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ON-SITE OTHER INFLATABLE OCCUPANT PROTECTION INVESTIGATION

CASE NUMBER - IN-05-039
LOCATION - ILLINOIS
VEHICLE - 2005 INFINITI QX56
CRASH DATE - September 2005

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The crash investigation process is an inexact science which requires that physical evidence such as skid marks, vehicular damage measurements, and occupant contact points be coupled with the investigator's expert knowledge and experience of vehicle dynamics and occupant kinematics in order to determine the pre-crash, crash, and post-crash movements of involved vehicles and occupants.

Because each crash is a unique sequence of events, generalized conclusions cannot be made concerning the crashworthiness performance of the involved vehicle(s) or their safety systems.

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16. *Abstract* This report covers an on-site investigation of an air bag deployment crash that involved a 2005 Infiniti QX56 (case vehicle), a 1991 Oldsmobile Aurora (1st other vehicle) and a 1991 Geo Tracker (2nd other vehicle). This crash is of special interest because the case vehicle was equipped with multiple Advanced Occupant Protection System (AOPS) features, including certified advanced 208-compliant front air bags and side curtain air bags, and the case vehicle's driver [44-year-old, (unknown race and ethnic origin) male] sustained a police reported "A" (incapacitating) injury as a result of the crash. The case vehicle was traveling south in the left turn lane of a divided, multi-lane city street , and the driver was in the process of turning left through the intersection to continue eastbound. The Oldsmobile was traveling north in the outside through lane of a multi-lane, divided city street, and the Geo was traveling west in the outside through lane, and was stopped at the intersection. The case vehicle and Oldsmobile entered the intersection, and the front of the case vehicle impacted the left front of the Oldsmobile causing the case vehicle's driver air bag to deploy. The case vehicle's side curtain air bags deployed during the rapid post-impact counterclockwise rotation as the case vehicle tilted to the right during the rotation. The impact with the case vehicle caused the Oldsmobile to rotate clockwise and travel northeast into the east leg of the intersection, and the front left of the Oldsmobile impacted the left rear side of the Geo. The case vehicle rotated counterclockwise and came to rest in the intersection facing northwest. The Geo rotated counterclockwise, traveled off the roadway and came to rest on the northeast corner or the intersection facing northeast. Following the impact with the Geo, the Oldsmobile traveled off the east leg of the intersection and came to rest on the north side of the roadway facing northeast. Immediately prior to the crash, the case vehicle's driver was most likely seated in a nominal upright driving position. He was not restrained by his manual, three-point, lap-and-shoulder safety belt system. The impact caused the driver to continue forward and move to the right opposite the case vehicle's 30 degree direction of principal force. His face and chest impacted his deployed air bag and his knees impacted the knee bolster. The driver was transported from the scene by ambulance to a hospital. The extent of his injuries could not be determined. The hospital could not locate his medical records.			
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BACKGROUND

IN-05-039

This investigation was brought to NHTSA's attention on October 21, 2005 by an agency representative. This crash involved a 2005 Infiniti QX56 (case vehicle), a 1991 Oldsmobile Aurora (1st other vehicle) and a 1991 Geo Tracker (2nd other vehicle), which were involved in an intersection crash. The crash occurred in September, 2005 at 10:53 a.m., in Illinois and was investigated by the applicable city police department. This crash is of special interest because the case vehicle was equipped with multiple Advanced Occupant Protection System (AOPS) features, including certified advanced 208-compliant front air bags, seat back-mounted side impact air bags and side curtain air bags, and the case vehicle's driver [44-year-old, (unknown race and ethnic origin) male] sustained a police reported "A" (incapacitating) injury as a result of the crash. This contractor inspected the scene and vehicles on December 6, 2005. The case vehicle's driver could not be contacted and has not responded to this contractor's attempts to establish cooperation and acquire an interview. This report is based on the police crash report, scene and vehicle inspections, occupant kinematic principles, and this contractor's evaluation of the evidence.

SUMMARY

The case vehicle was traveling south in the left turn lane of a divided, multi-lane city street, and the driver was in the process of turning left through the intersection to continue eastbound. The Oldsmobile was traveling north in the outside through lane of a multi-lane, divided city street and the Geo was traveling west in the outside through lane, and was stopped at the intersection. It is unknown if the case vehicle's driver made any avoidance maneuvers prior to the crash. The front of the case vehicle impacted the left front of the Oldsmobile causing the case vehicle's driver air bag to deploy. The case vehicle's side curtain air bags deployed during the rapid post-impact counterclockwise rotation as the case vehicle tilted to the right during the rotation. The impact with the case vehicle caused the Oldsmobile to rotate clockwise and travel northeast into the east leg of the intersection, and the front left of the Oldsmobile impacted the left rear side of the Geo. The case vehicle rotated counterclockwise and came to rest in the intersection facing northwest. The Geo rotated counterclockwise, traveled off the roadway and came to rest on the northeast corner or the intersection facing northeast. Following the impact with the Geo, the Oldsmobile traveled off the east leg of the intersection and came to rest on the north side of the roadway facing northeast.

The case vehicle's CDC was estimated to be: **81-FDEW-2** (**30** degrees). The force direction was incremented due to the leftward shift of both front frame members. The WinSMASH reconstruction program, missing vehicle algorithm was used to reconstruct the case vehicle's Delta Vs. The Total, Longitudinal, and Lateral Delta Vs are, respectively: 27 km.p.h. (16.8 m.p.h.), -23.4 km.p.h. (-14.5 m.p.h.), and -13.5 km.p.h. (-8.4 m.p.h.).

The CDCs for the Oldsmobile were determined to be: **11-LYEW-2** (**340** degrees) for the impact with the case vehicle and **12-FYEW-1** (**0** degrees) for the impact with the GEO. The WinSMASH reconstruction program, missing vehicle algorithm was used to reconstruct the Oldsmobile's Delta Vs for the impact with the case vehicle. The Total, Longitudinal, and Lateral Delta Vs are, respectively: 40 km.p.h. (24.9 m.p.h.), -37.6 km.p.h. (-23.4 m.p.h.), and 13.7 km.p.h. (8.5 m.p.h.).

Immediately prior to the crash, the case vehicle's driver was most likely seated in a nominal upright driving position. He most likely had both hands on the steering wheel, and his right foot was most likely on the accelerator or brake pedal. His seat was adjusted to its approximate mid-track position, and the steering wheel was adjusted to between its center and full up position. The position of his seat back is not known. The driver was not restrained by his manual, three-point, lap-and-shoulder safety belt system. It is not known if the driver was wearing glasses at the time of the crash.

The case vehicle's impact with the Oldsmobile caused the driver to continue forward and move to his right along a path opposite the case vehicle's 30 degree direction of principal force as the case vehicle decelerated. His face and chest impacted his deployed front air bag and his knees impacted the knee bolster. His right hip and thigh most likely impacted the center console, and his right hand may have impacted the rearview mirror breaking it off the windshield. The driver rebounded off his front air bag and most likely continued to move to the right as the case vehicle continued to rotate counterclockwise. He most likely remained in his seat as the case vehicle moved to its final rest position. The deployment of the driver's front air bag mitigated his interaction with the case vehicle's interior frontal components. The extent of the driver's injuries could not be determined. The hospital could not locate his medical records.

CRASH CIRCUMSTANCES

Crash Environment: The trafficway on which the case vehicle was traveling was a five-lane, divided, city street, traversing in a north and south direction approaching a four-leg intersection. The trafficway on which the Oldsmobile was traveling was a six-lane, divided city street, traversing in a north and south direction approaching the same four-leg intersection. The traffic way on which the Geo was traveling was a five-lane, divided trafficway traversing in an east and west direction approaching the same intersection. The north leg of the intersection had two southbound through lanes, a left turn lane, a paved median and two northbound through lanes. The south leg of the intersection had two northbound through lanes, a right turn lane, a left turn lane, a paved median and two southbound through lanes. The east leg of the intersection had two westbound through lanes, a left turn lane, a paved median and two eastbound through lanes. The west leg of the intersection had two eastbound through lanes, a left turn lane, a paved median and two westbound through lanes. The average median width was 1.2 meters (3.9 feet) and the average lane width was 3.9 meters (12.8). The roadways were bordered by barrier curbs and pavement markings consisted of broken white center lines, solid white turn lane edge lines and turn arrows, and solid yellow median edge lines. The intersection was controlled by three-phase traffic signals. At the time of the crash the light condition was daylight, the atmospheric condition was rain; the roadway pavement was level, wet concrete with an estimated coefficient of friction of 0.60 and the speed limit was 72 km.p.h. (45 m.p.h.). Traffic density was moderate to heavy, and the site of the crash was commercial. See the Crash Diagram at the end of this report.

Pre-Crash: The case vehicle was traveling south in the left turn lane (**Figure 1** below), and the driver was in the process of turning left through the intersection to continue eastbound. The Oldsmobile was traveling north in the outside through lane (**Figure 2** below), and the driver was intending to continue straight ahead through the intersection. The Geo was traveling west in the

outside through lane and was stopped at the intersection. It is unknown if the case vehicle's driver made any avoidance maneuvers prior to the crash. The crash occurred in the intersection of the two trafficways (**Figure 3**).

Figure 1: Approach of the case vehicle to the intersection, southbound in the left turn lane

Figure 2: Approach of the Oldsmobile northbound in outside through lane

Figure 3: View southeast from case vehicle's approach to the impact area (red arrow), green arrow shows area of case vehicle's final rest

Figure 4: Overview of damage to front of case vehicle, damaged components had been removed and disposed, each increments on tape measure is tenth of meter

Crash: The front of the case vehicle (**Figure 4**) impacted the left front of the Oldsmobile (**Figure 5** below) causing the case vehicle's driver air bag to deploy. The case vehicle's side curtain air bags deployed during the rapid post-impact counterclockwise rotation as the case vehicle tilted to the right during the rotation. The impact with the case vehicle caused the Oldsmobile to rotate clockwise and travel northeast into the east leg of the intersection. The front left of the Oldsmobile (**Figure 6** below) then impacted the left rear side of the Geo.

Post-Crash: The case vehicle rotated counterclockwise approximately 170 degrees and came to rest in the intersection facing northwest (**Figure 3**). Following the impact with the Geo, the Oldsmobile traveled off the east leg of the intersection and came to rest on the north side of the roadway facing northeast (**Figure 7** below). The Geo rotated counterclockwise and traveled off the roadway and came to rest on the northeast corner or the intersection facing northeast (**Figure**

7). The police crash schematic indicated that the right side of the Geo may have struck the traffic signal pole on the northeast corner of the intersection as it came to final rest.

Figure 5: Damage to Oldsmobile's left fender and left front door from impact with the case vehicle, each black mark on tape measure is 0.31 meter (1 foot)

Figure 6: Damage to front of Oldsmobile from impact with the Geo, each increment on rods is 5 cm (2 in)

Figure 7: View northeast to area of impact between Oldsmobile and Geo (red arrow), green arrow shows area of rest of Geo, blue arrow shows area of rest of Oldsmobile, yellow arrow shows area of rest of case vehicle

CASE VEHICLE

The 2005 Infiniti QX56 was an all-wheel drive, four-door sport utility vehicle (VIN: 5N3AA08C85N------) equipped with a 3.5 L, V6 engine; five-speed automatic transmission; power assisted, four wheel anti-lock disc brakes, tire pressure monitoring system; traction control, electronic stability control and a tilt and telescopic steering wheel. In addition, the case vehicle was equipped with power adjustable pedals, dual-stage driver and front right passenger air bags; manual, three-point, lap-and-shoulder safety belts with pretensioners and load limiters in the front seats; front seat back-mounted side impact air bags, side curtain air bags (i.e. front, second, and back seat) with rollover sensor, a LATCH system for securing child safety seats, and a front right occupant classification system.

The various sensors in the case vehicle's advanced occupant restraint system analyze a combination of factors including the predicted crash severity to determine the front air bag inflation level appropriate for the severity of the crash. For the front right seat position, an occupant weight sensor in the seat cushion determines if an occupant is on the seat and enables or suppresses deployment of the air bag based on the

amount of weight on the seat. The rollover sensor determines if the vehicle is approaching a potential rollover and deploys the side curtain air bags. The side curtain air bags are designed to remain inflated long enough to offer protection in a multiple rollover situation.

CASE VEHICLE DAMAGE

Exterior Damage: The case vehicle's impact with the Oldsmobile involved the front of the case vehicle. Due to the removal of the front bumper and sheet metal components, the length of direct damage is not known. However, based on the damaged components remaining on the case vehicle and the damage to the Oldsmobile, it appeared that the direct damage most likely involved the full width of the front of the case vehicle. Crush measurements were taken from the front frame members and also estimated based on a line projected across the front of the frame members. The residual maximum crush occurred at the right frame member and was determined to be 28 centimeters (11 inches). The table below shows the case vehicle's estimated crush profile.

Units	Event	Direct Damage		Field L	C_1	C_2	C_3	C_4	C_5	C_6	Direct	Field L
		Width CDC	Max Crush								±D	±D
cm	1	unk	28	85	15	15	17	19	22	28	0	0
in		unk	11.0	33.5	5.9	5.9	6.7	7.5	8.7	11.0	0.0	0.0

The impact reduced the case vehicle's left side wheelbase 4 centimeters (1.6 inches). The right side wheelbase was extended 3 centimeters (1.2 inches). Induced damage involved the hood, grille, both fenders and the front frame rails. No other induced damage or remote buckling was noted.

The case vehicle's recommended tire size was: P265/70R18, and the vehicle was equipped with tires of this size. The case vehicle's tire data are shown in the table below.

Tire	*Measured Pressure*		*Recommend Pressure*		*Tread Depth*		*Damage*	*Restricted*	*Deflated*
	kpa	psi	kpa	psi	milli-meters	32nd of an inch			
LF	207	30	241	35	7	9	None	No	No
RF	200	29	241	35	6	8	None	No	No
LR	193	28	241	35	8	10	None	No	No
RR	200	29	241	35	7	9	None	No	No

Vehicle Interior: Inspection of the case vehicle's interior (**Figures 8** and **9** below) revealed an occupant contact scuff mark on the driver's knee bolster, a small scuff on the driver's side curtain

air bag, and the rearview mirror was cracked and broken off the windshield. In addition, the driver's front air bag had several scuffs, dirt and grease marks, and a possible blood stain on it. No other occupant contact evidence was found, and no intrusion of the passenger compartment was observed. There was no deformation of the steering wheel. It is not known if the energy absorbing steering column sustained any compression.

Figure 8: Overview of steering wheel, left and center instrument panel and windshield

Figure 9: Overview of instrument panel, steering wheel and windshield

Damage Classification: The bumper and damaged sheet metal parts had been removed from the front of the case vehicle and were not available for inspection; however based on the damaged components remaining on the case vehicle, and the resulting damage to the left front side of the Oldsmobile, the case vehicle's CDC was estimated to be: **81-FDEW-2** (**30** degrees). The force direction was incremented due to the leftward shift of both front frame members. The WinSMASH reconstruction program, missing vehicle algorithm was used to reconstruct the case vehicle's Delta Vs. The Total, Longitudinal, and Lateral Delta Vs are, respectively: 27 km.p.h. (16.8 m.p.h.), -23.4 km.p.h. (-14.5 m.p.h.), and -13.5 km.p.h. (-8.4 m.p.h.). The case vehicle was towed due to damage.

AUTOMATIC RESTRAINT SYSTEM

The case vehicle was equipped with certified advanced 208-compliant front air bags, front seat back-mounted side impact air bags and side curtain air bags with rollover sensor. The driver's front air bag and the side curtain air bags deployed in this crash. The front right passenger air bag did not deploy because there was no front right passenger seated in the case vehicle at the time of the cash. The case vehicle's AOPs system determined the absence of a front right passenger and suppressed deployment of the front right air bag. The seat back-mounted side impact air bags did not deploy because the case vehicle sustained no side impacts.

The case vehicle's driver air bag was located in the steering wheel hub. An inspection of the air bag module cover flaps (**Figure 10** below) and the air bag fabric revealed that the cover flaps opened at the designated tear points. There was no evidence of damage during the deployment to the air bag or the air bag module cover flaps. The air bag module was designed with three cover flaps. The upper flap was constructed of pliable vinyl and approximately

rectangular in shape with a rounded contour in the middle to accommodate the Infiniti emblem. The upper flap was 15.5 centimeters in length (6.1 inches) and approximately 6 centimeters (2.4 inches) in height. The two lower flaps were constructed of pliable vinyl and were irregularly shaped with a rounded contour at the center to accommodate the rounded contour on the upper flap. Each lower flap was approximately 6.5 centimeters (2.6 inches) in height, approximately 4.5 centimeters (1.8 inches) in width at the bottom and approximately 7.8 centimeters (3.1 inches) in width at the top. The deployed driver's air bag (**Figure 11**) was round with a diameter of approximately 56 centimeters (22 inches). The air bag was designed with four tethers, each approximately 10 centimeters (4 inches) in width and had two vent ports, each approximately 2 centimeters (0.8 inches) in diameter, located on the back of the air bag near the center at the 9 and 3 o'clock positions. The tethers were attached to a double stitched internal ring of material (**Figure 11**) that was 24 centimeters (9.4 inches) in diameter. Inspection of the air bag revealed several areas of scuffs with dirt and grease on the air bag. There was also one possible blood spot noted in the left central quadrant of the air bag (**Figure 11**).

Figure 10: Case vehicle's driver air bag module cover flaps

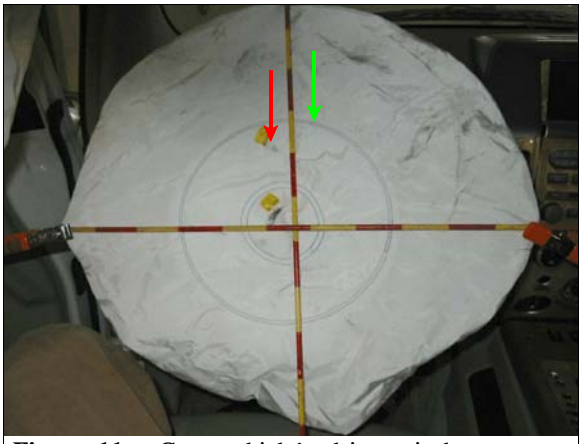


Figure 11: Case vehicle's driver air bag, green arrow shows double stitched ring of material on inside of air bag that tethers attach to, red arrow shows possible blood stain.

The front right passenger's air bag was located in the middle of the right instrument panel (**Figure 9** above). The deployment of the front right air bag was properly suppressed by the case vehicle's AOPs system because there was no front right passenger in the case vehicle at the time of the crash.

The case vehicle's driver and second seat left were equipped with a single side curtain air bag (**Figures 12** and **13** below), which was located along the left roof side rail below the headliner. The back left seat was equipped with an individual side curtain air bag (**Figure 14** below). The driver/second seat left side curtain air bag was approximately rectangular in shape. It was approximately 162 centimeters (63.8 inches) in length and 41 centimeters (16.1 inches) in height. The air bag was constructed with what appeared to be four inflatable chambers adjacent to the driver's seat, and three inflatable chambers adjacent to the second seat. The air bag was attached to the left "A"-pillar by a cloth anchor cord. The anchor cord was approximately 26 centimeters (10.2) in length, attached to the upper portion of the left "A"-pillar, and flared out to attach along the front edge of the air bag. A double tether cord (**Figure 15** below), 65 centimeters (25.6 inches) in length attached the back of the air bag to the front of the back left side curtain air bag.

The driver/second seat left side curtain air bag was not equipped with internal tethers, and there were no visible vent ports. Inspection of the air bag revealed no evidence of damage due to deployment. One small scuff was observed on the front central portion of the air bag (**Figure 12**). This did not appear to be an occupant contact mark.

Figure 12: Case vehicle's driver and second seat left side curtain air bag, arrow shows location of a small scuff mark on the air bag

Figure 13: Second seat left side curtain air bag

Figure 14: Overview of back left side curtain air bag

Figure 15: Overview of tether (arrow) between the back left side curtain air bag and the second seat left side curtain air bag

The back left side curtain air bag (**Figure 14**) was irregularly shaped. It was constructed with three inflatable chambers. The air bag's overall dimensions were 62 centimeters (24.4 inches) in length and 52 centimeters (20.5 inches) in height. A double tether cord, 65 centimeters (25.6 inches) in length, attached the front of the air bag to the back edge of the driver/second seat left air bag. The back left side curtain air bag was not equipped with internal tethers, and there were no visible vent ports. Inspection of the air bag revealed no evidence of damage due to deployment.

The case vehicle's right side curtain air bags also deployed in this crash. The back right side curtain air bag completely deployed; however, the front right passenger/second seat right side curtain air bag (**Figures 16** and **17** below) did not completely deploy. It did not break out of the headliner at the right "B"-pillar (**Figure 18** below). As a result, there was a gap in the air bag coverage along the right side and "B"-pillar of approximately 40 centimeters (15.7 inches).

The case vehicle's seat back-mounted side impact air bags were located in the outboard side of the driver and front right passenger seat. These air bags did not deploy during the crash.

Figure 16: Overview of front right passenger's side curtain air bag, it did not break through the headliner at the "B"-pillar during deployment

Figure 17: Overview of front right passenger's/second seat right side curtain air bag, it did not break through the headliner at the "B"-pillar during deployment

Figure 18: Close view of back section of front right passenger side curtain air bag that failed to break out of the headliner at the left "B"-pillar

CRASH DATA RECORDING

The case vehicle's Restraint Control Module (RCM) was interrogated in the field using a "Consult" scan tool sent to this contractor by a Nissan representative. The printout of the data codes from the RCM was then sent to the Nissan representative for interpretation. The data indicated that following the front air bag deployment, the case vehicle's rollover sensor detected a rotation rate about the case vehicle's longitudinal axis of 247 degrees-per-second and deployed the side curtain air bags. This indicates that during the case vehicle's post-impact counterclockwise spinout, the case vehicle rolled to the right at a rate sufficient to exceed the case vehicle's rollover sensing threshold, and the sensors deployed the side curtain air bags due to the possibility of a rollover occurrence. The data also indicated that the driver's and front right passenger's safety belt pretensioners activated in the crash. The Nissan representative indicated that the case vehicle was not equipped with event recording capability relative to pre-crash data or the deployment of the front air bags.

CASE VEHICLE DRIVER KINEMATICS

Immediately prior to the crash the case vehicle's driver [44-year-old (unknown race and ethnic origin) male; unknown height and weight] was most likely seated in a nominal upright driving posture. He was executing a left turn and most likely had both hands on the steering wheel, and his right foot was most likely on the accelerator or brake pedal. The driver's seat track

was found adjusted to its approximate mid-track position during the vehicle inspection, and his seat back was found nearly fully reclined. The seat track was most likely adjusted to the mid-track position at the time of the crash. However, the seat back was most likely not reclined to the position found at the time of the inspection. The steering column was adjusted to between it center and full up position. It is not known if the driver was wearing glasses at the time of the crash.

The case vehicle's driver was not restrained by his manual, three-point, lap-and-shoulder safety belt system. The safety belt's pretensioner had activated during the crash jamming the safety belt tightly in the unrestrained position.

Figure 19: Driver's knee bolster is displaced, yellow tape shows scuff from driver knee contact

It is not known if the driver took any avoidance actions just prior to the impact. However, regardless of any possible avoidance actions, he was most likely in an upright driving posture with both hands on the steering wheel at the moment of the impact. The case vehicle's impact with the Oldsmobile caused the driver to continue forward and move to his right along a path opposite the case vehicle's 30 degree direction of principal force as the case vehicle decelerated longitudinally and accelerated latterly to the left. His face and chest impacted his deployed front air bag, and his knees impacted the knee bolster (**Figure 19**). As the case vehicle rotated rapidly counterclockwise, his right hip and thigh most likely impacted the center console, and his right hand may have impacted the rearview mirror, breaking it off the windshield. The driver most likely rebounded off his front air bag and moved back into his seat as the case vehicle came to final rest. It is not known if the driver was able to exit the case vehicle under his own power following the crash. The deployment of the driver's front air bag mitigated his interaction with the case vehicle's interior frontal components and most likely prevented him from sustaining more serious injury.

CASE VEHICLE DRIVER INJURIES

The police crash report indicated the driver sustained an "A" (incapacitating) injury and was transported to a local hospital for treatment. The extent of the driver's injuries is not known because the hospital was unable to locate his medical records.

1ST OTHER VEHICLE

The 2001 Oldsmobile Aurora was a front wheel drive, four-door sedan (VIN: 1G3GS64CX14------) equipped with four wheel anti-lock brakes, redesigned driver and front right passenger air bags, and front seat back-mounted side impact air bags.

The Oldsmobile was also equipped with traction control, stability control and an Event Data Recorder (EDR). A download of the EDR was not undertaken because this contractor did not have permission to download the data.

Exterior Damage: The Oldsmobile's impact with the case vehicle involved the left fender, left front wheel and left front and rear doors. The left fender was crushed inward, and the left front wheel apparently snagged on the front of the case vehicle and was displaced rearward and angled outward. The back of the left front wheel had also contacted the left front MacPherson strut during the impact. Direct damage began 109 centimeters (42.9 inches) forward of the left rear axle and extended 232 centimeters (91.3 inches) along the left side of the Oldsmobile. Crush measurements were taken at the mid-door level; however, an accurate crush profile could not be obtained due to the missing driver's door sheet metal, broken door hinges, and what appeared to be post-crash manipulation of the door. The impact with the Geo involved the left portion of the front bumper, grille, hood and the left headlamp/turn signal assembly. The direct damage began at the front left bumper corner and extended 61 centimeters (24 inches) along the bumper. The maximum residual crush was measured as 15 centimeters (5.9 inches) occurring at C_1. The table below shows the Oldsmobile's crush profile for the front impact with the Geo.

Units	Event	Direct Damage		Field L	C_1	C_2	C_3	C_4	C_5	C_6	Direct	Field L
		Width CDC	Max Crush								±D	±D
cm	2	61	15	116	15	9	4	0	0	0	-44	0
in		24.0	5.9	45.7	5.9	3.5	1.6	0.0	0.0	0.0	-17.3	0.0

The Oldsmobile's left side wheelbase was reduced 15 centimeters (5.9 inches), while the right side wheelbase was reduced 4 centimeters (1.6 inches). Induced damaged involved the front bumper, hood, left front door and left rear door.

The Oldsmobile's recommended tire size was: P205/70R14, and the vehicle was equipped with tires of this size. The Ford's tire data are shown in the table below.

Tire	*Measured Pressure*		*Recommend Pressure*		*Tread Depth*		*Damage*	*Restricted*	*Deflated*
	kpa	psi	kpa	psi	milli-meters	32nd of an inch			
LF	207	30	241	35	6	8	None	No	No
RF	193	28	241	35	6	8	None	No	No
LR	193	28	241	35	7	9	None	No	No
RR	0	0	241	35	7	9	None visible	No	No

Damage Classification: Based on the vehicle inspection the CDCs for the Oldsmobile were determined to be: **11-LYEW-2** (**340** degrees) for the impact with the case vehicle and **12-FYEW-1** (**0** degrees) for the impact with the GEO. The WinSMASH reconstruction program, missing vehicle algorithm was used to reconstruct the Oldsmobile's Delta Vs for the impact with the case vehicle. The Total, Longitudinal, and Lateral Delta Vs are, respectively: 40 km.p.h. (24.9 m.p.h.), -37.6 km.p.h. (-23.4 m.p.h.), and 13.7 km.p.h. (8.5 m.p.h.). The Oldsmobile was towed due to damage.

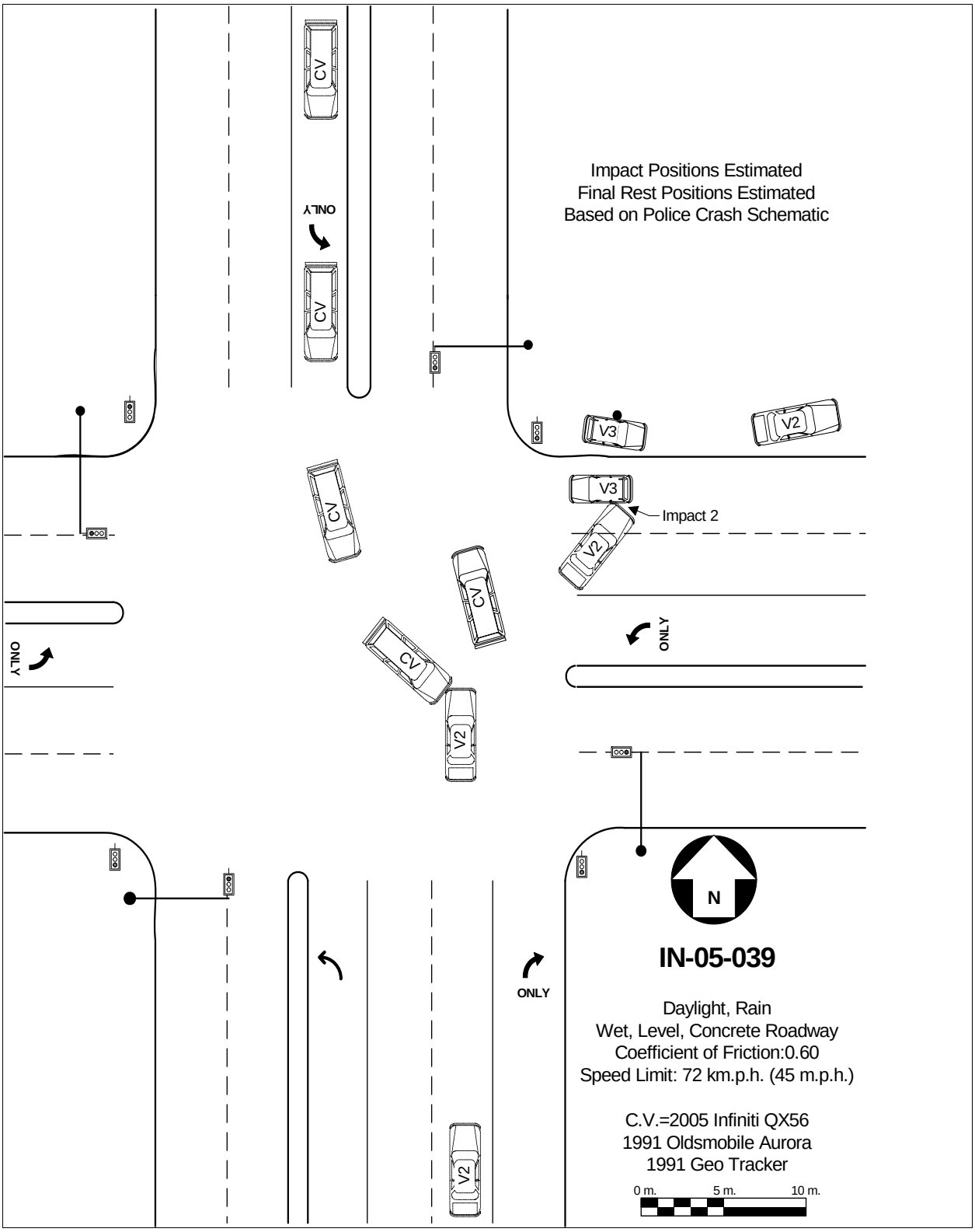
Oldsmobile's Occupants: According to the police crash report, the driver of the Oldsmobile [20-year-old, (unknown race and ethnic origin) male] was restrained by his manual, three-point, lap-and-shoulder safety belt system. The police crash report indicated the driver sustained a "A" (incapacitating) injury; however, no information was given regarding his medical transport or treatment status.

2nd Other Vehicle

The 1991 Geo Tracker was a two-door, four wheel drive sport utility vehicle (VIN: 2CNBJ18U8M6------) equipped with 1.6L engine.

Exterior Damage: The Geo Tracker was not inspected and no damage photographs were available. With no inspection or photographs of the damage, no CDC could be assigned.

Geo's Occupants: According to the police crash report, the driver of the Geo [30-year-old, (unknown race and ethnic origin) male] was restrained by his manual, three-point, lap-and-shoulder safety belt system. The police crash report indicated the driver sustained a "B" (non-capacitating-evident) injury and was not transported from the scene to a medical facility.


Impact Positions Estimated
Final Rest Positions Estimated
Based on Police Crash Schematic
CV
CV
ONLY
V3
V2
V3
Impact 2
V2
CV
CV
CV
ONLY
ONLY
V2
N
IN-05-039
ONLY
Daylight, Rain
Wet, Level, Concrete Roadway
Coefficient of Friction:0.60
Speed Limit: 72 km.p.h. (45 m.p.h.)
C.V.=2005 Infiniti QX56
1991 Oldsmobile Aurora
1991 Geo Tracker
V2
0 m.
5 m.
10 m.