U.S. Department
of Transportation
**National Highway
Traffic Safety
Administration**

Memorandum

NHTSA-99-5218-4

Subject: Submittal of Meeting Minutes of the NHTSA R&D Event Data Recorder (EDR) Working Group to Docket No. NHTSA-99-5218

Date: JUN 14 2000

From: Raymond P. Owings, Ph.D.
Associate Administrator for
Research and Development

Reply to Attn. of: NRD-01

To: The Docket

THRU: Frank Seales, Jr.
Chief Counsel

Attached are the meeting minutes of the NHTSA Research and Development Event Data Recorder (EDR) Working Group meeting held on February 2, 2000. This is the first meeting of the EDR working group sponsored by NHTSA R&D. Previous meetings on this subject were sponsored by the Motor Vehicle Safety Research Advisory Committee (MVSRAC), Crashworthiness Subcommittee. That sponsorship has terminated because the charter for the MVSRAC has expired and under the rules that apply to Advisory Committees, all activities related to an Advisory committee must be terminated.

Related meeting history:

Meeting #	Sponsor	DATE
1	MVSRAC	October 2, 1998
2	MVSRAC	February 17, 1999
3	MVSRAC	June 9, 1999
4	MVSRAC	October 6, 1999
5	NHTSA R&D	February 2, 2000

This working group is related to the following dockets:
NHTSA-98-3887: Crashworthiness Subcommitte
NHTSA-98-3928: MVSRAC Full Committee

Research and Development requests that the minutes of this meeting be placed in the public docket.

Attachments

#

NHTSA Research and Development

Event Data Recorder Working Group
Meeting #5

FINAL Minutes

Wednesday, February 2, 2000
9:30 AM - 4:00 PM
NHTSA Headquarters
Washington, DC

The Event Data Recorder (EDR) Working Group was formed under the Motor Vehicle Safety Research Advisory Committee's (MVSRAC) Crashworthiness Subcommittee. The Charter for MVSRAC has lapsed and working group efforts were terminated. Since the efforts of this working group were of the fact finding nature, the working group was transferred to the National Highway Traffic Safety Administration's (NHTSA) Research and Development (R&D) office for administration. This working group consists of a panel of government and industry officials.

The first formal meeting under the sponsorship of NHTSA R&D (EDR Meeting #5) met on February 2, 2000, at NHTSA headquarters in Washington, DC. The purpose of the meeting was to: 1) Review OEM EDR Systems through several OEM presentations and 2) hold two breakout sessions related to the objectives of the working group: **Status of EDR Technology** and **Who are the Customers**. The meeting was co-chaired by John Hinch and Kathy Gravino. The agenda for the meeting is included as **Attachment 1**. The current working group roster was circulated for correction, and is included as **Attachment 2**. A list of the meeting attendees is also included in this attachment.

1.0 Welcome, Introduction, Approval of Previous Meeting Minutes, and MVSRAC Discussion

The meeting was called to order by John Hinch, who welcomed everyone to the meeting. Kathy Gravino was recognized as the meeting co-chair. After self introductions, Dr. Ray Owings, Associate Administrator for Research and Development, welcomed the members and guests of the working group.

The minutes from the October 1999, meeting were approved, with minor typographical corrections, by the working group. The approved minutes and attachments for the October 1999, meeting will be placed in the document management system (DMS), NHTSA 1999 docket number 5218. You can review this information using the DMS at http://dms.dot.gov/.

2.0 MVSRAC Discussion

On May 31, 1999, the charter for the Motor Vehicle Safety Research Advisory Committee (MVSRAC) expired. The National Highway Traffic Safety Administration (NHTSA) Office of Research and Development (R&D) hopes to reconstitute the committee at some time in the near future under a new charter that reflects the current thinking of the agency and makes the committee more effective. Until the committee is reconstituted, however, MVSRAC and all of its components (including its sub-committees and working groups) are no longer authorized.

Since the purpose of the working group is to gather factual information and not to develop consensus recommendations for NHTSA or any other Federal agency, the group's work may continue and need not be conducted as part of a sanctioned advisory committee. Accordingly, the EDR Working Group can continue its work.

A letter was delivered to each member prior this meeting. A copy of the letter is found in **Attachment 3**.

3.0 Presentations

There were three presentations made to the working group. DaimlerChrysler, Ford, and General Motors representatives presented information from their respective companies on the future of EDRs. Copies of each presenter's slides are found in **Attachment 4**, **Attachment 5**, and **Attachment 6** for DaimlerChrysler, Ford, and GM.

LUNCH BREAK

During the lunch break, Chip Chidester demonstrated a beta-version of the Vetronix EDR retrieval tool, which is used to download EDR data from late model GM cars and trucks.

4.0 Breakout Sessions

4.1 Status of EDR Technology

Participants:

Dave Bauch
Bob Cameron
Art Carter
Doug Funke
Kathy Gravino
Jim Keller
Dan May
Tom Mercer
Mary Russell

Minutes of Breakout Session:
Recorder: Mary Russell

This session used a question and answer format

Question 1: What is the potential for streamlining the data elements for ACN and those used for EDR?

Answer:

1.a: OEM's see ACN and EDR as two separate technologies. Non-OEMs see the two technologies as linked

1.b: OEMs state that ACN data are immediately up-linked, not RECORDED, that is, air bag sensor communicates directly with ACN (or other sensor technologies).

1.c: OEMs express concern related to manufacturer liability if threshold for crashes not set correctly. Also, concern that it could impact on business end (people to answer ACN calls) if threshold was set too low.

1.d: OEMs not sure if ACN options or On-Star will be expanded to larger number of vehicles. Cost prohibitive potentially to customers.

1.e: A standard urgency algorithm could be shared among OEMs.

Question 2: What is the potential to develop a universal data download tool to assist in reconstruction of events?

Answer

2a: Short Term: A standardized extraction connector for download interface could be used.

2b: Long term: Target for 2004.

Question 3: How could loss of power be overcome to assist with data download?

Answer:

3: No answer yet. This remains a major challenge. Guidelines could be established for field investigation.

Question 4: What is the status of technologies?

Answer:

4a: Varies from company to company.

4b: Need to clarify from OEM perspective. What is the customer's benefit? Could information be used against customer?

4c: Engineers have wanted EDR technology within OEMs and have asked for it. List of data elements needs to be complied for collective OEM engineers.

4d: Benefits are great but perceptions of benefits may need to be established or explored.

4e: OEMs will design a template and establish a baseline list of data elements. Common data element definitions will also be clarified.

4.2 Who are the Customers.

Participants:

Mike Cammisa
Regina Dillard
Bob Douglas
Liz Garthe
Alan German
Doug Gurin
Martin Hargrave
Carl Hayden
Sandy Johnson
Tom Kowalick
Lou Lombardo
Andy Mackevicns
Joe Marsh
Bob McElroy
Malcolm Ray
Gerald Stewart
Sharon Vaughn

Minutes of Breakout Session:
Recorder: Bob McElroy

- **MANUFACTURERS ARE BUILDING EDR FOR THEIR OWN USE**
- **GOVERNMENT**
  - ➔ Federal charge
    - ⇨ Cars and highways - better safety management system
  - ➔ State government
    - ⇨ Manage road networks
    - ⇨ Design
      - ➼ Guardrails, crash cushions
  - ➔ Location important so that maintenance of deformed devices can be repaired
  - ➔ Medical EMS and safety
    - ⇨ Evaluation Capability
    - ⇨ Enhance EMS deployment
      - ➼ Who's assigned to an event
      - ➼ Right deployment to an event
  - ➔ Foundation to cooperatively use data
- **LAW ENFORCEMENT**
  - ➔ Law officers use data as a fact finding tool
  - ➔ Validate field collision data
  - ➔ Fraud
- **INSURANCE COMPANIES**
  - ➔ Subrogation claims
  - ➔ Claim analysis
- **PLAINTIFF AND DEFENSE ATTORNEYS**
- **HUMAN FACTORS RESEARCH**
  - ➔ Driver performance analysis
- **STATE INSURANCE COMMISSIONERS**
- **PARENT GROUPS**
- **COURTS**
  - ➔ Limit speed
- **DRIVER**
  - ➔ Could help driver safety
  - ➔ Educate drivers about technology on vehicles

→ Auto-download data for driver use
→ Could include vehicle safety characteristics (data element related)
→ General performance of vehicle

- **INJURY GUIDELINE DATA USAGE**
  → Trigger a series of events
  → Assist in getting the "right" help to the crash (ACN related)
  → Field triage decision
- **VEHICLE PURCHASER**
  → Get data on vehicle history (Data logging - Not EDR)
- **TRANSPORTATION RESEARCHERS**
  → Vehicle
  → Highway
  → Medical

The breakout session summarized the customers into two major types

1 - Real Time

Although the group identified many and varied "customers" for the data - the most time sensitive use is by EMS or safety personnel responding to a crash. This would involve the transmission of critical information about the crash severity immediately after the crash has occurred to an appropriate entity. This information is time sensitive and critical because it immediately impacts the ability of the EMS and health care system to save the lives of crash victims.

2 - Non-Real Time

The session members also classified the users into 5 major categories:

1 - R&D
- OEM
- Governments
- Academics

2 - Incident Management
- Medical
- Insurance Companies

3 - Fault Assignment
- Authorities (police, courts)
- OEM & Government
- Insurance Companies through Juries

4 - Driver
- Personal Data
- Vehicle Performance

5 - Owner
- Fleet
- Personal
- Self-Insured

4.3 Breakout Session Summaries

Both breakout sessions gave a short summary of their respective sessions activities.

5.0 Working Group Activities

5.1 **Next Meeting:** The WG discussed how many meeting would be desirable to complete the objectives of the working group. It was felt that we should try to target for two more meeting. The next meeting was scheduled for June 7, 2000, Washington, DC

5.2 **Topics For Next Meeting**: The following topics were presented for discussion at the next meeting:

Breakout sessions:

1. How should the data be collected & stored? (Objective #3)
2. How should the data be retrieved? (Objective #4)
3. Who should be responsible for keeping the permanent record? (Objective #5)
4. Demonstration of EDR technology. (Objective #8)

5.3 **Press Clips:** Tom Kowalick presented the working group with a copy of several articles he had located since the past meeting. They are found in **Attachment 7** .

5.4 **Working group for "passenger carrying" vehicles:** The EDR working group discussed forming a new working group targeted at large vehicles, in particular, those targeted by Chairman Hall safety recommendations to NHTSA regarding school buses and motor coaches. In his recommendations, Chairman Hall, asked NHTSA to require School buses and motor coaches to be equipped with EDRs and to set standards for EDRs. Several members expressed interest in forming a new working group. John Hinch requested that all interested members send a letter (e-mail) in support of this new working group.

5.5 **Objectives:** John Hinch led a short discussion regarding the objectives of the working group. John Hinch suggested that the working group review these objectives in light of the restrictions placed on the working group because of the new sponsorship. NHTSA guidelines prevent a working group from making recommendations. As such, each of the eight objectives were reviewed and revised as needed to reflect the new guidelines. A copy of the revised objectives are found in **Attachment 8**.

5.6 **NTSB:** NTSB will hold a symposium on recorders and the Law on April 25-16, 2000. You can follow the activities related to this symposium at: http://www.ntsb.gov/events/2000/symp_legal/default.htm

5.7 **NTSB**: NTSB supplied CD of the Transportation Symposium held in 1999. If you did not obtain a copy of the CD, and would like one, please contact John Hinch

Attachments

1 Agenda
2 Attendance List and Updated Working Group Member List
3 MVSRAC letter
4 Chrysler Slides
5 Ford Slides
6 GM Slides
7 Press Clips and News Stories on EDRs
8 Revised Working Group Objectives

AGENDA

Event Data Recorder Meeting #5

9:30 a.m. - 4:00 p.m.   Wednesday, February 2, 2000

Room 6200-04 NASSIF Building; 400 7th Street S.W.; Washington DC 20590

Working Group Objective

Facilitate the collection & utilization of collision avoidance and crashworthiness data from on-board EDRs.

Meeting Objectives:

Review OEM EDR Systems

Breakout sessions:

Status of EDR Technology

Who are the Customers

Morning	Afternoon
Morning 9:30 Welcome and Introductions John Hinch and Kathy Gravino ➔Sign-up for afternoon sessions ➔Introduction of new member Stephen Sprague (United Motorcoach Association) Retirements Wilbur Rumph (Blue Bird) ➔Hello from Ray Owings or Joe Kanianthra 9:45 MVSRAC status Termination of MVSRAC New Working Group 10:00 Review and Approval of October 6, 1999, Meeting Minutes (John Hinch) 10:15 OEM Presentations of EDR systems (Kathy Gravino) Break as fits into OEM presentations (sign up for afternoon sessions) 12:00 Lunch EDR Download Tool Demonstration (Chip Chidester)	**Afternoon** Breakout Sessions **Objective 1: What is the status of EDR technology?** **Objective 7: Who are the customers for EDR data?** 1:00 - 2:30 Session Discussions ➔ Names of participants ➔ Nominate facilitator ➔ Take session notes for meeting record ➔ Develop summary 2:30-2:40 Afternoon break 2:40 - 3:00 Breakout sessions summaries 3:00 -4:00 Working Group Business ➧ NTSB ➔ Recommendations for Recorders on Motor Coaches and School Buses ➔ New Recorder Symposium "Safety and the Law" April 25 & 26, 2000 ➧ "Passenger-Transport" Sub Group ➔ Interest in starting a separate subgroup? ➔ Target specific EDR needs for these vehicles ➧ Final Report ➔ Group discussion ➧ Next Meeting (WG Members) ➔ Date (possibly June 7, 2000) ➔ Topics ➔ Breakout Sessions ➔ Presenters ➔ Co-Chair for next meeting

February 18, 2000

MEMBER LIST MVSRAC WORKING GROUP on EVENT DATA RECORDERS

Name	Company	Phone	Fax	Company Address	e-mail
David Bauch	Ford	313 322-3884	313 390-5144	Advanced Vehicle Tech #3, 2A149 Rm 2122, Mail Drop 3010, Ford Motor Company, Dearborn, MI 48121	dbauch@ford.com
Joe Marsh		313 390 2171	313 594 0723	330 TownCenter Dr, Suite 500, Dearborn, MI 48126	jmarsh@ford.com
Robert Cameron	VW	201 894-6245	201 894-5498	Volkswagen of America, 600 Sylvan Ave, Englewood Cliffs, NJ 07632	Robert.Cameron@vw.com
Michael Cammisa	IIHS	703 247 1568	703 247 1587	1005 N. Glebe Rd.; Arlington, VA 22201-4751	mcammisa@iihs.org
John Carney	Worcester Polytechnic Institute	508 831-5222	508 831-5774	Worcester Polytech. Institute, 100 Institute Rd, Worcester, MA 01609-2280	jfc@wpi.edu
Alex Damman	Honda	937 645-	937 645-6344	Honda R&D Americas, Inc., 21001 State Route 739, Raymond, OH 43067-9705	@oh.hra.com
Bob Douglas	American Transportation	501 505 2190	501 505 2185	PO Box 6000 Conway, AR 72033	Bob.Douglas@Navistar.com
Liz Garthe	Garthe Associates	781 631 1553	781 631 2146	7 Skinners Place, Suite # B; Marblehead, MA 01945-4614	garthe@ibm.net
Charlie Gauthier	NASDPTS	703 734-1620	703 734-1868	1604 Longfellow St, McLean, VA 22101	
Alan German	Transport Canada	613 993-3609	613 991-5802	Road Safety and Motor Vehicle Regulation Directorate; Transport Canada; PO Box 8880; Ottawa Postal Terminal; Ottawa , Ontario, Canada K1G 3J2	GermanA@tc.gc.ca
Kathleen Gravino	DaimlerChrysler	248 576-3613	248 576-7918	CIMS 483-05-10; 800 Chrysler Drive, Auburn Hills, MI 48326-2757	kmg15@daimlerchrysler.com
Martin Hargrave	FHWA	202 493-3311	202 493-3417	FHWA, HRDS-04, Turner Fairbanks Highway Research Center, 6300 Georgetown Pike, McLean, VA 22101-2296	martin.hargrave@fhwa.dot.gov
Tim Hess	TRB	202 334-2049	202 334-2006	Transportation Research Board, NRC, 2101 Constitution Ave, Washington DC 20418	timhess@nas.edu
John Hinch	NHTSA-R&D	202 366-5195	202 366-5930	NHTSA, NRD-01, 400 7th St SW, Washington, DC 20590	john.hinch@nhtsa.dot.gov

DRAFT

MEMBER LIST MVSRAC WORKING GROUP on EVENT DATA RECORDERS					
Name	**Company**	**Phone**	**Fax**	**Company Address**	**e-mail**
Thomas Kowalick	Click, Inc.	910 692-5209	910 695-1566	560 East Massachusetts Ave, Southern Pines, NC 28387	kowalick@pinehurst.net
John Mackey (Andy Mackevicns)	Loss Management Services, Inc.	516 226-7359 (516 679-0311)	516 719-8882	36 Surf Road, Lindenhurst, NY 11757	Stlukech1@aol.com (awmackav@aol.com)
Tom Mercer	GM	810 986-3552	810 986-6219	GM Tech Center, Mail Code 480-111-S20, 30200 Mound Road, Warren, MI 48090-9010	Tom.C.Mercer@GM.com
Jeya Padmanaban	AAAM	650 941-5304	650 941-2132	35 Sylvian Way, Los Altos, Ca 94022	jeyap@aol.com
Vernon Roberts	NTSB	202 314-6483	202 314-6406	NTSB, HS-1, 490 L'Enfant Plaza East SW, Washington, DC 20594	robertv@ntsb.gov
Brian Shaklik	Navistar	219 428-3205	219 428-3501	Navistar Technical and Engineering Center, 2911 Meyer Rd, Fort Wayne, IN 46801	Brian.Shaklik@Navistar.com
Greg Shaw	UVA	804 296-7288	804 296-3453	UVA Auto Safety Lab, Charlottesville, VA	cgs5w@virginia.edu
Steve Sprague	United Motorcoach	703 838 2929	703 838 2950	113 South West St. 4th Floor, Alexandria, VA 22314-2824	www.uma.org
Sharon Vaughn	NHTSA-NCC	202 366-1834	202 366-3820	NHTSA, NCC-30, 400 7th St SW, Washington, DC 20590	svaughn@nhtsa.dot.gov

EDR MEETING # 5; Feb 2, 2000; Washington DC		
NAME	COMPANY	PHONE
Bob Cameron	VW of America Inc.	201-894-6245
Tom KOWALICK	Click, Inc.	910-692-5209
Liz Gartke	Gartke Associates	781-631-1553
Andy Mockevicius	Loss Mgmt Svcs, Inc	516 679-0311
Lou Lombardo	NHTSA	(202) 366 6208
Joe Marsh	Ford	313-390-2171
David Bauch	Ford	313-322-3884
Tom Mercer	GM	810 986-3552
MIKE CAMMISA	IIHS	703-247-1568
ALAN GERMAN	TRANSPORT CANADA	(613) 993-3609
Charlie Gauthier	NASDPTS	703-754-1620
Bob Douglas	Am Tran / SBMTC	501-505-2190
Martin W Hargrave	FHWA	202-493-3311
Robert Ferlis	FHWA	202-493-3268
JIM KELLER	HONDA	248-304-4890
Carl Hayden	FHWA HSA-1	202-366-2176
GERALD STEWART	NHTSA	202-366-5268
Eric Ferguson	NHTSA	202-366-9430
Chip Chidester	NHTSA	(202) 366-5393
MALCOLM RAY	WPI	508-831-5340
Sandy Johnson	NHTSA	202-366-5364
Douglas Gavin	NHTSA	202 366 5594

EDR MEETING # 5; Feb 2, 2000; Washington DC		
NAME	COMPANY	PHONE
MARY RUSSELL	FLORIDA ATLANTIC UNIVERSITY	561-297-2328
Doug Funke	Veridian Engineering	(716) 631-6958
DAN May	VDO North America	540-723-8013
Kathy Giovino	DAIMLERCHRYSLER	248 576-3613
Sharon Y VAUGHN	NHTSA	202-366-1834
Regina Dillard	State Farm	202-263-4403
Robert McElroy	FAI	561-995-6781

Members

Sent via facsimile

Subject: MVSRAC EDR Working Group Status Change

Dear Colleague:

On May 31, 1999, the charter for the Motor Vehicle Safety Research Advisory Committee (MVSRAC) expired. The National Highway Traffic Safety Administration (NHTSA) Office of Research and Development (R&D) hopes to reconstitute the committee at some time in the near future under a new charter that reflects the current thinking of the agency and makes the committee more effective. Until the committee is reconstituted, however, MVSRAC and all of its components (including its sub-committees and working groups) are no longer authorized.

Accordingly, the MVSRAC Event Data Recorder (EDR) Working Group, which was formed to gather information regarding the use of EDR technology in motor vehicle safety and report that information to MVSRAC is officially disbanded.

NHTSA believes, however, that there continues to be a need for the information that the MVSRAC EDR Working Group was asked to collect. The agency believes the members of the EDR Working Group have made significant progress in collecting the desired information, and we recognize that this work has not yet been completed.

Since the purpose of the working group is to gather factual information and not to develop consensus recommendations for NHTSA or any other Federal agency, the group's work may continue and need not be conducted as part of a sanctioned advisory committee.

Accordingly, the EDR Working Group can continue its work. NHTSA R&D (rather than MVSRAC) will now be the sponsor of the group, and the Working Group will now report its findings to NHTSA R&D (rather than to MVSRAC).

As you know, the MVSRAC EDR Working Group was scheduled to meet on February 2, 2000, in Washington DC. **The February 2, 2000, meeting will still take place,** as the first meeting of the NHTSA R&D EDR Working Group. We look forward to seeing you there.

At the beginning of the meeting on February 2, 2000, we will spend some time discussing the changes to the working group. If you have any questions or concerns about these changes, we encourage you to raise them at that time, so they can be discussed and hopefully resolved. The draft agenda I sent you a few weeks ago otherwise remains intact. We have added a lunchtime activity for Chip Chidester, NHTSA SCI staff, to demonstrate the GM EDR download tool. If you have any questions regarding this letter or about the upcoming meeting, please contact John Hinch at (202)366-5195 or john.hinch@nhtsa.dot.gov.

Sincerely,

Raymond P. Owings, Ph.D.
Associate Administrator
for Research and Development

DRAFT

cc: Heidi Coleman
Ed Graham
Roberta Fede

DAIMLERCHRYSLER

EDR Status Update

February 2, 2000

EDR-Definitions

- Event
  - Deployment of a pyrotechnic device
- Data
  - Restraint System Status & Vehicle System Status
- Recorder
  - 5 seconds before the event and 2 seconds after

DAIMLERCHRYSLER

NHTSA -EDR
Data Element Selection

- Priority
- Data Elements*
- Practicable
- When Possible*
- Event Phase
- Customers*
- Purpose

"Customers" for Stored Data from NHTSA EDR Data Element Selection

- 1) Accident <u>Reconstruction</u> = "... gather better information on...crash parameters in actual crashes...." (NTSB directive to NHTSA).

- 2) <u>Highway</u> Design Improvement Potential - (Location, Date, Time)

- 3) Improve <u>Emergency</u> Response - (ACN)
- Other-Causation, Injury, Special Applications, Threshold

- DC EDR (Short Term for North America) will address:
  - 1) Accident <u>Reconstruction</u> & "...gather better information on...crash parameters in actual crashes...." ***as related to the vehicle.***
  - Telematics can address 2) <u>Highway</u> and 3) <u>Emergency.</u>

DAIMLERCHRYSLER

EDR Categories from 10/99

• <u>CATEGORY</u>		• <u>WHEN POSSIBLE</u>
• Restraint System Usage (Status)		• Short Term (2003-2006)
• Vehicle/EDR ID	*Vehicle System Status*	• Short Term
• Speed		• Short Term
• Driver Controls (Brakes, acceleration, etc)		• Short Term
• Crash Pulse (delta V, deceleration, angular rates)		• Long Term (after 2006) -TBD- Today-have calibration, algorithm
• Location		• Not in EDR--Use Telematics
• ACN (time, date, location, # of occupants)		• Not in EDR--Use Telematics
• Environmental Conditions		• Long Term-TBD, Use Telematics

DRAFT

Data Elements

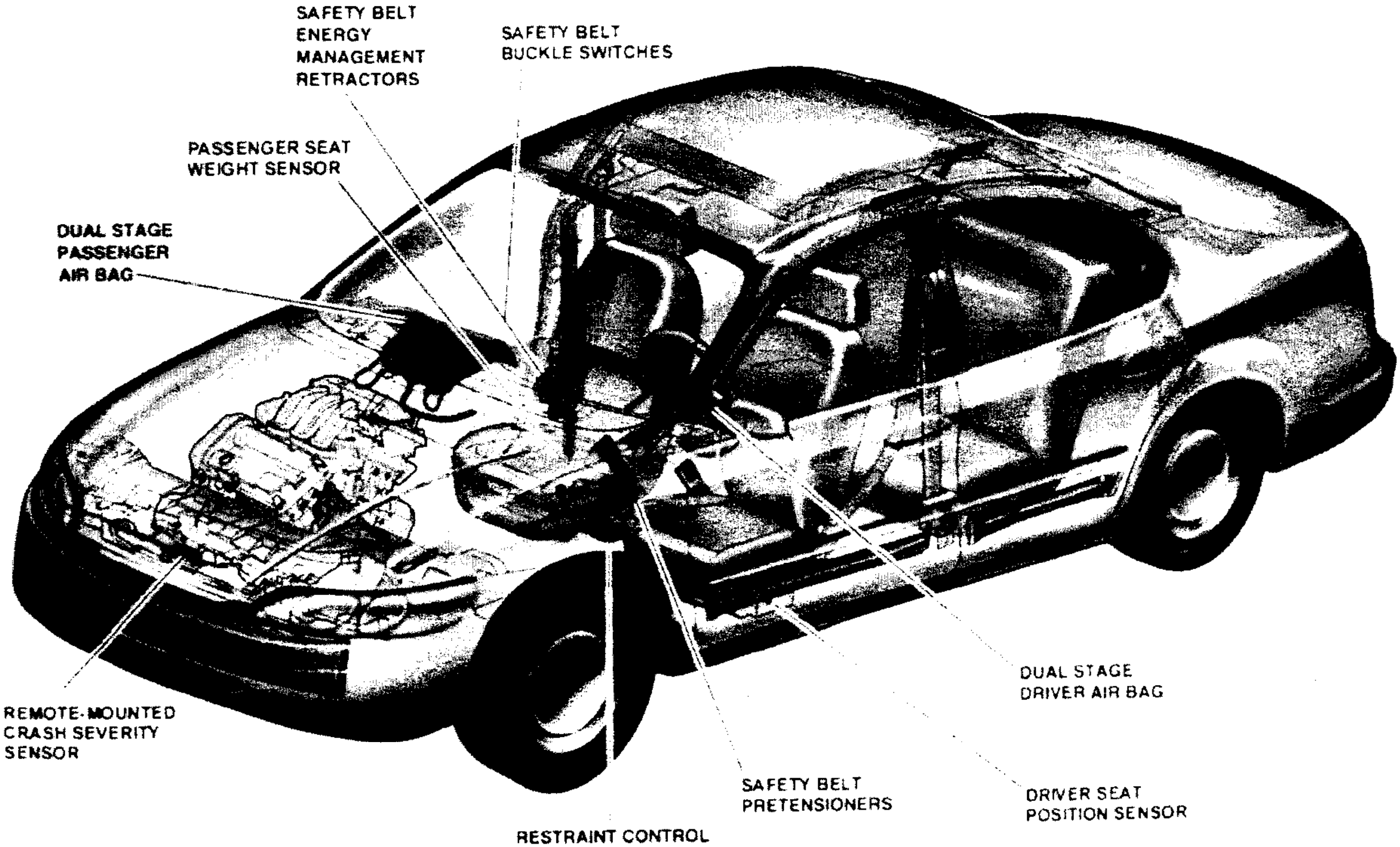
- Restraint System Status
  - Airbag Type Deployed
  - Ignition Cycle Counter
  - Seat Belt Status
  - Occupant Sensing Status
  - Airbag Disable Switch Status
  - Airbag Lamp Status
- Vehicle System Status
  - Vehicle Speed
  - Engine RPM
  - Throttle Position
  - Brake applies
  - ABS activated
  - Cruise Control status
  - Engine Lamp status
  - 2 x 4 wheel drive engaged
  - Traction Control
  - System Voltage
  - Head Lamp Status
  - Vehicle Mileage
  - VIN Number

DRAFT

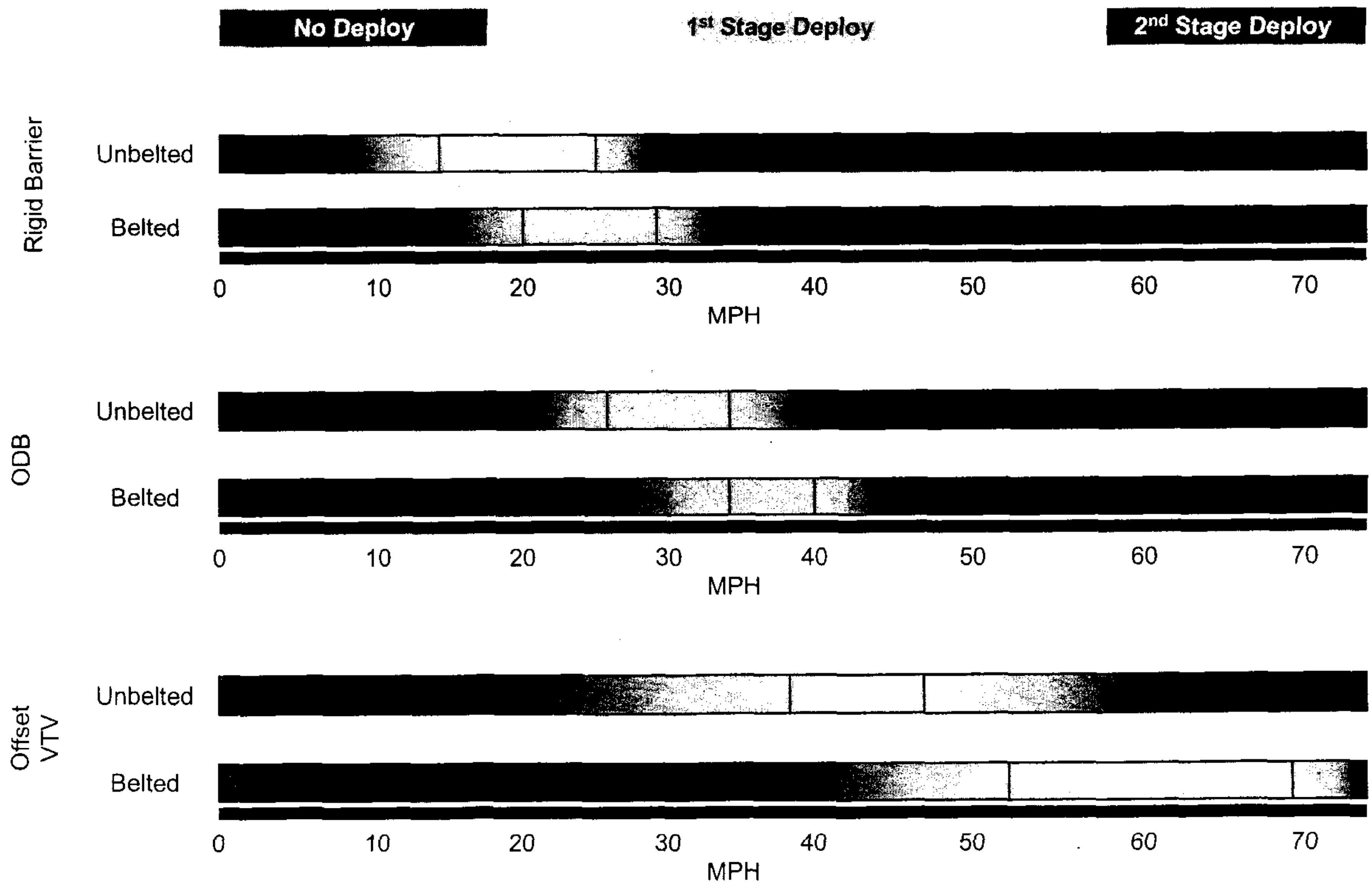
EDR Recommendation

- Data Elements to be stored are the same for all OEM's.

ADVANCED RESTRAINTS SYSTEM



Example Airbag Deployment Level vs. Crash Mode



2nd Preliminary **D R A F T**

EDR Report - Summary Page [Mock Data]

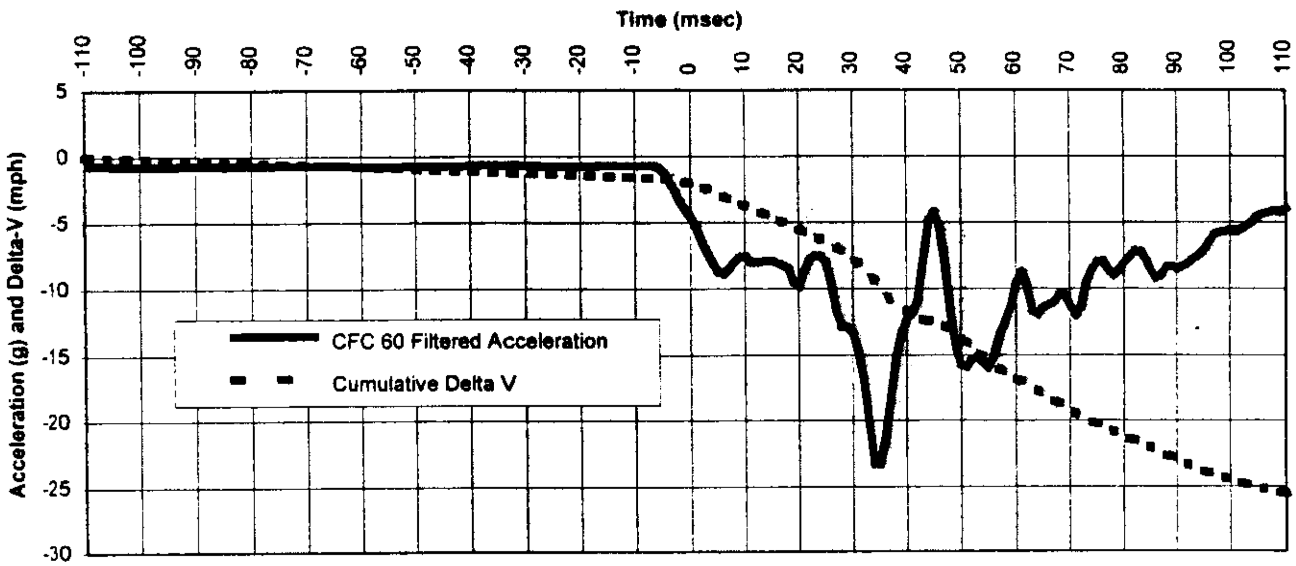
Investigator entered data:

Case No.	#1	Photos	No	Investigator	PG	Model Year	2000
VIN	195778			Invest. Date	4Jun99	Vehicle. Make/ Model	LM Sable 4dr

EDR Control module data:

		Data Validity Check	Valid	Deploy Attempt Made	YES
Read-Out Date	09-Jun-99	Time From Algorithm Wake-Up (0 msec) To Deploy Attempt (msec)			15
EDR Serial N	4107929028	Passenger Airbag Switch Position (On/ Off) During The Event			NA
Model-version	ECS 2a				-
Stored VIN	NA	Pretensioner	NA	Side Air Bags Deployed	NA
Diagnostic Codes Active When Recorded Event Occurred:			None		

Longitudinal Crash Pulse Data



Cumulative Delta-V (mph) Data Points

Time (msec)	-100	-90	-80	-70	-60	-50	-40	-30	-20	-10	0	10	20	30	40	50	60	70	80	90	100	110
Delta-V (mph)	-0.2	-0.3	-0.5	-0.6	-0.8	-0.9	-1.1	-1.3	-1.4	-1.6	-2.0	-3.7	-5.5	-7.7	-12	-14	-17	-19	-21	-23	-24	-25

Notes: + Read-Out Date based on PC/ tool's internal calendar.
+ Features and data parameters that are 'Not Available' are noted as 'NA'
+ CFC 60 is Butterworth 4-Pole Phaseless Digital Filter, SAE J211/ Part 1 MAR95, Appendix C.
+ Total and maximum Delta-V results are not available from truncated/ incomplete crash pulses. The actual time period recorded varies by EDR model.
+ Algorithm Wake-up (0 msec) is not the first moment of vehicle contact or impact.

2nd Preliminary **D R A F T**

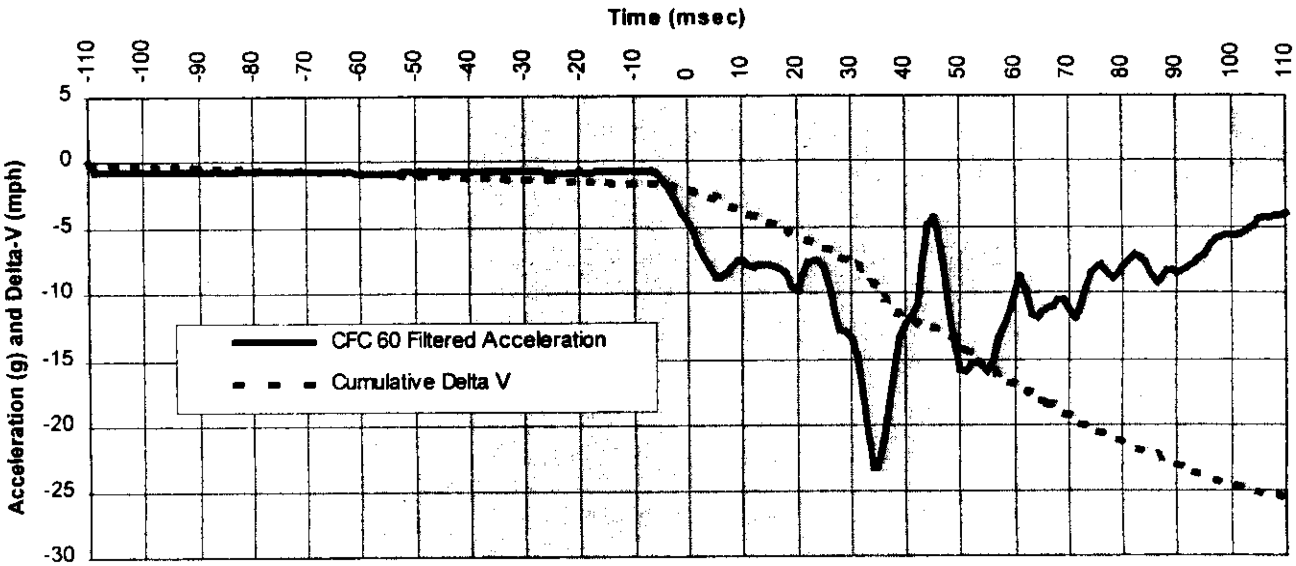
EDR Summary Report -Advanced Personal Safety System Data - Addendum (page 3)

Read Out Date	09-Jun-99	Module Serial No.	4107929028

[w Mock-up Data]

Advanced Personal Safety System Data:	**Driver**	**Passenger**
Single-Stage or Dual-Stage Deployment Used (NA = Not Available)	Singe-Stage	Dual-Stage
Seat Belt Switch (On/ Off)	On	Off
Driver Seat Position (Forward/ Back) / **Passenger** Seat Weight Switch (On/Off*)	Forward	NA
Time From Algorithm Wake-Up To Pretensioner Deploy Attempt (msec)	15	15
Time From Algorithm Wake-Up To 1st-Stage Deploy Attempt (msec)	15	20
Time From Algorithm Wake-Up To 2nd-Stage Deploy Attempt (msec)	115	25

Lateral Crash Pulse Data



Cumulative Delta-V (mph) Data Points

Time (msec) / **Delta-V (mph)**																					
-100	-90	-80	-70	-60	-50	-40	-30	-20	-10	0	10	20	30	40	50	60	70	80	90	100	110
-0.2	**-0.3**	**-0.5**	**-0.6**	**-0.8**	**-0.9**	**-1.1**	**-1.3**	**-1.4**	**-1.6**	**-2.0**	**-3.7**	**-5.5**	**-7.7**	**-12**	**-14**	**-17**	**-19**	**-21**	**-23**	**-24**	**-25**

Notes: + Read-Out Date based on PC/ tool's internal calendar.
+ Features and data parameters that are 'Not Available' are noted as 'NA'
+ CFC 60 is Butterworth 4-Pole Phaseless Digital Filter, SAE J211/ Part 1 MAR95, Appendix C.
+ Total and maximum Delta-V results are not available from truncated/ incomplete crash pulses. The actual time period recorded varies by EDR model.
+ Algorithm Wake-up (0 msec) is not the first moment of vehicle contact or impact.
+ Passenger front air bag deactivated when seat weight switch is 'off'

EDR Report - Detail Page

Read Out Date	09-Jun-99	Module Serial No.	4107929028

Longitudinal Acceleration (CFC 60 Filtered g's) Data Points

Time (mS)	-120	-100	-80	-60	-40	-20	0	20	40	60	80	100
0	g's	-0.7	-0.7	-0.7	-0.7	-0.7	-4.6	-9.8	-12.3	-9.6	-8.0	-5.6
1	-	-0.7	-0.7	-0.7	-0.7	-0.7	-5.4	-8.7	-11.8	-8.8	-7.6	-5.6
2	-	-0.7	-0.7	-0.7	-0.7	-0.7	-6.4	-7.8	-10.9	-9.9	-7.1	-5.5
3	-	-0.7	-0.7	-0.7	-0.7	-0.7	-7.3	-7.5	-8.0	-11.7	-7.2	-5.2
4	-	-0.7	-0.7	-0.7	-0.7	-0.7	-8.0	-7.5	-4.8	-11.9	-7.8	-4.9
5	-	-0.7	-0.7	-0.7	-0.7	-0.7	-8.7	-8.0	-4.2	-11.4	-8.6	-4.5
6	-	-0.7	-0.7	-0.7	-0.7	-0.7	-8.8	-9.6	-5.4	-11.2	-9.2	-4.3
7	-	-0.7	-0.7	-0.7	-0.7	-0.7	-8.4	-11.8	-8.1	-11.0	-8.9	-4.2
8	-	-0.7	-0.7	-0.7	-0.7	-0.7	-8.0	-12.8	-11.8	-10.5	-8.4	-4.1
9	-	-0.7	-0.7	-0.7	-0.7	-0.7	-7.6	-12.9	-14.3	-10.5	-8.3	-4.1
10	0.0	-0.7	-0.7	-0.7	-0.7	-0.7	-7.6	-13.4	-15.8	-11.3	-8.5	-3.9
11	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7	-7.9	-14.9	-15.9	-12.0	-8.3	-
12	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7	-8.0	-17.0	-15.3	-11.3	-8.1	-
13	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7	-7.9	-20.3	-15.1	-9.6	-7.7	-
14	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7	-7.9	-23.3	-15.6	-8.5	-7.5	-
15	-0.7	-0.7	-0.7	-0.7	-0.7	-1.2	-7.9	-23.3	-16.0	-8.0	-7.1	-
16	-0.7	-0.7	-0.7	-0.7	-0.7	-1.8	-8.1	-21.4	-15.0	-7.9	-6.4	-
17	-0.7	-0.7	-0.7	-0.7	-0.7	-2.5	-8.2	-18.3	-13.5	-8.5	-5.9	-
18	-0.7	-0.7	-0.7	-0.7	-0.7	-3.3	-8.5	-15.2	-12.5	-9.0	-5.7	-
19	-0.7	-0.7	-0.7	-0.7	-0.7	-4.0	-9.4	-13.4	-11.2	-8.6	-5.7	-

Hexadecimal Memory Dump

This is a full hexadecimal dump of the air bag control module EEPROM memory.

address	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F
0000B600	FF	FF	FF	FF	FF	FF	FF	FF	EE	34	05	25	B4	4D	40	6C
0000B610	6E	46	CC	29	12	24	0E	24	0E	21	32	D6	AF	08	4B	07
0000B620	0A	90	70	40	8	82	0F	28	31	42	31	03	A0	50	0A	1E
0000B630	19	01	0C	F5	0A	6E	5A	3A	3C	01	25	3C	3C	FE	12	C9
0000B640	06	FF	0F	00	28	00	02	00	28	00	28	00	32	14	09	01
0000B650	2C	FF	FF	00	64	02	0A	1E	FF	01	2C	FF	00	29	0C	05
0000B660	00	47	11	FF	64	64	05	12	0C	06	00	0B	04	45	6B	00
0000B670	10	0A	FF	0B	1B	0F	1E	96	50	C0	E9	02	BC	05	04	1E
0000B680	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF
0000B690	FF	59	01	61	98	8D	2C	00	01	FF	FF	00	00	FF	FF	00
0000B6A0	FF	FF	00	FF	FF	FF	00	FF	FF	FF	00	FF	FF	FF	00	FF
0000B6B0	FF	FF	00	FF	FF	FF	00	FF	FF	FF	00	FF	FF	FF	00	FF
0000B6C0	FF	FF	00	FF	FF	FF	00	FF	FF	FF	00	FF	FF	FF	00	FF
0000B6D0	FF	FF	00	FF	FF	FF	00	FF	FF	FF	00	FF	FF	FF	00	FF
0000B6E0	00	00	00	00	00	02	FF	41	40	07	13	71	56	08	FF	01
0000B6F0	FF	FF	A3	59	32	01	A3	59	21	01	A3	59	FF	FF	FF	FE
0000B700	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF
0000B710	65	65	66	65	65	65	65	65	65	FF	FF	FF	FF	FF	FF	FF
0000B720	65	65	65	65	65	66	65	65	65	64	64	64	64	64	64	64
0000B730	65	65	66	65	65	65	66	65	65							

EDR Data Elements Being Considered For Future
GM

- The attached list is tentative, far from being cast in concrete
- Asking our suppliers for the impact of storing the listed data
- GM assessing the usefulness of the data, reliability, and ease of implementation
    - Availability of data on serial data bus
    - Amount of EEPROM data storage needed - depends on the data element and resolution
    - Requires SDM software to capture data from the serial data bus, deduce its validity, and determine which vehicles the data is available from
- Technological developments, supplier cost estimates, GM business strategies, and EDR WG may cause the list to be modified
- Some of the data elements would be useful to an ACN implementation
- Want to strike a balance between:
    1. Demonstrating commitment to enhanced data recording
    2. Not alienating other OEMs by giving impression of trying to impose GM vision on them.

EDR Data Elements Being Considered For Future GM

Key: Practicable ==> New means not available on all vehicles and is new
Some means presently available but not on all vehicles

==> End user codes from 9/16/99 NHTSA-EDR Data Element Selection sheet

WG Priority[1]	Data Element	Practicable	End Users	Pre or Post Crash
1	Delta V – x and y deployment impact	New	Injury	Post
1	Delta V – x and y non-deployment impact	New	Injury	Post
2	Location of crash	New	Highway	Post
3	State of driver's seat belt switch	Exists	Injury	Pre
3	State of front seat passenger's seat belt switch	New	Injury	Pre
3	State of rear seat passenger's seat belt switch	New	Injury	Pre
5	Brake status (several seconds)	Some	Causation	Pre
5	Brake Warning lamp on	New	Causation	Pre
5	Cruise Control Active, Set/Reset, Resume/Accel. (several seconds)	New	Causation	Pre
5	Engine speed (several seconds)	Exists	Causation	Pre
5	Engine throttle position (several seconds)	Exists	Causation	Pre
5	Headlamp status (Off, high beam, low beam)	New	Causation	Pre
5	Steering wheel angle (several seconds)	New	Causation	Pre
5	Transmission actual gear selected	New	Causation	Pre

[1] List of "Top Ten" data needs developed at 2/99 EDR WG meeting

EDR Data Elements Being Considered For Future
GM

5	Vehicle speed (several seconds)	Exists	Causation	Pre
6	Date	New	Reconstruction	Pre
6	Time of day	New	Highway	Pre
7	Rollover status (< 1 roll, > 1 roll, final rest pos'n)	New	Injury	Post
8	Steering angle, yaw rate, lateral acceleration (several seconds)	New	Causation	Pre
9	ABS Active (several seconds)	New	Causation	Pre
9	Stability enhancement active (several seconds)	New	Causation	Pre
9	Traction control active (5 seconds before impact)	New	Causation	Pre
10	Crash-sensing criteria that were met	Exists	Threshold	Post
10	Diagnostic Trouble Codes present	Exists	Causation	Pre
10	Duration Warning Lamp was ON or OFF	Exists	Causation	Pre
10	Ignition cycle count at event	Exists	Causation	Pre
10	Maximum ΔV for event	Exists	Injury	Post
10	Passenger's airbag enabled or disabled state	Some	Injury	Pre
10	State of Driver's and Passenger's seat position	New	Injury	Pre
10	Time from impact to time of maximum ΔV	Exists	Reconstruction	Post
10	Time from vehicle impact to time of deployment	Exists	Reconstruction	Post
10	Warning lamp state when event occurred	Exists	Causation	pre
	Door Status (closed, ajar, open)	New	Injury	Pre
	Outside air temperature	New	Emergency	Pre
	Service Engine Soon lamp on act)	New	Causation	Pre
	Service Vehicle Soon Lamp on	New	Causation	Pre
	Tire pressure low lamp on	New	Causation	Pre
	VIN	New	Data entry	Pre

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Charting the Electronics Path

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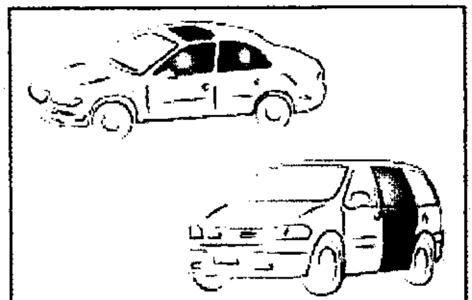
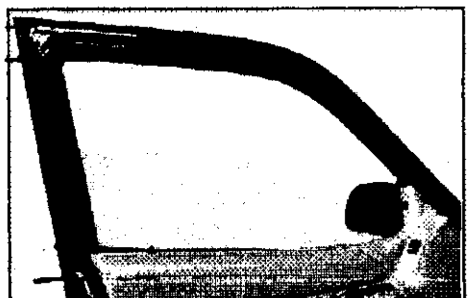
Software packages that address specific areas — such as wire harnesses, electrical motors, or electronic controllers — provide a cyberspace link from concept through design, engineering, and manufacturing.



Vehicle outlines showing SmartWindow usage.

Structural Dynamics Research Corp. (SDRC) and Transcendent Design Technology just released a next-generation software solution for wire harness and cable systems design. "The mechanical and electrical worlds have been separated by a chasm due to differences in skills, culture, language, and loosely integrated tools. Transcendent and SDRC are the first to engineer a completely integrated solution for the entire design process of wire harness and cable systems," notes Enrique Ortega, Transcendent's Vice President of System Design Products.



SmartWindow demonstration application

Adds SDRC's Vice President of Corporate Marketing, Bill Carrelli, "The significance of this solution is that the electrical engineer can now work concurrently with the mechanical engineer to maximize design trade-offs and optimize interdisciplinary design decisions."

Applied Dynamics International Inc.'s SIMsystem is being used for General Motors' next generation Hardware-in-the-Loop simulators to design, verify, and validate control strategies relating to electronic controllers. Hardware-in-the-Loop simulation enables analysis of control system hardware and software in a laboratory setting. "General Motors' goal is to reduce costs and time-to-market, and improve overall quality in the development of its electronic control systems across all vehicle platforms," notes John McIntosh, Applied Dynamics President and CEO.

A new electronic control unit software tool, TargetLink, automatically generates fixed-point code for production ECUs. "(The software) has already been tested with genuine ECU functions provided by automotive benchmark partners. TargetLink-generated code was equal and in several cases superior to handwritten production code in terms of execution and memory consumption," notes Herbert Hanselmann, President and CEO of dSPACE, the Paderborn, Germany-headquartered company that developed TargetLink. Code generated by the software runs on any processor that is programmable with standard ANSI-C code. TargetLink code documentation is done in HTML.

EDR

Event recorder usage is poised to become a mainstream monitoring tool for vehicle electronics. The U.S. Army Tank-Automotive & Armaments Command (TACOM)'s COMBATT (commercially based tactical truck) evaluation project will include an event recorder on modified full-size pick-up trucks (Ford F350 super duty platform, Dodge Ram 2500/3500 platform) as well as a modified HMMWV (High Mobility Multipurpose Wheeled Vehicle). "With real-time data recording, we can pinpoint when something went wrong and why it went wrong," says Elio DiVito, Electrical Engineer at TACOM's National Automotive Center. An event recorder integrates information from multiple systems, such as engine, transmission, and anti-lock brakes. "From an accident reconstruction or equipment failure standpoint, this is important data. And from a maintenance and diagnostic standpoint, an event recorder can be very helpful. Such a device helps you be a detective by giving you more information," DiVito says.

Unlike an electronic module that gathers data from that module only, an event recorder collects information from multiple vehicle areas with a memory capacity greater than that of a single electronic module. "The event recorder can be used on any vehicle with a databus. Although the U.S. Army has only three vehicles with a databus (palletized load system, family medium tactical vehicles, heavy equipment transport system/tank haulers), the likely future is re-manufactured vehicles with increased electronic content," DiVito says. COMBATT's first demonstration and evaluation prototypes are expected by the end of 1999.

As for production carry-over of event recorders, Ford Motor Co. equipped almost all 1999 model year vehicles with event data recorders. "It captures a limited amount of information, like how much the vehicle slows, when the algorithms are activated, and when an airbag deploys," says Jennifer Flake, Ford Public Affairs Safety Manager. Although the recorded data stored in the airbag control module remains untapped, a retrieval device for consumer vehicles is under development. "Ford wants to analyze and use real-world data to help enhance our vehicle safety systems," Flake explains.

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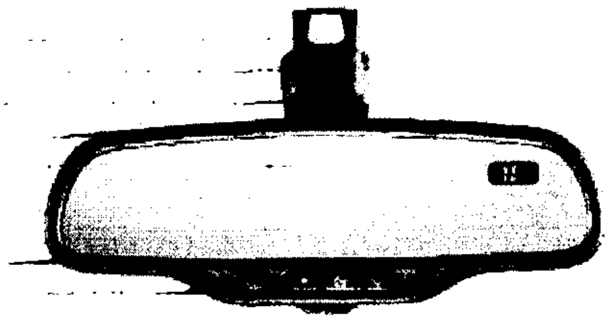
Detroit History

Gentex puts OnStar into rearview mirror

State firm builds device that lets drivers keep their heads up



Putting the OnStar in the rearview mirror lets drivers look at and interact with the security system while keeping their eyes on the road ahead.

Detroit News wire services

LIVONIA -- Gentex Corp. has developed and begun shipping automatic-dimming mirrors that will serve as the driver interface for OnStar.

OnStar is the in-vehicle safety, security and information service that uses Global Positioning System satellite technology and wireless communication to link the driver and vehicle to a 24-hour operator network that provides real-time, person-to-person assistance. Advisers at the professionally staffed OnStar Center can relay directions, track a stolen vehicle, unlock car doors,

Gentex Corp.

Makes: Electrochromic mirrors for the auto industry
Customers: Audi, Bentley, BMW, Daewoo, DaimlerChrysler, Fiat, Ford, General Motors, Gulf States Toyota, Hyundai, Infiniti, Kia Motors, Land Rover, Lexus, Nissan, Opel, Porsche, Rolls Royce, Samsung, Southeast Toyota Distributors and Toyota.

Founded: 1974
Locations: Zeeland, Livonia, automotive sales and

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JobHunter
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Place an ad
Home delivery

summons emergency services, diagnose vehicle/engine problems and provide a host of other services.

engineering subsidiaries in Germany and Japan and four regional U.S. sales offices for the Fire Protection Products Group.

"We couldn't be more pleased that OnStar has decided to locate one of the system's interfaces in the rearview mirror," said Ken La Grand, Gentex's executive vice-president. "OnStar's decision confirms what we've maintained for years -- that the rearview mirror is one of the best locations for the driver interfaces related to on-board messaging and communication systems. From an ergonomics standpoint, it's ideal because the mirror's location allows the driver to view and interact with the system while keeping his or her natural line-of-sight on the road ahead."

Locating OnStar in the rearview mirror also makes sense from an economics standpoint, Gentex said. It allows automakers to add OnStar to their vehicle lineups quickly, affordably and in a consistent location. It also saves space in the instrument panel and prevents interior redesigns.

Gentex is the world's top supplier of automatic-dimming mirrors, which use a combination of sensors and electronic circuits to detect glare from rearward approaching vehicles and automatically dim to protect driver vision.

Over the years, Gentex has developed automatic-dimming rearview mirrors that also contain compass displays, outside-temperature indicators, remote keyless entry receivers, map lamps and other value-added electronic devices.

Gentex is developing a number of different OnStar mirrors to accommodate various vehicle applications. In addition to automatically dimming, some versions of the OnStar mirror will contain a compass display and advanced map lamps utilizing light-emitting diodes. Gentex currently is shipping OnStar auto-dimming rearview mirrors for seven General Motors models.

The OnStar system interface itself will consist of a series of three small buttons located on the rearview mirror's chin. A fourth button will operate the mirror's additional functions.

"This new product has the potential to become significant incremental business for Gentex," said La Grand.

OnStar recently announced that its services would be included in nearly 1 million GM cars and trucks within the next 18 months.

Comments?

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Automotive Black Box Data Recovery Systems

By Don Gilman

Introduction

For years, airplane crash investigators have had the benefit of retrieving data from the flight-data recorder, or "black box." This data has proven invaluable for helping to determine what happened in the seconds before a crash. Now, in order to improve vehicle safety, General Motors is using similar technology in about 40% of its Model Year 1999 vehicles.

Background- Evolving Toward the Current State of the Automotive Art

In the 1970s, electronic sensors gained wide use in production automobiles. This proliferation was largely driven by the industry's move toward electronically controlled fuel injected engines. The computer, or Engine Control Module (ECM), used sensors to gather information about the current state of engine operation. Though it differed by manufacturer, sensors typically gathered information about Throttle Position, Engine RPM and Airflow. The ECM analyzed the information gathered from the sensors. Then, based on programming in the ECM, instructions were sent to actuators that could vary the length of time a fuel injector pulsed, or specify the amount of spark advance the engine received. These electronic systems were much more efficient than their mechanical predecessors and contributed to significant gains in fuel economy.

Efficiency notwithstanding, many mechanics found these new systems difficult to service. Enter onboard diagnostics. Onboard diagnostics increased the capabilities of the ECM and allowed it to check its well being as well as the condition of its associated sensors. Coupled with this diagnostic capability was a feature that allowed the ECM to store problems that it detected. This ability to store information aided the repair technician, and formed the foundation for the current data recovery technology.

As vehicles became more sophisticated, new electronic systems found their way into the automobile. Each of these systems required new sensors. Acceleration sensors were required for airbag modules. Wheel Speed sensors were required for ABS and Traction Control. Vehicle Yaw Rate sensors were necessary for Stability Control. Along with the new processors and sensors came on board diagnostics, and sometimes a little more. Just as the ECM could store problems, each new module also stored faults that were discovered in that particular system. For example, not only could the Airbag module store a fault, it could (and some do) count the number of times the engine had been started since the fault was generated. This was yet one more step toward storing data and the idea of data recovery and a "black box."

Data Recovery Systems (Black Boxes)

In the early 1970s, the National Transportation Safety Board (NTSB) made the recommendation that vehicle manufacturers and the National Highway Traffic Safety Administration work together to gather information on vehicle crashes using on-board collision sensing and recording devices. As a result, General Motors airbag equipped production vehicles have recorded data for impacts that caused a deployment of the airbag since 1974. Many of these systems also recorded data during impacts that were not severe enough to actually deploy the airbag ("near-deployment" events).

The capability to record *pre-crash data* originated with some 1999 GM vehicles. While the preceding introduction has been somewhat generic, the remainder of this article will focus specifically on the late model GM vehicles that are equipped with such systems. It is important to note that the extensive use of onboard sensors has made data recording possible. Conceptually, retaining the data is just a matter of adding memory and the software necessary to sample and capture the existing sensor outputs.

The Details

Airbag equipped vehicles use a crash sensing algorithm to decide when to deploy the airbags. The deployment criteria is based on various calibration data stored in the Sensing and Diagnostic Module (SDM). These criteria reflect that particular vehicle model's response to a wide variety of impact conditions. It is a predictive algorithm, typically making deployment decisions within 15-50 msec after impact. The SDM algorithm determines not only when to fire the airbag, but also helps to determine when to record the pre-crash data.

The amount of data retained for each crash event is limited by available memory. The combination of sampling rate and memory are insufficient for the SDM to record the actual crash deceleration data. However, the crash pulse can be reasonably well represented by the low-frequency velocity change data, (the information of interest to crash reconstructionists typically does not exceed 60 Hz). The SDM calculates the change in velocity by integrating the average of four 312-microsecond acceleration samples and stores them at 10 msec increments in RAM. Figure 1 shows the delta velocity values for a fairly high severity crash. The data points represent each 10-msec point with a smooth curve drawn through them.

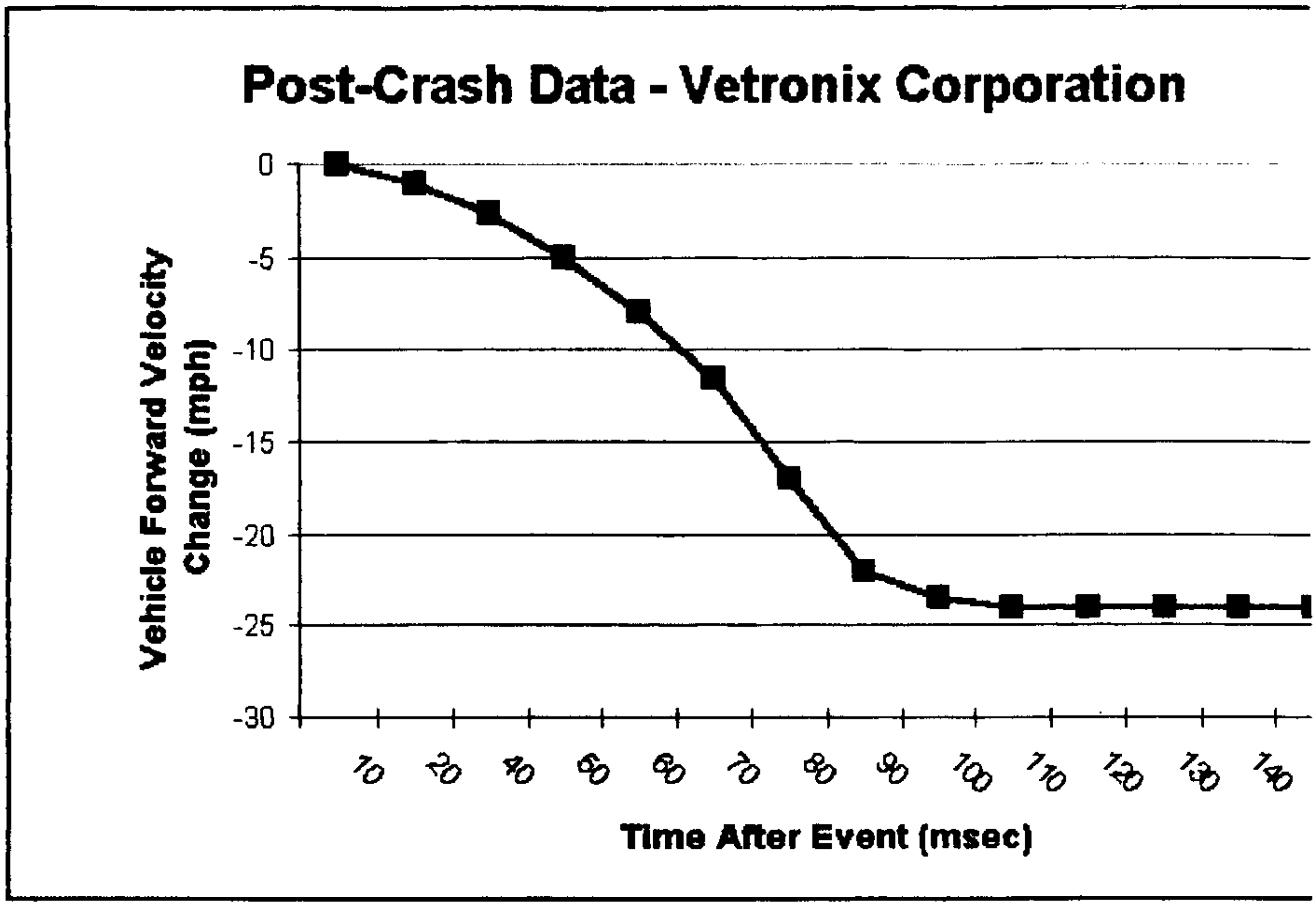


Figure 1: Delta V vs. Time

Late model GM vehicles also contain several other sensors which provide information such as driver seat belt status. If there is a deployment or near-deployment event, the last five seconds of data immediately prior to enabling the algorithm are stored in the module's memory (EEPROM). All of this stored data is available to the accident reconstructionist by using the proper software, interface hardware, and a PC.

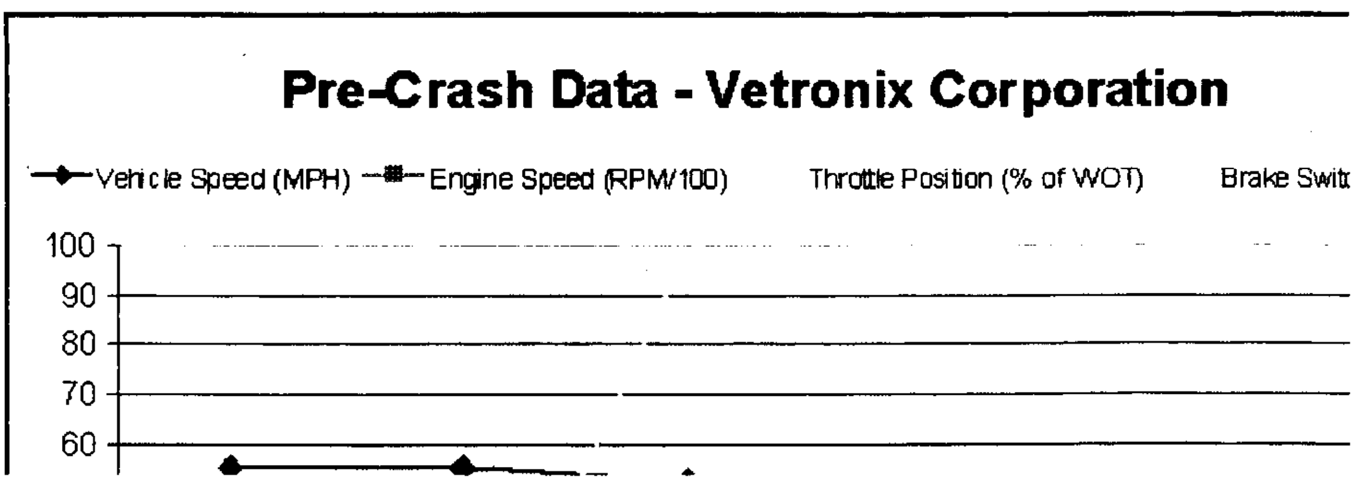


Figure 2: Pre-Crash Data vs. Time

Figure 2 shows how the pre-impact sensor data might appear when downloaded to a PC. Once each second, the module reads the most recent sensor data and stores them in a buffer that is constantly being refreshed, keeping only the most recent five seconds of data. When the SDM algorithm "enables" shortly after impact, buffer refreshing is suspended. It is important to note that the enabling of the algorithm is not synchronized with the buffering of the vehicle data. Therefore, the data recorded could be skewed in time from the crash by as much as one second.

The SDM is designed so that 150 msec after the deployment algorithm has enabled, all the data stored in memory is permanently written to the EEPROM. Once a deployment record is written, it cannot be erased, cleared, or altered by service or crash investigation personnel.

Near-deployment events are treated differently. The data contained in the record are largely the same, but the criteria used to determine whether an event is stored in EEPROM is based solely on the maximum delta V observed during the event. If the maximum delta V is greater than the previously stored delta V (from a previous event, perhaps), the new near-deployment event is stored along with its corresponding data. This near-deployment event is cleared from memory after 250 ignition cycles, or about 60 days on average.

Implications to the State of the Reconstruction Art

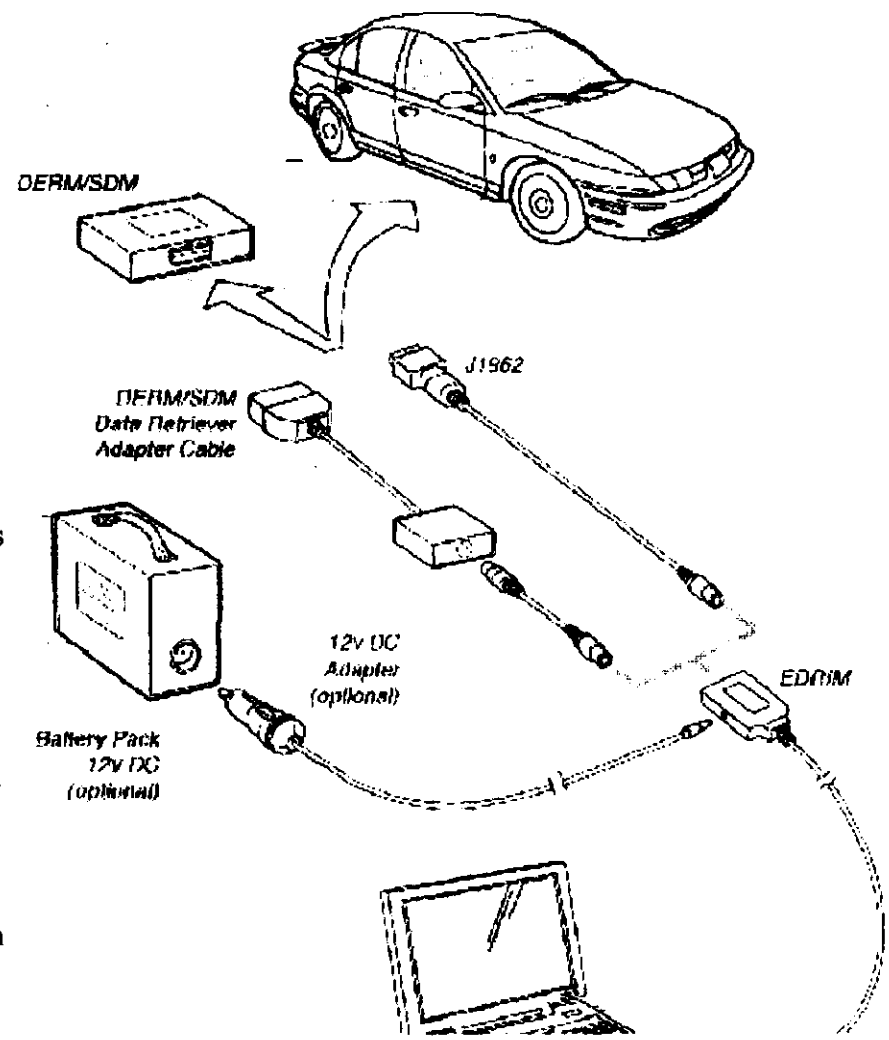
Any technology that allows vehicle safety researchers to collect objective, accurate data on crashes opens the door to a new generation of understanding and modeling. The available data sources are immense since about 18,000 tow-away crashes occur daily. An example of how this approach can be of benefit follows.

Currently, one of the primary metrics used to determine crash severity is the change in velocity, or delta V. Many current computer algorithms rely on stiffness parameters derived from short duration 35 mph rigid barrier impact tests to estimate delta V. This method is often a poor model of real world crashes, typically lasting longer with less than idealized impacts involving yielding fixed and narrow objects, underrides, or multiple impacts. These on-board data recorders can provide accurate delta V measurements for most real world crashes, and can validate the results from the software routines for unyielding rigid body collisions.

The photo at left shows a field crash from the NHTSA crash files involving a 1998 Chevrolet Malibu and a parked truck. As can be seen in the photo, this collision involved a severe underride condition. This crash had a long crash pulse. The software the investigator used estimated the delta V to be 23 mph. The investigator noted that this estimate appeared to be significantly low. A subsequent reading of the Event Data Recovery System indicated a delta V of approximately 50 mph, which appeared much more reasonable to the investigator.

General Availability

General Motors has contracted with Vetronix Corporation of Santa Barbara, California, to develop software and interface cables to allow the event data to be downloaded to commonly used laptop computers (Figure at Right). Data useful to researchers and investigators, such as delta V, driver seat belt usage, and pre-impact data will be stored and displayed in a standard format (see Figures 1 and 2). This new tool will also allow the investigator to input other pertinent information, such as the investigator's name, and export the data to a remote database. Interface cables and a portable power supply will be available for vehicles that cannot be powered up after a crash.



The Event Data Recovery System is expected to be available in the fall of 1999. Further information

is available at the Vetronix web
site, Vetronix.com

Don Gilman received a Bachelor's degree in Engineering Physics from Westmont College in 1989. A second Bachelor's degree in Nuclear Engineering from the University of California at Santa Barbara followed in 1991. Subsequently, he earned a Master's degree in Engineering Management from West Coast University in 1997. Following an 8-year career in aerospace, Mr. Gilman joined Vetronix Corporation in Santa Barbara, California, in 1998. Currently, Mr. Gilman is the Vetronix Program Manager for all North American and European automobile manufacturer accounts, including General Motors, Ford and DaimlerChrysler. Vetronix designs and manufactures computerized diagnostic equipment for the automotive industry, and has worked closely with General Motors since Vetronix was founded in 1984. Mr. Gilman can be contacted at ***DGilman@Vetronix.com***

DaimlerChrysler unit invests in sensor business

ANAHEIM, Calif., Jan 27 (Reuters) - California incubator firm, Odetics Inc. , said on Thursday DaimlerChrysler AG's venture capital arm has invested $3.75 million in Odetics's vehicle sensor subsidiary.

The German-U.S. automaker's wholly owned subsidiary, DaimlerChrysler Venture GmbH, will convert its investment into about 2.5 percent of Iteris Inc. stock after it is spun off in an initial public offering, said Anaheim-based Odetics, which owns 93 percent of Iteris.

Odetics spokeswoman Anne Warde declined to say when the spinoff would take place.

As part of the deal, DaimlerChrysler Venture will support the adoption of Iteris's AutoVue in-vehicle safety sensor in the world's No. 5 automaker's commercial vehicles and passenger cars, she said. The safety warning device already is being installed in Mercedes heavy trucks in Europe.

The sensor, the size of a computer mouse that is mounted behind the rear-view mirror, warns drivers with a sound that mimics a car driving over rumble strips when the vehicle moves from its lane without signaling, Warde said. It also includes a small circuit board installed in the vehicle.

The sensor also will be sold to other vehicle makers, and likely will initially enter the market on heavy trucks before being introduced on luxury vehicles like Mercedes cars, she said. DaimlerChrysler's higher-volume Chrysler unit was not involved in the talks.

DaimlerChrysler officials could not be reached to comment.

DaimlerChrysler Venture, established in 1997, invests in companies in high-tech areas related to the Stuttgart-based transportation firm's core businesses.

Odetics said it invests in companies that can be spun off to stockholders. Its units make communications equipment for the television broadcast, video security, telecommunications and intelligent transportation systems markets.

Objectives of the EDR Working Group				
#	Title	Breakout Sessions		
		Oct 99	Feb 00	Jun 00 planned
1.	What is the status of EDR technology?		X	
2.	What data is needed for recording?	X		
3.	How is the data be collected & stored?			X
4.	How is the data be retrieved?			X
5.	Who is responsible for keeping the permanent record?			X
6.	Who owns the data?	X		
7.	Who are the customers for EDR data?		X	
8.	Demonstration of EDR technology.			X