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REMOTE AIR BAG DEPLOYMENT REPORT

CASE NUMBER - IN99-017
LOCATION - Florida
VEHICLE - 1998 BUICK CENTURY
CRASH DATE - July 1998

Submitted:

September 3, 1999

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Contract Number: DTNH22-94-D-17058

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National Center for Statistics and Analysis
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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.

Technical Report Documentation Page

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15. *Supplementary Notes*
Remote air bag investigation involving a 1998 Buick Century equipped with manual safety belts and dual redesigned air bags, a 1996 Mack tractor-trailer rig and a 1982 Ford Thunderbird.

16. *Abstract*
This report covers a remote investigation of an air bag deployment crash that involved a 1998 Buick Century, a 1996 Mack tractor-trailer rig and a 1982 Ford Thunderbird. This case is of special interest because the case vehicle was equipped with redesigned air bags that deployed as a result of the collision events and the restrained driver (82-year-old female) was killed. The case vehicle (vehicle #1) was traveling north in a gravel driveway at its intersection with a two-lane undivided state route, intending to turn left onto the state route to travel west. Vehicle #2 was traveling east in the eastbound lane of the state route, approaching the driveway intersection. Vehicle #3 was traveling west in the westbound lane of the same state route. The case vehicle entered the road from the driveway, beginning the intended left turn. The turning maneuver was executed such that the case vehicle was traveling west entirely within the eastbound lane. The front right corner of vehicle #2 impacted the front left corner of the case vehicle, causing the case vehicle's driver and front right air bags to deploy. The case vehicle was pushed rearward and rotated approximately 180 degrees clockwise, ran off the south road edge and came to rest on the roadside headed east. Vehicle #2 jackknifed, the tractor crossed into the westbound lane and the front of vehicle #3 impacted the right side of vehicle #2's power unit. Vehicle #3 did not contact the case vehicle. The crash severity for the case vehicle was high [greater than 40 km.p.h. (25 m.p.h.)]. Incomplete medical data indicate that the case vehicle driver sustained bilateral broken legs, numerous other lower extremity injuries, a broken rib, a possible fracture of the pelvis and integumentary injuries.

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Additional photographs are available in SCI EDCS case IN99-017

BACKGROUND

IN99-017

This case was brought to the NHTSA's attention by a review of the 1998 Fatality Analysis Reporting System (FARS) in February 1999. The crash involved a 1998 Buick Century (case vehicle), a 1996 Mack truck-tractor towing a semi-trailer (vehicle #2) and a 1982 Ford Thunderbird (vehicle #3). The crash occurred in July 1998 at 7:00 a.m. in Florida and was investigated by the applicable state police. This case is of special interest because the case vehicle was equipped with redesigned air bags that deployed as a result of the collision events and the case vehicle's driver (82-year-old female) was killed. The Police Crash Report and police photographs were received in March 1999. The coroner's report of a non-invasive death examination was received in April 1999. This report is based on the Police Crash Report, the death examination report, police photographs, occupant kinematic principles and this contractor's evaluation of the evidence.

CRASH CIRCUMSTANCES

The case vehicle (vehicle #1) was traveling north in a gravel commercial driveway at its intersection with a two-lane undivided state route, intending to turn left onto the state route to travel west. Vehicle #2 was traveling east in the eastbound lane of the two-lane undivided state route, approaching the intersection with the commercial driveway (**Figure 1**). Vehicle #3 was traveling west in the westbound lane of the same state route. The posted speed limit was 89 km.p.h. (55 m.p.h.) for vehicles #2 and #3. There were no traffic control devices other than painted lane lines on the state route. It was daylight, the weather was clear and the asphalt road surface was dry and without defects. The case vehicle entered the road from the driveway, beginning the intended left turn (**Figure 2**). The turning maneuver was executed such that the case vehicle was traveling west entirely within the eastbound lane, directly in the path of vehicle #2. The driver of vehicle #2 observed the case vehicle and braked with full lockup, leaving 46 meters (151 feet) of skid marks.

Figure 1: Vehicle #2's east-bound approach; case vehicle emerges from gravel drive on right (case photo #01)

The crash occurred within the driveway intersection. The front right corner of vehicle #2 impacted the front left corner of the case vehicle, causing the case vehicle's driver and front right air bags to deploy. The case vehicle was pushed rearward and rotated approximately 180 degrees clockwise, ran off the south road edge, struck a roadside mailbox with its front and came to rest on the roadside headed east. Vehicle #2 jackknifed and the tractor crossed into the

Figure 2: Case vehicle driver's view of eastbound traffic and intended left turn, looking west from mouth of driveway (case photo #02)

westbound lane. The driver of vehicle #3 braked with full lockup and steered right but could not avoid the collision. The front of vehicle #3 impacted the right side of vehicle #2's power unit. Vehicle #2 came to rest with the power unit partially onto the north roadside headed northeast, and with the trailing unit blocking the westbound lane and extending partially into the eastbound lane. Vehicle #3 came to rest headed northwest with its front end partially on the north shoulder.

CASE VEHICLE

The case vehicle was a front wheel drive 1998 Buick Century six-passenger four-door sedan (VIN: 2G4WS52M7W1------) equipped with a 3.1 liter V6 engine and a four-speed automatic transmission with column-mounted selector lever. Four wheel anti-lock brakes were standard for this vehicle. The case vehicle's wheelbase was 277 centimeters (109.0 inches). The odometer reading is not known. The case vehicle was towed from the scene due to disabling damage.

The front of vehicle #2 overrode the front of the case vehicle, with direct contact to the case vehicle's bumper limited to the front left corner area where vehicle #2's front right wheel pushed the case vehicle's frontal components back to the axle (**Figure 3**). The right two-thirds of vehicle #2's front bumper penetrated into the case vehicle's engine compartment, buckling the hood and causing extensive induced damage to the case vehicle's right side. In addition, the case vehicle's instrument panel intruded into the passenger cabin across the entire front seat row, with the steering column jammed against the front edge of the driver's seat cushion and the steering wheel rim almost entirely collapsed (**Figure 4**). The available photographs show that the damage to the case vehicle was altered to permit extrication of the driver, and there is crash debris stacked in the interior. The floor and toe pan are not visible in the available photographs. The CDC for the case vehicle, estimated from photographs, is **12-FDEW-5** with principal direction of force 350 (-10) degrees. This collision is out-of-scope for the WinSMASH reconstruction program and Delta V was not calculated. The crash severity for the case vehicle was high [greater than 40 km.p.h. (25 m.p.h.)]. The crash was virtually unsurvivable for a front row occupant of the case vehicle.

Figure 3: Front of case vehicle, with A- and B-pillars cut, roof peeled back and debris piled on (case photo #9)

Figure 4: Case vehicle driver seat area; Note, deformed and intruded steering assembly and instrument panel (case photo #11)

The case vehicle's driver [82-year-old female, White (unknown if Hispanic), 156 centimeters, 75

kilograms (61 inches, 165 pounds)] was restrained by the available manual three-point lap-and-shoulder safety belt system. There was no other occupant in the case vehicle. The driver's pre-crash seat adjustments, seated posture and steering wheel adjustments are unknown. The driver was transported to a local hospital and subsequently transferred to a trauma center. She was hospitalized for treatment, but was declared dead approximately 24 hours post-crash. The following discussion of the case vehicle driver's injuries is based on the coroner's report of a non-invasive death examination and the principles of occupant kinematics. The coroner's report includes a brief review of the course of hospitalization, but the hospital records were not acquired and the injury information must be regarded as incomplete.

The case vehicle driver was probably seated in a normal driving posture, with her back against the seat back, her feet on the foot controls or floor and at least one hand on the steering wheel. There is no evidence that the case vehicle's driver attempted any avoidance actions. The impact with vehicle #2 deployed the air bags and caused the driver to move forward and upward. She encountered the driver's air bag and sustained abrasions on her face and neck. The steering assembly intruded, the air bag deflated and her chest and hips impacted the steering wheel, causing a fracture of the left tenth rib. In addition, the coroner's report indicates a possible fracture of the left inferior pubic ramus, but this possible fracture is not coded in the injury table. The instrument panel, floor and toe pan intruded and the driver suffered numerous injuries to her lower extremities, including: depressed fractures of the tibial plateau on both the left and right legs, fractures of bones in both feet, a laceration on her right lower leg, extensive abrasions over both lower legs and contusions of both feet.

CASE VEHICLE DRIVER INJURIES

Injury Number	Injury Description (including Aspect)	NASS Injury Code & AIS 90	Injury Source (Mechanism)	Source Confidence	Source of Injury Data
1.	Depressed fracture, left tibial plateau	853406.2 moderate	Left instrument panel	Probable	Coroner's Report
2.	Depressed fracture, right tibial plateau	853406.2 moderate	Left instrument panel	Probable	Coroner's Report
3.	Fracture, left fifth metatarsal	852200.2 moderate	Floor	Probable	Coroner's Report
4.	Fracture, right first metatarsal	852200.2 moderate	Floor	Probable	Coroner's Report
5.	Fracture, right first phalange	853602.1 minor	Floor	Probable	Coroner's Report
6.	Fracture, left tenth rib	450212.1 minor	Steering wheel	Probable	Coroner's Report
7.	Abrasions, right cheek	290202.1 minor	Driver's air bag	Probable	Coroner's Report

Injury Number	Injury Description (including Aspect)	NASS Injury Code & AIS 90	Injury Source (Mechanism)	Source Confidence	Source of Injury Data
8.	Abrasions, anterior neck	390202.1 minor	Driver's air bag	Probable	Coroner's Report
9.	Abrasions, lower legs, bilateral	890202.1 minor	Left Instrument panel	Probable	Coroner's Report
10.	Laceration, 4 cm, anterior right lower leg	890602.1 minor	Left instrument panel	Probable	Coroner's Report
11.	Contusions (ecchymosis and swelling), feet, bilateral	890402.1 minor	Floor	Probable	Coroner's Report

VEHICLE NUMBER 2

Vehicle #2 was a 1996 Mack model CH613 cab-over-engine 6x4 truck-tractor (VIN: 1M1AA13Y3TW------) that was towing a semi-trailer. Vehicle #2 was towed from the scene due to disabling damage. The TDC for vehicle #2's impact with the case vehicle, estimated from photographs, is **12-FZEW-2**. The driver [44-year-old male; race, ethnicity, height and weight unknown] sustained police-reported possible injuries. There was no other occupant in vehicle #2.

Figure 5: Front of vehicle #2 (case photo #14)

Figure 6: Front right corner of vehicle #2 (case photo #15)

VEHICLE NUMBER 3

Vehicle #3 was a rear wheel drive 1982 Ford Thunderbird five-passenger two-door sedan (VIN: 1FABP42D6CH------) equipped with a 4.2 liter V8 engine. Vehicle #3 did not contact the case vehicle but was towed from the scene due to disabling damage resulting from its impact with vehicle #2. The driver [42-year-old male; race, ethnicity, height and weight unknown] sustained police-reported possible injuries. There was no other occupant in vehicle #3.