V 2208

mga research corporation

NEW CAR ASSESSMENT PROGRAM (NCAP)

FRONTAL BARRIER IMPACT TEST

Volkswagen
1995 Passat 4 Door

MGA Reference No.: C94A-180

MGA PROVING GROUNDS
5000 WARREN ROAD
BURLINGTON, WI 53105

Test Date: December 09, 1994

Report Date: December 28, 1994

FINAL REPORT

Prepared For:

Volkswagen Of America
3800 Hamlin Road
Auburn Hills, MI 48326

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MAR 0 3 1995

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Date of Report Acceptance

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TABLE OF CONTENTS

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 Volkswagen of America. 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 Volkswagen Passat 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 December 9, 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, chest, and pelvis triaxial accelerometers, neck load cell, and right/left femur load cells. Seat belt load cells were also on the driver's and passenger's shoulder and lap belts to measure dummy torso and pelvic section loading. The driver ATD (Serial No. 307) and the right-front passenger ATD (Serial No. 306) were calibrated prior to this test. Certification details, along with instrumentation calibration data, are found in Appendix C and D.

The 70 channels of data were recorded on 8 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 568. The maximum chest deceleration over 3 milliseconds was 55 g's. The left and right femur loads were 1095 and 2279 Newtons respectively.

The right front passenger's HIC was 611 and maximum chest deceleration over 3 milliseconds was 53 g's. The left and right femur loads were 3652 and 2382 Newtons respectively.

GENERAL TEST AND VEHICLE PARAMETER DATA

Vehicle Yr/Make/Model/Body Style: 1995/Volkswagen/Passat/4 Door

VIN.: WVWEE83A4SE036399

Body color: Purple Date of Manufacture: 9/94

Engine: 6 Cylinders; __C.I.D.; __Liters; 2792 CC

X Gas; __Diesel; __Turbocharged

__Longitudinal; X Transverse

Transmission: 5 Speed; X Manual; __Automatic; __Overdrive

Final Drive: X Front Wheel; __Rear Wheel; __Four Wheel

Odometer Reading: 40.5 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: 3 point belts with pretensioners and airbags

DATA RECORDED FROM VEHICLE'S TIRE PLACARD:

Tire Pressure (at capacity): Front 228 kg/cm^2 (33 Psi) Rear 262 kg/cm^2 (38 Psi)

Recommended Tire Size: 215/50R15

Recommended Cold Tire Pressure: Lightly Loaded

Front 220 kg/cm^2 (32 Psi) Rear 220 kg/cm^2 (32 Psi)

Fully Loaded

Front 228 kg/cm^2 (33 Psi) Rear 262 kg/cm^2 (38 Psi)

Tires on Vehicle: 215/50R15 ; Manufacturer: Goodyear

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; __Power __Lever X Knob

Vehicle Capacity Weight (VCW) = 431.0 kg. (A)

No. of Occupants x 68.0 kg. = 340.0 kg. (B)

Rated Cargo Weight (RCW) A-B = 91.0 kg.

GVWR 1910 kg. GAWR: Front 1020 kg.; Rear 980 kg.

GENERAL TEST AND VEHICLE PARAMETER DATA (Cont'd)

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

Right Front = 435 kg Right Rear = 279 kg

Left Front = 439 kg Left Rear = 264 kg

TOTAL FRONT WEIGHT = 874 kg (61.7 % of Total Vehicle Weight)

TOTAL REAR WEIGHT = 543 kg (38.3 % of Total Vehicle Weight)

TOTAL UNLOADED DELIVERED WEIGHT (UDW) = 1417 kg

CALCULATION FOR TARGET TEST WEIGHT:

UDW = Unloaded Delivered Weight 1417 kg

VCW = Vehicle Capacity Weight 431 kg DSC = Designated Seating Capacity 5

RCW = VCW - 68 (DSC) = 91 *kg

Target Test Weight = UDW + RCW + (2 dummies x 75.8 kg/dummy)

Target Test Weight = 1660 kg

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND CARGO:

Right Front = 473 kg Right Rear = 358 kg

Left Front = 477 kg Left Rear = 342 kg

TOTAL FRONT WEIGHT = 950 kg (57.6 % of Total Vehicle Weight)

TOTAL REAR WEIGHT = 700 kg (42.4 % of Total Vehicle Weight)

TOTAL TEST WEIGHT = 1650 kg

Weight of ballast secured in vehicle trunk area = 4 kg

Vehicle components removed to meet target weight: None noted

VEHICLE ATTITUDE (all dimensions in mm):

Delivered Attitude: RF 663 LF 660 RR 667 LR 675

Test Attitude: RF 652 LF 648 RR 623 LR 649

Wheel Base: 2623 mm; C.G. = 1113 mm rearward of front wheel C/L

Remarks: None

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

POST-IMPACT DATA:

Type of Test: 35 mph Frontal Impact Impact Angle: 90°

Scheduled Date of Test: December 9, 1994 Time of Test: 3:15 a.m.

Date of Test: December 10, 1994

Ambient Temperature: 22 °C (Spec. Range = 18.8 to 25.6°C)

Temperature in Occupant Compartment: 22° C

Windshield Molding Temperature: 22° C

Required Impact Velocity Range: 55.5 to 57.1 kph

Impact Velocity: primary = 56.3 kph; secondary = 56.2 kph

Distance From Front Bumper to Barrier Face When

Entering Speed Trap: 1279 mm

Exiting Speed Trap: 279 mm

VEHICLE REBOUND AND CRUSH (mm):

Vehicle Length: Pre-test = R 4410 C_L 4595 L 4420

Post-test = R 3995 C_L 4373 L 3920

Crush = R 415 C_L 222 L 500

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

R 477 mm C_L 405 mm L 397 mm

VISIBLE DUMMY CONTACT POINTS:

	Driver	Passenger
Head	To airbag	To airbag
Chest	None Noted	None Noted
Abdomen	None Noted	None Noted
Left Knee	To knee bolster & Steering Column	To knee bolster
Right Knee	Knee bolster & strg column	To knee bolster

GENERAL TEST AND VEHICLE PARAMETER DATA (cont'd)

	Front		Rear	
Door Opening	Left	Right	Left	Right
(without use of tools)	opened	opened	opened	opened

	Front		Rear	
Seat Movement	Left	Right	Left	Right
Seat Back Movement	Ø	Ø	N/A	N/A
Seat Shift (mm)	Ø	Ø	N/A	N/A

Glazing Damage

Backlight/Windshield 22 mm of separation on left side of windshield, & hood created 12 mm hole on right lower corner.

Other Notable Impact Effects: None noted

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

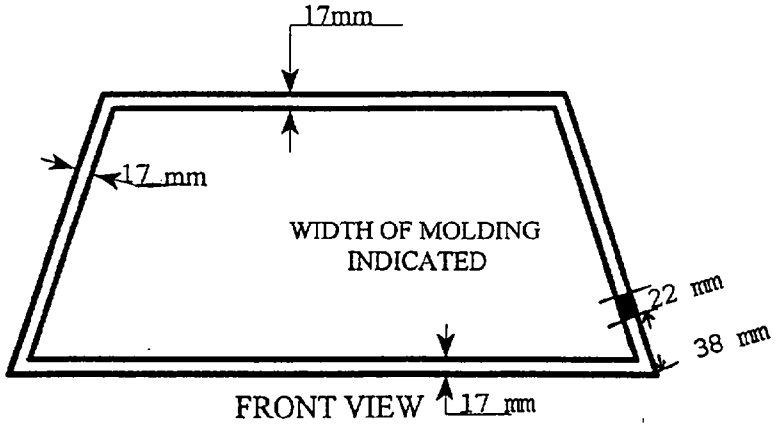
Details of windshield mounting such as retention method, trim type, etc.:
Windshield set in rubber with glue retention

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

FMVSS 212 TEST DATA:

	WINDSHIELD PERIPHERY		
	PRE-TEST (mm)	POST-TEST (mm)	PERCENT RETENTION
RIGHT SIDE	1978	1978	100%
LEFT SIDE	1978	1956	98.9%
TOTAL	3956	3934	99.4%

AREA OF RETENTION FAILURE: None



FAILURE DETAILS: 22 mm of separation 38 mm from bottom edge on driver's side.

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= 1113 mm

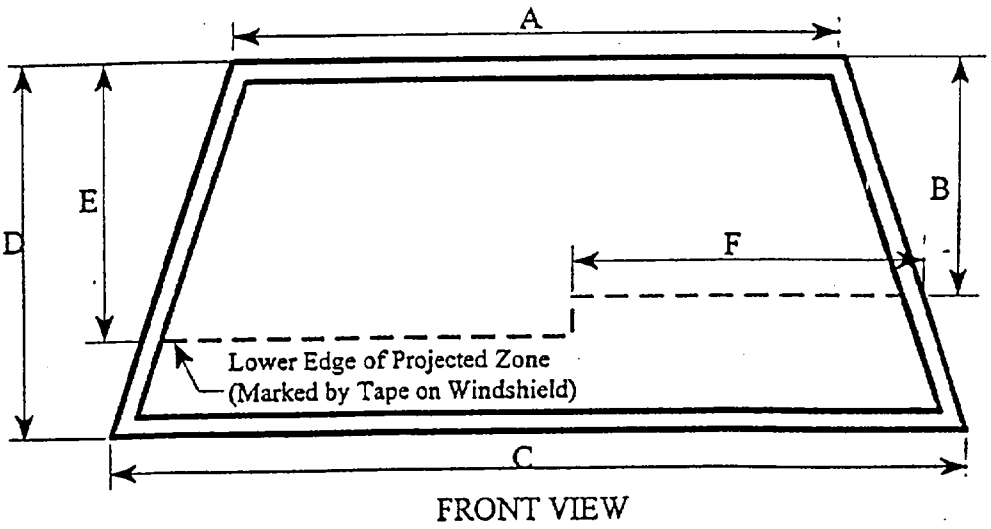
B= 343 mm

C= 1550 mm

D= 640 mm

E= 441 mm

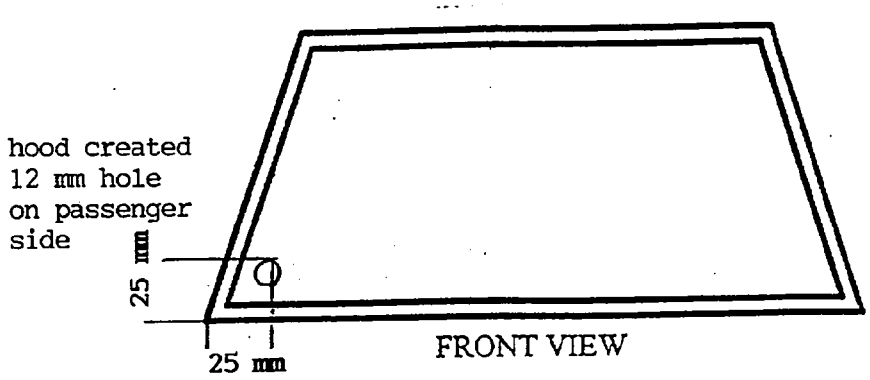
F= 877 mm



FRONT VIEW

DETAILS OF WINDSHIELD GLASS PENETRATION GREATER THAN 1/4":

(Show location of penetration)



FRONT VIEW

FMVSS NO. 301-75, FUEL SYSTEM INTEGRITY POST IMPACT TEST DATA

FMVSS NO. 301

Test Date: December 10, 1994

Vehicle Mfgr./Make/Model: 1995/Volkswagen/Passat/4 Door

Usable Capacity of Vehicle's Fuel Tank: 70.0 Liters
(figure furnished by vehicle manufacturer)

TEST REQUIREMENTS:

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

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

70.0 Liters which is 100 % of the stated USABLE CAPACITY.

TEST VEHICLE IMPACT TYPE:

- X Frontal (35 mph)
- ___ Oblique (30 mph) with ___° barrier face first contacting (driver/passenger) side
- ___ Rear Moving Barrier (30 mph)
- ___ Side Impact MDB (33.2 mph)

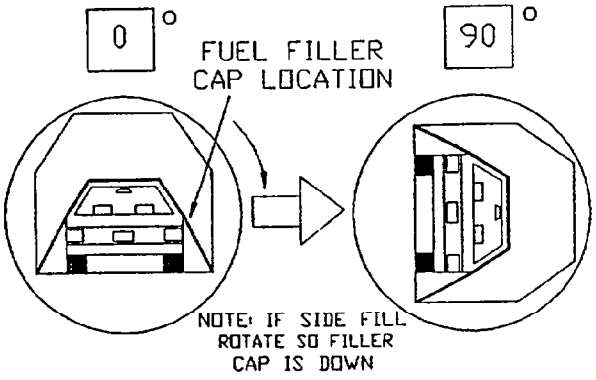
FUEL SPILLAGE MEASUREMENT:

	ACTUAL	MAX ALLOWED
1. From impact until vehicle motion ceases	0	1 OZ
2. For 5 minute period after vehicle motion ceases	0	5 OZ
3. For next 25 minutes	0	1 oz./1 MIN

SOLVENT SPILLAGE DETAILS: None

FMVSS NO. 301 STATIC ROLLOVER DATA SHEET

TEST PHASE: 0° - 90°



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:

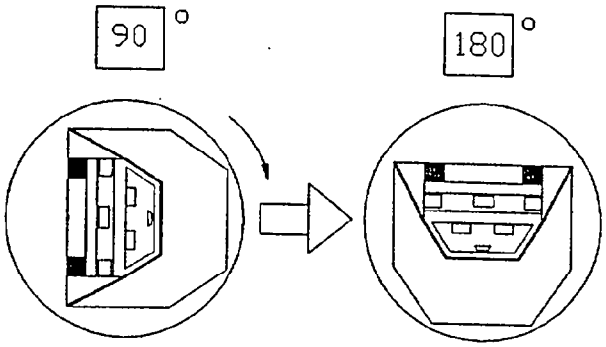
0	0	0	0

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°



I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time 2 minutes 27 seconds

(Spec. Range = 1 to 3 minutes)

FMVSS 301 Position Hold Time + 5 minutes 0 seconds

TOTAL 7 minutes 27 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:

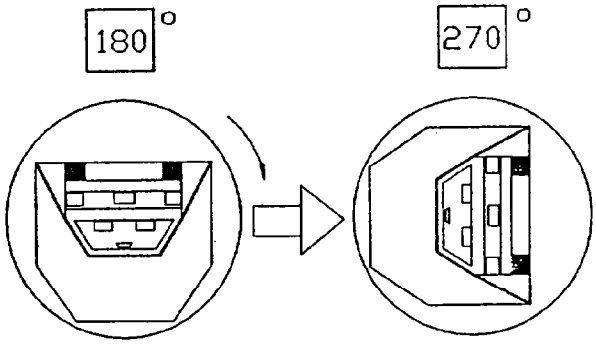
0	0	0	0

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°



I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time 2 minutes 24 seconds

(Spec. Range = 1 to 3 minutes)

FMVSS 301 Position Hold Time + 5 minutes 0 seconds

TOTAL 7 minutes 24 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:

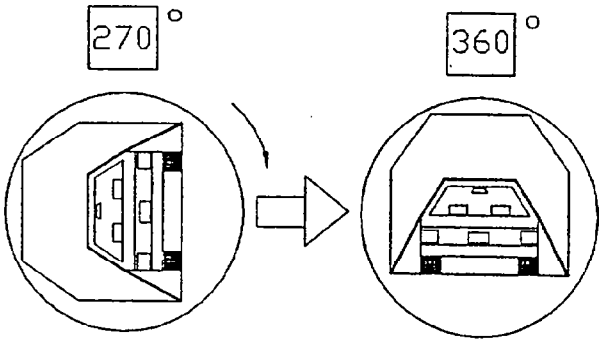
0	0	0	0

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°



I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time __2__ minutes __50__ seconds

(Spec. Range = 1 to 3 minutes)

FMVSS 301 Position Hold Time + __5__ minutes __0__ seconds

TOTAL __7__ minutes __50__ 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/Volkswagen/4 Door

TEST DATE: December 9, 1994

MAX. ACCELERATION VALUES: (g's)	DRIVER # 307	PASSENGER # 306
Head Channel X	-58.1	-63.8
Head Channel Y	9.8	-16.4
Head Channel Z	26.4	29.7
HEAD RESULTANT	64.0	65.5
Chest Channel X	-55.6	-54.6
Chest Channel Y	-10.6	7.5
Chest Channel Z	17.4	14.2
CHEST RESULTANT (CLIP)	55.4	53.3
TIME INTERVAL (msec) [0.003 seconds minimum]	t_1 = 68.98 t_2 = 72.04	t_1 = 67.76 t_2 = 70.69

* Secondary Head Z
** Secondary Head Z used to calculate resultant

HEAD INJURY CRITERIA (HIC) VALUES:

HIC	567.7	610.8
t_1 = (msec)	50.6	50.8
t_2 = (msec)	86.6	85.3
Avg. Accel. t_1 to t_2 (g's)	47.8	50.0

[The maximum time interval from t_1 to t_2 is 36 milliseconds.]

MAX. COMPRESSIVE FEMUR FORCES:

Left Side (N)	2279	3652
Right Side (N)	1095	2382

MAXIMUM SEAT BELT FORCES:

Lap Belt (N)	8740	6964
Shoulder Belt (N)	8698	6639

NOTE: All values listed must occur during primary impact event. (Head X,Y,Z and R listed must be during t_1 to t_2 HIC interval)

HYBRID III NECK AND CHEST DATA SHEET

VEHICLE YR./MAKE/MODEL/BODY STYLE: 1995/Volkswagen/Passat/4 Door

TEST DATE: December 9, 1994

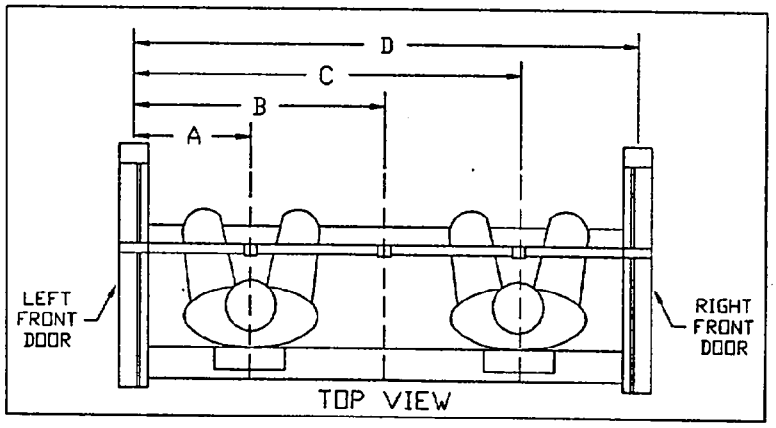
MAXIMUM VALUES	DRIVER DUMMY #307	PASSENGER DUMMY #306
Neck Load X (N)	450	656.0
Neck Load Y (N)	551	-212.0
Neck Load Z (N)	-2094	-1494.0
Neck Moment X (N.M)	-16.2	15.3
Neck Moment Y (N.M)	-39.6	-59.2
Neck Moment Z (N.M)	-15.3	-22.9
Chest Deflection X (mm)	7.0	invalid
Time of Max. Occurrence	52 msec.	invalid
Pelvis X	-59.7	-68.2
Pelvis Y	-14.3	18.3
Pelvis Z	29.8	32.0

PART 572 DUMMY IN-VEHICLE POSITION

Vehicle: 1995/Volkswagen/Passat/4 Door

SEAT TYPE:	ADJUSTER TYPE:	BUCKET SEAT BACK TYPE:
____Bench	Driver: _X_Manual	____Fixed
_X_Bucket	___Power	_X_Adjustable Reclining
____Split Bench		
	Passenger: _X_Manual	
	____Power	

Driver	Passenger
Adjusted to 8th position from front of total 14 positions	Adjusted to 8th position from front of total 14 positions



307 DUMMY ID 306

A	= Left Door to Driver Centerline	440 mm
B	= Left Door to Center Passenger Centerline	770 mm
C	= Left Door to Right Passenger Centerline	1070 mm
D	= Left Door to Right Door	1540 mm

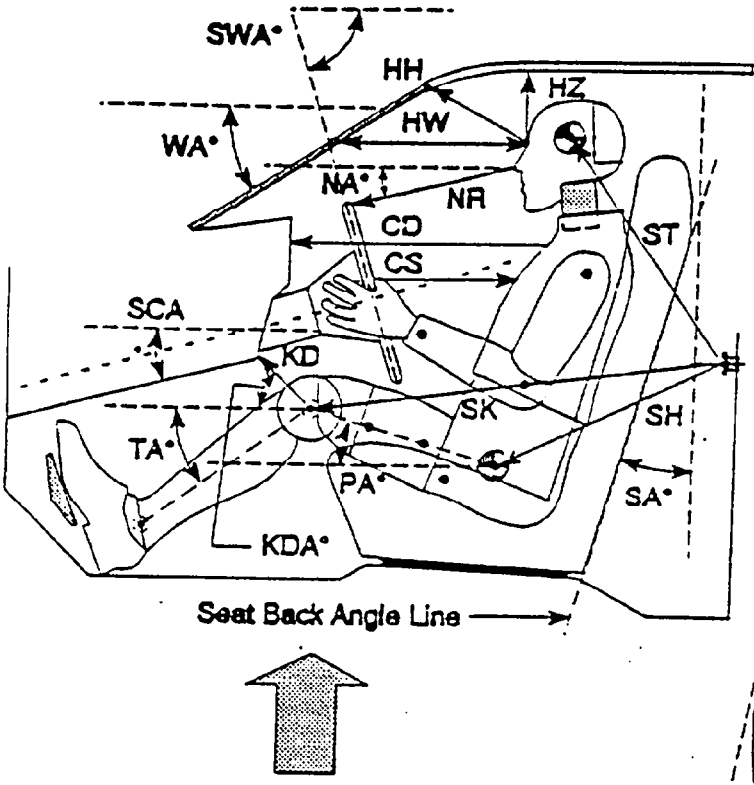
FRONT SEAT MEASUREMENT TABLE

Units (mm)

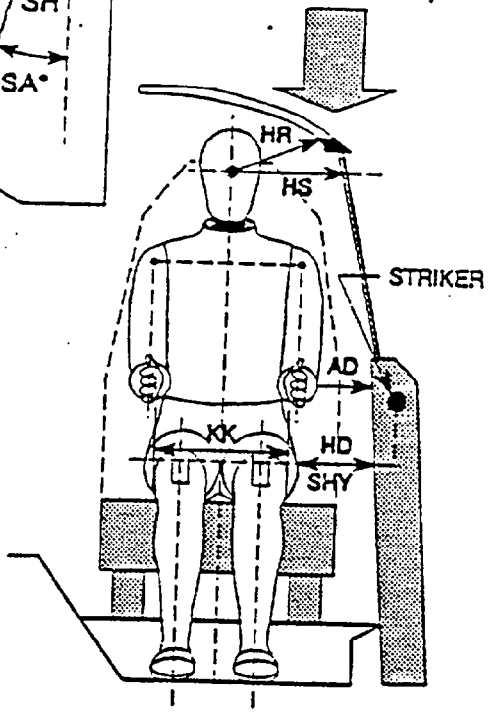
	DRIVER (Serial #307)	PASSENGER (Serial #306)
WA°	30.1°	
SWA°	27.7°	N/A
SCA°	28.6°	N/A
SA°	22.0°	22.0°
HZ	179	176
HH	376	377
HW	608	616
HR	250	240
NR	437	N/A
CD	570	599
CS	358	N/A
RA	250	N/A
KDL	187 Angle 14.0°	168
KDR	188	170 Angle 17.1°
PA°	21.4°	24.0°
TA°	39.8°	34.1°
KK	305	291
ST	442 Angle 12.6°	452 Angle 15.1°
SK	575 Angle 99.1°	607 Angle 11.8°
SH	277 Angle 137.0°	278 Angle 46.4°
SHY	231	247
HS	326	309
HD	136	126
AD	133	102

N/A = Not Applicable

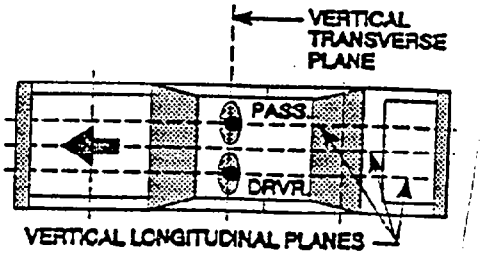
FRONT SEAT MEASUREMENTS



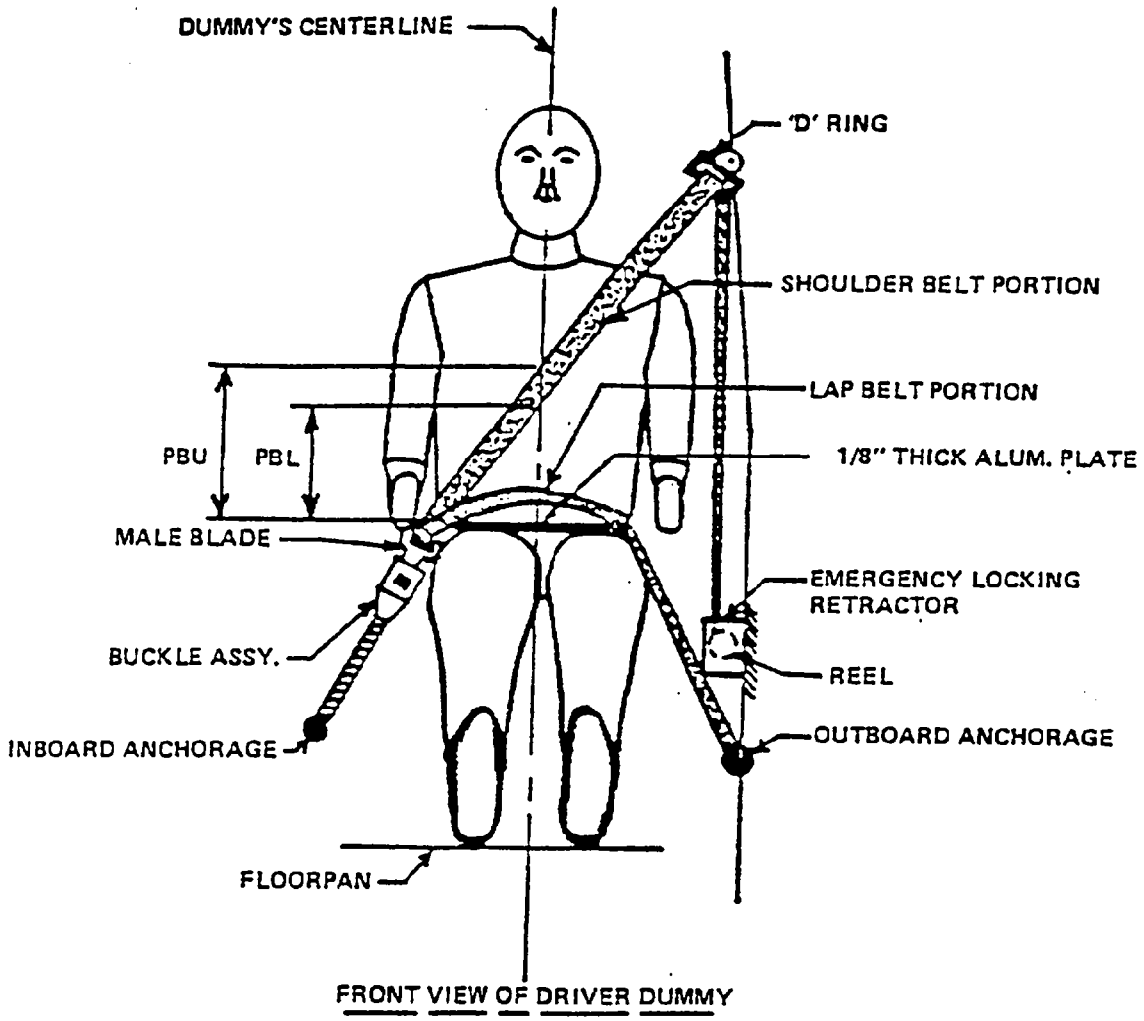
AD - Arm to Door
HD - H-Point to Door
HR - Head to Side Header
HS - Head to Side Window
KK - Knee to Knee
SHY- Striker to H-Point (Y Direction)



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
PBU --	Top surface of alum. plate to upper edge	275	285
PBL --	Top surface of alum. plate to belt lower edge	195	213

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

SEAT BELT PERFORMANCE ASSESSMENT TEST DATA

BELT LENGTH DATA:	Driver	Passenger
Belt length from trim panel exit to bolt hole anchor point for continuous webbing systems.	225 mm	226 mm
Shoulder belt length as measured on Part 572 Dummy.	860 mm	863 mm
Lap belt length as measured on Part 572 Dummy.	770 mm	775 mm

SHOULDER BELT SPOOL-OFF DATA:			
As determined by film analysis		0**	0**
As determined mechanically	Lap	2 mm	3 mm
	Shoulder	0 mm	0 mm
As determined electronically*		N/A	N/A

* Transducer not mounted due to interference with belt system

BELT STRETCH DATA:		
Measured electronically between shoulder belt load cell and the "D" ring.	NR	NR
Measured mechanically	NR	NR

RETRACTOR LOCK-UP TIME:		
As determined by shoulder belt spool-off observed in on-board cameras	N/A**	N/A**

NR = Not Recorded

** Vehicle equipped with pretensioners. Belts retract on impact.

CAMERA LOCATIONS

TEST DATE: December 9, 1994; TIME: 3:15 a.m.

VEH. YEAR/MAKE/MODEL/BODY STYLE: 1995/Volkswagen/Passat/4 Door

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	890	7390	1275	90°		25	980
3	Steering Column Top	1920	7700	1560	90°		25	881
4	Steering Column Bottom	1900	7690	1015	90°		25	976
5	Left Driver Close-up	1430	6980	1180	90°		50	1015
6	Left Angle	4670	5920	1970	50°		35	1176
7	Driver Onboard						35	1020
9	Right Overall	2600	-7180	1190	90°		13	1149
10	Right Front	1800	-5830	1160	90°		25	1064
11	Right Passenger Close-up	1590	-6720	1215	90°		50	1242
12	Right Angle	4010	-5340	2135	50°		35	926
13	Top View Wide	350	-10	4375			13	1136
14	Top Driver	-330	380	2410			13	883
15	Top Passenger	-310	-410	2430			13	1163
16	Pit Front	1200	0	-3135			13	1020
17	Pit Rear	2440	0	-3115			13	1020

* COORDINATES:

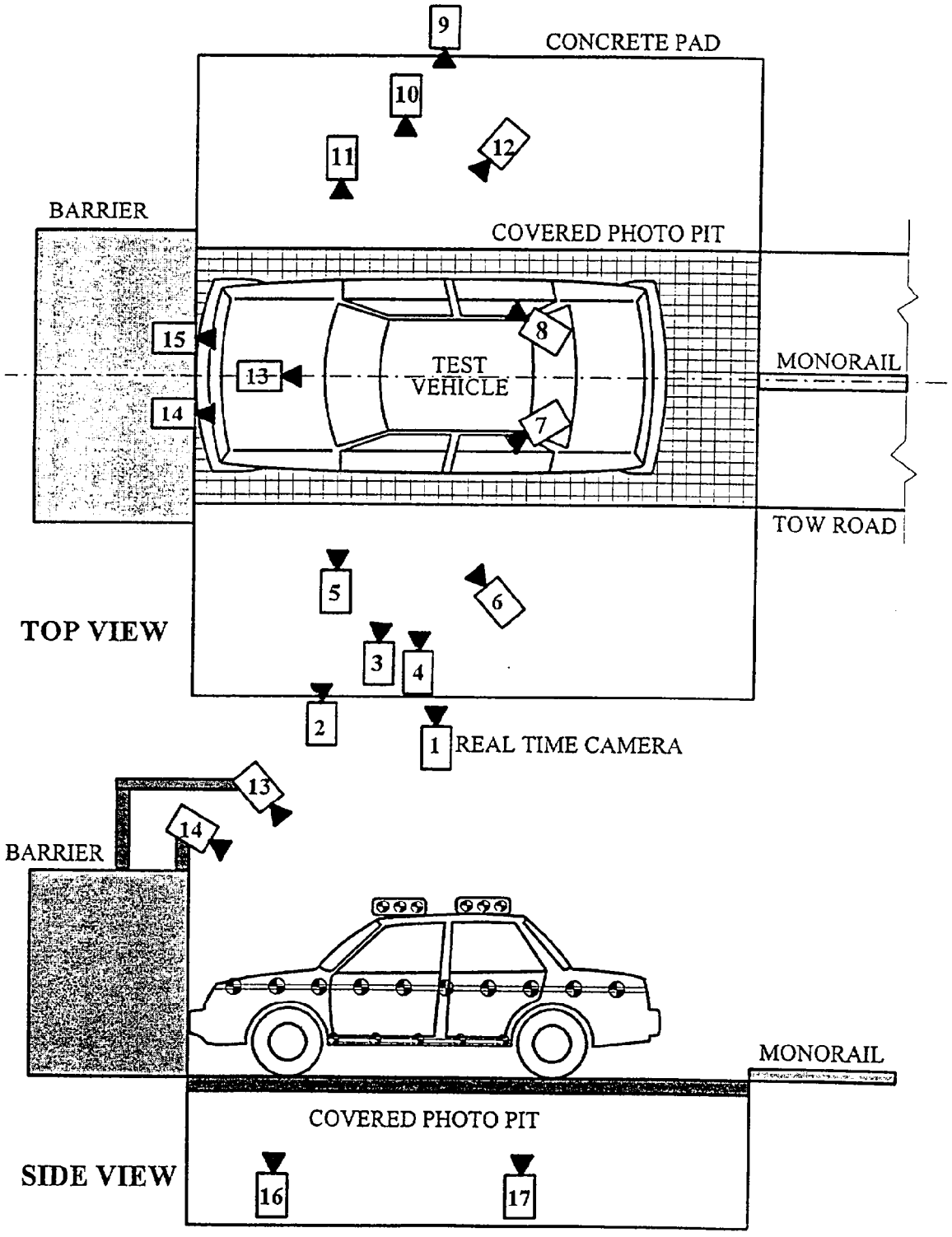
+X = film plane rearward of barrier

+Y = film plane to left of monorail centerline

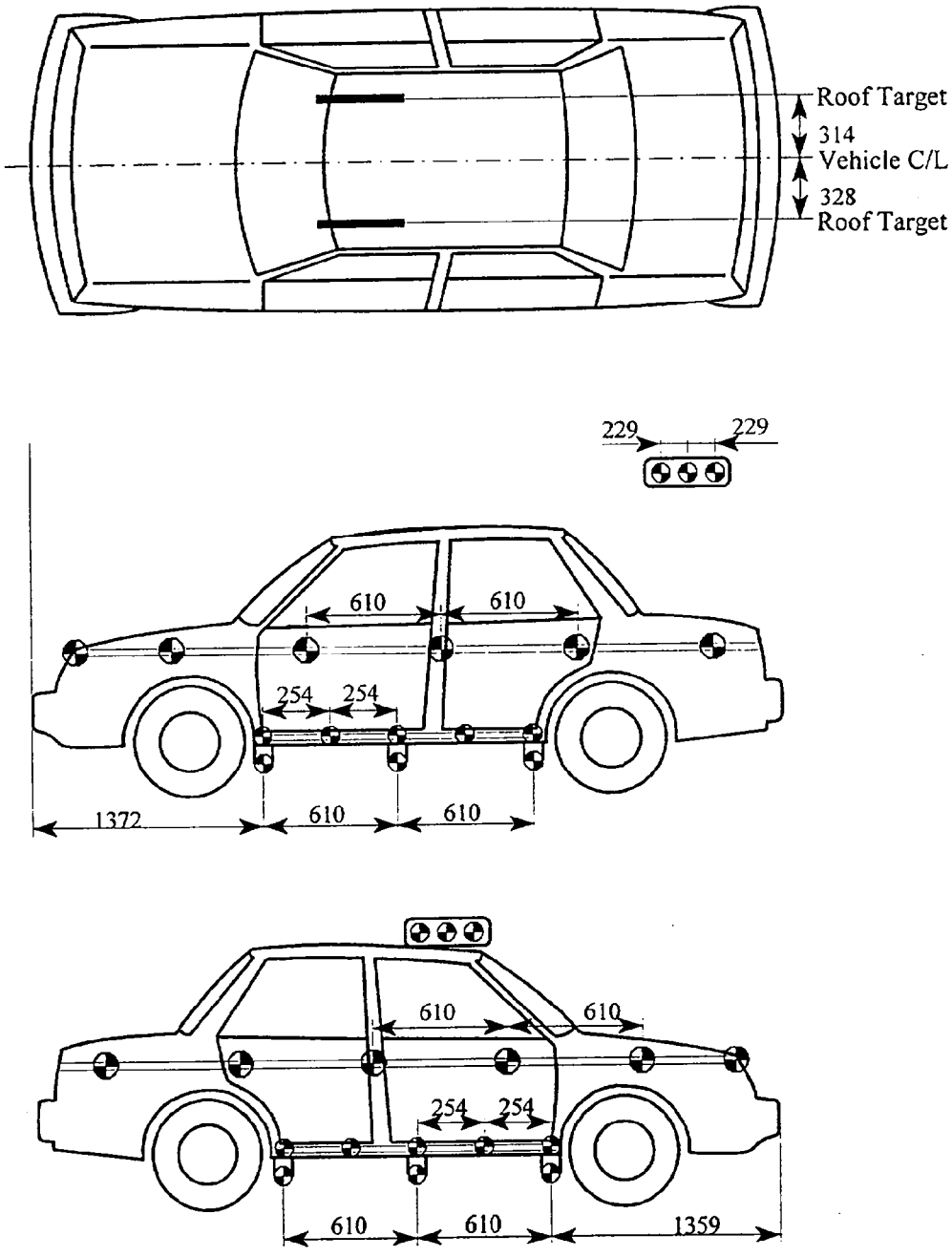
+Z = film plane to above ground level

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

CAMERA LOCATIONS (Cont'd)



VEHICLE TARGET LOCATIONS



(DIMENSIONS IN MM)

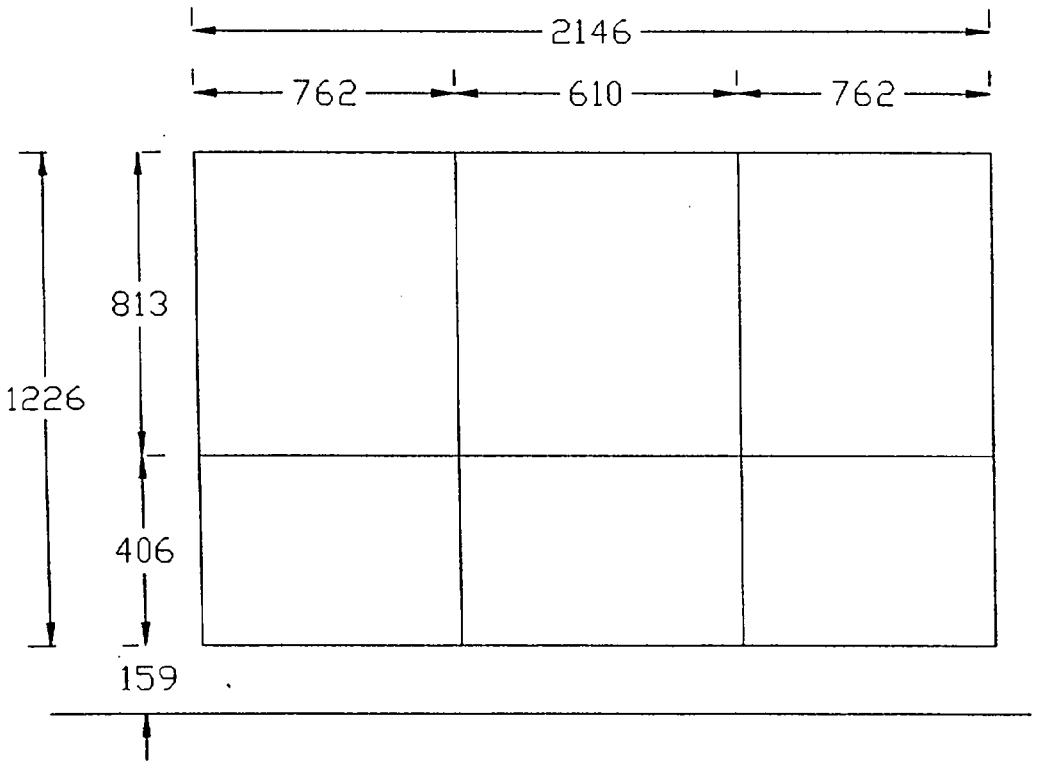
LOAD CELL LOCATIONS ON FIXED BARRIER

30 Load Cells

6 Rows

9 Columns

6 Groupings (5 cells/group)

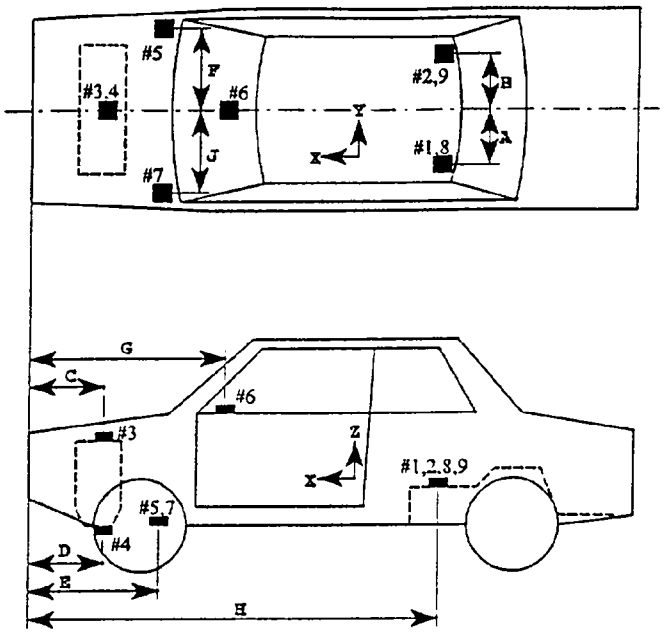


The following data is presented in Appendix B:

(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	518
B	518
C	591
D	648
E	772
F	627
G	1016
H	2864
J	627

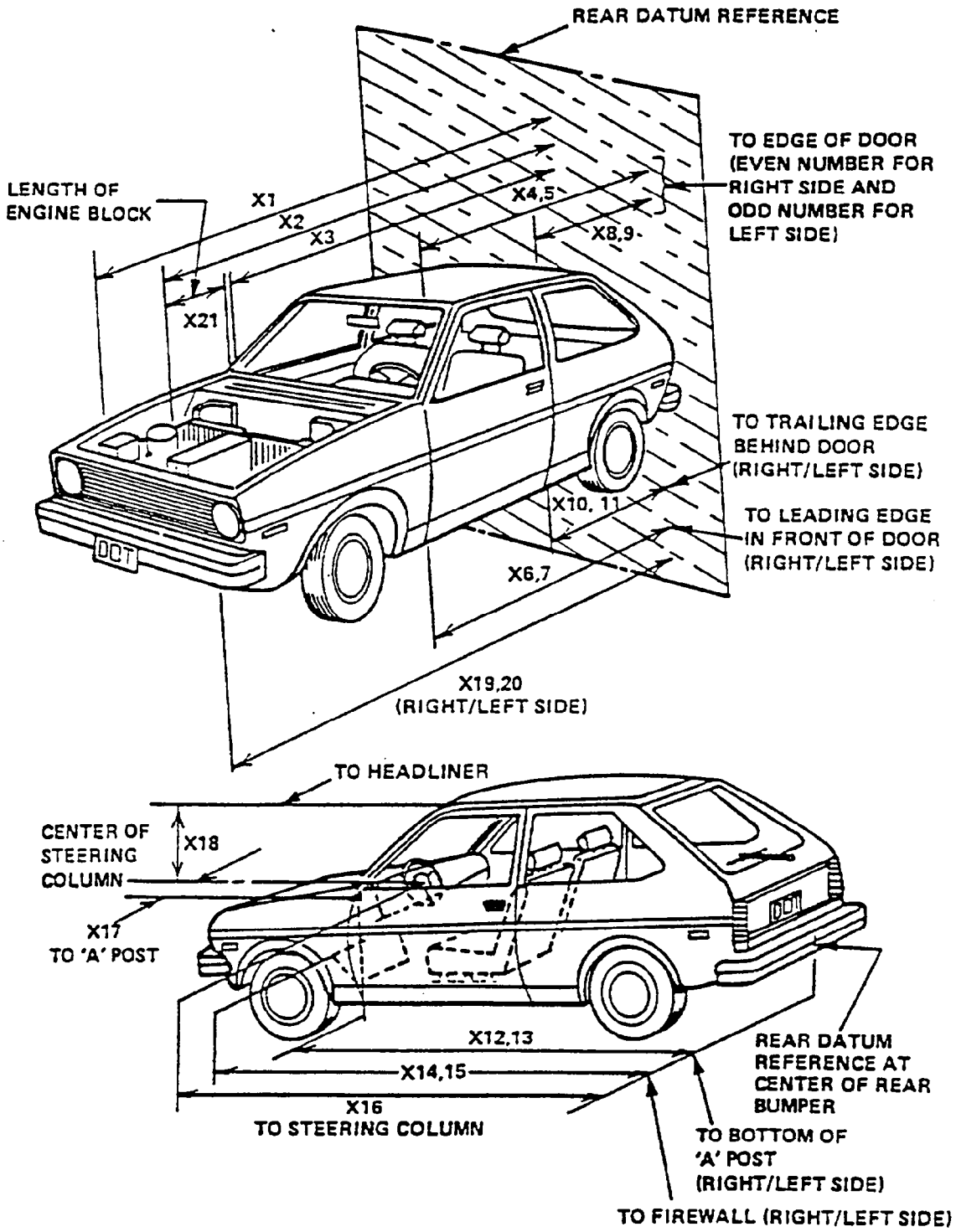
ACCEL. NO.	ACCELEROMETER	DIRECTION
1 and 8	Left Rear Seat Crossmember	X
2 and 9	Right Rear Seat Crossmember	X
3	Top of Engine	X
4	Bottom of Engine	X
5	Right Side Brake Caliper	X
6	Instrument Panel	X
7	Left Disc Brake Caliper	X

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

TEST VEHICLE MEASUREMENTS

No.	MEASUREMENT DESCRIPTION:	Pre-Test (mm)	Post-Test (mm)	Diff. (mm)
X1	Total Length of Test Vehicle at Centerline	4595	4373	222
X2	Rear Surface of Vehicle to Front of Engine	418Ø	4173	7
X3	Rear Surface of Vehicle to Firewall	3455	3443	12
X4	Rear Surface to Upr. Leading Edge of Rt. Door	3193	3192	1
X5	Rear Surface to Upr. Leading Edge of Left Door	N/A	32ØØ	N/A
X6	Rear Surface to Lwr. Leading Edge of Rt. Door	3177	3176	1
X7	Rear Surface to Lwr. Leading Edge of Left Door	3178	3171	7
X8	Rear Surface to Upr. Trailing Edge of Rt. Door	2178	214Ø	38
X9	Rear Surface to Upr. Trailing Edge of Left Door	2179	2155	24
X1Ø	Rear Surface to Lwr. Trailing Edge of Rt. Door	2167	2164	12
X11	Rear Surface to Lwr. Trailing Edge of Left Door	2168	216Ø	8
X12	Rear Surface to Bottom of 'A' Post on Rt. Side	3195	319Ø	5
X13	Rear Surface to Bottom of 'A' Post on Left Side	3192	3178	14
X14	Rear Surface to Firewall on Right Side	3578	345Ø	128
X15	Rear Surface to Firewall on Left Side	3571	349Ø	81
X16	Rear Surface to Steering Column	2774	2768	6
X17	Center of Steering Column to 'A' Post	394	39Ø	4
X18	Center of Steering Column to Headlining	435	433	2
X19	Rear Surface to Right Side of Front Bumper	441Ø	3995	415
X2Ø	Rear Surface to Left Side of Front Bumper	442Ø	392Ø	5ØØ
X21	Length of Engine Block	49Ø	49Ø	Ø

TEST VEHICLE MEASUREMENTS



ACCIDENT INVESTIGATION DIVISION DATA

FOR 35 MPH FRONTAL BARRIER IMPACT

VEHICLE MAKE/MODEL/BODY STYLE: 1995/Volkswagen/Passat/4 Door

VIN: WVWEE83A4SE036399

MODEL YEAR: 1995 ; BUILD DATE: 9/94 ; TEST DATE: December 9, 1994

VEH. SIZE CATEGORY: Mid Size ; TEST WEIGHT: 1650 kg

VEH. WHEELBASE: 2623 mm ; FRONT OVERHANG: 914 mm ; OVERALL WIDTH: 1715 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: 105 msec

VELOCITY CHANGE: 63.8 kph

COLLISION DEFORMATION CLASSIFICATION (CDC) CODE:

F (Frontal)

CRUSH DEPTH DIMENSIONS:

C1 = 500 mm

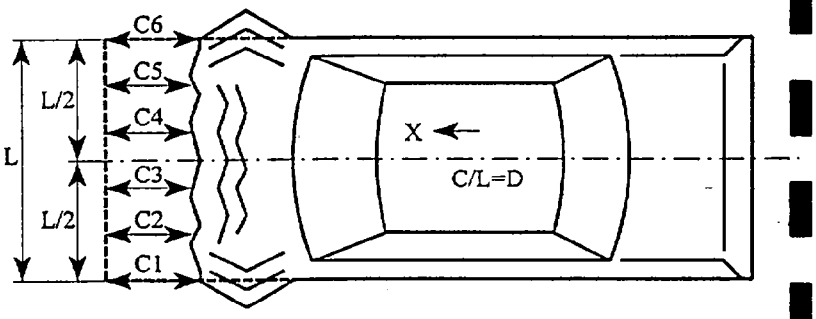
C2 = 652 mm

C3 = 685 mm

C4 = 653 mm

C5 = 623 mm

C6 = 415 mm



MIDPOINT OF DAMAGE: D = Vehicle Centerline (Longitude)

LENGTH OF DAMAGED REGION: L = 120 mm

APPENDIX A

PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

TABLE OF PHOTOGRAPHS (Cont'd)

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

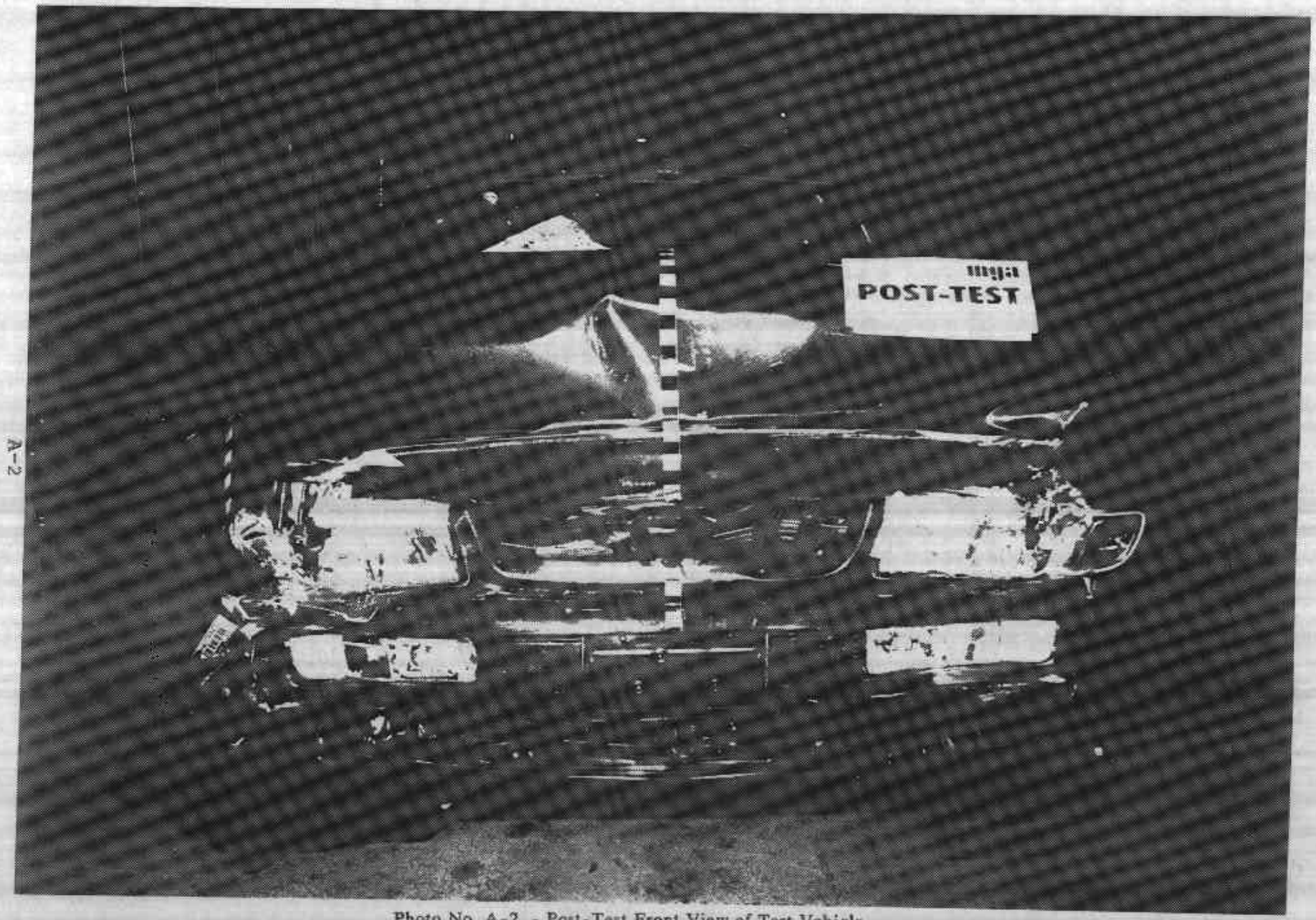


Photo No. A-2 - Post-Test Front View of Test Vehicle

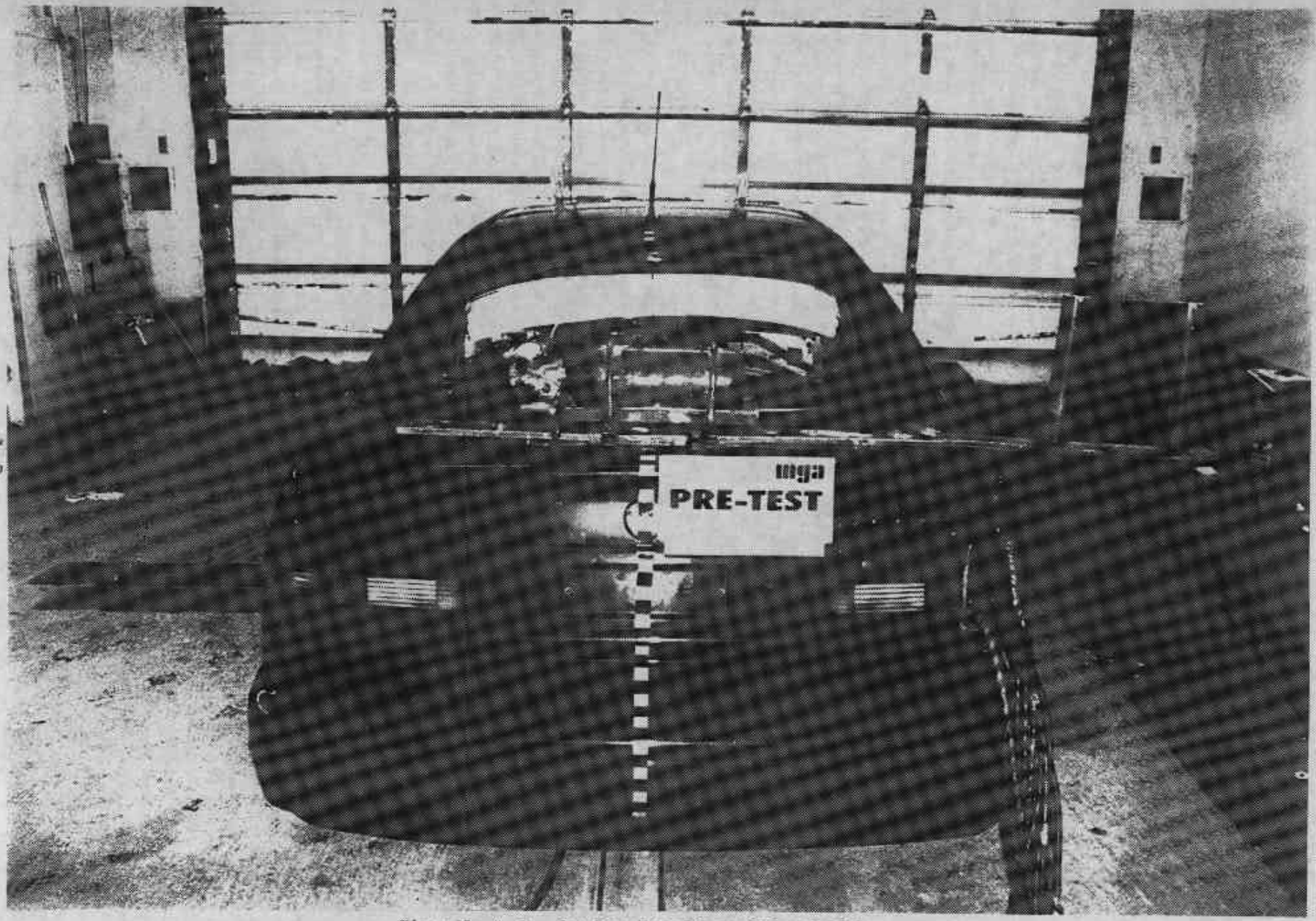


Photo No. A-3 - Pre-Test Rear View of Test Vehicle

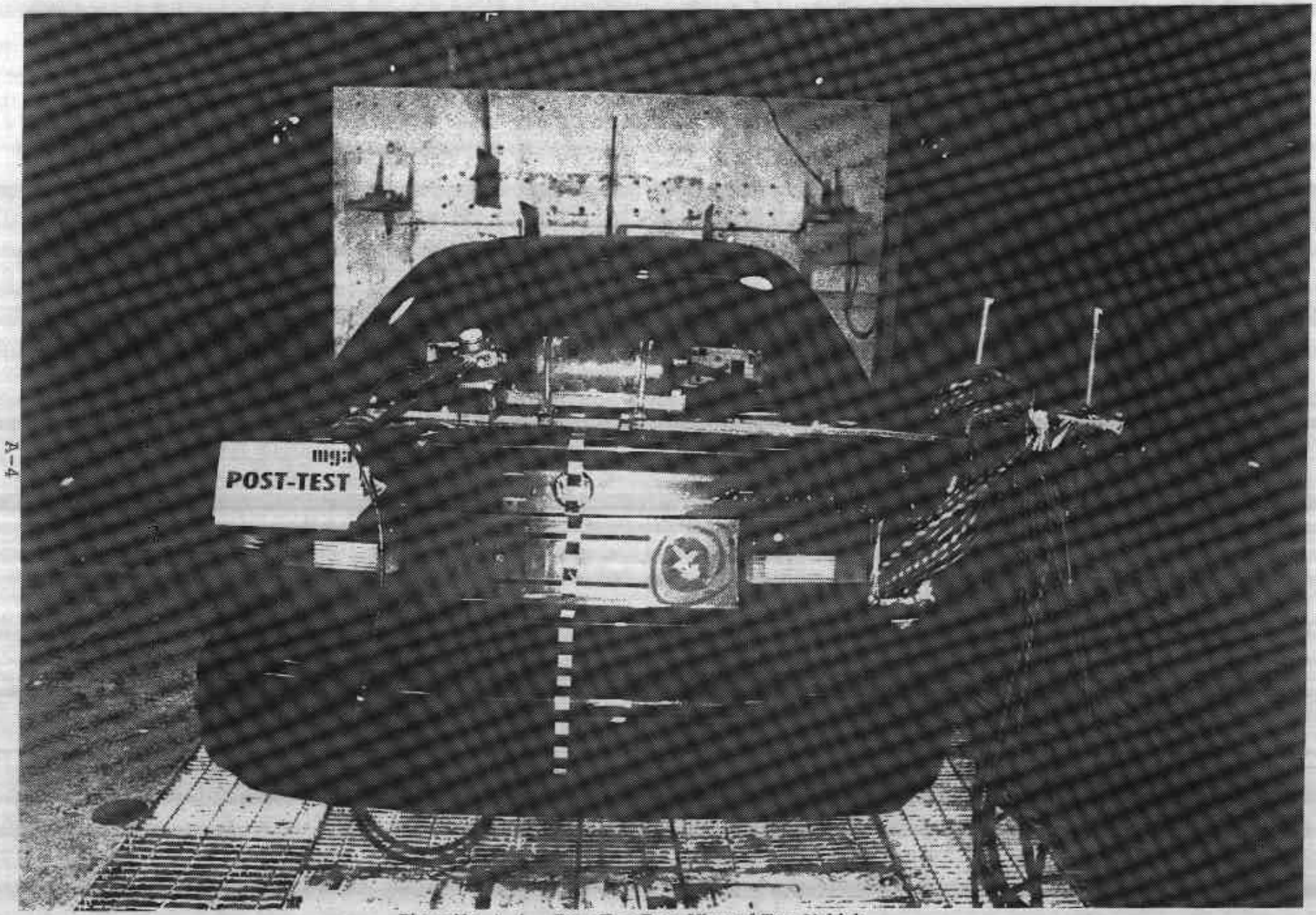


Photo No. A-4 - Post-Test Rear View of Test Vehicle

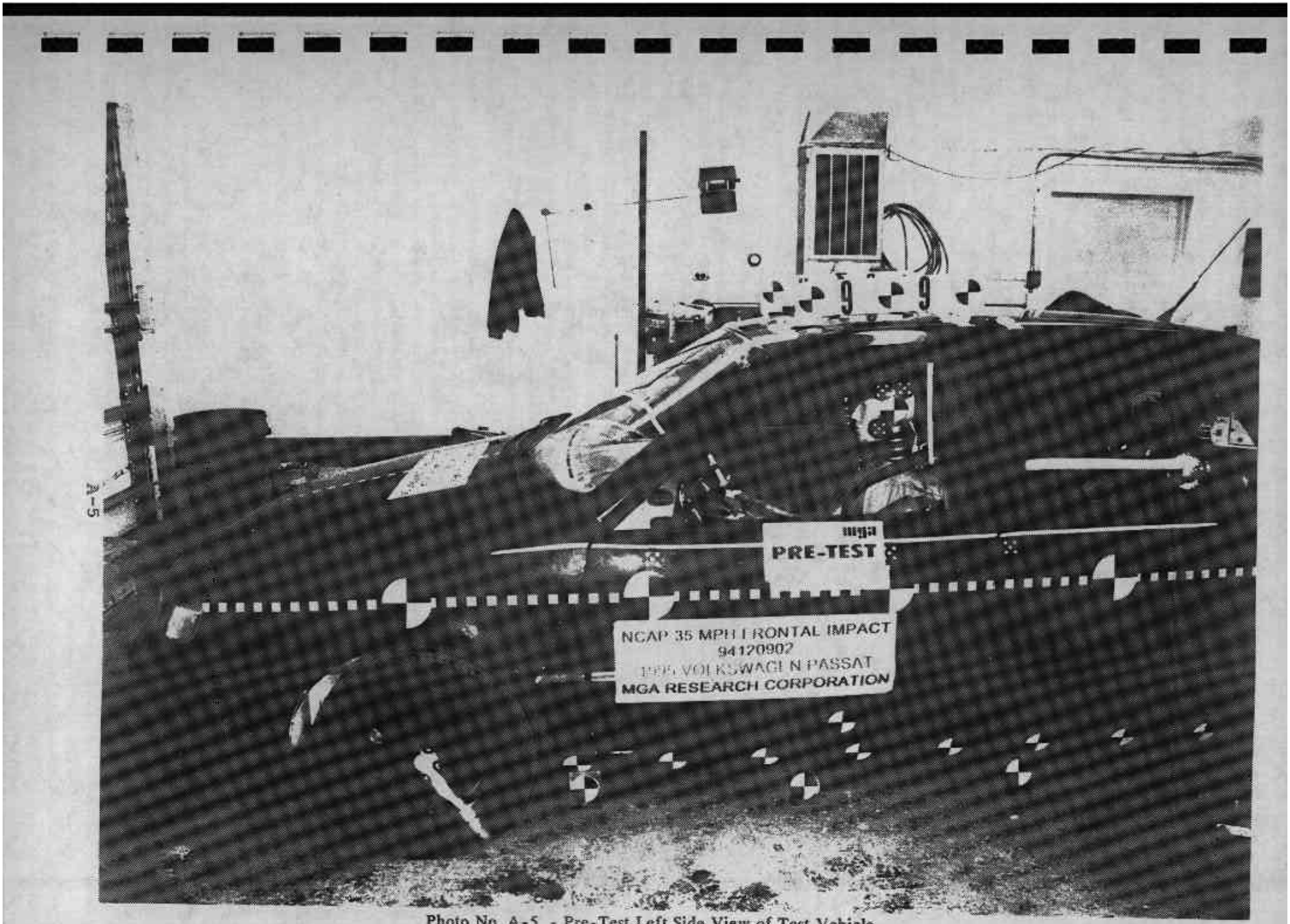


Photo No. A-5 - Pre-Test Left Side View of Test Vehicle

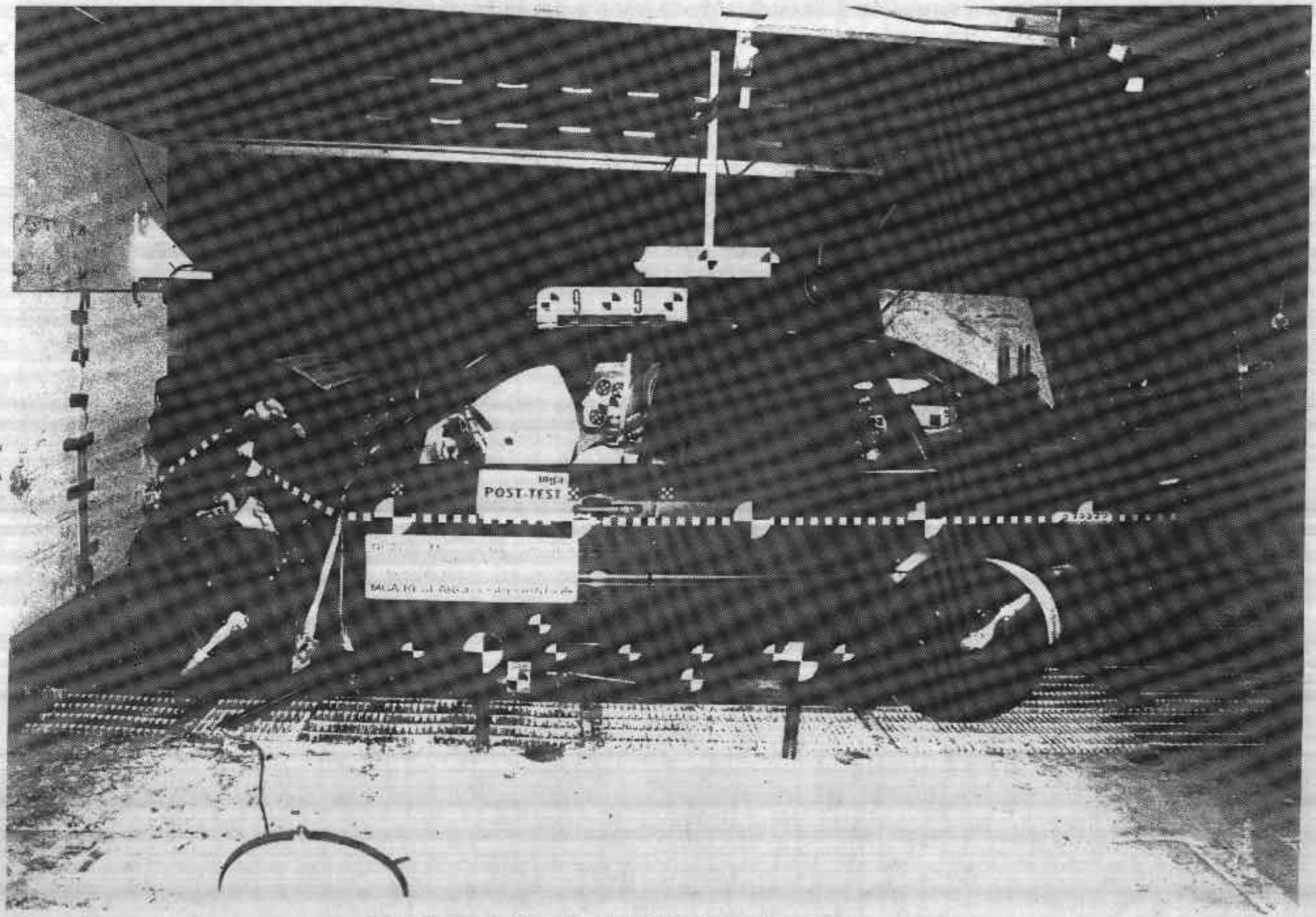


Photo No. A-6 - Post-Test Left Side View of Test Vehicle

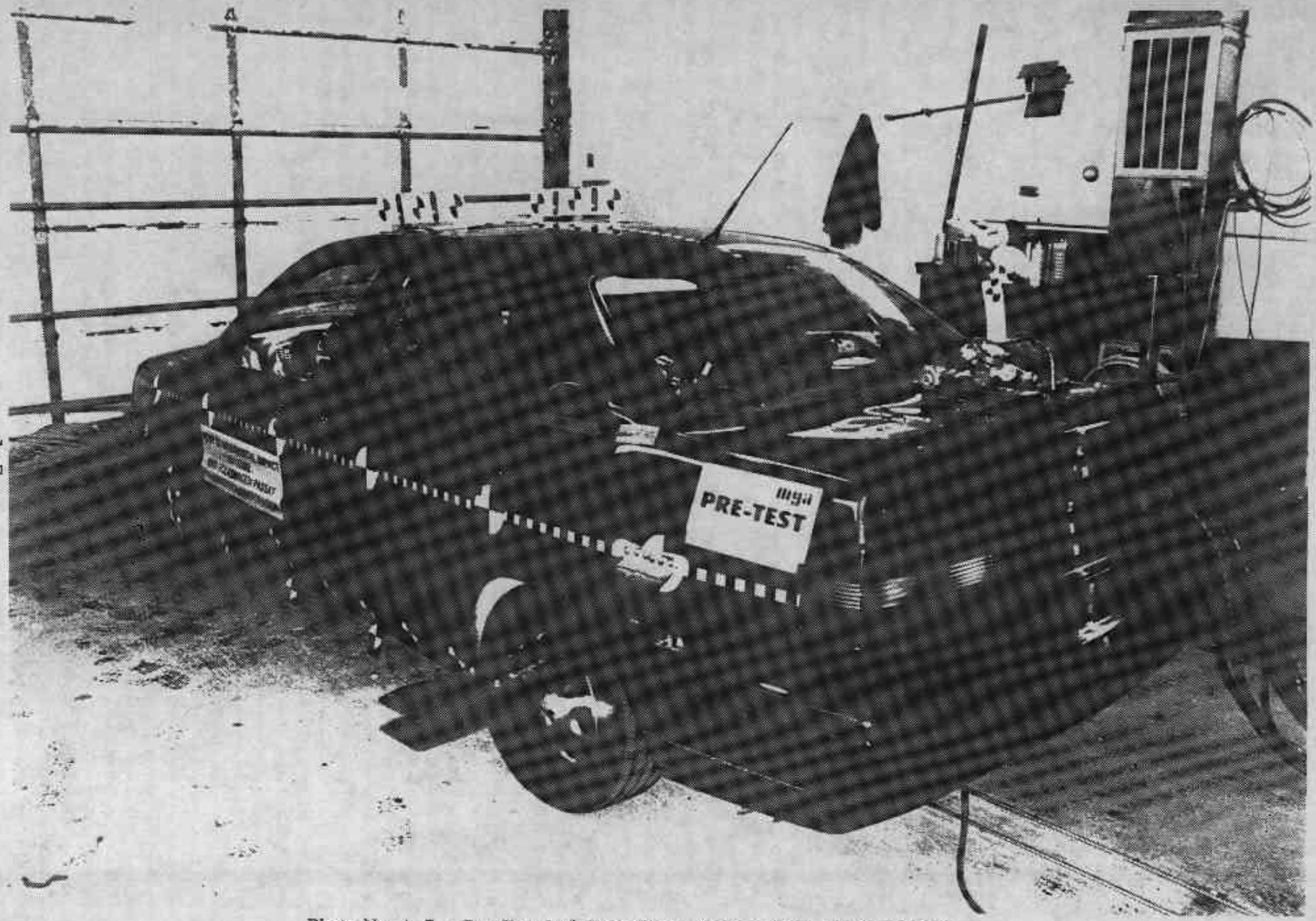


Photo No. A-7 - Pre-Test Left Rear Three-Quarter View of Test Vehicle

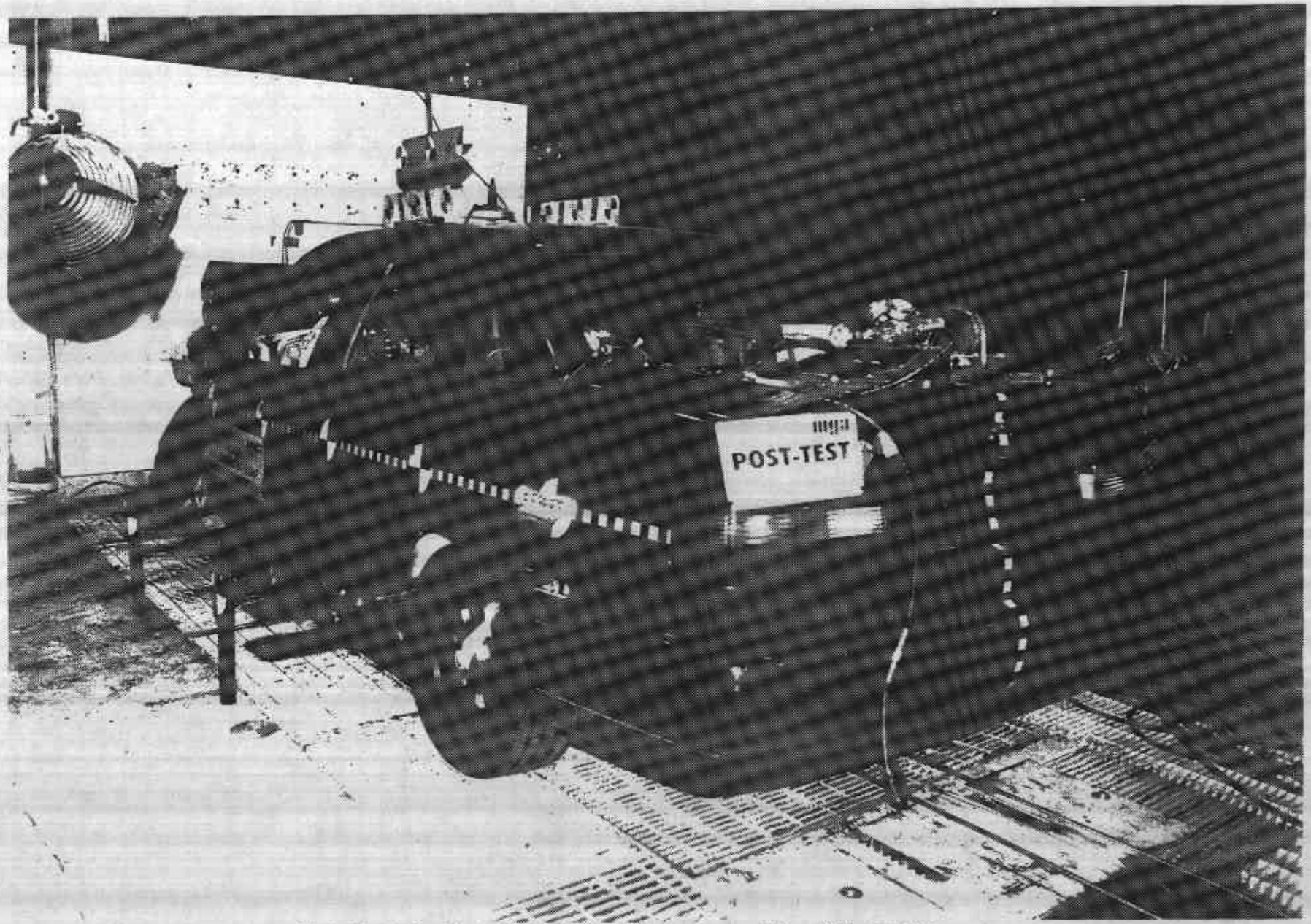


Photo No. A-8 - Post-Test Left Rear Three-Quarter View of Test Vehicle

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

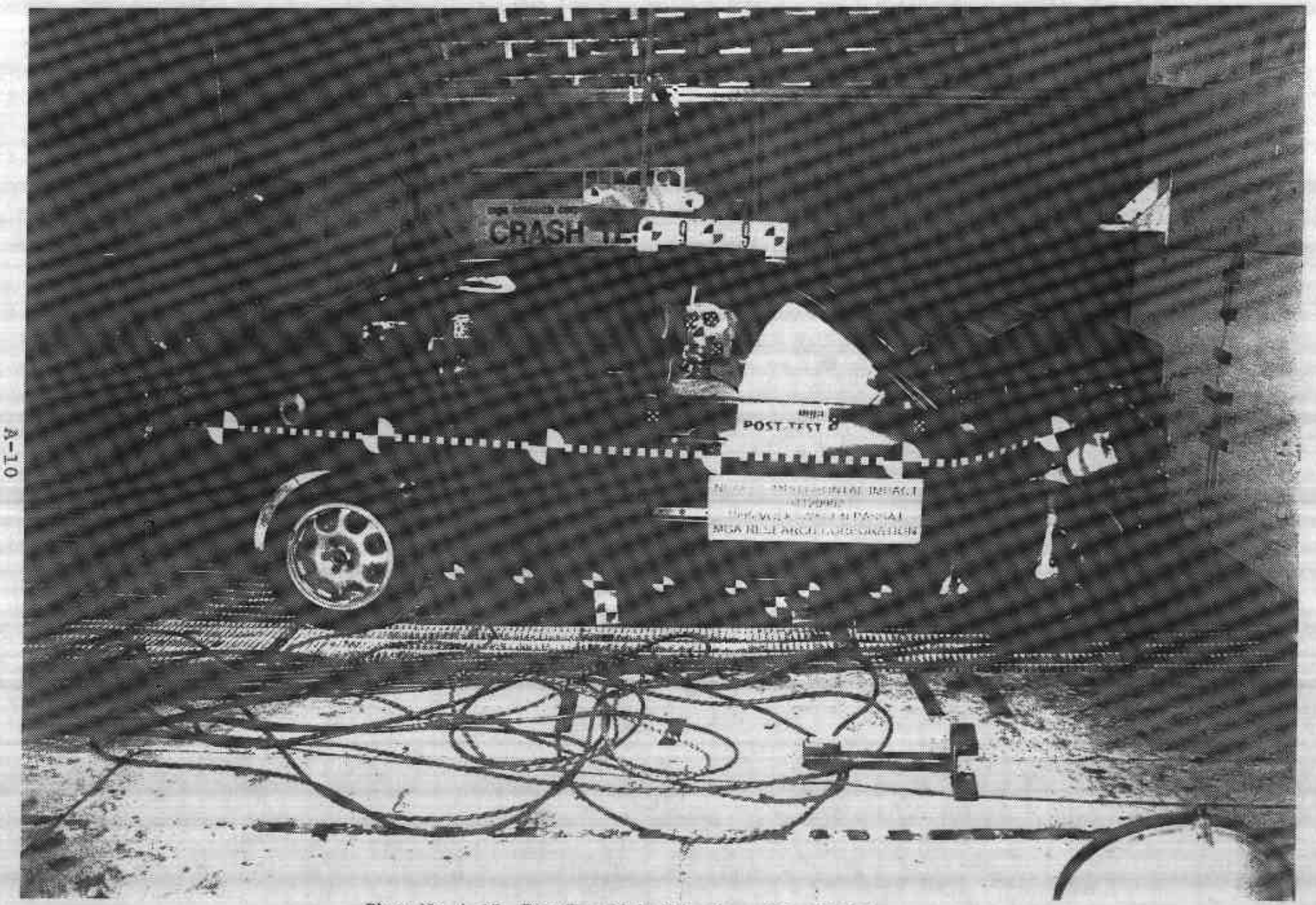


Photo No. A-10 - Post-Test Right Side View of Test Vehicle

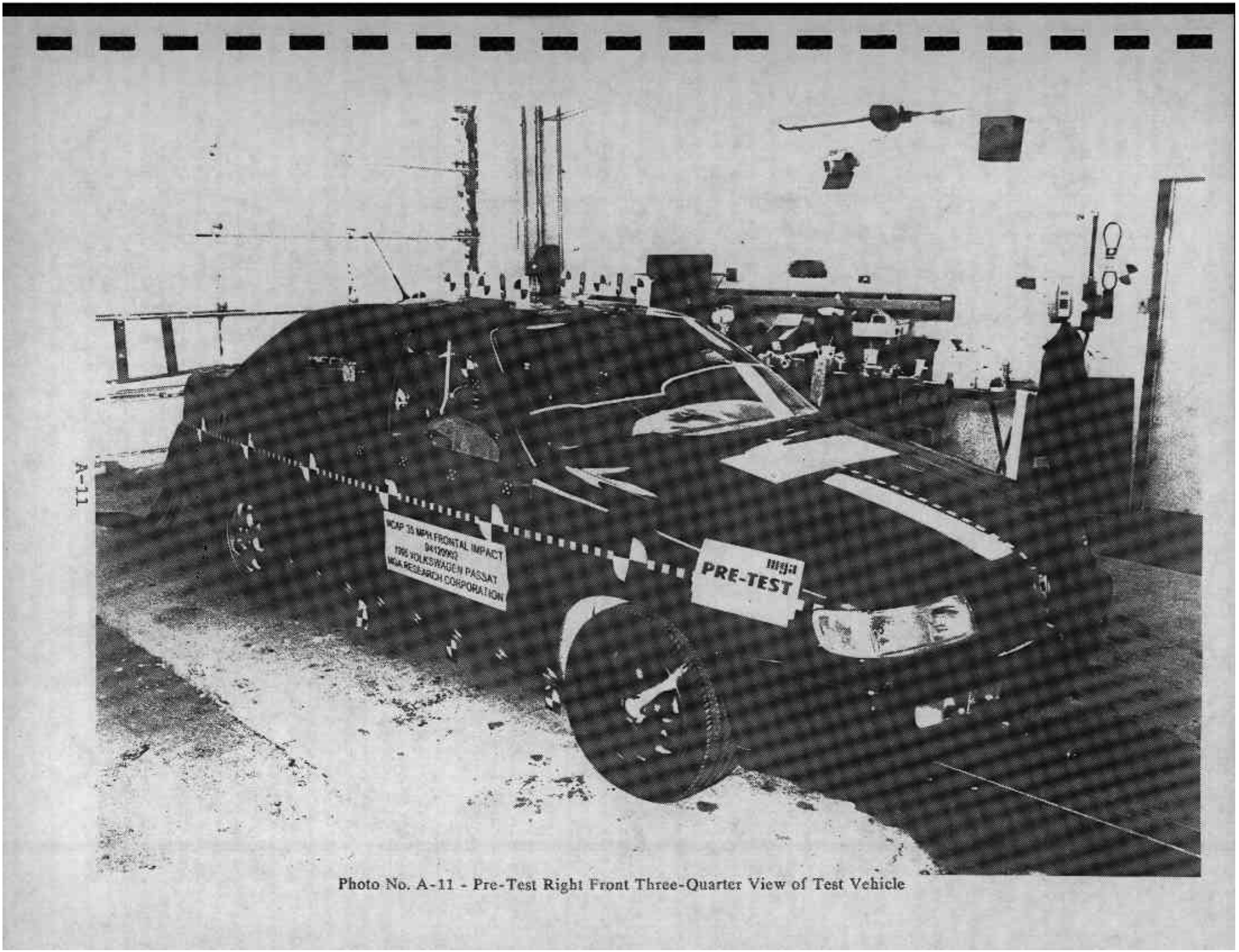


Photo No. A-11 - Pre-Test Right Front Three-Quarter View of Test Vehicle

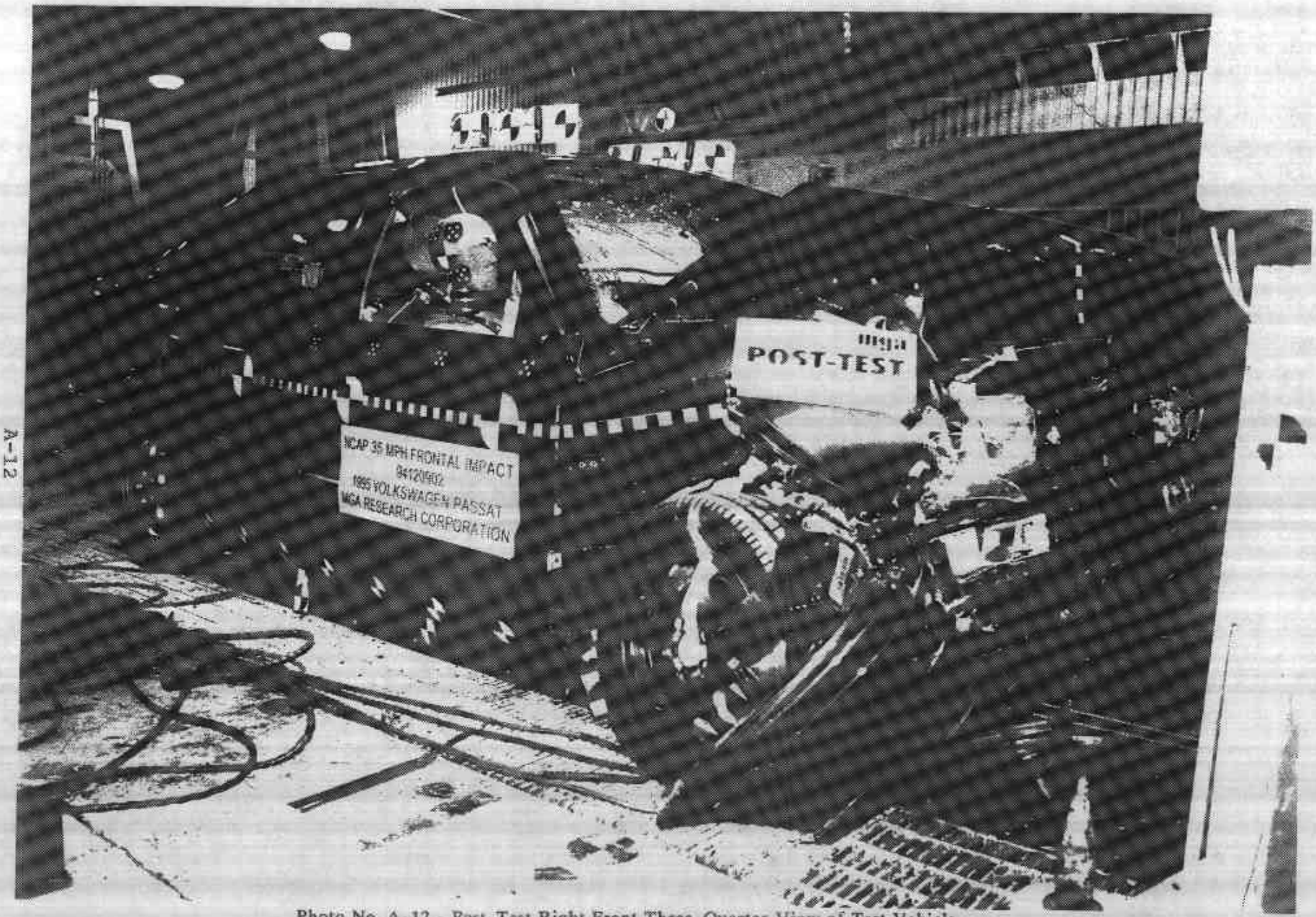


Photo No. A-12 - Post-Test Right Front Three-Quarter View of Test Vehicle

Photo No. A-13 - Pre-Test Fuel Filler Cap View

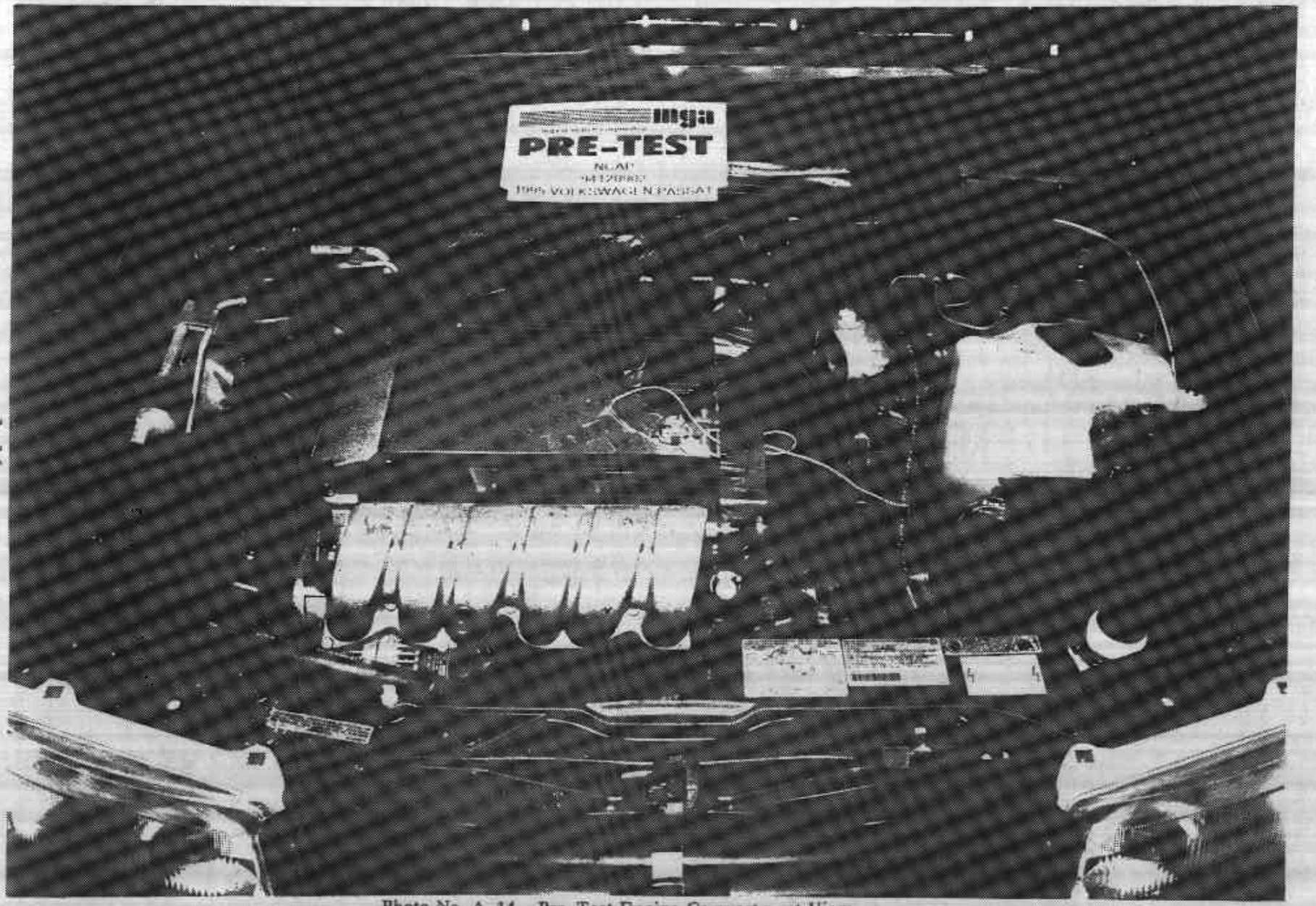


Photo No. A-14 - Pre-Test Engine Compartment View

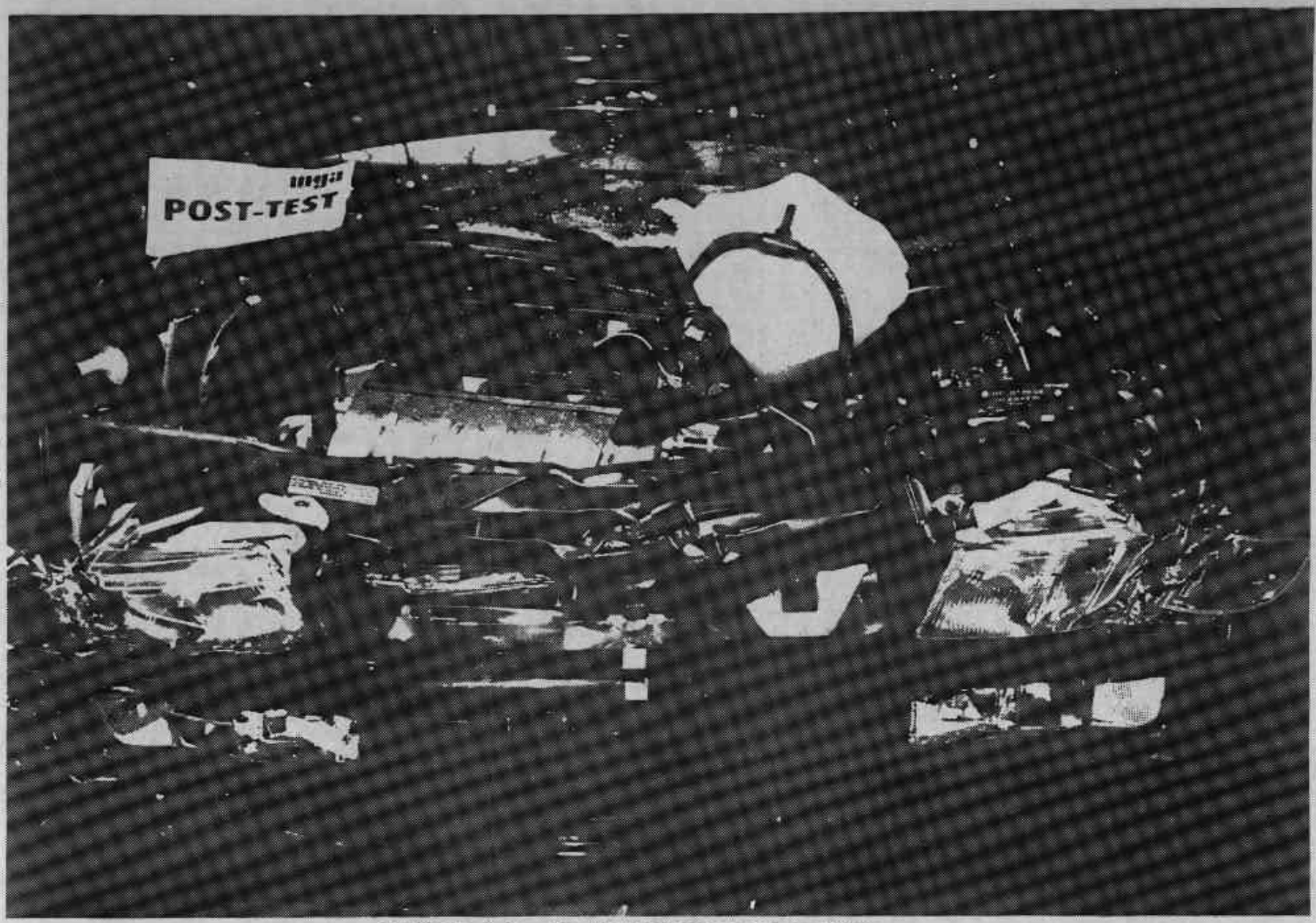


Photo No. A-15 - Post-Test Engine Compartment View

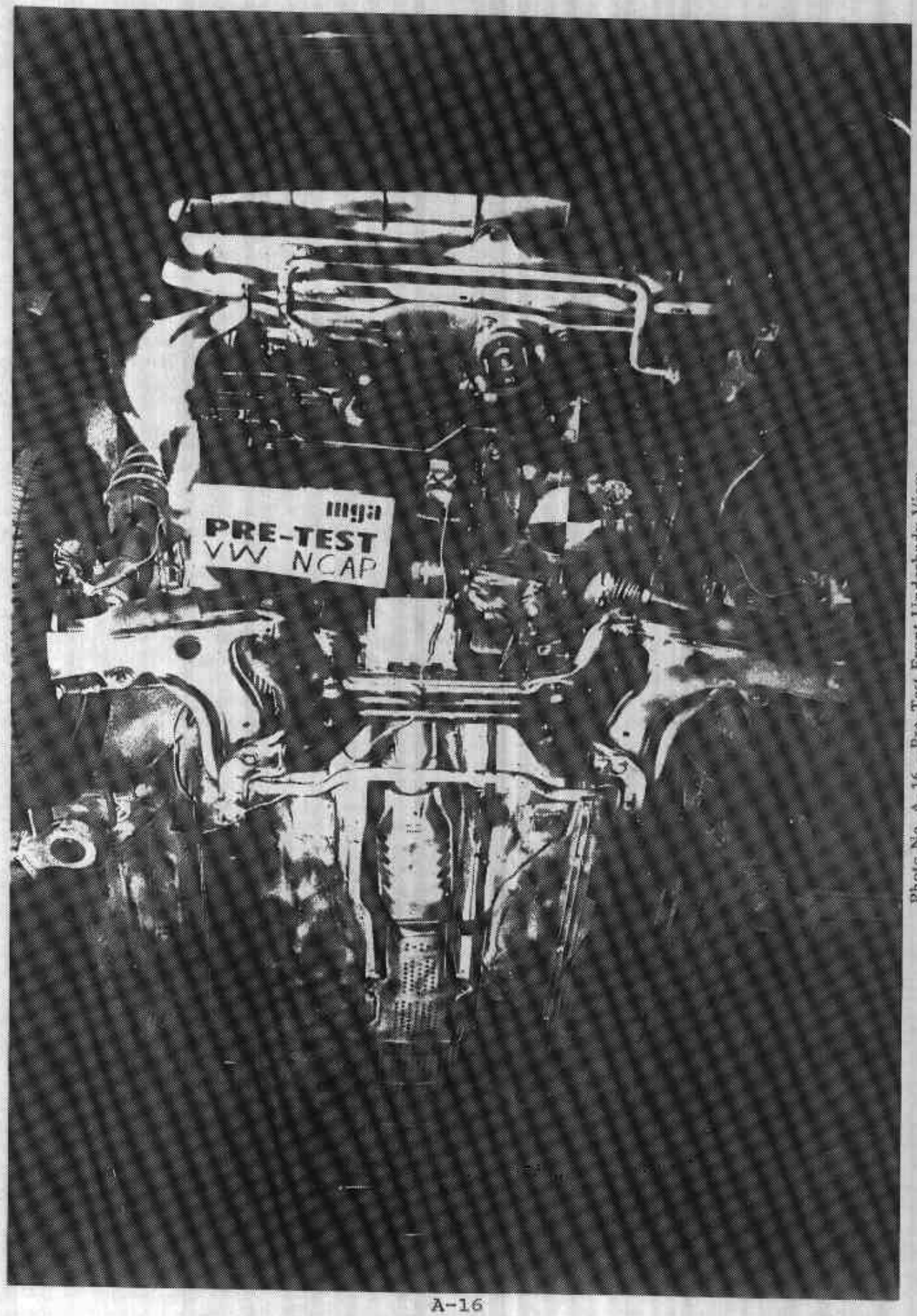


Photo No. A-16 - Pre-Test Front Underbody View

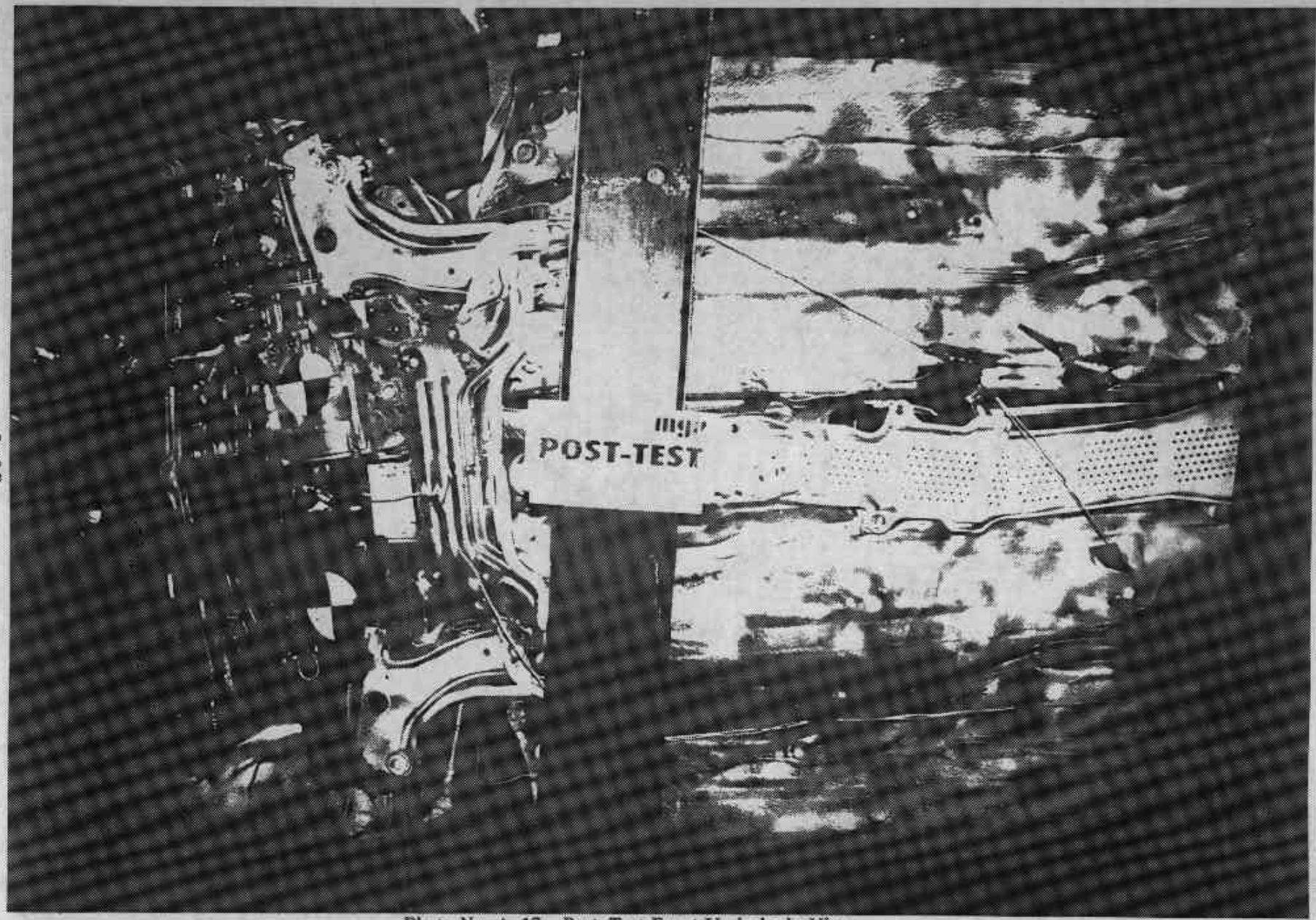


Photo No. A-17 - Post-Test Front Underbody View

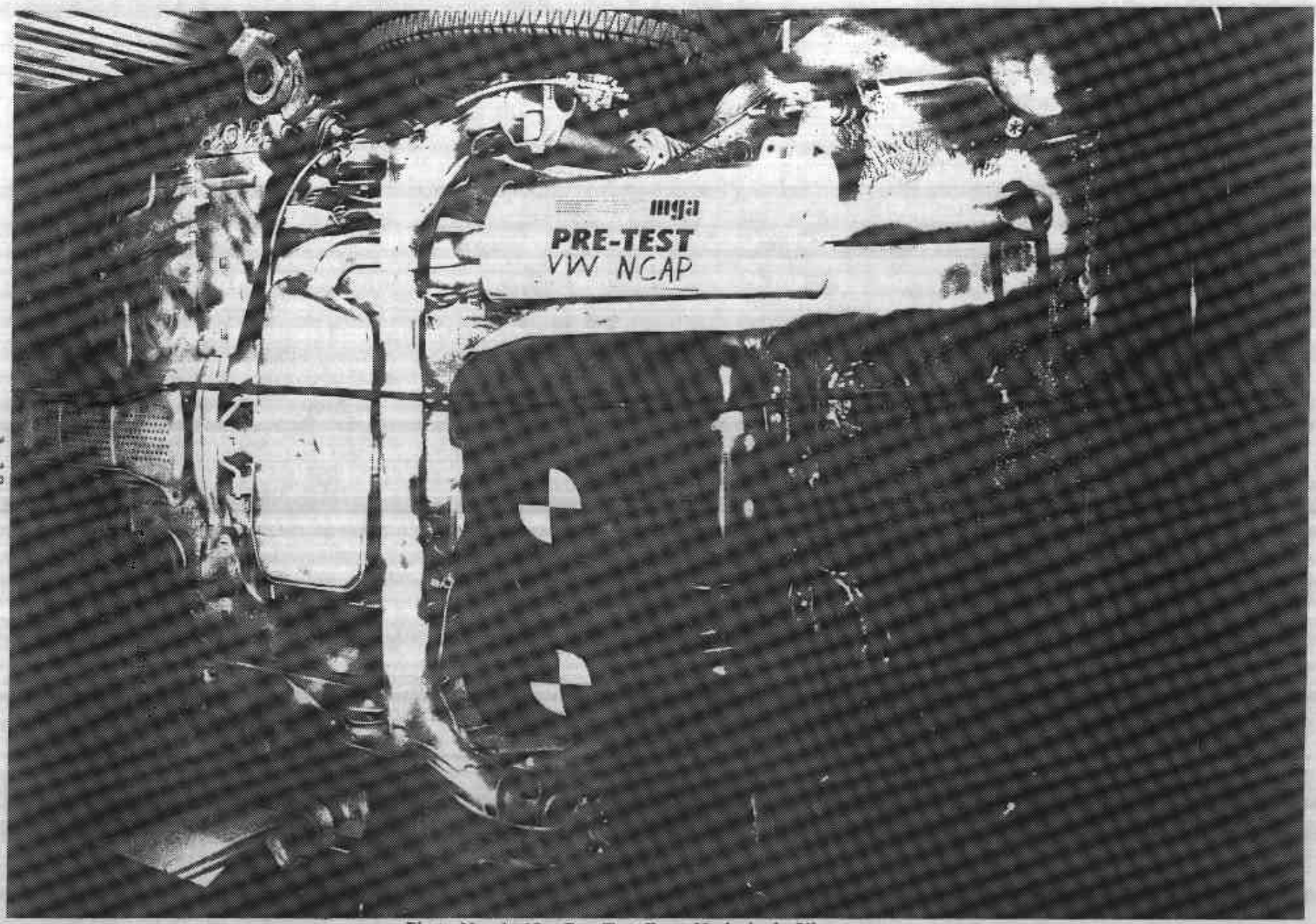
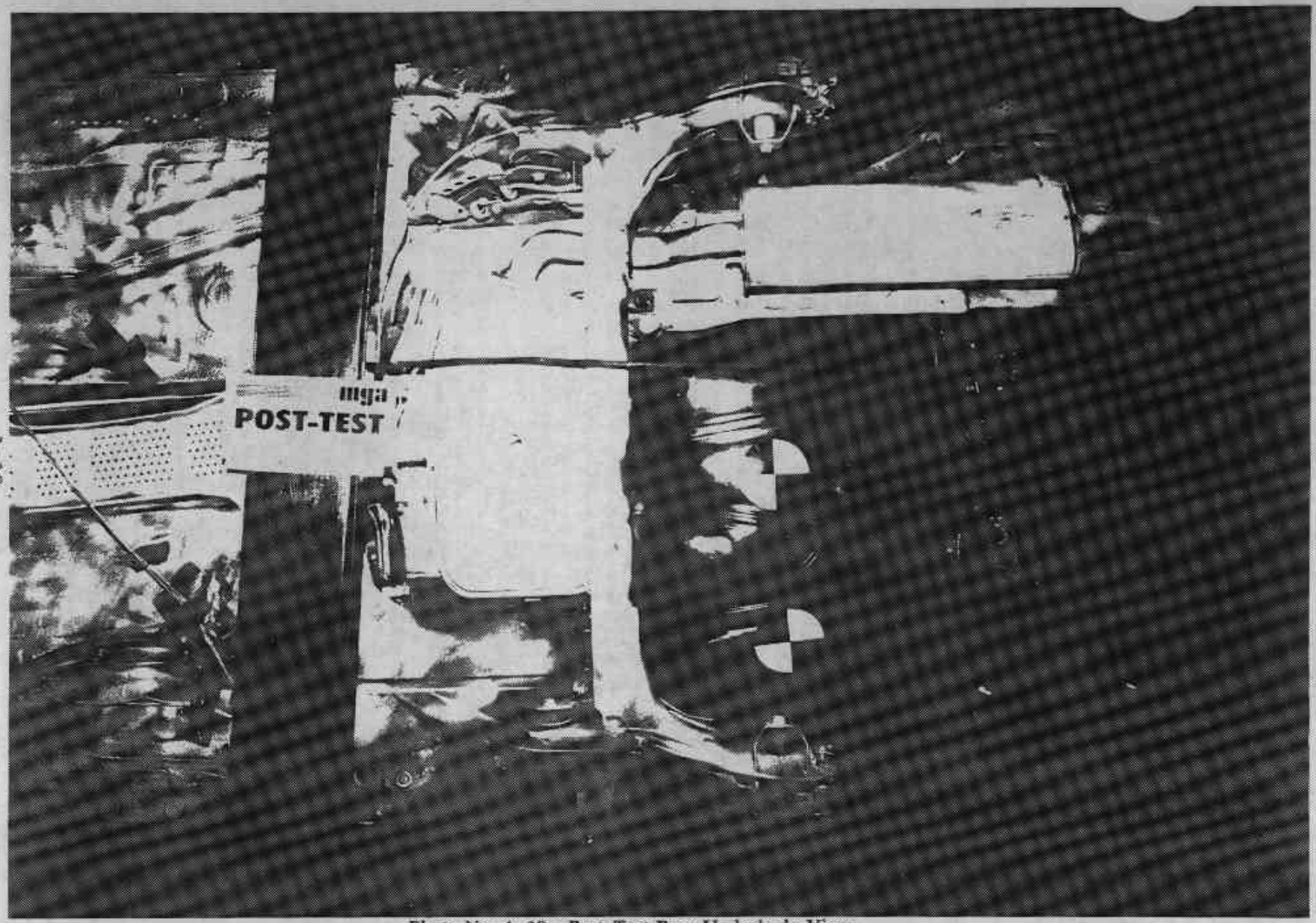


Photo No. A-18 - Pre-Test Rear Underbody View



A-19

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

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

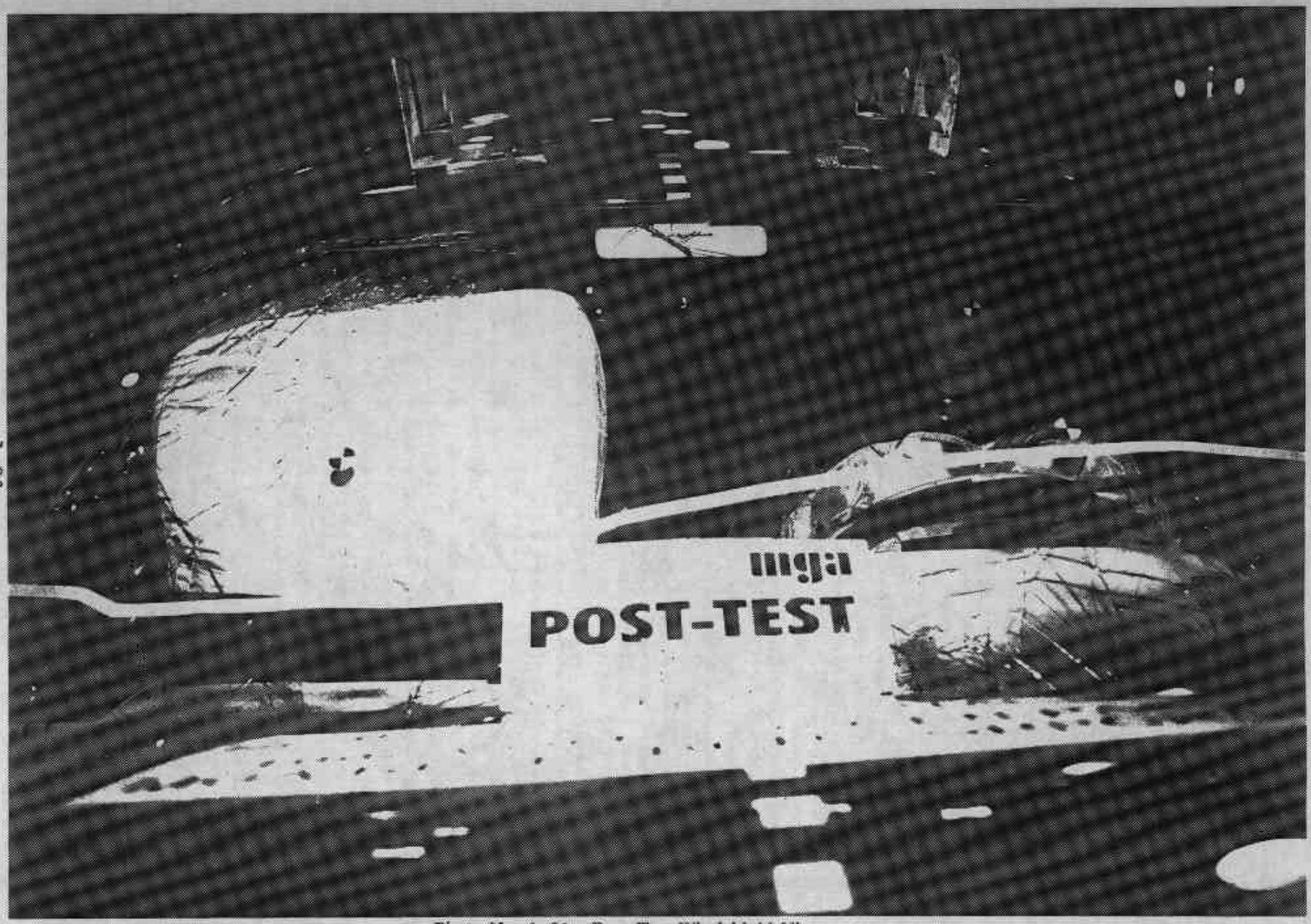
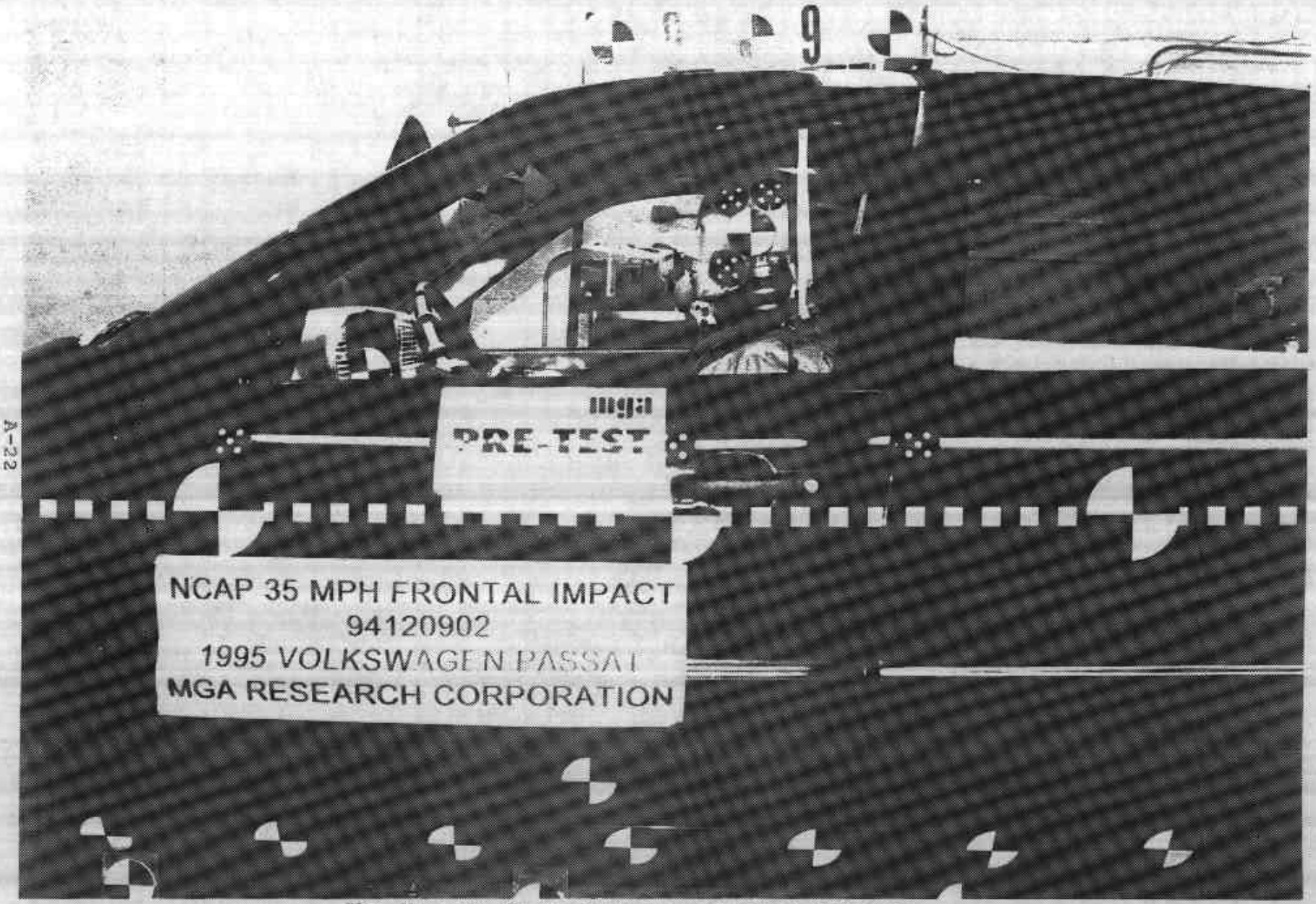


Photo No. A-21 - Post-Test Windshield View



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

A-24

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

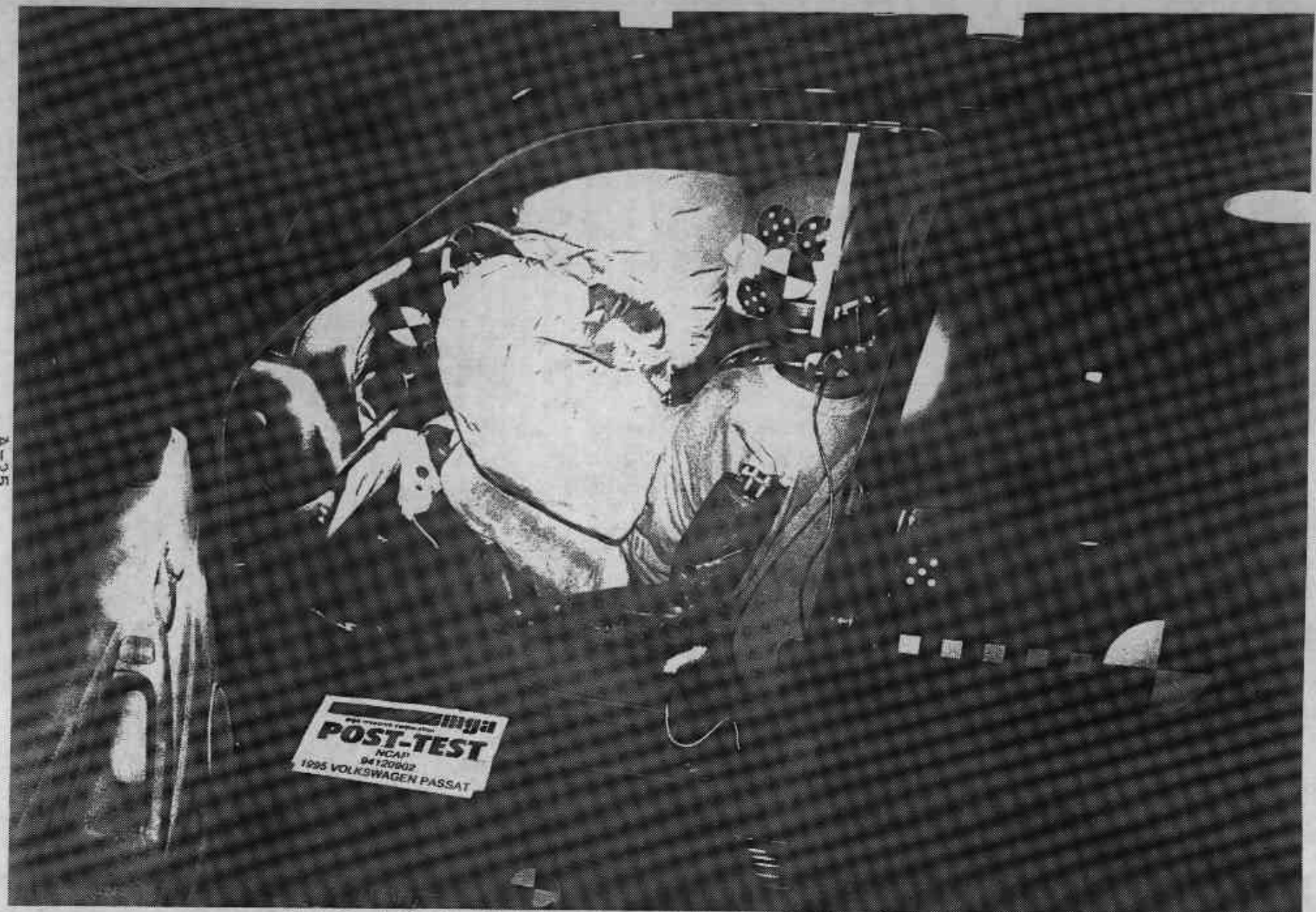


Photo No. A-25 - Post-Test Driver Dummy Position Left Side View (Door Open)

A-26

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

A-27

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

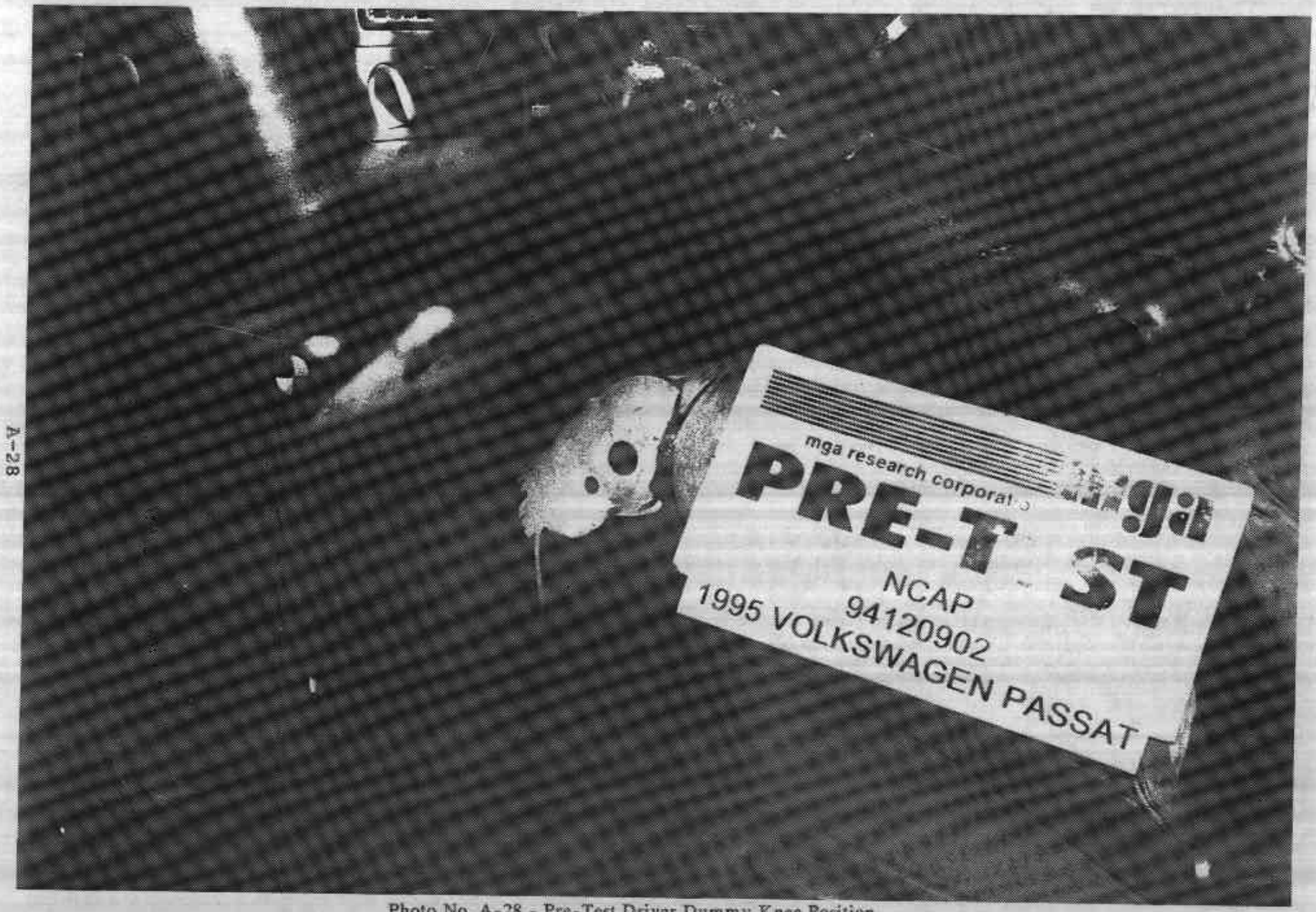


Photo No. A-28 - Pre-Test Driver Dummy Knee Position

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

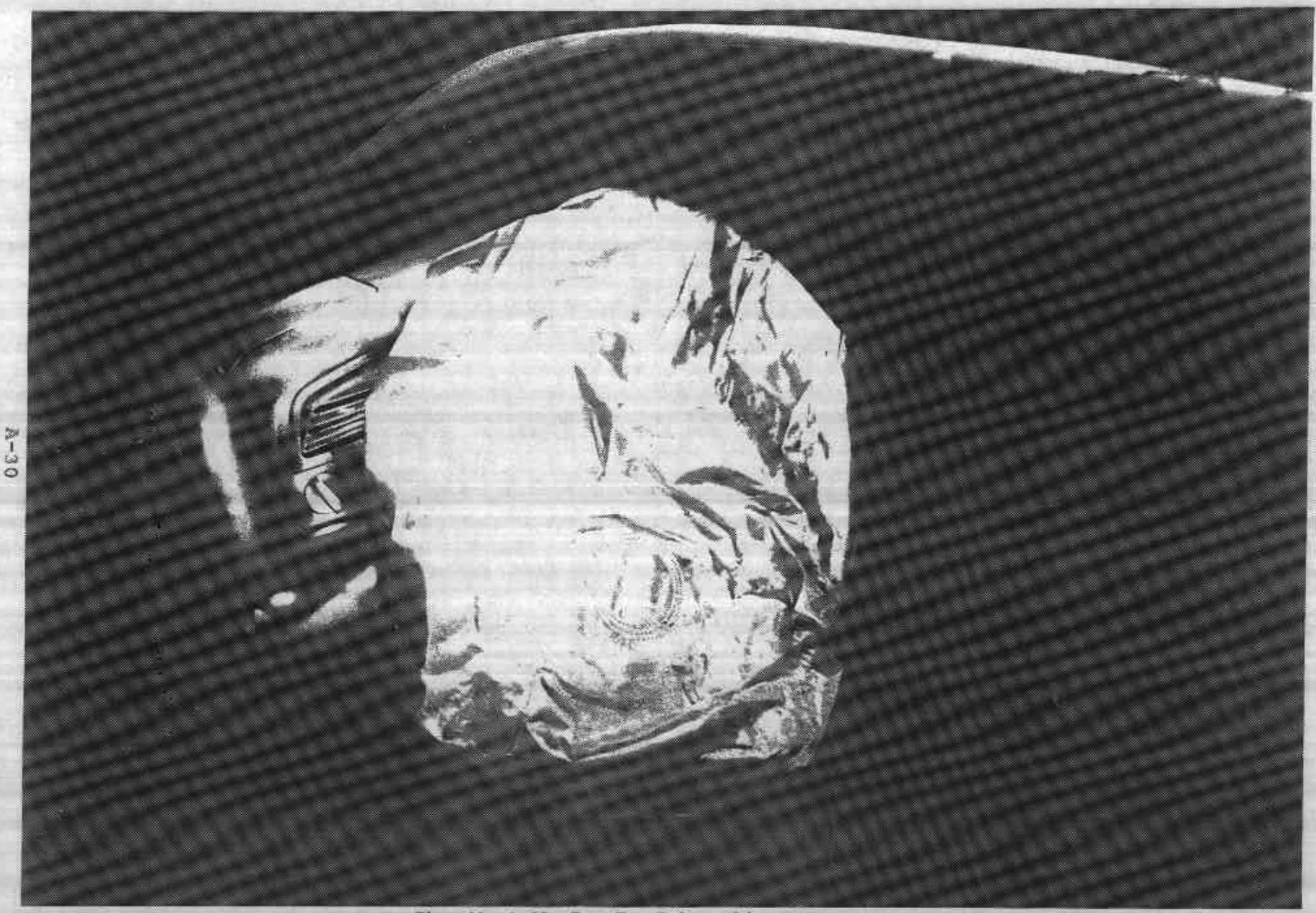


Photo No. A-30 - Post-Test Driver Airbag Contact

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

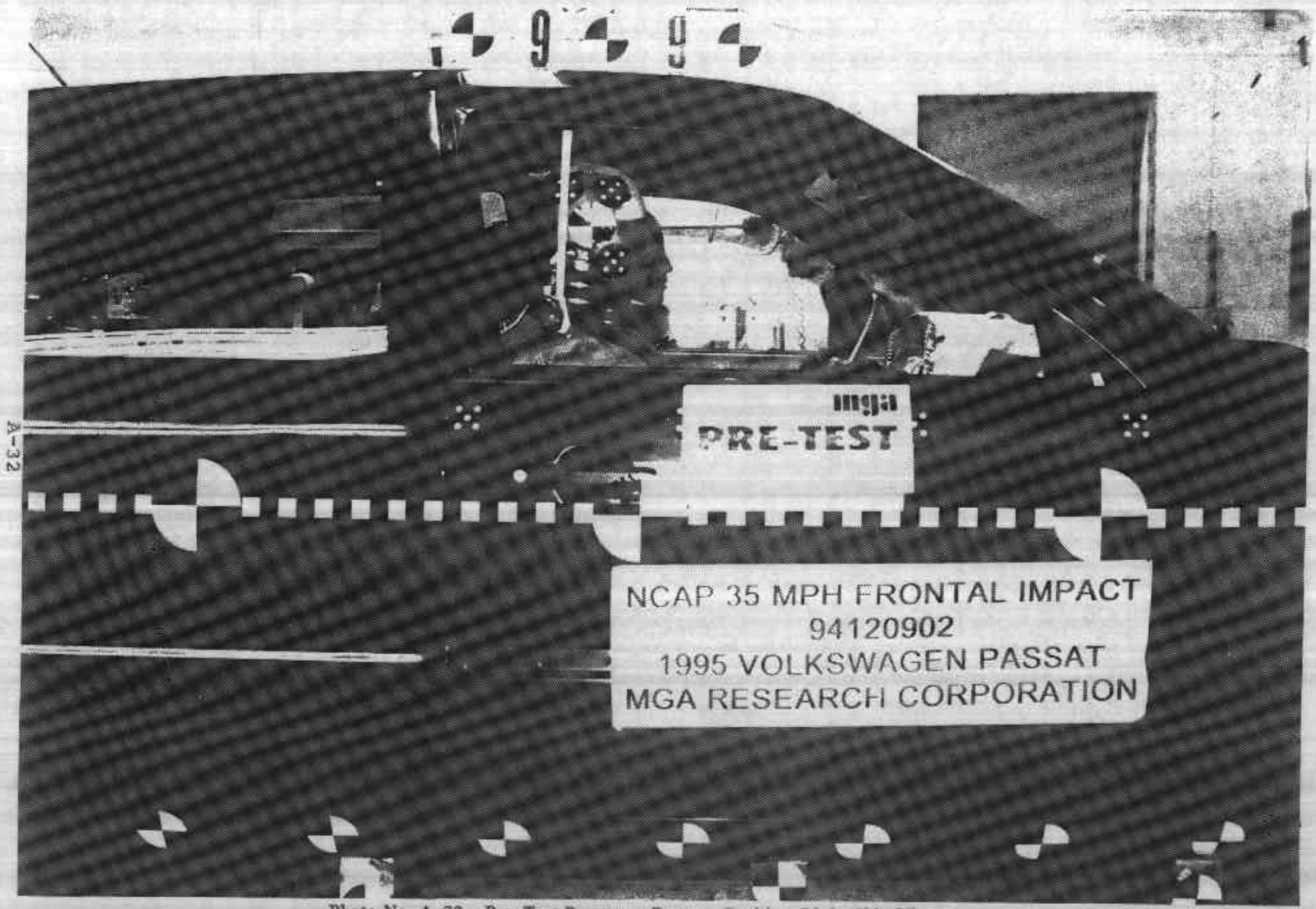
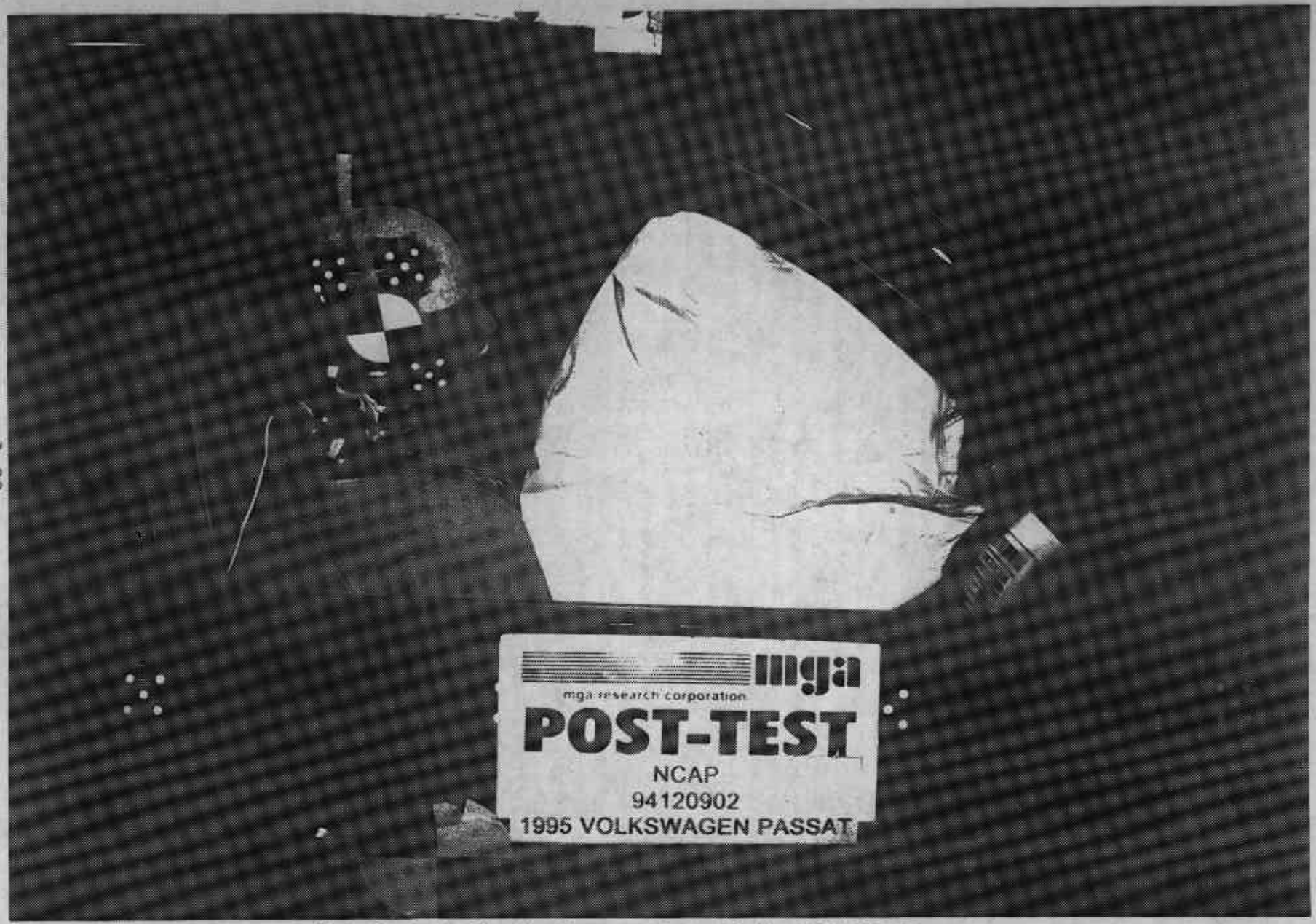
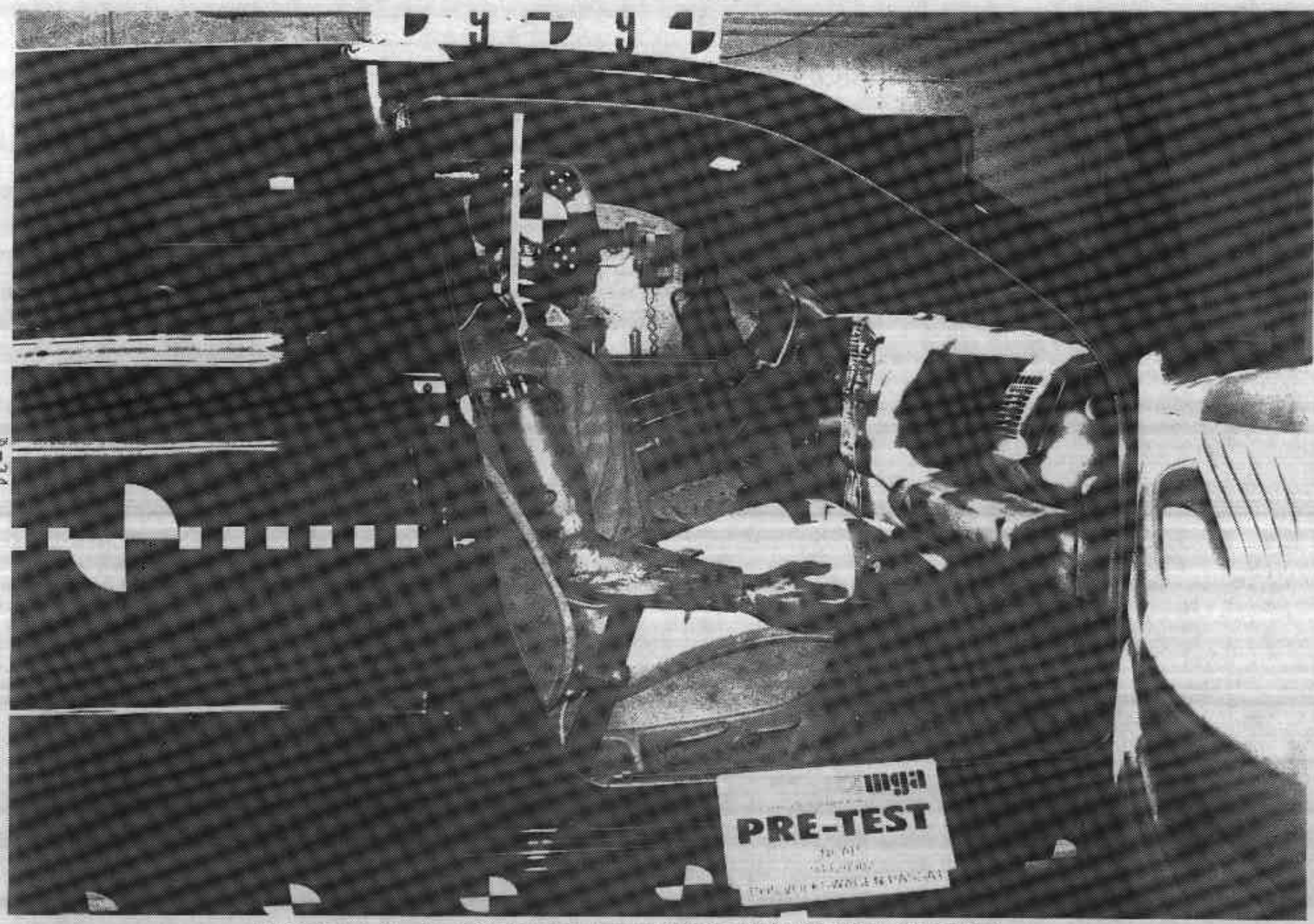


Photo No. A-32 - Pre-Test Passenger Dummy Position Right Side View



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)

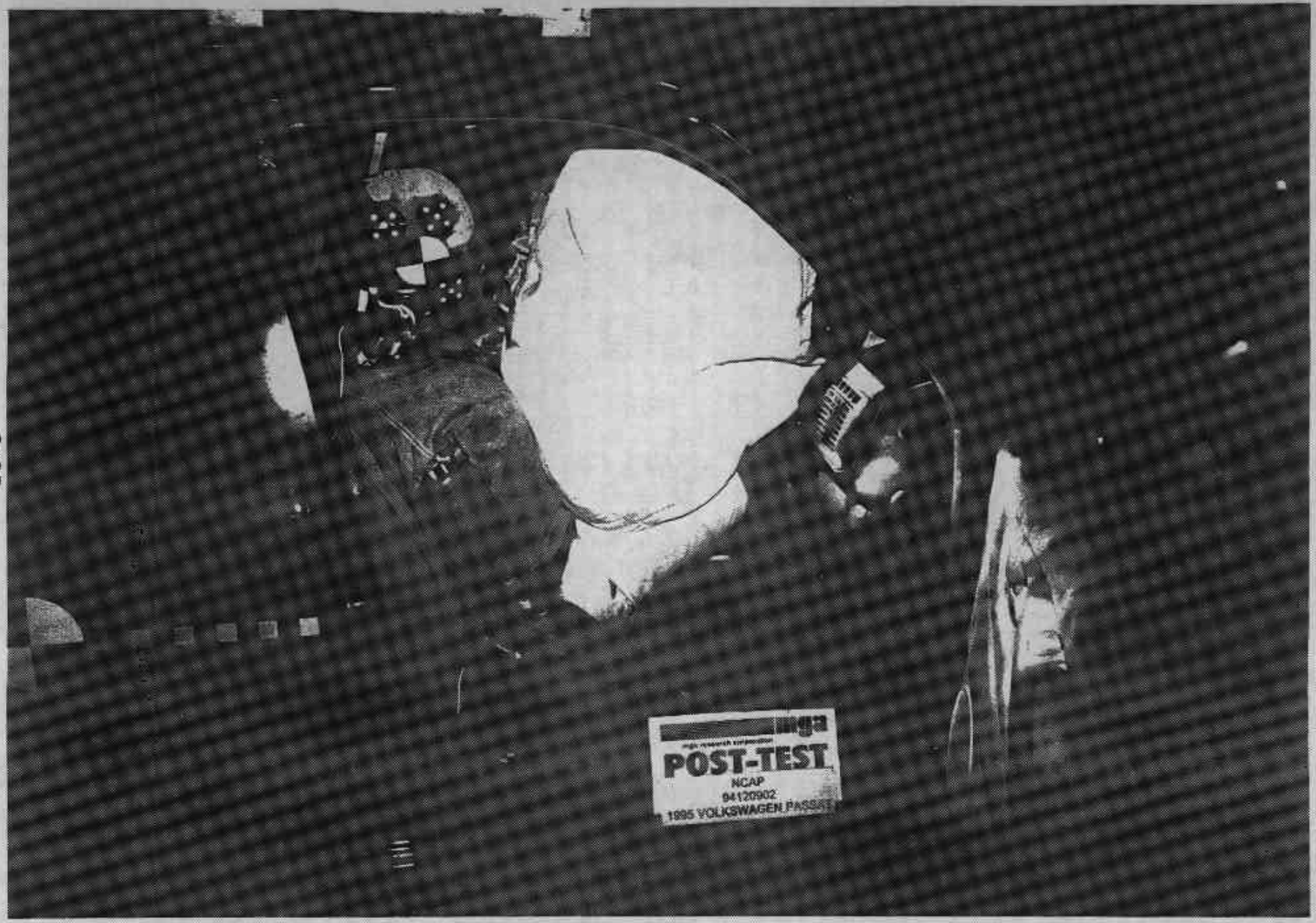


Photo No. A-35 - Post-Test Passenger Dummy Position Right Side View (Door Open)

A-36

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

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

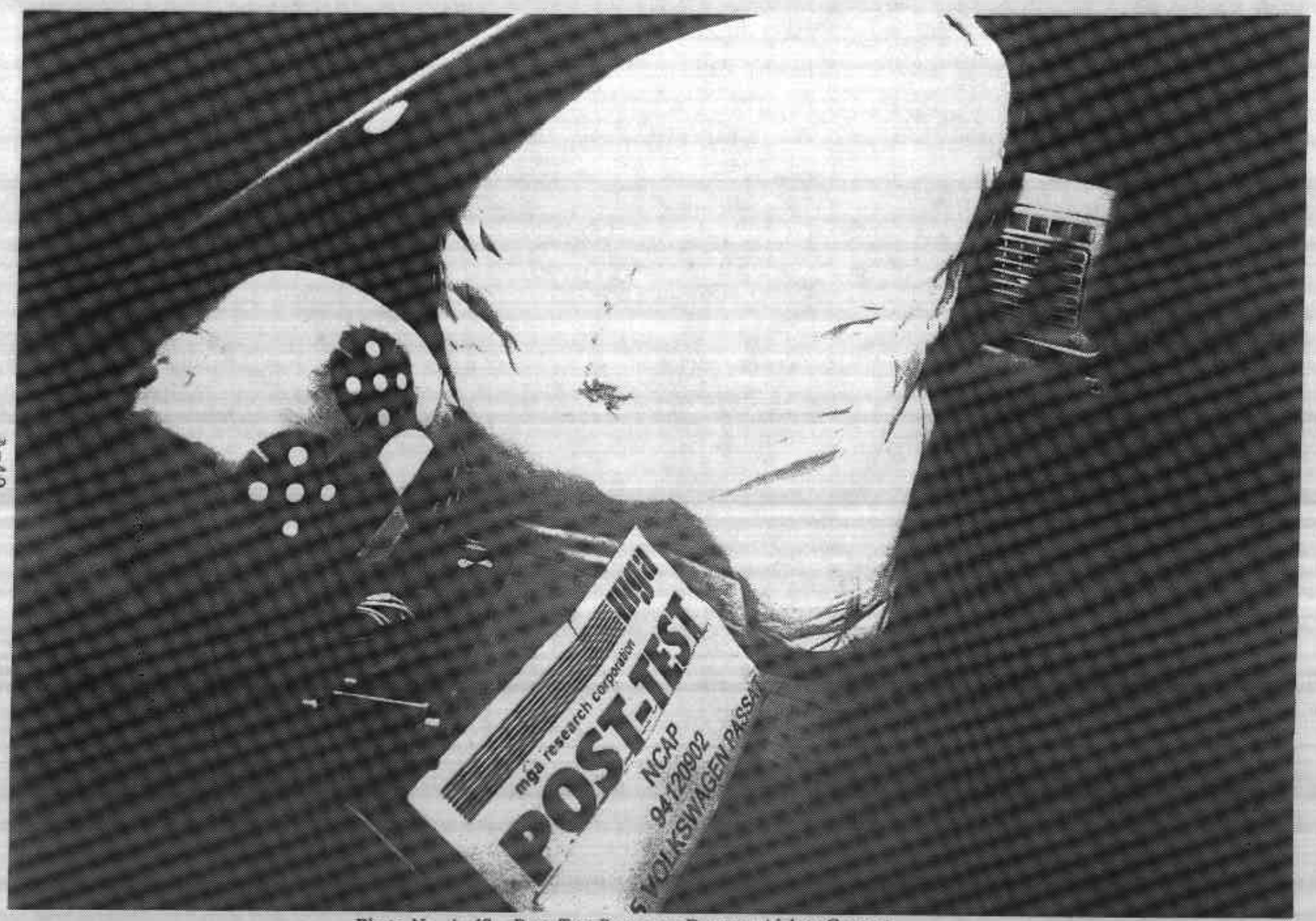
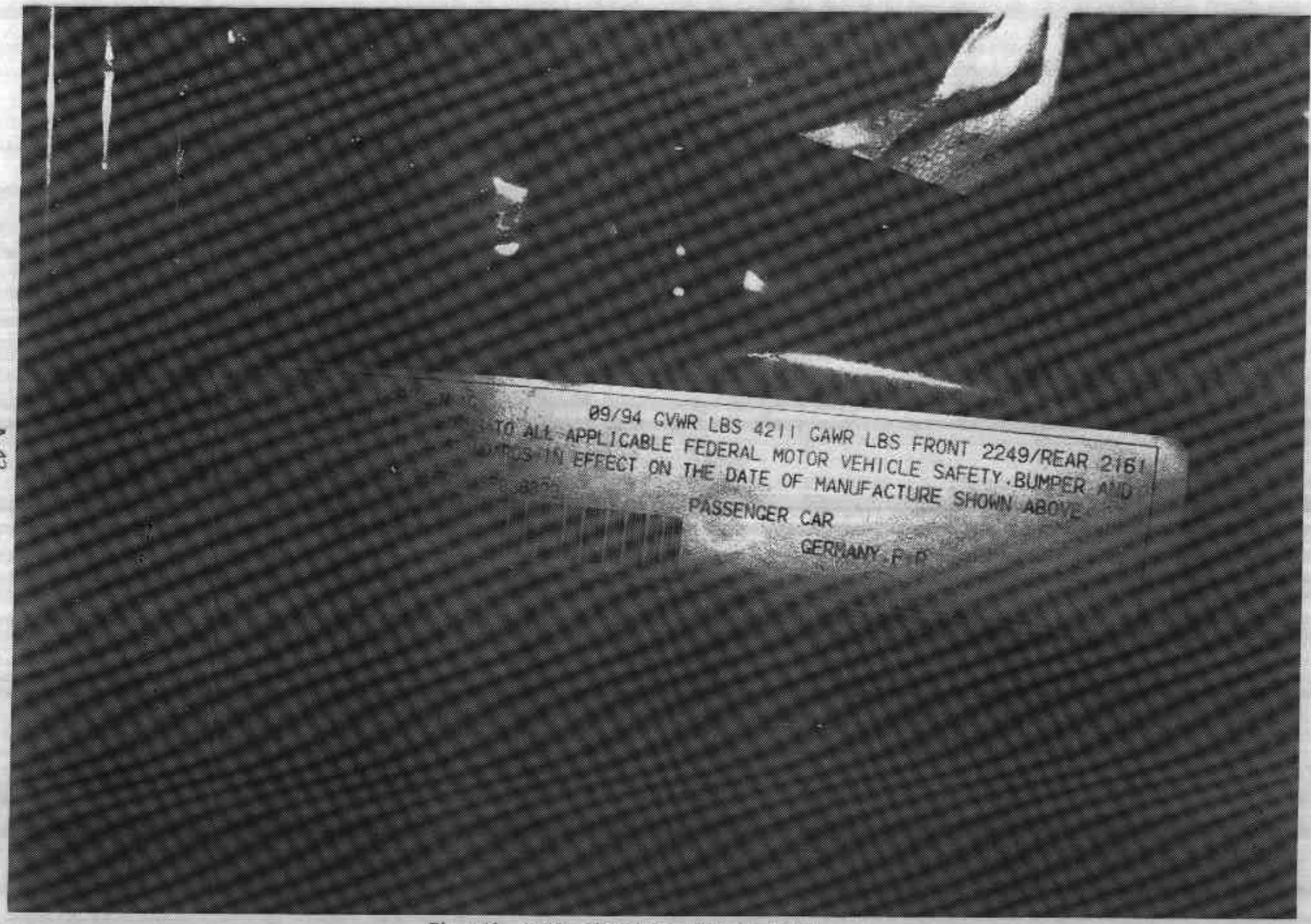


Photo No. A-48 - Post-Test Passenger Dummy Airbag Contact

A-41

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



A-42

Photo No. A-42 - Vehicle Certification Label

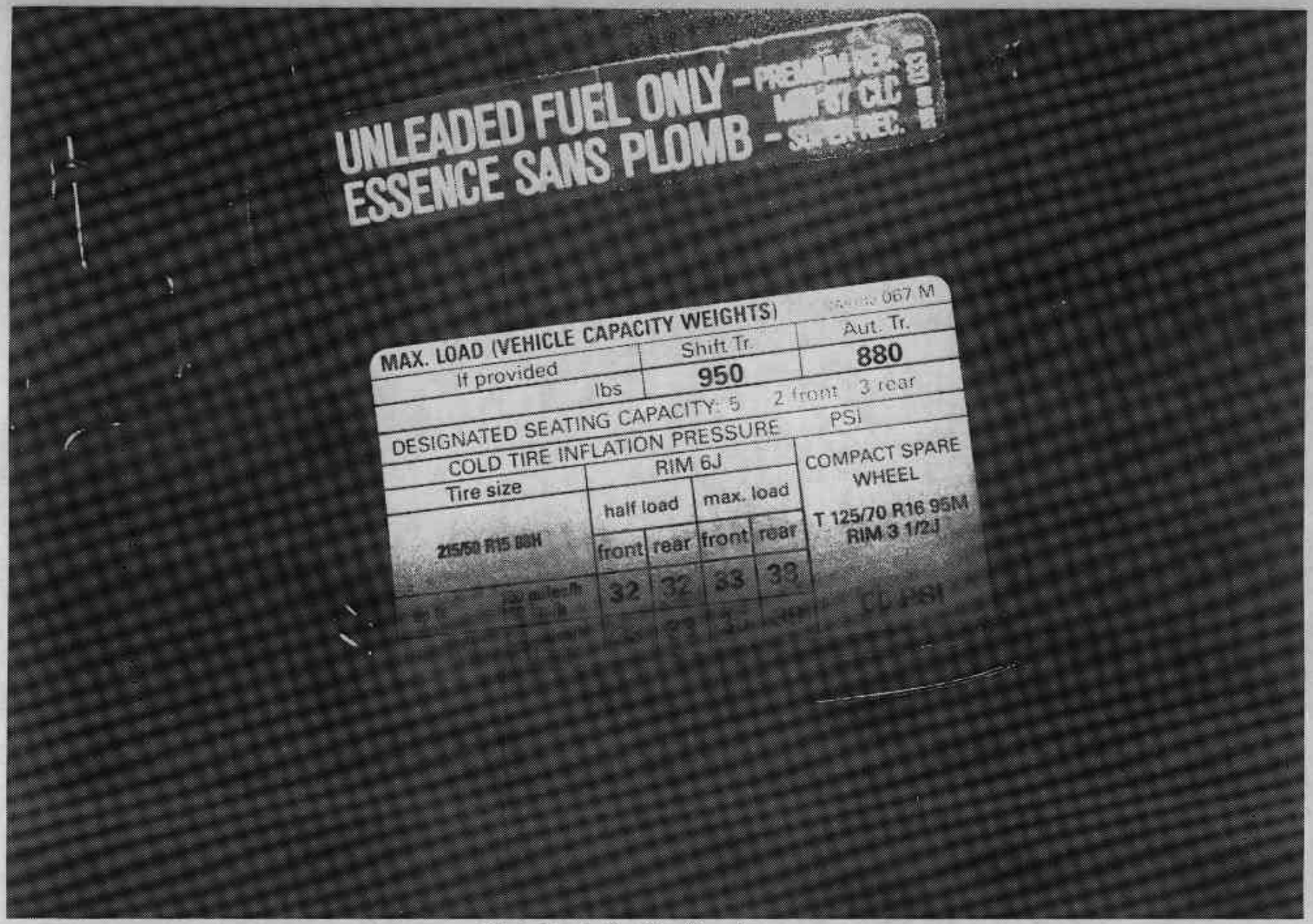
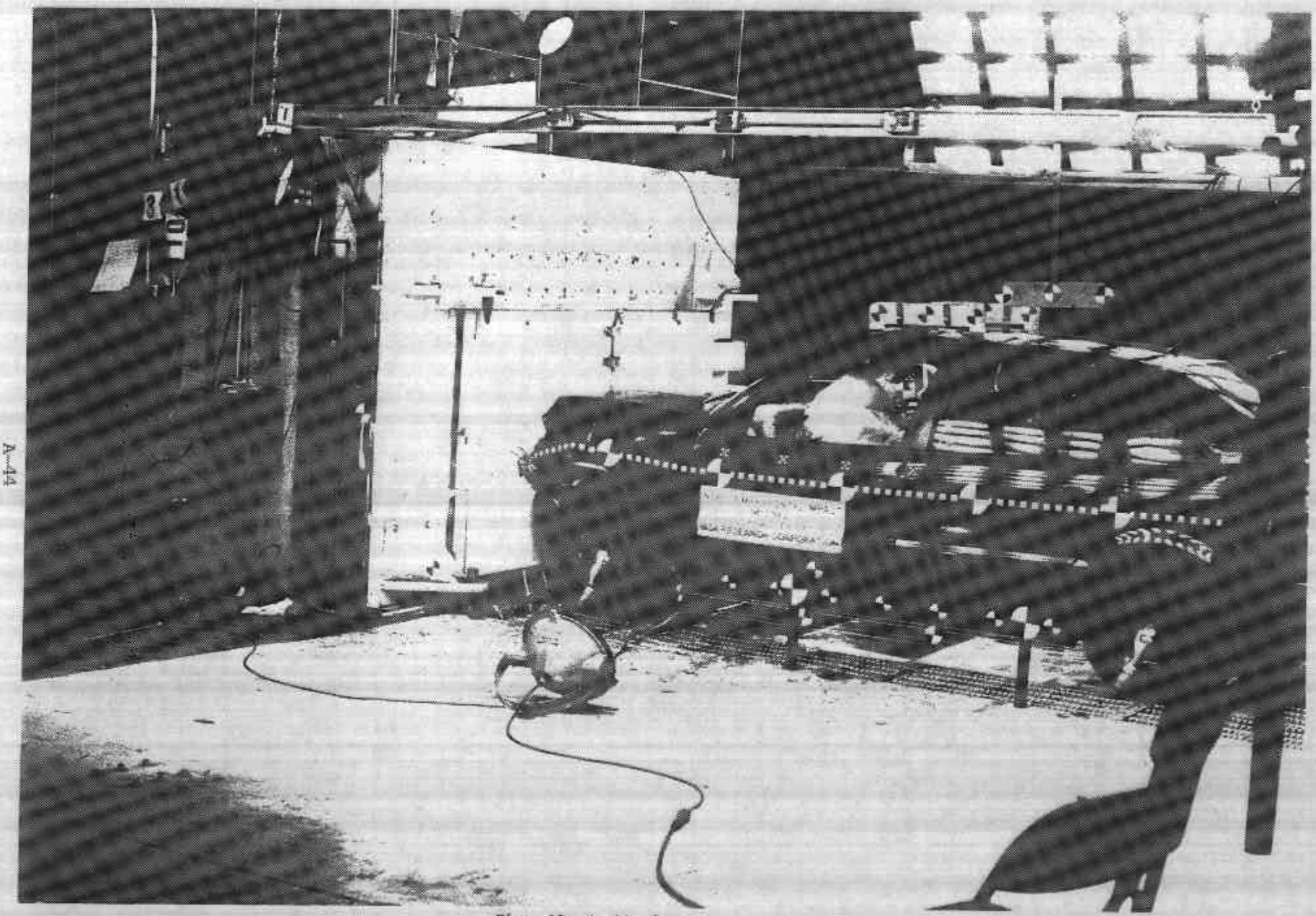


Photo No. A-43 - Tire Placard



A-44

Photo No. A-44 - Impact

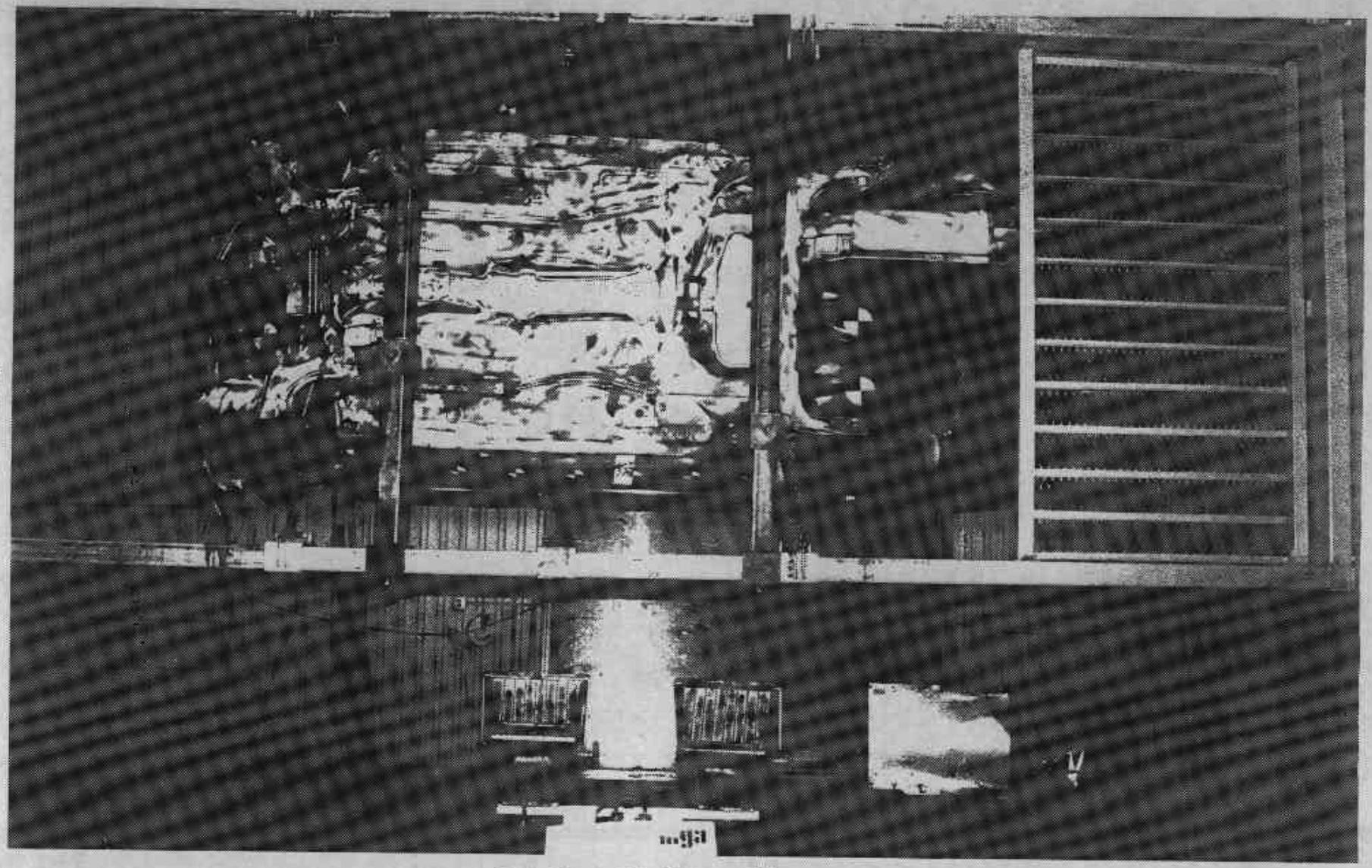


Photo No. A-45 - Rollover 90°

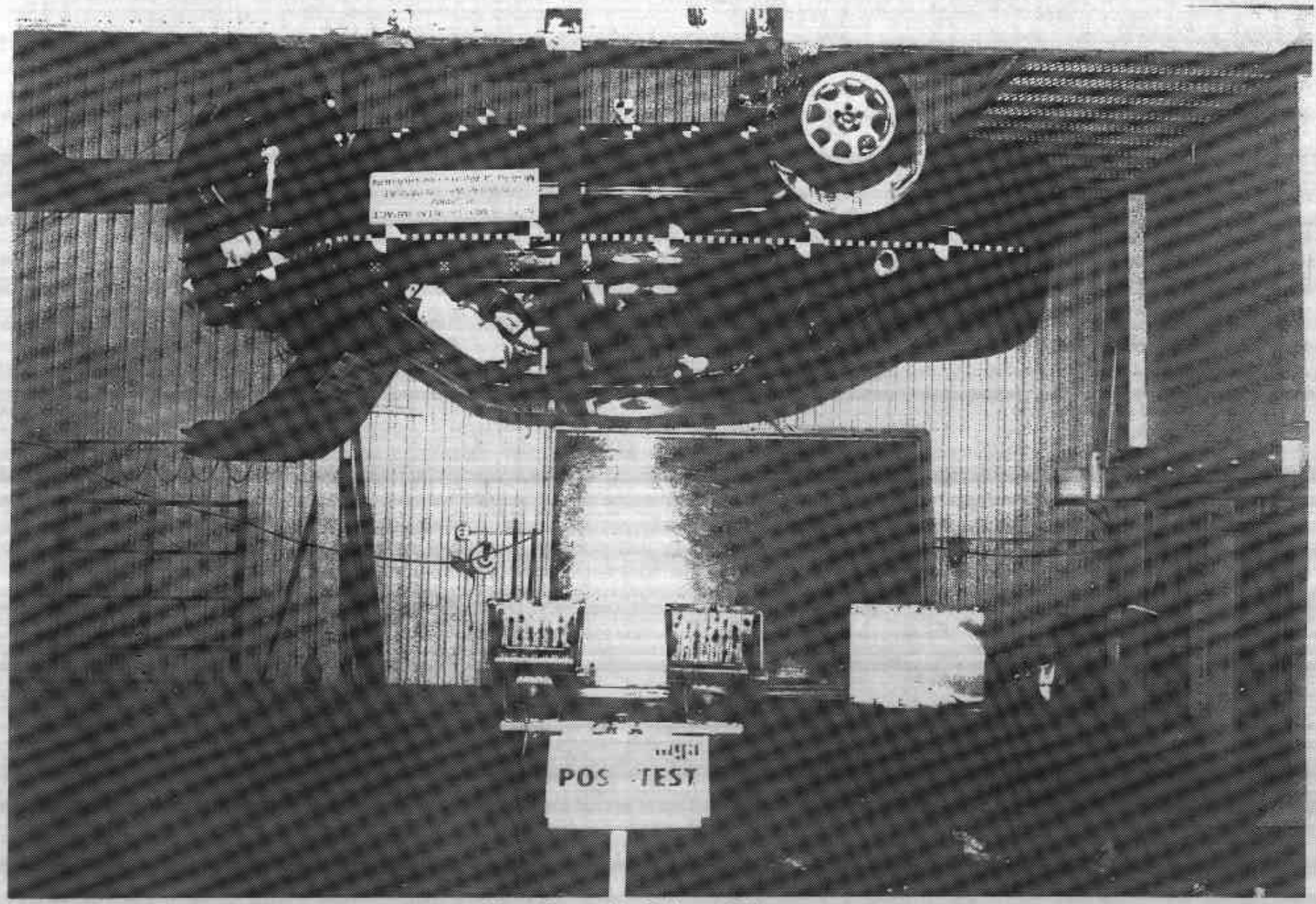


Photo No. A-46 - Rollover 180°

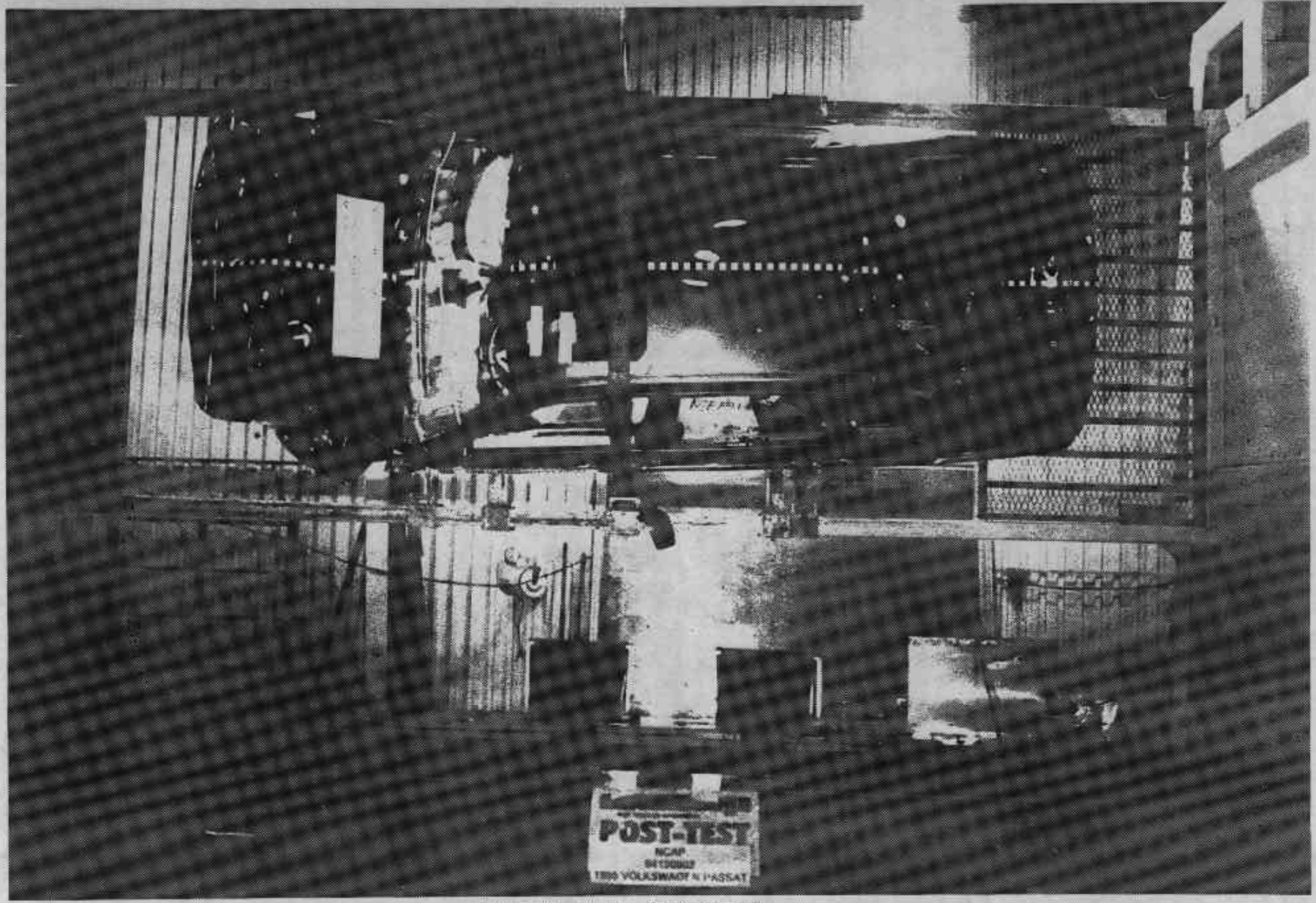


Photo No. A-47 - Rollover 270°

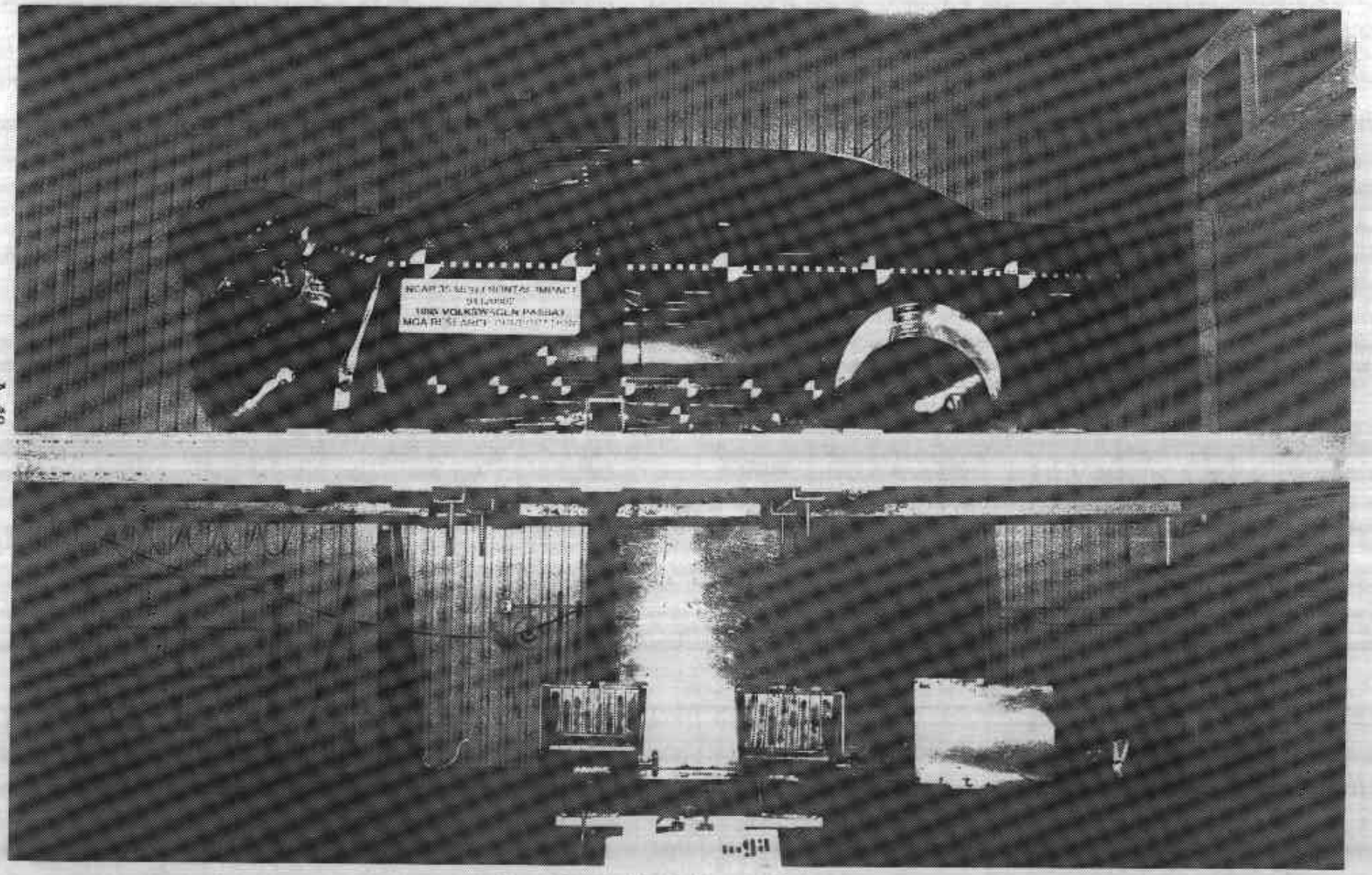


Photo No. A-48 - Rollover 360°

APPENDIX B

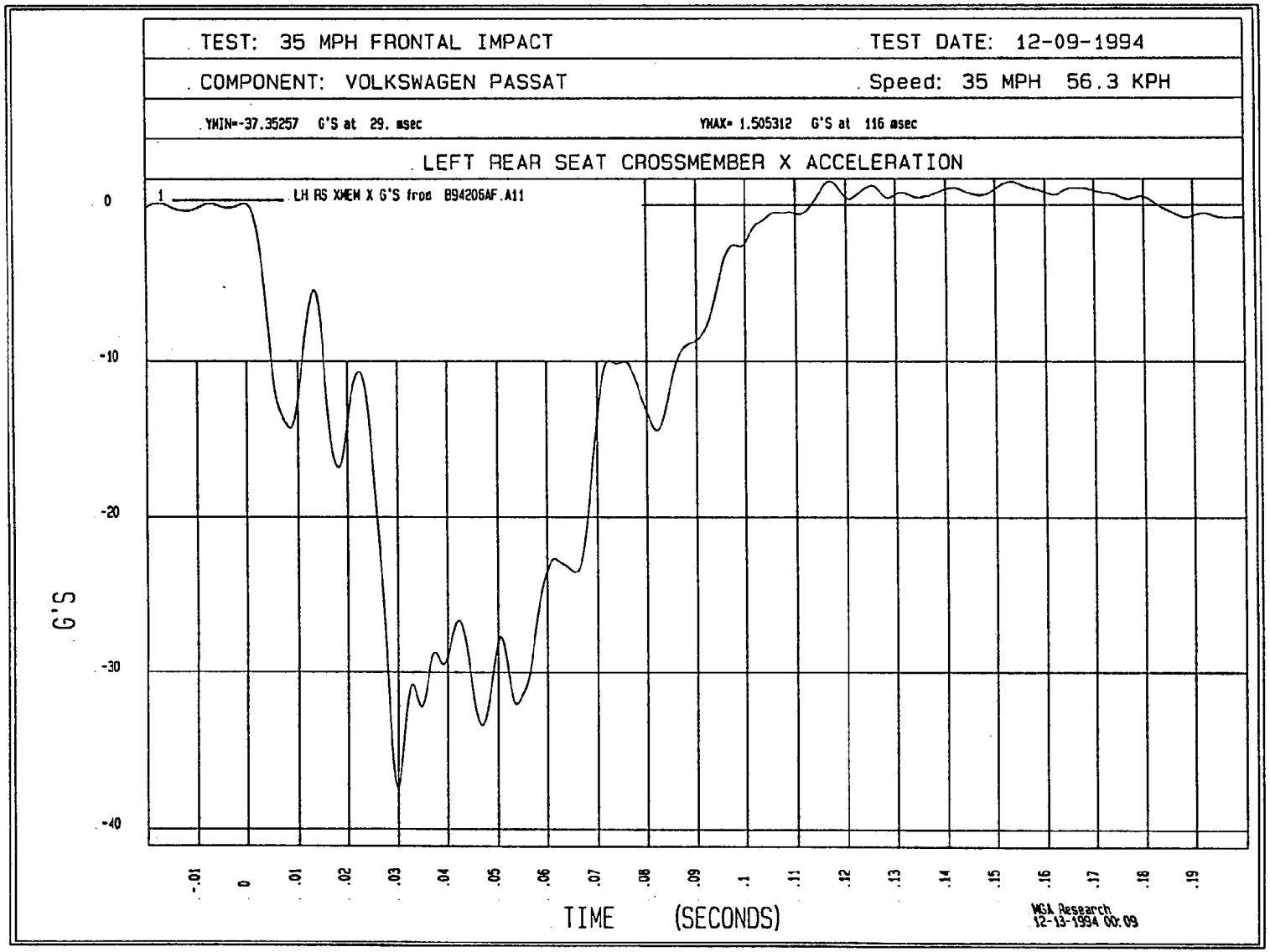
Vehicle, Load Cell Barrier and Dummy Response Data

1995 Volkswagen Passat 4-Door

VEHICLE DATA		FILTER CHANNEL CLASS
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)

* No valid data collected

* No valid data collected



B-1

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

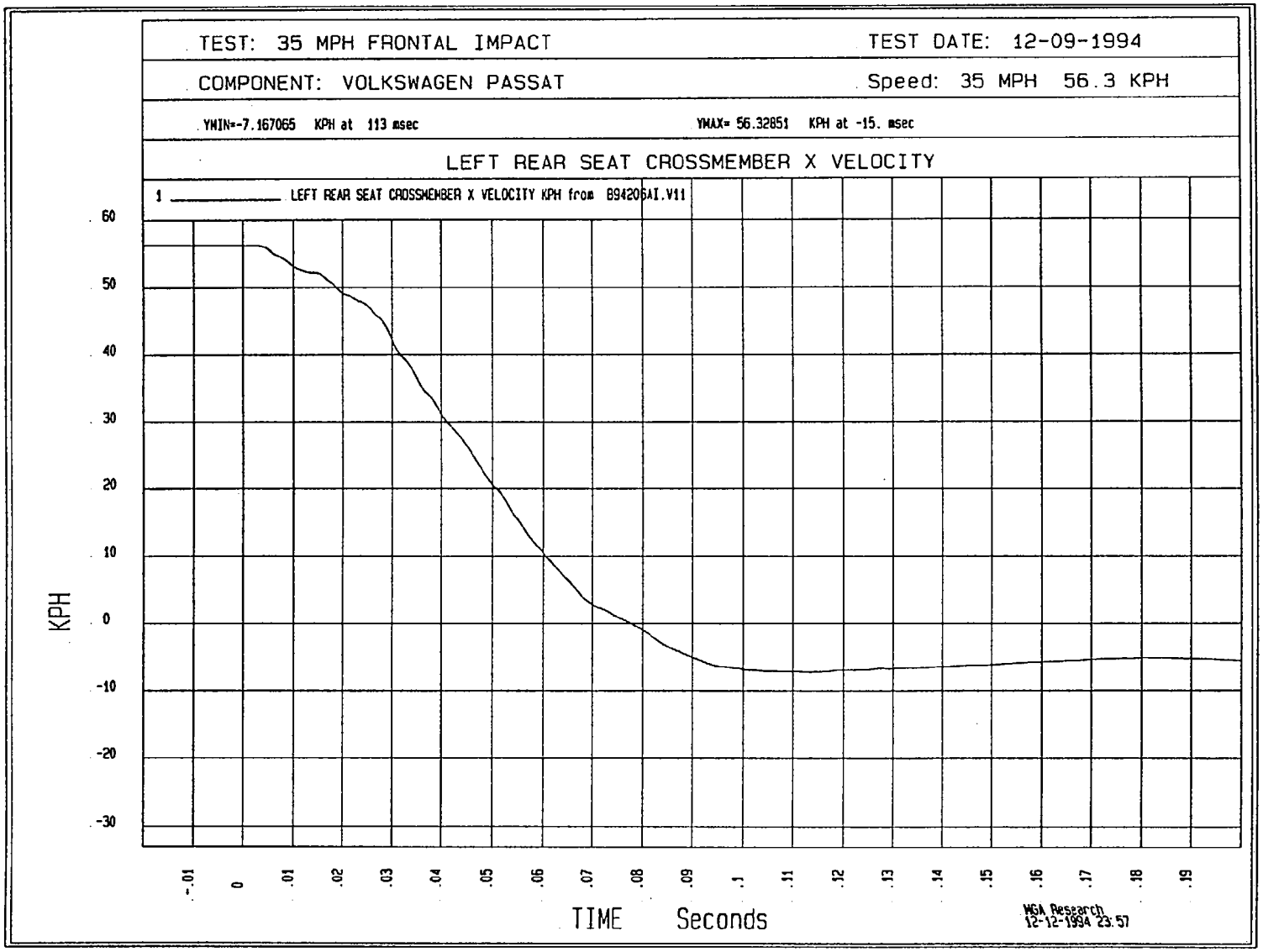


Figure B-2 - Left Rear Seat Crossmember X Velocity vs. Time

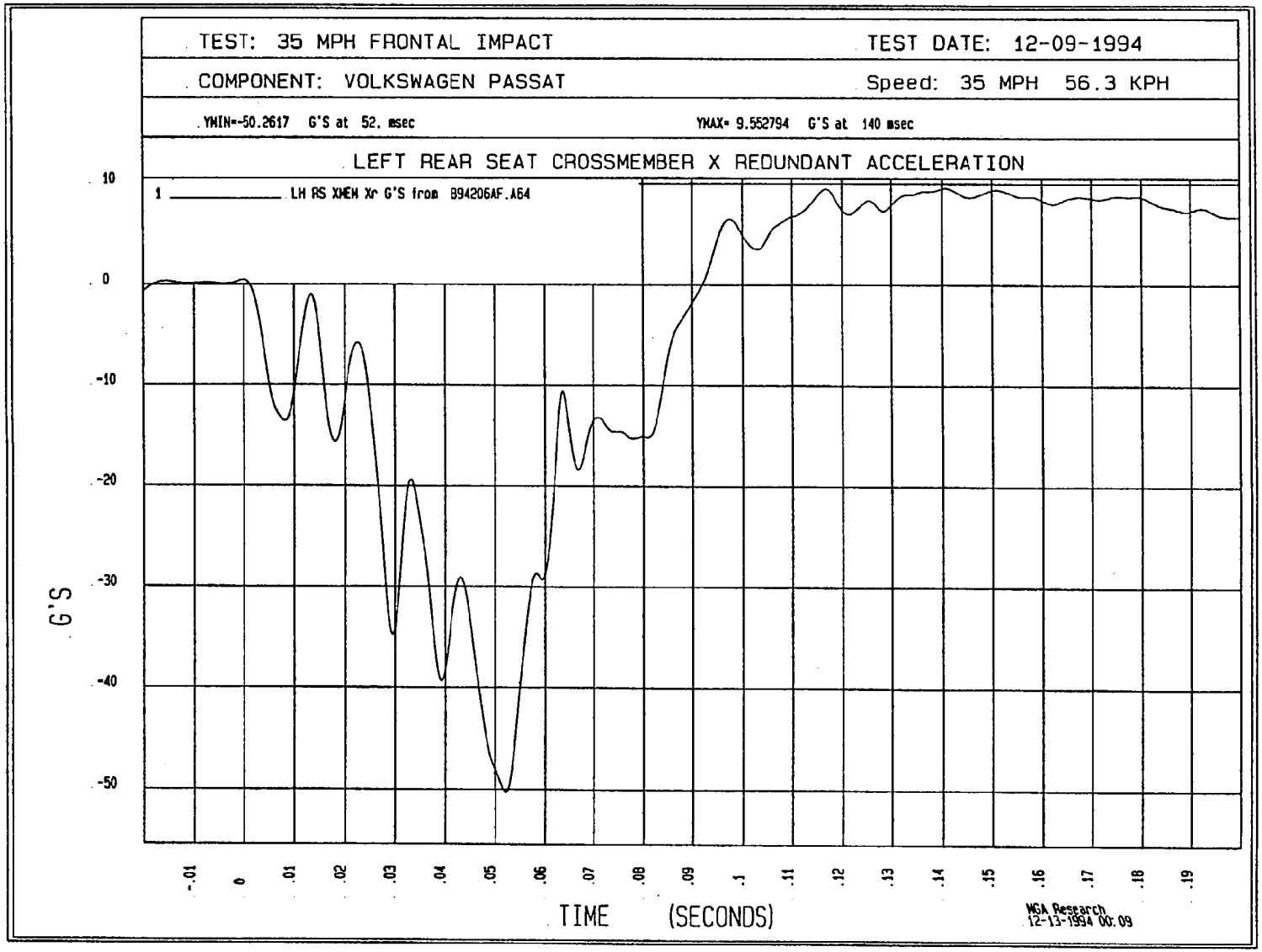


Figure B-3 - Left Rear Seat Crossmember X Redundant Acceleration vs. Time

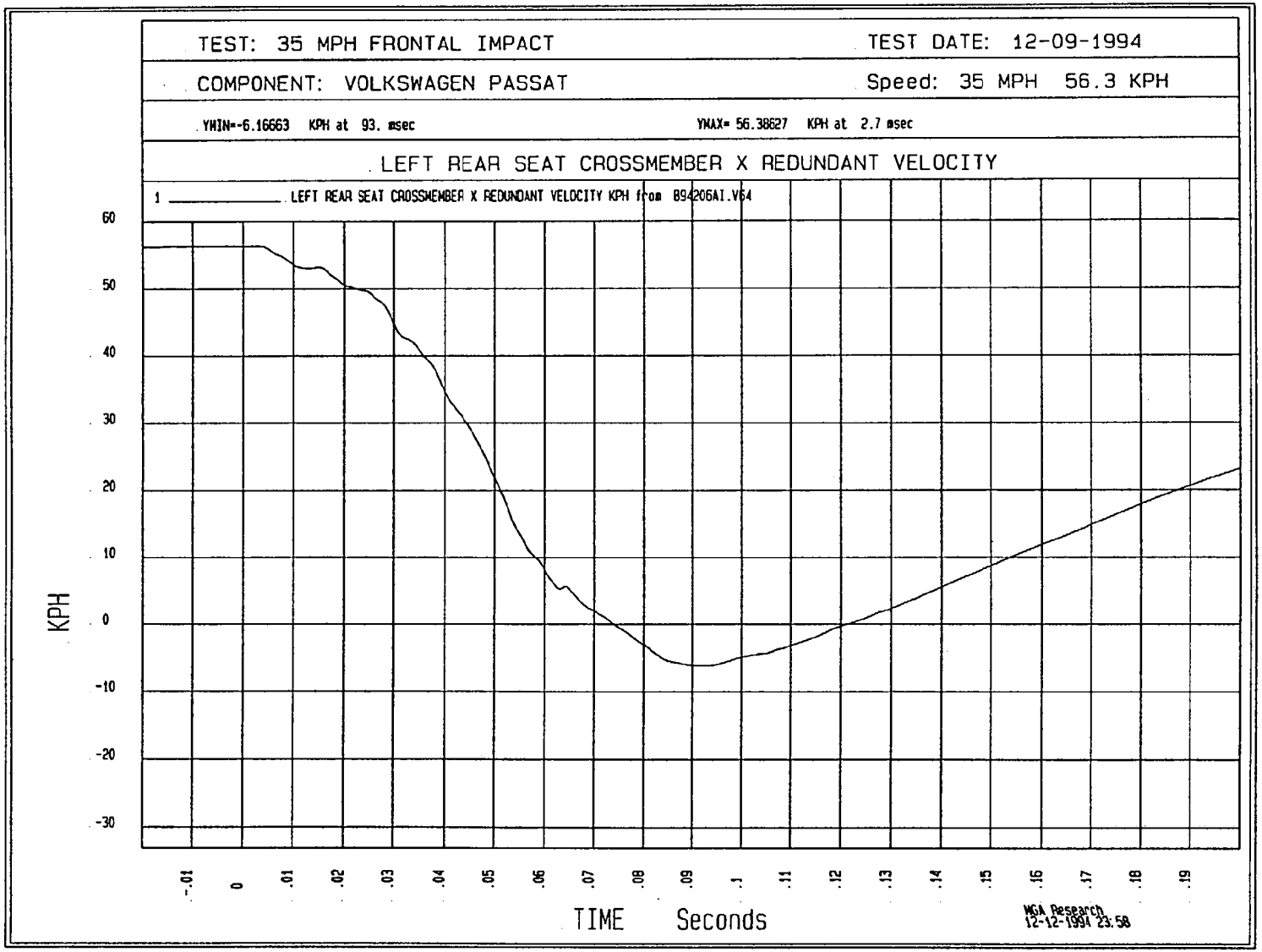
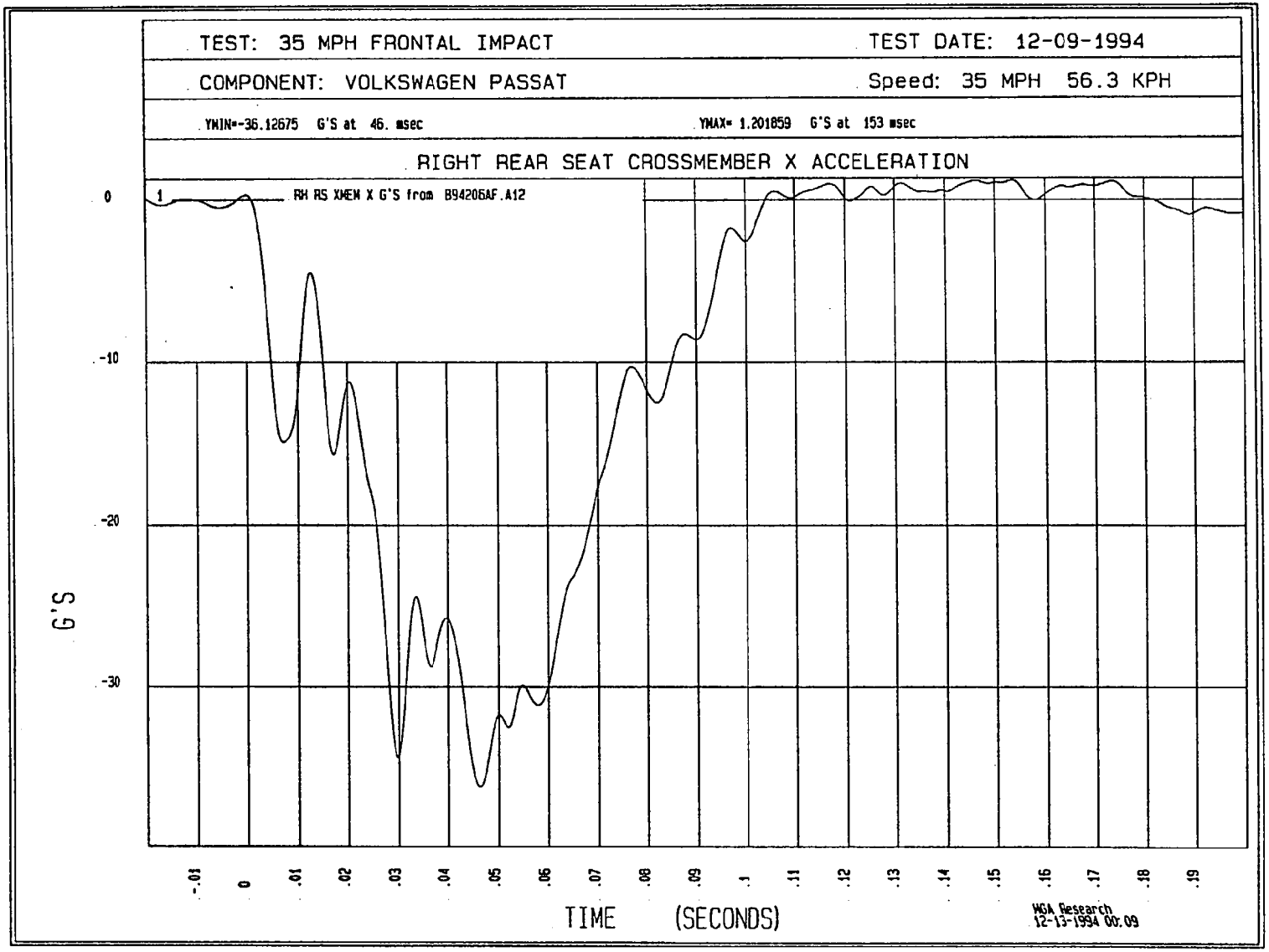


Figure B-4 - Left Rear Seat Crossmember X Redundant Velocity vs. Time



B-5

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

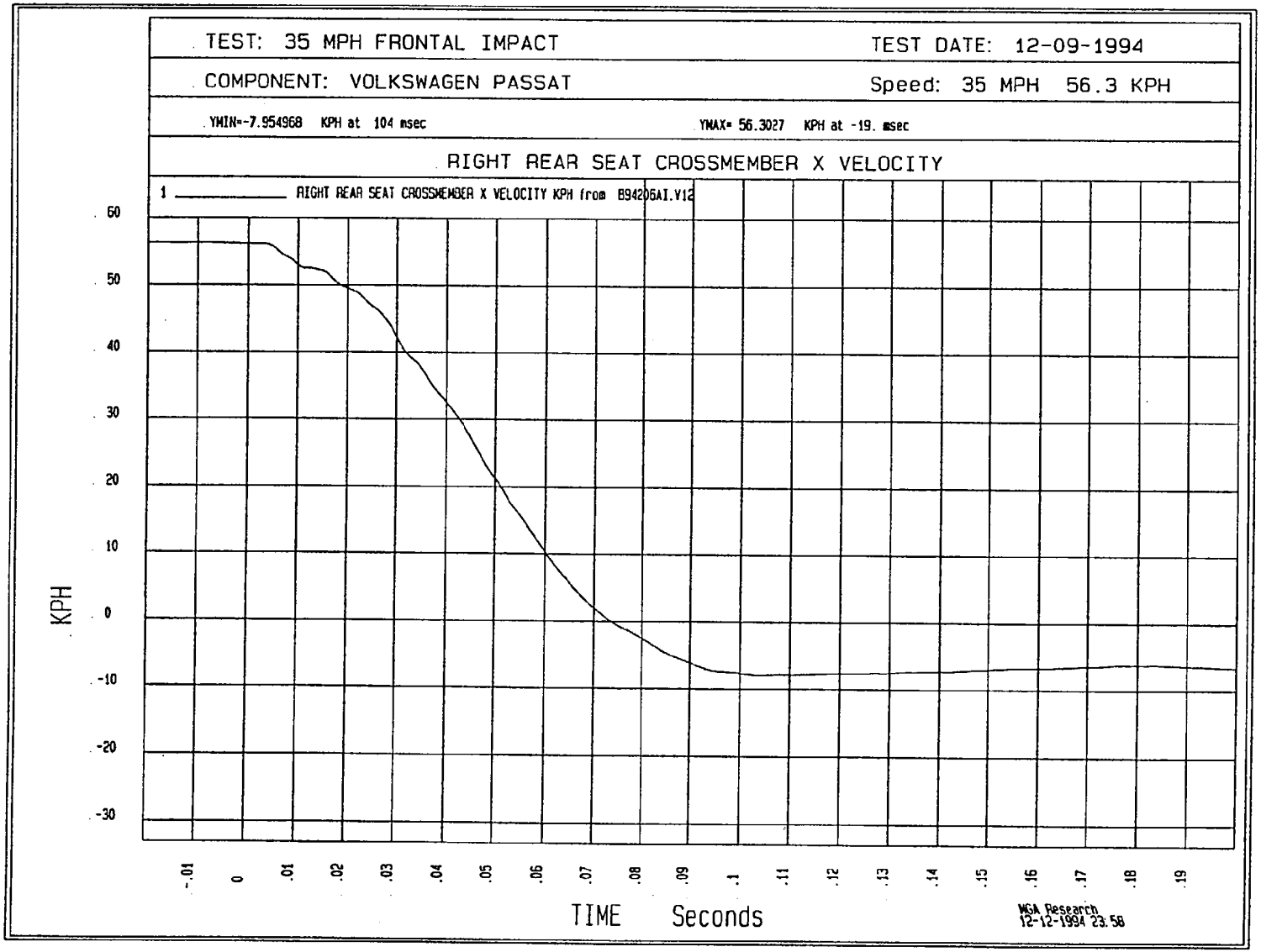
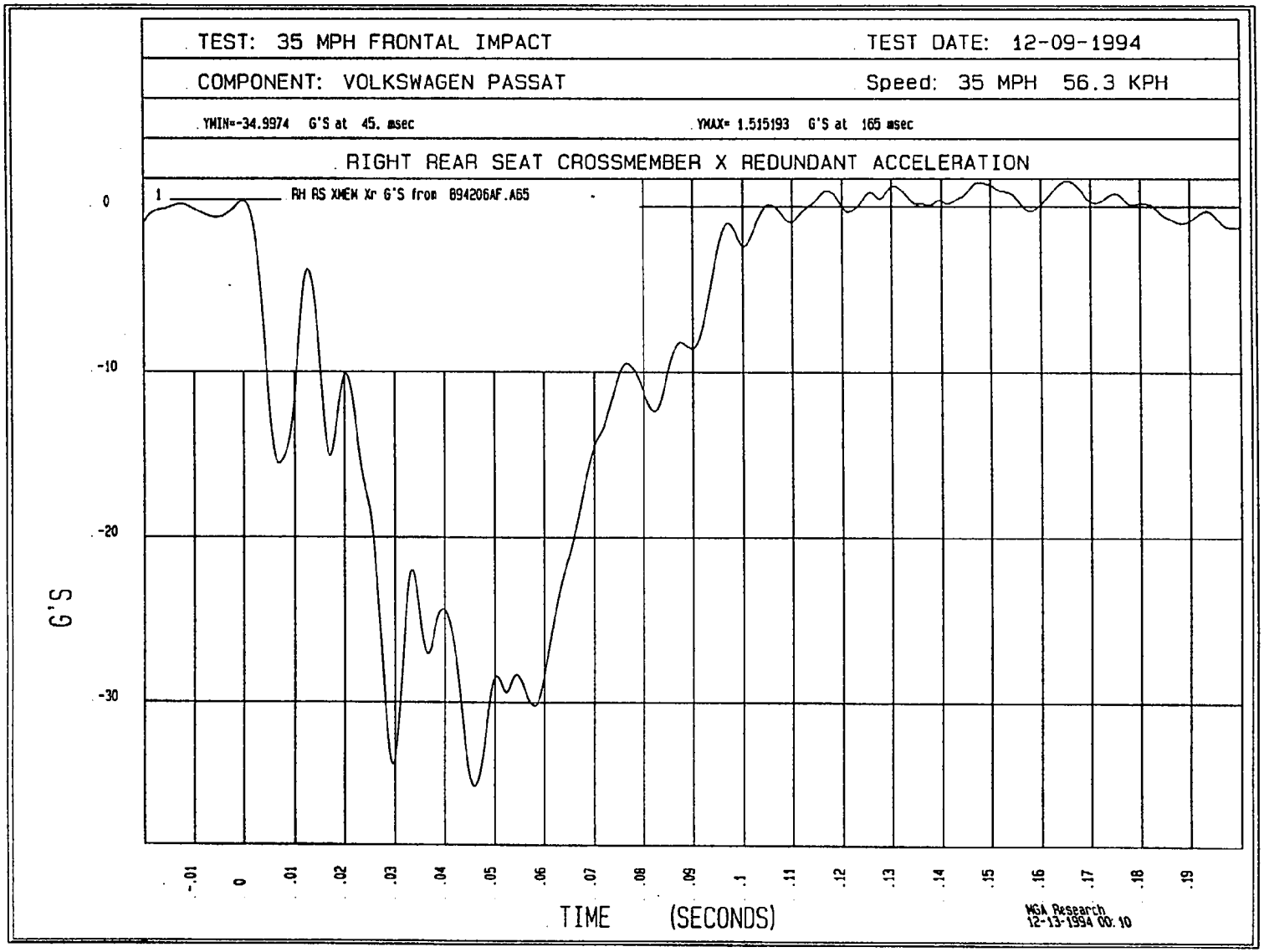


Figure B-6 - Right Rear Seat Crossmember X Velocity vs. Time



B-7

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

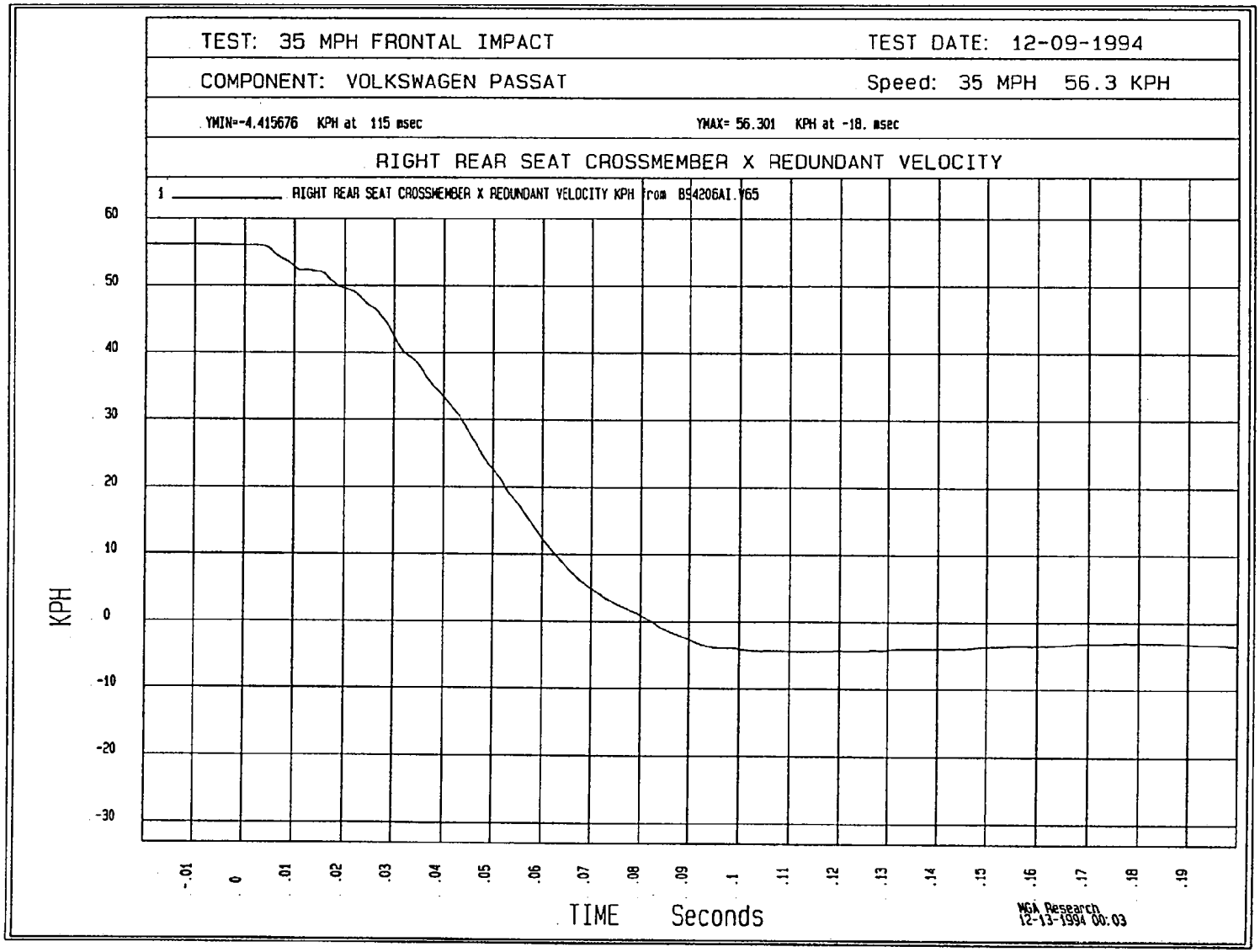


Figure B-8 - Right Rear Seat Crossmember X Redundant Velocity vs. Time

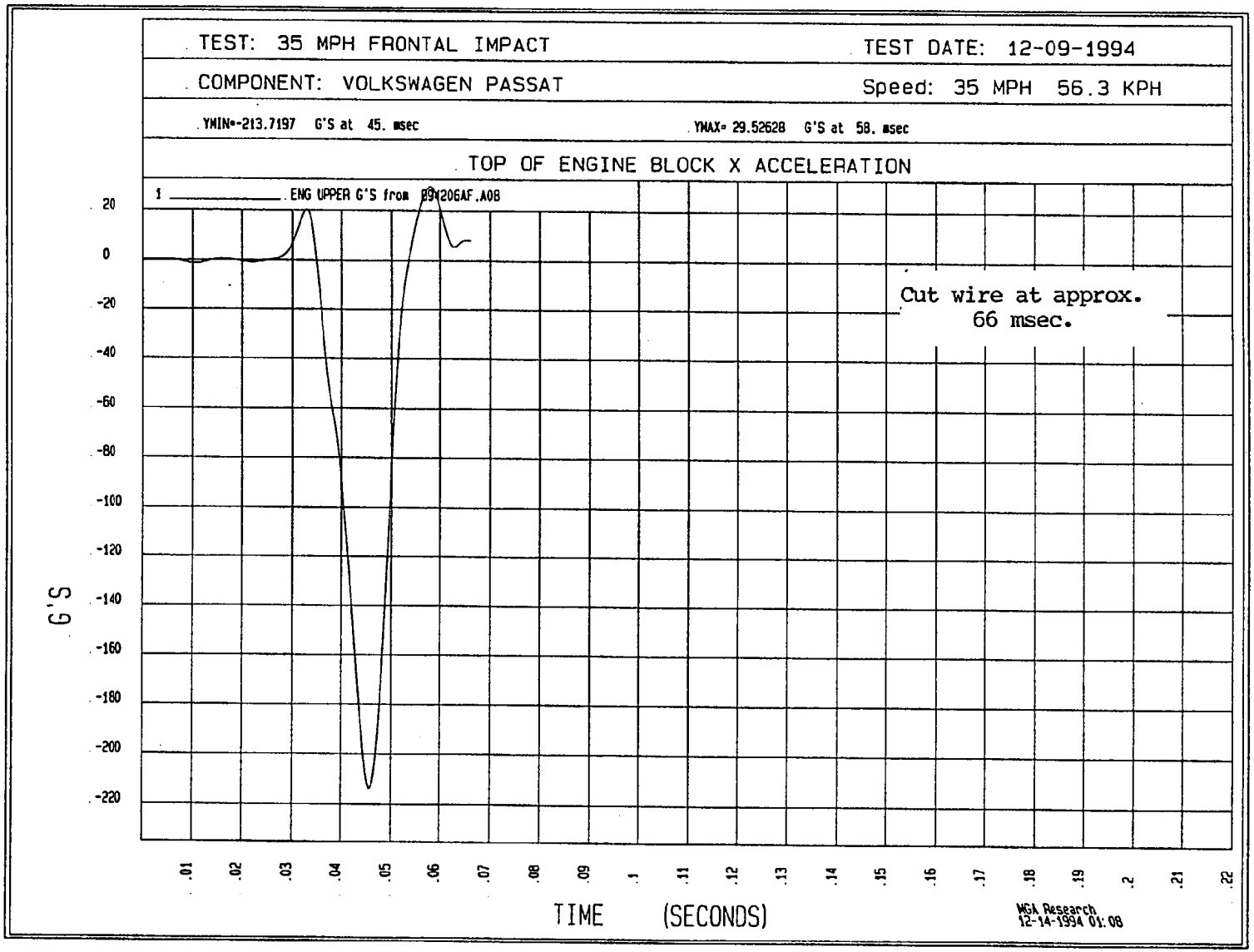


Figure B-9 - Top of Engine Block X Acceleration vs. Time

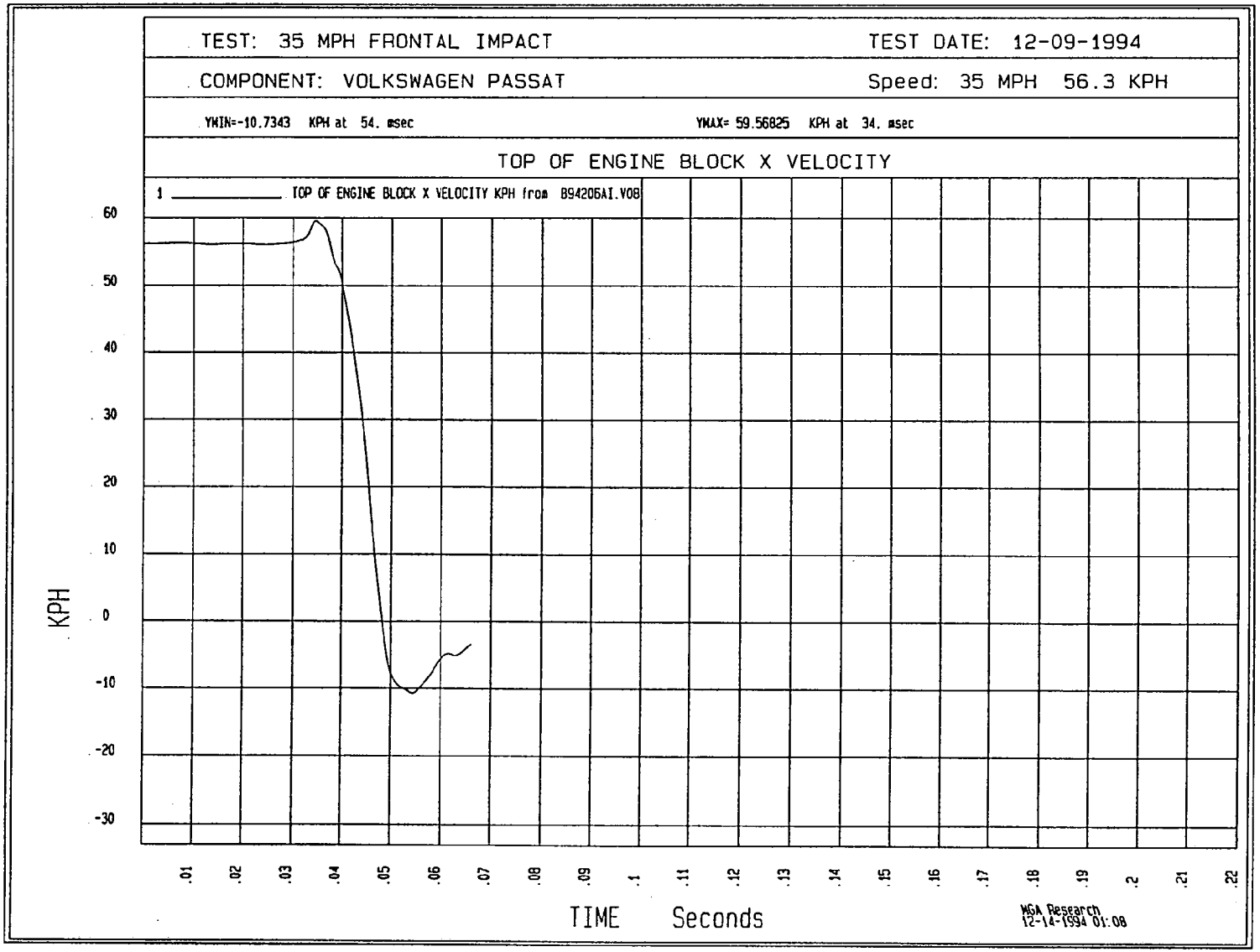


Figure B-10 - Top of Engine Block X Velocity vs. Time

NO VALID DATA COLLECTED

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

NO VALID DATA COLLECTED

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

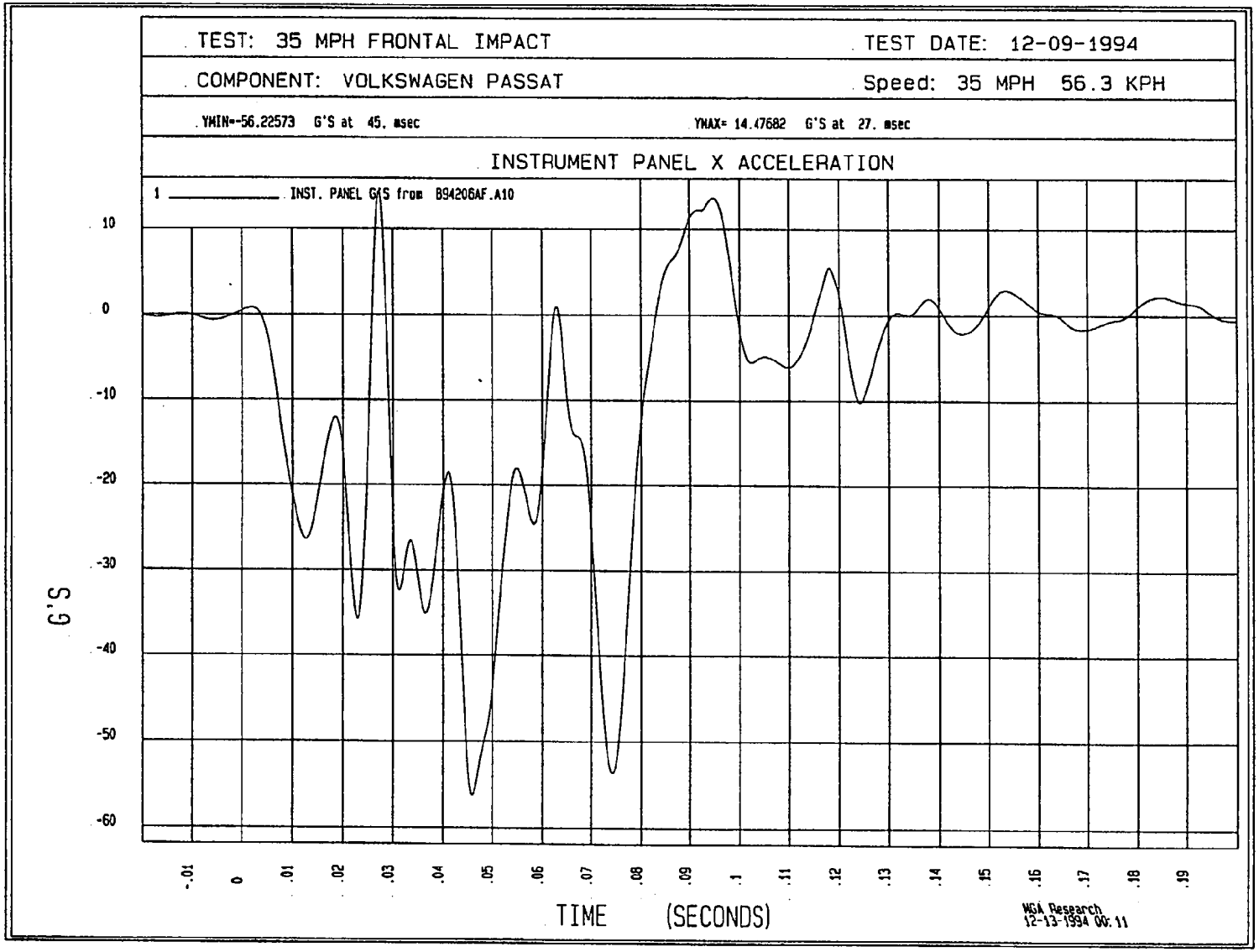


Figure B-13 - Instrument Panel X Acceleration vs. Time

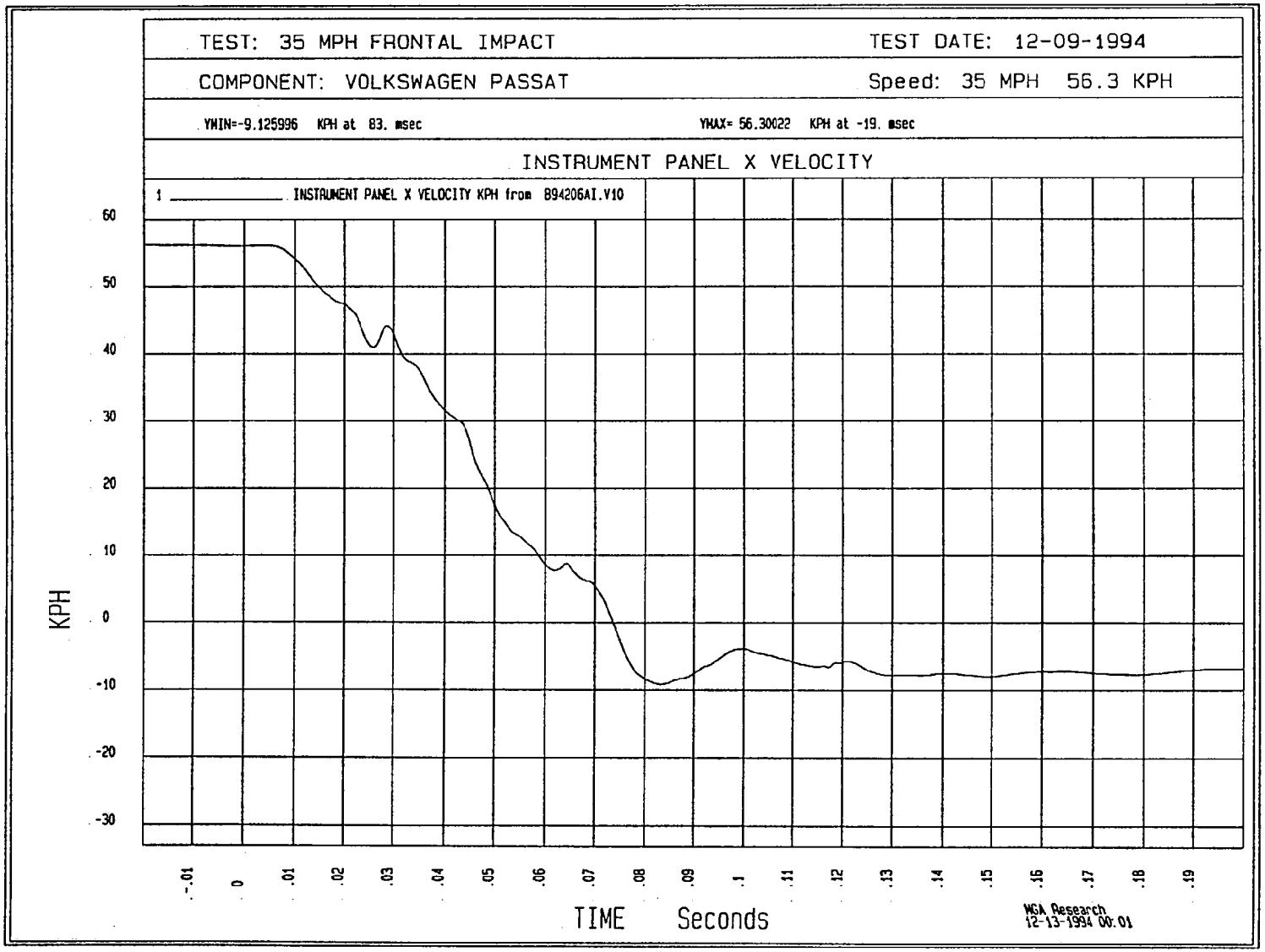


Figure B-14 - Instrument Panel X Velocity vs. Time

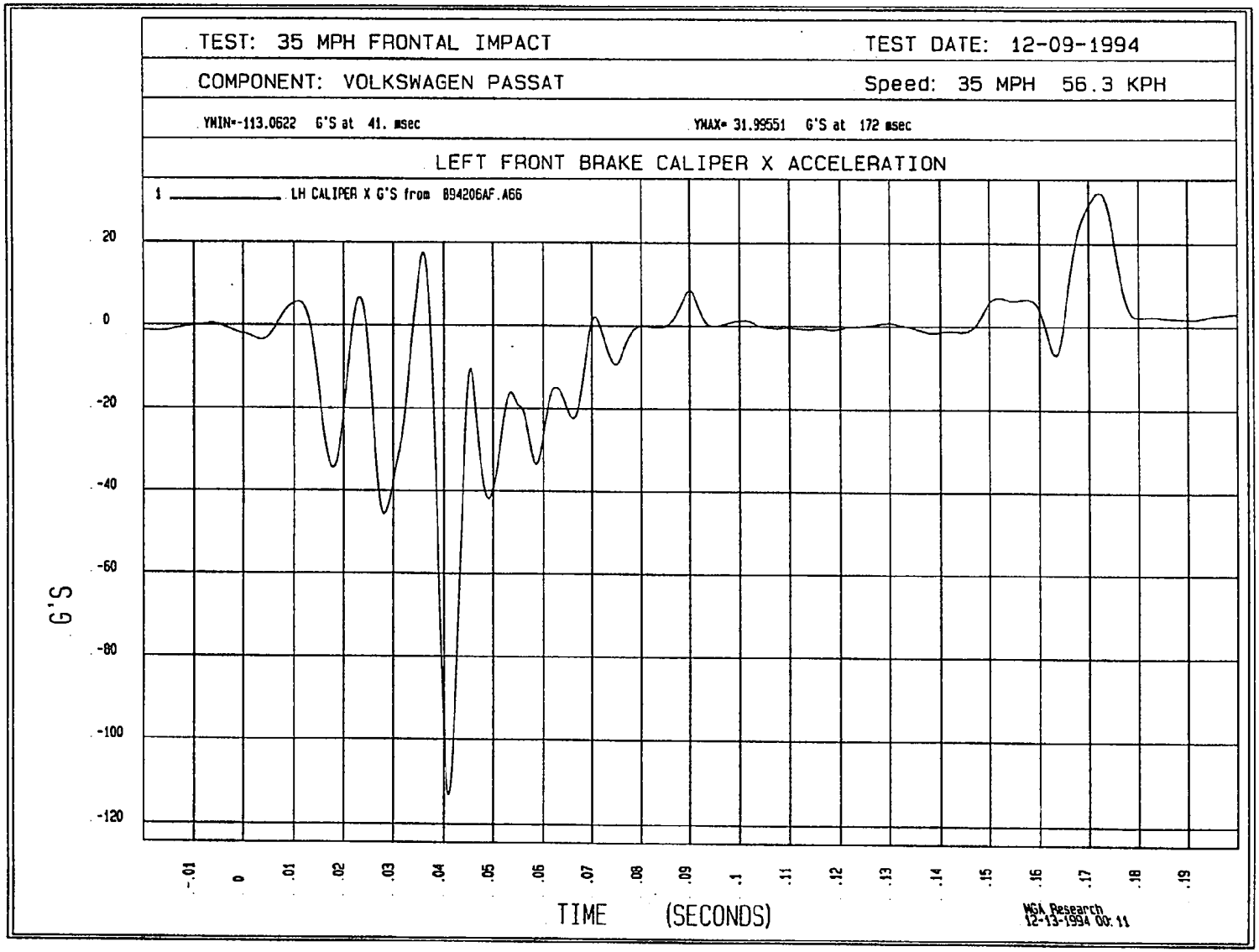


Figure B-15 - Left Brake Caliper X Acceleration vs. Time

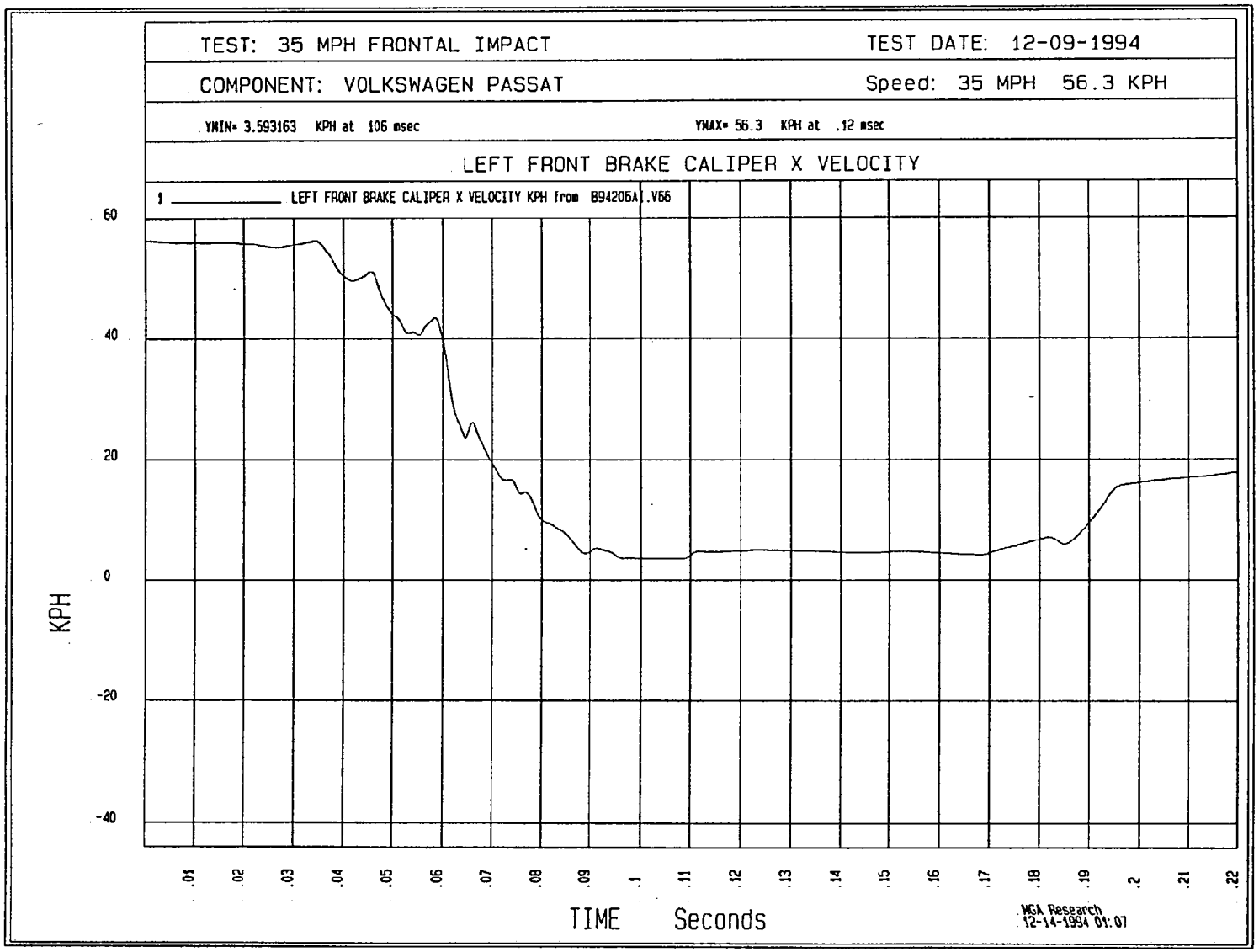


Figure B-16 - Left Brake Caliper X Velocity vs. Time

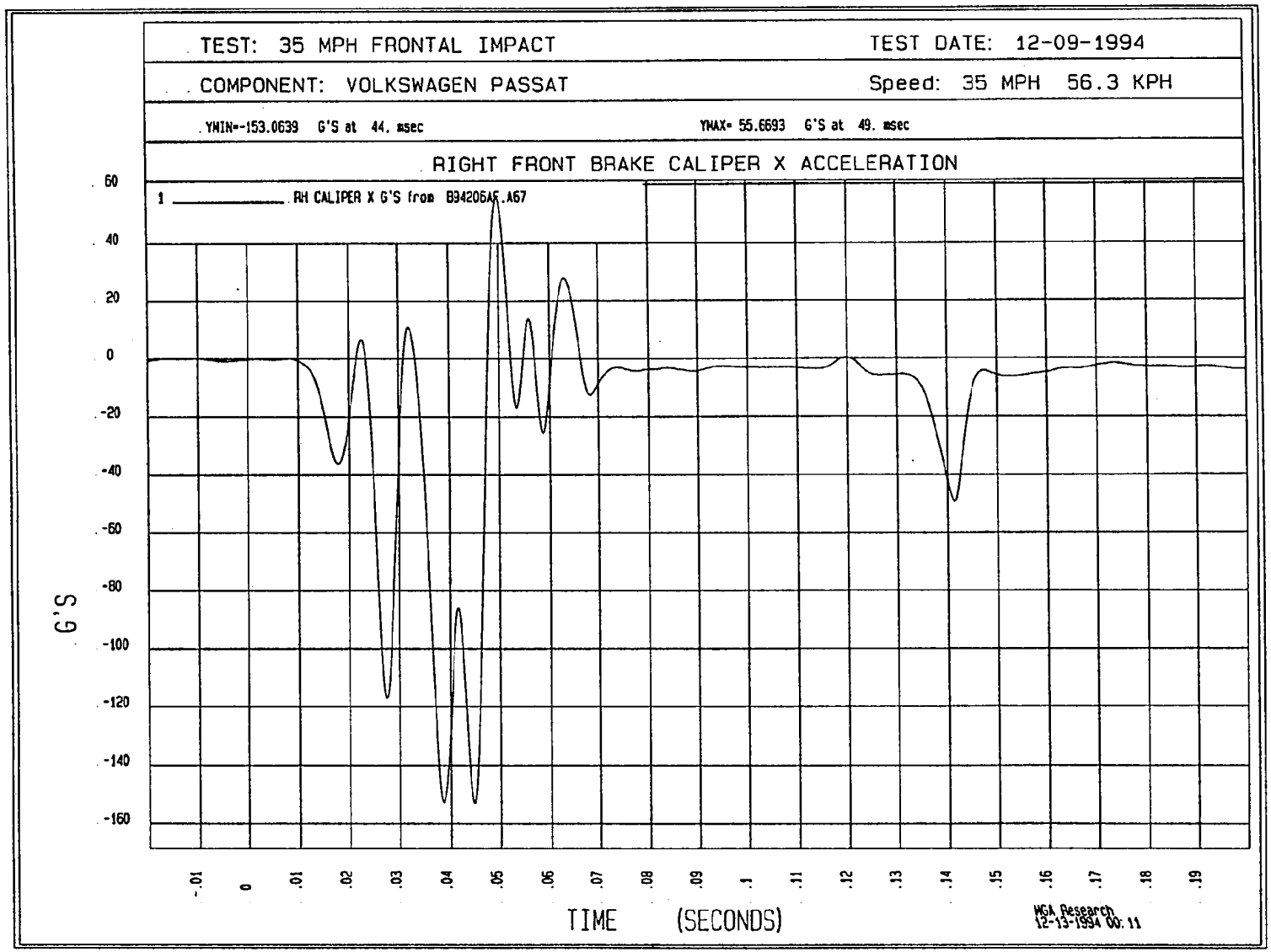


Figure B-17 - Right Brake Caliper X Acceleration vs. Time

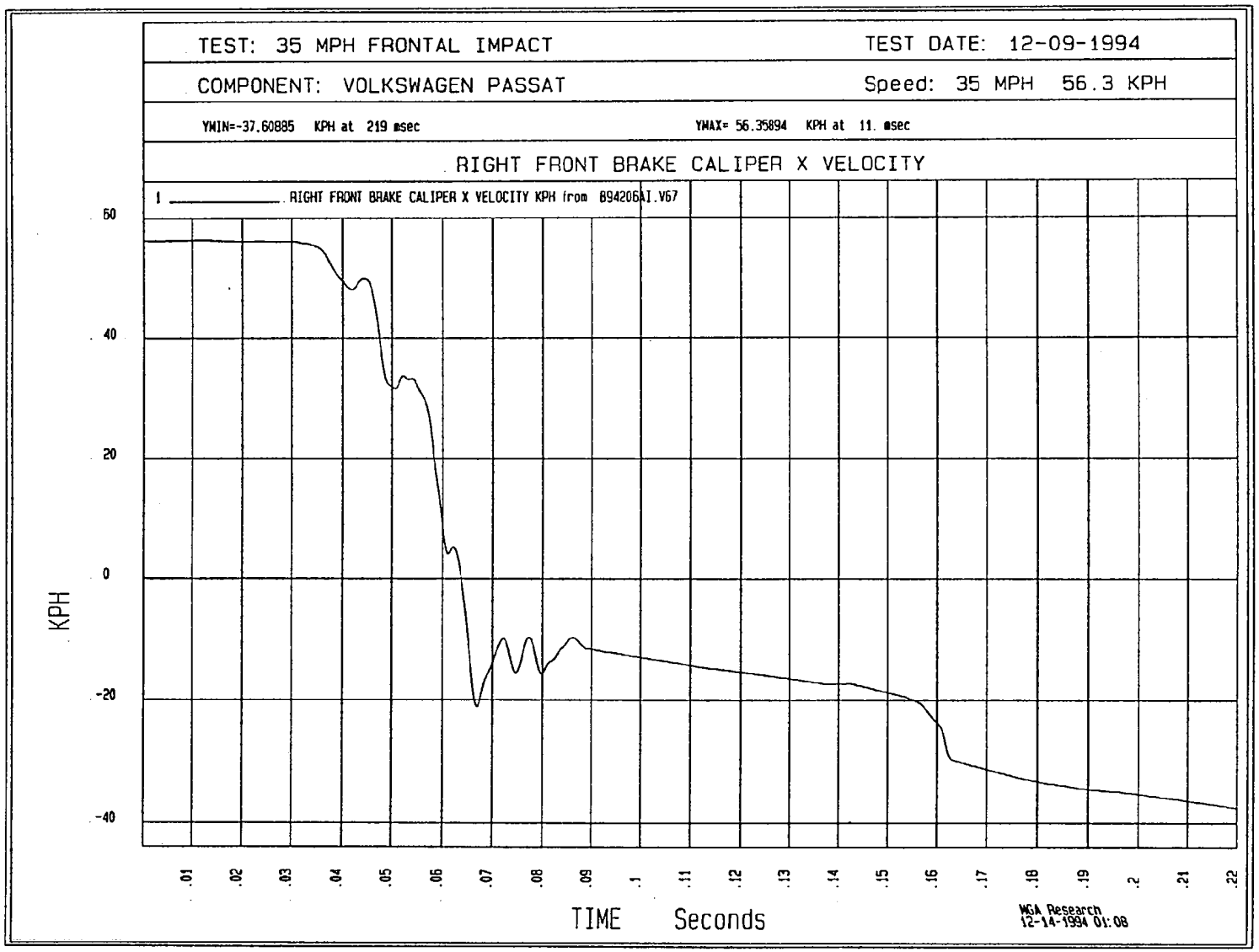


Figure B-18 - Right Brake Caliper X Velocity vs. Time

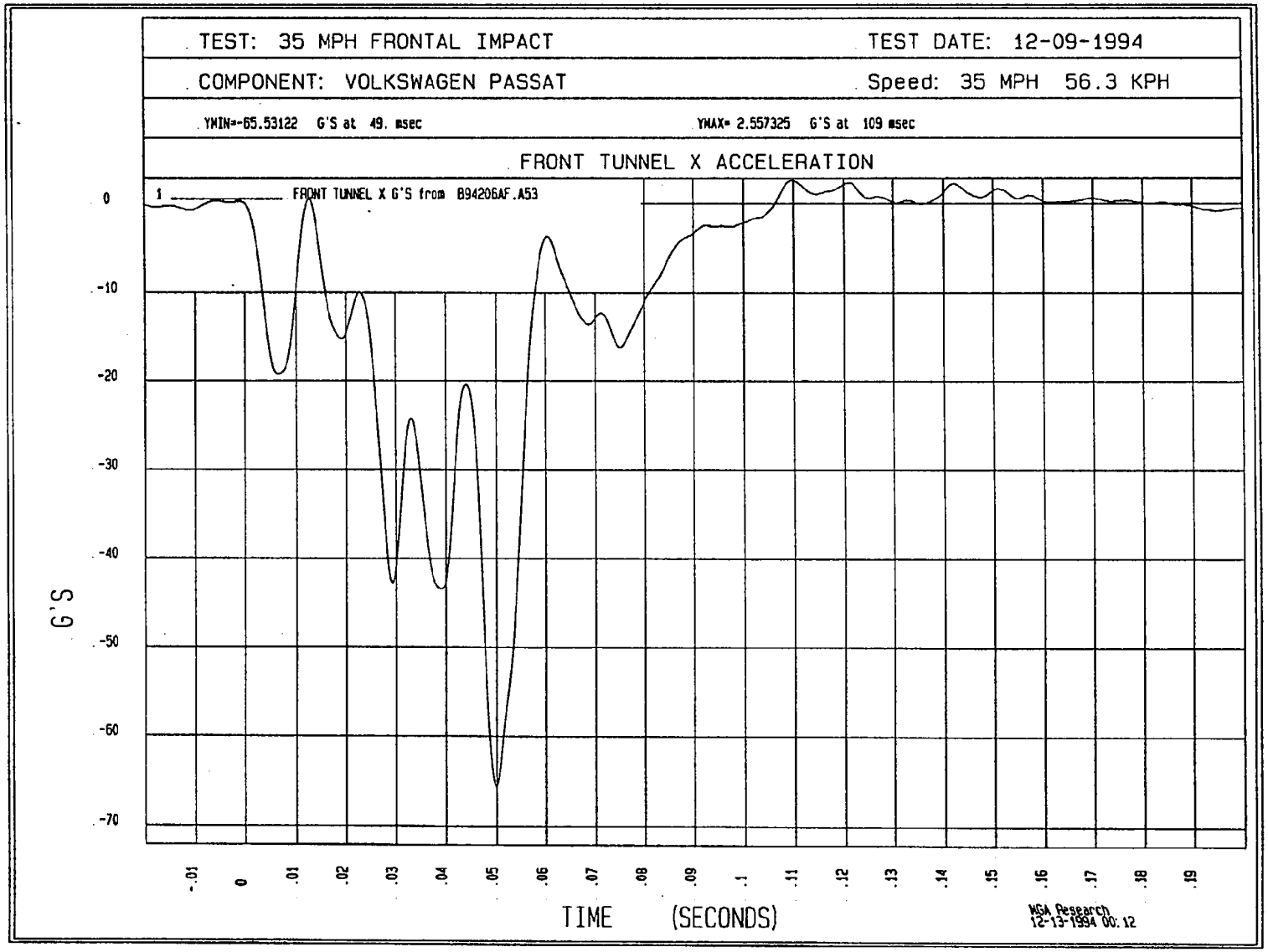


Figure B-19 - Front Tunnel X Acceleration vs. Time

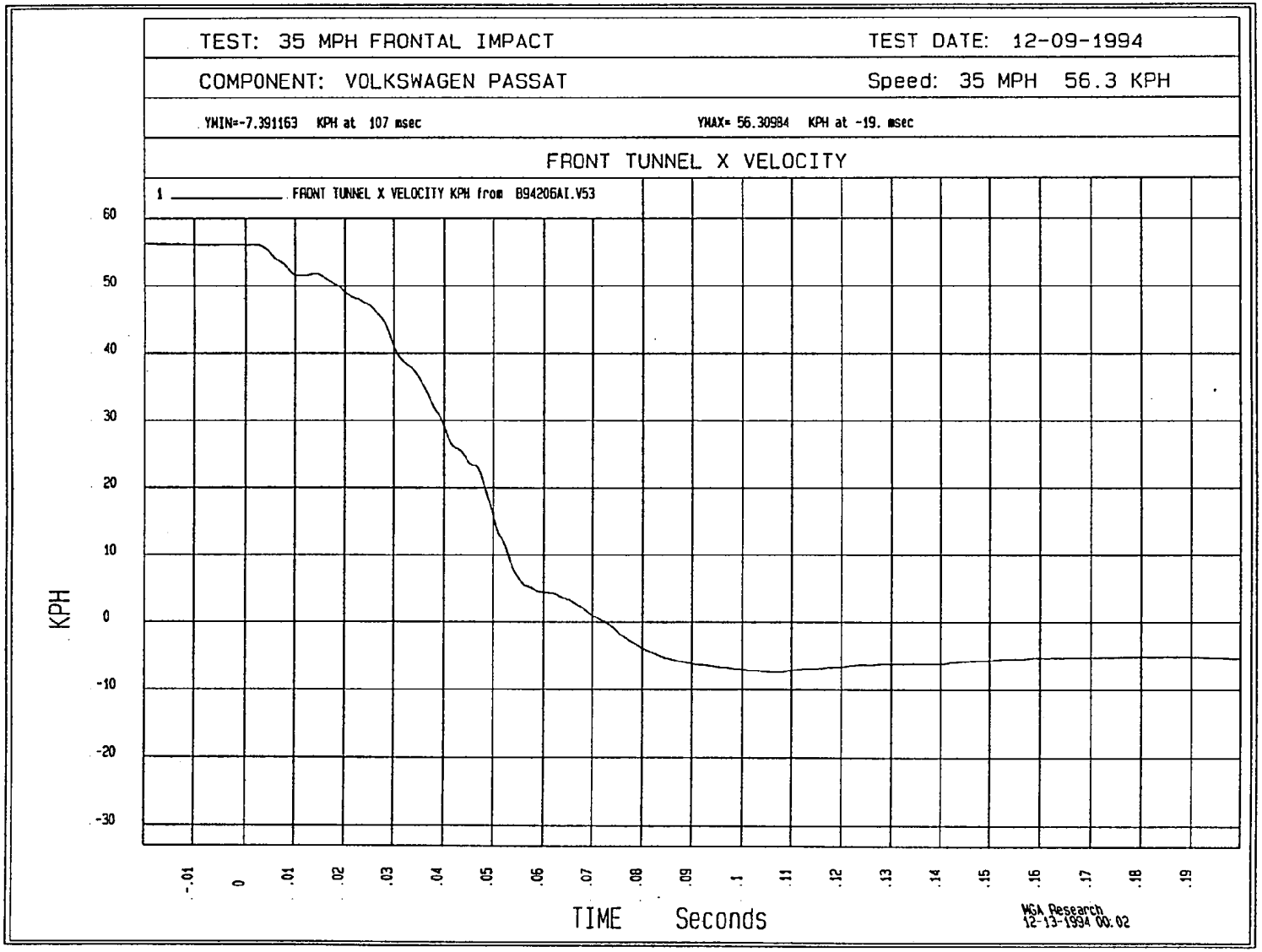


Figure B-2Ø - Front Tunnel X Velocity vs. Time

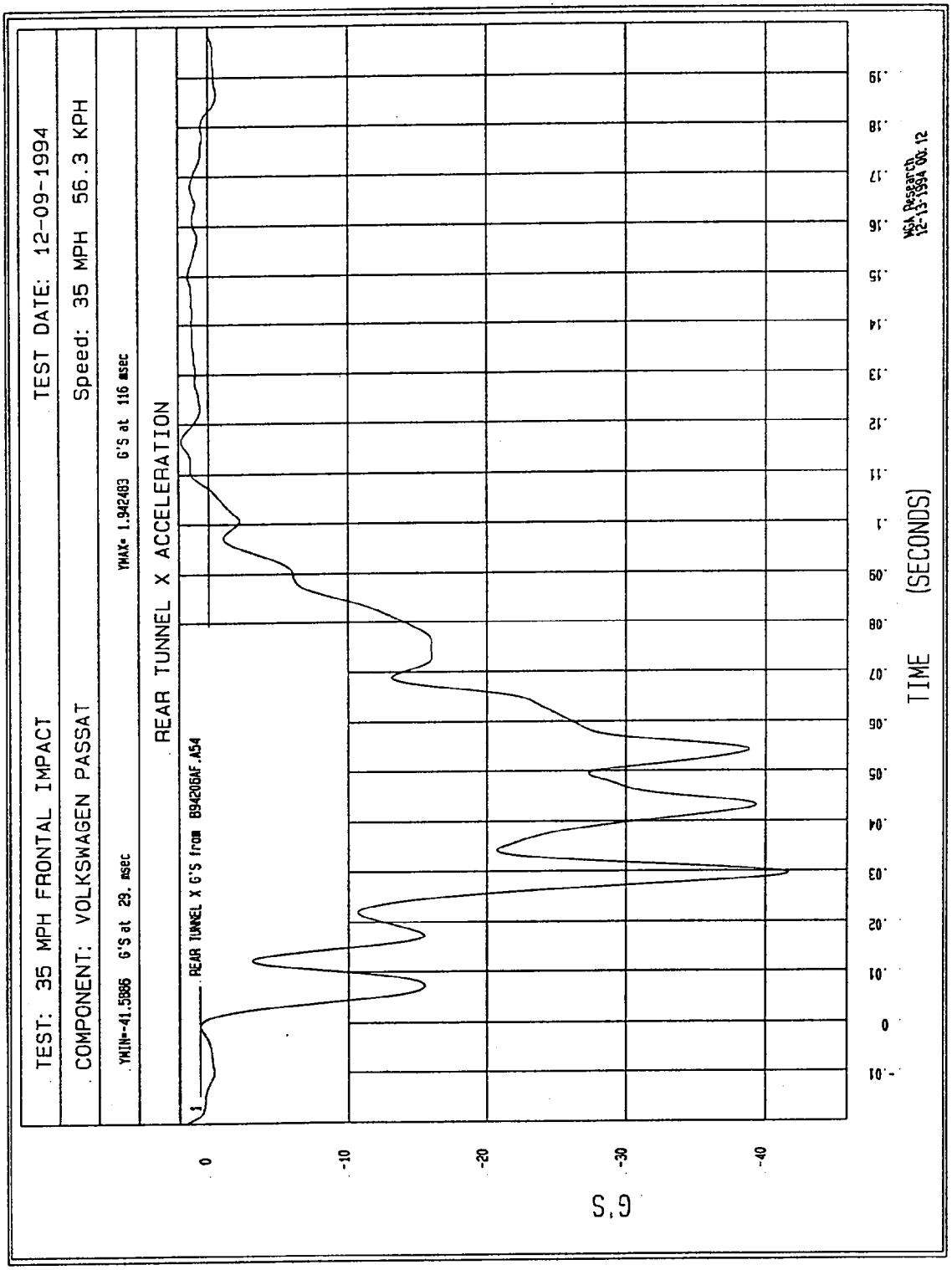


Figure B-21 - Rear Tunnel X Acceleration vs. Time

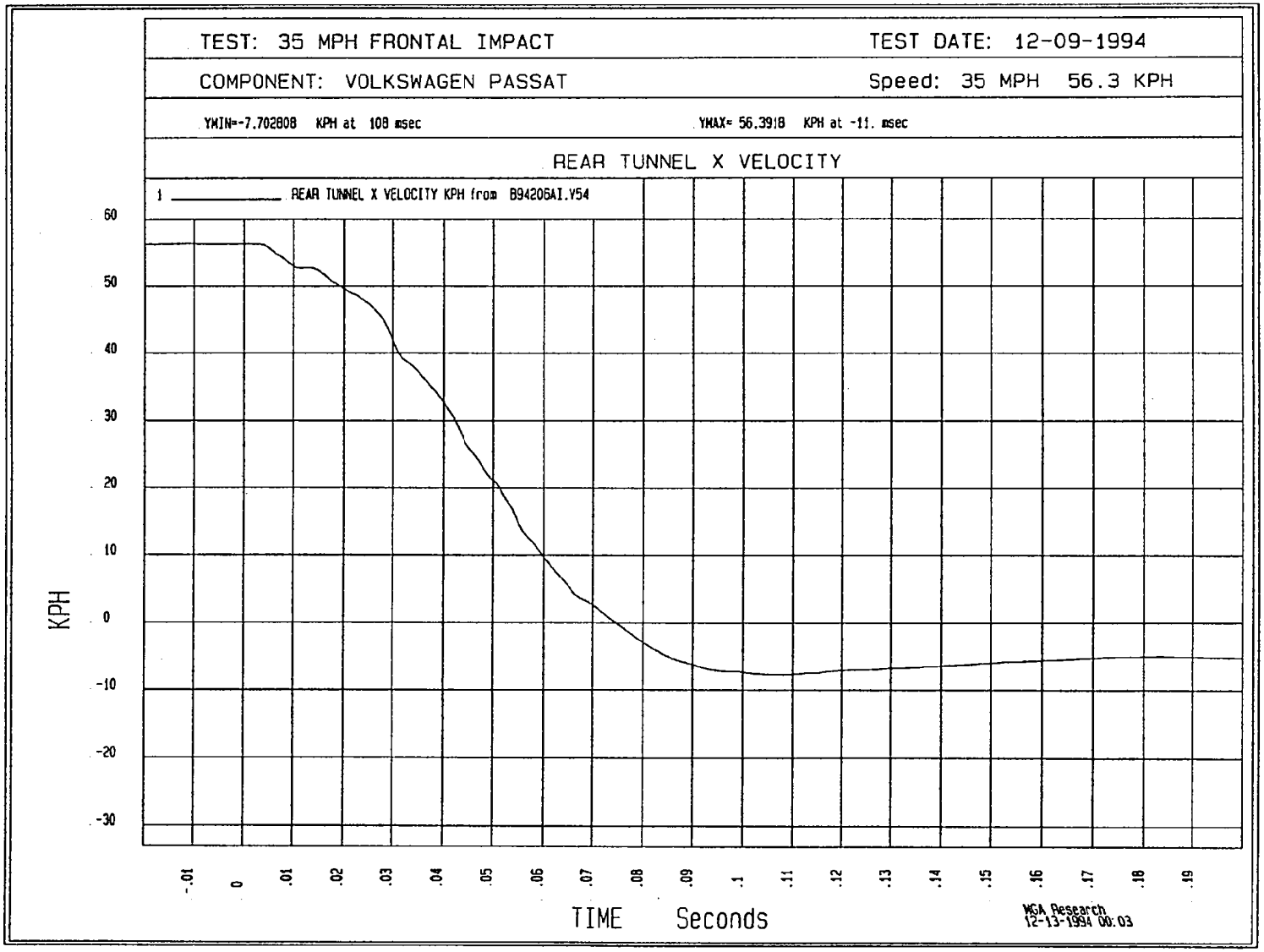


Figure B-22 - Rear Tunnel X Velocity vs. Time

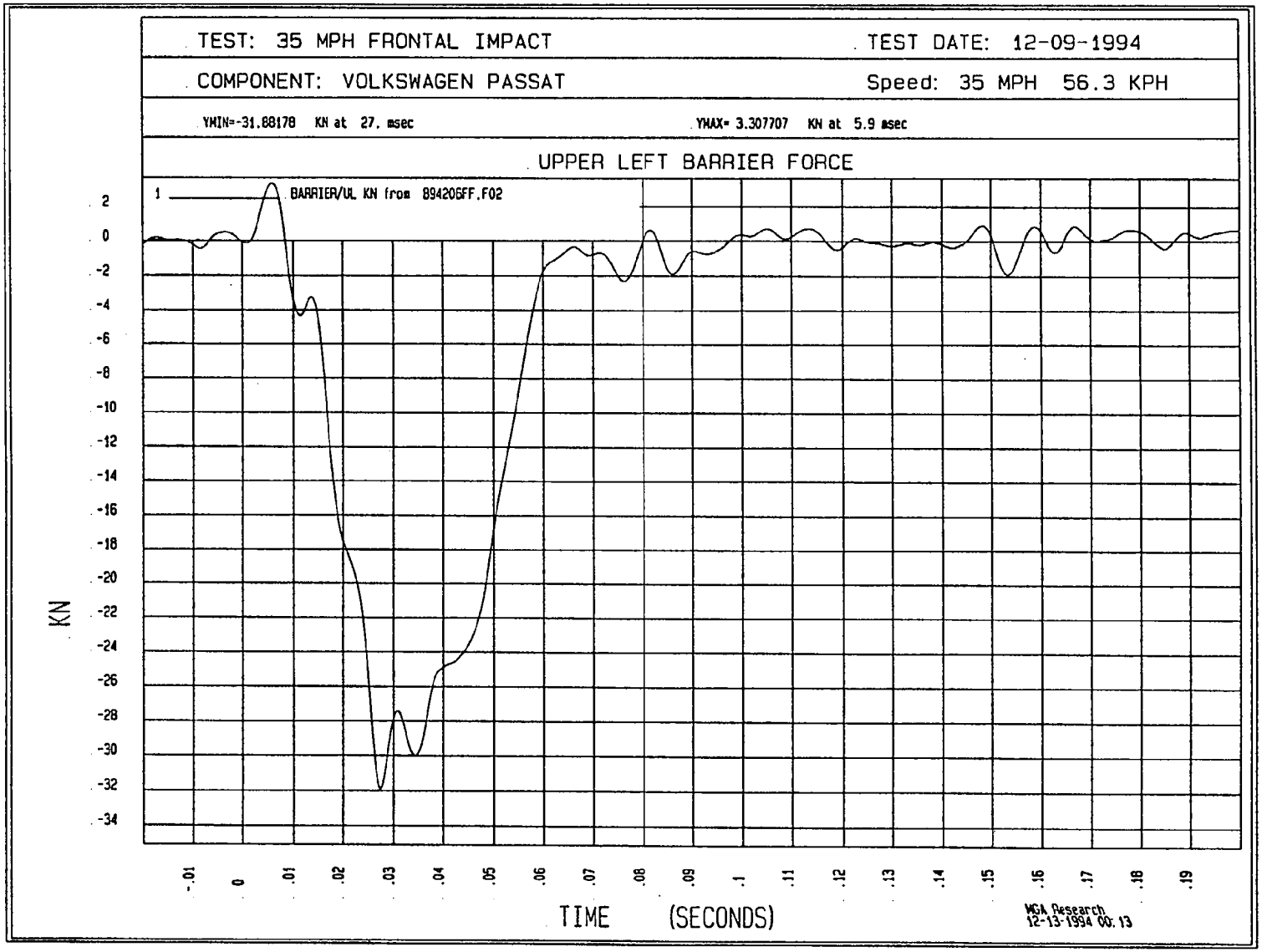


Figure B-23 - Upper Left Barrier Force vs. Time

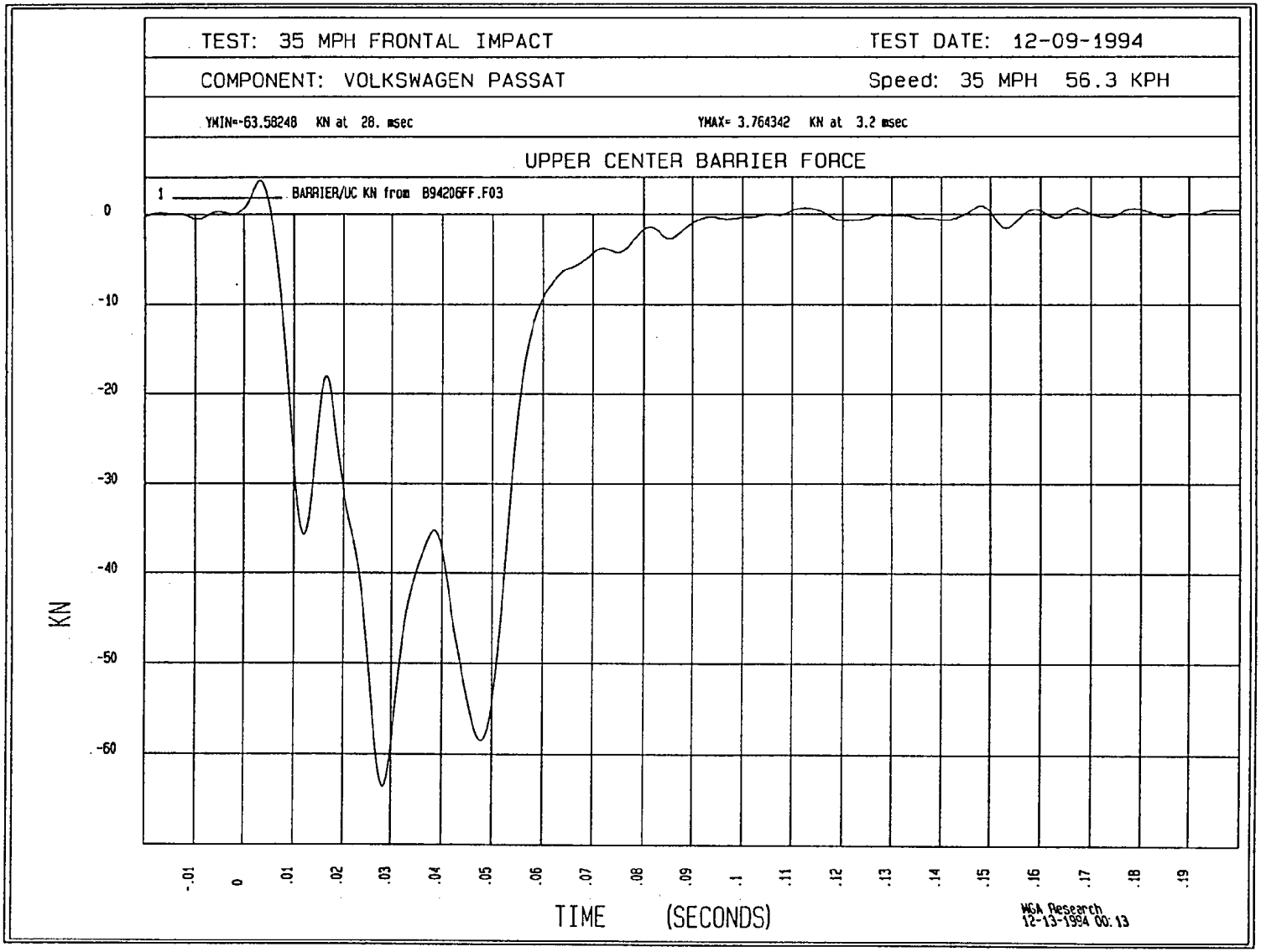


Figure B-24 - Upper Center Barrier Force vs. Time

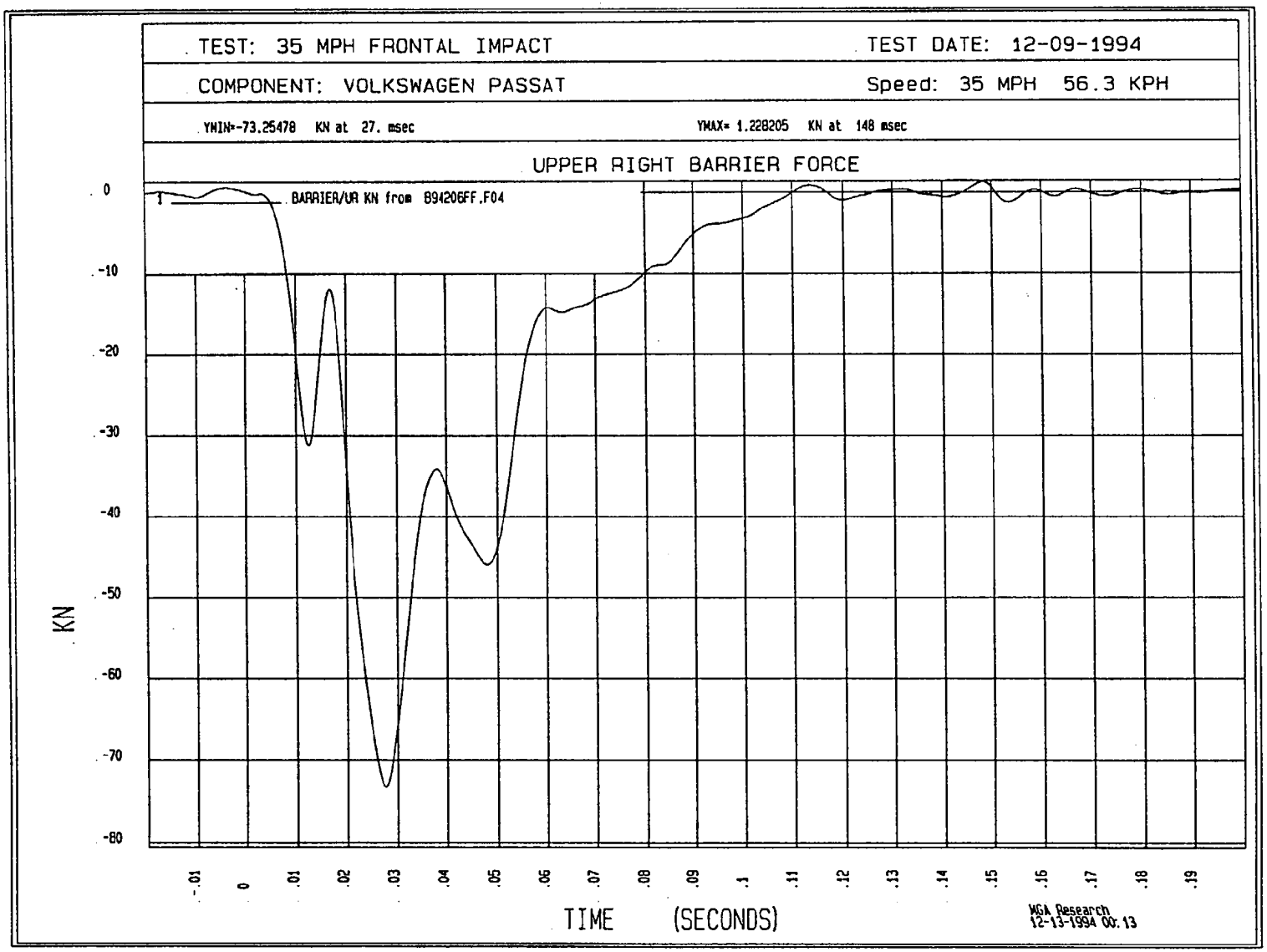


Figure B-25 - Upper Right Barrier Force vs. Time

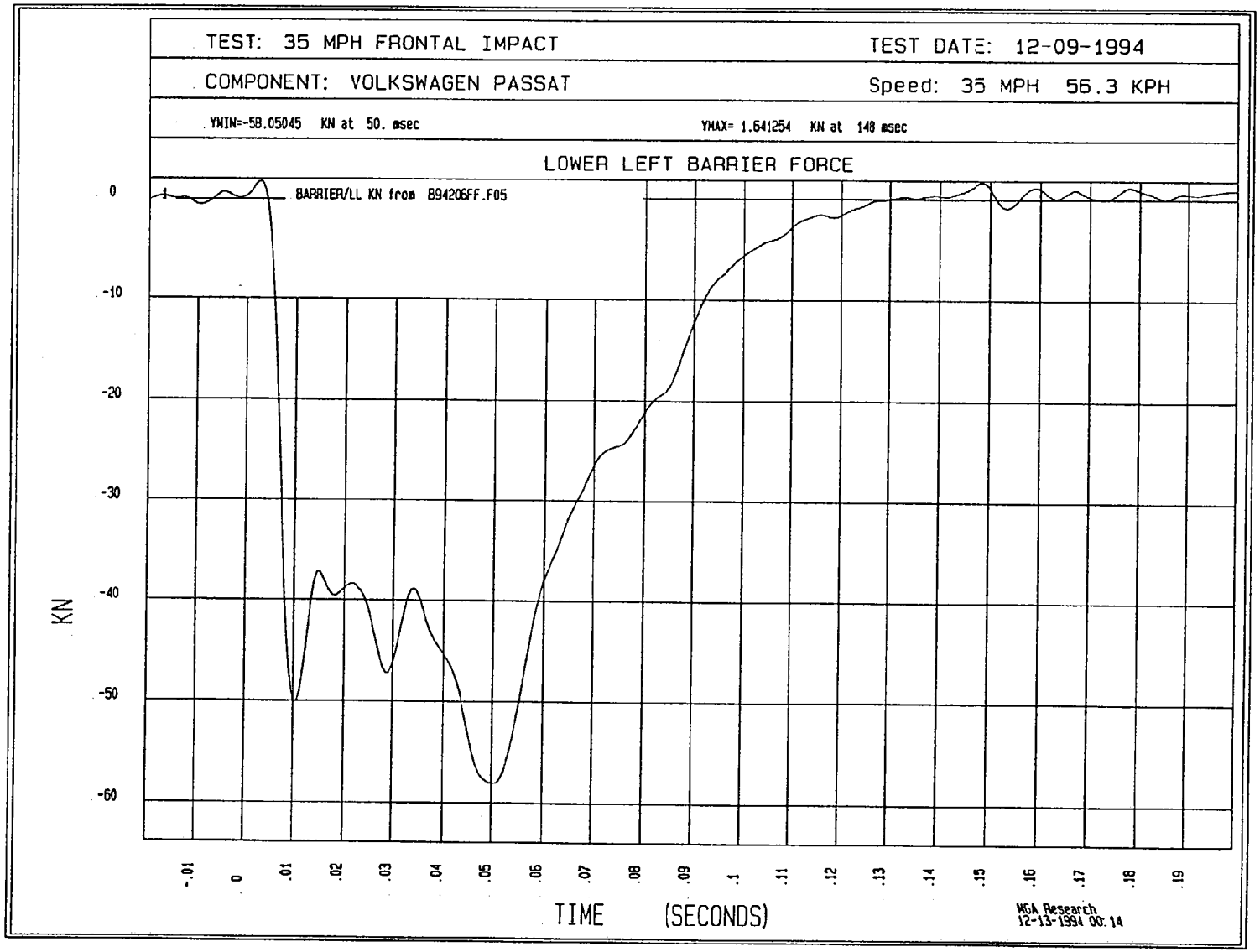


Figure B-26 - Lower Left Barrier Force vs. Time

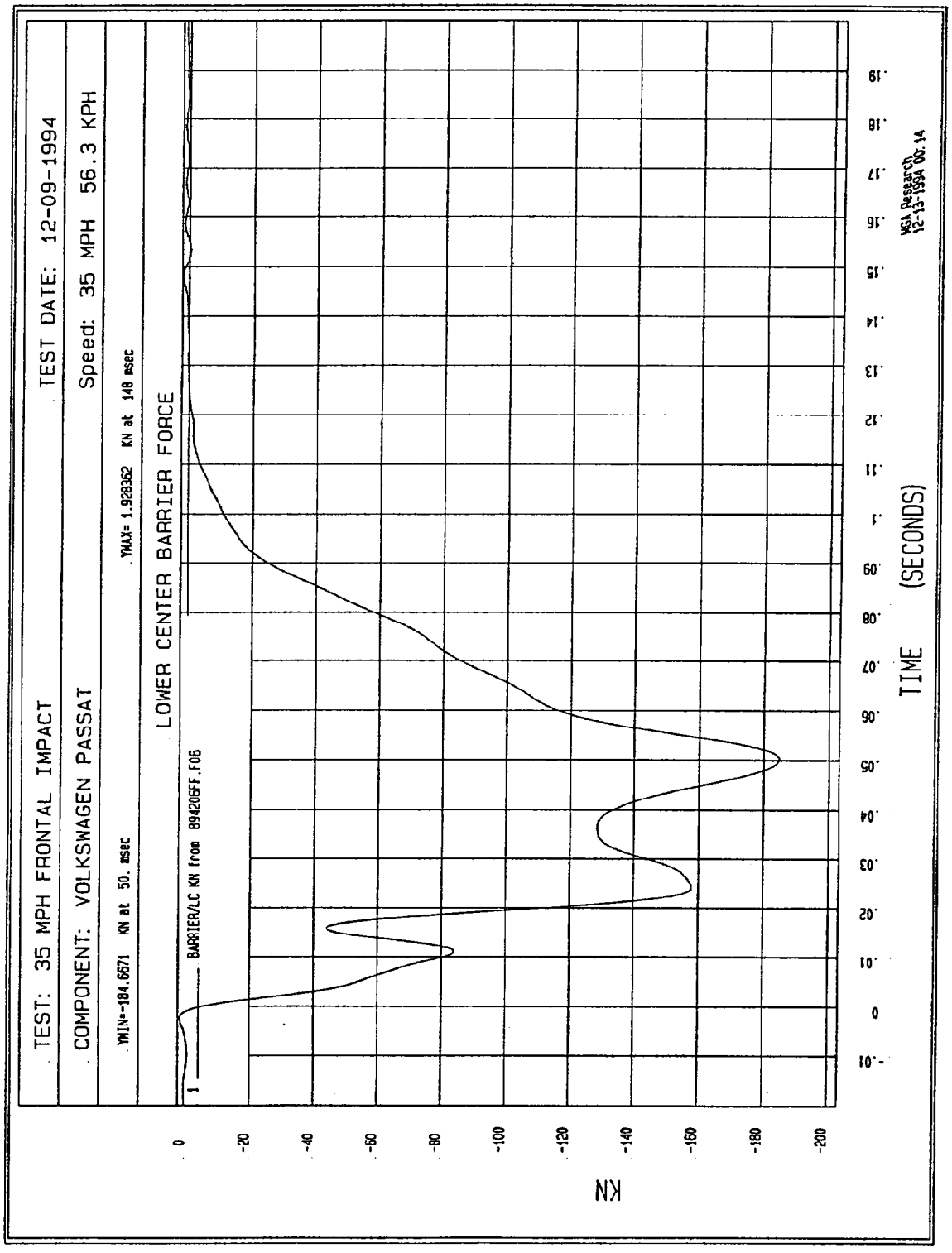


Figure B-27 - Lower Center Barrier Force vs. Time

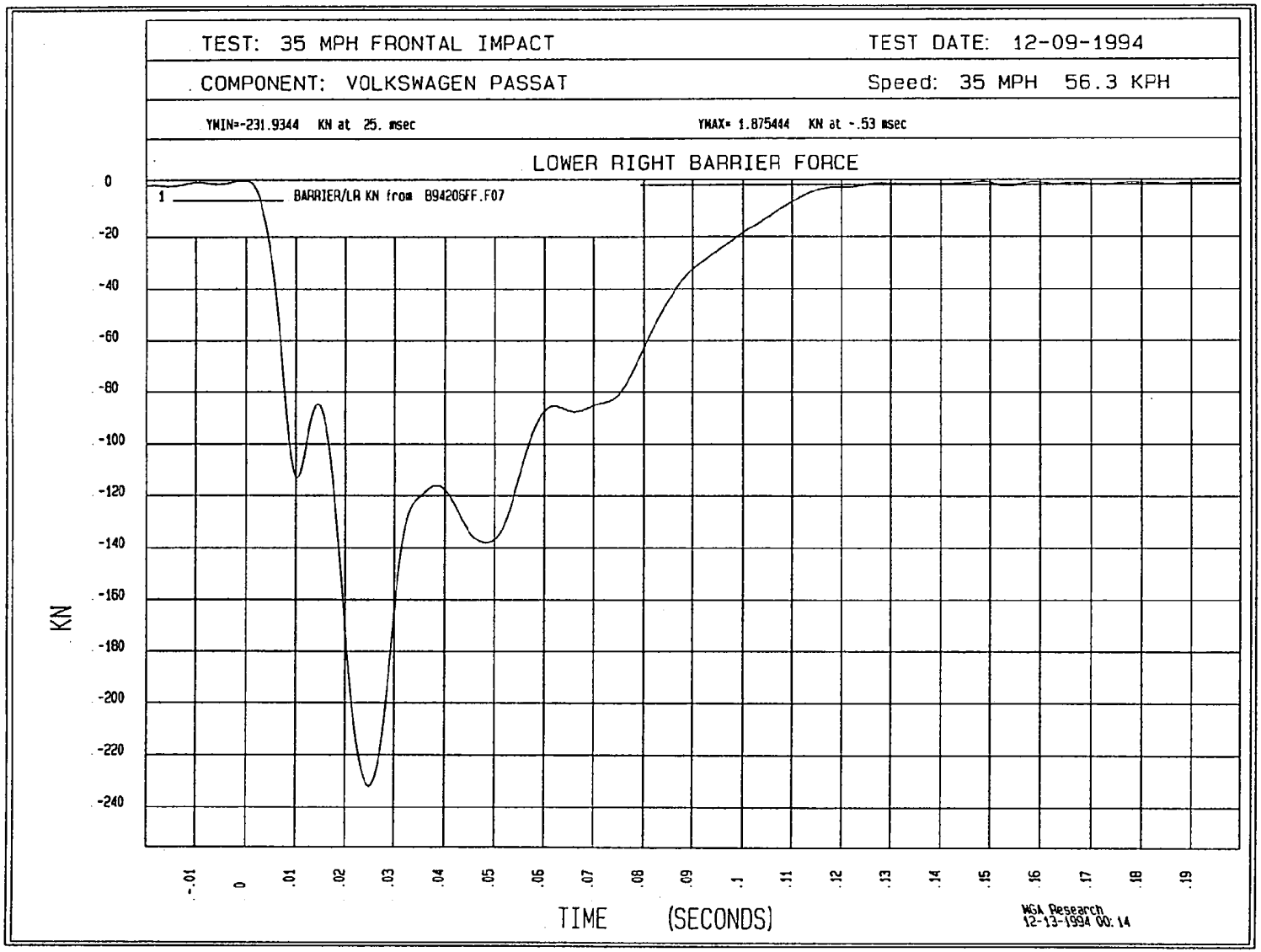


Figure B-28 - Lower Right Barrier Force vs. Time

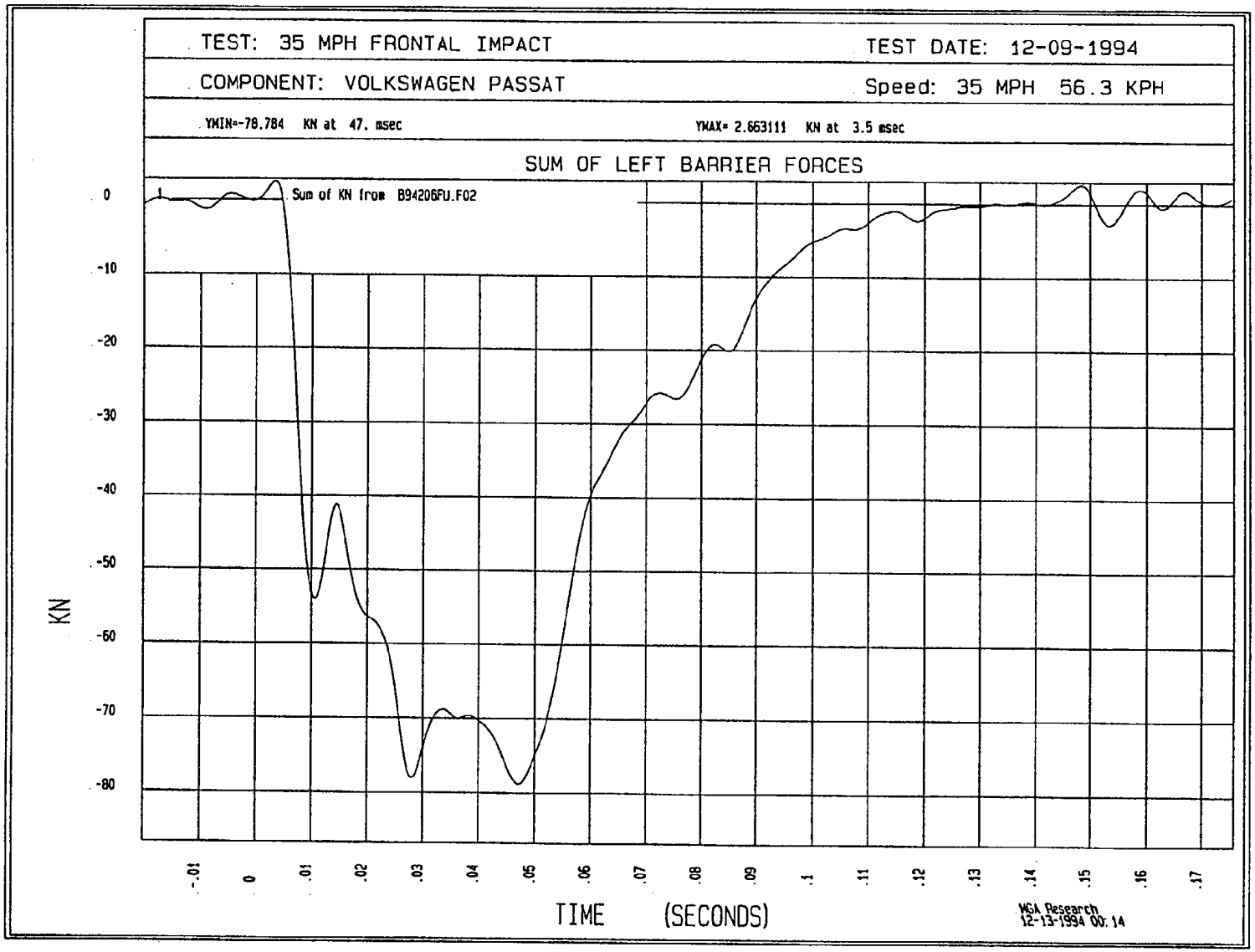


Figure B-29 - Sum of Left Barrier Forces vs. Time

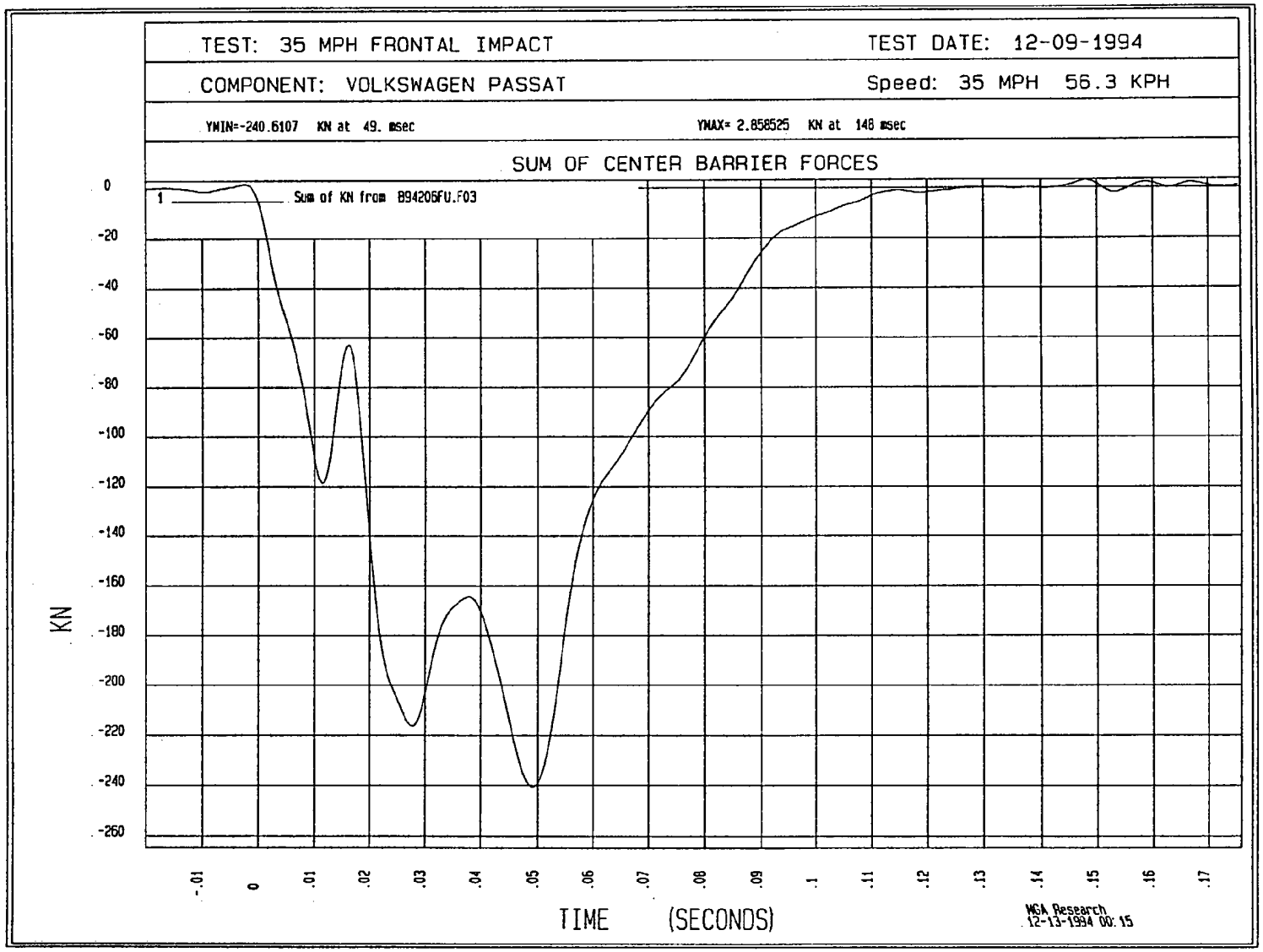


Figure B-30 - Sum of Center Barrier Forces vs. Time

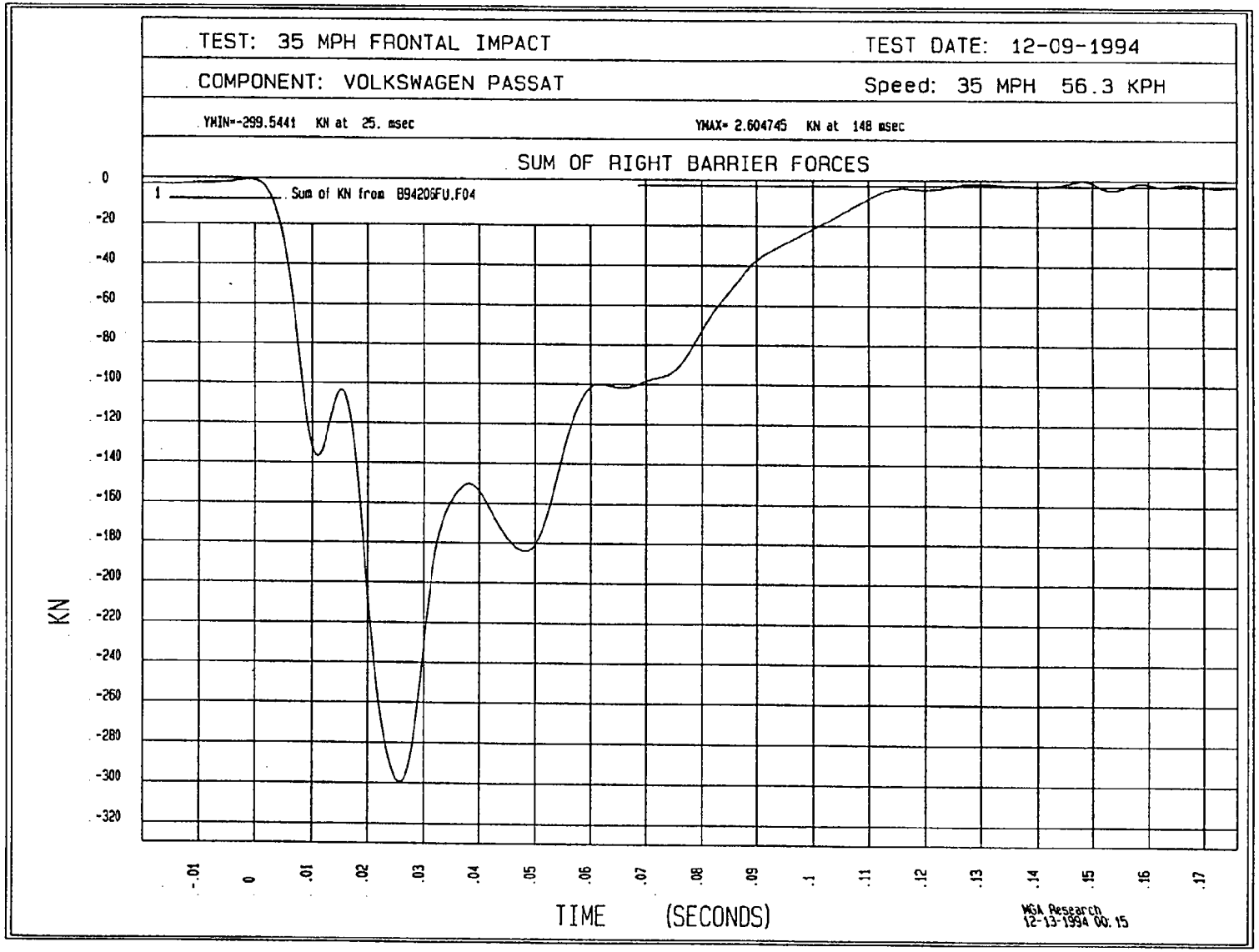


Figure B-31 - Sum of Right Barrier Forces vs. Time

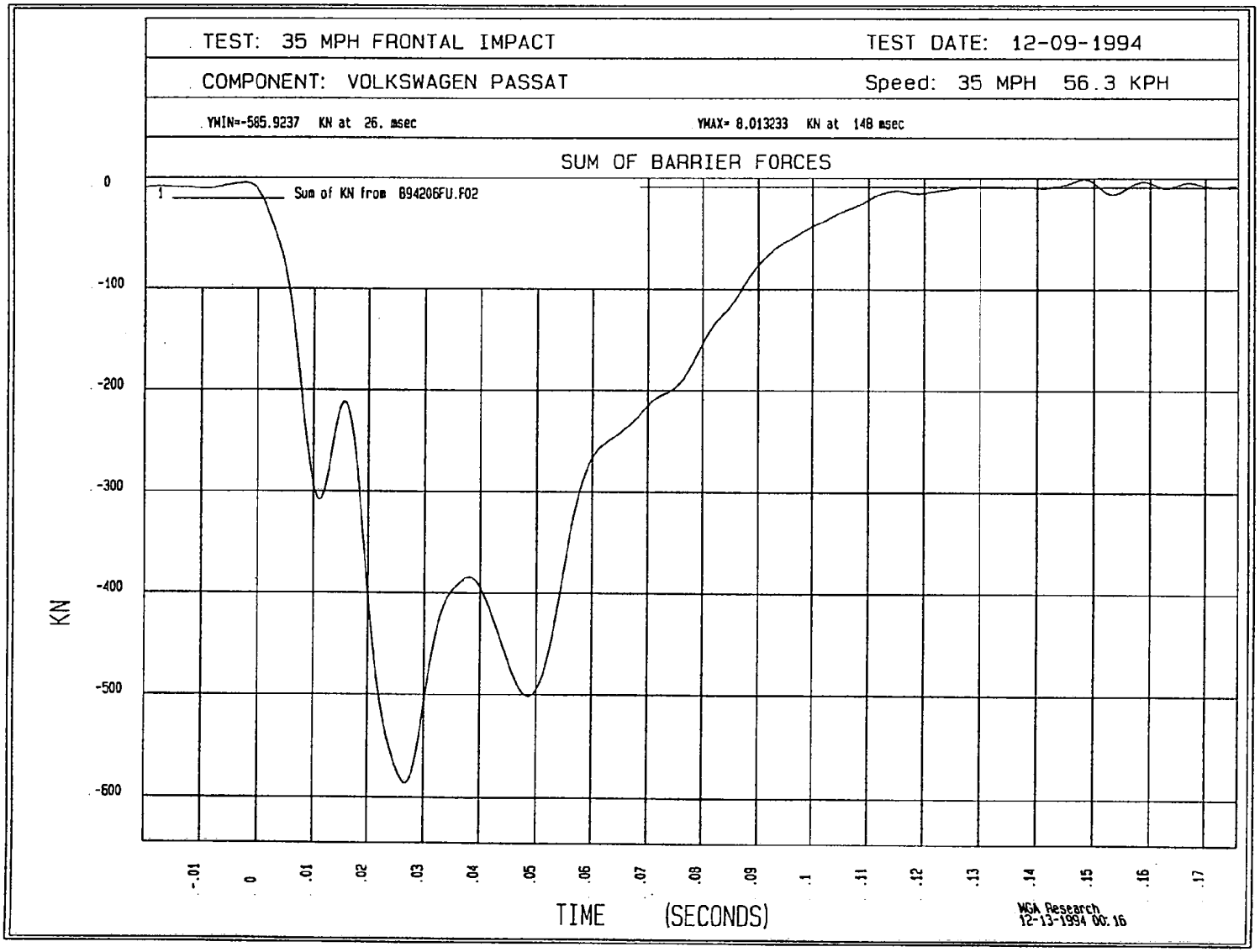


Figure B-32 - Sum of Barrier Forces vs. Time

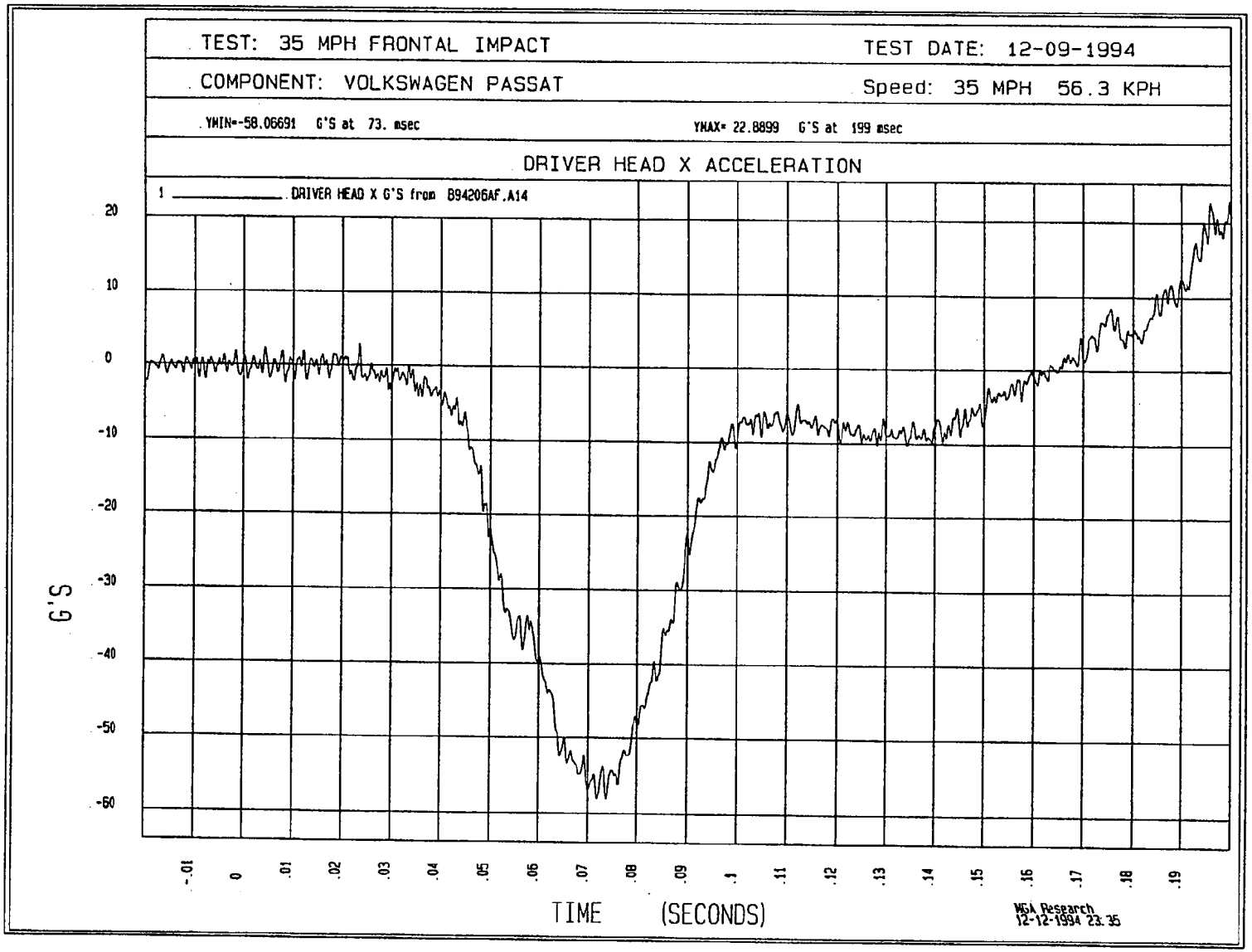


Figure B-33 - Driver Head X Acceleration vs. Time

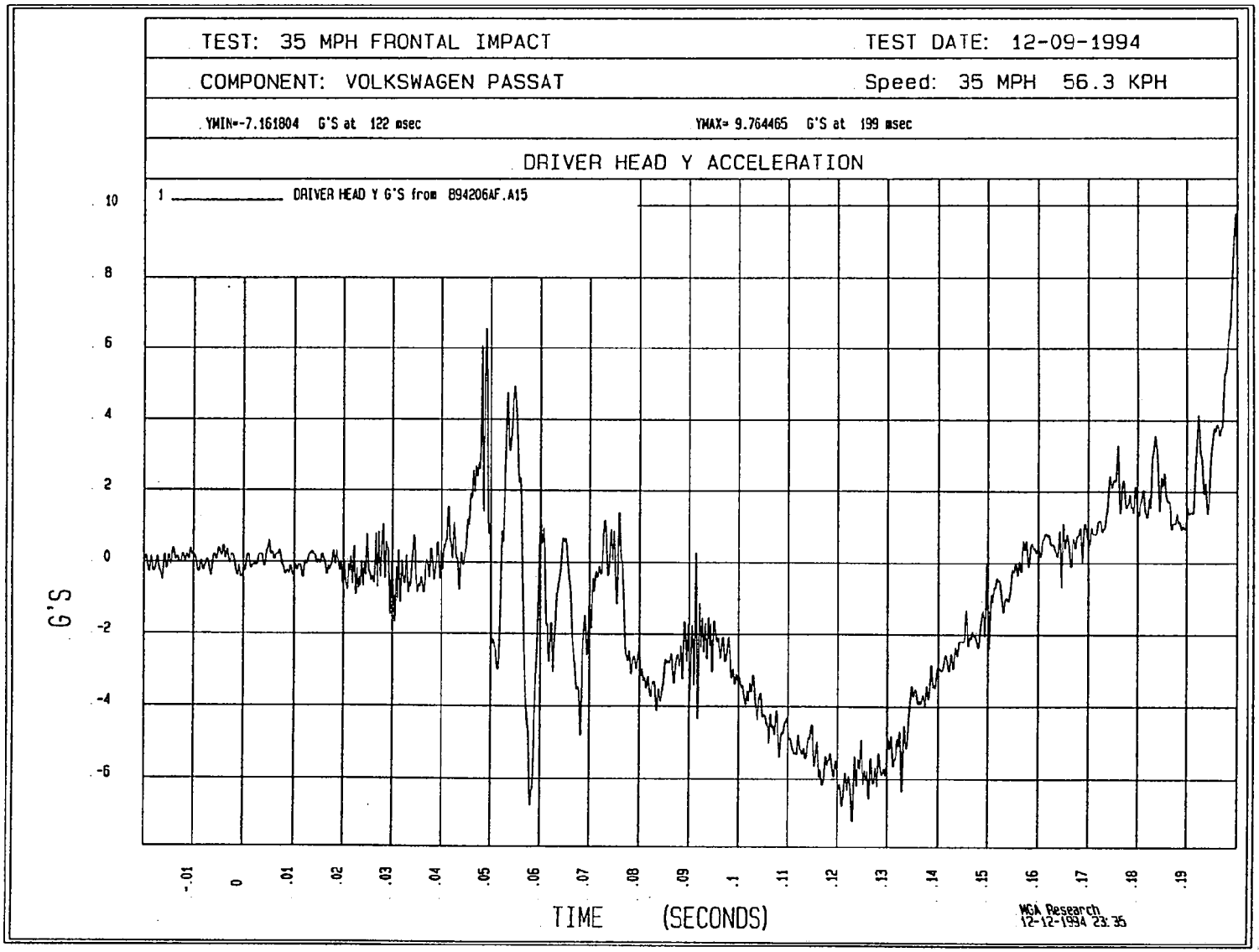


Figure B-34 - Driver Head Y Acceleration vs. Time

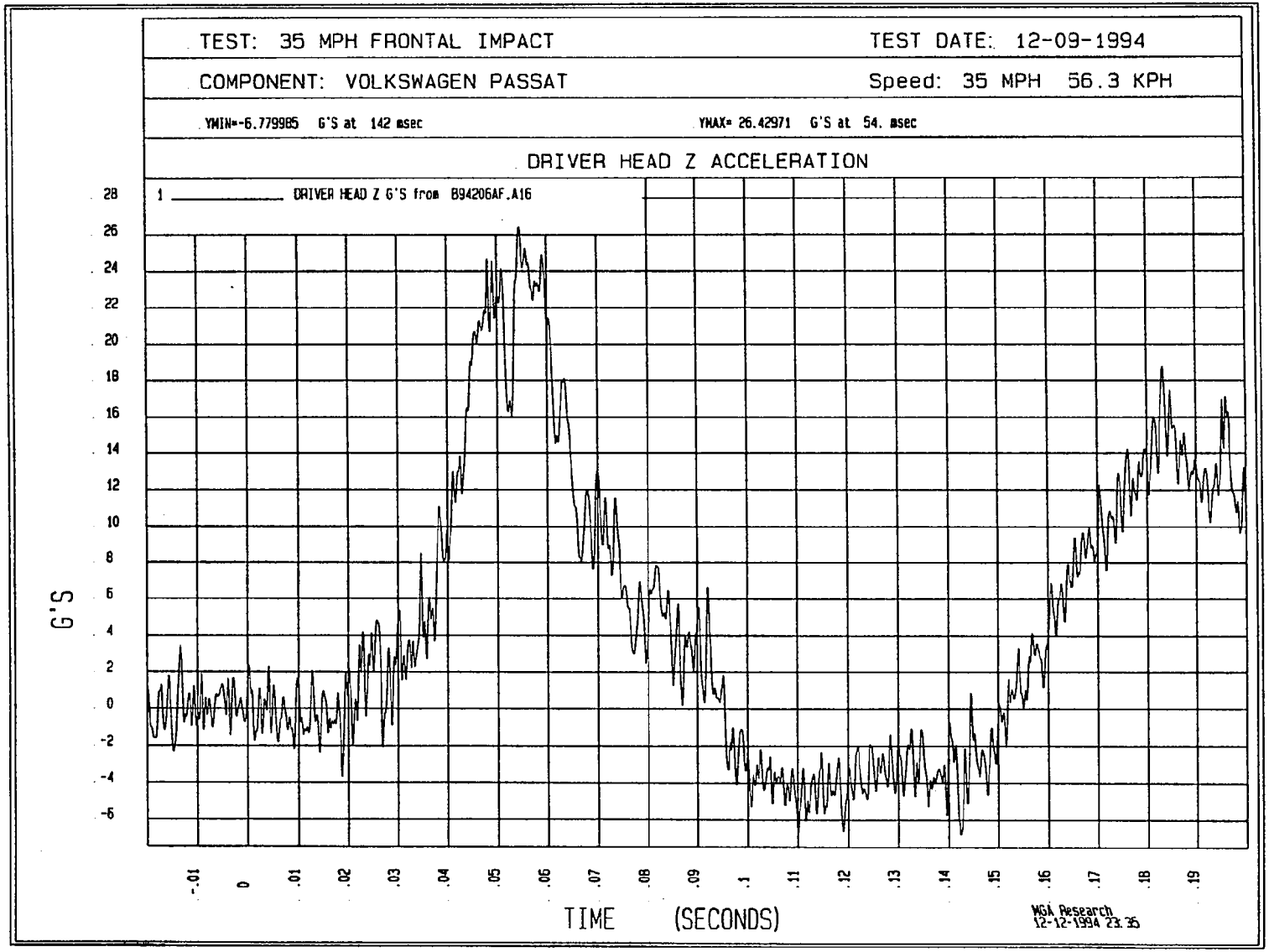


Figure B-35 - Driver Head Z Acceleration vs. Time

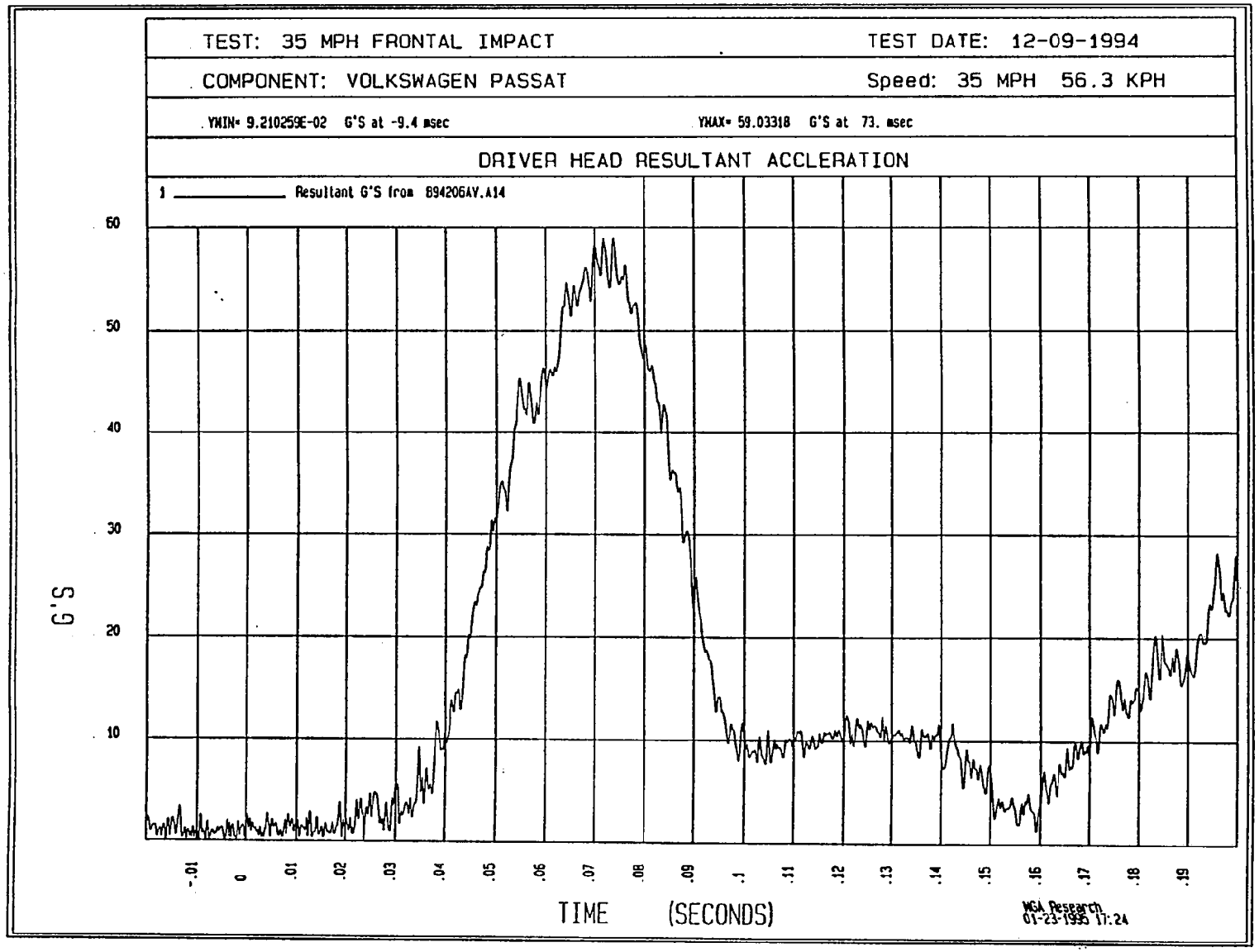


Figure B-36 - Driver Head Resultant Acceleration vs. Time

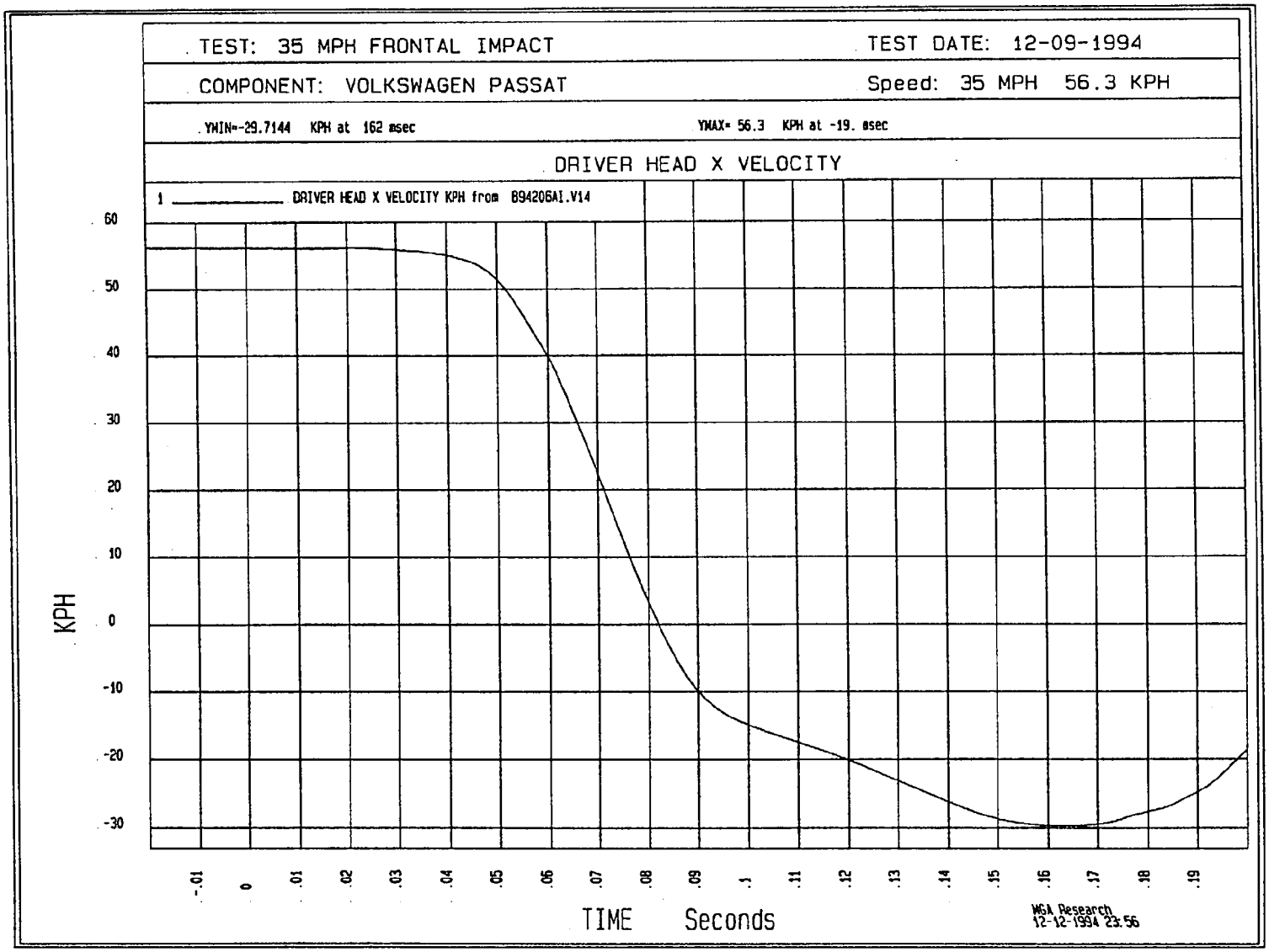


Figure B-37 - Driver Head X Velocity vs. Time

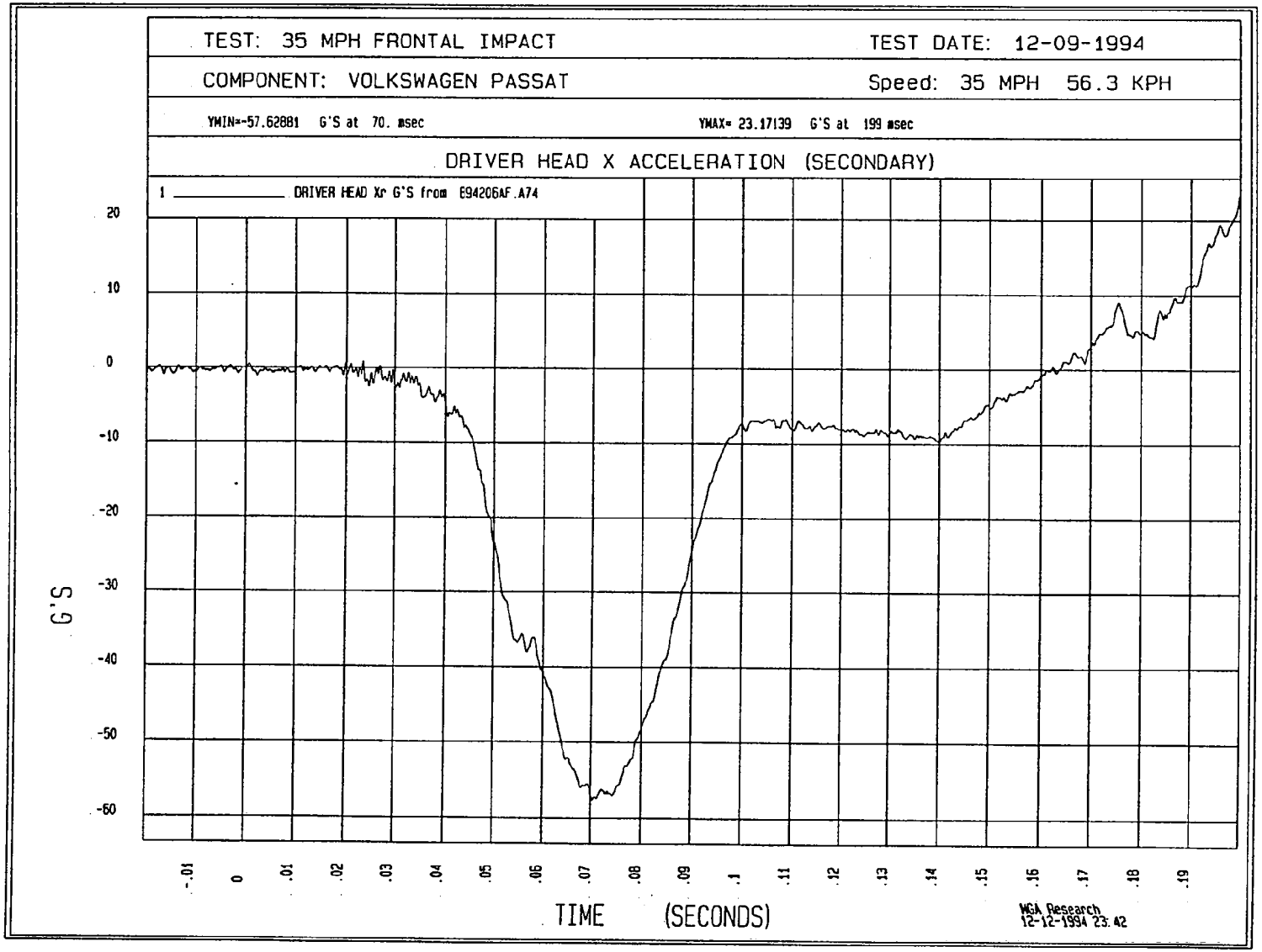


Figure B-38 - Driver Head X Redundant Acceleration vs. Time

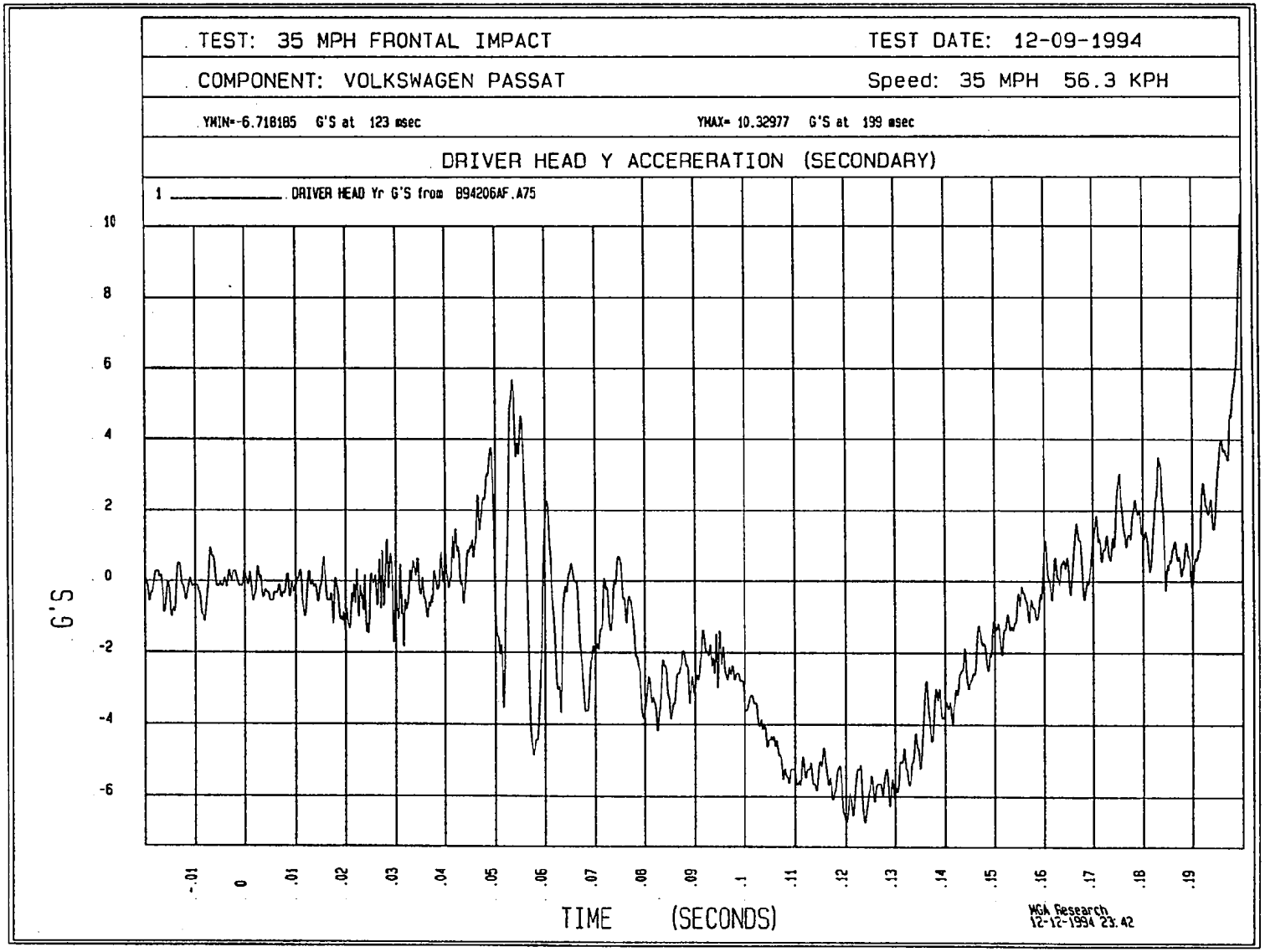


Figure B-39 - Driver Head Y Redundant Acceleration vs. Time

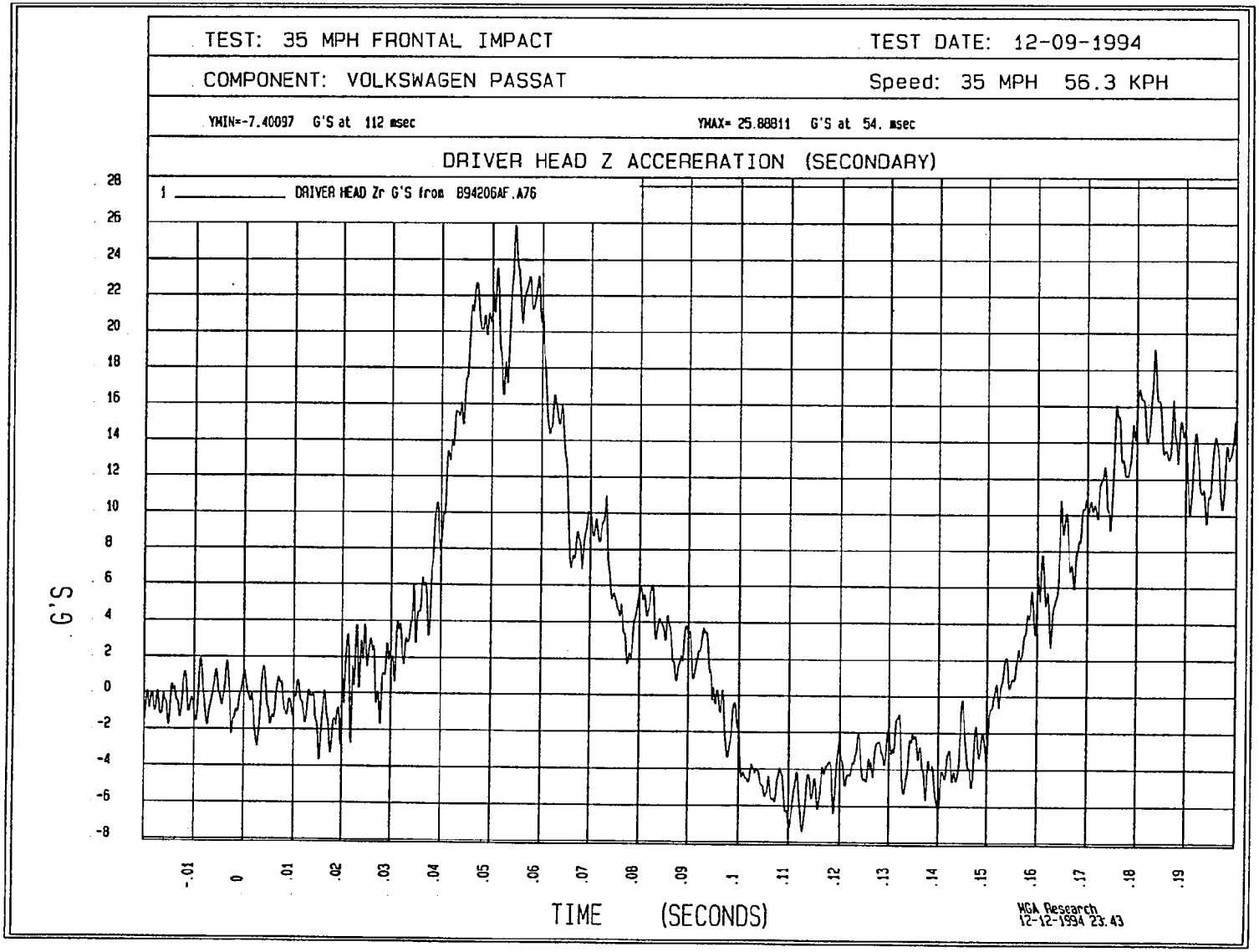


Figure B-4Ø - Driver Head Z Redundant Acceleration vs. Time

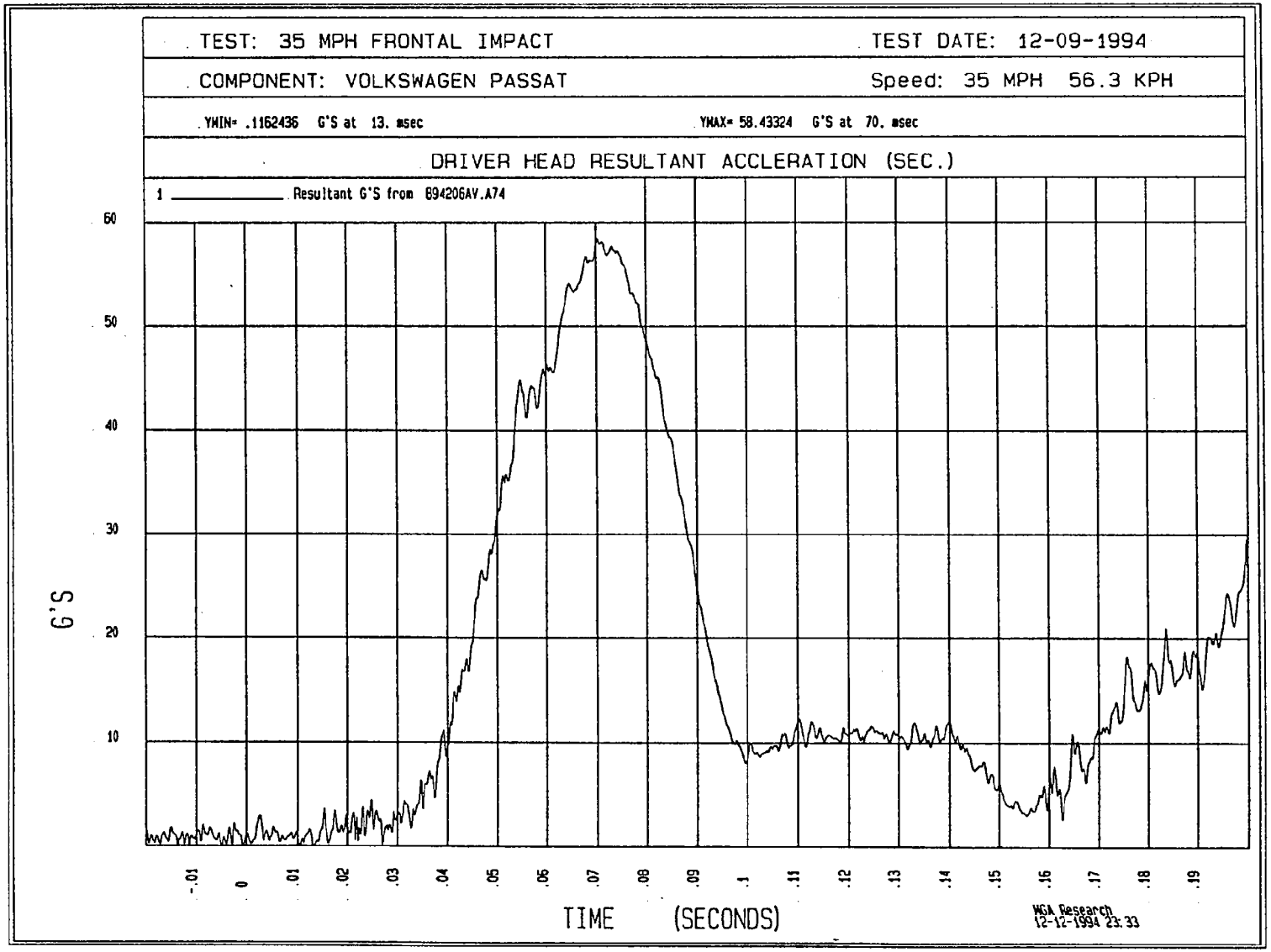


Figure B-41 - Driver Head Redundant Resultant Acceleration vs. Time

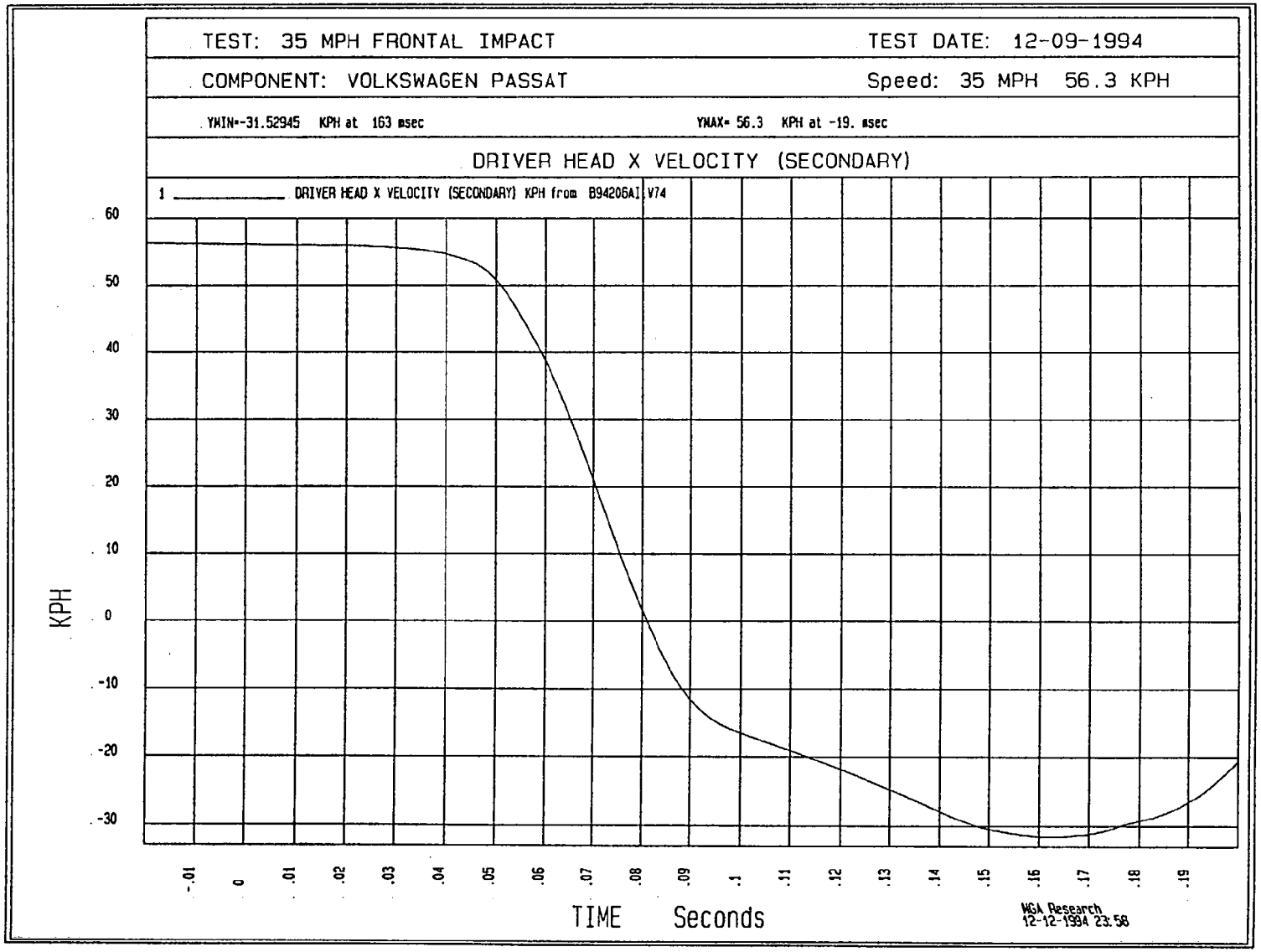


Figure B-42 - Driver Head X Redundant Velocity vs. Time

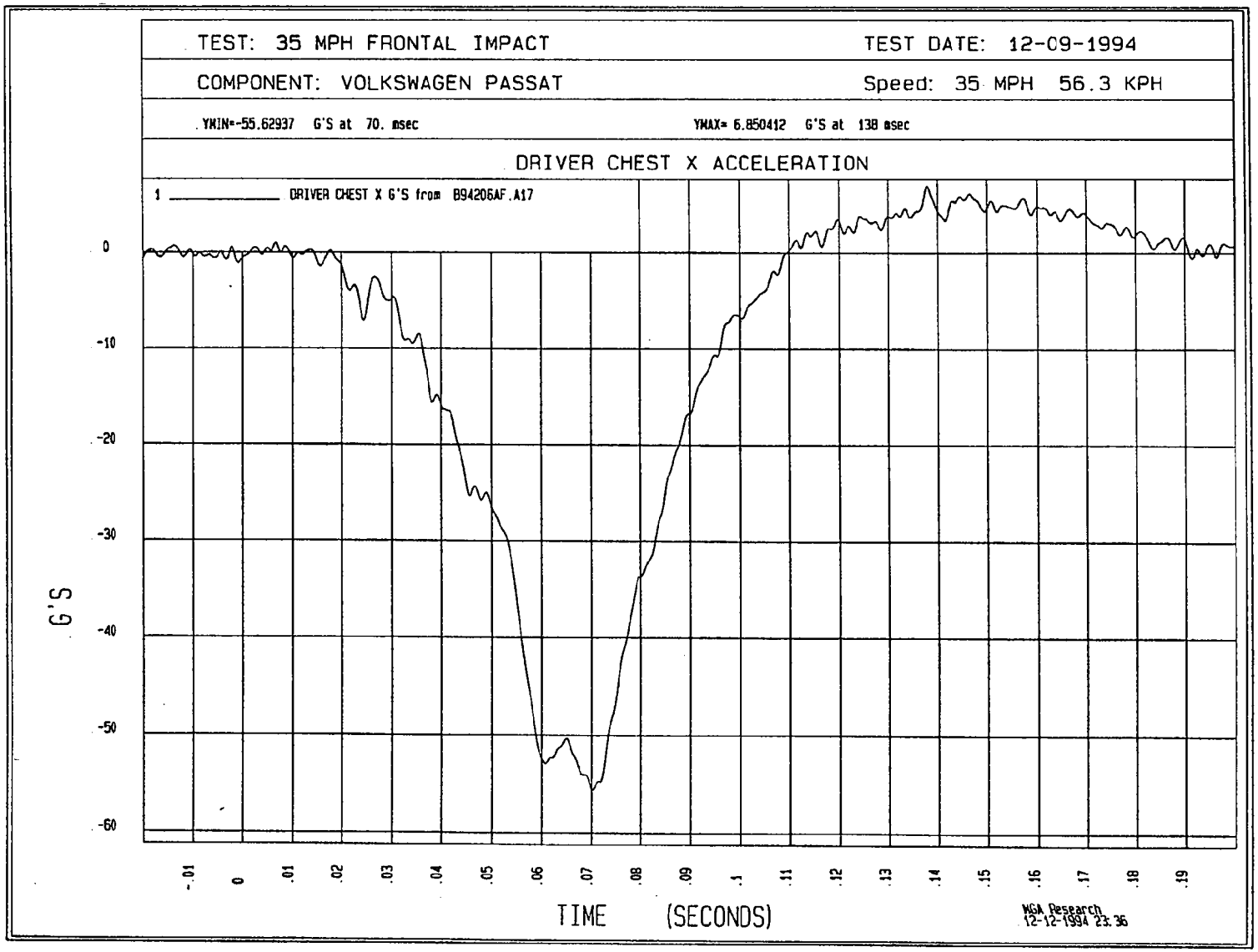


Figure B-43 - Driver Chest X Acceleration vs. Time

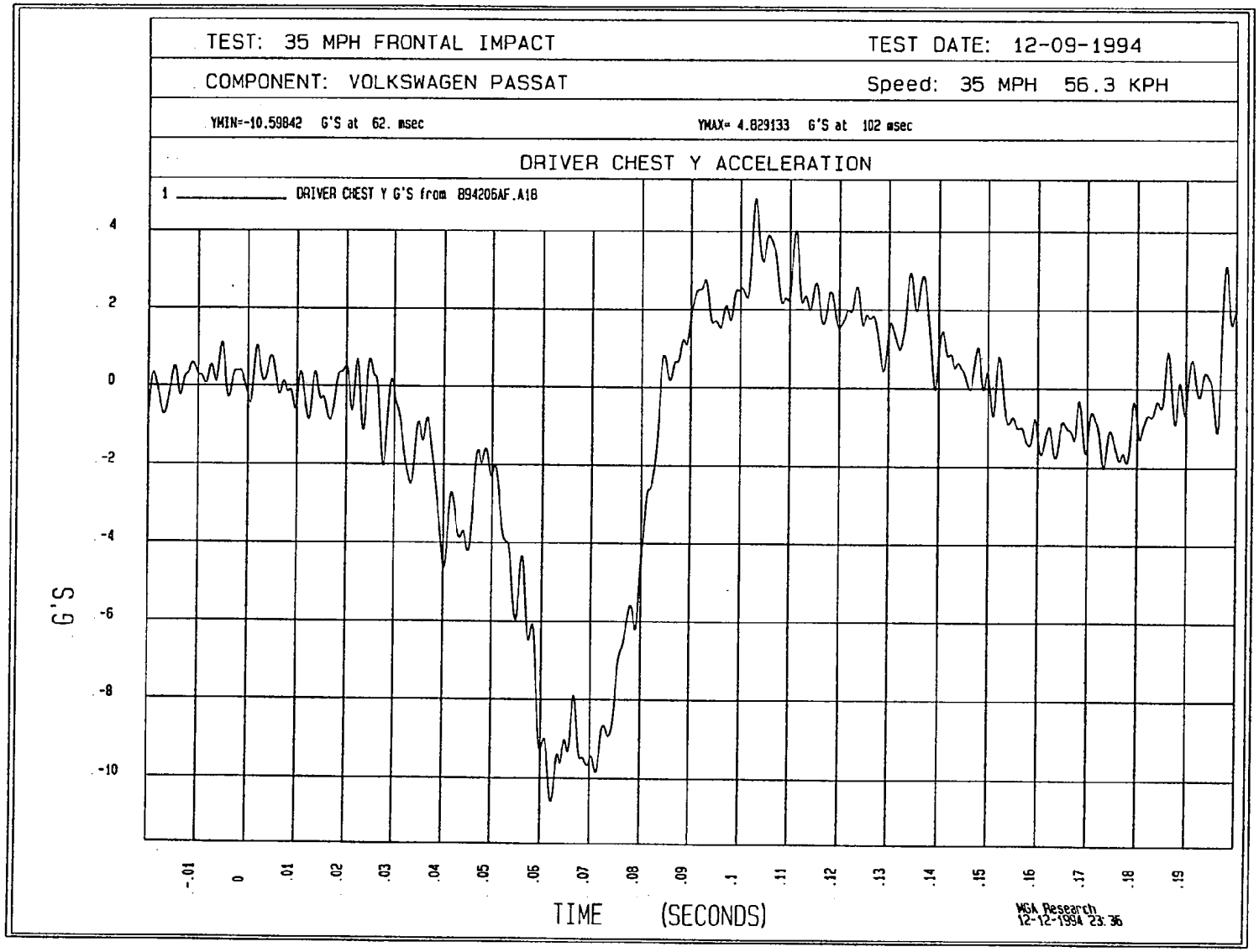


Figure B-44 - Driver Chest Y Acceleration vs. Time

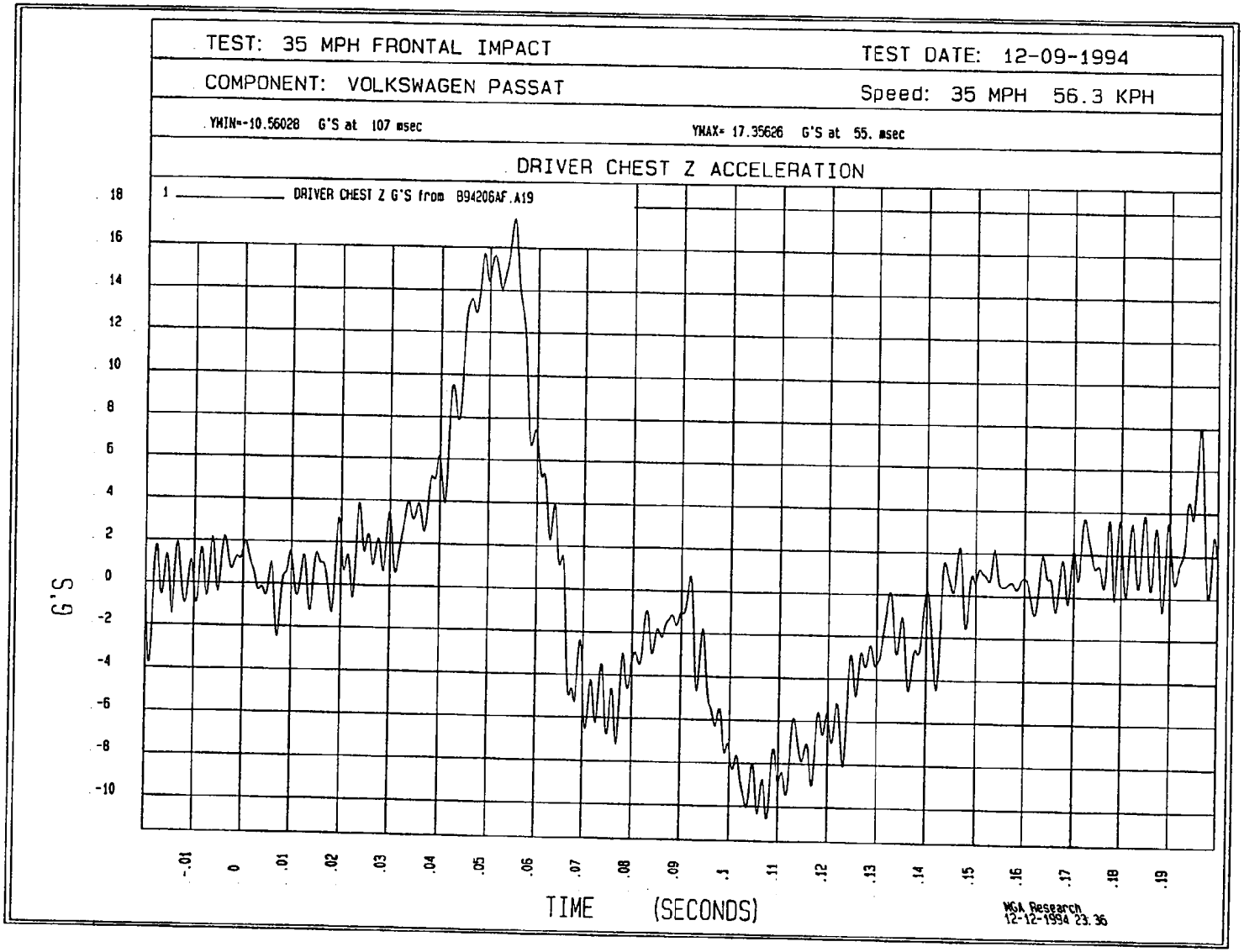


Figure B-45 - Driver Chest Z Acceleration vs. Time

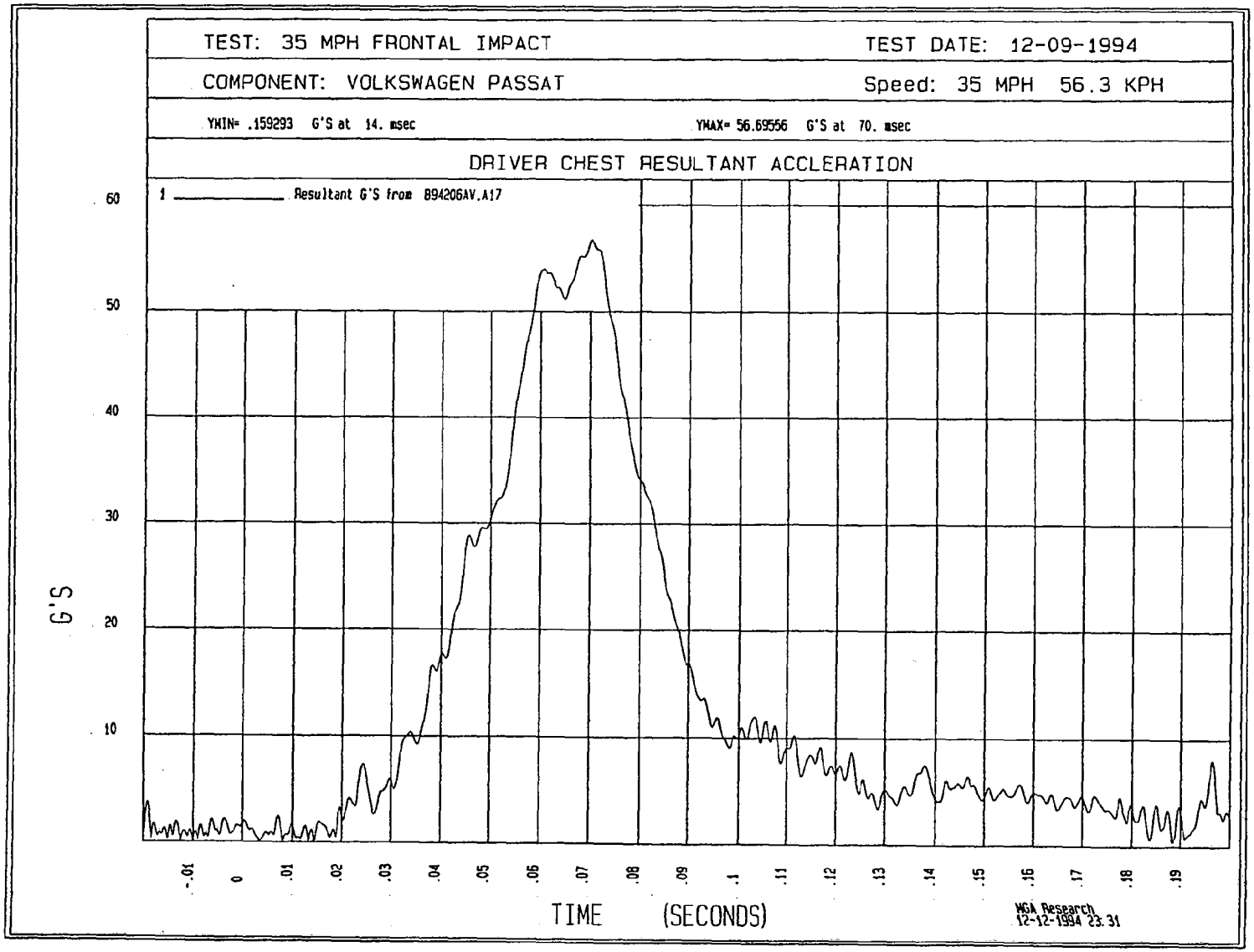


Figure B-46 - Driver Chest Resultant vs. Time

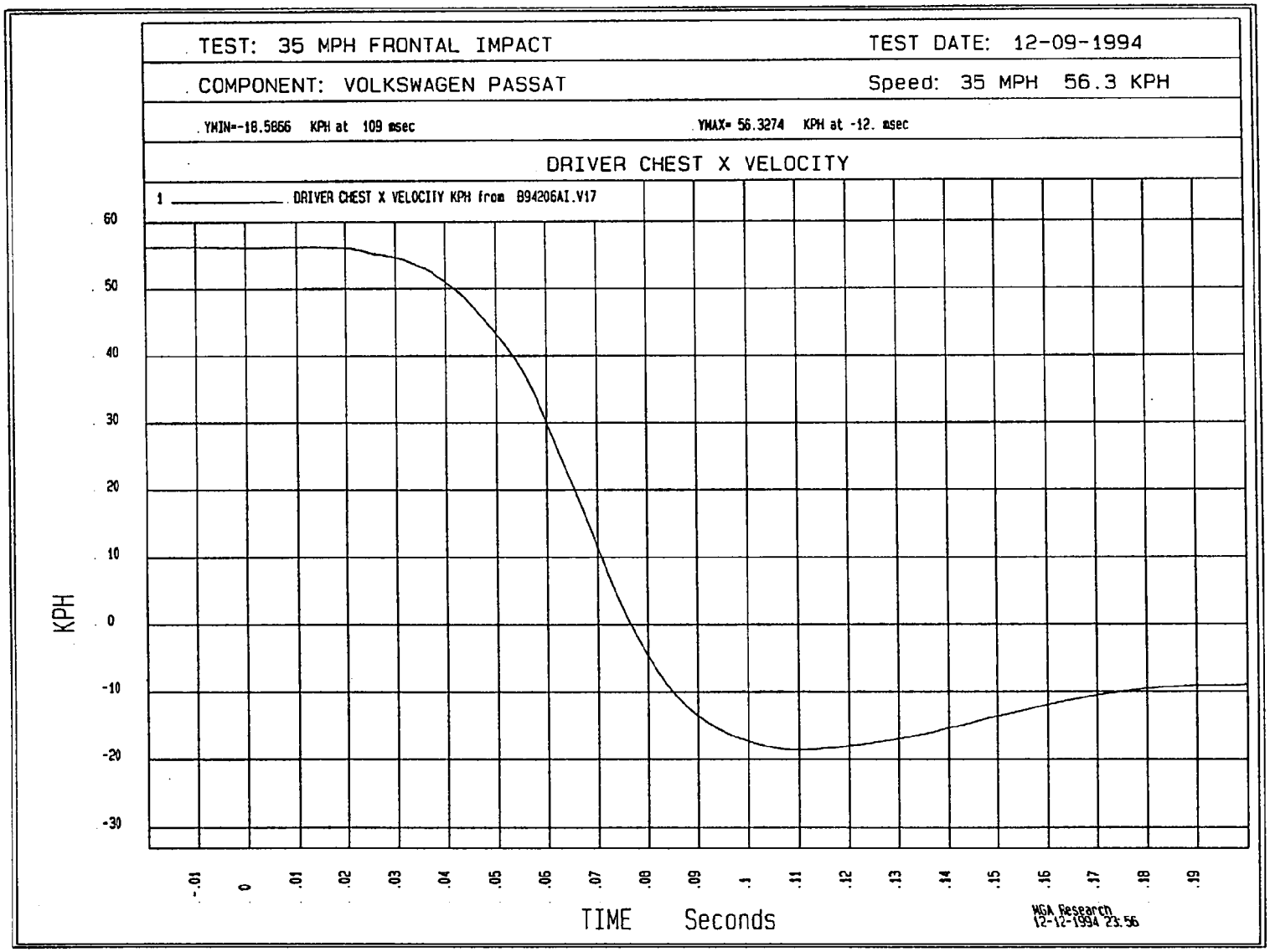


Figure B-47 - Driver Chest X Velocity vs. Time

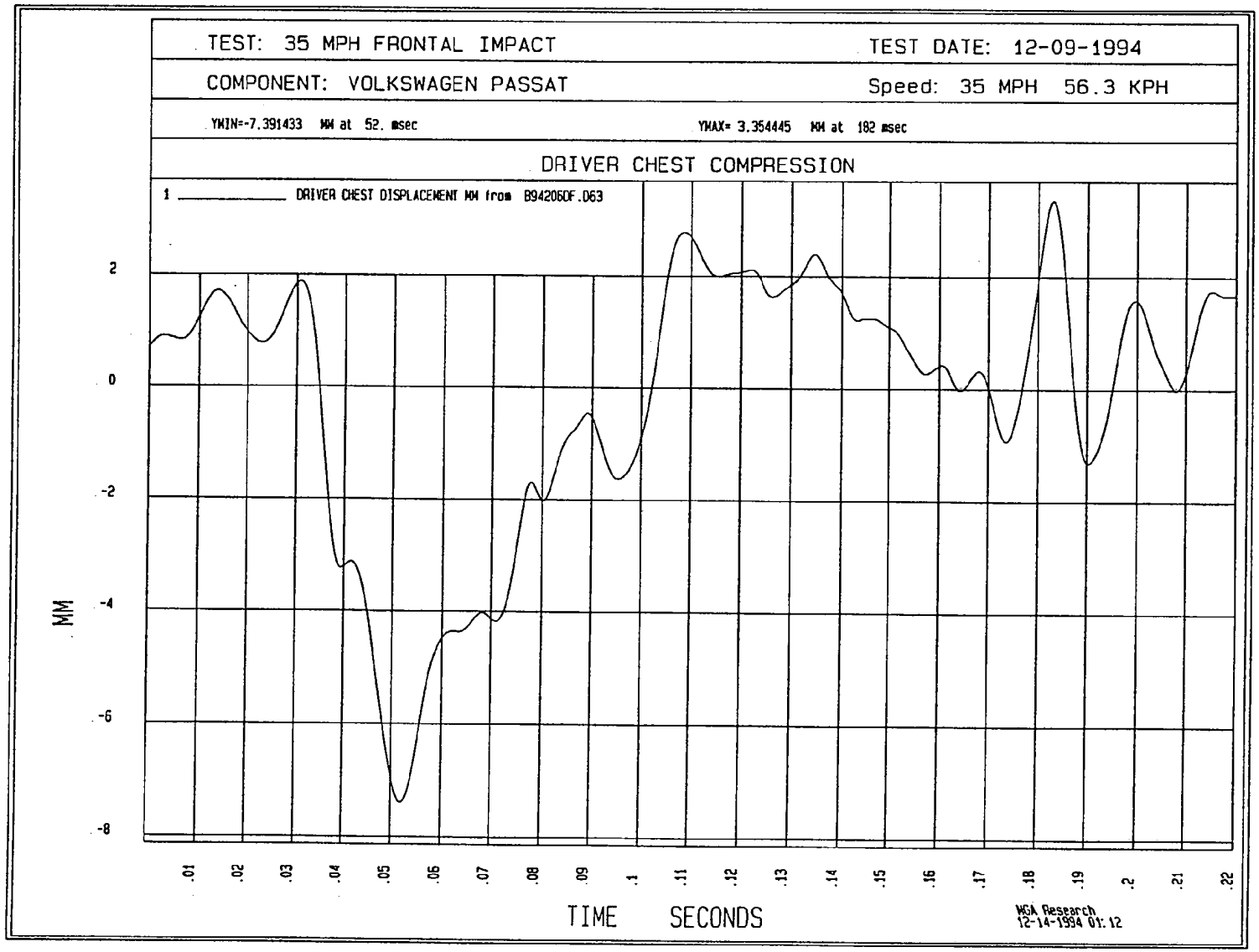


Figure B-48 - Driver Chest Compression vs. Time

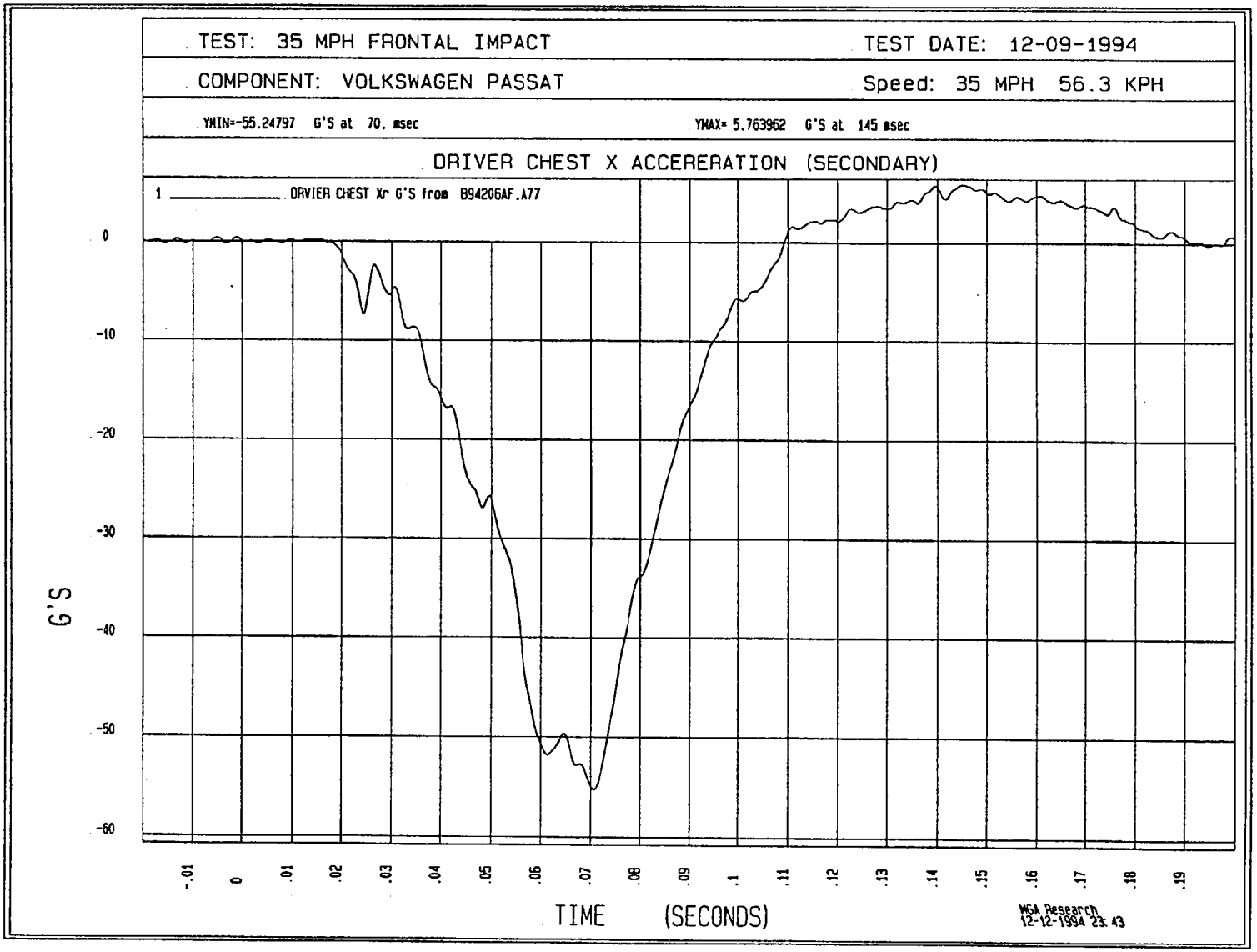


Figure B-49 - Driver Chest X Redundant Acceleration vs. Time

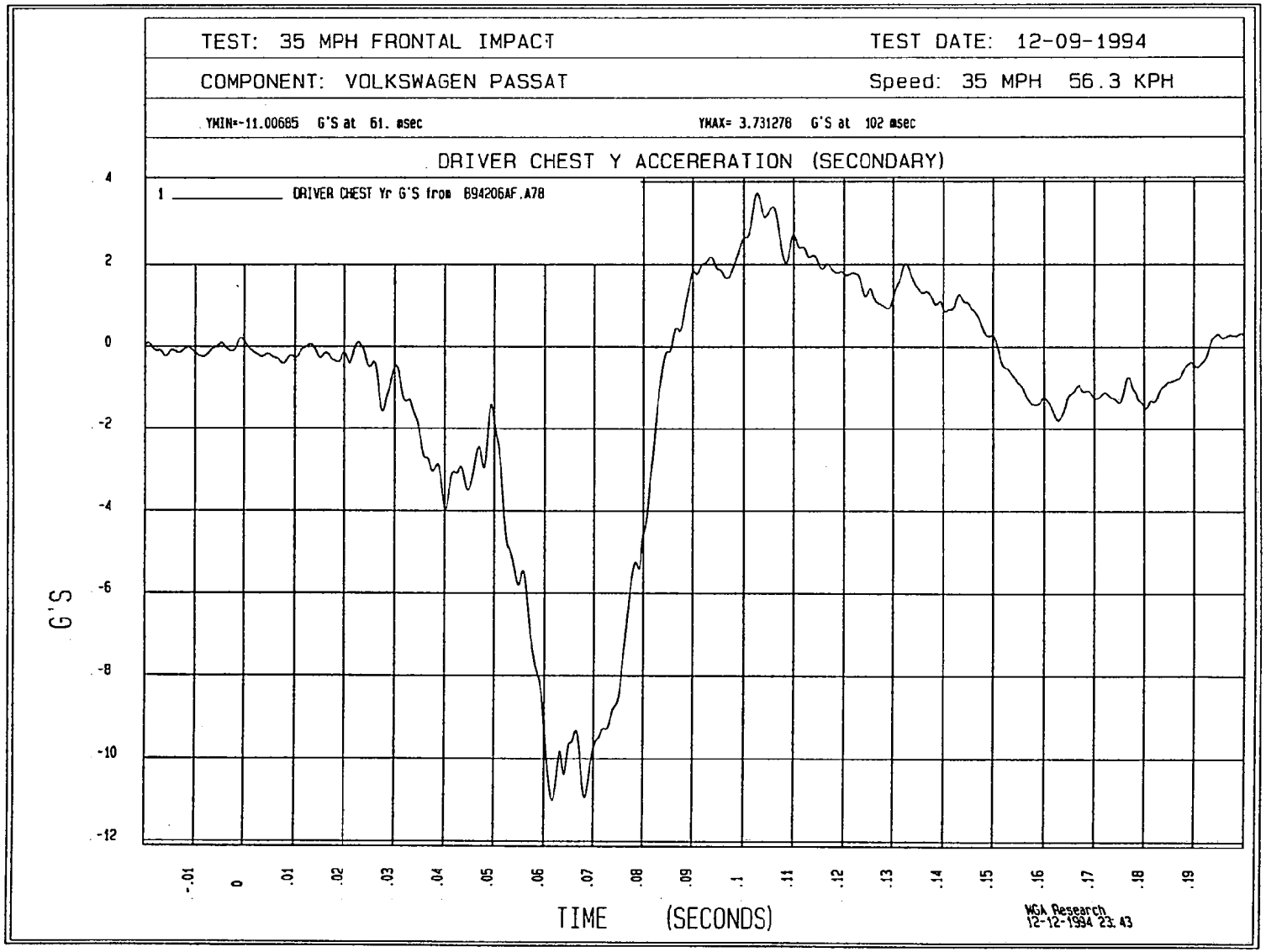


Figure B-5Ø - Driver Chest Y Redundant Acceleration vs. Time

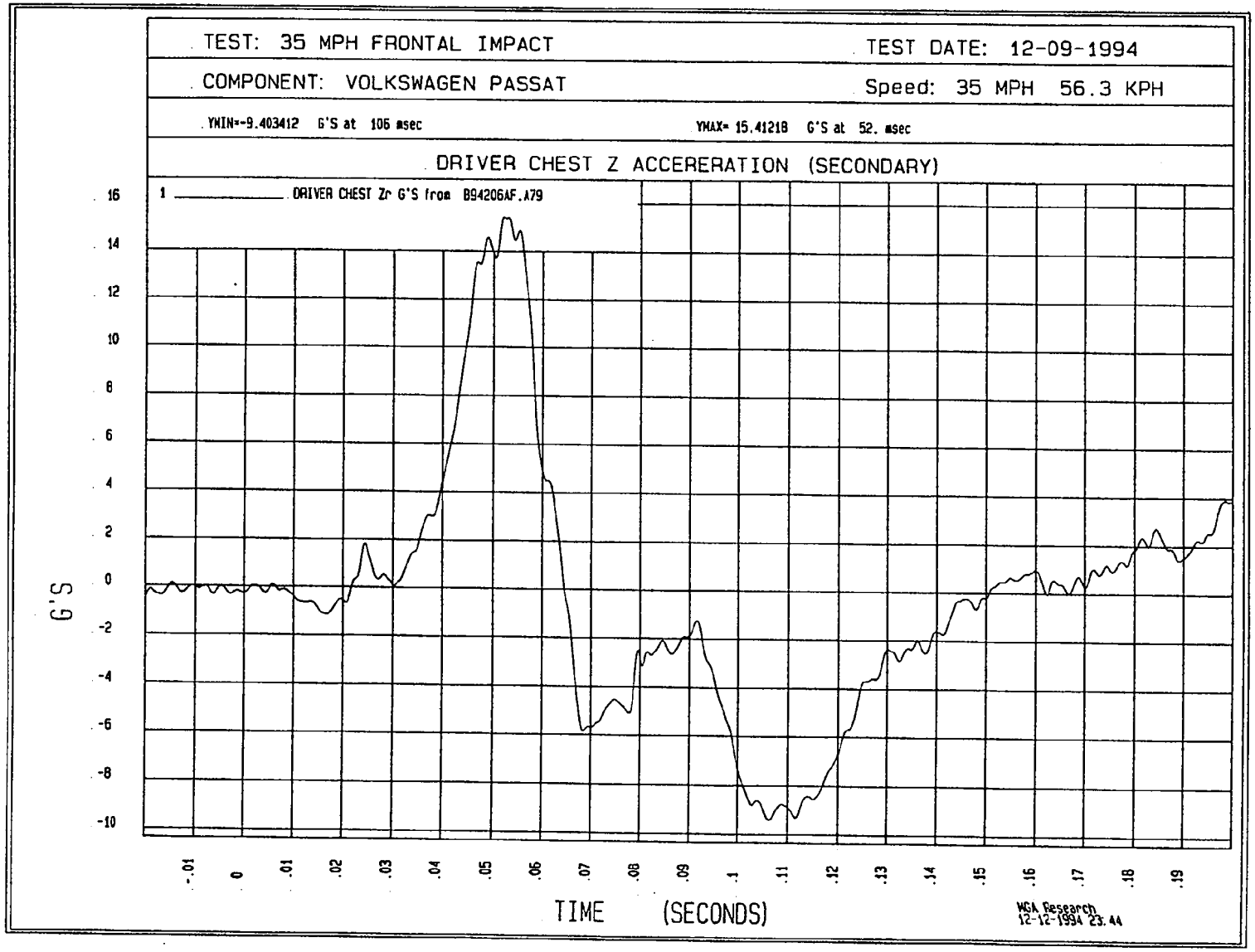


Figure B-51 - Driver Chest Z Redundant Acceleration vs. Time

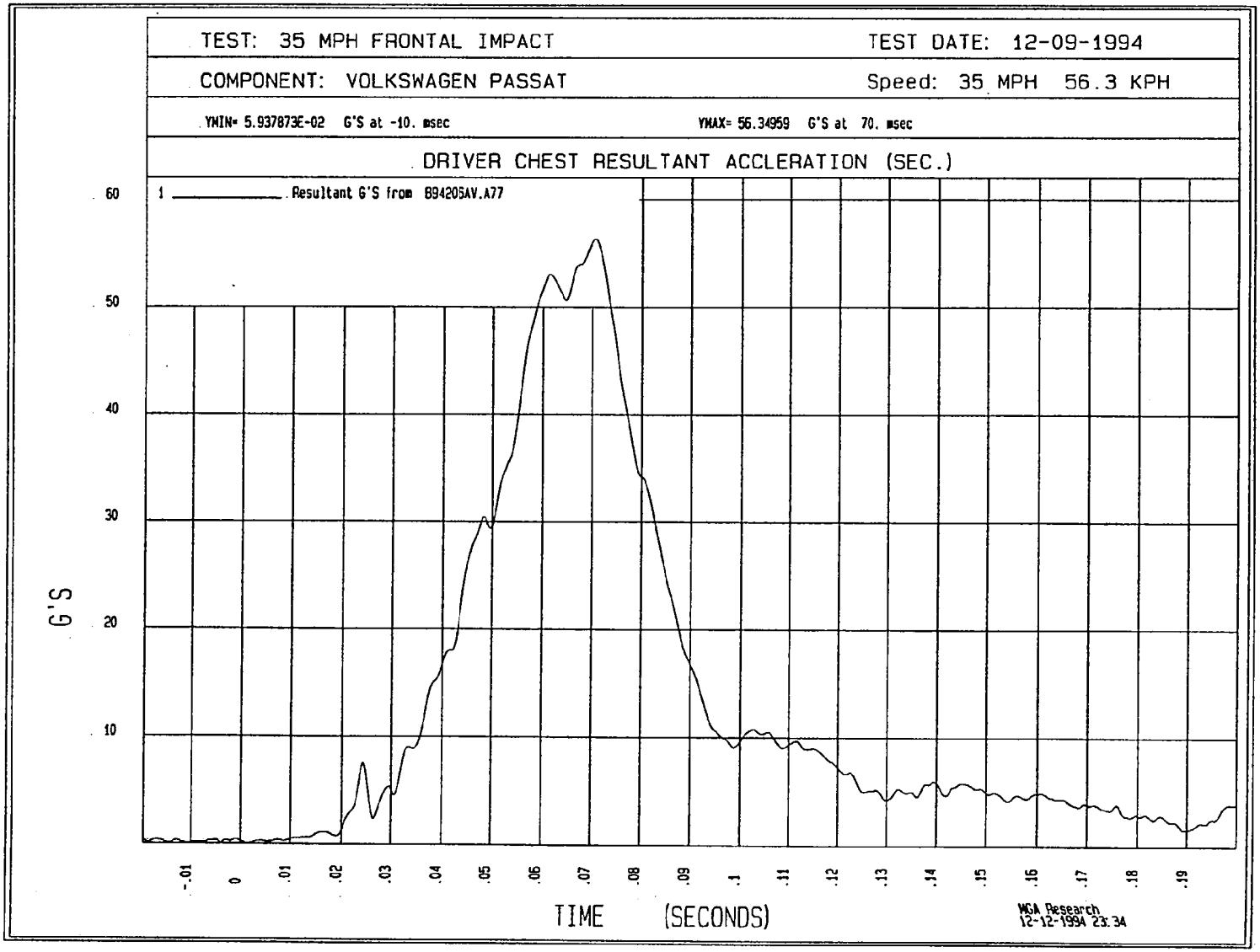


Figure B-52 - Driver Chest Redundant Resultant Acceleration vs. Time

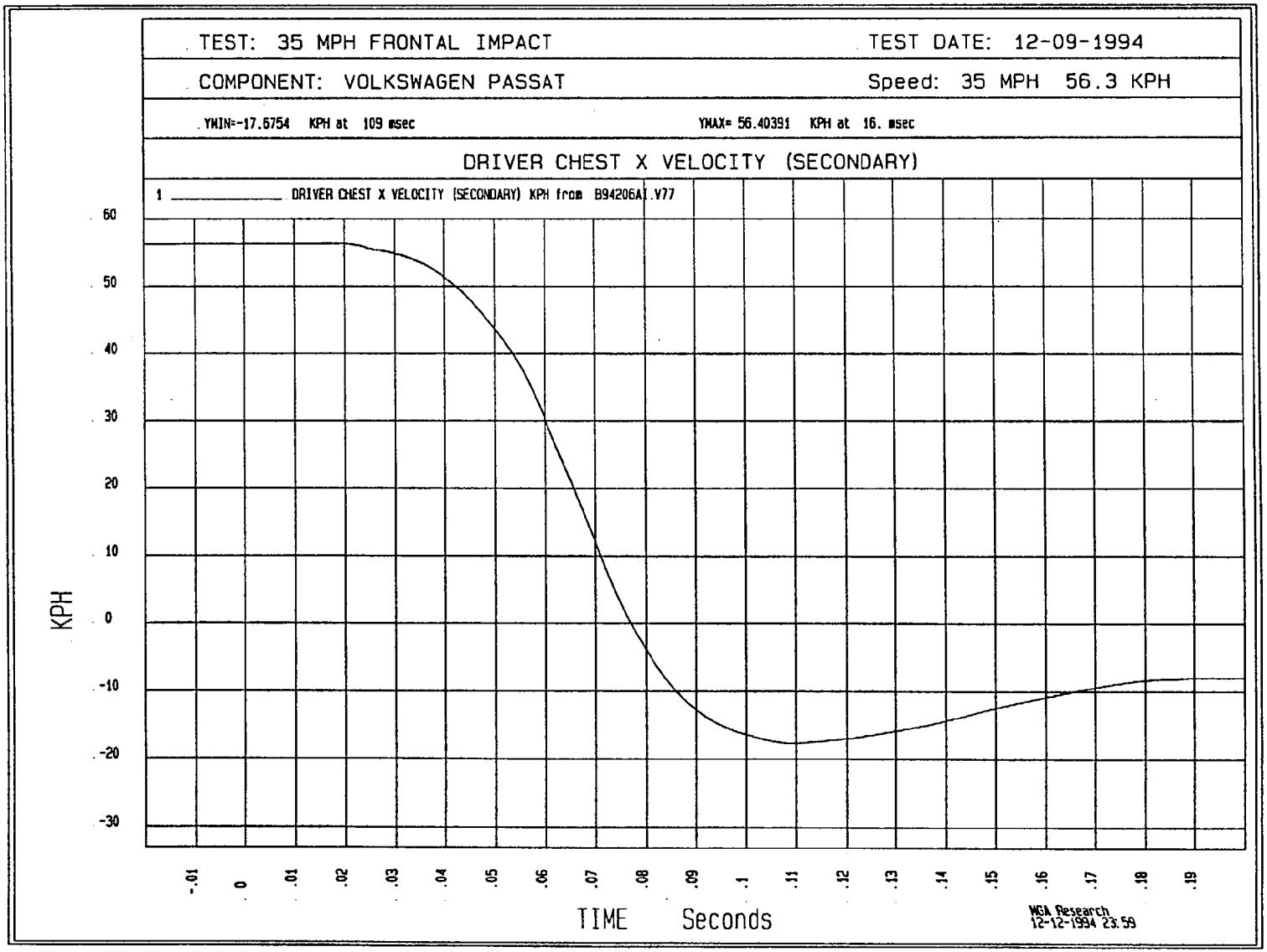


Figure B-53 - Driver Chest X Velocity vs. Time

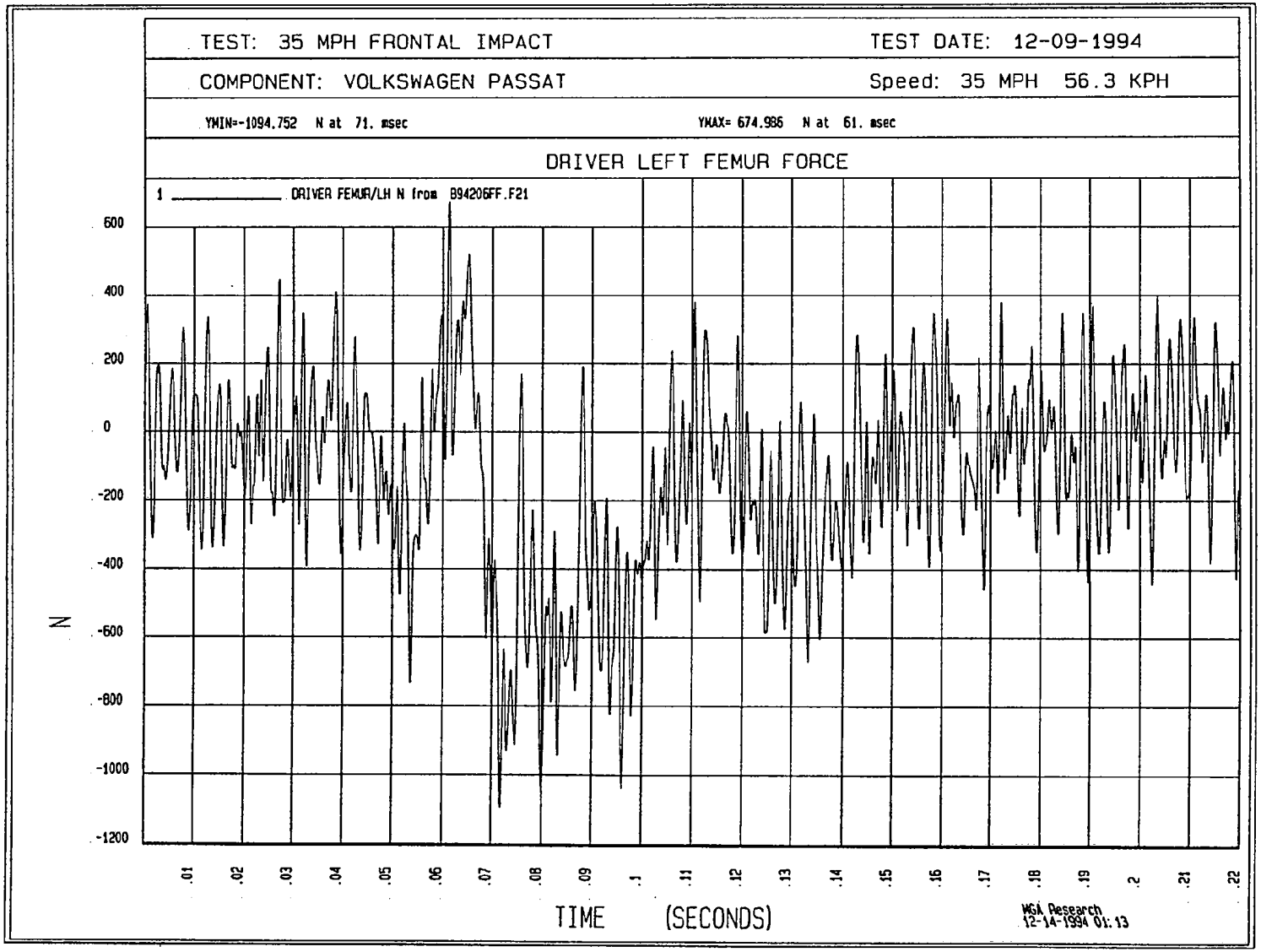


Figure B-54 - Driver Left Femur Force vs. Time

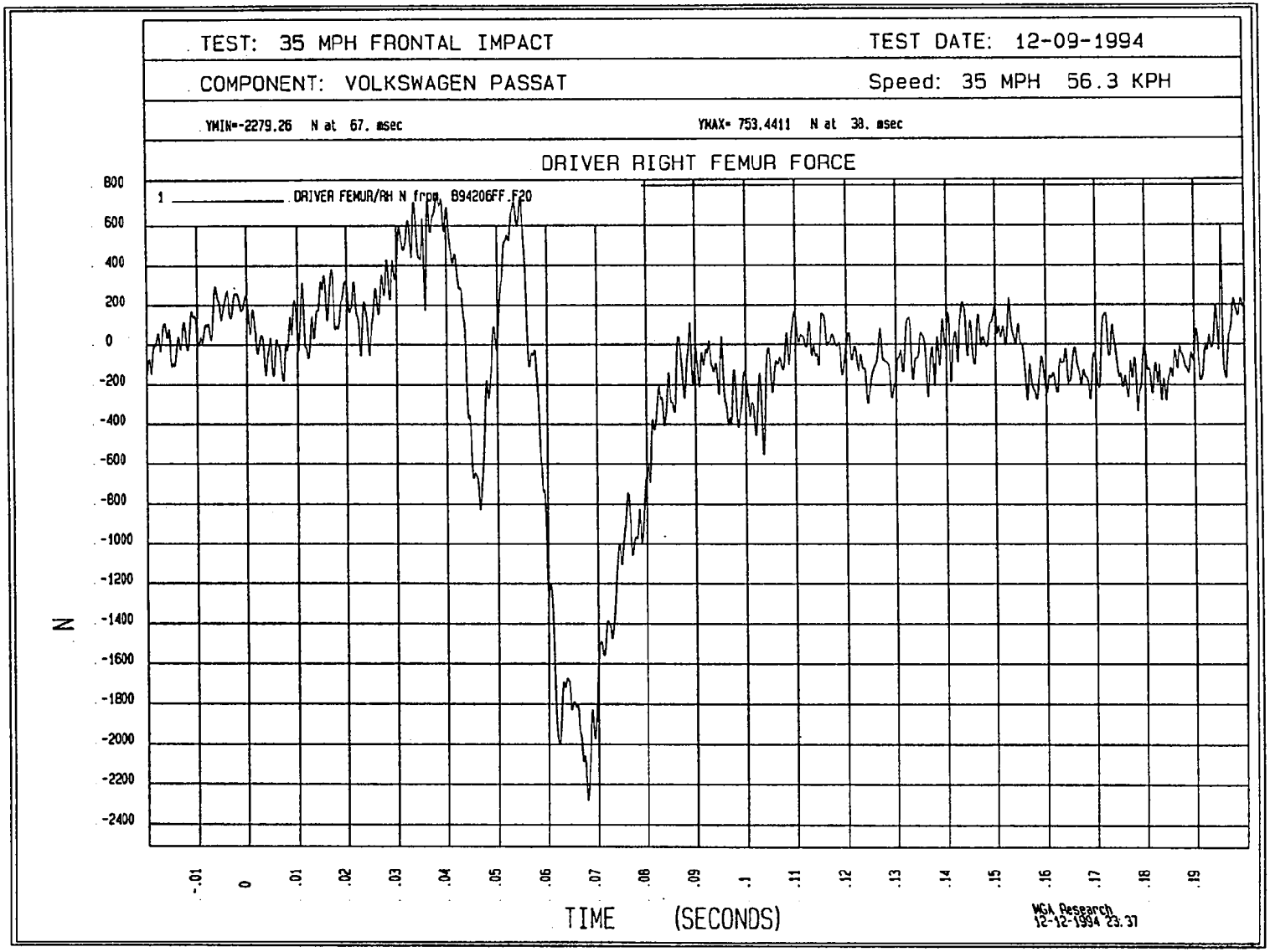


Figure B-55 - Driver Right Femur Force vs. Time

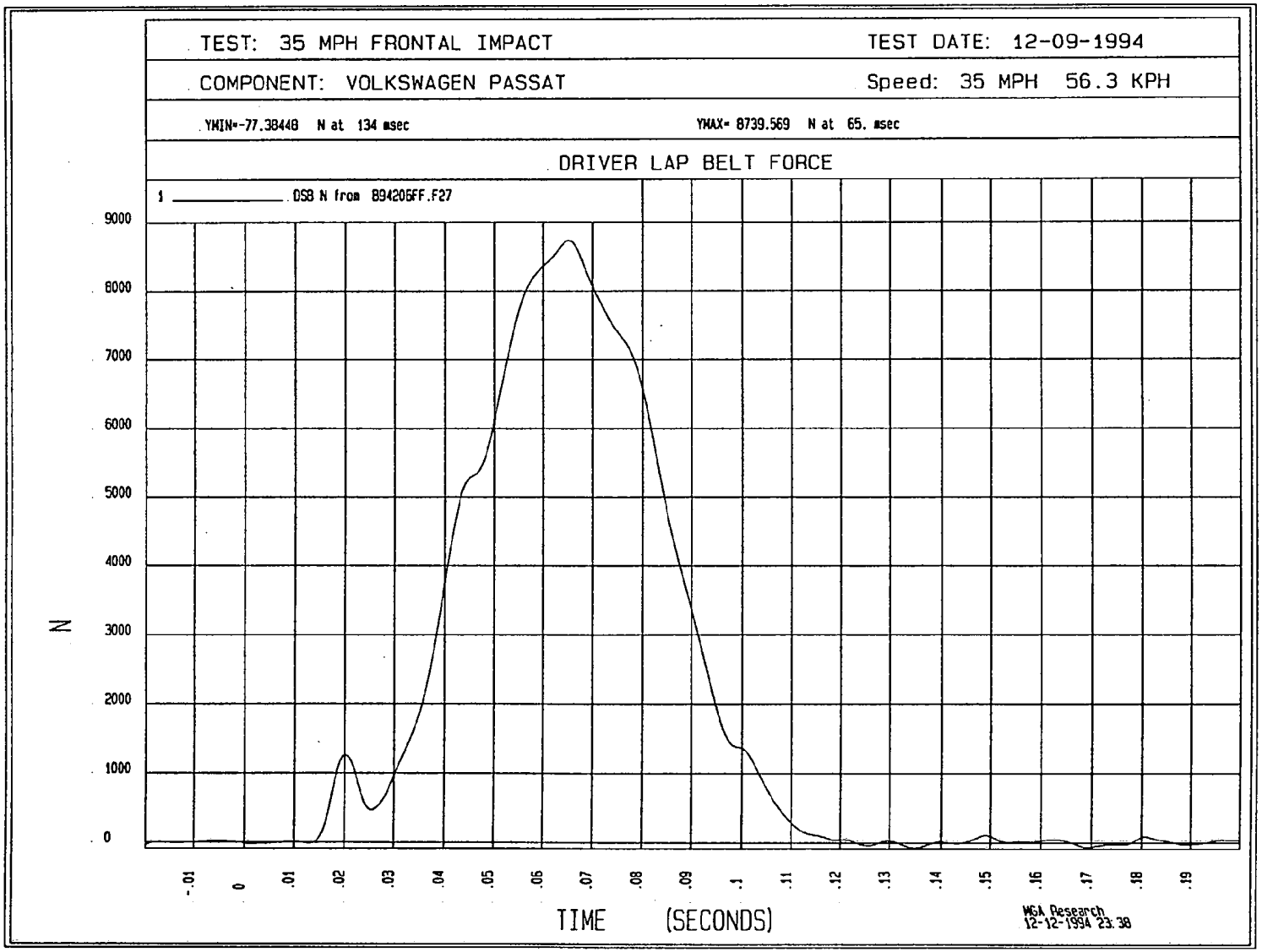


Figure B-56 - Driver Lap Belt Force vs. Time

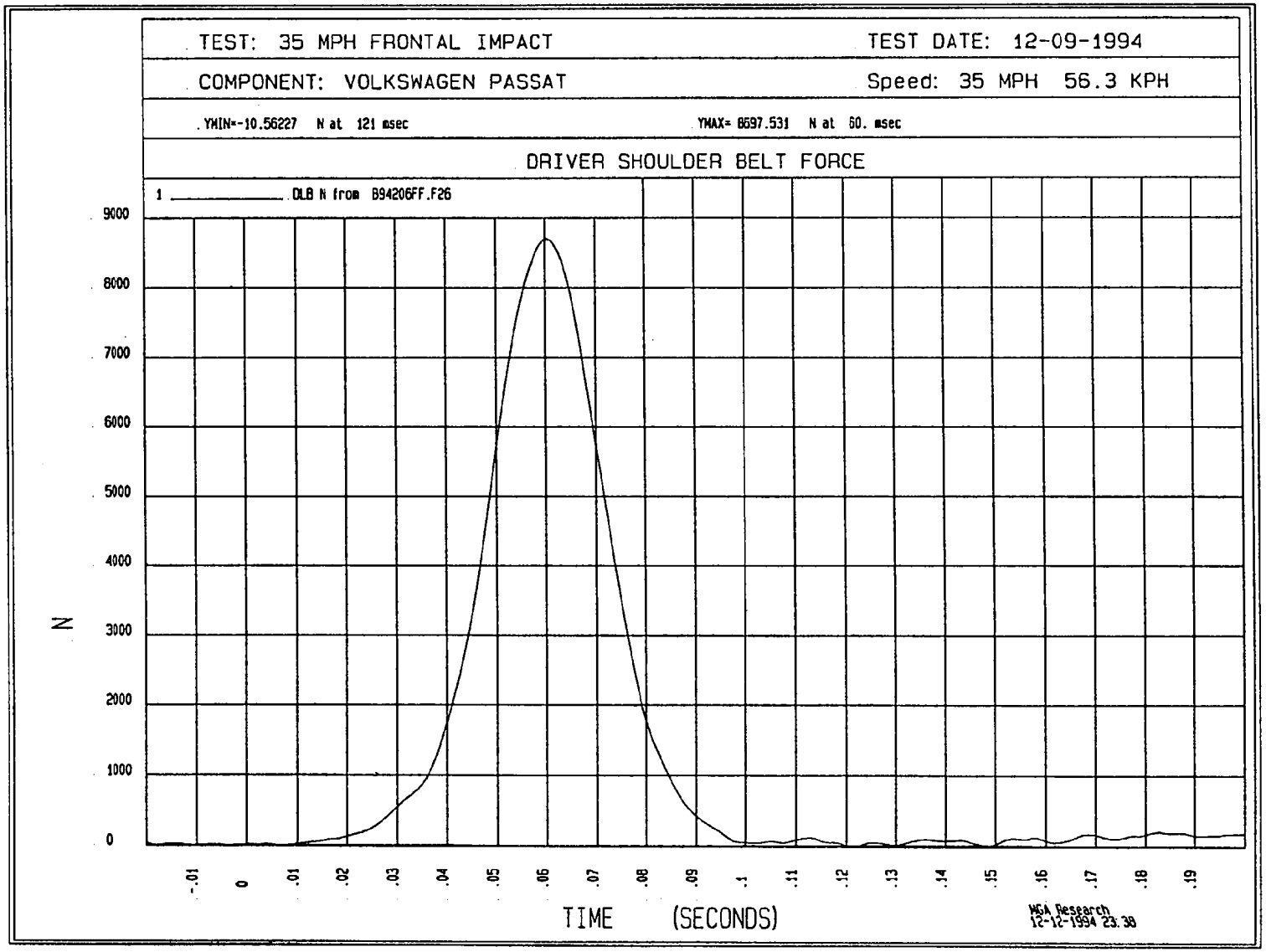


Figure B-57 - Driver Shoulder Belt Force vs. Time

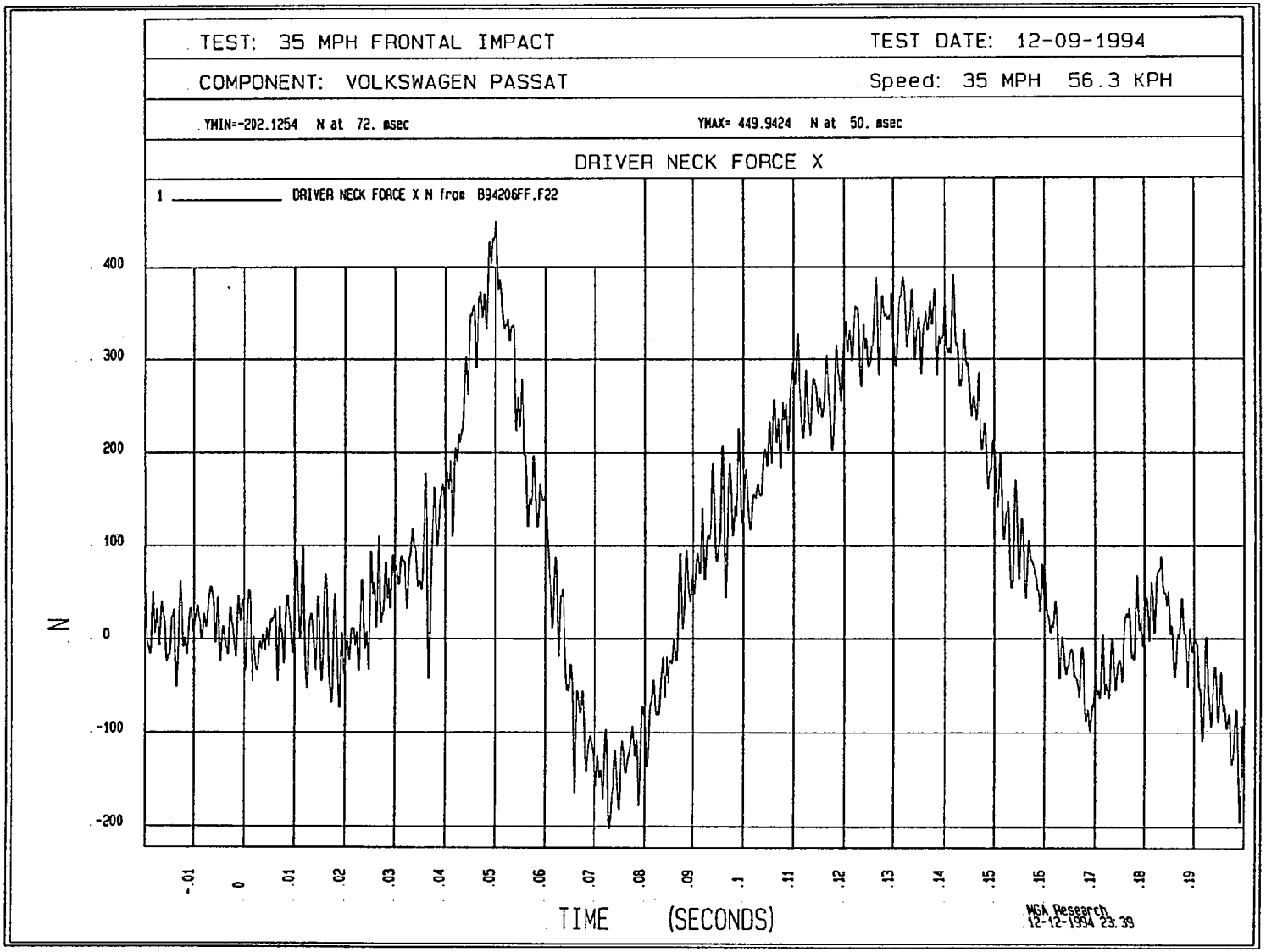


Figure B-58 - Driver Neck Force X vs. Time

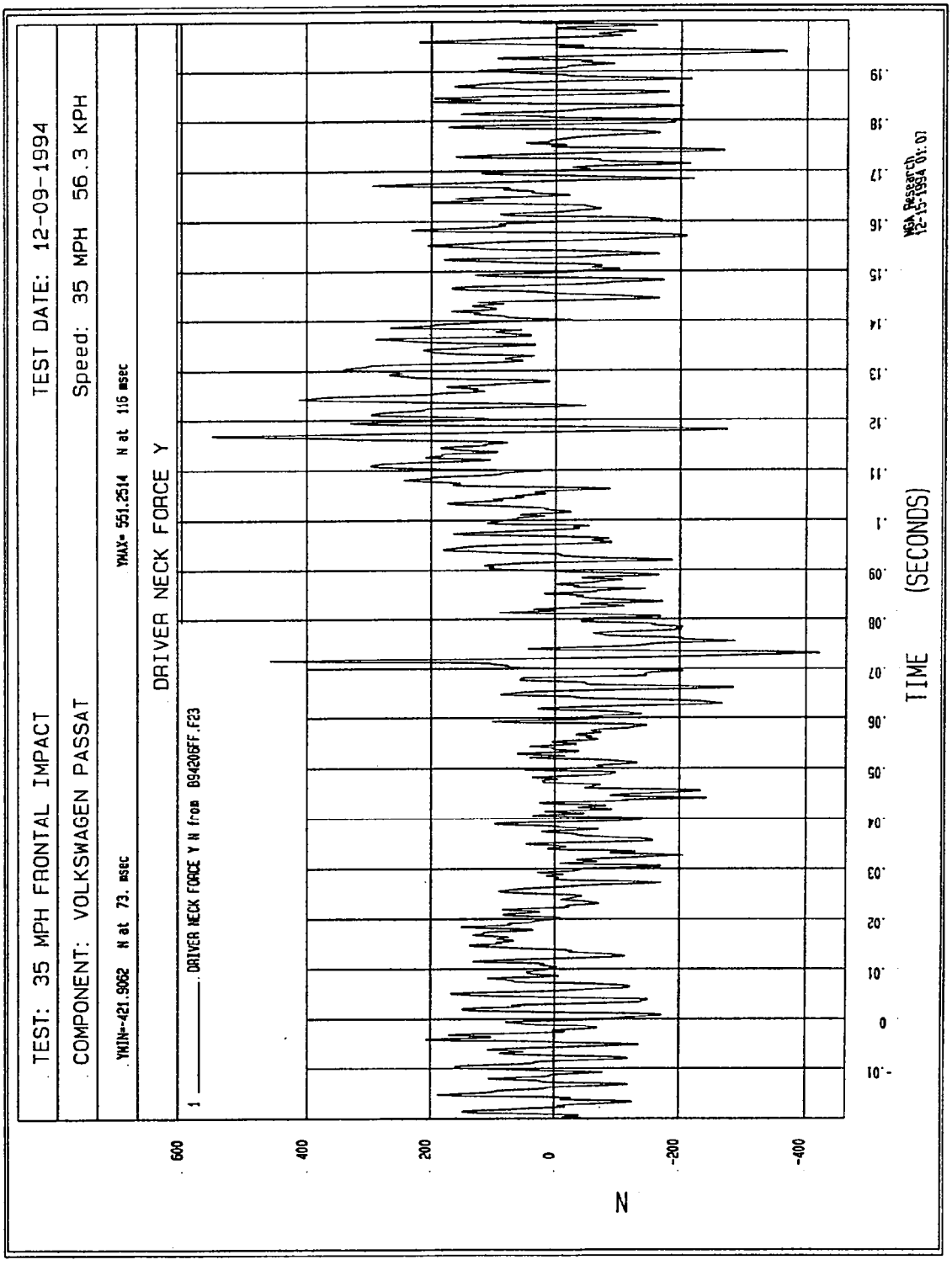


Figure B-59 - Driver Neck Force Y vs. Time

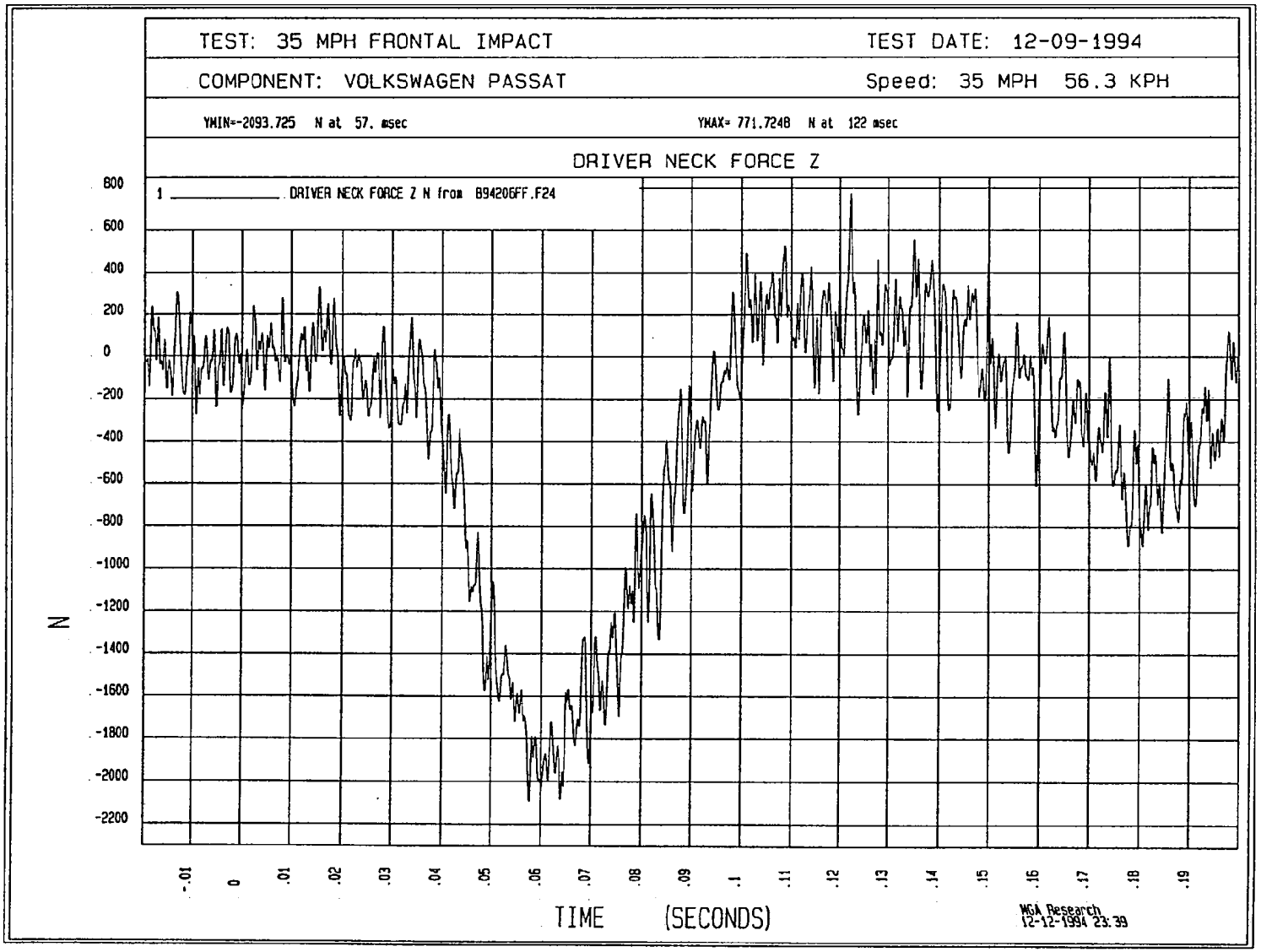


Figure B-60 - Driver Neck Force Z vs. Time

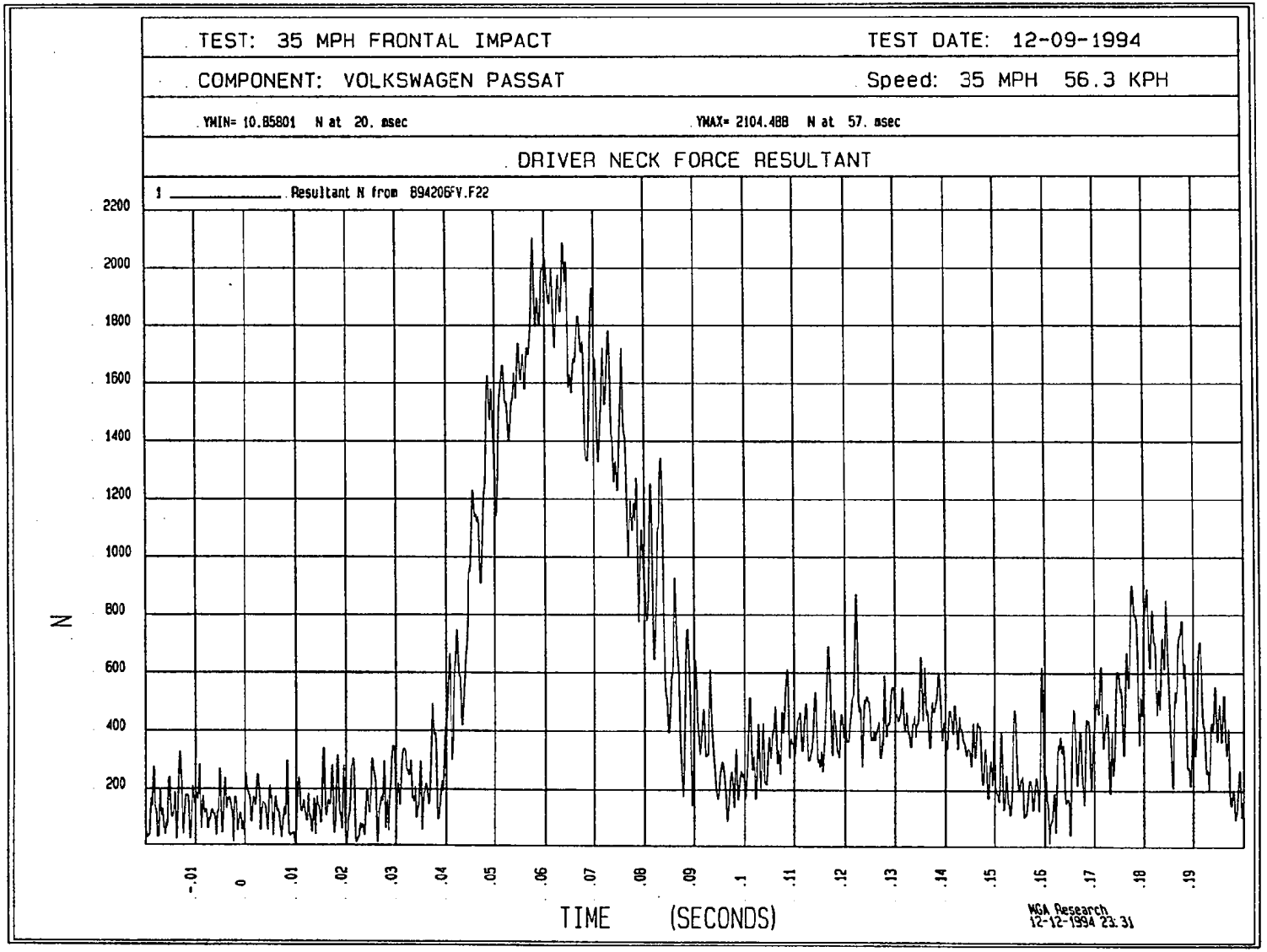


Figure B-61 - Driver Neck Force Resultant vs. Time

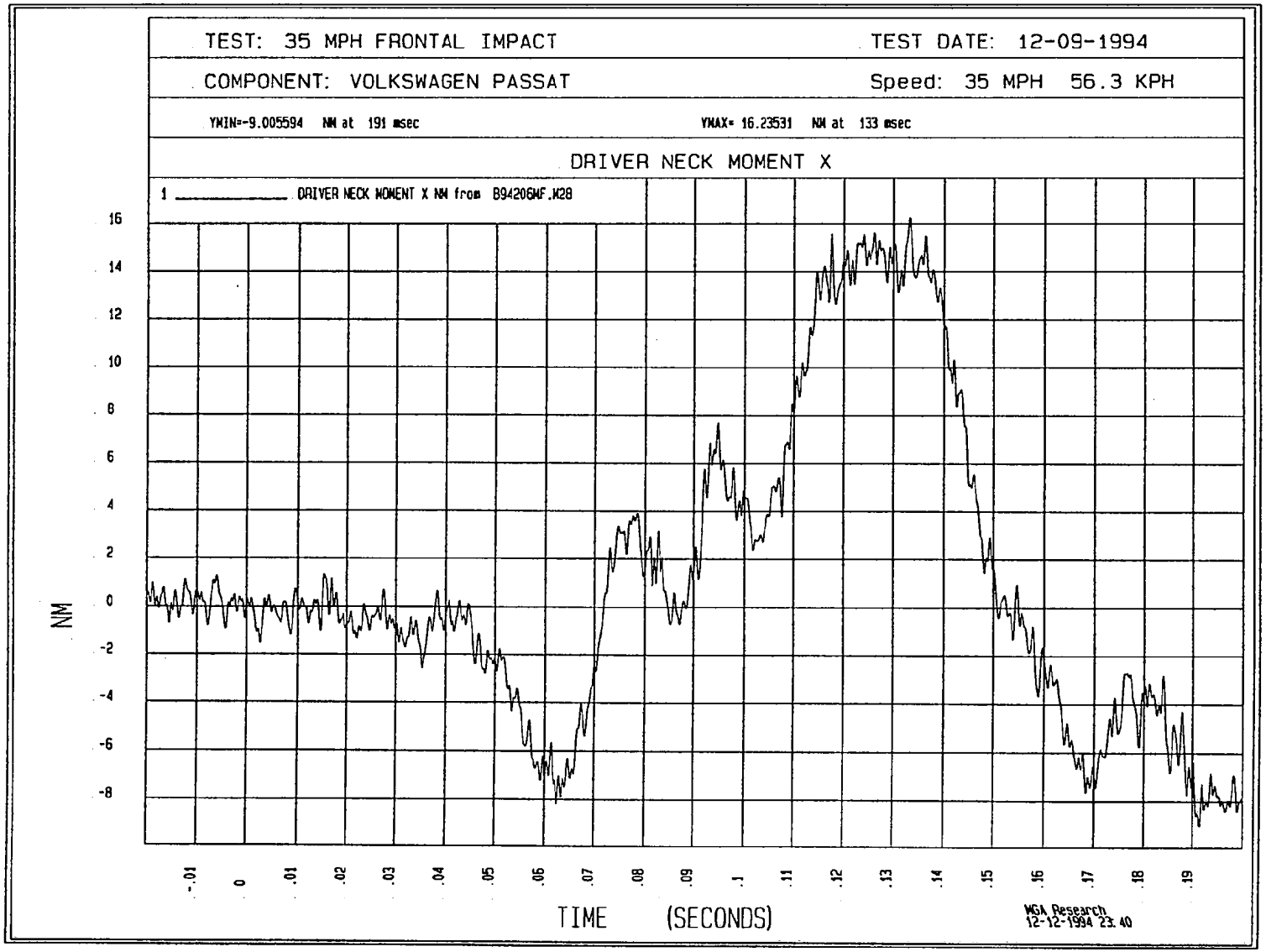


Figure B-62 - Driver Neck Moment X vs. Time

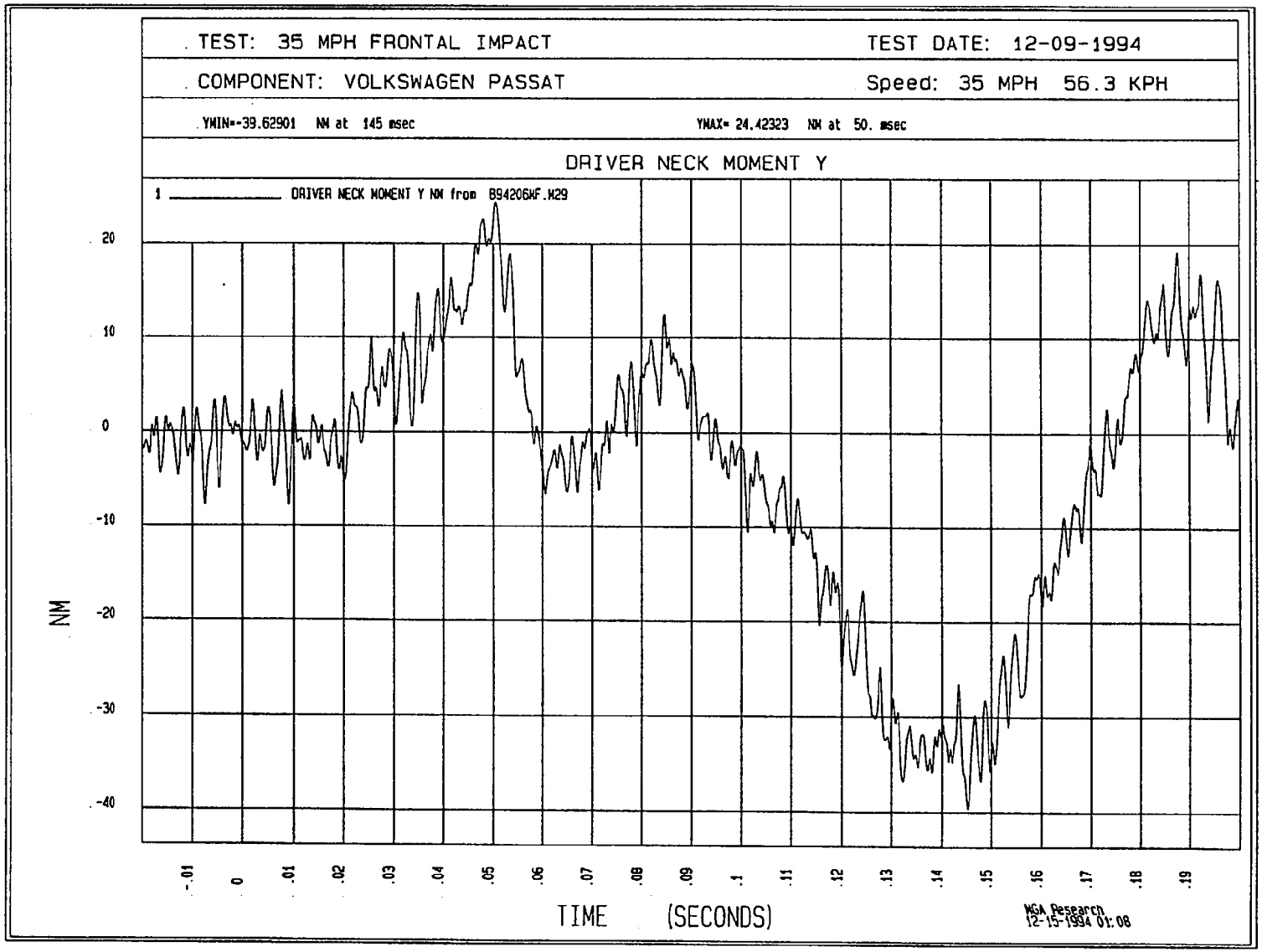


Figure B-63 - Driver Neck Moment Y vs. Time

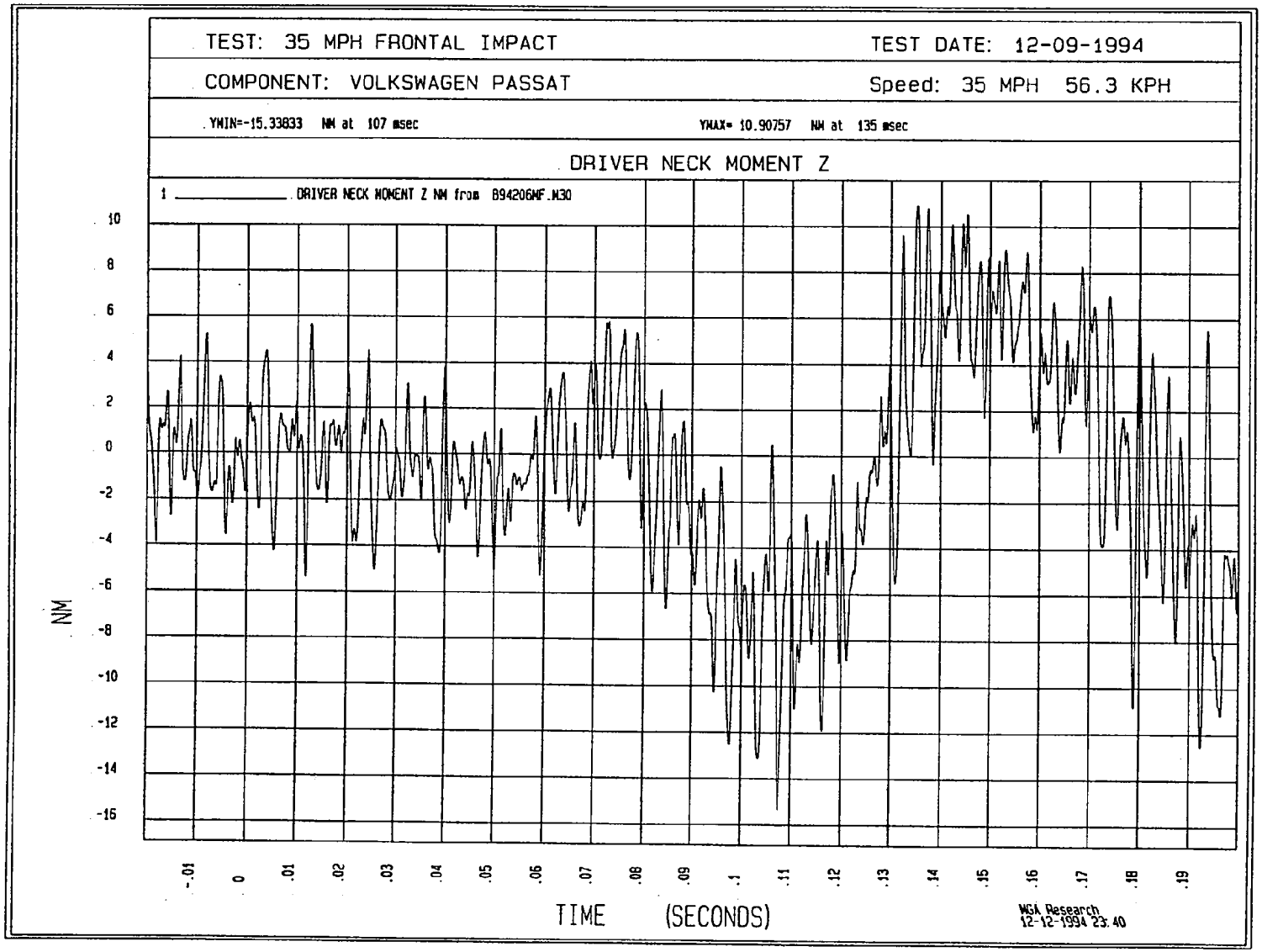


Figure B-64 - Driver Neck Moment Z vs. Time

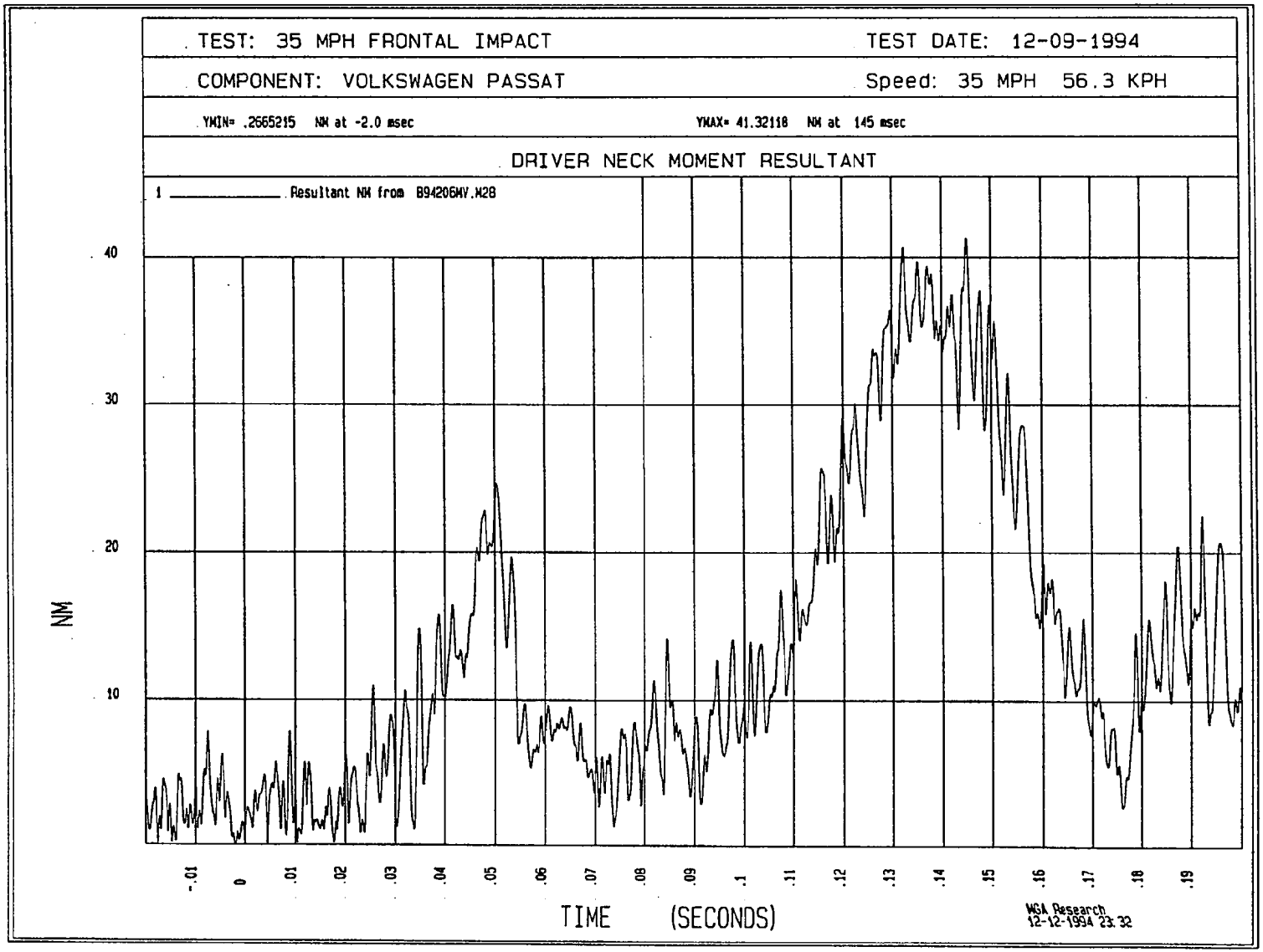
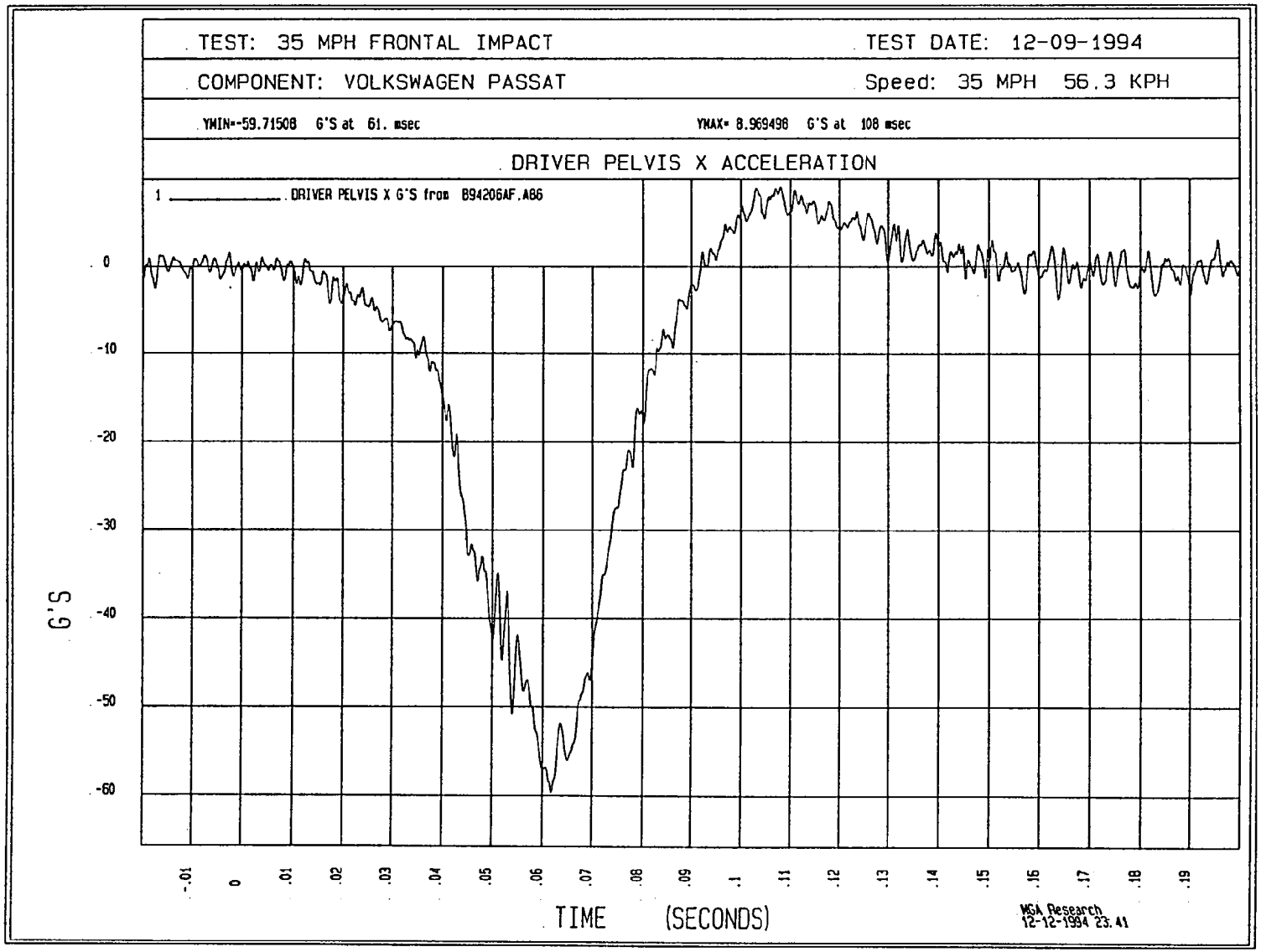


Figure B-65 - Driver Neck Moment Resultant vs. Time



B-66

Figure B-66 - Driver Pelvis X Acceleration vs. Time

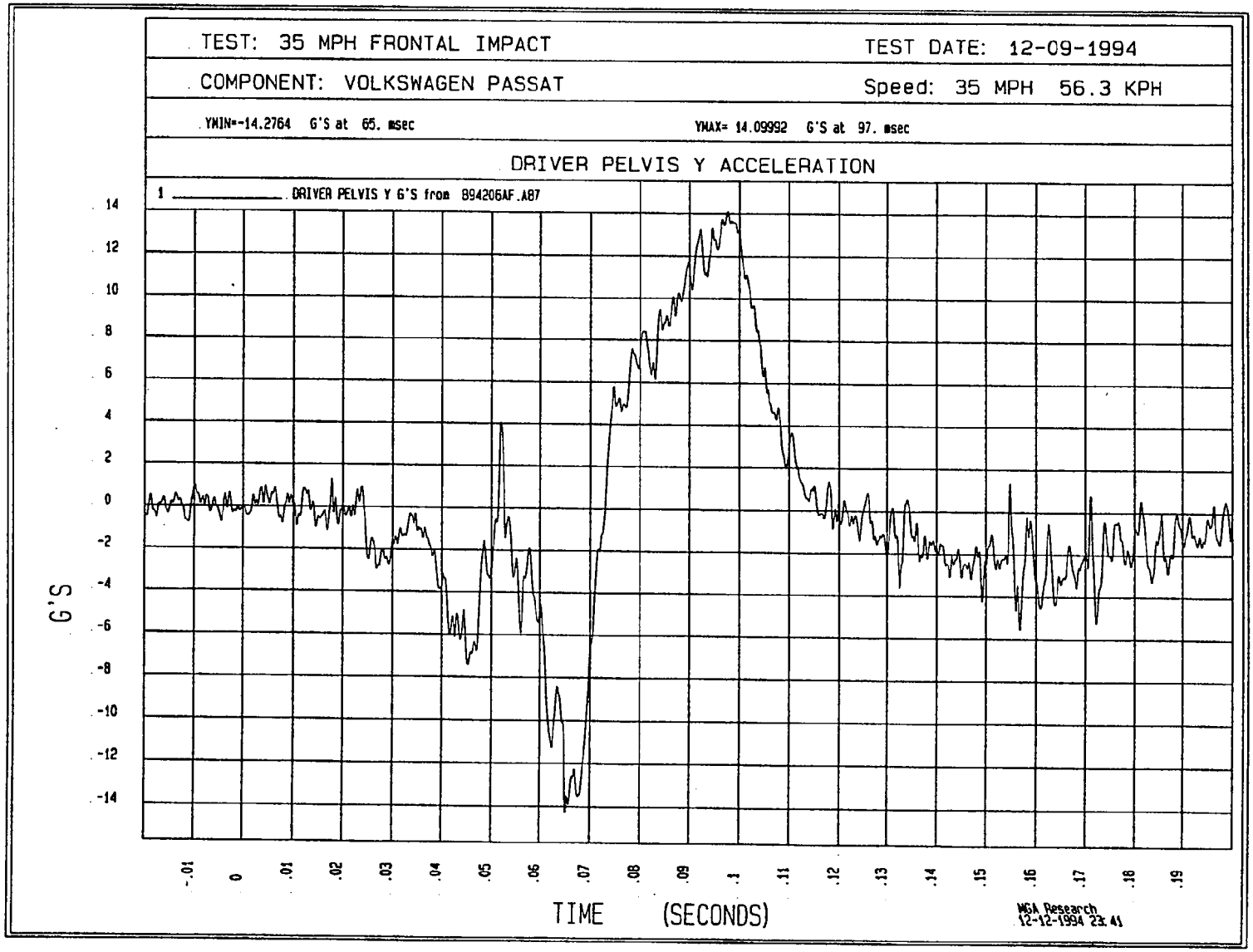


Figure B-67 - Driver Pelvis Y Acceleration vs. Time

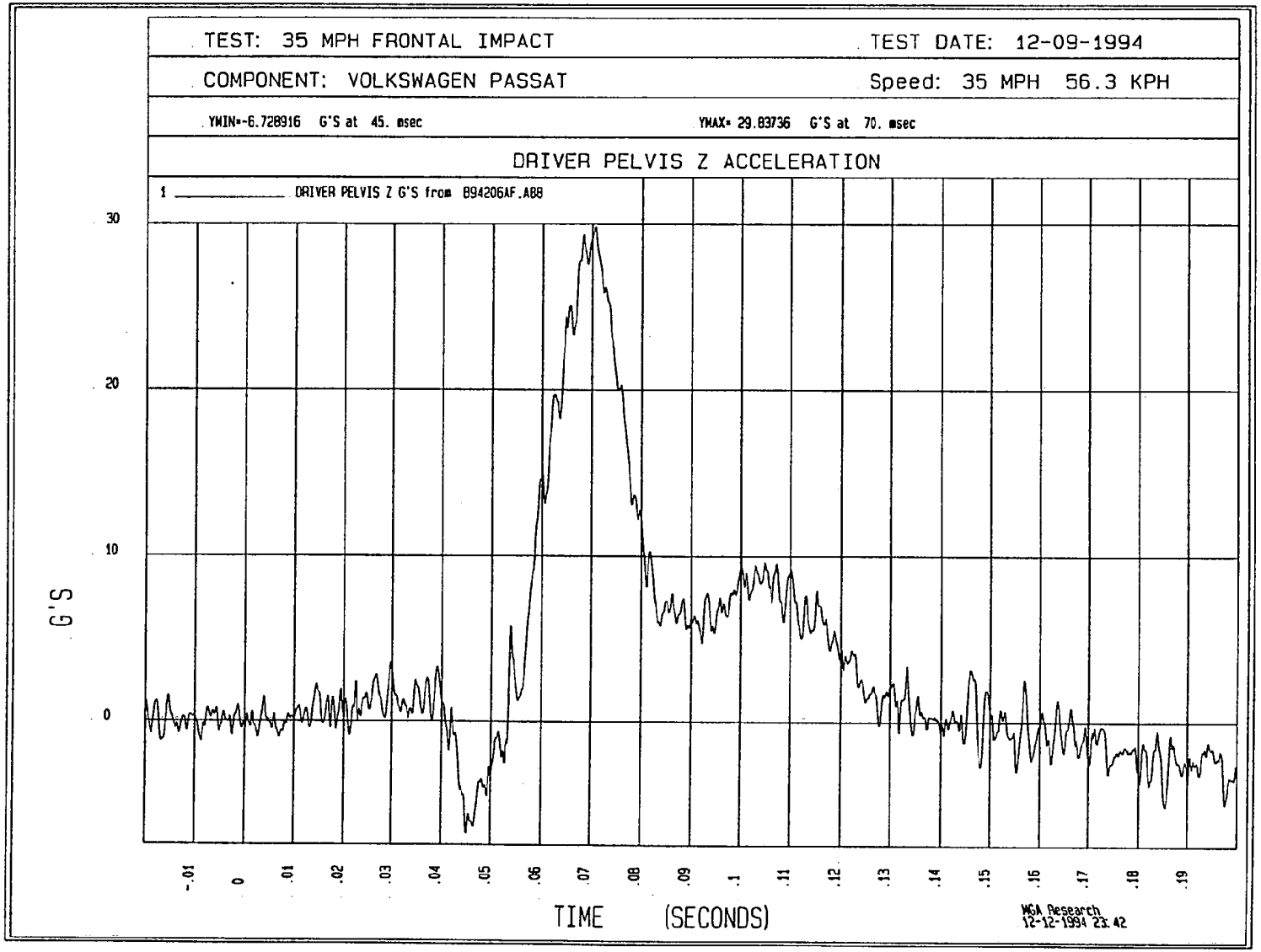


Figure B-68 - Driver Pelvis Z Acceleration vs. Time

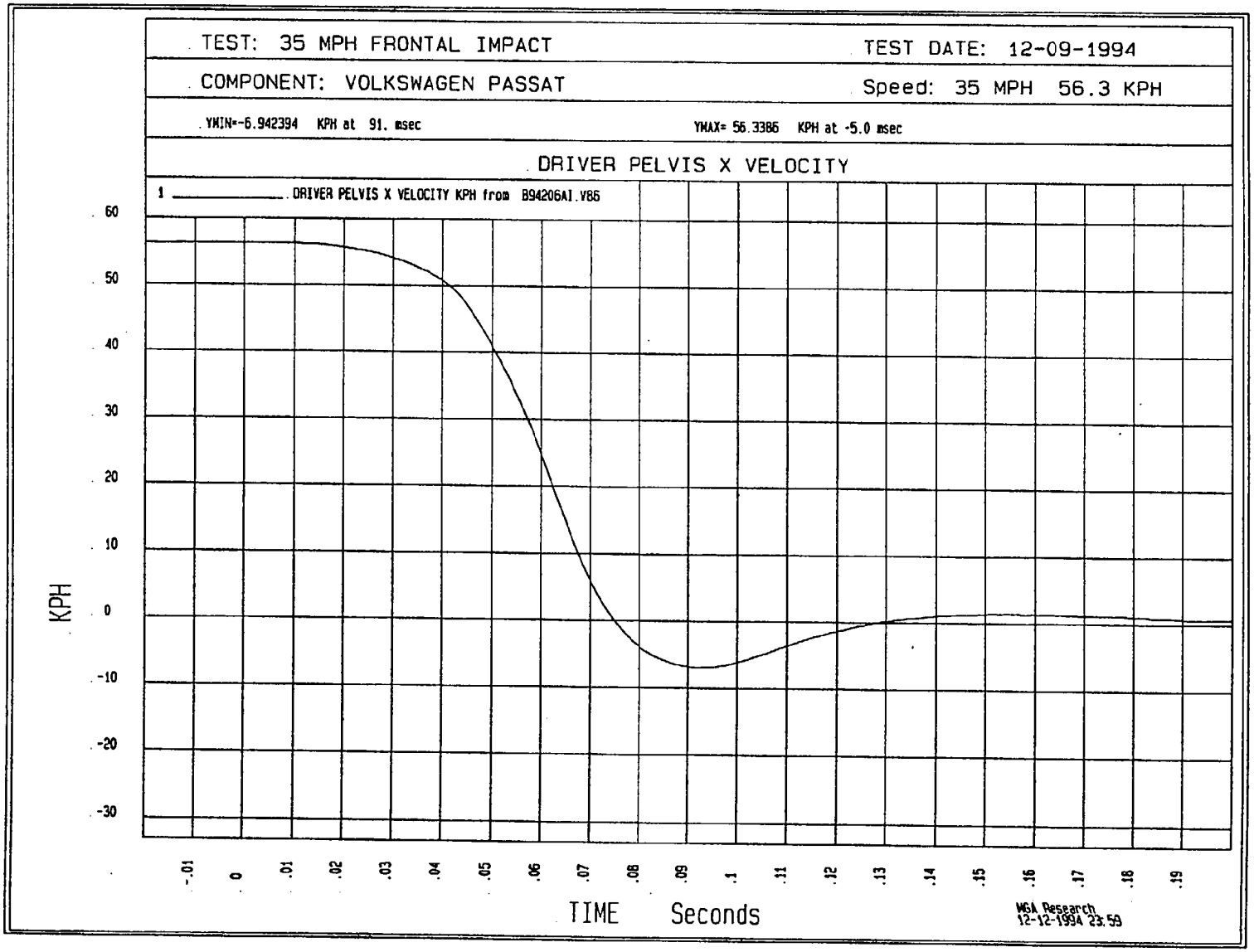


Figure B-69 - Driver Pelvis X Velocity vs. Time

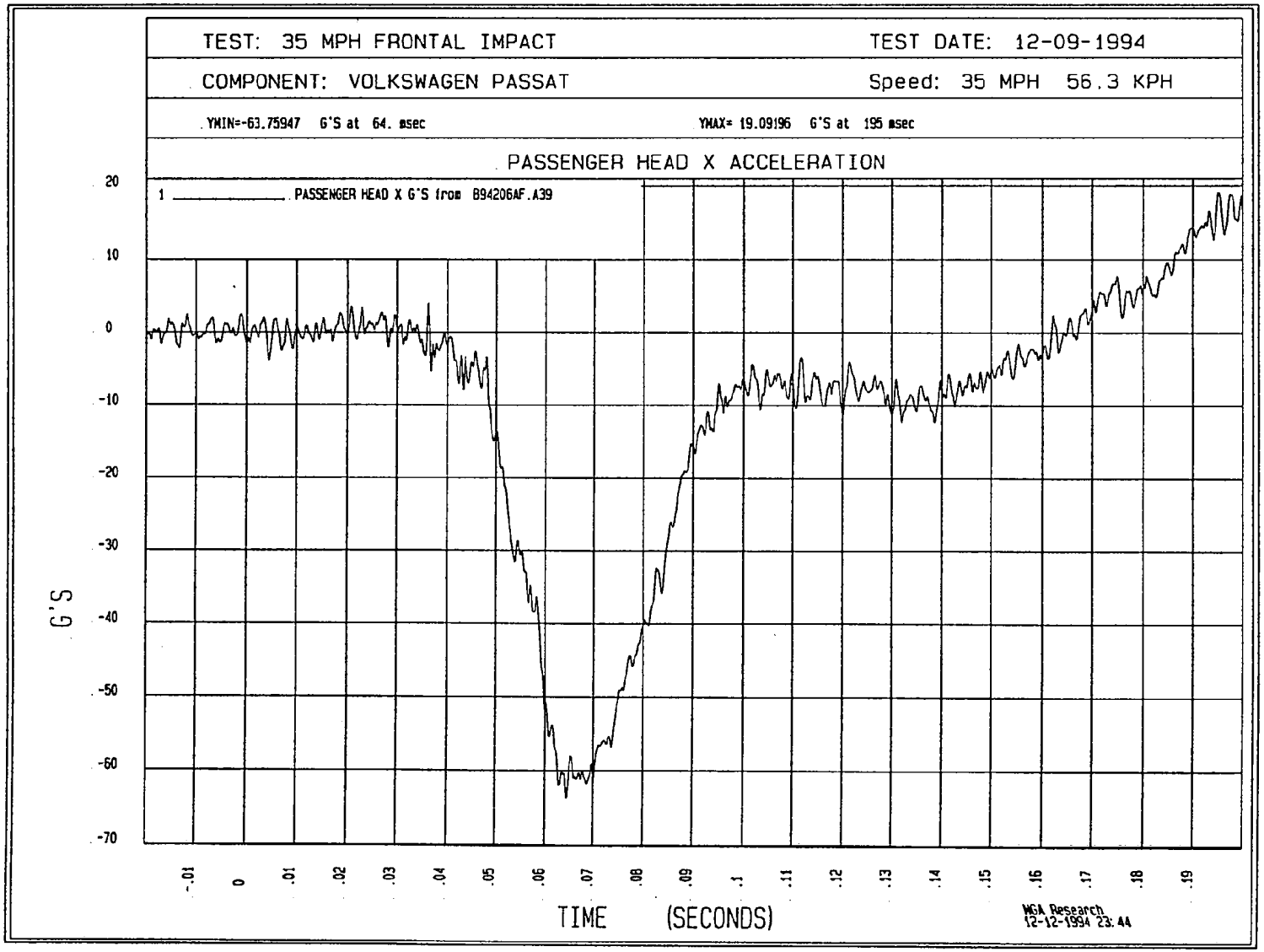


Figure B-70 - Passenger Head X Acceleration vs. Time

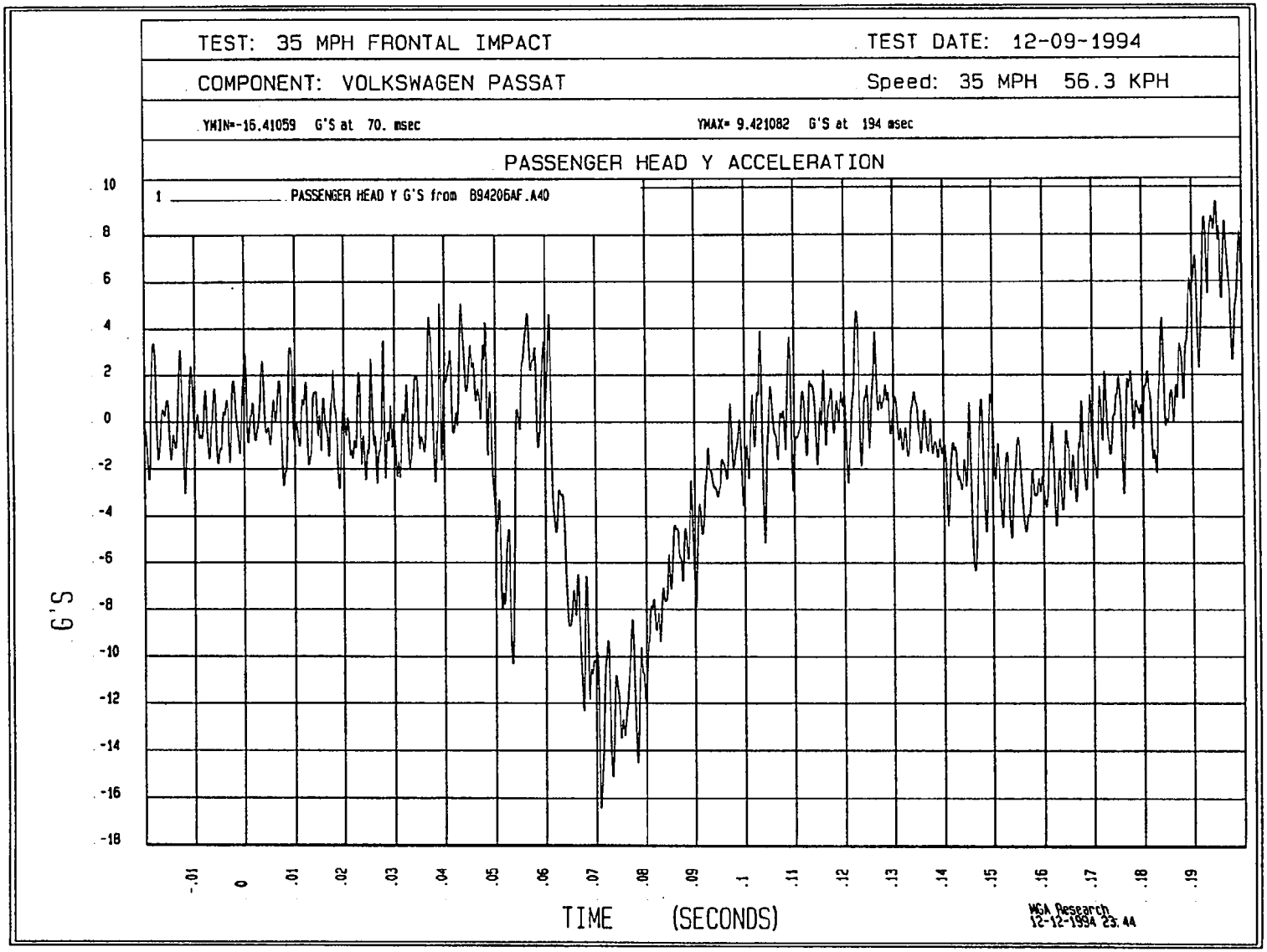


Figure B-71 - Passenger Head Y Acceleration vs. Time

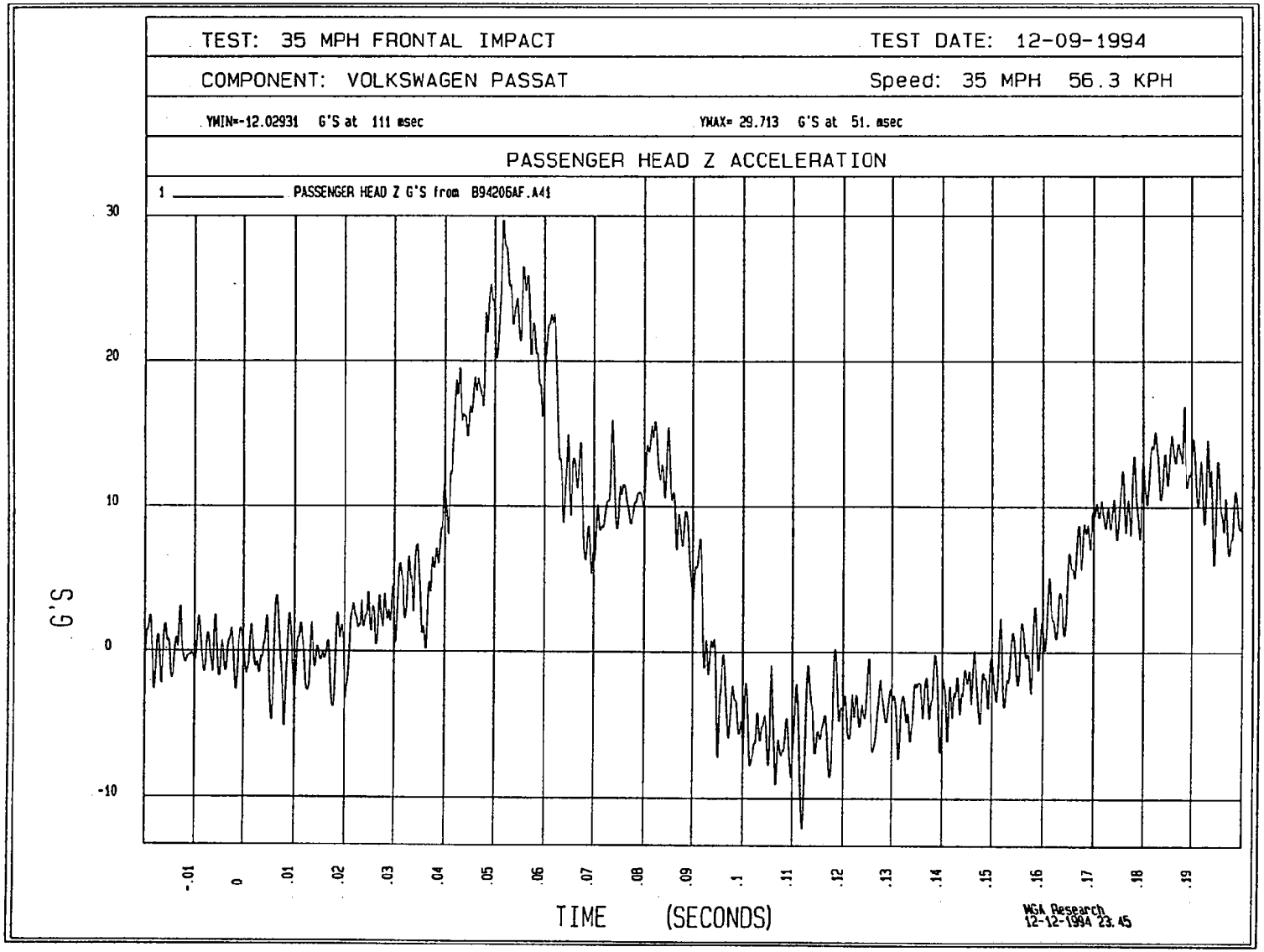


Figure B-72 - Passenger Head Z Acceleration vs. Time

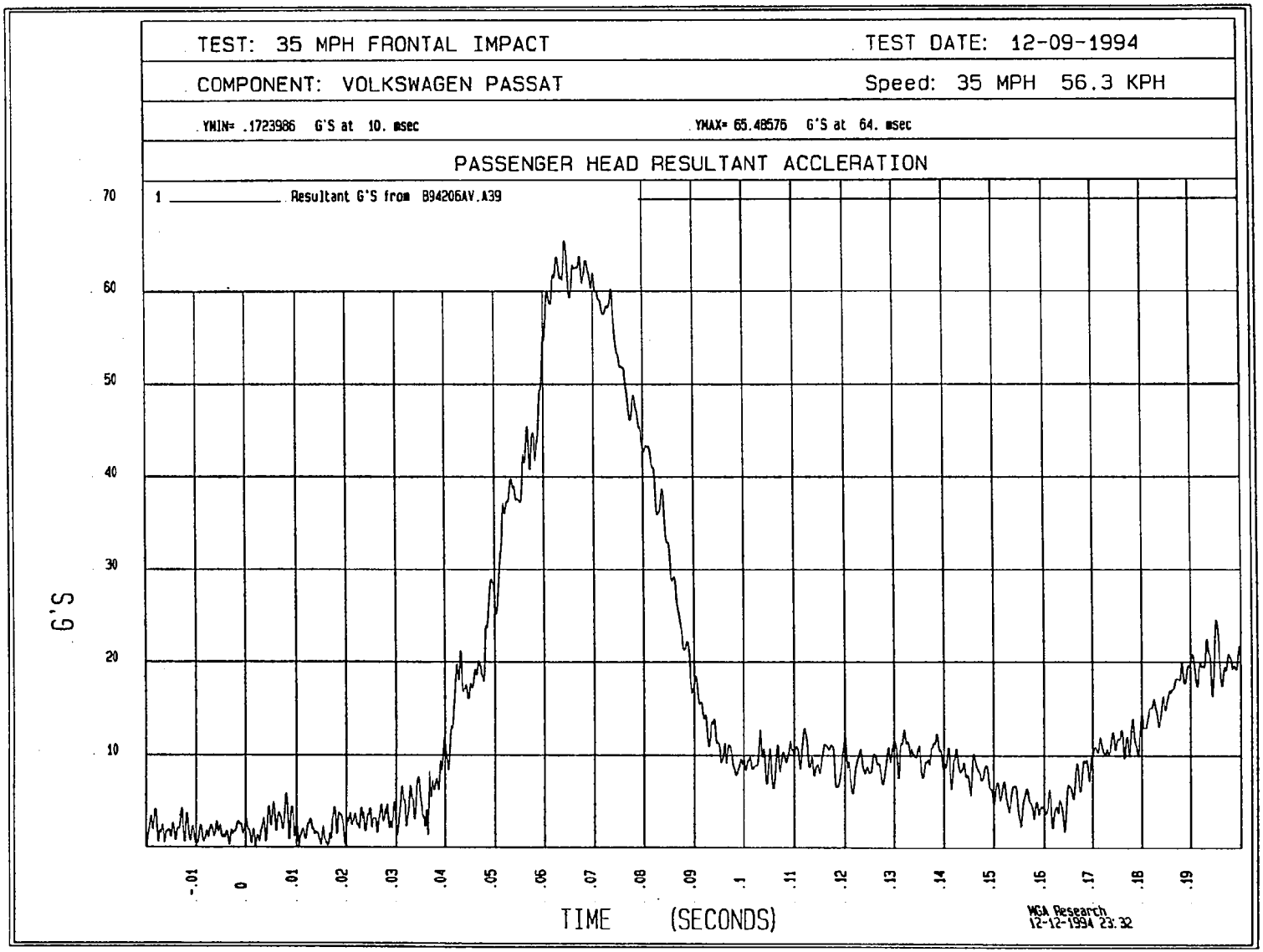


Figure B-73 - Passenger Head Resultant Acceleration vs. Time

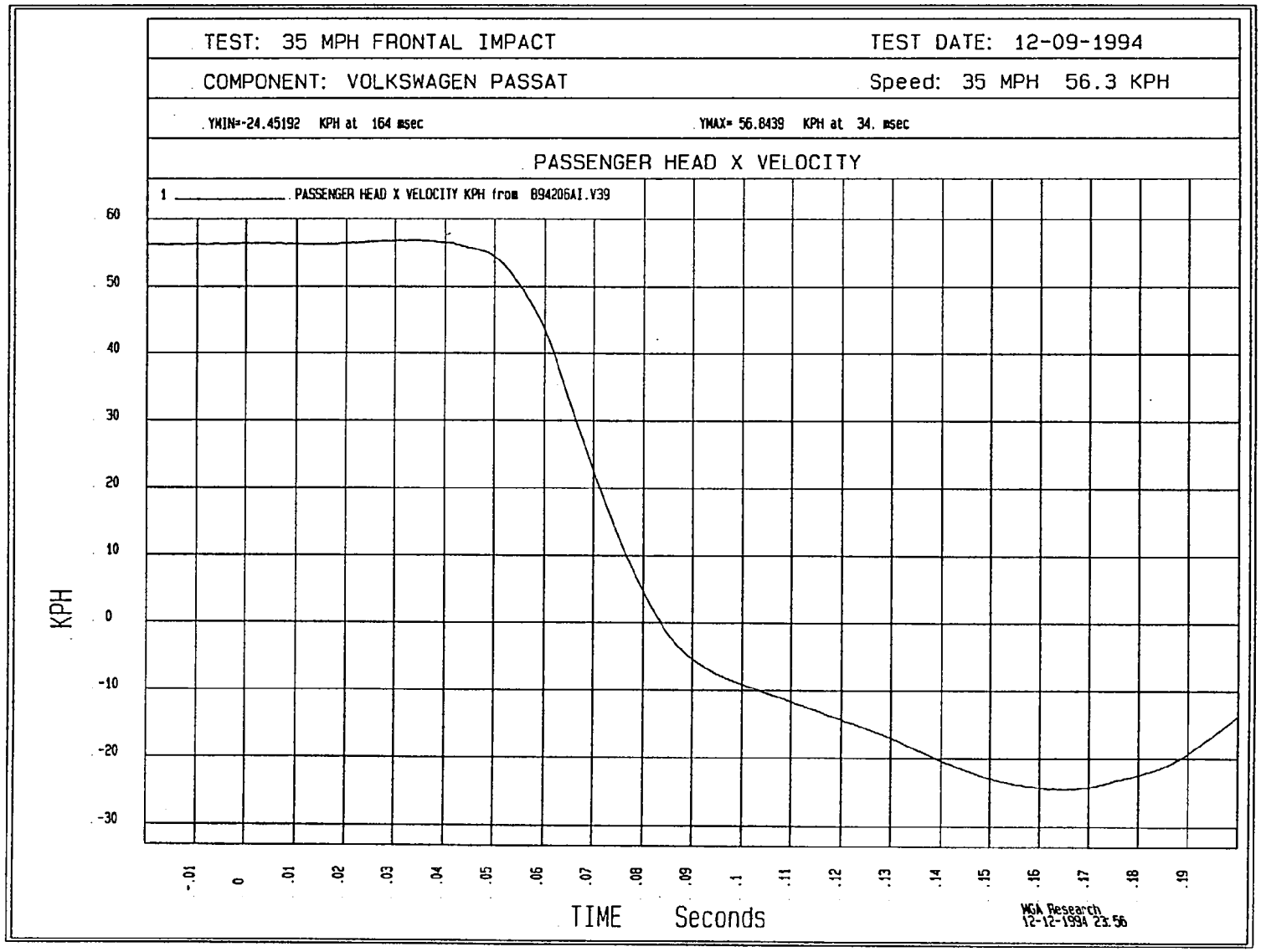


Figure B-74 - Passenger Head X Velocity vs. Time

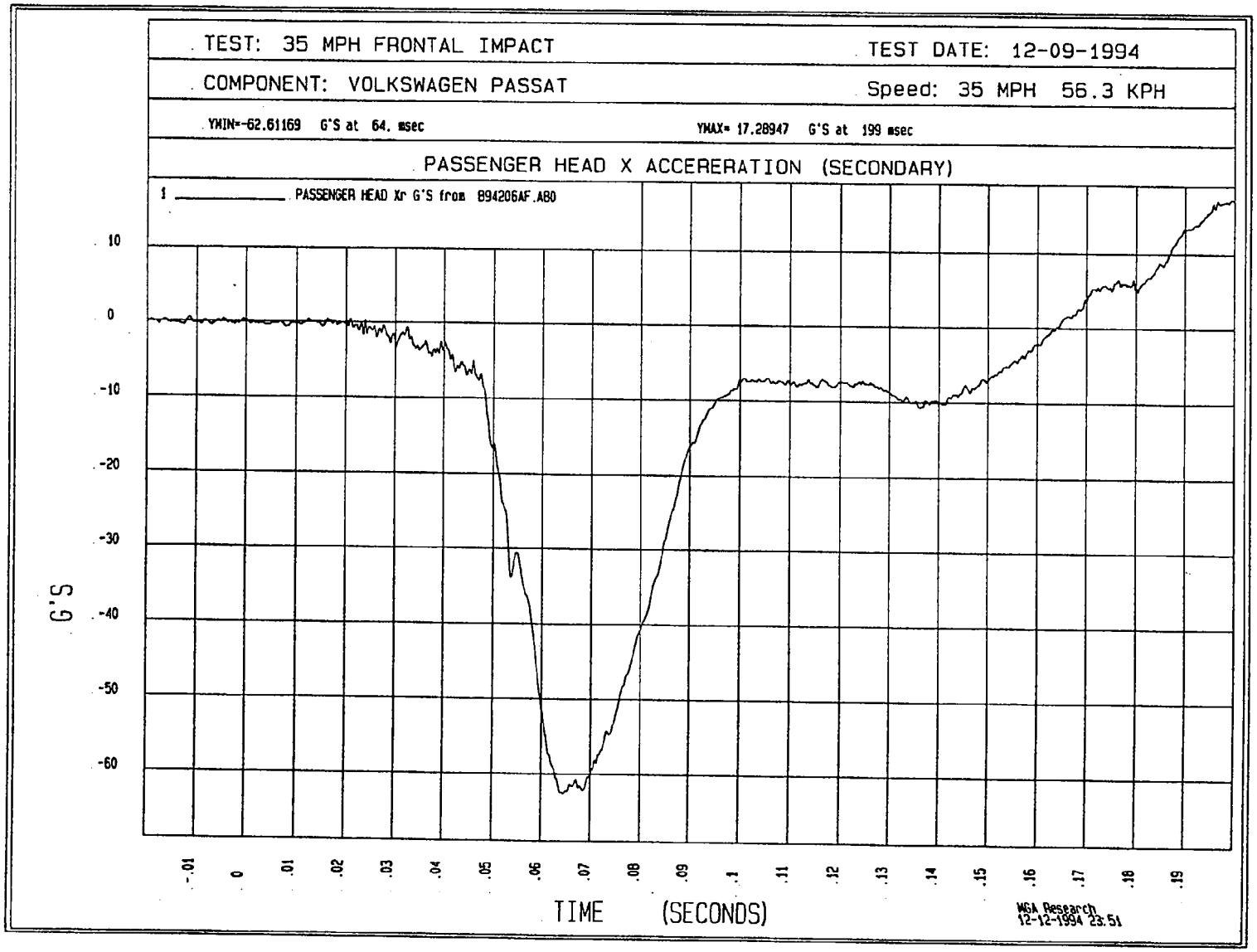


Figure B-75 - Passenger Head X Redundant Acceleration vs. Time

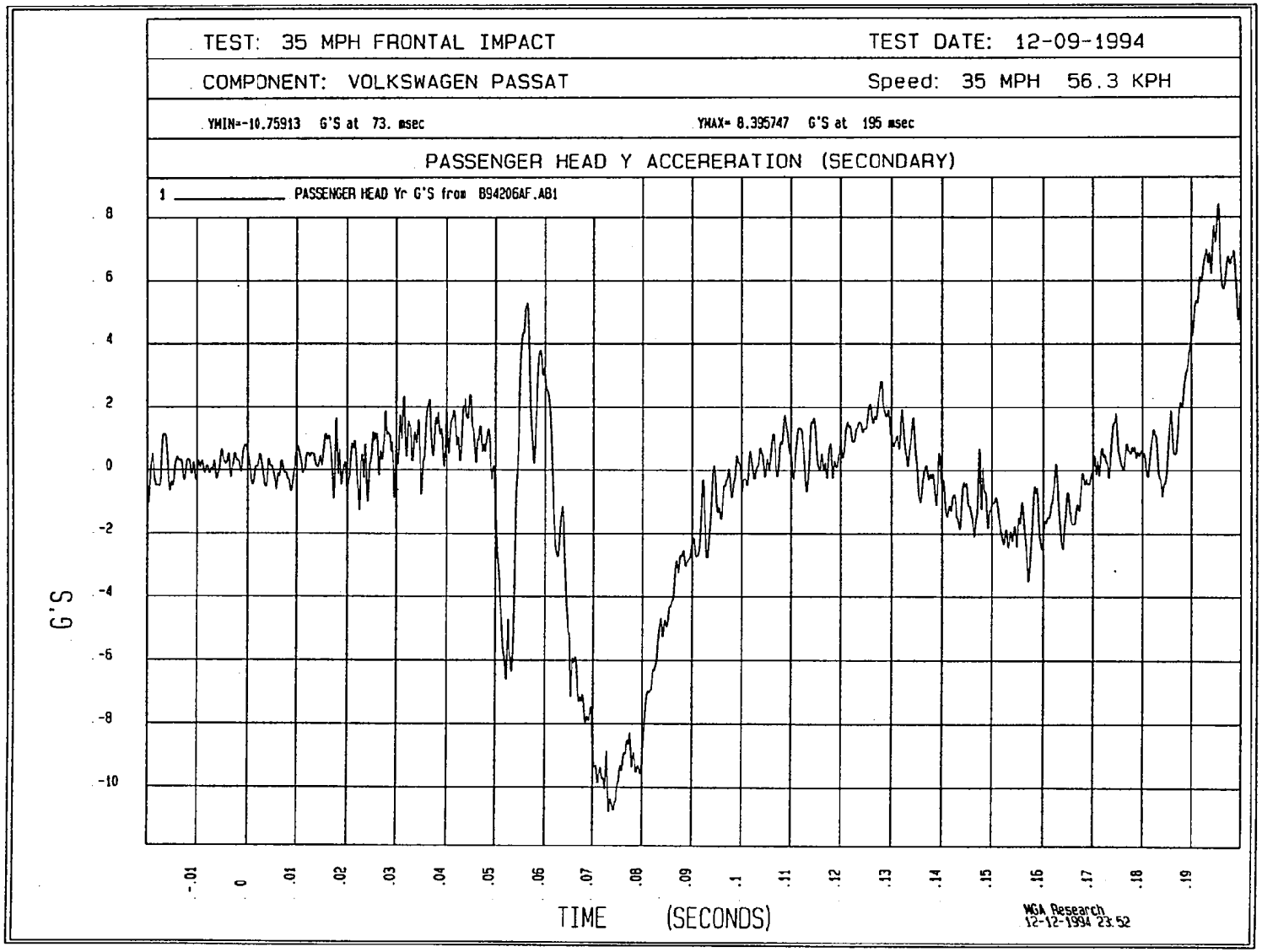


Figure B-76 - Passenger Head Y Redundant Acceleration vs. Time

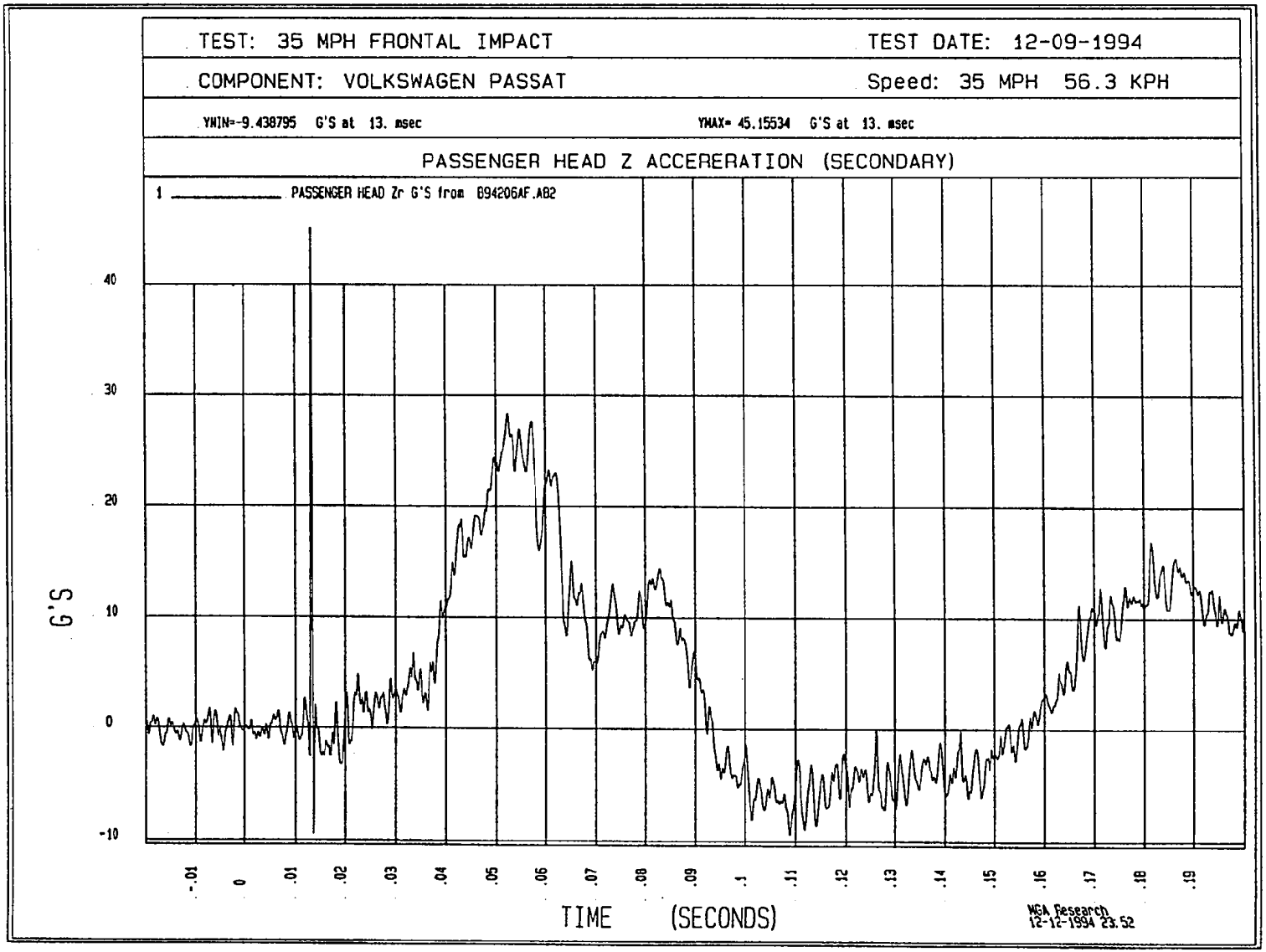


Figure B-77 - Passenger Head Z Redundant Acceleration vs. Time

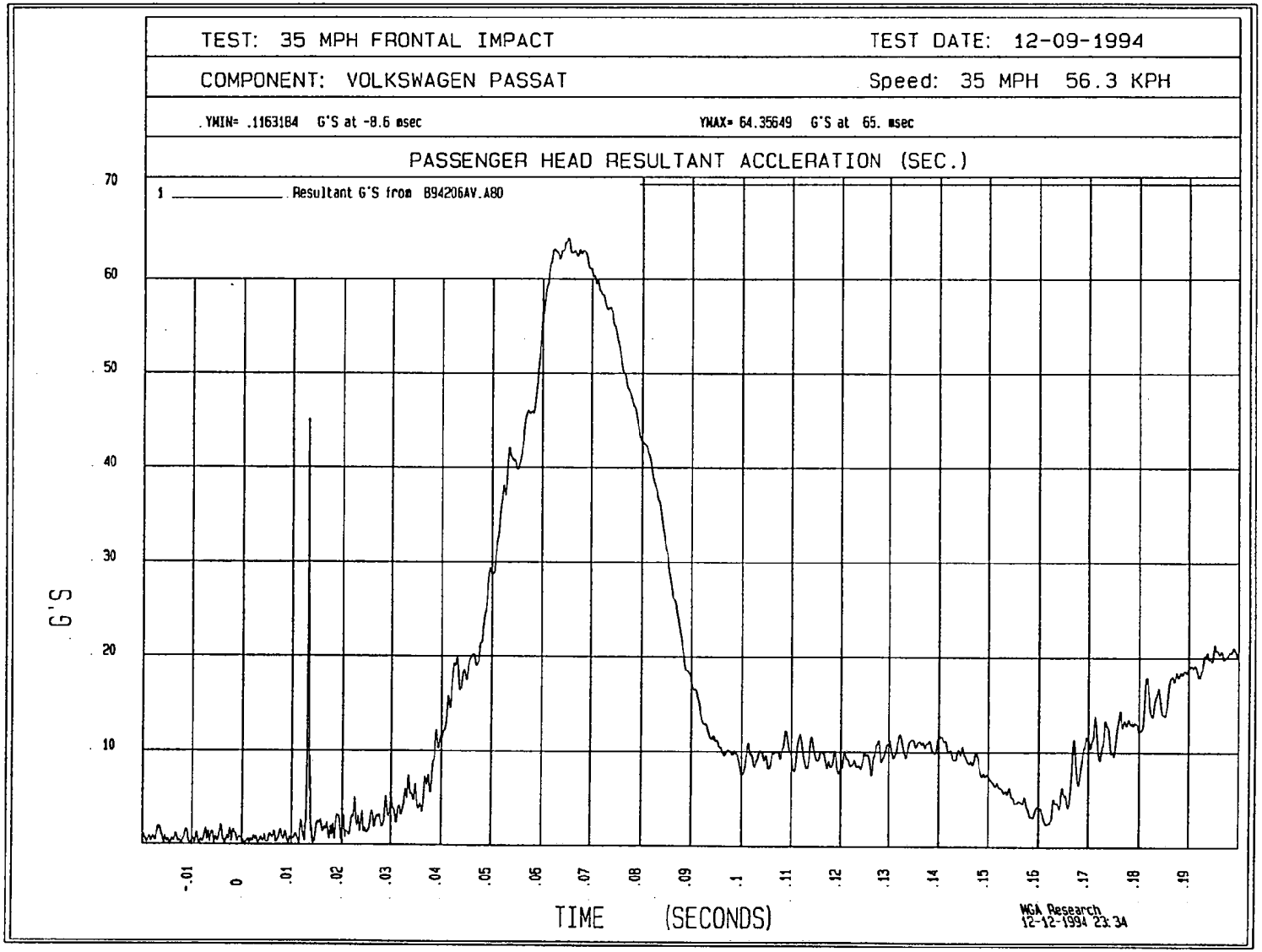


Figure B-78 - Passenger Head Redundant Resultant Acceleration vs. Time

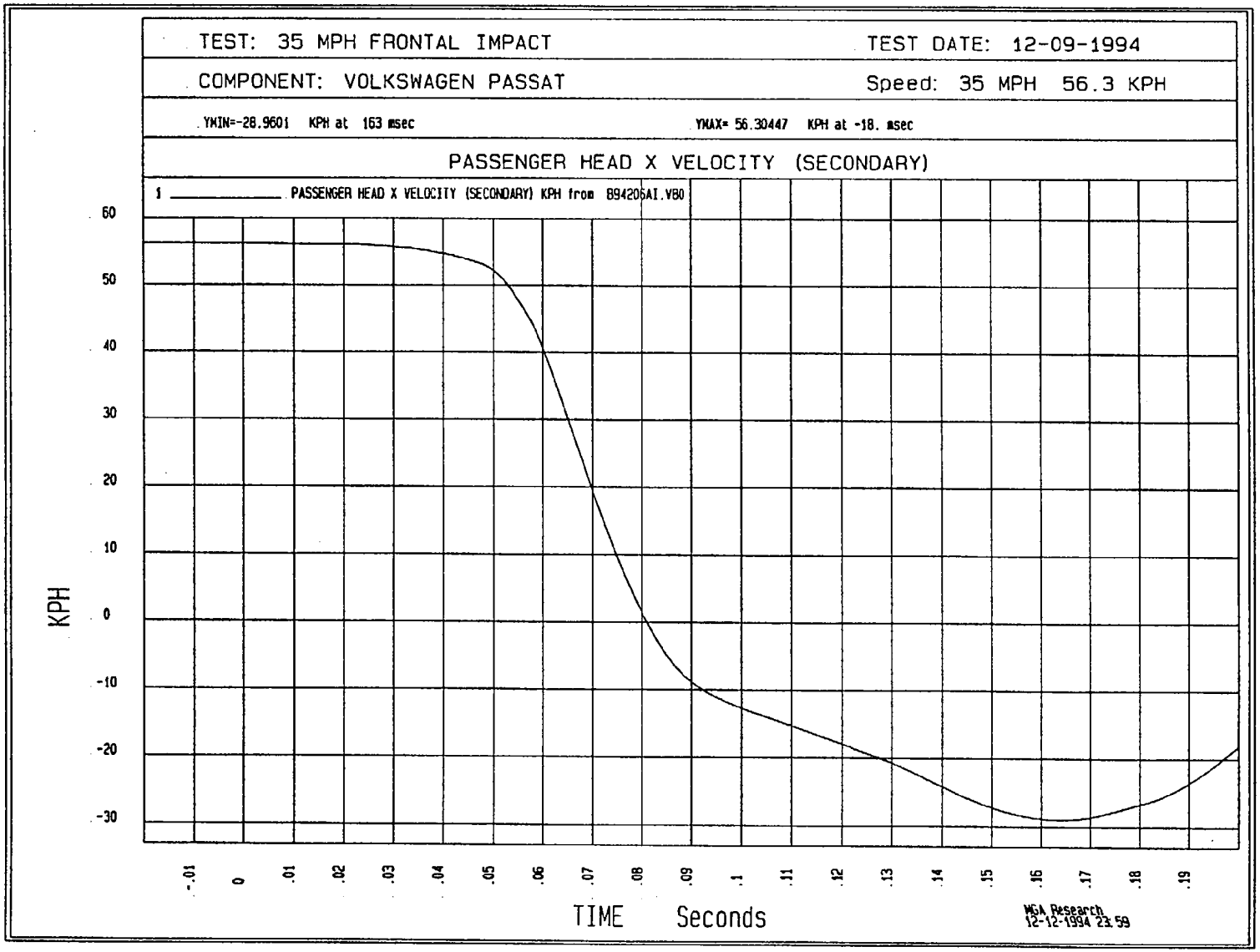


Figure B-79 - Passenger Head X Redundant Velocity vs. Time

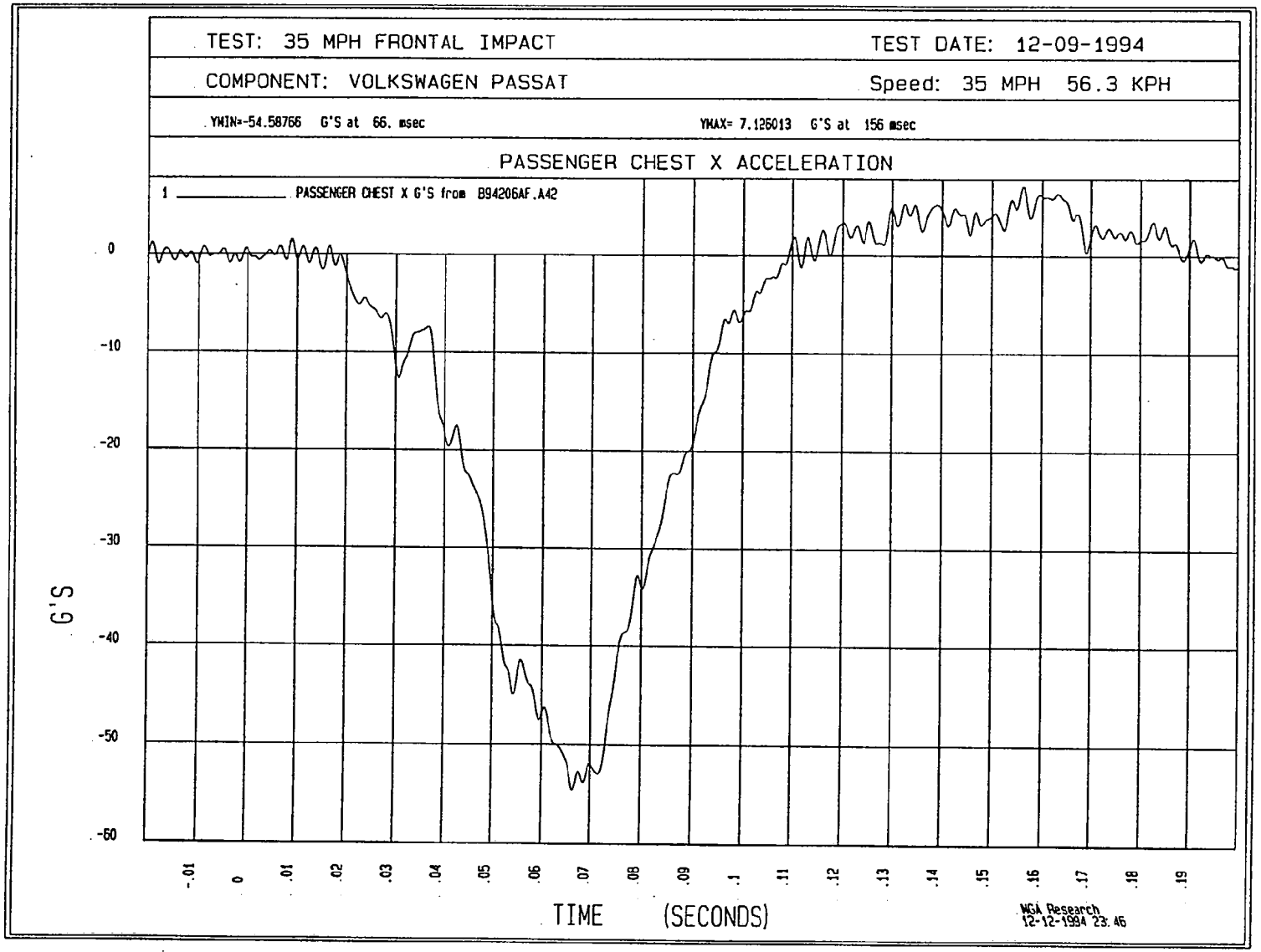
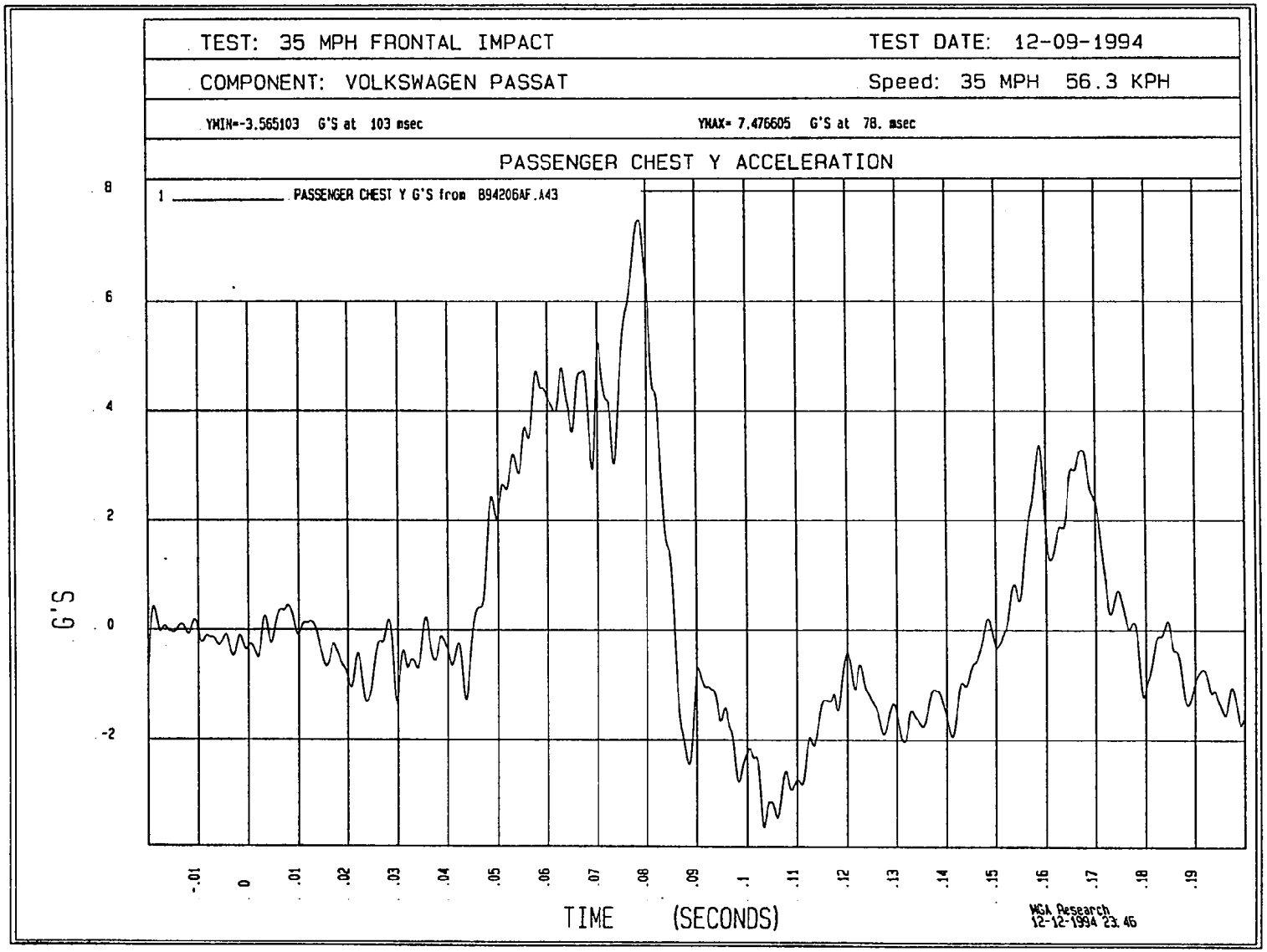


Figure B-8Ø - Passenger Chest X Acceleration vs. Time



B-81

Figure B-81 - Passenger Chest Y Acceleration vs. Time

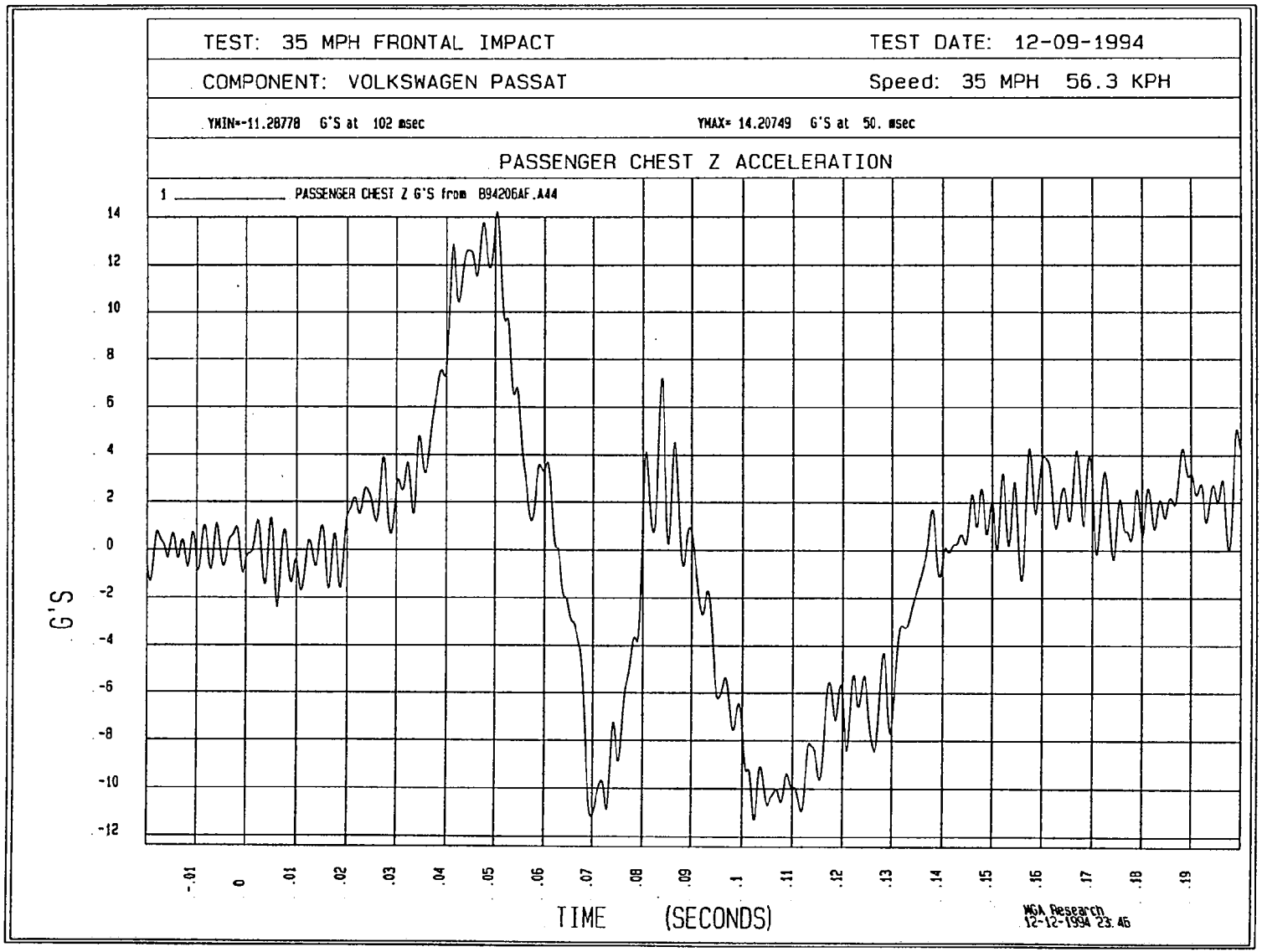


Figure B-82 - Passenger Chest Z Acceleration vs. Time

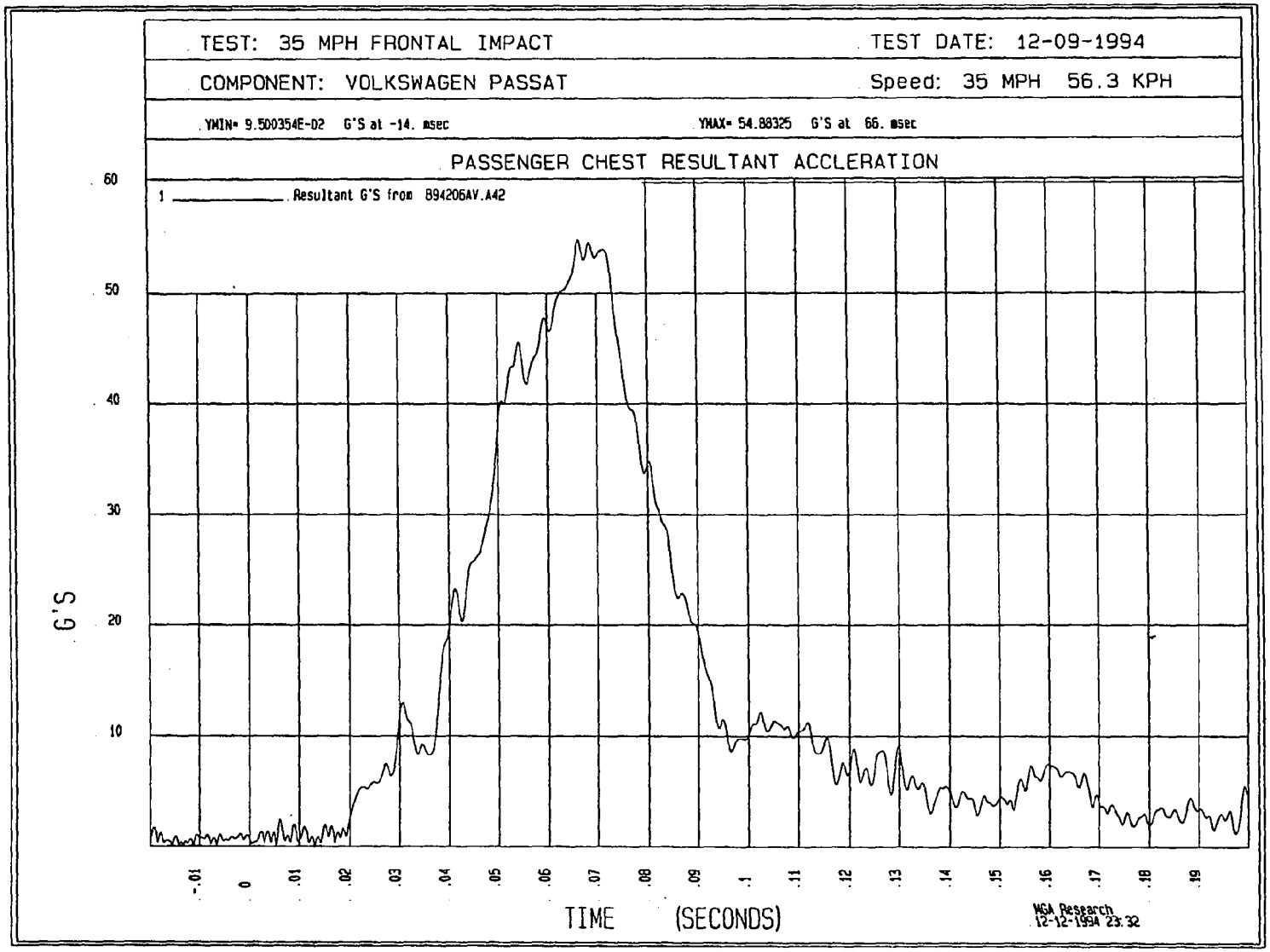


Figure B-83 - Passenger Chest Resultant vs. Time

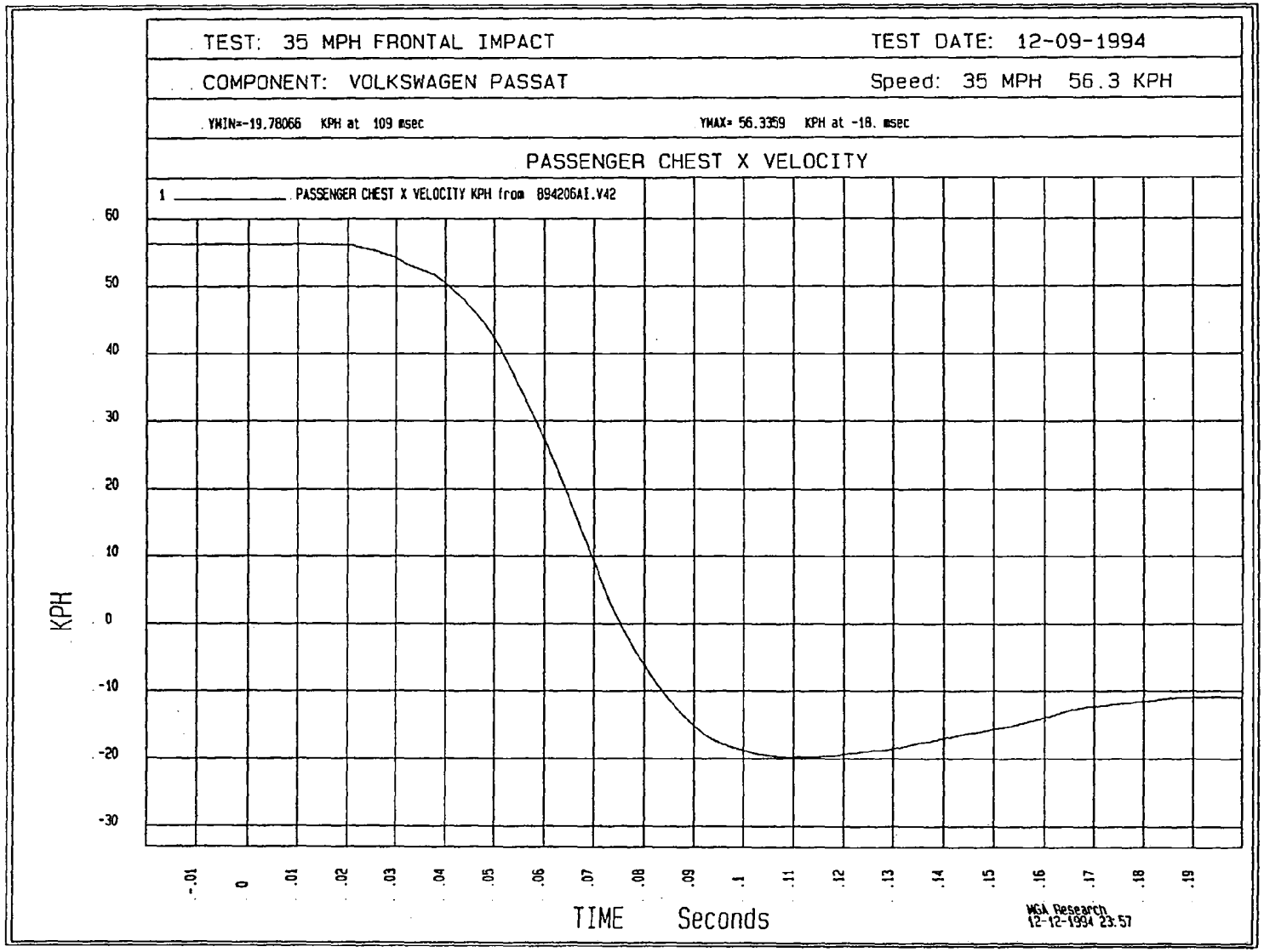
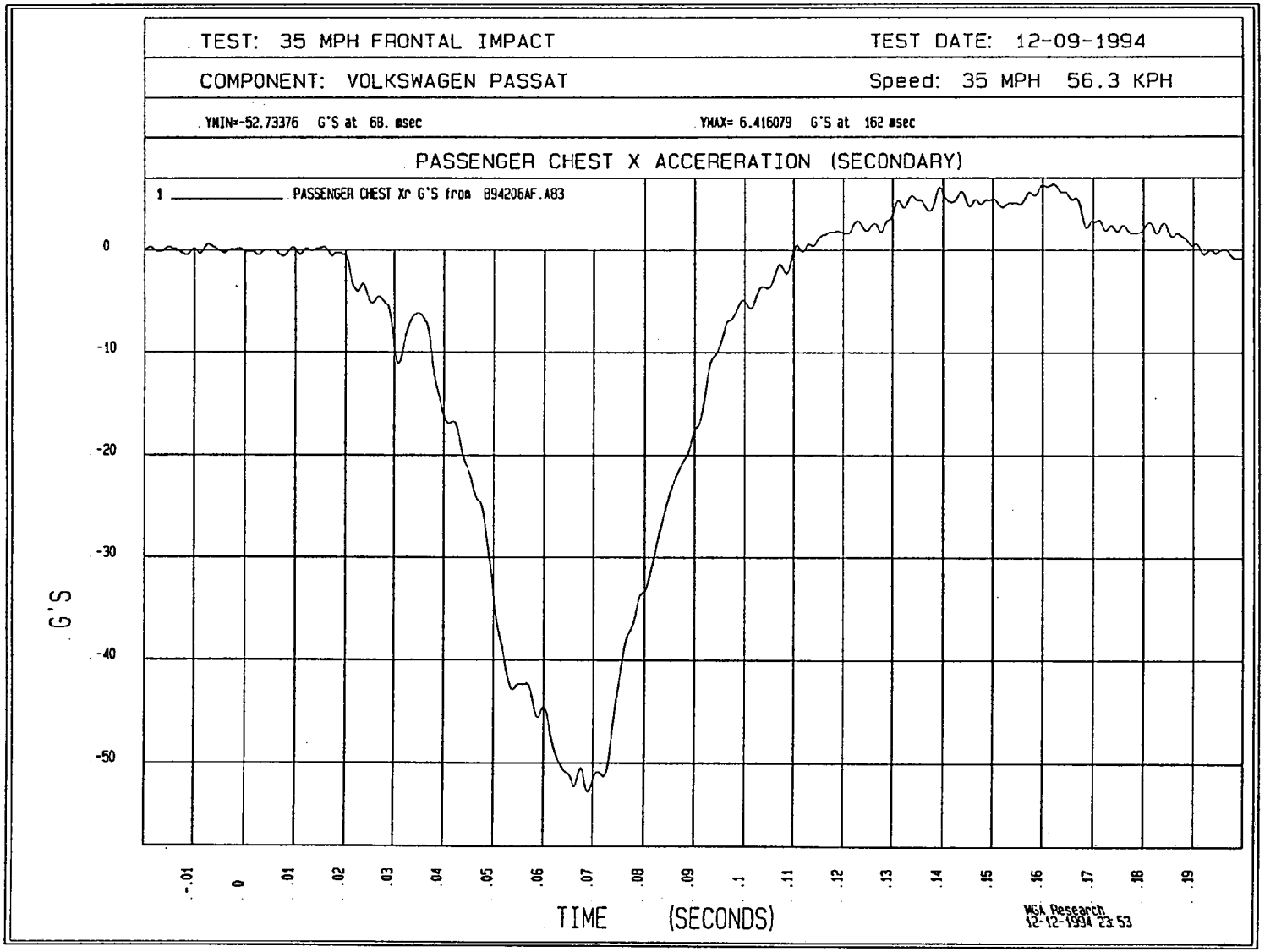


Figure B-84 - Passenger Chest X Velocity vs. Time

NO VALID DATA COLLECTED

Figure B-85 - Passenger Chest Compression vs. Time



B-86

Figure B-86 - Passenger Chest X Redundant Acceleration vs. Time

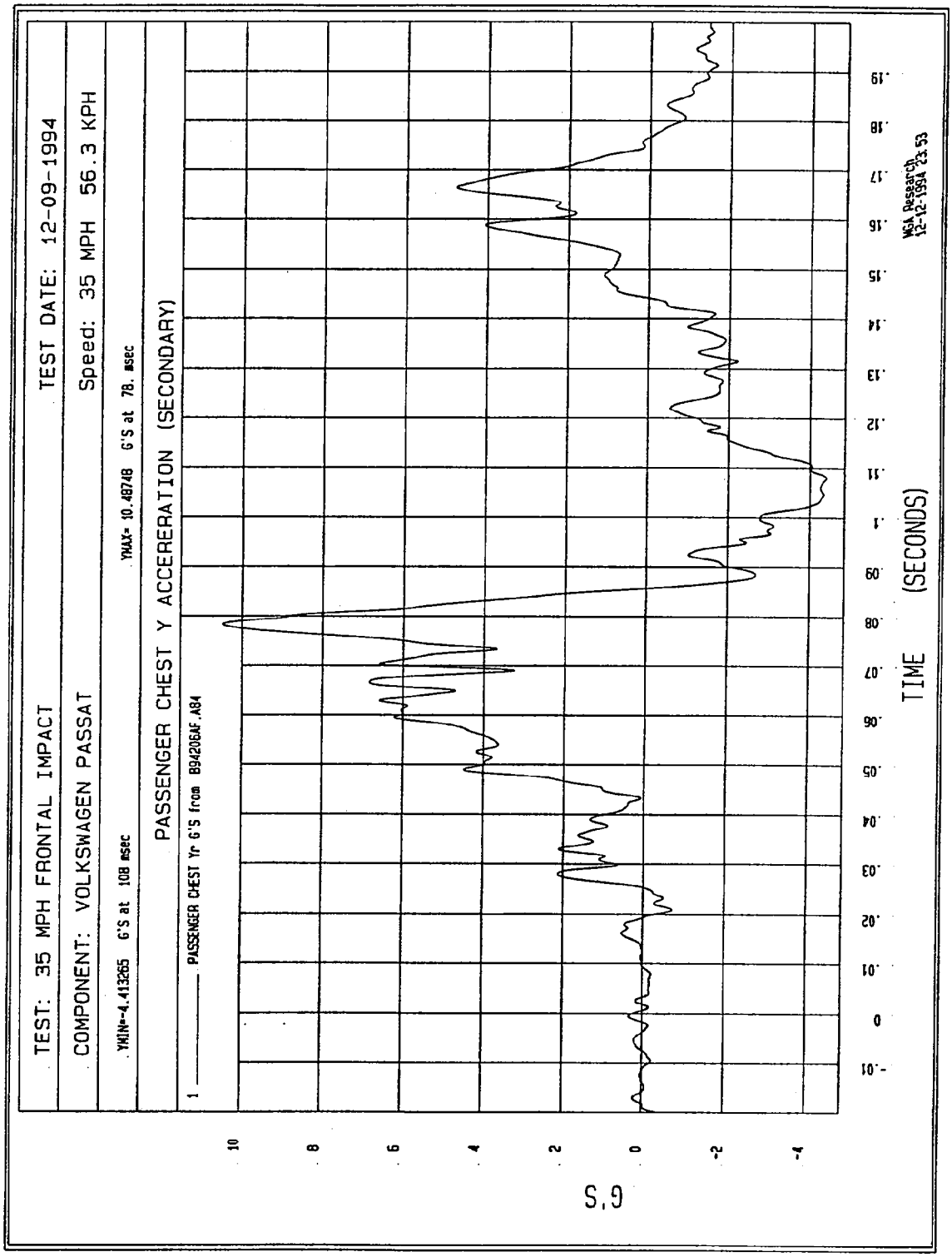


Figure B-87 - Passenger Chest Y Redundant Acceleration vs. Time

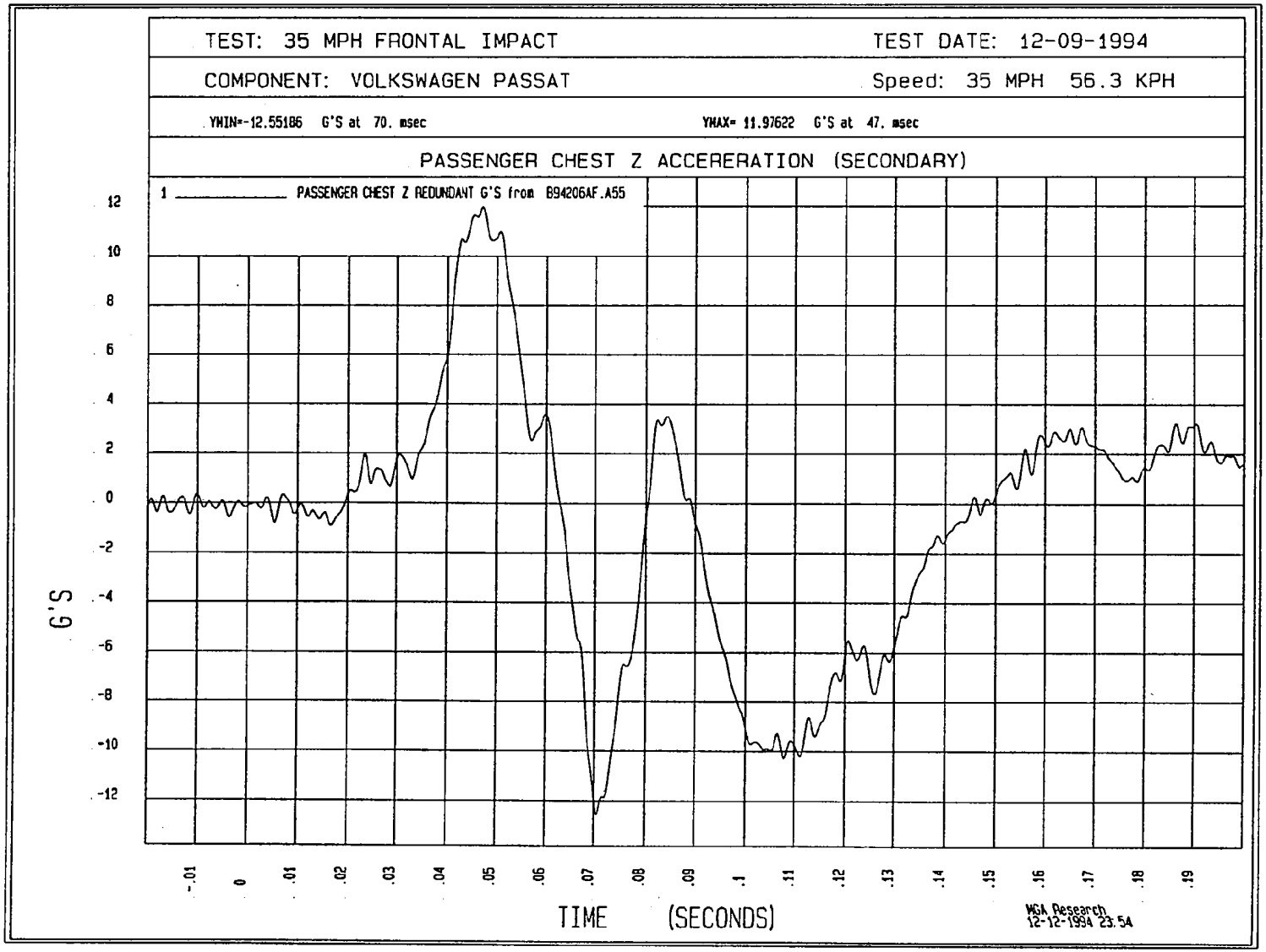


Figure B-88 - Passenger Chest Z Redundant Acceleration vs. Time

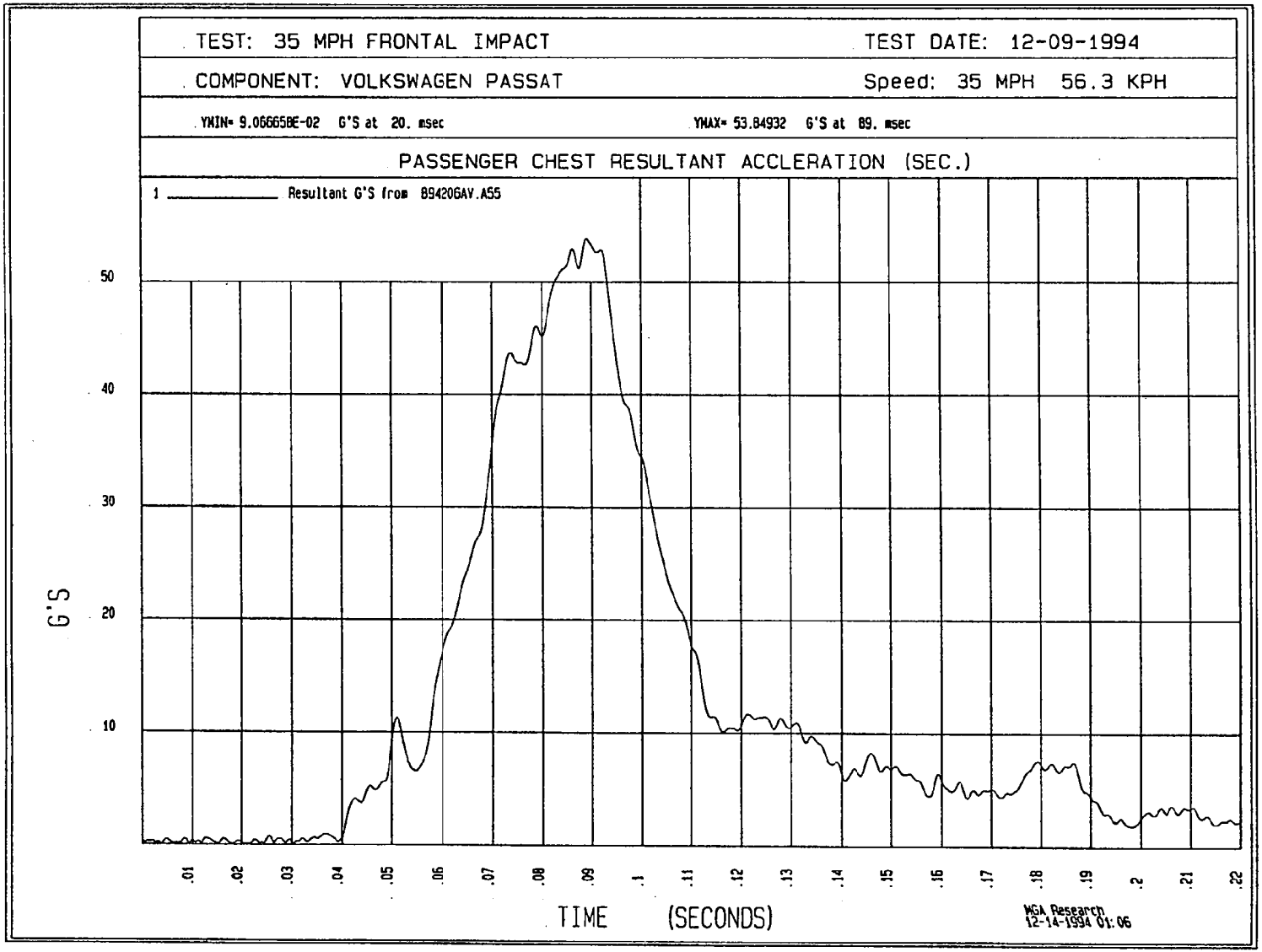


Figure B-89 - Passenger Chest Redundant Resultant Acceleration vs. Time

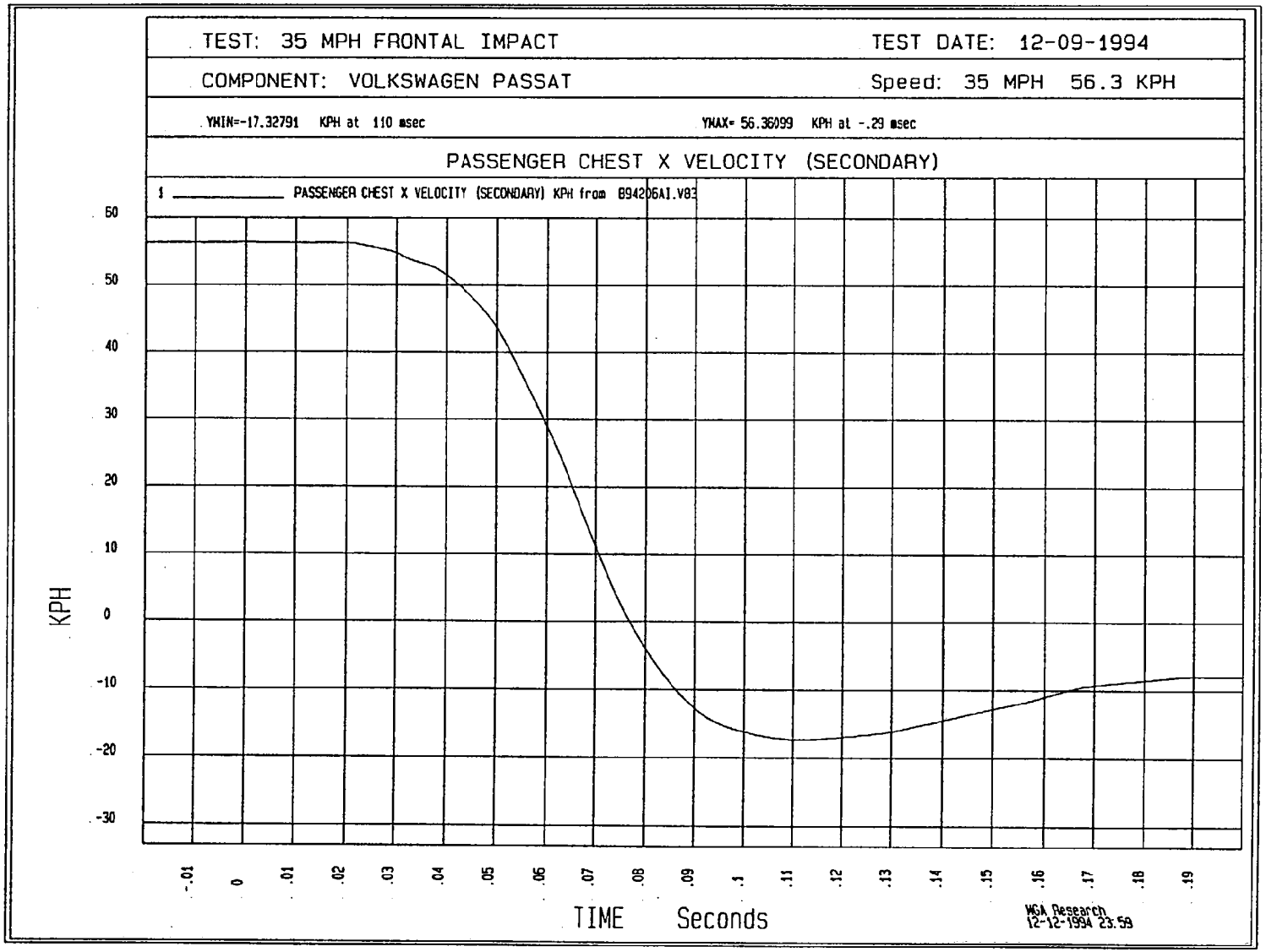


Figure B-9Ø - Passenger Chest X Redundant Velocity vs. Time

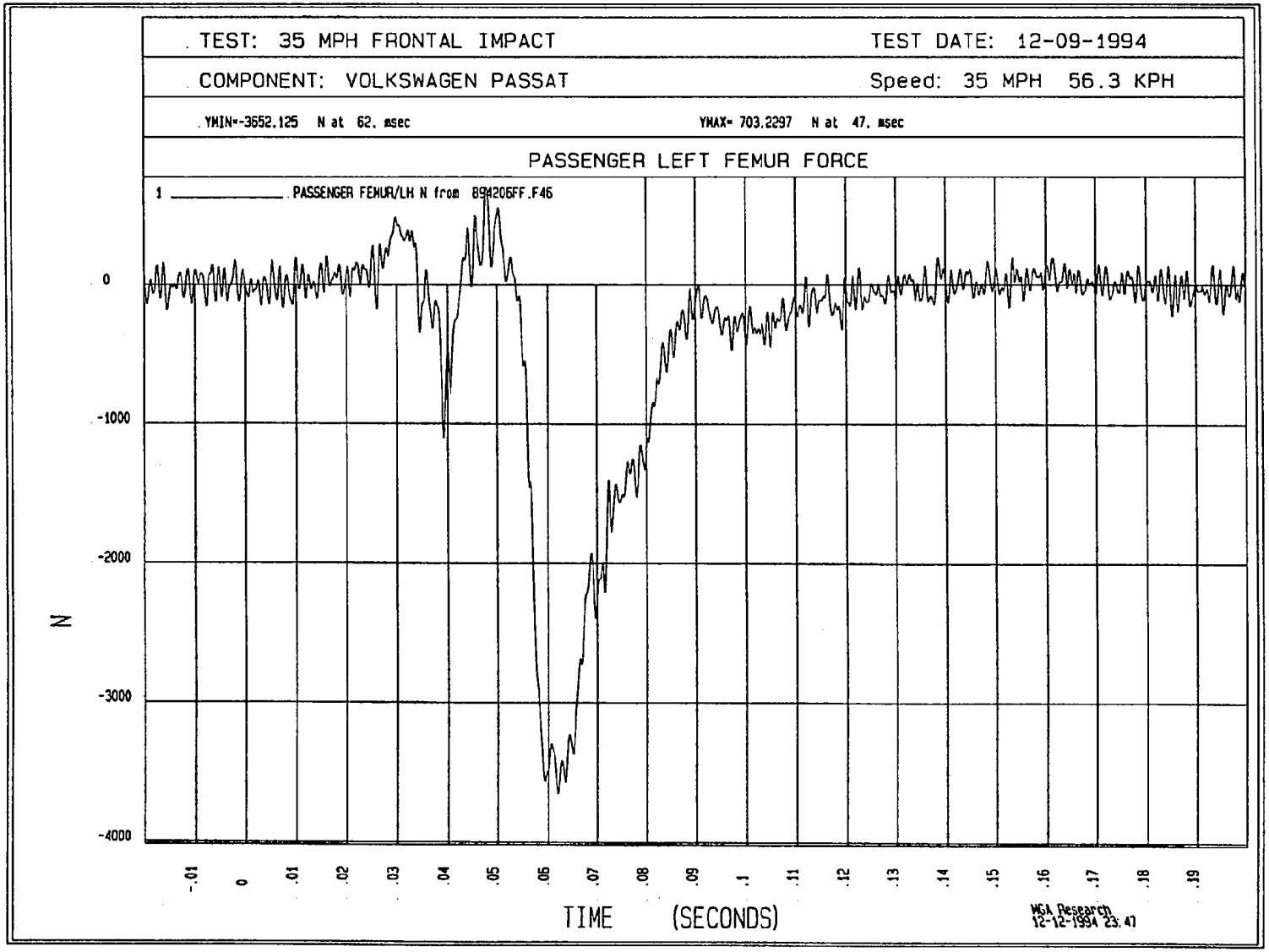


Figure B-91 - Passenger Left Femur Force vs. Time

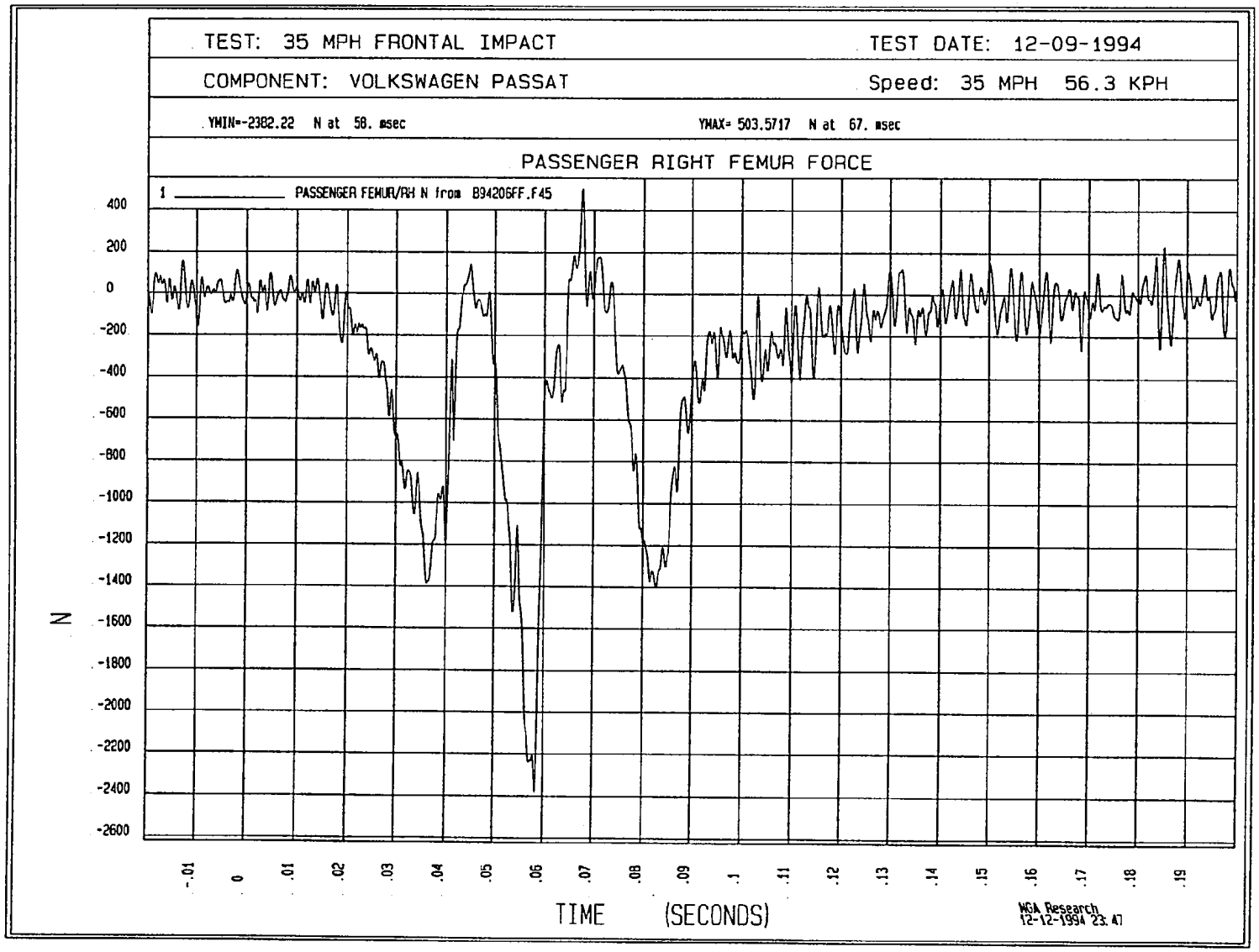


Figure B-92 - Passenger Right Femur Force vs. Time

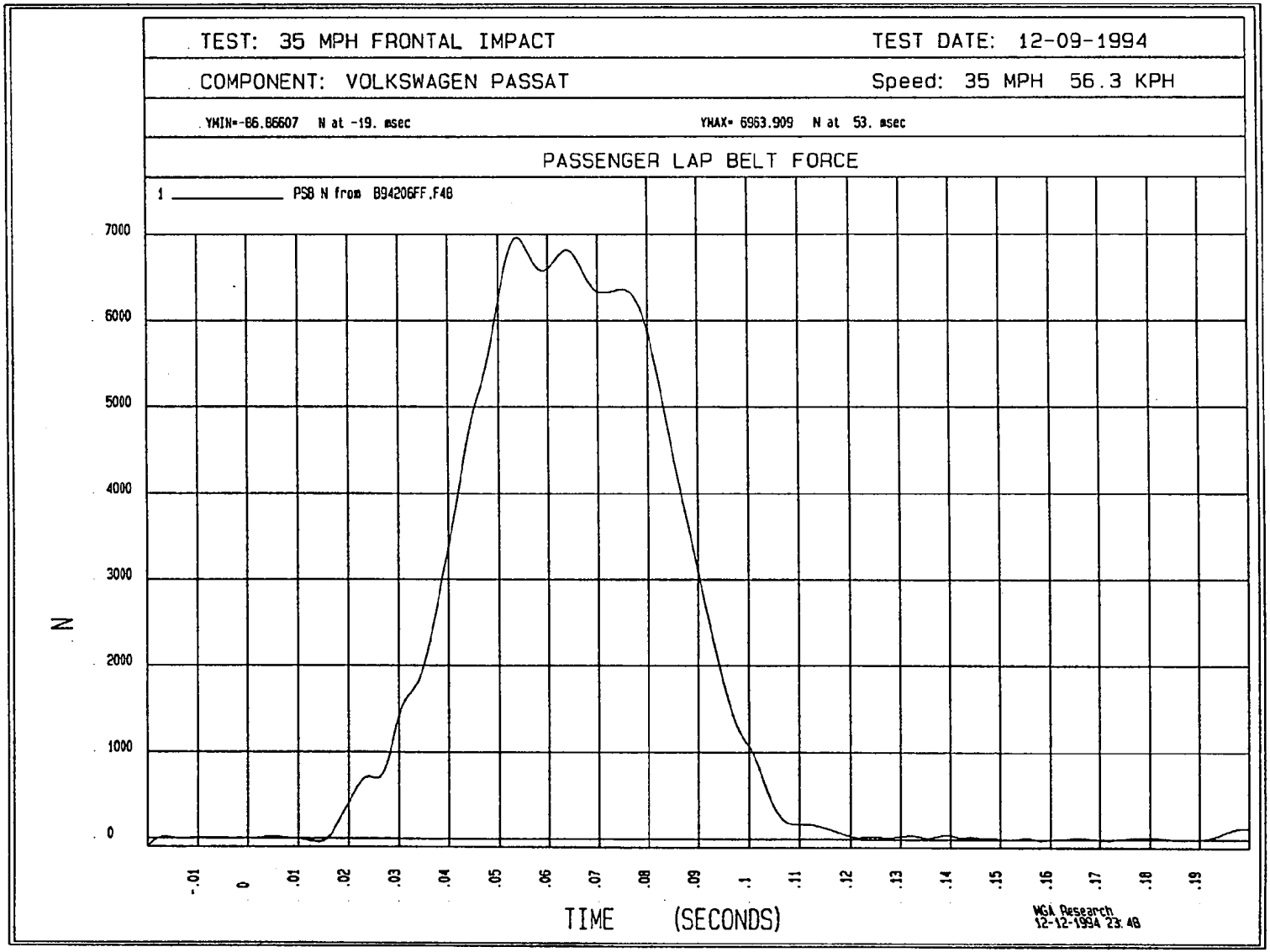


Figure B-93 - Passenger Lap Belt Force vs. Time

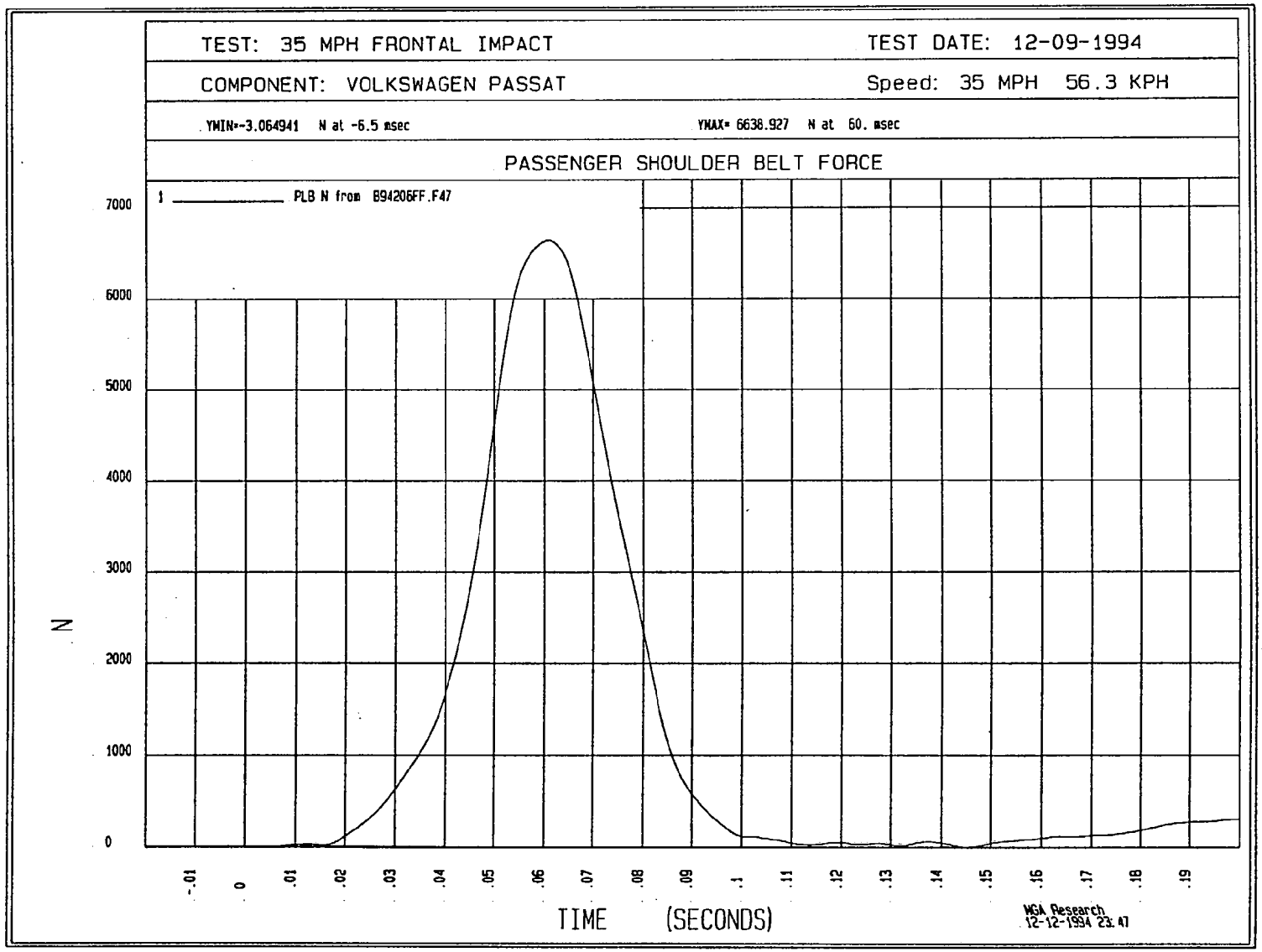


Figure B-94 - Passenger Shoulder Belt Force vs. Time

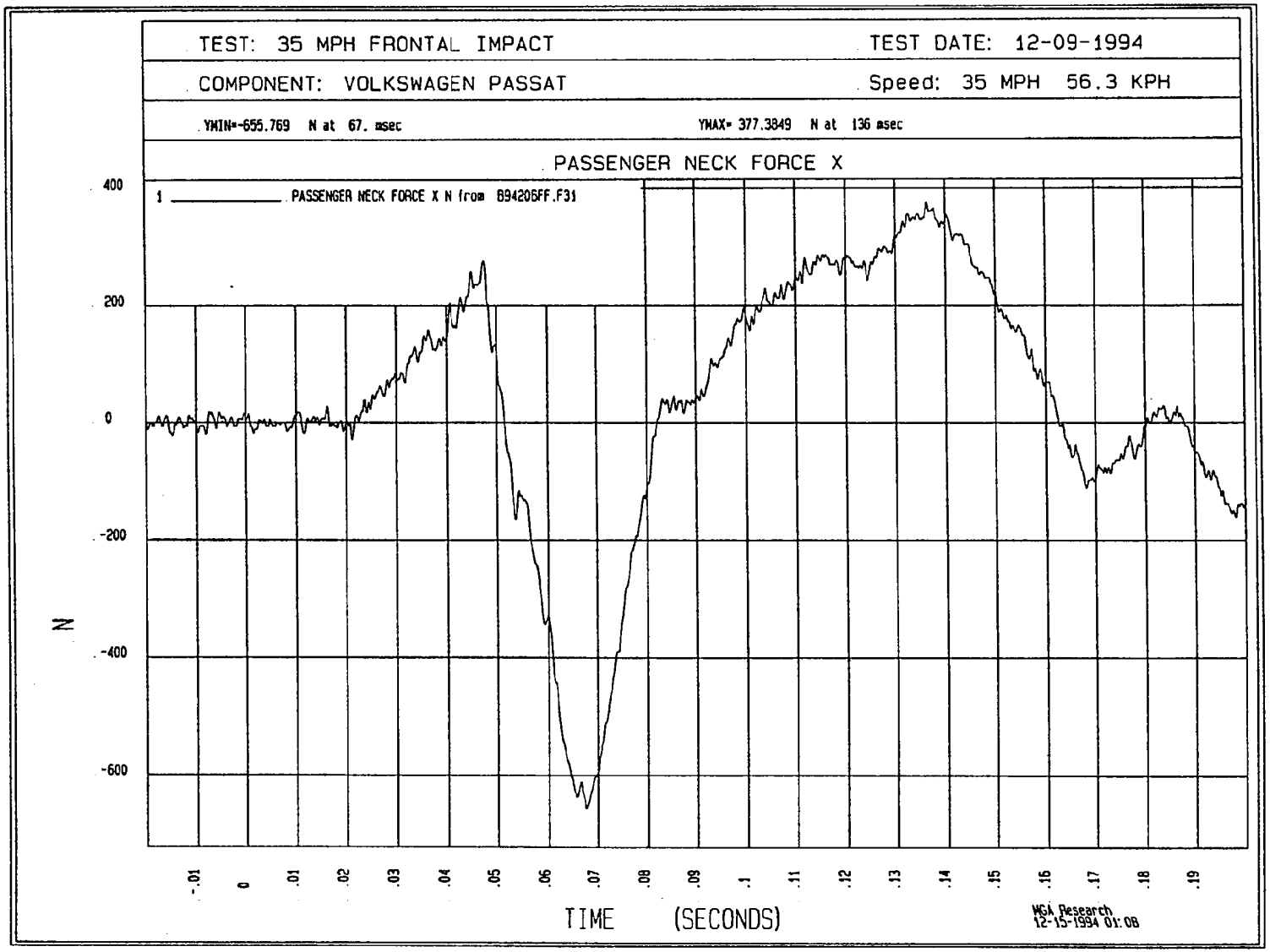


Figure B-95 - Passenger Neck Force X vs. Time

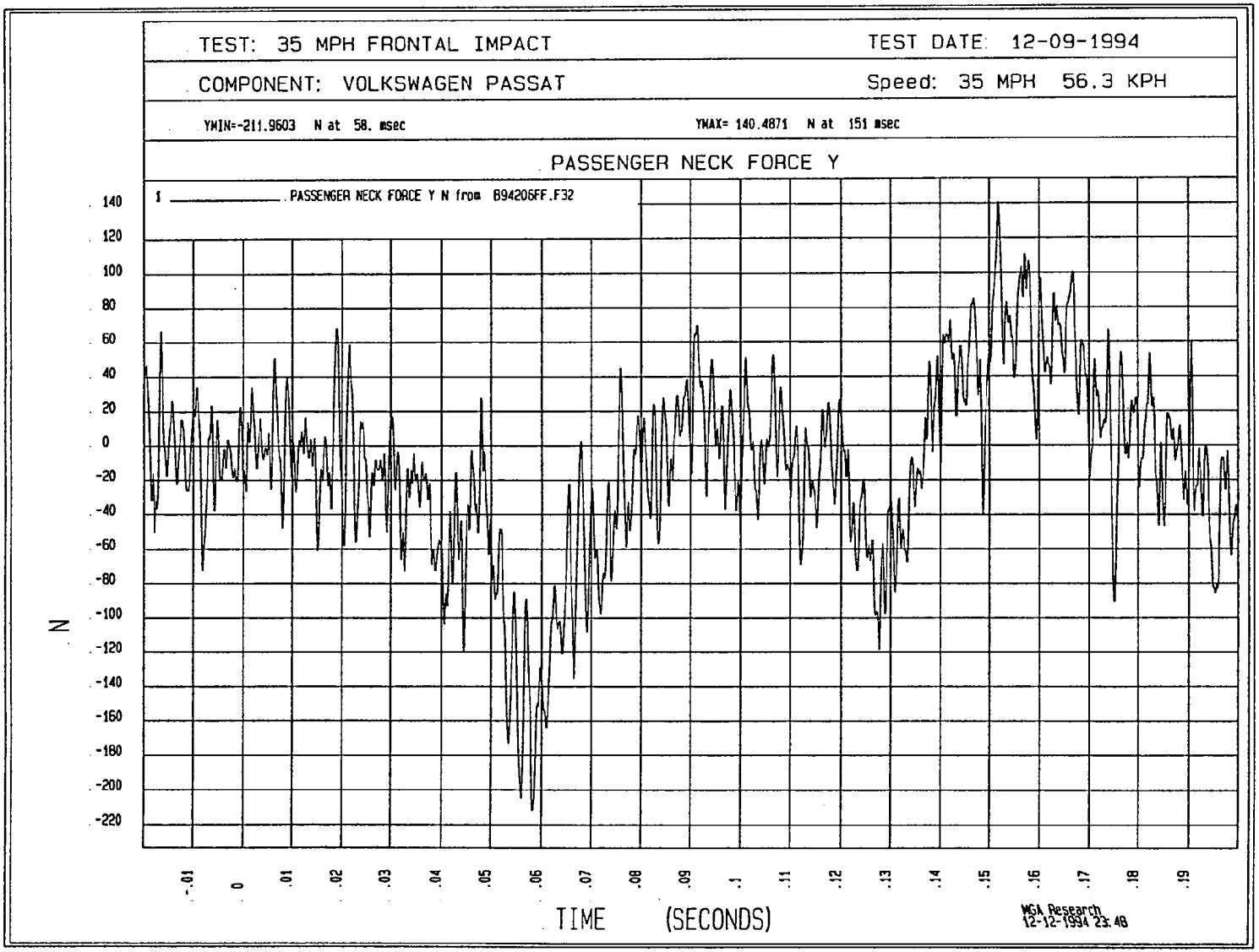


Figure B-96 - Passenger Neck Force Y vs. Time

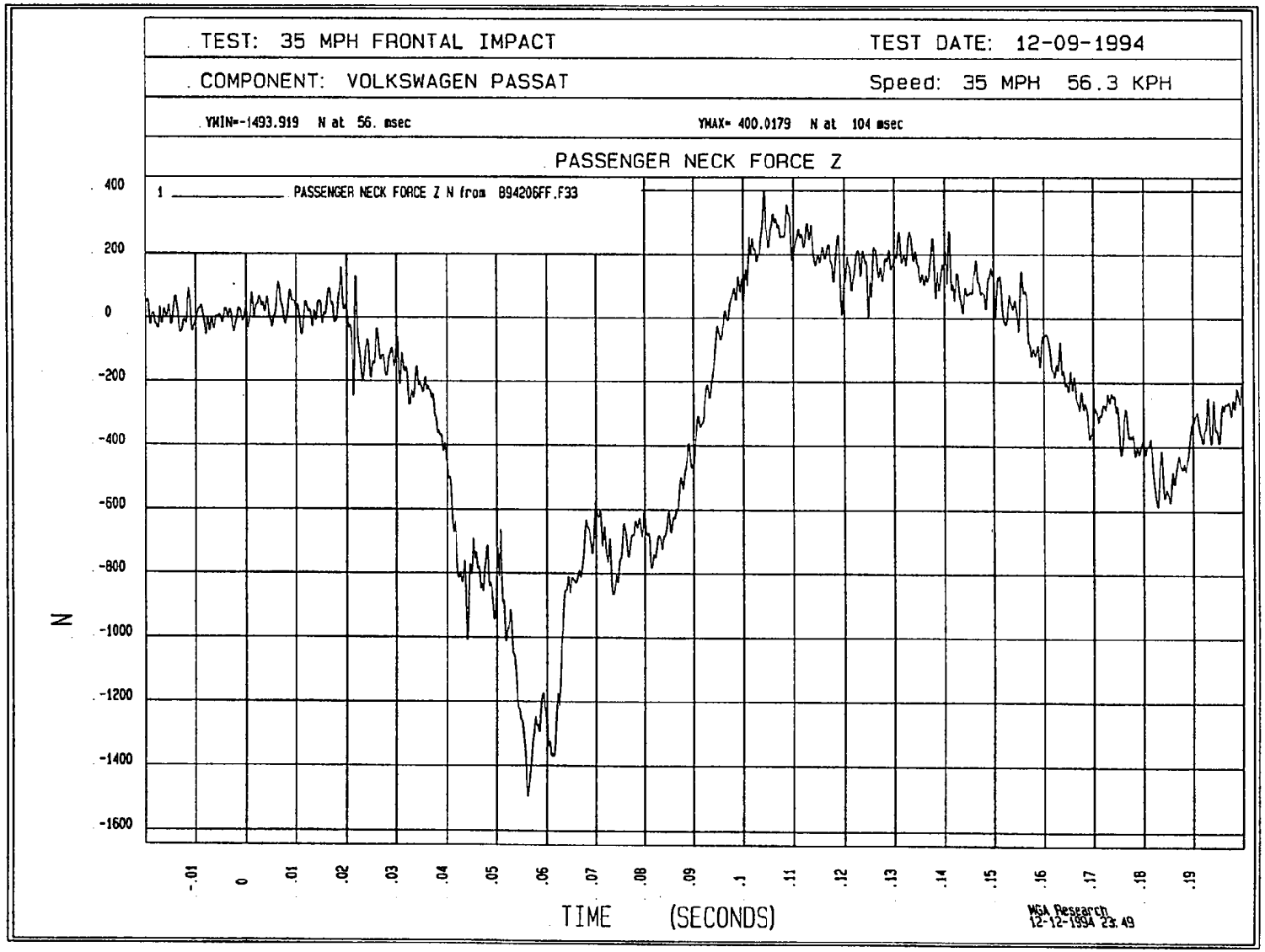


Figure B-97 - Passenger Neck Force Z vs. Time

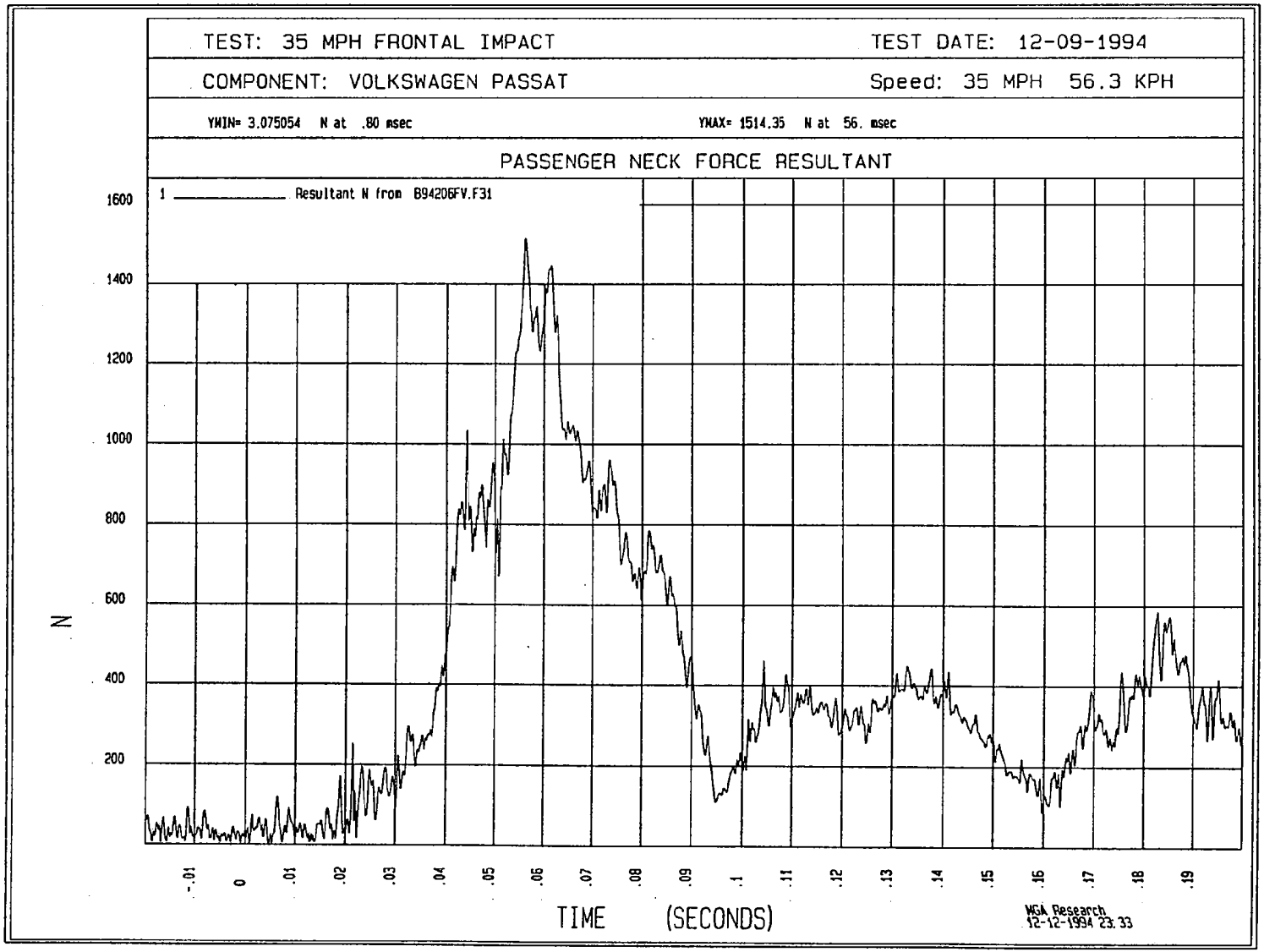


Figure B-98 - Passenger Neck Force Resultant Acceleration vs. Time

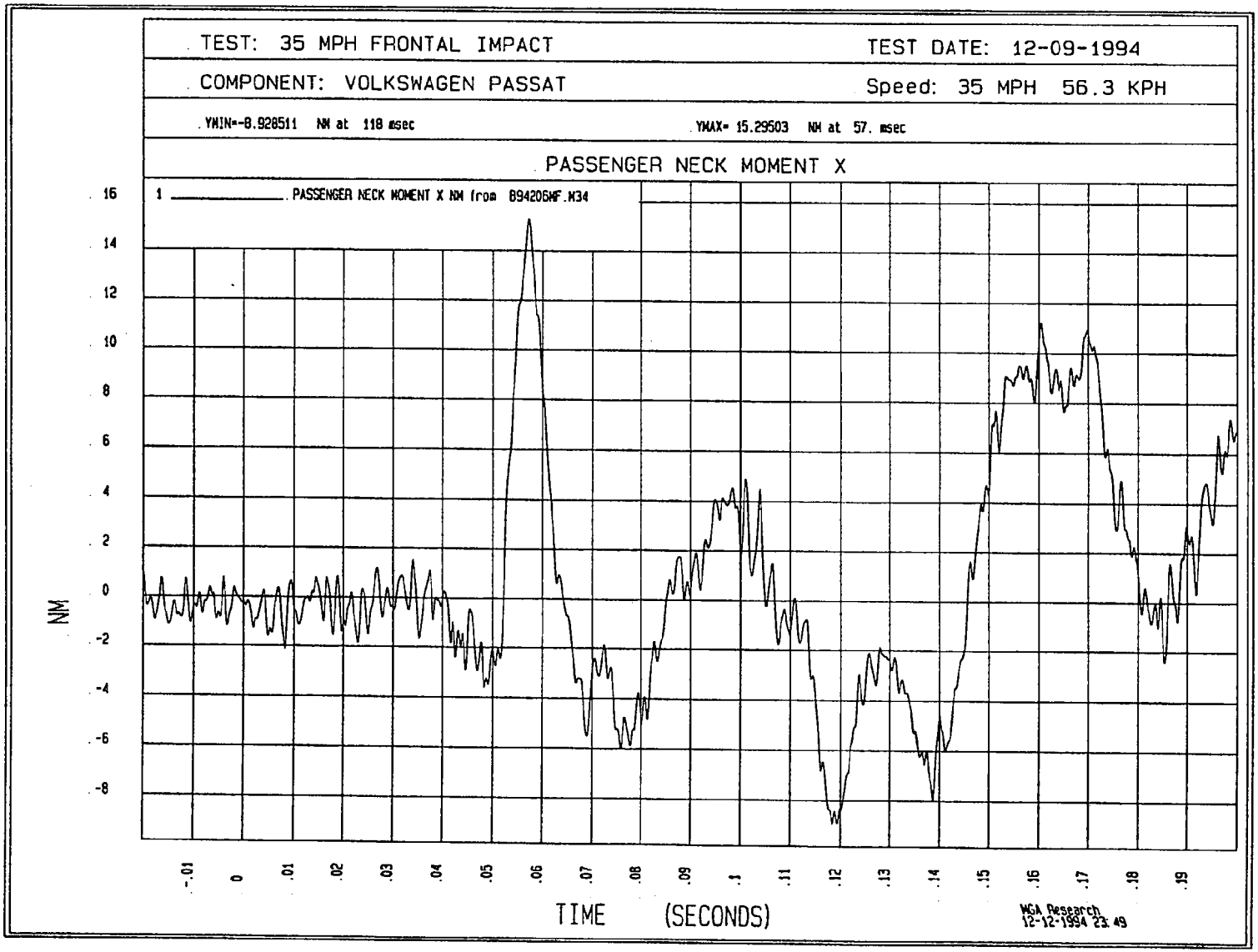


Figure B-99 - Passenger Neck Moment X vs. Time

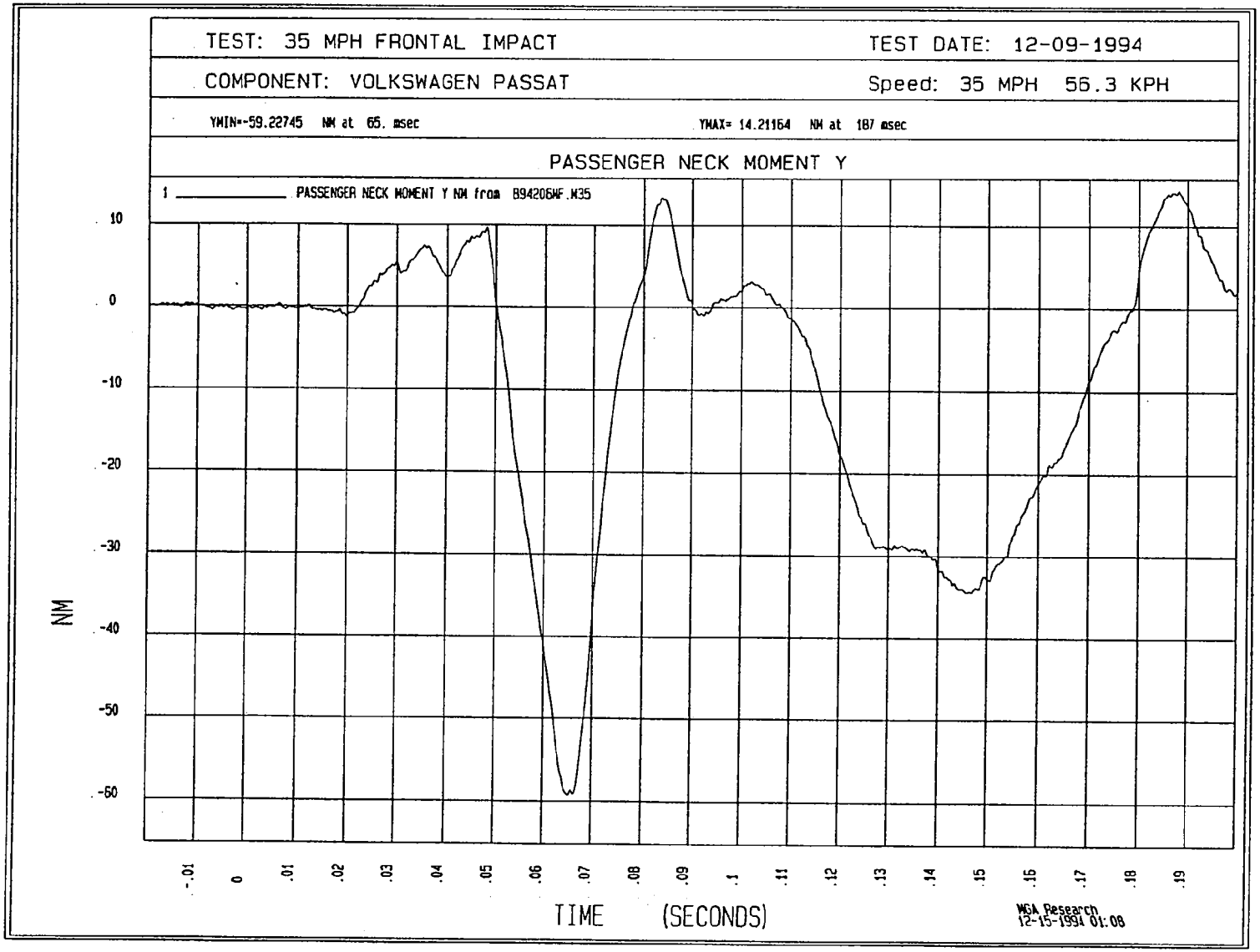


Figure B-100 - Passenger Neck Moment Y vs. Time

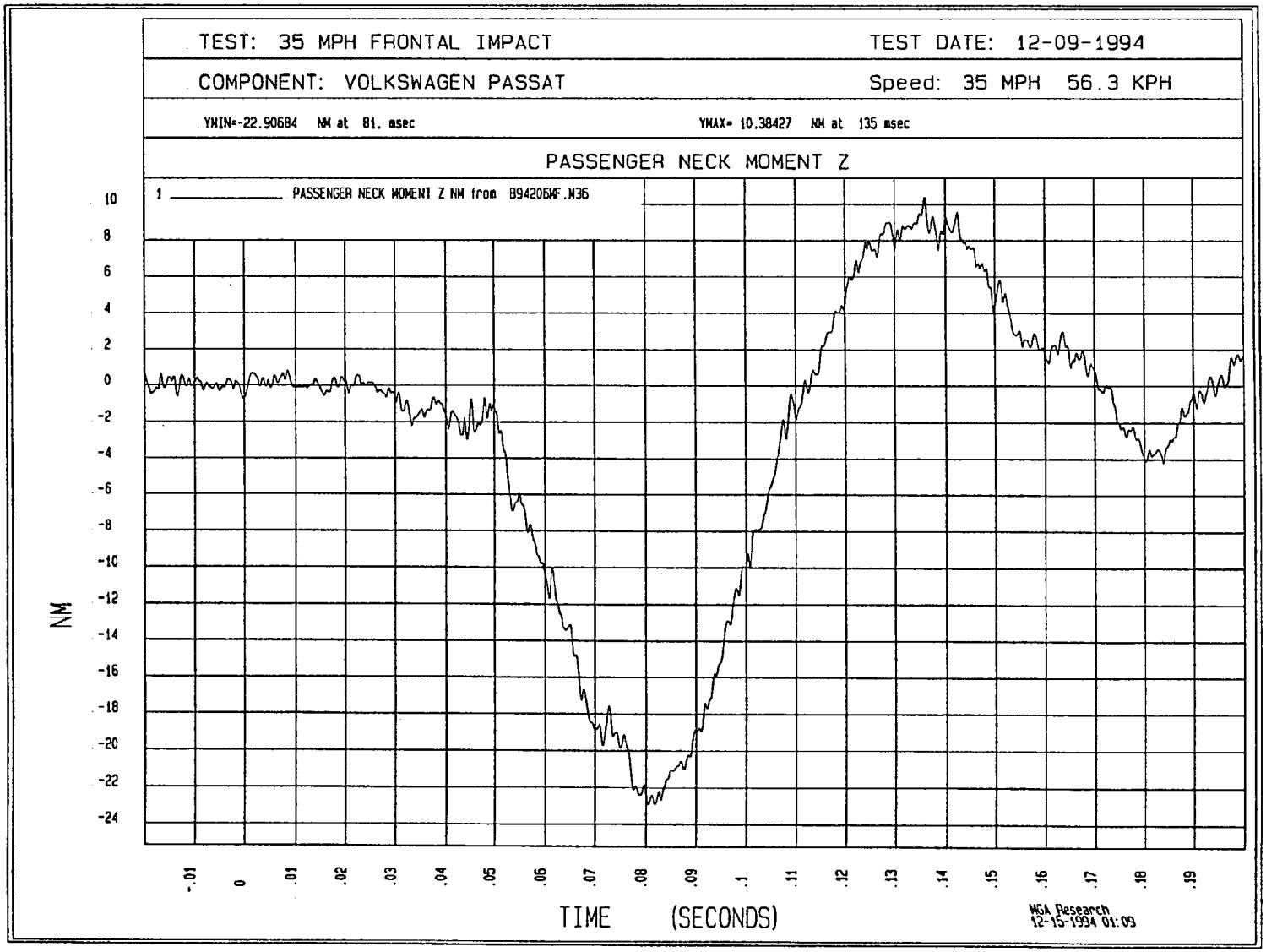


Figure B-101 - Passenger Neck Moment Z vs. Time

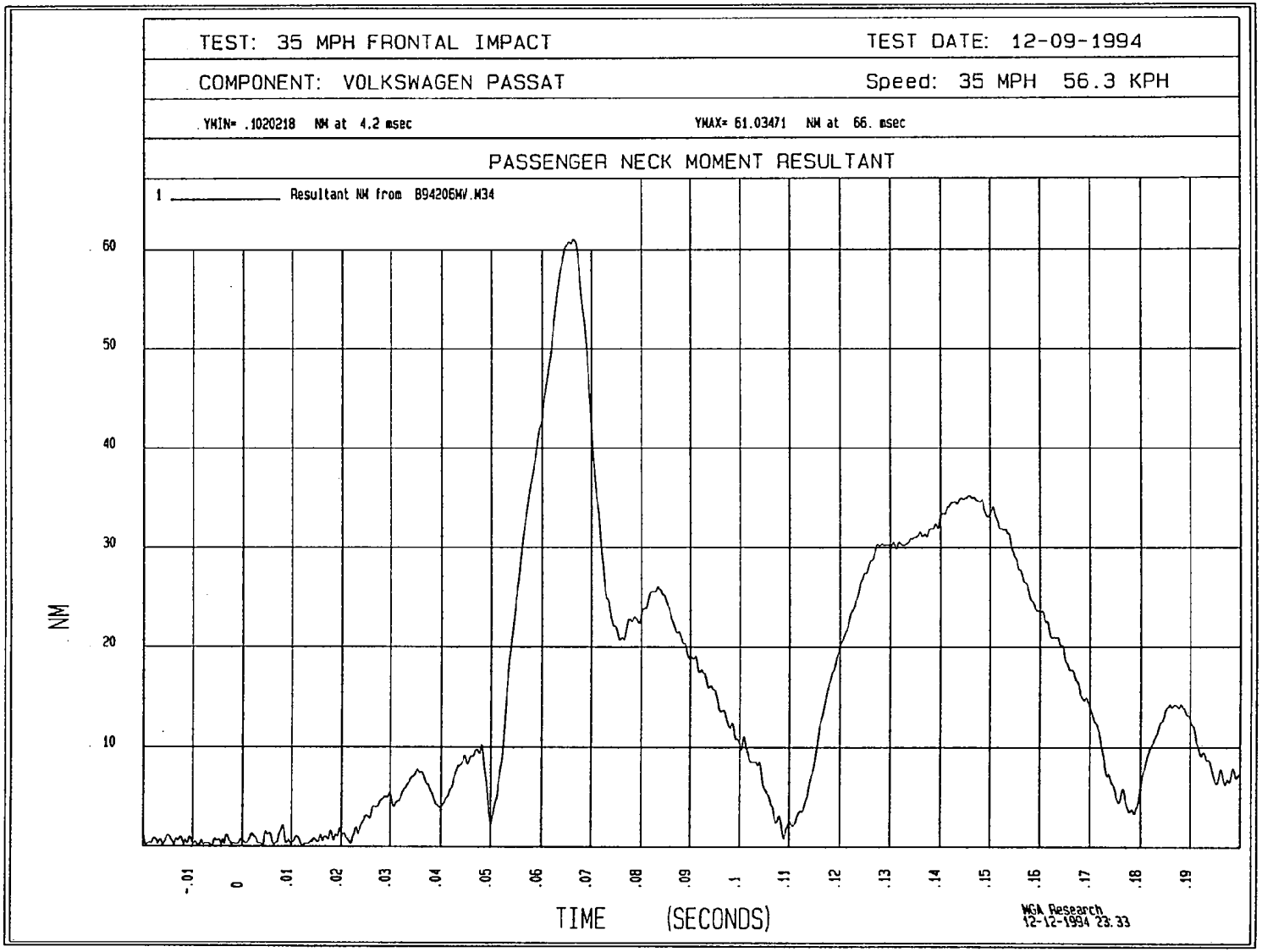


Figure B-102 - Passenger Neck Moment Resultant Acceleration vs. Time

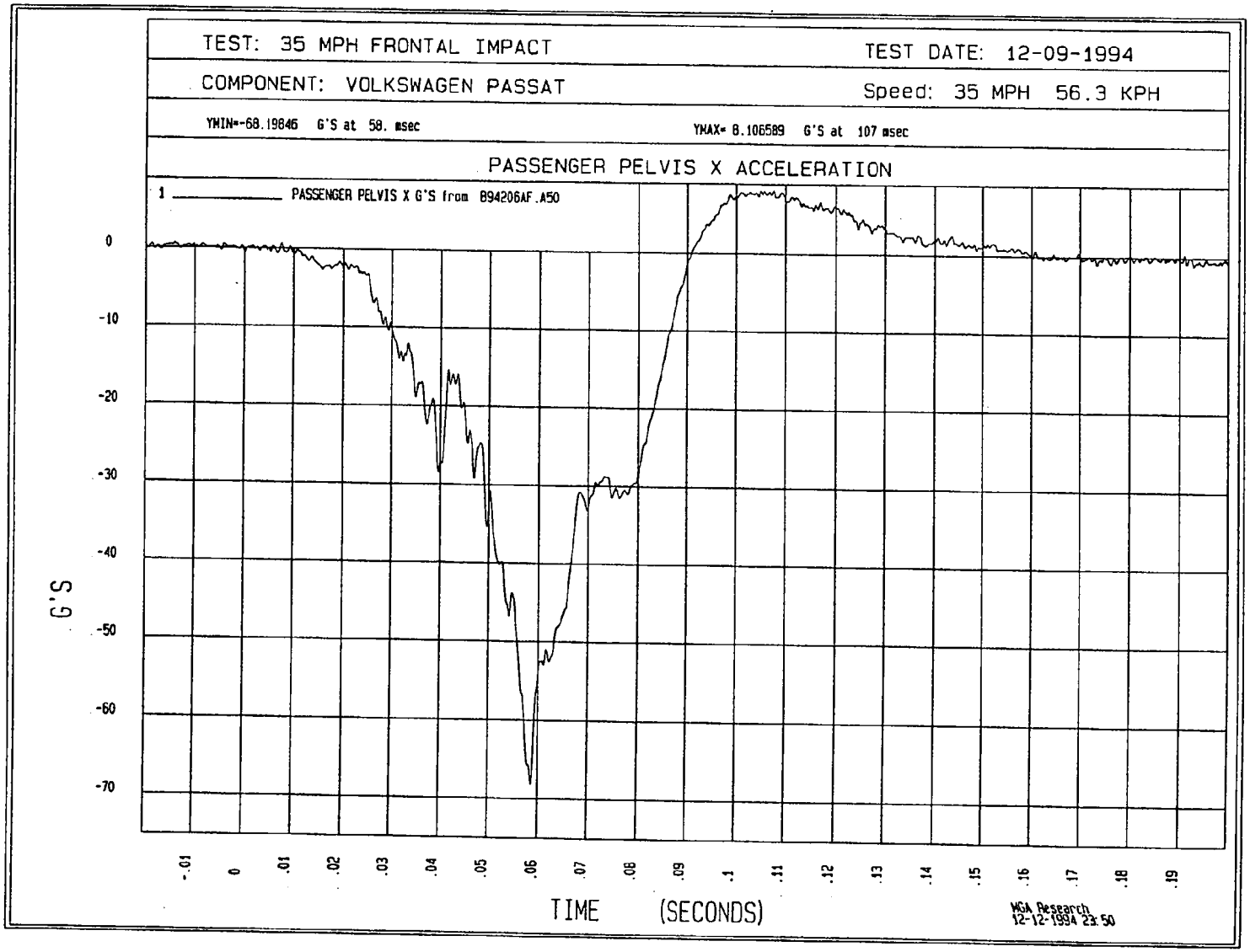


Figure B-103 - Passenger Pelvis X Acceleration vs. Time

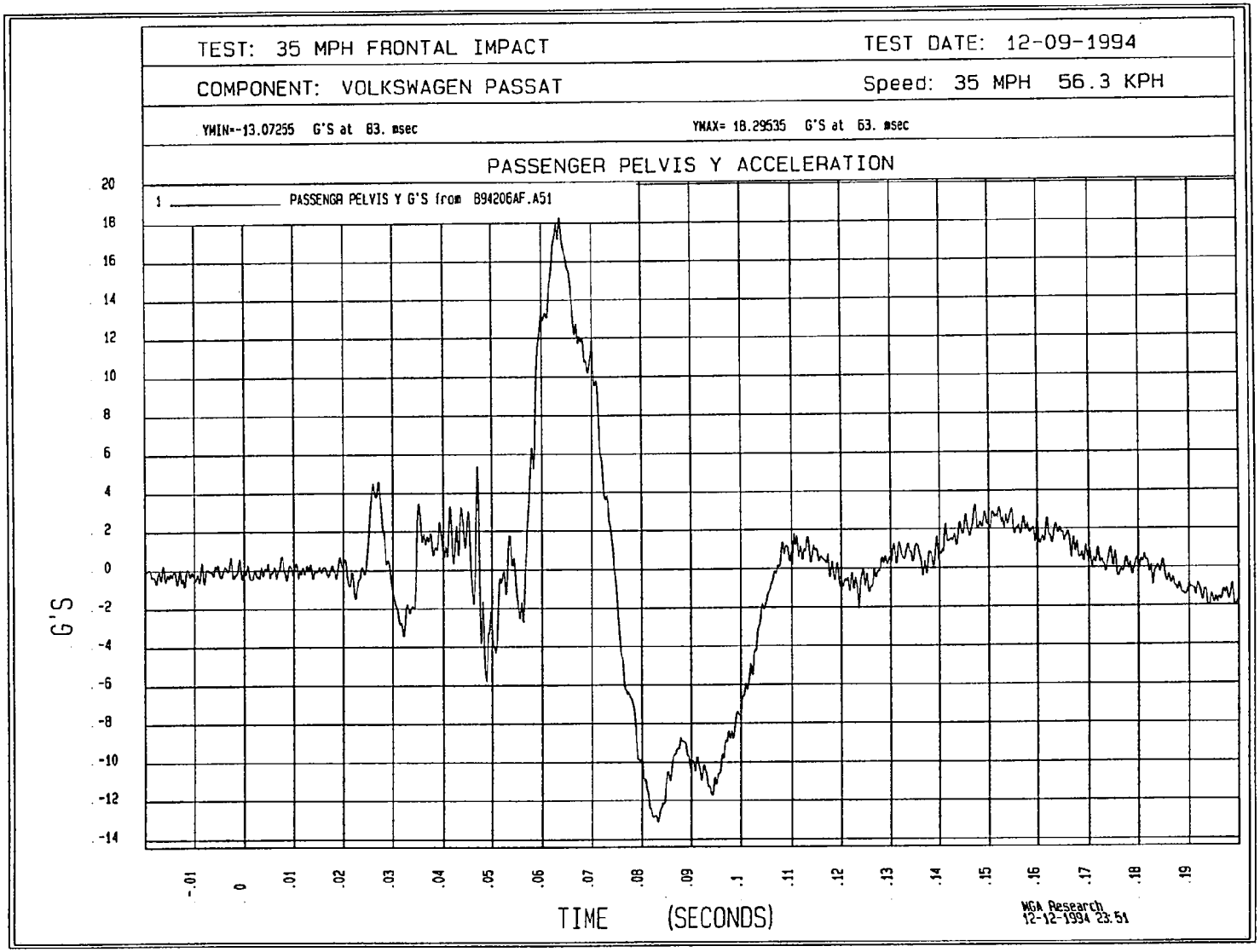
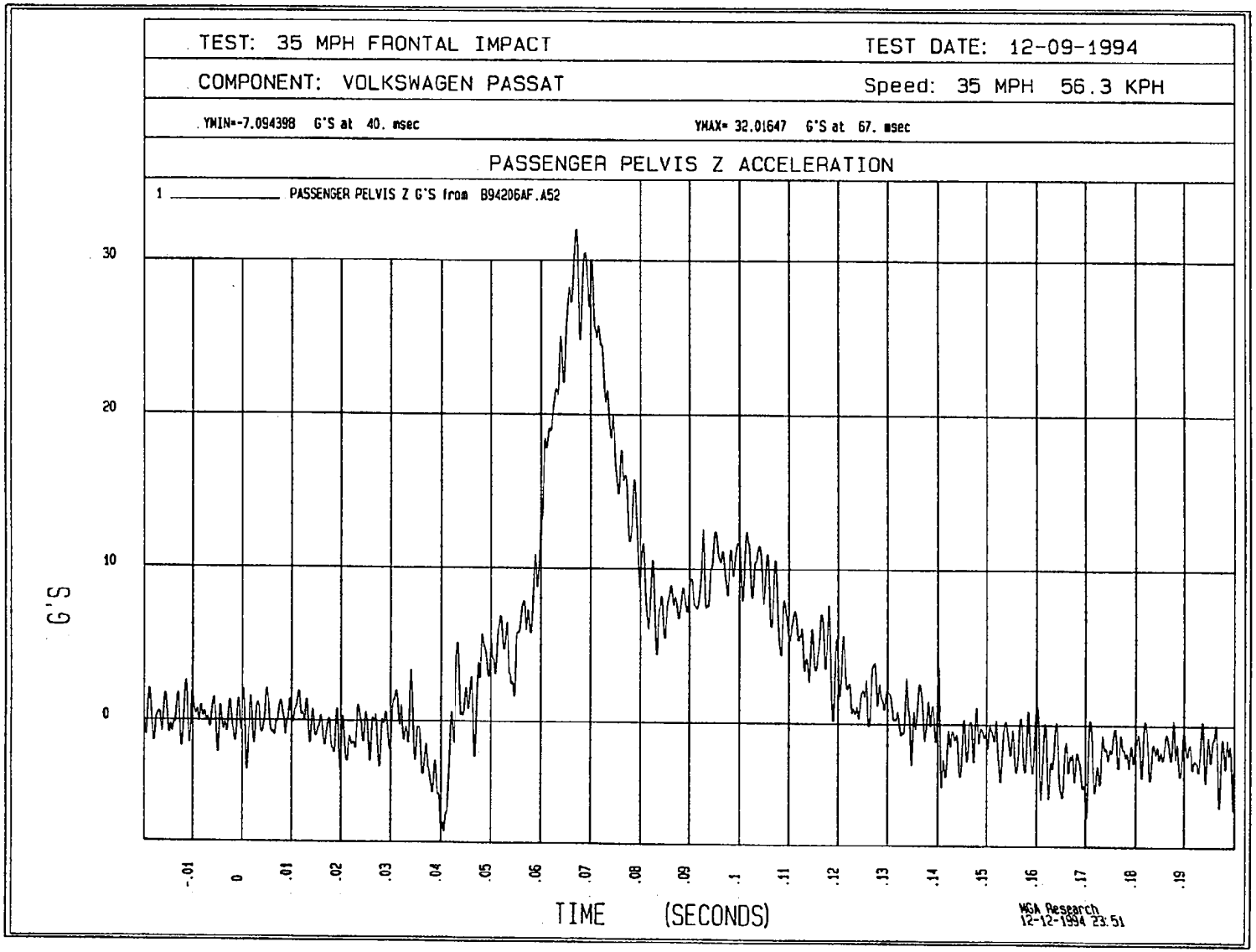


Figure B-104 - Passenger Pelvis Y Acceleration vs. Time



B-105

Figure B-105 - Passenger Pelvis Z Acceleration vs. Time

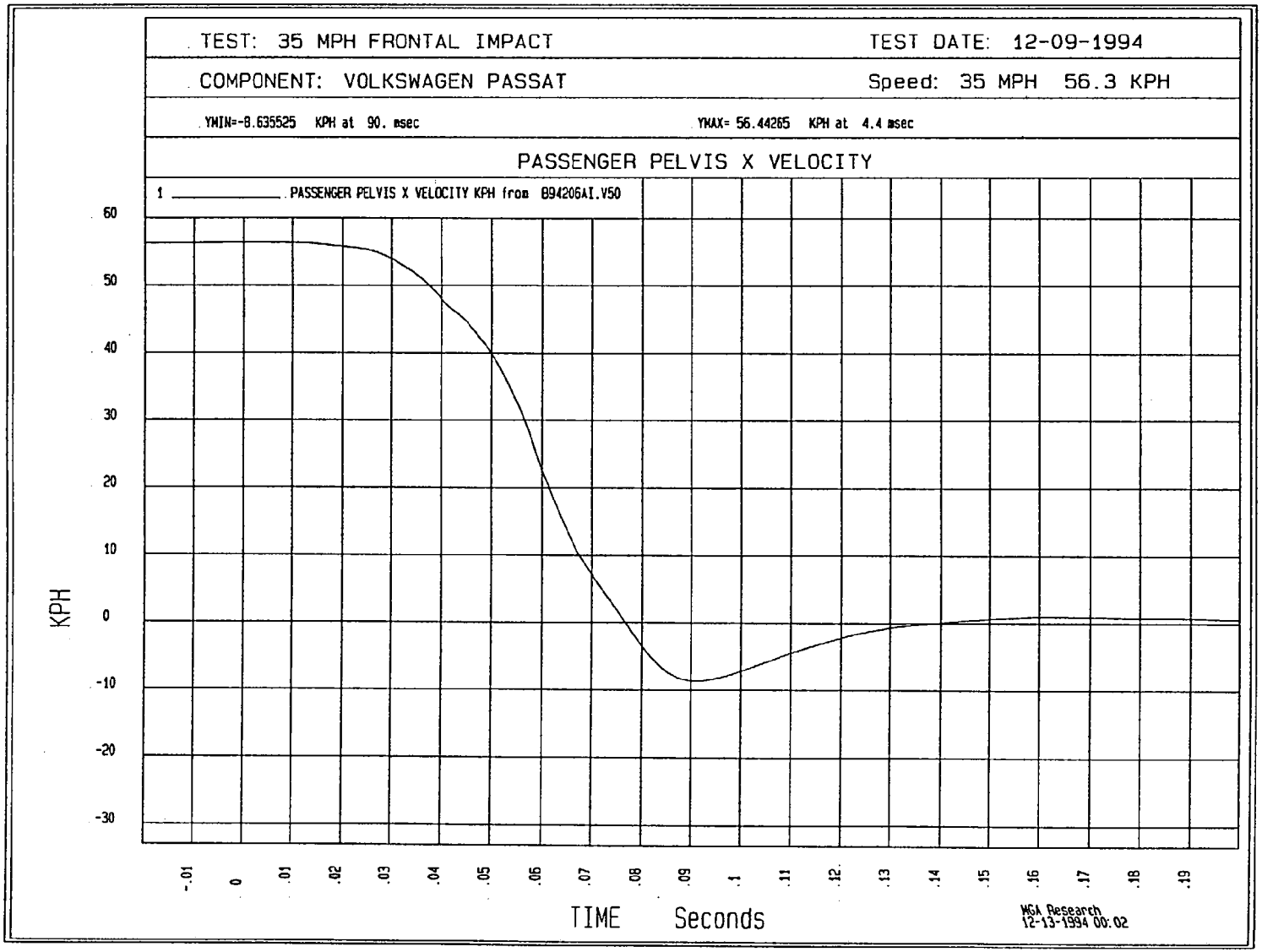


Figure B-106 - Passenger Pelvis X Velocity vs. Time

APPENDIX C

Dummy Configuration & Performance Verification Data

HYBRID III DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA

DUMMY NO.: 307 DUMMY CALIBRATION BY: Rod McClelland & Al Chalmers

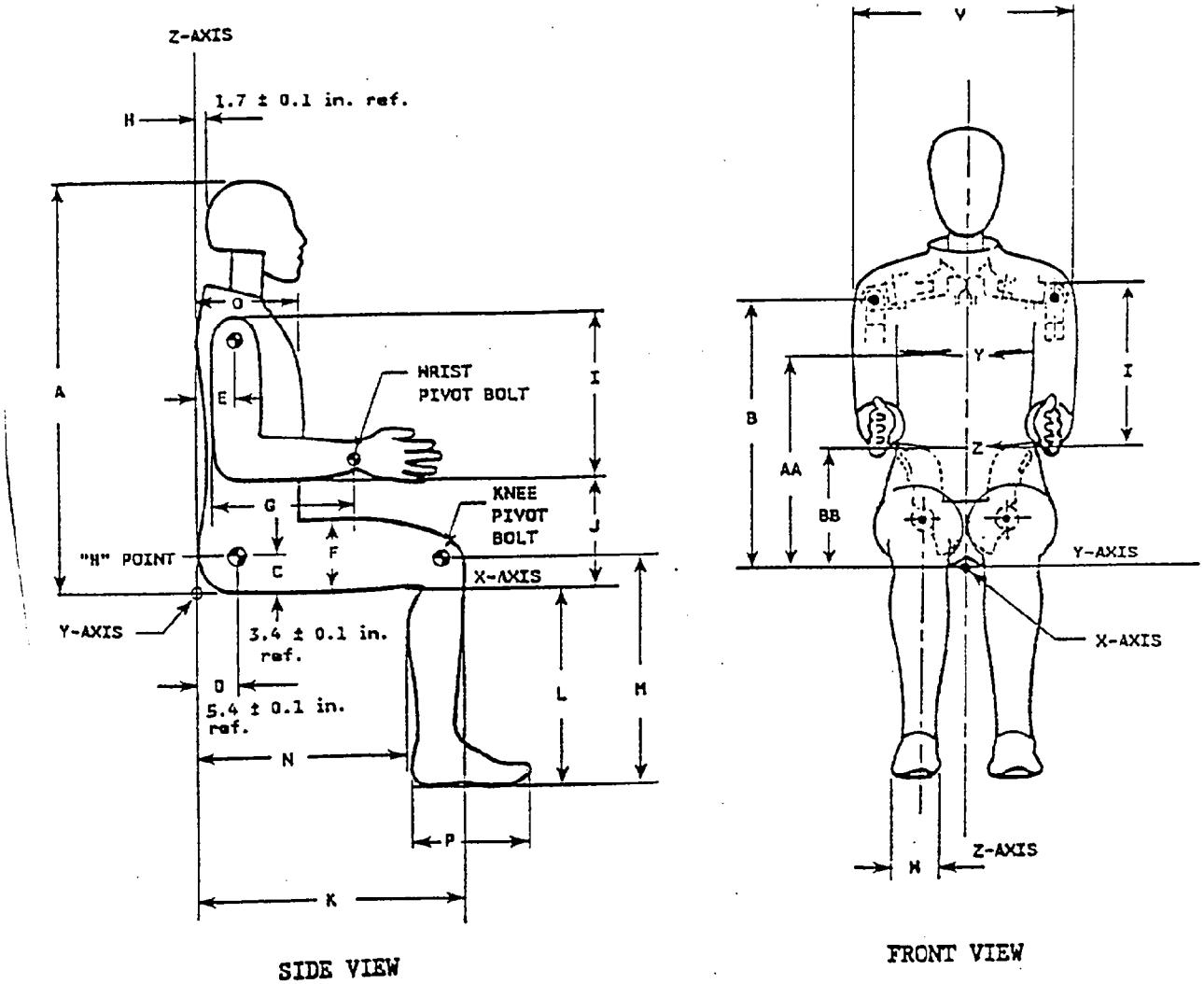
I. CONFIGURATION VERIFICATION DATA

DATE OF VERIFICATION: November 29, 1994

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



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.: 307 DUMMY CALIBRATION BY: Rod McClelland & Al Chalmers

VERIFICATION DATE: November 29, 1994

VERIFICATION LABORATORY TEMPERATURE (66° - 78°): 70°

1.0 HEAD DROP TEST

	SPECIFICATION	MEASUREMENT
Peak Resultant Acceleration	225 - 275 G	239
Peak Lateral Acceleration	15 G. MAX	4
Is Acceleration Curve Unimodel	within 10% of peak	Yes

2.0 NECK FLEXION TEST

		SPECIFICATION	MEASUREMENT
Pendulum Speed		22.6 - 23.4 FT/SEC	23.2
Pendulum Deceleration	10 MS	22.50 - 27.50 G	24.90
	20 MS	17.60 - 22.60 G	22.04
	30 MS	12.50 - 18.50 G	14.11
Max. Pendulum G Above 30 MS		29.0 G MAX	14.4
Deceleration - Time Curve Decay Time to 5 G		34 - 42 MS	39
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	66
	TIME	47 - 58 MS	52
Positive Moment - Time Curve Decay Time to Zero		97 - 107 MS	100

3.0 NECK EXTENSION TEST

		SPECIFICATION	MEASUREMENT
Pendulum Speed		19.50 - 20.30 F/S	19.99
Pendulum Deceleration	10 MS	17.20 - 21.20 G	20.67
	20 MS	14.00 - 19.00 G	17.48
	30 MS	11.00 - 16.00 G	13.56
Max. Pendulum G Above 30 MS		22 G Max	14
Deceleration - Time Curve Decay Time to 5 G		38 - 46 MS	40
D Plane Rotation	MAX	81 - 106 DEG.	93
	TIME	72 - 82 MS	73
Rotation Angle - Time Curve Decay Time to Zero		147 - 174 MS	150
Moment About Occipital Condyle	MIN.	-59.0/-39.0 FT LBS	-47.2
	TIME	65 - 79 MS	67
Positive Moment - Time Curve Decay Time to Zero		120 - 148 MS	134

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.	2.69
Peak Resistive Force	1160 to 1325 LBS.	1296
Internal Hysteresis	69 to 85%	70

5.0 KNEE IMPACT TESTS

LEFT KNEE	SPECIFICATION	MEASUREMENT
Probe Speed	6.8 to 7.0 F/S	6.97
Maximum Force	1060 - 1300 LBS.	1099

RIGHT KNEE	SPECIFICATION	MEASUREMENT
Probe Speed	6.8 to 7.0 F/S	7.01
Maximum Force	1060 - 1300 LBS.	1198

HYBRID III DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA

DUMMY NO.: 3Ø6 DUMMY CALIBRATION BY: Rod McClelland & Al Chalmers

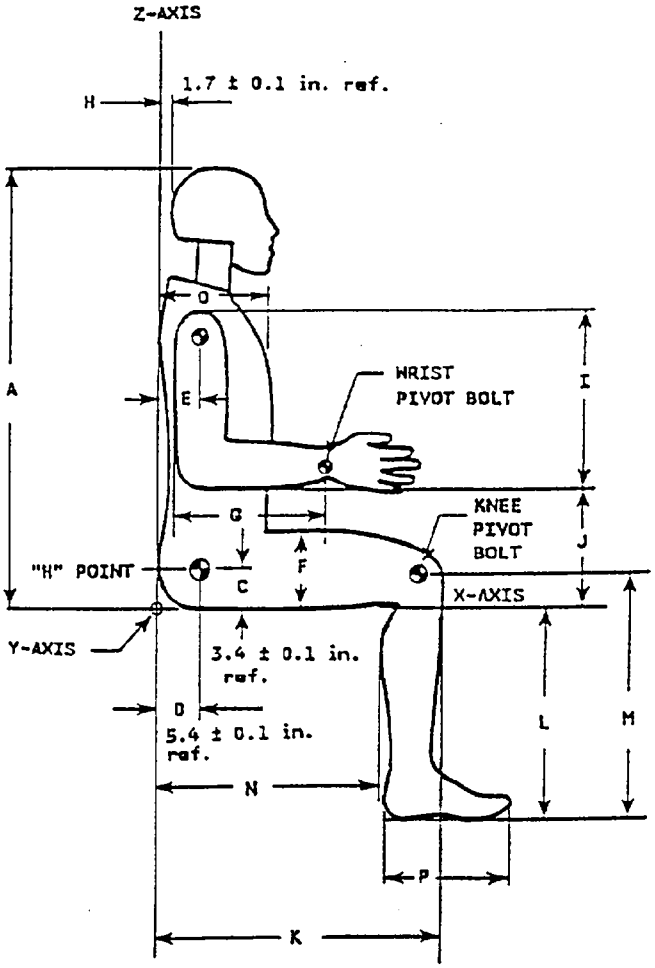
I. CONFIGURATION VERIFICATION DATA

DATE OF VERIFICATION: November 3Ø, 1994

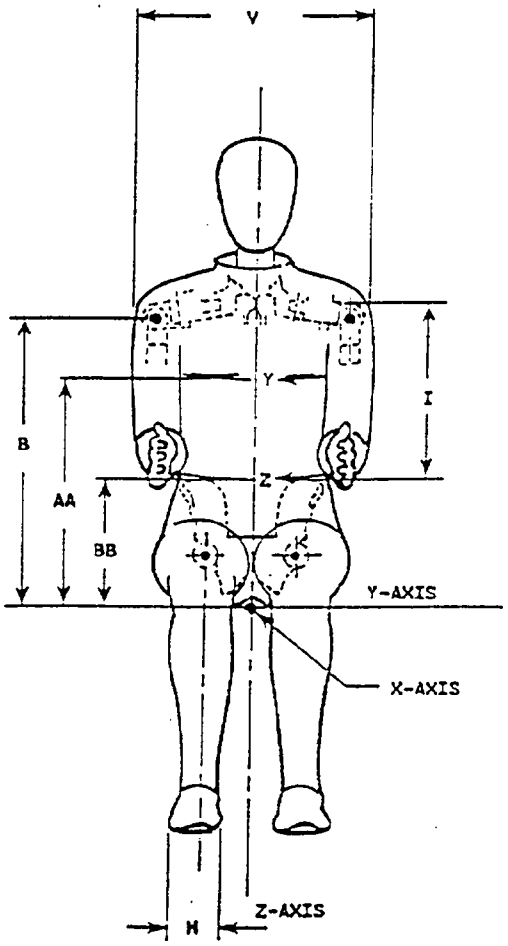
DESCRIPTION	SPECIFICATION (Inches)	ACTUAL MEASUREMENT (inches)
A - Total Sitting Height	34.6 - 35.Ø	34.8
B - Shoulder Pivot Height	19.9 - 2Ø.5	2Ø.5
C - "H" Point Height	3.3 - 3.5	3.4
D - "H" Point from Seat Back	5.3 - 5.5	5.5
E - Shoulder Pivot From Backline	3.3 - 3.7	3.5
F - Thigh Clearance	5.5 - 6.1	6.Ø
G - Back of Elbow to Wrist Pivot	11.4 - 12.Ø	11.5
H - Skull Cap Skin to Backline	1.6 - 1.8	1.7
I - Shoulder Elbow Length	13.Ø - 13.6	13.Ø
J - Elbow Rest Height	7.5 - 8.3	8.Ø
K - Buttock Knee Length	22.8 - 23.8	23.5
L - Popliteal Height	16.9 - 17.9	17.Ø
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.Ø	8.5
P - Foot Length	9.9 - 1Ø.5	1Ø.3
V - Shoulder Breadth	16.6 - 17.2	16.8
W - Foot Breadth	3.5 - 4.2	4.Ø
Y - Chest Circumference	38.2 - 39.4	39.Ø
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.: 306 DUMMY CALIBRATION BY: Rod McClelland & Al Chalmers

VERIFICATION DATE: November 30, 1994

VERIFICATION LABORATORY TEMPERATURE (66° - 78°): 70°

1.0 HEAD DROP TEST

	SPECIFICATION	MEASUREMENT
Peak Resultant Acceleration	225 - 275 G	245
Peak Lateral Acceleration	15 G. MAX	5
Is Acceleration Curve Unimodal	within 10% of peak	Yes

2.0 NECK FLEXION TEST

		SPECIFICATION	MEASUREMENT
Pendulum Speed		22.6 - 23.4 FT/SEC	23.0
Pendulum Deceleration	10 MS	22.50 - 27.50 G	23.25
	20 MS	17.60 - 22.60 G	22.28
	30 MS	12.50 - 18.50 G	15.45
Max. Pendulum G Above 30 MS		29.0 G MAX	15.4
Deceleration - Time Curve Decay Time to 5 G		34 - 42 MS	40
D Plane Rotation	MAX	64 - 78 DEG.	70
	TIME	57 - 64 MS	57
Rotation Angle - Time Curve Decay Time to Zero		113 - 128 MS	113
Moment About Occipital Condyle	MIN.	65 - 80 FT.LBS	65
	TIME	47 - 58 MS	53
Positive Moment - Time Curve Decay Time to Zero		97 - 107 MS	100

HYBRID III DUMMY CALIBRATION DATA SUMMARY SHEET (CONT.)

3.Ø NECK EXTENSION TEST

		SPECIFICATION	MEASUREMENT
Pendulum Speed		19.5Ø - 2Ø.3Ø F/S	2Ø.Ø1
Pendulum Deceleration	1Ø MS	17.2Ø - 21.2Ø G	2Ø.58
	2Ø MS	14.ØØ - 19.ØØ G	16.63
	3Ø MS	11.ØØ - 16.ØØ G	13.Ø9
Max. Pendulum G Above 3Ø MS		22 G Max	13
Deceleration - Time Curve Decay Time to 5 G		38 - 46 MS	41
D Plane Rotation	MAX	81 - 1Ø6 DEG.	93
	TIME	72 - 82 MS	73
Rotation Angle - Time Curve Decay Time to Zero		147 - 174 MS	151
Moment About Occipital Condyle	MIN.	-59.Ø/-39.Ø FT LBS	-46.1
	TIME	65 - 79 MS	69
Positive Moment - Time Curve Decay Time to Zero		12Ø - 148 MS	135

4.Ø CHEST IMPACT TESTS

	SPECIFICATION	MEASUREMENT
Probe Speed	21.6 to 22.4 F/S	21.8
Peak Deflection	2.5Ø to 2.86 IN.	2.74
Peak Resistive Force	116Ø to 1325 LBS.	1267
Internal Hysteresis	69 to 85%	71

5.Ø KNEE IMPACT TESTS

LEFT KNEE	SPECIFICATION	MEASUREMENT
Probe Speed	6.8 to 7.Ø F/S	7.Ø3
Maximum Force	1Ø6Ø - 13ØØ LBS.	1211

RIGHT KNEE	SPECIFICATION	MEASUREMENT
Probe Speed	6.8 to 7.Ø F/S	6.94
Maximum Force	1Ø6Ø - 13ØØ LBS.	1171

APPENDIX D

Dummy, Vehicle and Laboratory Calibration Data

DUMMY, VEHICLE AND LABORATORY INSTRUMENT CALIBRATION

INSTRUMENTS FOR DUMMY NO. 307

	DRIVER		
	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Head X	AJ809	Endevco	10/14/94
Head Y	AJ9R9	Endevco	10/13/94
Head Z	AJ836	Endevco	10/13/94
Chest X	AJ823	Endevco	10/17/94
Chest Y	AHY98	Endevco	06/20/94
Chest Z	AJ9Y3	Endevco	10/14/94
Right Femur Load Cell	732	GSE	11/11/94
Left Femur Load Cell	953	GSE	06/16/94
Neck Load Cell X	252	Denton	08/08/94
Neck Load Cell Y	252	Denton	08/08/94
Neck Load Cell Z	252	Denton	08/08/94
Neck Moment X	252	Denton	08/08/94
Neck Moment Y	252	Denton	08/08/94
Neck Moment Z	252	Denton	08/08/94
Chest Deflection Gauge	307	Servo	07/13/94
Lap Belt Load Cell	212	GSE	08/04/94
Torso Belt Load Cell	663	Lebow	12/05/94

DUMMY, VEHICLE AND LABORATORY INSTRUMENT CALIBRATION

INSTRUMENTS FOR DUMMY NO. 306

	PASSENGER		
	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Head X	ACC81	Endevco	06/10/94
Head Y	AJ404	Endevco	07/12/94
Head Z	AHRP6	Endevco	07/12/94
Chest X	AJ8Y6	Endevco	10/17/94
Chest Y	AJ9C1	Endevco	10/13/94
Chest Z	AGWA4	Endevco	10/10/94
Right Femur Load Cell	956	GSE	11/11/94
Left Femur Load Cell	945	GSE	11/11/94
Neck Load Cell X	495	Denton	10/10/94
Neck Load Cell Y	495	Denton	10/10/94
Neck Load Cell Z	495	Denton	10/10/94
Neck Moment X	495	Denton	10/10/94
Neck Moment Y	495	Denton	10/10/94
Neck Moment Z	495	Denton	10/10/94
Chest Deflection Gauge	307	Servo	07/13/94
Lap Belt Load Cell	211	Lebow	10/26/94
Torso Belt Load Cell	691	Lebow	10/26/94

DUMMY, VEHICLE AND LABORATORY INSTRUMENT CALIBRATION

	VEHICLE ACCELEROMETERS		
	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Left Rear Seat Crossmember X	AJ9J6	Endevco	10/10/94
Right Rear Seat Crossmember X	AHYR7	Endevco	07/12/94
Top of Engine Block X	AJ660	Endevco	10/14/94
Bottom of Engine X	ACC99	Endevco	05/24/94
Left Brake Caliper X	AH0P9	Endevco	10/12/94
Right Brake Caliper X	MGA076	Entran	11/18/94
Instrument Panel X	MGA145	Entran	05/24/94
Redundant Left Rear Seat Crossmember X	BC49	Endevco	06/23/94
Redundant Right Rear Seat Crossmember X	X14	Entran	10/30/94
Front Tunnel X	X02	Entran	11/07/94
Rear Tunnel X	MGA054	Entran	06/13/94

	LABORATORY INSTRUMENTS		
	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Neck Bending Pendulum Accelerometer	AGH90	Endevco	09/01/94
Neck Bending Rotary Potentiometer	019	Lebow	08/29/94
Neck Bending Rotary Potentiometer	018	Lebow	08/29/94
Femur/Chest/Thorax Probe Accelerometer	403069	Spectrol	10/24/94
Abdomen Compression Force Gauge	N/A	Transducers Inc.	N/A