NHTSA REFERENCE NO. 11206504

(See other side)

INFORMATION REDACTED PURSUANT TOTHE FREEDOM OF INFORMATION ACT (FOIA), 5 U.S.C.552(B)(6)

Worn while driving - Soles made of soft rubber.

Worn by Driver on date of accident, 2/23/19

No. 1 of 2 identical photos

Pair of SKECHERS

SIZE: 10 (USA)

This photo ID (other side) No. & Info.: July 3, 2019-Wednesday-9:15PM; /storage/emulated/0/DCIM/Camera/IMG_20190703_211512.jpg; 12.2MP 3024 x 4032 4.44mm; Google Pixel 3 XL; f/1.8 1/17 4.4MB 150279

(SWAP places

[redacted]

Photo I.D. No.: /storage/emulated/0/DCIM/Camera/IMG_20190703_ No. Cont.

2/19 54.jpg; 12.2MP 3024 x 4032 3.2MB; Google Pixel 3 XL; f/1.8, 1/60 4.44mm ISO 44

Part of pinned-foot series.

No. 1 of 2 identical photos.

Sole made of Soft Rubber.

Sole of SKECHERS worn during Accident, 2/23/19 by Driver of Subject car.

For visual reference to position of steel dowel pins, Reader/viewer is respetfully referred to Photo No.:
IMG_20190325_120506.jpg; 12.2MP 4032x3024
2.5 MB ISO395; Google Pixel 3 XL; f/1.8 1/17 sec. Taken:
03/05/2019 @ 12:05 pm; original: /storage/emulated/0/DCIM/Camera

1 of 2 identical photos included in this package.

part of pinned foot series photo

See circled area. See Blow-Up: Photo ID. No.: IMG_20190703_212101.jpg

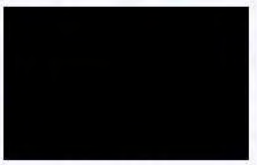
ID. No. This photo: July 3, 2019 - Wednesday - 9:21 PM: /storage/emulated/0/DCIM/Camera/IMG_20190703_212101.jpg; 12.2 MP 3024 x 4032 3.0 MB; Google Pixel 3 XL; f/1.8 1/40 JPG; 4.44 mm 1507/4

Part of Pinned Foot Series.

MISCELLANEOUS Photograph, Blow-Up of sole of right SKECHERS shoe worn during 4-car injury accident, 2/23/19. Use as a comparison.

Photo ID.: July 3, 2019, Wednesday; 9:20 PM; /Storage/emulated/0/DCIM/Camera/IMG_20190703_212010.jpg; 2.2MP 1702x1292 233KB; Google Pixel 3 XL; f/1.8 1/40 4.44mm ISO791.

No. 1 of 2 identical images included in this package.



part of pinned foot series of photos.

The dowel pin, steel, attop fastening-plate shoulder could easily make the impression seen in photo to left, (sole of shoe is soft-rubber.)

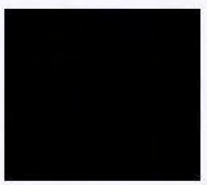
No. 1 of 2 identical photos.

Part of pinned-foot-series. Please see photo No.: IMG_20190325_120506.jpg, taken with Google Pixel 3 XL, f/1.8 @ 1/17 sec. ISO395, for a look at the steel dowel pins and their affixed positions on the accelerator-pedal-assembly (mounted in the subject C350W, M-B. This 2

Photo info.: July 3, 2019 - Wednesday - 9:21 PM

IMG_20190703_212106.jpg - 0.3MP - 515 x 515 3.2 MB - Google Pixel 3 XL - f/1.8 - 1/40 4.44mm ISO656.

No. 1 of 2 identical images includ in this package.



PHOTOGRAPHS - SERIES 8:

THE PAIN WAS TREMENDOUS THE MOMENT THE CRUISE-CONTROL APA TRAPPED THE DRIVER'S FOOT UNDER THE ACCELERATOR PEDAL, 2/23/2019. ALTHOUGH DRIVER COULD PLACE NO WEIGHT ON THE FOOT AND REQUIRED A WALKER FOR TEN DAYS, THERE WAS NO BRUISING. SEVERAL WEEKS LATER, THE BRUISING ROSE FROM THE INTERIOR OF THE DRIVER'S RIGHT FOOT. THAT IS WHAT IS DEPICTED IN THE PHOTOGRAPHS: THE BRUISING FROM THE INJURY CAUSED BY THE ACCELERATOR PEDAL DRIVING HARD INTO THE DRIVERS FOOT AFTER INADVERTANT ACTIVATION OF THE C-C BY M-B. NOTE: AAA, CHP, KAISER-PERMANENTE ER AND M-B EACH AND ALL HAVE EXPRESSED NO INTEREST WHATSOEVER IN MY BRUISED FOOT AND NONE OF THEM HAVE BEEN INTERESTED IN MY ACCOUNT OF MY FOOT BEING PINNED AS A PART OF THE ACCIDENT, UNDERNEATH THE ACCELERATOR PEDAL. IF THAT IS NOT A DANGER TO THE COMMUNITY, I DO NOT KNOW WHAT CONSTITUTES A DANGER TO THE COMMUNITY.

TOTAL PICTURES IN SERIES: THREE (3)

NHTSA - Reference No.: 11206504

Photo D: April 17, 2019 - Wednesday - 9AM; Storage emulated/0/DCIM/Camera/IMG_20190417_090017.jpg; 1,440 x 1,762; 595 KB; Google Pixel 3XL; F1.8; 1/40; 4.44mm; ISO419.

Bruising - photo is part of "pinned foot series."

Bruising - Areas where accelerator came down rapidly and forcefully on top of (my) Driver's foot, pinning it.

Bruising -

(see other side)

No. 1 of 2 identical photos included in this package.

(copy Version 1 of 2)

(See Other side.)

The moment cruise-control kicked in on 2-23-2019, I lost all control of my car except steering. As a result of "foot migration," my right foot was immediately pinned underneath the accelerator pedal with an extreme bolt of pain shooting through my right foot. (See other documents in this packet for further details.) Bruising did not become visible nor evident for a number of days until April 26, 2019. The next morning I took the picture on the reverse side and several more with my cell phone (Google Pixel 3). Bruising is in exact spot where I felt the extreme bolt of pain when my foot became pinned by the accelerator pedal.

(See Farmer Market Crash case study for information on limb "migration.")

[redacted] 06/29/2019

I swear the above is true and correct to the best of my belief and abilities.

[redacted] 06/29/2019

Far [redacted] ries; ALLUILUM) ALLL4CM
CH [redacted] decided in advance,
an [redacted] er of crucial and
ger [redacted] e accident was a
fa [redacted] th a properly conducted
inv [redacted] e available (some might
have [redacted] n. Officer Sepulveda
(over)

Pinned-Foot-Photo-Series: (2) photos of brake-gas pedal assembly, All photos of Driver's accident-worn shoes, all picture of Driver's right foot.

1 of 2 identical images included in package.

NHTSA-Reference #: 11206504

Driver's right foot with bruising showing.

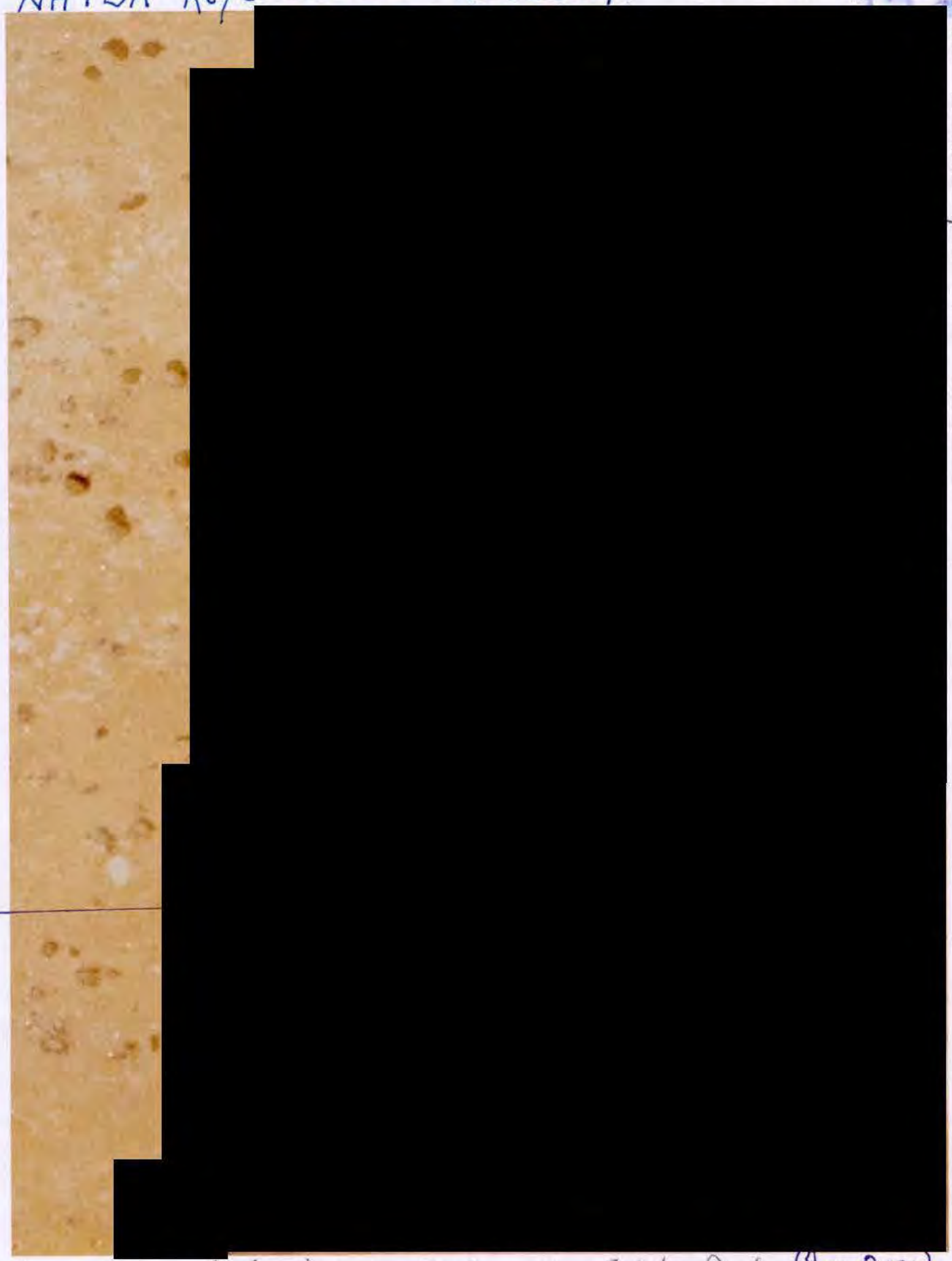
Forensic Photo ID. No. (this picture): April 17, 2019 - Wednesday - 9:00 A.M.; Storage/emulated/0/DCIM/Camera/IMG_20190417_090017; IDC!: 1.9MP 1143X1627 (1833X3168) 884KB: 5.8MP (& 090036)

NHTSA Ref. No. 11206504.

(Continued from reverse side) collected information from dri and passengers of each of the four vehicles involved. Reading of the report indicates that no "Interested Party's" nor outside witnes statements were obtained. Other than information in the TCR that was incorrect or incomplete regarding my passenger, wife, [redacted] (and myself), no errors were seen as read. Not once did officer K. Sepu ever ask (me) Driver what happened. Officer Sepulveda also left out a driver-witness statement that was germane and relevant and belonged in the TCR: She'd asked the driver-witness if he'd spoken to (me) Driver and asked (me) Driver what had happed? (I) Driver, overhear said-driver-witness-victim respond to the officer's question with words to th effect, "He said he got his foot stuck under the gas pedal." Without asking furt[redacted] about this statement (and new information), officer [redacted] Sepulveda quickly moved aw from the witness-driver-victi[redacted]ne of the cars involved in the H-Car collision, without further inquiry, question nor clarification. It is further noted that Officer Sepulveda never asked me about that critical and new information obtained from subject driver-witness-victim. In Contrast, however, Officer Sepulved found time to engage the Tip-Top Tow Truck Driver in an on scene check of the free-movement of the subject M-B C350. gas pedal which had no sticking during manual movement, t The Tip-Top-Tow-Truck driver (invalid experiment as conditions not duplicated. (Result however, does nothing to disprove (my) Drive statement given to AAA on 2/24/19. Previously noted elsewhere in packet, two different, First Responders, asked me the same leadin question (using slightly differing words but to the effect that, "Di you step on the gas pedal and then it got stuck?" This was similar to the same question Officer Sepulveda late asked or put to me. A/ told a tow driver, a fireman and a CHP officer then (and now), "No." "No, that did not happen." "No, "NO, absolutely not!" It was during this time, post-accident and d

NHTSA - Reference #: 11206504. (see Over)

FOOT OF DRIVER. ALEXFORD



Bruise located in exact spot where accelerator pedal is claimed to have pinned driver's foot at same time as sudden acceleration.

Close-up of bruise on Driver's right foot (See Over)

(over-Exposure)

No. 2 of 2 identical photos in package

(See over)

Photo ID.: IMG_20190417_090048/090048|_0000_
Burst20190417090048873_Cover; 1.2MP 3024x4032
1.2 MB; Google Pixel 3X2; f/1.8 1/60 4.44mm ISO579

Part 4:

REFERENCE AND COLLATERAL MATERIALS:

(NHTSA REFERENCE NO.: 112065504)

HIGHWAY ACCIDENT REPORT:

"FARMERS MARKET CRASH - SANTA MONICA"

NTSB/HAR-04/04

PB2004-916204 - NOTATION 7649B

ADOPTED AUGUST 3, 2004

THE VERGE - MAY 2, 2019

UNFINISHED ANNOTATED STORY OF THE

BOEING 737 MAX WITH MCAS

(PRESENTED BECAUSE OF IMPORTANT AREAS ANALOGOUS

BETWEEN GTWO TRANSPORTATION MANUFACTURERS:

MERCEDES-BENZ-DAIMLER & ALSO: BOEING

NHTSA Reference No. 11206504
from [redacted]
Exhibit and Supporting Document.

Partial

Highway Accident Report

Rear-End Collision and Subsequent Vehicle Intrusion Into Pedestrian Space at Certified Farmers' Market Santa Monica, California July 16, 2003

Driver included only the referenced pages and/or applicable pages. Pages omitted: 1-4, 12-26, 41-45. Pages omitted are maps, permits, diagrams, etc. that were and are not germane or applicable to the 02/23/2019 accident nor to the primary issue: Adding to the safety of the community.

NTSB/HAR-04/04
PB2004-916204
Notation 7649B
Adopted August 3, 2004

National Transportation Safety Board
490 L'Enfant Plaza, S.W.
Washington, D.C. 20594

2 of 2 identical copies.

National Transportation Safety Board. 2004. ***Rear-End Collision and Subsequent Vehicle Intrusion Into Pedestrian Space at Certified Farmers' Market, Santa Monica, California, July 16, 2003.*** **Highway Accident Report NTSB/HAR-04/04. Washington, DC.**

Abstract: On July 16, 2003, a 1992 Buick LeSabre was westbound on Arizona Avenue, approaching the intersection of Fourth Street, in Santa Monica, California. A 2003 Mercedes Benz S430 sedan was stopped on Arizona Avenue at the intersection for pedestrians in a crosswalk on Fourth Street. The Buick struck the Mercedes, continued through the intersection, and drove through a farmers' market, striking pedestrians and vendor displays before coming to rest. As a result of the accident, 10 people were fatally injured, and 63 people received injuries ranging from minor to serious. The Buick driver and both Mercedes occupants were uninjured.

The major safety issues discussed in this report are the unintended acceleration of the accident vehicle, the adequacy of temporary traffic control measures for the protection of pedestrian traffic in the Santa Monica Certified Farmers' Market, and the need to equip motor vehicles with event data recorders.

As a result of its investigation, the Safety Board made recommendations to the Federal Highway Administration, the National Highway Traffic Safety Administration, and the city of Santa Monica.

Contents

Acronyms and Abbreviations

AASHTO	American Association of State Highway and Transportation Officials
CCFD	Culver City Fire Department
CDMV	California Department of Motor Vehicles
CFM	certified farmers' market
CFR	*Code of Federal Regulations*
CHP	California Highway Patrol
CTM	*Caltrans Traffic Manual*
ECM	electronic control module
EDR	event data recorder
GVWR	gross vehicle weight rating
IC	incident commander
IEEE	Institute of Electrical and Electronics Engineers
LACFD	Los Angeles County Fire Department
LAFD	Los Angeles City Fire Department
MCI	multi-casualty incident
MUTCD	*Manual on Uniform Traffic Control Devices*
NHTSA	National Highway Traffic Safety Administration
NPRM	notice of proposed rulemaking
SAE	Society of Automotive Engineers
SMCFM	Santa Monica Certified Farmers' Market
SMFD	Santa Monica Fire Department
SMPD	Santa Monica Police Department
TA	typical application
USDA	U. S. Department of Agriculture
WATCH	*Work Area Traffic Control Handbook*

Executive Summary

On July 16, 2003, about 1:46 p.m. Pacific daylight time, a 1992 Buick LeSabre, driven by an [redacted] was westbound on Arizona Avenue, approaching the intersection of Fourth Street, in Santa Monica, Los Angeles County, California. At the same time, a 2003 Mercedes Benz S430 sedan, occupied by a driver and front-seat passenger, was also westbound on Arizona Avenue and had stopped for pedestrians in a crosswalk on Fourth Street at the intersection with Arizona Avenue. The Buick struck the left rear corner of the Mercedes, continued through the intersection, and drove through a farmers' market, striking pedestrians and vendor displays before coming to rest. As a result of the accident, 10 people were fatally injured, and 63 people received injuries ranging from minor to serious. The Buick driver and both Mercedes occupants were uninjured.

The National Transportation Safety Board determined that the probable cause of this accident was the failure of the Buick driver to maintain control of his vehicle due to his unintended acceleration. Contributing to the severity of the accident was the lack of a barrier system to protect pedestrians in the Santa Monica Certified Farmers' Market area from errant vehicles.

The major safety issues discussed in this report are the unintended acceleration of the accident vehicle, the adequacy of temporary traffic control measures for the protection of pedestrian traffic in the Santa Monica Certified Farmers' Market, and the need to equip motor vehicles with event data recorders.

As a result of its investigation, the Safety Board made recommendations to the Federal Highway Administration, the National Highway Traffic Safety Administration, and the city of Santa Monica.

Meteorological Information

At the time of the accident, the day was clear, and the roadway was dry. Winds were from the southeast (220°) at 12 mph. According to the official National Weather Service report for Santa Monica at 1:51 p.m., the temperature was 78° F, and the dew point was 67° F. Sun transit time (the point at which the sun appears directly overhead) was 1:00 p.m.

Driver Information

The [redacted] held a valid class C (noncommercial) California driver's license with a corrective lens restriction, issued on November 28, 2000, and valid for 5 years. He was issued a disabled parking placard in 1994 due to "severe hip arthritis" and associated limitations in mobility; it had been renewed biannually and was valid at the time of the accident. Several witnesses told police investigators that the driver was wearing eyeglasses at the time of the accident. In California, drivers [redacted] and older must renew their license in person.[2]

To renew his license, the driver was required to present the renewal notice or complete an application; permit a thumb print and photograph to be taken for identification; pay a $15 fee; and pass both a vision examination and a written test of traffic laws and signs. A road test is generally not required of California drivers [redacted] of age and older who are renewing their licenses, and the driver stated to police that he did not have to take a road test when he renewed his license in 2000. Drivers must have visual acuity of 20/40 or better in each eye and in both eyes together, to pass the vision examination. If corrective lenses are used at the time of testing, the license carries a corrective lens restriction. The written test comprises 18 multiple-choice questions; drivers must answer at least 15 correctly to pass and may retake the test as many as three times.

Accident History

The Buick driver had no moving violations prior to the accident; the California Department of Motor Vehicles (CDMV) revoked his license on July 21, 2003, following the accident, for "lack of knowledge or skill." On January 5, 2004, he was charged with 10 counts of vehicular manslaughter with gross negligence; he entered a plea of "not guilty" to the charges on January 6.

---

[1] Title 49 *Code of Federal Regulations* (CFR) 830.2 defines a fatal injury as any injury that results in death within 30 days of the accident. It defines a serious injury as an injury that requires hospitalization for more than 48 hours, commencing within 7 days from the date the injury was received; results in a fracture of any bone (except simple fractures of the fingers, toes, or nose); causes severe hemorrhages, nerve, muscle, or tendon damage; involves any internal organ; or involves second or third degree burns, or any burns affecting more than 5 percent of the body surface.

[2] See California Department of Motor Vehicles Web site <http://www.dmv.ca.gov/dl/dl.htm>.

Insurance records indicate that the driver had been involved in two previous incidents, but was not cited, and neither one was reported to the CDMV.[3] In November 1998, he struck an unattended, parked vehicle, causing approximately $200 in damage. According to the owner of the parked vehicle, the driver struck the right front corner of her automobile three or four times with his front bumper at low speeds. Insurance records indicate that she told police the driver was apparently unaware that he was striking her vehicle as he maneuvered fore and aft, in an attempt to park his own vehicle.

In the other accident, which occurred in September 1999, the driver was traveling southbound on 14th Street approaching Wilshire Boulevard in Santa Monica, when the right side of his vehicle was struck by another car, as the driver of that vehicle was backing out of a parking lot.

During its investigation of the 2003 accident, the Santa Monica Police Department (SMPD) learned of another incident involving the driver, which occurred in September 1993. A witness to the 1993 accident provided the SMPD with a videotape of a minor collision with a retaining wall, which took place when the driver was backing down a driveway (not his own) in Montecito, California.

Experience and Local Knowledge

The driver had lived in the Los Angeles area for more than 70 years and had owned the accident vehicle for more than 10 years. The driver stated that he had not patronized the SMCFM in 3 or 4 years, but was familiar with its location. He told police that he saw the market when he turned right from Fifth Street and that he saw the barricades in the roadway before he struck them.

In interviews conducted by Safety Board investigators, the driver's neighbors said they were "surprised" to learn of the driver's involvement in the accident at the farmers' market and stated that the driver had never exhibited any erratic or unsafe behavior during the time they had known him. Neighbors noted that the driver used a cane, but were unaware of any medical problems or prior crashes involving the driver.

One woman, who had been a neighbor for 30 years, stated that she saw the driver almost daily and spoke with him about once a week. She described the driver as "friendly" and "intelligent." She characterized him as a safe driver who never drove too fast, based on her observations of him in the neighborhood.

A neighboring couple first met the driver when they moved into the neighborhood about 2 1/2 years earlier. They told investigators that they spoke with the driver two or three times weekly and saw him walking around the neighborhood regularly. They described the driver as "clear" and "coherent" and said they had observed no indication that he was either physically or mentally unfit to drive.

[3] Section 16000 of the California Vehicle Code requires that all drivers (irrespective of "fault") file a report with the CDMV when they are involved in an accident that results in more than $750 in property damage ($500 for accidents prior to January 1, 2003). The September 1999 incident met the reporting threshold requirements.

Preaccident Activities

Investigators derived the following information about the driver's activities before the accident from the SMPD's postaccident interviews with the driver and his wife. The driver said he awoke between 7:00 a.m. and 7:30 a.m. on the morning of the accident, after a "normal night of sleep," showered, and read the newspaper. He had breakfast about 10:00 a.m. and shortly after 11:15 a.m., left his house to run some errands. The driver told police that he returned home about noon, had lunch, and watched television as he finished writing a letter. Shortly after 1:00 p.m., he again left his house to deliver the letter to the post office at 1248 Fifth Street (near the intersection with Arizona Avenue), where he deposited it in the curbside mailbox. The driver told SMPD investigators that he stopped at the curbside mailbox, put the transmission in "park," and reached out the passenger-side window to drop the letter in the receptacle. He said he then departed the post office and turned onto Arizona Avenue.

Postaccident Toxicological Testing

After the accident, SMPD officers took the driver to the University of California—Los Angeles Medical Center in Santa Monica, where blood was drawn from him at 2:40 p.m. The Los Angeles County Sheriff's Department Scientific Services Bureau tested the blood sample for alcohol, amphetamines, barbiturates, benzodiazepines, cannabinoids, cocaine, opiates, and phencyclidine; the results were negative. The Department of Justice Bureau of Forensic Services conducted additional testing for prescription medications, which confirmed the presence of quinine.

Medical History

The Safety Board reviewed the driver's medical records from seven physicians, a healthcare facility, and two other healthcare service providers. The records showed no other referrals or indications of treatment by additional providers.

The following medical conditions were noted: bilateral hip replacements in 1993 (right) and 1998 (left); pain in the right thigh (2000), diagnosed as spinal stenosis;[4] and lumbar arthritis. In the most recent entries (during 2001), the orthopedic surgeon noted that the driver's hips were "stable and exhibit[ed] little contracture."[5] The records did not indicate any episodes of seizures, cognitive dysfunction, or loss of consciousness.

A cardiologist examined the driver about 3 weeks after the accident and diagnosed significant atrioventricular node disease. The driver was subsequently implanted with a dual chamber pacemaker. According to the cardiologist's records, the driver had no prior cardiovascular history other than high cholesterol, and the driver denied having any symptoms prior to the diagnosis, including light-headedness, near syncope (fainting), or syncope.

---

[4] Spinal stenosis is a narrowing of the spinal canal. The driver's physician noted that the driver was able to walk a mile. No further indication of symptoms was found.

[5] Contracture is a permanent muscular shortening due to tonic spasm or fibrosis or to loss of muscular equilibrium.

The driver walked with a cane. In an interview with police, he stated that he "loses his cane twice a week" and noted that a person who "really needs a cane never loses his." The driver denied any problem sensing or distinguishing the accelerator and brake pedals and stated that his only problem as a result of hip replacement surgeries was that he walks with a minor limp. The driver denied any problems with the function of his legs.

The Safety Board reviewed the driver's medical records, including those from local pharmacies. The driver had not been prescribed any psychoactive medications, which affect the mind, mood, or mental processes, and no evidence of prescriptions beyond those listed in the records was found.

Vehicle and Wreckage

Vehicle Information

The 1992 Buick LeSabre was manufactured by General Motors at its Flint, Michigan, plant in January 1992. The Buick was of unibody construction and had a gross vehicle weight rating (GVWR) of 4,573 pounds and a curb weight of 3,456 pounds.[6] The odometer registered 67,026 miles at the time of postaccident inspection.

The Buick was equipped with a 3.8-liter, electronically controlled, fuel-injected, 6-cylinder gasoline engine and an automatic overdrive transmission. Postaccident inspection showed that accelerator cable movement was smooth, without restriction, binding, or sticking, as was throttle movement. Throttle return was consistent and spring force was firm. The throttle position sensor was securely mounted to the throttle body and all associated wiring was secure and in good condition. The vehicle's electronic control module (ECM), which controls fuel and ignition timing, revealed no fault or error codes. A query of the National Highway Traffic Safety Administration's (NHTSA's) Office of Defect Investigation database found no recalls or open investigations involving the vehicle's throttle controls and no incidents of unintended accelerations. No defect, deficiency, or abnormality was found in the vehicle's throttle controls.

All tires were examined and found to comply with California's vehicle inspection criteria for tread depth requirements.[7] The Buick was equipped with P215/60R16 (standard load range) tires, as recommended by the vehicle manufacturer. Results of the tire and wheel assembly inspections were unremarkable, except for an area of scuffing and minor tearing of the left front outer sidewall that extended into the area of the shoulder.

---

[6] The weight of a vehicle without passengers or payload, but including all fluids and other equipment specified as standard.

[7] *Vehicle Code*, Section 27465.

The Buick was equipped with a power-assisted, dual-circuit hydraulic brake system configured with front disc brakes and rear drum brakes. The master cylinder was adequately filled with fluid and the power booster supply check valve functioned properly. All wheel hubs rotated freely and without indications of drag or out-of-round conditions. Examination of each brake assembly and associated hydraulic lines revealed no leaks, restrictions, or operational defects. The brake pedal was intact and functional, offering consistent resistance and approximately 2 1/2 inches of nonpower-assisted travel. The rubber cover on the brake pedal was worn on the lower right edge, revealing the metal beneath (see figure 3). Separation between the brake pedal and the accelerator at the closest point was 2 inches.

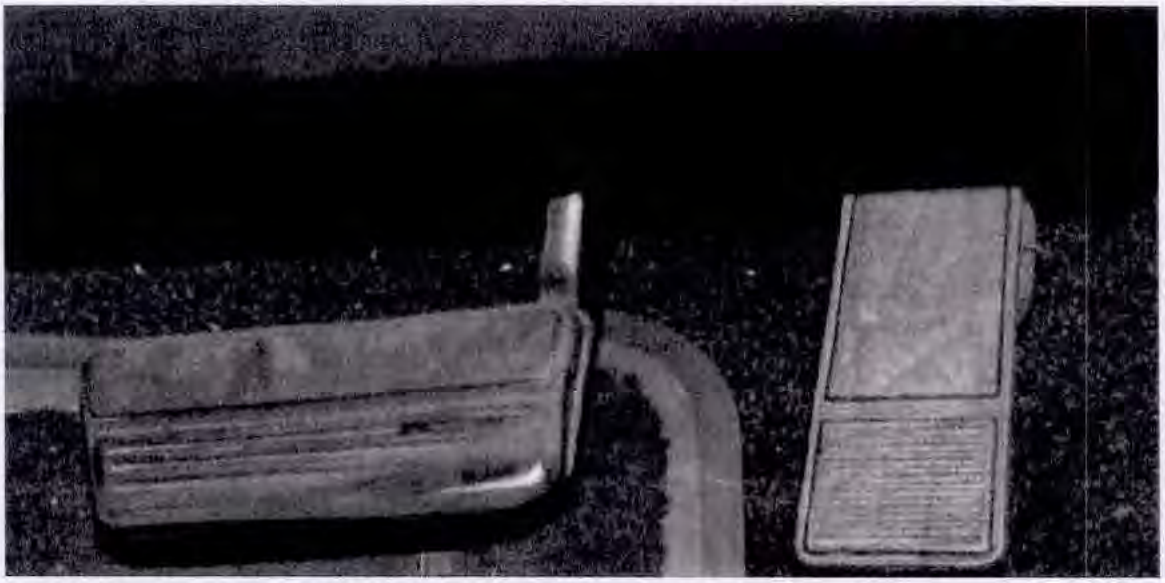


Figure 3. Accident vehicle's brake pedal.

California Highway Patrol (CHP) officers tested the vehicle's brake operation before the Buick was removed from the scene. They reported that an initial (booster-assisted) brake application was held for 30 seconds without pedal drop or fade and that all wheel assemblies locked when force was applied to the brake pedal.

Inspection results of the service and parking brake systems were unremarkable, except for slight fluid seepage noted at the right rear wheel cylinder dust covers. The brake components showed no signs of active fluid loss or contamination.

The Buick was equipped with a hydraulic rack-and-pinion power steering system. The power steering fluid reservoir was filled to the add level with clean, semitranslucent fluid. The pump drive belt was intact and free from obvious glazing, defects, or cracking. The low-pressure return line exhibited active fluid leaking and had been double-clamped at two locations. Results of the examination of the steering linkages and the front suspension were unremarkable. Inspection of the rear suspension revealed dry rotting or cracking of the rubber strut boots on the rear suspension and evidence of oil leakage from each strut assembly. A small area of wear, consistent with tire contact, was also noted within the rear left wheel well.

Review of available maintenance records showed that the vehicle had received general routine maintenance. The records indicated no driver complaints or major repairs to the vehicle's throttle controls, braking, or steering systems. California does not have an annual vehicle safety inspection program, and no inspection certificate was available for review.

Accident-Related Damage

The Buick sustained frontal damage encompassing the front bumper, forward light fixtures, radiator grill, radiator and support, left front quarter panel, windshield, roof, both side mirrors, and rear antenna. (See figure 4.) The two side-view mirrors were missing, and the shattered windshield had two distinct impact or indentation locations; remnants and debris from items struck were found embedded in the windshield. The right side of the front bumper had light blue paint transfer, and the rubber portion of the right rear bumper had white paint transfer. The left bumper quarter panel was missing and exhibited exposed, jagged edges. The bumper was angled upward from the frame, consistent with accident damage. The Buick's airbag had deployed.

Damage to the Mercedes consisted of horizontal surface scratching to the rear bumper cover.

Figure 4. Postaccident damage to 1992 Buick LeSabre.

Highway Information

Highway Design

The accident occurred on westbound Arizona Avenue between Fourth Street and Ocean Avenue. Arizona Avenue is a collector roadway that carries traffic between residential neighborhoods and the arterial street network. Collectors generally have a mixture of residential and commercial land uses along them. According to Santa Monica's "Transportation Circulation Element," average daily traffic volumes on collector roadways are to be held to below 15,000 vehicles in order to maintain acceptable levels of service at intersections and an environment compatible with residential land uses.

Arizona Avenue is a straight, level, asphalt, undivided roadway; it has one travel lane each westbound and eastbound. The roadway is 48 feet wide. The two travel lanes are separated by solid, double-yellow pavement markings. The posted speed limit is 25 mph. Marked parallel parking spaces border the sides of the through lanes, and concrete sidewalks are adjacent to the outer edges of the street.

At the time of the accident, Arizona Avenue was closed to vehicular traffic between the alley east of Ocean Avenue and the alley west of Fourth Street (see figure 5), and the roadway was being used as an outdoor farmers' market from 9:00 a.m. to 2:00 p.m. Prior to the beginning of the market area, westbound traffic was allowed to use Arizona Avenue between Fourth Street and an alley, located between Third and Fourth Streets, to access a bank parking lot on the southwest corner. A full closure was located at the west side of the intersection of Arizona Avenue and the alley between Third and Fourth Streets. Past the closure points on Arizona Avenue, fruit and vegetable vendor canopy tents occupied the outer edges of the roadway from the alley midway between Third and Fourth Streets to the alley midway between Second Street and Ocean Avenue.

Unintended Acceleration

NHTSA, in *An Examination of Sudden Acceleration,* has defined unintended acceleration (also known as sudden acceleration) as "an unintended, unexpected, high-power acceleration from a stationary position or a very low initial speed accompanied by an apparent loss of braking effectiveness."[23] The definition includes the phrase "an apparent loss of braking effectiveness," according to NHTSA, because drivers often claim they were pressing on the brake pedal but the vehicle would not stop. The study concluded:

> For a sudden acceleration incident in which there is no evidence of throttle sticking or cruise control malfunction, the inescapable conclusion is that these definitely involve the driver inadvertently pressing the accelerator instead of, or in addition to, the brake pedal.

Both Transport Canada[24] and the Japanese Ministry of Transport[25] have also examined this issue; the former concluded that driver error is the cause of the unintended acceleration phenomenon, and the latter found no common mechanical cause for sudden or unintended acceleration.

Highway Vehicle Event Data Recorders

The accident vehicle was not equipped with an event data recorder (EDR), nor was it required to be. It did have an electronic air bag control module and an engine ECM; neither device was designed for, or capable of, recording accident data. Currently, a small number of late-model automobiles and light-duty trucks are equipped with air bag control modules that can capture and record a limited amount of accident data. Additionally, many heavy-duty trucks are equipped with ECMs or with transmission control modules that record critical vehicle performance data. On a limited basis, General Motors, Ford, and, more recently, Daimler-Chrysler, have begun integrating crash data collection technologies in their vehicles. In the absence of industry standards or government regulations, each manufacturer has determined which parameters to record and methods to use in accessing the data from these devices. Manufacturers currently record different data parameters and use different formats, tools, and procedures to access the recorded data.

NHTSA and the automobile industry have been examining the utility of highway vehicle EDRs since the mid-1970s. In 1974, as part of its Disc Recorder Project, NHTSA equipped 1,000 vehicles with EDRs in several fleets that logged a total of 26 million miles. Researchers subsequently analyzed 26 crashes in which EDR-equipped vehicles were involved, measured Delta Vs up to 20 mph, and collected deceleration-time histories. During the same year, General Motors introduced the first regular production driver-passenger airbag systems in selected vehicles. These systems incorporated a data-recording feature designed to activate when the air bags deployed during severe crashes.

---

[23] U.S. Department of Transportation, Transportation Systems Center, *An Examination of Sudden Acceleration*, Report HS-807-367 (Cambridge, MA, January 1989).

[24] Transport Canada, *Investigation of Sudden Acceleration Incidents* (1989).

[25] Japanese Ministry of Transport, *An Investigation on Sudden Starting and/or Acceleration of Vehicles With Automatic Transmissions* (1989).

As a result of its 1997 public forum[26] on air bag, seat belt, and child restraint use, the Safety Board issued an EDR recommendation to NHTSA and a companion recommendation to the automobile manufacturers. The Board urged NHTSA to:

> H-97-18
>
> Develop and implement, in conjunction with the domestic and international automobile manufacturers, a plan to gather better information on crash pulses and other crash parameters in actual crashes, utilizing current or augmented crash sensing and recording devices.

In response, NHTSA formed an EDR working group in 1998 that included representatives from the Safety Board and automobile manufacturers. The group's objective, as stated by NHTSA, was to facilitate the collection and utilization of collision avoidance and crashworthiness data from on-board EDRs. The working group issued a final report in 2001 addressing issues such as the status of EDR technology, data elements, data retrieval, data collection and storage, permanent records, privacy and legal implications, customers for and uses of EDR data, and demonstration of EDR technology. As a result of these efforts, the Safety Board classified the recommendation to NHTSA "Closed—Exceeds Recommended Action" on July 18, 2002, and classified the recommendation to the automobile manufacturers "Closed—Acceptable Action" on April 22, 2004.

In 1998, as the result of an accident investigation in Slinger, Wisconsin, involving four vehicles,[27] the Safety Board issued EDR recommendations to the American Trucking Associations, the International Brotherhood of Teamsters, the Motor Freight Carrier Association, the Independent Truckers and Drivers, the National Private Truck Council, and the Owner-Operator Independent Drivers Association, Inc. The circumstances of the accident made it difficult to reconstruct the events, and the Safety Board concluded that, had the accident vehicle been equipped with an EDR, investigators would have been able to determine the speed at which the striking vehicle was traveling prior to losing control. The Safety Board therefore asked the trucking industry to:

> H-98-23 and -26
>
> Advise your members to equip their commercial vehicle fleets with automated and tamper-proof on-board recording devices, such as tachographs or computerized recorders, to identify information concerning both driver and vehicle operating characteristics.

---

[26] National Transportation Safety Board, *Proceedings of the National Transportation Safety Board Public Forum on Air Bags and Child Passenger Safety*, Report of Proceedings NTSB/RP-97/01 (Washington, DC: NTSB, 1997).

[27] National Transportation Safety Board, *Multiple Vehicle Crossover Accident, Slinger, Wisconsin February 12, 1997*, Highway Accident Report NTSB/HAR-98/01 (Washington, DC: NTSB, 1998).

The industry generally declined to do so, and the Safety Board classified the recommendations "Closed—Unacceptable Response" for all of the associations.

In 1999, the Safety Board again addressed the need for highway vehicle EDRs in its special investigation report on school bus and motorcoach safety.[28] The report noted that in several studies, drivers of EDR-equipped vehicles have demonstrated a decrease in accidents, and the Safety Board concluded that EDRs could help reduce the accident rates of fleet vehicles. The Board recommended that NHTSA:

H-99-53

Require that all school buses and motorcoaches manufactured after January 1, 2003, be equipped with on-board recording systems that record vehicle parameters, including, at a minimum, lateral acceleration, longitudinal acceleration, vertical acceleration, heading, vehicle speed, engine speed, driver's seat belt status, braking input, steering input, gear selection, turn signal status (left/right), brake light status (on/off), head/tail light status (on/off), passenger door status (open/closed), emergency door status (open/closed), hazard light status (on/off), brake system status (normal/warning), and flashing red light status (on/off) (School buses only). For those buses so equipped, the following should also be recorded: status of additional seat belts, airbag deployment criteria, airbag deployment time, and airbag deployment energy. The on-board recording system should record data at a sampling rate that is sufficient to define vehicle dynamics and should be capable of preserving data in the event of a vehicle crash or an electrical power loss. In addition, the on-board recording system should be mounted to the bus body, not the chassis, to ensure that the data necessary for defining bus body motion are recorded.

The Safety Board also recommended that NHTSA:

H-99-54

Develop and implement, in cooperation with other government agencies and industry, standards for on-board recording of bus crash data that address, at a minimum, parameters to be recorded, data sampling rates, duration of recording, interface configurations, data storage format, incorporation of fleet management tools, fluid immersion survivability, impact shock survivability, crush and penetration survivability, fire survivability, independent power supply, and ability to accommodate future requirements and technological advances.

[28] National Transportation Safety Board, *Bus Crashworthiness Issues*, Highway Special Investigation Report NTSB/SIR-99/04 (Washington, DC: NTSB, 1999).

NHTSA responded that its EDR working group would consider the recommended data elements, and in 2000, NHTSA established a second working group to concentrate on EDRs for trucks, motorcoaches, and school buses.

In August 2001, the EDR working group issued a final report. Its findings include:

1. EDRs have the potential to greatly improve highway safety, for example, by improving occupant protection systems and improving the accuracy of crash reconstructions.
2. EDR technology has potential safety applications for all classes of motor vehicles.
3. A wide range of crash-related and other data elements have been identified which might usefully be captured by future EDR systems.
4. NHTSA has incorporated EDR data collection in its motor vehicle research databases.
5. Open access to EDR data (minus personal identifiers) will benefit researchers, crash investigators, and manufacturers in improving safety on the highways.
6. Studies of EDRs in Europe and the U.S. have shown that driver and employee awareness of an on-board EDR reduces the number and severity of driver's crashes.
7. Given the differing nature of cars, vans, SUVs, and other lightweight vehicles, compared to heavy trucks, school buses, and motorcoaches, different EDR systems may be required to meet the needs of each vehicle class.
8. The degree of benefit from EDRs is directly related to the number of vehicles operating with an EDR and the current infrastructure's ability to use and assimilate these data.
9. Automatic crash notification systems integrate the on-board crash sensing and EDR technology with other electronic systems, such as global positioning systems and cellular telephones, to provide early notification of the occurrence, nature, and location of a serious collision.
10. Most systems utilize proprietary technology and require the manufacturer to download and analyze the data.

The Safety Board classified Safety Recommendations H-99-53 and -54 "Open—Acceptable Response" on April 15, 2004.

In 2002, the Society of Automotive Engineers (SAE) and the Institute of Electrical and Electronics Engineers (IEEE) agreed to work together to voluntarily develop standardization of data output and retrieval protocols that would facilitate analysis and promote compatibility of EDR data. In October 2002, NHTSA published a request for comments on EDRs that addressed major issue areas, such as the standardization of data and privacy issues. The Safety Board responded, encouraging NHTSA to maintain its

progress toward requiring that (1) all school buses and motorcoaches be equipped with EDRs and (2) standards for on-board recording of bus crash data be developed. NHTSA also began participating in an International Harmonized Research Activities EDR working group in 2002.

In December 2002, the Safety Board issued additional recommendations regarding EDRs as the result of its investigation of an accident near Canon City, Colorado, in which a motorcoach lost control on an icy roadway, left the roadway, and overturned before coming to rest.[29] The Safety Board asked the IEEE and the SAE to:

> H-02-35
>
> Work together, as part of your initiative to establish on-board vehicle recorder standards, to develop standards for brake and transmission electronic control units that require those units to store a full history of electronic fault codes that are time stamped using a recognized clock synchronized with other on-board event data recording devices.

As a result, the IEEE is developing an amendment to its EDR standards that would require brake and transmission electronic control units to store a full history of electronic fault codes that are time-stamped by a recognized clock synchronized with other on-board EDRs. The Safety Board classified Safety Recommendation H-02-35 to the IEEE "Open—Acceptable Response" on March 2, 2004. The SAE indicated that it is not developing an EDR standard or recommended practice for heavy vehicles. The Safety Board continues to urge the SAE to work with the IEEE on EDR technology for heavy vehicles and classified Safety Recommendation H-02-35 to the SAE "Open—Acceptable Response" on March 19, 2004.

In December 2003, the SAE issued Surface Vehicle Recommended Practice J1698, which established a standard format for displaying and presenting crash-related data recorded or stored by electronic components that are already installed in many light-duty vehicles. The format applies specifically to the postevent format of downloaded data and does not direct how data should be collected or which vehicle systems should be monitored. The recommended practice addresses some 70 data elements. The SAE has stated that it continues to develop Surface Vehicle Recommended Practice J1698/2 "Vehicular Data Extraction," which will address the collection of event data.

On June 4, 2004, the IEEE completed its work on a proposed "Standard for Motor Vehicle Event Data Recorders." This voluntary EDR standard for highway vehicles will be available throughout the 175 nations that accept IEEE standards. It is scheduled to go before the IEEE Standards Association in September 2004 for final adoption.

---

[29] National Transportation Safety Board, *Motorcoach Run-Off-the-Road Near Canon City, Colorado*, Highway Accident Brief NTSB/HAB-02/19 (Washington, DC: NTSB, 2002).

NHTSA issued a Notice of Proposed Rulemaking (NPRM) concerning EDRs on June 10, 2004. In it, the agency stated:

> Manufacturers have been voluntarily installing EDRs as standard equipment in increasingly larger numbers of light vehicles[30] in recent years. They are now being installed in the vast majority of new vehicles. The information collected by EDRs aids investigations of the causes of crashes and injuries, and makes it possible to better define and address safety problems. The information can be used to improve motor vehicle safety systems and standards. As the use and capabilities of EDRs increase, opportunities for additional safety benefits, especially with regard to emergency medical treatment, may become available.
>
> We are not presently proposing to require the installation of EDRs in any motor vehicles. We are proposing to (1) require that the EDRs voluntarily installed in light vehicles record a minimum set of specified data elements useful for crash investigations, analysis of the performance of safety equipment, e.g., advanced restraint systems, and automatic collision notification systems; (2) specify requirements for data format; (3) increase the survivability of the EDRs and their data by requiring that the EDRs function during and after the front, side and rear vehicle crash tests specified in several Federal motor vehicle safety standards; (4) require vehicle manufacturers to make publicly available information that would enable crash investigators to retrieve data from the EDR; and (5) require vehicle manufacturers to include a brief standardized statement in the owner's manual indicating that the vehicle is equipped with an EDR and describing the purposes of EDRs.

[30] As defined in the NPRM, light vehicles include passenger cars, multipurpose passenger vehicles, and trucks and buses with a GVWR of 8,500 pounds or less and an unloaded vehicle weight of 5,500 pounds or less.

Analysis

In the following analysis, the Safety Board will first exclude factors that neither caused nor contributed to the accident and then examine those factors that led to or had a role in the accident. The discussion that follows will focus on the accident driver's unintended acceleration, the adequacy of temporary traffic control measures for the protection of pedestrian traffic in the SMCFM, and the need to equip motor vehicles with EDRs.

Exclusions

The weather was clear and dry on the afternoon of the accident; the sun was almost directly overhead, indicating that visibility issues apparently did not affect the driver's performance. Postaccident examination of the 1992 Buick LeSabre by both the CHP and Safety Board investigators revealed no mechanical defects or conditions that would have caused the vehicle to accelerate in an uncontrolled manner. Therefore, the Safety Board concludes that neither weather conditions nor the mechanical condition of the vehicle contributed to this accident.

The driver had lived in the Los Angeles-Santa Monica area for more than 70 years and had owned the accident vehicle for more than 10 years. The SMCFM had taken place at the same location and on the same day of the week for 21 years and, although he had not patronized the market for a few years, the driver had some familiarity with it and indicated in his statement to police that he visually identified it ahead of him on Arizona Avenue. Therefore, the Safety Board concludes that the driver's experience and familiarity with his vehicle and the area of the farmers' market were not factors in this accident.

Toxicological testing by the Los Angeles County Sheriff's Department was negative for alcohol, amphetamines, barbiturates, benzodiazepines, cannabinoids, cocaine, opiates, and phencyclidine. A review of the driver's medical and prescription drug records indicated that the driver had not been prescribed medications that would have adversely affected his ability to operate a motor vehicle. Therefore, the Safety Board concludes that neither alcohol, nor illicit drugs, nor the driver's use of prescription medications was a factor in this accident.

Only limited information on the driver's usual sleep habits and rest, particularly during the 72 hours preceding the accident, could be obtained from police interviews of the driver and his wife. However, the circumstances of the accident and eyewitness accounts of the driver's behavior during the accident sequence do not indicate that the driver fell asleep or that his judgment or performance were fatigue-impaired. The driver's statements to the SMPD and the press suggest that he was alert, aware, and cognizant of what was happening throughout the accident sequence, beginning with his departure from

the post office, through the period of unintended acceleration, and continuing to the point at which the vehicle came to rest and he was taken into custody. Therefore, the Safety Board concludes that neither insufficient sleep nor fatigue was likely to have had a role in this accident.

The separation between the accelerator and brake pedals was 2 inches at the closest point. Many studies have been conducted on the size, shape, and placement of automobile pedals; the consensus is that a minimum horizontal separation of 50 mm and a vertical separation of 50.8 mm (2 inches) are necessary.[31]

The primary concern about pedal placement is dual activation, that is, the driver depressing both the accelerator and the brake when he or she only intends to depress one or the other. The pedal separation in the accident vehicle was at the recommended minimum,[32] and two factors suggest that dual activation did not occur in this accident. First, witnesses reported they did not see the vehicle's brake lights illuminate, which would have occurred if the brake pedal had been depressed, even in conjunction with the accelerator. Second, witness descriptions of the vehicle's motion and the physical evidence indicated significant increases in acceleration and speed during the accident sequence and did not indicate a retarding force, which would be expected if the brake pedal had been depressed.

Moreover, the Safety Board notes that the 1992 Buick LeSabre does not have a history of pedal problems since its production. Data maintained by NHTSA would probably indicate whether the horizontal separation between the vehicle's pedals has resulted in pedal misapplication errors or unintended acceleration more frequently than expected. Furthermore, the driver had owned and operated the accident vehicle for 10 years and thus was familiar with the placement and operation of the Buick's pedals. Absent evidence that the 1992 Buick LeSabre was predisposed to pedal misapplication errors or unintended acceleration and in light of physical evidence, witness accounts of the vehicle's motion during the accident sequence, and the driver's familiarity with the vehicle, the Safety Board concludes that the horizontal separation of the pedals in the vehicle neither caused nor contributed to this accident.

The driver stated that he was aware that he was entering the farmers' market. He made steering inputs while driving through the market, but he apparently failed to recognize that he was depressing the wrong pedal and to correct his error. A comprehensive review of the driver's medical records disclosed no evidence of a medical condition that would have accounted for or contributed to these circumstances.

---

[31] For example, see Joint Army-Navy-Air Force Steering Committee, *Human Engineering Guide to Equipment Design* (New York: John Wiley & Sons, 1972); J. Weiman, *Handbook of Ergonomics and Design Factors* (New Jersey: Prentice Hall, 1993); J.A. Adams, *Human Factors Engineering* (New York: MacMillan Press, 1989); and S. Konz, *Work Design: Industrial Ergonomics* (Worthington, OH: Publishing Horizons, Inc., 1990).

[32] Pedal separation is also a consideration in reducing brake response times; an increase in the distance between pedals is associated with a corresponding increase in time to make a brake application.

Although the driver had a significant history of orthopedic conditions affecting his lower spine and legs, and although he had been issued a disabled parking placard due to "severe hip arthritis" and associated limitations in mobility, the circumstances of the accident do not appear to have been associated with these conditions. The driver had been issued his disabled parking placard in 1994 and subsequently underwent surgery to replace his left hip and to revise an earlier right hip replacement. The driver's medical records document no persistent problems postoperatively, a finding that is consistent with research on human performance following hip replacement.[33] While the driver used a cane, at times, to walk, evidence does not indicate that his general ability to move his hips and legs in order to operate the accelerator and brake pedals was impaired. In fact, the driver was able to maneuver effectively, only moments before the accident, to deposit a letter from the passenger side window into the curbside receptacle at the post office. Finally, the absence of other medical conditions that might indicate impaired cognitive function; of a tendency toward syncope (fainting), near-syncope, or loss of consciousness; and of other impairment or incapacitation suggests that the driver's health was not a factor in this accident.

Therefore, the Safety Board concludes that, although the driver had a history of medical treatment for orthopedic conditions, neither these conditions nor his general health were likely to have been a factor in this accident.

Unintended Acceleration

During postaccident inspection of the Mercedes, Safety Board investigators found minor contact damage, consisting of horizontal surface scratching to the rear bumper cover. This minimal level of damage is consistent with witness statements indicating that the Buick was traveling at a comparatively low rate of speed when it struck the Mercedes, even though it attained much higher speeds as it accelerated away from the point of initial collision.

The accident vehicle's high-speed acceleration after it struck the Mercedes may have given the appearance of a "hit-and-run" incident, as some witnesses believed was the case. However, the available evidence does not support such an interpretation. Some witnesses, for example, observed the vehicle decelerate, as well as accelerate, as it proceeded through the market, and the driver himself told police that he did not recall striking the Mercedes. He also had no record of reckless or aberrant behavior over many years as a licensed driver. Moreover, even if he realized that he had struck the Mercedes, the accident driver is highly unlikely to have made a conscious decision to enter a crowded market area, thereby endangering his own life and the lives of many others, to flee the scene of a comparatively minor collision.

---

[33] See, for example, S.B. Ganz, A.Z. Levin, M.G. Peterson, and C.S. Ranawat, "Improvement in Driving Reaction Time After Total Hip Arthroplasty," *Clinical Orthopaedics* Vol. 413 (2003): 192-200; P.P. Gogia, C.M. Christensen, and C. Schmidt, "Total Hip Replacement in Patients With Osteoarthritis of the Hip: Improvement in Pain and Functional Status," *Orthopedics* Vol. 17, No. 2 (1994): 145-150; and W. MacDonald and J.W. Owen, "The Effect of Total Hip Replacement on Driving Reactions," *Journal of Bone and Joint Surgery* (British Volume), Vol. 70, No. 2 (1988): 202-205.

NHTSA Ref. #: 11206504.

A more plausible explanation of the circumstances of this accident is that the driver unintentionally accelerated his vehicle. A human performance analysis of unintended acceleration needs to account for two behaviors: the driver's inadvertent activation of the accelerator and the driver's subsequent failure either to recognize the initial mistake or to correct it.[34] The factors underlying unintended acceleration are described below.

Inadvertent Activation

Description below does not apply to 2-23-11 accident

Moving the foot to the accelerator instead of the brake is a well-documented, but rare occurrence, accounting for 0.03 percent of the accidents reviewed in one study.[35] Drivers press the wrong pedal either due to an error in response choice or an error in response execution.

Errors in response choice entail making the wrong choice when presented with alternatives. This kind of error is probably not a major factor in unintended acceleration, since drivers almost always make the correct conscious choice about which pedal they intend to press. In this accident, the driver of the Buick said he intended to apply the brake pedal and, in fact, believed he had. (End of line 3 (this paragraph) does not apply. Also, lines 4 and 5.)

Errors in response execution involve making the correct choice—for example, to press the brake—but failing to execute the response effectively. In the case of braking, factors affecting execution include response force (the more force used, the greater the variability in the movement), response time (the faster the movement, the greater the force needed), limb size (the larger the limb, the more variability in the motion), head and body position (if the head or body is out of position, the normal, habitual movement may result in an error), direction of gaze (looking to the right or left when executing the movement may introduce error), and negative transfer from other vehicles (the learned movement in one vehicle may produce an error in another), to name a few. Partial Explanation of pinned foot.

This accident sequence began when the Buick struck the Mercedes before entering the farmers' market. As the traffic light on Arizona Avenue at Fourth Street changed from red to green, the driver of the Mercedes, which had stopped at the red light, and the driver of the Buick, which was behind the Mercedes and may not have slowed or stopped,[36] both expected to proceed. As the Mercedes driver began moving into her turn, the movement would have served as a cue to the accident driver that traffic was about to resume flowing. However, the Mercedes driver observed pedestrians in the crosswalk and halted her turning maneuver. This action—stopping on a green light (especially after beginning to proceed)—would have violated the expectancy of the Buick driver. From his vantage point behind the Mercedes, the Buick driver had no reason to anticipate the Mercedes'

[34] R. Schmidt, "Unintended Acceleration: A Review of Human Factors Contributions," *Human Factors* Vol. 31, No. 3 (1989): 345-364.

[35] U.S. Department of Transportation, NHTSA, *Analyzing the Role of Driver/Vehicle Incompatibilities in Accident Causation Using Police Reports*, Technical Report HS-801-858 (Washington, DC: NHTSA, 1976).

[36] Evidence was insufficient to allow investigators to determine whether the accident driver slowed or stopped before reaching the Mercedes.

sudden stop. If his attention was focused on the movement of the Mercedes rather than on the pedestrians to the right, the Buick driver would have lacked advance warning of both the impending conflict between the pedestrian traffic and the Mercedes and the resulting braking by the Mercedes driver. This lack of advance warning, coupled with the possible violation of expectancy, would have created a situation conducive to human error.

Moreover, shortly before his vehicle struck the Mercedes, the Buick driver had deposited a letter in a curbside mailbox less than a block away. He had done so while remaining inside the automobile, requiring that he maneuver across the seating area and place the letter through the passenger-side window and into the outside receptacle. Thus, the accident driver may have been slightly out of position as he resumed driving toward the Fourth Street intersection. As noted above, one factor that can contribute to an error in response execution (such as applying one's foot to a pedal) is having the body out of position, in which case normal or habitual movement can result in a mistake.

Rear-end crashes at intersections where a vehicle ahead is stopped represent a majority of all rear-end crashes in which the struck vehicle is stopped (as opposed to rear-end collisions in which both vehicles are in motion).[37] Research indicates that a violation of driver expectancy can account for many accidents involving turning movements, and usually the actions of other drivers, rather than roadway geometry, are what violate expectancies.[38] When a driver slows or comes to a stop to turn, the following driver may be unprepared for the vehicle in his or her path, and a rear-end collision may ensue. Such situations frequently give rise to a hypervigilant reaction, or panic, on the part of the following driver, and human performance under hypervigilant conditions is generally less reliable than it is otherwise.

Hypervigilant Reactions (Panic)/Perceptual Narrowing. This term describes situations in which an individual is exposed to a strong, startling stimulus, sometimes perceived as life-threatening, accompanied by the perception that a solution must be found quickly. This combination of stimulus and perception can cause a temporary impairment of cognitive function; often, the individual appears to freeze, taking no action at all because his or her internal information processes are overloaded. The individual's attention narrows to the stimulus, and all other cues are missed. Some studies[39] have

---

[37] T. A. Dingus, S.K. Jahns, A. D. Horowitz, and R. Knipling, "Human Factors Design Issues for Crash Avoidance Systems," in *Human Factors in Intelligent Transportation Systems,* W. Barfield and T.A. Dingus, eds. (Hillsdale, NJ: Lawrence Earlbaum Associates, 1998).

[38] R. Storm, "Pavement Markings and Incident Reduction," *The 2000 MTC Transportation Scholars Conference, Ames, IA,* 2000.

[39] See, for example, E.G. Beier, "The Effect of Induced Anxiety of Flexibility of Intellectual Functioning," *Psychological Monographs* Vol. 65, No. 326 (1951); M.M. Burkun, H.M. Bialek, R.P. Kern, and K. Yagi, "Experimental Studies of Psychological Stress in Man," *Psychological Monographs* Vol. 75, No. 534 (1962); H.H. Kelly, J.C. Condry, A.E. Dahlke, and A.T. Hill, "Collective Behavior in a Simulated Panic Situation," *Journal of Experimental Social Psychology* Vol. 1 (1965): 20-54; R.S. Weinberg and V.V. Hunt, "The Interrelationships Between Anxiety, Motor Performance, and Electromyography," *Journal of Motor Behavior* Vol. 8 (1976): 219-224; R.S. Weinberg and J. Ragan, "Motor Performance Under Three Levels of Trait Anxiety and Stress," *Journal of Motor Behavior* Vol. 10 (1978): 169-176; and W.D. Fenz and G.B. Jones, "Individual Differences in Physiological Arousal and Performance in Sport Parachutists," *Psychosomatic Medicine* Vol. 34 (1972): 1-8.

shown simplistic reasoning and thinking, primitive motor control, and strong emotions among individuals who are in a hypervigilant state. Due to stress, this hypervigilant state can set the stage for a habitual response.

Habitual Responses Under Stress. When expectancies are violated and a driver suddenly perceives a dangerous situation, for example, an impending collision, the driver is placed under stress and may revert to a generic or habitual response, such as hard braking. Actions executed under stressful conditions, coupled with limitations on the time that the driver has to respond, can result in error. Under such conditions, an individual may attempt to emit more than one response simultaneously[40]—in the case of the accident driver, moving the foot to the brake pedal (the reasoned response) while simultaneously attempting to exert force on the pedal (the habitual response). The driver may not realize he has performed these responses in parallel, rather than serially, as intended. To complicate matters further, because the driver believes his or her foot is already on the brake when it is, in fact, on the accelerator, "hard braking" produces more acceleration. The unexpected acceleration again violates the driver's expectancy, producing more stress, and so on.

In statements to police, the accident driver indicated that he might have gotten the brake and the accelerator confused. These statements show the driver was aware that he needed to stop his vehicle, knew that braking was the appropriate response, and attempted to execute that response, thereby eliminating an error in response choice as a potential factor. Therefore, the Safety Board concludes that the accident driver made an error in response execution, inadvertently accelerating when he intended to brake, that resulted in the collision with the Mercedes Benz.

Error Detection and Correction

Although unintended acceleration is a rare phenomenon, the failure to detect inadvertent activation of the accelerator is comparatively common, explaining why drivers frequently insist they were pressing the brake when, in fact, they were pressing the accelerator.[41] This detection failure may result from the limited feedback provided after the response is executed. Among the human factors concepts that help account for the error are "efference copy"[42] (the brain orders a response and erroneously assumes it will be correctly executed) and selective attention (the driver, as a consequence of paying attention to the environment, steering, shifting, and so forth, is never able to verify the foot's actual position). Admittedly, such factors, regardless of their validity, fail to explain

---

[40] A situation similar to that described by Kantowitz in B.H. Kantowitz, ed., "Double Stimulation," *Human Information Processing* (Hillsdale, NJ: Lawrence Earlbaum Associates, 1974).

[41] Schmidt (1989).

[42] Efferent neural signals arouse or stimulate the muscles. When a neural signal or motor command produces certain sensory consequences with reasonable consistency, that consistency can make it unnecessary for the brain to conduct detailed sensory feedback processing. The term "efference copy" refers to what happens when the body sends a "copy" or duplicate of a frequently sent command to a body part (a limb, for example) to the sensory part of the brain in lieu of independent feedback from the actual response (for example, a limb movement). In other words, the *intent* is misperceived as the *effect.*

why the driver is not alerted to the mistake by the difference in expected vehicle position and dynamics when pressing the brake. But the fact that this difference again violates the driver's expectancies may at least partly account for the failure to immediately comprehend the incongruities.

Reaction times in simulated braking situations are on the order of 0.5 seconds. Unintended acceleration, however, can persist for as long as 12 seconds.[43] In this accident, the driver proceeded for approximately 2 1/2 blocks before coming to rest, some 10 seconds later. Thus, the driver's delay in correcting his initial error is consistent with prior findings on unintended acceleration.

The driver knew that he needed to brake and said that he attempted to do so. Instead, he pressed the accelerator pedal, propelling his vehicle into the Mercedes, through the intersection, and into the farmers' market. The fact that he did not detect his response execution error, which resulted in the unintended acceleration, may have been due to sensory processing errors, selective attention, violated expectancies, or a combination of some or all of these factors. The Safety Board concludes that the driver of the 1992 Buick failed to detect his error in response execution, thereby inadvertently accelerating his vehicle and propelling it through the SMCFM.

The witness descriptions of a racing engine, as the Buick continued to accelerate through the market, are consistent with an habitual driver response. As the driver's stress level rose and he focused on trying to stop his vehicle, he probably reverted to the habitual response of hard braking, but did so before he had moved his foot from the accelerator to the brake pedal. When he perceived that "hard braking" was not working, the driver probably tried to "pump" his brakes—a trained response and one that suggests he was selectively focused on stopping. Because his foot was on the accelerator rather than the brake, the result would have been "revving" or racing of the engine and acceleration of the vehicle. One witness reported that the Buick appeared to *accelerate* in response to striking various objects; such acceleration is consistent with more forceful application of the accelerator pedal—or, in the mind of the driver, more forceful brake applications. Additionally, the driver stated that he attempted to move the column transmission shift into park, a maneuver that would have further distracted his attention from the foot pedals. Efforts to move the vehicle immediately after the accident prevented the police or Safety Board investigators from determining what gear the Buick was in when it stopped.

The Safety Board concludes that the accident driver most likely reverted to the habitual response of hard braking or "pumping" the brakes as his stress level increased and the vehicle failed to slow, but because his foot was on the accelerator rather than the brake pedal, this response led to increased acceleration. The Safety Board further concludes that the ineffectiveness of the accident driver's efforts to stop his vehicle and the realization that he was striking objects in his path very likely increased the already high level of stress affecting him, thereby impeding his ability to quickly detect and correct his earlier response execution error.

[43] Schmidt (1989).

Although the accident resulted from the driver's error in response execution and his failure to detect that error, Safety Board investigators were unable to gather sufficient information to determine with certainty whether the [redacted] or use of nonprescription medications contributed to this accident. Neither the CHP or the SMPD cooperated with the Safety Board's investigation, and both declined to provide the Board with needed accident-related information, including witness and driver identities or statements, toxicological specimens, and on-scene data, until 6 months after the collision. As a result, the Safety Board conducted its investigation without the involvement of the police and without the access to certain critical and perishable information that the police had collected.

Older drivers are generally more susceptible to conditions that diminish cognition, perception, and physical reaction. An examination of the driver's medical history revealed that neither his orthopedic conditions, which affected his lower spine and legs, nor his general health were likely to have been factors in this accident. However, Safety Board investigators were denied access to the driver and, therefore, were unable to further evaluate his performance capabilities at the time of the accident.

Safety Board investigators were also unable to obtain a specimen of the driver's blood from the police, who tested for illicit drugs and prescription medications but did not test for nonprescription medications. Consequently, whether the driver used nonprescription medications, and, if he did, the possible effect on this accident are unknown. The Safety Board has found in previous investigations that over-the-counter medications can have detrimental effects on driver performance. The Board routinely tests toxicological specimens for evidence of the presence of such medications, which are not typically part of police-related toxicological testing. The Safety Board concludes that the contributions of the [redacted]nd use of nonprescription medications, if any, to his error in response execution and to his failure to detect that error could not be determined.

Adequacy of Temporary Traffic Control

When the Wednesday and Saturday SMCFMs were not in operation, Arizona Avenue was a through collector roadway open to vehicular traffic. Street closure to accommodate the SMCFMs involved a complex section of an urban collector road that included intersecting streets, alleyways, and traffic signals. Santa Monica was responsible for the maintenance and safety oversight of Arizona Avenue; it also sponsored and operated the two other farmers' markets located elsewhere, for a total of four, in the city. Each week, city contractors restricted vehicular traffic on Arizona Avenue by erecting traffic control devices based on a 1986 temporary traffic plan for the farmers' market. The temporary traffic plan failed to provide barriers and allowed vehicular traffic from the alleyway between Second and Third Streets to flow unimpeded into the pedestrian zone.

The full closures on Arizona Avenue at the alley between Third and Fourth Streets, as well as the Second Street closure, had only type I and A-frame plastic barricades in

the use of barricades, barriers, crash cushions, and other devices, as appropriate, for road closure situations other than highway construction or maintenance. The Safety Board will inform AASHTO, the American Public Works Association, the U.S. Conference of Mayors, the National Association of Counties, and the National Association of Towns and Townships of the circumstances of this accident, emphasizing the importance of physical barriers, as well as periodic reviews of traffic control plans, in protecting the public at farmers' markets and similar events.

Event Data Recorders

Had the accident vehicle been equipped with an EDR, the recorder would probably have collected valuable information about this accident. Driver and witness statements indicate that an unintended acceleration, initiated by pedal misapplication, most likely led to the accident. However, precise information about the Buick driver's actions before and during the collision with the Mercedes is unavailable. Similarly, the driver's precise actions—for example, whether he steered, braked, or accelerated—while traversing the farmer's market are not known. Additionally, how the vehicle was finally brought to a stop cannot be determined. While preliminary observations suggested that the driver's age or medical condition might have contributed to the accident, no age-related or medical factors were identified during the investigation. As a result, determination of the cause of the accident driver's actions had to be based on analysis of the limited investigative information, such as witness statements, available. Therefore, the Safety Board concludes that, had the accident vehicle been equipped with an event data recorder, a significantly higher level of science could have been applied to assessing and understanding the driver's behavior, as well as its contribution to this accident and the broader issue of unintended acceleration.

As in most accidents, the role of human factors in the Santa Monica accident could not be definitively determined or completely understood. By providing more comprehensive data on driver performance and behavior, EDRs assist safety researchers, accident investigators, and automotive designers in developing effective means for preventing similar occurrences. Better information about driver inputs and responses helps researchers understand whether certain brake and throttle geometry relationships affect the accident rate and whether certain drivers are at higher risk for performance-related accidents.

In addition, by providing prompt and impartial crash-related information, EDRs benefit law enforcement personnel, who are responsible for determining the facts and circumstances of highway accidents. Manufacturers can also use such data to improve vehicle design and to assist in the diagnosis of vehicle systems. EDR data have value for the health care community, which can base on-site injury triage decisions on more accurate and complete information, and assist in the deployment of appropriate emergency services by triggering automated systems that alert responders to the nature of an incident. Private vehicle owners have access to EDR information on how their vehicles have been operated and whether vehicles have been in previous crashes. Thus, vehicle EDRs provide qualitative and quantitative information critical to improving highway safety.

Recent integration of the event recording function with the crash detection and deployment functions of automotive air bag system controls has provided a hitherto unavailable source of unbiased, factual information. Some U.S. vehicle manufacturers have integrated limited event recording capability into their products by including this functionality in the vehicle's air bag control system. However, the parameters recorded and the manner in which the data are accessed are not uniform. Through years of experience with EDRs in the aviation, rail, and marine modes of transportation, the Safety Board and the transportation industry have learned a great deal about the effective integration and use of recording technology. Establishing industry standards for recording in these modes has been critical to effective EDR implementation. Industry standards ensure consistency and compatibility and prevent the unnecessary and inefficient proliferation of multiple formats and configurations.

The factors identified in developing event data recording standards for other modes of transportation provide a basis for formulating highway EDR standards in areas such as the specific data parameters to be recorded, sampling rates, recording duration, data extraction interface configurations, and data storage formats. Additionally, data survivability issues, such as backup power supplies and resistance to fluid immersion, impact shock, crush penetration, and fire must also be considered. The benefits of industry standards already realized in other modes of transportation demonstrate the need for similar EDR standards in the automotive industry.

NHTSA, the IEEE, and the SAE have efforts under way that provide a standardization platform to build upon, thereby ensuring that the benefits of EDRs can be realized quickly and efficiently for all light-duty vehicles. NHTSA's recently announced NPRM regarding EDR standards for light-duty vehicles is a welcome step forward and is necessary to ensure the timely and efficient implementation of EDR technology into the highway transportation system. In that NPRM, NHTSA has indicated that it does not propose to require that newly manufactured vehicles be equipped with EDRs. It has also predicted that 65 to 90 percent of new vehicles will be equipped with EDRs. The Safety Board is concerned that, unless installation of EDRs is mandatory, collection of national crash data will be incomplete. Effectively developing and establishing highway safety policy is dependent on accurate information about the causes of accidents. Collection of only partial fleet information could undermine the implementation of the most appropriate and cost-effective highway safety countermeasures. Therefore, the Safety Board concludes that NHTSA's proposed rulemaking on standards governing voluntary, rather than mandatory, installation of EDRs in light-duty vehicles will not result in obtaining the maximum highway safety benefits from this technology. The Safety Board believes that once standards for EDRs are developed, NHTSA should require their installation in all newly manufactured light-duty vehicles.