

REPORT NO. MGA-90-N009

NEW CAR ASSESSMENT PROGRAM (NCAP)

FRONTAL BARRIER IMPACT TEST

Toyota
1993 Toyota Pickup-Truck
NHTSA NO. MP5104

MGA PROVING GROUNDS
5000 WARREN ROAD
BURLINGTON, WI 53105



December 18, 1992

FINAL REPORT

Prepared For:

U. S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
OFFICE OF MARKET INCENTIVES
400 SEVENTH STREET, S.W.

Room No. 5313 (NRM-22)
400 Seventh Street, S.W.
Washington, D.C. 20590

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PREPARED BY:

John Fleck
John Fleck
MGA Research Corporation

APPROVED BY:

Rudy H. Arendt
Rudy H. Arendt
MGA Research Corporation

FINAL REPORT ACCEPTED BY:

[Signature]
Manager, New Car Assess. Program
(NCAP)

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Date of Report Acceptance

Ha S. Chae
Contracting Officer's Tech. Rep. (COTR)

FEB 03 1993

Date of Report Acceptance

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16. Abstract A 56 kph (35 mph) frontal barrier impact using 30 load cell barrier was conducted on a 1993 Toyota Pickup at the MGA Proving Grounds Crash Test Facility in Burlington, Wisconsin on December 2, 1992. The barrier impact velocity was 56.2 kph (34.9), and the ambient temperature at the time of impact was 21° C. The post test average crush was 537 mm. The test vehicle appeared to comply with the requirements of the following Federal Motor Vehicle Safety Standards. 1. FMVSS 212, "Windshield Mounting" 2. FMVSS 219, (Partial), "Windshield Zone Intrusion" 3. FMVSS 301, "Fuel System Integrity" With regard to FMVSS 208, "Occupant Crash Protection" injury criteria, the driver's HIC was 1155 and the 3 msec Clip (Chest g's) was 49.2. The left and right femur maximum loads for the driver were 4078 N and 3556 N, respectively. The passenger's HIC was 570 and the 3 msec Clip (Chest g's) was 41.9. The left and right femur maximum loads for the passenger were 2074 N and 3687 N, respectively.			
17. Key Words 35 mph Frontal Barrier Impact Test New Car Assessment Program (NCAP) FMVSS 212 Indicant Testing FMVSS 219 (Partial) Indicant Testing FMVSS 301 Indicant Testing		18. Distribution Statement Copies of this report available from: Technical Reference Division National Highway Traffic Safety Adm NASSIF Building, Room 5108 400 Seventh St., S.W. Wash D.C. 20590	
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SECTION 1

PURPOSE AND TEST PROCEDURE

This 35 mph frontal barrier impact test is part of the Composite FY'92 Vehicle Barrier Impact Testing Program sponsored by the National Highway Traffic Safety Administration (NHTSA) under Contract No. DTNH 22-90-D-12121. The purpose of this test was to obtain vehicle crashworthiness and occupant restraint system performance data for an impact speed in excess of the current 48 kph FMVSS 208/212/219/301-75 requirements.

The 56 kph (35 mph) frontal barrier impact test was conducted in accordance with the National Highway Traffic Safety Administration (NHTSA) Indicant Test Procedure for New Car Assessment Program (NCAP) dated January 1, 1990. Data for FMVSS No. 212, "Windshield Mounting", FMVSS No. 219 (Partial), "Windshield Zone Intrusion", FMVSS No. 301-75, "Fuel System Integrity," as well as occupant performance data are provided herein.



SECTION 2

SUMMARY OF TEST NUMBER MN0203

A load cell barrier consisting of 30 load cells was impacted by a 1993 Toyota Pickup at a velocity of 56.2 kph (34.9 mph). The test was performed at the MGA Proving Grounds and Crash Test Center on December 2, 1992. Pre- and post-test photographs of the vehicle and dummies can be found in Appendix A.

The frontal barrier impact event was documented by one real-time camera and 16 high speed cameras. Camera locations and other pertinent camera information can be found in this report.

Two Part 572, 50th percentile male anthropomorphic test devices (ATDs) were placed in the driver and right-front passenger seating positions according to dummy placement instructions specified in the Laboratory Indicant Test Procedure.

Both ATDs were fully instrumented with head and chest triaxial accelerometers and right/left femur load cells. Seat belt load cells were also on the driver's and passenger's lap and shoulder belts to measure dummy torso and pelvic section loading. The driver ATD (Serial No. 466) and the right-front passenger ATD (Serial No. 465) were calibrated previous to this test. Certification details, along with instrumentation calibration data, are found in Appendix C and D.

The 39 channels of data were recorded on 4 computers. Appendix B contains the vehicle, load cell barrier and dummy response data traces.

The driver's head struck the steering wheel rim and hub. The driver HIC was 1155.44 and maximum chest deceleration over 3 milliseconds was 49.2 g's. The left and right femur loads were 4078 and 3556 newtons respectively.

The right front passenger's HIC was 569.7 and maximum chest deceleration over 3 milliseconds was 41.9 g's. The left and right femur loads were 2074 and 3687 newtons respectively.

GENERAL TEST AND VEHICLE PARAMETER DATA

Vehicle Yr/Make/Model/Body Style: 1993 Toyota Pickup

NHTSA No.: MP5104 VIN.: 4TARN81A1PZ057095

Body color: White Date of Manufacture: 10/92

Engine: 4 Cylinders; C.I.D.; 2.4 liters; CC

 X Gas; Diesel; Turbocharged

 X Longitudinal; Transverse

Transmission: 5 Speed; X Manual; Automatic; X Overdrive

Final Drive: Front Wheel; X Rear Wheel; Four Wheel

Date Received: 10/92 Odometer Reading: 59

 X A/C; P/S; P/B; P/wdo; Tilt Wheel

 P/seats; Cruise Control

Type of Occupant Restraint: The vehicle was equipped with

type II belt restraint system.

DATA RECORDED FROM VEHICLE'S TIRE PLACARD:

Tire Pressure (at capacity): Front 2.03 kg/cm² Rear 2.46 kg/cm²

Recommended Tire Size: P195/75R14

Recommended Cold Tire Pressure: Front 2.03 kg/cm² Rear 2.46 kg/cm²

Tires on Vehicle: P195/75R14 ; Manufacturer: Dunlop

Number of Occupants: 3 Front; Rear; 3rd Seat; 3 TOTAL

Type of Front Seats: Bucket; X Bench; Split Bench

Type of Front Seat Back: X Fixed; Adj. With Level Rot. Knob

Vehicle Capacity Weight (VCW) = 499 kg. (A)

No. of Occupants x 67.5 kg. = 202.5 kg. (B)

Rated Cargo Weight (RCW) A-B = 296.5 kg.

GVWR 1996 kg. GAWR: Front 918.8 kg. Rear 1154.7 kg.

GENERAL TEST AND VEHICLE PARAMETER DATA (Cont'd)

WEIGHT OF TEST VEHICLE AS RECEIVED FROM DEALER (WITH MAXIMUM FLUIDS) = UDW:

Right Front = 342.6 kg. Right Rear = 249.1 kg.
Left Front = 321.7 kg. Left Rear = 249.1 kg.
TOTAL FRONT WEIGHT = 664.3 kg. (57.1% of Total Vehicle Weight)
TOTAL REAR WEIGHT = 498.2 kg. (42.9% of Total Vehicle Weight)
TOTAL UNLOADED DELIVERED WEIGHT (UDW) = 1162.5 kg.

CALCULATION FOR TARGET TEST WEIGHT:

UDW = Unloaded Delivered Weight 1162.5 kg.
VCW = Vehicle Capacity Weight 499 kg.
DSC = Designated Seating Capacity 3
RCW = VCW - 67.5 (DSC) = 135 *kg.
Target Test Weight = UDW + RCW + (2 dummies x 73.8 kg./dummy)
Target Test Weight = 1445.1 kg.

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND CARGO:

Right Front = 362.0 kg. Right Rear = 354.4 kg.
Left Front = 375.1 kg. Left Rear = 353.5 kg.
TOTAL FRONT WEIGHT = 737.1 kg. (51% of Total Vehicle Weight)
TOTAL REAR WEIGHT = 707.9 kg. (49% of Total Vehicle Weight)
TOTAL TEST WEIGHT = 1445.0 kg.
Weight of ballast secured in vehicle trunk area = 37 kgs.
Vehicle components removed to meet target weight: None

VEHICLE ATTITUDE (all dimensions in mm):

Delivered Attitude: RF 737 LF 743 RR 737 LR 745
Test Attitude: RF 727.0 LF 727 RR 705 LR 708
Wheel Base: 2616 mm.; C.G. = 1333.5mm rearward of front wheel C/L
Remarks: None

*light trucks and MPVs RCW is 135 kgs. or manufacturer's value,
whichever is less

GENERAL TEST AND VEHICLE PARAMETER DATA (Cont'd)

POST-IMPACT DATA:

Type of Test: 35mph Frontal Impact Impact Angle: 0°
Date of Test: December 2, 1992 Time of Test: 2:17 p.m.
Ambient Temperature: 21°C (Spec. Range = 18.8 to 25.6°C)
Temperature in Occupant Compartment: 22°C
Windshield Molding Temperature: 22°C
Required Impact Velocity Range: 55.5 to 57.1 kph
Impact Velocity: primary = 56.2 kph, secondary = 56.3 kph
Distance From Front Bumper to Barrier Face When
Entering Speed Trap: 1250 mm
Exiting Speed Trap: 250 mm

VEHICLE REBOUND AND CRUSH (mm):

Vehicle Length: Pre-test = R 4350 C_L 4455 L 4350
Post-test = R 3898 C_L 3945 L 3890
Crush = R 452 C_L 510 L 460

Distance from front of test vehicle to point of impact (rebound):

R 299 mm C_L 312 mm L 330 mm

VISIBLE DUMMY CONTACT POINTS:

	<u>Driver</u>	<u>Passenger</u>
Head	<u>to steering wheel rim & hub</u>	<u>to left shoulder</u>
Chest	<u>to steering wheel</u>	<u>None</u>
Abdomen	<u>to steering wheel rim</u>	<u>None</u>
Left Knee	<u>to instrument panel</u>	<u>to instrument panel</u>
Right Knee	<u>to instrument panel</u>	<u>to instrument panel</u>

GENERAL TEST AND VEHICLE PARAMETER DATA (cont'd)

	<u>Front</u>		<u>Rear</u>	
	<u>Left</u>	<u>Right</u>	<u>Left</u>	<u>Right</u>
Door Opening				
(without use of tools)	<u>Opened</u>	<u>Opened</u>	<u>N/A</u>	<u>N/A</u>

	<u>Front</u>		<u>Rear</u>	
<u>Seat Movement</u>	<u>Left</u>	<u>Right</u>	<u>Left</u>	<u>Right</u>
Seat Back Movement	<u>None</u>	<u>None</u>	<u>N/A</u>	<u>N/A</u>
Seat Shift (inches)	<u>None</u>	<u>None</u>	<u>N/A</u>	<u>N/A</u>

Glazing Damage

Backlight/Windshield None

Other Notable Impact Effects: None

SECTION 3

SUMMARY OF RESULTS FOR-----

FMVSS 212, "Windshield Mounting"

FMVSS 219 (Partial), "Windshield Zone Intrusion"

FMVSS 301-75, "Fuel System Integrity"

FMVSS NO. 212, "WINDSHIELD MOUNTING", DATA SHEET

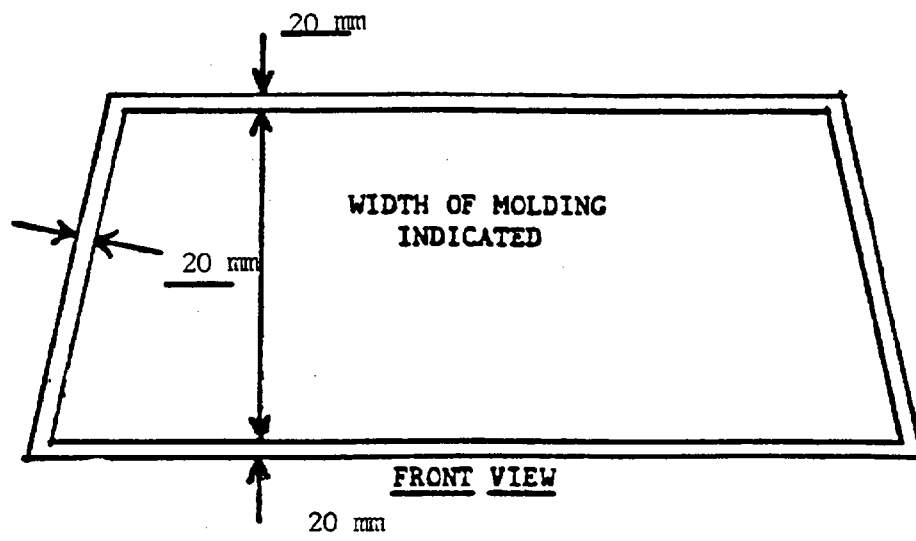
Details of windshield mounting such as retention method, trim type, etc.:
Steel trim with glue retention

FMVSS 212 Requirements: The Post-Test periphery retention amount must be at least 75% of the Pre-Test periphery measurement for vehicles NOT equipped with automatic restraints, and 50% for each side of windshield for vehicles equipped with automatic restraint systems for front occupants.

FMVSS 212 TEST DATA:

	WINDSHIELD PERIPHERY		
	PRE-TEST (mm)	POST-TEST (mm)	PERCENT RETENTION
RIGHT SIDE	1850	1850	100%
LEFT SIDE	1850	1850	100%
TOTAL	3700	3700	100%

AREA OF RETENTION FAILURE:



FAILURE DETAILS:

NONE

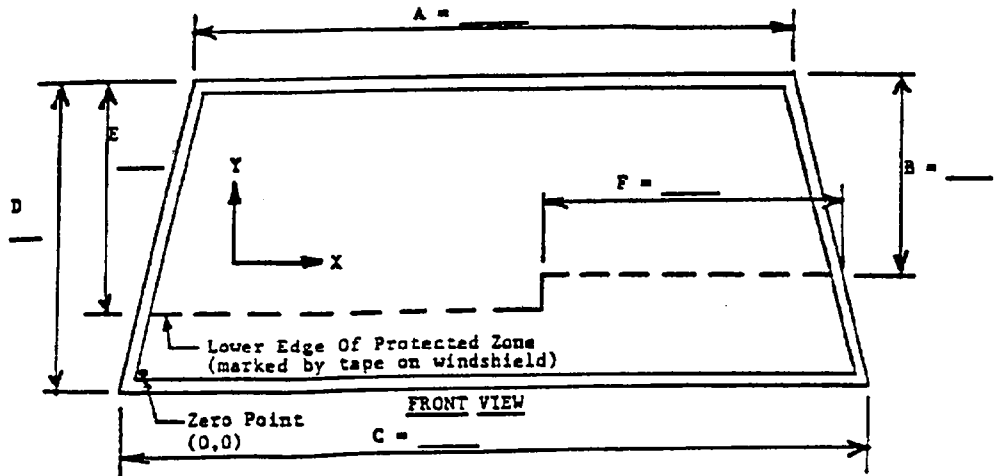
FMVSS NO. 219, "WINDSHIELD ZONE INTRUSION", DATA SHEET

PROTECTED ZONE LOWER EDGE REQUIREMENT:

The lower edge of the protected zone is determined by placing a 6.5" dia. rigid sphere weighing 15 pounds in a position such that it simultaneously contacts the inner surface of the windshield and the top surface of the instrument panel including padding. Draw the locus of points on the inner surface of the windshield contactable by the sphere across the width of the instrument panel. From the outermost contactable points, extend the locus line horizontally to the edges of the windshield, and then draw a line on the inner surface of the windshield below and 1/2" distant from the locus line. The LOWER EDGE OF THE PROTECTED ZONE is the longitudinal projection onto the outer surface of the windshield of this line.

FMVSS 219 TEST DATA:

A= 1112 mm
B= 320 mm
C= 1360 mm
D= 600 mm
E= 425 mm
F= 870 mm



DETAILS OF WINDSHIELD GLASS PENETRATION GREATER THAN 1/4":
(Show location of penetration)

NONE

FMVSS NO. 301-75, "FUEL SYSTEM INTEGRITY", DATA SHEETS

TEST VEHICLE NHTSA NO.: MP5104 TEST DATE: December 2, 1992

VEHICLE MAKE/MODEL/BODY STYLE: 1993 Toyota Pickup

USABLE CAPACITY OF VEHICLE'S FUEL TANK: 49.5 Liters
(figure furnished by vehicle manufacturer)

TEST REQUIREMENTS:

Test vehicle's engine operated to "run dry" condition, and then a small amount of Stoddard solvent which has been dyed RED shall be added to the vehicle's fuel tank. Operate the fuel pump enough to completely fill the fuel system ahead of the fuel tank, and add 92 to 94% of the stated USABLE CAPACITY to the fuel tank.

AMOUNT OF STODDARD SOLVENT ADDED TO VEHICLE'S FUEL TANK:

46 Liters Which is 92.9% of the Stated USABLE CAPACITY.

SOLVENT SPILLAGE MEASUREMENT AFTER 35 MPH FRONTAL BARRIER IMPACT TEST:

	<u>Actual</u>	<u>Maximum Allowable</u>
From impact until vehicle motion ceases-----	<u>0</u>	1 oz.
For 5 min. period after vehicle motion ceases	<u>0</u>	5 oz.
For next 25 minutes at barrier face-----	<u>0</u>	1 oz./1 minute

SOLVENT SPILLAGE DETAILS:

NONE

*STATIC ROLLOVER MACHINE ROTATION TIME INFORMATION: (Spec. Range-1 to 3min.)

Time reqd. for machine to rotate 90° = N/A minutes, N/A seconds

FMVSS 301-75 Position Hold Time = 5 minutes, 0 seconds

TOTAL----- = N/A minutes, N/A seconds

Next Whole Minute Interval - - - - - = N/A minutes

* Not applicable - test not performed as per NHTSA COTR

FMVSS NO. 301-75 TEST DATA . . . Continued:

*VEHICLE STATIC ROLLOVER DATA:

	<u>First 5 Minutes</u> <u>FROM ONSET OF ROTATION</u>	<u>6th</u> <u>Minute</u>	<u>7th</u> <u>Minute</u>	<u>8th</u> <u>Minute</u>
Maximum Allowable Solvent Spillage	5 oz.	1 oz.	1 oz.	1 oz.
0° to 90° (filler cap down)	N/A	N/A	N/A	N/A
90° to 180°	N/A	N/A	N/A	N/A
180° to 270°	N/A	N/A	N/A	N/A
270° to 360°	N/A	N/A	N/A	N/A

Solvent Spillage Location(s):

N/A

* Not Applicable - test not performed as per NHTSA COTR

SECTION 4
OMI FINAL DATA

Occupant and Vehicle Information

I. OMI DATA

1. Dummy Injury Criteria Data Summary
2. Dummy Positioning Data
3. Seat Belt Positioning Data
4. Seat Belt Performance Assessment Data
5. Driver Dummy to Steering Column Dimensions
6. Camera Locations
7. Vehicle Target Locations

II. OVR DATA

1. Load Cell Barrier Data
2. Vehicle Accelerometer Data
3. Test Vehicle Measurements

III. AID DATA

1. Accident Investigation Damage Data Summary

FMVSS NO. 208, "OCCUPANT CRASH PROTECTION", DATA SHEET

VEH. YR./MAKE/MODEL/BODY STYLE: 1993 Toyota Pickup

VEH. NHTSA NO.: MP5104 TEST DATE: December 2, 1992

MAXIMUM ACCELERATION VALUES: (g's)	DRIVER DUMMY #466	PASSENGER DUMMY #465
Head Channel X	-102.0	-20.3
Head Channel Y	-21.5	19.4
Head Channel Z	112.9	58.7
HEAD RESULTANT	141.5	59.1
Chest Channel X	-51.1	-43.6
Chest Channel Y	9.0	18.3
Chest Channel Z	12.5	15.7
CHEST RESULTANT	49.2	41.9
TIME INTERVAL (msec) [0.003 seconds minimum]	t ₁ = 57.9 t ₂ = 60.9	t ₁ = 51.5 t ₂ = 54.5

HEAD INJURY CRITERIA (HIC)
VALUES:

HIC	1155.4	569.7
t ₁ = (msec)	60.5	56.7
t ₂ = (msec)	92.3	92.7
Avg. Accel. t ₁ to t ₂ (g's)	66.7	47.8

[The maximum time interval from t₁ to t₂ is 36 milliseconds.]

MAXIMUM FEMUR FORCES:

Right Side (N)	-3556	-3687
Left Side (N)	-4078	-2074

MAXIMUM SEAT BELT FORCES:

Lap Belt (N)	5055	5824
Shoulder Belt (N)	8777	11123

NOTE: All values listed must occur during primary impact event.
(Head X,Y,Z and R listed must be during t₁ to t₂ HIC interval)

HYBRID III NECK AND CHEST DATA SHEET*

VEHICLE YR./MAKE/MODEL/BODY STYLE: 1993 Toyota Pickup

VEHICLE NHTSA NO.: MP5104 TEST DATE: December 2, 1992

MAXIMUM VALUES	DRIVER DUMMY #	PASSENGER DUMMY #
Neck Load X	N/A	N/A
Neck Load Y	N/A	N/A
Neck Load Z	N/A	N/A
Neck Moment X	N/A	N/A
Neck Moment Y	N/A	N/A
Neck Moment Z	N/A	N/A
Chest Deflection X (in.)	N/A	N/A
Time of Max. Occurrence	N/A	N/A

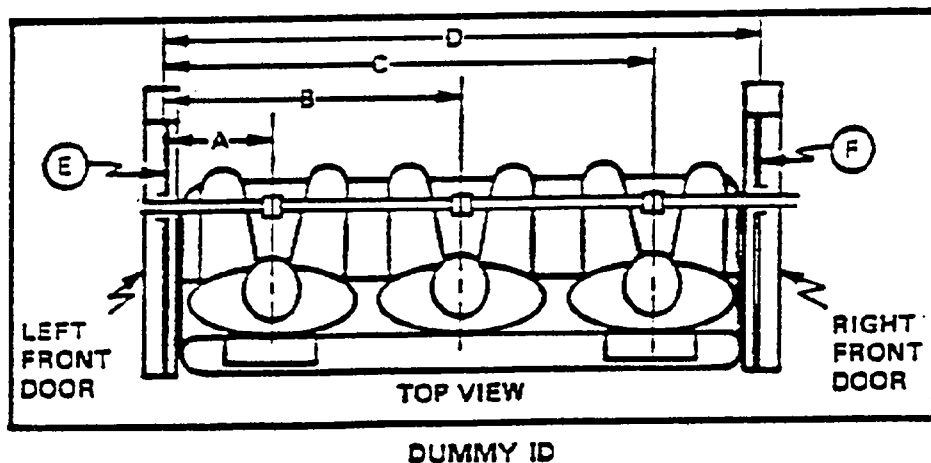
NOTE: All values listed must occur during primary impact event.
* For Hybrid III Dummy Application Only

PART 572 DUMMY IN-VEHICLE POSITION

Test No.: MP5104 Vehicle: 1993 Toyota Pickup

<u>SEAT TYPE:</u>	<u>ADJUSTER TYPE:</u>	<u>BUCKET SEAT BACK TYPE:</u>
<u>X</u> Bench	<u>X</u> Manual	<u>X</u> Fixed
<u> </u> Bucket	<u> </u> Power	<u> </u> Adjustable Reclining
<u> </u> Split Bench		

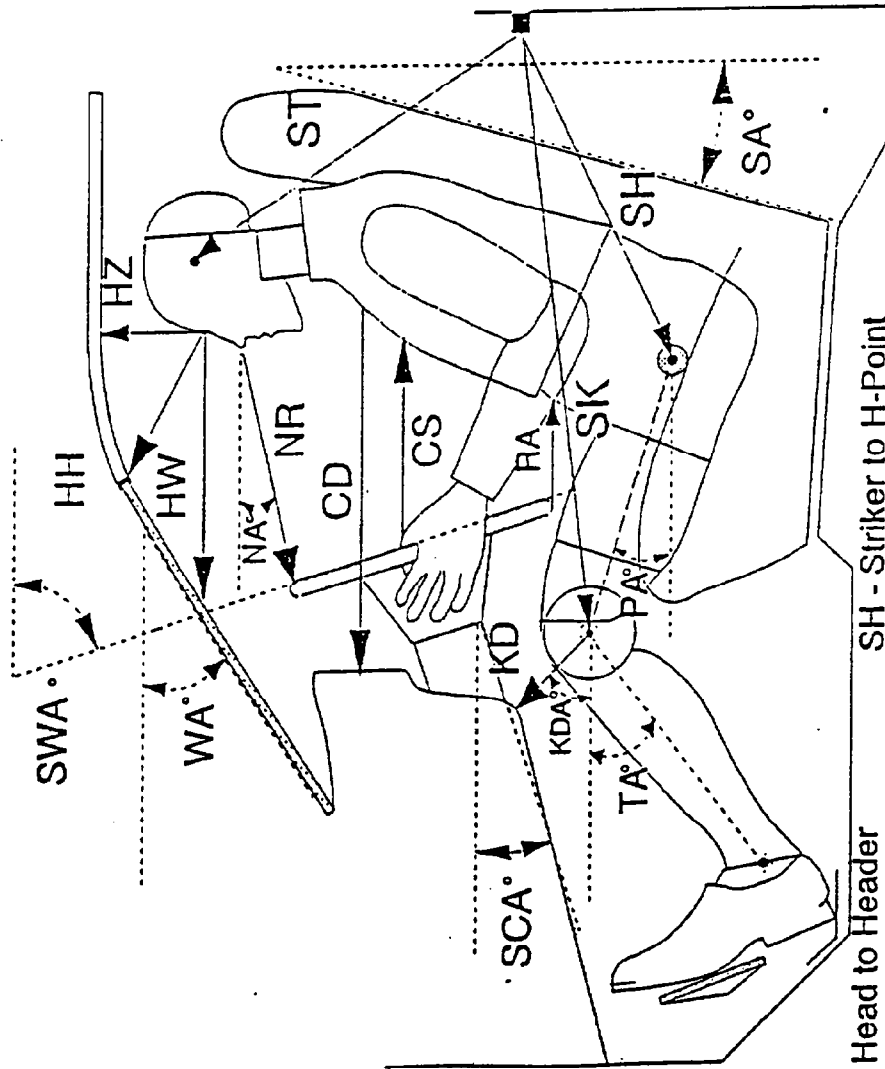
Seat notch 7 from rear Seat notch 7 from rear



466 DUMMY ID 465

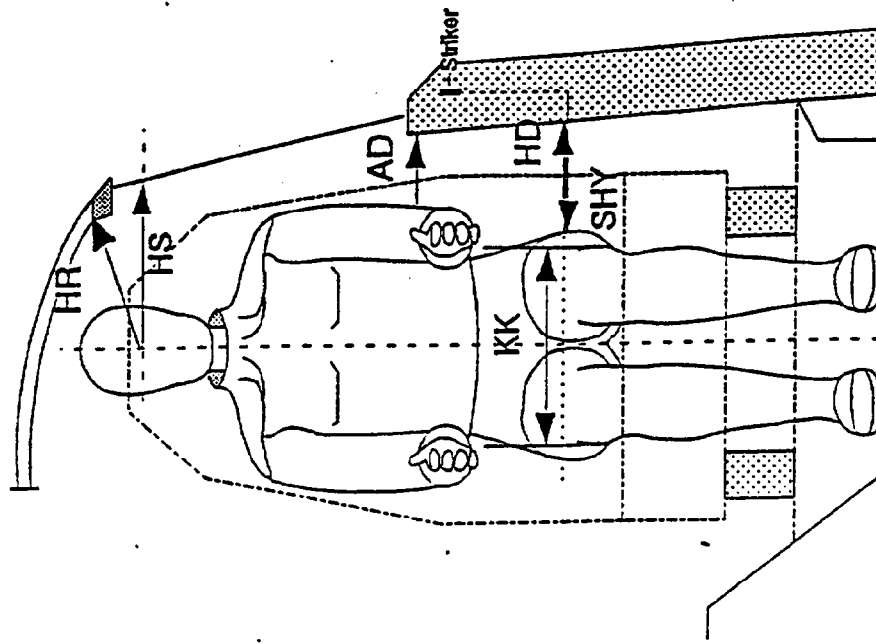
A	= Left Door to Driver Centerline	<u>392</u> mm
B	= Left Door to Center Passenger Centerline	<u>732.5</u> mm
C	= Left Door to Right Passenger Centerline	<u>1090</u> mm
D	= Left Door to Right Door	<u>1465</u> mm
E,F	= Window Glass Height (Right and Left Must Be Equal)	

DUMMY MEASUREMENTS FOR FRONT SEAT PASSENGERS

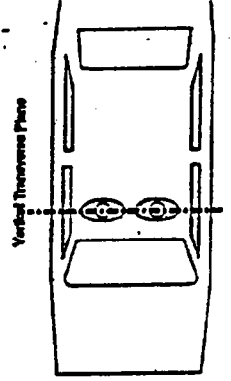
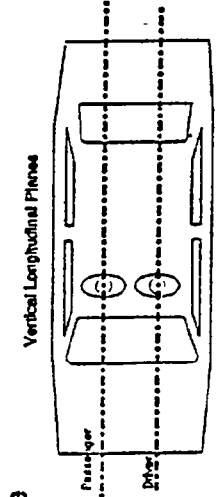


HH - Head to Head
HW - Head to Windshield
HZ - Head to Roof
NR - Nose to Rim
CS - Steering Wheel to Chest
CD - Chest to Dash
RA - Rim to Abdomen
KDL/KDR - Knee to Dash
KDA - Knee to Dash Angle

SH - Striker to H-Point
SK - Striker to Knee
ST - Striker to Head
NA - Nose to Rim Angle
TA - Tibial Angle
PA - Pelvic Angle
SA - Seat Back Angle
SCA - Steering Column Angle
SWA - Steering Wheel Angle
WA - Windshield Angle



HR - Head to Side Header
HS - Head to Side Window
AD - Arm to Door
HD - H-Point to Door
SHY - Striker to H-Point (Y Dir.)
KK - Knee to Knee

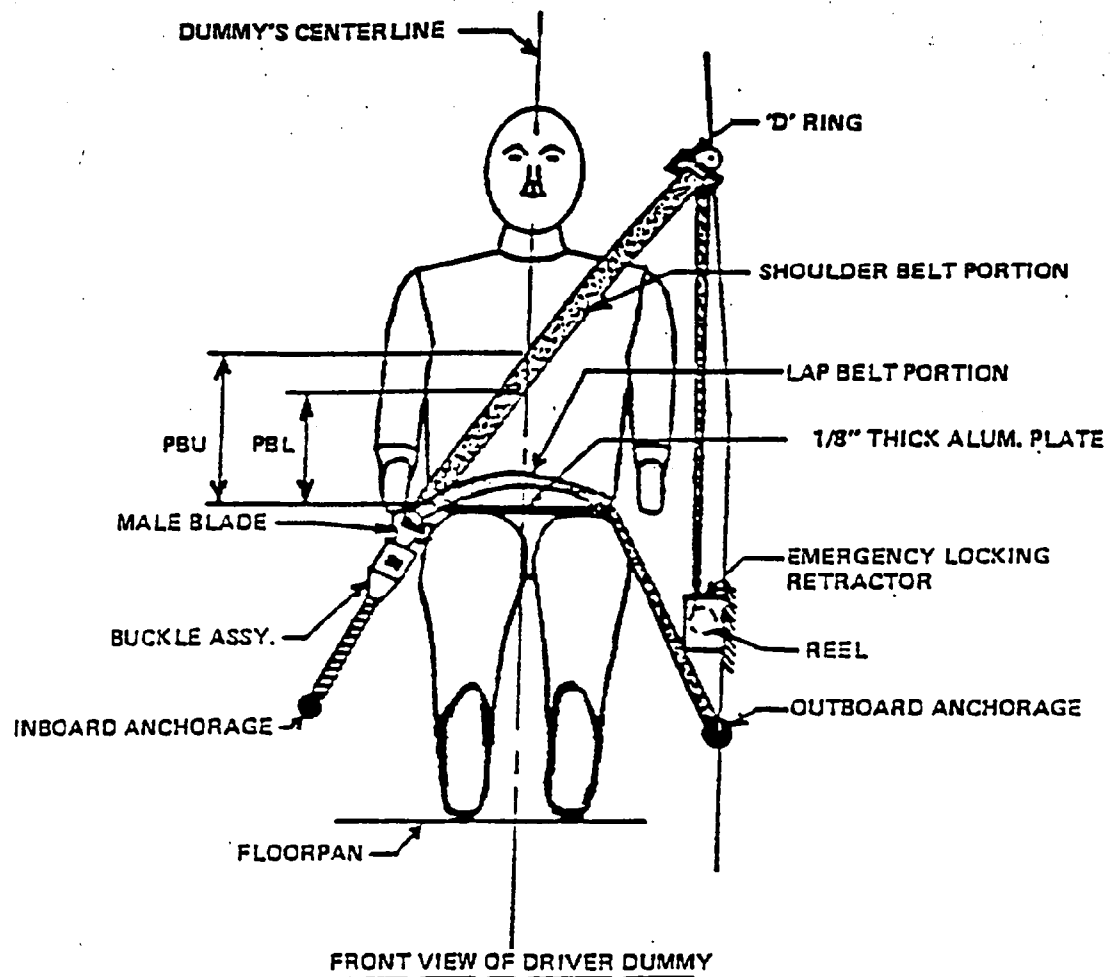


FRONT SEAT MEASUREMENT TABLE

Units (mm)

	DRIVER (Serial #) 466	PASSENGER (Serial #) 465
WA°	39°	NA
SWA°	23.5°	NA
SCA°	24.3°	NA
SA°	21°	21°
HZ	151	143
HH	445	436
HW	546	534
HR	241	245
NR	459 Angle (NA)	13.5°
CD	598	634
CS	341	
RA	217	
KDL	245 Angle (KDA) 33.4°	285
KDR	268	275 Angle (KDA) 23°
PA°	12°	8°
TA°	32°	30°
KK	365	290
ST	550 Angle -14.1°	562 Angle 12.5°
SK	687 Angle -2.6°	690 Angle 5.5°
SH	314 Angle -20.1°	314 Angle 20.3°
SHY	227	221
HS	286	236
HD	158	146
AD	100	93

SEAT BELT POSITIONING DATA



(illustration)

	DRIVER DUMMY	PASSENGER DUMMY
<u>PBU</u> -- Top surface of alum. plate to upper edge (inches)	360 mm	365 mm
<u>PBL</u> -- Top surface of alum. plate to belt lower edge (inches)	270 mm	275 mm
<u>LAP BELT TENSION</u> (kgs.)	1.8 kg.	1.8 kg.
<u>SHOULDER BELT TENSION</u> (kgs.)	.7 kg.	1.1 kg.

SEAT BELT PERFORMANCE ASSESSMENT TEST DATA

BELT LENGTH DATA:

	<u>Driver</u>	<u>Passenger</u>
Belt length from trim panel exit to bolt hole anchor point for continuous webbing systems.	<u>625 mm</u>	<u>625 mm</u>
Shoulder belt length as measured on Part 572 Dummy.	<u>825 mm</u>	<u>840 mm</u>
Lap belt length as measured on Part 572 Dummy.	<u>815 mm</u>	<u>810 mm</u>

SHOULDER BELT SPOOL-OFF DATA:

As determined by film analysis	<u>ND</u>	<u>ND</u>
As determined mechanically	<u>41 mm</u>	<u>54 mm</u>
As determined electronically	<u>37 mm</u>	<u>56 mm</u>

BELT STRETCH DATA:

Measured electronically between shoulder belt load cell and the "D" ring.	<u>.06mm/mm</u>	<u>ND</u>
Measured mechanically	<u>0</u>	<u>0</u>

RETRACTOR LOCK-UP TIME:

As determined by shoulder belt spool-off observed in on-board cameras	<u>25 msec</u>	<u>25 msec</u>
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ND = No Data

CAMERA LOCATIONS

VEH. NHTSA NO.: MP5104 ; TEST DATE: December 2, 1992; TIME: 2:17 pm

VEH. YEAR/MAKE/MODEL/BODY STYLE: 1993 Toyota Pickup

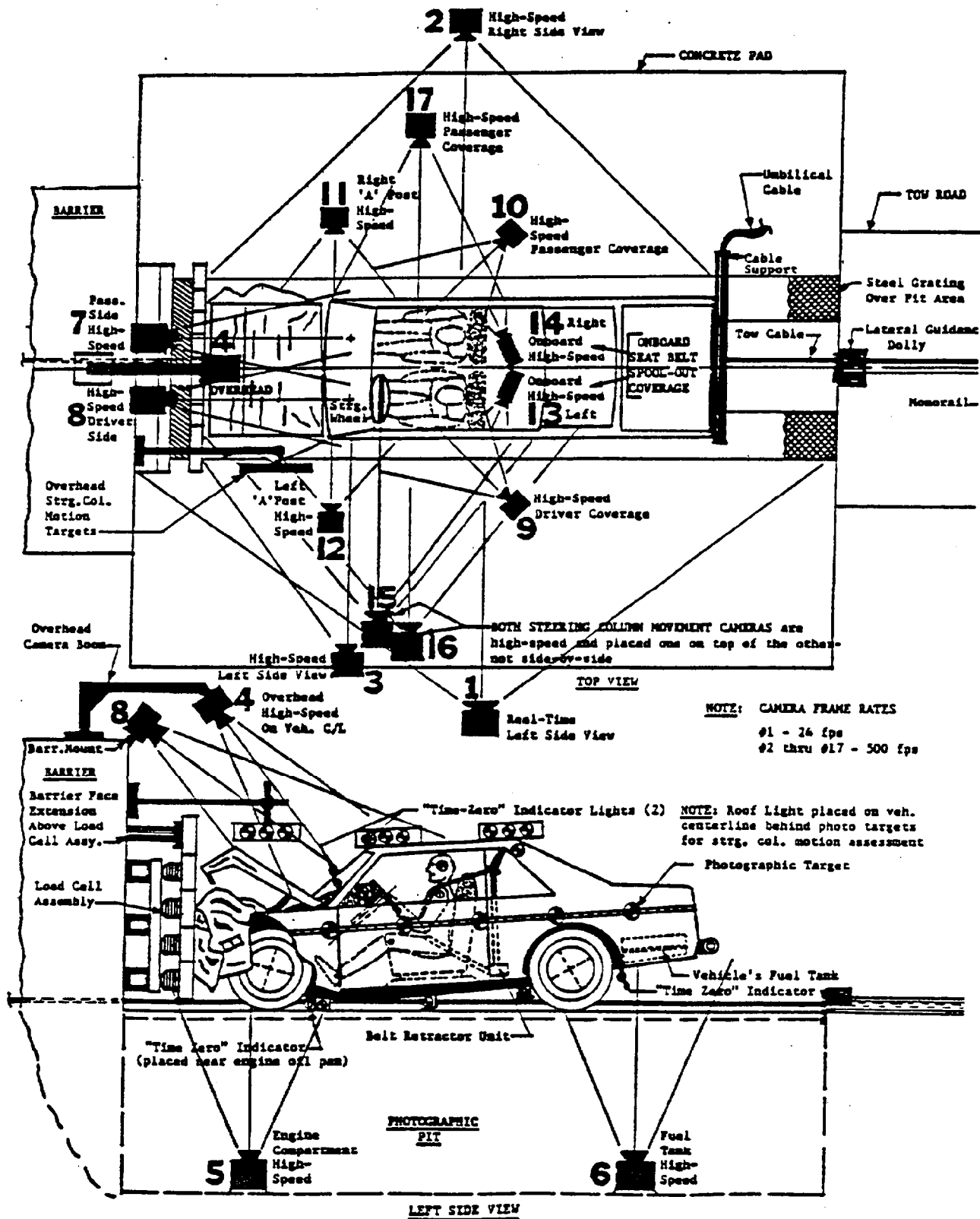
CAMERA NO.	VIEW	CAMERA POSITIONS (in.)*			ANGLE (deg)	FILM PLANE TO HEAD TARGET (in.)	LENS (mm)	SPEED (fps)
		X	Y	Z				
1	Real Time	-	-	-	-	-	20	24
13	Driver	520	9360	130	90	9005	35	NA
181	Left A Post	1440	5200	1050	90	4845	25	1010
8	Top Driver	2000	7200	1530	90	6833	25	1026
2	Bottom Driver	2000	7200	1000	90	6833	25	1163
6	Left B Post	4500	6000	1730	50	NA	50	NA
9	Onboard						13	1020
4	Onboard						13	NA
242	Right Overall	2180	7000	1280	90	6645	13	1204
15	Right Passenger	830	6860	1230	90	6505	25	952
14	Right A Post	1520	6200	1390	90	5845	35	985
5	Right B Post	5200	6000	1676	50	NA	50	1015
325	Pit Front	1100	0	-2750	90	NA	13	1020
241	Pit Fuel	2540	0	-3070	90	NA	13	1026
11	Top Front Half	900	0	4440	NA	NA	13	1204
12	Driver Windshield	-380	200	2740	35	NA	13	1176
190	Passenger Windsheild	-380	-200	2740	35	NA	13	1162

X = film plane to monorail centerline

Y = film plane to barrier face

Z = film plane to ground

CAMERA REQUIREMENTS FOR 35 MPH FRONTAL BARRIER IMPACT ASSESSMENT PROGRAM TEST



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4-11

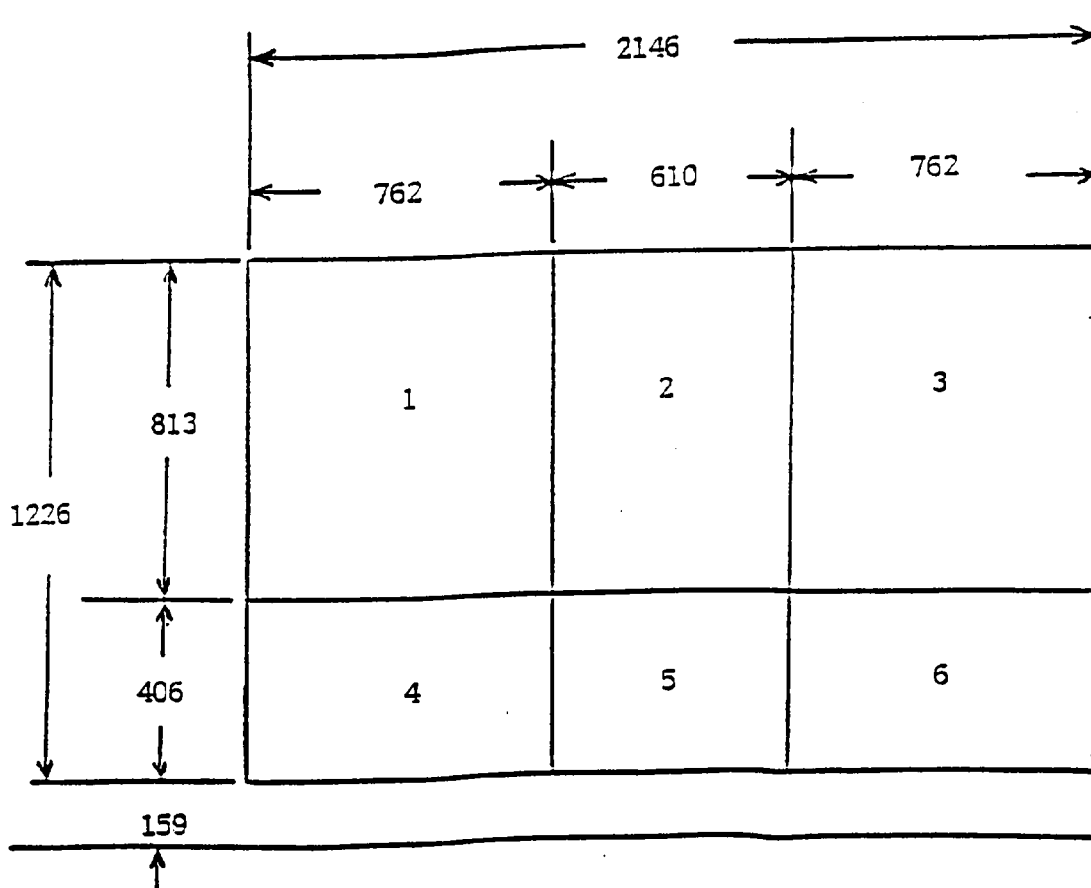
LOAD CELL LOCATIONS ON FIXED BARRIER

30 Load Cells

6 Rows

9 Columns

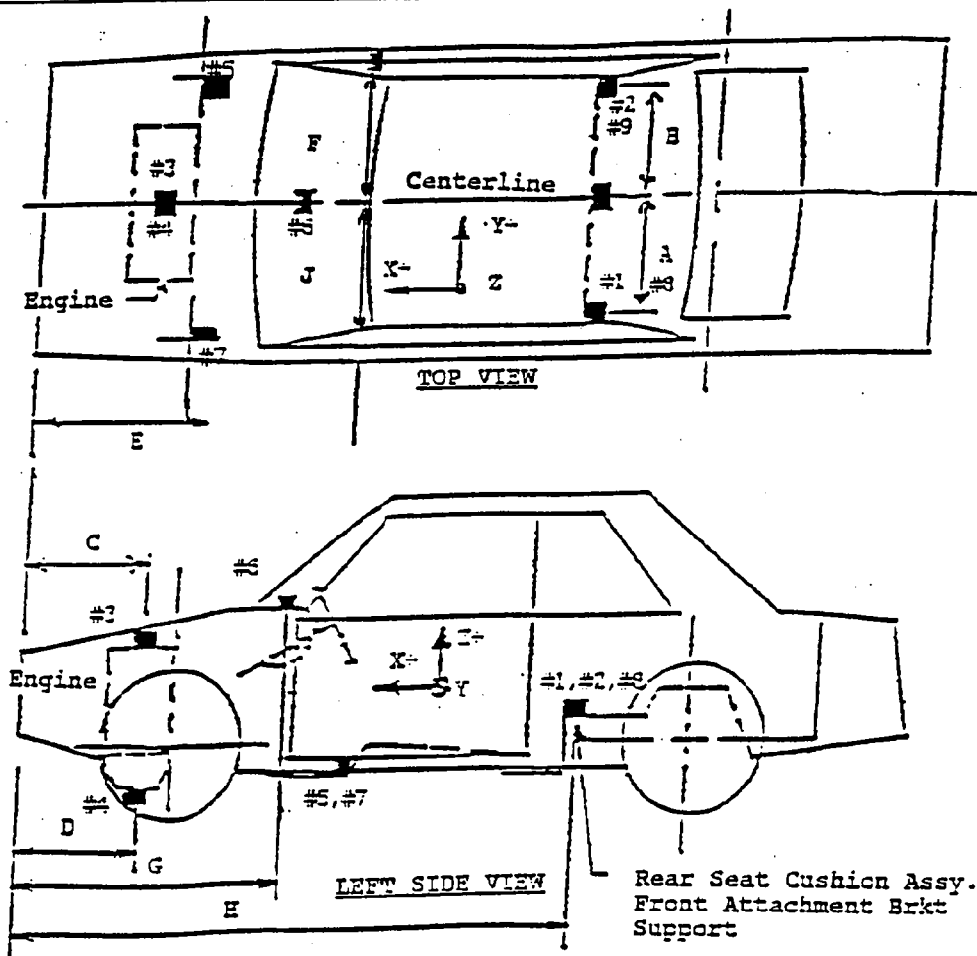
6 Groupings (5 cells/group)



The following data is presented in Appendix B:

- (1) Total or Sum of 30 individual load cells
- (2) Data from 6 Groupings shown above (5 cells/group)

VEHICLE ACCELEROMETER LOCATION AND DATA SUMMARY



Units: (mm)

Dimension	Length
A	575
B	575
C	695
D	848
E	877
F	589
G	1180
H	2354
J	587

ACCELEROMETER	ACCELEROMETER LOCATION	DIRECTION
1 and 8	Left Rear Seat Crossmember	X
2 and 9	Right Rear Seat Crossmember	X
3	Top of Engine	X
4	Bottom of Engine	X
5	Right Side Brake Caliper	X
6	Instrument Panel	X
7	Left Disc Brake Caliper	X

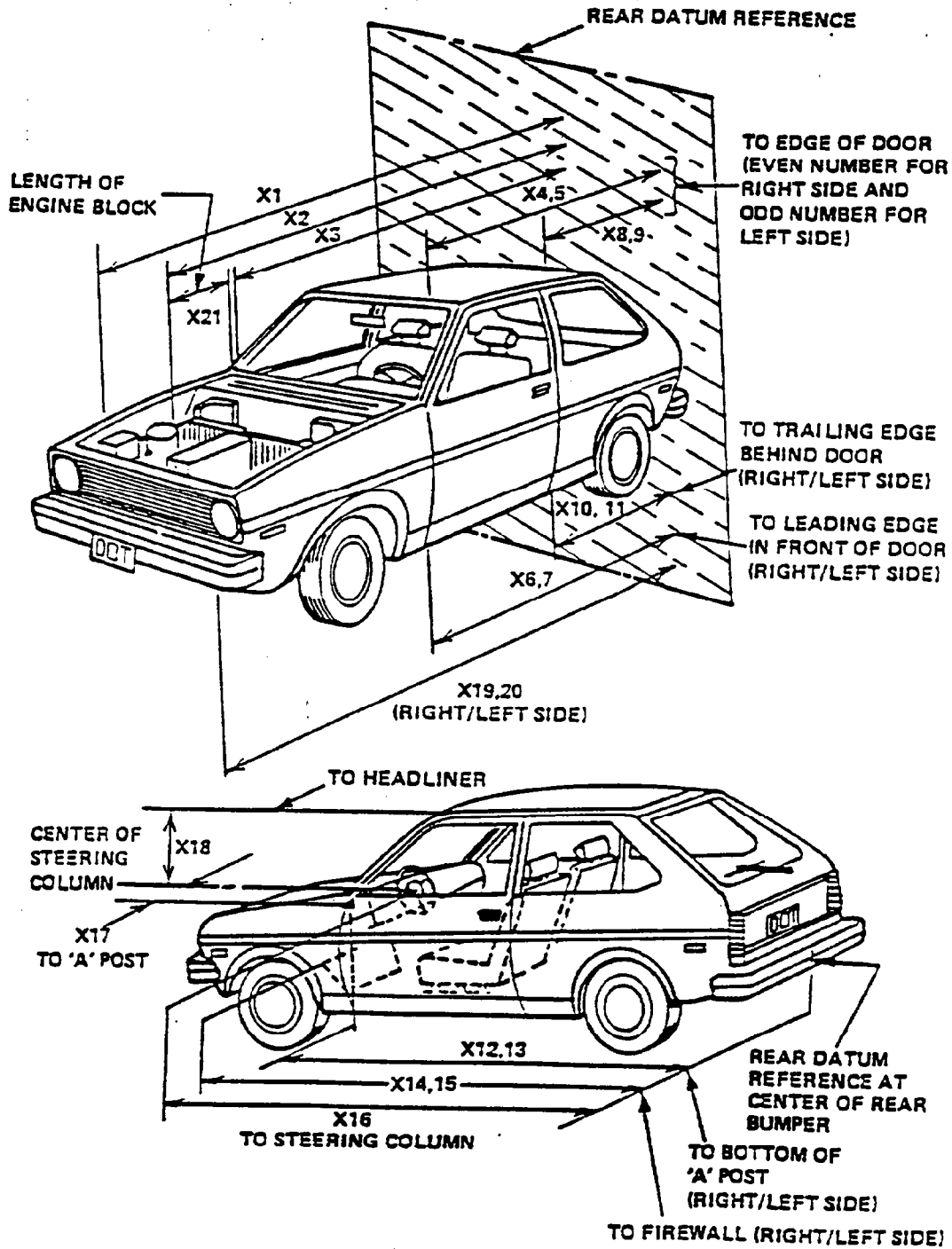
* The accelerometer pack number can be correlated with the vehicle response data traces in Appendix B.

TEST VEHICLE MEASUREMENTS

No.	MEASUREMENT DESCRIPTION:	Pre-Test (mm)	Post-Test (mm)	Diff. (mm)
X1	Total Length of Test Vehicle at Centerline	4455	3945	510
X2	Rear Surface of Vehicle to Front of Engine	3994	3785	209
X3	Rear Surface of Vehicle to Firewall	3458	3411	47
X4	Rear Surface to Upr. Leading Edge of Rt. Door	3143	3138	5
X5	Rear Surface to Upr. Leading Edge of Left Door	3143	3135	8
X6	Rear Surface to Lwr. Leading Edge of Rt. Door	3118	3100	18
X7	Rear Surface to Lwr. Leading Edge of Left Door	3121	3097	24
X8	Rear Surface to Upr. Trailing Edge of Rt. Door	2096	2089	7
X9	Rear Surface to Upr. Trailing Edge of Left Door	2099	2088	11
X10	Rear Surface to Lwr. Trailing Edge of Rt. Door	2067	2041	26
X11	Rear Surface to Lwr. Trailing Edge of Left Door	2073	2048	25
X12	Rear Surface to Bottom of 'A' Post on Rt. Side	3124	3110	14
X13	Rear Surface to Bottom of 'A' Post on Left Side	3124	3102	22
X14	Rear Surface to Firewall on Right Side	3448	3434	14
X15	Rear Surface to Firewall on Left Side	3445	3428	17
X16	Rear Surface to Steering Column	2731	2734	-3
X17	Center of Steering Column to 'A' Post	448	432	16
X18	Center of Steering Column to Headlining	457	416	41
X19	Rear Surface to Right Side of Front Bumper	4350	3898	452
X20	Rear Surface to Left Side of Front Bumper	4350	3890	460
X21	Length of Engine Block	521	521	0

*Refer to following page for No. locations

TEST VEHICLE MEASUREMENTS



ACCIDENT INVESTIGATION DIVISION DATA

FOR 35 MPH FRONTAL BARRIER IMPACT

VEHICLE MAKE/MODEL/BODY STYLE: 1993 Toyota Pickup

VEH. NHTSA NO.: MP5104 ; VIN: 4TARN81A1PZ057095

MODEL YEAR: 1993 ; BUILD DATE: 10/92 ; TEST DATE: 12/2/93

VEH. SIZE CATEGORY: Truck ; TEST WEIGHT: 1444.9 kg.

VEH. WHEELBASE: 2616 mm ; FRONT OVERHANG: 685 mm ; OVERALL WIDTH: 1530 mm

ACCELEROMETER DATA:

LOCATION: As per measurements on pages 4-13

CALIBRATION PROCEDURE: As per MGA Calibration Procedure

LINEARITY: >99.9% ; INTEGRATION ALGORITHM: Trapezoidal

VEH: IMPACT SPEED: 56.2 kph ; TIME OF SEPARATION: 79 msec

VELOCITY CHANGE: 61 kph

COLLISION DEFORMATION CLASSIFICATION (CDC) CODE:

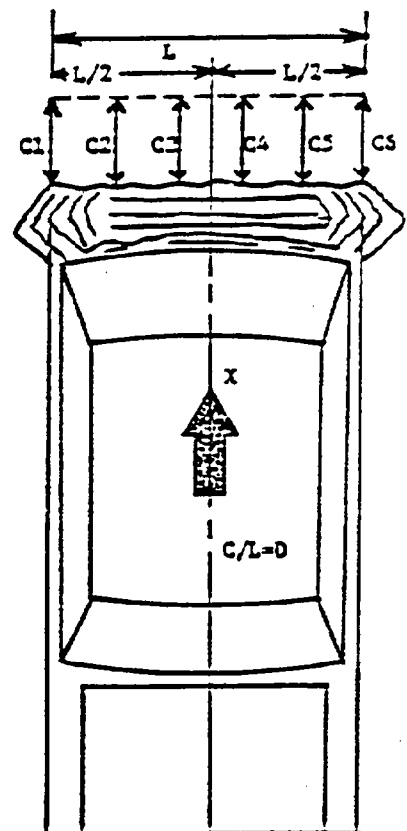
F (Frontal)

CRUSH DEPTH DIMENSIONS:

C1 =	<u>460</u>	mm
C2 =	<u>490</u>	mm
C3 =	<u>503</u>	mm
C4 =	<u>506</u>	mm
C5 =	<u>483</u>	mm
C6 =	<u>452</u>	mm

MIDPOINT OF DAMAGE: D = Vehicle Centerline (Longitud.)

LENGTH OF DAMAGED REGION: L = 1540 mm



APPENDIX A
PHOTOGRAPHS

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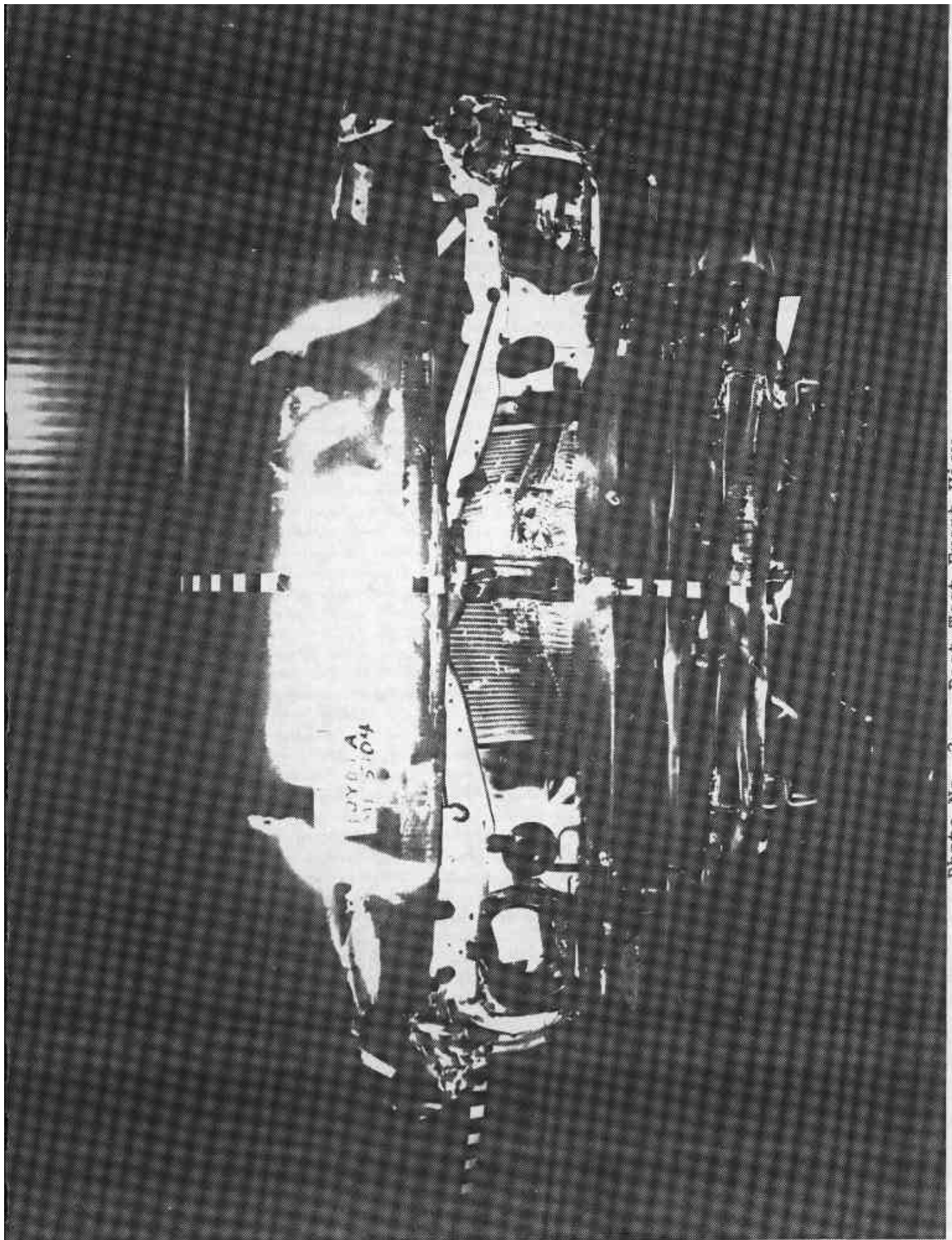


Photo No. 2 - Post-Test Front View

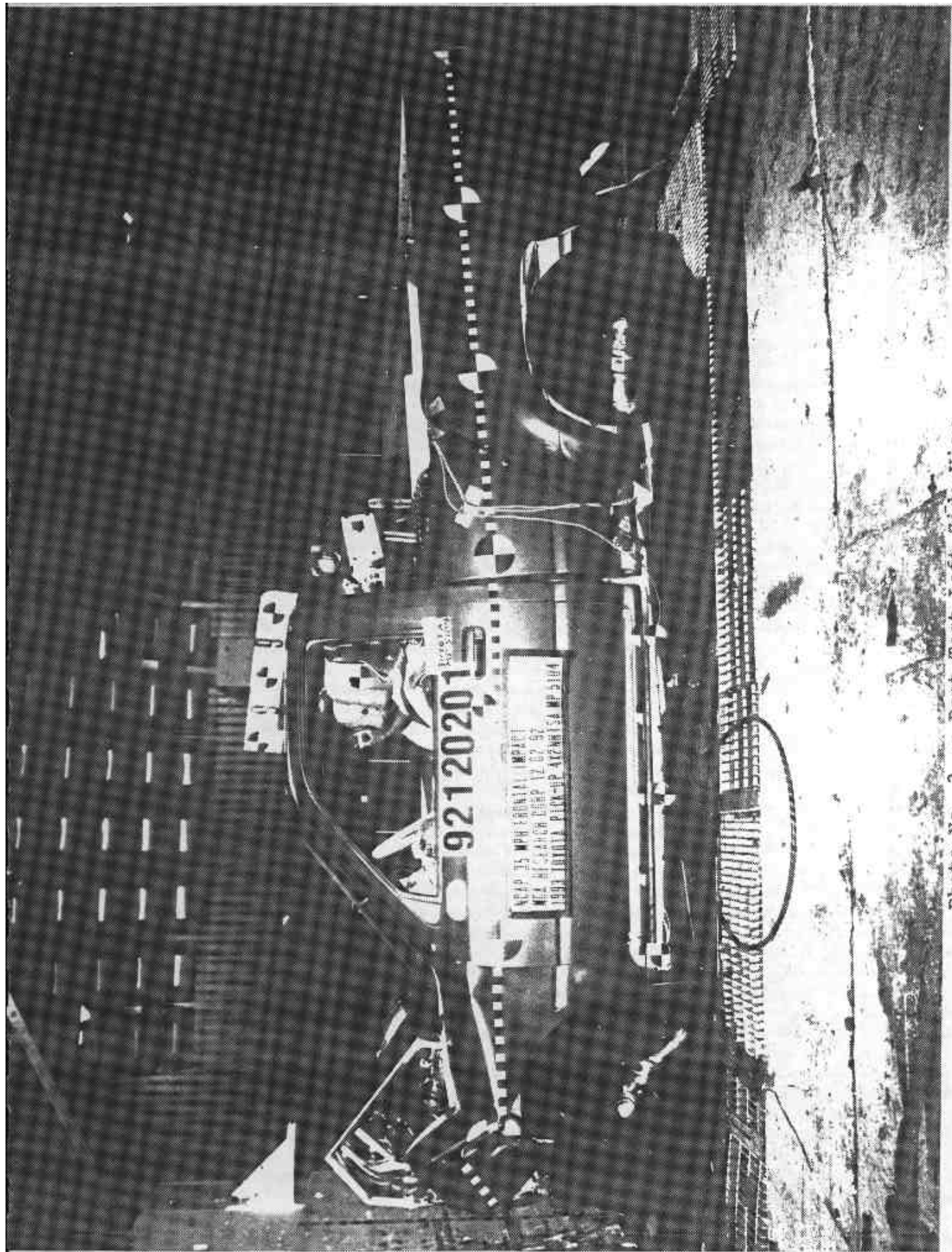


Photo No. 3 - Post-Test Left Side View

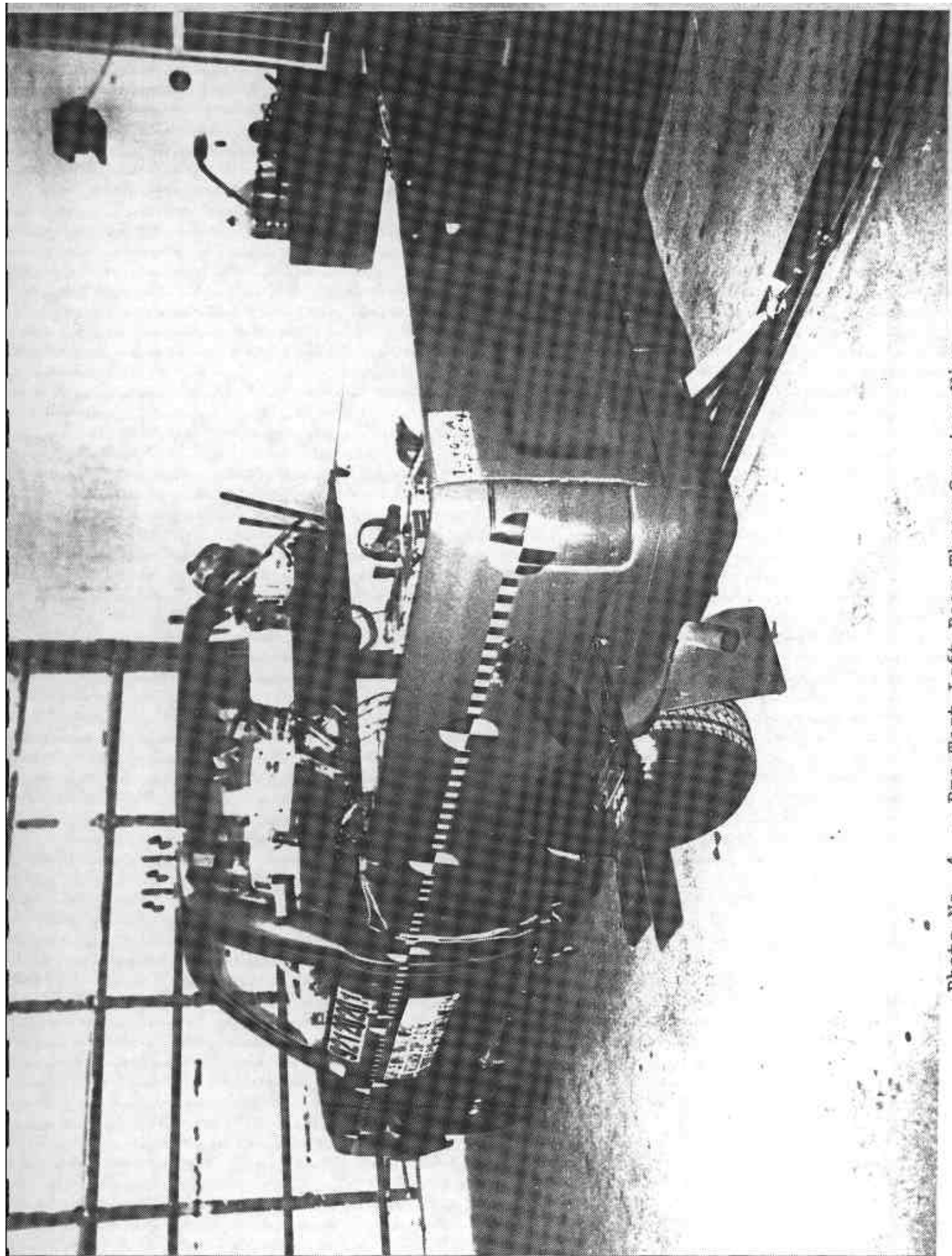
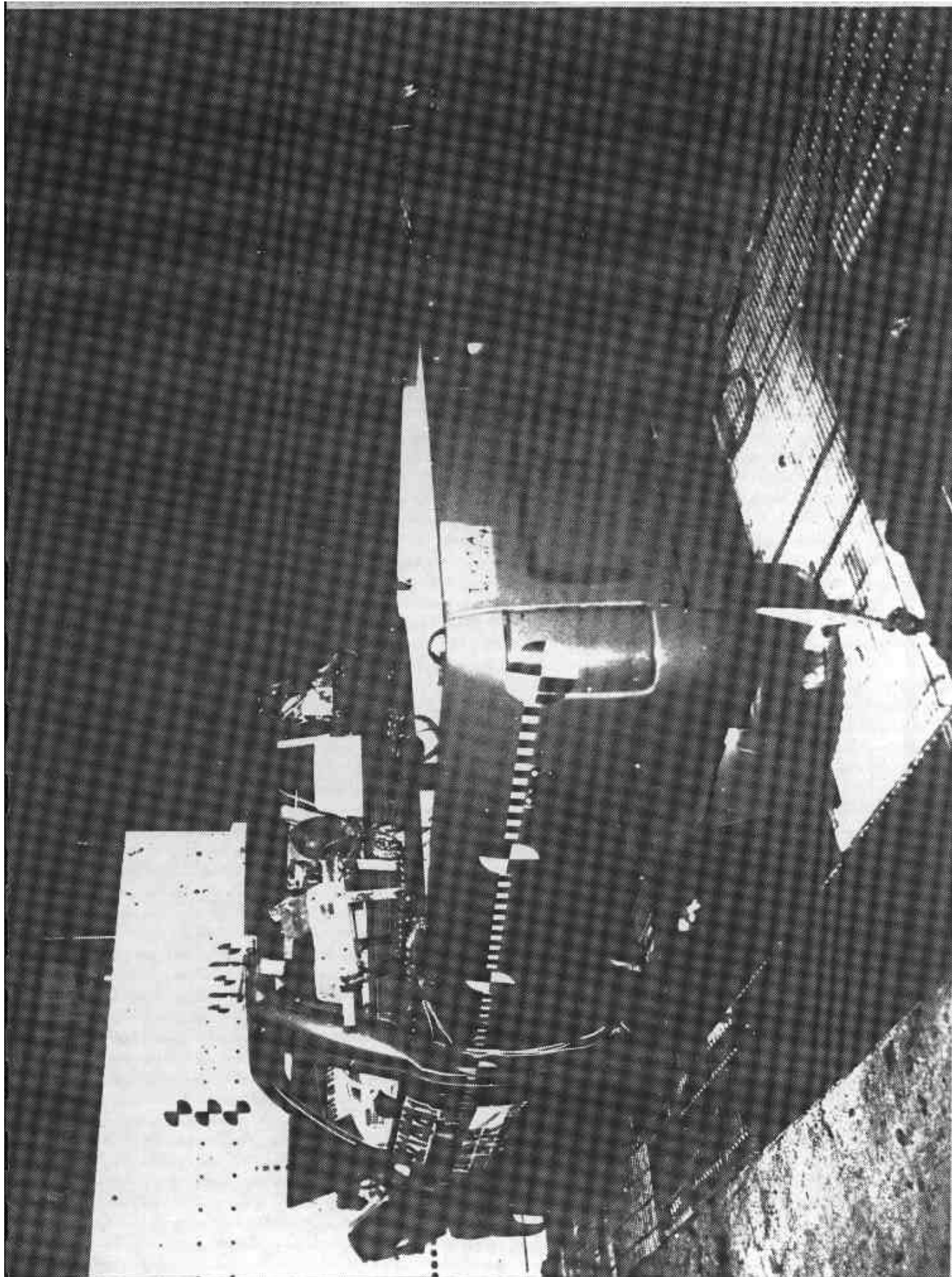


Photo No. 4 - Pre-Test Left Rear Three-Quarter View



A-5

Photo No. 5 - Post-Test Left Rear Three-Quarter View

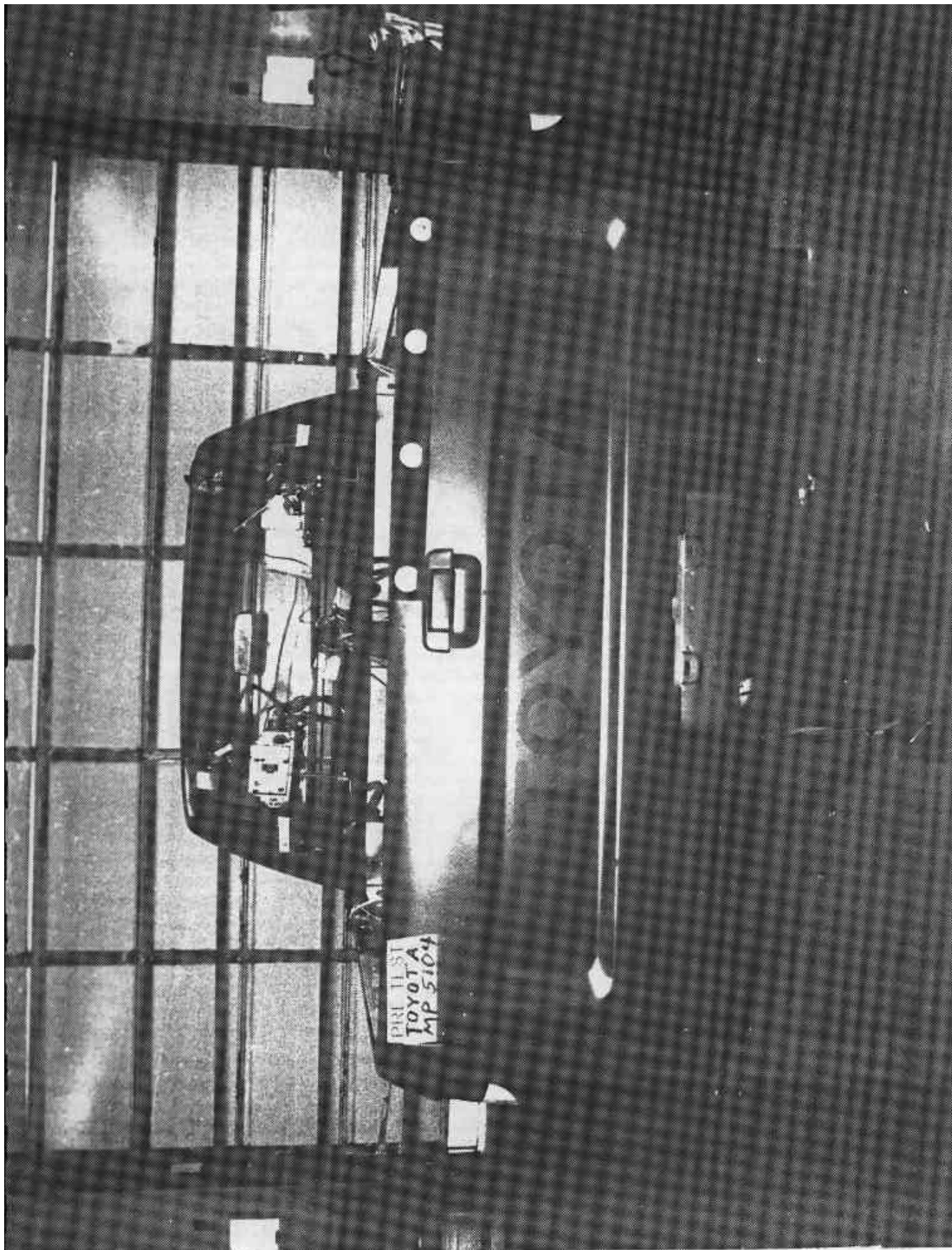


Photo No. 6 - Pre-Test Rear View

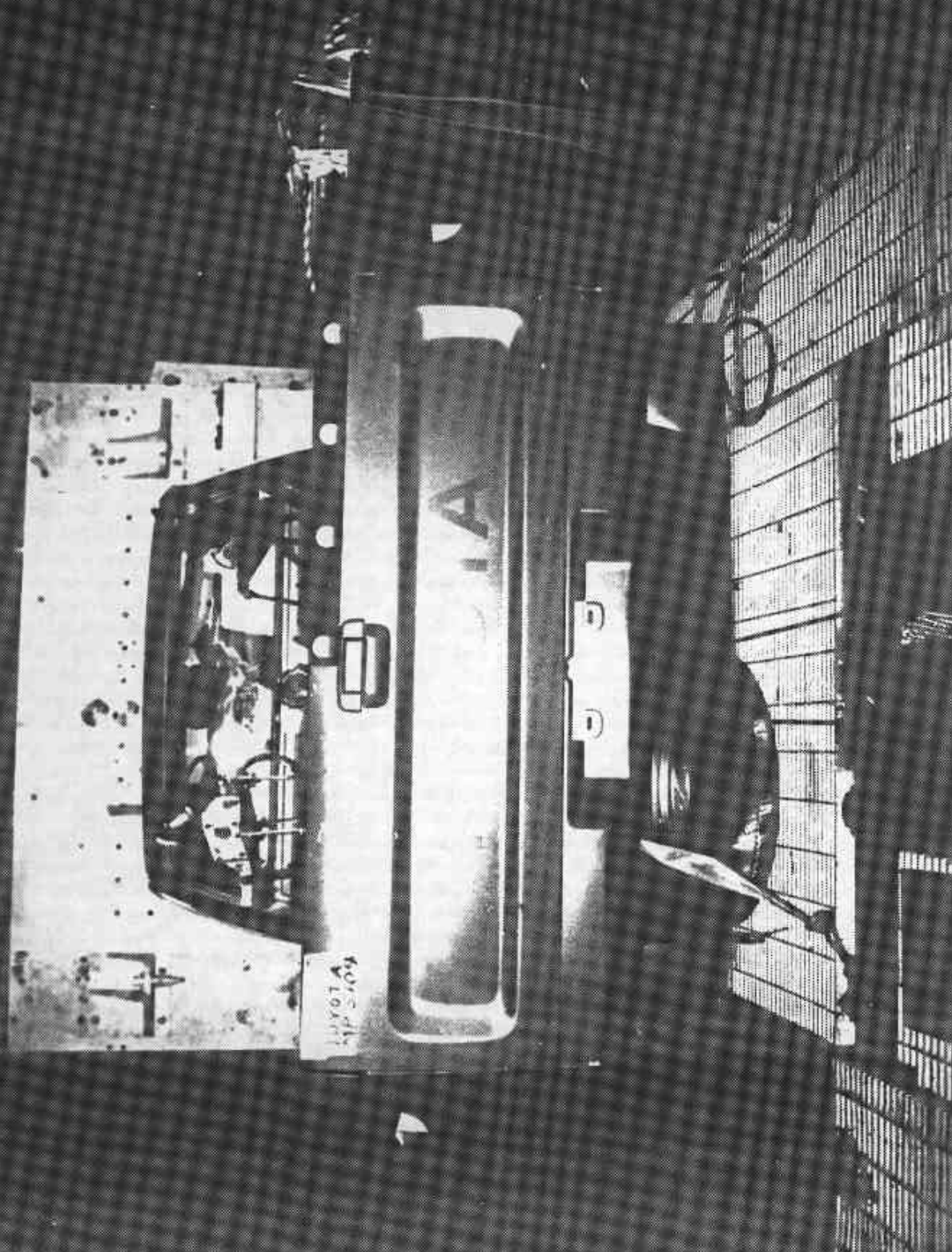


Photo No. 7 - Post-Test Rear View

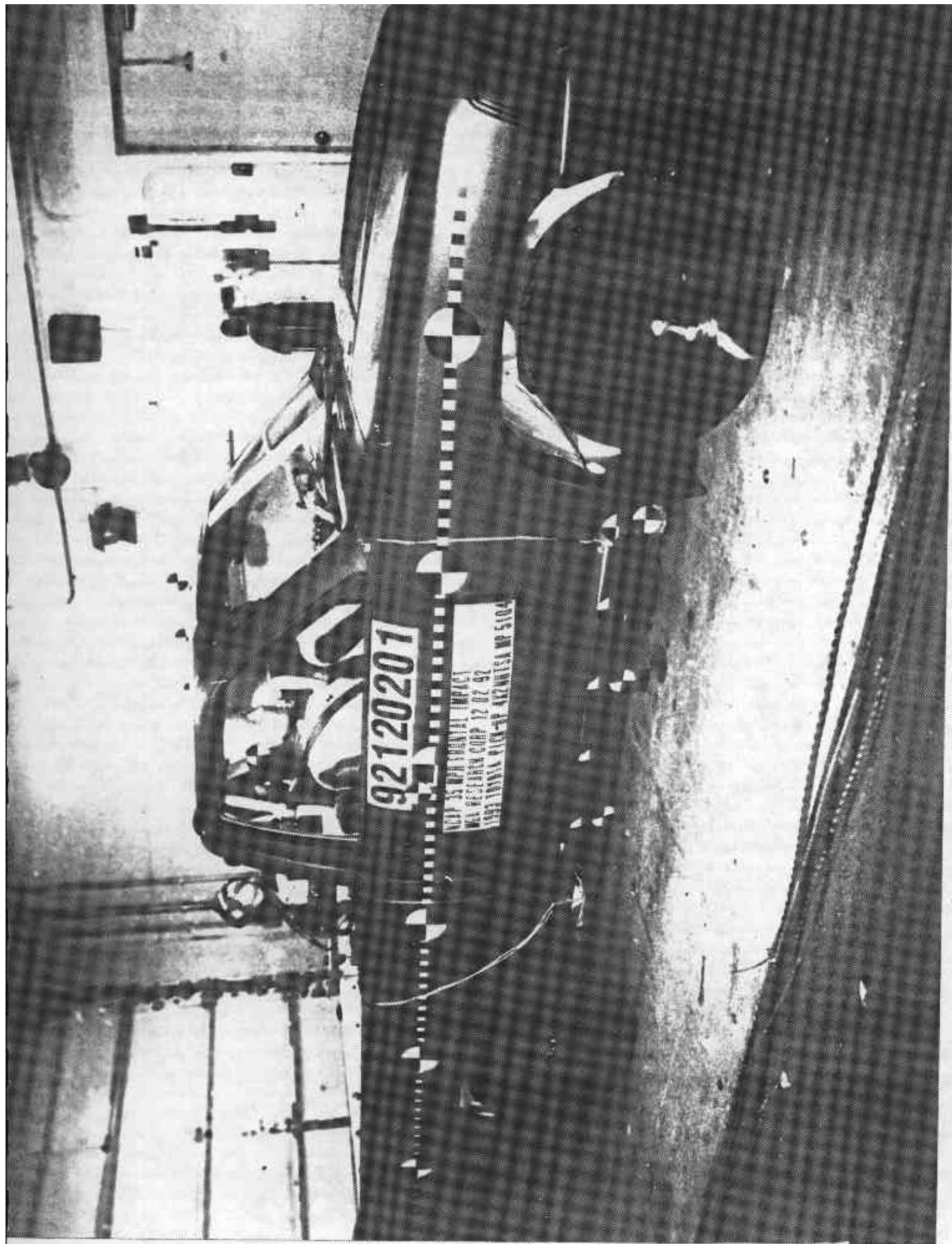


Photo No. 8 - Pre-Test Right Side View

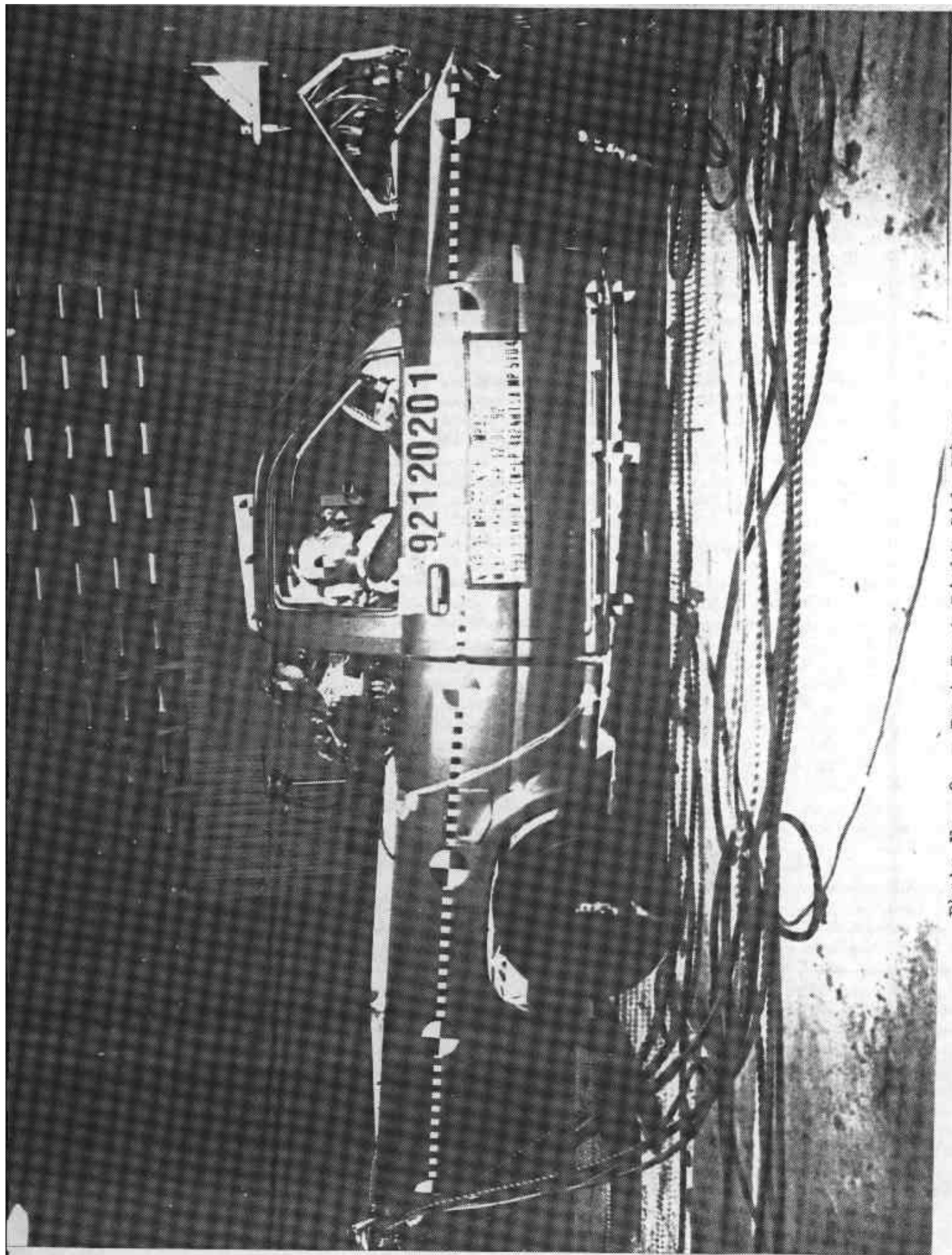


Photo No. 9 - Post-Test Right Side View

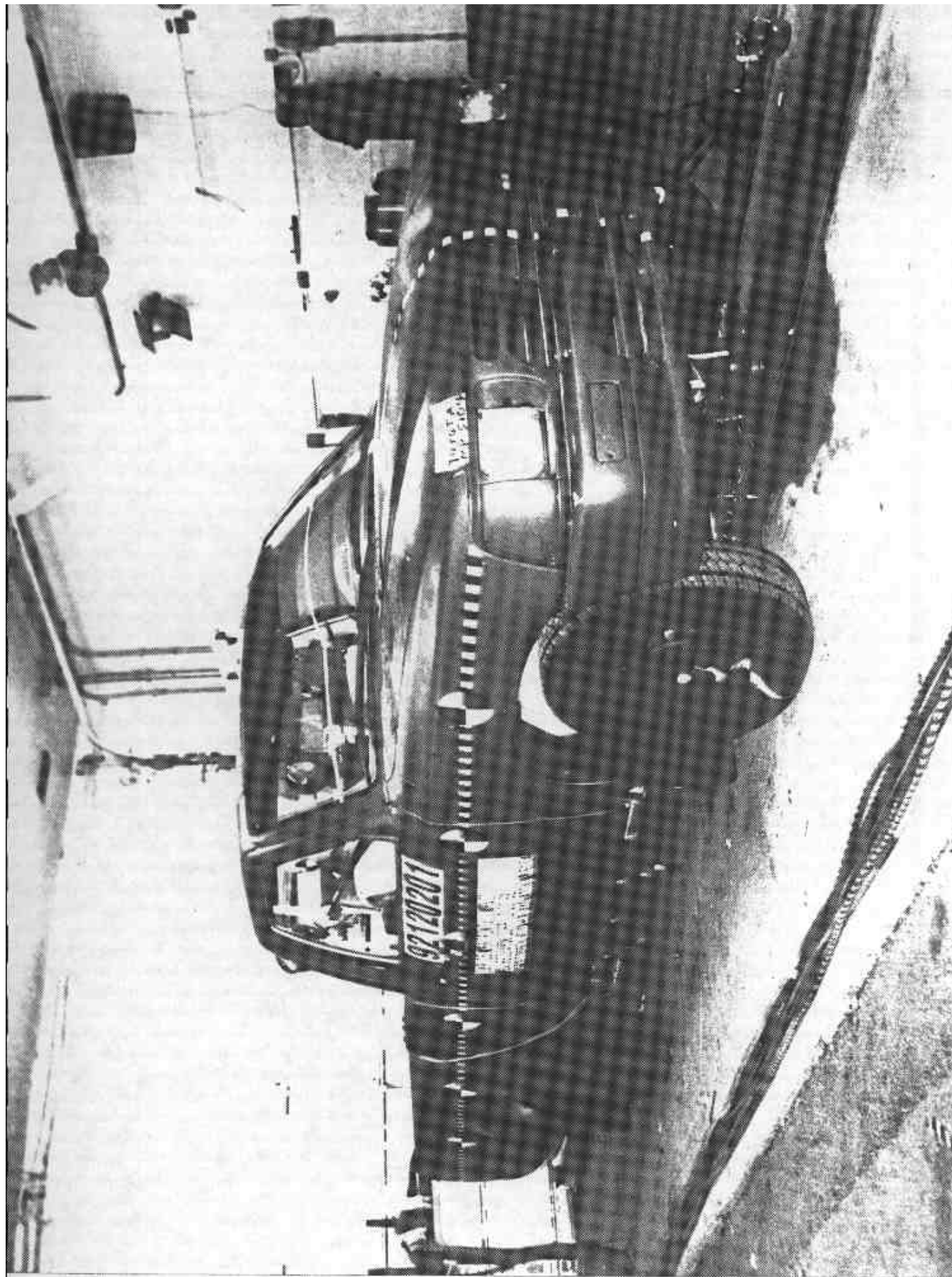


Photo No. 10 - Pre-Test Right Front Three-Quarter View

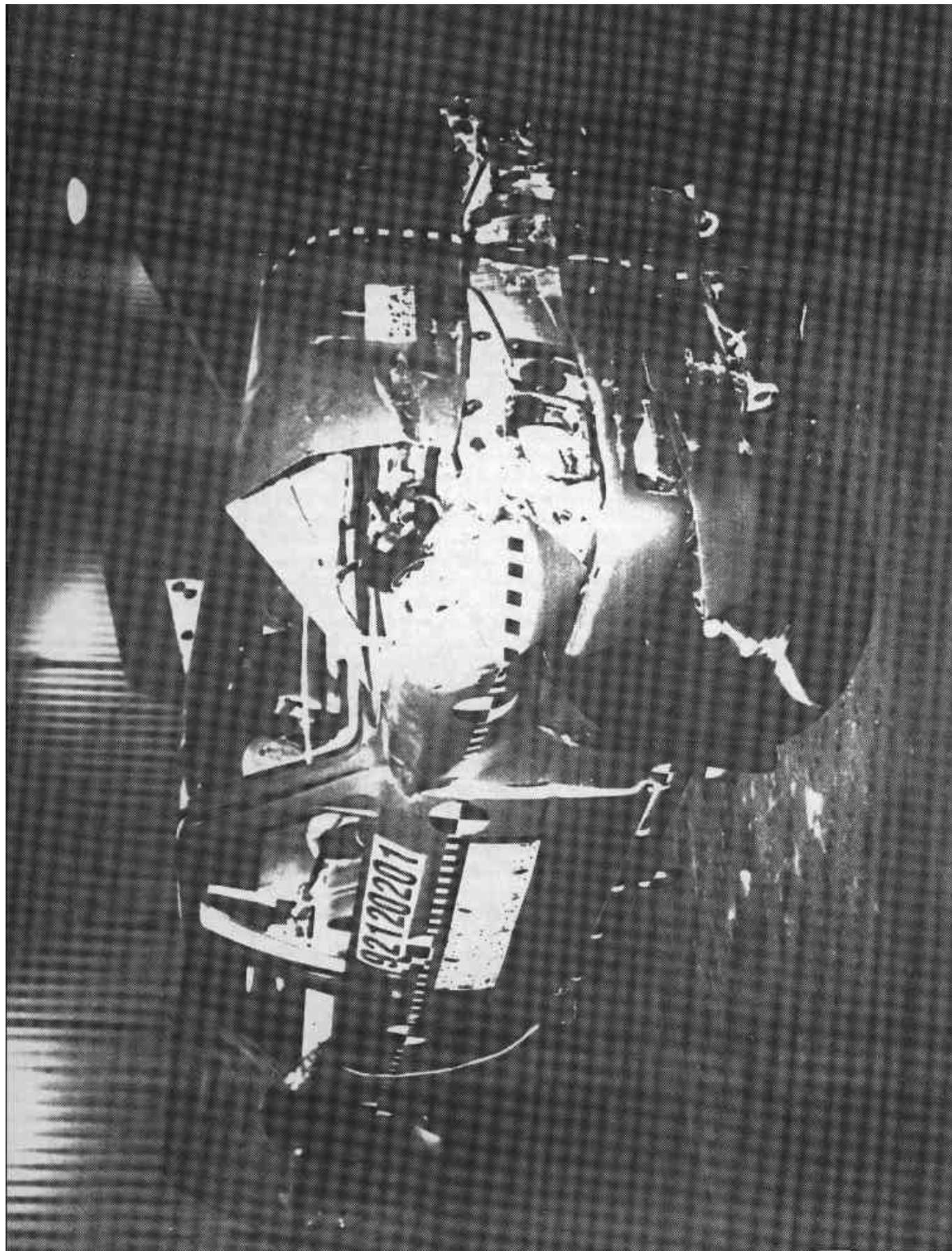


Photo No. 11 - Post-Test Right Front Three-Quarter View

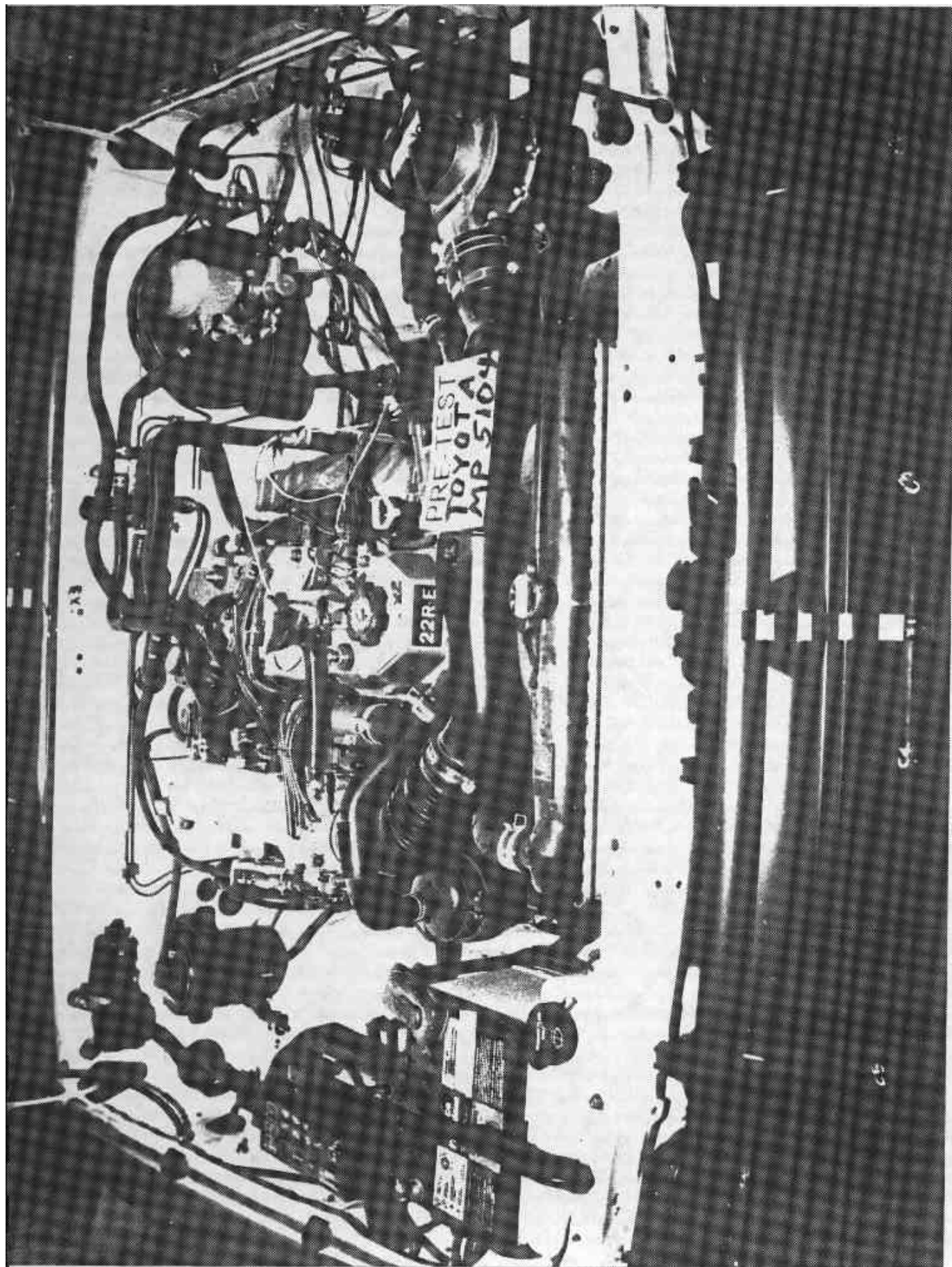


Photo No. 12 - Pre-Test Engine Compartment View

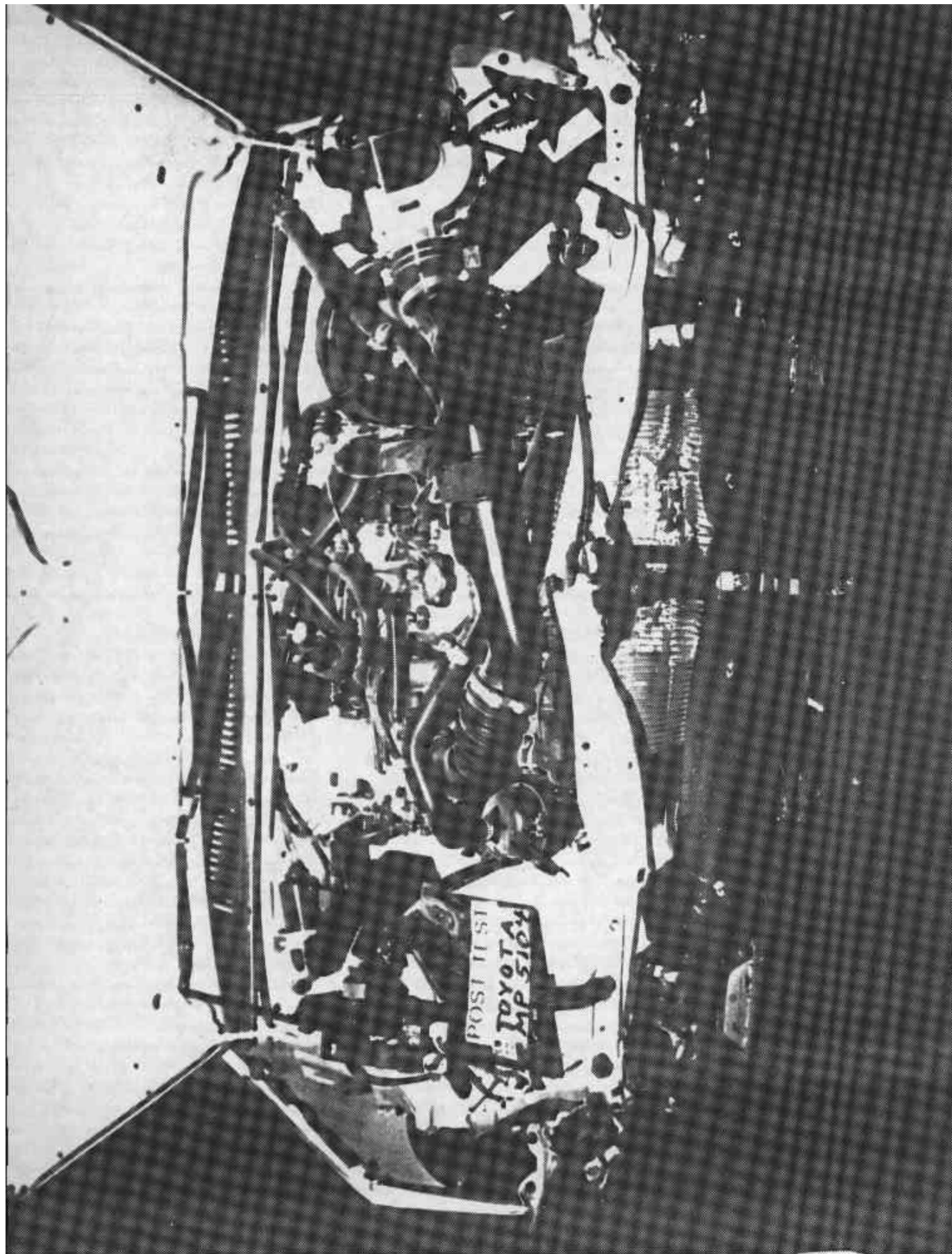


Photo No. 13 - Post-Test Engine Compartment View

PRE-TEST
TOYOTA
MP 5104

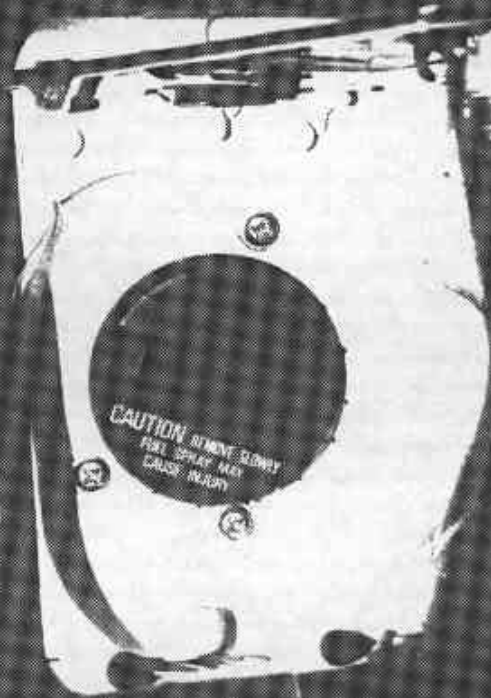


Photo No. 14 - Pre-Test Fuel Filler Cap View

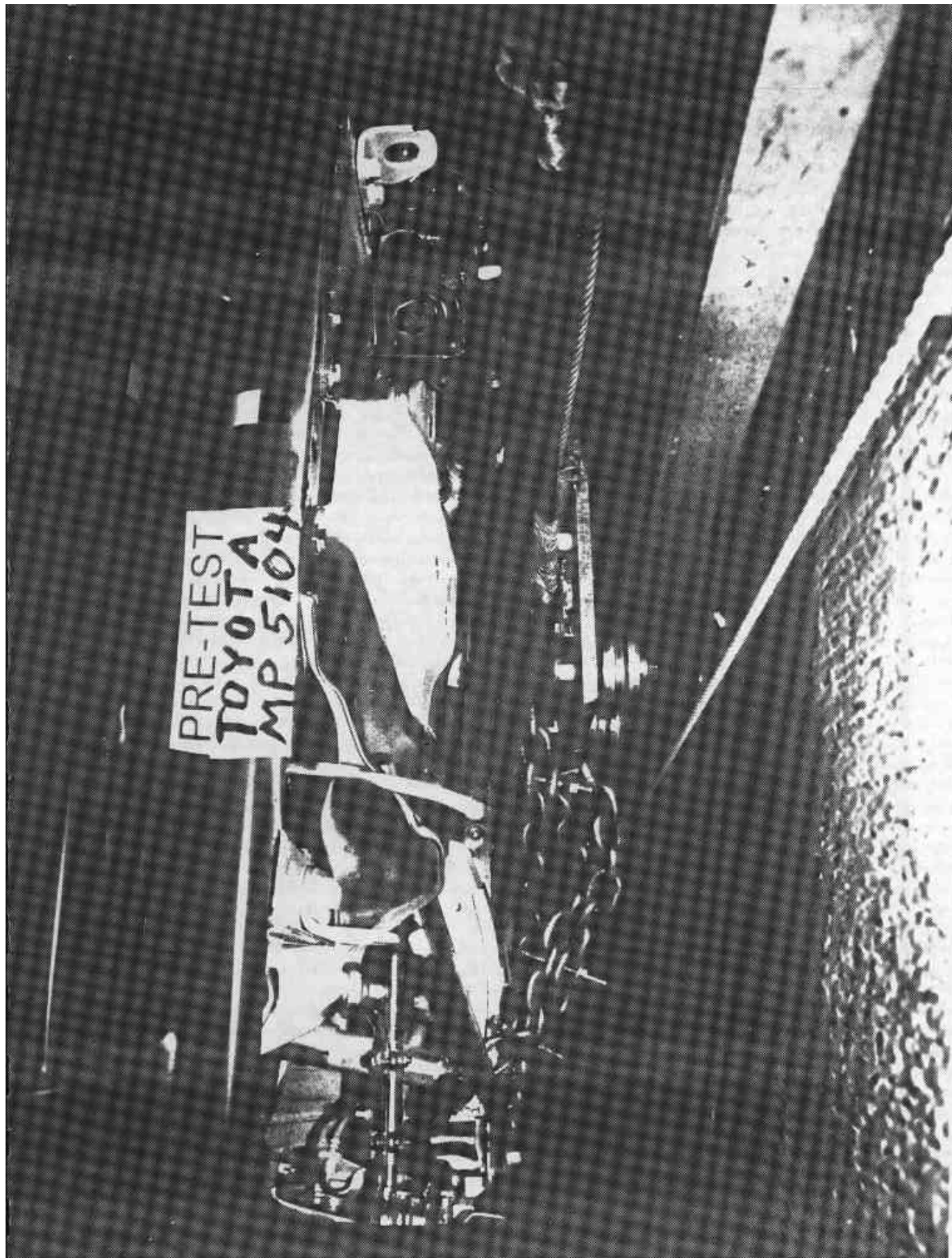


Photo No. 15 - Pre-Test Front Underbody View

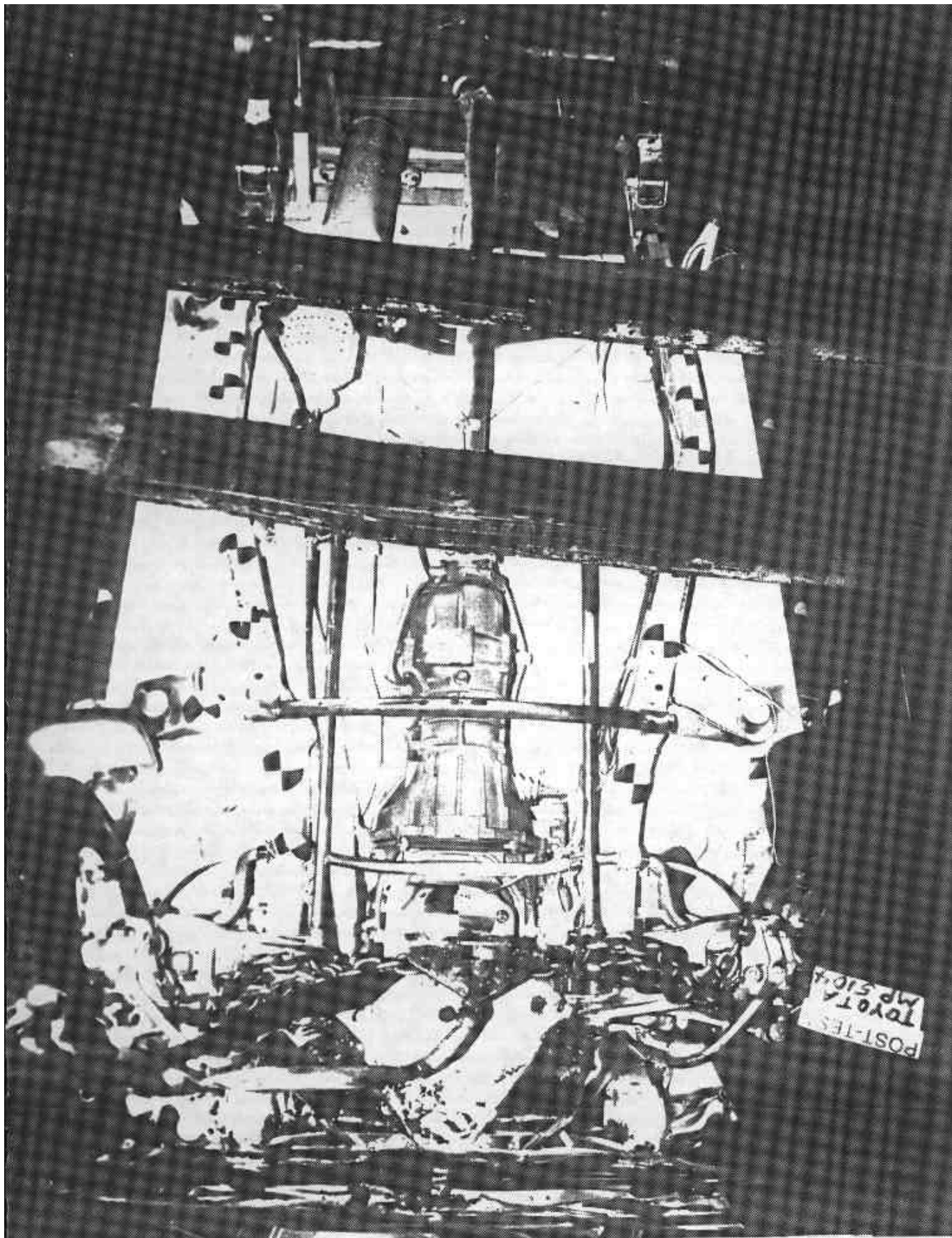


Photo No. 16 - Post-Test Front Underbody View

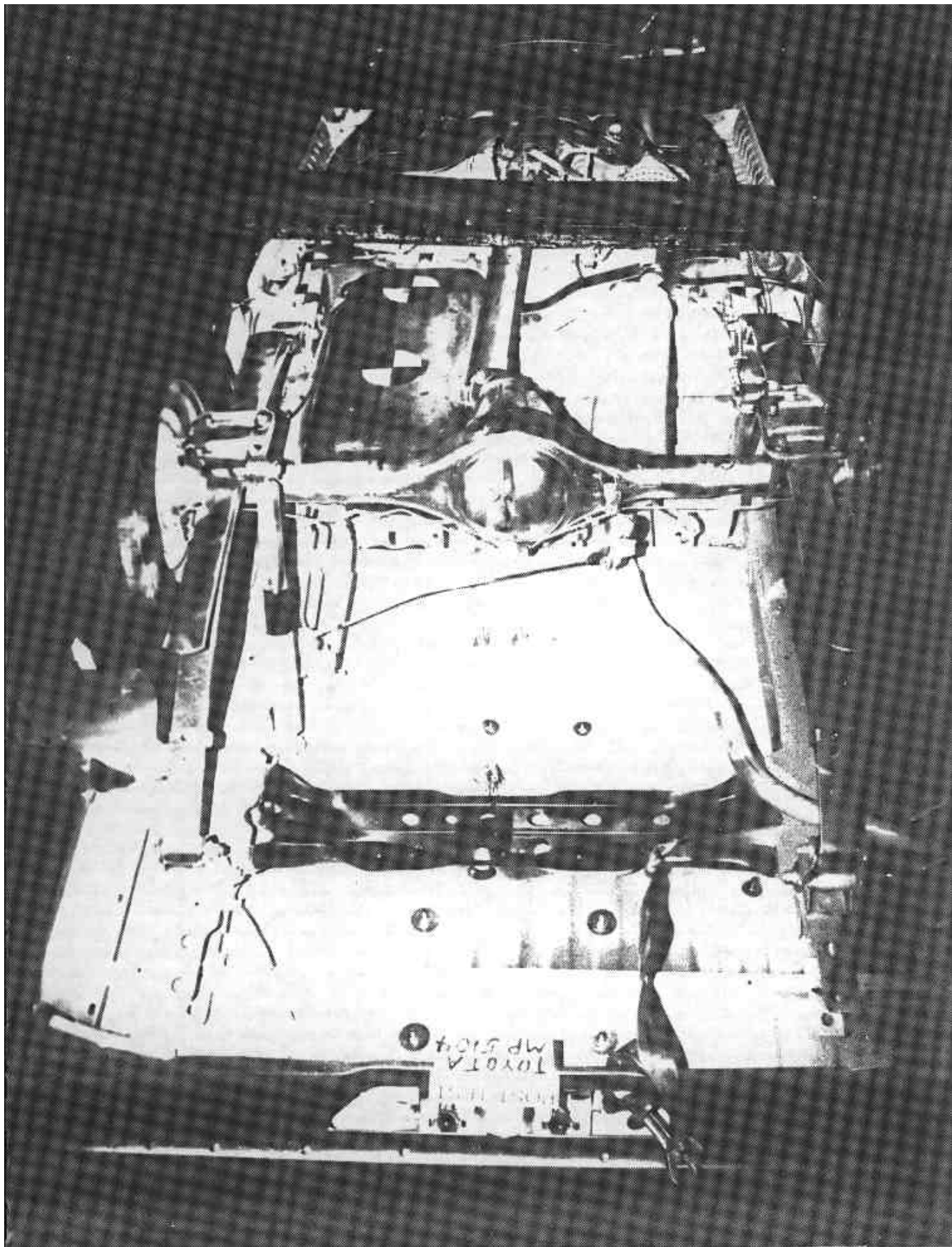


Photo No. 17 - Post-Test Center Underbody View

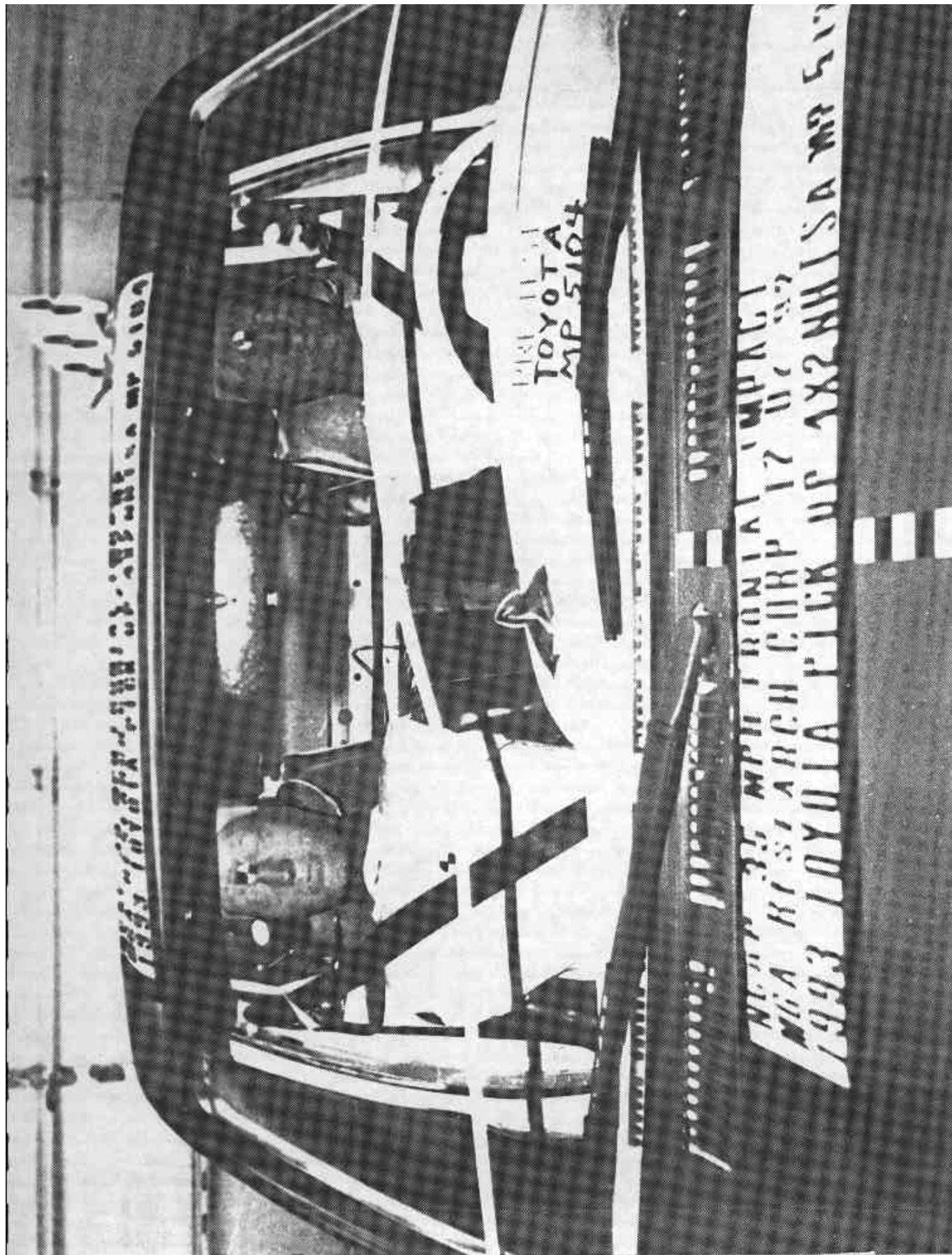


Photo No. 18 - Pre-Test Windshield View

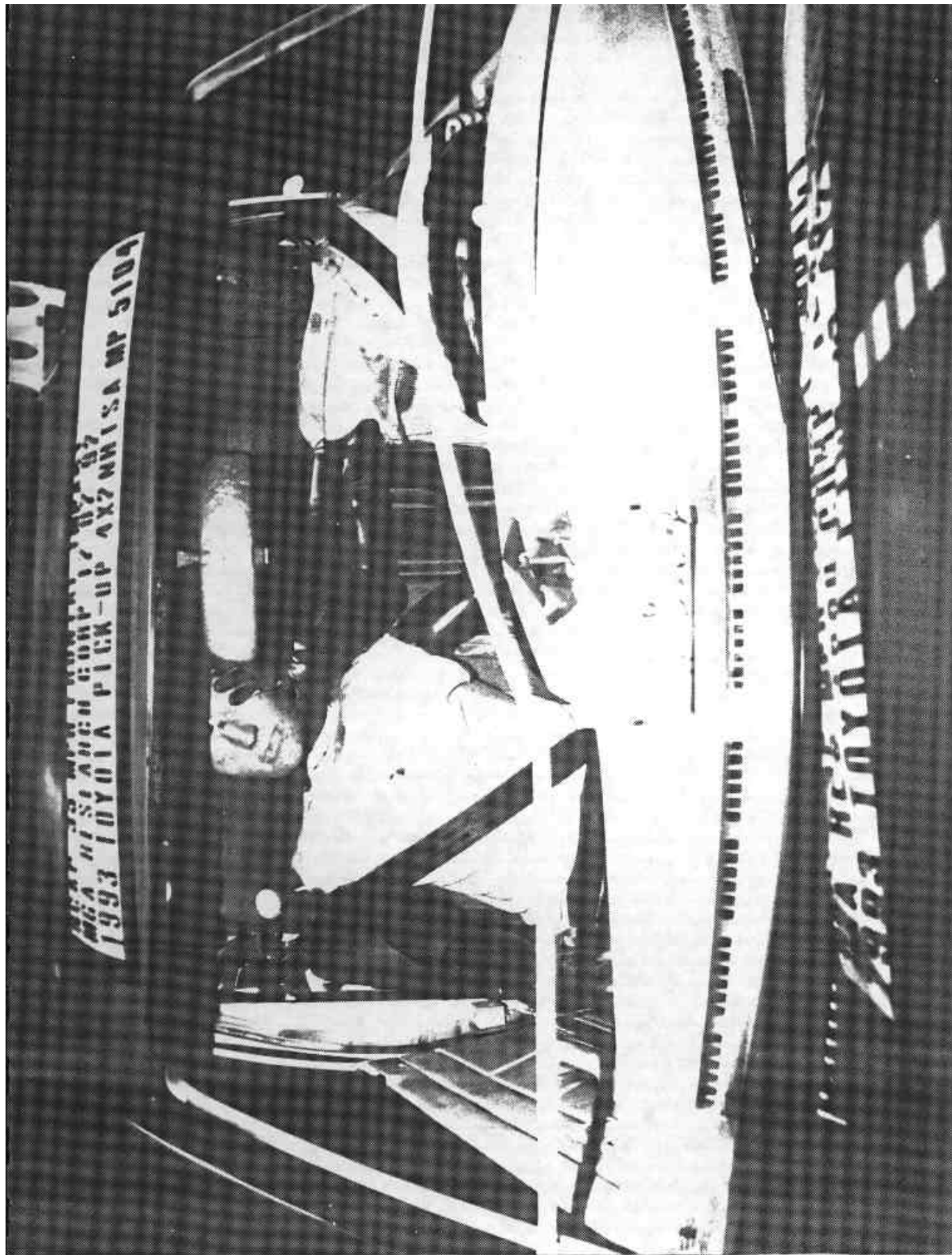


Photo No. 19 - Post-Test Windshield View



NEAP 35 MPH FRONTAL IMPACT

Photo No. 28 - Pre Test Driver Dummy Position View



Photo No. 21 - Post-Test Driver Dummy Position View



Photo No. 22 - Pre-Test Driver Dummy Three-Quarter View



Photo No. 23 - Post-Test Driver Dummy Three-Quarter View



Photo No. 24 - Pre-Test Driver Dummy Position View
(Door Open)

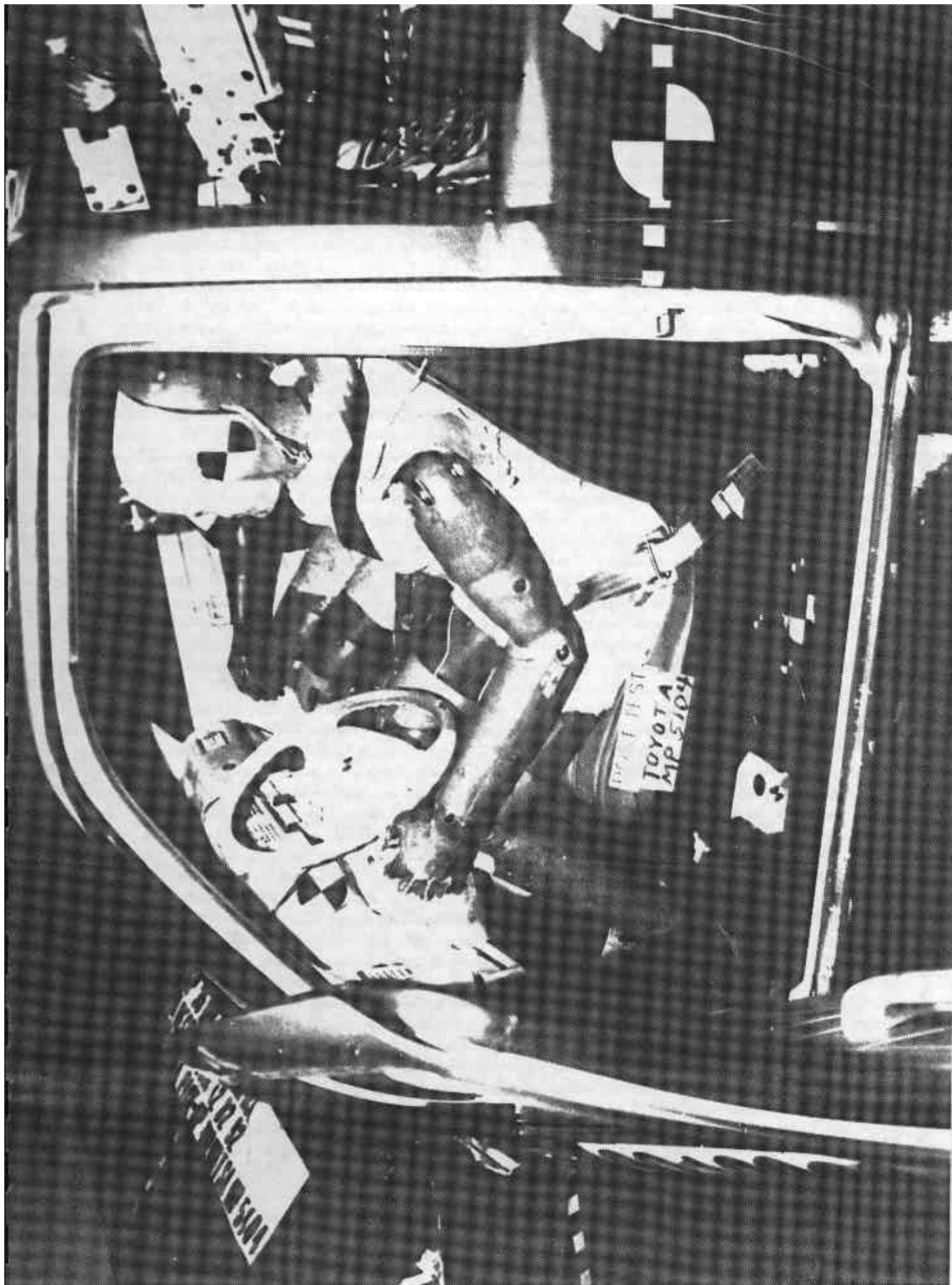


Photo No. 25 - Post-Test Driver Dummy Position View
(Door Open)

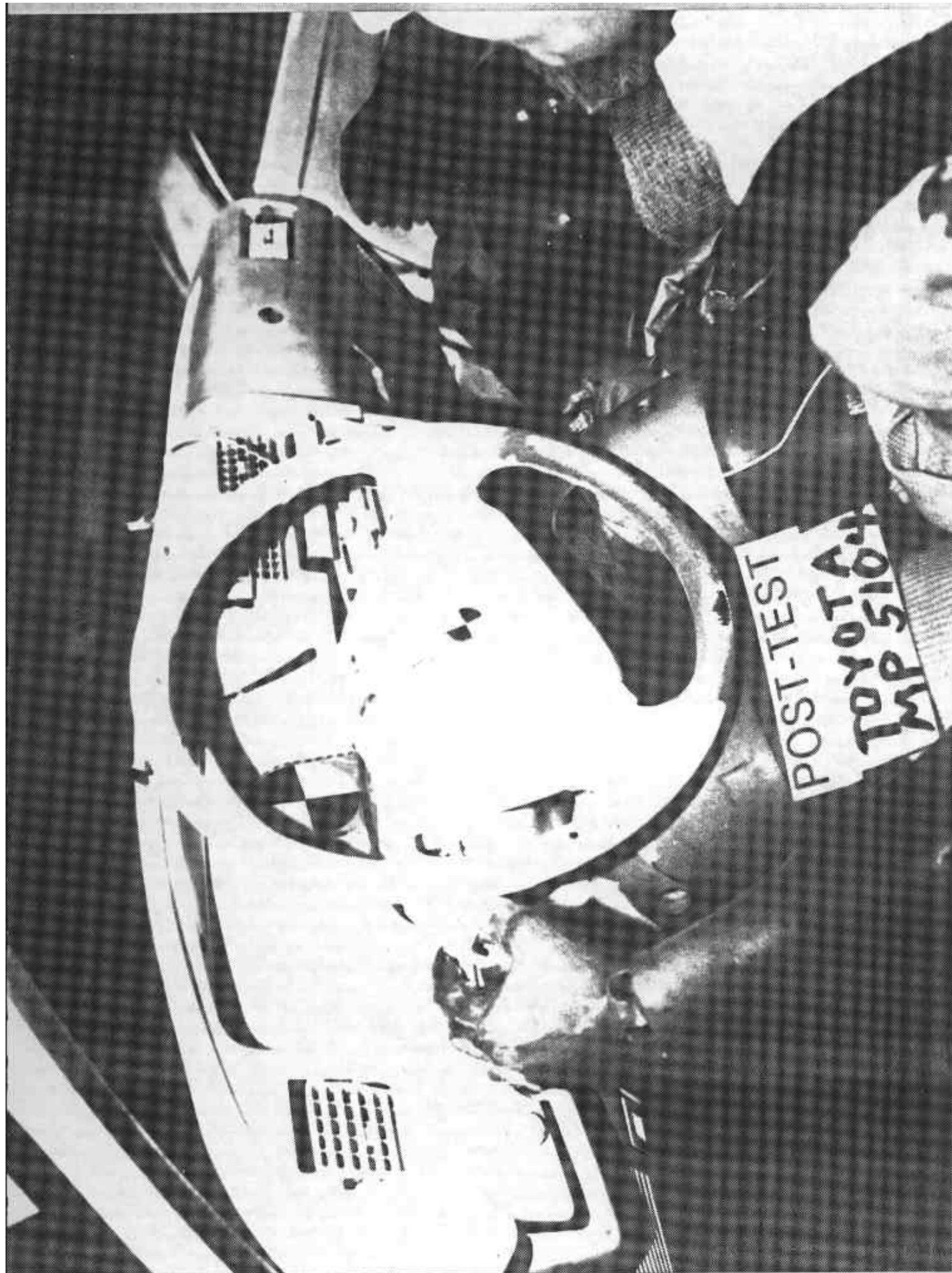


Photo No. 26 - Post-Test Steering Wheel Impact

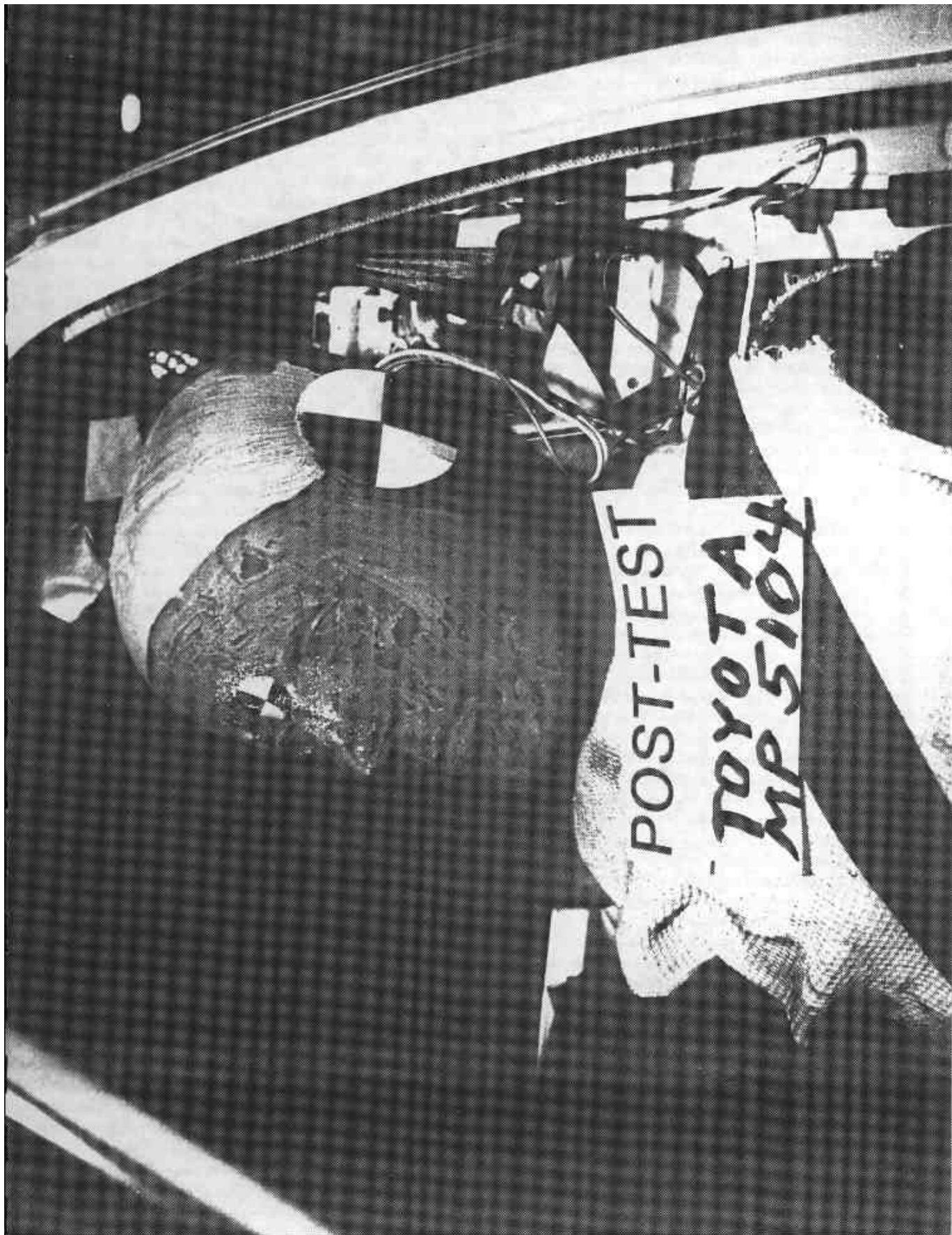


Photo No. 27 - Post-Test Driver Head Impact

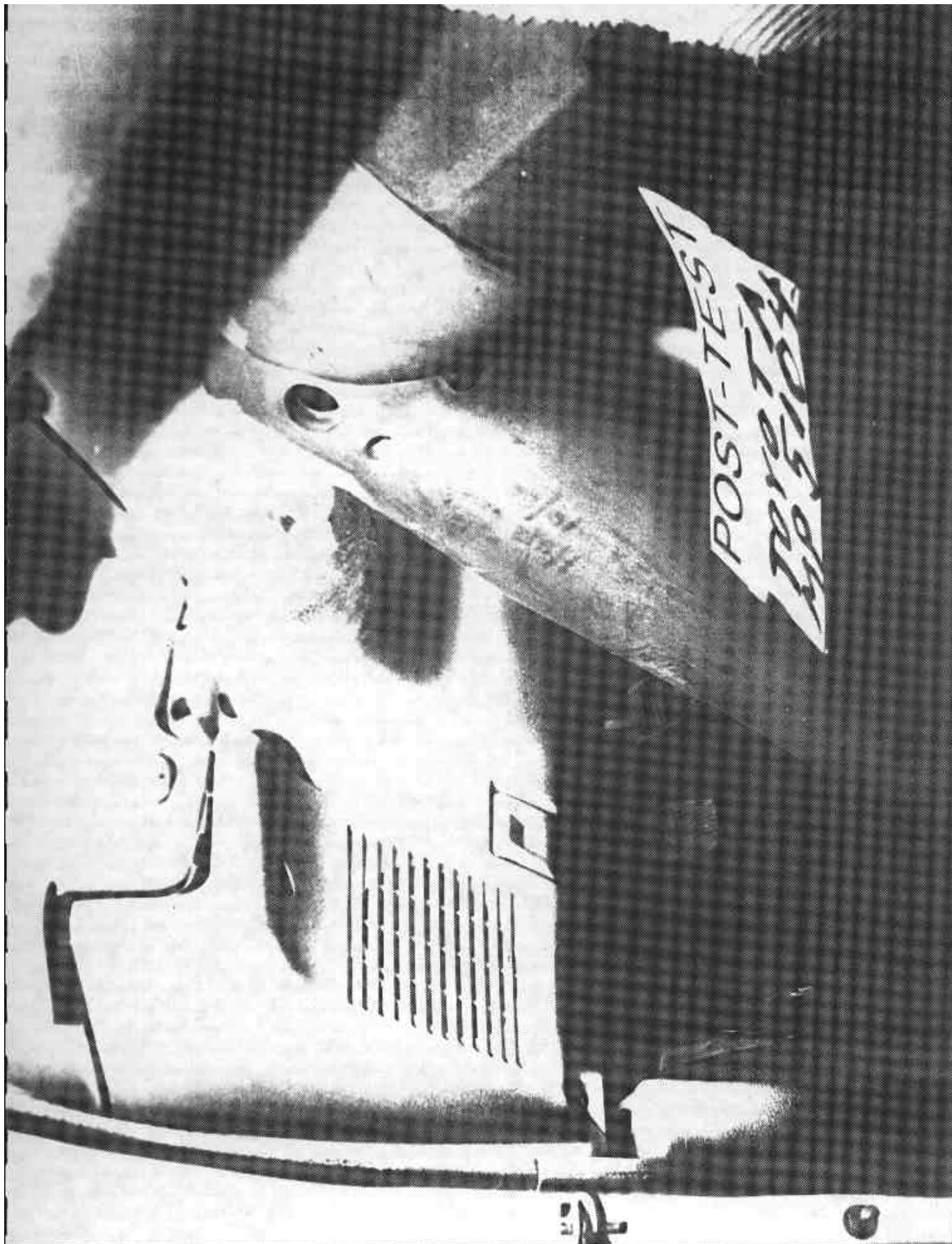


Photo No. 28 - Post-Test Driver Knee Contact Area

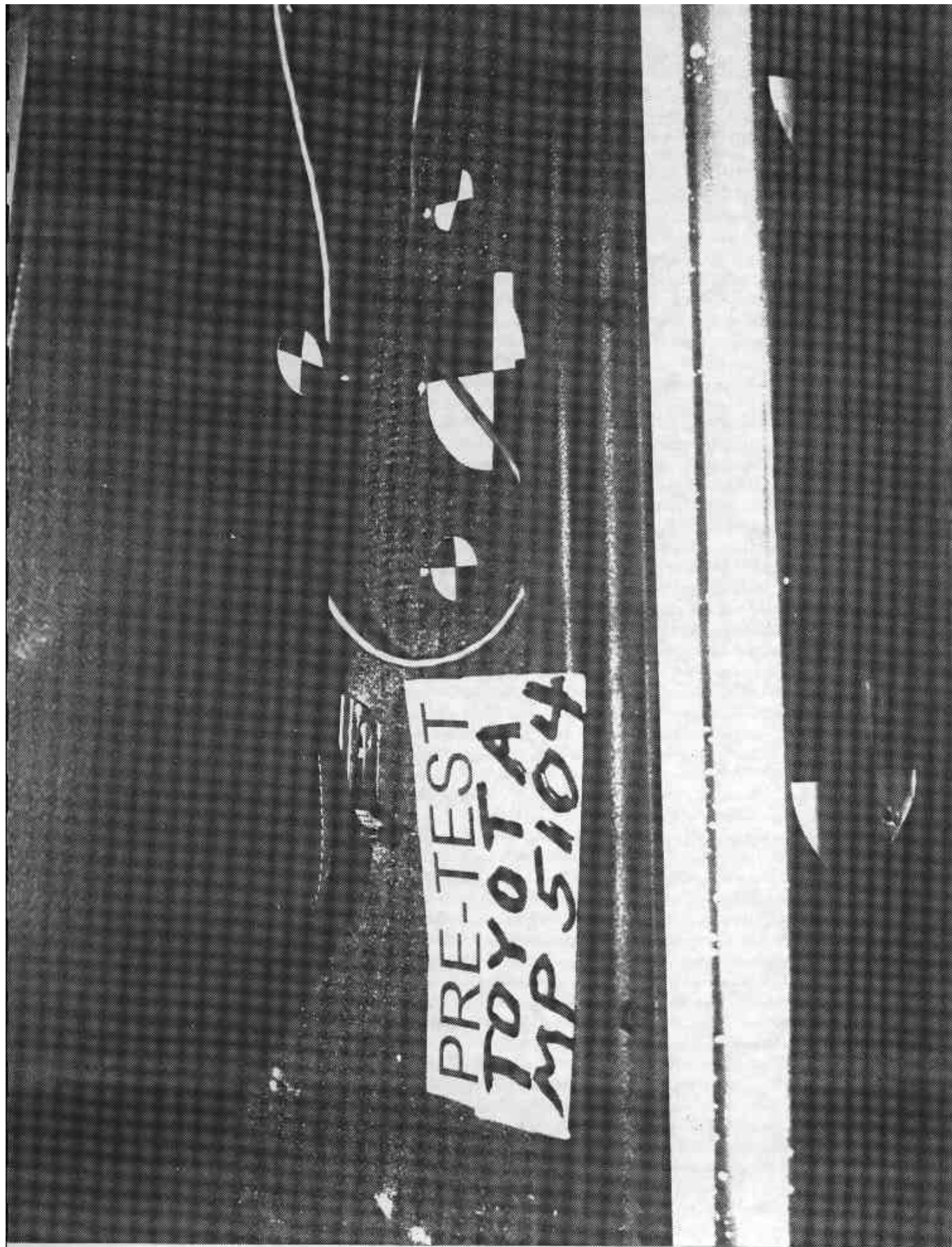


Photo No. 29 - Pre-Test Driver Seat Position View

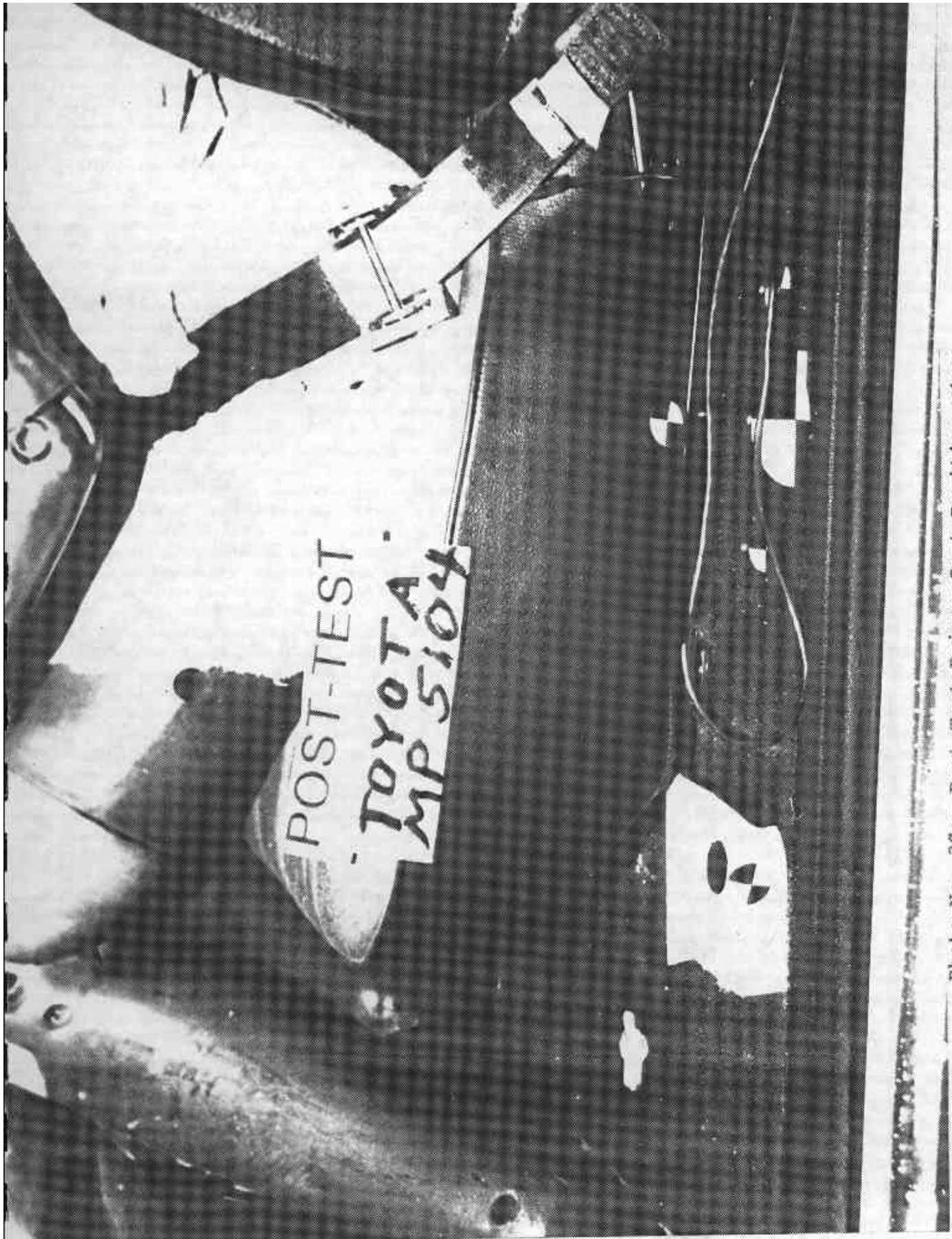


Photo No. 30 - Pos! Test Driver Seat Position View

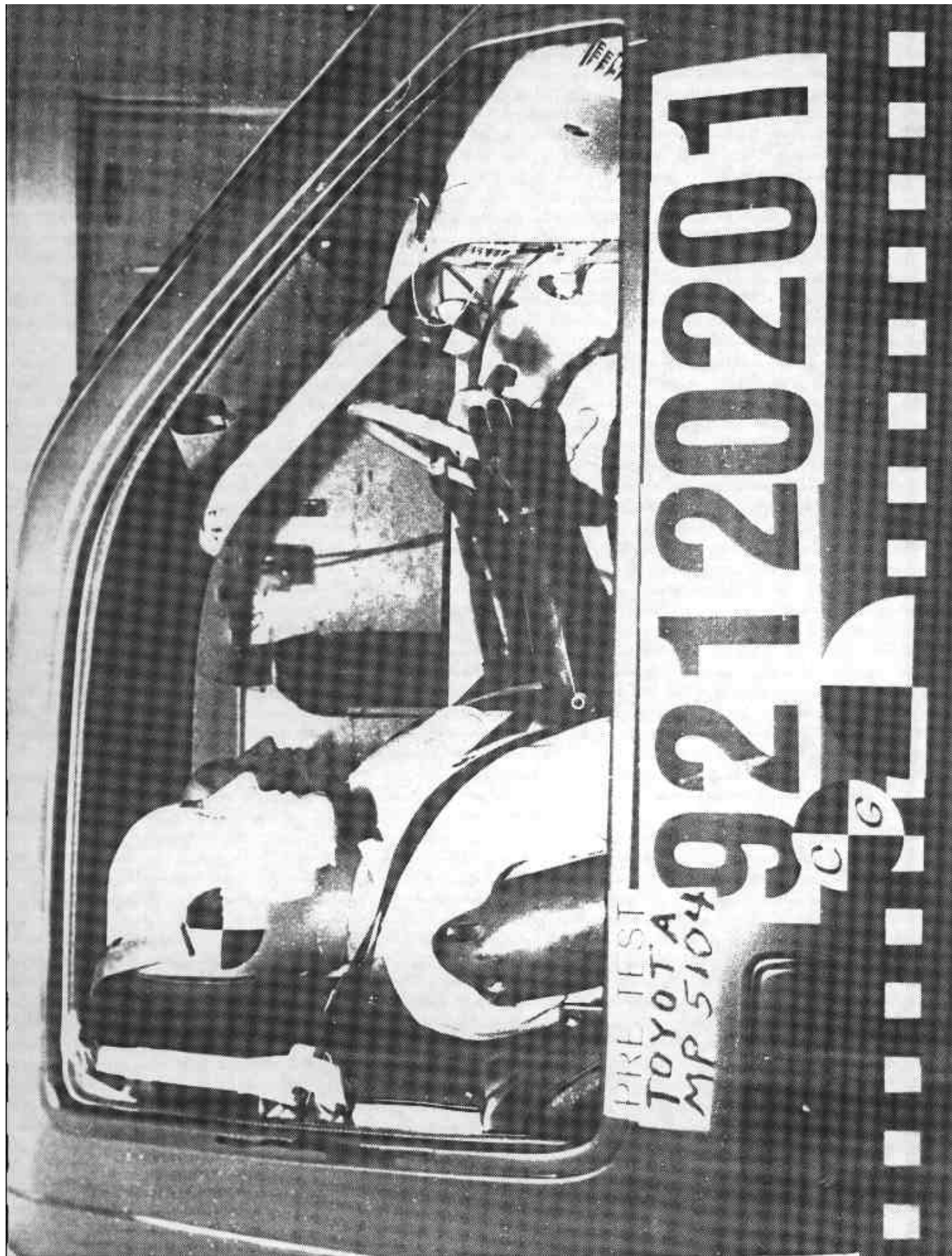


Photo No. 31 - pre-test Passenger Dummy Position View



Photo No. 32 - Post-Test Passenger Dummy Position View



Photo No. 33 - Pre-Test 3/4 Passenger Dummy Position View



Photo No. 34 - Post-Test 3/4 Passenger Dummy Position View



Photo No. 35 - Pre-Test Passenger Dummy Position View
(Door Open)

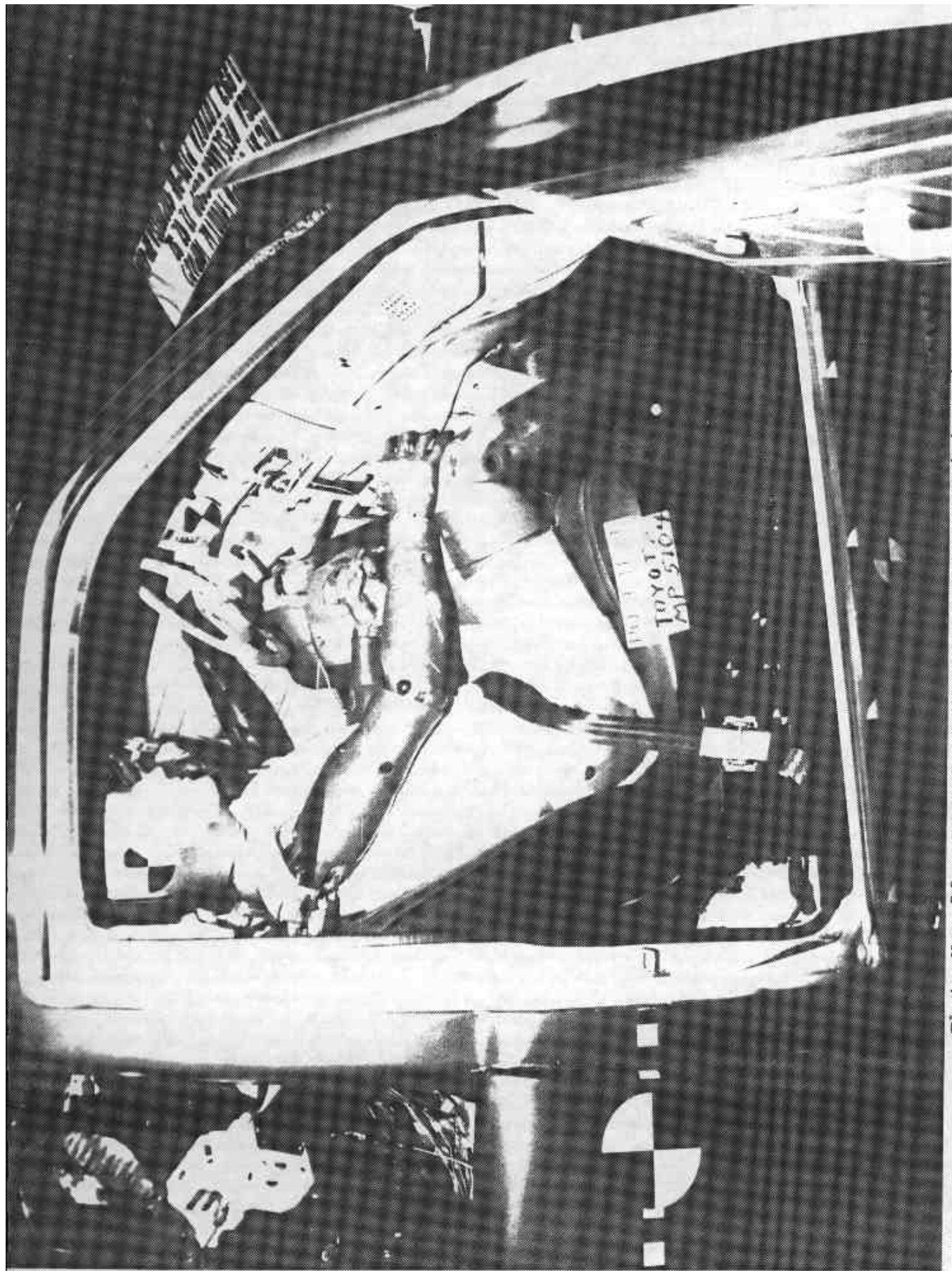


Photo No. 36 - Post-Test Passenger Dummy Position View
(Door Open)

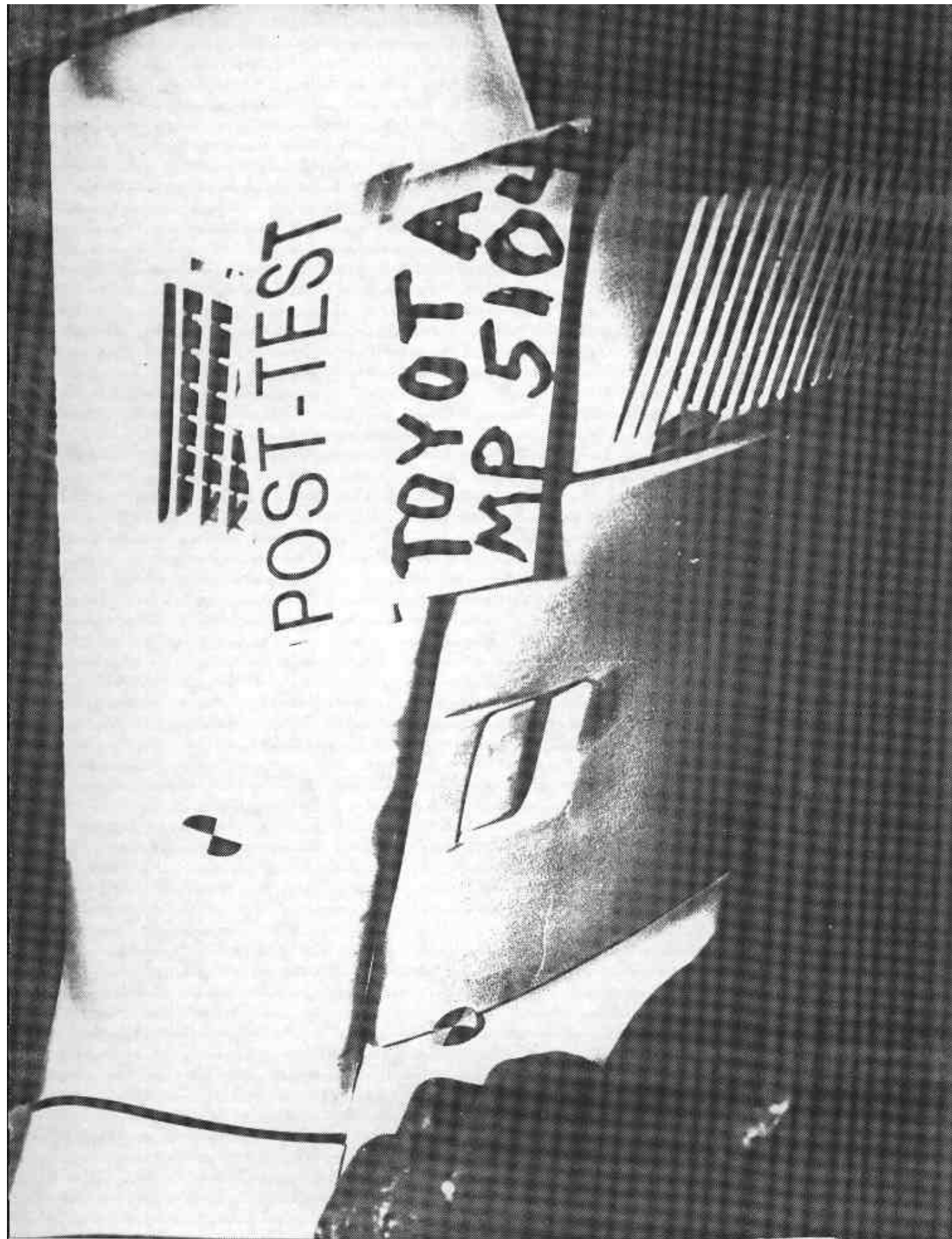


Photo No. 37 - Post-Test Passenger Dummy Knee Contact Area

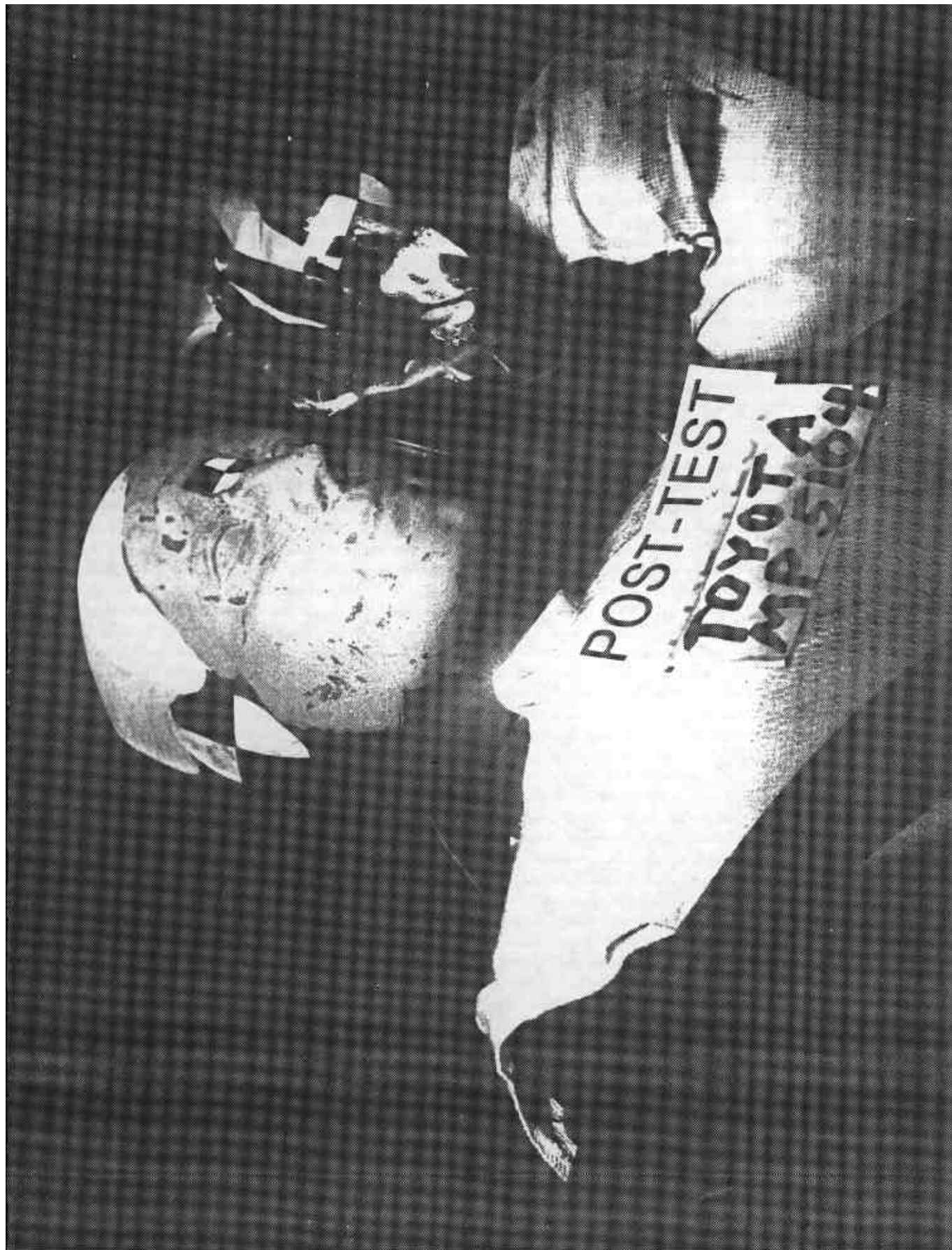


Photo No. 38 - Post-Test Passenger Dummy Head Contact



A-39

Photo No. 39 - Pre-Test Passenger Seat Position View



A-40

Photo No. 40 - Post-Test Passenger Seat Position View

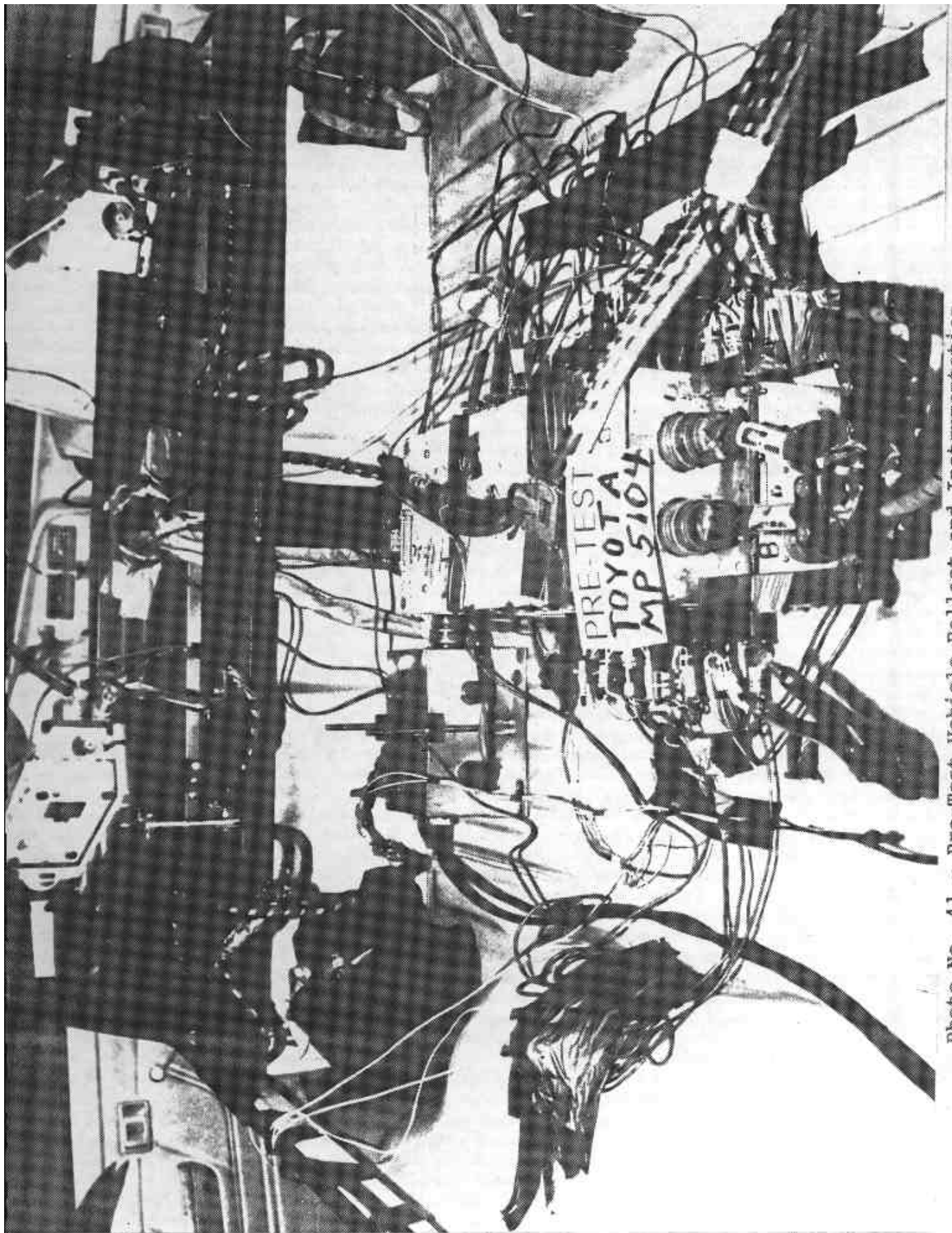


Photo No. 41 - Pre-Test Vehicle Ballast and Instrumentation

APPENDIX B

Vehicle, Load Cell Barrier and Dummy Response Data

1993 TOYOTA PICKUP

NHTSA NO.: MP5104

<u>VEHICLE DATA</u>	<u>FILTER CHANNEL CLASS</u>	
Head Accelerations	1000	(1650 Hz)
Chest Accelerometers	180	(300 Hz)
Vehicle Accelerometers	60	(100 Hz)
Barrier Load Cells	60	(100 Hz)
Femur Load Cells	600	(1000 Hz)
Lap and Torso Belts	60	(100 Hz)

Data Plot

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* No Valid Data Collected

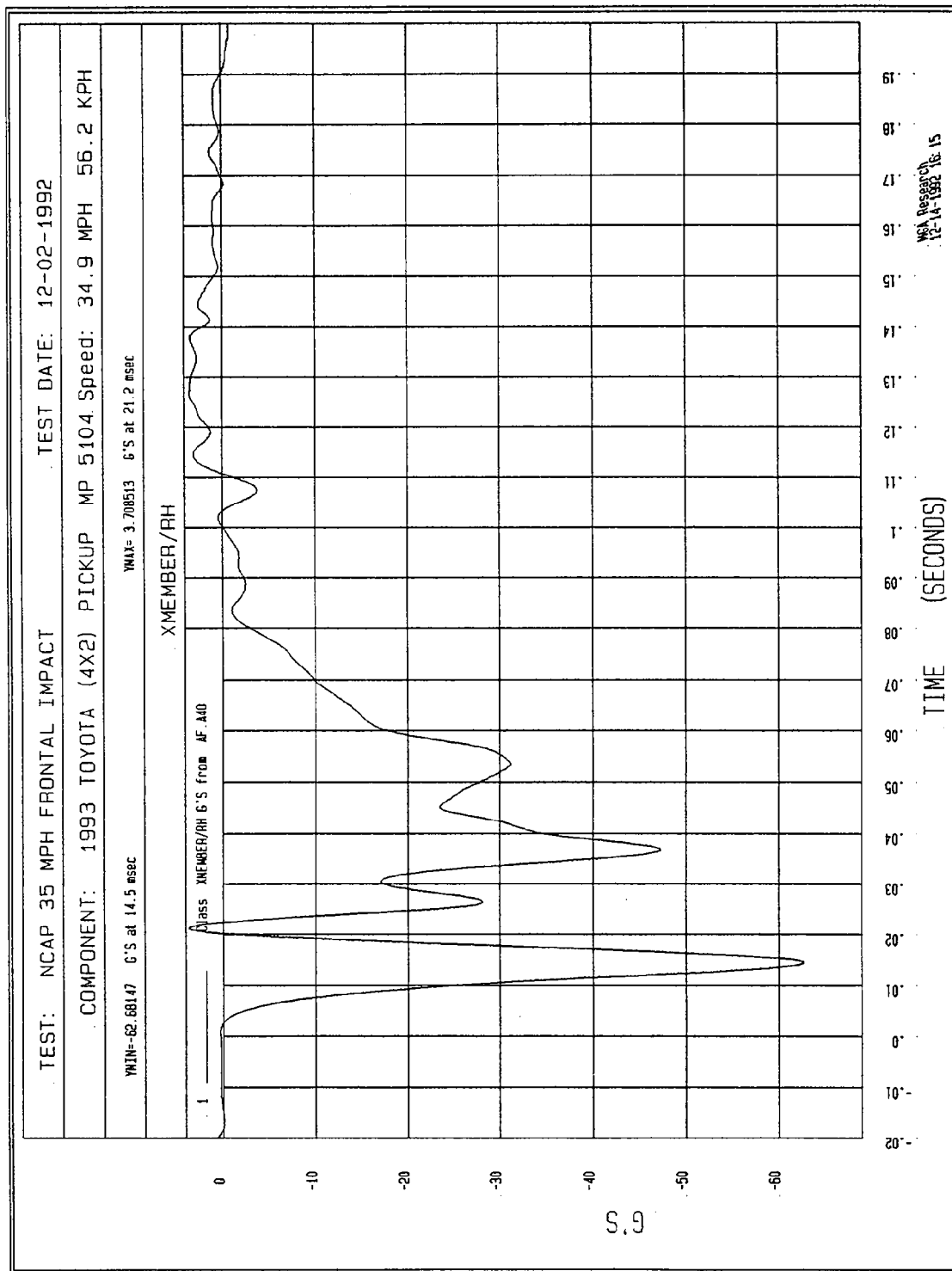


Figure B-1 - Right Rear Seat Crossmember X Acceleration vs. Time

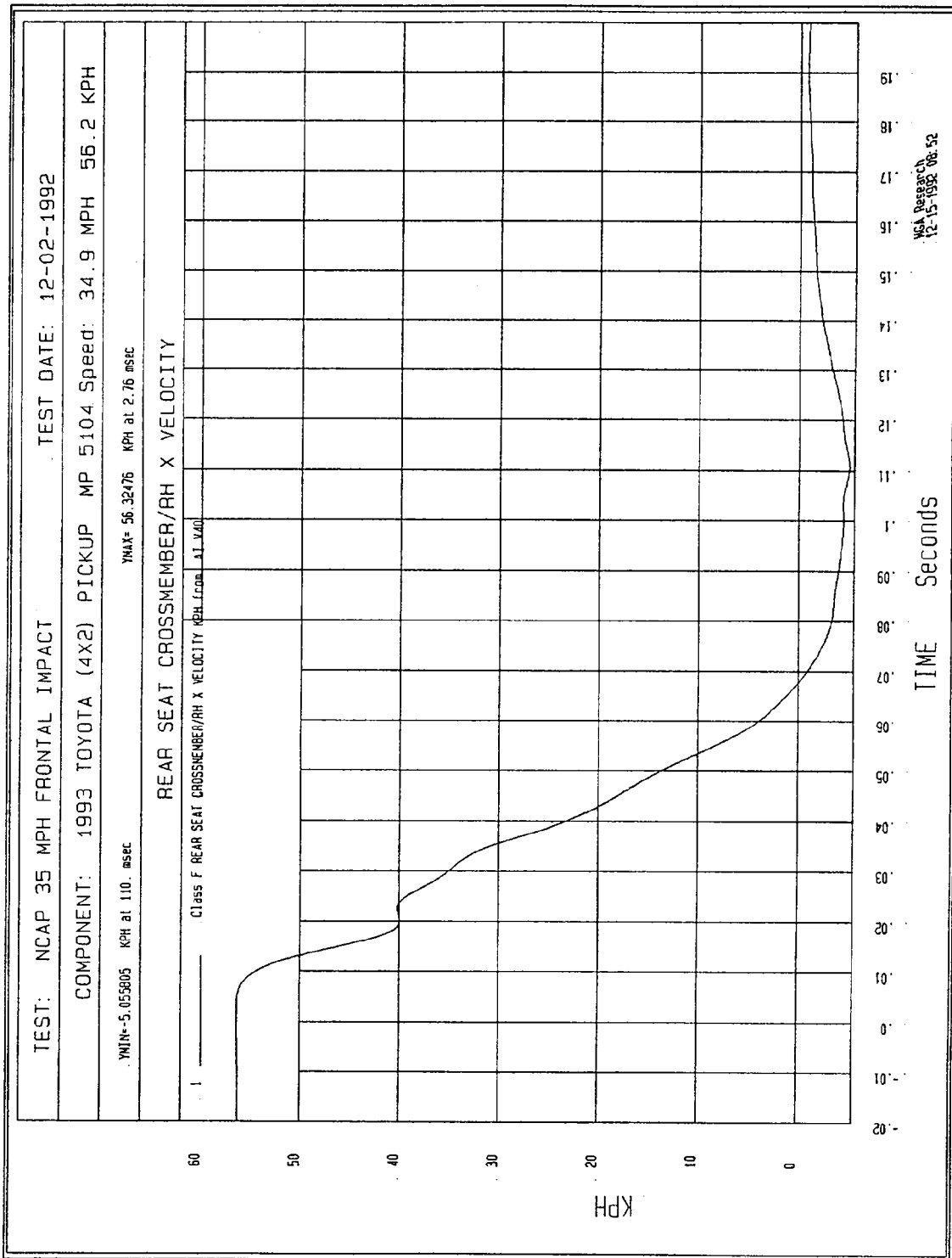


Figure B-2 - Right Rear Seat Crossmember X Velocity vs. Time

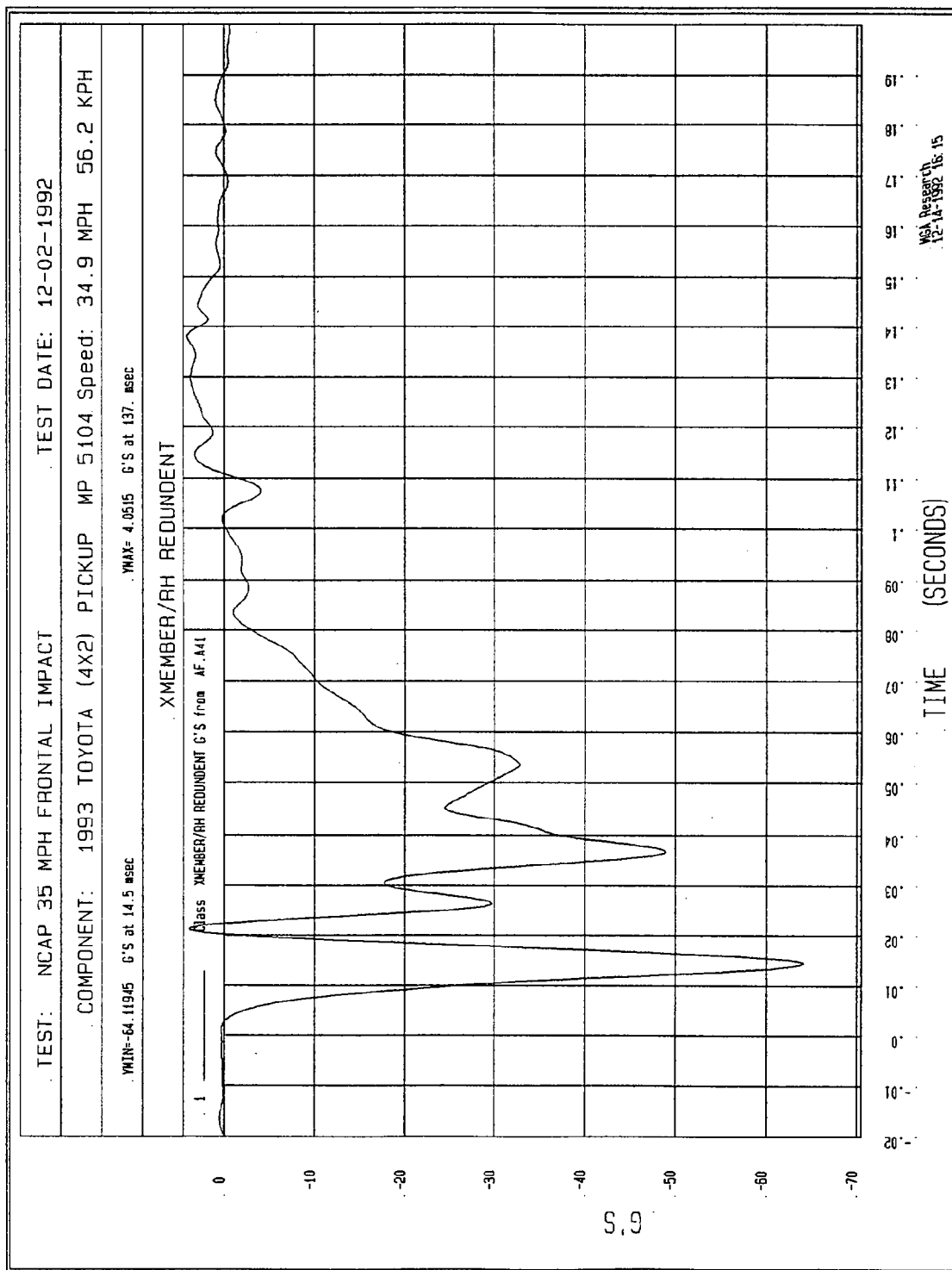


Figure B-3 - Right Rear Seat Crossmember X Redundant Acceleration vs. Time

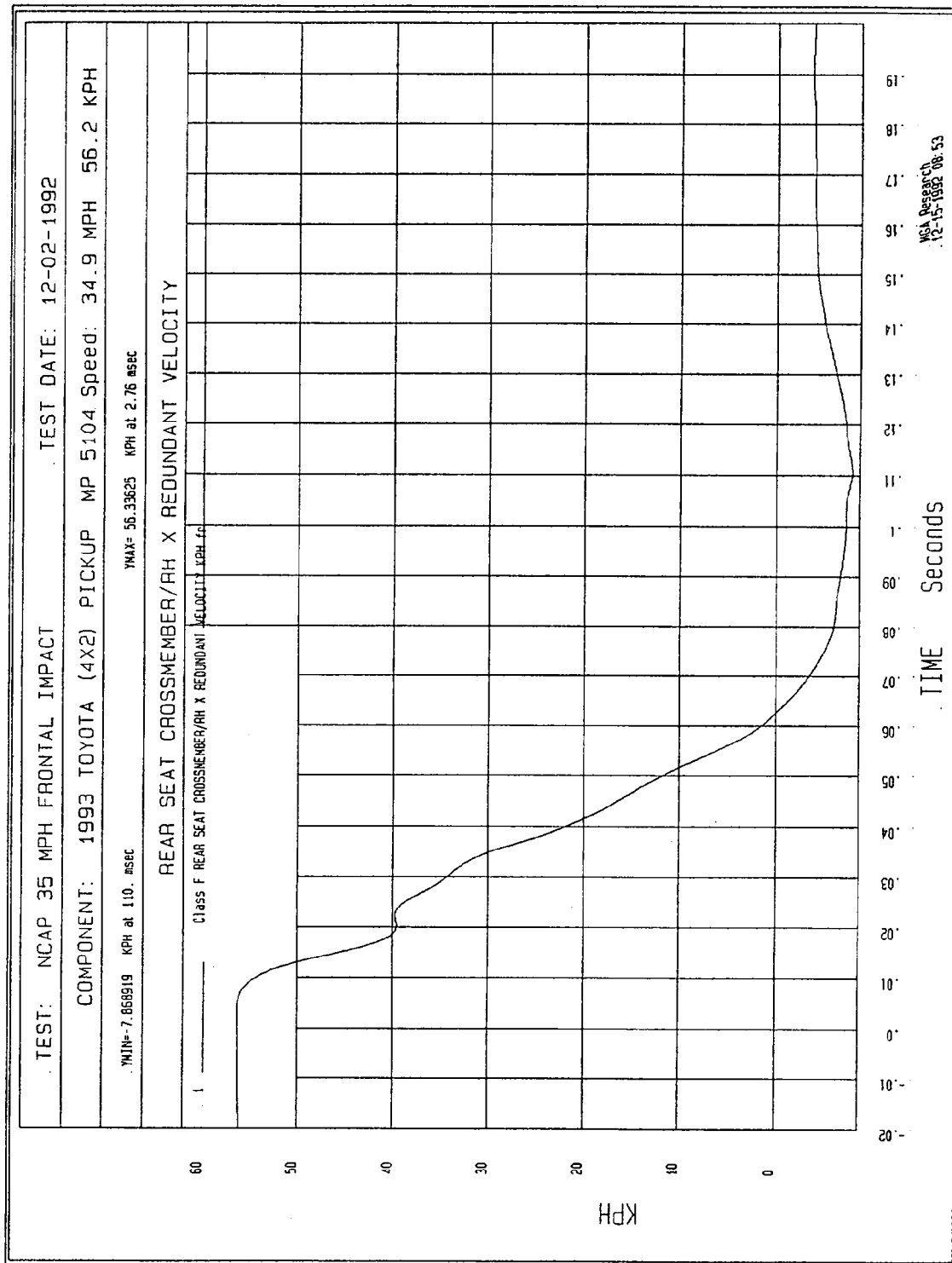


Figure B-4 - Right Rear Seat Crossmember X Redundant Velocity vs. Time

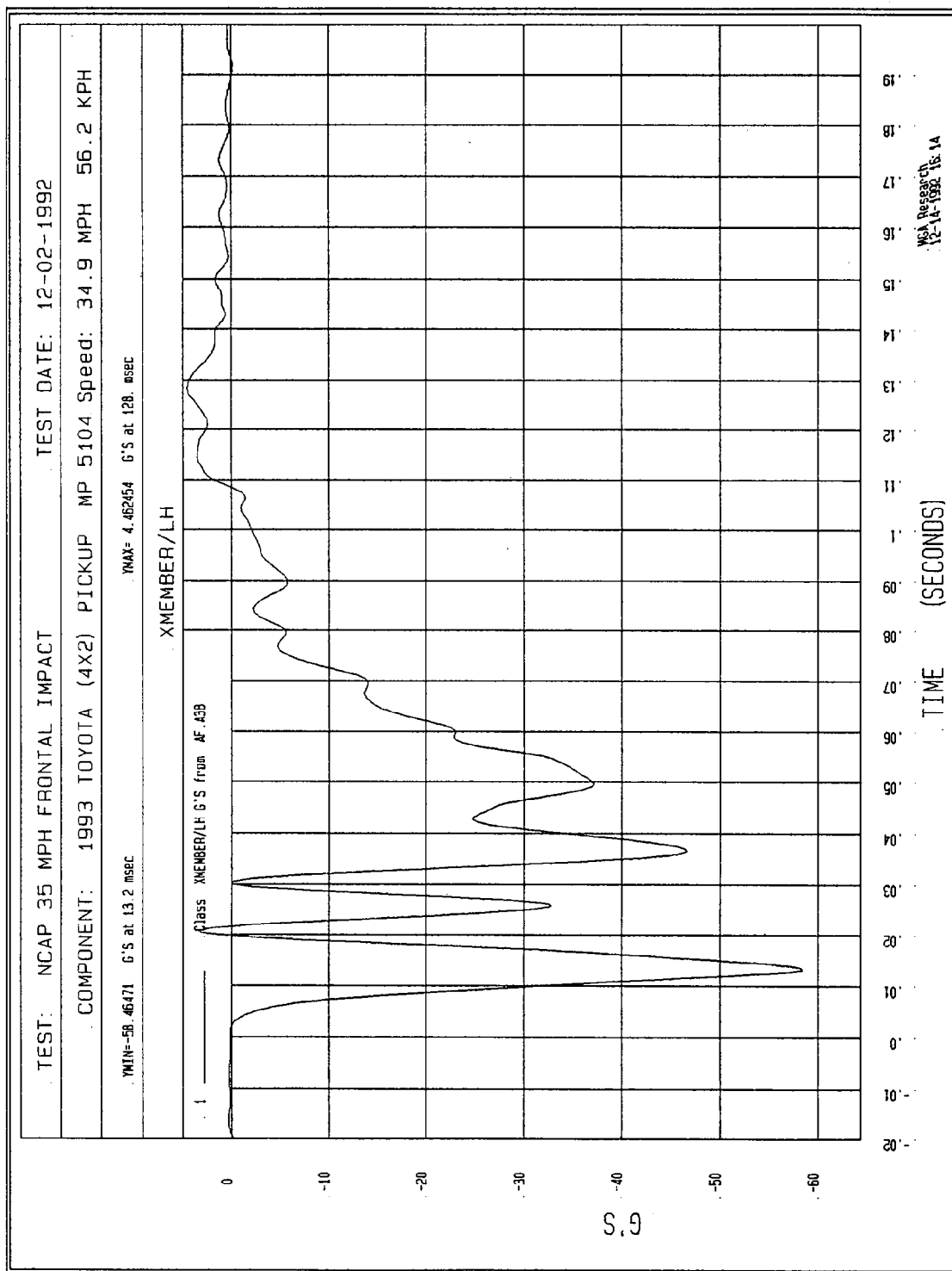


Figure B-5 - Left Rear Seat Crossmember X Acceleration vs. Time

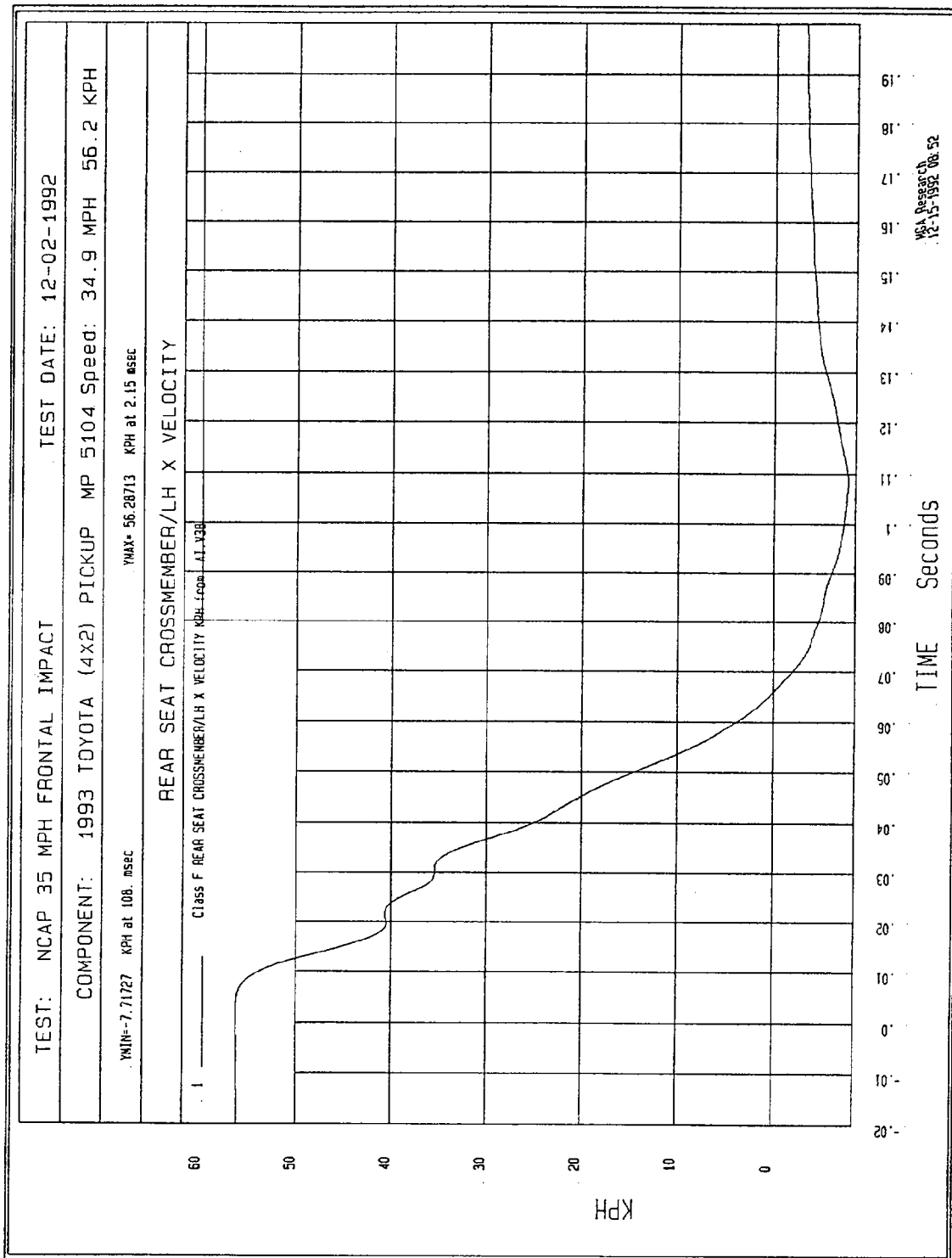


Figure B-6 - Left Rear Seat Crossmember X Velocity vs. Time

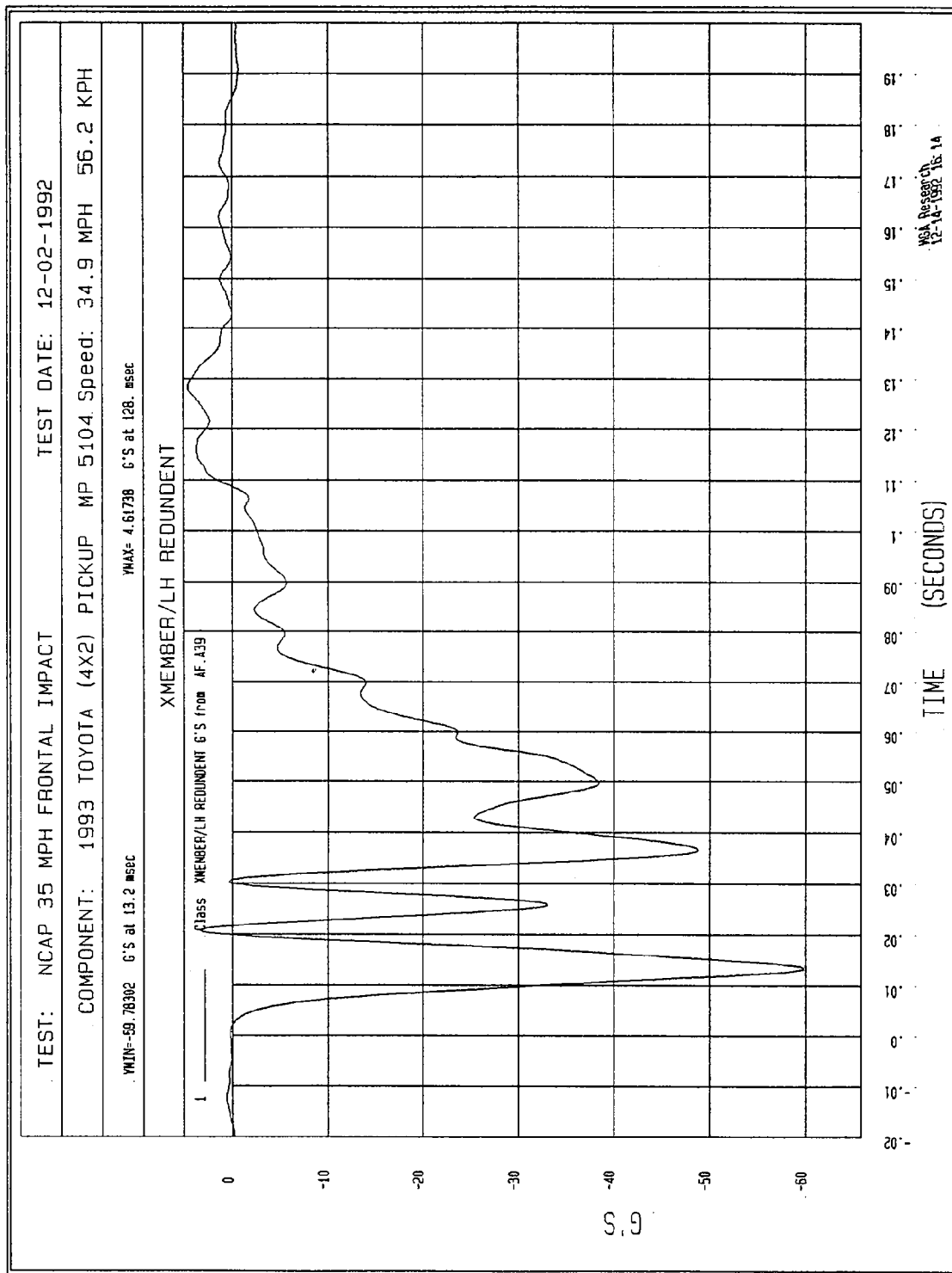


Figure B-7 - Left Rear Seat Crossmember X Redundant Acceleration vs. Time

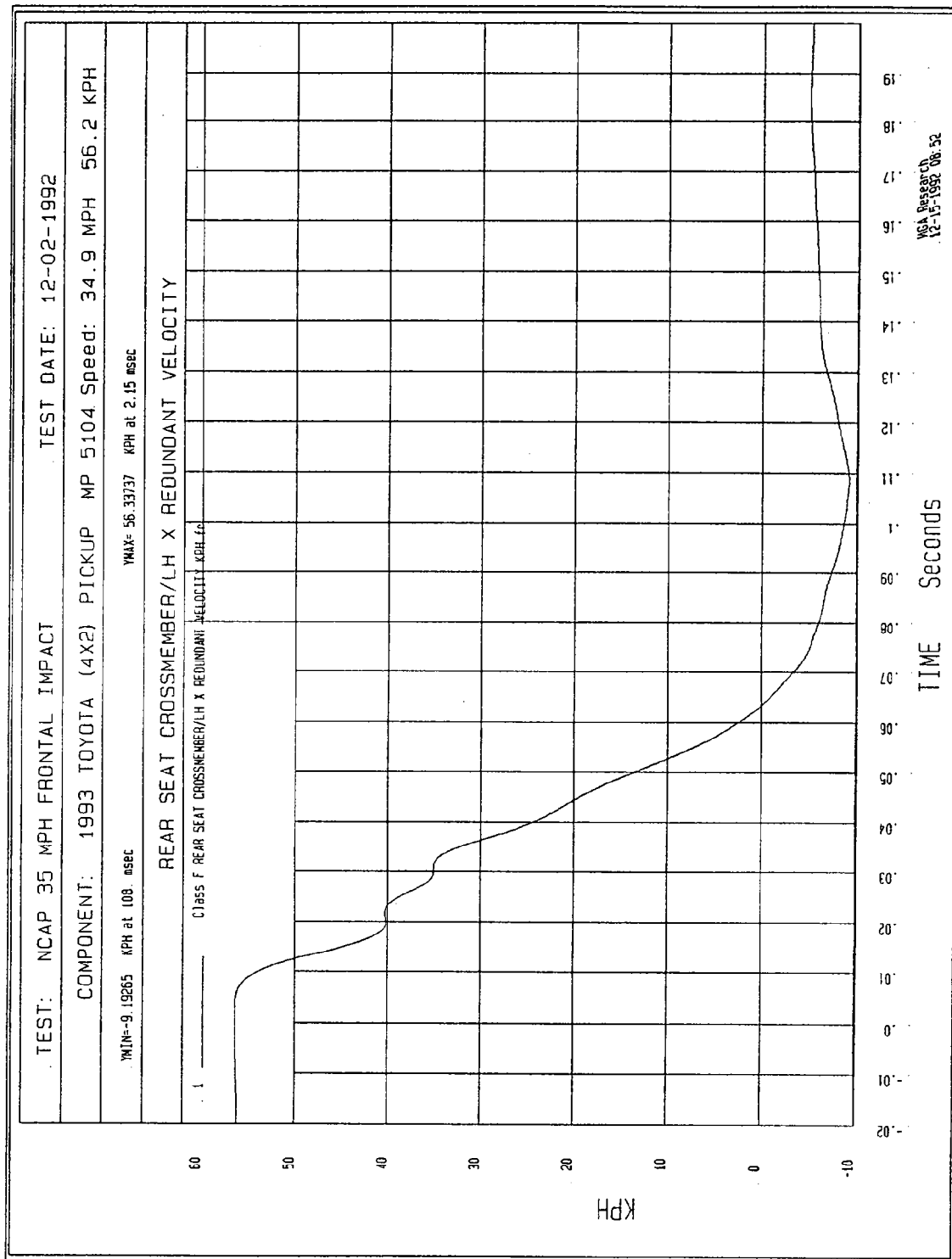


Figure B-8 - Left Rear Seat Crossmember X Redundant Velocity vs. Time

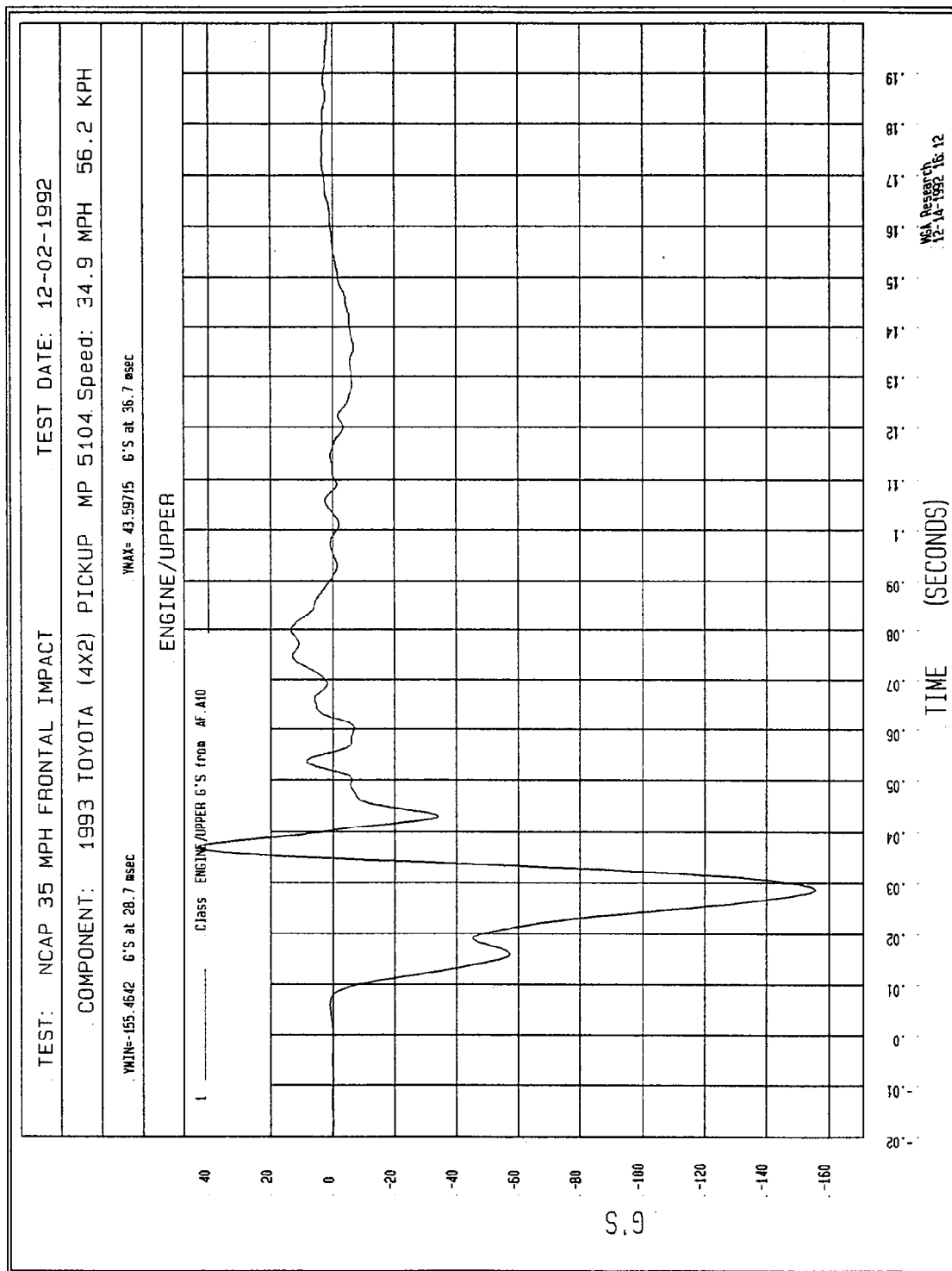


Figure B-9 - Top of Engine Block X Acceleration vs. Time

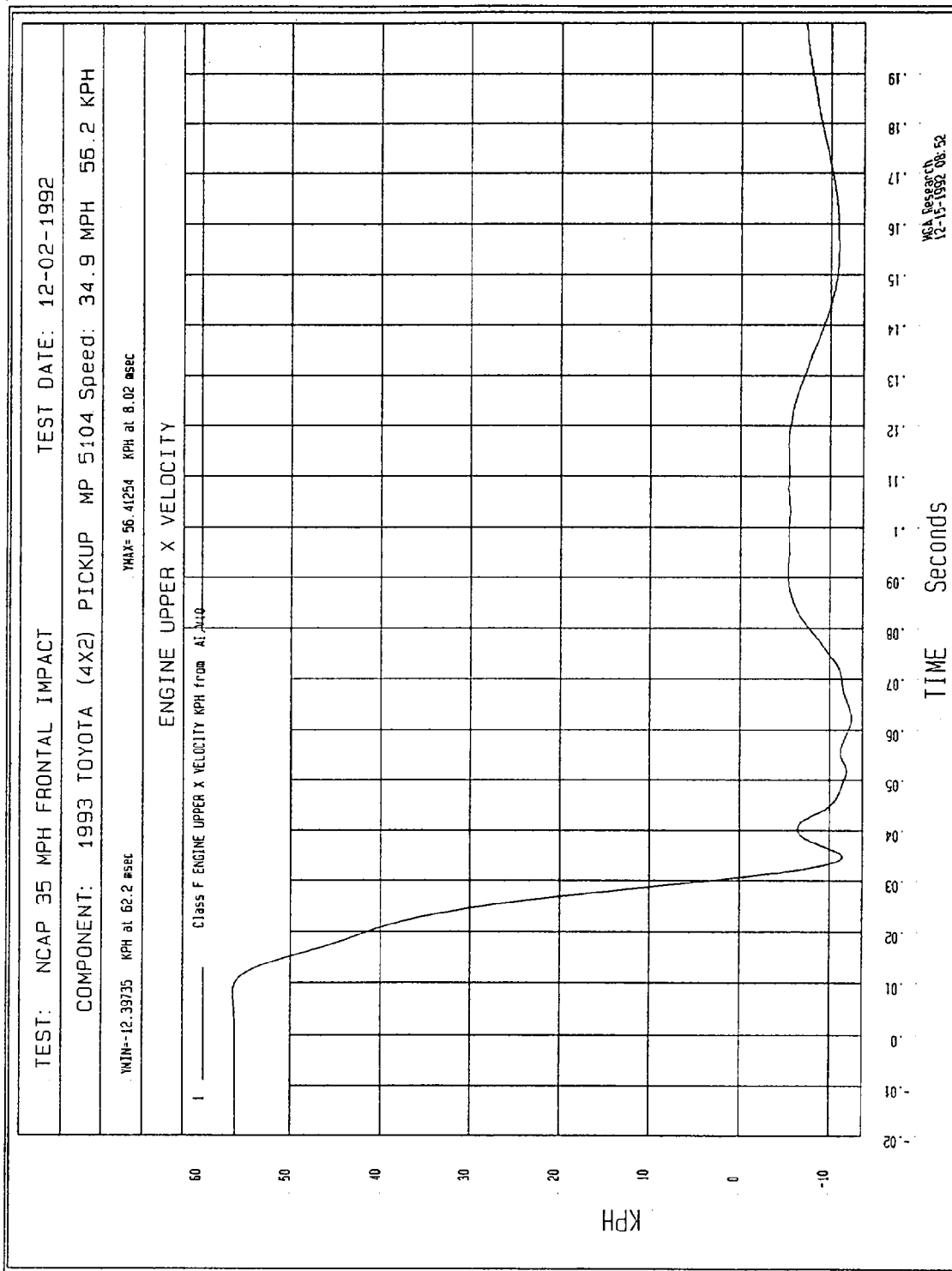


Figure B-10 - Top of Engine Block X Velocity vs. Time

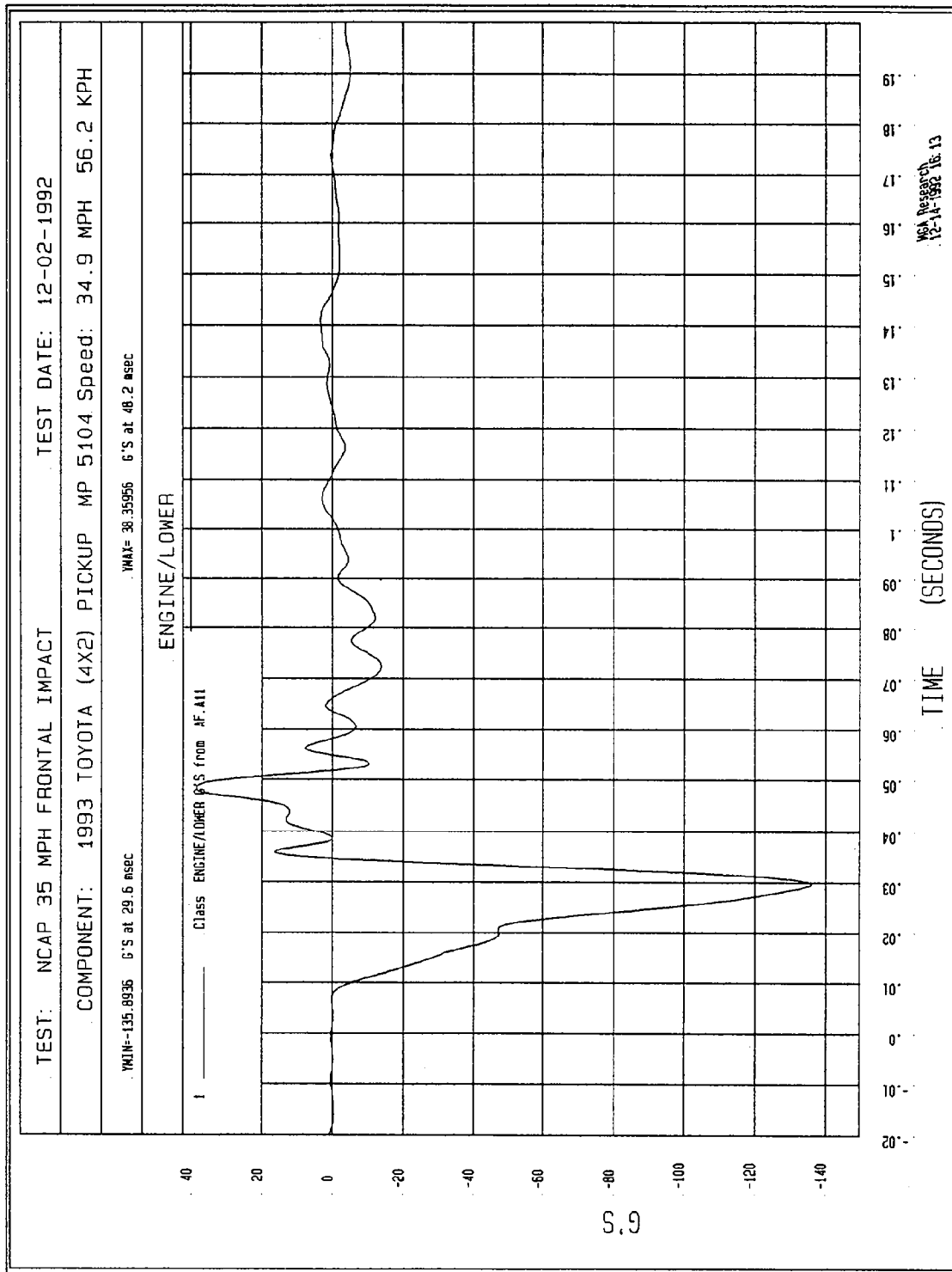


Figure B-11 - Bottom of Engine Block X Acceleration vs. Time

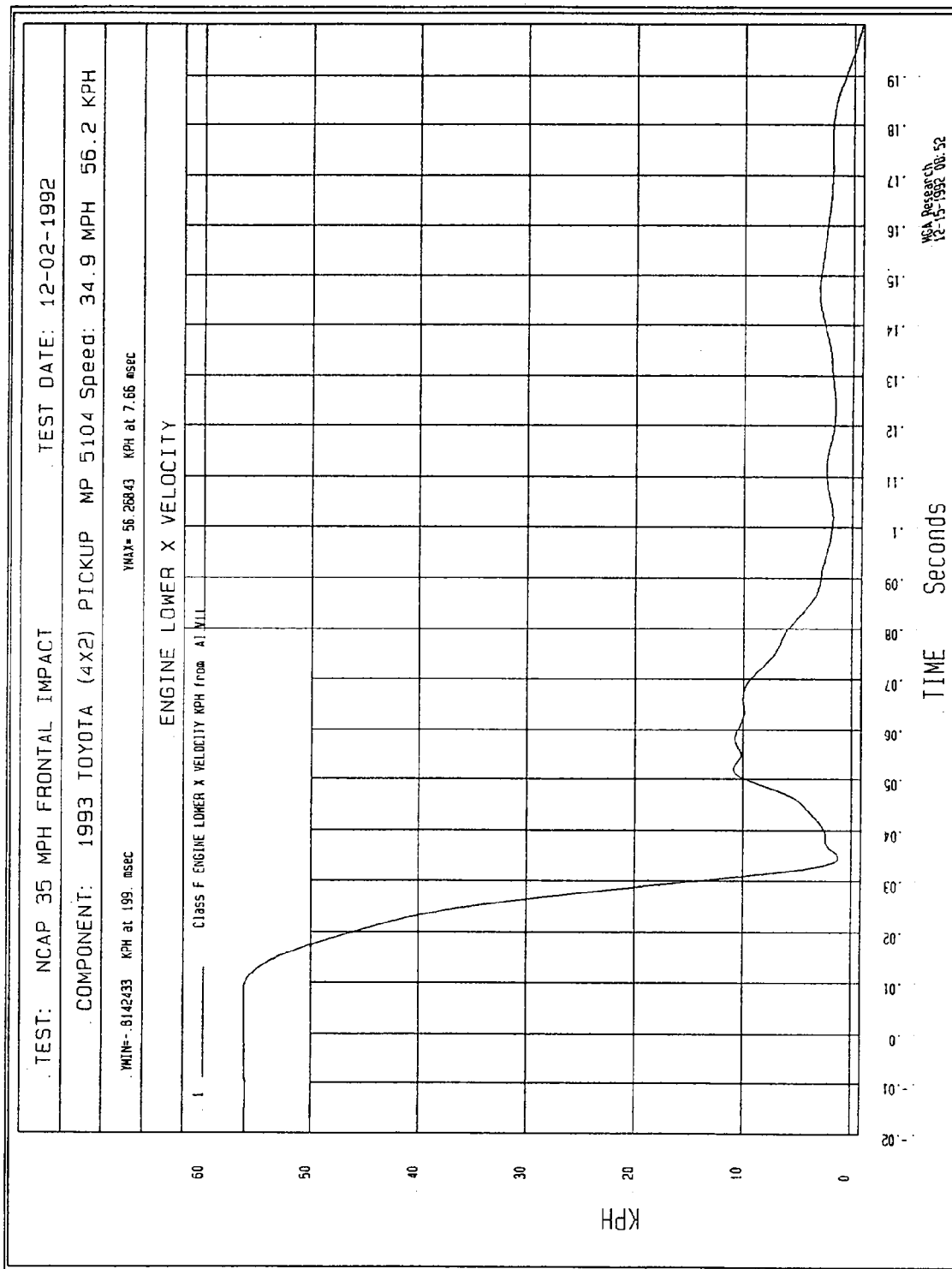


Figure B-12 - Bottom of Engine Block X Velocity vs. Time

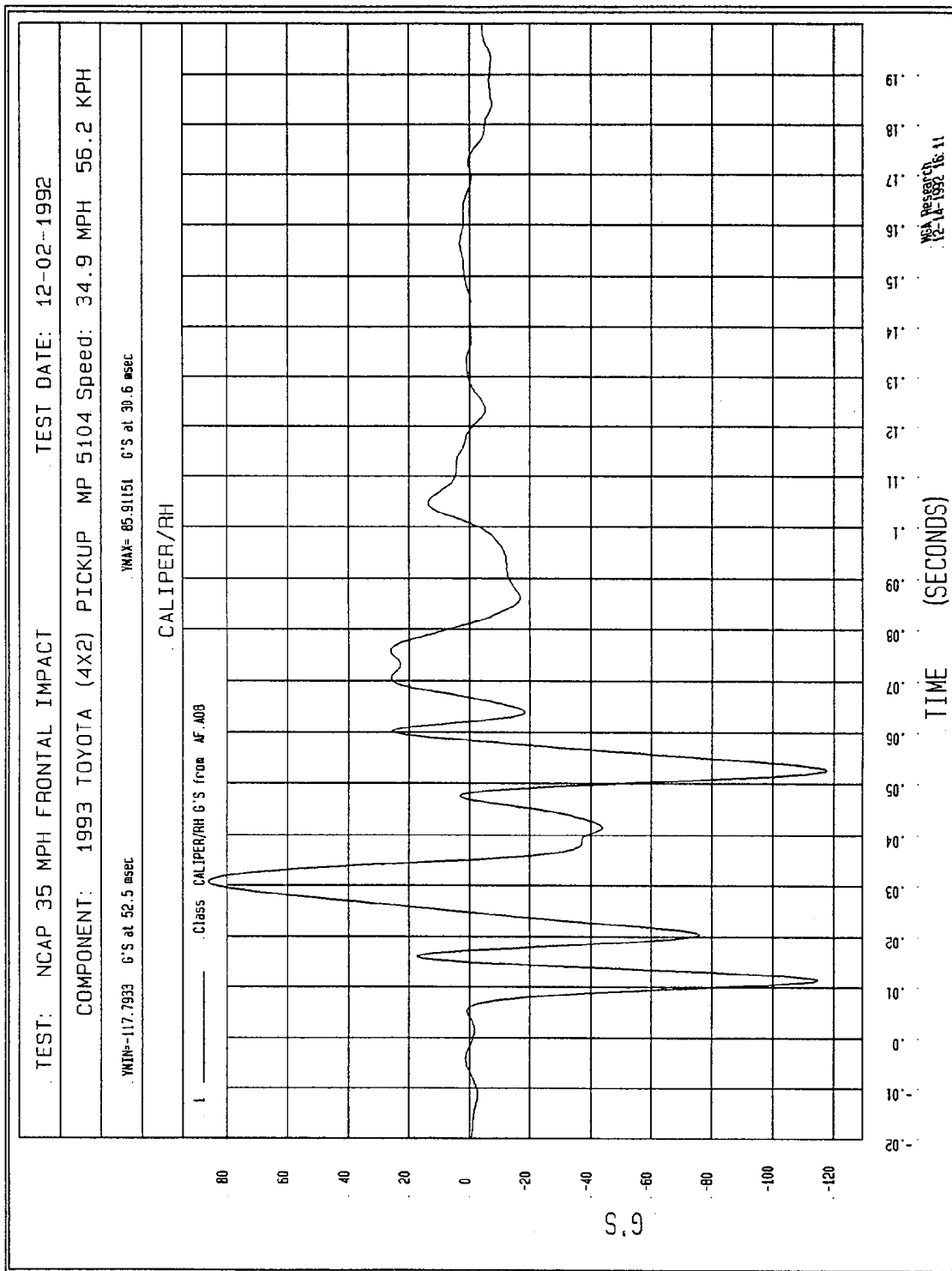


Figure B-13 - Right Front Disc Brake Caliper X Acceleration vs. Time

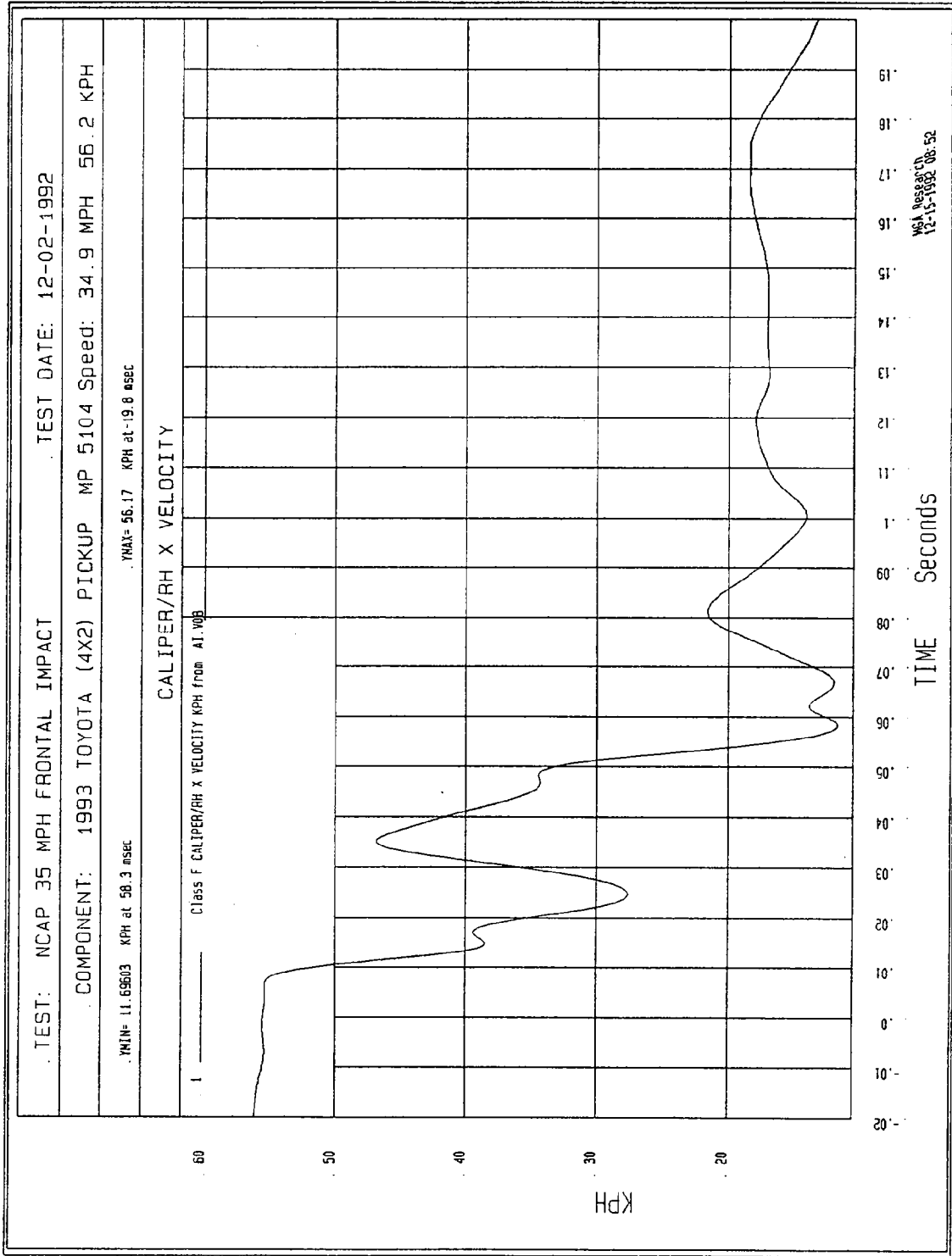


Figure B-14 - Right Front Disc Brake Caliper X Velocity vs. Time

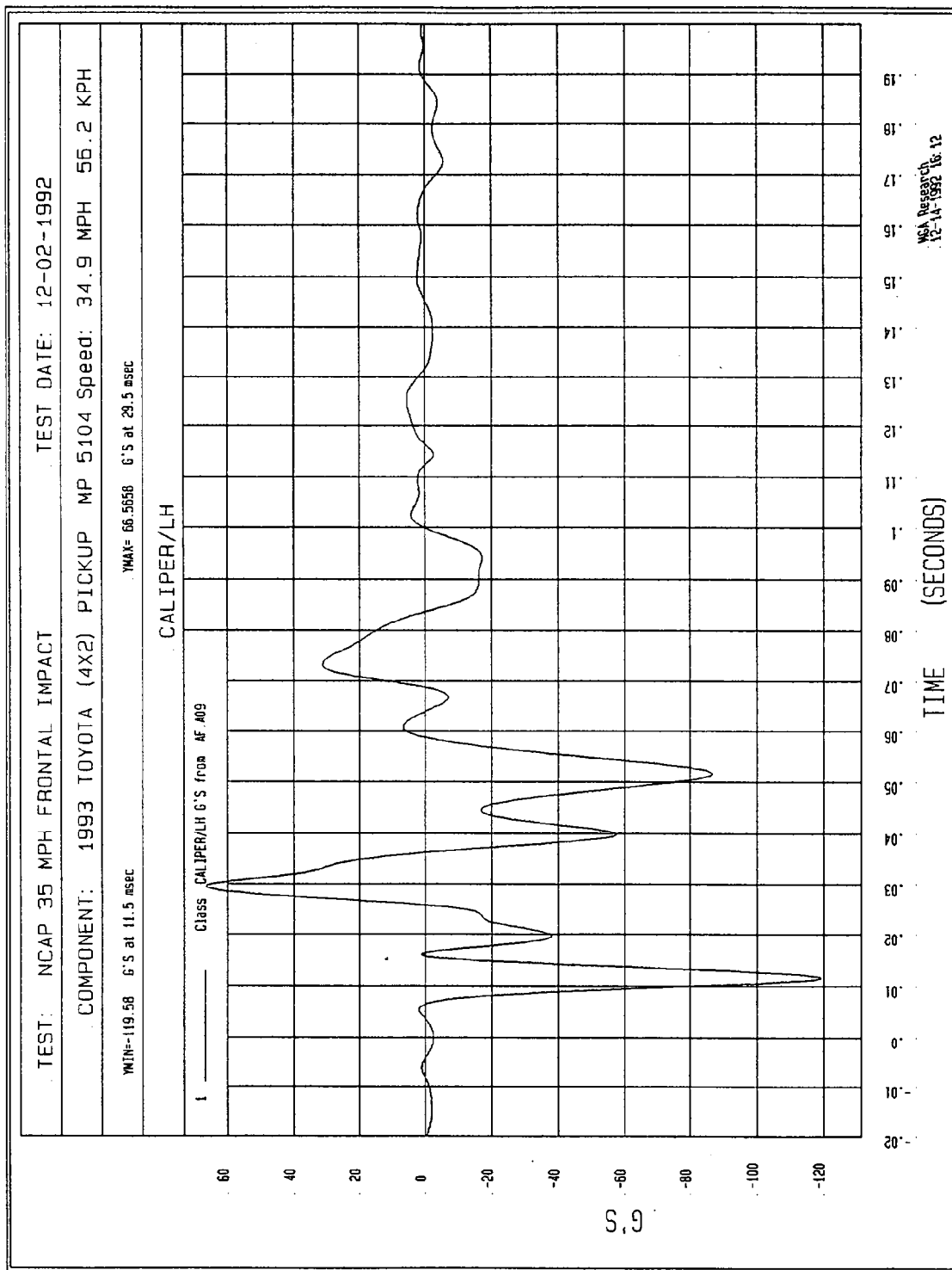


Figure B-15 - Left Front Disc Brake Caliper X Acceleration vs. Time

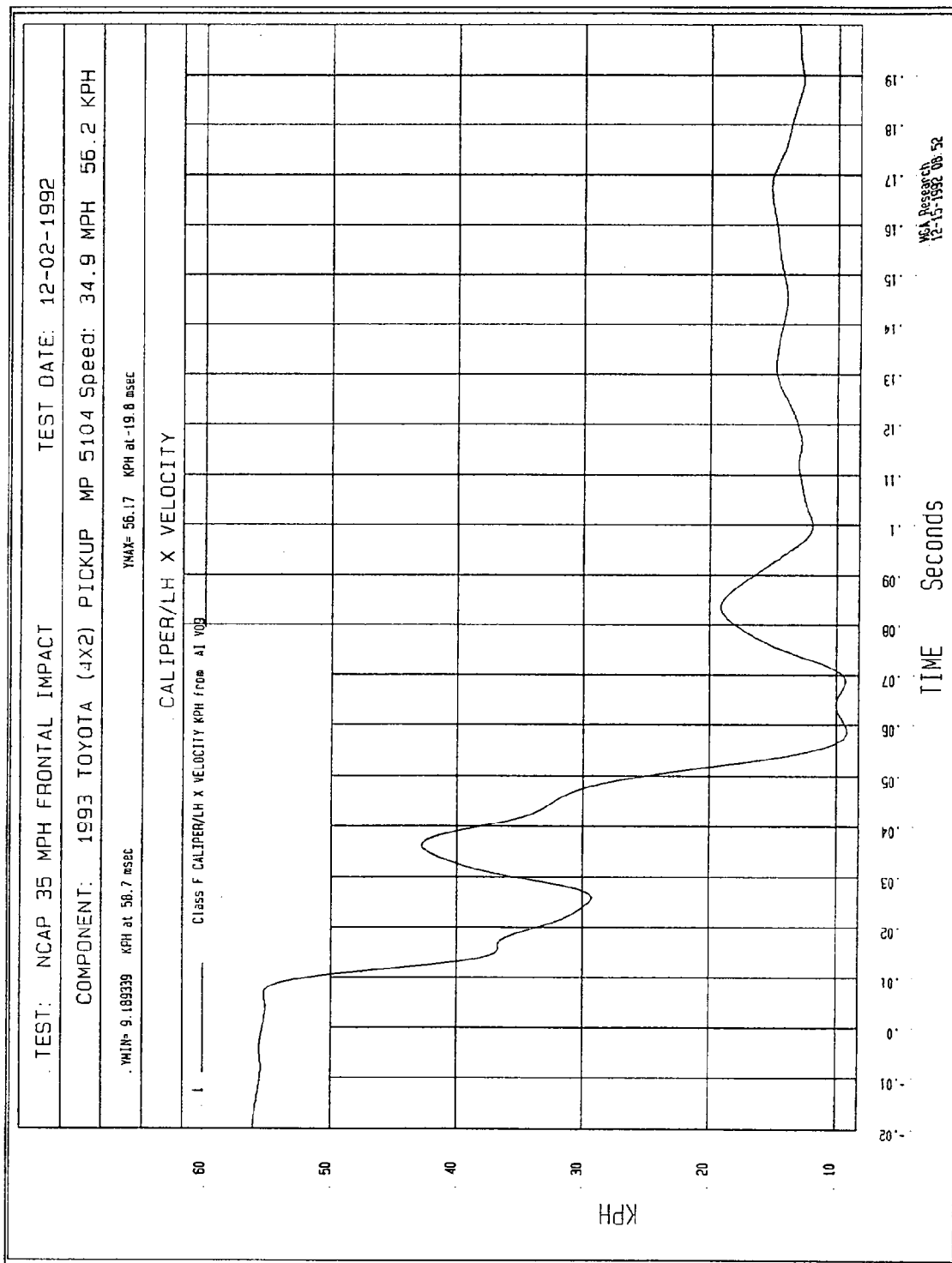


Figure B-16 - Left Front Disc Brake Caliper X Velocity vs. Time

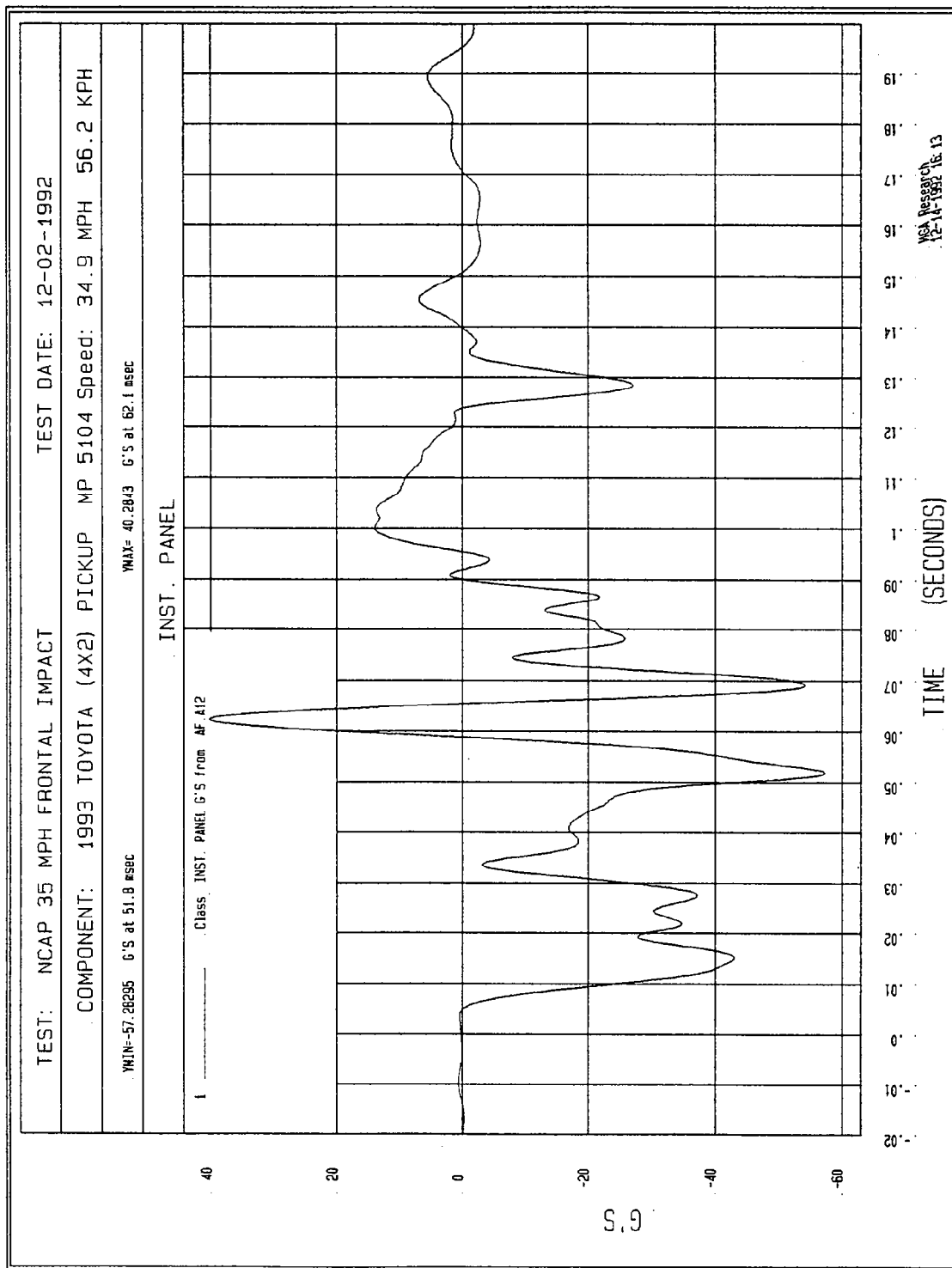


Figure B-17 - Center of Instrument Panel Top Surface X Acceleration vs. Time

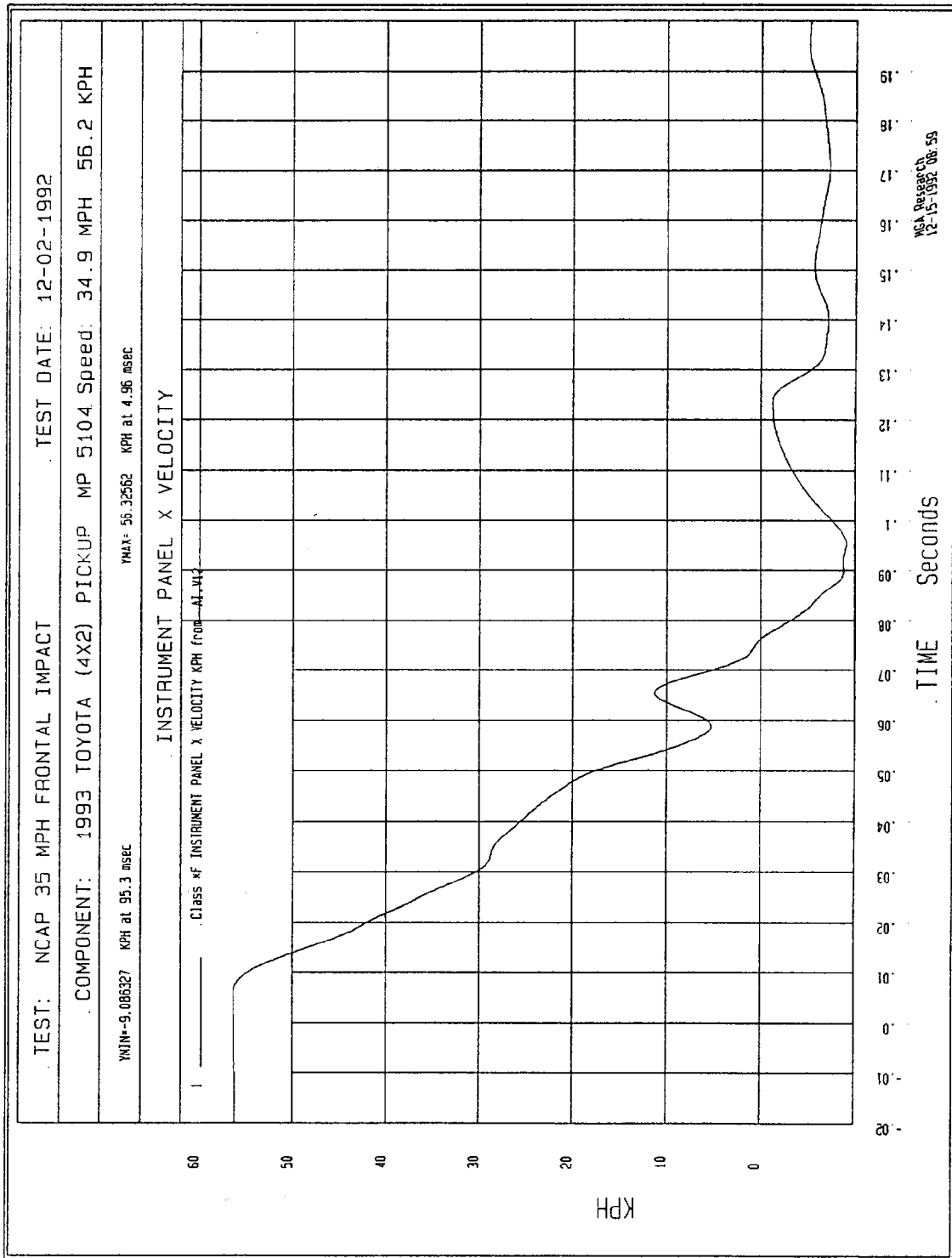


Figure B-18 - Center of Instrument Panel Top Surface X Velocity vs. Time

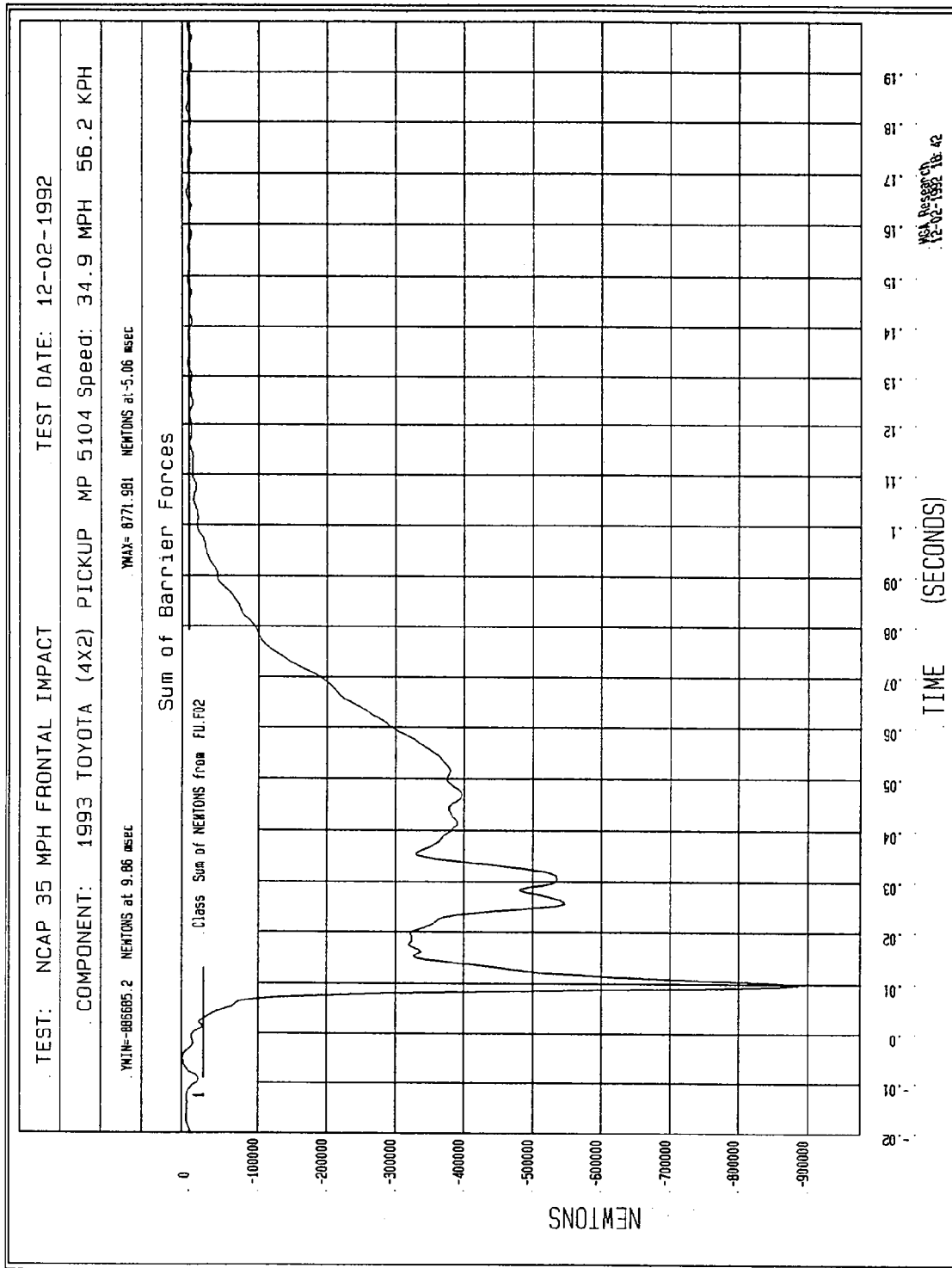


Figure B-19 Sum of Barrier 6 Load Cells Force vs. Time

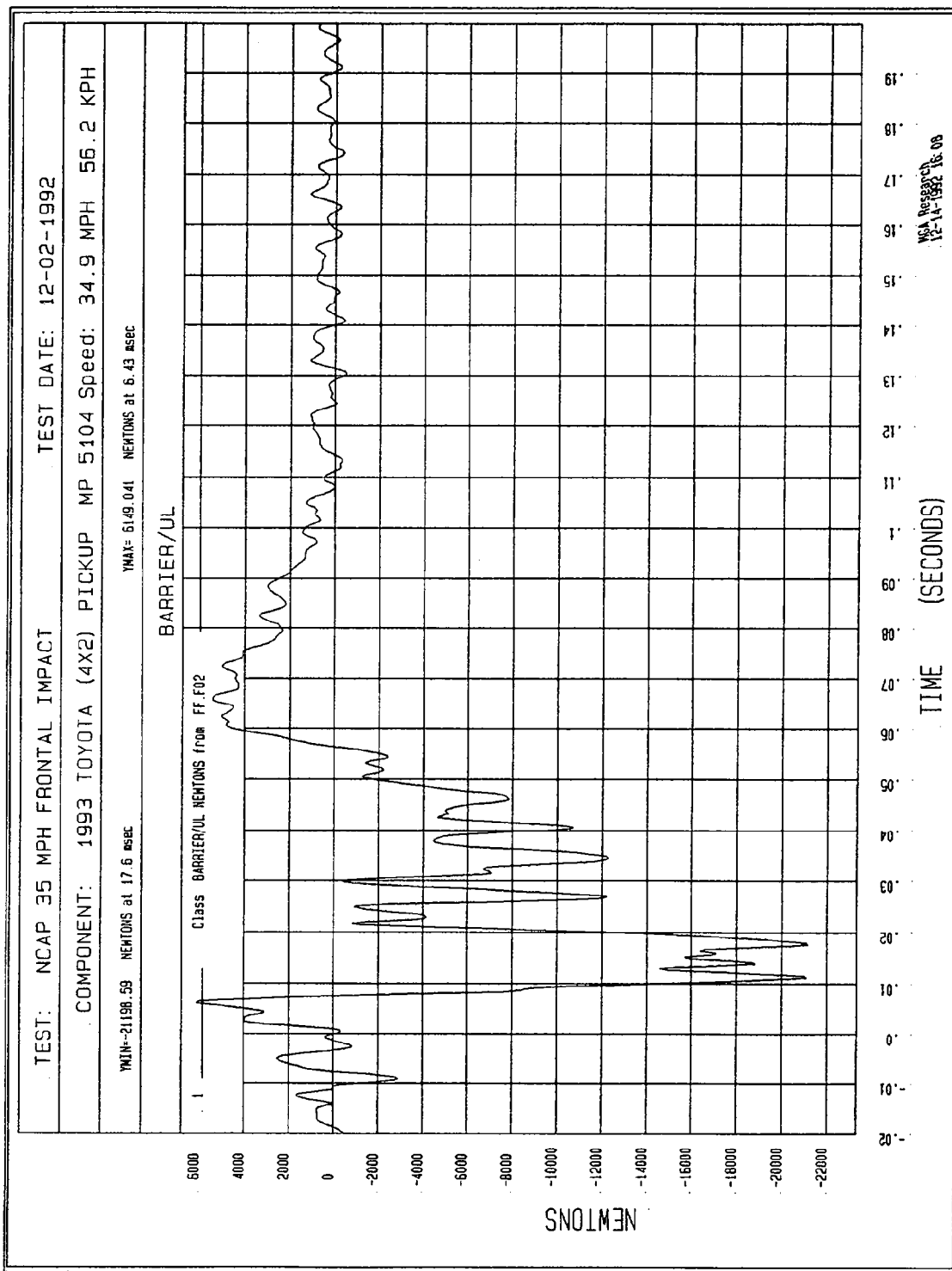


Figure B-20 - Sum of Load Cells A1-B3 Force vs. Time

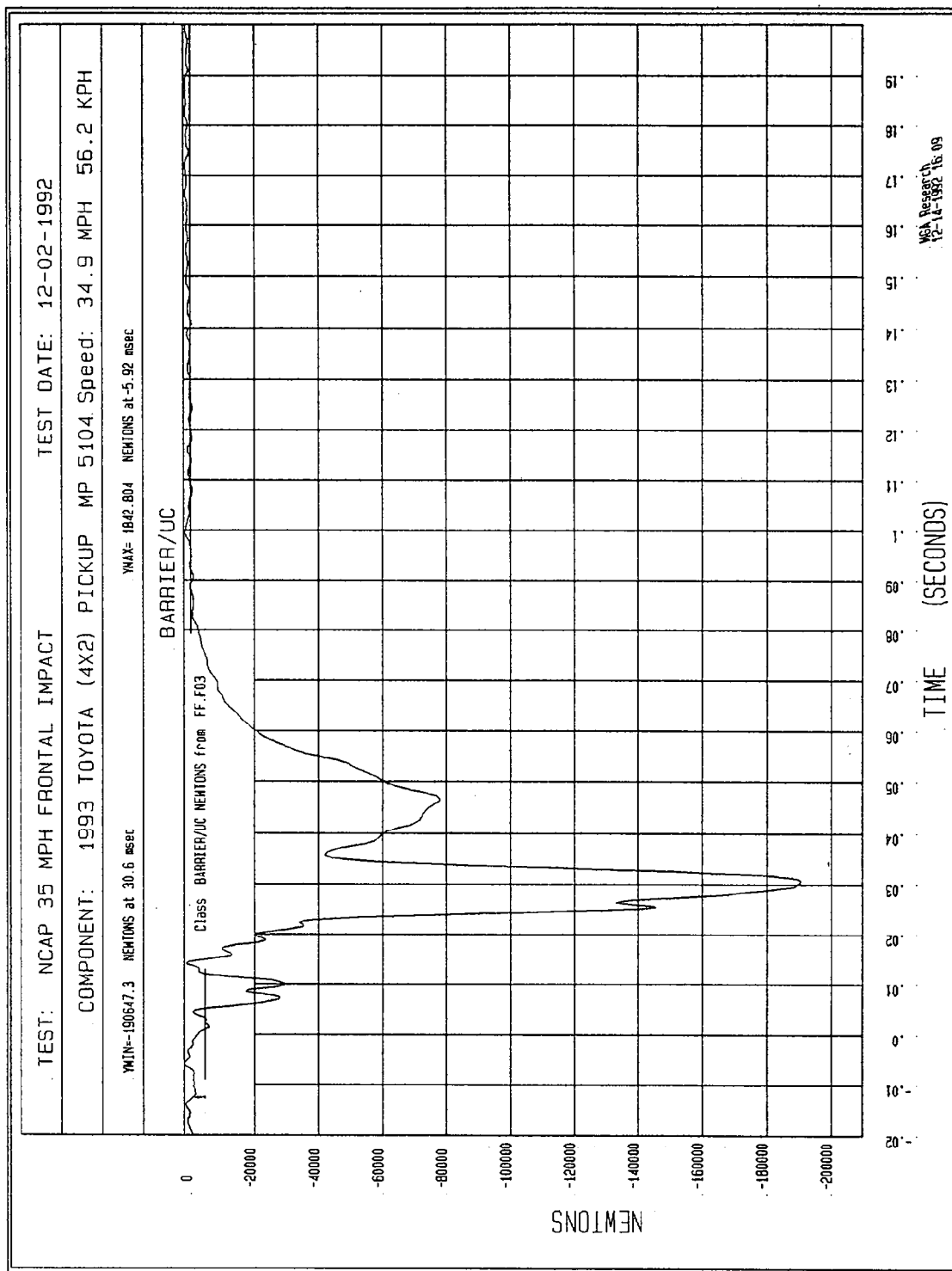


Figure B-21 - Sum of Load Cells A4-B6 Force vs. Time

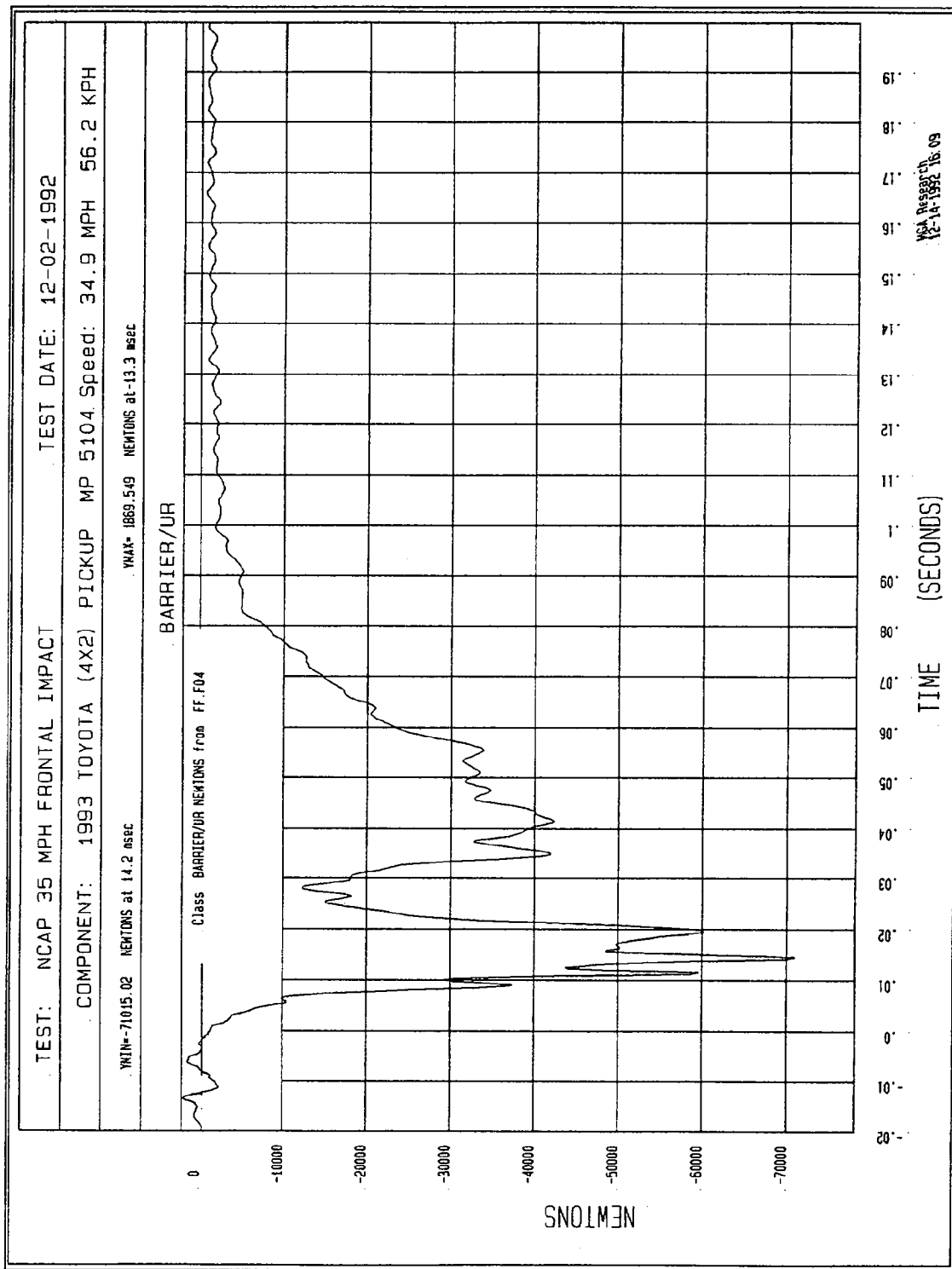


Figure B-22 - Sum of Load Cells A7-B9 Force vs. Time

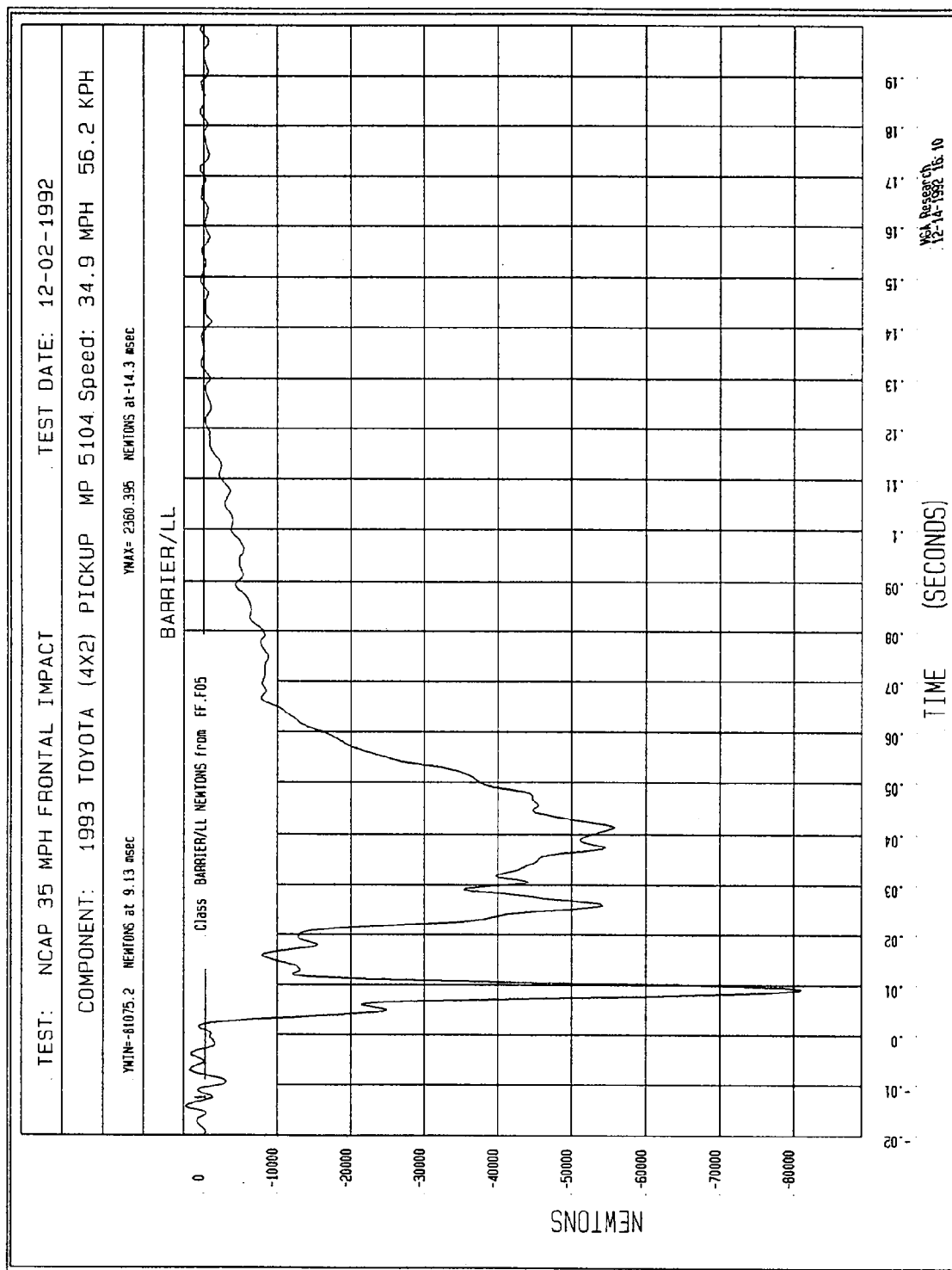


Figure B-23 - Sum of Load Cells C1-D3 Force vs. Time

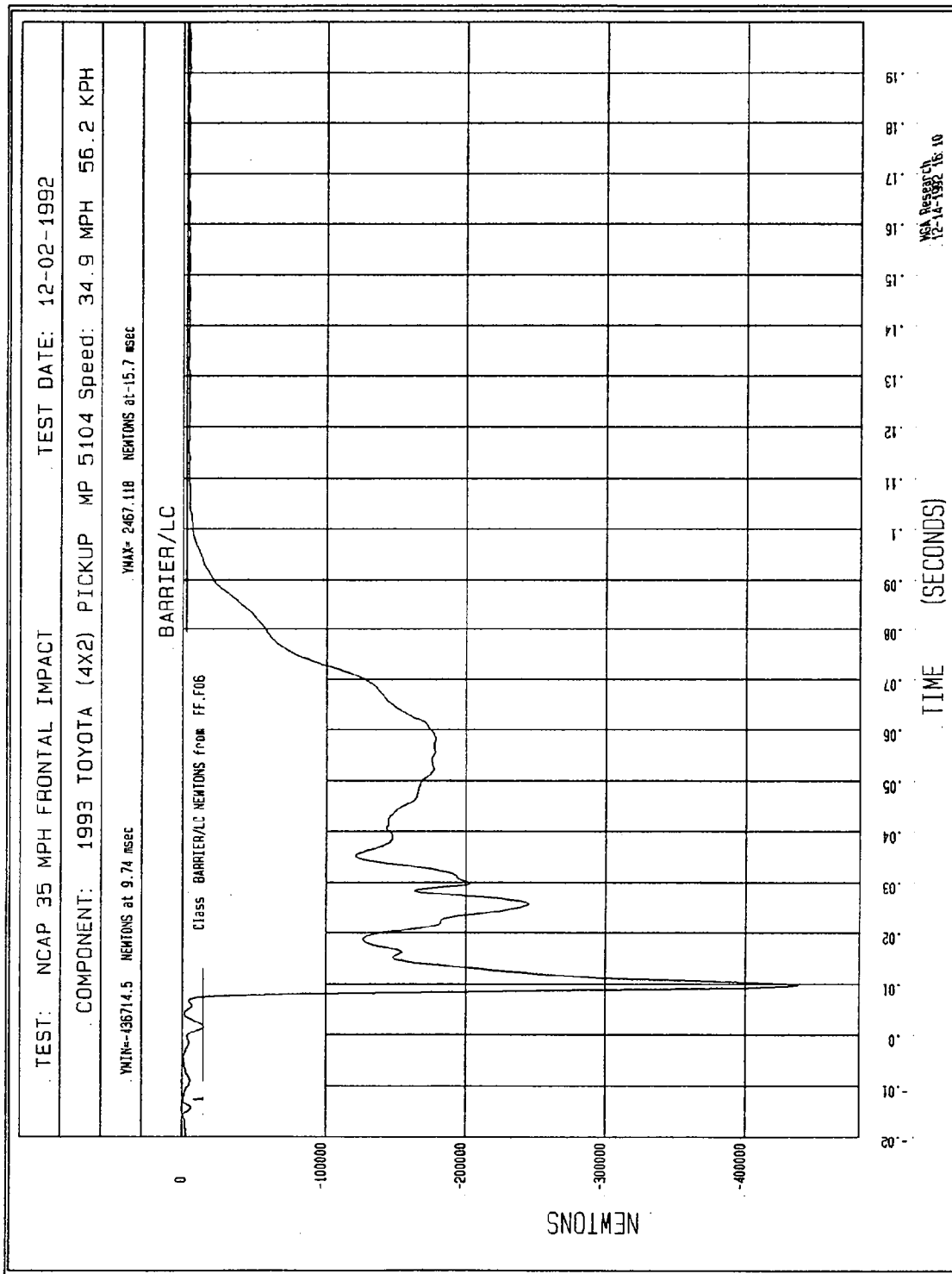


Figure B-24 - Sum of Load Cells C4-D6 Force vs. Time

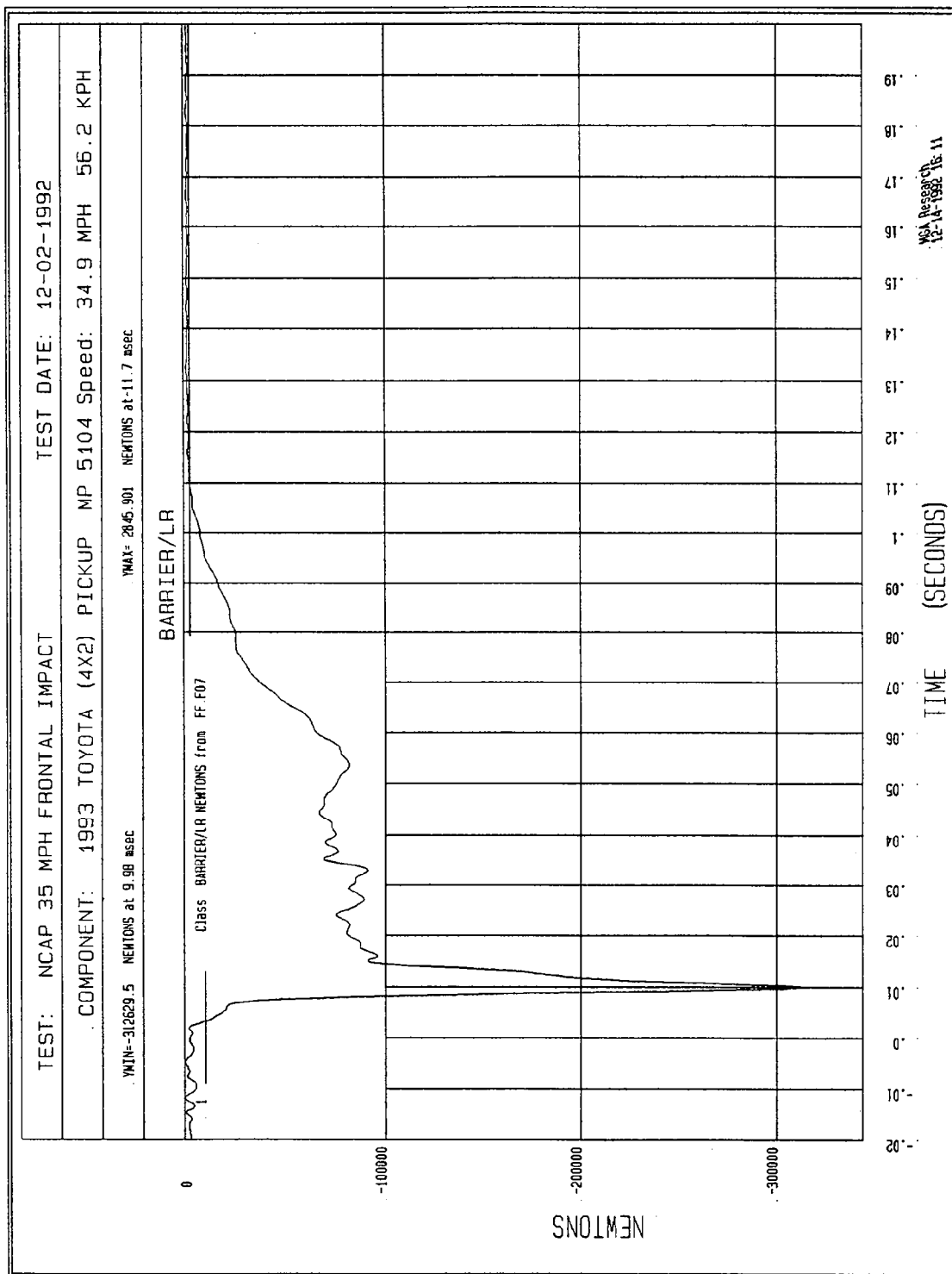


Figure B-25 - Sum of Load Cells C7-D9 Force vs. Time

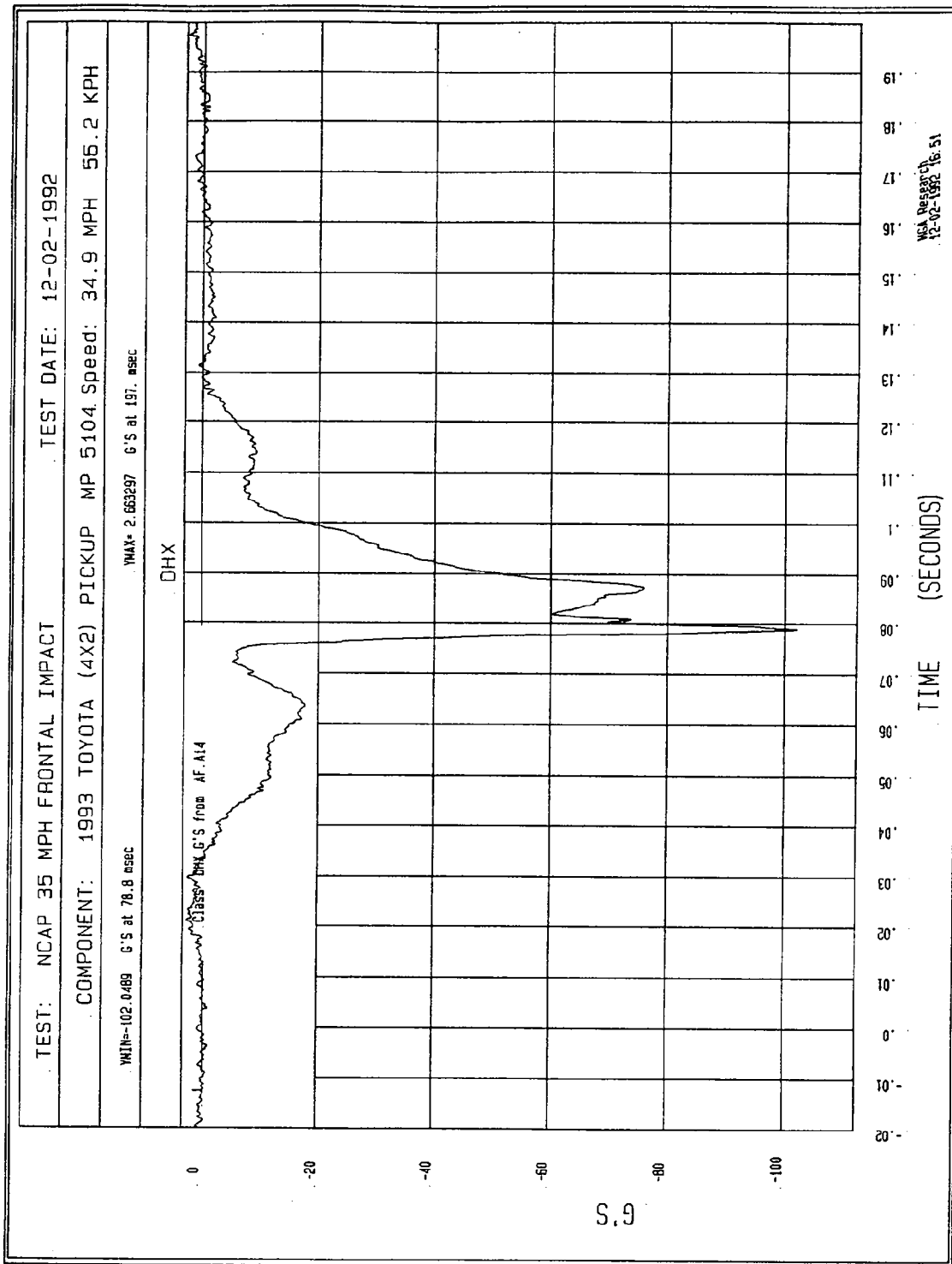


Figure B-26 - Driver Head X Acceleration vs. Time

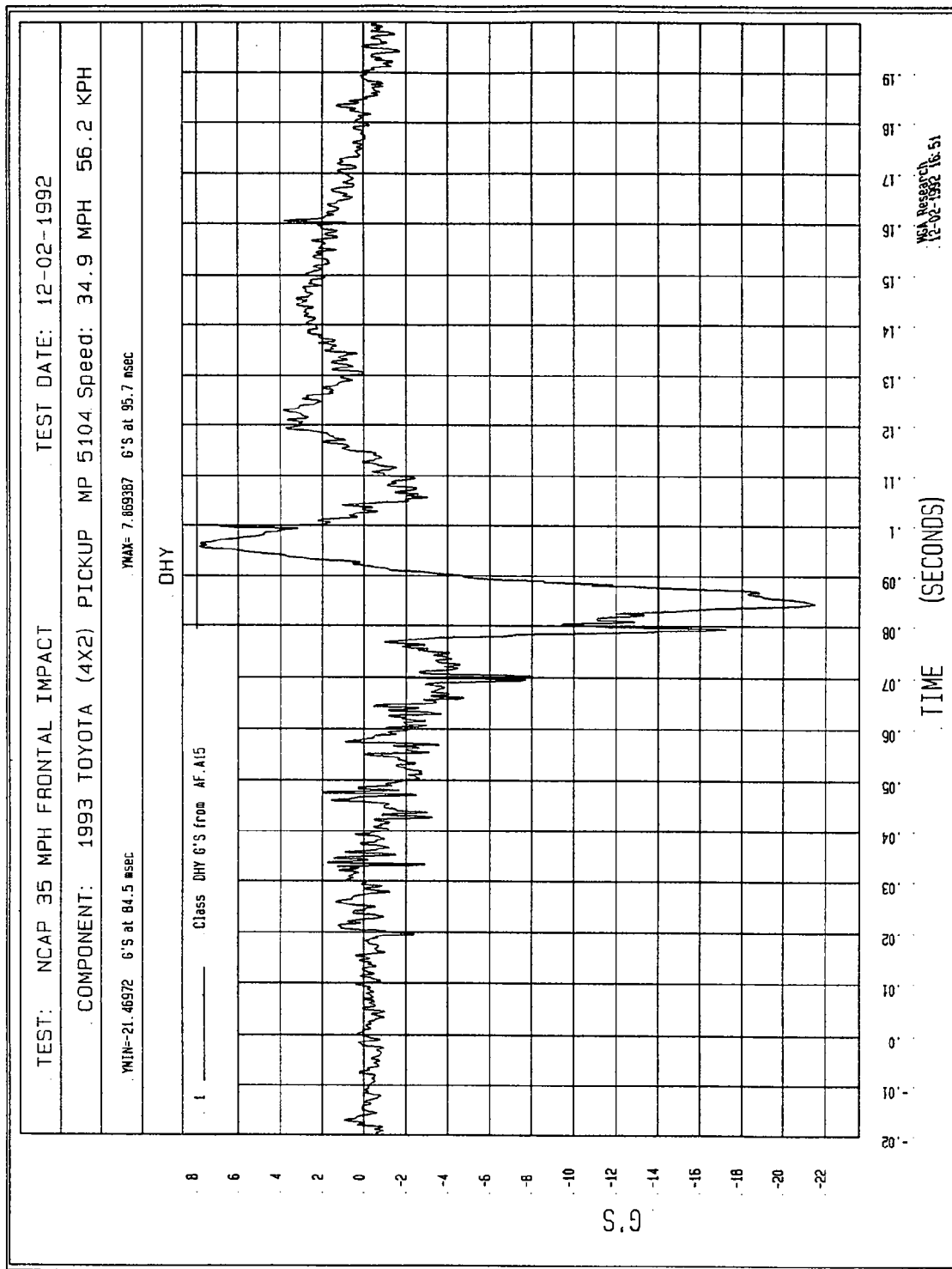


Figure B-27 - Driver Head Y Acceleration vs. Time

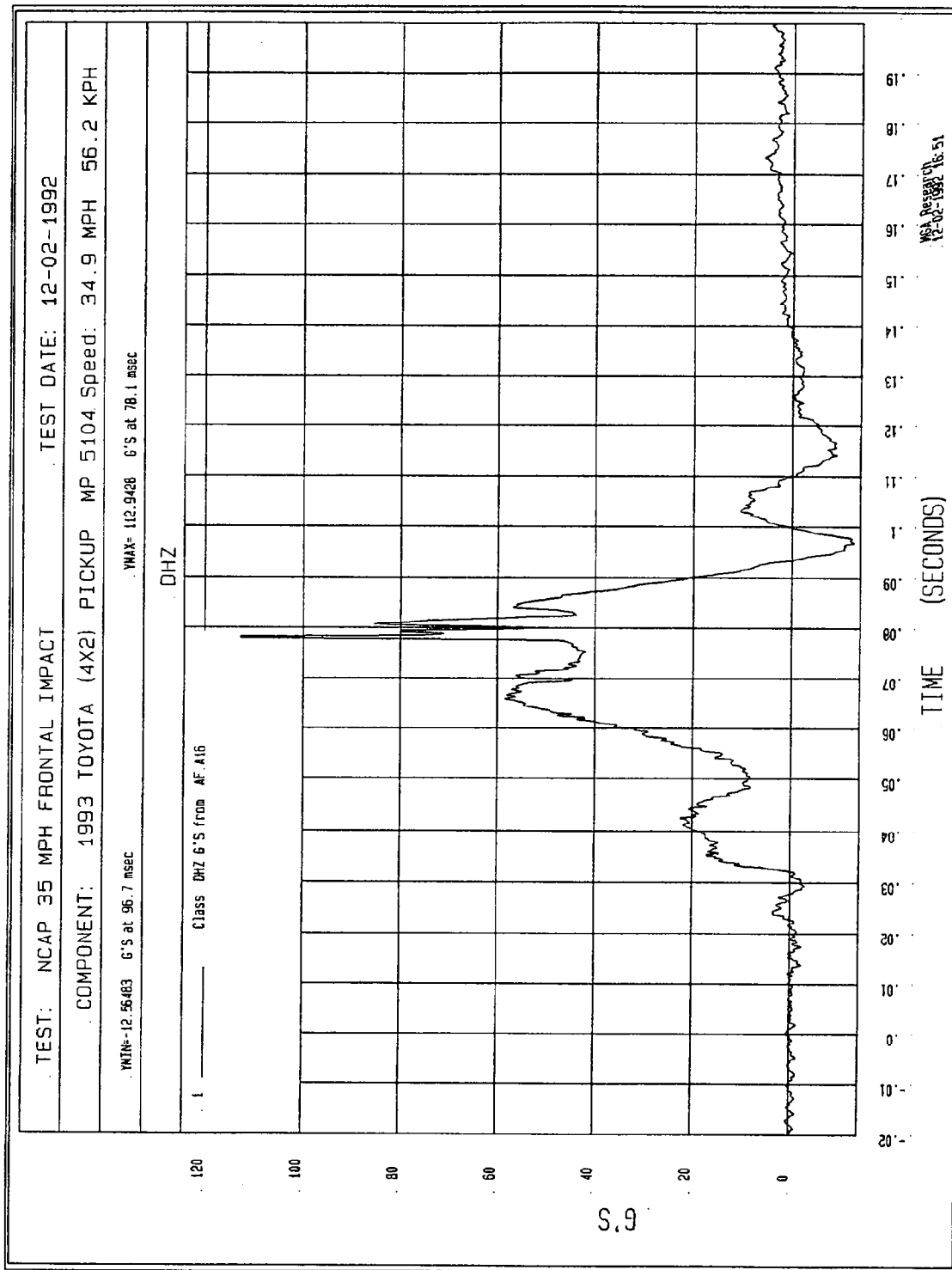


Figure B-28 - Driver Head Z Acceleration vs. Time

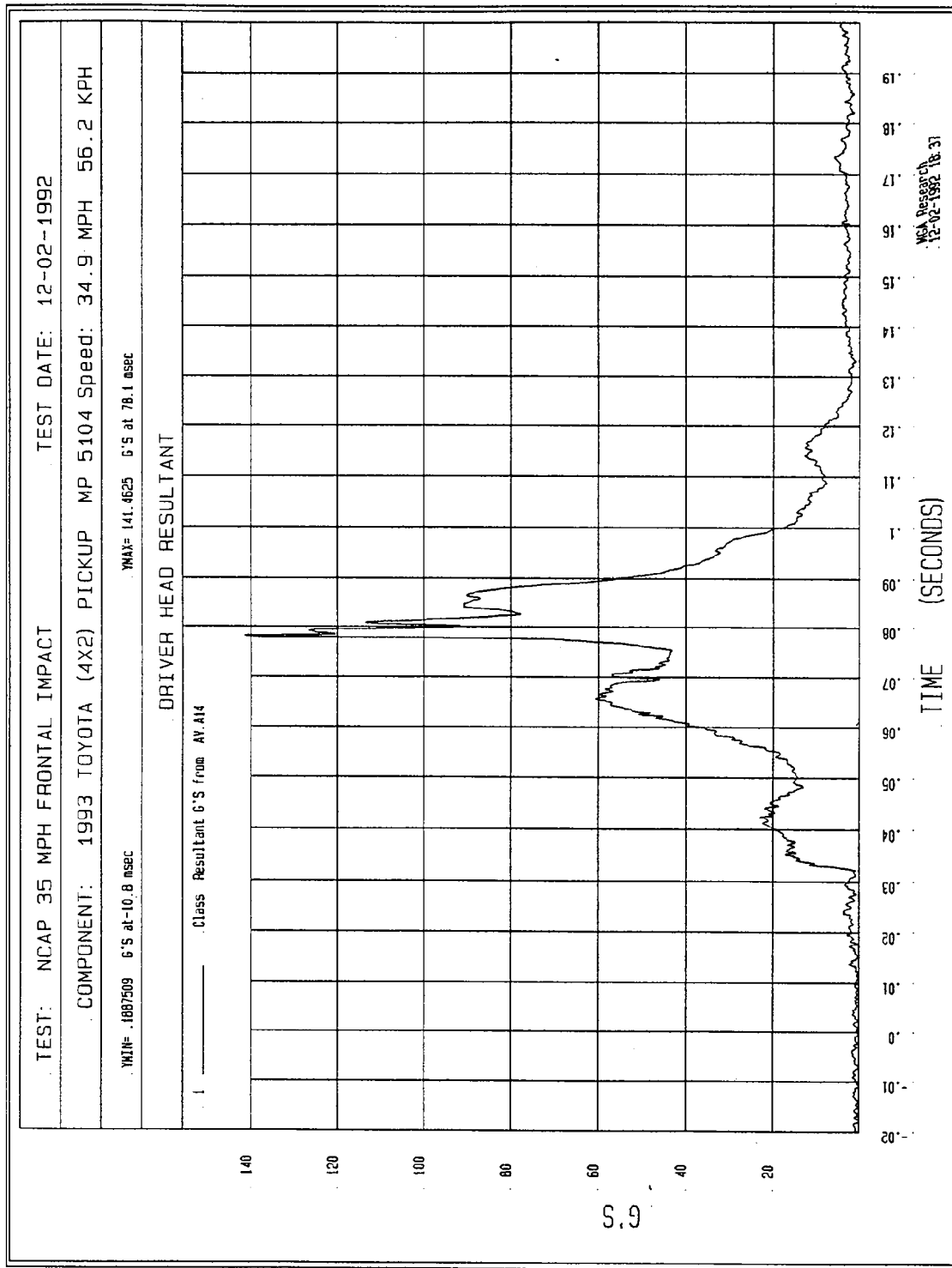


Figure B-29 - Driver Head Resultant Acceleration vs. Time

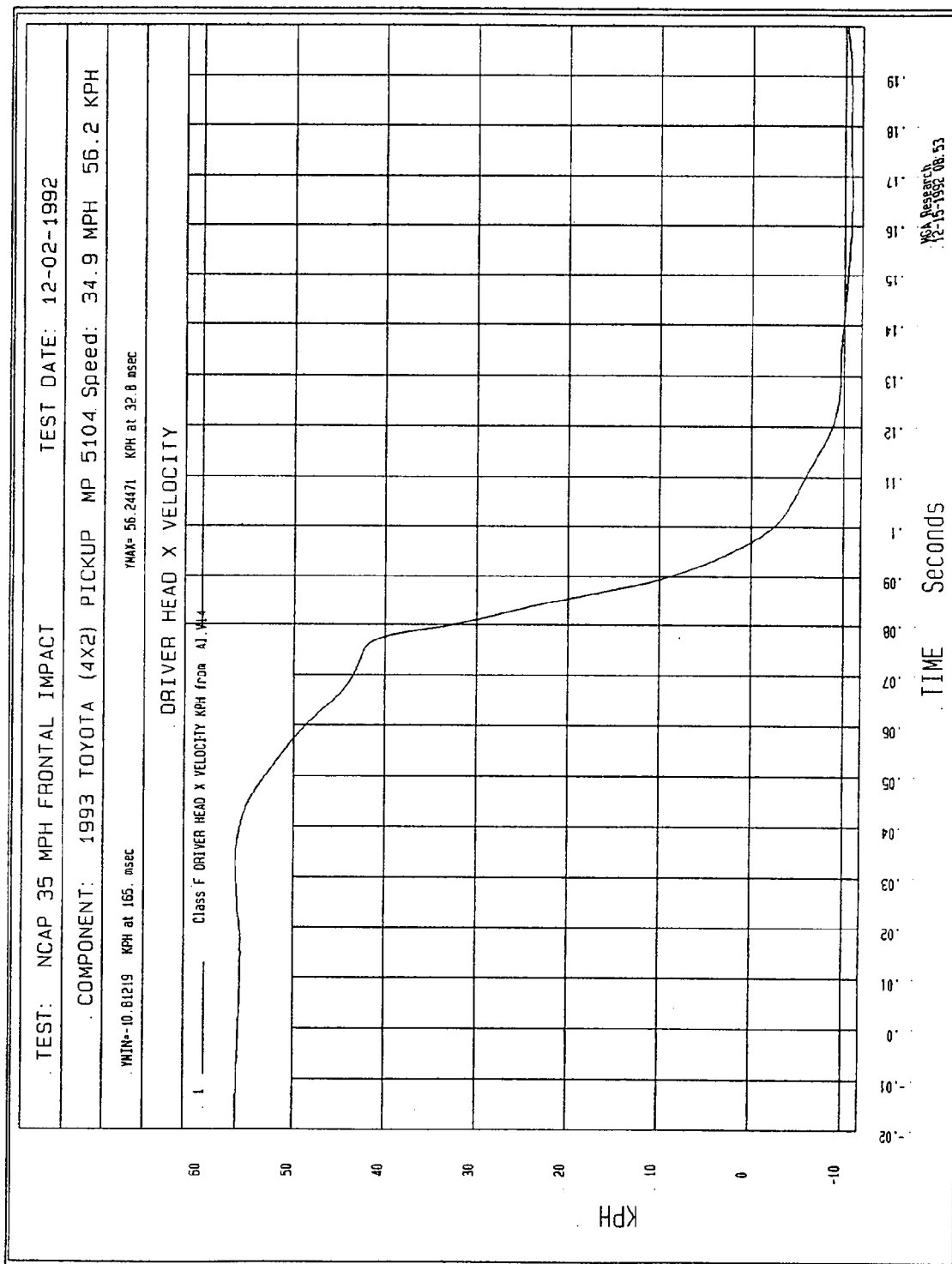


Figure B-30 - Driver Head X Velocity vs. Time

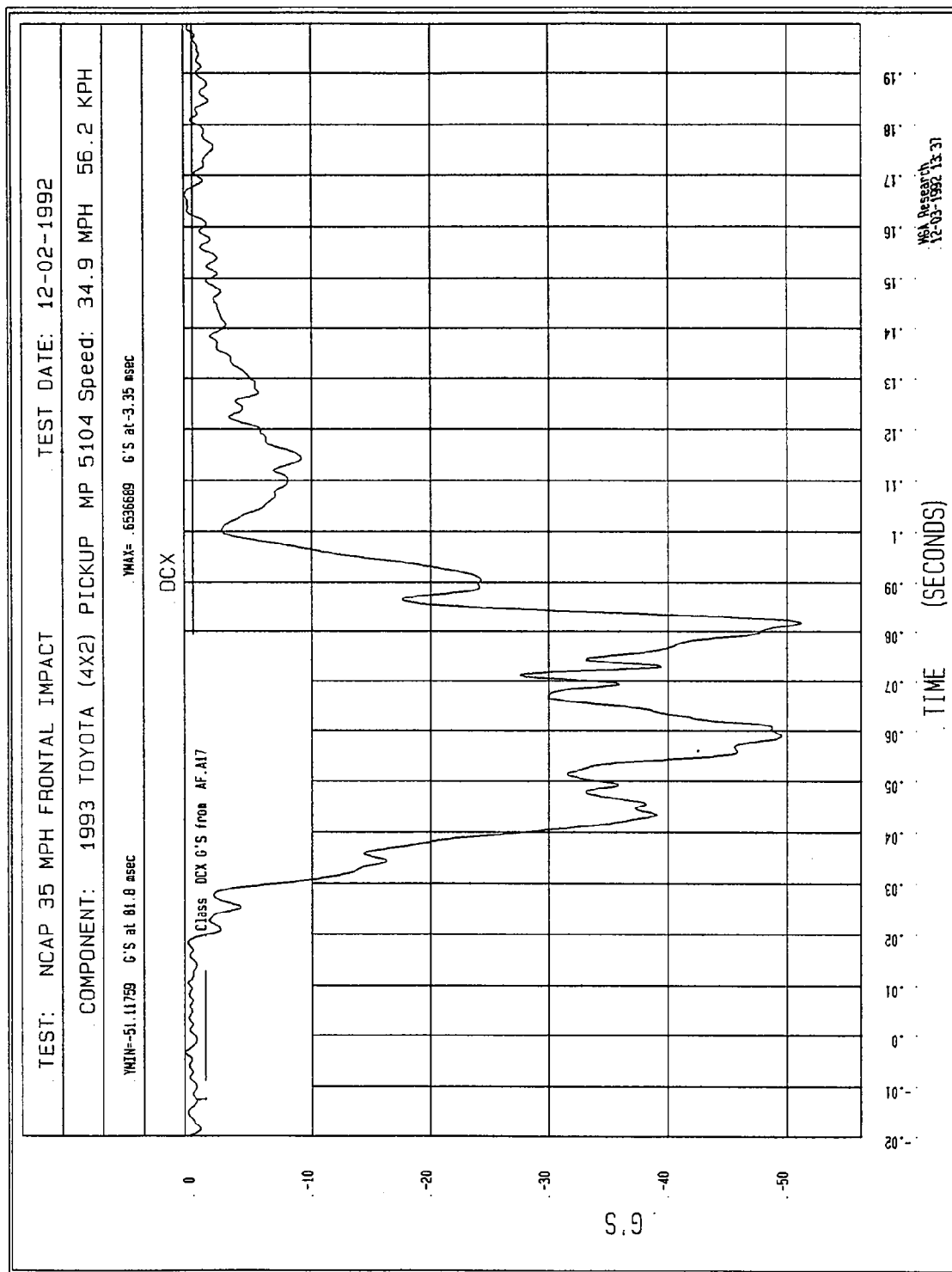


Figure B-31 - Driver Chest X Acceleration vs. Time

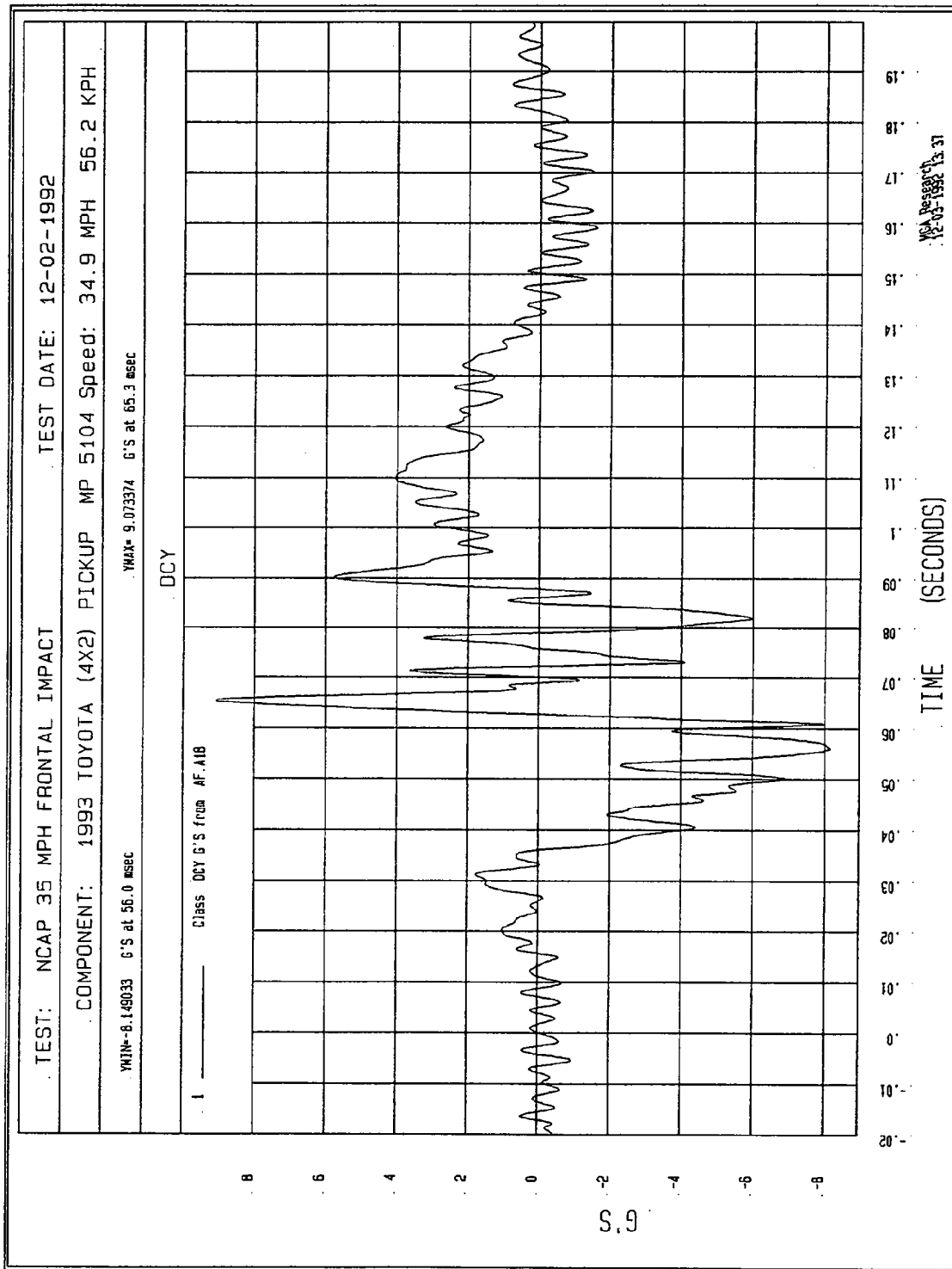


Figure B-32 - Driver Chest Y Acceleration vs. Time

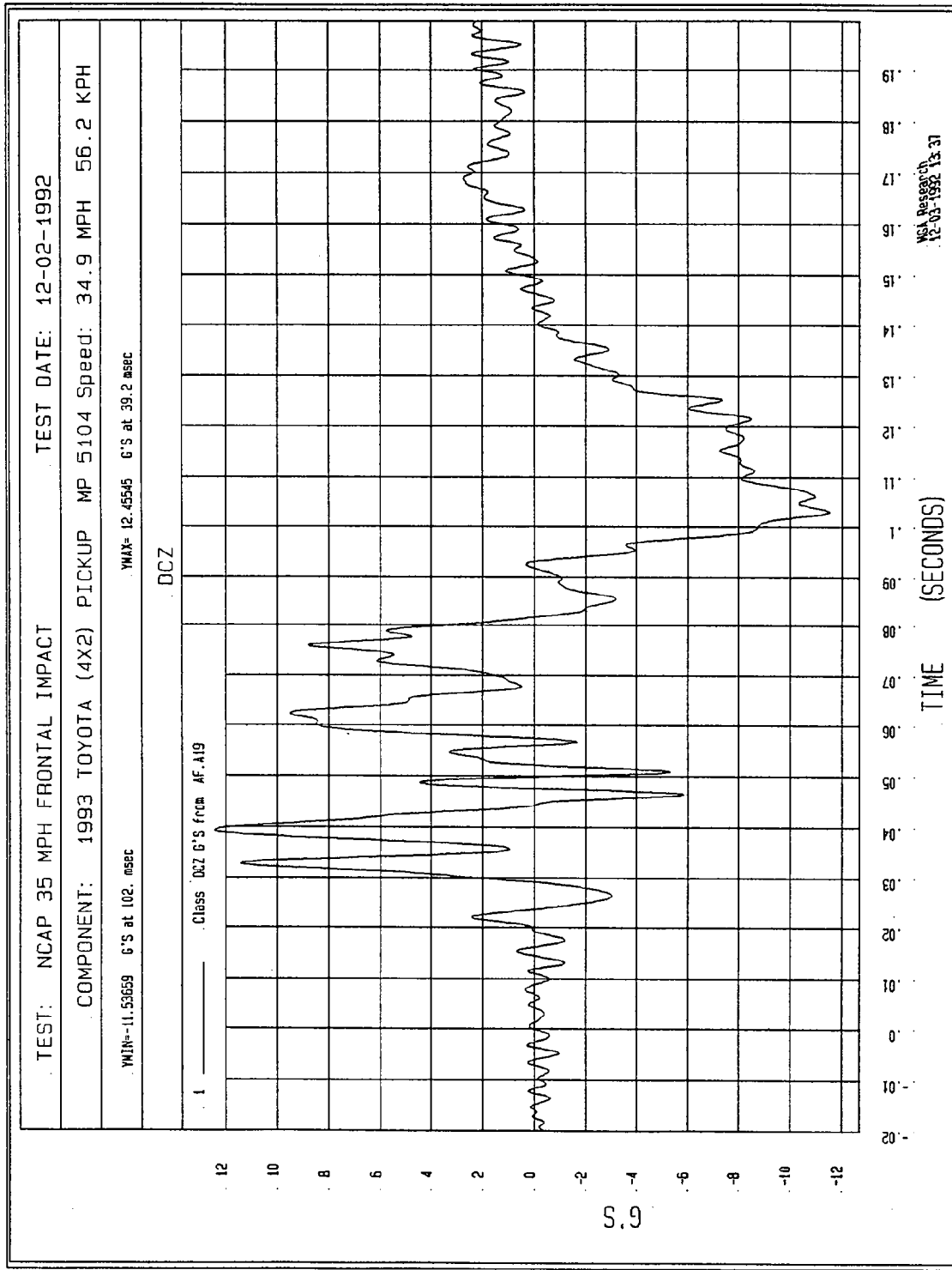


Figure B-33 - Driver Chest Z Acceleration vs. Time

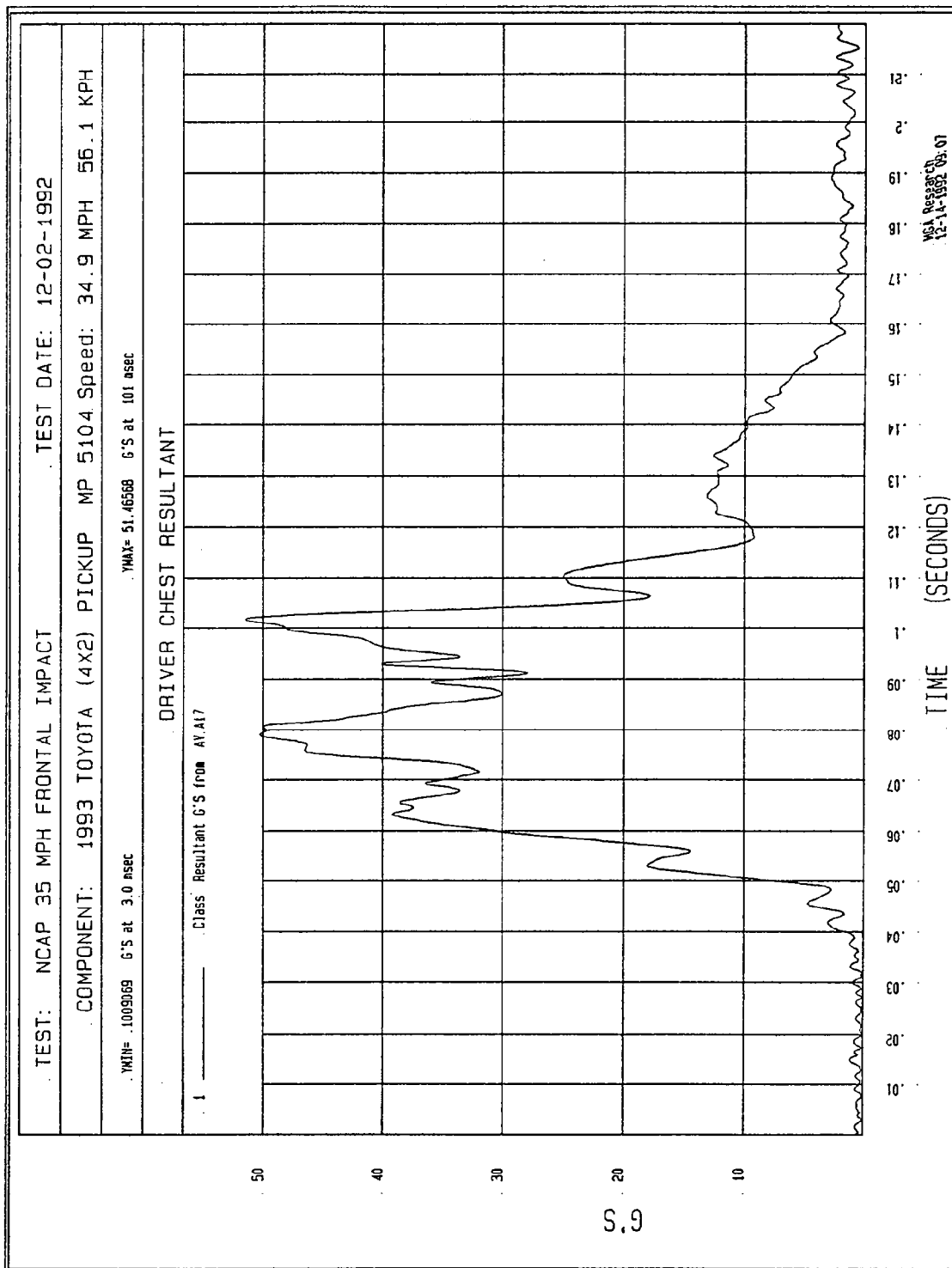


Figure B-34 - Driver Chest Resultant Acceleration vs. Time

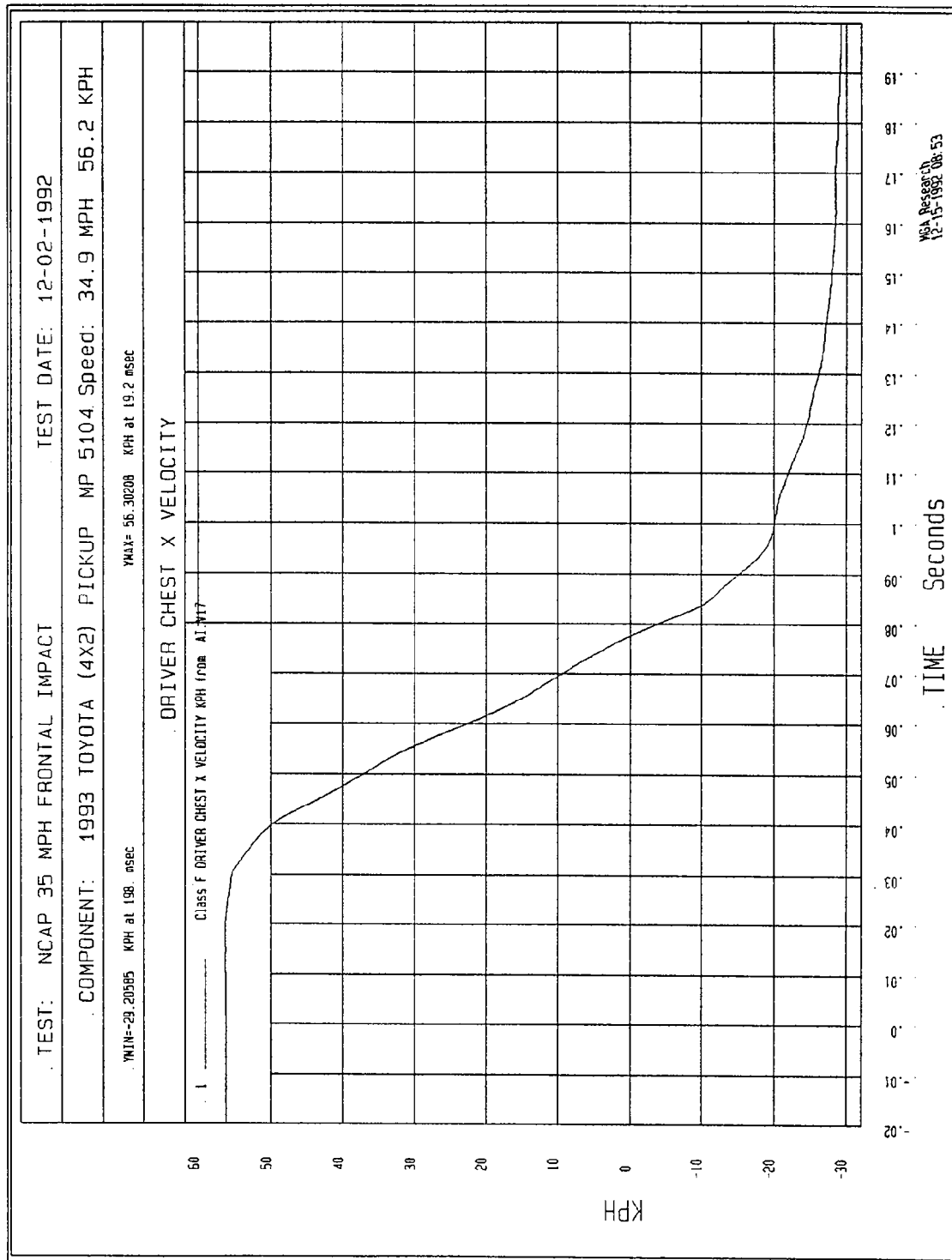


Figure B-35 - Driver Chest X Velocity vs. Time

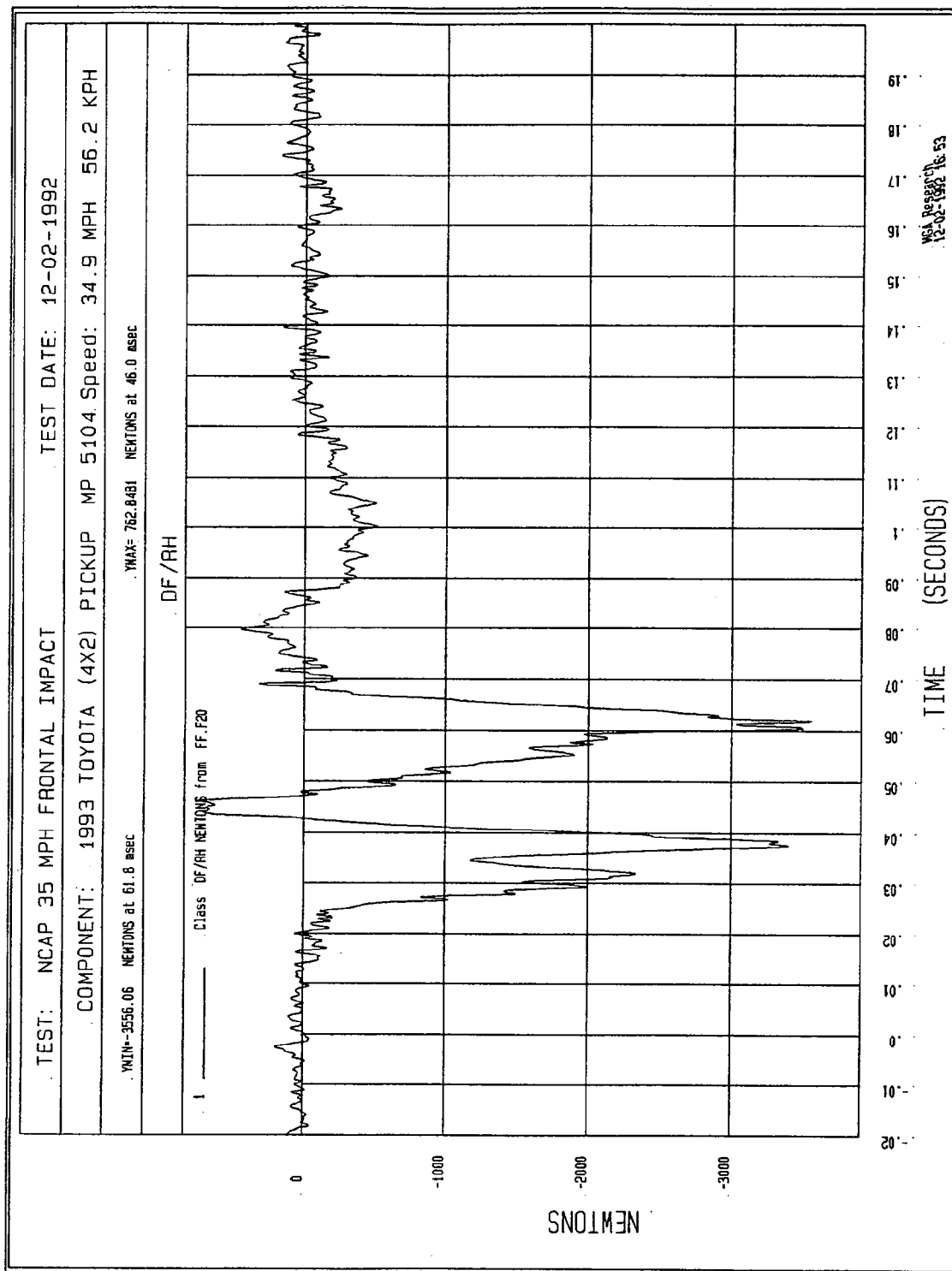


Figure B-36 - Driver Right Femur Force vs. Time

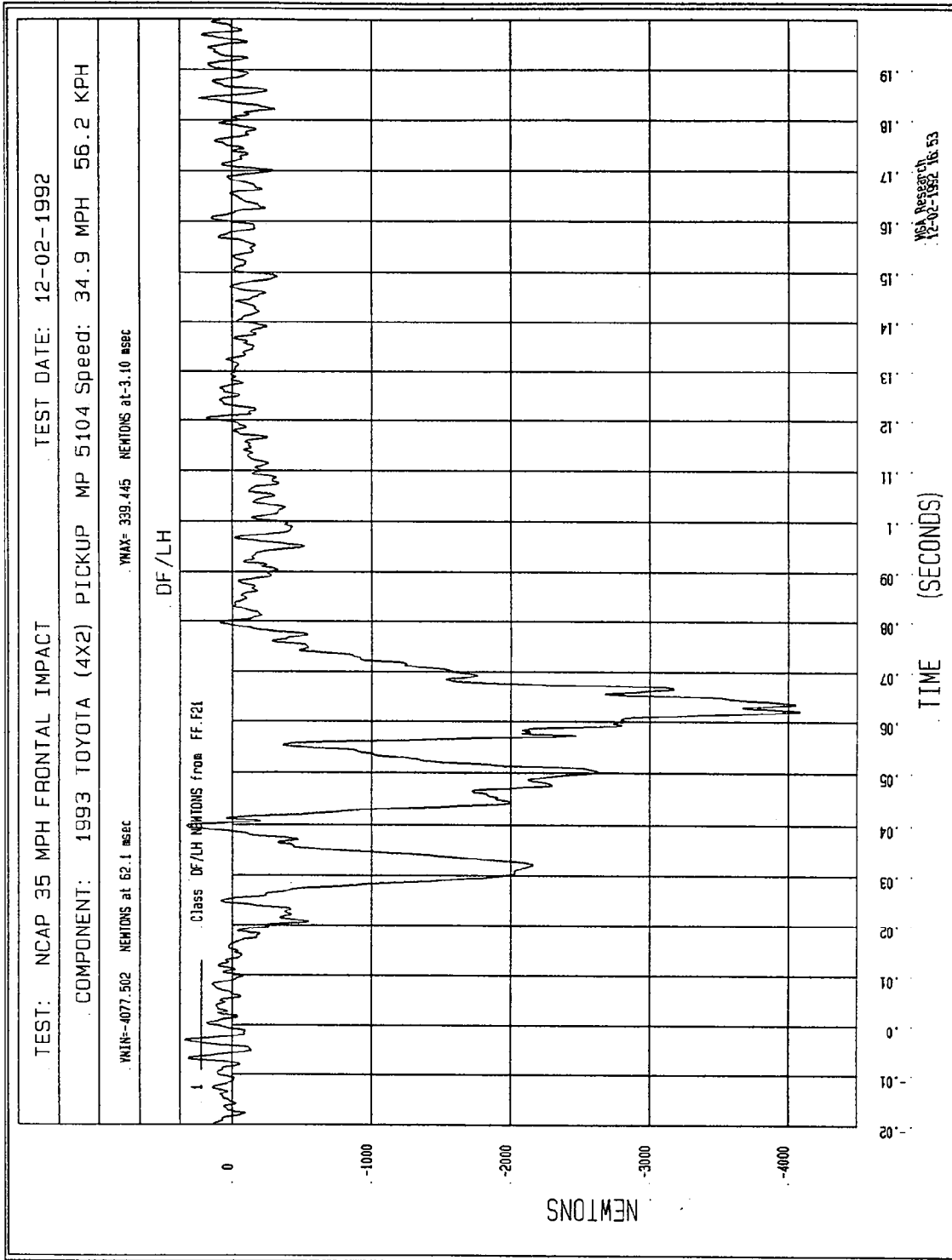


Figure B-37 - Driver Left Femur Force vs. Time

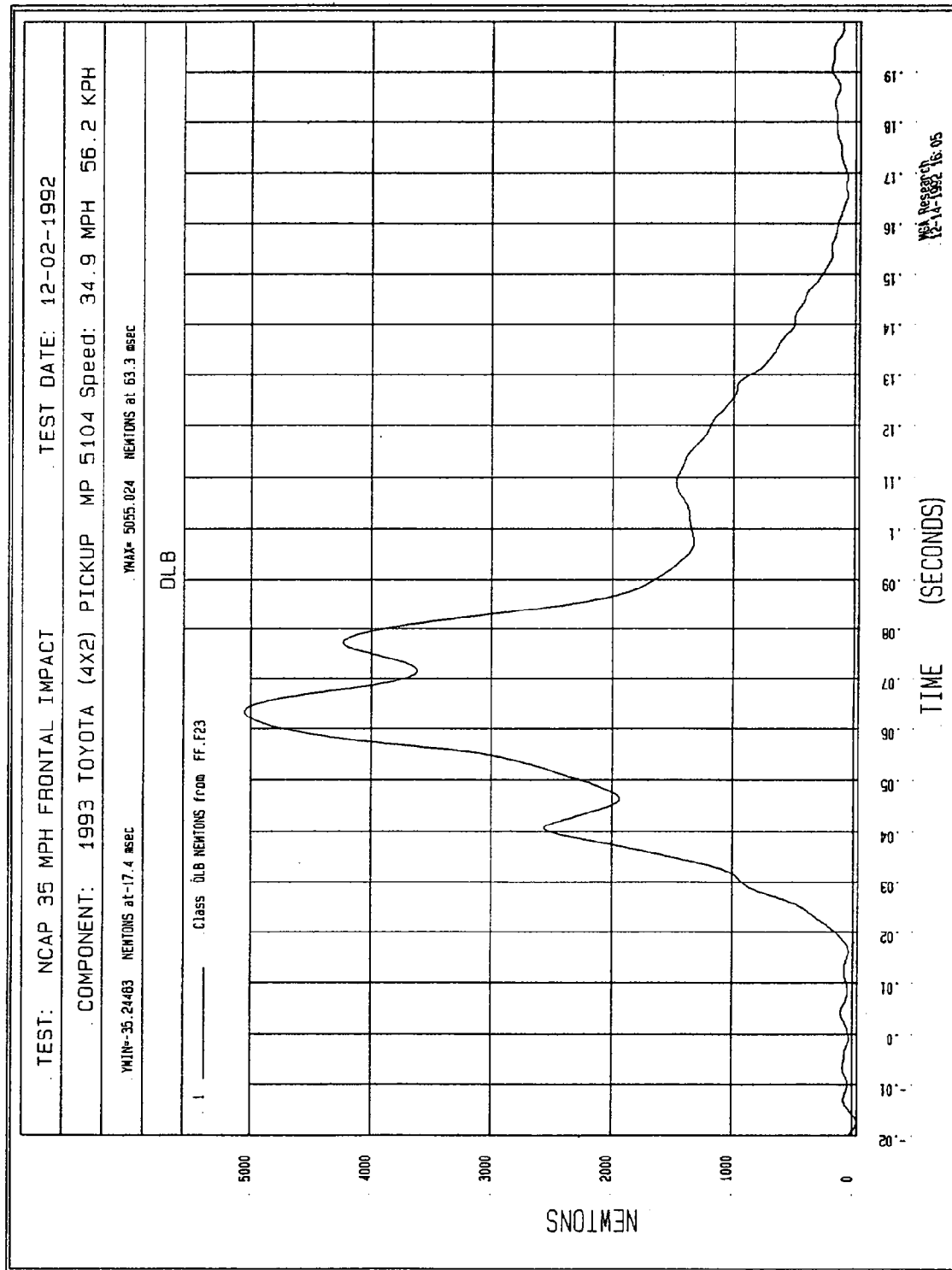


Figure B-38 - Driver Lap Belt Force vs. Time

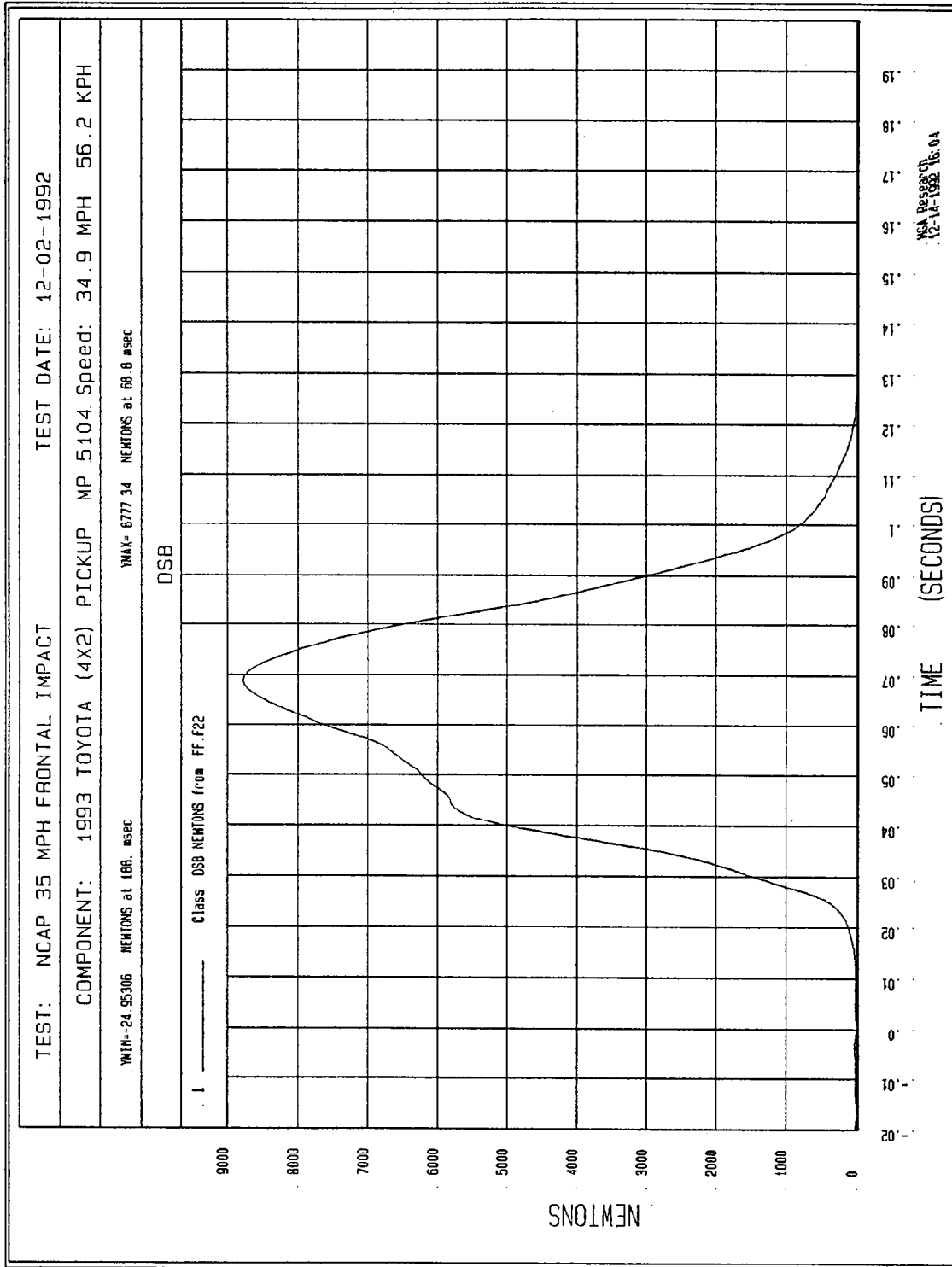


Figure B-39 - Driver Torso Belt Force vs. Time

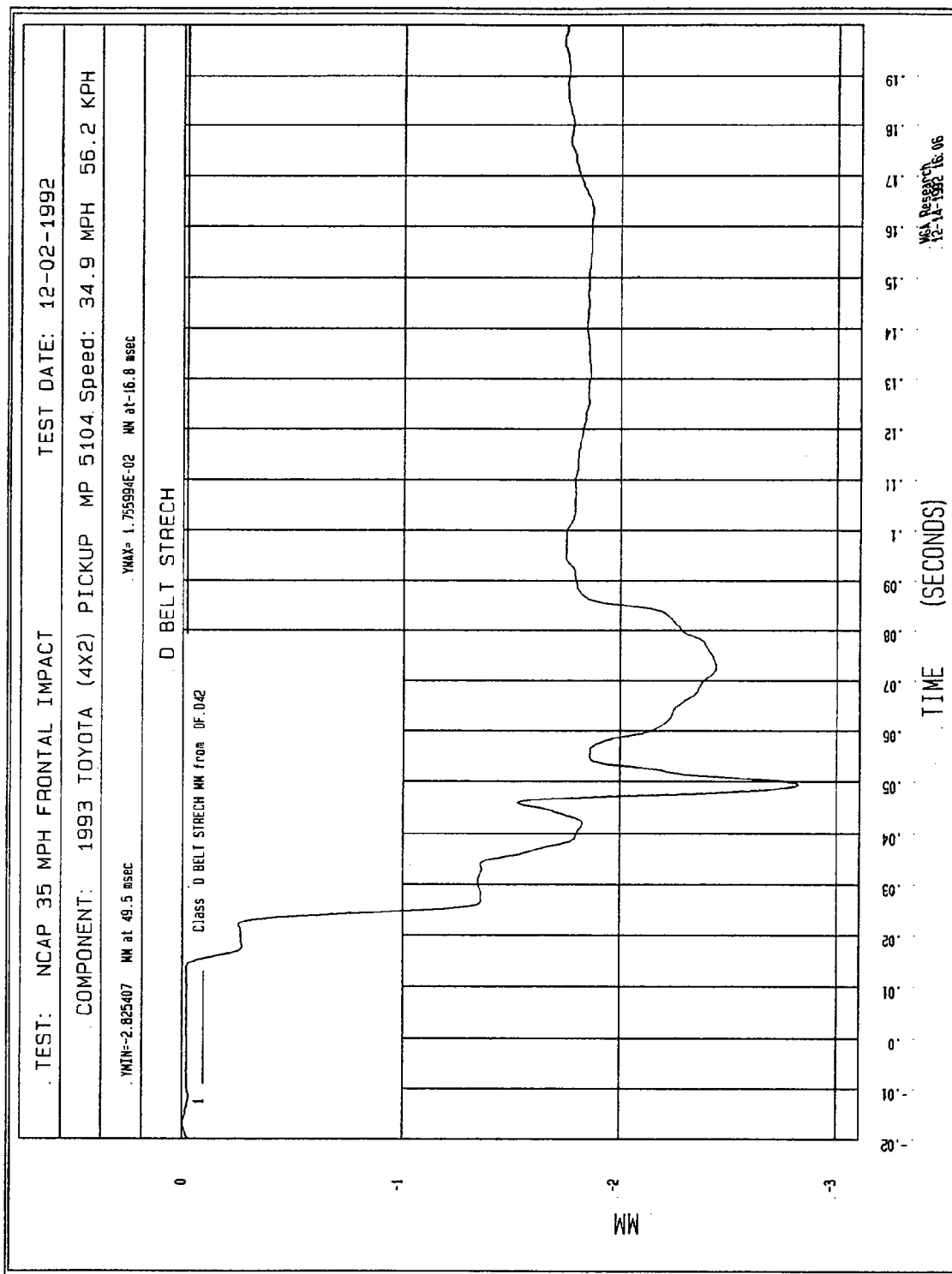


Figure B-40 - Driver Torso Belt Stretch vs. Time

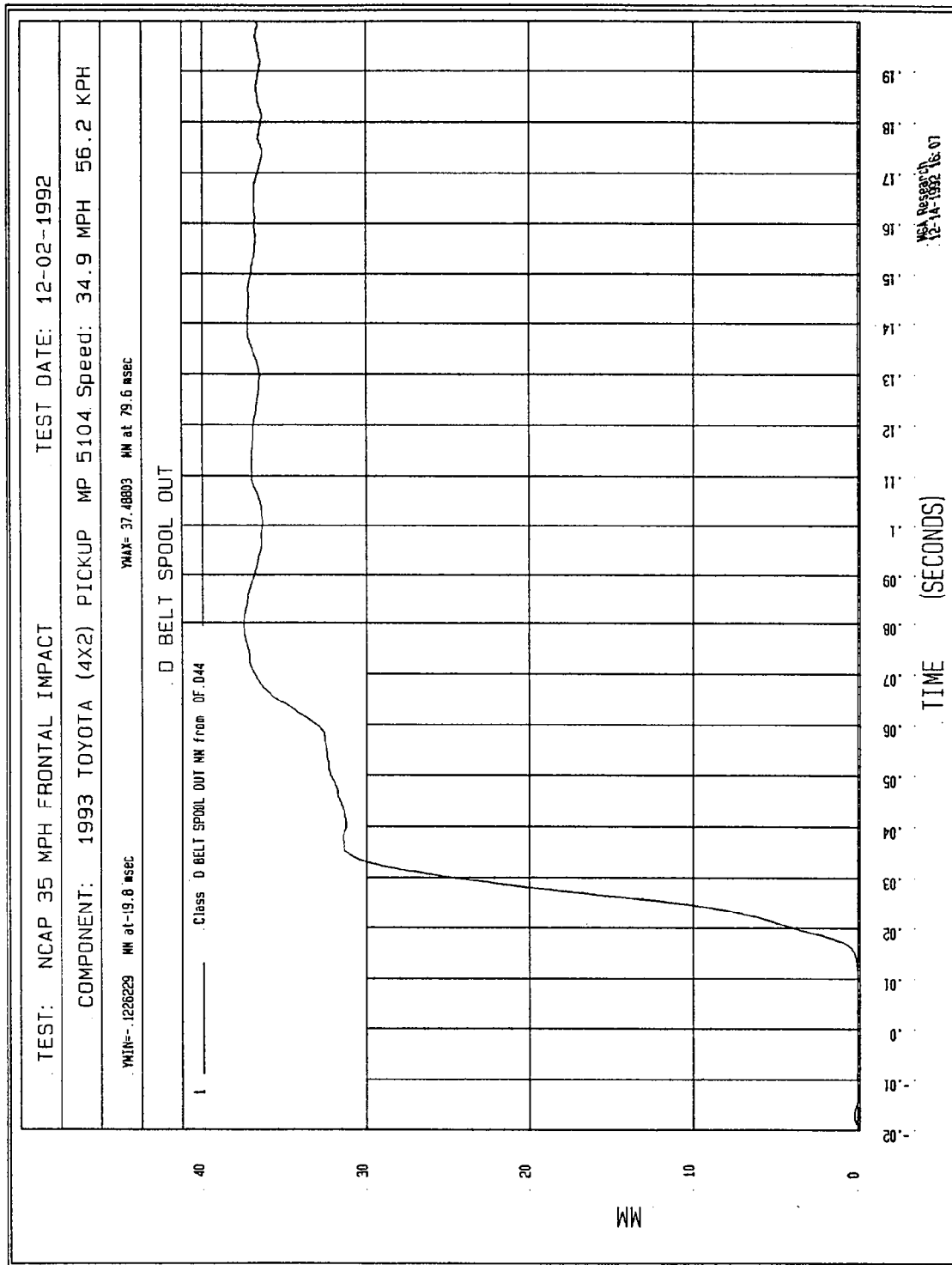


Figure B-41 - Driver Torso Belt Spool Out vs. Time

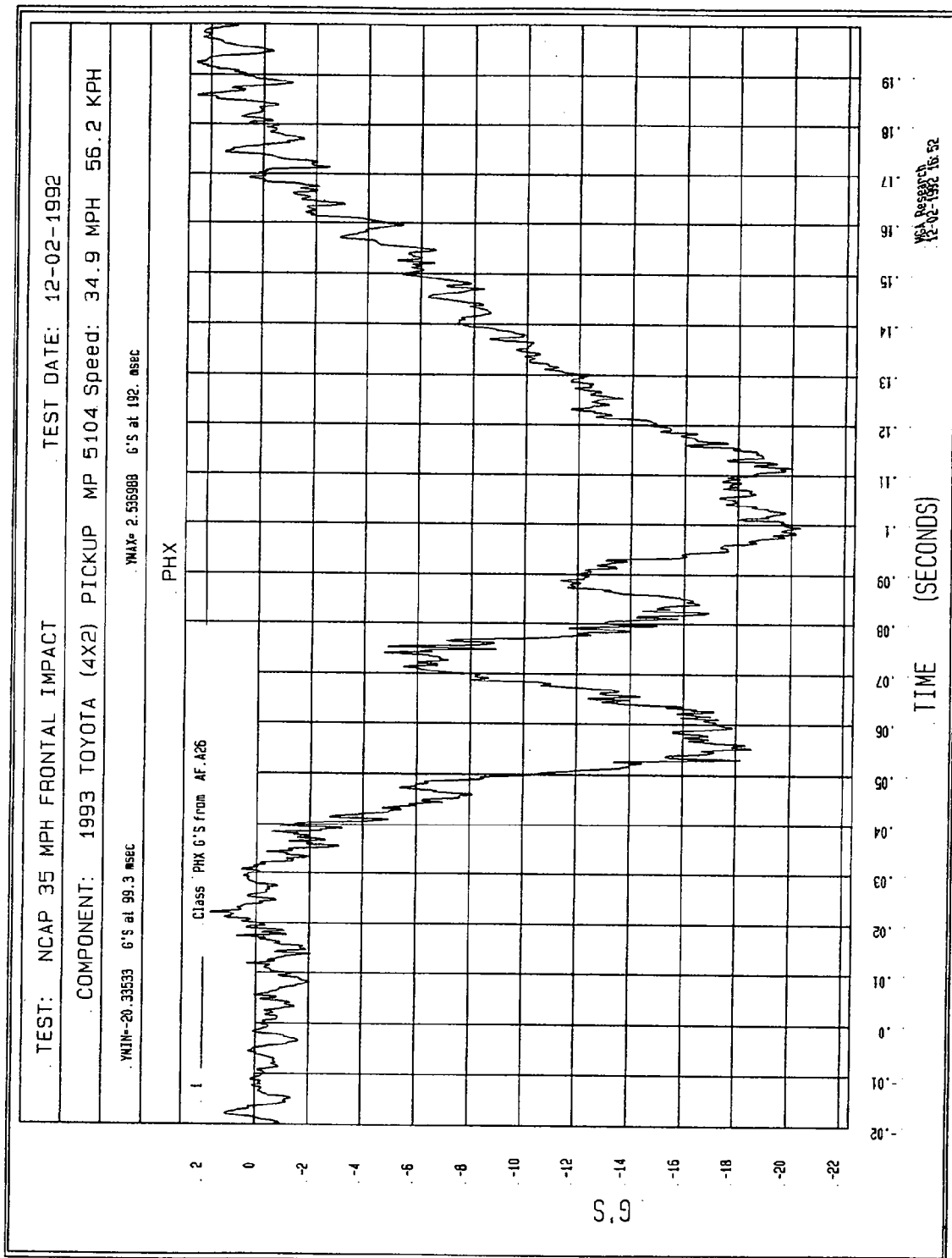


Figure B-42 - Passenger Head X Acceleration vs. Time

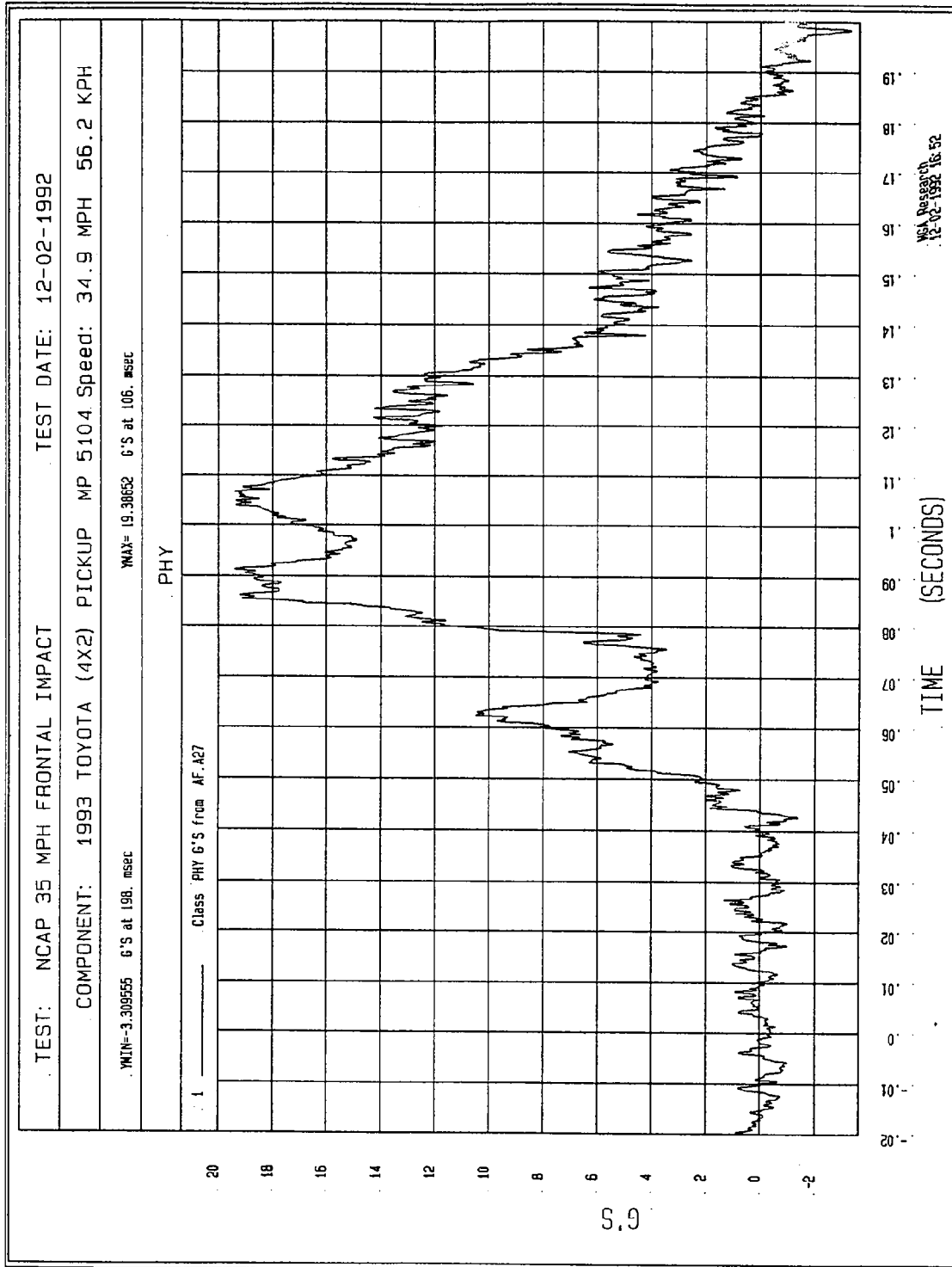


Figure B-43 - Passenger Head Y Acceleration vs. Time

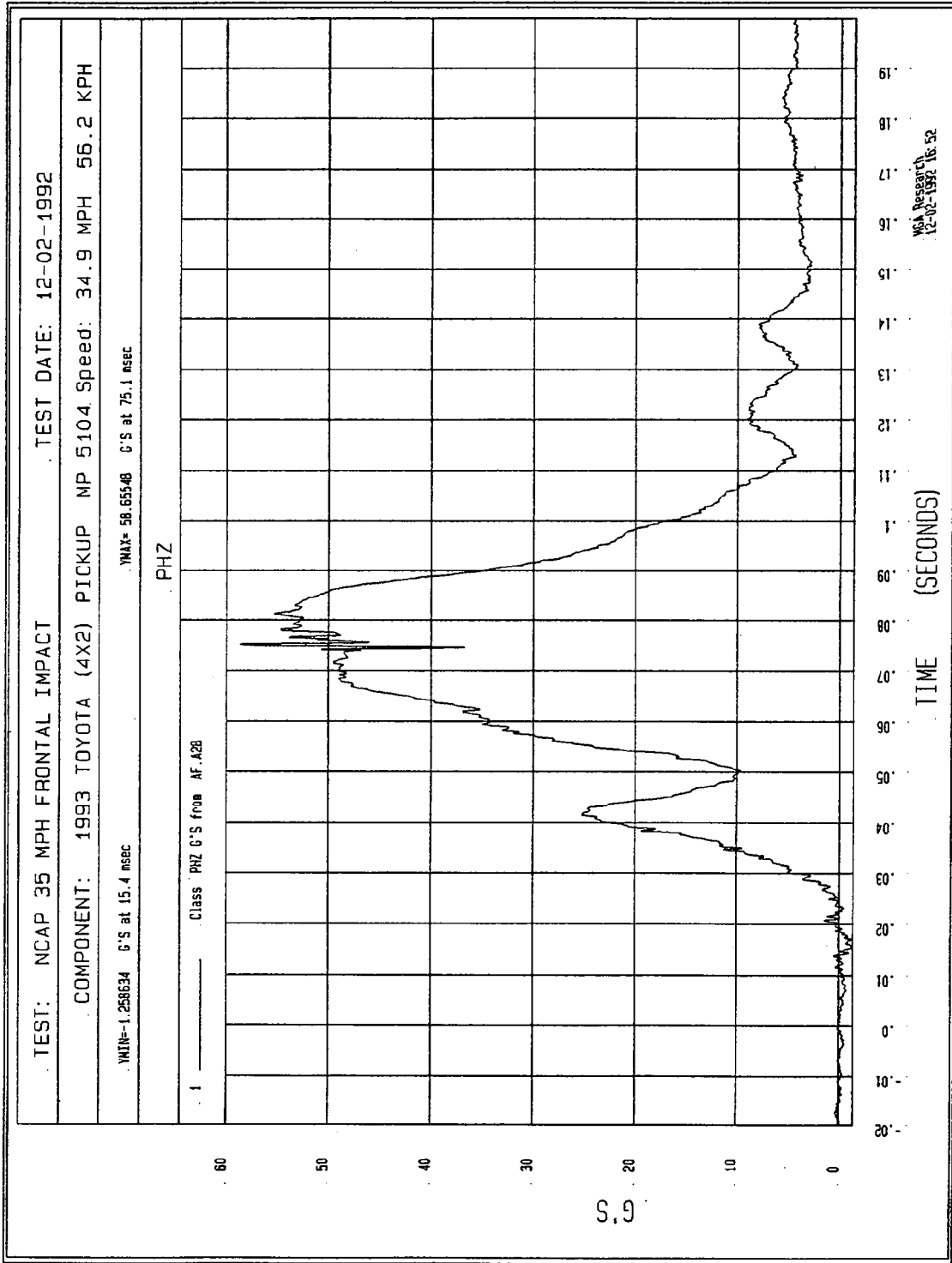


Figure B-44 - Passenger Head Z Acceleration vs. Time

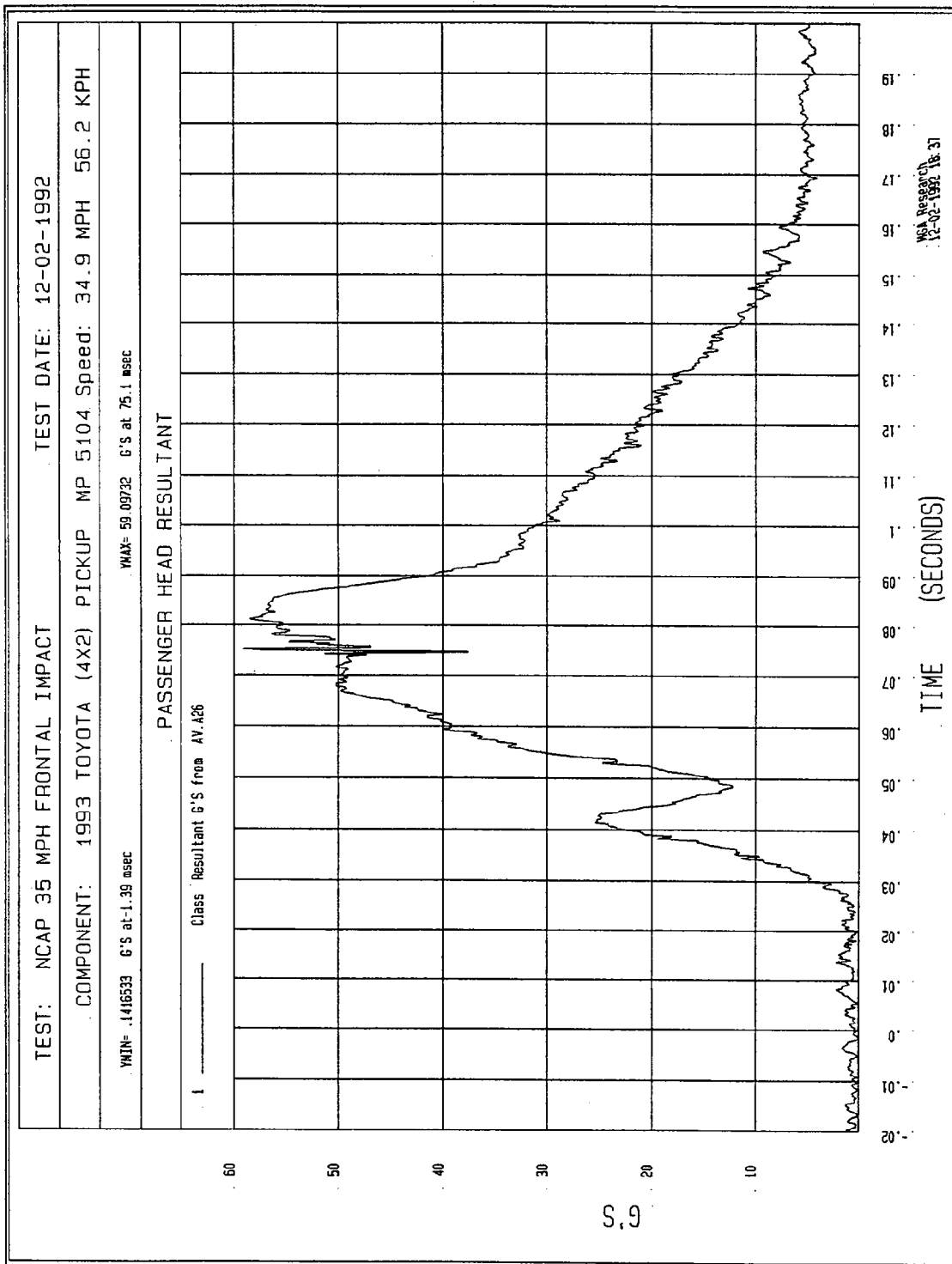


Figure B-45 - Passenger Head Resultant Acceleration vs. Time

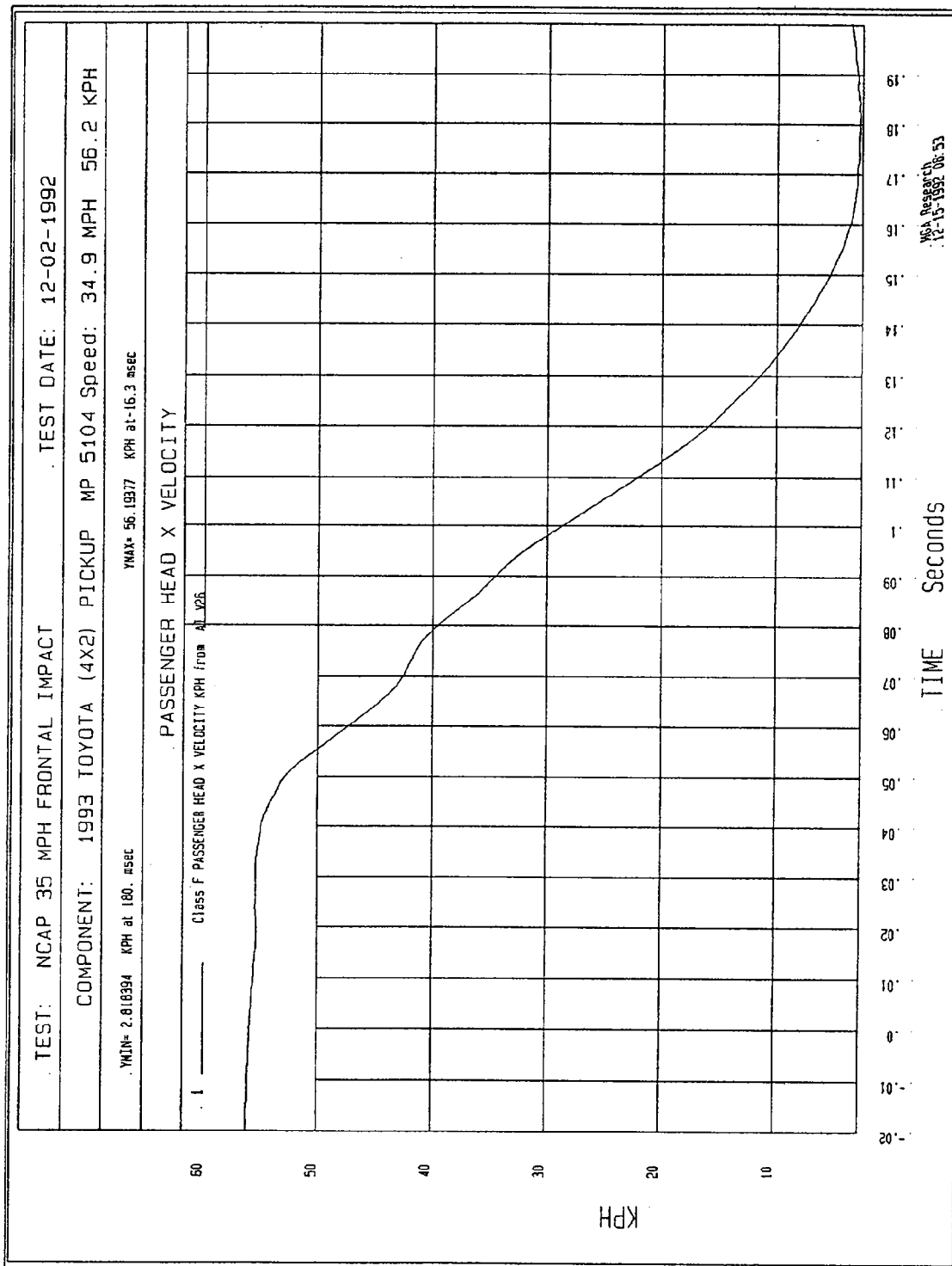


Figure B-46 - Passenger Head X Velocity vs. Time

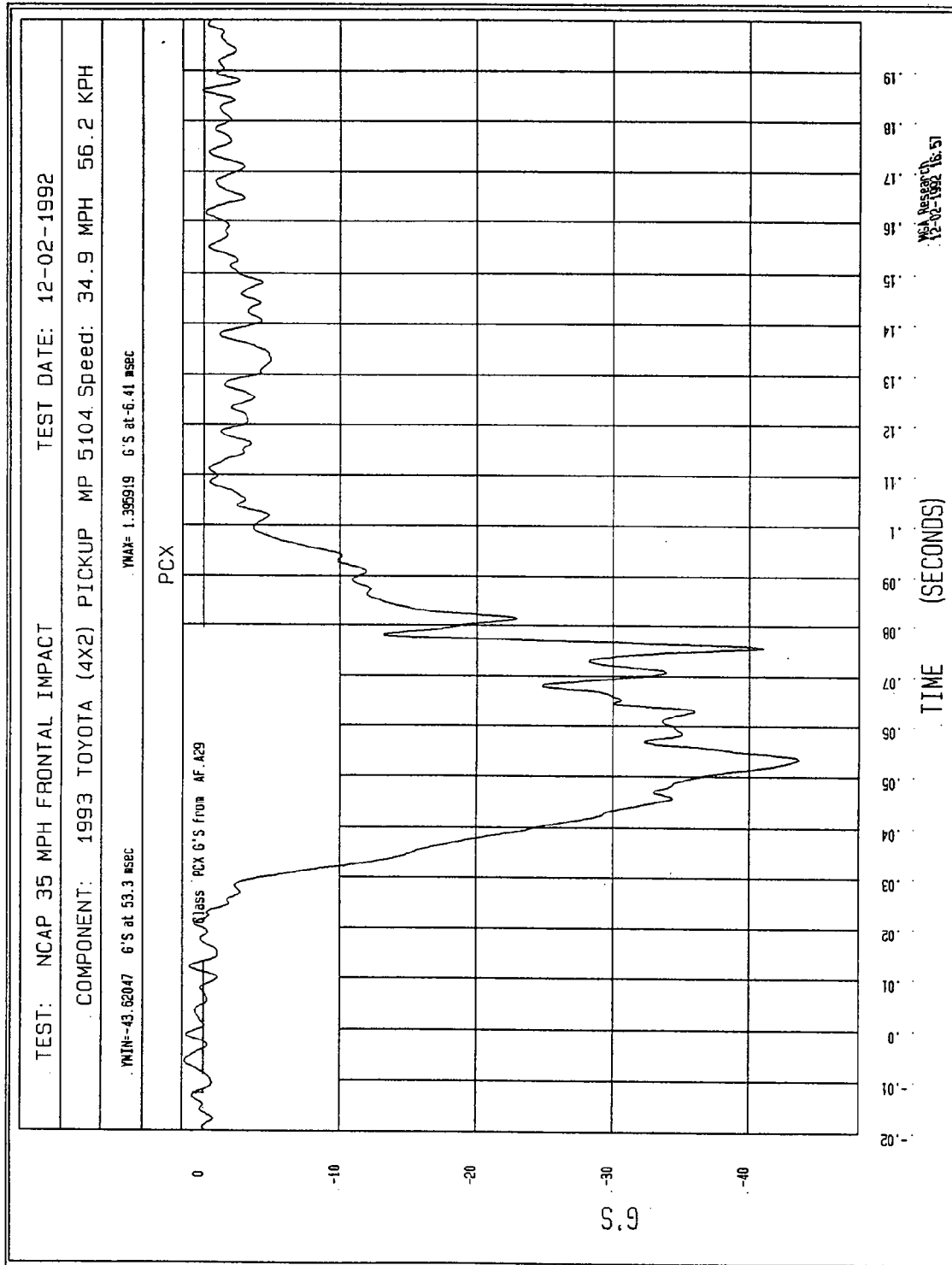


Figure B-47 - Passenger Chest X Acceleration vs. Time

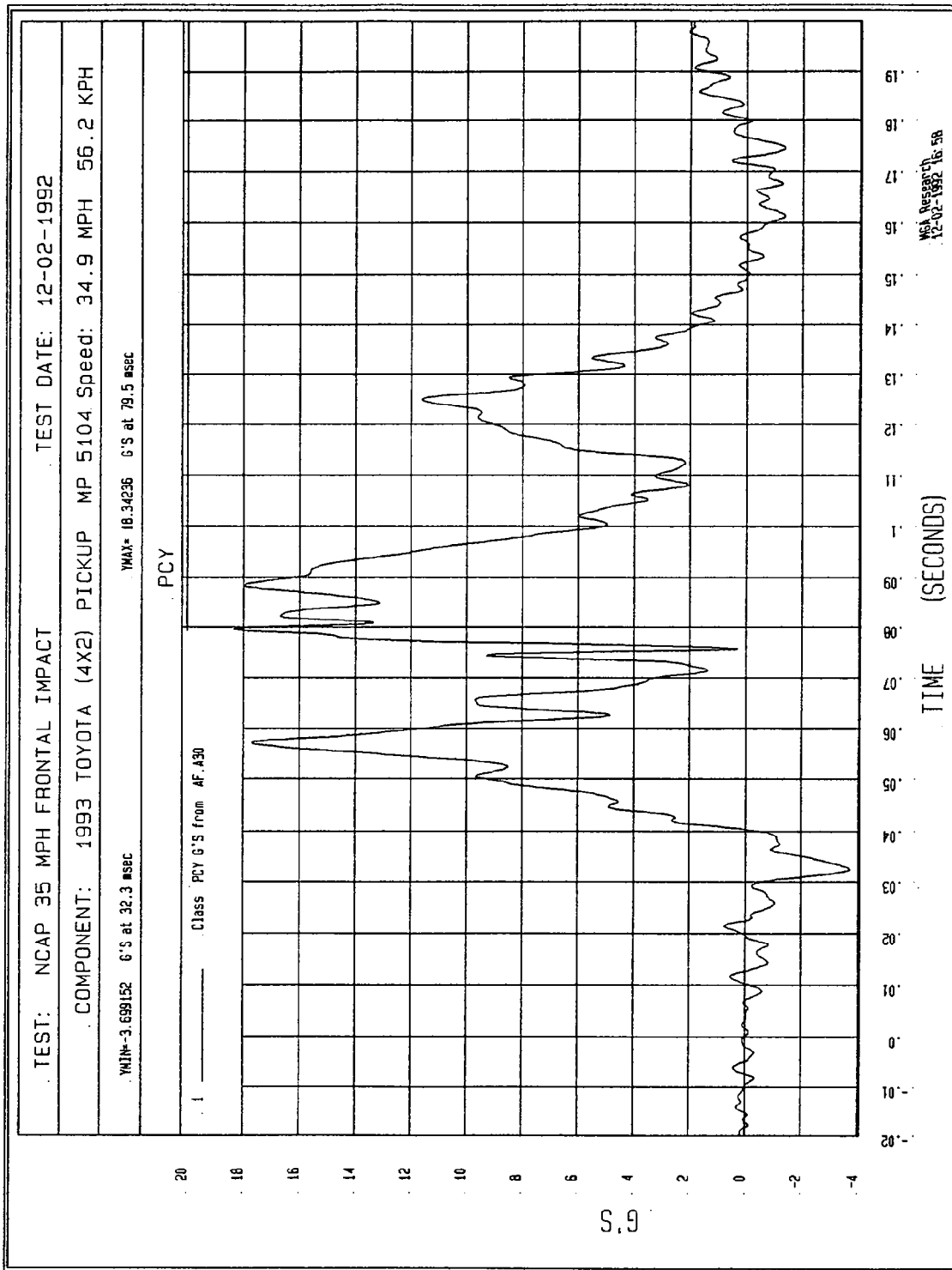


Figure B-48 - Passenger Chest Y Acceleration vs. Time

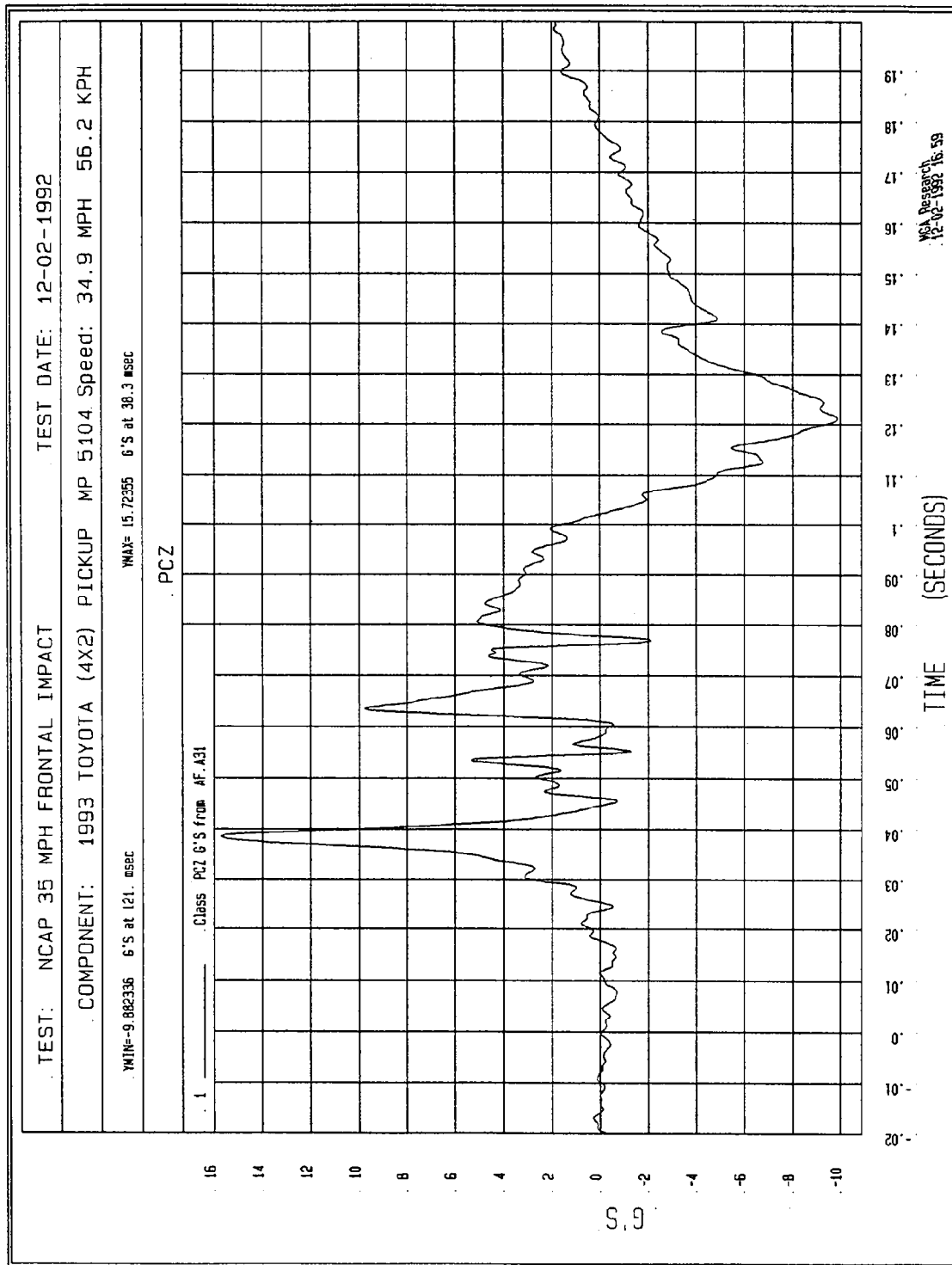


Figure B-49 - Passenger Chest z Acceleration vs. Time

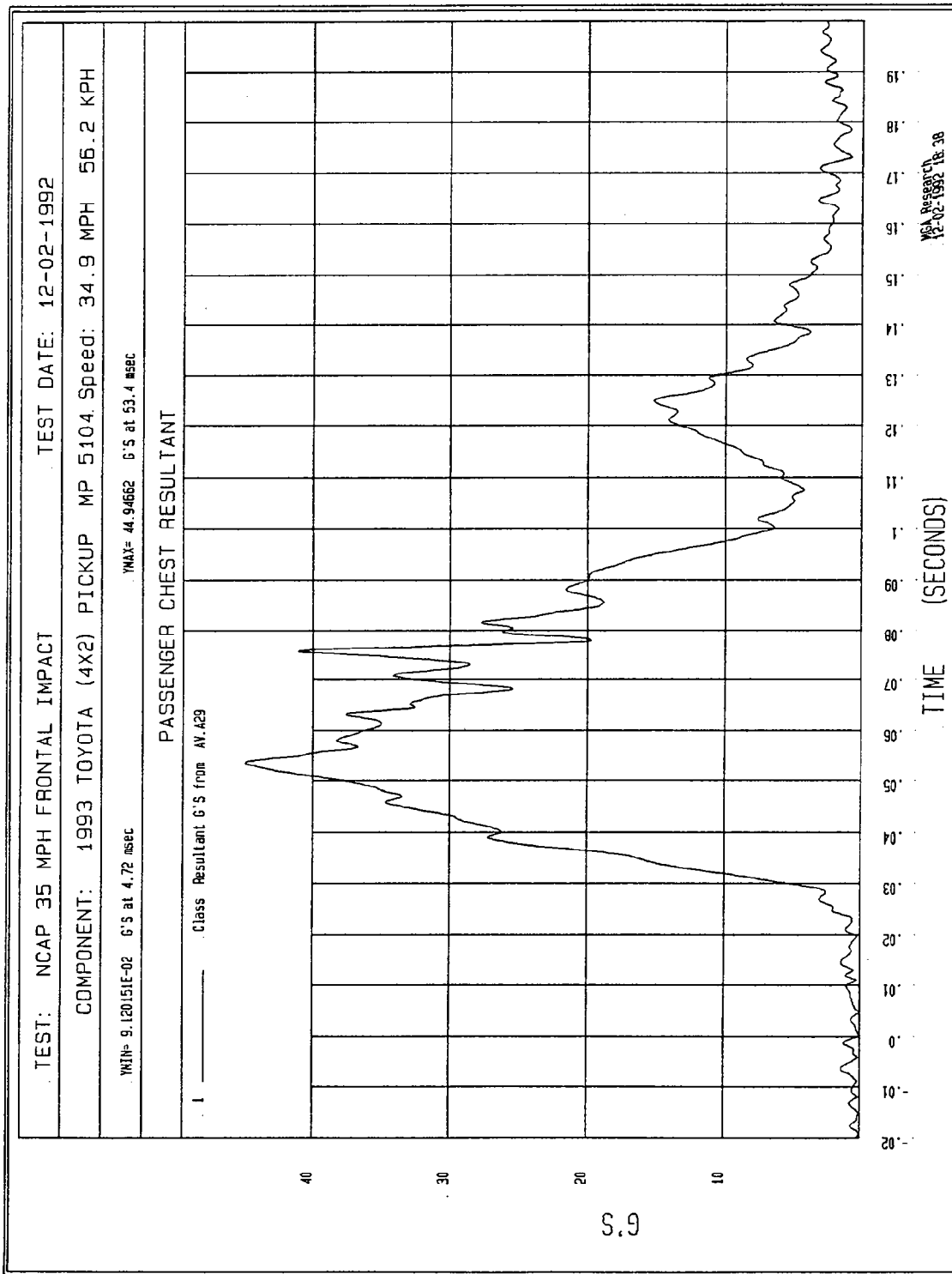


Figure B-50 - Passenger Chest Resultant Acceleration vs. Time

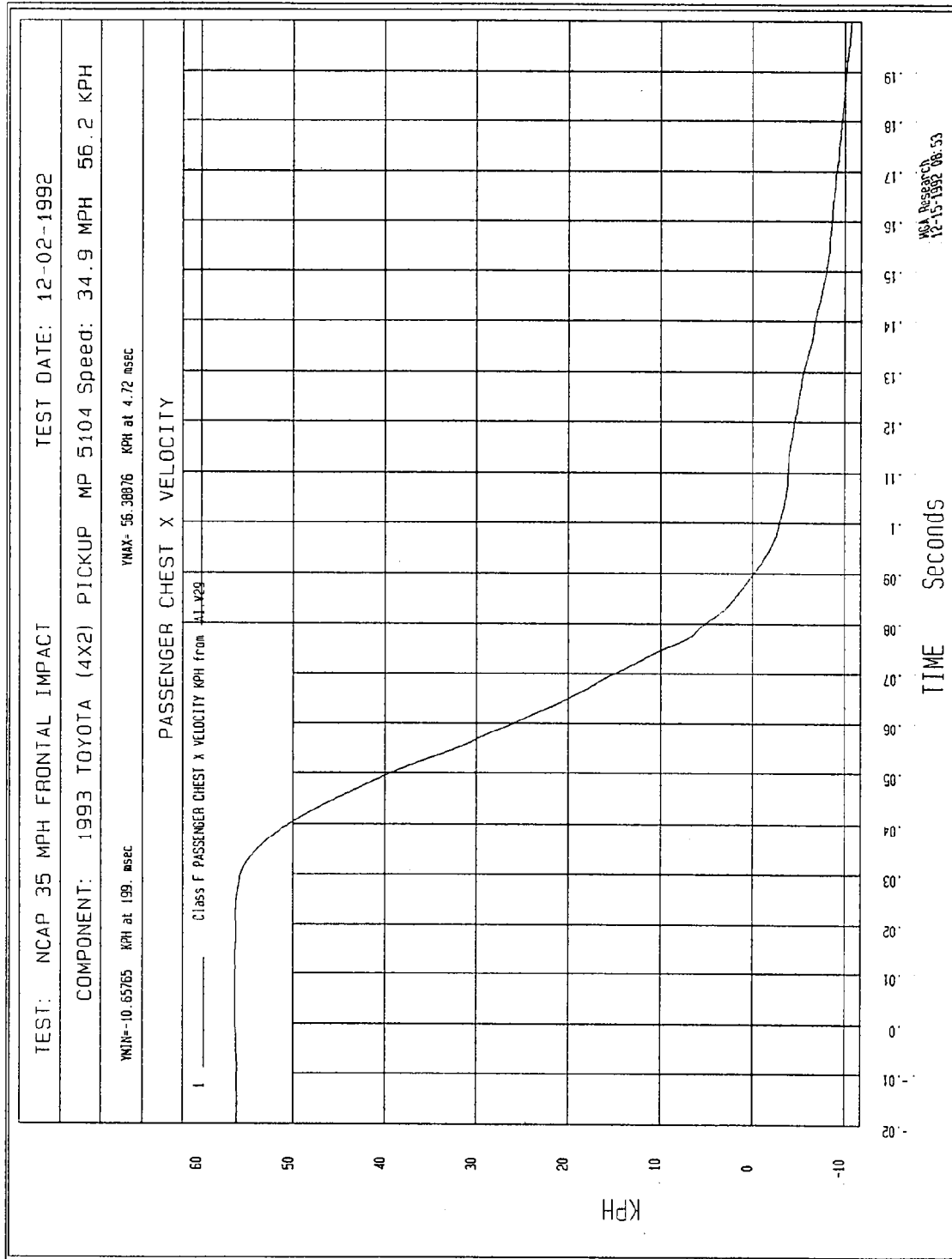


Figure B-51 - Passenger Chest X Velocity vs. Time

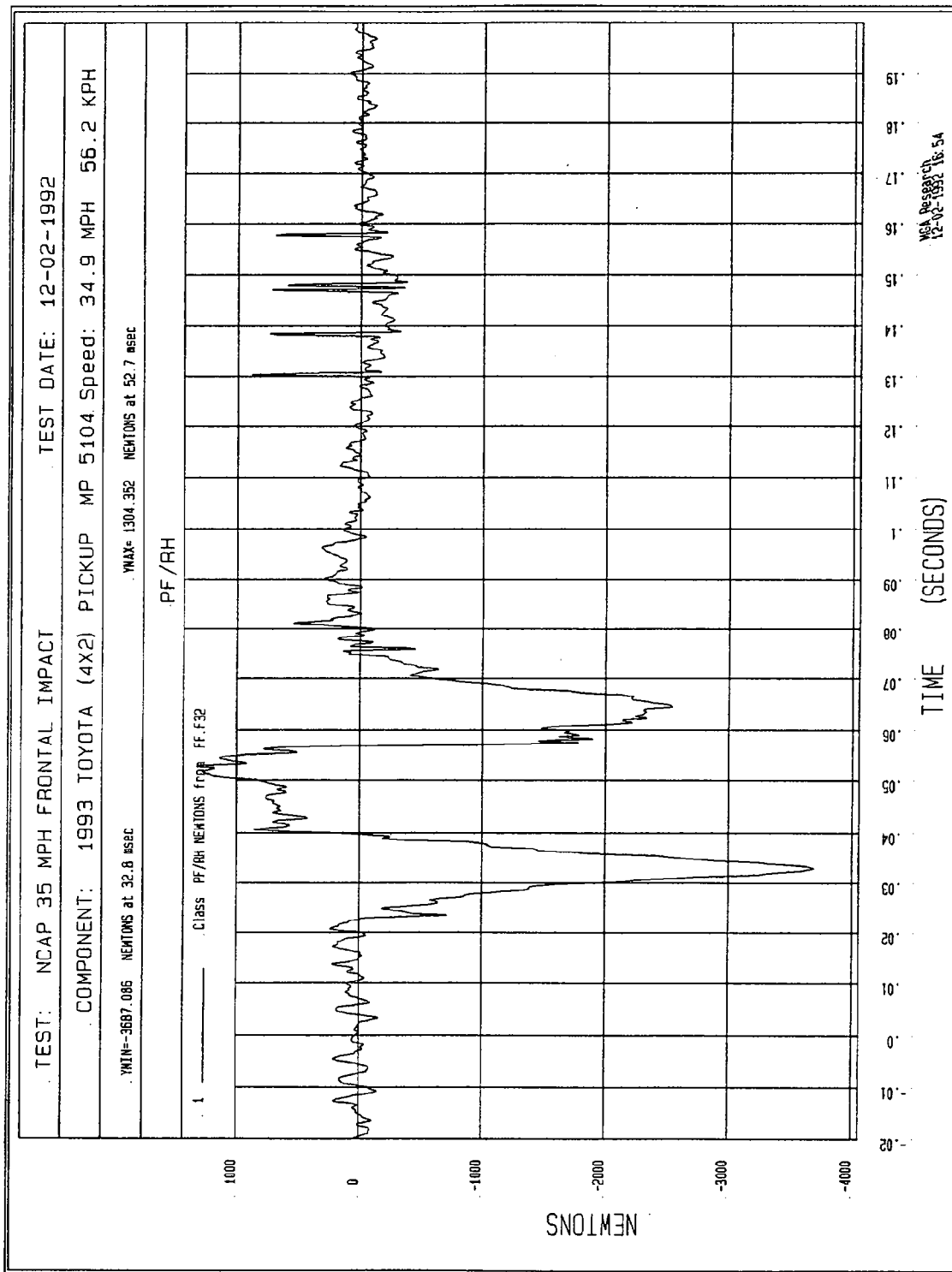


Figure B-52 - Passenger Right Femur Force vs. Time

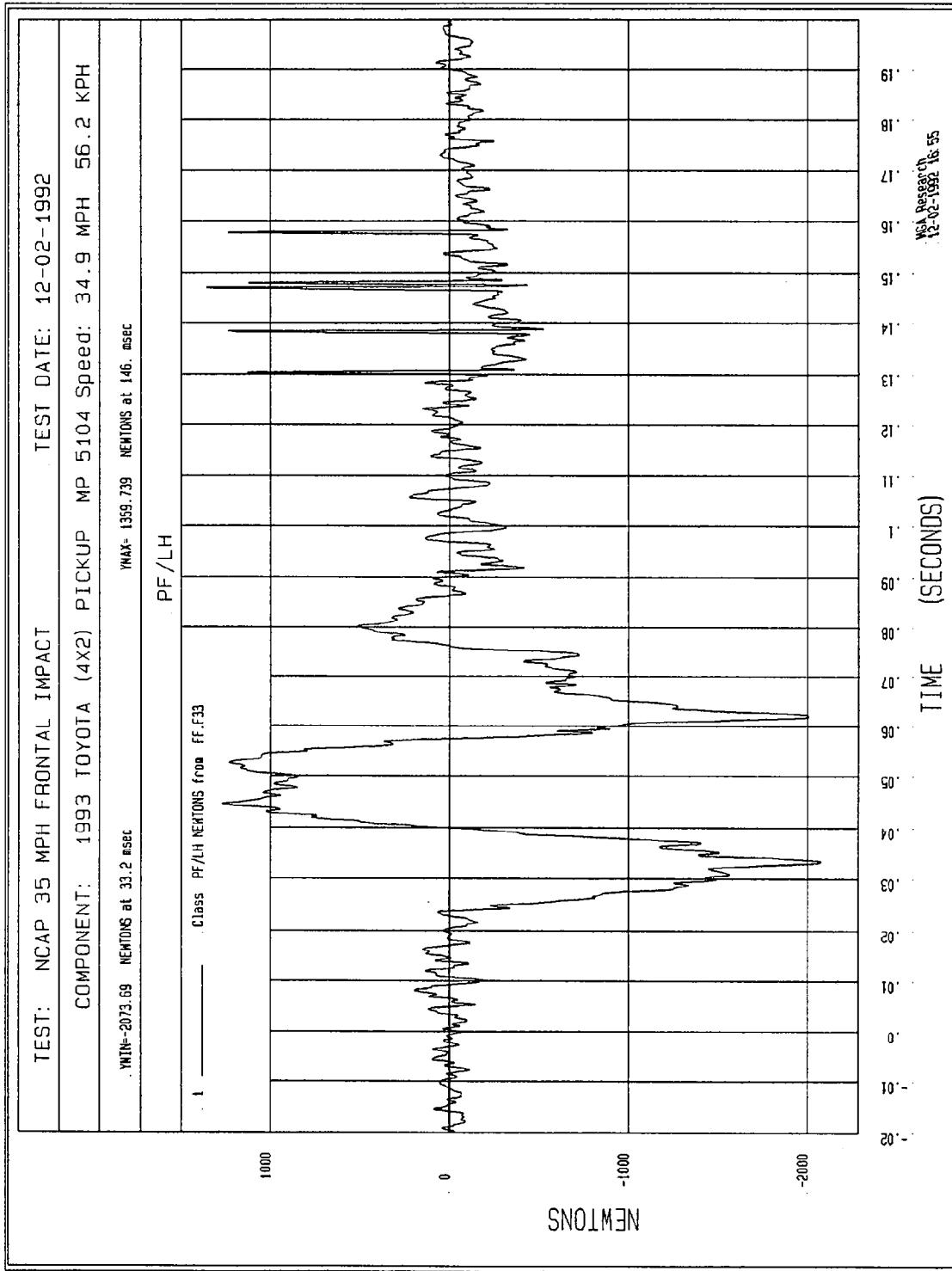


Figure B-53 - Passenger Left Femur Force vs. Time

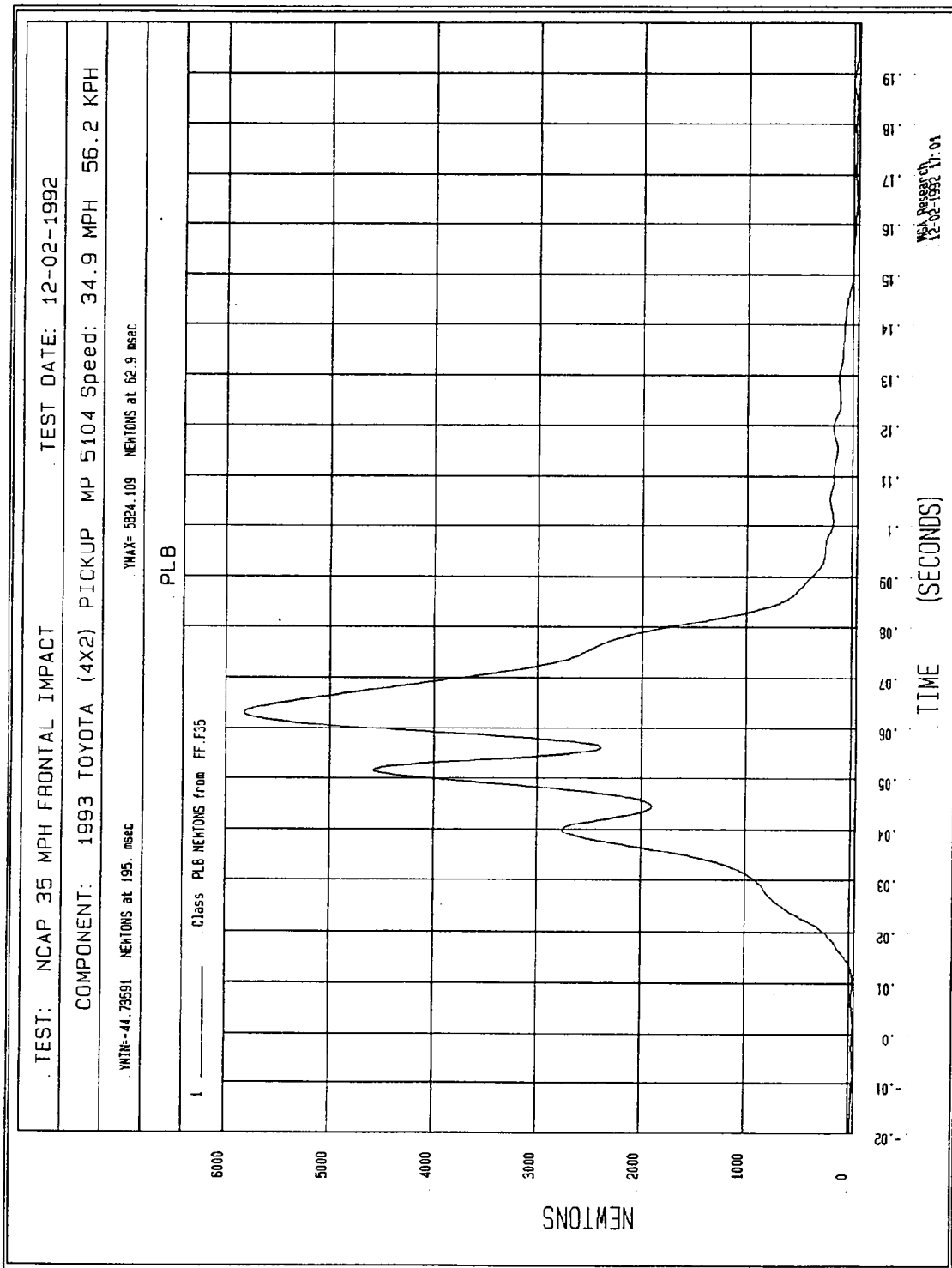


Figure B-54 - Passenger Lap Belt Force vs. Time

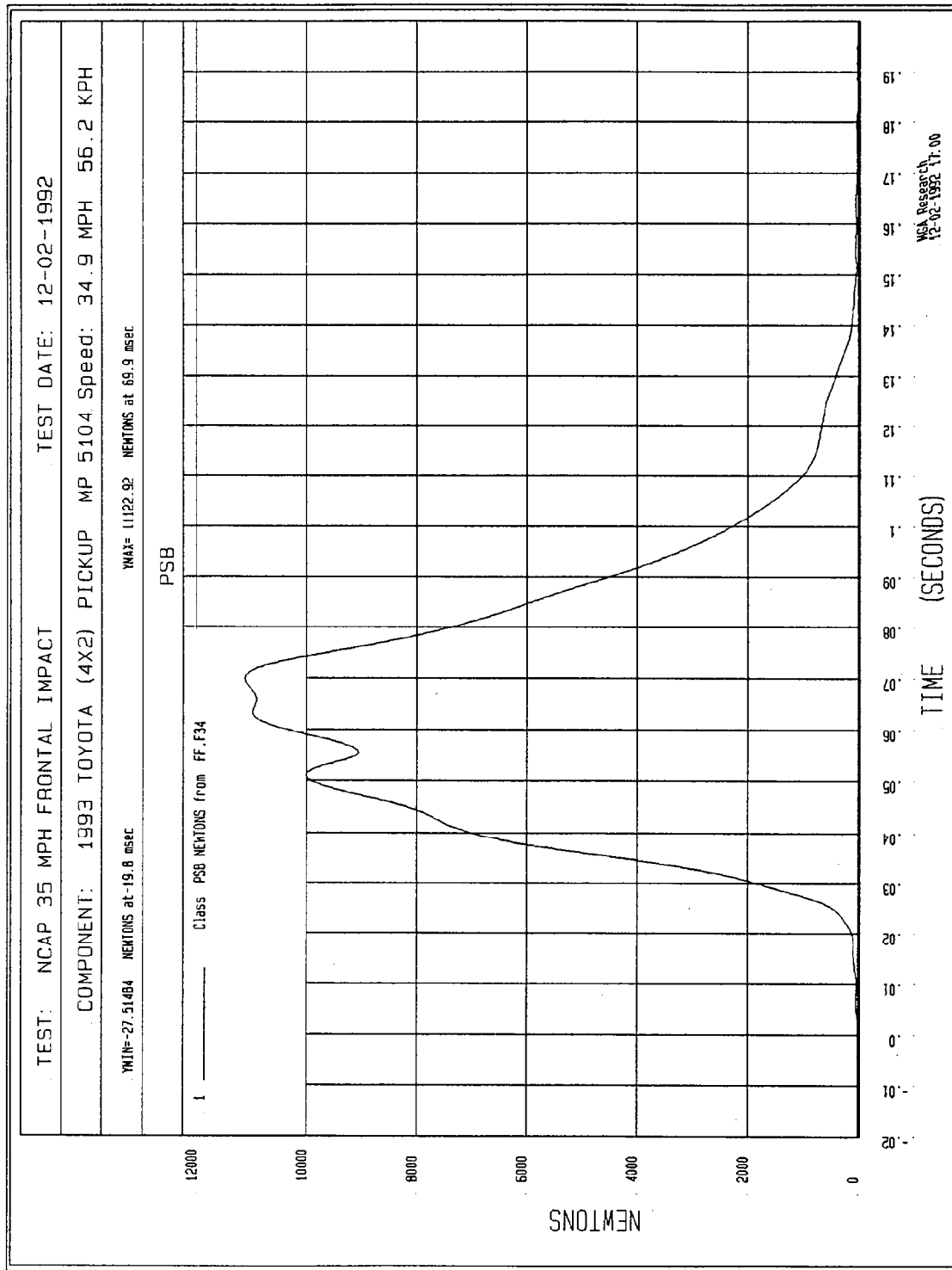


Figure B-55 - Passenger Torso Belt Force vs. Time

NO VALID DATA COLLECTED

B-56

Figure B-56 - Passenger Torso Belt Stretch vs. Time

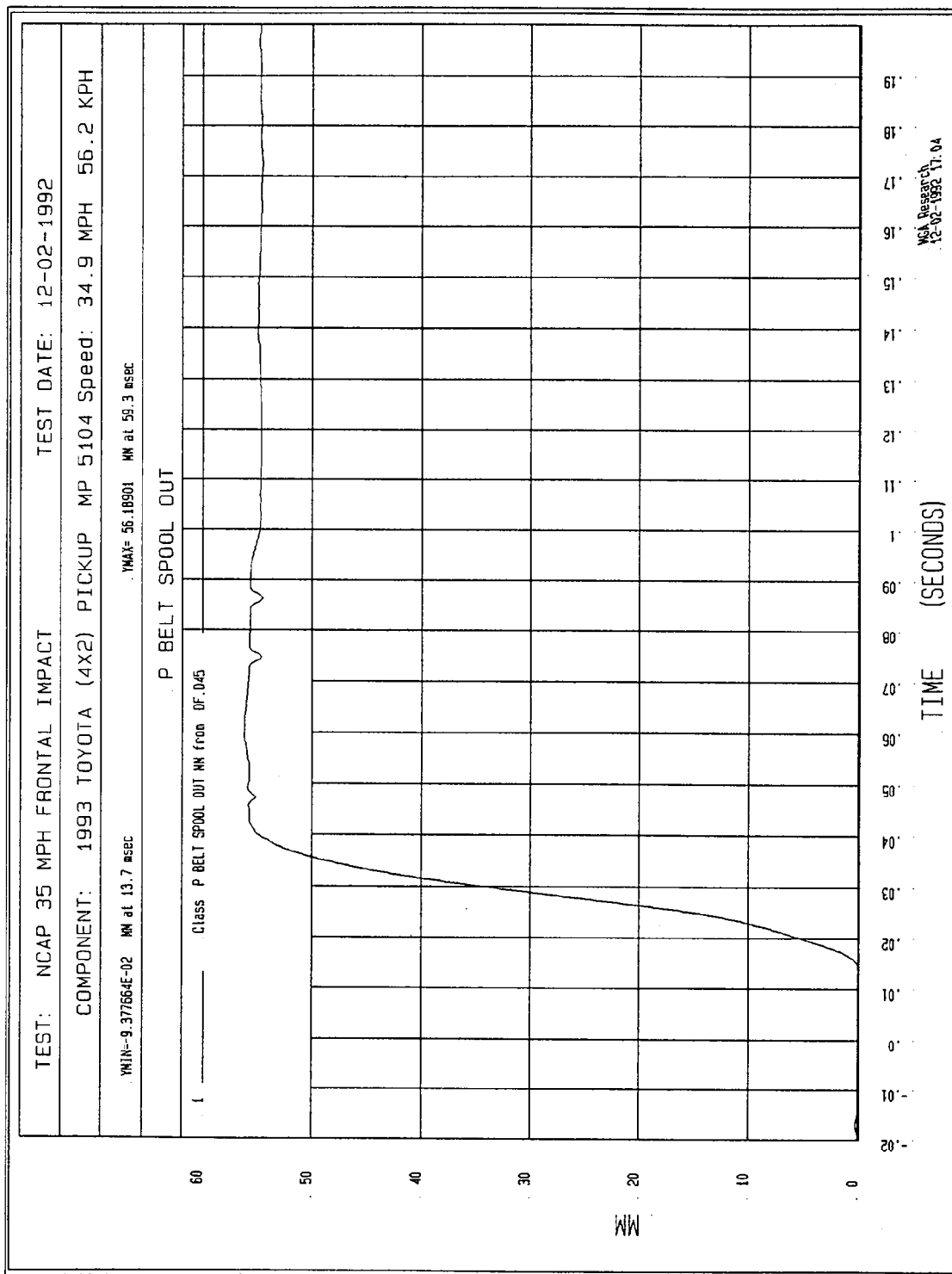


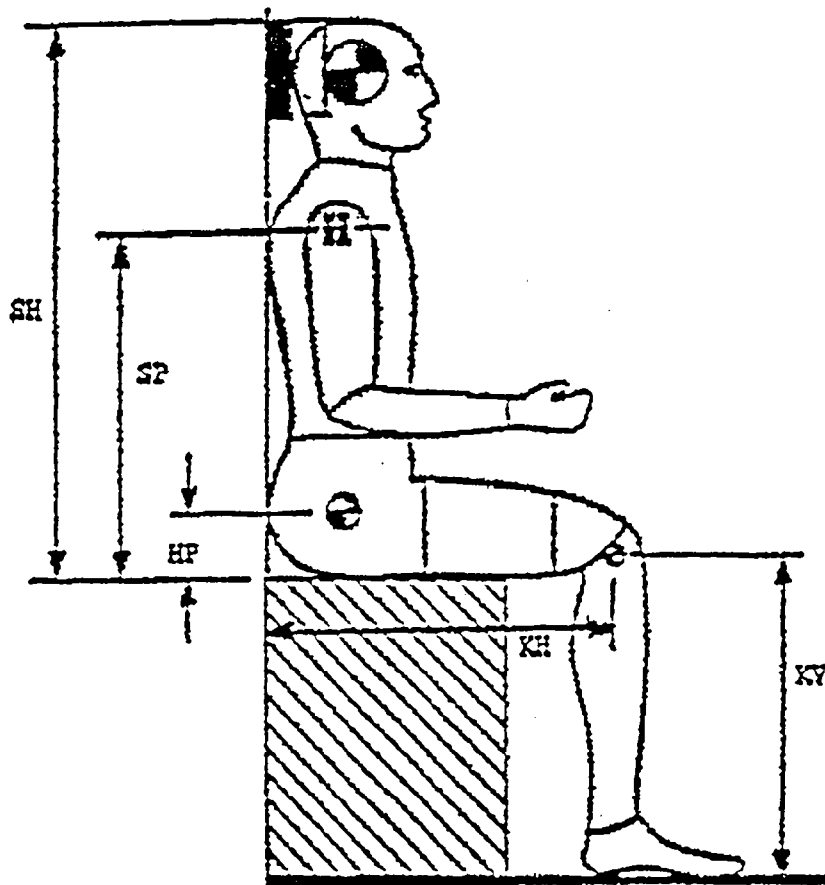
Figure B-57 - Passenger Torso Belt Spool Out vs. Time

APPENDIX C

Dummy Configuration & Performance Verification Data

PART 572 DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA

DUMMY NO.: 465 DUMMY CALIBRATION BY: Roni Dermer
I. CONFIGURATION VERIFICATION DATA



DATE OF VERIFICATION: 11-03-92

DESCRIPTION	SPECIFICATION	ACTUAL MEASUREMENT
SH - Seated Height	35.6" to 35.8"	35.6
SP - Shoulder Pivot Height	21.8" to 22.4"	21.9
HP - Hip Pivot Height	3.9" ref.	3.9
KH - Knee Pivot From Back Line	20.1" to 20.7"	20.6
KV - Knee Pivot From Floor	19.3" to 19.9"	19.5
SW - Shoulder Width	17.8" to 18.4"	18.1
HW - Hip Width	14.0" to 15.4"	14.8

PART 572 DUMMY CONFIGURATION AND PERFORMANCE (CONT.)

II. PERFORMANCE VERIFICATION DATA

DUMMY NO.: 465 DUMMY CALIBRATION BY: R.D & G.B
 VERIFICATION LABORATORY TEMPERATURE (66° - 78°F): 67°

		SPECIFICATION	MEASUREMENT
HEAD DROP TEST			
A.	Peak Resultant Acc.	210 to 260 g's	234
B.	Peak Lateral Acc.	< 10 g's	6
C.	Time above 100 g.	0.9 to 1.5 msec.	1.3
NECK BENDING TEST			
A.	Pendulum Speed	21.5 to 25.5 fps	23.5
B.	Pendulum Average Decel. Over $t_3 - t_2$	20 to 24 g's	23.3
C.	Peak Resultant Head Acc.	26 g maximum	25.6
D.	Pendulum Decel ($t_2 - t_1$)	≤ 3 ms	2.6
E.	Pendulum Decel ($t_3 - t_2$)	25 to 30 ms	28.2
F.	Pendulum Decel ($t_4 - t_3$)	≤ 10 ms	3.7
G.	Max Head Rotation	63° to 73°	69
H.	Chordal Displacement Head Rotation Angle		
0°	Time	-2 to 2 ms	0
	Displ.	-0.5 to 0.5 in	0
30°	Time	25.6 to 34.4 ms	27.6
	Displ.	2.1 to 3.1 in	2.5
60°	Time	40.3 to 51.7 ms	41.9
	Displ.	4.3 to 5.3 in	4.8
Maximum (68°)	Time	53.2 to 66.8 ms	56.3
	Displ.	5.0 to 6.0 in	5.6
60°	Time	67.0 to 83.0 ms	68.8
	Displ.	4.3 to 5.3 in	4.9
30°	Time	85.4 to 104.6 ms	87.9
	Displ.	2.1 to 3.1 in	2.4
0°	Time	101.0 to 123.0 ms	101.5
	Displ.	0 to 0.5 in	0.3

PART 572 DUMMY CONFIGURATION AND PERFORMANCE (CONT.)

	SPECIFICATION	MEASUREMENT
ABDOMINAL COMPRESSION TEST (Preload = 10 lbs.)		
Force @ 0.5 in	23.3 to 36.5 lbs	26.7
Force @ 0.75 in	36.7 to 49.8 lbs	39.5
Force @ 1.0 in	50 to 63 lbs	58.1
Force @ 1.3 in	73 to 88 lbs	82.7

	SPECIFICATION	MEASUREMENT
LUMBAR FLEXION TEST		
A. Force @ 20°	22 to 34 lbs	30.3
B. Force @ 30°	34 to 46 lbs	42.2
C. Force @ 40°	46 to 58 lbs	56.2
D. Return Angle	12° Maximum	8.6

	SPECIFICATION	MEASUREMENT
CHEST IMPACT TESTS		
A. High Speed		
(1) Probe Speed	21.78 to 22.22 fps	21.83
(2) Peak Deflection	1.7 in. (maximum)	1.08"
(3) Peak Resistive Force	2250 lbs. (maximum)	2,187.2 lbs.
(4) Internal Hysteresis	50% to 70%	55.5%
B. Low Speed		
(1) Probe Speed	13.86 to 14.14 fps	13.94 ft/sec.
(2) Peak Deflection	1.1 in. (maximum)	.79"
(3) Peak Resistive Force	1450 lbs. (maximum)	1381.7 lbs.
(4) Internal Hysteresis	50% to 70%	59.6%

PART 572 DUMMY CONFIGURATION AND PERFORMANCE (CONT.)

	SPECIFICATION	MEASUREMENT
KNEE IMPACT TESTS		
A. Right Side		
(1) Probe Speed	6.67 to 7.04 fps	7.02
(2) Maximum Force	1850 to 2500 lbs.	2090.2
(3) Time Above 1000 lbs.	1.7 msec. (minimum)	2.122
B. Left Side		
(1) Probe Speed	6.67 to 7.04 fps	7.02
(2) Maximum Force	1850 to 2500 lbs.	2190.9
(3) Time Above 1000 lbs.	1.7 msec. (minimum)	1.981

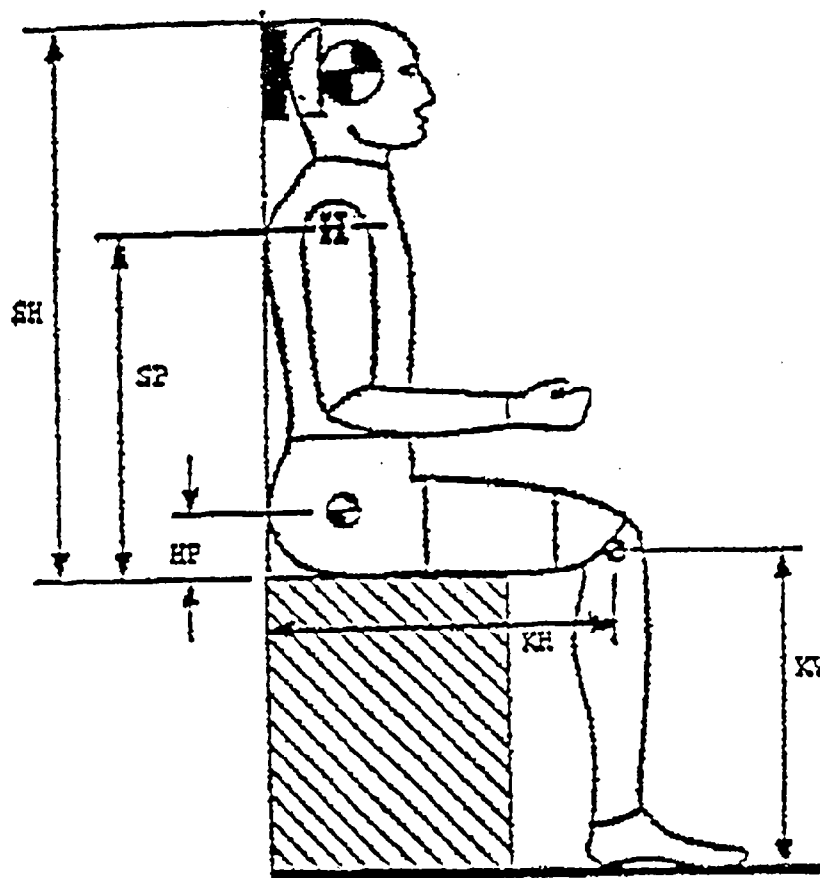
RD#1.P572/dmd

PART 572 DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA

DUMMY NO.: 466

DUMMY CALIBRATION BY: R. D. & G. B.

I. CONFIGURATION VERIFICATION DATA



DATE OF VERIFICATION: 11-05-92

DESCRIPTION	SPECIFICATION	ACTUAL MEASUREMENT
SH - Seated Height	35.6" to 35.8"	35.6
SP - Shoulder Pivot Height	21.8" to 22.4"	22.2
HP - Hip Pivot Height	3.9" ref.	3.9
KH - Knee Pivot From Back Line	20.1" to 20.7"	20.4
KV - Knee Pivot From Floor	19.3" to 19.9"	19.3
SW - Shoulder Width	17.8" to 18.4"	18.0
HW - Hip Width	14.0" to 15.4"	14.8

PART 572 DUMMY CONFIGURATION AND PERFORMANCE (CONT.)

II. PERFORMANCE VERIFICATION DATA

DUMMY NO.: 466 DUMMY CALIBRATION BY: R. D. & G. B.
 VERIFICATION LABORATORY TEMPERATURE (66° - 78°F): 68°

		SPECIFICATION	MEASUREMENT
HEAD DROP TEST			
A.	Peak Resultant Acc.	210 to 260 g's	258
B.	Peak Lateral Acc.	< 10 g's	5
C.	Time above 100 g.	0.9 to 1.5 msec.	1.2
NECK BENDING TEST			
A.	Pendulum Speed	21.5 to 25.5 fps	23.5
B.	Pendulum Average Decel. Over $t_3 - t_2$	20 to 24 g's	24
C.	Peak Resultant Head Acc.	26 g maximum	25.5
D.	Pendulum Decel ($t_2 - t_1$)	$\leq = 3$ ms	2.4
E.	Pendulum Decel ($t_3 - t_2$)	25 to 30 ms	28
F.	Pendulum Decel ($t_4 - t_3$)	$\leq = 10$ ms	4.6
G.	Max Head Rotation	63 to 73°	70°
H.	Chordal Displacement Head Rotation Angle		
0°	Time	-2 to 2 ms	0
	Displ.	-0.5 to 0.5 in	0
30°	Time	25.6 to 34.4 ms	28.7
	Displ.	2.1 to 3.1 in	2.6
60°	Time	40.3 to 51.7 ms	41.6
	Displ.	4.3 to 5.3 in	4.5
Maximum (69°)	Time	53.2 to 66.8 ms	57.3
	Displ.	5.0 to 6.0 in	5.5
60°	Time	67.0 to 83.0 ms	69.6
	Displ.	4.3 to 5.3 in	4.9
30°	Time	85.4 to 104.6 ms	87.4
	Displ.	2.1 to 3.1 in	2.6
0°	Time	101.0 to 123.0 ms	101.1
	Displ.	0 to 0.5 in	0.4

PART 572 DUMMY CONFIGURATION AND PERFORMANCE (CONT.)

	SPECIFICATION	MEASUREMENT
ABDOMINAL COMPRESSION TEST (Preload = 10 lbs.)		
Force @ 0.5 in	23.3 to 36.5 lbs	25.4
Force @ 0.75 in	36.7 to 49.8 lbs	39.5
Force @ 1.0 in	50 to 63 lbs	56
Force @ 1.3 in	73 to 88 lbs	83

	SPECIFICATION	MEASUREMENT
LUMBAR FLEXION TEST		
A. Force @ 20°	22 to 34 lbs	28.1
B. Force @ 30°	34 to 46 lbs	44.0
C. Force @ 40°	46 to 58 lbs	47.9
D. Return Angle	12° Maximum	7.3°

	SPECIFICATION	MEASUREMENT
CHEST IMPACT TESTS		
A. High Speed		
(1) Probe Speed	21.78 to 22.22 fps	21.82 ft/sec.
(2) Peak Deflection	1.7 in. (maximum)	1.41"
(3) Peak Resistive Force	2250 lbs. (maximum)	2180.86 lbs.
(4) Internal Hysteresis	50% to 70%	55.8%
B. Low Speed		
(1) Probe Speed	13.86 to 14.14 fps	13.92 ft/sec
(2) Peak Deflection	1.1 in. (maximum)	.82"
(3) Peak Resistive Force	1450 lbs. (maximum)	1433.42 lbs.
(4) Internal Hysteresis	50% to 70%	64.8%

PART 572 DUMMY CONFIGURATION AND PERFORMANCE (CONT.)

	SPECIFICATION	MEASUREMENT
KNEE IMPACT TESTS		
A. Right Side		
(1) Probe Speed	6.67 to 7.04 fps	6.97
(2) Maximum Force	1850 to 2500 lbs.	1,935
(3) Time Above 1000 lbs.	1.7 msec. (minimum)	1.7
B. Left Side		
(1) Probe Speed	6.67 to 7.04 fps	7.02
(2) Maximum Force	1850 to 2500 lbs.	1911.3
(3) Time Above 1000 lbs.	1.7 msec. (minimum)	2.2

RD#1.P572/dmd



APPENDIX D

Dummy, Vehicle and Laboratory Calibration Data

DUMMY, VEHICLE AND LABORATORY INSTRUMENT CALIBRATION

INSTRUMENTS FOR DUMMY NO. 465

	PASSENGER		
	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Head X	EA71	Endevco	11/6/92
Head Y	A06M	Endevco	11/6/92
Head Z	A55D	Endevco	11/6/92
Chest X	ACC00	Endevco	11/11/92
Chest Y	A82D	Endevco	11/11/92
Chest Z	A99L	Endevco	11/11/92
Right Femur Load Cell	950	GSE	11/4/92
Left Femur Load Cell	947	GSE	11/11/92
*Neck Load Cell X			
*Neck Load Cell Y			
*Neck Load Cell Z			
*Neck Moment X			
*Neck Moment Y			
*Neck Moment Z			
*Chest Deflection Gauge			
Lap Belt Load Cell	663	Eaton	11/3/92
Torso Belt Load Cell	690	GSE	11/4/92
Spool-Out Potentiometer	02	Bourns	12/2/92
Belt Stretch Transducer	02	Bourns	11/23/92

*Hybrid III use only.

DUMMY, VEHICLE AND LABORATORY INSTRUMENT CALIBRATION

INSTRUMENTS FOR DUMMY NO. 466

	DRIVER		
	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Head X	EH45	Endevco	11/06/92
Head Y	A11M	Endevco	11/06/92
Head Z	DR22	Endevco	11/06/92
Chest X	A43M	Endevco	11/11/92
Chest Y	A87M	Endevco	11/11/92
Chest Z	A07M	Endevco	11/11/92
Right Femur Load Cell	957	GSE	11/4/92
Left Femur Load Cell	932	GSE	11/11/92
*Neck Load Cell X			
*Neck Load Cell Y			
*Neck Load Cell Z			
*Neck Moment X			
*Neck Moment Y			
*Neck Moment Z			
*Chest Deflection Gauge			
Lap Belt Load Cell	691	GSE	11/4/92
Torso Belt Load Cell	211	Lebow	11/3/92
Spool-Out Potentiometer	01	Bourns	12/2/92
Belt Stretch Transducer	01	Bourns	11/23/92

*Hybrid III use only.

DUMMY, VEHICLE AND LABORATORY INSTRUMENT CALIBRATION

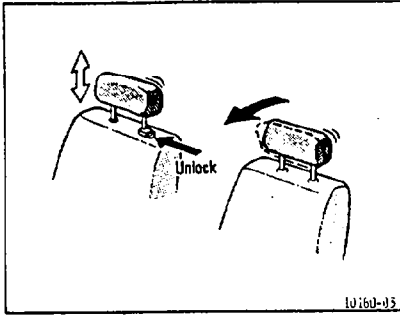
VEHICLE ACCELEROMETERS			
	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Left Rear Seat Crossmember X	AA1H9	Endevco	10/15/92
Right Rear Seat Crossmember X	MGA030	Entran	9/15/92
Top of Engine X	295848	Sensotec	7/1/92
Bottom of Engine X	295845	Sensotec	7/1/92
Left Brake Caliper X	MGA019	Entran	9/1/92
Right Brake Caliper X	MGA021	Entran	8/21/92
Instrument Panel X	MGA041	Entran	9/15/92
Redundant Left Rear Seat Crossmember X	MGA066	Entran	9/29/92
Redundant Right Rear Seat Crossmember X	MGA056	Entran	9/29/92

LABORATORY INSTRUMENTS			
	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Neck Bending Pendulum Accelerometer	1740035	Kyowa	6/15/92
Neck Bending Rotary Potentiometer	N/A	Bourns	PRIOR TO USE
Neck Bending Linear Potentiometer	N/A	Bourns	PRIOR TO USE
Femur/Chest/Thorax Probe Accelerometer	MGA077	Entran	10/1/92
Lumbar Flexion Force Gauge	Custom Fab.	-	PRIOR TO USE
Lumbar Flexion Rotation Gauge	Custom Fab.	-	PRIOR TO USE
Abdomen Compression Displacement Gauge	4856160	CIC	10/1/92
Abdomen Compression Force Gauge	49710	Transducers Inc.	10/1/92

APPENDIX E

Vehicle Owner's Occupant Restraint System Instructions

Headrests (vertically and rotationally adjustable type)



To raise the headrest, pull it up. To lower it, press the lock release button and push the headrest down. To move the headrest forward, pull on the top.

Pulling the top of the headrest as far as it can go will return it to the upright position.

The headrest is most effective when it is close to your head. Therefore, using a cushion on the seatback is not recommended.

CAUTION:

- Adjust the top of the headrest so that it is closest to the top of your ears.
- After adjusting the headrest, make sure it is locked in position.
- Do not drive with the headrests removed.

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Seat belts— —Seat belt precautions

Toyota recommends that the driver and passengers in the vehicle be properly restrained at all times with the seat belts provided. Failure to do so could increase the chance of injury and/or the severity of injury in accidents.

Baby or small child. Use a child restraint system which fits your vehicle. See "Child restraint" for details.

Child. If a child is too big for a child restraint system, the child should sit in the seat and must be restrained with the seat belt. Do not allow the child to stand up or kneel on the seat:

On models with rear seat belts, the child should sit in the rear seat and must be restrained with the seat belt. According to accident statistics, the child is safer when properly restrained in the rear seat than in the front seat.

On models without rear seat belts, the child must be restrained with the lap/shoulder belt. If the shoulder belt falls across the child's neck or face, move the seat fully backward so that the belt lays across the child's shoulder. In vehicles equipped with bench seats, if the shoulder belt cannot be positioned correctly, move the child to the center position and use the center lap belt.

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Small-framed person or youth in a 3-point type seat belt. On models with a bench seat, have a small-framed person or youth sit slightly closer to the center of the vehicle (so the shoulder belt does not cross over the neck). On models with separate seats, move the seat fully backward.

Pregnant woman. Toyota recommends the use of a seat belt. Ask your doctor for specific recommendations. The lap belt should be worn securely and as low as possible over the hips and not on the waist.

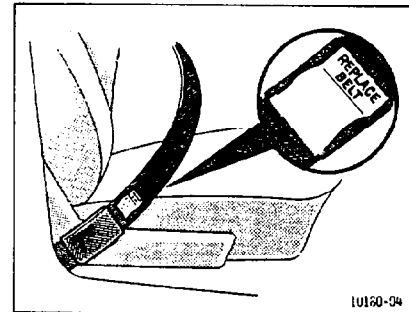
Injured person. Toyota recommends the use of a seat belt. Depending on the injury, however, first check with your doctor.

CAUTION:

Persons should ride in their seats properly wearing their seat belts whenever the vehicle is moving. Otherwise, they are much more likely to suffer serious bodily injury in the event of sudden braking or a collision. When using the seat belts, observe the following:

- Use the belt for only one person at a time. Do not use a single belt for two or more people—even children.

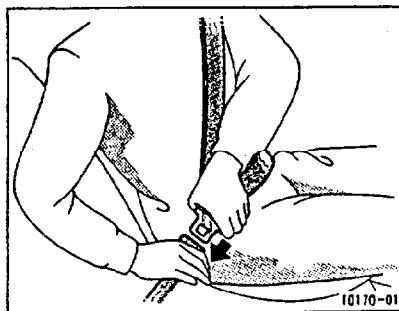
- After inserting the tab, make sure that the connection is secure and the belt is not twisted.
- Avoid reclining the seatbacks too much. The seat belts provide maximum protection when the seatbacks are in the upright position. (See the seat adjustment instructions.)
- Be careful not to damage the belt webbing or hardware, and take care that they do not get caught or pinched in the seat or doors.
- Inspect the belt system periodically. Check for cuts, frays, and loose parts. Damaged parts should be replaced. Do not disassemble or modify the system.
- Keep the belts clean and dry. If they need cleaning, use a mild soap solution or lukewarm water. Never use bleach, dye, or abrasive cleaners—they may severely weaken the belts.
- Replace the belt assembly if it has been used in a severe impact. The entire assembly should be replaced even if damage is not obvious.



- Replace the seat belt if the warning label under the sleeve can be seen. The warning label, "REPLACE BELT", will appear if the belt receives a severe impact or other force.

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- 3-point type



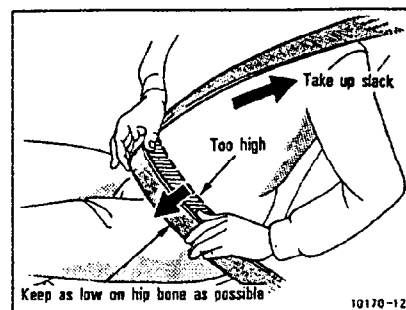
Adjust the seat as needed and sit up straight and well back in the seat. To fasten your belt, pull it out of the retractor and insert the tab into the buckle.

You will hear a click when the tab locks into the buckle.

The seat belt length automatically adjusts to your size and the seat position.

The retractor will lock the belt during a sudden stop or on impact. It also may lock if you lean forward too quickly. A slow, easy motion will allow the belt to extend, and you can move around freely.

If the seat belt cannot be pulled out of the retractor, firmly pull the belt and release it. You will then be able to smoothly pull the belt out of the retractor.



Adjust the position of the lap and shoulder belts.

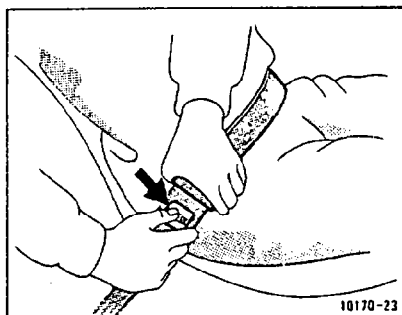
Position the lap belt as low as possible on your hips—not on your waist, then adjust it to a snug fit by pulling the shoulder portion upward through the latch plate.

CAUTION:

- High-positioned lap belts and loose-fitting shoulder belts both could increase the chance of injury due to sliding under the lap belt during an accident.
- For your safety, do not place the shoulder belt under your arm.

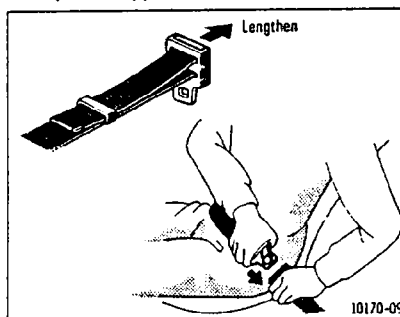
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- 2-point type



To release the belt, press the buckle-release button and allow the belt to retract.

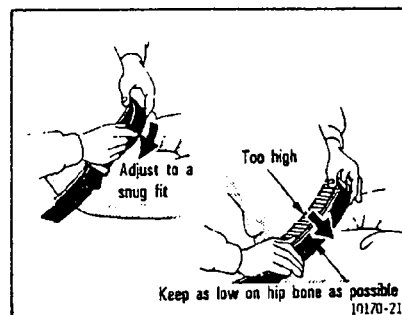
If the belt does not retract smoothly, pull it out and check for kinks or twists. Then make sure that it remains untwisted as it retracts.



Sit up straight and well back in the seat. To fasten your belt, insert the tab into the buckle.

You will hear a click when the tab locks into the buckle.

If the belt is not long enough for you, hold the tab at a right angle to the belt and pull on the tab.



Remove excess length of the belt and adjust the belt position.

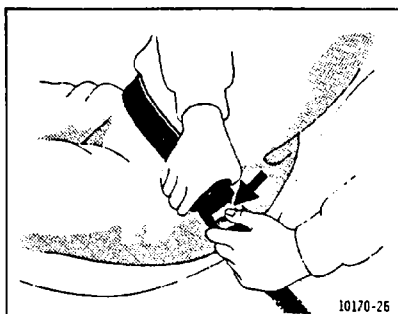
To shorten the belt, pull the free end of the belt.

Position the lap belt as low as possible on your hips—not on your waist, then adjust it to a snug fit.

CAUTION:

High-positioned lap belts could increase the chance of injury due to sliding under the lap belt during an accident.

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To release the belt, press the buckle-release button.

—Seat belt extender

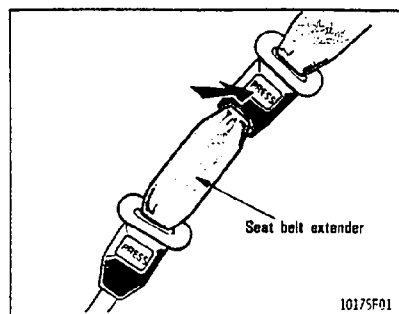
If your seat belt cannot be fastened securely because it is not long enough, a personalized seat belt extender is available from your Toyota dealer free of charge.

Please contact your local Toyota dealer so that the dealer can order the proper required length for the extender. Bring the heaviest coat you expect to wear for proper measurement and selection of length. Additional ordering information is available at your Toyota dealer.

CAUTION:

When using the seat belt extender, observe the following. Failure to follow these instructions could result in less effectiveness of the seat belt restraint system in case of vehicle accident, increasing the chance of personal injury.

- Never use the seat belt extender if you can fasten the seat belt without it.
- Remember that the extender provided for you may not be safe when used on a different vehicle, or for another person and at different seating position than specified.



To connect the extender to the seat belt, insert the tab into the seat belt buckle so that the buckle-release buttons of the extender and the seat belt are located on the same side as shown.

You will hear a click when the tab locks into the buckle.

When releasing the seat belt, press on the buckle-release button on the extender, not on the seat belt. This helps prevent damage to the vehicle interior and extender itself.

When not in use, remove the extender and store in the vehicle for future use.