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Special Crash Investigations: On-Site Steering Malfunction Crash Investigation; Vehicle: 2010 Nissan Versa; Location: Colorado; Crash Date: February 2020

DISCLAIMER

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Each crash represents a unique sequence of events, and generalized conclusions cannot be made concerning the crashworthiness performance of the involved vehicles or their safety systems. This report and associated case data are based on information available to the Special Crash Investigation team on the date this report was published.

16. Abstract

This report documents the on-site investigation of a single-vehicle rollover crash of a 2010 Nissan Versa with a steering malfunction. This crash occurred on a county highway in Colorado in February 2020. The Nissan was driven by a belted 33-year-old female. The Nissan had a steering malfunction while navigating a sweeping right curve. The driver retained enough control of the vehicle to steer to the right as the vehicle crossed the adjacent lane and began a clockwise rotation. The vehicle traveled off the south side of the roadway into a ditch. The vehicle continued the clockwise rotation before tripping and beginning a left-plane-leading rollover. The vehicle appeared to have rolled six quarter-turns and came to rest on its roof. The driver was fatally injured. During the police mechanical inspection of the vehicle they noticed that the steering wheel/shaft was free-spinning and there was damage to the internal splines. The police reported that the damage was not crash related.

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Special Crash Investigations
On-Site Steering Malfunction Crash Investigation
Office of Defects Investigation
Case Number: DS20006
Vehicle: 2010 Nissan Versa
Location: Colorado
Crash Date: February 2020

Background

This report documents the on-site investigation of a single-vehicle rollover crash of a 2010 Nissan Versa with a steering malfunction (Figure 1). The vehicle inspection documented the vehicle damage, the restraint systems, and the steering wheel/column assembly. This investigation was initiated by the Office of Defects Investigation (ODI) group of the National Highway Traffic Safety Administration in response to a police-reported possible steering malfunction. The Special Crash Investigations (SCI) group assigned the case to Dynamic Science, Inc., in March 2020. The inspection was originally scheduled for April 2020 but was rescheduled due to COVID-19 travel restrictions. The vehicle inspection was conducted in November 2020 at a secure storage location. The steering wheel had been removed and placed into evidence by the investigating police agency. The steering wheel was inspected at the police agency and taken into SCI's possession. It has since been shipped to the ODI group for further analysis. A representative from Nissan was present during the inspections. The vehicle was not supported by the Bosch Crash Data Retrieval system. The Nissan representative was able to extract diagnostic data from the vehicle during the inspection. He was not able to extract any crash/pre-crash data during the inspection from the vehicle's Event Data Recorder (EDR) but was able to extract the data from the vehicle during a follow-up visit. The EDR data, provided to SCI, are included as Appendix A at the end of this report.

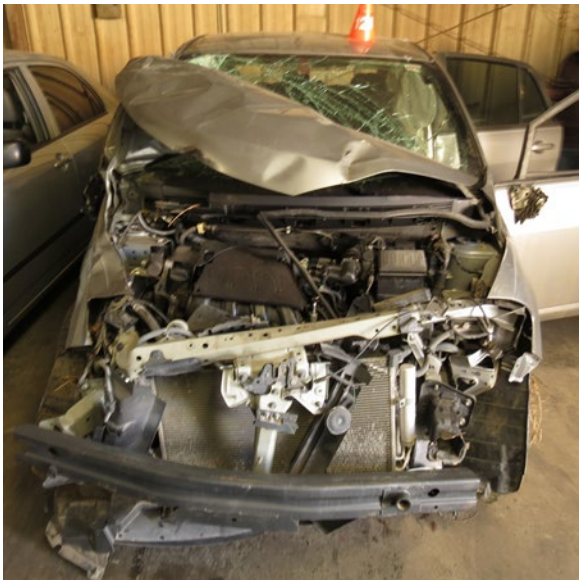


Figure 1. The 2010 Nissan Versa

This crash occurred on a county highway in Colorado in February 2020. The Nissan, driven by a belted 33-year-old female, was traveling on a sweeping right curve at a speed of 89 km/h–105 km/h (55 mph–65 mph).[1] The driver lost control of the vehicle due to a steering malfunction. The driver retained enough control of the vehicle to steer to the right as the vehicle crossed the adjacent lane, rotating clockwise. The vehicle traveled off the south side of the roadway into a ditch. The vehicle continued the clockwise rotation before tripping and beginning a left-plane-leading rollover. The vehicle appeared to have rolled six quarter-turns and came to rest on its roof. The driver was fatally injured. During the mechanical inspection of the vehicle, the police noticed that the steering wheel/shaft spun freely without the front wheels moving and that there was damage to the internal splines. The police reported that the damage was not crash related.

[1] Based on data from the EDR report.

Summary

Crash Site

The crash site was a curved two-lane county highway that transitions from a north/south roadway to an east/west roadway. The curve radius was approximately 277 m (910 ft) near the exit to the east/west roadway (Figure 2). The asphalt roadway was clear and dry. The critical speed of the curve in this area was calculated to be 170 km/h (106 mph). The roadway was level near the area of departure with a superelevation of 1.5 percent. The travel lanes were marked with a solid double yellow centerline and solid white fog lines. The roadway was bordered on the south by a drainage ditch. The ditch was located approximately 3 m (10 ft) south of the roadway and had a grade that varied between 10 and 15 degrees. The posted speed limit was 89 km/h (55 mph). The weather at the nearest reporting station was -5.5 ºC (22 ºF), 92 percent humidity, light winds, and cloudy. A crash diagram is included at the end of this report.

Figure 2. Westbound approach

Pre-Crash

The Nissan, driven by a belted 33-year-old female, was traveling southbound through a right curve transitioning to westbound travel. According to the EDR data, the vehicle was traveling at 103 km/h (64 mph) 7 seconds prior to the crash. The Nissan's pre-crash speeds and distances are shown in the table below.

Time	Vehicle Speed		Distance Traveled			
			Incremental		Cumulative	
-sec	km/h	mph	m	ft	m	ft
7	103	64	NA	NA	NA	NA
6	103	64	28.6	93.8	28.6	93.8
5	103	64	28.6	93.8	57.2	187.6

Time	Vehicle Speed		Distance Traveled			
			Incremental		Cumulative	
4	100	62	27.7	90.9	84.9	278.5
3	97	60	26.8	88	111.7	366.5
2	84	52	23.2	76.2	134.9	442.7
1	90	56	25	82.1	160	524.8
0	19	12	5.4	17.6	165.3	542.4

As the vehicle entered the curve, it appeared that the driver could no longer control the vehicle, and it began to cross the roadway to the south. The police reported that there were no braking tire marks at the incident scene. The EDR data reported the brake pedal switch state as "Off" throughout the event. The throttle pedal position was 0 percent 2 seconds before algorithm enable.

Crash

The police noted two marks on the eastbound fog line and, based on their appearance and distance between them, surmised that the vehicle was rotating clockwise prior to departing the roadway. The vehicle traveled off the south side of the roadway in a continuing clockwise rotation for approximately 20.2 m (66.3 ft). The vehicle rotated 90 degrees with a speed loss of approximately 49 km/h (31 mph) before tripping (Figure 3). The vehicle then began a left-plane-leading rollover. The vehicle appeared to have rolled six quarter-turns over a distance of 32.5 m (106.7 ft) with a speed loss of approximately 64 km/h (40 mph)[2] and came to rest on its roof (Figure 4). The combined speed loss for the road departure and overturn sequence was approximately 82 km/h (51 mph).

Figure 3. Path to trip points, looking west (police image)

Figure 4. Final rest, the 2010 Nissan Versa (police image)

[2] Using 0.5 as deceleration factor.

Post-Crash

The driver was still belted in the vehicle when emergency services arrived. She was extricated by EMS, but she stopped breathing after extrication. EMS began resuscitation efforts on scene. The resuscitation efforts continued during transport to a local hospital and into the emergency room. She died shortly after arrival at the hospital. The reported time of death was 45 minutes after the crash. The autopsy report indicated that the likely cause of death was complications from positional asphyxiation.

2010 Nissan Versa

Description

The 2010 Nissan Versa was a 5-passenger, 4-door sedan. The vehicle, identified by the Vehicle Identification Number 3N1BC1AP3ALxxxxxx, was manufactured in May 2010. The vehicle mileage was 208,439 km (129,518 mi). The vehicle was equipped with a 1.8-liter, 4-cylinder gasoline engine; a 4-speed automatic transmission; a front-wheel drive; and ABS. The vehicle manufacturer recommended tire size was P185/65R15 for the front and for the rear. The vehicle was equipped with Kenda Kinetica Touring of the recommended size. The specific tire information was as follows:

Position	Measured Tread Depth	Restricted	Damage
LF	6 mm (8/32 in)	No	De-beaded
LR	6 mm (8/32 in)	No	None
RR	6 mm (8/32 in)	No	None
RF	6 mm (8/32 in)	No	None

Vehicle History

A Carfax history report indicated that the Nissan had four previous owners. The vehicle had been registered in Washington and Colorado for five years to the first two owners. Any record of maintenance was routine, and there were no reported crashes during this time. The third owner purchased the vehicle in 2015 in Colorado. In July 2016, the vehicle sustained hail damage that was described as minor. However, the insurance company declared the vehicle a total loss. The vehicle was purchased by the current owner in October 2019.

Exterior Damage

The Nissan sustained minor damage to all planes during the six-quarter-turn rollover event (Figures 5–6). The damage to the roof began at the windshield header and measured 146 cm (57.4 in) in length by 106 cm (41.7 in) in width. The maximum crush was located on the roof and measured approximately 2 cm (0.8 in). The direct damage to the right plane began at the front right bumper corner and extended 90 cm (35.4 in) to the rear with a measured depth of 28 cm (11.0 in). There was damage to the right rear quarter panel that was 40 cm (15.7 in) wide and 20 cm (7.8 in) deep. The damage to the left plane was located along the left roof rail and at the left rear quarter panel. The panel damage was 57 cm (22.4 in) wide and 24 cm (9.4 in) deep. The trunk lid was displaced and shifted to the right. The hood and radiator support were displaced rearward, 95 cm (37.4 in) on the right and 38 cm (14.9 in) on the left. The bumper fascia was displaced from the vehicle but did not have any direct contact damage. The Collision Deformation Classification (CDC) was 00TDDO2. The right rear door was damaged during the extrication of the driver.

The left front tire was flat and de-beaded; the right front tire was restricted, the sidewall was cut, the rim was bent, and the wheel was displaced rearward 5 cm (2.0 in) reducing the wheelbase by the same length. The rear tires and wheels were unremarkable.

Figure 5. The 2010 Nissan Versa, front left oblique view

Figure 6. The 2010 Nissan Versa, front right oblique view

Event Data Recorder

The Nissan was equipped with an air bag control unit (ACU) that was configured with EDR[3] capabilities. The EDR recorded one event (the system was capable of only recording a single event). The record contains 7 seconds of pre-crash data and 300 ms of post-crash data. The pre-crash data includes vehicle speed, brake switch status, engine revolution, throttle pedal position percentage, and steering angle. Default values were reported for steering wheel angle data because this vehicle was not equipped with a steering wheel angle sensor. The Nissan representative was unable to image the data during the initial inspection. He was able to image it at a later date and provided it to NHTSA as a PDF document. The EDR report is included as an appendix at the end of this report. The following table summarizes the EDR-reported pre-crash data.

Time	Vehicle Speed		Service	Engine	Throttle Pedal	Steering
-sec	km/h	mph	Brake	Revolution	Position (%)	Angle
7	102	64	Off	2931	32	Default
6	102	64	Off	2575	1	Default
5	102	64	Off	2866	22	Default
4	99	62	Off	2688	15	Default
3	96	60	Off	2716	20	Default
2	83	52	Off	2122	10	Default

[3] This EDR pre-dated the requirements of the CFR49-563.

Time	Vehicle Speed		Service	Engine	Throttle Pedal	Steering
-sec	km/h	mph	Brake	Revolution	Position (%)	Angle
1	90	56	Off	2734	0	Default
0	19	12	Off	997	0	Default

Steering Column Discussion

The Nissan was configured with a tilt steering wheel and power steering (Figure 7).

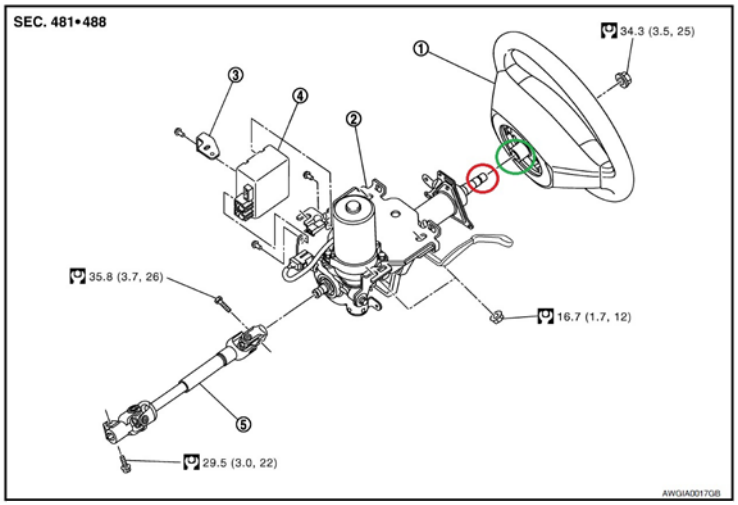


Figure 7. Steering column, the 2010 Nissan Versa, column spline (red), wheel spline (green)

Police investigators noted during their inspection that the steering wheel could be spun freely and that the front wheel did not respond. They indicated that the wheel made a light rumble noise and that they could feel a light vibration. The police visual inspection did not reveal any broken components or any occupant contact-related damage. They removed the air bag assembly so they could see the steering wheel connection to the column. When rotating the steering wheel, they could see that the wheel nut did not spin with the wheel. The officer was able to spin the nut with his finger. He removed the nut and steering wheel, and it came off with no resistance. The spline of the steering wheel (Figure 8) and the spline on the column (Figure 9) both had a small section of the spline that appeared to be worn down and flattened. The splines should be of uniform height across the entire spline length. The officer threaded the nut back onto the steering wheel shaft and used a socket wrench to turn the shaft. Both front wheels responded when the shaft was turned.

The threads on the steering wheel shaft appeared to be undamaged. The two areas of spline damage would have been the two areas first in contact as the steering assembly was reassembled per the Takata repair. The splines appear to have been misaligned during this recall repair assembly.

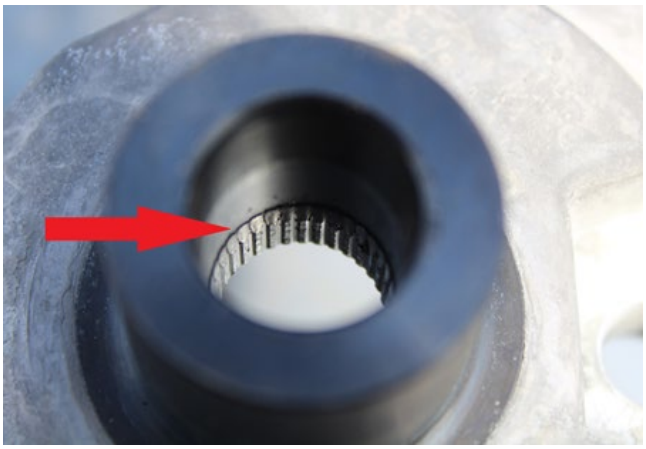


Figure 8. Steering wheel spline damage, the 2010 Nissan Versa

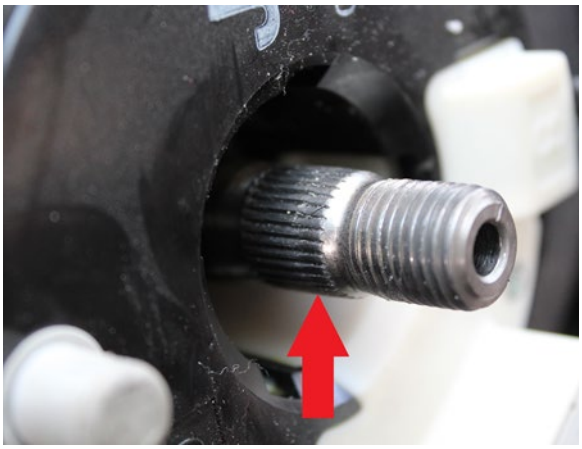


Figure 9. Steering column shaft damage, the 2010 Nissan Versa

The subject Nissan was taken into a Nissan dealership in October 2019 to complete a Takata air bag recall. The mechanic who performed the work was interviewed by the police. The mechanic stated in the police report that it was necessary to remove the steering wheel to complete the recall/replacement. The mechanic was aware that there was a torque value for the steering wheel nut, but he would typically just tighten the nut down. The tool used to tighten the nut is unknown. Nissan service procedures required 25 ft/lbs of torque for the steering wheel nut. SCI could not speak directly to the mechanic.

The cause of the loss of steering was likely from the failure to tighten the steering nut during the recall repair process for NHTSA recall number 20V008000.

Interior Damage

The Nissan sustained minor interior damage from air bag deployments, occupant contact, and impact forces. The vehicle sustained glazing damage to the windshield, side windows, and backlight. The second row right door was jammed shut and damaged during extrication. The remaining doors remained closed and operational. There were loading marks to the driver's seat belt. There was a probable head contact to the left roof area and a left knee contact to the left lower instrument panel. There was integrity loss from the disintegrated backlight and side door. There was slight intrusion along the right roof rail.

NHTSA Recalls and Investigations

A search queried in August 2021 using the Nissan's VIN revealed there were no open recalls or investigations.

Manual Restraint Systems

The front row was equipped with driver and front right passenger lap and shoulder seat belts. The driver's belt was equipped with continuous loop belt webbing, a sliding latch plate, an emergency locking retractor (ELR), and an adjustable upper anchor that was in the full-down position. The passenger's belt was equipped with continuous loop belt webbing, a sliding latch plate, a locking retractor, and an adjustable upper anchor. Both front row seat belts were equipped with retractor pretensioners. Both pretensioners actuated. The driver's seat belt was

found in the spooled-out position and was used in the crash. The passenger seat belt was found in the fully retracted position. The right front passenger seat was unoccupied at the time of the crash.

Supplemental Restraints System

The Nissan was equipped with a supplemental restraint system consisting of dual-stage frontal air bags for the driver and front right passenger positions, retractor pretensioners for the front seat positions, inflatable curtain (IC) side air bags for the front and second row outboard positions, and seat-mounted side air bags for the front row. As a result of the rollover, the driver's frontal air bag, both IC air bags, and both seat-mounted side air bags deployed. Both front row seat belt pretensioners actuated.

The driver's frontal air bag deployed from an H-configuration module cover located in the hub of the steering wheel rim. The air bag was circular and measured 42 cm (16.5 in) in diameter in its deflated state. The IC air bags measured 133 cm (52.3 in) in length and 43 cm (16.9 in) in height. They were configured with a 36 cm (14.1 in) tether attached to the A-pillar. Both IC air bags were cut by EMS during the driver extrication.

There was no indication of post-crash deformation of the steering wheel mounting system due to the air bag deployment.

Rollover Mitigation

The rollover rating for this vehicle was four stars, indicating a static rollover rating of 14 percent. The vehicle was equipped with four-wheel disc brakes with ABS, traction control, and power steering. The Nissan was traveling in a right curve at approximately 102 km/h (64 mph) at 7 seconds prior to the event. The steering wheel lost a solid connection to the steering shaft while in the curve. It appears that the driver may have been able to restore the connection briefly and was able to steer somewhat to the right. There was no evidence of braking either at the scene or in the EDR data. The vehicle traveled along the tangent of the curve. The vehicle traveled off the south side of the roadway in a slight clockwise rotation for approximately 20.2 m (66.3 ft). The vehicle rotated approximately 90 degrees before tripping and beginning a left-plane-leading rollover. The vehicle was traveling in the ditch when overturning. The vehicle appeared to have rolled six quarter-turns over a distance of 32.5 m (106.7 ft) and came to rest on its roof.

2010 Nissan Versa Occupant

Driver Demographics

Age/sex:	33 years/female (25 weeks pregnant)
Height:	170 cm (67 in)
Weight:	61 kg (134 lbs)
Eyewear:	Unknown
Seat type:	Bucket
Seat track position:	Middle
Manual restraint usage:	Lap and shoulder belt available, used
Usage source:	Vehicle inspection, manufacturer-supplied EDR data
Air bags:	Frontal, IC, and seat-mounted air bags deployed
Alcohol/drug data:	None detected
Egress from vehicle:	Extricated by emergency personnel
Transport from scene:	Transported by ambulance, pronounced deceased 45 minutes post-crash
Type of medical treatment:	CPR on-scene, treatment at ER

Driver Injuries

Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Component (IPC)	IPC Confidence Level
1	Probable positional asphyxiation[4]	020000.3	Seat belt	Probable
2	Focal subdural hematoma, posterior right cerebral lobe of brain	140629.3	Roof	Probable
3	Focal subgaleal hematoma, left frontal scalp	110402.1	Roof	Probable
4	15 x 1.3 cm parallel abrasions, left leg	810202.1	Lower left instrument panel	Probable
	Scattered conjunctival petechiae, left > right	Not codeable		

Source: medical examiner report/autopsy.

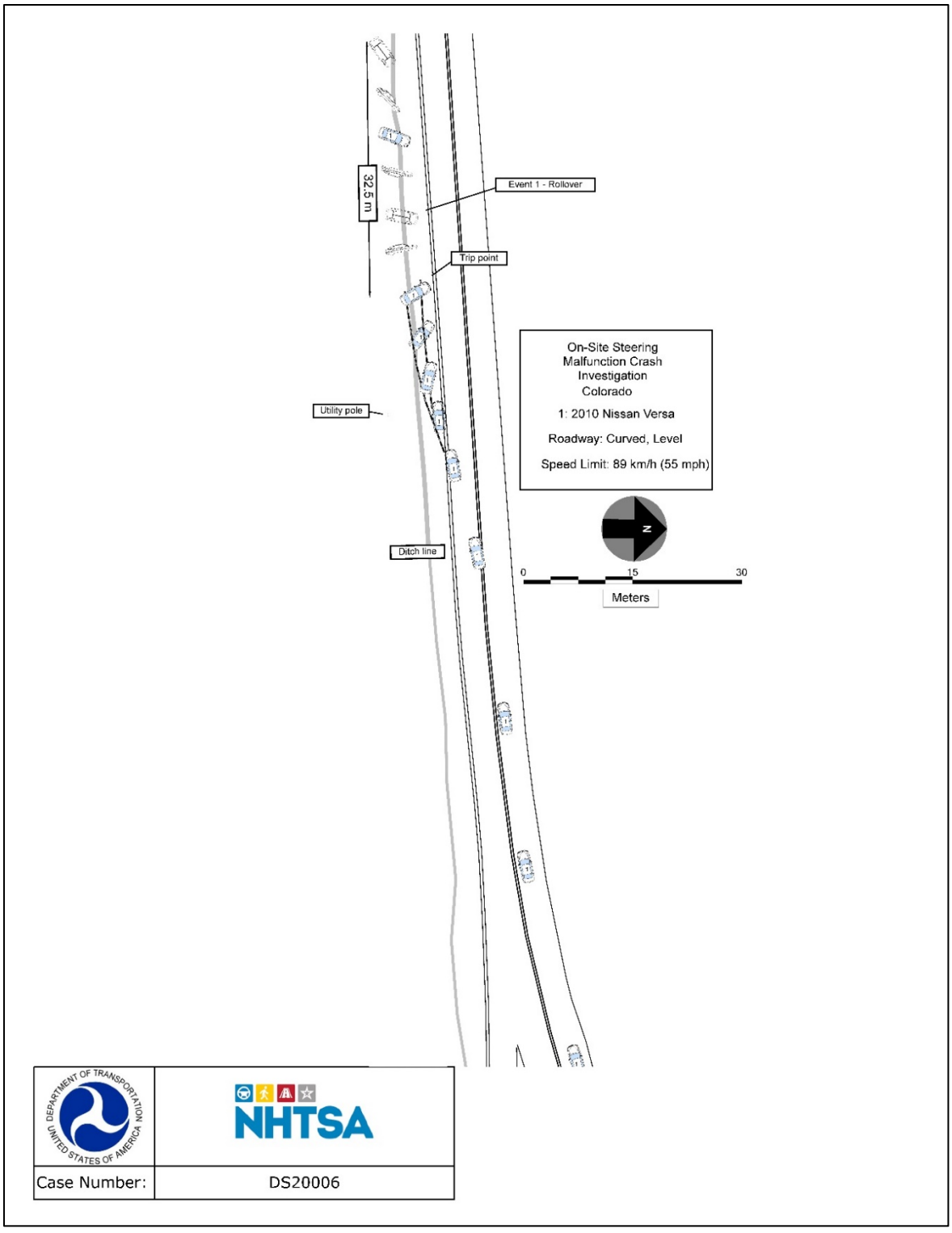
Driver Kinematics

The 33-year-old female was seated in an unknown posture. She was 25 weeks pregnant. She was belted with the shoulder adjuster in the full-down position. The seat was adjusted to the mid position. It is likely that she was actively steering initially and attempted to steer after the steering wheel no longer engaged the steering shaft. The driver was displaced slightly to the left as the vehicle went into a clockwise rotation. As the vehicle rotated approximately 90 degrees, tripped, and began a left-side-leading rollover, the driver was displaced to the left. She was displaced in several directions as the vehicle completed six quarter-turns. Her head likely struck the roof during one of the quarter-turns. The vehicle came to rest on its roof. The driver remained

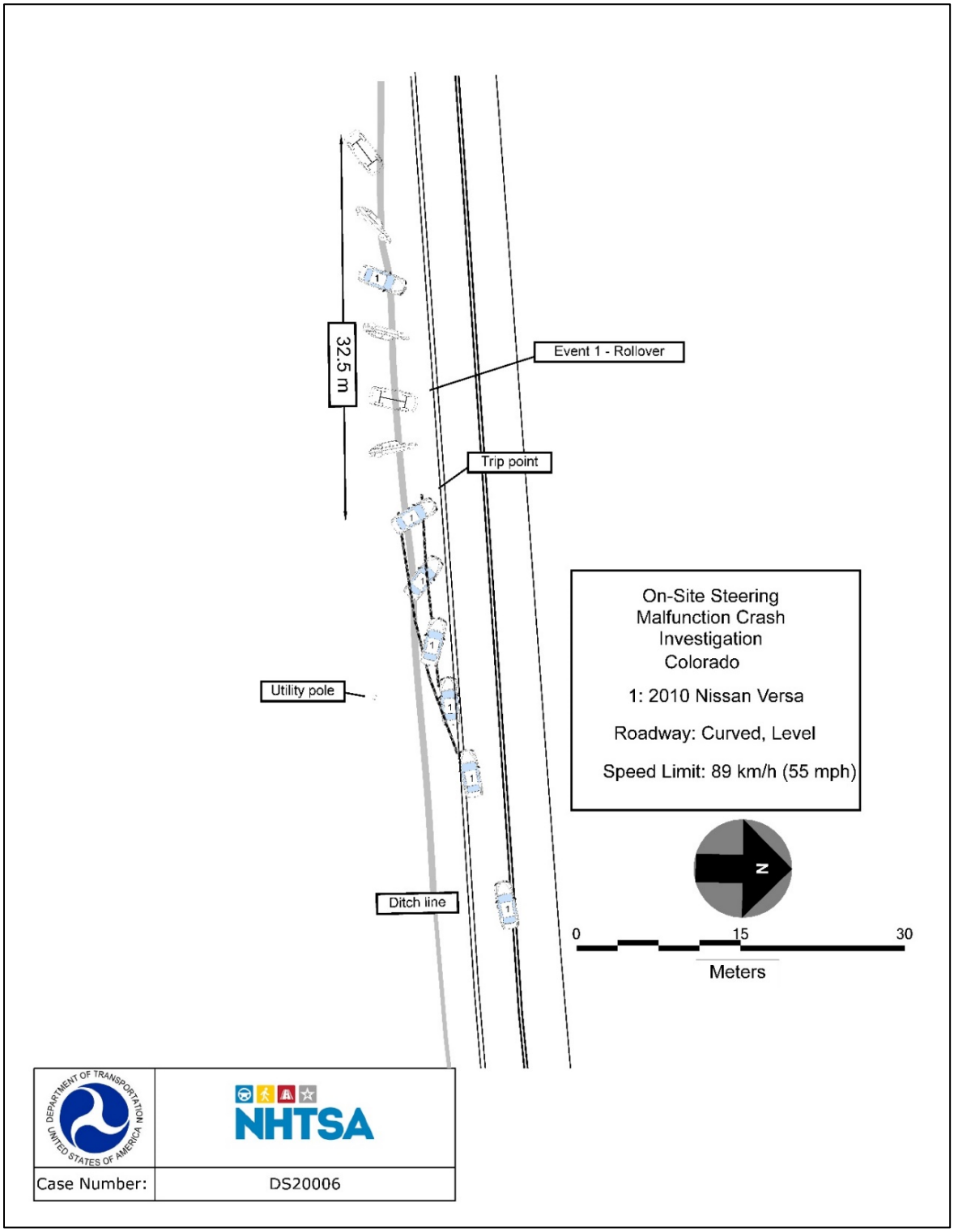
[4] Positional asphyxia happens when a person can't get enough air to breathe due to the positioning of his/her body.

belted as the vehicle came to rest. The position of her body, as held in place by the seat belt, was the probable cause of the asphyxiation. The driver was still belted in the vehicle when emergency services arrived. She was extricated by emergency services, but she stopped breathing after extrication.

Crash Diagram



Crash Diagram: A Detailed View



Appendix A: Event Data Recorder Report for 2010 Nissan Versa[5]

[5] SCI obtained the EDR report in PDF format from the manufacturer.

SYSTEM AIR BAG
DATE 11/19/2023 11:56:57
PROG No. 3000

SELF-DIAG [CURRENT]

DTC RESULTS

FRONTAL COLLISION
DETECTION
[B1209]
SIDE COLLISION
DETECTION
[B1210]
DRIVER AIRBAG MODULE
[OPEN]
[B1049]
PRE-TEN FRONT RH
[OPEN]
[B1081]
PRE-TEN FRONT LH
[OPEN]
[B1086]
DRIVER AIRBAG MODULE
[OPEN]
[B1054]
SIDE MODULE RH
[OPEN]
[B1129]
SIDE MODULE LH
[OPEN]
[B1134]
CURTAIN MODULE RH
[OPEN]
[B1145]
CURTAIN MODULE LH
[GND-SHORT]
[B1152]

SYSTEM AIR BAG
DATE 11/19/2023 11:57:24
PROG No. 3000

SELF-DIAG [PAST]

DTC RESULTS

NO DTC IS DETECTED.
FURTHER TESTING
MAY BE REQUIRED.

SYSTEM AIR BAG
DATE 11/19/2023 11:57:36
PROG No. 3000

NO DTC IS DETECTED.
FURTHER TESTING
MAY BE REQUIRED.

ECU DISCRIMINATED NO.

ECU No.
F6AA

MODE	BACK	LIGHT	COPY

SYSTEM AIR BAG
DATE 11/19/2020 11:58:16
PROG No. 3000

RECORDED DATA READOUT

f:00	r:01
a0:D1	a1:D2
a2:31	a3:51
a4:56	a5:36
a6:81	a7:86
a8:91	a9:98
aa:00	ab:00
ac:00	ad:00
ae:00	af:00
A1:00	A2:00
A3:00	A4:00
A5:00	B1:00
B2:00	B3:00
B4:00	B5:00
C1:00	C2:00
C3:00	C4:00
C5:00	D1:00
D2:00	D3:00
D4:00	D5:00
E1:00	E2:00
E3:00	E4:00
E5:00	F1:00
F2:00	G:00
U:0C	I1:00
J1:FF	K1:FF
L1:FF	M1:FF
I2:FF	J2:FF
K2:FF	L2:FF

MZ:FF	IR:FF
JR:FF	KR:FF
LR:FF	MR:FF
IL:13	JL:13
KL:00	LL:00
ML:FF	R:81
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S3:FF	S4:FF
S5:FF	S6:FF
S7:FF	S8:5A
W:00	O1:00
O2:00	O3:00
O4:00	O5:00
O6:00	O7:00
O8:00	O9:00
OA:00	OB:00
OC:00	OD:00
P:F6AA	

SYSTEM AIR BAG
DATE 11/19/2020 11:59:35
PROG No. 3000

LATERAL G

TIME	DATA
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-90ms	0.00G
-80ms	1.76G
-70ms	-0.88G
-60ms	0.29G
-50ms	0.29G
-40ms	3.22G
-30ms	1.17G
-20ms	2.93G
-10ms	5.57G
0ms	3.22G
10ms	2.93G
20ms	0.00G
30ms	-0.59G
40ms	-1.46G
50ms	-1.17G
60ms	-1.46G
70ms	0.59G
80ms	0.00G
90ms	-0.88G
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110ms	-1.17G
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200ms	0.00G
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260ms	-2.05G
270ms	-4.69G
280ms	-4.98G
290ms	-5.86G

290ms	-5.86G
300ms	-3.22G

SYSTEM AIR BAG
DATE 11/19/2020 00:00:32
PROG No. 3000

DIAGMUXON STATE

TIME	DATA
-7s	OFF
-6s	OFF
-5s	OFF
-4s	OFF
-3s	OFF
-2s	OFF
-1s	OFF
0s	OFF
1s	OFF
2s	OFF
3s	OFF
4s	OFF
5s	OFF
6s	OFF

SYSTEM AIR BAG
DATE 11/19/2020 00:01:18
PROG No. 3000

FRONTAL DELTA-V

TIME	DATA
-100ms	FF
-90ms	FF
-80ms	FF
-70ms	FF
-60ms	FF
-50ms	FF
-40ms	FF
-30ms	FF
-20ms	FF
-10ms	FF
0ms	FF
10ms	FF
20ms	FF
30ms	FF
40ms	FF
50ms	FF
60ms	FF
70ms	FF
80ms	FF
90ms	FF
100ms	FF
110ms	FF
120ms	FF
130ms	FF
140ms	FF
150ms	FF
160ms	FF
170ms	FF
180ms	FF
190ms	FF
200ms	FF
210ms	FF
220ms	FF
230ms	FF
240ms	FF
250ms	FF
260ms	FF
270ms	0mph
280ms	1mph
290ms	3mph
300ms	5mph

SYSTEM AIR BAG
DATE 01/01/1980 00:02:08
PROG No. 3000

LATERAL DELTA-V

TIME	DATA
-100ms	FF
-90ms	FF
-80ms	FF
-70ms	FF
-60ms	FF
-50ms	FF
-40ms	FF
-30ms	FF
-20ms	FF
-10ms	FF
0ms	0mph
10ms	1mph
20ms	1mph
30ms	1mph
40ms	1mph
50ms	1mph
60ms	0mph
70ms	0mph
80ms	0mph
90ms	0mph
100ms	0mph
110ms	0mph
120ms	0mph
130ms	0mph
140ms	0mph
150ms	FF
160ms	FF
170ms	FF
180ms	FF
190ms	FF
200ms	FF
210ms	FF
220ms	FF
230ms	FF
240ms	FF
250ms	FF
260ms	FF
270ms	FF
280ms	FF
290ms	FF
300ms	-2mph

SYSTEM AIR BAG
DATE 01/01/1980 00:02:45
PROG No. 3000

FRONTAL G

TIME	DATA
-100ms	-0.98G
-90ms	-0.49G
-80ms	-0.49G
-70ms	-0.98G
-60ms	0.00G
-50ms	-1.95G
-40ms	-1.46G
-30ms	-2.44G
-20ms	-0.98G
-10ms	-2.93G
0ms	-3.42G
10ms	-2.93G
20ms	-2.44G
30ms	-0.98G
40ms	-0.98G
50ms	-0.49G
60ms	-0.98G
70ms	-0.49G
80ms	0.00G
90ms	-0.49G
100ms	-0.49G

190ms	0.00G
200ms	0.49G
210ms	0.49G
220ms	0.49G
230ms	0.00G
240ms	0.98G
250ms	1.46G
260ms	2.44G
270ms	2.93G
280ms	6.84G
290ms	8.30G
300ms	7.81G

SYSTEM AIR BAG
DATE 01/01/1980 00:03:29
PROG No. 3000

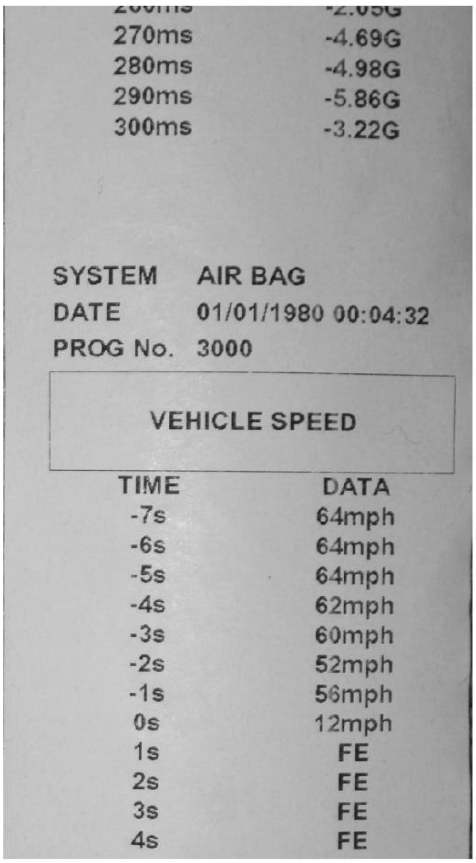
LATERAL G

TIME	DATA
-100ms	0.00G
-90ms	0.00G
-80ms	1.76G
-70ms	-0.88G
-60ms	0.29G
-50ms	0.29G
-40ms	3.22G
-30ms	1.17G
-20ms	2.93G
-10ms	5.57G
0ms	3.22G
10ms	2.93G
20ms	0.00G
30ms	-0.59G
40ms	-1.46G
50ms	-1.17G
60ms	-1.46G
70ms	0.59G
80ms	0.00G
90ms	-0.88G
100ms	-1.76G
110ms	-1.17G
120ms	-0.59G
130ms	0.29G
140ms	0.00G
150ms	0.00G
160ms	-1.17G
170ms	-0.59G
180ms	-0.29G
190ms	0.00G
200ms	0.00G
210ms	0.00G
220ms	-0.29G
230ms	-0.88G
240ms	-0.59G
250ms	-0.29G
260ms	-2.05G
270ms	-4.69G
280ms	-4.98G
290ms	-5.86G
300ms	-3.22G

SYSTEM AIR BAG
DATE 01/01/1980 00:04:32
PROG No. 3000

VEHICLE SPEED

TIME	DATA
-7s	64mph
-6s	64mph
-5s	64mph
-4s	62mph
-3s	60mph



260ms	-2.05G
270ms	-4.69G
280ms	-4.98G
290ms	-5.86G
300ms	-3.22G

SYSTEM AIR BAG
DATE 01/01/1980 00:04:32
PROG No. 3000

VEHICLE SPEED

TIME	DATA
-7s	64mph
-6s	64mph
-5s	64mph
-4s	62mph
-3s	60mph
-2s	52mph
-1s	56mph
0s	12mph
1s	FE
2s	FE
3s	FE
4s	FE

SYSTEM AIR BAG
DATE 01/01/1980 00:04:52
PROG No. 3000

ENGINE REVOLUTION

TIME	DATA
-7s	2931rpm
-6s	2575rpm
-5s	2886rpm
-4s	2688rpm
-3s	2716rpm
-2s	2122rpm
-1s	2734rpm
0s	997rpm
1s	691rpm
2s	1028rpm
3s	959rpm
4s	891rpm
5s	778rpm
6s	816rpm

SYSTEM AIR BAG
DATE 01/01/1980 00:05:12
PROG No. 3000

THROTTLE PEDAL POSITION

TIME	DATA
-7s	32%
-6s	1%
-5s	22%
-4s	15%
-3s	20%
-2s	10%
-1s	0%
0s	0%
1s	0%
2s	0%
3s	0%
4s	0%
5s	0%
6s	0%

SYSTEM AIR BAG
DATE 01/01/1980 00:05:31
PROG No. 3000

STEERING ANGLE

TIME	DATA
-7s	FF
-6s	FF
-5s	FF
-4s	FF
-3s	FF
-2s	FF
-1s	FF
0s	FF
1s	FF
2s	FF
3s	FF
4s	FF
5s	FF
6s	FF

BRAKE PEDAL SW STATE

TIME	DATA
-7s	OFF
-6s	OFF
-5s	OFF
-4s	OFF
-3s	OFF
-2s	OFF
-1s	OFF
0s	OFF
1s	OFF
2s	OFF
3s	OFF
4s	OFF
5s	OFF
6s	OFF

SYSTEM AIR BAG
DATE 01/01/1980 00:06:06
PROG No. 3000

BACKLE SW STATE[DR]

TIME	DATA
-7s	ON
-6s	ON
-5s	ON
-4s	ON
-3s	ON
-2s	ON
-1s	ON

SYSTEM AIR BAG
DATE 01/01/1980 00:06:21
PROG No. 3000

BACKLE SW STATE[AS]

TIME	DATA
-7s	OFF
-6s	OFF
-5s	OFF
-4s	OFF
-3s	OFF
-2s	OFF
-1s	OFF

SYSTEM AIR BAG
DATE 01/01/1980 00:06:30
PROG No. 3000

ROLL ANGLE

TIME	DATA
-7s	FF
-6s	FF
-5s	FF
-4s	FF
-3s	FF
-2s	FF
-1s	FF
0s	FF
1s	FF
2s	FF
3s	FF
4s	FF
5s	FF
6s	FF

DATE 01/01/1980 00:06:50
PROG No. 3000

ROLL RATE

TIME	DATA
-7s	FF
-6s	FF
-5s	FF
-4s	FF
-3s	FF
-2s	FF
-1s	FF
0s	FF
1s	FF
2s	FF
3s	FF
4s	FF
5s	FF
6s	FF

SYSTEM AIR BAG
DATE 01/01/1980 00:07:08
PROG No. 3000

DIAGMUXON STATE

TIME	DATA
-7s	OFF
-6s	OFF
-5s	OFF
-4s	OFF
-3s	OFF
-2s	OFF
-1s	OFF
0s	OFF
1s	OFF
2s	OFF
3s	OFF
4s	OFF
5s	OFF
6s	OFF

SYSTEM AIR BAG
DATE 01/01/1980 00:08:04
PROG No. 3000

MAX.FRONTAL G&TIME

FRONTAL	TIME
8.79G	290.0ms
LATERAL	
-6.15G	
VERTICAL	
FF	

SYSTEM AIR BAG
DATE 01/01/1980 00:08:16
PROG No. 3000

MAX.LATERAL G&TIME

FRONTAL	TIME
6.84G	300.0ms
LATERAL	
-13.77G	
VERTICAL	
FF	

SYSTEM AIR BAG
DATE 01/01/1980 00:08:21
PROG No. 3000

IGN CYCLE

	CYCLE
Event	FE
Download	FE

SYSTEM AIR BAG
DATE 01/01/1980 00:08:27
PROG No. 3000

OPERATION TIME

	TIME
Event	FE
Download	FE

SYSTEM AIR BAG
DATE 01/01/1980 00:08:32
PROG No. 3000

D/L COUNT AFTER EVENT

	STATE
	44count

SYSTEM AIR BAG
DATE 01/01/1980 00:08:41
PROG No. 3000

EDR RECORDING COMPLETE

	STATE
Priority 1	SUCCESS
Priority 2	SUCCESS
Priority 3	SUCCESS
Priority 4	SUCCESS

SYSTEM AIR BAG
DATE 01/01/1980 00:08:47
PROG No. 3000

GAP TIME FOR EDR

	TIME
High Freq	4.5ms
Low Freq	380ms

SYSTEM AIR BAG
DATE 01/01/1980 00:08:55
PROG No. 3000

CAN ABNORMALITY

	STATE
	NORMAL

STATE
NORMAL

SYSTEM AIR BAG
DATE 01/01/1980 00:13:34
PROG No. 3000

RECORDED DATA READOUT

f:00	r:01
a0:D1	a1:D2
a2:31	a3:51
a4:56	a5:36
a6:81	a7:86
a8:91	a9:98
aa:00	ab:00
ac:00	ad:00
ae:00	af:00
A1:00	A2:00
A3:00	A4:00
A5:00	B1:00
B2:00	B3:00
B4:00	B5:00
C1:00	C2:00
C3:00	C4:00
C5:00	D1:00
D2:00	D3:00
D4:00	D5:00
E1:00	E2:00
E3:00	E4:00
E5:00	F1:00
F2:00	G:00
U:0C	I1:00
J1:FF	K1:FF
L1:FF	M1:FF
I2:FF	J2:FF
K2:FF	L2:FF
M2:FF	IR:FF
JR:FF	KR:FF
LR:FF	MR:FF
IL:13	JL:13
KL:00	LL:00
ML:FF	R:81
S1:A5	S2:FF
S3:FF	S4:FF
S5:FF	S6:FF
S7:FF	S8:5A
W:00	O1:00
O2:00	O3:00

DOT HS 813 235
January 2022

U.S. Department
of Transportation

**National Highway
Traffic Safety
Administration**

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