Strickland

EA94-022

DATE	SUBJECT	PAGE NUMBERS
06-30-94	Opening Resume (prompted by PE94-032)	(2-3)
07-15-94	Letter to Distribution from ODI. Request for info.	(4-6)
	(Attachments) - Distribution List	(7)
	Notice to Police Dept.	(8)
08-31-94	Letter to Distribution from ODI. Request for info.	*(8-10)
	(Attachments) - Distribution List	(11)
	Officer Safety Letter / 4-21-94	(12)
09-15-94	Min-Memo to File from Safety Defects Engineer to enter the following documents:	(13)
	(1) (06-02-94) Letter to ODI from Law Offices of Horowitz & Foran with two Accident Reconstruction Reports	(14-53) (54-94)
	(2) (06-30-94) Supplemental Report from Prosecutor's Office Bergen County, Hackensack, NJ	(95-104)
	(3) (07-21-94 & 07-28-94) Letters to ODI from Michigan Department of State Police	(105-106)
	(4) (08-08-94) Letter ODI from DC Metropolitan Police Department	(107)
	(5) (08-15-94) Letter to ODI from Prince George's County Maryland Police Department	(108-184)
	(6) (Rec'd 9-19-94) Letter to ODI from Ames, Iowa Police Department. Reply to letter dated 8-31-94.	(185-192)
10-14-94	Letter to Metropolitan Toronto Police Force from ODI. Request for information regarding fatal accident.	(193-194)
11-17-94	Letter to Ford from ODI. Request for additional information.	(195-196)

EA94-022

ADDITIONAL INFORMATION RECEIVED AFTER CLOSING

DATE	SUBJECT	PAGE NUMBERS
03-01-94	Memo to Director, Office of Defects Investigation from Director, Vehicle Research & Test Center.	(234)
	Report: "TESTS REGARDING POWER-STEERING ON 1992 FORD CROWN VICTORIA POLICE VEHICLES" Final Report dated 2/95	(235-524)

EA94-022

Strickland

ADDITIONAL INFORMATION RECEIVED AFTER CLOSING

DATE	SUBJECT	PAGE NUMBERS
03-09-95	Memo to File from Safety Defects Engineer transmitting five (5) Accident Reconstruction Reports submitted by Calspan Corporation.	(525)
	CALSPAN EVALUATION OF FORD CROWN VICTORIA POLICE VEHICLE STEERING FAILURE ALLEGATIONS	
	(1) Steve DiLauria dated May 11, 1993	(526-563)
	(2) Peter Schirmer dated August 11, 1993	(564-599)
	(3) Roger P. Fleming dated October 27, 1992	(600-627)
	(4) John L. Bagileo dated February 28, 1994	(628-649)
	(5) Scarborough, Ontario (Canada) September 28, 1994	(650-767)
	THIS REPORT WAS NOT INCLUDED IN THE ABOVE MEMO	
	(6) Vincent M. Brock dated 11-27-93	(768-777)

ODI Action Number: EA94-022 Date: 06-30-94

Subject: Ford / Crown Victoria / Alleged Loss of Steering Power Assist

This file contains consumer letters received by the National Highway Traffic Safety Administration which complain of the alleged defect that is the subject of this Engineering Analysis. It also contains correspondence between this agency and the manufacturer on the subject. Portions of that correspondence may be withheld where the manufacturer has claimed that they are confidential pursuant to the Freedom of Information Act, 5 U.S.C. § 552(b)(4), which exempts from disclosure confidential commercial and financial information. Additional documents relating to this Engineering Analysis may exist, but have not been included in this public file.

If you have any information or concerns you would like to discuss with NHTSA staff, please call the

toll free AUTO SAFETY HOTLINE

800-424-9393

(in the Washington, DC metropolitan area, please call 202-366-0123)

Also, if you wish to discuss the investigation with NHTSA staff, the HOTLINE contact representative will have a technical staff member return your telephone call.

0000 01

ODI RESUME

INVESTIGATION: EA94-022

DATE OPENED: 30 JUN-94

SUBJECT: ALLEGED LOSS OF STEERING POWER ASSIST
PROMPTED BY: PE94-032

ENGINEER: L. STRICKLAND L. Strickland

MFR: FORD MOTOR COMPANY
MODEL: CROWN VICTORIA WITH POLICE EQUIPMENT PACKAGE

MODEL YR: 1992 - 1993

SYNOPSIS : CERTAIN VEHICLE MANEUVERS AT LOW SPEEDS, ESPECIALLY THOSE WHICH MAY BE ENCOUNTERED IN POLICE PRECISION PURSUIT, MAY CAUSE TEMPORARY LOSS OF POWER STEERING ASSIST AND ADVERSELY AFFECT VEHICLE CONTROLLABILITY.

VEHICLE POPULATION: 54,700

FAILURE REPORT SUMMARY**

	ODI	MFR	TOTAL
COMPLAINTS:	1	17	18
ACCIDENTS :	1	0	1
INJ ACCID :	0	0	0
# INJURED :	0	0	0
FAT ACCID :	1	0	1
# FATALS :	1	0	1
OTHER :	0	0	0

** DATA PROVIDED ARE CONSIDERED UNVERIFIED GROSS COUNTS DUE TO THE UNIQUE CIRCUMSTANCES UNDER WHICH THE ALLEGED DEFECT IS MANIFEST.

ACTION: AN ENGINERING ANALYSIS HAS BEEN OPENED.

BRCH CHF Richard Boyd DIV CHF Lloyd W. Brown OFC DIR [illegible]

30 June 94 DATE 6/30/94 DATE 6/30/94 DATE

SUMMARY: THIS ENGINEERING ANALYSIS WAS OPENED TO CONTINUE THE ASSESSMENT OF THE NATURE AND SAFETY IMPLICATIONS OF AN ALLEGED SUDDEN CHANGE IN STEERING EFFORT REQUIRED TO EXECUTE CERTAIN MANEUVERS IN THE SUBJECT VEHICLES EQUIPPED WITH POWER STEERING ASSIST.

0000 02

JM 7/1/94

IDENTICAL LETTERS SENT TO THE ATTACHED LIST

JUL 15 1994

Major Teresa C. Chambers
Commander, Training and Personnel Services
Prince Georges County Police Department
7600 Barlowe Road
Palmer Park, MD 20785

NEF-12lhs
EA94-022

Dear Major Chambers:

As you may know, the National Highway Traffic Safety Administration (NHTSA) is investigating the performance of the power steering systems installed in 1992 and 1993 Ford Crown Victoria vehicles equipped for police use. The purpose of this investigation is to determine whether the design or performance of the subject power steering systems contain a safety-related defect requiring recall and remedy in accordance with the applicable Federal law.

On April 21, 1994, NHTSA issued a notice regarding this investigation over the nationwide police telecommunications network. For your information, a copy of that notice is enclosed with this letter. This also advises you that, based on the information developed during the NHTSA's preliminary evaluation, the investigation was recently upgraded to an Engineering Analysis to allow for a more detailed and thorough review of the issues involved.

The purpose of this letter is to formally request your Department's input regarding the power steering system performance in the subject Crown Victoria vehicles operated in your fleet. For purposes of this information request, the following terms are defined unless otherwise described:

- <u>Subject vehicles</u>: all 1992 and 1993 model year Ford Crown Victoria "police equipped" vehicles in your fleet.
- <u>Alleged defect</u>: a sudden change in the amount of steering input force required to execute a given vehicle maneuver at low to moderate vehicle speeds (15 to 30 miles per hour). Such a change may be perceived by the driver as momentary binding or lockup of the steering system.

To assist NHTSA in developing a qualitative assessment of the scope of the subject steering condition and the general perceptions of officers who operate these vehicles in the line of duty, your numbered responses are requested to the following questions.

0000 04

1. State the number of the subject vehicles in your fleet, itemized by model year.

2. Identify and describe all incidents reported by officers from your Department in which the power assisted steering system in the subject vehicles was reported to allegedly have:

   a. malfunctioned due to binding or lockup;
   b. contributed to or caused a loss of control; and
   c. contributed to or caused a collision with another object or with a pedestrian.

For each item answered affirmatively, please provide complete details of the incident. Include copies of the accident report when applicable.

3. Is any type of precision vehicle maneuvering or pursuit training routinely given to officers in your Department? If so, please describe briefly that training, specifically noting the type of skills assessment road course employed, and if known, the origin of that course.

4. Please provide a "general consensus" view of your officers' opinions of the power steering system in the subject vehicles, if possible. Of particular interest is whether comments made by officers who operate the subject vehicles may have complained that the steering performance makes the vehicles "unsafe" to drive under precision maneuvering conditions, such as in dense traffic or when pedestrians are in close proximity.

5. In view of the recent publicity regarding this phenomenon, has your Department conducted any evaluations of the problem or included any driver training exercises specifically to familiarize officers with the condition? If so, please provide any details regarding your activities in these areas.

6. Does your Department also operate 1994 model year Crown Victoria police equipment vehicles? If so, please state the number of such vehicles in your fleet, and provide any appropriate details or comments regarding whether the alleged defect may also affect these newer vehicles.

This letter is being sent pursuant to Section 112 of the National Traffic and Motor Vehicle Safety Act of 1966 (the Act) (15 U.S.C. 1401), which authorizes NHTSA to conduct any investigation that may be necessary to enforce Title I of the Act.

In order that we might continue expeditious handling of this investigation we would appreciate your response to this letter by August 10, 1994. If you have any questions concerning the information requested in this letter, please contact Mr. Lee Strickland of my staff at (202) 366-5201.

Sincerely,

/s/ [redacted]

Charles L. Gauthier, Director
Office of Defects Investigation
Enforcement

Enclosure

Major Teresa C. Chambers
Commander, Training and Personnel Services
Prince Georges County Police Department
7600 Barlowe Road
Palmer Park, MD 20785

Captain John C. Daniels
Traffic Enforcement Branch
Metropolitan Police Department
501 New York Avenue, NW
Washington, DC 20001

Inspector Edward J. King
Commanding Officer, Traffic Division
New York City Police Department
One Police Plaza, Room 1104
New York, NY 10038-1497

Colonel Michael D. Robinson
Department of Michigan State Police
714 South Harrison Road
East Lansing, MI 48823

Sheriff Sherman Block
Los Angeles County
4700 Ramona Boulevard
Monterey Park, CA 91754-2169

Deputy Commissioner Dwight O. Helmick
California Highway Patrol
P.O. Box 942898
Sacramento, CA 94298-0001

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TO APB -- NATIONWIDE APRIL 21-94
ATTENTION -- FLEET MANAGEMENT PERSONNEL

SUBJECT: POLICE INFORMATION/OFFICER SAFETY

THIS IS TO NOTIFY YOUR AGENCY THAT THE NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION (NHTSA) HAS OPENED A SAFETY DEFECT INVESTIGATION CONCERNING THE PERFORMANCE OF THE POWER STEERING SYSTEM IN 1992 AND 1993 FORD CROWN VICTORIA VEHICLES, INCLUDING THOSE EQUIPPED WITH A "POLICE PACKAGE." THIS DOES NOT MEAN NHTSA HAS DETERMINED A PROBLEM EXISTS, BUT RATHER AN INVESTIGATION IS NECESSARY TO GATHER FACTS AND INFORMATION.

NHTSA HAS RECEIVED INFORMATION WHICH SUGGESTS THAT THE STEERING POWER ASSIST FUNCTION IN THESE VEHICLES MAY CONTRIBUTE TO "DROP-THROTTLE OVERSTEER," A CONDITION PRECIPITATED BY A SERIES OF RAPIDLY EXECUTED TURNS COUPLED WITH RELEASE OF THE THROTTLE AT MODERATE TO HIGH SPEEDS. IF THIS CONDITION WERE TO OCCUR, IT IS ALLEGED THAT THE DRIVER OF THE VEHICLE MAY NOT BE ABLE TO PROVIDE THE AMOUNT OF STEERING INPUT NECESSARY TO EXECUTE A GIVEN MANEUVER, POSSIBLY LEADING TO AN OVERSTEER AND SKID SITUATION.

NHTSA HAS INITIATED AN INVESTIGATION OF THE ALLEGATIONS TO DETERMINE WHETHER THE DESIGN OR PERFORMANCE OF THE POWER STEERING SYSTEMS IN THESE VEHICLES CONTAIN A SAFETY DEFECT REQUIRING RECALL AND CORRECTION. WHILE THE NHTSA INVESTIGATION HAS JUST STARTED, THIS IS TO ALERT YOU OF THIS MATTER AND THE REPORTED POWER STEERING PROBLEM DURING PURSUIT OR WHILE RESPONDING TO EMERGENCY CALLS. IF YOU HAVE RECEIVED SUCH COMPLAINTS FROM OFFICERS DRIVING THESE VEHICLES IN YOUR FLEET, PLEASE CALL THE NHTSA AUTO SAFETY HOTLINE AT 1-800-424-9393. OR, PLEASE CALL MR. LEE STRICKLAND, THE PRINCIPAL NHTSA INVESTIGATOR ON (202) 366-5201.

AUTH MAJOR CRAIG R MASTERSON
DIVISION TRAFFIC SERVICES

GARZETTA / 2-55 PM

0000 08

SEE LIST OF ADDRESSEES

NEF-121lhs
EA94-022

Dear Chief:

As you may know, the National Highway Traffic Safety Administration (NHTSA) is investigating the performance of the power steering systems installed in 1992 and 1993 Ford Crown Victoria vehicles equipped for police use. The purpose of this investigation is to determine whether the design or performance of the subject power steering systems contain a safety-related defect requiring recall and remedy in accordance with applicable Federal law.

On April 21, 1994, NHTSA issued a notice regarding this investigation over the nationwide police telecommunications network. For your information, a copy of that notice is enclosed with this letter. This also advises you that, based on the information developed during NHTSA's Preliminary Evaluation, the investigation was recently upgraded to an Engineering Analysis to allow for a more detailed and thorough review of the issues involved.

The purpose of this letter is to formally request your agency's input regarding the power steering system performance in the subject Crown Victoria vehicles operated in your fleet. For purposes of this information request, the following terms are defined unless otherwise described:

- Subject vehicles: all 1992 and 1993 model year Ford Crown Victoria "police equipped" vehicles in your fleet.
- Alleged defect: a sudden change in the amount of steering input force required to execute a given vehicle maneuver at low to moderate vehicle speeds (15 to 30 miles per hour). Such a change may be perceived by the driver as momentary binding or lockup of the steering system.

To assist NHTSA in developing a qualitative assessment of the scope of the subject steering condition and the general perceptions of officers who operate these vehicles in the line of duty, your numbered responses are requested to the following questions.

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1. State the number of the subject vehicles in your fleet, itemized by model year.

2. Identify and describe all incidents reported by officers from your agency in which the power assisted steering system in the subject vehicles was reported to have:

   a. malfunctioned due to binding or lockup;
   b. contributed to or caused a loss of control; and
   c. contributed to or caused a collision with another object or a pedestrian.

3. Is any type of precision vehicle maneuvering or pursuit training routinely given to officers in your agency? If so, please describe briefly that training, specifically noting the type of skills assessment road course employed, and if known, the origin of that course.

4. Please provide a "general consensus" view of your officers' opinion of the power steering system in the subject vehicles, if possible. Of particular interest is whether officers who operate the subject vehicles may have complained that the steering performance makes the vehicles "unsafe" to drive under precision maneuvering conditions, such as in dense traffic or when pedestrians are in close proximity.

5. In view of the recent publicity regarding this condition, has your department conducted any evaluations of the problem or included any driver training exercises specifically to familiarize officers with the condition? If so, please provide any details regarding your activities in these areas.

6. Does your Department also operate 1994 model year Crown Victoria police equipment vehicles? If so, please state the number of such vehicles in your fleet, and provide any appropriate details or comments regarding whether the alleged defect may also affect these newer vehicles.

This letter is being sent pursuant to 49 U.S.C. § 30166 (formerly Section 112 of the Act) which authorizes NHTSA to conduct any investigation that may be necessary to enforce Chapter 301 of Title 49.

In order that we might continue expeditious handling of this investigation, we would appreciate your response to this letter by September 14, 1994. If you have any questions concerning the information requested in this letter, please contact Mr. Lee Strickland of my staff at (202) 366-5201.

Sincerely,

Original signed by
Charles L. Gauthier, Director
Office of Defects Investigation
Enforcement

Enclosure:
Police Information/Officer Safety Letter

000010

LIST OF ADDRESSEES

1. Chief of Police
   City of Half Moon Bay
   501 Main Street
   Half Moon Bay, CA 94019

2. Chief of Police
   City of Hamilton
   20 Hugh Street
   Hamilton, OH 45011

3. Chief of Police
   City of Ames
   515 Clark
   Ames, IA 50010

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AM.NY10100T1.AP,CN.
.00011 FILE 25 SP ALBANY NY10100T1 APRIL 21-94
TO APB - NATIONWIDE
ATTENTION -- FLEET MANAGEMENT PERSONNEL

SUBJECT: POLICE INFORMATION/OFFICER SAFETY

THIS IS TO NOTIFY YOUR AGENCY THAT THE NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION (NHTSA) HAS OPENED A SAFETY DEFECT INVESTIGATION CONCERNING THE PERFORMANCE OF THE POWER STEERING SYSTEM IN 1992 AND 1993 FORD CROWN VICTORIA VEHICLES, INCLUDING THOSE EQUIPPED WITH A "POLICE PACKAGE." THIS DOES NOT MEAN NHTSA HAS DETERMINED A PROBLEM EXISTS, BUT RATHER AN INVESTIGATION IS NECESSARY TO GATHER FACTS AND INFORMATION.

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AUTH MAJOR CRAIG R MASTERSON
DIVISION TRAFFIC SERVICES

GARZETTA / 2-55 PM

000012

Page of Pages

Form FHWA-201
(Rev. 11-67)

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
MINUTE - MEMO

Use this form in lieu of transmittal slips within Dept. of Trans. when message comment is to be retained as file material. Do not prepare carbons. Not to be used in lieu of Form FHWA-121 for informal correspondence.

SUBJECT

Ford Crown Victoria Power Steering

TO	MESSAGE/COMMENT	FROM/DATE
FILE, EA94-022	This memorandum enters into the investigative file for the subject EA, the following documents: 1. Letter from Timothy J. Driscoll to Richard Boyd, ODI, dated 6/2/94. 2. Supplemental report in the matter of Vincent J. Brock, from Bergen County, NJ, Prosecutor's Office to ODI, via telefax dated 6/30/94. 3. Letter from Michigan Department of State Police to Charles Gauthier, ODI, via telefax dated 7/21/94 and 7/28/94. 4. Letter from District of Columbia, Metropolitan Police Department, to Charles Gauthier, ODI, dated 8/8/94. 5. Letter from Prince Georges County, MD, Police Department to Charles Gauthier, ODI, dated 8/15/94. 6. Letter from Ames, IA, Police Department to Charles Gauthier, ODI. Response to request for information dated 8/31/94.	L.Strickland 9/15/94 L. Strickland

OCC013

LAW OFFICES
HOROWITZ AND FORAN, P.A.
CAPITAL OFFICE PARK
6301 IVY LANE SUITE 812
GREENBELT, MARYLAND 20770
(301) 441-2022

EDWARD S. HOROWITZ
JOHN R. FORAN
STEPHEN C. OFFUTT

MD & DC BAR
FAX (301) 474-6054

94 JUN 13 PM 2:28
RECEIVED
OFFICE
DEFECTS INVESTIGATION

June 2, 1994

Mr. Richard Boyd
National Highway Transportation
Safety Administration
400 Seventh Street, S.W., Room 5326
Washington, D.C. 20590

Re: Decedent - Prince George's County Police
Officers Bagileo and Fleming

Dear Mr. Boyd:

Pursuant to our telephone conversation of June 1, 1994, enclosed please find the accident reconstruction reports for Officers Fleming and Bagileo and the information I have previously received from the County Prosecutor's office in Hackensack, New Jersey. Some of this material may be repetitive, but I wanted to make sure you received all relevant information.

From my reading of these reports, I believe it is possible that both officers, while conducting high speed chases, reduced power during braking maneuvers, and may have then suffered some type of steering bind or lock-up. Hopefully testing will be conducted at high speed which may mimic the conditions under which both officers were killed. I thank you in advance for your kind attention and please feel free to call me should you need any assistance on my part.

Very truly yours,

HOROWITZ AND FORAN, P.A.

T Driscoll

Timothy J. Driscoll

TJD:lf

000014

MEMORANDUM

TO ESH
FROM TJD
RE BAGILEO & FLEMING
DATE 5/19/94

See the attached from Bergen Co. New Jersey. Most of this material is reiteration of prior knowledge. Of note are the areas outlined in red near the end of the documents. Sgt. O'Brien, on page 3 of his 1/11/94 letter, infers that high speed operations kick in the overdrive and up the rear-end transmission ratio, thus, the engine speed lowers and tip up may occur.(I think, If I understand him correctly, he is saying that the gear ratio changes when the overdrive kicks in, the workload is temporarily reduced on the engine, power levels drop and a corresponding loss of power to the steering and brake mechanisms may occur. The analogy could be similar to a bicycle changing gears, when you shift, there is a temporary power reduction and reduced workload as the gearing changes and your legs adjust to the different stress.)

The second item of interest is the Police Magazine article from December of 1991. Notice the first time the Crown Vic "stepped out", occured at the beginning of a turn after an initial high speed burst. This scenario could be very similar to our Officers making an initial high speed turn or braking manuever.

The biggest problem I have with the testing so far, is the lack of high speed analysis. If O'Brien is right, it may only take one brake or turn at high speeds to cause this phenomenon. The Police Magazine Article would seem to confirm this. Obviously, most people interested in living, do not test defective vehicles at 75-100 mph. Who knows maybe Dennison or Wakefield have someone available? My gut feeling is that high speed testing will show positive results and that O'Brien will be vindicated in the future.

TJD

5/19 Ed: I have called Dave Dennison + asked for his testing again.

0000015

Office of the County Prosecutor
County of Bergen
HACKENSACK, NEW JERSEY 07601
(201) 646-2300

John J. Fahy
Prosecutor

Frank Puccio
First Assistant Prosecutor

Michael J. Tobin
Chief of Investigators

April 1, 1994

Enclosed please find copies of the reports which you have requested with regard to the 1992/1993 Ford Crown Victoria Police Vehicles.

If your department has experienced an accident involving said vehicles or similar incidents regarding the steering and/or braking problem, it is requested that you forward all pertinent reports to this office at the address listed below.

Bergen County Prosecutor's Office
Fatal Accident Investigation Unit
Justice Center, Room 215
Hackensack, New Jersey 07601

Thank you.

3000016

Office of the County Prosecutor

County of Bergen

HACKENSACK, NEW JERSEY 07601

(201) 646-2300

John J. Fahy
Prosecutor

Frank Puccio
First Assistant Prosecutor

Michael J. Tobin
Chief of Investigators

March 29, 1994

TO: ALL BERGEN COUNTY POLICE CHIEFS

Dear Chief:

On November 22, 1993 Paramus Police Officer Vincent Brock died while responding to a false report of a shooting at the Garden State Plaza Mall. His automobile crashed into a telephone pole. He was driving a 1992 Ford Crown Victoria, 4-door police car equipped with the standard police package and without an anti-locking braking system.

As part of our investigation into the tragic death of Police Officer Brock, we began to focus on the 1992 and 1993 Ford Crown Victoria police car. We discovered that the automobile has a deficiency which can be called "power steering bind" or "deep throttle oversteer." I was unable to test a 1994 model and do not know if this problem was corrected.

I have enclosed the following:

(1) article from Police-The Law Officers Magazine dated December 1991; (2) report of Sergeant Timothy O'Brien; (3) report of Senior Investigator Joseph Cofone; (4) report of American Standards Testing Bureau, Inc.; and (5) curriculum vital of principals of American Standards Testing Bureau, Inc.

All of the reports come to the conclusion that the 1992 and 1993 Crown Victorias become difficult to steer under extreme conditions. Although this may not be a problem for civilians this does create concern for police officers who could be involved in foreseeable police pursuits or responses to police emergencies.

The test that was done on March 21, 1994 by A.S.T.B. is very significant. The exemplar vehicle (vehicle with no modifications), and the test vehicle (vehicle equipped with the power steering pump and the brake master cylinder assembly from Police Officer Brock's vehicle) and the original Brock vehicle were ordered by and delivered to the Paramus Police Department in the same lot. Their vehicle identification numbers are :

(1) 2 FACP72WXNX217 315
(2) 2 FACP72WXNX217 316
(3) 2 FACP72WXNX217 317

These cars rolled off of the assembly line one after another.

Simply stated, the 1992 and 1993 Ford Crown Victoria vehicles may not be appropriate for police pursuits where rapid braking and turning is necessary. The steering wheel becomes difficult to turn when the operator executes a series of quick turns or swerves with the operator's foot off the accelerator pedal. This condition can occur at any speed and becomes more pronounced at higher speeds and when braking during maneuvers.

I realize that many departments have 1992 and 1993 Crown Victorias in their fleet. I request that you distribute these reports within your department and send your officers to the cumulative skill pursuit driving course. With this training they will be better able to understand the idiosyncrasies of their automobiles.

Police officers receive training in almost every aspect of police work. Since most police officers spend several hours per day in their automobiles, it is imperative for both the safety of our officers and the public at large that we institute a police vehicle training program. I will be meeting with you shortly to develop this program. Our goal is to have every police officer in the county to complete this program by the end of 1995.

Very truly yours,

JOHN J. FAHY
Bergen County Prosecutor

000018

American Standards Testing Bureau, Inc.
40 WATER STREET, NEW YORK, N.Y. 10004 • PHONE: (212) 943-3156 • FAX: (212) 825-2250

March 24, 1994

Bergen County Prosecutor's Office
Fatal Accident Unit
Justice Center
Hackensack, NJ 07601

Att: Mr. John J. Fahy, Bergen County Prosecutor

Gentlemen:

RE: Vincent Brock; D/A - 11/22/93
Your File #DBA93-87
ASTB P. #14172; LR. #294'0

Pursuant to your recent request, ASTB/New York has conducted an engineering examination of certain evidence allegedly involved in captioned single-vehicle accident. Background information for our study was retrieved from the sources listed in Schedule A, attached.

It was reported that on November 22, 1993, P.O. Vincent Brock of the Paramus P.D. was on patrol in a 1992 Ford Crown Victoria police vehicle. At one point in the early evening, Officer Brock received a radio communication of a crime in progress, later proven to be spurious, at the Garden State Plaza Shopping Center. In order to travel to the location, Officer Brock drove in an easterly direction along the Plaza Service Road, adjacent to State Route #4. Reportedly, his speed approached 60-70 MPH and it was necessary to change lanes a number of times to avoid other vehicles. As the patrol car reached a point about two hundred feet (200') west of PSE&G service pole #65256 near the plaza entrance, the auto began to sideslip and rotate in a clockwise direction. The vehicle subsequently slid sidewise into the pole, striking the latter on the driver's side. The left front door was crushed inward in excess of two feet (2'). Officer Brock expired from injuries sustained in the collision.

Subsequent to the accident, it was alleged that certain defects in the 1992 Ford Crown Victoria may have precipitated the accident. More specifically, a series of driving tests conducted under extreme conditions reportedly disclosed that the power steering assist function became temporarily impaired, as well as the power brake assist function. Accordingly, it was thought that similar conditions may have been initiated by the high speed maneuvers conducted by Officer Brock shortly before the accident, thereby causing a loss of control of the vehicle.

Proceeding further, a comprehensive examination of the Owner Notification bulletin, the safety recall notice and the FMC Technical Service Bulletins ~~was conducted~~ (Ref. Schedule B, attached). None of the problems covered in Schedule B are causally related to the Brock accident.

00C019

Subsequent to our review of the above information, we conducted an examination of the accident vehicle at the Paramus municipal garage on March 9, 1994. Pertinent identification information recorded during our examination of the subject equipment is as follows (Ref. Figures 1 and 2, Plates #96227 and #96228):

Make	-	1992 Ford Crown Victoria 4DRSDN
Equipment	-	Police package
VIN	-	2FACP72W3NX217317
P.D. Car	-	#14

At the time of our examination, the odometer registered 22,162 miles (Ref. Figure 3, Plate #96229). Our examination disclosed the following:

1) The roof had been cut from the body of the vehicle. This had been done during rescue operations (Ref. Figure 4, Plate #96230).

2) The left front door and frame of the vehicle had sustained massive collision damage due to the impact with the utility pole (Ref. Figures 5 and 6, Plates #96231 and #96232). Figure 7, Plate #96233, is a view of the deformation (intrusion) taken from above the vehicle, looking down. The intrusion is in excess of two feet (2'), indicating that the impact speed was about 40-45 MPH.

3) The LR wheel was removed at the time of our examination (Ref. Figure 8, Plate #96234). Note the presence of remnants of a shrub entangled in the caliper/disk assembly. Examination of the brake components did not disclose any unusual conditions.

4) The LR tire and rim were produced for our examination (Ref. Figure 9, Plate #96235). The outboard edge of the rim exhibited a dent, most probably caused by an impact with the curb at the accident site (Ref. Figure 10, Plate #96236). The tire was fully inflated. It was determined that the tire was not rotating at the time of impact.

5) A similar dent was found on the outboard rim of the LF tire (Ref. Figure 11, Plate #96237). The same observations and conclusions apply to the LF wheel as for the LR wheel.

6) The tread depth on all four (4) tires was found to be adequate (Ref. Figures 12 through 15, Plates #96238 through #96241).

7) At the time of our examination, the power steering pump and brake master cylinder had been removed from the vehicle. The exhibits were provided to ASTB and transported to our laboratories for examination.

8) The brake pedal had been cut off during rescue operations (Ref. Figure 16, Plate #96242). However, depression of the brake lever activated the master cylinder push rod in the normal manner.

9) The record reflects that the vehicle was involved in a major front end collision on January 6, 1993, at which time the mileage was 4,022. Extensive repairs were made to the auto. Accordingly, we examined the left front end of the vehicle, where the impact had occurred (Ref. Figure 17, Plate #96243). No readily obvious defects were found.

Subsequent to our field examination, the power steering pump, master cylinder and brake pedal were examined for defects in our laboratories (Ref. Figure 18, Plate #96244). With respect to the master cylinder assembly, no defects were found and the reservoir was in good condition (Ref. Figures 19 and 20, Plates #96245 and #96246). Similarly, the power steering pump and brake pedal were unremarkable (Ref. Figures 21 and 22, Plates #96247 and #96248).

ASTB also examined the accident site, which is located about thirty feet (30') west of the entrance to Garden State Plaza (Ref. Figures 23 and 24, Plates #96249 and #96250). The accident pole had broken off in the collision and had been replaced with a new unit (Ref. Figure 25, Plate #92651). The roadway is level and straight proceeding in an easterly direction to the accident site. Shortly thereafter, one can make a right turn into the shopping complex, or proceed east (Ref. Figures 26 and 27, Plates #92652 and #92653). Figure 28, Plate #92654, is a view of the roadway, looking west from the turn off for the shopping center. The accident pole location is on the left in this exhibit. Our site examination did not disclose any significant road hazards which may have been causally related to the accident, other than the presence of a downramp on the right side of the eastbound lane, about three hundred forty-five feet (345') from the accident pole. This ramp essentially has no merge zone with the main roadway, but is provided with a "YIELD" sign. A motorist descending the ramp at highway speeds onto the main road would, in our opinion, present a potent hazard to eastbound traffic, especially motorists traveling in the right lane.

In accordance with the description of the accident sequence and diagrams provided by the Bergen County Prosecutor's Office, it would appear that Officer Brock was initially traveling in the left lane as he approached the Garden State Plaza. Thereafter, he shifted into the right lane, preparing

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to enter the shopping center. At that time, he encountered an auto proceeding down the ramp on his right and, accordingly, swerved to the left lane. Thereafter, he pulled ahead of the aforementioned auto and swerved to the right to make the turn into the shopping center. At that time, the patrol car began to slide to the left and rotate in a clockwise direction towards the accident pole. The distance between the initial yaw and the pole was approximately two hundred four feet (204'). As noted earlier, the force of the collision was sufficient to deform the driver's door inward over two feet (2').

A series of auto test trials were conducted on March 21, 1994 in the parking lot of Giant Stadium, Meadowlands, NJ. These tests were conducted according to the following protocols:

1) A "training" course was set up using traffic cones. This course consisted of a series of turns, included two (2) U-turns, all of which are driven at high speed (Ref. Figure 29, Plate #96255).

2) A reconstruction of the path of travel of the Brock patrol car was also set up with the aid of traffic cones. This course was constructed to scale (Ref. Figure 30, Plate #96256).

3) A standard 1992 Ford Crown Victoria patrol car was used as an exemplar vehicle in initial test trials (Ref. Figure 31, Plate #96257). The VIN of the vehicle was:

   2FACP72WXNX217315

4) The test vehicle consisted of an identical (unmarked) patrol car in which the brake master cylinder assembly and power steering pump from the Brock vehicle had been installed (Ref. Figures 32 and 33, Plates #96258 and #96259). Pertinent information relevant to the test vehicle is as follows:

Mileage	-	9,199 (Ref. Figure 34, Plate #96260)
Tire pressure	-	35 psi
Plate #	-	MG-2735
VIN	-	2FACP72WXNX217316

A series of runs were made with the exemplar vehicle and test car in order to quantify the power steering problem under a number of conditions, as follows:

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1) We brought both vehicles up to a speed of 30 MPH, released the throttle and conducted a series of rapid swerving maneuvers. In all cases, the power steering assist function diminished during said maneuvers, making it difficult to control the vehicle. The duration of the loss was estimated to be about two (2) seconds before the hydraulic pressure of the power steering pump rose to a normal level. This operation was conducted ten (10) times, with the same results.

2) A series of ten (10) passes through the "training" course also resulted in the aforementioned problem with the power steering assist but to a lesser degree.

3) Two (2) passes through the reconstructed path of travel of the Brock vehicle were conducted with the exemplar patrol car. In both cases, the auto "spun out" (rotated clockwise) at the end of the course, which represented the attempted right turn into the shopping center. Speed trials were conducted at 40 MPH and 46 MPH, respectively.

4) Two (2) passes were made with the test vehicle operated by a PD driver/instructor. The test auto also "spun out" at the end of the course at the aforementioned speeds.

5) Lastly, we drove the test vehicle twice through the course at the same speeds in (4) above and experienced the same results. With respect to the power steering function, we experienced a partial loss of same during the maneuvers through the course. No air entrainment (indicative of a pump cavitation) was detected in the power steering fluid before or after the trials (Ref. Figure 35, Plate #96261).

On the basis of our examination, road tests and engineering analysis of all evidence produced to date in this matter, we submit that there is no doubt that a "drop throttle" syndrome exists in the 1992 Ford Crown Victoria police vehicles. More specifically, one will experience a substantial loss of the power steering assist function when executing a series of extreme maneuvers with the auto, accompanied by repeated depression and release of the throttle pedal. Although atypical of the average civilian driver, police personnel are often required to conduct said maneuvers, especially in pursuit operations. Accordingly, it would appear that a design defect exists in the subject PD equipped vehicles, in that one could experience a temporary impairment of the power steering function under extreme conditions. It should be noted that at no time during our auto tests did we experience any brake problems. We thus cannot comment on the alleged brake function impairment reported with 1992 Ford Crown Victoria (non-ABS) vehicles.

In summary, our analysis of 1992 Ford Crown Victoria vehicles equipped for police use disclosed that the power steering assist function becomes impaired under extreme, but foreseeable driving conditions. More specifically, the steering wheel becomes difficult to turn when executing a series of quick turns or swerves with the operator's foot off the accelerator pedal. This condition can occur at relatively low speeds and becomes more pronounced at higher speeds and/or when braking during the maneuvers.

Respectfully submitted,

AMERICAN STANDARDS TESTING BUREAU, INC.

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Technical Director

PAA/VM/dk
Enc.

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SCHEDULE A

Information Sources

1) NJ PAR #293169 relevant to the accident.

2) Maintenance and repair records for the 1992 Ford Crown Victoria police vehicle involved in the accident.

3) Accident history of the subject vehicle prior to November 22, 1993, including PAR's and damage estimates.

4) Borough of Paramus, NJ Specifications for 1992 Ford Crown Victoria Police Vehicles.

5) Ten (10) Technical Service Bulletins issued by Ford Motor Company for the 1992 Ford Crown Victoria model.

6) Safety Recall Bulletin #92543 for the 1992 Ford Crown Victoria model.

7) Owner Notification Program #93B25 documents relevant to the above vehicle model.

8) Copy of VINASSIST report for the subject vehicle.

9) Ford Motor Company Service Bulletin Report, issued by NHTSA on December 3, 1993.

10) NHTSA listing of owner reports for the 1992 Ford Crown Victoria sedan.

11) Two (2) drawings of the accident site and path of the accident vehicle.

SCHEDULE B

Service and Recall Bulletins

1) The Owner Notification is concerned with braking problems with ABS-equipped police vehicles. The auto involved in the instant case was not equipped with an antilock brake system and, accordingly, the notification did not apply to same.

2) The Safety Recall Notice also applies to ABS-equipped vehicles only.

3) The Technical Service Bulletins are concerned with the following problems with the 1992 Ford Crown Victoria:

ARTICLE #	PROBLEM
91-3-2	Rear brake hose washers
91-19-2	Rear tail light lens
92-8-6	"Pulsing" of power steering at certain speeds (steering function unaffected)
92-12-4	Brake roughness (rotor run out)
92-14-3	"Clicking" noise when brake pedal is depressed
92-15-8	Brake shift interlock
93-5-4	"Squeak" in steering column
93-7-3	Purging air from power steering unit (pre-delivery and repaired vehicles only)
93-10-1	ABS lamp failure
93-16-2	Front brake rotor roughness/brake lining material

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Metal Finishing, Joining and Working
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American Society of Metals
American Society of Safety Engineers
Electrochemical Society
Faraday Society
Intern. Comm. on Chem. Thermodynamics & Kinetics
National Fire Protection Association
National Society of Professional Engineers
New York Academy of Sciences
New York Society of Professional Engineers
Society for International Development
Society of Automotive Engineers
Society of Aerospace Materials & Process Engineers
Society of Plastics Engineers

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Society of Automotive Engineers
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Society of Sigma XI
Tau Beta Pi

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BERGEN COUNTY PROSECUTOR'S OFFICE

REPORT OF INVESTIGATION PAGE#1 OF 8

CASE TITLE:IN THE MATTER OF P.O. VINCENT BROCK CASE#:93-87

INVESTIGATOR: SR.INV. J. COFONE SQUAD:FAIU DATE: March 28,1994

OTHER INVESTIGATORS:SR.INV. PAUL CARDONE

REPORT RE: SPECIAL REPORT

REPORT ON CROWN VICTORIA

On November 24,1993 I received a telephone call from Sgt. Tim O'Brien of the Paterson Police Department. Sgt O'Brien told me that he is the Chief Driving Instructor for the Paterson Police Department and has been involved in the development of the NJ Attorney General's Pursuit Driving Course. He told me that he has personally conducted a multitude of dynamic driving tests utilizing 1992 Ford Crown Victorias. He told me that he discovered two prominent handling deficiencies he has noted regarding the vehicle. One condition results in a temporary loss of the power steering assist. The second condition results in a temporary diminished braking. Both are chronic conditions. On those occasions when either condition develops, it does so after or during times the vehicle undergoes several consecutive hard steering maneuvers. The sergeant said that he has had conversations with representatives from Ford Motor Company regarding each condition. He also said that Ford's response to the braking problem was to change the size of the master cylinder. Sgt O'Brien said he felt compelled to contact us after he discovered that a 1992 Ford Crown Victoria was involved in the collision.

On November 24,1993 I called the National Highway Traffic Safety Administration in Washington, DC and requested information regarding safety recalls, defect investigations, vehicle owner complaints, and technical service bulletins pertaining to 1992 Ford Crown Victorias.

On December 7,1993 I spoke with Sgt Bob Ring of the Michigan State Police Precision Driving Unit inquiring as to their tests of the 1992 Ford Crown Victoria. He told me the officer who performed the tests, Lt Curt VanDenBerg was no longer with the unit. Sgt Ring told me he would check for records pertaining to any problems encountered with braking or steering during their track testing of the vehicle. I subsequently received a copy of a teletype issued by the Lodi CA Police Department regarding braking and steering problems with their 1992 Ford Crown Victorias.

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On December 15, 1993 I received the NHTSA information. I learned there were 193 vehicle owner complaints, 105 technical service bulletins issued and 1 defect investigation conducted. Several of the technical service bulletins applied to braking and steering components of the vehicle.

On December 16,1993 I visited Ford Motor Co distribution center in Teterboro where I spoke to Customer Relations Manager Tom Suttles. Mr Suttles was served with a subpoena duces tecum for any and all records regarding any recalls, owner notifications, or technical service bulletins pertaining to the steering, brakes and suspension for the Paramus Police vehicle involved in the collision. After serving the subpoena, a legal representative from Ford telephoned and briefly spoke with Executive AP Hennessey.

On December 22,1993 I spoke to Dennis Callahan, who is the Building and Equipment Supervisor of the city of Lodi California Public Works Department. Mr. Callahan told me about a problem the Lodi PD experienced with 1992 Ford Crown Victoria regarding an occasionally occurring, temporary loss of the power steering assist during rapid steering maneuvers. The affected vehicles were manufactured in Canada in June of 1992. Mr Callahan said he received complaints from Lodi CA police officers regarding an occasional diminished braking of the vehicles. This condition was reported to have occurred after the police cars were subjected to several quick and severe left to right steering maneuvers. Tests he conducted failed to disclose any brake failure. He contacted Ford Motor Co. Ford sent representatives to Lodi CA to examine the vehicles. Ford changed the master cylinder in the cars. They attributed the steering loss to the fact that the tests performed by the Lodi Police were conducted on a test track.

Also on December 22,1993 I spoke to Craig Petersen who is a writer for POLICE magazine. In September of 1991 Mr Petersen test drove a 1992 Ford Crown Victoria at the Michigan State Police Driving Facility in Lansing, MI. He wrote an article in the December 1991 issue of the magazine in which he describes a condition referred to as drop-throttle oversteer. This condition was attributed to the designed tendency of the vehicle to oversteer. He told me the vehicle he tested was a pre-production model. He said Ford was made aware of the condition and stated they designed the oversteer tendency out of the car. In subsequent tests he conducted, Mr Petersen said the drop throttle oversteer condition did not occur. When asked if he had ever experienced any unusual steering condition with the vehicle Mr Petersen told me about a temporary steering loss that occurred after several consecutive quick steering inputs. He also experienced the same steering condition in the 1993 Ford Crown Victoria. His findings were documented in articles he wrote in the December 1991 and 1992 issue of POLICE magazine.

get copies in clerks

On January 4,1994 I called Mario Sanna, Fleet Supervisor Monroe County NY Sheriffs Department. He told me of several complaints from Sheriff's Deputies regarding an intermittent loss of power steering assist on their 1992 Ford Crown Victorias at speeds in the range of 65-70 MPH. Some of these power assist losses may have occurred during emergency call responses. Mr Sanna said he contacted Ford. They sent representatives Don Wilson and Dave Shaffer who tested the vehicles but found no problem. The representatives told him that the power steering pump was a new design for 1992. The involved vehicles were manufactured in Canada in July and August of 1992.

On January 5, 1994 I spoke to Lt Stan Olsen of the Las Vegas Metro Police Department. He told me about brake problems his department experienced with their 1992 Ford Crown Victorias equipped with ABS during the spring of 1993. It seemed that after three or more quick consecutive steering inputs the brakes would fade. He said they learned that the rear brake calipers were not performing properly due to a deficiency with the master cylinder. The lieutenant said that one non-injury collision involving the Crown Victoria has been attributed to the braking deficiency condition. The lieutenant also said that Ford was contacted and sent representatives who took three police cars to a testing facility in Kingman, Arizona. Ford evidently told LVPD that the master cylinder was too small to adequately engage the rear brakes under certain conditions. Ford replaced the master cylinders with a version typically found in the Mercury Marquis. It is believed that they subsequently instituted a design change for this component. LVPD has not had a reported problem since.

On January 7,1994 I spoke to Master Sergeant Scot Bodamer who supervises fleet maintenance at Nellis Air Force Base in Arizona. He said he maintains a small fleet of 1992 Ford Crown Victorias. Although no one on base has reported any immediate problems with the vehicle, he has received bulletins from his headquarters at Langley AFB, in Virginia, to take the vehicles to a near by Ford dealership to repair components of the brakes and suspensions.

On January 10,1994 I spoke to Undersheriff Tom Brenneman of the Stafford County, Kansas Sheriff's Department. The Undersheriff told me that he recalled two or three reports occurring approximately seven to eight months ago involving the temporary loss of the steering power assist for some of his department's 1992 Ford Crown Victorias. He said the condition was reported to occur at low speeds during turning maneuvers. The affected vehicles were taken to a local Ford dealership and there have been no complaints since that time.

On January 10,1994 I spoke to George Wendell, from Carson City Nevada who is a private investigator. Mr Wendell was formerly an investigator with the Nevada division of Investigation. In 1992 he was involved in a case involving a Nevada Department of Probation employee who was involved in a collision involving a 1992 Ford Crown Victoria equipped with a police package and ABS. The collision occurred when the driver of the Crown Victoria attempted to make a sudden stop for a school bus, swerved out of control and struck a tree. Mr Wendell said that according to two mechanics that examined the vehicle a problem existed with the front brakes.

On January 11,1994 I spoke to Lt. Robert Racine of the Ontario California Police Department. He told me that on January 1,1994 his department investigated a collision that occurred during a high speed pursuit involving a San Bernadino Sheriff's car. The vehicle lost control in a turn and struck a tree. The officer driving the car sustained minor injury. The involved police car was a 1993 Ford Crown Victoria equipped with ABS. The lieutenant said that the investigation appears to show that as the car decelerated rapidly after entering a curve a problem may have developed with the brakes. A static examination of the vehicle showed that there was brake reserve.

On January 14,1993 I spoke to Jay Dennett, Program Manager for the Motor Transport Section of the California Highway Patrol. Mr Dennett told me about a braking problem he learned about while testing a 1992 Ford Crown Victoria equipped with ABS. CHP received the car as a prototype and prelude to a fleet of such vehicles it had ordered. Mr Dennett said that his department found a diminished braking that occasionally occurred after several quick consecutive steering inputs. Two brake applications were required to restore braking ability. The first application reset the brakes and the second application produced braking. Mr Dennett said Ford was alerted to this condition and that their remedy was to change the brake master cylinder to a Mark 8 type. Since this exchange of master cylinders CHP has not experienced the braking problem. Mr Dennett also alerted me to a problem regarding ceasing engines with the Crown Victorias.

On January 24, 1994 I contacted NHTSA in Washington DC and requested copies of several technical service bulletins pertaining to braking and steering conditions and components for the 1992 Ford Crown Victoria.

On January 25,1994 myself and Sr Investigator Cardone visited Tom Suttles, Owner Relations Manager for the Ford Motor Co at the Ford Parts Distribution Center in Teterboro. I served Mr Suttles with a second subpoena which in addition to documents requested in the initial subpoena, also requested documents regarding any communications with other police departments and testing and analysis regarding the steering and braking systems of 1992 Ford Crown Victoria police cars. Mr Suttles told me that the information requested in the initial subpoena was almost ready for delivery. He also informed me that he received an inquiry from the Boro of Paramus Fleet Supervisor regarding steering problems with their police cars.

On January 25,1994 Sr Investigator Cardone and I visited Tony Pigoncelli, Paramus Fleet Supervisor. He told me he sent a letter dated January 10,1994 to Mr Suttles of the Ford Motor Co in Teterboro requesting that they further investigate a temporary

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loss of steering encountered during the testing of Paramus Police Department's 1992 Ford Crown Victorias. He has yet to receive a reply. I asked Mr Pigoncelli to contact me upon any communication from Ford Motor Co.

On February 2,1994 I returned a call to NHTSA in Washington DC. They requested further information on technical service bulletins I had requested. I mailed the requested information on February 3,1994.

On February 3,1994 I received a telephone call from Mr Jay Logel, an attorney for the Ford Motor Co, Dearborn MI. Mr Logel told me that he was calling in regards to our subpoena duces tecum and did not as of yet have all the information requested. I asked him to forward what ever was presently available and send the balance within the next two weeks. He said that he believed he would be able to comply with this request. He said he had to speak with people who would be able to provide the necessary information. He appeared to be remotely acquainted with the general facts in the case. On February 4, 1994 I received a Federal Express FedEx letter containing various technical service bulletins.

On February 17,1994 Myself and Lt. Compagnone of the Paramus PD met with Dr V. Morfopoulos and Dr Paul Ast of American Standards Testing Bureau Inc, 40 Water St, NY,NY at their offices. We discussed the general facts of the case and also the mechanical conditions that were discovered during dynamic testing we conducted and discussed previously in this report. Dr Ast was provided with a copy of the engineer's diagram and will be provided with other pertinent documents. After reviewing the documents and conducting his own research Dr Ast will advise me as to the type of examination or testing that may be required,and when such testing and examination can take place.

On February 28, 1994 I telephoned Jay Logel attorney for the Ford Motor Company in Michigan. I was informed by his secretary that he was not in but would return my call. He returned my call on March 1, 1994. I asked him when I could expect the balance of the information requested in the subpoena duces tecum. He said he was in contact with Ford engineers and would have to recontact them. I asked him to contact me as soon as possible and advise me of progress in this regard. I also provided him with the serial number from the master cylinder of the vehicle involved in the crash and asked him if he could provide exterior and interior measurements of the unit. He said he would attempt to provide this information.

On February 4, 1994 I received a call from American Standards Testing Bureau that they would like to examine the vehicle involved in the collision on February 9, 1994. ASTB also request an exemplary vehicle be made available at the same time. Arrangements were made with Paramus PD to have the requested vehicles brought to their Boro Garage on the day before the exam.

On March 8, 1994 I received a packet from NHTSA which

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contained a number of technical service bulletins requested on January 24,1994. Also included were four pages of broadcast messages sent from Ford to its dealerships.

On March 9, 1994 I met Dr Paul Ast from American Testing Standards Bureau at the Paramus Boro Garage where he conducted an inspection of the vehicle involved in the crash. Present during the examination was Inv Jeff Weinberg, Deputy Chief Majcher and Chief McCormack of the Paramus Police Department, Boro Mechanic Tony Pigoncelli and SO John Murphy of Bergen County Sheriff's Department BCI. At this time I turned over vehicle parts, previously removed from the crash vehicle, to Dr Ast for his further inspection back at his laboratory.

On March 10,1994 I received a call from Dr Ast. It was agreed that dynamic testing of two vehicles similar to the crash vehicle would be scheduled for March 17,1994. One of the vehicles will be refitted with parts removed from the crash vehicle. Following the communication with Dr Ast I contacted PO Ed Weber to make arrangements for him to conduct the removal and installation of the parts as indicated above. The refitting will be done on March 15, 1994.

On March 15,1994 I was present while PO Edward Weber of the FAIU, who is also an ASE certified auto mechanic, installed the master brake cylinder and power steering pump from the vehicle involved in the collision into a similar police vehicle. Present during this exchange of parts was Paramus Fleet Supervisor Tony Pigoncelli. On March 21,1994 I witnessed PO Edward Weber reinstall the original master cylinder and power steering pump to the test vehicle. I then retrieved and secured the components that originated from the crash vehicle.

On March 22,1994 I telephoned Mr Jay Logel of the Ford Motor Company to check on the progress of our subpoena. He told me that he was presently in the process of speaking to engineers about some of the requests in the subpoena. He said I would shortly be receiving information about the brakes, a drawing of the master cylinder, and data regarding the vehicle computer. I asked when I would receive information about communications between Ford engineers and other police agencies regarding the Crown Victoria as set forth in the subpoena. He said I would soon have information in that regard also.

TESTING

On December 23,1993 I supervised the road testing of a police vehicle similar to the police vehicle involved in the collision. Inv Weinberg assisted along with Sgt Tim O'Brien, PO Michael Deprospo,and PO Gus Seyden of the Paterson Police Department Traffic Division. These men are instructors for the Attorney General's Cumulative Skill Pursuit Driving Course. Also assisting was PO Ronald Polonkay of the Garfield PD who is also an FAIU investigator.

The tests were conducted in the Alexanders parking lot located at Rt 17 and 4 in Paramus. The vehicles tested were a 1992 Ford Crown Victoria Police Car VIN # 2FACP72W4NX217326, manufactured in May 1992, in Canada and owned by the Boro of Paramus and a 1993 Ford Crown Victoria Police Car, VIN # 2FACP71W3PX172576, manufactured in April 1993 in Canada and owned by the City of Garfield. The 1993 model was equipped with ABS. Tests were video taped.

Each vehicle was put through the Cumulative Skill Pursuit Driving Course numerous times. This driving course is designed to acquaint urban and suburban police officers with real world emergency maneuvers they can reasonably expect to encounter during the course of their duty. The course is additionally designed to educate officers as to the performance limits of their vehicles. Once armed with this knowledge officers learn to successfully and safely negotiate their vehicles through emergency driving situations under various conditions.

I personally drove the 1993 Ford through the course five times and videotaped PO Deprospo from the front passenger seat as he drove the 1992 Ford through the course at speeds between 20 to 25 MPH. On at least three occasions while proceeding through the last steering exercise in the course, which consisted of steering left and right through a series of cones, I experienced a brief loss of power steering assist. The temporary power steering loss occurred when I removed my foot from the accelerator and attempted to quickly steer around the cones. The condition appeared to develop after the second or third consecutive steering input. The power steering returned after I applied the brake and the vehicle slowed.

On one occasion while driving from the first evasive segment into the first turn around segment of the course I experienced what appeared to be a temporary loss of braking. I recall that during the testing and video taping of the 1992 Ford that PO Deprospo remarked experiencing similar handling deficiencies. Experiences of the same nature were also expressed by the other officers participating in the tests.

Sgt O'Brien has filed a report regarding testing he conducted relative to this investigation.

On March 21,1994 a second series of tests were conducted in Lot 16 of Giants Stadium in East Rutherford. Two Paramus Police vehicles were utilized. Car 17, a 1992 Ford Crown Victoria unmarked unit, VIN # 2FACP72W1NX217316, with an odometer reading of 9199 miles, was refitted with the master cylinder and power steering pump from the crash vehicle. The second vehicle utilized in the testing was a marked police unit, car # 7, a 1992 Ford Crown Victoria,VIN# 2FACP72WXNX217315, with an odometer reading of 34743 miles. Both vehicles were equipped with Goodyear Eagle GT+4 P225/70R15 tires inflated to 35 PSI. Car 17 was flat bed towed from the Paramus Municipal Garage to the test site by ABC Towing of FT Lee, NJ. Car 7 was driven to the test site by

Paramus Fleet Supervisor Tony Pigoncelli. I escorted the test vehicles from Paramus to the test site. I arrived at the site at approximately 10:20 AM where I met with Dr Paul Ast of American Standards Testing Bureau and Sgt Tim O'Brien of the Paterson Police Department.

A course was set up which attempted to replicate the final maneuvers of the crash vehicle. The weather was clear. Some melting from snow mounds adjacent to the entry of the test area created a narrow area of minor wetting of the road surface at the entry point. The road surface in the immediate area where the vehicle was put through consecutive hard steering maneuvers was dry. FAIU Investigators Polankay and Hagal operated video tape camcorders. The vehicle speed was measured by use of Doppler Radar which was operated by PO Michael Deprospo of the Paterson PD.

Under the direction of Dr Ast a total of six test runs were conducted. The test vehicles were occupied by both Dr Ast and Sgt O'Brien. Two tests were conducted using car 7 which was driven by PO Tim O'Brien. The vehicle travelled at speeds of 40 and 46 MPH respectively. Car 17 was used in the balance of the tests. Of these tests PO O'Brien and Dr Ast each drove twice. Vehicle speeds during this segment of the testing were 45,40,40, and 43 MPH respectively. I asked the drivers if during each of the six tests a temporary loss of power steering assist and or diminished braking was experienced. Neither Dr Ast or Sgt O'Brien reported impaired or diminished braking. They each reported a temporary loss of power steering assist for every one of the six tests that were performed.

Following the testing, Car 17 was flat bed towed to Paramus Municipal Garage by ABC Towing. I escorted the tow truck back to the garage and watched it being unloaded and placed in the garage. Car 7 was driven back to Paramus by Fleet Supervisor Tony Pigoncelli.

INVESTIGATOR'S SIGNATURE:	DATE:	APPROVED	DATE:
[signature]	3/28/94	Lt. [signature]	3/29/94

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VEHICLE SAFETY ALERT

To: All Law Enforcement Agencies

From: James F. Mulvihill
Director

Re: VEHICLE SAFETY ALERT
1992 & 1993 FORD CROWN VICTORIA

Date: March 31, 1994

On November 22, 1993, Officer Vincent Brock of the Paramus Police Department died while responding to a call for service. His automobile crashed into a telephone pole, with impact on the left side of the vehicle. He was driving a 1992 Ford Crown Victoria, equipped with a standard police package and without an anti-lock braking system.

A thorough investigation by the Bergen County Prosecutor's Office Fatal Accident Investigation Unit disclosed a deficiency in the 1992 and 1993 Ford Crown Victoria police car. The investigation revealed that these vehicles become difficult to steer under extreme conditions. When the vehicle's throttle is suddenly released following repeated or extreme turns or lane changes, the result is a drop in engine speed which causes the power steering to bind. This greatly increases steering wheel resistance making it very difficult to turn, and may result in oversteer several seconds later when the power steering re-engages.

The American Standards Testing Bureau, Inc., of New York, conducted detailed testing of the 1992 Crown Victoria police car. In their report, dated March 24, 1994, they conclude:

"... that there is no doubt that a "deep throttle" syndrome exists in the 1992 Ford Crown Victoria police vehicles. More specifically, one will experience a

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substantial loss of the power steering assist function when executing a series of extreme maneuvers with the auto, accompanied by repeated depression and release of the throttle pedal. Although atypical of the civilian driver, police personnel are often required to conduct said maneuvers, especially in pursuit operations. Accordingly, it would appear that a design defect exists in the subject PD equipped vehicles, in that one would experience a temporary impairment of the power steering function under extreme conditions."

Additional testing by the Bergen County Prosecutor's Office revealed the same problem in the 1993 Ford Crown Victoria police car. No tests were conducted of the 1994 model. The results are outlined in detail in a report issued by the Prosecutor. The report indicates that this problem is apparent only during extreme driving conditions, such as emergency or pursuit driving, and is not apparent during normal, routine driving

Recommendations

If your agency uses the 1992 or 1993 Ford Crown Victoria police car, we recommend the following courses of action:

1. Should your agency's vehicles experience this or any other operational difficulties, contact the Ford Motor Company or your dealer to report the problem. To date, the National Highway Traffic Safety Administration has not announced a recall of the vehicles in question.

2. As soon as possible, have all officers who drive the Crown Victoria complete the Cumulative Skill Pursuit Driving Course outlined in the 1993 report of the Attorney General's Task Force on Vehicular Pursuit. This course is a behind-the-wheel exercise designed to increase the skills of police officers in emergency vehicle operation and familiarize them with the unique qualities of a specific type of vehicle. Ideally, all police officers would complete this course periodically, and especially when vehicle types change. However, at this time, we recommend that officers who drive the 1992 or 1993 Ford Crown Victoria police car complete the course to become familiar with "deep throttle" syndrome as well as any other operational characteristics unique this vehicle.

   Information on the Cumulative Skill Pursuit Driving Course can be obtained from your County Prosecutor or from any police academy.

If you have any questions, please call the Division of Criminal Justice Law Enforcement Standards Section at (609) 984-0960.

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Paterson Police Academy

111 BROADWAY
PATERSON, NEW JERSEY 07505
(201) 881-6842

January 11, 1994

Sir,

I am a sergeant with the Paterson New Jersey Police Department, where I have been employed for the past 19 years. I am the chief driving instructor for the Paterson Police Academy and have been so for the past 12 years. During the past year, myself and my staff have been administering the Attorney General's Cumulative skill pursuit driving course to over 2,000 police officers in the State. The course is a behind the wheel course designed to increase the skills of the police officers in emergency vehicle operation.

Instructing this course has afforded me the opportunity to become very familiar with the handling characteristics of both the Chevrolet and Ford Police Packaged vehicles as I drive these cars through the course every day. As a result, I have personally become aware of certain difficulties associated with them.

In the month of December, I was contacted by Investigator Joseph Cofone of the Bergen County Prosecutor's Office. He asked me to assist him and his staff with an investigation that he was conducting into an accident involving the fatality of a police officer from Paramus, New Jersey while he was operating a 1992 Ford Crown Victoria police car. Subsequent to receiving permission from my chief, I agreed to assist.

On December 23, 1993, I met Investigators Cofone and Weinberg at the site of the Alexanders parking lot in Paramus. This is the location where our driving course is located. On the above date, I arrived with Officers Michael DeProspo and Gus Seyden, both from the Paterson Police Department. We set up the cones for the Attorney General's course and prepared to test the vehicles in question. Prior to starting, Investigator Cofone asked me if I had any negative experiences with the handling characteristics of the Ford Crown Victoria Police Package vehicles with respect to breaking and steering. I replied yes, and described the two conditions that I have experienced: Deep Pedal Syndrome and Power Steering Bind.

Brakes Deep Pedal Syndrome can best be described as a condition that presents itself when the vehicle is put through a series of quick turns or lane changes while under power without the use of the brakes. The brake rotors flex during the turning movements and

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knock back the brake pistons into their bore. The very next time the brakes are applied, the brake pedal goes almost to the floor. In an ABS equipped vehicle, the brake system reads a fault and forces the brake pedal back to its normal position. During this time, the vehicle continues to move forward thus increasing the total stopping distance. This condition also presents itself to a lesser degree on these vehicles equipped with conventional brakes.

Power Steering Bind can be described as a condition which presents itself when the vehicle is put through turning movements or lane changes and the throttle is suddenly released or tipped out. The result is a sudden drop in engine RPM which causes the power steering to bind. This greatly increases steering wheel resistance making the steering wheel very difficult to turn.

On the test date, Investigators Cofone and Weinberg arrived with two vehicles that they wished to test. Vehicle #1 was a 1992 Ford Crown Victoria Police car from the Paramus, New Jersey Police Department. Vin # 2FACP72W4NX217326. This car was equipped with conventional brakes. Vehicle #2 was a 1993 Ford Crown Victoria Police car from the Garfield, New Jersey Police Department. Vin # 2FACP71W3PX172576. This car had ABS brakes.

The testing began with me taking Investigator Weinberg through the Attorney General's course in Vehicle #2, the Garfield Unit. After a few familiarization runs, I took the unit through at speed (25-35 mph). The unit first exhibited Deep Pedal Syndrome just before the first U-turn. The unit went too deep into the turn without my control. I continued through the course making my way to the serpentine portion of the course. Midway into the serpentine, I let off the throttle and attempted to make the last two gates. The steering bind condition clearly presented itself and prevented me from making the last gate without hitting a cone. I subsequently asked the two investigators to drive the Garfield Unit in the course. After several runs when their skill levels increased, both men indicated that they each had experienced the conditions in question.

Vehicle #1, the Paramus Unit, was put through the same course under the same conditions. I experienced a low brake pedal in the first U-turn and a pronounced steering bind in the serpentine portion of the course. The investigators were both given opportunities to drive the Paramus Unit through the course. Both indicated that they experienced the power steering bind condition with this unit.

Officer DeProspo subsequently drove the Paramus Unit through the course, Investigator Cofone as a passenger video, taping the reactions of the unit in the course. I sat 100 yards passed the braking lane [illegible] a radar unit monitoring the speed of the Paramus Unit as it traversed the serpentine portion of the course. It was going 22 mph when I asked Officer DeProspo if they had experienced

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the power steering bind. He indicated that he had.

I was next requested to test the response of the Paramus Unit to turning movements at 45 miles per hour with the throttle released or dropped out. I took Investigator Weinberg with me as an observer and drove around to the rear of the property. I brought the unit up to 45 mph. The unit's transmission had shifted into overdrive by the time. I drove into the testing area and made a simulated lane change to the left, to the right, to the left and then attempted to make a hard right turn with no throttle applied. The steering wheel bound up and when I attempted to overcome the resistance, the steering wheel suddenly freed itself. Now with my increased steering input applied, the vehicle oversteered into a right hand slide or yaw. I had to react quickly in an attempt to bring the unit to a controlled stop. This test was repeated with varying results, some of which resulted in severe loss of vehicle control. It should be noted that this condition can almost be induced at will.

The condition may also, I feel, be impacted by the use of a higher rear end ratio. The higher the ratio coupled with activation of the overdrive, may induce this condition at higher speeds. This is the result of the higher ratio allowing for lower engine speeds when the throttle is released.

The above two demonstrations were also performed for several members of the Paramus Police Department, as well as the township mechanic.

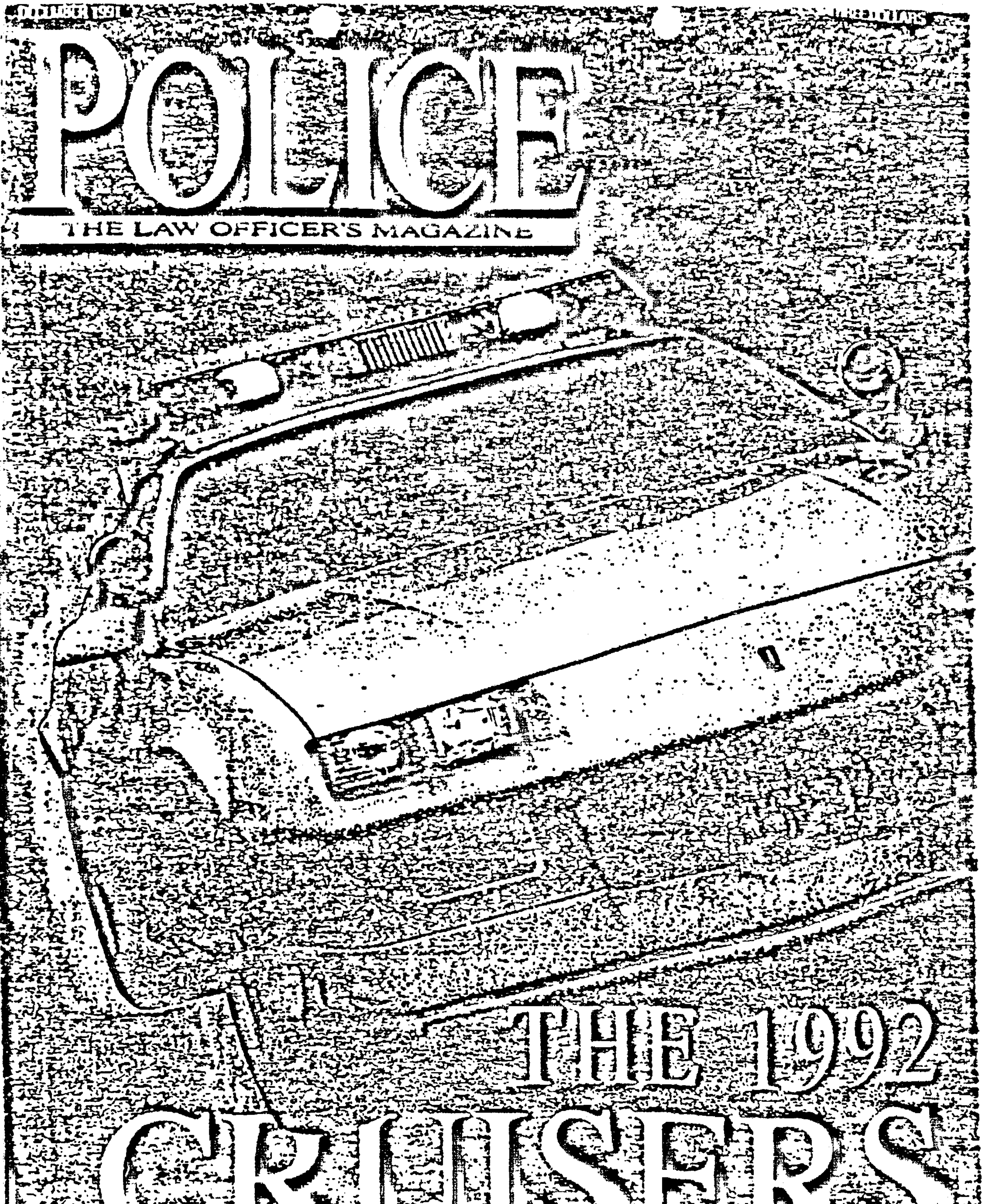
Investigator Cofone at one point asked me to induce a left hand yaw at 30 miles per hour. This test was performed with an activated radar unit (to insure conformed speed), and G-meter mounted to the right inside passenger window. This test was repeated several times with the brakes applied and without. The results of these tests are being interpreted by the investigators.

My impressions after a year of exposure to these vehicles and the testing which took place on the date listed above, are clearly that: The two conditions described above can present themselves during certain driving conditions. It is my opinion, that either one of these may contribute to loss of vehicle control and possible accidents.

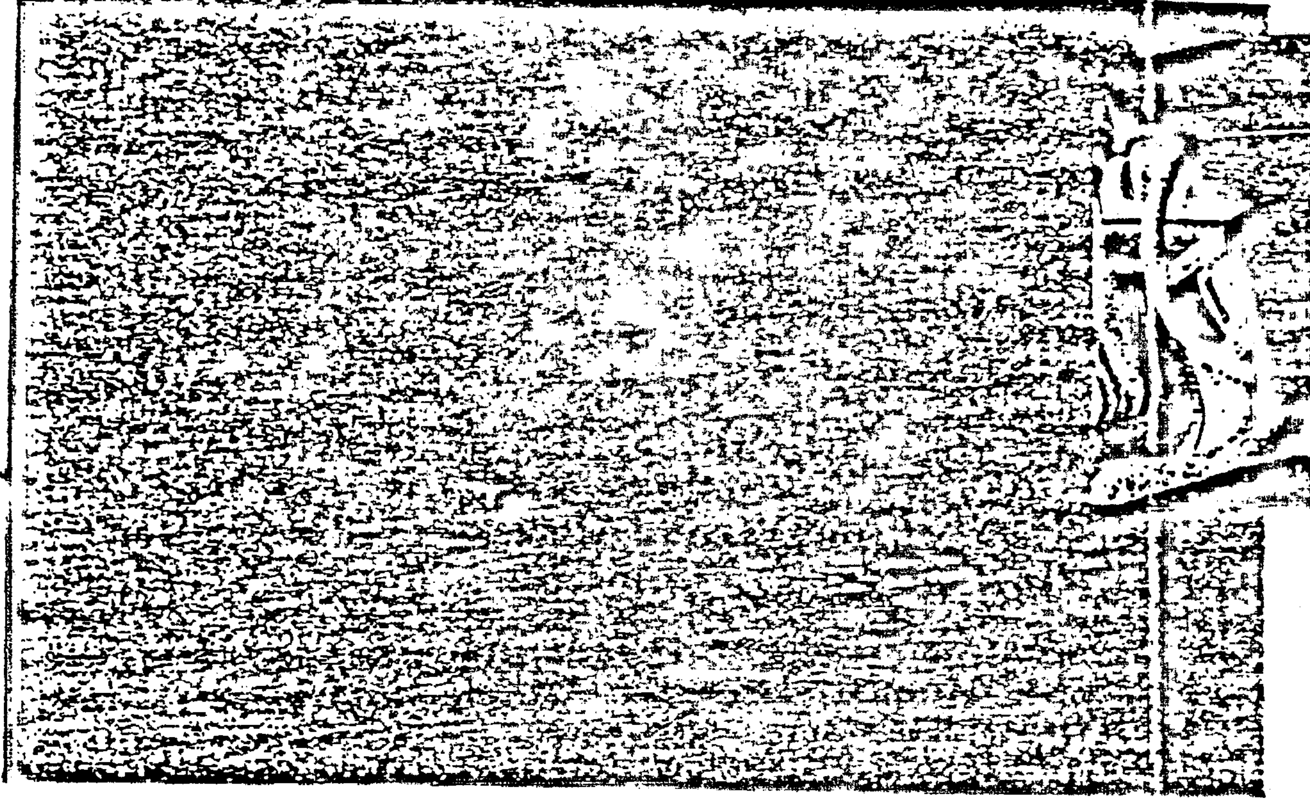
Respectfully submitted,

Sgt. Timothy O'Brien

Sgt. Timothy O'Brien


OCTOBER 1991
POLICE
THE LAW OFFICER'S MAGAZINE
THE 1992
CRUISERS

Police Magazine



FORD LTD CROWN VICTORIA

After a year's absence from the full-size police vehicle market, Ford at last has unveiled their 1992 Crown Victoria police car. Unfortunately, you can look now but you can't buy; the car won't be available until March. Although the Ford fleet engineering people had labored diligently to make a police car available for our evaluation, they were unsuccessful. Only through the generosity of Michigan State Police Lt. Curt VanDenBerg, honcho of the MSP tests, were we able to finally drive the new Crown Victoria at the MSP's new one-mile driving facility in Lansing

Aside from the slicked-up body work, the big news items this year, in order of significance, are the new engine, brakes and drivetrain.

The 4.6-liter, port-injected V-8 is fairly dripping with technology. It is Ford's first single overhead cam V-8 since the short-lived SOHC 427 cammer of the 1960s. High-flow aluminum cylinder heads, roller camshaft and sequential, multi-point fuel injection help it deliver a very high specific output of 210 hp at 4600 rpm and 270 ft. lbs. of torque at 3400 rpm. All this from 281 cubic inches of displacement. (By comparison, the Caprice's base 305 cubic inch motor delivers 170 hp and 270 ft. lbs. of torque.)

A new AOD-E electronic overdrive transmission and 3.27 axle ratio complete the powertrain. The brakes are four wheel discs, a welcomed addition to the standard equipment list. ABS is optional. (The Caprice has standard ABS, but the rear brakes remain heavy-duty drums.)

While the chassis and other mechanicals are largely carry-overs from years past, the handsome new sheetmetal is artfully sculpted to reduce drag. Visibility is good fore and aft with minor rear-quarter blind spots because of the thick B-pillars.

Inside, our test car had front split-bench cloth seats, power windows and tilt wheel. The seats offer no backrest adjustment and are unlikely to provide a comfortable driving position for most officers of average height. A six-way electrically adjustable driver's seat is available in either 40/40 buckets or split-bench configuration and we'd recommend it. A driver's side air bag is standard with a passenger-side bag optional.

On the road, revised suspension calibrations, direct-acting front anti-roll bar linkage and new gas-pressurized shocks combined to deliver a nicely snubbed ride with good directional stability and very high roll stiffness. The damping rates feel higher than in previous models and account for a slight decrease in the plush ride Fords have delivered in the past. But the payoff is in control: the Crown Victoria handles like a car weighing half a ton less.

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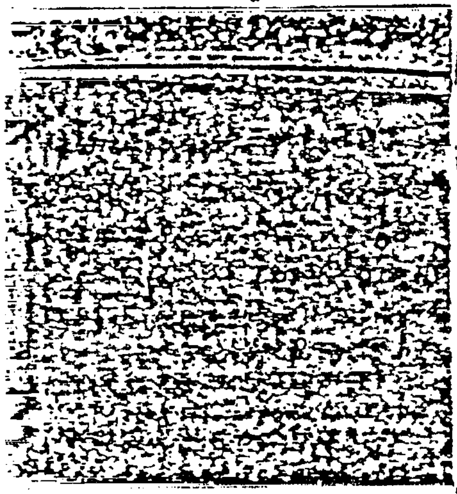


Hammering over the MSP driver training track, the LTD's new four-wheel disc brakes proved powerful, easy to modulate and capable of repeated maximum-G decelerations with zero fade and excellent balance. The speed-sensitive variable-effort steering is quick, accurate and provides acceptable feedback. With its responsive suspension, the LTD turned in well and developed substantial lateral G forces, due in part to the sticky General® all-season tires.

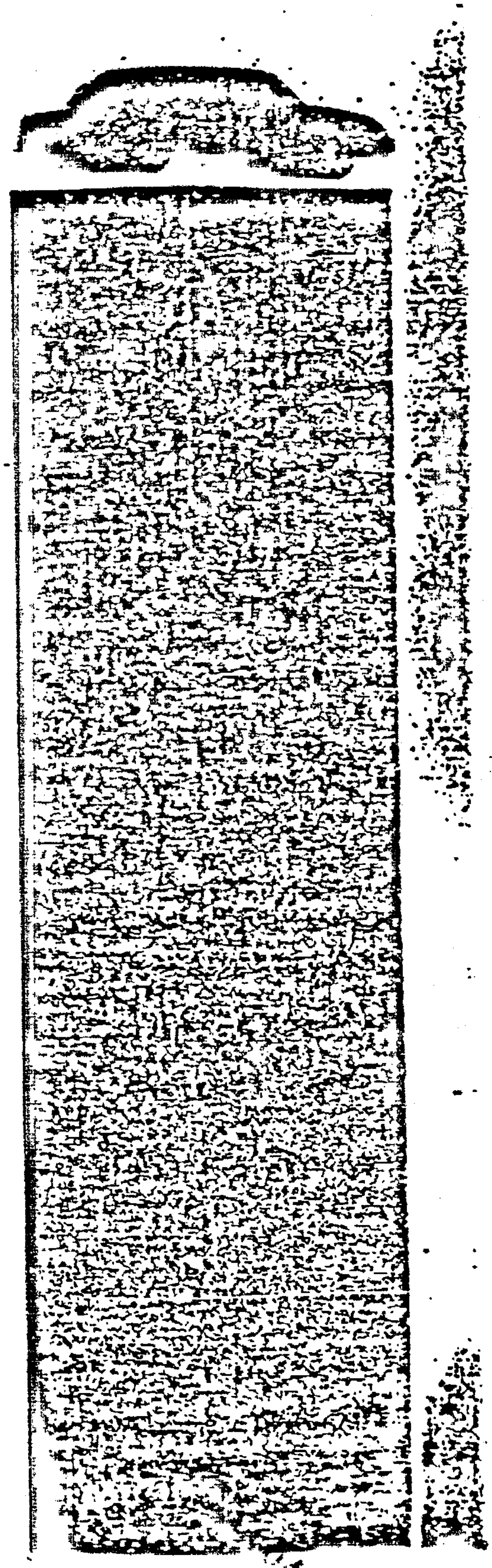
Our enthusiasm was tempered by only one negative: Our test car suffered from noticeable drop-throttle oversteer at all speeds. The first time we braked heavily to enter a medium-speed corner, the tail promptly stepped out and was only caught by throwing in an armful of opposite lock. We experimented at different speeds in other corners with identical results. Lifting slightly in one 75-mph sweeper, the car promptly snapped sideways. Although this could easily be corrected with a burst of power or steering input, the effect was unsettling. An officer of average ability—or worse, a rookie driving this car, particularly in the wet—would very likely stuff it backwards into the scenery without ever knowing what happened. While an experienced driver enjoys the ability to control a car's attitude with the throttle, oversteer for the unskilled or unwary eventually leads to crashes.

To gain a consensus on the car's handling, we quizzed the MSP officers who drove the LTD during the vehicle evaluation testing program. Highly proficient drivers, they all liked the Crown Victoria's responsive handling and powerful brakes. And each agreed the car oversteered.

In conversations with Ford engineering specialists, it became clear that the car was acting properly; Ford said they had deliberately added more rear roll stiffness to make the car neutral in steady-state cornering. They agreed that oversteer was present only during transients when the throttle was lifted but swore that other departments liked it that way. Maybe, but this is the first full-size police car in memory to offer oversteer as standard equipment. Ford says they're continuing to work on the LTD's handling.

The 4.6-liter overhead cam motor pulls strongly at any engine speed, and the new electronic overdrive automatic changes gears almost imperceptibly. We were surprised to find that with the slick new bodywork and advertised 210 horsepower, the Ford attained only 124.1 mph, 9 mph slower than the 5.7-liter Caprice and 4 mph behind the 5.0-liter Chevy. And it lagged behind the 5.7-liter Caprice in acceleration as well, reaching 60 mph in 9.86 seconds and 100 mph in 28.58—roughly one and 2.7 seconds, respectively, behind the Caprice. But its braking performance was exemplary: From 60 mph it averaged a scant 148.4 feet, a full 29 feet shorter than the Caprice.

Minor complaints aside, we liked the Crown Victoria. Ford does have some kinks to work out; until we can test another sample we'll also withhold judgment on whether the hard-working little motor has enough punch to motivate a two-ton cruiser. But with a comfortable, living-room-sized interior, robust construction and well balanced performance portfolio, they have the makings of a fine police vehicle here.



TAPED

TELEPHONE CONVERSATION

OF

TIM O'BRIEN AND PAT VISCAL

PRESENT:
SERGEANT TIM O'BRIEN, PATERSON POLICE DEPARTMENT

PAT VISCAL, FORD MOTOR COMPANY

TRANSCRIBED BY: MARIALYNN RIBAUDO, C.S.R., BERGEN COUNTY PROSECUTOR'S OFFICE

DATE: JANUARY 5, 1994
TIME:
PLACE:

Taped Message: Hello, this is Bill Genta, (Phonetic). I am currently unable to take your call. If you need to speak with me, please leave a message at the tone. However, if you require immediate assistance, please dial 1-800-34-FLEET. You'll find them to be most helpful in addressing your concerns regarding government sales, price concessions, Ford rent-a-car system and other Fleet related matters. Thank you, have a good day.

SGT. O'BRIEN: Bill, this is Tim O'Brien, Sergeant from Paterson. When you get in, can you give me a call back at 881-6840. I want to talk to you about the '94 Ford, thanks.

Taped Message: Welcome to the Ford Fleet Customer Information Center. Please listen to all three options before making your selection. If you are a dealer, please press 1. If you are a Fleet customer, please press 2. If you require VIN code or drop ship code information, please press 4. To reach the Ford Sales

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Division, please press 1. To reach the Lincoln/Mercury Sales Division, please press 2. For a service or parts related question, please press 3.

(Conversation between Colleen (Cust. Ser. Rep.) and Sgt. O'Brien)

C Ford Fleet Service, this is Colleen.

T Hi, Colleen, how are you? My name is Sgt. O'Brien with the Paterson, New Jersey Police.

C Hi, Sgt. O'Brien, how are you?

T Good, thanks. We had a couple questions about the Crown Vic. Police Interceptor. Maybe you can answer them?

C What type of questions?

T About the deep-pedal syndrome that we had experienced with a couple of the cars and the power steering bind that had presented itself.

C Okay. Why don't you try and hold on one moment, okay?

T All right, thanks.

C Thanks.

Okay, Sgt. O'Brien, I'm gonna send you over to Pat Viscal. He's pretty much our resident police expert.

T Okay. What's his name, I'm sorry?

C Pat Viscal.

T Okay.

C Okay, one moment, please.

(Conversation between Pat Viscal and Sgt. O'Brien)

P Good afternoon, this is Pat.

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T Hi Pat, my name's Tim O'Brien, I'm a sergeant with the Paterson, New Jersey, Police.

P Hey Tim, I'm doing fine and you?

T Good, thanks.

P Good.

T In '93, I talked to Bill Genta, we were looking at getting new cars and we looked at the Ford, Crown Vic., and we had experienced a couple problems which he was pretty much aware of. ? One was the deep-pedal syndrome, the car with ABS and also actually they said one without too, had a little problem, and the steering bind, the power steering bind, when you came out of the throttle if you're going through a slalom. Now, he had said to me that they were going to do something with a master cylinder later in the year and try and rectify the first problem. And I was wondering, now we're looking at cars again, and we were wondering how you guys made out or what you found.

P Oh, okay. Yeah, I'm with you here for a second. Yeah, you lost me there for a moment, but that's par for the course with me. Yeah, the deep-pedal I think refers to the Las Vegas Police test procedure, and we did rectify it by going to the Mark 8 master cylinder.

T Okay.

P An inch and a 16th cylinder slightly larger, up to pressures and took care of it. We went all kinds of crazy on that one, ripping our hair out, and evidently ended up with zero real life street reports. ? As in not a real problem

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T Right.

P No issues at all.

T Right.

P And it turns out that, sure, you can make it happen on about I think it was one fifth of the cars that you test.

T Right.

P In other words, two out of ten cars will have this characteristic if you put it through the kind of paces you need to.

T Right.

P And if you ever teach anybody to drive like that, I'll shoot you.

T Right.

P You'd have to have rocks in your head.

T Right.

P Quite literally, even in pursuit--

T Right.

P --you would not be driving like that.

T Right.

P But even though it can happen, you know, that's why--in fact, we went out and did an owner notification program on it.

T Okay.

P So which means that if you bought one of those cars, even though the Federal Highway Traffic Safety Admission--Administration agrees that there's no safety problem, we fix it no charge.

T Right.

P Trying to maintain the image of the car.

T Now, that was for police cars too, that you upgraded them all.

P That's all we did.

T Right.

P Yeah, this was never even close to a retail.

T Right, right.

P It only showed up in police because those are the people that,may I guess, occasionally drive that way.

T Yeah.

P You know, literally you had to go into, and the test track has to be huge. You literally have to go into five at least successive 90 degree turns, no braking at all, anywhere in there.

T Right.

P And, you know, wham, wham, wham, wham. What you're doing is you're slamming the caliper pistons back into their bore--

T Into the cylinder.

P And you're shoving the fluid up into the reservoir.

T Right.

P And it's called caliper--my God, I got a mental blank. You can get it on any disk brake system in the world. It was first discovered early on in a foreign built truck, I can't remember which one.

T Right.

P Caliper knockback, that's what it's called.

T Right.

P Yeah, and before that race cars, they were the first people that really had--kind of found that phenomenon.

T Right, right.

P Yeah, we issued an owner notification program bulletin out on it, God, I want to say August of last year, something like that.

T Right.

P Yeah, that's--that's taken care of. We're still into the steering bind on tip out. We don't know where that ones going just yet. We're gathering information, trying to figure out how big of a problem it is. We don't know yet.

T How did you guys--we noticed that like going through a carpentine, going left, right, come off the throttle and it seemed to just bind up.

P Yeah, momentarily--

T Is that because like the RPM drops down, Pat.

P Yep. We know exactly how to fix it. The question at this point, is--in fact, we did fix it for '94. So if you're thinking about buying '94's, you won't find that.

T Okay.

P The question is can we use the fix for the '92, '93 cars.

T Right, with the new pump or--

P ???????? service I'd fix it. No, it's a processor.

T Yeah.

P We replaced--or I should say recalibrated the idle strategy in the processor.

T Right, so you keep the RPM up.

P You got it.

T Right.

P You got it, yeah, and, you know, that was it. The question is we've changed the car so much electronically between '92, '93, '94 that we are going to have to go through all kinds of stuff to get that fix for the '94 car into the '92 cars.

T Right.

P And if it's a matter of, you know, 15 complaints out of 40,000 cars sold, we may not do it, quite frankly.

T Right.

P May not do it, because for one thing we don't certify the cars as being safe on a test track.

T Right.

P The government doesn't require us to. Big Deal

T Right.

P We tell you and we'll tell the world it's a safe car no matter how you drive it.

T Yeah. But we had--we had the opportunity to drive one and--on the highway, and basically the same thing, just to try to like advance our position on the highway as if we were going to chase somebody or pull over a violator and came off the throttle--as a

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matter of fact the car--what happened was the car came up on the right-hand side and came off the throttle to make a lane change after the car went by and it bound up on the road. close.

P Yeah.

T So that made us a little bit afraid.

P Yeah, you can get it to happen. If you're looking to make it happen you can do it.

T Yeah.

P No question about that.

T Yeah.

P And like I say, we've had about a year now to study this thing and as it turned out it was just exactly what you mentioned.

T Yeah.

P Low idle on tip out.

T What do you call it, tip out?

P Tip out, yeah. Tip in is where you get into the throttle, and tip out is just where you take your foot off the pedal.

T Right, right.

P So...

T What is your position there Dick--a Pat.

P I'm what they call a Fleet Service Analyst. I'm in the customer service general office.

T Right.

P And in this Fleet service support office we have a bunch of assigned police--excuse me, assigned Fleet engineers.

T Right.

P · They call on the major Fleet customers that Ford has. And there's probably 25 major police Fleets that they call on. My job is when they're in a meeting or on vacation or whatever, the assigned police Fleets know that they can call me if there's something--a part they need immediately.

T So you're pretty much aware of what's going on with them.

P I try to be.

T Yeah, yeah.

P I'm not an engineer, but that don't stop me.

T Real good, I appreciate your time.

P Not a problem.

T Thanks very much.

P You bet.

T All right, thanks.

P Bye.

T Bye.

(Whereupon the conversation was terminated.)

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Reconstruction / Report of Investigation:

Case # 92 - 300 - 1172   M.A.A.R.S. # 5490394

SGT. DAVID L. DENNISON #758

STATE OF MARYLAND

MOTOR VEHICLE ACCIDENT REPORT

1 REPORT NO							2 FORM
5490394							1 OF 1

LOCAL AREA CASE NO.	4 ACCIDENT DATE MO DAY YR	5 TIME (MILITARY)	6 DAY OF WEEK	7 REPORT TYPE 1 - TRAFFIC ACCIDENT 2 - NON TRAFFIC ACCIDENT	8 COUNTY	9 TIME NOTIFIED (MILITARY)	10 TIME ARRIVED (MILITARY)
92-300-1172	10 27 92	0006	TUE	1	16	0006	0006

RECONSTRUCTION / REPORT OF INVESTIGATION

LOCATION:

Southbound Baltimore Washington Parkway (MD 0295) approximately 242 feet south of the exit ramp for westbound John Hanson Highway (US 0050), Cheverly, Prince George's County, Maryland

DATE / TIME:

Tuesday
October 27, 1992
0006 hours / 12:06 AM

COLLISION TYPE:

Fixed Object
MAARS Type: 09
Subsequent Events: Fixed Object (09), Fixed Object (09)
Single vehicle
Fatal collision, one fatality no personal injuries

WEATHER:

Partly cloudy, cool, temperature approximately 50^0

ROAD TYPE:

The Baltimore Washington Parkway is a four lane highway divided by a wide grass median. At the collision site, southbound Baltimore Washington Parkway is a two lane roadway bordered by raised asphalt curbs. Lanes were delineated by painted edge lines and a broken center line. North of the collision site there are three southbound lanes. These lanes divide into a "Y" configuration with the right and center lanes forming the exit ramp to westbound John Hanson Highway and the left and center lanes continuing for the southbound Baltimore Washington Parkway. The southbound lanes and the exit ramp are divided by a widening dirt area. At the

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1 INVESTIGATING OFFICER	2 OFFICER ID NO	3 AGENCY	4 INSTALLATION
Sgt. David L. Dennison	758	DA	S.O.D.

5 PATROL AREA	6 DATE	SPECIAL STUDY	8 SUPER APPROVAL	9 ID NO	10 REVIEWER
3-6	11/20/92	N/A			

ROAD TYPE, continued:

collision site the southbound lanes curve slightly to the left with a 2140 foot radius arc. The collision site is basically level and is located at the base of a long downhill grade. Approximately 0.2 miles north of the collision site the Baltimore Washington Parkway curves to the right and immediately after the collision site the roadway curves to the left. The road surface was dry asphalt with a measured coefficient of friction of 0.75. The measured coefficient of friction of the grass median was 0.66. The speed limit was posted at 45 miles per hour. The median area is grass with hardwood trees scattered throughout. There is a wooded area to the west of the Baltimore Washington Parkway and an industrial complex to the east.

IDENTIFICATION:

DRIVER #1:

Roger Peck FLEMING
Prince George's County Police Department
7600 Barlowe Road
Landover, Maryland 20785
W/ (301) 336-8800
Maryland Driver's License # F-455-744-680-369
Fatal injuries

VEHICLE #1:

1992, Ford, Crown Victoria, Maryland Registration-PG0795/ #15, Owner: PRINCE GEORGE'S COUNTY MARYLAND, 9201 Basil Court, Landover, Maryland 20785

5490394
92-300-1172
October 27, 1992

WITNESSES:

WITNESS #1:

Corporal Douglas EASTER #1322
Prince George's County Police Department
7600 Barlowe Road
Landover, Maryland 20785
W/ (301) 336-8800

A written statement was obtained from Witness #1 on November 11, 1992.

Witness #1 was an on-duty police officer. Witness #1 monitored Driver #1's radio transmission regarding the pursuit of a fleeing Honda. Witness #1 joined the pursuit at the Baltimore Washington Parkway and Route 450. Witness #1 stated that as they proceeded south on the Parkway, Driver #1 was approximately 100 to 150 yards ahead of him. Witness #1 stated that as they neared the exit ramp to westbound John Hanson Highway he believes that Vehicle #1 was in the center lane and it appeared as if Driver #1 was going to take the exit ramp. Witness #1 stated that Vehicle #1's brake lights came on and Vehicle #1 appeared to fishtail, skidding from right to left. Witness #1 stated that Vehicle #1 skidded through the right median, across the southbound lanes and into the center median striking a tree. Witness #1 stated that he could not see the suspect's Honda. Witness #1 stated that at no time did he observe Vehicle #1 strike any other vehicles.

WITNESS #2:

Corporal Richard DELABRER #1446
Prince George's County Police Department
7600 Barlowe Road
Landover, Maryland 20785
W/ (301) 336-8800

A written statement was obtained from Witness #2 on October 28, 1992. Witness #2 was interviewed again at the scene of the collision on November 2, 1992.

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WITNESS #2, continued:

Witness #2 was a police officer operating an unmarked police vehicle. Witness #2 monitored Driver #1's radio transmission regarding the pursuit of a fleeing Honda. Witness #2 joined the pursuit on the Baltimore Washington Parkway south of Route 450. Witness #2 stated that as the pursuit approached his location on the Parkway from behind, he accelerated and attempted to gain speed. Witness #2 stated that he observed the suspect Honda approaching. Witness #2 pulled his vehicle to the left and the suspect Honda passed him at a high rate of speed with its lights off. Witness #2 allowed Vehicle #1 to also pass and then followed the pursuit. Near the exit ramp, Witness #2 observed two civilian vehicles ahead of the suspect Honda. One of these vehicles was in lane #1 and the other was in Lane #2. Witness #2 stated that the suspect Honda stayed to the far right of these vehicles as he approached the exit ramp. At the last moment, the suspect turned on his lights and veered to the left to continue south on the Parkway. This forced the civilian vehicle in lane #2 to brake and drift slightly left. Witness #2 stated that Driver #1 was forced to apply his brakes to avoid this civilian vehicle. When Vehicle #1 began to brake, its rear end slid to the left. Witness #2 stated that Vehicle #1 appeared to straighten then its rear end jerked strongly to the right and the collision occurred. Witness #2 stated that at this time he was approximately 1/4 mile behind Vehicle #1. Witness #2 stated that he did not see Vehicle #1 strike any other vehicles.

WITNESS #3:

Washington, D.C.
H/ W/
DOB: 09/21/62

A written statement was obtained from Witness #3 after the collision on October 27, 1992. Witness #3 responded to the office of the Collision Analysis and Reconstruction Unit on November 3, 1992, and a more

WITNESS #3, continued

extensive interview was conducted. Additionally, Witness #3 and this investigator also revisited the collision site on this day.

Witness #3 stated that he was operating his vehicle southbound on the Baltimore Washington Parkway in Lane #1, traveling at 45-50 miles per hour. In the area of the exit ramp for John Hanson Highway, Witness #3 stated that he was passed on the right by what appeared to be a Honda. Witness #3 stated that this Honda appeared to be traveling "well over 100". There was another unknown vehicle traveling in Lane #1 ahead of Witness #3. Witness #3 stated that the Honda grazed the right curb then cut sharply into lane #1 ahead of the vehicle in front. Witness #3 stated that the Honda disappeared around the curve. Witness #3 stated that he slowed down and several seconds later the police cruiser, Vehicle #1, began to pass him on the right. Witness #3 stated that Vehicle #1 ran up onto the right curb and this appeared to cause Driver #1 to lose control. Witness #3 stated that Vehicle #1 spun sideways across the road between he and the unknown vehicle, entered the grass median and struck the tree. Witness #3 stated that the air was filled with smoke, dust, dirt and flying debris. Witness #3 stated that he did not see Vehicle #1 strike or be struck by any other vehicles. Witness #3 did not recall any other vehicles immediately behind him or to his right.

WITNESS #4:

Washington, D.C.
H/
DOB: 03/18/66

A written statement was obtained from Witness #4 after the collision on October 27, 1992. Witness #4 responded to the office of the Collision Analysis and Reconstruction Unit on November 3, 1992, and a more extensive interview was conducted. Additionally, Witness

WITNESS #4, continued

#4 and this investigator also revisited the collision site on this day.

Witness #4 was a front seat passenger in Witness #3's vehicle and stated that they were traveling in the left lane. Witness #4 stated that a dark Honda passed their vehicle at a high rate of speed on the right. Witness #4 estimates the speed of this Honda to be 100 miles per hour. Witness #4 stated that seconds later Vehicle #1 also passed them on the right. Witness #4 stated that Vehicle #1 struck the curb on the right, went out of control, skidded across both lanes, into the median and struck the tree. Witness #4 stated that he did not see the Honda interfere with the travel of Vehicle #1 in any way. Witness #4 did not see Vehicle #1 strike, or be struck by any other vehicles. This witness stated that he believes that the driver of the Honda's last minute decision to go left at the exit ramp contributed to Driver #1's loss of control.

WITNESS #5:

Police Officer D. M. WELLER #1881
Prince George's County Police Department
7600 Barlowe Road
Landover, Maryland 20785
W/ (301) 336-8800

A written statement was obtained from Witness #5 on November 3, 1992.

Witness #5 was an on-duty police officer. Witness #5 monitored Driver #1's radio transmission regarding the pursuit of a fleeing Honda. Witness #5 joined the pursuit on Route 450 at Route 95. Witness #5 followed Vehicle #1 and the suspect vehicle west on Route 450 onto the Baltimore Washington Parkway. Witness #5 stated that as they proceeded south on the Parkway, Driver #1 was approximately 150 to 200 yards ahead. Witness #5 stated that as they proceeded south on the Baltimore Washington Parkway the Honda was weaving in and out of traffic with its lights off at speeds in excess 105 miles per hour.

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WITNESS #5, continued:

Witness #5 stated that the Honda was in the far right lane and appeared to be taking the John Hanson Highway exit. Witness #5 stated that at the last moment the Honda cut to the left in front of another vehicle, through the median and continued south on the Parkway. At this point Witness #5 stated that dirt and dust obscured his view of the collision.

WITNESS #6:

Corporal Trent L. TOLSON #1396
Prince George's County Police Department
7600 Barlowe Road
Landover, Maryland 20785
W/ (301) 336-8800

A written statement was obtained from Witness #6 on November 3, 1992.

Witness #6 was an on-duty police officer. Witness #6 monitored Driver #1's radio transmission regarding the pursuit of a fleeing Honda. Witness #6 observed the Honda traveling west on Route 450 in the right lane in excess of 80 miles per hour with its lights off. Witness #6 followed the pursuit onto the Baltimore Washington Parkway but did not observe the collision.

WITNESS #7:

Police Officer Jeffery SCOTT #1874
Prince George's County Police Department
7600 Barlowe Road
Landover, Maryland 20785
W/ (301) 336-8800

A written statement was obtained from Witness #7 on October 28, 1992.

Witness #7 was an on-duty police officer. Witness #8 monitored Driver #1's radio transmission regarding the pursuit of a fleeing Honda. Witness #6 observed the

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WITNESS #7, continued:

Honda traveling west on Route 450 at a high rate of speed. Witness #7 states that Vehicle #1 was approximately 30 yards behind the Honda at this time. Witness #7 followed the pursuit onto the Baltimore Washington Parkway but did not observe the collision.

WITNESS #8:

Corporal Edward C. BURKE Jr. #673
Prince George's County Police Department
7600 Barlowe Road
Landover, Maryland 20785
W/ (301) 336-8800

A written statement was obtained from Witness #8 on November 3, 1992.

Witness #8 was an on-duty police officer. Witness #8 monitored Driver #1's radio transmission regarding the pursuit of a fleeing Honda. Witness #8 positioned his vehicle, emergency lights activated, in the left turn lane in the 6100 block of Route 450. Witness #8 observed the Honda westbound on Route 450 with its lights off and traveling at approximately 100 miles per hour. Witness #8 stated that Vehicle #1 was approximately 7 to 8 car lengths behind the Honda. Witness #8 followed the pursuit onto the southbound Baltimore Washington Parkway but did not observe the collision.

WITNESS #9:

Lothian, Maryland

Witness #9 phoned the office of the Collision Analysis and Reconstruction Unit on November 2, 1992. A telephone interview was conducted at this time.

WITNESS #9, continued:

Witness #9 stated that she was on Kenilworth Avenue near Route 95. Witness #9 observed a small dark car traveling northbound on Kenilworth Avenue at approximately 100 miles per hour. Witness #9 observed this vehicle exit onto southbound Route 95. Witness #9 stated that she observed a marked police cruiser apparently in pursuit of this vehicle and that this cruiser was about five seconds behind. Witness #9 did not observe the cruiser (Vehicle #1) strike or be struck by any other vehicles.

WITNESS #10:

Arlington, Virginia

A telephone interview of Witness #10 was conducted on November 2, 1992, at 1020 hours.

Witness #10 stated that he was operating a Ryder truck southbound on Route 95 in Lane #2, north of Route 450. Witness #10 stated that he observed a police cruiser's (Vehicle #1) emergency lights in his mirrors. Witness #10 stated that he decided to change lanes to make sure he was out of this cruiser's way. Witness #10 stated that as he changed from Lane #2 to Lane #3 he almost struck a small dark car with no lights on. Witness #10 stated that this car was traveling at over 105 miles per hour. Witness #10 stated that when the dark car passed him the cruiser was 1/4 to 1/2 miles behind. Witness #10 stated that the dark car went around another vehicle and exited Route 95 at westbound Route 450. Witness #10 continued south on Route 95. Witness #10 never saw Vehicle #1 other than in his mirrors.

STATEMENTS:

DRIVER OF THE FLEEING HONDA:

Washington, D.C.
DOB/ 3-20-69

On October 27, 1992, a written statement was obtained from the driver of the fleeing Honda.

stated that in an attempt to flee from and elude a police officer (Driver #1) he traveled at speeds around 80 miles per hour, weaved in and out of traffic, and turned his vehicle's lights off. stated that they were southbound on the Baltimore Washington Parkway toward Washington, D.C. stated that at the split (Ramp to John Hanson Highway), he went around to the right of another car that was in the middle lane. stated that he turned his lights off so that Driver #1 could not tell which way he was going to go. stated that he turned toward Washington, D.C. (back onto the southbound Parkway) but did not go through the dirt area. stated that after that he went around a curve and did not see Vehicle #1 again. stated that his vehicle and Vehicle #1 never made contact at any time during the pursuit.

OCCUPANT #1 OF THE FLEEING HONDA:

Silver Spring, Maryland
DOB/ 11-23-75

On October 27, 1992, a written statement was obtained from Occupant #1 of the fleeing Honda.

stated that he was an occupant of the Honda fleeing from the police officer (Driver #1). stated that was the driver of the Honda.

OCCUPANT #1 OF THE FLEEING HONDA, continued:

stated while attempting to flee, was traveling at speeds over 100 miles per hour, weaving in and out of traffic, and turning his lights off. stated that as driving recklessly. stated that as they approached the "Y", slowed down, then sped up and turned across the median real fast. At this time Vehicle #1 was about five car lengths behind them. stated that Vehicle #1 pursued them across the median. stated that was the last time he saw Vehicle #1. stated that he did not see the collision.

OCCUPANT #2 OF THE FLEEING HONDA:

Upper Marlboro, Maryland
DOB/ 7-25-73

On October 28, 1992, a written statement was obtained from Occupant #2 of the fleeing Honda.

stated that was the driver of the fleeing Honda. stated that was driving at speeds around 90 miles per hour, weaving in and out of traffic, and turning his lights off.

SITE EXAMINATION:

This investigator was notified of this collision at 0014 hours and responded to the scene arriving at 0046 hours. A direct examination of the collision site was initiated immediately upon arrival. The scene had been secured by patrol officers and all traffic had been diverted. An additional examination of the collision site was conducted after sunrise on October 27, 1992, at approximately 0730 hours. Photographs and measurements that accurately depict the collision scene were taken on both occasions. During the direct examinations of the collision site the following observations were made:

SITE EXAMINATION, continued:

* General topographic observations as described in ROAD TYPE.

* Vehicle #1 was located in its position of final rest against a 16 inch diameter oak tree.

* In the area of Vehicle #1 right front there is evidence of fire extinguisher use. A discharged fire extinguisher is located in the grass north of Vehicle #1.

* Four side sliding tire marks from Vehicle #1 lead through the grass median from the edge of southbound Baltimore Washington Parkway directly to the tree.

* Four side sliding tire marks were located across both southbound lanes of the Parkway. These marks continued in line with the sliding tire marks in the median and continued directly to Vehicle #1. The arc of these sliding tire marks remains consistent as they cross both southbound lanes. There is no additional loading or deviation present which would have indicated impact with another vehicle during the slide.

* A very deep gouge, apparently caused by the right rear wheel of Vehicle #1, was located on the median curb.

* There is a dirt area that divides southbound Baltimore Washington Parkway from the exit ramp to westbound John Hanson Highway. This dirt area is eroded from the elements and vehicular traffic. The dirt has eroded away from the outside of the Baltimore Washington Parkway's southbound right curb. This has caused the curb to protrude upward as much as 5 inches, causing a hazard to traffic.

* There is a side sliding mark from Vehicle #1's right rear tire located in the dirt to the outside of the right curb. There are numerous fresh gouges and scrapes along the top surface of this curb from

SITE EXAMINATION, continued:

t.e undercarriage of Vehicle #1 in the same area. There is a tire strike scuff on the outside of the curb at the end of this tire mark.

* There were numerous tire tracks from unknown vehicles located throughout the dirt area.

MEASUREMENTS:

Measurements that accurately depict the collision scene were taken using the coordinate method. A base point was established al g the median curb of southbound Baltimore Washington P way at the southern corner of a storm drain. A ba line was the extended north and south along the edge the median b. All measurements were taken perpendicular to this base line. Measurements are depicted on the DIAGRAM OF ASUREMENT POINTS.

Point A: Base point on curb at storm drain, also location of a large gouge in the curb
Point B: Right front wheel of Vehicle #1
Point C: Right rear wheel of Vehicle #1
Point D: Tire strike on curb
Point E: Tire strikes on curb, front tires' side slide skid marks crossover
Point F: Rear tires' side slide skid marks crossover
Point G: Left rear side slide skid mark begins
Point H: Right rear tire strikes outside of curb
Point I: Right front side slide skid mark begins
Point J: Left front side slide skid mark begins
Point K: Widest point in the arc of the right rear sliding tire mark in the dirt
Point L: Beginning of sliding tire mark in the dirt

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MEASUREMENTS, continued:

Point A to B: South 139'5", East 18'7"
Point A to C: South 132'6", East 17'10"
Point A to D: South 20', on Base Line
Point A to E: North 40'to 50', on Base Line
Point A to F: North 55'8", West 12'
Point A to G: North 123', West 21'
Point A to H: North 140', on right curb
Point A to I: North 157', West 19'6"
Point A to J: North 162', West 15'8"
Point A to K: North 207', West 26'3"
Point A to L: North 249', West 25'

VEHICLE INSPECTION:

Vehicle #1 was examined on the scene of the collision and again on October 27, 1992, during daylight hours at the Prince George's County Police Department s Automotive Service's Lot, Upper Marlboro, Maryland. During this direct inspection of Vehicle #1 the following observations were made:

* Make- Ford
* Model- Crown Victoria
* Year- 1992
* VIN- 2FACP72W7NX209849
* Registration- Maryland PG0795
* Marked Prince George's County Police cruiser #15
* Color- White with blue interior
* Mileage- 9978
* Automatic transmission

* Extreme regression to the entire right side. Initial impact was just to the rear of the right "B" pillar. Entire vehicle is twisted to the right along its longitudinal axis.

* Right portion of the is frame crushed to the left.

* Right front door forced open during rescue operations. Pry marks evident near latching mechanism. Black transference evident on door's

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VEHICLE #1, continued:

exterior.

* Wood fibers and bark are embedded in the right rear door, right "B" pillar and roof.

* Right "A" pillar crushed downward and left.

* Right "C" pillar bent to the left.

* Roof buckled upward, forced to the left and rearward.

* Police emergency light bar torn from roof, wires still attached.

* Contact damage to the right rear fender. Fender is crushed inward, plastic rear bumper is torn on the right rear corner. Blue paint transference is evident across fender. Paint is smeared in a front to rear fashion. Black transference is evident on the lower portion of the fender. On the upper portion of the fender, mixed in the blue paint, there are glass fragments. Additionally, in this same area Vehicle #1's paint is scratched and gouged in a pock marked pattern which is indicative of safety glass impact.
** THIS INDICATES THAT AT SOME POINT VEHICLE #1 WAS INVOLVED IN A COLLISION WITH ANOTHER VEHICLE **

* Induced damage to right front fender.

* Hood forced up and rearward on right side. Evidence of fire extinguisher residue in the engine compartment.

* All windows with the exception of the smaller secondary window on the left rear door are shattered.

* Induced and contact damage across entire windshield. Left side of windshield has been torn outward during rescue operations.

VEHICLE #1, continued:

* Trunk lid has been sprung.

* Induced damage to left rear fender.

* Left rear door is jammed rearward. Window frame was bent outward and down during rescue operations.

* Left front fender is buckled downward above the wheel from induced damage.

* Front bumper is undamaged. Front bumper and head lamp cowl are separated.

* Driver's seat is crushed from the right, forced and twisted to the left.

* Right front seat is crushed, twisted and forced to the left. The cloth fibers of this seat are crushed and torn apparently from impacting Driver #1.

* Driver #1's right shoe wedged into pedal area by floor pan intrusion.

* Police radio assembly torn from vehicle. Federal signals control box torn from vehicle.

* AM/FM radio was on, volume low.

* Heat is on, temperature control set on medium cool, fan set on low.

* Driver's side air bag is deployed.

* Driver's safety belt harness has been cut during rescue operations. Safety belt latch plate is still attached to the latch. DRIVER #1 WAS RESTRAINED BY A SAFETY BELT DURING THE COLLISION.

* Instrument panel is buckled upward in the center.

* Rear seat is completely crushed.

JCCC070

VEHICLE #1, continued:

* Left wheel base measures 10'2", right wheel base measures 8'0".

* Maximum regression to right side measures 41 inches.

* TIRE EXAMINATION:

RIGHT FRONT/
GOODYEAR, EAGLE GT+4, M&S, P225/70R15, tread depth 6/32" to 7/32", 14 psi, dirt, grass and leaves embedded in wheel lip.

LEFT FRONT/
GOODYEAR, EAGLE GT+4, M&S, P225/70R15, tread depth 7/32", 31 psi.

RIGHT REAR/
GOODYEAR, EAGLE GT+4, M&S, P225/70R15, tread depth 7/32", tire is flat, interior sidewall is ripped. Outside wheel lip severely twisted inward with asphalt embedded in the bend. There is a smaller outward bending dent on the outside of the wheel and another on the inside. There is a fourth dent located on the outside of this wheel that appears to be a rotational contact.

LEFT REAR/
GOODYEAR, EAGLE GT+4, M&S, P225/70R15, tread depth 7/32", 31 psi.

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EXAMINATION OF SUSPECT VEHICLE:

The vehicle being pursued by Driver #1 was examined on October 27, 1992, at the Prince George's County Police Department's Evidence Bay. The vehicle was fully photographed and processed at this time. During the examination of this vehicle the following observations were made:

* Make- Honda
* Model- Accord
* Year- 1992
* Color- Black w/ gold pin stripe
* Registration- None displayed
* VIN- 1HGCB7276NA047594 ** FROM FEDERAL SAFETY STICKER **

* There is minor contact damage to the left front corner of the front bumper. Damage appears to be a scraping of the plastic bumper in a front to rear motion. This contact damage is 14 1/2" to 22 1/4" high. There is a brown transference and embedded within this damaged area appears to be creosote wood fibers and a thin green colored transference that is possibly vegetation.

* There is no evidence of any vehicle to vehicle contact.

EVIDENCE ANALYSIS:

In an effort to identify the vehicle that was involved in the collision with Vehicle #1, paint samples from the right rear fender of Vehicle #1 were submitted to the Federal Bureau of Investigation for analysis. As of November 20, 1992, this analysis has not been completed.

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SPEED CALCULATIONS:

The following data was used to determine to minimum speed of Vehicle #1:

> Center of mass side sliding distance on asphalt:
> 112 feet
> Asphalt coefficient of friction: 0.75
>
> Center of mass side sliding distance on grass:
> 152 feet
> Grass coefficient if friction: 0.66

The minimum speed of Vehicle #1 was determined to be 74 miles per hour.

SEQUENCE OF EVENTS:

Driver #1 was an on-duty Prince George's County Police Officer operating a marked police patrol cruiser (Vehicle #1). At the intersection of Kenilworth Avenue and Westchester Park Drive, Driver #1 attempted to initiate a traffic stop on the listed suspect vehicle. The driver of the suspect vehicle, attempted to flee from Driver #1. The pursuit went north on Kenilworth Avenue to southbound Route 95, south on Route 95 to westbound Route 450 (Annapolis Road), west on Route 450 to southbound Baltimore Washington Parkway and south on the Baltimore Washington Parkway. Speeds exceeded 100 miles per hour and the suspect vehicle was weaving in and out of traffic. Several times the suspect, turned off his vehicle's lights.

As the pursuit continued south on the Baltimore Washington Parkway the suspect vehicle initially appeared to be exiting the Parkway at the westbound John Hanson Highway ramp. The suspect vehicle swerved to the left and continued south on the Parkway.

JCC073

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SEQUENCE OF EVENTS, continued:

Just south of the exit ramp, Vehicle #1 struck a raised curb with its right rear wheel. Vehicle #1's right rear wheel went up and over this curb. This caused the frame of Vehicle #1 to drag and gouge the top surface of the curb. Vehicle #1 began rotate counter-clockwise and started sliding to the right. This caused Driver #1 to completely lose control. Vehicle #1 slid down the curb for approximately 109 feet continuing to rotate counter-clockwise. Vehicle #1 came back completely onto the southbound lanes, now sliding sideways to the right. Vehicle #1 crossed both southbound lanes of the Baltimore Washington Parkway and struck the median curb. Vehicle #1 continued over the median curb. Vehicle #1 slid southbound through the grass median and struck an oak tree with its right side. Vehicle #1 came to final rest against this tree and Driver #1 was trapped within the vehicle.

Driver #1 was transported to the Washington Hospital Center's Med Star Unit and pronounced at 0034 hours by Doctor Sykes.

Evidence on Vehicle #1's right rear fender indicates that a collision with another vehicle occurred at some point. The exact location of this collision is unknown. The identity of this vehicle's driver is also unknown. This unknown vehicle failed to stop and remain at the scene of this collision and failed to make any report of the collision. No witnesses observed any contact between Vehicle #1 and any another vehicles. Numerous efforts to identify this hit and run driver have been unsuccessful.

JCC074

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October 27, 1992

CONCLUSIONS:

1. The primary cause of this collision is **ROADWAY DEFECT.** The raised curb was a traffic hazard and caused Vehicle #1 to begin rotating. This in turn caused Driver #1 to completely lose control of his vehicle.

2. Vehicle #1 was involved in a collision with a hit and run vehicle. The contributory factors of this hit and run vehicle have not been determined. The collision with the hit and run vehicle may have caused Driver #1 to initially strike the raised curb.

3. There was no evidence of contact between Vehicle #1 and the fleeing Honda.

CLOSURE:

This case was reviewed with the Office of the State's Attorney on November 10, 1992. This case will remain **OPEN**, pending the identification of the hit and run driver.

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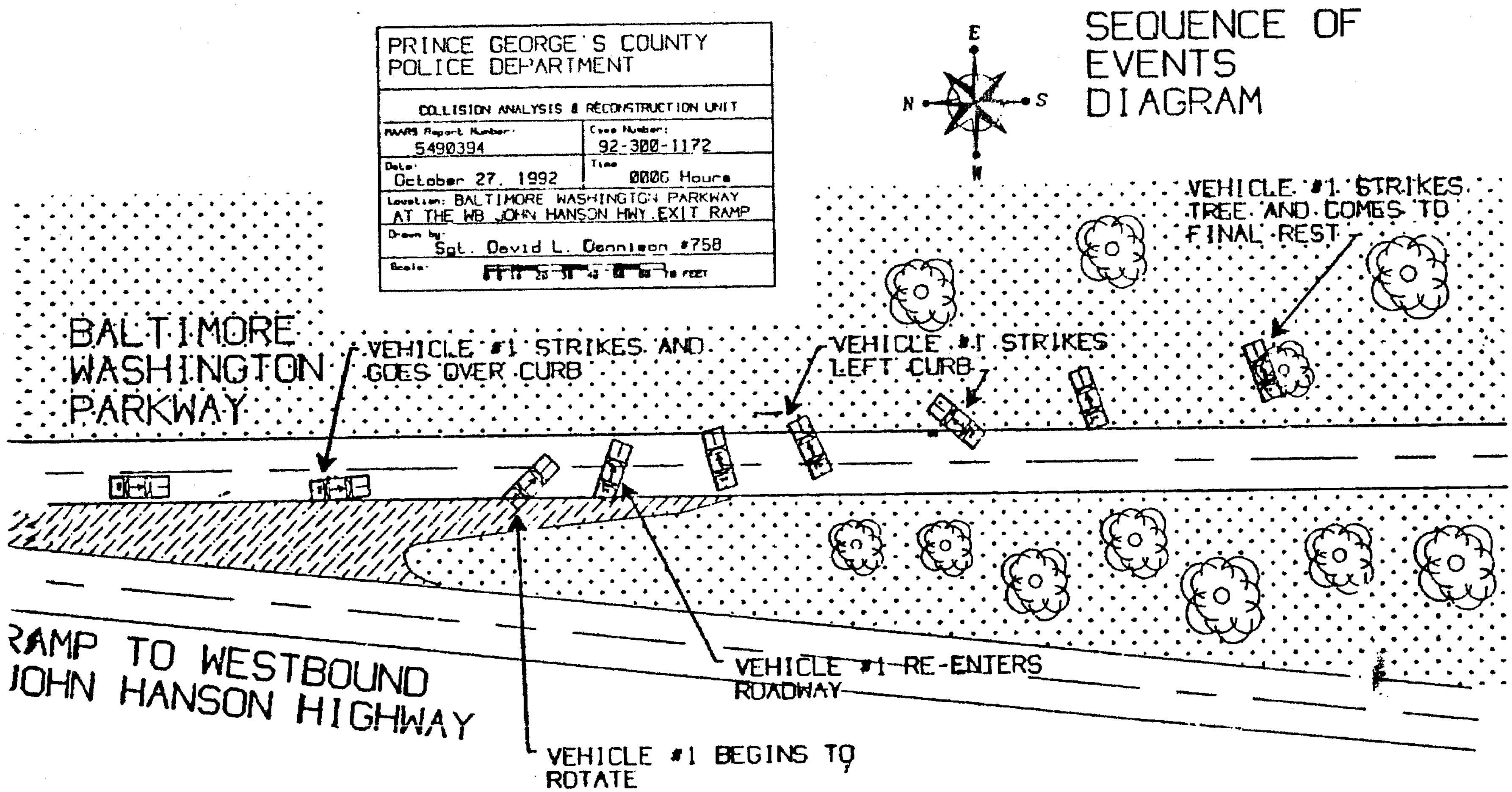
DJC076


SEQUENCE OF EVENTS DIAGRAM
PRINCE GEORGE'S COUNTY POLICE DEPARTMENT
COLLISION ANALYSIS & RECONSTRUCTION UNIT
MAARS Report Number: 5490394
Case Number: 92-300-1172
Date: October 27, 1992
Time: 0006 Hours
Location: BALTIMORE WASHINGTON PARKWAY AT THE WB JOHN HANSON HWY EXIT RAMP
Drawn by: Sgt. David L. Dennison #758
Scale:
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BALTIMORE WASHINGTON PARKWAY
VEHICLE #1 STRIKES AND GOES OVER CURB
VEHICLE #1 STRIKES LEFT CURB
VEHICLE #1 STRIKES TREE AND COMES TO FINAL REST
RAMP TO WESTBOUND JOHN HANSON HIGHWAY
VEHICLE #1 RE-ENTERS ROADWAY
VEHICLE #1 BEGINS TO ROTATE

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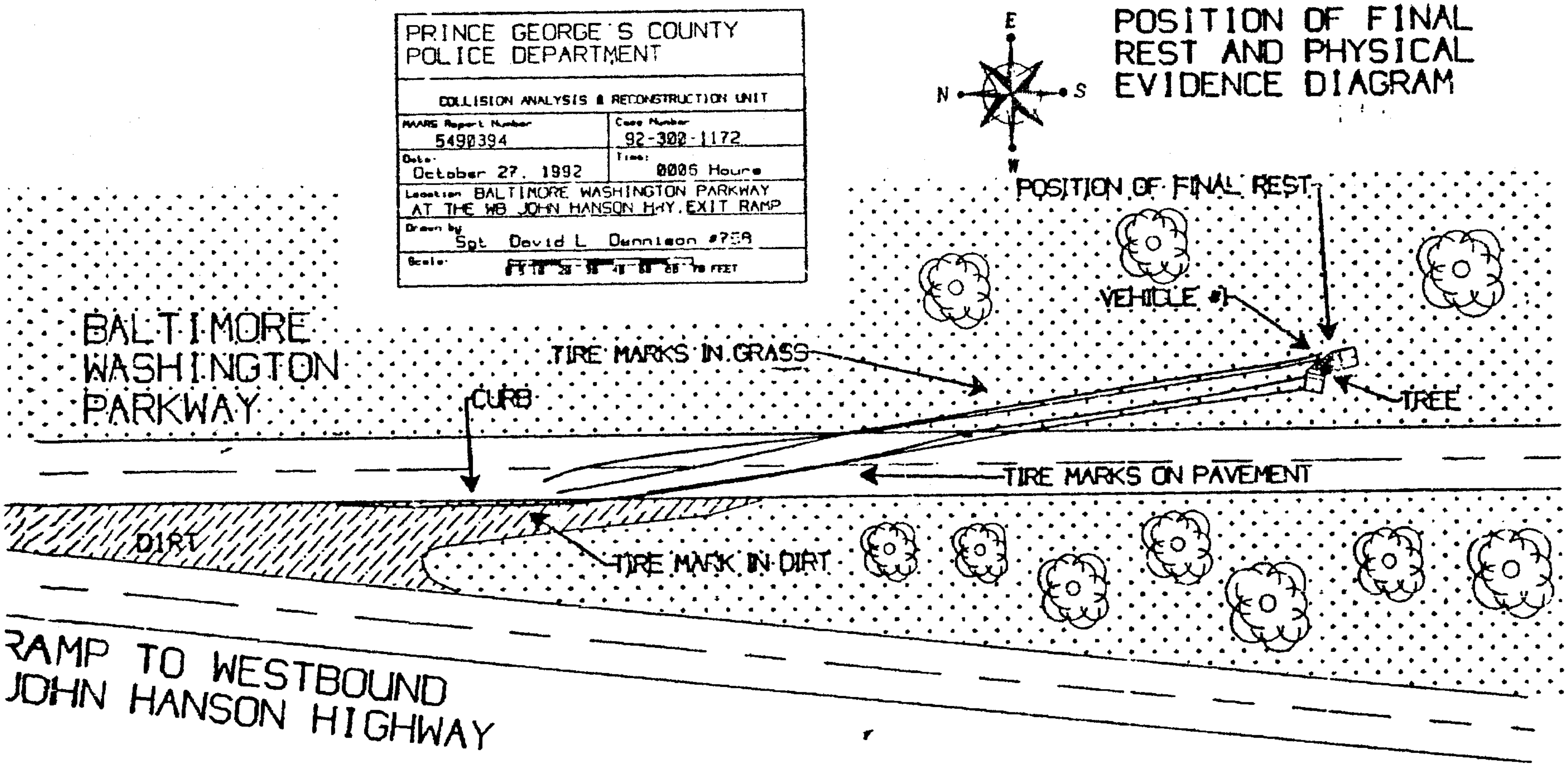
PRINCE GEORGE'S COUNTY
POLICE DEPARTMENT
COLLISION ANALYSIS & RECONSTRUCTION UNIT
MAARS Report Number
5490394
Case Number
92-300-1172
Date:
October 27, 1992
Time:
0006 Hours
Location BALTIMORE WASHINGTON PARKWAY
AT THE WB JOHN HANSON HWY. EXIT RAMP
Drawn by
Sgt David L Dennison #758
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EVIDENCE DIAGRAM
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TIRE MARKS ON PAVEMENT
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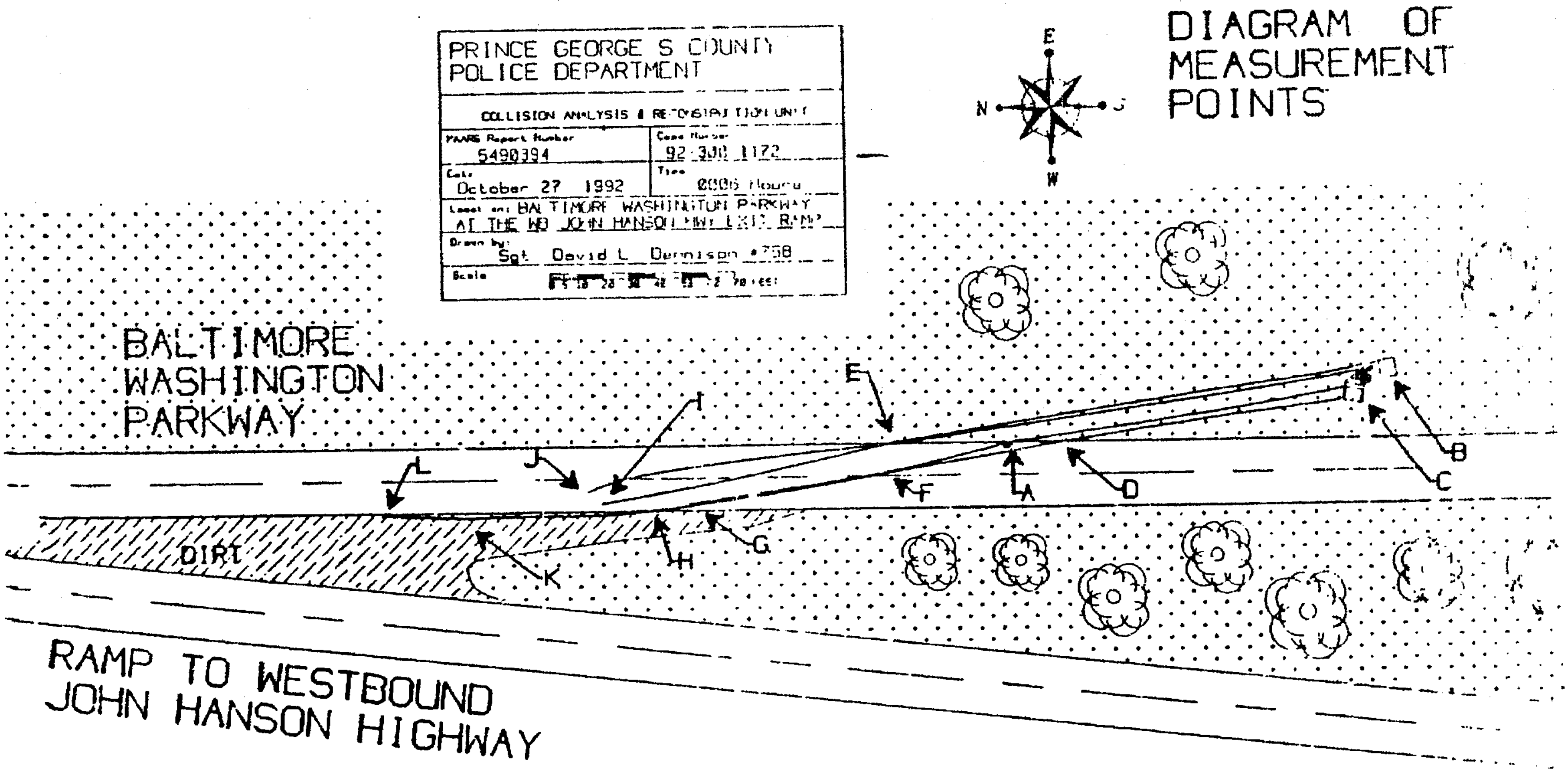
BALTIMORE
WASHINGTON
PARKWAY
RAMP TO WESTBOUND
JOHN HANSON HIGHWAY


PRINCE GEORGE S COUNTY
POLICE DEPARTMENT
COLLISION ANALYSIS & RECONSTRUCTION UNIT
Report Number
5490394
Case Number
92 300 1172
October 27 1992
0006 Hours
BALTIMORE WASHINGTON PARKWAY
AT THE WB JOHN HANSON HWY EXIT RAMP
Drawn by:
Sgt David L Dennison #758
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MEASUREMENT
POINTS
BALTIMORE
WASHINGTON
PARKWAY
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RAMP TO WESTBOUND
JOHN HANSON HIGHWAY
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State of Maryland Motor Vehicle Accident Report

REPORT NO	PAGE OF	ACCIDENT DATE	ACCIDENT TIME	REPORT TYPE	RESEARCH	LOCAL CASE NUMBER	PHOTOS
06277151	1, 10	02, 28, 94	2156 hrs.	☒ FATAL ☐ INJURY ☐ PDO ☐ HIT & RUN ☐ NON-TRAFFIC		94-039-1008	☐ NO ☒ YES
INVESTIGATING OFFICER ID		**AGENCY AND AREA**	**SUPERVISING OFFICER ID**	**REVIEWER ID#**		**CODE AND NAME OF MUNIC**	**COUNTY**
#758 Sgt. D. Dennison		DA, G-6				1,3,4 Seat Pleasant	16

RECONSTRUCTION / REPORT OF INVESTIGATION

LOCATION:

Martin Luther King Jr. Highway (MD 0704) approximately 286 feet west of Greig Street (MU 0160), Seat Pleasant, Prince George's County, Maryland

DATE / TIME:

February 28, 1994
2156 hours / 9:56 P.M.
Monday

TYPE OF COLLISION:

Fixed Object Struck
MAARS Type - 09
Subsequent Events, Fixed object struck, Fixed object struck, Overturned.
MAARS Type - 09, 09, 11
Fatal collision
One fatality, no personal injuries

WEATHER:

Partly cloudy, temperature approximately 30°

ROAD TYPE:

Martin Luther King Highway at the collision site is a six lane highway with three lanes each traveling east and west, divided by a raised concrete and grass median. This collision occurred completely on the westbound side of Martin Luther King Highway. The roadway is bordered on the right by a concrete curb. Travel lanes are delineated by painted broken white lines. The road surface is dry asphalt with a measured coefficient of friction of 0.81. The speed limit is posted at [illegible] miles per hour. The roadway is artificially illuminated with street lights. [illegible] Street intersects Martin Luther King Highway from the north [illegible] of the collision [illegible] traffic [illegible] Martin Luther King Highway from Greig Street is controlled by a stop sign. [illegible] Greig Street, Martin Luther King Highway curves to the north and there is a [illegible] running parallel to the westbound lanes. The [illegible] between [illegible] Martin Luther King Highway and Greig Street is [illegible] the curve [illegible] garden style apartments [illegible] Martin Luther King Highway.

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06277151
94-059-1008
February 28, 1994
Sgt. David L. Dennison #758

IDENTIFICATION:

DRIVER #1:

John Louis BAGILEO
7600 Barlowe Road
Landover, Maryland 20785
W/ (301) 336-8800
DOB/ 08-21-67
Maryland Driver's License # B-240-429-549-653
Fatal injuries

NEXT OF KIN:

Wife of Driver #1
Mrs. Bagileo was notified of Driver #1's death on February 28, 1994

VEHICLE #1:

1993, Ford, Crown Victoria, Maryland registration- PG1187, owned by PRINCE GEORGE'S COUNTY MARYLAND, 425 Brightseat Road, Landover, Maryland 20785.

OWNER OF FIXED OBJECTS STRUCK:

CURB (undamaged):

MARYLAND STATE HIGHWAY ADMINISTRATION

FIRE HYDRANT (destroyed):

WASHINGTON SUBURBAN SANITARY COMMISSION

UTILITY POLE (destroyed):

POTOMAC ELECTRIC POWER COMPANY, pole #827388 5238

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06277151
94-059-1008
February 28, 1994
Sgt. David L. Dennison #758

WITNESSES:

WITNESS #1:

Landover, Maryland

DOB/ 01-21-70

View of Witness # 1

A written statement was obtained from Witness #1 at her home on March 2, 1994 by Corporal Steven Markley #1134.

Witness #1 stated that she was on Greig Street and stopped at the intersection of Martin Luther King Highway. Witness #1 intended to turn left and proceed eastbound. Witness #1 stated that she checked for traffic both ways on Martin Luther King Highway and it was clear. Witness #1 stated that she started across westbound Martin Luther King Highway when she noticed a police car (Vehicle #1) westbound with its emergency lights and siren on. Witness #1 places Vehicle #1 in Lane #2 at this time. Witness #1 stated that she stopped in the slow lane, Lane #3. Witness #1 stated that Vehicle #1 changed lanes and started to slide sideways. Witness #1 stated that Vehicle #1 struck the median curb then slid across all lanes of Martin Luther King Highway. Witness #1 states that after Vehicle #1 struck the pole she went to her home and called the police.

WITNESS #2:

Seat Pleasant, Maryland

DOB/ 08-14-66

A written statement was obtained from Witness #2 at his place of employment on March 2, 1994

Witness #2 states that he was stopped on Greig Street at Martin Luther King Highway with one car in front of him (WITNESS #1). Witness #2 states that he intended to turn right and proceed west on Martin Luther King Highway. Witness #2 states that he observed the car in

JJC091

WITNESSES (continued):

front of him start forward into Martin Luther King Highway. Witness #2 states that this vehicle's brakes lights went off for 2 to 3 seconds and that this vehicle moved forward 1 to 2 feet. Witness #2 states that when the police car went past them the other car was approximately 7 feet into Lane #3. Witness #2 stated that Vehicle #1 was in Lane #2. Witness #2 stated that Vehicle #1 had its emergency lights and siren activated. Witness #2 stated that after Vehicle #1 went past him it struck the pole. Witness #2 believes that Driver #1's reaction to Witness #1's vehicle caused Driver #1 to lose control and strike the pole.

WITNESS #3:

Fort Washington, Maryland

DOB/ 10-23-5..

Witness #3 was interviewed by telephone on March 2, 1994 at 1025 hours

Witness #3 states that he was eastbound on Martin Luther King Highway and approximately 100 yards west of the collision site. Witness #3 states that he could [illegible] see oncoming westbound traffic. Witness #3 states that suddenly Vehicle #1's emergency lights came on. Witness #3 states that when the emergency lights came on Vehicle #1 appeared to be out of control. "The car seemed to be twirling". Witness #3 watched Vehicle #1 strike the utility pole and stated that for a few moments the emergency lights continued to turn. Witness #3 describes hearing a "click" then a "boom" and Vehicle #1 started to burn slowly. Witness #3 stated that at the speed Vehicle #3 was traveling, the emergency lights should have been on sooner. Witness #3 did not see any other vehicles interfere with Vehicle #1's driver prior to the collision

WITNESS #4:

Gaithersburg, Maryland

DOB/ 09 15 6.

A written [illegible] from Witness #4 on the scene of the [illegible]

JC 683

Witness #4 was in a parking lot on George Palmer Court. Witness #4 stated that he heard the skidding of tires and saw Vehicle #1 strike the utility pole. Witness #4 states that the emergency lights of Vehicle #1 were still on after the impact.

WITNESS #5:

Lynchburg, Virginia

DOB/ 08-05-57

A written statement was obtained from Witness #5 on the scene of the collision.

Witness #5 states that he was eastbound on Martin Luther King Highway approaching the point of the collision. Witness #5 places Vehicle #1 westbound in Lane #2. Witness #5 states that Vehicle #1 immediately "jetted" into the pole after its emergency lights came on. Witness #5 describes the movement of Vehicle #1 as "{Vehicle #1} seemed to turn into the direction with a sharp jerk and accelerated into the light post". Witness #5 stated that he did not observe any other vehicles interfere with the travel of Vehicle #1.

SITE EXAMINATION:

Vehicle # 1 - Final Rest

This investigator was notified of this collision at 2206 hours and responded from his residence to the scene of the collision, arriving at 2234 hours. The collision scene had been secured by Patrol Officers and all traffic had been diverted. Photographs and video were taken at this time. Measurements that accurately depict the scene were taken by Corporal P. R. Burley and Corporal R. B. Ratcliffe at this time. The locations of items of importance to this investigation were marked with optic orange spray paint for future reference and analysis. The scene was examined again on March 1, 1994 during daylight hours. Although a heavy snowfall had begun, additional photographs were taken at this time. During the direct examination of this collision site the following observations were made:

* General topographic observations as described in ROAD TYPE.

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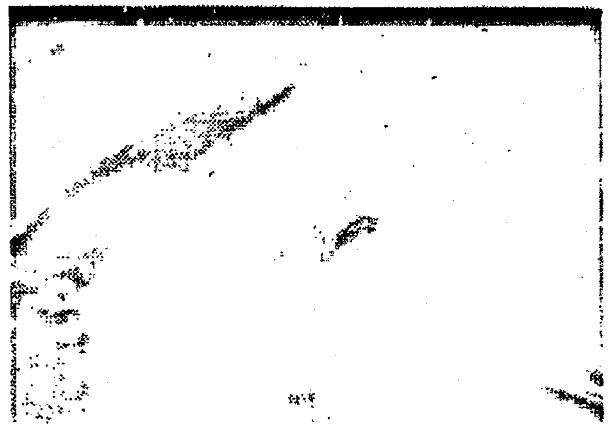
* Vehicle #1 was in its position of final rest, off of the northern road edge, facing west, lying partially on its left side and with the utility pole fully embedded from left to right into the occupant compartment. The Fire Department was on the scene and fire suppression efforts were underway. Driver #1, deceased, remained trapped within the vehicle.



Collision Scene

* P.E.P.C.O. pole #827388-5238 had been struck by Vehicle #1 This was a 45 foot Class 2 utility pole. Attached to this pole were electric and telephone wires, three transformers and a street light. This pole was fractured at the base and again approximately 20 feet above the ground. Several electric wires had fallen to the ground. Two telephone cables had broken locse from the pole and had fallen onto Vehicle #1. This pole had been burned by the vehicle and re-ignited several times.

* A fire hydrant had been struck by Vehicle #1 and broken at its base. A large quantity of water was flowing from this hydrant.

* A critical scuff yaw mark from Vehicle #1 started in Lane #1, within the intersection of Greig Street. As this yaw continued westbound, arcing toward the right road edge, marks from all four tires could be observed. This critical scuff yaw eventually becomes a four wheel side slide and continues to Vehicle #1's impact with the right curb.

* A tire scuff on the right curb indicated the initial point of impact of Vehicle #1.

MEASUREMENTS:

Measurements of the collision scene were taken using the coordinate method. A base point was established on the northern curb perpendicular to P.E.P.C.O. Pole #827388-6751. This base line was then extended east and west along the northern edge of the center island. All measurements were taken perpendicular to this base line. Measurements are depicted on DIAGRAM OF MEASUREMENT POINTS.

Point A: Base point
Point B: Yaw marks begin from left wheels of Vehicle #1

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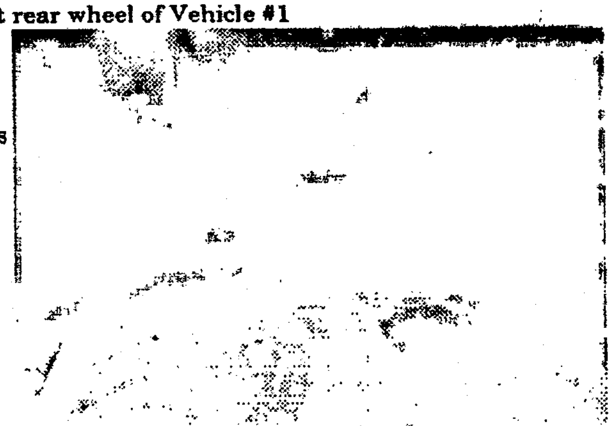


Collision Scene

Point C: Yaw mark begins from right rear wheel of Vehicle #1
Point D: Side sliding tire mark begins from right front wheel of Vehicle #1
Point E: First crossover of tire marks of Vehicle #1
Point F: Tire scuff on curb
Point G: Tire scuff on curb
Point H: Left rear wheel of Vehicle #1
Point I: Left front wheel of Vehicle #1
Point J: Fire hydrant
Point K: P E.P.C.O. pole #827388-5238
Point A to B: East 137'0" , North 5'3" & North 5'10"
Point A to C: East 100'0' , North 8'11"
Point A to D: East 33'6" , North 13'0"
Point A to E: East 10'7' , North 20'0"
Point A to F: West 91'4" , On curb
Point A to G: West 104'0", On curb
Point A to H: West 173' , North 41'5"
Point A to I: West 179' , North 46'6"
Point A to J: West 160' , North 35'6"
Point A to K: West 176'6" , North 45 3"

VEHICLE EXAMINATION:

VEHICLE #1:

Vehicle # 1 - Examination

A cursory examination of Vehicle #1 was conducted on the scene of the collision. An in-depth examination of Vehicle #1 was conducted on March 1, 1994, at the Prince George's County Police Department's Automotive Services Lot, Upper Marlboro, Maryland. Additional daylight photographs of Vehicle #1 were taken at this time. During this direct examination of Vehicle #1 the following observations were made:

DCC085

* Make: Ford
* Model: Crown Victoria, 4 door
* Year: 1993
* Registration: Maryland/ PG1187
* VIN: 2FACP71W9PX188474
* Color: White, marked uniformed police cruiser #631
* Mileage: Unknown,
* Automatic transmission

* Extreme regression on left side. Entire vehicle is bent in a "V" shape from left to right and downward in the center.

* The entire vehicle has suffered severe fire damage.

* Left front door is crushed downward and rearward.

* Left rear door is crushed behind the driver's door and forced rearward.

* There is contact damage to the left rear fender from impact with the fire hydrant.
* The rear portion of the differential housing has been torn open from impact with the fire hydrant.

* The trunk has sprung open and there is evidence of contact damage to the underside of the lid from falling wires.

* There is a cylindrical indentation to the top of the right rear fender from the impact of the falling wires.

* The roof was removed by the Fire Department during the extrication of Driver #1. The roof had been crushed downward and into the occupant compartment.

* Induced damage is evident on the right front fender.

* Both right doors are forced outward at the B pillar. The upper portion of the window frames are bent downward.

* Fuel filler cap has been burned off.

* Front bumper is twisted but exhibits no contact damage.

* Rear tires have been destroyed by fire.

* The interior of the vehicle has been destroyed by fire. The driver's seat back is in contact with the back of the rear seat.

* Driver's seat belt latching mechanism was located. The seat belt latch is not connected. Driver #1 was not restrained by a seat belt.

* The transmission housing was broken open during impact with the pole and several large holes are apparent.

* Gas tank has been crushed, there are no apparent holes or rips in the tank.

* All steering components were checked and appear intact.

* Left front tire is intact, 34 PSI, 8/32" tread. There is a rotational scratch on the lip of the wheel.

* Left rear wheel is bent inward from curb impact.

CALCULATIONS:

The following data was used to determine the speed of Vehicle #1.

Cord of critical speed yaw: 100 feet
Middle ordinate of critical speed yaw: 1 foot, 4 1/2 inches
Coefficient of friction: 0.81
Radius of yaw: 909 feet

The speed of Vehicle #1 was determined to be 104 miles per hour.

SEQUENCE OF EVENTS:

Driver #1 was an on-duty Prince George's County police officer operating Vehicle #1, a marked police cruiser. Driver #1 was responding to the complaint of a tampering with an automobile at 4700 Mann Street, Seat Pleasant, Maryland (CCN 94-059-1008). Vehicle #1 was westbound on Martin Luther King Jr. Highway in Lane #2 or Lane #1. Witness #1 was stopped on Greig Street at Martin Luther King Highway, intending to turn left and proceed eastbound. As Driver #1 approached the intersection of Greig Street, he apparently activated his emergency lights and siren. Witness #1 had just started into the intersection when she observed Vehicle #1 approaching. Witness #1 stopped within Lane #3. Vehicle #1 was in Lane #1 as it passed through the intersection of Greig Street. Driver #1 apparently swerved to the left fearing that Witness #1 was not stopping. Driver #1 lost control of the vehicle and yawed to the right. Vehicle #1 struck the right curb. Vehicle #1 continued over the curb and struck a fire hydrant with its left rear fender. Vehicle #1 sheared off the fire hydrant, continued westbound and started to overturn. Vehicle #1 struck P.E.P.C.O. Pole #827388-5238 with its left side and roof. Impact with the pole caused two heavy telephone cables to break loose and fall onto Vehicle #1.

JCC087

Vehicle #1 came to final rest, facing westbound and laying on its left side still in contact with the pole. Vehicle #1 began to burn and eventually became completely engulfed in flames. Driver #1, deceased, remained trapped within the vehicle. Medical Examiner, Dr. Devore responded to the scene and pronounced Driver #1 dead at 2335 hours.

CONCLUSIONS:

1. Vehicle #1 was traveling at a speed that was too great for the road and traffic conditions.

2. Driver #1 apparently lost control after reacting to the approach of another vehicle (Witness #1).

3. Driver #1 was not restrained by a seat belt.

CLOSURE:

This case will be closed as UNFOUNDED, pending review of the State's Attorney's Office for Prince George's County.

JCC088

94-059-1008
February 28, 1994
Martin Luther
King Jr. Hgwy.

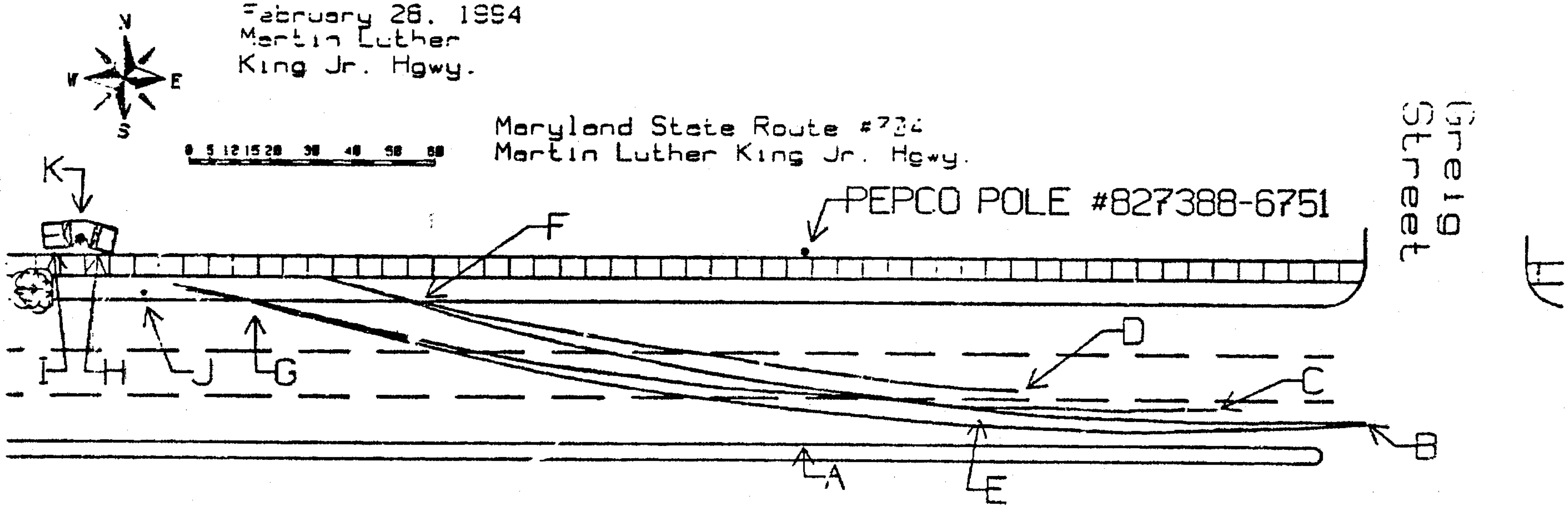
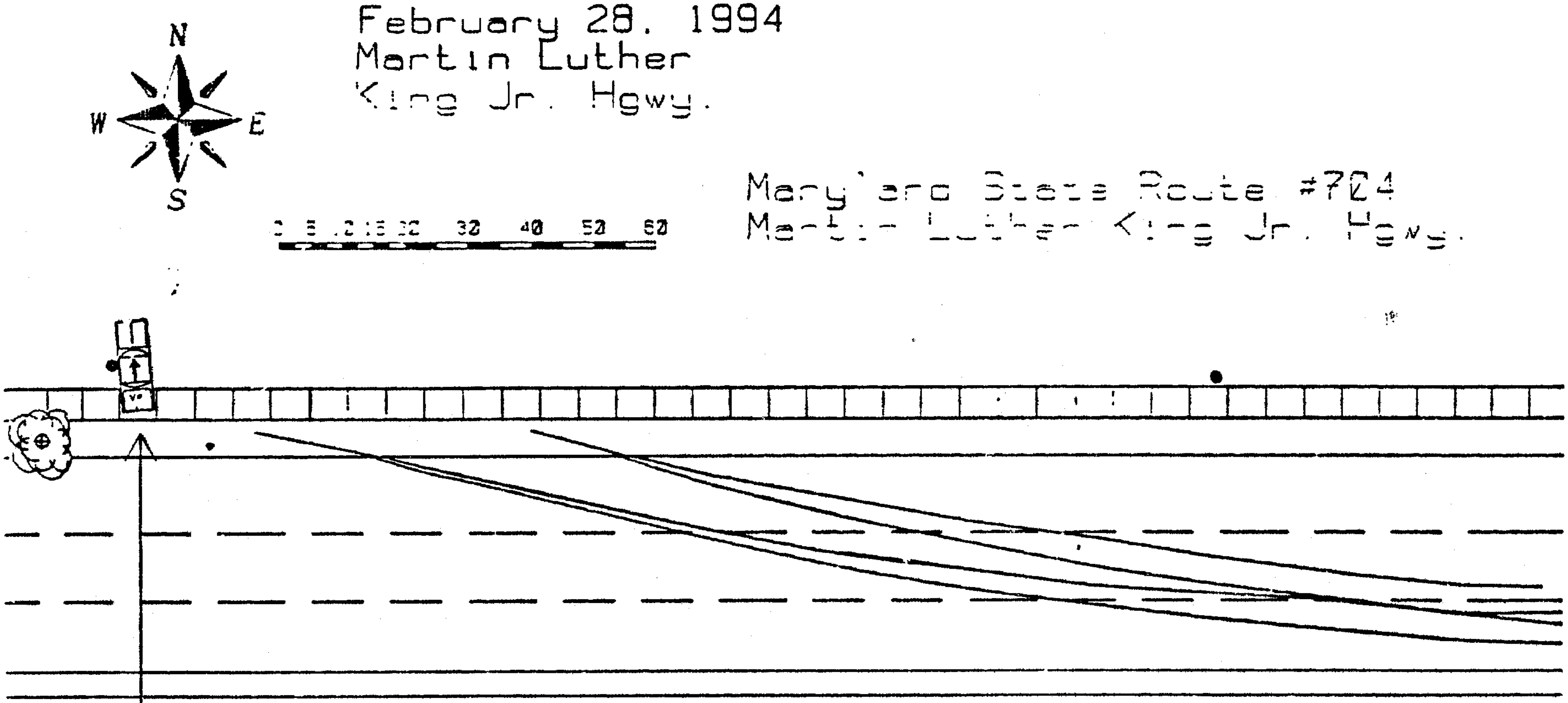


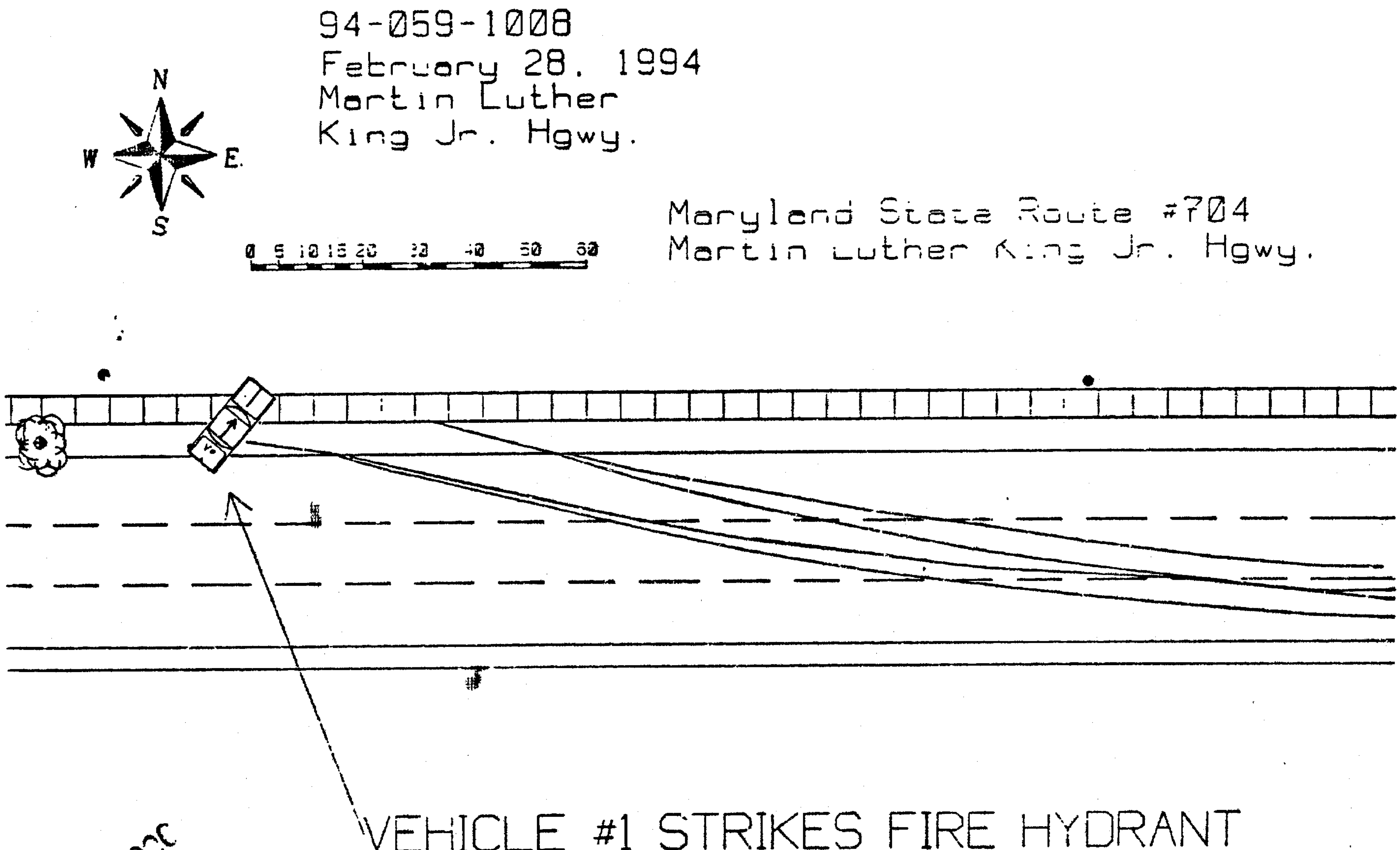
DIAGRAM OF MEASUREMENT POINTS

DC 0089

94-059-1008
February 28, 1994
Martin Luther
King Jr. Hgwy.



VEHICLE #1 STARTS TO OVERTURN
AND STRIKES PEPCO POLE


94-059-1008
February 28, 1994
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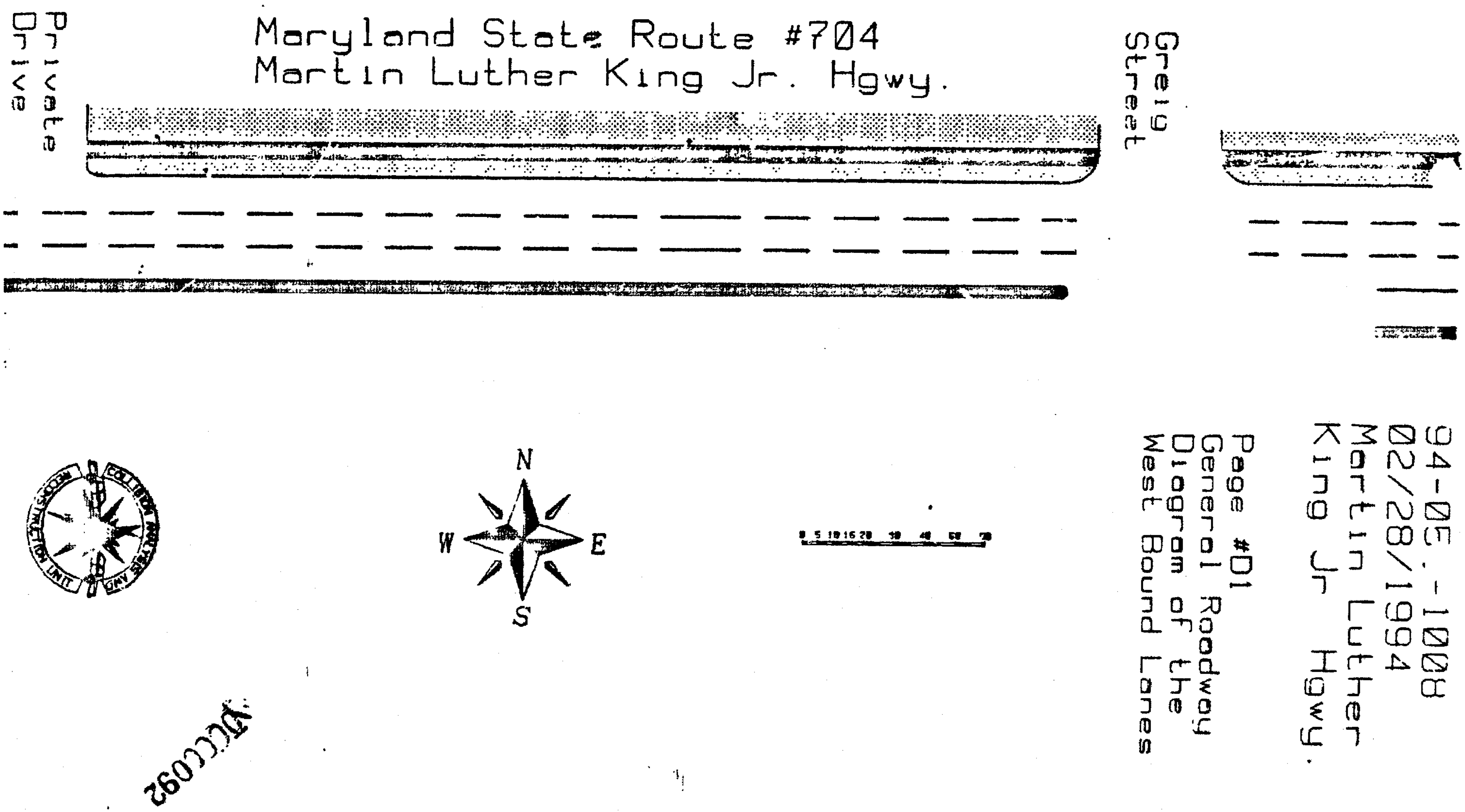
Maryland State Route #704
Martin Luther King Jr. Hgwy.
VEHICLE #1 STRIKES FIRE HYDRANT



Private Drive
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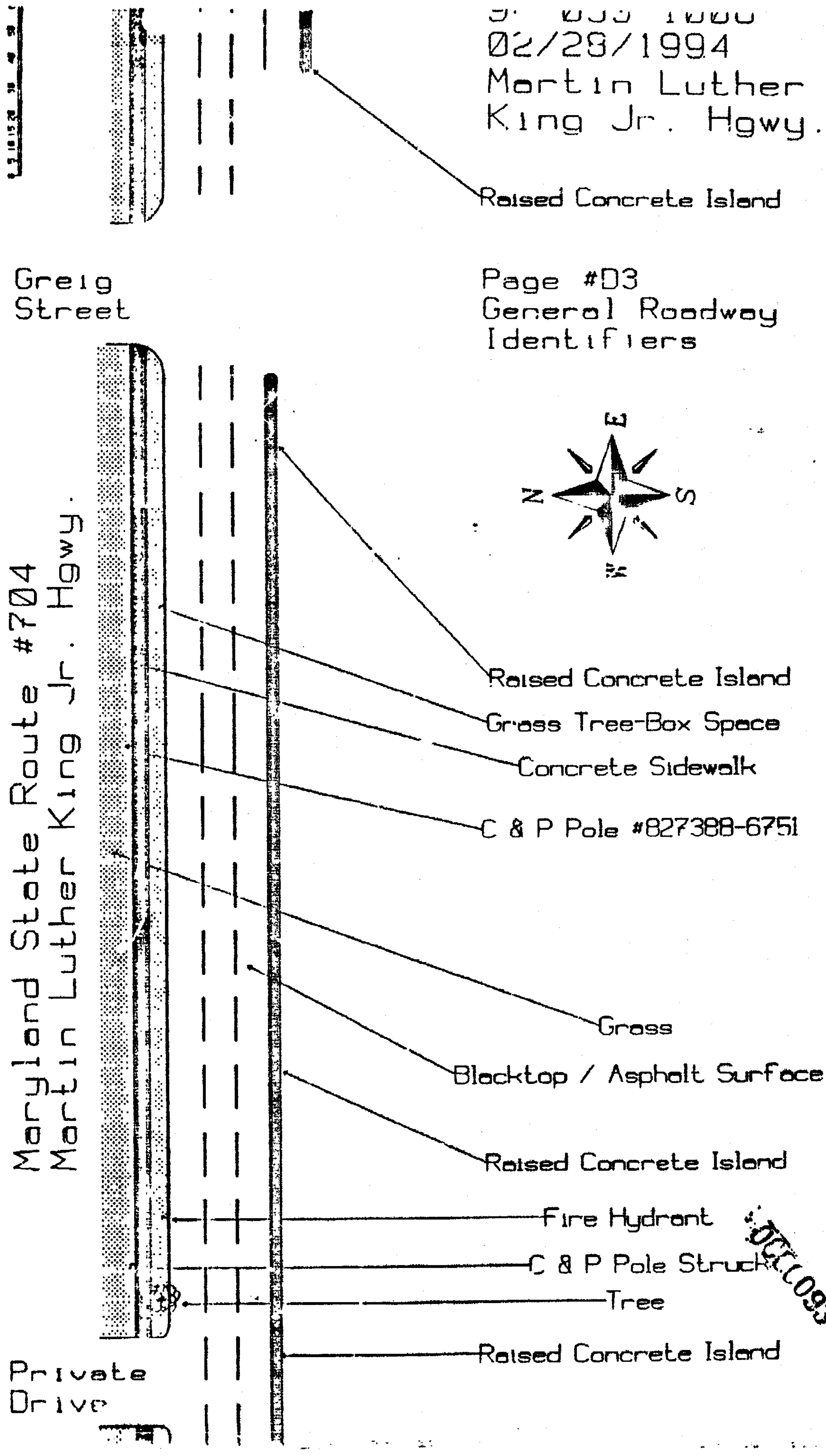
94-05.-1008
02/28/1994
Martin Luther King Jr Hgwy.
Page #D1
General Roadway Diagram of the West Bound Lanes
DCC0092

02/28/1994
Martin Luther
King Jr. Hgwy.

Page #D3
General Roadway
Identifiers



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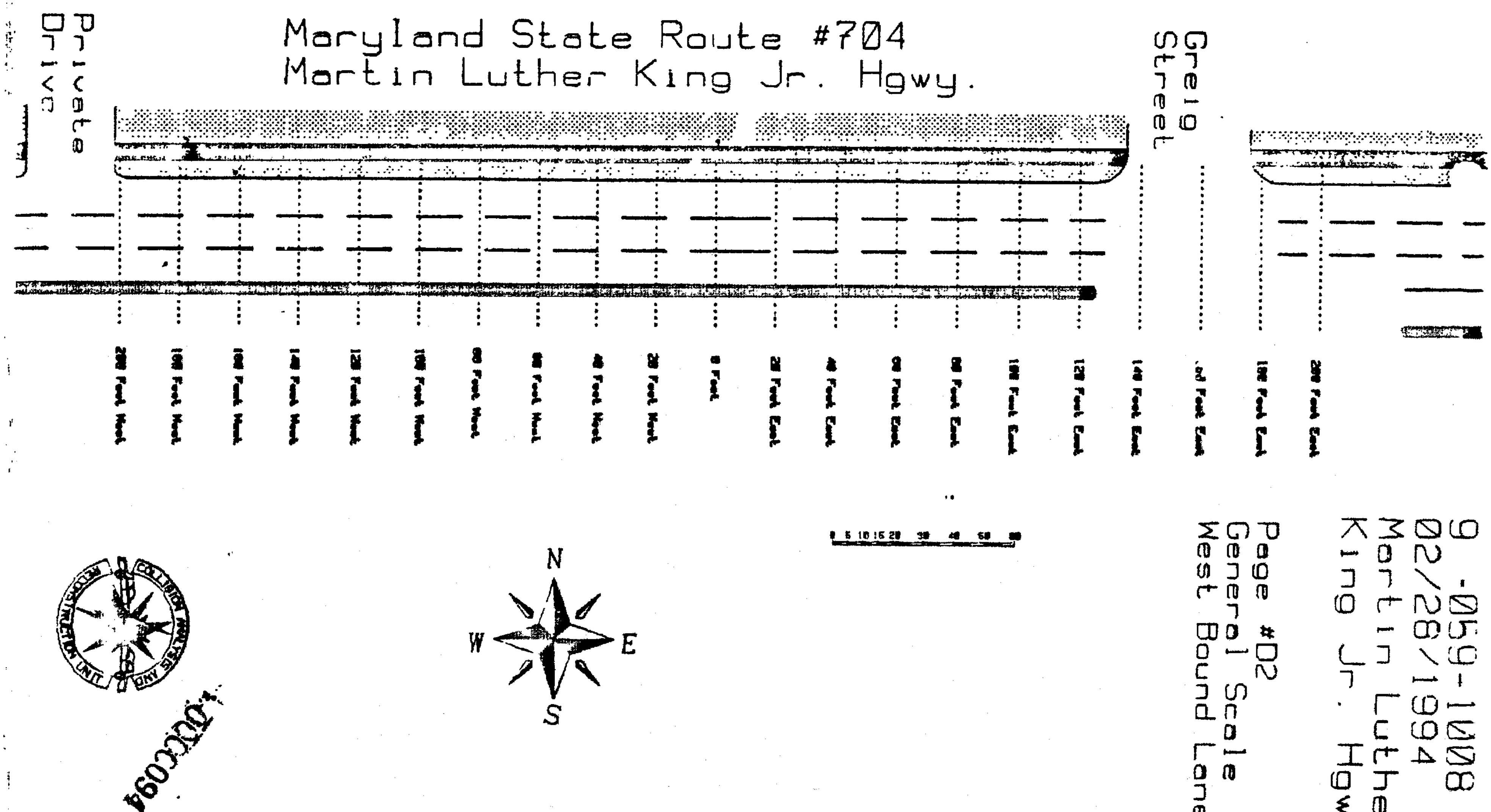


9-059-1008
02/28/1994
Martin Luther
King Jr. Hgwy.

Page #D2
General Scale
West Bound Lanes

SENT BY:Xerox Telecopier 7021 ; 6-30-94 ; 12:22 ; 12016463357→ # 1

Office of the County Prosecutor

County of Bergen
HACKENSACK, NEW JERSEY 07601
(201) 646-2300

John J. Fahy
Prosecutor

Frank Puccio
First Assistant Prosecutor

Michael J. Tobin
Chief of Investigators

FACSIMILE TRANSMISSION COVERSHEET

DATE: 6-30-94

TO: LEE STRICKLAND

FAX NUMBER: 202-366-1767

FROM: SR INV CERONE

SUBJECT: SUPPLEMENTAL REPORT - FORD CROWN VICS

There will be 9 pages following this sheet.

COMMENTS: AS PER E.A.P. ROBERT HENNESSEY

NOTE: If you do not receive the total number of pages indicated, please contact (201) 646-2300.

FAX NUMBER: (201) 646-3794

DOCL095

BERGEN COUNTY PROSECUTOR'S OFFICE

REPORT OF INVESTIGATION PAGE#1 OF 9

CASE TITLE: IN THE MATTER OF VINCENT BROCK CASE#:93-87

INVESTIGATOR: SR.INV. J. COFONE SQUAD:FAIU DATE:May 9, 1994

OTHER INVESTIGATORS:

REPORT RE: SUPPLEMENTAL REPORT

After a review of the nineteen complaints forwarded by Ford it was determined that I contact each police agency in order to confirm the reports. I learned that 18 of the 19 complaints originated from police or sheriff's departments. One complaint was generated from a police package vehicle belonging to a Ford distributor in Teterboro NJ. Other phone calls were received pertaining to the investigation. They are also documented. The police agencies contacted as part of the original 19 complaints received by Ford are indicated by an asterisk *.

PRINCE GEORGE COUNTY POLICE DEPT

On April 12, 1994 I received a phone call from Corporal Patrick Burley of the Prince Georges County Police Collision Analysis and Reconstruction Unit in Maryland. He said he received the package citing our experience with the Ford Crown Victoria. This information apparently ignited their interest. Cpl Burley informed me of two fatal collisions his department investigated that involved a 1992 and 1993 Ford Crown Victoria police car. One collision occurred in October of 1992 and the second collision occurred in February of 1994. A police officer was killed in each collision. Cpl Burley connected me to Sgt David Dennison who investigated the collisions.

Sgt Dennison told me that both collisions involved high speed and steering maneuvers. Following the 1992 collision he received a special service message # 7736 dated 12/18/92 from Douglas Meyers, a police mechanic for the Maryland National Capital Park Police citing a steering problem with the 1992 Ford Crown Victoria police car. After receiving this notice Sgt Dennison contacted Ford Motor Co for the purpose of examining the vehicle involved in the crash. Ford sent engineer Chuck Adams and attorney Donald Sharpe of Piper, Marberry of Baltimore MD. Sgt Dennison said that Ford found no problems with the vehicle. The case was subsequently closed. The 1994 case was also closed.

*READING PA PD

On April 21, 1994 I spoke to Chief Susseman from the Reading PA PD regarding a problem Ford Motor Co claims his PD reported

JCC 0096

regarding a high steering effort required after hard braking. The vehicle for which the problem was reported is a 1992 Ford Crown Victoria VIN # 2FACP72WXNX217606. The chief put me in touch with Reading Maintenance Supervisor George Fultz. Mr Fultz checked his records and found no report of such a problem. According to Ford's CQIS Detail Report dated February 15, 1993 the above vehicle was taken to Manderbach Ford in Temple PA with a complaint of Interim lack of power steering assist.

MARICOPA COUNTY AZ SHERIFF DEPT

On April 21,1994 I called Det Tim Lockwood of the Maricopa County, AZ Sheriff's Dept Accident Investigation Division. He told me of two recent collisions he is investigating involving Crown Victoria police cars where the involved officers claimed that a problem with the steering caused the collision. Both of these collisions occurred prior to any knowledge of our experience with the Crown Victorias. According to Sgt Luginbuhl to whom I also spoke, it was our information that prompted a reexamination of the events of these collisions. Both officers were injured in the crashes. Det Lockwood said he will forward copies of pertinent reports.

***KENTUCKY STATE POLICE**

On April 21,1994 I spoke to Trp Earl Gorrell of the Kentucky State Police regarding reported problems with a 1992 Ford Crown Victoria police car VIN # 2FACP72W6NX234581. Trp Gorrell told me that he experienced steering problems with his 1992 Ford Crown Victoria police car. He said the problem started gradually. He claims he experienced the problem while driving on a long left hand curve during which time he would briefly sense a loss of power steering. The trooper said the steering condition was more pronounced at lower speeds requiring both hands. He found by accelerating the vehicle power steering assist would be restored. After reporting the problem Trooper Gorrell was ordered to take the vehicle to Layne Bros Ford a local dealer. An inquiry by the local dealer to Ford disclosed that a problem did indeed exist with the vehicle. The car was subsequently taken to KSP Supply Division in Frankfurt. Since the vehicle was still under warranty it was taken to Crossroads Ford in Frankfurt. Ford requested that the vehicle not be driven. Trooper Gorrell said he heard that Ford sent a factory representative to examine the vehicle. Trooper Gorrell told me the vehicle was out of service for about a month. Since receiving the vehicle the trooper noticed that the problem still existed at lower speeds only.

***GLENCOE MN PD**

On April 21, 1994 I spoke to Chief Aldape of the Glencoe,MN Police Department inquiring as to any problems his department may have had with their 1992 Ford Crown Victoria VIN # 2FACP72W2NX207538. The chief said he would have his Maintenance Officer contact me. PO Jess Paluck called me later in the day to report that other than burning some power steering fluid during

JUCC097

maneuvering at a driving school he knew of no other problem his department has had with the Ford Crown Victorias. A Ford CQIS Detail Report indicates that on October 7, 1993 the above vehicle was taken to Glencoe Ford-Mercury because of a complaint of lack of power steering at stops.

MALVERN NY PD

On April 21, 1994 I received a telephone call from PO John Intermore of the Malvern NY PD. He told me of his involvement in a collision while driving a 1992 Ford Crown Victoria police car. Officer Intermore said he was in a pursuit and proceeded into a left curve. As he did so he came off the accelerator and applied the brakes. He claimed the vehicle went out of control and the steering locked on the vehicle. His car was equipped with ABS. PO Intermore said as a result of injuries sustained in the crash he was out of work for a year. The officer did not know if the vehicle was examined for any mechanical problems. He said he would forward copies of reports of his collision.

*THUNDERBOLT GA PD

On April 21,1994 I called Chief Whelden of the Thunderbolt GA Police Department. I inquired as to problems his department may have had with their 1993 Ford Crown Victoria VIN # 2FACP71W7PX127687. He said he did not recall any problems, but would check. If he discovered anything he would call me. According to Ford CQIS Detail Report dated December 29, 1992 the above vehicle was taken to Brent Walker Ford in Glennville G with a complaint of lack of power steering assist at idle.

*TOM GREEN CO TX SHERIFF'S DEPT

On April 25, 1994 I telephoned the Tom Green County TX Sheriff's Department and spoke to Sgt James Manning. Sgt Manning was assigned to a 1992 Ford Crown Victoria police car VIN # 2FACP72WXNX214539 in which he experienced a temporary loss of power steering assist. He said the problem was initially noticeable at low RPM's and aggressively got worse. Sgt Manning recalled experiencing the problem at speeds as high as 85 MPH. He told me the vehicle was taken to a nearby dealer where the power steering pump was replaced. He said the dealer was aware of problem. The problem however still persists.

*IOLA KS POLICE DEPT

On April 25,1994 I spoke to Chief Rex Taylor of the Iola KS PD and discussed his department's experience with their 1992 Ford Crown Victoria police car VIN # 2FACP72SNX203168. The Chief told me that some of his officers have noted a lack of steering response during braking at high speed. It was his understanding that nothing mechanically could be done to remedy the problem. He said he will contact me if he determines any further information regarding this condition in his vehicles.

JCC098

NYC EMS

On April 25, 1994 I received a telephone call from Alfred Improta, Supervising Supervisor of Auto Mechanics for NYC EMS. He told me that his department has a problem with the temporary loss of power steering assist on a 1992 Ford Crown Victoria equipped with the fleet package. The problem appears to manifest itself at normal speeds and in right turns only. He said he was able to duplicate the problem in the shop by placing the running vehicle into park and then quickly turning the steering wheel from side to side. Although his shop is authorized by Ford to perform warranty work, he is not sure how to correct the condition. He has removed the vehicle from service until he can determine if the condition is an isolated occurrence or a fleet wide condition.

*COPPERAS COVE TX POLICE DEPT

On April 25, 1994 I spoke with Captain Tim Molnes of the Copperas Cove TX Police Department. I asked the captain about any problems his department experienced with their 1992 or 1993 Ford Crown Victoria police car VIN # 2FACP72W1NX233998. He told me his department had one 1992 Ford Crown Victoria which under both normal and pursuit speeds would develop a temporary loss of approximately two seconds in the power steering assist. He learned of the problem from a patrol officer. The vehicle was taken to Schnorrenberg Ford in Gatesville Tx where it remained for about three weeks. The captain placed me in contact with John Pilgrim, Fleet Supervisor, for the city of Copperas Cove. Mr Pilgrim told me it took at least three occasions to remedy the problem. He said that he heard a factory representative from Ford visited the dealer to examine the vehicle. He also told me that since the car has been returned and placed back in service there has been no further complaint of the condition. Nor has there been a similar complaint with the 1993 Crown Victoria.

*ALMA WI POLICE DEPT

On April 25, 1994 I spoke to Chief Becker of the Alma WI Police Department. We discussed problems his department had with their 1992 Ford Crown Victoria VIN # 2FACP71W8PX136995. The chief mentioned a temporary loss of power steering assist at low speeds while the vehicle was decelerating. He ordered the vehicle taken to the local Ford dealership. He mentioned that Ford tried several times to remedy the condition but were unsuccessful. He was advised by Ford that the problem might be related to the engine rpms. After several communications with Ford the chief eventually spoke with a representative named Wayne Jefferies. Ford eventually agreed to replace the vehicle with a 1994 model at a nominal cost. The chief also told me his dealings with Ford were well documented. He said he will send a package of information regarding his dealings in this regard.

OCC099

*AMES IA POLICE DEPT

On April 25, 1994 I spoke to Sgt Campbell of the Ames IA Police Department and discussed his department's experience with their 1992 Ford Crown Victoria VIN # 2FACP72W6NX203783. Sgt Campbell referred me to Capt Snider of his department. Capt Snider told me that under highway speeds where heavy braking is engaged a temporary loss of power steering occurs. He told me of a personal experience he had in this regard during a high speed pursuit. He said that when he applied acceleration to the vehicle the power steering assist was restored. The affected vehicle was taken to a local Ford dealer where it was inspected but nothing could be done to correct the condition. The captain told me he became aware from the Ford dealer that Ford was aware of the condition in their vehicles since at least August of 1993. The vehicle has since been placed back into service. Patrol personnel have been made aware of the condition in the vehicle.

*HALF MOON BAY CA POLICE DEPT

On April 26, 1994 I spoke to Sgt Guy Reimche of the Half Moon Bay, CA Police Department. He owns and operates a 1992 Ford Crown Victoria police car VIN # 2FACP72W3NX234229, that he leases to his department. Sgt Reimche told me about a problem he had with the steering of the vehicle whereby steering would be temporarily lost during deceleration at moderate and high speed. The problem became progressively worse. He first noticed the problem shortly after he placed the car into service. The sergeant said that the steering would return if he accelerated the vehicle. The vehicle was taken to James Ford, a local dealer. The dealership service manager, Bob Ferris, told Sgt Reimche that according to the manufacturer there was no fix for the problem. The dealer did however replace the rack and pinion steering and fluid reservoir. The sergeant reports no further recurrence of the problem since the replacement of these components.

*WONDER LAKE IL POLICE DEPT

On April 27, 1994 I spoke to Ptl Dennis Leo of the Wonder Lake, IL Police Department. Officer Leo is the vehicle maintenance officer for his department. He is also employed part time as a service manager with Grant Mitchell Lincoln Mercury of Mc Henry IL. We discussed his department's experience with their 1993 Ford Crown Victoria police car VIN # 2FACP71W9PX163753. The officer told me that he experienced a temporary lack of steerability when at a stop with the 1993 Crown Victoria police car he drives. He claims the problem was resolved after replacement of the steering gear box.

*SNOHOMISH CO WA SHERIFF'S DEPT

On April 27, 1994 I spoke to Inspector Tutor of the Snohomish Co Sheriff's Dept regarding his department's experience with their 1993 Ford Crown Victoria police car VIN # 2FACP71W5PX145671. He told me that one of the officers assigned to their EVOC unit brought a steering condition to the

JCC0100

department's attention whereby a temporary loss of power steering assist occurred during braking. The vehicle was taken to a local dealer since it was still under warranty. He was not aware of what the dealer did or did not do to remedy the problem. According to Ford CQIS Detailed Report dated November 5, 1993 indicates that this vehicle was taken to Bickford Ford in Snohomish. Evidently there were no repairs done to the vehicle although a "ZR" may have known of a repair.

*BEEVILLE TX POLICE DEPT

On April 27, 1994 I spoke to Assistant Chief Carl Schrier of the Beeville TX Police Dept regarding a reported steering problem with the department's 1993 Ford Crown Victoria police car VIN # 2FACP71W7PX136812. The assistant chief said he was aware of no problem but would call back if he discovered any information. According to Ford CQIS Detailed Report dated May 3, 1993 the above vehicle was taken to Dave Moore Ford - Mercury in Beeville with a complaint of loss of power steering assist at stops.

*HAMILTON OH POLICE DEPT

On April 28, 1994 I spoke to Dan Winland, Fleet Maintenance Supervisor for the Hamilton OH PD. Mr Winland told me patrol officers alerted him to a problem with the power steering of one of his department's 1992 Ford Crown Victoria police car VIN # 2FACP72W2NX215817. Officers complained that the steering occasionally became difficult under normal driving conditions when executing right turns. Mr Winland said he initially changed the power steering fluid. After a second complaint the power steering pump was replaced. Evidently this still did not alleviate the condition so the vehicle was taken to a local Ford dealer. There was nothing the dealer could do to correct the condition. Mr Winland said he tried to replicate the condition while driving the vehicle in the maintenance yard but was unsuccessful. He said the dealer told him of an unsuccessful attempt to replicate the condition. Mr Winland said that there have been no further reports of a problem.

*WOODBRIDGE CT POLICE DEPT

On April 28, 1994 I spoke to Chief Phipps of the Woodbridge CT Police Department and inquired as to his department's experience with their 1993 Ford Crown Victoria police car VIN # 2FACP71W3PX145894. The chief put me in contact with Ptl John McKeown who said he reported a problem whereby it occasionally became difficult to turn the steering wheel when accelerating from a stop and turning. He said the steering was not smooth during these times. Officer McKeown said the vehicle was taken to a nearby Ford dealer where the steering box was replaced. He has not experienced a problem after this repair was performed.

*AVON CT POLICE DEPT

On April 28, 1994 I spoke to Roland Jacques, Superintendent of Machinery and Equipment for the Avon Police Department. We discussed his department's experience with their 1993 Ford Crown Victoria police car VIN # 2FACP71W0PX142421. He told me that one of the department's four Crown Victorias developed a problem with the power steering. The condition was reported by several police officers who claimed to temporarily lose power steering assist under conditions where there was hard steering in one direction followed by a sudden steering input in the opposite direction. The power loss lasted approximately one to two seconds. Mr Jacques' mechanics tested the vehicle and found the condition to exist. Since the vehicle was still under warranty it was returned to Hoffman Ford a local Ford dealer. Mr Jacques said the dealer told him the vehicle was tested and they also found the condition to exist. As a result the dealer replaced the steering gear. Since the repair there has been no further complaints.

*CALIFORNIA HIGHWAY PATROL, TRACY STATION

On April 29, 1994 I spoke with Chris Morgan Who is the Field Operations Manager for California Highway Patrol. In discussing any problems with their 1992 Ford Crown Victoria VIN # 2FACP72W6NX236119, I learned that only one vehicle had a reported problem concerning the speed sensitive power steering. It was reported from highway patrol officers that steering would become difficult at low speeds. This occurred while the vehicle was still new. The vehicle was taken to a nearby Ford dealer where the processor module was replaced. There has not been a reported problem since the repair was effectuated. Mr Morgan said he had read of a condition where the AIS motor, which relates to the idle speed of the vehicle, was not responding quickly enough under certain conditions. He said there was no history of any CHP vehicles with this condition. According to Ford CQIS Detail Report dated November 16, 1993 the above vehicle was taken to Shamrock Ford in Dublin CA with a complaint of stiff steering on quick turns after braking.

HEREFORD TX POLICE DEPT

On May 5, 1994 I spoke to Captain Pat Michael of the Hereford TX Police Dept regarding any reported problems his department experienced with 1992 or 1993 Ford Crown Victoria police cars. Capt Michael told me about a collision that occurred in September of 1993 in which one of his officer's was involved where the officer was forced to take a hard steering and braking evasive maneuver in order to avert an impact with another car. The police car struck a utility pole. Afterward the officer reported that when he applied his brakes he lost steering control. The involved police car was equipped with ABS and an air bag. The vehicle was taken to a nearby Ford dealer where it was repaired. There have been no other complaints to date. The Captain will forward a copy of the accident report and a statement from the involved officer.

DAYTONA BEACH FL POLICE DEPT

On May 3, 1994 I spoke to PO Ron DeSalvo of the Daytona

0000102

Beach FL Police Dept regarding his department's experience with the 1992 or 1993 Ford Crown Victoria police car. Officer DeSalvo told me that one of his department's supervising officers complained of a temporary loss of power steering assist. The vehicle has not been taken for any service inspection.

*NEWSITE AL POLICE DEPT

On May 3, 1994 I spoke to Chief Michael Waldrop of the Newsite AL Police Dept. I asked the chief about any problems he knew of concerning his department's 1992 Ford Crown Victoria police car VIN # 2FACP72W6NX219353. He told me about an occasion where he was responding to an emergency call travelling at about 80 MPH, executed a left turn and experienced a temporary loss of power steering assist. As he was struggling with the steering wheel the power assist returned. The vehicle nearly flipped over. The chief took the car to Tallapoosa Ford, a nearby dealer. The dealership service manager tested the vehicle and found the same condition to exist. Chief Waldrop told me the dealer could not correct the condition.

MILFORD CT POLICE DEPT

On May 6, 1994 I spoke to Sgt Tom DeMatteo of the Milford CT Police Dept. Sgt DeMatteo told me that after receiving our reports regarding the 1992 and 1993 Ford Crown Victoria police car, his department conducted tests on similar vehicles as well as a 1991 Ford Crown Victoria and 1992 Chevrolet Caprice. Tests were conducted at speeds between 25 to 40 MPH. Three different drivers were used. The tests consisted of driving the vehicles straight ahead and then steering quickly and successively. Following this the vehicles were put through a series of cones in a serpentine fashion. Each of the 92 and 93 Fords exhibited some degree of loss of power steering assist. The 91 Ford and 92 Chevy did not manifest the same condition. He said there were no reports of braking problems however he added that last fall the vehicles were taken to a nearby Ford dealer where a larger sized master cylinder was installed.

Sgt De Matteo said his department has adopted a policy whereby any officer electing to use a Crown Victoria for patrol can not operate the vehicle at speeds above 40 MPH.

Sgt DeMatteo said Ford was contacted on April 22, 1994 via an 800 number and spoke to fleet representative Jerry Lascar who asked the sergeant what he would like Ford to do with the problem. He then told the sergeant to take the department's vehicles to a dealer. In checking with Keating Ford of Stratford CT, Sgt DeMatteo was told that Ford could not replicate the condition. He was then provide with the telephone number for the Ford District Representative.

On May 5, 1994 Sgt DeMatteo called Iris Lapsley, a Ford District Representative, regarding the conditions that were discovered with his department's Crown Victorias. Ms Lapsley acknowledged that NHTSA was conducting an investigation in the steering condition. She also acknowledged that the vehicles do

DCC103

manifest a temporary loss of power steering assist but that this condition does not compromise the safety of the vehicle. She also said there were steering design changes in the 91, 92, and 93 model years. Ms Lapsley told Sgt De Matteo that Ford engineers found no problem in the NJ police cruisers. She suggested that the department take its vehicles to a Ford dealer and have the power steering units checked.

WEST HAVEN CT POLICE DEPT

On May 6, 1994 I spoke to Ptl Joe Wynoski who is a traffic officer for the West Haven CT Police Dept. After receiving our package of information regarding the 1992 and 1993 Ford Crown Victoria police cars, the West Haven Police conducted tests of their 1992 Ford Crown Victorias. Tests were conducted on April 29,1994 and May 2, 1994. The course consisted of a series of traffic cones set first at 50 feet apart then at 100 feet apart. The length of the course was 400 feet. Vehicles were driven through the cones in a serpentine fashion at speeds of 20, 30, and 40 MPH. In a first series of testing power was maintained through the course. In the second series of tests the driver removed their foot from the accelerator and or braked. Driving the vehicles was a police lieutenant and the Superintendent of Maintenance for the city of West Haven who was a former race car driver. The temporary loss of power steering assist occurred at speeds of 30 and 40 MPH while the vehicle was decelerated through the course. No loss of power steering assist was noted during those tests where the vehicles were accelerated through the series of cones.

As a result of their findings the Chief of Police ordered that all the department's 1992 Ford Crown Victorias be removed from active patrol duty. Vehicles were assigned to support personnel with orders not to operate the vehicles above 35 MPH.

Officer Wynoski said he contacted NHTSA. He also said he contacted Miller Ford a local dealer. The Ford dealer contacted District Representative by the name of Iris and asked her to call West Haven PD. Ptl Wynoski spoke to her. Iris told Officer Wynoski that Ford was fully cooperating with NHTSA on an open investigation NHTSA was conducting regarding the Ford Crown Victoria. Iris said Ford is standing by tests conducted by the Michigan State Police and the California Highway Patrol. She admitted there was a slight reduction in power steering assist but no loss of total steering. She also said there were no recalls planned for the present time.

INVESTIGATOR'S SIGNATURE: [signature] DATE: 5/9/94 APPROVED DATE:

000104

Charles Gauthier

Company

Location

Fax #

Telephone #

Comments

Karen Tarrant

Company

Location

Dept Charge

Fax #

Telephone #

Original Disposition: Destroy Return Call for pickup

STATE OF MICHIGAN

JOHN ENGLER, GOVERNOR

DEPARTMENT OF STATE POLICE

714 SOUTH HARRISON ROAD, EAST LANSING, MICHIGAN 48823

COL. MICHAEL D. ROBINSON, DIRECTOR

Lee/Dick/Lee

July 28, 1994

Mr. Charles L. Gauthier, Director
Office of Defects Investigation
National Highway Traffic Safety Association
400 Seventh Street, S.W.
Washington D.C. 20590

Dear Mr. Gauthier:

We reviewed your letter concerning the power steering system performance in Ford Crown Victoria vehicles. At the current time we do not own any vehicles of this type so we are unable to complete a response.

If we can ever assist you in the future, please contact us.

Sincerely,

Karen R. Tarrant

Karen R. Tarrant, Director
Management Services Division

djb

c: Lt. Col. James Snody
Mr. Duane Berger, MTD
Mr. Gar Salmon

ODCC105

Post-it™ brand Fax Transmittal Memo 7672

To Charles Gauthier		From Karen Tarrant	
Company NHTSA		Company MSP	
Location		Location	Dept. Charge
Fax #	Telephone #	Fax # 517 336-6258	Telephone # 517 336-6367
Comments		Original Disposition: ☐ Destroy ☐ Return ☐ Call for pickup	

No. of Pages 1 Today's Date 7/21 Time 4:15

JB / NB / LG / Dick / Lee

STATE OF MICHIGAN

JOHN ENGLER, GOVERNOR

DEPARTMENT OF STATE POLICE

714 SOUTH HARRISON ROAD, EAST LANSING, MICHIGAN 48823

COL. MICHAEL D. ROBINSON, DIRECTOR

July 21, 1994

Mr. Charles L. Gauthier, Director
Office of Defects Investigation
National Highway Traffic Safety Association
400 Seventh Street, S.W.
Washington D.C. 20590

Dear Mr. Gauthier;

We received your letter concerning the power steering system performance in Ford Crown Victoria vehicles. We will work with the Department of Management and Budget's Motor Transport Division to coordinate a response by August 10, 1994.

If you have any questions in the mean time, I can be reached at (517) 336-6139. Thank you.

Sincerely,

Karen Tarrant

Karen R. Tarrant, Director
Management Services Division

djb

c: Lt. Col. James Snody
Mr. Duane Berger, MTD
Mr. Gar Salmon

000106

GOVERNMENT OF THE DISTRICT OF COLUMBIA
METROPOLITAN POLICE DEPARTMENT
WASHINGTON, D.C 20001-2188

Metropolitan Police Department
Fleet Management Division
1501 South Capitol Street, S.W.
Washington, D.C. 20024

U.S. Department of Transportation
National Highway Taffic Safety Administration
400 7th Street, S.W.
Washington, D.C. 20590

August 8, 1994

Dear Mr. Gauthier:

Relative to your letter dated July 15, 1994 regarding possible safety defects to all 1992 and 1993 Ford Crown Victoria "police equipped" vehicles in the Metropolitan Police Department's fleet, this department has:

2	1992 Ford Crown Victoria
7	1993 Ford Crown Victoria
252	1994 Ford Crown Victoria

To date, there have been no defects reported in any of our Ford Crown Victorias, relating to the power steering. If any such defects should occur, we will contact your office and provide you with the necessary information.

For future reference, all correspondence relative to vehicles of this department should be addressed to the above address.

Robert L. Rose

Mr. Robert L. Rose
Director
Fleet Management Division

THE PRINCE GEORGE'S COUNTY GOVERNMENT

August 15, 1994

Mr. Charles L. Gauthier, Director
Office of Defects Investigation Enforcement
U.S. Department of Transportation
National Highway Traffic Safety Administration
400 Seventh Street, SW
Washington, DC 20590

Dear Mr. Gauthier:

Thank you for the opportunity to respond to your inquiries regarding our Crown Victoria police vehicles. I have attached the individual comments from our own experts and will summarize their answers for you here.

Question #1. We have 200 1992 Crown Victorias and 417 1993 Crown Victorias, for a total of 617.

Question #2. We have had no official reports of the power assisted steering system binding or locking up except in controlled training or testing environments. As some of the attached narratives indicate, this phenomenon has caused a loss of control in these settings.

We have had two officers killed in Crown Victorias in single vehicle, high speed accidents involving impacts with fixed objects. There was no evidence of a steering malfunction in either case. Copies of the reconstructions are included for your perusal.

Question #3. Information regarding mandatory training for our recruit officers is attached. Drivers training is not "routinely" offered for our police officers. We are in the planning stages to have a Public Safety Drivers Training Facility constructed. It is our hope that, once completed, this facility will afford us the opportunity to offer training on a regular basis for all our employees.

When front wheel drive vehicles were first issued, in-service training was provided for officers prior to their being issued front wheel drive vehicles for the first time. The response to Question #5 will describe an ongoing drivers training program to address the Crown

000108

Victoria's characteristics. We also use a portion of the program to familiarize officers with the handling characteristics of our Pontiac Grand Prixs as they are issued.

Question #4. Comments from a number of officers assigned Crown Victorias are included in the attached responses as well as comments from our driving instructors.

Question #5. We instituted a driving program to address the specific steering and braking characteristics of the Crown Victoria. Each of the 617 officers assigned a Crown Victoria must attend a full day's training program to not only acquaint the driver with the vehicle's characteristics but to train the driver to handle the vehicle proficiently. Specifics regarding the training program and its results are included in the attachments.

Question #6. We do not currently have any 1994 Crown Victorias, but we expect delivery of 23 in the near future. We have no information regarding any possible defects in these vehicles.

Thank you again for working with us in diagnosing the issues involving the Crown Victoria police vehicles. As always, we are prepared to assist you in any way possible as you continue with your engineering analysis.

Sincerely,

Teresa C. Chambers

Major Teresa C. Chambers
Commander, Training and
Personnel Services
301/772-4665

Attachments

000109

PRINCE GEORGE'S COUNTY GOVERNMENT

FROM: Commander, Central Services Division DATE: July 28, 1994

TO:

	INITIALS	DATE OUT
(1) Commander, Management Services		
(2) Cmdr, Pers. Training		
(3)		
(4)		

RE: Engineering Analysis Questionnaire Regarding Crown Vics

( ) For Your Information
( ) For Your Comments
( ) For Your Approval
( ) For Your Signature
( ) For Your Consideration
( ) For Immediate Action
( ) For Your Files
( ) Please Handle
( ) Please Advise
( ) Please Reply
( ) Please Read & Destroy
( ) Please Note & Return
( ) Please Supply More Details
( ) Please Discuss With Me
( ) Please Prepare Reply For Signature of ________
( ) No Reply Needed
( ) Per Our Conversation

REMARKS

In regards to the letter from the National Highway Traffic Safety Administration, the only question that we are able to answer is question #1. We have two hundred (200) 1992 Crown Victorias and four hundred seventeen (417) 1993 Crown Victorias for a total of six hundred seventeen (617) operable Crown Victorias.

Reference question #2, we have had no incidents officially reported to us. Our information is based on casual conversation with officers throughout the agency.

Reference question #4, other than what has become common knowledge among street officers, we have no official information regarding the safety of the Crown Victorias.

Reference question #6, at this point we do not have any 1994 Crown Victorias in our fleet, however, we anticipate delivery of twenty three (23) 1994 Crown Victorias within the next 30 to 60 days.

CC110

We currently have no information regarding any defect or safety concerns regarding the 1994 Crown Victorias.

Prince George's County Police
Inter-Office Memo

August 4, 1994

TO: Major Teresa C. Chambers, Commander
Training and Personnel Services

FROM: Corporal Barry S. Beam, Training Division

REF: Engineering Analysis Questionnaire Regarding Crown Vics

Per your request, the following information is provided with reference to the Engineering Analysis Questionnaire regarding the Ford Crown Vics (questions 3,4, and 5):

3. With reference to precision vehicle maneuvering or pursuit training, our officers receive 24 hours of classroom training and 64 hours of practical exercises with the Departmental Vehicles our agency has in its fleet to include the Ford Crown Vics. The classroom portion of training includes the AAA Driving Course, Vehicle Dynamics, and pursuit driving. I have attached the Driving Skills Manual outlining our practical courses to include the course design and the synopsis of what is required of the students to complete the course.

4. I have had the opportunity to talk to different officers that have been issued the Ford Crown Vics and have experienced the power steering problem. All seem to have had the problem when driving at slow speeds with tight maneuvers required. It has been noted that some feel that it could have caused a departmental had they not had the room to correctly steer out of the problem once they were able to regain control of the vehicle.

5. Our agency has been right on top of this problem. We have instituted an inservice program for all our officers issued Crown Vics. Two instructors have been assigned to complete the program.

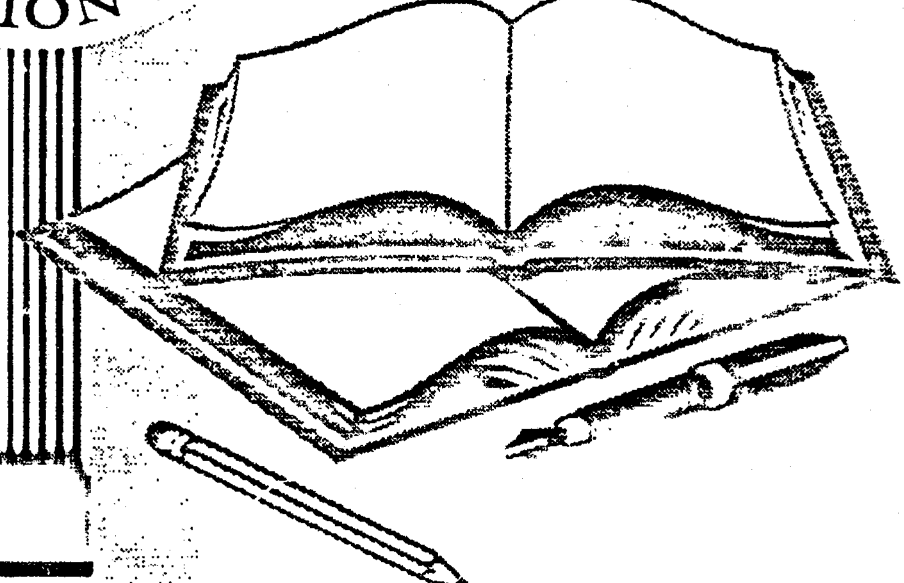
300111

ACADEMY

BASIC TRAINING CLASS
PG PD
SESSION 78

DRIVING SKILLS MANUAL

POLICE



PRINCE GEORGE'S COUNTY POLICE DEPARTMENT
PRINCE GEORGE'S COUNTY OFFICE OF THE SHERIFF
PRINCE GEORGE'S COUNTY FIRE DEPARTMENT
MARYLAND PARK POLICE

DCC0112

DRIVING RANGE RULES

1. Seat belts will be worn whenever vehicles are in motion.

2. Speeds will not exceed 25 MPH unless the course being driven requires greater speeds.

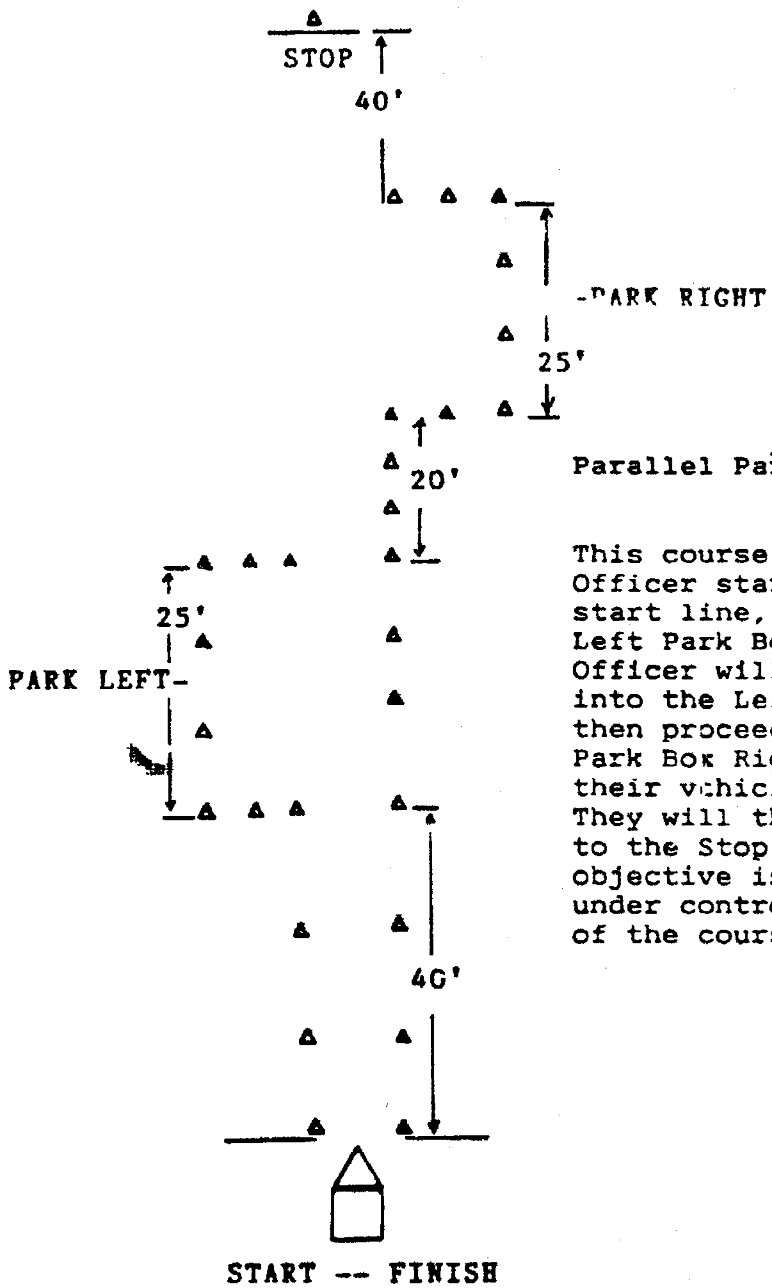
3. Windows will be either completely closed or completely opened. The only exception is that the windows may be opened two fingers width down from the top.

4. Doors will be locked at all times whenever vehicles are in motion.

5. The horn will be sounded twice before backing a vehicle.

6. There will be absolutely no reckless or negligent actions while on the driving range. Horseplay is strictly prohibited.

PARALLEL PARKING COURSE



COURSE TIME: 60 Sec.

Parallel Parking Course:

This course requires that the Student Officer start their vehicle on the start line, proceed swiftly past the Left Park Box and stop. The Student Officer will then back their vehicle into the Left Park Box. They will then proceed out of the box past the Park Box Right. They will then back their vehicle into the Park Box Right. They will then pull their vehicle out to the Stop Sign and Stop. The final objective is to safely and swiftly under control back their vehicle out of the course past the finish line.

PARALLEL PARKING

POLICE VEHICLE OPERATIONS EVALUATION

1	S/O NAME:	DATE	1	2	3	4	5	BEST QUAL	
2	COURSE FAMILIARIZATION		C T						1
3	QUALIFICATION RUNS							QUAL	3
4	QUALIFICATION RUNS								5
5	IDENTIFY PROBLEM AREAS								
6	REMEDIAL PRACTICE RUNS CLASSROOM TIME							QUAL	3
7	REMEDIAL QUALIFACTION								5
8	IDENTIFY PROBLEM AREAS								
9	REMEDIAL PRACTICE RUNS							QUAL	3
10	REMEDIAL QUALIFICATION								5
11	INSTRUCTOR SIGNATURE:						Total Runs:		
12	CRITICAL PERFORMANCE OBJECTIVES:								

IN ORDER TO SUCCESSFULLY COMPLETE THE COURSE, THE STUDENT OFFICER MUST:

A. ☐ COMPLETE THE COURSE IN THE SPECIFIED TIME. COURSE TIME: ____________

B. ☐ NOT HIT ANY CONES

C. ☐ NOT LOCK BRAKES OR USE THE BRAKES EXCEPT AS ALLOWED

D. ☐ DEMONSTRATE THE USE OF ALL PERFORMANCE OBJECTIVES DURING QUALIFICATION.

E. ☐ PERFORM WITHIN THE COURSE GUIDELINES / SAFETY REGULATIONS.

CRITICAL PERFORMANCE: INDICATE: P = PASS X = FAIL

A. ☐ DEMONSTRATE PROPER LANE POSITION: FAR RIGHT / FAIR LEFT / CENTER

B. ☐ DEMONSTRATE PROPER APEXING OF CURVE: EARLY / LATE SPEED CONTROL

C. ☐ DEMONSTRATE PROPER STEERING TECHNIQUE; HAND PSN. / OVER / UNDER

D. ☐ DEMONSTRATE PROPER SLOWING / STOPPING TECHNIQUE: LOCKED / - SPEED

E. ☐ DEMONSTRATE PROPER ACCELERATION TECHNIQUE: + SPEED / - UNEVEN

F. ☐ DEMONSTRATE PROPER SEAT / MIRROR ADJUSTMENT: + FORWARD / + BACK

G. ☐ DEMONSTRATE PROPER WEIGHT TRANSFER: FORWARD / RIGHT / LEFT / EXCESSIVE

H. ☐ DEMONSTRATE PROPER PREPARATION: ADJUST SEAT / MIRRORS / SEATBELTS / LOCKS

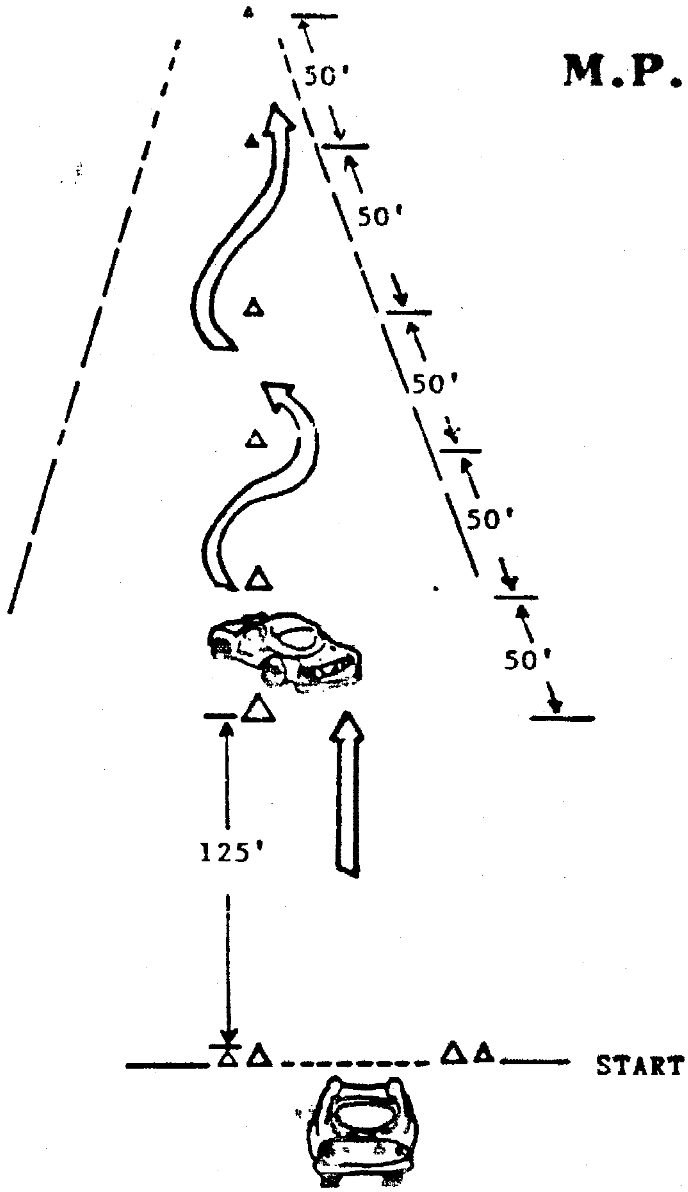
I. ☐ DEMONSTRATE THE ABILITY TO SUCCESSFULLY COMPLETE THE COURSE: WITHIN THE ALLOTTED TIME, WITHOUT STRIKING CONES AND ACCORDING TO COURSE RULES.

JCCL 115

STUDENT OFFICER SIGNATURE:	DATE:

SERPENTINE COURSE

M.P.T.C. 98



SERPENTINE

POLICE VEHICLE OPERATIONS EVALUATION

1	S/O NAME:	DATE	1	2	3	4	5	BEST QUAL	
2	COURSE FAMILIARIZATION		C T						1
3	QUALIFICATION RUNS							QUAL	3
4	QUALIFICATION RUNS								5
5	IDENTIFY PROBLEM AREAS								
6	REMEDIAL PRACTICE RUNS CLASSROOM TIME							OUAL	3
7	REMEDIAL QUALIFACTION								5
8	IDENTIFY PROBLEM AREAS								
9	REMEDIAL PRACTICE RUNS							QUAL	3
10	REMEDIAL QUALIFICATION								5
11	INSTRUCTOR SIGNATURE:						Total Runs: ______		
12	CRITICAL PERFORMANCE OBJECTIVES:								

IN ORDER TO SUCCESSFULLY COMPLETE THE COURSE, THE STUDENT OFFICER MUST:

A. ☐ COMPLETE THE COURSE IN THE SPECIFIED TIME. COURSE TIME: ______

B. ☐ NOT HIT ANY CONES

C. ☐ NOT LOCK BRAKES OR USE THE BRAKES EXCEPT AS ALLOWED

D. ☐ DEMONSTRATE THE USE OF ALL PERFORMANCE OBJECTIVES DURING QUALIFICATION.

E. ☐ PERFORM WITHIN THE COURSE GUIDELINES / SAFETY REGULATIONS.

CRITICAL PERFORMANCE: INDICATE: P = PASS X = FAIL

A. ☐ DEMONSTRATE PROPER LANE POSITION: FAR RIGHT / FAIR LEFT / CENTER

B. ☐ DEMONSTRATE PROPER APEXING OF CURVE: EARLY / LATE SPEED CONTROL

C. ☐ DEMONSTRATE PROPER STEERING TECHNIQUE; HAND PSN. / OVER / UNDER

D. ☐ DEMONSTRATE PROPER SLOWING / STOPPING TECHNIQUE: LOCKED / - SPEED

E. ☐ DEMONSTRATE PROPER ACCELERATION TECHNIQUE: + SPEED / - UNEVEN

F. ☐ DEMONSTRATE PROPER SEAT / MIRROR ADJUSTMENT: + FORWARD / + BACK

G. ☐ DEMONSTPATE PROPER WEIGHT TRANSFER: FORWARD / RIGHT / LEFT / EXCESSIVE

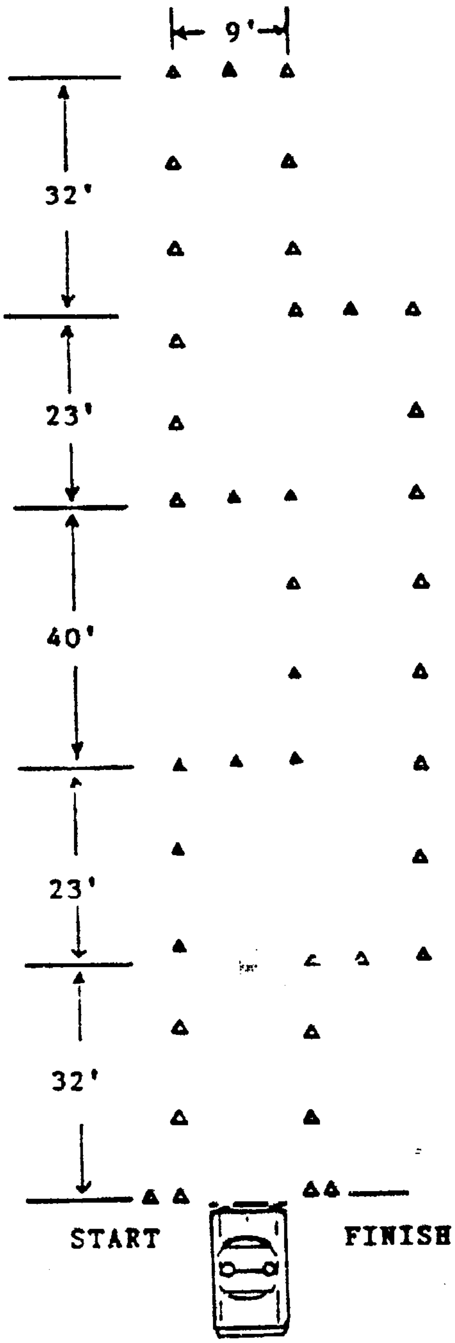
H. ☐ DEMONSTRATE PROPER PREPARATION: ADJUST SEAT / MIRRORS / SEATBELTS / LOCKS

I. ☐ DEMONSTRATE THE ABILITY TO SUCCESSFULLY COMPLETE THE COURSE: WITHIN THE ALLOTTED TIME, WITHOUT STRIKING CONES AND ACCORDING TO COURSE RULES.

STUDENT OFFICER SIGNATURE:	DATE:

DOJ 117

OFF-SET ALLEY COURSE



The student is required to line up on the Start Line, proceed forward and stop in the Bottom Box. After stopping the time stops until the Student has removed their seat belt, placed the vehicle in reverse, sound the horn and released the foot brake. They must then negotiate the course in reverse, while using the prescribed 12 o'clock hand Technique, without using Brakes and Pass the Finish line. Course time is 20 seconds.

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OFF-SET ALLEY COURSE

POLICE VEHICLE OPERATIONS EVALUATION

1	S/O NAME:	DATE	1	2	3	4	5	BEST QUAL	
2	COURSE FAMILIARIZATION		C T						1
3	QUALIFICATION RUNS							QUAL	3
4	QUALIFICATION RUNS								5
5	IDENTIFY PROBLEM AREAS								
6	REMEDIAL PRACTICE RUNS CLASSROOM TIME							QUAL	3
7	REMEDIAL QUALIFACTION								5
8	IDENTIFY PROBLEM AREAS								
9	REMEDIAL PRACTICE RUNS							QUAL	3
10	REMEDIAL QUALIFICATION								5
11	INSTRUCTOR SIGNATURE:						Total Runs: ______		
12	CRITICAL PERFORMANCE OBJECTIVES:								

IN ORDER TO SUCCESSFULLY COMPLETE THE COURSE, THE STUDENT OFFICER MUST:

A. ☐ COMPLETE THE COURSE IN THE SPECIFIED TIME . COURSE TIME:______

B. ☐ NOT HIT ANY CONES

C. ☐ NOT LOCK BRAKES OR USE THE BRAKES EXCEPT AS ALLOWED

D. ☐ DEMONSTRATE THE USE OF ALL PERFORMANCE OBJECTIVES DURING QUALIFICATION.

E. ☐ PERFORM WITHIN THE COURSE GUIDELINES / SAFETY REGULATIONS.

CRITICAL PERFORMANCE : INDICATE: P = PASS X = FAIL

A. ☐ DEMONSTRATE PROPER LANE POSITION: FAR RIGHT / FAIR LEFT / CENTER

B. ☐ DEMONSTRATE PROPER APEXING OF CURVE: EARLY / LATE SPEED CONTROL

C. ☐ DEMONSTRATE PROPER STEERING TECHNIQUE; HAND PSN. / OVER / UNDER

D. ☐ DEMONSTRATE PROPER SLOWING / STOPPING TECHNIQUE: LOCKED / - SPEED

E. ☐ DEMONSTRATE PROPER ACCELERATION TECHNIQUE: + SPEED / - UNEVEN

F. ☐ DEMONSTRATE PROPER SEAT / MIRROR ADJUSTMENT: + FORWARD / + BACK

G. ☐ DEMONSTRATE PROPER WEIGHT TRANSFER: FORWARD / RIGHT / LEFT / EXCESSIVE

H. ☐ DEMONSTRATE PROPER PREPARATION: ADJUST SEAT / MIRRORS / SEATBELTS / LOCKS

I. ☐ DEMONSTRATE THE ABILITY TO SUCCESSFULLY COMPLETE THE COURSE: WITHIN THE ALLOTTED TIME, WITHOUT STRIKING CONES AND ACCORDING TO COURSE RULES.

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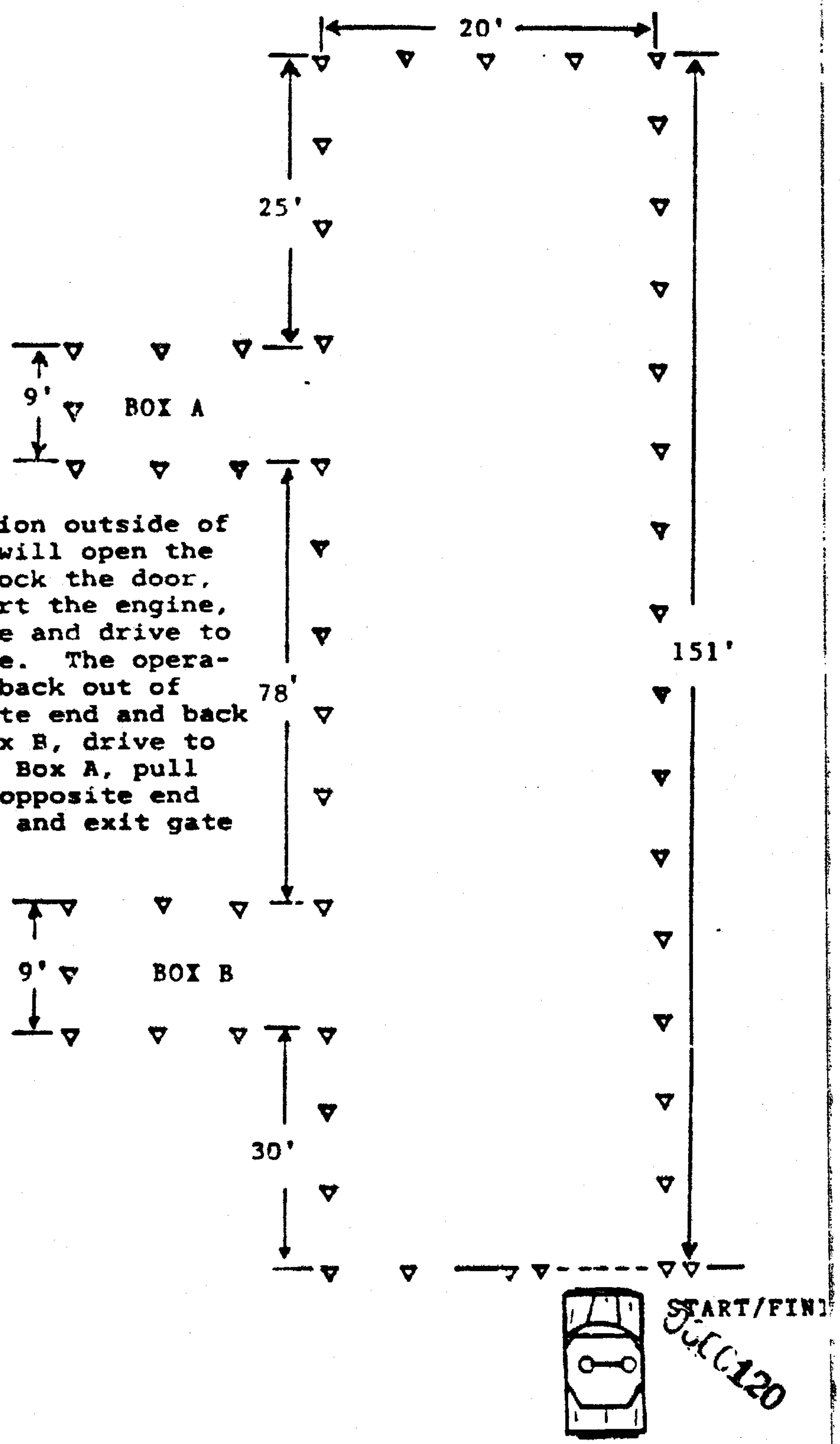
STUDENT OFFICER SIGNATURE: DATE:

EMERGENCY TURN-AROUND COURSE

M.P.T.C. 98,99



Procedure:

From a standing position outside of the vehicle, the operator will open the door, enter the vehicle, lock the door, fasten the seat belts, start the engine, release the emergency brake and drive to the other end of the course. The operator must pull into Box A, back out of Box A, drive to the opposite end and back into Box B, pull out of Box B, drive to opposite end and back into Box A, pull out of Box A and drive to opposite end going through the entrance and exit gate within 60 seconds.

EMERGENCY TURN-AROUND

POLICE VEHICLE OPERATIONS EVALUATION

1	S/O NAME:	DATE	1	2	3	4	5	BEST QUAL	
2	COURSE FAMILIARIZATION		C T						1
3	QUALIFICATION RUNS							QUAL	3
4	QUALIFICATION RUNS								5
5	IDENTIFY PROBLEM AREAS								
6	REMEDIAL PRACTICE RUNS CLASSROOM TIME							QUAL	3
7	REMEDIAL QUALIFACTION								5
8	IDENTIFY PROBLEM AREAS								
9	REMEDIAL PRACTICE RUNS							QUAL	3
10	REMEDIAL QUALIFICATION								5
11	INSTRUCTOR SIGNATURE:						Total Runs:		
12	CRITICAL PERFORMANCE OBJECTIVES:								

IN ORDER TO SUCCESSFULLY COMPLETE THE COURSE, THE STUDENT OFFICER MUST:

A. ☐ COMPLETE THE COURSE IN THE SPECIFIED TIME. COURSE TIME: ____________

B. ☐ NOT HIT ANY CONES

C. ☐ NOT LOCK BRAKES OR USE THE BRAKES EXCEPT AS ALLOWED

D. ☐ DEMONSTRATE THE USE OF ALL PERFORMANCE OBJECTIVES DURING QUALIFICATION.

E. ☐ PERFORM WITHIN THE COURSE GUIDELINES / SAFETY REGULATIONS.

CRITICAL PERFORMANCE: INDICATE: P = PASS X = FAIL

A. ☐ DEMONSTRATE PROPER LANE POSITION: FAR RIGHT / FAIR LEFT / CENTER

B. ☐ DEMONSTRATE PROPER APEXING OF CURVE: EARLY / LATE SPEED CONTROL

C. ☐ DEMONSTRATE PROPER STEERING TECHNIQUE; HAND PSN. / OVER / UNDER

D. ☐ DEMONSTRATE PROPER SLOWING / STOPPING TECHNIQUE: LOCKED / - SPEED

E. ☐ DEMONSTRATE PROPER ACCELERATION TECHNIQUE: + SPEED / - UNEVEN

F. ☐ DEMONSTRATE PROPER SEAT / MIRROR ADJUSTMENT: + FORWARD / + BACK

G. ☐ DEMONSTRATE PROPER WEIGHT TRANSFER: FORWARD / RIGHT / LEFT / EXCESSIVE

H. ☐ DEMONSTRATE PROPER PREPARATION: ADJUST SEAT / MIRRORS / SEATBELTS / LOCKS

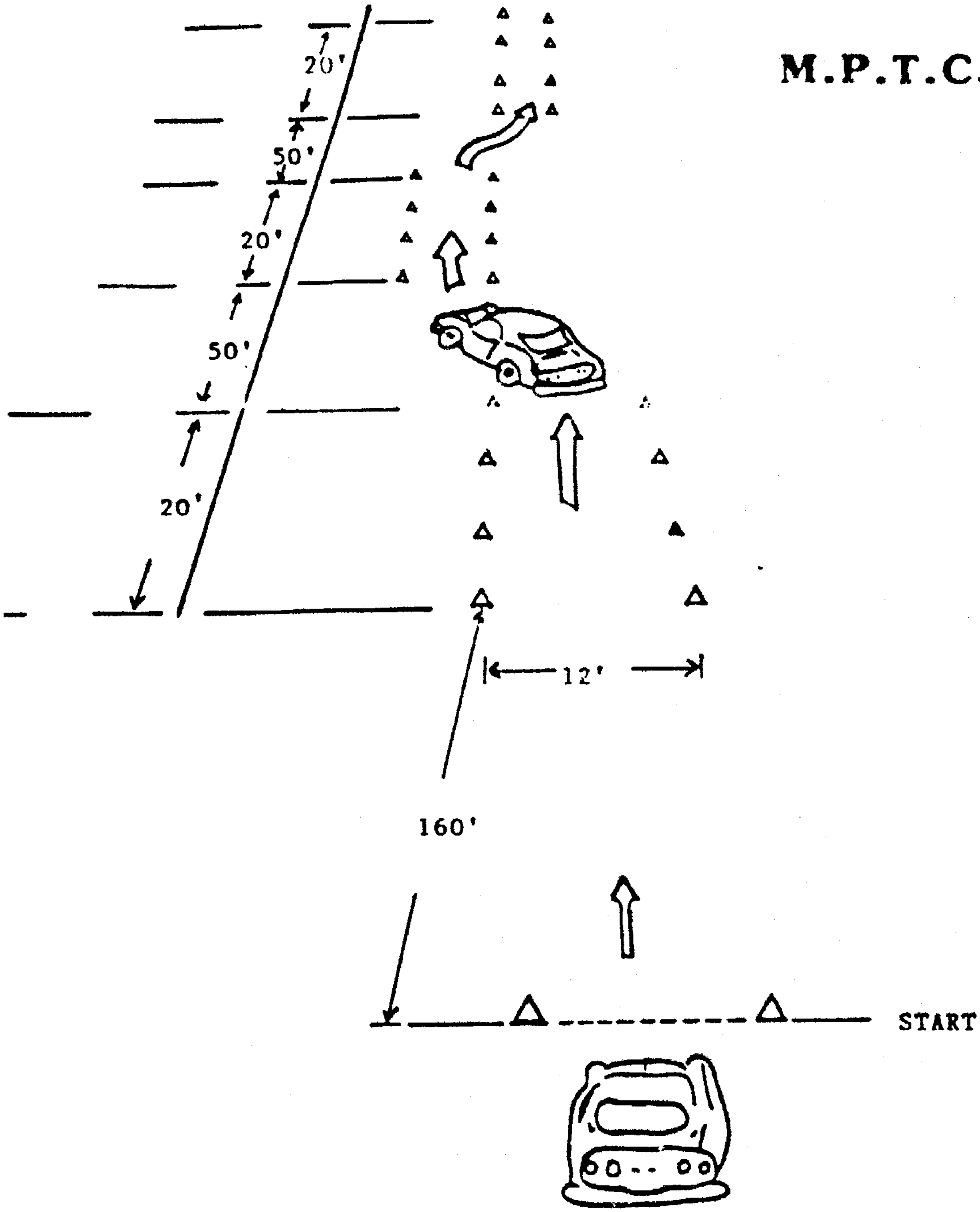
I. ☐ DEMONSTRATE THE ABILITY TO SUCCESSFULLY COMPLETE THE COURSE: WITHIN THE ALLOTTED TIME, WITHOUT STRIKING CONES AND ACCORDING TO COURSE RULES.

JCC121

STUDENT OFFICER SIGNATURE:	DATE:

DOUBLE LANE CHANGE COURSE

M.P.T.C. 98



0CC0122

DOUBLE LANE CHANGE

POLICE VEHICLE OPERATIONS EVALUATION

1	S/O NAME:	DATE	1	2	3	4	5	BEST QUAL	
2	COURSE FAMILIARIZATION		C / T						1
3	QUALIFICATION RUNS							QUAL	3
4	QUALIFICATION RUNS								5
5	**IDENTIFY PROBLEM AREAS**								
6	REMEDIAL PRACTICE RUNS CLASSROOM TIME							QUAL	3
7	REMEDIAL QUALIFACTION								5
8	**IDENTIFY PROBLEM AREAS**								
9	REMEDIAL PRACTICE RUNS							QUAL	3
10	REMEDIAL QUALIFICATION								5
11	INSTRUCTOR SIGNATURE:						Total Runs: ______		
12	CRITICAL PERFORMANCE OBJECTIVES:								

IN ORDER TO SUCCESSFULLY COMPLETE THE COURSE, THE STUDENT OFFICER MUST:

A. ☐ COMPLETE THE COURSE IN THE SPECIFIED TIME. COURSE TIME: ______

B. ☐ NOT HIT ANY CONES

C. ☐ NOT LOCK BRAKES OR USE THE BRAKES EXCEPT AS ALLOWED

D. ☐ DEMONSTRATE THE USE OF ALL PERFORMANCE OBJECTIVES DURING QUALIFICATION.

E. ☐ PERFORM WITHIN THE COURSE GUIDELINES / SAFETY REGULATIONS.

CRITICAL PERFORMANCE: INDICATE: P = PASS X = FAIL

A. ☐ DEMONSTRATE PROPER LANE POSITION: FAR RIGHT / FAIR LEFT / CENTER

B. ☐ DEMONSTRATE PROPER APEXING OF CURVE: EARLY / LATE SPEED CONTROL

C. ☐ DEMONSTRATE PROPER STEERING TECHNIQUE; HAND PSN. / OVER / UNDER

D. ☐ DEMONSTRATE PROPER SLOWING / STOPPING TECHNIQUE: LOCKED / - SPEED

E. ☐ DEMONSTRATE PROPER ACCELERATION TECHNIQUE: + SPEED / - UNEVEN

F. ☐ DEMONSTRATE PROPER SEAT / MIRROR ADJUSTMENT: + FORWARD / + BACK

G. ☐ DEMONSTRATE PROPER WEIGHT TRANSFER: FORWARD / RIGHT / LEFT / EXCESSIVE

H. ☐ DEMONSTRATE PROPER PREPARATION: ADJUST SEAT / MIRRORS / SEATBELTS / LOCKS

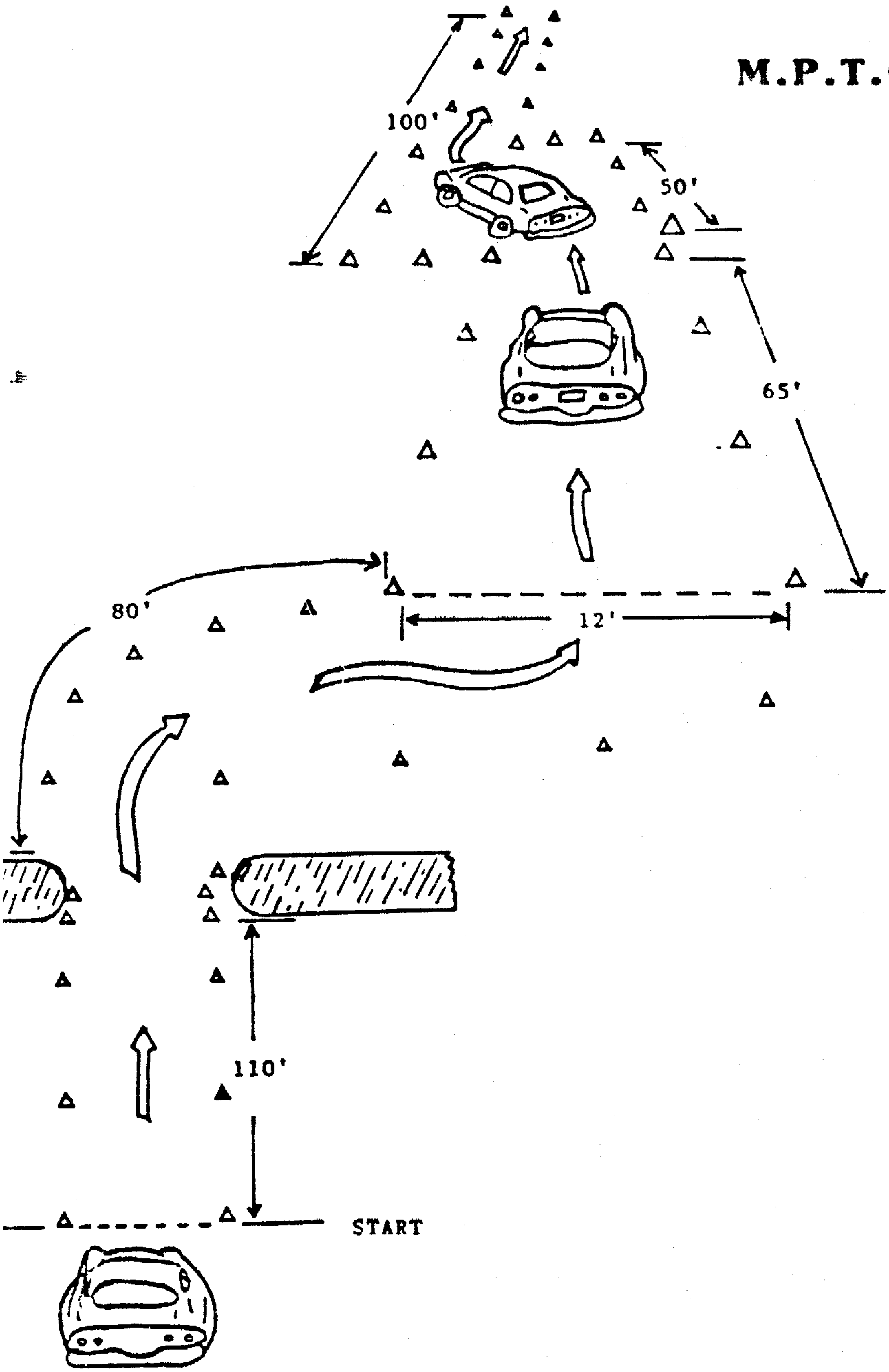
I. ☐ DEMONSTRATE THE ABILITY TO SUCCESSFULLY COMPLETE THE COURSE: WITHIN THE ALLOTTED TIME, WITHOUT STRIKING CONES AND ACCORDING TO COURSE RULES.

3CC123

STUDENT OFFICER SIGNATURE:	DATE:

CONTROLLED BRAKING / STAB COURSE

M.P.T.C. 97,98



DCC0124

CONTROLLED BRAKING COURSE (STAB)

POLICE VEHICLE OPERATIONS EVALUATION

1	S/O NAME:	DATE	1	2	3	4	5	BEST QUAL	
2	COURSE FAMILIARIZATION		C / T						1
3	[illegible]FICATION RUNS						QUAL		3
4	Q[illegible]ALIFICATION RUNS								5
5	IDENTIFY PROBLEM AREAS								
6	REMEDIAL PRACTICE RUNS CLASSROOM TIME						QUAL		3
7	REMEDIAL QUALIFACTION								5
8	IDENTIFY PROBLEM AREAS								
9	REMEDIAL PRACTICE RUNS						QUAL		3
10	REMEDIAL QUALIFICATION								5
11	INSTRUCTOR SIGNATURE:						Total Runs: ______		
12	CRITICAL PERFORMANCE OBJECTIVES:								

IN ORDER TO SUCCESSFULLY COMPLETE THE COURSE, THE STUDENT OFFICER MUST:

A. ☐ COMPLETE THE COURSE IN THE SPECIFIED TIME . COURSE TIME:______

B. ☐ NOT HIT ANY CONES

C. ☐ NOT LOCK BRAKES OR USE THE BRAKES EXCEPT AS ALLOWED

D. ☐ DEMONSTRATE THE USE OF ALL PERFORMANCE OBJECTIVES DURING QUALIFICATION.

E. ☐ PERFORM WITHIN THE COURSE GUIDELINES / SAFETY REGULATIONS.

CRITICAL PERFORMANCE : INDICATE: P = PASS X = FAIL

A. ☐ DEMONSTRATE PROPER LANE POSITION: FAR RIGHT / FAIR LEFT / CENTER

B. ☐ DEMONSTRATE PROPER APEXING OF CURVE: EARLY / LATE SPEED CONTROL

C. ☐ DEMONSTRATE PROPER STEERING TECHNIQUE; HAND PSN. / OVER / UNDER

D. ☐ DEMONSTRATE PROPER SLOWING / STOPPING TECHNIQUE: LOCKED / - SPEED

E. ☐ DEMONSTRATE PROPER ACCELERATION TECHNIQUE: + SPEED / - UNEVEN

F. ☐ DEMONSTRATE PROPER SEAT / MIRROR ADJUSTMENT: + FORWARD / + BACK

G. ☐ DEMONSTRATE PROPER WEIGHT TRANSFER: FORWARD / RIGHT / LEFT / EXCESSIVE

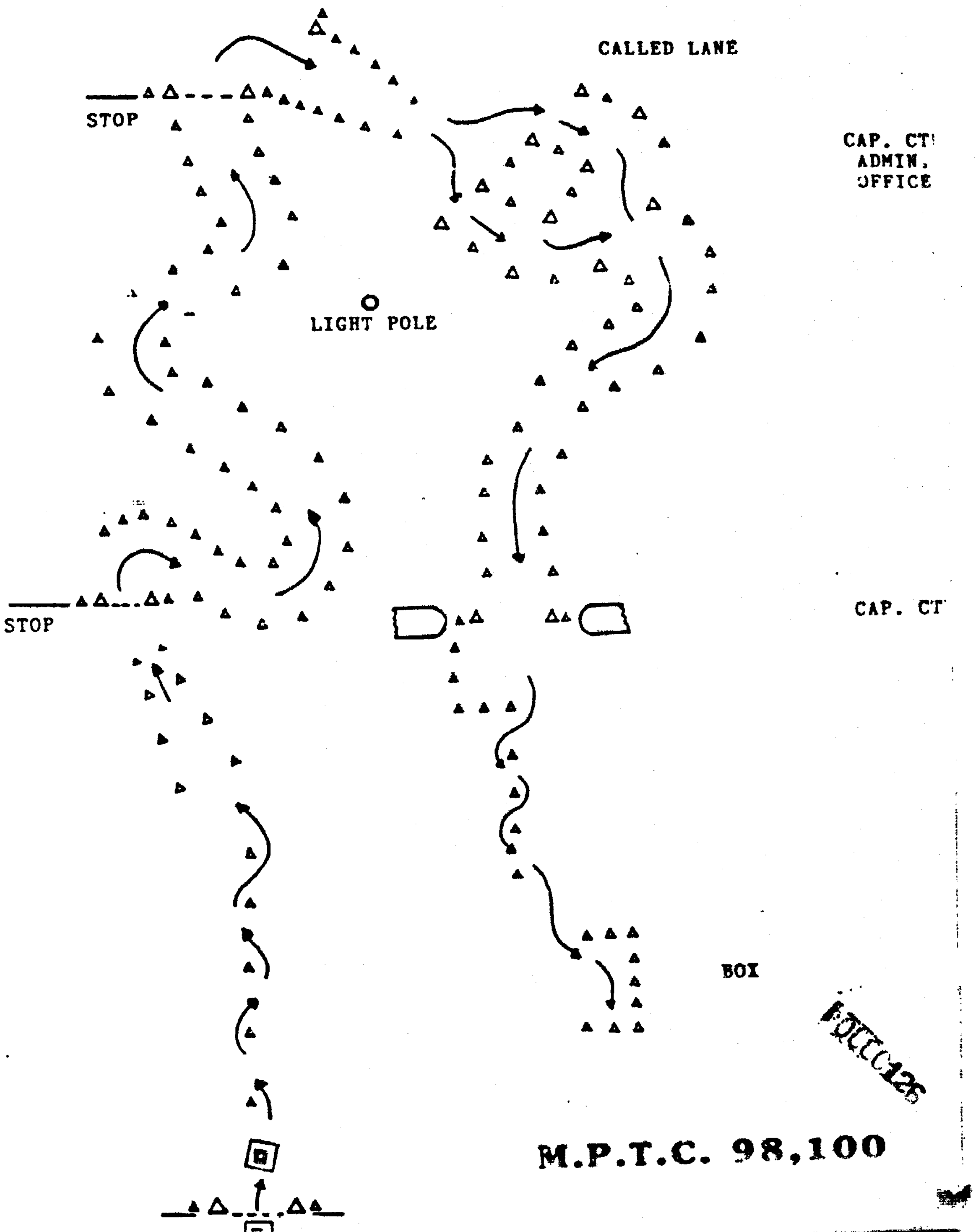
H. ☐ DEMONSTRATE PROPER PREPARATION: ADJUST SEAT / MIRRORS / SEATBELTS / LOCKS

I. ☐ DEMONSTRATE THE ABILITY TO SUCCESSFULLY COMPLETE THE COURSE: WITHIN THE ALLOTTED TIME, WITHOUT STRIKING CONES AND ACCORDING TO COURSE RULES.

0CC125

STUDENT OFFICER SIGNATURE: DATE:

E.V.O.C. / CONTROLLED CHASE COURSE



M.P.T.C. 98,100

SKID PAN MPTC #97 MPTC #102	
INSTRUCTOR:	PASS ☐ FAIL ☐
TIRE CHANGE EXERCISE	
FLARE EXERCISE	

INTER-OFFICE MEMORANDUM

OFFICE OF THE SHERIFF

PRINCE GEORGE'S COUNTY, MARYLAND

August 4, 1994

TO: Major Teresa C. Chambers, Commander
Training & Personnel Services

FROM: Sergeant David A. Norman, SGT. David A. Norman #553
Police Vehicle Operations Instructor

RE: Engineering Analysis Questionnaire Regarding Crown Vics

My response to your request, that I provide input, concerning the National Highway Traffic Safety Administration (NHTSA) Engineering analysis of the power steering on 1992-93 Ford Crown Victoria - Police Package Vehicles.

My first contact with the Ford Crown Victoria came as a result of having been selected to design and judge the 1993 Regional Patrol Officers Competition - Driving event. To accomplish this I was given five (5) brand new 1993 Ford Crown Victorias. As previously stated, I did design a cone course intended to demonstrate low speed precision driving skills, and after setting the course up, I attempted to qualify it as operational and to put in place a system of evaluation.

As I began driving the course, most of which was 5-10 mph, 15 max, I immediately experienced "steering Drag" and "Binding" whenever I applied stress to the system. This occurs more or less in all vehicles, whenever you exceed design capabilities. In the Crown Victoria I felt it was unreasonably excessive and at uncharacteristically low speeds. It was my contention that the steering unit displaced fluid insufficiently under the stress of weight transfer. The weight transfer created by right and left turns, in conjunction with the weight transfer created by deacceleration and counter steering would cause Binding or Drag. I found that the key to reducing this phenomenon was the skillful use of the accelerator and brake. The old driving adage "Stay off the Brake" takes on new meaning, however, speed control and weight transfer were equally important. As I continued to drive the course, and widen it to accommodate the Crown Victoria, I also switched car to car attempting to determine if the steering characteristics were isolated to a car or two. I found that all 5 basically responded alike. I was not pleased with the end result, as my course became far more challenging then I had intended. I simply ran out of space. I passed my feelings on to Lt. Calhoon the event coordinator concerning the characteristics of the Crown Victoria's steering. He was not issued a Crown Victoria and had no personal experience of his own.

JOC 128

My next exposure was during the Police Vehicle Operations Course given during a Police Basic Training Class. In addition to the low speed steering binding issue previously mentioned, we were also able to bring about "All Wheel Brake-Lock up" with the "Anti Lock" brake Crown Victoria's. I found that repeated heavy breaking at low speed (30 mph) causes "antilock" brakes to lock. After seven (7) applications of "swerve to avoid" including heavy braking, an all wheel skid occurred. I will not speculate on what specific component caused this failure, however, it seems to occur whenever excessive heat is created and insufficient time or air flow is created to dissipate the heat.

In conclusion, I have limited exposure to the Crown Victoria, and only under certain conditions. I certainly am not a mechanic and will not attempt to talk engineering, however, as a Police Driving instructor, somewhat familiar with vehicle operation and how it relates to police application/pursuit, etc. The Crown Victoria is much like any other automobile, subject to its own handling characteristics and limitations. No matter what vehicle is selected there will be trade offs at some point. I suggest that in the future more time and input be allowed during the selection process, followed by the development of training, specifically around those noted characteristics inherent to that particular automobile. Regardless of what vehicle we drive, safety and proficiency will ultimately rely on attitude, education, training and practical experience. Emergency Vehicle Operators require Repetition and Practical Training to maintain a desired level of proficiency. To be legitimate this training must be in the same type of vehicle they will operate. Switching back and forth is fine for routine driving, however, under the stress of tactical or pursuit driving, driver confusion may result. Much of the operation of a vehicle is subconscious, especially as stress is applied, this is where repetitive training pays off. Muscle memory, learned skills and improved reaction, in conjunction with the familiarity with the vehicle, play a major part in accident avoidance, vehicle control and survival.

DAN:blw

DCC 129

INTER-OFFICE MEMORANDUM

PRINCE GEORGE'S COUNTY, MARYLAND

Date: August 8, 1994

To: Major Teresa C. Chambers, Commander - Training & Personnel

From: Mr. L. Joy and Cpl. Steve Gibson - Driver Training Program

Re: ENGINEERING ANALYSIS QUESTIONNAIRE REGARDING CROWN VICS

In response to your memo dated July 19, 1994, regarding the National Highway Traffic Safety Administration's Analysis of Crown Victorias, we were asked to address specific questions. Our responses to questions 3, 4 and 5 are enumerated below.

#3 No. Vehicle maneuvering and/or pursuit training has not been routinely taught to officers within the department. Entrance level officers are however required to pass an extensive driving skills agenda to meet MPTC objectives. The courses currently being taught are:

a. Parallel Parking Course
b. Serpentine Course
c. Off-Set Alley Course
d. Emergency Turn-Around Course
e. Double Lane Change Course
f. E.V.O.C./Controlled Chase Course
* g. Controlled Braking/Stab Course

*This course is taught with vehicles not equipped with the ABS system. A two-fold problem develops in that recruit officers are probably going to be issued vehicles without the ABS system. That being the case, the Controlled Braking/Stab Course is adequate. However, since recruits are initially put with F.T.O.'s of which must drive Crown Vics equipped with ABS, the recruit officer must be taught the squeeze braking technique used with ABS systems. The recruit officer however, is expected to be cognizant of the type of vehicle they will be driving in the future. The squeeze brake technique (ABS) will not work in vehicles not equipped as such. Results could be disastrous.

See attached for copies of various courses.

4. The driving skills course currently underway, illuminates characteristics of the Crown Victoria and difference from that of the Diplomats and Caprices.

000130

1. Power Steering Bind
2. ABS Brakes
   (A) Possible pedal loss on rough roadway
3. Rear suspension
4. Blind spots located a left window post

With 315 of 630 now having attended the driving course, the biggest problem and "surprise" thus far has been the failure of the power steering system at low speed tight, "fast", precision turns. Numerous "collisions" have occurred during the off-set alley course causing the officer to strike cones because of the surprise occurrence of this phenomenon. Once aware of the condition, officers can "muscle" the wheel back hoping the power steering doesn't kick back in to abruptly causing oversteering. While an exact number of occurrences has not been logged, the power steering loss has occurred on at least 50% of the 315 cars tested. Also note that under stress, drivers steer and use speed control differently causing this characteristic to randomly appear. Should the condition occur during precision maneuvering conditions, it is many officers' opinion that accidents could easily occur. It is our opinion as driving instructors that since we have witnessed so many vehicles run "off course", because of the steering bind problem, this condition could very well be a contributing factor of an accident in the future.

*See attached copy of Off-Set Alley Course highlighted as to where phenomenon occurs.

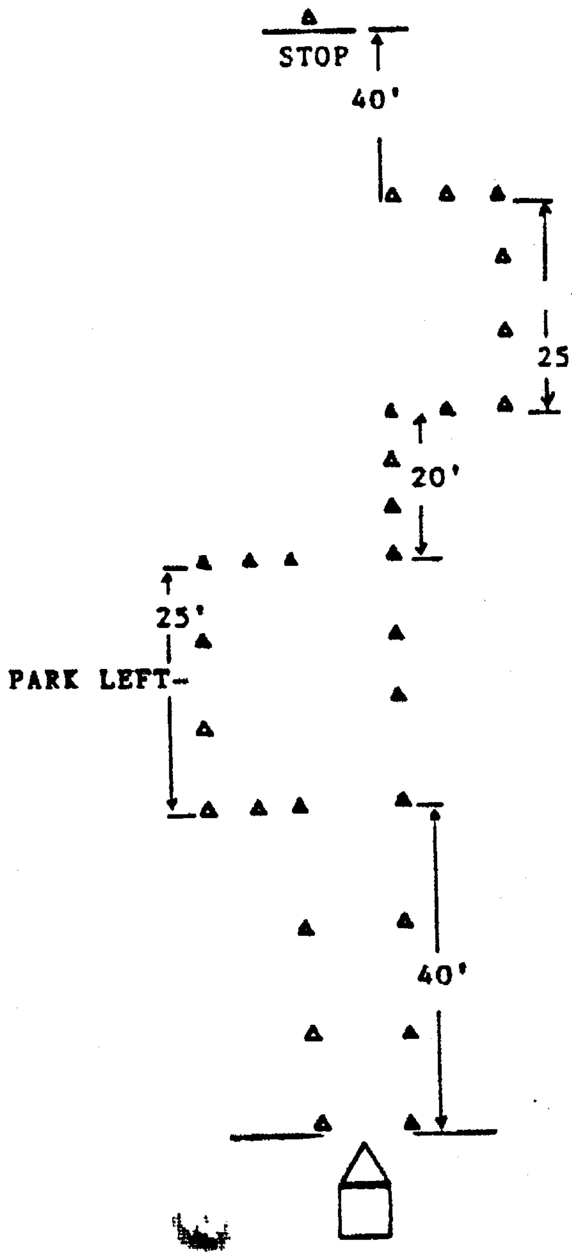
5. Yes, as previously addressed, the department has put together four (4) courses which highlight the characteristics of the Crown Victoria.

   1. Serpentine
   2. Off-Set Alley
   3. A.B.S. Braking
   4. E.V.O.C. (Modified)

*A combination of 1-3 as well as a diminishing lane, s turns and a 90 degree turn course under time to induce stress.

We are currently in our 7th week of training to familiarize officers which the different characteristics of the Crown Victoria. The response to our eight (8) hour/15 vehicle a day course has been overwhelming. Officers have expressed a profound learning experience from the course and a desire for more training. 80% to 90% of the students at least state they will know what the bind characteristic is, should it occur and how to maybe overcome it. The phenomenon has appeared to all of our courses, but again is more prevalent in off-set alley and the serpentine courses.

PARALLEL PARKING COURSE



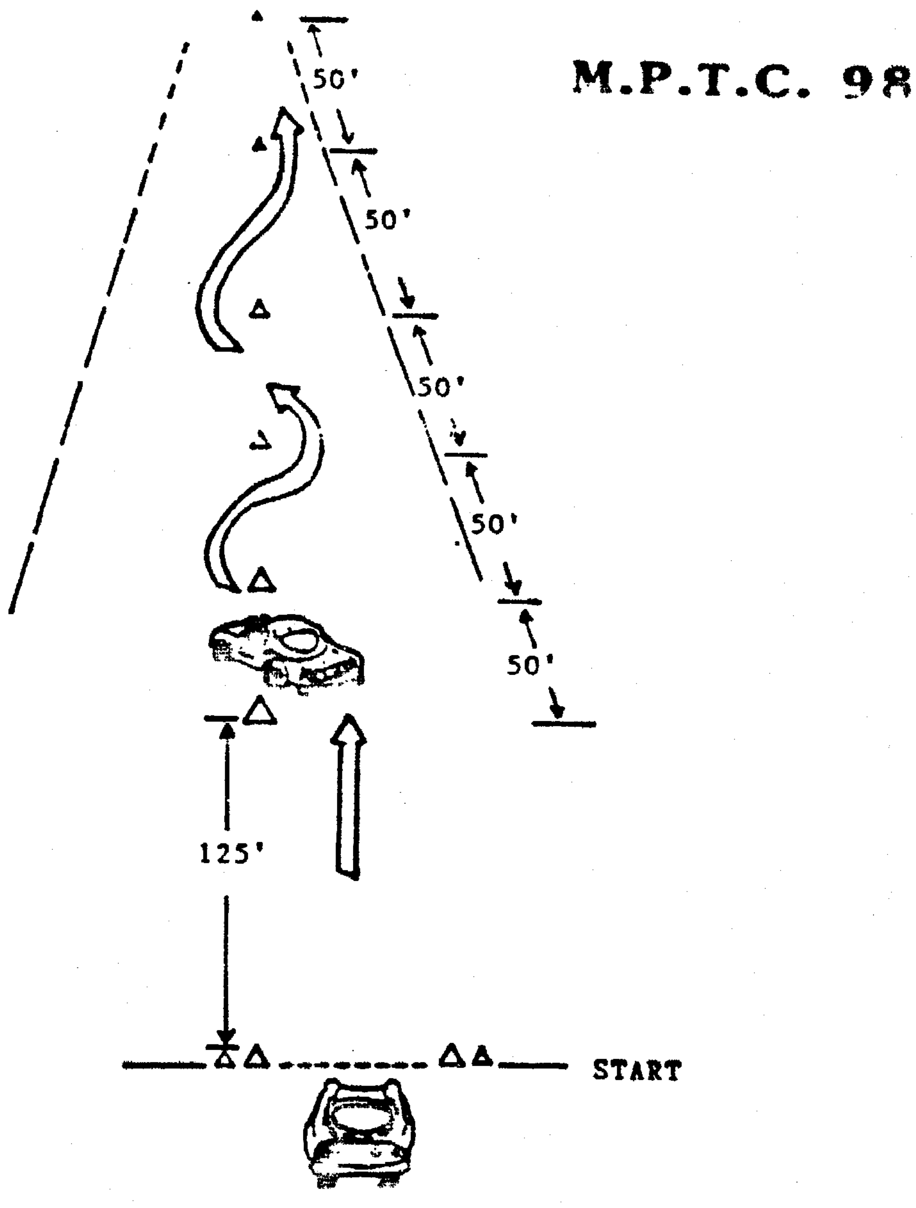
Parallel Parking Course:

This course requires that the Student Officer start their vehicle on the start line, proceed swiftly past the Left Park Box and stop. The Student Officer will then back their vehicle into the Left Park Box. They will then proceed out of the box past the Park Box Right. They will then back their vehicle into the Park Box Right. They will then pull their vehicle out to the Stop Sign and Stop. The final objective is to safely and swiftly under control back their vehicle out of the course past the finish line.

START -- FINISH

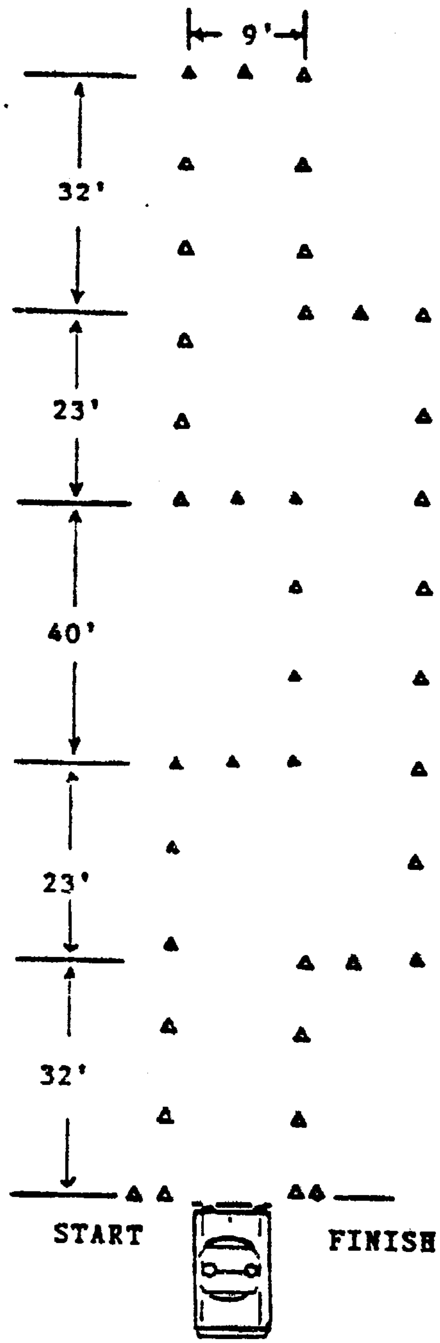
COURSE TIME: 60 Sec.

SERPENTINE COURSE



0000133

OFF-SET ALLEY COURSE

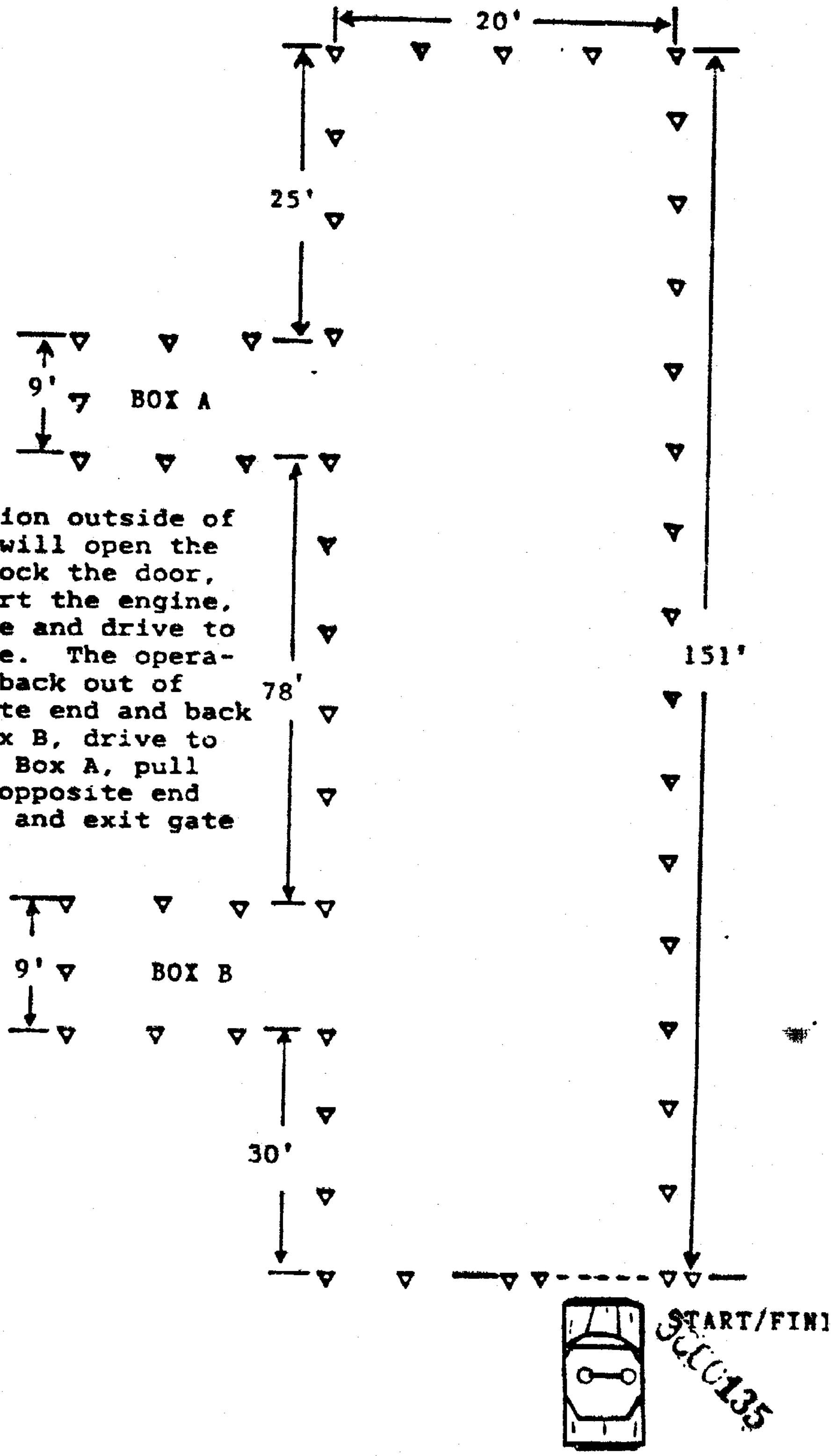


The student is required to line up on the Start Line, proceed forward and stop in the Bottom Box. After stopping the time stops until the Student has removed their seat belt, placed the vehicle in reverse, sound the horn and released the foot brake. They must then negotiate the course in reverse, while using the prescribed 12 o'clock hand Technique, without using Brakes and Pass the Finish line. Course time is 20 seconds.

0CCC134

EMERGENCY TURN-AROUND COURSE

M.P.T.C. 98,99



Procedure:

From a standing position outside of the vehicle, the operator will open the door, enter the vehicle, lock the door, fasten the seat belts, start the engine, release the emergency brake and drive to the other end of the course. The operator must pull into Box A, back out of Box A, drive to the opposite end and back into Box B, pull out of Box B, drive to opposite end and back into Box A, pull out of Box A and drive to opposite end going through the entrance and exit gate within 60 seconds.

OFF-SET ALLEY COURSE

POLICE VEHICLE OPERATIONS EVALUATION

1	S/O NAME:	DATE	1	2	3	4	5	BEST QUAL	
2	COURSE FAMILIARIZATION		C / T						1
3	QUALIFICATION RUNS							QUAL	3
4	QUALIFICATION RUNS								5
5	IDENTIFY PROBLEM AREAS								
6	REMEDIAL PRACTICE RUNS CLASSROOM TIME							QUAL	3
7	REMEDIAL QUALIFACTION								5
8	IDENTIFY PROBLEM AREAS								
9	REMEDIAL PRACTICE RUNS							QUAL	3
10	REMEDIAL QUALIFICATION								5
11	INSTRUCTOR SIGNATURE:						Total Runs: ____		
12	CRITICAL PERFORMANCE OBJECTIVES:								

IN ORDER TO SUCCESSFULLY COMPLETE THE COURSE, THE STUDENT OFFICER MUST:

A. ☐ COMPLETE THE COURSE IN THE SPECIFIED TIME . COURSE TIME: ____________

B. ☐ NOT HIT ANY CONES

C. ☐ NOT LOCK BRAKES OR USE THE BRAKES EXCEPT AS ALLOWED

D. ☐ DEMONSTRATE THE USE OF ALL PERFORMANCE OBJECTIVES DURING QUALIFICATION.

E. ☐ PERFORM WITHIN THE COURSE GUIDELINES / SAFETY REGULATIONS.

CRITICAL PERFORMANCE : INDICATE: P = PASS X = FAIL

A. ☐ DEMONSTRATE PROPER LANE POSITION: FAR RIGHT / FAIR LEFT / CENTER

B. ☐ DEMONSTRATE PROPER APEXING OF CURVE: EARLY / LATE SPEED CONTROL

C. ☐ DEMONSTRATE PROPER STEERING TECHNIQUE; HAND PSN. / OVER / UNDER

D. ☐ DEMONSTRATE PROPER SLOWING / STOPPING TECHNIQUE: LOCKED / - SPEED

E. ☐ DEMONSTRATE PROPER ACCELERATION TECHNIQUE: + SPEED / - UNEVEN

F. ☐ DEMONSTRATE PROPER SEAT / MIRROR ADJUSTMENT: + FORWARD / - BACK

G. ☐ DEMONSTRATE PROPER WEIGHT TRANSFER: FORWARD / RIGHT / LEFT / EXCESSIVE

H. ☐ DEMONSTRATE PROPER PREPARATION. ADJUST SEAT / MIRRORS / SEATBELTS / LOCKS

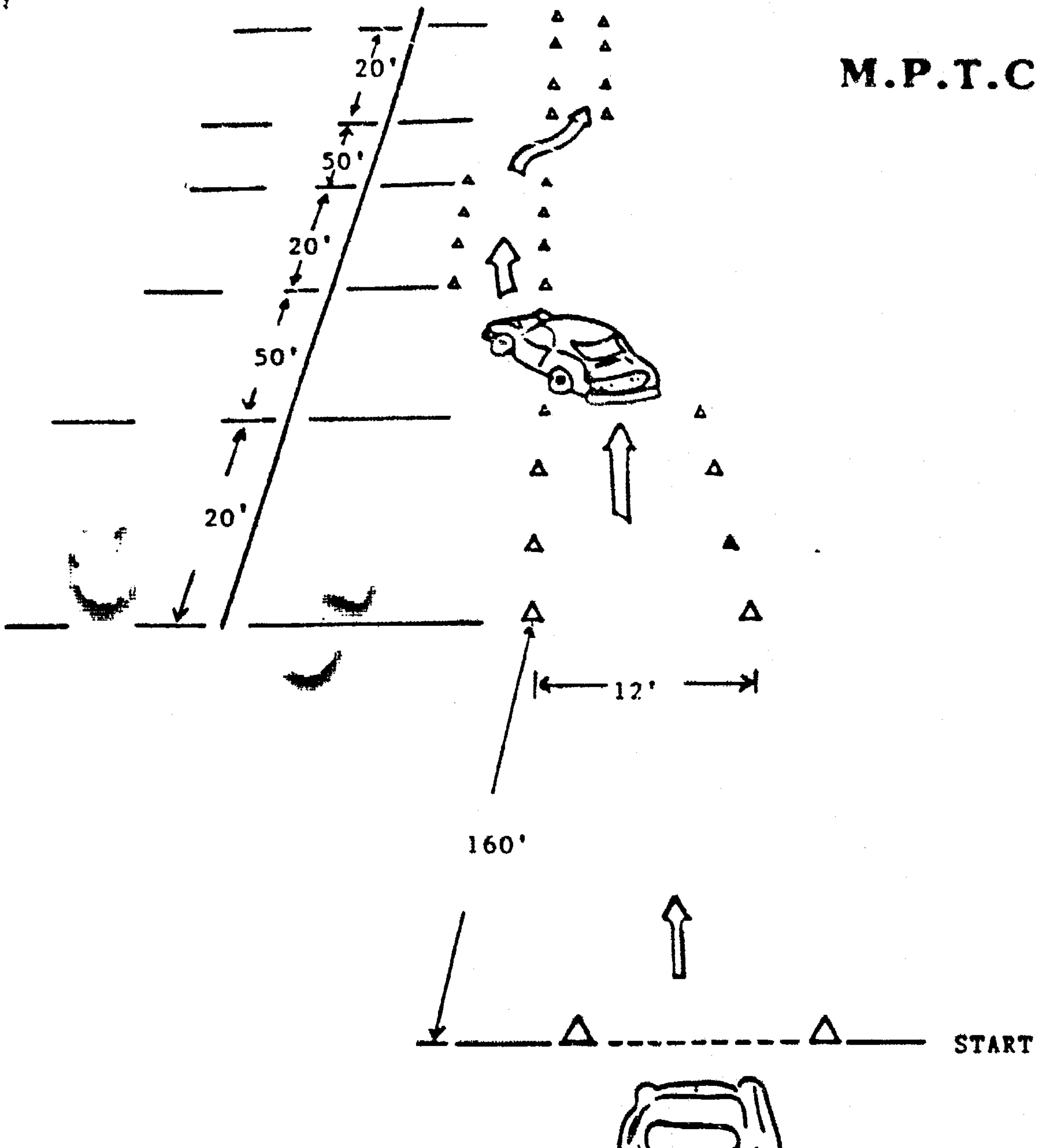
I. ☐ DEMONSTRATE THE ABILITY TO SUCCESSFULLY COMPLETE THE COURSE: WITHIN THE ALLOTTED TIME, WITHOUT STRIKING CONES AND ACCORDING TO COURSE RULES.

STUDENT OFFICER SIGNATURE: ____________ DATE: ________

FOCC 136

DOUBLE LANE CHANGE COURSE

M.P.T.C. 98



DCC137

EMERGENCY TURN-AROUND

POLICE VEHICLE OPERATIONS EVALUATION

		DATE	1	2	3	4	5	BEST QUAL	
1	S/O NAME:								
2	COURSE FAMILIARIZATION		C / T						1
3	QUALIFICATION RUNS							QUAL	3
4	QUALIFICATION RUNS								5
5	IDENTIFY PROBLEM AREAS								
6	REMEDIAL PRACTICE RUNS CLASSROOM TIME							QUAL	3
7	REMEDIAL QUALIFACTION								5
8	IDENTIFY PROBLEM AREAS								
9	REMEDIAL PRACTICE RUNS							QUAL	3
10	REMEDIAL QUALIFICATION								5
11	INSTRUCTOR SIGNATURE:						Total Runs: ______		
12	CRITICAL PERFORMANCE OBJECTIVES:								

IN ORDER TO SUCCESSFULLY COMPLETE THE COURSE, THE STUDENT OFFICER MUST:

A. ☐ COMPLETE THE COURSE IN THE SPECIFIED TIME. COURSE TIME: ______

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CRITICAL PERFORMANCE : INDICATE: P = PASS X = FAIL

A. ☐ DEMONSTRATE PROPER LANE POSITION: FAR RIGHT / FAIR LEFT / CENTER

B. ☐ DEMONSTRATE PROPER APEXING OF CURVE: EARLY / LATE SPEED CONTROL

C. ☐ DEMONSTRATE PROPER STEERING TECHNIQUE; HAND PSN. / OVER / UNDER

D. ☐ DEMONSTRATE PROPER SLOWING / STOPPING TECHNIQUE: LOCKED / - SPEED

E. ☐ DEMONSTRATE PROPER ACCELERATION TECHNIQUE: + SPEED / - UNEVEN

F. ☐ DEMONSTRATE PROPER SEAT / MIRROR ADJUSTMENT: + FORWARD / + BACK

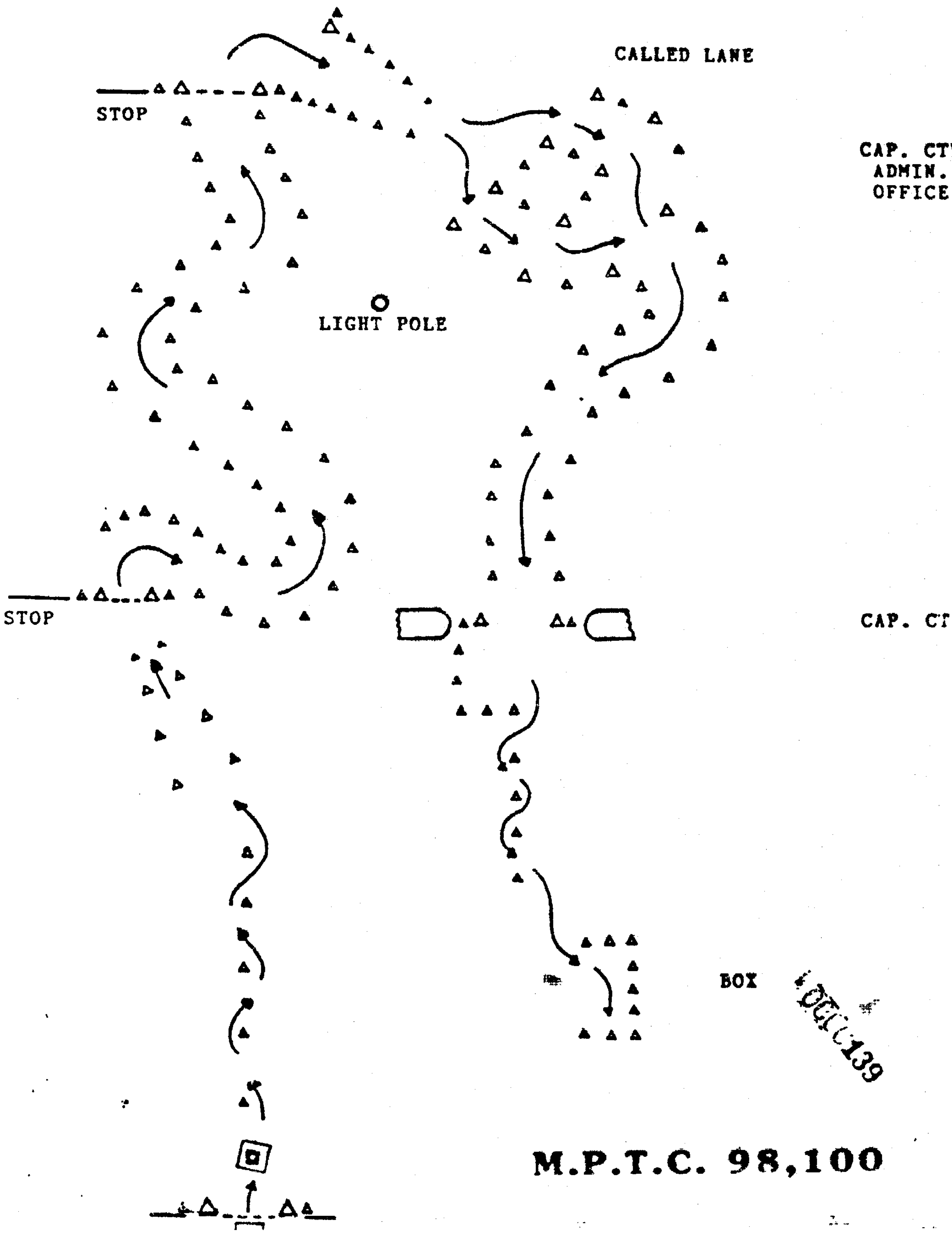
G. ☐ DEMONSTRATE PROPER WEIGHT TRANSFER: FORWARD / RIGHT / LEFT / EXCESSIVE

H. ☐ DEMONSTRATE PROPER PREPARATION: ADJUST SEAT / MIRRORS / SEATBELTS / LOCKS

I. ☐ DEMONSTRATE THE ABILITY TO SUCCESSFULLY COMPLETE THE COURSE: WITHIN THE ALLOTTED TIME, WITHOUT STRIKING CONES AND ACCORDING TO COURSE RULES.

STUDENT OFFICER SIGNATURE: DATE:

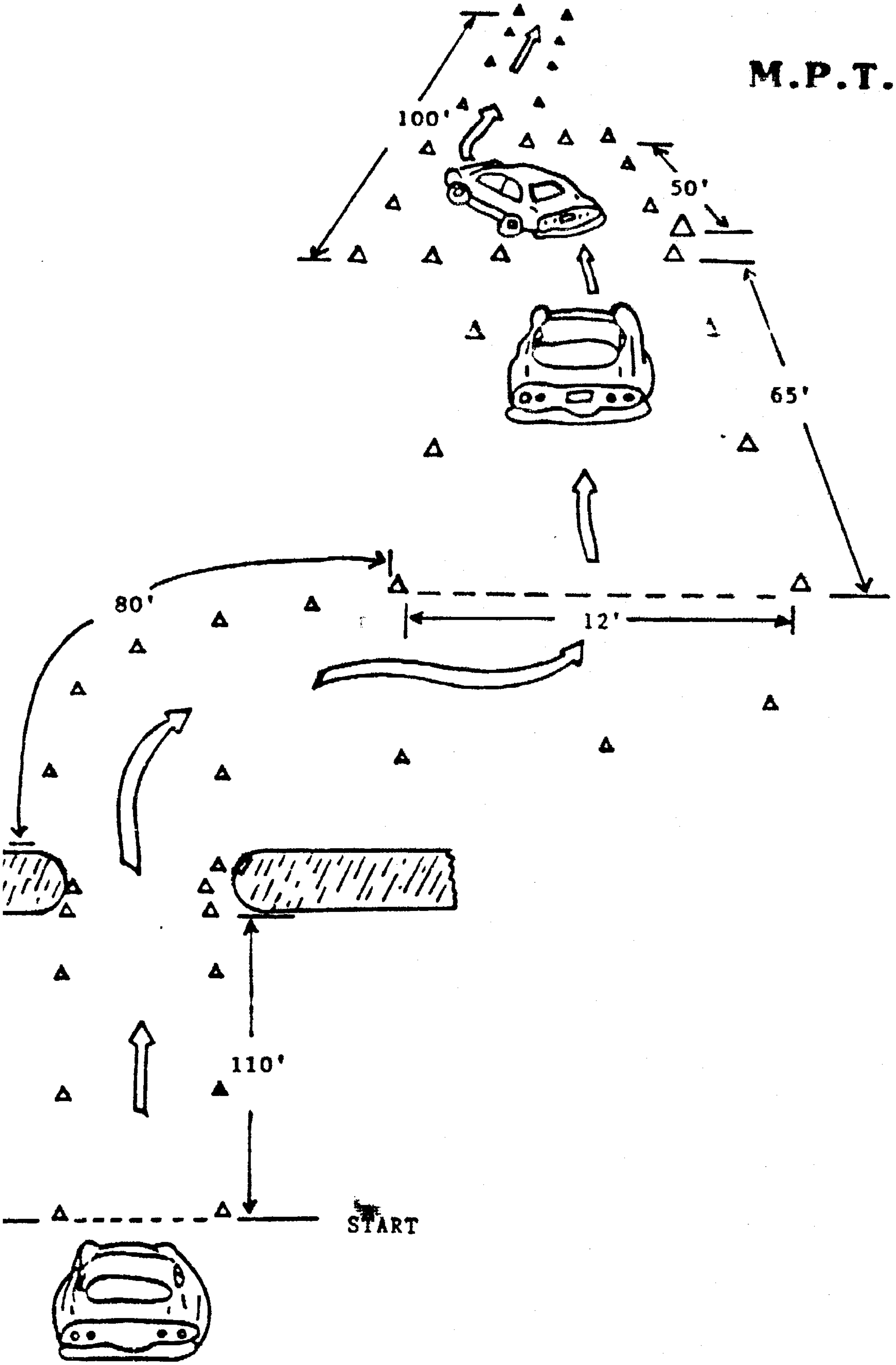
E.V.O.C. / CONTROLLED CHASE COURSE



M.P.T.C. 98,100

CONTROLLED BRAKING / STAB COURSE

M.P.T.C. 97,98



DOUBLE LANE CHANGE

POLICE VEHICLE OPERATIONS EVALUATION

1	S/O NAME:	DATE	1	2	3	4	5	BEST QUAL	
2	COURSE FAMILIARIZATION		C / T						1
3	QUALIFICATION RUNS							QUAL	3
4	QUALIFICATION RUNS								5
5	**IDENTIFY PROBLEM AREAS**								
6	REMEDIAL PRACTICE RUNS CLASSROOM TIME							QUAL	3
7	REMEDIAL QUALIFACTION								5
8	**IDENTIFY PROBLEM AREAS**								
9	REMEDIAL PRACTICE RUNS							QUAL	3
10	REMEDIAL QUALIFICATION								5
11	INSTRUCTOR SIGNATURE:						Total Runs: ____		
12	CRITICAL PERFORMANCE OBJECTIVES:								

IN ORDER TO SUCCESSFULLY COMPLETE THE COURSE, THE STUDENT OFFICER MUST:

A. ☐ COMPLETE THE COURSE IN THE SPECIFIED TIME. COURSE TIME: ____________

B. ☐ NOT HIT ANY CONES

C. ☐ NOT LOCK BRAKES OR USE THE BRAKES EXCEPT AS ALLOWED

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CRITICAL PERFORMANCE : INDICATE: P = PASS X = FAIL

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C. ☐ DEMONSTRATE PROPER STEERING TECHNIQUE; HAND PSN. / OVER / UNDER

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F. ☐ DEMONSTRATE PROPER SEAT / MIRROR ADJUSTMENT: + FORWARD / + BACK

G. ☐ DEMONSTRATE PROPER WEIGHT TRANSFER: FORWARD / RIGHT / LEFT / EXCESSIVE

H. ☐ DEMONSTRATE PROPER PREPARATION: ADJUST SEAT / MIRRORS / SEATBELTS / LOCKS

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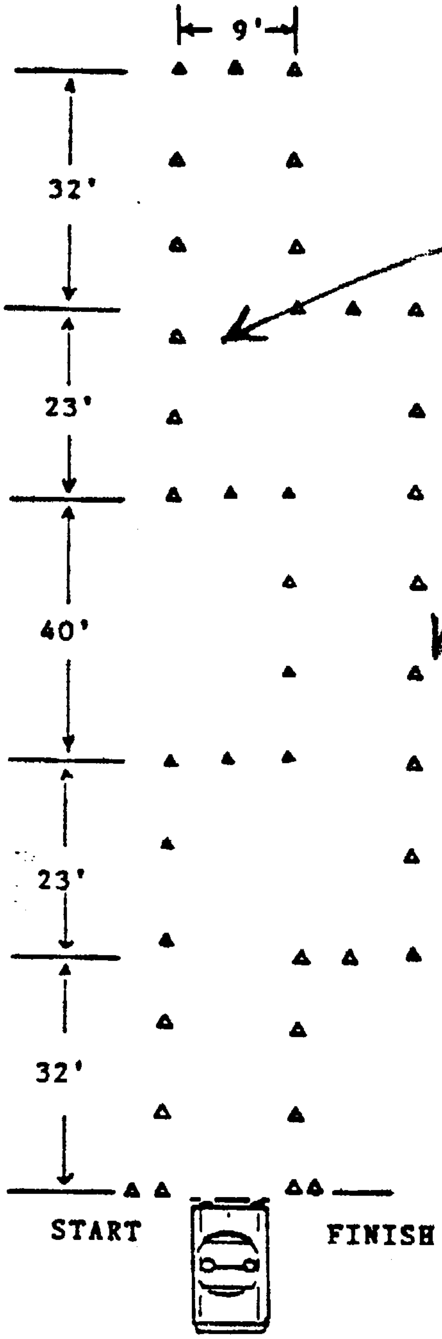
A0000141

STUDENT OFFICER SIGNATURE:	DATE:

OFF-SET ALLEY COURSE



Power Steering Binn

50% occurrence

10% occurrence

The student is required to line up on the Start Line, proceed forward and stop in the Bottom Box. After stopping the time stops until the Student has removed their seat belt, placed the vehicle in reverse, sound the horn and released the foot brake. They must then negotiate the course in reverse, while using the prescribed 12 o'clock hand Technique, without using Brakes and Pass the Finish line. Course time is 20 seconds.

0000142

DATE:

POLICE VEHICLE OPERATIONS / PERFORMANCE EVALUATION

PRINT NAME	I.D.	DUTY STATION	SIGNATURE

COURSE	
SERPENTINE O SAFE O UNSAFE	COMMENTS
OFF-SET ALLEY O SAFE O UNSAFE	COMMENTS
A.B.S. BRAKING O SAFE O UNSAFE	COMMENTS
E.V.O.C. O SAFE O UNSAFE	COMMENTS

COLLISION ANALYSIS & RECONSTRUCTION UNIT'S
RESPONSE TO N.H.T.S.A QUESTIONNAIRE

2.

C. TWO POLICE OFFICERS HAVE BEEN KILLED IN FATAL MOTOR VEHICLE COLLISIONS WHILE OPERATING FORD CROWN VICS. THESE WERE SINGLE VEHICLE COLLISIONS, IMPACTING FIXED OBJECTS. BOTH WERE HIGH ENERGY COLLISIONS AND INVOLVED HIGH SPEED. THE OFFICERS WERE KILLED INSTANTLY AND NO STATEMENT COULD BE OBTAINED. THERE WAS NO EVIDENCE OF A STEERING MALFUNCTION IN EITHER CASE. A COPY OF THE RECONSTRUCTIONS ARE ATTACHED.

4. THERE ARE SEVEN VETERAN POLICE OFFICERS IN THE COLLISION ANALYSIS & RECONSTRUCTION UNIT. EACH OFFICER IS ASSIGNED A 1993 FORD CROWN VIC. NONE OF THESE OFFICERS HAVE EXPERIENCED ANY PROBLEMS WITH THE STEERING OF THE VEHICLES. THE GENERAL CONSENSUS IS THAT THE VEHICLE IS "FAST" AND THE STEERING IS VERY RESPONSIVE.

1. REPORT NO.	STATE OF MARYLAND MOTOR VEHICLE ACCIDENT REPORT	2. FORM
5490394		1 OF 1

CAL AREA CASE NO.	4. ACCIDENT DATE MO	DAY	YR	5. TIME (MILITARY)	6. DAY OF WEEK	7. REPORT TYPE 1 - TRAFFIC ACCIDENT 2 - NON TRAFFIC ACCIDENT	8. COUNTY	9. TIME NOTIFIED (MILITARY)	10. TIME ARRIVED (MILITARY)
92-300-1172	10	27	92	0006	TUE	1	16	0006	0006

RECONSTRUCTION / REPORT OF INVESTIGATION

LOCATION:

Southbound Baltimore Washington Parkway (MD 0295) approximately 242 feet south of the exit ramp for westbound John Hanson Highway (US 0050), Cheverly, Prince George's County, Maryland

DATE / TIME:

Tuesday
October 27, 1992
0006 hours / 12:06 AM

COLLISION TYPE:

Fixed Object
MAARS Type: 09
Subsequent Events: Fixed Object (09), Fixed Object (09)
Single vehicle
Fatal collision, one fatality no personal injuries

WEATHER:

Partly cloudy, cool, temperature approximately 50°

ROAD TYPE:

The Baltimore Washington Parkway is a four lane highway divided by a wide grass median. At the collision site, southbound Baltimore Washington Parkway is a two lane roadway bordered by raised asphalt curbs. Lanes were delineated by painted edge lines and a broken center line. North of the collision site there are three southbound lanes. These lanes divide into a "Y" configuration with the right and center lanes forming the exit ramp to westbound John Hanson Highway and the left and center lanes continuing for the southbound Baltimore Washington Parkway. The southbound lanes and the exit ramp are divided by a widening dirt area. At the

000145

		1. INVESTIGATING OFFICER	2. OFFICER ID NO	3. AGENCY	4. INSTALLATION
		Sgt. David L. Dennison	758	DA	S.O.D.
5. PATROL AREA	6. DATE	7. SPECIAL STUDY / 8. SUPER APPROVAL	9. ID NO	10. REVIEWER	
B-6	11/20/92	N/A			

ROAD TYPE, continued:

collision site the southbound lanes curve slightly to the left with a 2140 foot radius arc. The collision site is basically level and is located at the base of a long downhill grade. Approximately 0.2 miles north of the collision site the Baltimore Washington Parkway curves to the right and immediately after the collision site the roadway curves to the left. The road surface was dry asphalt with a measured coefficient of friction of 0.75. The measured coefficient of friction of the grass median was 0.66. The speed limit was posted at 45 miles per hour. The median area is grass with hardwood trees scattered throughout. There is a wooded area to the west of the Baltimore Washington Parkway and an industrial complex to the east.

IDENTIFICATION:

DRIVER #1:

Roger Peck FLEMING
Prince George's County Police Department
7600 Barlowe Road
Landover, Maryland 20785
W/ (301) 336-8800
Maryland Driver's License # F-455-744-680-369
Fatal injuries

VEHICLE #1:

1992, Ford, Crown Victoria, Maryland Registration-PG0795/ #15, Owner: PRINCE GEORGE'S COUNTY MARYLAND, 9201 Basil Court, Landover, Maryland 20785

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WITNESSES:

WITNESS #1:

Corporal Douglas **EASTER** #1322
Prince George's County Police Department
7600 Barlowe Road
Landover, Maryland 20785
W/ (301) 336-8800

A written statement was obtained from Witness #1 on November 11, 1992.

Witness #1 was an on-duty police officer. Witness #1 monitored Driver #1's radio transmission regarding the pursuit of a fleeing Honda. Witness #1 joined the pursuit at the Baltimore Washington Parkway and Route 450. Witness #1 stated that as they proceeded south on the Parkway, Driver #1 was approximately 100 to 150 yards ahead of him. Witness #1 stated that as they neared the exit ramp to westbound John Hanson Highway he believes that Vehicle #1 was in the center lane and it appeared as if Driver #1 was going to take the exit ramp. Witness #1 stated that Vehicle #1's brake lights came on and Vehicle #1 appeared to fishtail, skidding from right to left. Witness #1 stated that Vehicle #1 skidded through the right median, across the southbound lanes and into the center median striking a tree. Witness #1 stated that he could not see the suspect's Honda. Witness #1 stated that at no time did he observe Vehicle #1 strike any other vehicles.

WITNESS #2:

Corporal Richard **DELABRER** #1446
Prince George's County Police Department
7600 Barlowe Road
Landover, Maryland 20785
W/ (301) 336-8800

A written statement was obtained from Witness #2 on October 28, 1992. Witness #2 was interviewed again at the scene of the collision on November 2, 1992.

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WITNESS #2, continued:

Witness #2 was a police officer operating an unmarked police vehicle. Witness #2 monitored Driver #1's radio transmission regarding the pursuit of a fleeing Honda. Witness #2 joined the pursuit on the Baltimore Washington Parkway south of Route 450. Witness #2 stated that as the pursuit approached his location on the Parkway from behind, he accelerated and attempted to gain speed. Witness #2 stated that he observed the suspect Honda approaching. Witness #2 pulled his vehicle to the left and the suspect Honda passed him at a high rate of speed with its lights off. Witness #2 allowed Vehicle #1 to also pass and then followed the pursuit. Near the exit ramp, Witness #2 observed two civilian vehicles ahead of the suspect Honda. One of these vehicles was in lane #1 and the other was in Lane #2. Witness #2 stated that the suspect Honda stayed to the far right of these vehicles as he approached the exit ramp. At the last moment, the suspect turned on his lights and veered to the left to continue south on the Parkway. This forced the civilian vehicle in lane #2 to brake and drift slightly left. Witness #2 stated that Driver #1 was forced to apply his brakes to avoid this civilian vehicle. When Vehicle #1 began to brake, its rear end slid to the left. Witness #2 stated that Vehicle #1 appeared to straighten then its rear end jerked strongly to the right and the collision occurred. Witness #2 stated that at this time he was approximately 1/4 mile behind Vehicle #1. Witness #2 stated that he did not see Vehicle #1 strike any other vehicles.

WITNESS #3:

Washington, D.C.
H/
DOB: 09/21/62

A written statement was obtained from Witness #3 after the collision on October 27, 1992. Witness #3 responded to the office of the Collision Analysis and Reconstruction Unit on November 3, 1992, and a more

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WITNESS #3, continued

extensive interview was conducted. Additionally, Witness #3 and this investigator also revisited the collision site on this day.

Witness #3 stated that he was operating his vehicle southbound on the Baltimore Washington Parkway in Lane #1, traveling at 45-50 miles per hour. In the area of the exit ramp for John Hanson Highway, Witness #3 stated that he was passed on the right by what appeared to be a Honda. Witness #3 stated that this Honda appeared to be traveling "well over 100". There was another unknown vehicle traveling in Lane #1 ahead of Witness #3. Witness #3 stated that the Honda grazed the right curb then cut sharply into lane #1 ahead of the vehicle in front. Witness #3 stated that the Honda disappeared around the curve. Witness #3 stated that he slowed down and several seconds later the police cruiser, Vehicle #1, began to pass him on the right. Witness #3 stated that Vehicle #1 ran up onto the right curb and this appeared to cause Driver #1 to lose control. Witness #3 stated that Vehicle #1 spun sideways across the road between he and the unknown vehicle, entered the grass median and struck the tree. Witness #3 stated that the air was filled with smoke, dust, dirt and flying debris. Witness #3 stated that he did not see Vehicle #1 strike or be struck by any other vehicles. Witness #3 did not recall any other vehicles immediately behind him or to his right.

WITNESS #4:

Washington, D.C.

DOB: 03/18/66

A written statement was obtained from Witness #4 after the collision on October 27, 1992. Witness #4 responded to the office of the Collision Analysis and Reconstruction Unit on November 3, 1992, and a more extensive interview was conducted. Additionally, Witness

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WITNESS #4, continued

#4 and this investigator also revisited the collision site on this day.

Witness #4 was a front seat passenger in Witness #3's vehicle and stated that they were traveling in the left lane. Witness #4 stated that a dark Honda passed their vehicle at a high rate of speed on the right. Witness #4 estimates the speed of this Honda to be 100 miles per hour. Witness #4 stated that seconds later Vehicle #1 also passed them on the right. Witness #4 stated that Vehicle #1 struck the curb on the right, went out of control, skidded across both lanes, into the median and struck the tree. Witness #4 stated that he did not see the Honda interfere with the travel of Vehicle #1 in any way. Witness #4 did not see Vehicle #1 strike, or be struck by any other vehicles. This witness stated that he believes that the driver of the Honda's last minute decision to go left at the exit ramp contributed to Driver #1's loss of control.

WITNESS #5:

Police Officer D. M. WELLER #1881
Prince George's County Police Department
7600 Barlowe Road
Landover, Maryland 20785
W/ (301) 336-8800

A written statement was obtained from Witness #5 on November 3, 1992.

Witness #5 was an on-duty police officer. Witness #5 monitored Driver #1's radio transmission regarding the pursuit of a fleeing Honda. Witness #5 joined the pursuit on Route 450 at Route 95. Witness #5 followed Vehicle #1 and the suspect vehicle west on Route 450 onto the Baltimore Washington Parkway. Witness #5 stated that as they proceeded south on the Parkway, Driver #1 was approximately 150 to 200 yards ahead. Witness #5 stated that as they proceeded south on the Baltimore Washington Parkway the Honda was weaving in and out of traffic with its lights off at speeds in excess 105 miles per hour.

WITNESS #5, continued:

Witness #5 stated that the Honda was in the far right lane and appeared to be taking the John Hanson Highway exit. Witness #5 stated that at the last moment the Honda cut to the left in front of another vehicle, through the median and continued south on the Parkway. At this point Witness #5 stated that dirt and dust obscured his view of the collision.

WITNESS #6:

Corporal Trent L. TOLSON #1396
Prince George's County Police Department
7600 Barlowe Road
Landover, Maryland 20785
W/ (301) 336-8800

A written statement was obtained from Witness #6 on November 3, 1992.

Witness #6 was an on-duty police officer. Witness #6 monitored Driver #1's radio transmission regarding the pursuit of a fleeing Honda. Witness #6 observed the Honda traveling west on Route 450 in the right lane in excess of 80 miles per hour with its lights off. Witness #6 followed the pursuit onto the Baltimore Washington Parkway but did not observe the collision.

WITNESS #7:

Police Officer Jeffery SCOTT #1874
Prince George's County Police Department
7600 Barlowe Road
Landover, Maryland 20785
W/ (301) 336-8800

A written statement was obtained from Witness #7 on October 28, 1992.

Witness #7 was an on-duty police officer. Witness #7 monitored Driver #1's radio transmission regarding the pursuit of a fleeing Honda. Witness #6 observed the

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WITNESS #7, continued:

Honda traveling west on Route 450 at a high rate of speed. Witness #7 states that Vehicle #1 was approximately 30 yards behind the Honda at this time. Witness #7 followed the pursuit onto the Baltimore Washington Parkway but did not observe the collision.

WITNESS #8:

Corporal Edward C. BURKE Jr. #673
Prince George's County Police Department
7600 Barlowe Road
Landover, Maryland 20785
W/ (301) 336-8800

A written statement was obtained from Witness #8 on November 3, 1992.

Witness #8 was an on-duty police officer. Witness #8 monitored Driver #1's radio transmission regarding the pursuit of a fleeing Honda. Witness #8 positioned his vehicle, emergency lights activated, in the left turn lane in the 6100 block of Route 450. Witness #8 observed the Honda westbound on Route 450 with its lights off and traveling at approximately [illegible] miles per hour. Witness #8 stated that Vehicle #1 was approximately 7 to 8 car lengths behind the Honda. Witness #8 followed the pursuit onto the southbound Baltimore Washington Parkway but did not observe the collision.

WITNESS #9:

Lothian, Maryland

Witness #9 phoned the office of the Collision Analysis and Reconstruction Unit on November 2, 1992. A telephone interview was conducted at this time.

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WITNESS #9, continued:

Witness #9 stated that she was on Kenilworth Avenue near Route 95. Witness #9 observed a small dark car traveling northbound on Kenilworth Avenue at approximately 100 miles per hour. Witness #9 observed this vehicle exit onto southbound Route 95. Witness #9 stated that she observed a marked police cruiser apparently in pursuit of this vehicle and that this cruiser was about five seconds behind. Witness #9 did not observe the cruiser (Vehicle #1) strike or be struck by any other vehicles.

WITNESS #10:

Arlington, Virginia

A telephone interview of Witness #10 was conducted on November 2, 1992, at 1020 hours.

Witness #10 stated that he was operating a Ryder truck southbound on Route 95 in Lane #2, north of Route 450. Witness #10 stated that he observed a police cruiser's (Vehicle #1) emergency lights in his mirrors. Witness #10 stated that he decided to change lanes to make sure he was out of this cruiser's way. Witness #10 stated that as he changed from Lane #2 to Lane #3 he almost struck a small dark car with no lights on. Witness #10 stated that this car was traveling at over 105 miles per hour. Witness #10 stated that when the dark car passed him the cruiser was 1/4 to 1/2 miles behind. Witness #10 stated that the dark car went around another vehicle and exited Route 95 at westbound Route 450. Witness #10 continued south on Route 95. Witness #10 never saw Vehicle #1 other than in his mirrors.

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STATEMENTS:

DRIVER OF THE FLEEING HONDA:

Washington, D.C.
DOB/ 3-20-69

On October 27, 1992, a written statement was obtained from the driver of the fleeing Honda.

stated that in an attempt to flee from and elude a police officer (Driver #1) he traveled at speeds around 80 miles per hour, weaved in and out of traffic, and turned his vehicle's lights off. stated that they were southbound on the Baltimore Washington Parkway toward Washington, D.C. stated that at the split (Ramp to John Hanson Highway), he went around to the right of another car that was in the middle lane. stated that he turned his lights off so that Driver #1 could not tell which way he was going to go. stated that he turned toward Washington, D.C. (back onto the southbound Parkway) but did not go through the dirt area. stated that after that he went around a curve and did not see Vehicle #1 again. stated that his vehicle and Vehicle #1 never made contact at any time during the pursuit.

OCCUPANT #1 OF THE FLEEING HONDA:

Silver Spring, Maryland
DOB/ 11-23-75

On October 27, 1992, a written statement was obtained from Occupant #1 of the fleeing Honda.

. stated that he was an occupant of the Honda fleeing from the police officer (Driver #1). stated that was the driver of the Honda.

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OCCUPANT #1 OF THE FLEEING HONDA, continued:

stated while attempting to flee, was traveling at speeds over 100 miles per hour, weaving in and out of traffic, and turning his lights off. stated that was driving recklessly. stated that as they approached the "Y" slowed down, then sped up and turned across the median real fast. At this time Vehicle #1 was about five car lengths behind them. stated that Vehicle #1 pursued them across the median. stated that was the last time he saw Vehicle #1. stated that he did not see the collision.

OCCUPANT #2 OF THE FLEEING HONDA:

Upper Marlboro, Maryland
DOB/ 7-25-73

On October 28, 1992, a written statement was obtained from Occupant #2 of the fleeing Honda.

stated that was the driver of the fleeing Honda. stated that was driving at speeds around 90 miles per hour, weaving in and out of traffic, and turning his lights off.

SITE EXAMINATION:

This investigator was notified of this collision at 0014 hours and responded to the scene arriving at 0046 hours. A direct examination of the collision site was initiated immediately upon arrival. The scene had been secured by patrol officers and all traffic had been diverted. An additional examination of the collision site was conducted after sunrise on October 27, 1992, at approximately 0730 hours. Photographs and measurements that accurately depict the collision scene were taken on both occasions. During the direct examinations of the collision site the following observations were made:

SITE EXAMINATION, continued:

* General topographic observations as described in ROAD TYPE.

* Vehicle #1 was located in its position of final rest against a 16 inch diameter oak tree.

* In the area of Vehicle #1 right front there is evidence of fire extinguisher use. A discharged fire extinguisher is located in the grass north of Vehicle #1.

* Four side sliding tire marks from Vehicle #1 lead through the grass median from the edge of southbound Baltimore Washington Parkway directly to the tree.

* Four side sliding tire marks were located across both southbound lanes of the Parkway. These marks continued in line with the sliding tire marks in the median and continued directly to Vehicle #1. The arc of these sliding tire marks remains consistent as they cross both southbound lanes. There is no additional loading or deviation present which would have indicated impact with another vehicle during the slide.

* A very deep gouge, apparently caused by the right rear wheel of Vehicle #1, was located on the median curb.

* There is a dirt area that divides southbound Baltimore Washington Parkway from the exit ramp to westbound John Hanson Highway. This dirt area is eroded from the elements and vehicular traffic. The dirt has eroded away from the outside of the Baltimore Washington Parkway's southbound right curb. This has caused the curb to protrude upward as much as 5 inches, causing a hazard to traffic.

* There is a side sliding mark from Vehicle #1's right rear tire located in the dirt to the outside of the right curb. There are numerous fresh gouges and scrapes along the top surface of this curb from

SITE EXAMINATION, continued:

the undercarriage of Vehicle #1 in the same area. There is a tire strike scuff on the outside of the curb at the end of this tire mark.

* There were numerous tire tracks from unknown vehicles located throughout the dirt area.

MEASUREMENTS:

Measurements that accurately depict the collision scene were taken using the coordinate method. A base point was established along the median curb of southbound Baltimore Washington Parkway at the southern corner of a storm drain. A base line was then extended north and south along the edge of the median curb. All measurements were taken perpendicular to this base line. Measurements are depicted on the DIAGRAM OF MEASUREMENT POINTS.

Point A: Base point on curb at storm drain, also location of a large gouge in the curb
Point B: Right front wheel of Vehicle #1
Point C: Right rear wheel of Vehicle #1
Point D: Tire strike on curb
Point E: Tire strikes on curb, front tires' side slide skid marks crossover
Point F: Rear tires' side slide skid marks crossover
Point G: Left rear side slide skid mark begins
Point H: Right rear tire strikes outside of curb
Point I: Right front side slide skid mark begins
Point J: Left front side slide skid mark begins
Point K: Widest point in the arc of the right rear sliding tire mark in the dirt
Point L: Beginning of sliding tire mark in the dirt

MEASUREMENTS, continued:

Point A to B: South 139'5", East 18'7"
Point A to C: South 132'6", East 17'10"
Point A to D: South 20', on Base Line
Point A to E: North 40'to 50', on Base Line
Point A to F: North 55'8", West 12'
Point A to G: North 123', West 21'
Point A to H: North 140', on right curb
Point A to I: North 157', West 19'6"
Point A to J: North 162', West 15'8"
Point A to K: North 207', West 26'3"
Point A to L: North 249', West 25'

VEHICLE INSPECTION:

Vehicle #1 was examined on the scene of the collision and again on October 27, 1992, during daylight hours at the Prince George's County Police Department's Automotive Service's Lot, Upper Marlboro, Maryland. During this direct inspection of Vehicle #1 the following observations were made:

* Make- Ford
* Model- Crown Victoria
* Year- 1992
* VIN- 2FACP72W7NX209849
* Registration- Maryland PG0795
* Marked Prince George's County Police cruiser #15
* Color- White with blue interior
* Mileage- 9978
* Automatic transmission

* Extreme regression to the entire right side. Initial impact was just to the rear of the right "B" pillar. Entire vehicle is twisted to the right along its longitudinal axis.

* Right portion of the is frame crushed to the left.

* Right front door forced open during rescue operations. Pry marks evident near latching mechanism. Black transference evident on door's

VEHICLE #1, continued:

exterior.

* Wood fibers and bark are embedded in the right rear door, right "B" pillar and roof.

* Right "A" pillar crushed downward and left.

* Right "C" pillar bent to the left.

* Roof buckled upward, forced to the left and rearward.

* Police emergency light bar torn from roof, wires still attached.

* Contact damage to the right rear fender. Fender is crushed inward, plastic rear bumper is torn on the right rear corner. Blue paint transference is evident across fender. Paint is smeared in a front to rear fashion. Black transference is evident on the lower portion of the fender. On the upper portion of the fender, mixed in the blue paint, there are glass fragments. Additionally, in this same area Vehicle #1's paint is scratched and gouged in a pock marked pattern which is indicative of safety glass impact.
** THIS INDICATES THAT AT SOME POINT VEHICLE #1 WAS INVOLVED IN A COLLISION WITH ANOTHER VEHICLE **

* Induced damage to right front fender.

* Hood forced up and rearward on right side. Evidence of fire extinguisher residue in the engine compartment.

* All windows with the exception of the smaller secondary window on the left rear door are shattered.

* Induced and contact damage across entire windshield. Left side of windshield has been torn outward during rescue operations.

OCC160

VEHICLE #1, continued:

* Trunk lid has been sprung.

* Induced damage to left rear fender.

* Left rear door is jammed rearward. Window frame was bent outward and down during rescue operations.

* Left front fender is buckled downward above the wheel from induced damage.

* Front bumper is undamaged. Front bumper and head lamp cowl are separated.

* Driver's seat is crushed from the right, forced and twisted to the left.

* Right front seat is crushed, twisted and forced to the left. The cloth fibers of this seat are crushed and torn apparently from impacting Driver #1.

* Driver #1's right shoe wedged into pedal area by floor pan intrusion.

* Police radio assembly torn from vehicle. Federal signals control box torn from vehicle.

* AM/FM radio was on, volume low.

* Heat is on, temperature control set on medium cool, fan set on low.

* Driver's side air bag is deployed.

* Driver's safety belt harness has been cut during rescue operations. Safety belt latch plate is still attached to the latch. DRIVER #1 WAS RESTRAINED BY A SAFETY BELT DURING THE COLLISION.

* Instrument panel is buckled upward in the center.

* Rear seat is completely crushed.

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EXAMINATION OF SUSPECT VEHICLE:

The vehicle being pursued by Driver #1 was examined on October 27, 1992, at the Prince George's County Police Department's Evidence Bay. The vehicle was fully photographed and processed at this time. During the examination of this vehicle the following observations were made:

* Make- Honda
* Model- Accord
* Year- 1992
* Color- Black w/ gold pin stripe
* Registration- None displayed
* VIN- 1HGCB7276NA047594 ** FROM FEDERAL SAFETY STICKER **

* There is minor contact damage to the left front corner of the front bumper. Damage appears to be a scraping of the plastic bumper in a front to rear motion. This contact damage is 14 1/2" to 22 1/4" high. There is a brown transference and embedded within this damaged area appears to be creosote wood fibers and a thin green colored transference that is possibly vegetation.

* There is no evidence of any vehicle to vehicle contact.

EVIDENCE ANALYSIS:

In an effort to identify the vehicle that was involved in the collision with Vehicle #1, paint samples from the right rear fender of Vehicle #1 were submitted to the Federal Bureau of Investigation for analysis. As of November 20, 1992, this analysis has not been completed.

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SPEED CALCULATIONS:

The following data was used to determine to minimum speed of Vehicle #1:

Center of mass side sliding distance on asphalt: 112 feet
Asphalt coefficient of friction: 0.75

Center of mass side sliding distance on grass: 152 feet
Grass coefficient if friction: 0.66

The minimum speed of Vehicle #1 was determined to be 74 miles per hour.

SEQUENCE OF EVENTS:

Driver #1 was an on-duty Prince George's County Police Officer operating a marked police patrol cruiser (Vehicle #1). At the intersection of Kenilworth Avenue and Westchester Park Drive, Driver #1 attempted to initiate a traffic stop on the listed suspect vehicle. The driver of the suspect vehicle,   , attempted to flee from Driver #1. The pursuit went north on Kenilworth Avenue to southbound Route 95, south on Route 95 to westbound Route 450 (Annapolis Road), west on Route 450 to southbound Baltimore Washington Parkway and south on the Baltimore Washington Parkway. Speeds exceeded 100 miles per hour and the suspect vehicle was weaving in and out of traffic. Several times the suspect,   turned off his vehicle's lights.

As the pursuit continued south on the Baltimore Washington Parkway the suspect vehicle initially appeared to be exiting the Parkway at the westbound John Hanson Highway ramp. The suspect vehicle swerved to the left and continued south on the Parkway.

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SEQUENCE OF EVENTS, continued:

Just south of the exit ramp, Vehicle #1 struck a raised curb with its right rear wheel. Vehicle #1's right rear wheel went up and over this curb. This caused the frame of Vehicle #1 to drag and gouge the top surface of the curb. Vehicle #1 began rotate counter-clockwise and started sliding to the right. This caused Driver #1 to completely lose control. Vehicle #1 slid down the curb for approximately 109 feet continuing to rotate counter-clockwise. Vehicle #1 came back completely onto the southbound lanes, now sliding sideways to the right. Vehicle #1 crossed both southbound lanes of the Baltimore Washington Parkway and struck the median curb. Vehicle #1 continued over the median curb. Vehicle #1 slid southbound through the grass median and struck an oak tree with its right side. Vehicle #1 came to final rest against this tree and Driver #1 was trapped within the vehicle.

Driver #1 was transported to the Washington Hospital Center's Med Star Unit and pronounced at 0034 hours by Doctor Sykes.

Evidence on Vehicle #1's right rear fender indicates that a collision with another vehicle occurred at some point. The exact location of this collision is unknown. The identity of this vehicle's driver is also unknown. This unknown vehicle failed to stop and remain at the scene of this collision and failed to make any report of the collision. No witnesses observed any contact between Vehicle #1 and any another vehicles. Numerous efforts to identify this hit and run driver have been unsuccessful.

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CONCLUSIONS:

1. The primary cause of this collision is **ROADWAY DEFECT**. The raised curb was a traffic hazard and caused Vehicle #1 to begin rotating. This in turn caused Driver #1 to completely lose control of his vehicle.

2. Vehicle #1 was involved in a collision with a hit and run vehicle. The contributory factors of this hit and run vehicle have not been determined. The collision with the hit and run vehicle may have caused Driver #1 to initially strike the raised curb.

3. There was no evidence of contact between Vehicle #1 and the fleeing Honda.

CLOSURE:

This case was reviewed with the Office of the State's Attorney on November 10, 1992. This case will remain OPEN, pending the identification of the hit and run driver.

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PRINCE GEORGE'S COUNTY
POLICE DEPARTMENT

COLLISION ANALYSIS & RECONSTRUCTION UNIT

MAARS Report Number:	Case Number:
5490394	92-300-1172
Date: October 27, 1992	Time: 0006 Hours

POSITION OF FINAL REST AND PHYSICAL EVIDENCE DIAGRAM

E N S W

POSITION OF FINAL REST

PRINCE GEORGE'S COUNTY
POLICE DEPARTMENT

COLLISION ANALYSIS & RECONSTRUCTION UNIT

MAARS Report Number:	Case Number:
5490394	92-300-1172
Date: October 27, 1992	Time: 0006 Hours

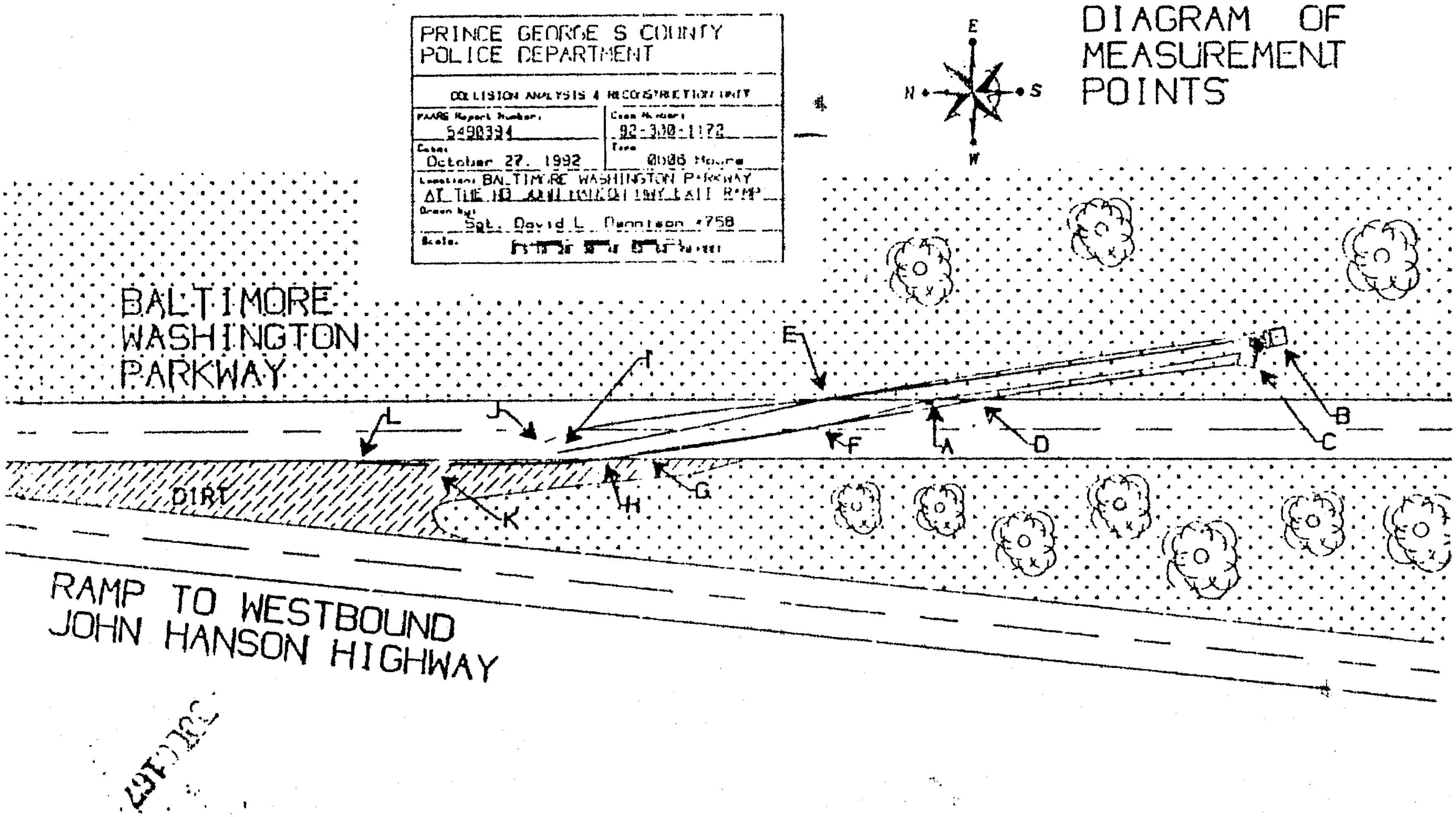
Location: BALTIMORE WASHINGTON PARKWAY AT THE WB JOHN HANSON HWY EXIT RAMP

Drawn by: Sgt. David L. Dennison #758

Scale: [illegible] feet

SEQUENCE OF EVENTS DIAGRAM

E N S W



PRINCE GEORGE S COUNTY
POLICE DEPARTMENT
5490394
92-300-1172
October 27, 1992
0006 Hours
BALTIMORE WASHINGTON PARKWAY
Sgt. David L. Dennison #758
E
N
S
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DIAGRAM OF
MEASUREMENT
POINTS
BALTIMORE
WASHINGTON
PARKWAY
A
B
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L
DIRT
RAMP TO WESTBOUND
JOHN HANSON HIGHWAY

State of Maryland Motor Vehicle Accident Report

REPORT NO	PAGE OF	ACCIDENT DATE	ACCIDENT TIME	REPORT TYPE	RESEARCH	LOCAL CASE NUMBER	PHOTOS
06277151	1 10	02 28 94	2156 hrs.	☒ FATAL ☐ INJURY ☐ PDO ☐ HIT & RUN ☐ NON TRAFFIC		94-059-1008	☐ NO ☒ YES
INVESTIGATING OFFICER ID	**AGENCY AND AREA**	**SUPERVISING OFFICER ID**		**REVIEWER ID#**		**CODE AND NAME OF MUNIC**	**COUNTY**
Sgt. D. Dennison #750	DA G-6					1,3,4 Seat Pleasant	16

RECONSTRUCTION / REPORT OF INVESTIGATION

LOCATION:

Martin Luther King Jr. Highway (MD 0704) approximately 286 feet west of Greig Street (MU 0160), Seat Pleasant, Prince George's County, Maryland

DATE / TIME:

February 28, 1994
2156 hours / 9:56 P.M
Monday

TYPE OF COLLISION:

Fixed Object Struck
MAARS Type 09
Subsequent Events, Fixed object struck, Fixed object struck, Overturned.
MAARS Type 09, 09, 11
Fatal collision
One fatality, no personal injuries

WEATHER:

Partly cloudy, temperature approximately 30°

ROAD TYPE:

Martin Luther King Highway at the collision site is a six lane highway with three lanes each traveling east and west, divided by a raised concrete and grass median. This collision occurred completely on the westbound side of Martin Luther King Highway. The roadway is bordered on the right by a concrete curb. Travel lanes are delineated by painted broken white lines. The road surface was dry asphalt with a measured coefficient of friction of 0.81. The speed limit is posted at 40 miles per hour. The roadway is artificially illuminated with street lights. Greig Street intersects Martin Luther King Highway from the north, east of the collision scene. Traffic entering Martin Luther King Highway from Greig Street is controlled by a stop sign. East of Greig Street, Martin Luther King Highway curves to the north and there is a high concrete wall running parallel to the westbound lanes. The site distance between westbound Martin Luther King Highway and Greig Street is reduced by the curve and wall. At the collision site, there are garden style apartments bordering Martin Luther King Highway.

JCT 168

06277151
94-059-1008
February 28, 1994
Sgt. David L. Dennison #158

IDENTIFICATION:

DRIVER #1:

John Louis BAGILEO
7600 Barlowe Road
Landover, Maryland 20785
W/ (301) 336-8800
DOB/ 08-21-67
Maryland Drivers License # B-240-429-549-653
Fatal injuries

NEXT OF KIN:

BAGILEO
Wife of Driver #1
Mrs. Bagileo was notified of Driver #1's death on February 28, 1994

VEHICLE #1:

1993, Ford, Crown Victoria, Maryland registration- PG1187, owned by PRINCE GEORGE'S COUNTY MARYLAND, 125 Brightseat Road, Landover, Maryland 20785.

OWNER OF FIXED OBJECTS STRUCK:

CURB (undamaged):

MARYLAND STATE HIGHWAY ADMINISTRATION

FIRE HYDRANT (destroyed):

WASHINGTON SUBURBAN SANITARY COMMISSION

UTILITY POLE (destroyed):

POTOMAC ELECTRIC POWER COMPANY, pole #827388-5238

JCC 169

06277151
94-059-1008
February 28, 1994
Sgt. David L. Dennison #758

WITNESSES:

WITNESS #1:

... Witness # 1

Landover, Maryland

DOB/ 01-21-70

A written statement was obtained from Witness #1 at her home on March 2, 1994 by Corporal Steven Markley #1134.

Witness #1 stated that she was on Greig Street and stopped at the intersection of Martin Luther King Highway. Witness #1 intended to turn left and proceed eastbound. Witness #1 stated that she checked for traffic both ways on Martin Luther King Highway and it was clear. Witness #1 stated that she started across westbound Martin Luther King Highway when she noticed a police car (Vehicle #1) westbound with its emergency lights and siren on. Witness #1 places Vehicle #1 in Lane #2 at this time. Witness #1 stated that she stopped in the slow lane, Lane #3. Witness #1 stated that Vehicle #1 changed lanes and started to slide sideways. Witness #1 stated that Vehicle #1 struck the median curb then slid across all lanes of Martin Luther King Highway. Witness #1 states that after Vehicle #1 struck the pole she went to her home and called the police.

WITNESS #2:

Seat Pleasant, Maryland

DOB/ 08-14-66

A written statement was obtained from Witness #2 at his place of employment on March 2, 1994.

Witness #2 states that he was stopped on Greig Street at Martin Luther King Highway with one car in front of him (WITNESS #1). Witness #2 states that he intended to turn right and proceed west on Martin Luther King Highway. Witness #2 states that he observed the car in

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06277151
94-059-1008
February 28, 1994
Sgt. David L. Dennison #758

WITNESSES (continued):

front of him start forward into Martin Luther King Highway. Witness #2 states that this vehicle's brakes lights went off for 2 to 5 seconds and that this vehicle moved forward 1 to 2 feet. Witness #2 states that when the police car went past them the other car was approximately 7 feet into Lane #3. Witness #2 stated that Vehicle #1 was in Lane #2. Witness #2 stated that Vehicle #1 had its emergency lights and siren activated. Witness #2 stated that after Vehicle #1 went past him it struck the pole. Witness #2 believes that Driver #1's reaction to Witness #1's vehicle caused Driver #1 to lose control and strike the pole.

WITNESS #3:

Fort Washington, Maryland

DOB/ 10-23-59

Witness #3 was interviewed by telephone on March 2, 1994 at 1025 hours.

Witness #3 states that he was eastbound on Martin Luther King Highway and approximately 100 yards west of the collision site. Witness #3 states that he could clearly see on-coming westbound traffic. Witness #3 states that suddenly Vehicle #1's emergency lights came on. Witness #3 states that when the emergency lights came on Vehicle #1 appeared to be out of control. "The car seemed to be twirling". Witness #3 watched Vehicle #1 strike the utility pole and stated that for a few moments the emergency lights continued to turn. Witness #3 describes hearing a "click", then a "boom" and Vehicle #1 started to burn slowly. Witness #3 stated that at the speed Vehicle #3 was traveling, the emergency lights should have been on sooner. Witness #3 did not see any other vehicles interfere with Vehicle #1's travel prior to the collision.

WITNESS #4:

Gaithersburg, Maryland

DOB/ 09-15-38

A written statement was obtained from Witness #4 on the scene of the collision.

JCC171

06277151
94-059-1008
February 28, 1994
Sgt. David L. Dennison #758

Witness #4 was in a parking lot on George Palmer Court. Witness #4 stated that he heard the skidding of tires and saw Vehicle #1 strike the utility pole. Witness #4 states that the emergency lights of Vehicle #1 were still on after the impact.

WITNESS #5:

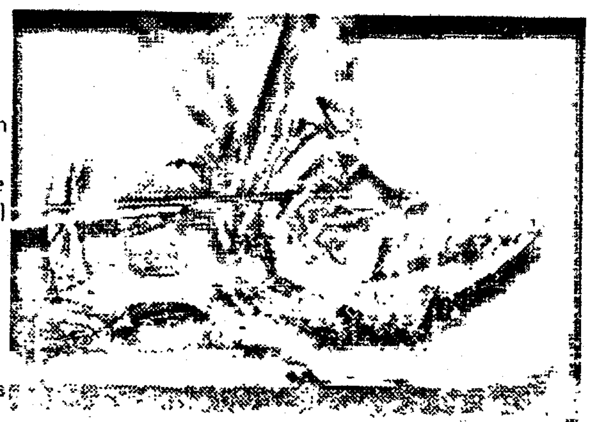
Lynchburg, Virginia

DOB/ 08-05-57

A written statement was obtained from Witness #5 on the scene of the collision.

Witness #5 states that he was eastbound on Martin Luther King Highway approaching the point of the collision. Witness #5 places Vehicle #1 westbound in Lane #2. Witness #5 states that Vehicle #1 immediately 'jetted' into the pole after its emergency lights came on. Witness #5 describes the movement of Vehicle #1 as "[Vehicle #1] seemed to turn into the direction with a sharp jerk and accelerated into the light post". Witness #5 stated that he did not observe any other vehicles interfere with the travel of Vehicle #1.

SITE EXAMINATION:

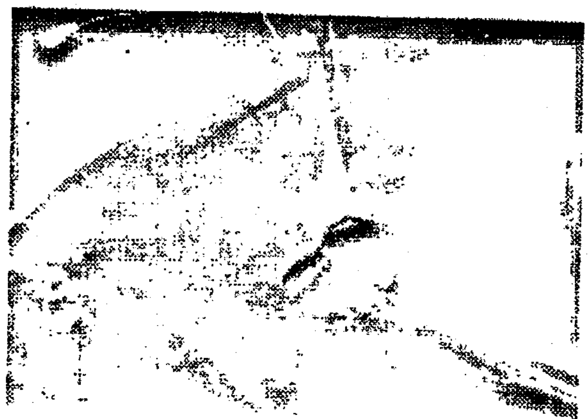


Vehicle # 1 - Final Rest

This investigator was notified of this collision at 2206 hours and responded from his residence to the scene of the collision, arriving at 2234 hours. The collision scene had been secured by Patrol Officers and all traffic had been diverted. Photographs and video were taken at this time. Measurements that accurately depict the scene were taken by Corporal P. R. Burley and Corporal R. B. Ratcliffe at this time. The locations of items of importance to this investigation were marked with optic orange spray paint for future reference and analysis. The scene was examined again on March 1, 1994 during daylight hours. Although a heavy snowfall had begun, additional photographs were taken at this time. During the direct examination of this collision site the following observations were made:

* General topographic observations as described in ROAD TYPE.

JJT 172


...sion Scene

* Vehicle #1 was in its position of final rest, off of the northern road edge, facing west, lying partially on its left side and with the utility pole fully embedded from left to right into the occupant compartment. The Fire Department was on the scene and fire suppression efforts were underway. Driver #1, deceased, remained trapped within the vehicle.

* P.E.P.C.O. pole #S27388-5238 had been struck by Vehicle #1. This was a 45 foot, Class 2 utility pole. Attached to this pole were electric and telephone wires, three transformers and a street light. This pole was fractured at the base and again approximately 20 feet above the ground. Several electric wires had fallen to the ground. Two telephone cables had broken loose from the pole and had fallen onto Vehicle #1. This pole had been burned by the vehicle and re-ignited several times.

* A fire hydrant had been struck by Vehicle #1 and broken at its base. A large quantity of water was flowing from this hydrant.

* A critical scuff yaw mark from Vehicle #1 started in Lane #1, within the intersection of Greig Street. As this yaw continued westbound, arcing toward the right road edge, marks from all four tires could be observed. This critical scuff yaw eventually becomes a four wheel side slide and continues to Vehicle #1's impact with the right curb.

* A tire scuff on the right curb indicated the initial point of impact of Vehicle #1.

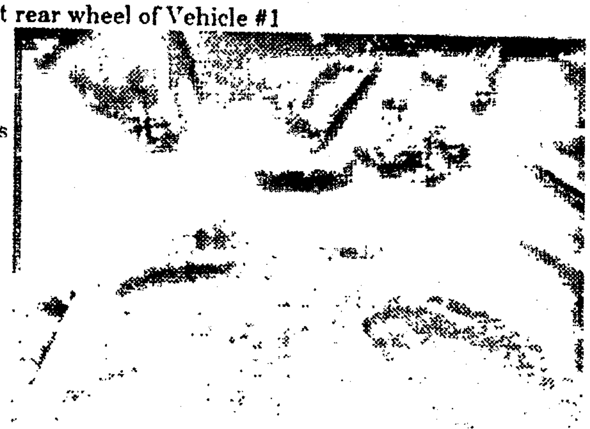
MEASUREMENTS:

Measurements of the collision scene were taken using the coordinate method. A base point was established on the northern curb perpendicular to P.E.P.C.O. Pole #S27388-6751. This base line was then extended east and west along the northern edge of the center island. All measurements were taken perpendicular to this base line. Measurements are depicted on DIAGRAM OF MEASUREMENT POINTS.

Point A: Base point
Point B: Yaw marks begin from left wheels of Vehicle #1

JCT 173

Point C: Yaw mark begins from right rear wheel of Vehicle #1
Point D: Side sliding tire mark begins from right front wheel of Vehicle #1
Point E: First crossover of tire marks of Vehicle #1
Point F: Tire scuff on curb
Point G: Tire scuff on curb
Point H: Left rear wheel of Vehicle #1
Point I: Left front wheel of Vehicle #1
Point J: Fire hydrant
Point K: P E.P.C.O. pole #827388-5238
Point A to B: East 137'0" , North 5'3" & North 5 10"
Point A to C: East 100'0' , North 8'11"
Point A to D. East 33'6" , North 13'0"
Point A to E: East 10'7' , North 20'0"
Point A to F: West 91'4" , On curb
Point A to G: West 104'0", On curb
Point A to H: West 173' , North 41'5"
Point A to I: West 179' , North 46 6"
Point A to J: West 160' , North 35'6"
Point A to K West 176'6" , North 45'3"



Collision Scene

VEHICLE EXAMINATION:

VEHICLE #1:

A cursory examination of Vehicle #1 was conducted on the scene of the collision. An in-depth examination of Vehicle #1 was conducted on March 1, 1994, at the Prince George's County Police Department's Automotive Services Lot, Upper Marlboro, Maryland. Additional daylight photographs of Vehicle #1 were taken at this time. During this direct examination of Vehicle #1 the following observations were made:

1 Examination

* Make: Ford
* Model: Crown Victoria, 4 door
* Year: 1993
* Registration: Maryland/ PG1187
* VIN: 2FACP71W9PX188474
* Color: White, marked uniformed police cruiser #631
* Mileage: Unknown.
* Automatic transmission

* Extreme regression on left side. Entire vehicle is bent in a "V" shape from left to right and downward in the center

* The entire vehicle has suffered severe fire damage.

* Left front door is crushed downward and rearward.

* Left rear door is crushed behind the driver's door and forced rearward.

* There is contact damage to the left rear fender from impact with the fire hydrant.
* The rear portion of the differential housing has been torn open from impact with the fire hydrant.

* The trunk has sprung open and there is evidence of contact damage to the underside of the lid from falling wires.

* There is a cylindrical indentation to the top of the right rear fender from the impact of the falling wires.

* The roof was removed by the Fire Department during the extrication of Driver #1. The roof had been crushed downward and into the occupant compartment.

* Induced damage is evident on the right front fender.

* Both right doors are forced outward at the B pillar. The upper portion of the window frames are bent downward.

* Fuel filler cap has been burned off.

* Front bumper is twisted but exhibits no contact damage.

* Rear tires have been destroyed by fire.

* The interior of the vehicle has been destroyed by fire. The driver's seat back is in contact with the back of the rear seat.

JCC 175

* Driver's seat belt latching mechanism was located. The seat belt latch is not connected Driver #1 was not restrained by a seat belt.

* The transmission housing was broken open during impact with the pole and several large holes are apparent.

* Gas tank has been crushed, there are no apparent holes or rips in the tank.

* All steering components were checked and appear intact.

* Left front tire is intact. 34 PSI, 8/32" tread. There is a rotational scratch on the lip of the wheel.

* Left rear wheel is bent inward from curb impact.

CALCULATIONS:

The following data was used to determine the speed of Vehicle #1.

Cord of critical speed yaw: 100 feet
Middle ordinate of critical speed yaw: 1 foot, 4 1/2 inches
Coefficient of friction: 0.81
Radius of yaw: 909 feet

The speed of Vehicle #1 was determined to be 104 miles per hour.

SEQUENCE OF EVENTS:

Driver #1 was an on-duty Prince George's County police officer operating Vehicle #1, a marked police cruiser Driver #1 was responding to the complaint of a tampering with an automobile at 4700 Mann Street, Seat Pleasant, Maryland (CCN 94-059-1008). Vehicle #1 was westbound on Martin Luther King Jr. Highway in Lane #2 or Lane #1. Witness #1 was stopped on Greig Street at Martin Luther King Highway, intending to turn left and proceed eastbound. As Driver #1 approached the intersection of Greig Street, he apparently activated his emergency lights and siren. Witness #1 had just started into the intersection when she observed Vehicle #1 approaching. Witness #1 stopped within Lane #3 Vehicle #1 was in Lane #1 as it passed through the intersection of Greig Street. Driver #1 apparently swerved to the left fearing that Witness #1 was not stopping. Driver #1 lost control of the vehicle and yawed to the right. Vehicle #1 struck the right curb. Vehicle #1 continued over the curb and struck a fire hydrant with its left rear fender. Vehicle #1 sheared off the fire hydrant. continued westbound and started to overturn. Vehicle #1 struck P.E.P.C.O Pole #827388-5238 with its left side and roof Impact with the pole caused two heavy telephone cables to break loose and fall onto Vehicle #1

JUT 176

Vehicle #1 came to final rest, facing westbound and laying on its left side still in contact with the pole. Vehicle #1 began to burn and eventually became completely engulfed in flames. Driver #1, deceased, remained trapped within the vehicle. Medical Examiner, Dr. Devore responded to the scene and pronounced Driver #1 dead at 2335 hours

CONCLUSIONS:

1. Vehicle #1 was traveling at a speed that was too great for the road and traffic conditions.

2. Driver #1 apparently lost control after reacting to the approach of another vehicle (Witness #1).

3. Driver #1 was not restrained by a seat belt.

CLOSURE:

This case will be closed as UNFOUNDED, pending review of the State's Attorney's Office for Prince George's County.

JJT 177

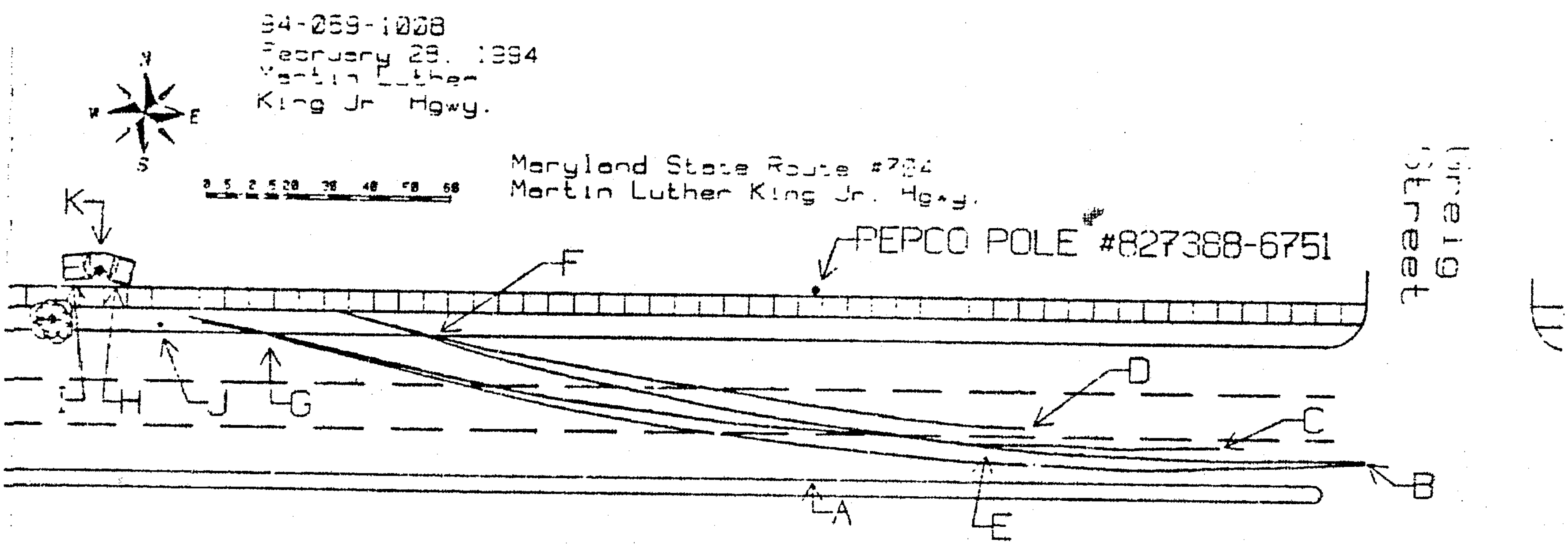
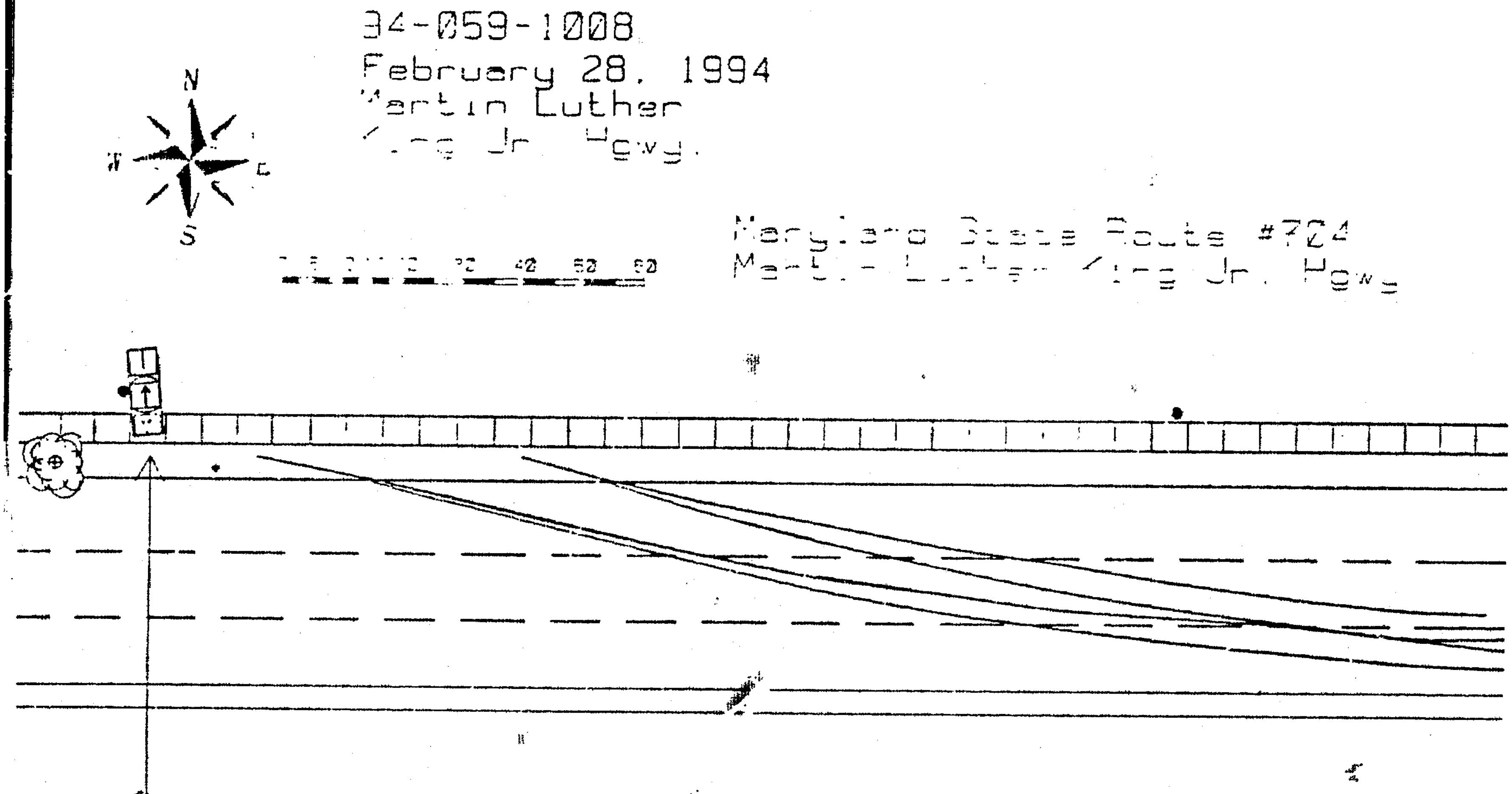
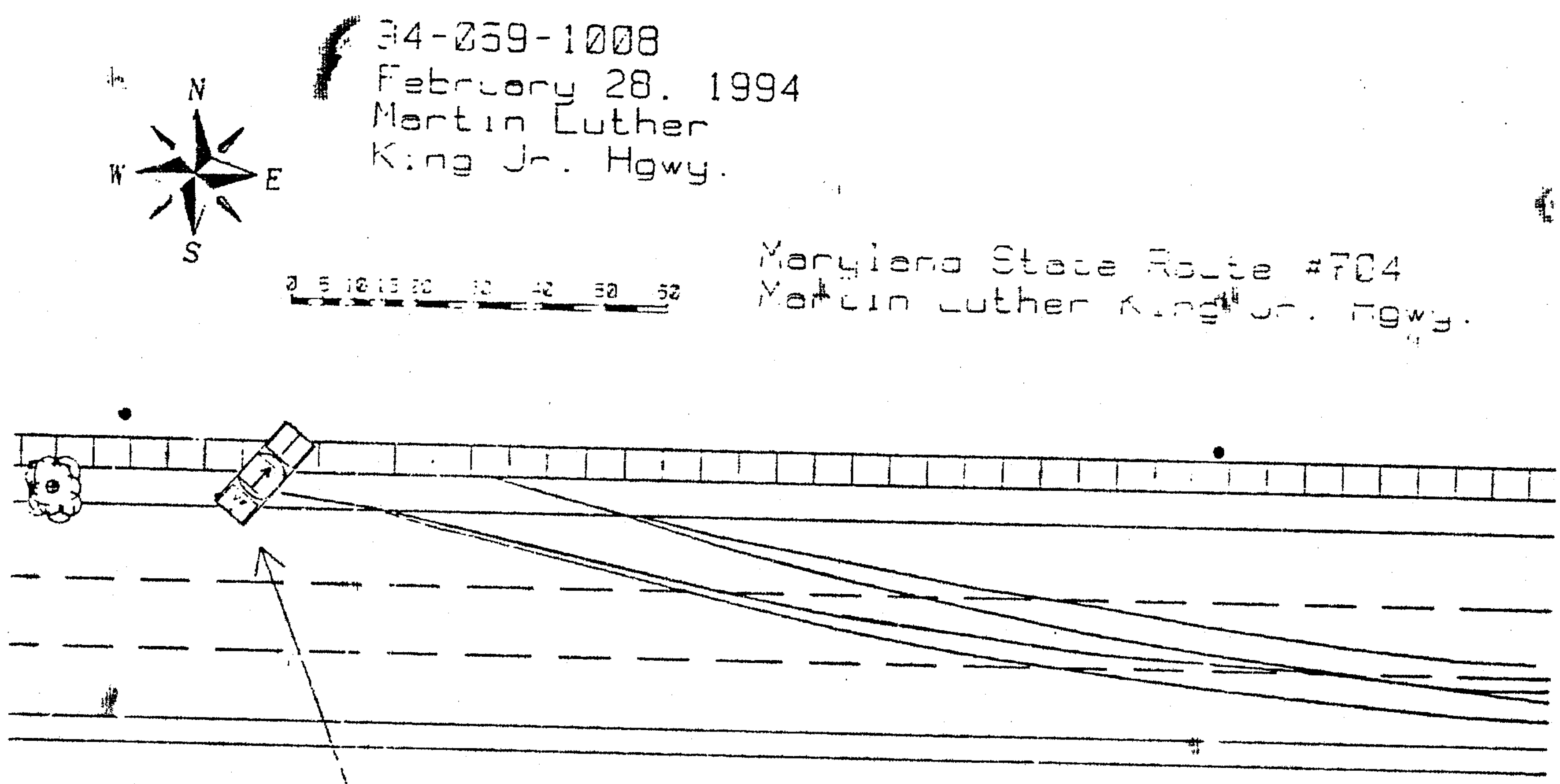


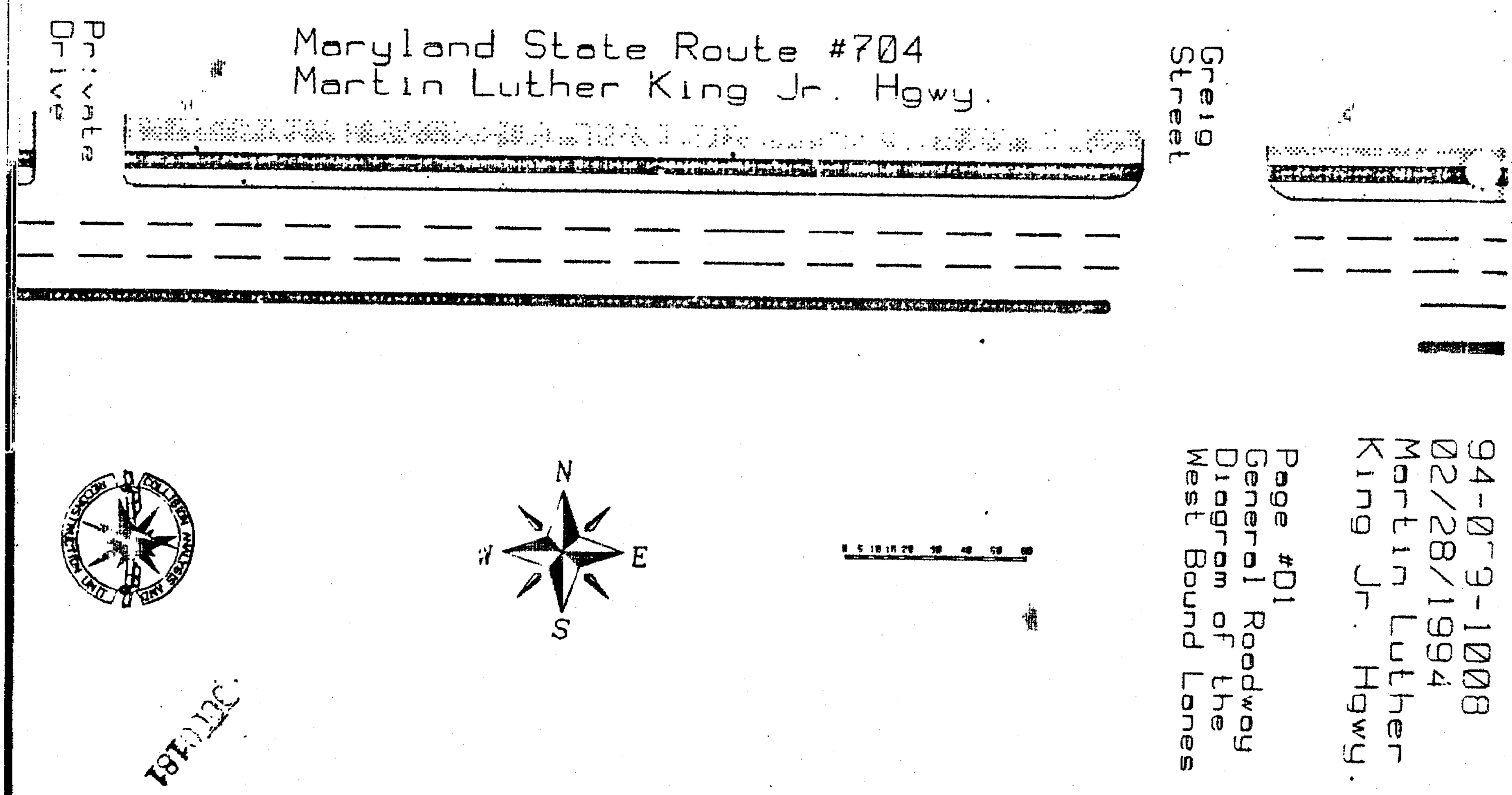
DIAGRAM OF MEASUREMENT POINTS



VEHICLE #1 STARTS TO OVERTURN
AND STRIKES PEPCO POLE



VEHICLE #1 STRIKES FIRE HYDRANT


Maryland State Route #704
Martin Luther King Jr. Hgwy.
Private Drive
Greig Street
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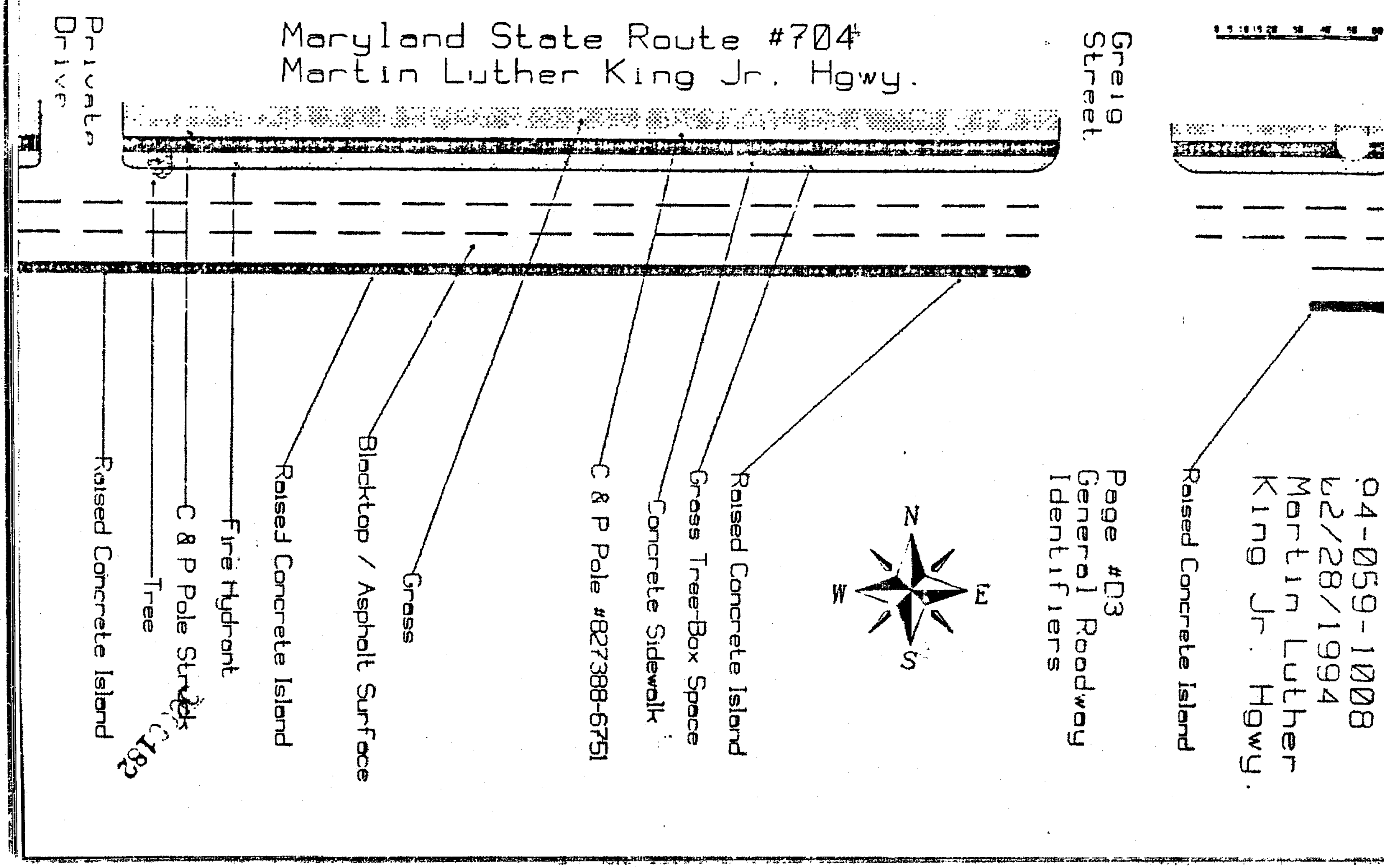
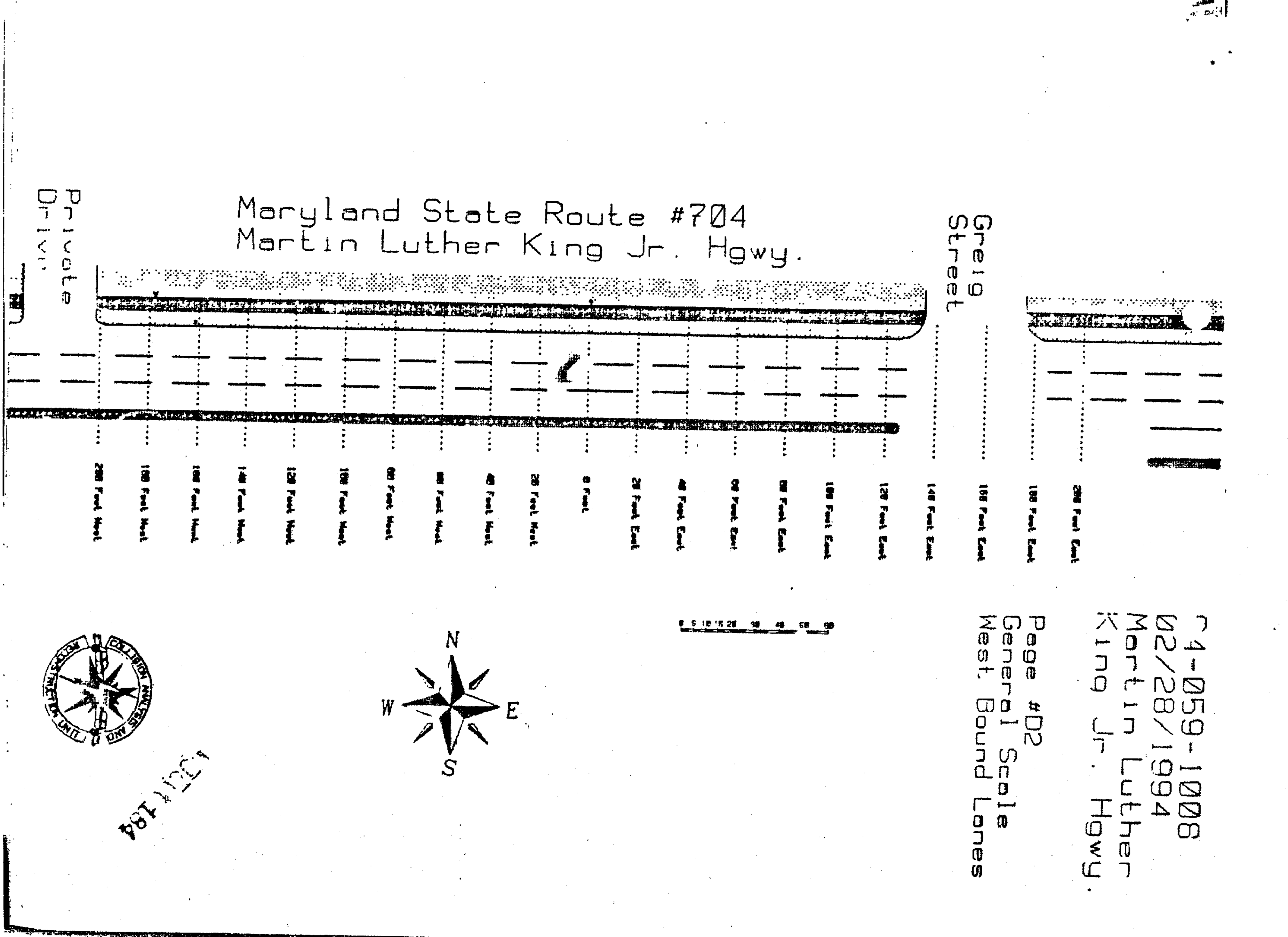
W
0 5 10 15 20 30 40 50 60
94-073-1008
02/28/1994
Martin Luther King Jr. Hgwy.
Page #D1
General Roadway Diagram of the West Bound Lanes



Maryland State Route #704
Martin Luther King Jr. Hgwy.
Private Drive
Greig Street
94-059-1008
02/28/1994
Martin Luther King Jr. Hgwy.
Page #03
General Roadway Identifiers
Raised Concrete Island
Raised Concrete Island
Grass Tree-Box Space
Concrete Sidewalk
C & P Pole #827388-6751
Grass
Blacktop / Asphalt Surface
Raised Concrete Island
Fire Hydrant
C & P Pole Struck
Tree
Raised Concrete Island
N
E
S
W
C182


Maryland State Route #704
Martin Luther King Jr. Hgwy.
Private Drive
Greig Street
200 Feet West
180 Feet West
160 Feet West
140 Feet West
120 Feet West
100 Feet West
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94-059-1008
02/28/1994
Martin Luther
King Jr. Hgwy.
Page #D2
General Scale
West Bound Lanes
184

US Department of Transportation
National Highway Traffic Safety Administration

400 Seventh Street, S.W.
Washington, D.C. 20590

AUG 31 1994

Chief of Police
City of Ames
515 Clark
Ames, IA 50010

NEF-121lhs
EA94 022

Dear Chief:

As you may know, the National Highway Traffic Safety Administration (NHTSA) is investigating the performance of the power steering systems installed in 1992 and 1993 Ford Crown Victoria vehicles equipped for police use. The purpose of this investigation is to determine whether the design or performance of the subject power steering systems contain a safety-related defect requiring recall and remedy in accordance with applicable Federal law.

On April 21, 1994, NHTSA issued a notice regarding this investigation over the nationwide police telecommunications network. For your information, a copy of that notice is enclosed with this letter. This also advises you that, based on the information developed during NHTSA's Preliminary Evaluation, the investigation was recently upgraded to an Engineering Analysis to allow for a more detailed and thorough review of the issues involved.

The purpose of this letter is to formally request your agency's input regarding the power steering system performance in the subject Crown Victoria vehicles operated in your fleet. For purposes of this information request, the following terms are defined unless otherwise described:

- **Subject_vehicles:** all 1992 and 1993 model year Ford Crown Victoria "police equipped" vehicles in your fleet.
- **Alleged defect:** a sudden change in the amount of steering input force required to execute a given vehicle maneuver at low to moderate vehicle speeds (15 to 30 miles per hour). Such a change may be perceived by the driver as momentary binding or lockup of the steering system.

To assist NHTSA in developing a qualitative assessment of the scope of the subject steering condition and the general perceptions of officers who operate these vehicles in the line of duty, your numbered responses are requested to the following questions.

In order that we might continue expeditious handling of this investigation, we would appreciate your response to this letter by September 14, 1994. If you have any questions concerning the information requested in this letter, please contact Mr. Lee Strickland of my staff at (202) 366-5201.

Sincerely,

Charles L. Gauthier, Director
Office of Defects Investigation
Enforcement

Enclosure:
Police Information/Officer Safety Letter

3 OCT 186

N 1501-1501 04/21/94 02422481 QTRF05244 PART 000 OF 001 *R*
QHQT QATH KNYB QSTA QTRF READ
N 1501-1501 04/21/94 02422481 QTRF05244 PART 001 OF 001 *R*
QTRF APTS LETS
AM.NY10100T1.AP,CN.
00011 FILE 25 SP ALBANY NY10100T1 APRIL 21-94
TO APB - NATIONWIDE
ATTENTION - FLEET MANAGEMENT PERSONNEL

SUBJECT: POLICE INFORMATION/OFFICER SAFETY

THIS IS TO NOTIFY YOUR AGENCY THAT THE NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION (NHTSA) HAS OPENED A SAFETY DEFECT INVESTIGATION CONCERNING THE PERFORMANCE OF THE POWER STEERING SYSTEM IN 1992 AND 1993 FORD CROWN VICTORIA VEHICLES, INCLUDING THOSE EQUIPPED WITH A "POLICE PACKAGE." THIS DOES NOT MEAN NHTSA HAS DETERMINED A PROBLEM EXISTS, BUT RATHER AN INVESTIGATION IS NECESSARY TO GATHER FACTS AND INFORMATION.

NHTSA HAS RECEIVED INFORMATION WHICH SUGGESTS THAT THE STEERING POWER ASSIST FUNCTION IN THESE VEHICLES MAY CONTRIBUTE TO "DROP-THROTTLE OVERSTEER," A CONDITION PRECIPITATED BY A SERIES OF RAPIDLY EXECUTED TURNS COUPLED WITH RELEASE OF THE THROTTLE AT MODERATE TO HIGH SPEEDS. IF THIS CONDITION WERE TO OCCUR, IT IS ALLEGED THAT THE DRIVER OF THE VEHICLE MAY NOT BE ABLE TO PROVIDE THE AMOUNT OF STEERING INPUT NECESSARY TO EXECUTE A GIVEN MANEUVER, POSSIBLY LEADING TO AN OVERSTEER AND SKID SITUATION.

NHTSA HAS INITIATED AN INVESTIGATION OF THE ALLEGATIONS TO DETERMINE WHETHER THE DESIGN OR PERFORMANCE OF THE POWER STEERING SYSTEMS IN THESE VEHICLES CONTAIN A SAFETY DEFECT REQUIRING RECALL AND CORRECTION. WHILE THE NHTSA INVESTIGATION HAS JUST STARTED, THIS IS TO ALERT YOU OF THIS MATTER AND THE REPORTED POWER STEERING PROBLEM DURING PURSUIT OR WHILE RESPONDING TO EMERGENCY CALLS. IF YOU HAVE RECEIVED SUCH COMPLAINTS FROM OFFICERS DRIVING THESE VEHICLES IN YOUR FLEET, PLEASE CALL THE NHTSA AUTO SAFETY HOTLINE AT 1-800-424-9393. OR, PLEASE CALL MR. LEE STRICKLAND, THE PRINCIPAL NHTSA INVESTIGATOR ON (202) 366-5201.

AUTH MAJOR CRAIG R MASTERSON
DIVISION TRAFFIC SERVICES

GARZETTA / 2-55 PM

30C187

1. State the number of the subject vehicles in your fleet, itemized by model year.

   8 - 1992 Crown Vic's 7Are being replaced with 1994 complete 12/94 .

2. Identify and describe all incidents reported by officers from your agency in which the power assisted steering system in the subject vehicles was reported to have:

   a. malfunctioned due to binding or lockup; 1major complaint few minor complaints
   b. contributed to or caused a loss of control; and
   c. contributed to or caused a collision with another object or a pedestrian.

3. Is any type of precision vehicle maneuvering or pursuit training routinely given to officers in your agency? If so, please describe briefly that training, specifically noting the type of skills assessment road course employed, and if known, the origin of that course. Defensive driving course

4. Please provide a "general consensus" view of your officers' opinion of the power steering system in the subject vehicles, if possible. Of particular interest is whether officers who operate the subject vehicles may have complained that the steering performance makes the vehicles "unsafe" to drive under precision maneuvering conditions, such as in dense traffic or when pedestrians are in close proximity.

   1 Major complaint causing it returned to dealer a few minor complaints

5. In view of the recent publicity regarding this condition, has your department conducted any evaluations of the problem or included any driver training exercises specifically to familiarize officers with the condition? If so, please provide any details regarding your activities in these areas.

   see inclosed memo

6. Does your Department also operate 1994 model year Crown Victoria police equipment vehicles? If so, please state the number of such vehicles in your fleet, and provide any appropriate details or comments regarding whether the alleged defect may also affect these newer vehicles. we are just starting our change over from 1992 we will be completly change over by ~~1~~9 12/94 only two 1994 in service at this time

This letter is being sent pursuant to 49 U.S.C. § 30166 (formerly Section 112 of the Act) which authorizes NHTSA to conduct any investigation that may be necessary to enforce Chapter 301 of Title 49.

We operate 8 Crown Vic's. they are all patrol cars 7 are 24 hr a day patrol cars the 8 is a ?? Car working his duty time only. Our cars are run for 130,oo Miles then changed over to their replacemett We are now in the process of changing our 1992 to 1994 ford Crown Vic's

The one major complaint caused a warranty claim to be filed we have been contacted by New Jersey ?BS news and Ford Motor Co. If there is any thing that we can do to answer some of these Questions please feel free to call
Sgt. Mike Campbell

000188

Memo

TO Chief Ballantine

FROM Sgt Mike Campbell

DATE May 29, 1994

SUBJECT 1992 Crown Victoria

Chief,

This report is in response to the vehicle safety report issued by the Bergan County Prosecutors office in Bergan Co. New Jersey where a new Jersey police officer lost his life.

I talked to Sgt Tim O'Brien, The Paterson Police Departments Driving Instructor, Paterson New Jersey. I asked Sgt O'Brien to fax our department a copy of his driving course that is mentioned in the Bergan Co report in which they duplicate the throttle drop syndrome He advised that he would fax the driving course and that they had just come in from testing the 1994 Crown Victoria's and that the 1994 Model was better than the 1992 but still had a problem with the steering They also have identified a problem with the anti lock brake system He also advises it was the position of some of the departments in New Jersey not to except delivery of the 1994's

I then called the ILEA, reference the reported steering problems in the Ford full size sedans I was referred to a Rod Van Wyk, the ILEA Driving Instructor. He reports that he has not had a chance to drive any 1992 Fords and had not heard of the throttle Drop Syndrome He went on to state that all vehicles will have some trouble in high speed situations and that this is not uncommon because the steering system is using more volume of fluid than it is able to handle Mr Van Wyk had not seen the report from Bergan County and asked if we could send him one I did that by return mail

Next I talked to the training Lt at the Michigan State Police Training Facility In Lansing, Michigan He referred me to a Sgt Bob Ring I made contact with him on Friday, May 13, 1994, and he advised me that he had heard of the problem. That he had been in contact with Sgt Tim O Brien of the Paterson New Jersey Police Department and also a subject from NHTSA, National Highway Traffic Safety Assn., Vehicle Defect Division However the Michigan Police Tests were not set up to test for the throttle drop syndrome and could not personally speak to that issue He gave me the name and phone number of the person doing the testing at NHTSA

I talked to a Mr Boyd from NHTSA on the same day He is the supervisor in the vehicle defect department. He stated that they were checking the complaint and that test were being run at this time. The preliminary reports coming in at this time are that the modified 93's were improved over the 92's and that the 94's were supposed to be even better over the 1993's Mr Boyd reported that there may have been other factors involved in the fatal accident that they were having trouble duplicating the reported severity of the skid He also said that their investigation was on going and that they should have more information by Mid June and I should call him back then

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He also stated that if they found a problem with these cars they had the right to start a recall on these vehicles

On May 16, 1994, seven 1994 Crown Victorias were delivered to the Ames Equipment Services

May 17 1994 driving tests were set up for car 2503 that reported the warranty claim that caused us to become aware of the throttle drop syndrome Sgt. Kessel, the Ames Police Departments Driving instructor, Marty Osam, Supervisor from Equipment Services and I ran the following police cars through the driving course that was setup similar to the course supplied by the New Jersey Department The following cars were put through the course City equipment numbers 2503, 2506 2502, 2505, all 1992 Ford Crown Victoria's and 1506 a 1994 Crown Victoria All of the 1992 vehicles have right at 100,000 to 120,000 miles on the odometer The 1506 1994 had less than 1000 miles on the odometer The course consisted of a serpentine drive this is a drive in and out of cones placed at distance of 30 feet apart with high speed turns made 30 feet passing the exit cone and going to the next cone for entrance Slow speed turns were made at every cone When exiting the serpentine course there was an immediate right hand tight curve where you entered an evasive action decision to go right or left and then make a 90 degree turn and making an emergency braking action This course was set up by Sgt Kessel that simulates 90 mph at 35 mph All of the 1992 cars performed reasonably well at 20 miles per hour the first time through the course There was some minor power steering loss but something that was very minor in nature and did not cause any over correction Starting with the second time through the course the steering loss was becoming more apparent It would appear that as the steering fluid became warmer, and as tires got hotter that the steering problem was becoming more apparent At the end of the serpentine run that over corrections were taking place and that this was becoming harder to steer the car through the course when you were muscling it through the power steering was intermittent that this was causing a problem As the speed picked up to about 33 miles per hour at the end of the serpentine course Sgt Kessel actually lost control of car 2503 to the point, that if he would have been in traffic, that an accident could have occurred These cars were driven by Sgt Kessel, Marty Osam and Myself If Sgt Kessel was not driving he was a passenger in the vehicles Each of us experienced the same conditions and each of us was aware of what would happen and were unable to prevent the over steering problems We all drove the 94 Ford through the course with quite different results there still was a small steering problem but that the handling was such that the minor drop in power assist something that did not cause the over steering problem This car was taken through the course faster than the 1992's and still not cause the problems of the 1992's The results of this test indicated we should take a closer look at the performance of our 1992 cars The 1992 cars have consecutive vin's 2501 through 2503 2504 through 2508 are random vin's Although 2502 and 2503 are consecutive vin's, 2502 has almost 20,000 miles more than 2503 but it did handle considerably better than 2503.

Another test was set up for May 24, 1994 to determine if this test could create the same problems in all cars or just the Crown Victoria's This time we used 2502 a 1992 Ford The tires were checked by Equipment Services and were found to be near new The Suspension appeared to be okay in every way 1506 A 1994 Crown Victoria, 511, a Ford Taurus and ISU DPS 1991, Chev Caprice vin 1G1B153E6MR1254028305 with 305 engine and 67000 Miles on the odometer. Those present were Marty Osam, Equipment Services, Ron Streigel, Ron Willey Ford Service Department Manager, two ISU Officers, Sgt Kessel and myself The test on the full size Fords were the same as the other test 1992 Fords being out performed by the 1994 Ford Marty, Dave, Randy and One ISU Officer drove this test We also used the ISU car in this test This car drove the course at all speeds without any power steering loss at all It did not duplicate any of the Fords Steering problems The only negative thing to say about this test that it lost three out of the four wheel covers 511 the Taurus drove the course without power steering loss however when you did lose traction you lost control of the rear of the car a problem inherent to front wheel drive

The course consisted of 560 feet of serpentine driving with cones placed 30 feet apart Then following a nonmarked curve which leads into a marked lane that went for 30 feet and an evasive action lane change turning hard right or left This lane was about 95 feet long Upon exiting the evasive lane change a sever turn right or left an a hard braking emergency stop

My recommendation is that there is nothing that we can do to train the officers to this problem They should be told that it can happen and the problem will persist and deteriorate rapidly if they continue to drive in the manner in which they are A memo should be issued making all officer aware of the situation and if they e experience power steering difficulty they should discontinue their present action and immediately return to a normal driving condition The steering problem will feel as if the engine has died and steering no longer has power assist causing the car to be hard to steer. Exertion then will be placed on the wheel to steer the vehicle This steering problem is only temporary and all of a sudden you have your power assist back and now it is over steered This problem starts out gradually and as you continue to steer in a radical manner the condition deteriorates rapidly causing the officer to completely loss control of his steering ability

Second if it is economically feasible switch to the 1994 cars sooner. Run studies on the 1994 cars every 30 000 miles Check if the handling is improved or if the reason they handle differently now is that they are new and as the mileage increases the steering problems may become the same as the 92's or if the systems changes are the reason for the better handling Also request that the replacement models considered actually be driven through this course to see how they handle and would react to this situation before bids are placed As it stands now we let bids on vehicles with no Idea how hese cars handle or if they will fill the needs to our department

This test has placed these cars in extreme handling situations but one that could be encountered every day by any member of the our Department

Copy Paul Hinderaker

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9-2-94

Mike Campbell -

Here is a copy of the response I received from Ford when this "steering assist" problem was reported.

I have received no other communications from Ford since May -

Paul Hinderaker

ODI 192

OCT 14 1994

NEF-121lhs
EA94-022

. . . .
Metropolitan Toronto Police Force
40 College Street
Toronto, Ontario
M5G 2J3

Dear

The National Highway Traffic Safety Administration (NHTSA), Office of Defects Investigation (ODI), has received a report of the recent fatality of a Toronto police officer while operating a 1992 Ford Crown Victoria police-equipped vehicle. Through the news media and our contacts with the Canadian Ministry of Transport (CMOT) in Ottawa, we have received general information regarding the circumstances of the accident.

The purpose of this letter is to formally request your approval for an in-depth review of the fatal accident in question by a representative of NHTSA. This office is presently conducting an investigation of the power steering system installed in the 1992 and 1993 model year police package equipped Crown Victorias, based on allegations that it may have contributed to the fatal crash of a police officer in the United States in November 1993. Given that the power steering system installed in police package Crown Victorias sold in Canada and the United States are likely to be similar in design and performance, if not identical, we believe that review of the accident may provide information useful to our investigation. Similarly, we expect that the findings of NHTSA's investigation may also apply to the police Crown Victorias sold in Canada.

The specific details associated with this request are as follows:

- NHTSA has retained the services of accident reconstructionists from the Calspan Corporation, located in Buffalo, New York. The principal point of contact for this effort at Calspan will be relayed to you by telephone.

- With approval to proceed, NHTSA will coordinate Calspan's activity through CMOT, to work with the special accident investigation team that we understand has been established within your Department.

- Calspan's reconstruction will be independent of the Toronto Police Department's investigation and the Calspan report will be submitted to NHTSA as an expert and independent review and analysis of the incident.

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- Calspan's findings will be made available to the Toronto Metropolitan Police, as well as to CMOT.

- CMOT has advised NHTSA that the special accident investigation team from your Department has expressed willingness to cooperate and assist with Calspan's reconstruction effort, with your approval.

- Calspan's report will be submitted directly to NHTSA in support of NHTSA's investigation, and NHTSA will not disclose the identities of any Toronto Police Department personnel in any documents subsequently made available to the public.

We appreciate your consideration and cooperation. Any questions that you may have regarding this letter or NHTSA's investigation, may be directed to Mr. Lee Strickland, the principal investigator in this matter at (202) 366-5201.

Sincerely,

Original signed by
William A Boehly

William A. Boehly
Associate Administrator
for Enforcement

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Mr. Robert H. Munson, Executive Director
Automotive Safety and Engineering Standards Office
Ford Motor Company
Fairlane Plaza South
330 Town Center Drive, Suite 400
Dearborn, MI 48126

NEF-12lhs
EA94-022

Dear Mr. Munson:

This letter requests additional information regarding the National Highway Traffic Safety Administration (NHTSA) Engineering Analysis (EA) 94-022, which concerns the power steering system installed in certain Ford Crown Victoria vehicles with police equipment packages.

For purposes of this letter, the following definitions shall apply, unless otherwise stated.

- **Subject vehicles:** all 1992 through 1994 model year Ford Crown Victoria "police equipped" vehicles equipped with power steering assist.

- **Ford:** all officers, employees, agents, contractors, and consultants of Ford Motor Company, whether assigned to its principal office or to any of its field locations, and all records or files maintained by Ford either in hard copy form or in electronic storage media.

- **Alleged defect:** a sudden change in the amount of manual steering input force required to execute a given vehicle maneuver at low to moderate vehicle speeds.

Pursuant to 49 U.S.C. § 30166 (formerly Sections 108 and 112 of the National Traffic and Motor Vehicle Safety Act of 1966), please provide Ford's response to the following question. If Ford cannot provide an answer to this question, please state the reason why Ford is unable to do so.

1. Provide detailed descriptions of all design, materials, and/or component changes incorporated into the suspension systems of the subject vehicles which may alter the handling characteristics from those of the "baseline" 1992 models. Provide this information for 1993, 1994, and 1995 model year Crown Victorias, together with

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descriptions or data which document the vehicle handling modifications that resulted. This information should include, but should not be limited to. any changes in original equipment manufacturer spring rates, shock absorbers, sway bars, wheels, and tires, and should include the dates that each modification was incorporated into production.

This letter is being sent to your company pursuant to 49 U.S.C § 30166 (formerly Section 112 of the Act) which authorizes NHTSA to conduct any investigation that may be necessary to enforce Chapter 301 of Title 49. Your failure to respond promptly and fully to this letter may be construed as a violation of 49 U.S.C. § 30165 (formerly Section 108(a)(1)(B) of the Act) which prohibits the failure or refusal to provide information requested under Section 30166.

Your response to this letter, in duplicate, must be submitted to this office by November 22, 1994. Please include in your response the identification codes referenced on page 1 of this letter. If you consider any portion of your response to be confidential information, include that material in a separate enclosure marked confidential. In addition, you must submit a copy of all such material to the Office of Chief Counsel (NCC-30), National Highway Traffic Safety Administration, 400 Seventh Street, SW, Washington, DC 20590, and comply with all other requirements for the submission of confidential business information stated in 49 CFR Part 512.

If you have any technical questions concerning this matter, please contact Mr. Lee Strickland of my staff at (202) 366-5201.

Sincerely,

Louis J. Brown, Jr., Acting Director
Office of Defects Investigation
Enforcement

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Robert H. Munson
Executive Director
Automotive Safety and Engineering Standards Office
Environmental and Safety
Engineering Staff

Ford Motor Company
330 Town Center Drive
Dearborn, Michigan 48126

December 21, 1994

Mr. Louis J. Brown, Jr. Acting Director
Office of Defects Investigation, Enforcement
National Highway Traffic Safety Administration
400 Seventh Street, S.W.
Washington, D.C. 20590

Dear Mr. Brown:

Subject: EA94-022-NEF-12lhs

This is in response to your letter of November 17, 1994, requesting additional information concerning the power steering system in 1992-1994 Ford Crown Victoria vehicles equipped with the police equipment package.

The scope of the searches conducted to locate materials potentially responsive to your request included inquiries to those Ford employees in the Dearborn, Michigan area most likely to be knowledgeable with respect to the subject matter about which you inquired and reviews of those files located in Ford's central offices in which materials such as that requested normally would be expected to be found. It did not extend, nor could it reasonably have been extended to "all officers, employees, agents, contractors, and consultants of Ford Motor Company, whether assigned to its principal office or to any of its field locations, and all records maintained by the Company either in hard copy form or in electronic media." We, of course, will answer any questions you may have as to the scope or specific nature of the searches that were made.

Answers to your specific questions are presented below. After each numeric designation, we have set forth verbatim the request for information followed by our response to it.

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Request No. 1

> "Provide detailed descriptions of all design, materials, and/or component changes incorporated into the suspension systems of the subject vehicles which may alter the handling characteristics from those of the baseline 1992 models. Provide this information for 1993, 1994, and 1995 model year Crown Victoria vehicles, together with descriptions or data which document the vehicle handling modifications that resulted. This information should include, but should not be limited to, any changes in original equipment manufacturer spring rates, shock absorbers, sway bars, wheels, and tires, and should include the dates that each modification was incorporated into production."

Answer

We have been advised that there have been six design changes to suspension system components of 1993-1995 model year Ford Crown Victoria vehicles equipped with the police equipment package. These changes are described below.

Suspension Revisions	Approximate Production Incorporation Date	Reason for Change / Expected results
Reduced the friction of the front lower ball joints by changing from a steel on steel joint design to a nylon joint	6/18/93	• Improve joint durability • Improve steering feel for small corrections • Improve ride quality
Points of attachment of the rear trailing arms to the frame were lowered 19 mm	3/29/93	• Improve on-center steering precision
The valving in the front shock absorbers was changed to alter their force velocity relationship	2/19/93	• Improve ride control by reducing body pitch and bounce

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Suspension Revisions	Approximate Production Incorporation Date	Reason for Change / Expected results
Modified the front stabilizer bar shape to a "drop center" design and increased bar diameter from 28.5 mm in the 1992/ 1993 model years to 29.5 mm in the 1994 model year to offset loss in stiffness efficiency	10/15/93	• Reroute the front stabilizer bar around a new engine oil cooler
Increased durometer/ hardness of the bushings that attach the rear suspension upper control arms to the frame from 26,000 to 35,000 newtons per millimeter	10/15/92	• Improve on-center steering feel
Increased durometer/ hardness of the bushings that attach the rear suspension upper control arms to the axle from 26,000 to 35,000 newtons per millimeter	5/23/94	• Improve on-center steering feel

Ford's Ride, Steering and Handling engineers initiated most of the above changes to improve on-center steering quality and owner satisfaction. On-center steering maneuvers are small steering corrections (less than +/- 10° of steering wheel input) at low lateral acceleration levels (less than +/- 0.1G).

We understand that you are specifically interested in comparing the handling of a 1992 Crown Victoria police vehicle with a 1994. In that regard, it is the opinion of Ford's Ride, Steering and Handling engineers that these suspension system changes, considered individually or as a group, would have the effect of slightly improving the handling characteristics of the 1994 model year Crown Victoria police vehicle when compared with the 1992 model year vehicle. Further, they would expect

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that any perceived handling differences between a 1992 and 1994 model year Ford Crown Victoria police vehicle would be more greatly affected by differences in tires (tread pattern, sidewall construction, inflation pressure, etc.), vehicle loading caused by the addition of special equipment by the operator, or differences in front end alignment settings than by the listed changes.

We trust that this information satisfactorily responds to your request.

Very truly yours,

R. H. Munson

EA\EA94-022.w51
prw/ae

JUL 2000

ENGINEERING ANALYSIS CLOSING REPORT

SUBJECT: Alleged Loss of Power Steering Assist in 1992-1993 Ford Crown Victoria Police Vehicles

EA No.: EA94-022 **Date Opened:** 30-JUN-94 **Date Closed:** MAR - 2 1995

BASIS:

Preliminary Evaluation, PE94-032, was opened on April 8, 1994, following receipt of information submitted to the National Highway Traffic Safety Administration (NHTSA) by the Bergen County, New Jersey, Prosecutor's Office (BCPO). The information described the fatal, single-vehicle accident of a Paramus, New Jersey, police officer which occurred on November 22, 1993. The report included a number of documents regarding the BCPO's investigation of that incident.

According to the information provided to NHTSA, Police Sergeant Vincent Brock was fatally injured while responding to an emergency call, when his 1992 model year Ford Crown Victoria police patrol car failed to successfully negotiate a series of lane-change maneuvers, and the vehicle impacted a light standard at the left-side B-pillar. The Bergen County Prosecutor's investigation of that incident included a series of vehicle tests, an engineering examination of certain evidence regarding the Brock incident, and inputs from the Paterson, New Jersey, Police Academy's chief driving instructor with potentially relevant knowledge of the steering system performance in the subject vehicles under certain unique maneuvering conditions.

Of particular interest to this agency was a report prepared by the American Standards Testing Bureau (ASTB) for the Bergen County Prosecutor. The ASTB conducted an engineering examination of the Brock incident and submitted a report which concluded the following:

> "In summary, our analysis of 1992 Ford Crown Victoria vehicles equipped for police use disclosed that the power steering assist function becomes impaired under extreme, but foreseeable conditions. More specifically, the steering wheel becomes difficult to turn when executing a series of quick turns or swerves with the operator's foot off the accelerator pedal. This condition can occur at relatively low speeds and becomes more pronounced at higher speeds and/or when braking during the maneuvers."

The ASTB report was submitted to this agency as an attachment to a letter dated April 4, 1994, by a Senior Investigator from the Fatal Accident Investigation Unit of the BCPO.

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The above letter also included as an attachment, a memorandum to all Bergen County Police Chiefs, which stated that the subject vehicle has a deficiency described as "power steering bind" or "deep throttle oversteer." Also submitted was a copy of an article that reportedly appeared in the December 1991 issue of Police-The Law Officer's Magazine and that described a "drop-throttle oversteer" condition, which tests had shown the 1992 police Crown Victoria to exhibit.

The above information delineates the specifics of the basis for initiating PE94-032. Information subsequently developed, including preliminary tests conducted by this agency, provided a basis for upgrading the referenced PE to the subject Engineering Analysis (EA) on June 30, 1994.

THE ALLEGED DEFECT:

The alleged defect in this investigation refers to unforewarned and significantly diminished level of steering power assist, including but not limited to, circumstances in which the power steering assist system may appear to have failed completely. In this regard, the safety-related issues include consideration of the vehicle operator's expectations of a level of power steering assist, and the possibility that the operator may perceive failure of the steering assist function if the amount of force required to steer the vehicle suddenly increases.

Most contemporary steering power assist systems are designed to reduce the level of power assist as vehicle speed increases. The "diminished" level of steering power assist of concern in this investigation, however, far exceeds that normally experienced as a result of the "variable assist" function. Of concern in this investigation is a significantly reduced level of power steering assist to the point of potentially giving the driver a signal that the steering system is binding or possibly locked, and that increasing the amount of input force on the steering wheel will have minimal effect, if any, on retaining directional control of the vehicle.

DESCRIPTION OF COMPONENT OR VEHICLE SYSTEM:

The subject vehicles in this investigation are four-door sedans equipped with 4.6 liter, electronic fuel injected engines and automatic transmissions. They are also equipped with a heavy-duty suspension package, and P225/70R15 radial tires. An antilock braking system is optional equipment on these vehicles.

The power steering assist system installed in the 1992-1993 Crown Victoria police vehicles utilizes the same design and components as that installed in the consumer version of the vehicle. It does, however, include a power steering fluid cooler and a steering gear with a higher effort torsion bar. The basic system is depicted in the block diagram of Figure 3-A and includes components manufactured by several suppliers. The model CIII pump and XR-50 recirculating ball power steering gear are manufactured by Ford, and both designs have been used in various vehicles manufactured by Ford for several years.

The CIII vane-type, power steering pump is mounted directly to the engine by four retaining bolts, and is powered by a serpentine accessory drive belt. The pump design is such that its output is sufficient to provide full power steering assist at minimum engine (idle) speed. Connected to the pump body is the electronically variable orifice (EVO) actuator assembly, a component of the variable power assist feature of the system.

The EVO system is designed to vary the flow of fluid from the power steering pump as a function of vehicle speed and rate of steering wheel rotation, providing a variable amount of power assist under different vehicle performance conditions. The system provides full power steering assist at low vehicle speed for light driver effort, e.g., during parking maneuvers, and minimum assist at high speeds to enhance the driver's "road feel" and directional stability. During evasive steering maneuvers when the values of its two control parameters (vehicle speed and rate of steering wheel rotation) exceed predetermined thresholds, the EVO system restores full power assist.

An optical sensor, mounted on the steering column, is used to establish the rate of steering wheel rotation. When the steering wheel rotation rate reaches 30 rev per minute (rpm) i.e., 0.5 rev per second (rps), the output current to the actuator drops and additional power assist is provided. When the steering wheel rotation rate reaches 60 rpm (1.0 rps) and higher, the output current to the actuator reaches zero, and full power steering assist is provided.

The other EVO critical parameter is vehicle speed, measured by a sensor located on the transmission. When the vehicle speed is less than 10 miles per hour (mph) and the actuator output current is less than a specified amount, full power assist is provided. As vehicle speed increases to 25 mph, the output current increases linearly to another specified value. Beyond that speed, the output current increases linearly up to a third value and remains constant for all vehicle speeds greater than 88 mph.

The EVO actuator generates a differential pressure, dependent on fluid flow and current input. The differential pressure controls the position of the spool valve in the CIII pump. The actuator/spool valve regulates the flow of power steering fluid and when combined with a current controlling device provides the variable assist capability of the power steering system.

The outputs of the vehicle speed sensor and the steering wheel rotation sensor are analyzed continuously by a microprocessor in the EVO control module. With this information, the control module/microprocessor controls the EVO actuator valve, thereby regulating the fluid flow from the power steering pump. At low vehicle speeds, the actuator valve is controlled to provide full pump flow for full power assist. At higher vehicle speeds, the actuator valve reduces pump flow for reduced power assist. In evasive maneuvering, the actuator valve increases pump flow, and provides full power assist. A graphical illustration of the EVO output versus vehicle speed is shown in Figure 1, and Figure 2 shows a plot of "normal" steering effort versus vehicle speed.

The power steering unit is a torsion bar type of hydraulically assisted system, which provides power to reduce the amount of driver effort on the steering wheel for turning (Block Diagram of system shown in Figure 3-A). The steering gear assembly is attached to, and is an integral part of, the steering linkage as shown in Figure 3-B. An exploded view of the steering gear is shown in Figure 3-C.

The power steering gear is designed with a rack piston, worm and sector shaft in one housing, and a rotary valve sleeve assembly in an attached housing. Thus, all external fluid lines and hoses are eliminated as internal fluid passages are utilized between the rotary valve sleeve and the power cylinder. The only external fluid lines are the pressure and return hoses between the pump and the steering gear assembly.

The double-acting power cylinder piston is part of the gear housing. Fluid pressure may be applied to either side of the piston. The steering gear ratio is 14:1, and the gear requires 3.3 turns from steering stop to steering stop.

When power assist is not required, i.e., in a neutral, straight ahead position, the valve input shaft and sleeve are held in a central position by the torsion bar. Fluid flows from the inlet port through the outlet port and back to the pump. In this position, no area of the steering gear is under high pressure.

The valve input shaft is attached to the steering column/steering wheel on one end. The other end connects to the worm through the torsion bar, and provides the link to the wheel side of the steering system. When a steering maneuver is initiated, the rotational force applied by the driver through the steering wheel is transmitted to the worm where it meets the resisting force of the road wheels. When the steering forces are great enough, the rotational deflection of the torsion bar changes the relative position of the input shaft and control sleeve, directing the high pressure fluid to the appropriate side of the piston in the gear housing. This pressure differential on opposite ends of the piston helps to move the sector shaft, thus providing assist to the driver's turning effort. Fluid in the opposite end of the gear housing flows through the return outlet of the control valve and back to the reservoir/pump. As steering input effort is increased, the increased displacement of the valve provides a proportionately higher level of assisting pressure.

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CORRESPONDENCE:

The primary request for information from the manufacturer was sent under PE94-032, by letter dated April 20, 1994. Ford responded to that inquiry by letter dated June 3, 1994, with a supplementary response dated June 13, 1994.

By letter dated September 26, 1994, Ford provided to NHTSA the results and discussions of additional steering/handling tests conducted in reference to the subject investigation. In addition, Ford submitted a letter dated November 17, 1994, in response to a verbal NHTSA request for a comparison of the accident experience of the subject vehicles with that of the Chevrolet Caprice.

An additional NHTSA request for information was sent by letter dated November 17, 1994. Ford responded to that inquiry by letter dated December 21.1994. All of the aforementioned correspondence has been placed in the public file.

PROBLEM EXPERIENCE:

The alleged defect in this investigation concerns an issue of performance; the ability of the power steering assist system to meet the vehicle operator's expectation of that system's performance. Further, this investigation concerns the performance of that system in a select subset of a total vehicle population under extremely aggressive, though foreseeable, operating conditions.

Through tests and data analyses, this investigation developed a sufficient scientific understanding of the alleged defect so that simple reports of "power steering failure or malfunction" could be evaluated accurately. With this knowledge, all reports and/or inquiries regarding this issue were evaluated to determine whether the circumstances and details of the report identified an actual instance of the alleged defect being experienced in the field.

NHTSA's consumer database was searched and found to contain a total of eight complaints related to the power steering systems in 1992 and 1993 Ford Crown Victorias. Seven of the eight complainants were contacted via a telephone survey. None of these complaints were found to describe a performance anomaly consistent with the issues being considered in this investigation. A memorandum summarizing the results of this survey was prepared and placed in the public file.

BCPO contacted Ford and was provided information regarding 19 reports potentially relevant to the alleged defect. In addition, several law enforcement agencies contacted the BCPO directly and provided additional information regarding their experiences. BCPO provided to NHTSA a summary report regarding the results of its contacts, including information from law enforcement agencies. The nature of the individual reports was

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varied and included several complaints of diminished power steering assist at engine idle or during braking, claims of power assist loss at high vehicle speeds, and other information extracted from the manufacturer's Corporate Quality Information System (CQIS) reports. Information from Ford's CQIS reports was also provided to NHTSA directly by the manufacturer in response to an information request as a routine part of this investigation. Review of the BCPO summary report disclosed no new or significant information regarding a documented report of the alleged defect not reported by other sources. The BCPO report was placed in the public file for this investigation.
In response to NHTSA's request for information during the PE phase of this investigation, Ford provided by letter dated June 13, 1994, a total of 17 potentially relevant complaints and/or field reports of the alleged steering condition in the subject police equipment package vehicles.

Ford also provided 21 additional complaints or other reports involving non-police vehicles potentially relevant to this investigation. Five of these involved vehicles at operating speeds greater than 15 mph. and 16 reports involved vehicles for which "... a vehicle speed was not stated or implied and could not be determined." These reports fit a descriptive pattern consistent with NHTSA's original description of the alleged defect, which referenced alleged loss or diminished power steering assist at low to moderate vehicle speeds, i.e., 15 to 30 mph.

Information subsequently developed during the investigation established two facts regarding the actual relevance of the above complaints, as follows:

1. Non-police vehicles are not affected by the alleged defect in steering system performance, because of their inability to retain tire traction up to the point of onset of the alleged defect, and

2. Vehicle tests disclosed that if the alleged defect were to be experienced at speeds above 40 to 45 mph, it would not represent the primary compromise to vehicle safety.

Based on the above, it was established that the non-police vehicle complaints were clearly not relevant to this investigation. It was further established that vehicle speed was important in evaluating the potential relevance of police vehicle complaints in this investigation.

Ford also reported two accidents claimed to be potentially relevant to this investigation. One of these was the fatal incident reported by the Bergen County, New Jersey, Prosecutor. NHTSA conducted a detailed reconstruction of that crash and it is discussed in this report. The second incident reportedly involved the non-injury crash of a police vehicle in Louisiana while being driven "... very aggressively through a devised pylon course." No additional information was sought regarding this incident because it occurred in a vehicle test environment as opposed to actual in-service application.

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Review of the documentation provided by Ford to NHTSA disclosed no information providing clear indication of the alleged defect being reported during in-service use of the subject vehicles under circumstances known to precipitate its onset.

NHTSA has not identified any verified and documented cases in which the alleged defect occurred during in-service use of the subject vehicles.

VEHICLE POPULATION:

The following numbers of subject vehicles were reported by the manufacturer as sold in the United States:

	POLICE	CONSUMER	TOTALS
1992 Crown Victoria	26,557	110,392	136,949
1993 Crown Victoria	28,219	71,964	100,183
TOTALS	54,776	182,356	237,132

Vehicles within the "Police-Equipment Group" as identified above include the following standard equipment modifications that relate to power steering, steering, and suspension systems:

- Heavy duty front and rear springs
- Heavy duty rear front and rear shock absorbers
- Heavy duty stabilizer bar
- Power steering fluid cooler
- Power steering gear (higher effort torsion bar)
- High performance/H speed rated tires

The above modifications give the police equipment vehicle group superior cornering, and better recovery characteristics in the event of temporary loss of control, than the consumer version of the 1992 and 1993 Crown Victoria.

No information was received or discovered during the course of this investigation to suggest or indicate that the alleged defect may affect the 1992 and 1993 model years of Mercury Grand Marquis vehicles. However, because the power steering assist system in this vehicle group is essentially identical to that installed in comparable year Crown Victoria vehicles, the following sales statistics for the Grand Marquis were requested by NHTSA and reported by Ford:

1992 Model Year	146,370
1993 Model Year	82,977
Total	229,347

The above data for the Grand Marquis include all vehicles sold to consumers and fleet purchasers.

WARRANTY:

Warranty claims, "goodwill," or other types of policy adjustments and repairs potentially relating to the alleged defect were requested from the manufacturer. These data, although provided, contained insufficient detail to be useful in evaluating the potential of the alleged diminished power steering assist condition as a safety-related issue. Computerized warranty data typically reflect only a basic description of an owner's concern and the repairs made by a dealer to address it.

The requested data contained 203 reports that cited the power steering pump or gear as a relevant component for a customer concern code of "hard to turn." This report explains, in later sections, why any such customer complaints resolved by repair or replacement of the power steering pump are clearly not relevant to this investigation. The data are tabulated by month of report, component, and relevant vehicle speed in the manufacturer's letter to NHTSA under PE94-032 dated June 13, 1994. It is also noted that these data include reports for consumer versions of the 1992-1993 Crown Victoria.

SERVICE BULLETINS:

No service literature or bulletins of any type are known to have been issued by Ford to its dealers or distributors regarding the alleged defect in the subject vehicles.

PARTS SALES:

Parts sales information was not requested in this investigation, based on test results during the PE phase which suggested that the alleged defect was a performance-related issue, rather than a failed part issue. Sales of replacement parts were judged not significant to this investigation.

DESIGN, MATERIAL, AND/OR PRODUCTION MODIFICATIONS:

Ford responded to NHTSA's inquiry on this matter by stating that 1994 model year Crown Victoria police equipment group vehicles included one design change that could affect the performance of the power steering system under certain unique conditions of low engine speed. Some law enforcement agencies reported that during U-turns or sharp turning maneuvers at speeds of approximately 5 mph following hard braking, the subject vehicles could exhibit reduced power steering assist or high steering effort. Ford's analysis of this condition found that a momentary reduction in the engine idle speed to about 50 rpm less than specified idle speed could reduce the output of the power steering pump to less than that required for full steering assist. The condition was eliminated in the 1994 model year police equipment group Crown Victoria by revising the algorithm of the electronic engine control module to prevent this temporary reduction of engine idle speed below the specified value.

No substantive changes relating to the alleged defect were identified in the design or components of the power steering system installed in the subject vehicles.

A subsequent NHTSA inquiry to Ford dated November 17, 1994 posed questions regarding suspension modifications in Crown Victoria police vehicles produced since the 1993 model year. Ford responded to that inquiry by letter dated December 21, 1994, and identified six design changes to suspension system components incorporated into production since June 1993. According to Ford, the design changes cited would, individually or as a group, improve slightly the handling characteristics of a 1994 Crown Victoria police vehicle as compared to a 1992 model.

TESTING:

All test activities during this investigation were conducted at the NHTSA Vehicle Research and Test Center (VRTC) in East Liberty, Ohio. The complete test report prepared by VRTC (VRTC-74-0331) in support of this investigation has been placed in the public file.

A comprehensive test program was initiated to address the potential safety related implications associated with the following two objectives:

1. To identify and quantify through a series of engineering tests of instrumented vehicles, the performance characteristics of the subject power steering system under driving circumstances sufficiently aggressive to exhibit the alleged "binding" or "lockup" of the system. In addition, to compare the performance of the subject power steering system with that of a peer vehicle, specifically the 1992 model year Chevrolet Caprice police cruiser.

2. To evaluate through a series of exercises with a cross-section of "typical" police officer volunteer drivers, the behavioral/driving responses of those officers to an unforewarned occurrence of the alleged defect.

The VRTC report provides full information regarding the preliminary aspects of the test program, including establishing a road course for the steering/handling evaluations, test vehicle identifications, initializing steering system static performance to manufacturer specifications, and instrumentation/data acquisition systems.

Also documented in the VRTC report are the road test courses used in this investigation, together with the basis for having selected these courses. The fundamental premise in selecting the test courses was to utilize widely-accepted, precision type, high-maneuverability test circuits. This type of course provides a good representation of the types of situations potentially presented in congested urban environments which, when driven in a very aggressive manner as might be anticipated during police/emergency responses, would be sufficient to evaluate the onset of the alleged defect. The test courses proved adequate in providing the required difficulty to both drivers and steering system, and all police officers who drove the test vehicles during subsequent phases of the test program agreed that the courses were successful in achieving those objectives. A typical test course is shown in Figure 4; it is based on the Cumulative Skills Pursuit Course C as recommended by the Task Force report of the International Association of Directors of Law Enforcement Standards and Training, dated May 1989.

The initial series of tests included a series of "drop throttle serpentine" tests, a series of quick turns of about one full rotation of the steering wheel, with the driver's foot removed from the throttle pedal. These tests were performed at speed of 35 mph, and repeated in the 5 mph increments up to a 55 mph maximum. The results of these tests are documented in the VRTC report and were first the quantified indicators of increased steering torque requirements under repeated steering reversals in the subject vehicles. Subsequently, other similar tests were conducted and described as lane change and slalom maneuvers. Results of these tests are summarized in this report and are provided in detail in the VRTC report.

<u>VALIDATION AND QUANTIFICATION OF THE ALLEGED DEFECT</u>:

It was established that a driver must negotiate the course with a maximum elapsed time of 29 seconds, while avoiding impact with all of the traffic cones defining the course. Drivers were instructed to consider that each cone represented a pedestrian, another vehicle, or a fixed object. These qualifying criteria were determined to require sufficiently aggressive driving to precipitate the onset of the alleged defect.

Results from the engineering test phase were analyzed, and the following significant determinations made:

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1. The "normal" level of driver input torque for the 1992 Crown Victoria at low to moderate speeds was found typically to be on the order of 5 to 7 foot-pounds (ft-lbs).

2. When the limit of performance of the subject power steering system was approached, precipitated by rapid steering reversals as the test course was driven, the driver input torque requirement increased by a factor of approximately four, i.e., 20 to 28 ft-lbs.

3. In comparison, the typical, "normal" steering input effort required in the 1992 Chevrolet Caprice was on the order of 8 to 10 ft-lbs. The Caprice also demonstrated an ability to experience increased input torque requirements during the highly aggressive maneuvers in the test course, but the torque increase represented only a two-fold magnification of the normal level and had a shorter time duration than that exhibited by the Crown Victoria. Coupled with the overall "feel" of the Caprice as a "heavier" vehicle than the Crown Victoria, these factors allowed a driver perception that the Caprice did not exhibit steering system performance characteristics that should be considered "anomalous."

Typical data plots of steering wheel angle and torque versus time for the unmodified 1992 Crown Victoria (Vehicle 5) are shown in Figure 5; comparable data plots for the 1992 Caprice (Vehicle 3) are shown in Figure 6.

Analysis of the data acquired during the engineering tests of the subject vehicles provided indicators of the possible origin of the "performance anomaly" in the power steering system. A series of procedures to improve the power steering fluid flow in the steering gear was performed, the system reassembled, and tested to evaluate the performance of this "modified" system. The test data, as well as driver response, showed a marked improvement in the ability of the power steering system to respond to driver input while maneuvering the test course. In so doing, the system response was such that the "lag, binding or perception of system lock-up" was significantly reduced. At this phase of the test activities, the modified vehicle being used by the test drivers, described in the VRTC report as Drivers A, B, and C, was equipped with a steering gear reworked to <u>eliminate</u> the anomalous system performance.

<u>BEHAVIORAL/DRIVER RESPONSE TESTS</u>:

The second phase of the test program involved utilizing as test vehicles, the standard or unmodified Crown Victoria, a semi-modified Crown Victoria (with steering gear reworked to <u>reduce</u> but not completely eliminate the anomalous performance), and a Chevrolet Caprice. These test vehicles were driven over the prescribed test course by a group of police officer volunteers. Given no prior knowledge of the specific nature of the driving tests, the officers were advised only that the "handling characteristics" of the vehicles were being evaluated. The results of this test series were documented by videotapes of pre- and post-driving interviews, as well as an inside car/over the shoulder view of the steering wheel during the test runs. The test vehicles were not instrumented for data acquisition.

The tests in this phase of the program were intended to provide a body of information from which to assess the behavioral driving responses of typical police officers when confronted with the unforewarned steering anomaly identified in the first phase of testing of the Crown Victoria.

The initial phase of the test program focused on validating and quantifying the alleged defect, but also enabled some additional judgments which became important in subsequent tests with volunteer drivers. Due to the driving circumstances necessary to precipitate the onset of the alleged defect, it was apparent that:

1. All police officers would not be likely to possess the upper body strength necessary to steer quickly enough to produce onset of the alleged defect.

2. All police officers would not be likely to possess the skills to drive the vehicle aggressively enough to create the onset of the alleged defect.

3. Some, but not all, police officers would probably have sufficiently good driving skills to minimize the onset of the alleged defect. In this regard, it was qualitatively established that the better, "smoother" driver would probably be able to negotiate the test course with less apparent lag or binding in the steering system.

4. By "learning" the test course through repeated driving exercises, most police officers could improve their driving performances, becoming "smoother" and probably achieving lower elapsed times.

Thirty-four active police officers, male and female, with various types of upper body physique and different capacities of strength, participated in this phase of the test program. In addition, these volunteers represented a spectrum of law enforcement experience in terms of years as well as type and size of agency, and possessed various amounts and types of driver training and experience. A total of 835 test course runs were completed by the police volunteers, and each individual run provided more than one "opportunity" for onset of the subject steering anomaly. As stated in the VRTC report, each test run typically created three events of so-called "supertorque"- driver torque input exceeding 7.5 ft lbs and typically in the 15 to 30 ft-lbs range, when the operator has "beaten" the steering system hydraulics and the application of additional torque does not produce a corresponding level of turning response at the road wheels of the vehicle. These events normally occurred just prior to two U-turns and near the end of the test

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course as the vehicle maneuvered through the successive lane changes.
The following is a tabular summary of the results of the test runs completed by the police volunteer drivers:

	<u>Unmodified Crown Victoria (294 Tests)</u>	<u>Semi-Modified Crown Victoria (306 Tests)</u>	<u>Caprice (235 Tests)</u>
<u>TEST RESULTS</u>			
Steering Wheel "Bind"	50	21	12
Steering Wheel "Lockup"	27	15	1
Steering Wheel "Kickback"	29	13	0
Driver Lost Control of Vehicle	3	0	0
Driver Failed to Stay in Lane	2*	0	0

* These 2 incidents are a subset of the 3 incidents in which driver lost control of vehicle.

The above tabulation of test results provides a numerical itemization of the numbers of specific occurrences during the tests with volunteer drivers. It is noted that, while the semi-modified steering gear in one of the Crown Victorias did not eliminate the difficulty associated with maneuvering successfully through the test course, the improvements did contribute to better driving performances than in the unmodified subject vehicle.

The significant occurrences, described as steering wheel binding, lockup, and kickback have meanings that relate to the input effort of the driver at the instant of experiencing the supertorque events. Tabulations of these occurrences were made by performing frame-by-frame analyses of the videotapes taken from the on-board camera (over driver's right

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shoulder). In each type of occurrence, the driver experienced a steering anomaly to the point where the effort being applied to the steering wheel was in the supertorque range of 15 to 30 ft lbs. Upon crossing that threshold of steering input effort, each driver instantly continued torque application, and the amount of that additional effort determined whether the event constituted binding, lockup, or kickback, as follows:

Binding: Significant and abrupt slowing of steering wheel rotation from a rate of about 1000 degrees per second (about 3 full rotations of the steering wheel in one second) to a level on the order of 100 degrees per second within a time frame of about 200 milliseconds, but during which the steering wheel did not come to a complete rotational stop.

Lockup: Significant and abrupt slowing of steering wheel rotation from a rate of about 1000 degrees per second to a complete rotational stop within a time frame of about 200 milliseconds, followed by a stationary position for 30 to 100 milliseconds, and finally, continued rotation of the steering wheel in the original direction.

Kickback: Significant and abrupt slowing of steering wheel rotation from a rate of about 1000 degrees per second to a complete rotational stop within a time frame of about 200 milliseconds, and in spite of continued driver effort, reverse rotation of the steering wheel caused by counter torque in the steering system. These events are rapidly followed by a second complete stop of the steering wheel, then by rotation in the original direction as the driver continues to apply torque in that direction.

The tabulation of test results for the volunteer drivers were reviewed to evaluate their significance. In so doing, certain statistical tests were applied to determine whether the results for the unmodified Crown Victoria were significantly different from the results for the Caprice peer vehicle. The differences between the numbers of steering binding, lockup, and kickback incidents in the unmodified Crown Victoria versus the Caprice vehicle were determined to be statistically significant. In one sense, however, the assessment of what those differences represent is subjective, other than the fact that the unmodified Crown Victoria consistently required more driver work than did the Caprice to successfully negotiate the test course.

On the other hand, the differences were not statistically significant between the numbers of incidents in which the driver lost vehicle control, or failed to stay in the test course lane in the unmodified Crown Victoria versus like numbers for the Caprice. Stated another way, the results showed that the volunteer drivers were as successful in retaining control of the unmodified Crown Victoria as they were in controlling the Caprice during the test runs. These test results are considered to be more important than the "feel" of the steering wheel, because they address more directly the real-word issue of crash avoidance.

Having previously noted that each test run typically presented at least three supertorque events, it follows that the 835 test runs provided approximately 2,500 total opportunities for exceeding the response capability of the power steering system. Similarly, the numbers of such opportunities for the respective vehicles are 882 for the unmodified Crown Victoria, 918 for the modified Crown Victoria, and 705 for the Caprice. If rates or percentages of steering wheel binding, lockup, and kickback events were computed based on the numbers of opportunities, rather than numbers of test runs, those rates or percentages decrease by a factor of three. For example, the unmodified Crown Victoria demonstrated an "binding" rate of 17.01 percent when based on number of test runs, but that rate becomes 5.67 percent when based on the 882 supertorque opportunities during those runs. Another simply stated finding is that the test drivers lost control a total of only three times out of 882 opportunities to "crash;" this represents their collective ability to avoid a crash in 99.66 percent of those instances.

Each of the volunteer drivers was interviewed after completion of the driving exercise, using a set of questions developed to ensure that each driver was given a consistent set of issues to discuss. These questions gave each driver an opportunity to express an opinion regarding the steering system performance for each of the three vehicles driven. From their responses it was found that the percentage of drivers who complained about the steering performance varied, depending on the order in which they drove the three test vehicles. For example when the unmodified Crown Victoria was driven first, 78 percent of the volunteers complained about the steering response, as compared to 0 percent for the Caprice when driven first in the sequence. However, when the unmodified Crown Victoria was driven last in the order, 29 percent complained about the steering, as compared to 8 percent for the Caprice when driven last. Overall, the "complaint" rates were 13 percent for the Caprice, 18 percent for the semi-modified Crown Victoria, and 53 percent for the unmodified Crown Victoria.

The "complaint rates" were determined from the subjective and verbal assessments of steering response of the test vehicles by the drivers. On the other hand, the data tabulated above regarding loss of vehicle control are objective, in that they are based on actual "crash" incidents, as denoted by vehicle impact with one or more of the test course pylons.

SLALOM AND LANE CHANGE TESTS:

A series of evasive maneuver tests using professional drivers was conducted. In these tests, the vehicles were driven through a series of "gates" at incrementally increasing speeds, so as to simulate three scenarios, each of which required rapid and successive reversals of steering direction. These tests were designed to assess the thresholds of vehicle speeds at which performance of the power steering system ceased to be the primary issue affecting vehicle controllability. It was recognized that as vehicle speed increases, the angular excursion and rate of rotation of the steering wheel required to perform a lane change

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maneuver must decrease in order to retain tire traction with the road surface. With rapid and large steering inputs as vehicle speed increased, uncontrolled yaw would result; an event beyond which steering system lockup or binding has no significance.

Descriptions of the evasive maneuvers test scenarios are detailed in the aforementioned VRTC test report. These procedures are described as slalom tests using two configurations, and lane change tests using three configurations.

The slalom tests demonstrated that steering tests of the subject vehicles must utilize appropriate initial vehicle speeds and sufficiently short gates in order to create the onset of the alleged defect. If these two conditions are not met, evasive maneuvers can be successfully executed without a steering wheel input rotation rate sufficient to create an abnormality in the steering response.

Specifically noted were the findings that the alleged steering defect occurred before the vehicle reached its threshold of apparent tire traction loss with 30 ft and 40 ft gates, both of which required rapid and aggressive steering inputs. With the longer 50 ft and 60 ft gates, requiring less rapid and less aggressive steering inputs, the steering anomaly and loss of tire traction occurred at about the same speeds.

ADDITIONAL INFORMATION:

INFORMATION SOLICITED FROM LAW ENFORCEMENT AGENCIES:

Specific actions were taken to solicit information relevant to this investigation from the law enforcement community. Meetings were held, dialogue with police authorities were sought, and a targeted survey of selected law enforcement agencies was conducted.

On April 18, 1994, NHTSA representatives met with Prince Georges County (Maryland), Police Department (PGCPD) officials. The nature of NHTSA's concerns were discussed and PGCPD provided several of the subject vehicles for driving maneuvers so that the alleged steering phenomenon could be experienced by NHTSA staff personnel. The vehicles were not instrumented, but the qualitative assessments were useful in understanding the basic "feel" of the alleged defect. In addition, limited discussions were held regarding the separate fatal crashes of two PGCPD officers in single-vehicle incidents while operating the subject vehicle models. These incidents were critically reviewed by NHTSA and the findings of those reviews are discussed under Accident Reconstructions, in this report.

On April 21, 1994, NHTSA staff met with the Bergen County (New Jersey) Prosecutor and Executive Assistant Prosecutor to discuss the specifics of the fatal incident involving the Paramus, New Jersey, officer which precipitated this investigation. In addition to the details and forensic reports regarding that incident, information was also provided to NHTSA regarding police driver training exercises utilized in Bergen County, and the precision

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maneuver exercises which allowed the alleged defect to be demonstrated consistently and repeatably under controlled circumstances.

On April 24, 1994, NHTSA issued the first of two notices over the nationwide police electronic telecommunications system. The purpose of this notice was to advise the law enforcement community of the initiation of the subject investigation, and to solicit input from those agencies regarding any incidents known or reported to have resulted from diminished power steering assist in the subject vehicles. A second notice of similar nature was issued on September 15, 1994, to again solicit such reports from law enforcement agencies across the Nation. In response to these solicitations, over 100 contacts were received from law enforcement agencies. None, however, reported an incident in which the alleged defect had been definitively and officially established as causal or contributory to a crash incident. These notices were significant in that they effectively represented a survey of 100 percent of users of the subject vehicles, and none provided an affirmative report of the alleged defect in actual service, as previously indicated.

SURVEY OF LAW ENFORCEMENT AGENCIES:

A specific effort was made to formally contact and request certain information from selected law enforcement agencies. NHTSA contacted each of the selected agencies by letter, with questions regarding any known or reported incidents attributable to diminished power steering assist. Also considered important was an inquiry regarding the prevailing opinions and/or attitudes among officers as to whether the subject vehicles were suspected to have power steering characteristics that may cause them to be perceived as "unsafe."

Responses to the letter survey were consistently negative. The specific letters from NHTSA, and the responses thereto, have been placed in the public record of this investigation.

REVIEW OF NHTSA ACCIDENT DATA:

NHTSA's National Center for Statistics and Analysis was asked to search its State accident data files, and the Fatal Accident Reporting System (FARS) files, to review the involvement of the subject vehicles in fatal and non-fatal single- and multiple-vehicle crashes. As is normally the case when such data reviews are conducted, this effort was intended to determine whether there were any apparent trends of over-involvement of the subject vehicle group in crashes of a type that might suggest a potential causal relationship between those crashes and the alleged defect.

NCSA's review of the accident data and the statistical tests to evaluate the significance of that data, disclosed conflicting results. The studies included both police and consumer vehicles in the analyses, and generated the following findings:

1. For the 1987-1991 model years, Florida state data indicates that more Crown Victorias were involved in single-vehicle accidents than expected. In FARS, for the same model years, fewer Crown Victorias were involved in fatal crashes than expected. For these model years, an "indeterminable" conclusion was reached.

2. For the 1992-1994 model years, NCSA found that data from two states (Missouri and Florida) indicate the Crown Victoria to be over represented in single vehicle crashes.

NCSA concluded that "... while the data does show some significant results in regarding relationships among model year and single/multiple vehicle crash type, there are no consistent patterns." As they relate to this investigation, NCSA's findings do not support or provide evidence that the subject vehicles have experienced power steering malfunctions that may have contributed to crashes.

ACCIDENT RECONSTRUCTIONS:

Independent reconstructions of selected police vehicle crash incidents were performed. Under contract with NHTSA, the Calspan Corporation provided expert reviews and detailed reconstructions of six incidents involving the subject vehicles, as follows:

1. Bergen County, New Jersey, one fatal;
2. Prince Georges County, Maryland, two fatal;
3. Toronto, Ontario, Canada, one fatal; and
4. Harrison, New York, two non-fatal.

The detailed reconstruction reports submitted by Calspan to NHTSA have been placed in the public file for this investigation. The reconstructions included review of police accident and other reports, on-site inspections, interviews as appropriate, and analytical exercises to establish important crash parameters. The alleged defect was not found to have been a probable cause leading to the occurrence of any of the crashes included in this detailed review.

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The following are brief summaries of the specific circumstances and findings regarding the six accidents reviewed:

1. Vincent R. BROCK, Paramus, New Jersey: (Fatal). 1992 Crown Victoria police sedan. This crash occurred when the driver of the subject vehicle, while responding to an emergency police call, initiated a lane change maneuver that was the first of a series of events which resulted in a loss of vehicle control. The travel path of the subject vehicle was such that it entered uncontrolled yaw at a computed speed of 65 mph, and impacted a light standard at the left side B-pillar.

Reconstruction of the sequence of events in this fatal crash included review of the forensic report prepared by the American Standards Testing Bureau for the Bergen County Prosecutor, as well as analysis of all other available information and data. Calspan's reconstruction concluded that the evidence does not support the theory that the alleged defect was a causative or contributory factor in occurrence of this crash.

2. John L. BAGILEO, Prince Georges County, Maryland: (Fatal). 1993 Crown Victoria police sedan. The police investigation of this incident concluded that excessive speed, computed to be 104 mph, was a major factor in causation of this incident. Calspan's analysis concurred with this finding, and found no evidence to indicate that the alleged defect in the steering system was a contributor to the crash.

3. Roger P. FLEMING, Prince Georges County, Maryland: (Fatal). 1992 Crown Victoria police sedan. This incident involved high-speed (100+ mph) pursuit during which the subject vehicle struck a curb. The police investigation concluded that a road defect (curb) was the primary accident cause. Calspan's analysis concluded that the alleged defect was not a contributing factor in the causation of this crash.

4. Peter SCHIRMER, Harrison, New York: (Non-fatal). 1992 Crown Victoria police equipment sedan. Calspan noted discrepancies between the driver's reconstruction of the sequence of events and the police reconstruction. Analysis of the evidence indicated several possible scenarios of the vehicle's travel path and initial velocity. Calspan's conclusion expressed doubt that the alleged steering defect contributed to the impact sequence.

5. Steve DiLAURIA, Harrison, New York: (Non-fatal). 1992 Crown Victoria police equipment sedan. Based on the mechanics of the crash, Calspan concluded that the front tires were locked just prior to impact and for this reason, the vehicle could not respond to a steering input. Therefore, if any steering anomaly had occurred at this point, it would have played no role in causation of the crash.

6. City of Scarborough, Ontario, Canada: (Fatal). 1992 Crown Victoria police equipment sedan. The reconstruction concluded that the primary causal factor in this incident was the high rate of speed at which the Crown Victoria was travelling, while in pursuit of a stolen

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vehicle. A lane change maneuver was required in the sequence of the Crown Victoria's path but its severity is not known. Three possible pre-impact scenarios for the Crown Victoria's path were developed, due to certain evidentiary information that could not be validated. Nonetheless, the vehicle speed was computed to be between 82 and 102 mph during the sequence of events, and contact occurred between the left front tire and a curb. The critical maneuver was found to be the Crown Victoria driver's action to avoid impacting another police vehicle, which placed the subject vehicle on a collision course with a light standard. All steering inputs beyond that point could have redirected the heading angle of the subject vehicle but would not have changed the heading of its center of gravity. Thus, if any steering anomaly occurred after the initial left input, it would not have been a factor in causation of the fatal crash.

WARNING SYMPTOMS:

There are no known or reported indicators or symptoms which give warning of the alleged defect. The alleged defect is an anomaly in the performance of the power steering assist system which becomes apparent to the vehicle operator only under circumstances of extremely aggressive, precision vehicle maneuvers. It is not exhibited under normal driving circumstances, and is apparent only if the road wheels/tires have proper traction with the road surface. In addition, manifestation of this performance anomaly requires that the vehicle operator possess sufficient upper body strength and be highly adept in maneuvering the vehicle so that the limit of its handling capabilities are approached.

CONTRIBUTING FACTORS:

The alleged defect, a steering system performance anomaly identified through vehicle testing, occurs when a combination of several factors exist. In addition to the design of the steering system itself, also critical are the suspension characteristics unique to police equipment package vehicles, and the operational circumstances in which the vehicle is placed.

It is foreseen, and validated by interviews with police officers who volunteered as drivers in the tests conducted, that precision maneuvers as required in those tests are representative of driver actions that may be necessary during police work. Such driving maneuvers are not seen as the norm, but rather the type of actions that may become necessary during emergencies or in precision pursuit circumstances such as might exist in urban traffic.

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FAILURE/MALFUNCTION MODES:

In a strictly technical sense, a "malfunction or failure" of the power steering assist system does not occur. This investigation disclosed that the issue of concern is more appropriately characterized as involving the driver's expectation of vehicle response to a certain level of steering input.

As established through NHTSA's engineering tests of instrumented Crown Victorias, the "failure" or "malfunction" occurs when the internal restrictions of fluid flow through the power steering gear results in a delayed response of the power assist system. When this occurs, the amount of steering input torque required to maintain vehicle control may increase four-fold, without a noticeable and corresponding change in vehicle turning response. This phenomenon may be perceived as lockup or binding of the power steering system because the vehicle does not turn as the driver anticipates that it should.

MANUFACTURER'S EVALUATION OF THE ALLEGED DEFECT:

NHTSA staff personnel met with representatives of Ford's Automotive Safety Office, as well as technical personnel with power steering system design responsibilities on May 31, 1994, during the PE phase of this investigation. The purpose of the meeting was to discuss technical and design details, as well as performance characteristics, of the subject power steering assist system. The meeting was followed by a series of driving exercises at Ford's test facilities, to qualitatively assess various circumstances and maneuvers during which the alleged defect would, or would not, occur.

The manufacturer has consistently held the position that the design and/or performance of the power steering system installed in the subject vehicles are not deficient so as to represent a safety-related defect. Articulation of Ford's position regarding this issue, together with the detailed basis for this position, were provided by letters dated June 3 and June 13, 1994, during the PE phase of this investigation. That information has also been placed in the public file.

In support of its position regarding the performance of the subject power steering system and in response to a verbal request from NHTSA, Ford conducted an independent analysis of the accident experience of the subject vehicles as compared to its primary peer vehicle. The analysis was based primarily on data from NHTSA's FARS files, and showed the fatal accident experience of the 1992-1993 Crown Victoria to compare favorably with that of the Chevrolet Caprice police vehicle. The analysis concentrated, however, on incidents which involved high-speed, pursuit-type situations. The details of that analysis were provided to NHTSA by letter dated November 17, 1994.

SUMMARY OF FINDINGS:

Performance of the power steering assist system in the 1992 and 1993 Ford Crown Victoria police package vehicle is such that a brief partial or total loss of power assist may be experienced by certain drivers, as follows:

1. In the low to moderate speed range of approximately 15 to 40 mph.

2. During rapid and successive changes in the direction of steering wheel rotation.

3. With no prior warning of impending anomalous steering behavior. When the capability of the system to respond as the driver anticipates is exceeded, there is a quantifiable lag in that response.

4. In a repeatable and reproducible manner, which can be readily demonstrated.

5. As a results of restricted fluid flow within the steering gear.

6. In police package vehicles only, as the consumer version of these vehicles will enter uncontrolled yaw before the onset of the steering system anomaly.

7. During highly aggressive, precision maneuvering of the subject vehicles, after more than one complete reversal of steering direction.

When steering system lag is perceived, the driver effort at the steering wheel may increase by a factor of approximately four times the normal torque required for vehicle control. During this realm of extremely high torque application, the system may exhibit binding, lockup, or kickback of the steering wheel.

Producing the steering anomaly (the alleged defect) requires a high rate of steering wheel rotation, typically on the order of 800 to 1000 degrees per second (2.2 to 2.8 rev per second of the steering wheel). It also requires a significant angular movement of the steering wheel at the high rotation rates during turning maneuvers; both of these factors are limited by a maximum vehicle speed at which tire traction and vehicle control can be maintained with such severe steering inputs. At the onset of uncontrolled vehicle yaw during such aggressive

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turning maneuvers, the steering anomaly becomes inconsequential.

When a group of active police officer volunteers were exposed to the steering anomaly with no prior warning of its onset, all were able to successfully maintain control of the test vehicle and traverse a prescribed road course; although not necessarily during their first test run. These volunteers, when confronted with the alleged defect in an unforewarned driving exercise, were able to control the 1992 Crown Victoria police vehicle equally as well as they were able to control a Chevrolet Caprice peer vehicle.

The law enforcement community as a group apparently does not perceive the alleged defect as a significant safety-related issue. Similarly, there is no documentation available to demonstrate that the alleged defect has resulted in a single fatal or nonfatal police vehicle crash. Independent reconstructions of six specific incidents, where the alleged defect was a possible contributing factor, concluded that there were no causal relationships in any of those instances. Finally, review and analysis of fatal and nonfatal accident statistics do not conclusively show that the subject vehicles have been over represented in crashes that may have resulted from the alleged defect.

REASONS FOR CLOSING:

The particular performance characteristics of the subject steering system may present a brief loss of power assist during extremely aggressive but foreseeable driving maneuvers. The collective body of information disclosed or developed during this investigation shows that this performance does not represent a significant threat to motor vehicle safety.

The performance of the power steering assist system installed in 1992 and 1993 Ford Crown Victoria police vehicles is adequate under all but the most extreme operating conditions and does not establish the existence of a safety-related defect within the meaning of the National Traffic and Motor Vehicle Safety Act of 1966.

Safety Defects Engineer — Date: March 2, 1995

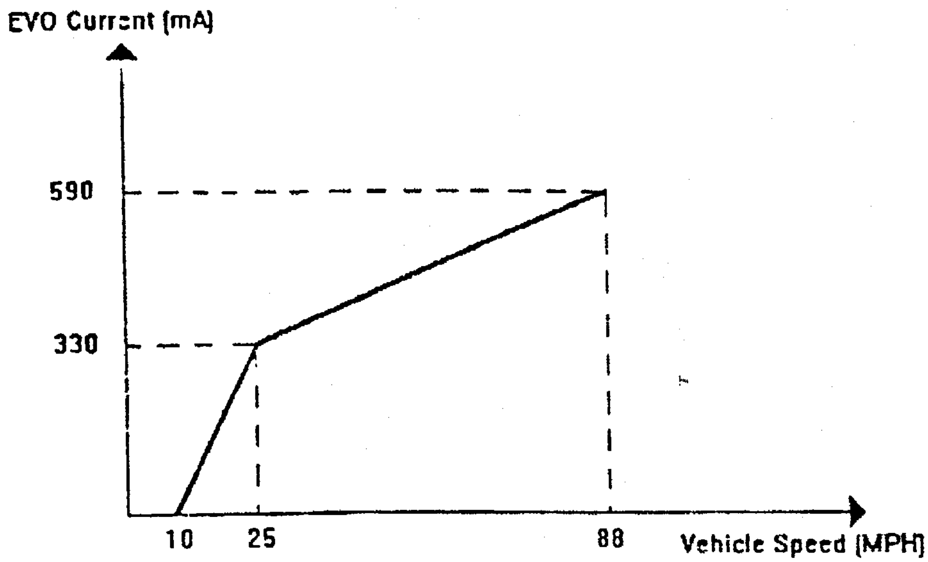
I Concur:,

Richard P. Boyd

Chief, Vehicle Control Branch — Date: March 2, 1995

Director, Office of Defects Investigation — Date: March 2, 1995

Figure 1. EVO Output vs. Vehicle Speed



EVO System Characteristics:

- Full assist is returned at higher speeds during evasive maneuvers
- A "fail safe" feature is designed into the EVO system. In the event of an electrical circuit malfunction, such as an open or shorted circuit, or a controller failure, the EVO provides full power-steering assist. (note: prolonged operation under such conditions may overheat the system).
- Service diagnostics are designed into the control module to assist in service troubleshooting.

Figure 2. Steering Effort vs. Vehicle Speed

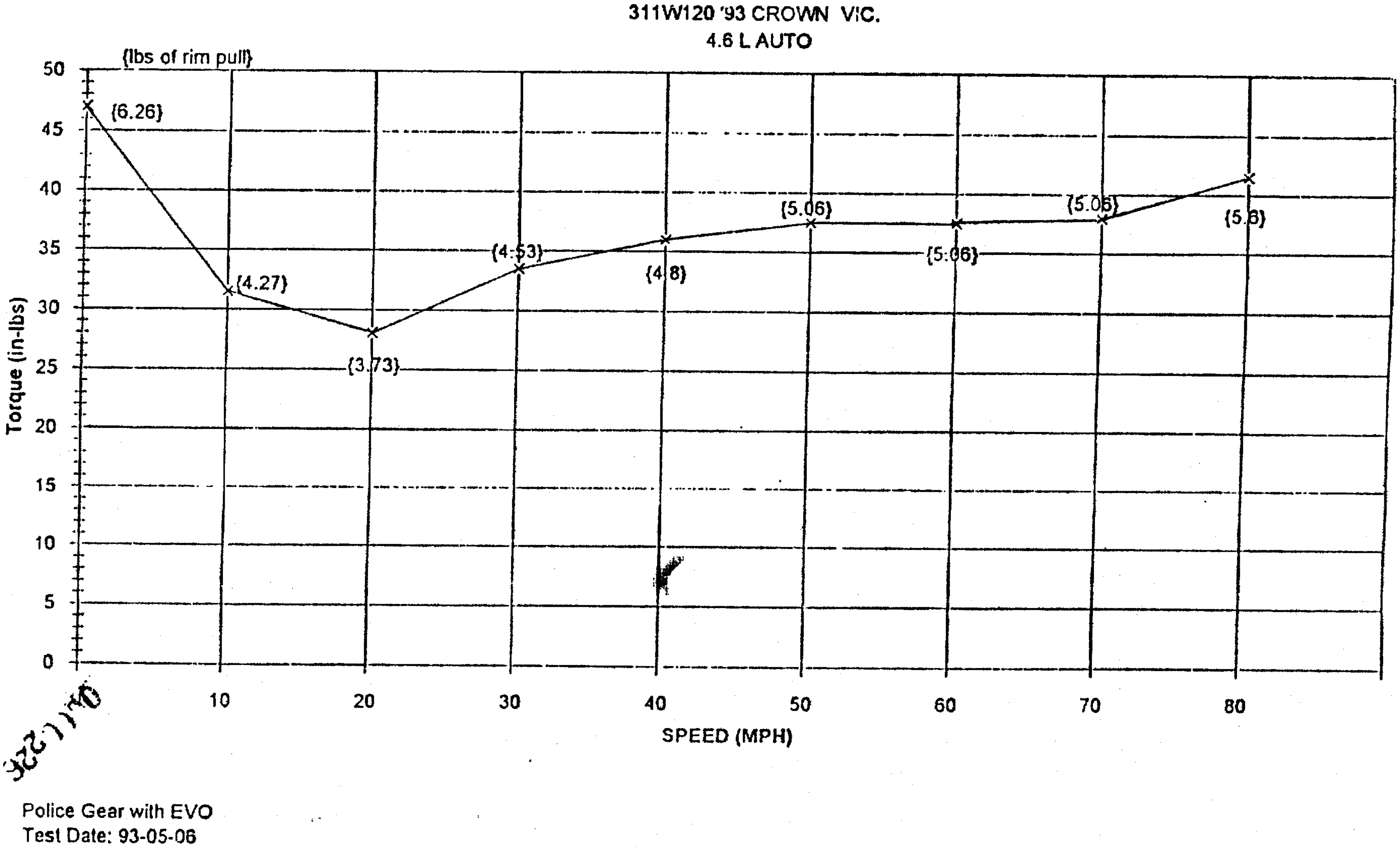


Figure 3-A. Block Diagram of Power Steering Assist System

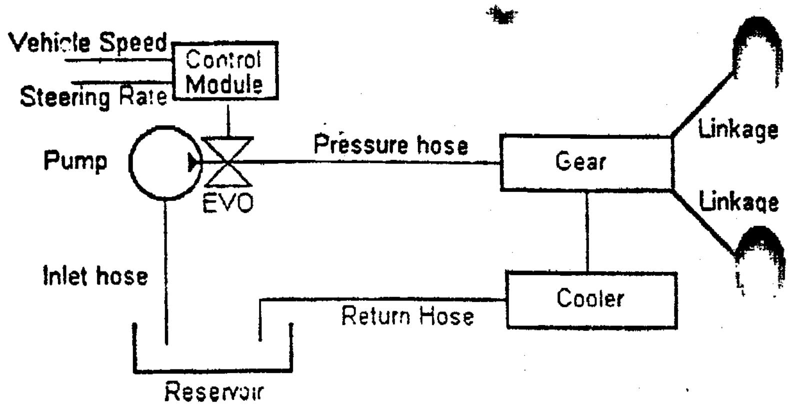


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Figure 3-B. Steering Linkage

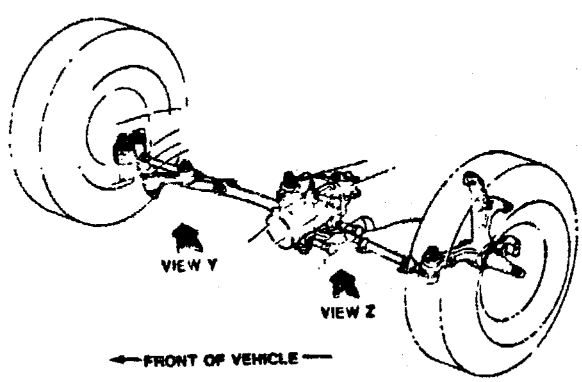

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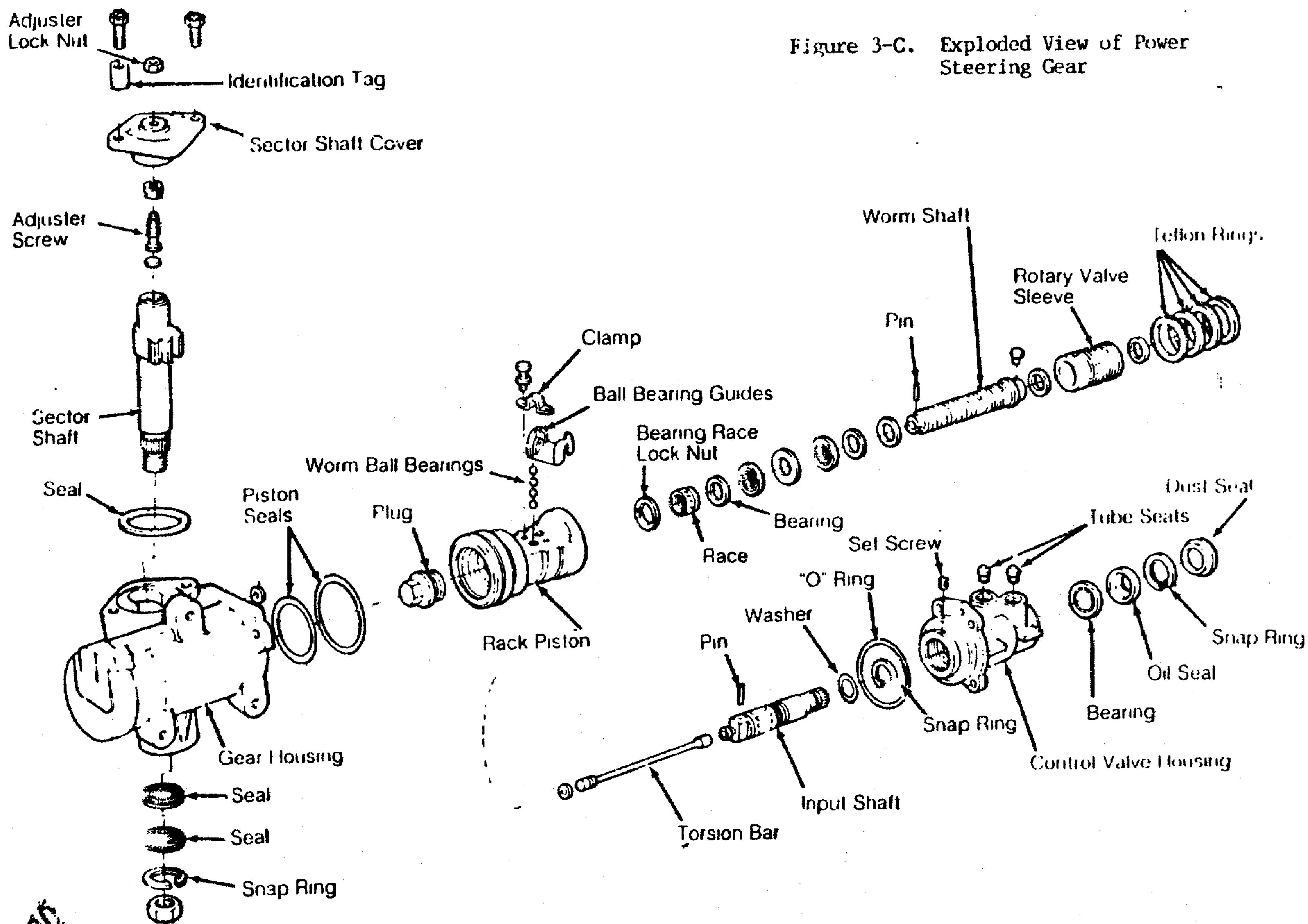
Figure 3-C. Exploded View of Power Steering Gear



Courtesy of Ford Motor Co

Figure 4. Typical VRTC Test Course. Based on IADLEST Cumulative Skills Pursuit Course C.

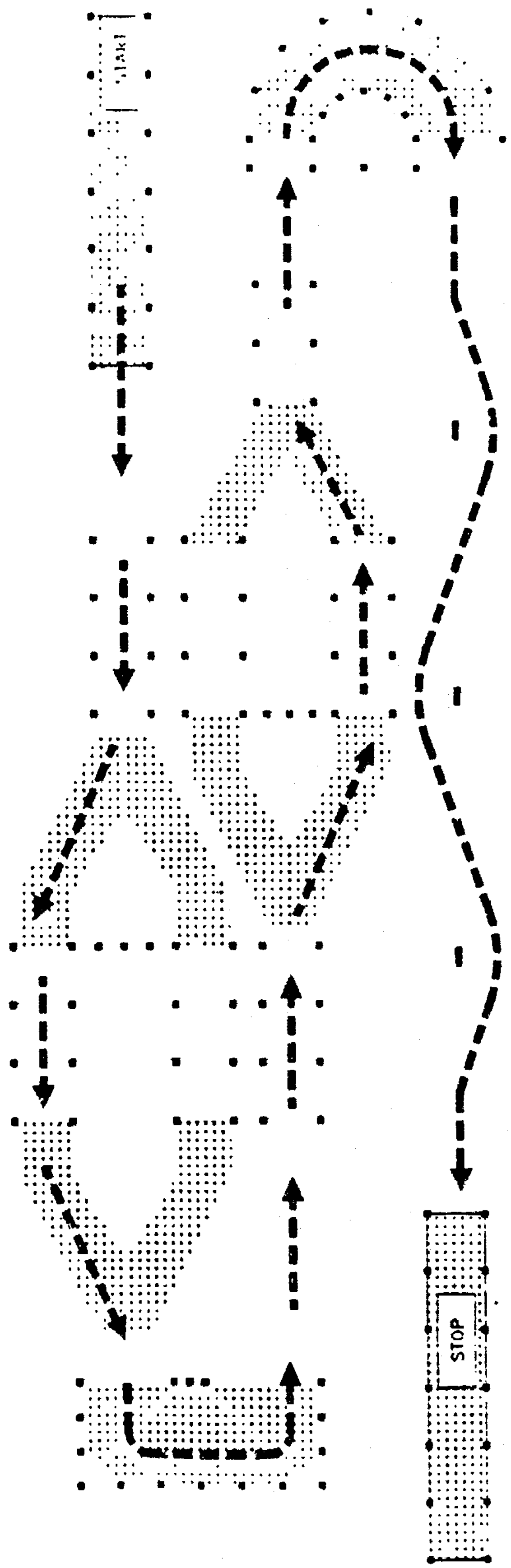


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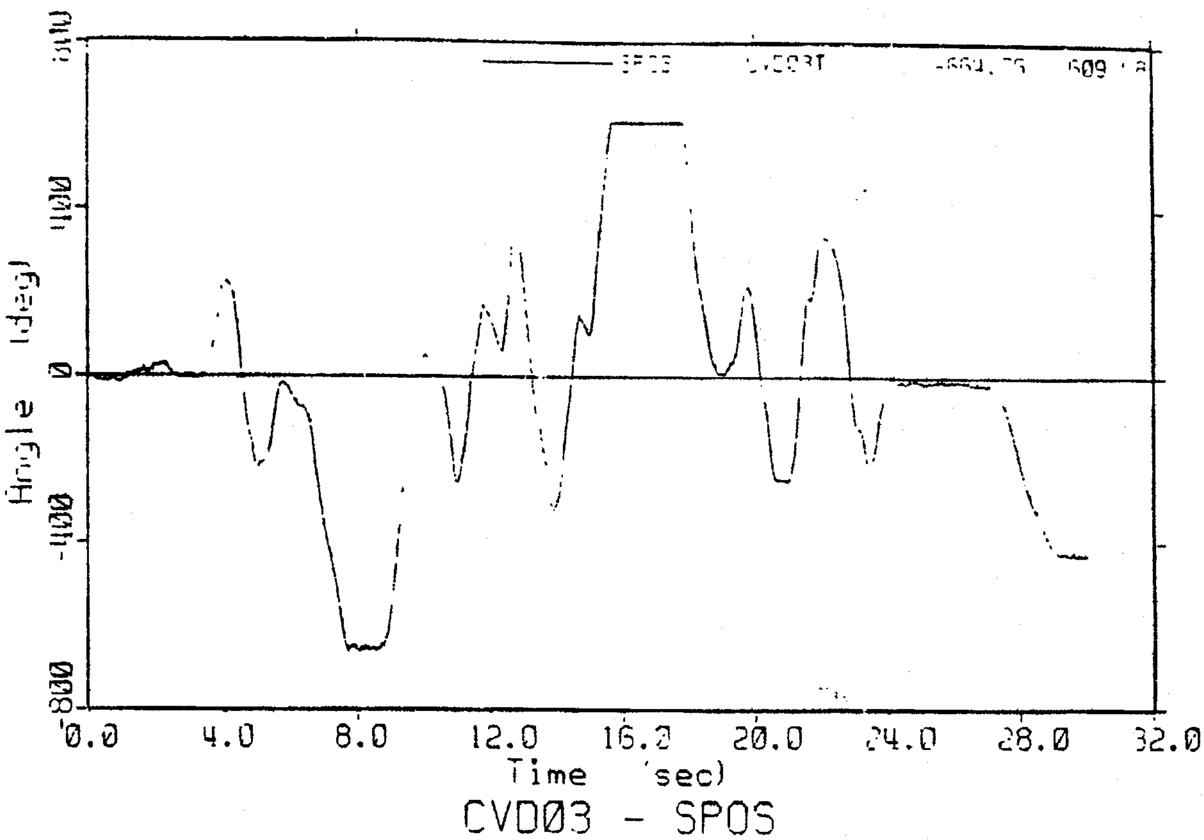
Figure 5. Steering Wheel Angle and Torque
1992 Crown Victoria (unmodified)
Police Vehicle (Veh. #5)



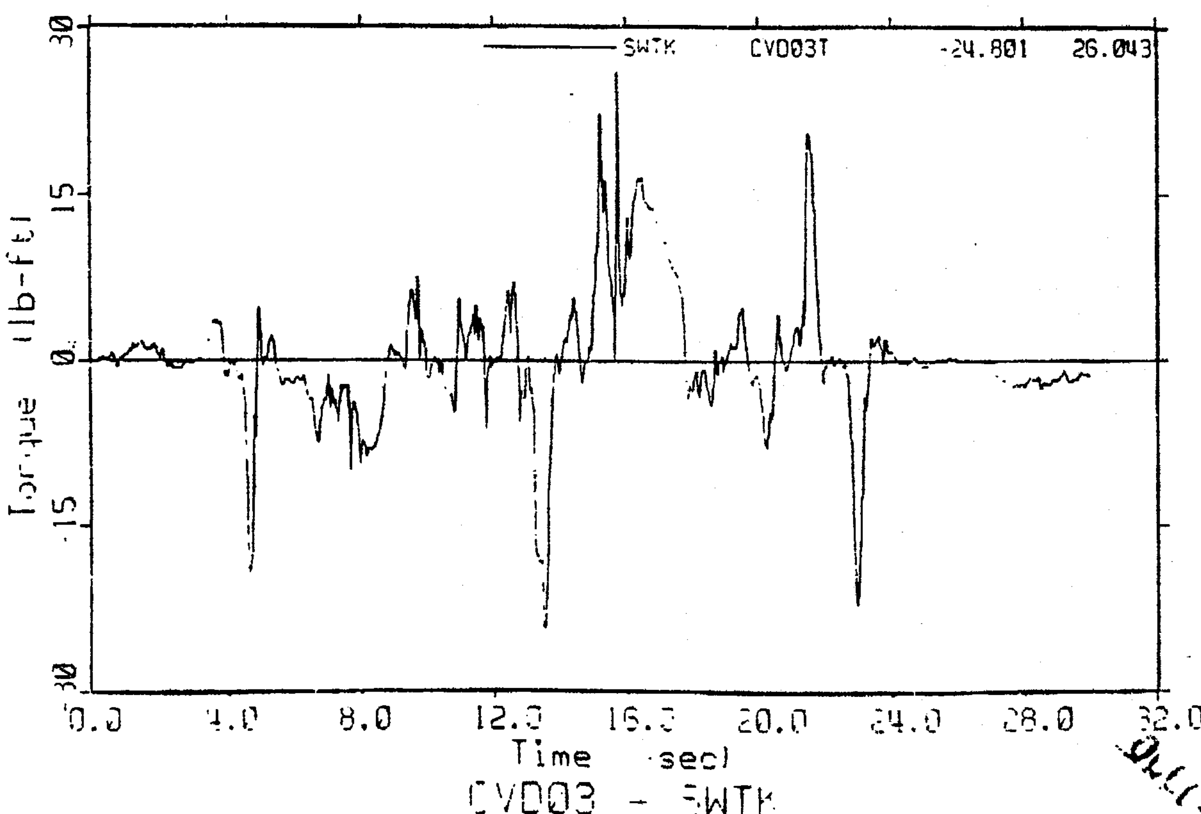


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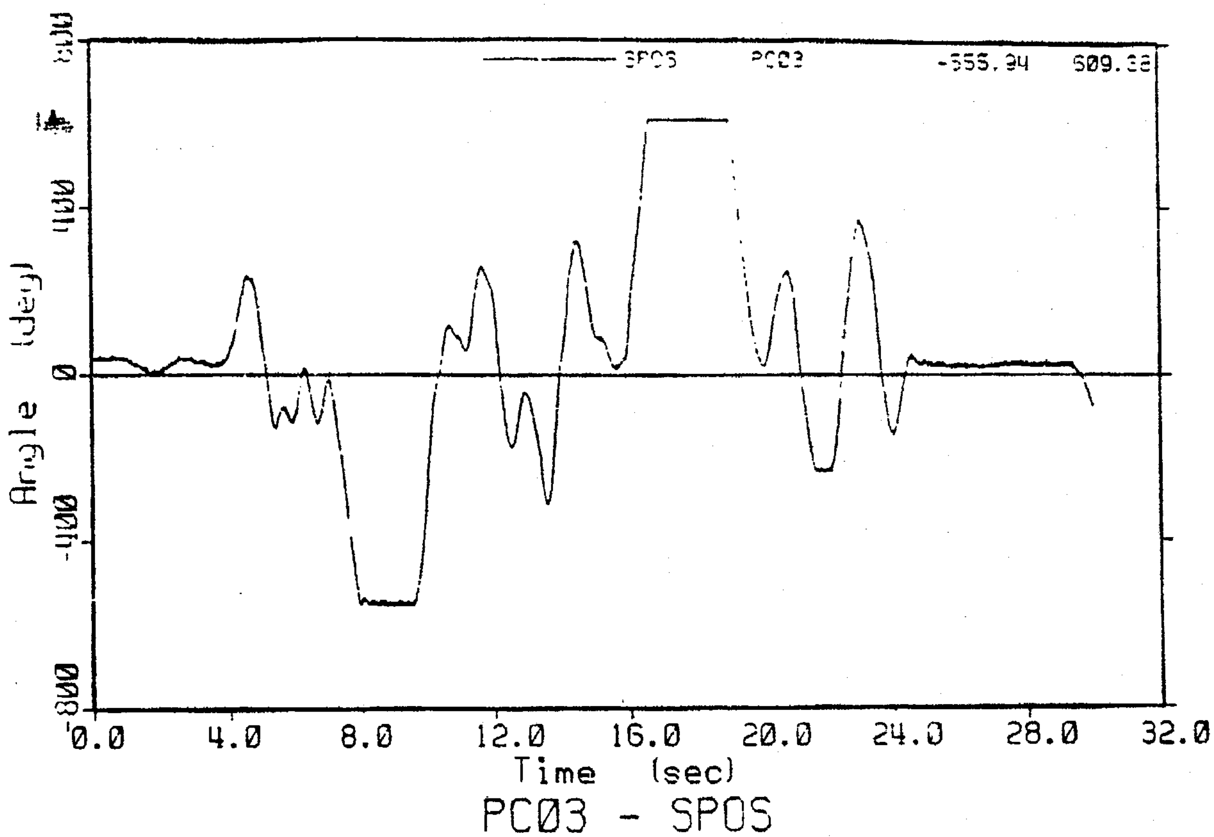
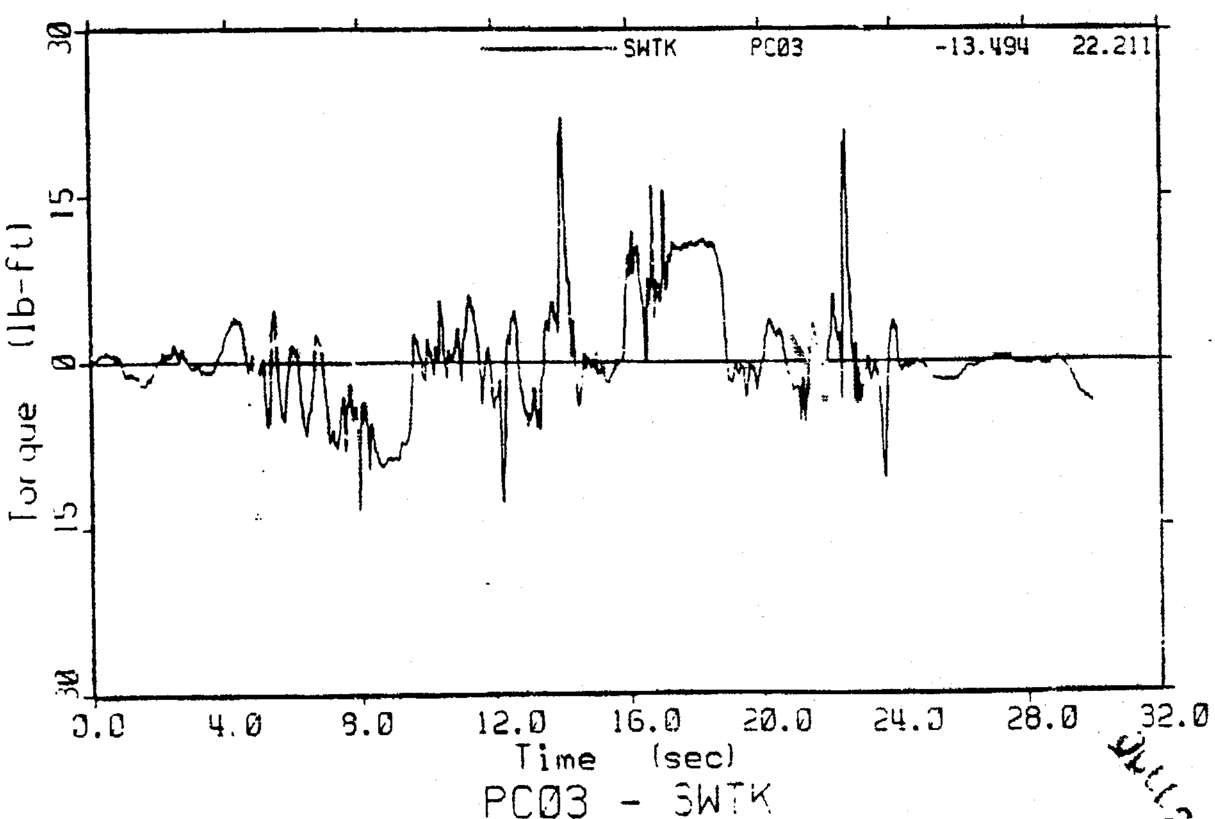
Figure 6. Steering Wheel Angle and Torque
1992 Chevrolet Caprice Police
Vehicle (Ven. # 3)





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ODI RESUME

INVESTIGATION : EA94-022 DATE CLOSED: March 2, 1995
SUBJECT : Loss of Power Steering Assist
PROMPTED BY : PE94-032

PRINCIPAL ENGINEER: L. Strickland L. Strickland

MANUFACTURER : Ford Motor Company
MODEL : Crown Victoria Equipped with Police Package

MODEL YEARS : 1992 - 1993 VEHICLE POPULATION: 54,776

SYNOPSIS: The alleged defect in this investigation refers to unforewarned and significantly diminished level of steering power assist, including but not limited to, circumstances in which the power steering assist system may appear to have failed completely.

ACTION: Close this Engineering Analysis.

BRCH CHF Richard P. Boyd OFC DIR [signature]

March 2, 1995 March 2, 1995
DATE DATE

SUMMARY: To fully evaluate the issues involved in this investigation, ODI conducted a comprehensive analysis involving:

- Surveys of Law Enforcement Agencies
  Two notices were broadcast over the nationwide police electron telecommunication system; Information Requests were sent to 9 Law Enforcement Agencies; and meetings were held with two police agencies.

- Accident Reconstruction
  NHTSA contracted with an independent engineering firm to have all accidents reconstructed that were allegedly caused by this phenomena.

- Accident Data Analysis
  NHTSA's National Center for Statistics and Analysis conducted a review of State Data and the Fatal Accident Reporting System.

- Manufacturer Inputs
  ODI staff met with Ford to discuss technical merits of the investigation and submitted two information requests for data.

- ODI Database Analysis
  ODI conducted a telephone survey of all complaints in its database which appeared to be related to this issue.

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- **Testing**

  ODI conducted extensive testing to:
  - verify and quantify the phenomenon using instrumented vehicles and test drivers on a precision maneuvers driving course;
  - examined the human factors aspects of the phenomenon using 34 police officer volunteers on a test track;
  - conducted slalom and lane change tests; and
  - conducted drop-throttle tests and static tests.

After reviewing all of the data obtained during this analysis, ODI has determined that the particular performance characteristics of the subject steering system may present a brief loss of power assist during extremely aggressive but foreseeable driving maneuvers. However, the collective body of information disclosed and developed during this investigation shows that this performance does not represent an unreasonable risk to motor vehicle safety within the meaning of the National Traffic and Motor Vehicle Safety Act. Therefore this investigation is closed. Detailed information on all aspects of this investigation is contained in the EA Closing Report.

#

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

Memorandum

Vehicle Research and Test Center P.O. Box 37
East Liberty, Ohio 43319
(513) 666-4511

FINAL REPORT -- VRTC-74-0331
Tests Regarding Power-Steering Performance on
1992 Ford Crown Victoria Police Vehicles

M W Monk
Michael W. Monk, Director
Vehicle Research & Test Center NRD-20

Kathleen C. Demeter, Director
Office of Defects Investigation NEF-10

Attached are four color copies of the subject report. This completes the requirements for this program.

Attachments

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VRTC-74-0331
EA94-022

Tests Regarding Power-Steering Performance on 1992 Ford Crown Victoria Police Vehicles

VEHICLE RESEARCH AND TEST CENTER
EAST LIBERTY, OHIO 43319-0337

FINAL REPORT
February 1995

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

Technical Report Documentation Page

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No. EA94-022
4. Title and Subtitle: Tests Regarding Power-Steering Performance on 1992 Ford Crown Victoria Police Vehicles		5. Report Date: February 1995
		6. Performing Organization Code: NRD-23
7. Author(s): James H. Hague		8. Performing Organization Report No. VRTC-74-0331
9. Performing Organization Name and Address: National Highway Traffic Safety Administration, Vehicle Research & Test Center, P.O. Box 37, East Liberty, Ohio 43319		10. Work Unit No. (TRAIS)
		11. Contract or Grant No.
12. Sponsoring Agency Name and Address: National Highway Traffic Safety Administration, 400 7th St. SW, Washington, DC 20590		13. Type of Report and Period Covered: Final Report 04/94 - 02/95
		14. Sponsoring Agency Code
15. Supplementary Notes		

16. Abstract

Driving tests were performed on various courses to evaluate and compare the steering performance of 1992 Crown Victorias with a peer police vehicle. The major findings were:

1) The subject steering condition, described in some complaints as steering wheel bind, was observed during certain aggressive driving maneuvers with the subject vehicles, when the steering wheel input rate was rapid enough to "beat" the power steering hydraulic system.

2) When 34 law enforcement officer volunteers were asked to evaluate the handling performance of three test vehicles on a "combined skills police pursuit" driving course, allegations of unsafe performance were noted for all three vehicles, including a stock Ford Crown Victoria, an altered (the alterations were intended to reduce but not eliminate the subject steering condition) Ford Crown Victoria, and a peer Chevrolet Caprice. However, steering was cited most often as a problem for the stock Ford Crown Victoria. During approximately 300 test runs, there were three instances where drivers lost their grip on the steering wheel during an apparent episode of the subject steering condition.

3) When a stock Ford Crown Victoria was driven through various slalom and lane change courses, the subject steering condition was generally noted at speeds up to 55 mph but control of the vehicle was maintained up to the limit of tire traction. When the test driver attempted to drive through one of the lane change courses using his left hand only, he was unable to successfully negotiate the course, apparently because of the subject steering condition.

17. Key Words	18. Distribution Statement
Steering Ford Crown Victoria Police Vehicle	

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

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Reproduction of completed page authorized

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JL00228

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1.0 INTRODUCTION

At the request of the Office of Defects Investigation (ODI) of the National Highway Traffic Safety Administration (NHTSA), the Vehicle Research and Test Center (VRTC) conducted tests concerning safety considerations of power-steering system response in 1992 Ford Crown Victoria police vehicles.

The ODI has received several complaints alleging that the subject vehicles exhibit a momentary loss of power-steering assist "which feels like a steering wheel bind," during rapid aggressive steering maneuvers. This steering response behavior had been dubbed by some police officers as 'drop throttle understeer.' Published reports suggest that the manufacturer agrees that the behavior occurs when the engine speed drops too low or only during maneuvers that one would never make in the real world. According to the manufacturer, this condition has been eliminated in the 1994 model vehicles.

The ODI has also received reports of several accidents, involving the subject vehicles, wherein the steering system is alleged to have been a causative or contributing factor

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2.0_OBJECTIVES

The objectives of these tests were to attempt to document the steering phenomena causing the complaints, to determine the conditions in which it can occur, and to determine the degree to which it can affect driver steering control.

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3.0_DISCUSSION

The six vehicles used for testing and the different types of tests performed are described in the sections that follow

3.1 Test Vehicles

All vehicles were tested in a lightly loaded (unladen) condition which consisted of the vehicle empty weight. driver. and test equipment

Vehicle 1 was a 1992 Ford Crown Victoria police-package vehicle This vehicle was still in service It was equipped with roof lights communications radio (control head only), new brakes and Goodyear P225/70R15 GT+4 tires with approximately 10/32-inch tread depth. Its odometer indicated approximately 70.000 accumulated miles. See Appendix A for additional information.

Vehicle 2 was a 1992 Ford Crown Victoria police-package vehicle. This vehicle was still in service. It was equipped with roof lights. communications radio (control head only). ABS brakes. Positraction and Goodyear P225/70R15 GT+4 tires with approximately 9/32-inch tread depth Its odometer indicated approximately 70.000 accumulated miles.

Vehicle 3 was a 1992 Chevrolet Caprice police-package vehicle This vehicle was still in service. It was equipped with a communications radio. ABS brakes. and Dayton P235/70R15 tires with approximately 4/32-inch tread depth. Its odometer indicated approximately 50.000 accumulated miles

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Vehicle 4 was a 1992 Ford Crown Victoria police-package vehicle. This vehicle had been removed from service It was equipped with new brakes and new Goodyear P225/70R15 GT+4 tires Its odometer indicated approximately 70,000 accumulated miles. See Appendix A for additional information.

Vehicle 5 was a 1992 Ford Crown Victoria police-package vehicle This vehicle had been removed from service. It was equipped with new brakes and new Goodyear P225/70R15 GT+4 tires. Its odometer indicated approximately 80,000 accumulated miles. See Appendix A for additional information

Vehicle 6 was a 1992 Chevrolet Caprice police-package vehicle. This vehicle had been removed from service. It was equipped with new brakes (ABS) and new Goodyear P235/70R15 tires Its odometer indicated approximately 70,000 accumulated miles. See Appendix A for additional information

3.2 Vehicle Preparation

Tire pressures were adjusted to 35 psi in all cases and fuel levels were maintained above 3/4 full

Vehicles 4, 5, and 6 were fitted with new shocks, brakes, and tires Each of these vehicles was subjected to a 200-stop brake burnish[1] prior to any testing.

Instruments were installed in Vehicle 1 and Vehicle 2 that allowed the driver to record the time history (100 Hz sampling rate) of steering wheel position, steering wheel torque, throttle position, power-steering pump outlet pressure, engine speed, and power-steering pump shaft speed.

[1] This procedure was performed in a manner similar to that prescribed in Federal Motor Vehicle Safety Standard 105

Figure 1 is a photograph of the interior of Vehicle 2. The steering wheel torque transducer, signal conditioners, and data acquisition computer are visible in this view.

Instruments were installed in Vehicle 3 that allowed the driver to record the time history (100 Hz sampling rate) of steering wheel position and steering wheel torque.

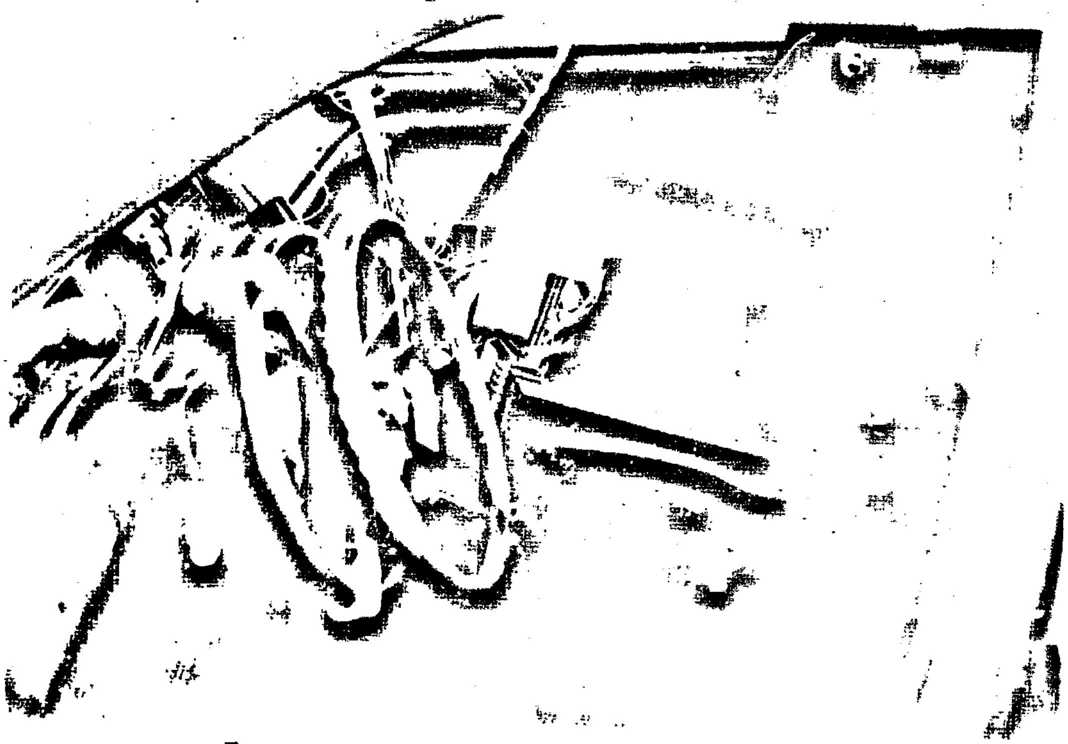

Figure 1 - Onboard Data Acquisition Equipment

A video camera and videotape recorder were installed in Vehicles 4, 5, and 6. The forward-facing camera was mounted on the right-rear interior deck. It was aimed to the left front which provided a view of the steering wheel from over the driver's right shoulder. Figure 2 is a photograph of the interior of Vehicle 5. The video camera and videotape recorder are visible in this view.

Figure 2 - Onboard Video Recording Equipment

Except during the volunteer driver tests instruments were installed in Vehicles 4 and 5 that allowed the driver to record the time history (100 Hz sampling rate) of steering wheel position and steering wheel torque.

3.3 Static Tests

The following tests were performed only on Vehicle 1

A nearby Ford dealer was contracted to supply personnel, supplies, and equipment to perform the "Pump Flow and Pressure Tests" as prescribed in Section 11-00 of the 1992 Crown Victoria/Grand Marquis Body/Chassis Electrical/Powertrain Service Manual Appendix B contains a photocopy of this section of the service manual Appendix B also contains an exploded view drawing of the power-steering gear box.

The mechanic from the dealership had difficulty attaching the "Rotunda Power-steering System Analyzer 014-00207" to the outlet port of the power-steering pump. The supplied adapters apparently did not fit the port correctly which allowed excessive leakage of fluid when operation was attempted. The adapter was wrapped with Teflon thread-sealant tape and installed and removed numerous times. On one occasion, when the adapter was removed, a broken piece of plastic fell from the port. It was assumed that the pressure relief mechanism may have been damaged by the poor-fitting adapter. When a partial seal was obtained at the outlet port, an attempt was made to accomplish the "flow" test procedures. It was discovered during this testing that the prescribed sequence of testing must be altered by reversing the order of Procedures 7 and 8 (See Page 11-00-3 in Appendix B). If Procedures 7 and 8 were not reversed, the flow meter indicator was driven off scale when the engine speed was increased to 1500 rpm. The flow meter indicator would not return on scale until the flow meter was removed from the system and subjected to reversed flow. When the altered test sequence was used, all measurements were within specifications, except the maximum relief pressure which confirmed that the pressure relief system was not functioning.

Notwithstanding the malfunctioning pressure relief system, an attempt was made to begin testing Vehicle 1 in the "as received" condition. The test driver inadvertently overpressurized the steering system, by attempting a locked-wheel turning maneuver, which caused the sector shaft cover to crack.

A new power-steering pump and gear box were installed on Vehicle 1 and another attempt was made to accomplish the "pump-flow and pressure tests" on Vehicle 1. The mechanic obtained another Rotunda 014-00207 tester from another nearby Ford dealer. This test kit also did not contain the proper adapter for the pump outlet port. VRTC fabricated a makeshift adapter for the outlet port. The tester was attached and the tests were attempted again. Again the flow

002110

meter indicator was driven off scale when the engine speed was increased to 1500 rpm. Procedures 7 and 8 were once again reversed and the tests were completed without further incident. All measurements were within the Ford specifications except system back pressure which was slightly high[2]

The torque required to rotate the input shaft left or right within and to the mechanical limit of the worm shaft (torque setting) was measured. The measurement was taken for both the original gear box and the replacement gear box. The torque setting is established by the designer by selecting the torsion bar characteristics. The torque setting of Vehicle 6 (1992 Caprice) was also measured.

If during operation of the vehicle, all steering maneuvers are accomplished by the power assist system, the steering wheel torque will be less than the torque setting. If, however, the rate of steering wheel rotation exceeds the rate at which the power assist system can drive the rack piston, the steering wheel torque loads will rise rapidly when the input shaft stop contacts the worm shaft limit stop. When this limit has been reached, the operator must supply override torque (supertorque) to continue to move the rack piston at the desired rate. When this happens, it is sometimes referred to as "beating the power-steering pump." It should, however, be referred to as "beating the power-steering hydraulics" because the flow efficiency of the control valve and associated plumbing also contribute to the response rate.

3.4 Drop-Throttle Serpentine Tests

The following tests were performed only on Vehicles 1 and 5.

2 The slightly high system back pressure was thought to be caused by the makeshift adapter. The test kit and makeshift adapter were removed prior to any driving tests.

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Vehicle 1 was subjected to four drop-throttle serpentine tests. These tests were done on smooth asphalt with a one-percent downhill slope and were driven by Driver A. A nearby monitored area on the same surface suggests that the nominal peak/slide skid number for this area is 90/80 dry and 85/65 wet.

The maneuver was accomplished by accelerating the vehicle to approximately 45 mph. With the vehicle at approximately 45 mph, the driver removed his foot from the accelerator pedal and began a series of quick turns. The steering wheel was quickly turned left approximately 200 degrees and was immediately turned back to the right approximately 400 degrees. The steering wheel continued to be quickly turned back and forth through approximately 400 degrees of travel throughout the rest of the maneuver. A complete series normally consisted of 5 to 10 steering cycles.

Vehicle 5 (unmodified configuration)[3] was also subjected to drop-throttle serpentine tests. These six tests were done on the same surface as described above for Vehicle 1 and were accomplished in a similar manner. They were done at speeds of 40, 35, 40, 45, 50, and 55 mph by Driver B.

3.5 Pursuit Course Tests

The pursuit courses used for this phase of the testing were based on the Cumulative Skills Pursuit Course C described in Appendix C of the task force report of the International Association of Directors of Law Enforcement Standards and Training. A photocopy of the Course C description is included in Appendix C. Because this drawing was not to scale, nor fully dimensioned, many dimensions were indeterminate. Values for some dimensions were arbitrarily chosen by VRTC.

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[3] Vehicle test configurations will be explained in the sections that follow.

Three versions of a pursuit course were developed from the Course C description The first version was labeled the "Yellow Course" The Yellow Course was used for all Pursuit Course Tests involving Vehicles 1 and 2. It was also used for some tests involving Vehicles 3, 4, and 5.

The second version was labeled the "Red Course." The Red Course was a modification of the Yellow Course. These modifications were intended to make the course resemble the course prescribed by the Attorney General of New Jersey. The Red and Yellow courses differ only in the area of the second U-turn and the braking lane. The Red Course was used for those tests involving Vehicles 3, 4, and 5.

The third version was labeled the "Blue Course." The Blue Course was a combination/modification of the Yellow and Red courses. This course was used for some tests involving Vehicles 4 and 5 The Blue Course differs from Red in the area just before the second U-turn. It differs from both the Yellow and Red Courses in the area just before the braking lane The difficulty level of this course is slightly higher than either the Yellow Course or the Red Course.

Appendix C contains a drawing of each of the courses. In these drawings the black squares indicate positions where pylons (12-inch and 18-inch-tall traffic cones) were placed to delineate the course. The courses were located on smooth asphalt with a 1-percent slope from left to right (viewed from the start position). A nearby monitored area on the same surface suggests that the nominal peak/slide skid number for this area is 90/80 dry and 85/65 wet

At the request of ODI, a police officer, who was familiar with the alleged steering wheel bind, visited VRTC. This officer served as a driving instructor within his agency, and was experienced in driving the subject vehicles through the New Jersey version of the cumulative skills pursuit course Using Vehicle 1, he

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demonstrated how the combined skills pursuit course was driven and discussed performance guidelines used in the driving course in which he participated. He also demonstrated the steering behavior that was alleged to be a steering wheel bind. This officer later returned to VRTC to assist in the evaluation of the steering system modification tests described in Section 3 6.

The course was driven by positioning the vehicle in the start location. From this stationary position the driver began the run through the course by releasing the brakes and accelerating towards the first lane change and thence along a prescribed path leading to the braking lane Appendix C contains a diagram which illustrates this path. The drivers were encouraged to attempt to drive through the course in the quickest possible time without knocking down or dislodging any pylons. The elapsed time counter was started when the vehicle first moved. The counter was stopped when the vehicle was in the braking lane, under control, and the driver was braking

Vehicle 1 was driven through the Yellow Course 30 times. Some of these runs were driven by Driver A and some by Driver B The last 18 runs were done with the electronic variable orifice (EVO) assembly electrically disconnected. According to service literature this should cause the power-steering pump to remain in the high output state at all times. The time history of the various data channels was recorded by the onboard data system.

Vehicle 2 was driven through the Yellow Course 28 times. Some of these runs were driven by Driver A, some by Driver B, and one by Driver C. The first six runs were done by Driver A who was instructed to drive two easy, two quick, and two maximum effort (minimum elapsed time) runs. Driver B drove the next six runs while attempting to follow the same instructions. The next nine runs were done with the EVO assembly electrically disconnected. This time the drivers were instructed to drive a series of one easy one quick, and one maximum effort

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run. Driver A drove two series and Driver B drove one series for a total of nine runs. The EVO assembly was reconnected and Driver A and Driver B each drove one series of three runs. Driver C drove one quick run. The time history of the various data channels was recorded by the onboard data system.

Vehicle 3 was driven through the Yellow Course nine times. These runs were driven by Drivers A, B and C. It was driven through the Red Course two times by Driver A. The time history of the various data channels was recorded by the onboard data system.

Vehicle 4 was driven through the Yellow Course eight times. These runs were driven by Drivers A, B and C. It was driven through the Red Course two times and through the Blue Course four times by Driver A. The time history of the various data channels was recorded by the onboard data system. The vehicle was in a modified configuration which will be explained in Section 3.7.

Vehicle 5 was driven through the Yellow Course seven times. These runs were driven by Drivers A, B and C. It was driven through the Red Course two times and through the Blue Course five times by Driver A. The time history of the various data channels was recorded by the onboard data system.

3.6 Steering System Modification Tests

In an attempt to further understand the causes of the steering response observed during the testing of Vehicles 1 and 2 in the pursuit course tests described in Section 3.5, components of the steering system of Vehicle 2 were modified. These modifications and subsequent tests were intended to aid in the determination and understanding of which components of the steering system were causing or contributing to the subject behavior. These modifications were not intended to serve as a prototype for product improvement, but only as an aid in proof-of-concept determination.

JLC251

The control valve housing, input shaft, and rotary valve sleeve of a new power-steering gear box were modified to improve full-flow characteristics. Vehicle 2, with this single modification (power-steering gear box), was driven through the Yellow Course by Drivers A, B, and C. The time history of the various data channels was recorded by the onboard data system

The needle valve, orifice, and valve body of a new EVO assembly were later modified to minimize pressure drop across the valve. The pressure drop across the EVO assembly is used to position an internal spool valve in the power-steering hydraulic pump. The spool valve controls the output of the pump from low output (low power-steering assist for high speed non-aggressive driving) to high output (high power-steering assist for low speed or aggressive maneuvering). The modified EVO assembly was also installed in Vehicle 2. The modifications rendered the EVO assembly inoperable causing the pump to remain fixed in the high output state. Vehicle 2, with this double modification (power-steering gear box and EVO assembly), was driven through the Yellow Course by Drivers A, B, and C. The time history of the various data channels was recorded by the onboard data system.

The original (unmodified) power-steering gear box was reinstalled on Vehicle 2. Vehicle 2, with the single modification (EVO assembly), was driven through the Yellow Course by Drivers A, B, and C. The time history of the various data channels was recorded by the onboard data system.

At the request of ODI, the police officer, who had assisted earlier, returned to VRTC. As Driver D, he drove Vehicle 2 in the test configurations described below.

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The modified steering box and EVO were installed in Vehicle 2. Vehicle 2, with this double modification (power-steering gear box and EVO assembly), was driven through the Red and Yellow Courses by Driver D. The time history of the various data channels was recorded by the onboard data system

The original (unmodified) power-steering gear box and the original (unmodified) EVO assembly were installed on Vehicle 2. Vehicle 2 (unmodified) was driven through the Yellow and Red Courses by Driver D The time history of the various data channels was recorded by the onboard data system.

3.7 Volunteer Driver Tests

Four groups of law enforcement officer volunteers were utilized for these tests. Group 1 (100 series subject numbers) included 20 officers. Group 2 (200 series subject numbers) included three officers. Group 3 (300 series subject numbers) included one officer, and Group 4 (400 series subject numbers) included 10 officers. The officers were solicited from regional law enforcement agencies. The headquarters of the respective agencies were contacted and volunteers were requested to participate in the study. Criteria, such as male/female, average/above average or skilled/highly skilled driving ability (based on subjective supervisor evaluation), and type of patrol car assigned were often included. Appendix D includes three examples of letters that were used during the solicitation. Some agencies were contacted directly by telephone. Also included in Appendix D is a script that was used as a guide for direct telephone as well as follow-up contact

If the headquarters personnel requested more detailed information during direct or follow-up contact, it was provided; but the stated purpose was typically limited to "investigation concerning allegations of a safety related defect in the power-steering system of police vehicles." In the majority of cases, however, additional information was not requested. The headquarters personnel were asked not to

JLC253

inform the potential volunteers of the exact nature or purpose of the tests They were to be told only that it involved driving police cars on a maneuvering course, which, in the majority of cases, was the only information the headquarters personnel had.

Only Groups 1 and 4 were structured. The plan attempted to provide some cross-sectional representation of law enforcement patrol officers within the two groups In order to minimize test delays it was necessary to sometimes overbook officers from some categories or agencies. Cancellations and other last-minute substitutions by the agencies resolved most conflicts. There were, however, four officers who were unmatched to the remaining slots within the two main group makeups. Three of these officers were subjected to a different test protocol and formed Group 2. The one remaining officer was subjected to another test protocol and formed the entire population of Group 3.

Vehicles 4, 5, and 6 were used for these tests. The participants in Groups 1, 3, and 4 were to drive all three vehicles up to 12 times each through the Red Course. Participants in Group 2 were to drive Vehicles 4 and 5 up to 15 times each through the Blue Course.

Vehicle 5 was initially in a semi-modified configuration This configuration was intended to reduce the frequency of occurrence and the resultant amplitude of supertorque events. The target was to make the steering system behave more like that of the peer vehicle (Chevrolet Caprice). This modification was different from the modification that was used for Vehicle 2 which was intended to eliminate supertorque events. The same modified power-steering gear box, as was used for Vehicle 2 and described in Section 3 6, but a different EVO actuator assembly, were installed. This EVO actuator assembly had been modified so that the pressure drop across the valve was approximately 25 percent less than the pressure drop across an unmodified valve for both a

JUC254

0-percent duty cycle and a 100-percent duty cycle using compressed air as the test fluid

It was arbitrarily decided that the modified components would be moved from Vehicle 5 to Vehicle 4 at about the half-way point during the testing of Group 1 A 3-inch by 3-inch piece of yellow tape was affixed to the instrument panel of Vehicle 5 and was moved to Vehicle 4 when the components were moved. This piece of yellow tape was within the view of the video camera and served as an indicator of whether the vehicle was semi-modified or unmodified. Since only one open day was available in the initial schedule, the changeover was made between Subjects 115 and 116. The modified components remained in Vehicle 4 for the rest of the testing of Group 1 and all of the testing of Groups 2, 3, and 4

Group 1 consisted of 15 males and five females. They were all on active duty and were either patrol officers or had experience as patrol officers[4]. Thirteen were currently assigned to Ford police vehicles and seven to Chevrolet police vehicles. Seven were state police officers, four were city (population less than 20,000) police officers, two were large city (population about 75,000) police officers, and seven were metropolitan (population greater than 250,000) police officers.

Group 2 consisted of three males. They were also all on active duty and were street patrol officers. Two were currently assigned to Ford police vehicles and one to Chevrolet police vehicles. All three were city (population less than 20,000) patrol officers

[4] No differentiation was made between highway patrol traffic patrol special traffic (accident) patrol or street patrol

3001255

Group 3 consisted of one female. She was also on active duty and a street patrol officer. She was currently assigned to Chevrolet police vehicles. She was a large city (population about 75,000) police officer.

Group 4 consisted of eight males and two females. They were also on active duty and were either patrol officers or had experience as patrol officers[4]. Two were state police officers, two were city police officers, two were sheriff's deputies, and four were suburban (metropolitan population greater than 1,000,000) police officers

The following restrictions were established for Groups 1 and 4:

1) Not more than 10 percent of the police force of any agency can participate.
2) At least 40 percent of the participants in each group must be suburban, large city, or metropolitan patrol officers.
3) Each group must have at least one sheriff's deputy or state highway patrol officer.
4) The test course must be dry for the majority of participants in each group.

The tests were conducted in three distinct phases. Phase 1 consisted of a briefing. In this briefing the participants were asked about their law enforcement experience, current duty assignment and driver training. The participants in Groups 1, 3, and 4 were also asked about their knowledge of any allegations of problems with handling characteristics of police vehicles. However, the participants in Group 2 were asked to focus on steering[5]. The participants were briefed on the driving course and were encouraged to make notes to evaluate the test course and handling characteristics of the vehicles for the debriefing that would follow the driving phase. They were advised that their driving performance was to be measured by the number of pylons (cones) struck and the elapsed

[5] "Steering problems in 1992 Ford Crown Victorias" for Subjects 201 and 202. "Steering characteristics of police cars" for Subject 203. (See Appendix F)

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time The briefings were recorded on videotape. The participants were aware of the video recording.

Phase 2 consisted of the participant driving two or three test vehicles on the Red or Blue Course They had been advised during the briefing that an arbitrary standard in use was that officers were required to drive the course in 28 seconds or less with no cones down in order to qualify The participants driving performance was recorded by the onboard videotape recording equipment. Videotape equipment, elevated about 70 feet above track level on an observation tower, located approximately 300 yards horizontally from the test-course start position, was also used to record the driving performance of the participants. The participants were aware of both the onboard and "tower" video recording. This phase will be discussed in more detail later in this section.

Phase 3 consisted of a debriefing. In the debriefing, the participants were asked to express their opinion of the driving course and handling characteristics of each of the vehicles they had driven[6] The participants were given an opportunity to make comments and ask questions. The debriefings were recorded on videotape. The participants were aware of the video recording

The participants were tested one at a time. In all cases, the driving phase began within minutes of the end of the briefing phase and the debriefing phase began within minutes of the end of the driving phase

The driving sequence of the groups were different The Group 1 participants always drove the semi-modified Ford first The second vehicle driven depended upon what type of vehicle the participant was currently assigned. If the participant currently drove a Ford vehicle on patrol, he drove the unmodified Ford

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[6] Notwithstanding the differences in the Group 2 briefing format (See Footnote 5) all groups were asked these questions in a similar manner

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second and the Chevrolet last. If the participant currently drove a Chevrolet vehicle on patrol, he drove the Chevrolet second and the Ford last All driving for this group was accomplished on the Red Course. The semi-modified vehicle was referred to as the "practice car" for Group 1 only Appendix E contains a copy of the script (Script A) used as a guide for the briefing and debriefing of Group 1

The Group 2 participants drove the unmodified Ford first and the semi-modified Ford last. They did not drive the Chevrolet. All driving for this group was accomplished on the Blue Course which required slightly more aggressive maneuvers to successfully negotiate. The drivers were told that one vehicle was unmodified and that the other vehicle was modified so that it may have better or worse (or unchanged) steering performance. They were not told which vehicle was which. Appendix F contains a copy of the script (Script B for Subjects 201 and 202; Script C for Subject 203) used as a guide for the briefing and debriefing of Group 2

The Group 3 participant drove the unmodified Ford first The second vehicle driven depended upon what type vehicle the participant was currently assigned. The participant currently drove a Chevrolet vehicle on patrol Consequently, she drove the Chevrolet second and the semi-modified Ford last All driving for this group was accomplished on the Red Course. Appendix G contains a copy of the script (Script D) used as a guide for the briefing and debriefing of Group 3.

The Group 4 participants always drove the semi-modified vehicle last. The first vehicle driven depended upon what type vehicle the participant was currently assigned. If the participant currently drove a Ford vehicle on patrol, the unmodified Ford was driven first and the Chevrolet second. If the participant currently drove a Chevrolet vehicle on patrol, the Chevrolet was driven first and the unmodified Ford second All driving for this group was accomplished on the

Red Course. Appendix G contains a copy (Script D) of the script used as a guide for the briefing and debriefing of Group 4.

The driving phase of the "volunteer" testing was monitored by Drivers B and C. Driver A was also present for the testing of most participants. This phase began with each participant being driven through the course two times, by Driver A or B, in the first vehicle that was scheduled to be driven[7]. The first run was done at low speed while Driver A or B explained various tactics for negotiating the course. The second run was done at full speed so that the participant could experience what it was like to negotiate the course for excellent qualifying times. Following these two runs, the participant moved into the driver's seat and drove solo for the rest of the tests. Each participant was given an opportunity to make a slow-speed pass (pace lap) through the course.

Prior to beginning the first timed run, the participants were informed of the course record, held by Driver A, and also informed of the typical low times for Drivers B and C. They were told that they could ask for advice from any of the three test drivers if they were having trouble with the course or just wanted to improve their performance. The participants were instructed to return to the start position after completing each pass.

When they returned to the start position, they were informed of the elapsed time and number of cones down for the run just completed. They drove run after run until they had successfully completed a qualifying run (elapsed time 28 seconds or less and no cones dislodged or knocked down). If the qualifying run occurred before their 12th attempt[8], they were told that they could take any or all of their remaining runs or stop and move on to the next scheduled vehicle. Even if they

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[7] The demonstration runs for the Group 2 participants were accomplished in the Chevrolet which this group did not drive.

[8] 15th attempt for the Group 2 participants.

failed to complete a qualifying run by their 12th attempt, they were moved on to the next scheduled vehicle.

3.8 Slalom Course Tests

Vehicle 5 was used for these tests by Driver A The vehicle was in the unmodified configuration following completion of the volunteer driver testing described in Section 3.7 The onboard data acquisition system recorded the time history of steering wheel position and steering wheel torque. The onboard videotape recorder recorded the driver's performance An exterior view of the vehicle passing through the course was recorded by an offboard videotape recorder.

Two different slalom courses were established by placing five traffic pylons along a line at either 50-ft or 100-foot intervals. The driving surface had similar characteristics as the driving surface used for the Drop Throttle Serpentine tests described in Section 3 4.

The driver approached the course at a steady speed, along a path parallel and close to the line of pylons, leaving the first pylon on the right, and then making rapid right-hand and left-hand turns in an attempt to weave in and out of the pylons. During the run, the driver was attempting to maintain a steady speed

Runs were made at 25, 30, 35, 40 and 35 mph on the 50-ft slalom course. For the 100-ft slalom course, runs were made from 30 to 65 mph at 5 mph intervals with an additional run at 60 and 65 mph

3.9 Lane Change Course Tests

Vehicle 5 was used for these tests by Driver A. The vehicle was in the unmodified configuration following completion of the slalom course tests described in Section 3 8 The onboard data acquisition system recorded the time history of steering wheel position and steering wheel torque. The onboard videotape recorder recorded the driver's performance. An exterior view of the vehicle passing through the course was recorded by an offboard videotape recorder An observer recorded the location of any pylons that were dislodged or knocked down by the vehicle

Two adjacent 12 ft-wide lanes were established by placing traffic pylons along three lines at 10-ft intervals. One of the lines was common to both lanes. By removing pylons along the common line, openings were created between the lanes where lane changes could be accomplished By adding pylons in the lanes, barriers were created The driving surface had similar characteristics as the Slalom Course described in Section 3 8

Figure 3 contains a diagram (not to scale) that represents a typical setup. Also indicated on this diagram is the path the driver was attempting to follow as he drove the test vehicle through the course The distance available (gate) for the initial crossover maneuver is indicated by Dimension A, whereas the final-crossover distance (gate) is indicated by Dimension C The length of the barrier (obstacle) that must be avoided is indicated by Dimension B

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A run through the course was accomplished with the driver approaching the course at a steady (target) speed while tracking along the center line of the right-hand lane. He attempted to maintain the target speed until forced by the presence of the obstacle to begin an evasive steering maneuver into the left-hand lane. The driver lifted his foot (drop-throttle) from the accelerator pedal of the vehicle when he began the initial maneuver. The last-moment closing of the throttle was done in an attempt to simulate an evasive maneuver as if the obstacle had suddenly appeared without warning. The initial and final-crossover distances also influenced the nature of the maneuver. The driver had to maneuver the vehicle more aggressively when these two distances became smaller. He also had to maneuver more aggressively when vehicle speed was increased.

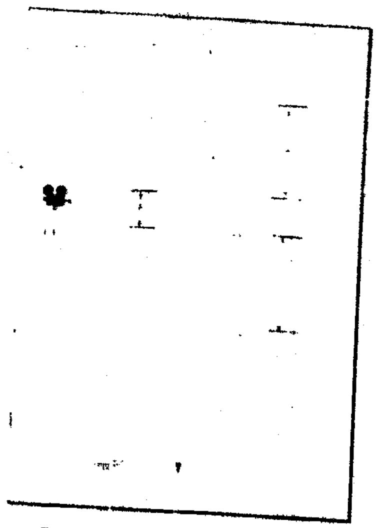

Figure 3 - Lane Change Course

Three types of lane change (evasive steering maneuver) courses were configured from the basic two-lane layout. Each course was driven at various target speeds.

The first type of course was set up with A = C and B = 20 ft for A = 30, 40, 50, and 60 ft. This course was dubbed the 7-11 course. The course dimensions were arbitrarily established in an attempt to simulate a scenario wherein:

> A law enforcement officer is driving in the left lane of a four-lane undivided urban street in an emergency response mode. Spotting a stopped vehicle in the left-hand lane ahead, signaling to turn left into a parking lot, the officer moves into the right-hand lane. Shortly after moving into the right-hand lane, a second vehicle suddenly pulls out of a curbside parking lot directly into the path of the officer. With insufficient stopping distance remaining in which to avoid a collision, the officer elects to attempt an evasive steering maneuver to the left. If the officer is to be successful in avoiding

the second vehicle without crossing the center line and colliding with oncoming vehicles. the officer must quickly return to the right-hand lane in order to avoid striking the stopped left-hand turning vehicle

The 7-11 course was driven at various speeds with different values for A=C. The test matrix for the course is tabulated in Table 1

Speed (mph)	30 ft Gate	40 ft Gate	50 ft Gate	60 ft Gate
15	x			
20	x			
25	x			
30	x	x		
35	x	x		
40	x	x	x	
45	x	x	x	x
50			x	x
55				x
60				x

Table 1 - 7-11 Course Test Matrix

The second type of course was set up with A = B = C for A = 30, 40, and 50 ft. The course was dubbed the moving vehicle (MV) course. The course dimensions were arbitrarily established in an attempt to simulate a scenario wherein:

> A law enforcement officer is driving in the left lane of a four-lane divided urban street in an emergency response mode. Spotting a vehicle in the left-hand lane ahead, apparently slowing down in response to the emergency signals, the officer moves into the right-hand lane passing the slowing vehicle. Shortly thereafter, a second vehicle suddenly emerges from an acceleration lane directly into the path of the officer. Although sufficient distance may remain in which to brake in order to avoid a collision, the officer elects to make an evasive steering maneuver to the left. The officer is successful in passing the second vehicle and elects to quickly return to the right-hand lane in preparation for an upcoming right-hand turn

The MV course was driven at various speeds with different values of A=B=C. The test matrix for the course is tabulated in Table 2

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Speed (mph)	30-30-30	40-40-40	50-50-50
	A=B=C ft	A=B=C ft	A=B=C ft
20	x		
25	x		
30	x		
35	x	x	
40	x	x	x
45	x	x	
50		x	x
55			x
60			x

Table 2 - MV Course Test Matrix

The third type of course was set up so A = C and B = 50 ft for A = 40 and 30 ft. This course was dubbed the aggressive (driver) moving vehicle (AMV) course. This course was intended to simulate a scenario wherein:

> A law enforcement officer is faced with a situation similar to that described for the MV course above. In this circumstance, however, the officer either elects or is compelled to more aggressively execute the lane change maneuvers. The 30-ft setup was used for two series of tests. In the last series, the driver was encouraged to use only his left hand for steering as if his right hand was being used for the operation of a hand-held communications microphone.

The AMV course was driven at various speeds with different driver techniques and values of A=C. For the final left-hand-only series, the driver was instructed to go up to about 15 ft-lbs of supertorque and not to force through any supertorque events ("Don't muscle through it") The test matrix for the aggressive MV course is tabulated in Table 3.

Speed (mph)	40-50-40	30-50-30	30-50-30*
30		x	
35		xx	xxx
40	x	x	x
45	x	x	x
50	x	x	
55	x		

* Note: This series driven with left hand only.

Table 3 - AMV Course Test Matrix

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4.0 TEST RESULTS

The results of the static, drop-throttle serpentine, pursuit course, steering system modification, volunteer driver, slalom course, and lane change course tests will be presented in the following sections.

4.1 Static Test Results

The following measurements were taken from the "Rotunda Power-steering System Analyzer 014-00207" while performing the pump-flow and pressure tests on the power-steering system of Vehicle 1

The flow recorded for Procedure 5.a was 2.5 gpm which met the minimum specified flow of 1.6 gpm. The pressure recorded for Procedure 5.b was 160 psi which exceeded the maximum specified pressure of 150 psi[2]

The flow recorded for Procedure 6 was 2.0 gpm which met the minimum specified flow of 1.4 gpm

The flow recorded for Procedure 8 was 3.0 gpm which met the maximum specified flow of 3.4 gpm.

The pressure recorded for Procedure 7 was 1390-1400 psi which met the minimum to maximum specification of 1200-1400 psi.

The pressure and flow recorded for Procedure 8 was 1400 psi and approximately zero gpm respectively, for both the left-hand and right-hand steering stops, which

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met the specification of pressure equal to the maximum pump output pressure and hydraulic flow less than 0 5 gpm.

The torque required to rotate the input shaft to its mechanical limit within the worm shaft was found to be approximately 8 ft-lbs for both gear boxes of Vehicle 1. The torque setting for Vehicle 3 was found to be approximately 9 ft-lbs

4.2 Drop-Throttle Serpentine Test Results

Appendix H contains graphical representations of the time history of steering wheel position and torque for the drop-throttle serpentine tests of Vehicle 1 The graphs are labeled CVS01 through CVS04. In all graphs in this report, negative values indicate left-hand or counterclockwise steering actions and positive values indicate right-hand or clockwise steering actions

Figures 4 and 5 depict the same data wherein the steering wheel position and applied torque are plotted along a common axis. An examination of these figures reveals that the applied steering wheel torque exceeded 8 ft-lbs (minimum limit of supertorque) repeatedly during the tests.

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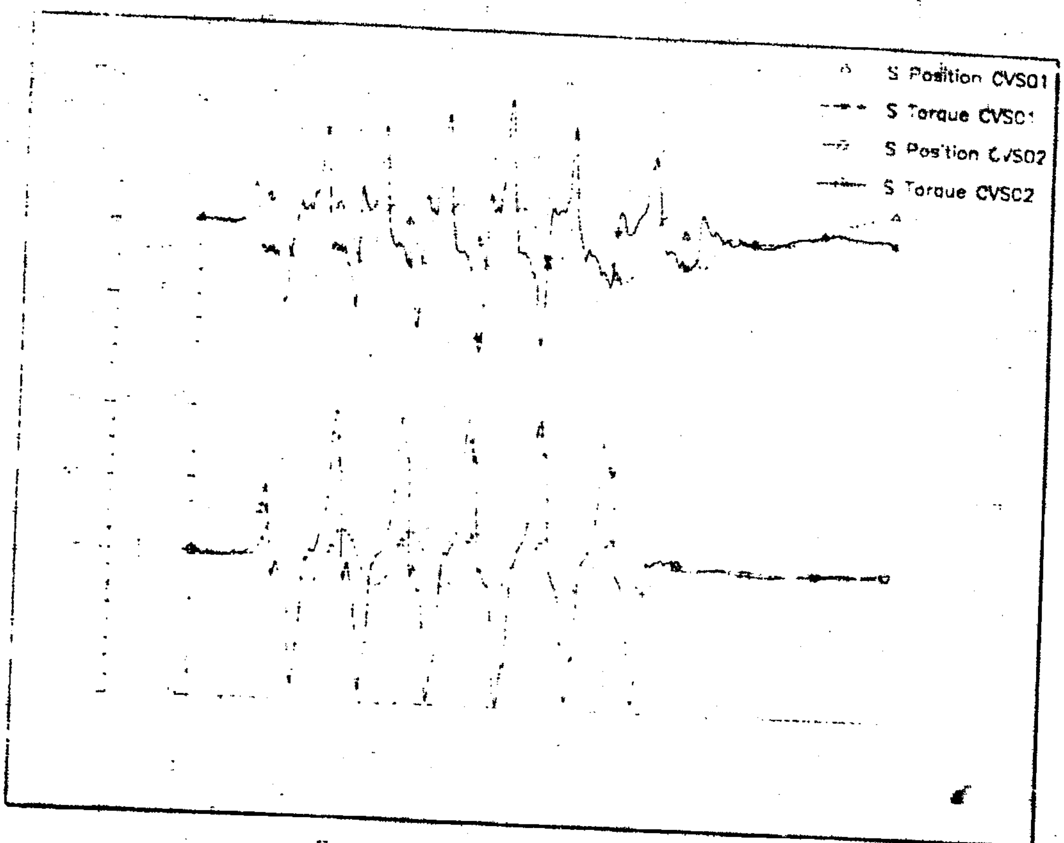

Figure 4 -Vehicle 1 Serpentine 01-02

Recall from the discussion in Section 3 3 and the results presented in Section 4.1, that whenever the applied torque exceeds approximately 8 ft-lbs, the operator has "beaten" the power-steering hydraulic system. When the hydraulic system is "beaten", the operator can continue in an attempt to rotate the steering wheel by supplying supertorque which will require a significant increase in steering effort. The driver could abandon his attempt to rotate the steering wheel further and simply maintain approximately 8 ft-lbs of torque, in which case the wheel will move at the system response rate for the current conditions. The response rate is influenced by the steering loads. power-steering pump shaft speed. power-steering pump spool valve position. power-steering gear box capacity. and associated hydraulic plumbing.

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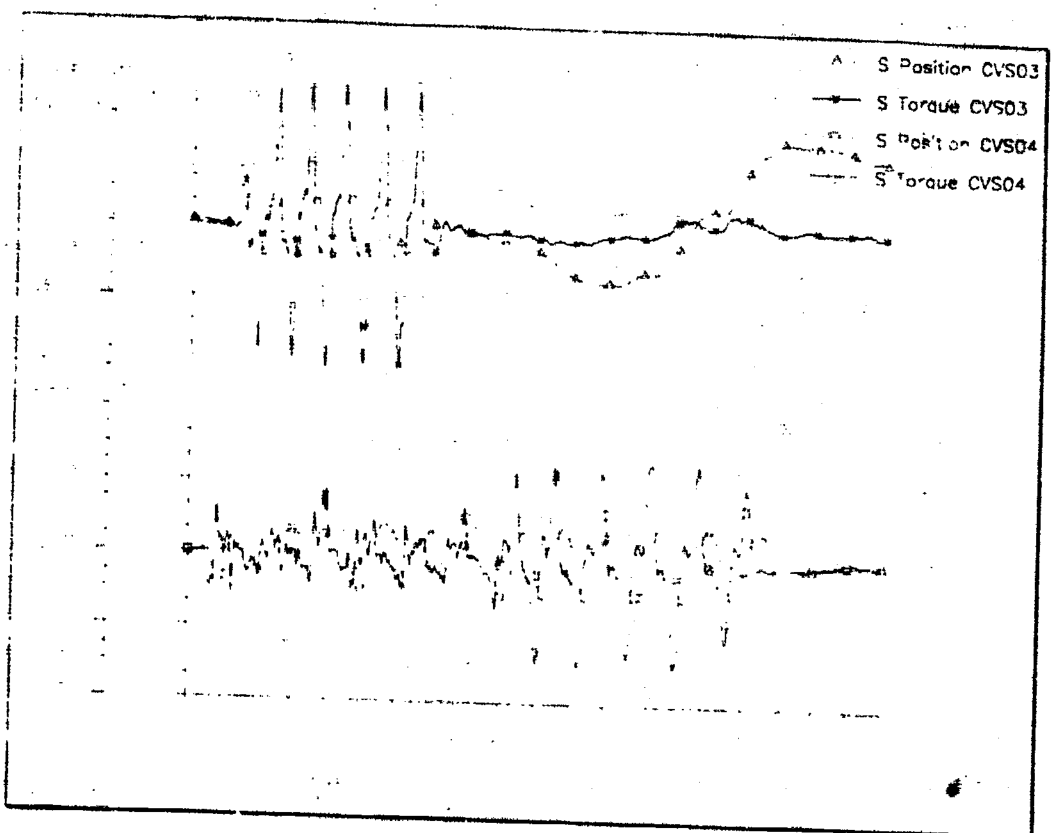

Figure 5 -Vehicle 1 Serpentine 03-04 A

An examination of Figures 4 and 5 reveals that in Runs CVS01, CVS02, and CVS03, the amplitude and frequency of the steering wheel position are very similar at approximately ±180 degrees and 1 Hz respectively. In Run CVS01 the amplitude of the applied torque rises from approximately 8 ft-lbs to near 30 ft-lbs before returning to approximately 8 ft-lbs. However, in Runs CVS02 and CVS03 the amplitude of the applied torque remains relatively constant near 30 ft-lbs. Since the conditions were similar in all three runs, it appears that the driver was applying a nearly constant supertorque throughout Runs CVS02 and CVS03, but varied the amount of supertorque during Run CVS01

An examination of the graph of Run CVS04, in Figure 5, reveals that the amplitude of the steering wheel position is also approximately ±180 degrees but the frequency is approximately 0.75 Hz. The applied steering wheel torque mostly remained below approximately 8 ft-lbs for the first half (up to about 9 seconds) of the run, then rose and remained at approximately 20 ft-lbs through the remainder of the run. Note how the resultant steering wheel positions were similar during the first 9 seconds, when the applied torque typically remained below 8 ft-lbs, as it was during last 7 seconds when the applied torque had been increased by a factor of two. Obviously, doubling the effort did not double the steering wheel excursions.

Further examination of Figures 4 and 5 reveals that in all runs there is an apparent phase difference between steering wheel position and applied torque. This result is not unexpected as steering wheel position results from steering wheel applied torque

Figure 6 contains graphs of data and data calculations for Run CVS04. The upper graph is the time history of applied torque and steering wheel position plotted along a common axis The lower graph is the time history of applied torque and the first derivative[9] of steering wheel position plotted along a common axis. The first derivative represents the rate of change of the steering wheel position (angular velocity) with respect to time. In the upper graph the phase difference is apparent. In the lower graph there is no apparent phase difference. During the first 9 seconds the driver's perception would be that when the applied torque is zero the angular velocity is zero, and when the applied torque is increased, the angular velocity is increased. During the last 7 seconds, however, when the driver dramatically increased the applied torque, the angular velocity did not increase during periods of supertorque, but started decreasing.

[9] Except for the endpoints, the derivative plotted is the slope of the Lagrange polynomial interpolation formula of degree two

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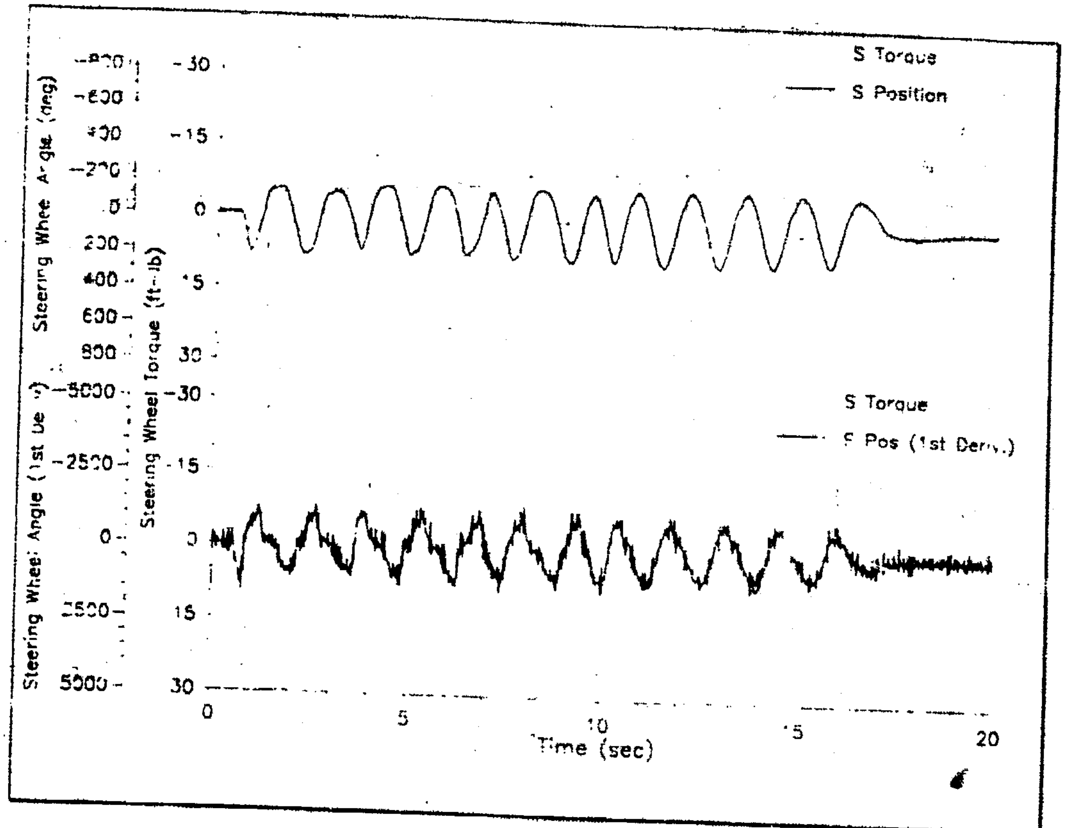

Figure 6 -Vehicle 1 Serpentine 04 Derivative

Appendix I contains graphical representations of the time history of steering wheel position and applied torque for each of the drop-throttle serpentine tests of Vehicle 5. These tests were done at speeds of 40, 35, 40, 45 50, and 55 mph and were numbered CVD21, CVD22, CVD23, CVD24, CVD25, AND CVD26 respectively. Note that these runs were driven by Driver B. An examination of these graphs reveals that the time history of steering wheel position and applied torque of each of these runs is similar to that observed for Driver A in Vehicle 1 described above.

Figure 7 contains graphs of data and data calculations of Run CVD22. As in Figure 6, the upper graph is the time history of applied torque and steering wheel position plotted along a common axis, and the lower graph is the time history of applied torque and the calculated steering wheel angular velocity plotted along a common axis. The decrease in the angular velocity of the steering wheel during periods of peak supertorque, observed in the lower graph of this figure, is more pronounced than in Figure 6 Also more pronounced in Figure 7 is the notched appearance of the torque curve near each maximum. This "kick-back" coincides with a sudden slowing of the wheel which is also noticeable as a flattening of steering wheel position curve in the upper graph. This indicates that the steering wheel was beginning to stop in spite of the high supertorque. Driver B (See Figure 7) is not as physically strong as Driver A (See Figure 6). Driver A was apparently able to prevent the "kick-back" of the steering wheel on all but one occasion (near 11 seconds in Run CVS04).

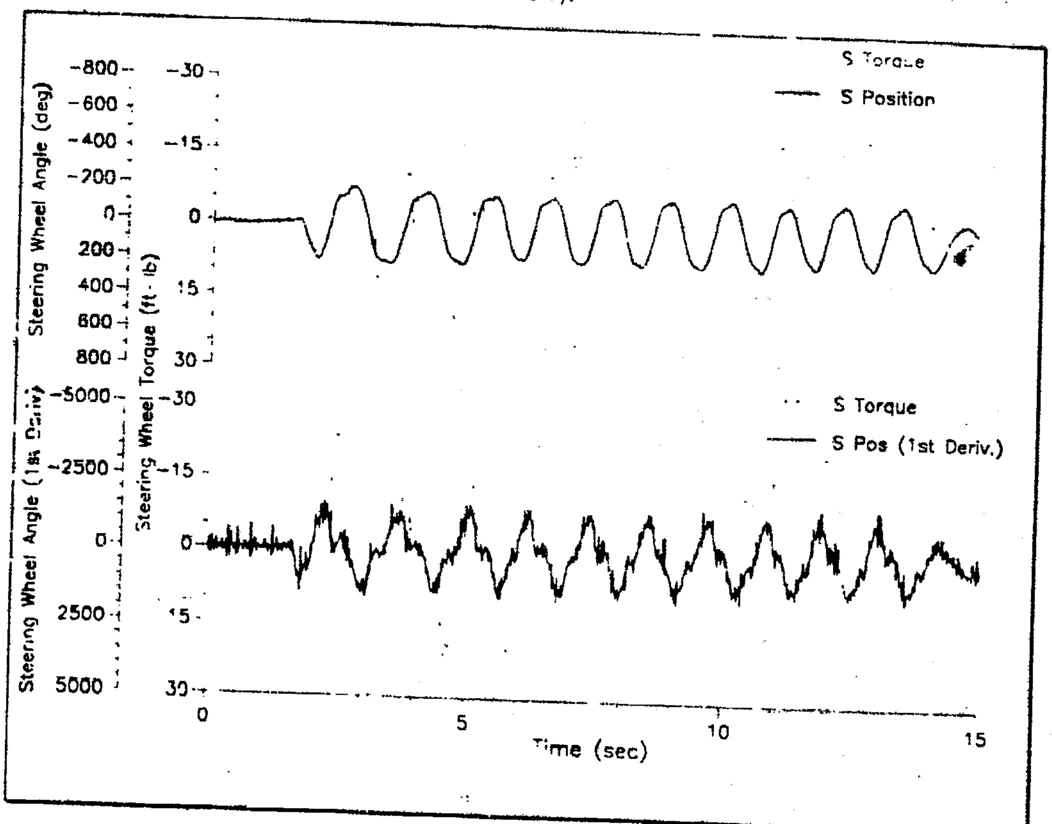

Figure 7 -Vehicle 5 Serpentine 22 Derivative

These results are also not unexpected because both drivers had "beaten" the hydraulics. Any attempt to operate beyond this point, i.e. application of supertorque beyond the breakpoint (8 ft-lbs). resulted in operation in a region

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where the steering wheel input to output relationship was dramatically different. This phenomena (steering wheel angular velocity suddenly slows during periods of applied supertorque) would violate the expectations of the driver and is the probable cause of the allegations of "steering wheel bind."

4.3 Pursuit Course Test Results

Appendix J contains graphical representations of the time history of steering wheel position (top graph) and torque (bottom graph) for the pursuit course tests of Vehicle 1. The graphs are labeled CVS08 through CVS37. Note that Runs CVS20 through CVS37 were done with the EVO disconnected.

An examination of the graphs of the steering wheel position data in Appendix J reveals two large steering wheel angle inputs of about ±600 degrees by the driver. The first large input typically occurs between 8 and 10 seconds of each run. This event occurs when the driver is negotiating the first U-turn on the course. This turn is to the left and is best accomplished by turning the steering wheel all the way to the steering stop.

The second large input typically occurs between 18 and 20 seconds of each run. This event occurs when the driver is negotiating the second U-turn on the course. This turn is to the right and is also best accomplished by turning the steering wheel all the way to the steering stop. Attempts by the driver to turn the wheel beyond the stop will not produce further motion of the wheel, but will result in increased levels of torque. Most drivers should be familiar with this condition from their experiences in tight-quarter maneuvering in driveways and parking lots.

When the steering wheel reaches its limit and stops during these two locked-wheel maneuvers, the driver most likely does not expect the wheel to turn further even though high levels of torque are applied. In this report, high torque

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levels during locked-wheel maneuvers are not considered to be supertorque. These locked-wheel maneuvers can be used as markers to indicate the position of the vehicle in the course during the run.

An examination of the graphs of the applied steering wheel torque data in Appendix J reveals numerous occurrences of supertorque in each of the runs. These occurrences typically appear just prior to the two U-turns and near the end of the runs. It is during these sections of the courses that the most rapid and aggressive steering maneuvers are required. There is little apparent difference between the runs when the EVO was disconnected and those when it was connected. In Runs CVS32 through CVS37, the number and amplitude of supertorque occurrences was greatly reduced when the drivers were attempting to drive the course more slowly and smoothly, although their elapsed times increased.

Figure 8 contains graphs of the time history data of steering wheel position, applied steering wheel torque, throttle position, power-steering pump shaft speed, and power-steering pump outlet pressure for Run CVS08. Figures 9 and 10 contain the same information for Runs CVS16 and CVS20 respectively.

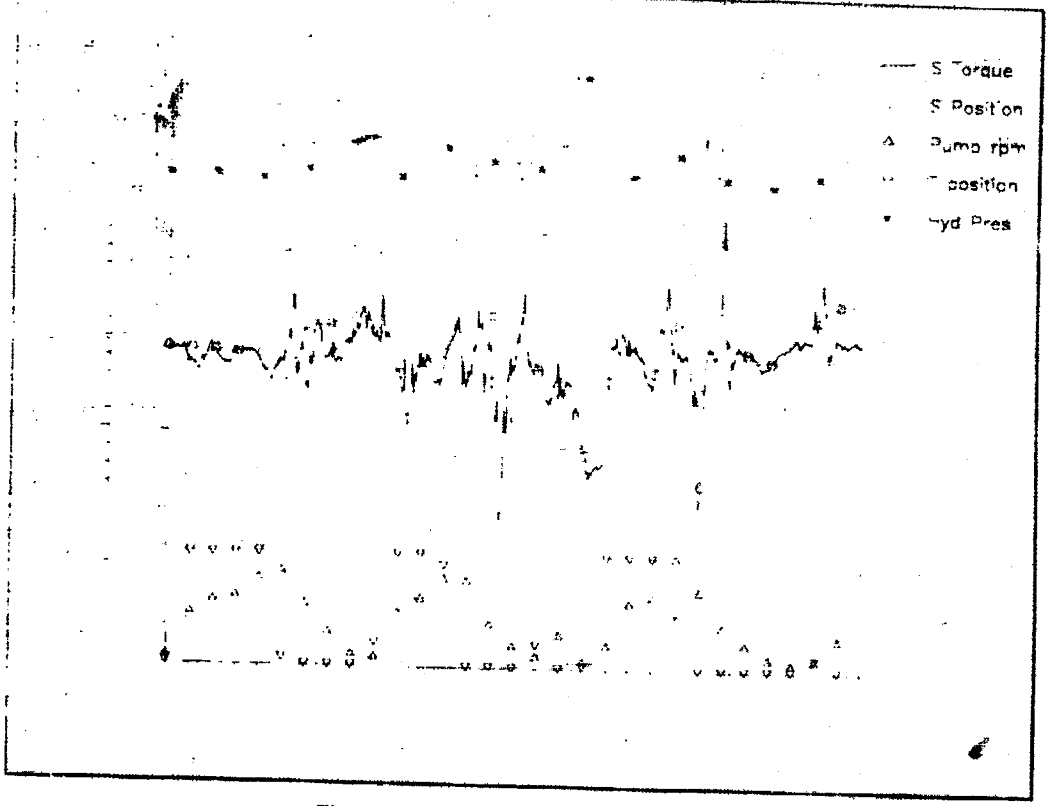

Figure 8 -Vehicle 1 Pursuit Course 08

Examination of Figure 8 reveals three significant occurrences of supertorque. These events occurred at about 14. 23. and 24 seconds into the run. Note that for the most part. the driver either operated the vehicle at full throttle or closed throttle. Further note that the throttle was always closed when the period of supertorque occurred. This result was not unexpected because the driver had lifted his foot from the throttle pedal in order slow the vehicle with the service brakes prior to entering the respective turn Had the driver not lifted his foot (drop-throttle) prior to the required turn. the speed of the vehicle would have been too high to make the turn. Even if the speed of the vehicle would not have been too high. attempting to accomplish the turn with significant throttle opening would have likely resulted in extreme vehicle oversteer and spin-out.

Examination of Figure 8 also reveals that occurrences of supertorque were not limited to times when the engine speed, and consequently power-steering pump shaft speed were low. Looking at the supertorque event that occurred at about 23 seconds, it is apparent that the pump shaft speed is about 3700 rpm. This would indicate that although low engine speed would exacerbate the condition, it is not the prim[illegible] cause of the subject steering condition

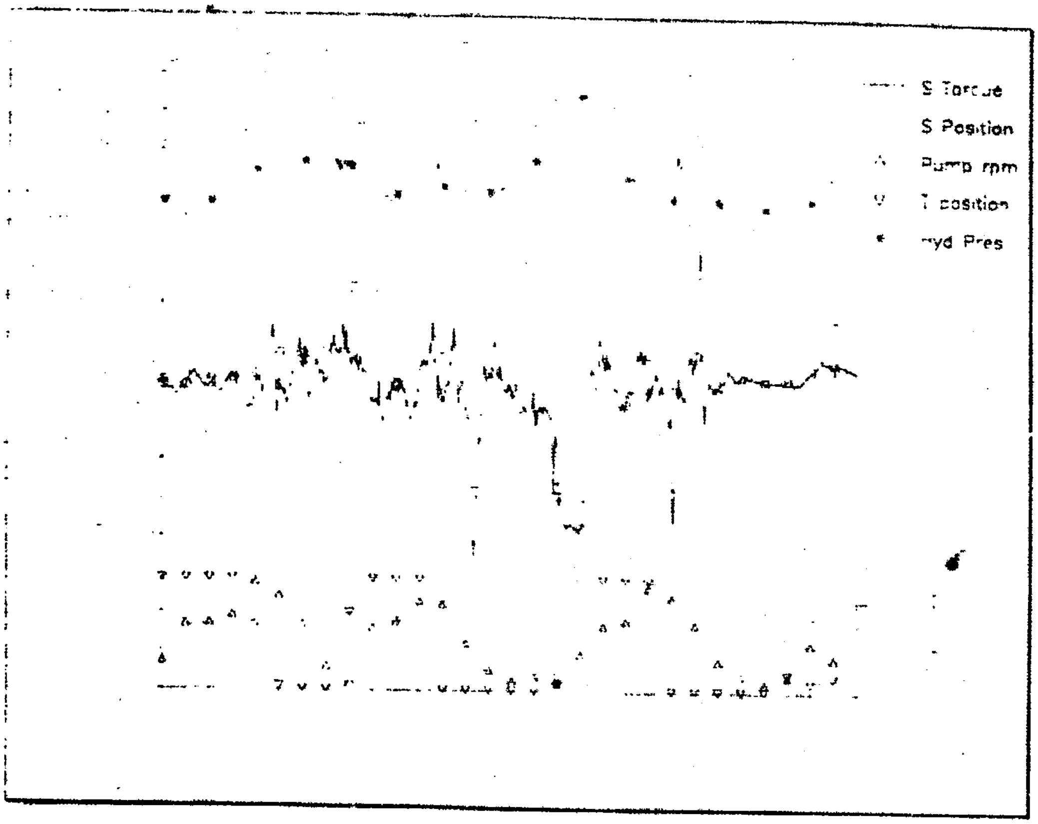

Figure 9 -Vehicle 1 Pursuit Course 16

Further examination of Figure 8 reveals that during the locked-wheel maneuvers (1st and 2nd U-turns), the outlet pressure of the power-steering pump rose quickly to about 1400 psi. This indicates that the pump was capable of generating high pressure (during periods of extremely low flow) and that the pressure relief valve was functioning properly. Interestingly, however, the pressure never rose much above 700 psi during the rest of the run, even during episodes of supertorque. During the supertorque events, the flow would be much greater than during locked-wheel events.

A comparison of the graphs in Figure 8 and Figure 9 reveals a high degree of similarity. Apparently the driver attempted to drive both runs in a similar manner and the response of the vehicle was also similar.

An examination of Figure 10 reveals supertorque events still occurred even though the EVO assembly was disconnected. This run was also driven more slowly (elapsed time about 29 seconds) than Runs 08 and 16 (elapsed times about 26 and 25 seconds respectively). The response rate of the EVO system could exacerbate the condition by failing to quickly switch to the maximum assist state. Since the EVO assembly was electrically disconnected (power-steering pump should remain in maximum assist state) during Run CVS20, the

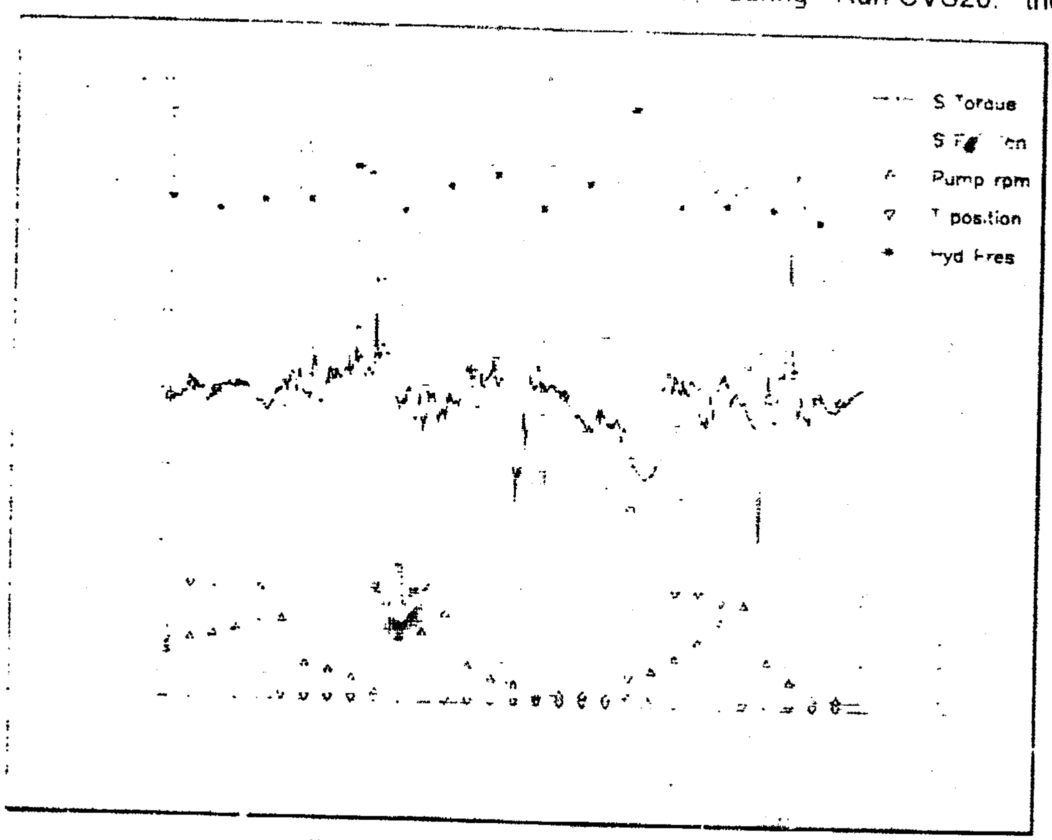

Figure 10 -Vehicle 1 Pursuit Course 20

supertorque events in Figure 10 indicate that the EVO system response rate is not the primary cause of the subject steering condition.

Appendix K contains graphical representations of the time history of steering wheel position (top graph) and torque (bottom graph) for the pursuit course tests of Vehicle 2. The graphs are labeled CVP01 through CVP28. Runs CVP13 through CVP15 are not included because the data was not properly recorded by the onboard system due to a disk I/O error. Runs CVP13 through CVP15 were repeated and are included as Runs CVP16 through CVP18 Note that Runs CVP13 through CVP21 were done with the EVO assembly disconnected.

An examination of the graphs for Runs CVP01 through CVP06 reveals that when Driver A drove more slowly in the first two runs supertorque events were virtually nonexistent. When Driver A drove more aggressively in Runs CVP03 through CVP06. the supertorque events appeared similar to those of Vehicle 1

An examination of the graphs for Runs CVP07 through CVP12 reveals that when Driver B drove more slowly on Run CVP08, supertorque events were virtually nonexistent. On Run CVP07, when Driver B drove more aggressively, the supertorque events appeared similar to those of Vehicle 1

An examination of the graphs for Runs CVP16 through CVP21 reveals that when the EVO was electrically disconnected. supertorque events still occurred for Vehicle 2

Appendix L contains graphical representations of the time history of steering wheel position (top graph) and torque (bottom graph) for the pursuit course tests of Vehicle 3 (1992 Caprice). The graphs are labeled PC01 through PC06. Runs PC07 through PC11 are not included because of a malfunction in the torque

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channel data that began during Run PC06. The first four runs were driven by Driver A and the last two runs by Driver C.

An examination of the graphs for Runs PC01 through PC06 reveals that supertorque events occurred in each of the runs. The appearance of the events is somewhat similar to those of Vehicles 1 and 2. The moment of failure of the torque data channel can be observed in the graph for Run PC06 at about 24 5 seconds into the run.

All three test drivers were aware of the supertorque events during the runs in Vehicle 3, but none of the three thought they were significant when compared to Vehicles 1 and 2. The reasons for this observation is believed to be related to the duration of the supertorque events. A similar result would be indicated later, during the volunteer driver tests, when Vehicle 6 (1992 Caprice) was driven by the participants. For reasons that are not fully understood all three test drivers thought that Vehicles 3 and 6 felt "nose heavy" when driven through the course. This perception probably influenced the drivers' subjective evaluations of supertorque events in these vehicles.

Appendix M contains graphical representations of the time history of steering wheel position (top graph) and torque (bottom graph) for the pursuit course tests of Vehicle 4. The graphs are labeled CVC02 through CVC15. Runs were made on the Yellow Course (CVC02-CVC09), the Red Course (CVC10-CVC11), and the Blue Course (CVC12-CVC15).

Appendix N contains graphical representations of the time history of steering wheel position (top graph) and torque (bottom graph) for the pursuit course tests of Vehicle 5. The graphs are labeled CVD01 through CVD14 Runs were made on the Yellow Course (CVD08-CVD14), the Red Course (CVD06-CVD07), and the Blue Course (CVD01-CVD05) During Runs CVD01 through CVD03 the vehicle was driven through the course via a different path than was followed for the other runs. During Runs CVD01 and CVD02 the driver followed the left-hand option at the first barrier instead of taking the normal right-hand option. During Run CVD03 the driver followed the left-hand option at the second barrier instead of taking the normal right-hand option. (See normal path schematic in Appendix C)

An examination of the graphs contained in Appendices M and N reveals that although supertorque events occurred during all runs of Vehicles 4 and 5, the frequency of occurrence and the magnitude of the events were significantly less for Vehicle 4 than it was for Vehicle 5. This result was expected because Vehicle 4 was in the semi-modified configuration described in Section 3.7

4.4 Steering System Modification Test Results

Appendix O contains graphical representations of the time history of steering wheel position (top graph) and torque (bottom graph) for the steering system modification tests of Vehicle 2. The graphs are labeled CVP29 through CVP52. Runs CVP29, CVP30, and CVP31 were driven by Drivers A, B, and C respectively and the vehicle was equipped with a single modification (power-steering gear box). These runs were driven on the Yellow Course

Runs CVP32, CVP33, and CVP34 were driven by Drivers A, B, and C respectively and the vehicle was equipped with the double modification (power-steering gear box and EVO assembly). These runs were driven on the Yellow Course

Runs CVP35, CVP36, and CVP37 were driven by Drivers A, B, and C respectively and the vehicle was equipped with a single modification (EVO assembly). These runs were driven on the Yellow Course

Runs CVP38 through CVP52 were driven by Driver D. Runs CVP38 through CVP40 were driven on the Red Course and the vehicle was equipped with the double modification (power-steering gear box and EVO assembly).

Runs CVP41 through CVP43 were driven on the Yellow Course. The vehicle was equipped with the double modification (power-steering gear box and EVO assembly).

The unmodified vehicle was driven on the Yellow Course for Runs CVP44 through CVP47 and on the Red Course for Runs CVP48 through CVP52.

Figures 11 through 14 are graphical representations of the data collected during run pairs CVP24[10] and CVP 32, CVP27[10] and CVP 33, CVP28[10] and CVP 34, and CVP47 and CVP 41 driven by Drivers A, B, C, and D respectively. In these figures, the upper graphs were created from the data collected from runs when the vehicle was unmodified, whereas the lower graphs were created from the data collected from runs when the vehicle was in the double modified (power-steering gear box and EVO assembly) configuration. An examination of these figures reveals that each driver experienced several supertorque events during each run when the vehicle was unmodified. Supertorque events were virtually nonexistent during runs when the vehicle was modified.

[10] Data for this run was previously shown in Appendix K

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Drivers A, B, and C all reported that when the vehicle was in the double modified configuration the steering system felt light at high speeds and somewhat numb at lower speeds.

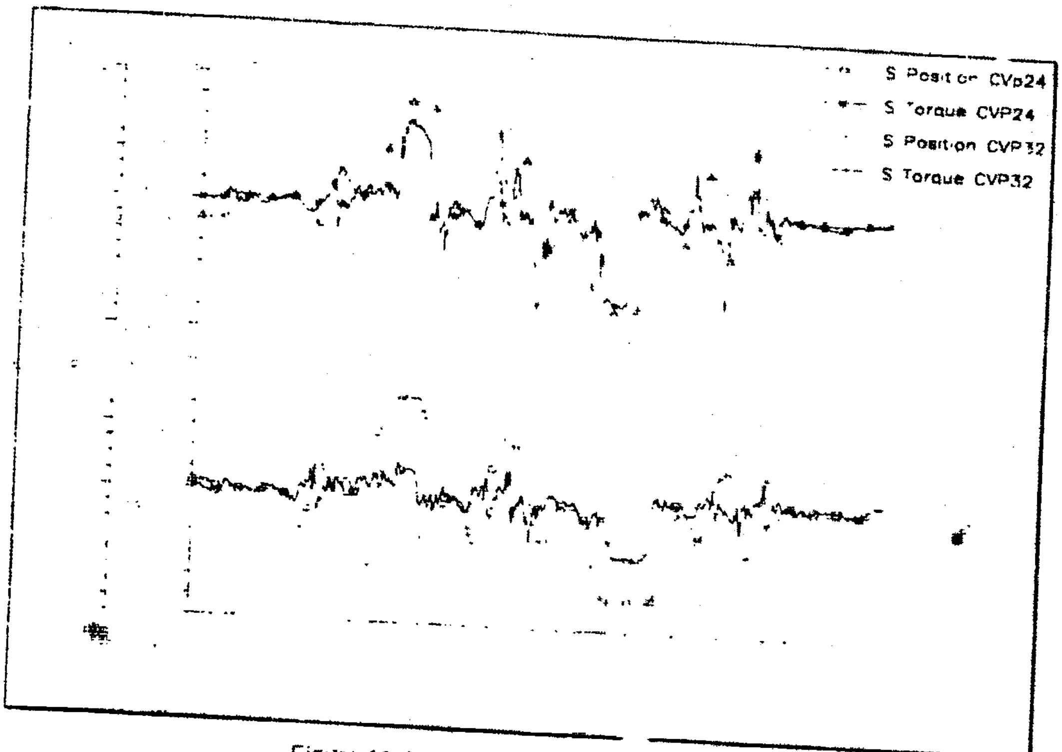

Figure 11 -Vehicle 2 Pursuit Course 24-32

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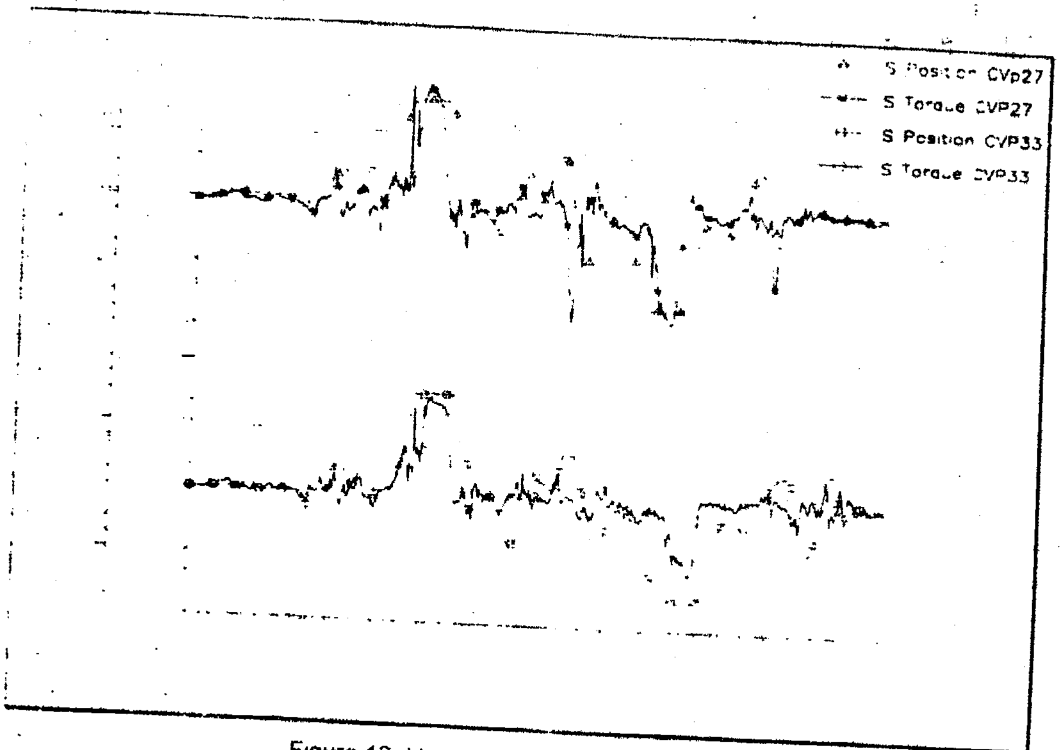

Figure 12 -Vehicle 2 Pursuit Course 27-33

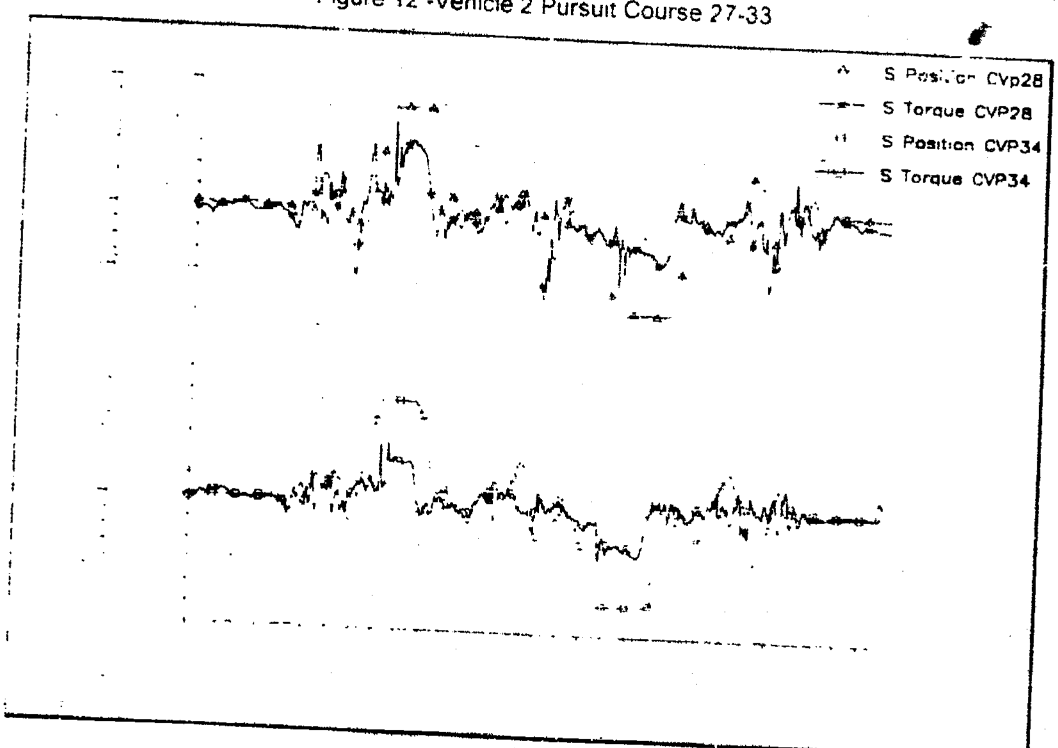

Figure 13 -Vehicle 2 Pursuit Course 28-34

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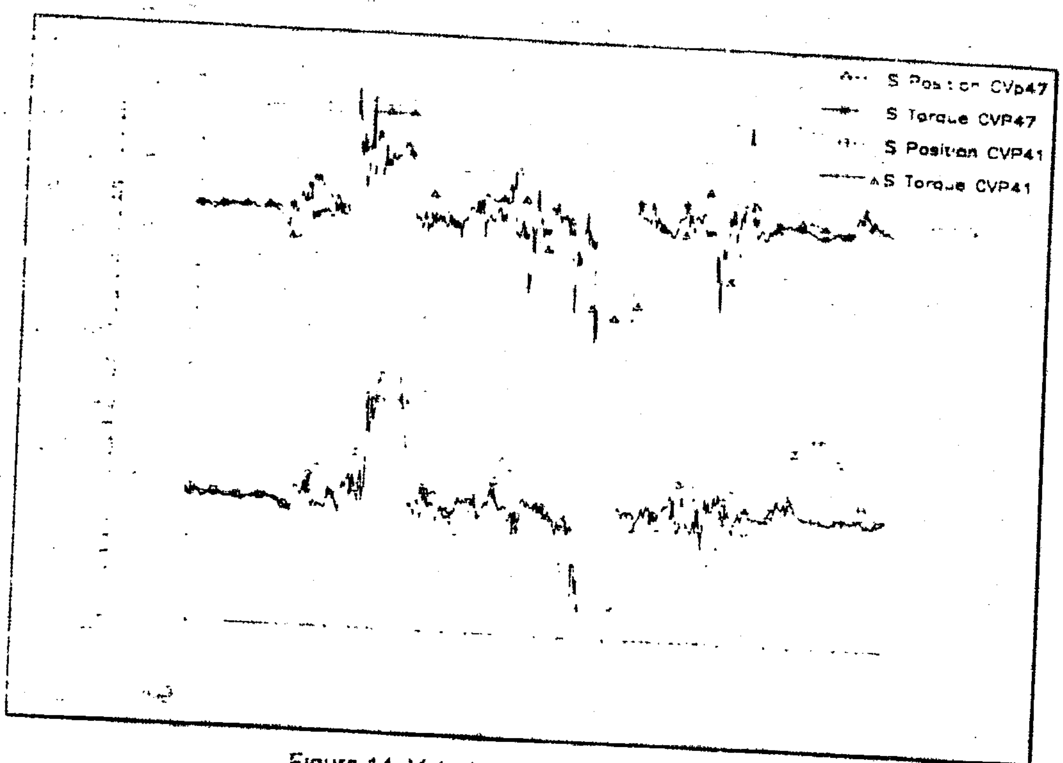

Figure 14 -Vehicle 2 Pursuit Course 47-41

4.5 Volunteer Driver Test Results

The results of the briefings of the volunteer drivers are documented on the videotape recordings. The vehicle driving performance of the volunteer drivers is documented on the videotape recordings produced from the onboard and tower video cameras. A malfunction of the onboard videotape recording equipment resulted in a loss of both the audio and video signals during runs driven in the third vehicle by Subject Sgt117 and loss of the video signal during runs driven in the second and third vehicles by Subject 118

It should be noted that during the driving, the participants were primarily trying to avoid striking any cones. They were not always trying to improve their elapsed time on each subsequent run.

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Appendix P contains a tabulation of the elapsed times and number of cones struck for each participant. The vehicles are listed in the order driven except for Subjects 201, 202, and 402. These exceptions will be explained within the Group 2 and Group 4 discussions that follow.

The 20 participants of Group 1 drove a total of 499 completed runs through the course and struck 765 cones. They struck an average of 1.95 cones/run with the first vehicle driven. It should be remembered that this group always drove the semi-modified Ford first. They struck an average of 1.45 cones/run with the second vehicle driven and an average of 1.09 cones/run with the third vehicle driven. Based on the average cones/run, it appears that the driving performances improved as each vehicle was driven[11].

Remember from the discussion in Section 3.7 that the seven officers who drove Chevrolet vehicles on duty drove the Chevrolet second and the unmodified Ford third. Their driving performances improved from an average of 1.94 cones/run with the first vehicle (semi-modified Ford) to an average of 1.55 cones/run with the second vehicle (Chevrolet). Their driving performances declined to an average of 1.71 cones/run with the third vehicle (unmodified Ford). Their subgroup average of 1.94 cones/run in the first vehicle driven (semi-modified Ford) was virtually the same as the overall group average of 1.95 cones/run in the first vehicle.

Remember from the discussion in Section 3.7 that the 13 officers who drove Ford vehicles on duty drove the unmodified Ford second and the Chevrolet third. Their driving performances improved from an average of 1.96 cones/run with the

[11] During the testing of Subjects 112 and 113, the engine of Vehicle 5 (semi-modified) died one time for each participant as they attempted to accelerate after rounding the second U-turn. During the testing of Subjects 121 and 122, the engine of Vehicle 5 (now unmodified) died seven times when the participants attempted to accelerate after rounding the second U-turn. The vehicle was serviced before testing with the next subject. The engine never died again but the exact cause of the engine response was never determined.

first vehicle (semi-modified Ford) to an average of 1.38 cones/run with the second vehicle (unmodified Ford). Their driving performances significantly improved to an average of 0.72 cones/run with the third vehicle (Chevrolet). Their subgroup average of 1.96 cones/run in the first vehicle driven (semi-modified Ford) was virtually the same as the overall group average of 1.95 cones/run in the first vehicle.

The three participants in Group 2 drove a total of 63 completed runs through the course and struck 172 cones. Remember from the discussion in Section 3.7 that the participants in this group always drove the unmodified Ford first and the semi-modified Ford second. Also remember that unlike other groups, this group could return to the first vehicle, after driving the second, and drive any or all of their 15 runs still remaining. Subjects 201 and 202 elected to return to the first vehicle and drove a total of 10 additional runs. These runs are listed on the data sheets but are not included in the following calculated values. They did not drive the Chevrolet. They struck an average of 4.20 cones/run with the first vehicle driven (unmodified Ford). They struck an average of 1.57 cones/run with the second vehicle driven (semi-modified Ford). The group average of 1.57 cones/run in the second vehicle suggests that the overall driving ability of this group was similar to Group 1. The performance of the Group 2 participants in their first vehicle driven (unmodified Ford) was relatively poor compared to the performance of the Group 1 participants in their first vehicle driven (semi-modified Ford).

The only Group 3 participant drove a total of 25 completed runs through the course and struck 59 cones. The participant failed to complete the first five attempts and the cones struck during those runs are not included in this summary. The participant struck an average of 3.29 cones/run with the first vehicle driven, the unmodified Ford. The participant struck an average of 2.18

cones/run with the second vehicle driven, the Chevrolet, and 1.71 cones with the third vehicle driven, the semi-modified Ford.

The 10 participants in Group 4 drove a total of 248 completed runs through the course and struck 391 cones Subject 402, who had driven the unmodified Ford first drove three additional runs in this vehicle after completing runs in the second and third vehicles. This was done because the track conditions had changed during the time the vehicles were driven. These runs are listed on the data sheet but are not included in the following calculated values Also remember that the participants in this group always drove the semi-modified Ford third. They struck an average of 1 28 cones/run with the third vehicle. The group struck an average of 2.15 cones/run when driving the unmodified Ford and 1 20 cones/run when driving the Chevrolet

Remember from the discussion in Section 3 7 that the officers who drove Chevrolet vehicles on duty drove the Chevrolet first and the unmodified Ford second. Their driving performances declined from an average of 1.24 cones/run with the first vehicle (Chevrolet) to an average of 1 64 cones/run with the second vehicle (unmodified Ford) Their driving performances improved back to an average of 1 24 cones/run with the third vehicle (semi-modified Ford). This subgroup performed relatively well in the Chevrolet even though it was the first vehicle driven

Also remember from the discussion in Section 3 7 that the officers who drove Ford vehicles on duty drove the unmodified Ford first and the Chevrolet second. Their driving performances improved from an average of 2 56 cones/run with the first vehicle (unmodified Ford) to an average of 1 15 cones/run with the second vehicle (Chevrolet). Their driving performances declined to 1.32 cones/run with the third vehicle (semi-modified Ford). This subgroup's performance was also poorest in the unmodified Ford

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The results of the debriefings of the volunteer drivers are documented on the videotape recordings. Some of the questions asked, and the subsequent responses, will be discussed in the remainder of this section.

When the participants were asked if the maneuvers they were required to perform to successfully negotiate the driving course represented maneuvers that police officers may have to perform on the public streets from time to time, all 34 responded affirmatively.

When the participants were asked if they agreed with the statement that the maneuvers were too severe and too aggressive and that police officers would never have to do them in the real world, all 34 responded negatively

When the 20 participants of Group 1 were asked if they noticed anything about the handling characteristics of the "practice vehicle" (semi-modified Ford) that would lead them to believe that it might be unsafe for police service on the public streets (safety question), five answered affirmatively. The five reasons cited were: steering, suspension, front-end push, rear-end wobble, and lag in steering and brakes. When asked the same question concerning the Chevrolet, seven responded affirmatively Each cited one of the following reasons: brake system, seat belt, rocky steering and body roll, occupant not held securely, rear end steps out, fishtailed, and engine overpowered. When asked the same question concerning the 1992 Ford (unmodified) vehicle, six answered affirmatively. The six reasons cited were: steering steering and brake response, steering glitch, steering hard to bring back, easy to lose control, and steering

When the three participants of Group 2 were asked the safety question concerning the blue/white (semi-modified Ford) vehicle, one responded affirmatively citing steering When asked the same question concerning the

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black/white (unmodified Ford) vehicle. all three responded affirmatively. Each cited one of the following reasons: absolutely steering, tire traction. and steering would lock up It should be remembered that this group drove on the Blue Course which had a slightly higher difficulty level than the Red Course driven by the other groups Also. this group was told during the briefing phase that the steering characteristics of the vehicles were of interest.

The Group 3 participant responded negatively to the safety question for all three vehicles.

When the 10 participants of Group 4 were asked the safety question concerning the blue/white (semi-modified Ford) vehicle all responded negatively When asked the same question concerning the Chevrolet, two responded affirmatively. Each cited one of the following reasons; rear-end stability, and lack of stability. When asked the same question concerning the black/white (unmodified Ford), four responded affirmatively The four reasons cited were: steering. steering. steering, and rear-end slide

The number of complaints about vehicle steering responses that were expressed by the volunteer drivers during their debriefings are tabulated in Table 4 The semi-modified Ford was driven third by the single participant of Group 3 and the 10 participants of Group 4 Three participants of Group 4 mentioned that they detected a steering behavior in the third vehicle (semi-modified Ford) as they had in the unmodified Ford. driven earlier but that it was only noticeable and was not a problem These three remarks were not considered complaints and are not listed as complaints in Table 4 Remember from the discussion in Section 3 7 that the modifications to the semi-modified Ford were not intended to eliminate supertorque events but to reduce the frequency of occurrence and amplitude of them The intent was to make the steering response of the semi-

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modified Ford resemble the steering response of the peer vehicle (Chevrolet Caprice)

Vehicle Driven	Chevrolet Caprice	Semi-Modified Ford	Unmodified Ford
	Percentage of drivers complaining (complaints/number of drivers)		
First	0% (0/5)	20% (4/20)	78% (7/9)
Second	23% (3/13)	0% (0/3)	50% (9/18)
Third	8% (1/13)	18% (2/11) *	29% (2/7)
Overall	13% (4/31)	18% (6/34)	53% (18/34)

* See Text

Table 4 - Volunteer Driver Steering Complaints

The data tabulated in Table 4 suggests that the unmodified Ford exhibited an undesirable steering behavior that was either different or substantially more pronounced than either the semi-modified Ford or the Chevrolet which resembled each other.

4.6 Slalom Course Test Results

Appendix Q contains graphical representations of the time history of steering wheel position (top graph) and torque (bottom graph) for the slalom course tests of Vehicle 5, the unmodified Ford The graphs are labeled CVD38 through CVD52 Runs CVD38 through CVD 42 were driven on the 50-ft slalom course Runs CVD 43 through CVD 52 were driven on the 100-ft slalom course

An examination of the graphs for Runs CVD38 and CVD39 reveals that supertorque events did not occur, probably because the angular velocity of the steering wheel was too low An examination of the video recording of the exterior view reveals that the vehicle tracked through the course without undue understeer or oversteer No cones were struck in Run CVD38. Cone 3 was struck during Run CVD39 when the driver apparently misjudged the clearance.

Numbers were assigned to the cones (placed in a straight line) in the order of appearance in the vehicle path

An examination of the graphs for Runs CVD40 through CVD42 reveals that supertorque events occurred in each of the runs. An examination of the video recording of the exterior view reveals that the vehicle loosely tracked through the course with a slight drift around the third and fourth cones in Runs CVD40 and CVD42. No cones were struck during these two runs In Run CVD41 the vehicle appears to understeer then oversteer and failed to track through the course Cones 3 and 4 were struck during this attempt

Figure 15 contains graphs of data and data calculations for Run CVD41 The upper graph is the time history of applied torque and steering wheel position plotted along a common axis The lower graph is the time history of applied torque and the calculated steering wheel angular velocity plotted along a common axis

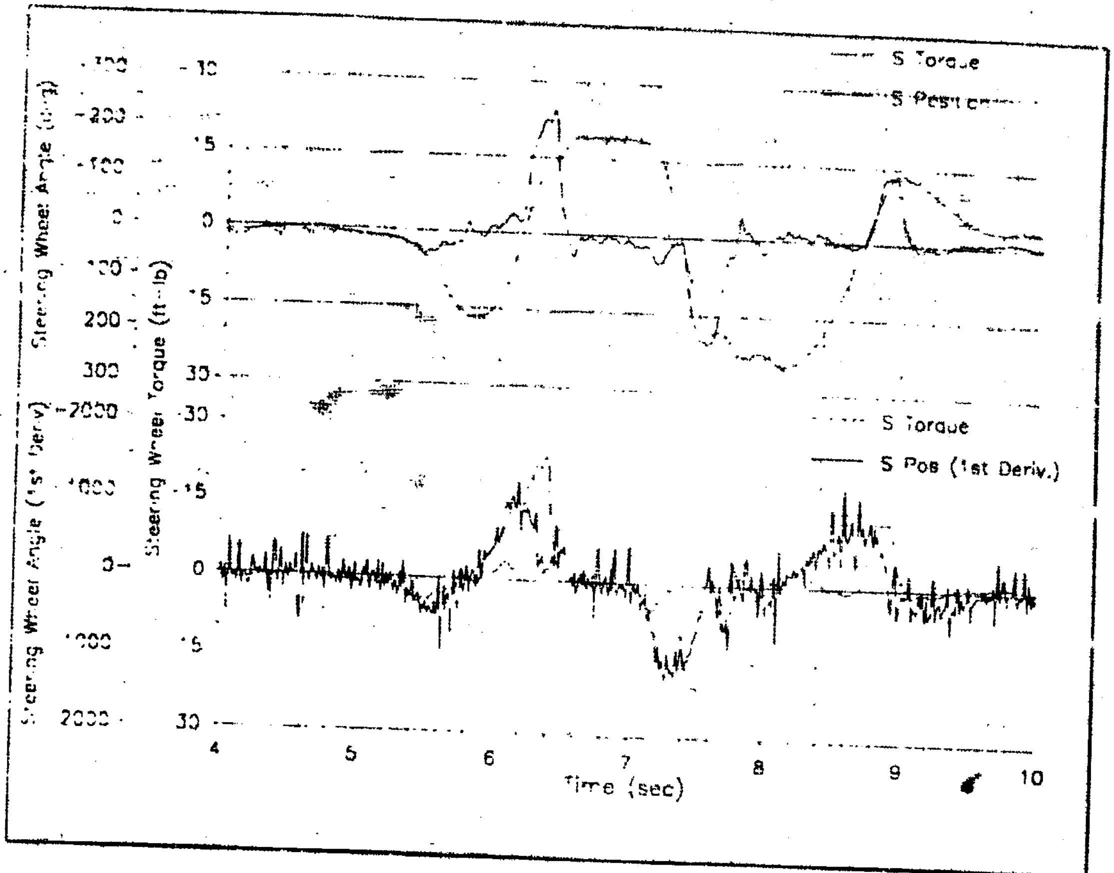

Figure 15 -Vehicle 5 50-ft Slalom 41

An examination of the upper graph in Figure 15 reveals the occurrence of three supertorque events during this run. These events occurred at about 6.3, 7.5, and 8.9 seconds into the data file[12]. A close inspection of the steering wheel position curve in the upper graph during the time of the second supertorque event reveals two points of inflection located at about 7.5 and 7.7 seconds. During this time interval the steering wheel stops its right-hand motion, reverses direction, stops, and reverses again to continue on in the original direction. In the onboard videotape recording of the run, this erratic steering wheel motion is

[12] Unlike the Pursuit Course Tests where the data acquisition system was triggered by the driver at about the same time as the throttle was opened to begin the initial acceleration the driver manually triggered the system during final approach to the Serpentine, Slalom, and Lane Change Courses. In this run it is apparent that the driver triggered the system about 5 seconds before beginning the right-hand turn around the first pylon

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clearly visible. This type of steering wheel response was reported by all four test drivers and by some volunteer drivers following runs through the pursuit course. An examination of the onboard videotape recordings of the volunteer drivers reveals numerous occurrences of this behavior.

A similar steering wheel response occurred during the first event of Run CVD41 and it is also visible in the videotape recording.

A examination of the lower graph in Figure 15 during the period of time between 7.0 and 7.8 seconds reveals an interesting aspect of the behavior just described. Remember that in this graph the curves are steering wheel applied torque and steering wheel angular velocity. By following the curves from 7 0 to 7 8 seconds and with reference to steering wheel position depicted in the upper graph the following sequence of events is suggested.

> At 7.0 seconds, the steering wheel is positioned about 200 degrees counter-clockwise (of center straight ahead position), the driver is applying about 2 ft-lbs of clockwise torque, and the wheel is beginning to slowly move clockwise. At 7 1 seconds, position is about 175 degrees counter-clockwise, applied torque is about 2½ ft-lbs clockwise, and the wheel is now moving clockwise at about 200 degrees/sec. At 7.2 seconds, position is about 130 degrees counter-clockwise, applied torque is about 4 ft-lbs clockwise, and the wheel is now moving clockwise at about 900 degrees/sec. At 7.3 seconds, position is about 30 degrees counter-clockwise, applied torque is about 1½ ft-lbs clockwise, and the wheel is now moving clockwise at about 1100 degrees/sec. At 7.4 seconds, position is about 75 degrees clockwise, applied torque is about 12½ ft-lbs clockwise, and the wheel is now slowing to about 1000 degrees/sec clockwise. At 7.5 seconds, position is about 180 degrees clockwise, applied torque has increased to about 20 ft-lbs clockwise, and the wheel has now slowed to about 600 degrees/sec clockwise. At 7 6 seconds, position is still about 180 degrees clockwise, applied torque is about 17 ft-lbs clockwise, and the wheel has now reversed directions and is moving about 100 degrees/sec counter-clockwise. At 7 7 seconds, position is now about 200 degrees clockwise, applied torque is about 3½ ft-lbs clockwise, and the wheel has reversed directions again and is moving about 500 degrees/sec clockwise. At 7.8 seconds, position is about 225 degrees clockwise, applied torque is about 1½ ft-lbs counter-clockwise, and the wheel is stationary, which approximates

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the starting conditions except the wheel is now positioned clockwise from the centered position.

In the sequence of events just described, the driver experienced a condition between 7.3 and 7.6 seconds where he increased his clockwise steering effort by more than an order of magnitude (from about 1½ ft-lbs to about 20 ft-lbs) only to have the angular velocity of the steering wheel change from about 1100 degrees/sec clockwise to about 100 degrees/sec counter-clockwise. The steering wheel came to an abrupt stop in about 200 msec (between 7.4 and 7.6 seconds) while the driver was applying in excess of 15 ft-lbs of torque. This event could violate the expectations of a driver that was not familiar and experienced with the phenomena. During the Pursuit Course testing of Vehicle 1, Drivers A, B, and C described the phenomena as a steering wheel "kick-back." Driver C stated that that it was like "stubbing your toe" on an unseen obstacle. Volunteer drivers described it as a steering wheel "back-slap" or "kick-back." Some stated it felt as if the wheel had "locked up."

During the testing of Vehicles 1 and 2, Drivers A, B, and C complained of sprains and minor muscle pulls caused by steering wheel lock-up and steering wheel kick-back supertorque events. Each driver claimed to have developed a strategy for coping with the kick-back phenomena after he had gained some experience with it. The stated strategies were all centered around the anticipation of when an event would occur and the employment of various tactics to minimize the adverse physical consequences. The tactics consisted mostly of optimizing body position along with hand positions on the steering wheel to enable maximum torque generation capability while ensuring a firm (four-fingered) hand grip.

The onboard video recordings of the volunteer drivers contain some indications that an unaware driver may lose his grip on the wheel, with subsequent loss of control when encountering the phenomena for the first time. Notable examples were Subject 122 (third vehicle, 9th run[13]), Subject 201 (first vehicle, first run), and Subject 401 (second vehicle, 3rd run).

Notwithstanding the steering phenomena described above, the test driver reported that apparent loss of traction was the cause of the failure to make all gates in Run CVD41. Remember that the Slalom Course tests were being driven by Driver A[14]

An examination of the graphs for Runs CVD43 through CVD52 (100-ft Slalom Course) reveals that supertorque events were virtually nonexistent during these runs. An examination of the video recording of the exterior view reveals that the vehicle tracked well through the course without undue understeer or oversteer. During Runs CVD49, CVD50, and CVD52, the vehicle drifted while rounding the third and fourth cones. During Run CVD51, the vehicle drifted more while rounding the second and third cones prompting the driver to abort the run by bypassing the fourth and fifth cones.

The results of the Slalom Course tests described above indicate that steering tests on the subject vehicles based only on a 100-ft slalom course would probably fail to reveal the subject steering condition.

4.7 Lane Change Course Test Results

Appendix R contains graphical representations of the time history of steering wheel position (top graph) and torque (bottom graph) for the tests of Vehicle 5 on the lane change course. The graphs are labeled CVD53 through CVD99[15]

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[13] Although this event occurred before the second U-turn, it is possible that low engine idle speed could have contributed to the event. (See Footnote 11)

[14] Driver A is physically big and strong. He was experienced and very proficient in performing rapid and aggressive steering maneuvers in this vehicle.

[15] Run CVD7[illegible] is not included because the data was not properly recorded by the onboard system due to a disk I/O error.

Included in Appendix S is a sketch (not to scale) for each of the lane change tests The approximate path of the vehicle through the course is depicted. Struck cones are also indicated

The test sequence numbers for the 7-11 course tests are tabulated in Table 5. For clarity, the prefix "CVD" is not included in this and other tables that follow.

Speed (mph)	30 ft Gate	40 ft Gate	50 ft Gate	60 ft Gate
15	53			
20	54(1)			
25	55			
30	56	60(1)		
35	57	61		
40	58(2)	62(2)	64	
45	59	63	65(1)	67
50			66(2)	68
55				69(2)
60				70(1)

(1) Minimum Speed for Supertorque
(2) Loss of Control Speed

Table 5 - 7-11 Course Test Numbers

An examination of the graphs of Runs CVD53 through CVD70 reveals numerous incidences of supertorque events The frequency of occurrence and the amplitude of the events generally increased as the vehicle speed increased for a given gate size or as the gate size decreased at a given speed

For each gate size there was a minimum speed necessary to cause supertorque events to occur (See Table 5) This result was expected because, as the vehicle speed is reduced, the rate of steering input required to drive through the course decreases Eventually the rate of steering input falls below the rate necessary to cause the subject steering condition to occur

For each gate size there was a maximum speed that the vehicle would track through the course without striking pylons (See Table 5) The test driver reported that it was loss of traction (with subsequent drift understeer, and/or oversteer) and not the subject steering condition that caused the vehicle to fail to track through the course. An examination of the exterior-view videotape recording generally tends to confirm that loss of traction was the apparent cause of striking pylons It should be remembered that these tests were driven by Driver A[14].

The results of the 7-11 Course tests indicate that that the subject steering condition occurs before the vehicle reaches its apparent traction limit for the 30 and 40 ft gates, which require rapid and aggressive steering inputs. The tests for the longer 50 and 60 ft gates, which require less rapid and less aggressive steering inputs, indicate that the subject steering condition and loss of traction occur at about the same speeds. Interesting to note was the fact that for the 60-ft gate there were virtually no supertorque events even though speeds increased to 60 mph.

The test sequence numbers for the MV course tests are tabulated in Table 5.

Speed (mph)	30-30-30	40-40-40	50-50-50
	A=B=C ft	A=B=C ft	A=B=C ft
20	71		
25	72(1)		
30	73		
35	74	77	
40	75(2)	78	81
45	76[16]	79(1)	
50		80(2)	82
55			83
60			84(1, 2)

(1) Minimum Speed for Supertorque
(2) Loss of Control Speed

Table 6 - MV Course Test Numbers

An examination of the graphs of Runs CVD71 through CVD84 also reveals numerous incidences of supertorque events. The frequency of occurrence and the amplitude of the events also generally increased as the vehicle speed increased for a given gate size or as the gate size decreased at a given speed.

For each gate size there was also a minimum speed necessary to cause supertorque events to occur (See Table 6). This result was also expected because, as the vehicle speed is reduced, the rate of steering input required to drive through the course decreases. Eventually the rate of steering input falls below the rate necessary to cause the subject steering condition to occur.

For each gate size there was a maximum speed that the vehicle would track through the course without striking pylons (See Table 6). The test driver again reported that it was loss of traction (with subsequent drift, understeer, and/or oversteer) and not the subject steering condition that caused the vehicle to fail to

16 Data not recorded. (See Footnote 15)

track through the course. An examination of the exterior-view videotape recording generally tends to confirm that loss of traction was the apparent cause of striking pylons.

Figures 16, 17, and 18 contain graphs of data and data calculations for Runs CVD71, CVD72, and CVD73 respectively. The upper graph is the time history of applied torque and steering wheel position plotted along a common axis. The lower graph is the time history of applied torque and the calculated steering wheel angular velocity plotted along a common axis.

Interesting to note was the fact that two supertorque events were noted during Run CVD72 (25 mph) even though the vehicle speed was lower than Run CVD73 (30 mph) which produced no supertorque events. Run CVD71 (20 mph) also produced no supertorque events. The probable cause for this apparent contradiction was that the driver did not execute Run CVD72 well and had to act quickly to "catch up" by aggressively maneuvering the vehicle. Aggressive maneuvers would require high steering wheel angular velocities which would cause supertorque events to occur.

An examination of the graphs in Figures 16, 17, and 18 confirms that some of the steering maneuvers were done more aggressively during Run CVD72 than were done during the other two runs. This indicates that, although the occurrence of the subject steering condition is directly related to the rate of steering input, it is only indirectly related to actual vehicle speed

The results of the MV Course tests indicate that the subject steering condition occurs before the vehicle reaches its apparent traction limit for the 30 ft gates, which require rapid and aggressive steering inputs. The tests for the longer gates (40 and 50 ft), which require less rapid and less aggressive steering

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inputs. indicate that the subject steering condition and loss of traction occur at about the same speeds.

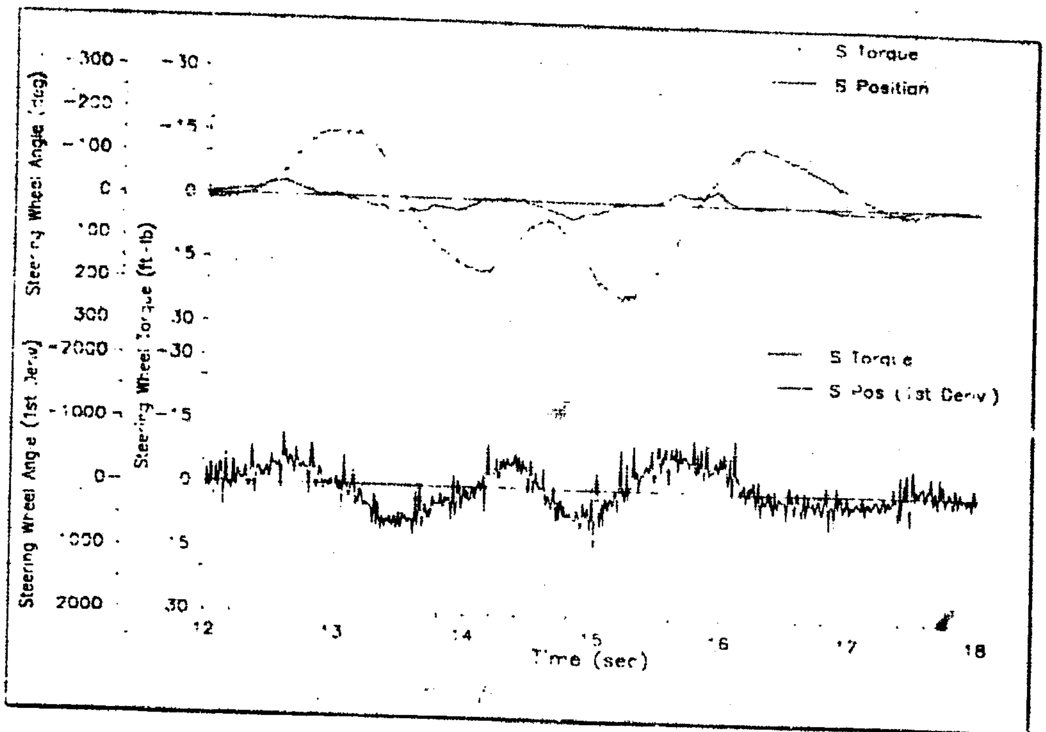


Figure 16 -Vehicle 5 Lane Change 71

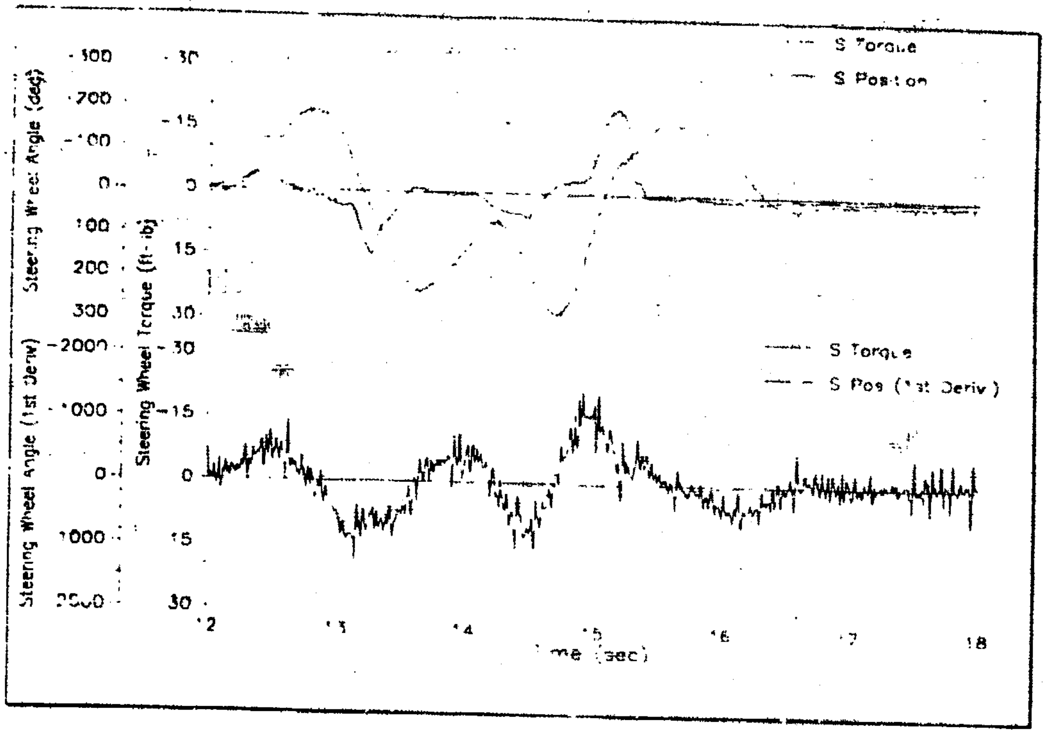
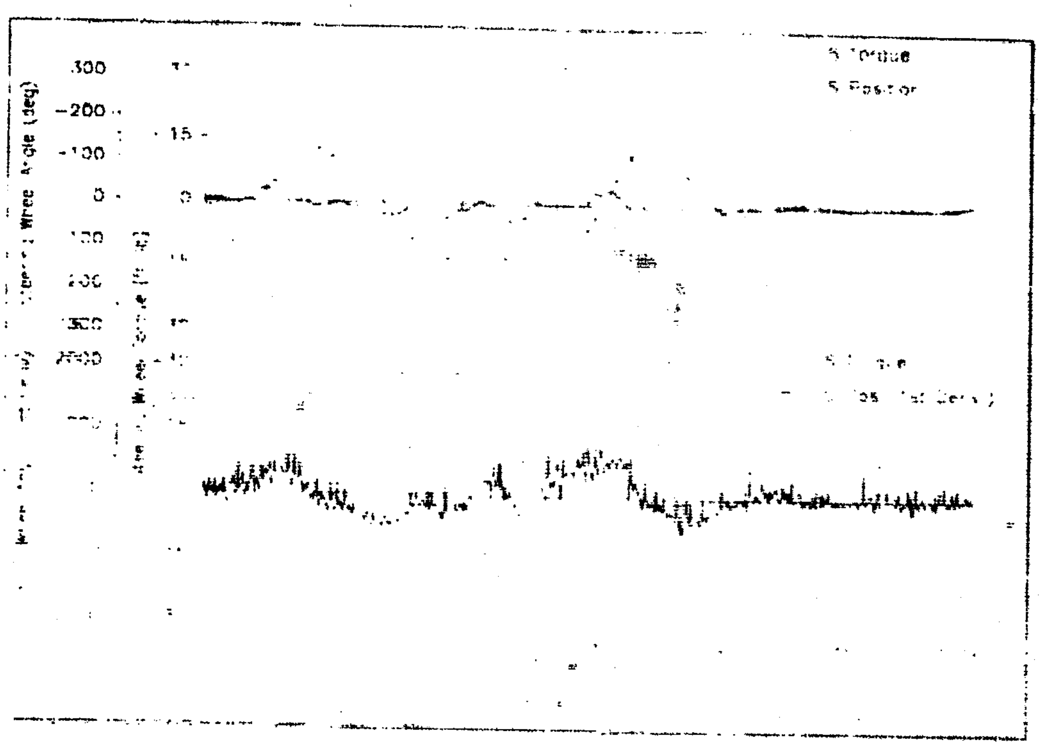


Figure 17 -Vehicle 5 Lane Change 72



The test sequence numbers for the AMV course tests are tabulated in Table 7.

Speed (mph)	40-50-40	30-50-30	30-50-30*
30		90[1]	
35		89,91	95,96,99[1]
40	85[1]	92	97
45	86	93[2]	98
50	87	94	
55	88[2]		

[1] Minimum Speed for Supertorque
[2] Loss of Control Speed
* Note: This series driven with left hand only and traction limit speed was not determined

Table 7 - AMV Course Test Numbers

An examination of the graphs of Runs CVD85 through CVD94 (two-handed runs) also reveals numerous incidences of supertorque events. The frequency of occurrence and the amplitude of the events also generally increased as the vehicle speed increased for a given gate size or as the gate size decreased at a given speed

For each gate size there was also a minimum speed necessary to cause supertorque events to occur (See Table 7) This result was also expected because, as the vehicle speed is reduced, the rate of steering input required to drive through the course decreases Eventually the rate of steering input falls below the rate necessary to cause the subject steering condition to occur.

For each gate size there was a maximum speed that the vehicle would track through the course without striking pylons (See Table 7). The test driver again reported that it was loss of traction (with subsequent drift, understeer and/or oversteer) and not the subject steering condition that caused the vehicle to fail to track through the [illegible]. An examination of the exterior view videotape recording generally tends to confirm that loss of traction was the apparent cause of striking pylons

Figure 19 contains graphs of data and data calculations for Run CVD89. The upper graph is the time history of applied torque and steering wheel position plotted along a common axis. The lower graph is the time history of applied torque and the calculated steering wheel angular velocity plotted along a common axis.

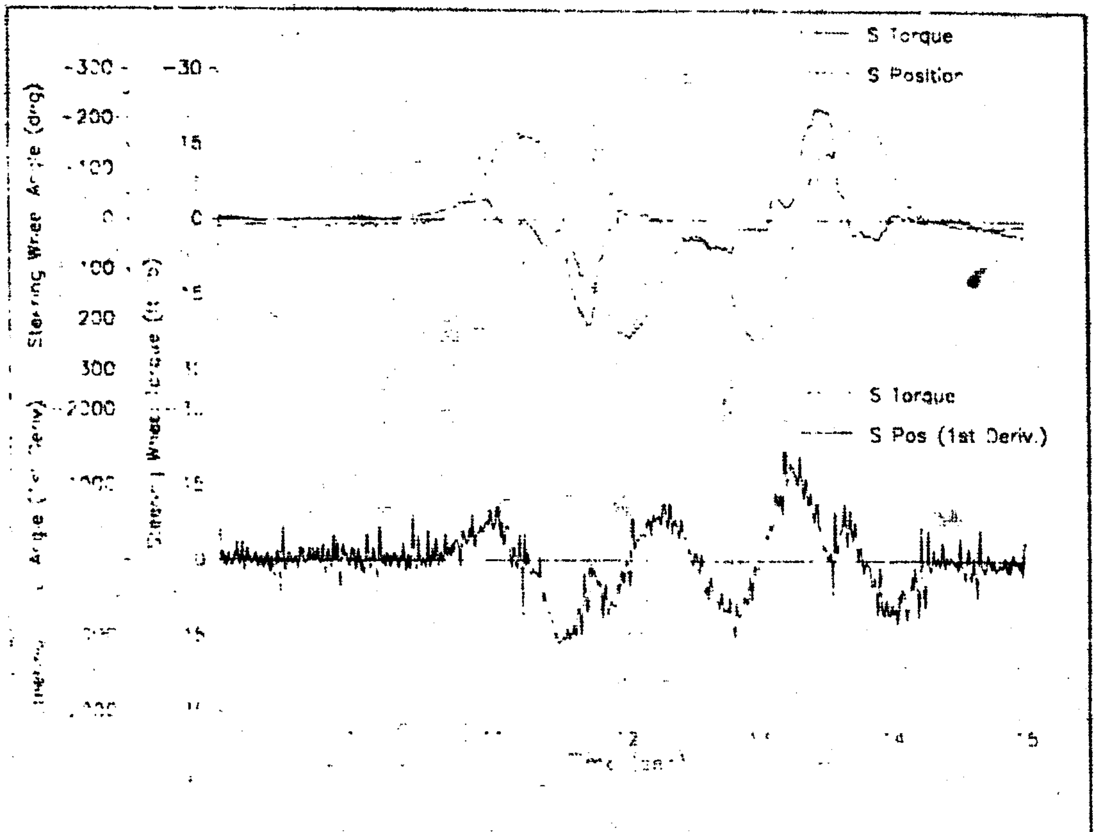


Figure 19 [illegible]

An examination of the upper graph [illegible] Figure 19 reveals the occurrence of two [illegible] during this run. These events occurred at about 11.7 and [illegible] data [illegible] close inspection of the curves in both graphs from 13.0 to 13.8 seconds suggests that an event occurred that was very similar to the event that occurred during Run CVD41 (See Figure 15). In the onboard videotape recording of this run, erratic steering wheel motion, very similar to the kick-back motion observed in Run CVD41, is clearly visible.

An examination of the graphs of Runs CVD95 through CVD99 (one-handed runs) reveals some occurrences of supertorque events. None of the events produced torque levels greater than 15 ft-lbs. Remember that the driver had been instructed not to "muscle through it" and to use no more than about 15 ft-lbs of torque. He was encouraged to drive with his left hand only to limit his torque generation capability.

A comparison of the sketches included in Appendix [illegible] for Runs CVD[illegible] and CVD91 (35 mph two-handed runs) and Runs CVD95, CVD96 and CVD99 (35 mph one-handed runs) reveals that no cones were struck when the vehicle was driven two-handed and that numerous cones were struck when the vehicle was driven one-handed.

The test driver reported that it was the steering response of the vehicle that caused the vehicle to fail to track through the course. The 15 ft-lb torque limit restricted his ability to quickly maneuver the vehicle. The test driver also reported that he probably could not have applied significantly more supertorque because of the left-hand-only requirement. An examination of the exterior view videotape recording generally tends to confirm that slow steering response was the apparent cause of striking pylons.

The results of the AMA Course tests indicate that the subject steering [illegible] occurs before the vehicle reaches its apparent [illegible] 45, 50 [illegible] gates (two handed runs) which require [illegible] [illegible] the subject steering [illegible]

Loss of steering wheel control could present an unaware driver with a very difficult task of maintaining control of the vehicle. Remember, the test driver reported that the subject steering condition was not the cause when the vehicle failed to track through the course. However, when the test driver was limited to one-handed operation in the tests for the 30-50-30 gates, he reported that the subject steering condition was the limiting factor of vehicle performance which caused the vehicle to fail to track through the course

5.0 SUMMARY OF RESULTS

The major findings of the results of the tests conducted are summarized below

1) The subject steering condition described in some complaints as steering wheel bind, was observed during certain aggressive driving maneuvers with the subject vehicles, when the steering wheel input rate was rapid enough to 'beat' the power-steering hydraulic system

2) When 34 law enforcement officer volunteers were asked to evaluate the handling performance of three test vehicles on a "combined skills police pursuit" driving course, allegations of unsafe performance were noted for all three vehicles, including a stock Ford Crown Victoria, an altered (the alterations were intended to reduce but not eliminate the subject steering condition) Ford Crown Victoria and a peer Chevrolet Caprice. However, steering was cited most often as a problem for the stock Ford Crown Victoria During approximately 300 test runs, there were three instances where drivers lost their grip on the steering wheel during an apparent episode of the subject steering condition.

3) When a stock Ford Crown Victoria was driven through various slalom and lane change courses the subject steering condition was generally noted at speeds up to 55 mph but control of the vehicle was maintained up to the limit of tire traction When the test driver attempted to drive through one of the lane change courses using his left hand only he was unable to successfully negotiate the course, apparently because of the subject steering condition

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APPENDIX A

300306

VINASSIST Version 1.24

(c) by NICB 1991

Vehicle 1

Law Enforcement Edition

VIN:2FACP72WXNX217315

DIGIT	DESCRIPTION	MEANING
2	Country of Origin	CANADA
F	Manufacturer	FORD FORD
A	Vehicle Type	PASSENGER CAR
C	Restraint System	ACTIVE BELTS PLUS DRIVER AIR BAG
P	Line	PASSENGER CAR
72	Body Style	LTD CROWN VICTORIA S 4 DR SEDAN
W	Engine	4.6L V8 EFI
X	Check Digit	CHECK DIGIT VALID
N	Year	1992
X	Assembly Plant	ST. THOMAS, CANADA
217315	Sequence Number	IN RANGE

************ VIN Passed Test ************

VIN indicates a 1992 FORD LTD CROWN VICTORIA S 4 DR SEDAN

JLC 307

VINASSIST Version 1.04

(c) by NICB 1991

Law Enforcement Edition

Vehicle 4

VIN:2FACP72W1NX233113

DIGIT	DESCRIPTION	MEANING
2	Country of Origin	CANADA
F	Manufacturer	FORD FORD
A	Vehicle Type	PASSENGER CAR
C	Restraint System	ACTIVE BELTS PLUS DRIVER AIR BAG
P	Line	PASSENGER CAR
72	Body Style	LTD CROWN VICTORIA S 4 DR SEDAN
W	Engine	4.6L V8 EFI
1	Check Digit	CHECK DIGIT VALID
N	Year	1992
X	Assembly Plant	ST. THOMAS, CANADA
233113	Sequence Number	IN RANGE

************* VIN Passed Test ************

VIN indicates a 1992 FORD LTD CROWN VICTORIA S 4 DR SEDAN

2CC 305

VINASSIST Version 1.04

(c) by NICB 1991

Law Enforcement Edition

Vehicle 5

VIN:2FACP72WXNX213412

DIGIT	DESCRIPTION	MEANING
2	Country of Origin	CANADA
F	Manufacturer	FORD FORD
A	Vehicle Type	PASSENGER CAR
C	Restraint System	ACTIVE BELTS PLUS DRIVER AIR BAG
P	Line	PASSENGER CAR
72	Body Style	LTD CROWN VICTORIA S 4 DR SEDAN
W	Engine	4.6L V8 EFI
X	Check Digit	CHECK DIGIT VALID
N	Year	1992
X	Assembly Plant	ST. THOMAS, CANADA
213412	Sequence Number	IN RANGE

************ VIN Passed Test ************

VIN indicates : 1992 FORD LTD CROWN VICTORIA S 4 DR SEDAN

JCC 3030

VINASSIST Version 1.04

(c) by NICB, 1991

Law Enforcement Edition   Vehicle 6

VIN:1G1BL5374NW138451

DIGIT	DESCRIPTION	MEANING
1	Country of Origin	UNITED STATES
G	Manufacturer	CHEV GENERAL MOTORS
1	Make	CHEVROLET
BL	Line	CAPRICE
5	Body Style	4 DR SEDAN
3	Restraint System	MANUAL BELTS/DRIVER INFLATABLE
7	Engine	5.7L V8 TBI
4	Check Digit	CHECK DIGIT VALID
N	Year	1992
W	Assembly Plant	WILLOW RUN, MI
138451	Sequence Number	IN RANGE

************ VIN Passed Test ************

VIN indicates a 1992 GENERAL MOTORS CAPRICE

JC210

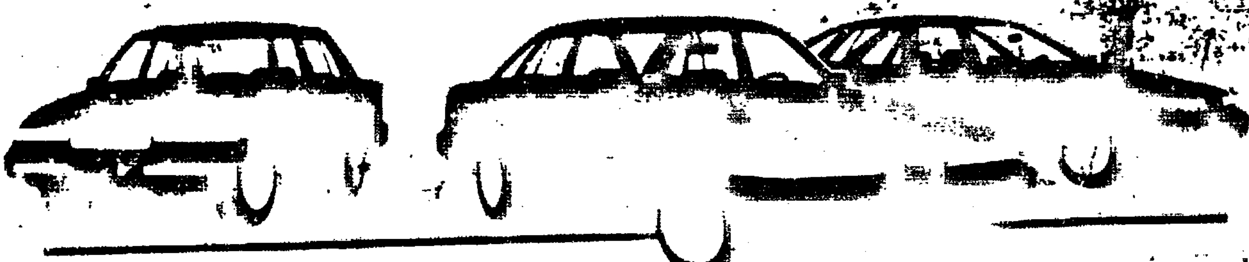
APPENDIX B

J-00311

Crown Victoria/ Grand Marquis

Body/Chassis/Electrical/Powertrain

1992



SERVICE MANUAL

GROUP 11 (3000)

STEERING SYSTEM

SECTION TITLE	PAGE

SECTION 11-00 Steering System—Service

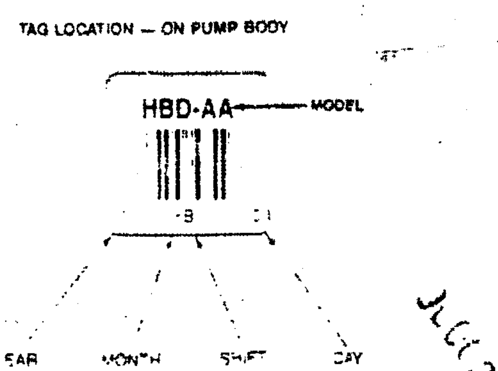
SUBJECT	PAGE

VEHICLE APPLICATION

Crown Victoria, Grand Marquis

DESCRIPTION

The power steering pump has a service identification tag to identify assemblies for service purposes. The tag is [illegible] and contains information as shown.



G5870-B

TESTING

Preliminary Tests

Make the following preliminary tests before replacing or servicing power steering.

Air Bleeding

If air bubbles are present in the power steering fluid, bleed the system as follows:

1. Fill the reservoir to specification.
2. Run the engine until the fluid reaches normal operating temperature of 74-79°C (165-175°F).
3. Turn the steering wheel all the way to the left and right several times.

   CAUTION: Do not hold the wheel in the far left or right position.
4. Check the fluid level.
5. If air is still trapped in the system, refer to Purging Power Steering System of Air.

Fluid Level Check

1. Run the engine until the fluid reaches normal operating temperature of 74-79°C (165-175°F).
2. Turn the steering wheel all the way to the left and right several times. Turn the engine off.
3. Check the fluid level in the power steering reservoir. If the level is low, add Premium Power Steering Fluid E6AZ-19582-AA (ESW-M2C33-F) or equivalent.

   CAUTION: Do not refill the reservoir.

Pump Belt Check

Replace and adjust broken, glazed or worn pump belts. Refer to Section 03-05 for adjustment procedure.

Fluid Leak Check

1. With engine idling, turn steering wheel left to right several times. Check all possible leakage points.
2. Tighten all loose fittings to specification. Replace damaged lines and seals.
3. Check hoses for cut O-rings.

Turning Effort Check

Ensure front wheels are properly aligned and tire pressure is correct before checking turning effort.

1. Park vehicle on dry concrete and set the parking brake.
2. Idle the engine for two or three minutes. Turn the steering wheel to the left and right several times to warm the fluid to 43-49°C (110-120°F).
3. With the engine running, attach a pull scale to the rim of the steering wheel. Starting with the road wheels in straight-ahead position, measure the pull required to turn the steering wheel one complete revolution in each direction. Static Steering Wheel Turning Effort should measure 7.5 lbs of power.

Pump Flow and Pressure Tests

Before performing the pump flow and pressure tests, complete the following checks for conditions which could cause loss of power assist. Take corrective action if necessary.

1. Check pump reservoir for proper fluid level.
2. Check tires for correct air pressure.
3. Check pump belt for proper tension.
4. Check pump for correct model and vehicle application.
5. Check for correct-size pulleys on pump and engine.
6. Check entire system for damage. Replace parts as necessary.

If the above items are to specification or have been corrected, and the loss of assist still exists, test the power steering pump flow and pressure to determine whether the trouble is in the pump, power steering gear, control valve or in the hydro boost valve, if so equipped.

Test Equipment

1. Engine tachometer
2. Thermometer -17.8°C to 148.9°C (0°F to 300°F)
3. Rotunda Power Steering System Analyzer 014-00207 or equivalent
4. Set of adapter fittings

The test procedure used in conjunction with the Rotunda Power Steering System Analyzer 014-00207 or equivalent, provides a method for checking the complete power steering system. This analyzer can be used on integral or non-integral power steering systems to determine the cause of hard steering and/or lack of assist concerns.

The analyzer provides readouts for the following:

- System Back Pressure
- Pump Flow
- Steering Gear Internal Leakage
- Pump Relief Pressure

The interpretation of the above readouts will determine which of the following conditions or components are the cause of the concern:

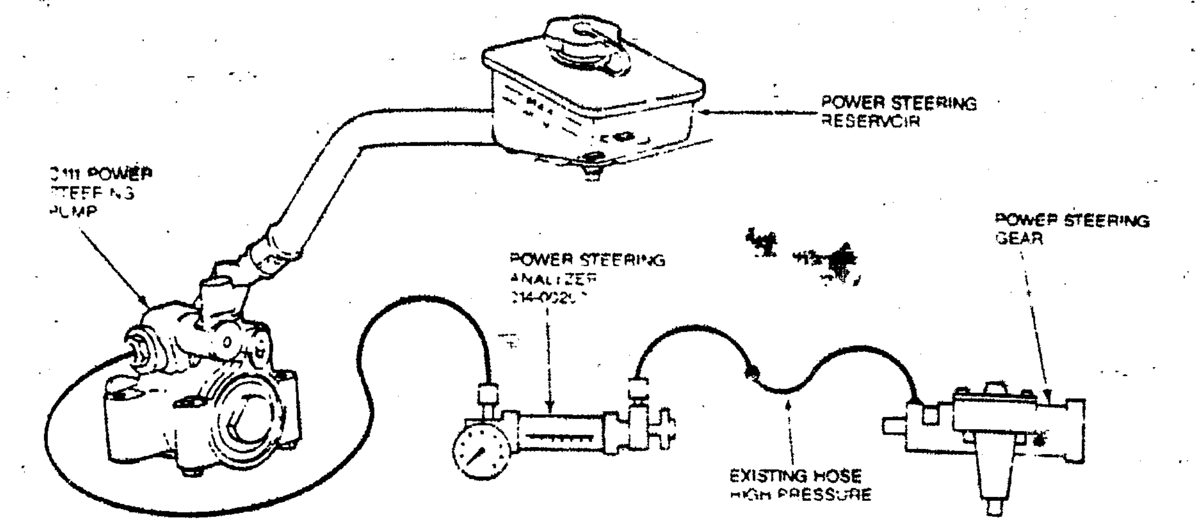
- Restriction in Hoses or Fittings
- Sticking Gear Valve

TESTING (Continued)

- Inefficient Pump Cam Pack
- Sticking Relief Valve
- Binding in Suspension

Test Procedure

1. To connect the analyzer into the steering system, remove the pressure fitting from the pump and connect it into the appropriate adapter of the analyzer.
2. Thread the other adapter of the analyzer into the pump.
3. Connect the analyzer to the adapters. Tighten both connections to 20 N·m (15 lb-ft) maximum.



G8869-A

4. Add power steering fluid, if required. Start the engine, ensure transmission is in PARK and the parking brake is engaged and run it for approximately two minutes **with the idle set to specification.**
5. Record the following:

   NOTE. The vehicle must not be moving during the following checks.

   a. Flow, liters/min. (gallons/min.) at 78° ± 2°C (172° ± 5°F)

   b. Pressure, psi at 78° ± 2°C (172° ± 5°F) at idle with the gate valve fully open

   - If flow is below 6 liters/min. (1.6 gallons/min.), the pump may require service. However, at this point continue the diagnosis. Check for flow and relief pressure against the vehicle and engine being tested.
   - If pressure is above 1034 kPa (150 psi), check hoses for restrictions.
6. Partially close the gate valve to build up 5100 kPa (740 psi). Observe and record flow (liters/min.) (gallons/min.) at 78° ± 2°C (172° ± 5°F).

   If flow drops below 5.2 liters/min. (1.4 gallons/min.), replace pump.
7. Completely close and partially open the gate valve three times. (Do not allow the valve to remain closed for more than five seconds.) Observe and record pressure, kPa (psi).

   Pressure specification should maintain a current pressure between 1200-1400 psi minimum to maximum. If the pressure recorded is lower than the minimum specification listed, replace the pump.

   If the pressure recorded is above the maximum specification listed, replace pump.
8. Increase the engine speed from idle to approximately 1500 rpm. Observe and record flow liters/min. (gallons/min.).

   If flow exceeds the maximum free flow specification, replace the pump.
9. Check idle speed, and set to specification if necessary. With the engine at idle, turn (or have an assistant turn) the steering wheel to the LH and RH stops. Record the pressure and flow at stops.

C(315)

TESTING (Continued)

- Pressure developed at both stops should be nearly the same as the maximum pump output pressure.

  At the same time, flow should drop below 1.9L (.5 gallon/min). If pressure does not reach maximum output or flow does not drop below 1.9L (.5 gallon/min), excessive internal leakage is occurring. Remove and disassemble the steering gear. Replace damaged or broken parts. Pay particular attention to the piston and valve seals for damage.

10. Turn (or have an assistant turn) steering wheel slightly in both directions, and release quickly while watching the pressure gauge. The needle should move from the normal back pressure reading and snap back as the wheel is released. If it comes back slowly or sticks, either the rotary valve in the steering gear is sticking or steering column is binding. Check the column before replacing the steering gear valve.

    NOTE: If condition still exists, check ball joints, linkage, etc. Refer to Diagnosis.

11. Disconnect and remove analyzer and connect lines.

PRESSURE SPECIFICATIONS

Minimum Flow ‡		Minimum Relief Pressure		Maximum Relief Pressure		Pump Model	Maximum Free Flow @ 1500 RPM	
Liters/Min.	Gal./Min	kPa	psi	kPa	psi		Liters/Min.	Gal./Min.
5.7	1.5	8270	1200	9520	1380	HBC-AA	12.9	3.42

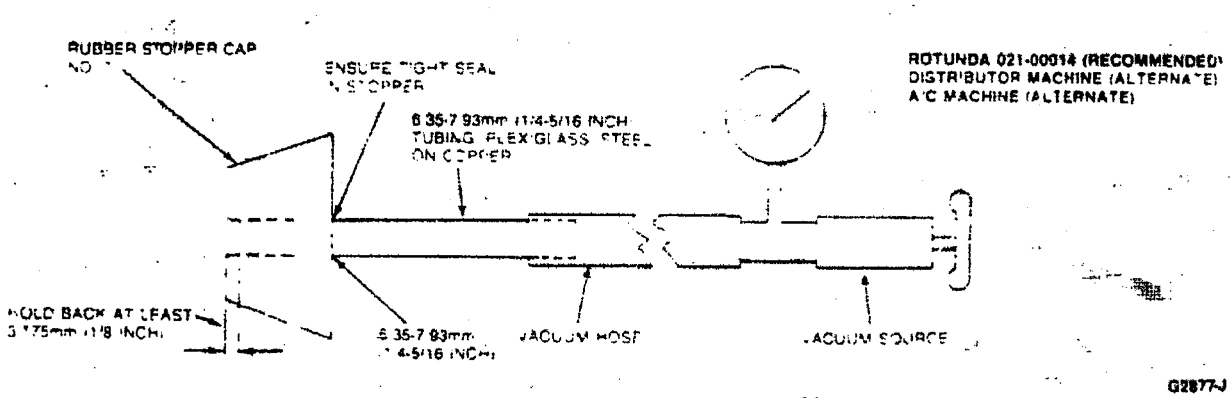
*IMPORTANT: Flow depends on pump model, engine rpm, and pulley ratio. Engine idle rpm must be set to specification when checking pump minimum flow capacity.

‡ At zero speed (vehicle not moving)

CG3060-K

Purging Power Steering System of Air

Air trapped in the power steering system, which causes a whine or moan-type noise, can be removed by using a power steering pump air evacuator assembly (devac tool). Fabricate as shown, or use Rotunda Vacuum Tester 021-00014 or equivalent.



G2877-J

CAUTION: Under no circumstances should engine vacuum be used.

1. Check power steering fluid and fill if required with Premium Power Steering Fluid E6AZ-19582-AA (ESW-M2C33-F) or equivalent to the minimum indication on the reservoir.
2. Remove engine coil wire and raise front wheels off floor. Refer to Section 00-02.
3. Crank engine with starter motor and check fluid level. Do not turn steering wheel at this time.

316

CTOR SHAFT MESH LOAD

Mark pitman arm to sector shaft relation for installation reference. connect pitman arm from sector shaft. Disconnect fluid return line power steering reservoir and cap line fitting.

Disconnect air bag simulator. Reconnect air bag connector. Install air bag module on steering wheel. Connect battery terminal. Turn ignition to ON position. Air bag indicator light should illuminate for about six

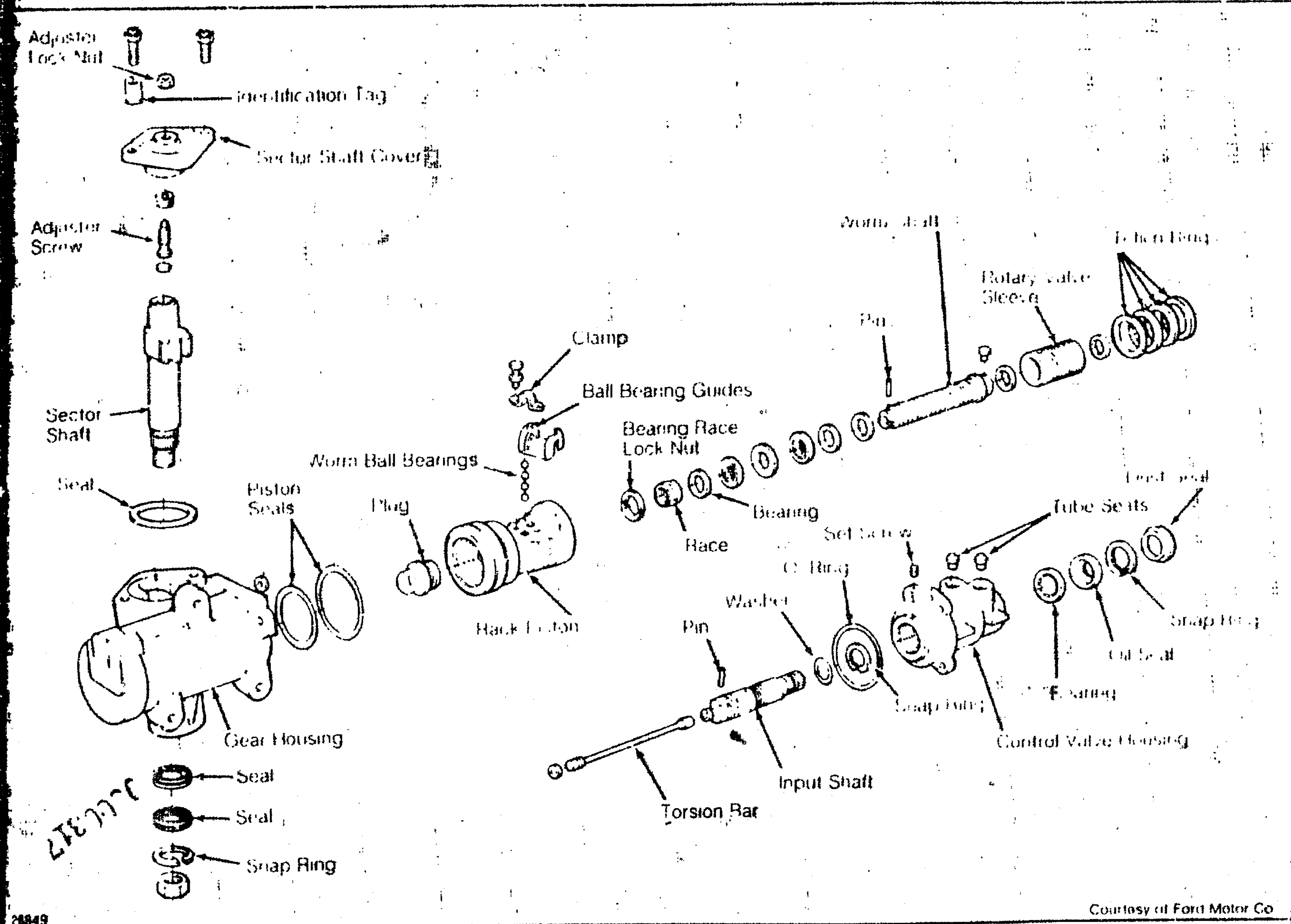
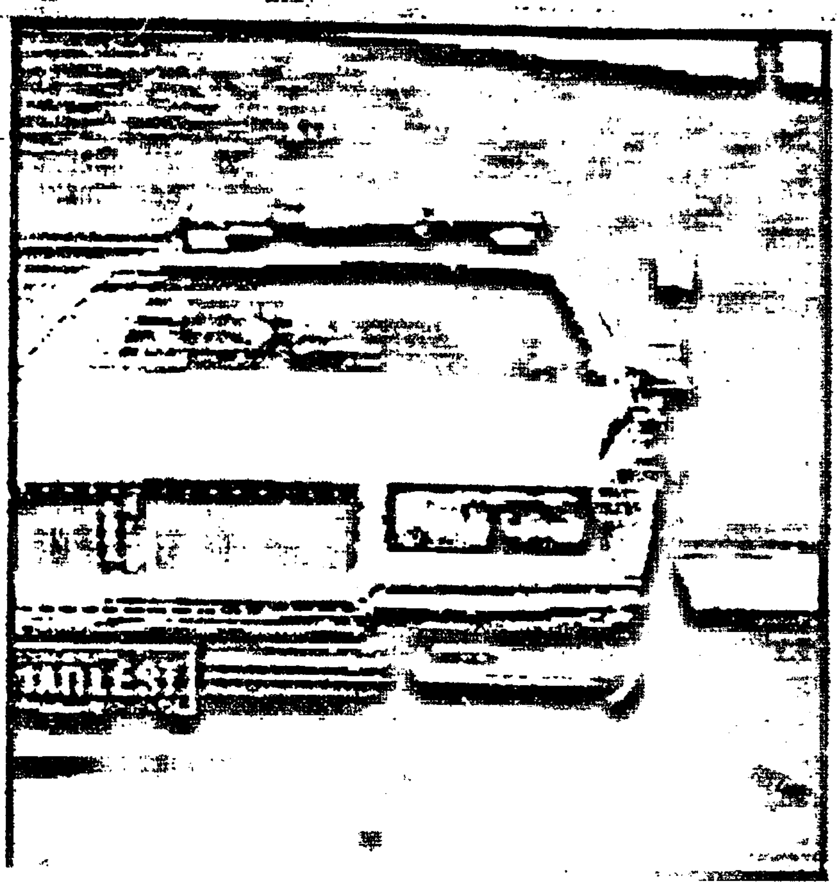


Fig. 2: Exploded View of Power Steering Gear

APPENDIX C

00CC329

GUIDELINES FOR THE EVALUATION AND STRUCTURING OF A DRIVER TRAINING PROCESS FOR LAW ENFORCEMENT PERSONNEL



A Task Force Report
by
The International Association of Directors of
Law Enforcement Standards and Training

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

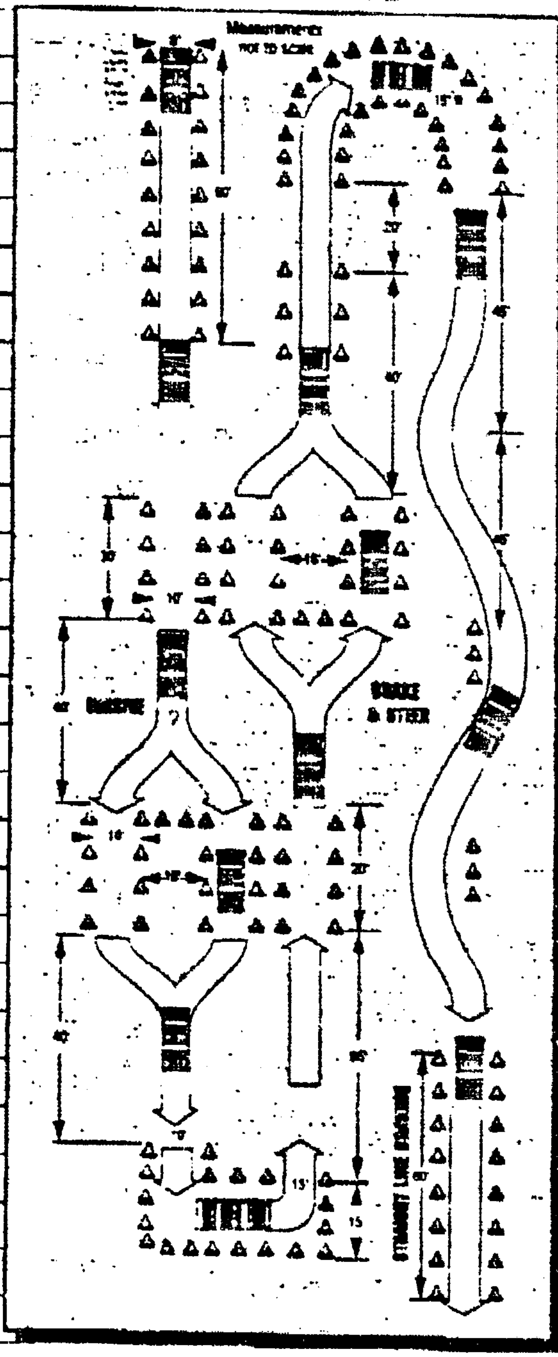
Funded by NHTSA Grant No. DTNH22-87-X-05127 MPT-88-006A

Published May 1989

EVALUATION DEVICES: CUMULATIVE SKILLS

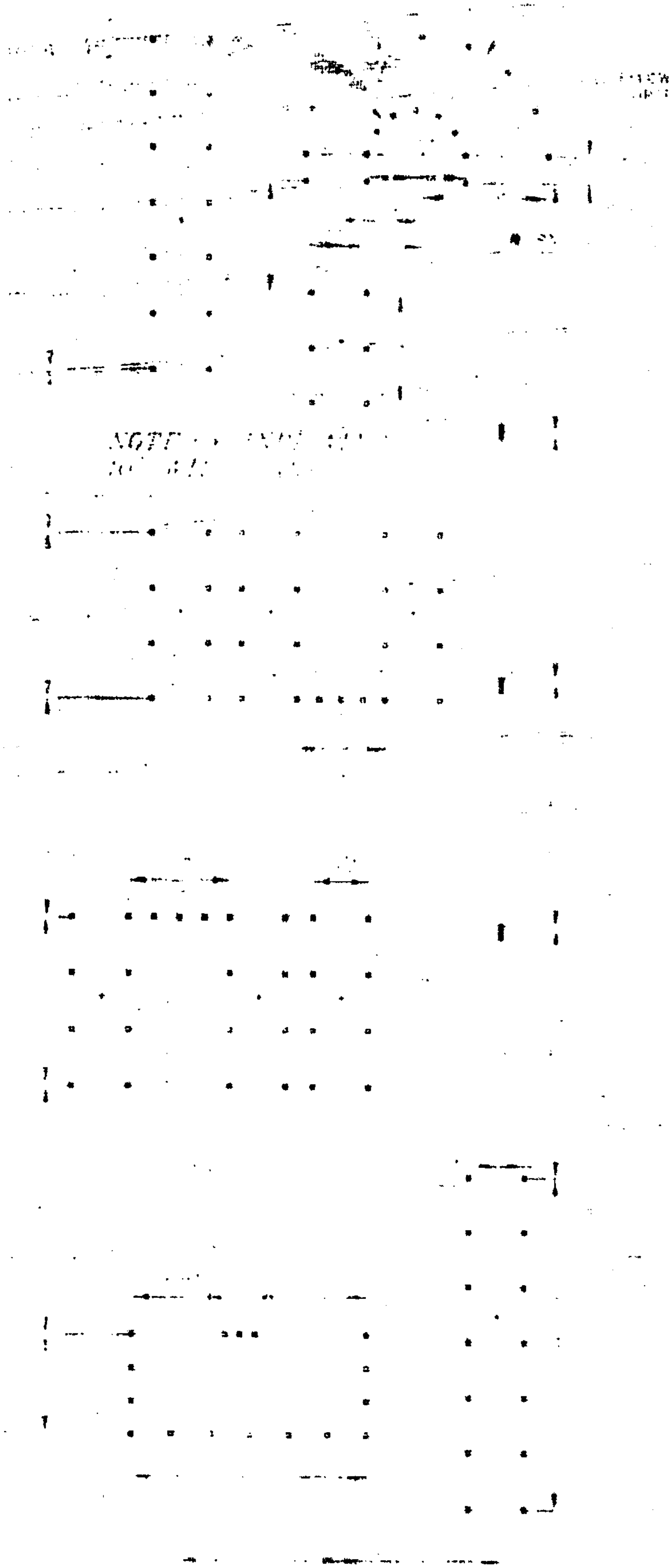
APPENDIX C

CUMULATIVE SKILL PURSUIT COURSE COURSE C

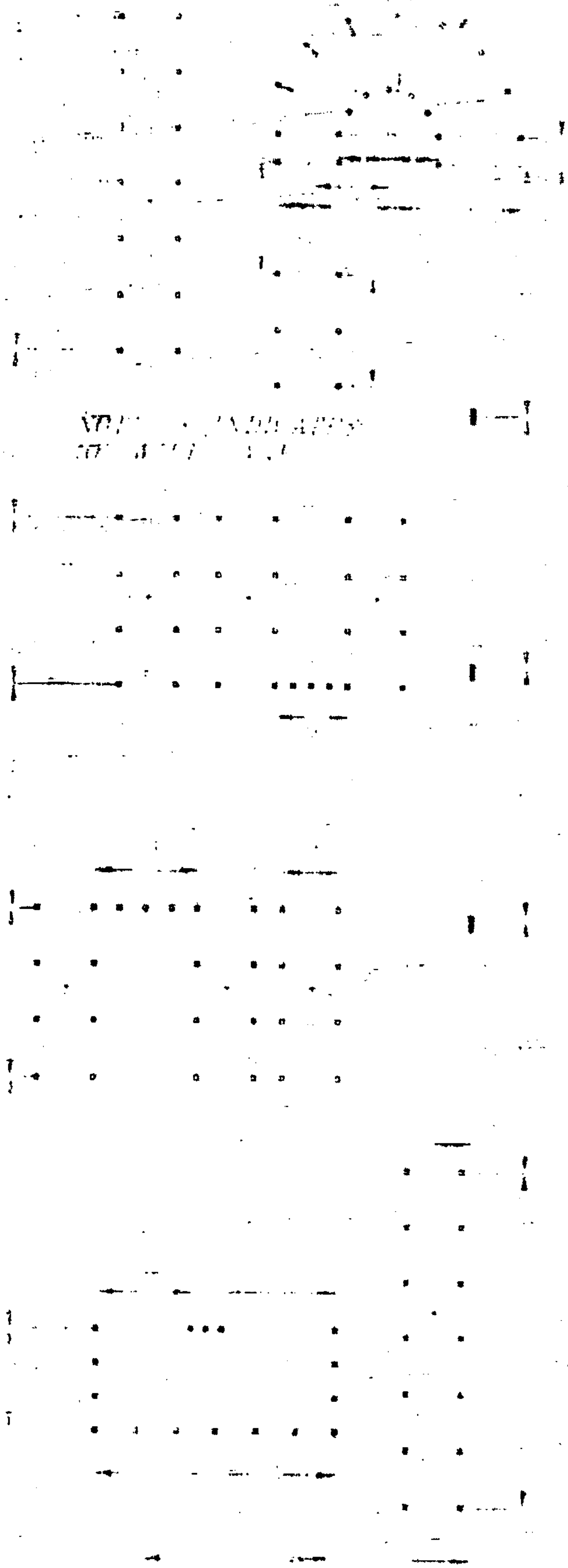


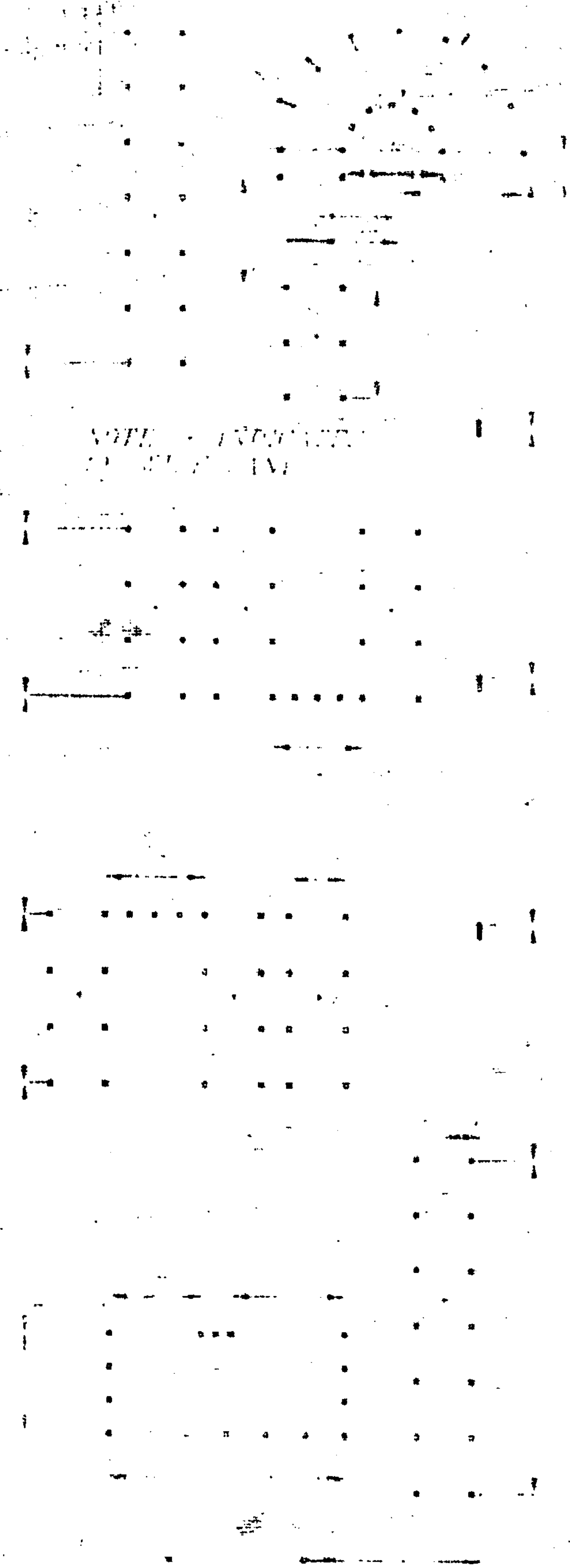
EXERCISE REQUIREMENTS

110 X 300
235 Cones

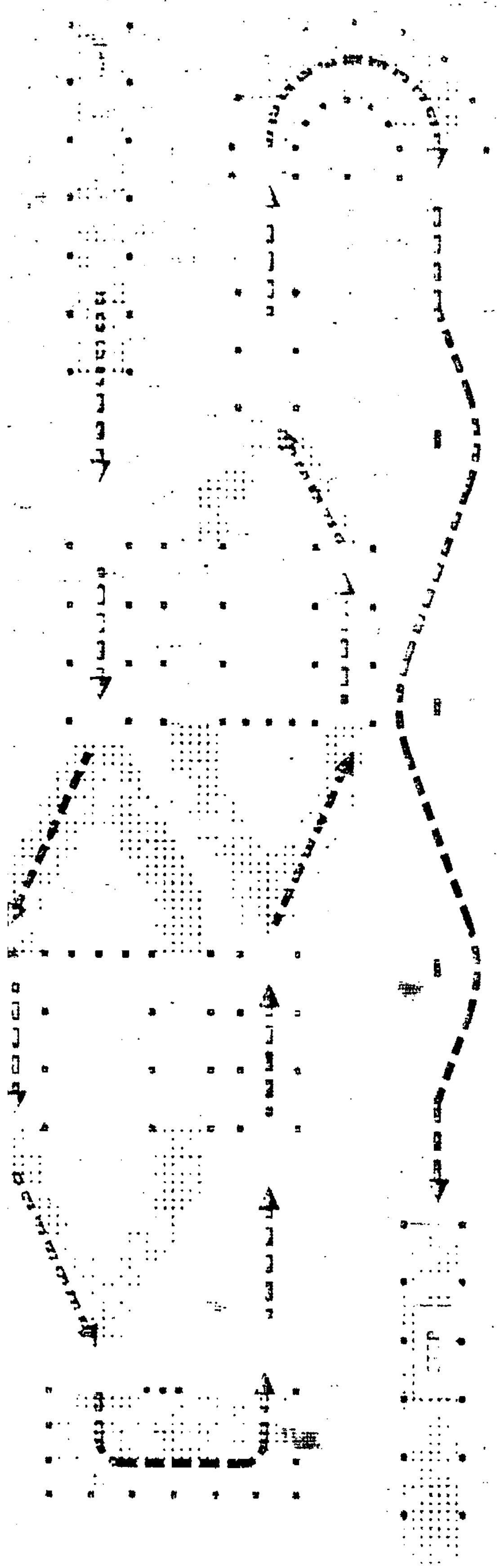


JLL 321





JLC 323



JCC324

APPENDIX D

U.S. Department of Transportation

National Highway Traffic Safety Administration

AUG [illegible]3 1994

[redacted]

Dear [redacted]

We are conducting a test program at the National Highway Traffic Safety Administration's (NHTSA) Vehicle Research and Test Center (VRTC) in East Liberty, Ohio. We are inviting officers from several departments to participate in this program so as to obtain a diverse sample of driving abilities and experiences. It is not the purpose of this program to evaluate either the driving ability of the individual officers or the adequacy of their department's driver training programs.

The testing involves police officers driving three police vehicles through a course on an asphalt surface, marked with pylons. The three vehicles will be supplied by the VRTC, but the officer may also drive his or her own police vehicle through the course, if desired.

We are seeking the services of four to eight police officers who meet certain criteria for participation in this program. First, the officers must spend a significant portion of their time driving police vehicles. Next, we would like one or two officers that fit into each of the four following categories:

1. Male - good to excellent driving skills
2. Male - average or typical driving skills
3. Female - above average upper body strength
4. Female - average or typical upper body strength

This is a very short term program and we would like to complete our testing by September 16 of this year. It takes about two to three hours to conduct the testing on each officer, so we will not ask that more that two officers participate on the same day. The NHTSA will reimburse your department for any necessary travel expenses.

I hope your department is interested in helping us with this program. Please contact either myself or Don Willke of my staff with your response or if you have any further questions.

Sincerely,

Michael W. Monk

Michael W. Monk, Acting Director
Vehicle Research and Test Center
(513) 666-4511

JUL 22

Get it together.

AUTO SAFETY HOTLINE
(800) 424-9393

US Department of Transportation
National Highway Traffic Safety Administration

OCT 1994

[redacted]

Dear [redacted]

I would like to thank you for allowing several of your officers to participate in a test program we are conducting at the National Highway Traffic Safety Administration's (NHTSA) Vehicle Research and Test Center (VRTC) in East Liberty, Ohio. Their performances through the course and their opinions concerning their experiences have been very helpful in our analysis.

We are now beginning a second round of testing and are once again requesting your cooperation. This second series of tests will be very similar to the first in that we are inviting officers from several departments to participate so as to obtain a diverse sample of driving abilities and experiences. As with the first series, it is not the purpose of this program to evaluate either the driving ability of the individual officers or the adequacy of their department's driver training programs.

The testing will again involve police officers driving police vehicles through a course on an asphalt surface, marked with pylons. The vehicles will be supplied by the VRTC, but the officer may also drive his or her own police vehicle through the course, if desired.

We are seeking the services of two police officers who meet certain criteria for participation in this program. First, both officers must spend a significant portion of their time driving police vehicles. The officers should, in your department's judgement, qualify as skillful to highly skillful drivers. We are seeking both male and female officers whose primary vehicle assignment is to a Chevrolet Caprice or a Ford Crown Victoria police vehicle.

This is a very short term program, so we would like to complete our testing by October 31 of this year. The testing takes about two to three hours per officer to conduct and it is not necessary that both officers participate on the same day. The NHTSA will reimburse your department for any necessary travel expenses.

I hope your department is again interested in helping us with this program. Please contact either myself or Don Willke of my staff at 513-666-4511 with your response or if you have any further questions.

Sincerely,

Michael W. Monk

Michael W. Monk
Acting Director

[redacted]

Dear [redacted]

We are conducting a test program at the National Highway Traffic Safety Administration's (NHTSA) Vehicle Research and Test Center (VRTC) in East Liberty, Ohio. We are inviting officers from several departments to participate in this program so as to obtain a diverse sample of driving abilities and experiences. It is not the purpose of this program to evaluate either the driving ability of the individual officers or the adequacy of their department's driver training programs.

The testing will involve police officers driving police vehicles through a course on an asphalt surface, marked with pylons. The vehicles will be supplied by the VRTC, but the officer may also drive his or her own police vehicle through the course, if desired.

We are seeking the services of two police officers who meet certain criteria for participation in this program. First, both officers must spend a significant portion of their time driving police vehicles. The officers should, in your department's judgment, qualify as skillful to highly skillful drivers. We are seeking both male and female officers whose primary duty vehicle is a Chevrolet Caprice. These officers should be "in the line of duty" during the testing.

This is a very short term program, so we would like to complete our testing by November 4, 1994. The testing takes about two to three hours per officer to conduct and it is not necessary that both officers participate on the same day. The NHTSA will reimburse your department for any necessary travel expenses.

I hope your department is interested in helping us with this program. Please contact either myself or Don Willke of my staff at 513-666-4511 with your response or if you have any further questions.

Sincerely,

Michael W. Monk
Acting Director

NRD-23:RLKIRKBRIDE:siw:10/26/94:513-666-4511
Copies to: NRD 20 Chron
Kirkbride
Willke
Parmer
File

JCC 224

This is [redacted] calling from the U.S. DOT's VRTC in East Liberty. We are conducting a test program of police vehicles. We are soliciting law enforcement agencies to assist in our program by providing personnel to participate as test subjects. The program involves spending about 1 hour driving police vehicles provided by us on our combined skills urban pursuit course, as used in some PD training programs. Max speed is 25-35 mph, but course requires aggressive driving manuevers. While our purpose is to gather data for our test program, test subjects have reported their participation had practical value in developing applicable driving skills

Specifications:
Need 2 officers
good-excellent driving skills
Acting in line of duty in our testing
Caprice or Crown Victoria
female, male 1+

rain date phone #

JUC 229

APPENDIX E

J-00330

Briefing A

1) *State for the record the date, time, and place*
2) *State for the record the persons in the room*
3) *State for the record the subject number assignment*
4) *State for the record the videotape recording*
5) Are you aware of the recording?
6) Do you object to the recording?
7) Have we ever met before today? The others?
8) *Before we begin I must caution you that you must not publicly disclose any information you acquire during your participation with us until we tell you it is all right to do so. You may discuss with your commanding officer your experiences, after pointing out the requirement to protect this information from public disclosure.* Do you agree to be bound by this requirement? Do you swear to not publicly disclose any information acquired as a result of your participation here today?
9) How many years have you been employed as a law enforcement officer?
10) What is you current job assignment?
11) How many hours a week do you spend in a patrol car?
12) What kind of car? What percentage if more than one
13) What is the size of your police force?
14) What is population of your town or city, or size of your district?
15) How do you characterize your patrol district?
16) What kind of specialized police driver training have you had?
17) How many times a day do you drive a police vehicle in an emergency response?
18) How many times do you do flat out response?
19) Do you do any type of competitive driving either as a hobby or professionally?
20) What were you told about your visit here today?
21) What are you expecting?

JCC 331

22) *We are looking into allegations about safety problems involving handling characteristics of police vehicles. What have you heard?*

23) *We have three police vehicles for you to drive. A 92 CV practice vehicle, a 92 CV, and a 92 Caprice. It is important for you to remember your experiences in each of the vehicles because we are looking at all three.*

24) *We will be driving on a course we have set up. This course is a cumulative skills pursuit course and is based on one proposed by The National Task Force on Law Enforcement Driver Training. We take no position on police pursuit and leave that decision to local jurisdictions. However, the course does teach and evaluate skills that can be useful for emergency vehicle response.*

25) *The course is only 300 ft by 110 ft and top speeds will only be 25 to 35 mph. It is laid out as follows.*

26) *You will have the opportunity to drive each vehicle up to 12 times through the course. It will be necessary for you to remember your experiences in each vehicle. Afterwards we will ask for your evaluation of the course and the handling characteristics of each of the vehicles. You may take notes to help your recall during debriefing.*

27) *An arbitrary standard of performance is*

28) Did you bring your police vehicle with you? *When we are all through you will have an opportunity to drive your vehicle today.*

29) *Let's go drive.*

30) *Sign off.*

JLL332

Debriefing A

1) *Sign on same place same station*
2) You've driven three police vehicles on the course?
3) Were you able to form an opinion about the usefulness of the course for law enforcement driver training?
4) What is your opinion of the driving course?
5) Is this something police officers should do once or twice a year?
6) Should driver qualification be as routine as weapons qualification?
7) Did the maneuvers you were required to perform to successfully negotiate the course represent maneuvers that a police officer may have to perform on the public streets from time to time?
8) Some people say that the maneuvers are too severe and aggressive and that police officers would never have to do them in the real world. Do you agree?
9) Were you given an ample opportunity to drive each vehicle to form an opinion?
10) *We will discuss each vehicle in the order you drove them beginning with and ending with*
11) What is your opinion of the first vehicle? Did you notice anything about the handling characteristics of this vehicle that would lead you to believe that it might be unsafe for police service on the public streets?
12) What is your opinion of the second vehicle? Did you notice anything about the handling characteristics of this vehicle that would lead you to believe that it might be unsafe for police service on the public streets?
13) What is your opinion of third vehicle? Did you notice anything about the handling characteristics of this vehicle that would lead you to believe that it might be unsafe for police service on the public streets?
14) Are these opinions your own?
15) Have you formed these opinions base solely on your experiences here today?
16) Have you been led to these conclusions by anyone?
17) Has anyone told you what to say? Tried in anyway to influence your opinions?

JCC 337

18) *Specifically we are investigating allegations of a safety related problem in 1992 Ford Crown Victorias The complainants allege the subject vehicles exhibit a loss of power steering assist which feels like a steering wheel bind during aggressive steering maneuvers* Did you notice this condition in any of the vehicles?

19) Do you have any questions?

20) Do you have anything you would like to add?

21) *I remind you to not disclose publicly any information concerning your participation in this study*

22) *Sign off..*

JCC334

APPENDIX F

Briefing B

1) *State for the record the date, time, and place.*
2) *State for the record the persons in the room*
3) *State for the record the subject number assignment*
4) *State for the record the videotape recording.*
5) Are you aware of the recording?
6) Do you object to the recording?
7) Have we ever met before today? The others?
8) *Before we begin I must caution you that you must not publicly disclose any information you acquire during your participation with us until we tell you it is all right to do so. You may discuss with your commanding officer your experiences, after pointing out the requirement to protect this information from public disclosure* Do you agree to be bound by this requirement and swear to not publicly disclose any information acquired as a result of your participation here today?
9) How many years have you been employed as a law enforcement officer?
10) What is you current job assignment?
11) How many hours a week do you spend in a patrol car?
12) What kind of car? What percentage if more than one
13) What is the size of your police force?
14) What is population of your town or city, or size of your district?
15) How do you characterize your patrol district?
16) What kind of specialized police driver training have you had?
17) How many times a day do you drive a police vehicle in an emergency response?
18) How many times do you do flat out response?
19) Do you do any type of competitive driving either as a hobby or professionally?
20) What were you told about your visit here today?
21) What are you expecting?
22) We are not doing these things.

JUCC 336

23) *What we are doing is investigating allegations of a steering problem in 1992 Ford Crown Victorias.* What have you heard?

24) *We have two '92 CV's for you to drive. The steering system of one of the vehicles has been modified. This modification may help, hurt, or cause no change. The steering system of the other vehicle has not been modified Both vehicles are otherwise similar*

25) *We will be driving on a course we have set up. This course is a cumulative skills pursuit course and is based on one proposed by The National Task Force on Law Enforcement Driver Training We take no position on police pursuit and leave that decision to local jurisdictions However, the course does teach and evaluate skills that can be useful for emergency vehicle response*

26) *The course is only 300 ft by 110 ft and top speeds will only be 25 to 35 mph It is laid out as follows*

27) *You will have the opportunity to drive each vehicle It will be necessary for you to remember your experiences in each vehicle Afterwards we will ask for your evaluation of the course and the steering behavior of each of the vehicles. You may take notes to help your recall during debriefing.*

28) *An arbitrary standard of performance is*

29) Did you bring your police vehicle with you? *When we are all through you will have an opportunity to drive your vehicle today*

30) One vehicle is black and the other is blue Which vehicle would you like to drive first.

31) *Let's go drive.*

32) *Sign off*

Debriefing B

1) *Sign on same place same station.*
2) You've drivenboth police vehicles on the course?
3) Were you able to form an opinion about the usefulness of the course for law enforcement driver training?
4) What is your opinion of the driving course?
5) Is this something police officers should do once or twice a year?
6) Should driver qualification be as routine as weapons qualification?
7) Did the maneuvers you were required to perform to successfully negotiate the course represent maneuvers that a police officer may have to perform on the public streets from time to time?
8) Some people say that the maneuvers are too severe and aggressive and that police officers would never have to do them in the real world. Do you agree?
9) Were you given an ample opportunity to drive each vehicle to form an opinion?
10) What is your opinion of the vehicles? Did you notice anything about the handling characteristics of this vehicle that would lead you to believe that it might be unsafe for police service on the public streets?
11) Are these opinions your own?
12) Have you formed these opinions base solely on your own experiences?
13) Have you been led to these conclusions by anyone?
14) Has anyone told you what to say? Tried in anyway to influence your opinions?
15) Do you have any questions?
16) Do you have anything you would like to add?
17) *I remind you to not disclose publicly any information concerning your participation in this study*
18) *Sign off*

Briefing C

1) *State for the record the date, time, and place.*
2) *State for the record the persons in the room.*
3) *State for the record the subject number assignment*
4) *State for the record the videotape recording.*
5) Are you aware of the recording?
6) Do you object to the recording?
7) Have we ever met before today? The others?
8) *Before we begin I must caution you that you must not publicly disclose any information you acquire during your participation with us until we tell you it is all right to do so You may discuss with your commanding officer your experiences. after pointing out the requirement to protect this information from public disclosure.* Do you agree to be bound by this requirement and swear to not publicly disclose any information acquired as a result of your participation here today?
9) How many years have you been employed as a law enforcement officer?
10) What is you current job assignment?
11) How many hours a week do you spend in a patrol car?
12) What kind of car? What percentage if more than one
13) What is the size of your police force?
14) What is population of your town or city; or size of your district?
15) How do you characterize your patrol district?
16) What kind of specialized police driver training have you had?
17) How many times a day do you drive a police vehicle in an emergency response?
18) How many times do you do flat out response?
19) Do you do any type of competitive driving either as a hobby or professionally?
20) What were you told about your visit here today?
21) What are you expecting?
22) We are not doing these things

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23) *What we are doing is looking at the steering characteristics of police cars This week we are looking at the Fords Today we're doing '92 Crown Vics* " What have you heard about steering characteristics of police cars?

24) *I have selected two of our 1992 Police Crown Vic's for you to drive. The steering system of one of the vehicles has been modified Today, I have this mod set so that it might help, it might hurt, or it might cause no change in the steering characteristics of the vehicle. The steering system of the other one I have chosen for you has not been modified. This vehicle may or may not exhibit any unusual steering characteristics Otherwise, both vehicles are similar*

25) *We will be driving on a course we have set up. This course is a cumulative skills pursuit course and is based on one proposed by The National Task Force on Law Enforcement Driver Training. We take no position on police pursuit and leave that decision to local jurisdictions. However, the course does teach and evaluate skills that can be useful for emergency vehicle response*

26) *The course is only 300 ft by 110 ft and top speeds will only be 25 to [illegible] mph. It is laid out as follows.*

27) *An arbitrary standard of performance is.*

28) *You will have the opportunity to drive each vehicle up to 15 times. We'll start out with as a passenger Then you drive solo*

29) *It will be necessary for you to remember your experiences in each vehicle. Afterwards we will ask for your evaluation of the course and the steering behavior of each of the vehicles. You may take notes to help your recall during debriefing*

30) Did you bring your police vehicle with you? *When we are all through you will have an opportunity to drive your vehicle today.*

31) *Let's go drive.*

32) *Sign off*

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Debriefing C

1) *Sign on same place same station*
2) You've driven both police vehicles on the course?
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4) What is your opinion of the driving course?
5) Is this something police officers should do once or twice a year?
6) Should driver qualification be as routine as weapons qualification?
7) Did the maneuvers you were required to perform to successfully negotiate the course represent maneuvers that a police officer may have to perform on the public streets from time to time?
8) Some people say that the maneuvers are too severe and aggressive and that police officers would never have to do them in the real world. Do you agree?
9) Were you given an ample opportunity to drive each vehicle to form an opinion?
10) What is your opinion of the ______________ vehicle? Did you notice anything about the handling characteristics of this vehicle that would lead you to believe that it might be unsafe for police service on the public streets?
11) What is your opinion of the ______________ vehicle? Did you notice anything about the handling characteristics of this vehicle that would lead you to believe that it might be unsafe for police service on the public streets?
12) Are these opinions your own?
13) Have you formed these opinions base solely on your own experiences?
14) Have you been led to these conclusions by anyone?
15) Has anyone told you what to say? Tried in anyway to influence your opinions?

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16) *Specifically we are investigating allegations of a safety related problem in 1992 Ford Crown Victorias The complainants allege the subject vehicles exhibit a loss of power steering assist which feels like a steering wheel bind during aggressive steering maneuvers.* Did you notice this condition in any of the vehicles?

17) Do you have any questions?

18) Do you have anything you would like to add?

19) *I remind you to not disclose publicly any information concerning your participation in this study*

20) *Sign off*