On-scene Investigation / Vehicle to Vehicle
Dynamic Science, Inc. / Case Number:DS00-006
2000 Ford Taurus
California
May, 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.

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16. Abstract

This crash occurred in California in May, 2000 at 1042 hours. The crash took place in a three-leg intersection. The weather was clear and the asphalt roadway was dry and free of defects. The north-south undivided roadway is comprised of a northbound travel lane, a southbound travel lane, and a middle turn lane. The western edge of the northbound roadway is marked for bicycle traffic by a single white line. Adjacent to this lane is a marked area for parking. There are no controls for north or southbound traffic. The speed limit is 56 km/h (35 mph) in both directions. The western leg of the intersection is comprised of one westbound and one eastbound travel lane. Eastbound traffic is controlled by a stop sign.

The case vehicle, a 2000 Ford Taurus four-door sedan driven by a restrained 40-year-old female (168 cm/66 in., 50 kg/110 lbs.), was traveling southbound approaching the intersection. The other vehicle, a 1989 Mercury Grand Marquis, driven by a 31-year-old male, was in the middle turn lane traveling northbound prior to making a left hand turn to go west. The rear left seat was occupied by a restrained 9-year-old male. The rear right seat was occupied by a second restrained 9-year-old male. The driver of the case vehicle indicated that she saw the Marquis moving slowly in the turn lane. She took her foot off the accelerator and then noticed that the Marquis was going to turn. She braked and swerved to the right to avoid the crash. The front of the case vehicle (12FDEW1) struck the right side of the Marquis. The case vehicle sustained a longitudinal delta v of -18.4 km/h (-11.4 mph) as computed by WinSmash. The impact was of insufficient magnitude to deploy the driver's air bag and the front right passenger's air bag. The driver's side seat belt pretensioner did however fire at this time.

There were no injuries to any of the parties in this crash.

17. Key Words	18. Distribution Statement
Air bag, non-deployment, no injury, redesigned, pretensioner	

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No of pages	22. Price

Dynamic Science, Inc.
Accident Investigation
Case Number: DS00-006

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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 07, 2000. DSI was assigned the case on July 12, 2000 and an on-site investigation was conducted.
Investigation Type:	On-scene
Crash Location:	California
Crash Date:	May, 2000
Notification Date:	July 7, 2000
Field Work Completed:	July 12, 2000

SUMMARY:

This crash occurred in California in May, 2000 at 1042 hours. The crash took place in a three-leg intersection. The weather was clear and the asphalt roadway was dry and free of defects. The north-south undivided roadway is comprised of a northbound travel lane, a southbound travel lane, and a middle turn lane. The western edge of the northbound roadway is marked for bicycle traffic by a single white line. Adjacent to this lane is a marked area for parking. There are no controls for north or southbound traffic. The speed limit is 56 km/h (35 mph) in both directions. The western leg of the intersection is comprised of one westbound and one eastbound travel lane. Eastbound traffic is controlled by a stop sign.

Figure 1. Case vehicle approach to area of impact

The case vehicle, a 2000 Ford Taurus four-door sedan driven by a restrained 40-year-old female (168 cm/66 in., 50 kg/110 lbs.), was traveling southbound approaching the intersection.

Figure 2. Exterior, case vehicle

A1989 Mercury Grand Marquis, driven by a 31-year-old male, was in the middle turn lane traveling northbound prior to making a left hand turn to go west. The rear left seat was occupied by a restrained 9-year-old male. The rear right seat was occupied by a second restrained 9-year-old male.

The driver of the case vehicle indicated that she saw the Marquis moving slowly in the turn lane. She took her foot off the accelerator and then noticed that the Marquis was going to turn. She braked and swerved to the right to avoid the crash. The front of the case vehicle (12FDEW1) struck the right side of the Marquis.

Figure 3. Driver's seated position

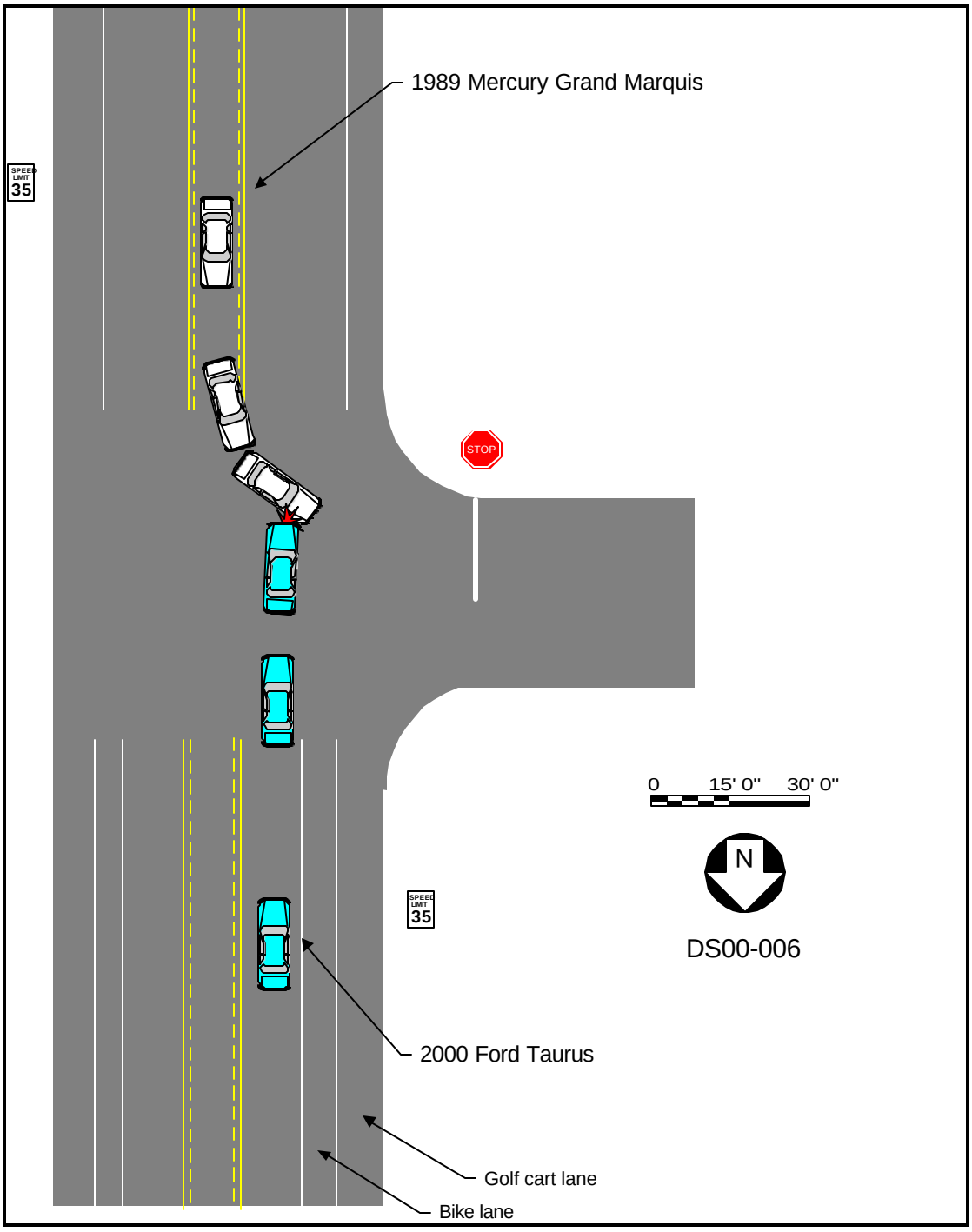
The case vehicle sustained a longitudinal delta v of -18.4 km/h (-11.4 mph)[1] as computed by WinSmash. The downloaded Electronic Data Recorder (EDR) data indicates a cumulative longitudinal delta v of -16.7 km/h (-10.4 mph) at the 78 ms mark. The data indicates that the driver's seat belt was latched and that the pretensioner on the driver's side fired. The EDR report is included as an attachment to this report.

[1]Calculated using stiffness values provided by Ford

The impact was of insufficient magnitude to deploy the driver's air bag and the front right passenger's air bag. The driver's side seat belt pretensioner did however fire at this time. The pretensioner tube measurement on the driver's side was 5.6 cm. There was no movement of the steering column shear capsules.

There were no injuries to any of the parties in this crash.

Scene Diagram



DETAILED INFORMATION

Vehicles

2000 Ford Taurus

Description:	2000 Ford Taurus	
VIN:	1FAFO5222YGxxxxxx	
Odometer:	5,037 km (3,130 miles)	
Engine:	V6	
Reported Defects:	None	
Cargo:	None	
Damage Description:	Minor to moderate frontal crush to bumper and grille.	
CDC:	12FDEW1	
Delta V:	Total	18.7 km/h (11.6 mph)
	Longitudinal	-18.4 km/h (-11.4 mph)
	Latitudinal	3.2 km/h (2.0 mph)
	Energy	14,229 joules (10,495 ft-lbs)

1989 Mercury Grand Marquis

Description:	1989 Mercury Grand Marquis	
VIN:	Unknown	
Odometer:	Unknown	
Engine:	Unknown	
Reported Defects:	None reported	
Cargo:	Unknown	
Damage Description:	Described as “Major” side damage by police	
CDC:	Unknown	
Delta V:	Total	17.1 km/h (10.6 mph)
	Longitudinal	-11.5 km/h (-7.1 mph)
	Latitudinal	-12.7 km/h (-7.9 mph)
	Energy	32,364 joules (23,847 ft-lbs)

Occupants

Ford Taurus	Occupant 1
Age/Sex:	40/Female
Seated Position:	Front left
Seat Type:	Bucket
Height:	168 cm (66 in.)
Weight:	50 kg (110 lbs.)
Occupation:	Sales
Pre-existing Medical Condition:	None
Alcohol/Drug Involvement:	None
Driving Experience:	Unknown
Body Posture:	Normal, upright
Hand Position:	Both hands on steering wheel–at 1 and 11 o'clock positions.
Foot Position:	Right foot on brake, left on floor.
Restraint Usage:	Lap and shoulder belt used properly.
Air bag:	Deployed at impact.

Occupants

Mercury Grand Marquis			
Age/Sex:	30/Male	9/Male	9/Male
Seated Position:	Front left	Rear left	Rear right
Seat Type:	Unknown	Unknown	Unknown
Height:	170 cm (67 in.)	Unknown	Unknown
Weight:	67 kg (147 lbs.)	Unknown	Unknown
Occupation:	Unknown	NA	NA
Pre-existing Medical Condition:	None noted	None noted	None noted
Alcohol/Drug Involvement:	None	NA	NA
Driving Experience:	Unknown	NA	NA
Body Posture:	Unknown	Unknown	Unknown
Hand Position:	Unknown	Unknown	Unknown
Foot Position:	Unknown	Unknown	Unknown
Restraint Usage:	Lap and shoulder belt used	Lap and shoulder belt used	Lap and shoulder belt used

Injuries and Injury Mechanisms

Ford Taurus

	INJURY	OIC CODE	ICD-9	SOURCE
Driver:	Not injured			

Mercury Grand Marquis

	INJURY	OIC CODE	ICD-9	SOURCE
Driver:	Not injured			
Rear left occupant	Not injured			
Rear right occupant	Not injured			

Occupant Kinematics

The 40-rear-old female driver (168 cm/66 in., 50 kg/110 lbs.) of the case vehicle was seated in a forward facing fashion. She was wearing the available lap and shoulder belt. The shoulder belt upper anchorage was adjusted to the mid position. The seat was in the full rearward position at the time of inspection, but the driver indicated that she normally had the seat in a more middle position. The seat back was set at 13 degrees from vertical. The tilt steering wheel was adjusted to between the full up and the center position. The driver of the case vehicle indicated that she saw the Marquis moving slowly in the turn lane. She took her foot off the accelerator and then noticed that the Marquis was going to turn. She braked and swerved to the right to avoid the crash. At impact, the driver pitched forward and to the left in response to the 350 degree direction of force. The impact was of insufficient magnitude to deploy the driver's air bag and the front right passenger's air bag. The driver's side seat belt pretensioner did however fire at this time. The pretensioner tube measurement on the driver's side was 5.6 cm. There was no movement of the steering column shear capsules. There was a small scuff found on the lower left instrument panel, but there were no reported injuries.

Figure 5. Compressed driver's buckle

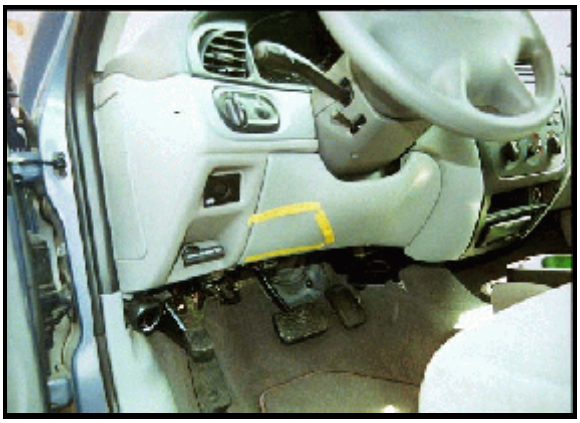


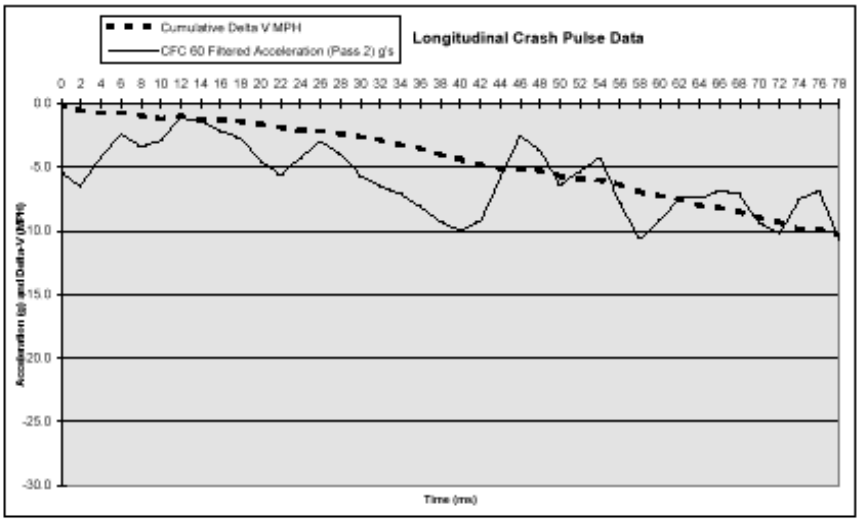
Figure 6. Possible contact point to lower left instrument panel

Attachment 1. EDR report

2000 Taurus/Sable EDR Report - Charts

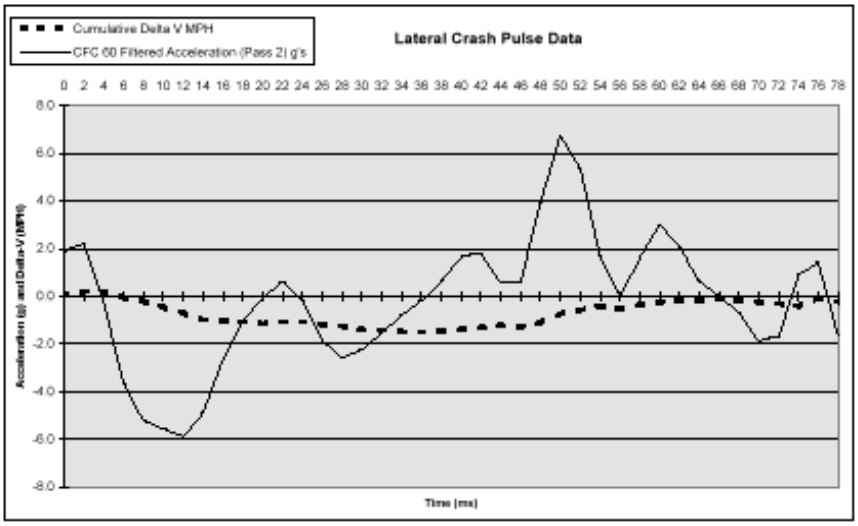
Longitudinal Cumulative Delta-V

Time (ms)	0	10	20	30	40	50	60	70	78
Delta-V (MPH)	-0.2	-1.2	-1.6	-2.6	-4.4	-5.7	-7.3	-9.0	-10.4



Lateral Cumulative Delta-V

Time (ms)	0	10	20	30	40	50	60	70	78
Delta-V (MPH)	0.0	-0.5	-1.1	-1.4	-1.4	-0.7	-0.3	-0.2	-0.2



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	D5	E7	FF	72	4E	13	25	B1
0850	EC	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	38	E9	ED	E6	00	8F	FF	59	46	31	41	00	02	FF	0C
0880	02	E8	80	33	E8	80	30	E8	80	16	EF	80	FF	FF	00	FF
0890	FF	FF	00	FF	FF	00	FF	FF	00	FF	FF	00	FF	FF	00	FF
08A0	04	00	40	00	00	00	09	00	00	00	FF	FF	FF	FF	FF	FF
08B0	02	FF	81	38	00	8D	01	FF	FF	FF	FF	FF	22	01	CE	11
08C0	FF	22	01	CE	12	31	01	CE	12	51	01	61	44	22	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	33	00	00	00	33	00	00	0B	00	00	04	07	1F	54	28	00
0960	0D	00	00	25	33	1B	09	00	00	00	00	20	2D	04	22	00
0970	00	00	AC	90	A3	7F	B3	AE	AE	B1	A6	9E	B0	B1	B3	9B
0980	B1	AF	AA	B1	C9	D2	BE	AA	8A	60	84	D5	89	C1	AC	68
0990	79	C9	E5	DF	C2	64	C7	DE	A1	96	B7	BC	85	A1	B9	9C
09A0	91	99	A6	98	96	AF	94	A4	9D	9A	97	98	A2	98	97	98
09B0	92	97	8C	93	8F	94	A1	A0	8E	99	A0	93	87	95	98	8D
09C0	99	96	8E	92	89	A6	89	81	85	81	73	77	74	74	72	7D
09D0	7D	7C	83	7F	79	7C	79	7D	7D	7F	80	82	83	83	7B	88
09E0	90	86	87	78	87	84	84	7E	81	7D	7C	7C	7A	8E	78	00
09F0	00	00	00	00	00	00	00	FF	FF	60	00	FF	FF	FF	FF	04