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Special Crash Investigations On-Site Side Inflatable Curtain Occupant Protection Crash Investigation Vehicle: 2014 Volkswagen Jetta Location: Nebraska Crash Date: May 2015

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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 the side inflatable curtain (IC) occupant protection system of a 2014 Volkswagen Jetta and the injuries sustained by the four passengers. This crash occurred in the intersection of a three-lane urban street and three two-lane urban streets. The Volkswagen was a 4-door sedan equipped with side-impact IC air bags, front-seat-mounted side-impact air bag, and multi-stage frontal air bags. A belted 42-year-old male driver, belted 28-year-old male front row right passenger, unbelted 59-year-old female second row left passenger, and unbelted 61-year-old male second-row right passenger occupied the vehicle. The Volkswagen was eastbound through the intersection when it was struck by a northbound 2011 Chevrolet Silverado 2500 (Event 1). The Volkswagen rotated clockwise and struck the right fender of the Chevrolet (Event 2). The Volkswagen continued in a northeasterly direction and struck a concrete curb (Event 3) as it departed the roadway. It continued through a residential yard and struck a bush (Event 5) and came to final rest next to a private residence. The Chevrolet struck a wooden utility pole (Event 4) and came to final rest heading northeast. The driver and front passenger of the Volkswagen sustained police-reported “C” (possible) injuries and were transported by ambulances to a trauma center. The second row left passenger sustained police-reported “A” (incapacitating) injuries and was transported by ambulance to a trauma center. The second-row right passenger sustained critical injuries and was transported by ambulance to a trauma center where he was pronounced deceased. A belted 63-year-old male driver occupied the Chevrolet. He sustained police-reported “C” (possible) injuries but was not transported for medical treatment. Both vehicles were towed from the crash scene due to damage.

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BACKGROUND

This report documents the on-site investigation of the side inflatable curtain (IC) occupant protection system of a 2014 Volkswagen Jetta (**Figure 1**) and the injuries sustained by the front row right and second row right passengers. This crash investigation was initiated by the National Highway Traffic Safety Administration in July 2015, through the sampling activities of the National Automotive Sampling System (NASS)-General Estimates System (GES). This investigation was assigned in June 2016, when permission to inspect the Volkswagen was obtained from the insurance company following a lengthy waiting period in which a hold was in place on the vehicle. The crash occurred in May 2015 in the morning in Nebraska and was investigated by a local police agency. The crash involved the Volkswagen and a 2011 Chevrolet Silverado 2500 pickup truck. The Volkswagen and crash scene were inspected in June 2016.

Figure 1: The damaged 2014 Volkswagen Jetta

This crash occurred in the four-leg intersection of an undivided, three-lane, two-way urban street and three undivided, two-lane, two-way urban streets. The Volkswagen was a 4-door sedan equipped with side impact IC air bags, front-seat-mounted side impact air bag, and multi-stage frontal air bags. A belted 42-year-old male driver, belted 28-year-old male front row right passenger, unbelted 59-year-old female second row left passenger, and unbelted 61-year-old male second row right passenger occupied the vehicle. The Volkswagen was traveling east through the intersection when its right plane was struck by the front plane of the northbound Chevrolet pickup (Event 1). The Volkswagen rotated clockwise, was redirected northeast, and its right fender struck the right fender of the Chevrolet (Event 2). The Volkswagen continued in a northeast direction and its right front wheel struck a 10 cm (3.9 in) high concrete curb (Event 3) as it departed the roadway. The Chevrolet also traveled northeast and its front plane struck a 36 cm (14.2 in) diameter wooden utility pole (Event 4) as the vehicle came to final rest heading northeast. The Volkswagen continued in a northeasterly direction through a residential yard and the left plane struck a bush (Event 5) as the vehicle came to final rest heading northeast next to a private residence. The driver and front passenger of the Volkswagen sustained police-reported "C" (possible) injuries and were transported by ambulance to a trauma center. The second row left passenger sustained police-reported "A" (incapacitating) injuries and was transported by

ambulance to a trauma center. The second-row right passenger sustained critical injuries and was transported by ambulance to a trauma center where he was pronounced deceased. A belted 63-year-old male driver occupied the Chevrolet. He sustained police-reported "C" (possible) injuries but was not transported for medical treatment. Both vehicles were towed from the crash scene due to damage.

CRASH SUMMARY

Crash Site

This crash occurred in the morning in the four-leg intersection of an undivided, three-lane, two-way urban street and three undivided, two-lane, two-way urban streets. The weather conditions were cloudy, southerly winds at 24 km/h (15 mph), a temperature of 16.7 °C (62 °F), and a dew point of 13.3 °C (56 °F), according to local weather reports. The Volkswagen's roadway was on the west leg of the intersection and had one eastbound through lane, a right-turn lane, and one westbound through lane. Each lane was 3.6 m (11.8 ft) wide and the roadway pavement markings consisted of a solid white right turn arrow, solid white right-turn lane line, and double yellow center line. The Chevrolet's roadway was on the south leg of the intersection and had one northbound through lane and one southbound through lane on the approach to the intersection. Each lane was approximately 5 m (16 ft) wide near the intersection where the roadway transitioned from two southbound through lanes and one northbound through lane with a parking lane on the east side of the roadway. The roadway pavement markings consisted of double yellow center lines and a solid white transition edge line for the northbound lane. The roadways were bordered by 10 cm (3.9 in) high concrete curbs at the sidewalk junction in each corner of the intersection and 15 cm (5.9 in) high concrete curbs along each roadway. The roadway surfaces were dry concrete. The east/west legs of the intersection were each controlled by a stop sign. The north/south legs of the intersection were uncontrolled. The speed limit for each vehicle was 40 km/h (25 mph). The crash diagram is included at the end of this report.

Pre-Crash

The Volkswagen was traveling east in the eastbound through lane (**Figure 2**) and the driver stopped at the intersection for the stop sign, according to the police crash report. The Chevrolet pickup was traveling north in the northbound through lane approaching the intersection (**Figure 3**), and the driver intended to continue northbound straight through the intersection. The driver of the Volkswagen accelerated from the stop sign into the intersection, intending to continue eastbound straight through the intersection.

Figure 2: Eastbound approach of the Volkswagen

Crash

The front plane of the Chevrolet struck the right plane of the Volkswagen (**Figure 4**, Event 1). The force direction on the Volkswagen was in the 2 o'clock sector and the impact actuated both front seat belt pretensioners and deployment of both frontal, IC, and front passenger's seat-mounted side impact air bags. The "missing vehicle" algorithm of the WinSMASH program calculated the total delta V for the Volkswagen as 20 km/h (12 mph). The longitudinal and lateral velocity changes were -10 km/h (-6 mph) and -17 km/h (11 mph), respectively. WinSMASH calculated the total delta V for the Chevrolet as 11 km/h (7 mph). The longitudinal and lateral velocity changes were -10 km/h (-6 mph) and 6 km/h (4 mph), respectively. The results were considered borderline for each vehicle since the Chevrolet was not inspected.

The impact caused the Volkswagen to rotate clockwise an estimated 100 degrees and the vehicle's right fender (**Figure 5**) struck the right fender of the Chevrolet (Event 2). The force direction on the Volkswagen was in the 3 o'clock sector and the "missing vehicle" algorithm of WinSMASH calculated the total delta V as 7 km/h (4 mph). The longitudinal and lateral velocity changes were 0 km/h and -7 km/h (-4 mph), respectively. WinSMASH calculated the total delta V for the Chevrolet as 4 km/h (3 mph). The longitudinal and lateral velocity changes were -4 km/h (-3 mph) and 0 km/h, respectively. The results were considered borderline for each vehicle.

The Volkswagen separated from the Chevrolet following the right fender side-slap impact and continued to rotate clockwise an estimated 200 degrees as it traveled northeast approximately 6 m (20 ft). The right front wheel then struck a 10 cm (3.9 in) high concrete curb (Event 3) as the vehicle departed the roadway in the northeast corner of the intersection (**Figure 6**). The impact dented the wheel rim and chipped the curb. The Chevrolet also traveled in northeaster direction an

Figure 3: Northbound approach of the Chevrolet

Figure 4: Damage to the Volkswagen's right plane from impact by the front plane of the Chevrolet

Figure 5: Damage to the Volkswagen's right fender from impact with the Chevrolet's right fender

estimated 12 m (39 ft) and the front plane struck a 36 cm (14.2 in) diameter wooden utility pole (Event 4). The vehicle then came to final rest against the pole heading northeast (**Figure 6**) with the rear portion of the vehicle remaining in the roadway. The Volkswagen continued northeast following the curb impact through a residential yard for approximately 18 m (59 ft) and the left front corner struck a bush (Event 5) as the vehicle came to final rest heading northeast next to a private residence.

Post-Crash

The police were notified of the crash at 0646 hours. The police crash report did not state an arrival time at the crash scene. The driver and front passenger of the Volkswagen sustained police-reported "C" (possible) injuries and were transported by ambulance to a trauma center. The second row left passenger sustained police-reported "A" (incapacitating) injuries and was transported by ambulance to a trauma center. The second-row right passenger sustained critical injuries and was transported by ambulance to a trauma center where he was pronounced deceased. The driver of the Chevrolet sustained police-reported "C" (possible) injuries but was not transported for medical treatment. Both vehicles were towed from the crash scene due to damage.

Figure 6: Volkswagen's northeast approach to curb impact and final rest near house; final rest of the Chevrolet against the utility pole in the foreground

2014 VOLKSWAGEN JETTA

Description

The Volkswagen was a front-wheel drive, 5-occupant, 4-door sedan with the Vehicle Identification Number (VIN) 3VWD17AJ8EMXXXXXX manufactured in January 2014. The vehicle was equipped with a 1.8-liter, I-4 turbocharged engine, 6-speed automatic transmission with sport shift feature, 4-wheel antilock brakes with electronic brake force distribution, brake assist, traction control, and electronic stability control. The vehicle was also equipped with front seat-mounted side impact air bags, side impact IC air bags, multi-stage frontal air bags, active front head restraints, and a tilt steering column that was adjusted to the full-up position. The specified wheelbase was 265 cm (104.4 in).

The vehicle manufacturer's recommended tire size was P205/55R16. The vehicle was equipped with Bridgestone Turanza EL400 tires of the recommended size on the left front, right front, and right rear, and a Hifly HF201 tire of the recommended size on the left rear. The vehicle manufacturer's recommended cold tire pressure for the front and rear tires was 241 kPa (35 psi). The tires were all in good condition prior to the crash.

The front row was equipped with driver and front passenger leather-covered bucket seats with adjustable head restraints. The second row was equipped with a leather-covered bench seat with

folding backs and adjustable head restraints. The driver's and front passenger's seat tracks were adjusted to the full-rear and middle positions, respectively. The driver's and front passenger's seat backs were reclined 25 and 22 degrees, respectively, aft of vertical, and the top of each head restraint was adjusted 22 cm (8.7 in) above the top of the seat back. The second-row seat track and seat back were fixed, and the top of the left and right head restraints were each adjusted 15 cm (5.9 in) above the top of the seat back.

Exterior Damage

Exterior Damage Event 1: The Volkswagen sustained direct and induced damage to both right side doors, B- and C-pillars, right rear window frame, quarter panel, and the roof side rail. The direct damage began 172 cm (67.7 in) forward of the right rear axle and extended 172 cm (103.1 in) rearward. The Field L was 262 cm (103.1 in) in length beginning 220 cm (86.6 in) forward of the right rear axle. The crush measurements were taken at the mid-door level and the maximum residual crush was 27 cm (10.6 in) occurring 35 cm (13.8 in) forward of the right rear axle. The crush values were: C_1 = 0 cm, C_2 = 12 cm (4.7 in), C_3 =21 cm (8.3 in), C_4 = 12 cm (4.7 in), C_5 = 22 cm (8.7 in), C_6 = 0 cm. The sill height was 25 cm (9.8 in) and the height of the maximum crush was 60 cm (23.6 in). The door sill differential (DSD) was 18 cm (7.1 in).

Damage Classification Event 1: The Collision Deformation Classification (CDC) was 02RZEW3 (60 degrees).

Exterior Damage Crash Event 2: The vehicle sustained direct and induced damage to the front portion of the right front door, right fender, and right side of the front bumper fascia during the side- slap impact with the right fender of the Chevrolet. The direct damage began 320 cm (126.0 in) forward of the right rear axle and extended 110 cm (43.3 in) rearward. The Field L was also 110 cm (43.3 in) long beginning at the same location as the direct damage. The crush measurements were taken at the mid-door level and the maximum residual crush was 8 cm (3.1 in) occurring 89 cm rear of the right-rear axle. The crush values were: C_1 = 0 cm, C_2 = 0 cm, C_3 = 4 cm (1.6 in), C_4 = 6 cm (2.4 in), C_5 = 8 cm (3.1 in), C_6 = 0 cm.

Damage Classification Crash Event 2: The CDC was 03RYEW2 (90 degrees).

Exterior Damage Crash Event 3: The vehicle sustained direct damage to the right front wheel when it struck a 10 cm (3.9 in) high concrete curb. The wheel rim was bent.

Damage Classification Crash Event 3: The CDC was 12FRWN3 (0 degrees). The severity of the damage was minor.

Exterior Damage Crash Event 5: The vehicle sustained minor scratching to the left side of the front bumper fascia and a small area at the front of the left fender during the impact with a bush as the vehicle came to final rest.

Damage Classification Crash Event 5: The CDC was 12LFLS2 (0 degrees). The severity of the damage was minor.

Event Data Recorder
The Volkswagen was not supported by the Bosch Crash Data Retrieval tool.

Interior Damage
The interior of the Volkswagen sustained moderate damage from eight intrusions, all in the front and second row right seating positions. The most severe intrusions in the front row right seating position involved the B-pillar and lower rear quadrant of the right front door, which intruded laterally 19 and 18 cm (7.5 and 7.1 in), respectively. The most severe intrusion in the second-row right seating position involved the forward, lower quadrant of the right rear door, which intruded laterally 20 cm (7.9 in). The deployed front row passenger's frontal air bag was scuffed from possible contact by the passenger's chest. The right rear door arm rest was fractured, probably from contact by the second-row right occupant's right flank. The interior of the vehicle was very soiled from storage and no other discernable evidence of occupant contact was observed. The windshield glazing was cracked from impact forces. The right front, right rear, second right rear, and backlight were disintegrated from impact forces. The remaining glazing was undamaged. The right front and right rear doors were jammed shut. The left front and left rear doors remained closed and operational.

Manual Restraint Systems
The front and second rows were equipped with three-point lap and shoulder seat belts with sliding latch plates. The driver's and front row passenger's upper anchors were adjusted to the full-up position. The front row seat belts were also equipped with retractor-mounted pretensioners that actuated during the crash.

The driver was restrained by the lap and shoulder seat belt as evidenced by load marks from the belt webbing on the latch plate belt guide. The retractor was also locked from pretensioner actuation with a length of belt webbing extending out of the retractor consistent with usage.

The front row right passenger was restrained by the lap and shoulder seat belt as evidenced by the condition of the belt as found at the SCI vehicle inspection. The belt had been cut by emergency responders and the latch plate remained in the buckle. The occupant's medical records also reported that the occupant was belted.

The second row left occupant was not restrained by the lap and shoulder seat belt. Inspection of the seat belt assembly revealed no load marks on the belt webbing or latch plate belt guide. The occupant's medical records also reported that the occupant was not belted.

The second-row right occupant was not restrained by the lap and shoulder seat belt. The seat belt was locked tightly in the retracted position. The occupant's medical records also reported that the occupant was not belted.

Supplemental Restraint Systems

The Volkswagen was equipped with multi-stage frontal, front-seat-mounted side impact, and side impact IC air bags. Both frontal, IC, and the front right seat-mounted side impact air bags deployed when the vehicle's right plane was struck by the front plane of the Ford.

The driver's frontal air bag was located in the steering wheel hub and the air bag module cover was a four-flap configuration constructed of pliable vinyl. The top flap was 12 cm (4.7 in) wide and the bottom flap was 7 cm (2.8 in) wide. Each side flap was 8 cm (3.1 in) high. The cover flaps opened at the designated tear seams and were undamaged. The deflated air bag was 52 cm (20.5 in) in diameter. Inspection of the air bag revealed no discernable evidence of occupant contact and no damage.

The passenger's frontal air bag was located in the top of the instrument panel and the module cover was a single flap constructed of pliable vinyl with a plastic back plate. The cover flap was 40 cm (15.7 in) wide at the top, 24 cm (9.4 in) wide at the bottom, and 10 cm (3.9 in) high. The cover flap opened at the designated tear seams and was undamaged. The deflated air bag was 50 cm (19.7 in) wide at the top, 40 cm (15.7 in) wide at the bottom, and 57 cm (22.4 in) high. Inspection of the air bag revealed a scuff in the lower, central portion of the air bag from possible contact by the front passenger's chest. The air bag sustained no damage during the crash.

Figure 7: The Volkswagen's deflated front right seat-mounted side impact and right IC air bag

The front right seat-mounted side impact air bag was located in the outboard side of the seat back and deployed through a tear seam. The deflated air bag (**Figure 7**) was 50 cm (19.7 in) high and 15 cm (5.9 in) wide and had a single vent port. There was no discernable evidence of occupant contact and no damage to the air bag.

The IC air bags were located along the roof side rail inside the headliner and extended from the A-pillar to the C-pillar. The deflated left IC was 179 cm (70.5 in) wide and 45 cm (17.7 in) high and extended 21 cm (8.7 in) below the beltline. There was no gap between the front of the IC and the left A-pillar. Inspection of the IC revealed no discernable evidence of occupant contact and there was no crash-related damage to the IC. Emergency responders cut the top of the air bag from the C- pillar to the B-pillar. The deflated right IC (**Figure 8**) was 185 cm (72.8 in) long and 50 cm (19.7 in) high and extended 22 cm (8.7 in) below the beltline. There was no gap between

Figure 8: The Volkswagen's deflated right IC air bag in the second row

the front of the IC and right A-pillar. The air bag was very soiled from exposure to the elements at the salvage facility and there was no discernable evidence of occupant contact. The IC sustained no damage during the crash.

2014 VOLKSWAGEN JETTA OCCUPANTS

Driver Demographics

Age/sex:	42 years/male
Height:	Unknown
Weight:	65 kg (143 lbs)
Eyewear:	Unknown
Seat type:	Bucket
Seat track position:	Rear-most
Manual restraint usage:	Lap and shoulder belt
Usage source:	Vehicle inspection
Air bags:	Front and IC air bags - available and deployed; seat-mounted side impact air bag – available and not deployed
Alcohol/drug involvement:	None
Egress from vehicle:	Exited without assistance
Transport from scene:	Ambulance
Medical treatment:	Treated in trauma center emergency room and released

Driver Injuries

Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Components (IPC)	IPC Confidence Level
1	Abrasion, 1 cm (0.4 in), on forehead with bleeding controlled, not further specified	210202.1	Isolated Left air bag - Steering wheel hub	Probable
2	Contusion (soft tissue injury) left anterior chest wall, not further specified	410402.1	Isolated Interior - Shoulder portion of belt restraint	Probable
3	Strain, acute, lumbar, with tenderness to lumbar paraspinal muscles, not further specified	640678.1	Isolated Interior - Lap portion of belt restraint	Probable

Sources: Emergency room records and EMS treatment record. Injury Numbers 1 to 3 came only from emergency room records.

Driver Kinematics

The driver was restrained by a lap and shoulder seat belt. The seat track was adjusted to the rear-most position and the seat back was reclined 25 degrees aft of vertical. The top of the head restraint was located 22 cm (8.7 in) above the top of the seat back. The right plane impact to the Volkswagen resulted in actuation of the driver's seat belt pretensioner and deployment of the driver's frontal and both IC air bags. The driver was displaced to the right and forward and loaded his seat belt resulting in a contusion to his chest and a lumbar strain. The driver's face

also loaded the frontal air bag resulting in an abrasion to his forehead. The right plane side-slap impact with the right plane of the Chevrolet redirected the driver to the right and he probably then rebounded to the left. The subsequent right front wheel impact with the curb and left front impact with the bush were minor and probably had little effect on redirecting the driver. The driver exited the vehicle following the crash according to his medical records. He was transported by ambulance to a trauma center where he was treated in the emergency room for minor injuries and released.

Front Row Right Occupant Demographics

Age/sex:	28 years/male
Height:	165 cm (65 in)
Weight:	62 kg (137 lbs)
Eyewear:	Glasses
Seat type:	Bucket
Seat track position:	Middle
Manual restraint usage:	Lap and shoulder belt
Usage source:	Vehicle inspection
Air bags:	Front-seat-mounted side impact and IC air bags: available and deployed
Alcohol/drug involvement:	Not reported
Egress from vehicle:	Unknown
Transport from scene:	Ambulance
Medical treatment:	Treated in trauma center emergency room and released

Front Row Right Occupant Injuries

Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Components (IPC)	IPC Confidence Level
1	Laceration, cut 0.5 cm (0.2 in), between eyes from occupant's glasses, not further specified	210602.1	Isolated Right air bag - Right top instrument panel	Certain
2	Abrasion over left hip, not further specified	810202.1	Isolated Interior - Lap portion of belt restraint	Probable
3	Abrasions, scattered, left hand, not further specified	710202.1	Isolated Noncontact injury - Flying glass	Probable

Sources: Emergency room records, EMS treatment record, and follow-up emergency room records. Injury numbers 1 and 2 came only from emergency room records. Injury number 3 came from a combination of EMS treatment and emergency room records.

Front Row Right Occupant Kinematics

The front row right occupant was restrained by a lap and shoulder seat belt. The seat track was adjusted to the middle position and the seat back was slightly reclined. The top of the head restraint was located 22 cm (8.7 in) above the top of the seat back. The right plane impact to the Volkswagen resulted in actuation of the occupant's seat belt pretensioner and deployment of the occupant's frontal, seat-mounted side impact, and both IC air bags. The occupant was displaced

to the right and forward and loaded the seat belt resulting in an abrasion to the left hip. His face loaded the frontal air bag forcing his glasses into his forehead and causing a laceration between his eyes. His right flank loaded the seat-mounted side impact air bag and his head loaded the IC air bag, but he sustained no injuries from these contacts. Flying glass fragments from the disintegrated right front glazing caused scattered abrasions on his left hand. The right plane side-slap impact to the vehicle redirected the occupant to the right and he probably then rebounded to the left. The subsequent right front wheel impact with the curb and left front impact with the bush were minor and probably had little effect on redirecting the occupant. The front row right occupant was transported by ambulance to a trauma center where he was treated in the emergency room for minor injuries and released.

Second Row Left Occupant Demographics

Age/sex:	59 years/female
Height:	163 cm (64 in)
Weight:	82 kg (180 lbs)
Eyewear:	Unknown
Seat type:	Bench with folding backs
Seat track position:	Fixed
Manual restraint usage:	None
Usage source:	Vehicle inspection and medical records
Air bags:	IC air bag available and deployed
Alcohol/drug involvement:	None
Egress from vehicle:	Removed by emergency responders
Transport from scene:	Ambulance
Medical treatment:	Hospitalized 10 days

Second Row Left Occupant Injuries

Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Components (IPC)	IPC Confidence Level
1	Hematoma, extra-axial, small, left high frontal vertex, not further specified	140629.3	Isolated IPC Primary: Roof - Roof or convertible top Alternate: Right door panel/unknown quadrant	Probable Possible
2	Contusion, hemorrhagic, small foci, parenchymal, subcortical white matter of bilateral frontal lobes, not further specified	140622.3	Isolated IPC Primary: Roof - Roof or convertible top Alternate: Right door panel/unknown quadrant	Probable Possible
3	Hemorrhage, splenium of corpus callosum in a pattern consistent with diffuse axonal shear injury, not further specified	140643.2	Isolated IPC Primary: Roof - Roof or convertible top Alternate: Right door panel/unknown quadrant	Probable Possible

Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Components (IPC)	IPC Confidence Level
4	Hemorrhage, subarachnoid, right, adjacent to frontal lobes and right parietal lobe and was also found within Sylvian fissures bilaterally, right ambient cistern, quadrigeminal plate cistern, and interpeduncular cistern without any mass effect	140694.2	Isolated IPC Primary: Roof - Roof or convertible top Alternate: Right door panel/unknown quadrant	Probable Possible
5	Hemorrhage, subarachnoid, left, adjacent to frontal lobes and right parietal lobe and was also found within Sylvian fissures bilaterally, right ambient cistern, quadrigeminal plate cistern, and interpeduncular cistern without any mass effect	140694.2	Isolated IPC Primary: Roof - Roof or convertible top Alternate: Right door panel/unknown quadrant	Probable Possible
6	Hemorrhage, intraventricular, small, in left occipital horn not further specified	140675.2	Isolated IPC Primary: Roof - Roof or convertible top Alternate: Right door panel/unknown quadrant	Probable Possible
7	Fracture right ribs: 1st through 9th with 8th and 9th ribs fractured posteriorly, not further specified	450203.3	Isolated IPC Primary: Interior - Other occupants (specify): Second row right occupant Alternate: Right door panel/unknown quadrant	Probable Possible
8	Pneumothorax, apical, small right lung with scattered ground glass opacities right and left lungs, not further specified	442202.2	Isolated IPC Primary: Interior - Other occupants (specify): Second row right occupant Alternate: Right door panel/unknown quadrant	Probable Possible
9	Lung contusion-> bilateral NFS, No Further Specificity	441410.3	Isolated IPC Primary: Interior - Other occupants (specify): Second row right occupant Alternate: Right door panel/unknown quadrant	Probable Possible
10	Fracture, sternum, along manubrium with deformity and ecchymosis noted, not further specified	450804.2	Isolated IPC Primary: Interior - Other occupants (specify): Second row right occupant Alternate: Right door panel/unknown quadrant	Probable Possible

Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Components (IPC)	IPC Confidence Level
11	Dislocation (widening) right occipital- C_1 joint space with fluid consistent with joint disruptions/dissociation and ligamentous injury with malalignment	650208.3	Isolated IPC Primary: Roof - Roof or convertible top Alternate: Right door panel/unknown quadrant	Probable Possible
12	Dislocation (widening) C_1-C_2 facet joints and spinous processes with ligamentous injury	650206.3	Isolated IPC Primary: Roof - Roof or convertible top Alternate: Right door panel/unknown quadrant	Probable Possible
13	Thoracic vertebra(e) injury fracture without neurologic deficit-> transverse process, Right Vertebrae T4	650420.1	Isolated Interior - Other occupants (specify): Second row right occupant	Probable
14	Thoracic vertebra(e) injury fracture without neurologic deficit-> transverse process, Right Vertebrae T5	650420.1	Isolated Interior - Other occupants (specify): Second row right occupant	Probable
15	Thoracic vertebra(e) injury fracture without neurologic deficit-> transverse process, Right Vertebrae T6	650420.1	Isolated Interior - Other occupants (specify): Second row right occupant	Probable
16	Thoracic vertebra(e) injury fracture without neurologic deficit-> transverse process, Right Vertebrae T7	650420.1	Isolated Interior - Other occupants (specify): Second row right occupant	Probable
17	Laceration, grade I, liver, right hepatic lobe, not further specified	541822.2	Isolated IPC Primary: Interior - Other occupants (specify): Second row right occupant Alternate: Right door panel/unknown quadrant	Probable Possible
18	Contusion (bruised, ecchymosis) over anterior right chest wall with deformity noted, not further specified	410402.1	Isolated Interior - Other occupants (specify): Second row right occupant	Probable

Sources: Emergency room records, hospitalization records, EMS treatment record. Injury number 18 came only from emergency room records. Injury numbers 1, 6, and 9 came only from hospitalization records. Injury numbers 2 through 5, 7, 8, and 10 through 17 came from a combination of emergency room and hospitalization records.

Second Row Left Occupant Kinematics

The second row left occupant was not restrained by a lap and shoulder seat belt. The seat track and seat back were fixed, and the top of the head restraint was located 15 cm (5.9 in) above the top of the seat back. The right plane impact to the Volkswagen displaced the occupant to the right, forward, and upward. The occupant's right flank contacted the left flank of the second-row right occupant, and the second row left occupant's head also probably contacted the roof near the right roof side rail. Alternately, it was possible that the occupant's head contacted the right door. Either of these contacts resulted in a brain hematoma, hemorrhagic contusion to the frontal lobes of the brain, intracerebral hemorrhages, and subarachnoid and intraventricular hemorrhages. The contacts with the roof and/or right door in combination with impact forces and vehicle rotation resulted in dislocation of the right occipital-C1 joint space and dislocation of C1 - C2 facet joints and spinous processes with ligamentous injury. The contact between the two occupants or right door resulted in fractures of right ribs 1 -9 with pneumothorax, bilateral lung contusions, liver laceration, and contusion to the right anterior chest. The second row left occupant's sternum and the right transverse processes of T4 - T7 were also fractured. The occupant probably rebounded following this contact. The right plane side-slap impact to the vehicle probably redirected the occupant to the right. The subsequent impacts to the vehicle were minor and probably had little effect on redirecting the occupant. The second row left occupant was removed from the vehicle by emergency responders and transported by ambulance to a trauma center where she was hospitalized 10 days for treatment of her injuries.

Second Row Right Occupant Demographics

Age/sex:	61 years/male
Height:	175 cm (69 in)
Weight:	73 kg (160 lbs)
Eyewear:	Unknown
Seat type:	Bench with folding backs
Seat track position:	Fixed
Manual restraint usage:	None
Usage source:	Vehicle inspection and medical records
Air bags:	IC air bag available and deployed
Alcohol/drug involvement:	Not reported
Egress from vehicle:	Removed by emergency responders
Transport from scene:	Ambulance
Medical treatment:	Pronounced deceased at trauma center

Second Row Right Occupant Injuries

Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Components (IPC)	IPC Confidence Level
1	Laceration, transection, of thoracic aorta just after the origin of the subclavian vessels	420210.5	Isolated IPC Right Door Panel - Right rear upper quadrant	Certain
2	Laceration transversely oriented, of the mediastinum	441800.2	Isolated Right Door Panel - Right rear upper quadrant	Certain

Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Components (IPC)	IPC Confidence Level
3	Hemomediastinum, significant, not further specified	442208.2	Isolated IPC Right Door Panel - Right rear upper quadrant	Certain
4	Contusions, superficial, on right atrium and ventricle of heart, not further specified	441004.1	Isolated Right Door Panel - Right rear upper quadrant	Certain
5	Fractured ribs: right–lateral, comminuted, 3rd through 10th and posterior 1st through 3rd, 6th, and 7th; left–non-displaced, anterolateral scattered ribs, not further specified with hemorrhage in soft tissues of anterior chest and right lateral chest and torso; not further specified	450203.3	Critical IPC 2-point Right Door Panel - Right rear upper quadrant/Interior - Other occupants (specify): Second row left occupant	Certain
6	Lung contusion-> bilateral NFS, No Further Specificity	441410.3	Critical IPC 2-point Right Door Panel - Right rear upper quadrant /Interior – Other occupants (specify): Second row left occupant	Certain
7	Laceration right middle and lower lobes of lung, not further specified	441432.4	Isolated IPC Right Door Panel - Right rear upper quadrant	Certain
8	Hemopneumothorax, with 300 ml bloody fluid in right pleural cavity and compressed lungs; not further specified	442205.3	Isolated IPC Right Door Panel - Right rear upper quadrant	Certain
9	Hemopneumothorax, with 300 ml bloody fluid in left pleural cavity and compressed lungs; not further specified	442205.3	Isolated IPC Interior - Other occupants (specify): Second row left occupant	Probable
10	Avulsion, 12 by 8 by 2 cm (4.7 x 3.1 x 0.8 in), to diaphragmatic aspect of right lobe of liver with 400 ml of blood in peritoneal cavity, not further specified	541826.4	Isolated IPC Right Door Panel - Right rear upper quadrant	Certain
11	Contusions, small, patchy, on diaphragmatic aspect of liver, not further specified	541812.2	Isolated IPC Right Door Panel - Right rear upper quadrant	Certain
12	Laceration, 0.3 cm (0.1 in), shallow in capsule of spleen, not further specified	544222.2	Isolated IPC Interior - Other occupants (specify): Second row left occupant	Probable

Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Components (IPC)	IPC Confidence Level
13	Fracture, non-displaced, pelvis with associated hemorrhage in the pelvis, not further specified	856100.2	Isolated IPC Right Door Panel - Right rear upper quadrant	Certain
14	Distal tibia fracture NFS [includes isolated medial or posterior malleolus; pilon fracture], Right No Further Specificity	854331.2	Isolated IPC Right Door Panel - Right forward lower quadrant	Certain
15	Fibula [malleoli] fracture NFS, Right No Further Specificity	854441.2	Isolated Right Door Panel - Right forward lower quadrant	Certain
16	Abrasions, punctate, minor, on right cheek, not further specified	210202.1	Isolated Right air bag - Right roof side rail	Probable
17	Abrasions, punctate, minor, on left lower lip, not further specified	210202.1	Isolated Right air bag - Right roof side rail	Probable
18	Abrasions, five, punctate, over right subclavian area, not further specified	410202.1	Isolated Right air bag - Right roof side rail	Probable
19	Abrasion right dorsal (back) hand, not further specified	710202.1	Isolated Right air bag - Right roof side rail	Probable
20	Abrasion on left medial ankle, not further specified	810202.1	Isolated Interior - Other seating position seat back	Probable

Sources: Autopsy records, medical examiner records, emergency room records, and EMS treatment record. Injury numbers 1 to 6 and 8 to 18 came only from autopsy records. Injury number 7 came from a combination of emergency room and autopsy records.

Second Row Right Occupant Kinematics

The second-row right occupant was not restrained by a lap and shoulder seat belt. The seat track and seat back were fixed, and the top of the head restraint was located 15 cm (5.9 in) above the top of the seat back. The right plane impact to the Volkswagen resulted in deployment of the right IC air bag and displaced the second-row right occupant to the right and forward. He loaded the IC air bag resulting in abrasions to the right cheek, left lower lip, subclavian area, and right hand. The occupant's right thorax contacted the intruded right rear door resulting in a laceration and transection of the thoracic aorta and laceration of the mediastinum. Contact with the right rear door also caused contusions to the right atrium and ventricle, laceration to the right and middle lower lobes of the lungs, avulsion of the right lobe of the liver with contusions on the diaphragmatic aspect of the liver, fractured pelvis, right hemopneumothorax, and fractures of the right tibia and fibula. The combination of the thorax contact to the right rear door and contact to the occupant's left thorax by the right flank of the second row left occupant resulted in multiple bi-lateral rib fractures, a left hemopneumothorax, and contusions to both lungs. Contact with the

second row left occupant also caused a laceration to the spleen. Contact to the front row occupant's seatback resulted in an abrasion on the left medial ankle. The subsequent impacts to the vehicle were minor and probably had little effect on redirecting the occupant. The second-row right occupant was removed from the vehicle by emergency responders and transported by ambulance to a trauma center where he was pronounced deceased 41 minutes after the crash.

2011 CHEVROLET SILVERADO

Description

The Chevrolet was a 4-wheel drive, 5-occupant, 4-door, crew cab pickup truck with the VIN 1GC1KXC85BFxxxxxx, equipped with a 6.6-liter, V-8, turbocharged diesel engine, 6-speed automatic transmission with sport shift feature, 4-wheel antilock brakes with electronic brake force distribution, brake assist, traction control, and ESC. The vehicle was also equipped with multistage frontal air bags and IC air bags.

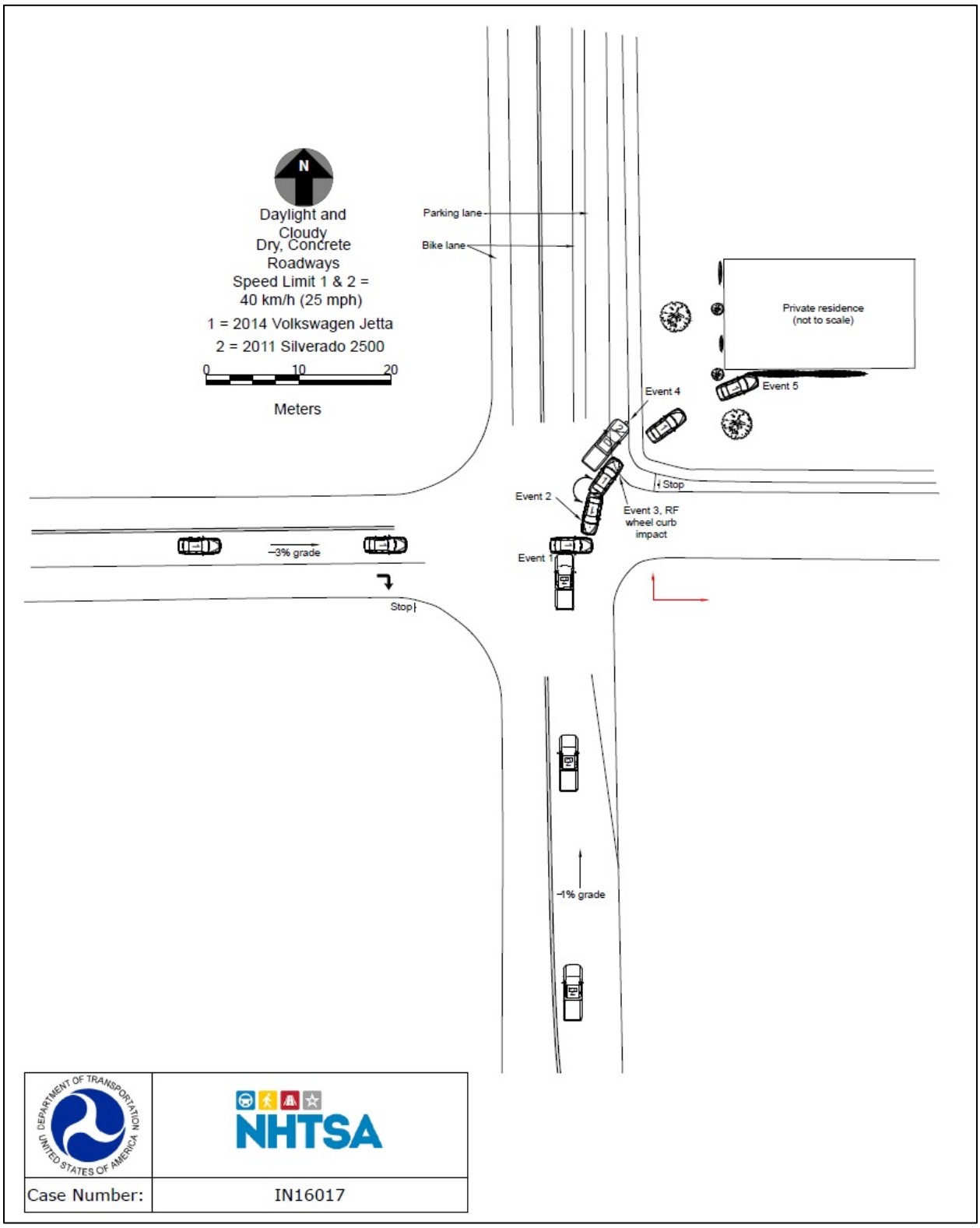
Exterior Damage

Exterior Damage Crash Events 1, 2, and 4: The Chevrolet was not inspected. Based on the police crash schematic and damage to the Volkswagen, the Chevrolet sustained damage to the front plane during the impacts with Volkswagen and a wooden utility pole (Events 1 and 4). It also sustained damage to the right fender during the side-slap impact with the right fender of the Volkswagen (Event 2).

Occupant Data

The driver, a 31-year-old male, was restrained by a lap and shoulder seat belt according to the police crash report. The driver sustained police-reported "A" (incapacitating) injuries and was transported by ambulance to a hospital. His injuries and level of treatment are not known.

CRASH DIAGRAM



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**National Highway
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