

V2131

REPORT NO. MGA-95-N005

NEW CAR ASSESSMENT PROGRAM (NCAP)

FRONTAL BARRIER IMPACT TEST

Mazda Motor Corporation
1995 Mazda Millenia
4 Door
NHTSA NO. MS5400

MGA PROVING GROUNDS
5000 WARREN ROAD
BURLINGTON, WI 53105



Test Date: August 31, 1994

Report Date: October 10, 1994

FINAL REPORT

Prepared For:

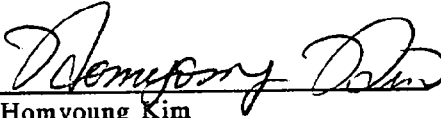
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NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
OFFICE OF MARKET INCENTIVES
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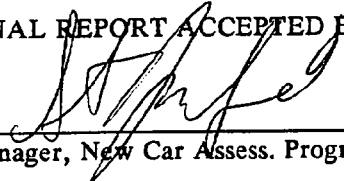
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16. Abstract A 56 kph (35 mph) frontal barrier impact using a 30 load cell barrier was conducted on a 1995 Mazda Millenia 4 Door Sedan at the MGA Proving Grounds and Crash Test Center in Burlington, WI. on August 31, 1994. The barrier impact velocity was 56.3 kph (35.0 mph), and the ambient temperature at the time of impact was 21°C. The post-test maximum static crush was 487 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 433.4 and the 3 msec. Clip (Chest g's) was 45.6 g's. The left and right femur loads for the driver were 5951 and 3688 Newtons, respectively. The passenger's HIC was 202.4 and the 3 msec Clip was 41.9 g's. The left and right femur maximum loads were 5542 and 4960 Newtons respectively.					
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Date of Report Acceptance


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SECTION 1

PURPOSE AND TEST PROCEDURE

This 35 mph frontal barrier impact test is part of the Composite FY'95 Vehicle Barrier Impact Testing Program sponsored by the National Highway Traffic Safety Administration (NHTSA) under Contract No. DTNH22-90-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 (30 mph) 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 FRONTAL BARRIER IMPACT TEST

A load cell barrier consisting of 30 load cells was impacted by a 1995 Mazda Millenia 4-Door at a velocity of 56.3 kph (35.0 mph). The test was performed at the MGA Proving Grounds and Crash Test Center on August 31, 1994. 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 572E, 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, neck load cell, and right/left femur load cells. The driver was also instrumented with right and left lower leg sensors. 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. Both the driver ATD (Serial No. 37) and the right-front passenger ATD (Serial No. 36) were calibrated prior to this test. Certification details, along with instrumentation calibration data, are found in Appendix C and D.

The 59 channels of data were recorded on 6 computers. Appendix B contains the vehicle, load cell barrier and dummy response data traces.

The driver's head struck the inflated airbag. The driver HIC was 433.4. The maximum chest deceleration over 3 milliseconds was 45.6 g's. The left and right femur loads were 5951 and 3688 Newtons respectively.

The right front passenger's HIC was 202.4 and maximum chest deceleration over 3 milliseconds was 41.9 g's. The left and right femur loads were 5542 and 4960 Newtons respectively.

GENERAL TEST AND VEHICLE PARAMETER DATA

Vehicle Yr/Make/Model/Body Style: 1995/Mazda/Millenia/4 Door Sedan

NHTSA No.: MS5400 VIN.: JM1TA2216S1110057

Body color: Starlight Mica Date of Manufacture: 03-94

Engine: 6 Cylinders; C.I.D.; 2.5liters; CC

 Gas; Diesel; Turbocharged

 Longitudinal; X Transverse

Transmission: 4 Speed; Manual; X Automatic; Overdrive

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

Odometer Reading: 259 miles

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

 X P/seats; X Tilt Wheel; X Cruise Control;

Type of Occupant Restraint: Driver and passenger airbag and type II belt system

DATA RECORDED FROM VEHICLE'S TIRE PLACARD:

Tire Pressure (at capacity): Front 2.2 kg/cm² (32 Psi) Rear 2.0 kg/cm² (29 Psi)

Recommended Tire Size: P205/65R15

Recommended Cold Tire Pressure: Front 2.2 kg/cm²; Rear 2.0 kg/cm²

Tires on Vehicle: P205/65R15 ; Manufacturer: Bridgestone

Number of Occupants: 2 Front; 3 Rear; 3rd Seat; 5 TOTAL

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

Type of Front Seat Back: Fixed; X Adj. With; X Power (driver); X Lever (passenger)

Vehicle Capacity Weight (VCW) = 385 kg. (A)

No. of Occupants x 68.0 kg. = 340 kg. (B)

Rated Cargo Weight (RCW) A-B = 45 kg.

GVWR 1852 kg. GAWR: Front 1002 kg.; Rear 850 kg.

GENERAL TEST AND VEHICLE PARAMETER DATA (Cont'd)

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

Right Front = 459 kg Right Rear = 248 kg
Left Front = 450 kg Left Rear = 272 kg
TOTAL FRONT WEIGHT = 909 kg (64 % of Total Vehicle Weight)
TOTAL REAR WEIGHT = 520 kg (36 % of Total Vehicle Weight)
TOTAL UNLOADED DELIVERED WEIGHT (UDW) = 1429 kg

CALCULATION FOR TARGET TEST WEIGHT:

UDW = Unloaded Delivered Weight 1429 kg
VCW = Vehicle Capacity Weight 385 kg DSC = Designated Seating Capacity 5
RCW = VCW - 68 (DSC) = 45 *kg
Target Test Weight = UDW + RCW + (2 dummies x 75.8 kg/dummy)
Target Test Weight = 1626 kg

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND CARGO:

Right Front = 488 kg Right Rear = 322 kg
Left Front = 471 kg Left Rear = 339 kg
TOTAL FRONT WEIGHT = 959 kg (59 % of Total Vehicle Weight)
TOTAL REAR WEIGHT = 661 kg (41 % of Total Vehicle Weight)
TOTAL TEST WEIGHT = 1620 kg

Weight of ballast secured in vehicle trunk area = 0 kg

Vehicle components removed to meet target weight: Rear seat back & cushion,
spare tire, muffler, right rear combination lamp, jack and tool kit.

VEHICLE ATTITUDE (all dimensions in mm):

Delivered Attitude: RF 708 LF 710 RR 746 LR 748

Test Attitude: RF 695 LF 697 RR 705 LR 706

Wheel Base: 2750 mm; C.G. = 1122 mm rearward of front wheel C/L

Remarks: None

*light trucks and MPVs RCW is 136 kgs or manufacturer's value, whichever is less

GENERAL TEST AND VEHICLE PARAMETER DATA (cont'd)

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

<u>Seat Movement</u>	<u>Front</u>		<u>Rear</u>	
	<u>Left</u>	<u>Right</u>	<u>Left</u>	<u>Right</u>
Seat Back Movement	<u>0</u>	<u>0</u>	<u>N/A</u>	<u>N/A</u>
Seat Shift (mm)	<u>4 mm forward LH: 175 mm forward</u>		<u>N/A</u>	<u>N/A</u>
	<u>RH: 5 mm rearward</u>			

Glazing Damage

Backlight/Windshield Cracked windshield

Other Notable Impact Effects: Left side detents of passenger seat track were disengaged during test.

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.:

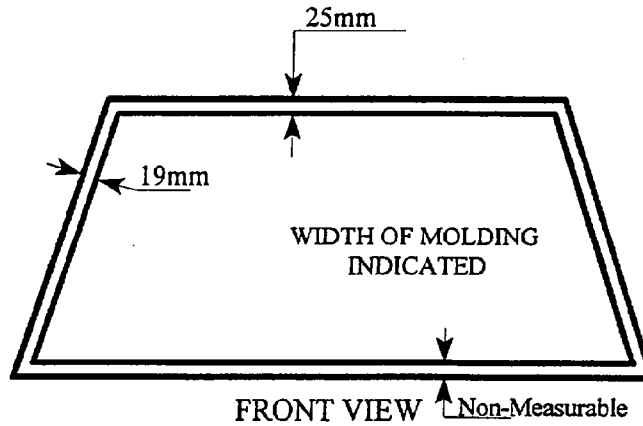
Windshield set in rubber molding within windshield frame

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	2073	2073	100%
LEFT SIDE	2073	2073	100%
TOTAL	4146	4146	100%

AREA OF RETENTION FAILURE:



FAILURE DETAILS: None

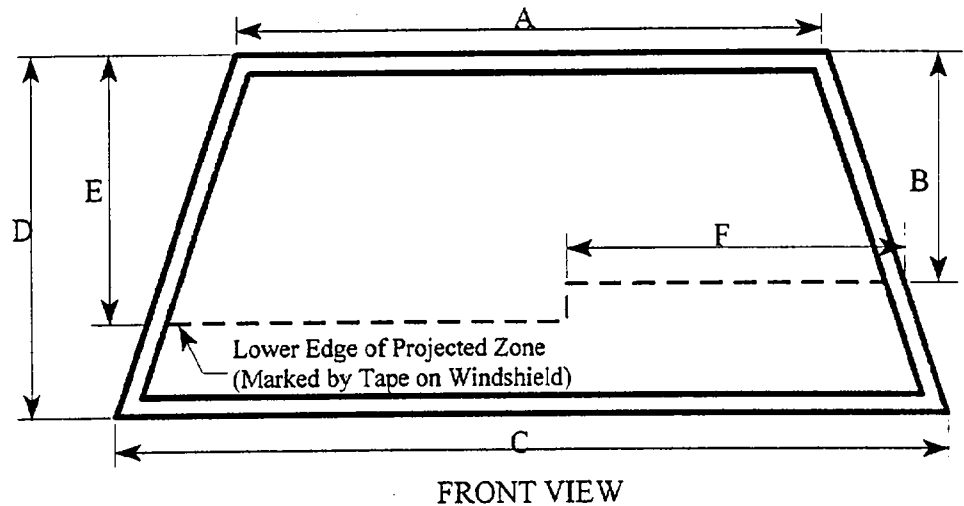
FMVSS NO. 219, "WINDSHIELD ZONE INTRUSION", DATA SHEET

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 contacted by the sphere across the width of the instrument panel. From the outermost contact 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= 1074 mm
B= 422 mm
C= 1517 mm
D= 778 mm
E= 466 mm
F= 804 mm



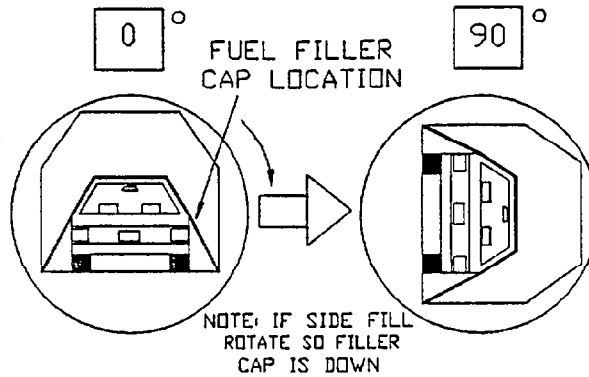
DETAILS OF WINDSHIELD GLASS PENETRATION GREATER THAN 1/4":
(Show location of penetration)

NONE

FMVSS NO. 301 STATIC ROLLOVER DATA SHEET

TEST PHASE: 0° - 90°

Vehicle NHTSA ID No.: MS5400



I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time 2 minutes 42 seconds
(Spec. Range = 1 to 3 minutes)

FMVSS 301 Position Hold Time + 5 minutes 0 seconds
TOTAL 7 minutes 42 seconds
Next whole minute interval 8 minutes

II. FMVSS 301 REQUIREMENTS:

(1) Time Period

First 5 min FROM onset of rotation	6th min.	7th min.	8th min. if reqd.
------------------------------------	----------	----------	-------------------

(2) Maximum Allowable Solvent Spillage

5 ounces	1 ounce	1 ounce	1 ounce
----------	---------	---------	---------

III. ACTUAL TEST VEHICLE SOLVENT SPILLAGE:

0	0	0	0
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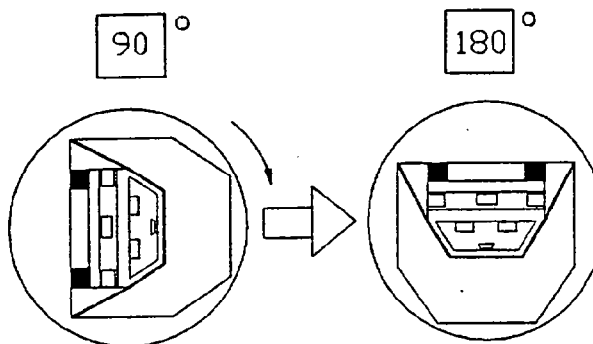
Note: Record Spillage for whole minute intervals only as determined above.

IV. SOLVENT SPILLAGE LOCATIONS(S): None

FMVSS NO. 301 STATIC ROLLOVER DATA SHEET

TEST PHASE: 90° - 180°

Vehicle NHTSA ID No.: MS5400



I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time 2 minutes 30 seconds
(Spec. Range = 1 to 3 minutes)

FMVSS 301 Position Hold Time + 5 minutes 0 seconds
TOTAL 7 minutes 30 seconds
 Next whole minute interval 8 minutes

II. FMVSS 301 REQUIREMENTS:

(1) Time Period

First 5 min FROM onset of rotation	6th min.	7th min.	8th min. if reqd.
------------------------------------	----------	----------	-------------------

(2) Maximum Allowable Solvent Spillage

5 ounces	1 ounce	1 ounce	1 ounce
----------	---------	---------	---------

III. ACTUAL TEST VEHICLE SOLVENT SPILLAGE:

0	0	0	0
---	---	---	---

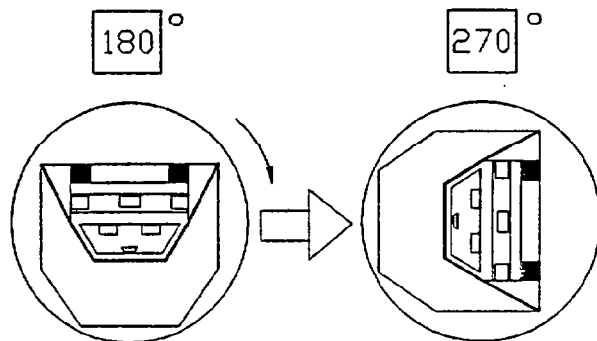
Note: Record Spillage for whole minute intervals only as determined above.

IV. SOLVENT SPILLAGE LOCATIONS(S): None

FMVSS NO. 301 STATIC ROLLOVER DATA SHEET

TEST PHASE: 180° - 270°

Vehicle NHTSA ID No.: MS5400



I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time 2 minutes 14 seconds
 (Spec. Range = 1 to 3 minutes)

FMVSS 301 Position Hold Time + 5 minutes 0 seconds

TOTAL 7 minutes 14 seconds

Next whole minute interval 8 minutes

II. FMVSS 301 REQUIREMENTS:

(1) Time Period

First 5 min FROM onset of rotation	6th min.	7th min.	8th min. if reqd.
------------------------------------	----------	----------	-------------------

(2) Maximum Allowable Solvent Spillage

5 ounces	1 ounce	1 ounce	1 ounce
----------	---------	---------	---------

III. ACTUAL TEST VEHICLE SOLVENT SPILLAGE:

0	0	0	0
---	---	---	---

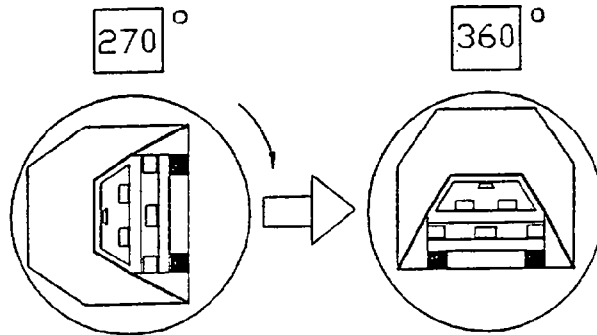
Note: Record Spillage for whole minute intervals only as determined above.

IV. SOLVENT SPILLAGE LOCATIONS(S): None

FMVSS NO. 301 STATIC ROLLOVER DATA SHEET

TEST PHASE: 270° - 360°

Vehicle NHTSA ID No.: MS5400



I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time 2 minutes 46 seconds
(Spec. Range = 1 to 3 minutes)

FMVSS 301 Position Hold Time + 5 minutes 0 seconds
TOTAL 7 minutes 46 seconds
 Next whole minute interval 8 minutes

II. FMVSS 301 REQUIREMENTS:

(1) Time Period

First 5 min FROM onset of rotation	6th min.	7th min.	8th min. if reqd.
------------------------------------	----------	----------	-------------------

(2) Maximum Allowable Solvent Spillage

5 ounces	1 ounce	1 ounce	1 ounce
----------	---------	---------	---------

III. ACTUAL TEST VEHICLE SOLVENT SPILLAGE:

0	0	0	0
---	---	---	---

Note: Record Spillage for whole minute intervals only as determined above.

IV. SOLVENT SPILLAGE LOCATIONS(S): None

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. Camera Locations
6. 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: 1995/Mazda/Millenia/4 Door Sedan

VEH. NHTSA NO.: MS5400 TEST DATE: August 31, 1994

MAX. ACCELERATION VALUES: (g's)	DRIVER # <u>37</u>	PASSENGER # <u>36</u>
Head Channel X	-51.0	-37.8
Head Channel Y	5.7	-23.6
Head Channel Z	21.7	17.9
HEAD RESULTANT	53.2	40.1
Chest Channel X	-46.2	-45.0
Chest Channel Y	7.9	7.7
Chest Channel Z	-8.9	16.6
CHEST RESULTANT (CLIP)	45.6	41.9
TIME INTERVAL (msec) [0.003 seconds minimum]	t ₁ = 70.6 t ₂ = 73.6	t ₁ = 61.6 t ₂ = 64.5

HEAD INJURY CRITERIA (HIC) VALUES:

HIC	433.4	202.4
t ₁ = (msec)	51.9	49.7
t ₂ = (msec)	87.9	85.7
Avg. Accel. t ₁ to t ₂ (g's)	42.9	31.6

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

MAX. COMPRESSIVE FEMUR FORCES:

Right Side (N)	3688	4960
Left Side (N)	5951	5542

MAXIMUM SEAT BELT FORCES:

Lap Belt (N)	1339	1118
Shoulder Belt (N)	4892	3576

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: 1995/Mazda/Millenia/4 Door Sedan

VEHICLE NHTSA NO.: MS5400 TEST DATE: August 31, 1994

MAXIMUM VALUES	DRIVER DUMMY #37	PASSENGER DUMMY #36
Neck Load X (N)	-357.1	-677.8
Neck Load Y (N)	259.4	-544.7
Neck Load Z (N)	-1607.7	-1837.6
Neck Moment X (N.M)	-13.0	45.9
Neck Moment Y (N.M)	-44.6	-40.8
Neck Moment Z (N.M)	-11.6	-31.0
Chest Deflection X (mm)	35.8	30.7
Time of Max. Occurrence	76 msec.	64 msec.

PART 572 DUMMY IN-VEHICLE POSITION

Vehicle NHTSA No.: MS5400 Vehicle: 1995 Mazda Millenia 4 Door

<u>SEAT TYPE:</u>	<u>ADJUSTER TYPE:</u>	<u>BUCKET SEAT BACK TYPE:</u>
<input type="checkbox"/> Bench	Driver: <input type="checkbox"/> Manual	<input type="checkbox"/> Fixed
<input checked="" type="checkbox"/> Bucket	<input checked="" type="checkbox"/> Power	<input checked="" type="checkbox"/> Adjustable Reclining
<input type="checkbox"/> Split Bench		

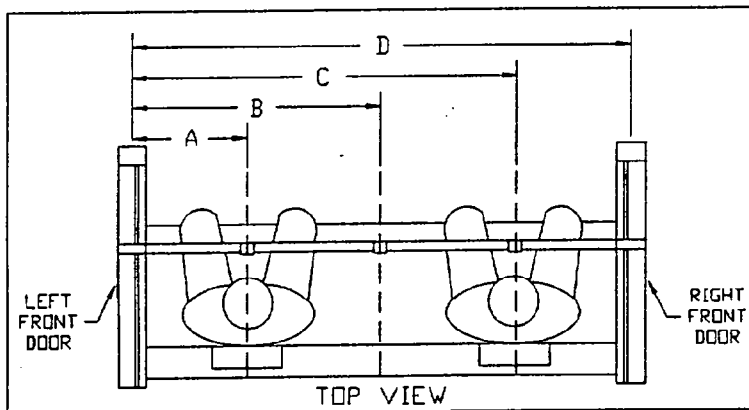
Passenger: Manual
 Power

Driver

Passenger

Adjusted to the mid position

Seat notch 13th from front



37 DUMMY ID 36

- | | |
|--|----------------|
| A = Left Door to Driver Centerline | <u>408</u> mm |
| B = Left Door to Center Passenger Centerline | <u>757</u> mm |
| C = Left Door to Right Passenger Centerline | <u>1110</u> mm |
| D = Left Door to Right Door | <u>1514</u> mm |

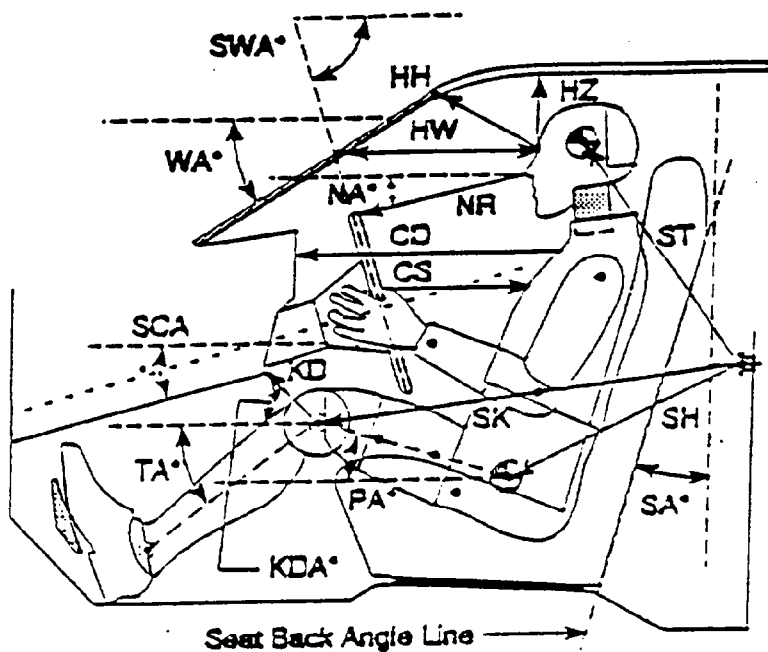
FRONT SEAT MEASUREMENT TABLE

Units (mm)

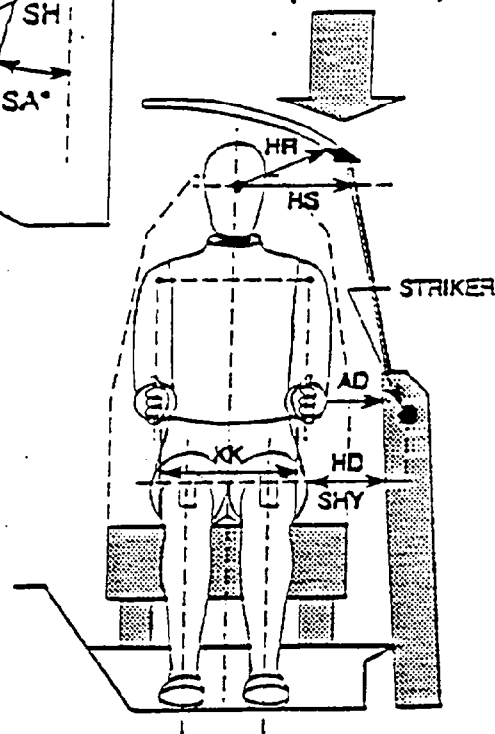
	DRIVER (Serial #37)	PASSENGER (Serial #36)
WA°	28.5°	
SWA°	71.0°	N/A
SCA°	N/A	N/A
SA°	21°	21°
HZ	191	183
HH	340	326
HW	603	573
HR	212	210
NR	384 Angle 11.4°	N/A
CD	569	626
CS	314	N/A
RA	197	N/A
KDL	160 Angle 29.2°	148
KDR	152	168 Angle 18.5°
PA°	23.6°	21.0°
TA°	40.1°	38.6°
KK	293	231
ST	522 Angle 83.9°	504 Angle 79.2°
SK	561 Angle -0.6°	565 Angle -0.5°
SH	250 Angle 38.1°	230 Angle 40.0°
SHY	260	256
HS	306	299
HD	125	128
AD	132	92

N/A = Not Applicable

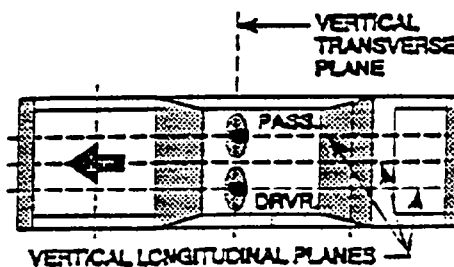
FRONT SEAT MEASUREMENTS



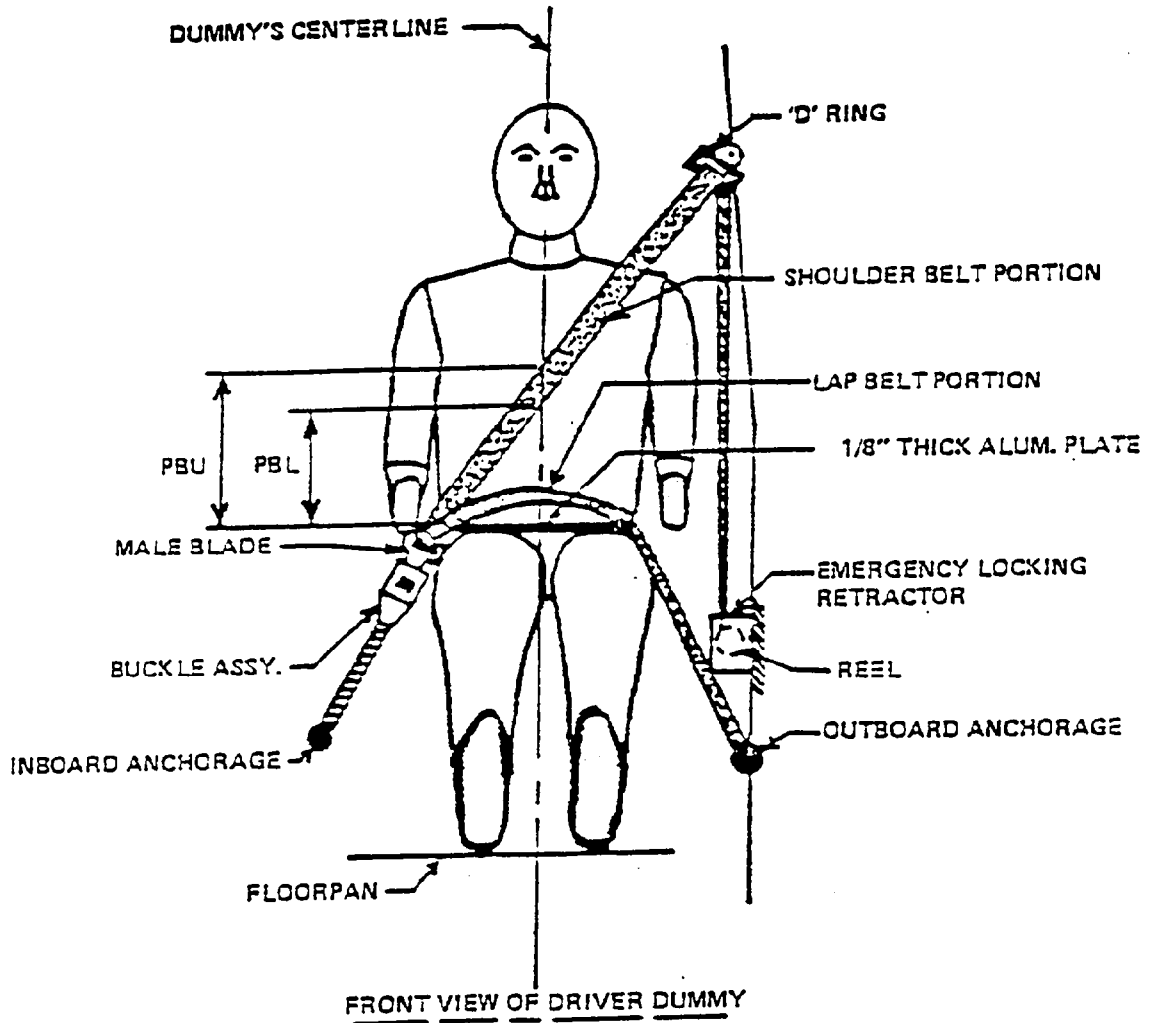
- AD - Arm to Door
- HD - H-Point to Door
- HR - Head to Side Header
- HS - Head to Side Window
- KK - Knee to Knee
- SHY- Striker to H-Point (Y Direction)



- CD - Chest to Dash
- CS - Steering Wheel to Chest
- HH - Head to Header
- HW - Head to Windshield
- HZ - Head to Roof
- KDA - Knee to Dash Angle
- KDL - Left Knee to Dash
- KDR - Right Knee to Dash
- NA - Nose to Rim Angle
- NR - Nose to Rim
- PA - Pelvic Angle
- RA - Rim to Abdomen
- SA - Seat Back Angle
- SCA - Steering Column Angle
- SH - Striker to H-Point
- SK - Striker to Knee
- ST - Striker to Head
- SWA - Steering Wheel Angle
- TA - Tibial Angle
- WA - Windshield Angle



SEAT BELT POSITIONING DATA



(illustration)

Dimension = mm

		DRIVER DUMMY	PASSENGER DUMMY
<u>PBU</u> --	Top surface of alum. plate to upper edge	350	314
<u>PBL</u> --	Top surface of alum. plate to belt lower edge	275	234

Note: Adjustable "D" ring set in the fourth position for the highest.

SEAT BELT PERFORMANCE ASSESSMENT TEST DATA

<u>BELT LENGTH DATA:</u>	<u>Driver</u>	<u>Passenger</u>
Belt length from trim panel exit to bolt hole anchor point for continuous webbing systems.	<u>172 mm</u>	<u>172 mm</u>
Shoulder belt length as measured on Part 572 Dummy.	<u>820 mm</u>	<u>850 mm</u>
Lap belt length as measured on Part 572 Dummy.	<u>798 mm</u>	<u>740 mm</u>

SHOULDER BELT SPOOL-OFF DATA:

As determined by film analysis	<u>51 mm</u>	<u>51 mm</u>
As determined mechanically	<u>78* mm</u>	<u>114 mm</u>
As determined electronically**	<u>NR</u>	<u>NR</u>

BELT STRETCH DATA:

Measured electronically between shoulder belt load cell and the "D" ring.	<u>NR</u>	<u>NR</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>26 msec</u>	<u>24 msec</u>
---	----------------	----------------

NR = Not Recorded

* The cube for lap belt was broken during test

** The potentiometer was not installed in this test because of no space.

CAMERA LOCATIONS

VEH. NHTSA NO.: MS5400 ; TEST DATE: August 31, 1994; TIME: 3:37 p.m.

VEH. YEAR/MAKE/MODEL/BODY STYLE: 1995/Mazda/Millenia/4 Door Sedan

CAMERA POSITION NO.	VIEW	CAMERA POSITIONS (mm.)*			ANGLE (deg)	FILM PLANE TO HEAD TARGET (mm)	LENS (mm)	SPEED (fps)
		X	Y	Z				
1	Real-Time Left Side View	-	-	-	-	-	10	24
2	Left Front View	1090	8470	1170	90°	8106	25	1026
3	Steering Column Top	1310	7620	1560	90°	7256	25	1136
4	Steering Column Bottom	1310	7600	1015	90°	7236	25	1000
5	Left Driver Close-up	1720	6410	1000	90°	6046	35	980
6	Left Angle	4280	5000	1930	50°		50	1053
7	Driver Onboard Seat Belt						35	985
8	Passenger Onboard Seat Belt						35	786
9	Right Overall	2360	-8010	985	90°	7646	13	1020
10	Right Front	950	-7430	1080	90°	7066	25	1000
11	Right Passenger Close-up	1310	-6590	1070	90°	6226	50	1042
12	Right Angle	3890	-5000	2170	50°		35	917
13	Top View Wide	370	0	4340			13	no timing ¹
14	Top Driver	-250	380	2350			13	1005
15	Top Passenger	-250	-380	2470			13	844
16	Pit Engine	1170	0	-3155			13	1005
17	Fuel Tank	2200	330	-3165			13	1000

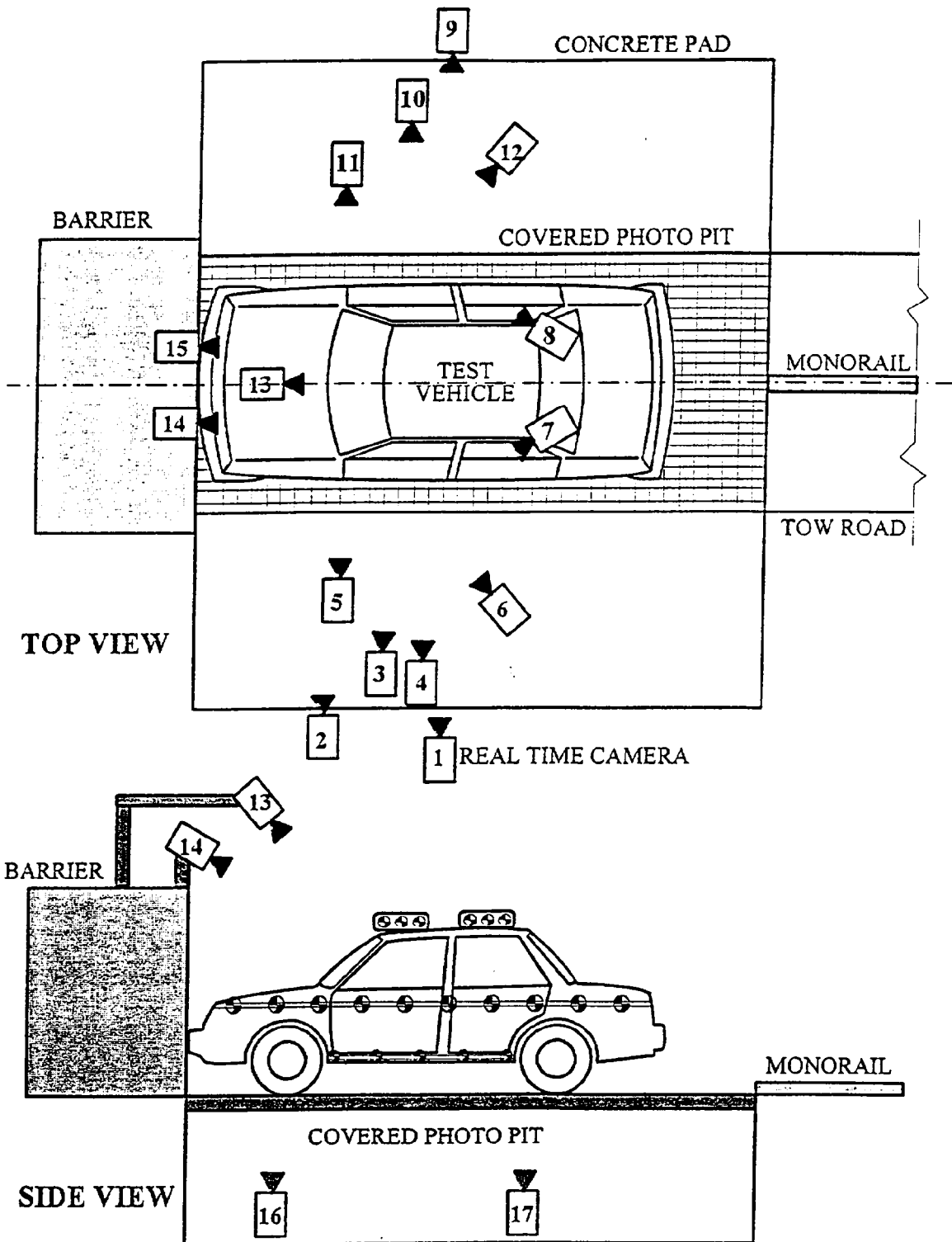
COORDINATES:

- * +X = film plane rearward of barrier
- +Y = film plane to left of monorail centerline
- +Z = film plane to above ground level

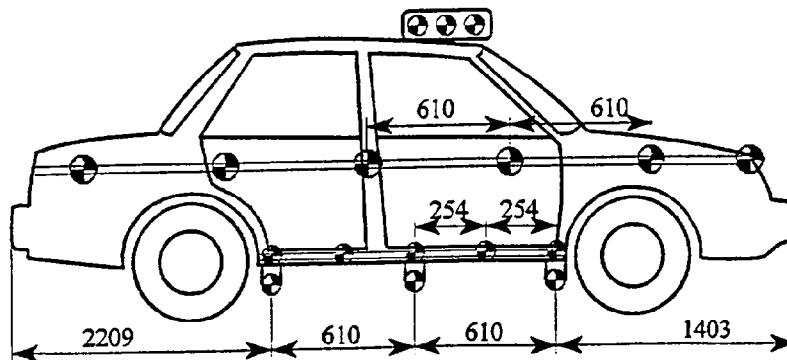
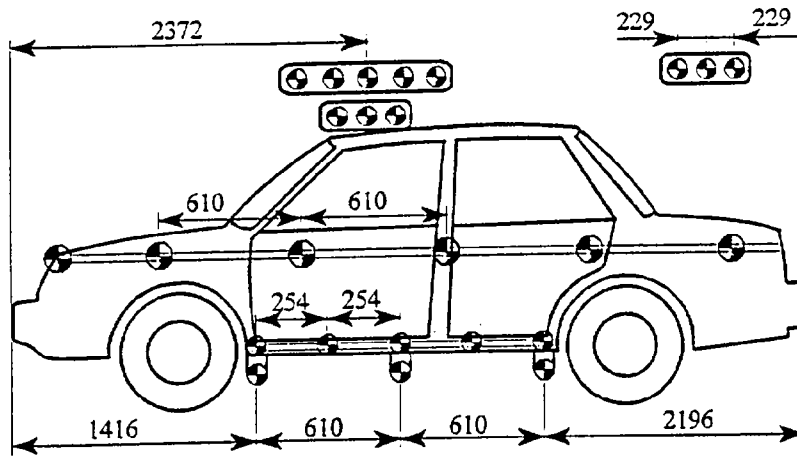
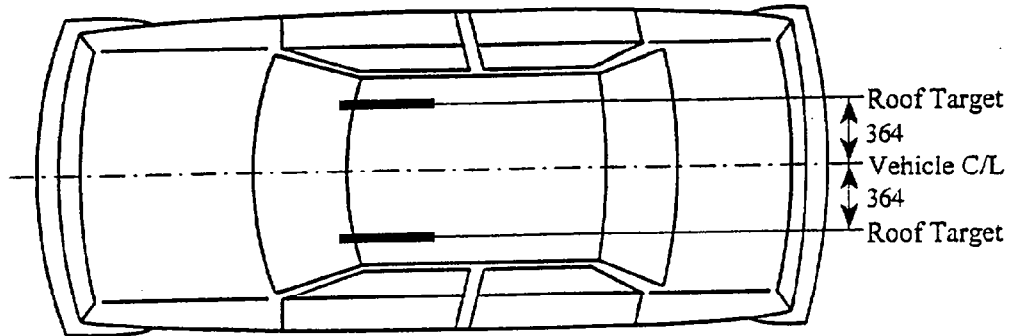
ORIGIN: For X and Y it is the Impact Point. For Z it is the Floor.

¹ No timing mark was recorded. The camera was preset to 1000 fps.

CAMERA LOCATIONS (Cont'd)



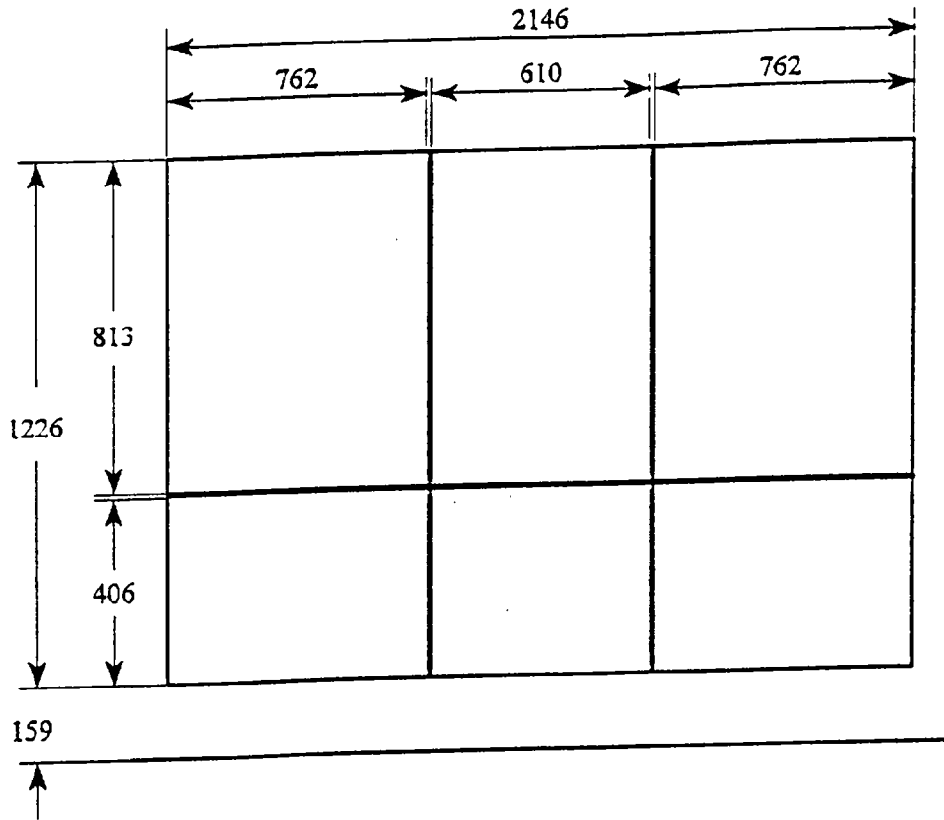
VEHICLE TARGET LOCATIONS



(DIMENSIONS IN MM)

LOAD CELL LOCATIONS ON FIXED BARRIER

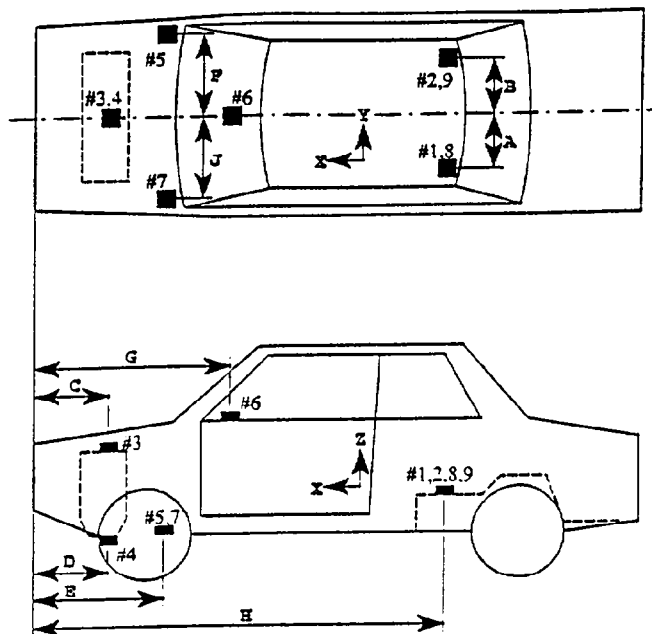
30 Load Cells
6 Rows
9 Columns
6 Groupings (5 cells/group)



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	648
B	660
C	978
D	784
E	892
F	676
G	1461
H	2959
J	676

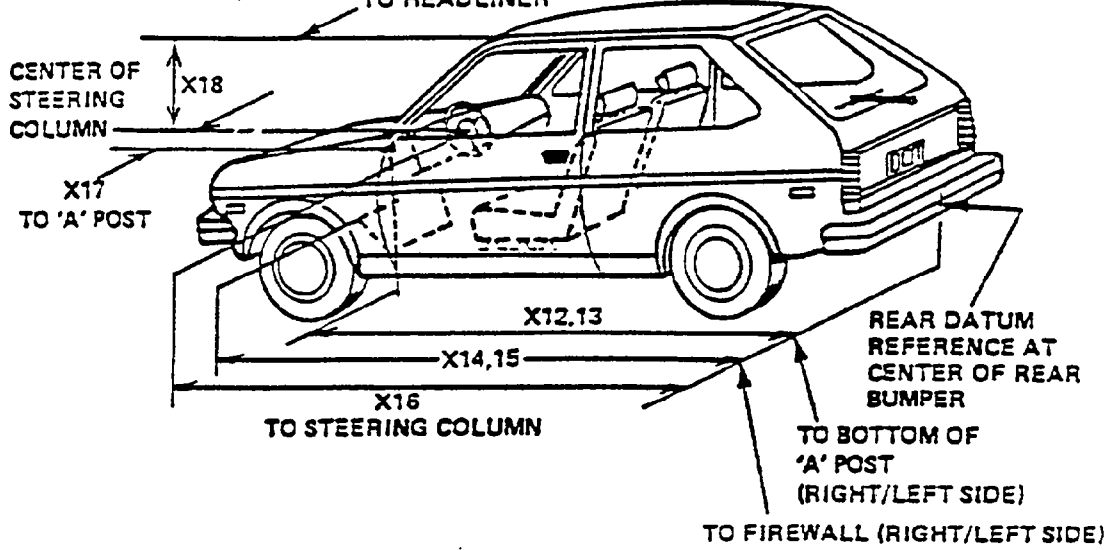
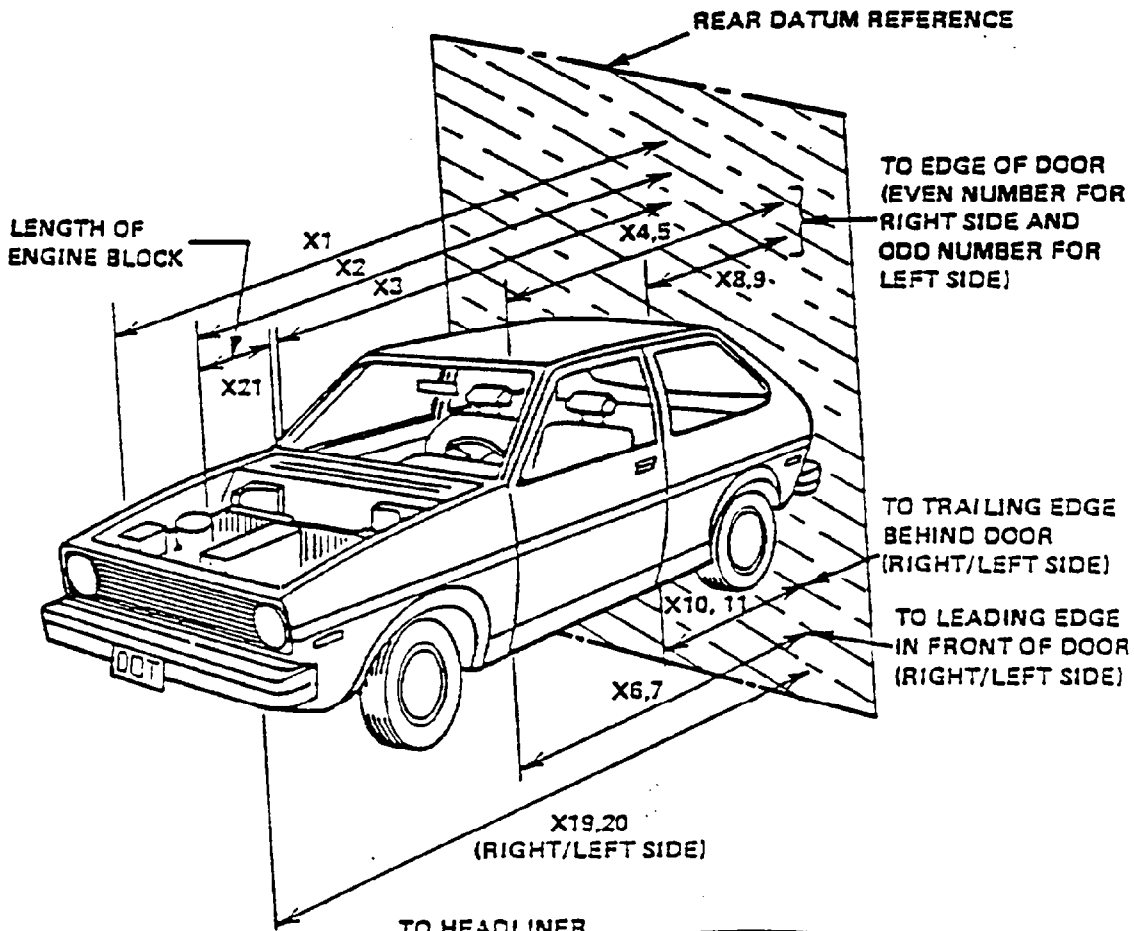
ACCELEROMET	ACCELEROMETER	DIRECTIO
1 and 8	Left Rear Seat Crossmember	X
2 and 9	Right Rear Seat Crossmember	X
3	Top of Engine	X
4	Bottom of Engine	X
5	Right Side Brake Caliper	X
6	Instrument Panel	X
7	Left Disc Brake Caliper	X

* 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	4832	4345	487
X2	Rear Surface of Vehicle to Front of Engine	4370	4125	245
X3	Rear Surface of Vehicle to Firewall	3688	3573	115
X4	Rear Surface to Upr. Leading Edge of Rt. Door	3290	3281	9
X5	Rear Surface to Upr. Leading Edge of Left Door	3290	3285	5
X6	Rear Surface to Lwr. Leading Edge of Rt. Door	3304	3295	9
X7	Rear Surface to Lwr. Leading Edge of Left Door	3306	3310	-4
X8	Rear Surface to Upr. Trailing Edge of Rt. Door	2277	2250	27
X9	Rear Surface to Upr. Trailing Edge of Left Door	2268	2266	2
X10	Rear Surface to Lwr. Trailing Edge of Rt. Door	2263	2256	7
X11	Rear Surface to Lwr. Trailing Edge of Left Door	2262	2269	-7
X12	Rear Surface to Bottom of 'A' Post on Rt. Side	3318	3313	5
X13	Rear Surface to Bottom of 'A' Post on Left Side	3320	3333	-13
X14	Rear Surface to Firewall on Right Side	3654	3596	58
X15	Rear Surface to Firewall on Left Side	3662	3619	43
X16	Rear Surface to Steering Column	2856	2836	20
X17	Center of Steering Column to 'A' Post	349	357	-8
X18	Center of Steering Column to Headlining	394	404	-10
X19	Rear Surface to Right Side of Front Bumper	4664	4313	351
X20	Rear Surface to Left Side of Front Bumper	4666	4296	370
X21	Length of Engine Block	390	390	0

TEST VEHICLE MEASUREMENTS



ACCIDENT INVESTIGATION DIVISION DATA
FOR 35 MPH FRONTAL BARRIER IMPACT

VEHICLE MAKE/MODEL/BODY STYLE: 1995/Mazda/Millenia/4 Door Sedan

VEH. NHTSA NO.: MS5400 ; VIN: JM1TA2216S1110057

MODEL YEAR: 1995 ; BUILD DATE: 03-94 ; TEST DATE: August 31, 1994

VEH. SIZE CATEGORY: Mid ; TEST WEIGHT: 1620 kg

VEH. WHEELBASE: 2750 mm ; FRONT OVERHANG: 930 mm ; OVERALL WIDTH: 1774 mm

ACCELEROMETER DATA:

LOCATION: As per measurements on pages 4-12

CALIBRATION PROCEDURE: As per MGA Calibration Procedure

LINEARITY: >99.9% ; INTEGRATION ALGORITHM: Trapezoidal

VEH: IMPACT SPEED: 56.3 kph ; TIME OF SEPARATION: 77 msec

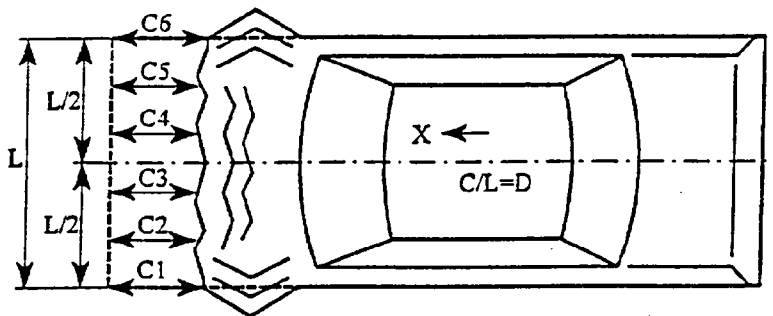
VELOCITY CHANGE: 65.4 kph

COLLISION DEFORMATION CLASSIFICATION (CDC) CODE:

F (Frontal)

CRUSH DEPTH DIMENSIONS:

C1 =	<u>370</u> mm
C2 =	<u>372</u> mm
C3 =	<u>479</u> mm
C4 =	<u>487</u> mm
C5 =	<u>437</u> mm
C6 =	<u>351</u> mm



MIDPOINT OF DAMAGE: D = Vehicle Centerline (Longitude)

LENGTH OF DAMAGED REGION: L = 1448 mm

APPENDIX A
PHOTOGRAPHS

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Photo No. A-5 - Pre-Test Left Side View of Test Vehicle	A-5
Photo No. A-6 - Post-Test Left Side View of Test Vehicle	A-6
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Photo No. A-35 - Post-Test Passenger Dummy Position Right Side View (Door Open)	A-35
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Photo No. A-50 - Rollover 270°	A-50
Photo No. A-51 - Rollover 360°	A-51

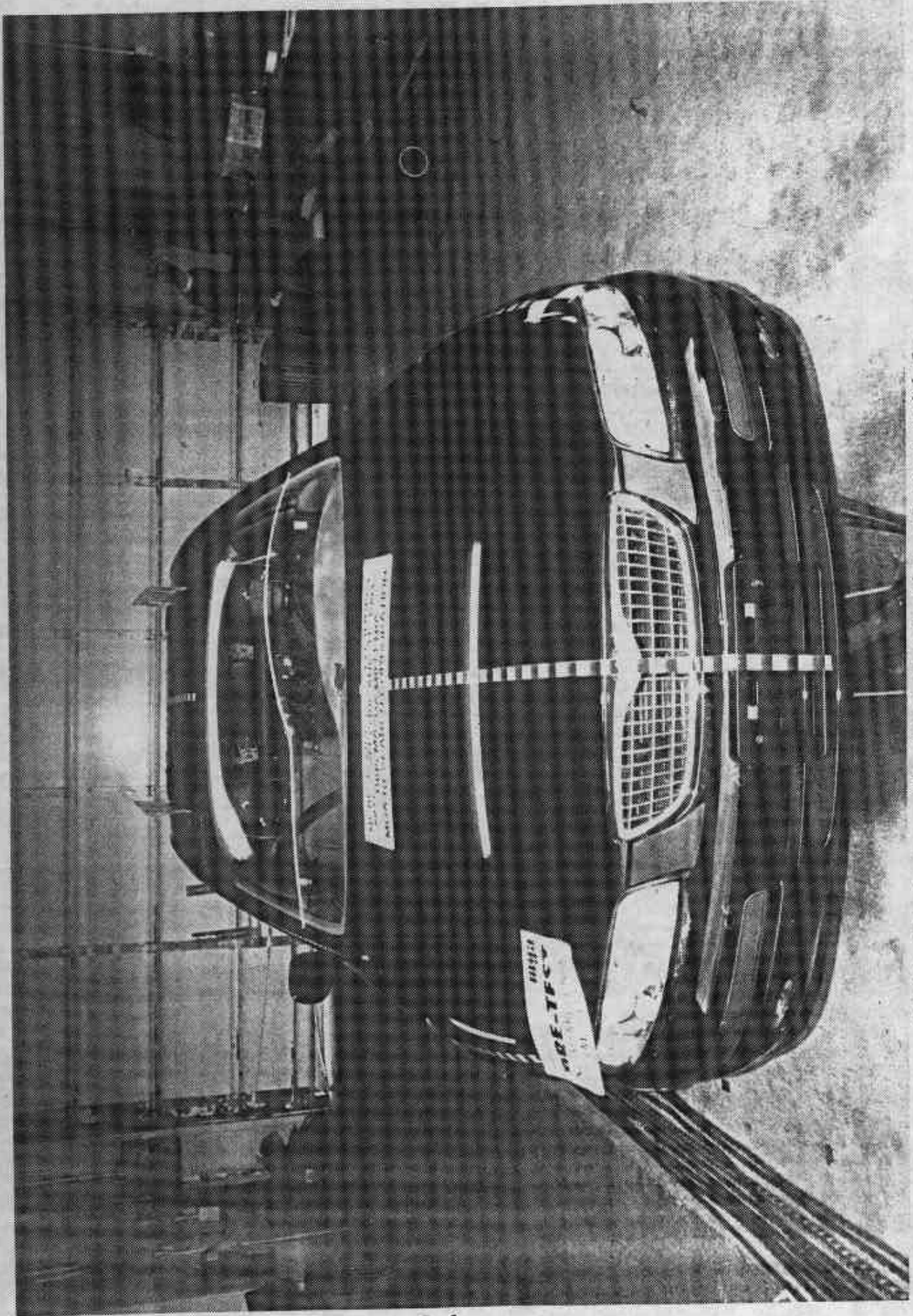


Photo No. A-1 - Pre-Test Front View of Test Vehicle

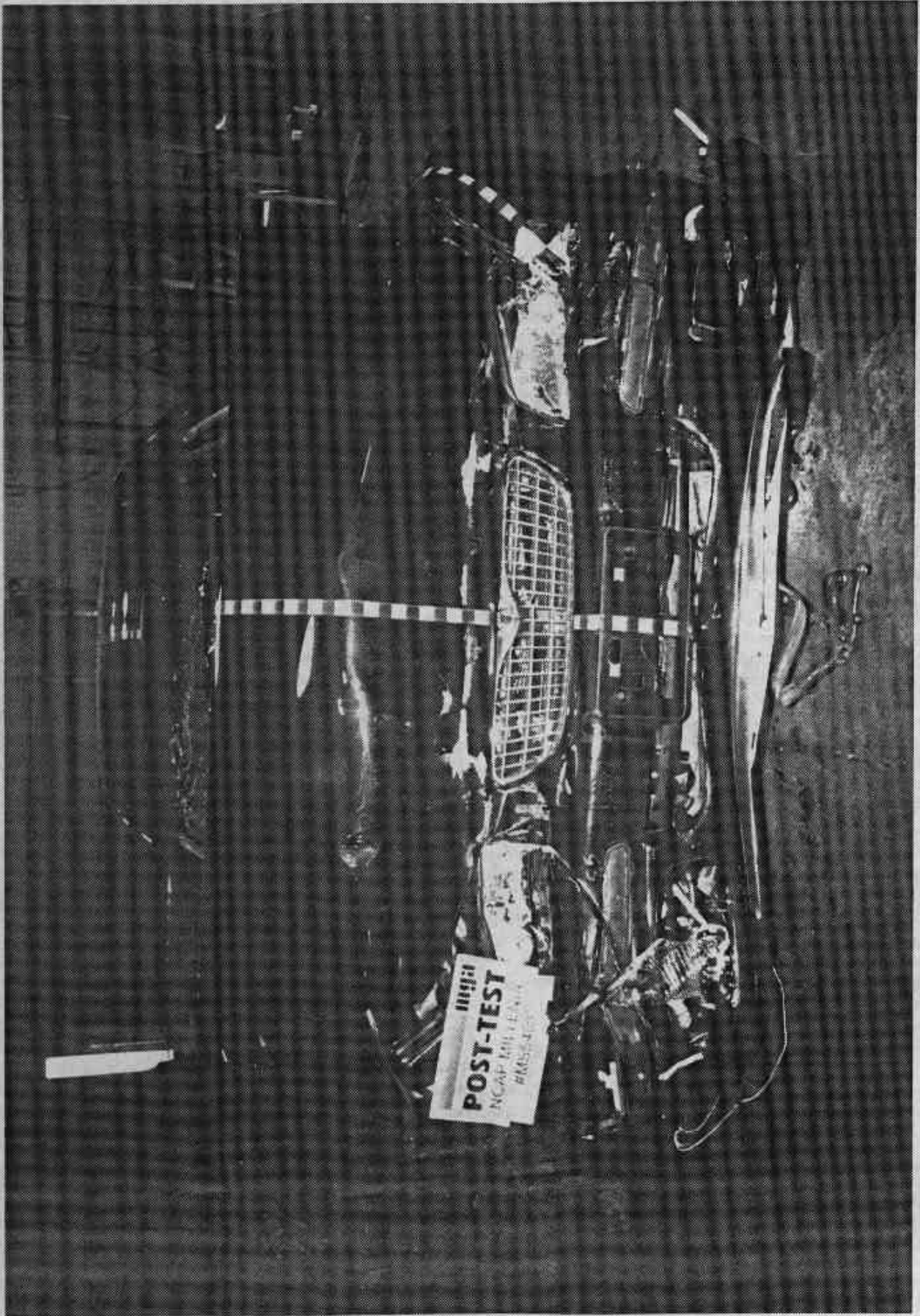


Photo No. A-2 - Post-Test Front View of Test Vehicle

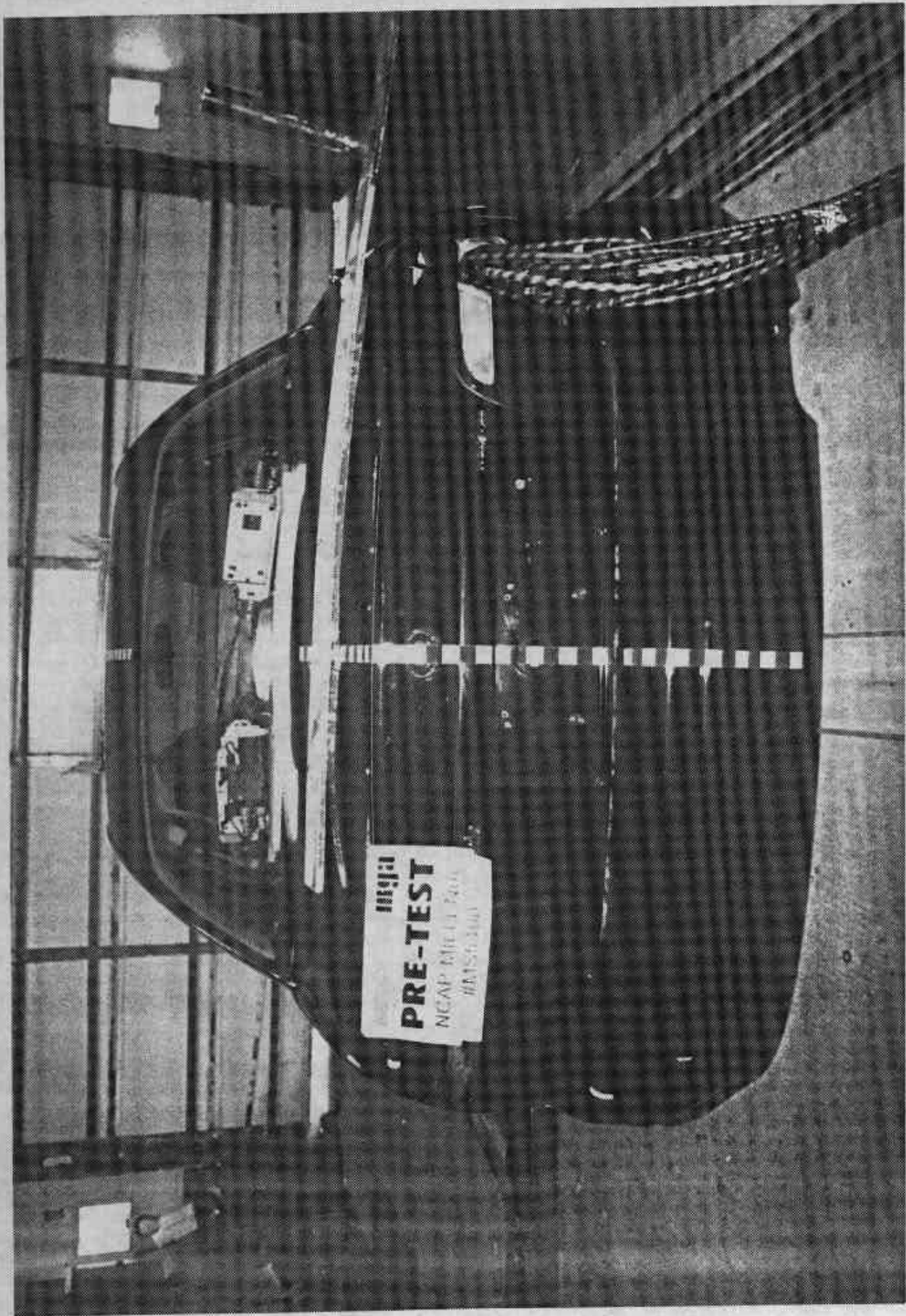


Photo No. A-3 - Pre-Test Rear View of Test Vehicle

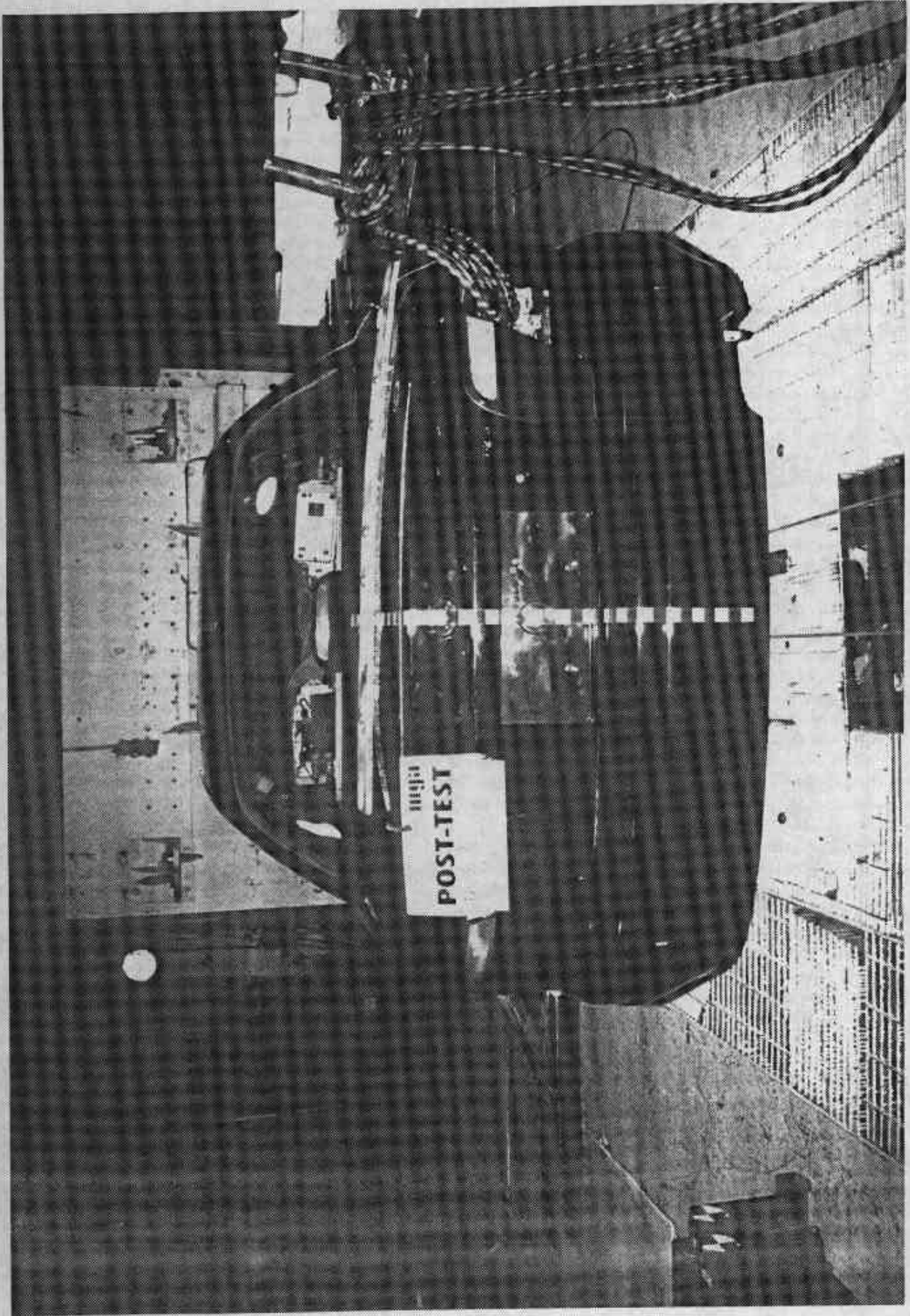
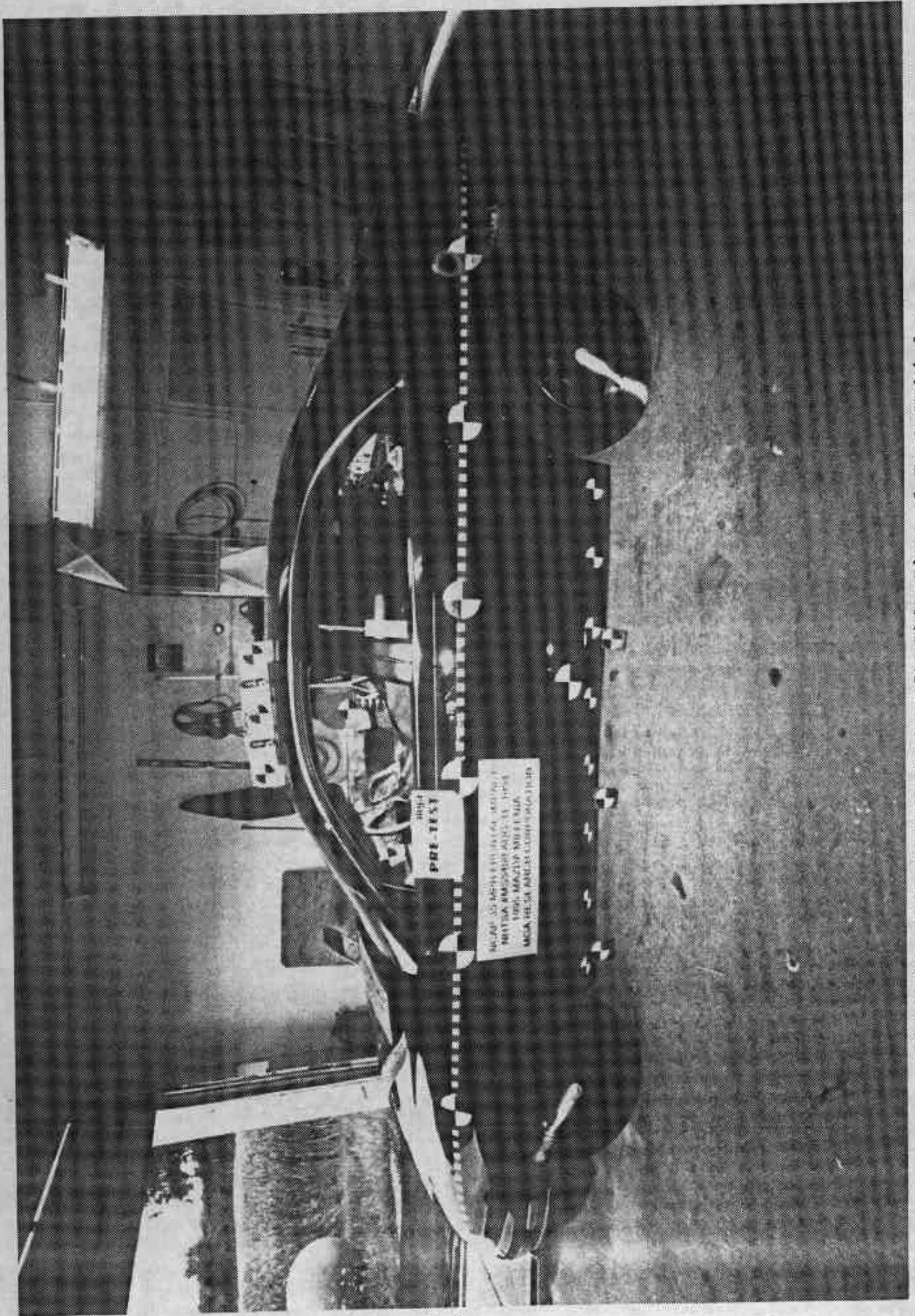


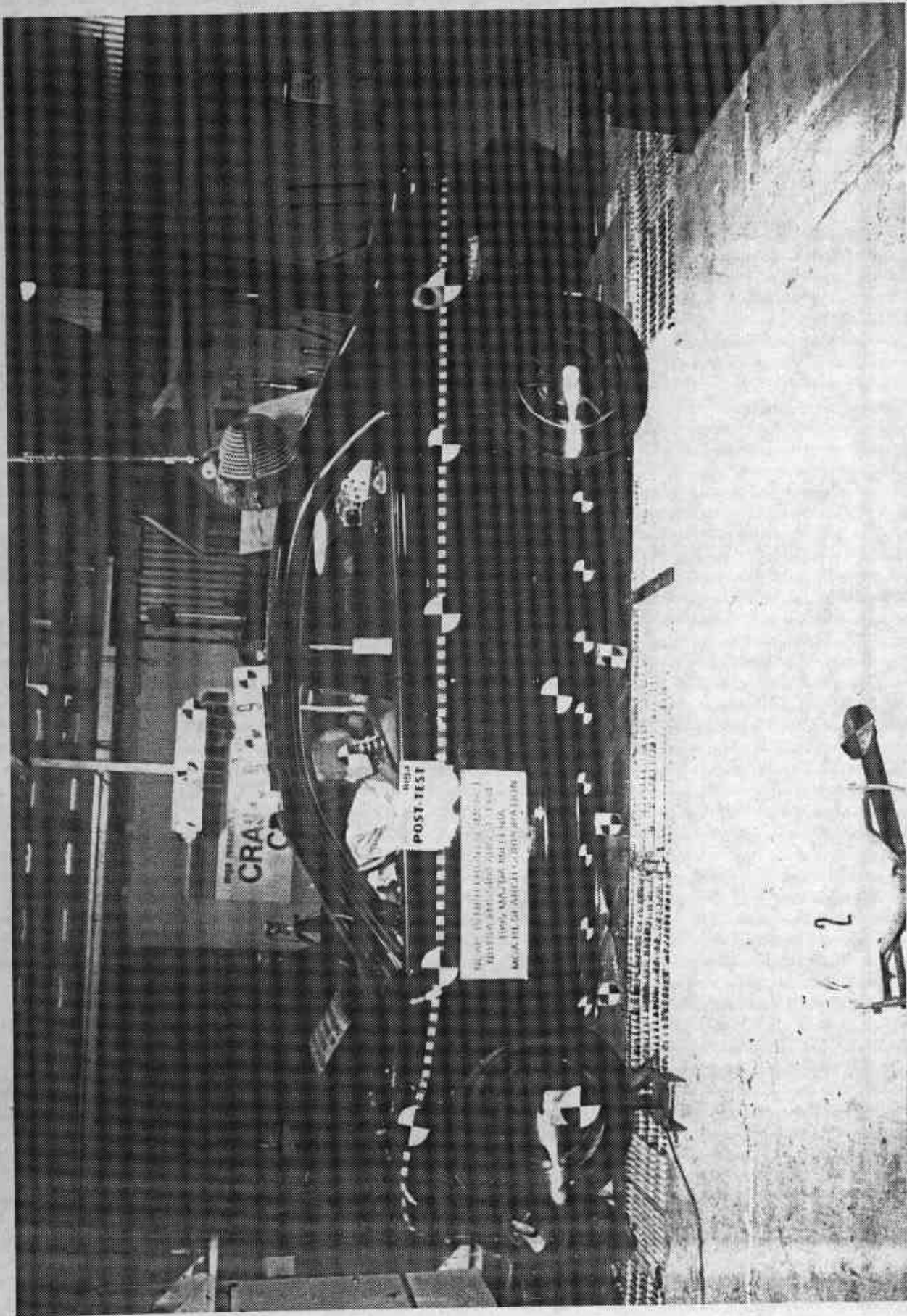
Photo No. A-4 - Post-Test Rear View of Test Vehicle

A-4



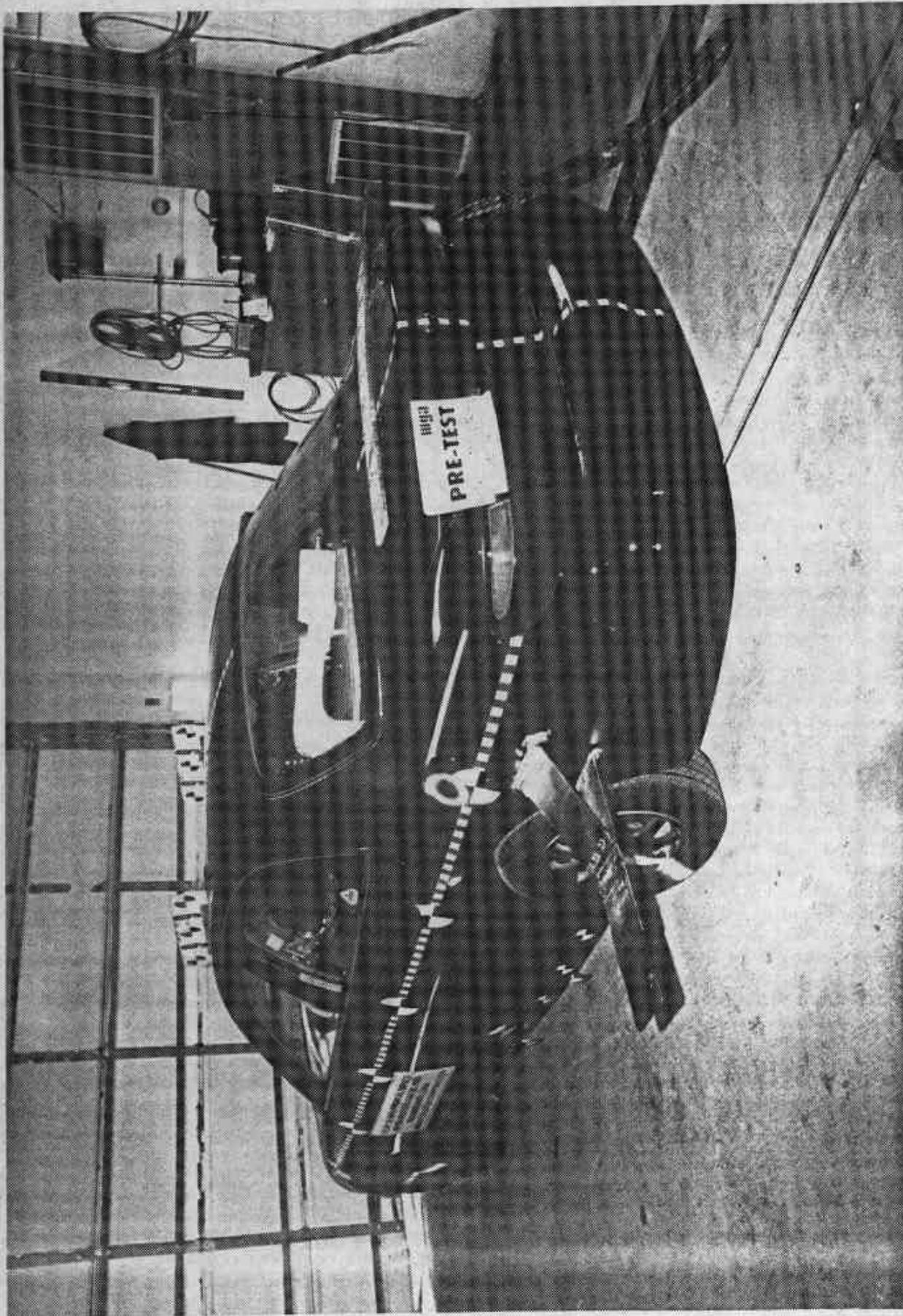
A-5

Photo No. A-5 - Pre-Test Left Side View of Test Vehicle



A-6

Photo No. A-6 - Post-Test Left Side View of Test Vehicle



A-7

Photo No. A-7 - Pre-Test Left Rear Three-Quarter View of Test Vehicle

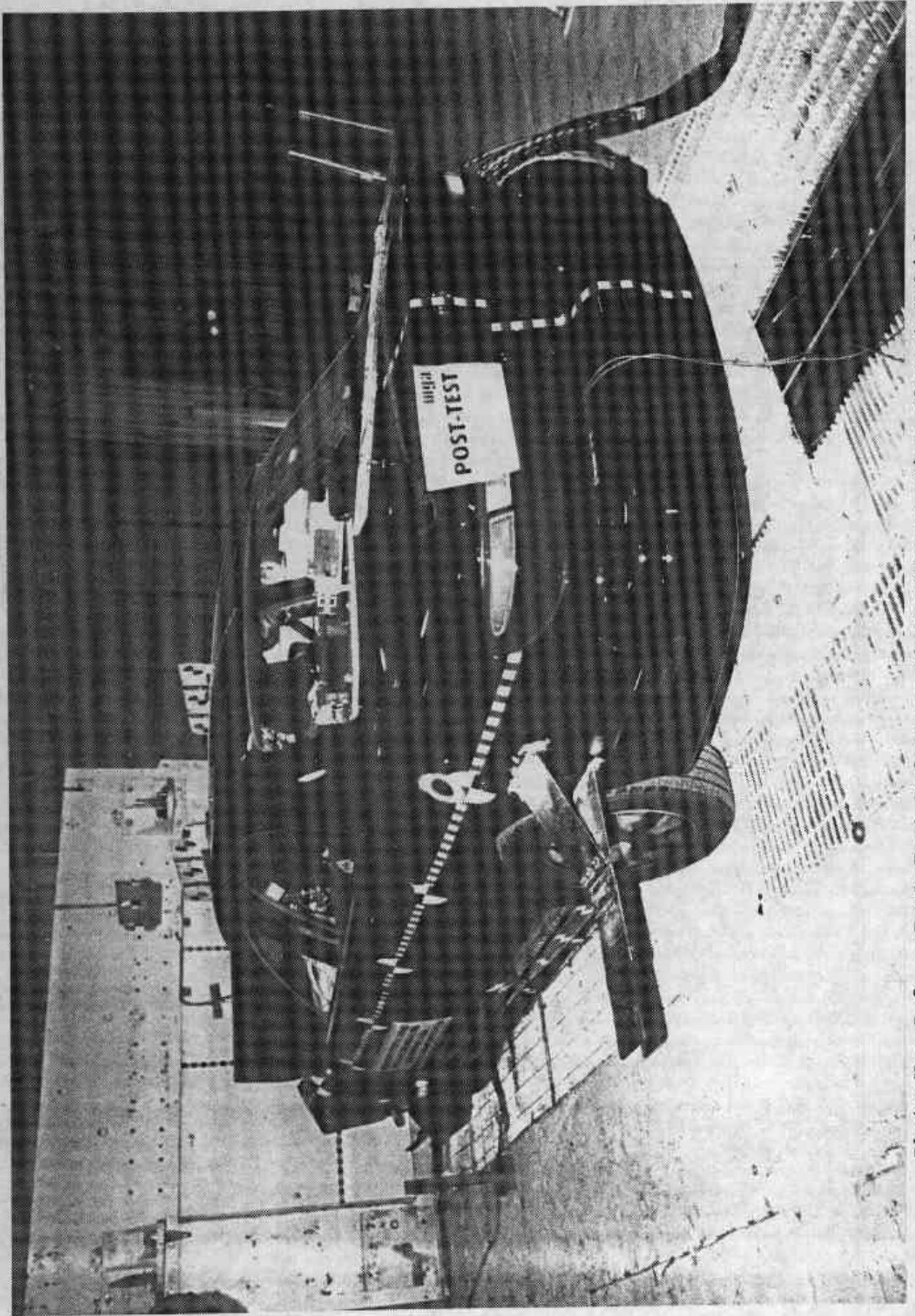


Photo No. A-8 - Post-Test Left Rear Three-Quarter View of Test Vehicle

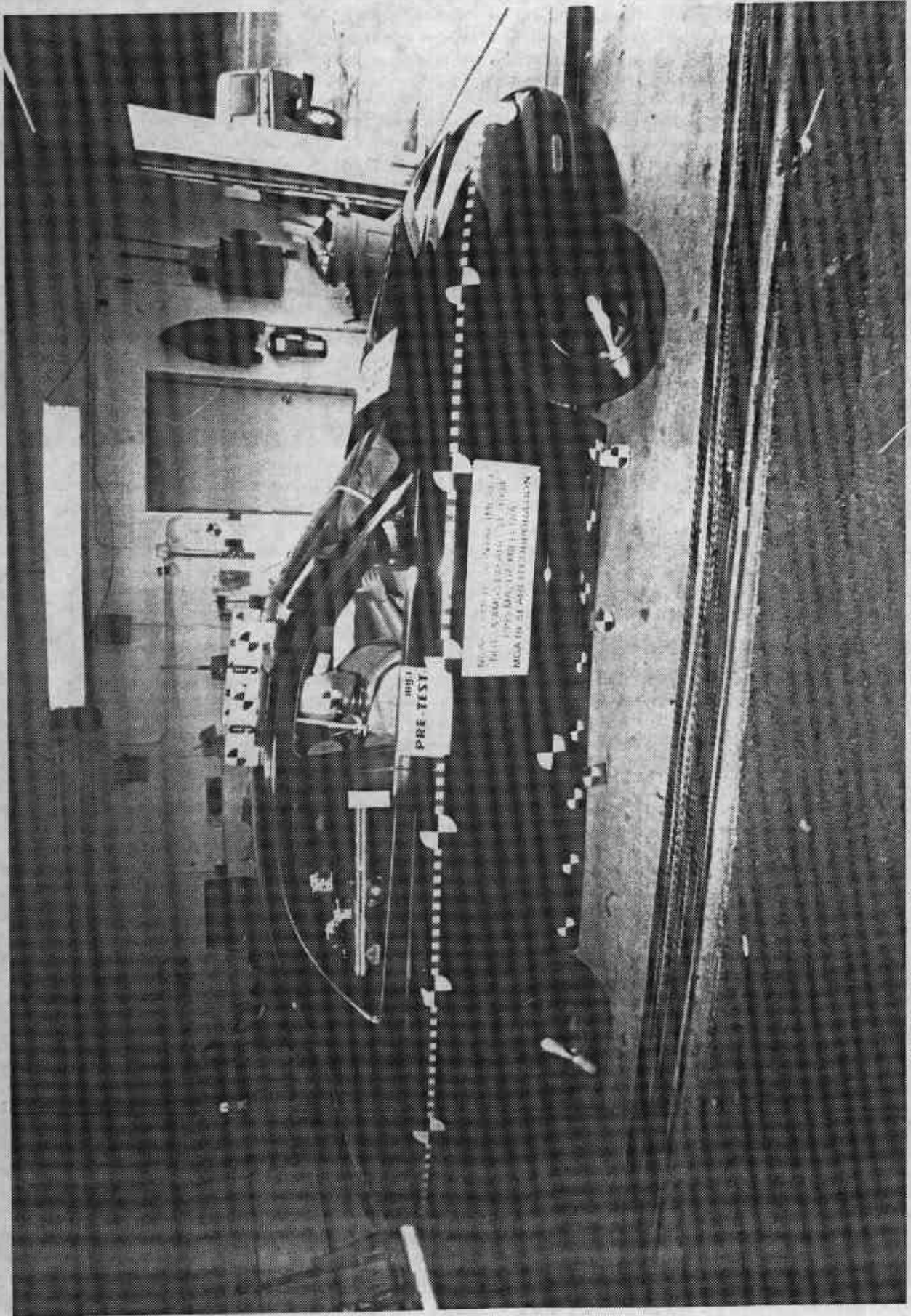
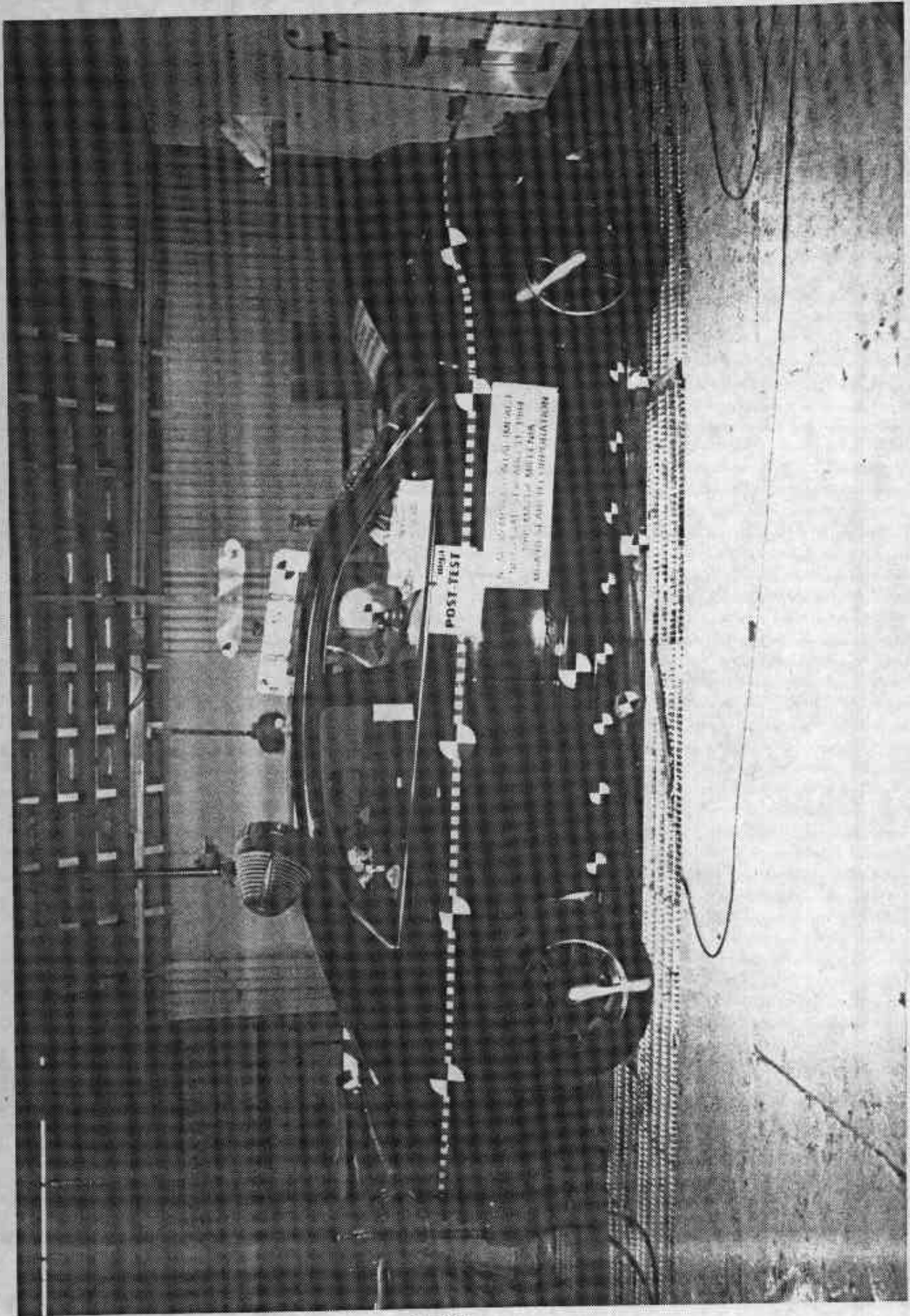


Photo No. A-9 - Pre-Test Right Side View of Test Vehicle



A-10

Photo No. A-10 - Post-Test Right Side View of Test Vehicle

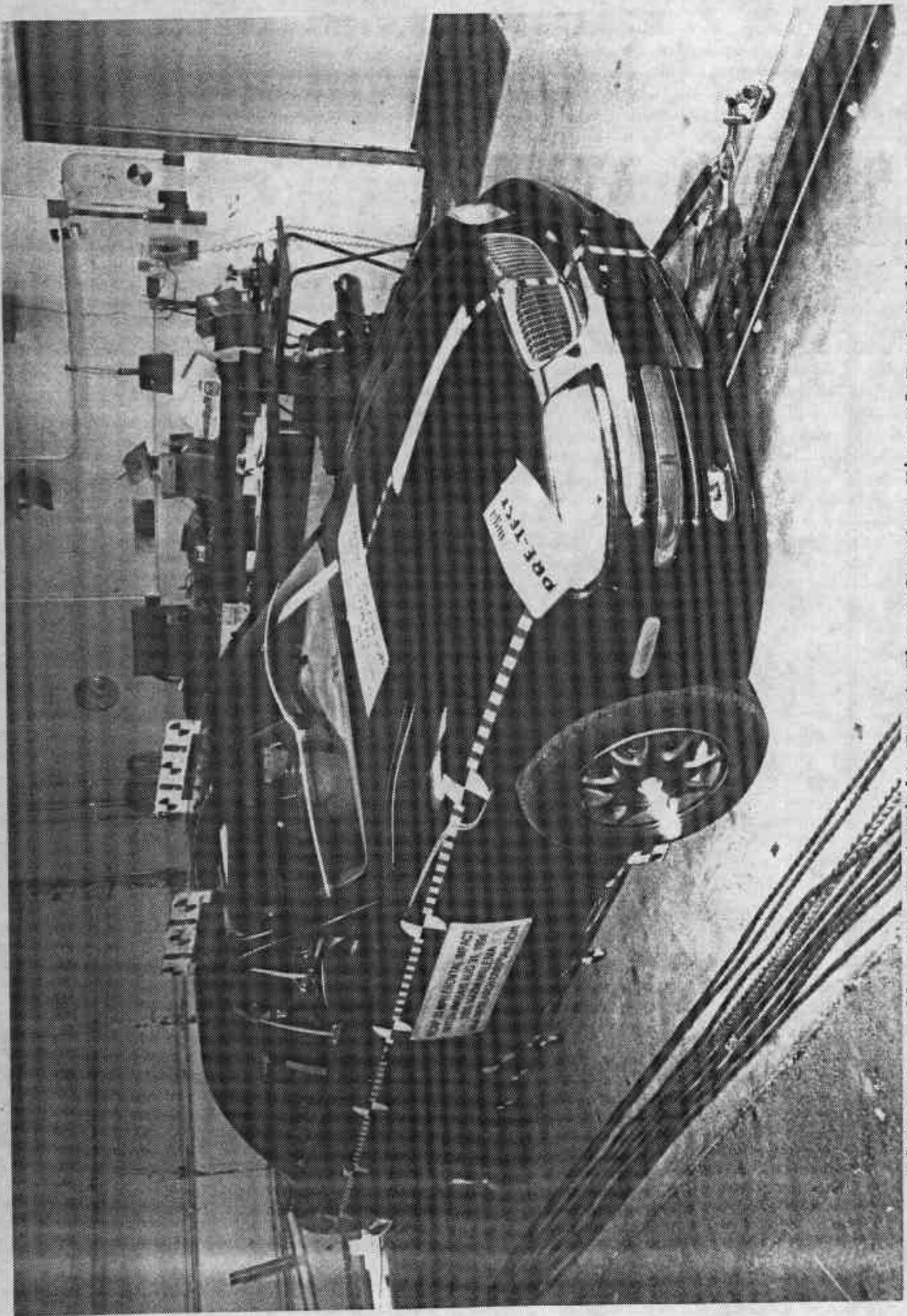


Photo No. A-11 - Pre-Test Right Front Three-Quarter View of Test Vehicle

A-11

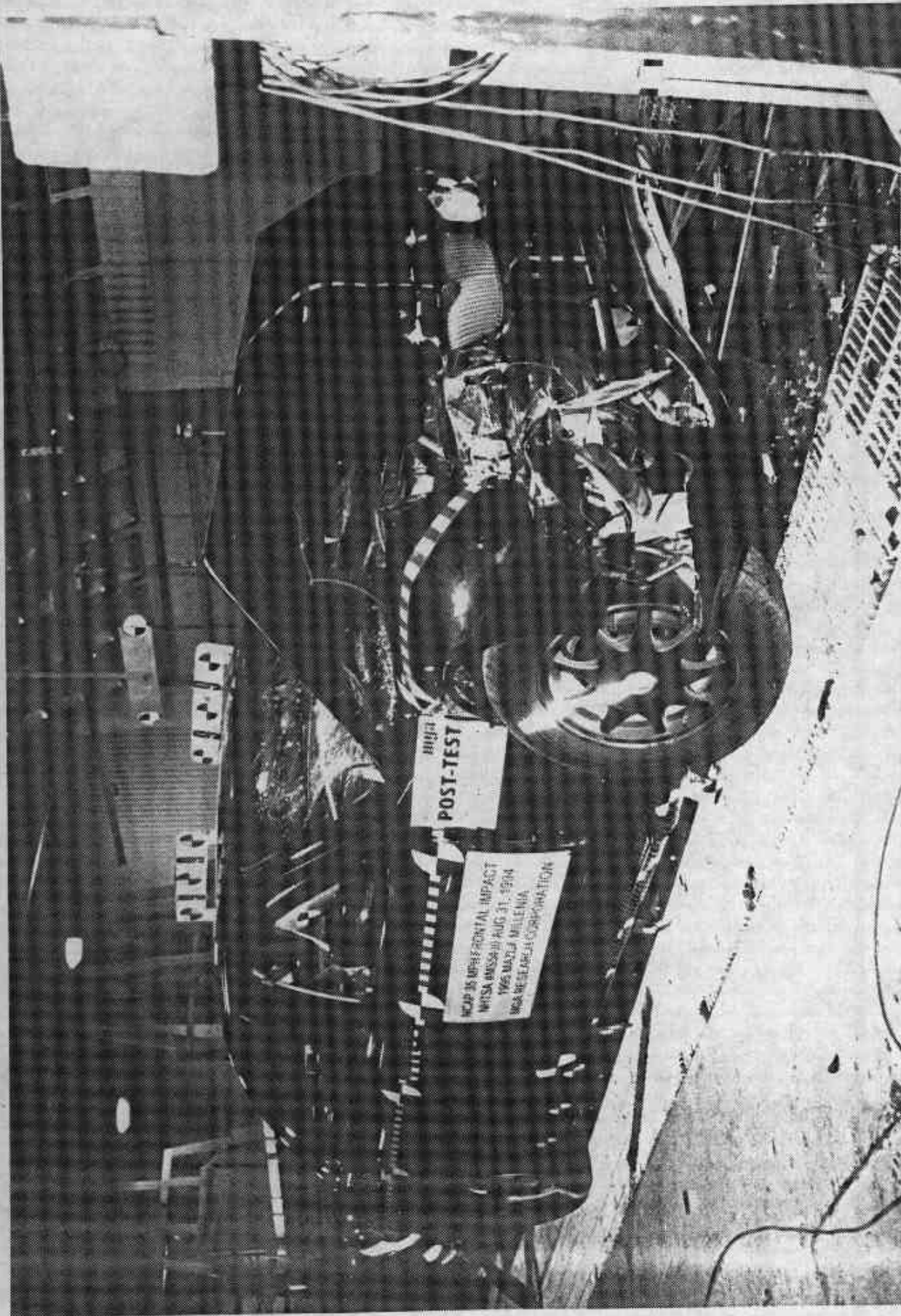


Photo No. A-12 - Post-Test Right Front Three-Quarter View of Test Vehicle

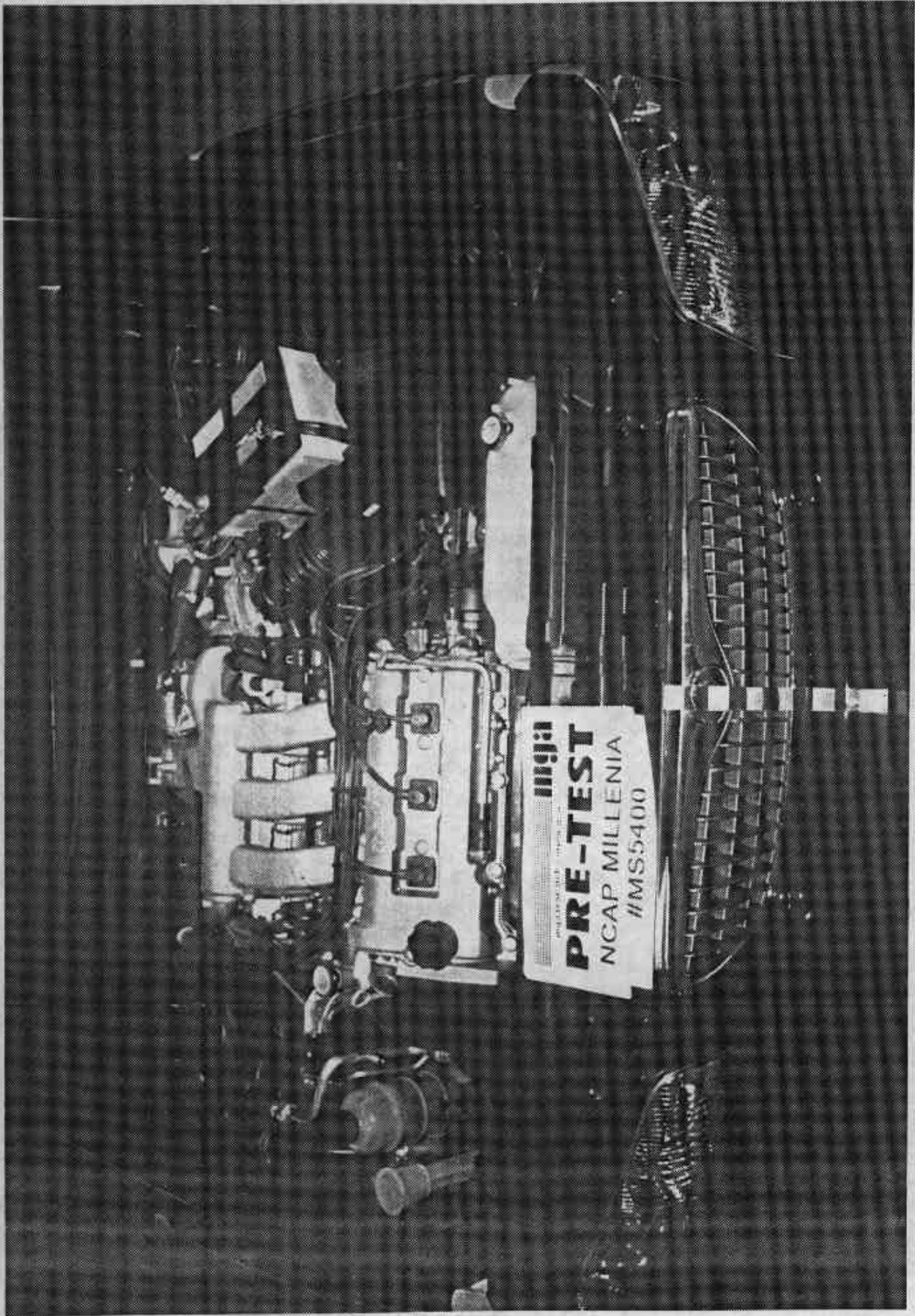
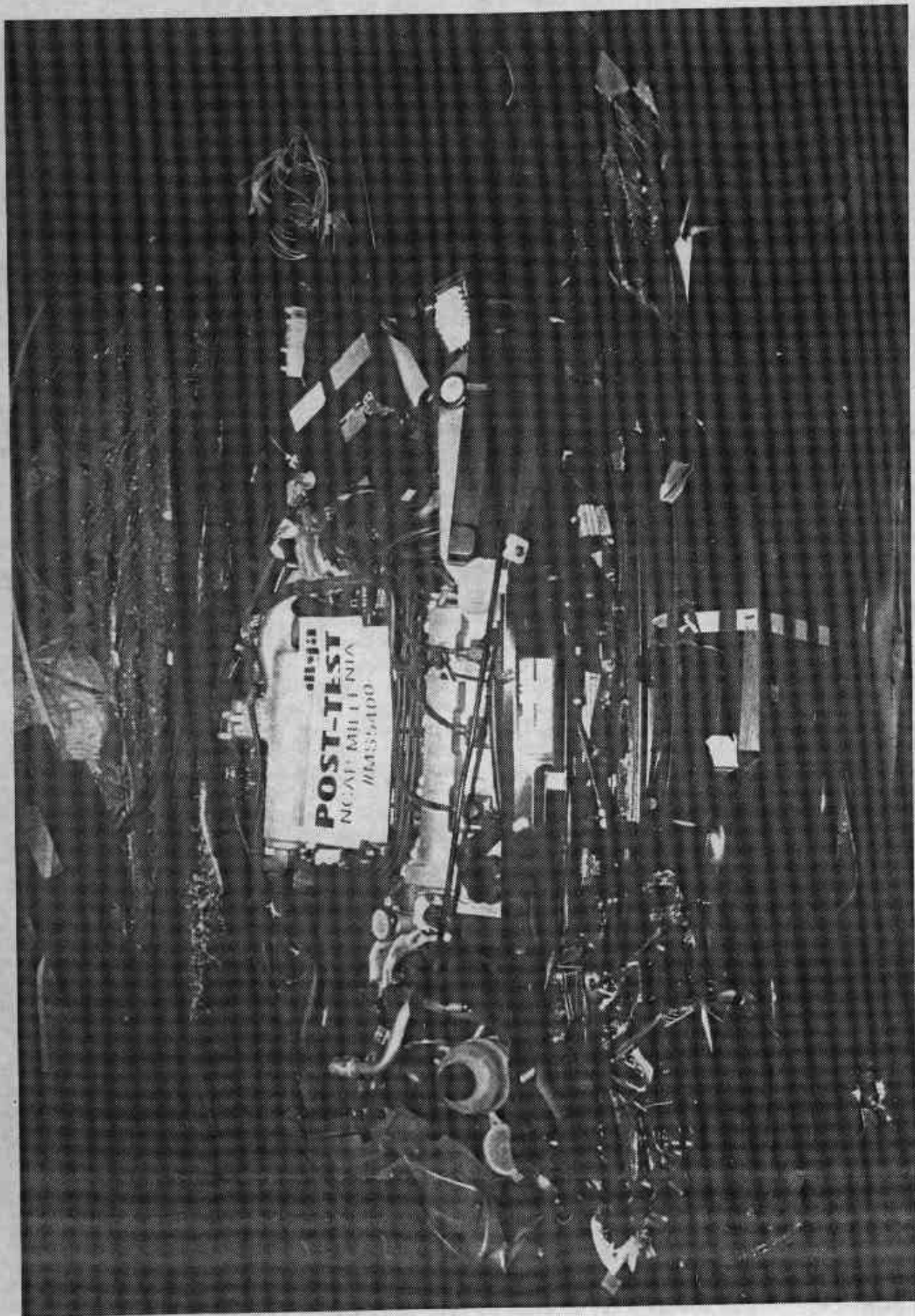


Photo No. A-13 - Pre-Test Engine Compartment View



A-14

Photo No. A-14 - Post-Test Engine Compartment View

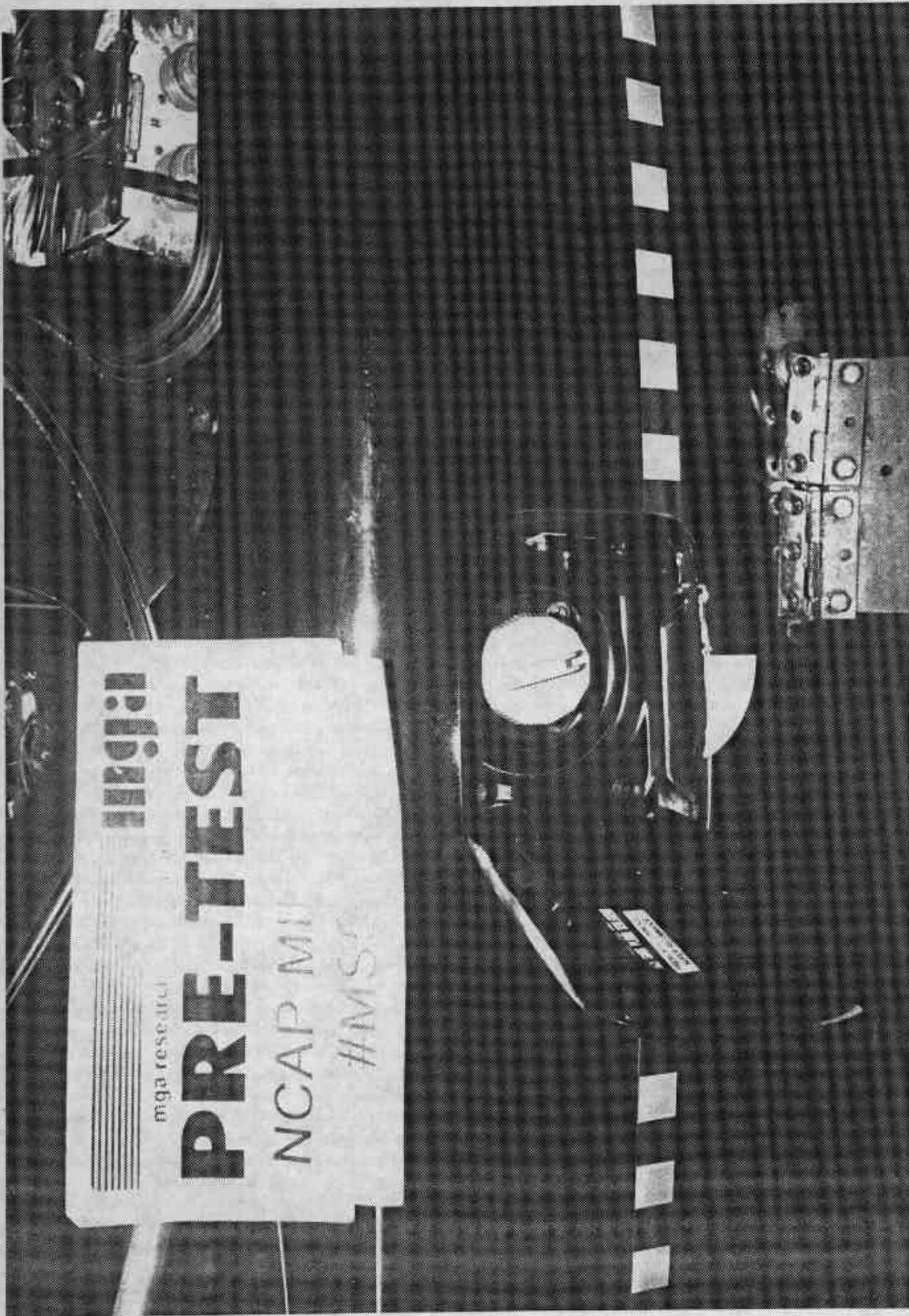


Photo No. A-15 - Pre-Test Fuel Filler Cap View

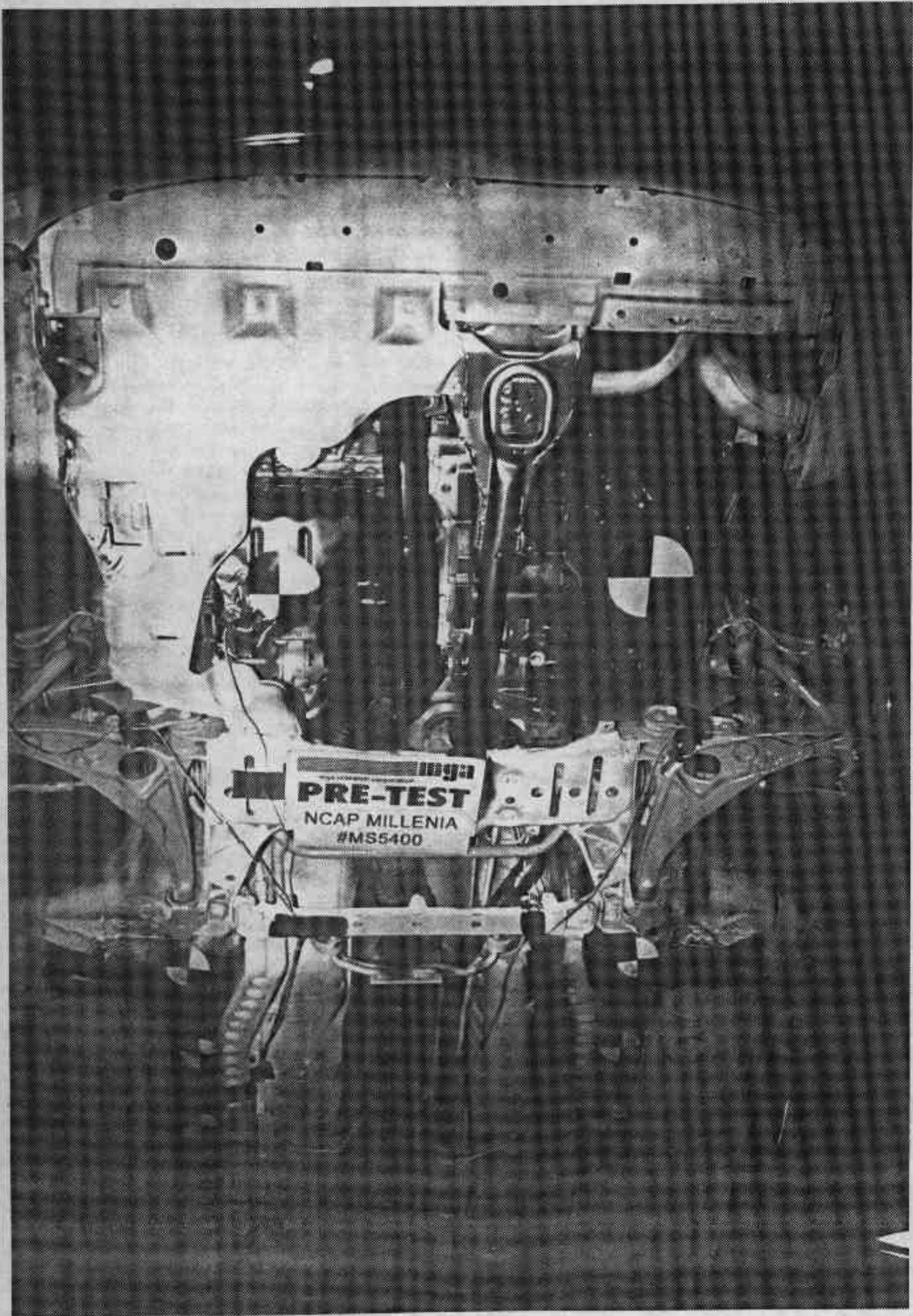


Photo No. A-16 - Pre-Test Front Underbody View

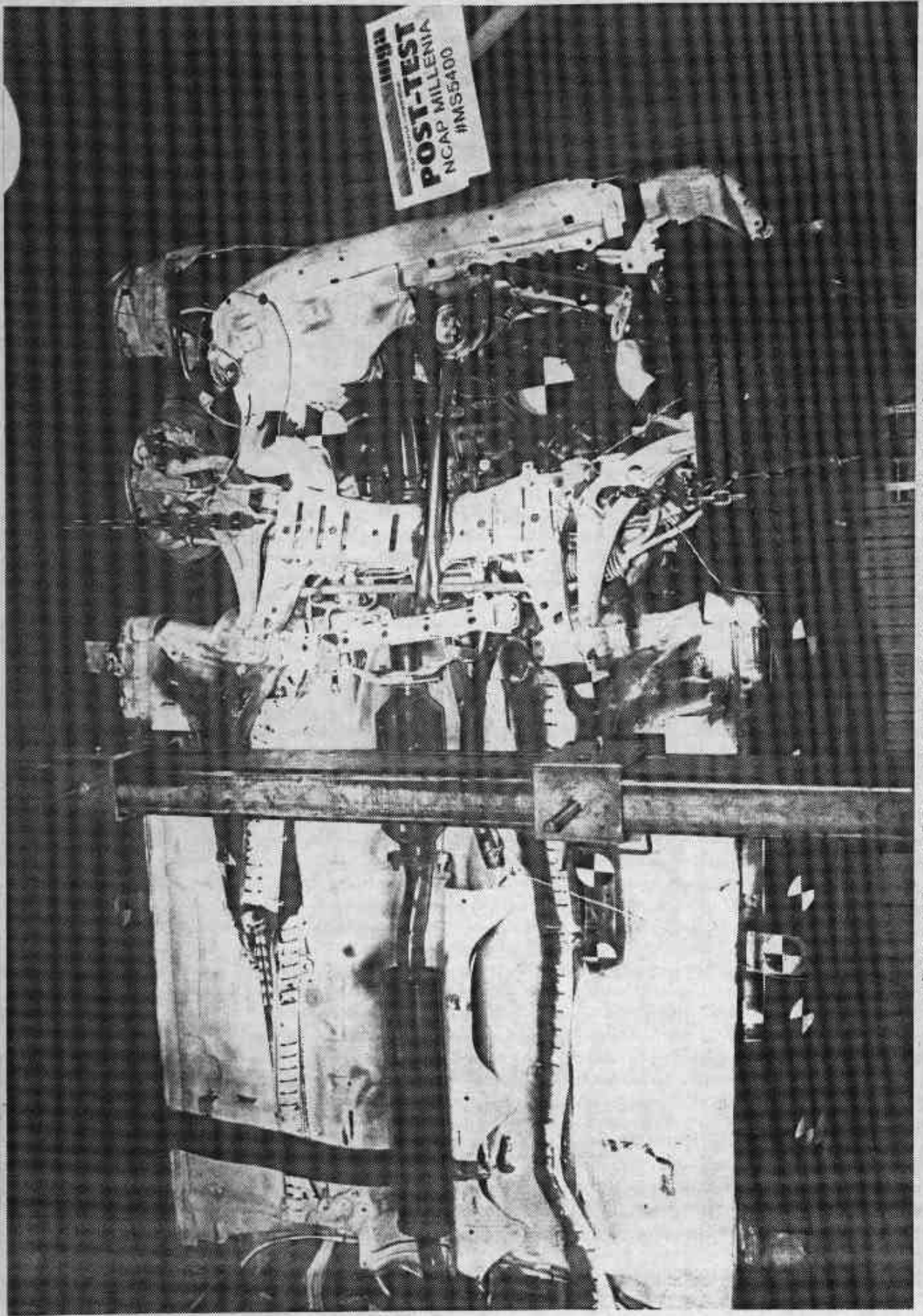


Photo No. A-17 - Post-Test Front Underbody View

A-17

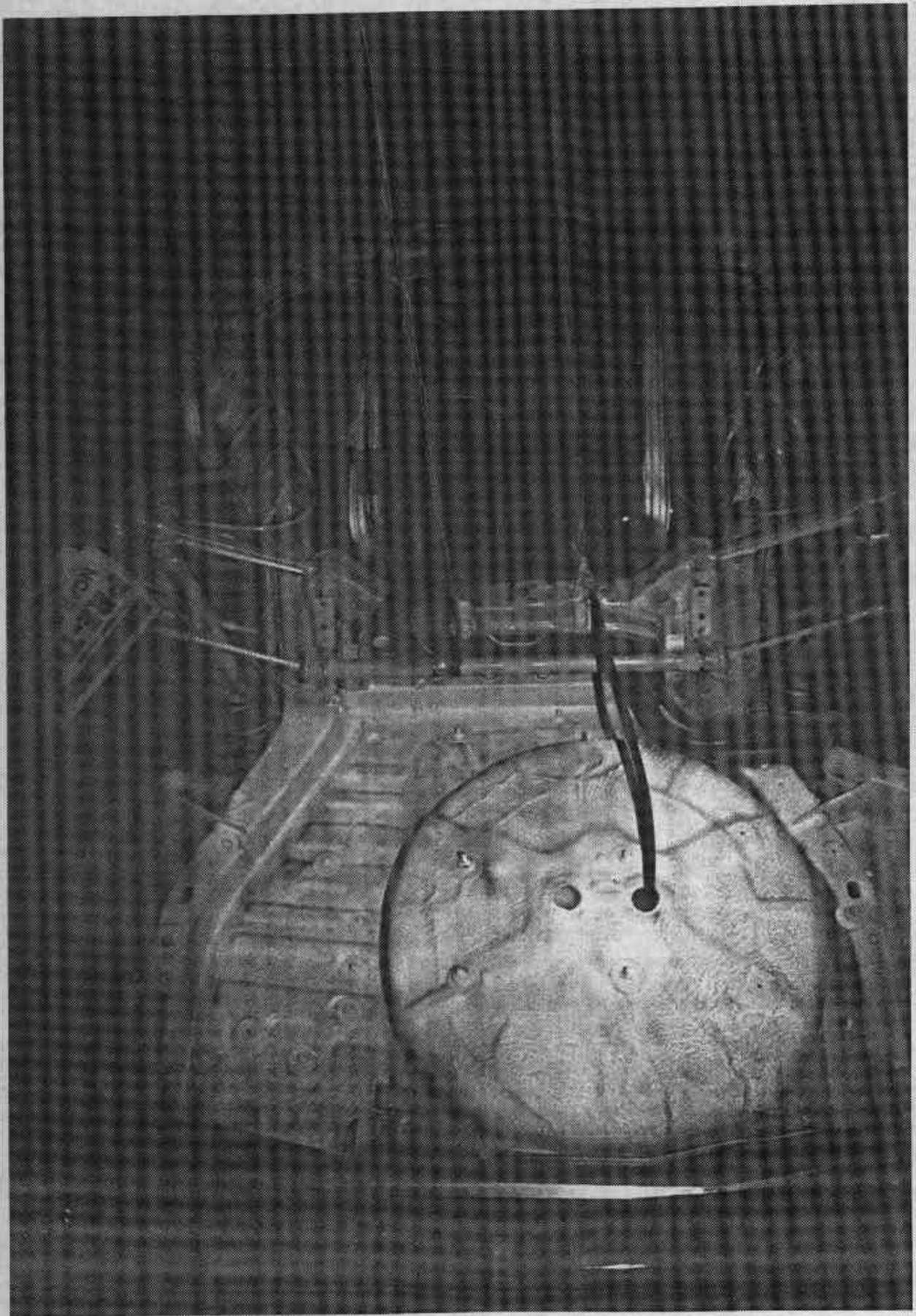


Photo No. A-18 - Pre-Test Rear Underbody View

A-18

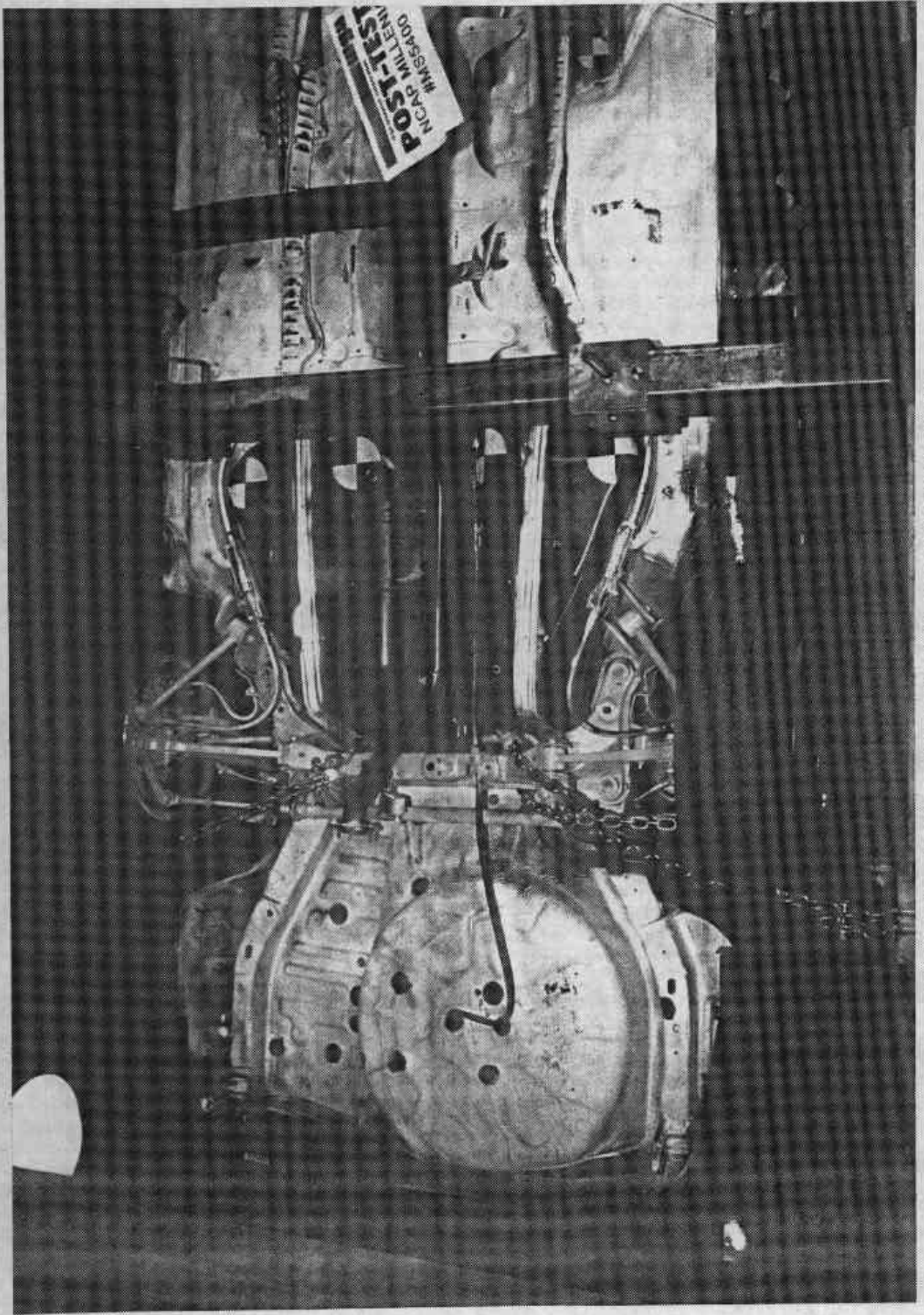


Photo No. A-19 - Post-Test Rear Underbody View

A-19

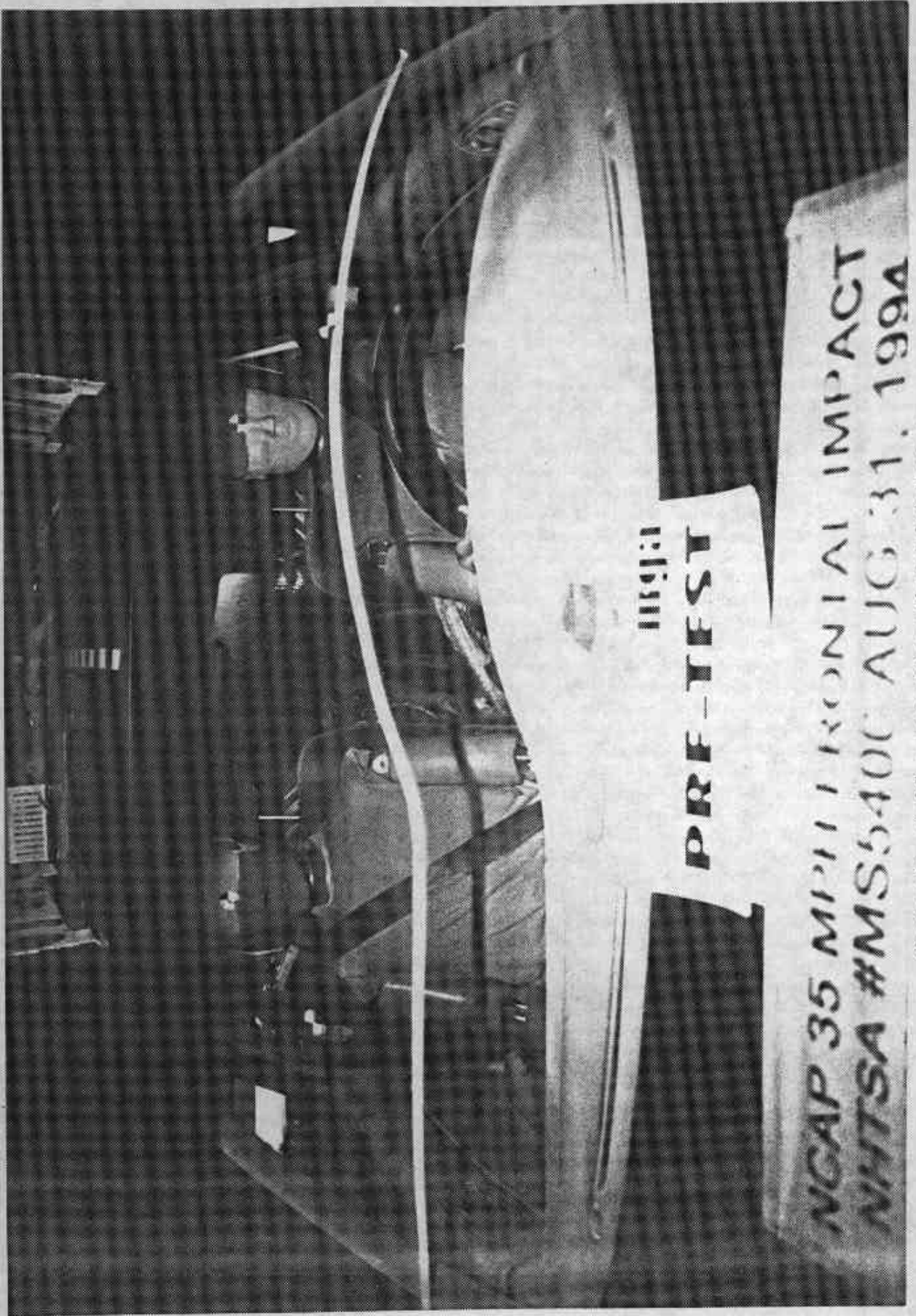


Photo No. A-20 - Pre-Test Windshield View

A-20

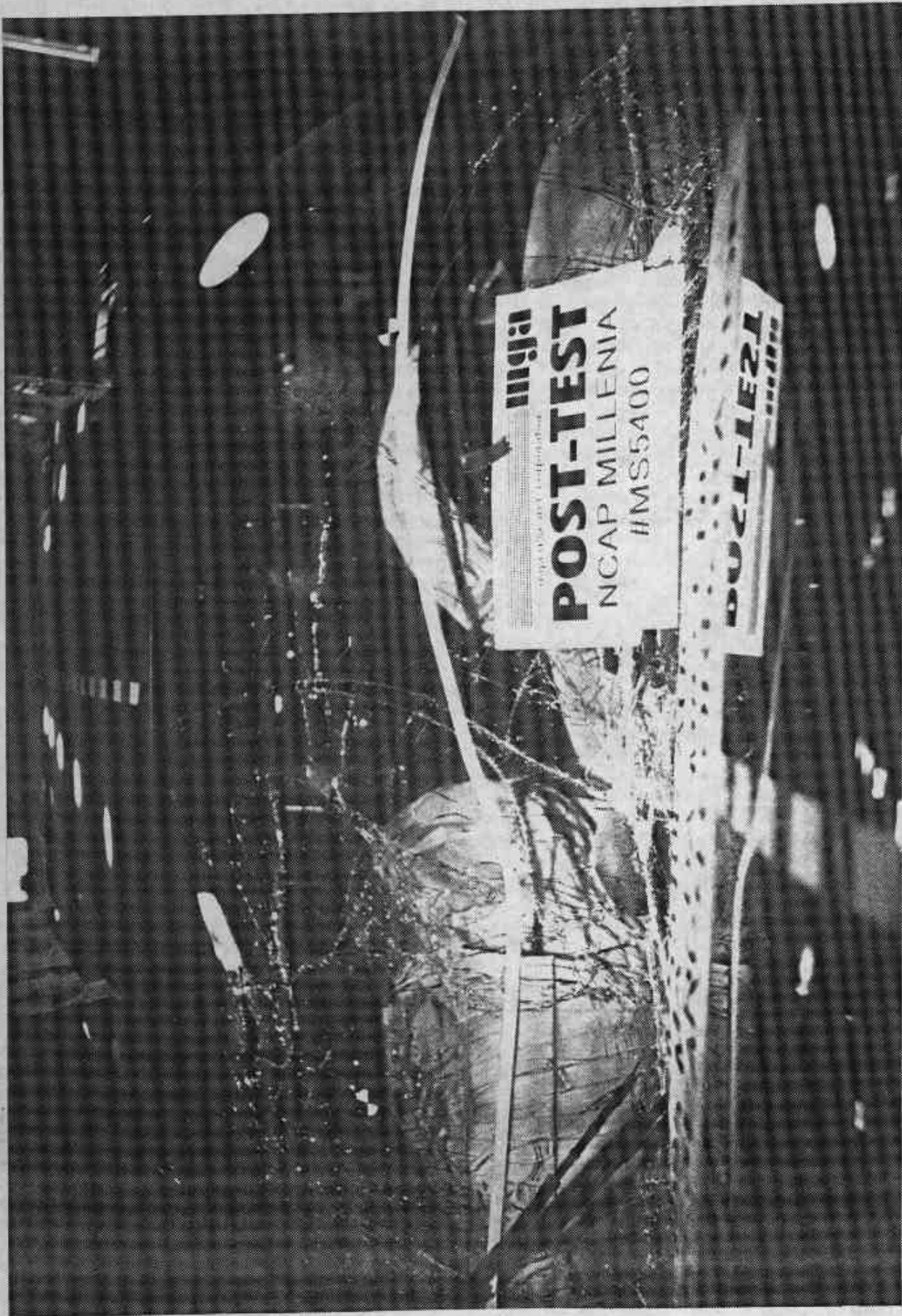
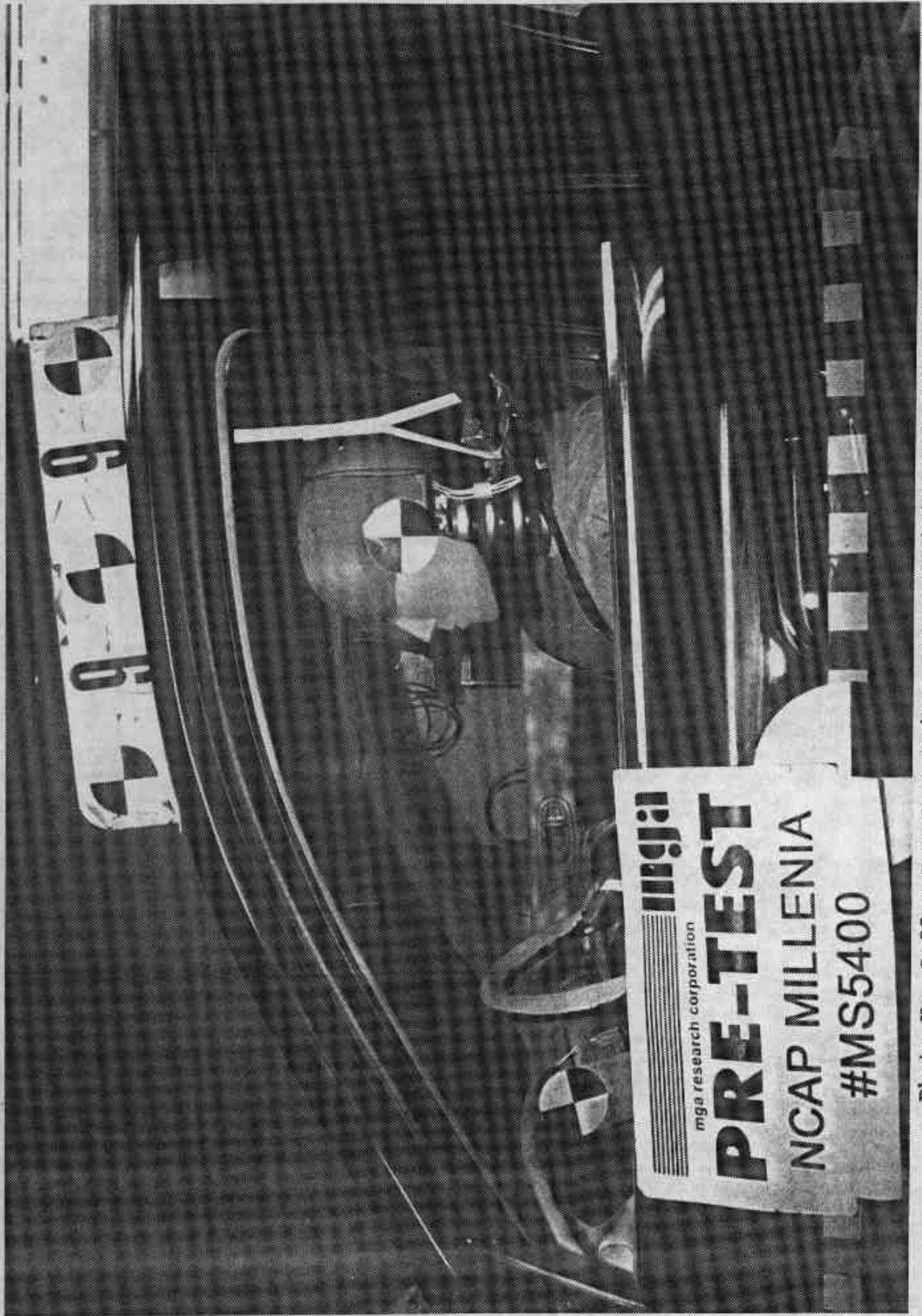


Photo No. A-21 - Post-Test Windshield View

A-21



A-22

Photo No. A-22 - Pre-Test Driver Dummy Position Left Side View

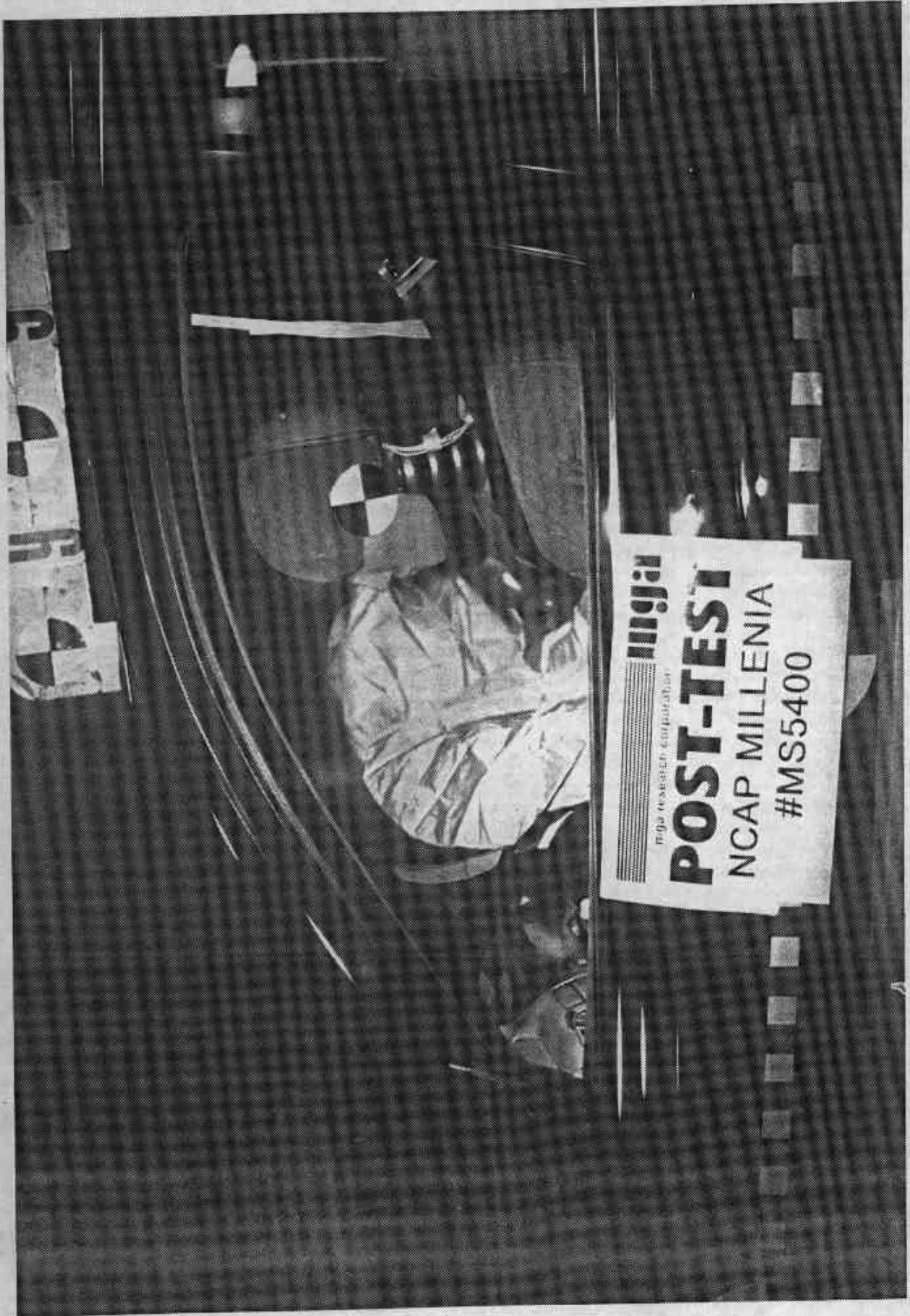


Photo No. A-23 - Post-Test Driver Dummy Position Left Side View

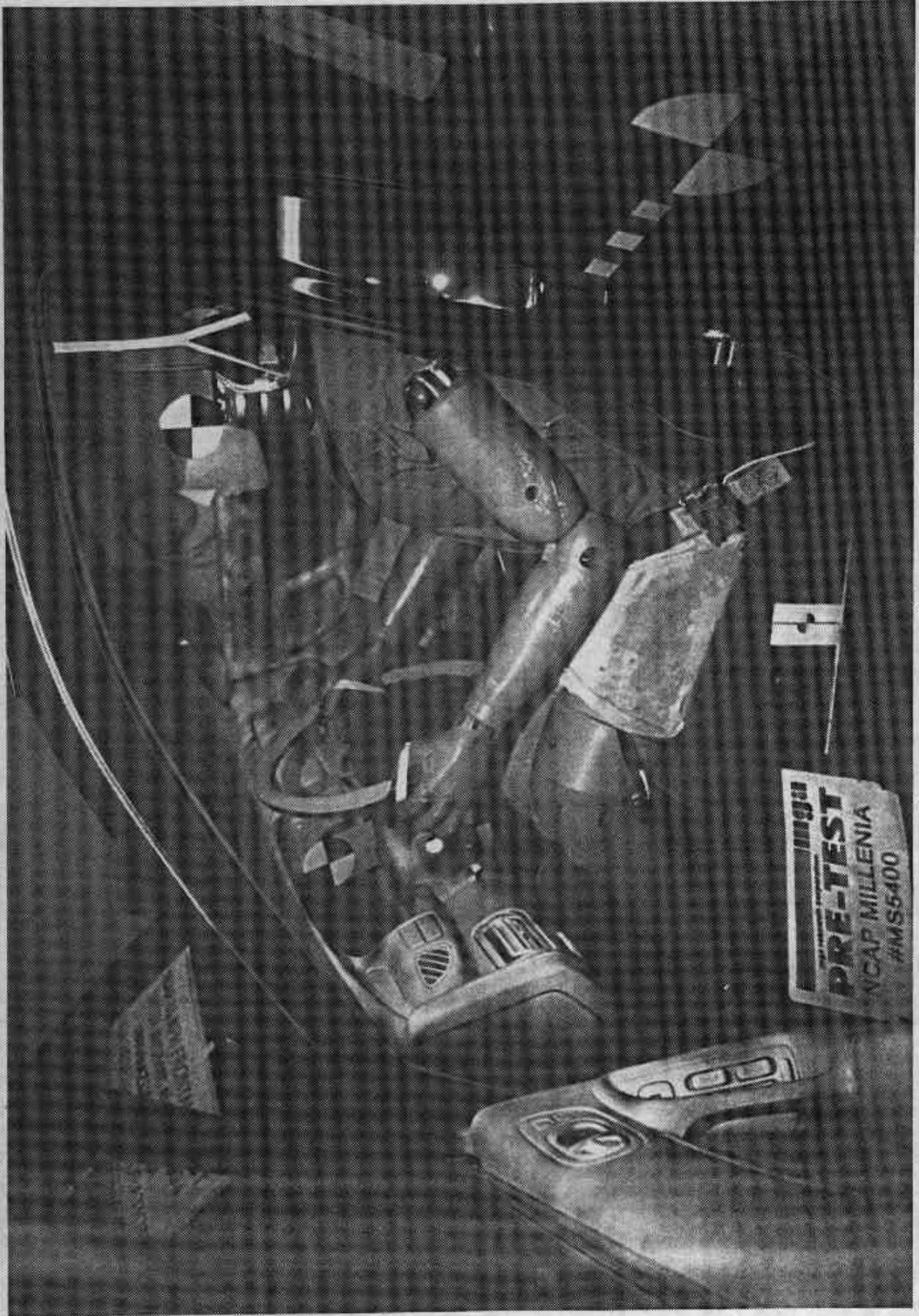


Photo No. A-24 - Pre-Test Driver Dummy Position Left Side View (Door Open)

A-24

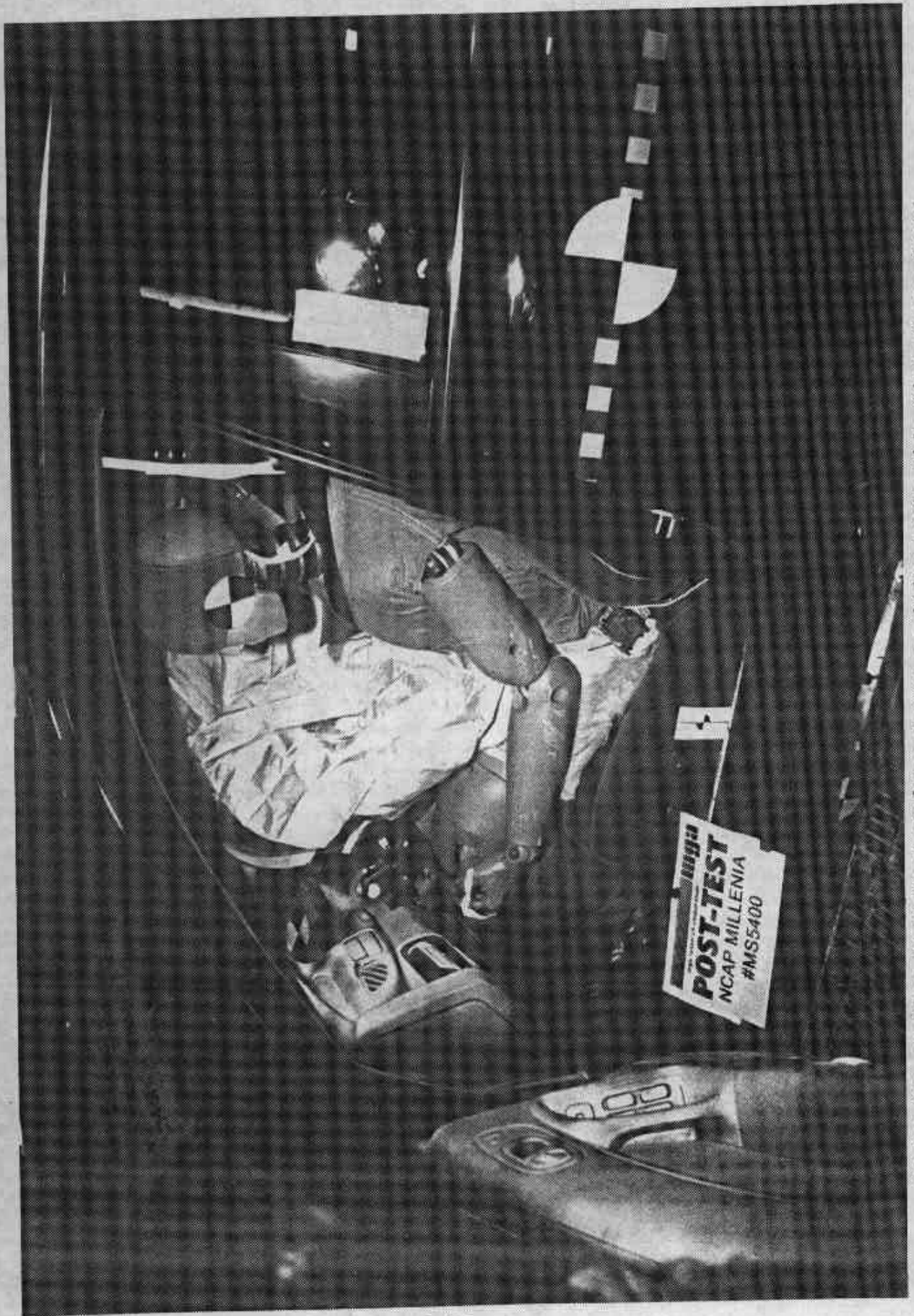


Photo No. A-25 - Post-Test Driver Dummy Position Left Side View (Door Open)

A-25



A-26

Photo No. A-26 - Pre-Test Driver Seat Position View



A-27

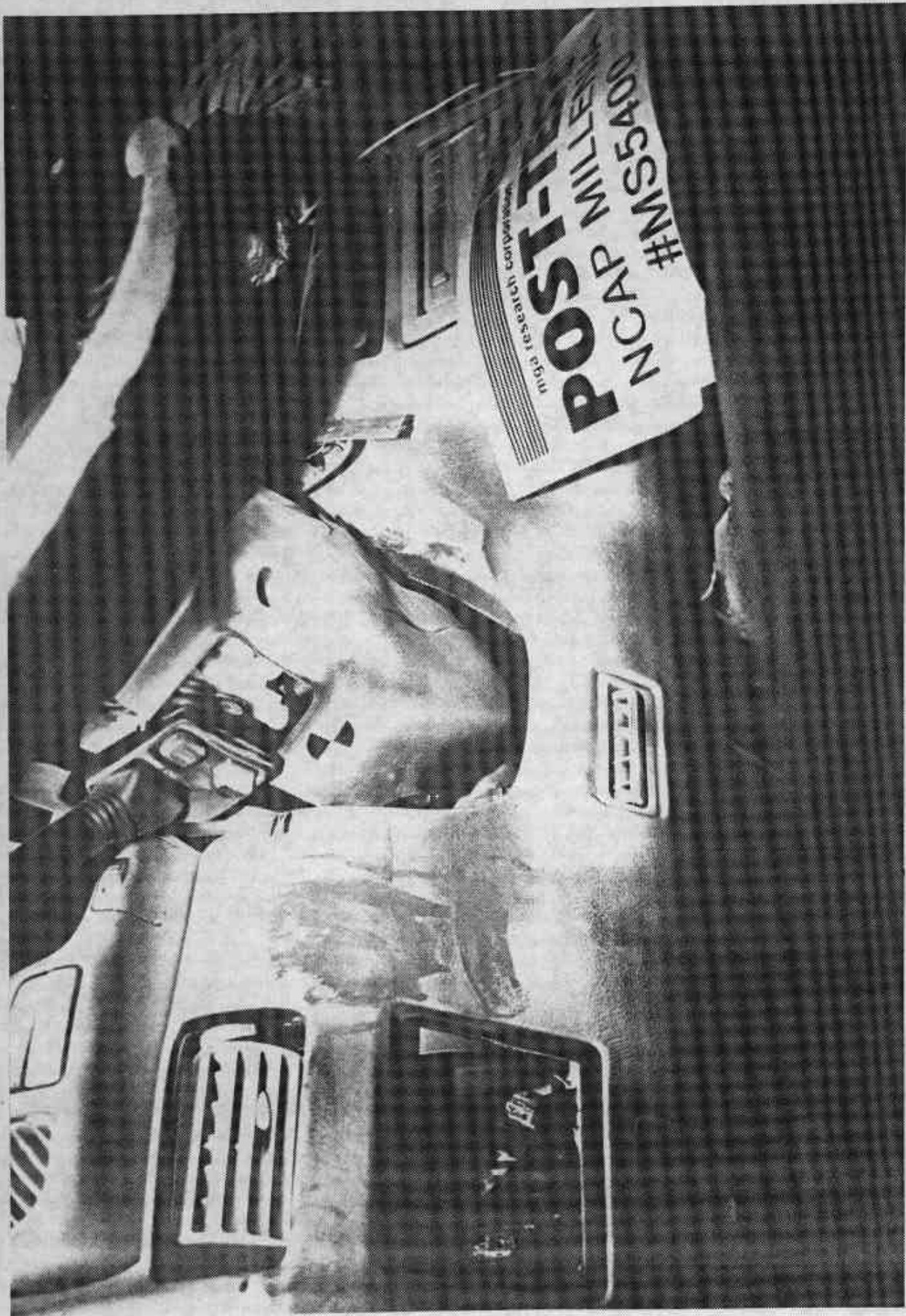
Photo No. A-27 - Post-Test Driver Seat Position View



Photo No. A-28 - Pre-Test Driver Dummy Knee Position



Photo No. A-29 - Post-Test Driver Dummy Knee Position



A-30

Photo No. A-30 - Post-Test Driver Dummy Knee Contact

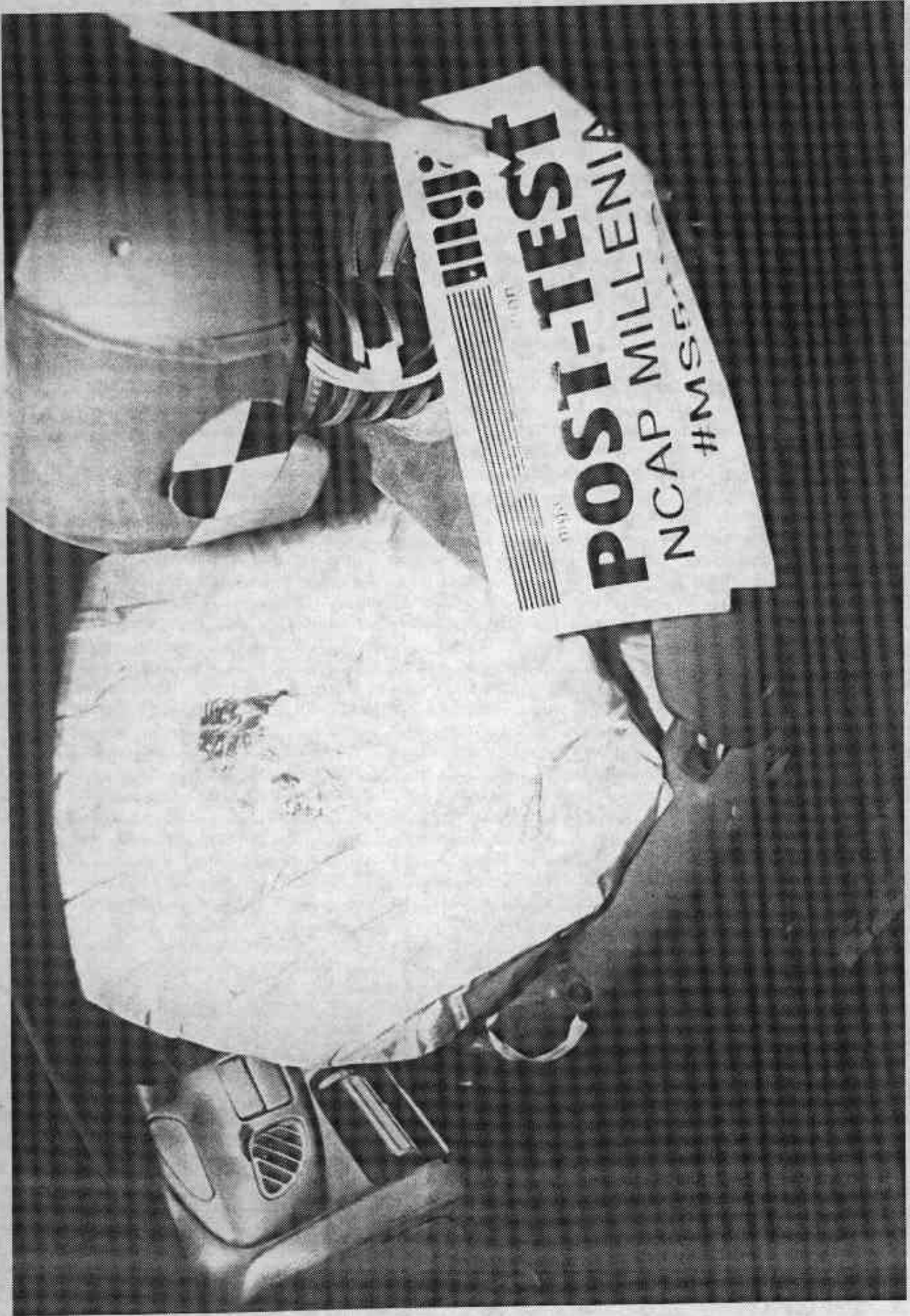


Photo No. A-31 - Post-Test Driver Airbag Contact

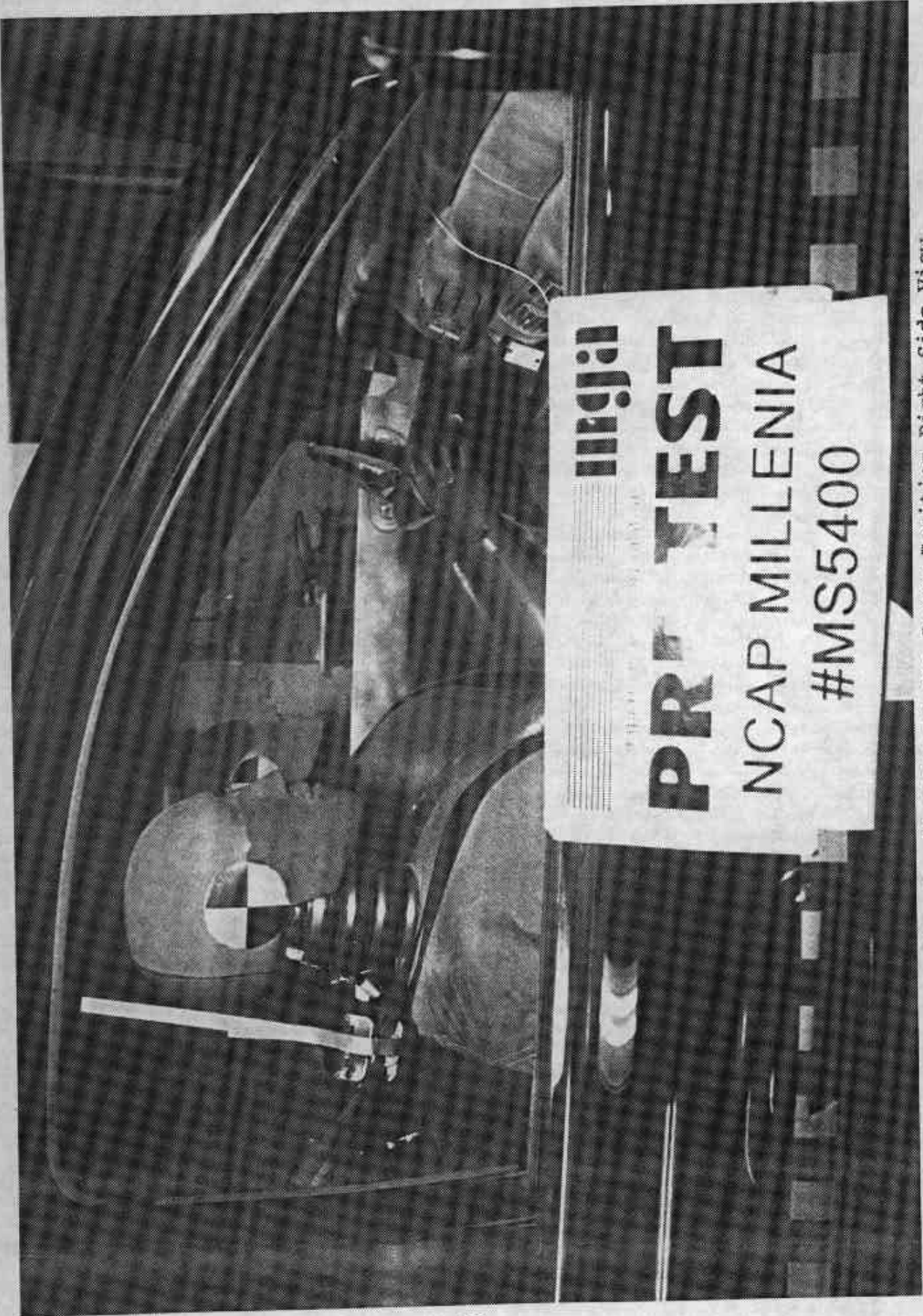
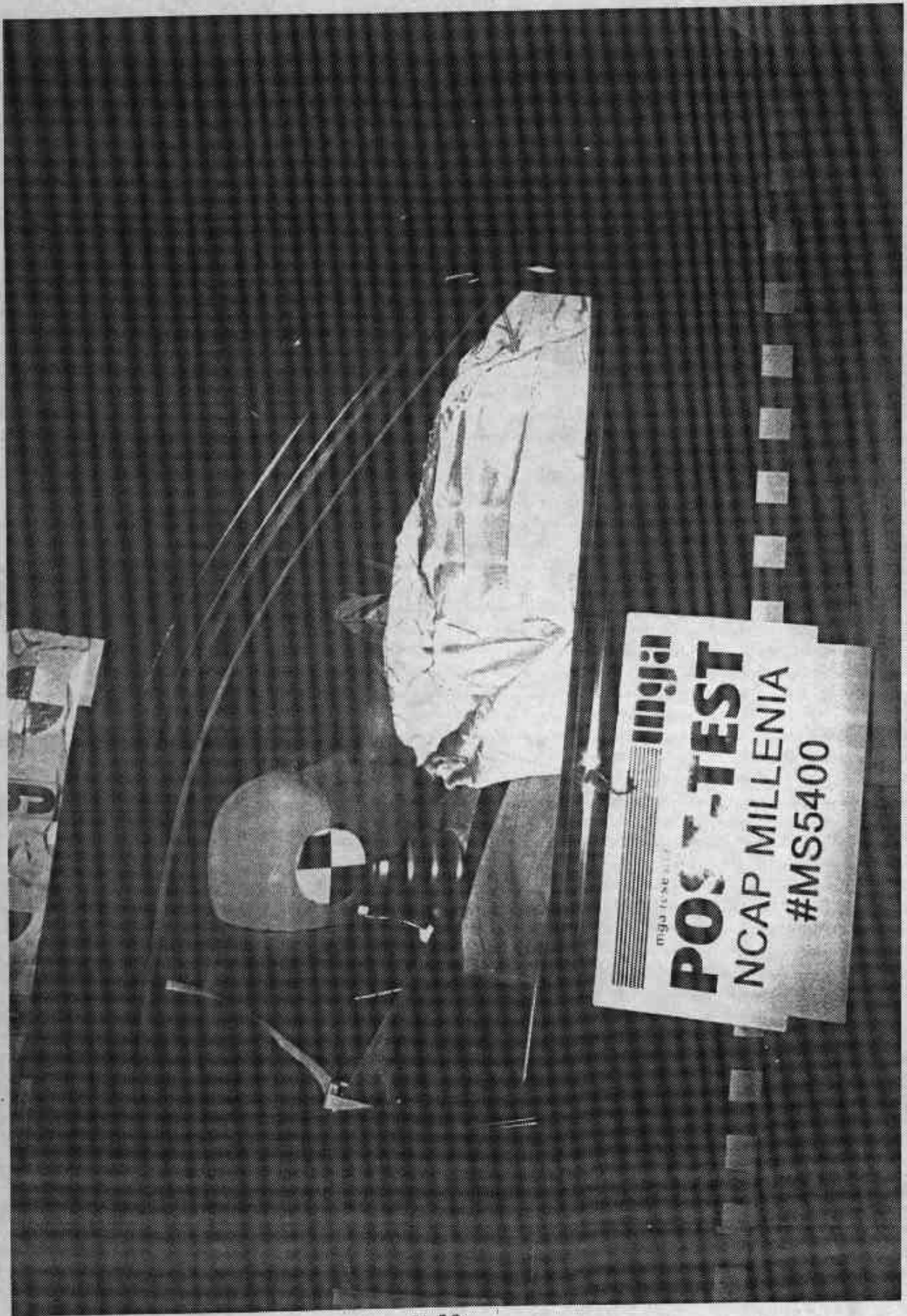
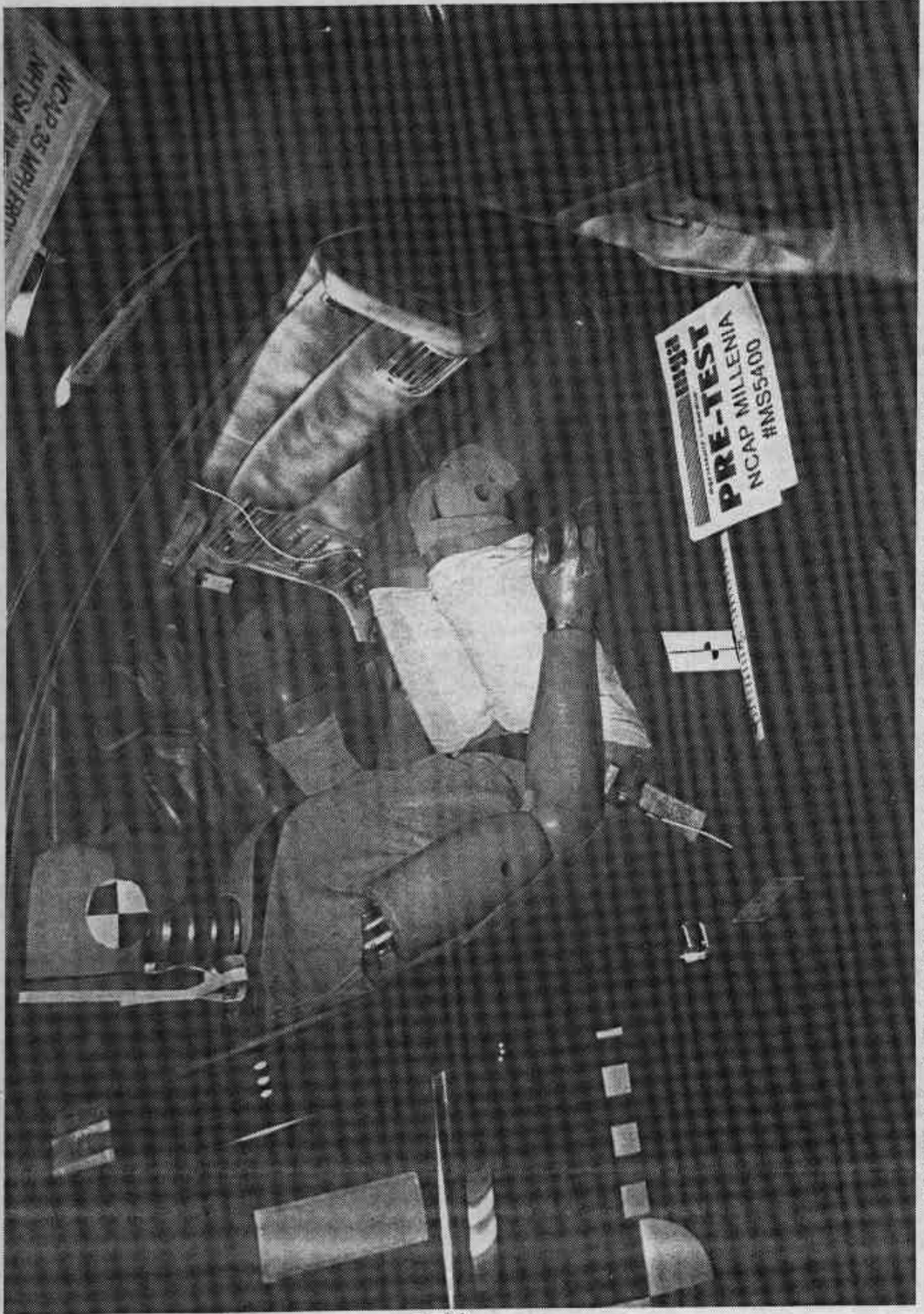


Photo No. A-32 - Pre-Test Passenger Dummy Position Right Side View



A-33

Photo No. A-33 - Post-Test Passenger Dummy Position Right Side View



A-34

Photo No. A-34 - Pre-Test Passenger Dummy Position Right Side View (Door Open)



A-35

Photo No. A-35 - Post-Test Passenger Dummy Position Right Side View (Door Open)



A-36

Photo No. A-36 - Pre-Test Passenger Seat Position View



A-37

Photo No. A-37 - Post-Test Passenger Seat Position View



Photo No. A-38 - Pre-Test Passenger Dummy Knee Position

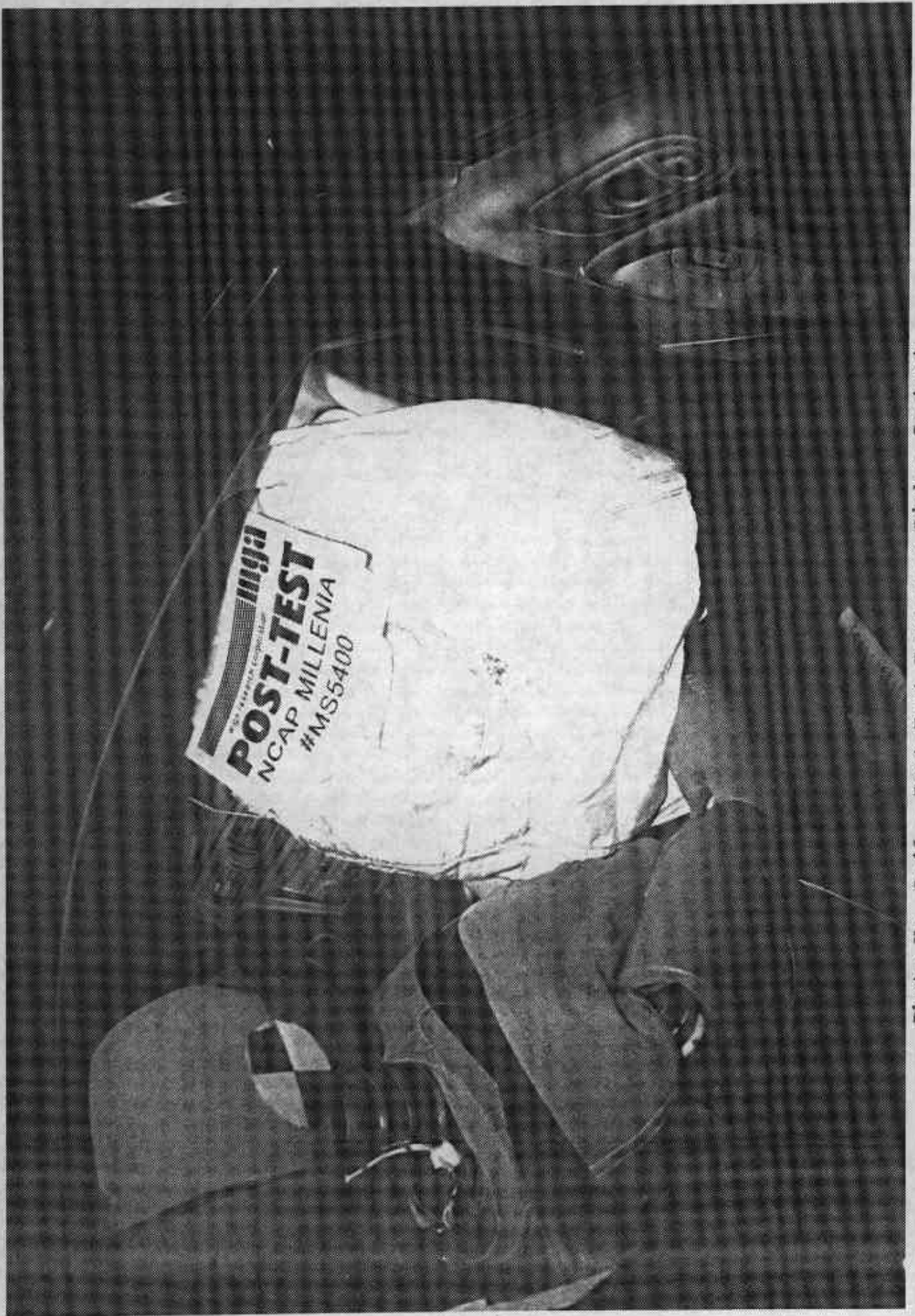


Photo No. A-39 - Post-Test Passenger Dummy Knee Position



A-40

Photo No. A-40 - Post-Test Passenger Dummy Knee Contact



A-41

Photo No. A-41 - Post-Test Passenger Airbag Contact



A-42

Photo No. A-42 - Right Front Passenger Seat Movement - Front View



Photo No. A-43 - Right Front Passenger Seat Movement - Rear View

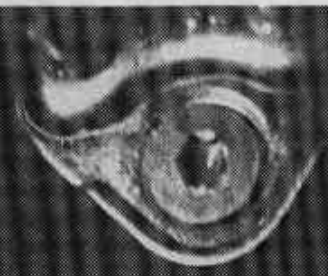
A-43



Photo No. A-44 - Right Front Passenger Seat Movement - Bottom Rear View

A-44

TOYOTA CORPORATION
1974 (R)
850 (R)
BUMPER AND TRAILER IDENTIFICATION
JMI TA2216S1110657 PASSENGER
BODY COLOR CODE : A5
MADE IN JAPAN

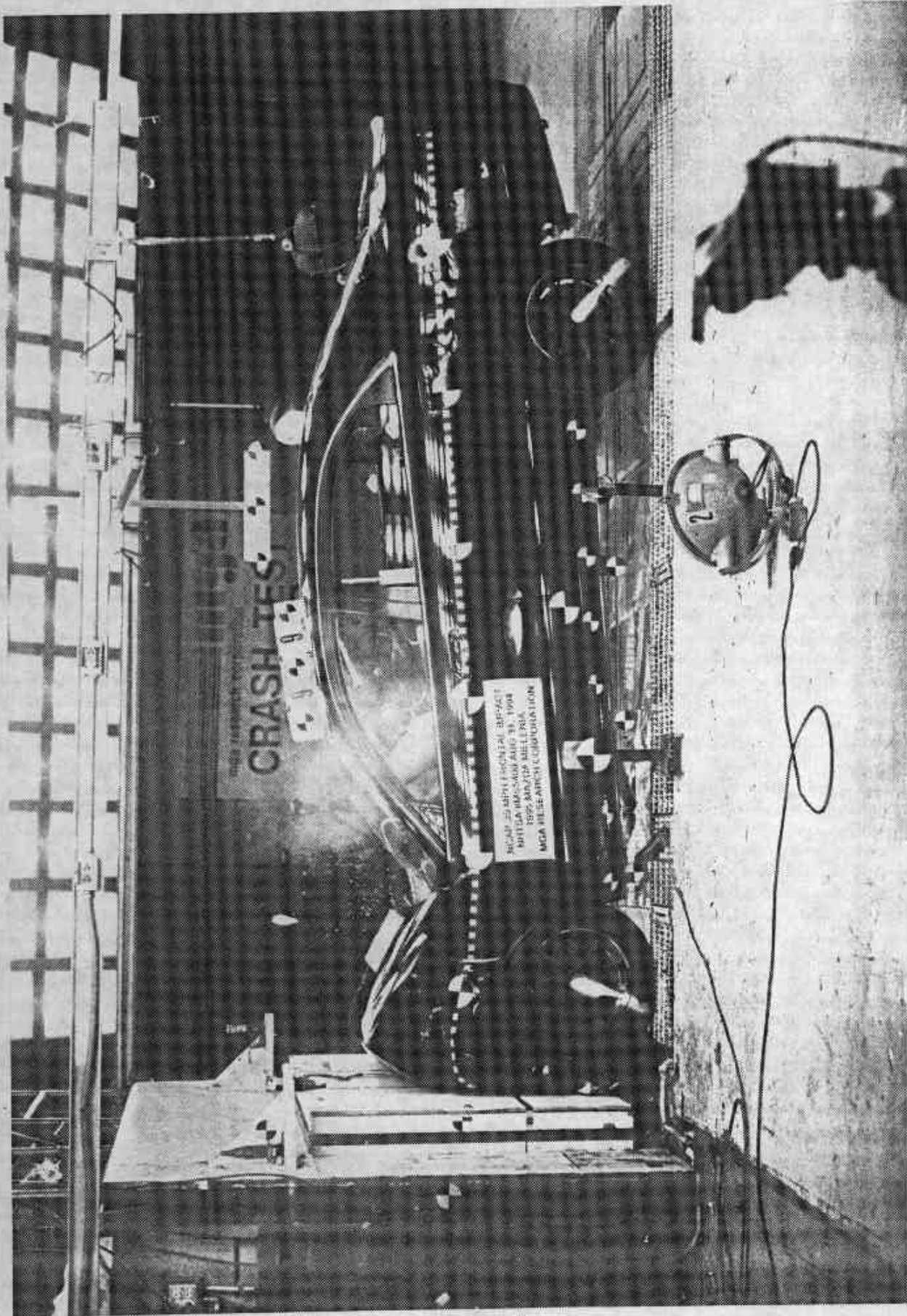


VEHICULE CAPACITE MOYENNE
 CAPACITE PORTANCE MOYENNE 3850 KG. BOULONS
 20x1.5" 2
 22x1.5" 3
 SEATING CAPACITY 5
 NOMBRE DE PLACES 5

TIRE INFLATION PRESSEUR
 PRESION DE GONFLEGE DES PNEUS 2.2 (32) 2.0 (29)
 TIRE SIZE FRONT AV REAR AR
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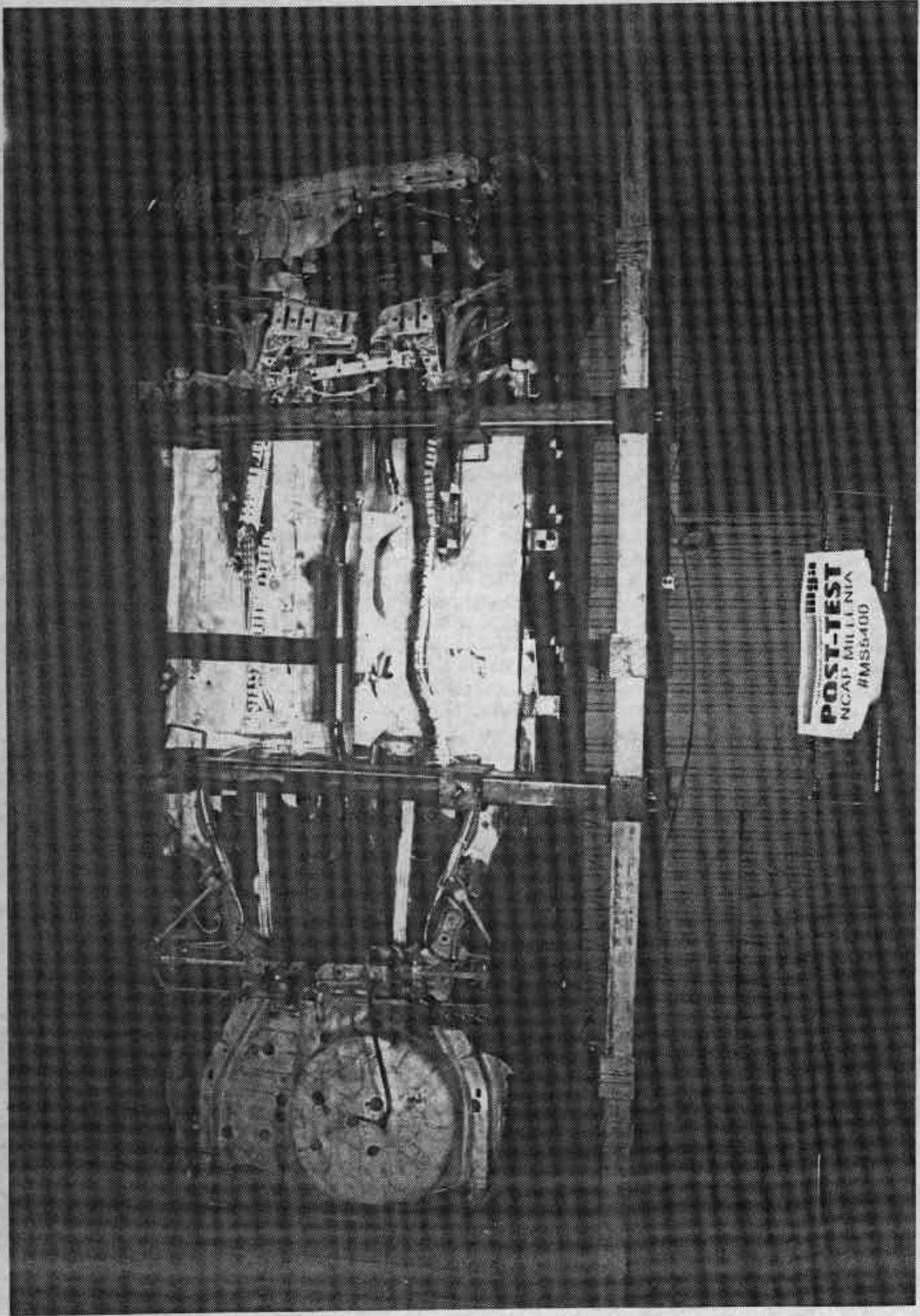
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Photo No. A-46 - Tire Placard



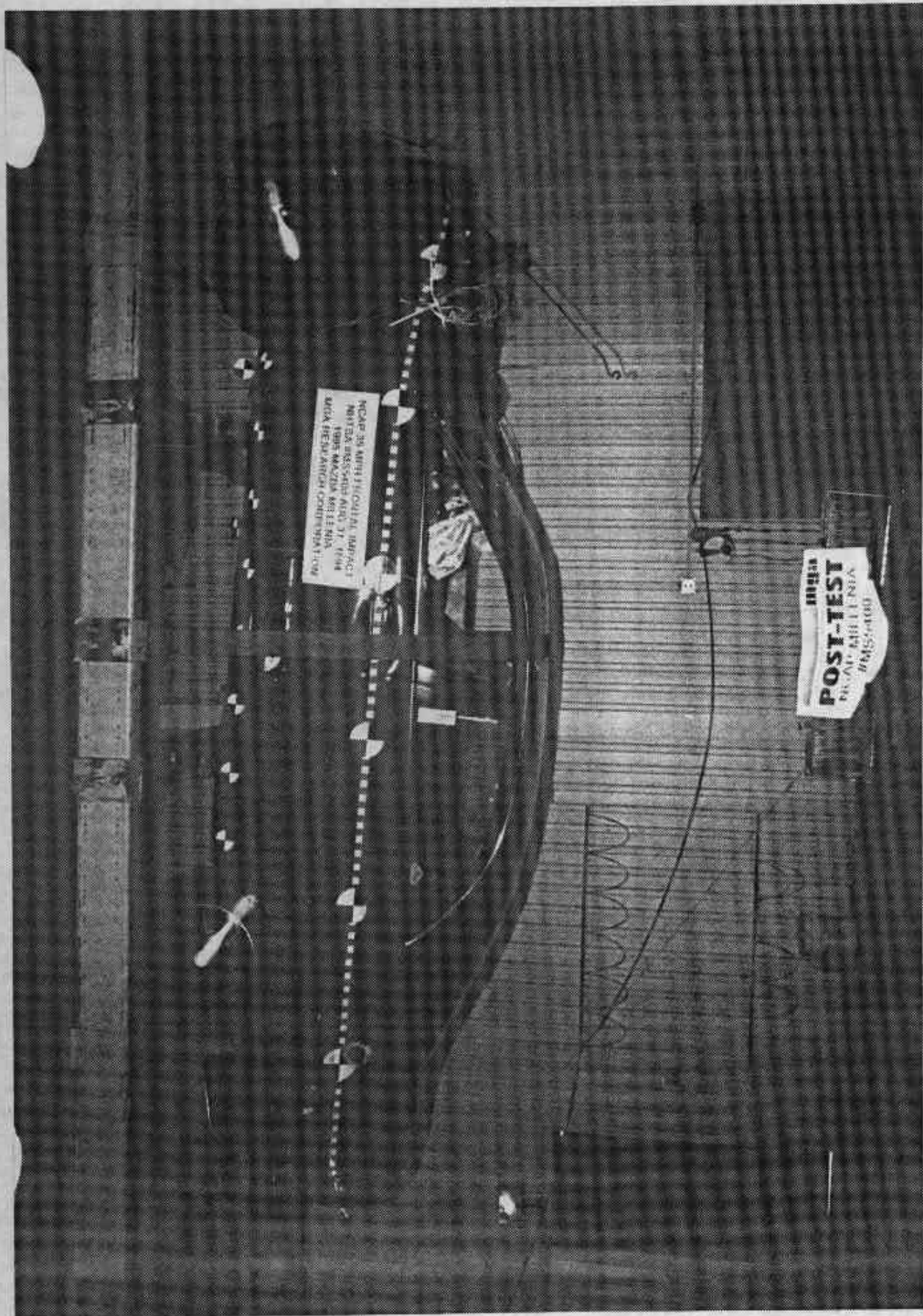
A-47

Photo No. A-47 - Impact



A-48

Photo No. A-48 - Rollover 90°

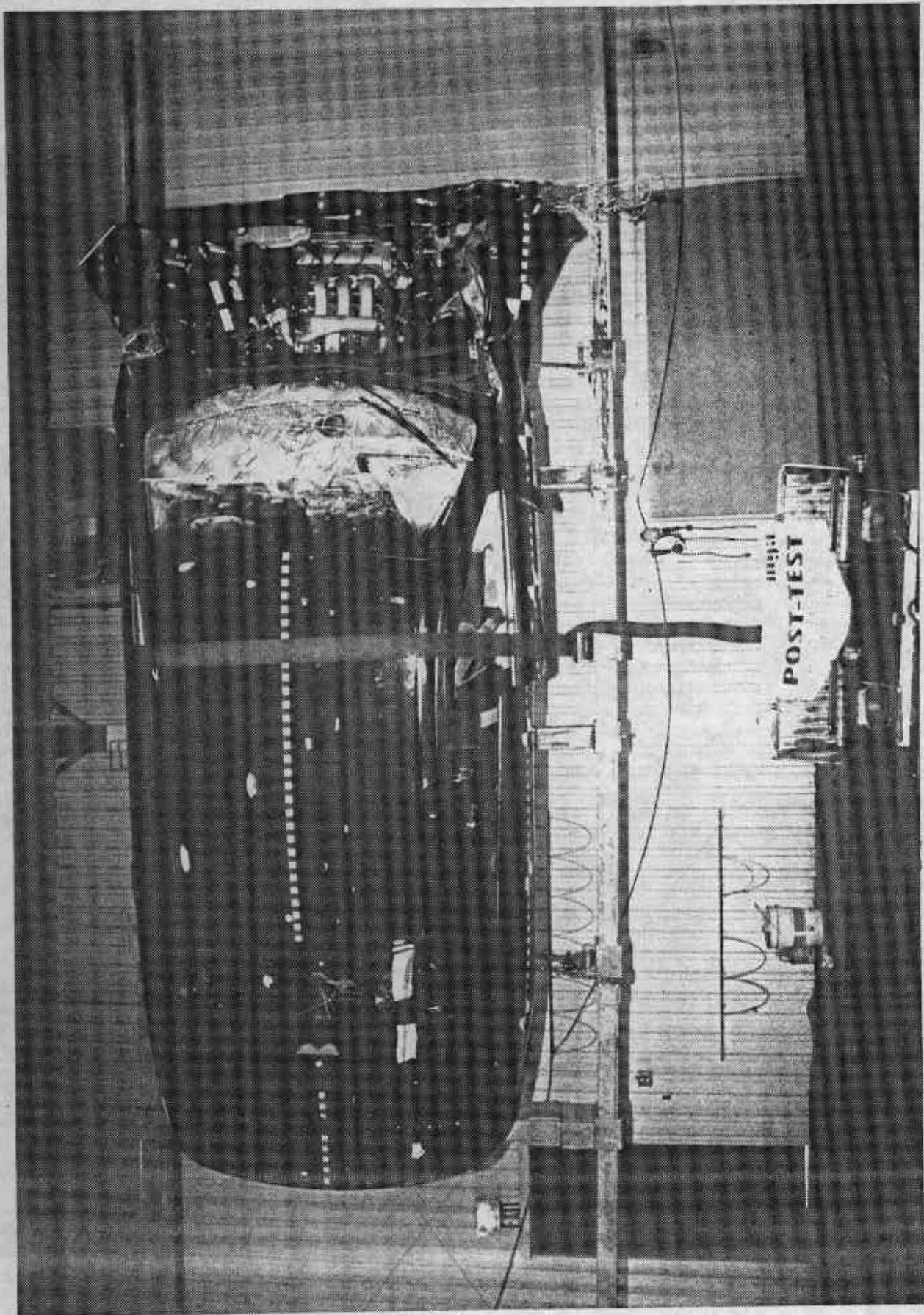


MOJAK SA AMPLIFIKASI DAN BERSI
MATERI KEMAMPUAN DAN TINGKAT
MUDA BERSAMA SAMA MELAKUKAN
MUDA BERSAMA SAMA MELAKUKAN

POST-TEST
MUDA BERSAMA SAMA MELAKUKAN

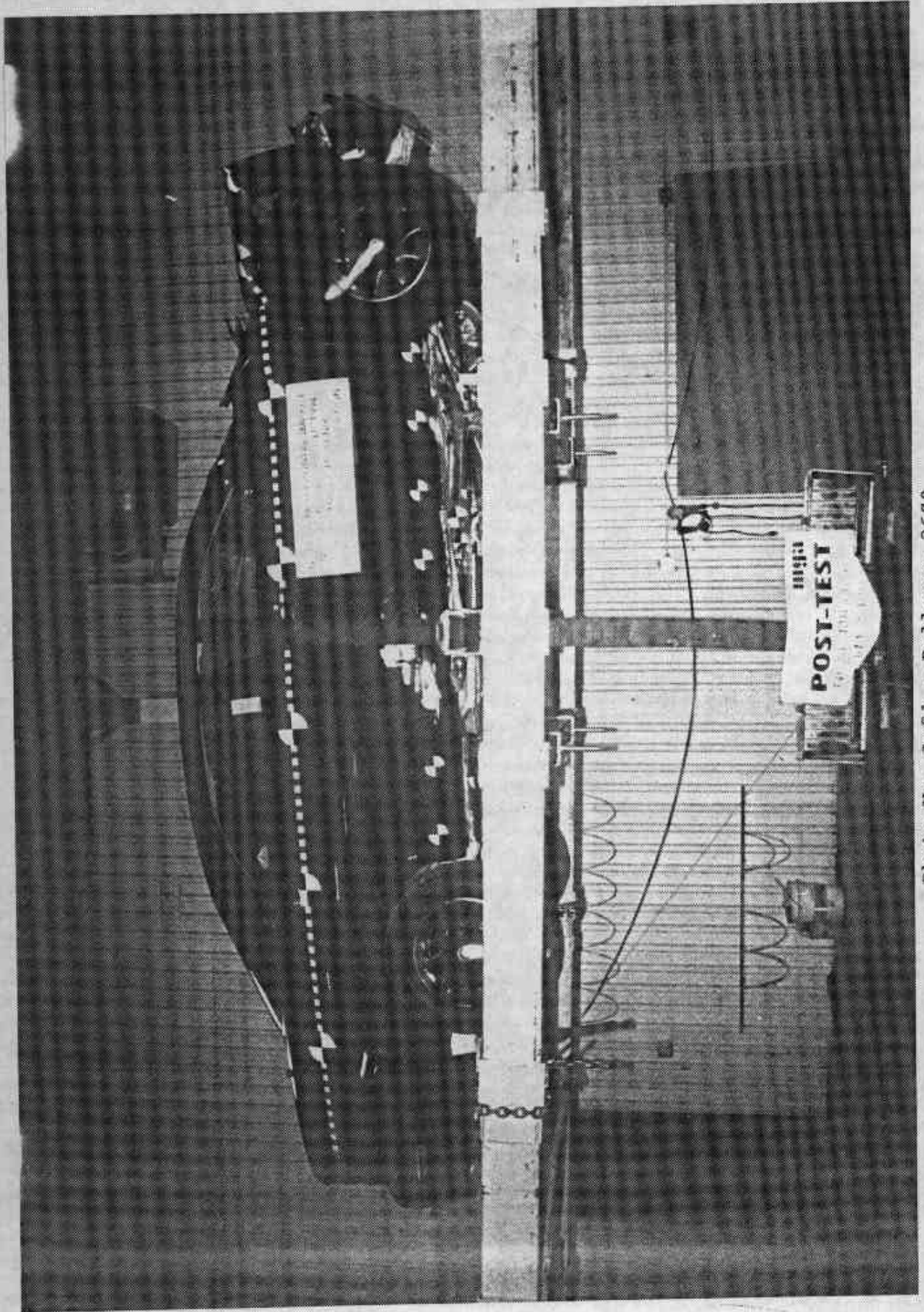
A-49

Photo No. A-49 - Rollover 180°



A-50

Photo No. A-50 - Rollover 270°



A-51

Photo No. A-51 - Rollover 360°

APPENDIX B

Vehicle, Load Cell Barrier and Dummy Response Data

1995 Mazda Millenia 4-Door

NHTSA NO.: MS5400

<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)

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Data Plot

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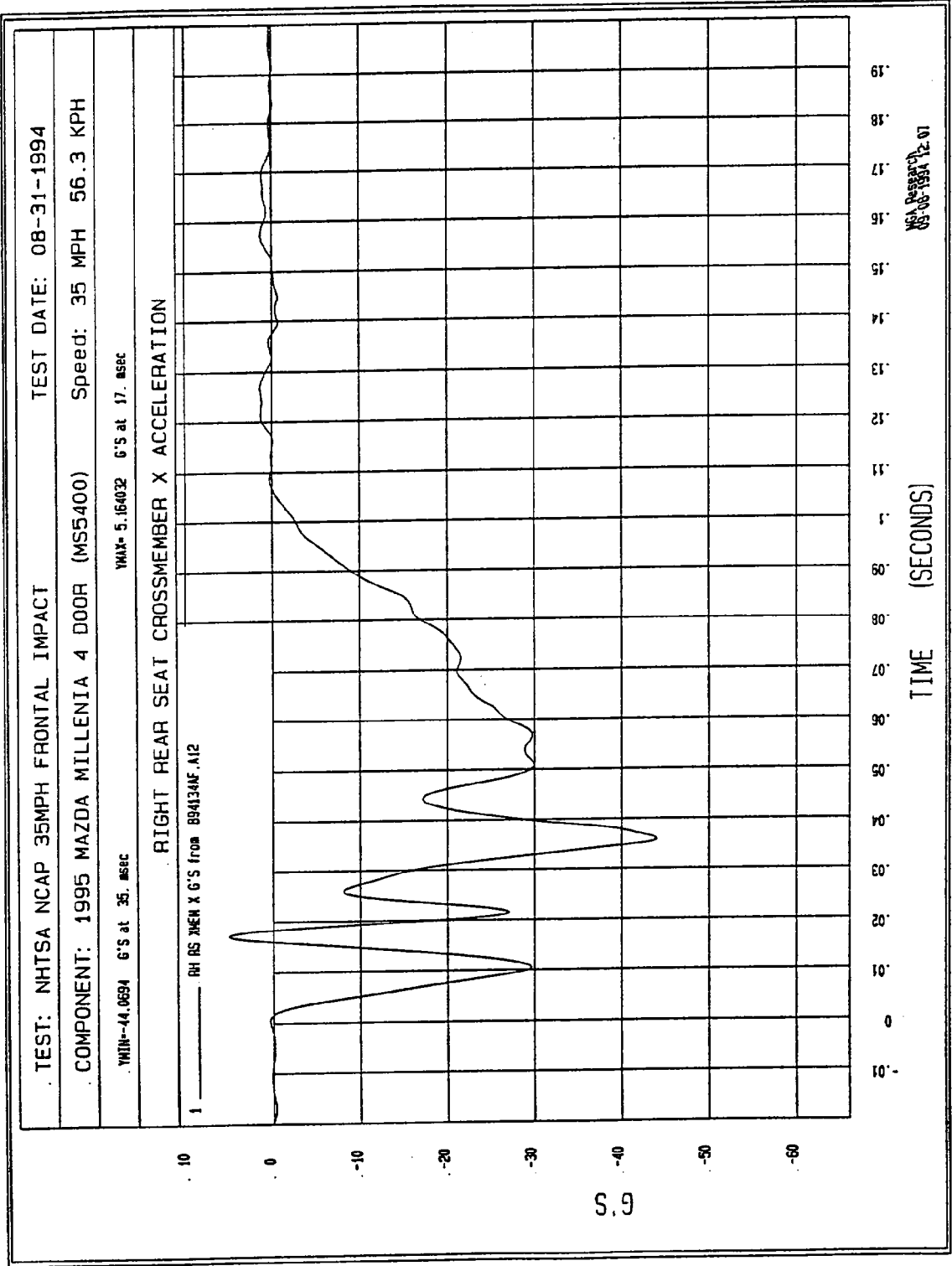
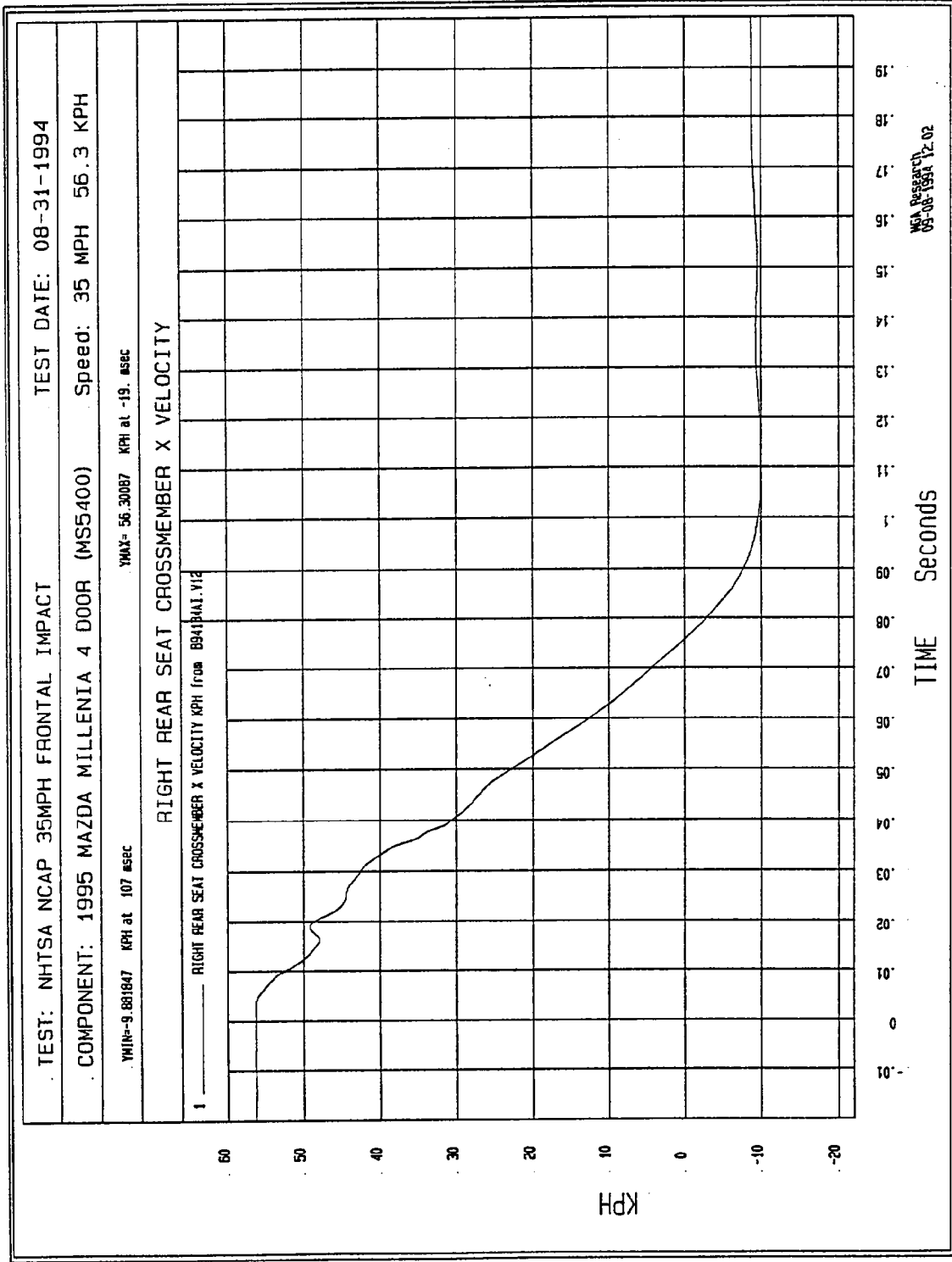


Figure B-1 - Right Rear Seat Crossmember X Accel. vs. Time



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

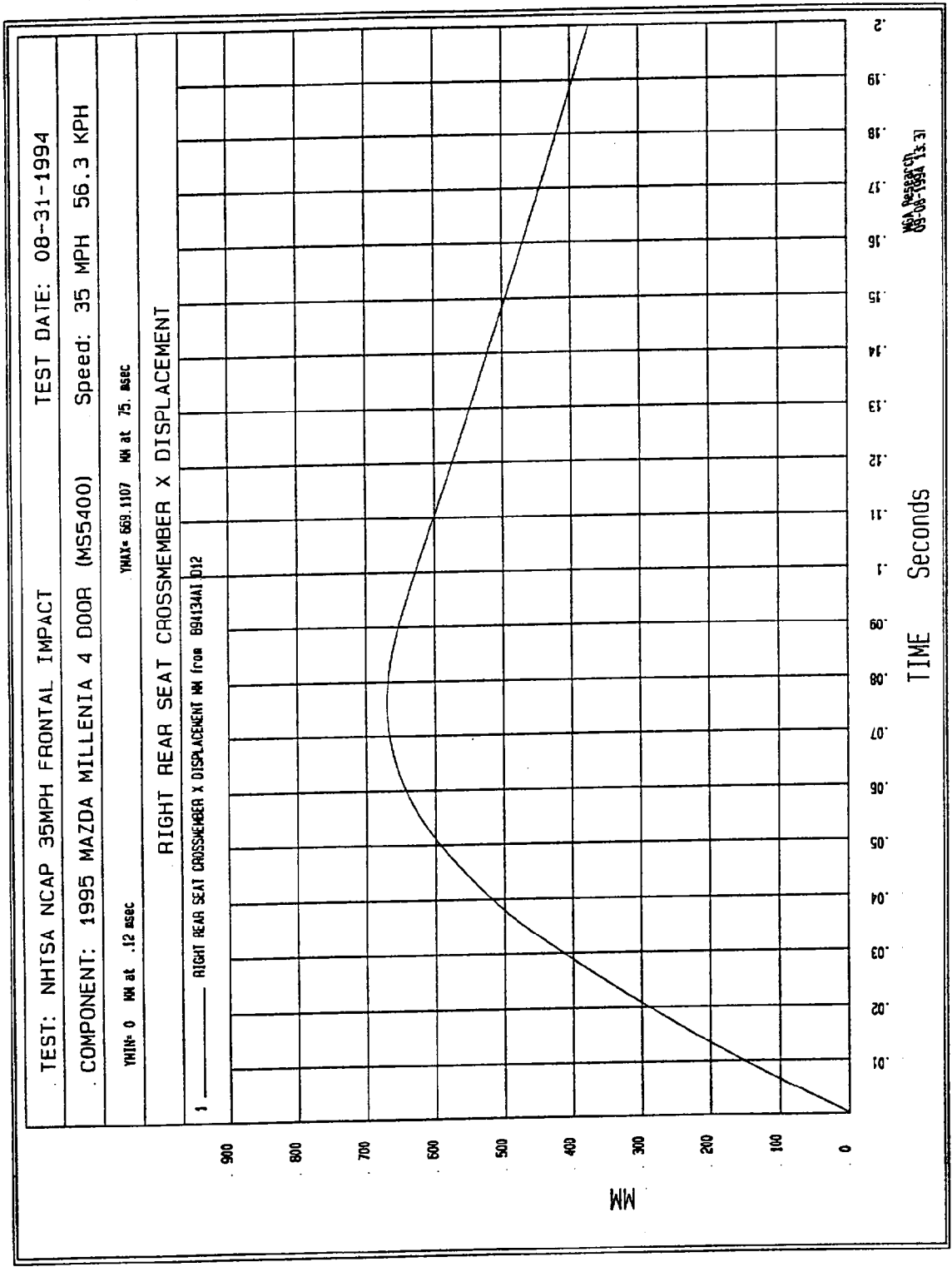


Figure B-3 - Right Rear Seat Crossmember X Displacement vs. Time

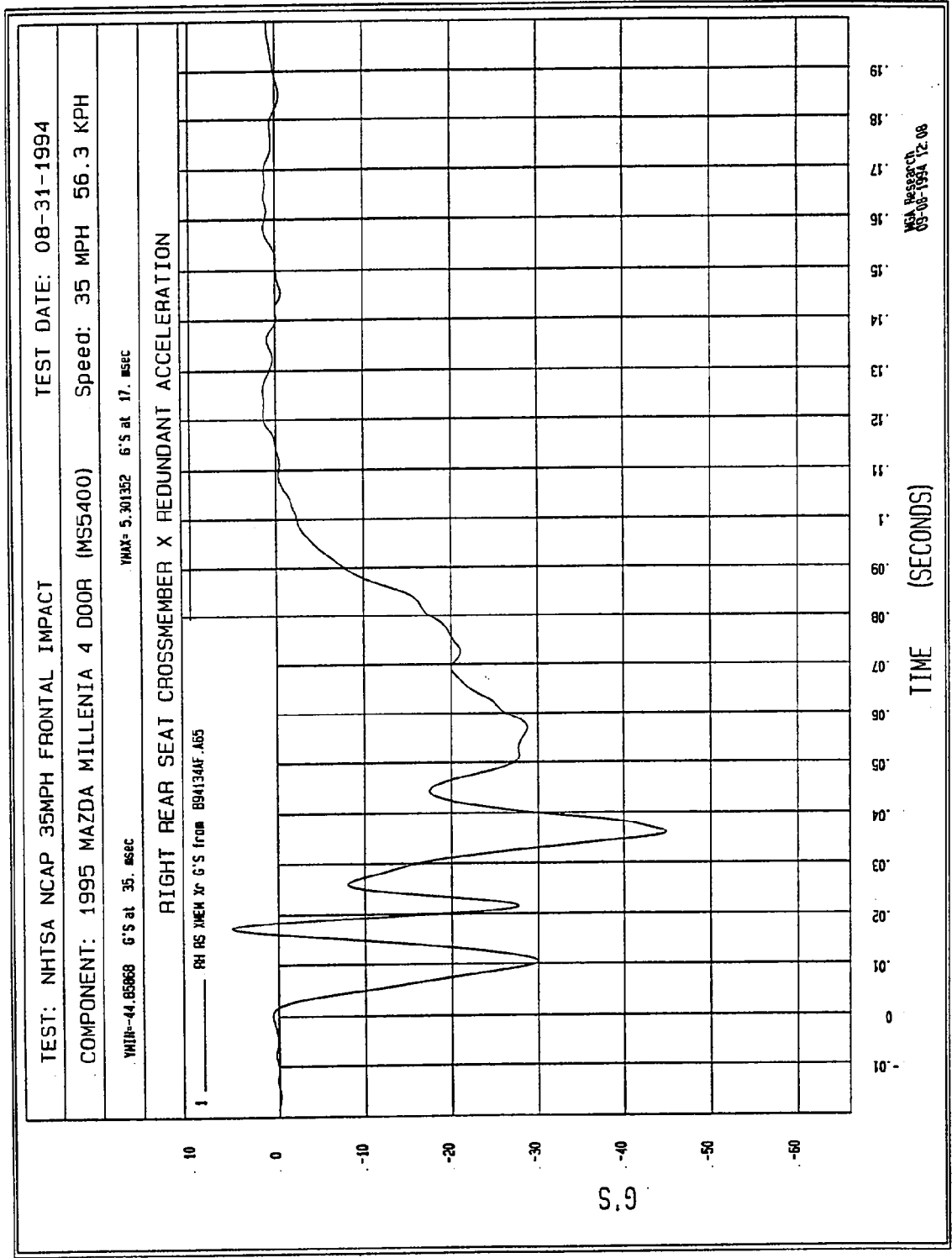


Figure B-4 - Right Rear Seat Crossmember X Redundant Acceleration vs. Time

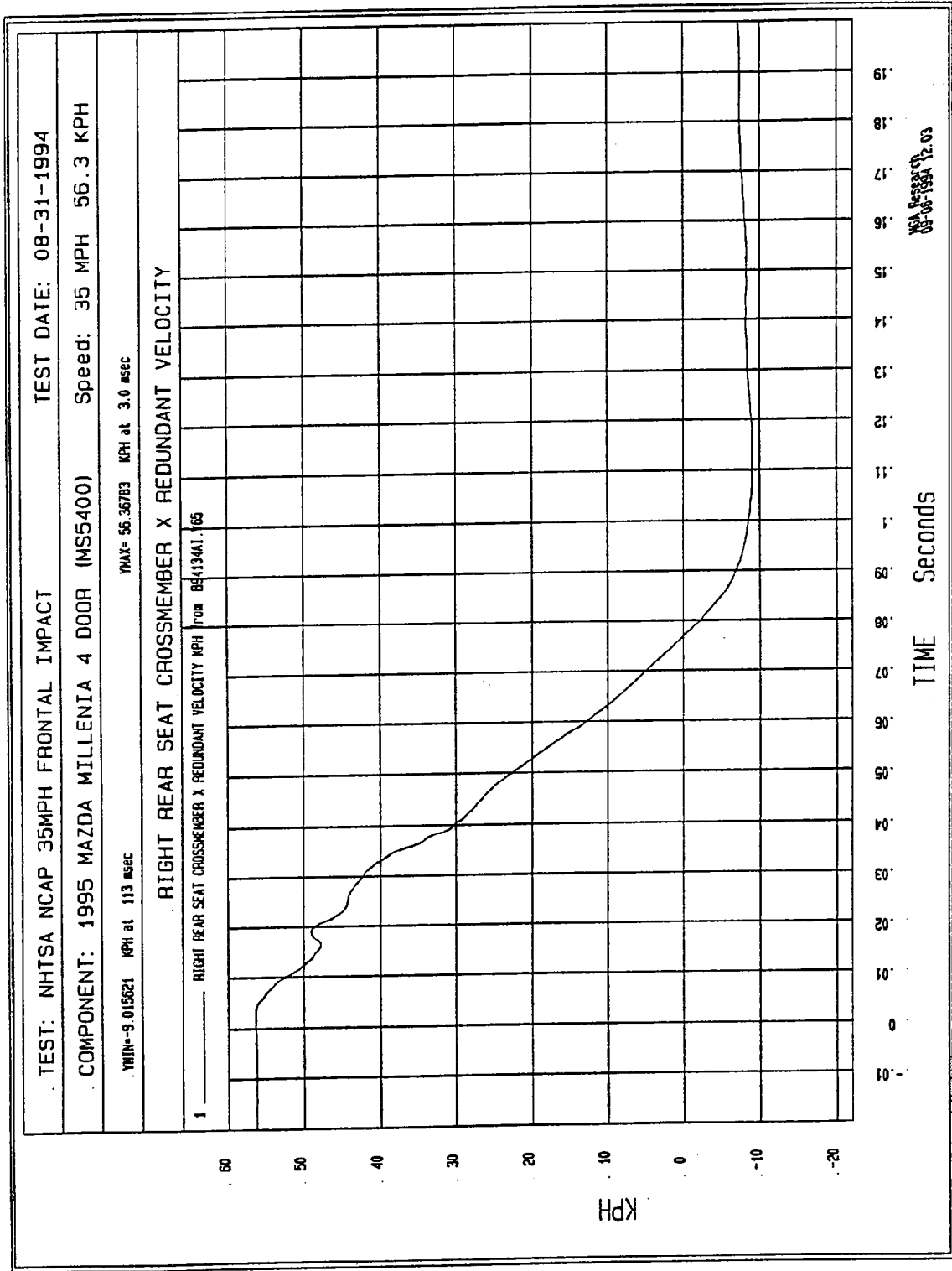


Figure B-5 - Right Rear Seat Crossmember X Redundant Velocity vs. Time

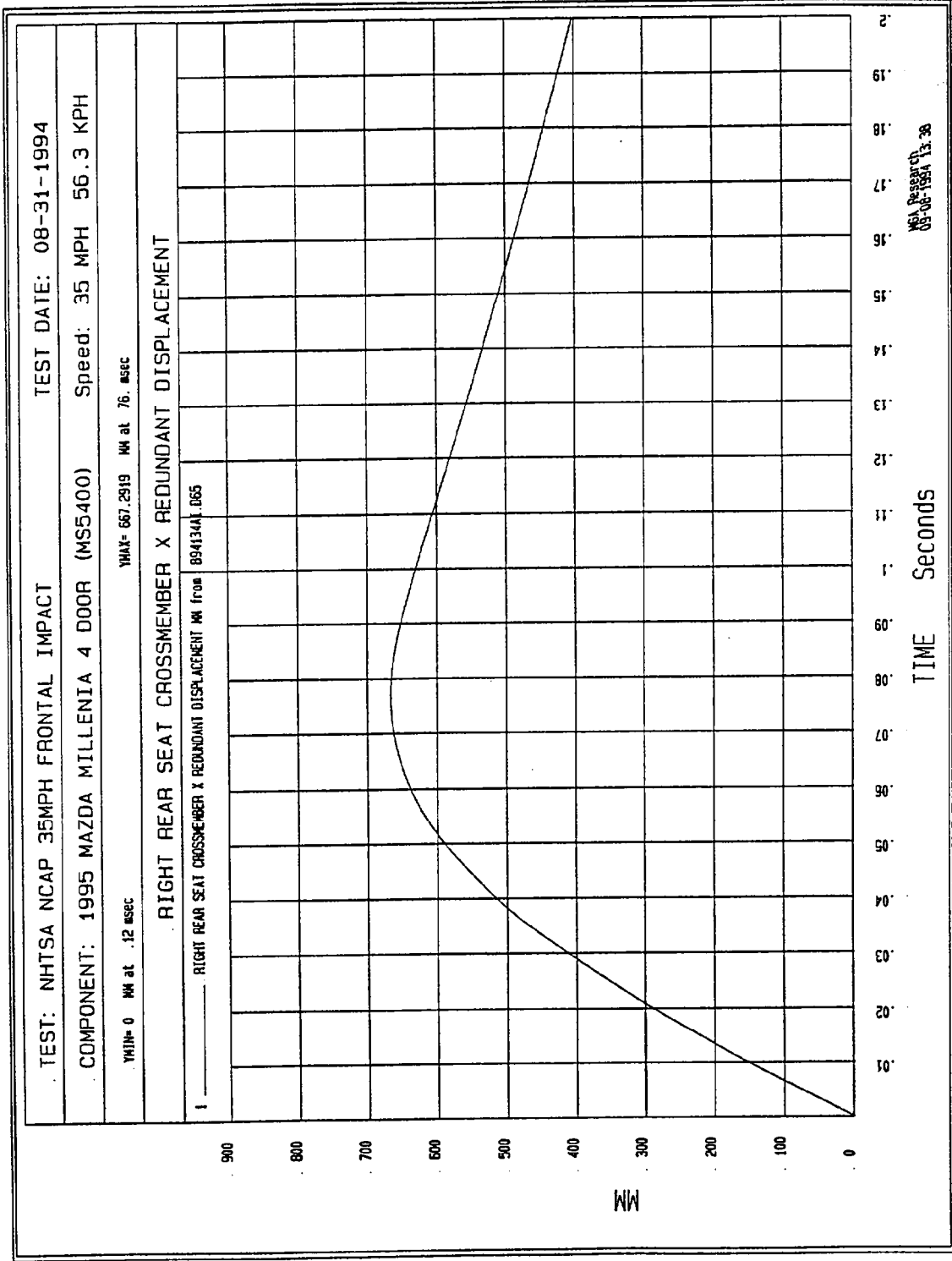


Figure B-6 - Right Rear Seat Crossmember X Redundant Displacement vs. Time

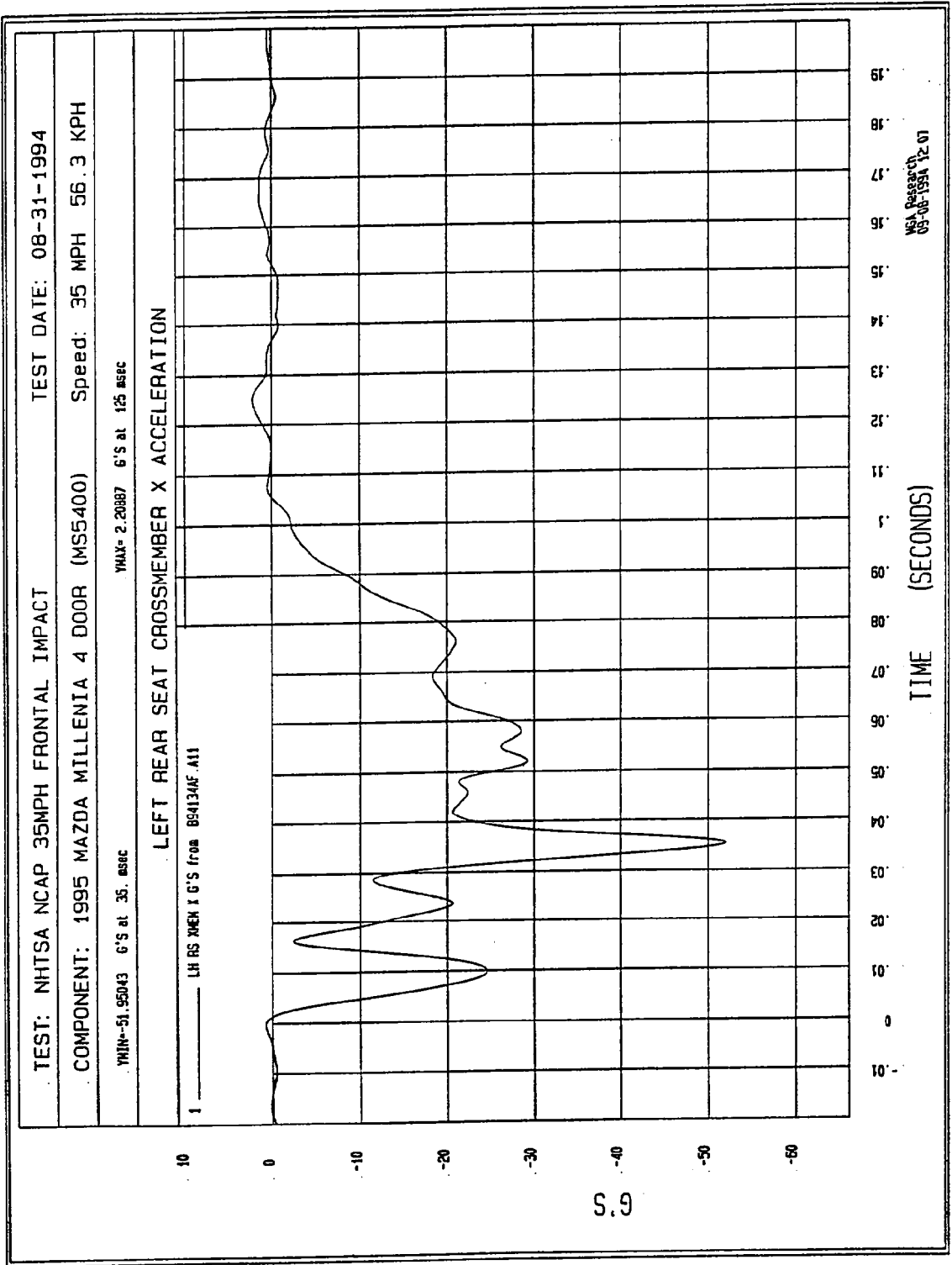


Figure B-7 - Left Rear Seat Crossmember X Acceleration vs. Time

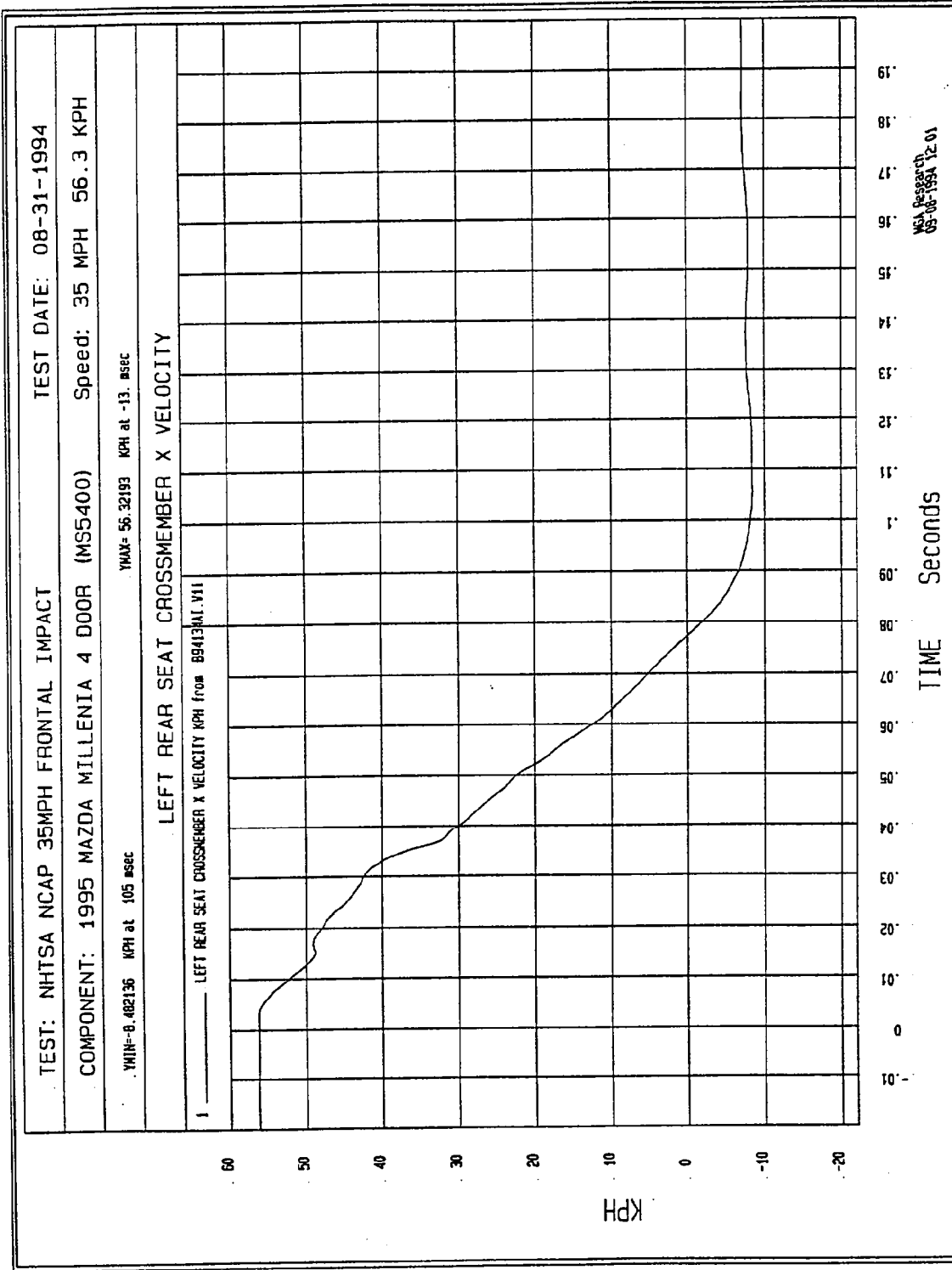


Figure B-8 - Left Rear Seat Crossmember X Velocity vs. Time

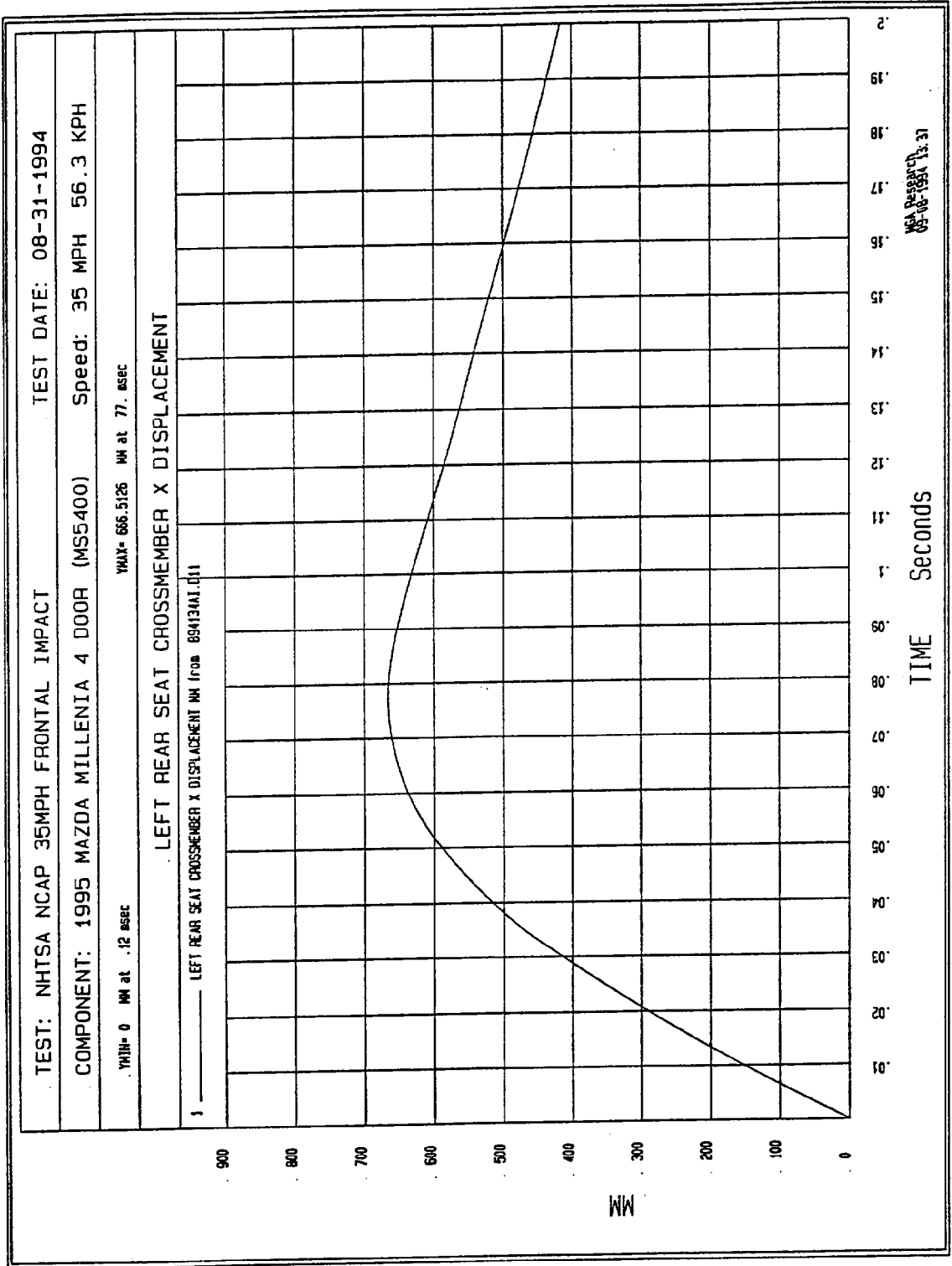


Figure B-9 - Left Rear Seat Crossmember X Displacement vs. Time

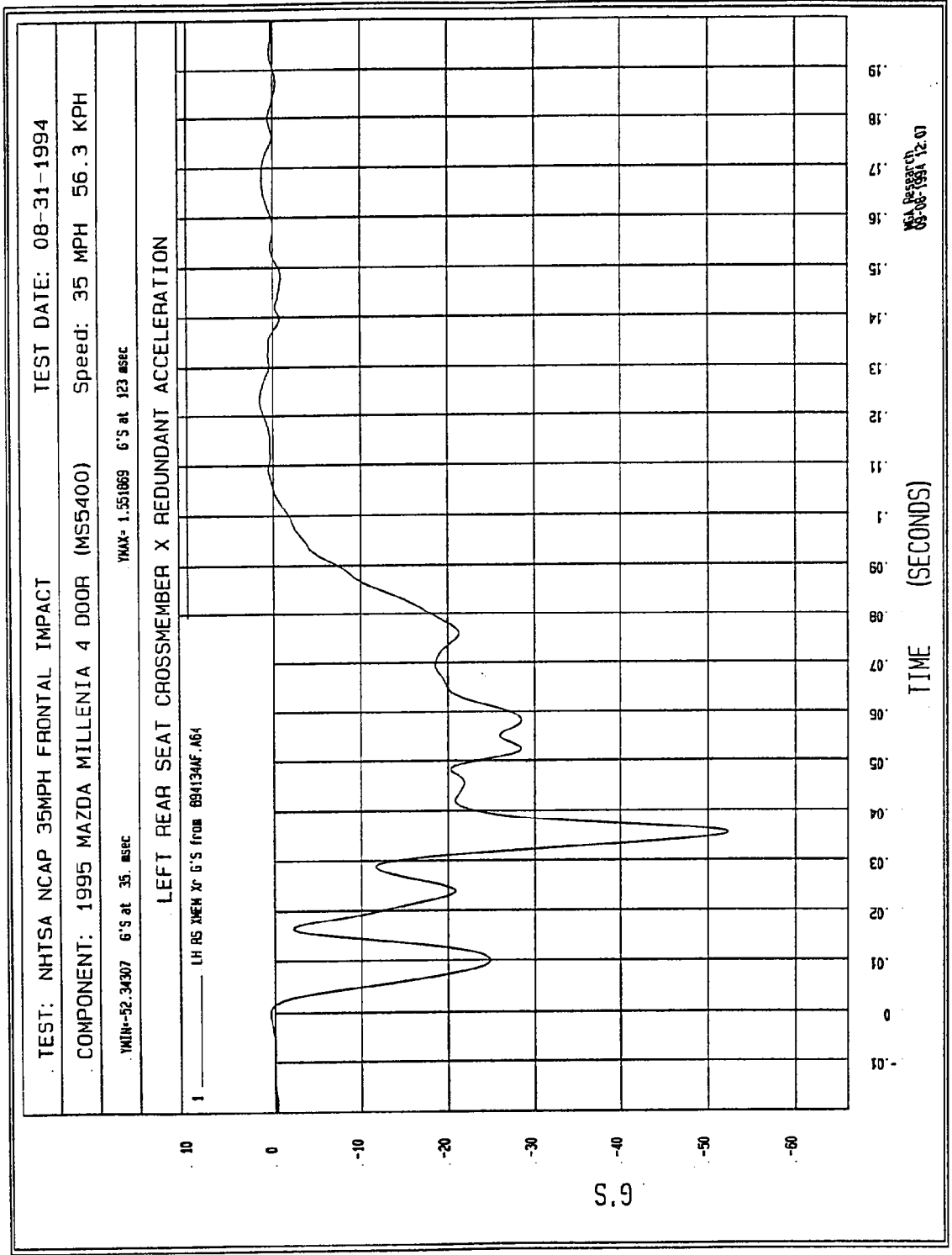


Figure B-10 - Left Rear Seat Crossmember X Redundant Acceleration vs. Time

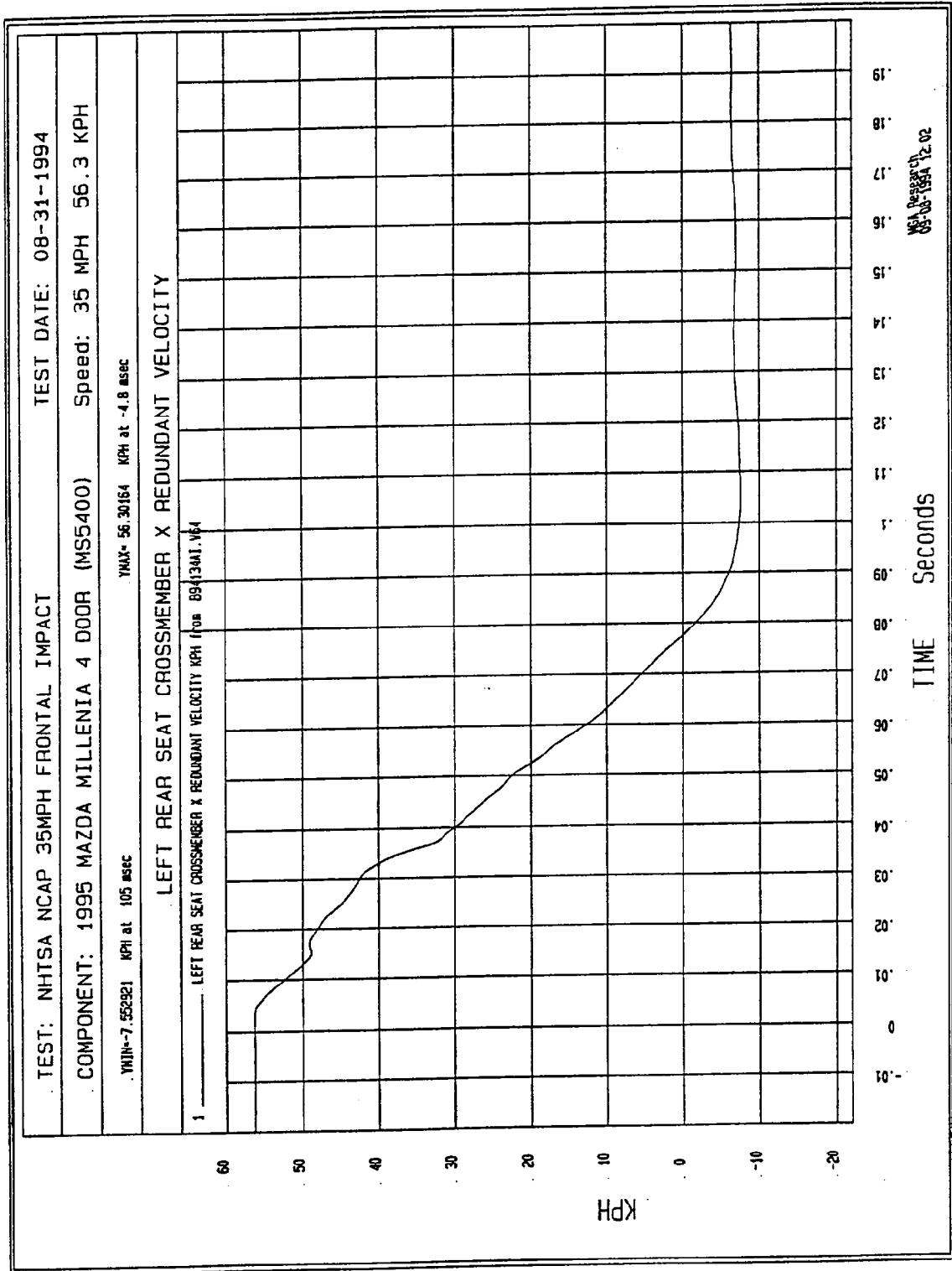


Figure B-11 - Left Rear Seat Crossmember X Redundant Velocity vs. Time

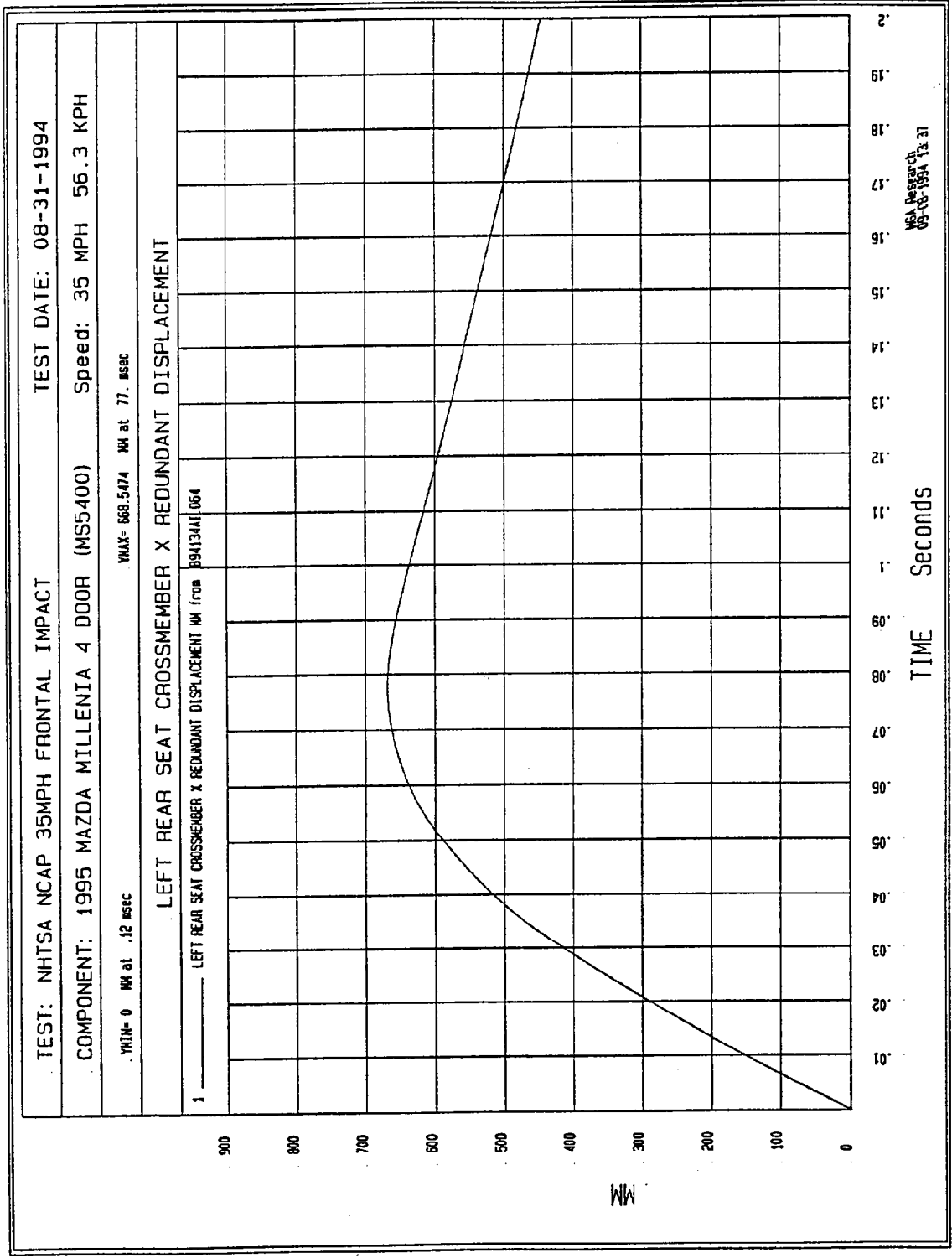


Figure B-12 - Left Rear Seat Crossmember X Redundant Displacement vs. Time

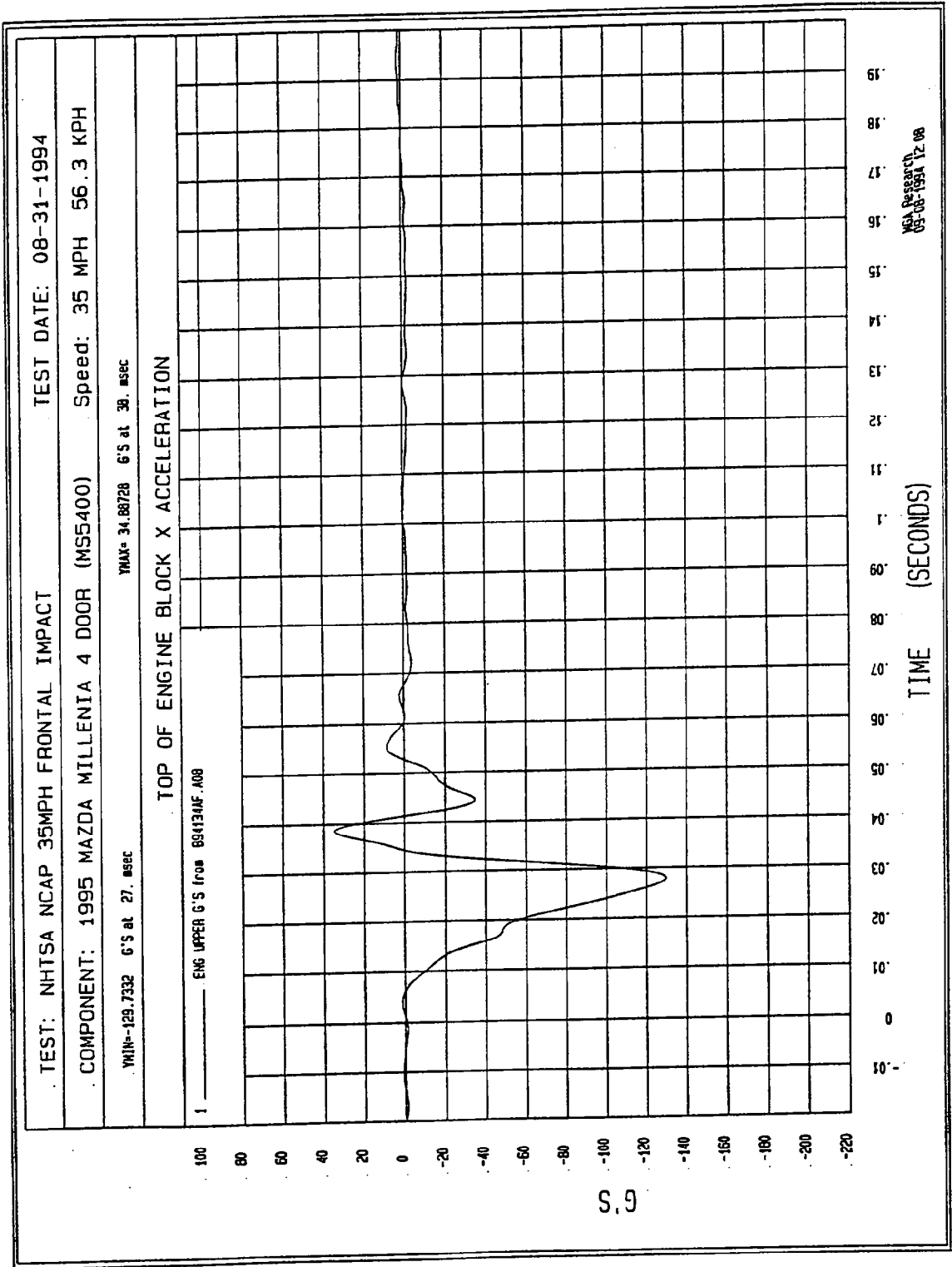


Figure B-13 - Top of Engine Block X Acceleration vs. Time

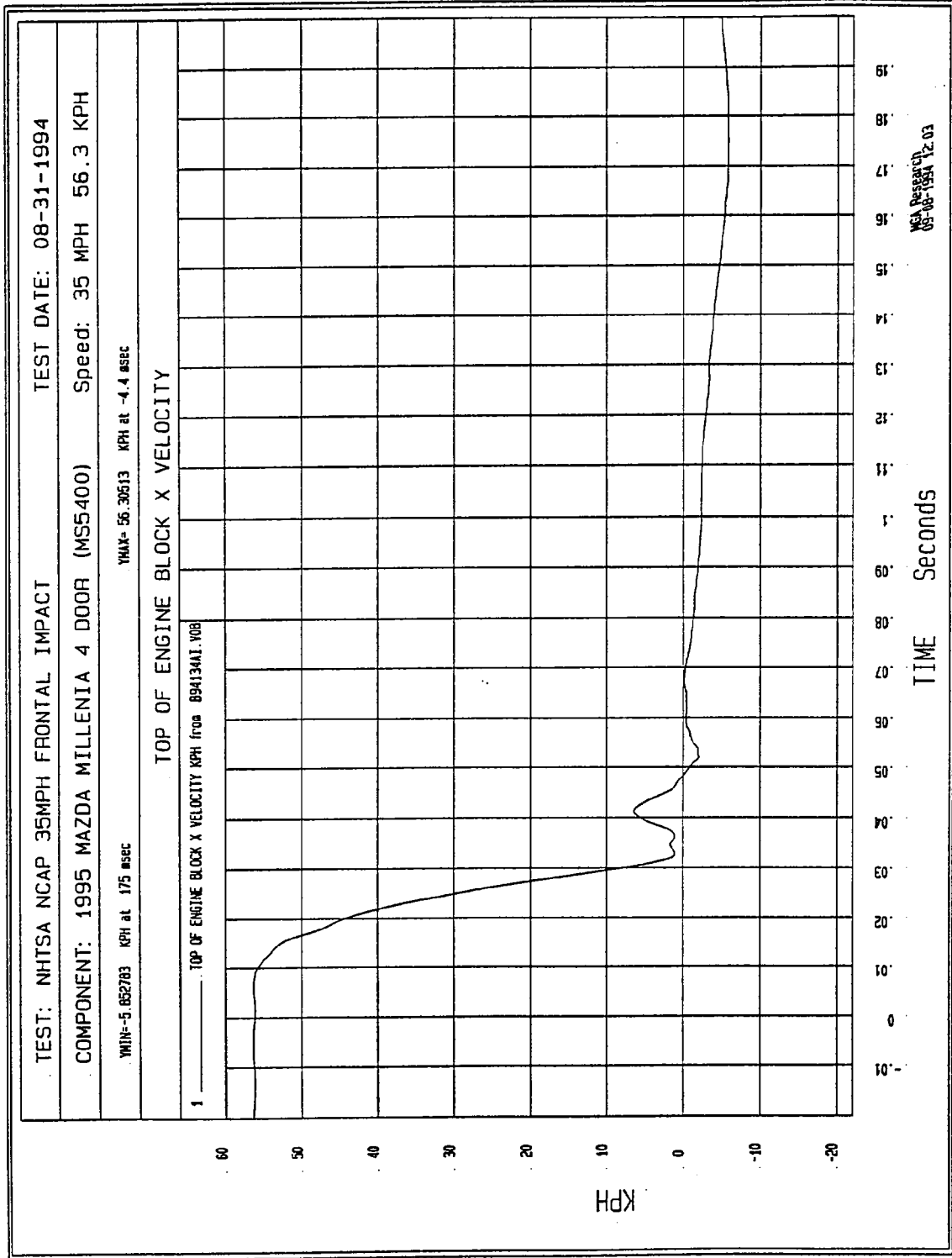


Figure B-14 - Top of Engine Block X Velocity vs. Time

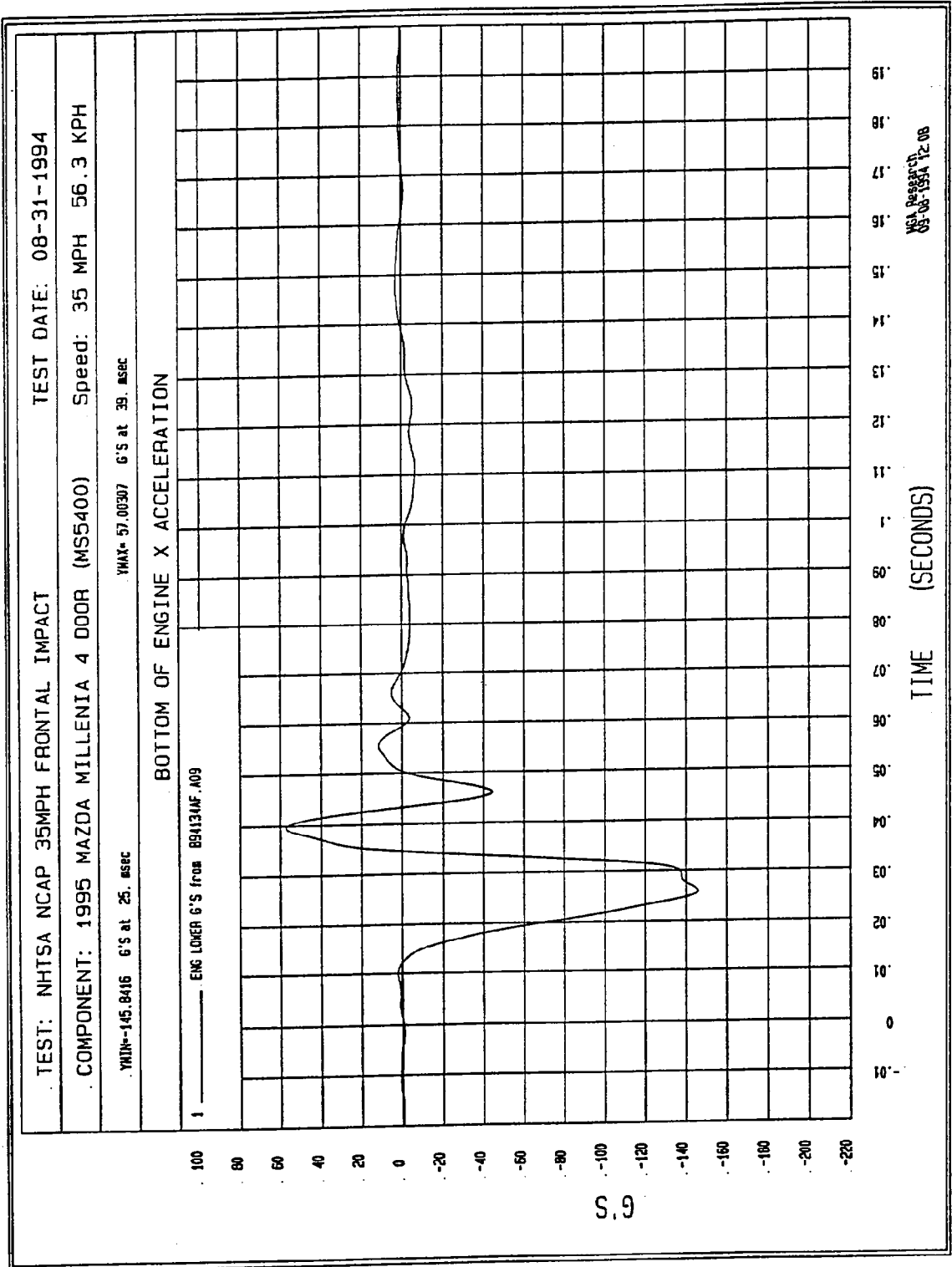


Figure B-15 - Bottom of Engine X Acceleration vs. Time

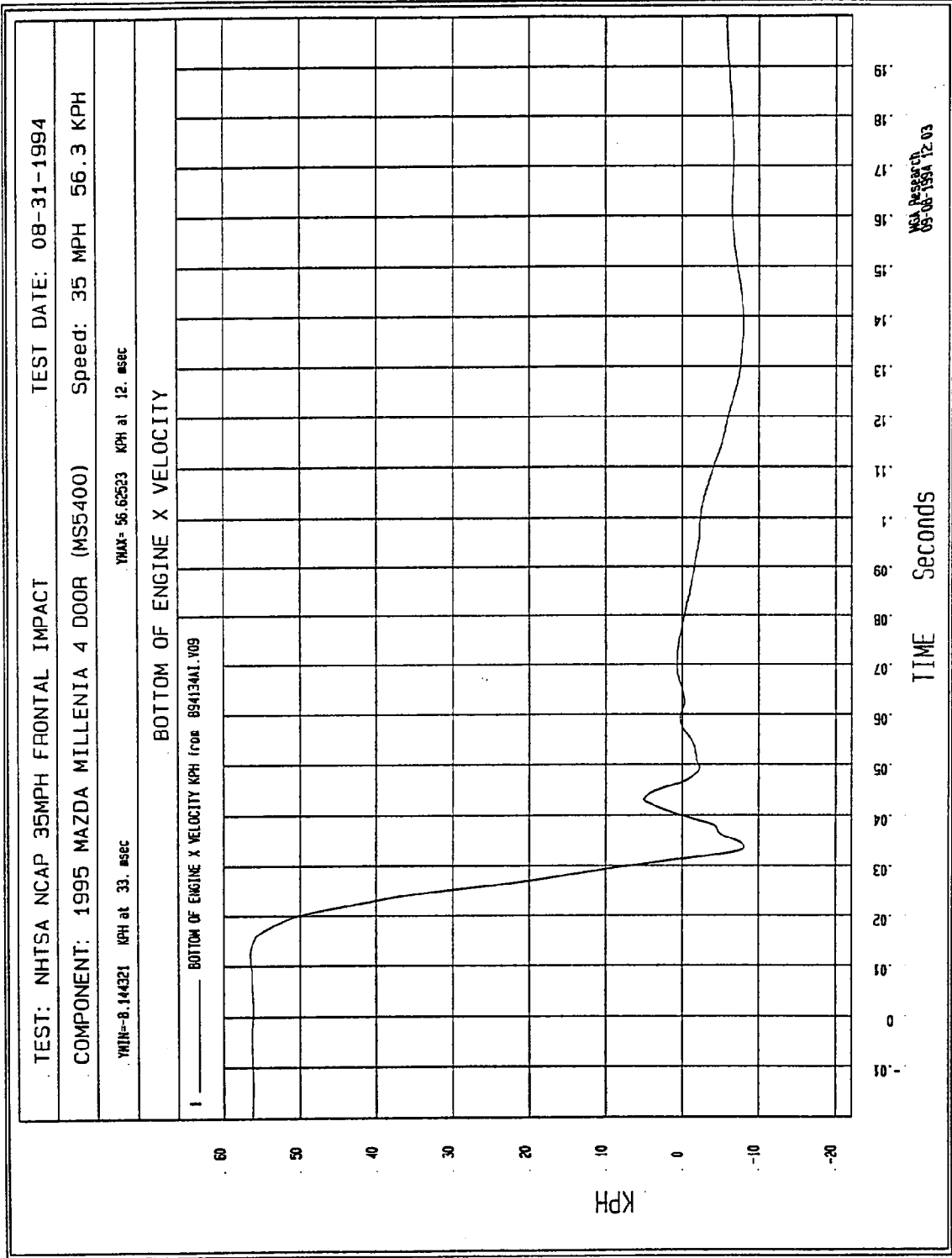


Figure B-16 - Bottom of Engine X Velocity vs. Time

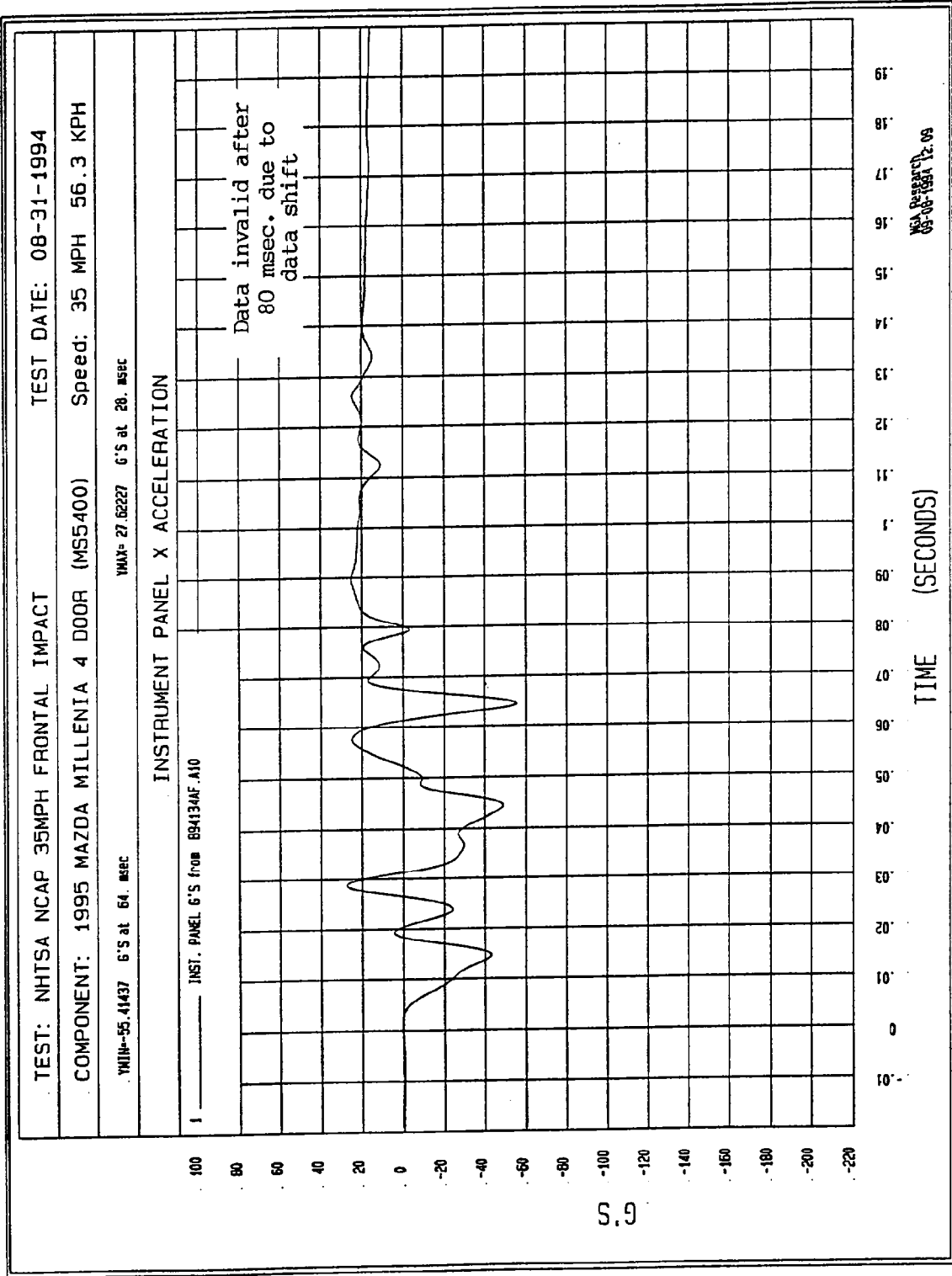
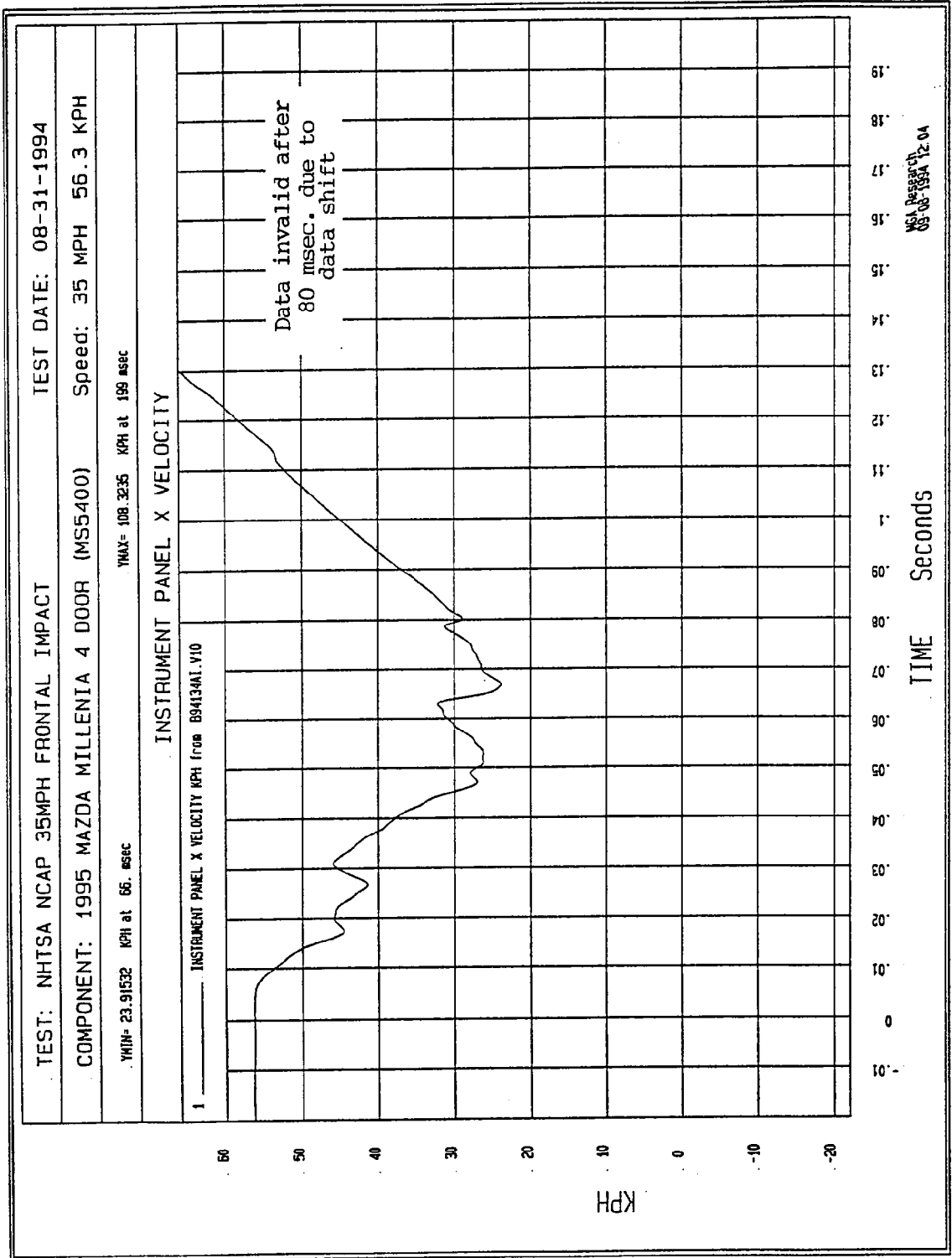


Figure B-17 - Instrument Panel X Acceleration vs. Time



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Figure B-18 - Instrument Panel X Velocity vs. Time

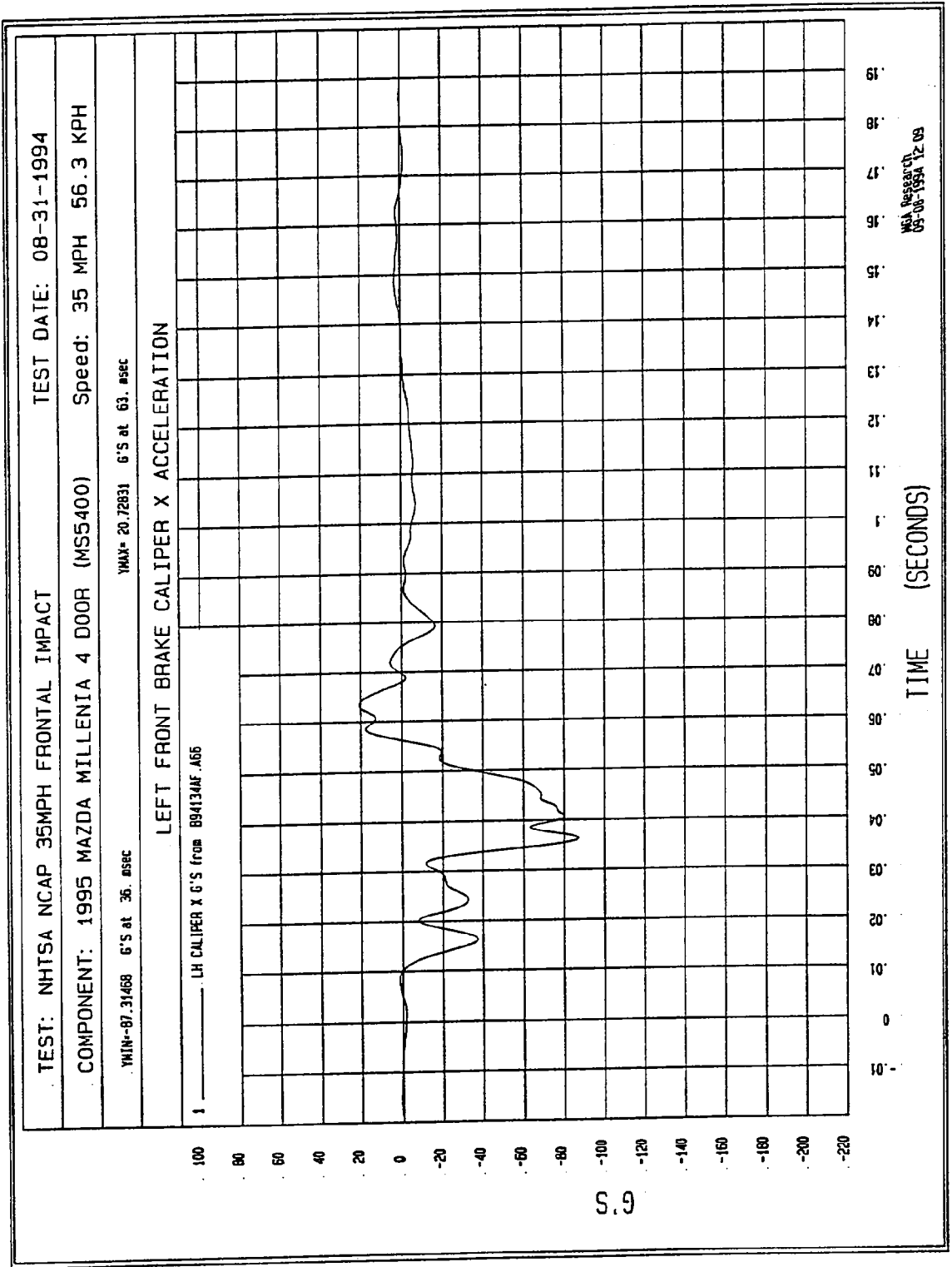


Figure B-19 - Left Brake Caliper X Acceleration vs. Time

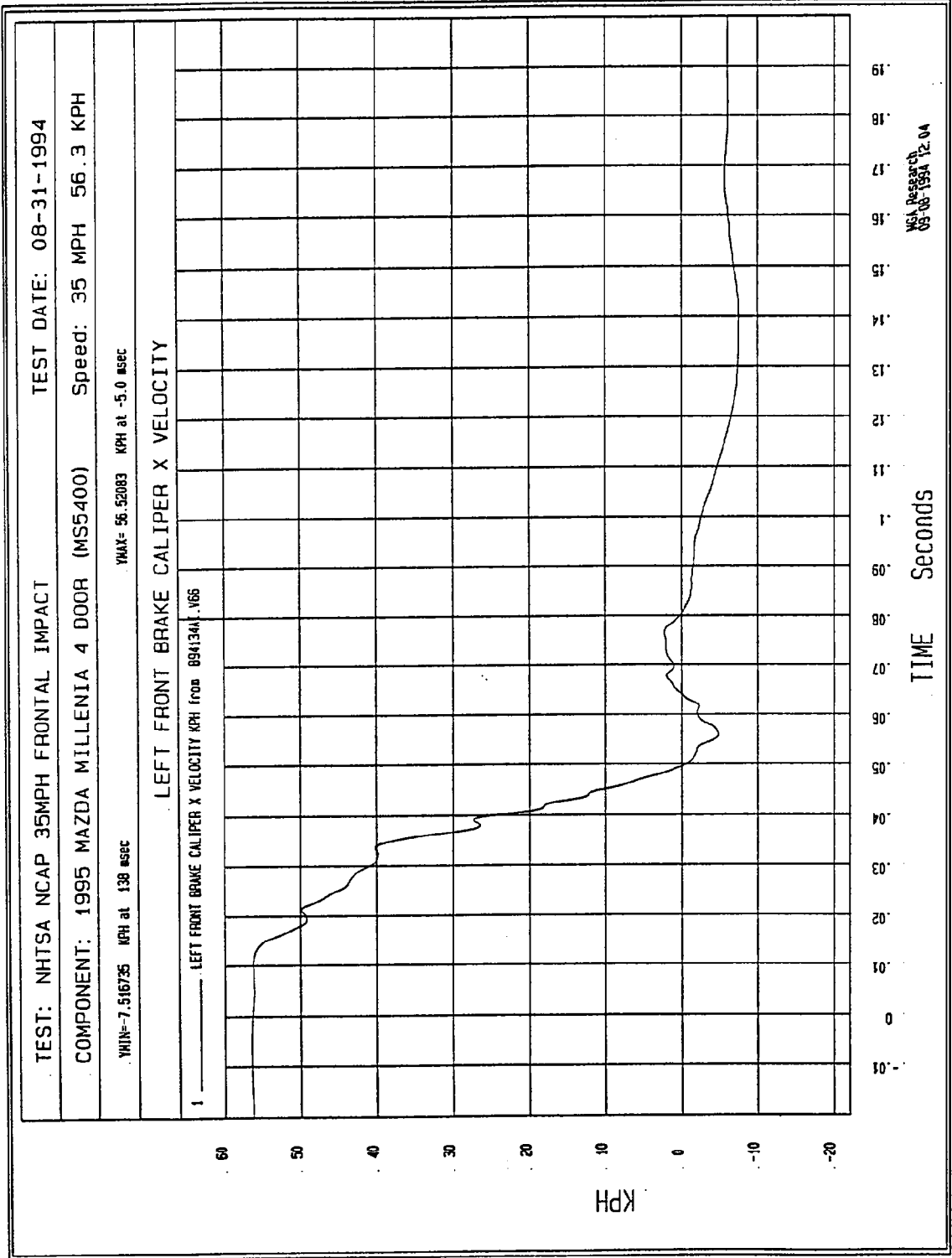


Figure B-20 - Left Brake Caliper X Velocity vs. Time

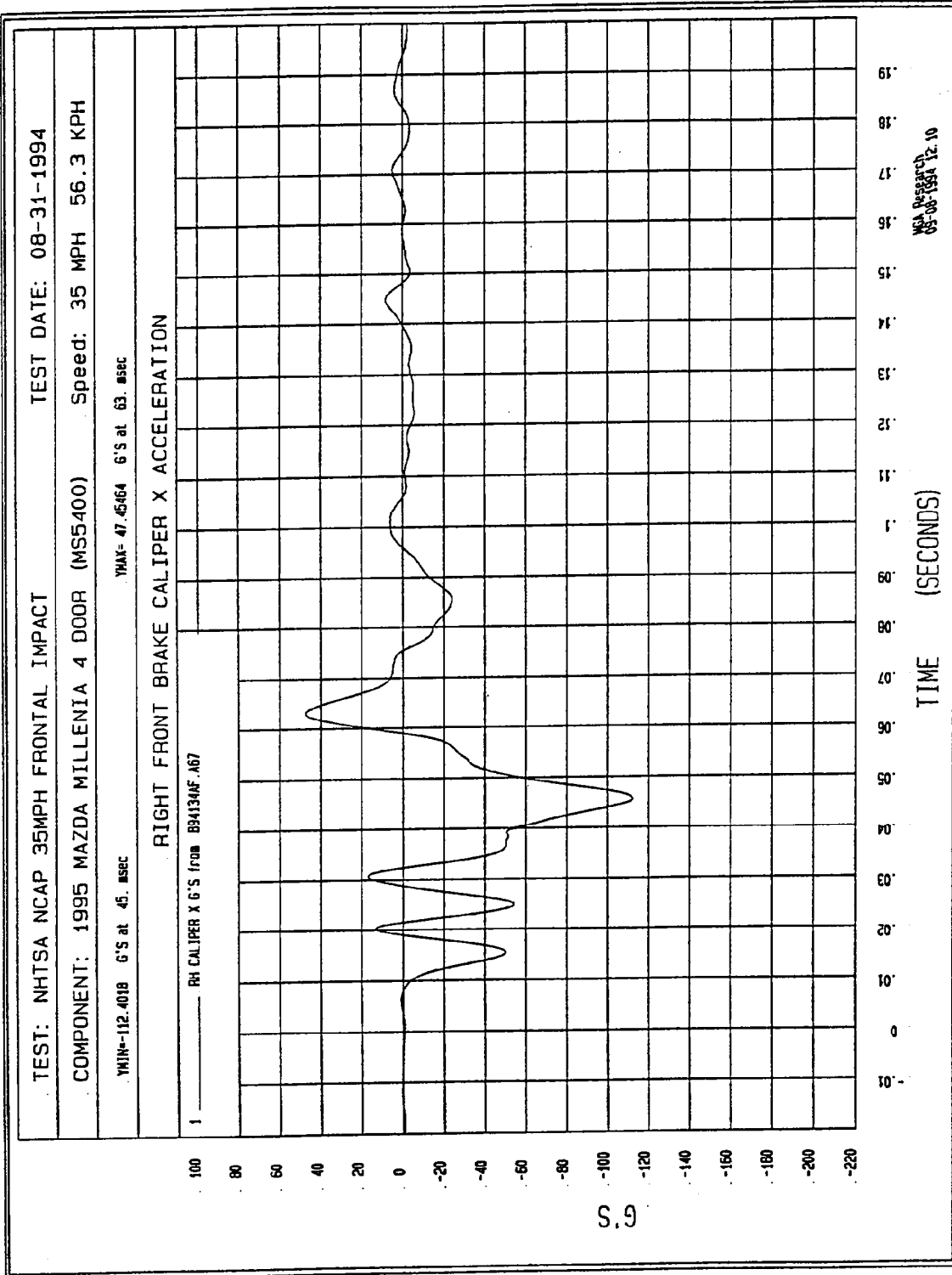


Figure B-21 - Right Brake Caliper X Acceleration vs. Time

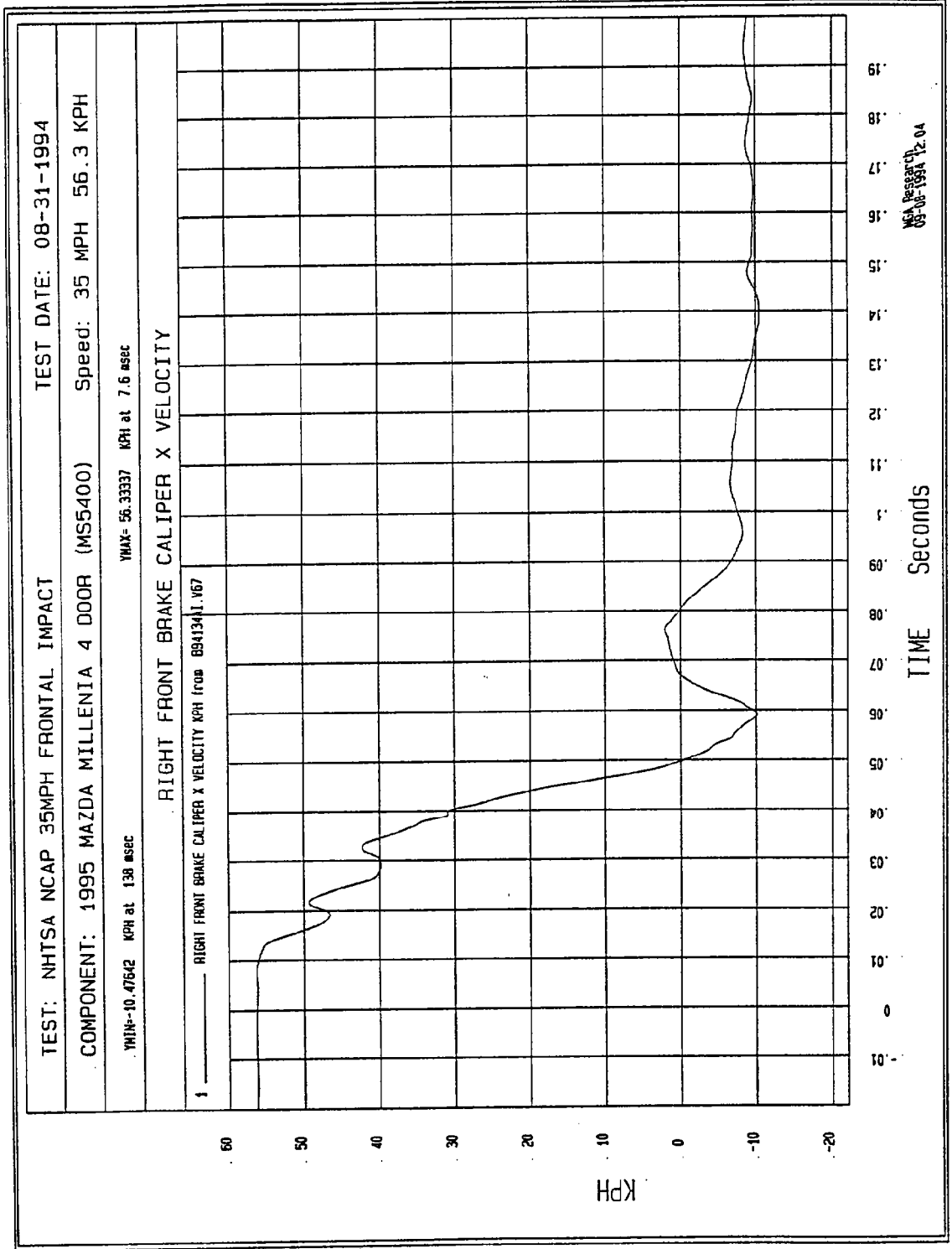


Figure B-22 - Right Brake Caliper X Velocity vs. Time

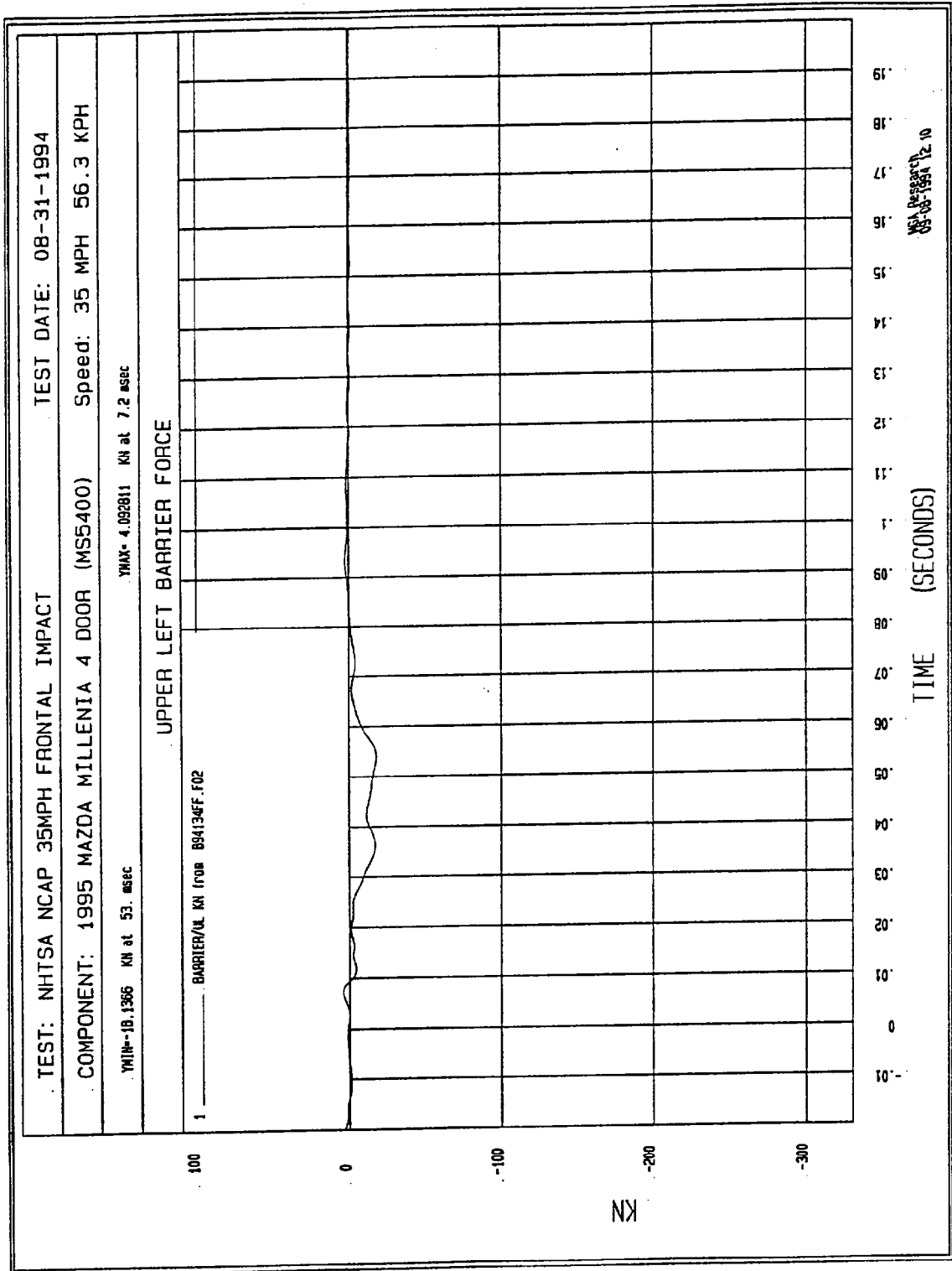


Figure B-23 - Upper Left Barrier Force vs. Time

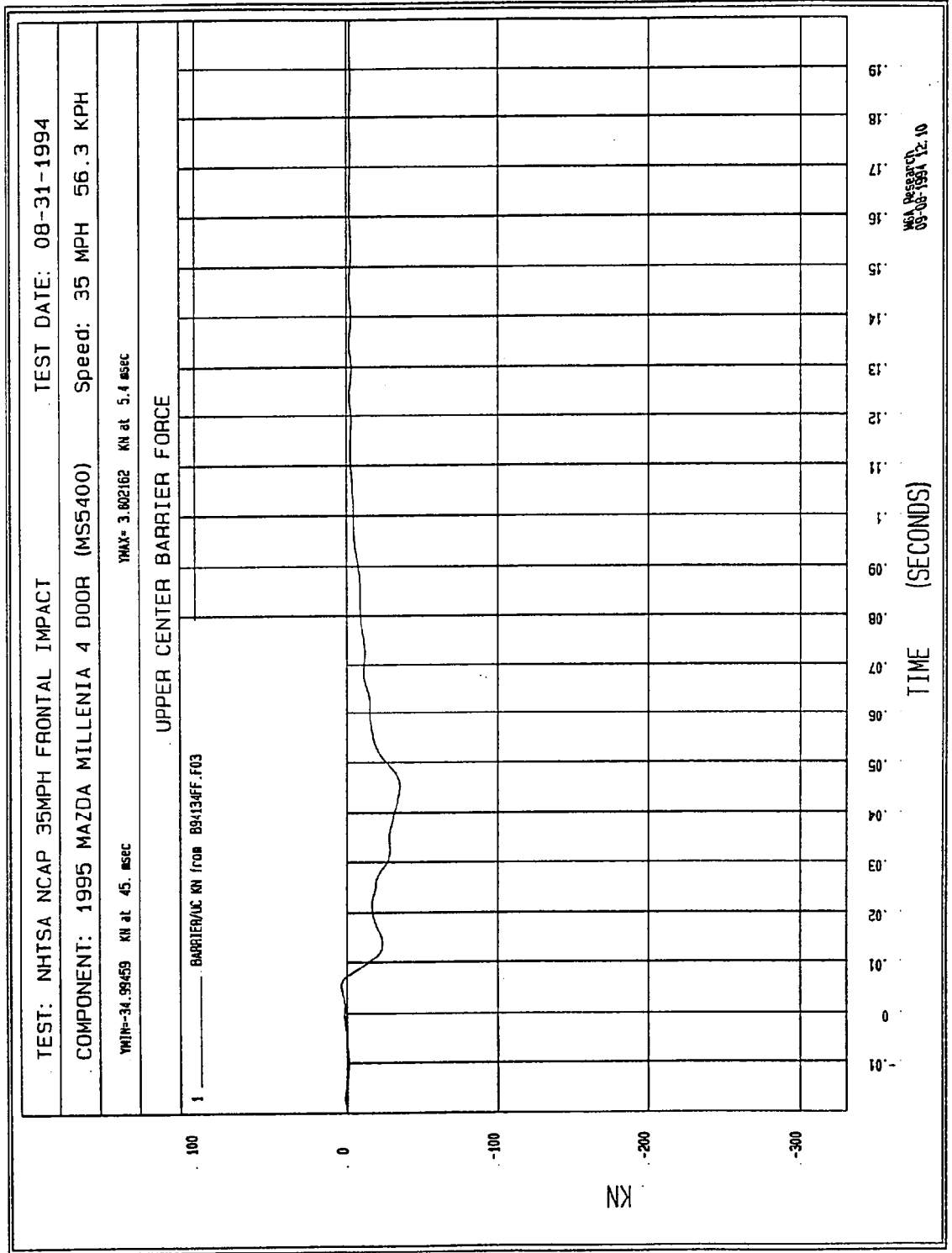


Figure B-24 - Upper Center Barrier Force vs. Time

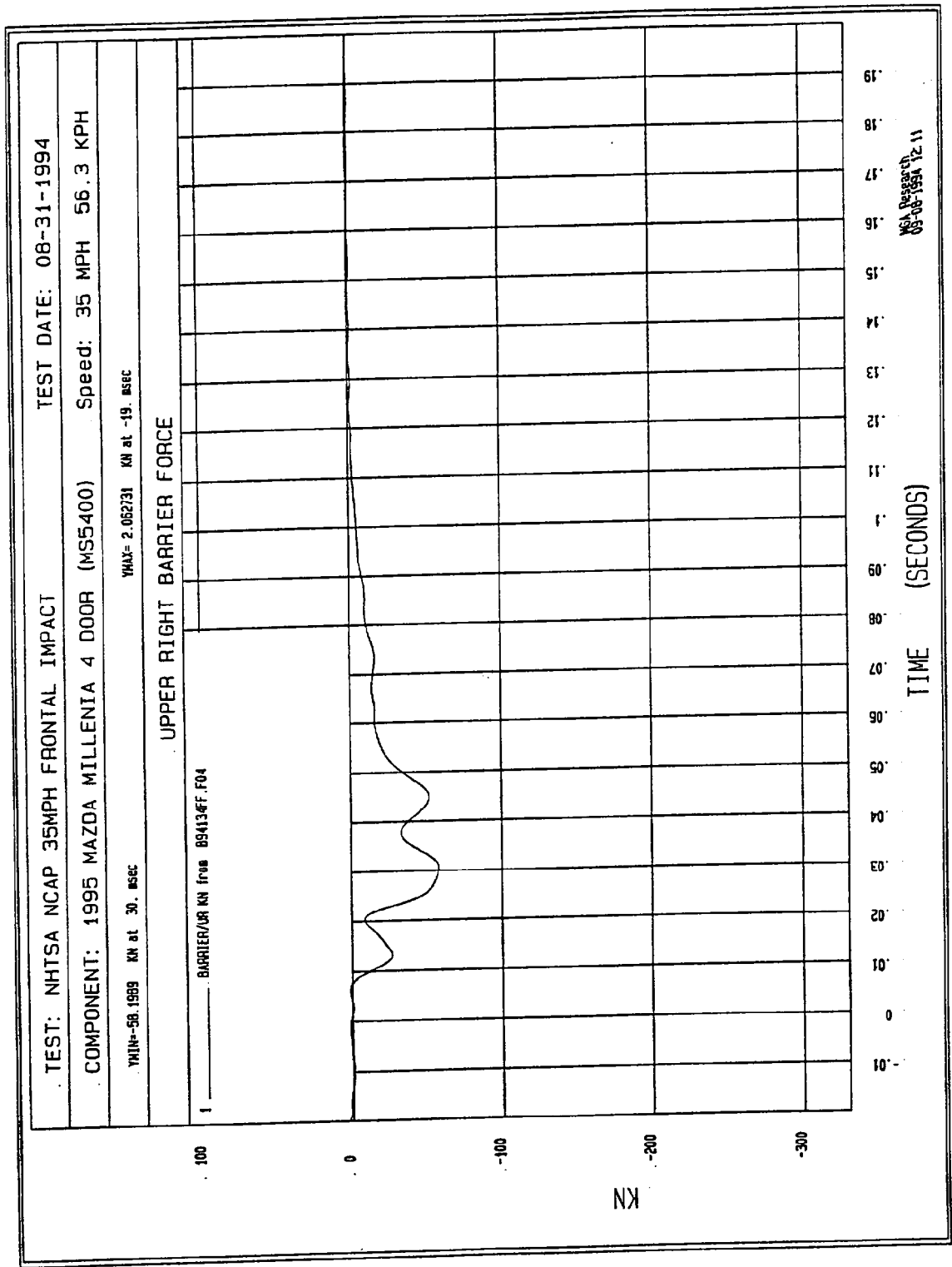


Figure B-25 - Upper Right Barrier Force vs. Time

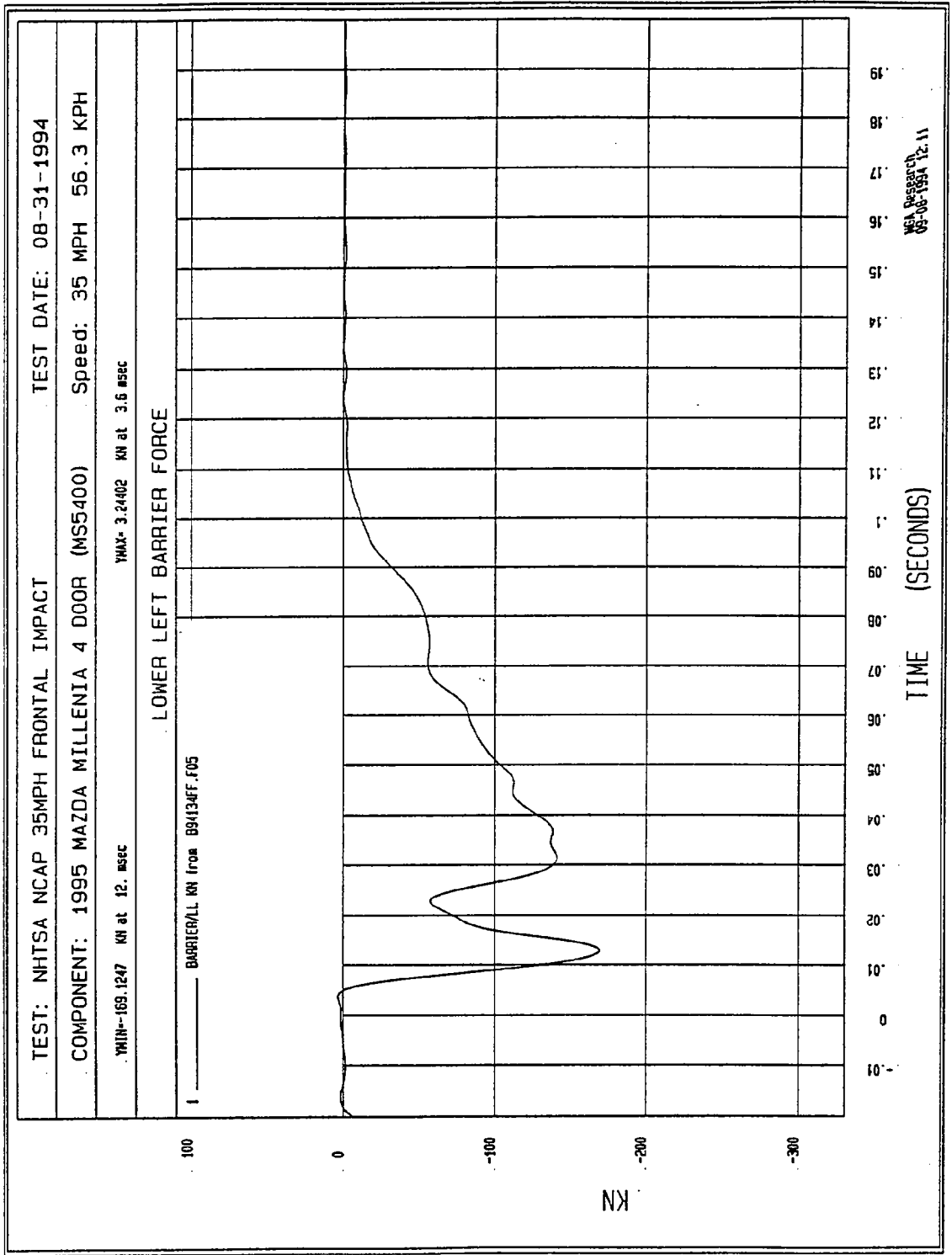
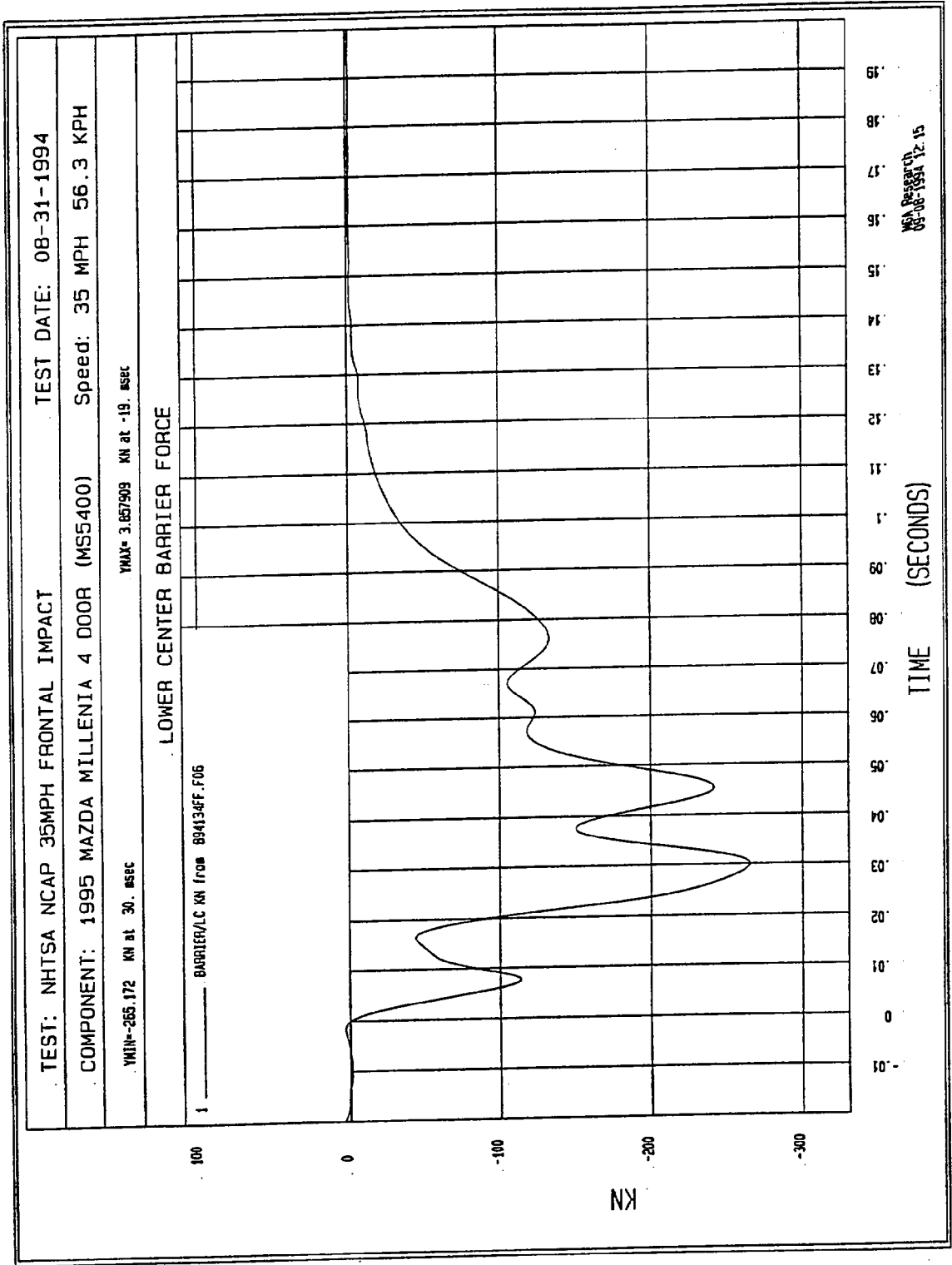
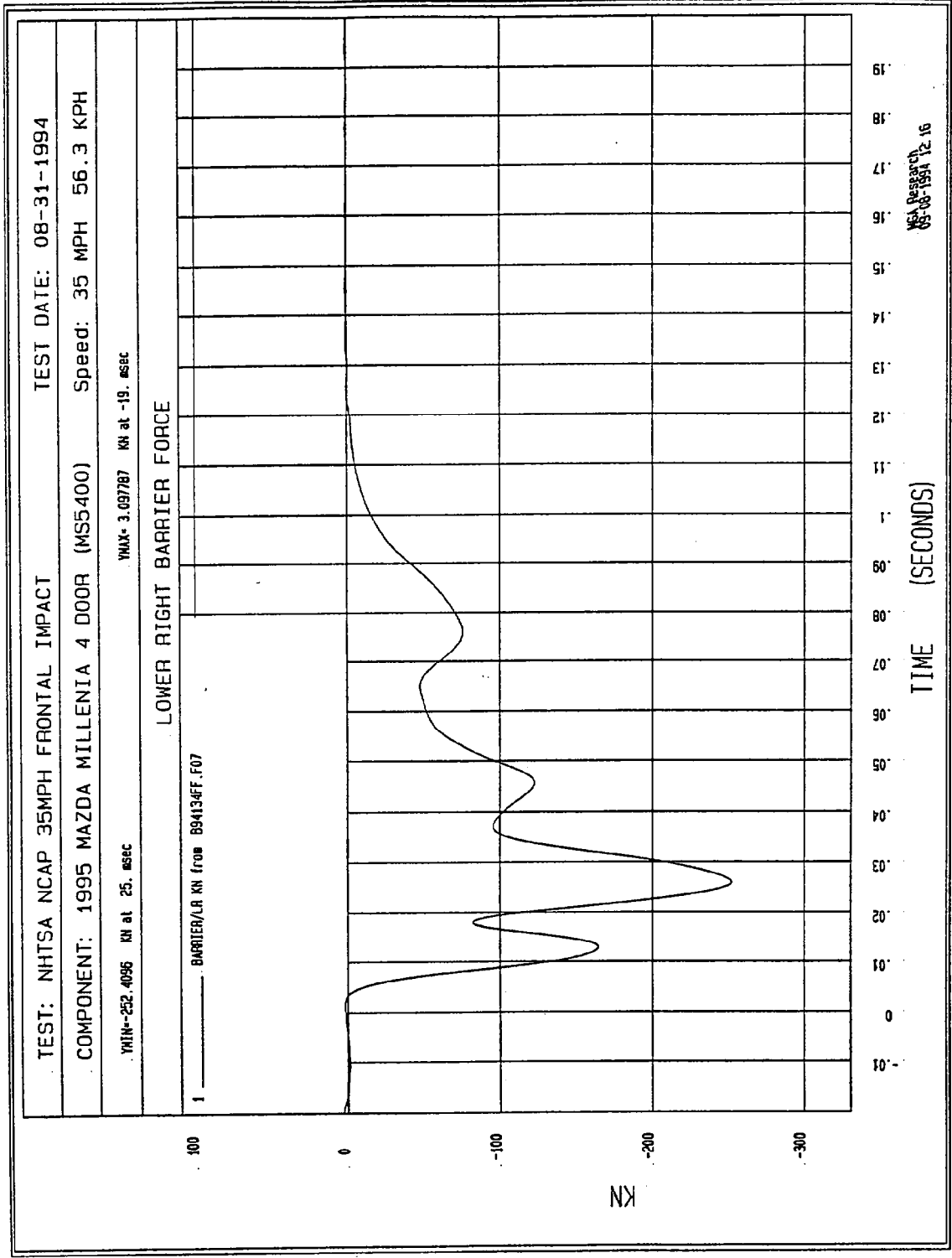


Figure B-26 - Lower Left Barrier Force vs. Time



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Figure B-27 - Lower Center Barrier Force vs. Time



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Figure B-28 - Lower Right Barrier Force vs. Time

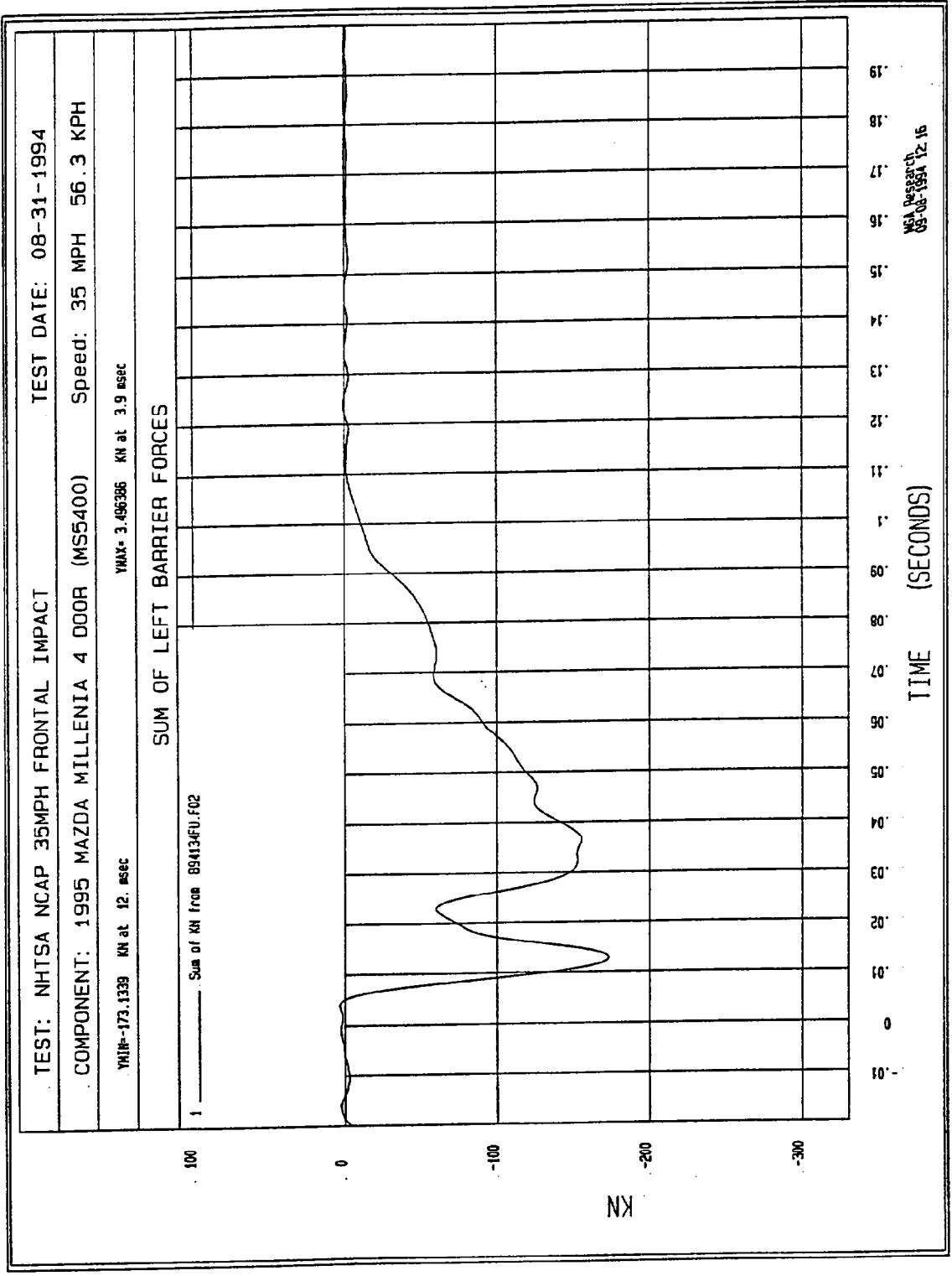


Figure B-29 - Sum of Left Barrier Forces vs. Time

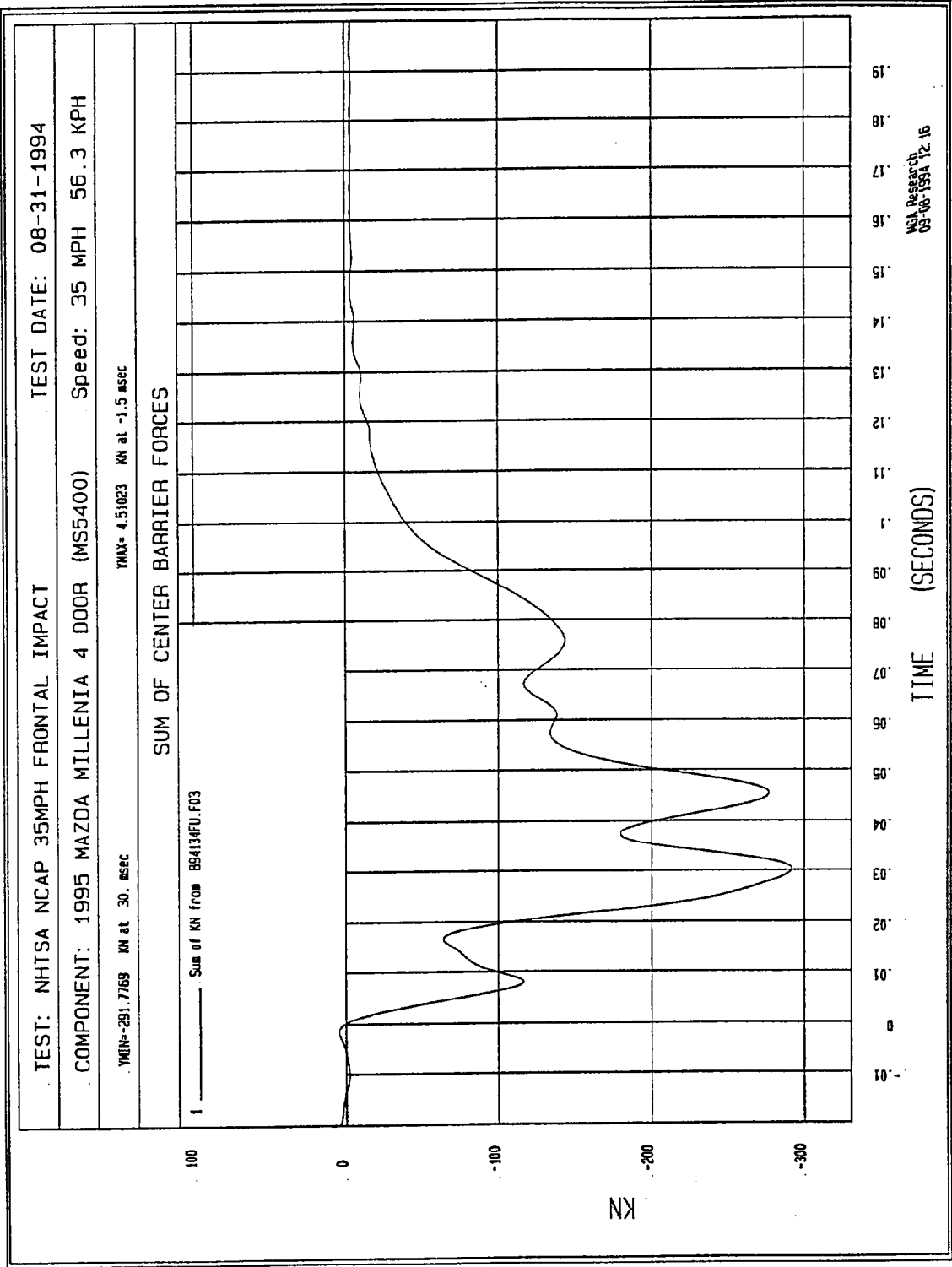


Figure B-30 - Sum of Center Barrier Forces vs. Time

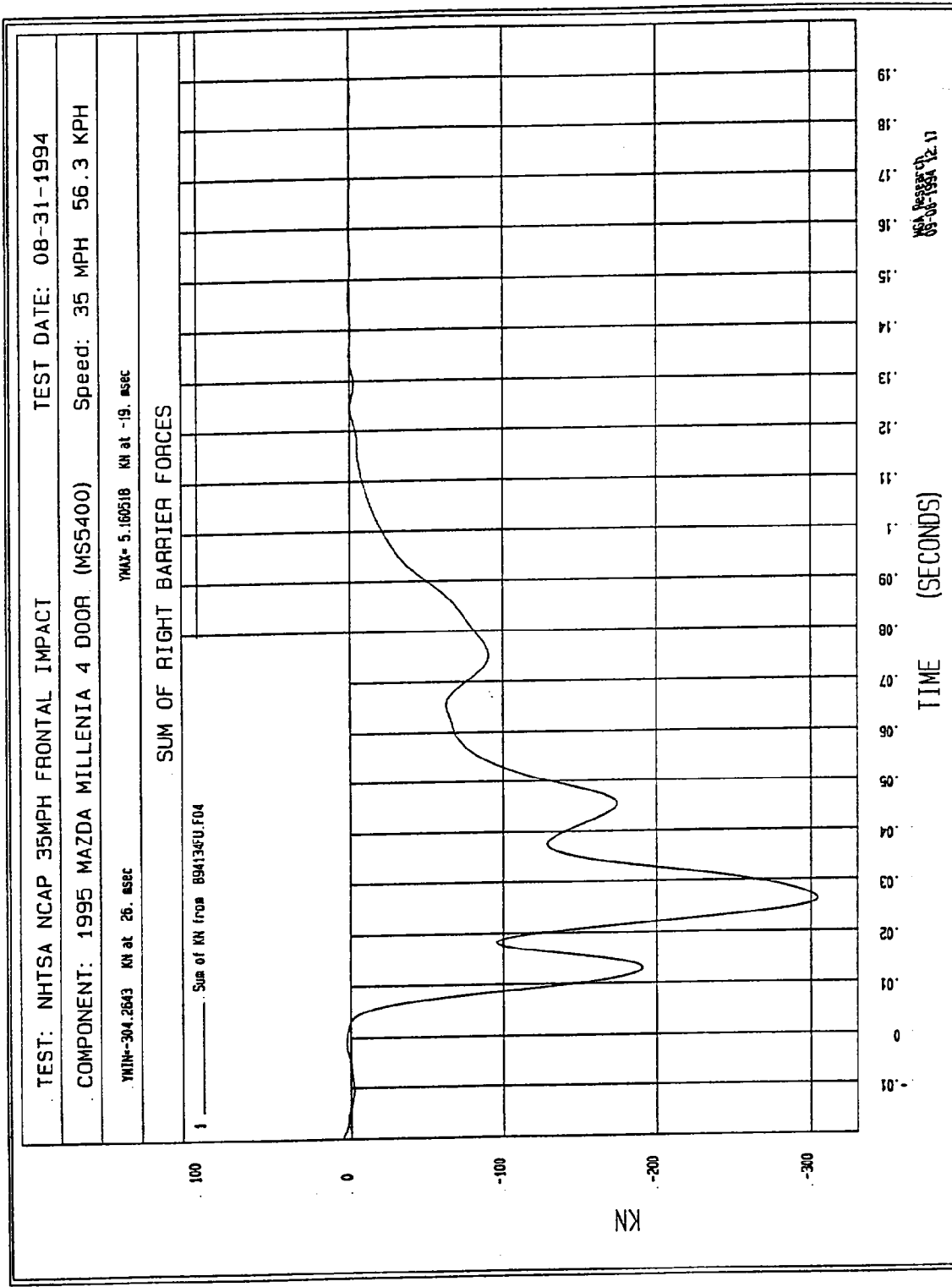


Figure B-31 - Sum of Right Barrier Forces vs. Time

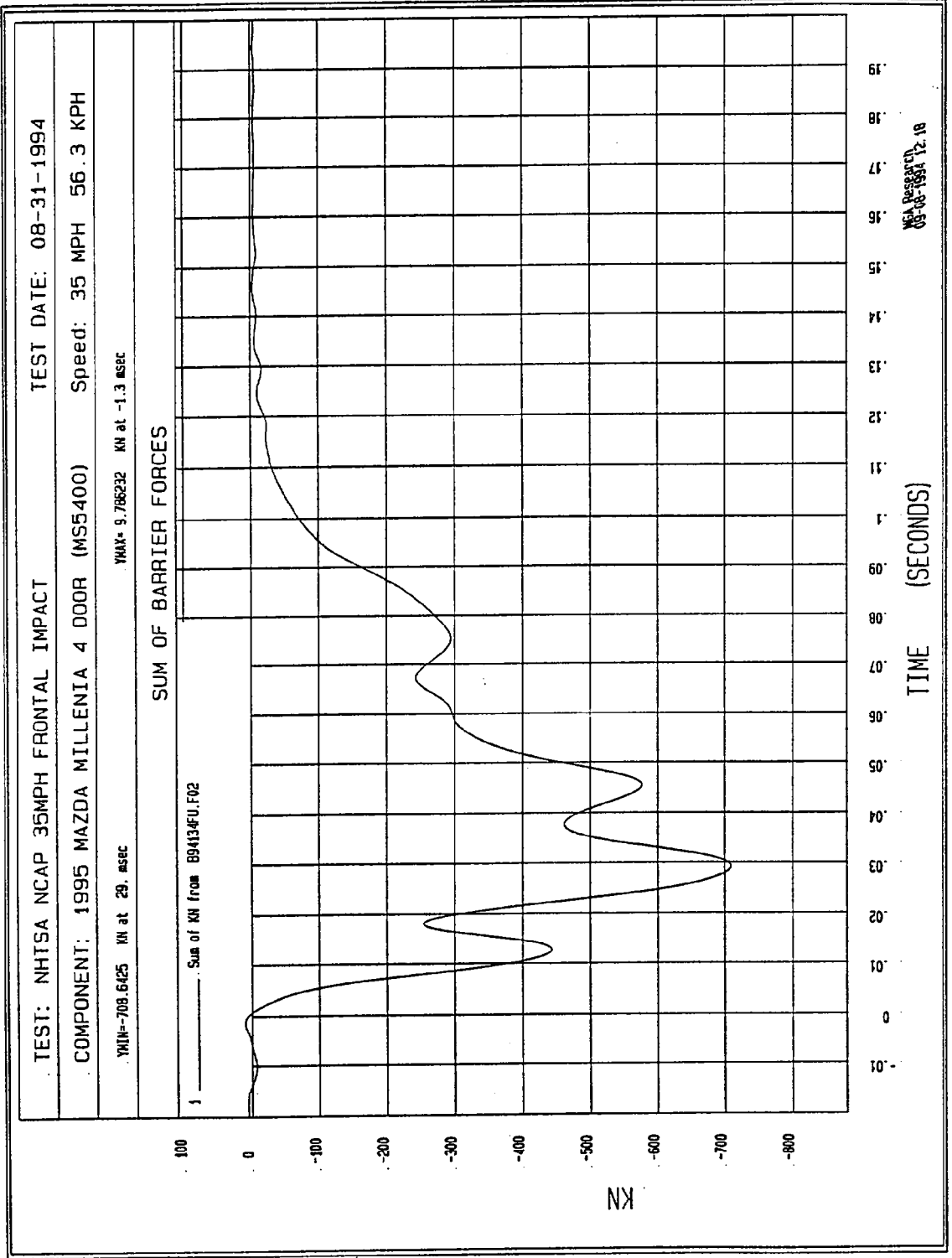


Figure B-32 - Sum of Barrier Forces vs. Time

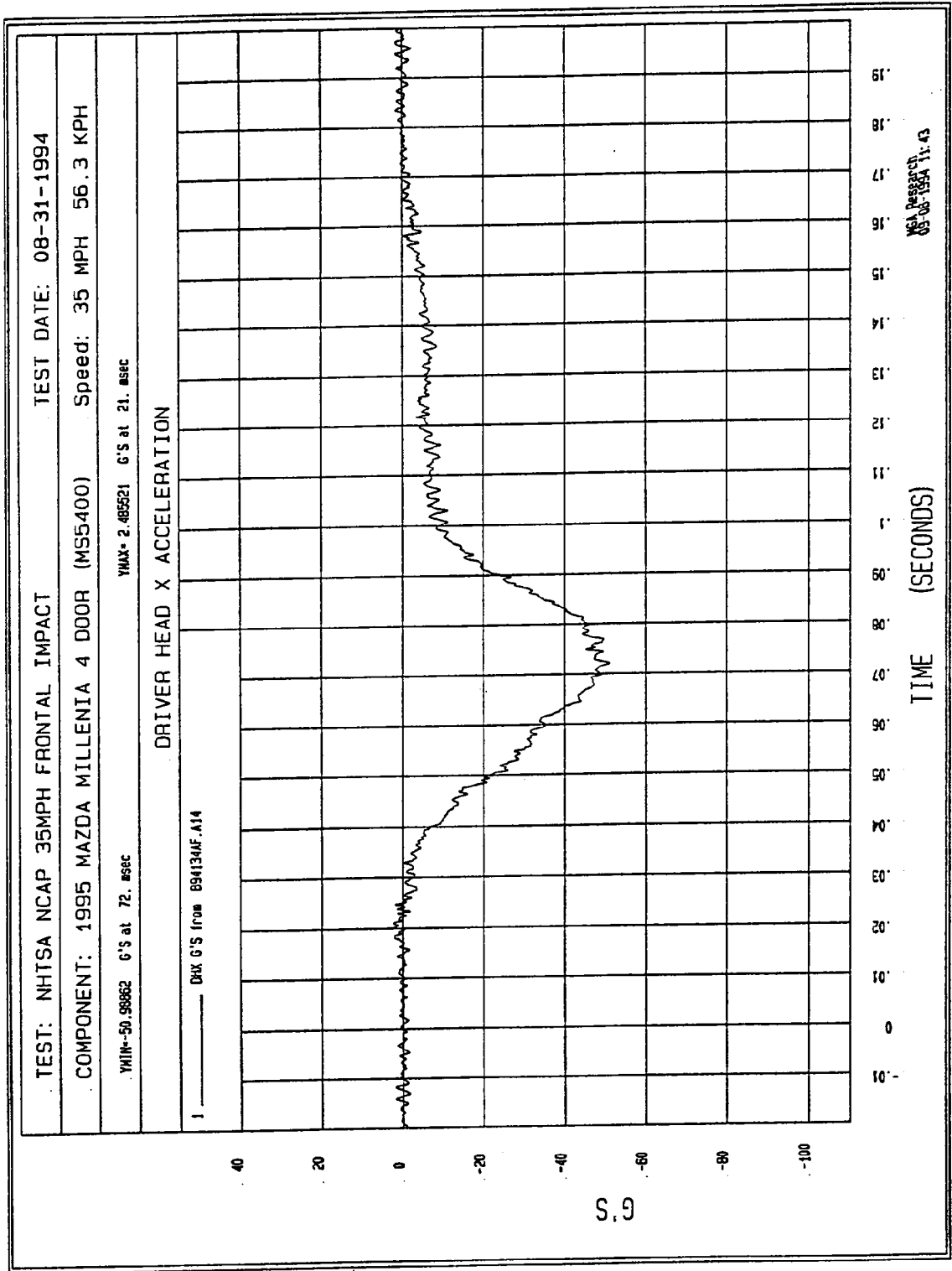


Figure B-33 - Driver Head X Acceleration vs. Time

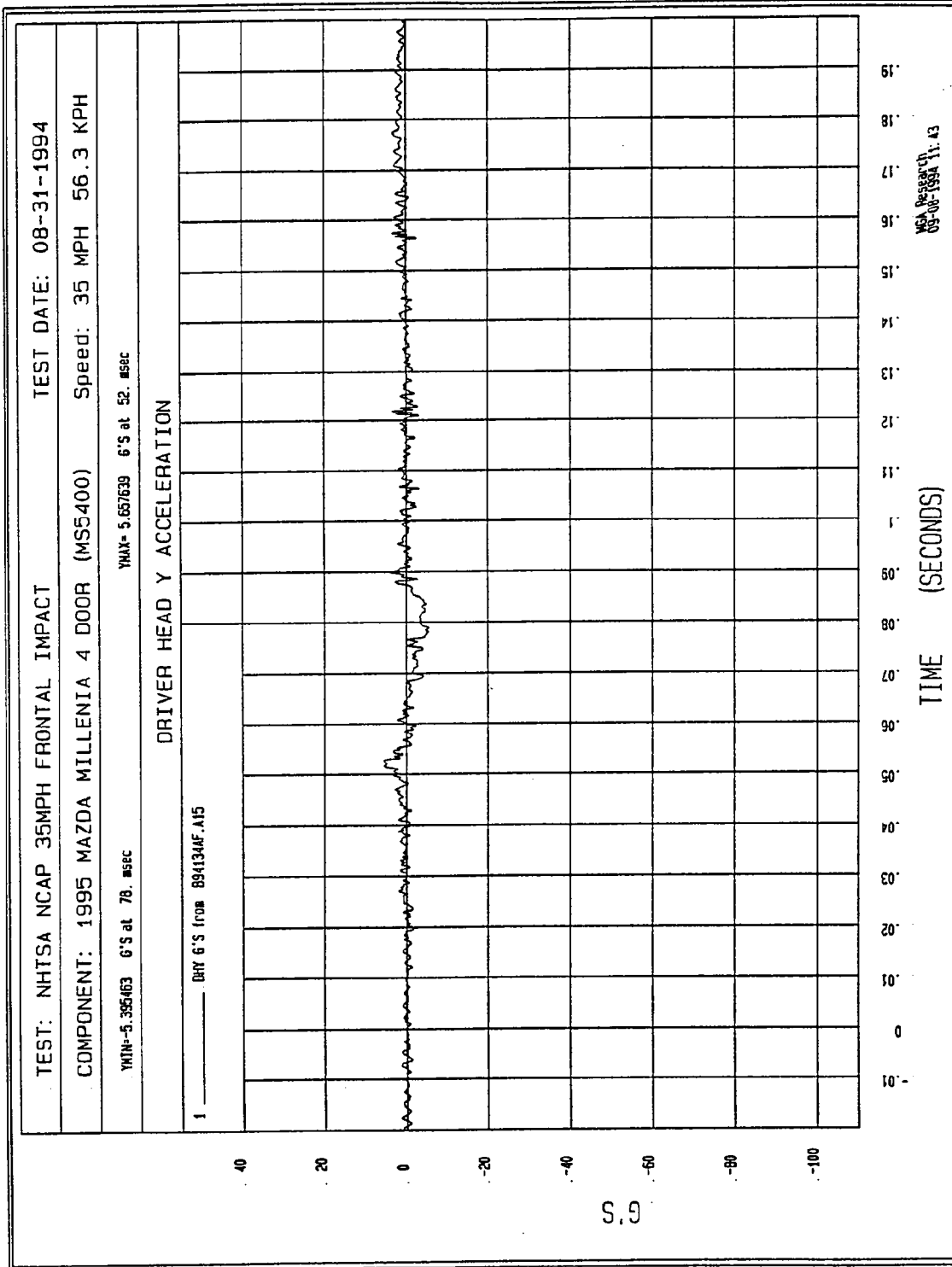


Figure B-34 - Driver Head Y Acceleration vs. Time

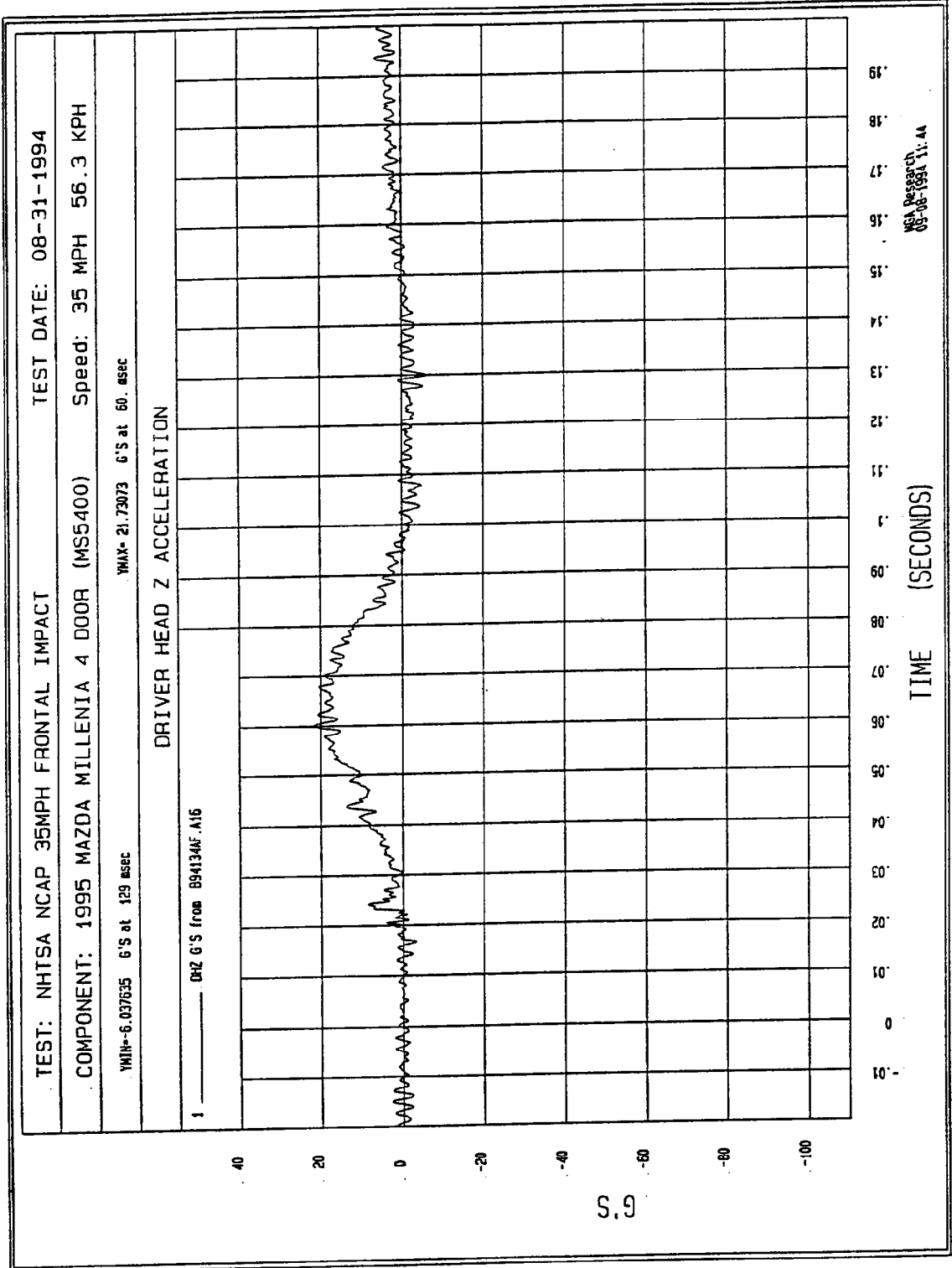


Figure B-35 - Driver Head Z Acceleration vs. Time

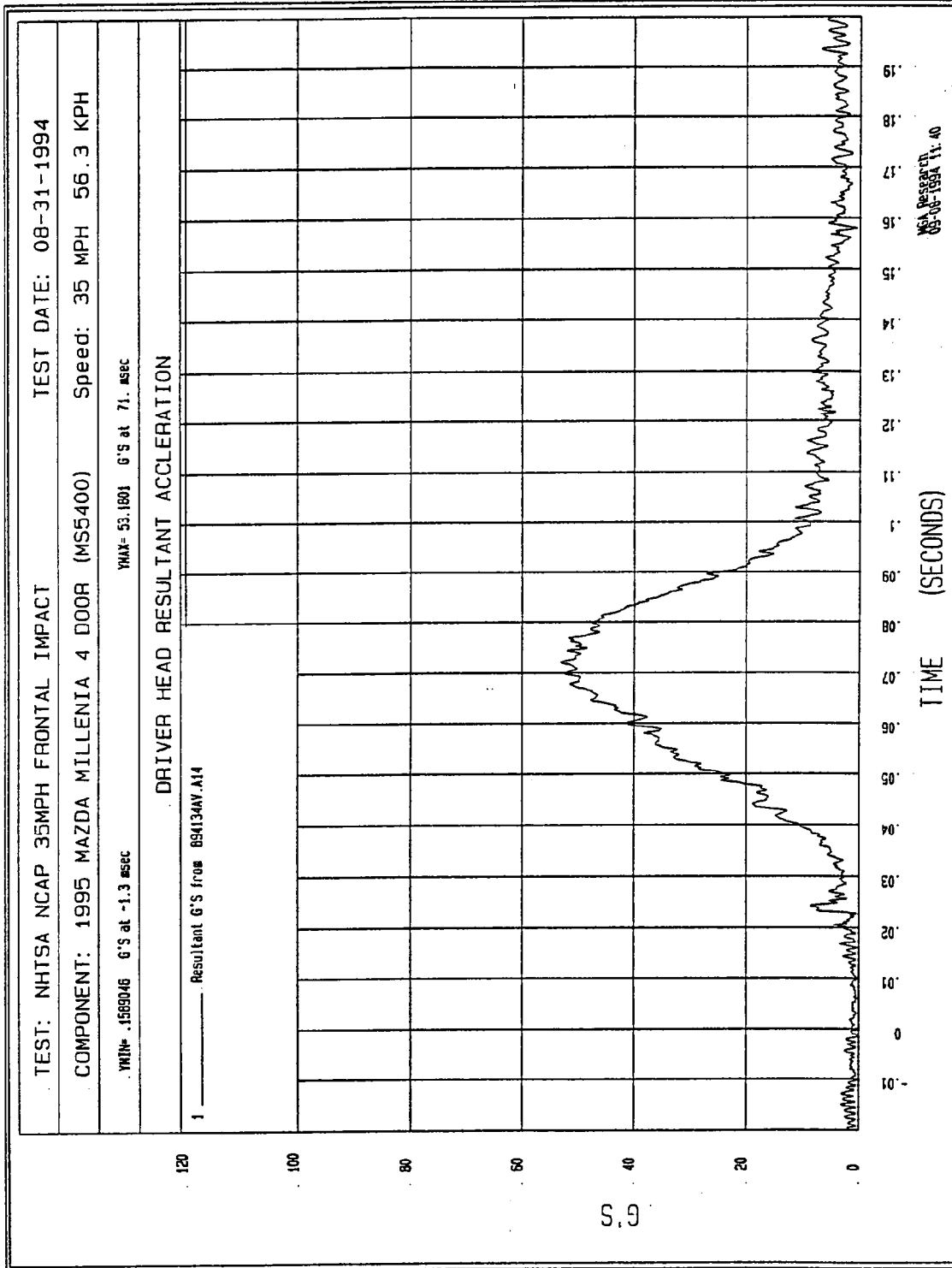


Figure B-36 - Driver Head Resultant Acceleration vs. Time

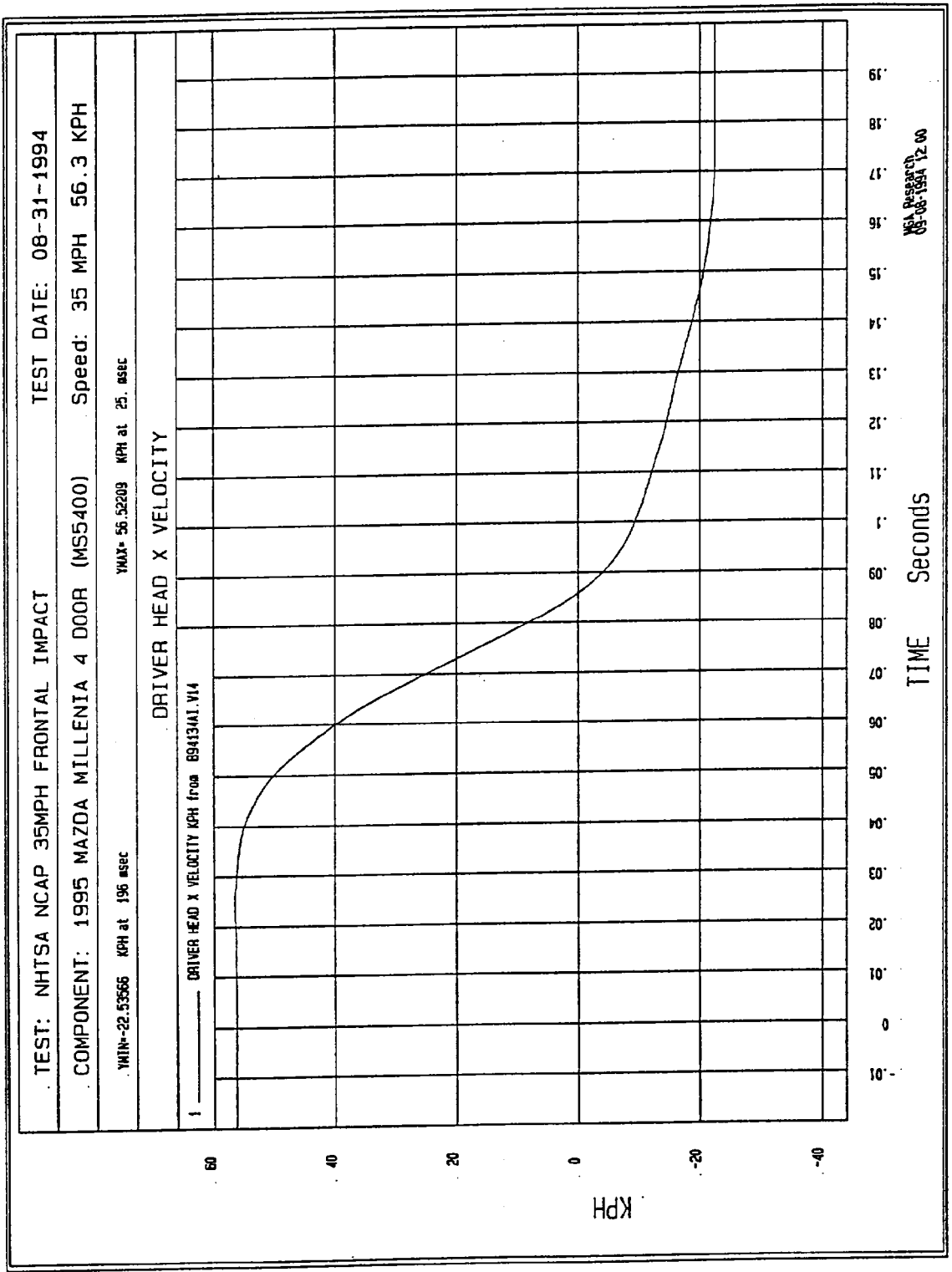


Figure B-37 - Driver Head X Velocity vs. Time

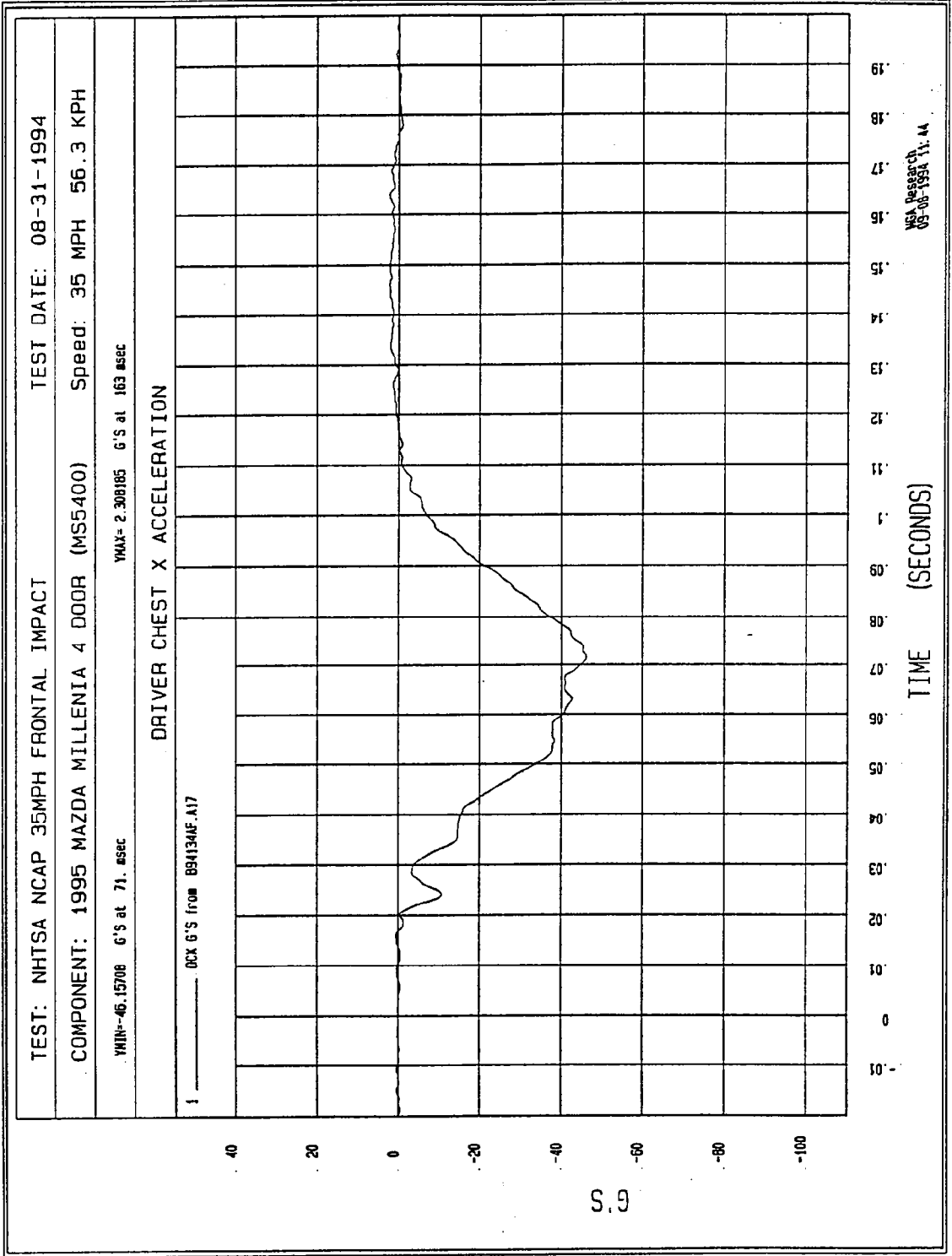


Figure B-38 - Driver Chest X Acceleration vs. Time

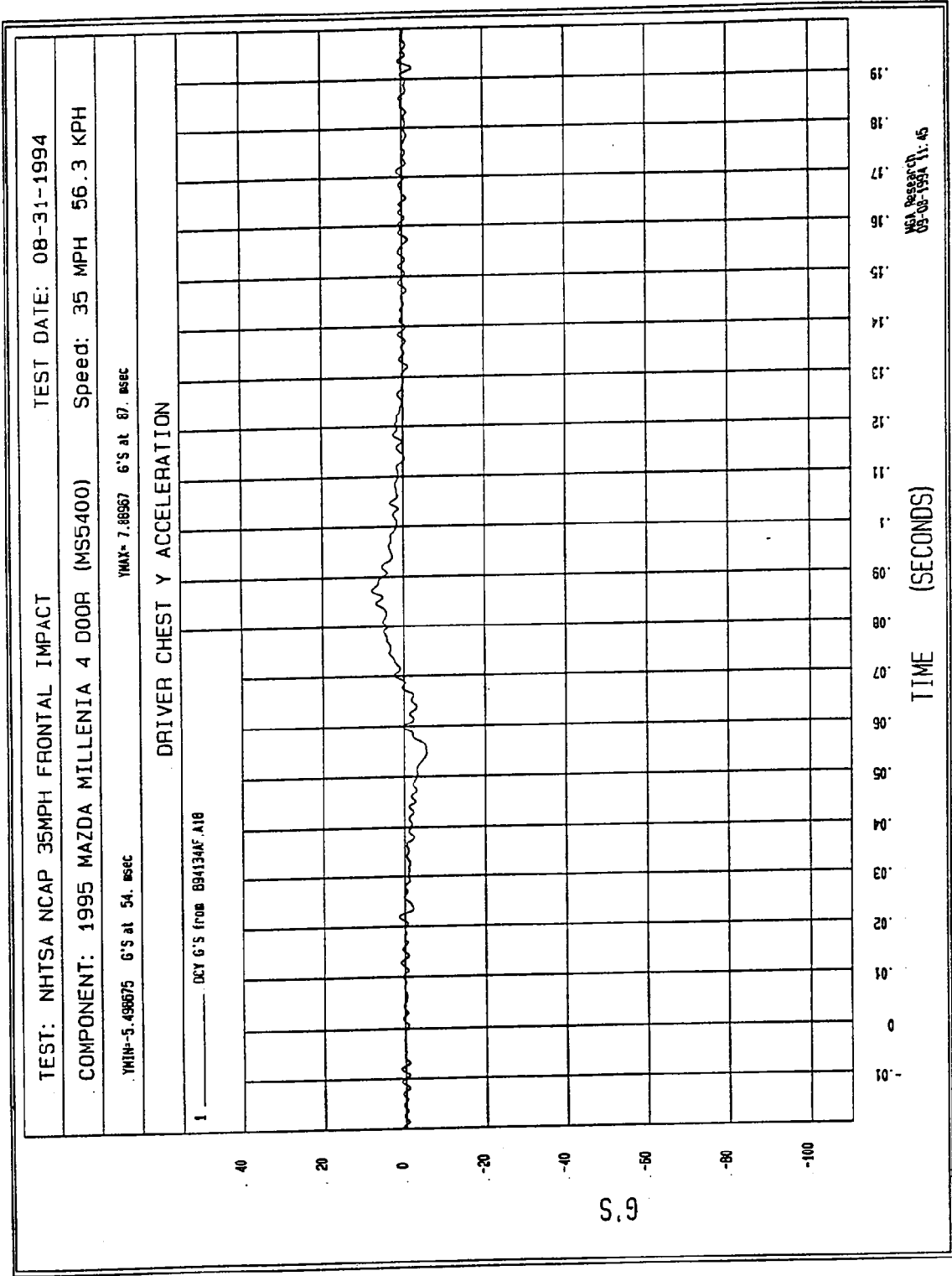


Figure B-39 - Driver Chest Y Acceleration vs. Time

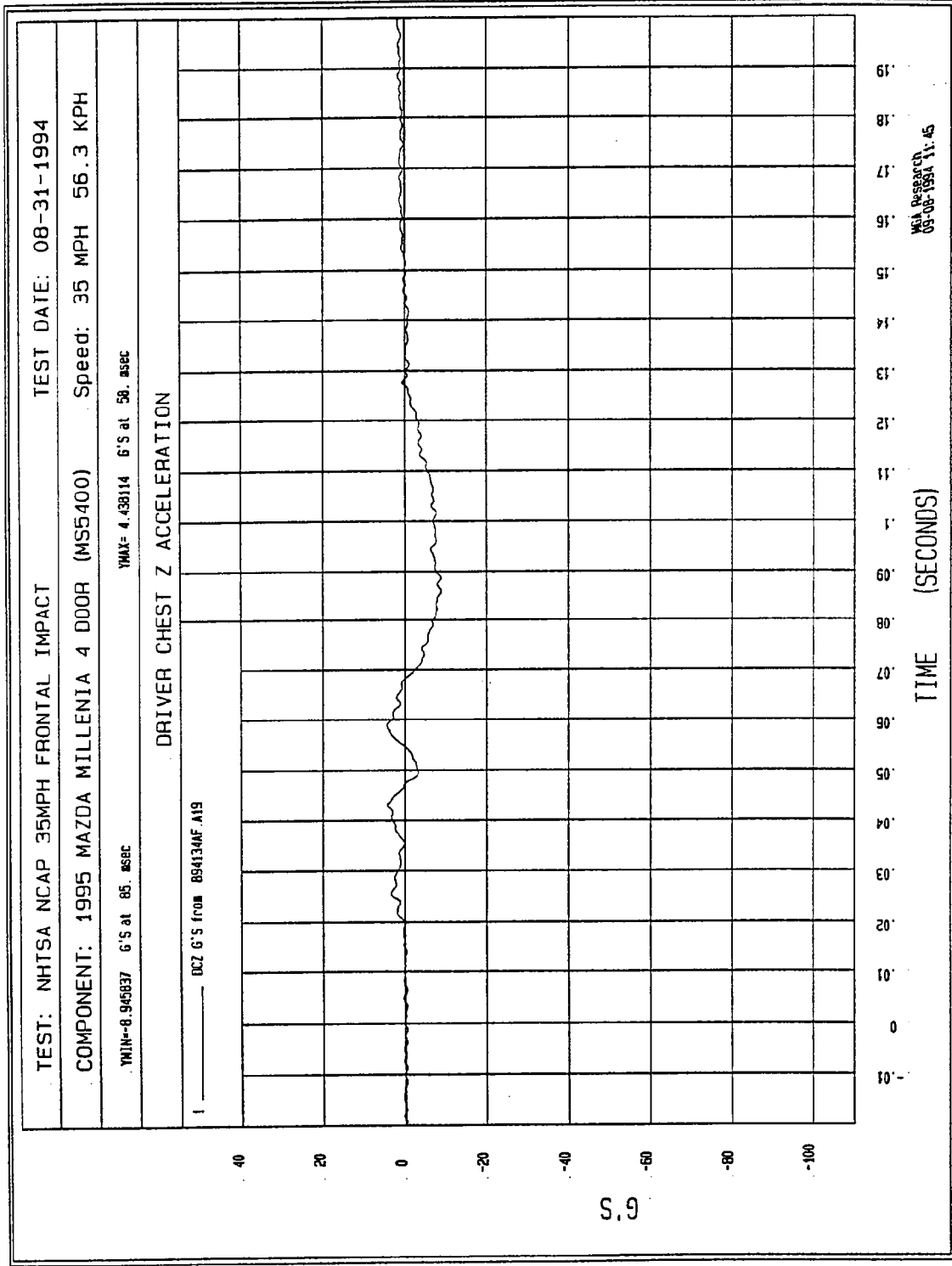


Figure B-40 - Driver Chest Z Acceleration vs. Time

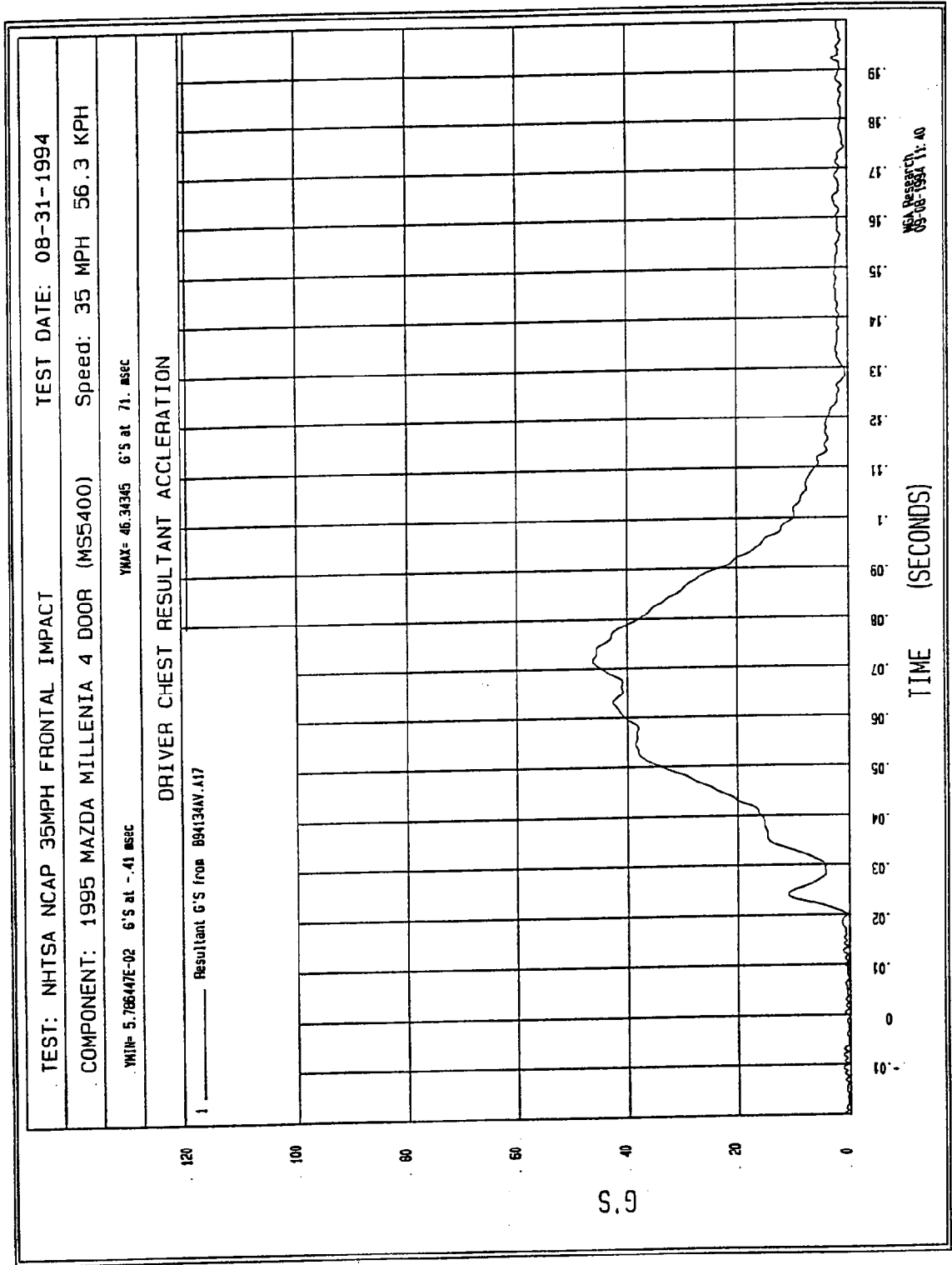


Figure B-41 - Driver Chest Resultant Acceleration vs. Time

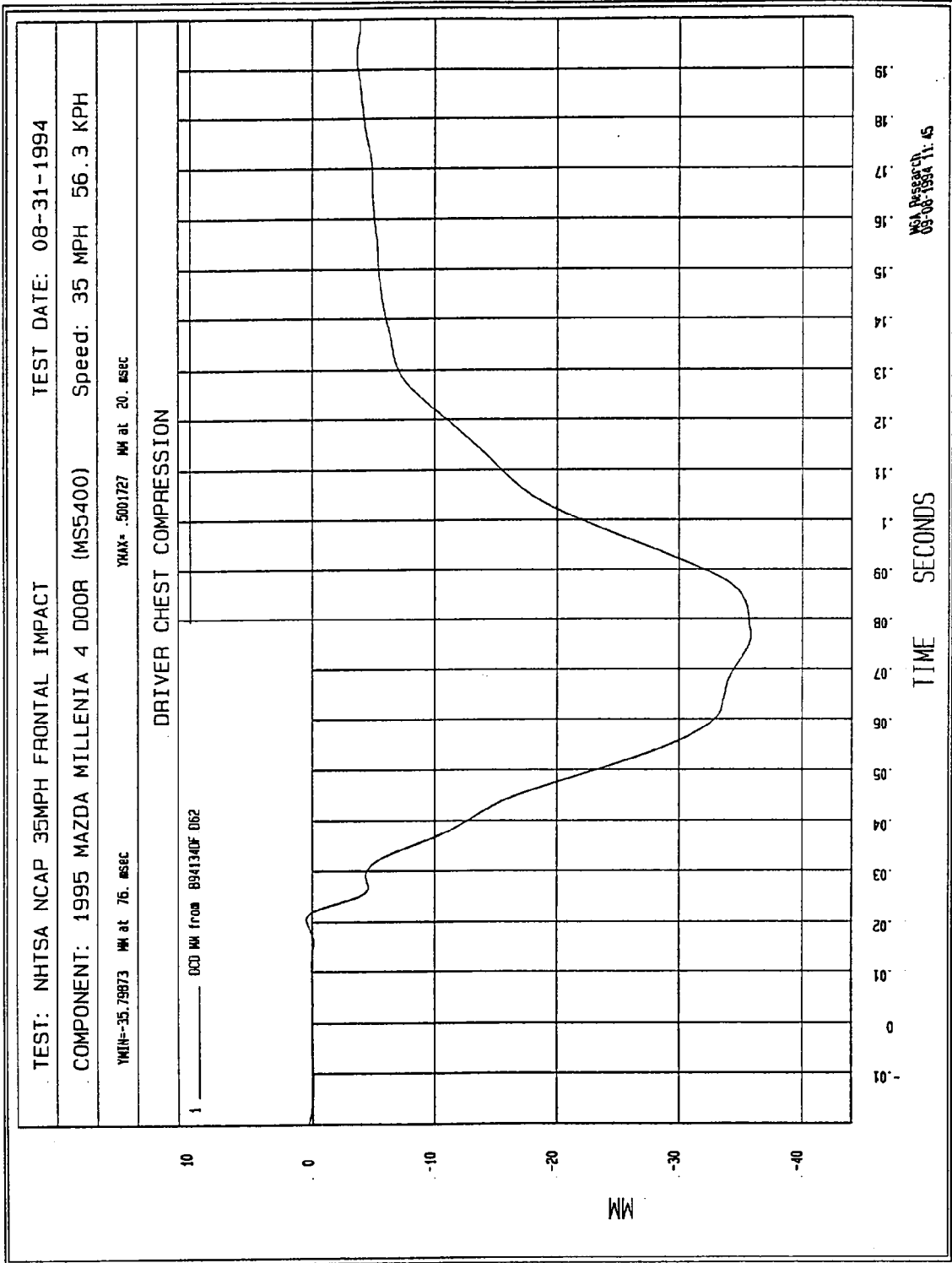


Figure B-42 - Driver Chest Compression vs. Time

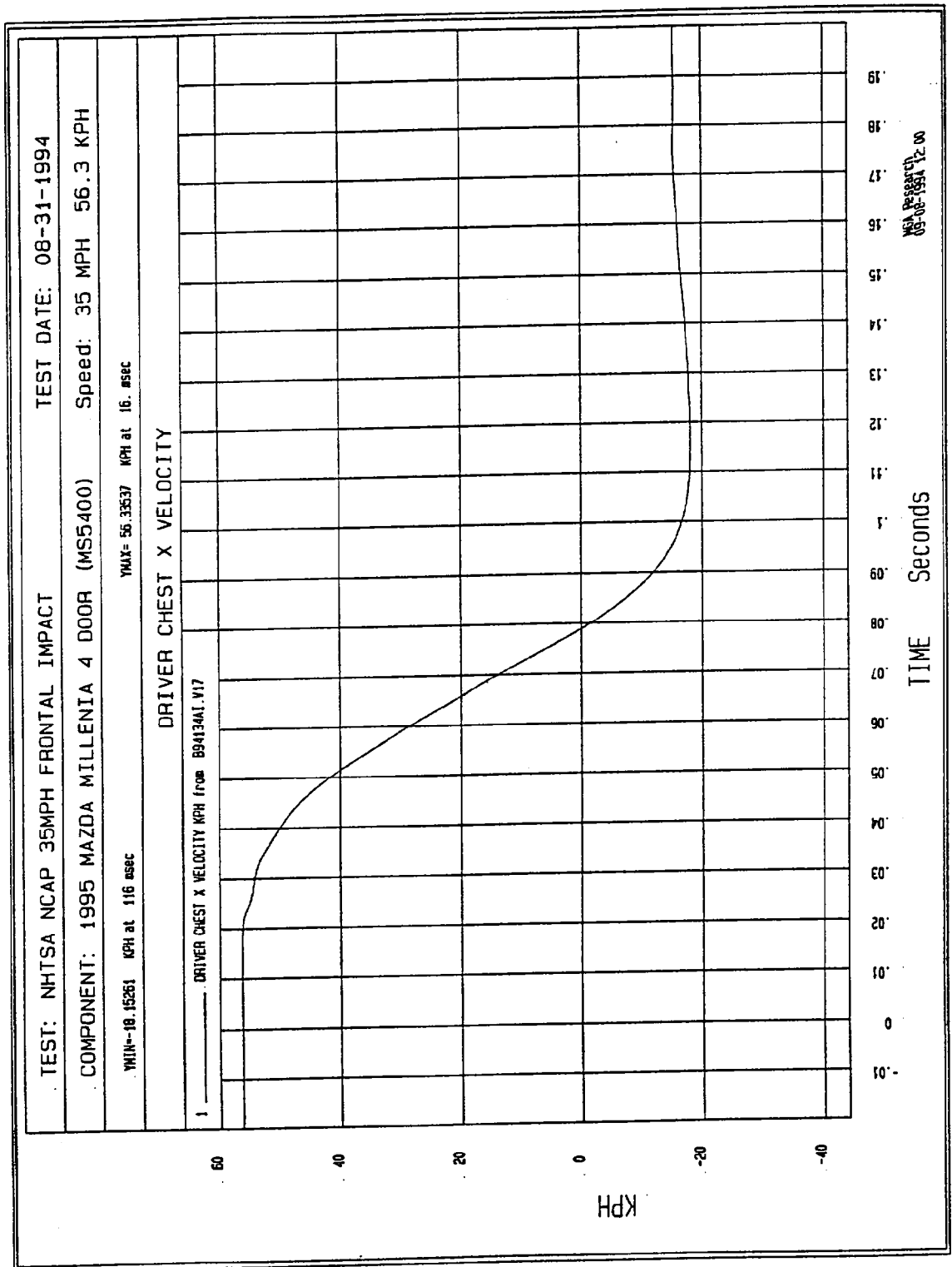


Figure B-43 - Driver Chest X Velocity vs. Time

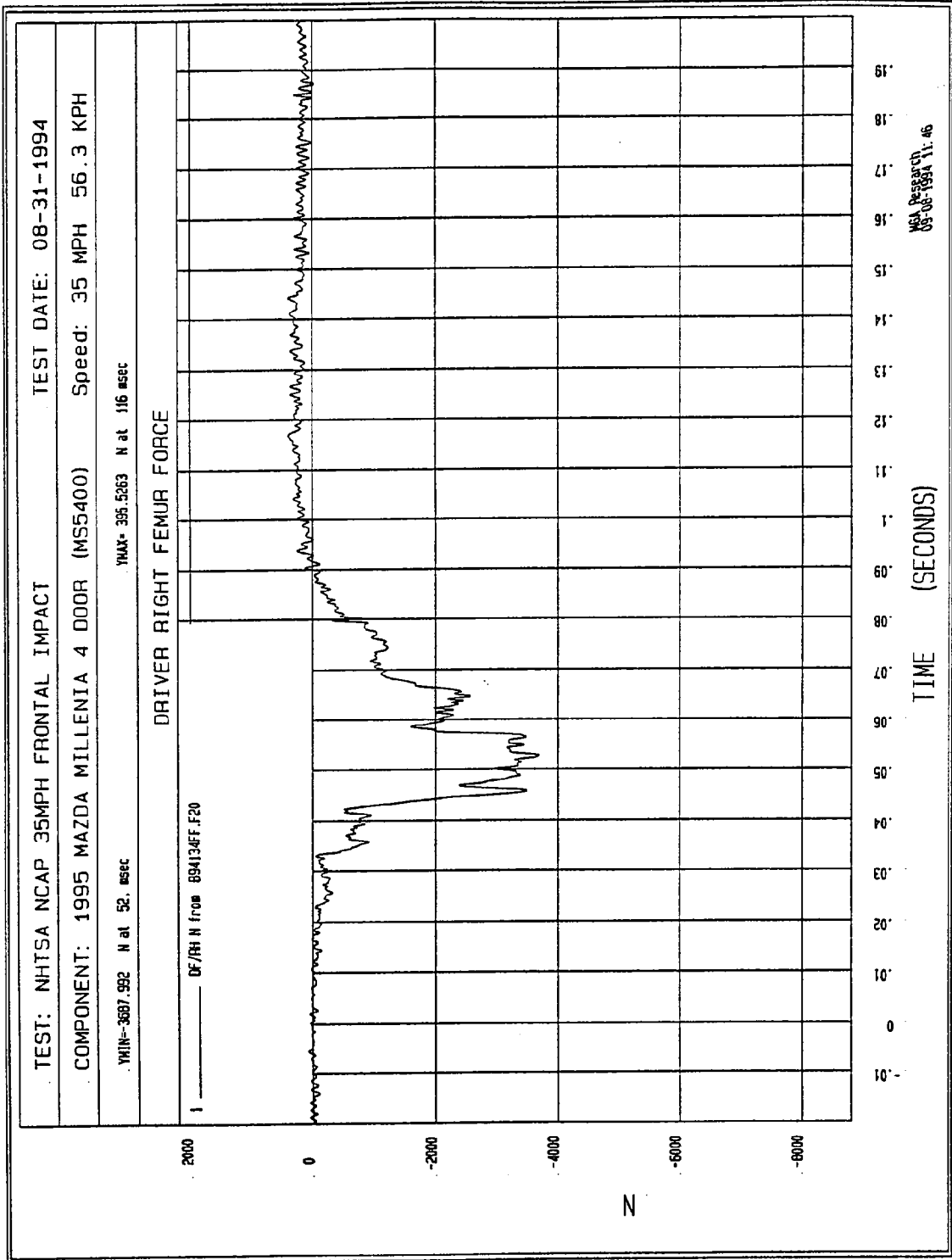


Figure B-44 - Driver Right Femur Force vs. Time

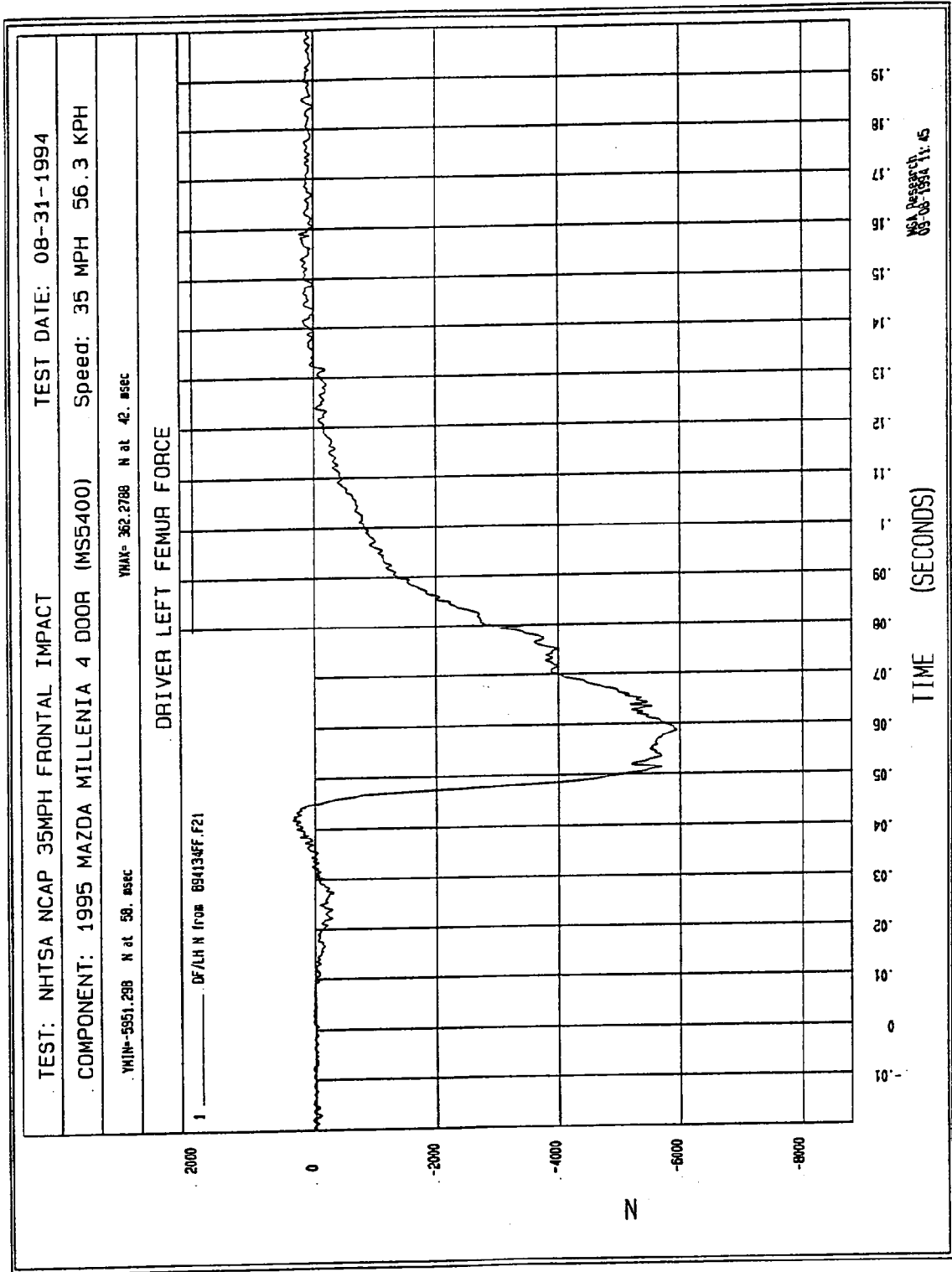


Figure B-45 - Driver Left Femur Force vs. Time

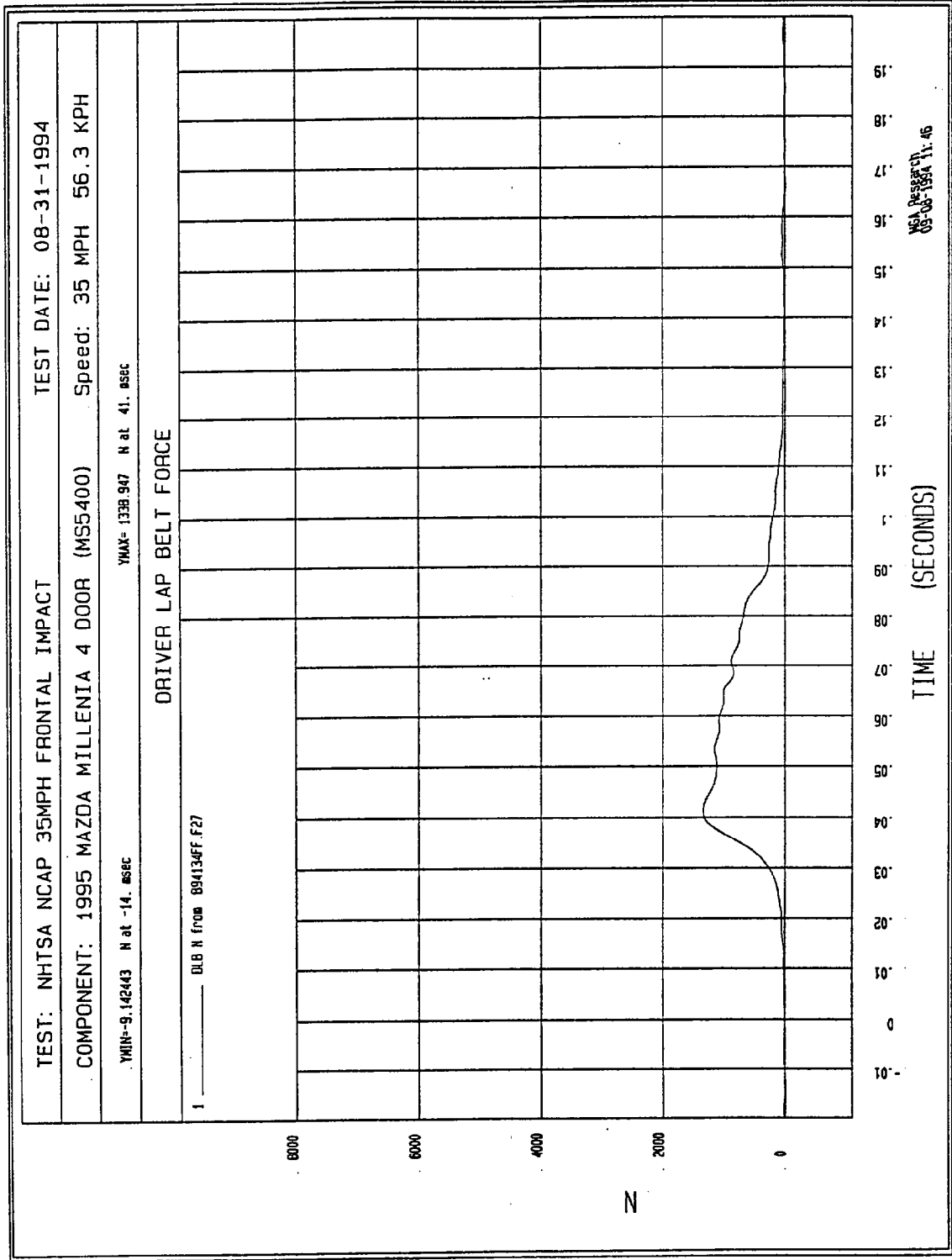
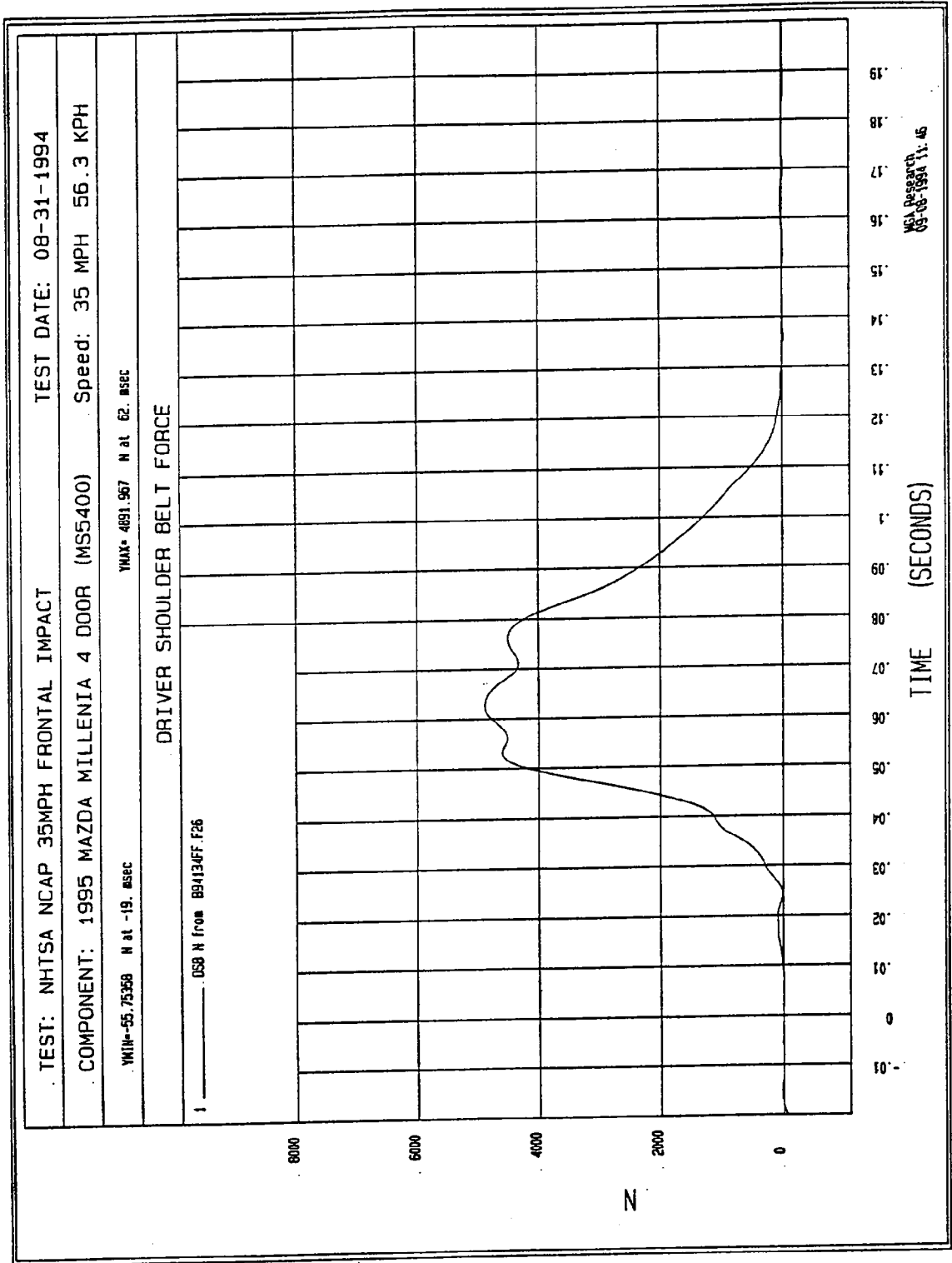


Figure B-46 - Driver Lap Belt Force vs. Time



TIME (SECONDS)

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Figure B-47 - Driver Shoulder Belt Force vs. Time

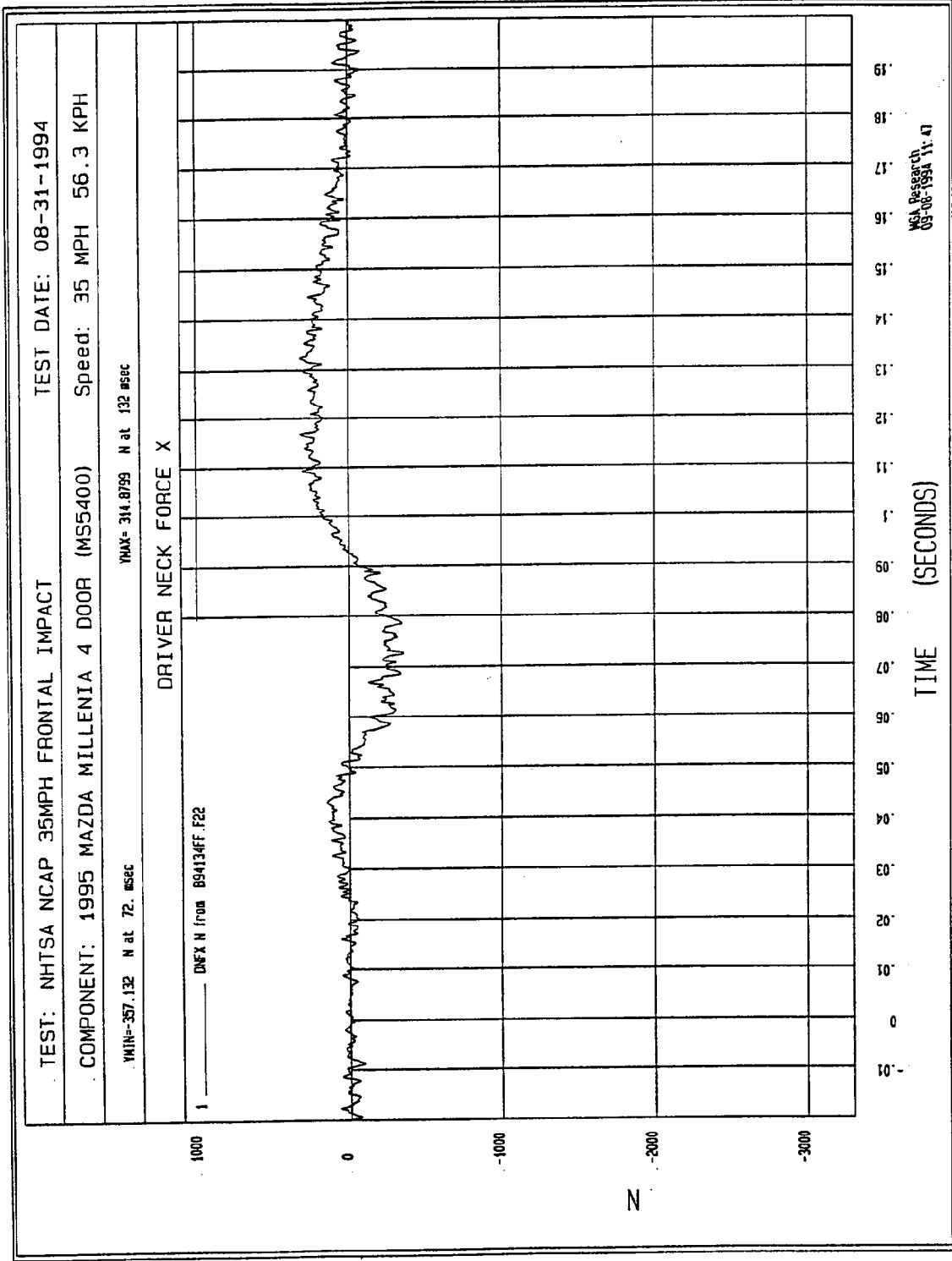


Figure B-48 - Driver Neck Force X vs. Time

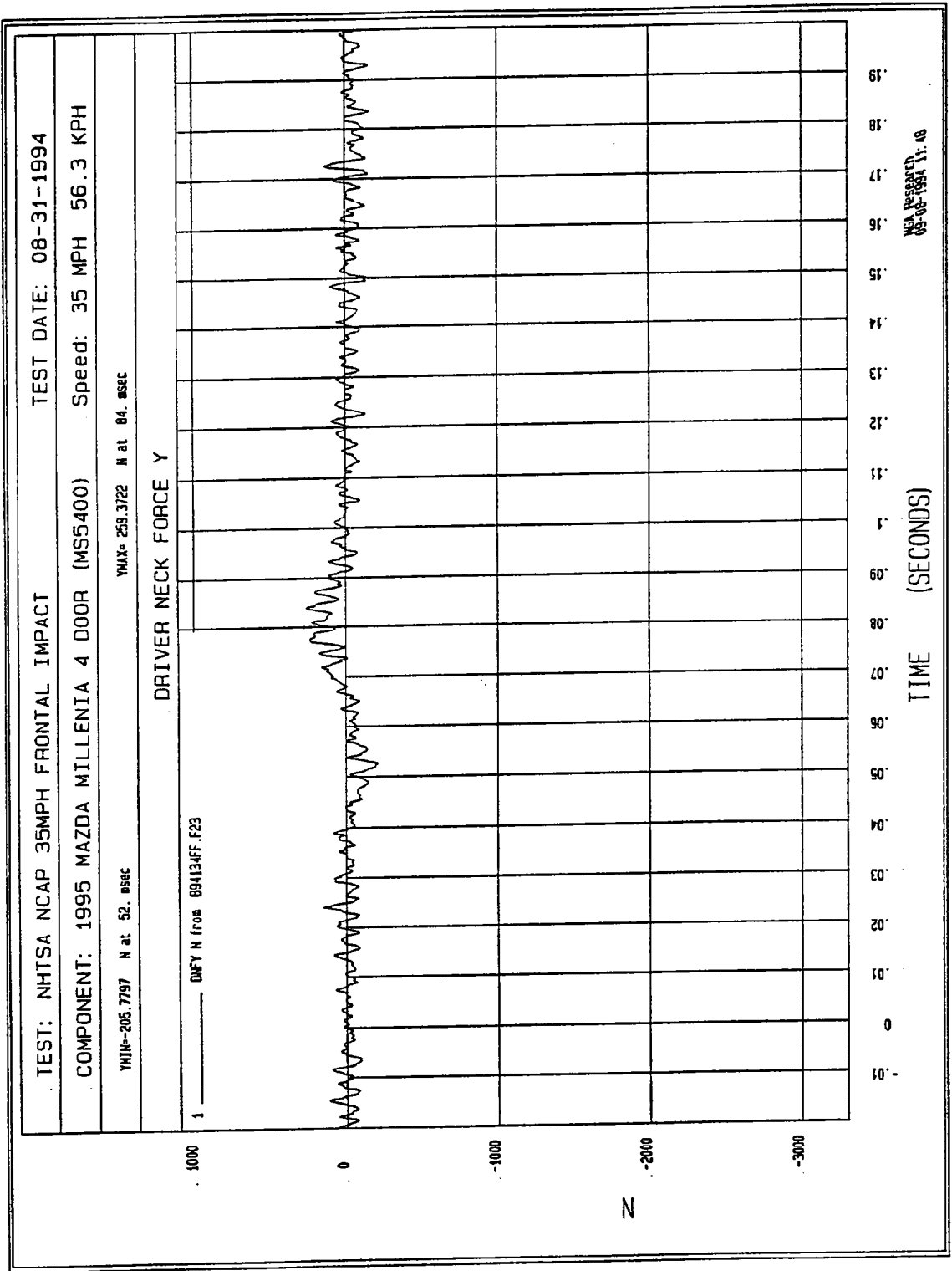


Figure B-49 - Driver Neck Force Y vs. Time

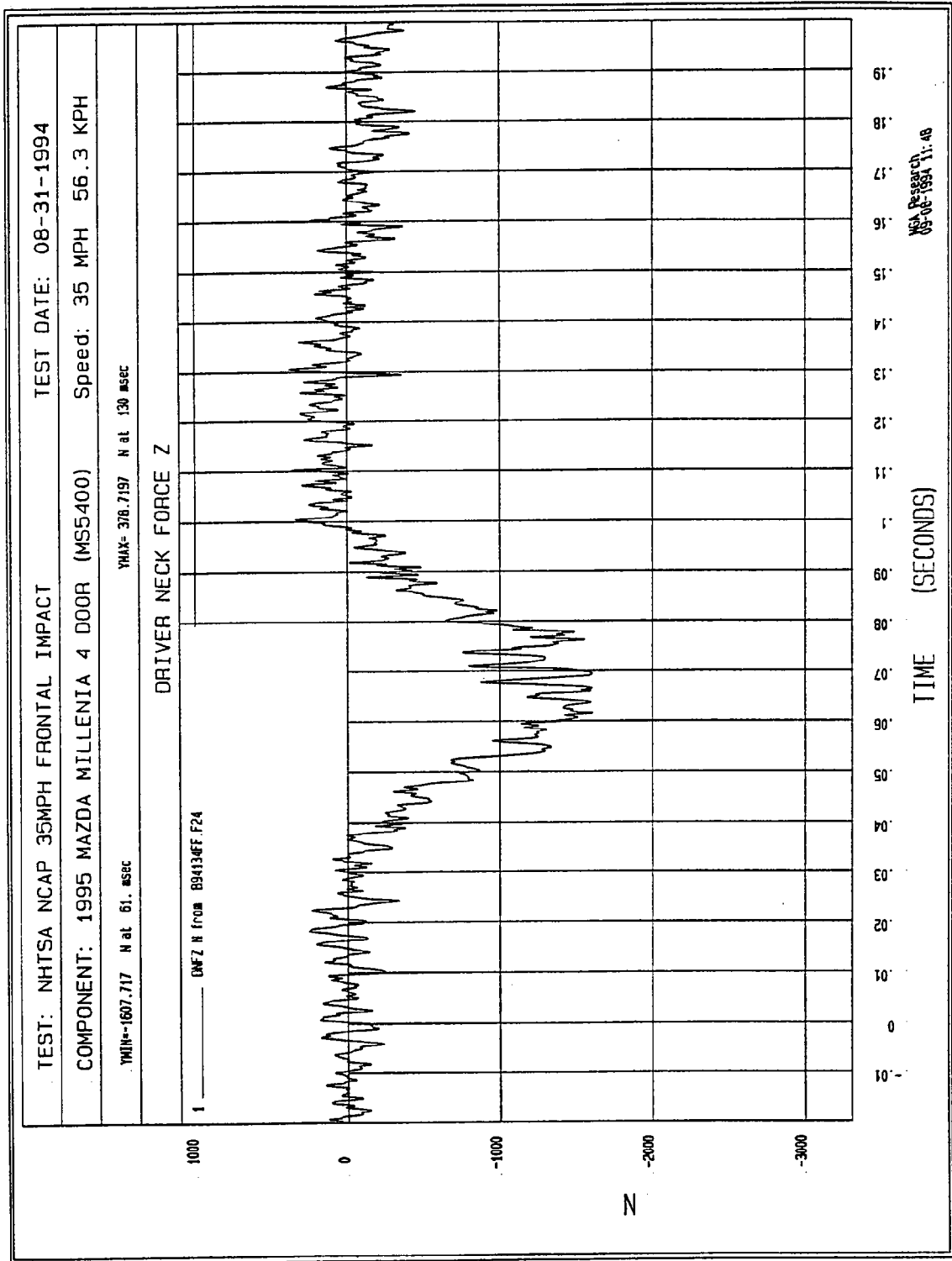


Figure B-50 - Driver Neck Force Z vs. Time

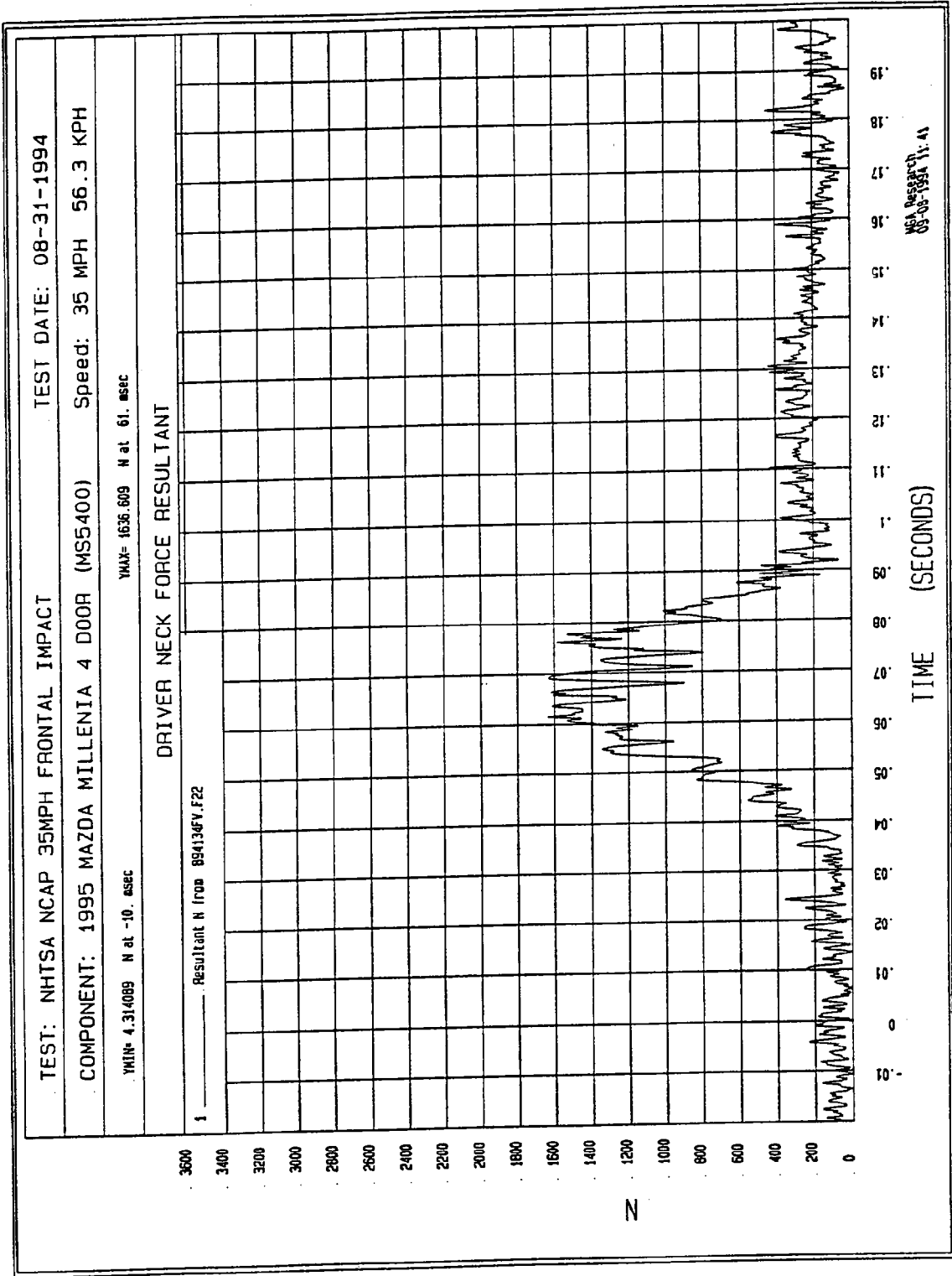


Figure B-51 - Driver Neck Force Resultant vs. Time

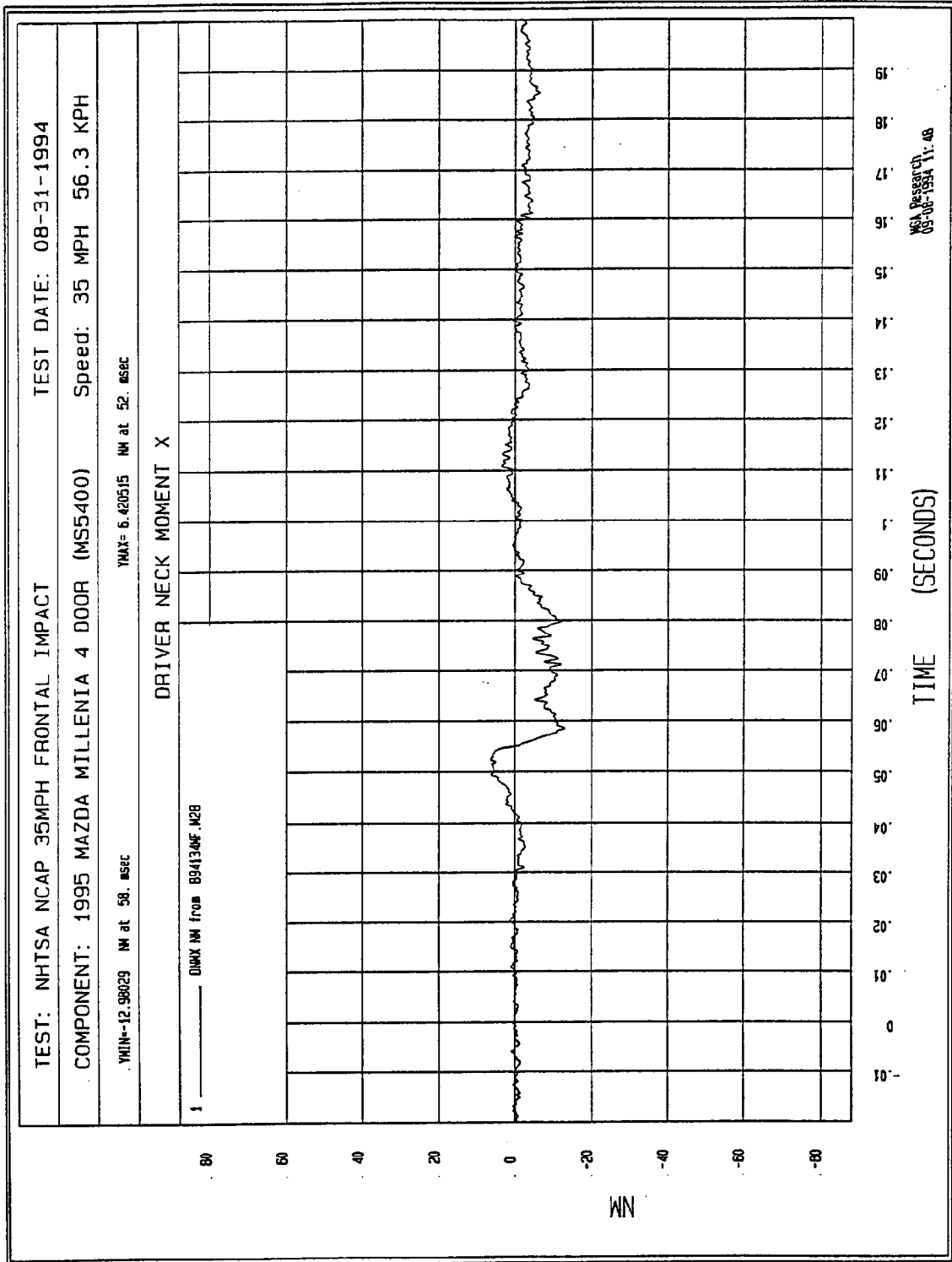


Figure B-52 - Driver Neck Moment X vs. Time

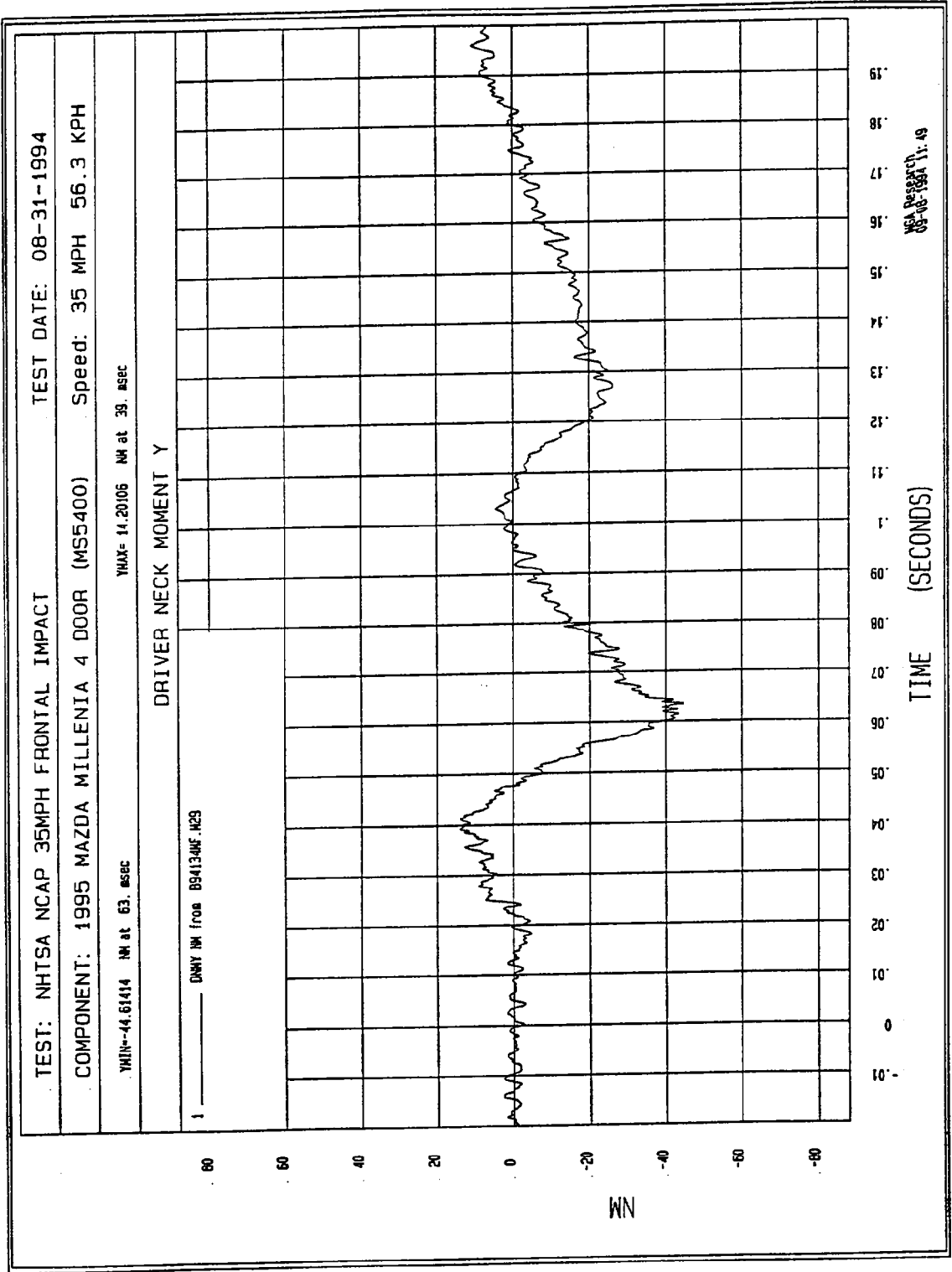
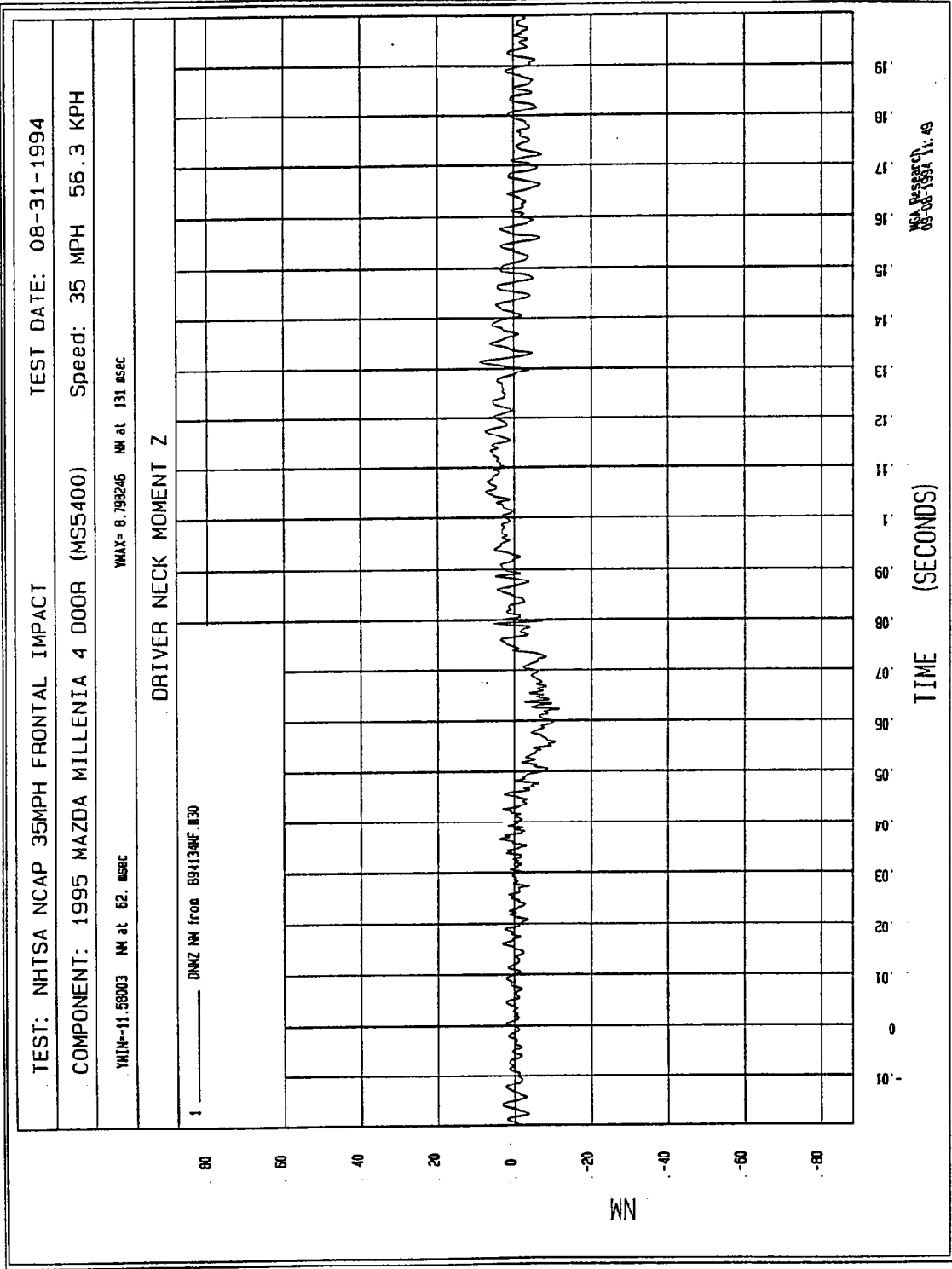


Figure B-53 - Driver Neck Moment Y vs. Time



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Figure B-54 - Driver Neck Moment Z vs. Time

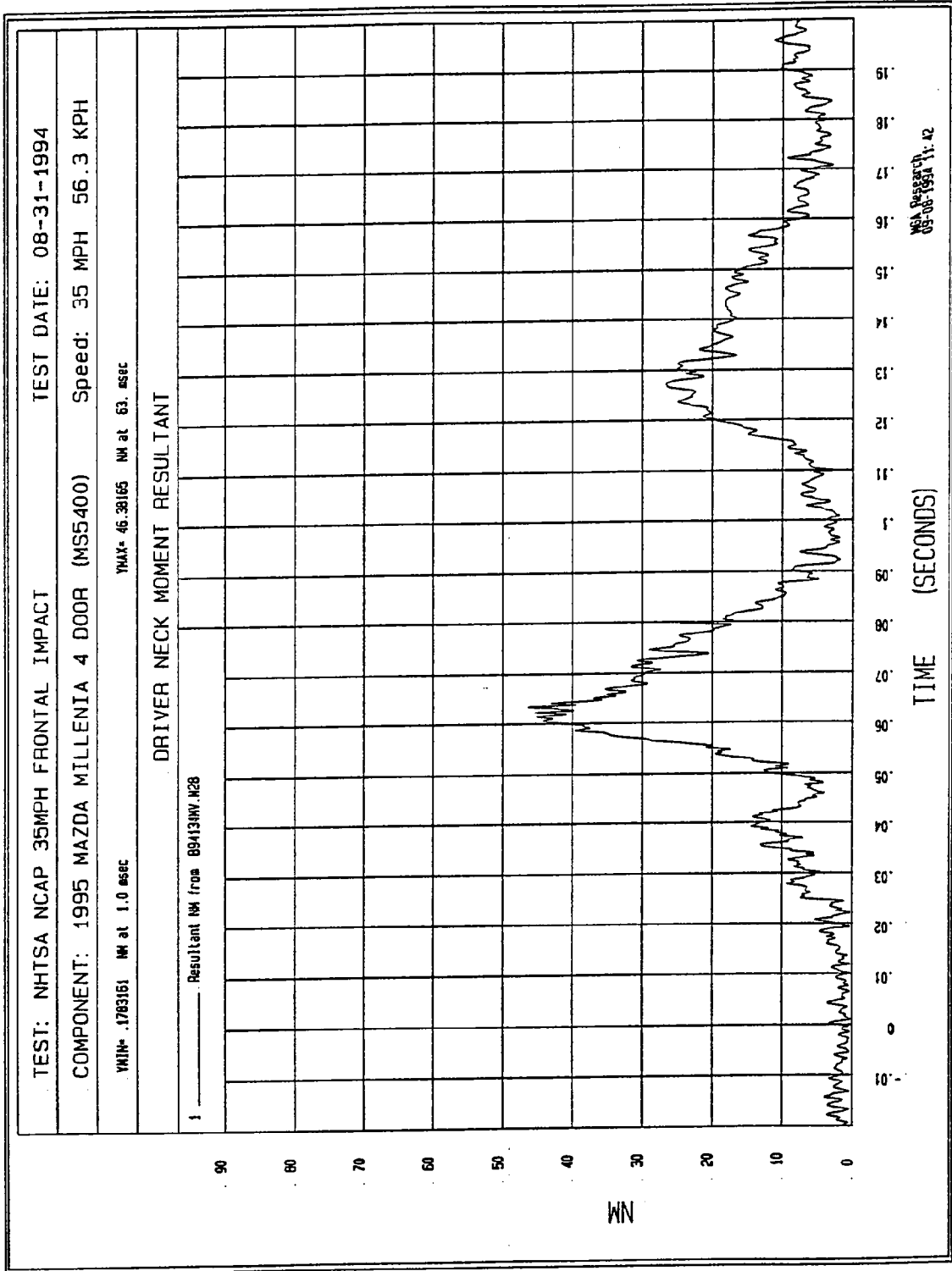


Figure B-55 - Driver Neck Moment Resultant vs. Time

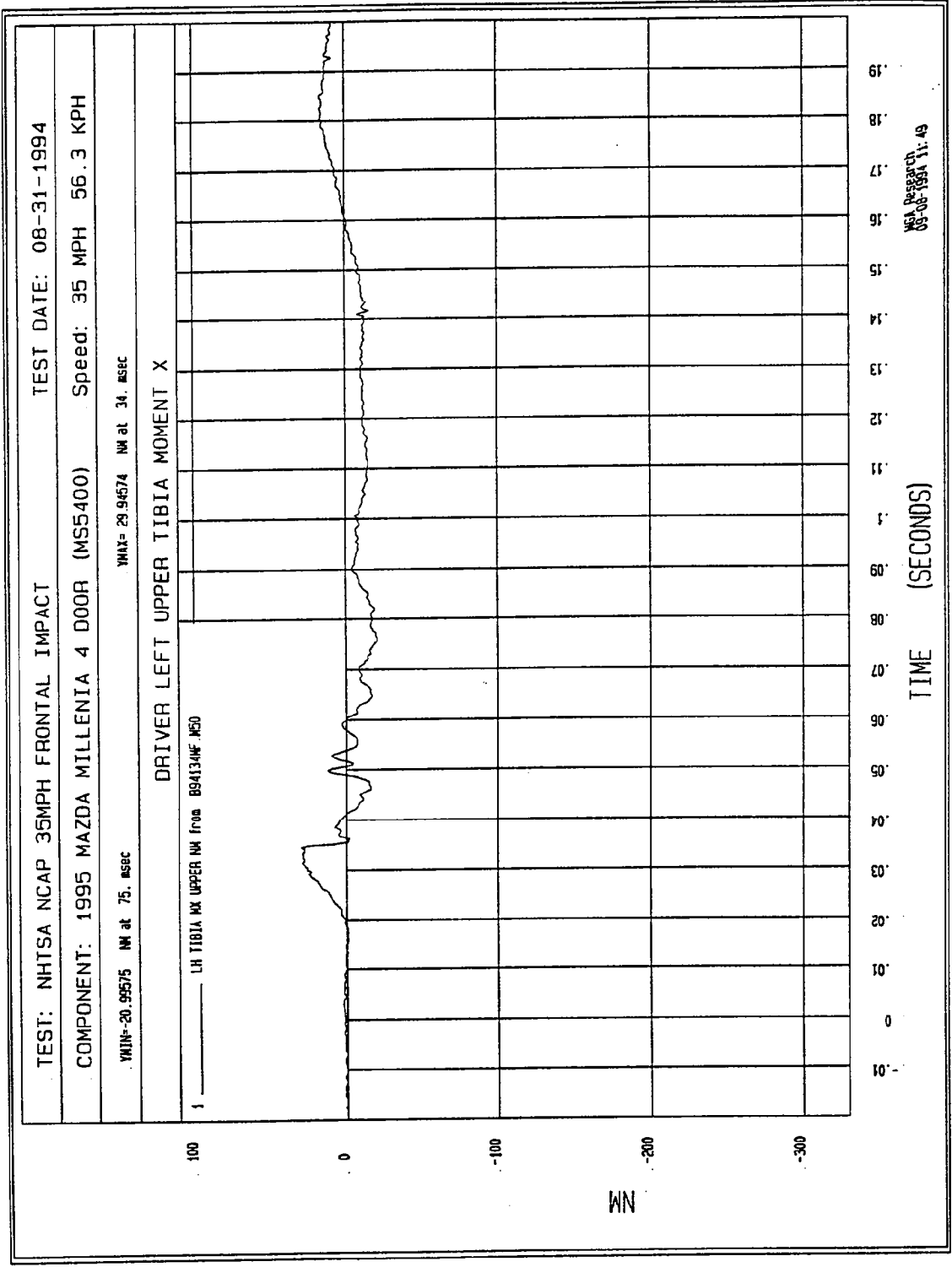


Figure B-56 - Driver Left Upper Tibia Moment X vs. Time

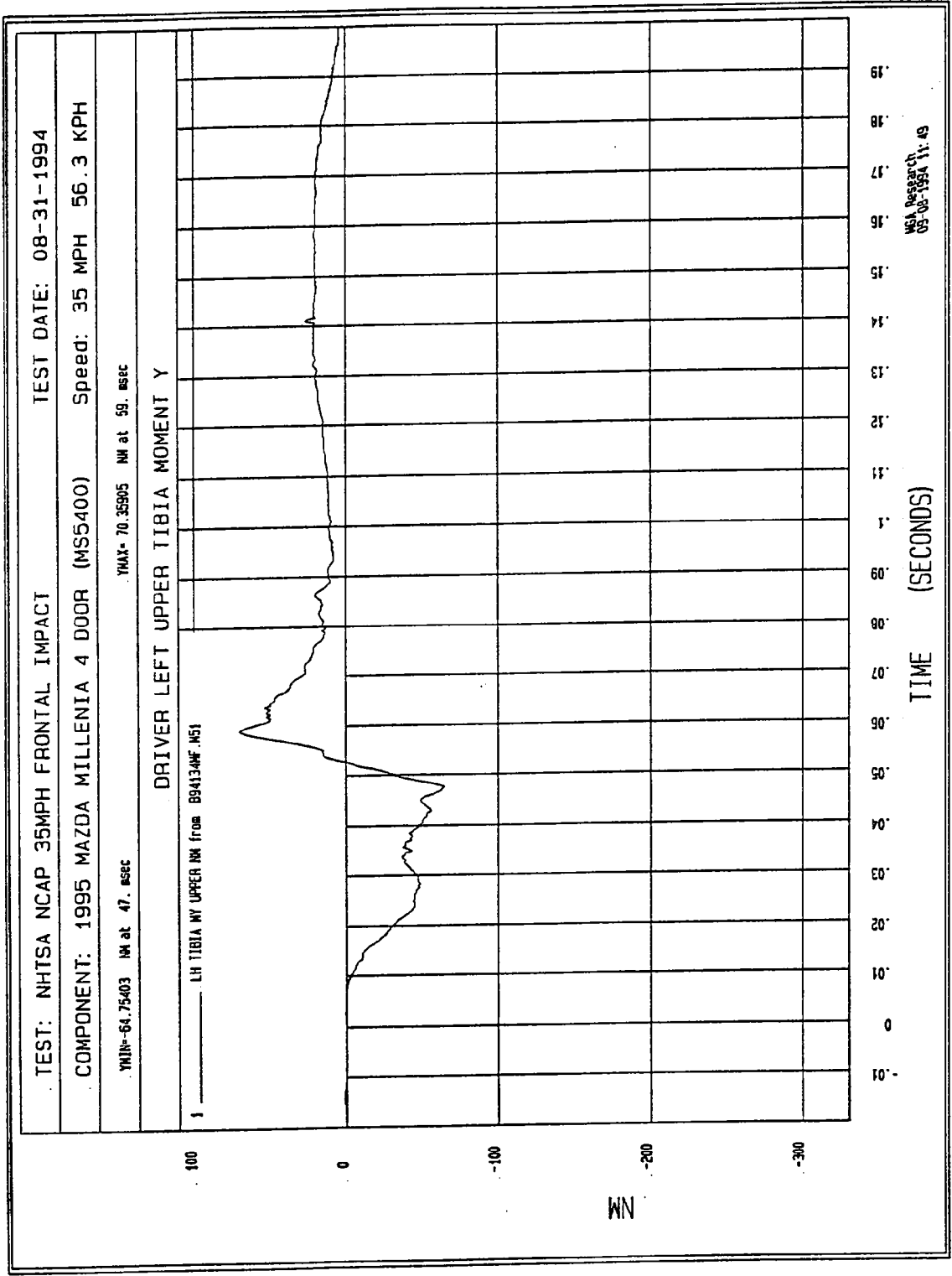


Figure B-57 - Driver Left Upper Tibia Moment Y vs. Time

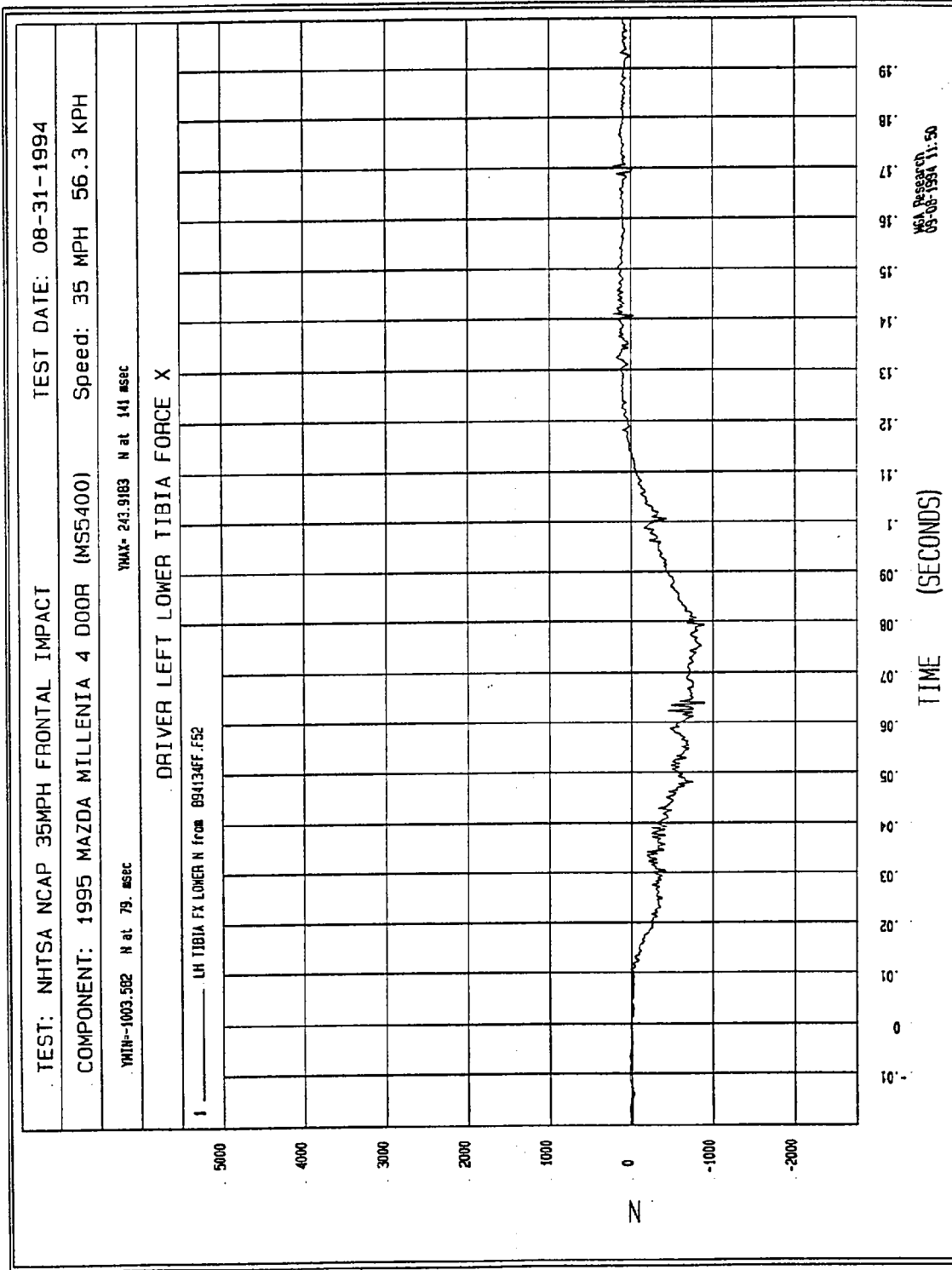


Figure B-58 - Driver Left Lower Tibia Force X vs. Time

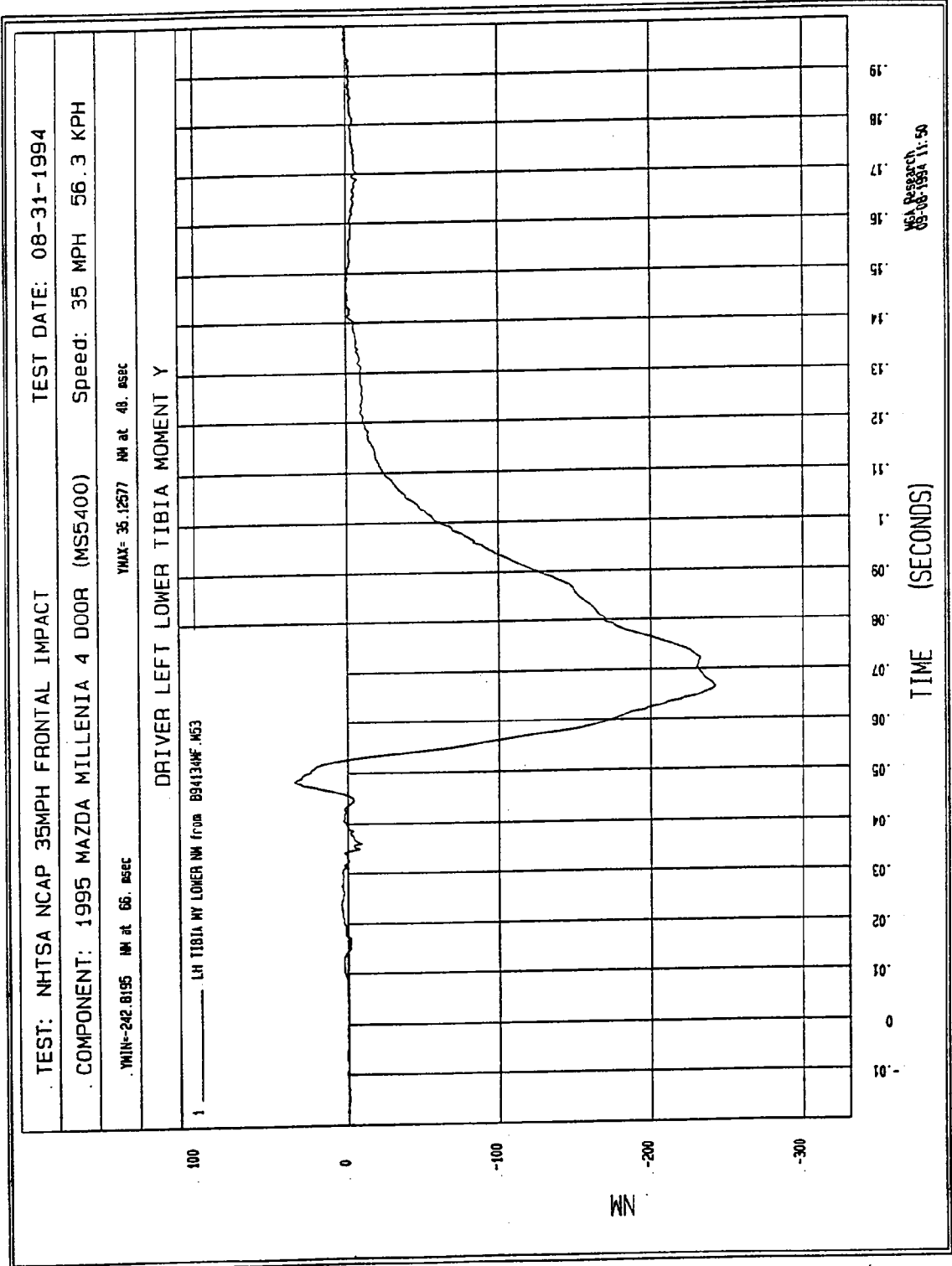


Figure B-59 - Driver Left Lower Tibia Moment Y vs. Time

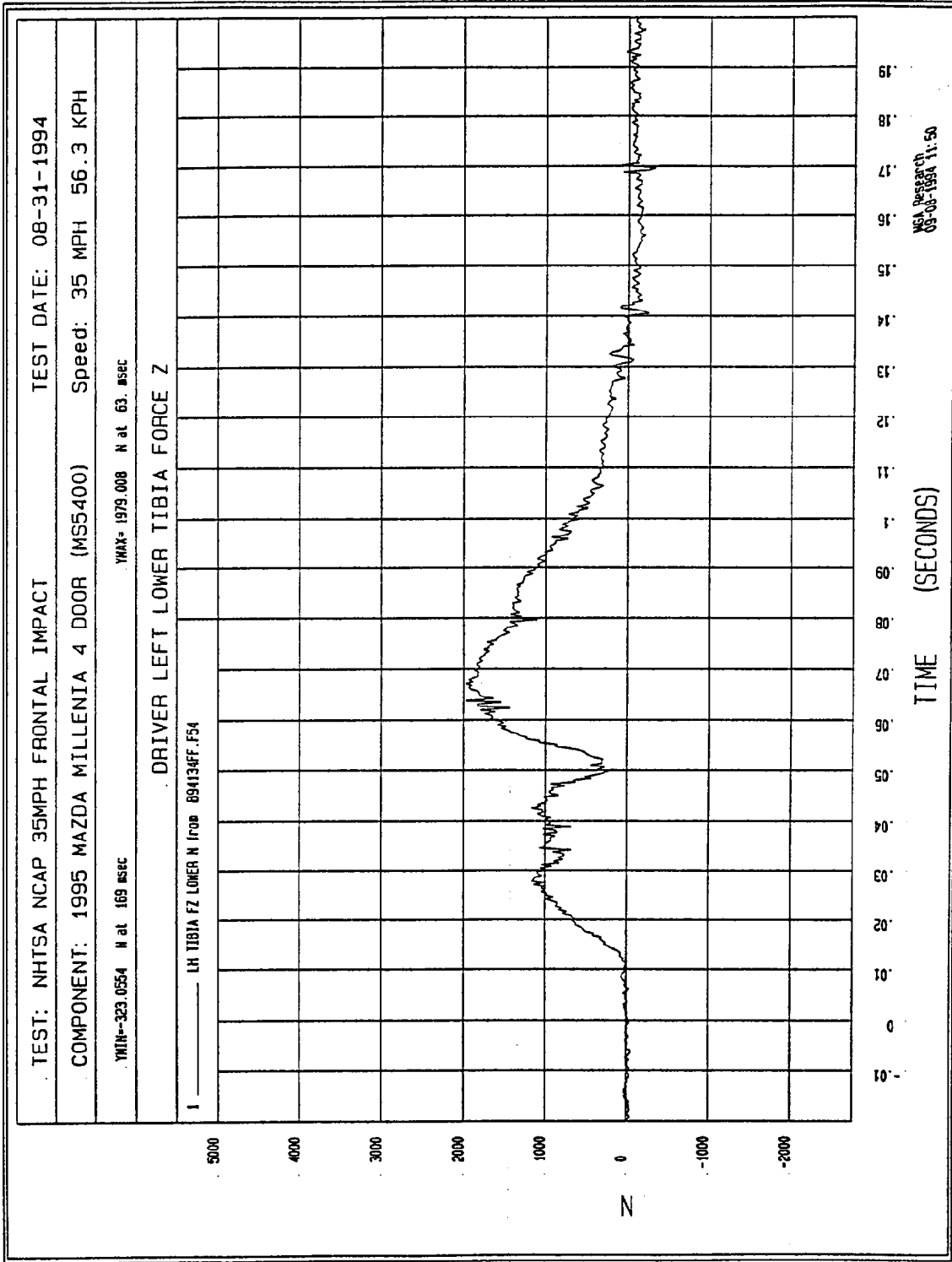


Figure B-60 - Driver Left Lower Tibia Force Z vs. Time

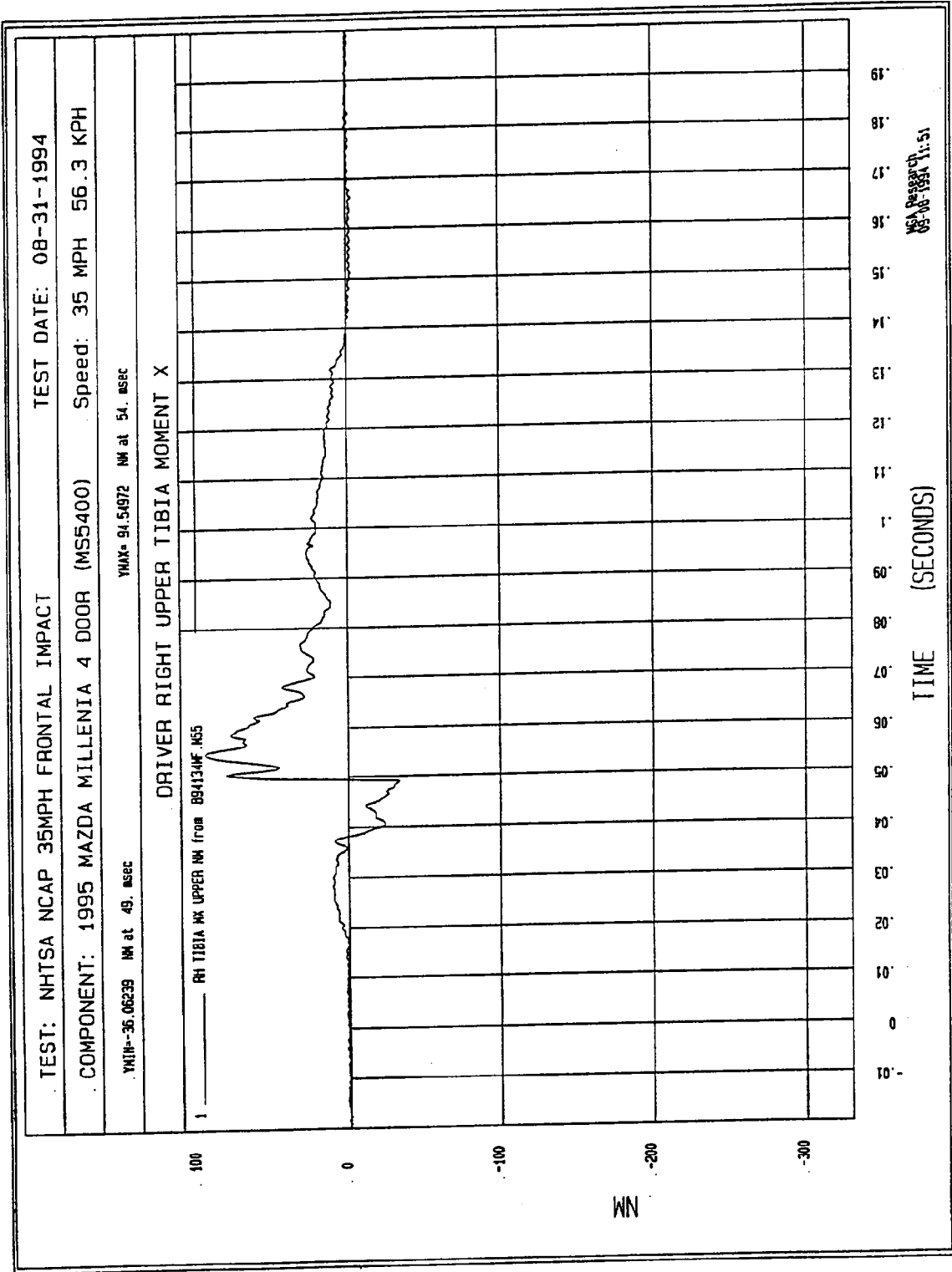


Figure B-61 - Driver Right Upper Tibia Moment X vs. Time

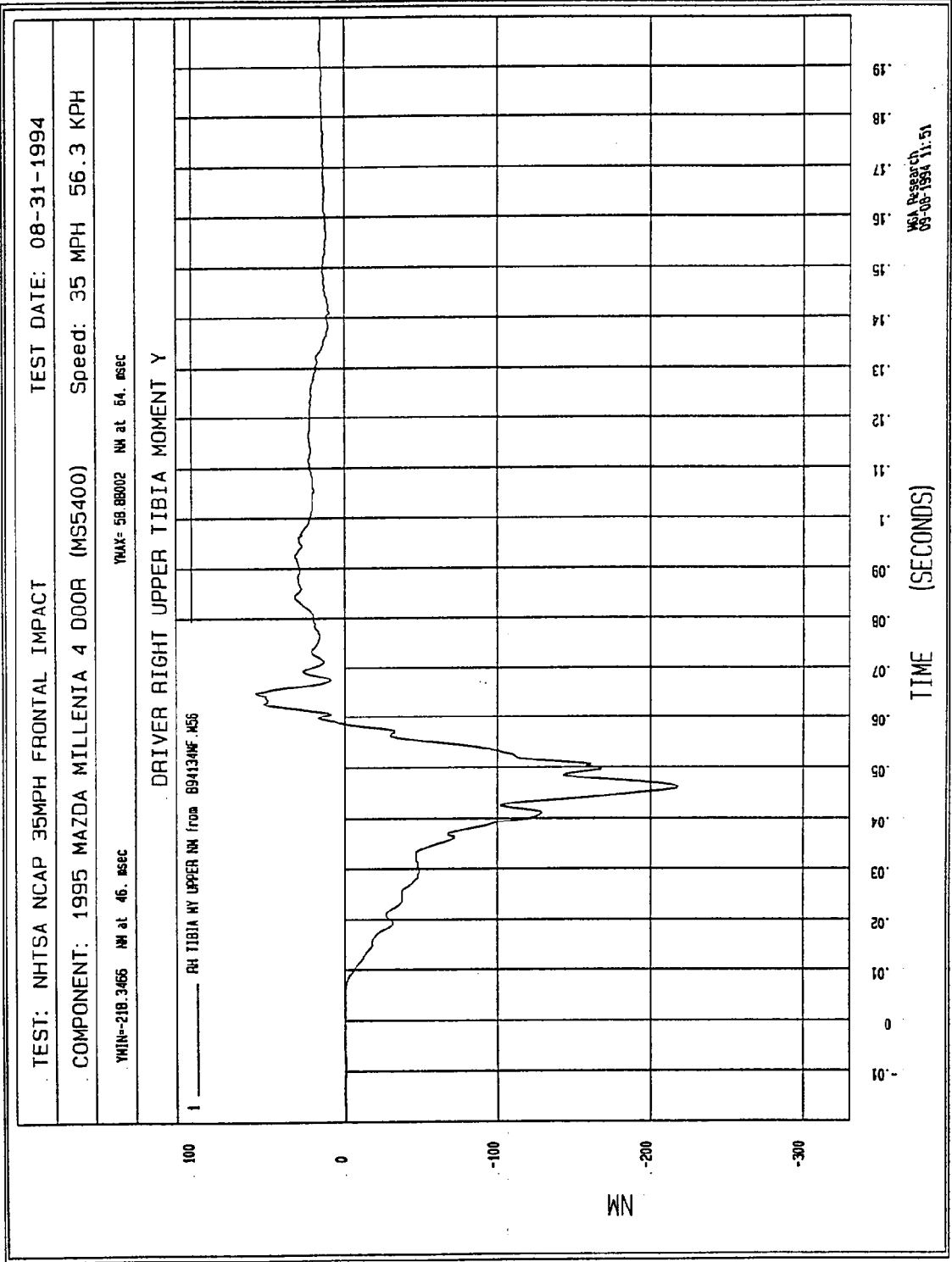


Figure B-62 - Driver Right Upper Tibia Moment Y vs. Time

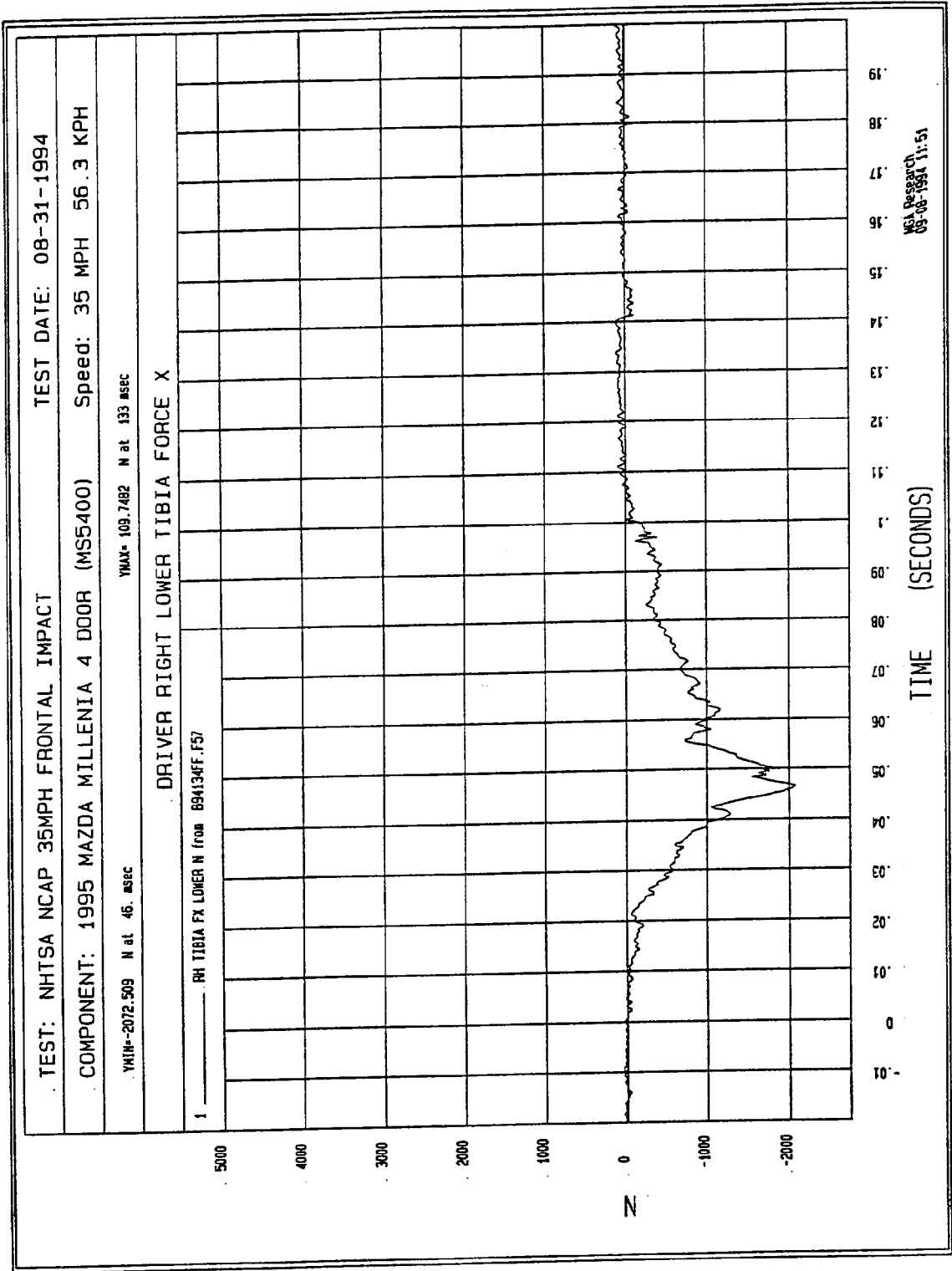


Figure B-63 - Driver Right Lower Tibia Force X vs. Time

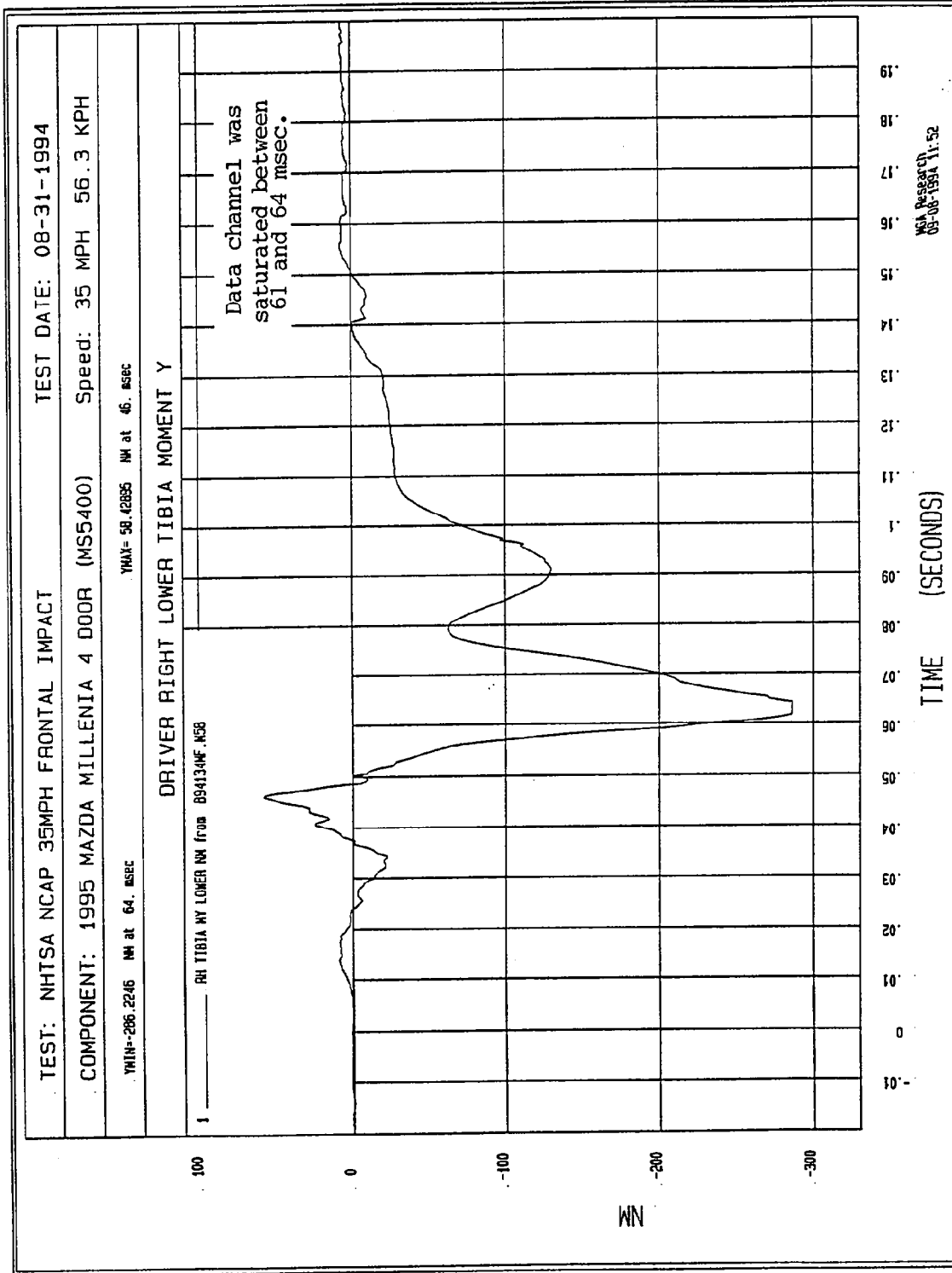


Figure B-64 - Driver Right Lower Tibia Moment Y vs. Time

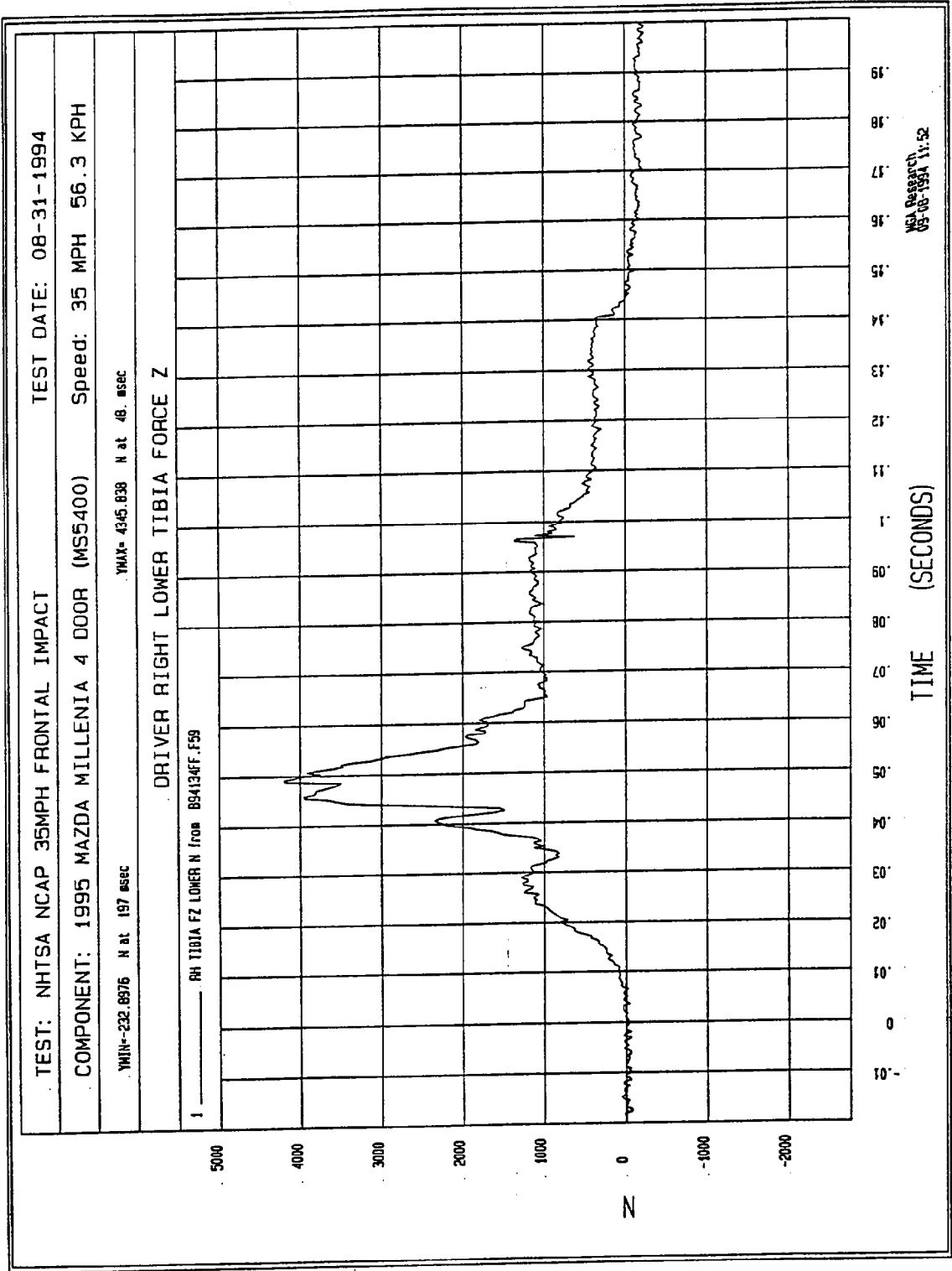
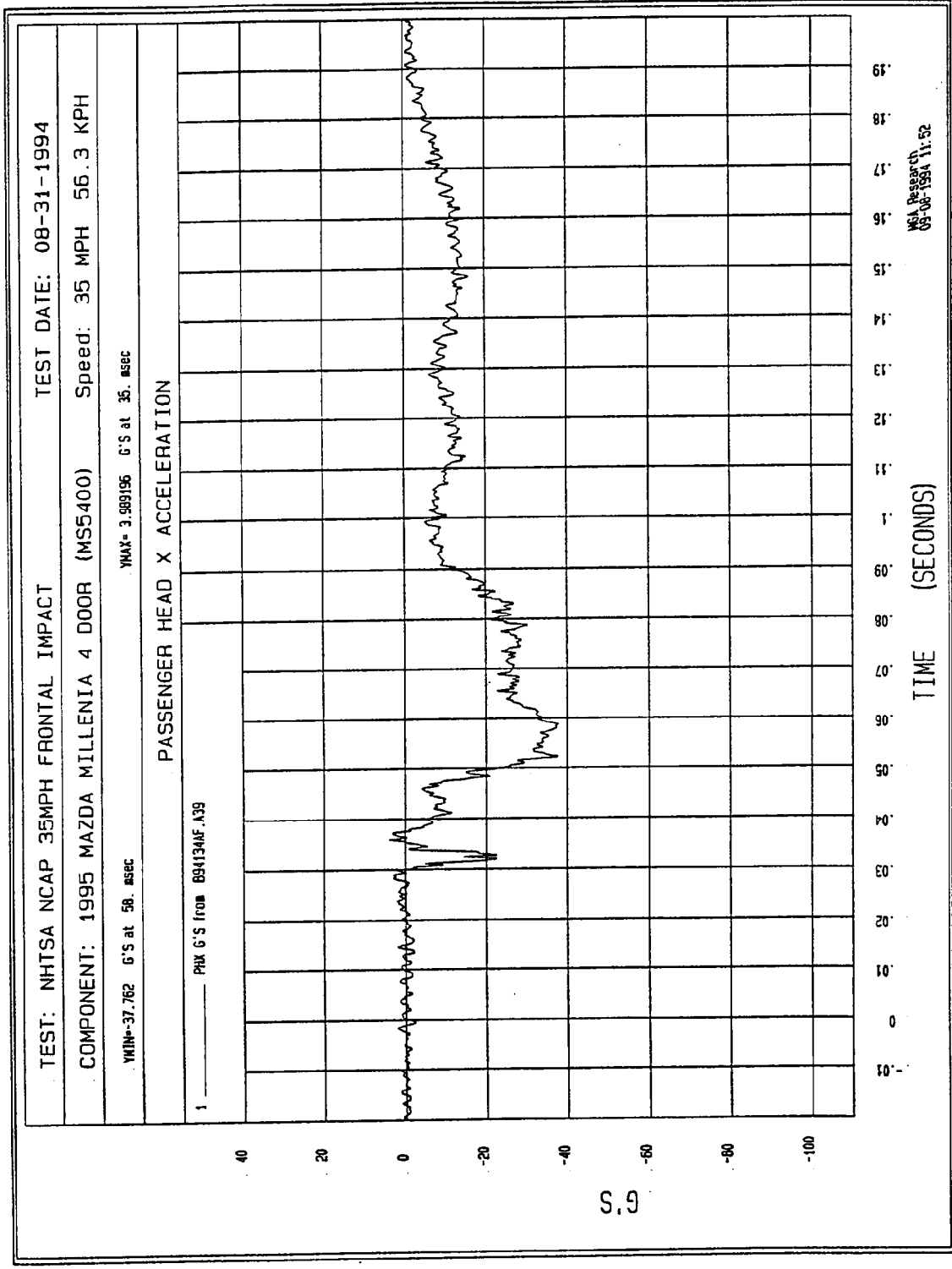


Figure B-65 - Driver Right Lower Tibia Force Z vs. Time



B-66

Figure B-66 - Passenger Head X Acceleration vs. Time

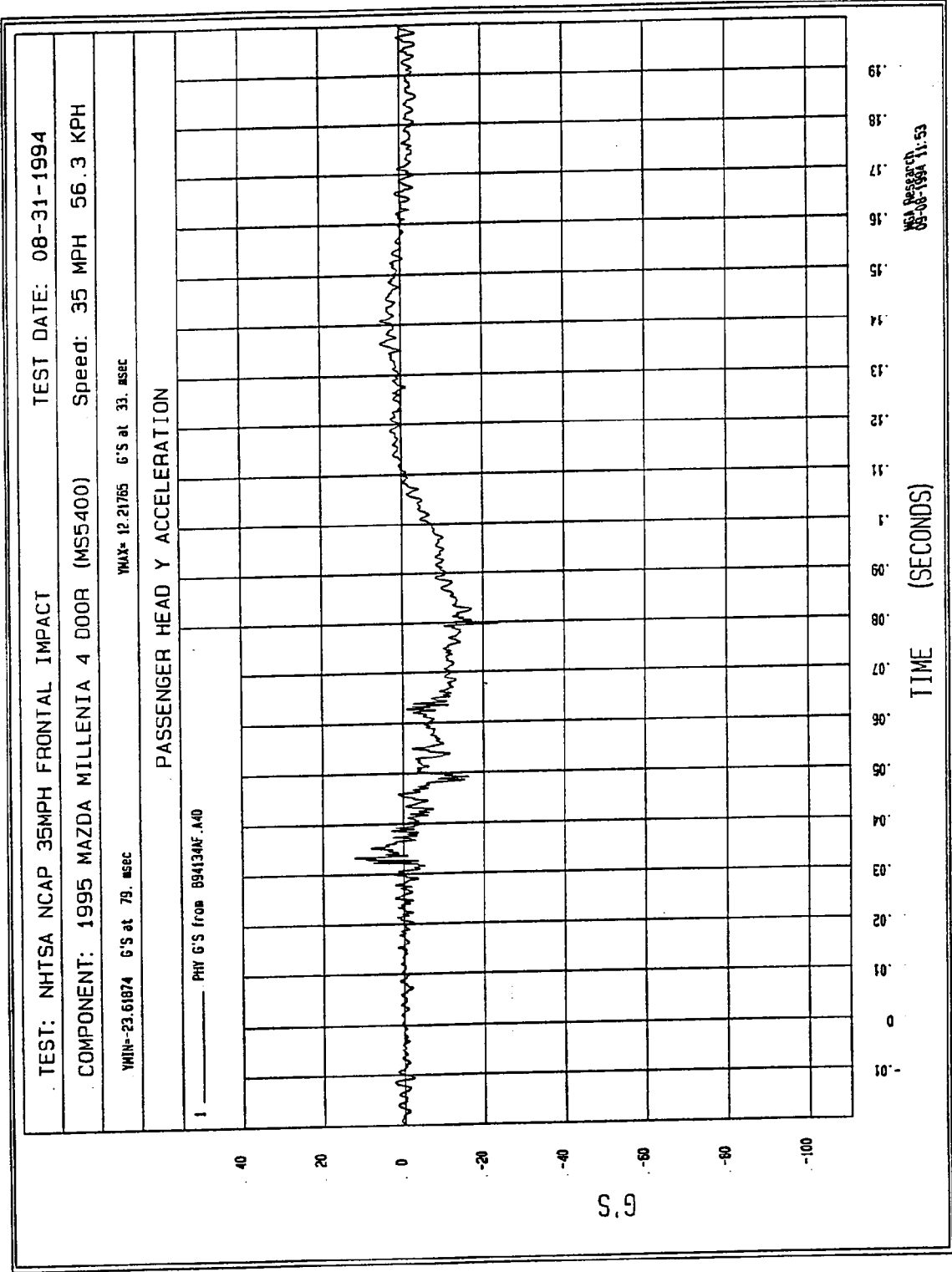


Figure B-67 - Passenger Head Y Acceleration vs. Time

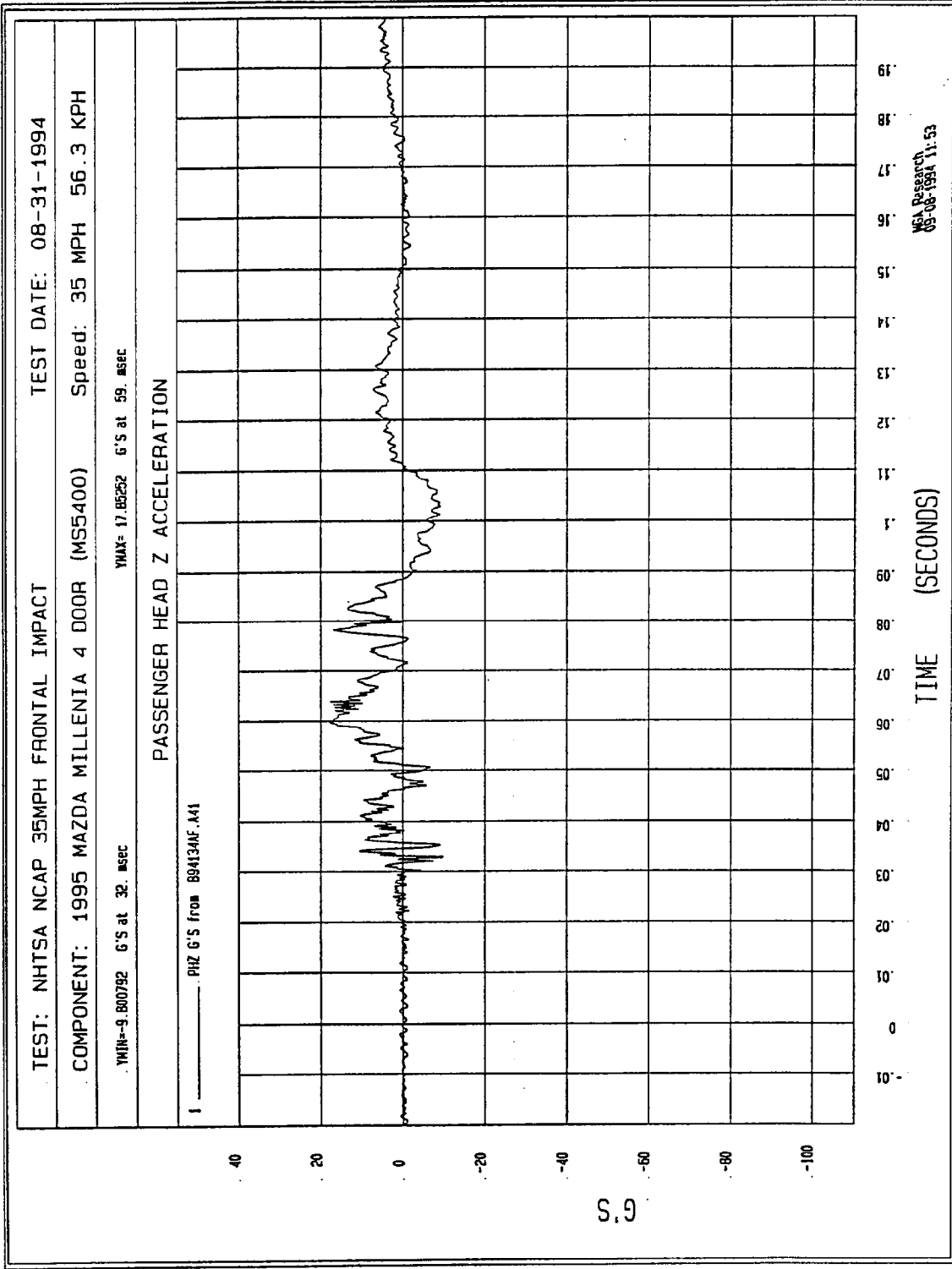


Figure B-68 - Passenger Head Z Acceleration vs. Time

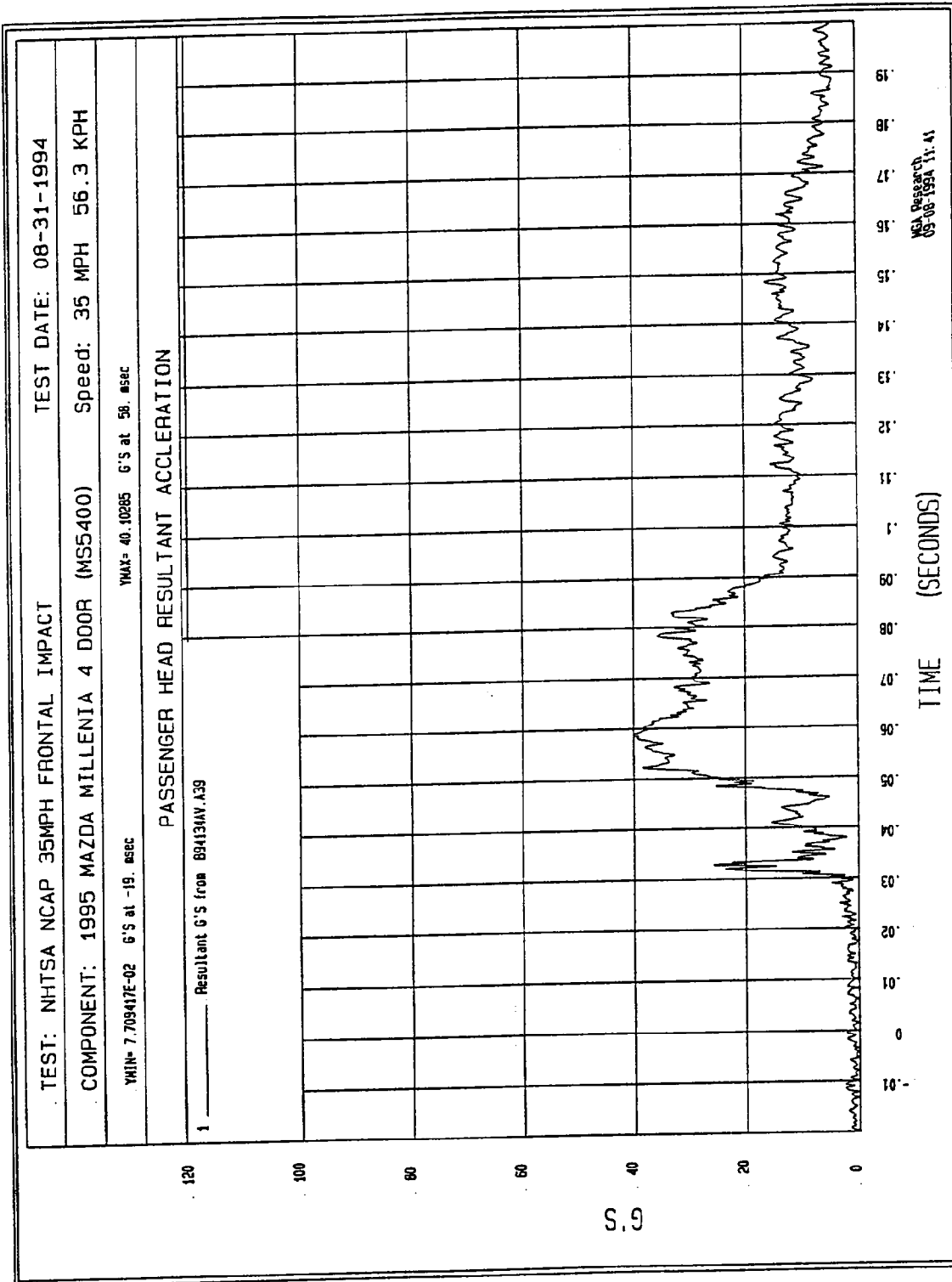


Figure B-69 - Passenger Head Resultant Acceleration vs. Time

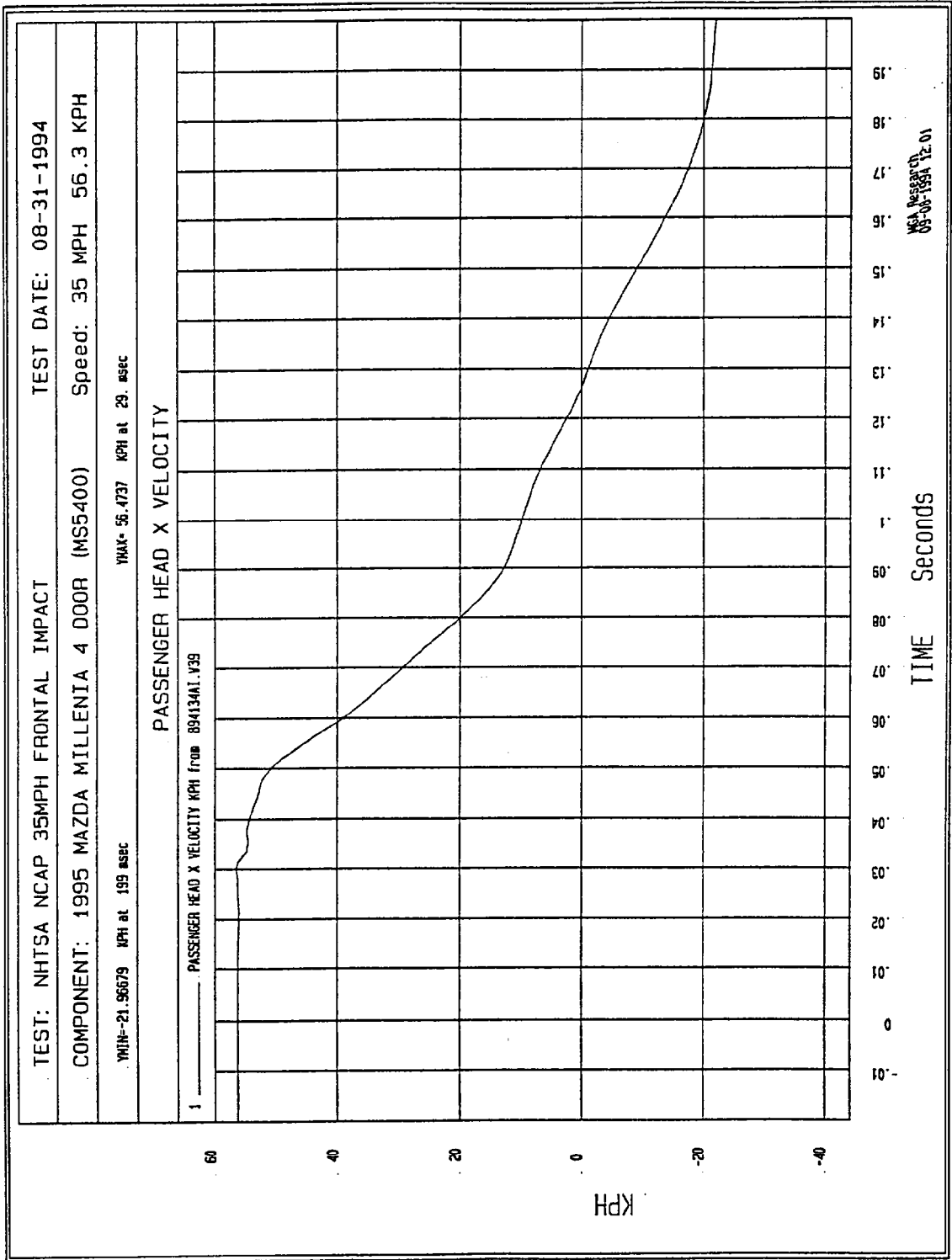


Figure B-70 - Passenger Head X Velocity vs. Time

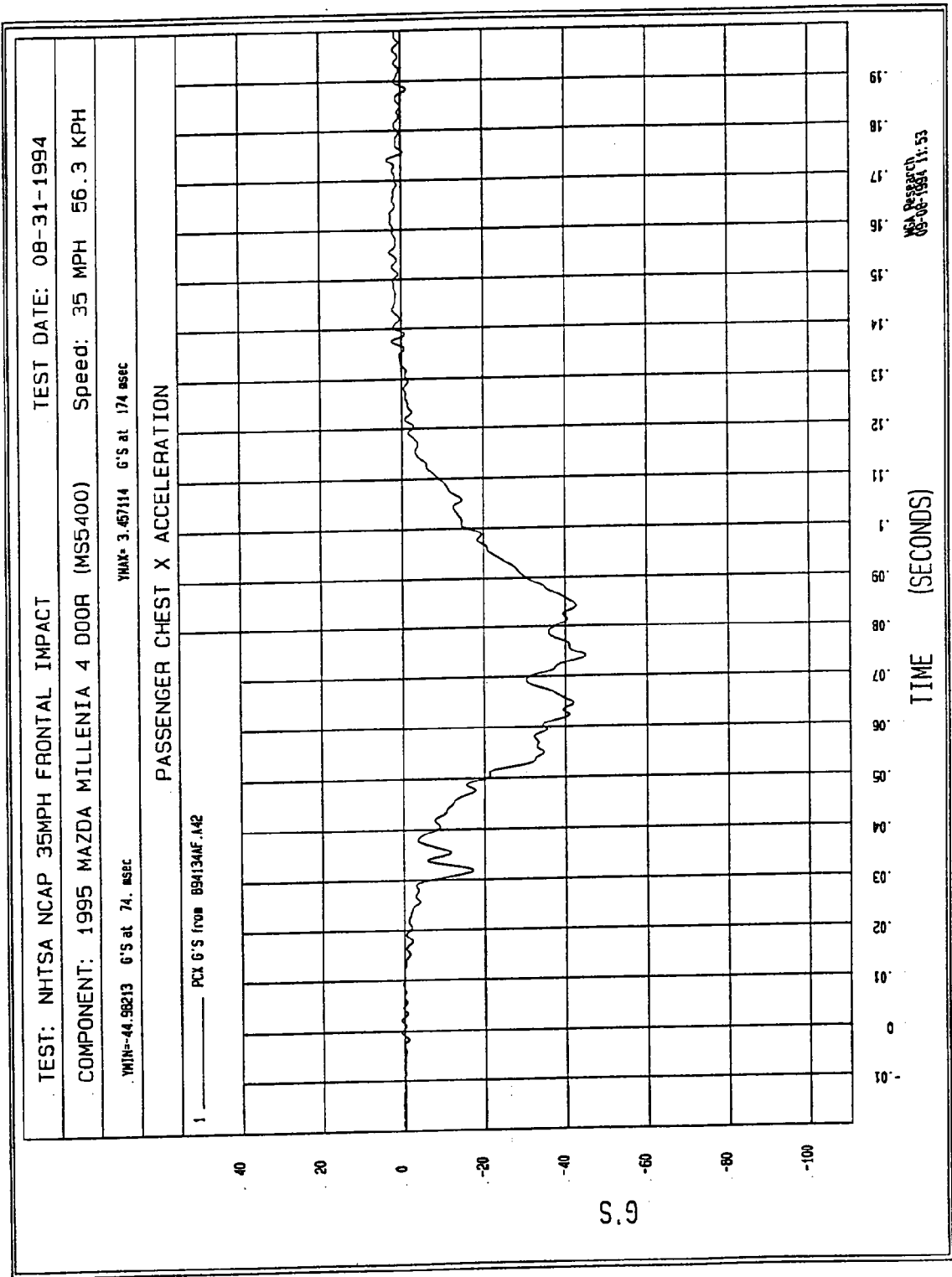


Figure B-71 - Passenger Chest X Acceleration vs. Time

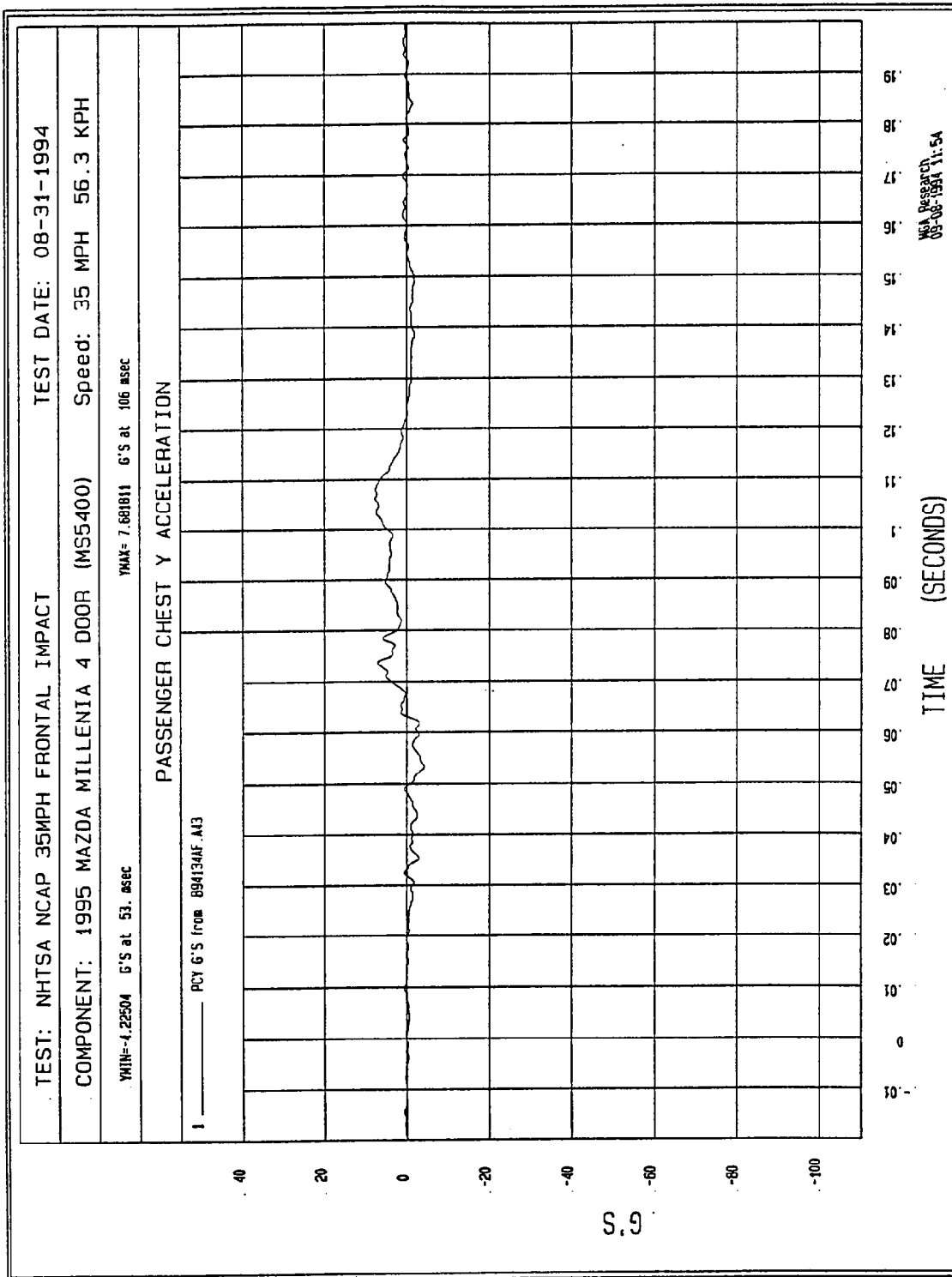


Figure B-72 - Passenger Chest Y Acceleration vs. Time

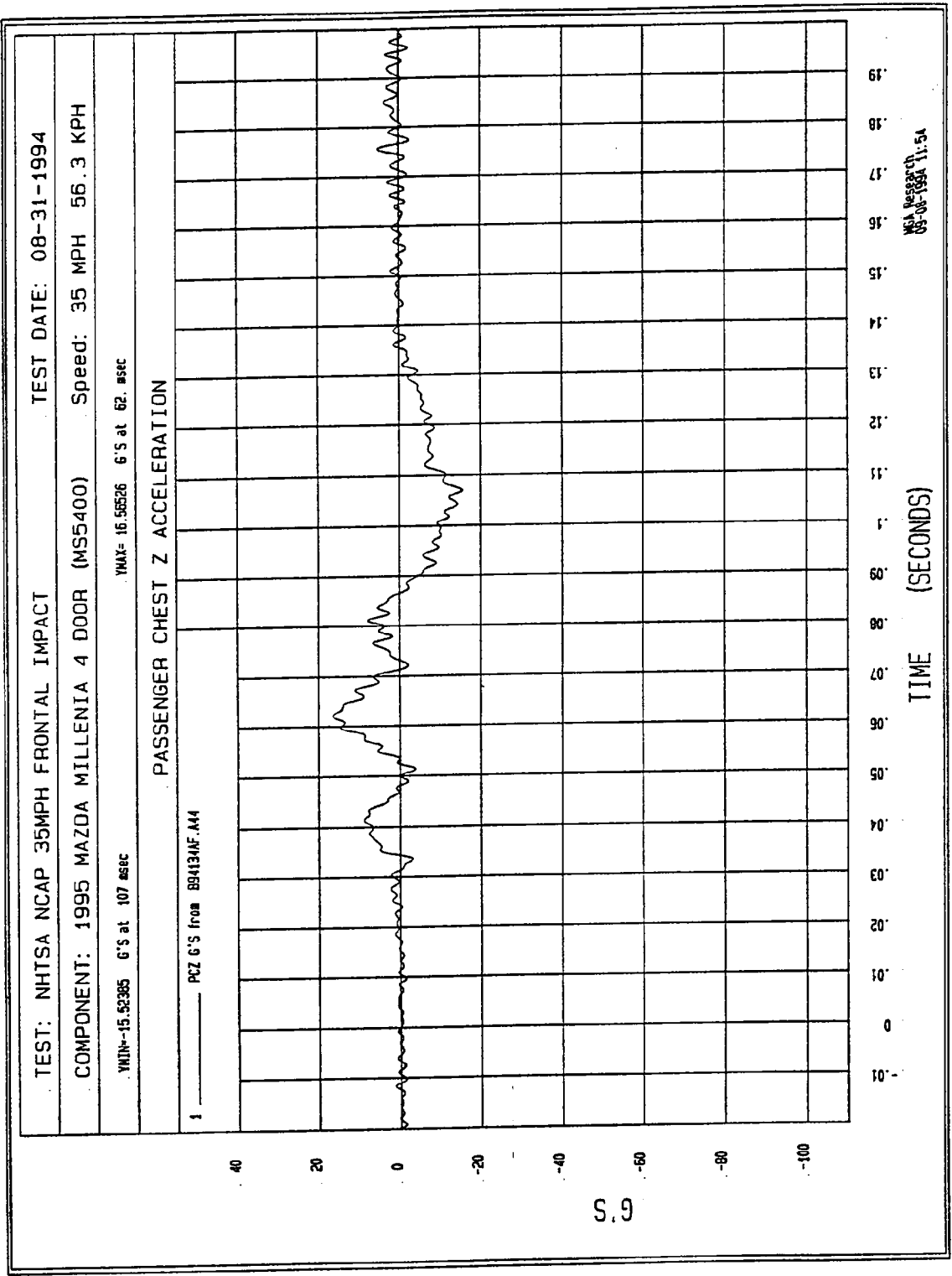
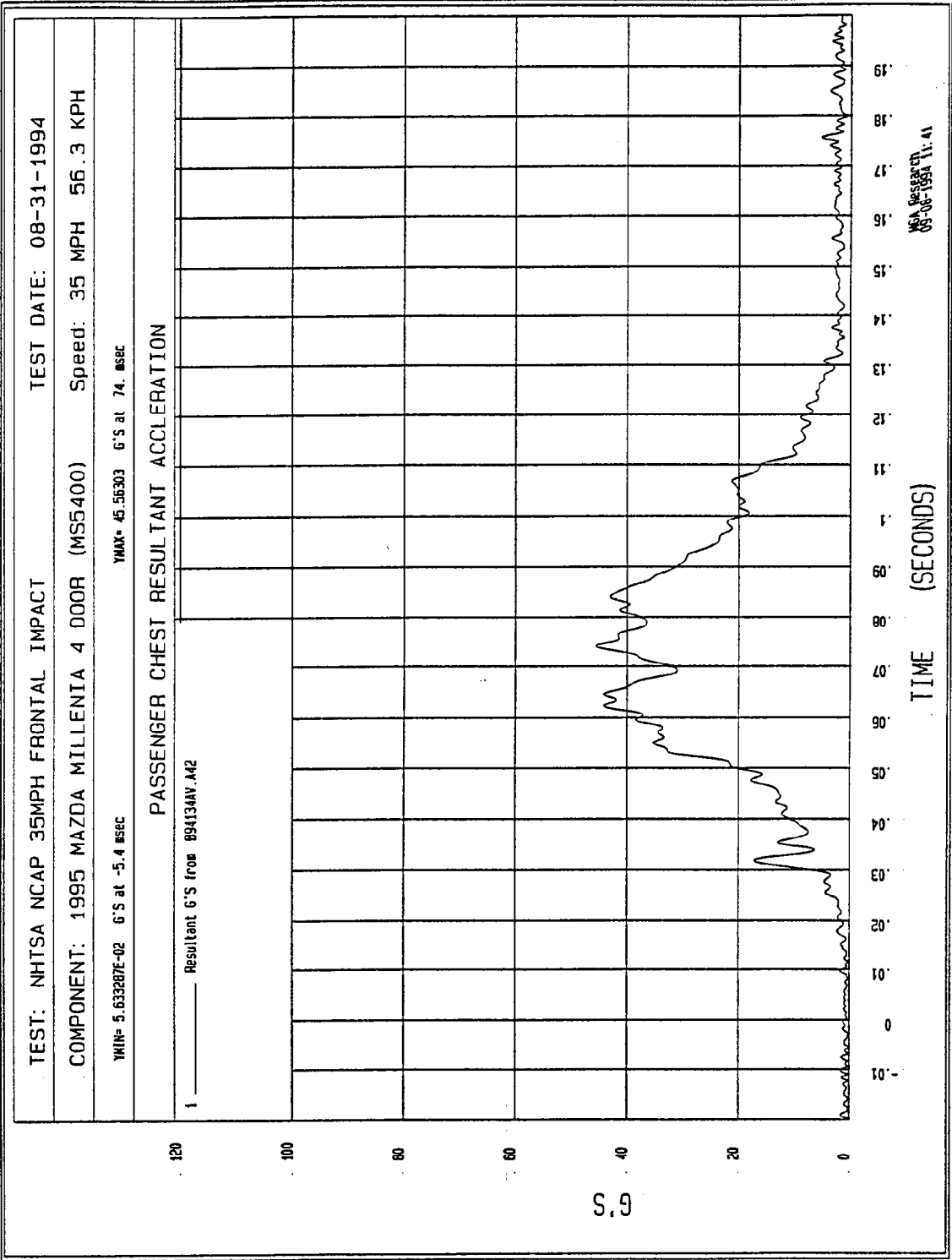


Figure B-73 - Passenger Chest Z Acceleration vs. Time



B-74

Figure B-74 - Passenger Chest Resultant Acceleration vs. Time

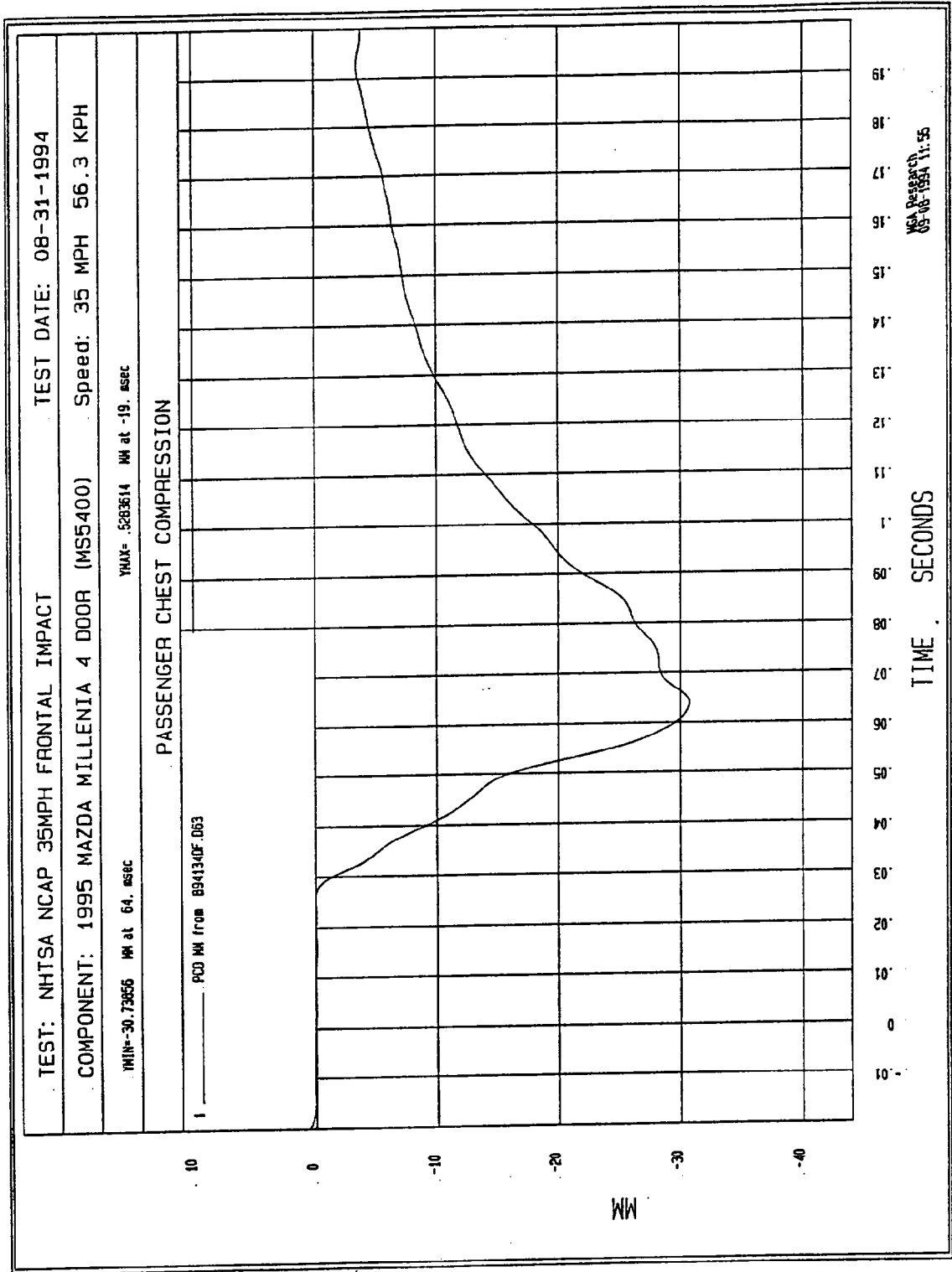


Figure B-75 - Passenger Chest Compression vs. Time

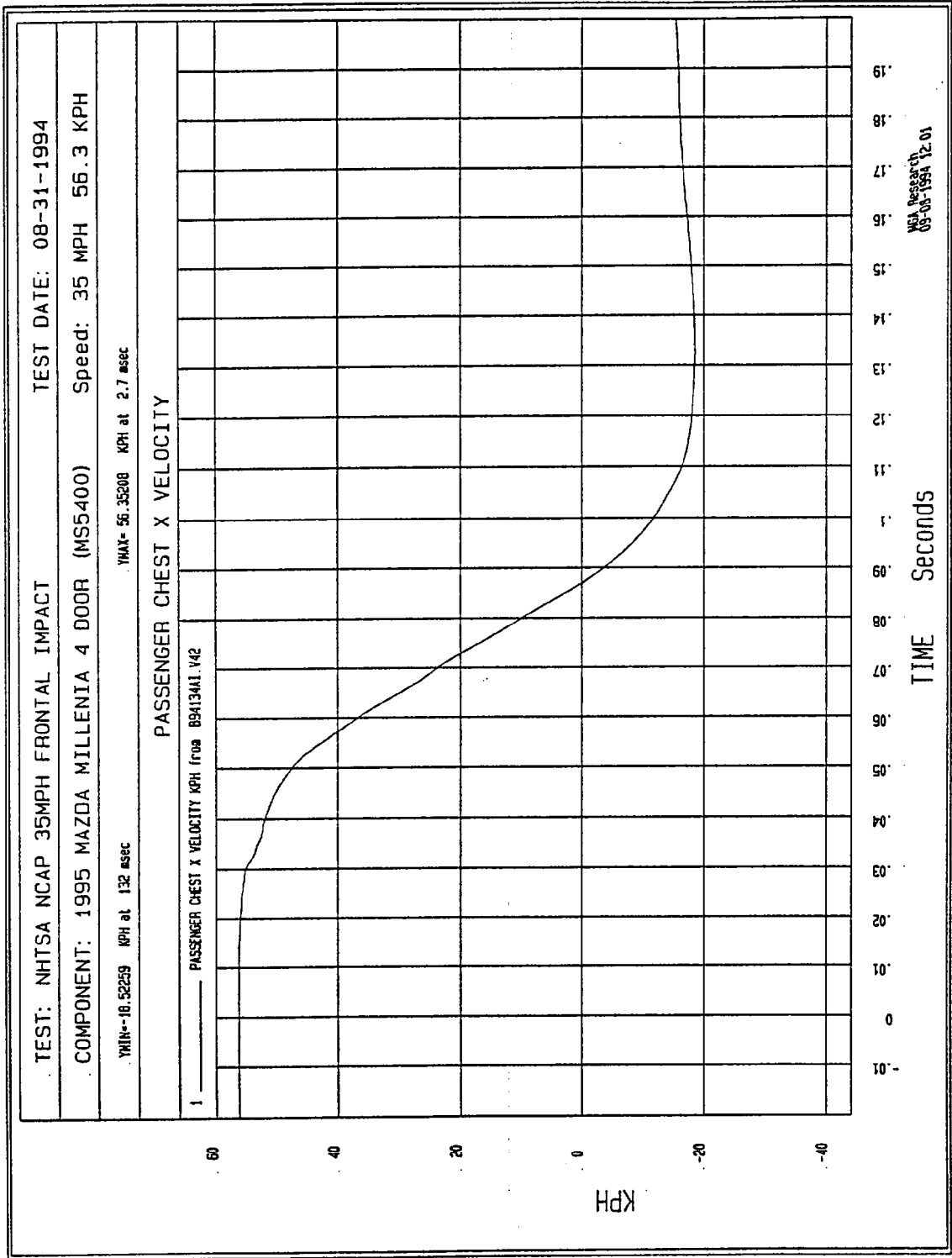


Figure B-76 - Passenger Chest X Velocity vs. Time

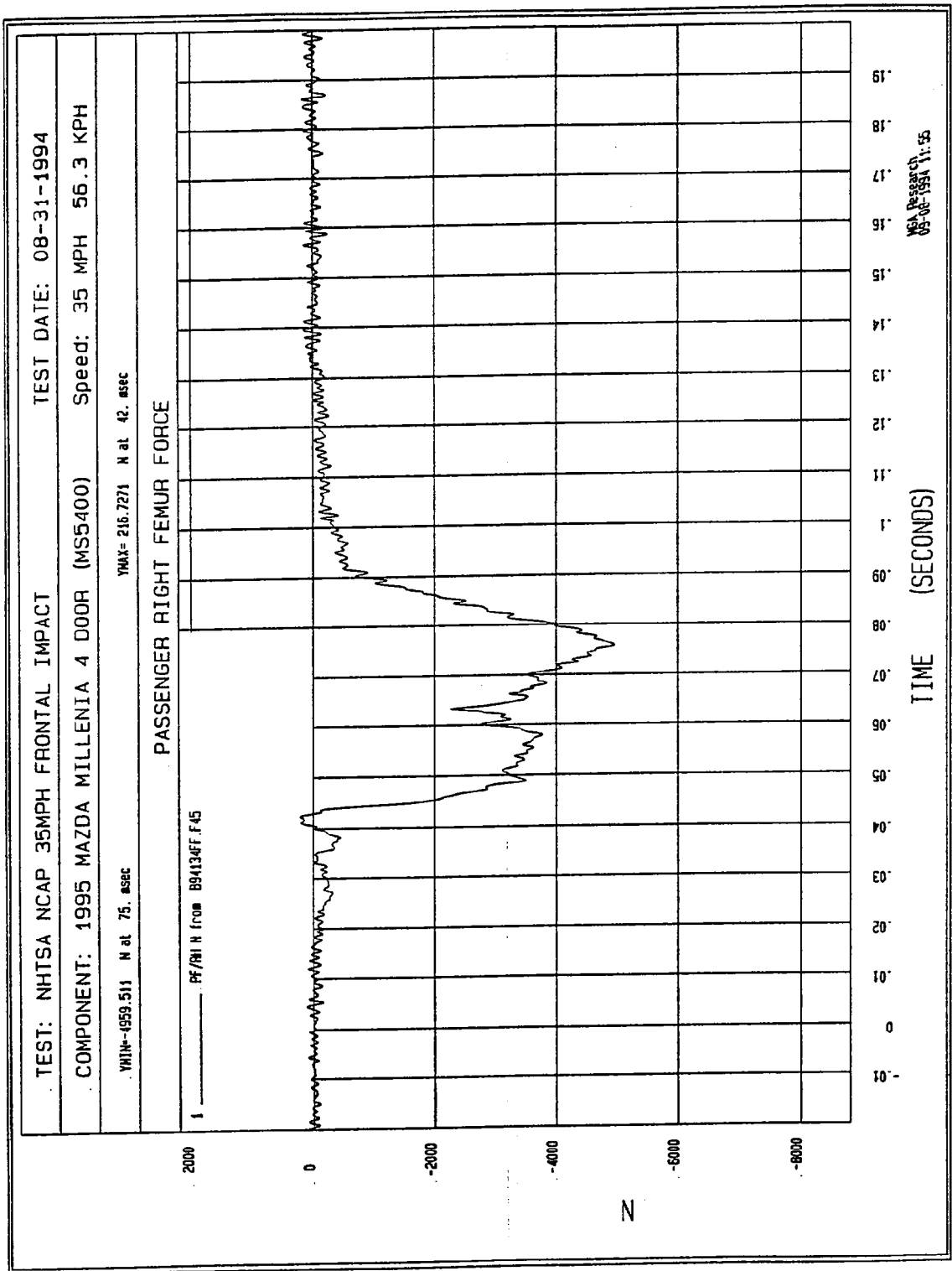


Figure B-77 - Passenger Right Femur Force vs. Time

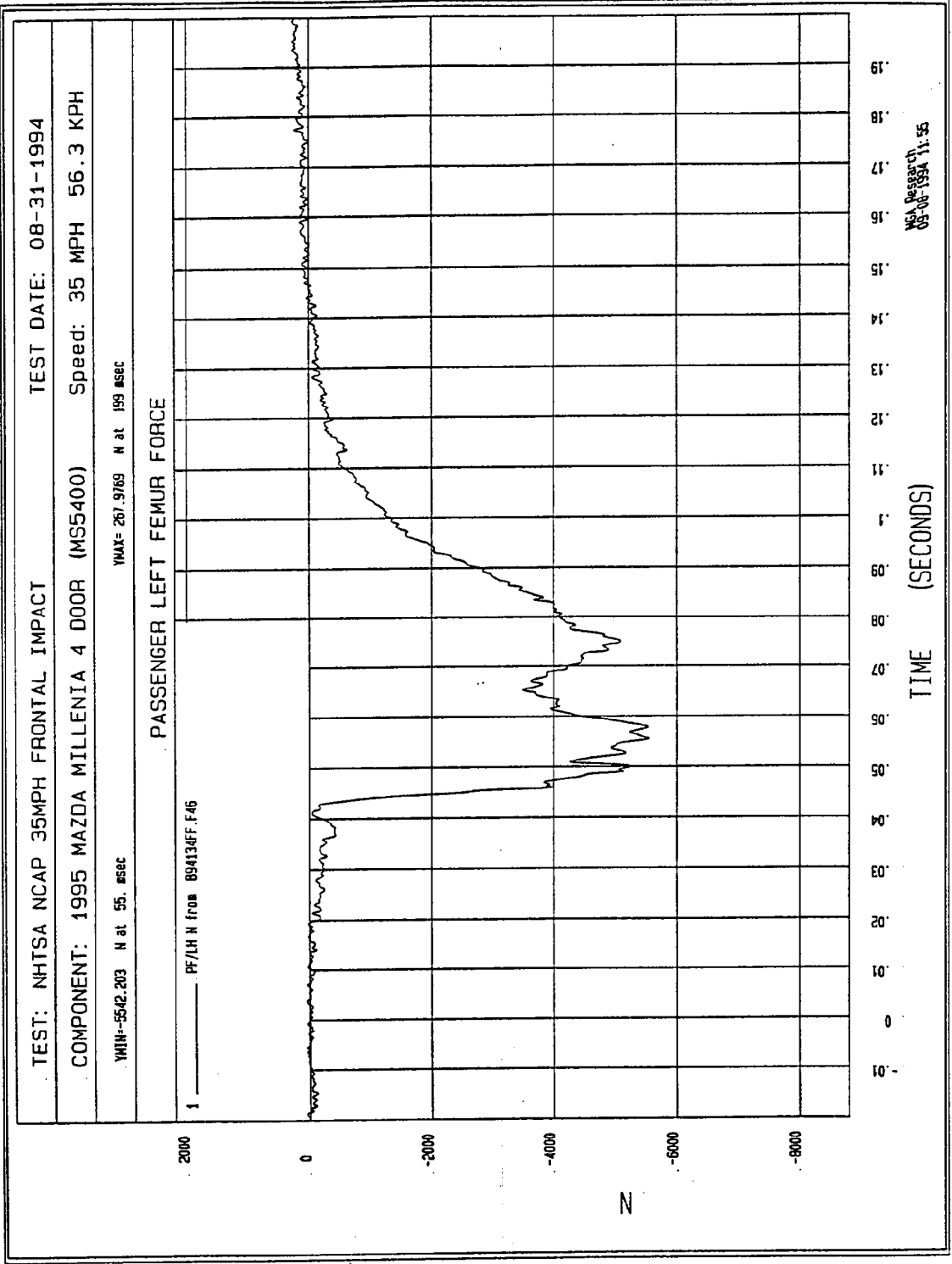
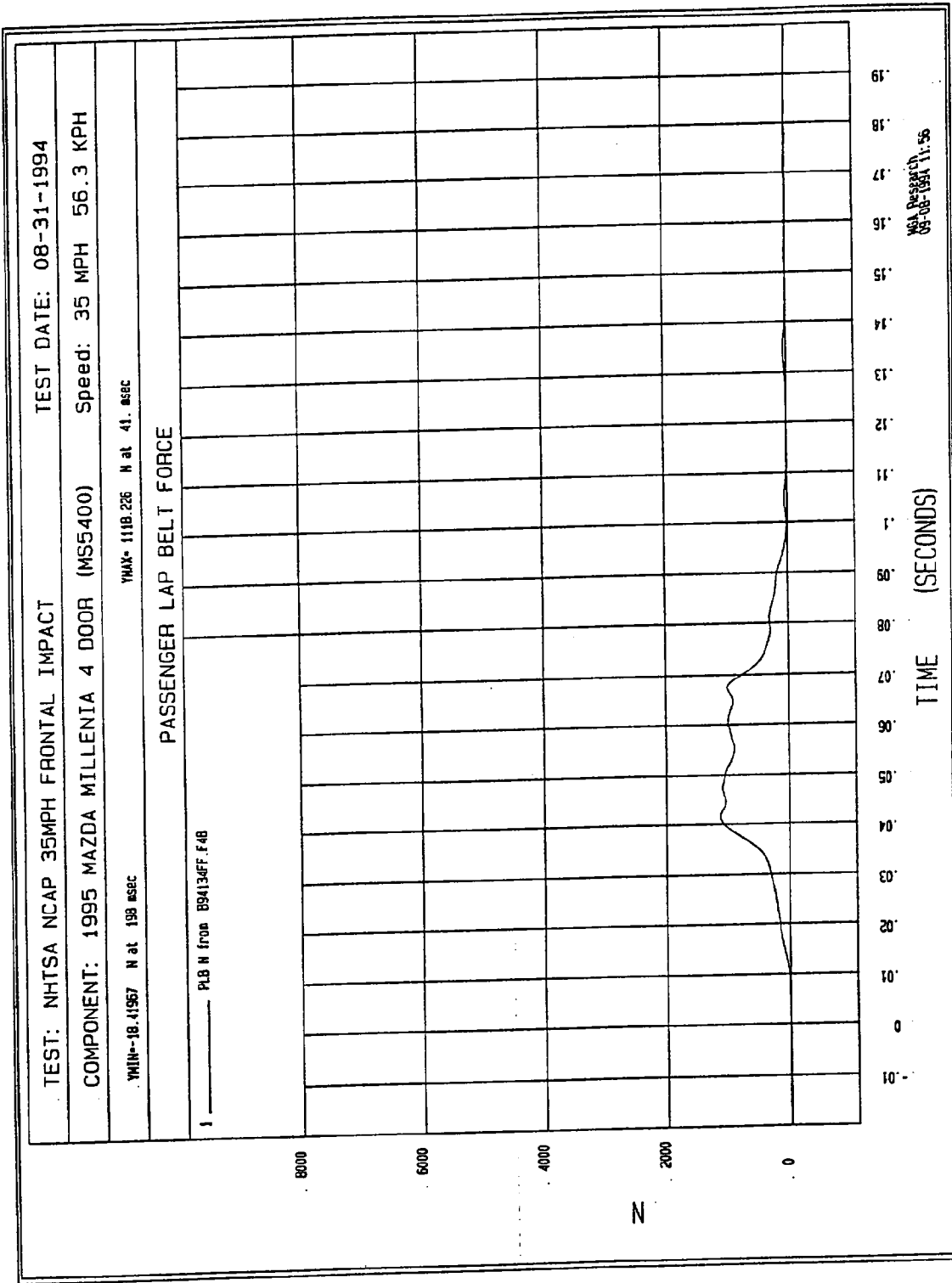


Figure B-78 - Passenger Left Femur Force vs. Time



B-79

Figure B-79 - Passenger Lap Belt Force vs. Time

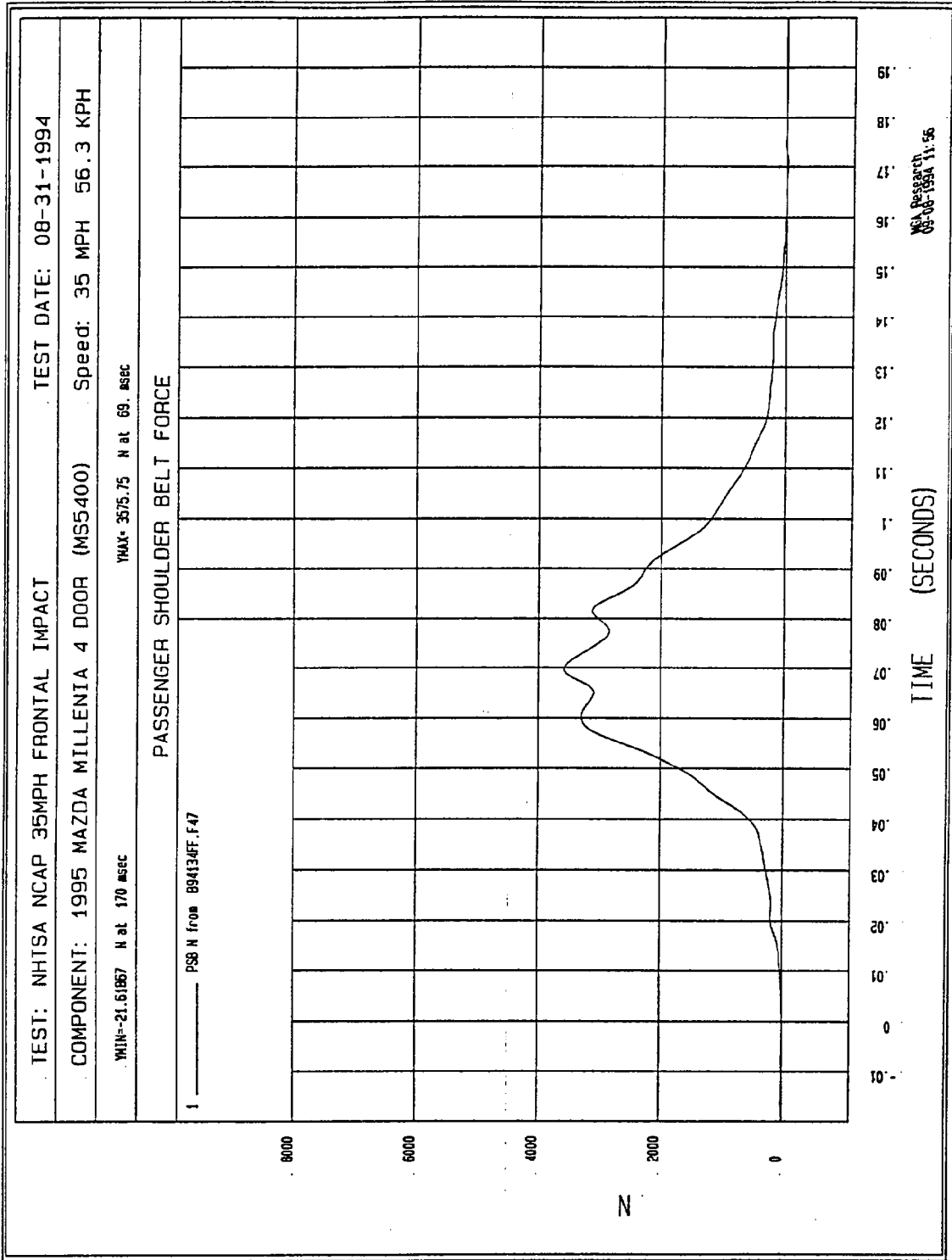
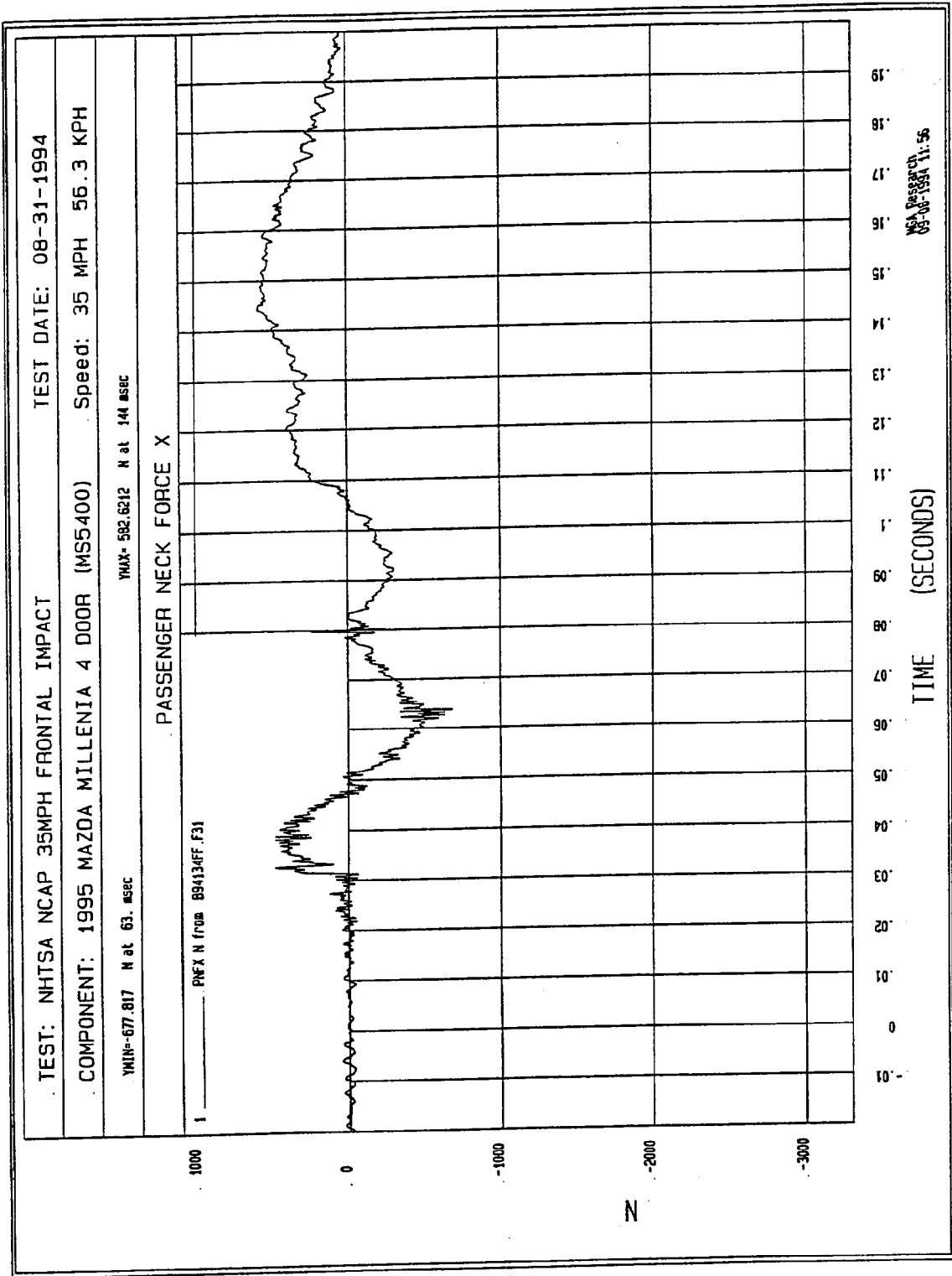


Figure B-80 - Passenger Shoulder Belt Force vs. Time



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Figure B-81 - Passenger Neck Force X vs. Time

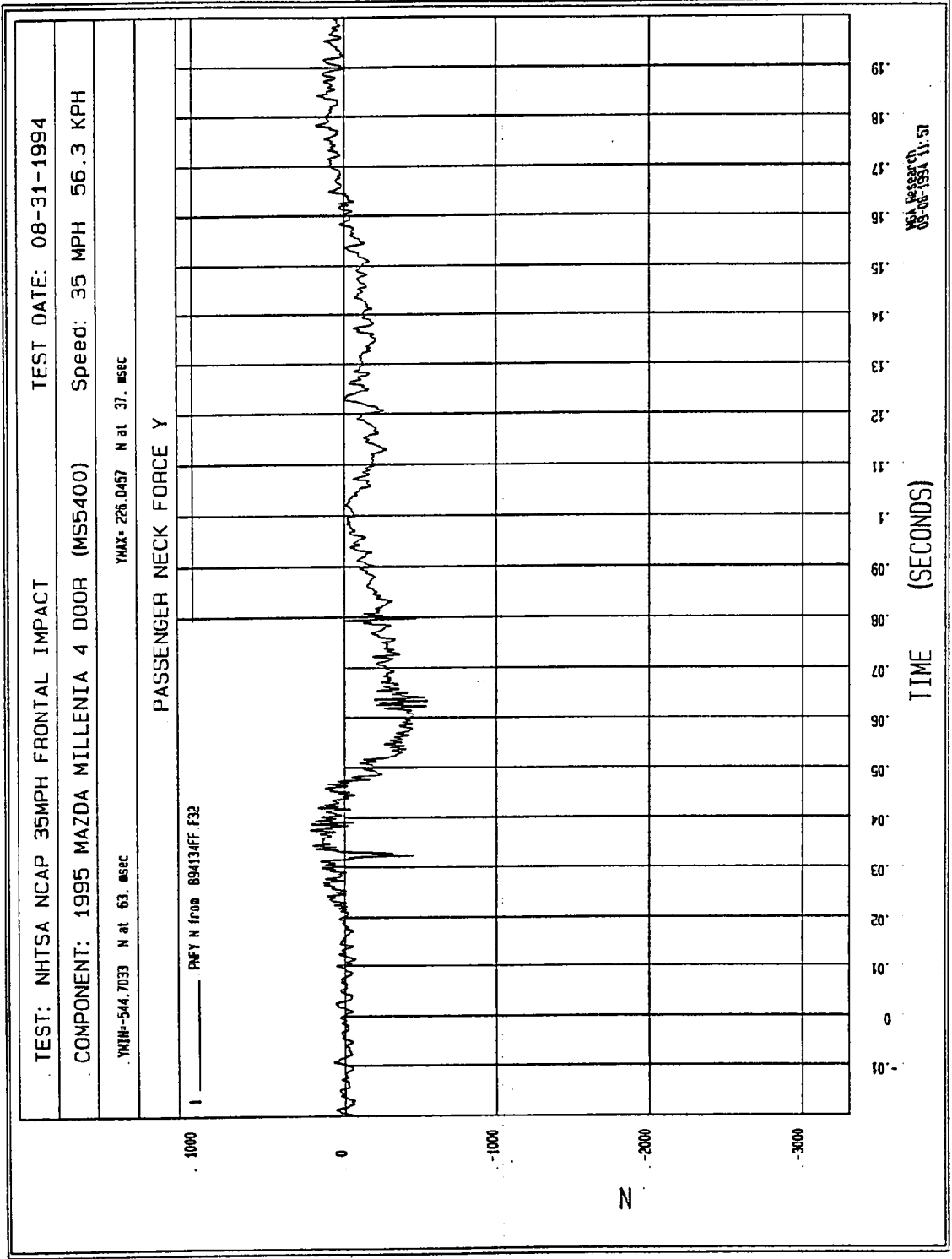


Figure B-82 - Passenger Neck Force Y vs. Time

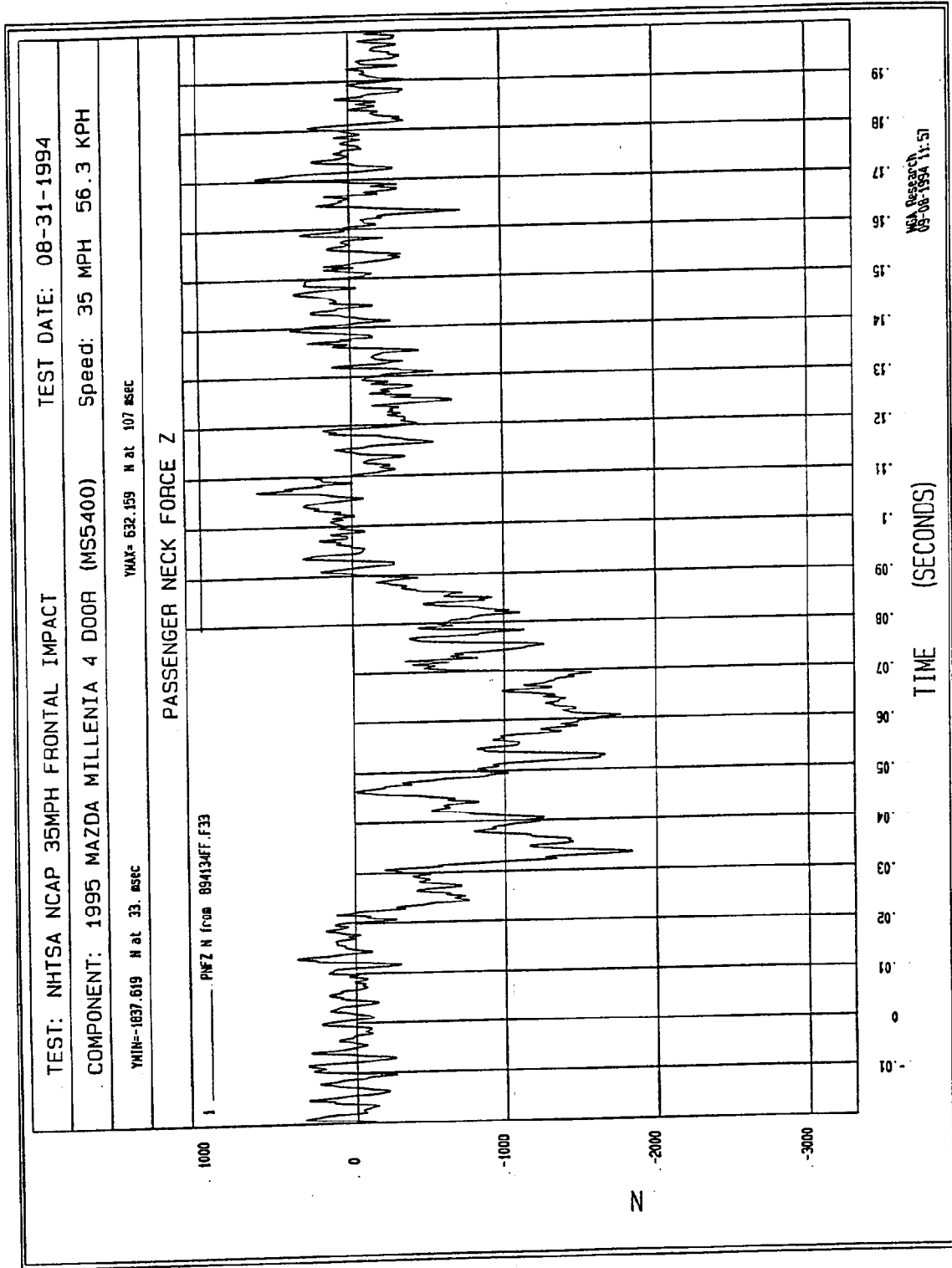


Figure B-83 - Passenger Neck Force Z vs. Time

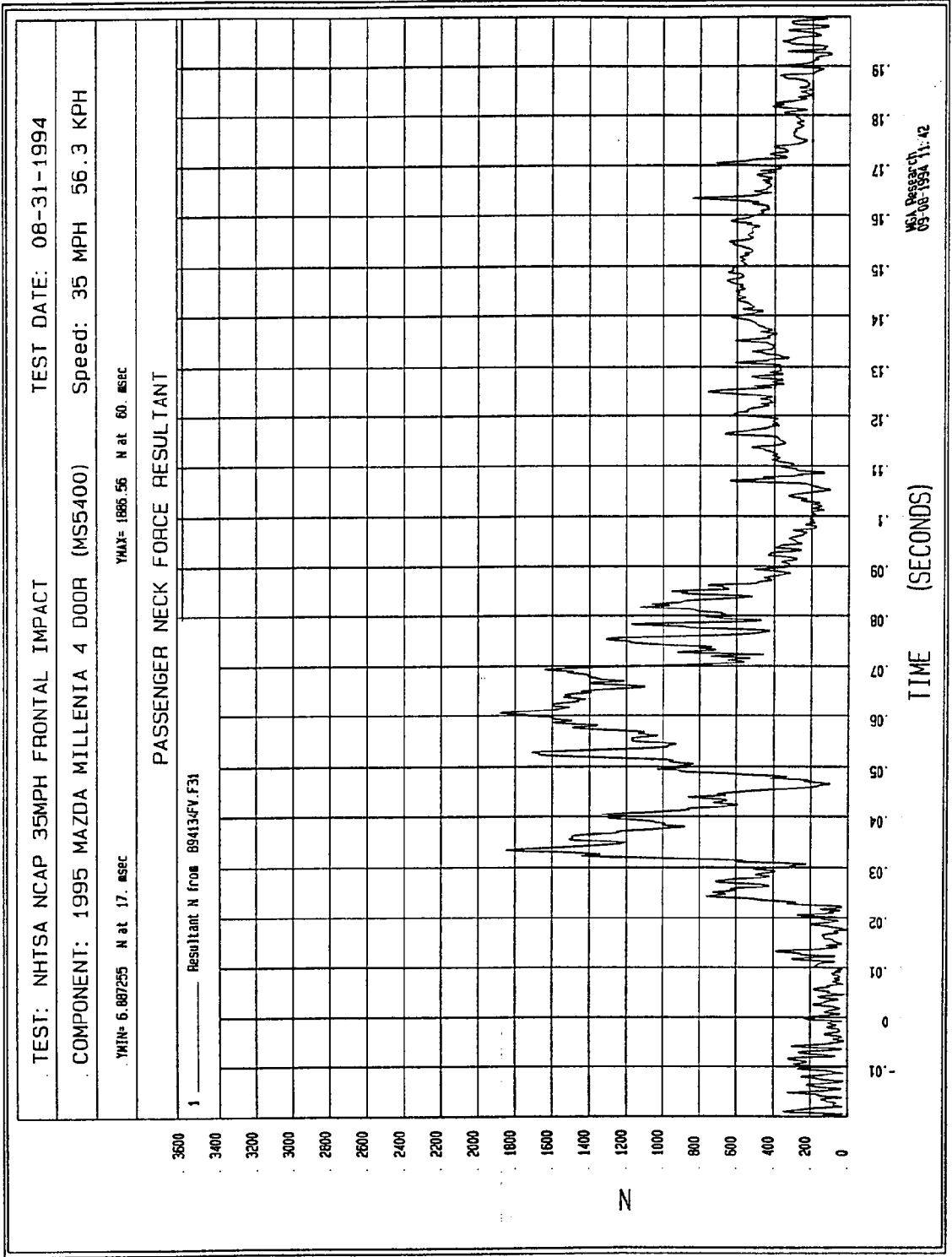


Figure B-84 - Passenger Neck Force Resultant vs. Time

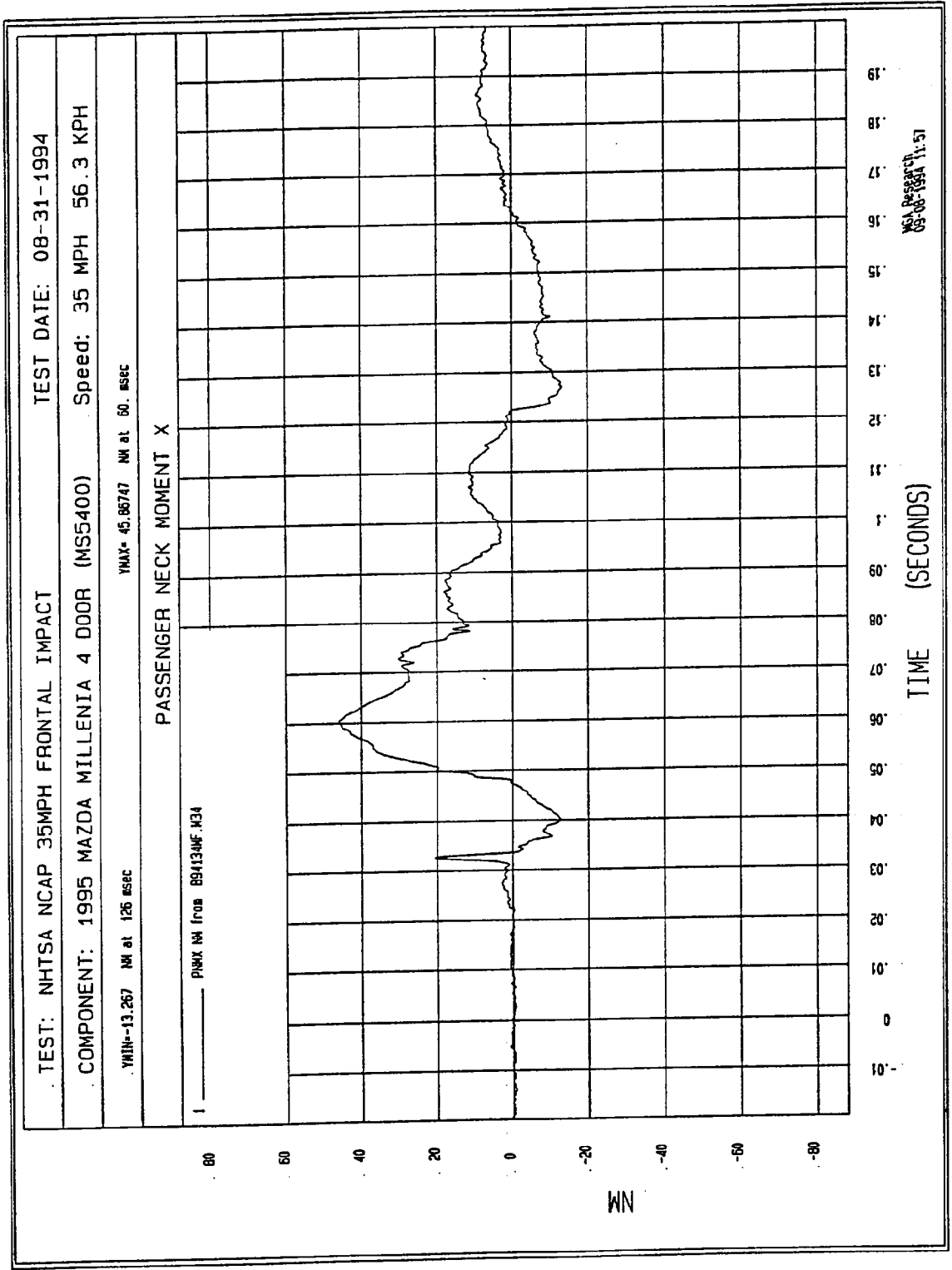


Figure B-85 - Passenger Neck Moment X vs. Time

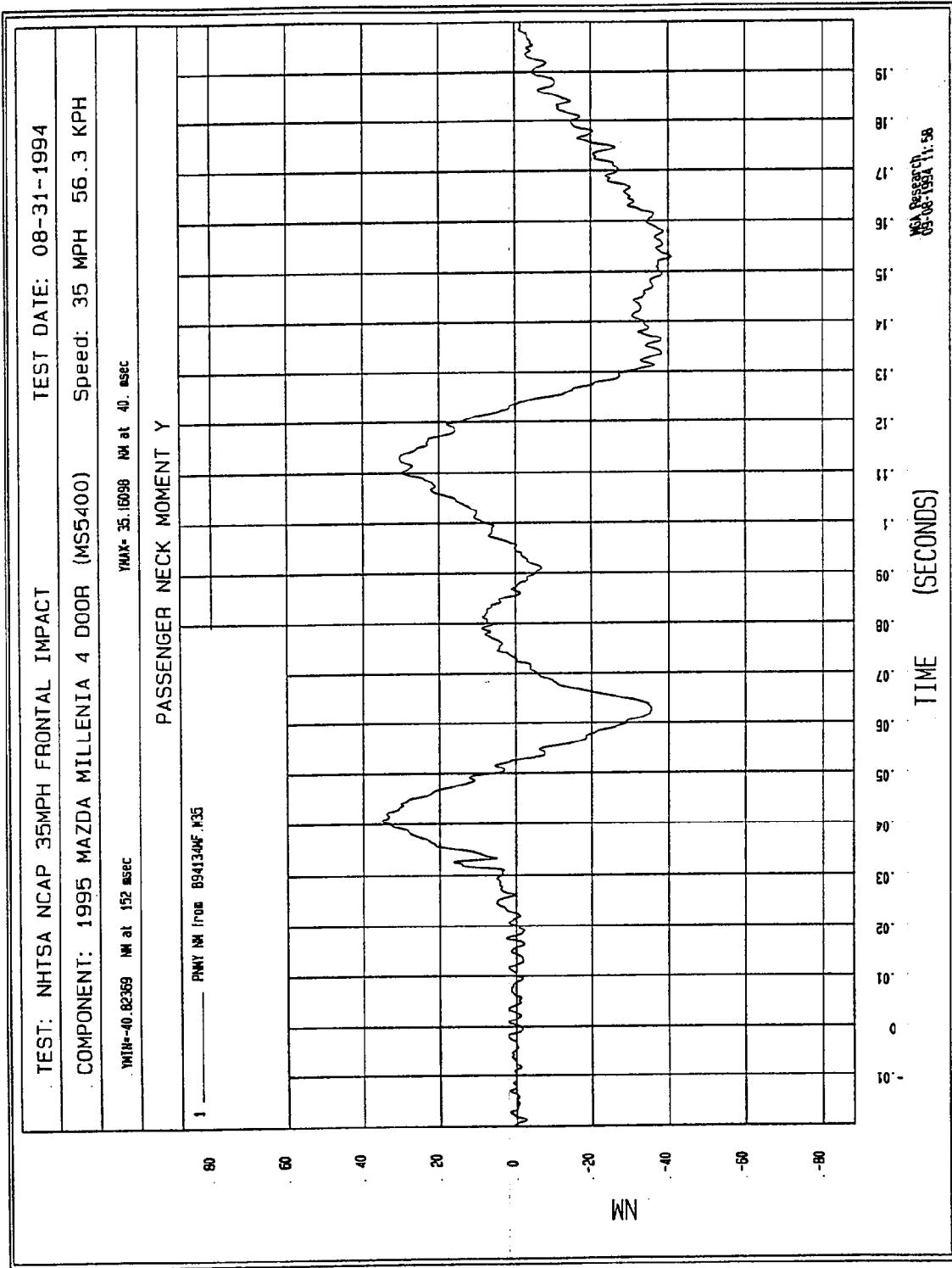


Figure B-86 - Passenger Neck Moment Y vs. Time

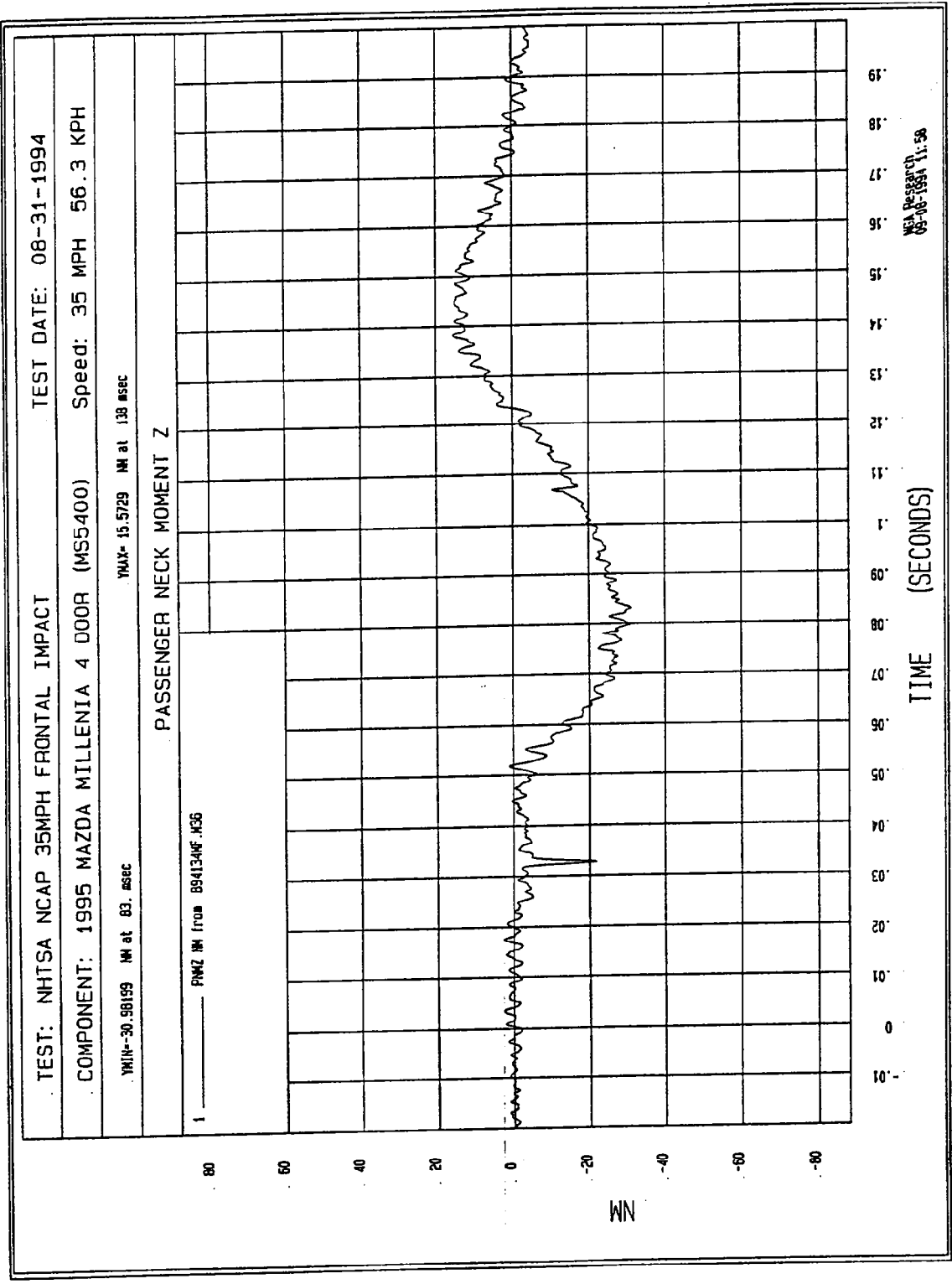


Figure B-87 - Passenger Neck Moment Z vs. Time

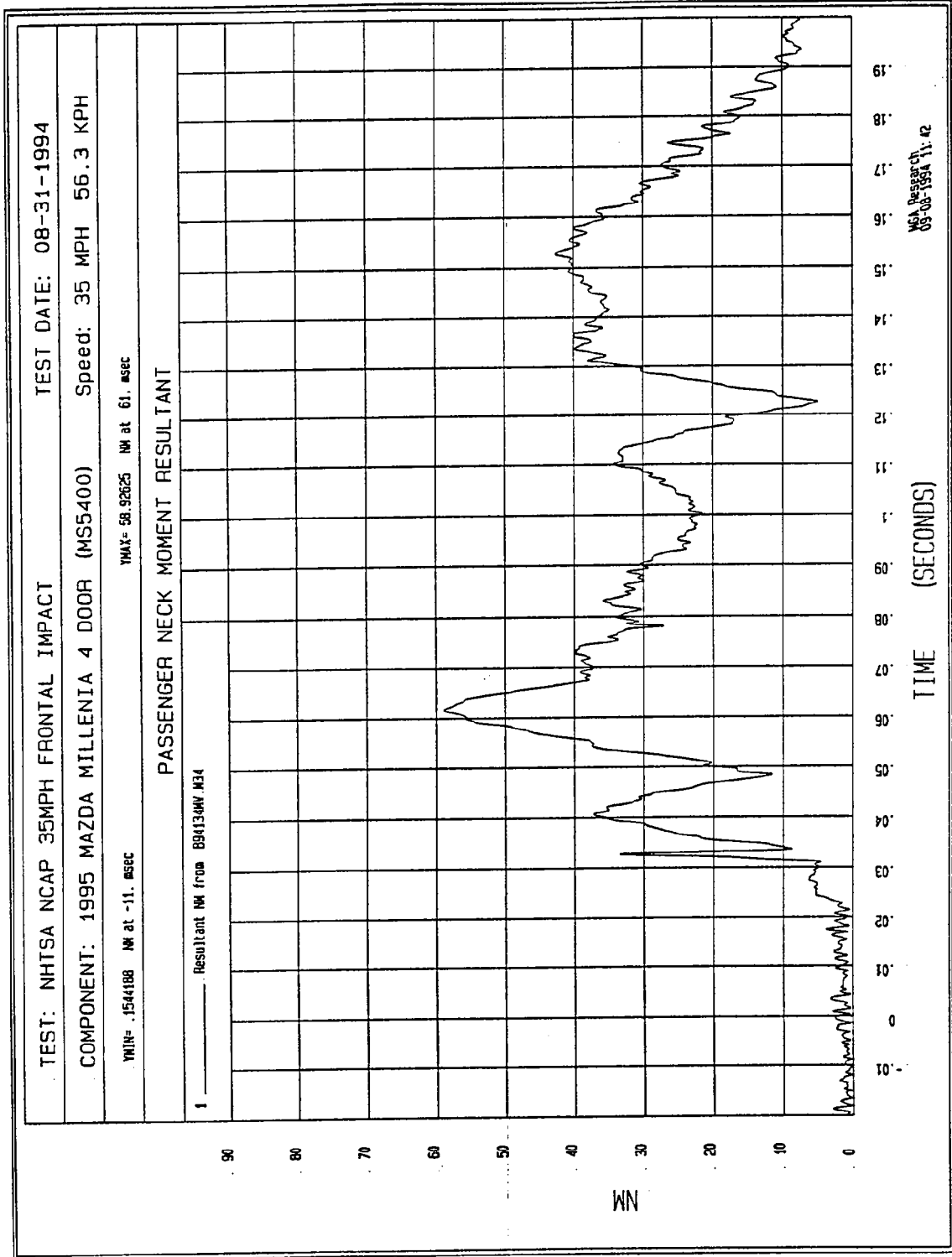


Figure B-88 - Passenger Neck Moment Resultant vs. Time

APPENDIX C
Dummy Configuration & Performance Verification Data

HYBRID III DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA

DUMMY NO.: 37 DUMMY CALIBRATION BY: Rod McClelland

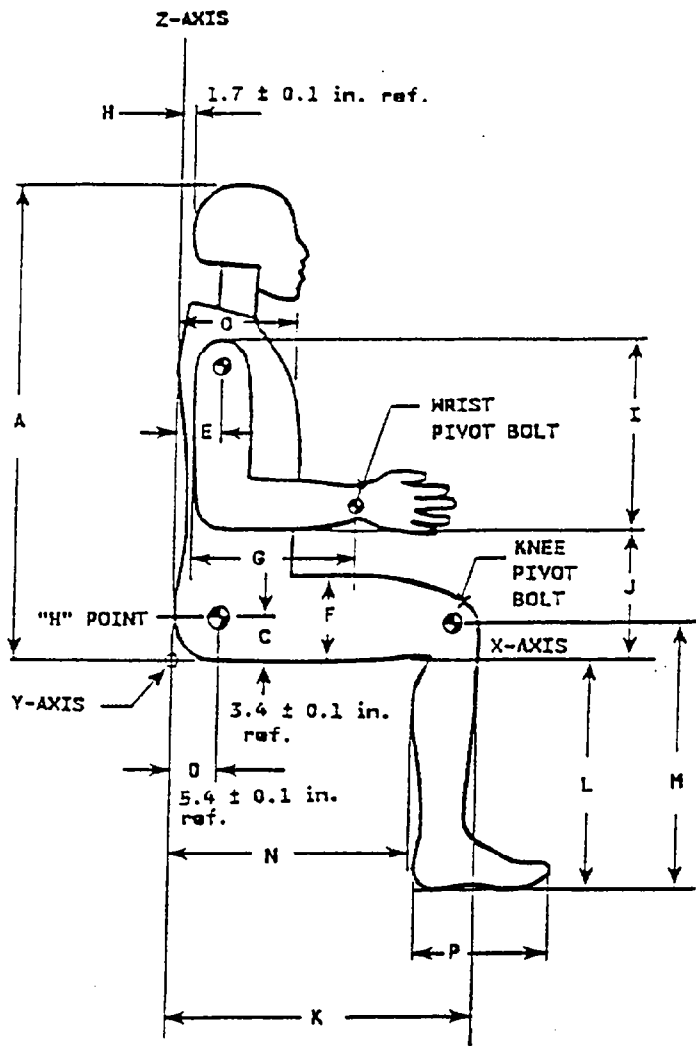
I. CONFIGURATION VERIFICATION DATA

DATE OF VERIFICATION: 08-16-94

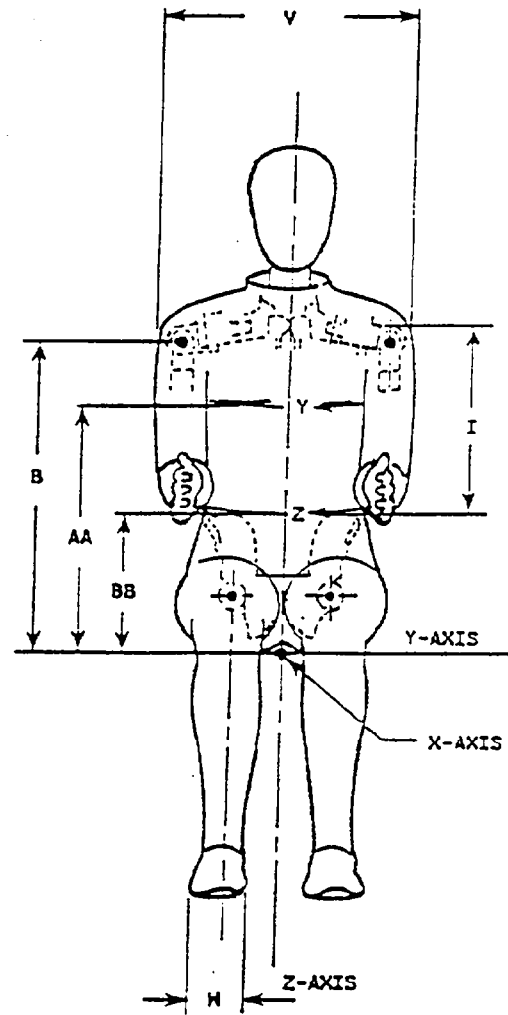
DESCRIPTION	SPECIFICATION (inches)	ACTUAL MEASUREMENT (inches)
A - Total Sitting Height	34.6 - 35.0	35.0
B - Shoulder Pivot Height	19.9 - 20.5	20.0
C - "H" Point Height	3.3 - 3.5	3.5
D - "H" Point from Seat Back	5.3 - 5.5	5.5
E - Shoulder Pivot From Backline	3.3 - 3.7	3.5
F - Thigh Clearance	5.5 - 6.1	6.0
G - Back of Elbow to Wrist Pivot	11.4 - 12.0	11.5
H - Skull Cap Skin to Backline	1.6 - 1.8	1.7
I - Shoulder - Elbow Length	13.0 - 13.6	13.0
J - Elbow Rest Height	7.5 - 8.3	8.0
K - Buttock to Knee Length	22.8 - 23.8	23.5
L - Popliteal Height	16.9 - 17.9	17.0
M - Knee Pivot Height	19.1 - 19.9	19.5
N - Buttock Popliteal Length	17.8 - 18.8	18.5
O - Chest Depth at 3rd Rib	8.4 - 9.0	8.5
P - Foot Length	9.9 - 10.5	10.3
V - Shoulder Breadth	16.6 - 17.2	16.8
W - Foot Breadth	3.6 - 4.2	4.0
Y - Chest Circumference	38.2 - 39.4	39.0
Z - Waist Circumference	32.9 - 34.1	33.5

Note: (See next page for external dimensions)

HYBRID III EXTERNAL DIMENSIONS



SIDE VIEW



FRONT VIEW

Note: Figure is referenced to the erect seated position. The curved lumbar does not allow the hybrid III to be positioned in a perfect erect attitude.

HYBRID III DUMMY CALIBRATION DATA SUMMARY SHEET

DUMMY NO.: 37 DUMMY CALIBRATION BY: Rod McClelland

VERIFICATION DATE: 08-16-94

VERIFICATION LABORATORY TEMPERATURE (66° - 78°): 69°

1.0 HEAD DROP TEST

	SPECIFICATION	MEASUREMENT
Peak Resultant Acceleration	225 - 275 G	256
Peak Lateral Acceleration	15 G. MAX	2
Is Acceleration Curve Unimodal	within 10% of peak	Yes

2.0 NECK FLEXION TEST

		SPECIFICATION	MEASUREMENT
Pendulum Speed		22.6 - 23.4 FT/SEC	22.8
Pendulum Deceleration	10 MS	22.50 - 27.50 G	25.22
	20 MS	17.60 - 22.60 G	19.15
	30 MS	12.50 - 18.50 G	13.38
Max. Pendulum G Above 30 MS		29.0 G MAX	13.3
Deceleration - Time Curve Decay Time to 5 G		34 - 42 MS	39
D Plane Rotation	MAX	64 - 78 DEG.	77
	TIME	57 - 64 MS	61
Rotation Angle - Time Curve Decay Time to Zero		113 - 128 MS	119
Moment About Occipital Condyle	MIN.	65 - 80 FT.LBS	67
	TIME	47 - 58 MS	54
Positive Moment - Time Curve Decay Time to Zero		97 - 107 MS	106

HYBRID III DUMMY CALIBRATION DATA SUMMARY SHEET (CONT.)

3.0 NECK EXTENSION TEST

		SPECIFICATION	MEASUREMENT
Pendulum Speed		19.50 - 20.30 F/S	20.07
Pendulum Deceleration	10 MS	17.20 - 21.20 G	18.52
	20 MS	14.00 - 19.00 G	15.03
	30 MS	11.00 - 16.00 G	12.64
Max. Pendulum G Above 30 MS		22 G Max	13
Deceleration - Time Curve Decay Time to 5 G		38 - 46 MS	45
D Plane Rotation	MAX	81 - 106 DEG.	101
	TIME	72 - 82 MS	75
Rotation Angle - Time Curve Decay Time to Zero		147 - 174 MS	160
Moment About Occipital Condyle	MIN.	-59.0/-39.0 FT LBS	-49.5
	TIME	65 - 79 MS	71
Positive Moment - Time Curve Decay Time to Zero		120 - 148 MS	146

4.0 CHEST IMPACT TESTS

	SPECIFICATION	MEASUREMENT
Probe Speed	21.6 to 22.4 F/S	22.1
Peak Deflection	2.50 to 2.86 IN.	2.75
Peak Resistive Force	1160 to 1325 LBS.	1271
Internal Hysteresis	69 to 85%	70

5.0 KNEE IMPACT TESTS

LEFT KNEE	SPECIFICATION	MEASUREMENT
Probe Speed	6.8 to 7.0 F/S	6.9
Maximum Force	1060 - 1300 LBS.	1223

RIGHT KNEE	SPECIFICATION	MEASUREMENT
Probe Speed	6.8 to 7.0 F/S	6.9
Maximum Force	1060 - 1300 LBS.	1217

HYBRID III DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA

DUMMY NO.: 36 DUMMY CALIBRATION BY: Rod McClelland

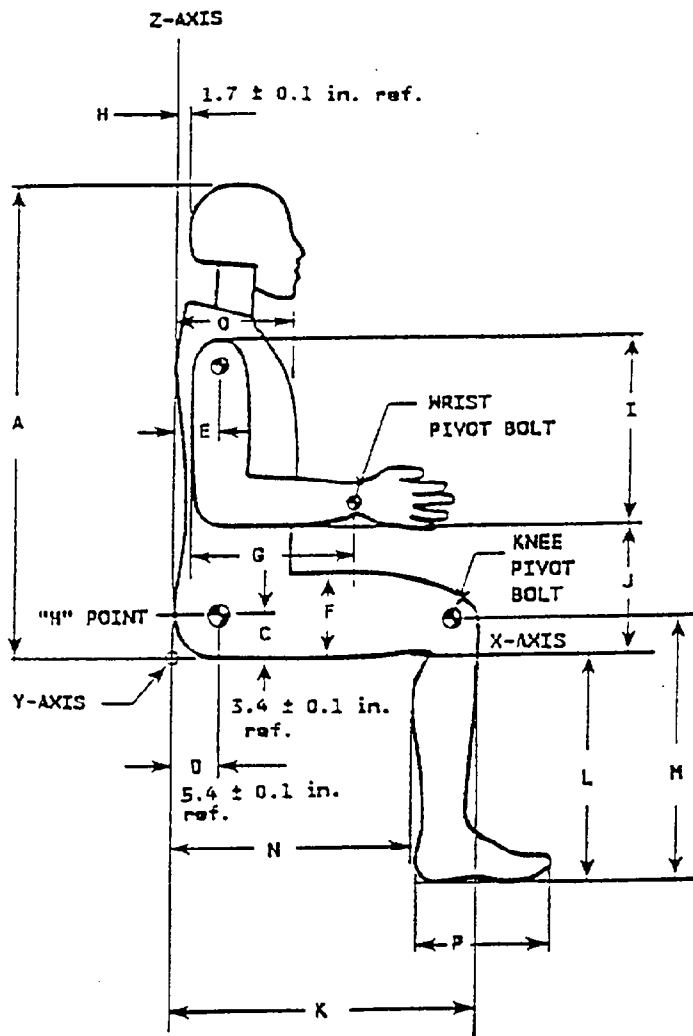
I. CONFIGURATION VERIFICATION DATA

DATE OF VERIFICATION: 08-16-94

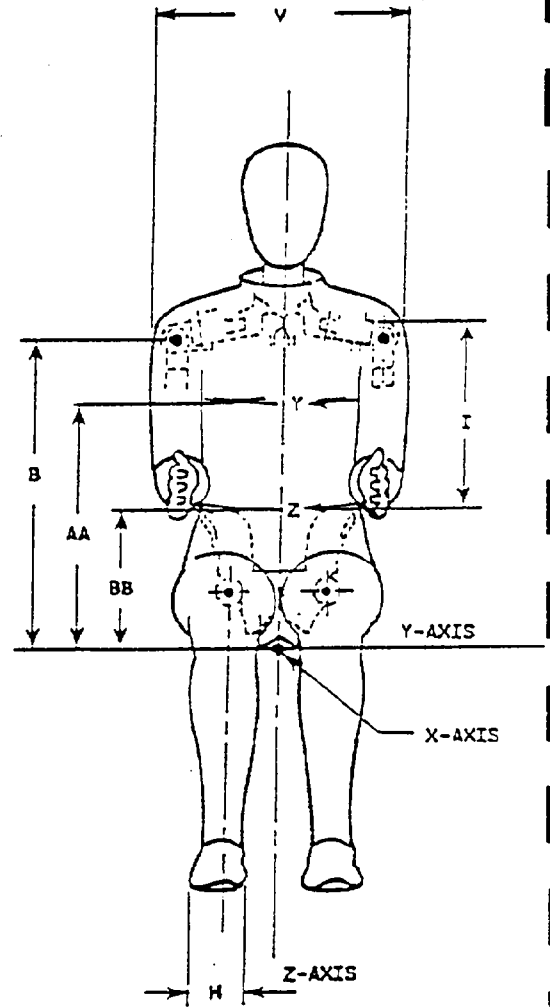
DESCRIPTION	SPECIFICATION (Inches)	ACTUAL MEASUREMENT (inches)
A - Total Sitting Height	34.6 - 35.0	34.8
B - Shoulder Pivot Height	19.9 - 20.5	20.5
C - "H" Point Height	3.3 - 3.5	3.4
D - "H" Point from Seat Back	5.3 - 5.5	5.5
E - Shoulder Pivot From Backline	3.3 - 3.7	3.5
F - Thigh Clearance	5.5 - 6.1	6.0
G - Back of Elbow to Wrist Pivot	11.4 - 12.0	11.5
H - Skull Cap Skin to Backline	1.6 - 1.8	1.7
I - Shoulder Elbow Length	13.0 - 13.6	13.0
J - Elbow Rest Height	7.5 - 8.3	8.0
K - Buttock Knee Length	22.8 - 23.8	23.5
L - Popliteal Height	16.9 - 17.9	17.0
M - Knee Pivot Height	19.1 - 19.9	19.5
N - Buttock Popliteal Length	17.8 - 18.8	18.5
O - Chest Depth at 3rd Rib	8.4 - 9.0	8.5
P - Foot Length	9.9 - 10.5	10.3
V - Shoulder Breadth	16.6 - 17.2	16.8
W - Foot Breadth	3.5 - 4.2	4.0
Y - Chest Circumference	38.2 - 39.4	39.0
Z - Waist Circumference	32.9 - 34.1	33.5

Note: (See next page for external dimensions)

HYBRID III EXTERNAL DIMENSIONS



SIDE VIEW



FRONT VIEW

Note: Figure is referenced to the erect seated position. The curved lumbar does not allow the hybrid III to be positioned in a perfect erect attitude.

HYBRID III DUMMY CALIBRATION DATA SUMMARY SHEET (CONT.)

DUMMY NO.: 36 DUMMY CALIBRATION BY: Rod McClelland

VERIFICATION DATE: 08-16-93

VERIFICATION LABORATORY TEMPERATURE (66° - 78°): 69°

1.0 HEAD DROP TEST

	SPECIFICATION	MEASUREMENT
Peak Resultant Acceleration	225 - 275 G	273
Peak Lateral Acceleration	-15 G. MAX	7
Is Acceleration Curve Unimodal	within 10% of peak	Yes

2.0 NECK FLEXION TEST

		SPECIFICATION	MEASUREMENT
Pendulum Speed		22.6 - 23.4 FT/SEC	22.9
Pendulum Deceleration	10 MS	22.50 - 27.50 G	24.00
	20 MS	17.60 - 22.60 G	19.72
	30 MS	12.50 - 18.50 G	12.56
Max. Pendulum G Above 30 MS		29.0 G MAX	13.4
Deceleration - Time Curve Decay Time to 5 G		34 - 42 MS	40
D Plane Rotation	MAX	64 - 78 DEG.	72
	TIME	57 - 64 MS	58
Rotation Angle - Time Curve Decay Time to Zero		113 - 128 MS	113
Moment About Occipital Condyle	MIN.	65 - 80 FT.LBS	72
	TIME	47 - 58 MS	52
Positive Moment - Time Curve Decay Time to Zero		97 - 107 MS	102

HYBRID III DUMMY CALIBRATION DATA SUMMARY SHEET (CONT.)

3.0 NECK EXTENSION TEST

		SPECIFICATION	MEASUREMENT
Pendulum Speed		19.50 - 20.30 F/S	20.11
Pendulum Deceleration	10 MS	17.20 - 21.20 G	19.40
	20 MS	14.00 - 19.00 G	16.46
	30 MS	11.00 - 16.00 G	11.75
Max. Pendulum G Above 30 MS		22 G Max	12
Deceleration - Time Curve Decay Time to 5 G		38 - 46 MS	44
D Plane Rotation	MAX	81 - 106 DEG.	98
	TIME	72 - 82 MS	75
Rotation Angle - Time Curve Decay Time to Zero		147 - 174 MS	154
Moment About Occipital Condyle	MIN.	-59.0/-39.0 FT LBS	-48.6
	TIME	65 - 79 MS	68
Positive Moment - Time Curve Decay Time to Zero		120 - 148 MS	141

4.0 CHEST IMPACT TESTS

	SPECIFICATION	MEASUREMENT
Probe Speed	21.6 to 22.4 F/S	21.8
Peak Deflection	2.50 to 2.86 IN.	2.63
Peak Resistive Force	1160 to 1325 LBS.	1269
Internal Hysteresis	69 to 85%	72

5.0 KNEE IMPACT TESTS

LEFT KNEE	SPECIFICATION	MEASUREMENT
Probe Speed	6.8 to 7.0 F/S	6.8
Maximum Force	1060 - 1300 LBS.	1102

RIGHT KNEE	SPECIFICATION	MEASUREMENT
Probe Speed	6.8 to 7.0 F/S	6.9
Maximum Force	1060 - 1300 LBS.	1174

APPENDIX D

Dummy, Vehicle and Laboratory Calibration Data

DUMMY, VEHICLE AND LABORATORY INSTRUMENT CALIBRATION

INSTRUMENTS FOR DUMMY NO. 37

	DRIVER		
	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Head X	ACCY6	Endevco	7/28/94
Head Y	ACCH1	Endevco	7/28/94
Head Z	AAMW5	Endevco	7/28/94
Chest X	ACCY1	Endevco	7/28/94
Chest Y	ACCC8	Endevco	7/28/94
Chest Z	ACCT7	Endevco	7/28/94
Right Femur Load Cell	261	Denton	8/01/94
Left Femur Load Cell	262	Denton	8/01/94
Neck Load Cell X	443	Denton	7/14/94
Neck Load Cell Y	443	Denton	7/14/94
Neck Load Cell Z	443	Denton	7/14/94
Neck Moment X	443	Denton	7/14/94
Neck Moment Y	443	Denton	7/14/94
Neck Moment Z	443	Denton	7/14/94
Chest Deflection Gauge	37G	Bourns	8/03/94
Lap Belt Load Cell	691	Lebow	4/27/94
Torso Belt Load Cell	662	Lebow	4/28/94

DUMMY, VEHICLE AND LABORATORY INSTRUMENT CALIBRATION

INSTRUMENTS FOR DUMMY NO. 37

	DRIVER		
	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Upper Right Tibia Moment X	040	Denton	3/22/94
Upper Right Tibia Moment Y	040	Denton	3/22/94
Lower Right tibia Moment Y	034	Denton	3/22/94
Lower Right Tibia Force X	034	Denton	3/22/94
Lower Right Tibia Force Z	034	Denton	3/22/94
Upper Left Tibia Moment X	023	Denton	3/22/94
Upper Left Tibia Moment Y	023	Denton	3/22/94
Lower Left Tibia Moment Y	019	Denton	3/22/94
Lower Left Tibia Force X	019	Denton	3/22/94
Lower Left Tibia Force Z	019	Denton	3/22/94

DUMMY, VEHICLE AND LABORATORY INSTRUMENT CALIBRATION

INSTRUMENTS FOR DUMMY NO. 36

	PASSENGER		
	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Head X	ACDE7	Endevco	7/28/94
Head Y	ACC70	Endevco	7/28/94
Head Z	ACCW9	Endevco	7/28/94
Chest X	ACC78	Endevco	7/12/94
Chest Y	ACCE6	Endevco	7/12/94
Chest Z	ACCY3	Endevco	7/12/94
Right Femur Load Cell	259	Denton	8/01/94
Left Femur Load Cell	260	Denton	8/01/94
Neck Load Cell X	442	Denton	7/14/94
Neck Load Cell Y	442	Denton	7/14/94
Neck Load Cell Z	442	Denton	7/14/94
Neck Moment X	442	Denton	7/14/94
Neck Moment Y	442	Denton	7/14/94
Neck Moment Z	442	Denton	7/14/94
Chest Deflection Gauge	36G	Bourns	8/03/94
Lap Belt Load Cell	211	GSE	4/28/94
Torso Belt Load Cell	625	Lebow	5/31/94

DUMMY, VEHICLE AND LABORATORY INSTRUMENT CALIBRATION

VEHICLE ACCELEROMETERS		
SERIAL NO.	MANUFACTURER	CALIBRATION DATE
MGA124	Entran	8/26/94
MGA121	Entran	5/16/94
AHT42	Endevco	7/12/94
AC997	Endevco	8/22/94
AHTE5	Endevco	7/12/94
MGA076	Entran	7/25/94
MGA086	Entran	8/26/94
MGA089	Entran	8/26/94
MGA021	Entran	5/16/94

LABORATORY INSTRUMENTS		
SERIAL NO.	MANUFACTURER	CALIBRATION DATE
AGH90	Endevco	5/06/94
N/A	Bourns	PRIOR TO USE
N/A	Bourns	PRIOR TO USE
403069	Sensotec	3/30/94
N/A	Transducers Inc.	N/A

APPENDIX E

Vehicle Owner's Occupant Restraint System Instructions

Rear Seat

⚠ WARNING

Stacking Cargo:

Stacking luggage or other cargo higher than the seat backs can be dangerous. During a sudden stop or collision, it can become a projectile that may hit and injure passengers. Don't stack things higher than the seat backs.

Seat Belt System

Seat belts help decrease the possibility or severity of injury during accidents and sudden stops. Mazda recommends that the driver and passengers wear seat belts at all times.

The front seats have a lap/shoulder belt. These belts have retractors with inertia locks that keep them out of the way when not in use. The locks allow the belts to remain comfortable on users, but they'll lock in position during a collision.

The rear seat has lap/shoulder belts that have retractors with inertia locks for the door-side seats and a lap belt with manual adjustment for the center seat.

⚠ WARNING

Seat Belts:

Passengers not wearing seat belts during a collision can be injured much worse than those wearing seat belts. They can hit things inside the vehicle or even be thrown from it. They can be seriously injured or killed. In the same collision, passengers wearing seat belts might be much safer.

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⚠ WARNING

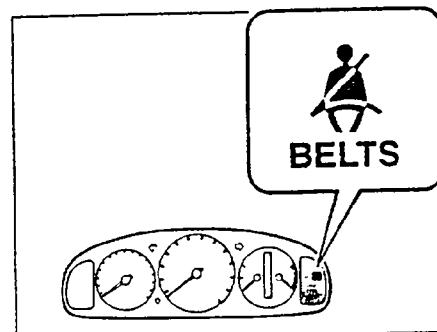
Damaged Seat Belts:

An accident can damage a seat belt in use. The belt webbing can be weakened and retractors and anchors can be bent or broken. Therefore a damaged seat belt may not provide adequate protection in a collision. Have a professional inspect all seat belt systems in use during an accident before they are used again.

⚠ WARNING

One Belt, One Passenger:

Using one seat belt for more than one person at a time is dangerous. A seat belt used in this way can't spread the impact forces properly and the two passengers could be crushed together and seriously injured. Never use one belt for more than one person at a time.



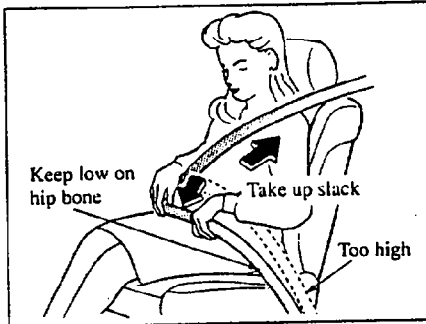
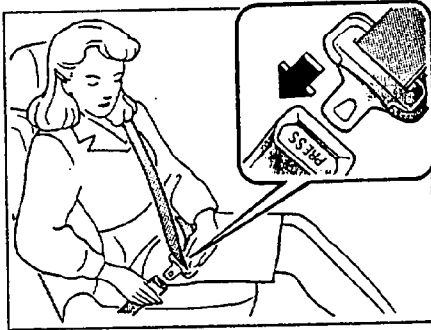
■ Seat Belt Warning Light/Beep

When you turn on the ignition before fastening your seat belt, a warning light will come on and a beep will sound (warning lights/beeps, page 4-26).

⚠ WARNING

Twisted Seat Belts:

Twisted seat belts can cause injury. In a collision, the full width of the belt isn't available to absorb the impact. This puts more force on the bones beneath the belt, which could break them or cause other serious injury. Don't wear twisted seat belts.



⚠ WARNING

Positioning the Lap Portion of the Seat Belt:
The lap portion of the seat belt worn too high can be dangerous. In a collision, this would concentrate the impact force directly on the abdominal area, causing serious injury. Wear the lap portion of the belt snugly and as low as possible.

■ Front Seat Belts

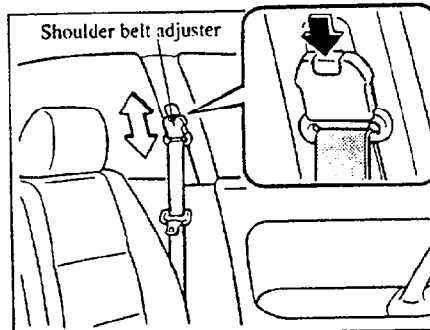
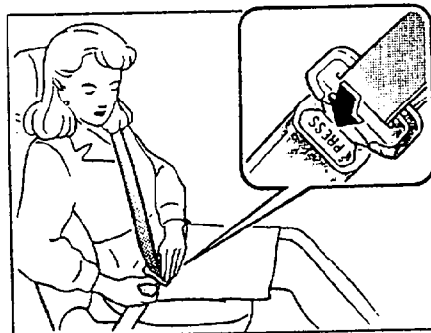
To fasten:

1. Grasp the buckle and tongue plate.
2. Slowly pull out the lap/shoulder belt.
3. Insert the plate into the buckle until you hear a click.

⚠ WARNING

Positioning the Shoulder Portion of the Seat Belt:
Failure to position the shoulder portion of the seat belt properly reduces the amount of protection in an accident and increases the chance of injury. Make sure the shoulder portion of the seat belt is positioned across your shoulder near your neck, not on your neck or upper arm.

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To unfasten:

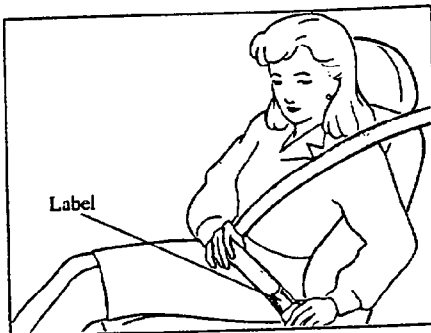
Depress the buckle release.

▼ Shoulder belt adjuster

This adjusts the shoulder belt angle for a more comfortable fit. Simply push the button, move it to the desired position, and then release it. Make sure the adjuster is locked.

⚠ WARNING

Positioning the Shoulder Portion of the Seat Belt:
Failure to position the shoulder portion of the seat belt properly reduces the amount of protection in an accident and increases the chance of injury. Make sure the shoulder portion of the seat belt is positioned across your shoulder near your neck, not on your neck or upper arm.



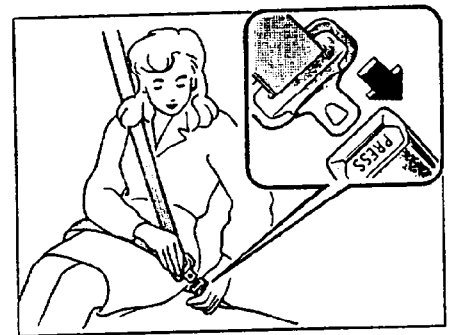
■ **Seat Belt Caution Label**

A caution label is inside the sleeve of each front seat lap belt. If a belt is used in an accident, the stress will cause this label to be pulled from the sleeve.

This indicates that the seat belt must be replaced.

Also, if the seat belt undergoes excessive stress at any time, the belt's webbing, metal fittings, and anchor bolt may be damaged. The damage may not be apparent, so the

seat belt should be replaced after this kind of stress, even if the label is not exposed.



■ **Rear Seat Belts**

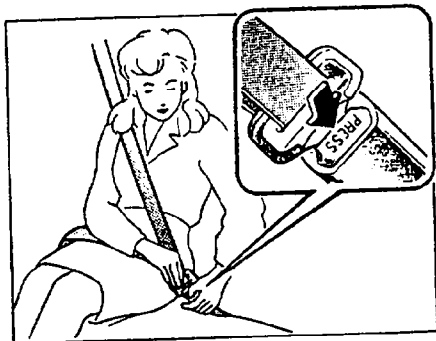
▼ **Lap/shoulder belt**

To fasten:

1. Grasp the tongue plate and pull it to the desired length.
2. Insert this plate into the buckle until you hear a click.

The retractor will take up excess belt and maintain tension.

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To unfasten:

Depress the button on the buckle.

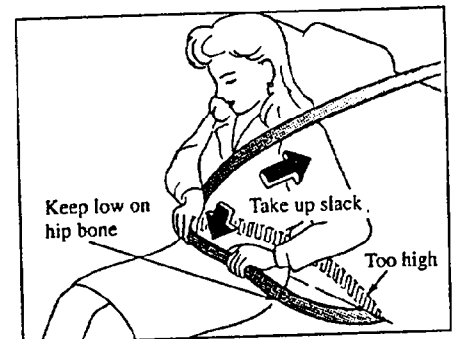
NOTE

If a belt does not fully retract, inspect it for kinks and twists.

⚠ WARNING

Positioning the Shoulder Portion of the Seat Belt:

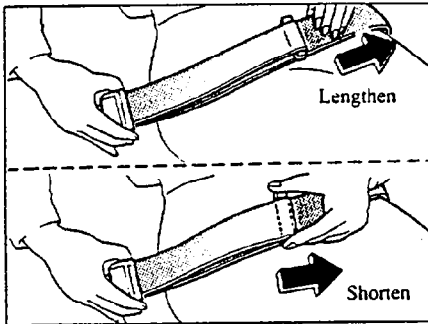
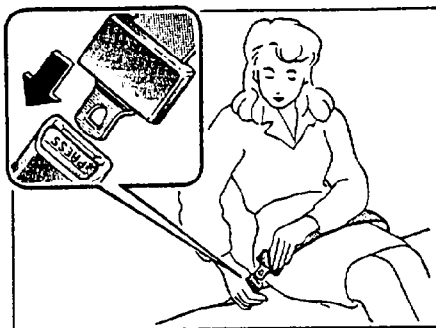
Failure to position the shoulder portion of the seat belt properly reduces the amount of protection in an accident and increases the chance of injury. Make sure the shoulder portion of the seat belt is positioned across your shoulder near your neck, not on your neck or upper arm.



⚠ WARNING

Positioning the Lap Portion of the Seat Belt:

The lap portion of the seat belt worn too high can be dangerous. In a collision, this would concentrate the impact force directly on the abdominal area, causing serious injury. Wear the lap portion of the belt snugly and as low as possible.



▼ Lap belt

To fasten:

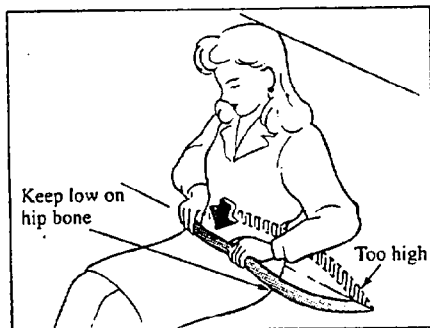
1. Pull the tongue to the desired length.
2. Insert it into the buckle until you hear a click.

3. To lengthen the belt, hold the tongue at a right angle to the webbing and pull; to shorten, pull the loose end of the webbing.

To unfasten:

Depress the button on the buckle.

Knowing Your Mazda



■ Pregnant Women

Pregnant women should wear seat belt assemblies as recommended by their doctors. The lap belt should be worn **SNUGLY AND AS LOW AS POSSIBLE**.

■ Small Children

Small children should be protected by a child-restraint system that meets the Federal Motor Vehicle Safety Standard (FMVSS).

It should fit the seat and the child.

⚠ WARNING

Wearing the Lap Belt:

A lap belt worn too high can be dangerous. In a collision, this would concentrate the impact force directly on the abdominal area, causing serious injury. Wear the lap belt snugly and as low as possible.

NOTE

Every child-restraint system is designed for use with a lap belt or the lap-belt portion of a lap/shoulder belt.

Follow all instructions when installing a child-restraint system, which should be secured with the lap portion of the lap/shoulder belt. Since accident statistics reveal that a child is safer in the rear seat, we recommend that the child-restraint system be placed in the rear seat.

⚠ WARNING

Unsecured Restraint System:

A child restraint system that is not securely fastened down can be dangerous. In a sudden stop or collision, it can become a projectile and hit someone, causing serious injury. When not in use, remove it from the vehicle or fasten it with a seat belt.

⚠ WARNING

Unattended Children:

Leaving children unattended in a vehicle can be dangerous. In hot weather, temperatures inside a parked vehicle can become high enough to cause brain damage or even death. Never leave children or animals unattended in the vehicle.

⚠ WARNING

Child-Restraint Anchor:

Your Mazda has no child-restraint anchor. Therefore, using a child-restraint system that requires an anchor can be dangerous. In a collision, it would not be properly secured; thus it could move around in the cabin and seriously injure someone. Use only a system designed for use without an anchor.

⚠ WARNING

Holding a Child:

A child should never be held on the lap or in the arms of a passenger in a moving vehicle. No matter how strong a person may be, he or she cannot hold a child during an accident. The child may thus be injured by hitting parts of the vehicle or by being crushed by an unrestrained passenger.

Knowing Your Mazda

⚠ WARNING

Child Restraint Positioning:

Child restraints used in the front seat and which face the rear are unsafe. The restraint can be hit by a deploying air bag, moved out of position, and result in your child being seriously injured. Don't use child restraints which face the rear in the front seat.

■ Older Children

A child who has outgrown child-restraint systems should sit in the rear and use seat belts, both lap and shoulder. If the shoulder belt crosses the neck or face, move the child closer to the center.

Accident statistics reveal that a child is safer in the rear seat.

⚠ CAUTION

A seat belt or child restraint can become very hot in a closed vehicle during warm weather. To avoid burning yourself or a child, inspect either before using.

Supplemental Restraint System

In a front-end accident, the supplemental restraint system with air bags is designed to provide protection for the driver and front seat passenger in addition to the three-point seat belt system.

⚠ WARNING

The Importance of Seat Belts:

The air bags must have assistance from the seat belt system to provide its best protection. Alone, an air bag may not prevent severe injury in an accident. Vehicle occupants should always wear seat belts.

⚠ WARNING

Air Bag Activation:

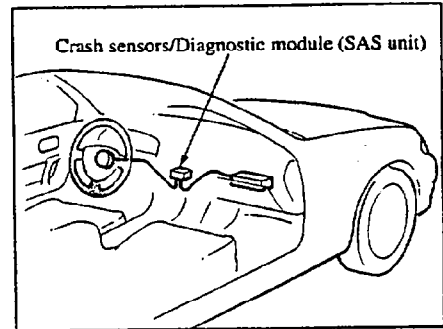
The air bags will inflate only during a frontal or near-frontal collision that is at least moderate in force. In other kinds of accidents, such as side impact, rear impact or roll over, only seat belts can protect occupants because the air bags will not activate. Vehicle occupants should always wear seat belts to help reduce the possibility of injury during a sudden stop or an accident.

Small children, those under 40 lbs. (18 kg), should be protected by a child restraint system.

⚠ WARNING

Child Restraint Positioning:

Child restraints used in the front seat and which face the rear are unsafe. The restraint can be hit by a deploying air bag, moved out of position, and result in your child being seriously injured. Don't use child restraints which face the rear in the front seat.



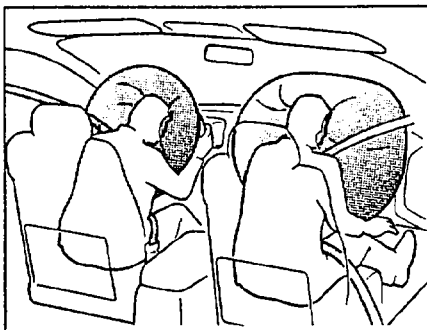
■ **System Description**

The supplemental restraint system has two basic subsystems:

- 1) The air bag system with inflator and air bags
- 2) The electric system with crash sensors and diagnostic module

The air bags are mounted in the center of the steering wheel and passenger side of the dashboard, but they are out of sight until activated.

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■ **How Air Bags Work**

When air bag crash sensors detect a greater than moderate frontal impact, an electrical current is sent to the inflators. Nitrogen gas is produced to inflate both bags. After the inflation, they quickly deflate.

⚠ WARNING

Seating Position:

Sitting too close to an air-bag storage compartment or placing hands on it increases the risk of injury if the air bags inflate. The driver should hold onto only the steering wheel rim. Front seat occupants should adjust their seats as far back as possible and always sit upright against the seat backs.

NOTE

- During a severe front-end impact, you will hear a loud inflation noise and some smoke will be released.

Neither will cause injury, and the smoke doesn't indicate a fire.

- The air bags will function only once. After that, the air bags will not work again and must be replaced.

Only an Authorized Mazda Dealer can replace the system.

⚠ WARNING

Modification of the Air Bag System:
 Modifying the components or wiring of the Air Bag System is dangerous. You could accidentally activate it or make it inoperable. Don't make any modifications to the Air Bag System. This includes installing trim, badges, and anything else over the air bag storage areas and extra electrical/electronics equipment on or near system components and wiring.

⚠ WARNING

Air Bag Storage Area:
 Attaching an object to an air bag storage area or placing one in front of it is dangerous. In an accident, the object could interfere with air bag inflation or injure the occupants. Always keep the air bag storage areas free of objects.

⚠ WARNING

Air Bag Inspection after a Collision:
 If your Mazda was in a collision not strong enough to inflate the air bags, parts on which the sensors are mounted may be distorted, and without repairs the system may not operate when necessary. Have an Authorized Mazda Dealer make a very careful inspection of the system.

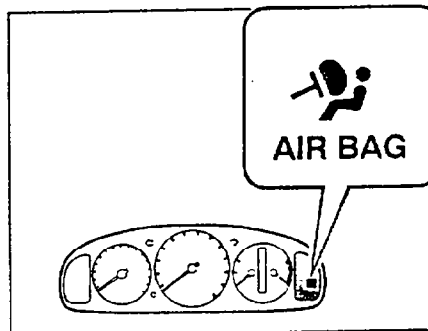
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■ Constant Monitoring

These components are monitored by the supplemental restraint system warning light or beeper:

- SAS unit
- Air bag modules
- Related wiring
- Warning light

A diagnostic module continuously monitors the system's readiness. This begins when the ignition is turned on and continues while the vehicle is being driven.



▼ Warning light

If the supplemental restraint system is OK, the warning light comes on when the ignition is turned on or after the engine is cranked. After about 6 seconds it goes out.

A system malfunction is indicated when this light constantly flashes or stays on or if it doesn't come on at all. If one of these happens, consult an Authorized Mazda Dealer as soon as possible. The system may not work in an accident.

▼ Warning beeper

A warning light is the basic method of reporting the system's condition.

But if the light is out and a malfunction occurs, a series of beeps will be heard.

This also signals need for servicing. Consult an Authorized Mazda Dealer at your first opportunity.

These beeps will continue until the reason for the light being out is taken care of.

Again: if this happens, the system may not work in an accident.

 **WARNING**

Supplemental Restrain System Service:
Don't try to self-serve the system. Tampering with it could cause it to activate, and this could result in injury. For servicing and repairs, have an Authorized Mazda Dealer do the work.

 **WARNING**

Air Bag Disposal:
Disposing of an air bag can be dangerous. Unless all safety procedures are followed, injury can result. Ask an Authorized Mazda Dealer how to safely dispose of an air bag or how to scrap an air bag equipped vehicle.

■ **Maintenance**

This air bag system is maintenance-free. But if any of the following occurs, take your vehicle to an Authorized Mazda Dealer as soon as possible.

- Warning light flashes
- Warning light stays on
- Warning light stays off when the ignition is turned on and warning beeps sound
- Air bag inflates

NOTE

Should you sell your Mazda, we urge you to tell the new owner it has an air bag system and that he or she should become familiar with all instructions about it in the Owner's Manual.