

DP09-005

KORCO

5-16-2011

VEHICLE TO VEHICLE REAR IMPACT
30 % OFFSET 1996 JEEP GRAND
CHEROKEE 1988 FORD TAURUS 5-16-
2011 FINAL REPORT P31070-01,

2011-1955

TR-P31070-01-NC,

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5-16-2011

VEHICLE TO VEHICLE
REAR IMPACT 30 % OFFSET

1996 JEEP GRAND

CHEROKEE 1988 FORD

TAURUS 5-16-2011 FINAL

REPORT P31070-01,

2011-1955

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Appendix A

**APPENDIX A
PHOTOGRAPHS**

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FIGURE 1. Bullet Vehicle, As Received



FIGURE 2. Bullet Vehicle, As Received

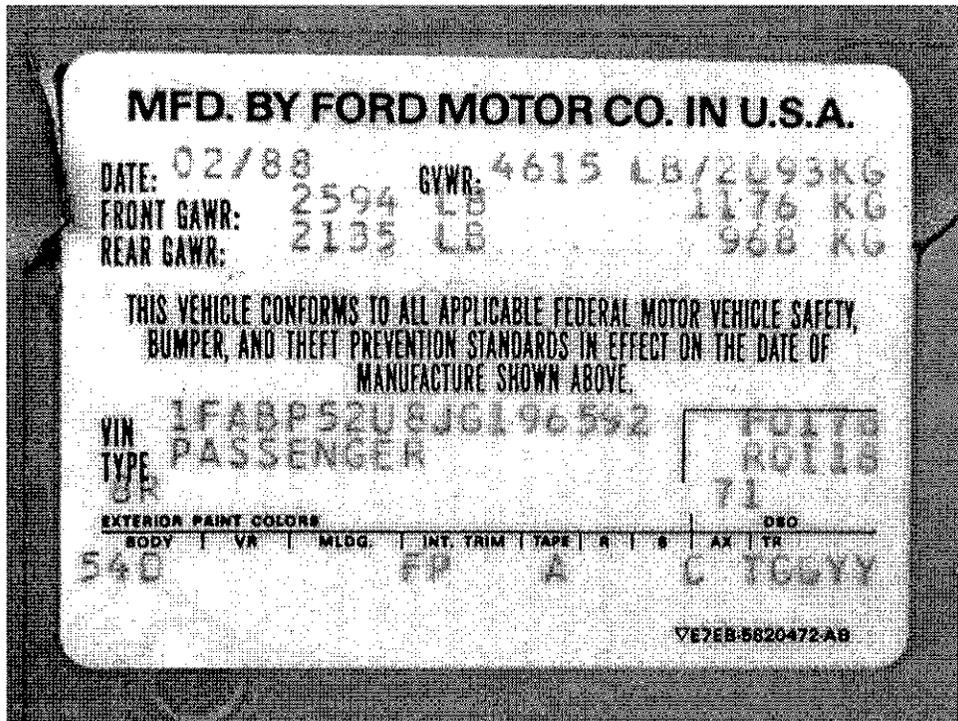


FIGURE 3. Bullet Vehicle Manufacturer's Label

| MODEL | | MAXIMUM LOAD | SEATING | DISTRIBUTION (SEATING) | | | | LOGGING |
|-------------------|---------|---------------|---------|------------------------|------------|-------|---------------|---------|
| MODEL | SEATING | SEATING | FRONT | REAR | THIRD SEAT | TRUCK | TRUCK | |
| SEDANS - BERLINAS | 4 | 300 lb/136 kg | 2 | 3 | 0 | 0 | 290 lb/131 kg | |
| STATION WAGONS | 5 | 300 lb/136 kg | 2 | 3 | 0 | 0 | 300 lb/136 kg | |
| CAMIONETAS | 7 | 150 lb/68 kg | 2 | 0 | 2 | 2 | 150 lb/68 kg | |
| | 8 | NDAC | 3 | 0 | 0 | 2 | NDAC | |

FIGURE 4. Bullet Vehicle Tire Placard



FIGURE 5. Target Vehicle, As-Received



FIGURE 6. Target Vehicle, As-Received

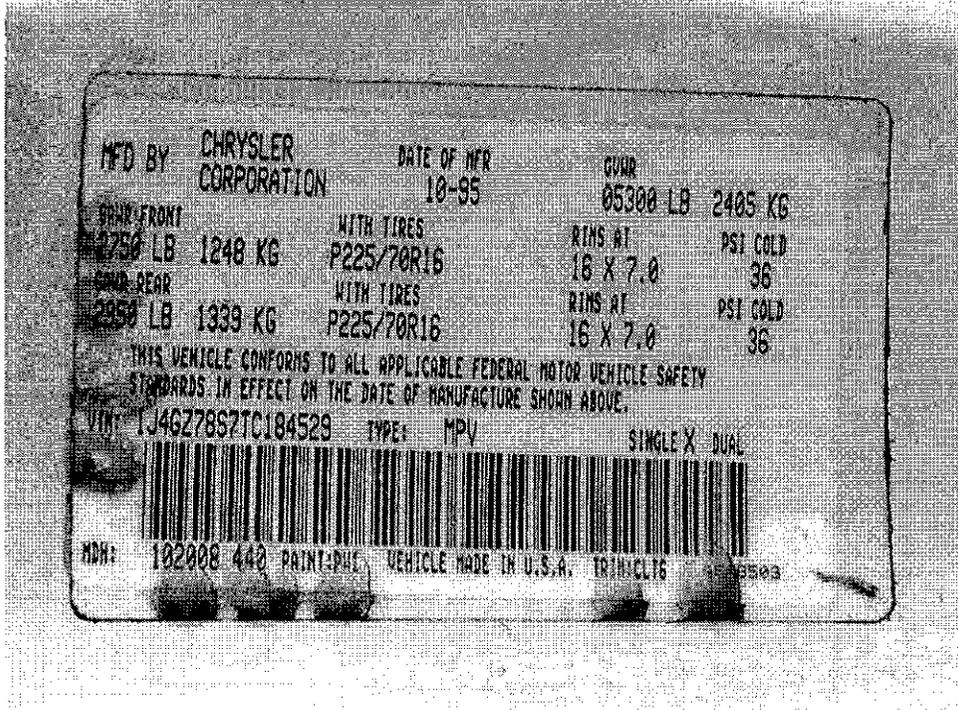


FIGURE 7. Target Vehicle Manufacturer's Label

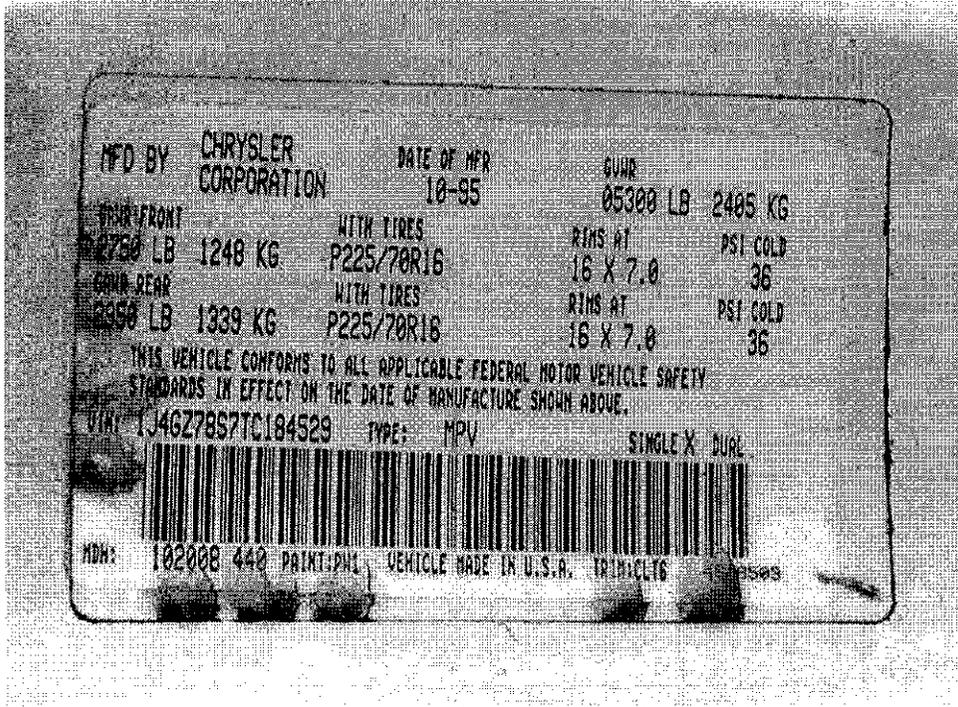


FIGURE 8. Target Vehicle Tire Placard



FIGURE 9. Test Setup, Left Side



FIGURE 10. Test Setup, Left Front $\frac{3}{4}$



FIGURE 11. Test Setup, Front



FIGURE 12. Test Setup, Right Front $\frac{3}{4}$



FIGURE 13. Test Setup, Right Side



FIGURE 14. Test Setup, Right Rear $\frac{3}{4}$



FIGURE 15. Test Setup, Rear



FIGURE 16. Test Setup, Left Rear $\frac{3}{4}$

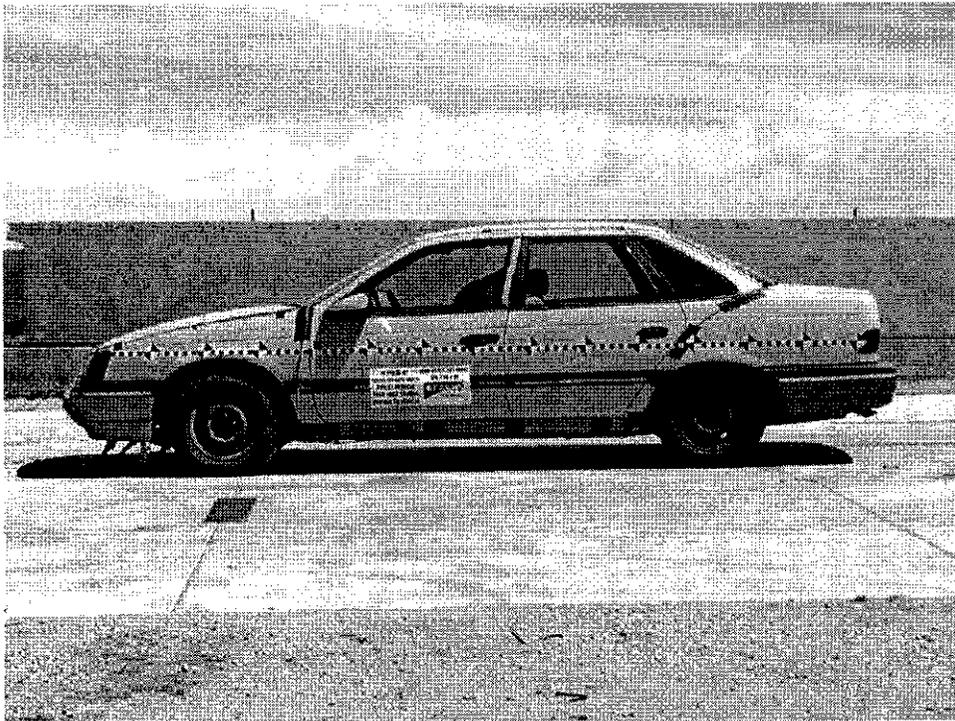


FIGURE 19. Pre-Test Bullet Vehicle, Left Side

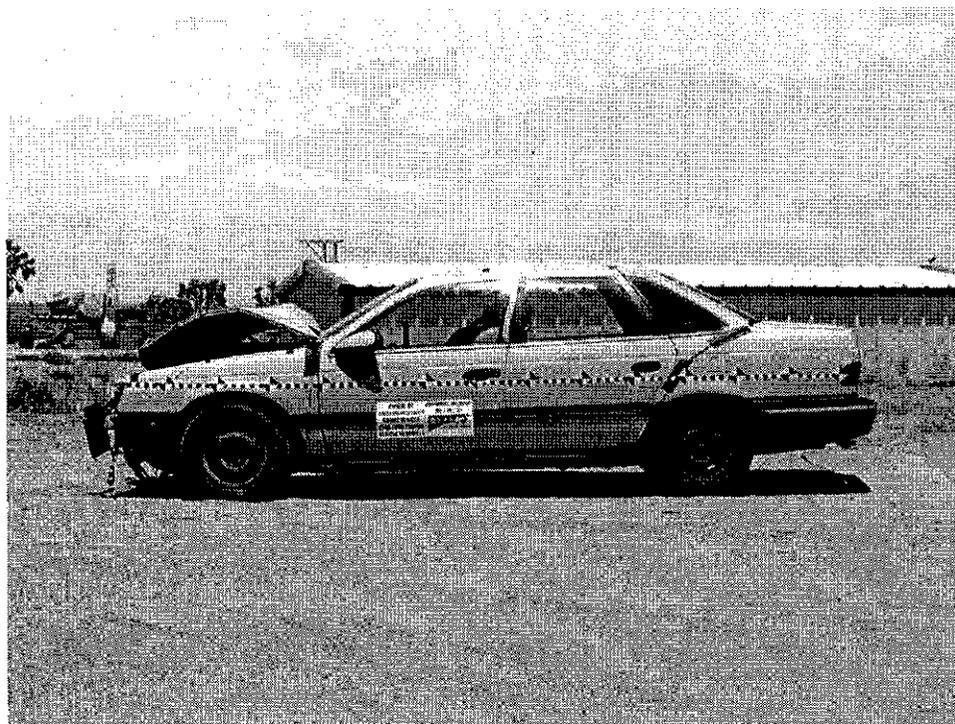


FIGURE 20. Post-Test Bullet Vehicle, Left Side

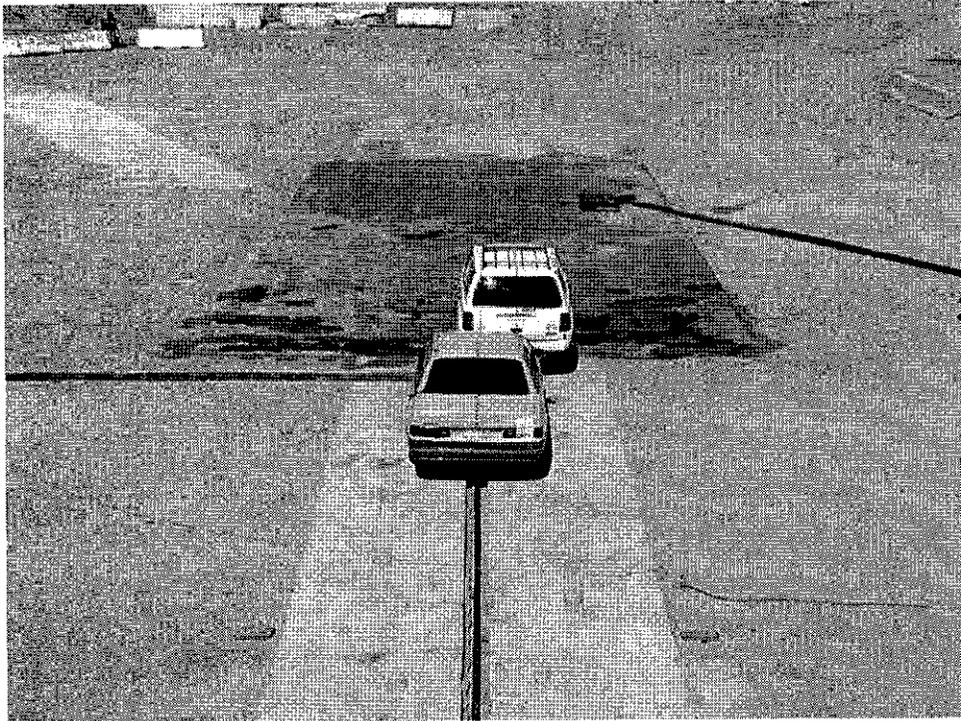


FIGURE 17. Test Setup

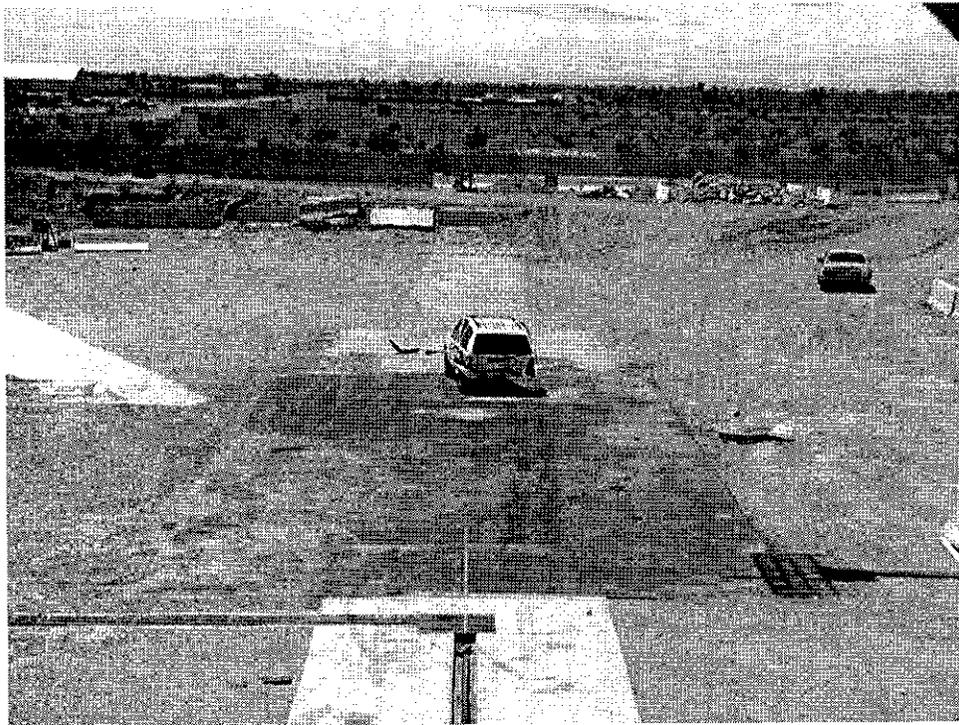


FIGURE 18. Post Test

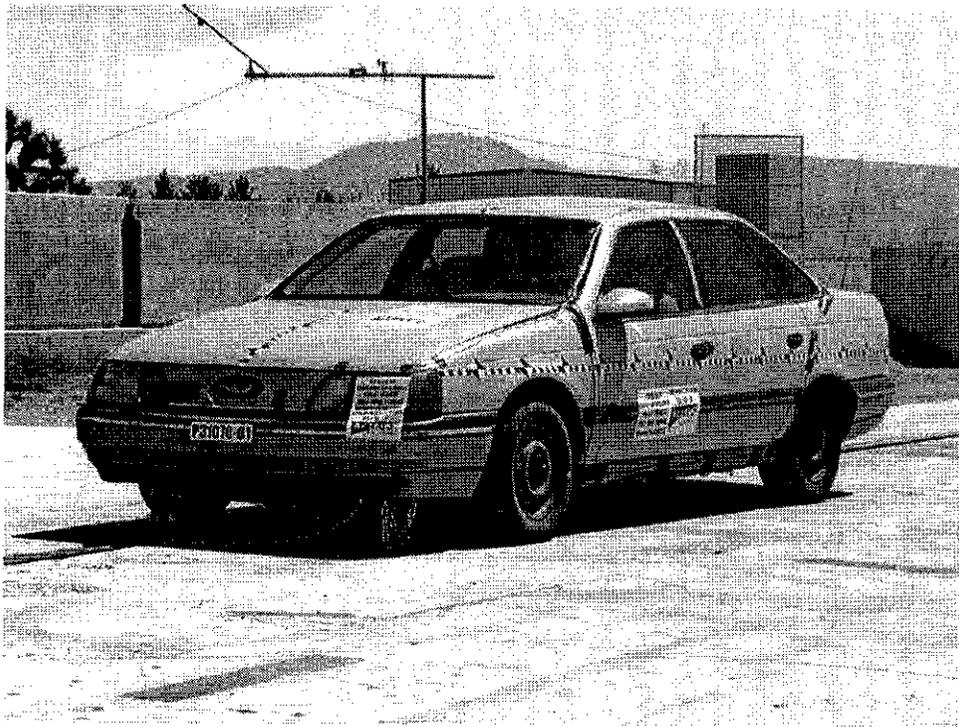


FIGURE 21. Pre-Test Bullet Vehicle, Left Front $\frac{3}{4}$

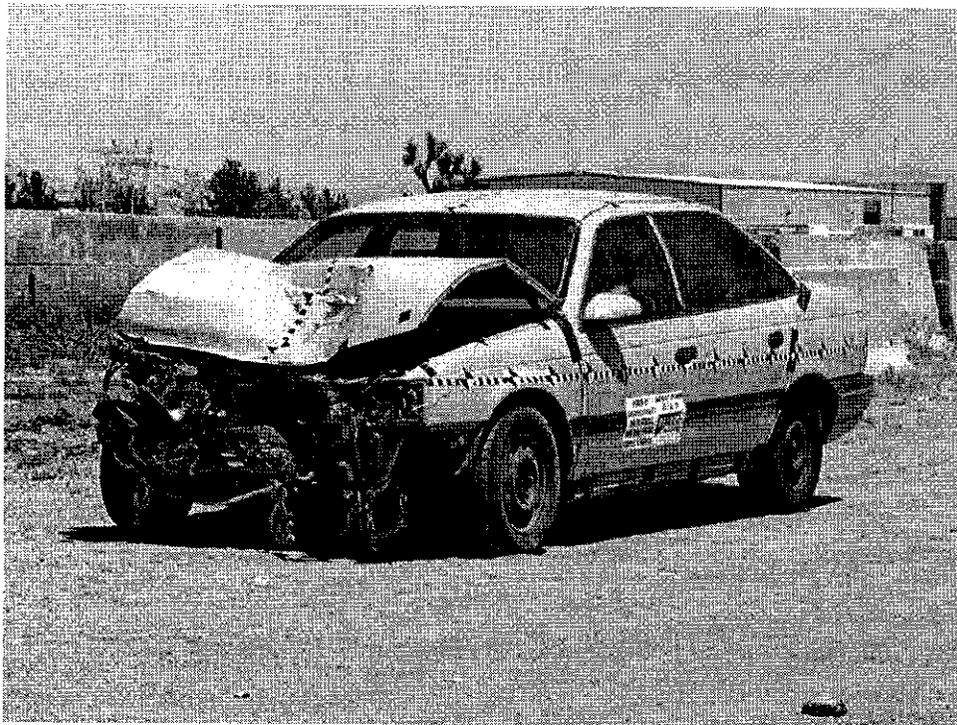


FIGURE 22. Post-Test Bullet Vehicle, Left Front $\frac{3}{4}$



FIGURE 23. Pre-Test Bullet Vehicle, Front



FIGURE 24. Post-Test Bullet Vehicle, Front

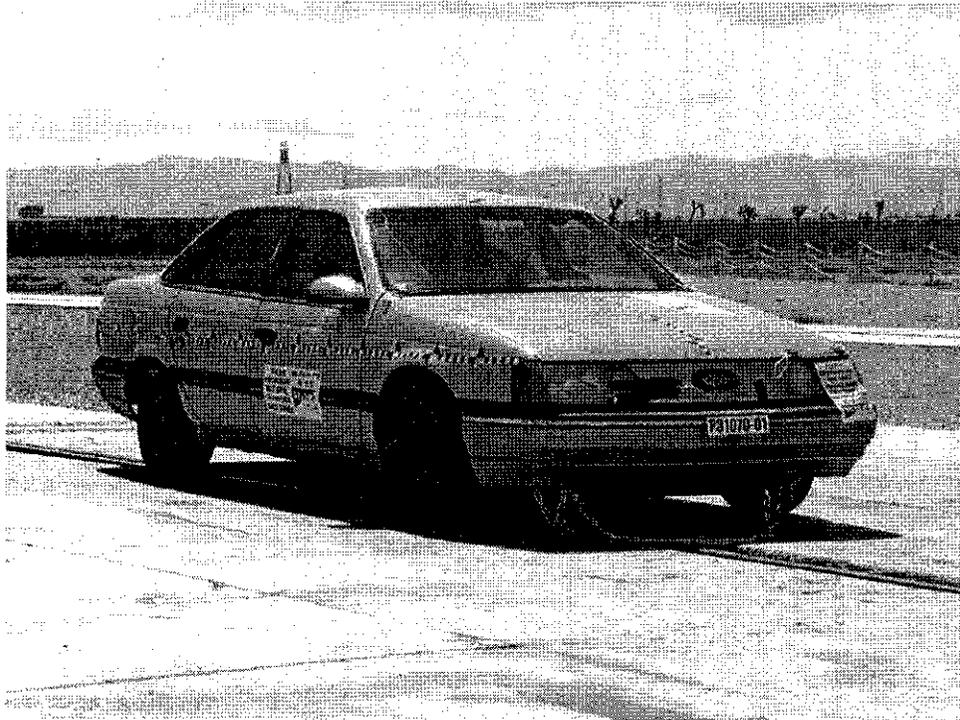


FIGURE 25. Pre-Test Bullet Vehicle, Right Front ¾



FIGURE 26. Post-Test Bullet Vehicle, Right Front ¾



FIGURE 27. Pre-Test Bullet Vehicle, Right Side

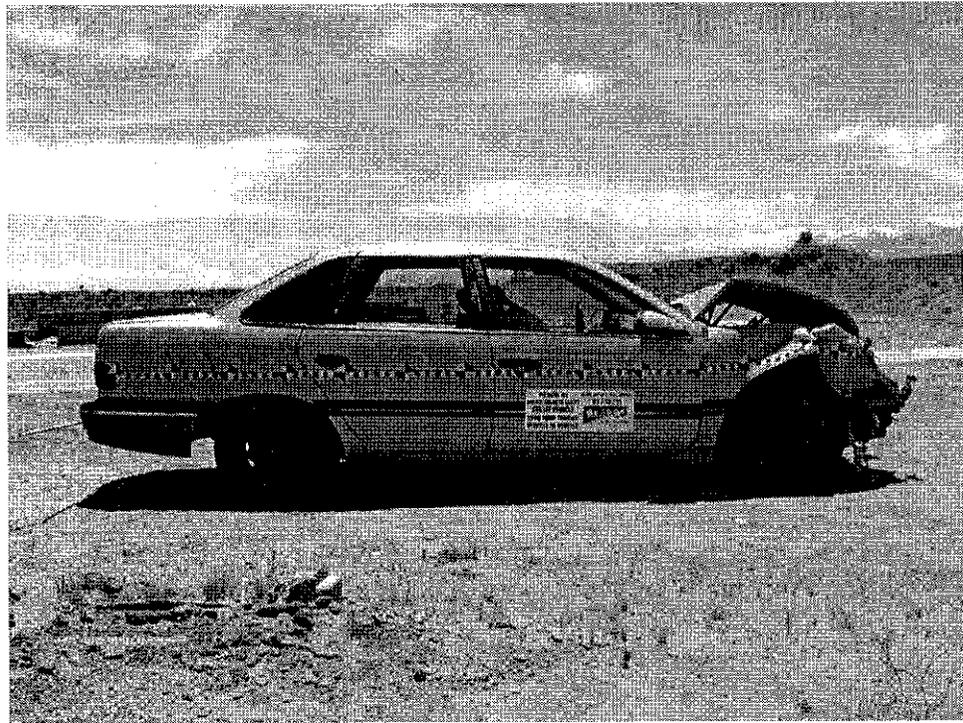


FIGURE 28. Post-Test Bullet Vehicle, Right Side



FIGURE 29. Pre-Test Target Vehicle, Left Side



FIGURE 30. Post-Test Target Vehicle, Left Side



FIGURE 31. Pre-Test Target Vehicle, Left Rear $\frac{3}{4}$



FIGURE 32. Post-Test Target Vehicle, Left Rear $\frac{3}{4}$



FIGURE 33. Pre-Test Target Vehicle, Rear



FIGURE 34. Post-Test Target Vehicle, Rear



FIGURE 35. Pre-Test Target Vehicle, Right Rear $\frac{3}{4}$



FIGURE 36. Post-Test Target Vehicle, Right Rear $\frac{3}{4}$



FIGURE 37. Pre-Test Target Vehicle, Right Side



FIGURE 38. Post-Test Target Vehicle, Right Side

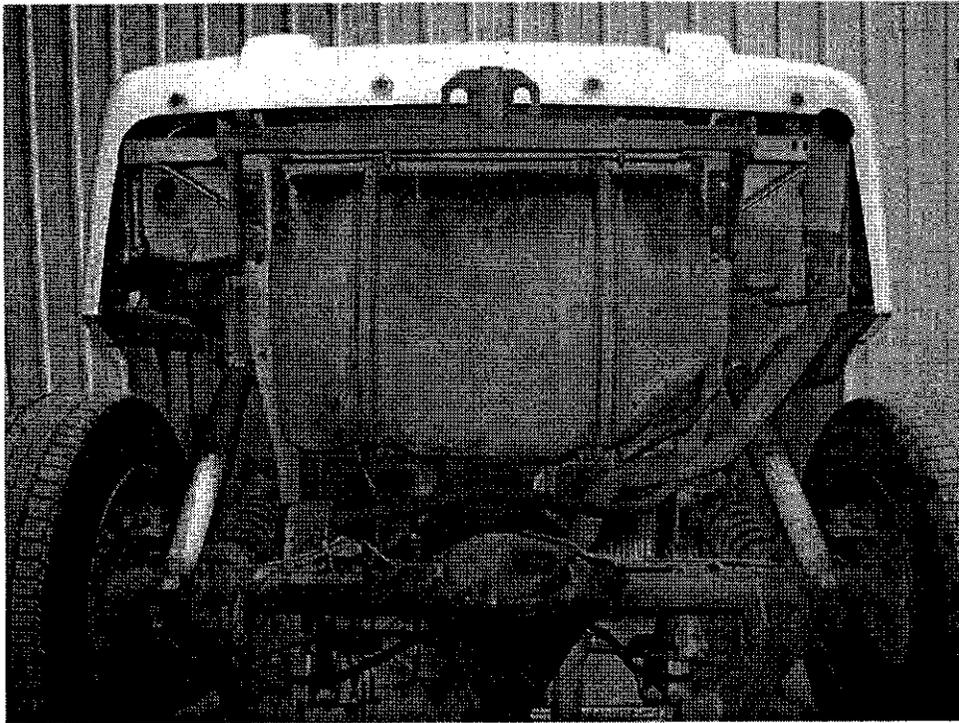


FIGURE 39. Pre-Test Target Vehicle

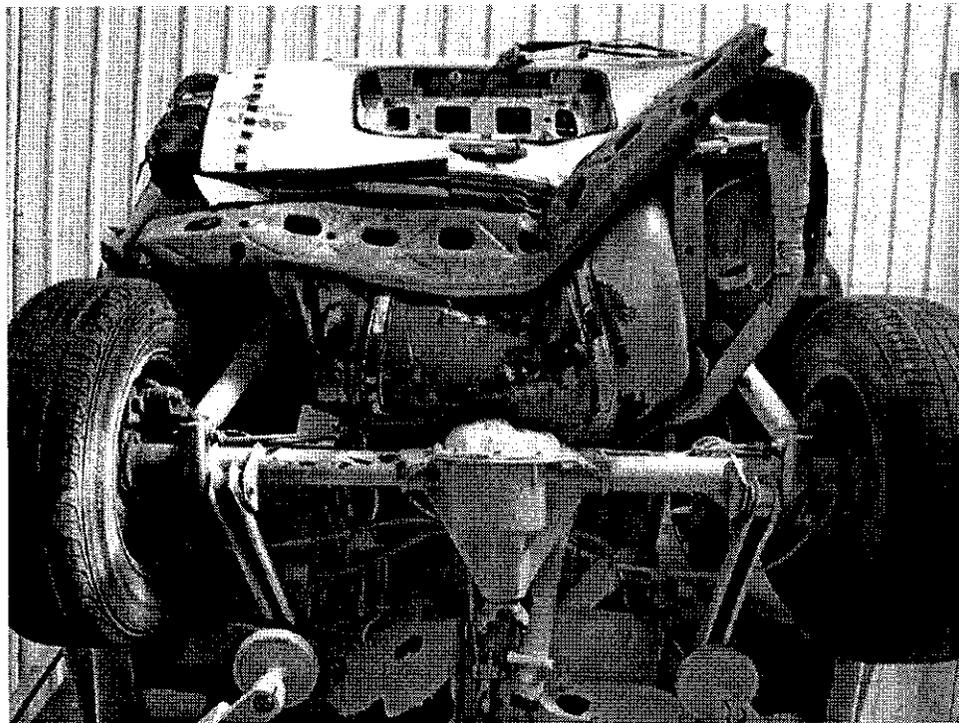


FIGURE 40. Post-Test Target Vehicle

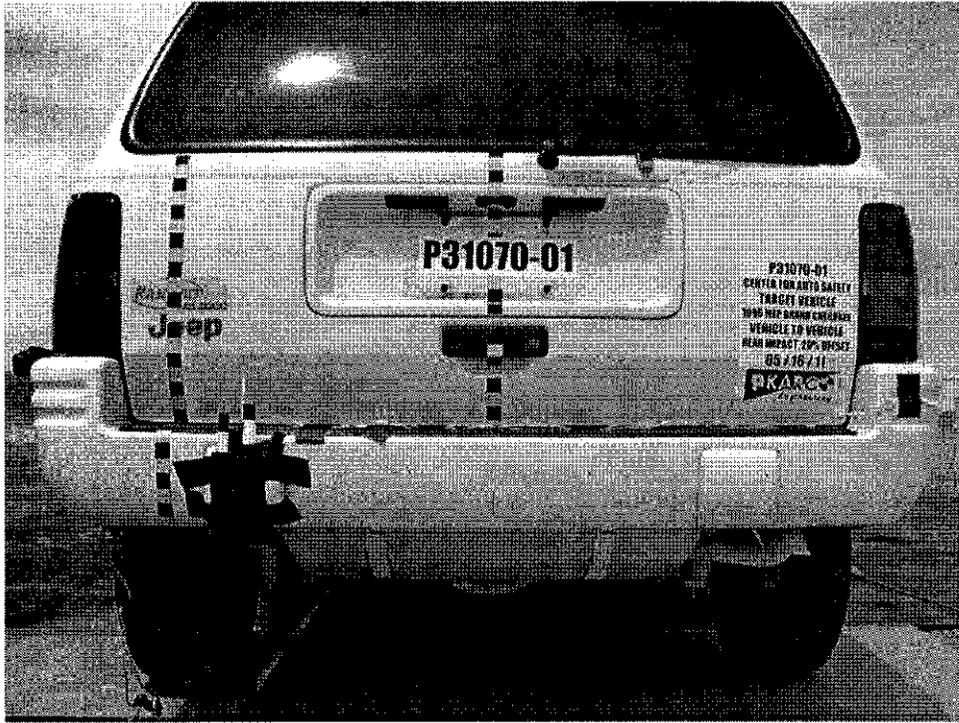


FIGURE 41. Pre-Test Target Vehicle

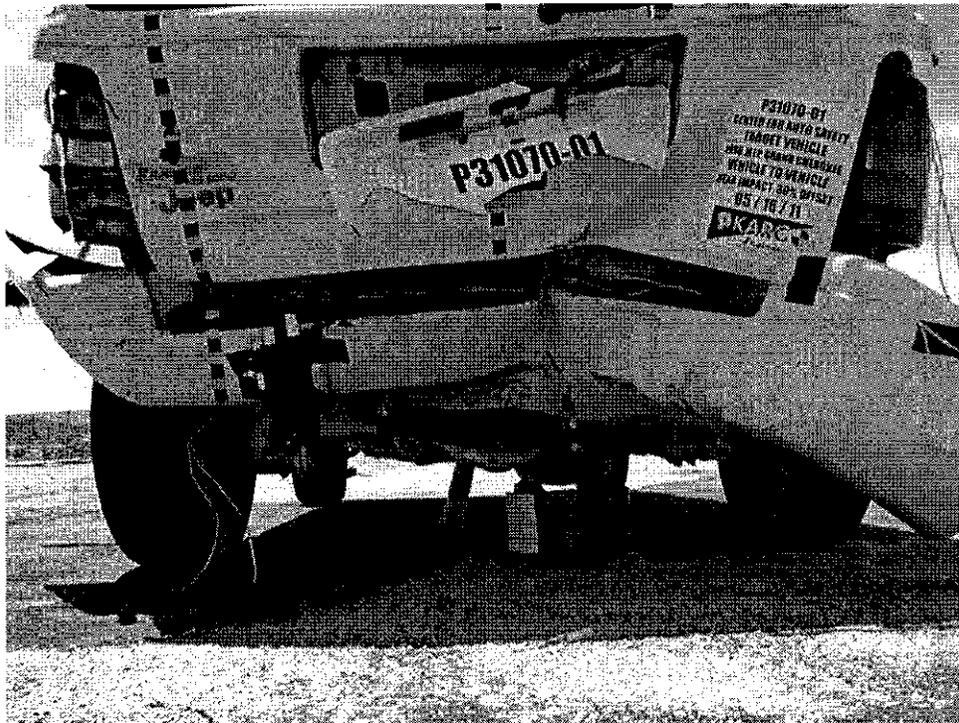


FIGURE 42. Post-Test Target Vehicle

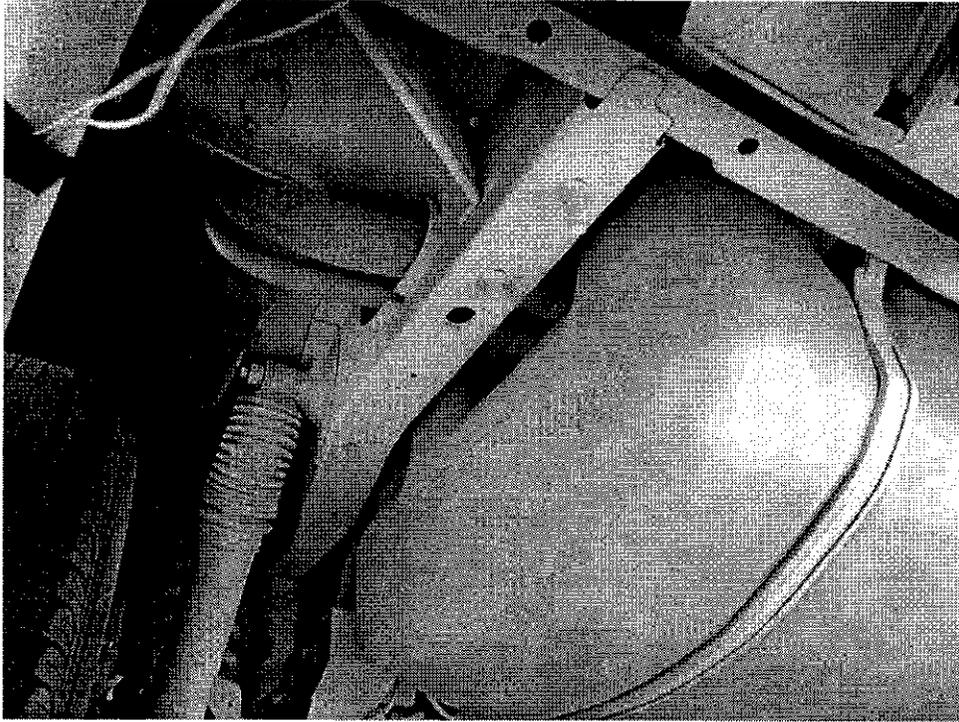


FIGURE 43. Pre-Test Target Vehicle

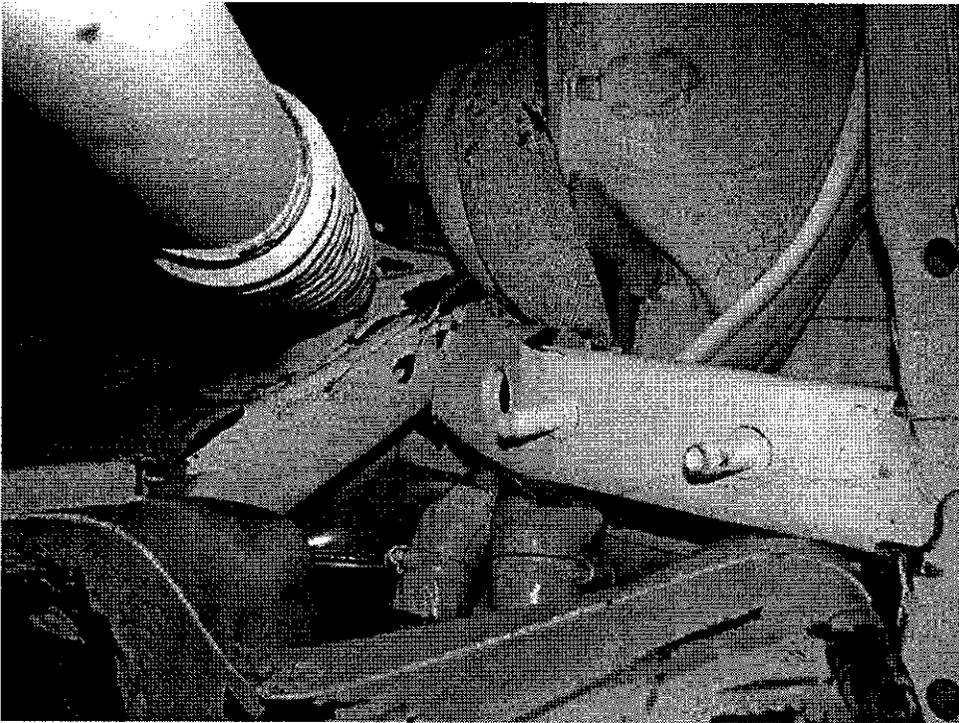


FIGURE 44. Post-Test Target Vehicle

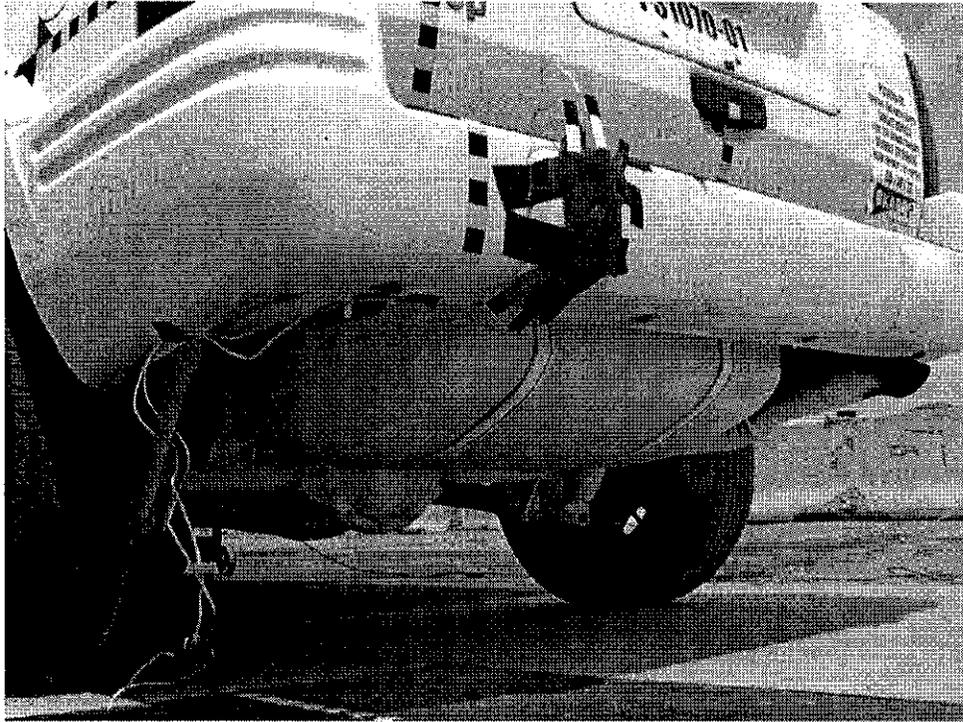


FIGURE 45. Pre-Test Target Vehicle

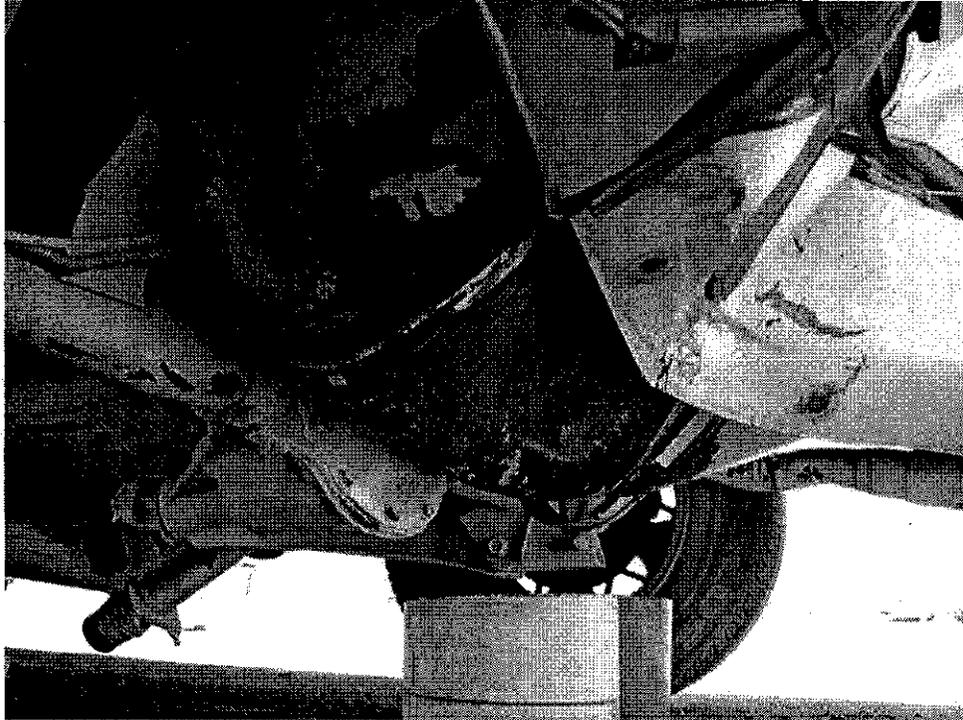


FIGURE 46. Post-Test Target Vehicle

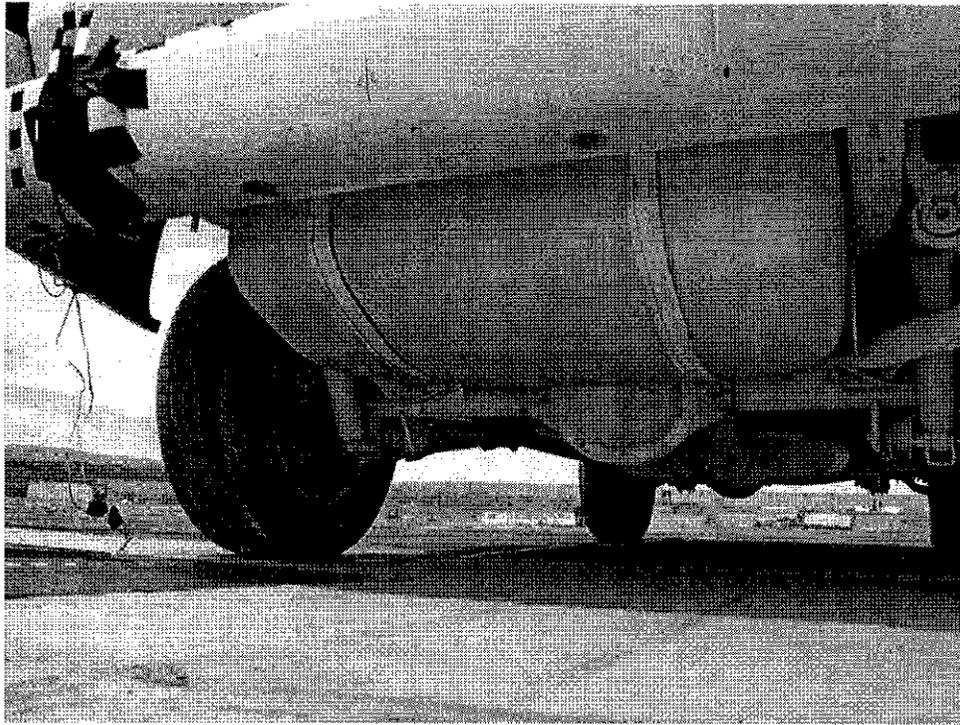


FIGURE 47. Pre-Test Target Vehicle

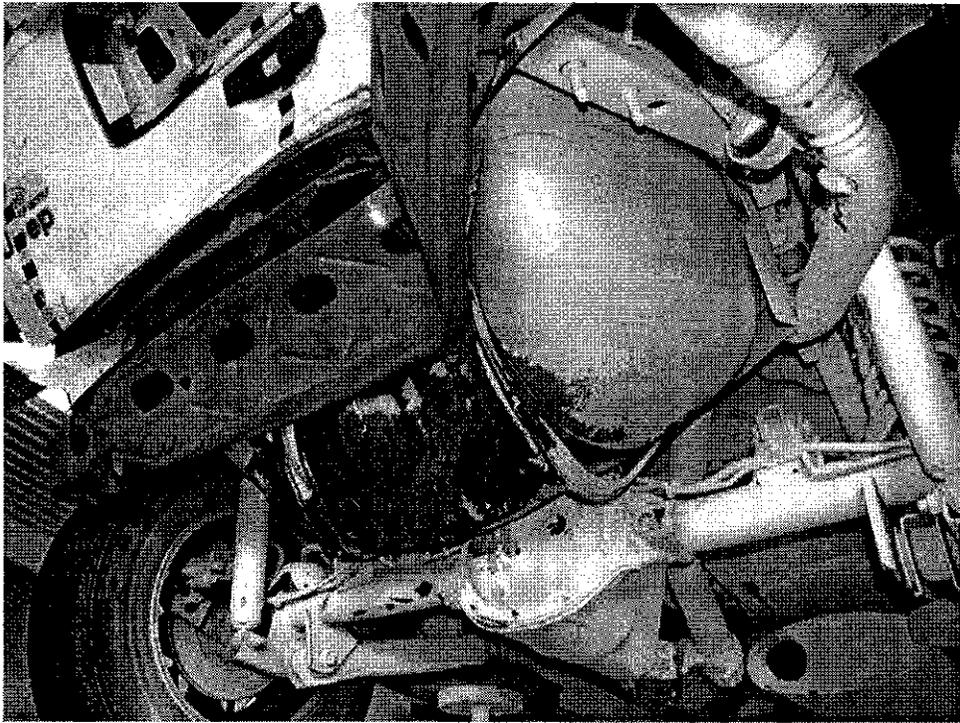


FIGURE 48. Post-Test Target Vehicle

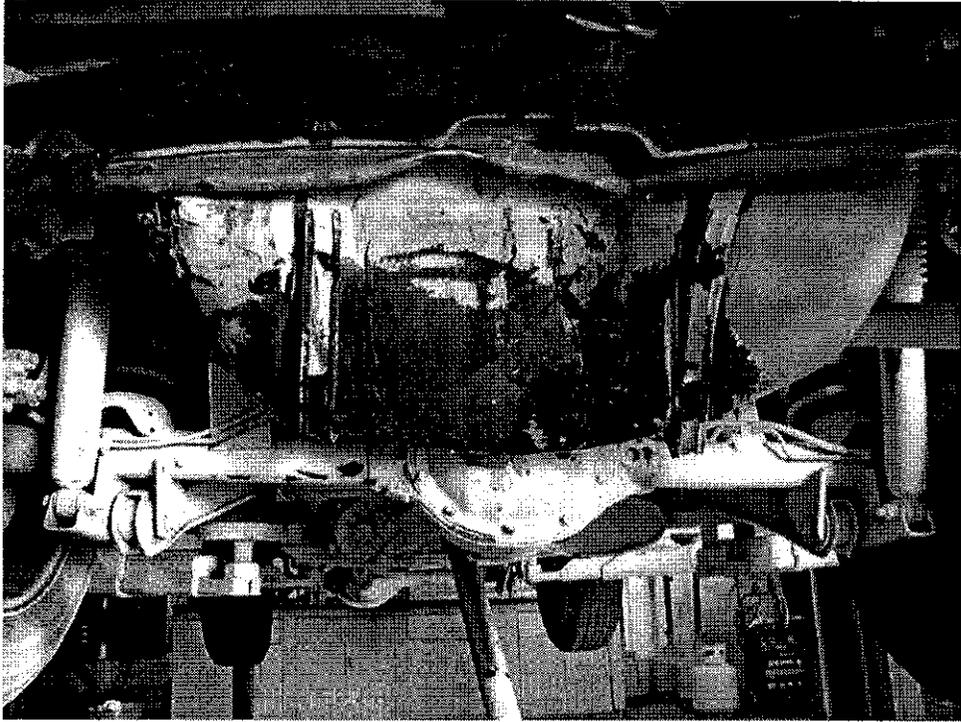


FIGURE 49. Post-Test Target Vehicle

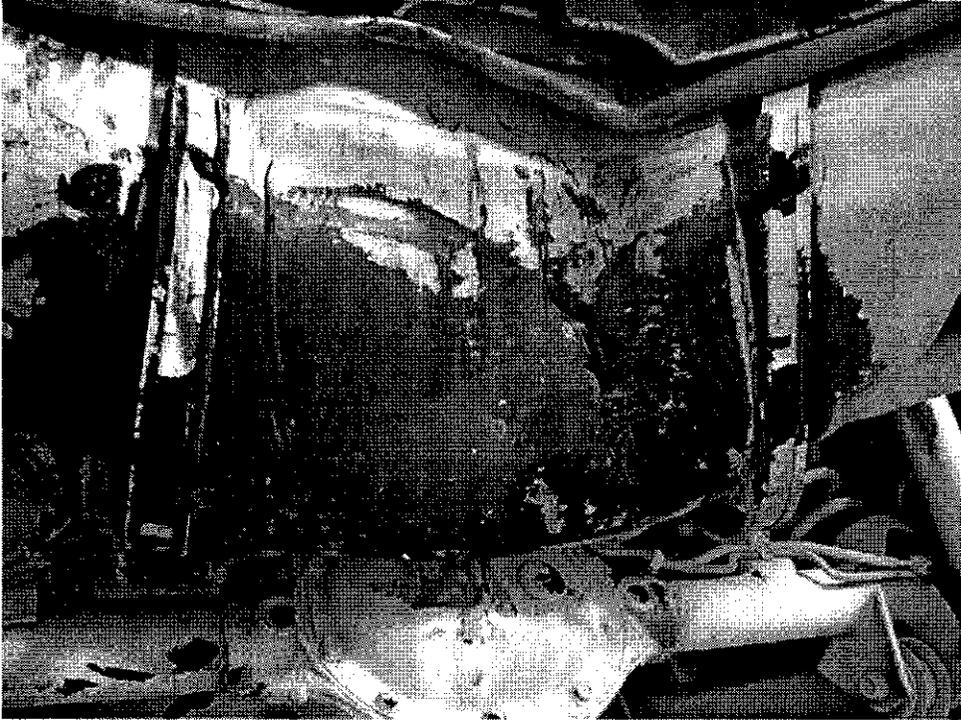


FIGURE 50. Post-Test Target Vehicle

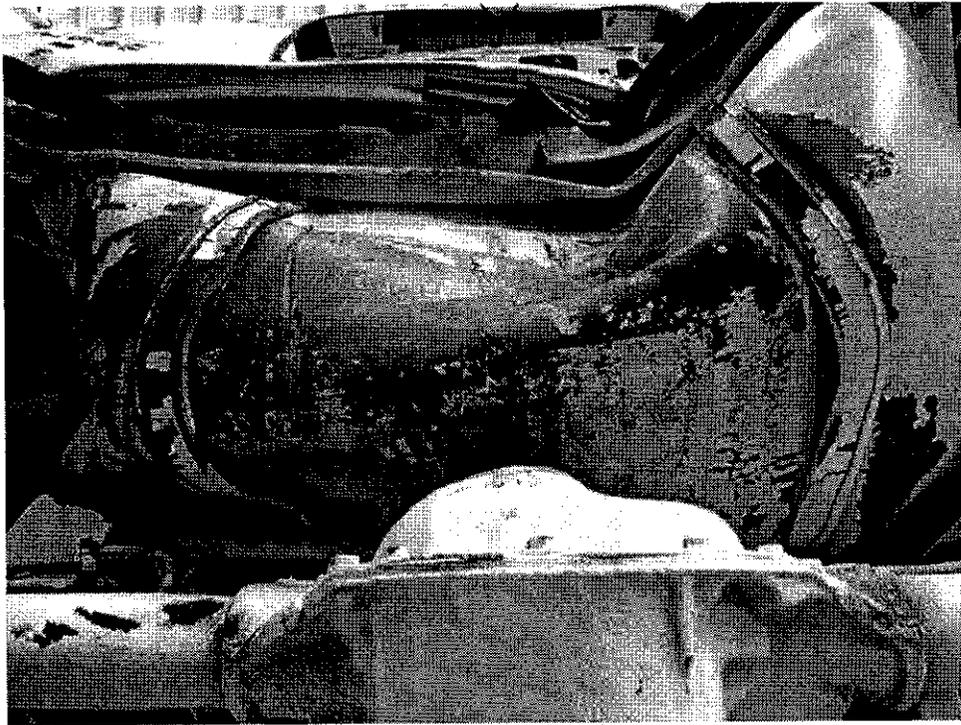


FIGURE 51. Post-Test Target Vehicle



FIGURE 52. Post-Test Target Vehicle

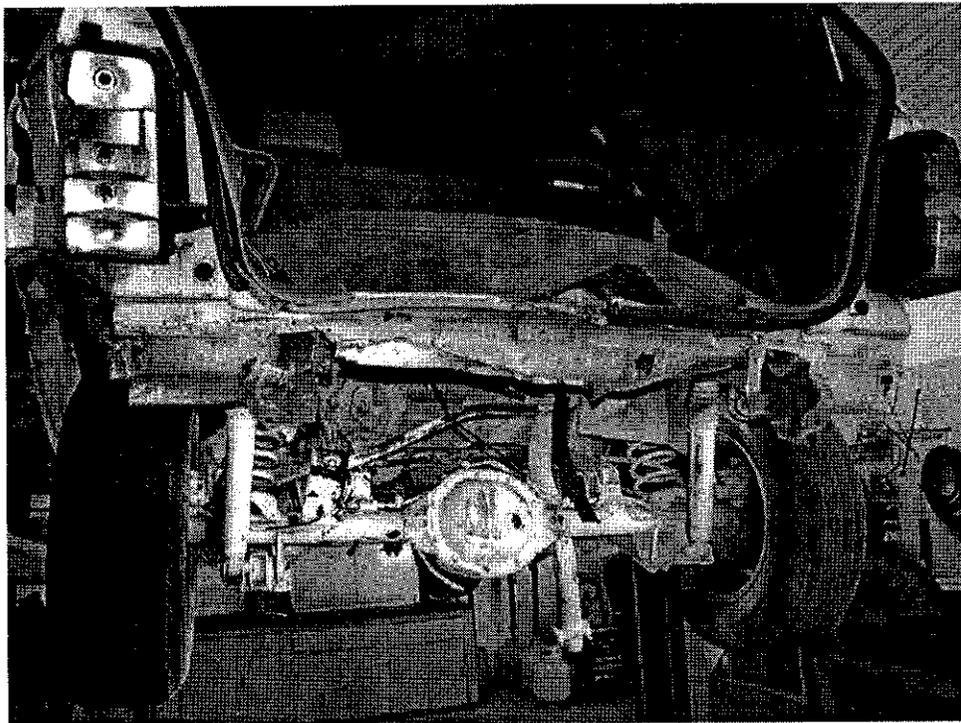


FIGURE 53. Post -Test Target Vehicle

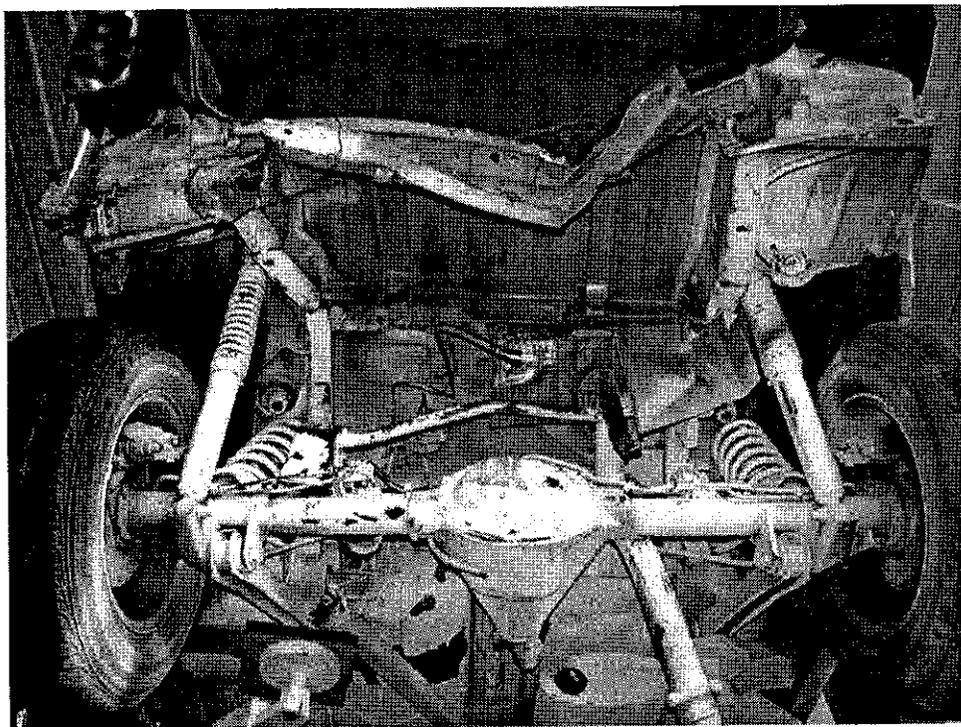


FIGURE 54. Post-Test Target Vehicle

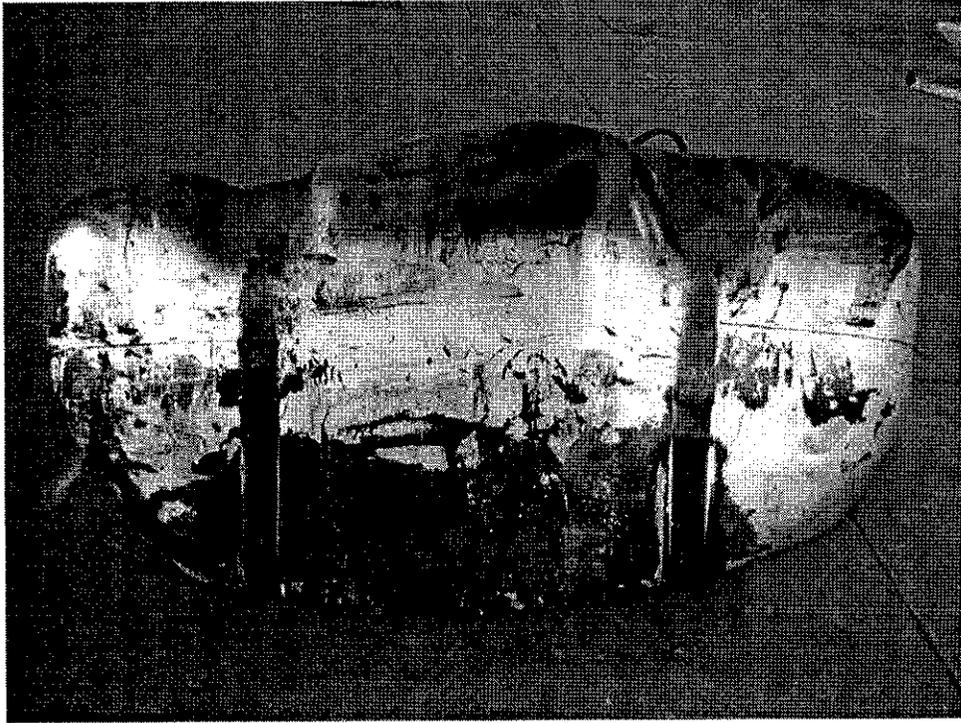


FIGURE 55. Post -Test Target Vehicle, Fuel Tank



FIGURE 56. Post-Test Target Vehicle, Fuel Tank

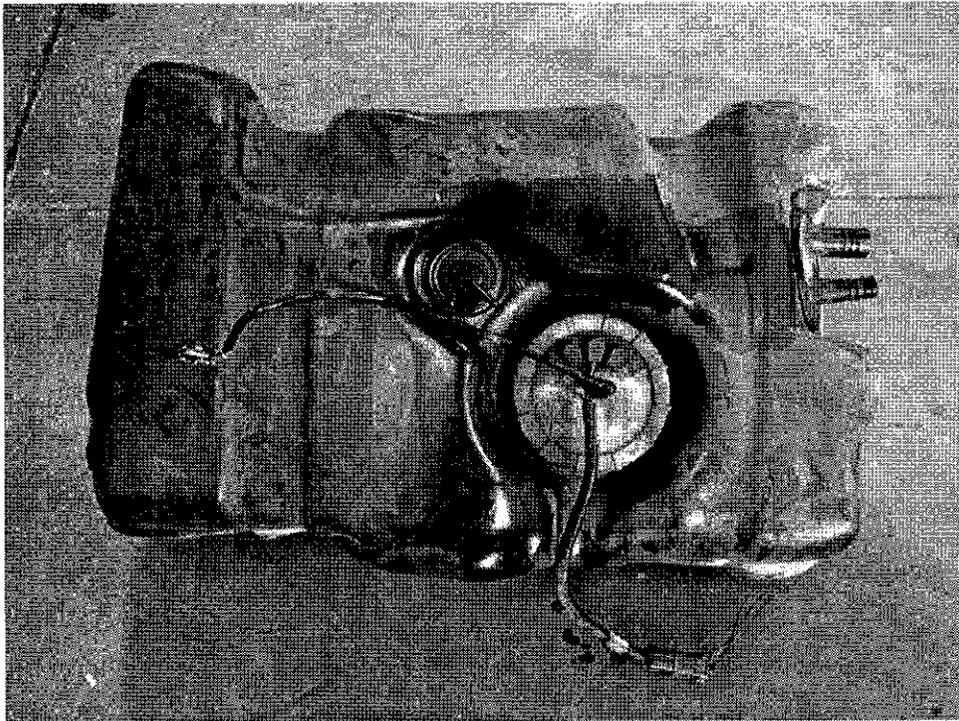


FIGURE 57. Post -Test Target Vehicle, Fuel Tank

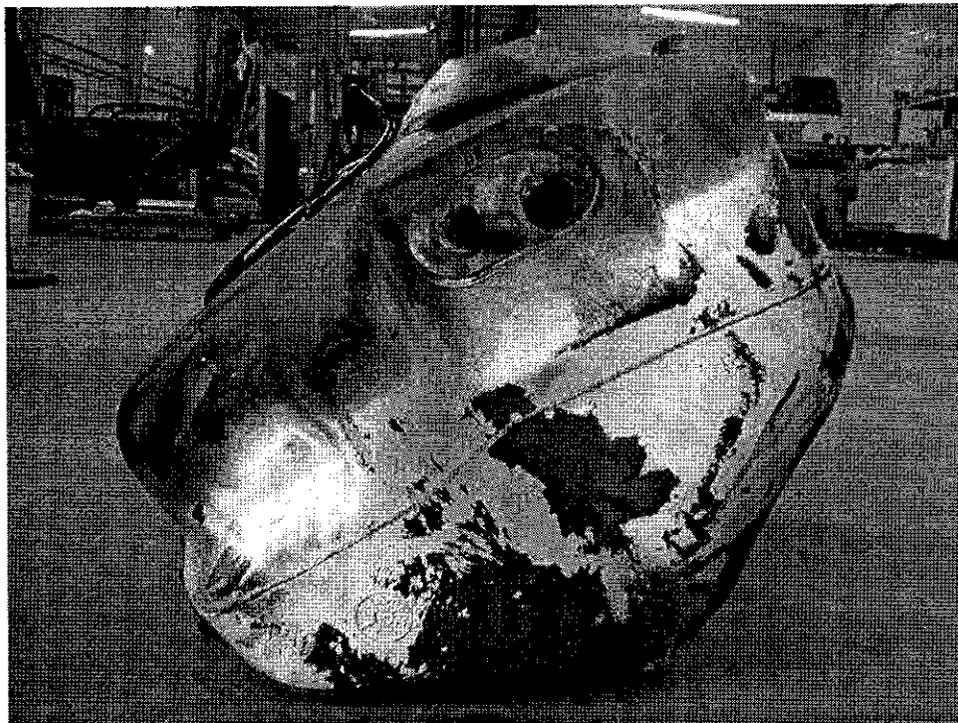


FIGURE 58. Post-Test Target Vehicle, Fuel Tank

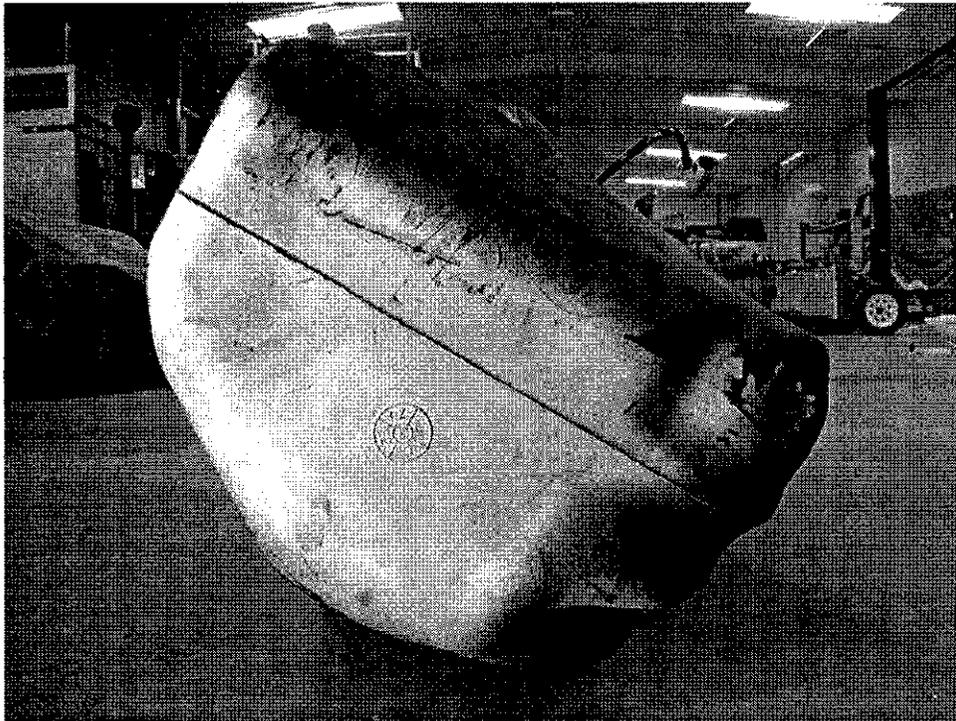


FIGURE 59. Post -Test Target Vehicle, Fuel Tank

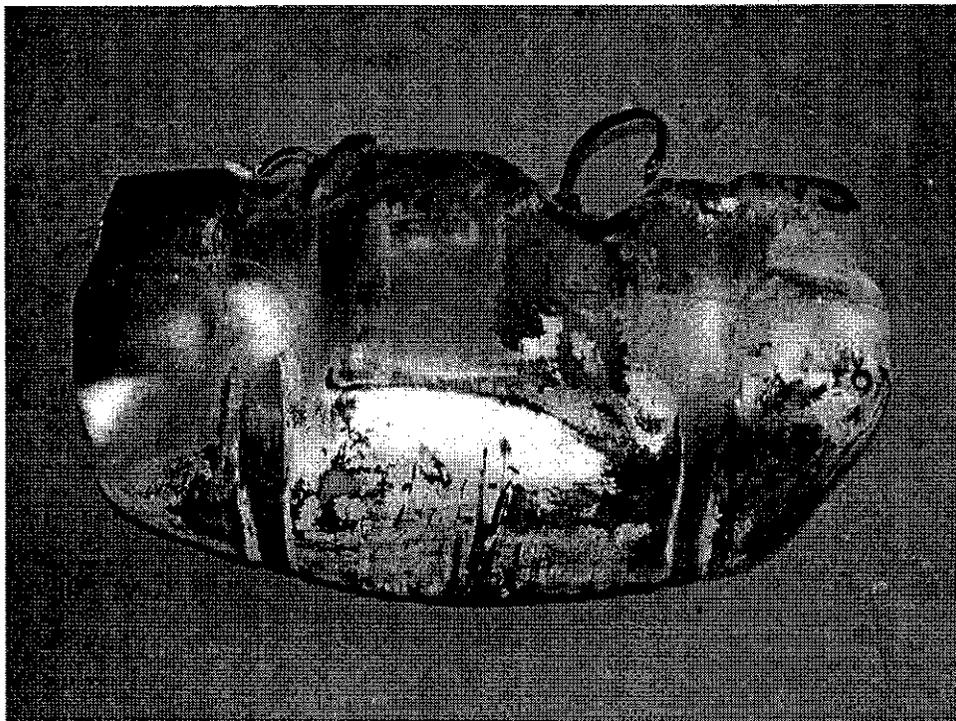


FIGURE 60. Post-Test Target Vehicle, Fuel Tank

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VEHICLE TO VEHICLE
REAR IMPACT 30 % OFFSET

1996 JEEP GRAND

CHEROKEE 1988 FORD

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REPORT P31070-01,

2011-1955

TR-P31070-01-NC,

Appendix B

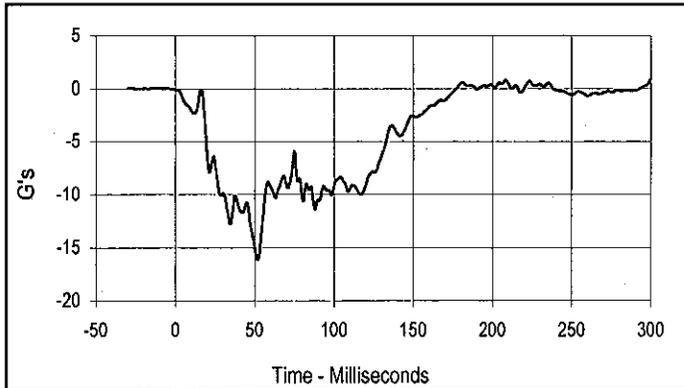
APPENDIX B
INSTRUMENTATION DATA TRACES

TABLE OF DATA PLOTS

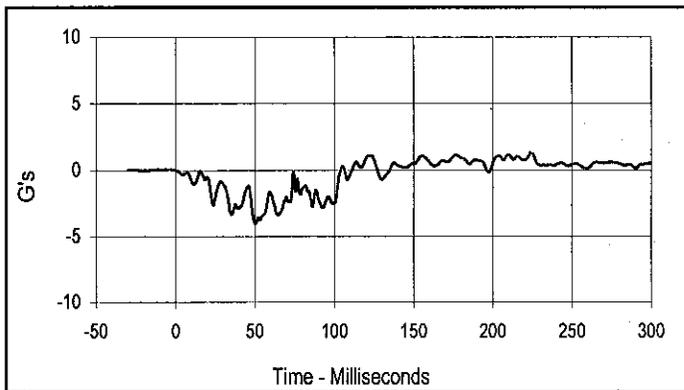
| <u>Plot</u> | | <u>Page</u> |
|-------------|---|-------------|
| 1 | Bullet Vehicle Center Tunnel X | B-1 |
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| 3 | Bullet Vehicle Center Tunnel Z | B-1 |
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| 5 | Bullet Vehicle Center Tunnel X Velocity | B-2 |
| 6 | Target Vehicle Center Tunnel X | B-3 |
| 7 | Target Vehicle Center Tunnel Y | B-3 |
| 8 | Target Vehicle Center Tunnel Z | B-3 |
| 9 | Target Vehicle Center Tunnel Resultant | B-3 |
| 10 | Target Vehicle Center Tunnel X Velocity | B-4 |

Test Vehicle: 1988 Ford Taurus 4-Dr Sedan
 Test Program: 40 MPH Rear Impact 30% Offset

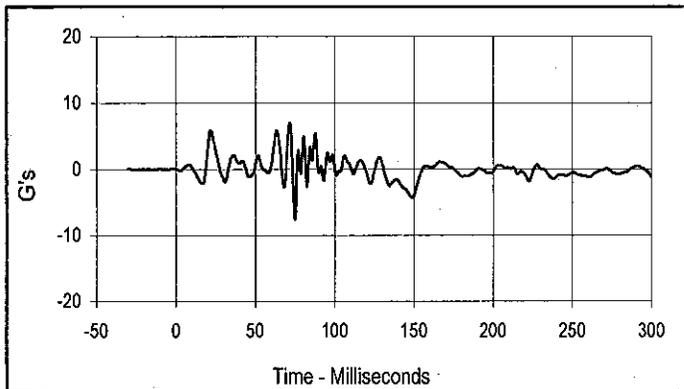
Project No.: P31070-01
 Test Date: 5/16/11



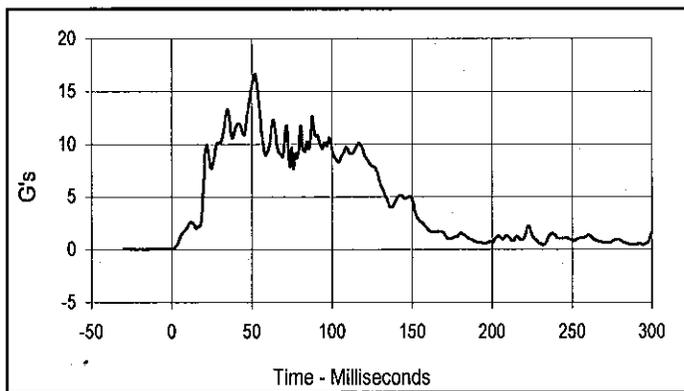
| Curve Description | | | |
|--------------------------------|-------|-----------|-------|
| Bullet Vehicle Center Tunnel X | | | |
| Plot | Type | SAE Class | Units |
| 001 | FIL | 60 | G's |
| Max | Time | Min | Time |
| 0.9 | 299.9 | -16.1 | 51.9 |



| Curve Description | | | |
|--------------------------------|-------|-----------|-------|
| Bullet Vehicle Center Tunnel Y | | | |
| Plot | Type | SAE Class | Units |
| 002 | FIL | 60 | G's |
| Max | Time | Min | Time |
| 1.3 | 223.7 | -4.1 | 50.3 |



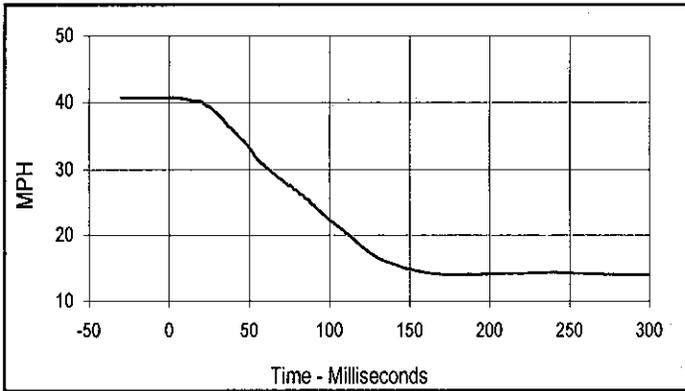
| Curve Description | | | |
|--------------------------------|------|-----------|-------|
| Bullet Vehicle Center Tunnel Z | | | |
| Plot | Type | SAE Class | Units |
| 003 | FIL | 60 | G's |
| Max | Time | Min | Time |
| 7.0 | 71.7 | -7.6 | 75.0 |



| Curve Description | | | |
|--|------|-----------|-------|
| Bullet Vehicle Center Tunnel Resultant | | | |
| Plot | Type | SAE Class | Units |
| 004 | RES | 60 | G's |
| Max | Time | Min | Time |
| 16.7 | 51.9 | 0.1 | 0.0 |

Test Vehicle: 1988 Ford Taurus 4-Dr Sedan
Test Program: 40 MPH Rear Impact 30% Offset

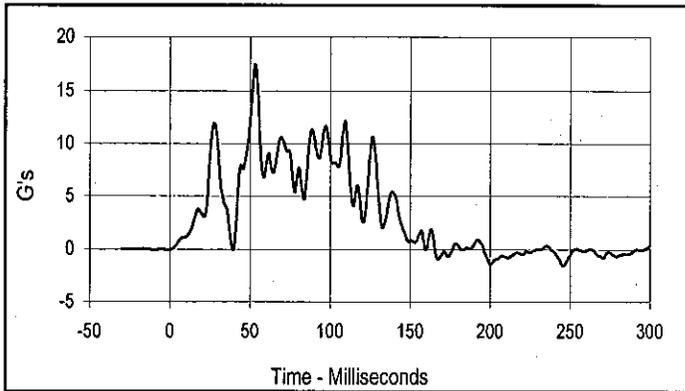
Project No.: P31070-01
Test Date: 5/16/11



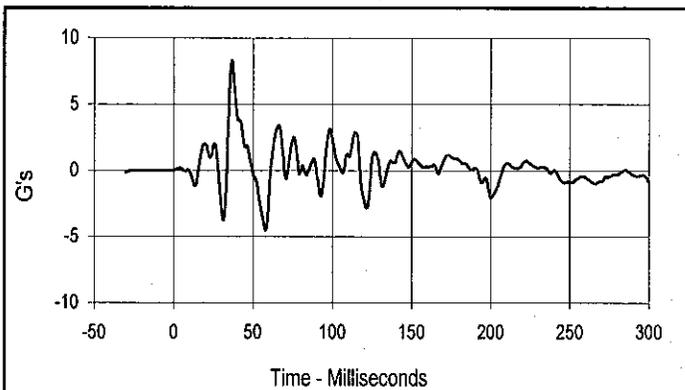
| Curve Description | | | |
|---|------|-----------|-------|
| Bullet Vehicle Center Tunnel X Velocity | | | |
| Plot | Type | SAE Class | Units |
| 005 | IN1 | 180 | MPH |
| Max | Time | Min | Time |
| 40.7 | 0.0 | 13.9 | 178.9 |

Test Vehicle: 1996 Jeep Grand Cherokee 5-Dr MPV
 Test Program: 40 MPH Rear Impact 30% Offset

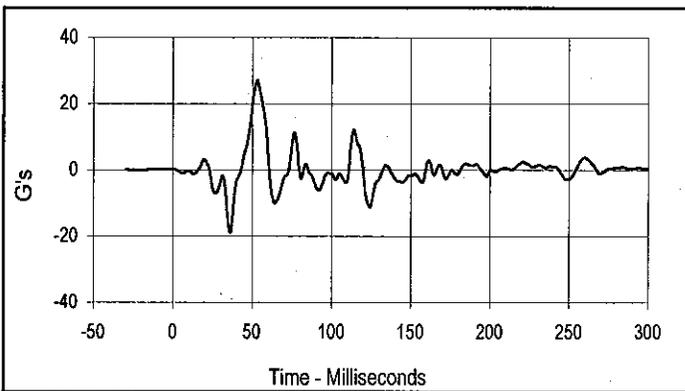
Project No.: P31070-01
 Test Date: 5/16/11



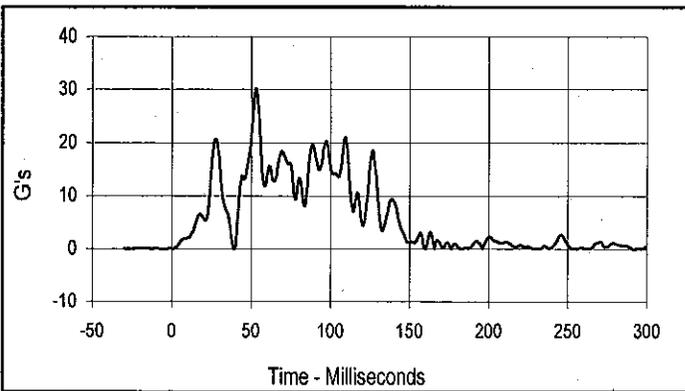
| Curve Description | | | |
|--------------------------------|------|-----------|-------|
| Target Vehicle Center Tunnel X | | | |
| Plot | Type | SAE Class | Units |
| 006 | FIL | 60 | G's |
| Max | Time | Min | Time |
| 17.4 | 53.1 | -1.6 | 245.8 |



| Curve Description | | | |
|--------------------------------|------|-----------|-------|
| Target Vehicle Center Tunnel Y | | | |
| Plot | Type | SAE Class | Units |
| 007 | FIL | 60 | G's |
| Max | Time | Min | Time |
| 8.3 | 36.7 | -4.5 | 58.0 |



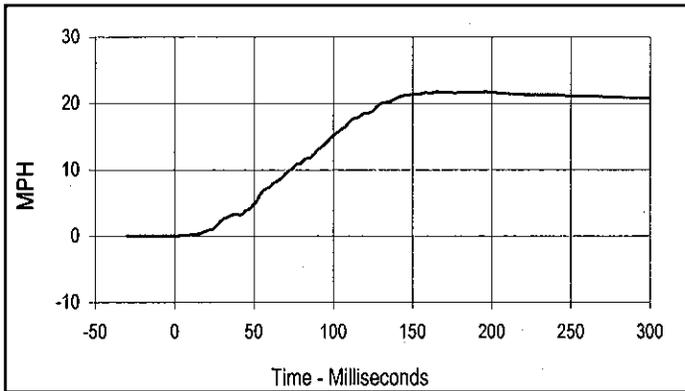
| Curve Description | | | |
|--------------------------------|------|-----------|-------|
| Target Vehicle Center Tunnel Z | | | |
| Plot | Type | SAE Class | Units |
| 008 | FIL | 60 | G's |
| Max | Time | Min | Time |
| 27.1 | 53.1 | -18.9 | 36.3 |



| Curve Description | | | |
|--|------|-----------|-------|
| Target Vehicle Center Tunnel Resultant | | | |
| Plot | Type | SAE Class | Units |
| 009 | RES | 60 | G's |
| Max | Time | Min | Time |
| 30.2 | 53.1 | 0.0 | 291.3 |

Test Vehicle: 1996 Jeep Grand Cherokee 5-Dr MPV
Test Program: 40 MPH Rear Impact 30% Offset

Project No.: P31070-01
Test Date: 5/16/11



| Curve Description | | | |
|---|-------|-----------|-------|
| Target Vehicle Center Tunnel X Velocity | | | |
| Plot | Type | SAE Class | Units |
| 010 | IN1 | 180 | MPH |
| Max | Time | Min | Time |
| 21.7 | 196.0 | 0.0 | 1.0 |

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Appendix C

APPENDIX C
INSTRUMENTATION DATA CHANNEL ASSIGNMENTS

**40 MPH Rear Impact 30% Offset
Instrumentation Data Channel Assignments
Vehicle Accelerometers
5/16/11
1988 Ford Taurus 4-Dr Sedan**

| CH. | LOCATION | AXIS | IDENT. NO. | DESCRIPTION | MFR | MODEL | UNITS |
|-----|-----------------------|------|------------|---------------------|---------|-----------|-------|
| 1 | Vehicle Center Tunnel | X | J36724 | Accel., Single Axis | Endevco | 7264-2000 | G |
| 2 | Vehicle Center Tunnel | Y | AR17 | Accel., Single Axis | Endevco | 7264-2000 | G |
| 3 | Vehicle Center Tunnel | Z | AD99 | Accel., Single Axis | Endevco | 7264-2000 | G |

1996 Jeep Grand Cherokee 5-Dr MPV

| | | | | | | | |
|---|-----------------------|---|--------|---------------------|---------|-----------|---|
| 6 | Vehicle Center Tunnel | X | J24512 | Accel., Single Axis | Endevco | 7264-2000 | G |
| 7 | Vehicle Center Tunnel | Y | B114H | Accel., Single Axis | Endevco | 7264-2000 | G |
| 8 | Vehicle Center Tunnel | Z | J24533 | Accel., Single Axis | Endevco | 7264-2000 | G |

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REPORT P31070-01,

2011-1955

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Complete Report

TEST REPORT FOR:

The Center for Auto Safety

40 mph Vehicle to Vehicle 30% Offset Rear Impact



40 mph Vehicle to Vehicle 30% Offset Rear Impact

1996 Jeep Grand Cherokee Limited

1988 Ford Taurus

PREPARED FOR:

The Center for Auto Safety

1825 Connecticut Ave, NW

Washington, DC 20009

TEST REPORT NUMBER:

TR-P31070-01-NC

TEST DATE:

May 16, 2011

REPORT DATE:

June 7, 2011



KARCO Engineering, LLC.

Automotive Research Center

9270 Holly Road

Adelanto CA 92301

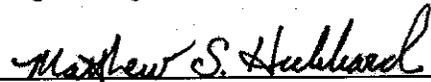
Tel: (760) 246-1672

Fax: (760) 246-8112

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Prepared By: 

Mr. Kelsey A. Chiu, Engineering Department Supervisor
KARCO Engineering, LLC.

Reviewed By: 

Mr. Mathew S. Hubbard, Quality Assurance Manager
KARCO Engineering, LLC.

Approved By: 

Mr. Michael L. Dunlap, Director of Operations
KARCO Engineering, LLC.

Approval Date: June 7, 2011

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SECTION 1
PURPOSE AND SUMMARY OF TEST

PURPOSE

This 40 mph (64.4 km/h) 30% offset rear impact test was conducted to examine the fuel system integrity of the subject target vehicle, a 1996 Jeep Grand Cherokee Limited 5-door MPV, when impacted by a target vehicle, a 1988 Ford Taurus 4-door sedan, under conditions similar to those of FMVSS 301.

The impact test was conducted in accordance with instructions received by KARCO Engineering, LLC from The Center for Auto Safety. This test was funded by the Santos Family Foundation.

SUMMARY

A 1996 Jeep Grand Cherokee Limited 5-door MPV (target vehicle) was impacted by a 1988 Ford Taurus 4-door sedan (bullet vehicle) at a velocity of 65.53 km/h. The target vehicle was sitting stationary with the transmission in neutral and the parking brake disengaged. It was oriented parallel to the bullet vehicle facing the same direction, with a target offset of 574 mm.

The test was performed at KARCO Engineering, LLC. on May 16, 2011. Pre- and post-test photographs of the vehicle and dummies can be found in Appendix A of this report. Two (2) real-time camera and three (3) high-speed cameras were used to document the vehicle to vehicle impact event.

One Part 572E 50th percentile male anthropomorphic test device (ATD) was placed in both the driver and left front seating positions of the target vehicle. Both ATD's were uninstrumented. One surrogate occupant was placed in both the driver and left front seating positions of the bullet vehicle.

The 6 channels of data were recorded on an on-board data acquisition system. Appendix B contains the dummy response data traces.

The maximum static crush of the target vehicle was 580 mm located at DPD 3 to the left of the vehicle centerline. Both the driver and passenger side doors remained closed during the impact event and were jammed shut after the impact.

The maximum static crush of the bullet vehicle was 370 mm located at DPD 4 to the right of the vehicle centerline¹. Both the driver and passenger side doors remained closed during the impact event and were operable after the impact.

The target vehicle had immediate Stoddard solvent leakage as a result of the impact with the bullet vehicle. Solvent leaked out from two (2) locations on the fuel tank, both of them were cracks formed on what was the bottom of the fuel tank. All of the Stoddard solvent leaked from the fuel tank from these two (2) locations after the impact, with only trace amounts remaining in the tank.

The hoses routed to the fuel filler remained attached to the fuel tank and the filler neck, and were not severed. The fuel tank did end up with cracks in the plastic around the hose connections, but no Stoddard solvent leaked from that area.

An FMVSS 301 rollover was not performed on the target vehicle as all of the Stoddard solvent had already leaked from the fuel tank.

¹ -Post-Test measurements were taken without the bumper fascia due to damage to the fascia as a result of the impact.

SECTION 2
DATA SHEETS

Bullet Vehicle: 1988 Ford Taurus 4-Door Sedan Project No.: P31070-01

Target Vehicle: 1996 Jeep Grand Cherokee Limited 5-Door MPV Test Date: 05/16/11

CONVERSION FACTORS

| Quantity | Typical Application | Std Units | Metric Unit | Multiply By |
|--------------------|---------------------|---------------------|-------------|------------------|
| Mass | Vehicle Weight | lb | kg | 0.4536 |
| Linear Velocity | Impact Velocity | miles/hr | km/hr | 1.609344 |
| Length or Distance | Measurements | in | mm | 25.4 |
| Volume | Fuel Systems | gal | liter | 3.785 |
| Volume | Small Fluids | oz | mL | 29.573 |
| Pressure | Tire Pressures | lbf/in ² | kPa | 7.0 |
| Volume | Liquid | gal | liter | 3.785 |
| Temperature | General Use | °F | °C | $=(tf - 32)/1.8$ |
| Force | Dynamic Forces | lbf | N | 4.448 |
| Moment | Torque | lbf·ft | N·m | 1.355 |

**DATA SHEET NO. 1
CRASH TEST SUMMARY**

Bullet Vehicle: 1988 Ford Taurus 4-Door Sedan Project No.: P31070-01
 Target Vehicle: 1996 Jeep Grand Cherokee Limited 5-Door MPV Test Date: 05/16/11

PRIMARY IMPACT DATA

| Parameter | Units | Value |
|-------------------------------------|-------|--------|
| Bullet Vehicle Velocity at Impact | km/h | 65.53 |
| Bullet Vehicle Test Weight | kg | 1529.0 |
| Bullet Vehicle Maximum Static Crush | mm | 370 |
| Target Vehicle Test Weight | kg | 1899.0 |
| Target Vehicle Maximum Static Crush | mm | 580 |
| Impact Point (From Centerline) | mm | 560 |

BULLET VEHICLE DOOR OPENING AND SEAT TRACK DATA

| Description | Driver | Passenger |
|--------------------|---------------------------------|---------------------------------|
| Front Door Opening | Remained closed and operational | Remained closed and operational |
| Rear Door Opening | Remained closed and operational | Remained closed and operational |
| Seat Track Shift | Unknown | Unknown |
| Seat Back Failure | No | No |

TARGET VEHICLE DOOR OPENING AND SEAT TRACK DATA

| Description | Driver | Passenger |
|--------------------|-------------|-------------|
| Front Door Opening | Jammed shut | Jammed shut |
| Rear Door Opening | Jammed shut | Jammed shut |
| Seat Track Shift | Unknown | Unknown |
| Seat Back Failure | Yes | Yes |

VIDEO COVERAGE

| Description | Number |
|--------------------------|--------|
| High Speed Video Cameras | 3 |
| Real Time Video Cameras | 2 |
| Total | 5 |

INSTRUMENTATION SUMMARY

| Description | Number |
|---|--------|
| Driver ATD Sensors | |
| Passenger ATD Sensors | |
| Bullet Vehicle Structure Accelerometers | 3 |
| Target Vehicle Structure Accelerometers | 3 |
| Total | 6 |

DATA SHEET NO. 2

BULLET VEHICLE PARAMETER DATA

Bullet Vehicle: 1988 Ford Taurus 4-Door Sedan Project No.: P31070-01
 Target Vehicle: 1996 Jeep Grand Cherokee Limited 5-Door MPV Test Date: 05/16/11

BULLET VEHICLE INFORMATION AND OPTIONS

| | |
|-------------------------|-------------------|
| Make | Ford |
| Year | 1988 |
| Model | Taurus |
| Body Style | 4-Door Sedan |
| VIN | 1FABP52U8JG196592 |
| Body Color | Tan |
| Delivery Date | 5/6/2011 |
| Odometer Reading (mi) | 48,952 |
| Odometer Reading (km) | 78,781 |
| Dealer | |
| Transmission | 3-Speed Automatic |
| Final Drive | Front |
| Type / No. of Cylinders | V6 |
| Engine Displacement (L) | 3.0 |

| | |
|---------------------|------------|
| Engine Placement | Transverse |
| Power Brakes | Yes |
| Front Disc Brakes | Yes |
| Rear Disc Brakes | No |
| Anti-Lock Brakes | No |
| Driver Front Airbag | No |
| Pass. Front Airbag | No |
| Power Windows | No |
| Power Steering | Yes |
| Tilt Wheel | Yes |
| Power Door Locks | Yes |
| Air Conditioning | Yes |
| Power Seat | Yes |
| AM/FM/Cassette | Yes |

DATA FROM CERTIFICATION LABEL

| | |
|---------------------|----------------|
| Manufactured By | Ford Motor Co. |
| Date of Manufacture | Feb-88 |

| | |
|-----------------|--------|
| GVWR (kg) | 2093.0 |
| GAWR Front (kg) | 1176.0 |
| GAWR Rear (kg) | 968.0 |

VEHICLE SEATING AND CAPACITY WEIGHT INFORMATION

| Measured Parameter | Front | Rear | Third | Total |
|----------------------------|--------|-------|-------|-------|
| Type of Seats | Bucket | Bench | | |
| Number of Occupants | 2 | 3 | | 5 |
| Capacity Weight (VCW) (kg) | | | | 408.0 |
| Cargo Weight (RCLW) (kg) | | | | 67.8 |

DATA SHEET NO. 2 ... (CONTINUED)

BULLET VEHICLE PARAMETER DATA

Bullet Vehicle: 1988 Ford Taurus 4-Door Sedan Project No.: P31070-01
 Target Vehicle: 1996 Jeep Grand Cherokee Limited 5-Door MPV Test Date: 05/16/11

BULLET VEHICLE WEIGHTS

| | Units | As Delivered Weights (UVW) | | | As Tested Weights (ATW) | | |
|-------|-------|----------------------------|-----------|--------|-------------------------|-----------|--------|
| | | Front Axle | Rear Axle | Total | Front Axle | Rear Axle | Total |
| Left | kg | 503.5 | 203.5 | | 514.5 | 273.0 | |
| Right | kg | 401.5 | 268.0 | | 461.0 | 280.5 | |
| Ratio | % | 65.7% | 34.3% | 100.0% | 63.8% | 36.2% | 100.0% |
| Total | kg | 905.0 | 471.5 | 1376.5 | 975.5 | 553.5 | 1529.0 |

BULLET VEHICLE TARGET TEST WEIGHT CALCULATION

| Measured Parameter | Units | Value | |
|---|-------|--------|-------|
| Total Delivered Weight (UVW) | kg | 1376.5 | A |
| Weight of Surrogate Occupants | kg | 170.0 | B |
| Rated Cargo/Luggage Weight (RCLW) | kg | 67.8 | C |
| Calculated Vehicle Target Weight (TVTW) | kg | 1614.3 | A+B+C |

BULLET VEHICLE ATTITUDES

| Condition | Units | LF | RF | LR | RR |
|--------------|-------|-----|-----|-----|-----|
| As Delivered | mm | 696 | 693 | 654 | 647 |
| As Tested | mm | 667 | 665 | 615 | 608 |
| Post-Test | mm | 649 | 695 | 628 | 609 |

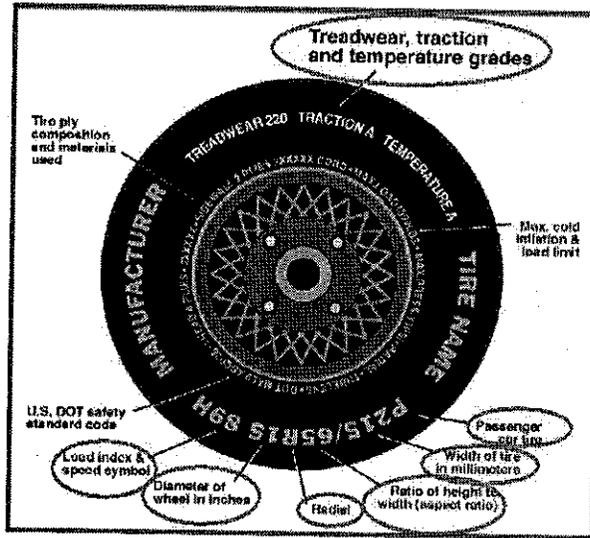
| Description | Units | Value |
|----------------------------|-------|-------|
| Vehicle Components Removed | kg | 0.0 |
| Ballast Added | kg | 36.0 |

BULLET VEHICLE COMPONENTS REMOVED:

None

DATA SHEET NO. 2 ... (CONTINUED)
BULLET VEHICLE PARAMETER DATA

Bullet Vehicle: 1988 Ford Taurus 4-Door Sedan Project No.: P31070-01
 Target Vehicle: 1996 Jeep Grand Cherokee Limited 5-Door MPV Test Date: 05/16/11



BULLET VEHICLE TIRE INFORMATION

| Measured Parameter | Front | Rear |
|---------------------------|----------------------|----------------------|
| Max. Tire Pressure (kPa) | 245 | 245 |
| Cold Pressure (kPa) | 240 | 240 |
| Recommended Tire Size | P205/70R14 | P205/70R14 |
| Tire Size on Vehicle | P195/70R14 | P195/70R14 |
| Tire Manufacturer | Futura | Futura |
| Tire Model | 775 | 775 |
| Treadwear | 380 | 380 |
| Traction | A | A |
| Temperature Grades | B | B |
| Tire Plies Sidewall | 2 Polyester | 2 Polyester |
| Tire Plies Body | 2 Steel, 1 Polyester | 2 Steel, 1 Polyester |
| Load Index / Speed Symbol | 90S | 90S |
| Tire Material | Polyester, Steel | Polyester, Steel |
| DOT Safety Code Left | U9RW XC8 0304 B12L | U9RW XC8 3003 B12L |
| DOT Safety Code Right | U9RW XC8 0404 A12L | U9RW XC8 0304 B12R |

DATA SHEET NO. 3

BULLET VEHICLE ACCELEROMETER DATA

Bullet Vehicle: 1988 Ford Taurus 4-Door Sedan Project No.: P31070-01
Target Vehicle: 1996 Jeep Grand Cherokee Limited 5-Door MPV Test Date: 05/16/11

BULLET VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

| No. | Description | Location | | |
|-----|---------------------------|----------|---|-----|
| | | X | Y | Z |
| 1 | Vehicle Center of Gravity | 2187 | 0 | 277 |

Reference Points: X – Rear Surface of Vehicle (+ forward)
Y – Vehicle Centerline (+ to left)
Z – Ground Plane (+ up)

DATA SHEET NO. 4

BULLET VEHICLE ACCIDENT INVESTIGATION DATA

Bullet Vehicle: 1988 Ford Taurus 4-Door Sedan Project No.: P31070-01
 Target Vehicle: 1996 Jeep Grand Cherokee Limited 5-Door MPV Test Date: 05/16/11

VEHICLE INFORMATION

VIN: 1FABP52U8JG196592 Wheelbase (mm): Unknown
 Vehicle Size Category: 4-Door Sedan Test Weight (kg): 1529.0

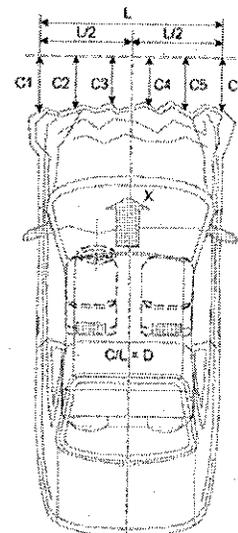
ACCELEROMETER DATA

Accelerometer Locations: Vehicle Center Tunnel
 Cal. Procedure/Interval: Drop Test / 6 months
 Integration Algorithm: NHTSA Standard
 Impact Velocity (km/h): 65.53
 Velocity Change (km/h): 43.1
 Time of Separation (msec): n/a

Linearity: Good

CRUSH PROFILE

Collision Deformation Classification: 01FZEW2
 Midpoint of Damage: Vehicle Centerline
 Damage Region Length (mm): 1507
 Impact Mode: Offset Frontal



| No. | Measurement Description | Units | Pre-Test | Post-Test ² | Difference |
|-----|----------------------------|-------|----------|------------------------|------------|
| C1 | Crush Zone 1 at Left Side | mm | 160 | 180 | -20 |
| C2 | Crush Zone 2 at Left Side | mm | 60 | 110 | -50 |
| C3 | Crush Zone 3 at Left Side | mm | 20 | 383 | -363 |
| C4 | Crush Zone 4 at Right Side | mm | 20 | 390 | -370 |
| C5 | Crush Zone 5 at Right Side | mm | 60 | 283 | -223 |
| C6 | Crush Zone 6 at Right Side | mm | 160 | 271 | -111 |
| L | C1 to C6 | mm | 1507 | | |

² – Post-Test measurements were taken without the bumper fascia due to damage to the fascia as a result of the impact.

DATA SHEET NO. 5

TARGET VEHICLE PARAMETER DATA

Bullet Vehicle: 1988 Ford Taurus 4-Door Sedan Project No.: P31070-01
 Target Vehicle: 1996 Jeep Grand Cherokee Limited 5-Door MPV Test Date: 05/16/11

TARGET VEHICLE INFORMATION AND OPTIONS

| | |
|-------------------------|------------------------|
| Make | Jeep |
| Year | 1996 |
| Model | Grand Cherokee Limited |
| Body Style | 5-Door MPV |
| VIN | 1J4GZ78S7TC184529 |
| Body Color | White |
| Delivery Date | 5/6/2011 |
| Odometer Reading (mi) | 172,686 |
| Odometer Reading (km) | 277,911 |
| Dealer | |
| Transmission | 4-Speed Automatic |
| Final Drive | 4x4 |
| Type / No. of Cylinders | Inline-6 |
| Engine Displacement (L) | 4.0 |

| | |
|---------------------|--------------|
| Engine Placement | Longitudinal |
| Power Brakes | Yes |
| Front Disc Brakes | Yes |
| Rear Disc Brakes | Yes |
| Anti-Lock Brakes | Yes |
| Driver Front Airbag | Yes |
| Pass. Front Airbag | Yes |
| Power Windows | Yes |
| Power Steering | Yes |
| Tilt Wheel | Yes |
| Power Door Locks | Yes |
| Air Conditioning | Yes |
| Power Seat | Yes |
| AM/FM/Cassette | Yes |

DATA FROM CERTIFICATION LABEL

| | |
|---------------------|----------------------|
| Manufactured By | Chrysler Corporation |
| Date of Manufacture | Oct-95 |

| | |
|-----------------|--------|
| GVWR (kg) | 2405.0 |
| GAWR Front (kg) | 1248.0 |
| GAWR Rear (kg) | 1339.0 |

VEHICLE SEATING AND CAPACITY WEIGHT INFORMATION

| Measured Parameter | Front | Rear | Third | Total |
|----------------------------|--------|-------|-------|-------------|
| Type of Seats | Bucket | Bench | | |
| Number of Occupants | 2 | 3 | | 5 |
| Capacity Weight (VCW) (kg) | | | | Unavailable |
| Cargo Weight (RCLW) (kg) | | | | Unavailable |

DATA SHEET NO. 5 ... (CONTINUED)

TARGET VEHICLE PARAMETER DATA

Bullet Vehicle: 1988 Ford Taurus 4-Door Sedan Project No.: P31070-01
 Target Vehicle: 1996 Jeep Grand Cherokee Limited 5-Door MPV Test Date: 05/16/11

TARGET VEHICLE WEIGHTS

| | Units | As Delivered Weights (UVW) | | | As Tested Weights (ATW) | | |
|-------|-------|----------------------------|-----------|--------|-------------------------|-----------|--------|
| | | Front Axle | Rear Axle | Total | Front Axle | Rear Axle | Total |
| Left | kg | 505.5 | 378.5 | | 544.0 | 420.0 | |
| Right | kg | 502.0 | 359.5 | | 533.0 | 402.0 | |
| Ratio | % | 57.7% | 42.3% | 100.0% | 56.7% | 43.3% | 100.0% |
| Total | kg | 1007.5 | 738.0 | 1745.5 | 1077.0 | 822.0 | 1899.0 |

TARGET VEHICLE TARGET TEST WEIGHT CALCULATION

| Measured Parameter | Units | Value | |
|---|-------|--------|-------|
| Total Delivered Weight (UVW) | kg | 1745.5 | A |
| Weight of 2 P572E ATD's | kg | 152.0 | B |
| Rated Cargo/Luggage Weight (RCLW) | kg | 136.0 | C |
| Calculated Vehicle Target Weight (TVTW) | kg | 2033.5 | A+B+C |

TARGET VEHICLE ATTITUDES

| Condition | Units | LF | RF | LR | RR |
|--------------|-------|-----|-----|-----|-----|
| As Delivered | mm | 810 | 810 | 825 | 824 |
| As Tested | mm | 792 | 799 | 814 | 802 |
| Post-Test | mm | 806 | 781 | 690 | 728 |

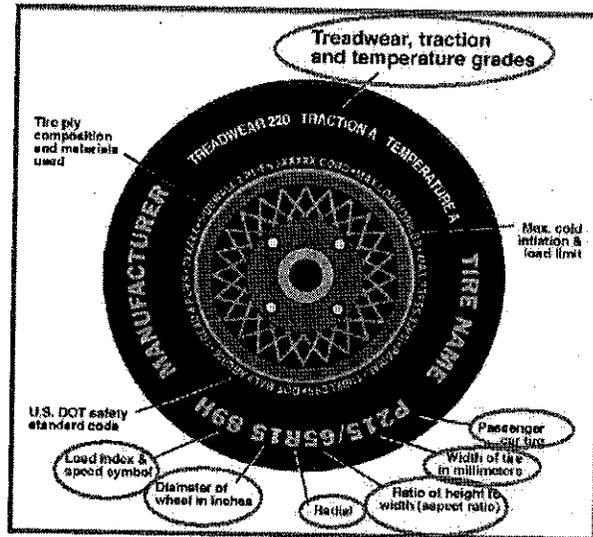
| Description | Units | Value |
|----------------------------|-------|-------|
| Vehicle Components Removed | kg | 52.5 |
| Ballast Added | kg | 38.0 |

TARGET VEHICLE COMPONENTS REMOVED:

Rear Door Panels (5.0 kg), Front Door Panels (7.0 kg), Rear Door Side Windows (12.0 kg)
Outboard Mirrors (3.0 kg), Rear Door Speakers (2.0 kg), Spare Tire (21.5 kg), Front Door
Speakers (2.0 kg)

DATA SHEET NO. 5 ... (CONTINUED)
TARGET VEHICLE PARAMETER DATA

Bullet Vehicle: 1988 Ford Taurus 4-Door Sedan Project No.: P31070-01
 Target Vehicle: 1996 Jeep Grand Cherokee Limited 5-Door MPV Test Date: 05/16/11



TARGET VEHICLE TIRE INFORMATION

| Measured Parameter | Front | Rear |
|---------------------------|------------------------------|------------------------------|
| Max. Tire Pressure (kPa) | 300 | 300 |
| Cold Pressure (kPa) | 248 | 248 |
| Recommended Tire Size | P225/75R16 | P225/75R16 |
| Tire Size on Vehicle | P245/70R16 | P245/70R16 |
| Tire Manufacturer | Kumho | Kumho |
| Tire Model | Solus KR21 | Solus KR21 |
| Treadwear | 680 | 680 |
| Traction | A | A |
| Temperature Grades | B | B |
| Tire Plies Sidewall | 2 Polyester | 2 Polyester |
| Tire Plies Body | 2 Polyester, 2 Steel, 1Nylon | 2 Polyester, 2 Steel, 1Nylon |
| Load Index / Speed Symbol | 101T | 101T |
| Tire Material | Polyester, Steel, Nylon | Polyester, Steel, Nylon |
| DOT Safety Code Left | C0VH YP6V 2507 | C0VH YP6V 2507 |
| DOT Safety Code Right | C0VH YP6V 2507 | C0VH YP6V 2507 |

DATA SHEET NO. 6

TARGET VEHICLE ACCELEROMETER DATA

Bullet Vehicle: 1988 Ford Taurus 4-Door Sedan Project No.: P31070-01

Target Vehicle: 1996 Jeep Grand Cherokee Limited 5-Door MPV Test Date: 05/16/11

TARGET VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

| No. | Description | Location | | |
|-----|---------------------------|----------|---|-----|
| | | X | Y | Z |
| 1 | Vehicle Center of Gravity | 1745 | 0 | 498 |

Reference Points: X – Rear Surface of Vehicle (+ forward)
Y – Vehicle Centerline (+ to left)
Z – Ground Plane (+ up)

DATA SHEET NO. 7

TARGET VEHICLE ACCIDENT INVESTIGATION DATA

Bullet Vehicle: 1988 Ford Taurus 4-Door Sedan Project No.: P31070-01
 Target Vehicle: 1996 Jeep Grand Cherokee Limited 5-Door MPV Test Date: 05/16/11

VEHICLE INFORMATION

VIN: 1J4GZ78S7TC184529
 Vehicle Size Category: 5-Door MPV

Wheelbase (mm): 2690
 Test Weight (kg): 1899.0

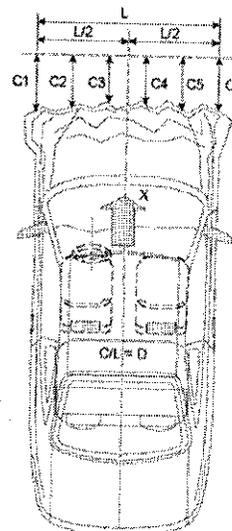
ACCELEROMETER DATA

Accelerometer Locations: Vehicle Center Tunnel
 Cal. Procedure/Interval: Drop Test / 6 months
 Integration Algorithm: NHTSA Standard
 Impact Velocity (km/h): 65.53
 Velocity Change (km/h): 34.9
 Time of Separation (msec): n/a

Linearity: Good

CRUSH PROFILE

Collision Deformation Classification: 07BYEW4
 Midpoint of Damage: Vehicle Centerline
 Damage Region Length (mm): 1465
 Impact Mode: Offset Frontal



| No. | Measurement Description | Units | Pre-Test | Post-Test | Difference |
|-----|----------------------------|-------|----------|-----------|------------|
| C1 | Crush Zone 1 at Left Side | mm | 65 | 85 | -20 |
| C2 | Crush Zone 2 at Left Side | mm | 0 | 303 | -303 |
| C3 | Crush Zone 3 at Left Side | mm | 20 | 600 | -580 |
| C4 | Crush Zone 4 at Right Side | mm | 20 | 543 | -523 |
| C5 | Crush Zone 5 at Right Side | mm | 0 | 507 | -507 |
| C6 | Crush Zone 6 at Right Side | mm | 65 | 520 | -455 |
| L | C1 to C6 | mm | 1465 | | |

DATA SHEET NO. 8

TARGET VEHICLE PROFILE MEASUREMENTS

Bullet Vehicle: 1988 Ford Taurus 4-Door Sedan Project No.: P31070-01
 Target Vehicle: 1996 Jeep Grand Cherokee Limited 5-Door MPV Test Date: 05/16/11

TARGET VEHICLE PROFILE MEASUREMENTS

| No. | Measurement Description | Pre-Test | Post-Test | Difference |
|-----|--|----------|-----------|------------|
| 1 | Total Length of Vehicle at Centerline | 4500 | 3970 | -530 |
| 2 | Rear Surface of Vehicle to Front of Engine | | | |
| 3 | RSOV to Firewall | | | |
| 4 | FSOV to Upper Leading Edge of Right Door | 1383 | 1405 | 22 |
| 5 | FSOV to Upper Leading Edge of Left Door | 1385 | 1391 | 6 |
| 6 | FSOV to Lower Leading Edge of Right Door | 1430 | 1428 | -2 |
| 7 | FSOV to Lower Leading Edge of Left Door | 1435 | 1422 | -13 |
| 8 | FSOV to Upper Trailing Edge of Right Door | 2446 | 2469 | 23 |
| 9 | FSOV to Upper Trailing Edge of Left Door | 2448 | 2456 | 8 |
| | FSOV to Leading Edge of Left Door | 1385 | 1391 | 6 |
| | FSOV to Leading Edge of Right Door | 1383 | 1405 | 22 |
| | FSOV to Trailing Edge of Left Door | 2448 | 2456 | 8 |
| | FSOV to Trailing Edge of Right Door | 2446 | 2469 | 23 |
| 10 | FSOV to Lower Trailing Edge of Right Door | 2471 | 2479 | 8 |
| 11 | FSOV to Lower Trailing Edge of Left Door | 2469 | 2470 | 1 |
| | FSOV to Upper Trailing Edge of Right Rear Door | 3351 | 3359 | 8 |
| | FSOV to Upper Trailing Edge of Left Rear Door | 3351 | 3340 | -11 |
| | FSOV to Trailing Edge of Right Rear Door | 3351 | 3359 | 8 |
| | FSOV to Trailing Edge of Left Rear Door | 3351 | 3355 | 4 |
| | FSOV to Lower Trailing Edge of Right Rear Door | 3062 | 3067 | 5 |
| | FSOV to Lower Trailing Edge of Left Rear Door | 3064 | 3053 | -11 |
| 12 | FSOV to Bottom of A-Pillar of Right Side | 1431 | 1432 | 1 |
| 13 | FSOV to Bottom of A-Pillar of Left Side | 1433 | 1424 | -9 |
| | FSOV to Bottom of B-Pillar on Right Side | 2480 | 2477 | -3 |
| | FSOV to Bottom of B-Pillar on Left Side | 2480 | 2475 | -5 |
| | FSOV to Bottom of C-Pillar on Right Side | 3350 | 3358 | 8 |
| | FSOV to Bottom of C-Pillar on Left Side | 3355 | 3313 | -42 |
| 14 | RSOV to Firewall, Right Side | | | |
| 15 | RSOV to Firewall, Left Side | | | |
| 16 | FSOV to Steering Column | 1877 | 1935 | 58 |
| 17 | Center of Steering Column to A-Pillar | 402 | 400 | -2 |
| 18 | Center of Steering Column to Headliner | 420 | 435 | 15 |
| 19 | FSOV to Right Side of Rear Bumper | 3813 | 4237 | 424 |
| 20 | FSOV to Left Side of Rear Bumper | 3814 | 3627 | -187 |

All measurements in millimeters.

DATA SHEET NO. 9

TARGET VEHICLE STRUCTURAL MEASUREMENTS

Bullet Vehicle: 1988 Ford Taurus 4-Door Sedan Project No.: P31070-01
 Target Vehicle: 1996 Jeep Grand Cherokee Limited 5-Door MPV Test Date: 05/16/11

TARGET VEHICLE STRUCTURAL MEASUREMENTS

| No. | Description | Pre-Test | Post-Test | Difference |
|-----|---------------------------------------|----------|-----------|------------|
| 1 | Total Length | 4500 | 4450 | -50 |
| 2 | Total Width | 1765 | 2060 | 295 |
| 3 | Bumper Top Height | 705 | 735 | 30 |
| 4 | Bumper Bottom Height | 350 | 390 | 40 |
| 5 | Longitudinal Member Top Height | | | |
| 6 | Distance Between Longitudinal Members | | | |
| 7 | Longitudinal Member Width | | | |
| 8 | Engine Top Height | | | |
| 9 | Engine Bottom Height | | | |
| 10 | Engine and Gearbox Width | | | |
| 11 | Front Bumper to Engine Distance | | | |
| 12 | Front Shock Absorber Fixing Height | | | |
| 13 | Bonnet Leading Edge Height | | | |
| 14 | Front Shock Absorber Fixing Width | | | |
| 15 | Front Bumper to Front Axle Distance | | | |
| 16 | Front Axle to A-Pillar Distance | 610 | 610 | 0 |
| 17 | A-Pillar to B-Pillar Distance | 978 | 975 | -3 |
| | C-Pillar to Rear Axle Distance | 433 | 355 | -78 |
| 18 | B-Pillar to Rear Axle Distance | 1035 | 935 | -100 |
| 19 | B-Pillar to C-Pillar Distance | 840 | 813 | -27 |
| 20 | Roof Sill Bottom Height | 1522 | 1524 | 2 |
| 21 | Roof Sill Top Height | 1601 | 1600 | -1 |
| 22 | Floor Sill Bottom Height | 361 | 365 | 4 |
| 23 | Floor Sill Top Height | 498 | 503 | 5 |

All measurements in millimeters.

DATA SHEET NO. 10

TARGET VEHICLE INTRUSION MEASUREMENTS

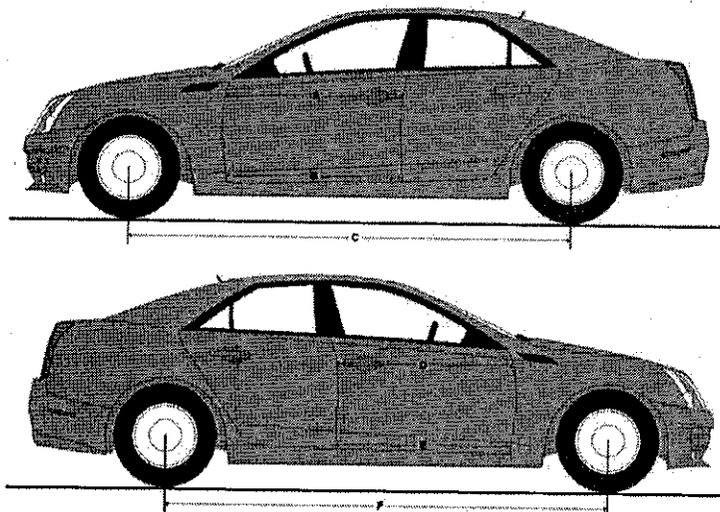
Bullet Vehicle: 1988 Ford Taurus 4-Door Sedan Project No.: P31070-01
 Target Vehicle: 1996 Jeep Grand Cherokee Limited 5-Door MPV Test Date: 05/16/11

DOOR OPENING WIDTH

| Item | Description | Units | Pre-Test | Post-Test | Difference |
|------|------------------------|-------|----------|-----------|------------|
| A | Left Side Front Upper | mm | 980 | 975 | -5 |
| B | Left Side Front Lower | mm | 921 | 926 | 5 |
| | Left Side Rear Upper | mm | 840 | 796 | -44 |
| | Left Side Rear Lower | mm | 544 | 528 | -16 |
| D | Right Side Front Upper | mm | 976 | 975 | -1 |
| E | Right Side Front Lower | mm | 920 | 918 | -2 |
| | Right Side Rear Upper | mm | 840 | 823 | -17 |
| | Right Side Rear Lower | mm | 541 | 526 | -15 |

WHEELBASE MEASUREMENTS

| Item | Description | Units | Pre-Test | Post-Test | Difference |
|------|----------------------|-------|----------|-----------|------------|
| C | Left Side Wheelbase | mm | 2690 | 2610 | -80 |
| F | Right Side Wheelbase | mm | 2690 | 2690 | 0 |



DATA SHEET NO. 10 ... (CONTINUED)

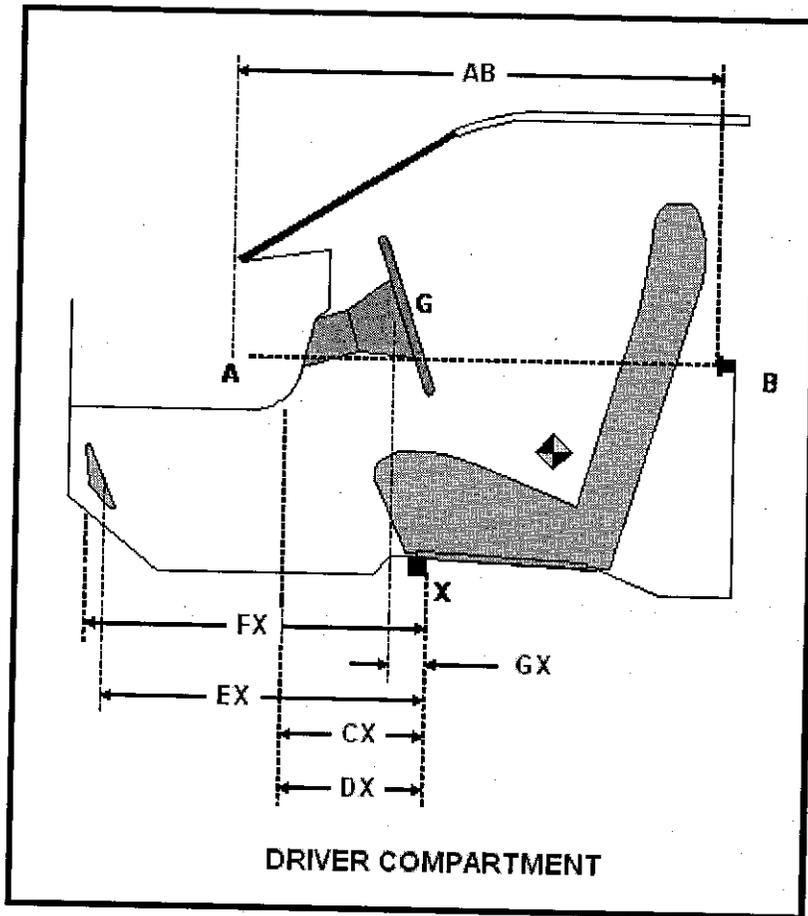
TARGET VEHICLE INTRUSION MEASUREMENTS

Bullet Vehicle: 1988 Ford Taurus 4-Door Sedan Project No.: P31070-01
 Target Vehicle: 1996 Jeep Grand Cherokee Limited 5-Door MPV Test Date: 05/16/11

DRIVER COMPARTMENT INTRUSION

| Item | Description | Units | Pre-Test | Post-Test | Difference |
|------|-----------------------------------|-------|----------|-----------|------------|
| AB | Door Opening (Inside Window Jam) | mm | 980 | 903 | -77 |
| CX | Left Knee Bolster to X | mm | 302 | 320 | 18 |
| DX | Right Knee Bolster to X | mm | 325 | 285 | -40 |
| EX | Brake Pedal to X | mm | 464 | 540 | 76 |
| FX | Foot Rest to X | mm | 690 | 600 | -90 |
| GX | Center of Steering Wheel Hub to X | mm | 115 | 20 | -95 |

X = Front of Seat Track (Stationary)



**APPENDIX A
PHOTOGRAPHS**

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FIGURE 1. Bullet Vehicle, As Received



FIGURE 2. Bullet Vehicle, As Received

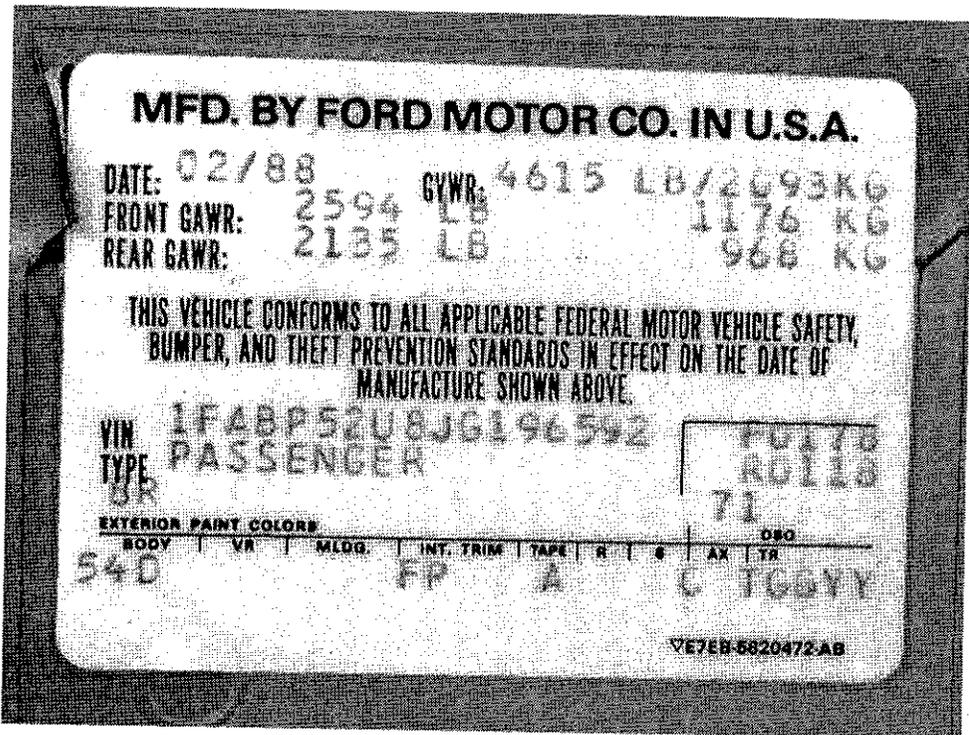


FIGURE 3. Bullet Vehicle Manufacturer's Label

| MODEL | | LOAD RANGE | RECOMMENDED TIRE SIZE AND INFLATION PRESSURE (COLD) | |
|--|---|---|---|---|
| MODELO | | CARGA MAXIMA | TAMANO DE NEUMATICO INFLACION EN CIERRE (FRODO) | |
| | | | FRONT (DELANTERA) | REAR (ATRAS) |
| ALL TOURS | STD | P205/70R14 P205/65R15 | 35 PSI (lb/pul) 240 kPa | 35 PSI (lb/pul) 240 kPa |
| ALL TOURS | T | T135/80R14 T135/80D14 TEMPORAL SPARE REPLETIDO TEMPORAL | 60 PSI (lb/pul) 415 kPa | 60 PSI (lb/pul) 415 kPa |
| TOTAL LOAD - OCCUPANTES PLUS CARGA - CARGA TOTAL ADICIONALES MAS CARGA | | | | |
| MODEL - MODELO | MAXIMUM LOAD - CARGA MAXIMA | OCCUPANTS - PASAJEROS | DISTRIBUTION - DISTRIBUCION | |
| | | | FRONT (DELANTERA) | REAR (ATRAS) |
| SEDANS - BERLINAS | 900 lb/408 kg 1100 lb/499 kg | 2 3 | 3 3 | 0 0 |
| STATION WAGONS - CAMIONETAS | 900 lb/408 kg 1200 lb/544 kg 1050 lb/476 kg 1200 lb/544 kg | 5 6 7 8 | 2 3 2 3 | 0 0 2 2 |
| | | | | 200 lb/91 kg 300 lb/136 kg 150 lb/68 kg NONE - NINGUNO |

LOW SPEED HIGH SPEED TRAILER TOWING RECREATIONAL ACCESSORIES AND TEMPORAL SPARE USAGE - SEE OWNER'S GUIDE. BAJA ALTA VELOCIDAD SUSPENSIÓN TRIPLE AL NEUMÁTICO ACCESORIOS REPLETIDO TEMPORAL Y USO TEMPORAL DE LA RUEDA DE REPUESTO. CONSULTE LA GUÍA DEL PROPIETARIO PARA OBTENER MÁS INFORMACIÓN.

FIGURE 4. Bullet Vehicle Tire Placard



FIGURE 5. Target Vehicle, As-Received



FIGURE 6. Target Vehicle, As-Received

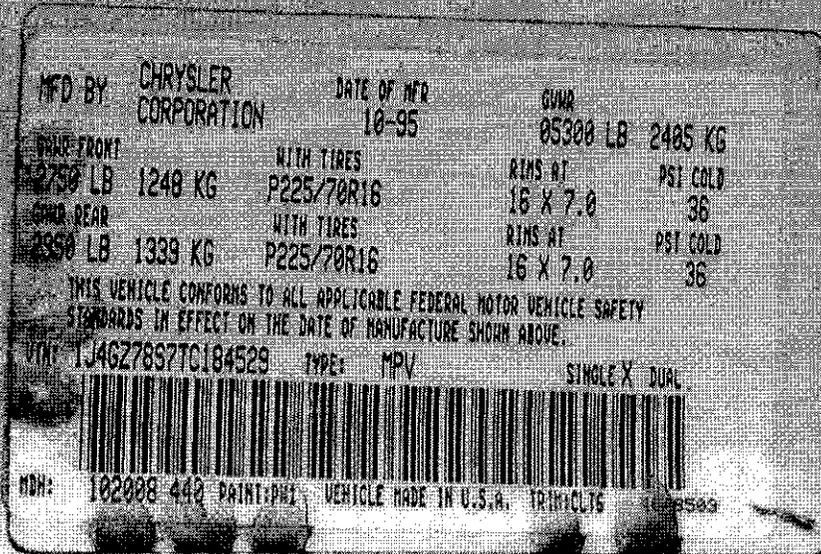


FIGURE 7. Target Vehicle Manufacturer's Label

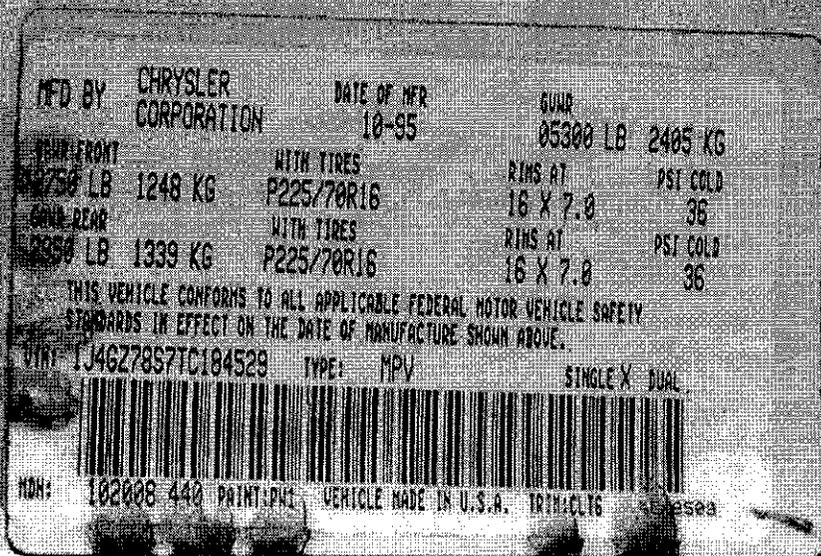


FIGURE 8. Target Vehicle Tire Placard



FIGURE 9. Test Setup, Left Side



FIGURE 10. Test Setup, Left Front $\frac{3}{4}$



FIGURE 11. Test Setup, Front



FIGURE 12. Test Setup, Right Front $\frac{3}{4}$



FIGURE 13. Test Setup, Right Side



FIGURE 14. Test Setup, Right Rear $\frac{3}{4}$

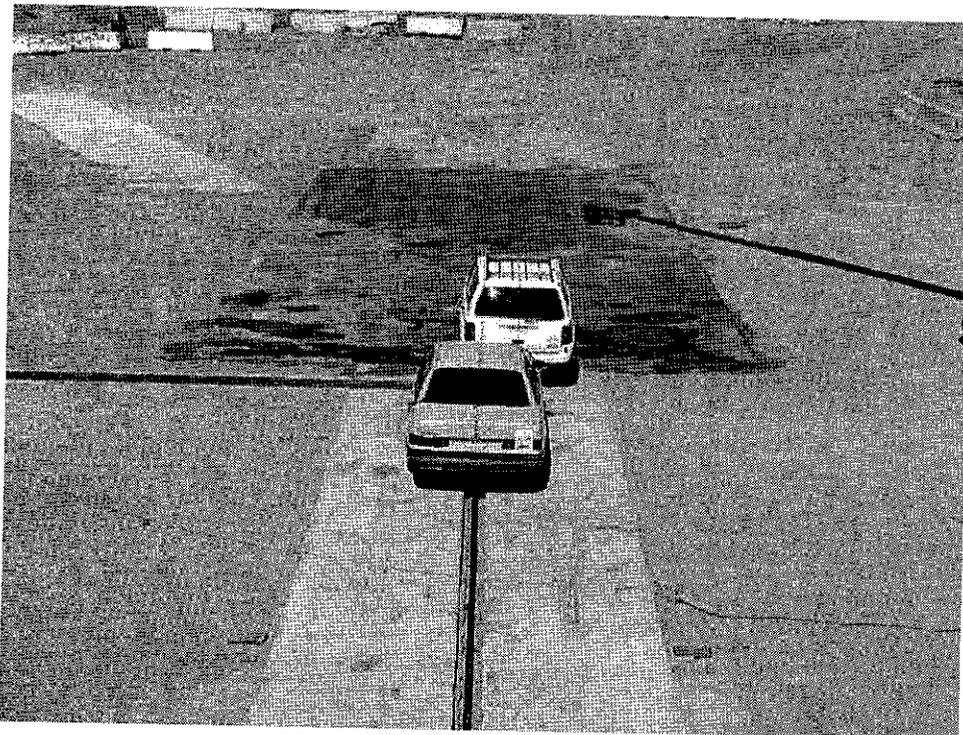


FIGURE 17. Test Setup

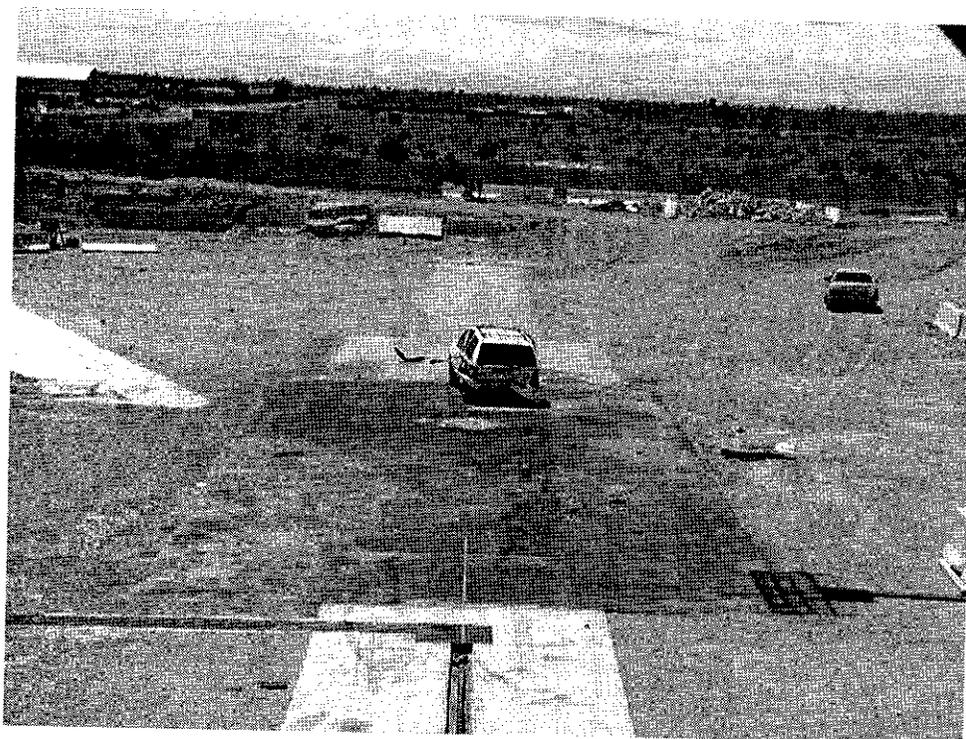


FIGURE 18. Post Test



FIGURE 19. Pre-Test Bullet Vehicle, Left Side

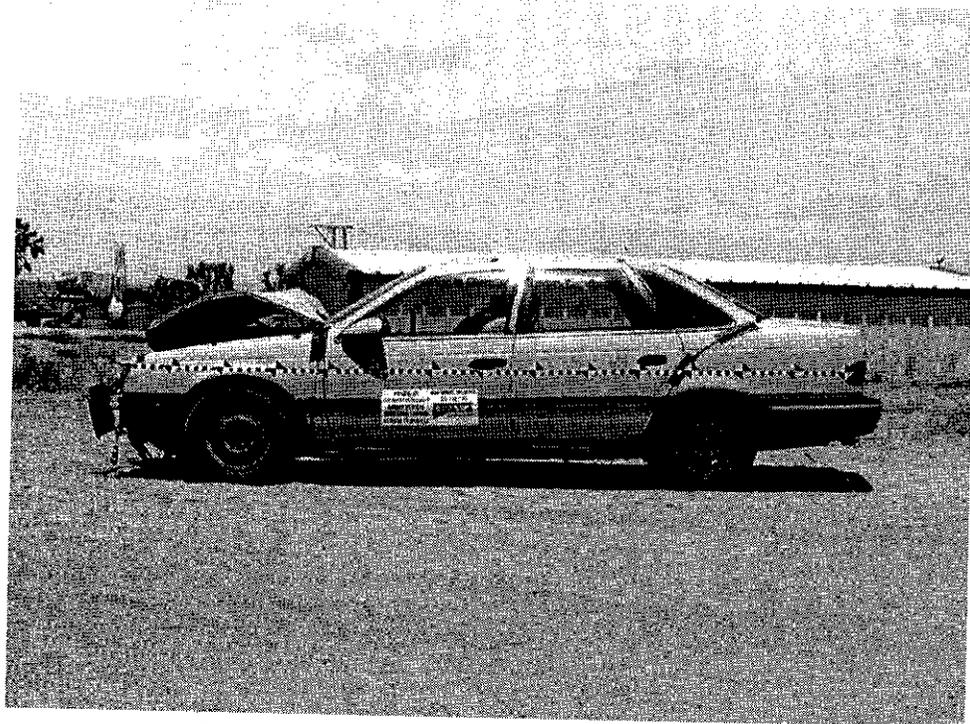


FIGURE 20. Post-Test Bullet Vehicle, Left Side



FIGURE 21. Pre-Test Bullet Vehicle, Left Front $\frac{3}{4}$

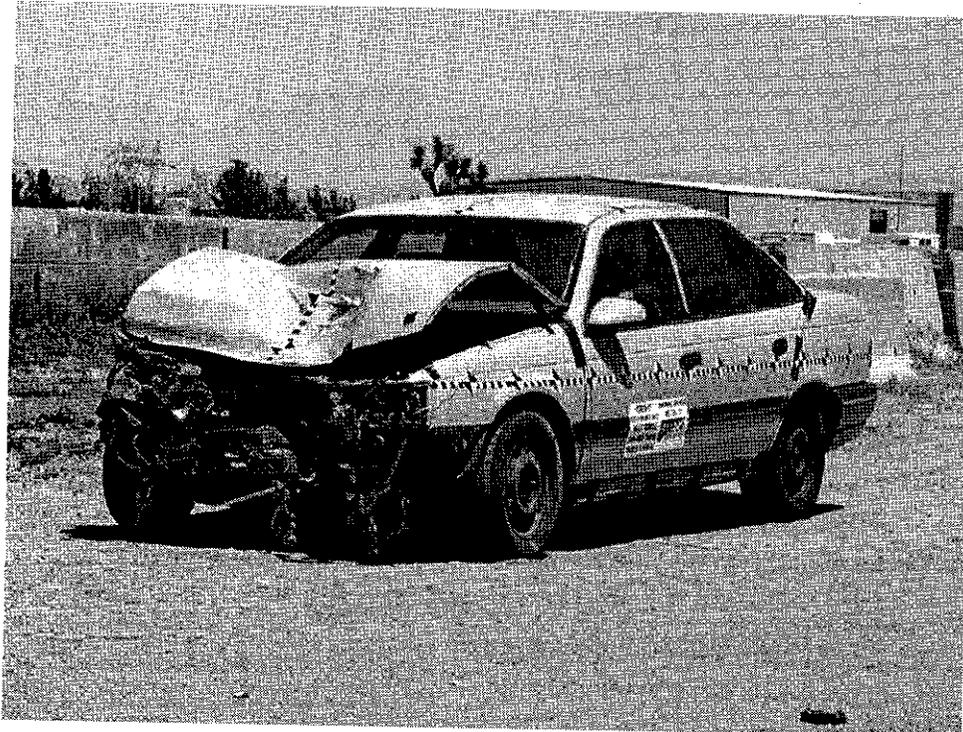


FIGURE 22. Post-Test Bullet Vehicle, Left Front $\frac{3}{4}$



FIGURE 23. Pre-Test Bullet Vehicle, Front



FIGURE 24. Post-Test Bullet Vehicle, Front

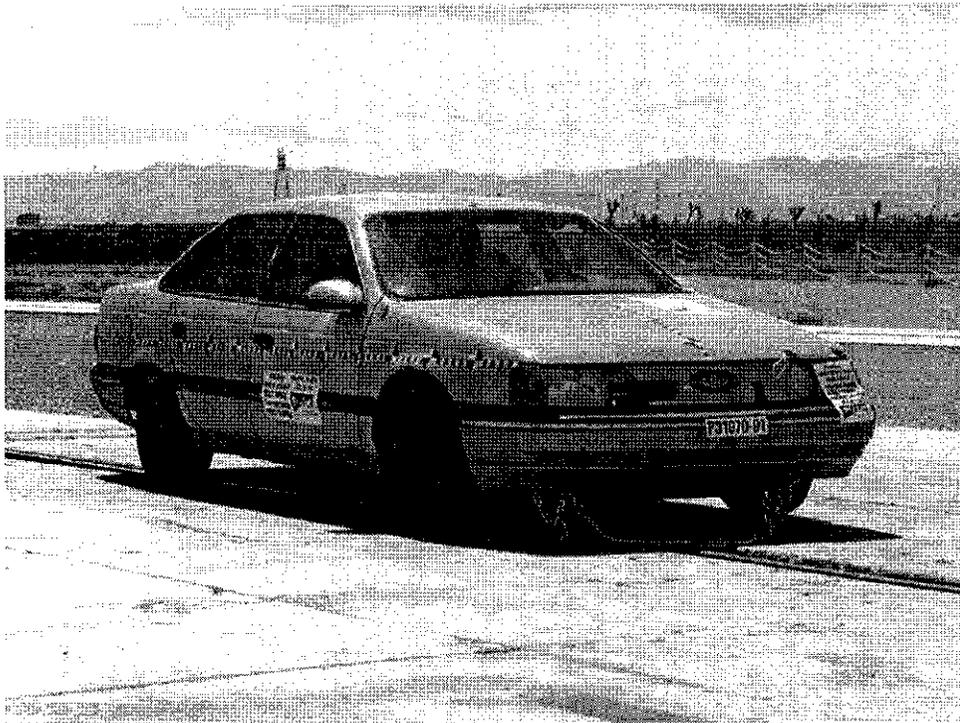


FIGURE 25. Pre-Test Bullet Vehicle, Right Front $\frac{3}{4}$



FIGURE 26. Post-Test Bullet Vehicle, Right Front $\frac{3}{4}$



FIGURE 27. Pre-Test Bullet Vehicle, Right Side



FIGURE 28. Post-Test Bullet Vehicle, Right Side



FIGURE 29. Pre-Test Target Vehicle, Left Side



FIGURE 30. Post-Test Target Vehicle, Left Side



FIGURE 31. Pre-Test Target Vehicle, Left Rear ¾



FIGURE 32. Post-Test Target Vehicle, Left Rear ¾

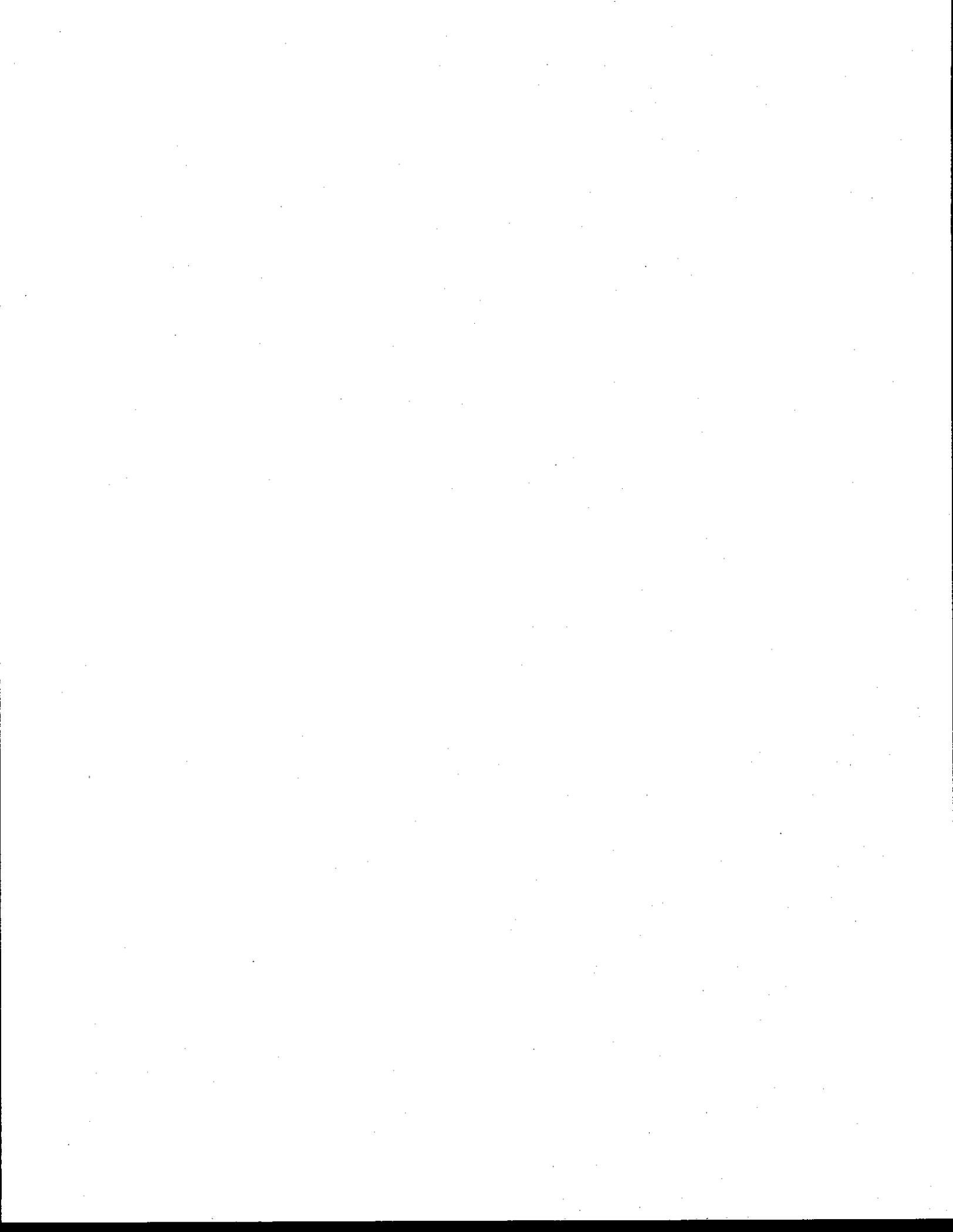




FIGURE 33. Pre-Test Target Vehicle, Rear



FIGURE 34. Post-Test Target Vehicle, Rear



FIGURE 35. Pre-Test Target Vehicle, Right Rear $\frac{3}{4}$



FIGURE 36. Post-Test Target Vehicle, Right Rear $\frac{3}{4}$



FIGURE 37. Pre-Test Target Vehicle, Right Side



FIGURE 38. Post-Test Target Vehicle, Right Side

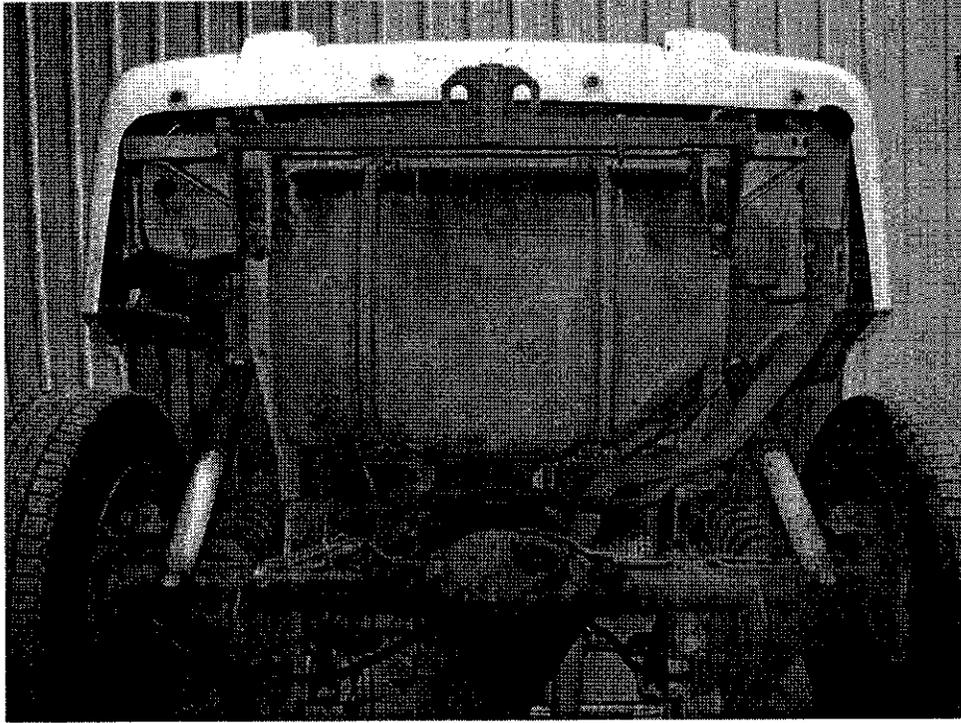


FIGURE 39. Pre-Test Target Vehicle

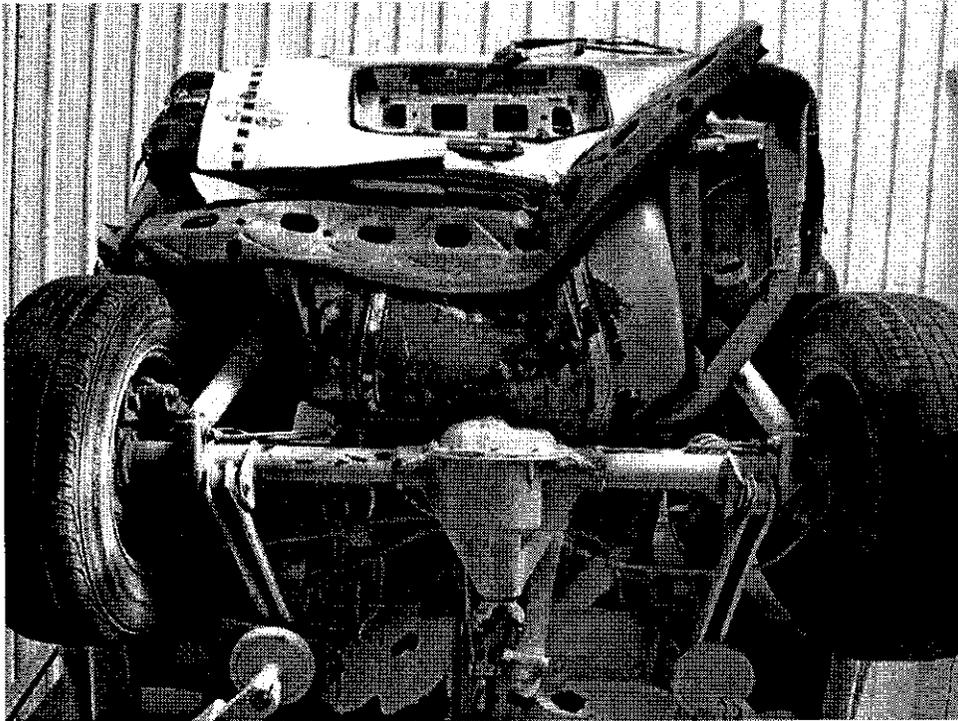


FIGURE 40. Post-Test Target Vehicle

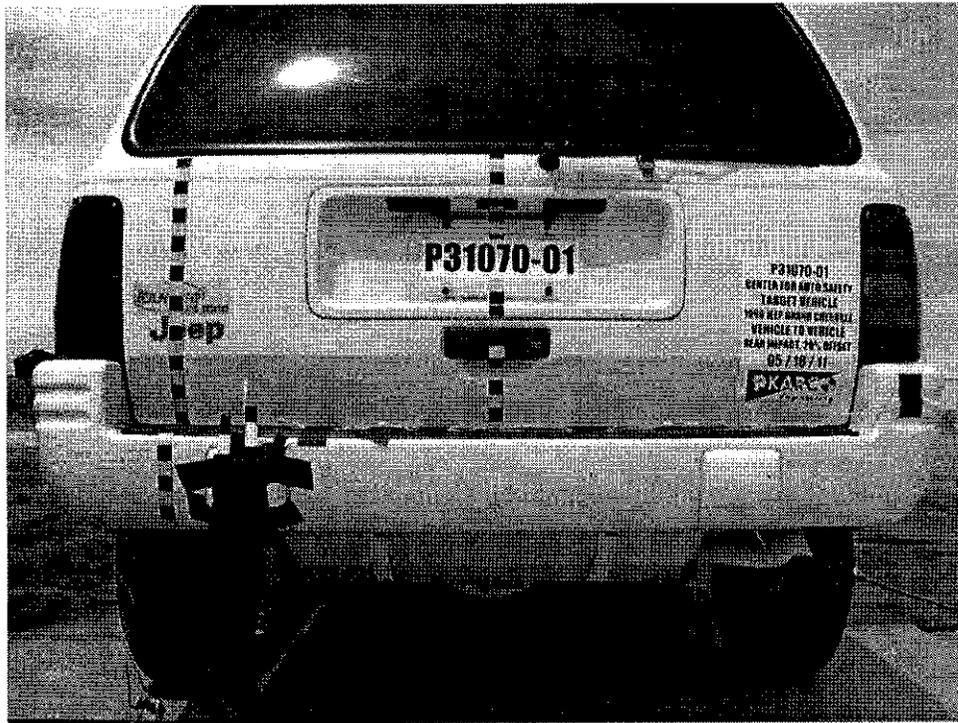


FIGURE 41. Pre-Test Target Vehicle



FIGURE 42. Post-Test Target Vehicle

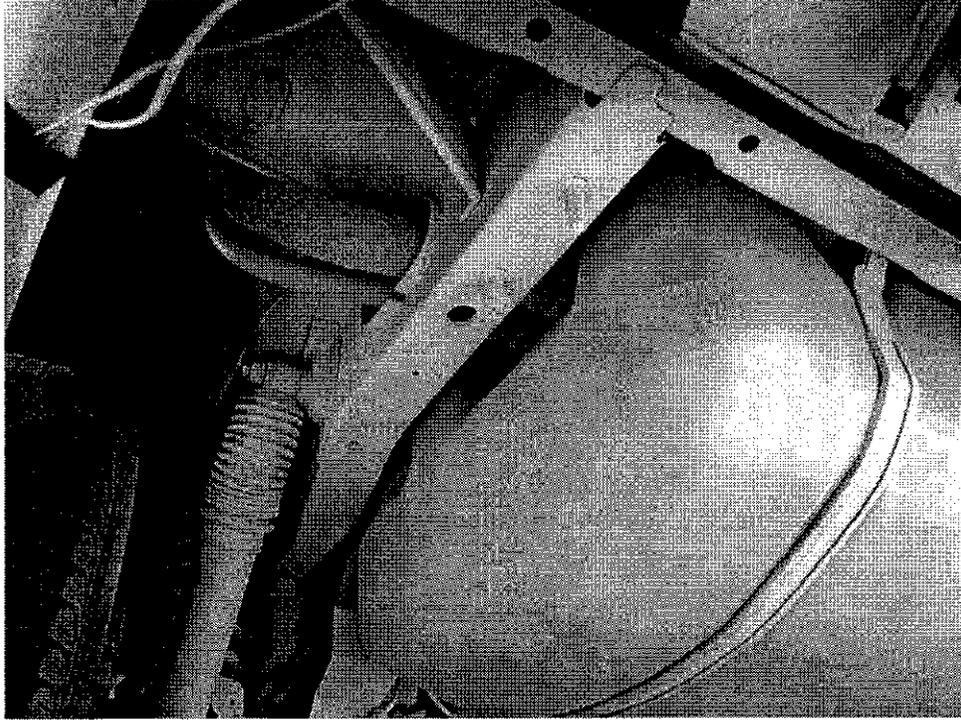


FIGURE 43. Pre-Test Target Vehicle

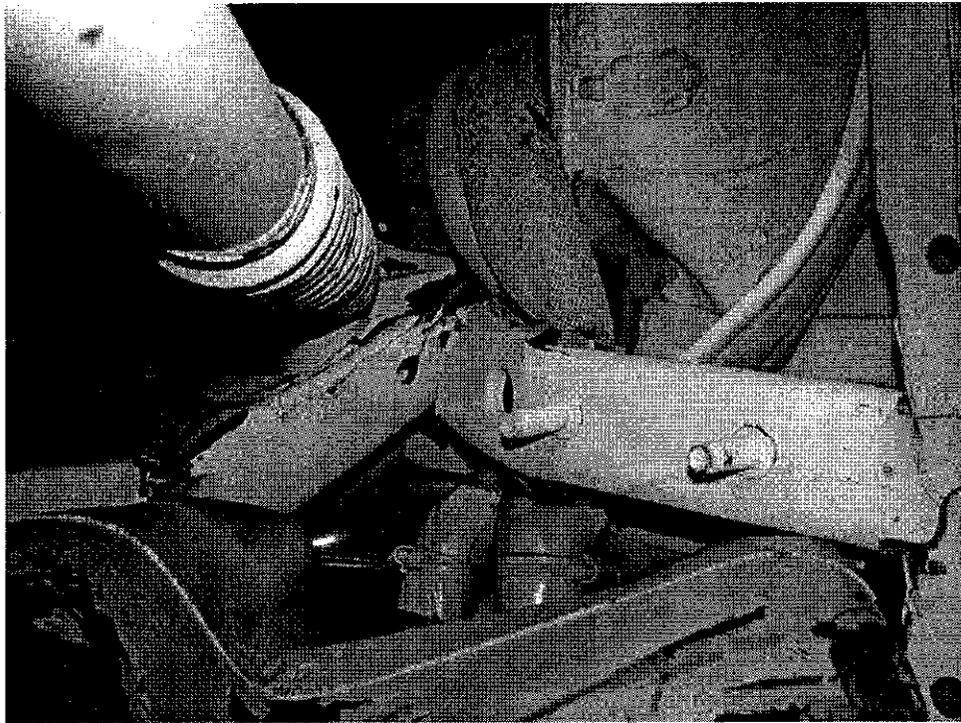


FIGURE 44. Post-Test Target Vehicle

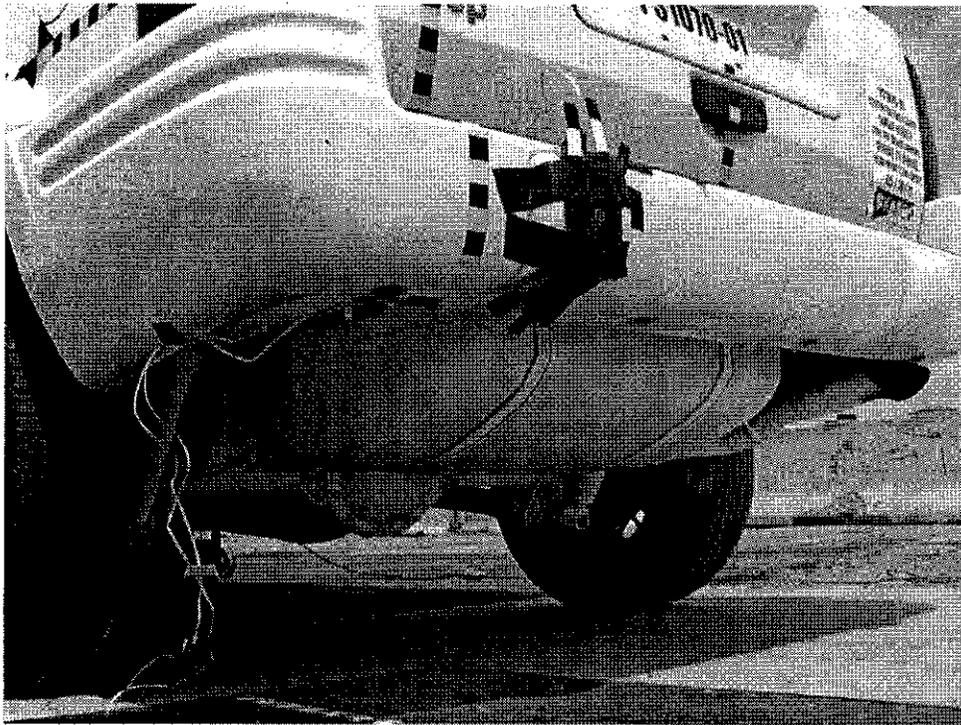


FIGURE 45. Pre-Test Target Vehicle

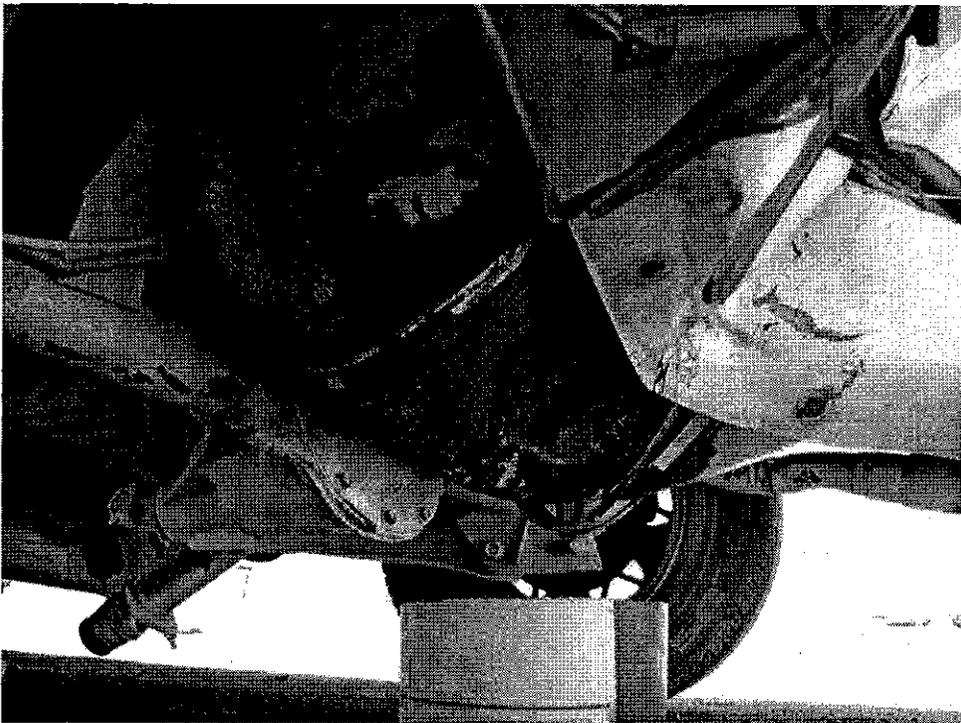


FIGURE 46. Post-Test Target Vehicle

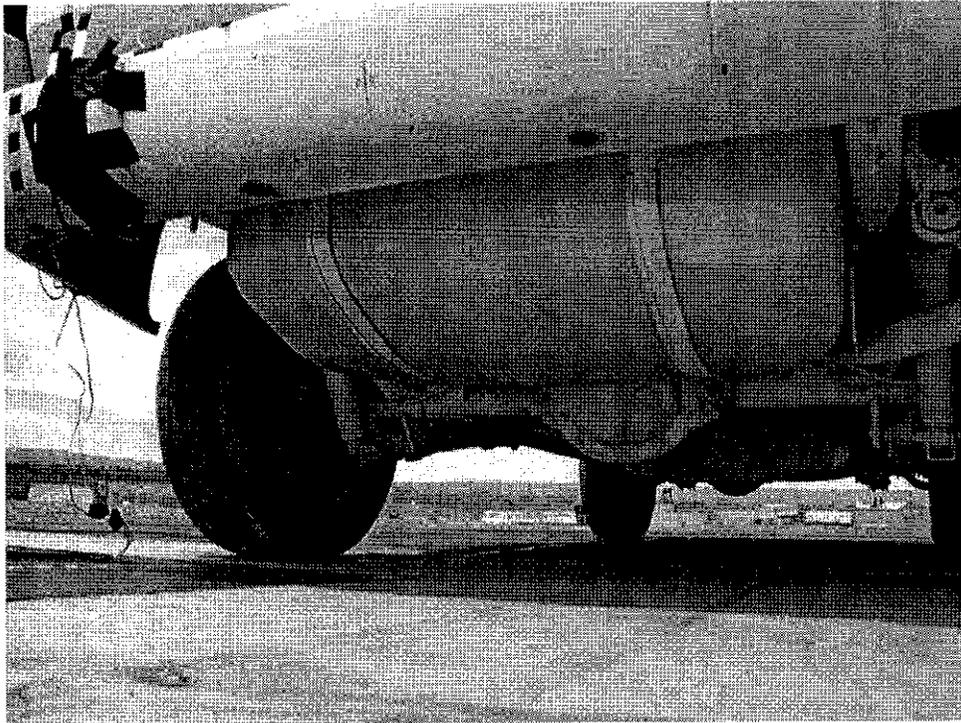


FIGURE 47. Pre-Test Target Vehicle

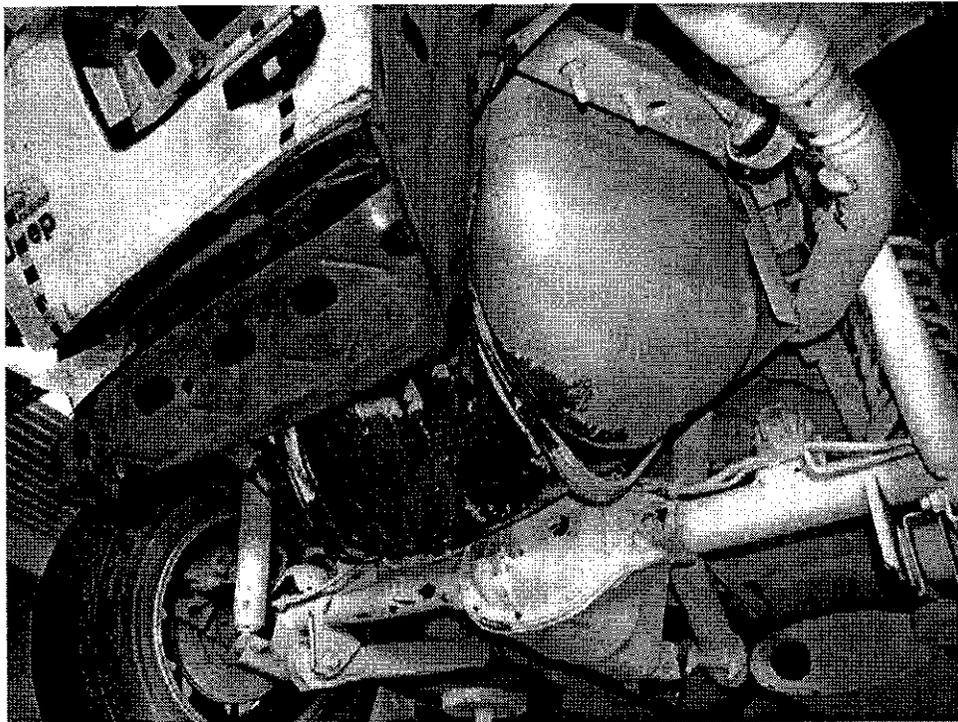


FIGURE 48. Post-Test Target Vehicle

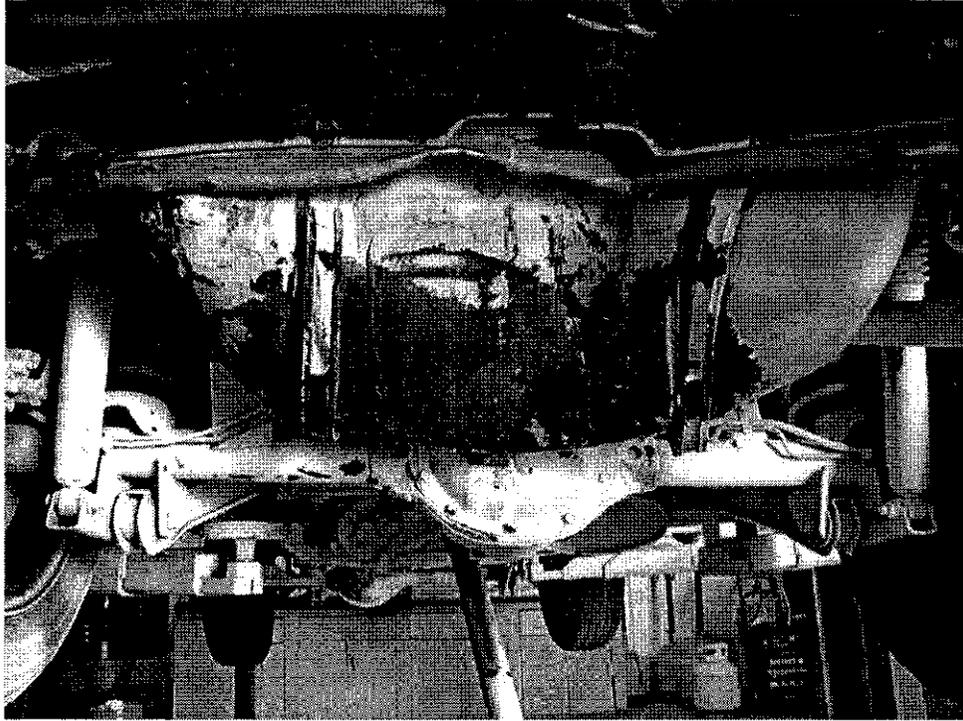


FIGURE 49. Post-Test Target Vehicle

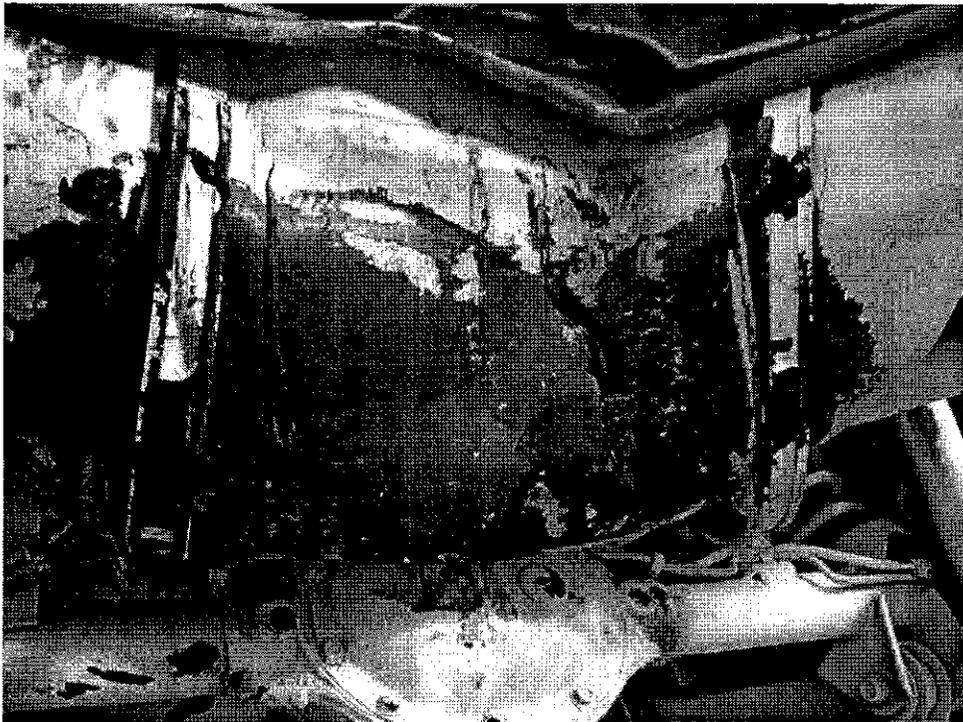
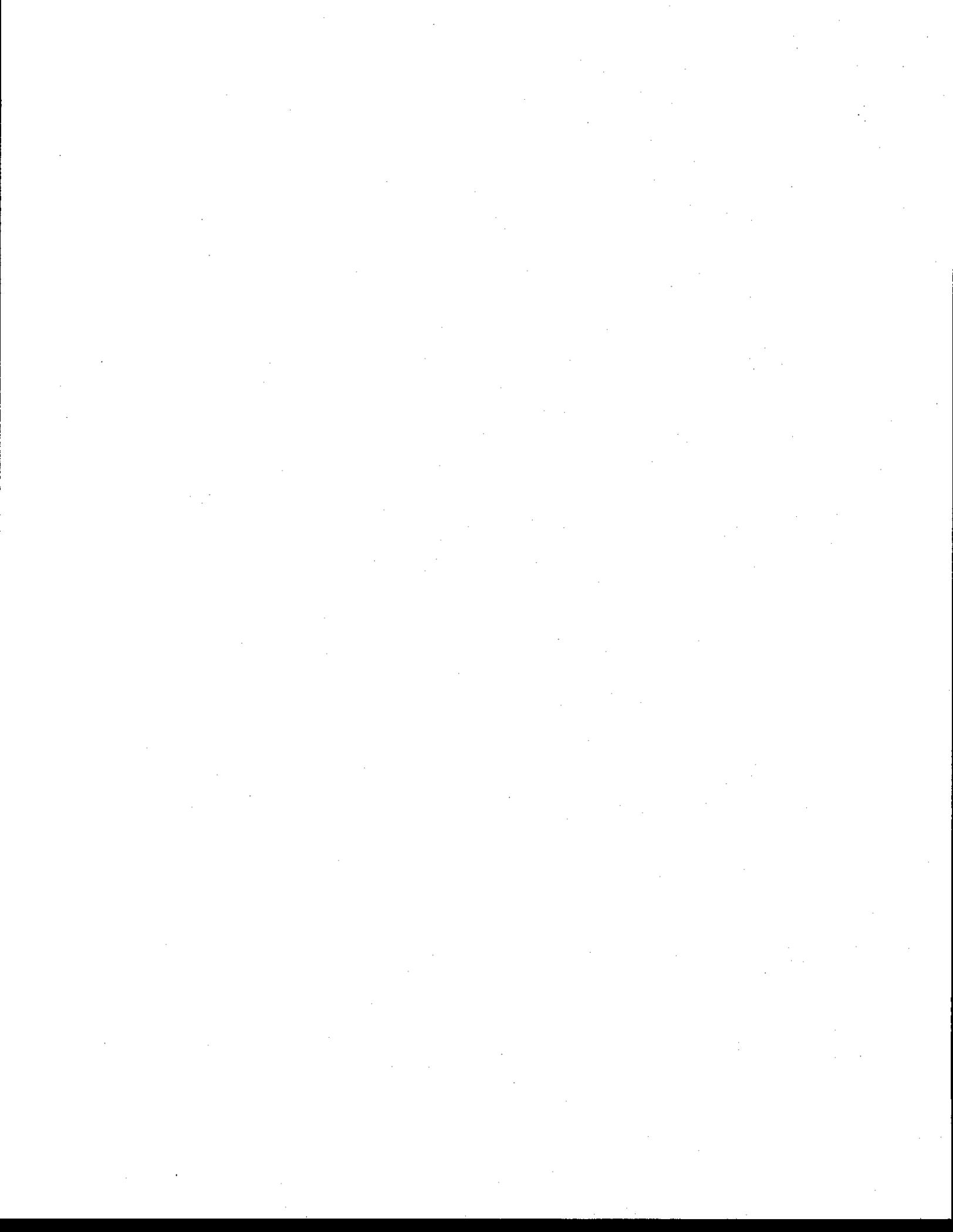


FIGURE 50. Post-Test Target Vehicle



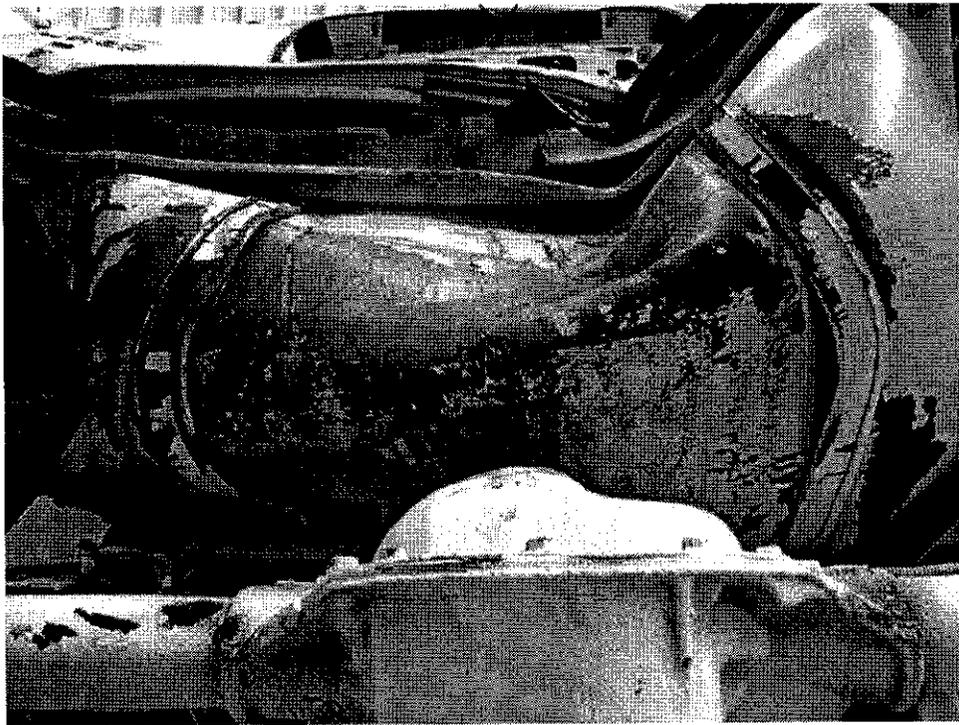


FIGURE 51. Post-Test Target Vehicle

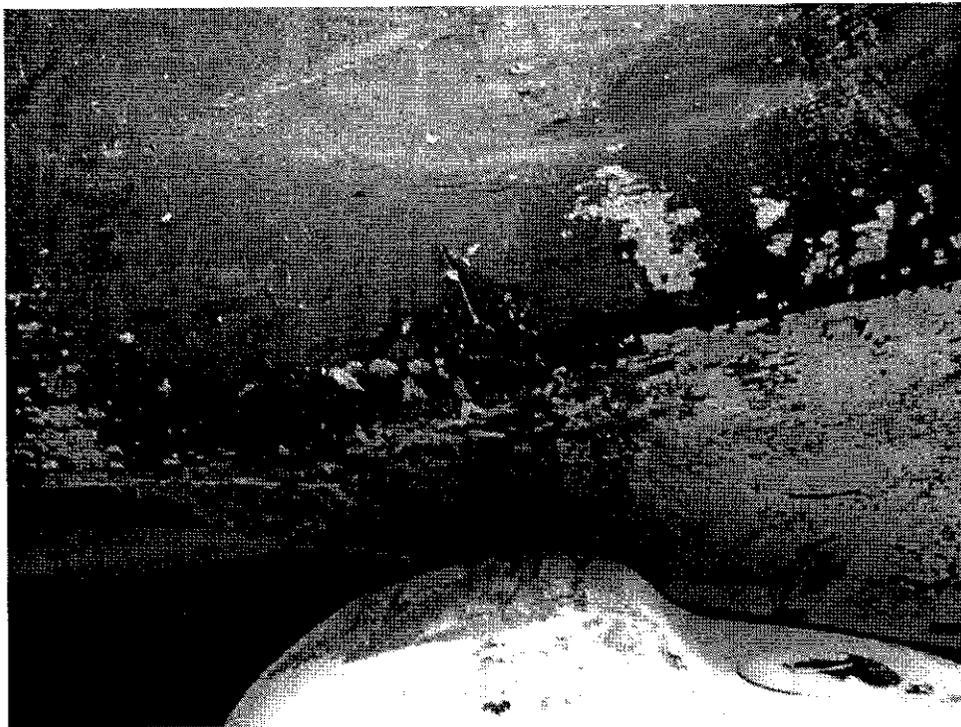


FIGURE 52. Post-Test Target Vehicle

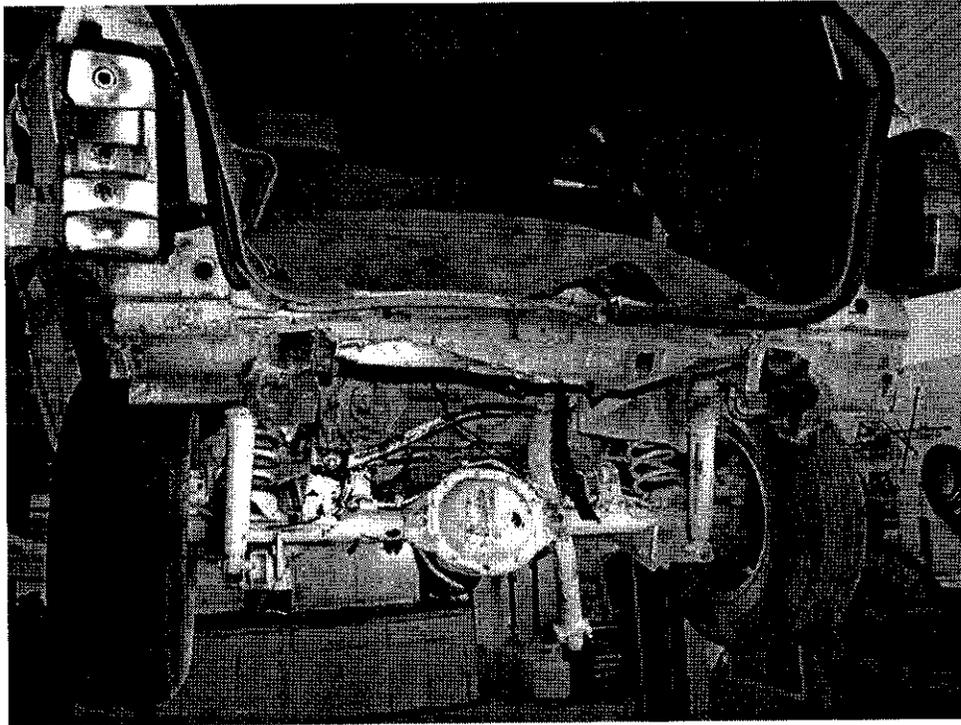


FIGURE 53. Post -Test Target Vehicle

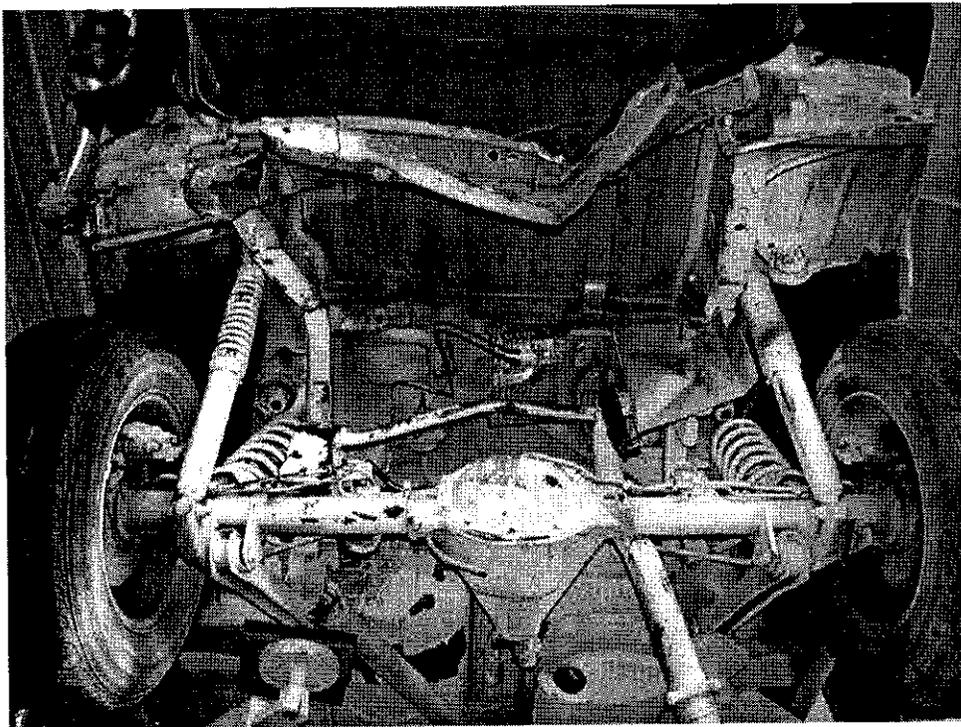


FIGURE 54. Post-Test Target Vehicle

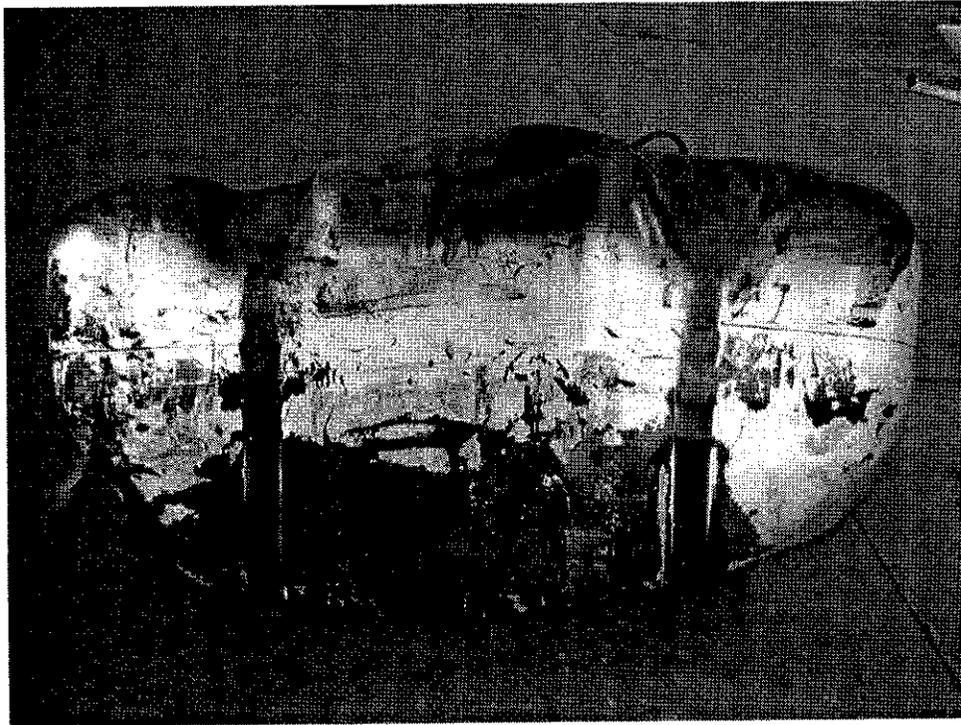


FIGURE 55. Post -Test Target Vehicle, Fuel Tank



FIGURE 56. Post-Test Target Vehicle, Fuel Tank

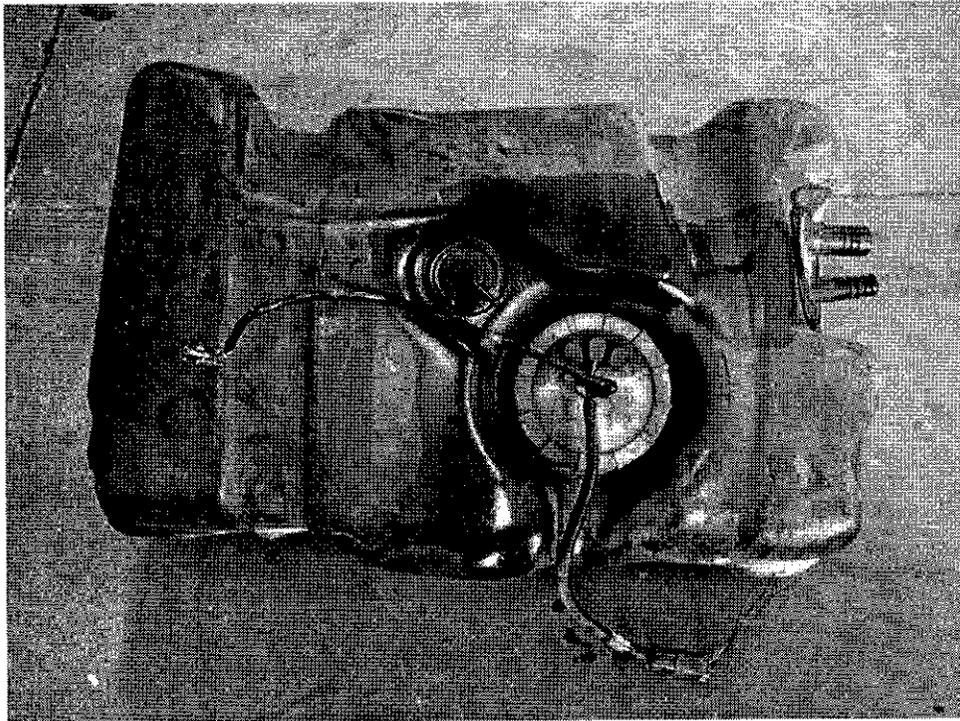


FIGURE 57. Post -Test Target Vehicle, Fuel Tank

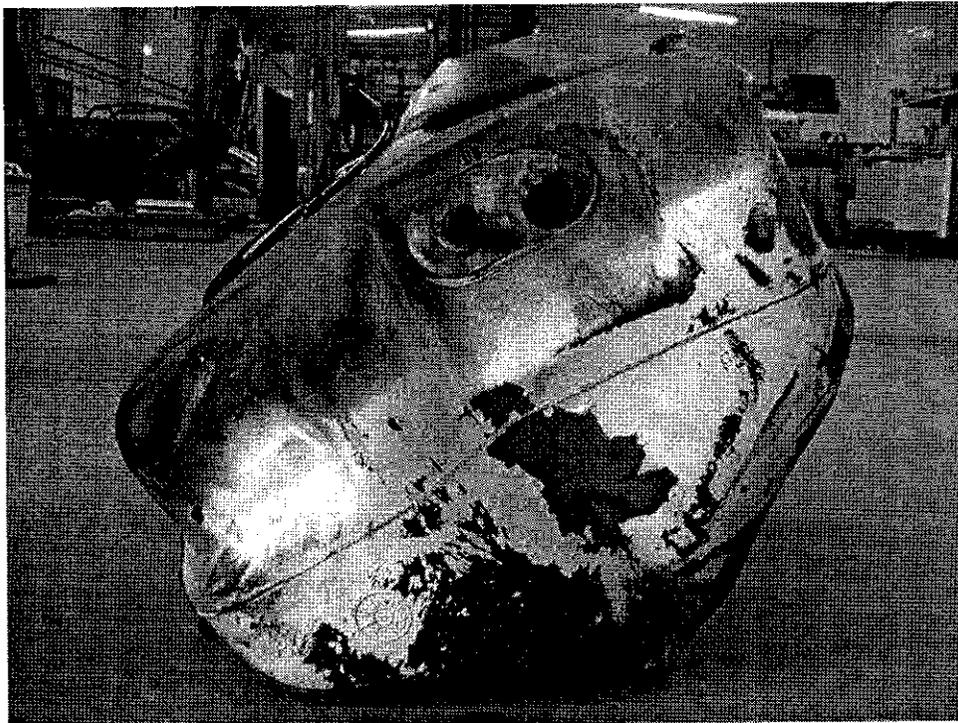


FIGURE 58. Post-Test Target Vehicle, Fuel Tank

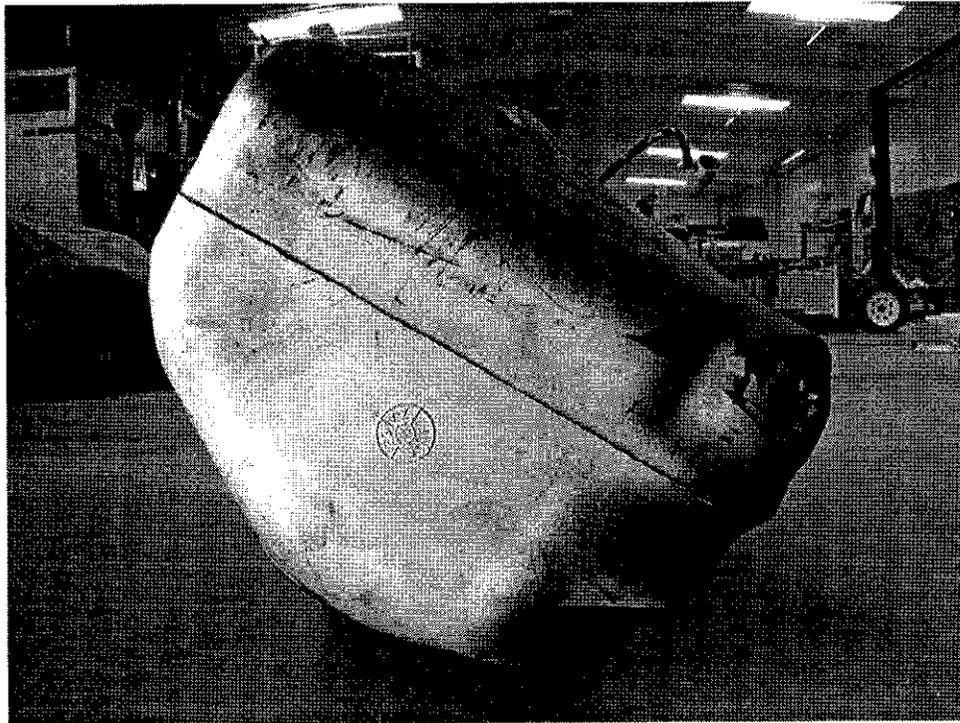


FIGURE 59. Post -Test Target Vehicle, Fuel Tank



FIGURE 60. Post-Test Target Vehicle, Fuel Tank

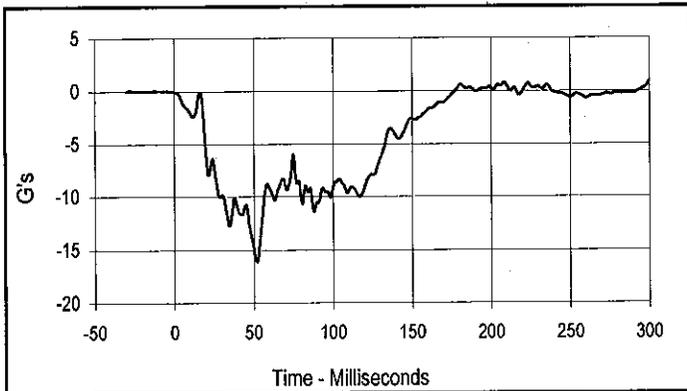
APPENDIX B
INSTRUMENTATION DATA TRACES

TABLE OF DATA PLOTS

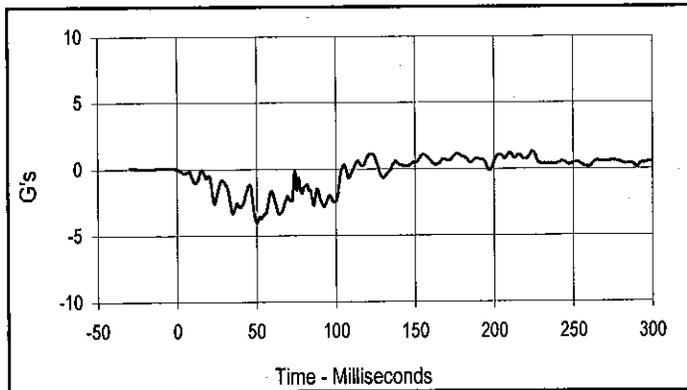
| <u>Plot</u> | | <u>Page</u> |
|-------------|---|-------------|
| 1 | Bullet Vehicle Center Tunnel X | B-1 |
| 2 | Bullet Vehicle Center Tunnel Y | B-1 |
| 3 | Bullet Vehicle Center Tunnel Z | B-1 |
| 4 | Bullet Vehicle Center Tunnel Resultant | B-1 |
| 5 | Bullet Vehicle Center Tunnel X Velocity | B-2 |
| 6 | Target Vehicle Center Tunnel X | B-3 |
| 7 | Target Vehicle Center Tunnel Y | B-3 |
| 8 | Target Vehicle Center Tunnel Z | B-3 |
| 9 | Target Vehicle Center Tunnel Resultant | B-3 |
| 10 | Target Vehicle Center Tunnel X Velocity | B-4 |

Test Vehicle: 1988 Ford Taurus 4-Dr Sedan
 Test Program: 40 MPH Rear Impact 30% Offset

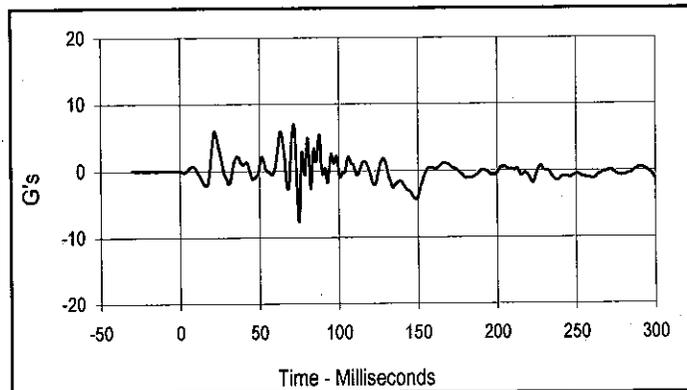
Project No.: P31070-01
 Test Date: 5/16/11



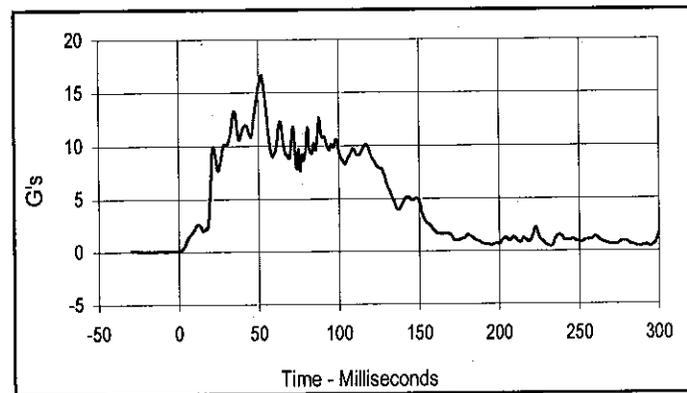
| Curve Description | | | |
|--------------------------------|-------|-----------|-------|
| Bullet Vehicle Center Tunnel X | | | |
| Plot | Type | SAE Class | Units |
| 001 | FIL | 60 | G's |
| Max | Time | Min | Time |
| 0.9 | 299.9 | -16.1 | 51.9 |



| Curve Description | | | |
|--------------------------------|-------|-----------|-------|
| Bullet Vehicle Center Tunnel Y | | | |
| Plot | Type | SAE Class | Units |
| 002 | FIL | 60 | G's |
| Max | Time | Min | Time |
| 1.3 | 223.7 | -4.1 | 50.3 |



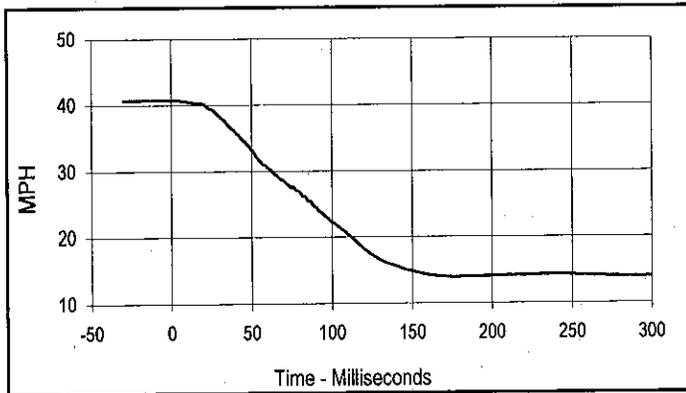
| Curve Description | | | |
|--------------------------------|------|-----------|-------|
| Bullet Vehicle Center Tunnel Z | | | |
| Plot | Type | SAE Class | Units |
| 003 | FIL | 60 | G's |
| Max | Time | Min | Time |
| 7.0 | 71.7 | -7.6 | 75.0 |



| Curve Description | | | |
|--|------|-----------|-------|
| Bullet Vehicle Center Tunnel Resultant | | | |
| Plot | Type | SAE Class | Units |
| 004 | RES | 60 | G's |
| Max | Time | Min | Time |
| 16.7 | 51.9 | 0.1 | 0.0 |

Test Vehicle: 1988 Ford Taurus 4-Dr Sedan
 Test Program: 40 MPH Rear Impact 30% Offset

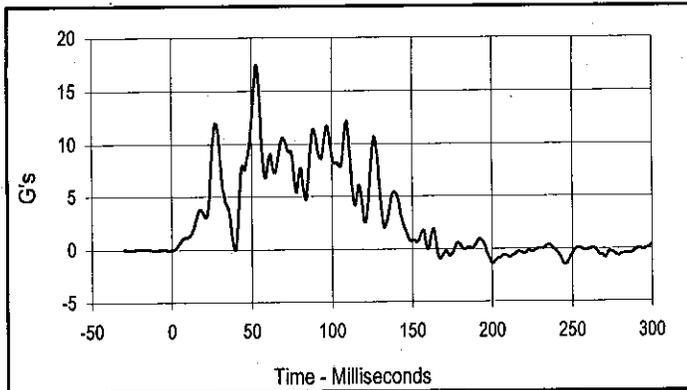
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 Test Date: 5/16/11



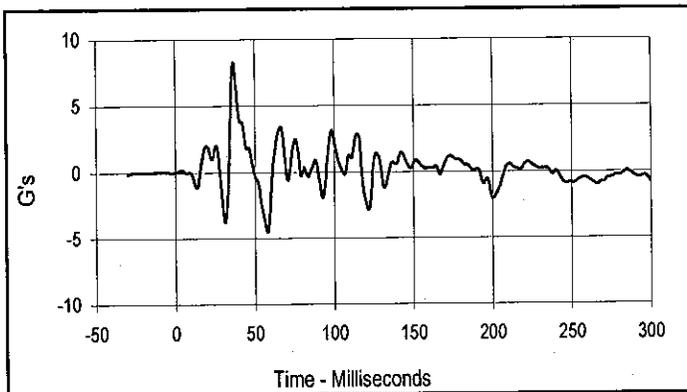
| Curve Description | | | |
|---|------|-----------|-------|
| Bullet Vehicle Center Tunnel X Velocity | | | |
| Plot | Type | SAE Class | Units |
| 005 | IN1 | 180 | MPH |
| Max | Time | Min | Time |
| 40.7 | 0.0 | 13.9 | 178.9 |

Test Vehicle: 1996 Jeep Grand Cherokee 5-Dr MPV
 Test Program: 40 MPH Rear Impact 30% Offset

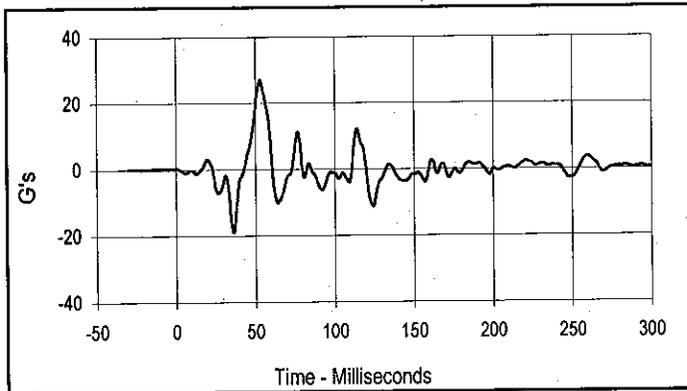
Project No.: P31070-01
 Test Date: 5/16/11



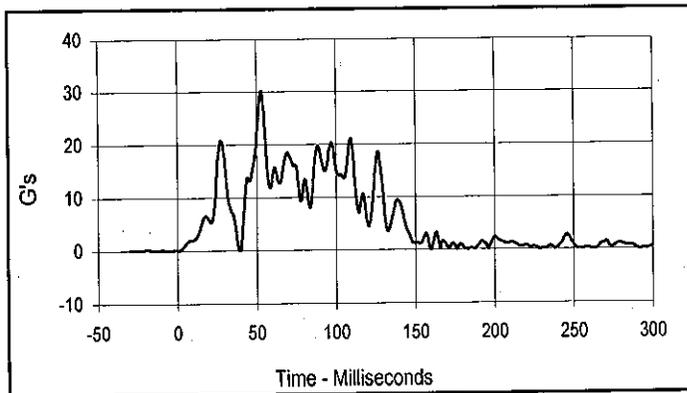
| Curve Description | | | |
|--------------------------------|------|-----------|-------|
| Target Vehicle Center Tunnel X | | | |
| Plot | Type | SAE Class | Units |
| 006 | FIL | 60 | G's |
| Max | Time | Min | Time |
| 17.4 | 53.1 | -1.6 | 245.8 |



| Curve Description | | | |
|--------------------------------|------|-----------|-------|
| Target Vehicle Center Tunnel Y | | | |
| Plot | Type | SAE Class | Units |
| 007 | FIL | 60 | G's |
| Max | Time | Min | Time |
| 8.3 | 36.7 | -4.5 | 58.0 |



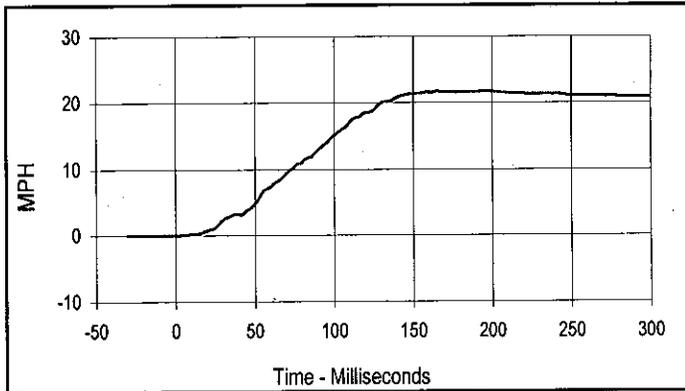
| Curve Description | | | |
|--------------------------------|------|-----------|-------|
| Target Vehicle Center Tunnel Z | | | |
| Plot | Type | SAE Class | Units |
| 008 | FIL | 60 | G's |
| Max | Time | Min | Time |
| 27.1 | 53.1 | -18.9 | 36.3 |



| Curve Description | | | |
|--|------|-----------|-------|
| Target Vehicle Center Tunnel Resultant | | | |
| Plot | Type | SAE Class | Units |
| 009 | RES | 60 | G's |
| Max | Time | Min | Time |
| 30.2 | 53.1 | 0.0 | 291.3 |

Test Vehicle: 1996 Jeep Grand Cherokee 5-Dr MPV
Test Program: 40 MPH Rear Impact 30% Offset

Project No.: P31070-01
Test Date: 5/16/11



| Curve Description | | | |
|---|-------|-----------|-------|
| Target Vehicle Center Tunnel X Velocity | | | |
| Plot | Type | SAE Class | Units |
| 010 | IN1 | 180 | MPH |
| Max | Time | Min | Time |
| 21.7 | 196.0 | 0.0 | 1.0 |

APPENDIX C
INSTRUMENTATION DATA CHANNEL ASSIGNMENTS

40 MPH Rear Impact 30% Offset
Instrumentation Data Channel Assignments
Vehicle Accelerometers
5/16/11
1988 Ford Taurus 4-Dr Sedan

| CH. | LOCATION | AXIS | IDENT. NO. | DESCRIPTION | MFR | MODEL | UNITS |
|-----|-----------------------|------|------------|---------------------|---------|-----------|-------|
| 1 | Vehicle Center Tunnel | X | J36724 | Accel., Single Axis | Endevco | 7264-2000 | G |
| 2 | Vehicle Center Tunnel | Y | AR17 | Accel., Single Axis | Endevco | 7264-2000 | G |
| 3 | Vehicle Center Tunnel | Z | AD99 | Accel., Single Axis | Endevco | 7264-2000 | G |

1996 Jeep Grand Cherokee 5-Dr MPV

| | | | | | | | |
|---|-----------------------|---|--------|---------------------|---------|-----------|---|
| 6 | Vehicle Center Tunnel | X | J24512 | Accel., Single Axis | Endevco | 7264-2000 | G |
| 7 | Vehicle Center Tunnel | Y | B114H | Accel., Single Axis | Endevco | 7264-2000 | G |
| 8 | Vehicle Center Tunnel | Z | J24533 | Accel., Single Axis | Endevco | 7264-2000 | G |