

On-scene Investigation / Vehicle to Vehicle
Dynamic Science, Inc. / Case Number: DS00007
2000 Ford Taurus
Missouri
April 2000

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

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

Technical Report Documentation Page

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16. Abstract <p>This crash occurred in Missouri in April, 2000 at 1035 hours. The crash occurred in a four-leg intersection. The weather was clear and the asphalt roadway was dry and free of defects. The southern leg of the intersection is comprised of two southbound travel lanes, a left turn lane, and two northbound travel lanes. The northern leg of the intersection is comprised of two northbound travel lanes, a left turn lane, and two southbound travel lanes. The intersection is controlled by tri-color traffic signals. According to all parties the lights were green for north and southbound traffic. The speed limit is 40 km/h (25 mph).</p> <p>The case vehicle, a 2000 Ford Taurus SE four-door sedan driven by a restrained 44-year-old, was traveling northbound approaching the intersection. The other vehicle, a 1990 Plymouth Acclaim four-door sedan driven by a restrained 57-year-old female, was in the middle turn lane traveling southbound prior to making a left hand turn at the intersection. The front right seat was occupied by a restrained 84-year-old male. The back seat was occupied by a restrained 53-year-old female.</p> <p>As the vehicles reached the intersection, the Plymouth Acclaim began a left hand turn. The front of the case vehicle (11FDEW2) struck the right front of the Plymouth Acclaim. The case vehicle sustained a longitudinal delta v of -37.5 km/h (-23.3 mph). The driver's air bag and the front right passenger's air bag did not deploy. The driver's side seat belt pretensioner did however fire at this time. There was no movement of the steering column shear capsules. The case vehicle rotated in a clockwise direction after the initial impact and the other vehicle was pushed in a counterclockwise direction. There was a second, "side-slap" type impact on the driver's door.</p> <p>The driver of the Ford Taurus reported some back pain and some dizziness. He was transported to a hospital where he was examined and released. There were injuries reported to several occupants of the other vehicle, but the nature of the injuries is unknown. The two occupants of the other vehicle were transported to a hospital for medical treatment. Both vehicles were towed from the scene due to the damage.</p>					
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Dynamic Science, Inc.
Accident Investigation
Case Number: DS00007

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BACKGROUND:

Description: This Advanced Occupant Protection Systems case was generated by DSI through existing insurance contacts. NHTSA was notified of the case on July 12, 2000. DSI was assigned the case on July 12, 2000 and an on-site investigation was conducted.

Investigation Type: On-scene

Crash Location: Missouri

Crash Date: April, 2000

Notification Date: July 12, 2000

Field Work Completed: July, 2000

SUMMARY:

This crash occurred in Missouri in April, 2000 at 1035 hours. The crash occurred in a four-leg intersection. The weather was clear and the asphalt roadway was dry and free of defects. The southern leg of the intersection is comprised of two southbound travel lanes, a left turn lane, and two northbound travel lanes. The northern leg of the intersection is comprised of two northbound travel lanes, a left turn lane, and two southbound travel lanes. The intersection is controlled by tri-color traffic signals. According to all parties the lights were green for north and southbound traffic. The speed limit is 40 km/h (25 mph).

The case vehicle, a 2000 Ford Taurus SE four-door sedan driven by a restrained 44-year-old male (173 cm/68 in., 66 kg/145 lbs), was traveling northbound approaching the intersection.

The other vehicle, a 1990 Plymouth Acclaim four-door sedan driven by a restrained 57-year-old female, was in the middle turn lane traveling southbound prior to making a left hand turn at the intersection. The front right seat was occupied by a restrained 84-year-old male. The back seat was occupied by a restrained 53-year-old female.



Figure 1. Path of other vehicle to area of impact (south)

As the vehicles reached the intersection, the Plymouth Acclaim began a left hand turn. The front of the case vehicle (11FDEW2) struck the right front of the Plymouth Acclaim.

The case vehicle sustained a longitudinal delta v of -37.5 km/h (-23.3 mph)¹ as computed by WinSmash. The downloaded Electronic Data Recorder (EDR) data indicates a cumulative longitudinal delta v of -31 km/h (-19.3 mph) at the 78 ms mark. The data indicates that the driver's seat belt was engaged and that the pretensioner on the driver's side fired. The EDR report is included as an attachment to this report.

The driver's air bag and the front right passenger's air bag did not deploy. The driver's side seat belt pretensioner did however fire at this time. The pretensioner tube measurement on the driver's side was 3 cm (1.2 in.). There was no movement of the steering column shear capsules.

The case vehicle rotated in a clockwise direction after the initial impact and the other vehicle was pushed in a counterclockwise direction. There was a second, "side-slap" type impact on the driver's door.



Figure 2. Front view, Ford Taurus



Figure 3. Left front quarter view, Ford Taurus. Shows second impact

¹Calculated using stiffness values from NCAP barrier test

The driver of the Ford Taurus reported some back pain and some dizziness. He was transported to a hospital where he was examined and released.

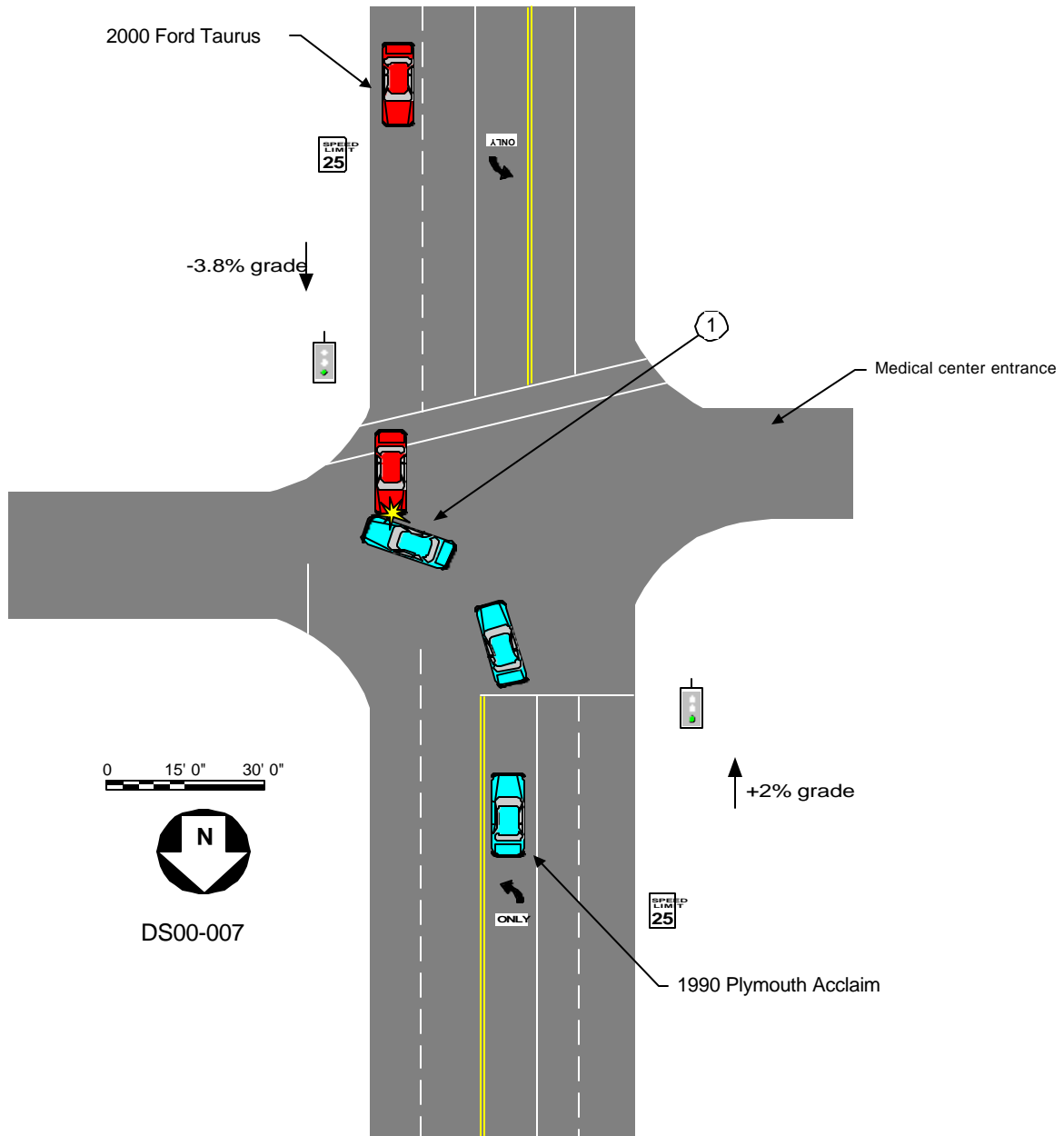
There were injuries reported to several occupants of the other vehicle, but the nature of the injuries is unknown. The two occupants of the other vehicle were transported to a hospital for medical treatment.

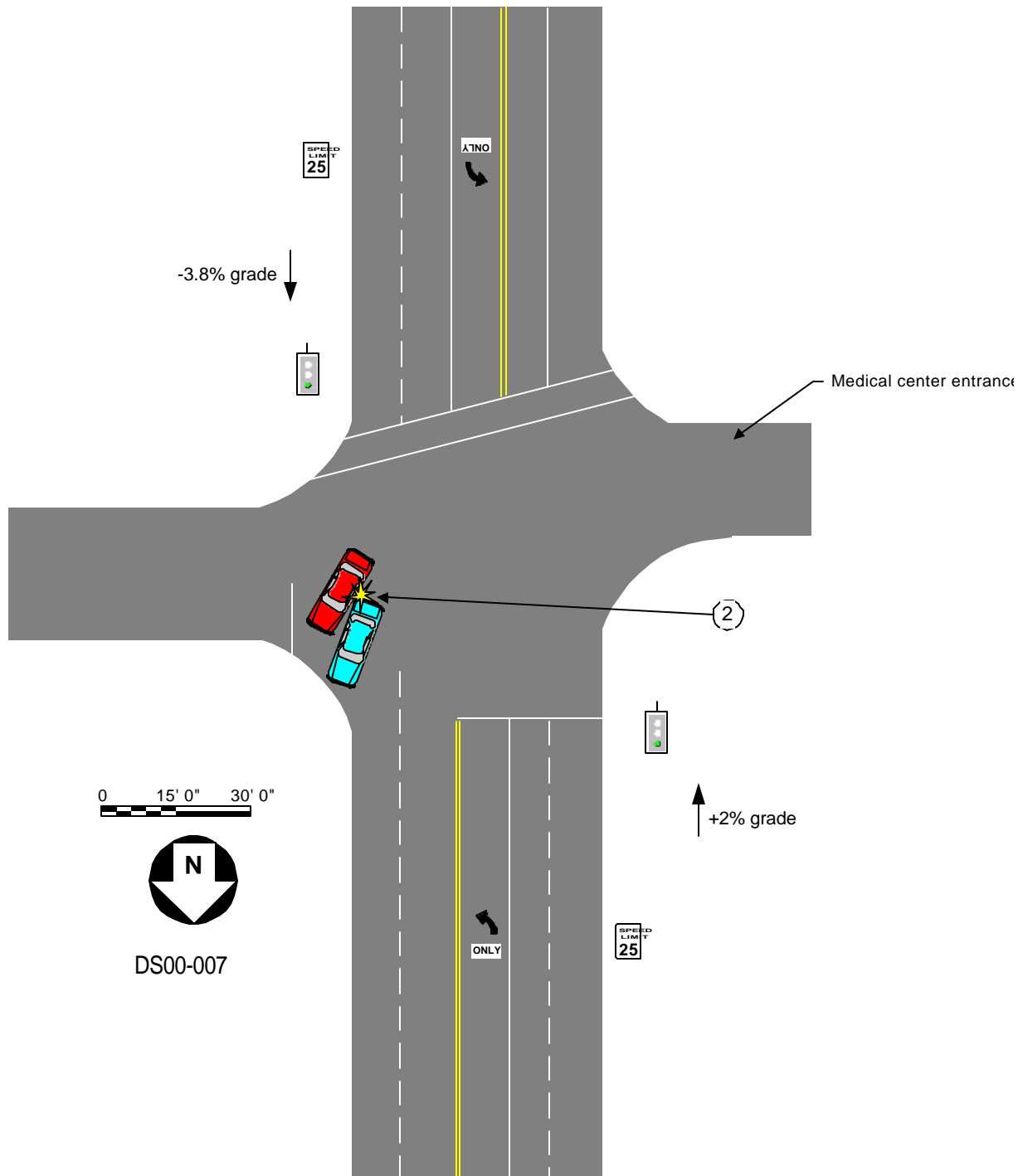
Both vehicles were towed from the scene due to the damage.



Figure 4. Left front seating position

Scene Diagram





DETAILED INFORMATION**Vehicles**Case vehicle

Description:	2000 Ford Taurus	
VIN:	1FAFP55U2YGxxxxxx	
Odometer:	32,495 km (20,192 miles)	
Engine:	182 CID, 6 cylinder	
Reported Defects:	None	
Cargo:	None	
Damage Description:	Moderate contact damage to front bumper and left passenger door.	
CDC:	Impact 1: 11FDEW2 Impact 2: 10LPEW1	
Delta V (Impact 1):	Total	39.2 km/h (24.4 mph)
	Longitudinal	-37.5 km/h (-23.3 mph)
	Latitudinal	11.5 km/h (7.1 mph)
	Energy	41,076 joules (30,326 ft-lbs)

Other vehicle

Description:	1990 Plymouth Acclaim four door	
VIN:	1P3XA46KXLFxxxxxx	
Odometer:	Unknown	
Engine:	2.5 L EFI	
Reported Defects:	None noted	
Cargo:	Unknown	
Damage Description:	Police report indicates damage to right front fender area. Vehicle was towed from the scene.	
CDC:	Unknown	
Delta V:	Total	48.3 km/h (30.0 mph)
	Longitudinal	-21.9 km/h (-13.6 mph)
	Latitudinal	-43.0 km/h (-26.7 mph)
	Energy	185,092 joules (136,747 ft-lbs)

Occupants

<u>2000 Ford Taurus</u>	Occupant 1
Age/Sex:	44/Male
Seated Position:	Front left
Seat Type:	Bucket
Height:	173 cm (68 in.)
Weight:	66 kg (145 lbs)
Occupation:	Unknown
Pre-existing Medical Condition:	None noted
Alcohol/Drug Involvement:	None
Body Posture:	Normal, upright
Hand Position:	11 and 1 o'clock positions
Foot Position:	Right foot on brake, left on floor
Restraint Usage:	Lap and shoulder belt used properly
Air bag:	Did not deploy

<u>1990 Plymouth Acclaim</u>	Occupant 1	Occupant 2
Age/Sex:	57/Female	84/Male
Seated Position:	Front left	Front right
Seat Type:	Bucket	Bucket
Height:	Unknown	Unknown
Weight:	Unknown	Unknown
Occupation:	Unknown	Unknown
Pre-existing Medical Condition:	None noted	Unknown
Alcohol/Drug Involvement:	None	NA
Driving Experience:	Unknown	NA
Body Posture:	Unknown	Unknown
Hand Position:	Unknown	Unknown
Foot Position:	Unknown	Unknown
Restraint Usage:	Lap and shoulder belt used	Lap and shoulder belt used

Injuries and Injury Mechanisms

2000 Ford Taurus

	<u>INJURY</u>	<u>OIC CODE</u>	<u>ICD-9</u>	<u>SOURCE</u>
Driver:	No codeable injuries			

1990 Plymouth Acclaim

	<u>INJURY</u>	<u>OIC CODE</u>	<u>ICD-9</u>	<u>SOURCE</u>
Driver:	Injured, unknown severity			
Front right occupant	Injured, unknown severity			

Occupant Kinematics

The 44-year-old male driver of the case vehicle was seated in a normal upright fashion in the cloth covered front left bucket seat. The seat was adjusted to between the middle and rear most track positions. He was wearing the available lap and shoulder belt—the shoulder belt upper anchorage was adjusted to the full down position. The driver of the case vehicle saw the other vehicle prior to impact and began braking with his right foot. At impact, the driver pitched forward and to the left before being cinched down by the seat belt pretensioner. The driver did not recall contacting any interior surfaces of the vehicle; however, there was an indication of a right knee contact to the lower instrument panel (see Figure 7). There was a second, side-slap impact with the other vehicle. This would have caused this occupant to move the left, but there were no indications of any contact.

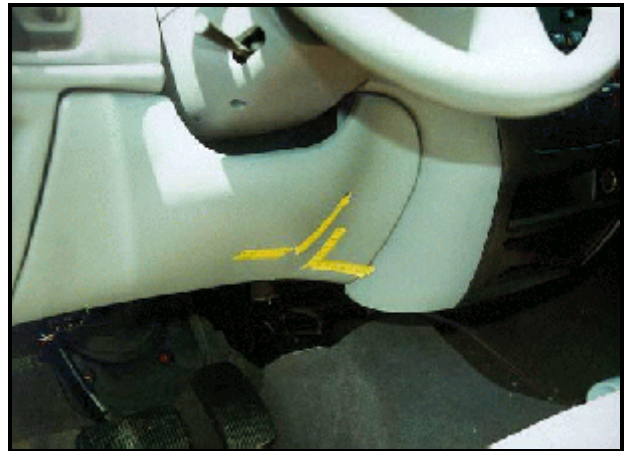


Figure 7. Knee contact to lower instrument panel

Attachment 1. EDR report

2000 Taurus/Sable EDR Report - Summary Page

Investigation Data

File Name:	DS00-007.hex	File Save Date:	21-Jul-2000
File Read-out Date:	N/A	Report Date:	21-Jul-2000
Report Version:	1.2		

EDR Control Module Data

Data Validity Check:	Valid	EDR Model Version:	141
Left (Driver) Side Bag Deployment Time (ms):			Not Deployed
Right (Passenger) Side Bag Deployment Time (ms):			Not Deployed
Passenger Airbag Switch Position During Event:			N/A
Diagnostic Codes Active When Event Occurred:			0

Algorithm Times

Actual initiation depends on restraint system status (below).

	ms
Time From Algorithm Wakeup to Pretensioner:	20
Time From Algorithm Wakeup to First Stage - Unbelted:	20
Time From Algorithm Wakeup to First Stage - Belted:	0
Time From Algorithm Wakeup to Second Stage:	0

Restraint System Status

Driver Seat Belt Buckle:	Engaged
Passenger Seat Belt Buckle:	Not Engaged
Driver Seat Track In Forward Position:	No
Passenger Seat Weight Switch Position:	N/A

Deployment Initiation Attempt Times

	Driver	Passenger
Time From Algorithm Wakeup to Pretensioner Deployment Attempt:	20	Unbelted
Time From Algorithm Wakeup to First Stage Deployment Attempt:	Not Deployed	Not Deployed
Time From Algorithm Wakeup to Second Stage Deployment Attempt:	Not Deployed	Not Deployed

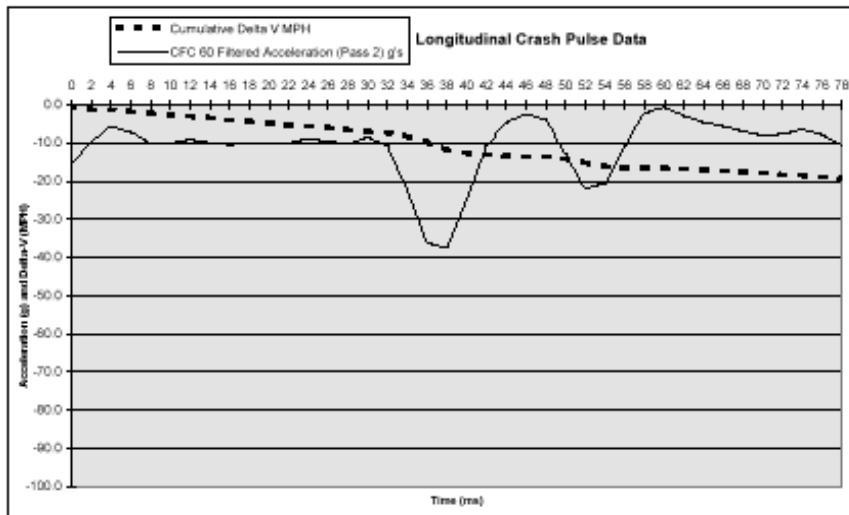
Notes

1. Read-out date is set by the PC interface tool.
2. Features and data parameters which are not available on the module are marked "N/A".
3. CFC 60 is a Butterworth 4-pole phaseless digital filter. (See SAE J211 Part 1 Appendix C dated March 1995.)
4. Total and maximum Delta-V results are not available from truncated/incomplete crash pulses.
5. Algorithm wakeup (0 ms) is not the first moment of vehicle contact or impact.
6. The Excel "Analysis ToolPak" Add-in must be enabled for this spreadsheet to operate properly.

2000 Taurus/Sable EDR Report - Charts

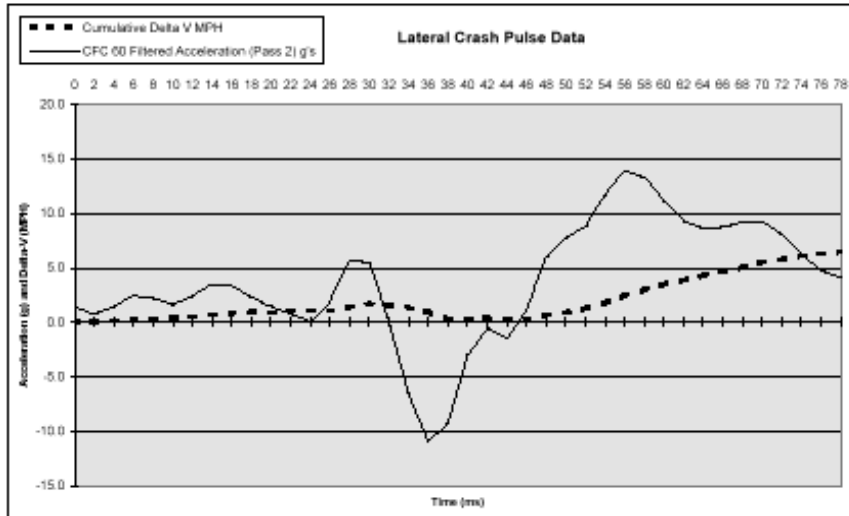
Longitudinal Cumulative Delta-V

Time (ms)	0	10	20	30	40	50	60	70	78
Delta-V (MPH)	-0.7	-2.7	-4.8	-6.9	-12.6	-14.1	-16.6	-17.9	-19.3



Lateral Cumulative Delta-V

Time (ms)	0	10	20	30	40	50	60	70	78
Delta-V (MPH)	0.1	0.4	1.0	1.7	0.4	0.9	1.5	5.5	6.5



2000 Taurus/Sable EDR Report - Memory Dump

Hexidecimal Module Memory Dump

Address	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F
0800	0F	4A	40	76	14	FB	FF	FF	FF	FF	0E	24	0F	2D	3A	4C
0810	C8	FF	00	FF	52	60	52	60	60	52	E3	20	3C	78	D6	A0
0820	08	03	28	37	5F	0F	0F	0A	F5	0A	B7	84	A1	5E	D5	AA
0830	03	0C	1B	1E	00	FF	3C	3C	80	06	28	64	64	00	0C	01
0840	5A	96	50	FF	FF	FF	EF	DF	05	E7	FF	72	48	13	25	B1
0850	BC	14	09	0F	01	FF	FF	88	7F	FF	CD	44	08	FF	FF	95
0860	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF
0870	05	37	DC	0E	6A	00	8F	FF	59	46	31	41	00	02	FF	13
0880	17	FF	00	02	FD	80	01	FF	7E	00	FF	7E	30	FD	80	FF
0890	38	FF	80	FF	FF	00	FF	FF	00	FF	FF	00	FF	FF	00	FF
08A0	07	00	80	00	00	00	01	01	01	00	FF	FF	FF	FF	FF	FF
08B0	02	FF	81	38	00	8D	01	FF	FF	FF	FF	FF	14	02	C4	8E
08C0	FF	24	24	C4	8E	41	01	C4	8F	51	00	12	48	47	FF	FE
08D0	01	0E	0C	80	02	58	16	87	1F	BE	01	0A	00	8C	01	04
08E0	00	F0	01	36	00	A0	01	54	00	3F	02	30	02	C7	02	8A
08F0	05	14	07	08	01	2C	03	CA	04	CE	06	40	73	33	00	A0
0900	3F	FF	00	03	00	4B	01	CC	00	03	0F	FF	00	14	00	78
0910	00	A0	00	6E	0A	16	FF	01	00	00	00	7F	0F	0C	0F	02
0920	03	5A	32	46	05	50	02	02	FA	1E	08	0C	0A	1C	02	23
0930	09	06	28	32	16	20	16	1F	5F	FF	FF	02	FF	FF	FF	11
0940	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF
0950	14	00	00	00	14	00	00	03	00	00	03	05	0C	1D	1D	25
0960	05	07	09	00	14	10	05	0F	00	00	08	13	15	0F	0D	00
0970	00	00	B4	90	A1	80	B3	B0	A2	98	96	B5	C9	7B	A7	BC
0980	59	9A	E5	E5	A9	09	B3	D1	C6	A4	A2	BF	BB	B8	B3	A7
0990	B6	AA	B9	A4	B5	AC	B0	AF	B1	B1	AF	AD	B1	AE	B3	7F
09A0	88	A2	89	90	8B	90	90	85	93	8C	87	96	8D	88	91	8E
09B0	77	59	49	7B	8A	9B	91	A4	88	6E	79	8C	9E	A2	96	9A
09C0	96	92	93	8D	98	92	8A	85	7E	85	84	86	82	83	8B	83
09D0	88	7F	85	81	7E	8F	8F	7A	77	6D	62	84	B1	77	81	93
09E0	8C	90	98	9E	98	99	8F	94	91	90	97	8C	8F	88	88	00
09F0	00	00	00	00	00	00	00	FF	FF	95	00	FF	FF	FF	FF	04