STAGED COLLISION AND DAMAGE DATA REPORT
FOR ACCIDENT RECONSTRUCTION
OF THIRTY (30) TEST VEHICLES
VOL. II

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Volume Three (3) - Staged Collision and Damage Data Report for Accident Reconstruction of Thirty (30) Test Vehicles

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Abstract
The thirty (30) test vehicles were impacted tested for compliance with FMVSS 212/219/301-75 and documented in previous submitted reports.

As a parallel non-conflicting effort, the test vehicles were instrumented with accelerometers to measure vehicle acceleration resultants. The vehicles were also identified for residual crush and collision deformation classification (CDC) measurements. The results of this effort are documented herein and presented in three (3) volumes.

Key Words
Frontal and Rear Moving Barrier Impact Tests Vehicle Acceleration Collision Deformation

Security Classification of this report: Unclassified

Distribution Statement
Unclassified

Number of Pages 196
# Metric Conversion Factors

## Approximate Conversions to Metric Measures

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## Approximate Conversions from Metric Measures

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# VOLUME THREE (3)

## TABLE OF CONTENTS

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SECTION 1

1.0 INTRODUCTION

This report contains information regarding vehicle-to-rigid barrier and moving barrier versus vehicle crash test damage and acceleration data relative to accident reconstruction, as performed under Contract Number DOT-HS-6-01477, by Approved Engineering Test Laboratories, 1536 East Valencia Drive, Fullerton, California.

All tests were performed in accordance with National Highway Traffic Safety Administration, Office of Vehicle Safety Compliance Laboratory Procedures for "Windshield Mounting", "Windshield Zone Intrusion", "Fuel System Integrity", TP212-01 and/or TP219-02, dated March 20, 1979 and January 9, 1979 respectively.

This report presents the residual crush and accelerometer traces along with other related data including post-impact photographs.
1.1 TEST VEHICLES

Twenty (20) test vehicles were subjected to rear moving barrier impacts and ten (10) test vehicles to frontal fixed barrier impacts. The twenty (20) rear impact test vehicles are listed below followed by the ten (10) frontal impact test vehicles.

**MOVING BARRIER VERSUS VEHICLE**

<table>
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<tr>
<th>Vehicle</th>
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<td>1979 Ford Thunderbird - 2 Door Hardtop</td>
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<td>1979 Datsun 280ZX - 2 Seater</td>
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### MOVING BARRIER VERSUS VEHICLE

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SECTION 2

2.0 SUMMARY OF VEHICLE DAMAGE

The following report sheets present damage criteria for each test vehicle. These data show impact speed (mph), speed change (mph), maximum crush (in.), and collision deformation classification (CDC) separately for each test vehicle.
<table>
<thead>
<tr>
<th>Vehicle</th>
<th>Impact MPH</th>
<th>MPH Change</th>
<th>Max. Crush In.</th>
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SECTION 3

3.0 TEST VEHICLE COLLISION AND DAMAGE DATA

The following report sheets present data separately for each test vehicle. This section includes the appropriate accelerometer traces and post-test photographs.
3.21 CHEVROLET C20 BEAUVILLE SPORTVAN

This section presents information on the 1979 Chevrolet C20 Beauville Sportvan, NHTSA 791302. This test vehicle was subjected to a frontal fixed barrier impact at 29.21 mph.
TEST SUMMARY

STAGED COLLISION AND DAMAGE DATA

Impact Configuration: Vehicle Into Frontal Fixed Barrier
Vehicle Model Year: 1979
Vehicle Make: Chevrolet
Vehicle Model: C20 Beauville Sportvan
Vehicle Size Category: Multi Purpose
Vehicle Test Weight: 5,402 lbs.
Impact Speed: 29.21 mph
Speed Change: 32.66 mph
Principal Direction of Force: 0 deg.
Initial Contact: Front Bumper

Damage Elevation

\[
L = 73.5''
\]

\[
D = 0
\]

C1 = 15.7''
C2 = 16.5''
C3 = 16.0''
C4 = 13.8''

Collision Deformation Classification: 12FDEW4
Center of Gravity (Accel.) Location: 60.0'' Behind Front Axle
Moving Barrier Model: N/A
Moving Barrier Weight: N/A lbs.
Impact Speed: N/A mph
Speed Change: N/A mph
Center of Gravity (Accel.) Location: N/A
Test Track: Dry Concrete
VEHICLE: CHEV. 110 AV
VEHICLE ID: NHTSA T91302
TEST FILE NO: 191 FRONTAL
DATE: JANUARY 25, 1980

IMPACT SPEED

VEHICLE: 29.21 MPH

DELTA VELOCITIES (AT TIME OF MAX NEGATIVE VEHICLE LONGITUDINAL VELOCITY)

VEHICLE LONGITUDINAL: 32.66 MPH

PLOT DATA

IMPACT OCCURRED AT: 0 MS
DELTA VEL TAKEN AT: 118 MS
VEHICLE: CHEV. 020 VAN
VEHICLE ID: NHTSA 791302
TEST FILE NO: 191 FRONTAL
DATE: JANUARY 25, 1980

VEHICLE SPEED: 29.21 MPH
0-IMPACT ONSET 0 MS
X-DELTA V MAX 118 MS
VEHICLE SPEED: 29.21 MPH

O-IMPACT ONSET 0 MS
X-DELTA V MAX 118 MS

VEHICLE CG LONGITUDINAL ACCELERATION
VEHICLE: CHEVETTE 130 MAN
VEHICLE ID: VATIA TK130
TEST FILE NO: 131 FRONTAL
DATE: JANUARY 25, 1980

VEHICLE SPEED: 29.21 MPH

O-IMPACT ONSET 3.0 MS
O-DELTA Y MAX 11.5 MS
1979 Chevrolet C20 Beauville Sportvan

NHTSA 791302

Post-Impact, Front View
1979 Chevrolet C20 Beauville Sportvan

NHTSA 791302

Post-Impact, Left Side View
1979 Chevrolet C20 Beauville Sportvan
NHTSA 791302
Post-Impact, Right Side View
1979 Chevrolet C20 Beauville Sportvan
NHTSA 791302
Post-Impact, Overhead View
3.22 ODYSSEY MINI-LUX MOTOR HOME

This section presents information on the 1980 Odyssey Mini-Lux Motor Home, NHTSA 791306. This test vehicle was subjected to a frontal fixed barrier impact at 29.56 mph.
TEST SUMMARY
STAGED COLLISION AND DAMAGE DATA

Impact Configuration    Vehicle Into Frontal Fixed Barrier
Vehicle Model Year      1980
Vehicle Make            Odyssey
Vehicle Model            Mini-Lux Motor Home
Vehicle Size Category    Multi Purpose
Vehicle Test Weight     4,656 lbs.
Impact Speed            29.56 mph
Speed Change            30.52 mph
Principal Direction of Force        0 deg.
Initial Contact        Front Bumper

Damage Elevation

\[ \begin{align*}
L &= 67.3'' \\
D &= 0 \\
C_1 &= 19.3'' \\
C_2 &= 19.8'' \\
C_3 &= 20.0'' \\
C_4 &= 19.8'' \\
\end{align*} \]

Collision Deformation Classification    12FDEW3
Center of Gravity (Accel.) Location    82.0" Behind Front Axle
Moving Barrier Model      N/A
Moving Barrier Weight     N/A lbs.
Impact Speed              N/A mph
Speed Change              N/A mph
Center of Gravity (Accel.) Location    N/A
Test Track    Dry Concrete
IMPACT SPEED

VEHICLE: 29.56 MPH

DELTA VELOCITIES (AT TIME OF MAX NEGATIVE VEHICLE LONGITUDINAL VELOCITY)

VEHICLE LONGITUDINAL: 30.52 MPH

PLOT DATA

IMPACT OCCURRED AT: 2 MS
DELTA VEL TAKEN AT: 158 MS
VEHICLE SPEED: 29.56 MPH

O-IMPACT ONSET 2 MS
X-DELTA V MAX 158 MS
VEHICLE: ODYSSEY MINI-LUX
VEHICLE ID: NHTSA 791306
TEST FILE NO: 215 FRONTAL
DATE: FEBRUARY 22, 1980

VEHICLE SPEED: 29.56 MPH
O-IMPACT ONSET 0 MS
X-DELTA V MAX 219 MS
VEHICLE: ID: OCC: "MINI-LUX"
VEHICLE ID: NHTSA 910306
TEST FILE NO: 315 FRONTAL
DATE: FEBRUARY 22, 1980

VEHICLE SPEED: 29.56 MPH

G-IMPACT ONSET 8 MS
V-DELTA V MAX 219 MS

VEHICLE CG VERTICAL ACCELERATION
1980 Odyssey Mini-Lux Motor Home

NHTSA 791306

Post-Impact, Left Side View
1980 Odyssey Mini-Lux Motor Home

NHTSA 791306

Post-Impact, Right Side View
1980 Odyssey Mini-Lux Motor Home

NHTSA 791306

Post-Impact, Overhead View
SECTION 3

3.23 DODGE D50 PICK UP

This section presents information on the 1979 Dodge D50 - Pick Up, NHTSA 790605. This test vehicle was subjected to a frontal fixed barrier impact at 29.75 mph.
TEST SUMMARY
STAGED COLLISION AND DAMAGE DATA

Impact Configuration ______ Vehicle Into Frontal Fixed Barrier

Vehicle Model Year ______ 1979 ________

Vehicle Make ______ Dodge

Vehicle Model ______ D50 Pick Up

Vehicle Size Category ______ Truck

Vehicle Test Weight ______ 3,113 ______ lbs.

Impact Speed ______ 29.75 ______ mph

Speed Change ______ 31.16 ______ mph

Principal Direction of Force ______ 0 ______ deg.

Initial Contact ______ Front Bumper

Damage Elevation

L = ______ 59.5" ______

D = ______ 0 ______

Cl = ______ 14.3" ______

C2 = ______ 15.9" ______

C3 = ______ 16.8" ______

C4 = ______ 14.5" ______

Collision Deformation Classification ______ 12FDEW2

Center of Gravity (Accel.) Location ______ 54.9" Behind Front Axle

Moving Barrier Model ______ N/A

Moving Barrier Weight ______ N/A ______ lbs.

Impact Speed ______ N/A ______ mph

Speed Change ______ N/A ______ mph

Center of Gravity (Accel.) Location ______ N/A

Test Track ______ Dry Concrete
IMPACT SPEED

VEHICLE: 29.74 MPH

DELTA VELOCITIES (AT TIME OF MAX NEGATIVE VEHICLE LONGITUDINAL VELOCITY)

VEHICLE LONGITUDINAL: 31.16 MPH

PLOT DATA

IMPACT OCCURRED AT: 8 MS
DELTA YEL TAKEN AT: 106 MS
VEHICLE ID: 0706 FD
VEHICLE ID: CO+06008
TEST FILE NO: 195 FRONTAL
DATE: FEBRUARY 27, 1980

VEHICLE SPEED: 29.74 MPH

O-IMPACT ONSET 3 MS
K-DELTA V MAX 106 MS

VEHICLE CG LONGITUDINAL VELOCITY

[Graph showing vehicle speed and impact onset]
VEHICLE SPEED: 29.74 MPH

D-IMPACT ONSET: 8 MS

X-DELTA V MAX: 106 MS
VEHICLE: DODGE D50 PICKUP
VEHICLE ID: NHTSA 790605
TEST FILE NO.: 195 FRONTAL
DATE: FEBRUARY 27, 1980

VEHICLE SPEED: 29.74 MPH

0-IMPACT ONSET 0 MS
X-DELTA V MAX 107 MS

VEHICLE CG VERTICAL ACCELERATION
VEHICLE: 1508559
VEHICLE II: NHTSA TEST
TEST FILE NO: 156 FRONTAL
DATE: FEBRUARY 27, 1980

VEHICLE SPEED: 29.74 MPH

O-IMPACT ONSET: 9 MS
\(\Delta V\) MAX: 105 MS

VEHICLE IS LONGITUDINAL DISPLACEMENT
1979 Dodge D50 Pick Up

NHTSA 790605

Post-Impact, Left Side View
1979 Dodge D50 Pick Up

NHTSA 790605

Post-Impact, Right Side View
1979 Dodge D50 Pick Up

NHTSA 790605

Post-Impact, Overhead View
SECTION 3

3.24 TOYOTA LONG BED 3/4 TON - PICK UP

This section presents information on the 1979 Toyota Long Bed 3/4 Ton - Pick Up, NHTSA 790609. This test vehicle was subjected to a frontal fixed barrier impact at 29.55 mph.
Impact Configuration: Vehicle Into Frontal Fixed Barrier

Vehicle Model Year: 1979

Vehicle Make: Toyota

Vehicle Model: Long Bed 3/4 Ton - Pick Up

Vehicle Size Category: Truck

Vehicle Test Weight: 3,129 lbs.

Impact Speed: 29.55 mph

Speed Change: 33.72 mph

Principal Direction of Force: 0 deg.

Initial Contact: Front Bumper

Damage Elevation:

\[ L = 62.2" \]
\[ D = 0 \]
\[ C_1 = 10.8" \]
\[ C_2 = 13.3" \]
\[ C_3 = 13.8" \]
\[ C_4 = 12.2" \]

Collision Deformation Classification: 12FDEW2

Center of Gravity (Accel.) Location: 57.0" Behind Front Axle

Moving Barrier Model: N/A

Moving Barrier Weight: N/A lbs.

Impact Speed: N/A mph

Speed Change: N/A mph

Center of Gravity (Accel.) Location: N/A

Test Track: Dry Concrete
VEHICLE: TOYOTA 3 4 P...

TEST FILE NO: 219 FRONTAL

DATE: MARCH 1, 1990

IMPACT SPEED

VEHICLE: 29.55 MPH

DELTA VELOCITIES (AT TIME OF MAX NEGATIVE VEHICLE LONGITUDINAL VELOCITY)

VEHICLE LONGITUDINAL: 33.72 MPH

PLOT DATA

IMPACT OCCURRED AT: 5 MS

DELTA VEL TAKEN AT: 30 MS
VEHICLE: TOYOTA 14 F.C.
VEHICLE ID: 4HTCA 790609
TEST FILE NO: 219 FRONTAL
DATE: MARCH 1, 1980

VEHICLE SPEED: 29.55 MPH
O-IMPACT ONSET 5 MS
X-Delta V MAX 30 MS
VEHICLE: TOYOTA 3 4 F.U.
VEHICLE ID: NHTSA 790609
TEST FILE NO: 219 FRONTAL
DATE: MARCH 1, 1990

VEHICLE SPEED: 29.55 MPH

O-IMPACT ONSET 5 MS
X-DELTA V MAX 80 MS

VEHICLE CG LONGITUDINAL ACCELERATION
VEHICLE SPEED: 29.55 MPH

D-IMPACT ONSET: 0 MS
\( \Delta V \) MAX: 32 MS

VEHICLE IS LONGITUDINAL ACCELERATION
VEHICLE: TOLL I 4 P L
VEHICLE III: UNIVER SITY 708609
TEST FILE NO.: 213 FRONTAL
DATE: MARCH 1, 1990

VEHICLE SPEED: 29.55 MPH

D-IMPACT ONSET 0 MS
D-DELTA V MAX 35 MS

VEHICLE 1G LATERAL ACCELERATION
1979 Toyota Long Bed 3/4 Ton - Pick Up

NHTSA 790609

Post-Impact, Left Side View
1979 Toyota Long Bed 3/4 Ton - Pick Up

NHTSA 790609

Post-Impact, Right Side View
1979 Toyota Long Bed 3/4 Ton - Pick Up
NHTSA 790609
Post-Impact, Overhead View
3.25 **JEEP WAGONEER - 4 DOOR STATION WAGON**

This section presents information on the 1979 Jeep Wagoneer - 4 Wheel Drive - 4 Door Station Wagon, NHTSA 791301. This test vehicle was subjected to a frontal fixed barrier impact at 29.71 mph.
TEST SUMMARY

STAGED COLLISION AND DAMAGE DATA

Impact Configuration: Vehicle Into Frontal Fixed Barrier

Vehicle Model Year: 1979

Vehicle Make: Jeep

Vehicle Model: Wagoneer - 4 Wheel Drive - 4 Door Station Wagon

Vehicle Size Category: Multi Purpose

Vehicle Test Weight: 5,033 lbs.

Impact Speed: 29.71 mph

Speed Change: 32.36 mph

Principal Direction of Force: 0 deg.

Initial Contact: Front Bumper Guards

Damage Elevation:

L = 70.3"

D = 0

C1 = 15.0"

C2 = 16.4"

C3 = 17.5"

C4 = 16.3"

Collision Deformation Classification: 12FDEW2

Center of Gravity (Accel.) Location: 53.5" behind front axle

Moving Barrier Model: N/A

Moving Barrier Weight: N/A lbs.

Impact Speed: N/A mph

Speed Change: N/A mph

Center of Gravity (Accel.) Location: N/A

Test Track: Dry Concrete
VEHICLE: JEEP WAGONEER
VEHICLE ID: NHTSA 791301
TEST FILE NO: 129 FRONTAL
DATE: MARCH 7, 1980

IMPACT SPEED

VEHICLE: 29.71 MPH

DELTA VELOCITIES (AT TIME OF MAX NEGATIVE VEHICLE LONGITUDINAL VELOCITY)

VEHICLE LONGITUDINAL: 32.36 MPH

PLOT DATA

IMPACT OCCURRED AT: 0 MS
DELTA VEL TAKEN AT: 157 MS
VEHICLE: JEEP WAGONEER
VEHICLE ID: WR0A 781301
TEST FILE NO.: 199 FRONTAL
DATE: MARCH 7, 1980

VEHICLE SPEED: 29.71 MPH
O-IMPACT ONSET 0 MS
X-DELTA V MAX 157 MS

10^{-3} SEC  VEHICLE CG LONGITUDINAL VELOCITY

MPH FWD+
VEHICLE: JEEP WAGONEER
VEHICLE ID: NCSCA 791301
TEST FILE NO: 199 FRONTAL
DATE: MARCH 7, 1980

VEHICLE SPEED: 29.71 MPH
O-IMPACT ONSET: 0 MS
X-DELTA V MAX: 157 MS

VEHICLE CG LONGITUDINAL ACCELERATION
VEHICLE: JEEP WAGONEER
VEHICLE ID: VHTRA T91301
TEST FILE NO: 199 FRONTAL
DATE: MARCH 7, 1980

VEHICLE SPEED: 29.71 MPH

G AXE LEFT:

- IMPACT ONSET 0 MS
- DELTA V MAX 164 MS

VEHICLE CG LATERAL ACCELERATION
JST CRASH PROGRAM

VEHICLE: JEEP WAGONEER
VEHICLE ID: NHTSA 7311301
TEST FILE NO: 199 FRONTAL
DATE: MARCH 7, 1980

VEHICLE SPEED: 29.71 MPH

O-IMPACT ONSET 0 MS
X-DELTA v MAX 164 MS
VEHICLE: JEEP WAGONEER
VEHICLE ID: NHSTA 791301
TEST FILE NO: 199 FRONTAL
DATE: MARCH 7, 1980

VEHICLE SPEED: 29.71 MPH
O-IMPACT ONSET 0 MS
% DELTA V MAX 157 MS
1979 Jeep Wagoneer - 4 Wheel Drive - 4 Door Station Wagon

NHTSA 791301

Post-Impact, Left Side View
1979 Jeep Wagoneer - 4 Wheel Drive - 4 Door Station Wagon

NHTSA 791301

Post-Impact, Right Side View
1979 Jeep Wagoneer - 4 Wheel Drive - 4 Door Station Wagon

NHTSA 791301

Post-Impact, Overhead View
SECTION 3

3.26 CHEVROLET SILVERADO K20 (4X4) - PICK UP

This section presents information on the 1979 Chevrolet Silverado K20 (4X4) Fleetside - Pick Up, NHTSA 790607. This test vehicle was subjected to a frontal fixed barrier impact at 30.44 mph.
Impact Configuration  Vehicle Into Frontal Fixed Barrier

Vehicle Model Year  1979

Vehicle Make  Chevrolet

Vehicle Model  Silverado K20 (4X4) Fleetside - Pick Up

Vehicle Size Category  Truck

Vehicle Test Weight  6,044  lbs.

Impact Speed  30.44  mph

Speed Change  31.47  mph

Principal Direction of Force  0  deg.

Initial Contact  Front Bumper

Damage Elevation

\[ L = 76.0" \]

\[ D = 0 \]

\[ C1 = 22.6" \]

\[ C2 = 23.2" \]

\[ C3 = 23.2" \]

\[ C4 = 22.6" \]

Collision Deformation Classification  12FDEW3

Center of Gravity (Accel.) Location  59.3" Behind Front Axle

Moving Barrier Model  N/A

Moving Barrier Weight  N/A  lbs.

Impact Speed  N/A  mph

Speed Change  N/A  mph

Center of Gravity (Accel.) Location  N/A

Test Track  Dry Concrete
TEST IMPACT PROGRAM

VEHICLE: CHEV. SILVERADO 20 P U
VEHICLE ID: NHTSA 790607
TEST FILE NO: 203 FRONTAL
DATE: MARCH 13, 1980

IMPACT SPEED

VEHICLE: 30.44 MPH

DELTA VELOCITIES (AT TIME OF MAX NEGATIVE VEHICLE LONGITUDINAL VELOCITY)

VEHICLE LONGITUDINAL: 31.47 MPH

PLOT DATA

IMPACT OCCURED AT: 0 MS
DELTA VEL TAKEN AT: 265 MS
VEHICLE: CHEV. SILVERADO K20 P/U
VEHICLE ID: NHTSA 790607
TEST FILE NO: 283 FRONTAL
DATE: MARCH 13, 1980

VEHICLE SPEED: 30.44 MPH

O-IMPACT ONSET 0 MS
X-DELTA V MAX 223 MS
VEHICLE: CHEV. SILVERADO 20 F U

VEHICLE ID: NHTSA 780607

TEST FILE NO: 303 FRONTAL

DATE: MARCH 13, 1980

VEHICLE SPEED: 30.44 MPH

G-IMPACT ONSET: 0 MS
K-DELTA V MAX: 223 MS
VEHICLE: CHEV. SILVERADO K20 P/U
VEHICLE ID: NHTSA 790607
TEST FILE NO.: 203 FRONTAL
DATE: MARCH 13, 1980

VEHICLE SPEED: 30.44 MPH
O-IMPACT ONSET 0 MS
X-Delta V MAX 223 MS
DOT CRASH PROGRAM

VEHICLE: CHEV. SILVERADO K20 P U
VEHICLE ID: NHTSA 790607
TEST FILE NO: 203 FRONTAL
DATE: MARCH 13, 1980

VEHICLE SPEED: 30.44 MPH

O-IMPACT ONSET 0 MS
X-DELTA V MAX 223 MS
1979 Chevrolet Silverado K20 (4X4) Fleetside - Pick Up

NHTSA 790607

Post-Impact, Front View
1979 Chevrolet Silverado K20 (4X4) Fleetside - Pick Up

NHTSA 790607

Post-Impact, Left Side View
1979 Chevrolet Silverado K20 (4X4) Fleetside - Pick Up

NHTSA 790607

Post-Impact, Right Side View
1979 Chevrolet Silverado K20 (4X4) Fleetside - Pick Up

NHTSA 790607

Post-Impact, Overhead View
SECTION 3

3.27 FORD CUSTOM STYLESIDE F350 - PICK UP

This section presents information on the 1979 Ford Custom Styleside F350 - Pick Up, NHTSA 790608. This test vehicle was subjected to a frontal fixed barrier impact at 29.70 mph.
TEST SUMMARY

STAGED COLLISION AND DAMAGE DATA

Impact Configuration: Vehicle Into Frontal Fixed Barrier

Vehicle Model Year: 1979

Vehicle Make: Ford

Vehicle Model: Custom Styleside F350 - Pick Up

Vehicle Size Category: Truck

Vehicle Test Weight: 5,217 lbs.

Impact Speed: 29.70 mph

Speed Change: 29.94 mph

Principal Direction of Force: 0 deg.

Initial Contact: Front Bumper

Damage Elevation

\[ L = 76.1" \]
\[ D = 0 \]
\[ C1 = 18.6" \]
\[ C2 = 19.3" \]
\[ C3 = 19.1" \]
\[ C4 = 16.2" \]

Collision Deformation Classification: 12FDEW2

Center of Gravity (Accel.) Location: 65.0" Behind Front Axle

Moving Barrier Model: N/A

Moving Barrier Weight: N/A lbs.

Impact Speed: N/A mph

Speed Change: N/A mph

Center of Gravity (Accel.) Location: N/A

Test Track: Dry Concrete
IST CRASH PROGRAM

VEHICLE: FORD F350 P.U.
VEHICLE ID: NHTSA 790608
TEST FILE NO: 223 FRONTAL
DATE: MARCH 20, 1980

IMPACT SPEED

VEHICLE: 29.70 MPH

DELTA VELOCITIES (AT TIME OF MAX NEGATIVE VEHICLE LONGITUDINAL VELOCITY)

VEHICLE LONGITUDINAL: 29.94 MPH

PLOT DATA

IMPACT OCCURRED AT: 0 MS
DELTA VEL TAKEN AT: 135 MS
VEHICLE: FORD F350 PU  
VEHICLE ID: HITA 796868  
TEST FILE NO: 223 FRONTAL  
DATE: MARCH 20, 1980

VEHICLE SPEED: 29.70 MPH

G-IMPACT ONSET 0 MS  
X-DELTA V MAX 135 MS

10^-3 SEC  
VEHICLE CG LATERAL ACCELERATION
JCT CRASH PROGRAM

VEHICLE: Ford F350 P.U.  
VEHICLE ID: NHTSA 790608  
TEST FILE NO: 223 FRONTAL  
DATE: MARCH 20, 1980

VEHICLE SPEED: 29.70 MPH

O-IMPACT ONSET 18 MS  
X-DELTA V MAX 135 MS

VEHICLE CG LONGITUDINAL DISPLACEMENT
1979 Ford Custom Styleside F350 - Pick Up

NHTSA 790608

Post-Impact, Full Front View
1979 Ford Custom Styleside P350 - Pick Up

NHTSA 790608

Post-Impact, Left Side View
1979 Ford Custom Styleside F350 - Pick Up

NHTSA 790608

Post-Impact, Right Side View
1979 Ford Custom Styleside F350 - Pick Up

NHTSA 790608

Post-Impact, Overhead View
SECTION 3

3.28 CHINOOK GAZELLE POP-TOP – MOTOR HOME

This section presents information on the 1979 Chinook Gazelle Pop-Top – Motor Home, NHTSA 791303. This test vehicle was subjected to a frontal fixed barrier impact at 29.68 mph.
Impact Configuration: Vehicle Into Frontal Fixed Barrier

Vehicle Model Year: 1979

Vehicle Make: Chinook

Vehicle Model: Gazelle Pop-Top Motor Home

Vehicle Size Category: Multi-Purpose

Vehicle Test Weight: 3,996 lbs.

Impact Speed: 29.68 mph

Speed Change: 30.45 mph

Principal Direction of Force: 0 deg.

Initial Contact: Front Bumper

Damage Elevation:

\[ L = 62.2'' \]

\[ D = 0 \]

\[ C_1 = 16.9'' \]

\[ C_2 = 18.7'' \]

\[ C_3 = 19.3'' \]

\[ C_4 = 19.0'' \]

Collision Deformation Classification: 12FDEW3

Center of Gravity (Accel.) Location: \( 66.0'' \) Behind Front Axle

Moving Barrier Model: N/A

Moving Barrier Weight: N/A lbs.

Impact Speed: N/A mph

Speed Change: N/A mph

Center of Gravity (Accel.) Location: N/A

Test Track: Dry Concrete
VEHICLE: CHICO - MINI
VEHICLE II: Honica T91303
TEST FILE NO: 210 FRONTAL
DATE: MARCH 27, 1980

IMPACT SPEED

VEHICLE: 29.68 MPH

DELTA VELOCITIES (AT TIME OF MAX NEGATIVE VEHICLE LONGITUDINAL VELOCITY)

VEHICLE LONGITUDINAL: 30.45 MPH

PLOT DATA

IMPACT OCCURED AT: 0 MS
DELTA VEL TAKEN AT: 140 MS
VEHICLE: CHINOOK - MINI
VEHICLE ID: NHTSA 791303
TEST FILE NO: 210 FRONTAL
DATE: MARCH 27, 1980

VEHICLE SPEED: 29.68 MPH
O-IMPACT ONSET 0 MS
X-DELTA V MAX 140 MS
VEHICLE: CHINGO - MINI
VEHICLE ID: MHTSA 791803
TEST FILE NO: 210 FRONTAL
DATE: MARCH 27, 1980

VEHICLE SPEED: 29.68 MPH

O-IMPACT ONSET 0 MS
X-DELTA V MAX 140 MS

VEHICLE CG LONGITUDINAL ACCELERATION
1979 Chinook Gazelle Pop-Top - Motor Home

NHTSA 791303

Post-Impact, Full Front View
1979 Chinook Gazelle Pop-Top - Motor Home

NHTSA 791303

Post-Impact, Left Side View
1979 Chinook Gazelle Pop-Top - Motor Home

NHTSA 791303

Post-Impact, Right Side View
1979 Chinook Gazelle Pop-Top - Motor Home

NHTSA 791303

Post-Impact, Overhead View
SECTION 3

3.29 MAZDA B2000 - PICK UP

This section presents information on the 1979 Mazda B2000 (Long Body) - Pick Up, NHTSA 790606. This test vehicle was subjected to a frontal fixed barrier impact at 29.73 mph.
TEST SUMMARY
STAGED COLLISION AND DAMAGE DATA

Impact Configuration  Vehicle Into Frontal Fixed Barrier
Vehicle Model Year  1979
Vehicle Make  Mazda
Vehicle Model  B2000 (Long Body) - Pick Up
Vehicle Size Category  Truck
Vehicle Test Weight  3,184 lbs.
Impact Speed  29.73 mph
Speed Change  30.58 mph
Principal Direction of Force  0 deg.
Initial Contact  Front Bumper

Damage Elevation
L = 69.5"
D = 0
C1 = 16.5"
C2 = 17.3"
C3 = 17.8"
C4 = 16.7"

Collision Deformation Classification  12FDEW2
Center of Gravity (Accel.) Location  $55.0"$ Behind Front Axle
Moving Barrier Model  N/A
Moving Barrier Weight  N/A lbs.
Impact Speed  N/A mph
Speed Change  N/A mph
Center of Gravity (Accel.) Location  N/A
Test Track  Dry Concrete
VEHICLE: MADA 45
VEHICLE ID: NHHC-79-06
TEST FILE NO: 327 FRONTAL
DATE: APRIL 3, 1960

IMPACT SPEED

VEHICLE: 29.73 MPH

DELTA VELOCITIES (AT TIME OF MAX NEGATIVE VEHICLE LONGITUDINAL VELOCITY)

VEHICLE LONGITUDINAL: 30.58 MPH

PLOT DATA

IMPACT OCCURED AT: 0 MS
DELTA VEL TAKEN AT: 145 MS
VEHICLE: MAZDA 625
VEHICLE ID: NHTSA 790606
TEST FILE NO: 227 FRONTAL
DATE: APRIL 3, 1980

VEHICLE SPEED: 29.73 MPH
O-IMPACT ONSET 0 MS
X-DELTA V MAX 145 MS
VEHICLE: MAZDA P-U
VEHICLE ID: NHTSA 790606
TEST FILE NO: 227 FRONTAL
DATE: APRIL 3, 1980

VEHICLE SPEED: 29.73 MPH
O-IMPACT ONSET 0 MS
X-DELTA V MAX 145 MS
VEHICLE: MAZDA P-U
VEHICLE ID: NHTSA 790606
TEST FILE NO: 227 FRONTAL
DATE: APRIL 3, 1980

VEHICLE SPEED: 29.73 MPH

G-IMPACT ONSET 0 MS
X-DELTAV MAX 145 MS
VEHICLE: MAZDA F U  
VEHICLE ID: NHTSA T90606  
TEST FILE NO: 22T FRONTAL  
DATE: APRIL 3, 1980  

VEHICLE SPEED: 29.73 MPH  

O-IMPACT ONSET 0 MS  
X-DELTA V MAX 145 MS  

VEHICLE CG LONGITUDINAL DISPLACEMENT
1979 Mazda B2000 (Long Body) - Pick Up

NHTSA 790606

Post-Impact, Full Front View
1979 Mazda B2000 (Long Body) - Pick Up

NHTSA 790606

Post-Impact, Left Side View
1979 Mazda B2000 (Long Body) - Pick Up

NHTSA 790606

Post-Impact, Right Side View
1979 Mazda B2000 (Long Body) - Pick Up

NHTSA 790606

Post-Impact, Overhead View
SECTION 3

3.30 CHAMPION TRANS VAN - MOTOR HOME

This section presents information on the 1979 Champion Trans Van - Motor Home, NHTSA 791304. This vehicle was subjected to a frontal fixed barrier impact at 29.48 mph.
Impact Configuration  Vehicle Into Frontal Fixed Barrier

Vehicle Model Year   1979

Vehicle Make       Champion

Vehicle Model      Trans Van - Motor Home

Vehicle Size Category   Multi-Purpose

Vehicle Test Weight  5,912   lbs.

Impact Speed       29.48   mph

Speed Change       31.26   mph

Principal Direction of Force  0   deg.

Initial Contact Front Bumper

Damage Elevation

\[
\begin{align*}
L & = 78.0'' \\
D & = 0 \\
C_1 & = 16.8'' \\
C_2 & = 19.9'' \\
C_3 & = 18.3'' \\
C_4 & = 14.4'' \\
\end{align*}
\]

Collision Deformation Classification  L2FDEW6

Center of Gravity (Accel.) Location  \(\frac{C}{65.0''}\) Behind Front Axle

Moving Barrier Model N/A

Moving Barrier Weight N/A  lbs.

Impact Speed N/A  mph

Speed Change N/A  mph

Center of Gravity (Accel.) Location N/A

Test Track Dry Concrete
VEHICLE: CHAMPION TRANS VAN
VEHICLE ID: NHTSA 791304
TEST FILE NO: 211 FRONTAL
DATE: APRIL 24, 1980

IMPACT SPEED

VEHICLE: 29.48 MPH

DELTA VELOCITIES (AT TIME OF MAX NEGATIVE VEHICLE LONGITUDINAL VELOCITY)

VEHICLE LONGITUDINAL: 31.26 MPH

PLOT DATA

IMPACT OCCURED AT: 0 MS
DELTA VEL TAKEN AT: 146 MS
VEHICLE: CHAMPION TRANS VAN
VEHICLE ID: NHTSA T91304
TEST FILE NO: 211 FRONTAL
DATE: APRIL 24, 1980

VEHICLE SPEED: 29.48 MPH

O-IMPACT ONSET 0 MS
X-DELTA V MAX 146 MS
VEHICLE: CHAMPION TRANS VAN
VEHICLE ID: NHTSA 721304
TEST FILE NO: 211 FRONTAL
DATE: APRIL 24, 1988

VEHICLE SPEED: 29.48 MPH

0-IMPACT ONSET 0 MS
X-DELTA v MAX 125 MS
VEHICLE: CHAMPION TRANS VAN  
VEHICLE ID: NHTSA 791308  
TEST FILE NO: 211 FRONTAL  
DATE: APRIL 24, 1980

VEHICLE SPEED: 29.48 MPH

0-IMPACT ONSET 0 MS
\( V_{\text{DELTA}} \) MAX 125 MS

VEHICLE CG VERTICAL ACCELERATION
1979 Champion Trans Van - Motor Home

NHTSA 791304

Post-Impact, Full Front View
1979 Champion Trans Van - Motor Home

NHTSA 791304

Post-Impact, Left Side View
1979 Champion Trans Van - Motor Home

NHTSA 791304

Post-Impact, Right Side View
1979 Champion Trans Van - Motor Home

NHTSA 791304

Post-Impact, Overhead View
4.0 DATA ACQUISITION AND REDUCTION

The data acquisition and analysis system used for acquiring barrier and vehicle accelerations is shown schematically in Figure 4-1. A complete list of instrumentation is shown in Table 4-1. An itemized procedure for acquiring data is provided in Table 4-2.

Prior to the vehicle impact test, onboard instrumentation is installed and a calibration and null reference check is performed to check out all data analog devices including FM magnetic tape recorders. Immediately following vehicle impact a post-impact calibration and null reference check is performed.

Analog data is replayed and digitized using a Hewlett Packard Digital Fourier Analyzer (DFA). The data is digitized three channels at a time and placed into permanent storage on magnetic disc. The only modifications to the data at the time of permanent storage are: the application of a 250 Hz predigitizing analog filter (60 db/octave rolloff), the filtering and digitizing
process of the FM tape recorder (2500 Hz) and the DFA (1000 Hz sampling for a 1 second window), and the application of the appropriate calibration scale factors.

As the data is recalled for integration or plotting, the appropriate SAE filter is applied. These filters are in accordance with SAE J211a, Instrumentation for Impact Tests. Acceleration data is plotted after the application of an SAE class 60 filter. Velocity and displacement data is plotted after the application of an SAE class 180 filter. The filters are shown in Figure 4-2.

Before plotting, the test engineer determines vehicle onset and vehicle separation times. This is done by looking for characteristics contained in both the vehicle and barrier acceleration signals which indicate when these events occurred. Impact onset is verified with the trigger signal. When a velocity, or displacement trace is to be plotted, integration of the appropriate acceleration signal is performed digitally in the DFA.
All impact data is presented in computer plots of a 1 second time window. Impact onset and vehicle separation times are shown, as well as appropriate labels defining the test vehicle, filter class and data plotted. The descriptions on the plots are self explanatory, noting that the velocity plot of the barrier vs vehicle is a plot of the vehicle velocity subtracted from the barrier velocity.

In addition to the data plots, a table listing the barrier closing speed, impact and vehicle separation times and delta velocities is given. Delta velocity is taken as the difference between the velocity at the moment of impact and the velocity at the moment of separation for the barrier or vehicle.

The aforesaid process from digitizing data through plotting data is controlled with standard Hewlett Packard Fourier software in conjunction with AETL designed software written specifically for crash data reduction.
VEHICLE AND OCCUPANT CRASH IMPACT DATA ACQUISITION SYSTEM

FIGURE 4-1
COMPARISON PLOT OF SAE CLASS 60, 180, 600, 1000 FILTERS AND THE DATA ANALYSIS 1250 HZ PREDIGITIZING ANALOG FILTER.

SAE FILTERS ROLL OFF IS 12DB/OCT, ANALOG FILTER ROLL OFF IS 60DB/OCT

DB FILTER GAIN

FIGURE 4-2
<table>
<thead>
<tr>
<th>Instrument</th>
<th>Manufacturer</th>
<th>Model No.</th>
<th>Full Scale</th>
<th>Accuracy</th>
<th>Frequency Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accelerometers, Vehicle, Barrier</td>
<td>Endevco</td>
<td>2262C-200</td>
<td>200g</td>
<td>±1%</td>
<td>3600 Hz</td>
</tr>
<tr>
<td>Contact Switch, Impact</td>
<td>AEIL</td>
<td>–</td>
<td>2 V</td>
<td>–</td>
<td>&lt;200 us rise time</td>
</tr>
<tr>
<td>FM Tape Recorder</td>
<td>Bell &amp; Howell</td>
<td>4020</td>
<td>±2.8 V</td>
<td>47 db SNR</td>
<td>2500 Hz WB</td>
</tr>
<tr>
<td>Programmable Filter, All Data</td>
<td>Hewlett Packard</td>
<td>54440A</td>
<td>–</td>
<td>0.5%</td>
<td>1250 Hz, 60 db/oct</td>
</tr>
<tr>
<td>Analog-Digital Converter, All Data</td>
<td>Hewlett Packard</td>
<td>5466B</td>
<td>–</td>
<td>0.5%</td>
<td>200 us sampling</td>
</tr>
<tr>
<td>Analysis Computer, All Analysis</td>
<td>Hewlett Packard</td>
<td>2100S</td>
<td>32 K Words</td>
<td>16 Bit Word</td>
<td>–</td>
</tr>
<tr>
<td>Disc Drive</td>
<td>Hewlett Packard</td>
<td>7900A</td>
<td>5 Meg Words</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>STEP</td>
<td>DESCRIPTION</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>------</td>
<td>-------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>DA System Installation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>DA System Pre-Impact Calibration</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Impact Trigger Checkout</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Vehicle Impact Performed</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>DA System Post-Impact Calibration</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| 6    | Data Reproduced From FM Tape Into Computer  
   a) Data analog filtered at 250 Hz  
   b) Data digitized at 100 ms sample rate  
   c) Data synchronized by impact trigger signal |
| 7    | Digitized Data Examined |
| 8    | Data Transferred Permanent Disc Storage |
| 9    | Appropriate SAE Filters Are Applied |
| 10   | Each Data Signal Plotted With Labels |
4.1 FRONTAL FIXED BARRIER IMPACT DELTA VELOCITY CALCULATION

The data acquisition and reduction process for a frontal fixed barrier impact delta velocity calculation is outlined in the step by step discussion which follows. Figures 4-3 through 4-7 illustrate each step in the process. Reflected in the processed data is:

1) Relying on the optical speed trap data as the most accurate source of the test vehicle impact speed, the calibration factor, which converts the vehicle longitudinal acceleration signal from volts to g's, is forced to produce a velocity consistent with the optical speed trap data.

Step 1: Acquire a two (2) second time history of the test vehicle longitudinal acceleration signal at a sample rate and with a pre-digitizing filter that is in accordance with the guideline established by SAE J211b. (Figure 4-3)
SECTION 4

Step 2: Remove bias from the longitudinal acceleration signal. Bias removal is based on the assumption that the test vehicle comes to rest at some point in time prior to the end of the two (2) second time history window. From this point in time through the end of the two (2) second window, the acceleration signal should be at zero, and the velocity trace should exhibit no change (flat). (Figure 4-4 and 4-5)

Step 3: Calculate the test vehicle longitudinal acceleration calibration factor. The optical speed trap reading is used in this step, along with the knowledge that the test vehicle comes to rest, i.e. a known delta velocity from impact to rest. (Figure 4-6)

Step 4: Calculate the delta velocity at the time of test vehicle and barrier separation. The time of separation is determined by examining the test vehicle longitudinal acceleration signal and velocity trace while noting that:
1) Since any external force acting to decelerate the test vehicle in the positive forward direction become zero upon separation, the vehicle should reach its maximum negative velocity (rebound velocity) immediately prior to separation and should exhibit no further deceleration in the positive forward direction after this time.

2) After separation, the vehicle is slowed from its rebound velocity to a stop by the friction forces. The vehicle velocity trace should exhibit a slight positive slope (max 1 G) immediately after separation until the vehicle comes to rest. (Figure 4-7)
VEHICLE: EXAMPLE
TEST FILE: FRONTAL IMPACT
DATE: JANUARY 1981

SAMPLING: 1000 HZ
FILTER: CLASS 100

DATA AS ORIGINALLY DIGITIZED
UNSCALED AND BIAS ED (DC OFFSET)

VEHICLE CG LONGITUDINAL ACCELERATION

FIGURE 4-3
FIGURE 4-4
VEHICLE: EXAMPLE
TEST FILE: FRONTAL IMPACT
DATE: JANUARY 1981

Figure 4-5

BIASED DATA INTEGRATED

DATA WITH BIAS REMOVED

VEHICLE CG ACCELERATION INTEGRATED ONCE

SAMPLING: 1000 Hz
FILTER: CLASS 180

5.0 VOLTS SECONDS
PROCEDURE FOR OBTAINING VEHICLE SCALE FACTOR:

1. USING UNBIASED DATA, INTEGRATE TO MPH-VOLTS/G
2. OBSERVING WHERE VEHICLE HAS STOPPED, CALCULATE A DELTA MPH-VOLTS/G VALUE (AN AVG. VALUE OVER VEHICLE'S STOPPED RANGE)
3. DIVIDE THE VEHICLE CLOSING SPEED AS MEASURED BY OPTICAL TRAPS BY DELTA TO OBTAIN SCALE FACTOR IN G/VOLT

VEHICLE CLOSING SPEED = THIS X SCALE FACTOR G/VOLT

VEHICLE STOPPED

FIGURE 4-6
VEHICLE: EXAMPLE
TEST FILE: FRONTAL IMPACT
DATE: JANUARY 1981

1 G'S OR MPH

VEH. VELOCITY

VEH. ACCELERATION

< SEPARATION POINT

VEHICLE CG LONG. VELOCITY AND ACCELERATION

FIGURE 4-7
4.2 REAR MOVING BARRIER IMPACT DELTA VELOCITY CALCULATION

The data acquisition and reduction process for a rear moving barrier impact delta velocity calculation is outlined in the step by step discussion which follows. Figure 4-8 through 4-17 illustrate each step in the process. Reflected in the processed data is:

1) Relying on the optical speed trap data as the most accurate source of the moving barrier impact speed, the calibration factor, which converts the moving barrier longitudinal acceleration signal from volts to g's, is forced to produce a velocity consistent with the optical speed trap data.

2) Since there is no comparable method of forcing a calibration factor on the test vehicle longitudinal acceleration signal, calibration factor for the test vehicle data are the result of the pre-test accelerometer calibration.
SECTION 4

Step 1: Acquire a five (5) second time history of the moving barrier longitudinal and test vehicle longitudinal acceleration signal. (Figure 4-8 and 4-9)

Step 2: Remove bias from the longitudinal acceleration signals. Bias removal is based on the assumption that once the moving barrier and test vehicle come to rest, the acceleration trace should remain at zero and the velocity trace should exhibit no change (flat) from the "stop" time through the remainder of the five (5) second time history window. (Figure 4-10 through 4-13) The five (5) second time history was selected to allow sufficient time for both the moving barrier and the test vehicle to come completely to rest.

Step 3: Calculate the moving barrier longitudinal acceleration calibration factor. The optical speed trap reading is used in this step, along with the knowledge that the moving barrier comes to rest, i.e. a known delta velocity from impact to rest. (Figure 4-14).
Step 4: Acquire a one (1) second time history of the moving barrier longitudinal and test vehicle longitudinal acceleration signal at a sample rate and with a pre-digitizing filter that is in accordance with the guideline established by SAE J211b. Remove bias and apply calibration factor calculated from the five (5) second time history data. (Figure 4-15 and 4-16)

Step 5: Calculate the delta velocity at the time of moving barrier/test vehicle separation. The time of separation is determined by examining the moving barrier and test vehicle longitudinal acceleration signal and velocity traces while noting that:

1) The moving barrier exhibits no appreciable deceleration from the time of separation until the moment the moving barrier brakes are applied, i.e. a period of constant velocity should be exhibited by the moving barrier immediately following barrier/test vehicle separation.
2) Since any external force acting to accelerate
the test vehicle in the positive forward direc-
tion becomes zero at separation, the test vehicle
should exhibit maximum velocity immediately prior
to separation and only deceleration due to friction
forces thereafter. (Figure 4-17)
VEHICLE: EXAMPLE
TEST FILE: REAR IMPACT
DATE: JANUARY 1981

10^{-1} VOLTS

DATA AS ORIGINALLY DIGITIZED
UNSCALED AND BIAS (DC OFFSET)

FIGURE 4-8
VEHICLE: EXAMPLE
TEST FILE: REAR IMPACT
DATE: JANUARY 1981

DATA AS ORIGINALLY DIGITIZED
UNSCALED AND BIASED (DC OFFSET)

FIGURE 4-9
VEHICLE: EXAMPLE
TEST FILE: REAR IMPACT
DATE: JANUARY 1981

SAMPLING: 200 HZ
FILTER: 50 HZ

BIAS

SIGNAL WITH BIAS REMOVED

FIGURE 4-10
VEHICLE: EXAMPLE
TEST FILE: REAR IMPACT
DATE: JANUARY 1981
SAMPLING: 200 Hz
FILTER: 50 Hz

10.0 VOLTS SECONDS

BIASED DATA INTEGRATED

DATA WITH BIAS REMOVED INTEGRATED

10^{-3} SEC BARRIER LONITUDINAL ACCELERATION INTEGRATED ONCE

FIGURE 4-11
FIGURE 4-12
VEHICLE: EXAMPLE
TEST FILE: REAR IMPACT
DATE: JANUARY 1981

10.0 VOLTS SECONDS

DATA WITH BIAS REMOVED INTEGRATED

BIASED DATA INTEGRATED

0 500 1000 1500 2000 2500 3000 3500 4000 4500 5000
10^-3 SEC VEHICLE CG ACCELERATION INTEGRATED ONCE

FIGURE 4-13
PROCEDURE FOR OBTAINING BARRIER SCALE FACTOR:
1. USING UNBIASED DATA, INTEGRATE TO MPH-VOLTS/G
2. OBSERVING WHERE BARRIER HAS STOPPED, CALCULATE A DELTA MPH-VOLTS/G (AN AVE VALUE OVER "STOPPED" RANGE)
3. DIVIDE THE BARRIER CLOSING SPEED AS MEASURED BY OPTICAL TRAPS BY THE DELTA TO OBTAIN SCALE FACTOR IN G/VOLT

FIGURE 4-14
VEHICLE: EXAMPLE
TEST FILE: REAR IMPACT
DATE: JANUARY 1981

SAMPLING: 1000 Hz
FILTER: CLASS 120

CLOSED SPEED = 35.13 MPH FROM OPTICAL TRAPS

BARRIER VELOCITY (OFFSET TO REFLECT CLOSING VEL)

BARRIER ACCELERATION

FIGURE 4-15
FIGURE 4-16
VEHICLE: EXAMPLE
TEST FILE: REAR IMPACT
DATE: JANUARY 1981

SAMPLE: 1000 Hz
FILTER: CLASS 180

VEHICLE LONGITUDINAL VELOCITY
BARьер LONGITUDINAL VELOCITY

< SEPARATION PT (WHERE DELTA V IS CALCULATED)

BARьер DELTA V: 35.13 - 17.22 = 17.91 MPH
VEHICLE DELTA V: 24.41 MPH

FIGURE 4-17