similar to nosewheel on runway]
CAM: [sound of rattle/thump from external source]
HOT-2: you're gonna have to get hard on the brakes.
HOT-1: yep I'm on 'em. they're not goin'.
HOT-1: I'm goin' around. I'm goin' around.
HOT-2: no it's too late now. you can't go around now.
CAM: [momentary decrease in sound, similar to aircraft not touching ground]
REFERENCE TIME (SECONDS)

HENDRICK MOTORSPORTS GULFSTREAM G150 (N480JJ), [SIMULATION DATA, CASES 141-142, EMERGENCY WHEEL BRAKING]
DRY RUNWAY LANDING OVERRUN, KEY WEST, FLORIDA; OCTOBER 31, 2011 [EMERGENCY REVERSE THRUST, ENGINE N1=50 PERCENT TO 0 KNOTS GROUND SPEED]



(CASE_141_SPOILERS_DEPLOYED)
(CASE_142_SPOILERS_STOWED)
GROUNDSPEED_(CVR_SOUND_SPECTRUM)
AIR DISTANCE 1,650 FEET
TOUCHDOWN SPEED 119 KNOTS
WEIGHT 17,800 LB
FLAPS 40
GEAR DOWN
HEAD/TAIL WIND (+/-) 0 KNOTS
TEMPERATURE 26 C
PRESSURE 29.96 in. Hg
RUNWAY SLOPE 0 PERCENT
GROUND SPEED (KNOTS)
GROUND ROLL DISTANCE (FEET)
Eng1N1_(CASE_141_SPOILERS_DEPLOYED)
Eng2N1_(CASE_141_SPOILERS_DEPLOYED)
Eng1N1_(CASE_142_SPOILERS_STOWED)
Eng2N1_(CASE_142_SPOILERS_STOWED)
ENGINE N1 (PERCENT)
Eng1N1_(DEEC)<20,1=20-30,2=30-40,3=40-50,4=50-55,5=55-60,6=60-65,7=65-70,8=70-75,9=75-80,10=80-85,11=85-90,12=90-95,13=95-101
Eng2N1_(DEEC)<20,1=20-30,2=30-40,3=40-50,4=50-55,5=55-60,6=60-65,7=65-70,8=70-75,9=75-80,10=80-85,11=85-90,12=90-95,13=95-101
ENGINE N1 MAPPING (DEEC DATA)
Eng1PLA_(DEEC), 0=<Idle,1=Idle-40,2=40-60,3=60-Max_Cruise,4=Max_Cruise-Max_Climb,5=Max_Climb-T/O,6=>T/O
Eng2PLA_(DEEC), 0=<Idle,1=Idle-40,2=40-60,3=60-Max_Cruise,4=Max_Cruise-Max_Climb,5=Max_Climb-T/O,6=>T/O
ENGINE PLA (DEEC DATA)
Eng1TR_(DEEC), 0=Stowed,1=Deployed
Eng2TR_(DEEC), 0=Stowed,1=Deployed
ENGINE THRUST MODEL
REVERSE THRUST MODEL
SPOILER
MU AIRPLANE (NONDIMEN)
WHEEL BRAKE LEVEL
TIME DELAY TO APPLY WHEEL BRAKES (SECONDS)
EGPWS: fifty.
EGPWS: forty.
HOT-2: aaaand. there's ref.
EGPWS: thirty.
EGPWS: twenty.
HOT-1: and I'm long here.
EGPWS: ten.
CAM: [sound of thump, similar to touchdown]
CAM: [sound of clicks, similar to landing gear handle solenoid weight on wheels]
HOT-2: ah you're one ten.
CAM: [sound of changed background noise, similar to nosewheel on runway]
CAM: [sound of rattle/thump from external source]
HOT-2: you're gonna have to get hard on the brakes.
HOT-1: yep. I'm on 'em. they're not goin'.
HOT-1: I'm goin' around. I'm goin' around.
HOT-2: no it's too late now. you can't go around now.
CAM: [momentary decrease in sound, similar to aircraft not touching ground]
REFERENCE TIME (SECONDS)
NATIONAL TRANSPORTATION SAFETY BOARD

HENDRICK MOTORSPORTS GULFSTREAM G150 (N480JJ), [SIMULATION DATA, CASES 151-152, NO WHEEL BRAKING]

DRY RUNWAY LANDING OVERRUN, KEY WEST, FLORIDA; OCTOBER 31, 2011 [EMERGENCY REVERSE THRUST, ENGINE N1=50 PERCENT TO 0 KNOTS GROUND SPEED]

AIR DISTANCE	1,650 FEET
TOUCHDOWN SPEED	119 KNOTS
WEIGHT	17,800 LB
FLAPS	40
GEAR	DOWN
HEAD/TAIL WIND (+/-)	0 KNOTS
TEMPERATURE	26 C
PRESSURE	29.96 in. Hg
RUNWAY SLOPE	0 PERCENT

GROUND SPEED (KNOTS)

GROUND ROLL DISTANCE (FEET)

ENGINE N1 (PERCENT)

ENGINE N1 MAPPING (DEEC DATA)

ENGINE PLA (DEEC DATA)

ENGINE THRUST MODEL

REVERSE THRUST MODEL

SPOILER

MU AIRPLANE (NONDIMEN)

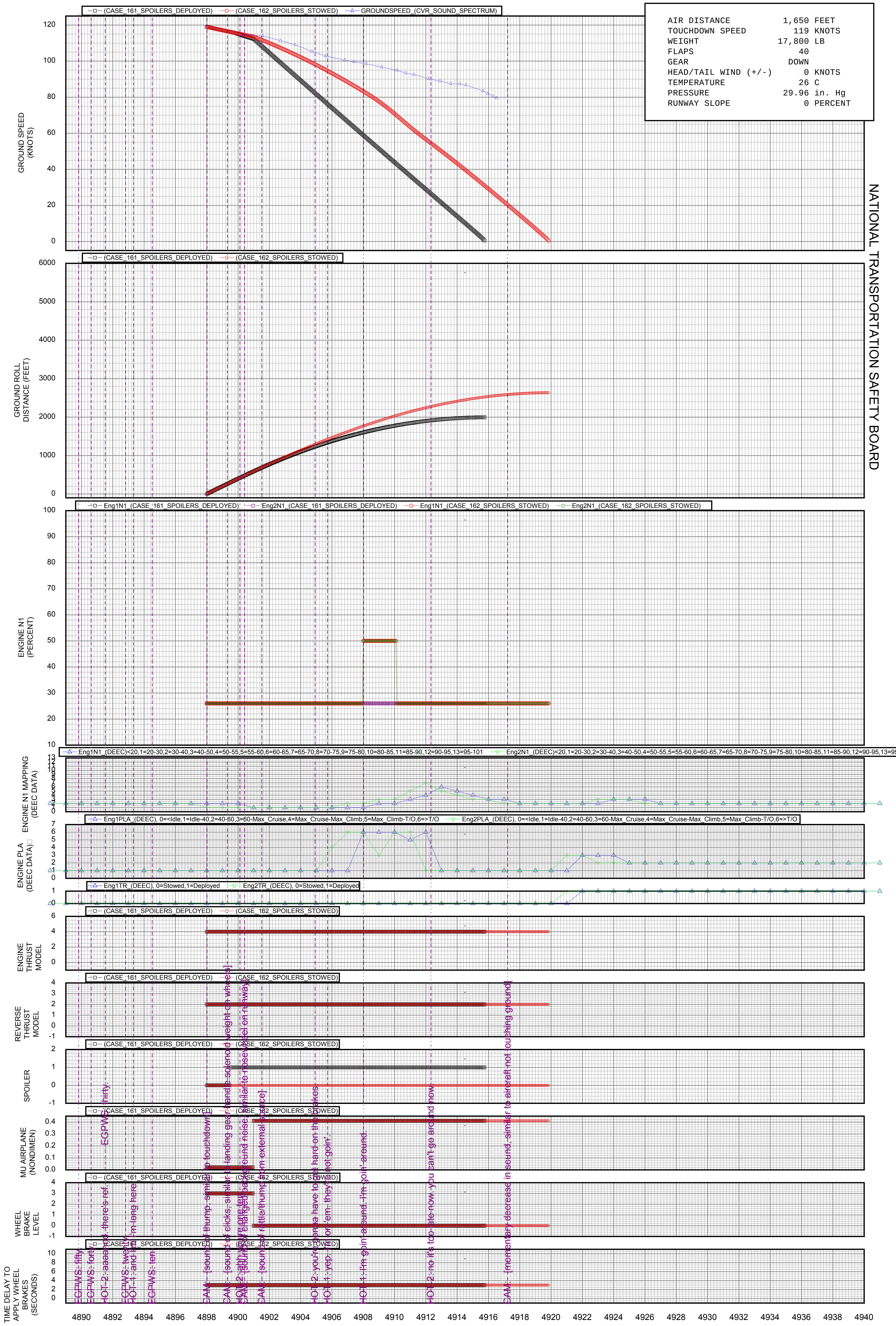
WHEEL BRAKE LEVEL

TIME DELAY TO APPLY WHEEL BRAKES (SECONDS)

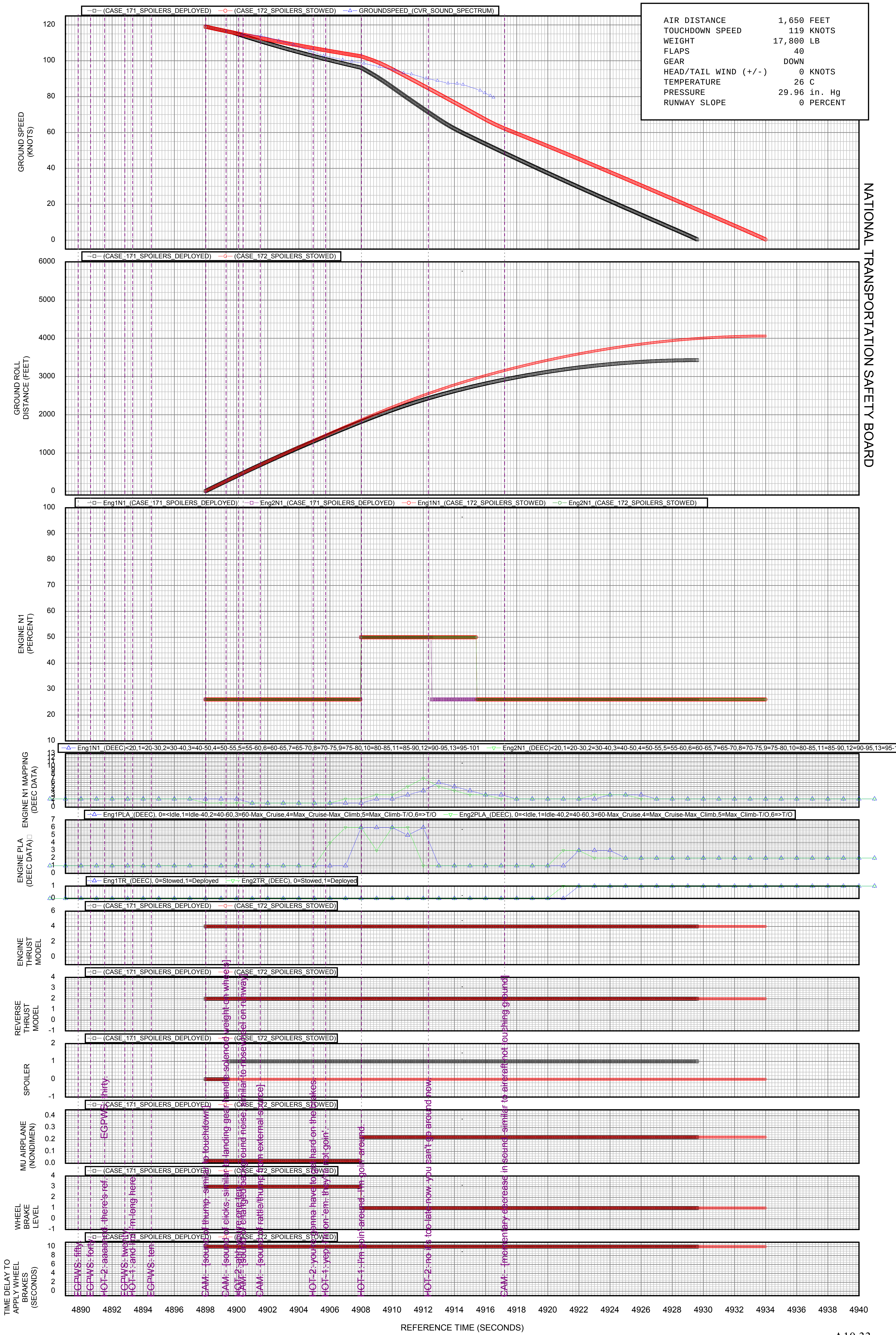
REFERENCE TIME (SECONDS)

NATIONAL TRANSPORTATION SAFETY BOARD

HENDRICK MOTORSPORTS GULFSTREAM G150 (N480JJ), [SIMULATION DATA, CASES 161-162, MAXIMUM MANUAL WHEEL BRAKING]
DRY RUNWAY LANDING OVERRUN, KEY WEST, FLORIDA; OCTOBER 31, 2011 [NOMINAL REVERSE THRUST, ENGINE N1=50 PERCENT TO 70 KNOTS GROUND SPEED]

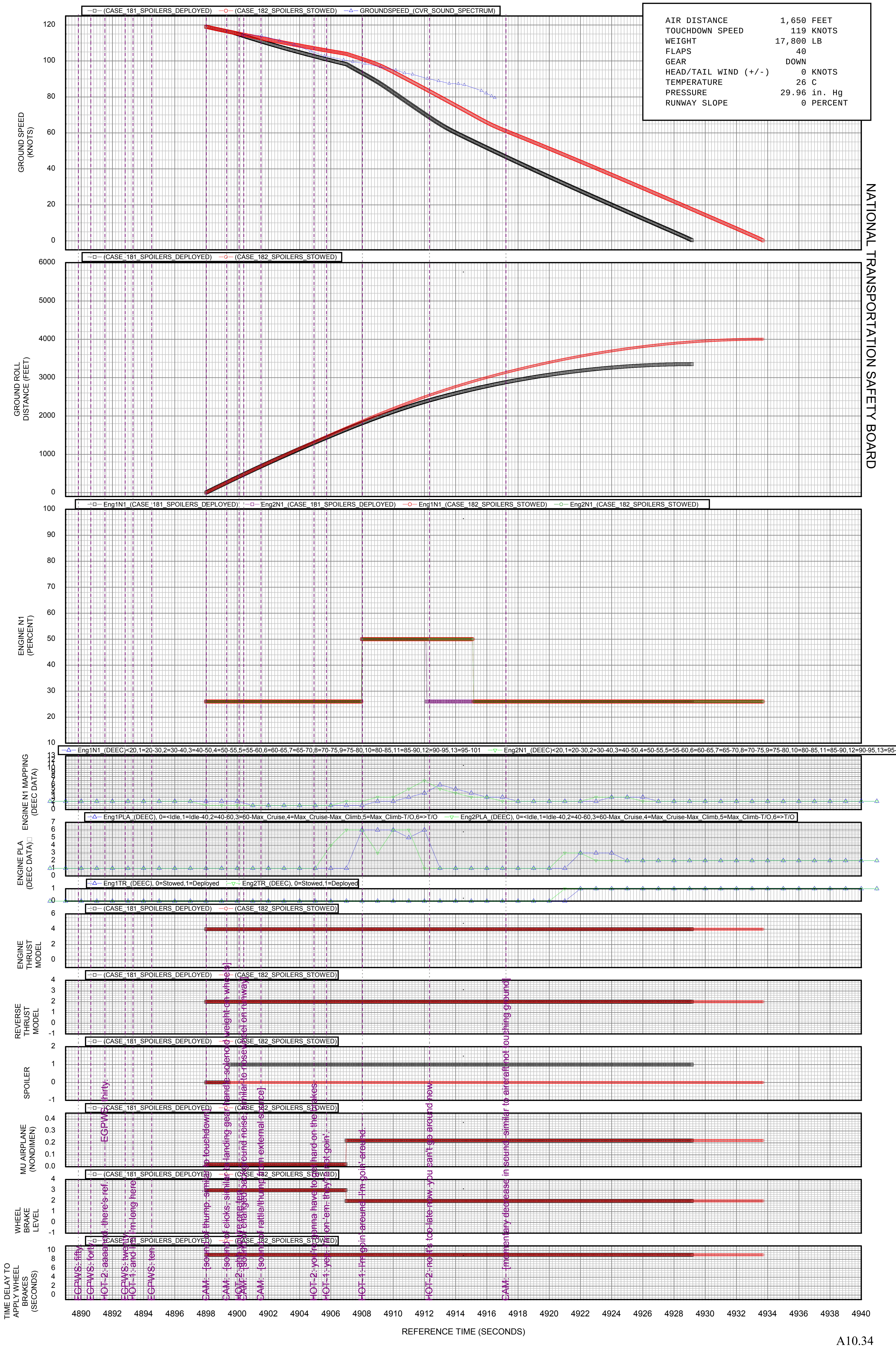


HENDRICK MOTORSPORTS GULFSTREAM G150 (N480JJ), [SIMULATION DATA, CASES 171-172, ANTI-SKID INOPERATIVE WHEEL BRAKING]
DRY RUNWAY LANDING OVERRUN, KEY WEST, FLORIDA; OCTOBER 31, 2011 [NOMINAL REVERSE THRUST, ENGINE N1=50 PERCENT TO 70 KNOTS GROUND SPEED]



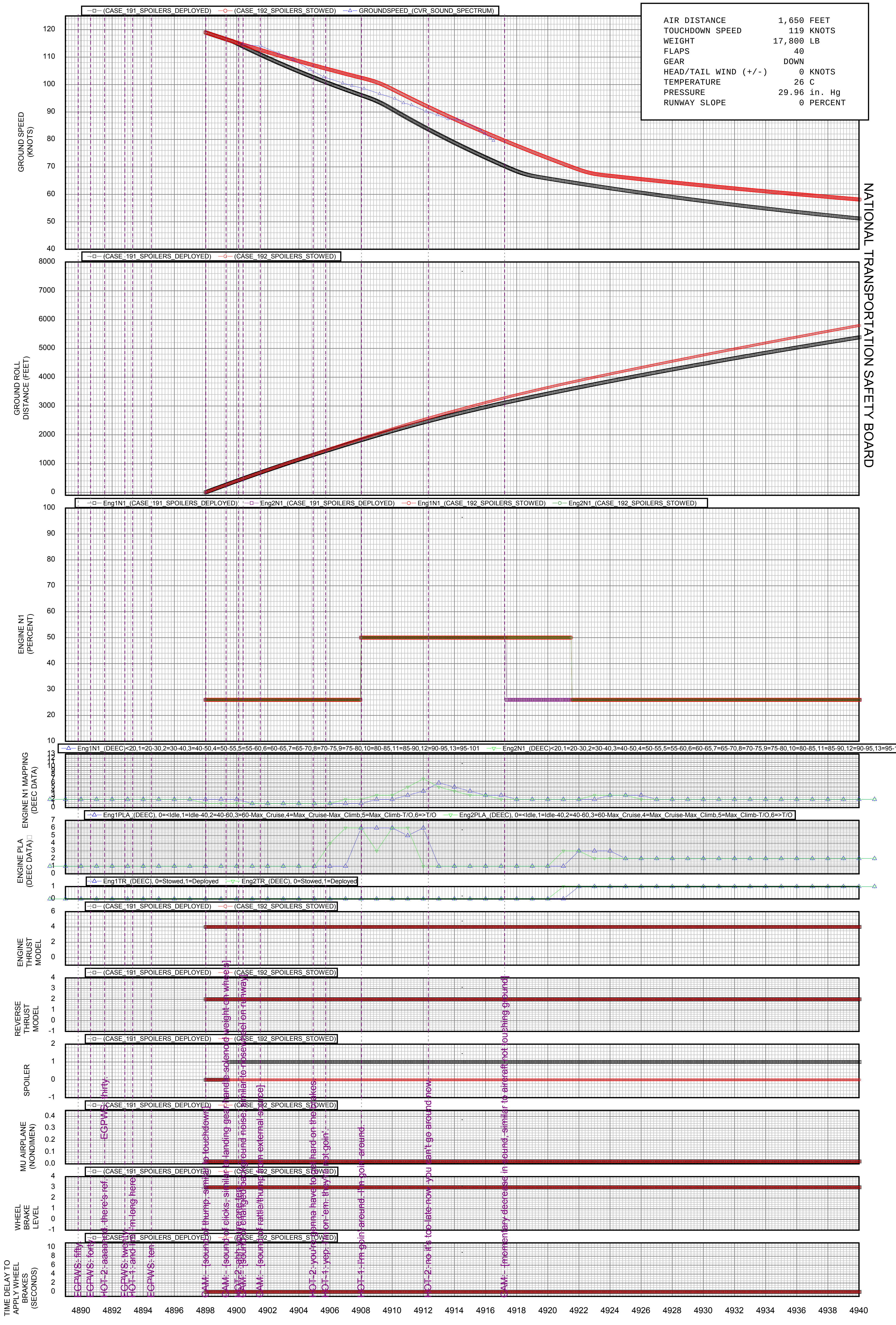
(CASE_171_SPOILERS_DEPLOYED)
(CASE_172_SPOILERS_STOWED)
GROUNDSPEED_(CVR_SOUND_SPECTRUM)
GROUND SPEED (KNOTS)
AIR DISTANCE 1,650 FEET
TOUCHDOWN SPEED 119 KNOTS
WEIGHT 17,800 LB
FLAPS 40
GEAR DOWN
HEAD/TAIL WIND (+/-) 0 KNOTS
TEMPERATURE 26 C
PRESSURE 29.96 in. Hg
RUNWAY SLOPE 0 PERCENT
GROUND ROLL DISTANCE (FEET)
Eng1N1_(CASE_171_SPOILERS_DEPLOYED)
Eng2N1_(CASE_171_SPOILERS_DEPLOYED)
Eng1N1_(CASE_172_SPOILERS_STOWED)
Eng2N1_(CASE_172_SPOILERS_STOWED)
ENGINE N1 (PERCENT)
Eng1N1_(DEEC)<20,1=20-30,2=30-40,3=40-50,4=50-55,5=55-60,6=60-65,7=65-70,8=70-75,9=75-80,10=80-85,11=85-90,12=90-95,13=95-101
Eng2N1_(DEEC)<20,1=20-30,2=30-40,3=40-50,4=50-55,5=55-60,6=60-65,7=65-70,8=70-75,9=75-80,10=80-85,11=85-90,12=90-95,13=95-1
ENGINE N1 MAPPING (DEEC DATA)
Eng1PLA_(DEEC), 0=<Idle,1=Idle-40,2=40-60,3=60-Max_Cruise,4=Max_Cruise-Max_Climb,5=Max_Climb-T/O,6=>T/O
Eng2PLA_(DEEC), 0=<Idle,1=Idle-40,2=40-60,3=60-Max_Cruise,4=Max_Cruise-Max_Climb,5=Max_Climb-T/O,6=>T/O
ENGINE PLA (DEEC DATA)
Eng1TR_(DEEC), 0=Stowed,1=Deployed
Eng2TR_(DEEC), 0=Stowed,1=Deployed
ENGINE THRUST MODEL
REVERSE THRUST MODEL
SPOILER
MU AIRPLANE (NONDIMEN)
WHEEL BRAKE LEVEL
TIME DELAY TO APPLY WHEEL BRAKES (SECONDS)
EGPWS: fifty.
EGPWS: forty.
HOT-2: aaaand. there's ref.
EGPWS: thirty.
EGPWS: twenty.
HOT-1: and I'm I'm long here.
EGPWS: ten.
CAM: [sound of thump, similar to touchdown]
CAM: [sound of clicks, similar to landing gear handle solenoid weight on wheels]
HOT-2: ahh you're one ten.
CAM: [sound of changed background noise, similar to nosewheel on runway]
CAM: [sound of rattle/thump from external source]
HOT-2: you're gonna have to get hard on the brakes.
HOT-1: yep I'm on 'em. they're not goin'.
HOT-1: I'm goin' around. I'm goin' around.
HOT-2: no it's too late now. you can't go around now.
CAM: [momentary decrease in sound, similar to aircraft not touching ground]
REFERENCE TIME (SECONDS)
NATIONAL TRANSPORTATION SAFETY BOARD

HENDRICK MOTORSPORTS GULFSTREAM G150 (N480JJ), [SIMULATION DATA, CASES 181-182, EMERGENCY WHEEL BRAKING]
DRY RUNWAY LANDING OVERRUN, KEY WEST, FLORIDA; OCTOBER 31, 2011 [NOMINAL REVERSE THRUST, ENGINE N1=50 PERCENT TO 70 KNOTS GROUND SPEED]

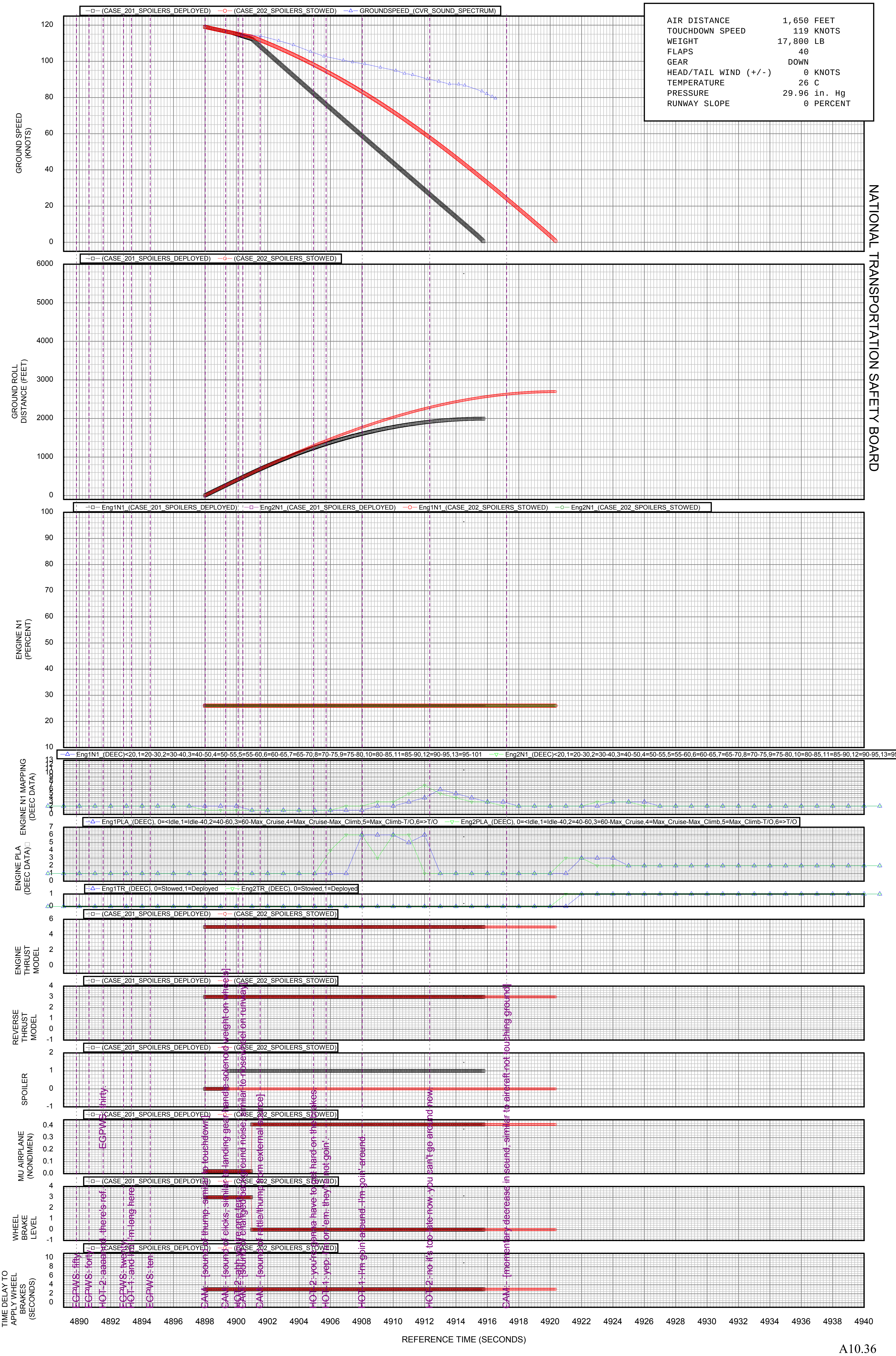


HENDRICK MOTORSPORTS GULFSTREAM G150 (N480JJ), [SIMULATION DATA, CASES 191-192, NO WHEEL BRAKING]

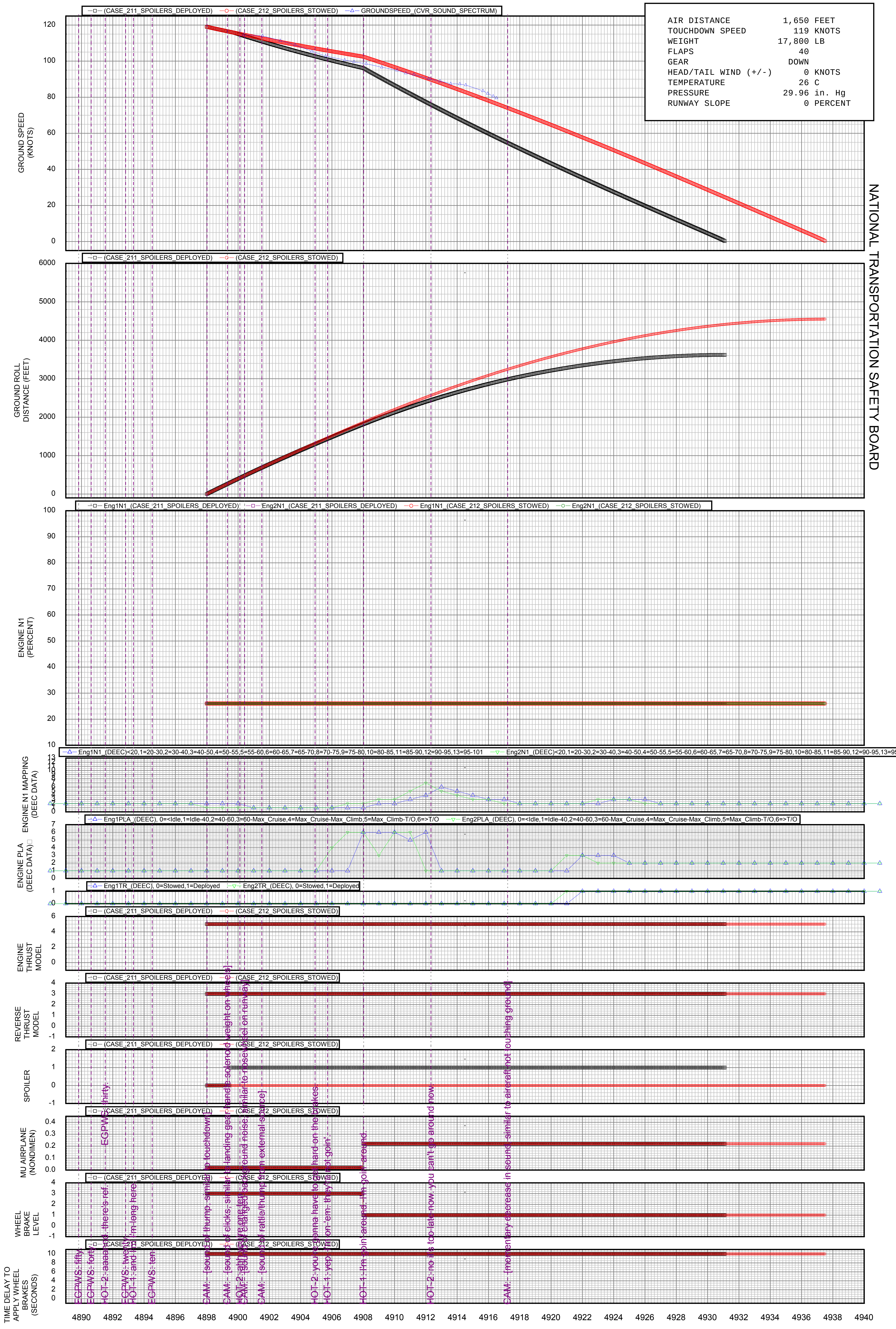
DRY RUNWAY LANDING OVERRUN, KEY WEST, FLORIDA; OCTOBER 31, 2011 [NOMINAL REVERSE THRUST, ENGINE N1=50 PERCENT TO 70 KNOTS GROUND SPEED]



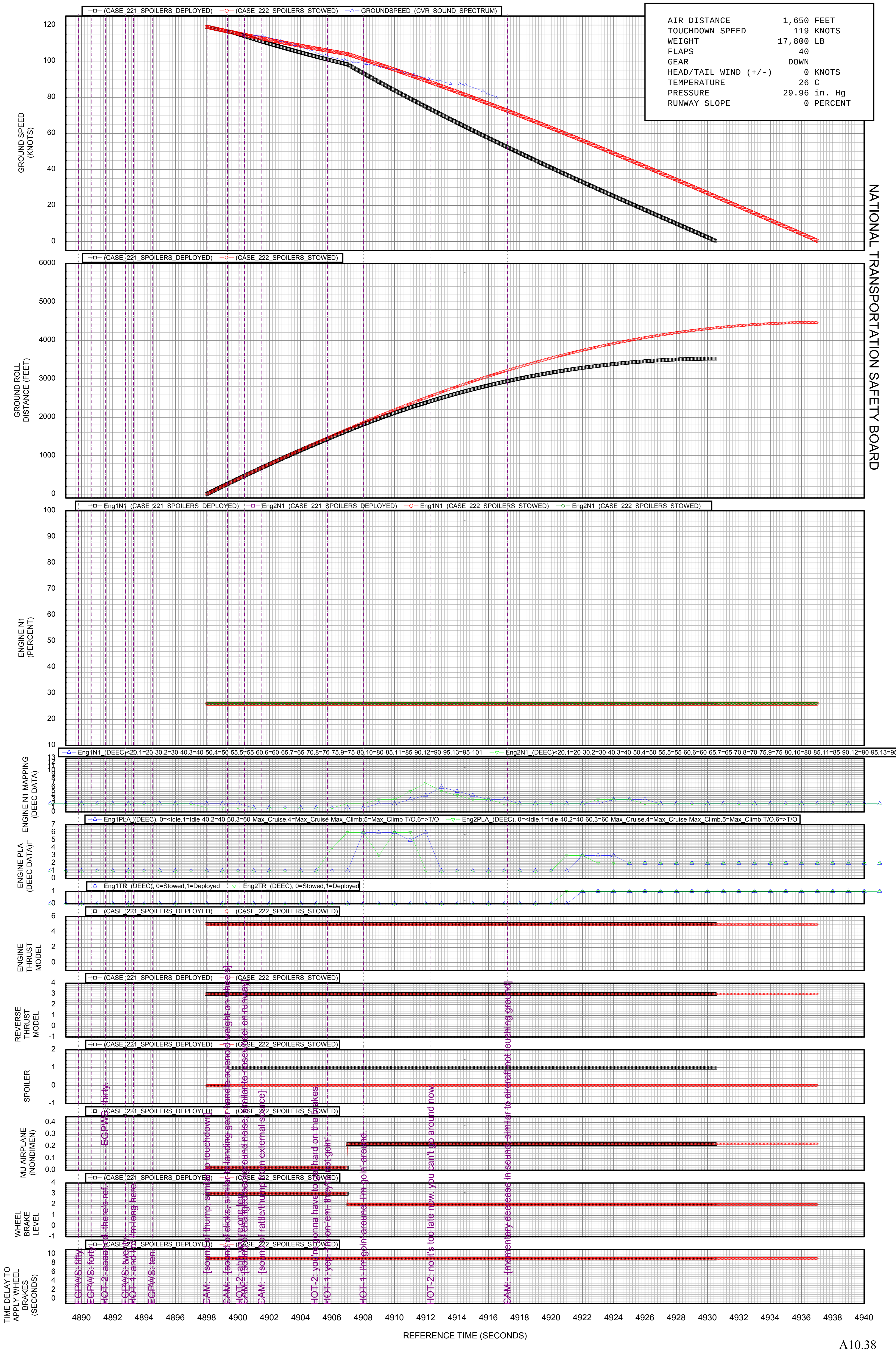
HENDRICK MOTORSPORTS GULFSTREAM G150 (N480JJ), [SIMULATION DATA, CASES 201-202, MAXIMUM MANUAL WHEEL BRAKING]
DRY RUNWAY LANDING OVERRUN, KEY WEST, FLORIDA; OCTOBER 31, 2011 [NO REVERSE THRUST, ENGINE N1 AT FLIGHT/GROUND IDLE]



HENDRICK MOTORSPORTS GULFSTREAM G150 (N480JJ), [SIMULATION DATA, CASES 211-212, ANTI-SKID INOPERATIVE WHEEL BRAKING]
DRY RUNWAY LANDING OVERRUN, KEY WEST, FLORIDA; OCTOBER 31, 2011 [NO REVERSE THRUST, ENGINE N1 AT FLIGHT/GROUND IDLE]



HENDRICK MOTORSPORTS GULFSTREAM G150 (N480JJ), [SIMULATION DATA, CASES 221-222, EMERGENCY WHEEL BRAKING]
DRY RUNWAY LANDING OVERRUN, KEY WEST, FLORIDA; OCTOBER 31, 2011 [NO REVERSE THRUST, ENGINE N1 AT FLIGHT/GROUND IDLE]



HENDRICK MOTORSPORTS GULFSTREAM G150 (N480JJ), [SIMULATION DATA, CASES 231-232, NO WHEEL BRAKING]

DRY RUNWAY LANDING OVERRUN, KEY WEST, FLORIDA; OCTOBER 31, 2011 [NO REVERSE THRUST, ENGINE N1 AT FLIGHT/GROUND IDLE]

AIR DISTANCE	1,650 FEET
TOUCHDOWN SPEED	119 KNOTS
WEIGHT	17,800 LB
FLAPS	40
GEAR	DOWN
HEAD/TAIL WIND (+/-)	0 KNOTS
TEMPERATURE	26 C
PRESSURE	29.96 in. Hg
RUNWAY SLOPE	0 PERCENT

(CASE_231_SPOILERS_DEPLOYED) (CASE_232_SPOILERS_STOWED) GROUNDSPEED_(CVR_SOUND_SPECTRUM)

GROUND SPEED (KNOTS)

(CASE_231_SPOILERS_DEPLOYED) (CASE_232_SPOILERS_STOWED)

GROUND ROLL DISTANCE (FEET)

Eng1N1_(CASE_231_SPOILERS_DEPLOYED) Eng2N1_(CASE_231_SPOILERS_DEPLOYED) Eng1N1_(CASE_232_SPOILERS_STOWED) Eng2N1_(CASE_232_SPOILERS_STOWED)

ENGINE N1 (PERCENT)

Eng1N1_(DEEC)<20,1=20-30,2=30-40,3=40-50,4=50-55,5=55-60,6=60-65,7=65-70,8=70-75,9=75-80,10=80-85,11=85-90,12=90-95,13=95-101 Eng2N1_(DEEC)<20,1=20-30,2=30-40,3=40-50,4=50-55,5=55-60,6=60-65,7=65-70,8=70-75,9=75-80,10=80-85,11=85-90,12=90-95,13=95-1

ENGINE N1 MAPPING (DEEC DATA)

Eng1PLA_(DEEC), 0=<Idle,1=Idle-40,2=40-60,3=60-Max_Cruise,4=Max_Cruise-Max_Climb,5=Max_Climb-T/O,6=>T/O Eng2PLA_(DEEC), 0=<Idle,1=Idle-40,2=40-60,3=60-Max_Cruise,4=Max_Cruise-Max_Climb,5=Max_Climb-T/O,6=>T/O

ENGINE PLA (DEEC DATA)

Eng1TR_(DEEC), 0=Stowed,1=Deployed Eng2TR_(DEEC), 0=Stowed,1=Deployed

(CASE_231_SPOILERS_DEPLOYED) (CASE_232_SPOILERS_STOWED)

ENGINE THRUST MODEL

(CASE_231_SPOILERS_DEPLOYED) (CASE_232_SPOILERS_STOWED)

REVERSE THRUST MODEL

(CASE_231_SPOILERS_DEPLOYED) (CASE_232_SPOILERS_STOWED)

SPOILER

(CASE_231_SPOILERS_DEPLOYED) (CASE_232_SPOILERS_STOWED)

MU AIRPLANE (NONDIMEN)

(CASE_231_SPOILERS_DEPLOYED) (CASE_232_SPOILERS_STOWED)

WHEEL BRAKE LEVEL

(CASE_231_SPOILERS_DEPLOYED) (CASE_232_SPOILERS_STOWED)

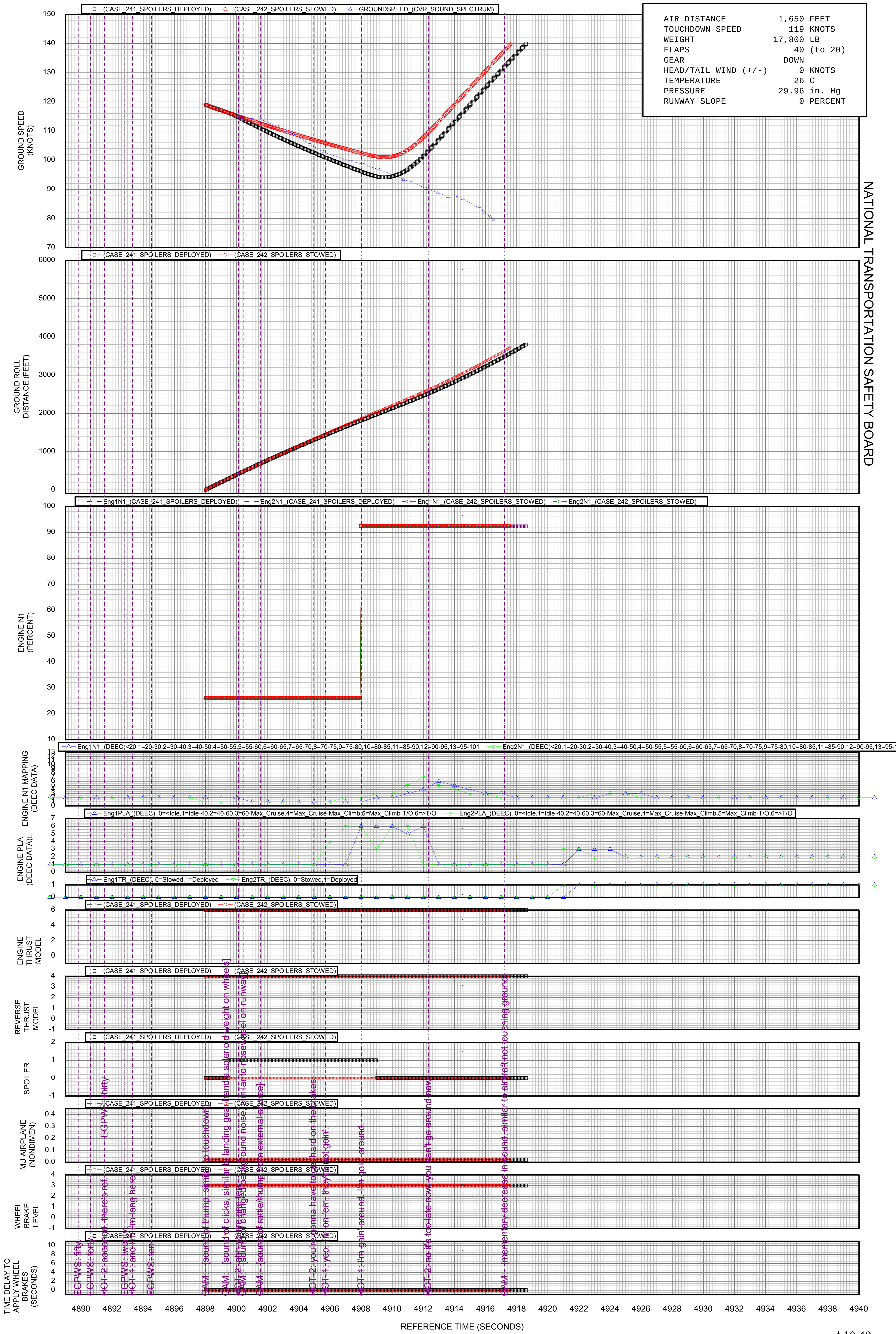
TIME DELAY TO APPLY WHEEL BRAKES (SECONDS)

EGPWS: fifty.
EGPWS: forty.
FOT-2: aaaaand, there's ref.
EGPWS: thirty.
EGPWS: twenty.
FOT-1: and I'm long here.
EGPWS: ten.
CAM-1: [sound of thump, similar to touchdown]
CAM-2: [sound of clicks, similar to landing gear handle selected weight on wheels]
CAM-1: [sound of engine acceleration]
CAM-2: [sound of engine acceleration]
CAM-1: [sound of rattle/thump, similar to external sound]
FOT-2: you're gonna have to get hard on the brakes.
FOT-1: yep. I'm on 'em. they're not goin'.
FOT-1: I'm goin' around. I'm goin' around.
FOT-2: no it's too late now. you can't go around now.
CAM-1: [momentary decrease in sound, similar to aircraft not touching ground]

REFERENCE TIME (SECONDS)

NATIONAL TRANSPORTATION SAFETY BOARD

HENDRICK MOTORSPORTS GULFSTREAM G150 (N480JJ), [SIMULATION DATA, CASES 241-242, NO WHEEL BRAKING, FLAPS 20 TAKEOFF]
DRY RUNWAY LANDING OVERRUN, KEY WEST, FLORIDA; OCTOBER 31, 2011 [NO REVERSE THRUST, ENGINE N1 AT FLIGHT/GROUND IDLE]



HENDRICK MOTORSPORTS GULFSTREAM G150 (N480JJ), [SIMULATION DATA, CASES 251-252, NO WHEEL BRAKING, FLAPS 40 TAKEOFF]

DRY RUNWAY LANDING OVERRUN, KEY WEST, FLORIDA; OCTOBER 31, 2011 [NO REVERSE THRUST, ENGINE N1 AT FLIGHT/GROUND IDLE]

AIR DISTANCE	1,650 FEET
TOUCHDOWN SPEED	119 KNOTS
WEIGHT	17,800 LB
FLAPS	40
GEAR	DOWN
HEAD/TAIL WIND (+/-)	0 KNOTS
TEMPERATURE	26 C
PRESSURE	29.96 in. Hg
RUNWAY SLOPE	0 PERCENT

NATIONAL TRANSPORTATION SAFETY BOARD

GROUND SPEED (KNOTS)

GROUND ROLL DISTANCE (FEET)

ENGINE N1 (PERCENT)

ENGINE N1 MAPPING (DEEC DATA)

ENGINE PLA (DEEC DATA)

ENGINE THRUST MODEL

REVERSE THRUST MODEL

SPOILER

MU AIRPLANE (NONDIMEN)

WHEEL BRAKE LEVEL

TIME DELAY TO APPLY WHEEL BRAKES (SECONDS)

REFERENCE TIME (SECONDS)