V2714

REPORT NO. KAR-98-1

NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
NEW CAR ASSESSMENT PROGRAM
FRONTAL BARRIER IMPACT TEST

GENERAL MOTORS CORPORATION
1998 CHEVROLET MALIBU
4-DOOR SEDAN
NHTSA NO. MW0106

PREPARED BY:
KARCO ENGINEERING
9270 HOLLY ROAD
ADELANTO, CALIFORNIA 92301

DECEMBER 19, 1997
FINAL REPORT

PREPARED FOR:
U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
SAFETY PERFORMANCE STANDARDS
OFFICE OF CRASHWORTHINESS STANDARDS
MAIL CODE: NPS-10
400 SEVENTH STREET, SW, ROOM 5313
WASHINGTON, D.C. 20590

This final test report was prepared for the U.S. Department of Transportation, National Highway Traffic Safety Administration, in response to Contract Number DTNH22-97-D-02007.

Prepared by: James E. Gorth Date: December 19, 1997
Mr. James E. Gorth, Project Engineer
KARCO Engineering

Reviewed by: Jerry L Kratzke Date: December 19, 1997
Mr. Jerry L. Kratzke, Director of Operations
KARCO Engineering

Approved by: Frank D Richardson Date: December 19, 1997
Mr. Frank D. Richardson, Program Manager
KARCO Engineering

FINAL REPORT ACCEPTED BY:

_____ _____
Manager, New Car Assessment Program

_____
Date of Acceptance

_____
COTR, NCAP Frontal Impact Program

_____ _____
Date of Acceptance

Technical Report Documentation Page

1. *Report No.* KAR-98-1	2. *Government Accession No.*	3. *Recipient's Catalog No.*
4. *Title and Subtitle* Final Report of New Car Assessment Program (NCAP) Frontal Barrier Impact Test Testing of a 1998 Chevrolet Malibu Four Door Sedan NHTSA NO. MW0106		5. *Report Date* December 12, 1997 6. *Performing Organization Code* KARCO
7. *Author(s)* Mr. Mark A. Kratzke, Test Technician, KARCO Mr. Frank D. Richardson, Program Manager, KARCO		8. *Performing Organization Report No.* KAR-97-97050-01
9. *Performing Organization Name and Address* KARCO Engineering 9270 Holly Road Adelanto, California 92301		10. *Work unit No.* 11. *Contract or Grant No.* DTNH22-97-D-02007
12. *Sponsoring Agency Name and Address* U.S. Department of Transportation National Highway Traffic Safety Administration Safety Performance Standards Office of Crashworthiness Standards Mail Code: NPS-10 400 Seventh Street, SW, Room 5313 Washington, D.C. 20590		13. *Type of report and Period Covered* Final Report-Option Year 1 14. *Sponsoring Agency Code* DOT/NHTSA/NRM/OMI

15. *Supplementary Notes*

16. *Abstract*

A 35 mph (56.3 km/h) frontal barrier impact test was conducted on a 1998 Chevrolet Malibu 4-door sedan at KARCO Engineering on November 21, 1997. This test was conducted to obtain data indicant of FMVSS 208, 212, 219 (partial), 301 and footwell intrusion performance. The impact velocity was 56.62 km/h. The ambient temperature at the barrier face at the time of impact was 26.7°C. The vehicle's maximum post-test static crush was 573 mm, located at the centerline of the vehicle. The test vehicle was equipped with a 3-point continuous belt system and second generation supplemental airbags at both frontal outboard-seating positions.

With respect to FMVSS 208 "Occupant Crash Protection - Injury Criteria" the occupant injury response data summary is as follows:

Injury Criteria	Threshold Value	Driver Dummy	Passenger Dummy
Head Injury Criteria (HIC)	1000	690.9	472.6
Chest Resultant Peak 3 msec clip	60 G's	41.8	49.9
Left Femur Force	10009 N	-3392.2	-5632.9
Right Femur Force	10009 N	-3615.0	-2352.2

17. *Key Words* 56.3 km/h NCAP Frontal Barrier Impact Test 1998 Chevrolet Malibu 4-door sedan, NHTSA NO. MW0106		18. *Distribution Statement* Copies of this report are available from: Technical Reference Division National Highway Traffic Safety Admin. Room 5108, Nassif Building 400 7th St., SW Washington, DC 20590	
19. *Security Classification (of this report)* UNCLASSIFIED	20. *Security Classification (of this page)* UNCLASSIFIED	21. *No. of Pages* 315	22. *Price*

Form DOT F1700.7 (8-72)

TABLE OF CONTENTS

SECTION 1

PURPOSE, TEST PROCEDURE AND SUMMARY OF TEST MW0106

1.1 PURPOSE

This 35 mph (56.3 km/h) frontal barrier impact test is part of the FY' 98 New Car Assessment Program (NCAP) frontal barrier crash worthiness evaluation program sponsored by the National Highway Traffic Safety Administration (NHTSA) under Contract Number DTNH22-97-D-02007. The purpose of this test was to obtain vehicle crashworthiness and occupant restraint system performance data for frontal barrier impacts at a speed in excess of the current 30 mph (48 km/h) FMVSS 208/212/219/301 requirements.

1.2 TEST PROCEDURE

This 56.3 km/h frontal barrier impact test was conducted in accordance with the Office of Crashworthiness Standards (OCS) New Car Assessment Program (NCAP) Laboratory Indicant Test Procedure, dated 01 October 1996 and corresponding KARCO Engineering Test Procedure KTP-001, dated October 18, 1996. Data was obtained indicant of FMVSS 208, "Occupant Crash Protection"; FMVSS 212, "Windshield Retention"; FMVSS 219, "Windshield Zone Intrusion (Partial)"; and FMVSS 301 "Fuel System Integrity" performance. Procedures for receiving, inspection testing and reporting of test results are described in the test procedures and are not repeated in this report.

The test was conducted at KARCO Engineering on November 21, 1997, at a speed of 56.62 km/h. The test vehicle was instrumented with nine (9) accelerometers to measure longitudinal axis accelerations. The driver and passenger's restraint systems were instrumented with four (4) seat belt load cells to measure lap and shoulder belt tension. The specified impact velocity range was 55.5 to 57.1 km/h. The frontal barrier impact event was documented by one (1) real-time panning motion picture camera and seventeen (17) high-speed motion picture cameras. The pre- and post-test conditions were recorded by one (1) real-time motion picture camera. Camera locations and pertinent camera information is documented in the data sheets. Pre- and post-test photographs of the vehicle and dummies can be found in Appendix A.

The test vehicle contained two (2) part 572E 50th percentile adult male anthropomorphic test devices (ATDs). Both ATDs were instrumented with head and chest primary and redundant tri-axial accelerometers, pelvic tri-axial accelerometers, left/right femur load cells, left/right lower leg sensors and left/right feet accelerometers. In addition, chest displacement and neck six-axis load and moment sensors were utilized. Seat belt load cells were also placed on the driver and passenger shoulder and lap belts to measure torso and pelvic section loading. The ATDs were positioned in the front outboard seating positions according to the dummy placement procedures specified in the Laboratory Indicant Test Procedure. Ninety-six channels of data were recorded with a PC based (TDAS) on-board data acquisition system. The data was digitally sampled at 10,000 samples per second and processed per section IP11 of the Laboratory Indicant Test Procedure.

The Driver ATD (serial No. 34) and the right-front passenger ATD (serial No. 35) were re-instrumented and calibrated just prior to this test. Injury criteria were not exceeded by either ATD during this NCAP frontal impact test.

1.3 SUMMARY OF FRONTAL BARRIER IMPACT TEST

A immovable barrier was impacted by a 1998 Chevrolet Malibu 4-door sedan at a velocity of 56.62 km/h. The test weight, with two (2) 50th percentile male ATDs, was 1619 kg.

The driver's Head Injury Criteria (HIC) was 690.9, the maximum chest deceleration over three (3) milliseconds was 41.8 g and the left and right femur loads were –3392.2 and –3615.0 Newtons, respectively. Chest deflection for the driver ATD was –38.6 mm. The driver ATD head contacted the airbag and headrest, its chest and abdomen contacted the airbag, and both knees contacted the lower dash knee bolster.

The right front passenger's HIC was 472.6, maximum chest deceleration over three (3) milliseconds was 49.9 g, and the left and right femur loads were –5632.9 and –2352.2 Newtons respectively. Chest deflection for the passenger ATD was –35.4 mm. The passenger ATD head contacted the airbag and headrest, the chest and abdomen contacted the airbag, both knees contacted the glove box and knee bolster.

Seat belt spoolout, measured by on-board pullout potentiometers was 80.8 mm for the driver ATD and 148.7 mm for the passenger ATD. Shoulder belt stretch was 0.60 cm/cm for the driver ATD and 0.44 cm/cm for the passenger ATD.

There was 100 percent windshield retention, no intrusion into the protected or unprotected zone of the windshield, and no Stoddard solvent leakage occurred after impact or during any phase of the rollover.

The test vehicle sustained a maximum static crush of 573 mm at the vehicle centerline. The driver side doors and the passenger side doors opened without the aid of tools.

1.4 GENERAL COMMENTS

The 1998 Chevrolet Malibu 4-door sedan passed the requirements of FMVSS 212, FMVSS 219 and FMVSS 301-75. Data pertaining to these standards are presented in the data sheets.

The vehicle, occupant, camera and measurement data are presented in Section 2. Appendix A contains the still photograph prints. Appendix B contains the dummy and vehicle response data traces. Appendix C is not applicable to this test. Appendix D contains the instrumentation and data channel assignments. Appendix E contains the dummy calibration data and Appendix F contains the vehicle owner's manual instructions for the occupant restraint systems.

SECTION 2.

OCCUPANT AND VEHICLE INFORMATION/DATA SHEETS

TEST MODE: 56.3 km/h New Car Assessment Program (NCAP) Frontal Barrier Impact

CONVERSION FACTORS USED IN THIS REPORT:

2.2 pounds (lb.)	=	1 kilogram (kg)
1 mile (mi.)	=	1.609 kilometer (km)
1 gallon (gal.)	=	3.785 liters (L)
1 pound/square inch (psi)	=	7000 Pascal (7 kPa)

DATA SHEET NO. 1

CRASH TEST SUMMARY

TEST MODE: 56.3 km/h NCAP Frontal Barrier Impact NHTSA NO. MW0106

TEST DATE: November 21, 1997 TIME: 3:25 PM TEMPERATURE: 26.7° C

VEHICLE YEAR/MAKE/MODEL/BODY STYLE: 1998 CHEVROLET MALIBU 4-DOOR SEDAN

TEST WEIGHT: 1619 kg IMPACT VELOCITY: 56.62 km/h

VEHICLE REBOUND AT CENTER OF EACH WHEEL; REBOUND ANGLE = 0°

Measurements in mm	Left Side	Centerline	Right Side
Vehicle Rebound	675	590	635

VEHICLE STATIC CRUSH

Measurements in mm	Left	Center	Right
Pre-test Measurements	4705	4840	4705
Post-test Measurements	4220	4267	4185
Static Crush	485	573	520

DOOR OPENING AND SEAT TRACK INFORMATION

	Driver	Passenger
Door Opening (Front)	OPENED	OPENED
Door Opening (Rear)	OPENED	OPENED
Seat Track Shift (mm of shift)	NONE	NONE
Seat Back Failure	NONE	NONE

DUMMY INFORMATION

	Driver	Passenger
Dummy Type/No.	50% Male Hybrid III (S/N 34)	50% Male Hybrid III (S/N 34)
Data Channels	44	44
Visible Contact Points		
Head	AIR BAG, HEAD REST	AIR BAG, HEAD REST
Chest	AIR BAG	AIR BAG
Abdomen	AIR BAG	AIR BAG
Left Knee	KNEE BOLSTER	KNEE BOLSTER, CONSOLE
Right Knee	KNEE BOLSTER	KNEE BOLSTER

DATA SHEET NO. 2

GENERAL TEST AND VEHICLE PARAMETER DATA

VEHICLE YEAR/MAKE/MODEL/BODY STYLE: 1998 CHEVROLET MALIBU 4-DOOR SEDAN

TEST VEHICLE INFORMATION			
Manufacturer	GENERAL MOTORS CORP	VIN	1G1ND52T2W6142881
Manufacturing Date	10/97	Delivery Date	11/14/97
Dealer	CLAREMONT CHEVROLET	NHTSA No.	MW0106
Odometer Reading	000062 MI	Fuel Type	UNLEADED
Engine Displacement	2.4 LITER	Cylinders	4
Transmission	AUTOMATIC	Final Drive	FRONT
Engine Placement	TRANSVERSE	Color	BLUE
Tire Press./Max. Cap. Front	203	Cold Tire Press. Front	203
Tire Press./Max. Cap. Rear	182	Cold Tire Press. Rear	182
Recommend Tire Size	P215\60R15	Type of Spare	T105/80D13
Tire Size on Vehicle	P215\60R15	Manufacturer	FIRESTONE
GVWR	1808	Cargo Capacity	76
GAWR Front	1011	GAWR Rear	797
Air Conditioning	YES	Power Steering	YES
Power Brakes	YES	AM/FM/Cassette	YES
Disc Brakes (Front)	YES	Disc Brakes (Rear)	NO
Power Windows	YES	Tilt Steering	YES
Anti-lock Brakes (ABS)	YES	Power Seats	NO
Driver Airbag	YES	Passenger Airbag	YES

VEHICLE CAPACITY DATA:

TYPE OF FRONT SEATS Bucket Seats

TOTAL NUMBER OF OCCUPANTS 5 OCCUPANTS x 68 kg. 340 kg

WEIGHT OF VEHICLE AS RECEIVED AT KARCO (with maximum fluids): 1398 kg

Data Sheet No. 2... (Continued)

VEHICLE CAPACITY WEIGHT (kg):

Vehicle Capacity Weight	416 kg
Occupant Weight	340 kg
Rated Cargo/Luggage Weight (RCLW)	76 kg

	FRONT	REAR	TOTAL
Right	453	249	702
Left	446	250	696
Total	899	499	1398
Percent of Total	64.3	35.7	100

CALCULATION OF TEST TARGET WEIGHT (kg):

Total Delivered Weight	1398 kg
RCLW	76 kg
Weight of 2 P572 ATDs	152 kg
TARGET TEST WEIGHT	1626 kg

TEST WEIGHT OF VEHICLE WITH 2 ATDs AND BALLAST

	FRONT	REAR	TOTAL
Right	473	334	807
Left	470	342	812
Total	943	676	1619
Percent of Total	58.2	41.8	100

Weight of Ballast secured in cargo area: 44 kg — Includes cameras, instrumentation, brake abort and bags containing lead shot secured in the right and left rear fender wells.

Vehicle Components Removed For Weight Reduction: Side mirrors, jack, tools, rear seat assembly and spare tire.

TEST VEHICLE ATTITUDE (mm)

ATTITUDE	LF	RF	LR	RR
As Delivered	710	710	710	710
As Tested	685	692	651	652

Vehicle Wheelbase: 2718 mm

FUEL SYSTEM DATA:

Fuel System Capacity From Owner's Manual = 57.5 liters

Usable Capacity Figure Furnished by COTR = 57.5 liters

Test Volume Range (92 to 94% of Usable Capacity) = 52.9 to 54.1 liters

ACTUAL TEST VOLUME = 53.0 liters (With entire fuel system filled)

Test Fluid Type = Stoddard Solvent **Specific Gravity =** 0.764

Kinematic Viscosity = as per ASTM Standard D484-71 **Color =** Red

Type of Fuel Pump = Electric X Mechanical ____

Does electric pump operate with ignition switch "ON" & engine "OFF"? **Yes** X **No** ____

DETAILS OF FUEL SYSTEM: Electrically operated, ignition key activated, with automatic shutoff

DATA SHEET NO. 3

POST IMPACT DATA

TEST VEHICLE: 1998 CHEVROLET MALIBU 4-DOOR SEDAN NHTSA NO. MW0106

TEST MODE: 56.3 km/h New Car Assessment Program (NCAP) Frontal Barrier Impact

TEST DATE: November 21, 1997 TIME: 3:25 PM TEMPERATURE: 26.7° C

REQUIRED IMPACT VELOCITY RANGE: 59.53 km/h to 61.14 km/h

BARRIER IMPACT VELOCITY: (speed traps within 5 feet of impact plane)

Trap No. 1 = 56.62 km/h Trap No. 2 = 56.68 km/h

Distance from vehicle to barrier - -

A. entering trap = 1818 mm

B. leaving trap = 599 mm

VEHICLE STATIC CRUSH: (for Frontal and Rear Impacts Only)

Vehicle Length	Left	Center	Right
Pre-test Measurements (mm)	4705	4840	4705
Post-test Measurements (mm)	4220	4267	4185
Static Crush (mm)	485	573	520
Average	526		

VEHICLE REBOUND: (from rigid barrier with rotational movement)

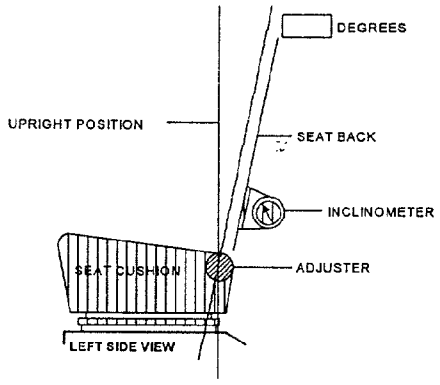
Measurements in mm	Left Side	Centerline	Right Side
Vehicle Rebound	675	590	635

DATA SHEET NO. 4

TEST VEHICLE INFORMATION

TEST VEHICLE: 1998 CHEVROLET MALIBU 4-DOOR SEDAN NHTSA NO. MW0106

1. NOMINAL DESIGN RIDING POSITION -



FRONT SEAT ASSEMBLY

For adjustable driver and passenger seat backs. Please describe how to position the inclinometer to measure the seat back angle. Include description of the location of the adjustment latch detent if applicable. Indicate, if applicable, how the detents are numbered (Is the first detent "0" of "1"?).

Measurement Instructions: A special application tool with pointed probes was inserted through the fabric to make contact with the rigid portion of the lower seat frame assembly approximately 13 inches above the pivot point of the seat back. The inclinometer was placed against the flat surface of the tool and the seat back angle was measured directly from the dial face. For reference purposes the first detent from the front of the seat was identified as number "1".

Seat back angle for driver's seat = 25°

Measurement Instructions: A special application tool with pointed probes was inserted through the fabric to make contact with the rigid portion of the lower seat frame assembly approximately 13 inches above the pivot point of the seat back. The inclinometer was placed against the flat surface of the tool and the seat back angle was measured directly from the dial face. For reference purposes the first detent from the front of the seat was identified as number "1".

Seat back angle for passenger's seat = 25 °

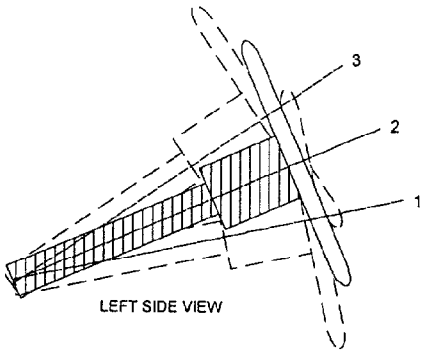
2. SEAT FORE & AFT POSITIONS -

Provide instructions for positioning the driver and front outboard passenger seat(s) in the center of fore and aft travel. For example, provide information to locate the detent in which the seat track is to be locked.

Positioning of the driver's seat: 24 seating positions, set to 13th from front

Positioning of the passenger's seat (if applicable): 24 seating positions, set to 13th from front

3. STEERING COLUMN ADJUSTMENTS:



STEERING COLUMN ASSEMBLY

Steering wheel and column adjustments are made so that the steering wheel hub is at the geometric center of the locus it describes when it is moved through its full range of driving positions. If the tested vehicle has any of these adjustments, does your company use any specific procedures to determine the geometric center.

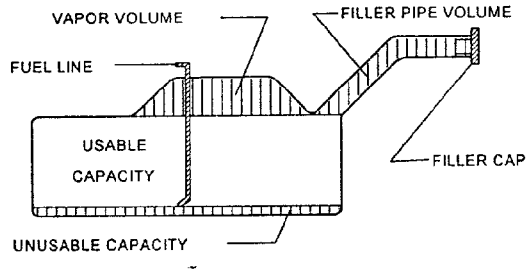
Operational Instructions:

Position No. 1 is at 4°
Position No. 2 is at 17°
Position No. 3 is at 27°

4. SEAT BELT UPPER ANCHORAGE:

Set to mid-position.

5. FUEL TANK CAPACITY DATA



VEHICLE FUEL TANK ASSEMBLY

5.1 A. "Usable Capacity" of standard equipment fuel tank = 57.5 liters.

B. "Usable Capacity" of optional equipment fuel tank = N/A liters.

C. "Usable Capacity" of vehicle(s) used for certification testing to requirements of FMVSS 301 = 52.9 to 54.1 liters.

Operational Instructions:

5.2 Amount of Stoddard solvent added to vehicle(s) used for certification test(s) = 53.0 liters

5.3 Is vehicle equipped with electric fuel pump?

Yes X No ____

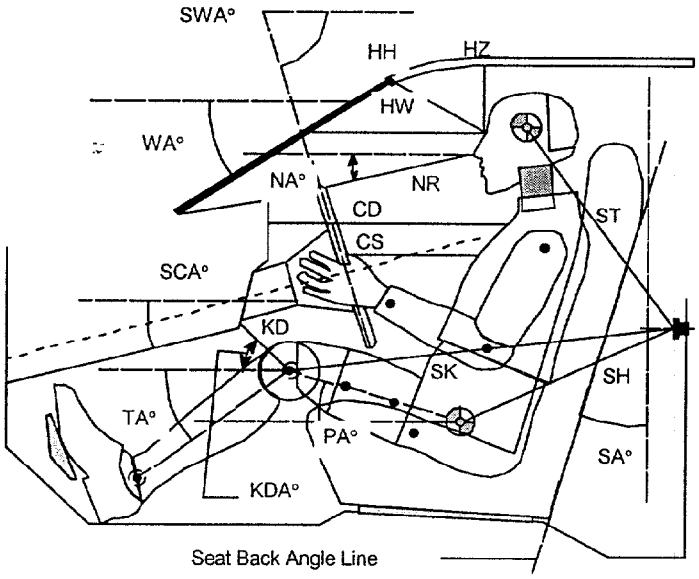
If YES, explain the vehicle operating conditions under which the fuel pump will pump fuel.

Fuel pump is activated when ignition key is turned to the "ON" (operational) position.

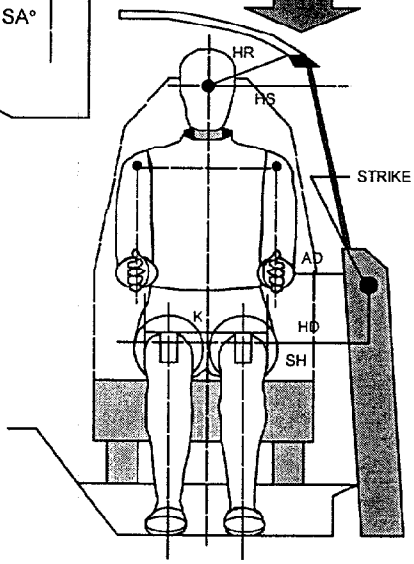
DATA SHEET NO. 5

DUMMY POSITIONING IN VEHICLE

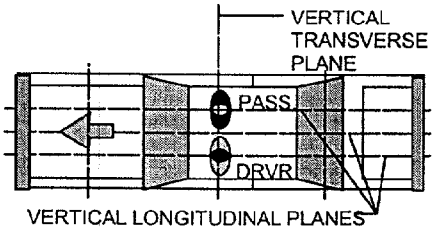
DUMMY MEASUREMENT FOR FRONT SEAT PASSENGERS



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	Chest to Steering Wheel Hub
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
LP	Left Leg to Dash
NA	Nose to Rim Angle
NP	Nose to Dash
NR	Nose to Rim
PA	Pelvic Angle
RA	Rim to Abdomen
RP	Right Leg to Dash
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
TR	Torso to Rim
WA	Windshield Angle



DATA SHEET NO. 5...(continued)

DUMMY POSITIONING IN VEHICLE

TEST VEHICLE: 1998 CHEVROLET MALIBU 4-DOOR SEDAN NHTSA NO. MW0106

FRONT SEAT MEASUREMENT TABLE

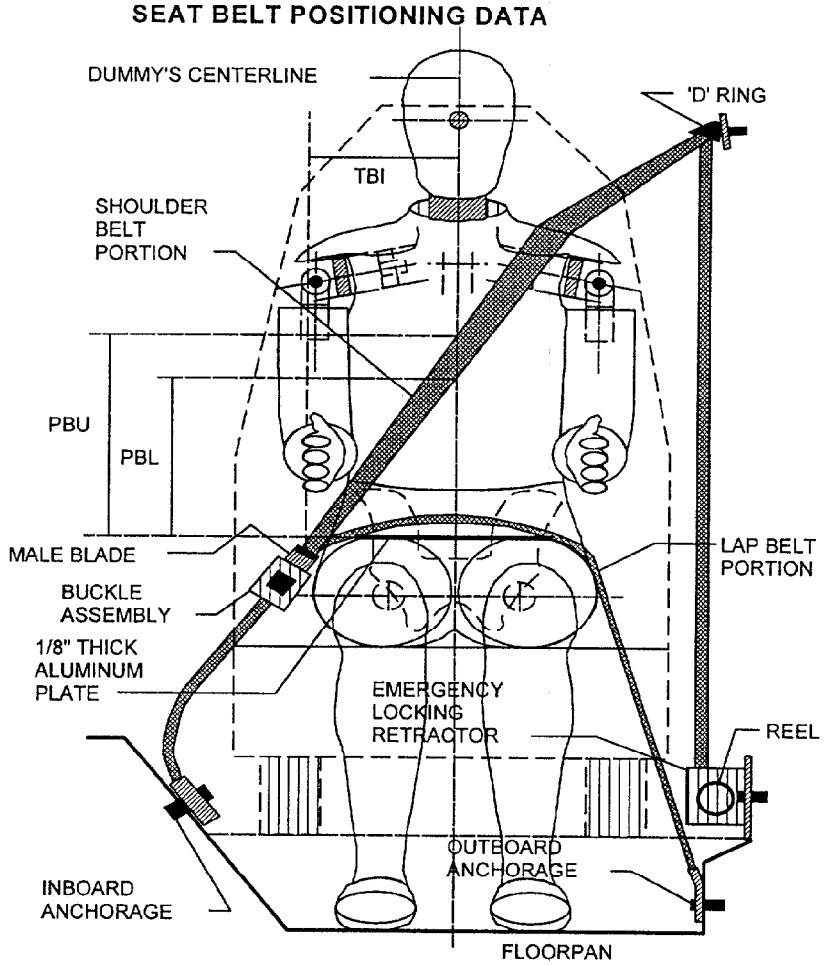
	DRIVER (Serial No. 34)		PASS. (Serial No. 35)	
	DISTANCE (mm)	ANGLE (°)	DISTANCE (mm)	ANGLE (°)
WA°		25		
SWA°		17		
SCA°		17		
SA°		25		25
HZ	230	90	200	90
HH	430	0	420	0
HW	730	0	720	0
HR	220		190	
NR	410	10		
CD	580		550	
CS	310	0		
RA	200	0		
KDL	150	32	170	
KDR	155		165	40
PA°		27		25
TA°		35		40
KK	210		200	
ST	560	9	570	5
SH	115	11	133	19
SHY	270		265	
HS	330		290	
HD	150		143	
AD	80		50	

DATA SHEET NO. 6

SEAT BELT POSITIONING DATA

SEATING POSITION	DRIVER	PASSENGER
TCI -- Dummy centerline to shoulder bolt	240	250
PBU--Top surface of aluminum plate to belt upper edge	240	200
PBL--Top surface of aluminum plate to belt lower edge	155	110
Lap Belt tension	10 Newtons	10 Newtons
Shoulder Belt tension	Retractor	Retractor

SEAT BELT POSITIONING DATA



FRONT VIEW OF DUMMY

DATA SHEET NO. 7 - VEHICLE ACCELEROMETER LOCATION AND DATA SUMMARY

VEHICLE YR/MAKE/MODEL/BODY: 1998 CHEVROLET MALIBU 4 DOOR SEDAN NHTSA No.: MW0106

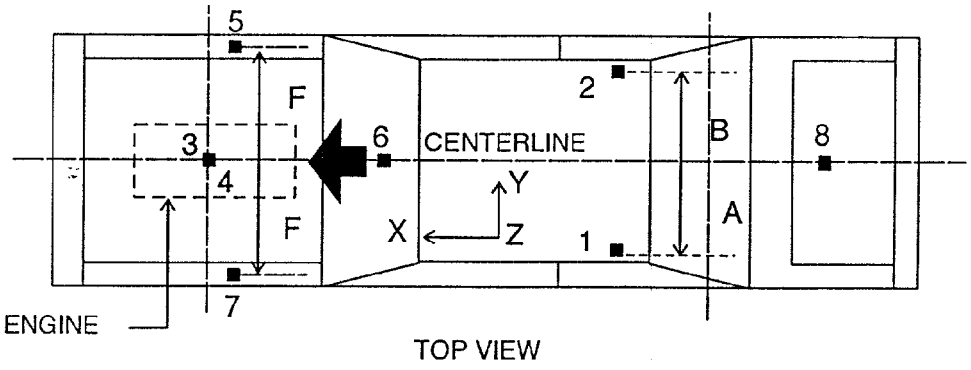
TEST PROGRAM: 1998 NHTSA 35 MPH NCAP TEST DATE: 11/21/97

VEHICLE X-AXIS ACCELEROMETER PEAK DATA AND PRE-TEST LOCATIONS

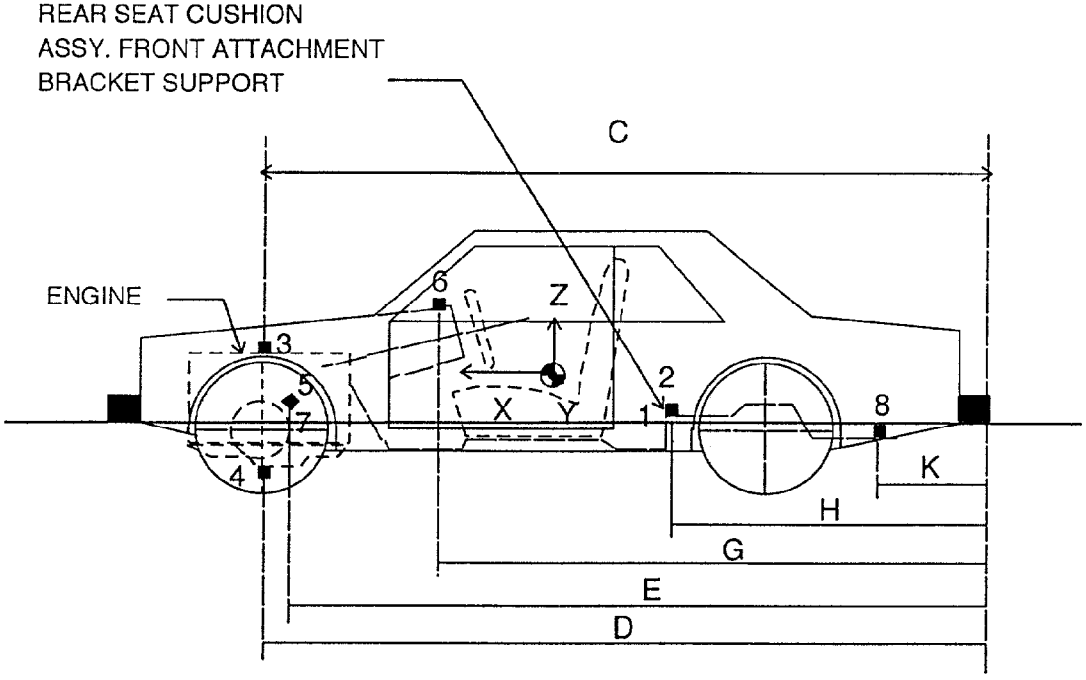
No.	Accelerometer Location	Measurements (mm)			Peak Values				
		X	Y	Z	Units	Max	Time	Min	Time
1	Left Rear X-Member (Pri.)	1920	-654	375	G's	3.1	140.2	-31.5	40.2
2	Right Rear X-Member (Pri.)	1915	661	400	G's	2.9	138.6	-33.4	40.7
3	Engine Top	3995	256	832	G's	48.4	50.3	-139.9	35.2
4	Engine Bottom	4004	40	157	G's	15.7	49.4	-101.1	34.8
5	Left Brake Caliper	3905	-680	245	G's	59.3	62.7	-96.1	45.7
6	Right Brake Caliper	3905	680	245	G's	42.0	67.3	-94.6	43.4
7	Instrument Panel	3110	70	980	G's	20.3	24.1	-48.4	44.4
8	Left Rear X-Member (Rednt.)	1855	-650	375	G's	3.0	139.8	-31.8	40.2

Reference Points X - From Rear Surface of Vehicle Y - Vehicle Centerline Z - Ground Plane

VEHICLE ACCELEROMETER LOCATION AND DATA SUMMARY



TOP VIEW



LEFT SIDE VIEW

DATA SHEET NO. 8 - HYBRID III ATD INJURY CRITERIA AND SENSOR DATA

VEHICLE YR/MAKE/MODEL/BODY: 1998 CHEVROLET MALIBU 4 DOOR SEDAN NHTSA No.: MW0106

TEST PROGRAM: 1998 NHTSA 35 MPH NCAP TEST DATE: 11/21/97

HEAD PRIMARY PEAK ACCELERATIONS

			Driver				Passenger			
Location	Axis	Units	Max	Time	Min	Time	Max	Time	Min	Time
Head CG	X	G's	52.0	139.3	-65.7	79.2	17.1	211.9	-50.7	83.7
Head CG	Y	G's	40.5	139.2	-15.1	149.3	5.0	62.0	-9.3	55.4
Head CG	Z	G's	30.1	62.5	-8.2	103.2	28.2	67.8	-4.6	109.6
Head CG Resultant	N/A	G's	68.2	139.3			54.6	83.7		

CHEST PRIMARY PEAK ACCELERATIONS

			Driver				Passenger			
Location	Axis	Units	Max	Time	Min	Time	Max	Time	Min	Time
Chest CG	X	G's	8.5	174.3	-43.2	69.2	5.1	257.4	-51.6	67.4
Chest CG	Y	G's	2.6	132.0	-9.9	81.8	9.9	67.0	-2.2	115.5
Chest CG	Z	G's	10.8	60.7	-11.3	92.1	11.4	71.0	-10.8	95.0
Chest CG Resultant	N/A	G's	43.8	69.3			52.9	67.4		

FEMUR PEAK FORCES

			Driver				Passenger			
Location	Axis	Units	Max	Time	Min	Time	Max	Time	Min	Time
Left Femur	Z	Newtons	312.5	164.0	-3392.2	54.3	811.0	92.9	-5632.9	56.3
Right Femur	Z	Newtons	510.9	42.5	-3615.0	49.2	298.8	196.9	-2352.2	50.1

SEAT BELT PEAK FORCES

			Driver				Passenger			
Location	Axis	Units	Max	Time	Min	Time	Max	Time	Min	Time
Lap Belt	N/A	Newtons	7407.1	63.0	0.8	1.5	9041.7	64.2	-19.8	299.9
Shoulder Belt	N/A	Newtons	8503.4	76.7	-54.5	167.7	8903.5	65.6	-37.4	161.0

HEAD INJURY CRITERA (HIC)

	Driver				Passenger			
Location	HIC	Avg G's	T^1	T^2	HIC	Avg G's	T^1	T^2
Head CG Primary	690.9	49.9	63.0	98.9	472.6	43.4	58.2	94.1

CHEST CLIP (3MSEC)

	Driver			Passenger		
Location	CLIP	T^1	T^2	CLIP	T^1	T^2
Chest CG Primary	41.8	67.7	70.7	49.9	66.2	69.2

VEHICLE YR/MAKE/MODEL/BODY: 1998 CHEVROLET MALIBU 4 DOOR SEDAN NHTSA No.: MW0106

TEST PROGRAM: 1998 NHTSA 35 MPH NCAP TEST DATE: 11/21/97

PELVIC PEAK ACCELERATIONS

			Driver				Passenger			
Location	Axis	Units	Max	Time	Min	Time	Max	Time	Min	Time
Pelvis	X	G's	5.1	246.4	-55.1	50.2	3.8	132.6	-57.9	56.2
Pelvis	Y	G's	5.7	99.5	-13.7	50.5	14.0	52.1	-5.5	109.2
Pelvis	Z	G's	7.6	187.3	-22.7	83.4	4.1	224.5	-18.3	95.7

UPPER NECK PEAK FORCES AND MOMENTS

			Driver				Passenger			
Location	Axis	Units	Max	Time	Min	Time	Max	Time	Min	Time
Neck Force	X	Newtons	333.5	166.7	-1013.2	82.3	447.9	56.3	-549.1	77.6
Neck Force	Y	Newtons	84.0	103.5	-420.0	159.8	235.4	68.5	-104.2	171.5
Neck Force	Z	Newtons	1350.0	63.6	-848.8	170.4	1516.7	67.7	-214.4	248.8
Neck Moment	X	Joules	28.0	144.1	-4.2	68.9	14.2	67.5	-8.9	122.8
Neck Moment	Y	Joules	55.3	66.5	-62.4	171.4	35.4	77.3	-24.1	257.7
Neck Moment	Z	Joules	26.4	200.5	-5.4	59.0	8.2	72.2	-1.6	229.1

FOOT PEAK ACCELERATIONS

			Driver				Passenger			
Location	Axis	Units	Max	Time	Min	Time	Max	Time	Min	Time
Left Foot Aft	X	G's	164.1	43.8	-10.8	66.6	209.7	50.3	-14.1	68.0
Left Foot Aft	Z	G's	90.0	43.6	-158.0	42.2	74.3	49.8	-93.0	54.1
Left Foot Fore	Z	G's	29.4	54.0	-269.8	42.3	72.2	49.8	-140.6	54.0
Right Foot Aft	X	G's	278.5	47.6	-25.3	57.5	109.3	49.9	-14.7	67.5
Right Foot Aft	Z	G's	118.7	48.0	-279.7	48.4	6.7	64.4	-78.1	52.9
Right Foot Fore	Z	G's	99.6	68.5	-200.4	50.1	17.4	71.4	-111.7	43.2

UPPER AND LOWER TIBIA PEAK FORCES AND MOMENTS

			Driver				Passenger			
Location	Axis	Units	Max	Time	Min	Time	Max	Time	Min	Time
Left Lower Force	X	Newtons	76.8	197.0	-1262.0	43.5	93.2	149.5	-1391.0	55.4
Left Lower Force	Z	Newtons	279.6	197.0	-4716.0	44.3	209.0	173.0	-4947.7	53.9
Left Lower Moment	Y	Joules	52.3	43.1	-44.3	57.5	44.6	53.6	-19.4	60.1
Left Upper Moment	X	Joules	84.2	44.6	-48.7	38.8	17.5	62.6	-15.9	90.0
Left Upper Moment	Y	Joules	159.4	43.5	-21.8	55.3	217.1	55.1	-15.2	145.6
Right Lower Force	X	Newtons	110.2	156.5	-2368.1	50.5	95.0	197.4	-990.3	52.3
Right Lower Force	Z	Newtons	244.3	196.9	-10351.3	49.7	219.5	205.7	-4368.0	50.2
Right Lower Moment	Y	Joules	37.0	47.6	-77.1	72.8	54.0	53.0	-2.3	36.0
Right Upper Moment	X	Joules	65.1	48.1	-147.8	51.2	8.0	63.5	-31.2	90.0
Right Upper Moment	Y	Joules	263.0	51.1	-16.7	181.6	142.0	52.0	-13.1	252.0

VEHICLE YR/MAKE/MODEL/BODY: 1998 CHEVROLET MALIBU 4 DOOR SEDAN NHTSA No.: MW0106

TEST PROGRAM: 1998 NHTSA 35 MPH NCAP TEST DATE: 11/21/97

CHEST PEAK DISPLACEMENTS

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Chest CG	X	MM	0.2	0.3	-38.6	79.8	0.4	1.6	-35.4	70.0

HEAD REDUNDANT PEAK ACCELERATIONS

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Head CG	X	G's	46.1	139.3	-66.4	78.7	18.0	211.9	-50.0	84.0
Head CG	Y	G's	18.0	29.0	-48.7	139.2	5.1	61.9	-3.4	108.6
Head CG	Z	G's	34.2	139.3	-11.0	103.2	28.7	68.0	-3.2	105.9
Head CG Resultant	N/A	G's	71.5	139.3			53.3	84.0		

CHEST REDUNDANT PEAK ACCELERATIONS

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Chest CG	X	G's	10.4	173.9	-47.6	69.1	5.1	256.9	-50.8	67.4
Chest CG	Y	G's	3.1	129.7	-10.9	81.7	12.1	66.6	-2.2	103.7
Chest CG	Z	G's	9.1	92.3	-8.1	53.2	11.2	71.1	-9.5	95.3
Chest CG Resultant	N/A	G's	48.0	69.1			52.7	67.4		

REDUNDANT HEAD INJURY CRITERA (HIC)

Location	Driver				Passenger			
	HIC	Avg G's	T^1	T^2	HIC	Avg G's	T^1	T^2
Head CG Redundant	720.0	51.2	62.9	98.8	449.6	42.6	58.5	94.4

REDUNDANT CHEST CLIP (3MSEC)

Location	Driver			Passenger		
	CLIP	T^1	T^2	CLIP	T^1	T^2
Chest CG Redundant	45.8	67.6	70.6	49.7	66.2	69.2

DATA SHEET NO. 9

SEAT BELT PERFORMANCE ASSESSMENT TEST DATA

TEST VEHICLE: 1998 CHEVROLET MALIBU 4-DOOR SEDAN NHTSA NO. MW0106

BELT LENGTH DATA (mm)	DRIVER	PASSENGER
Total belt length for continuous webbing systems.	2790	2790
Retractor reel to 'D' ring	710	710
Shoulder belt length as measured on Part 572 Dummy	800	800
Lap belt length as measured on Part 572 Dummy	800	800
Remainder of belt on reel	480	480

SHOULDER BELT SPOOL-OFF DATA (mm)	DRIVER	PASSENGER
As determined mechanically	108	145
As determined electronically	80.8	148.7

BELT STRETCH DATA (cm/cm)	DRIVER	PASSENGER
Measured electronically between shoulder belt load cell and the "D" ring	0.60	0.44
Measured mechanically	.01	.02

DATA SHEET NO. 10

SUMMARY OF FMVSS 212 DATA

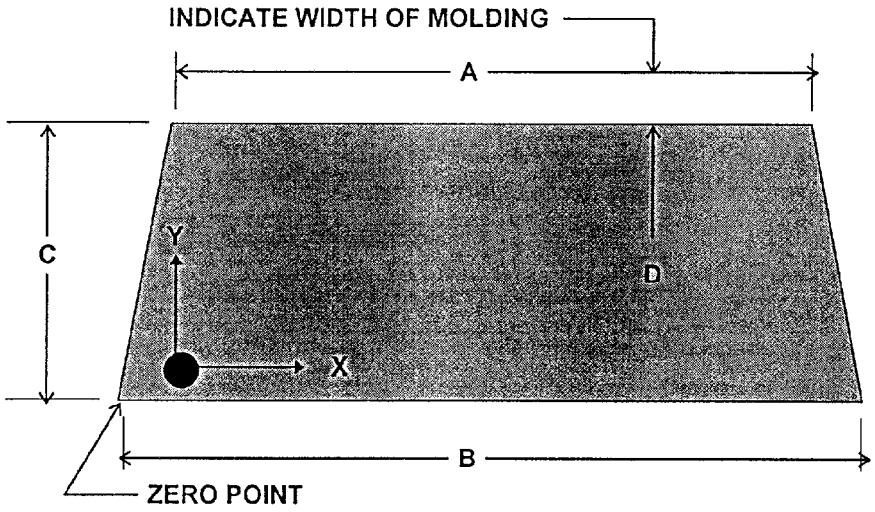
TEST VEHICLE: 1998 CHEVROLET MALIBU 4-DOOR SEDAN NHTSA NO. MW0106

Details of windshield mounting (method of retention, type of trim, etc.):
Windshield glass is secured to the vehicle frame with a rubber adhesive type adhesive with rubber molding along the top and sides with rubber and plastic molding along the bottom.

The standard requires that the post test retention measurement be a minimum of 75 percent of the pretest total periphery measurement for vehicles not equipped with occupant passive restraints and 50 percent for each side of the windshield for vehicles which are equipped with occupant passive restraints.

WINDSHIELD PERIPHERY MEASUREMENTS (mm)			
	PRETEST	POST TEST	PERCENT RETENTION
Right Side	1795	1795	100%
Left Side	1795	1795	100%
Total	3590	3590	100%

Indicate area of retention failure.



FRONT VIEW OF WINDSHIELD

Width of molding = Top & Sides 20 mm, Bottom 17 mm.

Temperature of windshield molding during test = 26.1 °C

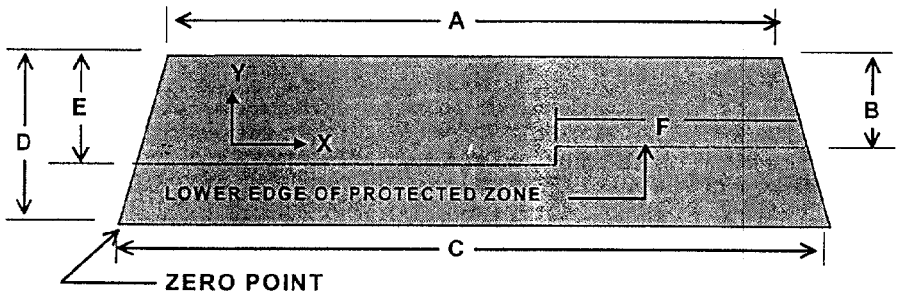
DATA SHEET NO. 11

WINDSHIELD ZONE INTRUSION FMVSS 219 (PARTIAL) DATA

TEST VEHICLE: 1998 CHEVROLET MALIBU 4-DOOR SEDAN NHTSA NO. MW0106

SKETCH OF FRONT VIEW OF WINDSHIELD:

Provide all dimensions necessary to reproduce the protected area.



	DIMENSION (mm)
A	1170
B	470
C	1460
D	880
E	530
F	724

FRONT VIEW OF WINDSHIELD

AREA OF PROTECTED ZONE FAILURES:

A. Provide coordinates of the area that the protected zone was penetrated more than 0.25 in. by a vehicle component other than one which is normally in contact with the windshield.

X	Y
N/A	N/A
N/A	N/A
N/A	N/A
N/A	N/A

B. Provide coordinates of the area beneath the protected zone template that the inner surface of the windshield was penetrated by a vehicle component

X	Y
N/A	N/A
N/A	N/A
N/A	N/A
N/A	N/A

DATA SHEET NO. 12

FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

TEST VEHICLE: 1998 CHEVROLET MALIBU 4-DOOR SEDAN NHTSA NO. MW0106

TEST MODE: 56.3 km/h New Car Assessment Program (NCAP) Frontal Barrier Impact

TEST DATE: November 21, 1997 TIME: 3:25 PM TEMPERATURE: 26.7° C

STODDARD SOLVENT SPILLAGE MEASUREMENT:

A. From impact until vehicle motion ceases - -
Actual = 0.0 oz. (Maximum Allowable = 1 ounce)

B. For 5 minute period after vehicle motion ceases - -
Actual = 0.0 oz. (Maximum Allowable = 5 ounces)

C. For next 25 minutes - -
Actual = 0.0 oz. (Maximum Allowable = 1 oz./minute)

D. Provide Spillage Details: No solvent spillage occurred

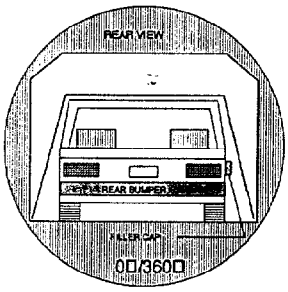
DATA SHEET NO. 13

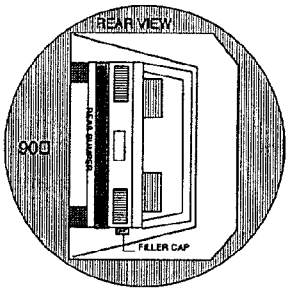
FMVSS 301 STATIC ROLLOVER DATA SHEET

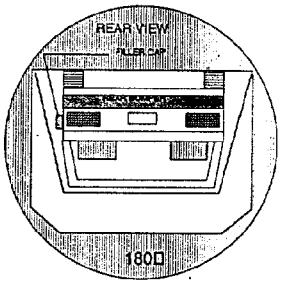
TEST VEHICLE: 1998 CHEVROLET MALIBU 4-DOOR SEDAN NHTSA NO. MW0106

TEST MODE: 56.3 km/h New Car Assessment Program (NCAP) Frontal Barrier Impact

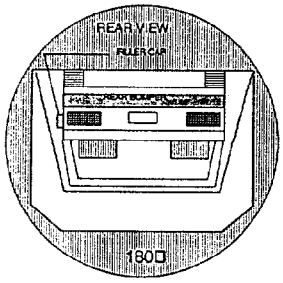
TEST DATE: November 21, 1997 TIME: 3:25 PM TEMPERATURE: 26.7° C

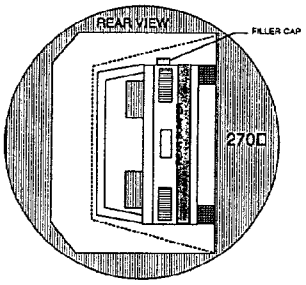


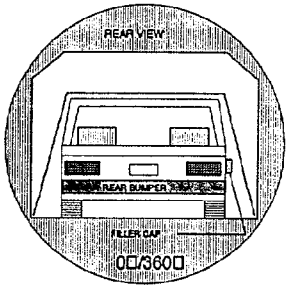




0° TO 90° **90° TO 180°**







180° TO 270° **270° TO 0°**

1. The specified fixture rollover rate for each 90° of rotation = 1 to 3 minutes.

2. The position hold time at each position = 5 minutes (minimum)

TEST PHASE	ROTATION TIME (sec.)	POSITION HOLD TIME (sec)	STODDARD SPILLAGE (oz.)
0° TO 90°	89	353	0.0
90° TO 180°	82	357	0.0
180° TO 270°	85	341	0.0
270° TO 360°	87	346	0.0

3. Provide Details of Stoddard Solvent Spillage Locations--

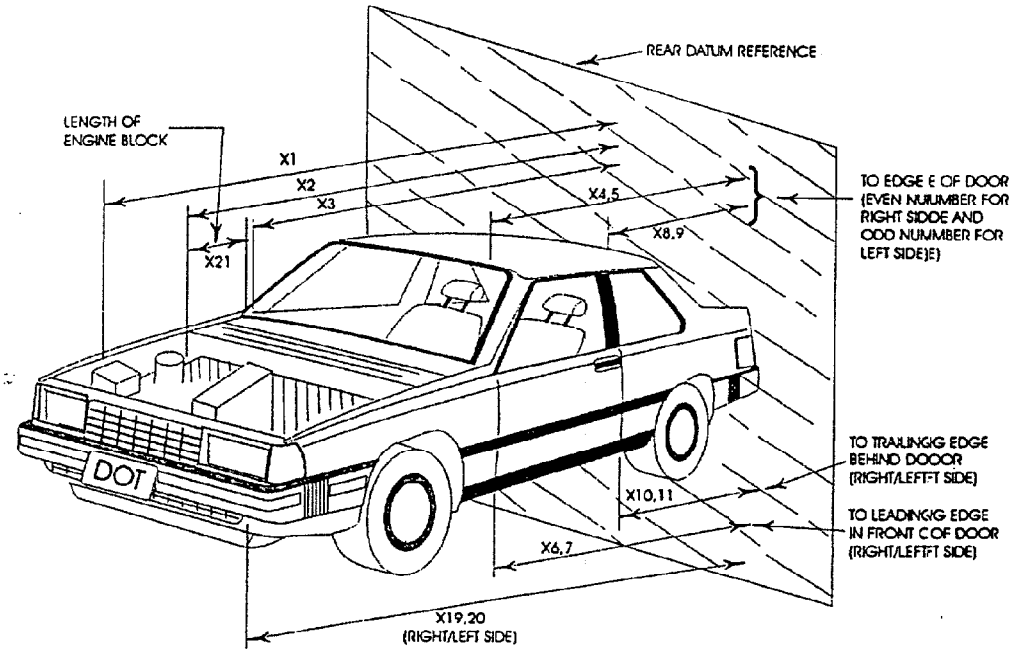
No solvent leakage occurred during rollover tests.

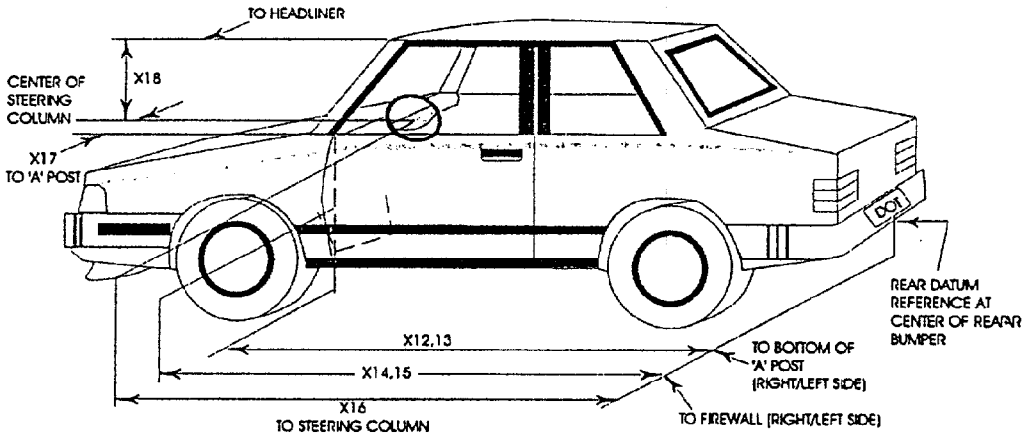
DATA SHEET NO. 14

VEHICLE MEASUREMENTS

TEST VEHICLE: 1998 CHEVROLET MALIBU 4-DOOR SEDAN NHTSA NO. MW0106

NO.	MEASUREMENT DESCRIPTION	DIMENSIONS IN MM		
		PRE-TEST	POST-TEST	DIFFERENCE
1	Total length of vehicle at centerline	4840	4267	-573
2	Rear surface of vehicle (RSOV) to front of engine	4130	3670	-460
3	RSOV to firewall centerline	3750	3631	-119
4	RSOV to leading edge of right door	3290	3285	-5
5	RSOV to leading edge of left door	3290	3285	-5
6	RSOV to lower leading edge of right door	3280	3275	-5
7	RSOV to lower leading edge of left door	3280	3280	0
8	RSOV to upper trailing edge of right door	2250	2246	-4
9	RSOV to upper trailing edge of left door	2250	2250	0
10	RSOV to lower trailing edge of right door	2245	2235	-10
11	RSOV to lower trailing edge of left door	2245	2240	-5
12	RSOV to bottom of right 'A' pillar	3250	3240	-10
13	RSOV to bottom of left 'A' pillar	3250	3240	-10
14	RSOV to firewall on right side	3700	3640	-60
15	RSOV to firewall of left side	3700	3620	-80
16	RSOV to steering column	2850	2830	-20
17	Center of steering column to left 'A' pillar	306	309	+3
18	Center of steering column to headlining	440	450	+10
19	RSOV to right side of front bumper	4705	4185	-520
20	RSOV to left side of front bumper	4705	4220	-485
21	Length of engine block	435	435	0
22	RSOV to right side of dash panel	3010	2990	-20
23	RSOV to center of dash panel	3000	2980	-20
24	RSOV to left side of dash panel	2990	2990	0


REAR DATUM REFERENCE
LENGTH OF ENGINE BLOCK
X1
X2
X3
X21
X4,5
X8,9
TO EDGE E OF DOOR (EVEN NUMBER FOR RIGHT SIDE AND ODD NUMBER FOR LEFT SIDE)E)
DOT
TO TRAILINGG EDGE BEHIND DOOOR (RIGHT/LEFTFT SIDE)
X10,11
TO LEADINGG EDGE IN FRONT COF DOOR (RIGHT/LEFTFT SIDE)
X6,7
X19,20
(RIGHT/LEFT SIDE)


TO HEADLINER
CENTER OF STEERING COLUMN
X18
X17
TO 'A' POST
DOT
REAR DATUM REFERENCE AT CENTER OF REARR BUMPER
X12,13
TO BOTTOM OF 'A' POST (RIGHT/LEFT SIDE)
X14,15
X16
TO STEERING COLUMN
TO FIREWALL (RIGHT/LEFT SIDE)

DATA SHEET NO. 15
CAMERA LOCATIONS

TEST VEHICLE: 1998 CHEVROLET MALIBU 4-DOOR SEDAN NHTSA NO. MW0106

CAMERA NO.	VIEW	CAMERA POSITIONS (mm) *			ANGLE (Deg.)	FILM PLANE TO HEAD TARGET (mm)	LENS (mm)	SPEED (fps)
		X	Y	Z				
1	Right Side View-Real Time	645	19,800	1370	0	19,800	Zoom	24
2A	Left Side View No. 1	1981	-7670	914	0	7824	13	260
2B	Left Side View No. 2	1397	-9500	1320	0	9677	25	950
3	Left Side View No. 3	1676	-9500	1320	0	9662	50	950
4	Left Side View No. 4	3200	-2336	1880	24	2195	19	990
5	Left Side View No. 5	1981	-7770	3150	12	8077	25	1000
6	Left Side View No. 6	1981	-7770	2540	10	8027	25	900
7	Right Side View No. 1	1854	8382	1096	0	8046	13	1070
8	Right Side View No. 2	1270	10,185	1066	0	9875	50	1000
9	Right Side View No. 3	6935	11,912	1117	8	12,314	80	960
10	Right Side View No. 4	2997	10,871	1066	10	10,546	50	900
11	Overhead Windshield	10,660	0	5540	0	4650	13	1150
12	Front View No. 1 Driver	-279	-457	2515	40	3050	19	1100
13	Front View No. 2 Passenger	-279	254	2515	40	3050	19	900
14	Pit Camera Engine View	660	0	-1575	0	N/A	13	880
15	Pit Camera Fuel Tank View	4724	260	-1727	48	N/A	19	1000
16	Driver Side Onboard	3302	-260	1194	15	1046	13	400
17	Passenger Side Onboard	3302	260	1194	15	1046	13	475

* X - film plane to barrier face Y - film plane to monorail centerline Z - film plane to ground

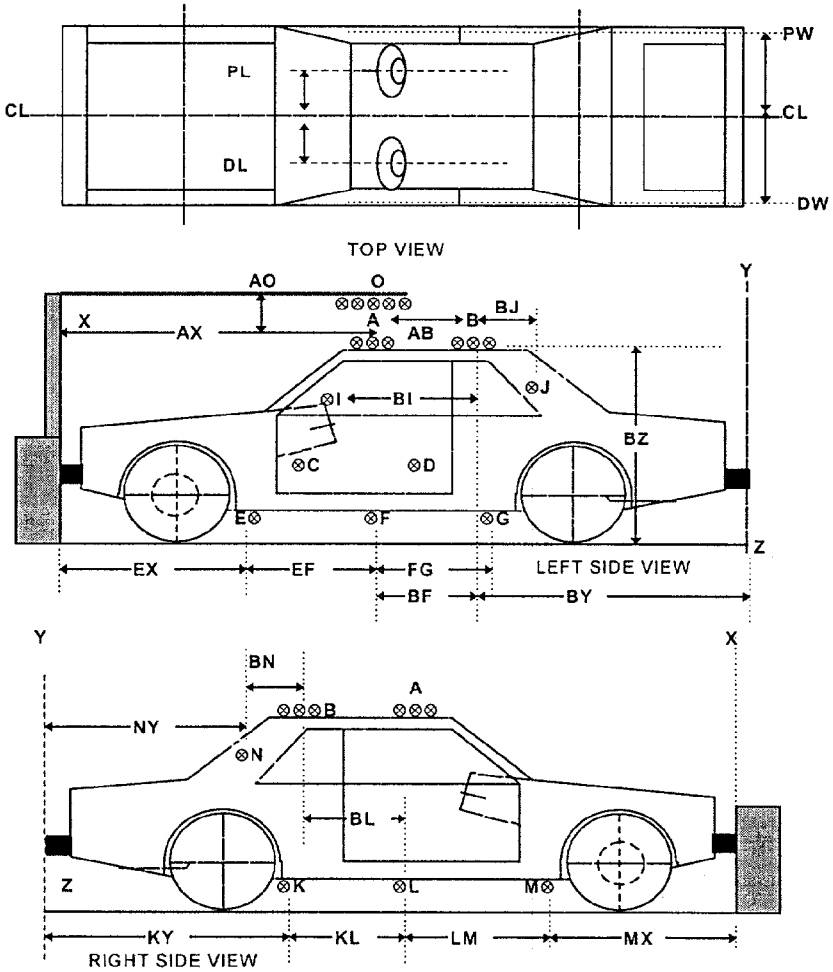
DATA SHEET NO. 16

REFERENCE PHOTOGRAPH TARGETS

TEST VEHICLE: 1998 CHEVROLET MALIBU 4-DOOR SEDAN NHTSA NO. MW0106

ITEM	DESCRIPTION	VALUE	ITEM	DESCRIPTION	VALU
AX	TARGET A TO BARRIER	2495	NY	TARGET N TO REAR BUMPER	1190
AB	TARGET A TO TARGET B	610	BN	TARGET B TO TARGET N	560
AO	VERTICAL DISTANCE A TO O	153	KY	TARGET K TO REAR BUMPER	1535
BJ	TARGET B TO TARGET J	500	KL	TARGET K TO TARGET L	852
BI	TARGET B TO STEERING COLUMN	1140	BL	TARGET B TO TARGET L	710
BZ	TARGET B TO GROUND LEVEL	1550	LM	TARGET L TO TARGET M	842
EX	TARGET E TO BARRIER	1570	MX	TARGET M TO BARRIER	1600
EF	TARGET E TO TARGET F	850	CL/PL	VEHICLE CENTERLINE TO PASSENGER	355
FG	TARGET F TO TARGET G	860	CL/PW	VEHICLE CENTERLINE TO RIGHT SILL	745
BF	TARGET B TO TARGET F	710	CL/DL	VEHICLE CENTERLINE TO DRIVER	320
BY	TARGET B TO REAR BUMPER	1720	CL/DW	VEHICLE CENTERLINE TO LEFT SILL	425

Distances in mm

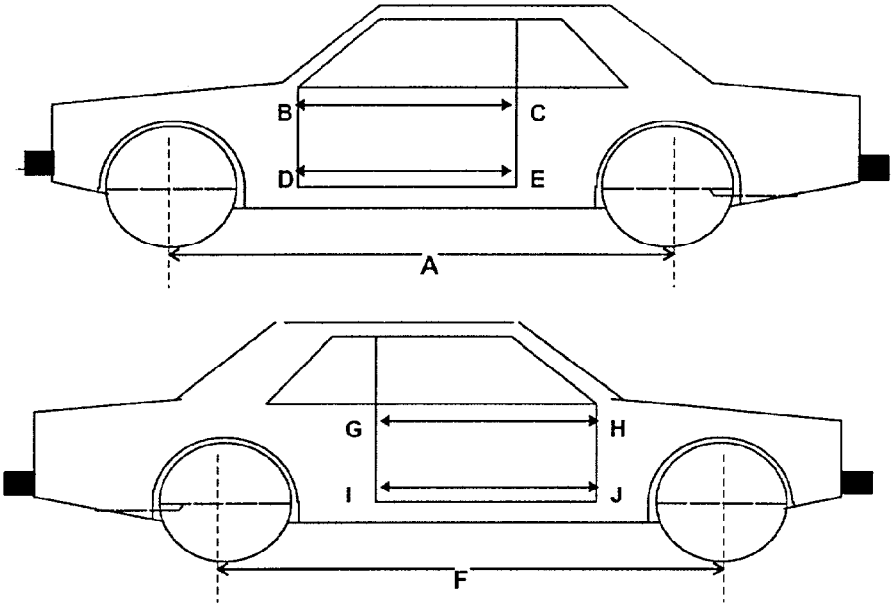


DATA SHEET NO. 17

VEHICLE INTRUSION MEASUREMENTS

TEST VEHICLE: 1998 CHEVROLET MALIBU 4-DOOR SEDAN NHTSA NO. MW0106

DOOR OPENING WIDTH



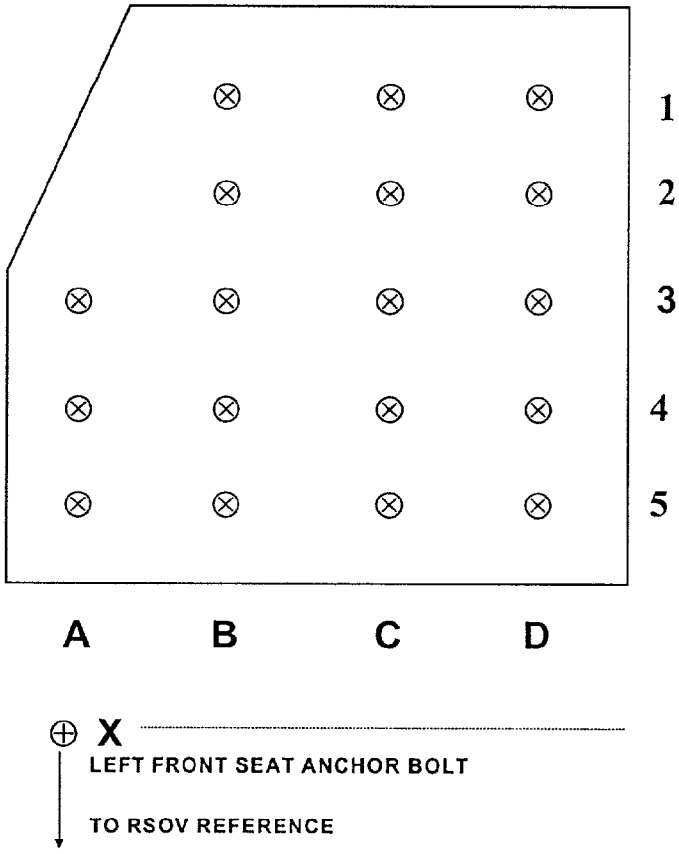
UNITS (mm)	LEFT SIDE		RIGHT SIDE	
MEASUREMENT	BC	DE	GH	IJ
PRE-TEST	1040	1035	1040	1035
POST-TEST	1040	1035	1040	1035
DIFFERENCE	0	0	0	0

VEHICLE WHEELBASE CHANGE

UNITS (mm)	A = LEFT SIDE WHEELBASE	F = RIGHT SIDE WHEELBASE
PRE-TEST	2717	2717
POST-TEST	2590	2590
DIFFERENCE	-127	-127

FLOOR PAN INTRUSION (Distances in mm)

TARGET COLUMN	A		B		C		D	
TARGET ROW	PRE-TEST	POST-TEST	PRE-TEST	POST-TEST	PRE-TEST	POST-TEST	PRE-TEST	POST-TEST
1	N/A	N/A	750	610	750	630	750	610
2	N/A	N/A	600	530	600	535	600	540
3	450	415	450	415	450	395	450	395
4	300	290	300	270	300	265	300	265
5	150	1160	150	155	150	160	150	162
REF. POINT	RSOV TO ANCHOR BOLT (PRE-TEST)		2780		RSOV TO ANCHOR BOLT (POST-TEST)		2780	

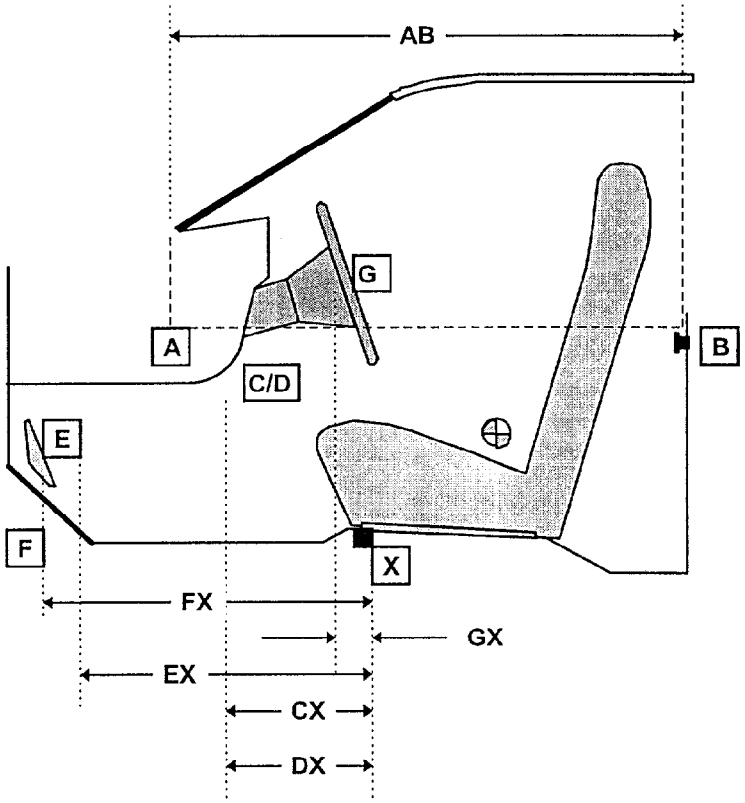


DRIVER SIDE FLOOR PLAN

DRIVER COMPARTMENT INTRUSION (Distances in mm)

REF.	DESCRIPTION	PRE-TEST	POST-TEST
AB	DOOR OPENING (INSIDE WINDOW JAM)	999	985
CX	LOWER LEFT KNEE BOLSTER TO X	480	335
DX	LOWER RIGHT KNEE BOLSTER TO X	530	313
EX	BRAKE PEDAL TO X	600	460
FX	FOOT REST TO X	700	555
GX	STEERING COLUMN HUB (CENTER) TO X	23	70

X = LEFT FRONT SEAT ANCHOR BOLT



DRIVER COMPARTMENT

DATA SHEET NO. 18

BARRIER ORIENTATION

TEST VEHICLE: 1998 CHEVROLET MALIBU 4-DOOR SEDAN NHTSA NO. MW0106

A = VEHICLE WIDTH MEASURED AT WIDEST POINT N/A mm

B = OFFSET FROM LEFT EDGE OF VEHICLE N/A mm

ACTUAL OFFSET DURING TEST N/A mm = N/A %

(NO OFFSET REQUIRED FOR THIS TEST)

DATA SHEET NO. 19

ACCIDENT INVESTIGATION DIVISION DATA

TEST VEHICLE: 1998 CHEVROLET MALIBU 4-DOOR SEDAN NHTSA NO. MW0106

VIN: 1G1ND52T2W6142881 TEST DATE: 11/21/97

WHEELBASE: 2718 mm TEST WEIGHT: 1626 kg

VEHICLE SIZE CATEGORY: 4-DOOR PASSENGER SEDAN

ACCELEROMETER DATA:

LOCATION: Left and right rear floor pans

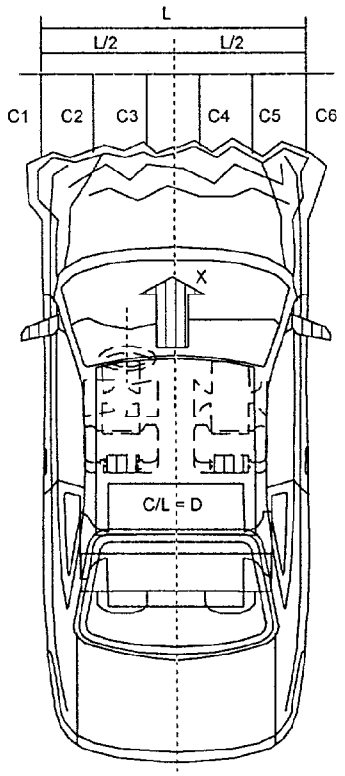
CALIBRATION PROCEDURE: 6 months/ drop test

LINEARITY: Good INTEGRATION ALGORITHM: NHTSA Standard

VEHICLE IMPACT SPEED: 56.62 km/h TIME OF SEPARATION: 119.9 msec

VELOCITY CHANGE: 68.60 km/h

COLLISION DEFORMATION CLASSIFICATION (CDC) CODE: F (frontal)



IMPACT MODE: Full Frontal

CRUSH DEPTH DIMENSIONS:

C1 = 485 mm

C2 = 455 mm

C3 = 455 mm

C4 = 460 mm

C5 = 450 mm

C6 = 480 mm

MIDPOINT OF DAMAGE: D = vehicle centerline 647MM

LENGTH OF DAMAGE REGION:

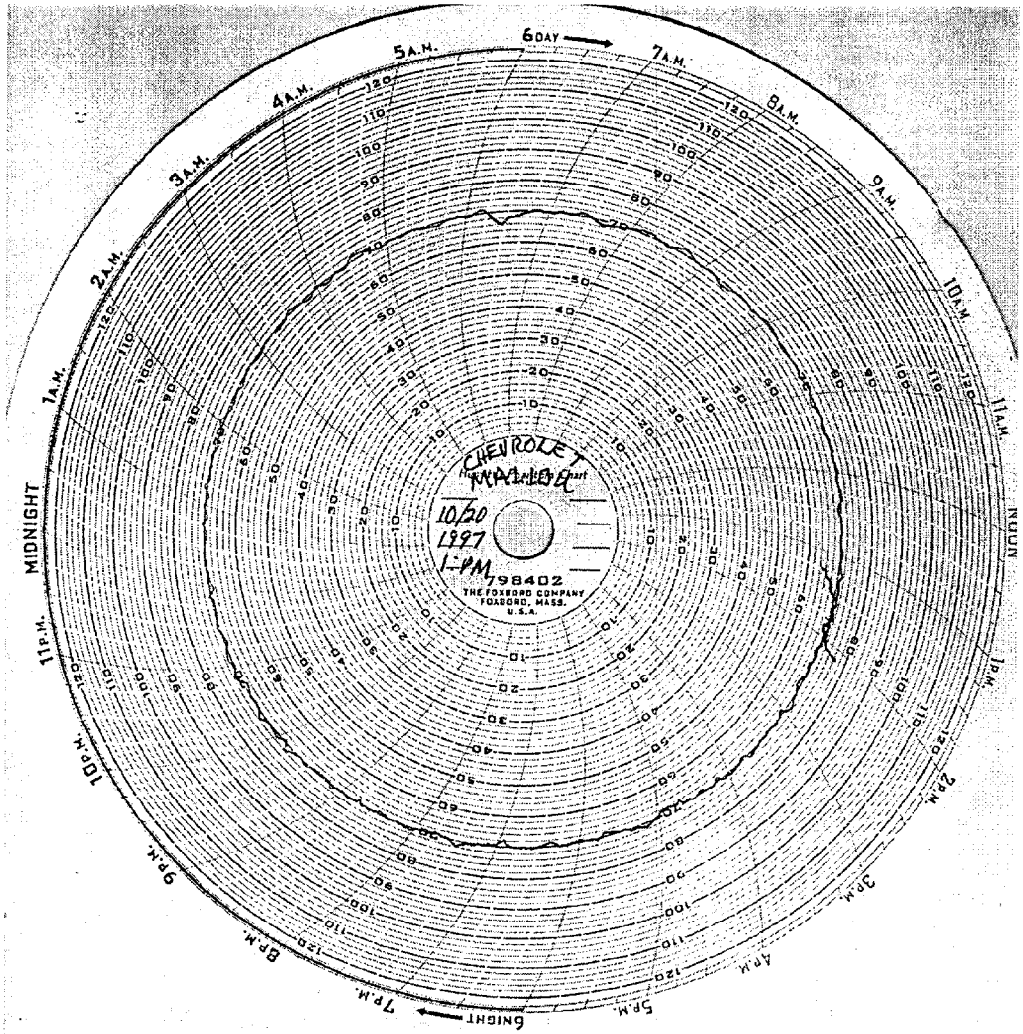
L = 1295 mm

DATA SHEET NO. 20

DUMMY/VEHICLE TEMPERATURE STABILIZATION

TEST VEHICLE: 1998 CHEVROLET MALIBU 4-DOOR SEDAN NHTSA NO. MW0106

VIN: 1G1ND52T2W6142881 TEST DATE: 11/21/97



APPENDIX A

PHOTOGRAPHS

LIST OF PHOTOGRAPHS

LIST OF PHOTOGRAPHS...(Continued)

FIGURE A-1. RIGHT FRONT AS RECEIVED

FIGURE A-2. LEFT REAR AS RECEIVED

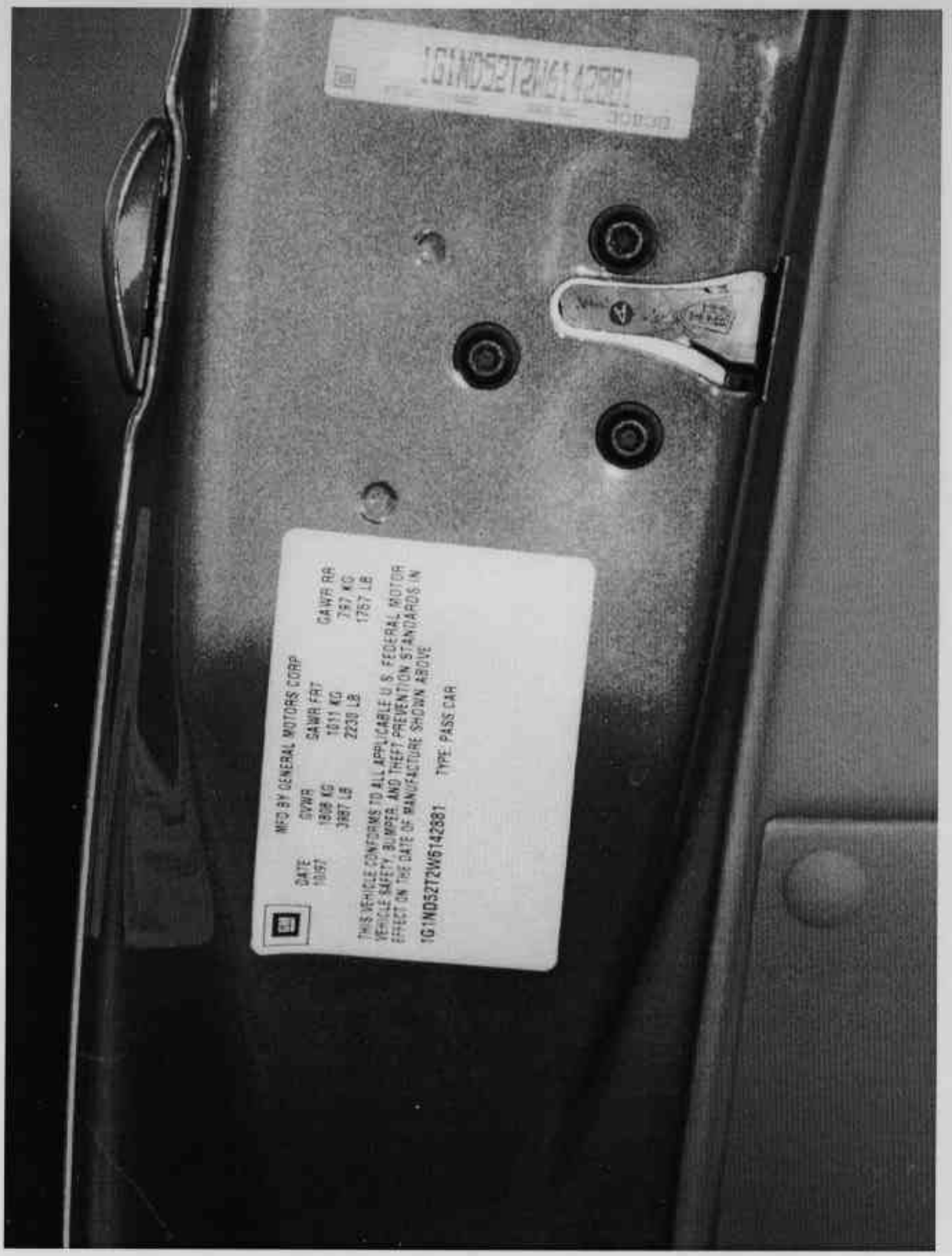


FIGURE A-3. VEHICLE CERTIFICATION LABEL

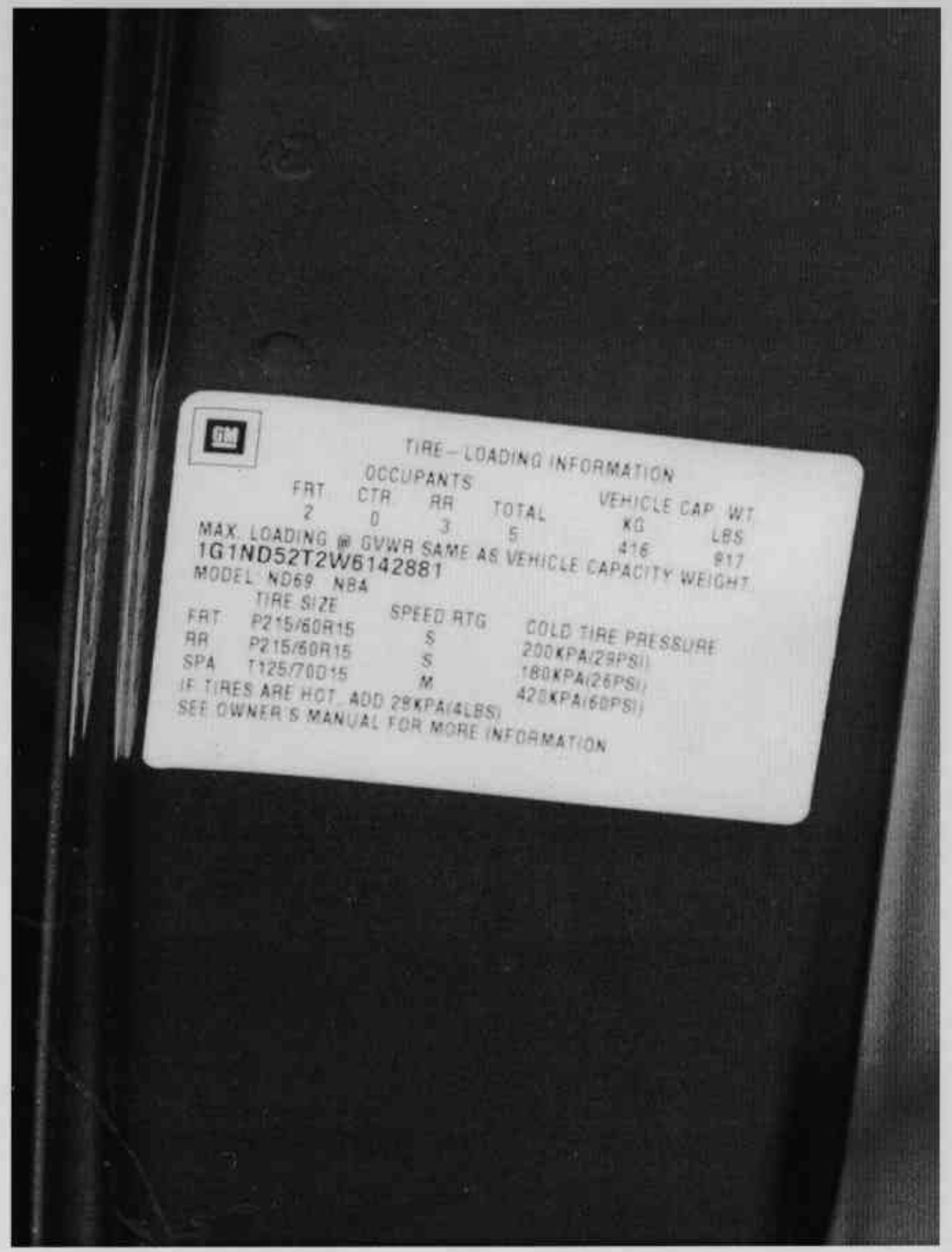


FIGURE A-4. VEHICLE TIRE PLACARD

FIGURE A-5. PRETEST FRONT VIEW

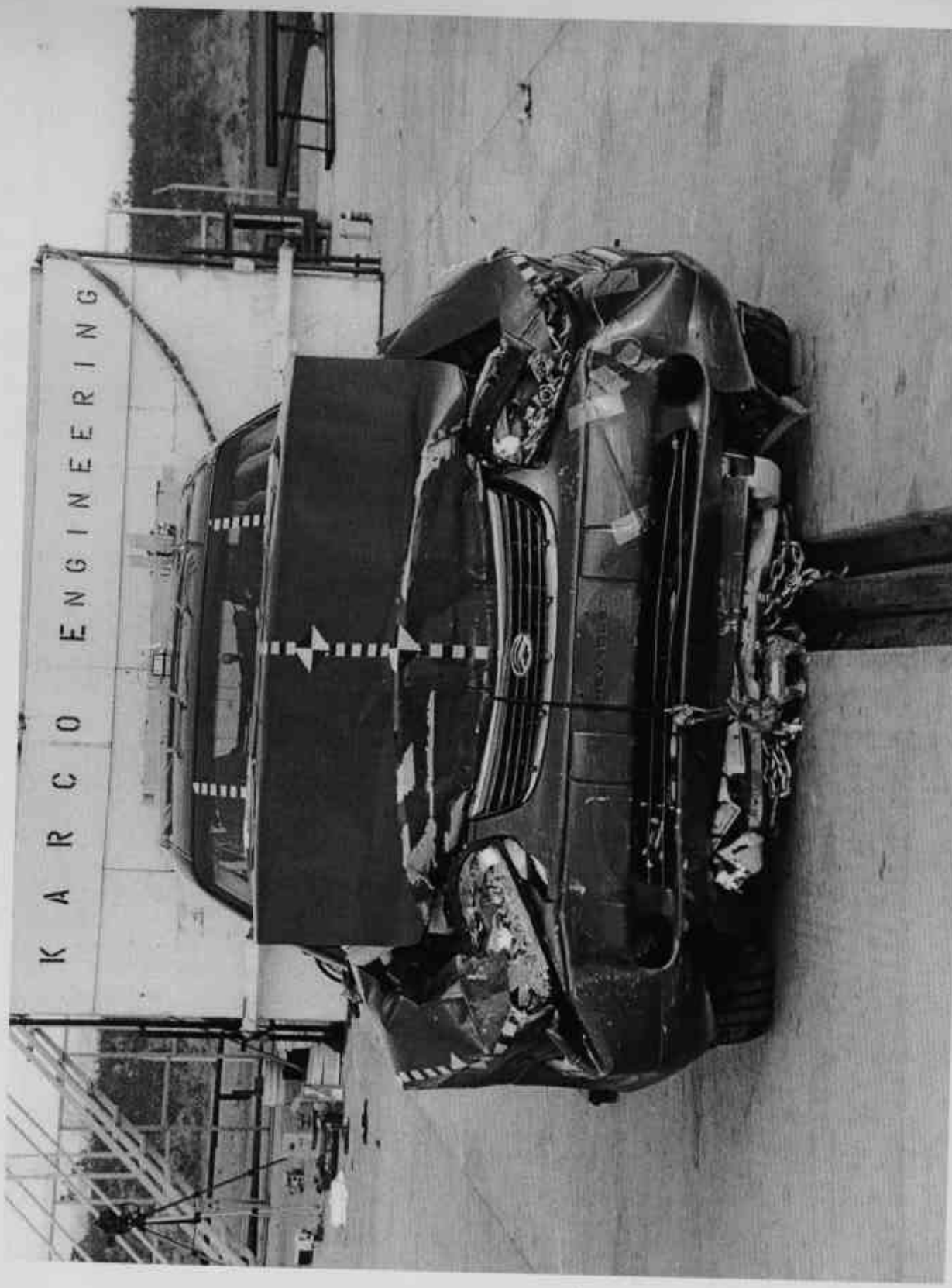


FIGURE A-6. POST TEST FRONT VIEW

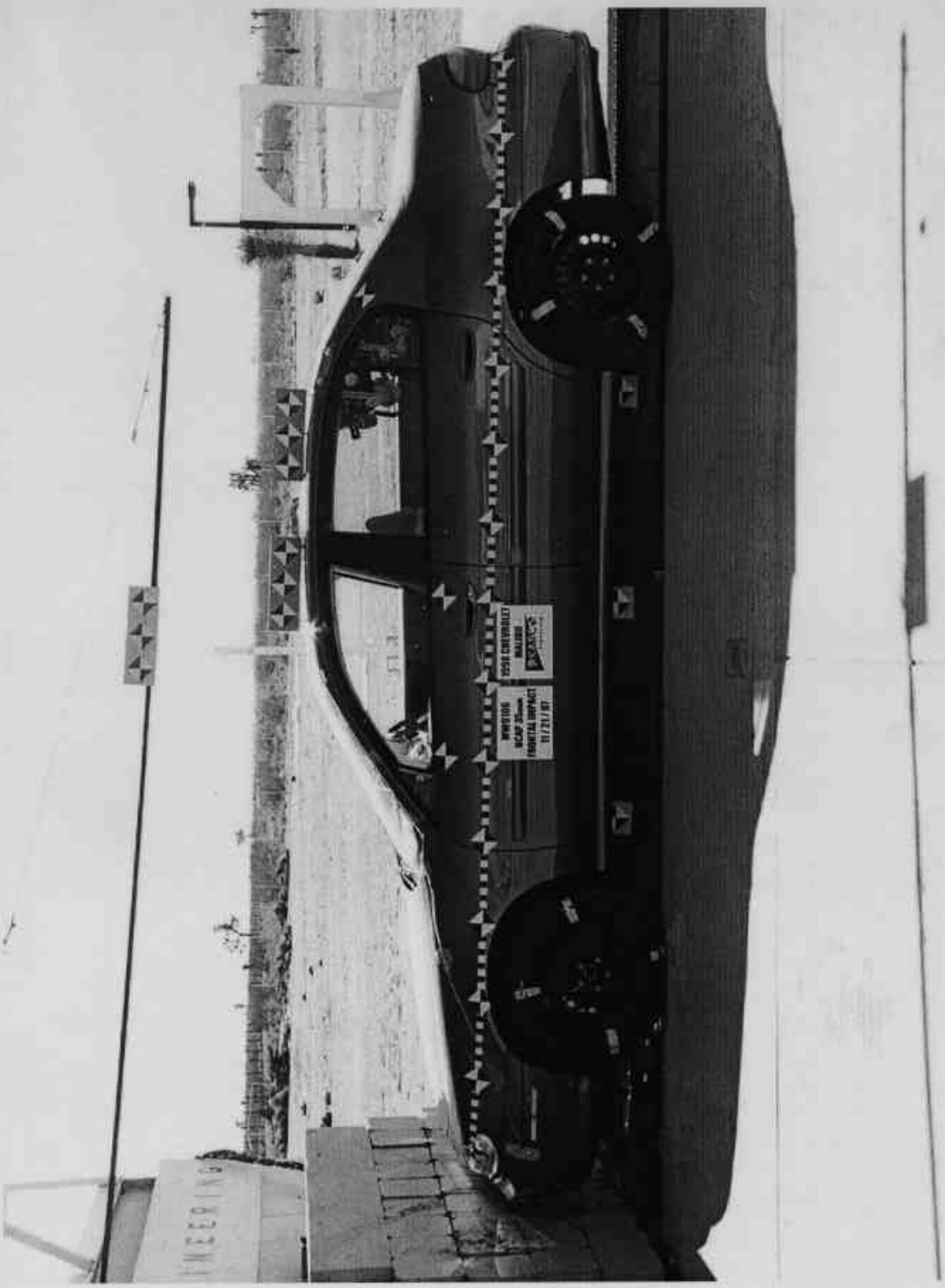


FIGURE A-7. PRETEST LEFT SIDE VIEW

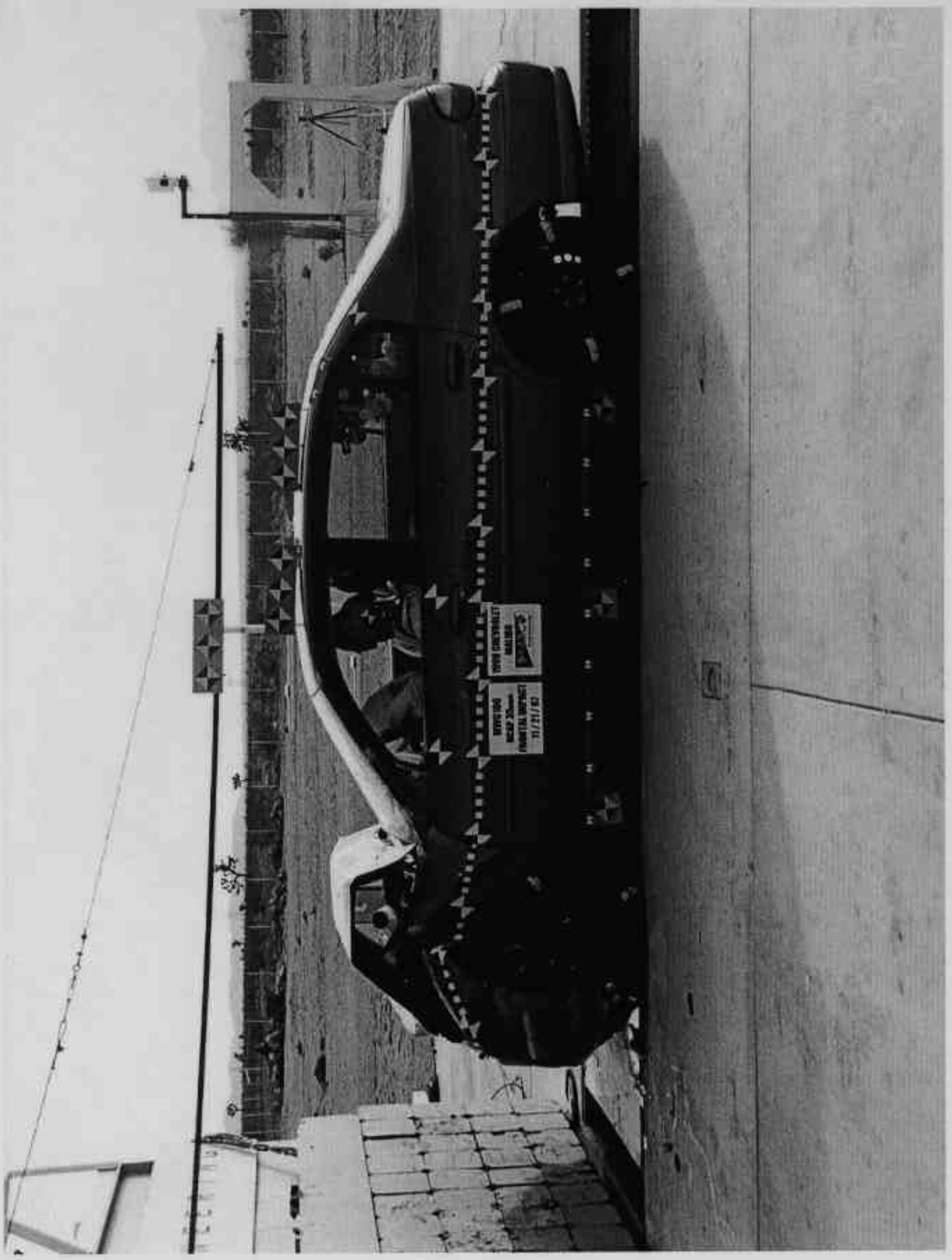


FIGURE A-8. POST TEST LEFT SIDE VIEW

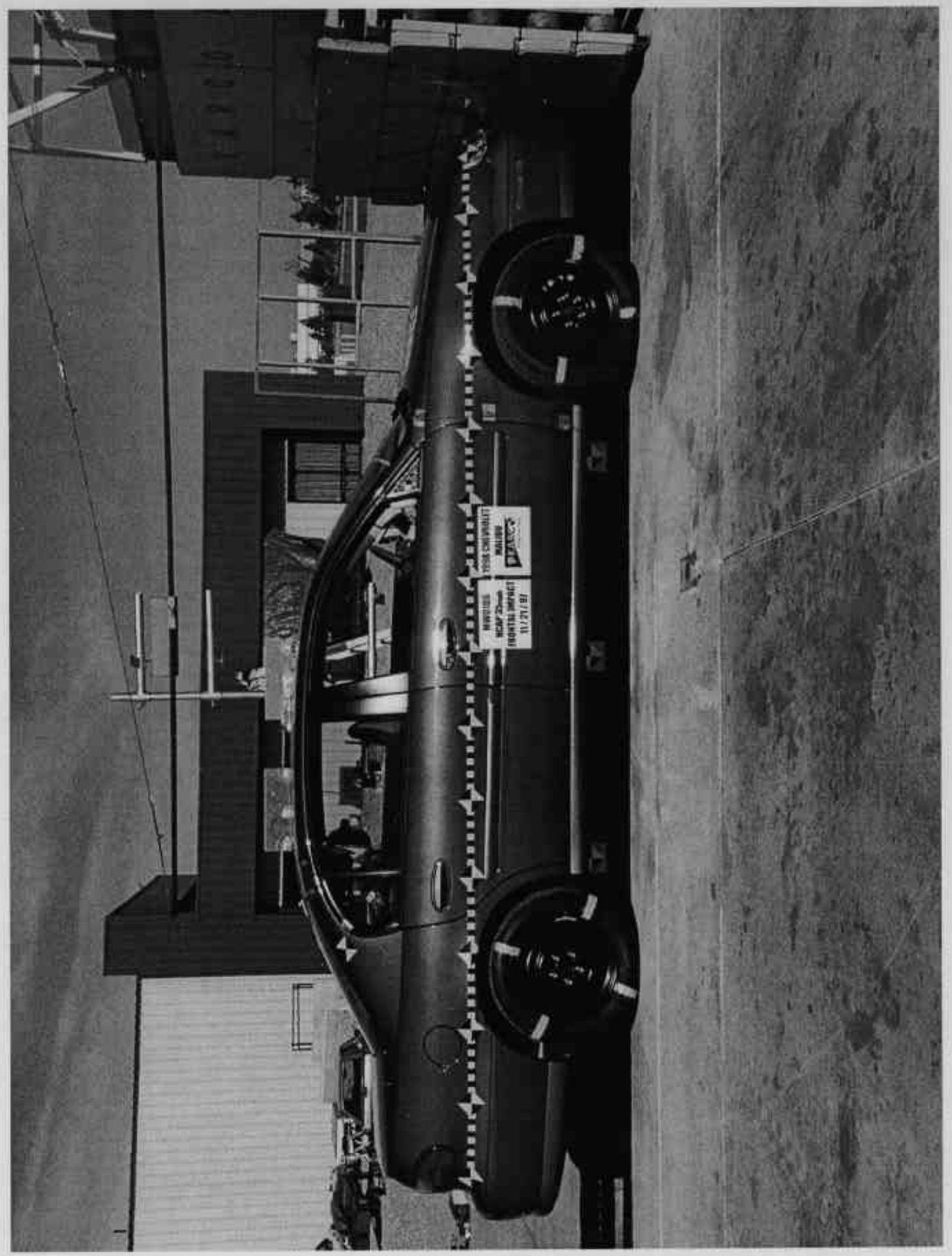


FIGURE A-9. PRETEST RIGHT SIDE VIEW

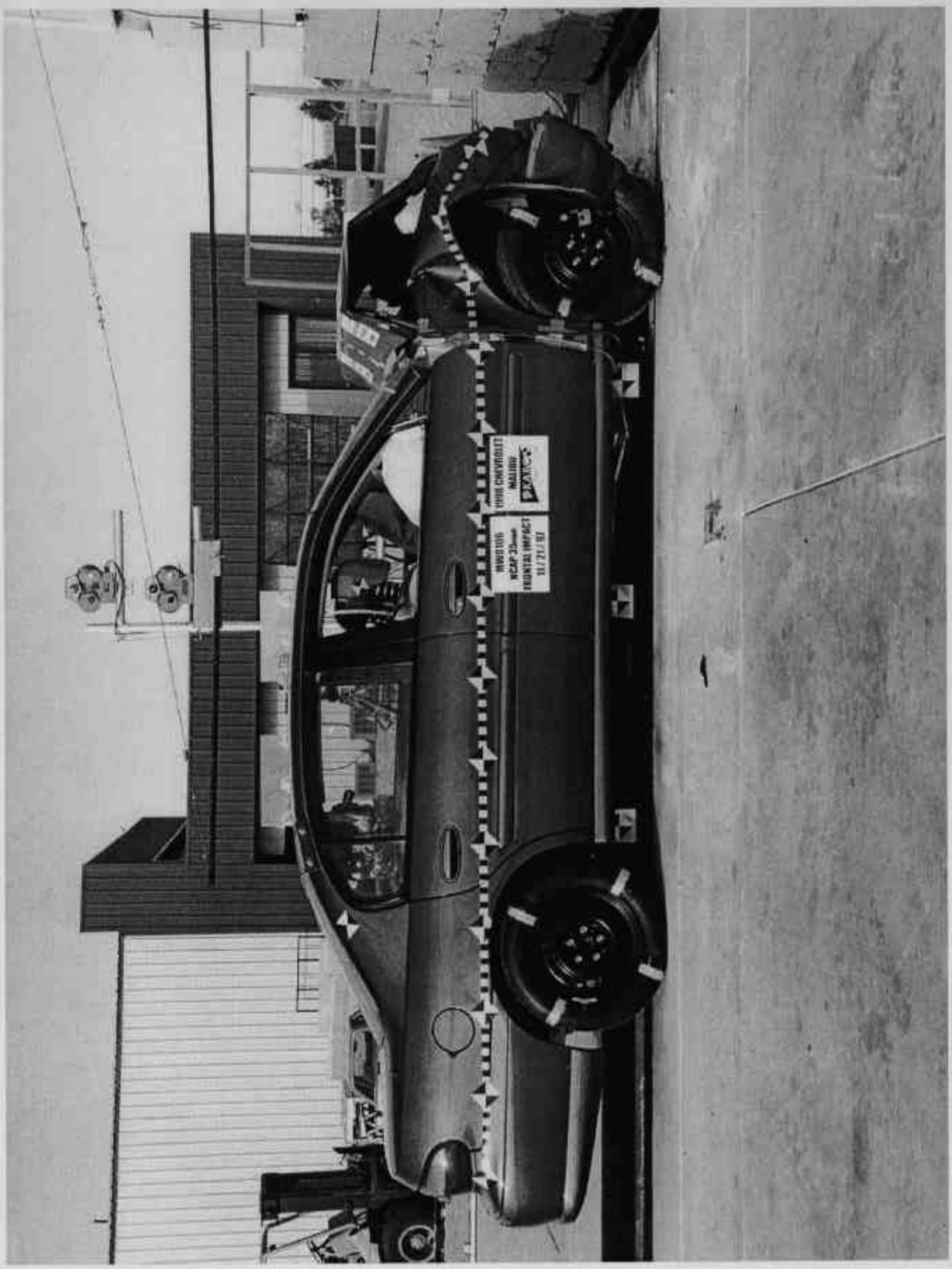


FIGURE A-10. POST TEST RIGHT SIDE VIEW

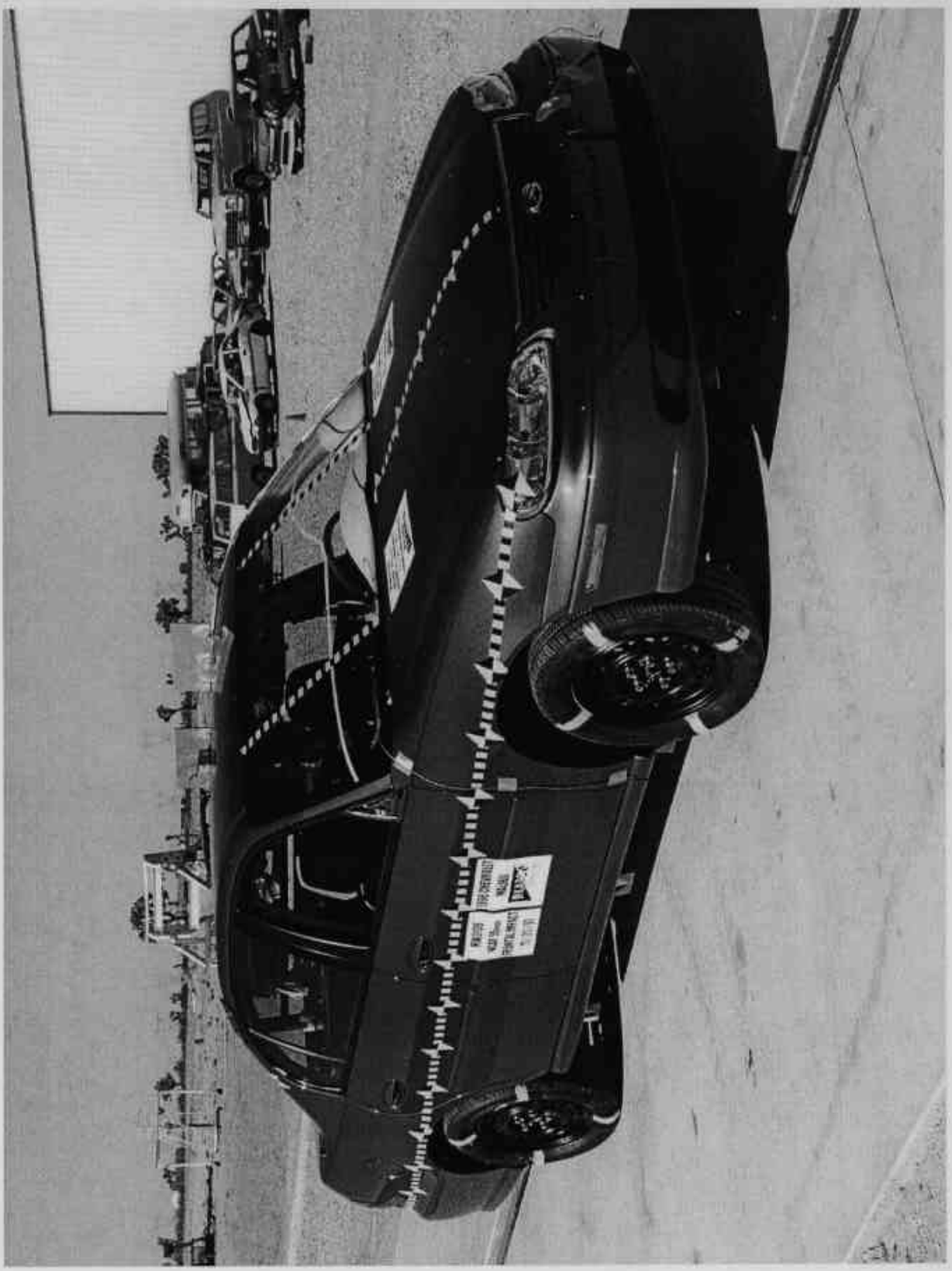


FIGURE A-11. PRETEST RIGHT FRONT VIEW

FIGURE A-12. POST TEST RIGHT FRONT VIEW

FIGURE A-13. PRETEST LEFT REAR VIEW

FIGURE A-14 POST TEST LEFT REAR VIEW

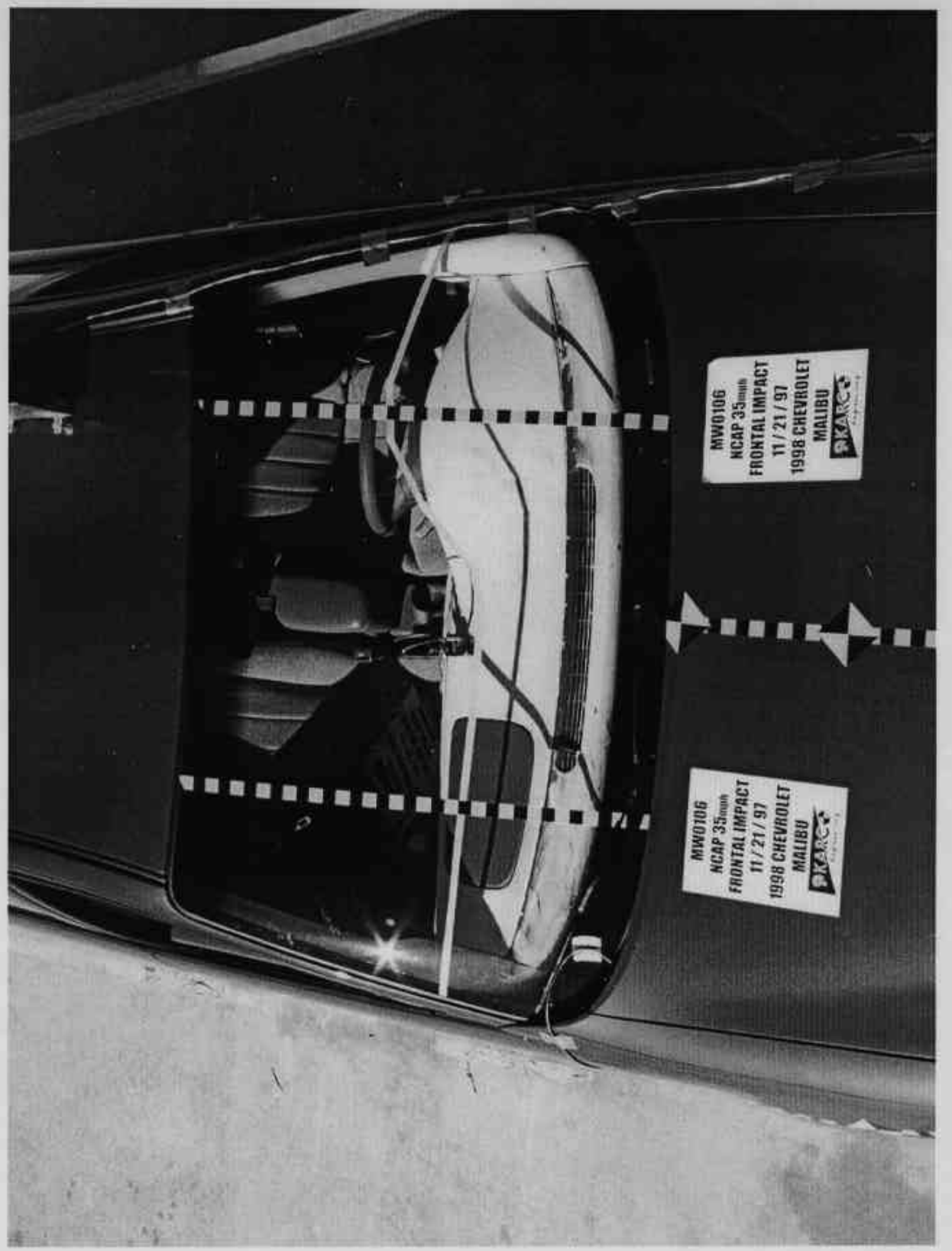


FIGURE A-15. PRETEST WINDSHIELD

FIGURE A-16. POST TEST WINDSHIELD

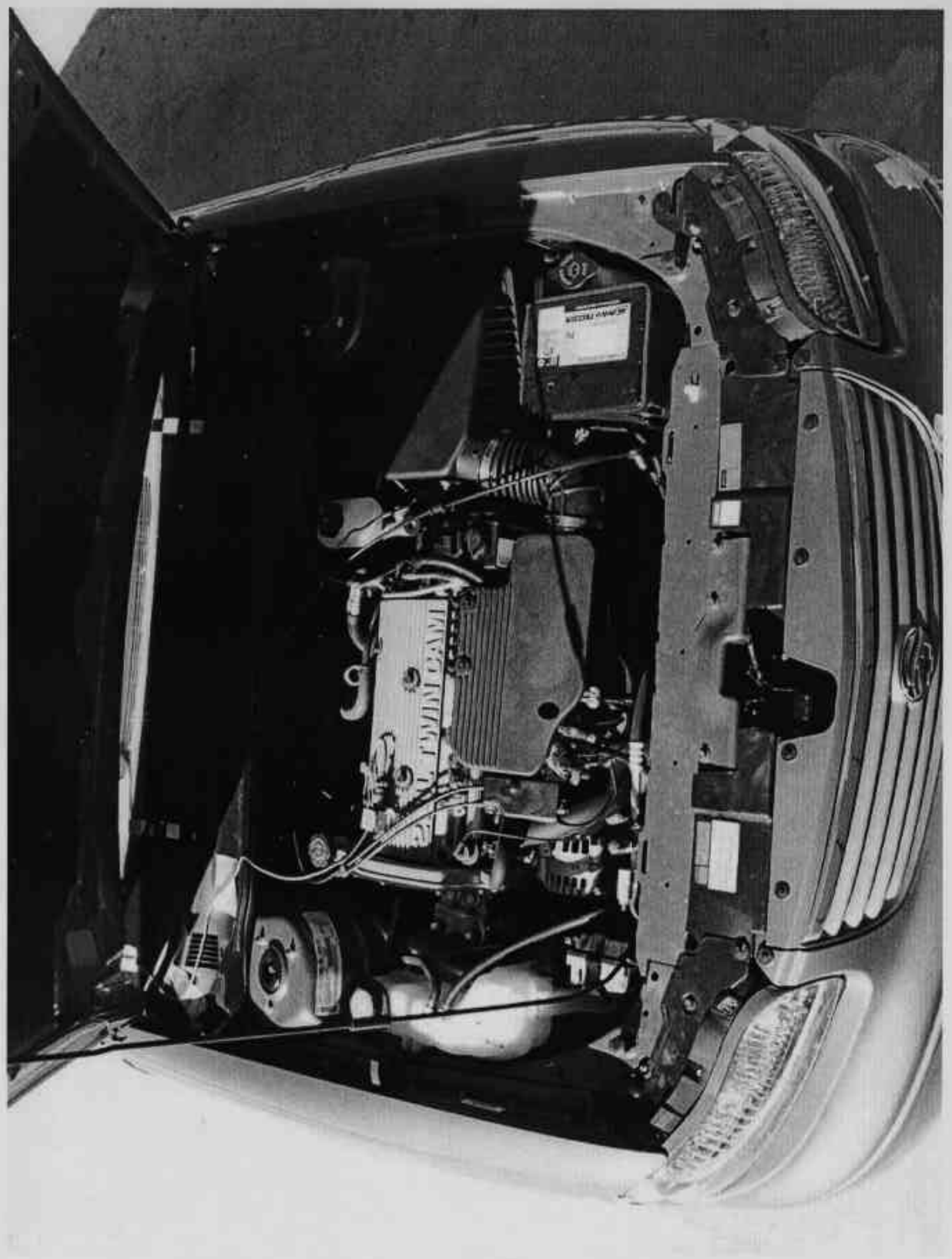


FIGURE –17. PRETEST ENGINE COMPARTMENT

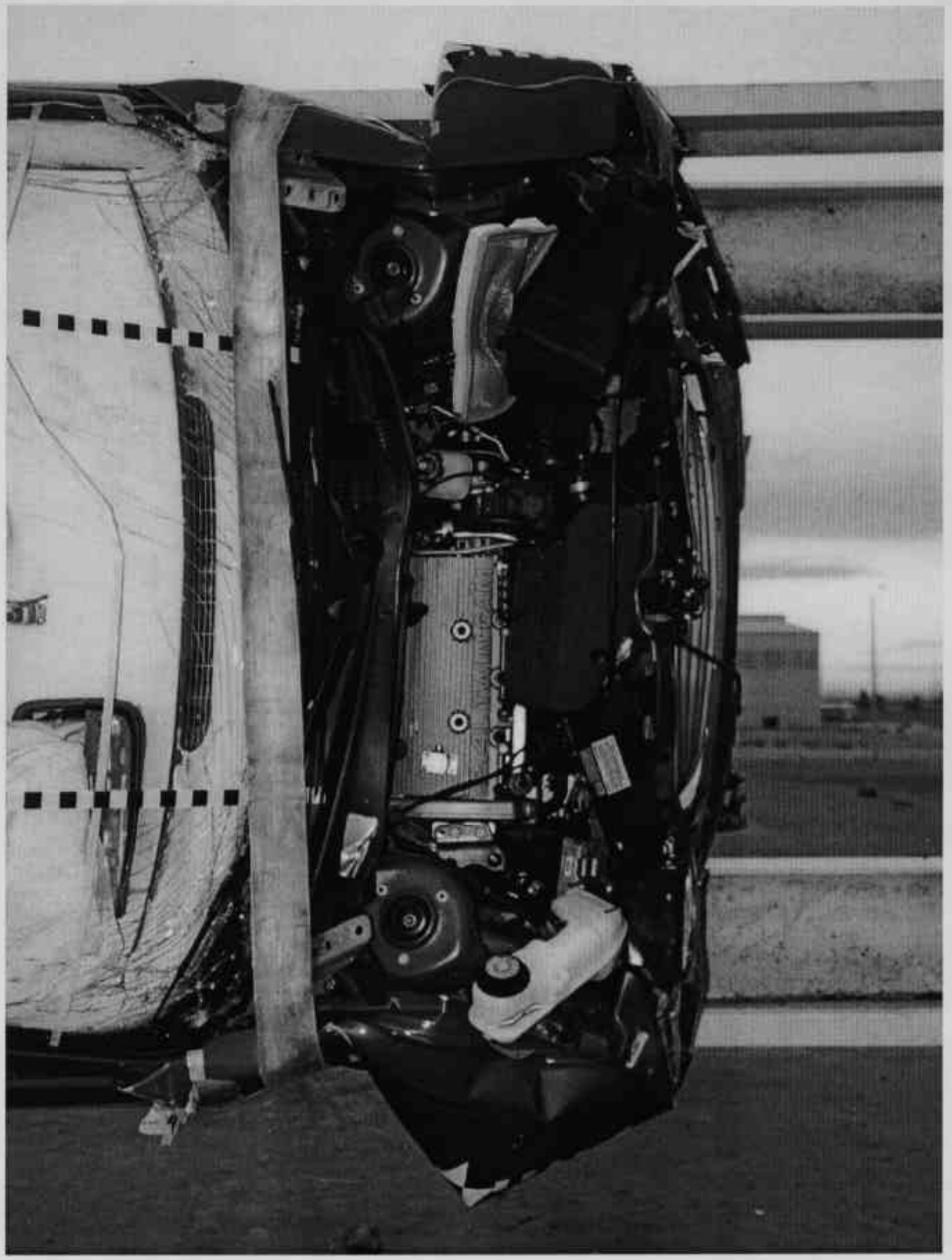


FIGURE A-18. POST TEST ENGINE COMPARTMENT

FIGURE A-19. PRETEST FUEL CAP

FIGURE A-20. POST TEST FUEL CAP

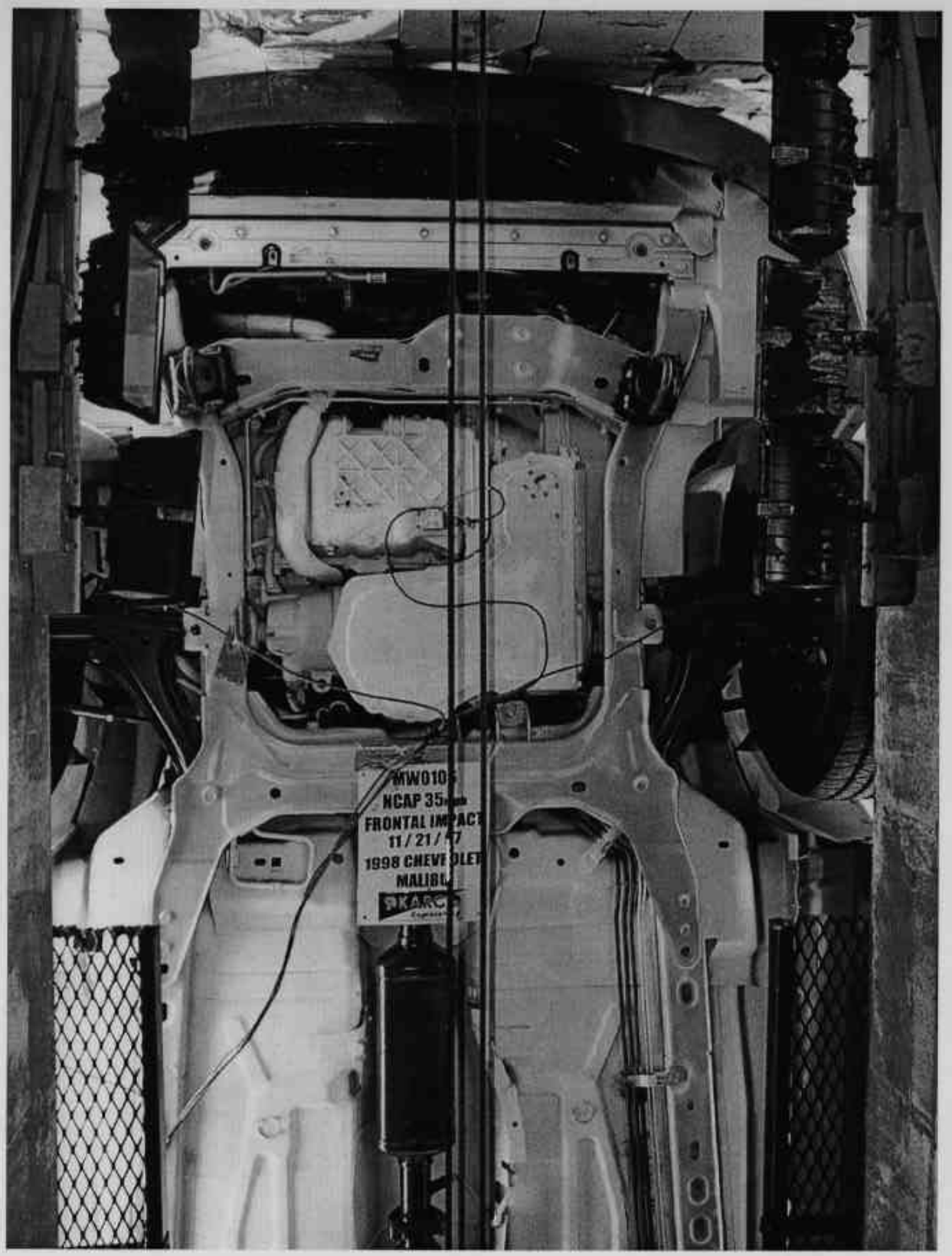


FIGURE-21. PRETEST FRONT UNDERSIDE

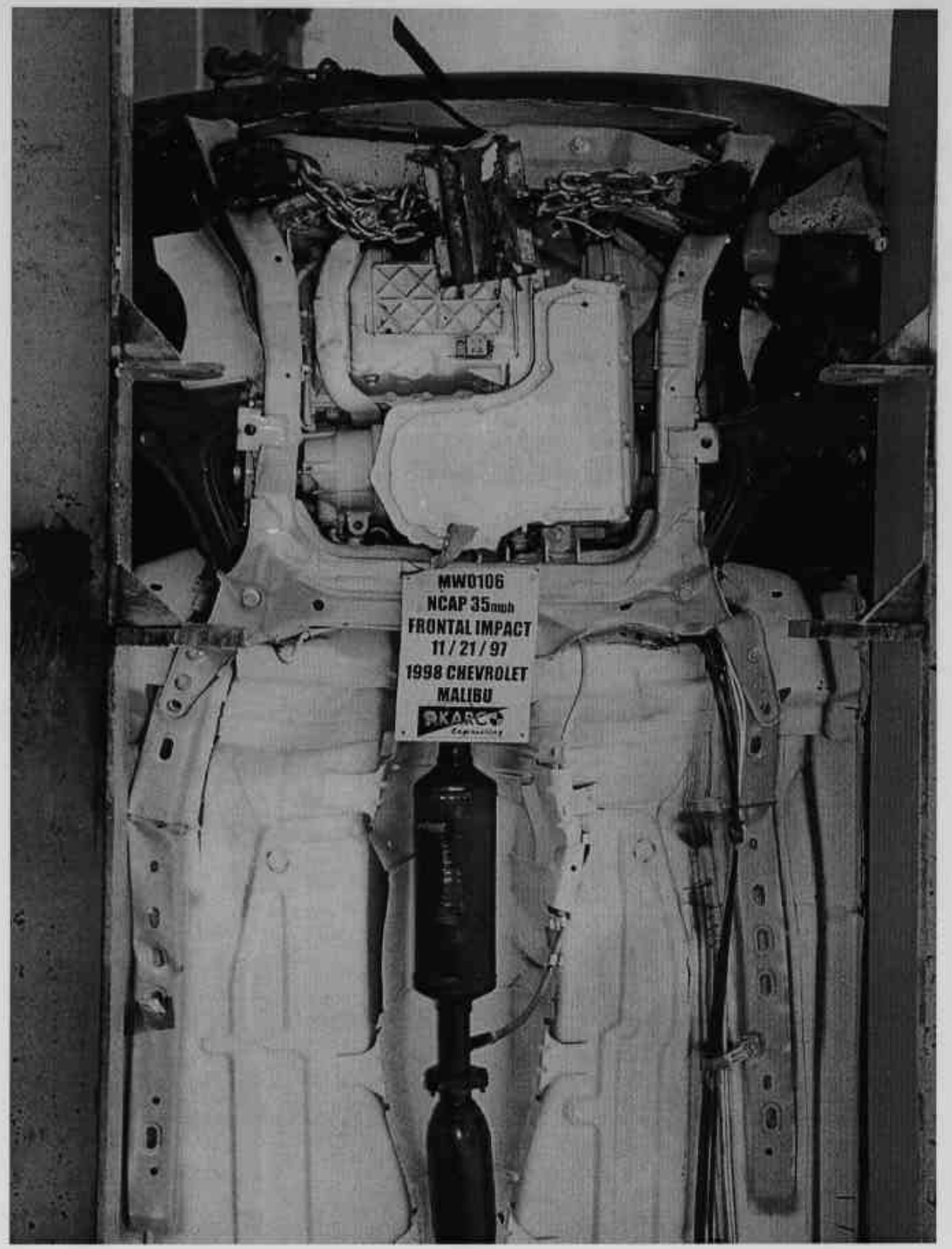


FIGURE A-22. POST TEST FRONT UNDERSIDE

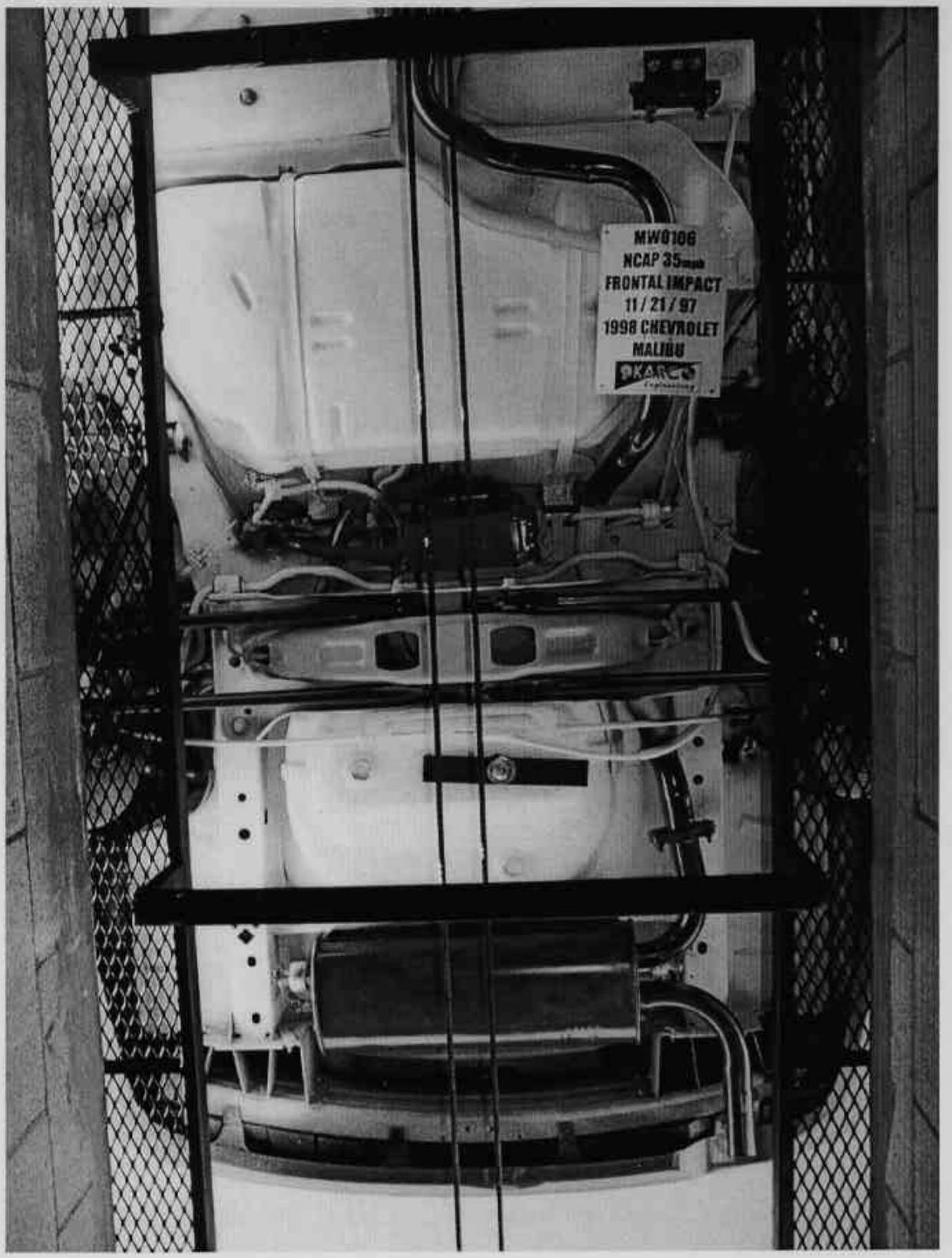


FIGURE A-23. PRETEST REAR UNDERSIDE

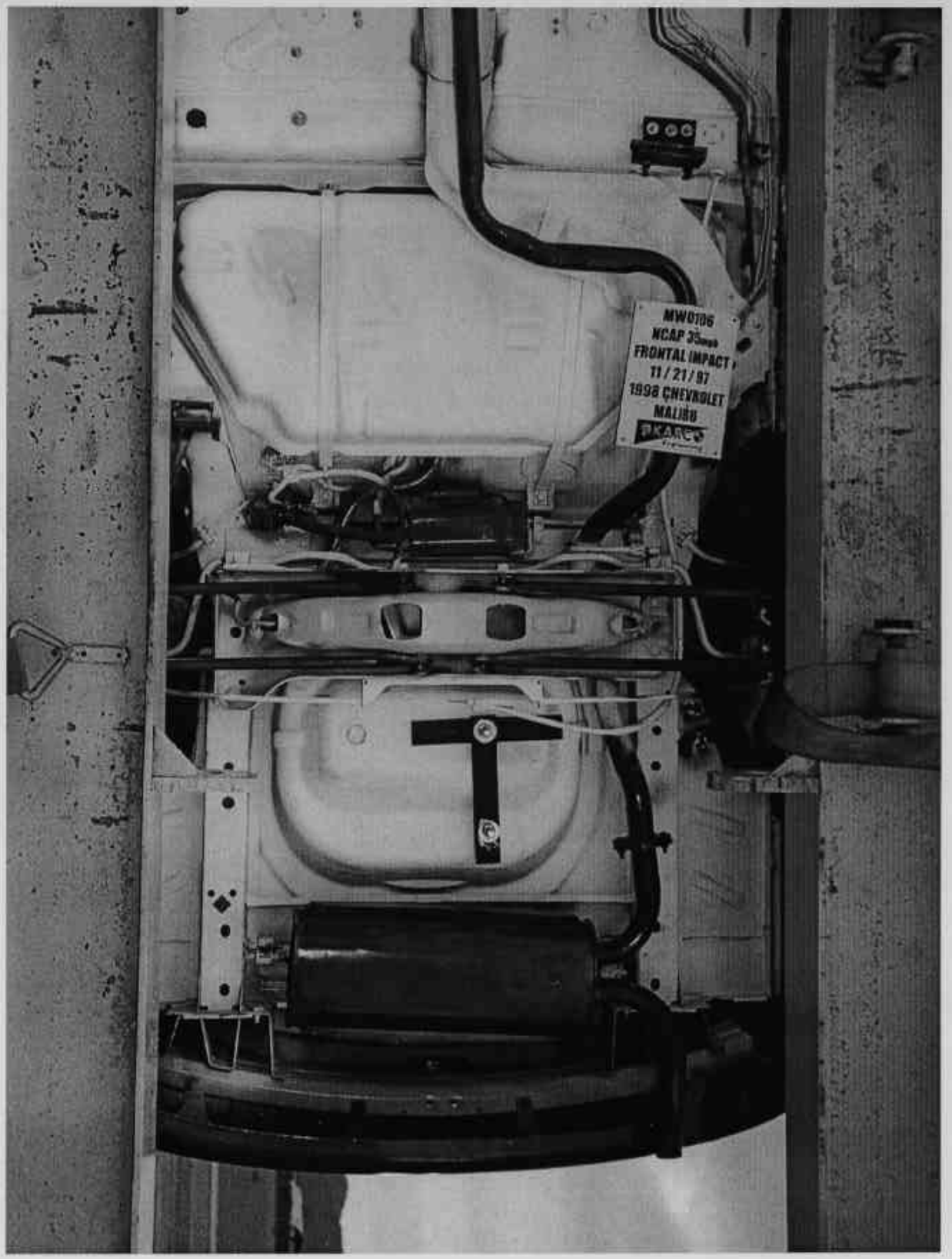


FIGURE A-24. POST TEST REAR UNDERSIDE

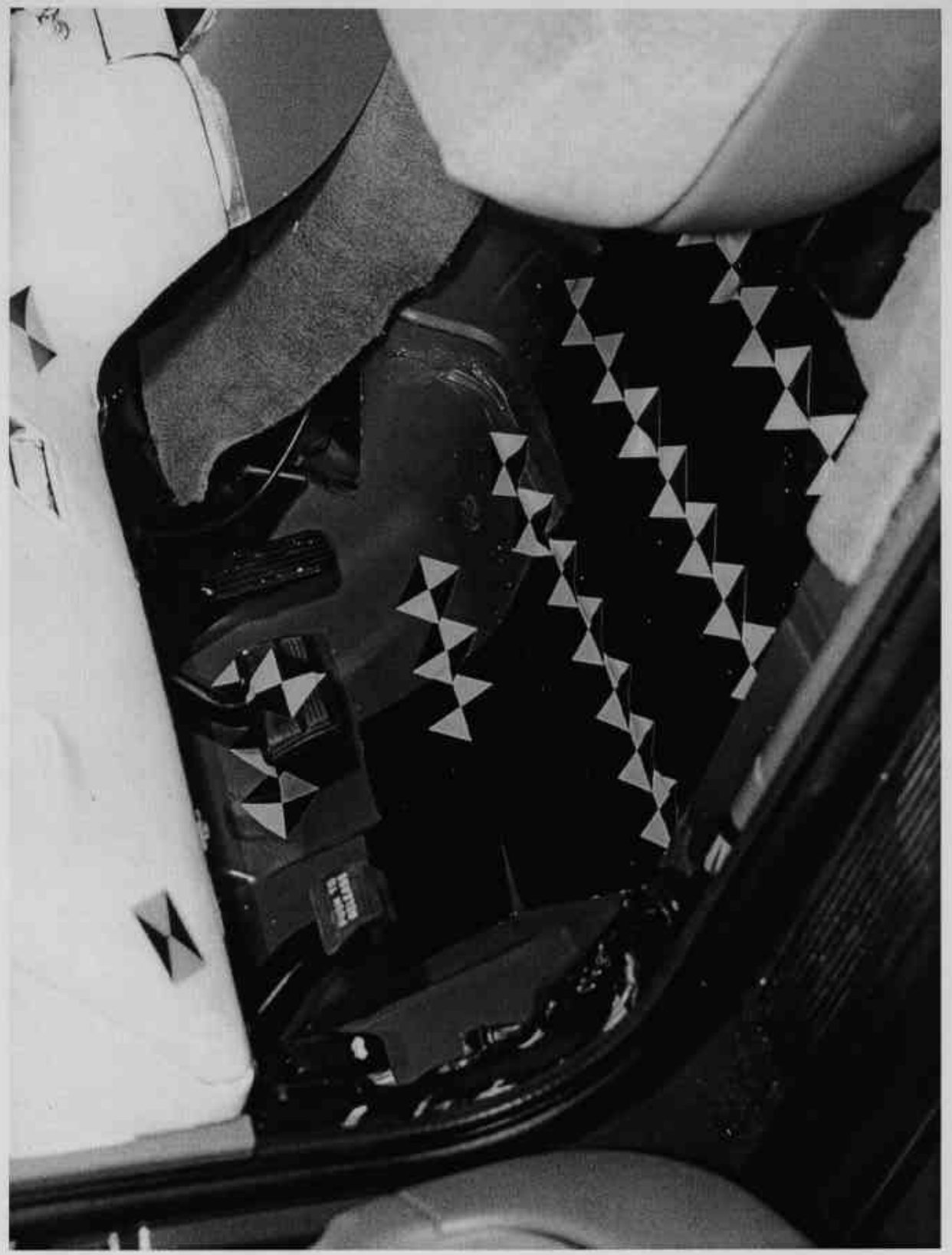


FIGURE A-25. PRETEST DRIVER FLOOR PAN

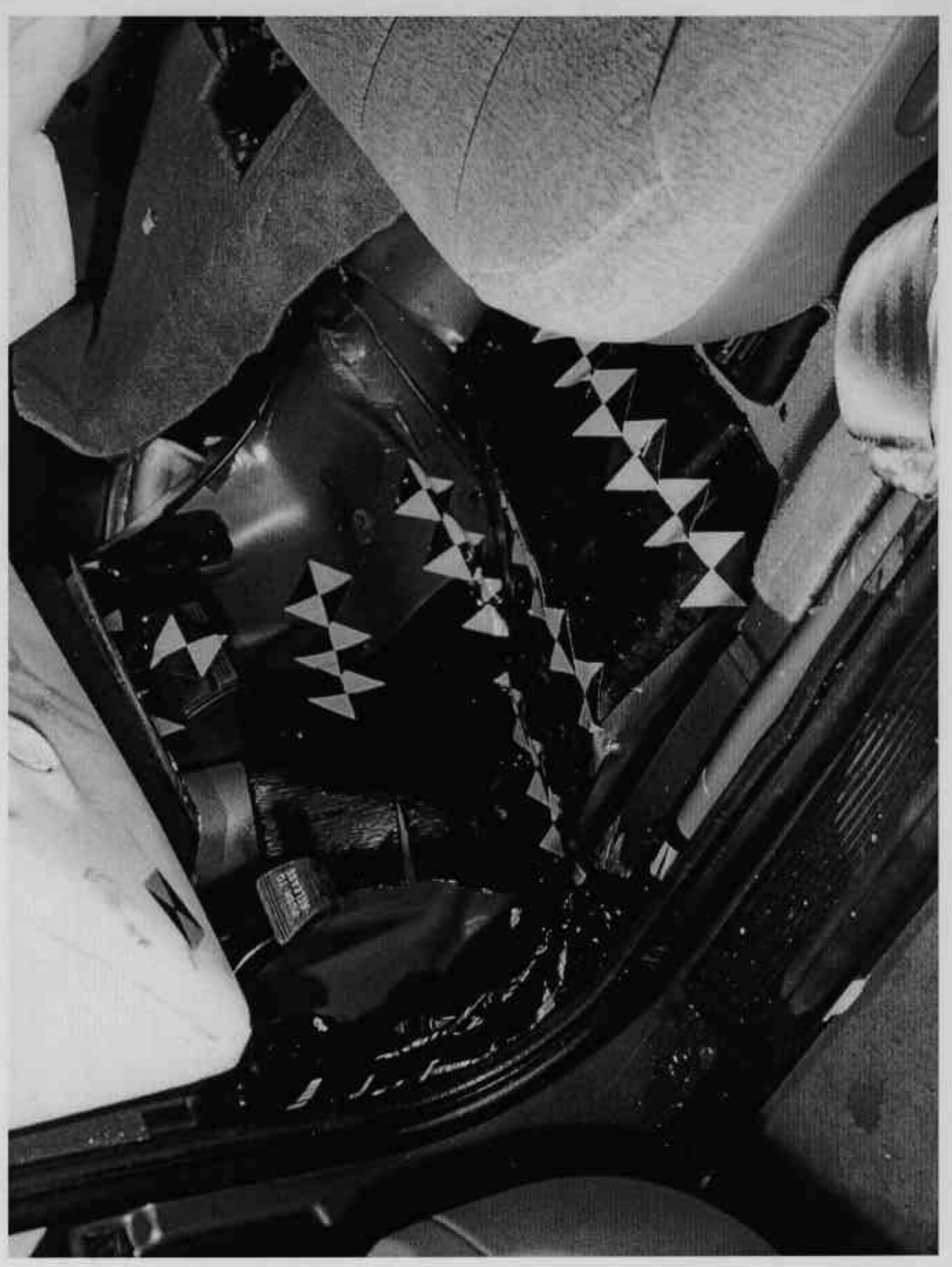


FIGURE A-26. POST TEST DRIVER FLOOR PAN

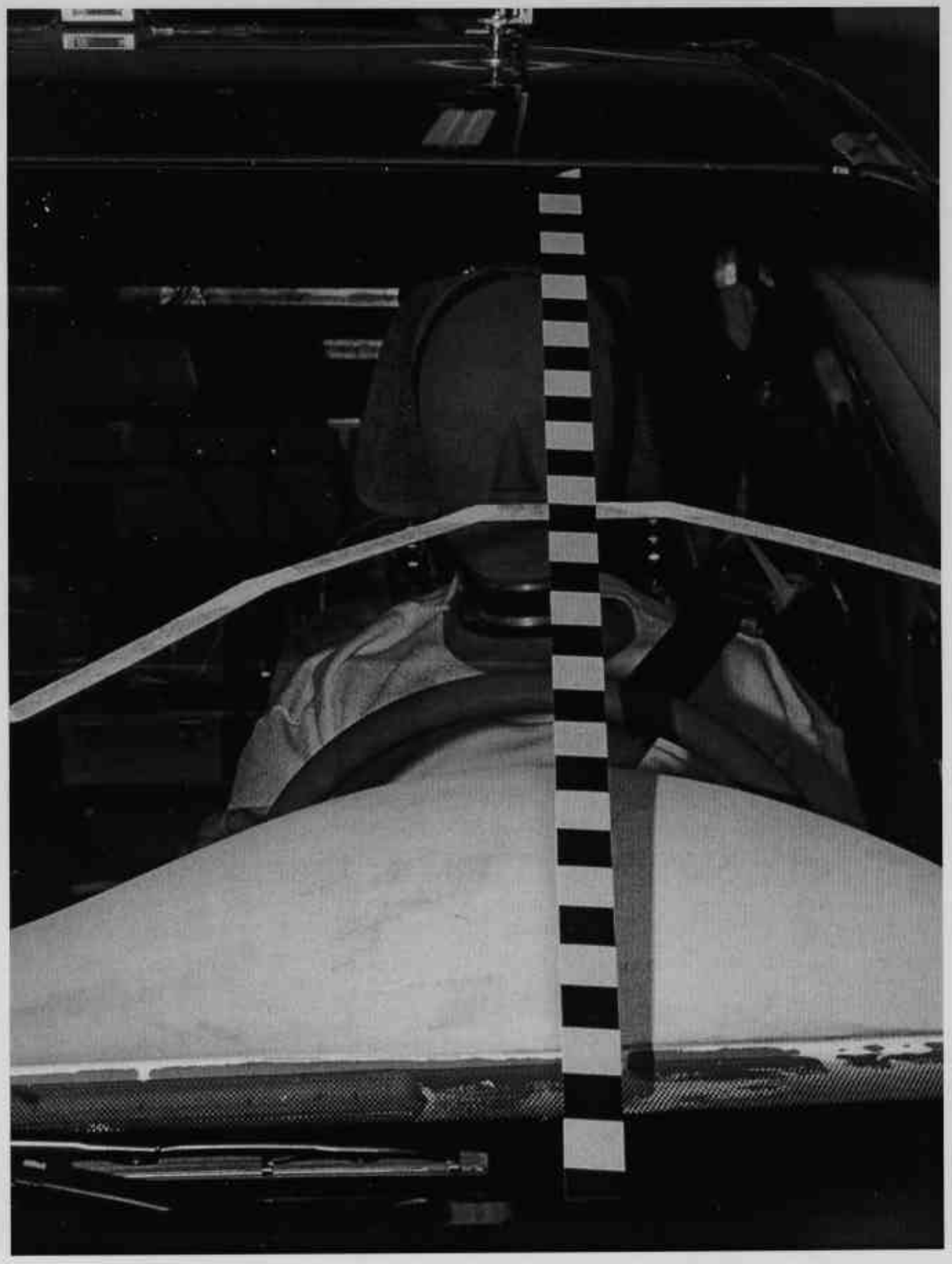


FIGURE A-27. PRETEST DRIVER DUMMY (FRONT VIEW)

FIGURE A-28. POST TEST DRIVER DUMMY (FRONT VIEW)

FIGURE A-29. PRETEST DRIVER DUMMY (THRU WINDOW)

FIGURE A-30. POST TEST DRIVER DUMMY (THRU WINDOW)

FIGURE A-31. PRETEST DRIVER DUMMY (DOOR OPEN)

FIGURE A-32. POST TEST DRIVER DUMMY (DOOR OPEN)

FIGURE A-33. PRE TEST DRIVER DUMMY (90° TO VEHICLE)

FIGURE A-34. POST TEST DRIVER DUMMY (90° TO VEHICLE)

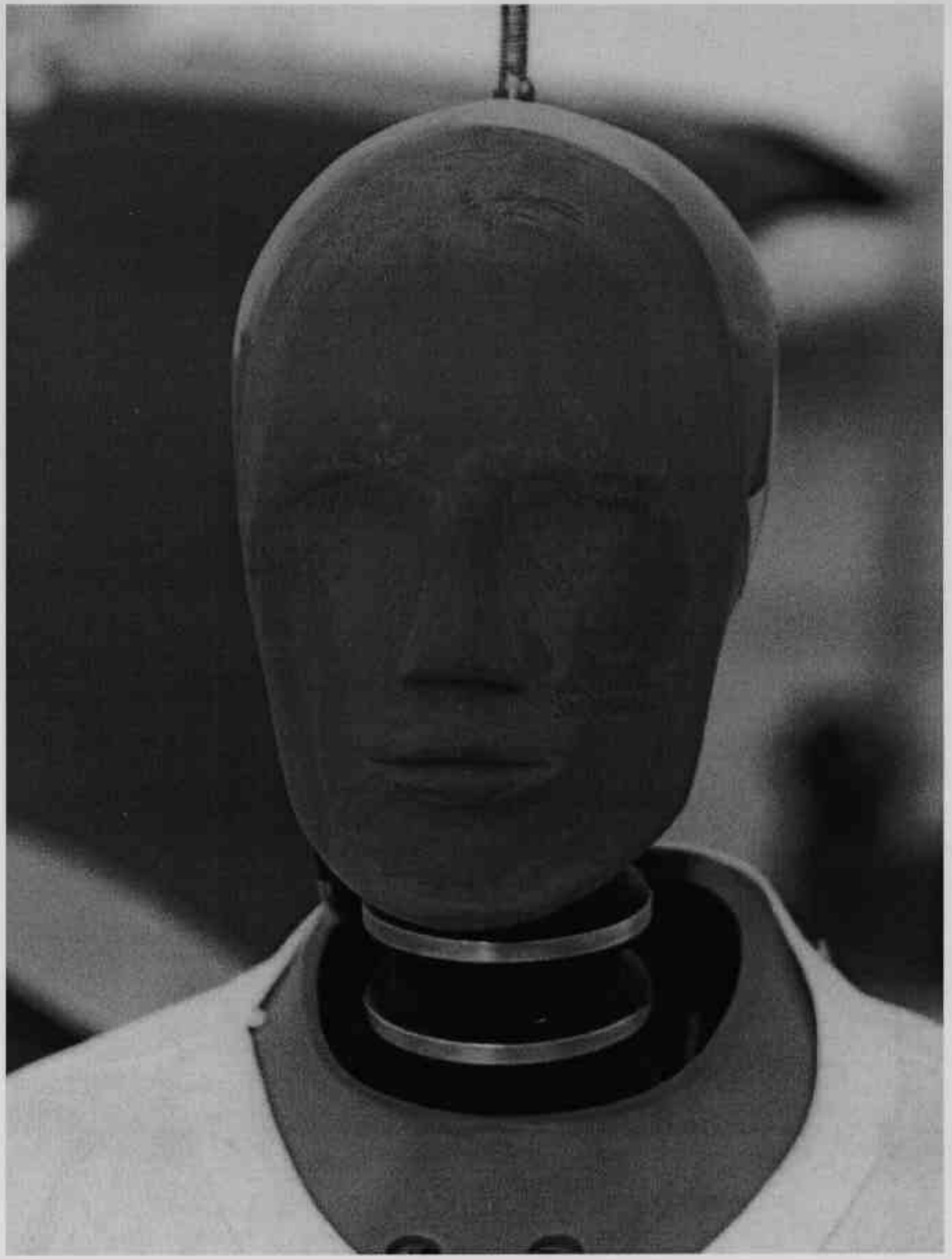


FIGURE A-35. POST TEST DRIVER DUMMY HEAD

FIGURE A-36. POST TEST DRIVER DUMMY CONTACT POINT

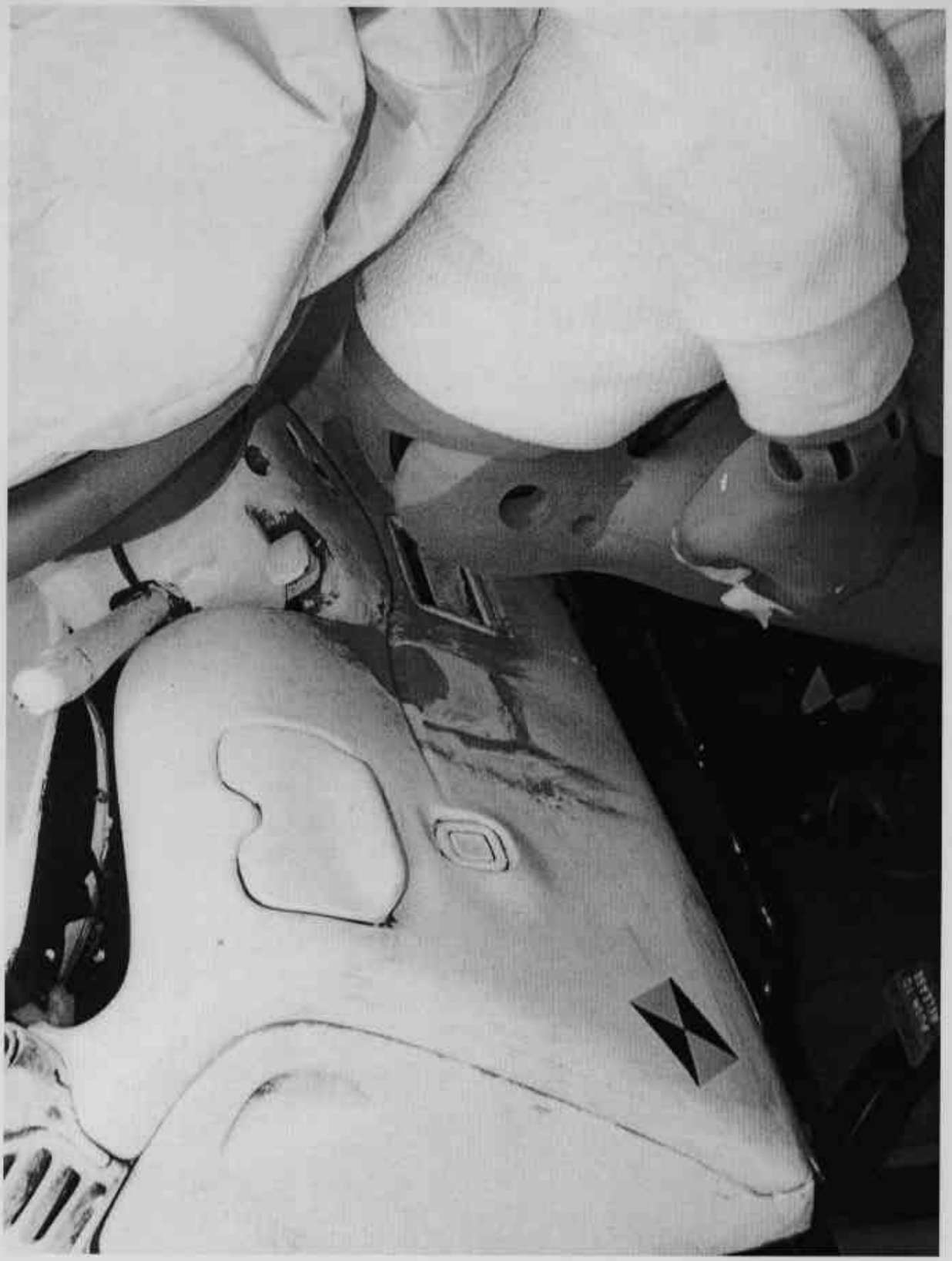


FIGURE A-37. POST TEST DRIVER DUMMY CONTACT POINT

FIGURE A-38. PRETEST DRIVER SIDE KNEE BOLSTER

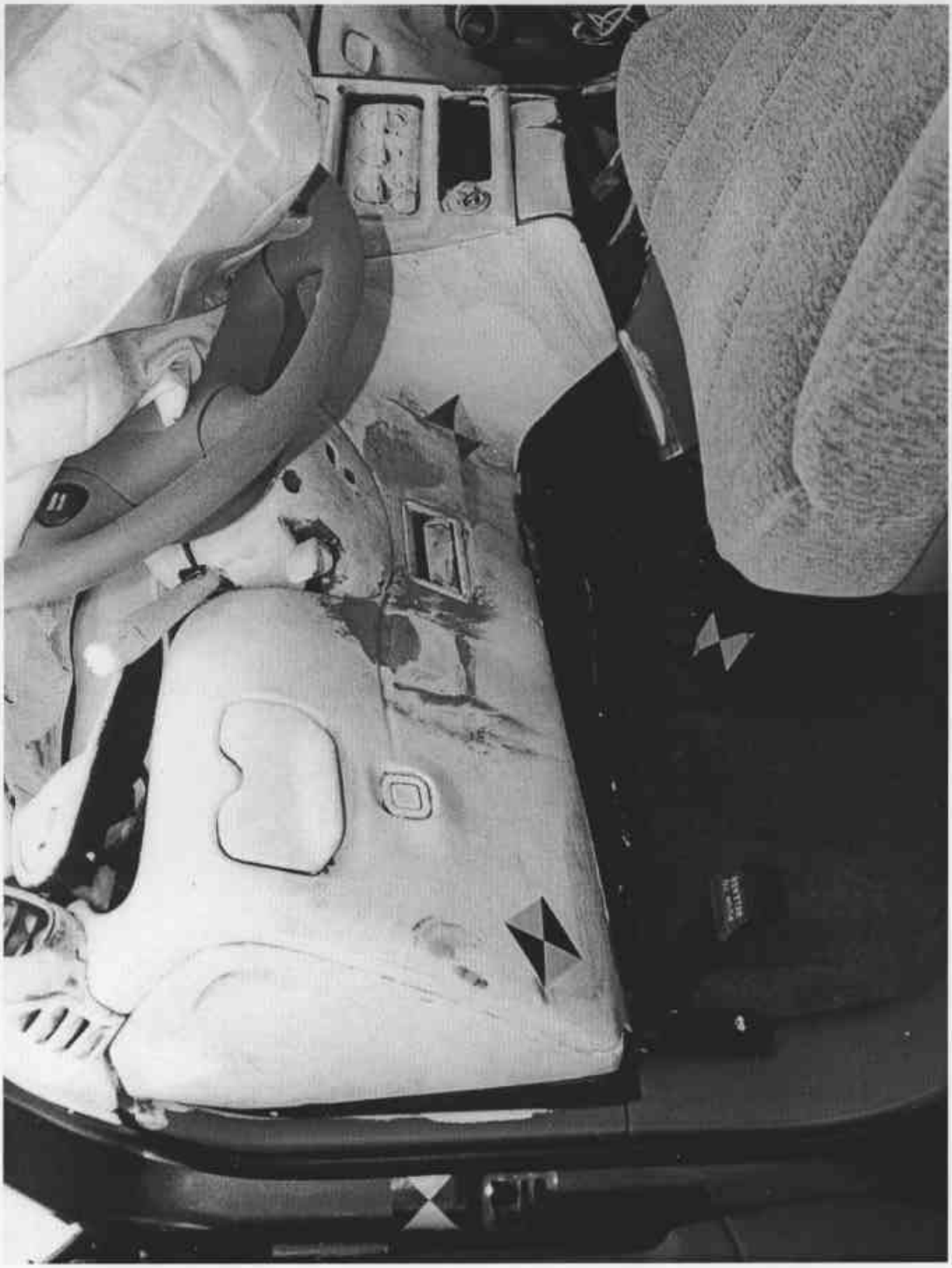


FIGURE A-39. POST TEST DRIVER KNEE BOLSTER

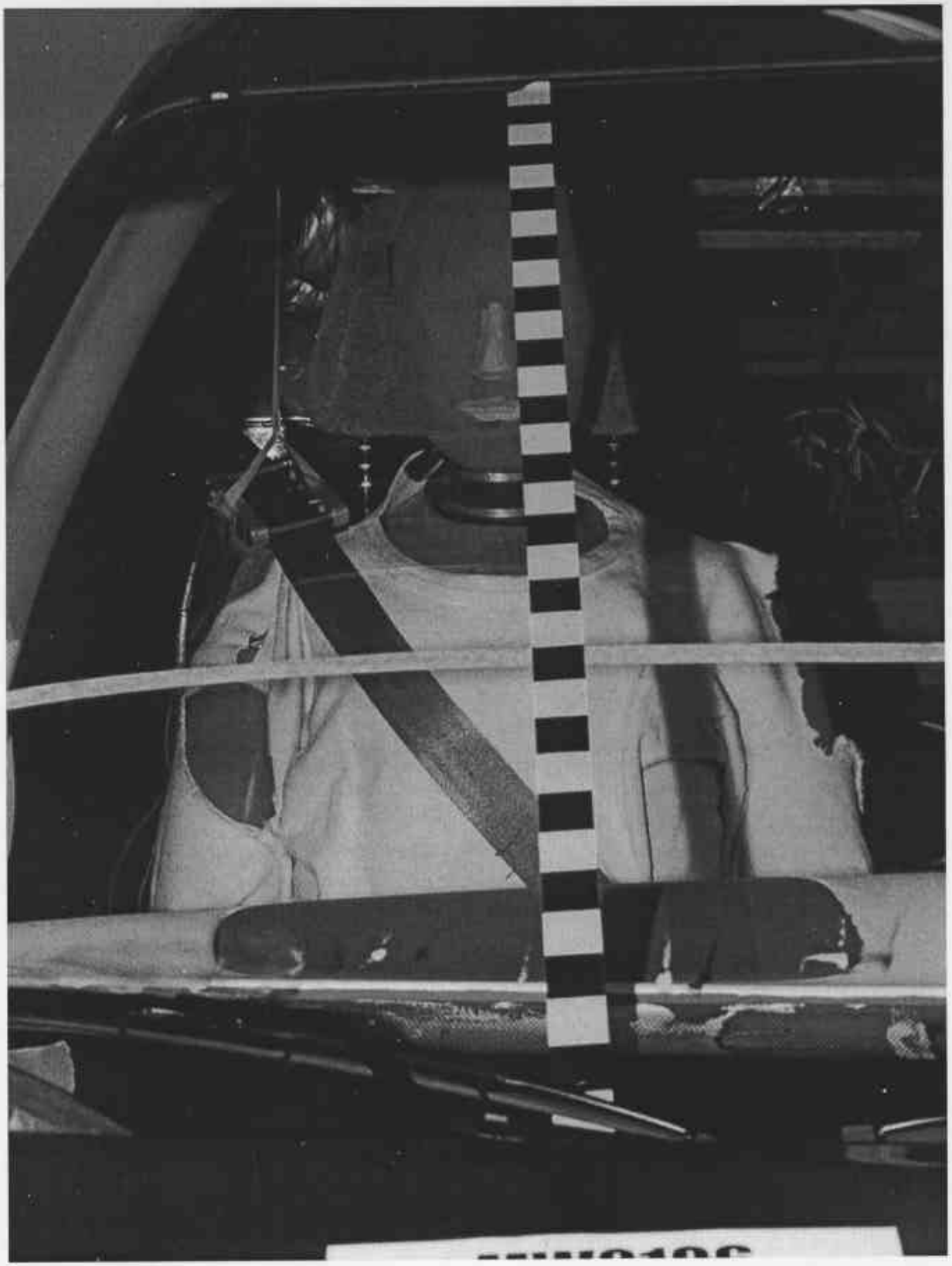


FIGURE A-40. PRETEST PASSENGER DUMMY (FRONT VIEW)

FIGURE A-41. POST TEST PASSENGER DUMMY (FRONT VIEW)

FIGURE A-42. PRETEST PASSENGER DUMMY (THUR WINDOW)

FIGURE A-43. POST TEST PASSENGER DUMMY (THRU WINDOW)

FIGURE A-44. PRETEST PASSENGER DUMMY (DOOR OPEN)

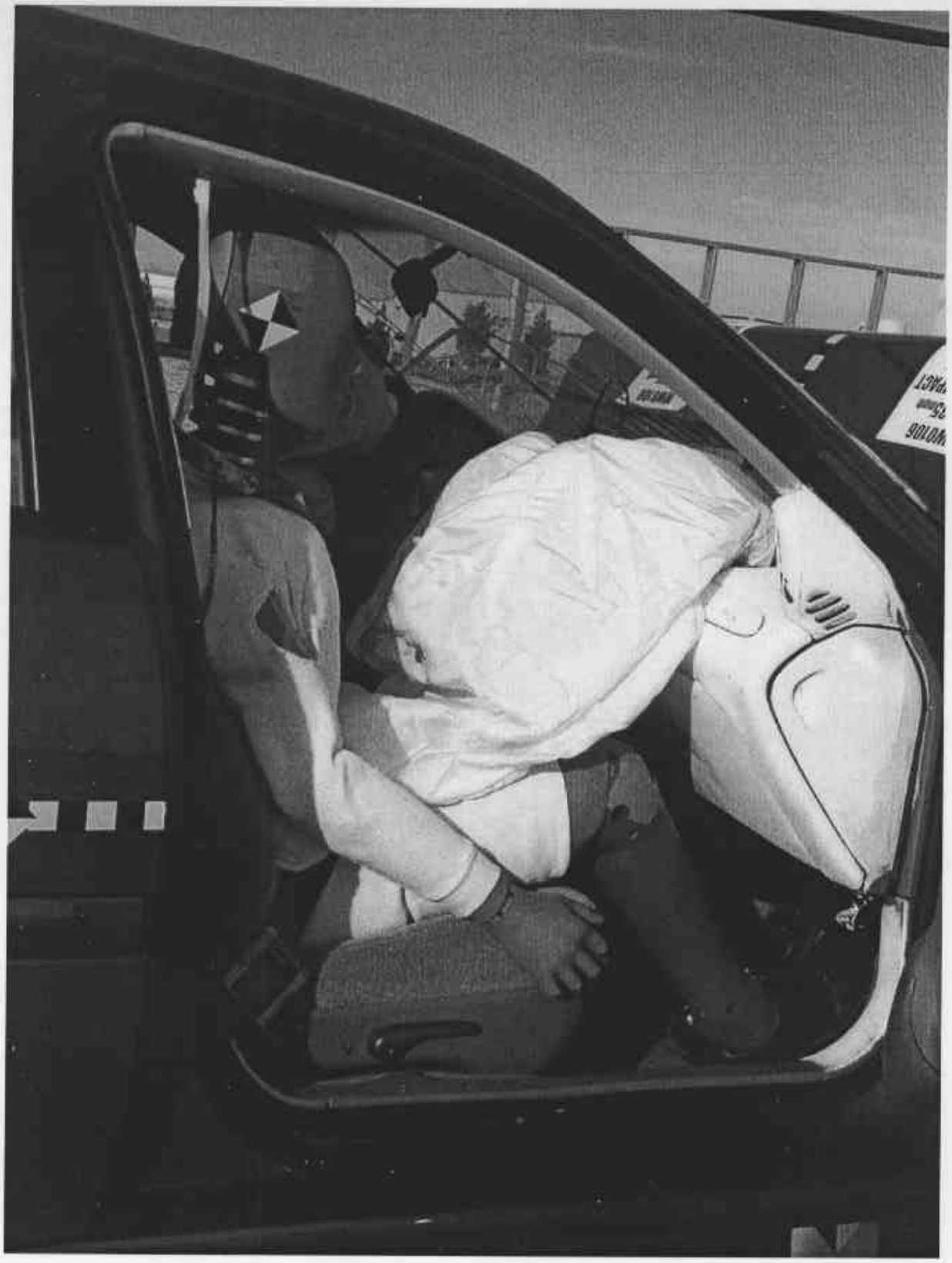


FIGURE A-45. POST TEST PASSENGER DUMMY (DOOR OPEN)

FIGURE A-46. PRETEST PASSENGER DUMMY (90° TO VEHICLE)

FIGURE A-47. POST TEST PASSENGER DUMMY (90° TO VEHICLE)

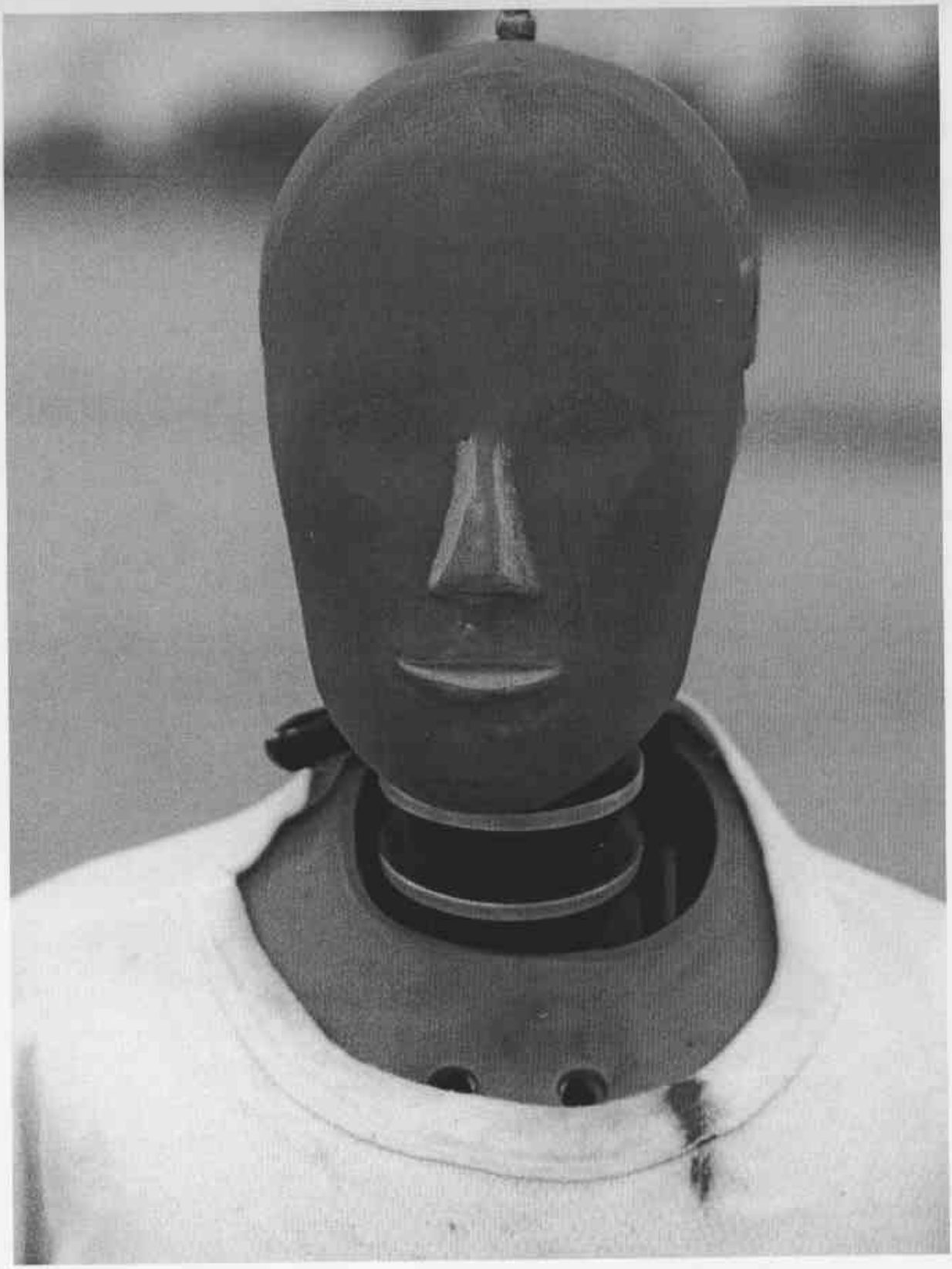


FIGURE A-48. POST TEST PASSENGER DUMMY HEAD

FIGURE A-49.POST TEST PASSENGER DUMMY CONTACT POINT

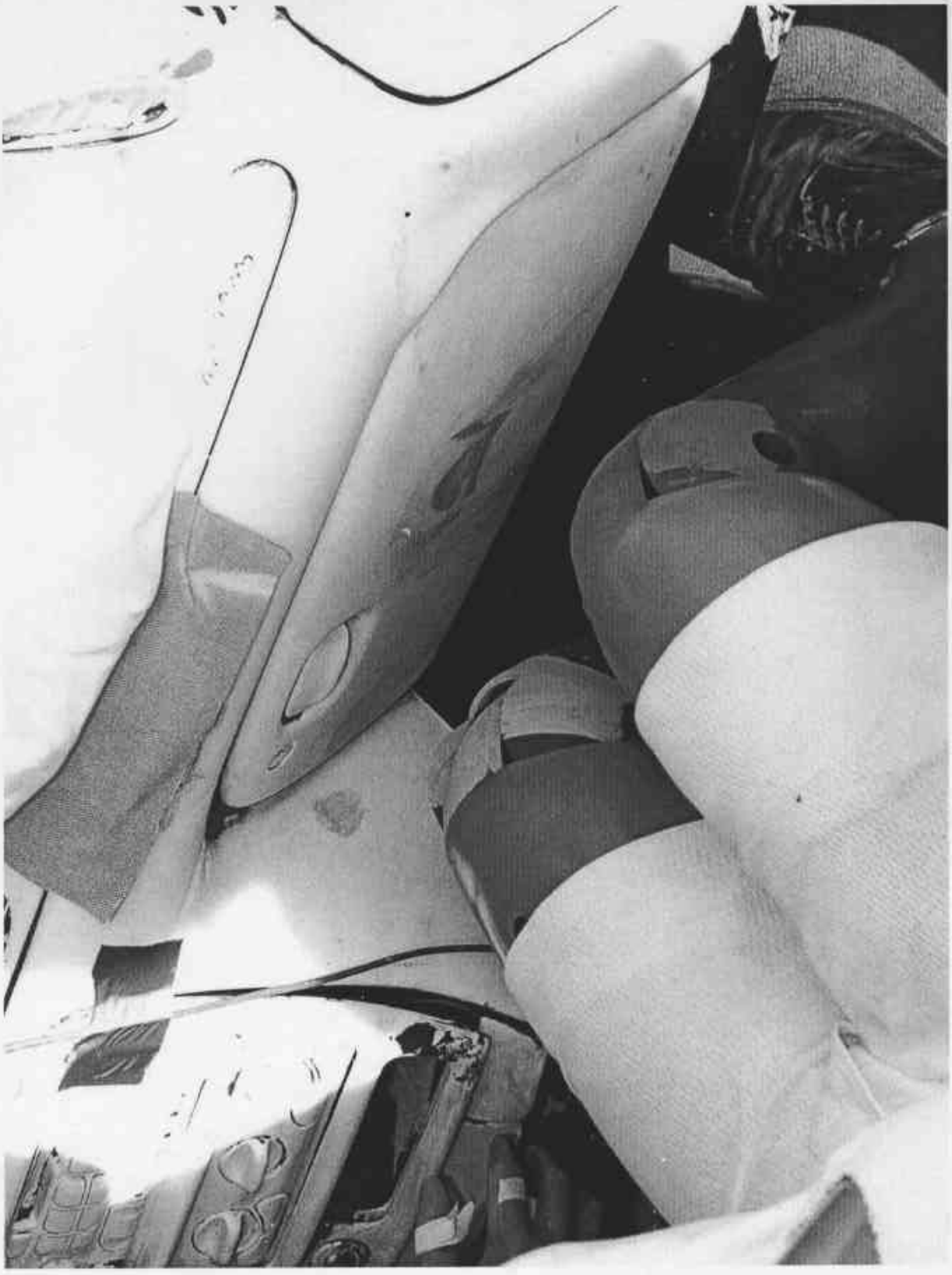


FIGURE A-50. POST TEST PASSENGER DUMMY CONTACT POINT

FIGURE A-51.PRETEST PASSENGER SIDE KNEE BOLSTER

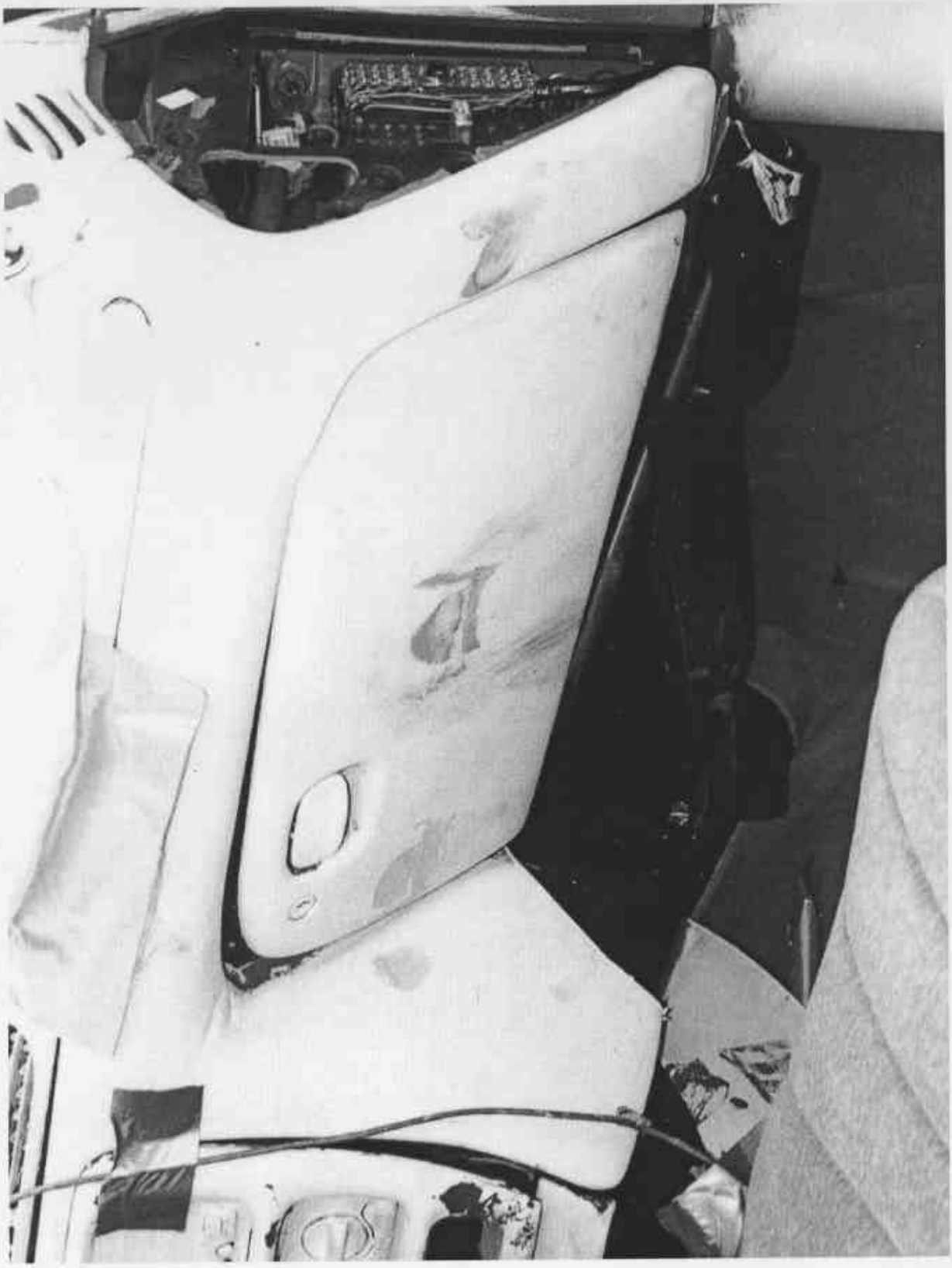


FIGURE A-52. POST TEST PASSENGER SIDE KNEE BOLSTER

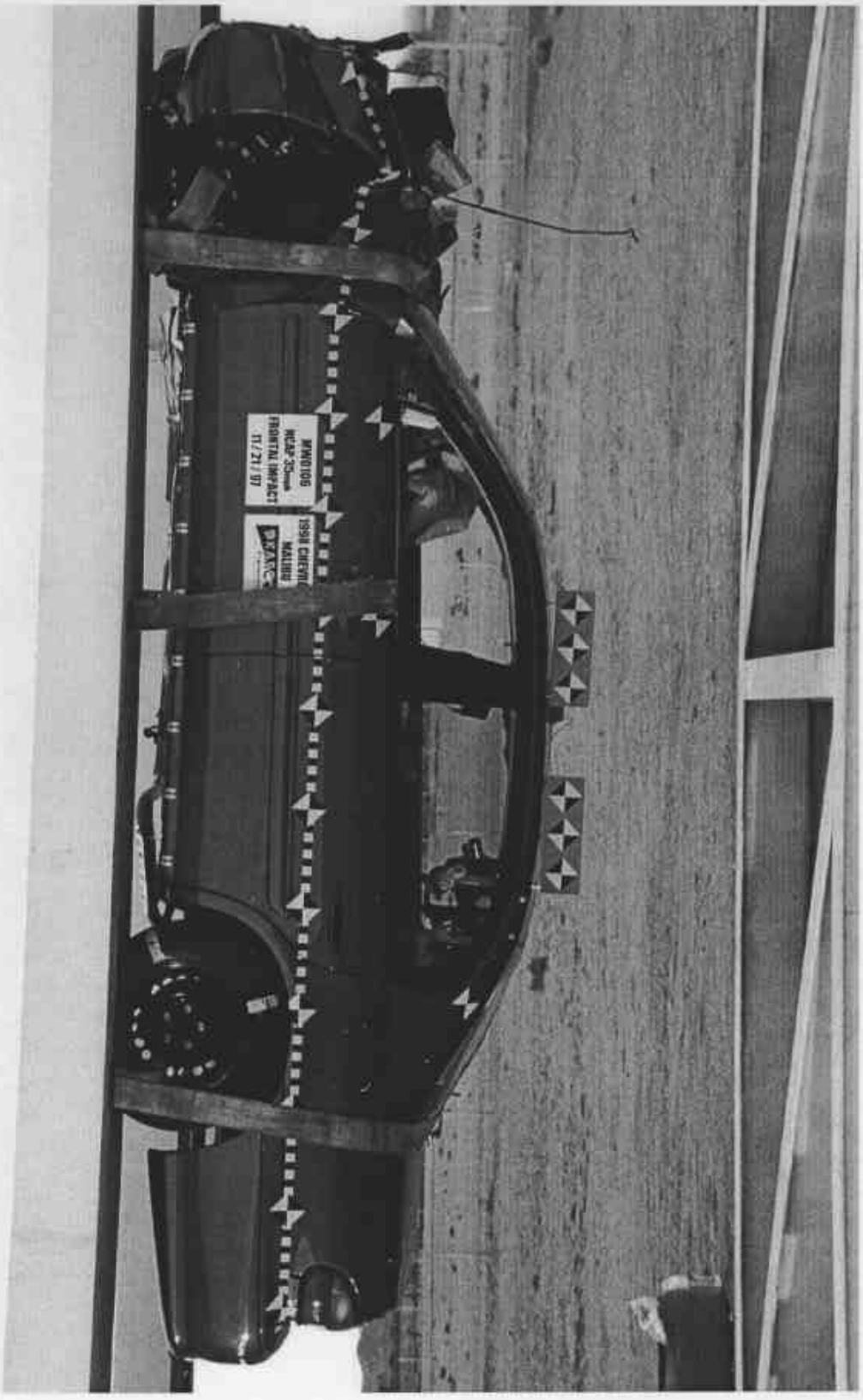


FIGURE 53. VEHICLE ON ROLLOVER

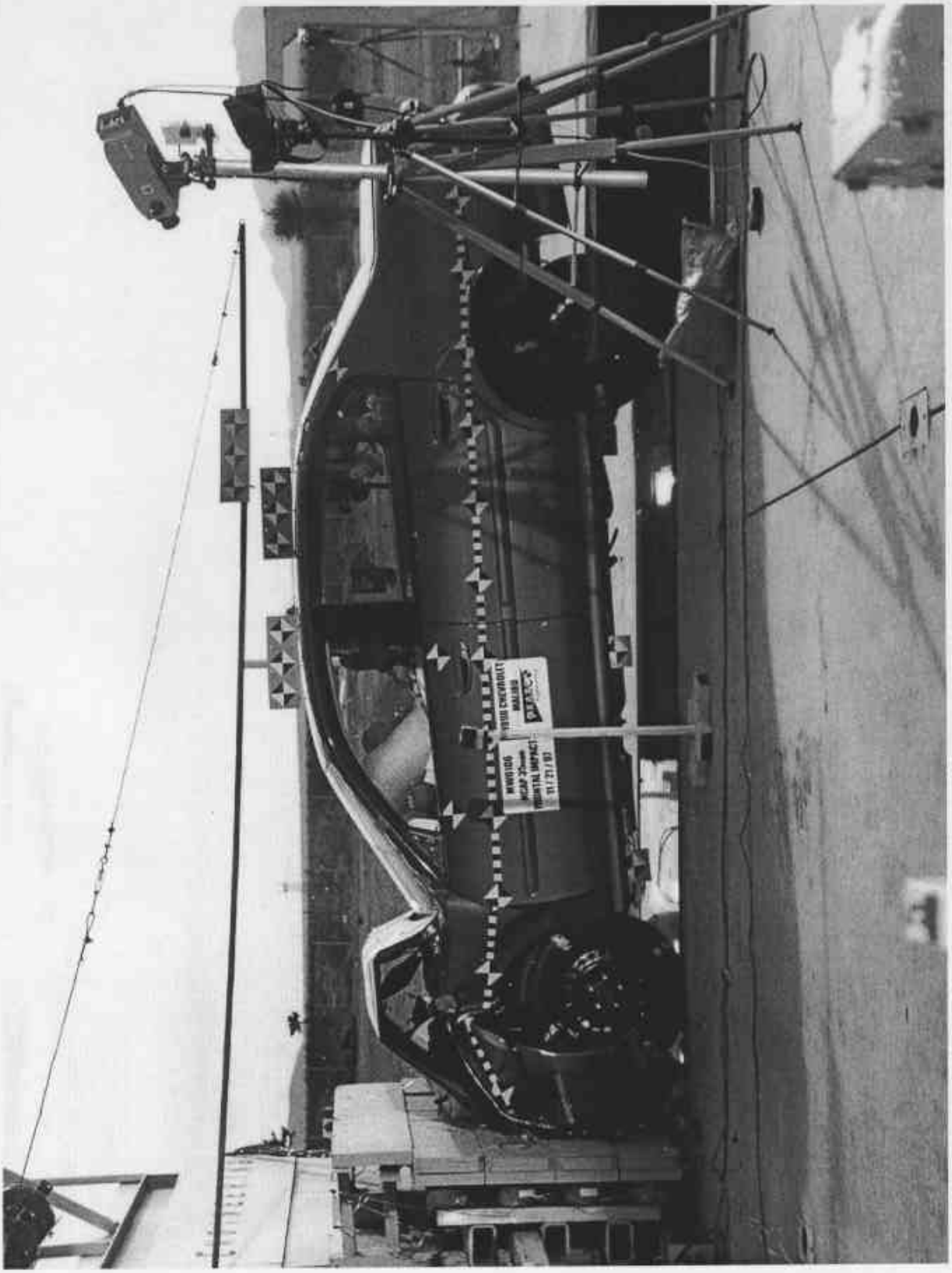


FIGURE 54. VEHICLE DURING IMPACT

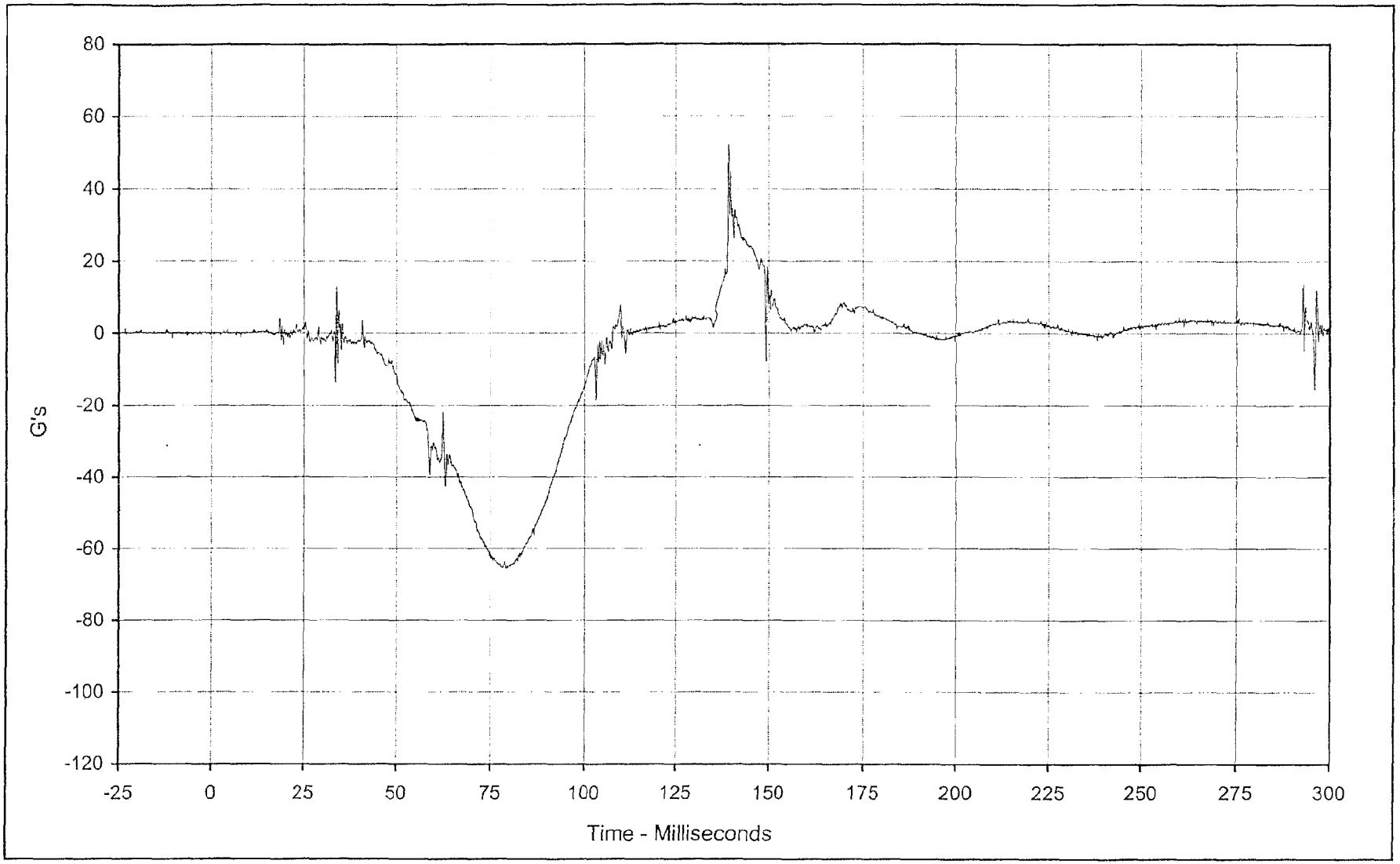
APPENDIX B

DUMMY, VEHICLE AND RESPONSE DATA TRACES

LIST OF DATA PLOTS

LIST OF DATA PLOTS...(Continued)

LIST OF DATA PLOTS...(Continued)

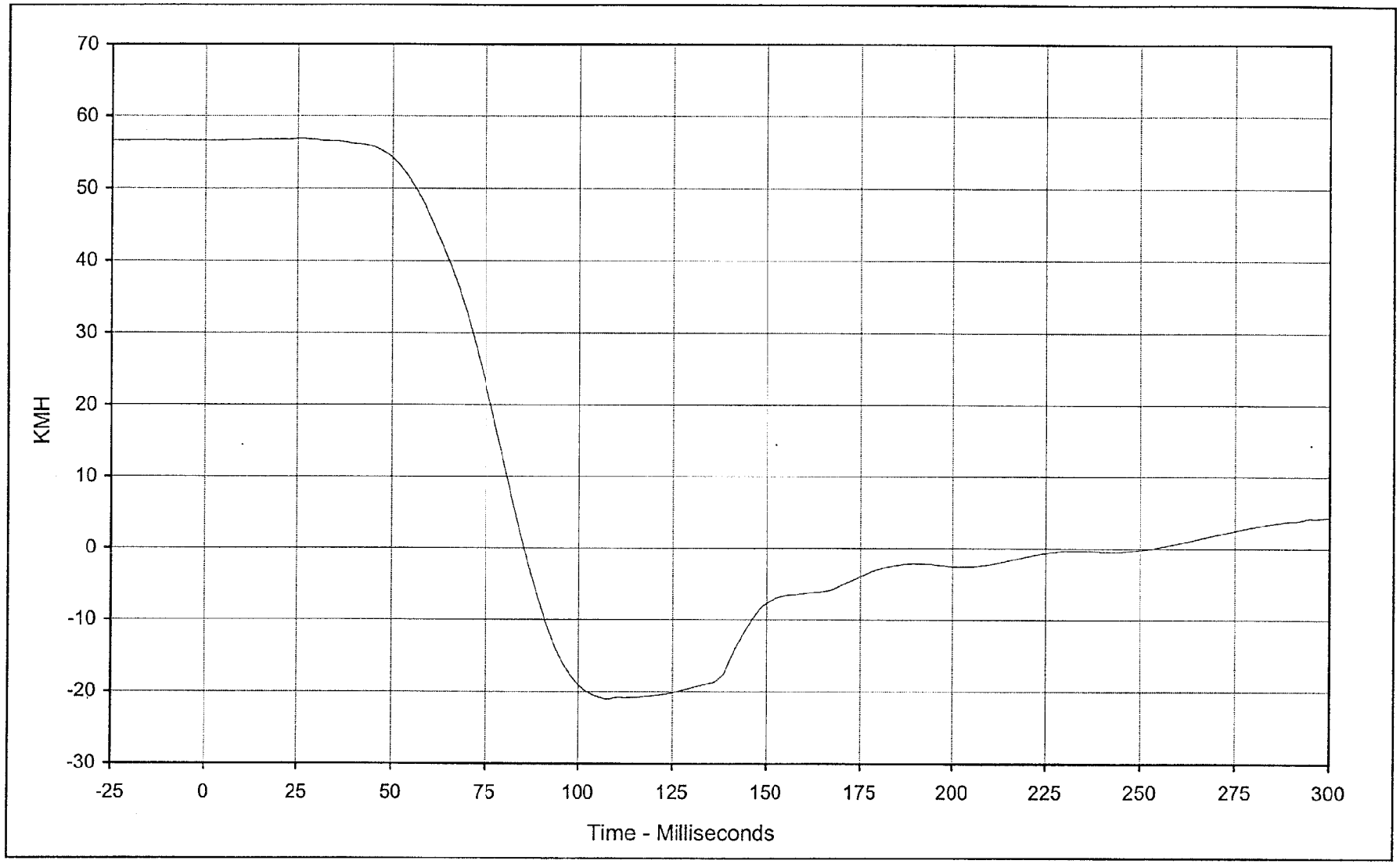


Curve Description:	Driver Head Primary X			
Maximum Value:	52.0	at	139.3	Milliseconds
Minimum Value:	-65.7	at	79.2	Milliseconds
SAE Filter Class:	1000			
Date of Test:	11/21/97			
Curve Number:	FIL-001			

Testing Program: 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering

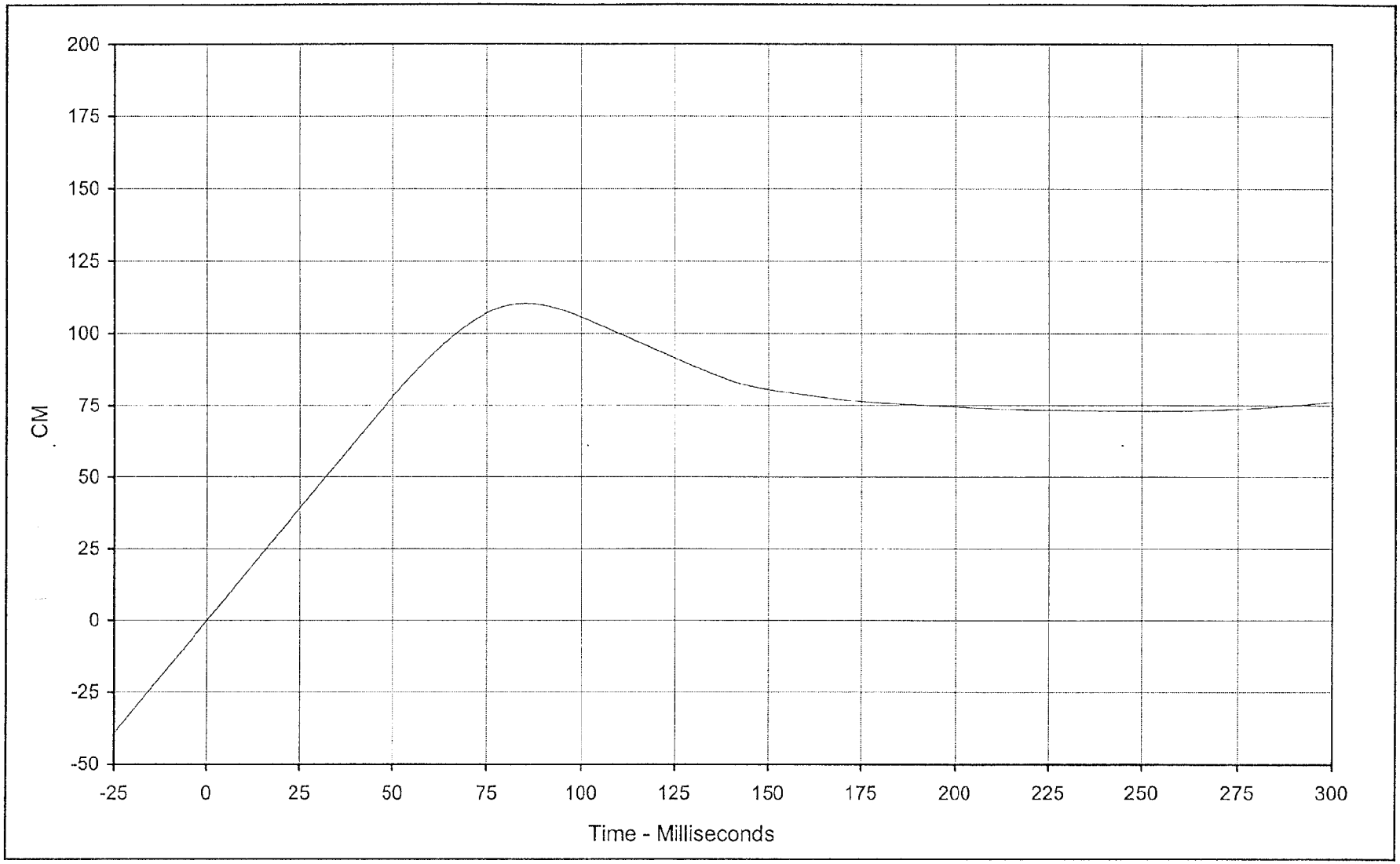


Curve Description:	Driver Head Primary X Velocity			
Maximum Value:	56.9	at	26.0	Milliseconds
Minimum Value:	-21.0	at	107.9	Milliseconds
SAE Filter Class:	180			
Date of Test:	11/21/97			
Curve Number:	IN1-001			

Testing Program: 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description: Driver Head Primary X Displ.

Maximum Value: 110.3 at 85.2 Milliseconds

Minimum Value: -0.1 at 0.0 Milliseconds

SAE Filter Class: 180

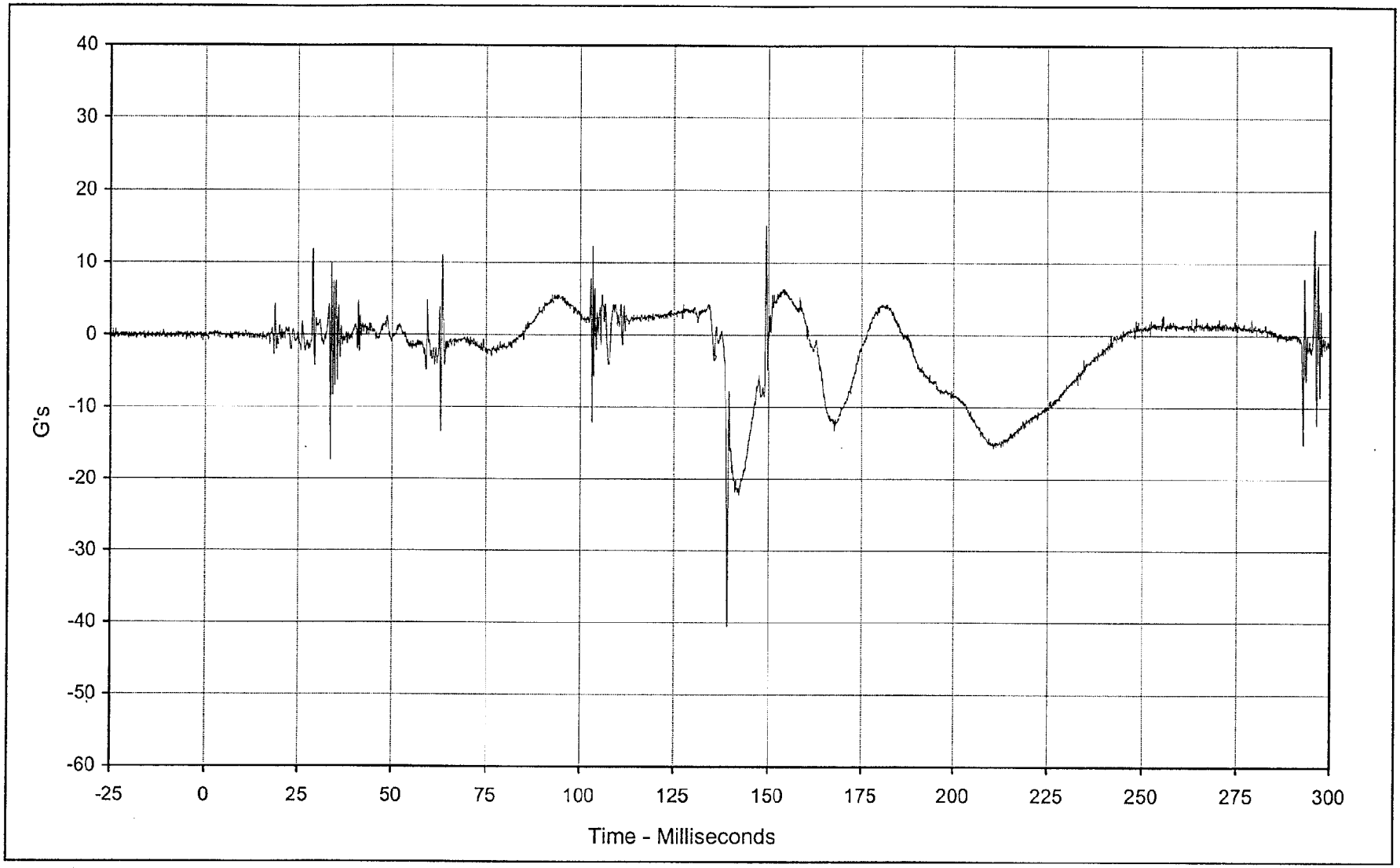
Date of Test: 11/21/97

Curve Number: IN2-001

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description: Driver Head Primary Y

Maximum Value: 15.1 at 149.3 Milliseconds

Minimum Value: -40.5 at 139.2 Milliseconds

SAE Filter Class: 1000

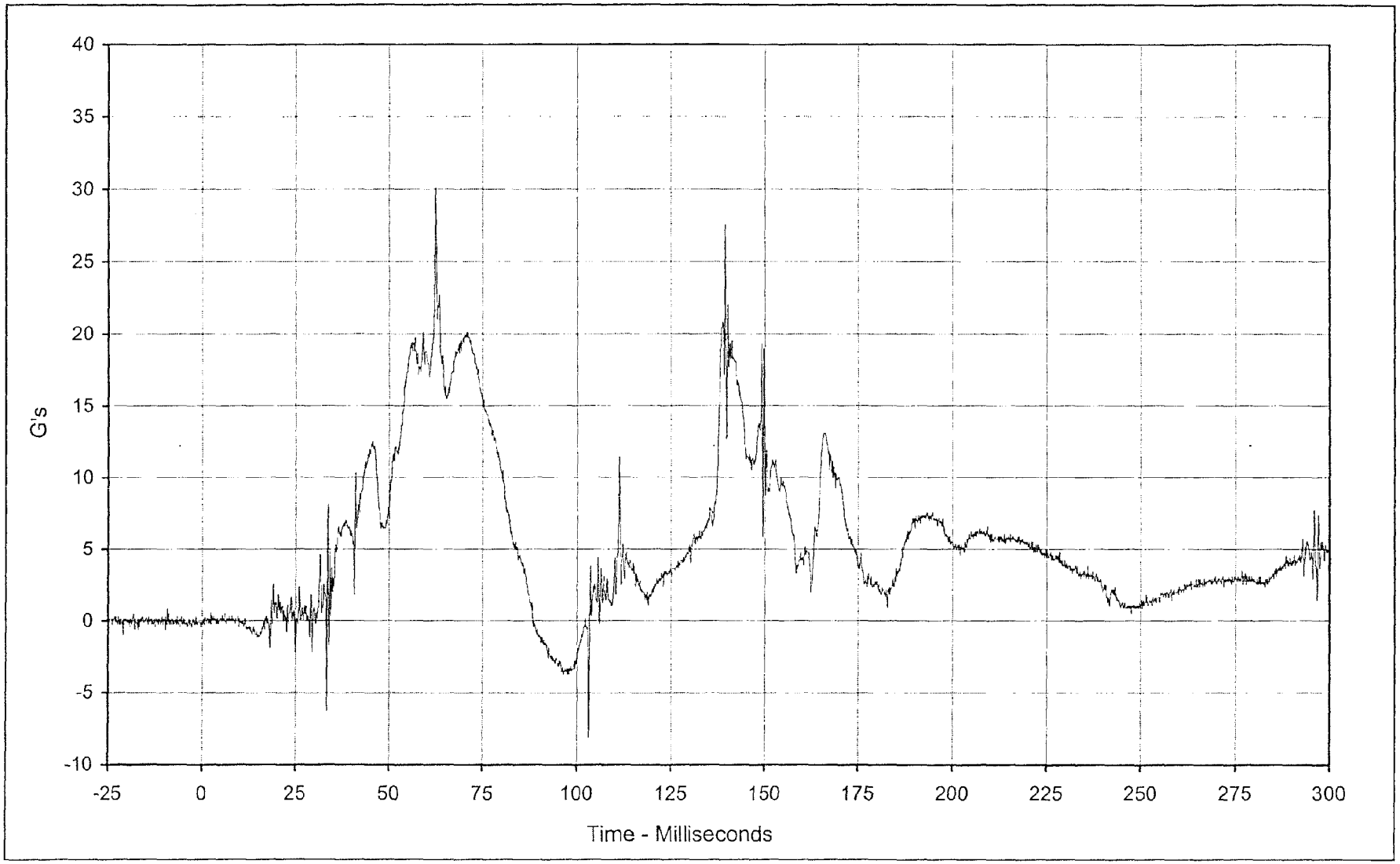
Date of Test: 11/21/97

Curve Number: FIL-002

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering

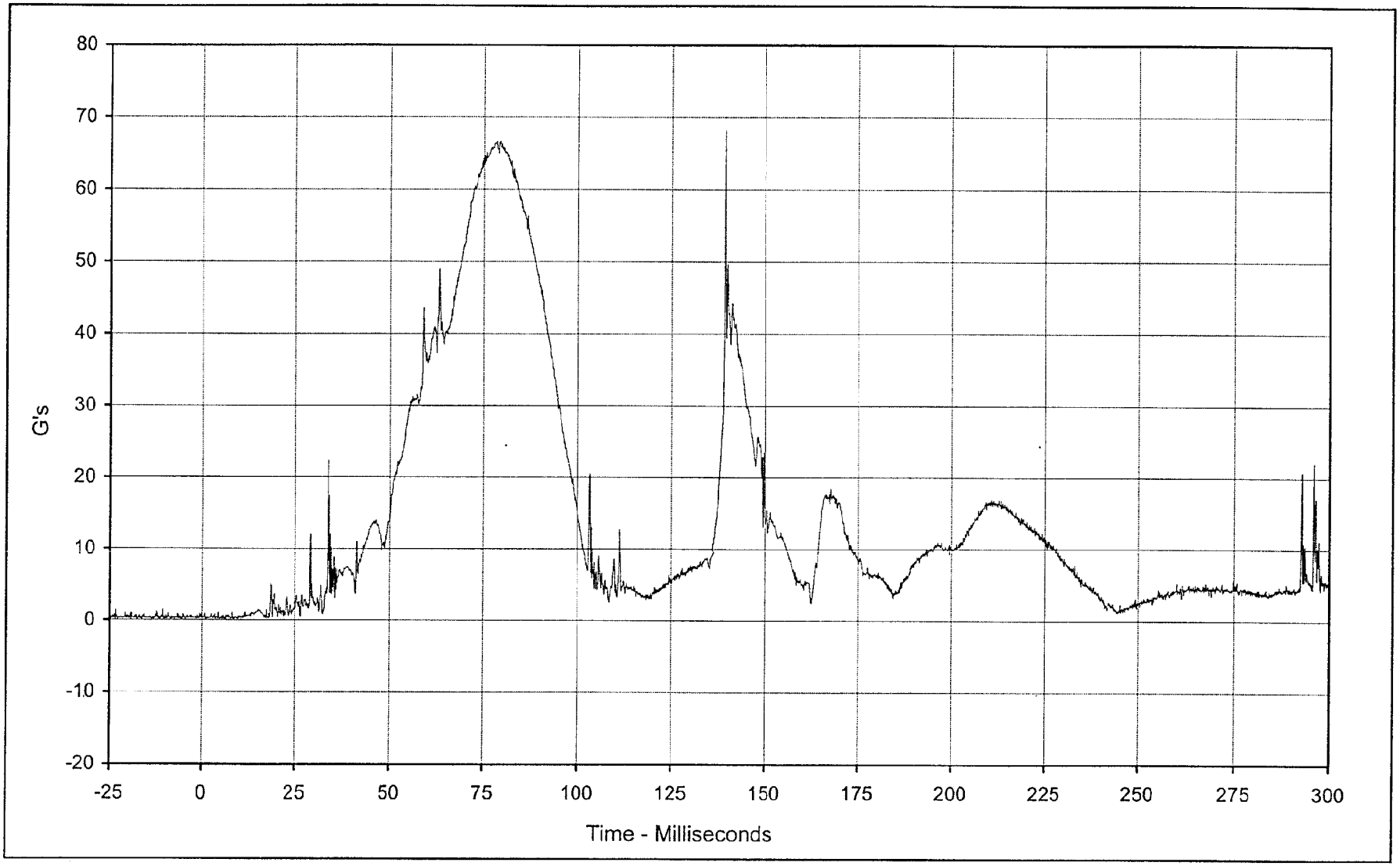


Curve Description:	Driver Head Primary Z				
Maximum Value:	30.1	at	62.5	Milliseconds	
Minimum Value:	-8.2	at	103.2	Milliseconds	
SAE Filter Class:	1000				
Date of Test:	11/21/97				
Curve Number:	FIL-003				

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description: Driver Head Resultant Primary

Maximum Value: 68.2 at 139.3 Milliseconds

Minimum Value: 0.1 at 1.1 Milliseconds

SAE Filter Class: 1000

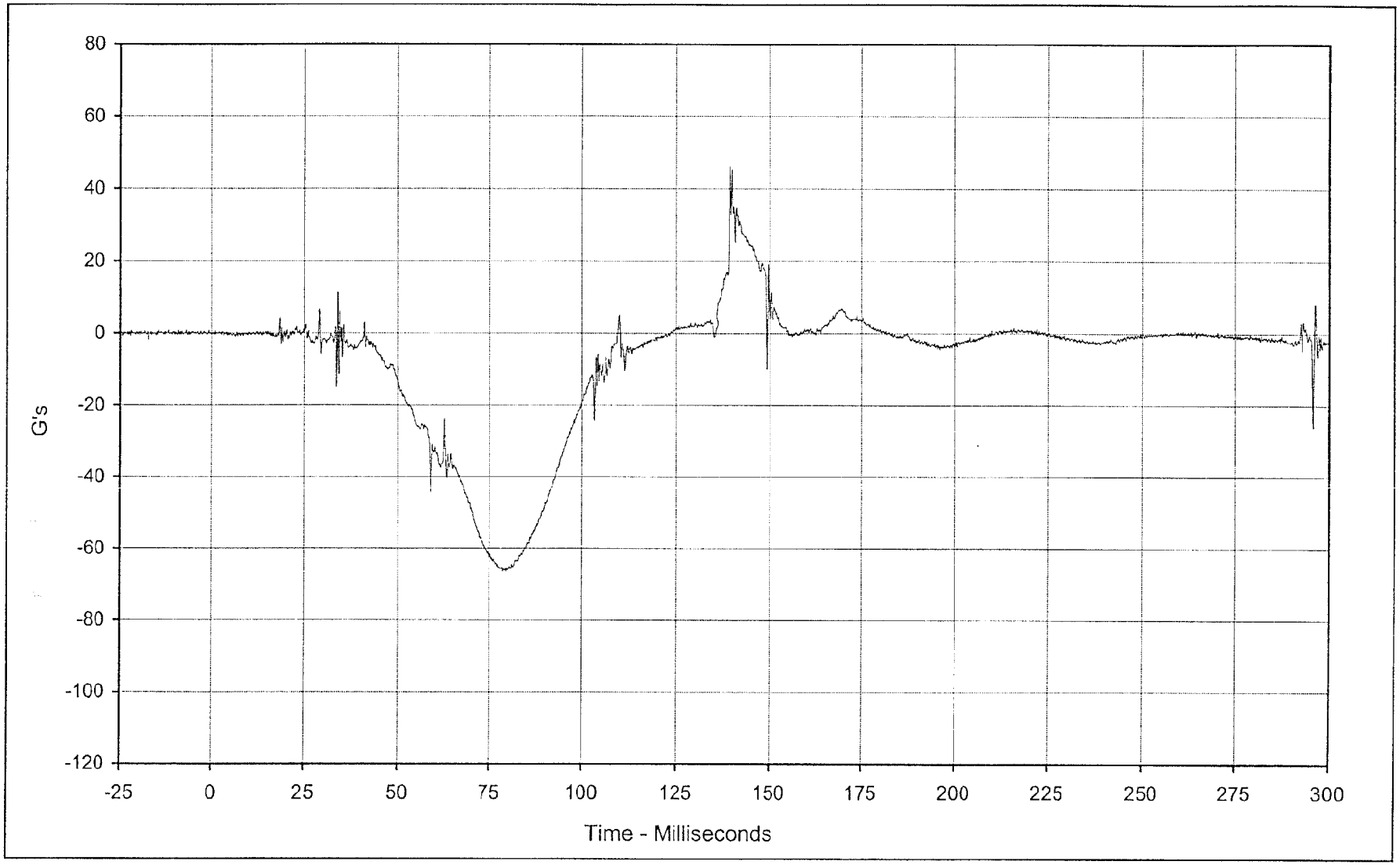
Date of Test: 11/21/97

Curve Number: RES-001

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering

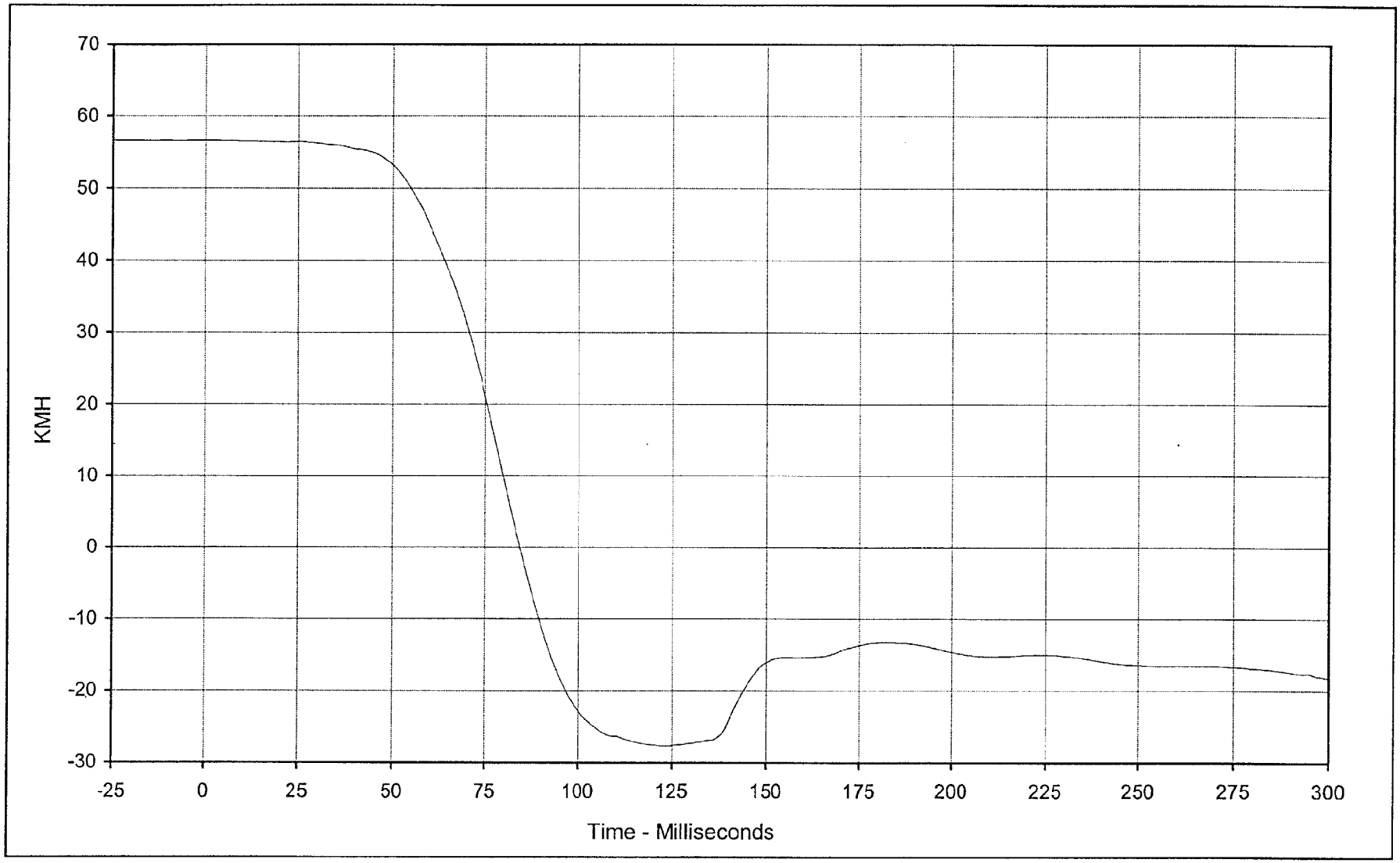


Curve Description:	Driver Head Redundant X			
Maximum Value:	46.1	at	139.3	Milliseconds
Minimum Value:	-66.4	at	78.7	Milliseconds
SAE Filter Class:	1000			
Date of Test:	11/21/97			
Curve Number:	FIL-004			

Testing Program: 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description: Driver Head Redundant X Velocity

Maximum Value: 56.6 at 0.0 Milliseconds

Minimum Value: -27.7 at 123.3 Milliseconds

SAE Filter Class: 180

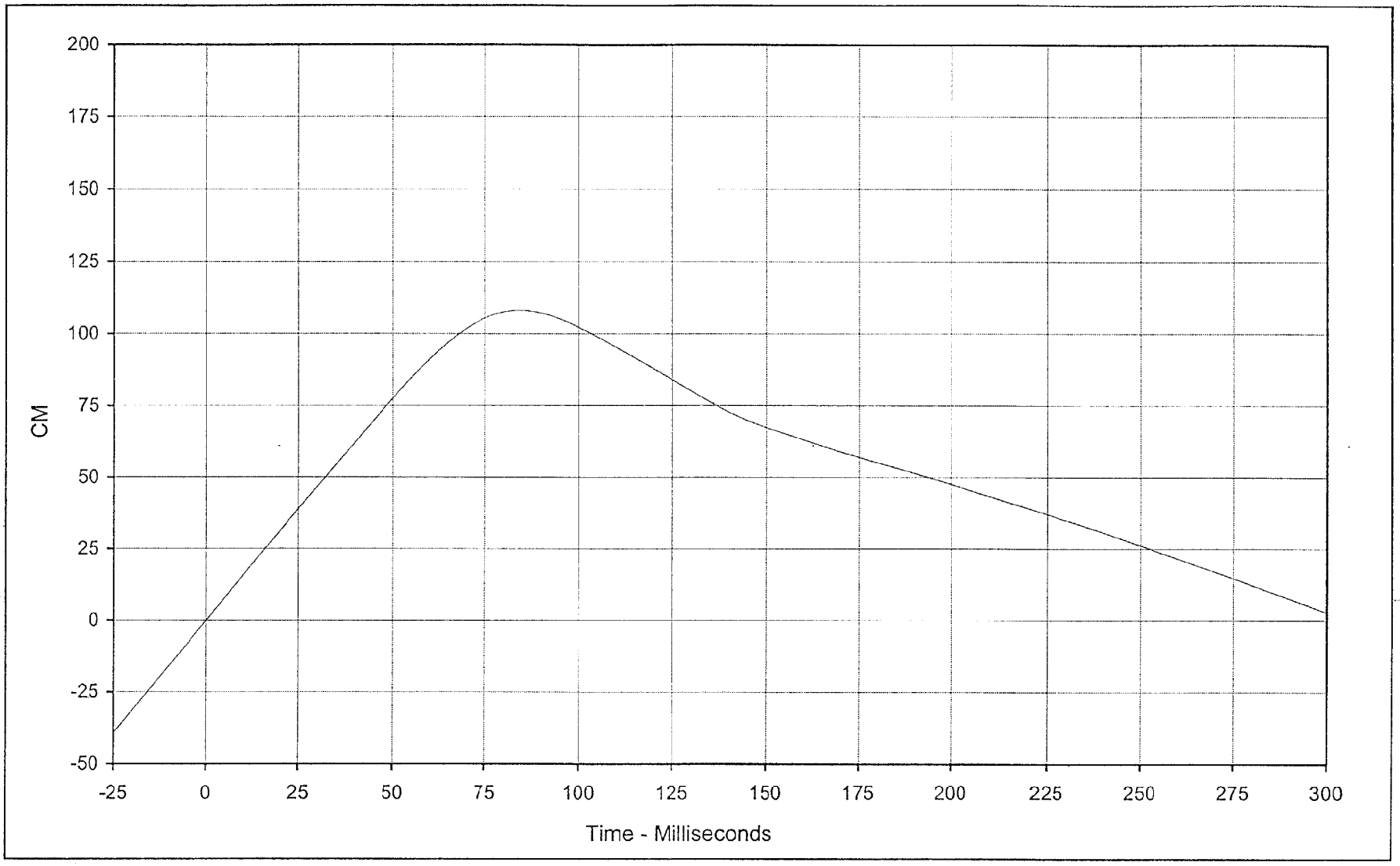
Date of Test: 11/21/97

Curve Number: IN1-004

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description: Driver Head Redundant X Displ.

Maximum Value: 108.1 at 84.2 Milliseconds

Minimum Value: -0.1 at 0.0 Milliseconds

SAE Filter Class: 180

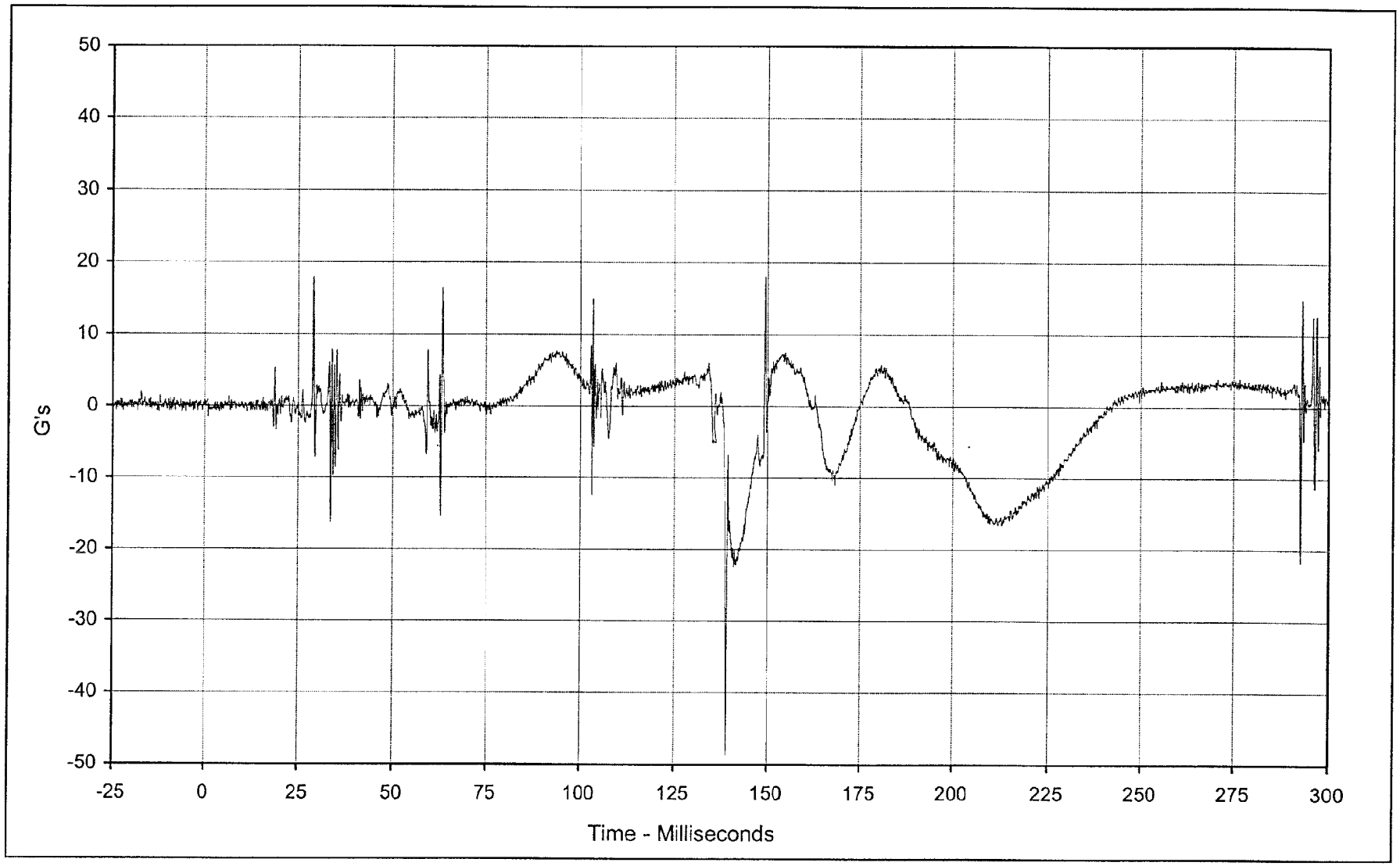
Date of Test: 11/21/97

Curve Number: IN2-004

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description: Driver Head Redundant Y

Maximum Value: 18.0 at 29.0 Milliseconds

Minimum Value: -48.7 at 139.2 Milliseconds

SAE Filter Class: 1000

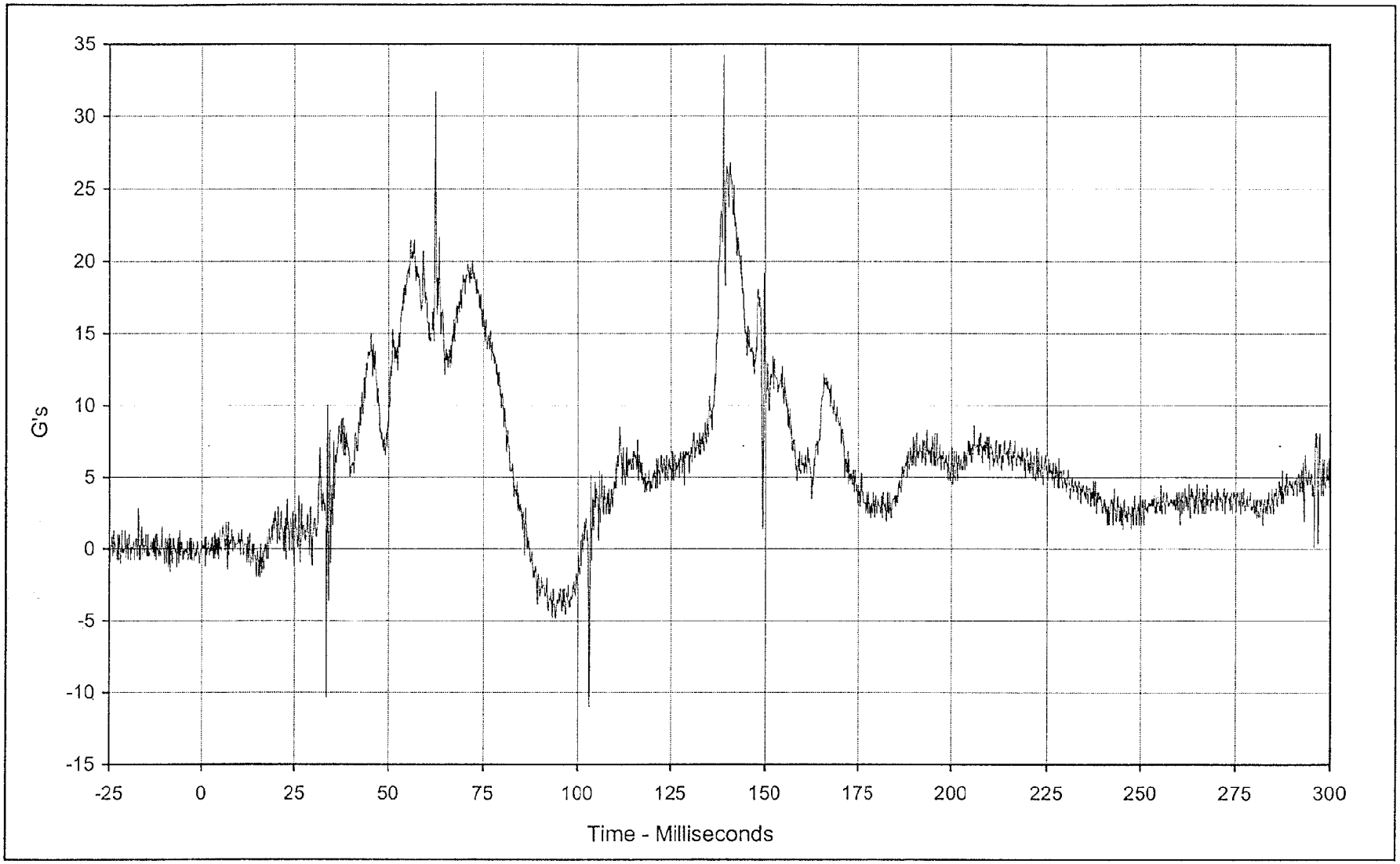
Date of Test: 11/21/97

Curve Number: FIL-005

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering

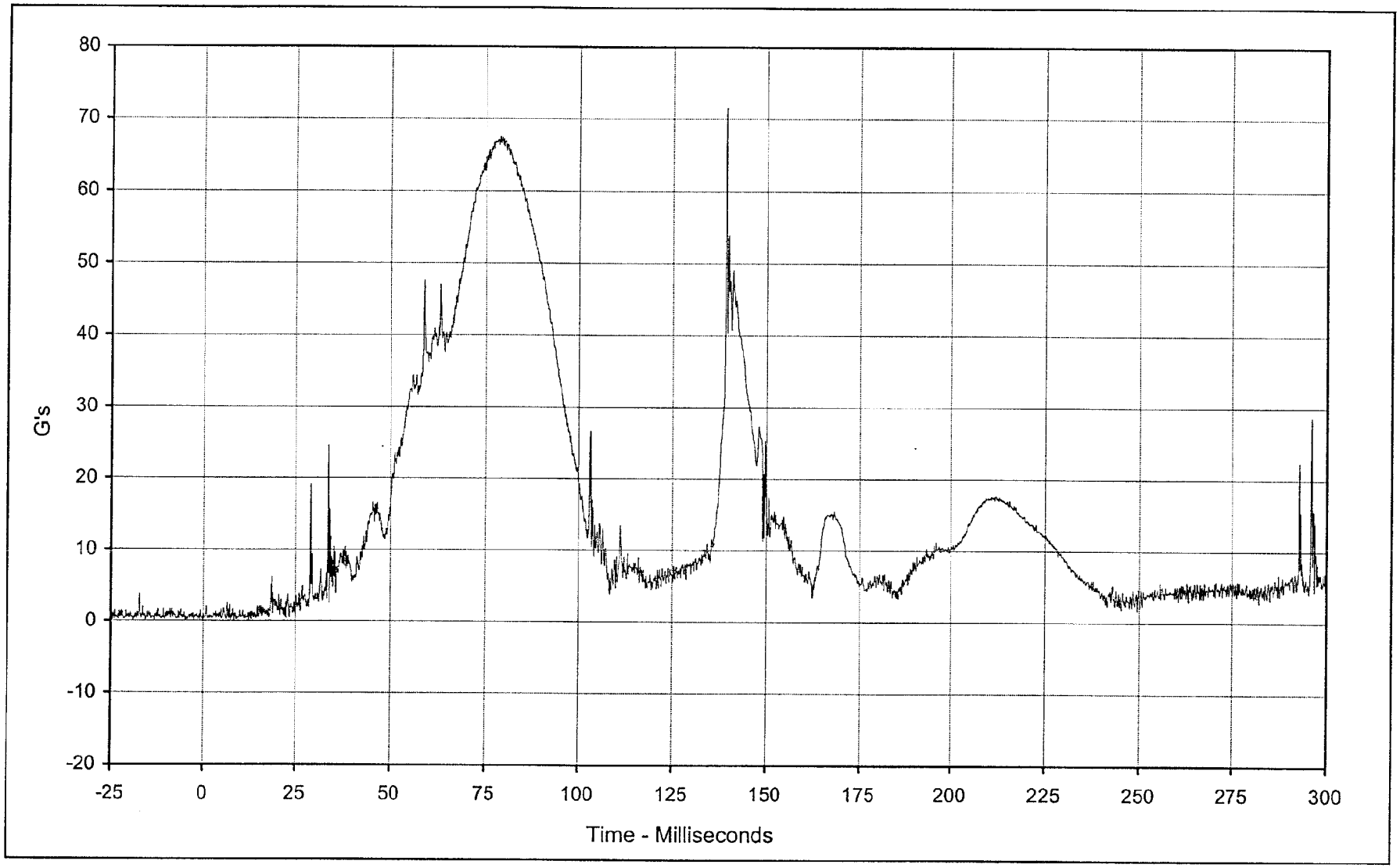


Curve Description:	Driver Head Redundant Z			
Maximum Value:	34.2	at	139.3	Milliseconds
Minimum Value:	-11.0	at	103.2	Milliseconds
SAE Filter Class:	1000			
Date of Test:	11/21/97			
Curve Number:	FIL-006			

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

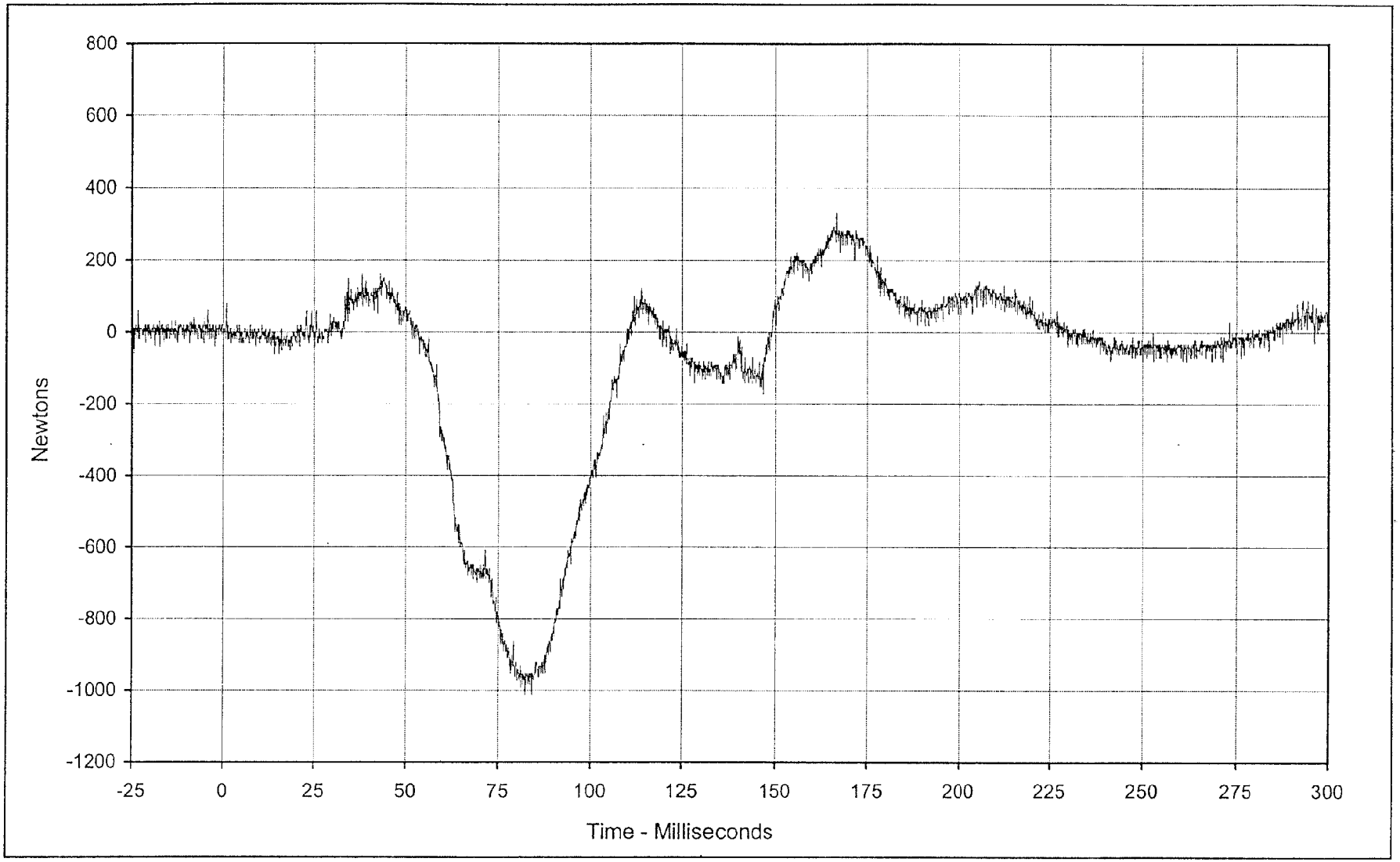
KARCO Engineering



Curve Description:	Driver Head Resultant Redundant			
Maximum Value:	71.5	at	139.3	Milliseconds
Minimum Value:	0.2	at	7.5	Milliseconds
SAE Filter Class:	1000			
Date of Test:	11/21/97			
Curve Number:	RES-004			

Testing Program	1998 NHTSA 35 mph NCAP No.: MW0106
Test Vehicle:	1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering

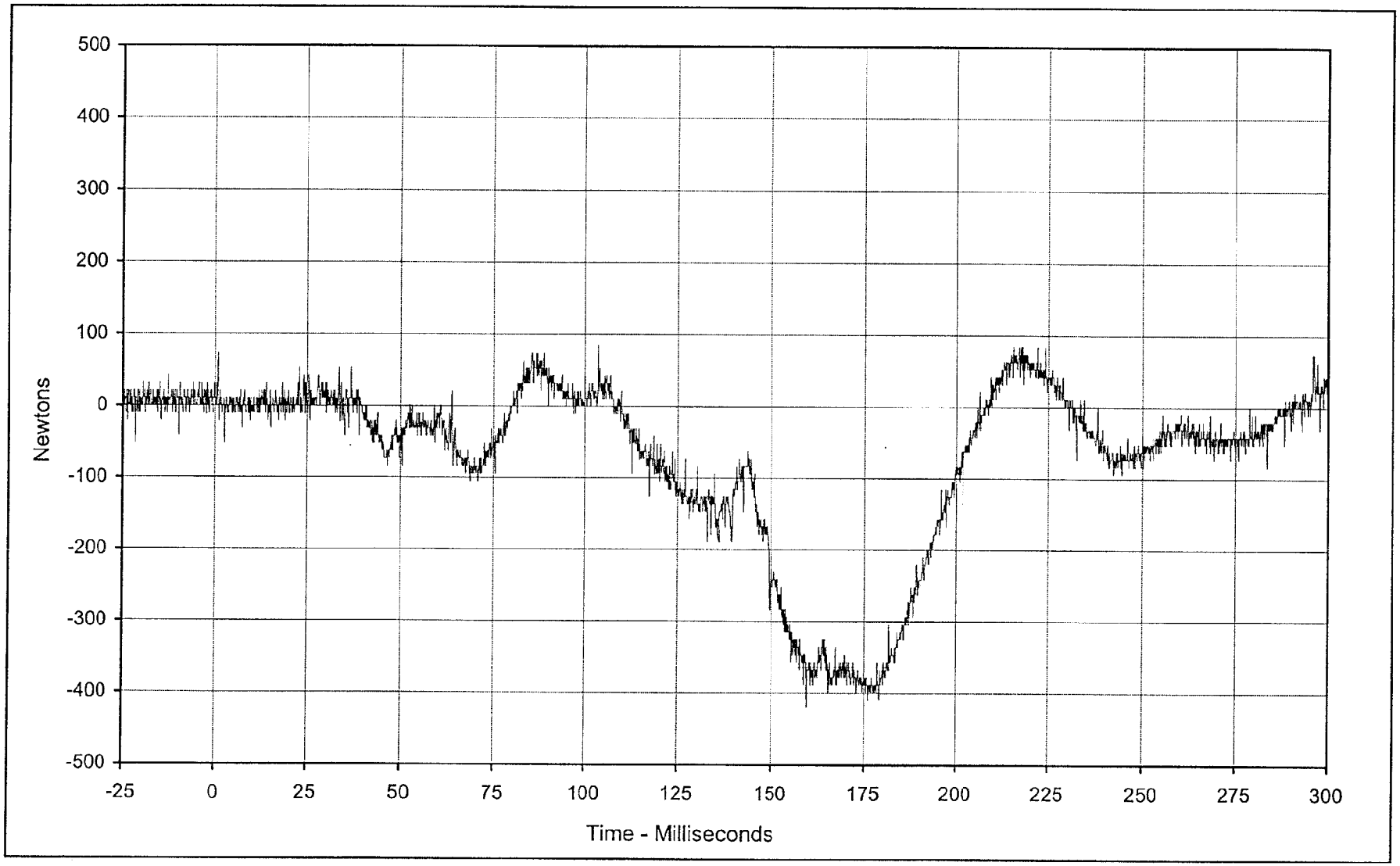


Curve Description:	Driver Neck Force X			
Maximum Value:	333.5	at	166.7	Milliseconds
Minimum Value:	-1013.2	at	82.3	Milliseconds
SAE Filter Class:	1000			
Date of Test:	11/21/97			
Curve Number:	FIL-007			

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description: Driver Neck Force Y

Maximum Value: 84.0 at 103.5 Milliseconds

Minimum Value: -420.0 at 159.8 Milliseconds

SAE Filter Class: 1000

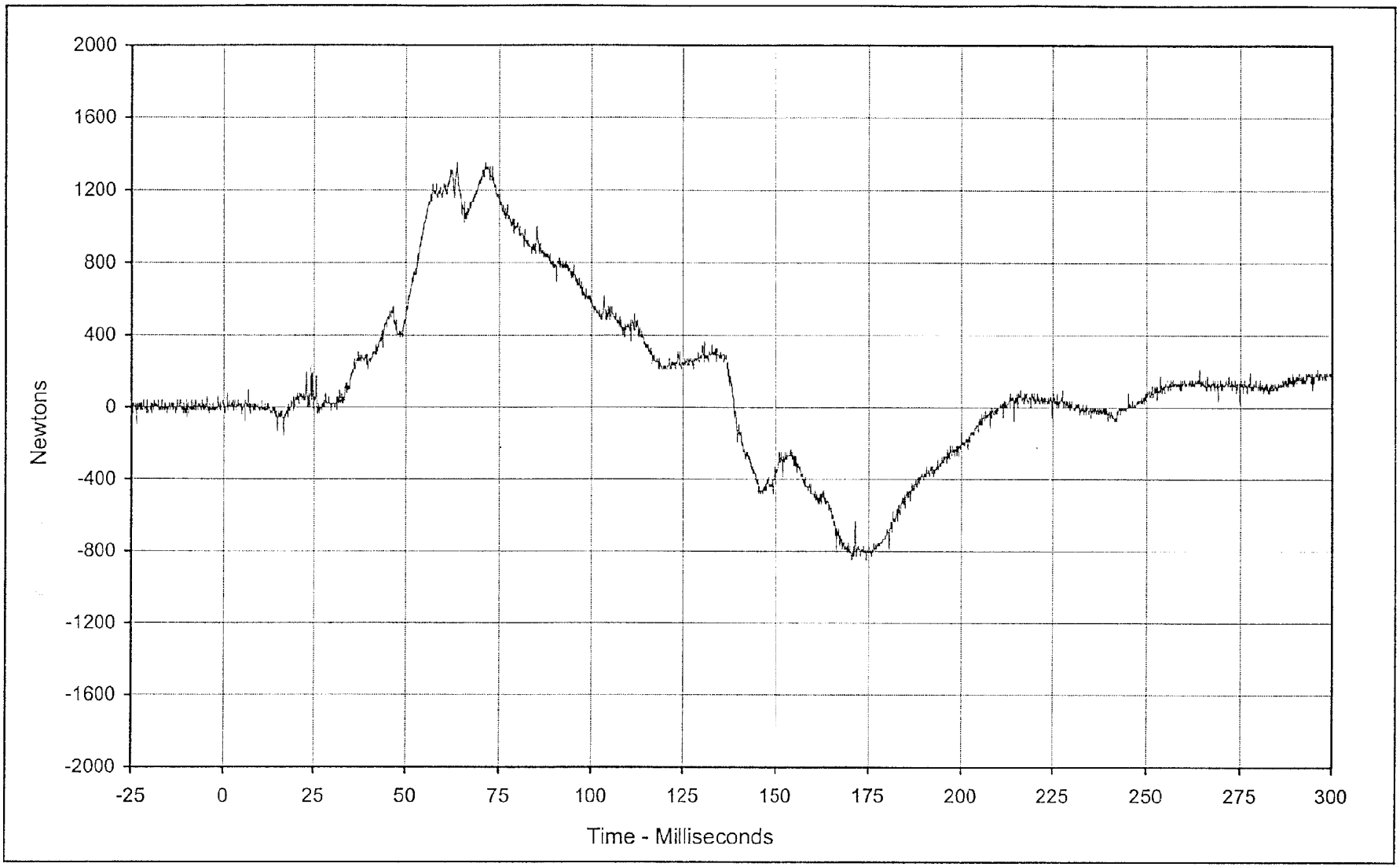
Date of Test: 11/21/97

Curve Number: FIL-008

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering

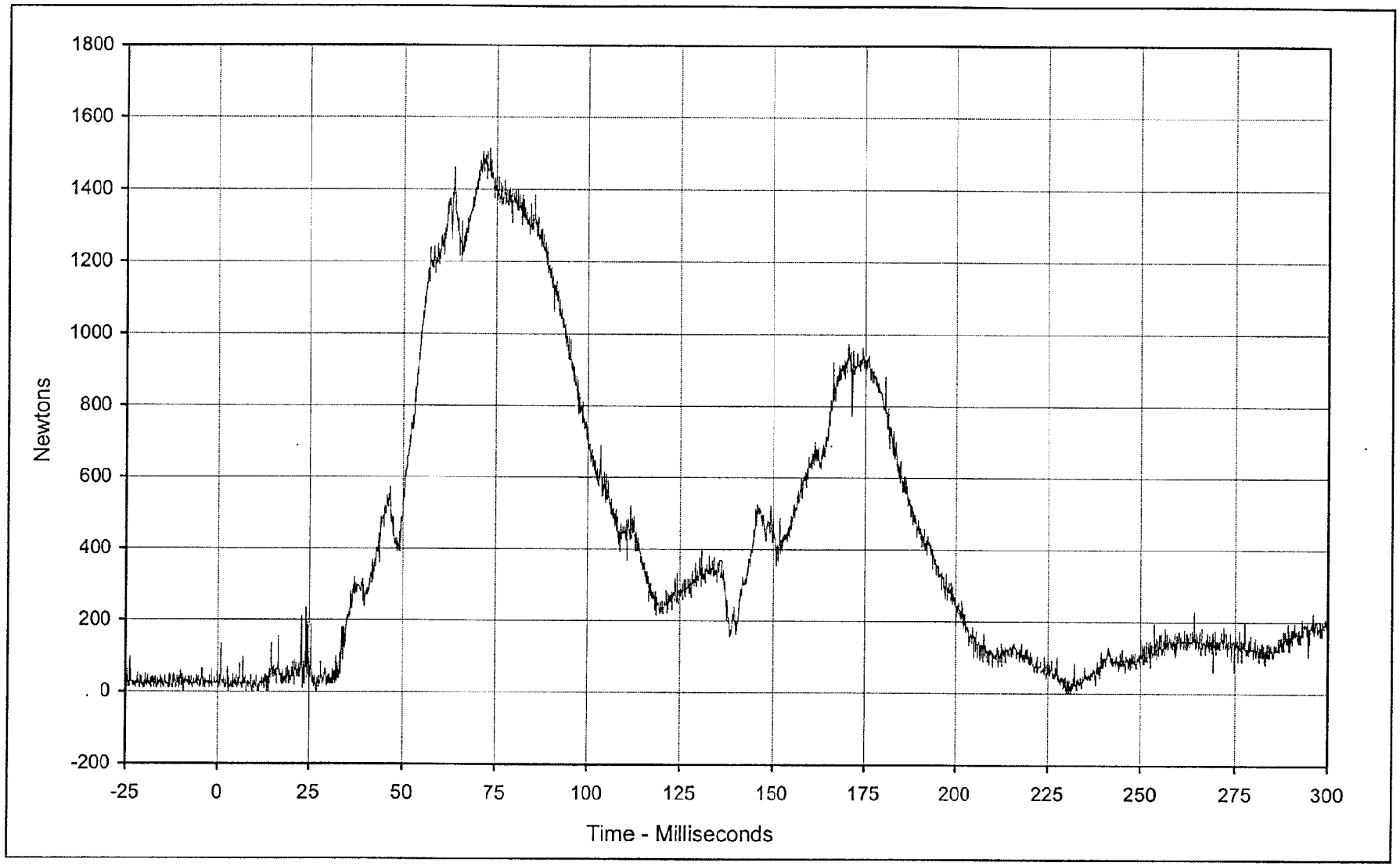


Curve Description:	Driver Neck Force Z			
Maximum Value:	1350.0	at	63.6	Milliseconds
Minimum Value:	-848.8	at	170.4	Milliseconds
SAE Filter Class:	1000			
Date of Test:	11/21/97			
Curve Number:	FIL-009			

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description: Driver Neck Force Resultant

Maximum Value: 1514.1 at 73.2 Milliseconds

Minimum Value: 0.6 at 2.8 Milliseconds

SAE Filter Class: 1000

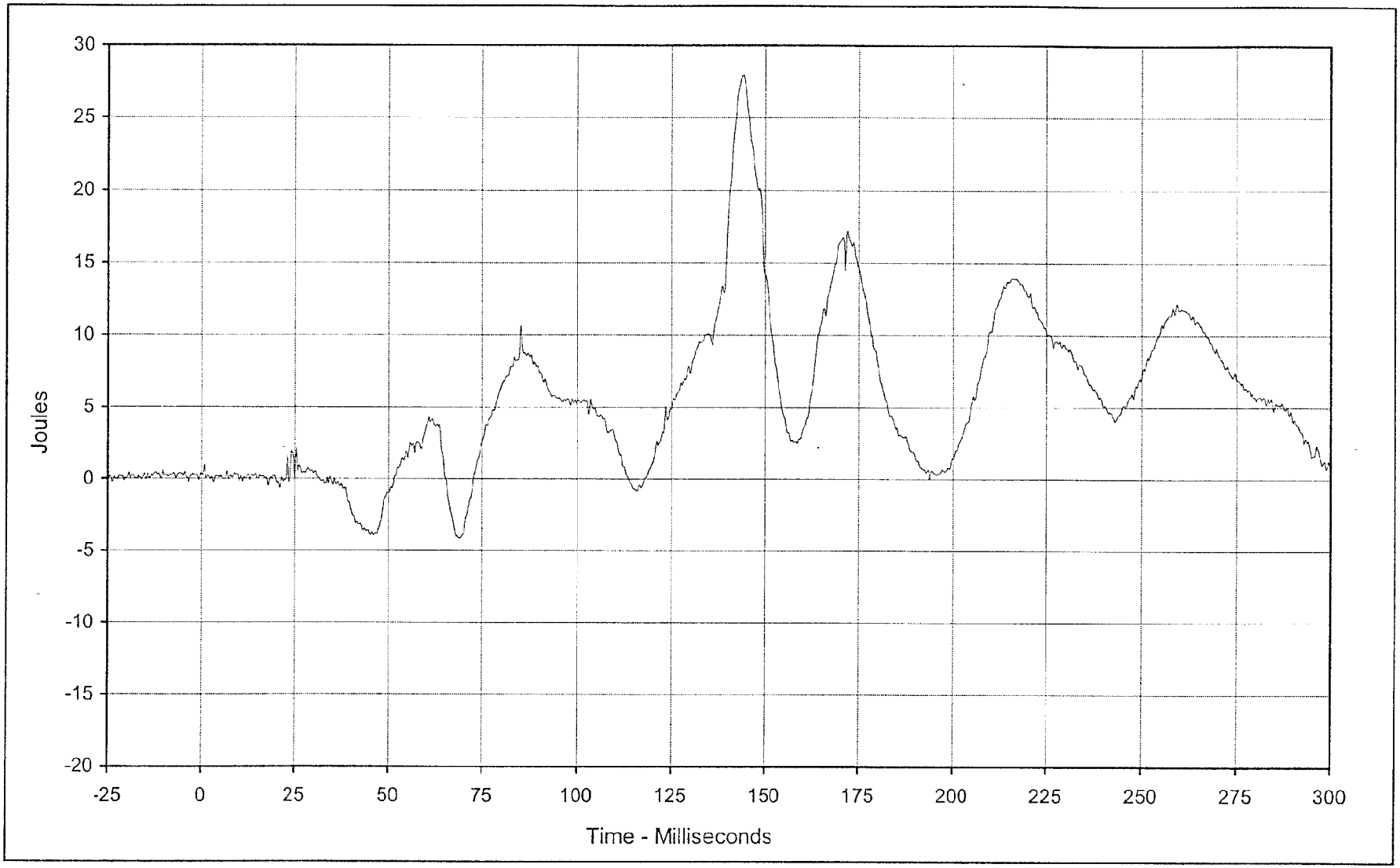
Date of Test: 11/21/97

Curve Number: RES-007

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering

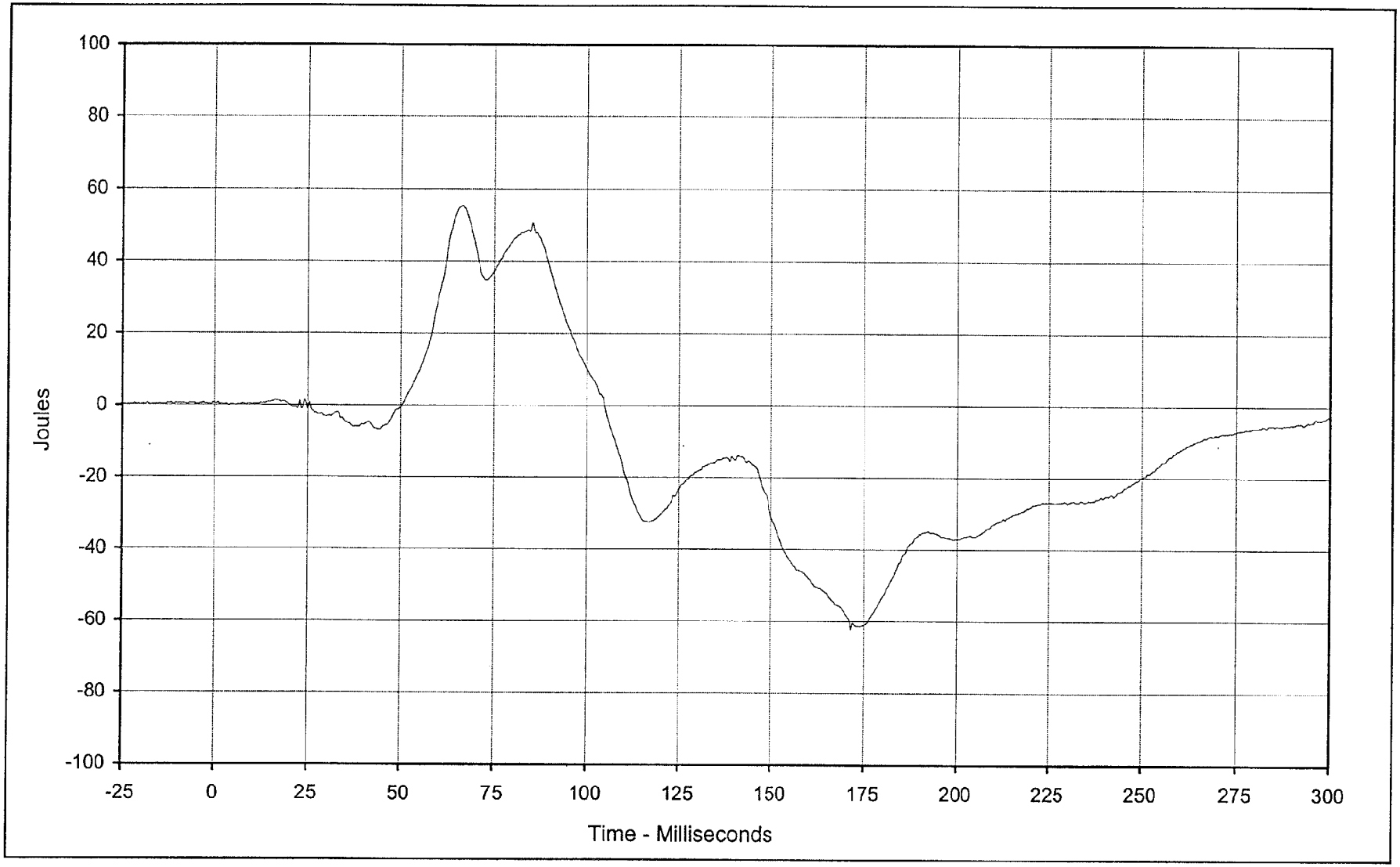


Curve Description:	Driver Neck Moment X			
Maximum Value:	28.0	at	144.1	Milliseconds
Minimum Value:	-4.2	at	68.9	Milliseconds
SAE Filter Class:	600			
Date of Test:	11/21/97			
Curve Number:	FIL-010			

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description: Driver Neck Moment Y

Maximum Value: 55.3 at 66.5 Milliseconds

Minimum Value: -62.4 at 171.4 Milliseconds

SAE Filter Class: 600

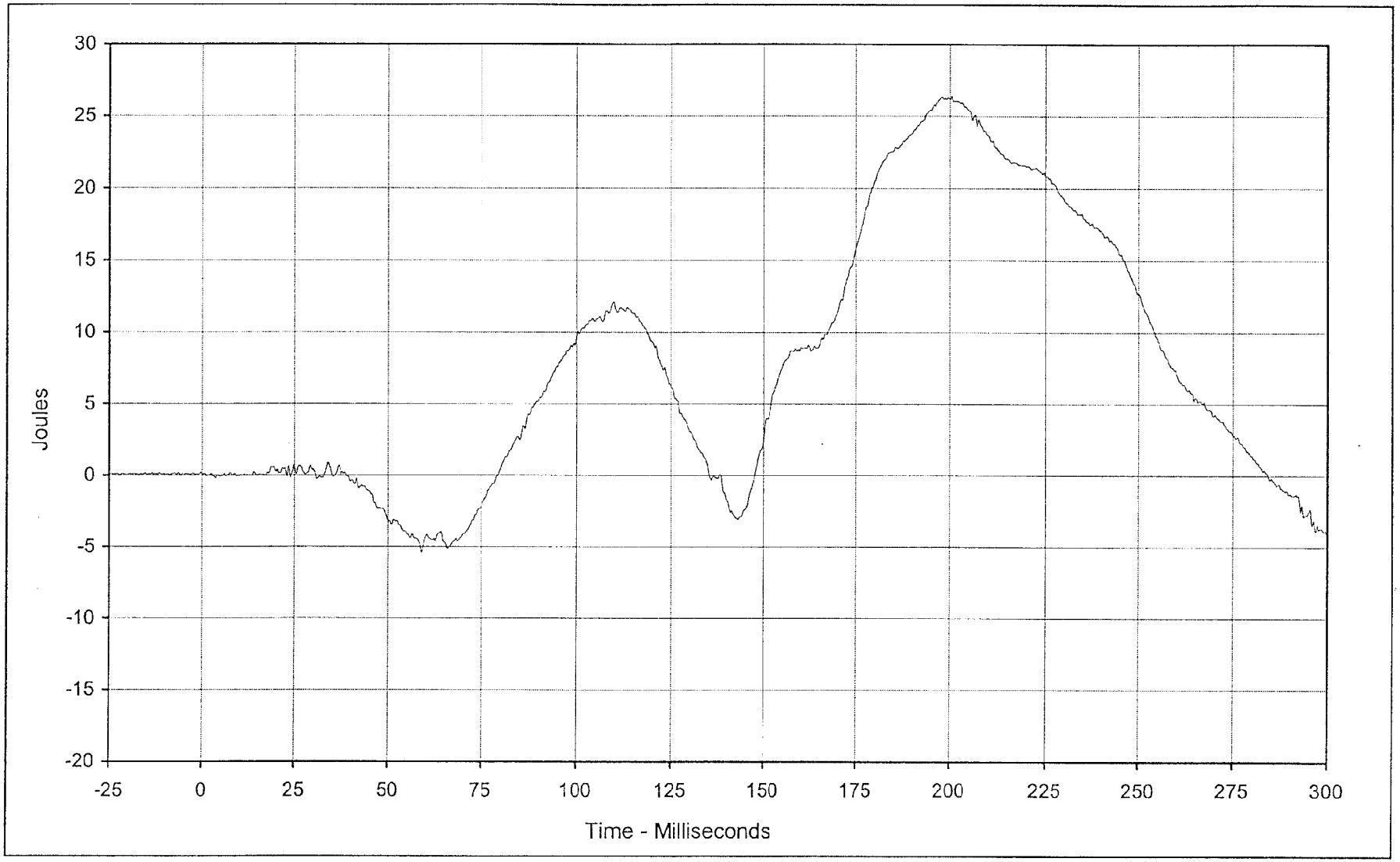
Date of Test: 11/21/97

Curve Number: FIL-011

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description: Driver Neck Moment Z

Maximum Value: 26.4 at 200.5 Milliseconds

Minimum Value: -5.4 at 59.0 Milliseconds

SAE Filter Class: 600

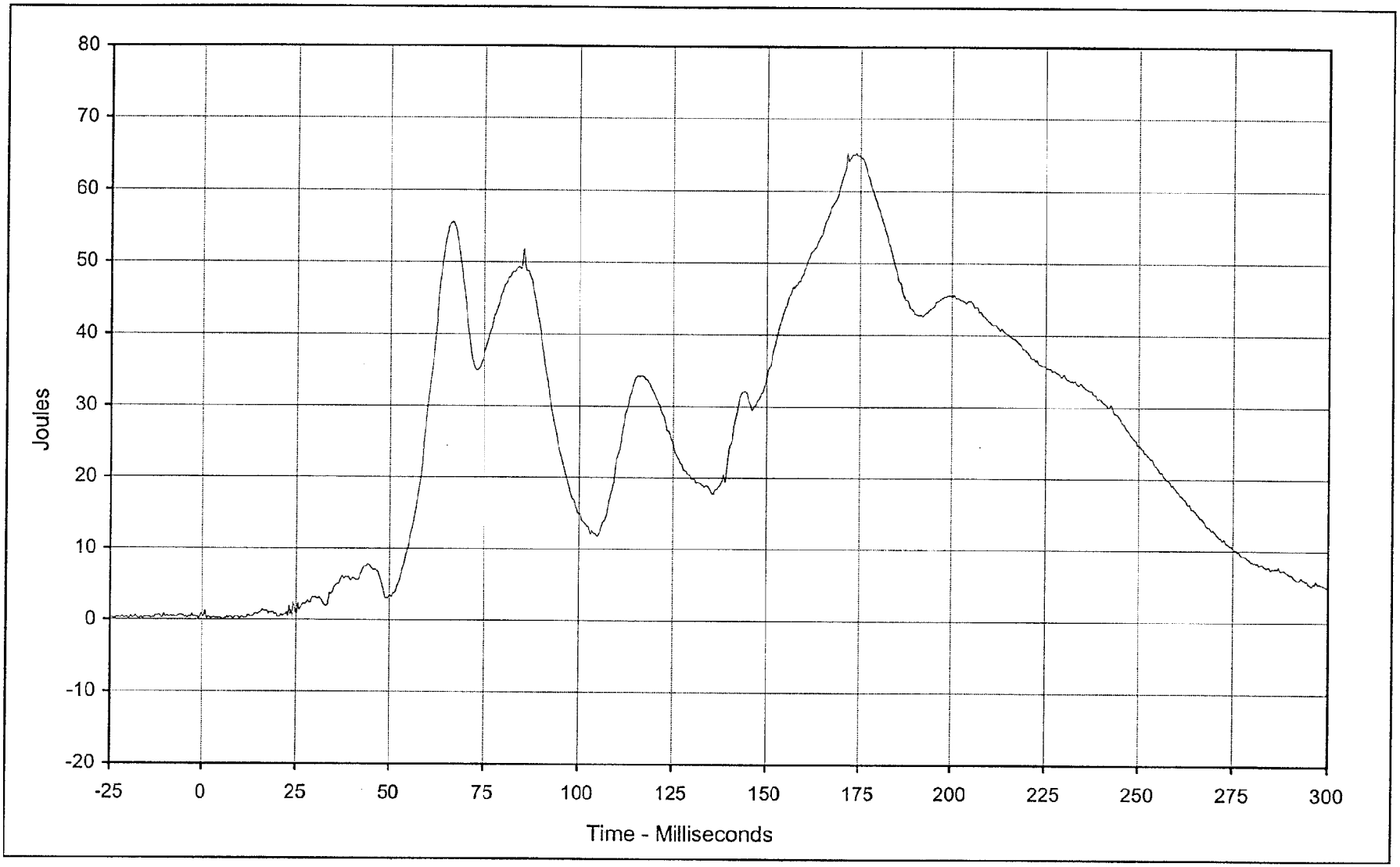
Date of Test: 11/21/97

Curve Number: FIL-012

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering

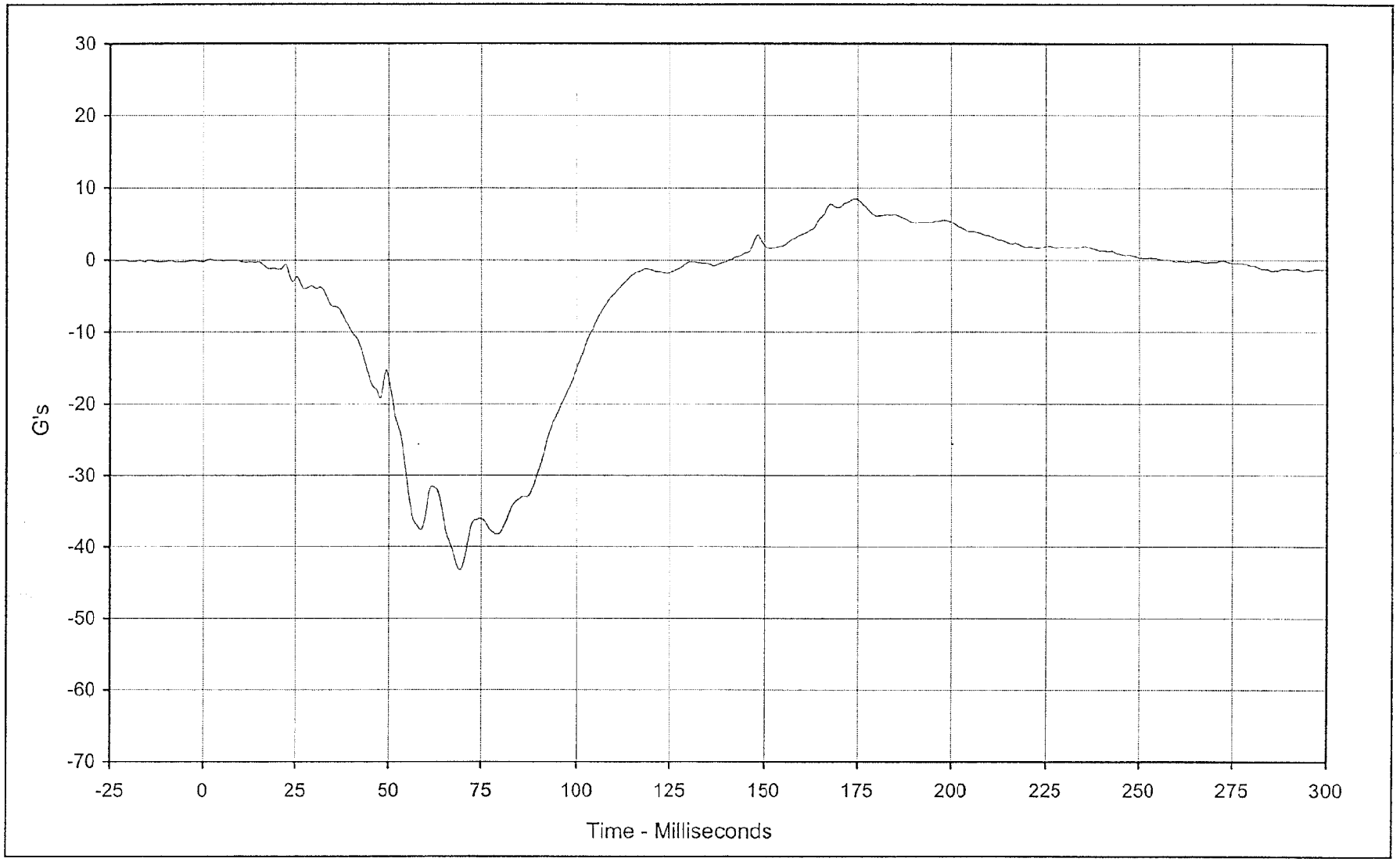


Curve Description:	Driver Neck Moment Resultant			
Maximum Value:	65.3	at	173.8	Milliseconds
Minimum Value:	0.0	at	5.7	Milliseconds
SAE Filter Class:	600			
Date of Test:	11/21/97			
Curve Number:	RES-010			

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering

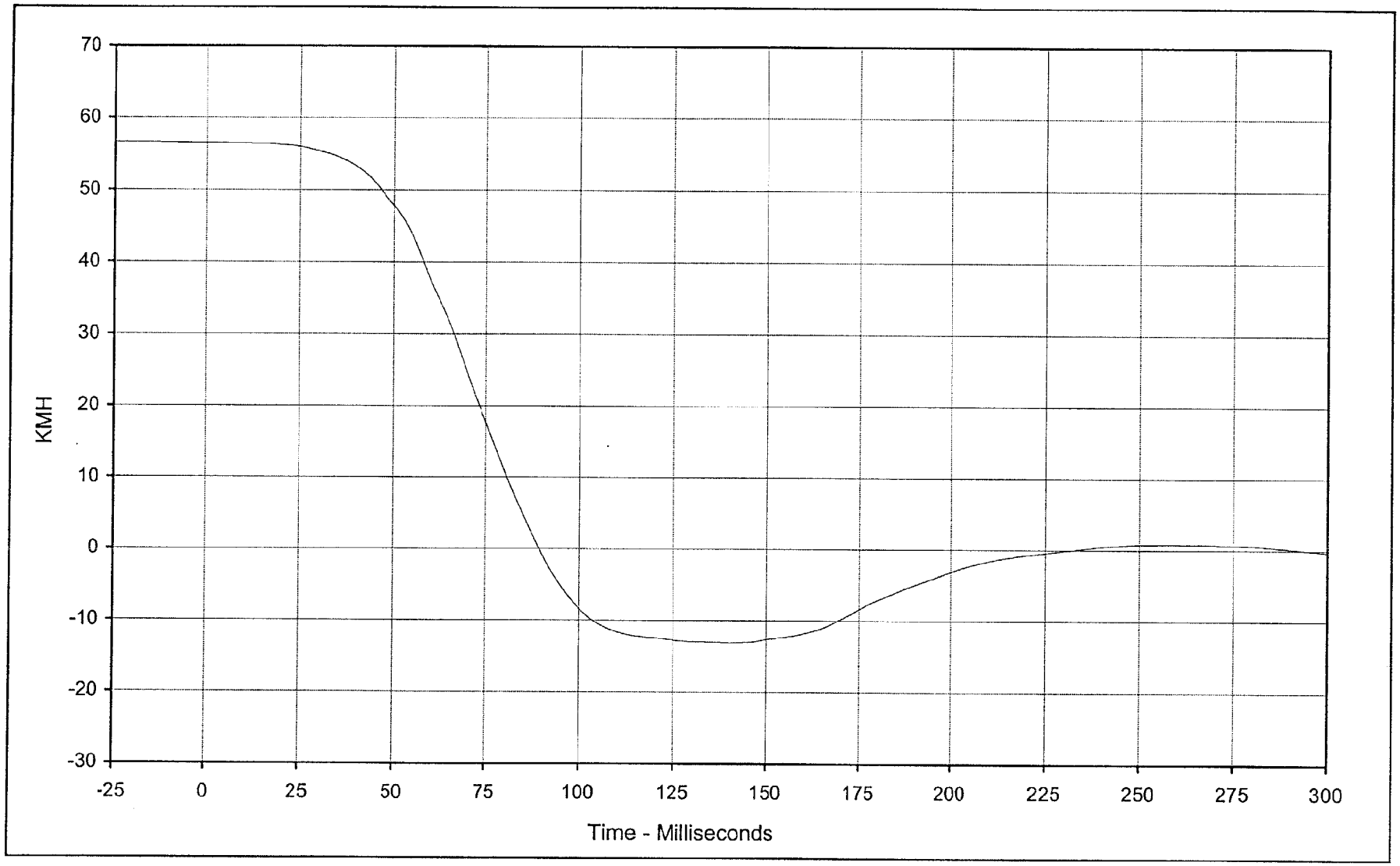


Curve Description:	Driver Chest Primary X			
Maximum Value:	8.5	at	174.3	Milliseconds
Minimum Value:	-43.2	at	69.2	Milliseconds
SAE Filter Class:	180			
Date of Test:	11/21/97			
Curve Number:	FIL-013			

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering

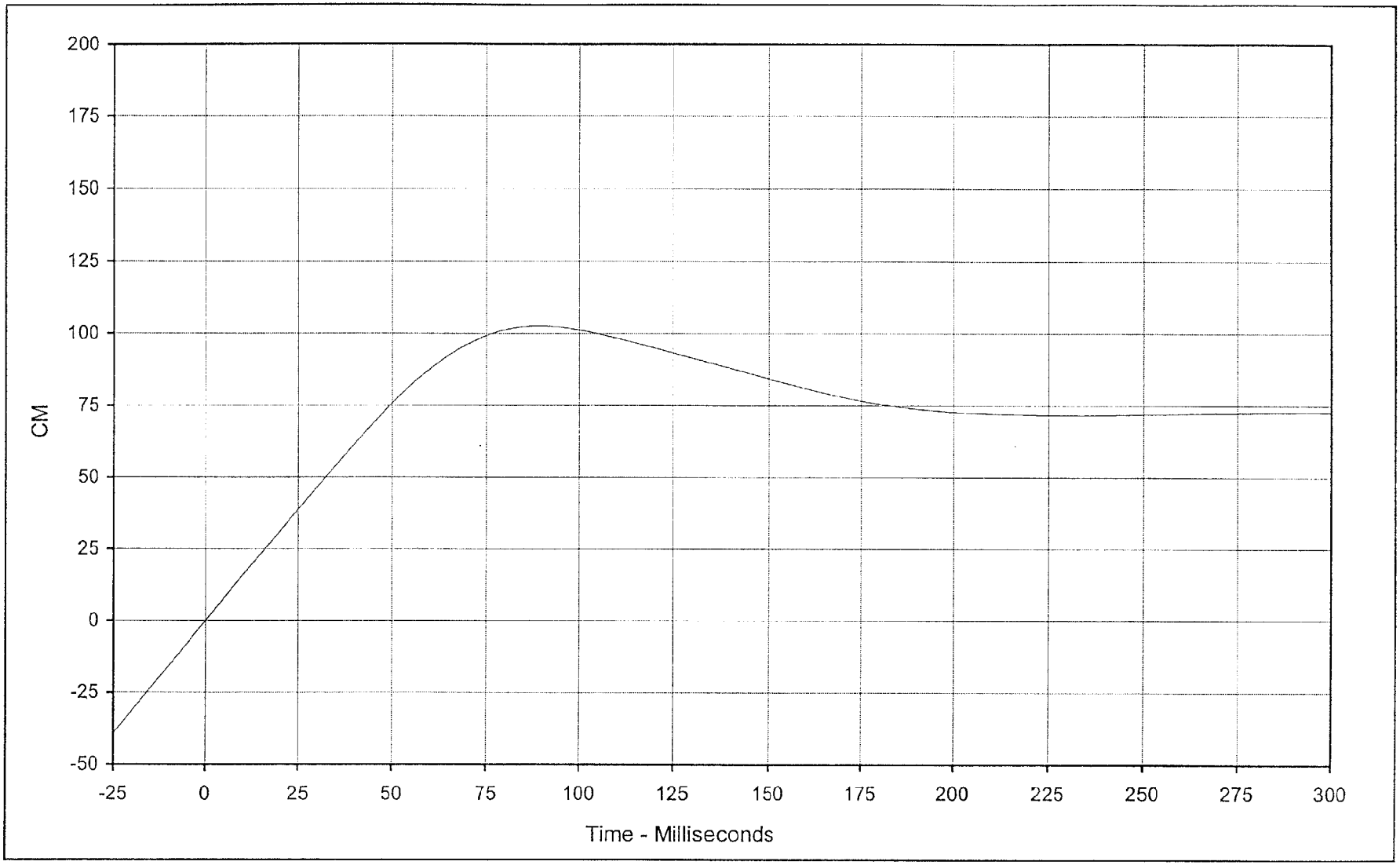


Curve Description:	Driver Chest Primary X Velocity			
Maximum Value:	56.5	at	2.9	Milliseconds
Minimum Value:	-13.1	at	140.7	Milliseconds
SAE Filter Class:	180			
Date of Test:	11/21/97			
Curve Number:	IN1-013			

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description: Driver Chest Primary X Displ.

Maximum Value: 102.6 at 89.2 Milliseconds

Minimum Value: -0.2 at 0.0 Milliseconds

SAE Filter Class: 180

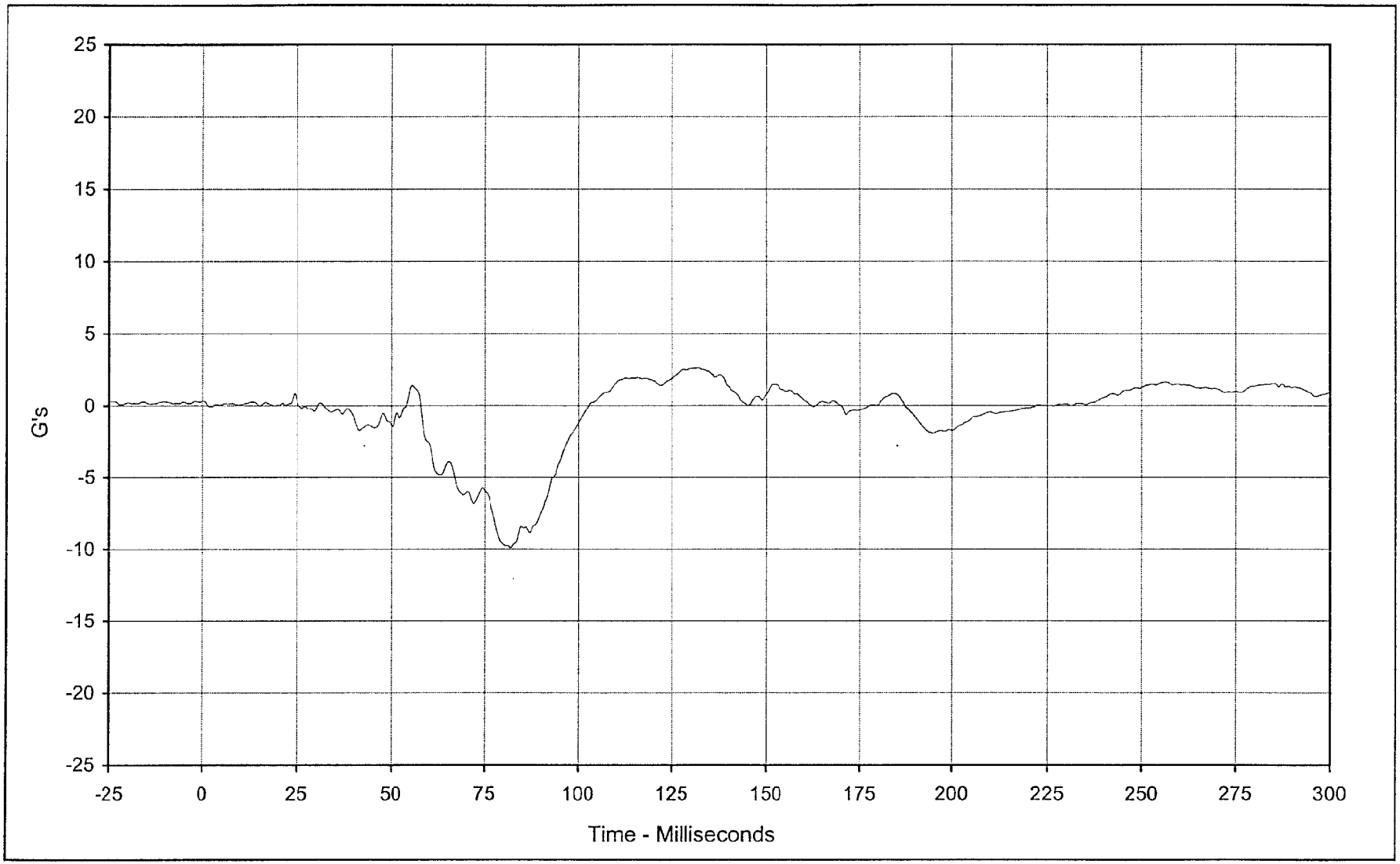
Date of Test: 11/21/97

Curve Number: IN2-013

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

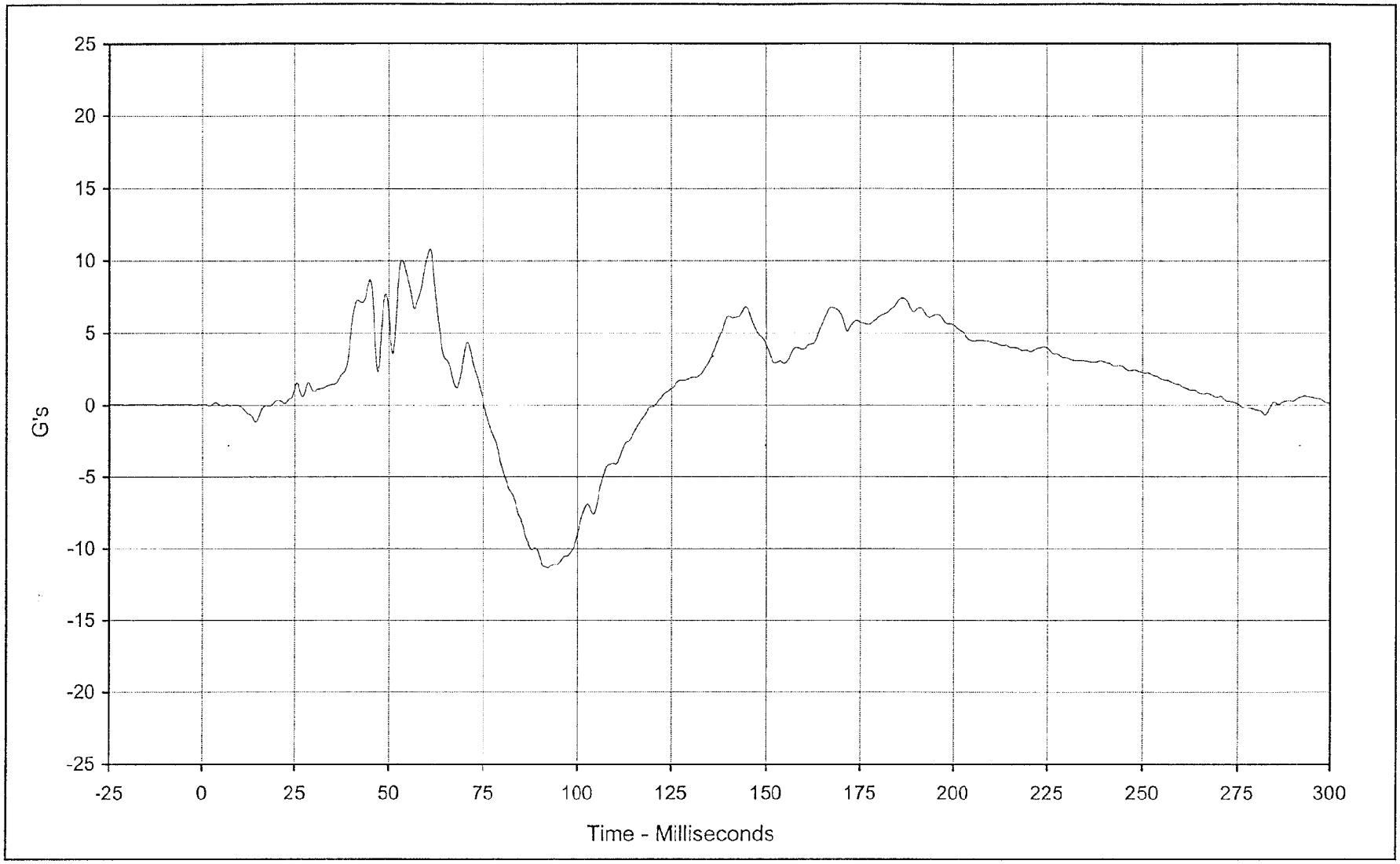
Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description:	Driver Chest Primary Y				Testing Program	1998 NHTSA 35 mph NCAP	No.: MW0106
Maximum Value:	2.6	at	132.0	Milliseconds	Test Vehicle:	1998 Chevrolet Malibu 4 Door Sedan	
Minimum Value:	-9.9	at	81.8	Milliseconds			
SAE Filter Class:	180						
Date of Test:	11/21/97						
Curve Number:	FIL-014						

KARC Engineering

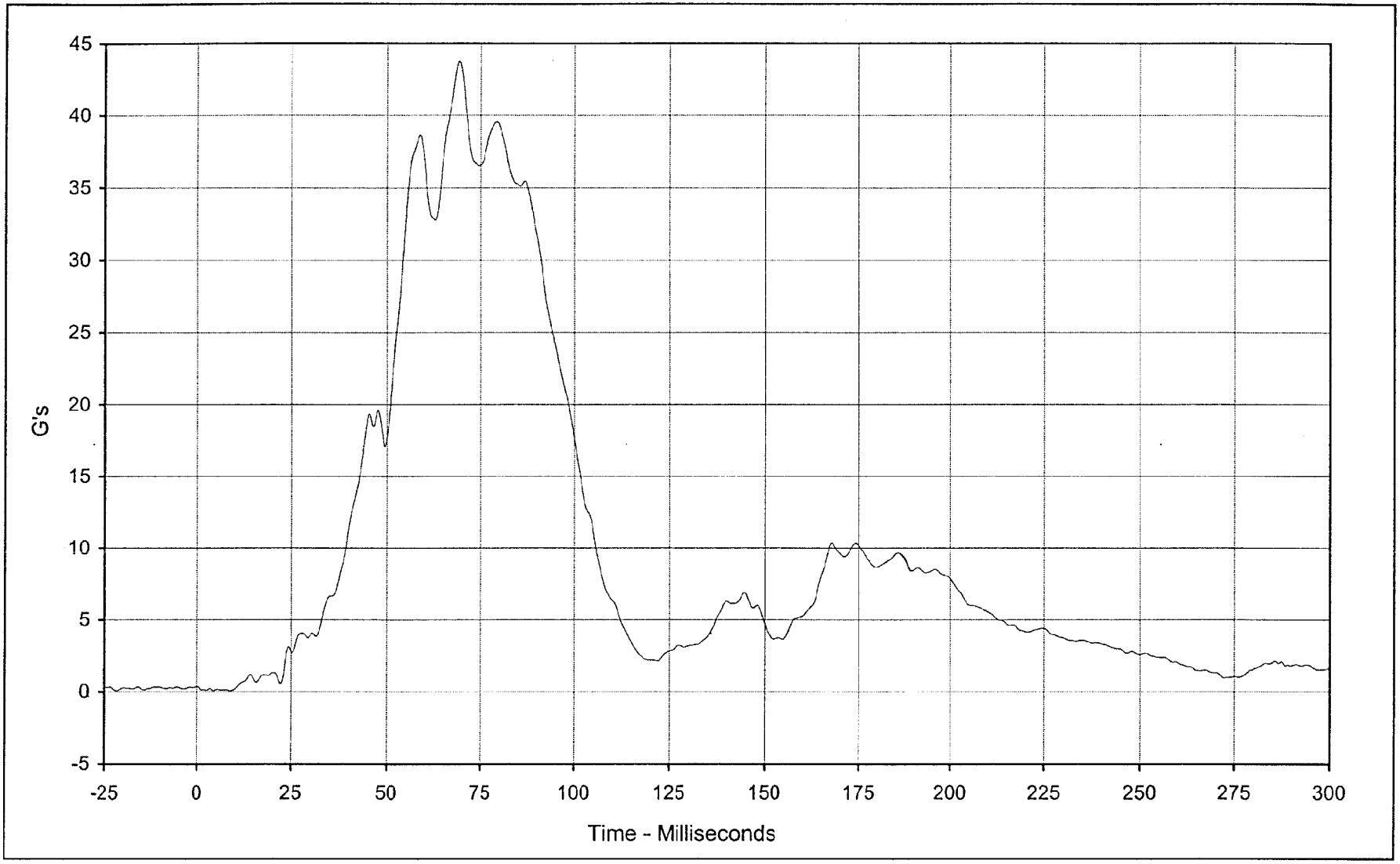


Curve Description:	Driver Chest Primary Z			
Maximum Value:	10.8	at	60.7	Milliseconds
Minimum Value:	-11.3	at	92.1	Milliseconds
SAE Filter Class:	180			
Date of Test:	11/21/97			
Curve Number:	FIL-015			

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

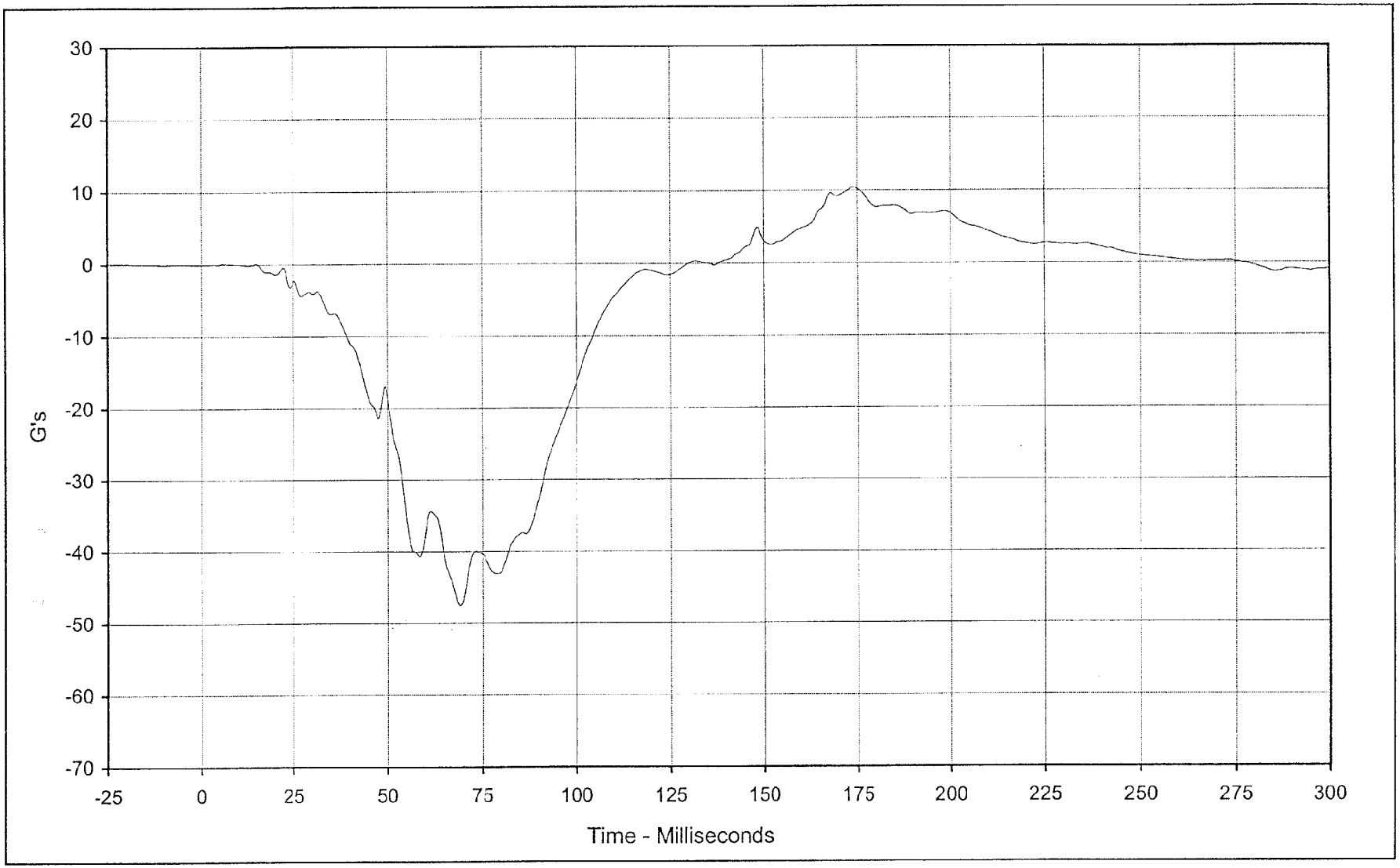
Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description:	Driver Chest Resultant Primary				Testing Program	1998 NHTSA 35 mph NCAP No.: MW0106	
Maximum Value:	43.8	at	69.3	Milliseconds	Test Vehicle:	1998 Chevrolet Malibu 4 Door Sedan	
Minimum Value:	0.1	at	9.2	Milliseconds			
SAE Filter Class:	180						
Date of Test:	11/21/97						
Curve Number:	RES-013						

KARC Engineering



Curve Description: Driver Chest Redundant X

Maximum Value: 10.4 at 173.9 Milliseconds

Minimum Value: -47.6 at 69.1 Milliseconds

SAE Filter Class: 180

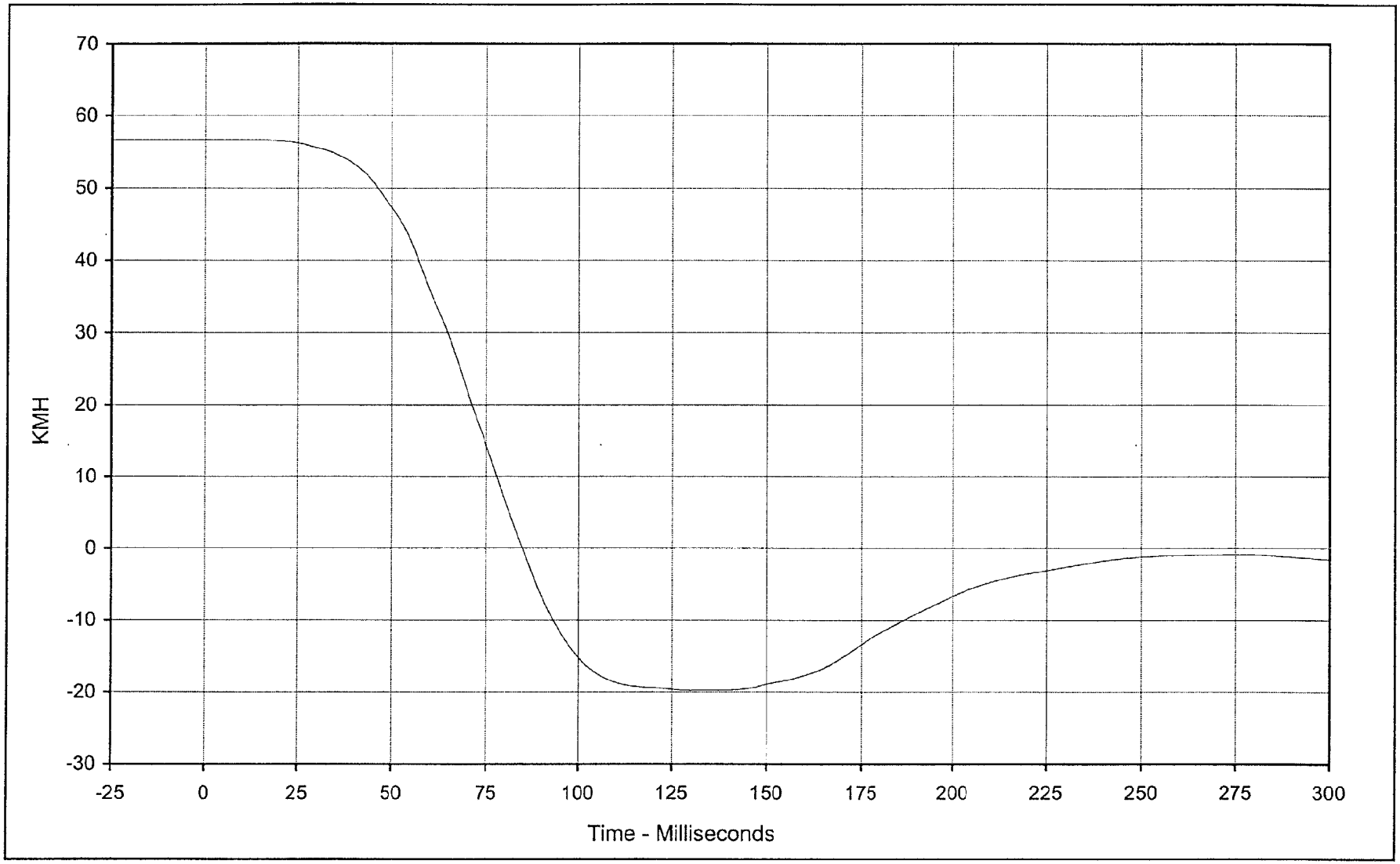
Date of Test: 11/21/97

Curve Number: FIL-016

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

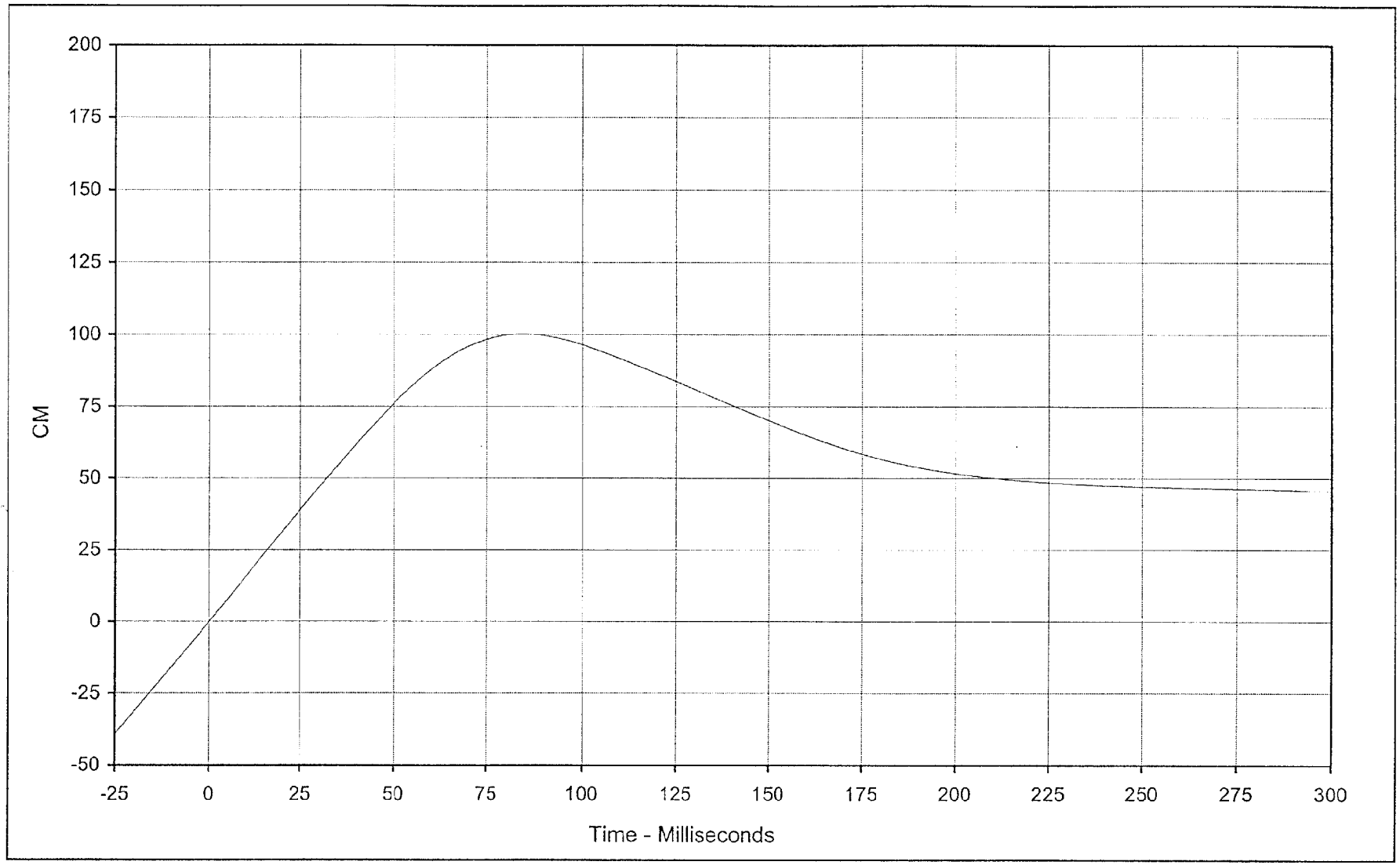
KARCO Engineering



Curve Description:	Driver Chest Redundant X Velocity				
Maximum Value:	56.7	at	9.3	Milliseconds	
Minimum Value:	-19.8	at	130.0	Milliseconds	
SAE Filter Class:	180				
Date of Test:	11/21/97				
Curve Number:	IN1-016				

Testing Program	1998 NHTSA 35 mph NCAP No.: MW0106
Test Vehicle:	1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description: Driver Chest Redundant X Displ.

Maximum Value: 100.1 at 84.8 Milliseconds

Minimum Value: -0.1 at 0.0 Milliseconds

SAE Filter Class: 180

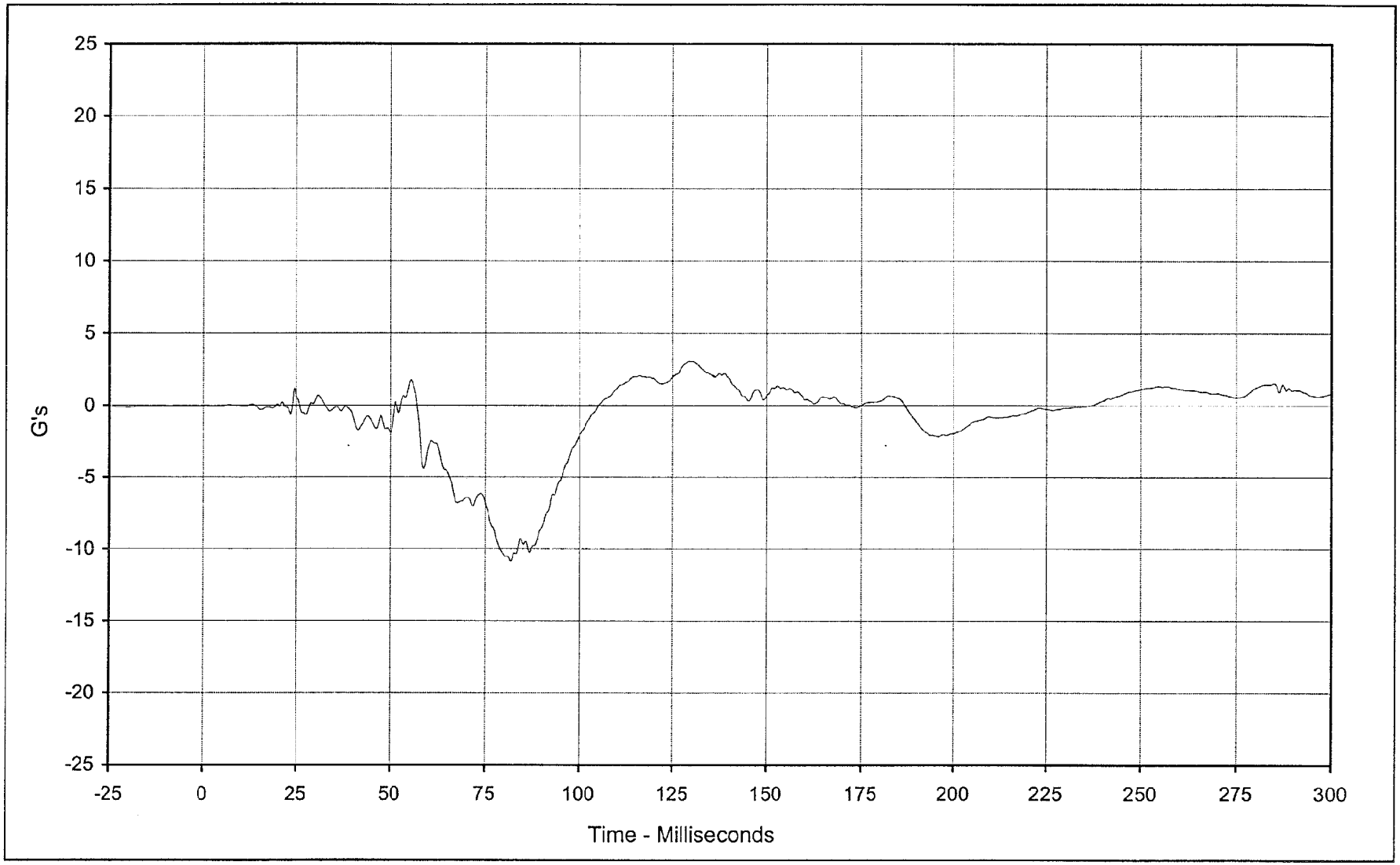
Date of Test: 11/21/97

Curve Number: IN2-016

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

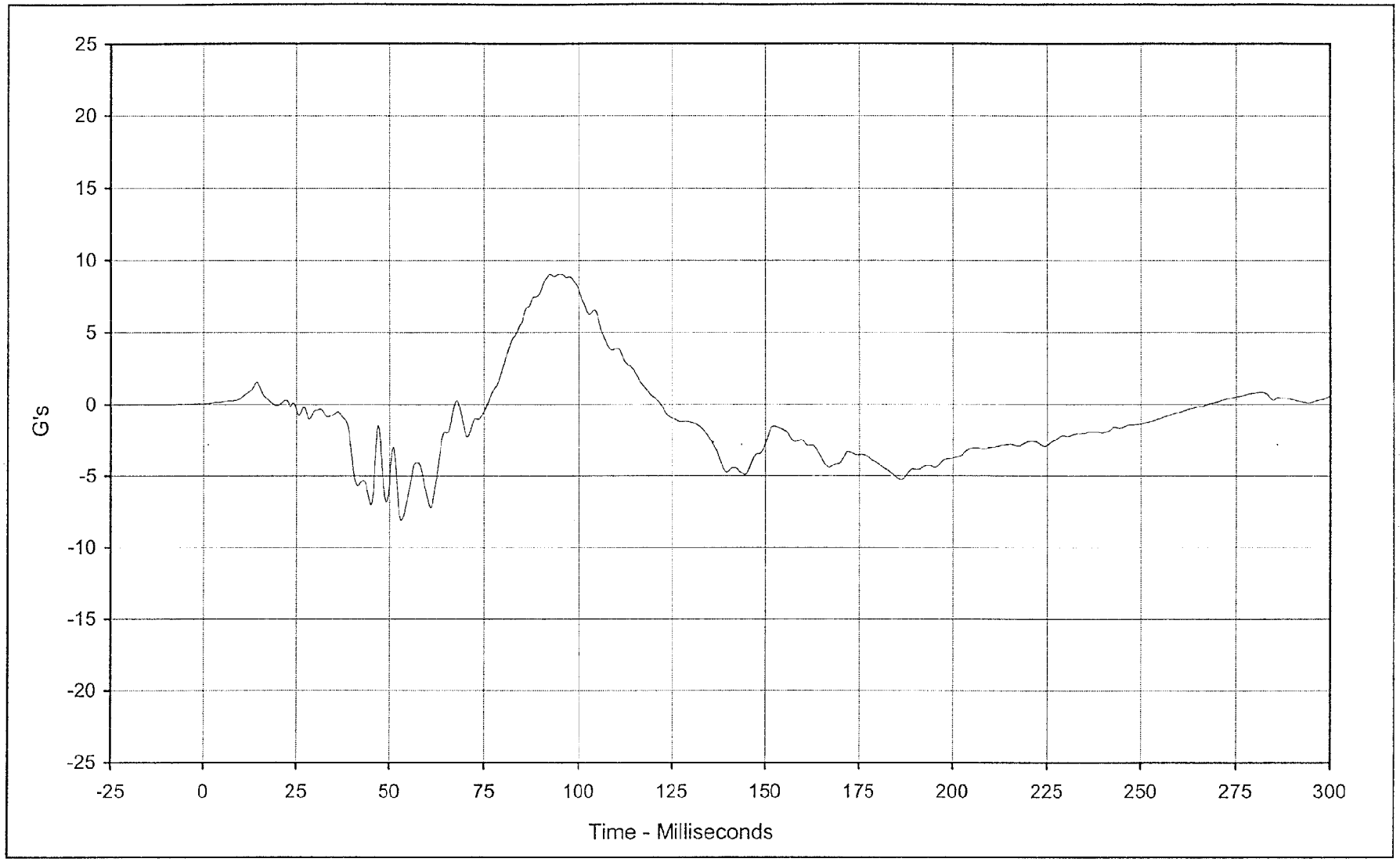
Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description:	Driver Chest Redundant Y			Testing Program	1998 NHTSA 35 mph NCAP No.: MW0106
Maximum Value:	3.1	at	129.7 Milliseconds	Test Vehicle:	1998 Chevrolet Malibu 4 Door Sedan
Minimum Value:	-10.9	at	81.7 Milliseconds		
SAE Filter Class:	180				
Date of Test:	11/21/97				
Curve Number:	FIL-017				

KARC Engineering

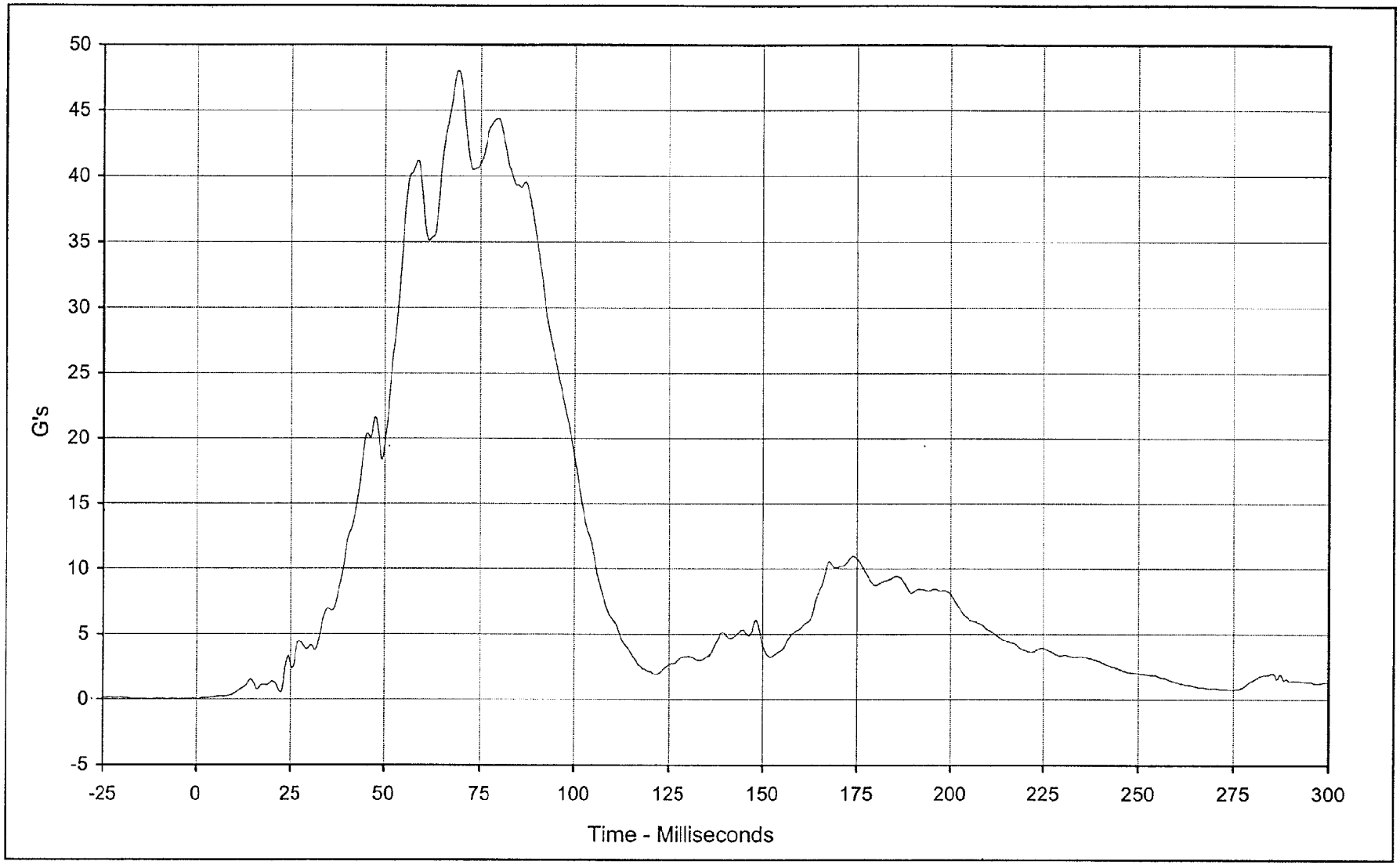


Curve Description:	Driver Chest Redundant Z			
Maximum Value:	9.1	at	92.3	Milliseconds
Minimum Value:	-8.1	at	53.2	Milliseconds
SAE Filter Class:	180			
Date of Test:	11/21/97			
Curve Number:	FIL-018			

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARC Engineering

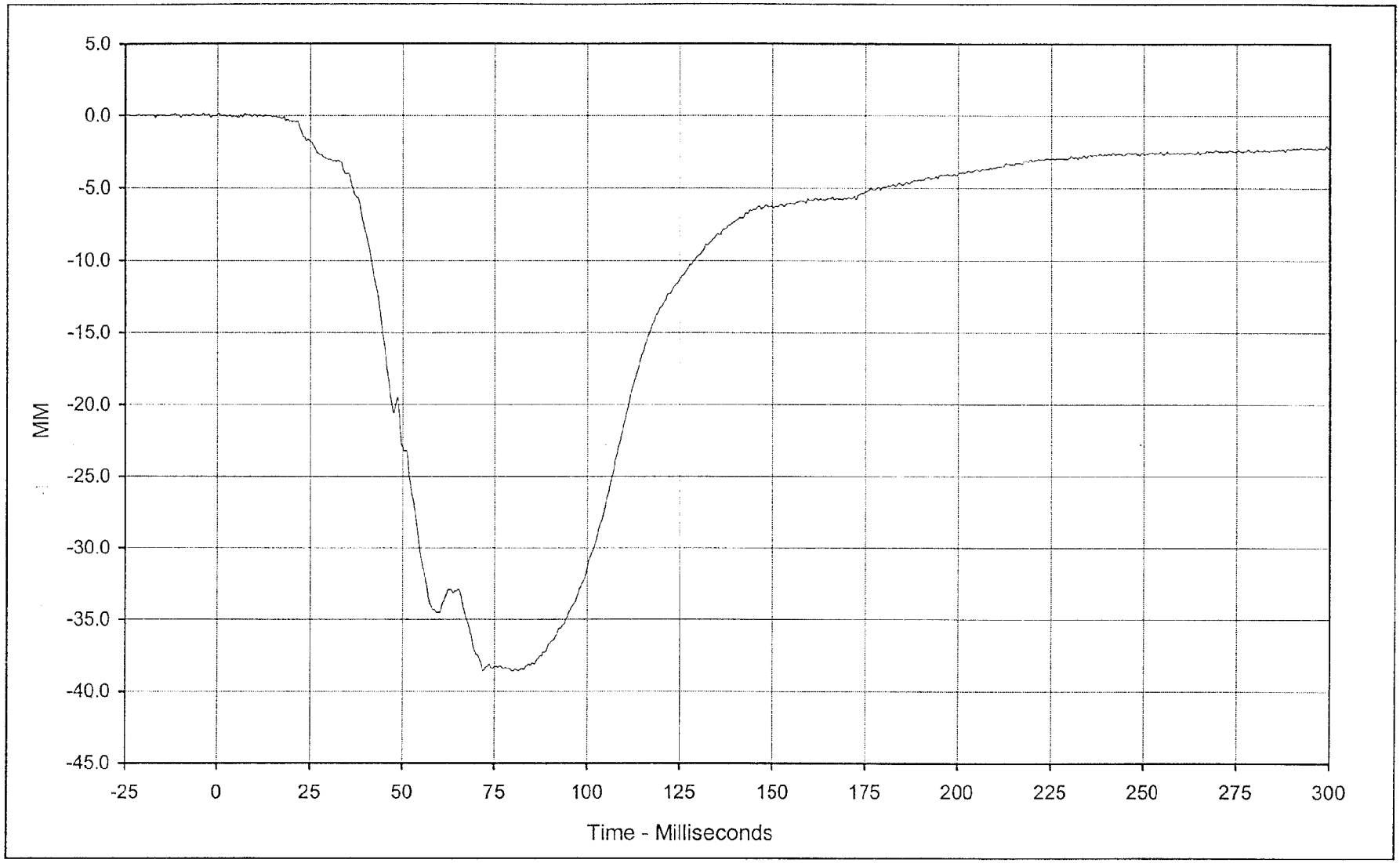


Curve Description:	Driver Chest Resultant Redundant			
Maximum Value:	48.0	at	69.1	Milliseconds
Minimum Value:	0.0	at	0.6	Milliseconds
SAE Filter Class:	180			
Date of Test:	11/21/97			
Curve Number:	RES-016			

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description: Driver Chest Displacement X

Maximum Value: 0.2 at 0.3 Milliseconds

Minimum Value: -38.6 at 79.8 Milliseconds

SAE Filter Class: 600

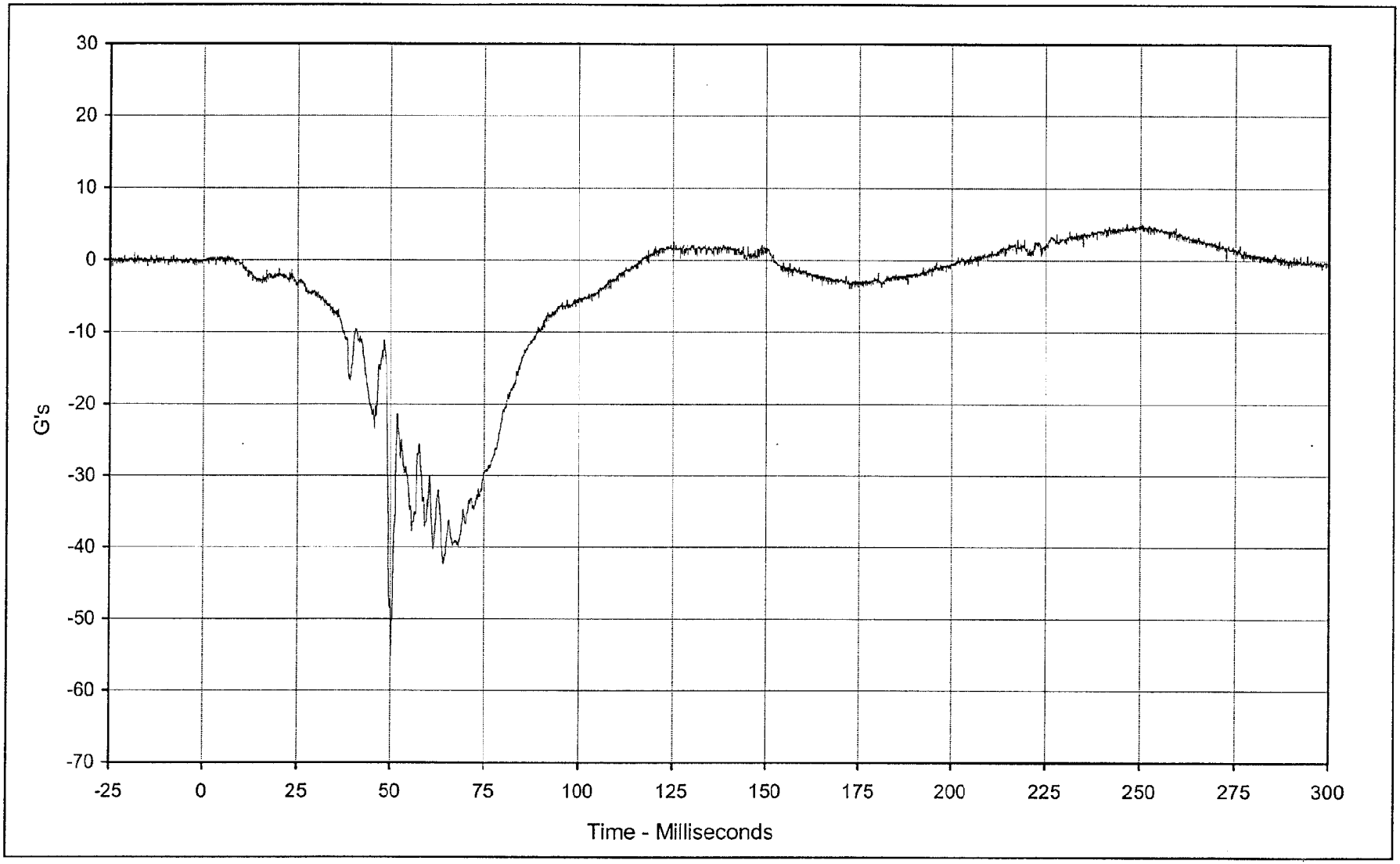
Date of Test: 11/21/97

Curve Number: FIL-019

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description: Driver Pelvis X

Maximum Value: 5.1 at 246.4 Milliseconds

Minimum Value: -55.1 at 50.2 Milliseconds

SAE Filter Class: 1000

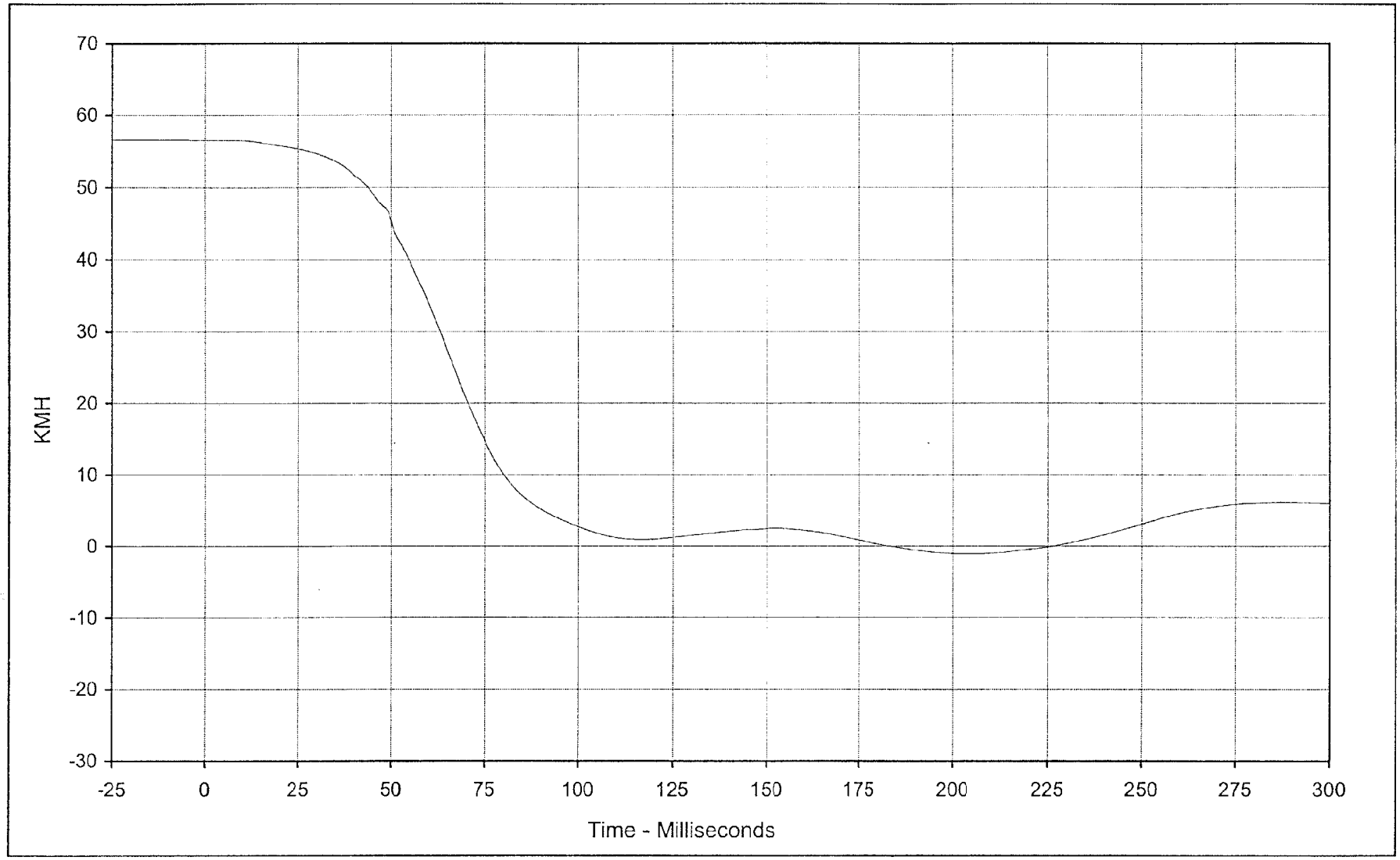
Date of Test: 11/21/97

Curve Number: FIL-020

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description: Driver Pelvis X Velocity

Maximum Value: 56.5 at 7.8 Milliseconds

Minimum Value: -1.0 at 204.7 Milliseconds

SAE Filter Class: 180

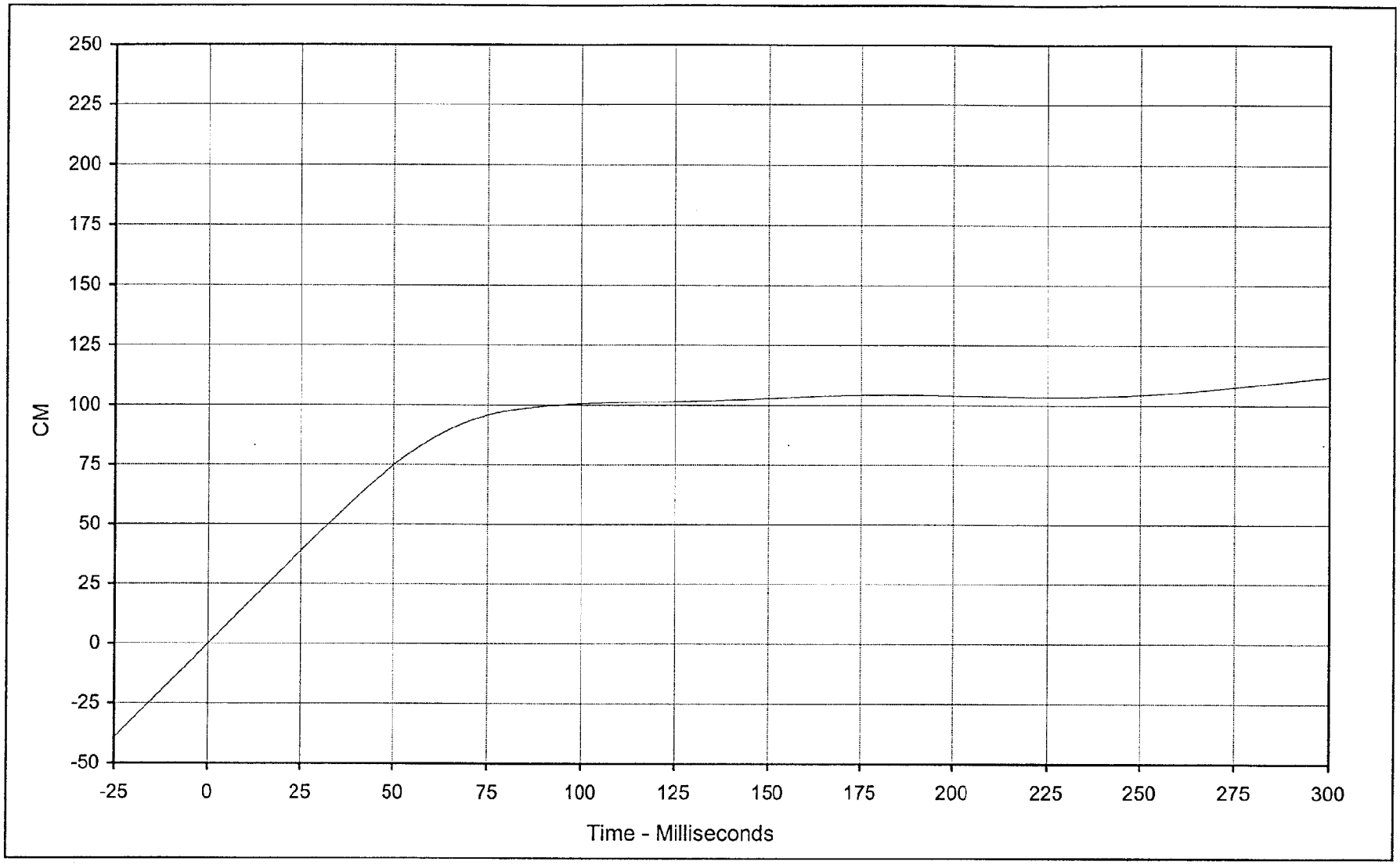
Date of Test: 11/21/97

Curve Number: IN1-020

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description: Driver Pelvis X Displ.

Maximum Value: 111.8 at 299.9 Milliseconds

Minimum Value: -0.2 at 0.0 Milliseconds

SAE Filter Class: 180

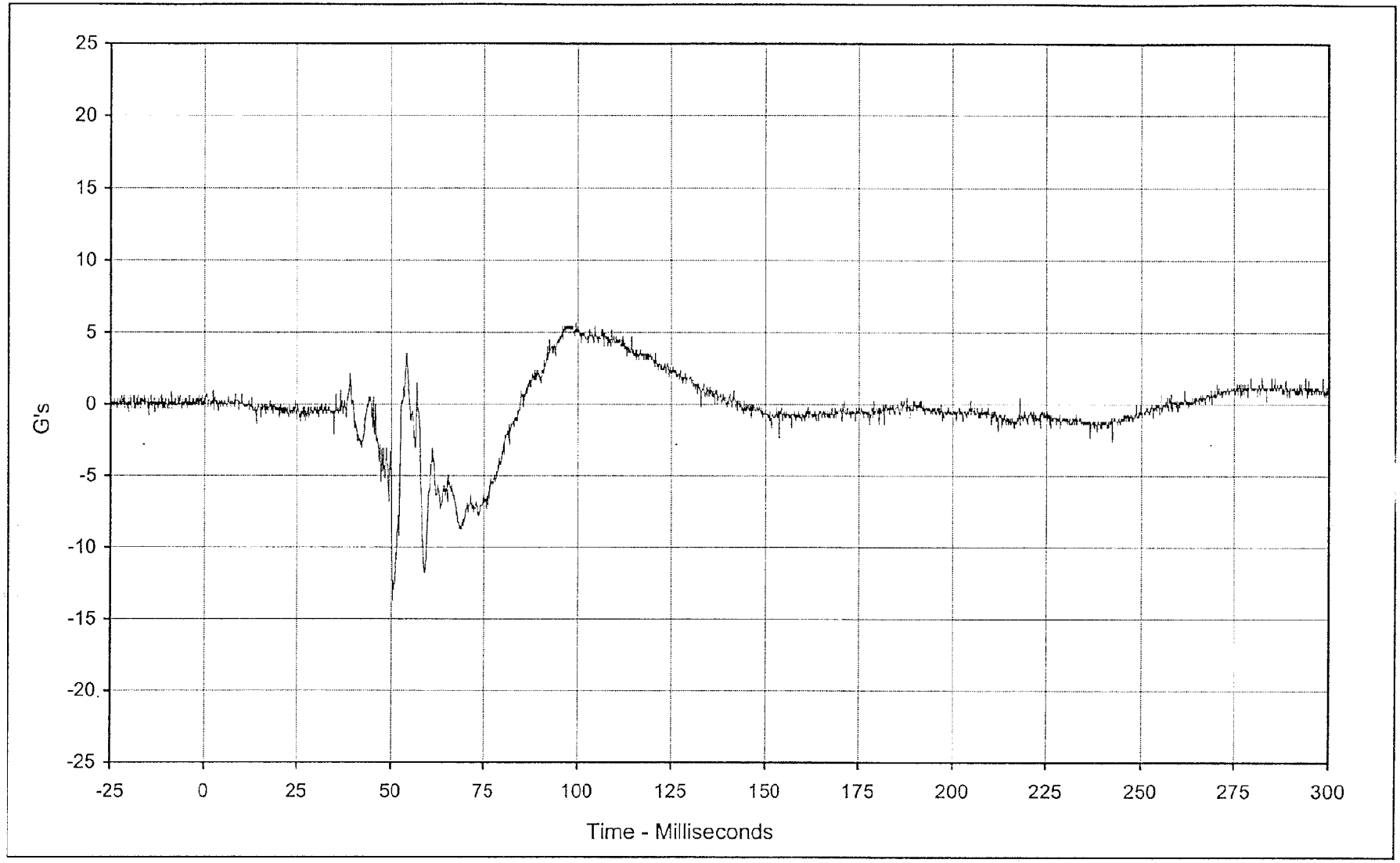
Date of Test: 11/21/97

Curve Number: IN2-020

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering

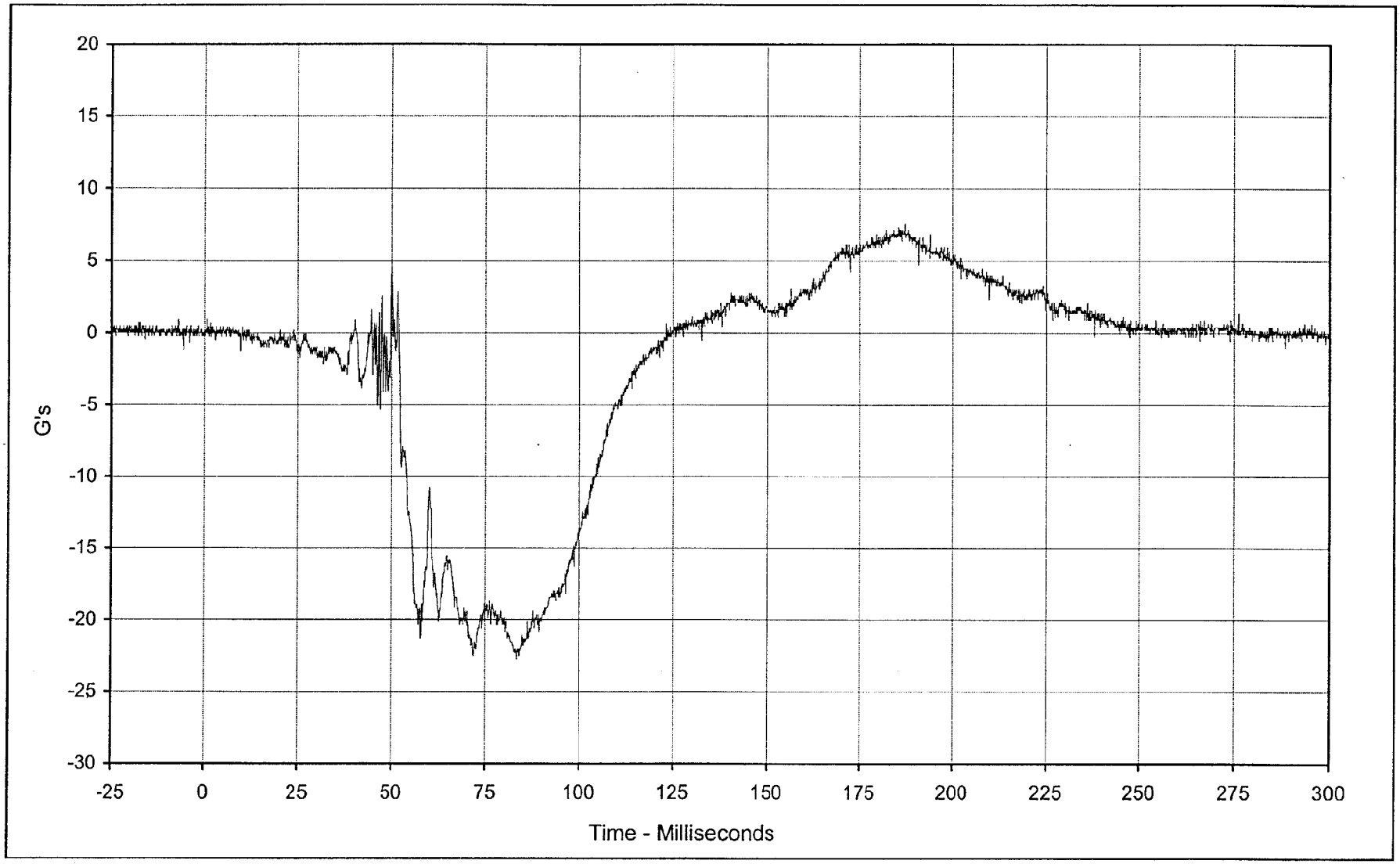


Curve Description:	Driver Pelvis Y			
Maximum Value:	5.7	at	99.5	Milliseconds
Minimum Value:	-13.7	at	50.5	Milliseconds
SAE Filter Class:	1000			
Date of Test:	11/21/97			
Curve Number:	FIL-021			

Testing Program: 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description: Driver Pelvis Z

Maximum Value: 7.6 at 187.3 Milliseconds

Minimum Value: -22.7 at 83.4 Milliseconds

SAE Filter Class: 1000

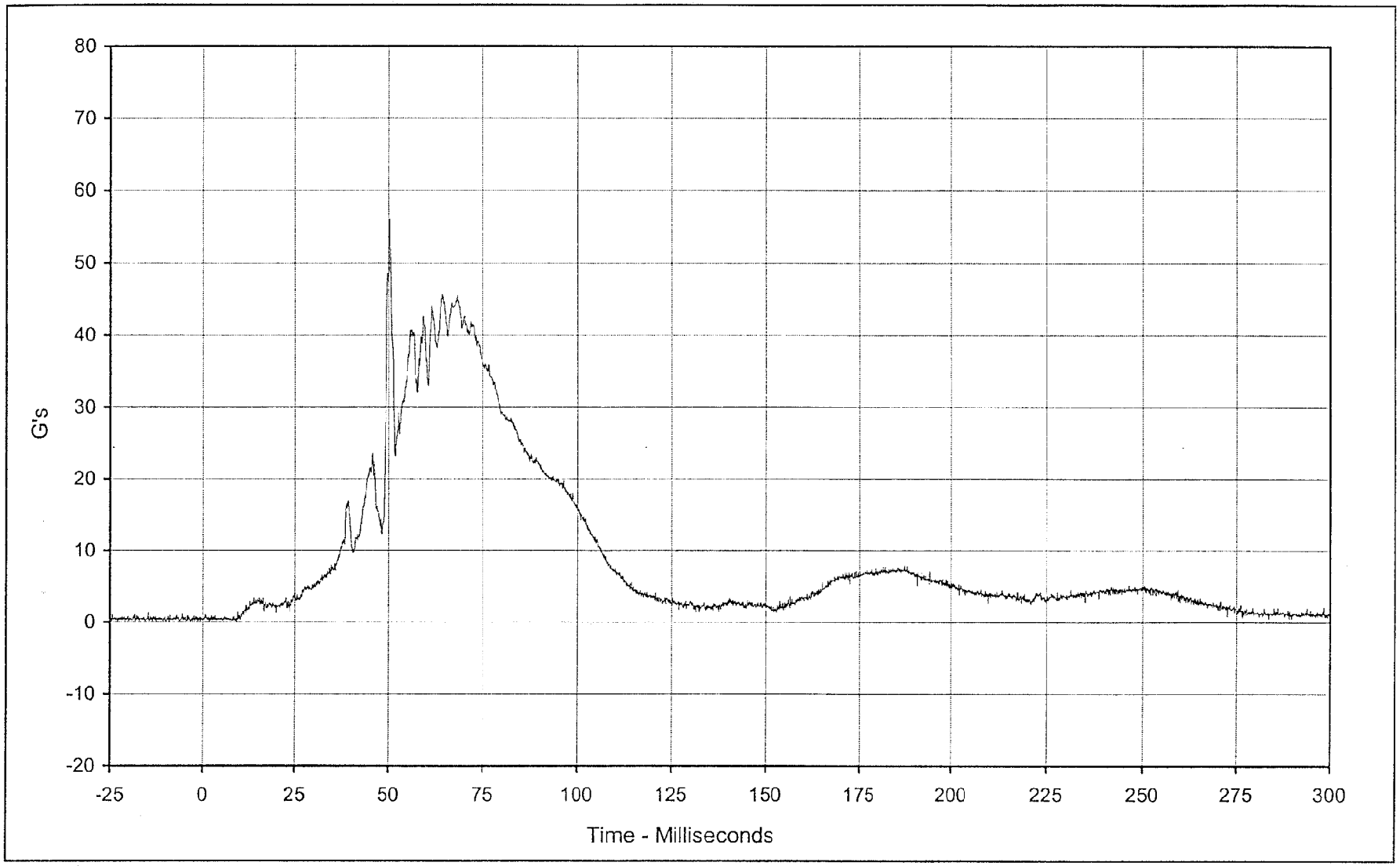
Date of Test: 11/21/97

Curve Number: FIL-022

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description: Driver Pelvis Resultant

Maximum Value: 56.0 at 50.3 Milliseconds

Minimum Value: 0.1 at 1.8 Milliseconds

SAE Filter Class: 1000

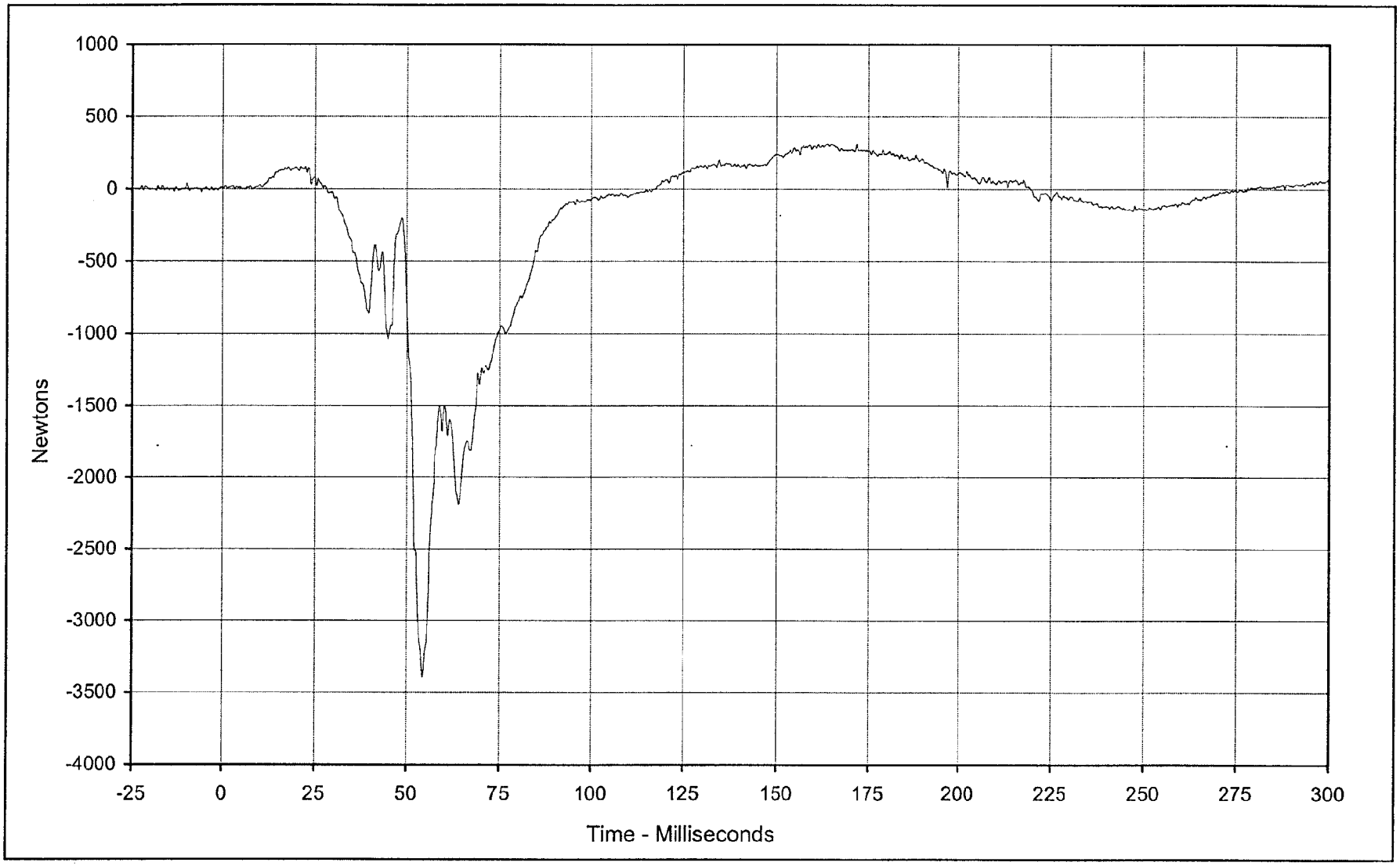
Date of Test: 11/21/97

Curve Number: RES-020

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description: Driver Left Femur Force

Maximum Value: 312.5 at 164.0 Milliseconds

Minimum Value: -3392.2 at 54.3 Milliseconds

SAE Filter Class: 600

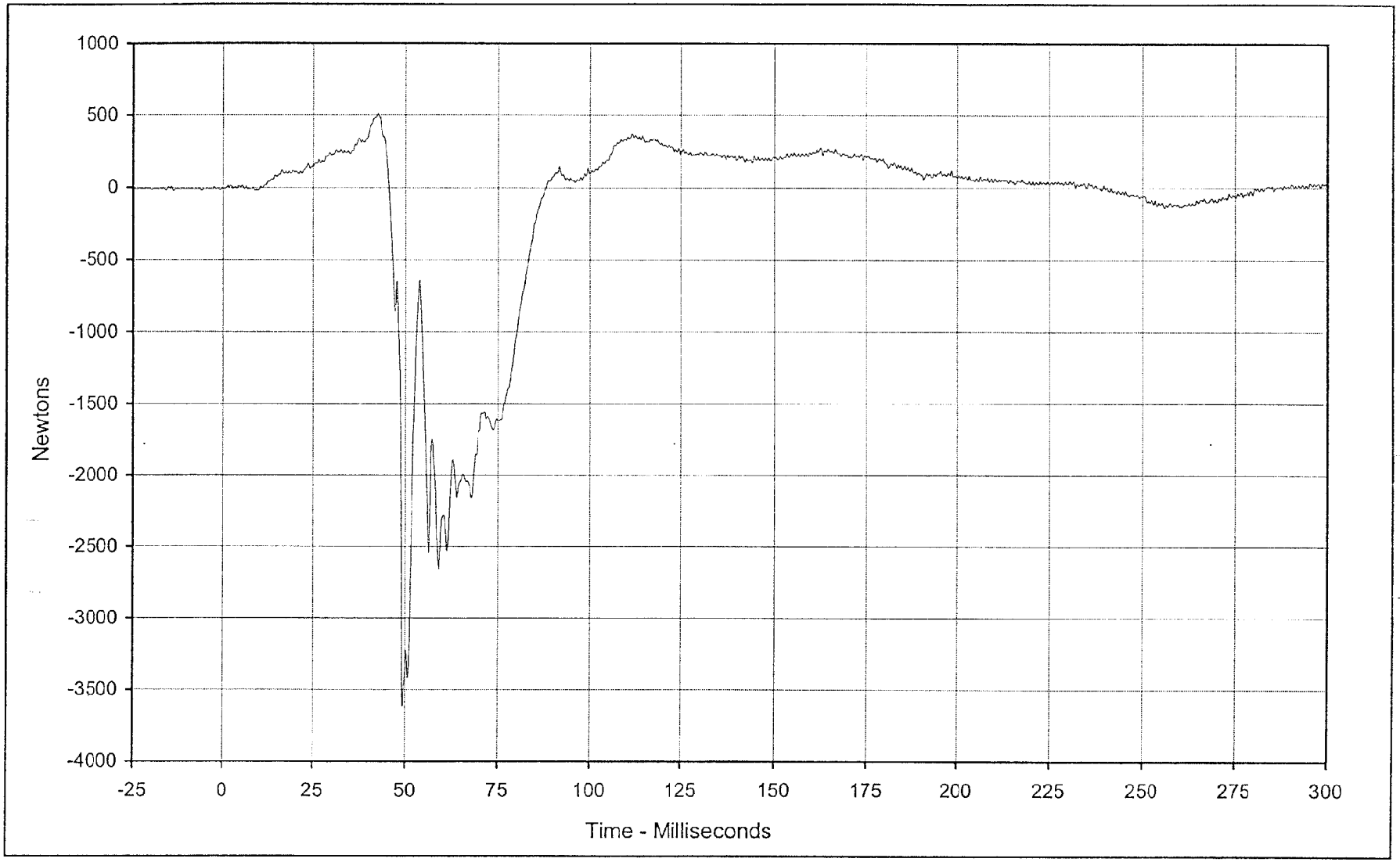
Date of Test: 11/21/97

Curve Number: FIL-023

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering

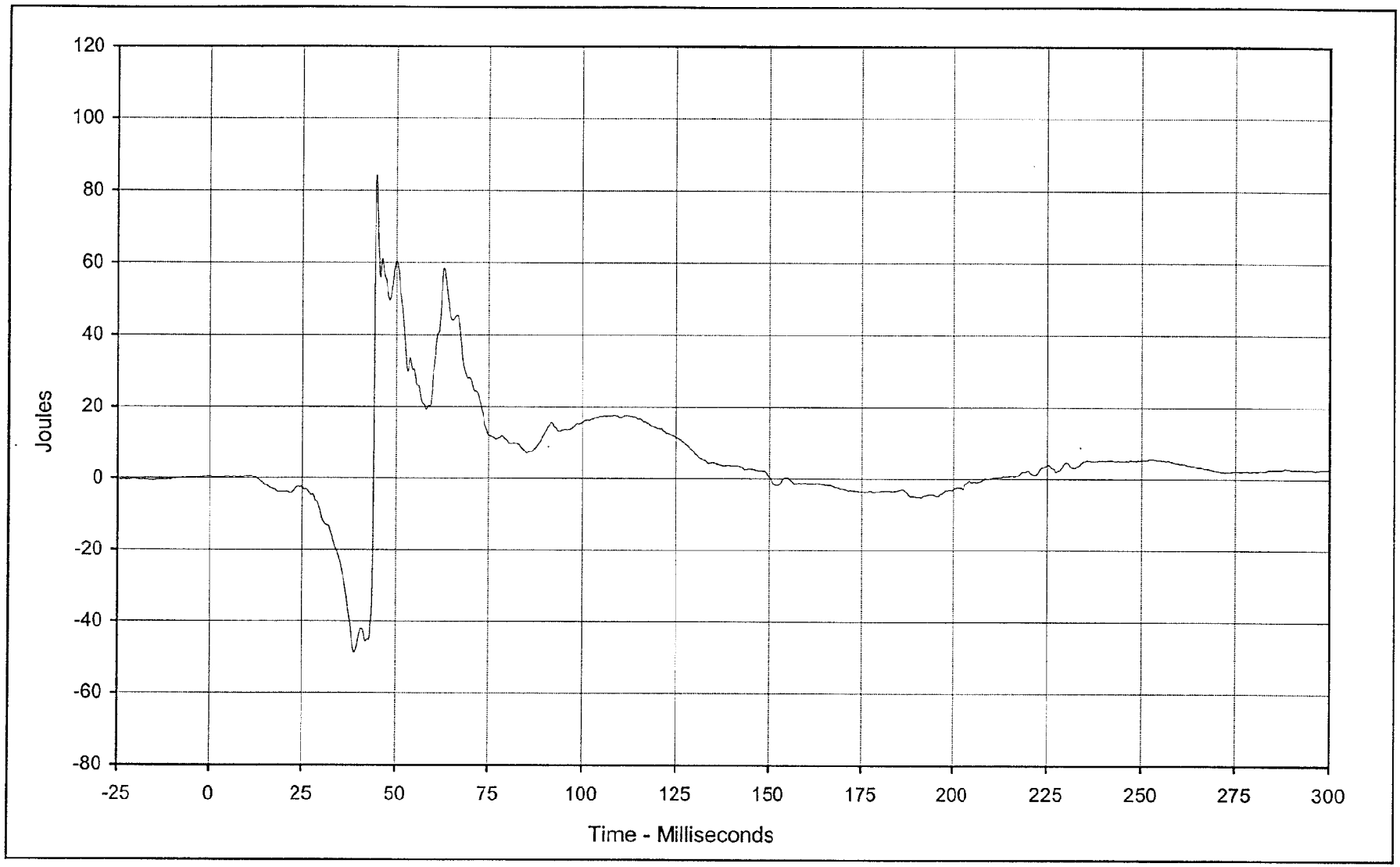


Curve Description:	Driver Right Femur Force			
Maximum Value:	510.9	at	42.5	Milliseconds
Minimum Value:	-3615.0	at	49.2	Milliseconds
SAE Filter Class:	600			
Date of Test:	11/21/97			
Curve Number:	FIL-024			

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description: Driver Left Upper Tibia Moment X

Maximum Value: 84.2 at 44.6 Milliseconds

Minimum Value: -48.7 at 38.8 Milliseconds

SAE Filter Class: 600

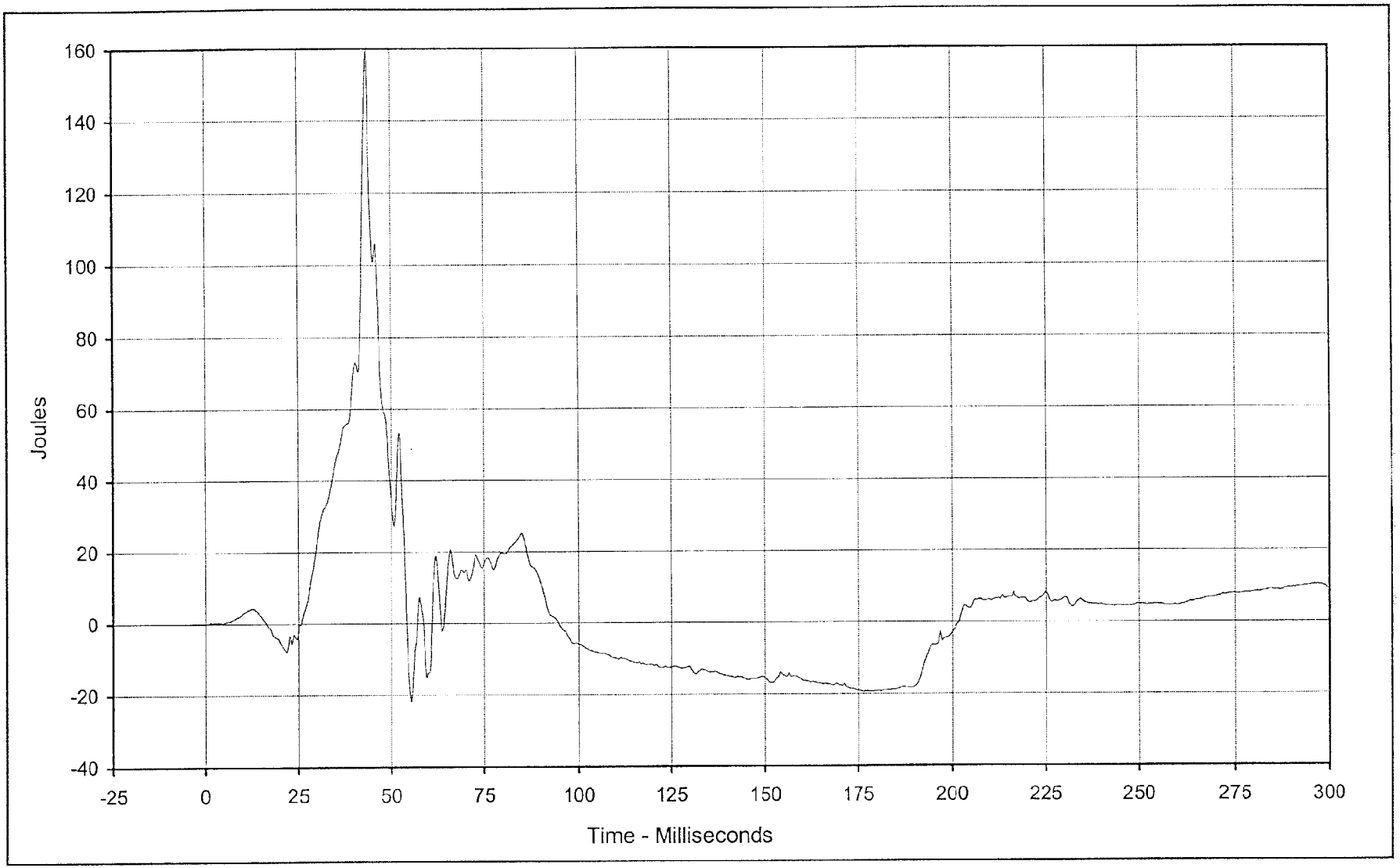
Date of Test: 11/21/97

Curve Number: FIL-025

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description: Driver Left Upper Tibia Moment Y

Maximum Value: 159.4 at 43.5 Milliseconds

Minimum Value: -21.8 at 55.3 Milliseconds

SAE Filter Class: 600

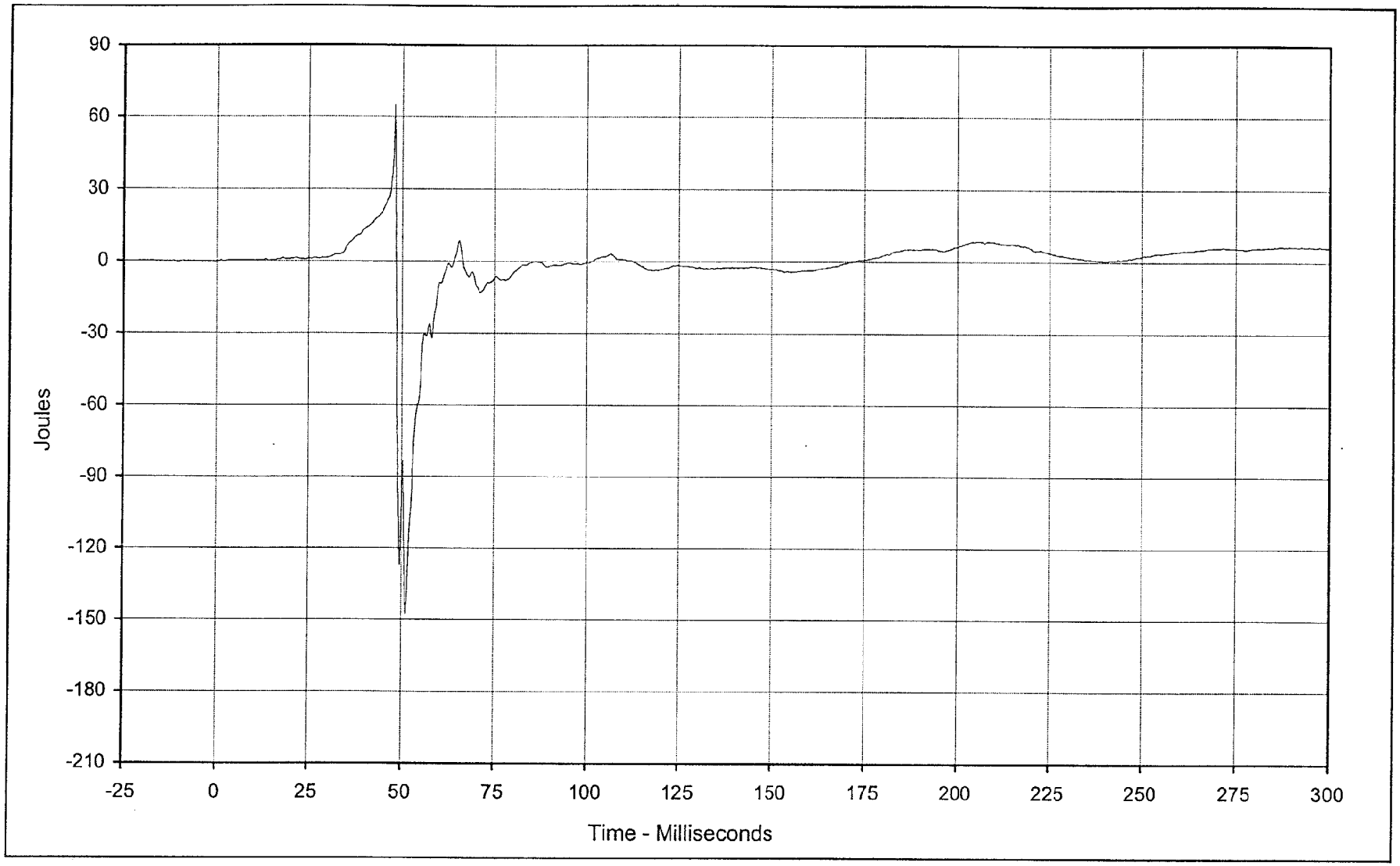
Date of Test: 11/21/97

Curve Number: FIL-026

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description: Driver Right Upper Tibia Moment X

Maximum Value: 65.1 at 48.1 Milliseconds

Minimum Value: -147.8 at 51.2 Milliseconds

SAE Filter Class: 600

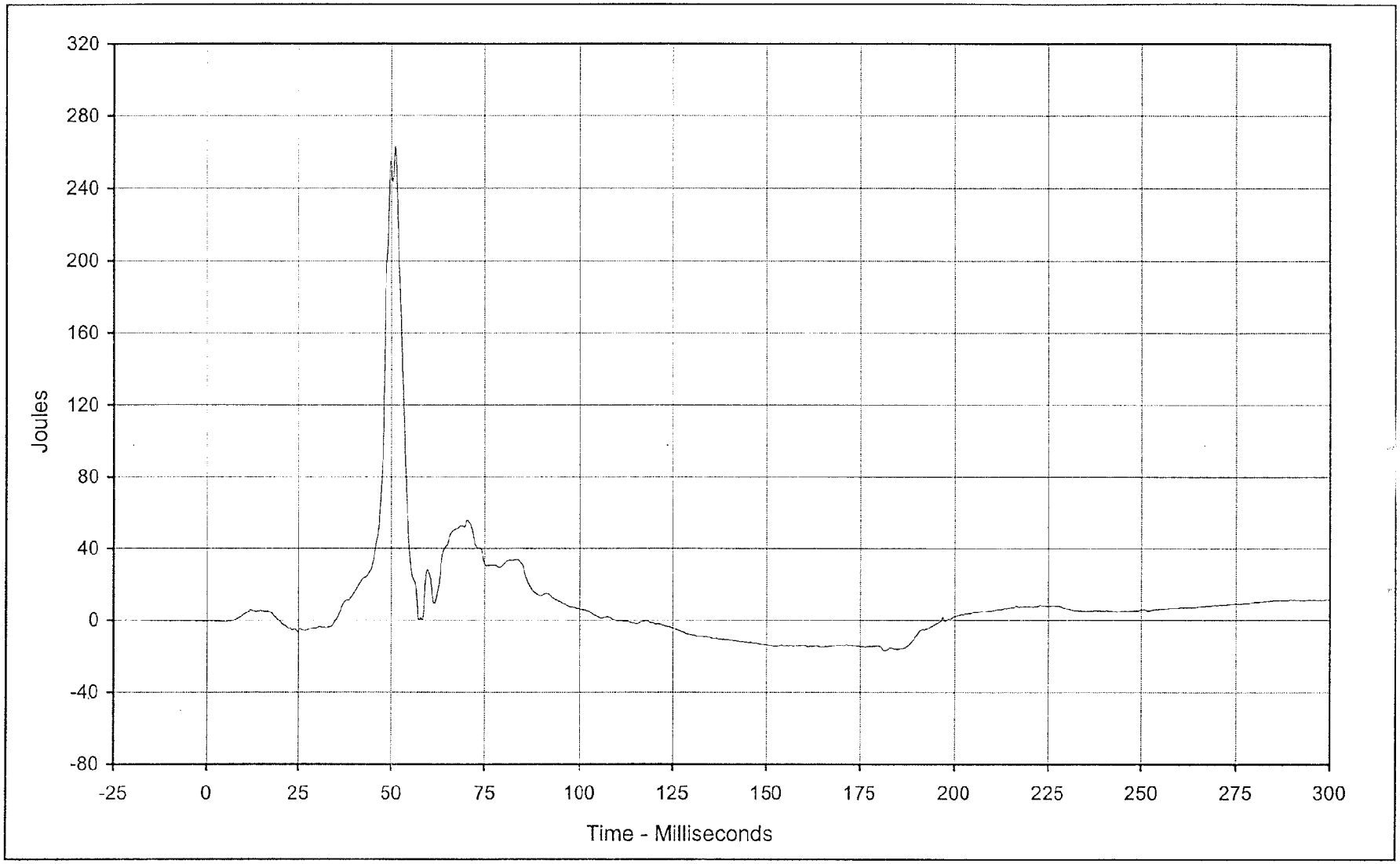
Date of Test: 11/21/97

Curve Number: FIL-027

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering

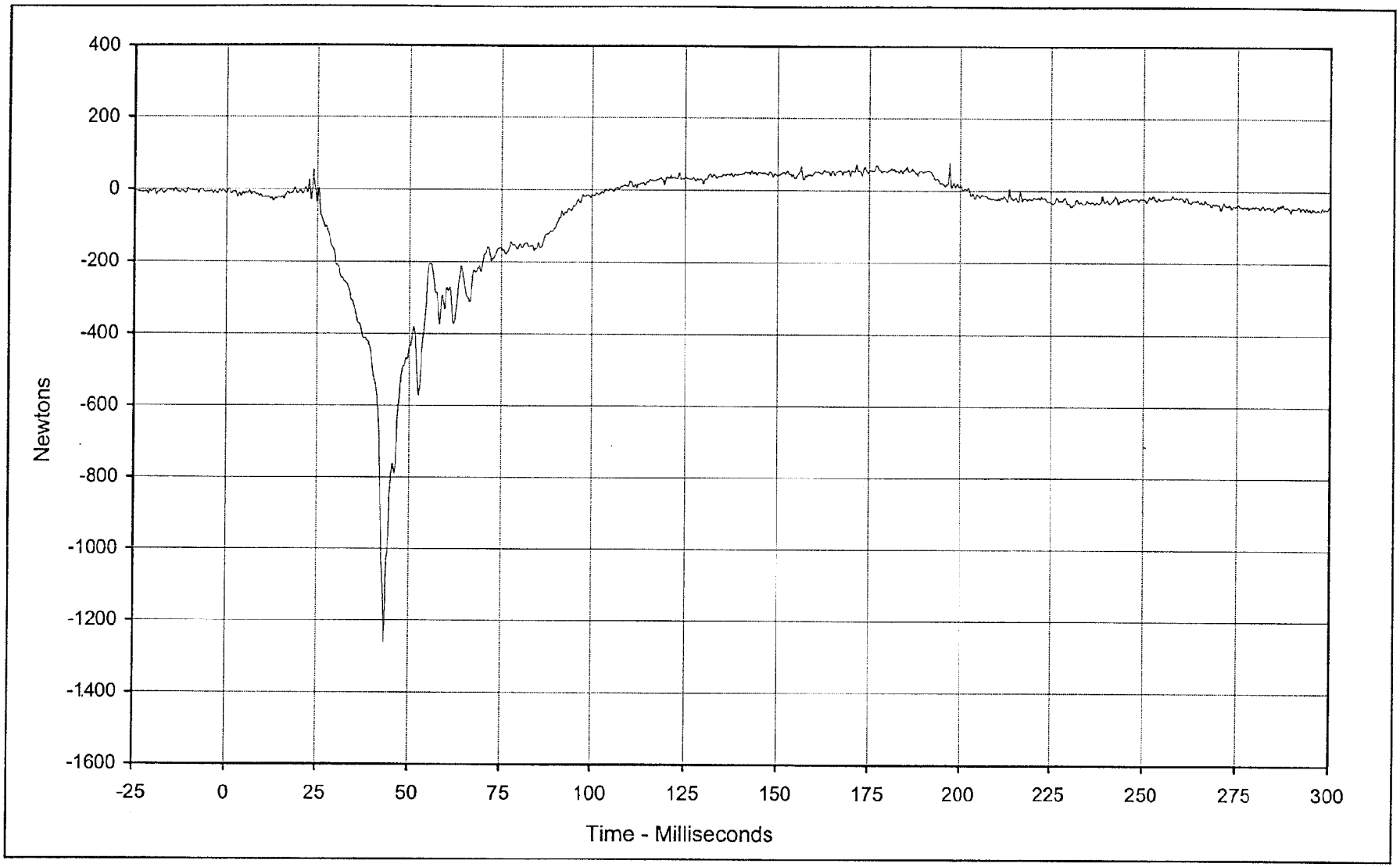


Curve Description:	Driver Right Upper Tibia Moment Y				
Maximum Value:	263.0	at	51.1	Milliseconds	
Minimum Value:	-16.7	at	181.6	Milliseconds	
SAE Filter Class:	600				
Date of Test:	11/21/97				
Curve Number:	FIL-028				

Testing Program: 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description: Driver Left Lower Tibia Force X

Maximum Value: 76.8 at 197.0 Milliseconds

Minimum Value: -1262.0 at 43.5 Milliseconds

SAE Filter Class: 600

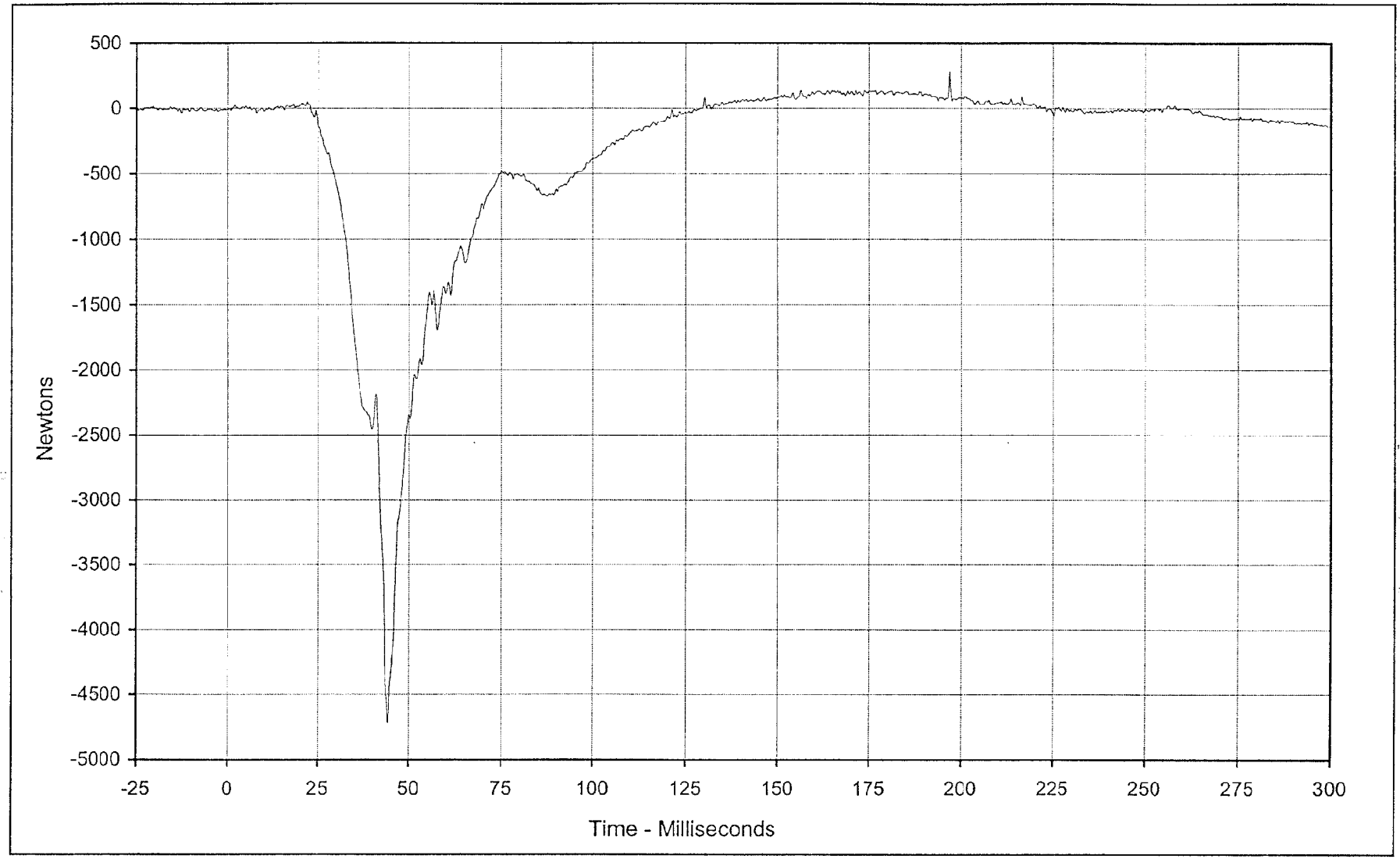
Date of Test: 11/21/97

Curve Number: FIL-029

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description: Driver Left Lower Tibia Force Z

Maximum Value: 279.6 at 197.0 Milliseconds

Minimum Value: -4716.0 at 44.3 Milliseconds

SAE Filter Class: 600

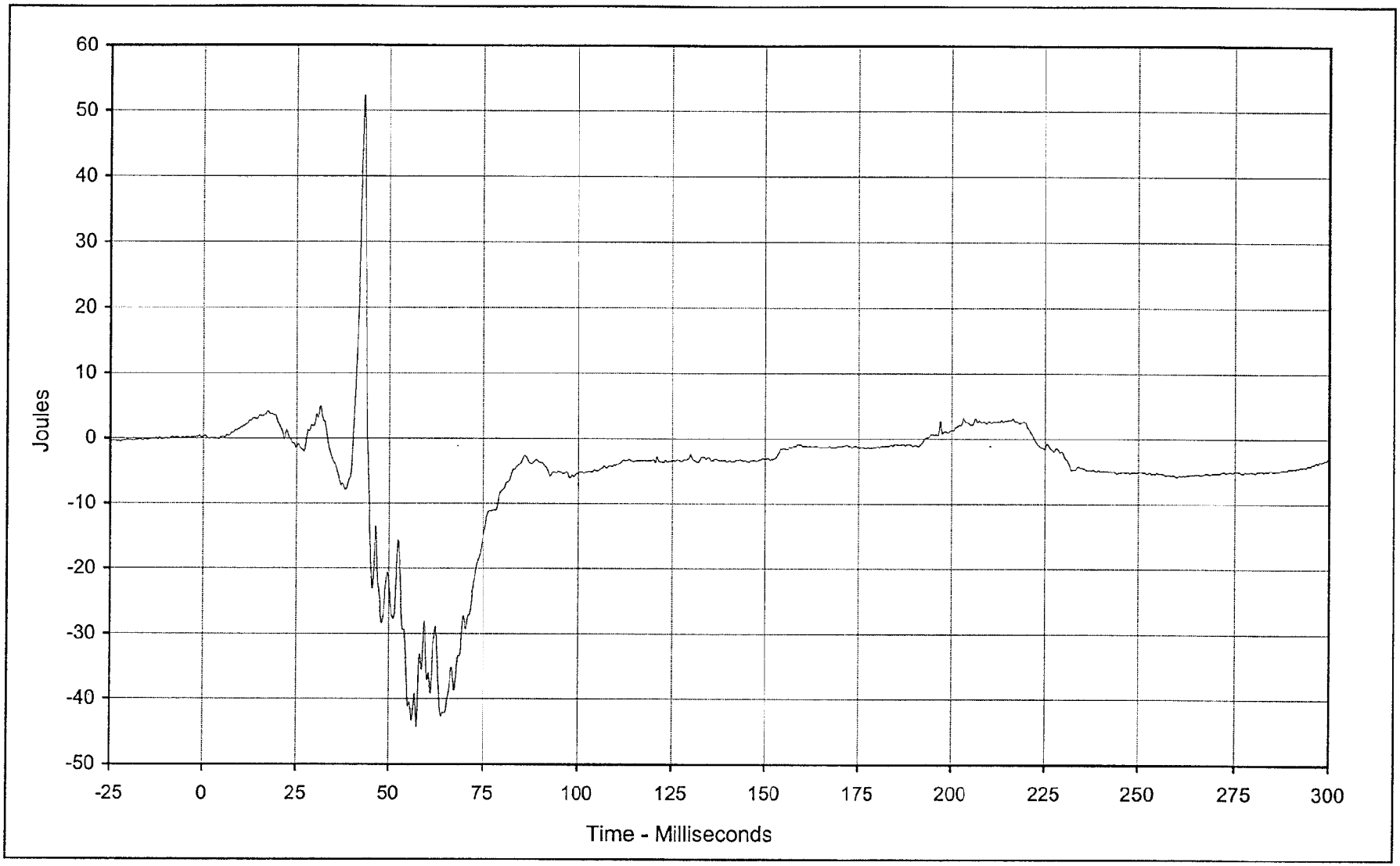
Date of Test: 11/21/97

Curve Number: FIL-030

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description: Driver Left Lower Tibia Moment Y

Maximum Value: 52.3 at 43.1 Milliseconds

Minimum Value: -44.3 at 57.5 Milliseconds

SAE Filter Class: 600

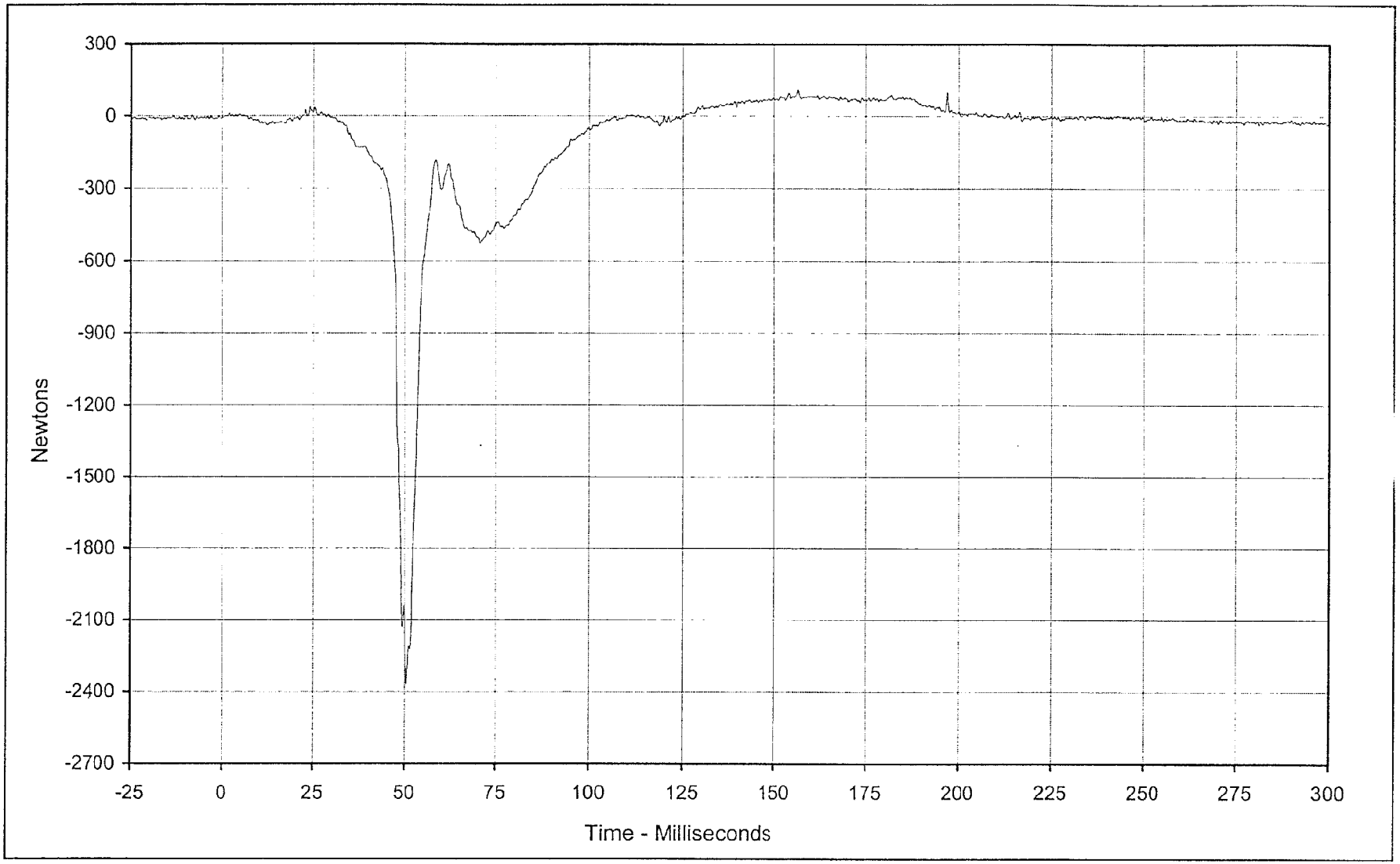
Date of Test: 11/21/97

Curve Number: FIL-031

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering

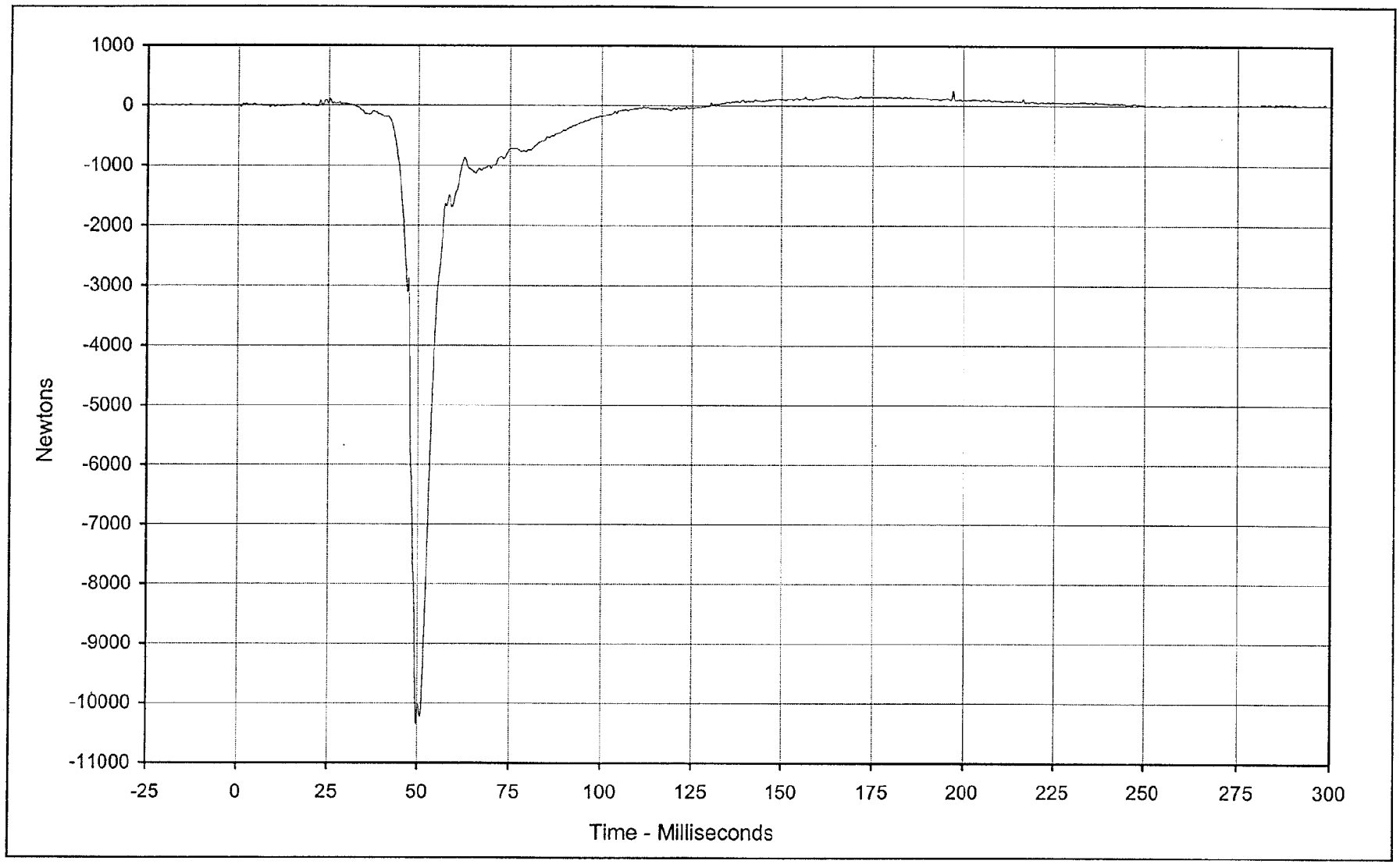


Curve Description:	Driver Right Lower Tibia Force X			
Maximum Value:	110.2	at	156.5	Milliseconds
Minimum Value:	-2368.1	at	50.5	Milliseconds
SAE Filter Class:	600			
Date of Test:	11/21/97			
Curve Number:	FIL-032			

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description: Driver Right Lower Tibia Force Z

Maximum Value: 244.3 at 196.9 Milliseconds

Minimum Value: -10351.3 at 49.7 Milliseconds

SAE Filter Class: 600

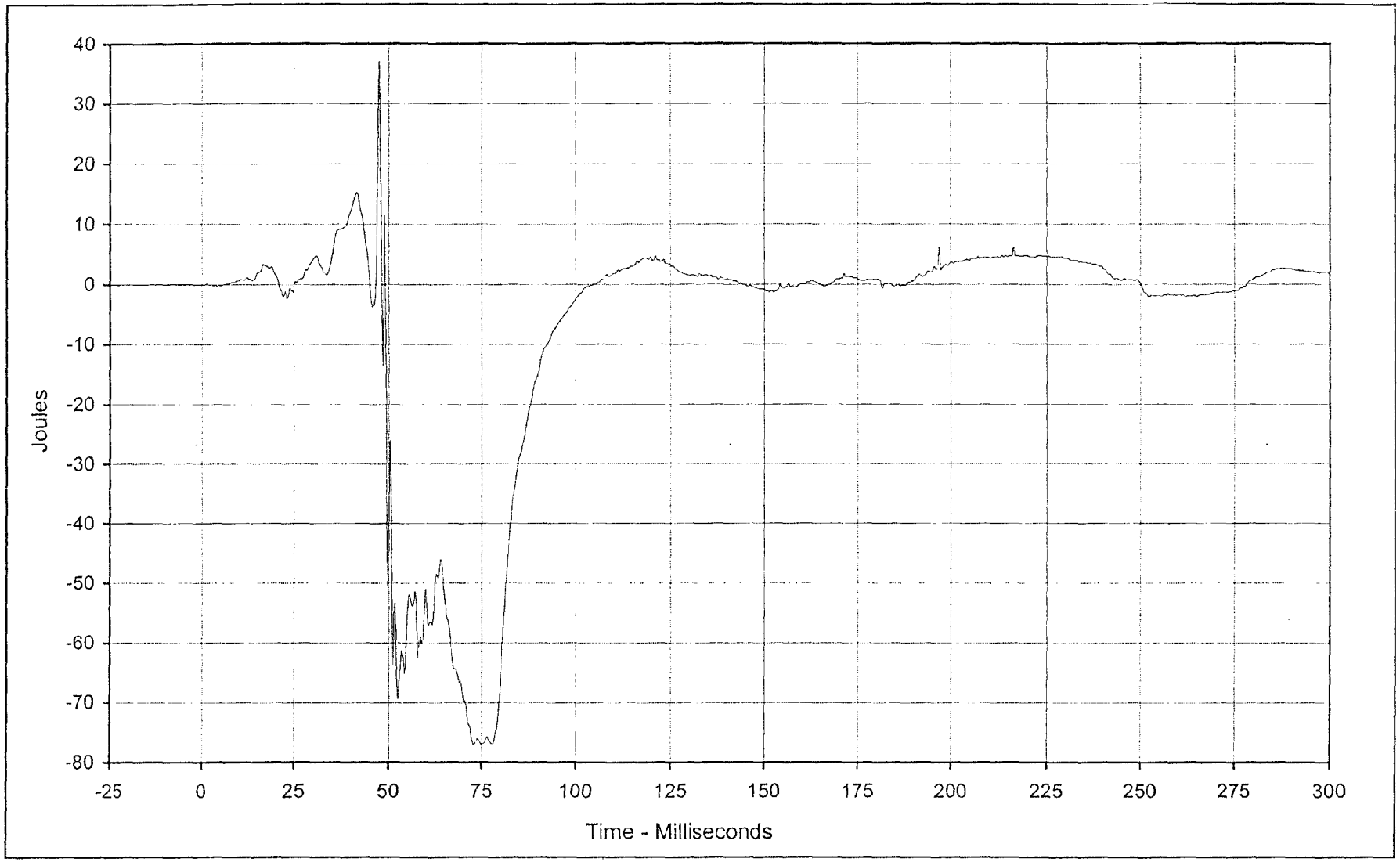
Date of Test: 11/21/97

Curve Number: FIL-033

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering

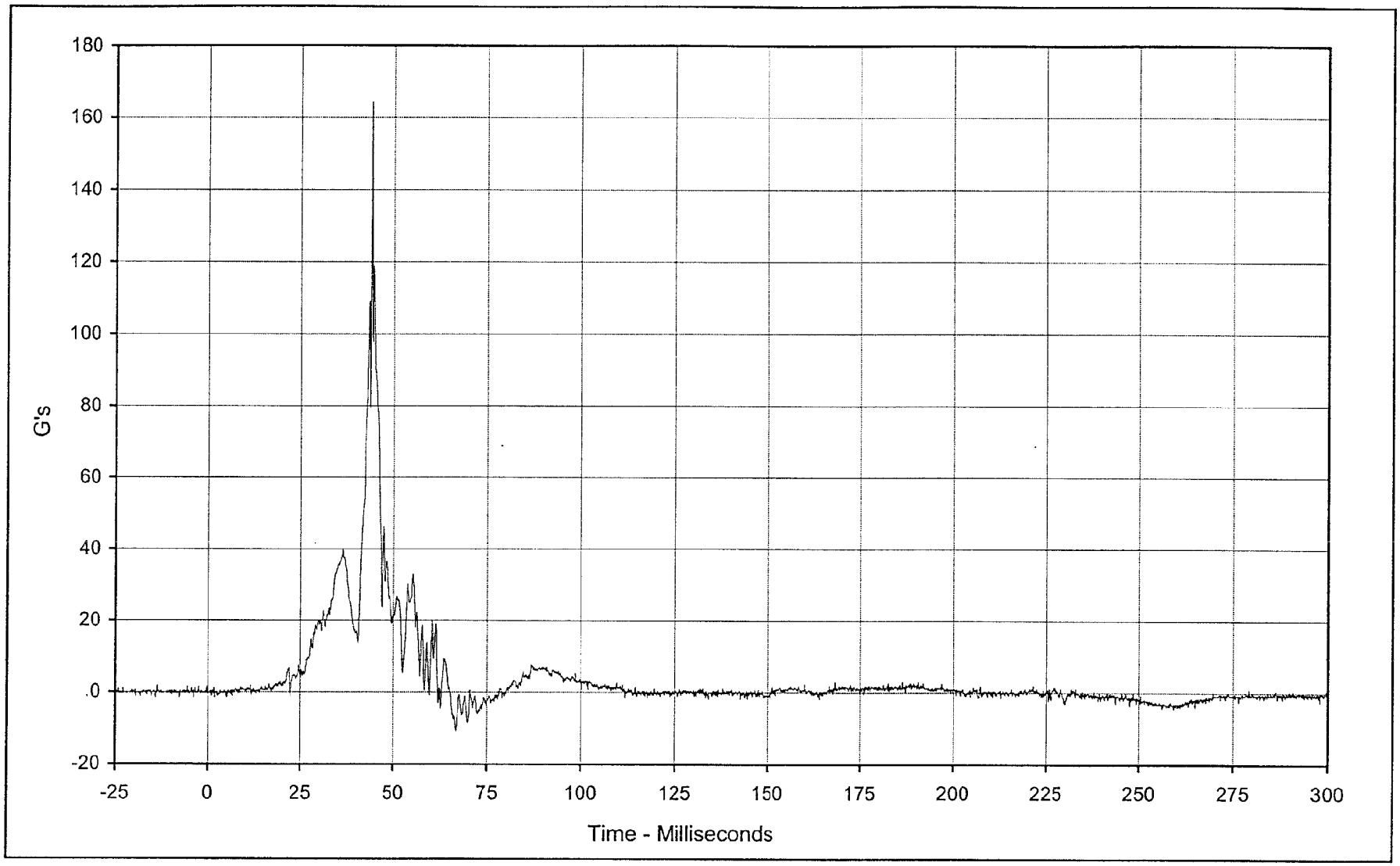


Curve Description:	Driver Right Lower Tibia Moment Y			
Maximum Value:	37.0	at	47.6	Milliseconds
Minimum Value:	-77.1	at	72.8	Milliseconds
SAE Filter Class:	600			
Date of Test:	11/21/97			
Curve Number:	FIL-034			

Testing Program: 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description: Driver Left Foot Aft X

Maximum Value: 164.1 at 43.8 Milliseconds

Minimum Value: -10.8 at 66.6 Milliseconds

SAE Filter Class: 1000

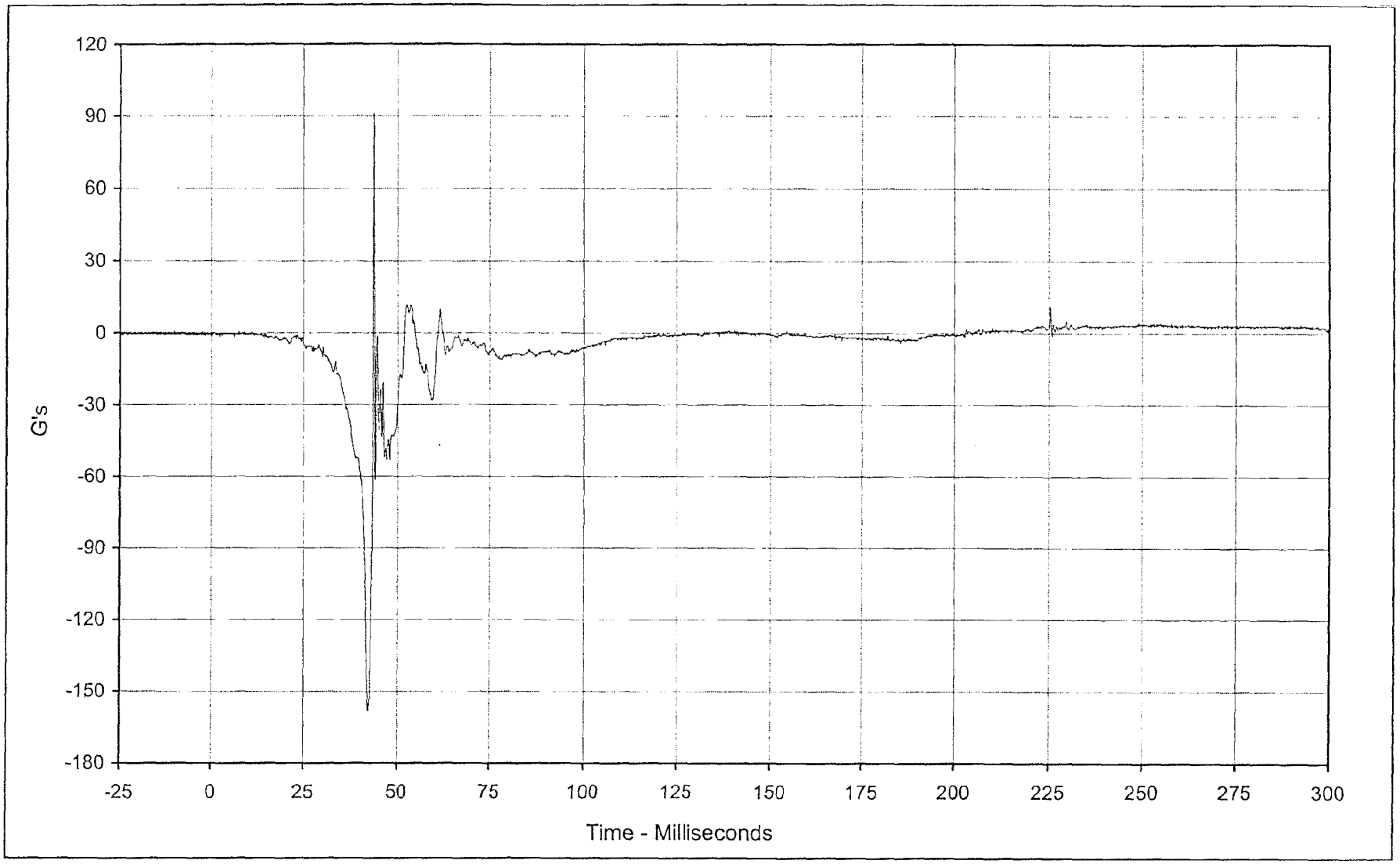
Date of Test: 11/21/97

Curve Number: FIL-035

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description: Driver Left Foot Aft Z

Maximum Value: 90.0 at 43.6 Milliseconds

Minimum Value: -158.0 at 42.2 Milliseconds

SAE Filter Class: 1000

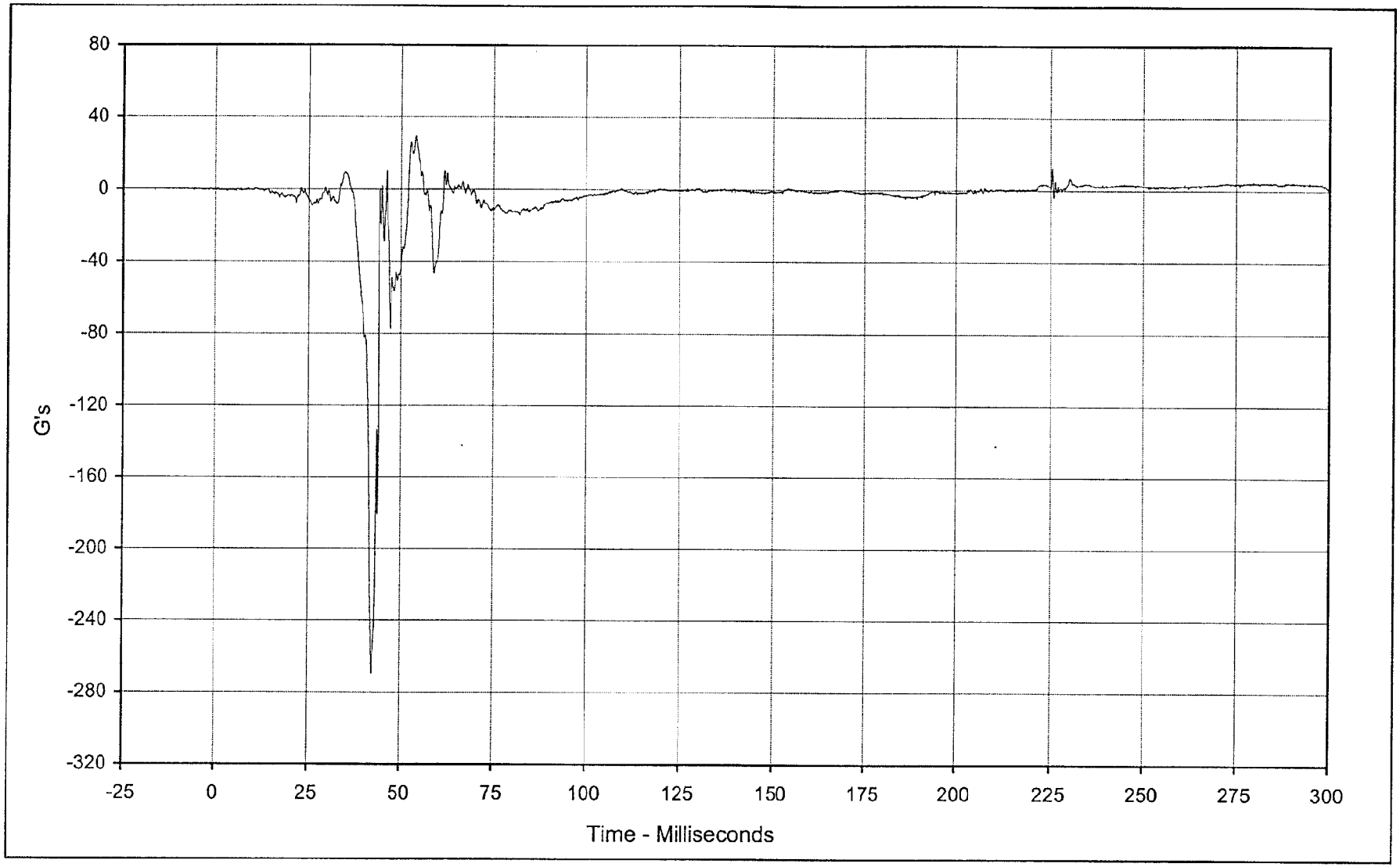
Date of Test: 11/21/97

Curve Number: FIL-036

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description: Driver Left Foot Fore Z

Maximum Value: 29.4 at 54.0 Milliseconds

Minimum Value: -269.8 at 42.3 Milliseconds

SAE Filter Class: 1000

Date of Test: 11/21/97

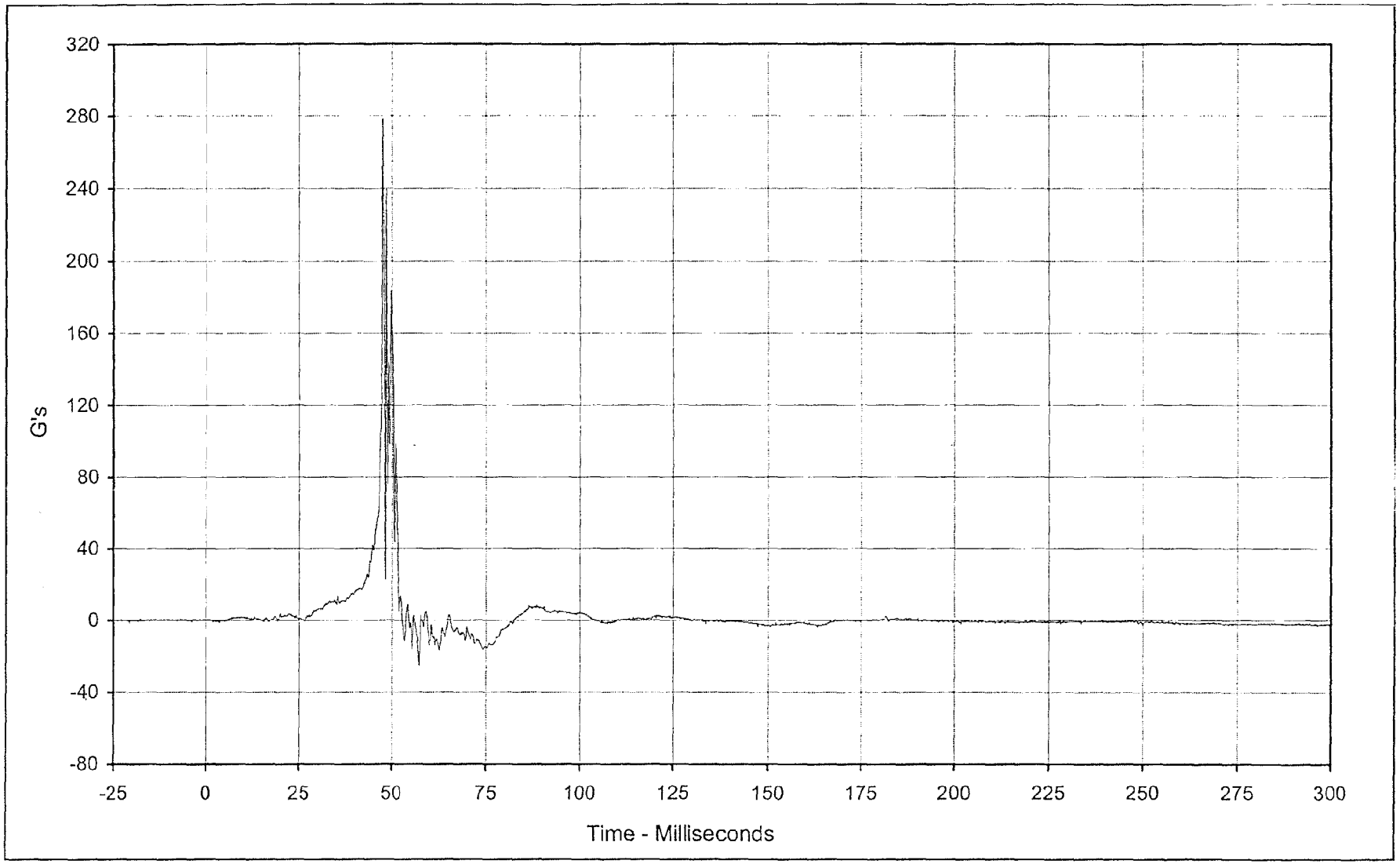
Curve Number: FIL-037

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering

KAR-97-R97050-01

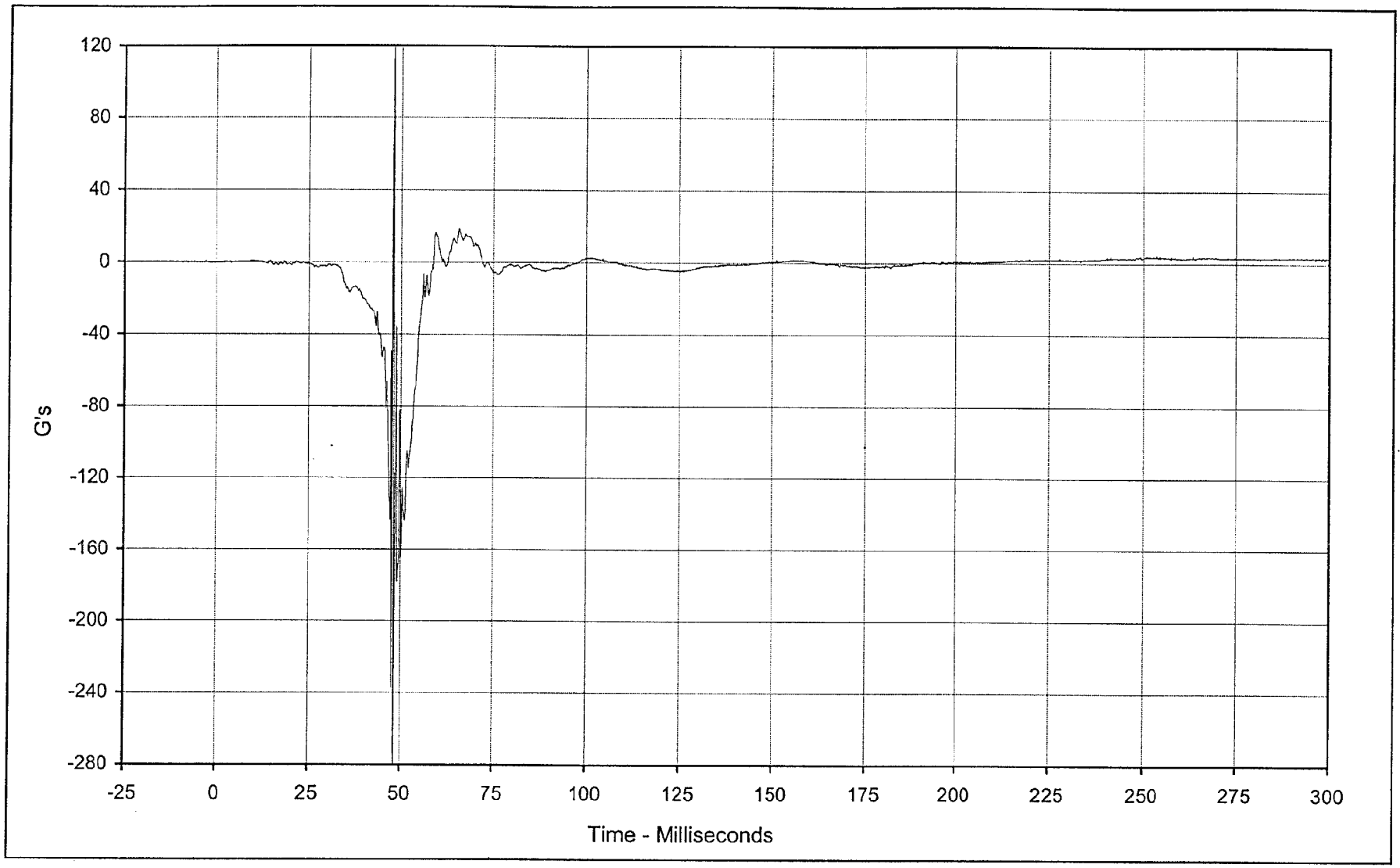


Curve Description:	Driver Right Foot Aft X			
Maximum Value:	278.5	at	47.6	Milliseconds
Minimum Value:	-25.3	at	57.5	Milliseconds
SAE Filter Class:	1000			
Date of Test:	11/21/97			
Curve Number:	FIL-038			

Testing Program: 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description: Driver Right Foot Aft Z

Maximum Value: 118.7 at 48.0 Milliseconds

Minimum Value: -279.7 at 48.4 Milliseconds

SAE Filter Class: 1000

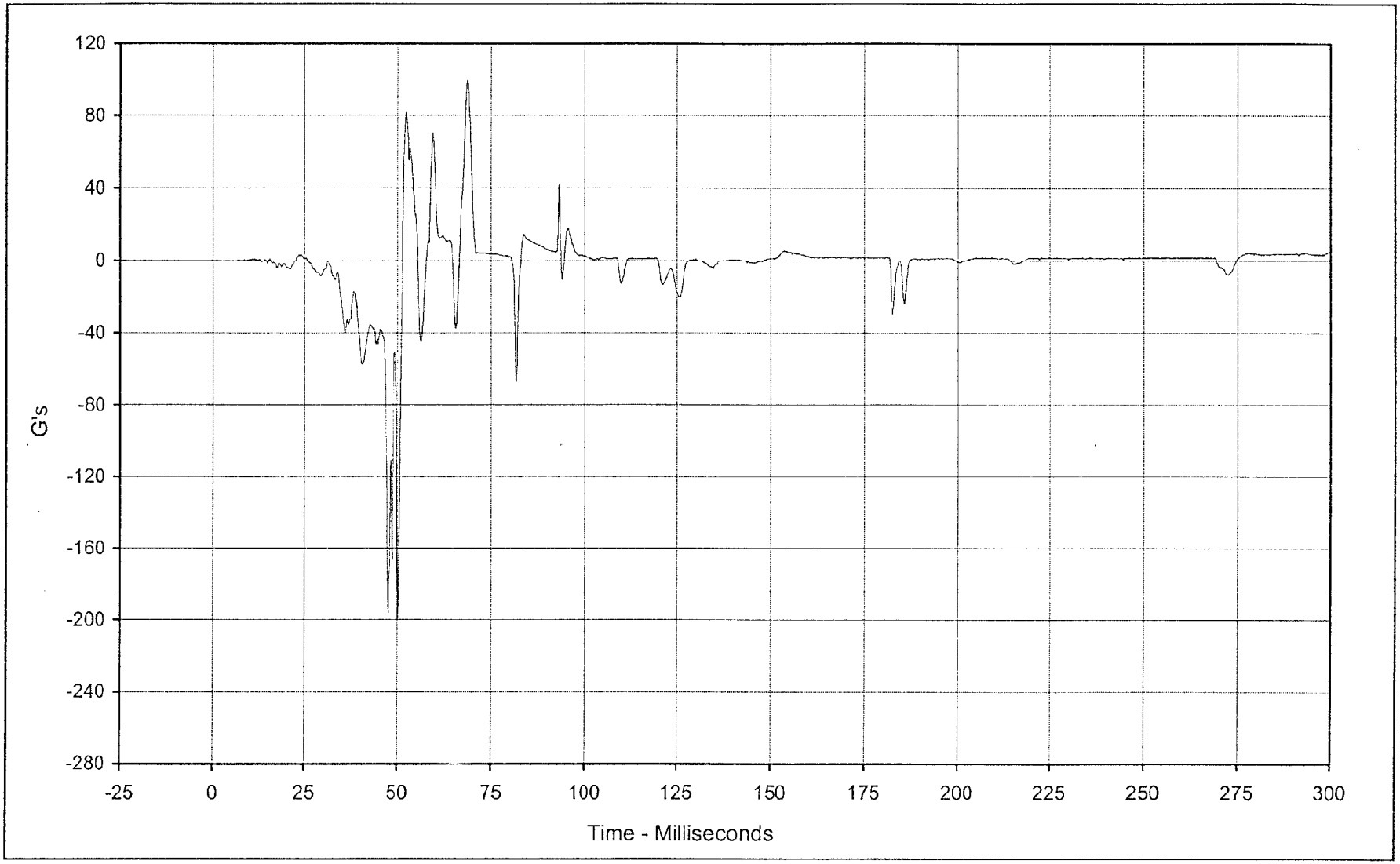
Date of Test: 11/21/97

Curve Number: FIL-039

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



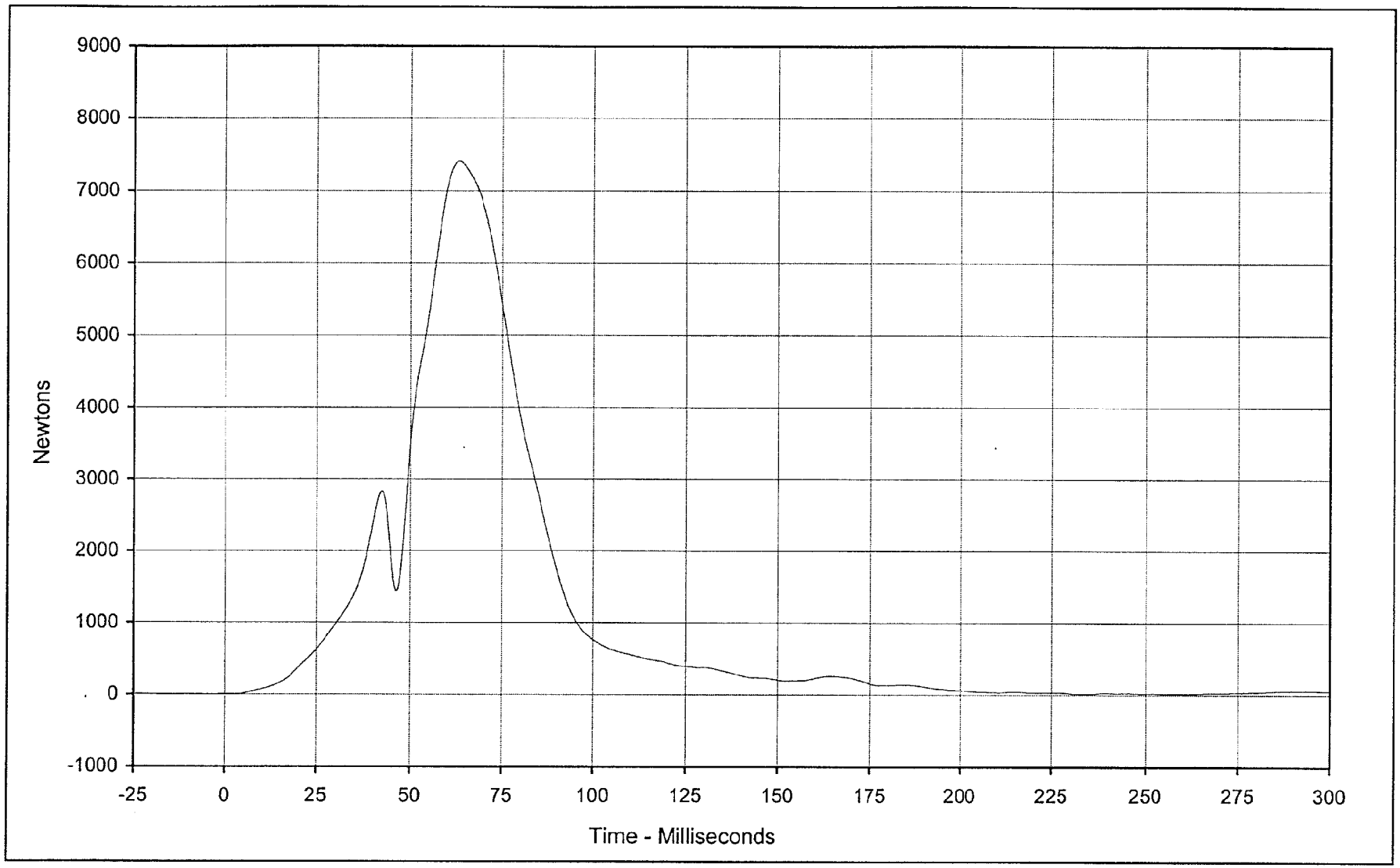
Curve Description:	Driver Right Foot Fore Z			
Maximum Value:	99.6	at	68.5	Milliseconds
Minimum Value:	-200.4	at	50.1	Milliseconds
SAE Filter Class:	1000			
Date of Test:	11/21/97			
Curve Number:	FIL-040			

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering

KAR-97-R97050-01



Curve Description: Driver Lap Belt Force

Maximum Value: 7407.1 at 63.0 Milliseconds

Minimum Value: 0.8 at 1.5 Milliseconds

SAE Filter Class: 60

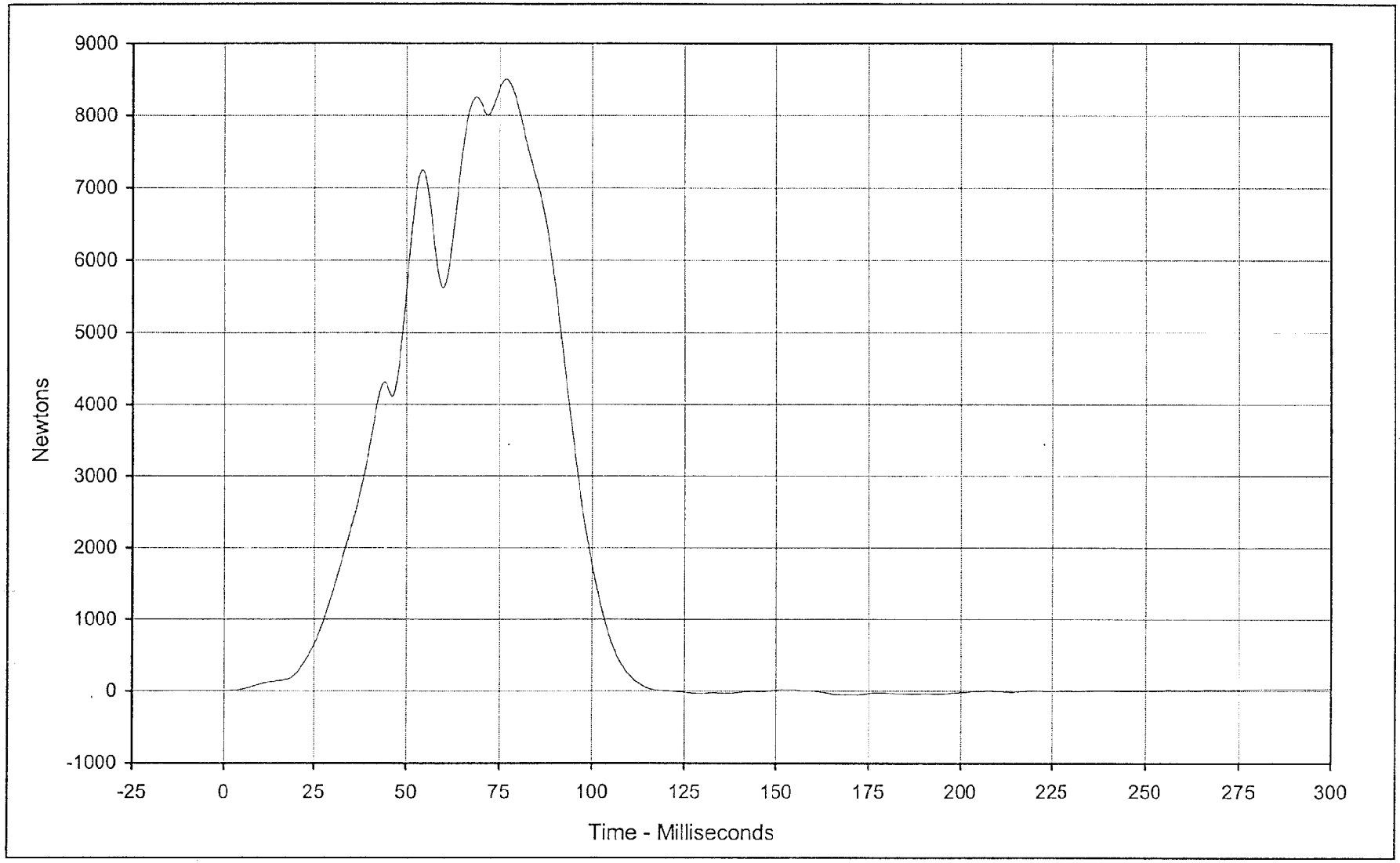
Date of Test: 11/21/97

Curve Number: FIL-041

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering

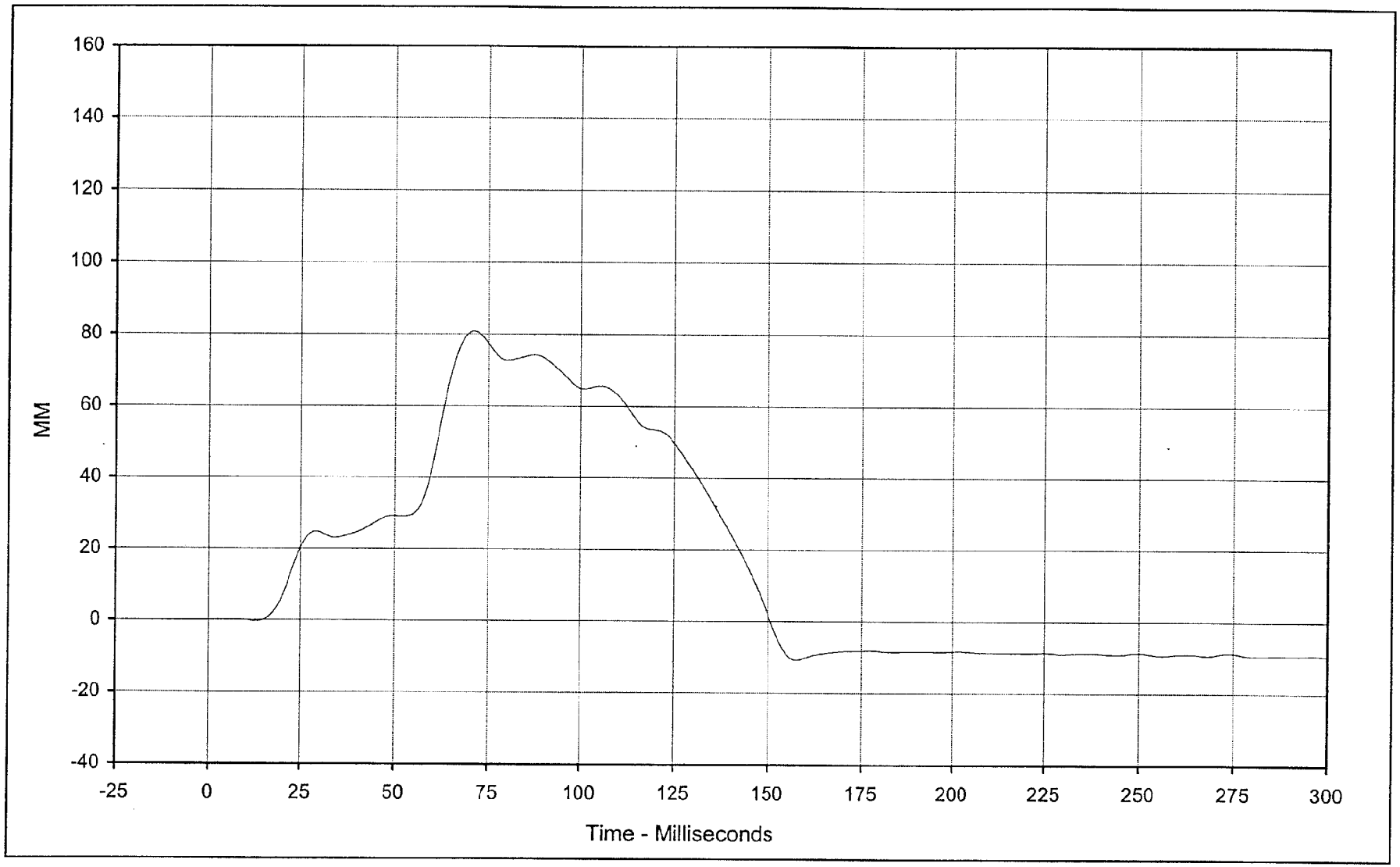


Curve Description:	Driver Shoulder Belt Force			
Maximum Value:	8503.4	at	76.7	Milliseconds
Minimum Value:	-54.5	at	167.7	Milliseconds
SAE Filter Class:	60			
Date of Test:	11/21/97			
Curve Number:	FIL-042			

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description: Driver Shoulder Belt Pullout

Maximum Value: 80.8 at 70.9 Milliseconds

Minimum Value: -10.8 at 157.7 Milliseconds

SAE Filter Class: 60

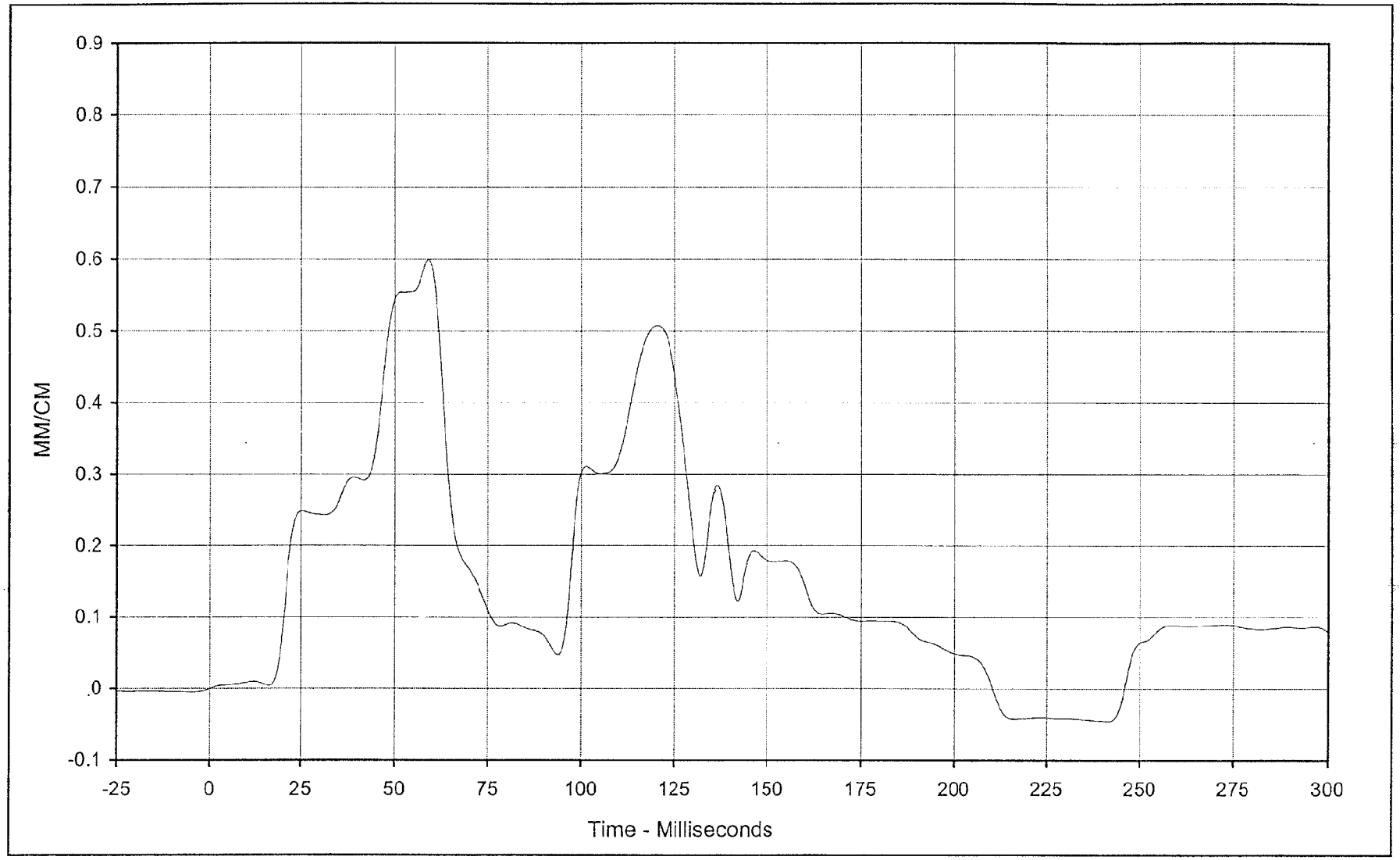
Date of Test: 11/21/97

Curve Number: FIL-043

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering

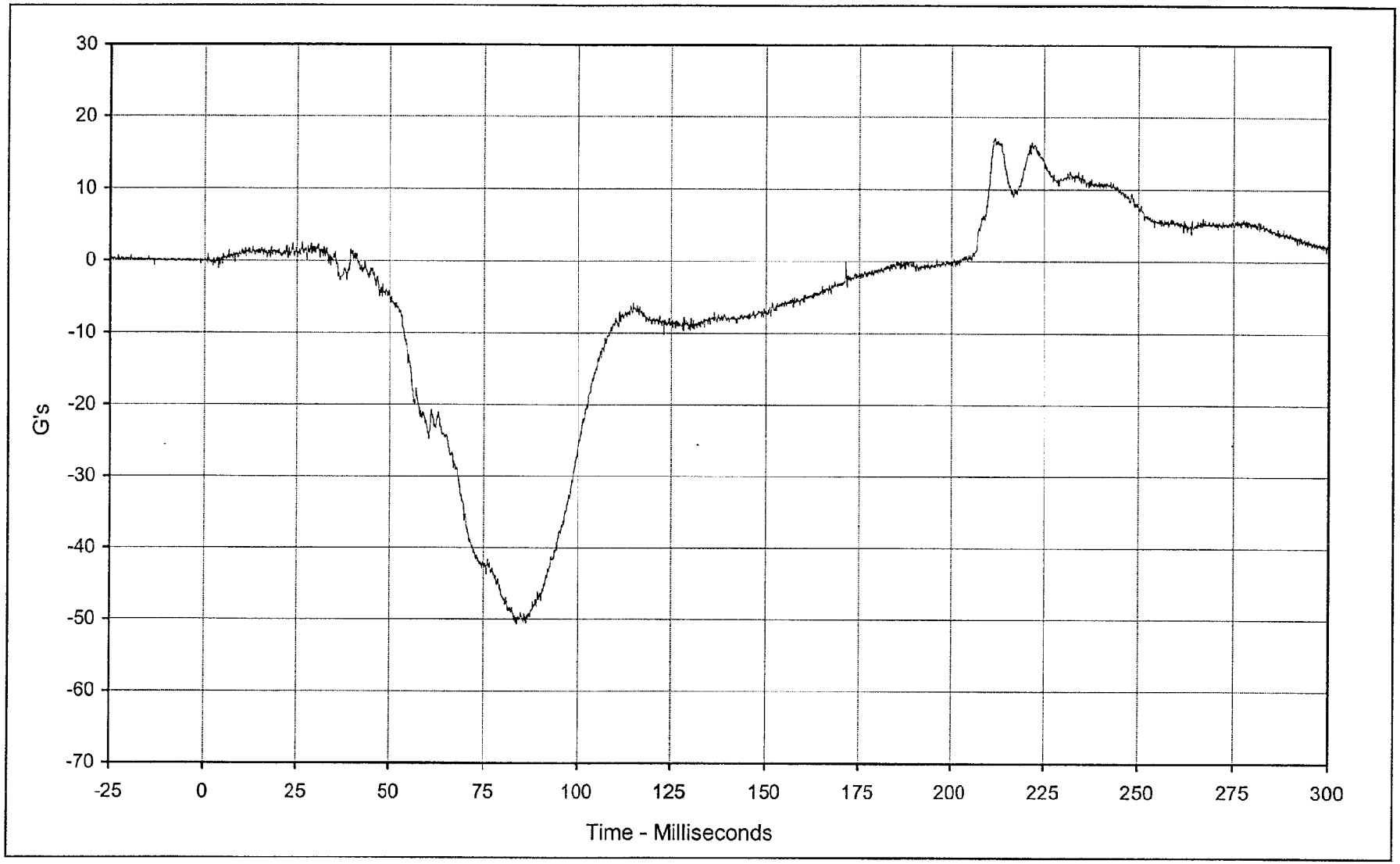


Curve Description:	Driver Shoulder Belt Elongation			
Maximum Value:	0.60	at	59.1	Milliseconds
Minimum Value:	-0.05	at	241.3	Milliseconds
SAE Filter Class:	60			
Date of Test:	11/21/97			
Curve Number:	FIL-044			

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description: Passenger Head Primary X

Maximum Value: 17.1 at 211.9 Milliseconds

Minimum Value: -50.7 at 83.7 Milliseconds

SAE Filter Class: 1000

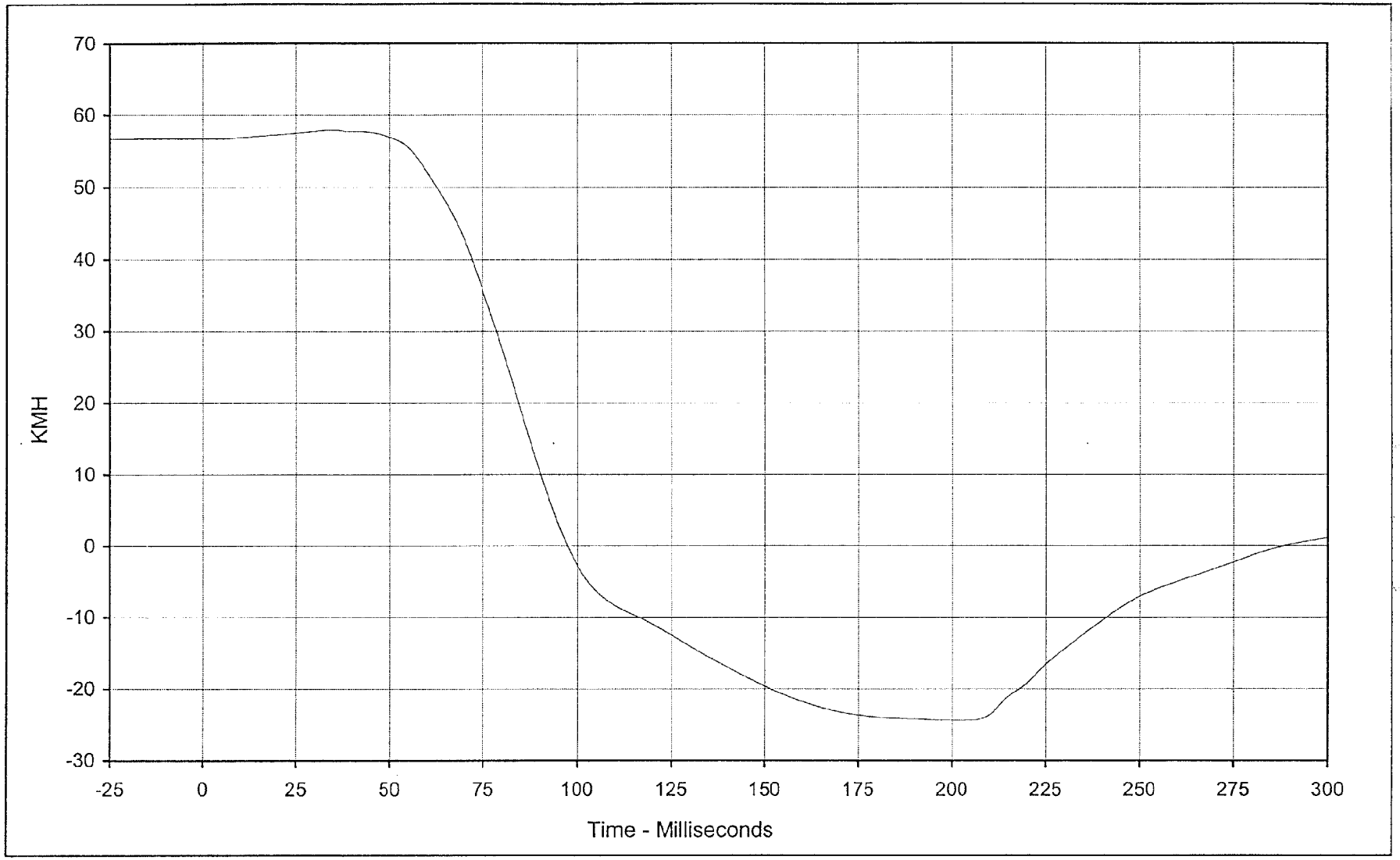
Date of Test: 11/21/97

Curve Number: FIL-045

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description: Passenger Head Primary X Velocity

Maximum Value: 57.9 at 35.2 Milliseconds

Minimum Value: -24.4 at 202.3 Milliseconds

SAE Filter Class: 180

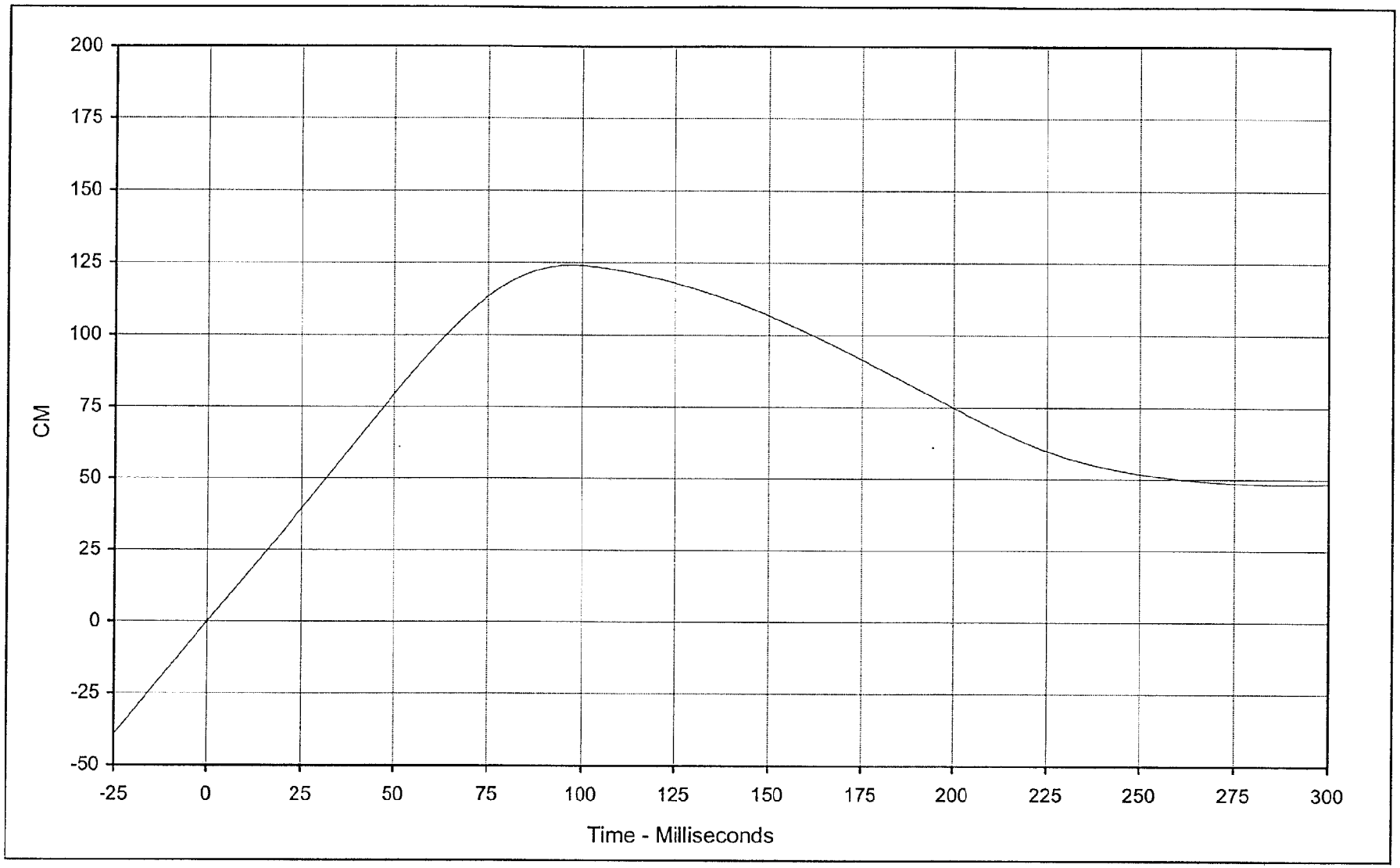
Date of Test: 11/21/97

Curve Number: IN1-045

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering

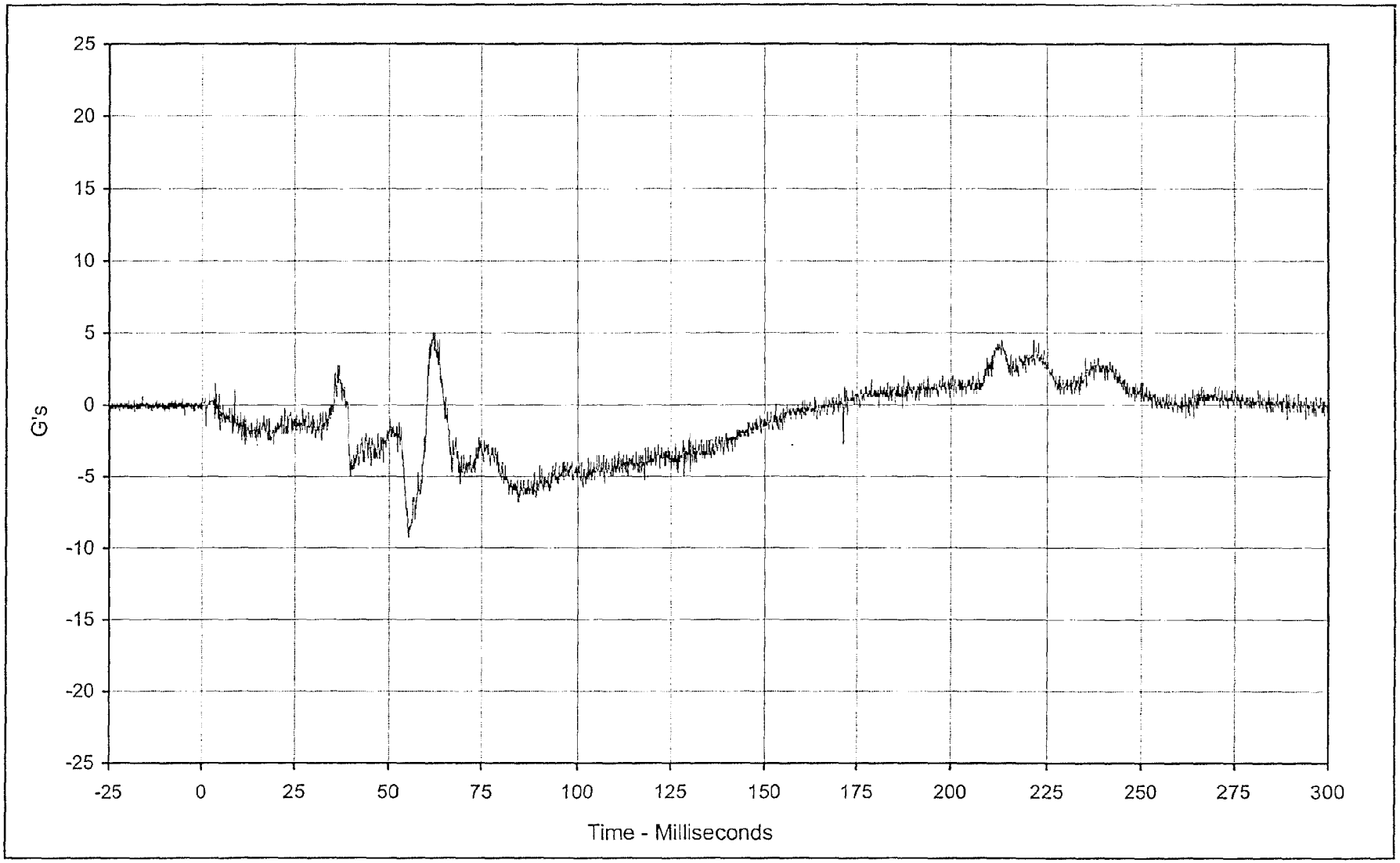


Curve Description:	Passenger Head Primary X Displ.			
Maximum Value:	124.1	at	97.4	Milliseconds
Minimum Value:	0.0	at	0.0	Milliseconds
SAE Filter Class:	180			
Date of Test:	11/21/97			
Curve Number:	IN2-045			

Testing Program: 1998 NHTSA 35 mph NCAP No.: MW0106

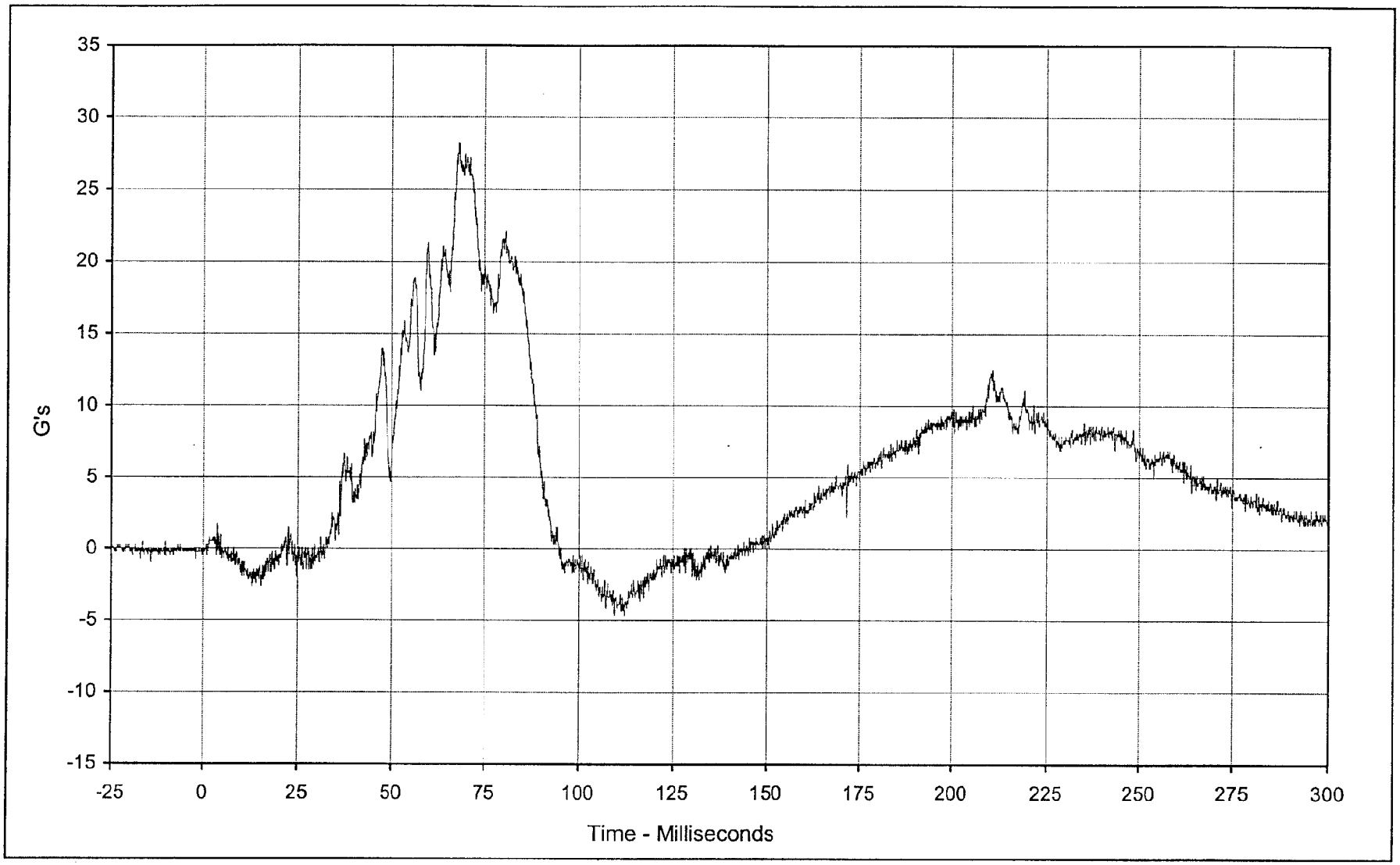
Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description:	Passenger Head Primary Y				Testing Program	1998 NHTSA 35 mph NCAP No.: MW0106	
Maximum Value:	5.0	at	62.0	Milliseconds	Test Vehicle:	1998 Chevrolet Malibu 4 Door Sedan	
Minimum Value:	-9.3	at	55.4	Milliseconds			
SAE Filter Class:	1000						
Date of Test:	11/21/97						
Curve Number:	FIL-046						

KARCO Engineering



Curve Description: Passenger Head Primary Z

Maximum Value: 28.2 at 67.8 Milliseconds

Minimum Value: -4.6 at 109.6 Milliseconds

SAE Filter Class: 1000

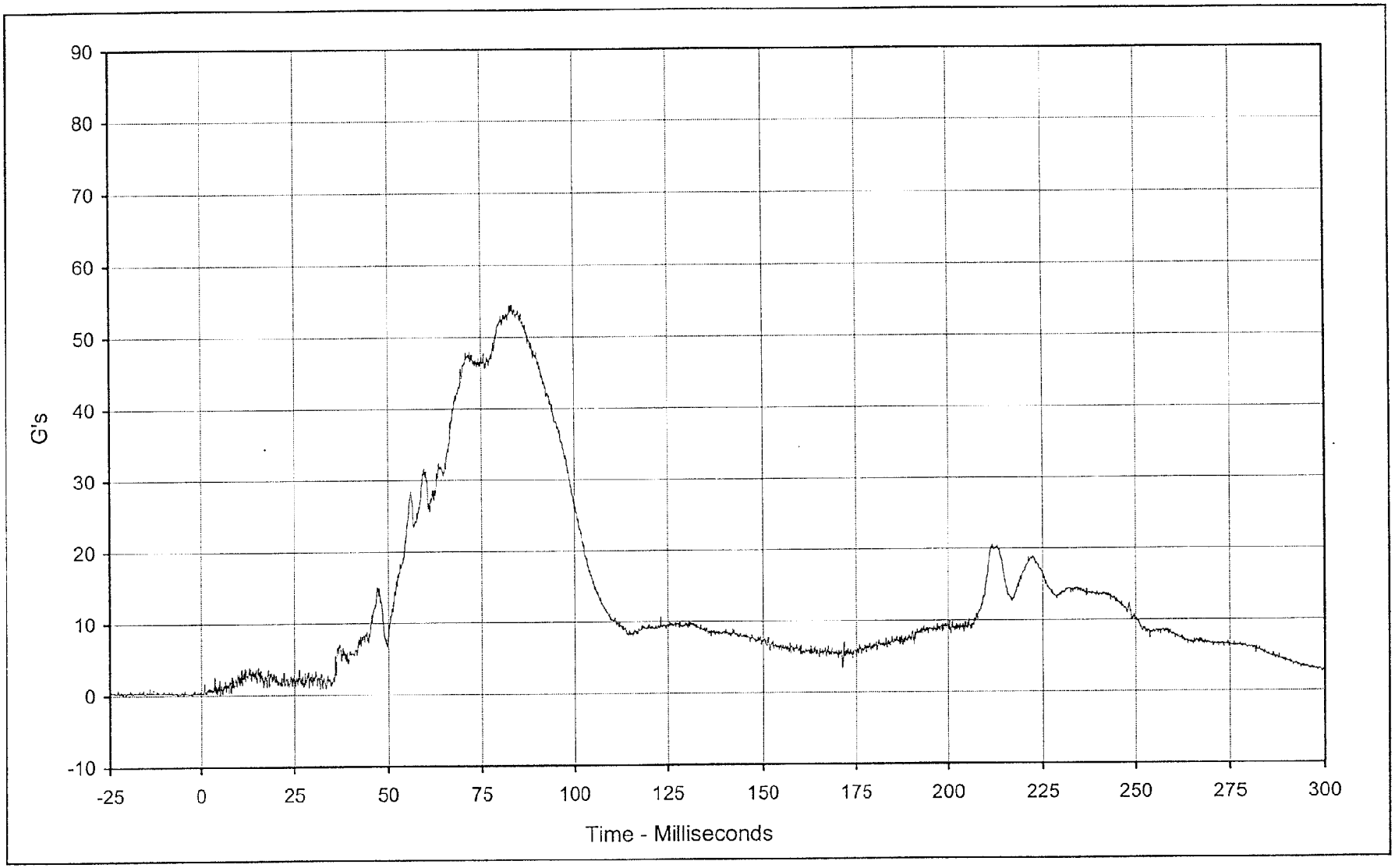
Date of Test: 11/21/97

Curve Number: FIL-047

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description: Passenger Head Resultant Primary

Maximum Value: 54.6 at 83.7 Milliseconds

Minimum Value: 0.0 at 5.1 Milliseconds

SAE Filter Class: 1000

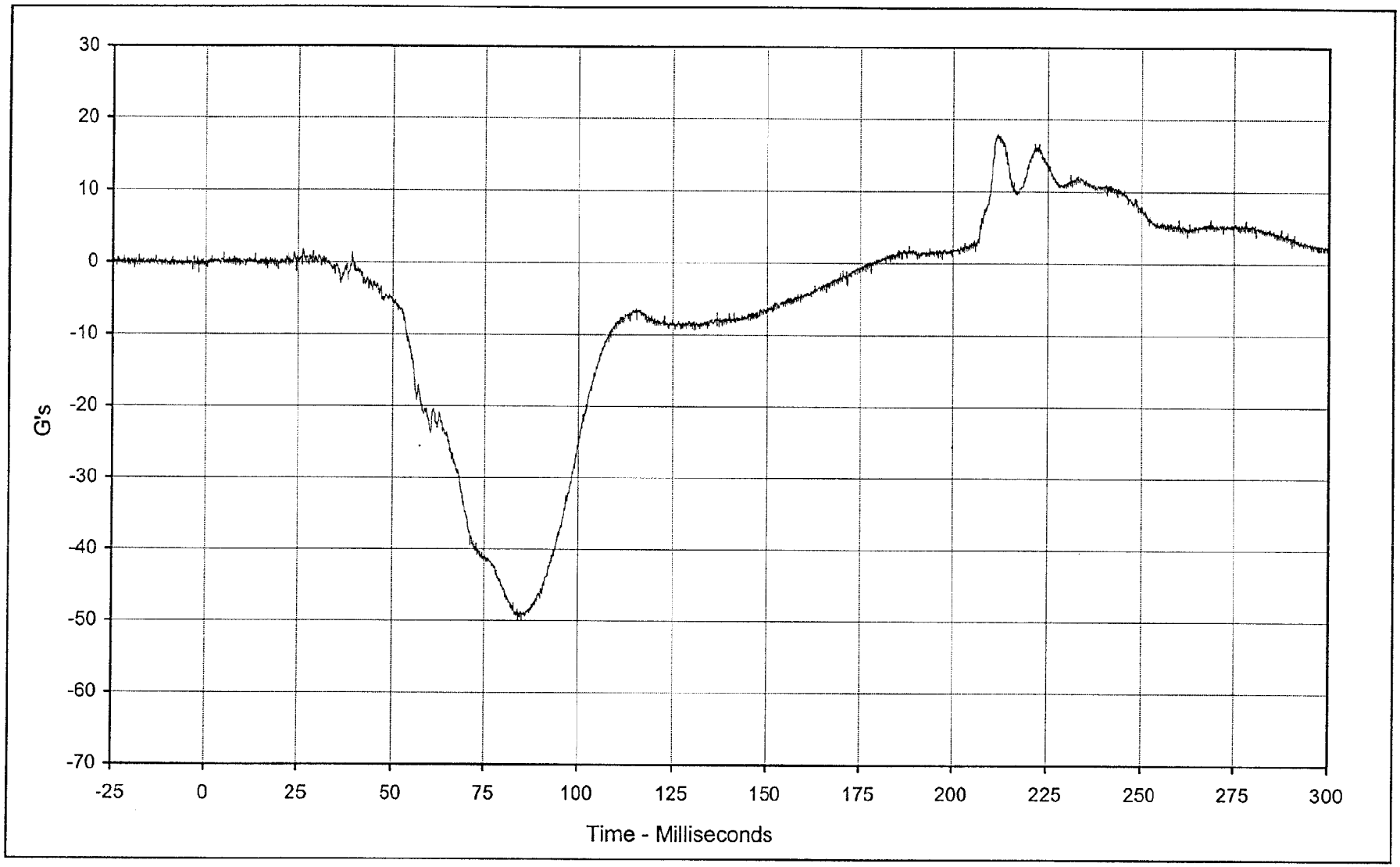
Date of Test: 11/21/97

Curve Number: RES-045

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description: Passenger Head Redundant X

Maximum Value: 18.0 at 211.9 Milliseconds

Minimum Value: -50.0 at 84.0 Milliseconds

SAE Filter Class: 1000

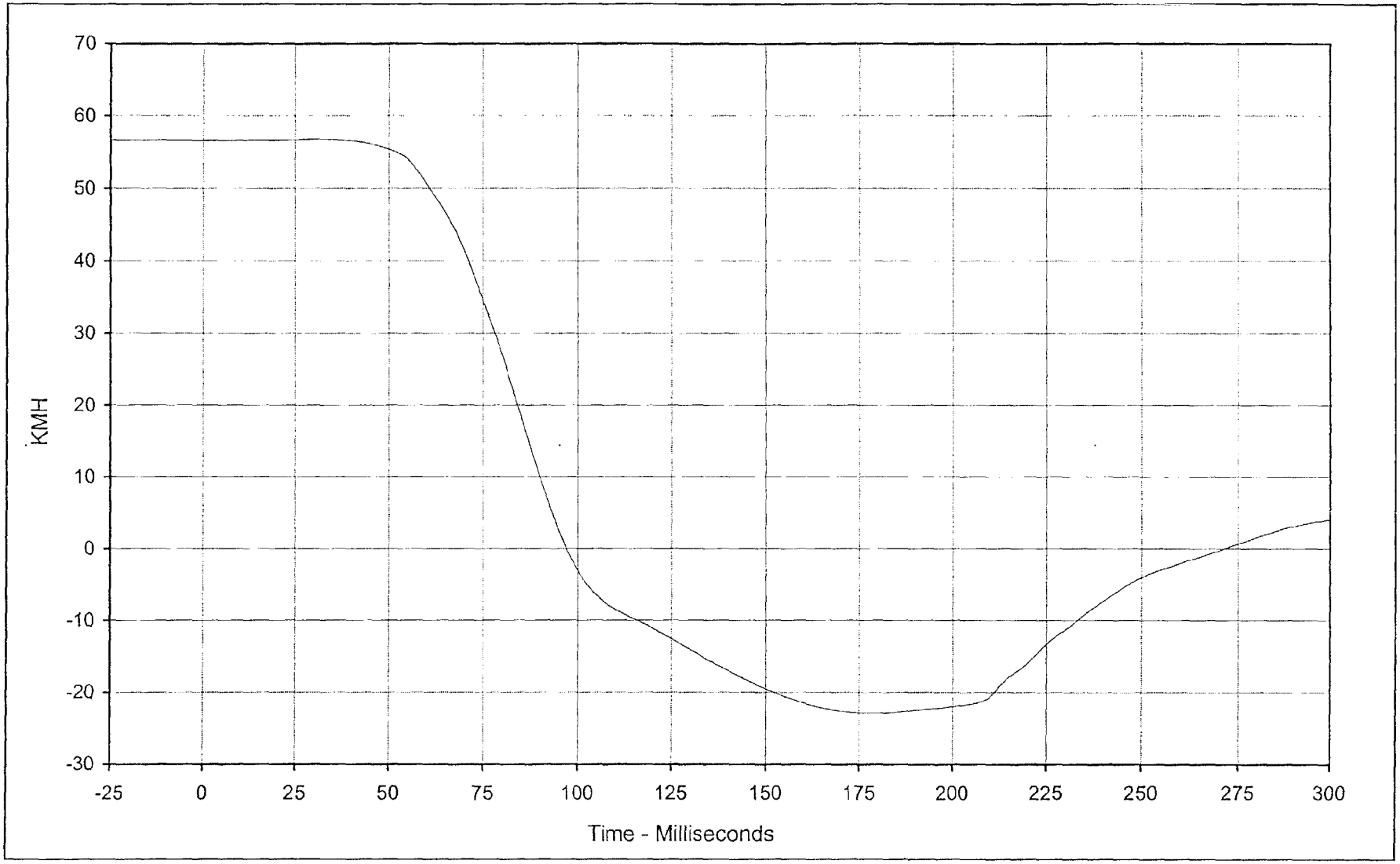
Date of Test: 11/21/97

Curve Number: FIL-048

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

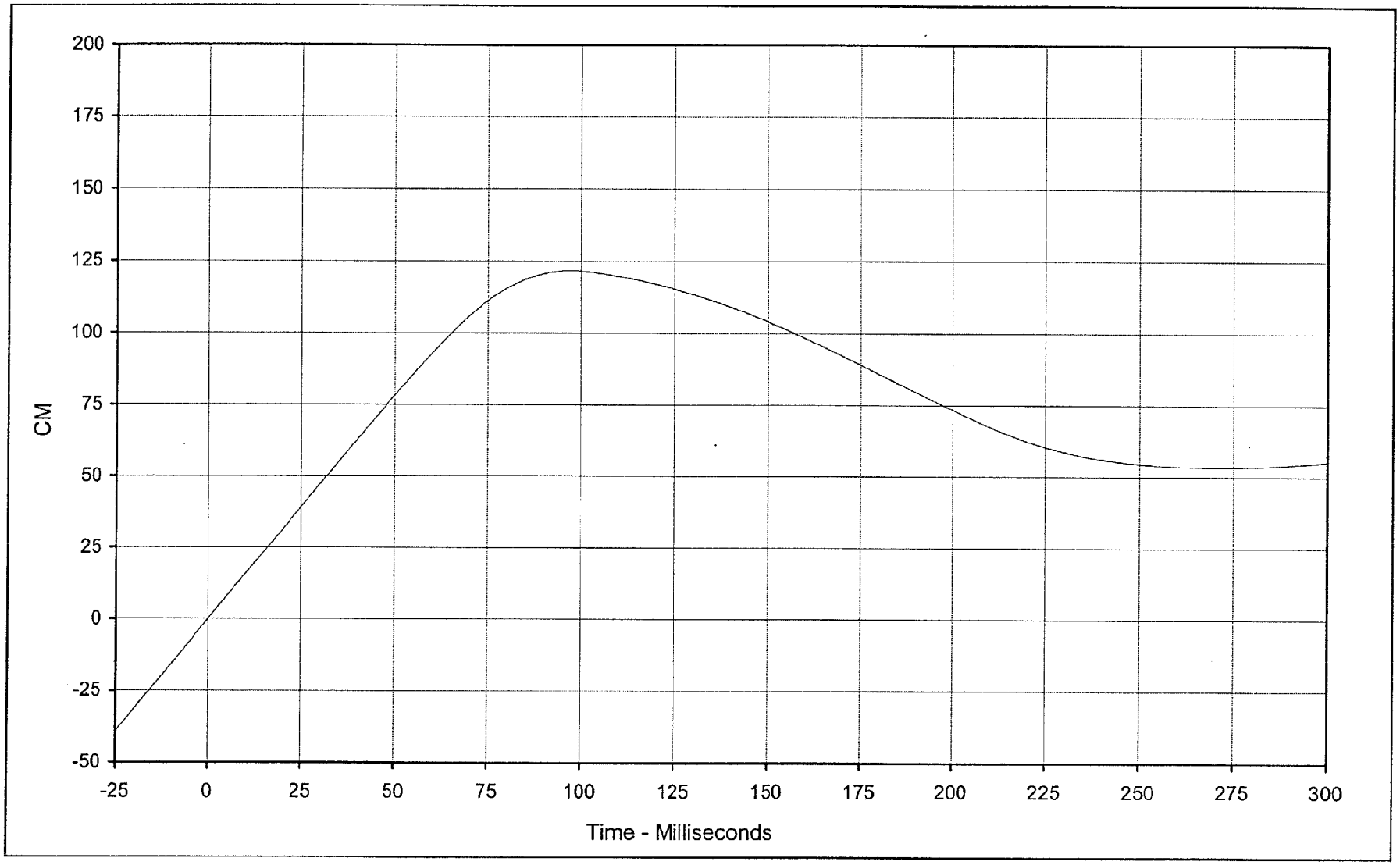
Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description:	Passenger Head Redundant X Velocity				Testing Program	1998 NHTSA 35 mph NCAP No.: MW0106	
Maximum Value:	56.8	at	32.6	Milliseconds	Test Vehicle:	1998 Chevrolet Malibu 4 Door Sedan	
Minimum Value:	-23.0	at	178.5	Milliseconds			
SAE Filter Class:	180						
Date of Test:	11/21/97						
Curve Number:	IN1-048						

KARCO Engineering



Curve Description: Passenger Head Redundant X Displ.

Maximum Value: 121.5 at 97.0 Milliseconds

Minimum Value: -0.1 at 0.0 Milliseconds

SAE Filter Class: 180

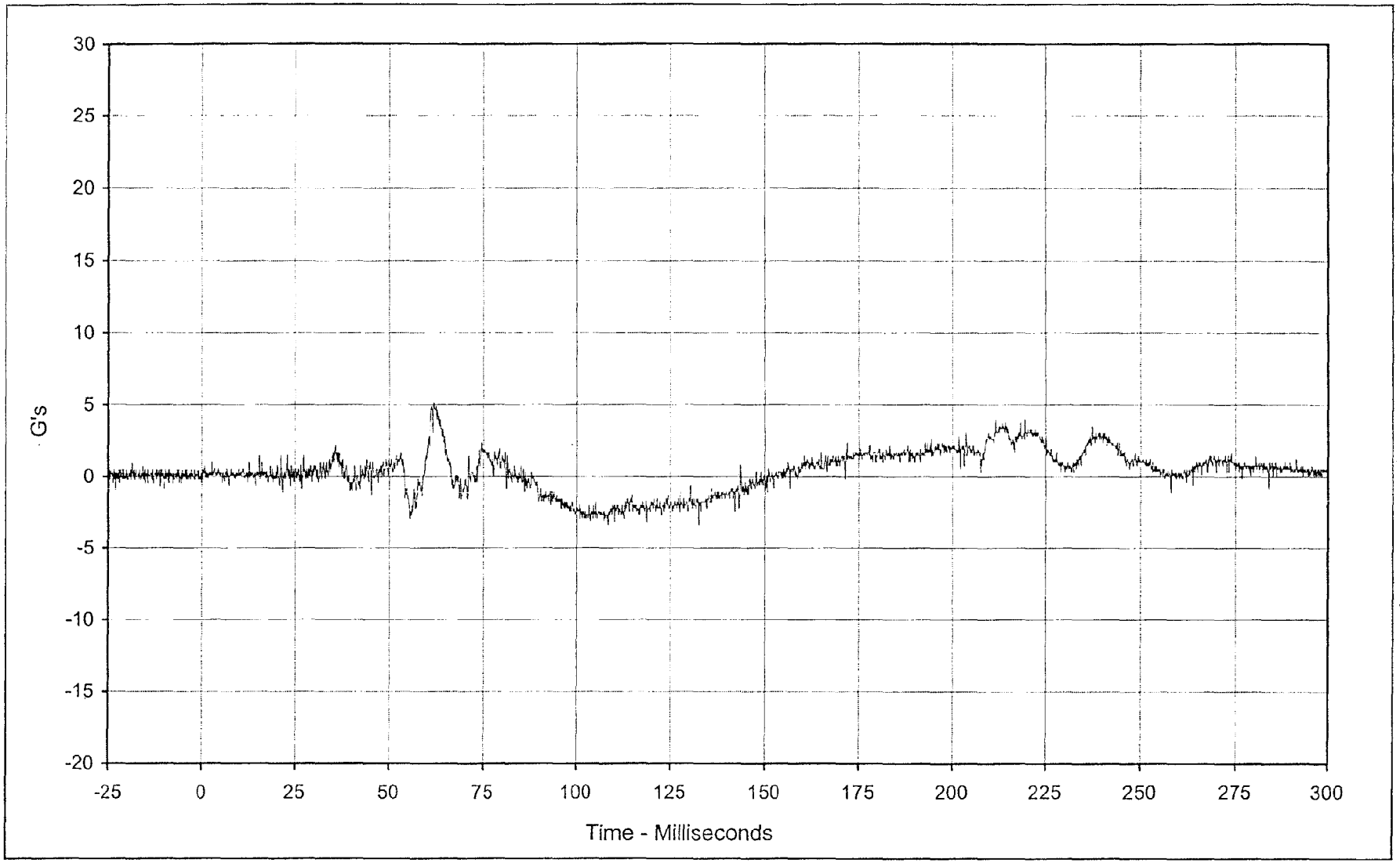
Date of Test: 11/21/97

Curve Number: IN2-048

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

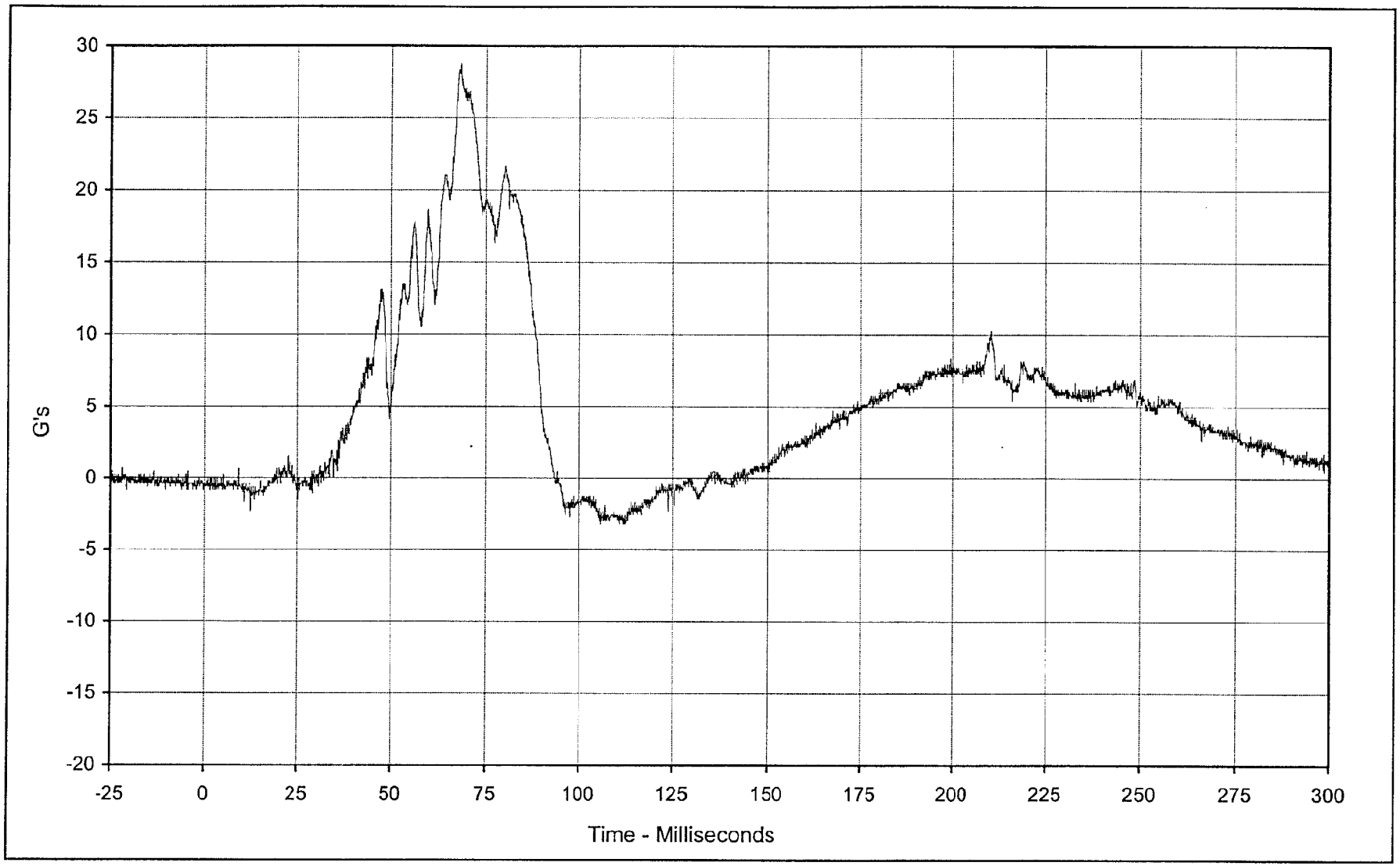
Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description:	Passenger Head Redundant Y				Testing Program	1998 NHTSA 35 mph NCAP	No.: MW0106
Maximum Value:	5.1	at	61.9	Milliseconds	Test Vehicle:	1998 Chevrolet Malibu 4 Door Sedan	
Minimum Value:	-3.4	at	108.6	Milliseconds			
SAE Filter Class:	1000						
Date of Test:	11/21/97						
Curve Number:	FIL-049						

KARC Engineering



Curve Description: Passenger Head Redundant Z

Maximum Value: 28.7 at 68.0 Milliseconds

Minimum Value: -3.2 at 105.9 Milliseconds

SAE Filter Class: 1000

Date of Test: 11/21/97

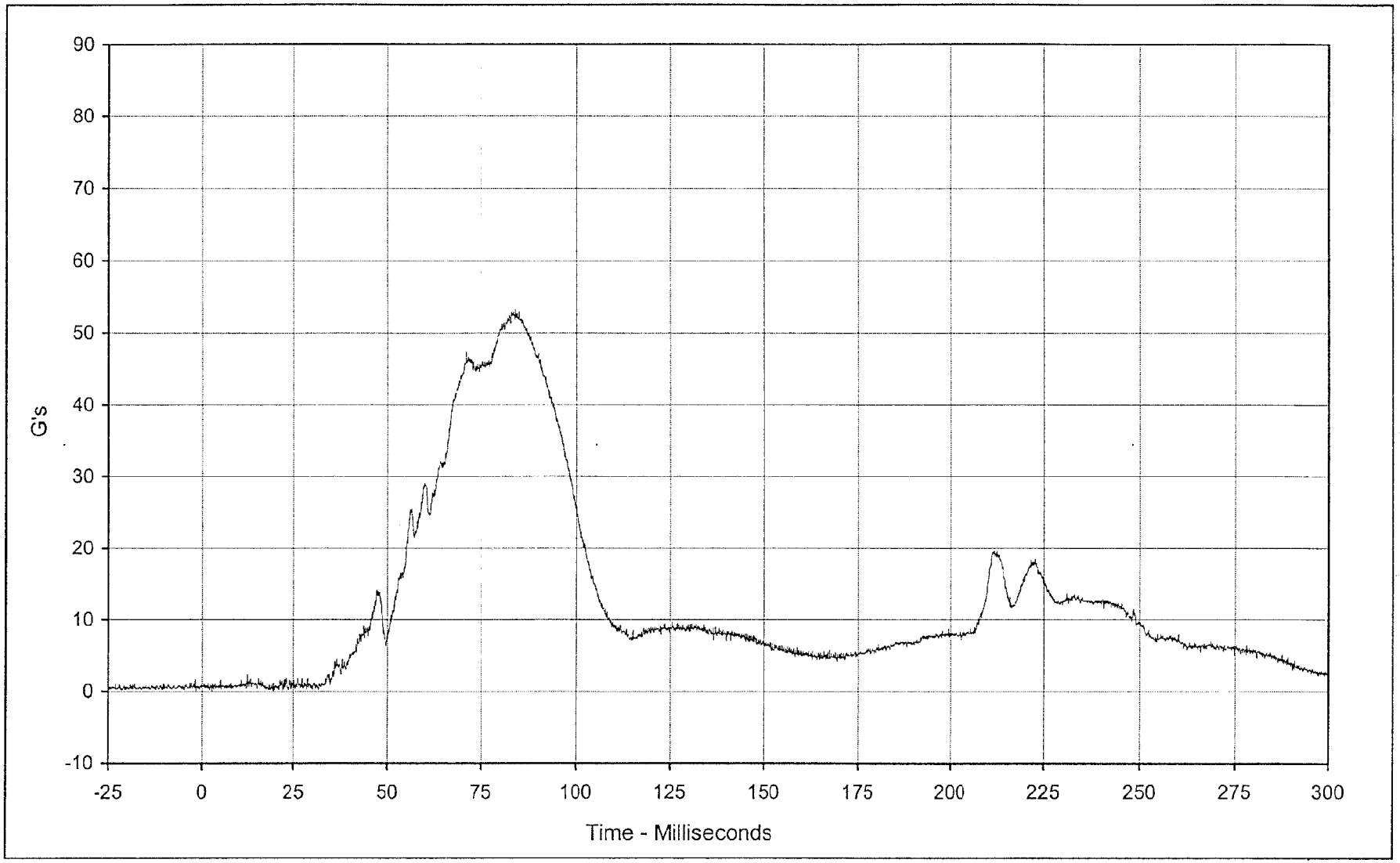
Curve Number: FIL-050

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering

KAR-97-R97050-01

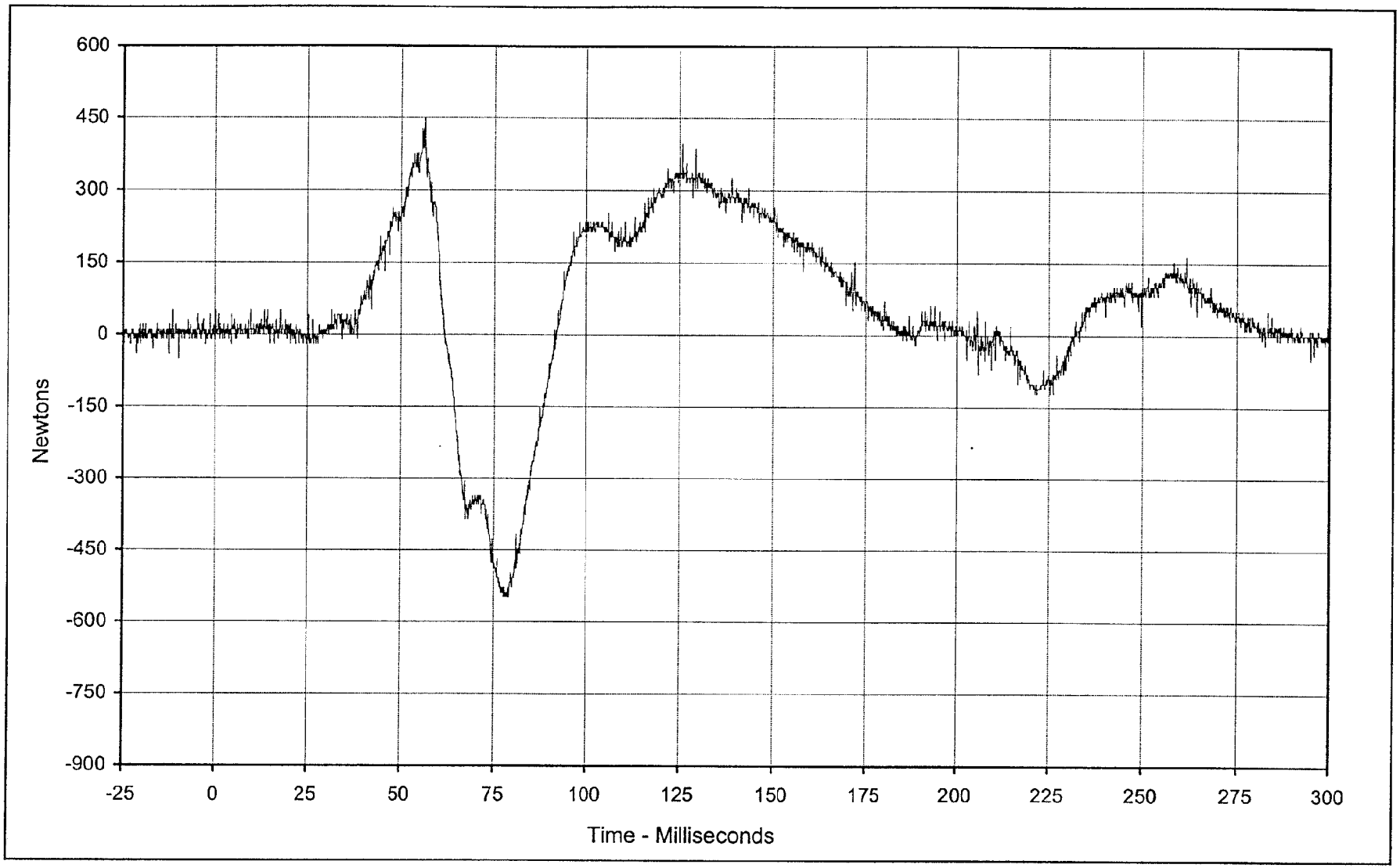


Curve Description:	Passenger Head Resultant Redundant			
Maximum Value:	53.3	at	84.0	Milliseconds
Minimum Value:	0.1	at	2.5	Milliseconds
SAE Filter Class:	1000			
Date of Test:	11/21/97			
Curve Number:	RES-048			

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description: Passenger Neck Force X

Maximum Value: 447.9 at 56.3 Milliseconds

Minimum Value: -549.1 at 77.6 Milliseconds

SAE Filter Class: 1000

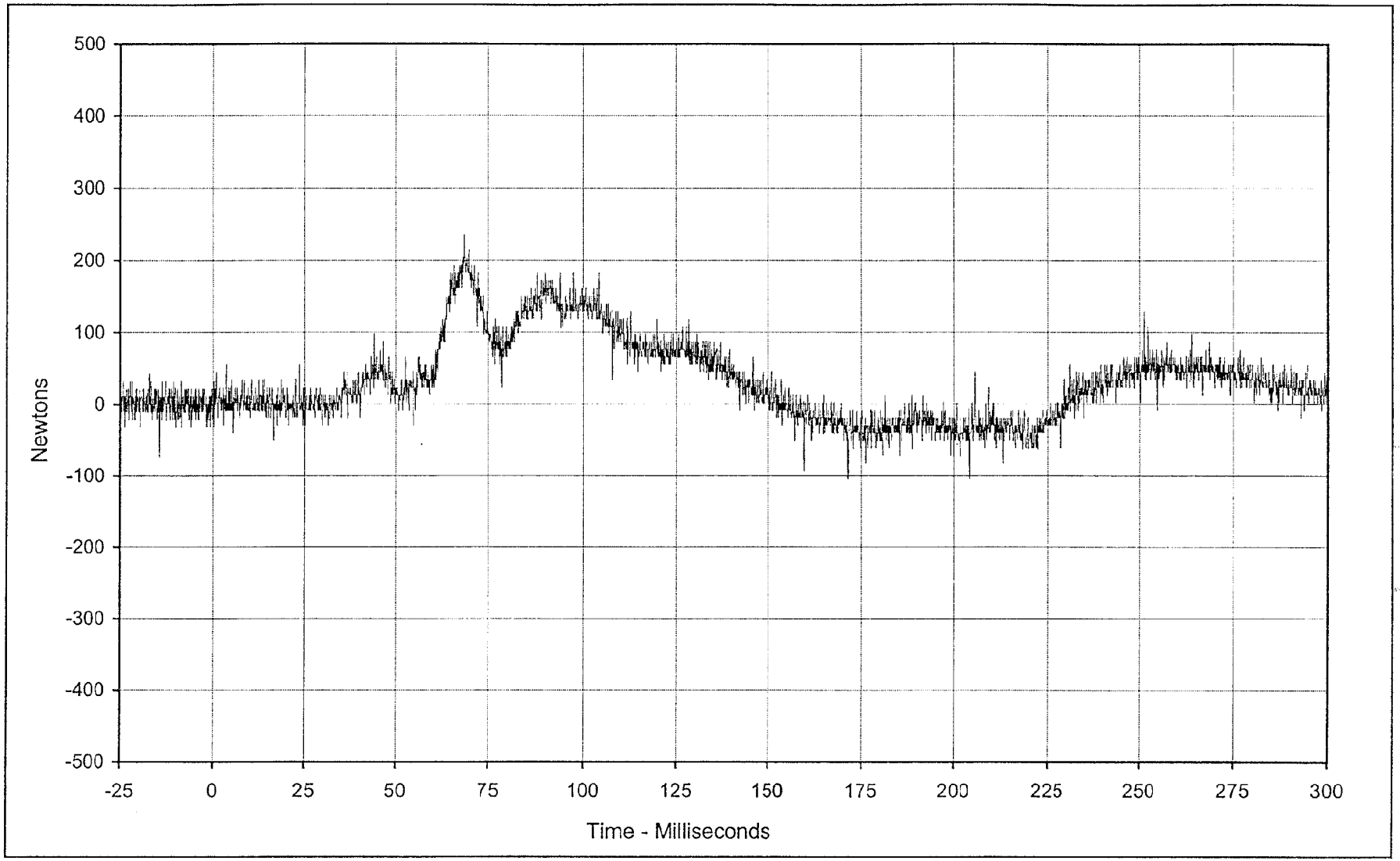
Date of Test: 11/21/97

Curve Number: FIL-051

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description: Passenger Neck Force Y

Maximum Value: 235.4 at 68.5 Milliseconds

Minimum Value: -104.2 at 171.5 Milliseconds

SAE Filter Class: 1000

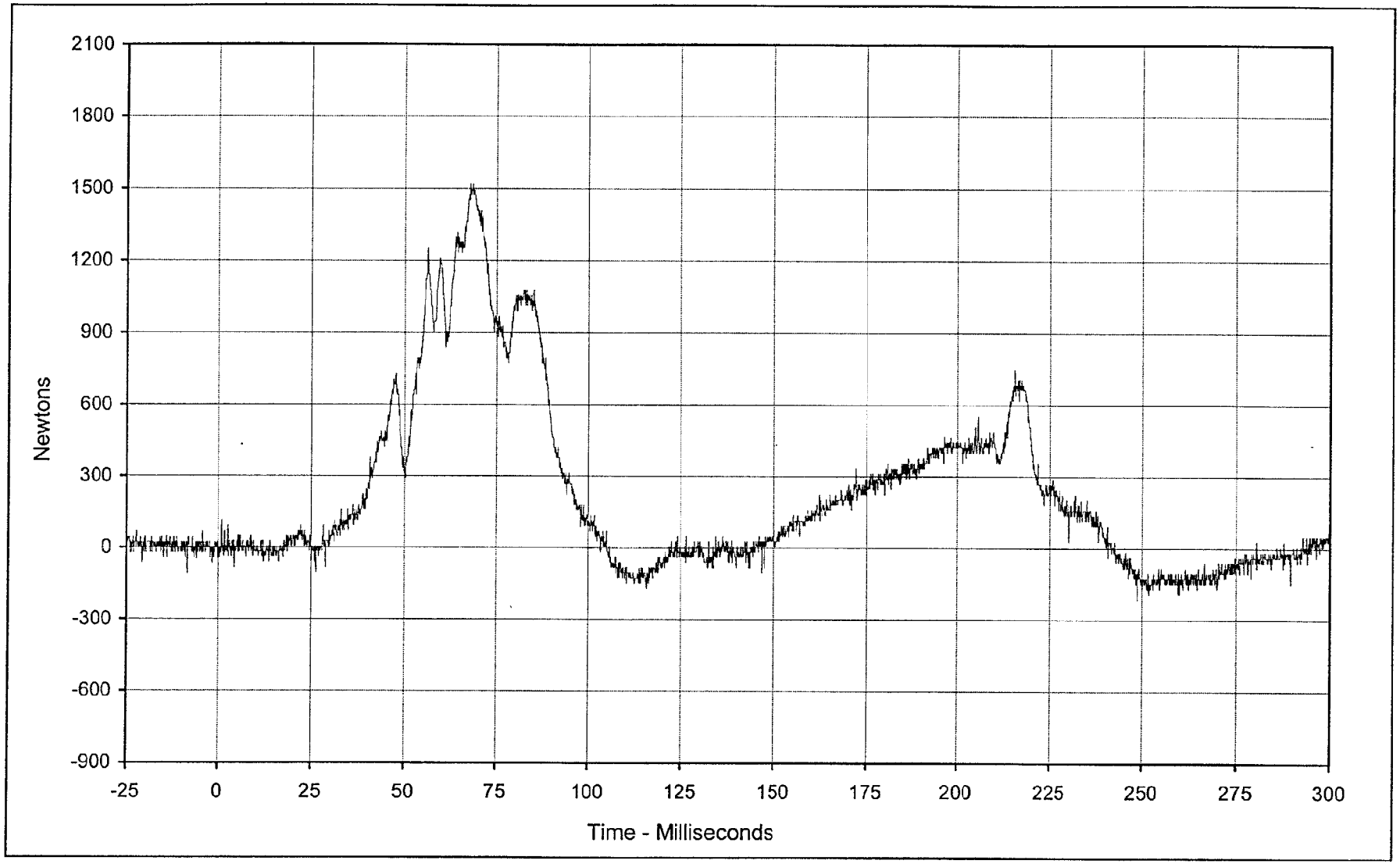
Date of Test: 11/21/97

Curve Number: FIL-052

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering

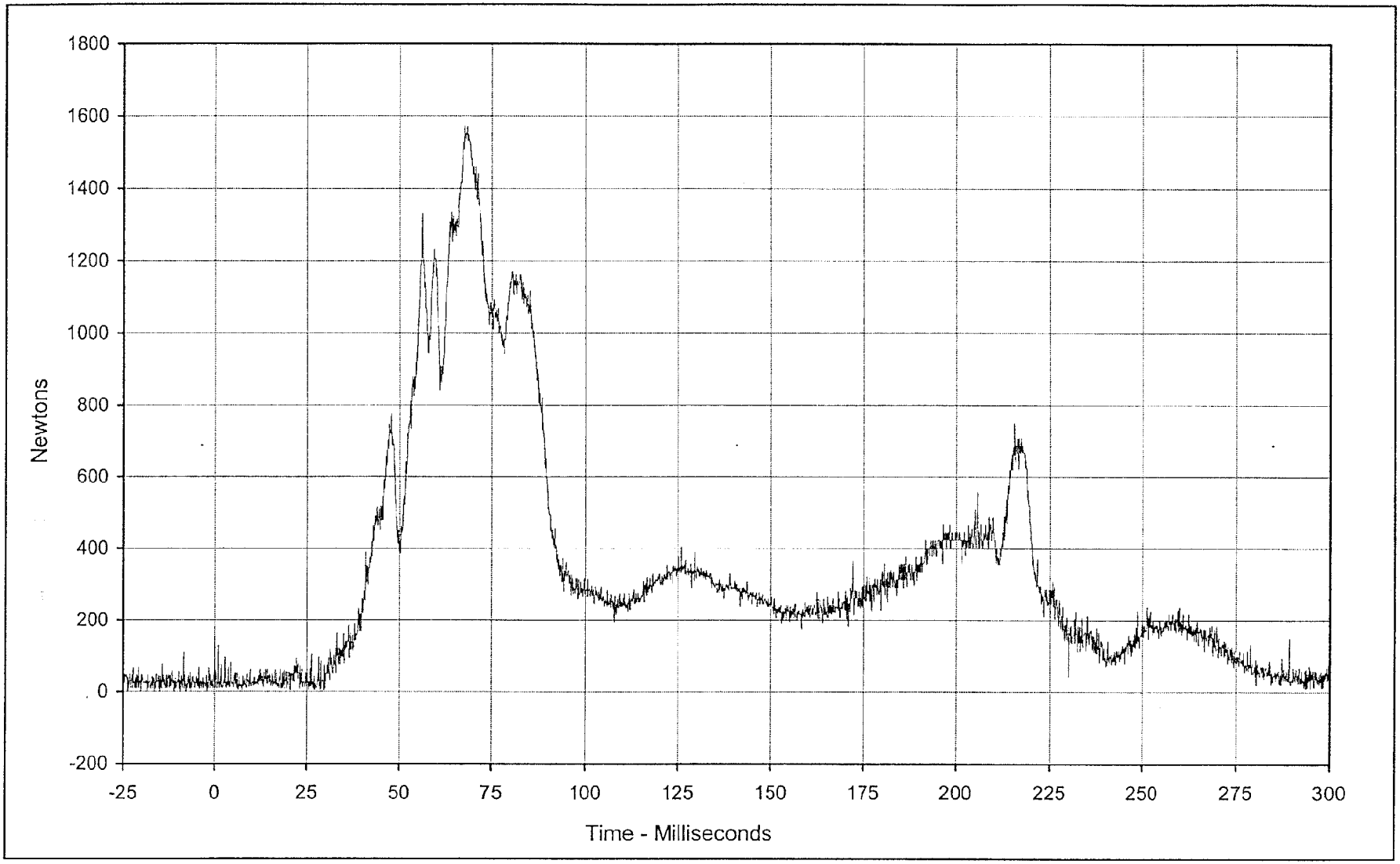


Curve Description:	Passenger Neck Force Z			
Maximum Value:	1516.7	at	67.7	Milliseconds
Minimum Value:	-214.4	at	248.8	Milliseconds
SAE Filter Class:	1000			
Date of Test:	11/21/97			
Curve Number:	FIL-053			

Testing Program: 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering

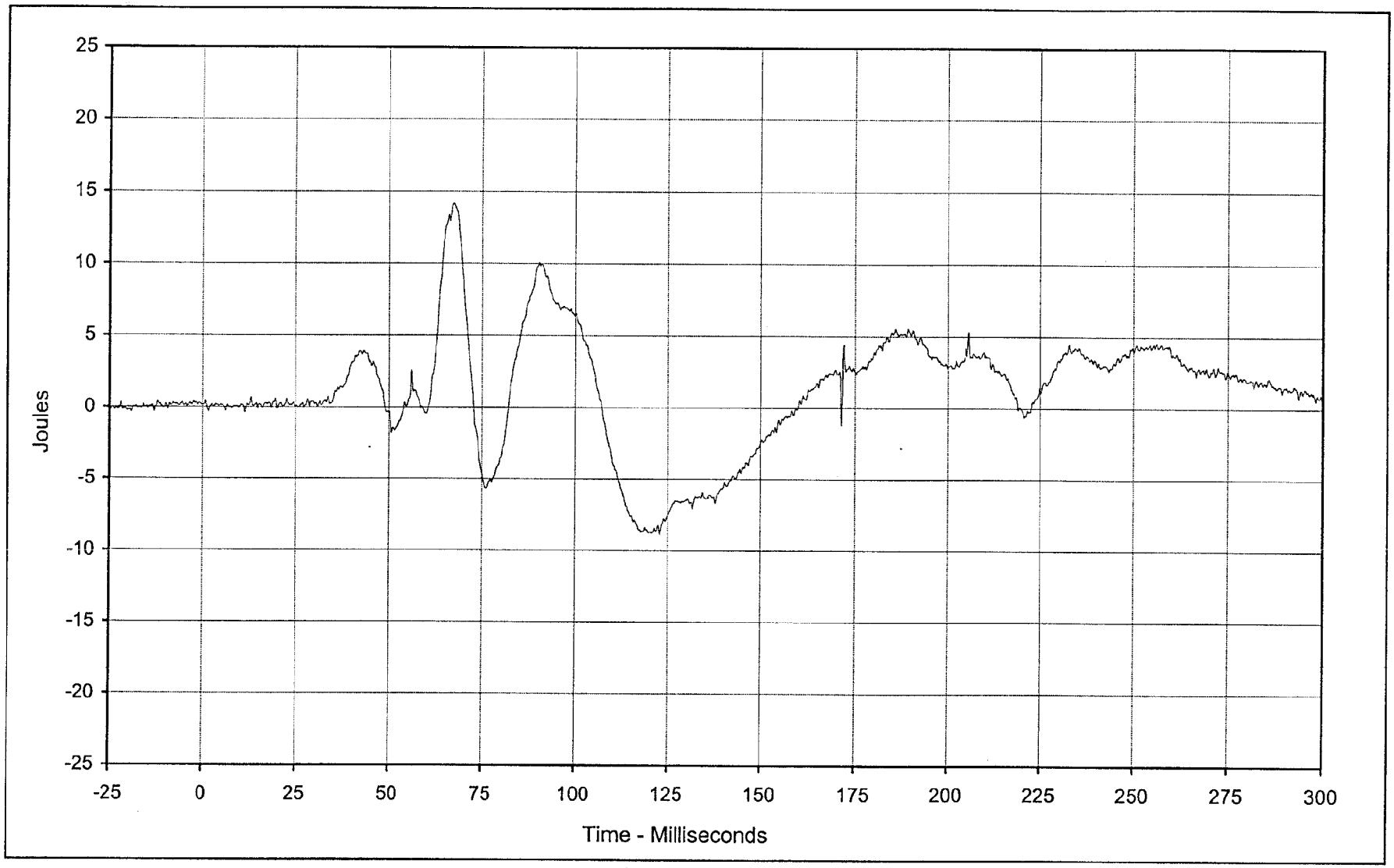


Curve Description:	Passenger Neck Force Resultant			
Maximum Value:	1569.7	at	67.7	Milliseconds
Minimum Value:	5.1	at	6.3	Milliseconds
SAE Filter Class:	1000			
Date of Test:	11/21/97			
Curve Number:	RES-051			

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description: Passenger Neck Moment X

Maximum Value: 14.2 at 67.5 Milliseconds

Minimum Value: -8.9 at 122.8 Milliseconds

SAE Filter Class: 600

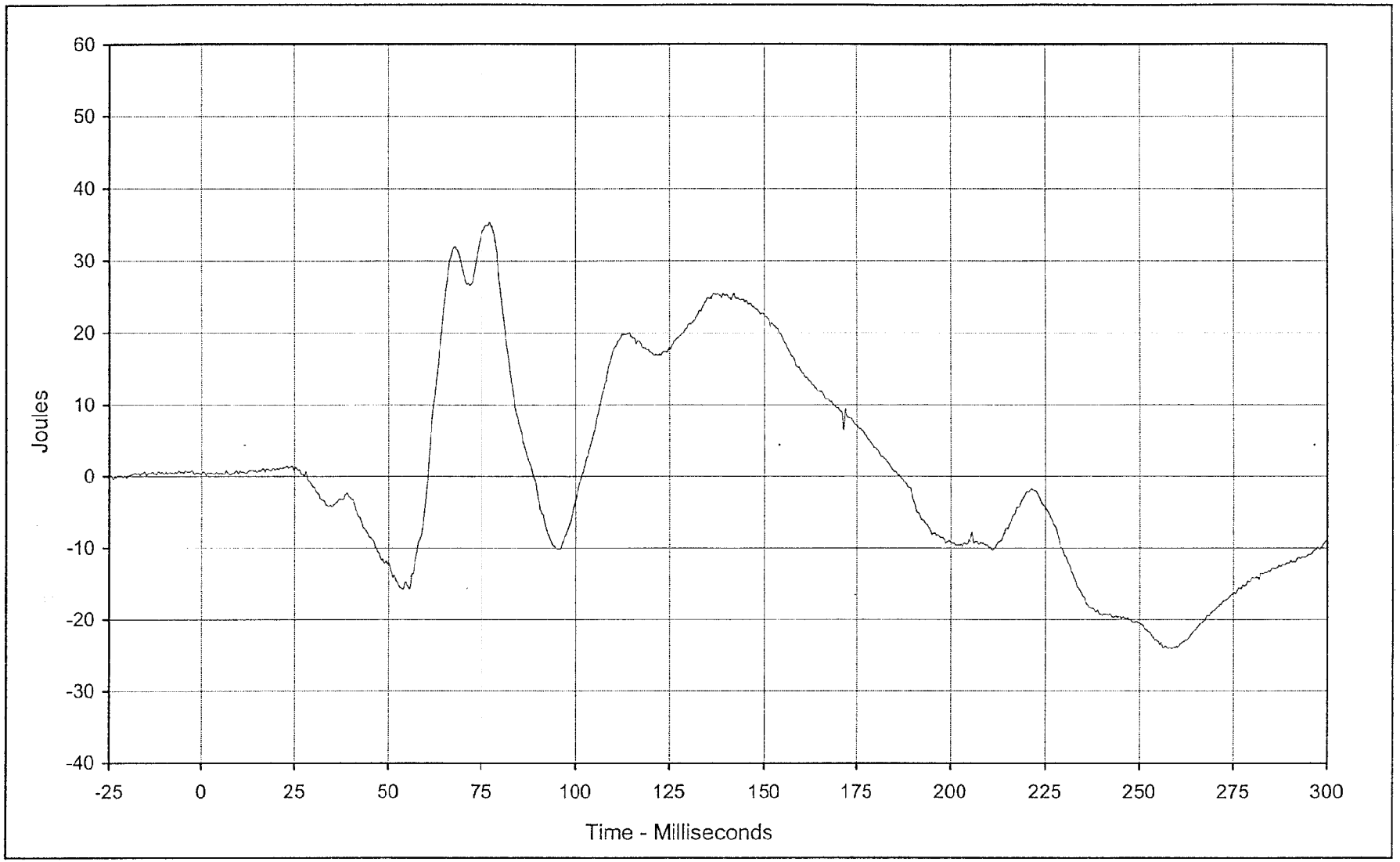
Date of Test: 11/21/97

Curve Number: FIL-054

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

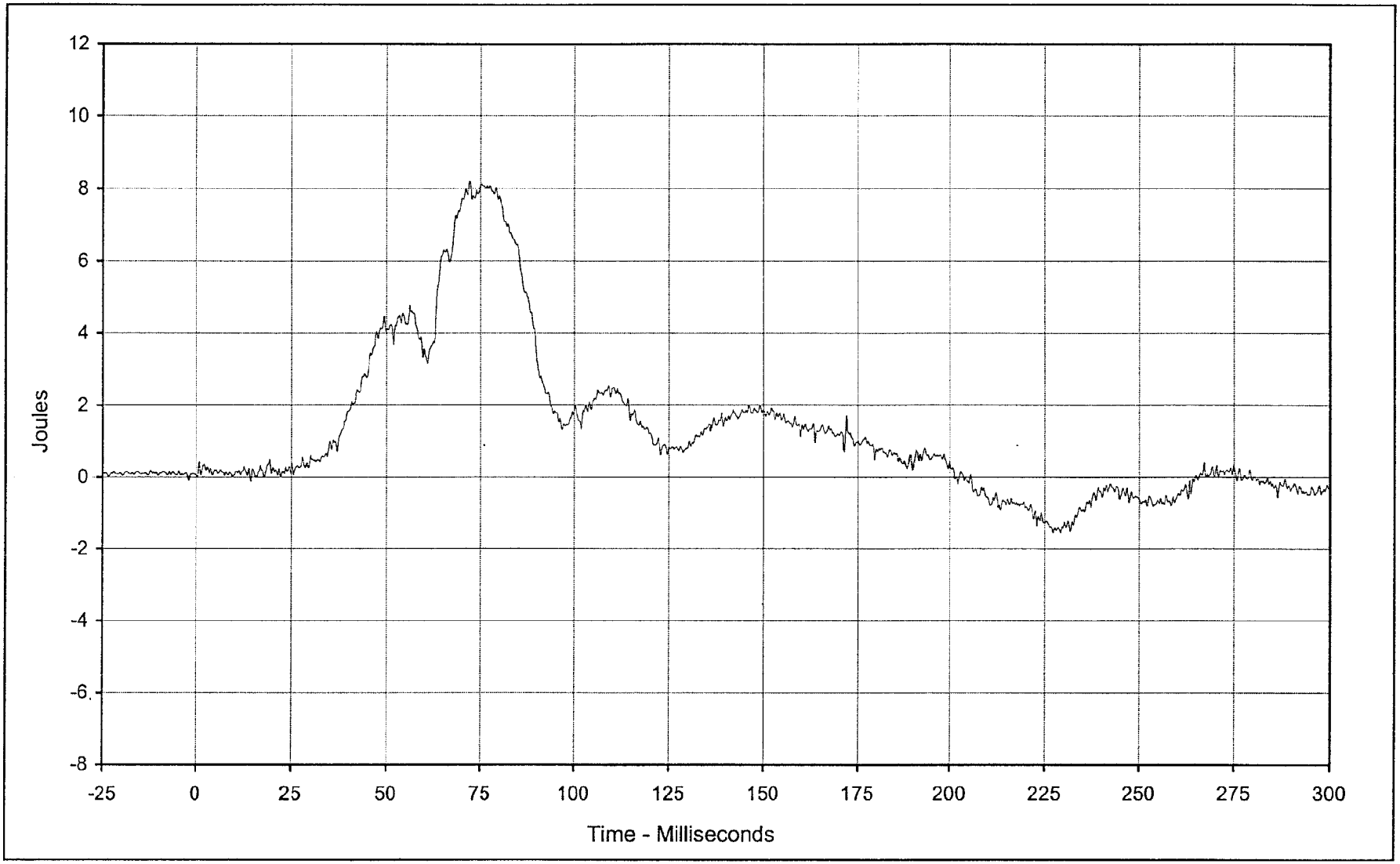
Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description:	Passenger Neck Moment Y			Testing Program	1998 NHTSA 35 mph NCAP No.: MW0106
Maximum Value:	35.4	at	77.3 Milliseconds	Test Vehicle:	1998 Chevrolet Malibu 4 Door Sedan
Minimum Value:	-24.1	at	257.7 Milliseconds		
SAE Filter Class:	600				
Date of Test:	11/21/97				
Curve Number:	FIL-055				

KARC Engineering



Curve Description: Passenger Neck Moment Z

Maximum Value: 8.2 at 72.2 Milliseconds

Minimum Value: -1.6 at 229.1 Milliseconds

SAE Filter Class: 600

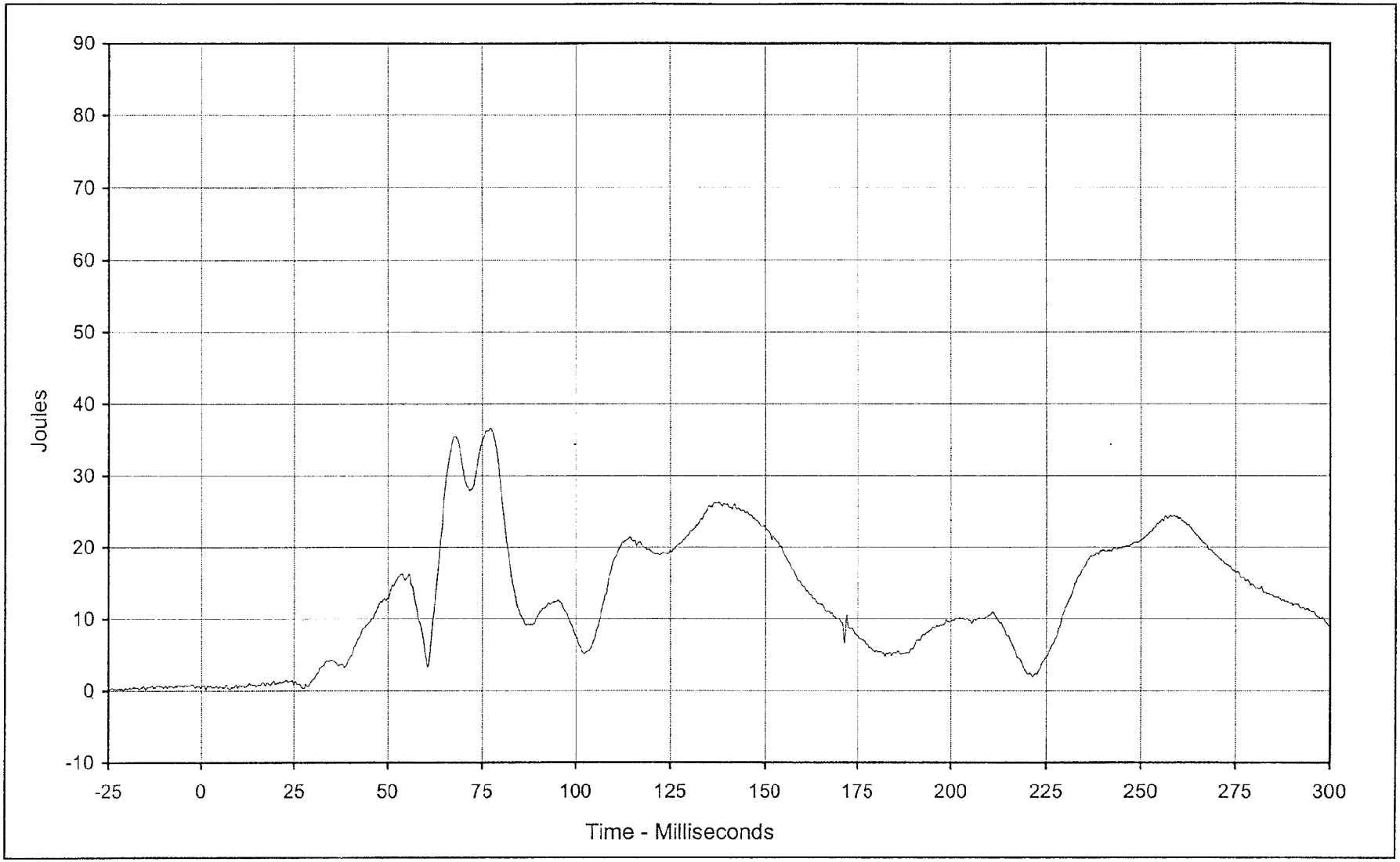
Date of Test: 11/21/97

Curve Number: FIL-056

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering

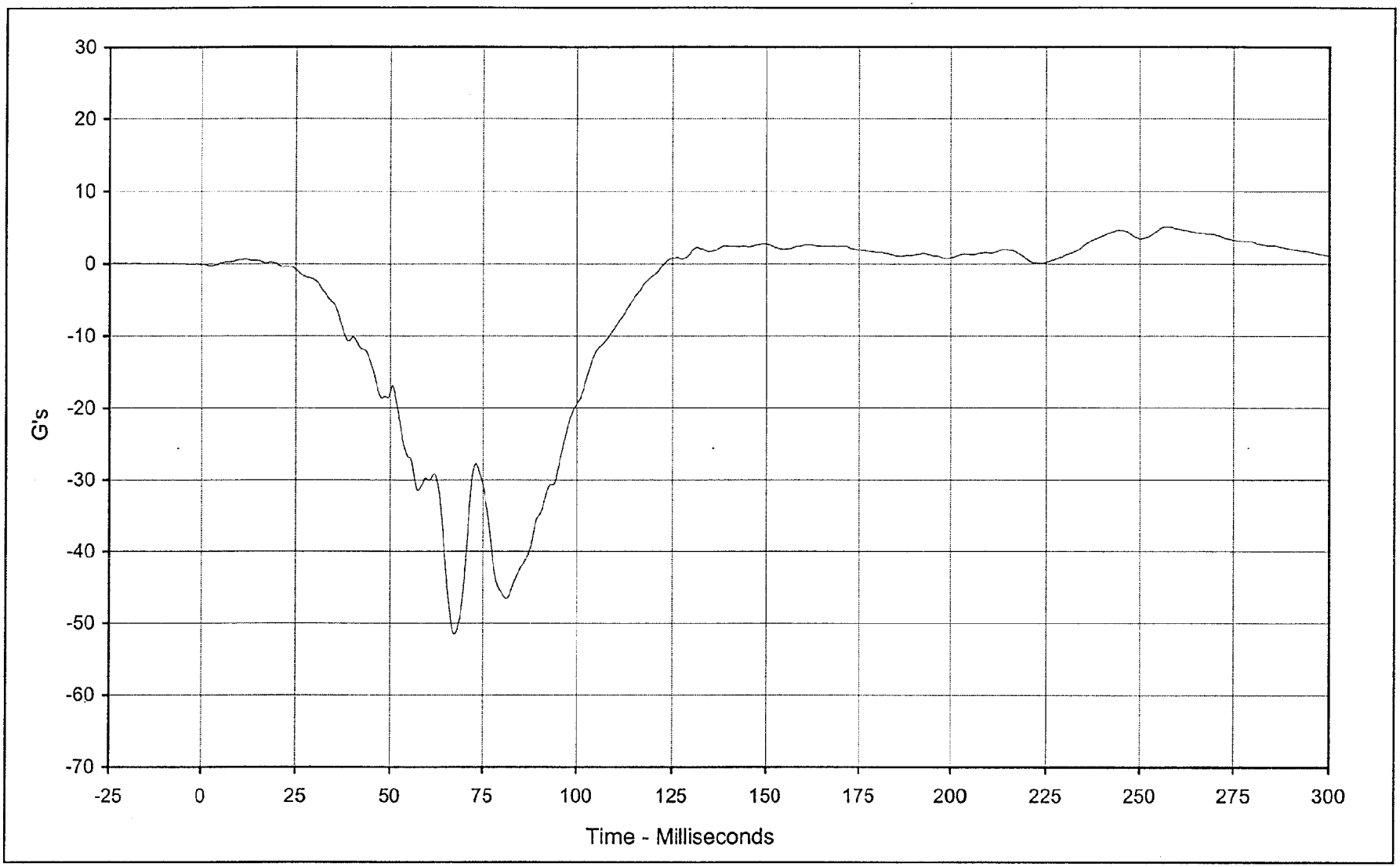


Curve Description:	Passenger Neck Moment Resultant			
Maximum Value:	36.6	at	77.3	Milliseconds
Minimum Value:	0.1	at	1.2	Milliseconds
SAE Filter Class:	600			
Date of Test:	11/21/97			
Curve Number:	RES-054			

Testing Program: 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description: Passenger Chest Primary X

Maximum Value: 5.1 at 257.4 Milliseconds

Minimum Value: -51.6 at 67.4 Milliseconds

SAE Filter Class: 180

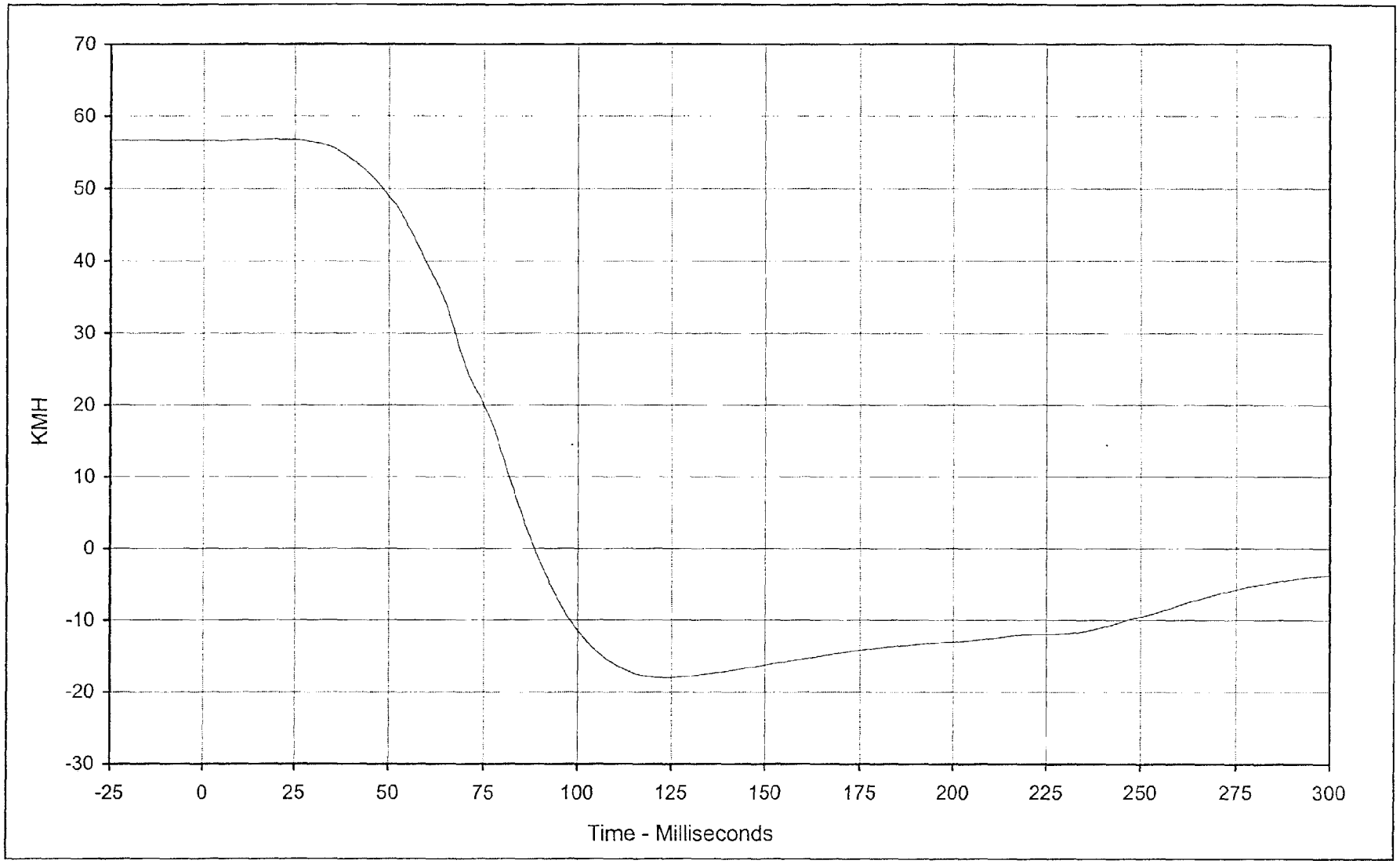
Date of Test: 11/21/97

Curve Number: FIL-057

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARC Engineering



Curve Description: Passenger Chest Primary X Velocity

Maximum Value: 56.8 at 20.0 Milliseconds

Minimum Value: -18.0 at 122.9 Milliseconds

SAE Filter Class: 180

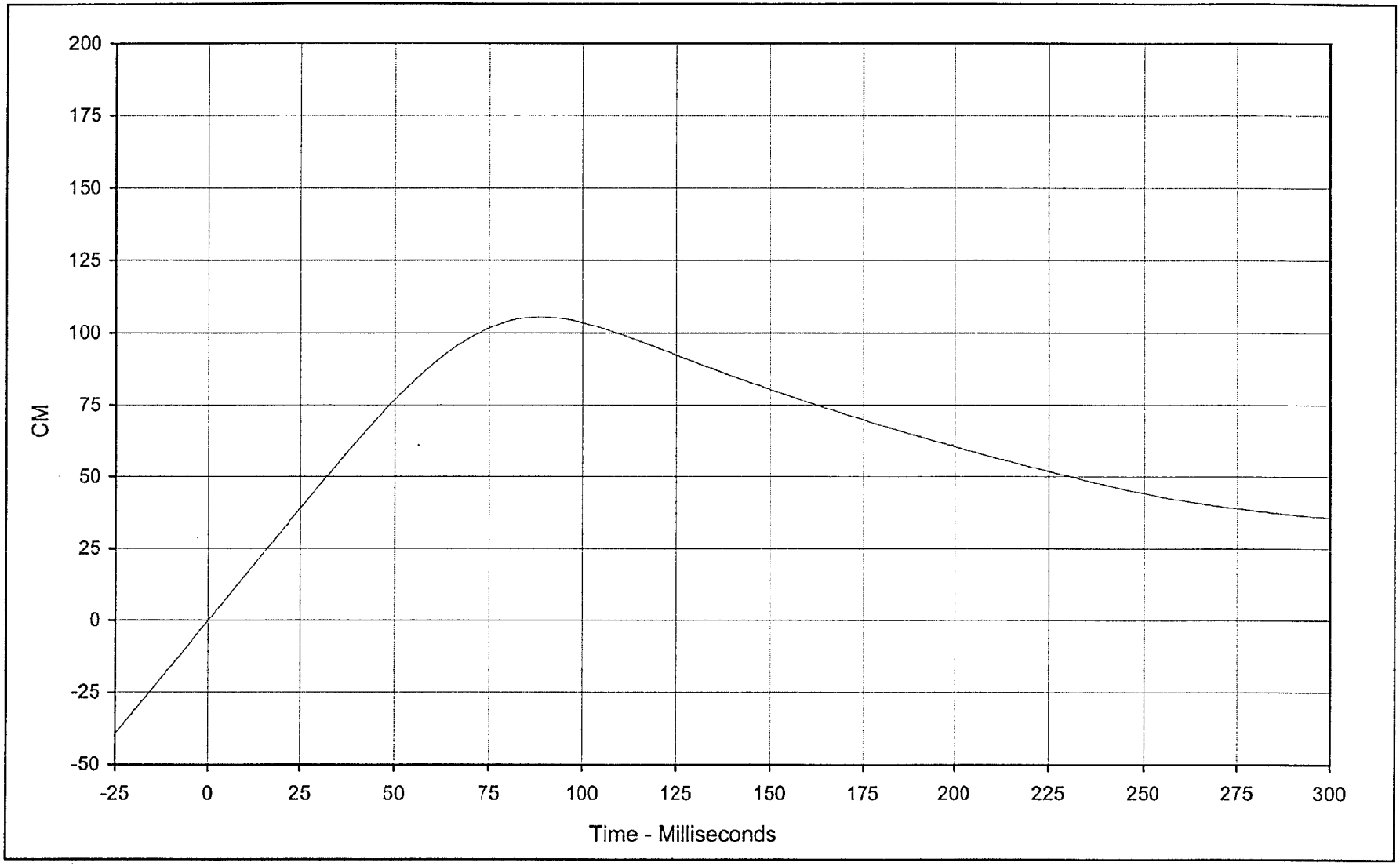
Date of Test: 11/21/97

Curve Number: IN1-057

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description: Passenger Chest Primary X Displ.

Maximum Value: 105.5 at 88.6 Milliseconds

Minimum Value: -0.1 at 0.0 Milliseconds

SAE Filter Class: 180

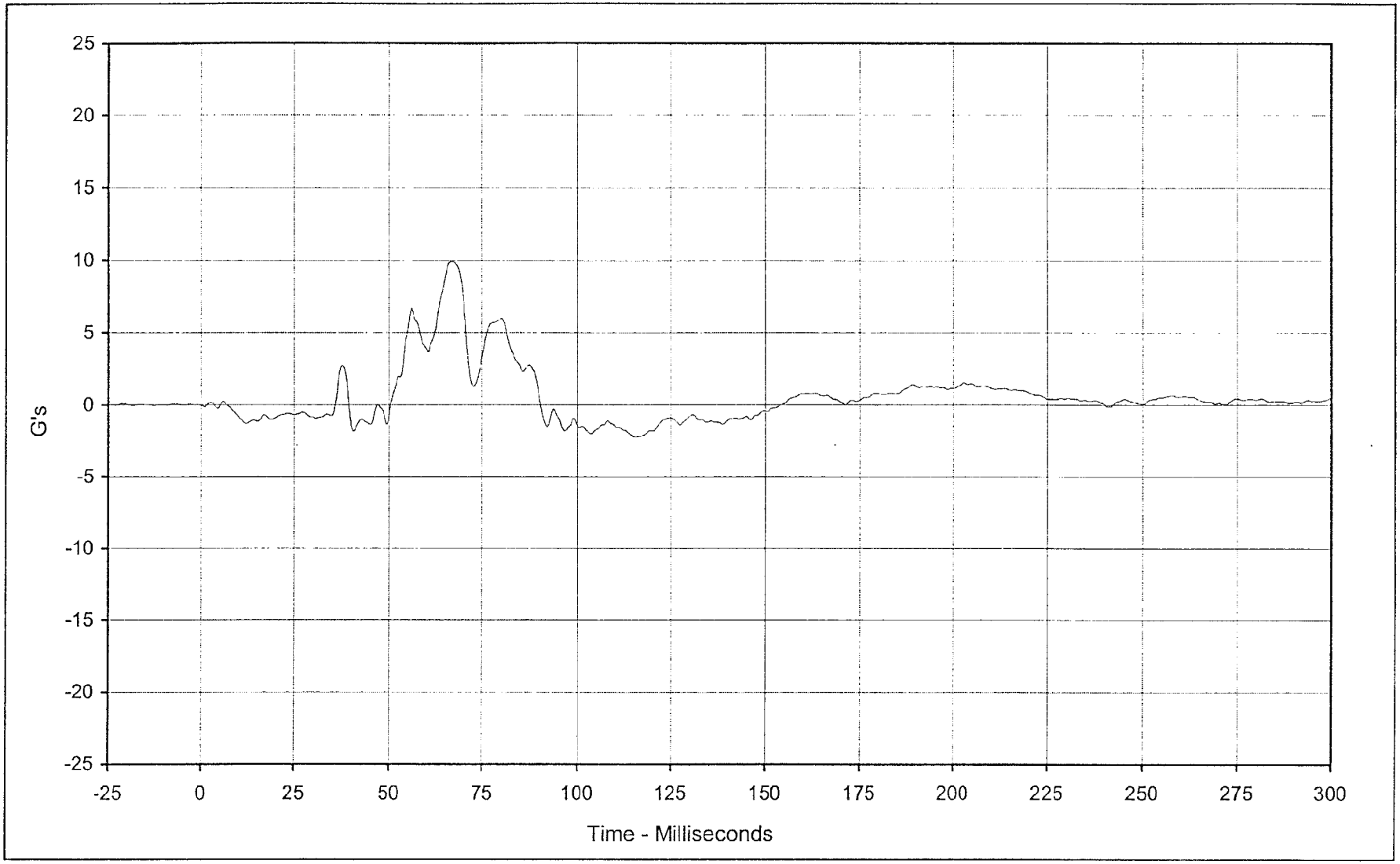
Date of Test: 11/21/97

Curve Number: IN2-057

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description: Passenger Chest Primary Y

Maximum Value: 9.9 at 67.0 Milliseconds

Minimum Value: -2.2 at 115.5 Milliseconds

SAE Filter Class: 180

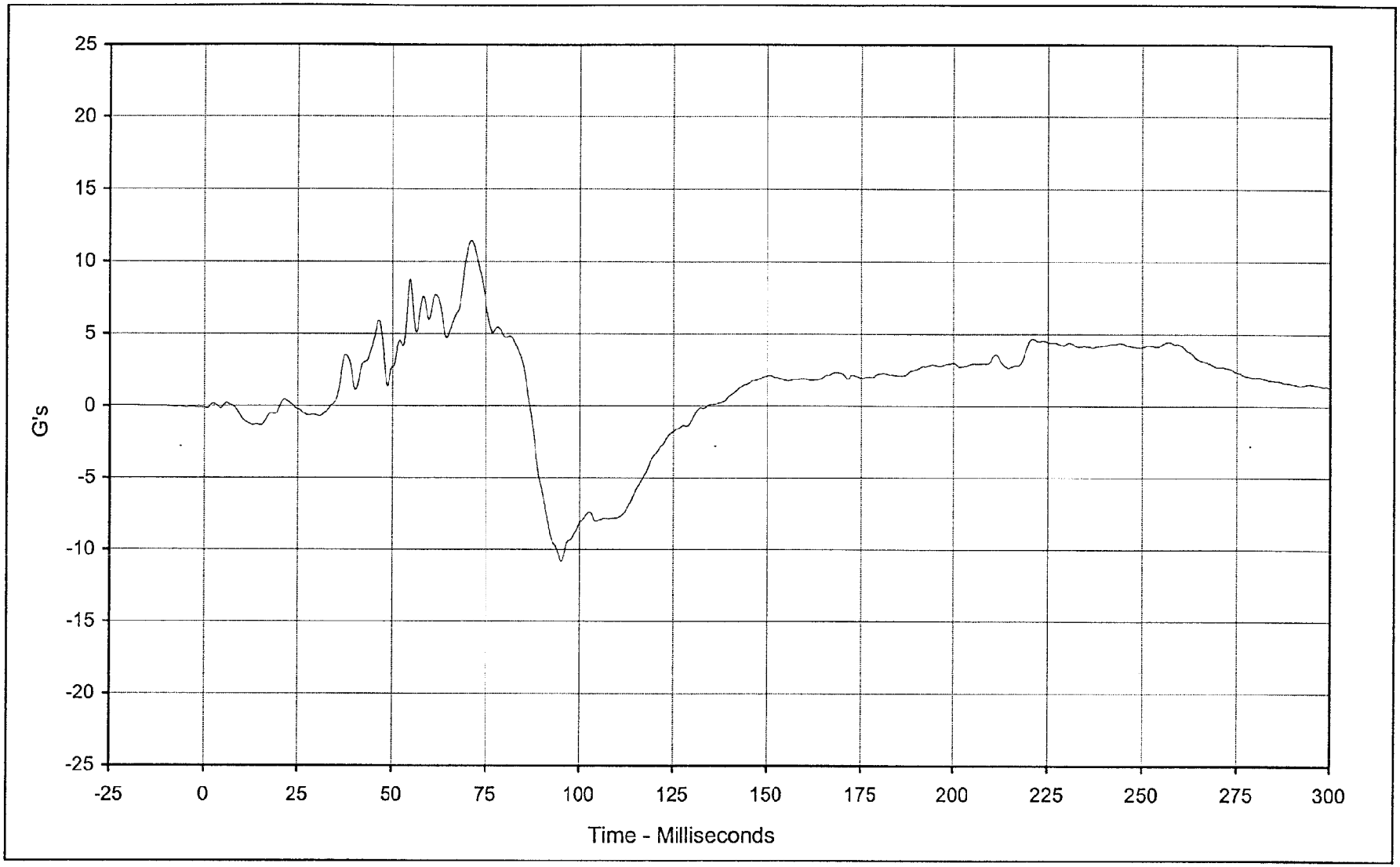
Date of Test: 11/21/97

Curve Number: FIL-058

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description: Passenger Chest Primary Z

Maximum Value: 11.4 at 71.0 Milliseconds

Minimum Value: -10.8 at 95.0 Milliseconds

SAE Filter Class: 180

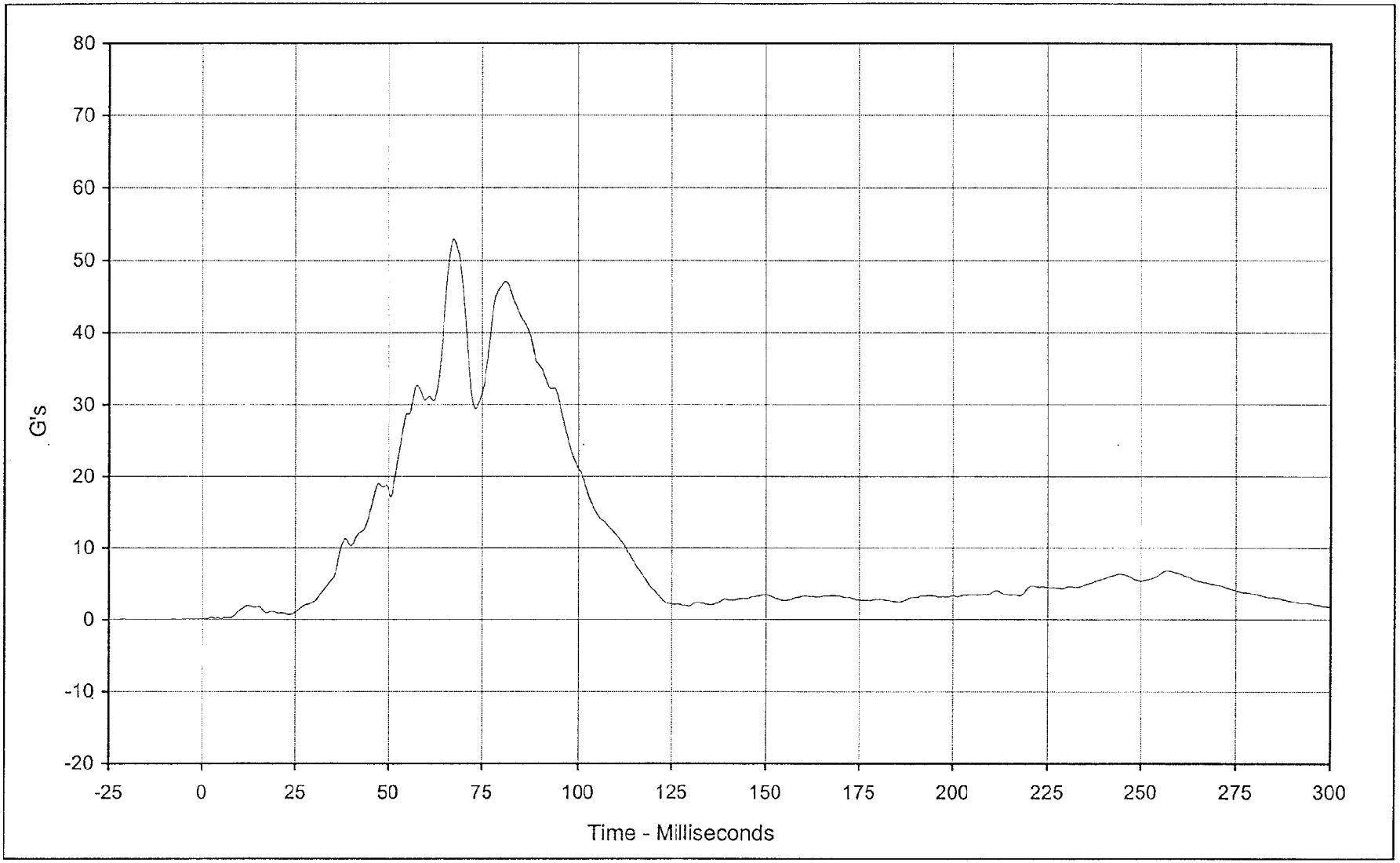
Date of Test: 11/21/97

Curve Number: FIL-059

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

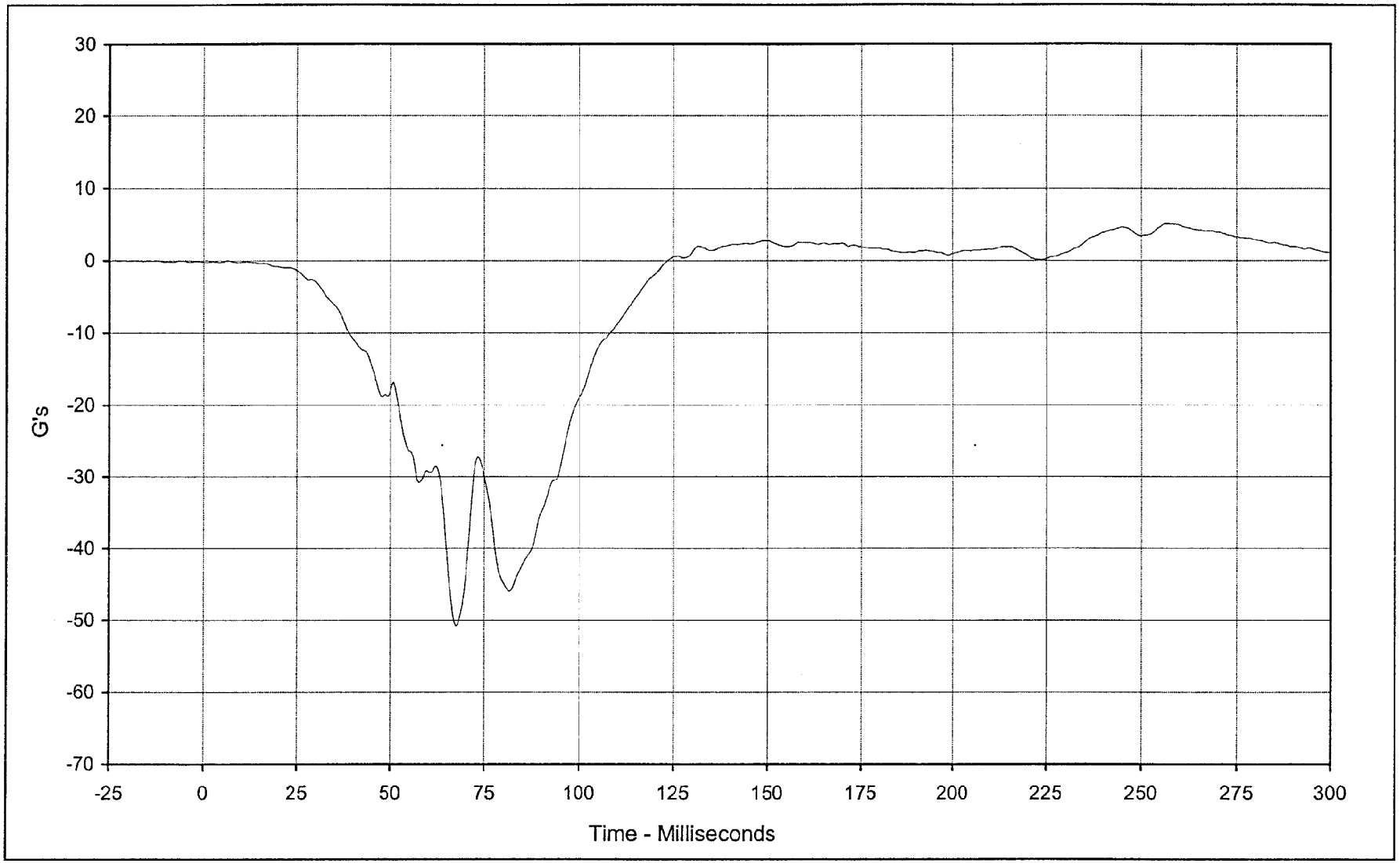
KARCO Engineering



Curve Description:	Passenger Chest Resultant Primary			
Maximum Value:	52.9	at	67.4	Milliseconds
Minimum Value:	0.1	at	5.0	Milliseconds
SAE Filter Class:	180			
Date of Test:	11/21/97			
Curve Number:	RES-057			

Testing Program	1998 NHTSA 35 mph NCAP No.: MW0106
Test Vehicle:	1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description: Passenger Chest Redundant X

Maximum Value: 5.1 at 256.9 Milliseconds

Minimum Value: -50.8 at 67.4 Milliseconds

SAE Filter Class: 180

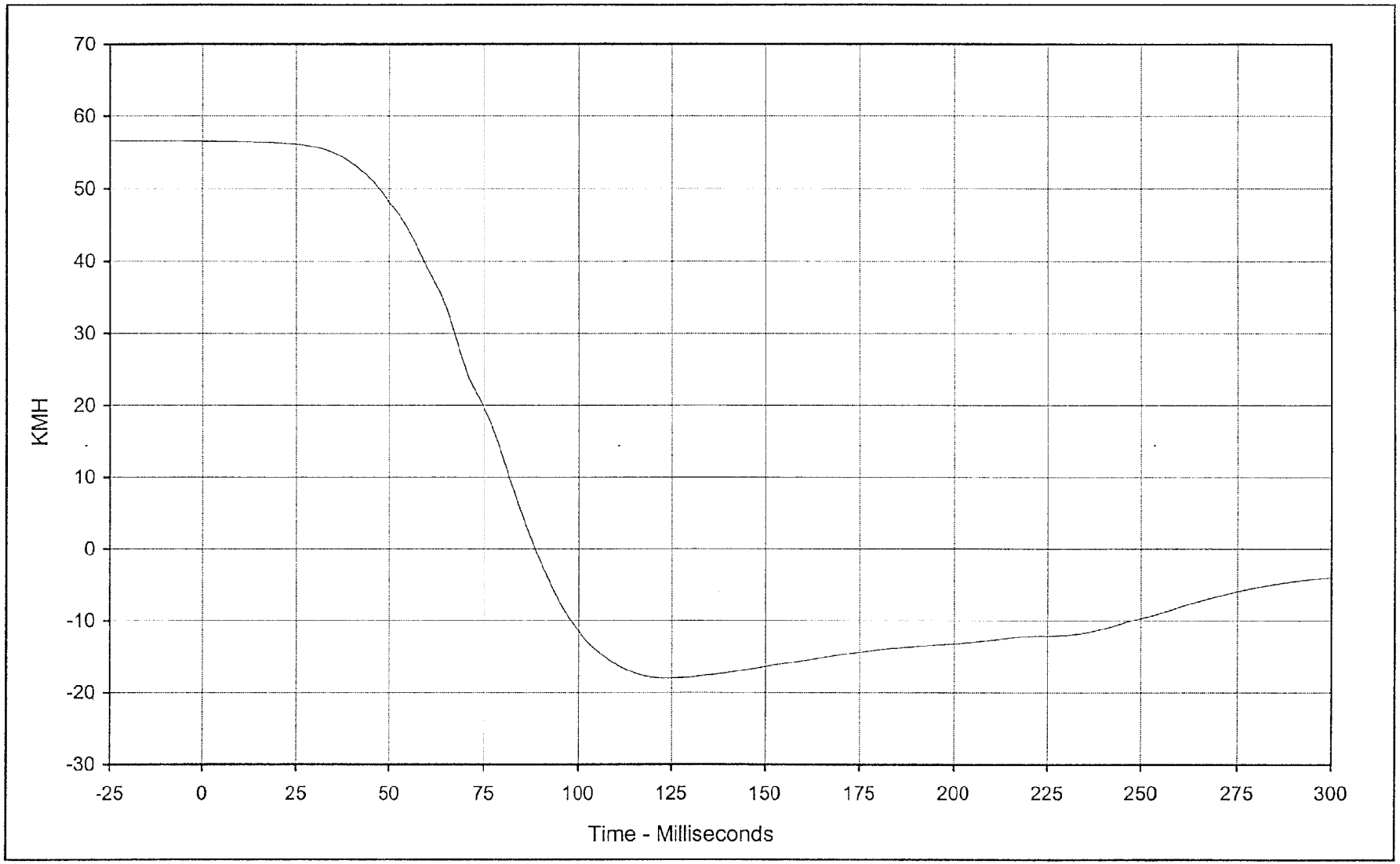
Date of Test: 11/21/97

Curve Number: FIL-060

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description: Passenger Chest Redundant X Velocity

Maximum Value: 56.5 at 0.0 Milliseconds

Minimum Value: -18.0 at 123.5 Milliseconds

SAE Filter Class: 180

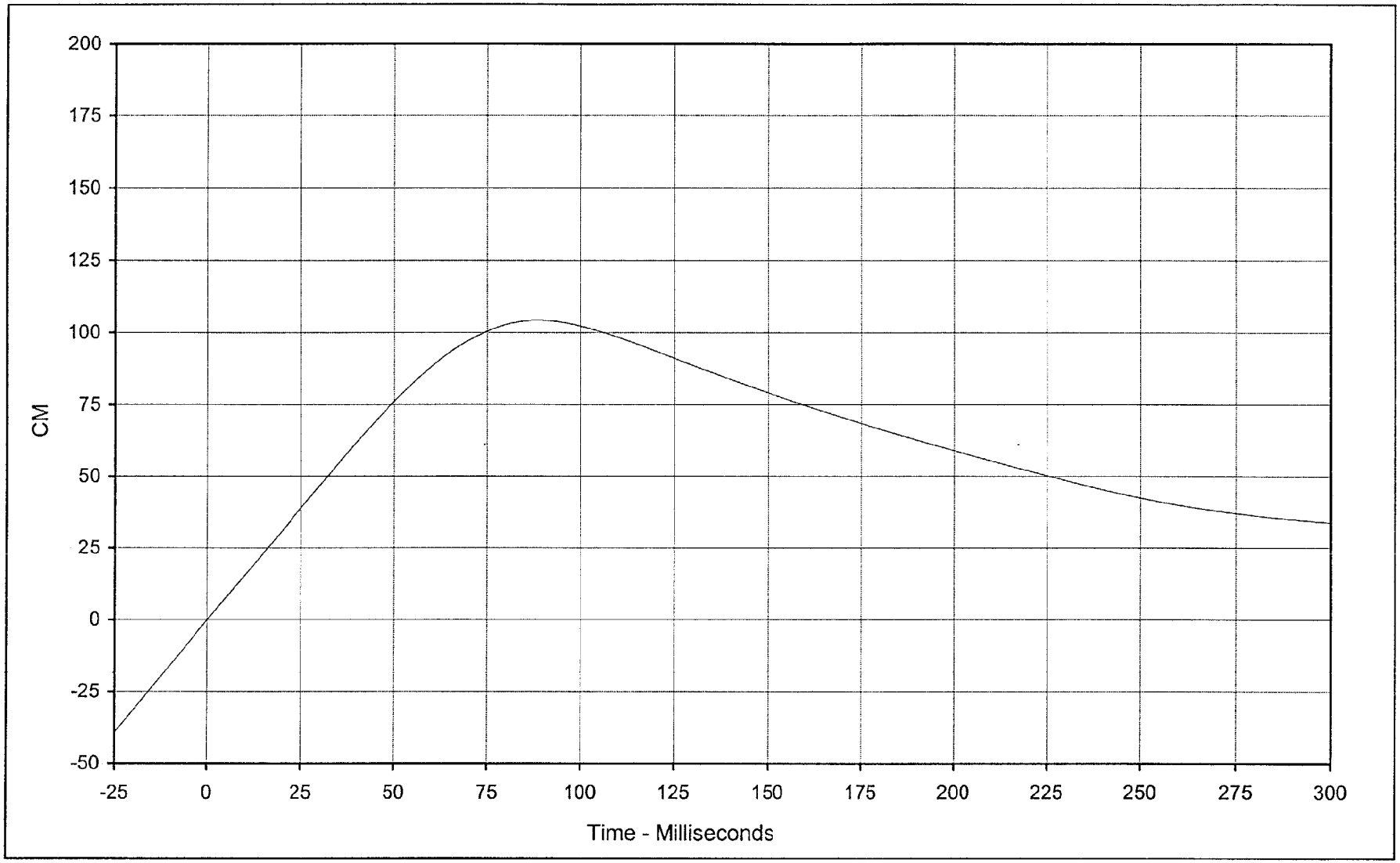
Date of Test: 11/21/97

Curve Number: IN1-060

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description: Passenger Chest Redundant X Displ.

Maximum Value: 104.2 at 88.5 Milliseconds

Minimum Value: -0.1 at 0.0 Milliseconds

SAE Filter Class: 180

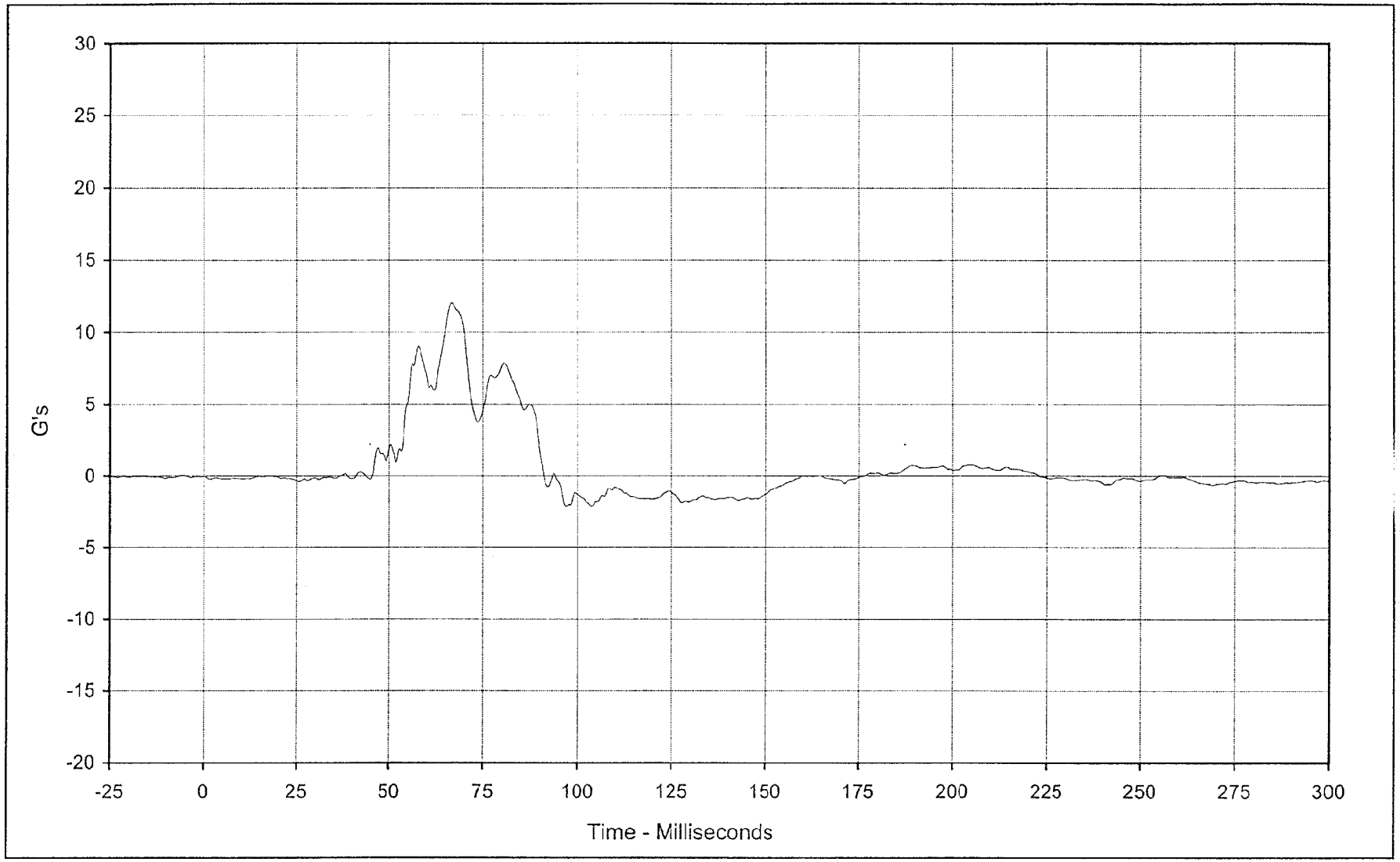
Date of Test: 11/21/97

Curve Number: IN2-060

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description: Passenger Chest Redundant Y

Maximum Value: 12.1 at 66.6 Milliseconds

Minimum Value: -2.2 at 103.7 Milliseconds

SAE Filter Class: 180

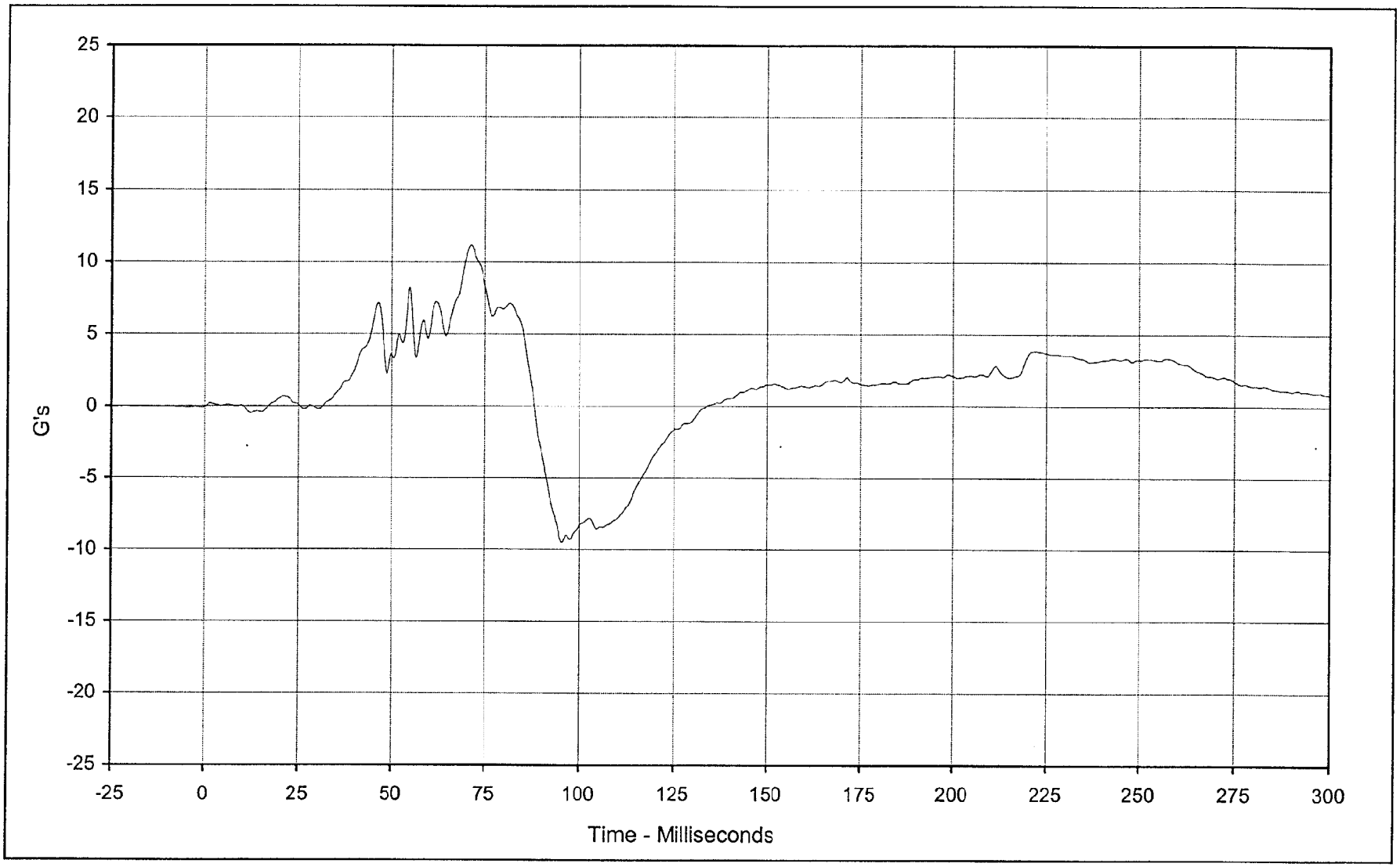
Date of Test: 11/21/97

Curve Number: FIL-061

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description: Passenger Chest Redundant Z

Maximum Value: 11.2 at 71.1 Milliseconds

Minimum Value: -9.5 at 95.3 Milliseconds

SAE Filter Class: 180

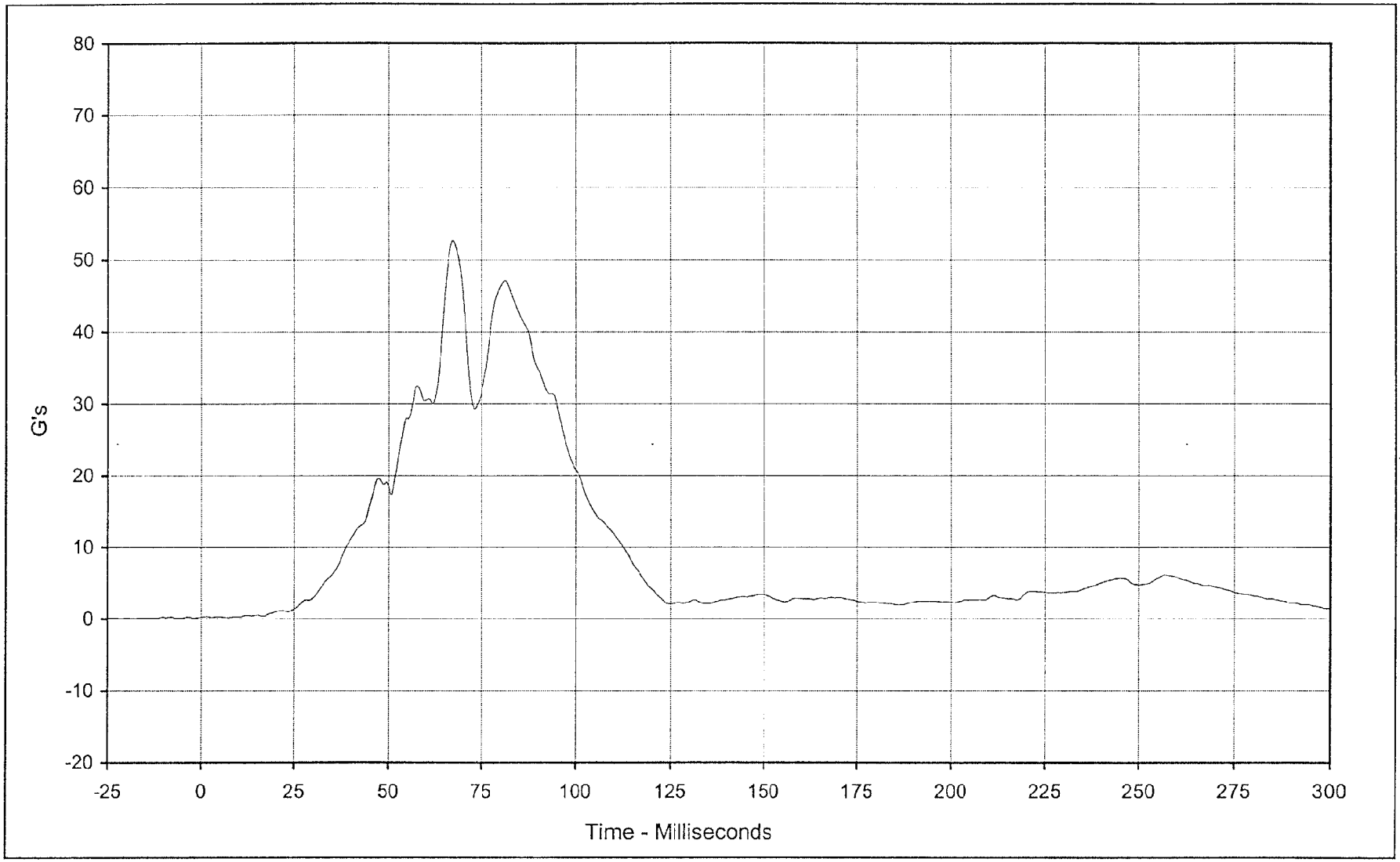
Date of Test: 11/21/97

Curve Number: FIL-062

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description: Passenger Chest Resultant Redundant

Maximum Value: 52.7 at 67.4 Milliseconds

Minimum Value: 0.2 at 6.9 Milliseconds

SAE Filter Class: 180

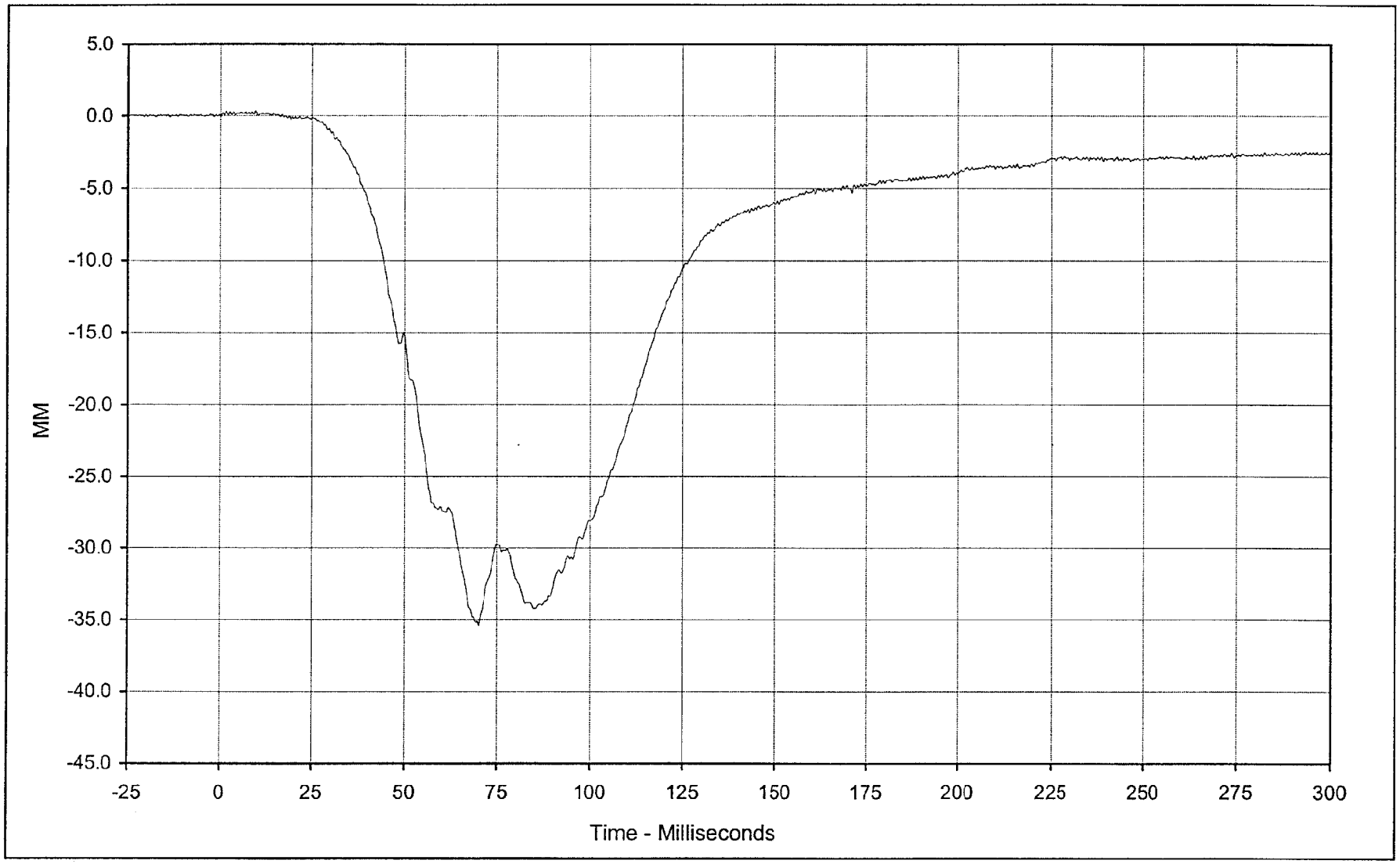
Date of Test: 11/21/97

Curve Number: RES-060

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description: Passenger Chest Displacement X

Maximum Value: 0.4 at 1.6 Milliseconds

Minimum Value: -35.4 at 70.0 Milliseconds

SAE Filter Class: 600

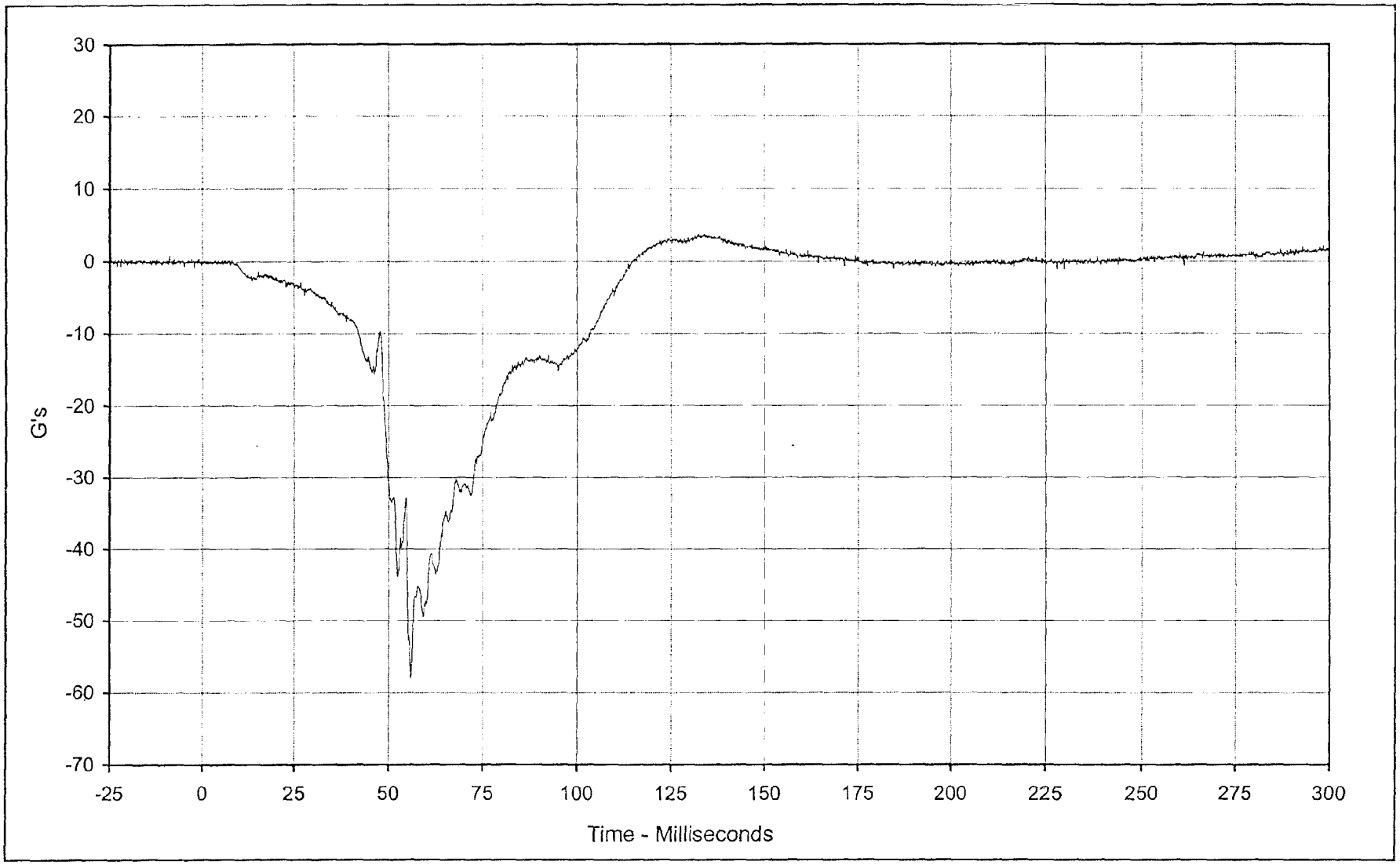
Date of Test: 11/21/97

Curve Number: FIL-063

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description: Passenger Pelvis X

Maximum Value: 3.8 at 132.6 Milliseconds

Minimum Value: -57.9 at 56.2 Milliseconds

SAE Filter Class: 1000

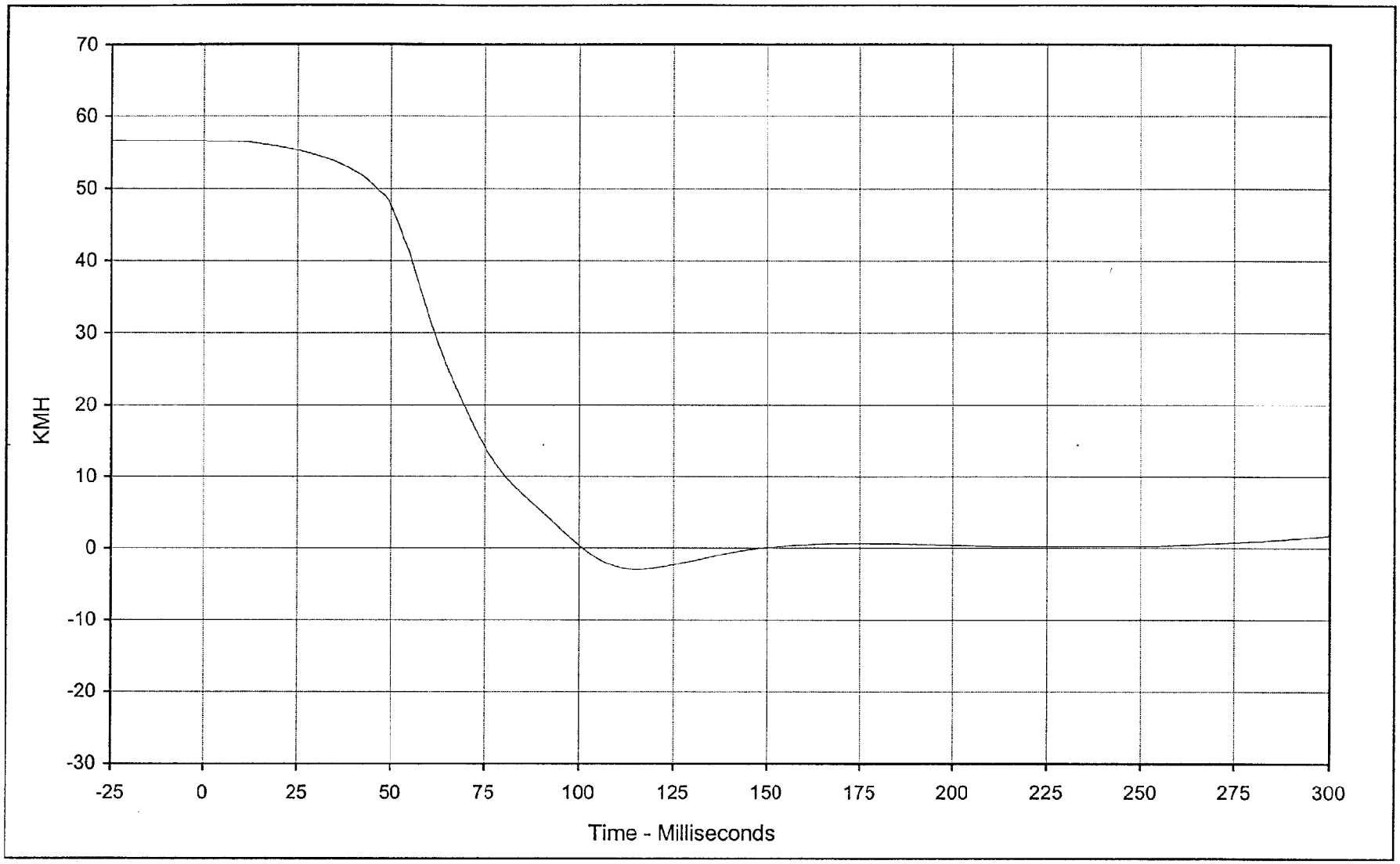
Date of Test: 11/21/97

Curve Number: FIL-064

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description: Passenger Pelvis X Velocity

Maximum Value: 56.6 at 0.0 Milliseconds

Minimum Value: -2.9 at 115.0 Milliseconds

SAE Filter Class: 180

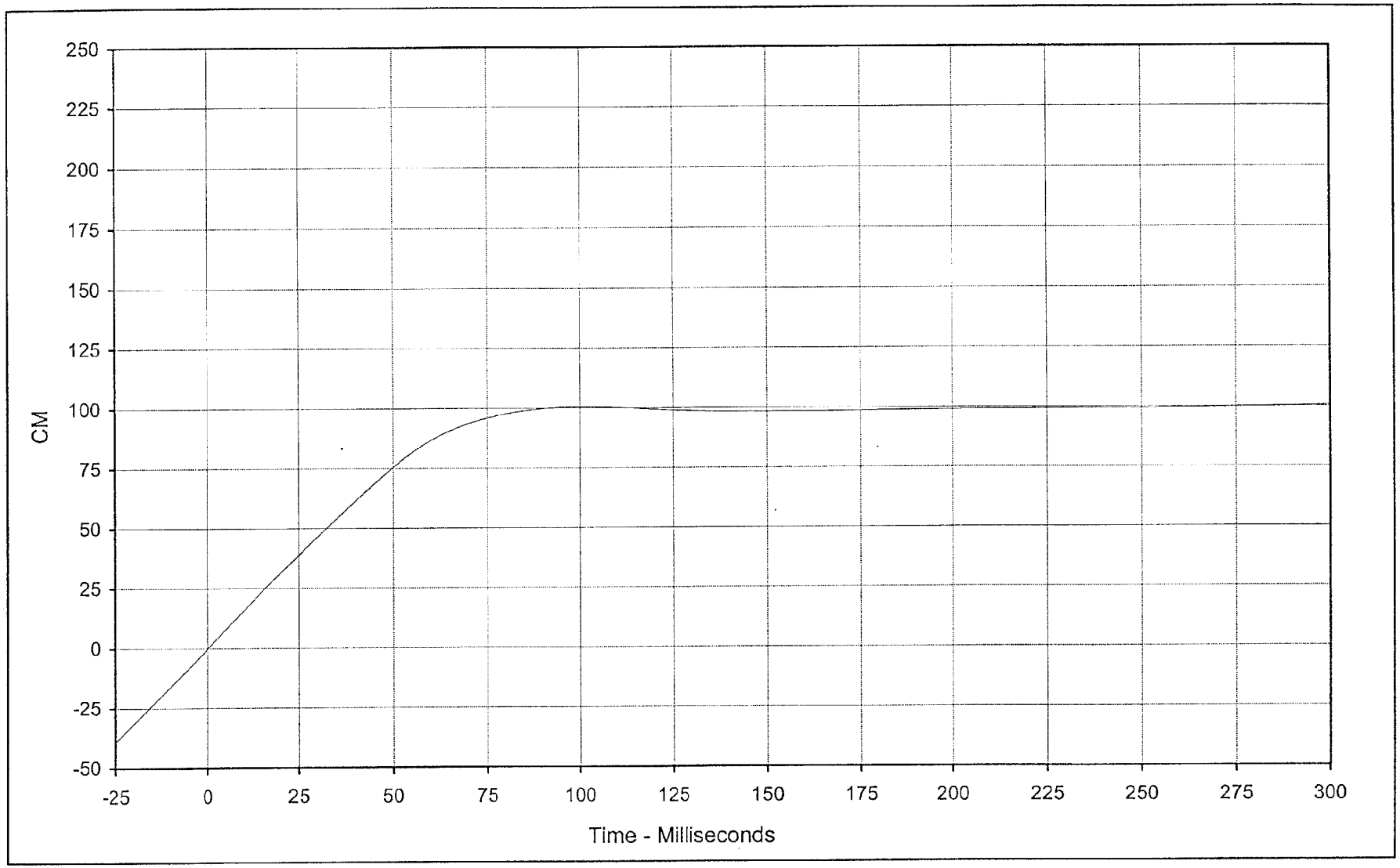
Date of Test: 11/21/97

Curve Number: IN1-064

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description: Passenger Pelvis X Displ.

Maximum Value: 100.5 at 299.9 Milliseconds

Minimum Value: -0.1 at 0.0 Milliseconds

SAE Filter Class: 180

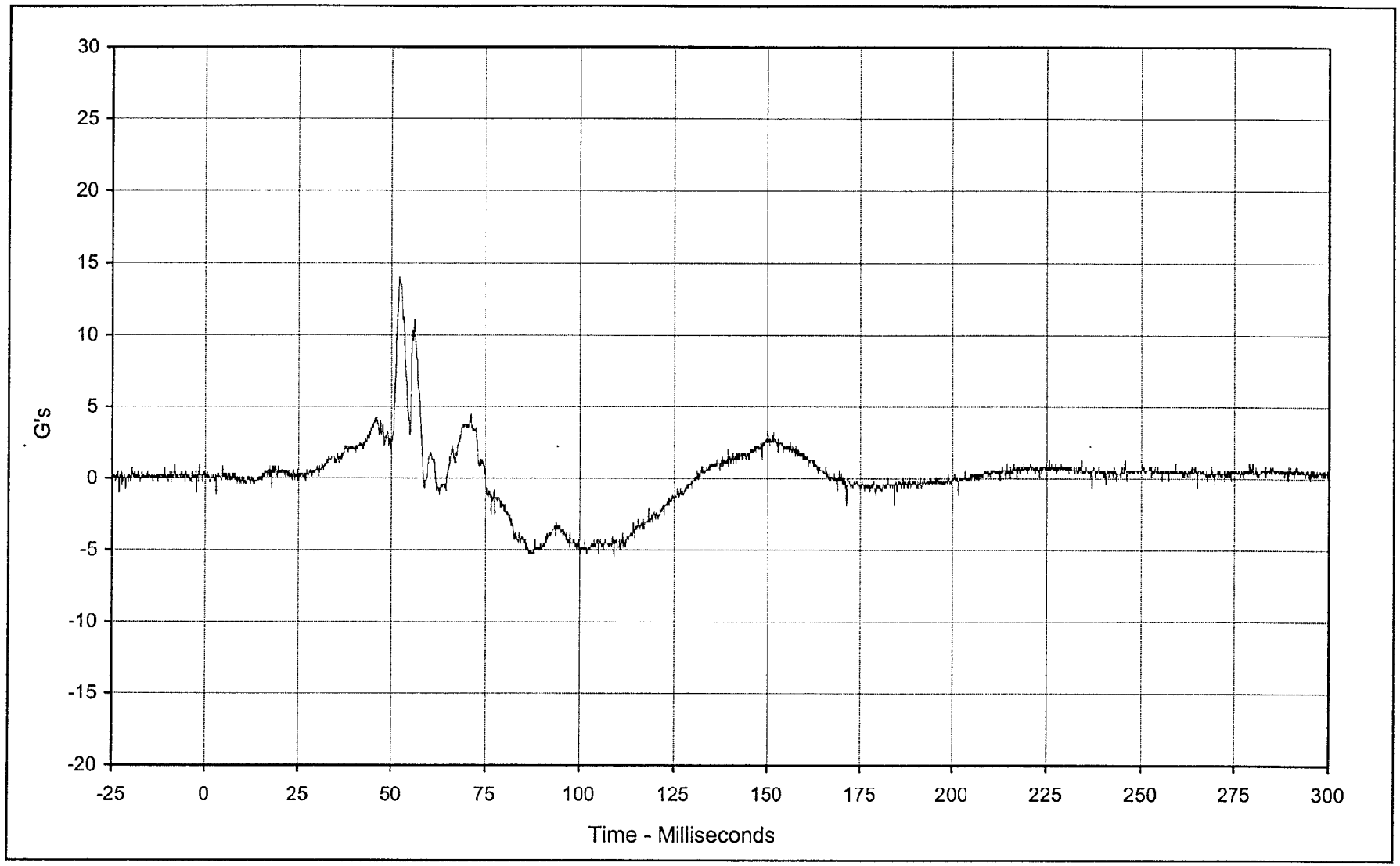
Date of Test: 11/21/97

Curve Number: IN2-064

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description: Passenger Pelvis Y

Maximum Value: 14.0 at 52.1 Milliseconds

Minimum Value: -5.5 at 109.2 Milliseconds

SAE Filter Class: 1000

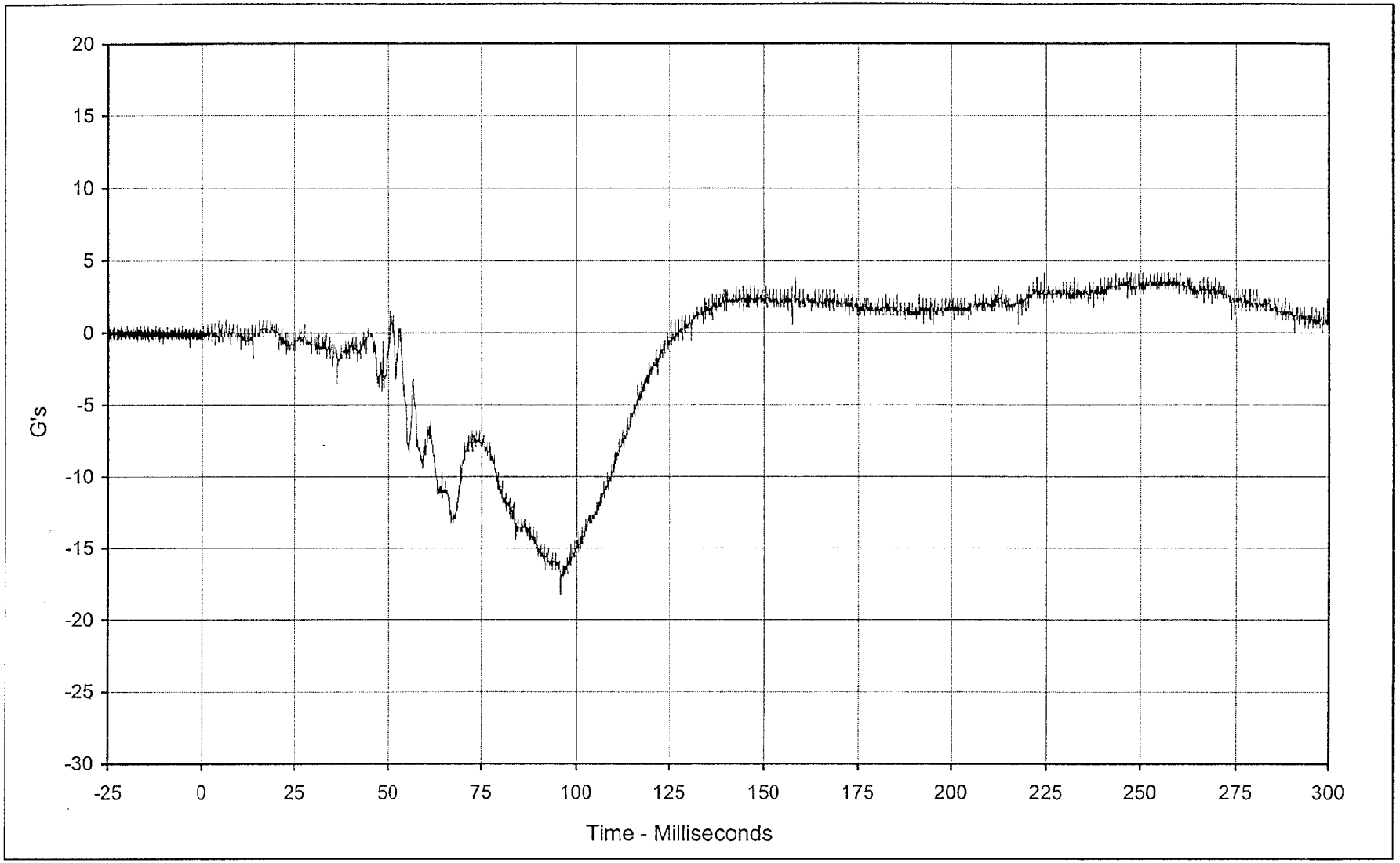
Date of Test: 11/21/97

Curve Number: FIL-065

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering

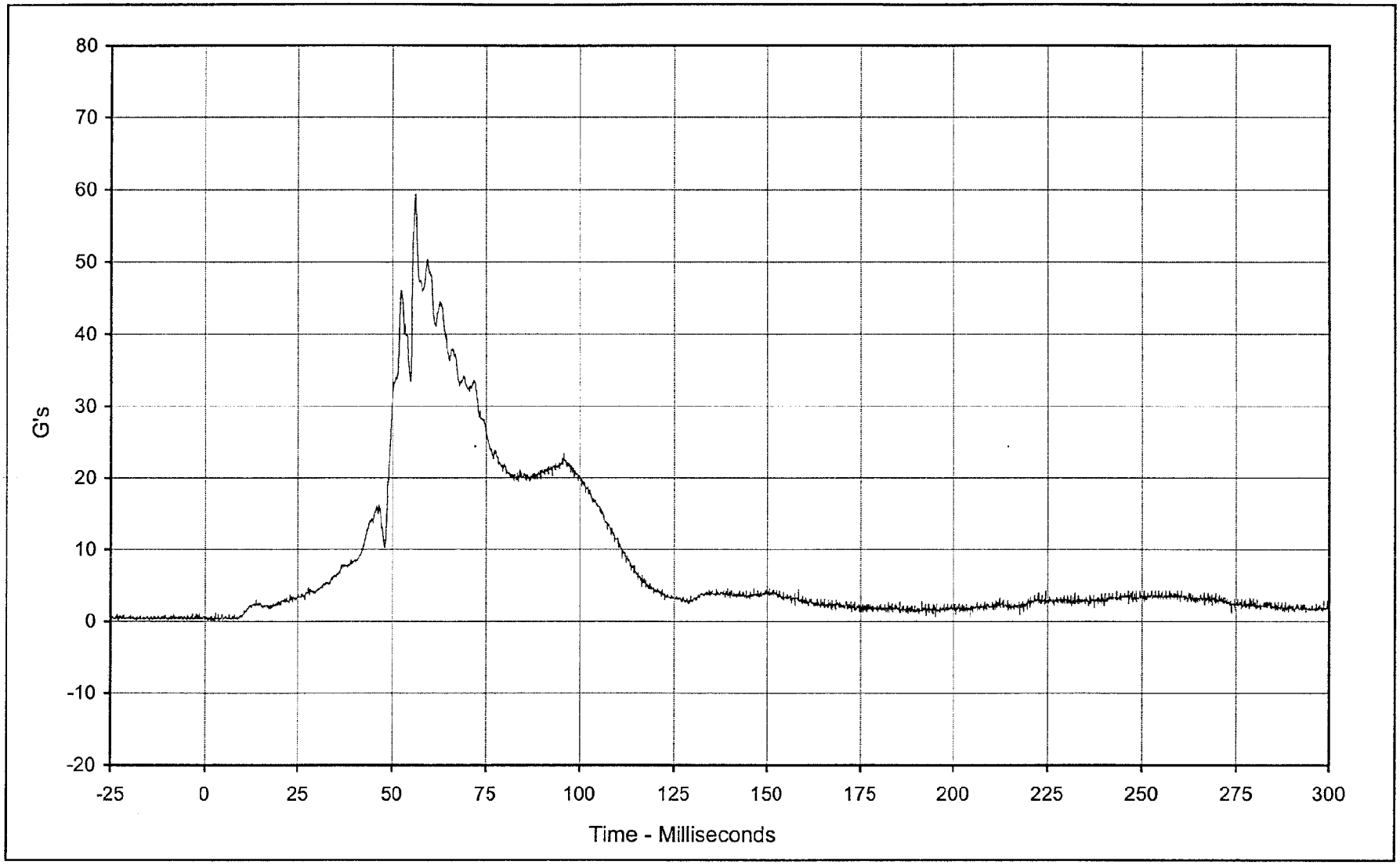


Curve Description:	Passenger Pelvis Z			
Maximum Value:	4.1	at	224.5	Milliseconds
Minimum Value:	-18.3	at	95.7	Milliseconds
SAE Filter Class:	1000			
Date of Test:	11/21/97			
Curve Number:	FIL-066			

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description: Passenger Pelvis Resultant

Maximum Value: 59.3 at 56.2 Milliseconds

Minimum Value: 0.0 at 1.6 Milliseconds

SAE Filter Class: 1000

Date of Test: 11/21/97

Curve Number: RES-064

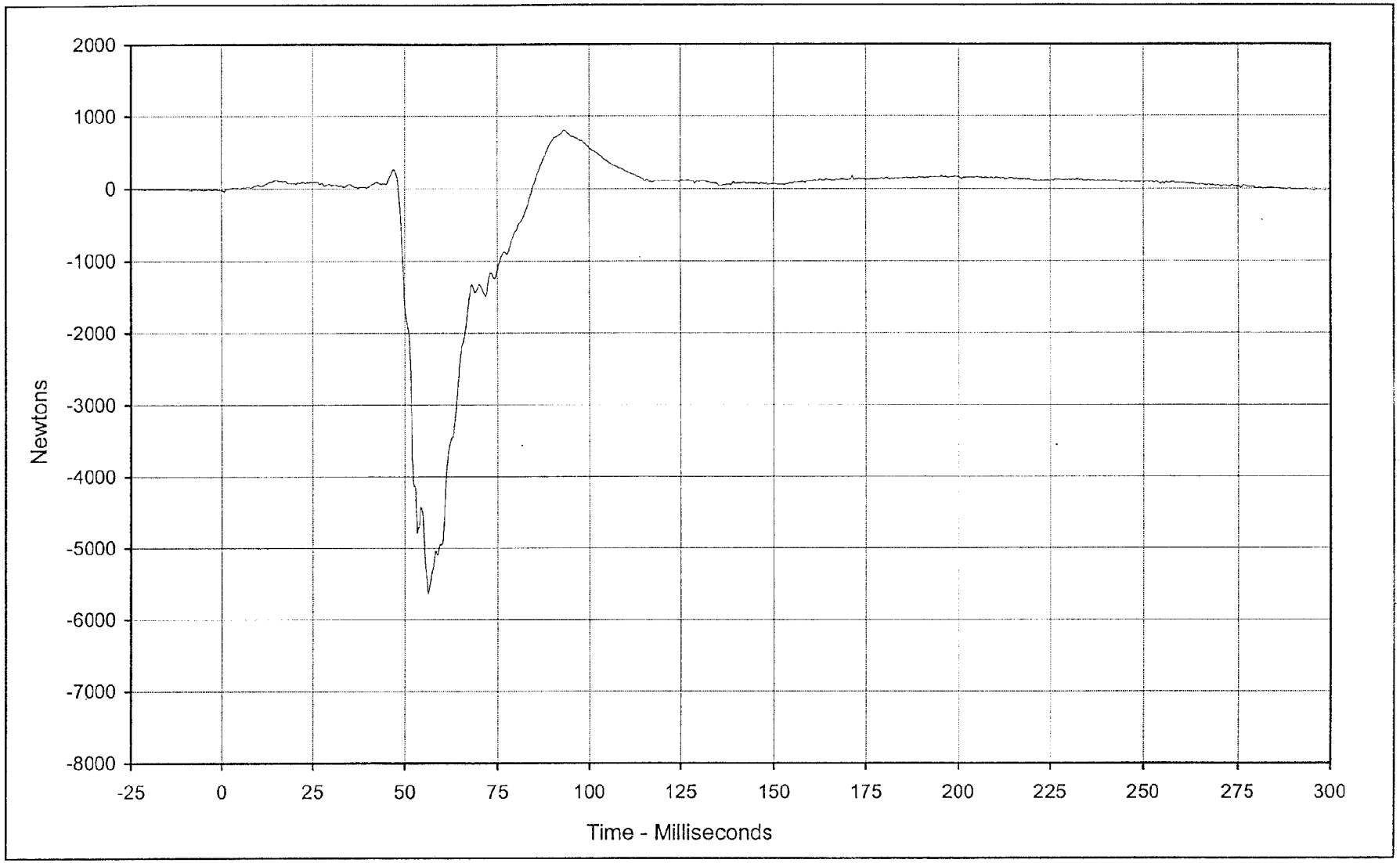
Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering

B-100

KAR-97-R97050-01



Curve Description: Passenger Left Femur Force

Maximum Value: 811.0 at 92.9 Milliseconds

Minimum Value: -5632.9 at 56.3 Milliseconds

SAE Filter Class: 600

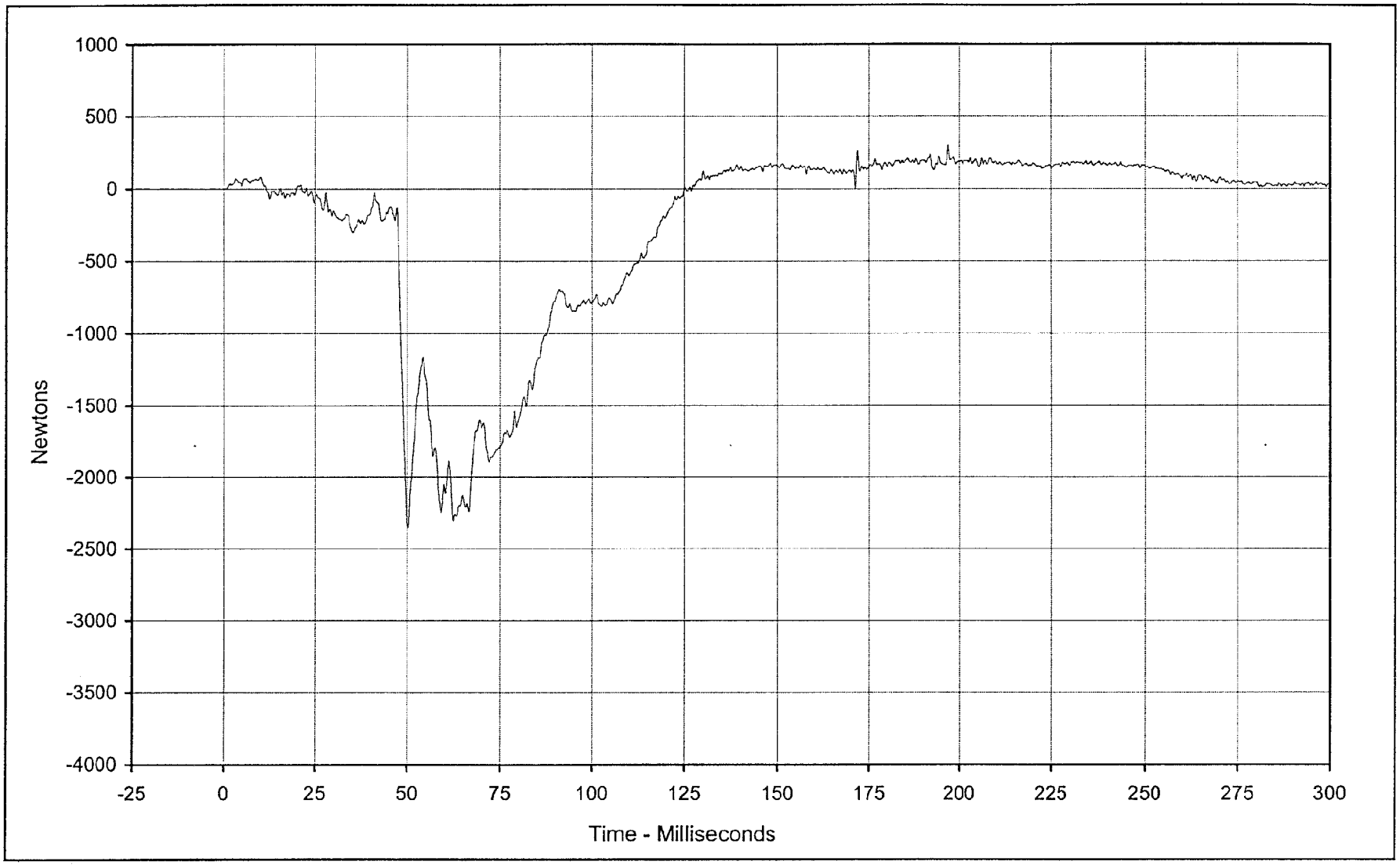
Date of Test: 11/21/97

Curve Number: FIL-067

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description: Passenger Right Femur Force

Maximum Value: 298.8 at 196.9 Milliseconds

Minimum Value: -2352.2 at 50.1 Milliseconds

SAE Filter Class: 600

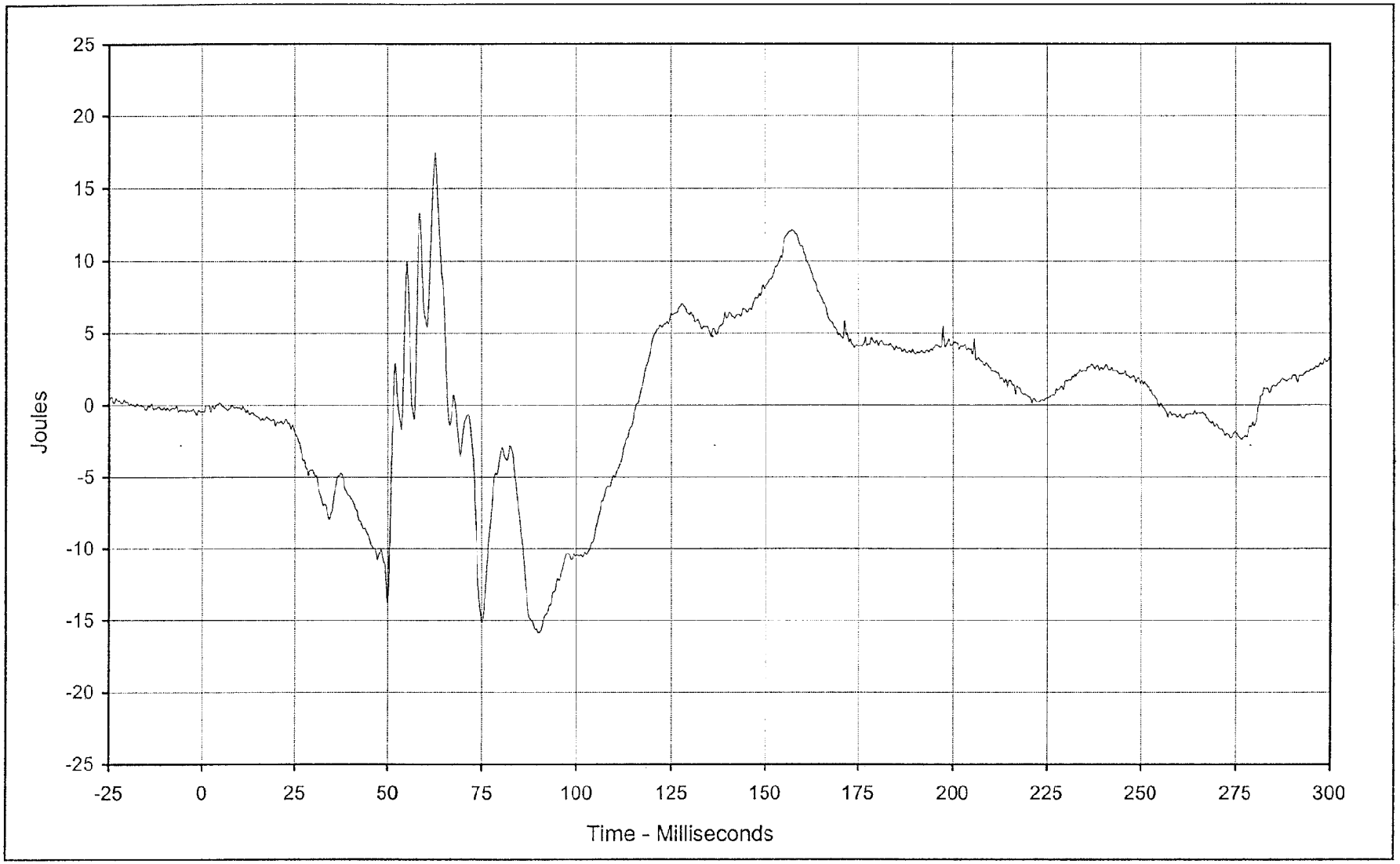
Date of Test: 11/21/97

Curve Number: FIL-068

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description: Passenger Left Upper Tibia Moment X

Maximum Value: 17.5 at 62.6 Milliseconds

Minimum Value: -15.9 at 90.0 Milliseconds

SAE Filter Class: 600

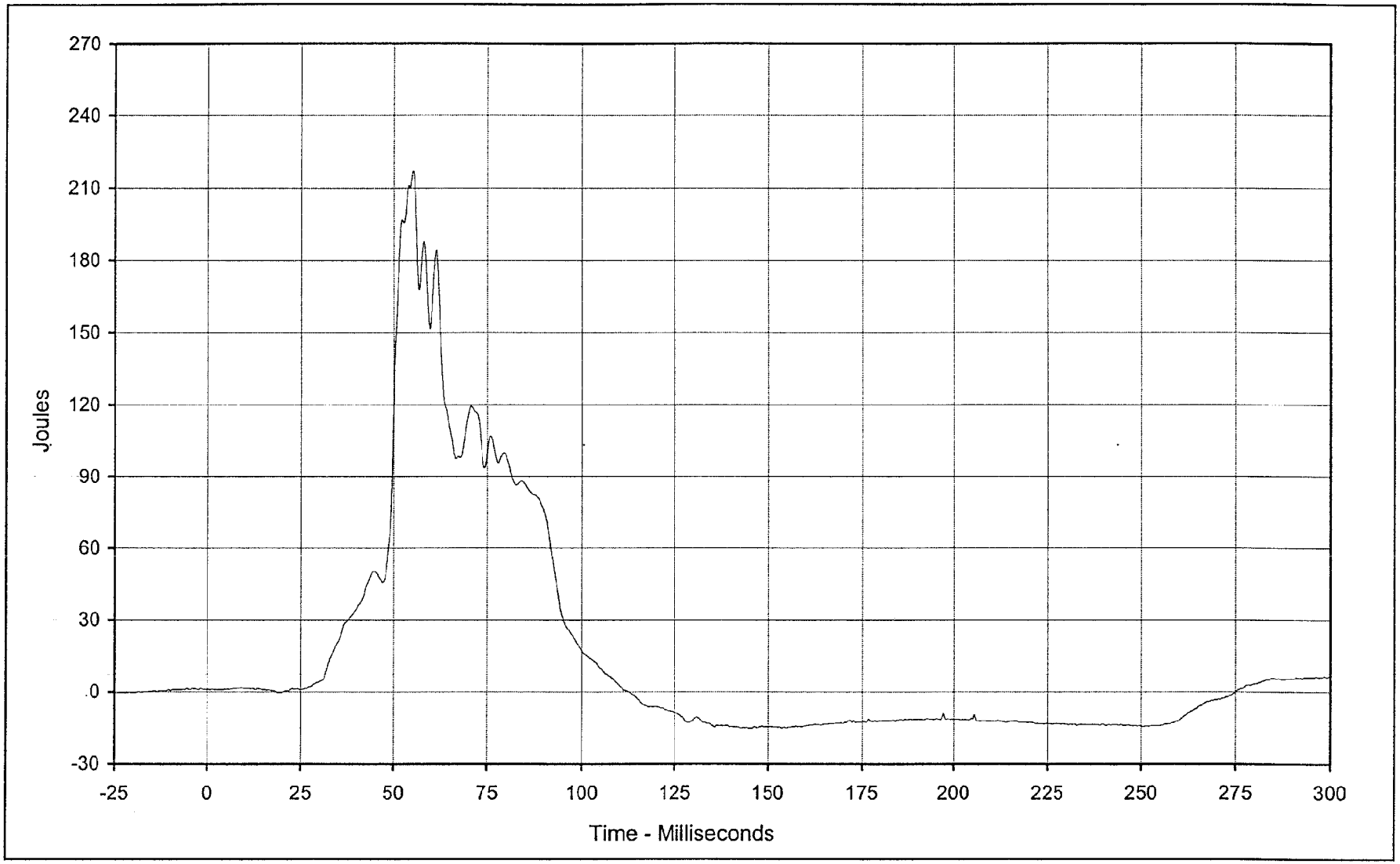
Date of Test: 11/21/97

Curve Number: FIL-069

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description: Passenger Left Upper Tibia Moment Y

Maximum Value: 217.1 at 55.1 Milliseconds

Minimum Value: -15.2 at 145.6 Milliseconds

SAE Filter Class: 600

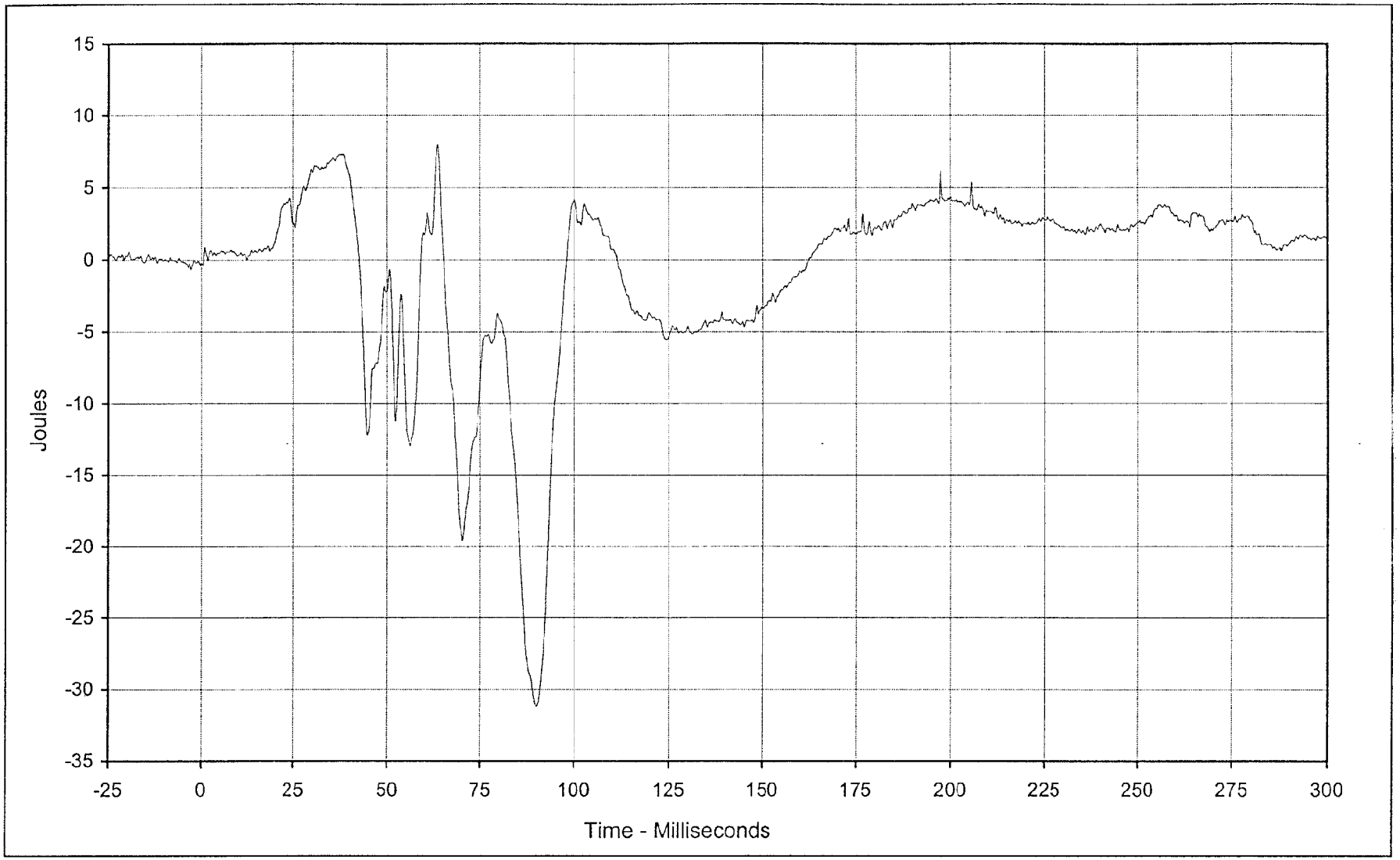
Date of Test: 11/21/97

Curve Number: FIL-070

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description: Passenger Right Upper Tibia Moment X

Maximum Value: 8.0 at 63.5 Milliseconds

Minimum Value: -31.2 at 90.0 Milliseconds

SAE Filter Class: 600

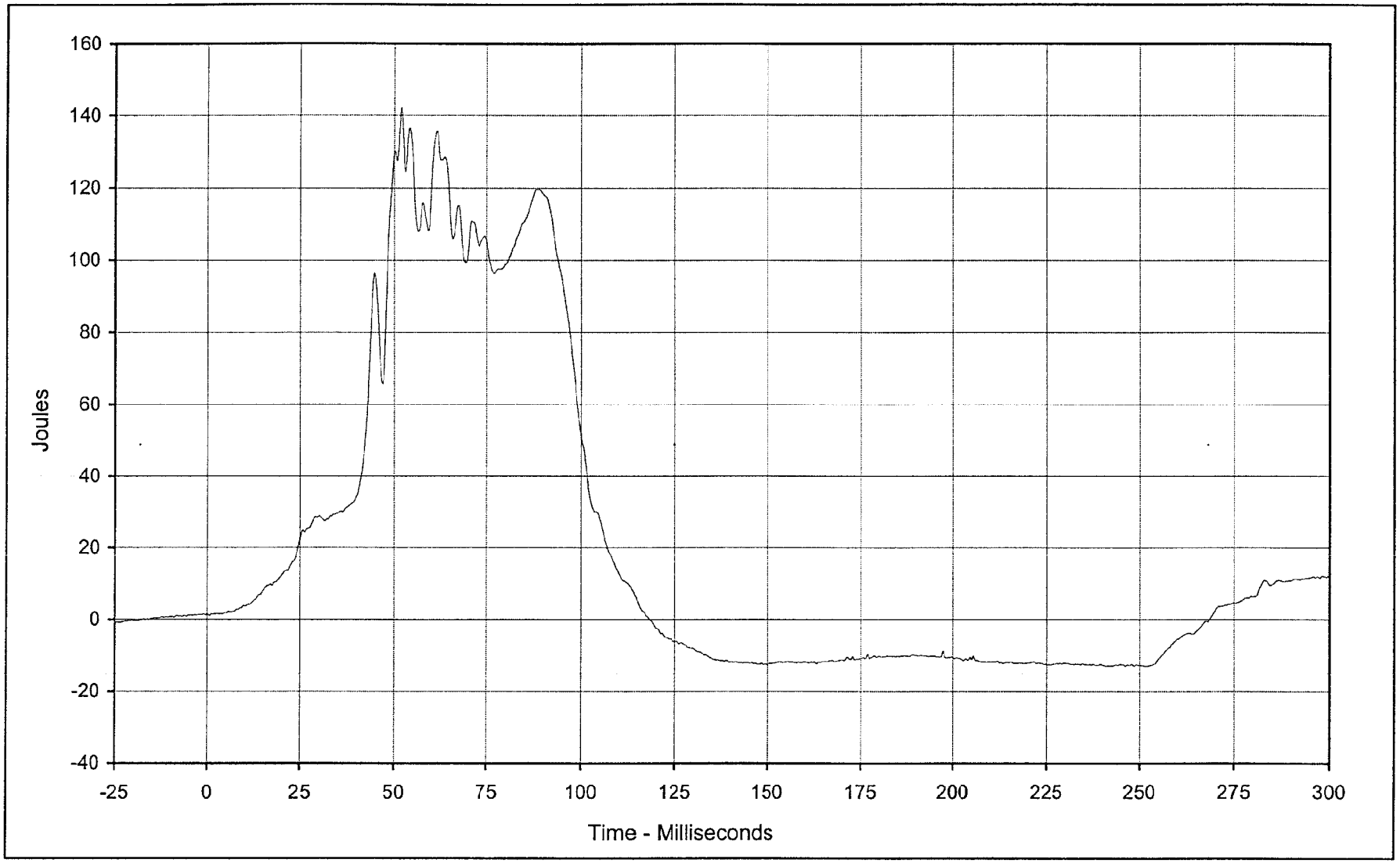
Date of Test: 11/21/97

Curve Number: FIL-071

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description: Passenger Right Upper Tibia Moment Y

Maximum Value: 142.0 at 52.0 Milliseconds

Minimum Value: -13.1 at 252.0 Milliseconds

SAE Filter Class: 600

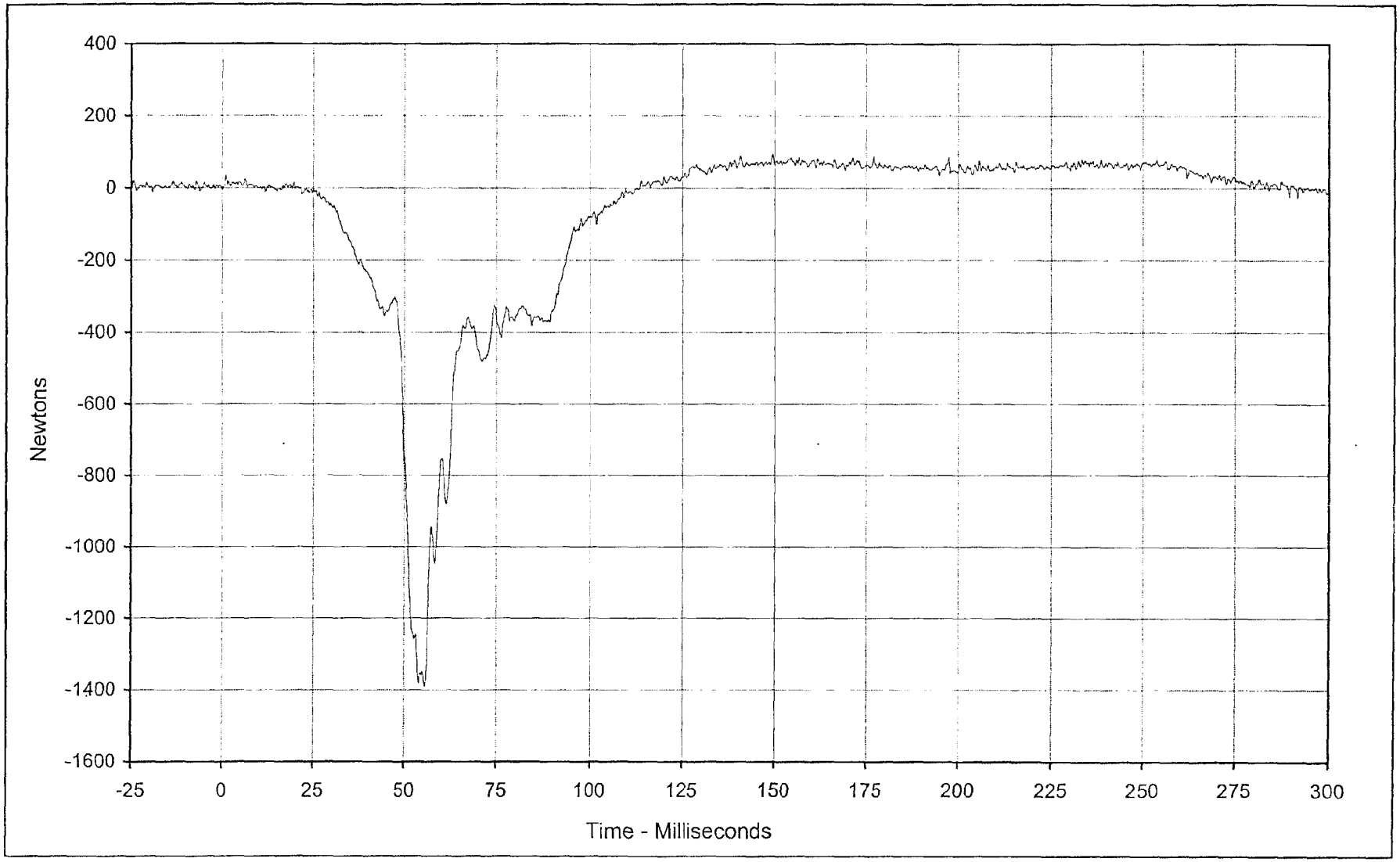
Date of Test: 11/21/97

Curve Number: FIL-072

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering

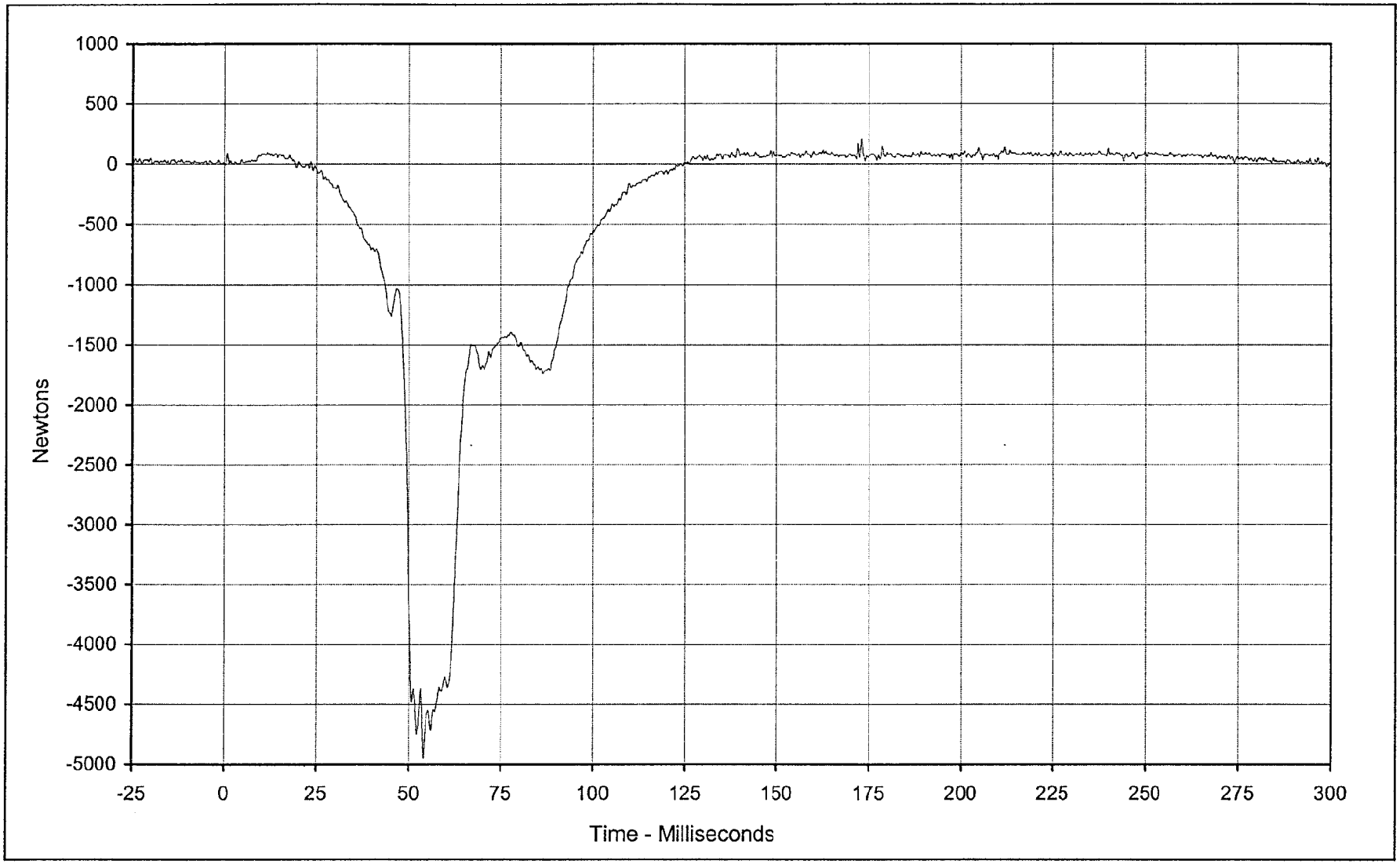


Curve Description:	Passenger Left Lower Tibia Force X			
Maximum Value:	93.2	at	149.5	Milliseconds
Minimum Value:	-1391.0	at	55.4	Milliseconds
SAE Filter Class:	600			
Date of Test:	11/21/97			
Curve Number:	FIL-073			

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description: Passenger Left Lower Tibia Force Z

Maximum Value: 209.0 at 173.0 Milliseconds

Minimum Value: -4947.7 at 53.9 Milliseconds

SAE Filter Class: 600

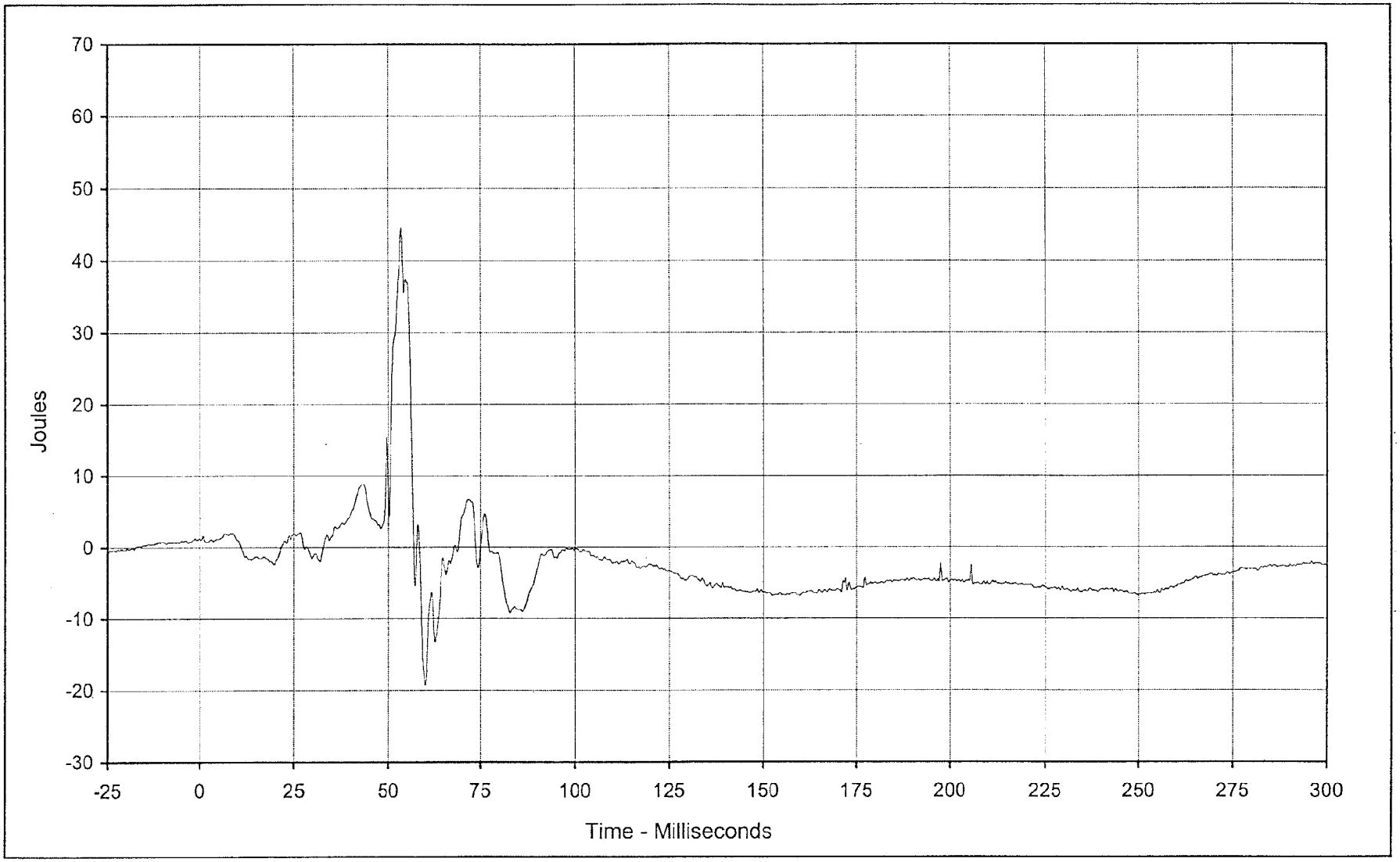
Date of Test: 11/21/97

Curve Number: FIL-074

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

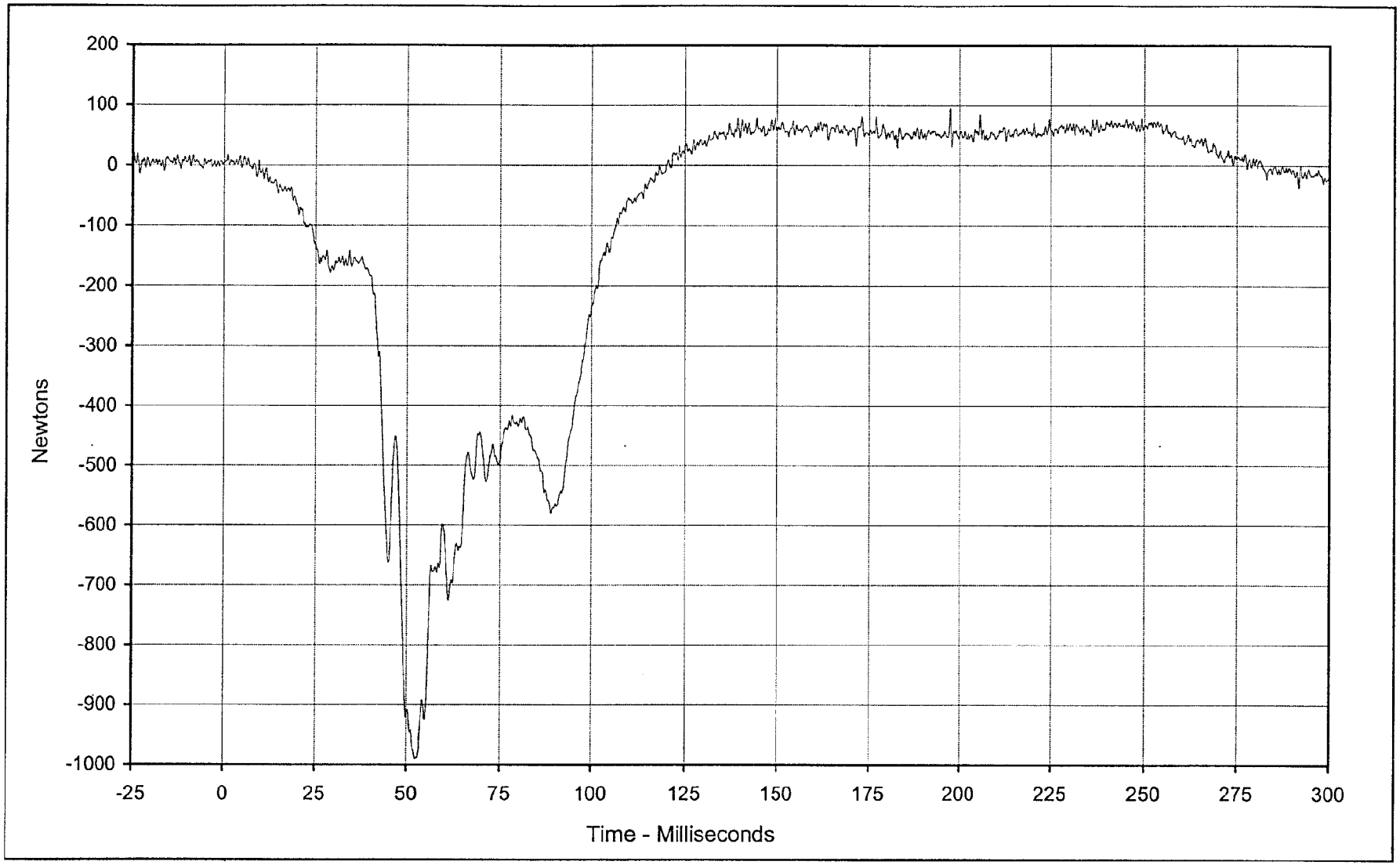
Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description:	Passenger Left Lower Tibia Moment Y			Testing Program	1998 NHTSA 35 mph NCAP No.: MW0106
Maximum Value:	44.6	at	53.6 Milliseconds	Test Vehicle:	1998 Chevrolet Malibu 4 Door Sedan
Minimum Value:	-19.4	at	60.1 Milliseconds		
SAE Filter Class:	600				
Date of Test:	11/21/97				
Curve Number:	FIL-075				

KARC Engineering



Curve Description: Passenger Right Lower Tibia Force X

Maximum Value: 95.0 at 197.4 Milliseconds

Minimum Value: -990.3 at 52.3 Milliseconds

SAE Filter Class: 600

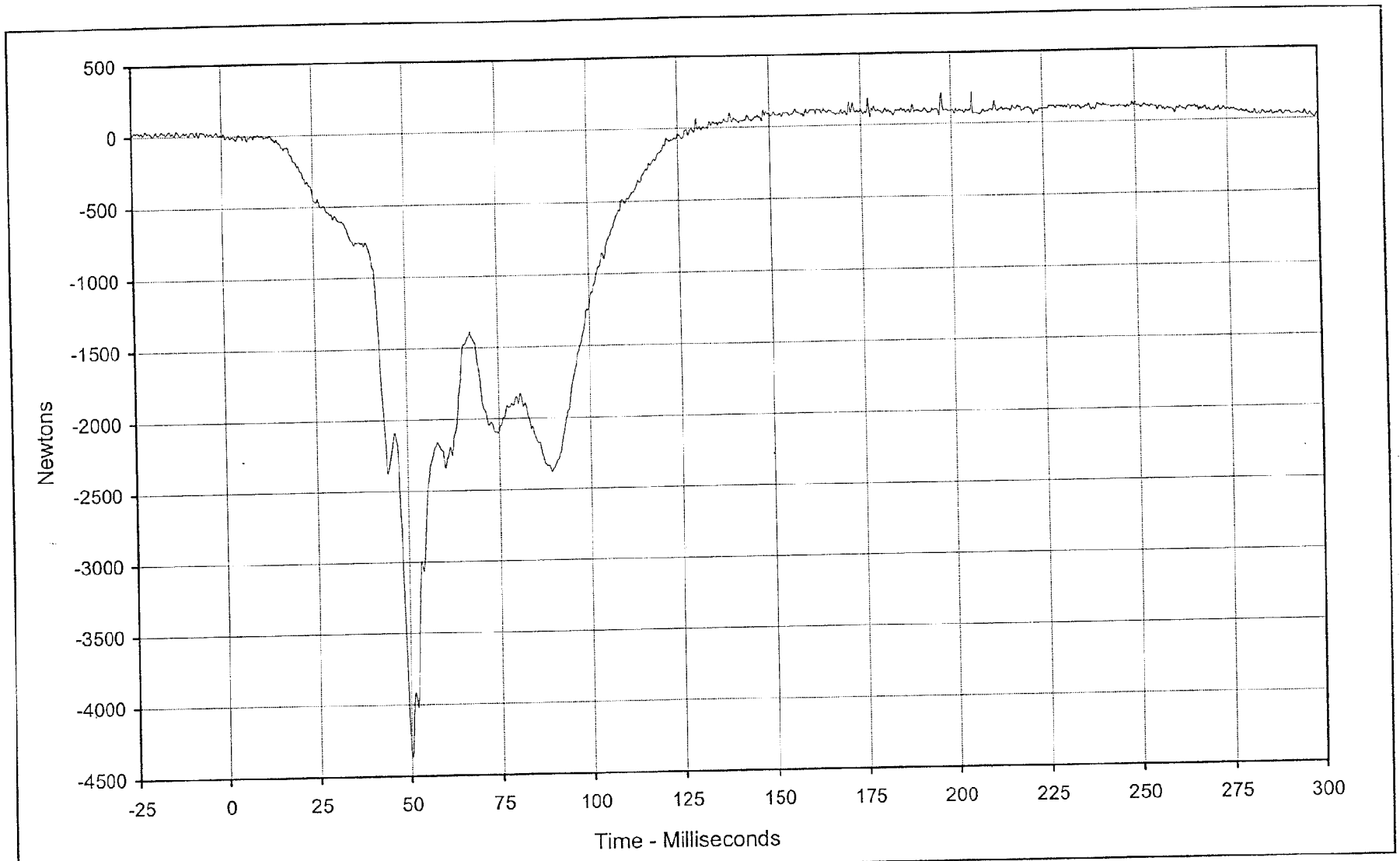
Date of Test: 11/21/97

Curve Number: FIL-076

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description: Passenger Right Lower Tibia Force Z

Maximum Value: 219.5 at 205.7 Milliseconds

Minimum Value: -4368.0 at 50.2 Milliseconds

SAE Filter Class: 600

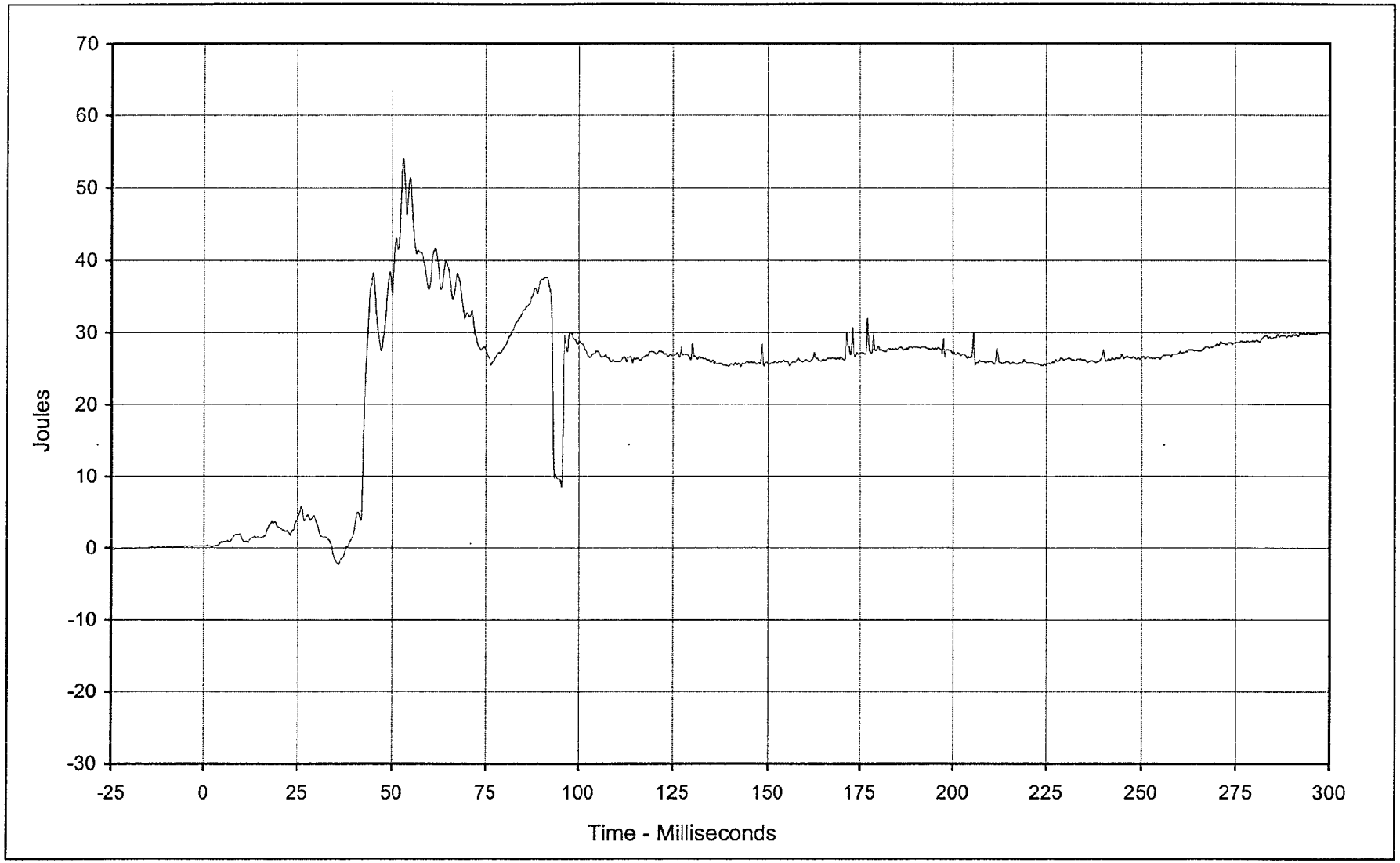
Date of Test: 11/21/97

Curve Number: FIL-077

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description: Passenger Right lower Tibia Moment Y

Maximum Value: 54.0 at 53.0 Milliseconds

Minimum Value: -2.3 at 36.0 Milliseconds

SAE Filter Class: 600

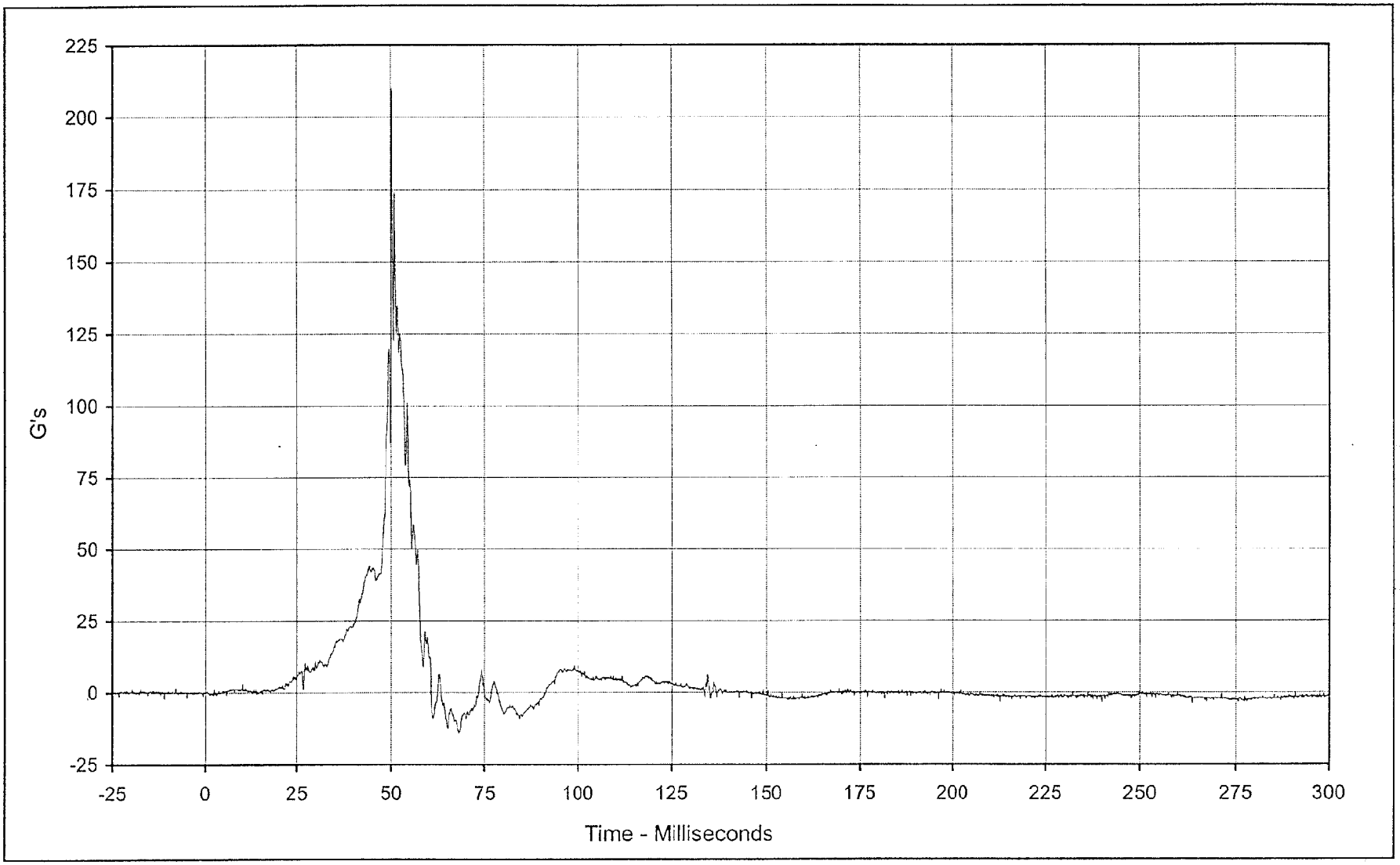
Date of Test: 11/21/97

Curve Number: FIL-078

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description: Passenger Left Foot Aft X

Maximum Value: 209.7 at 50.3 Milliseconds

Minimum Value: -14.1 at 68.0 Milliseconds

SAE Filter Class: 1000

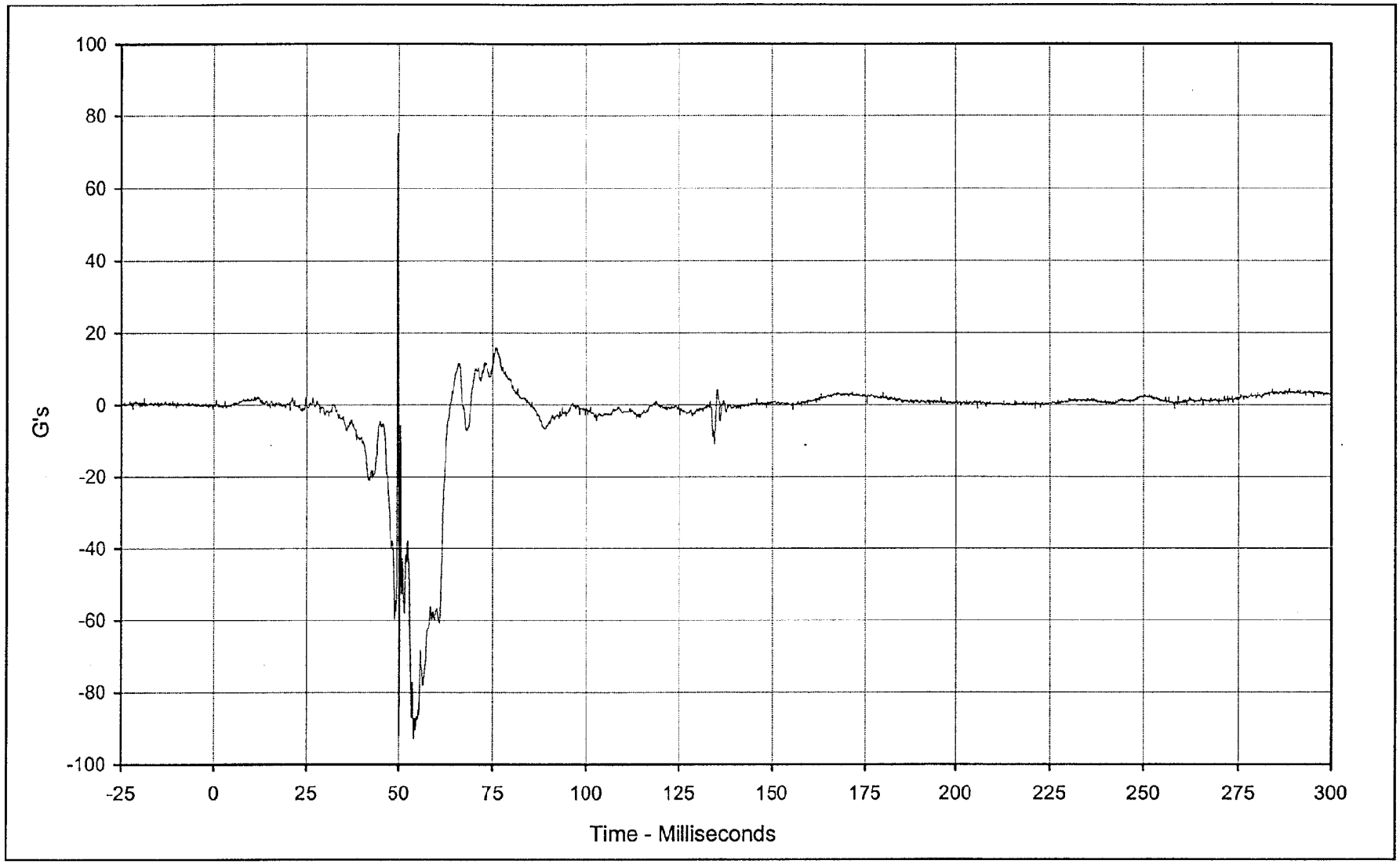
Date of Test: 11/21/97

Curve Number: FIL-079

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description: Passenger Left Foot Aft Z

Maximum Value: 74.3 at 49.8 Milliseconds

Minimum Value: -93.0 at 54.1 Milliseconds

SAE Filter Class: 1000

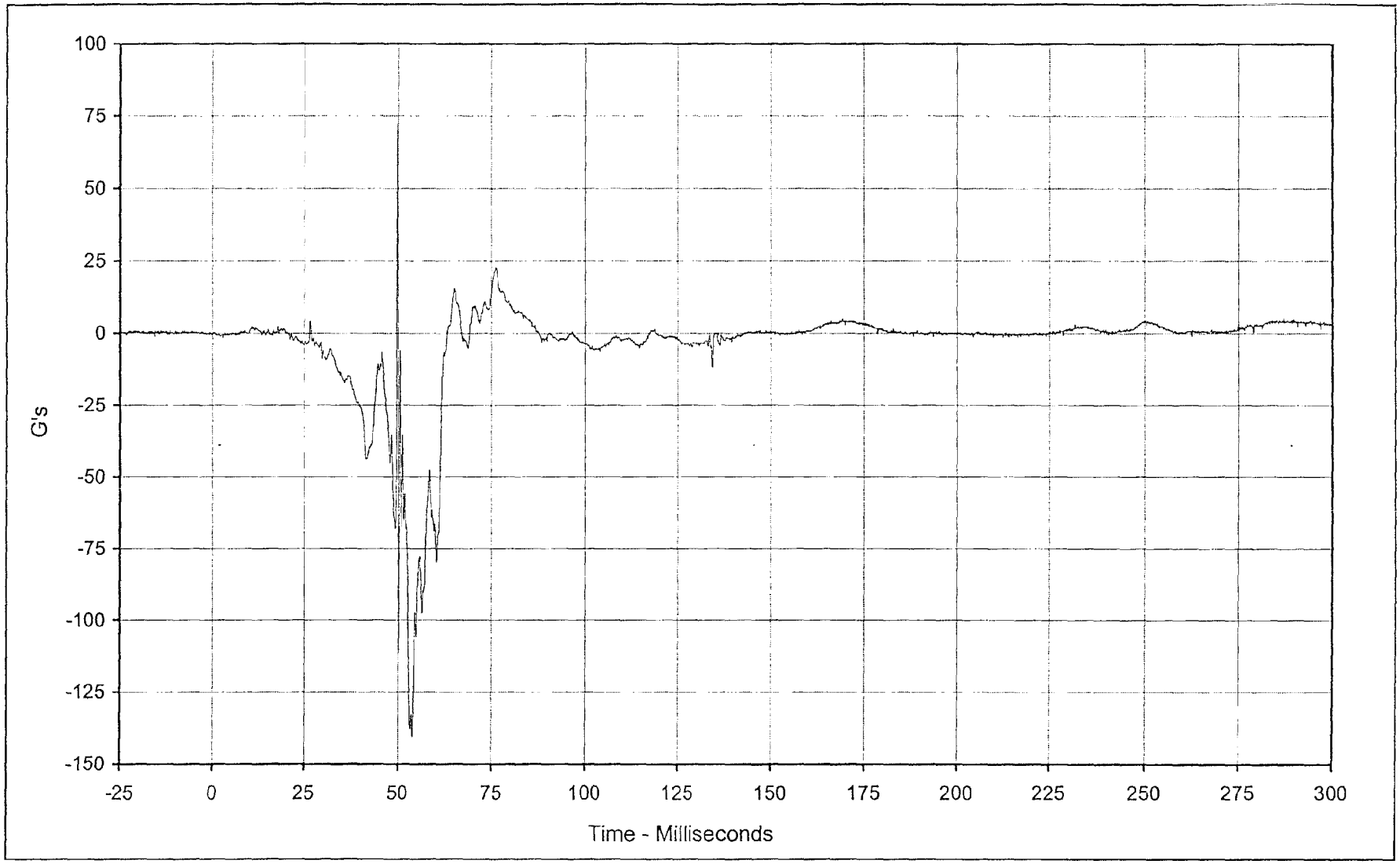
Date of Test: 11/21/97

Curve Number: FIL-080

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering

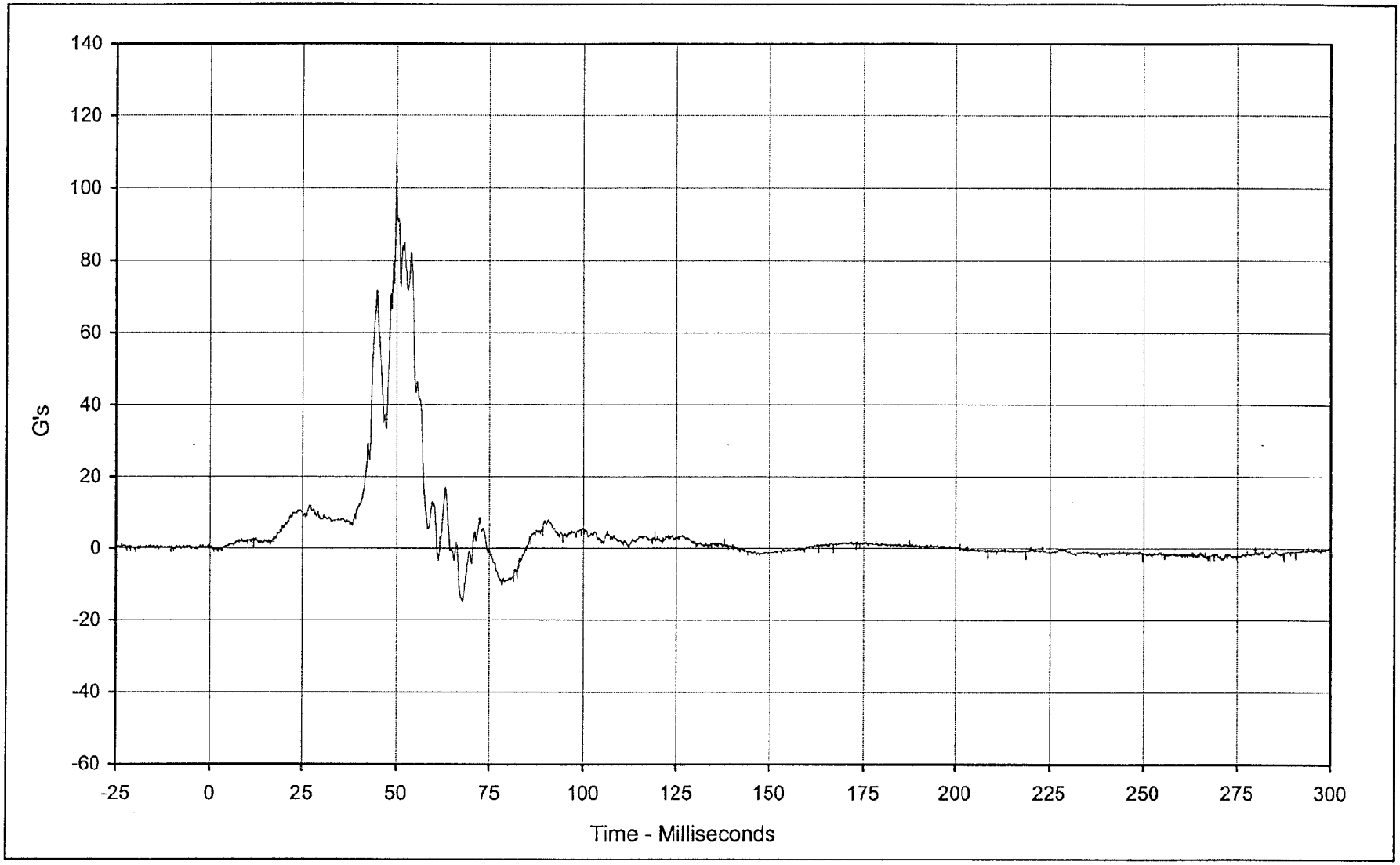


Curve Description:	Passenger Left Foot Fore Z				
Maximum Value:	72.2	at	49.8	Milliseconds	
Minimum Value:	-140.6	at	54.0	Milliseconds	
SAE Filter Class:	1000				
Date of Test:	11/21/97				
Curve Number:	FIL-081				

Testing Program: 1998 NHTSA 35 mph NCAP No.: MW0106

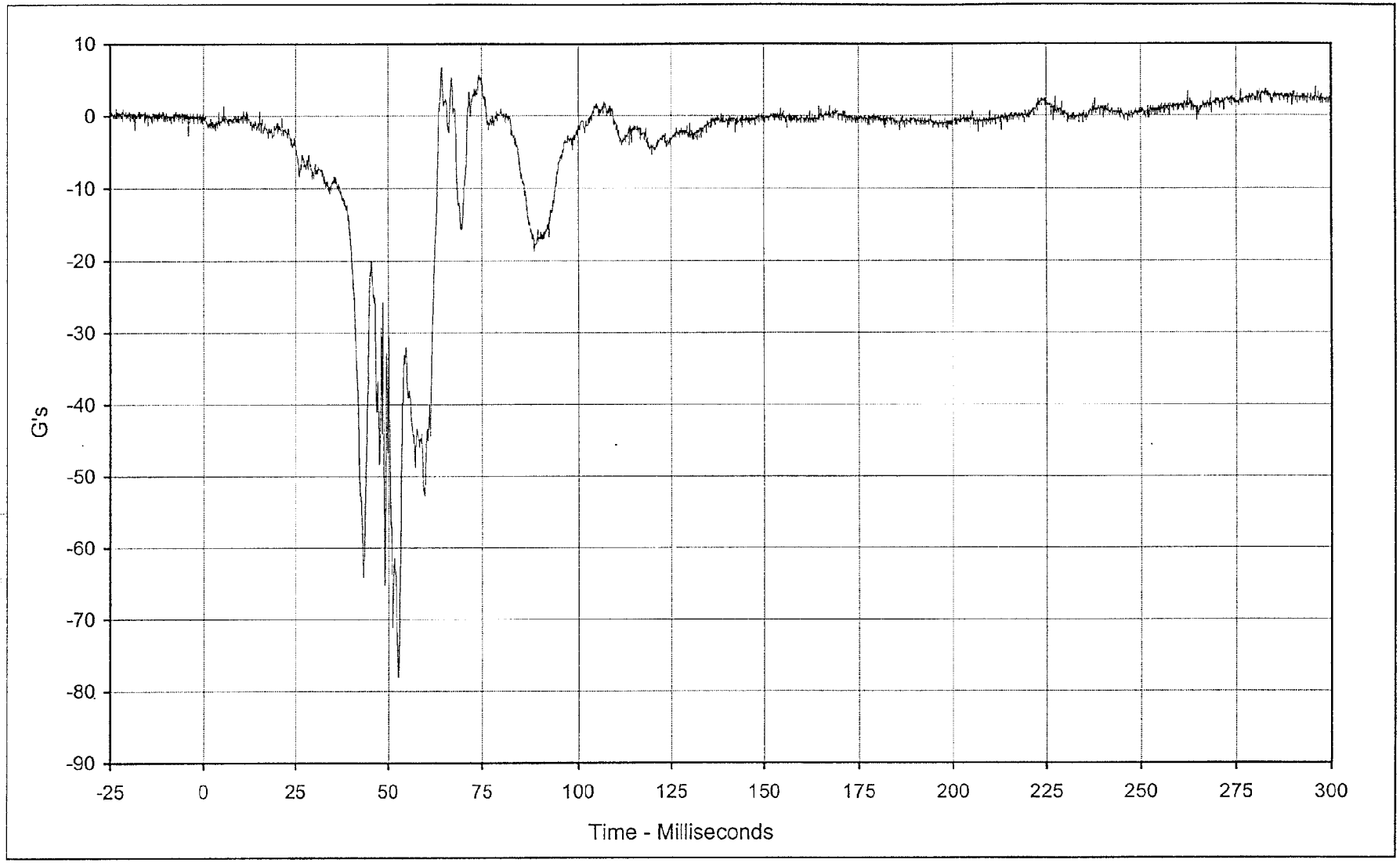
Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description:	Passenger Right Foot Aft X			Testing Program	1998 NHTSA 35 mph NCAP No.: MW0106
Maximum Value:	109.3	at	49.9 Milliseconds	Test Vehicle:	1998 Chevrolet Malibu 4 Door Sedan
Minimum Value:	-14.7	at	67.5 Milliseconds		
SAE Filter Class:	1000				
Date of Test:	11/21/97				
Curve Number:	FIL-082				

KARCO Engineering



Curve Description: Passenger Right Foot Aft Z

Maximum Value: 6.7 at 64.4 Milliseconds

Minimum Value: -78.1 at 52.9 Milliseconds

SAE Filter Class: 1000

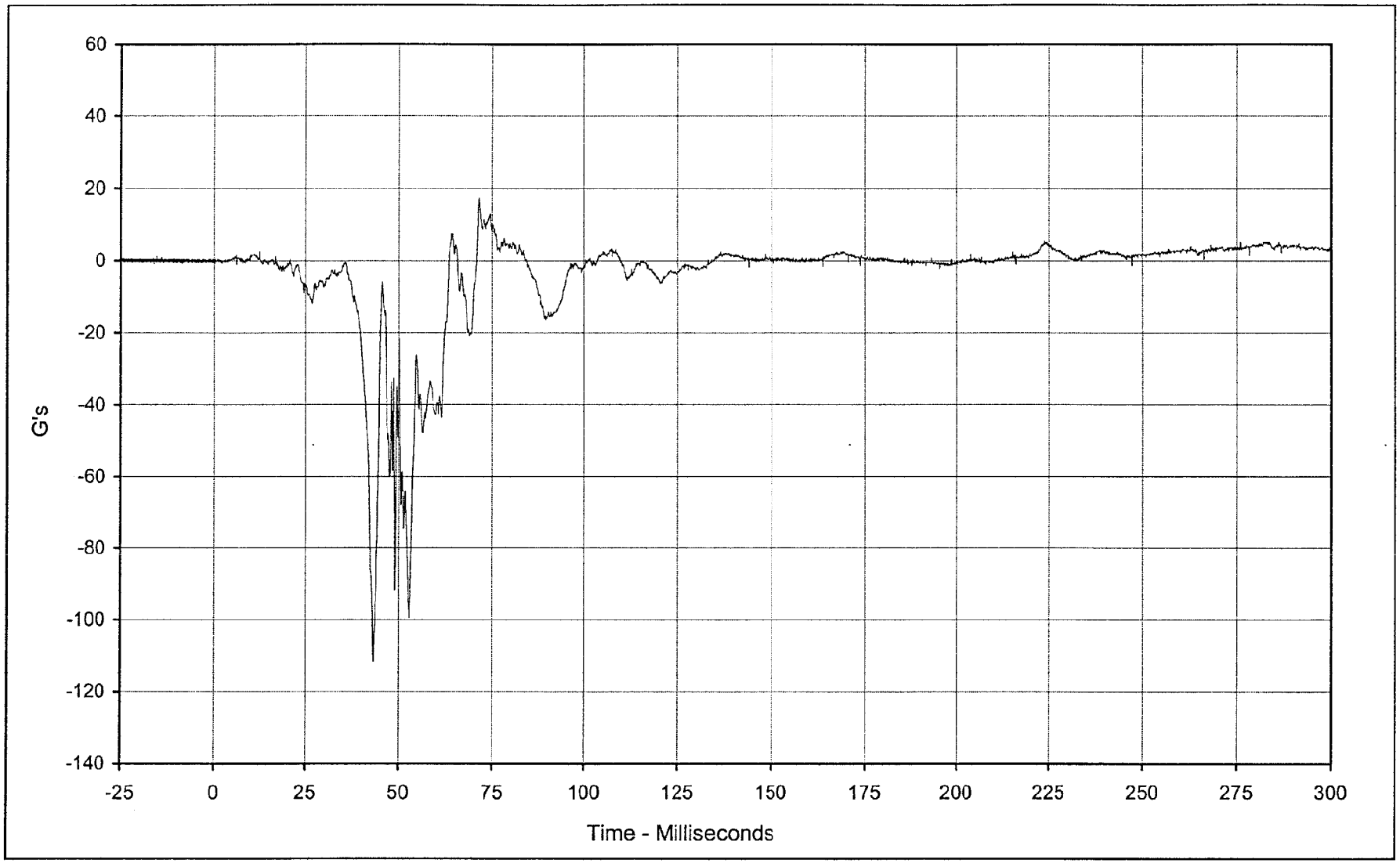
Date of Test: 11/21/97

Curve Number: FIL-083

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description: Passenger Right Foot Fore Z

Maximum Value: 17.4 at 71.4 Milliseconds

Minimum Value: -111.7 at 43.2 Milliseconds

SAE Filter Class: 1000

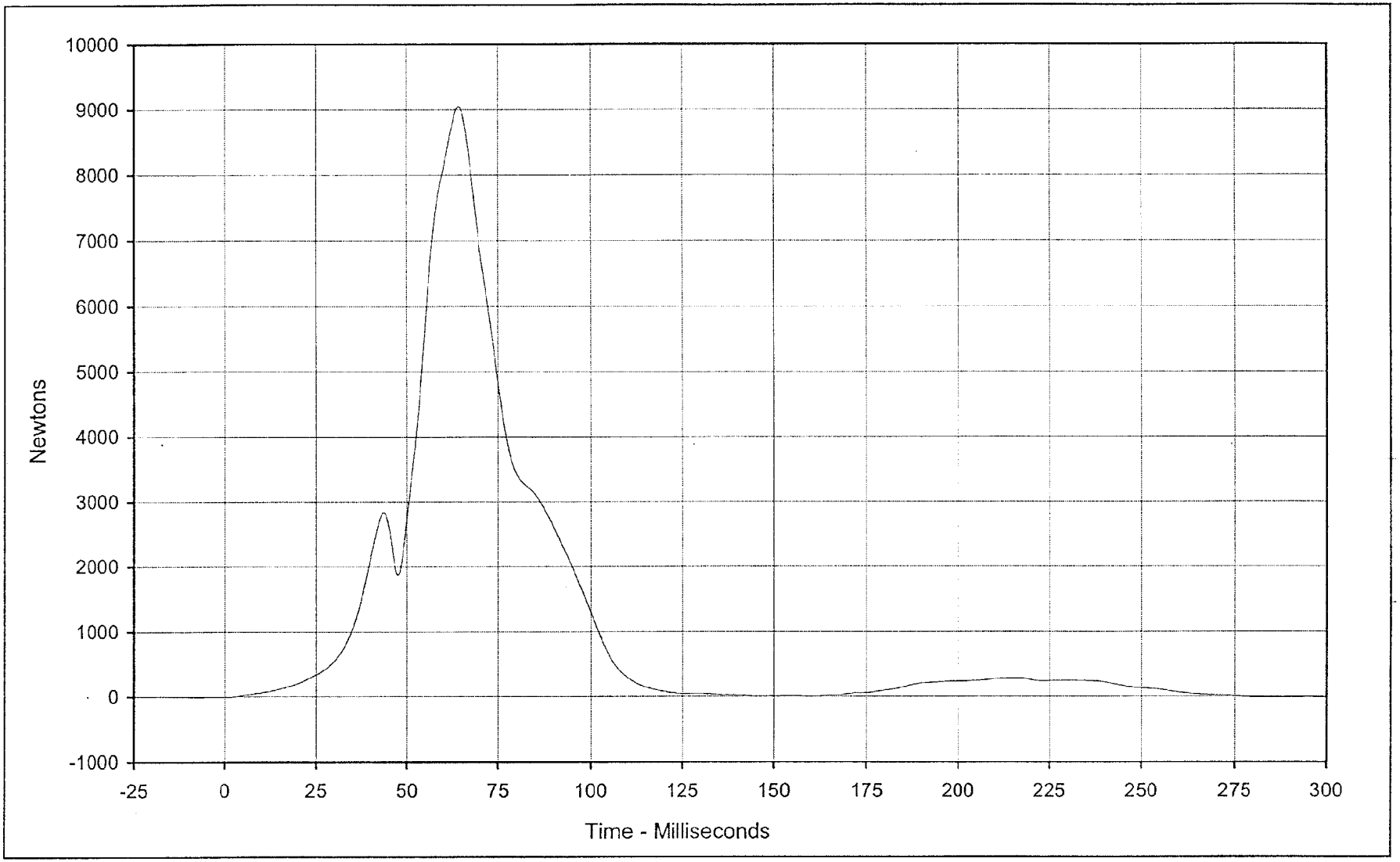
Date of Test: 11/21/97

Curve Number: FIL-084

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering

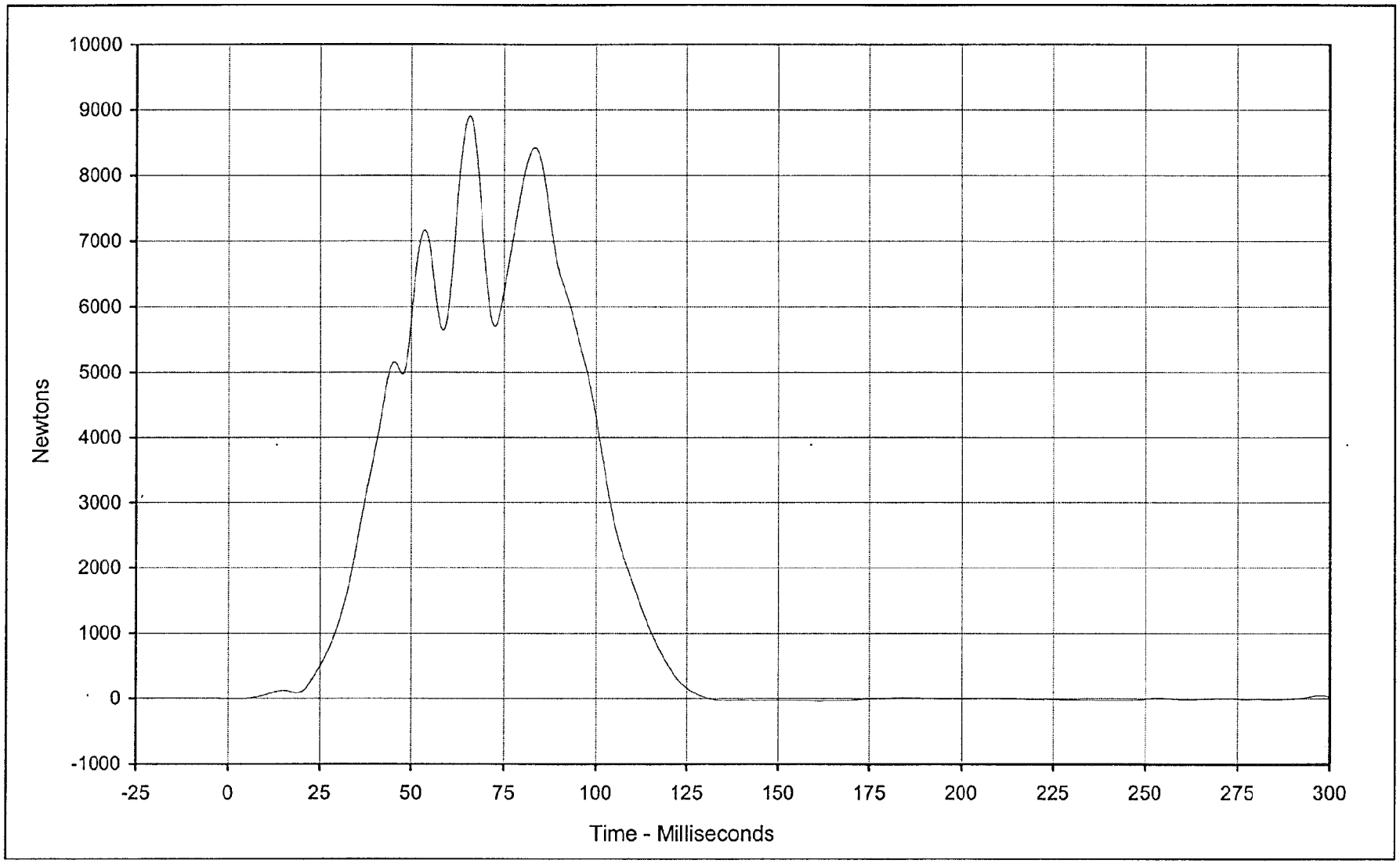


Curve Description:	Passenger Lap Belt Force			
Maximum Value:	9041.7	at	64.2	Milliseconds
Minimum Value:	-19.8	at	299.9	Milliseconds
SAE Filter Class:	60			
Date of Test:	11/21/97			
Curve Number:	FIL-085			

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description: Passenger Shoulder Belt Force

Maximum Value: 8903.5 at 65.6 Milliseconds

Minimum Value: -37.4 at 161.0 Milliseconds

SAE Filter Class: 60

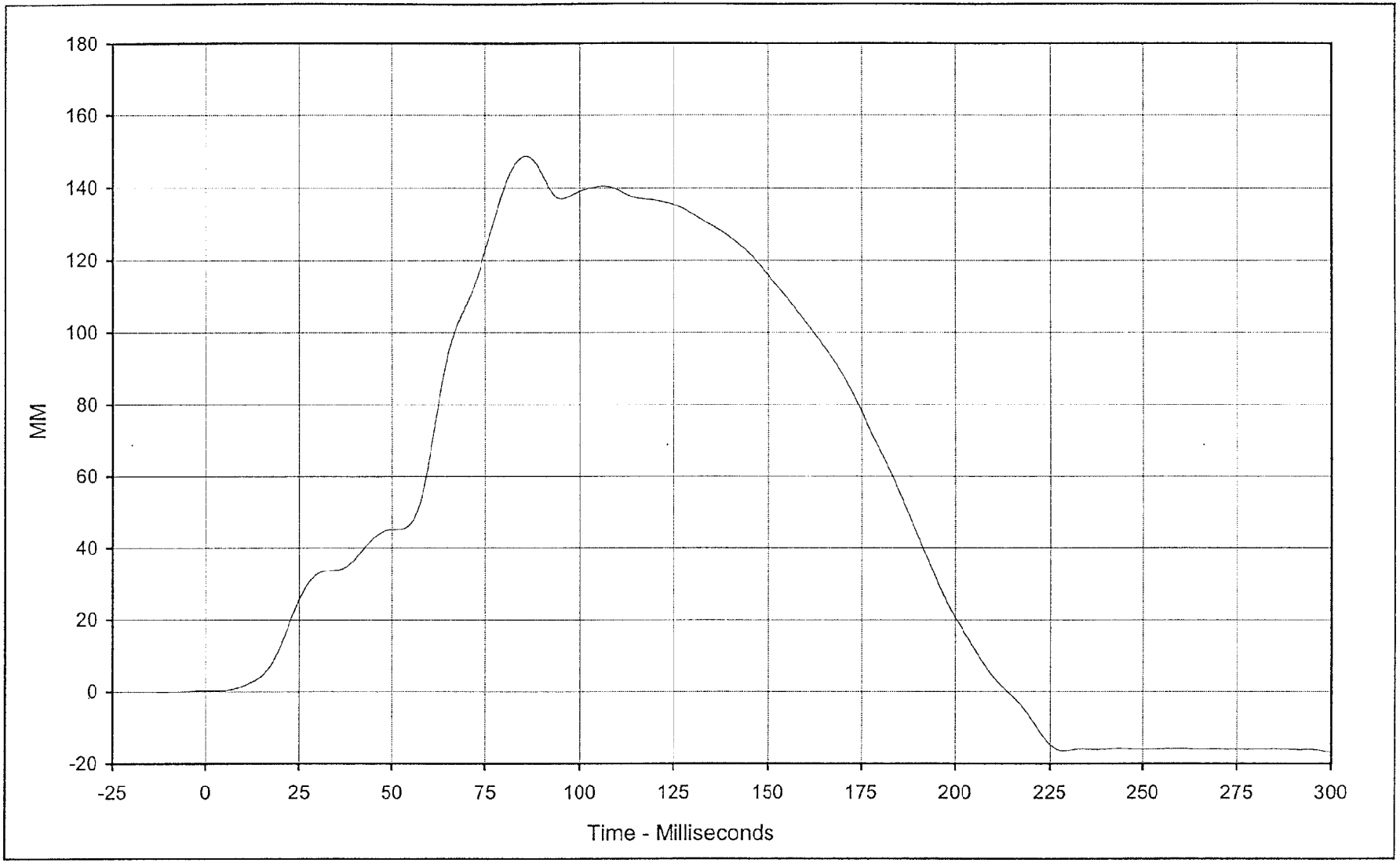
Date of Test: 11/21/97

Curve Number: FIL-086

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description: Passenger Shoulder Belt Pullout

Maximum Value: 148.7 at 85.7 Milliseconds

Minimum Value: -16.7 at 299.2 Milliseconds

SAE Filter Class: 60

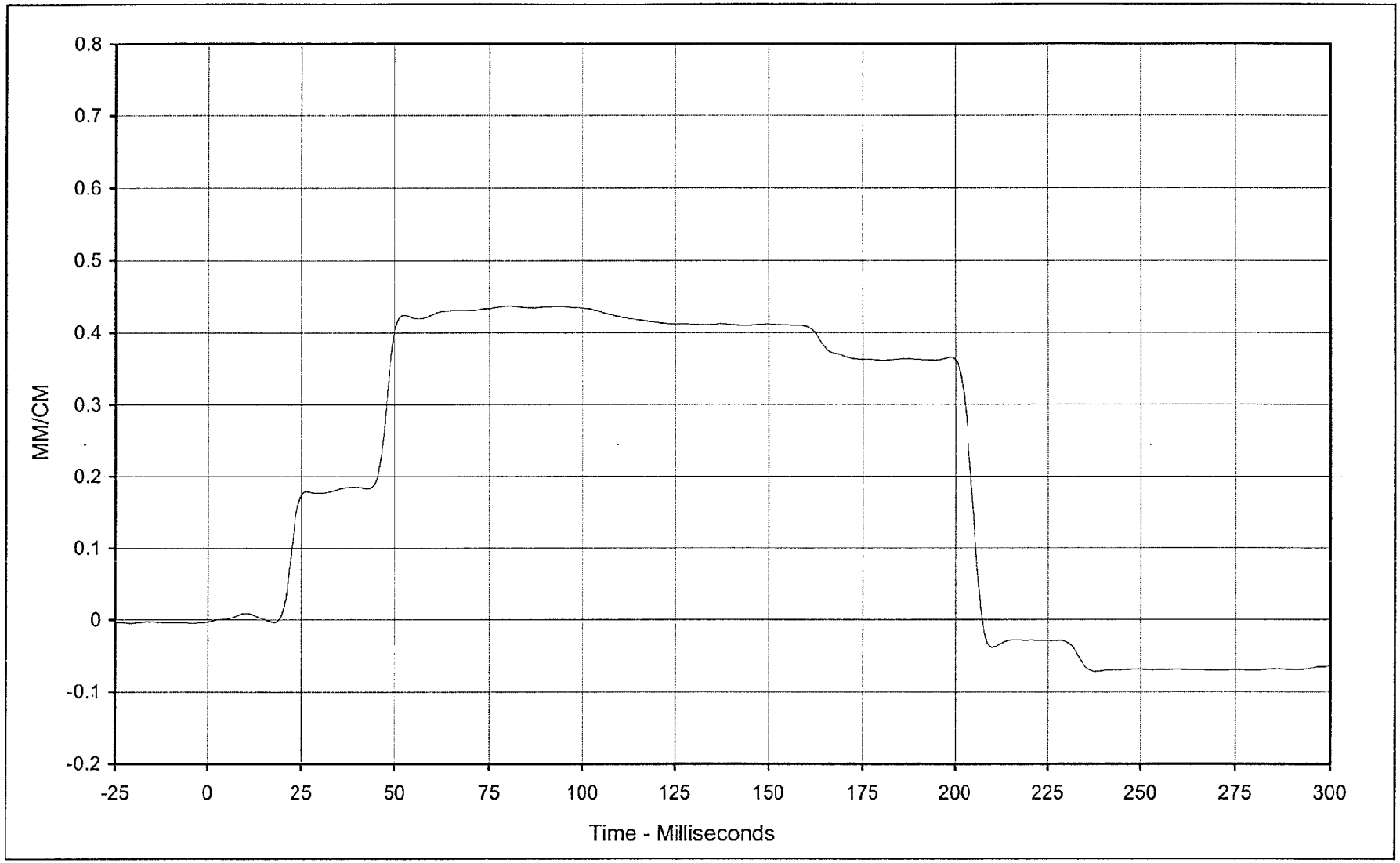
Date of Test: 11/21/97

Curve Number: FIL-087

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

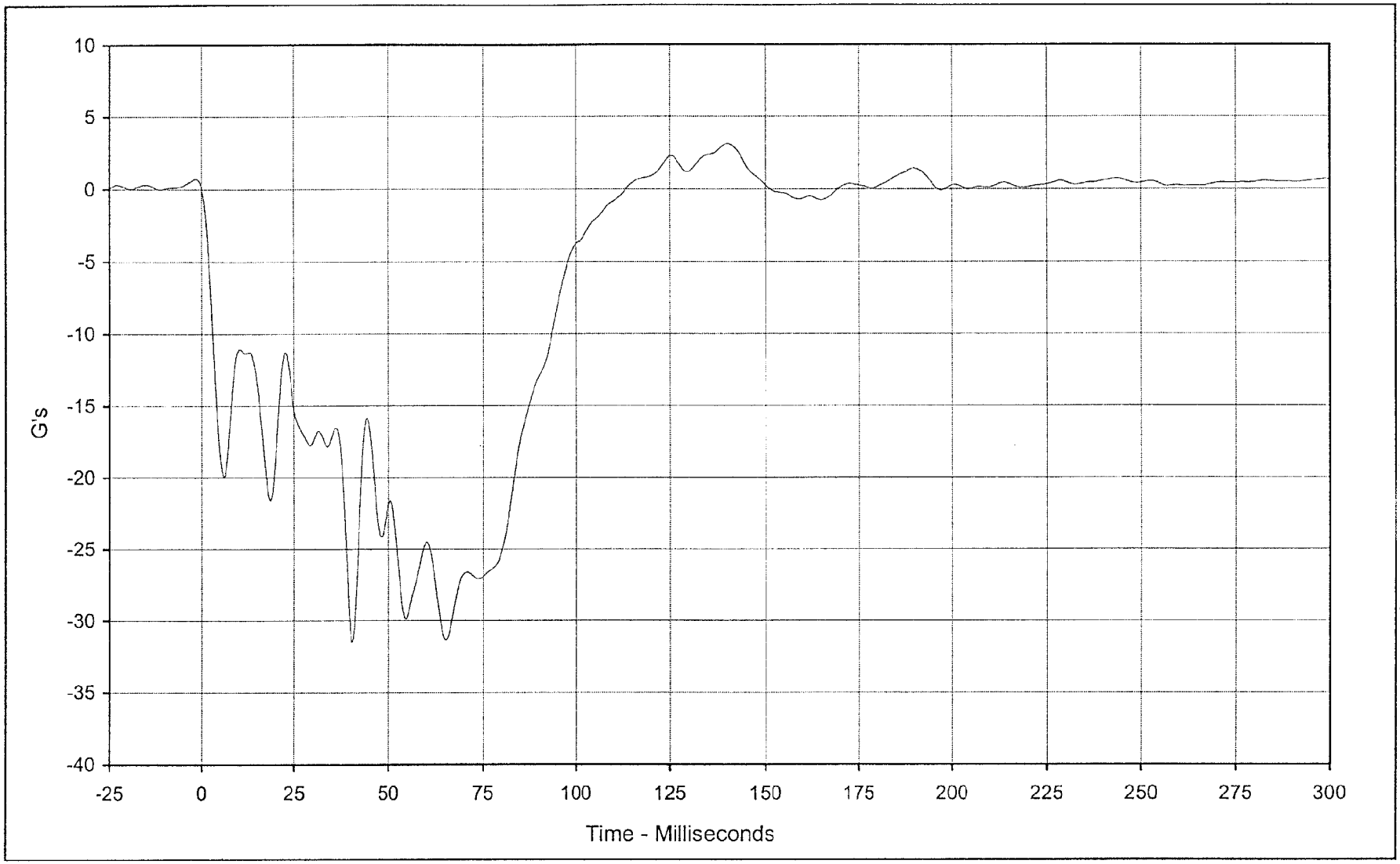
KARCO Engineering



Curve Description:	Passenger Shoulder Belt Elongation			
Maximum Value:	0.44	at	80.2	Milliseconds
Minimum Value:	-0.07	at	238.1	Milliseconds
SAE Filter Class:	60			
Date of Test:	11/21/97			
Curve Number:	FIL-088			

Testing Program	1998 NHTSA 35 mph NCAP No.: MW0106
Test Vehicle:	1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description: Vehicle Left Rear Primary X

Maximum Value: 3.1 at 140.2 Milliseconds

Minimum Value: -31.5 at 40.2 Milliseconds

SAE Filter Class: 60

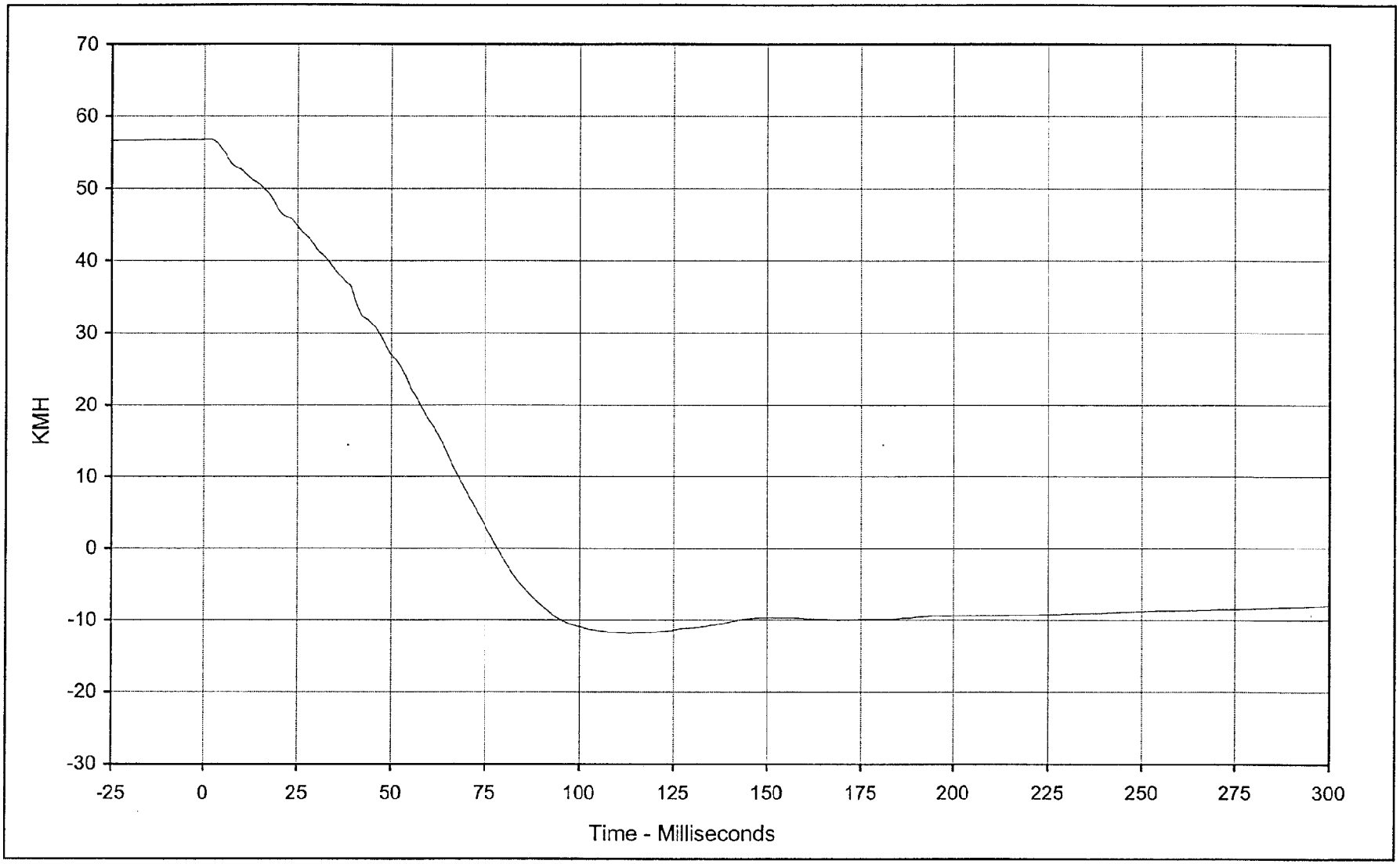
Date of Test: 11/21/97

Curve Number: FIL-089

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

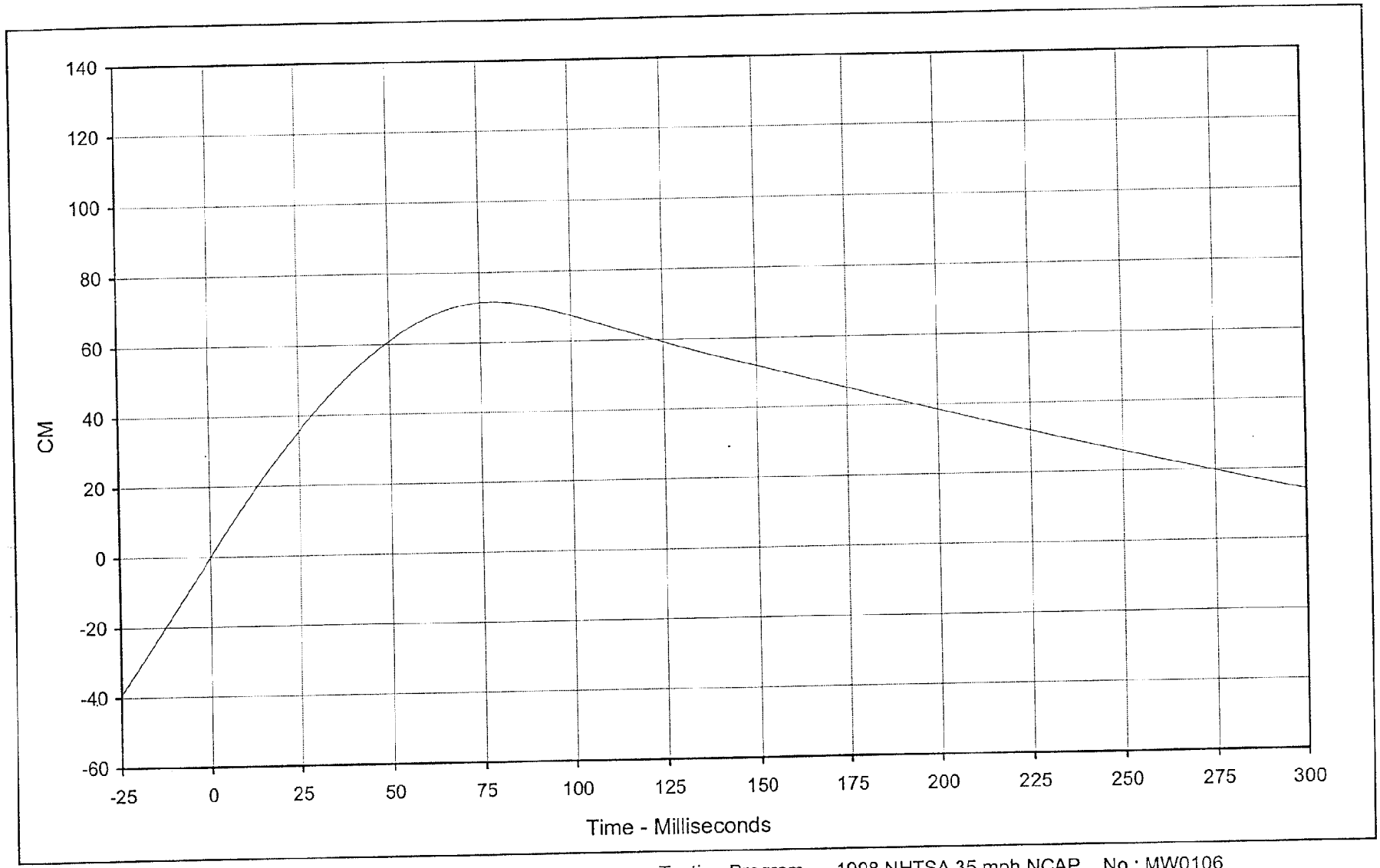
Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description:	Vehicle Left Rear Primary Velocity X				Testing Program	1998 NHTSA 35 mph NCAP No.: MW0106
Maximum Value:	56.8	at	1.4	Milliseconds	Test Vehicle:	1998 Chevrolet Malibu 4 Door Sedan
Minimum Value:	-11.8	at	113.4	Milliseconds		
SAE Filter Class:	180					
Date of Test:	11/21/97					
Curve Number:	IN1-089					

KARCO Engineering



Curve Description: Vehicle Left Rear Primary Displ.

Maximum Value: 71.5 at 78.3 Milliseconds

Minimum Value: 0.0 at 0.0 Milliseconds

SAE Filter Class: 180

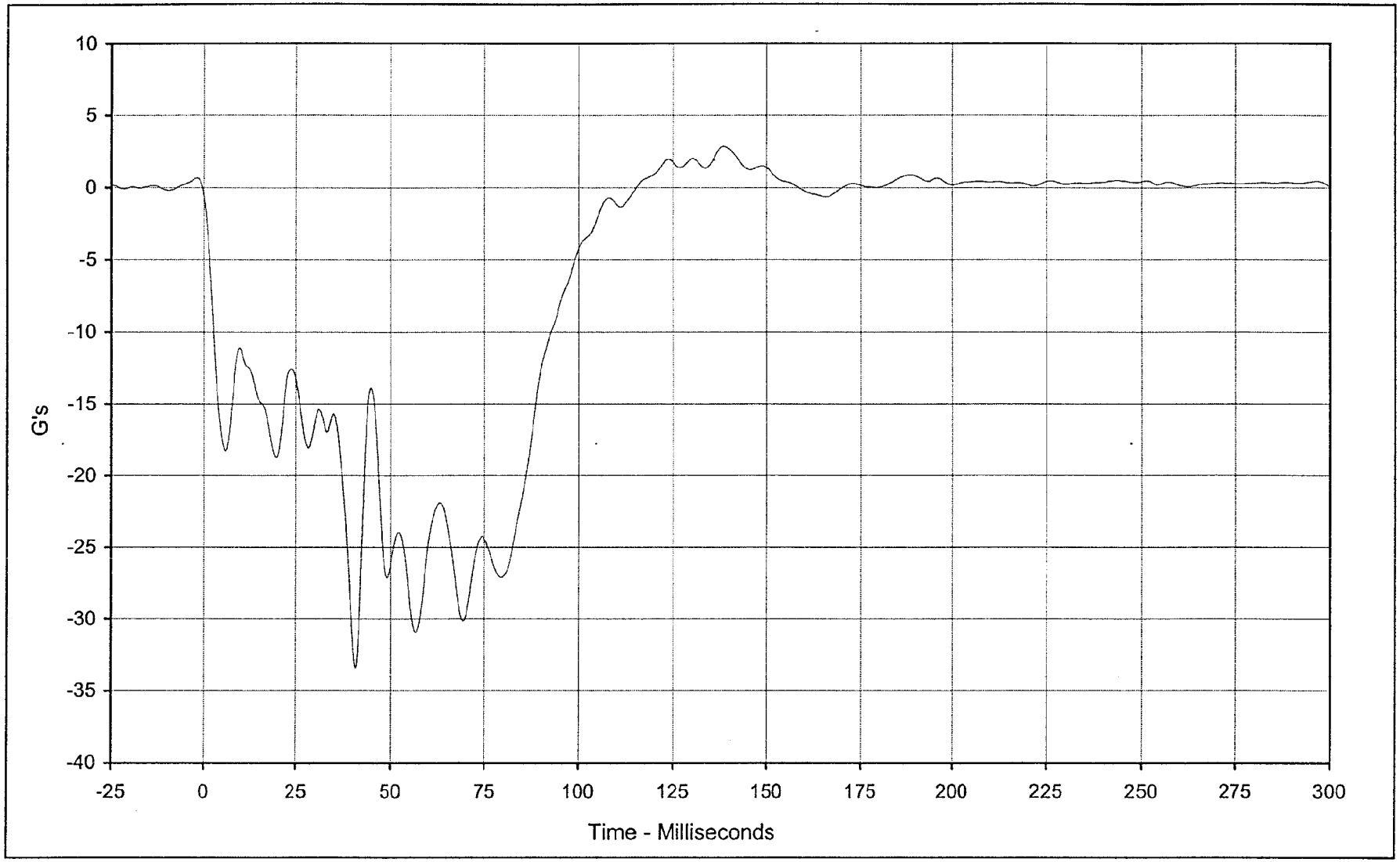
Date of Test: 11/21/97

Curve Number: IN2-089

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description: Vehicle Right Rear Primary X

Maximum Value: 2.9 at 138.6 Milliseconds

Minimum Value: -33.4 at 40.7 Milliseconds

SAE Filter Class: 60

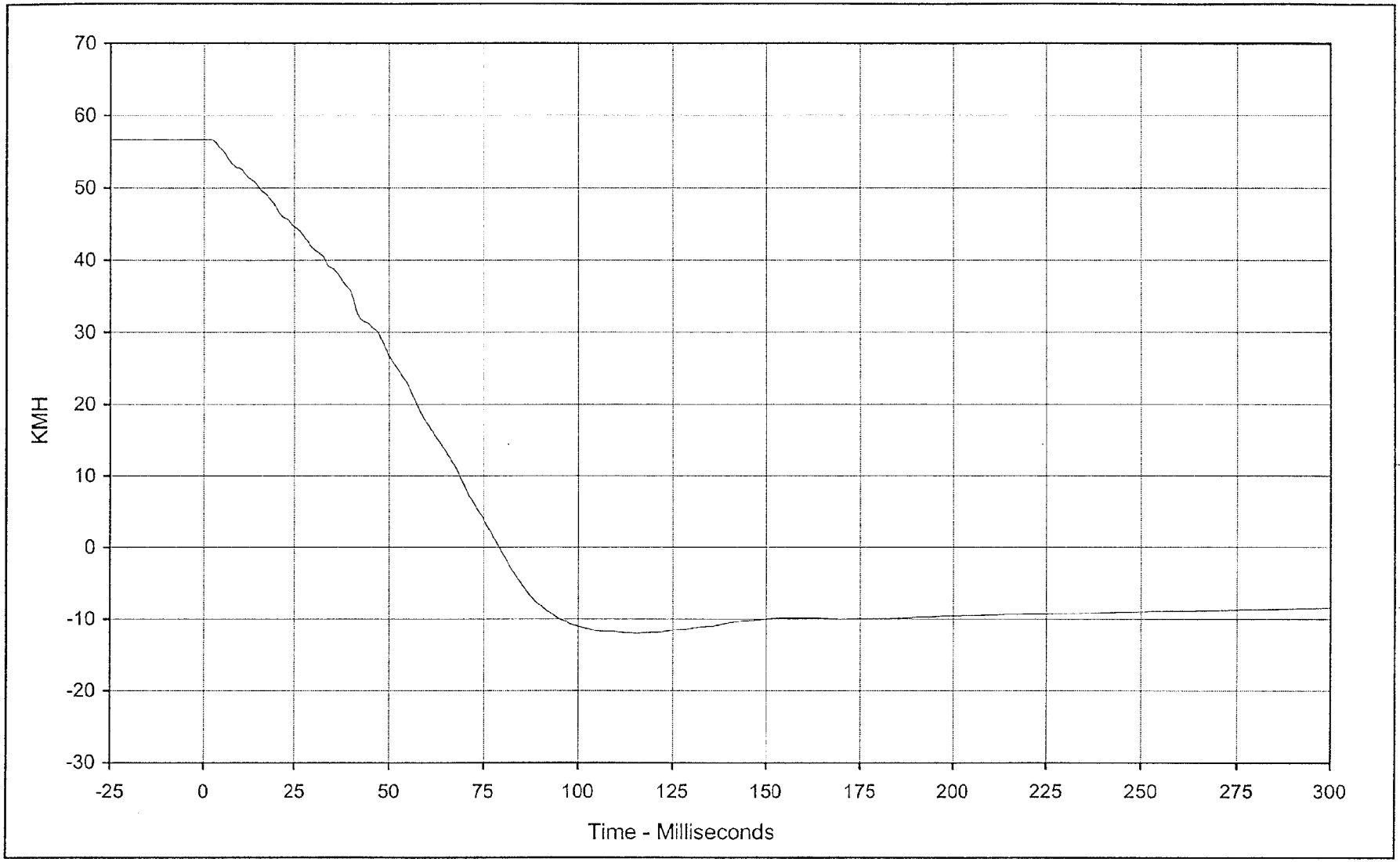
Date of Test: 11/21/97

Curve Number: FIL-090

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description: Vehicle Right Rear Primary Velocity X

Maximum Value: 56.7 at 1.1 Milliseconds

Minimum Value: -12.0 at 115.5 Milliseconds

SAE Filter Class: 180

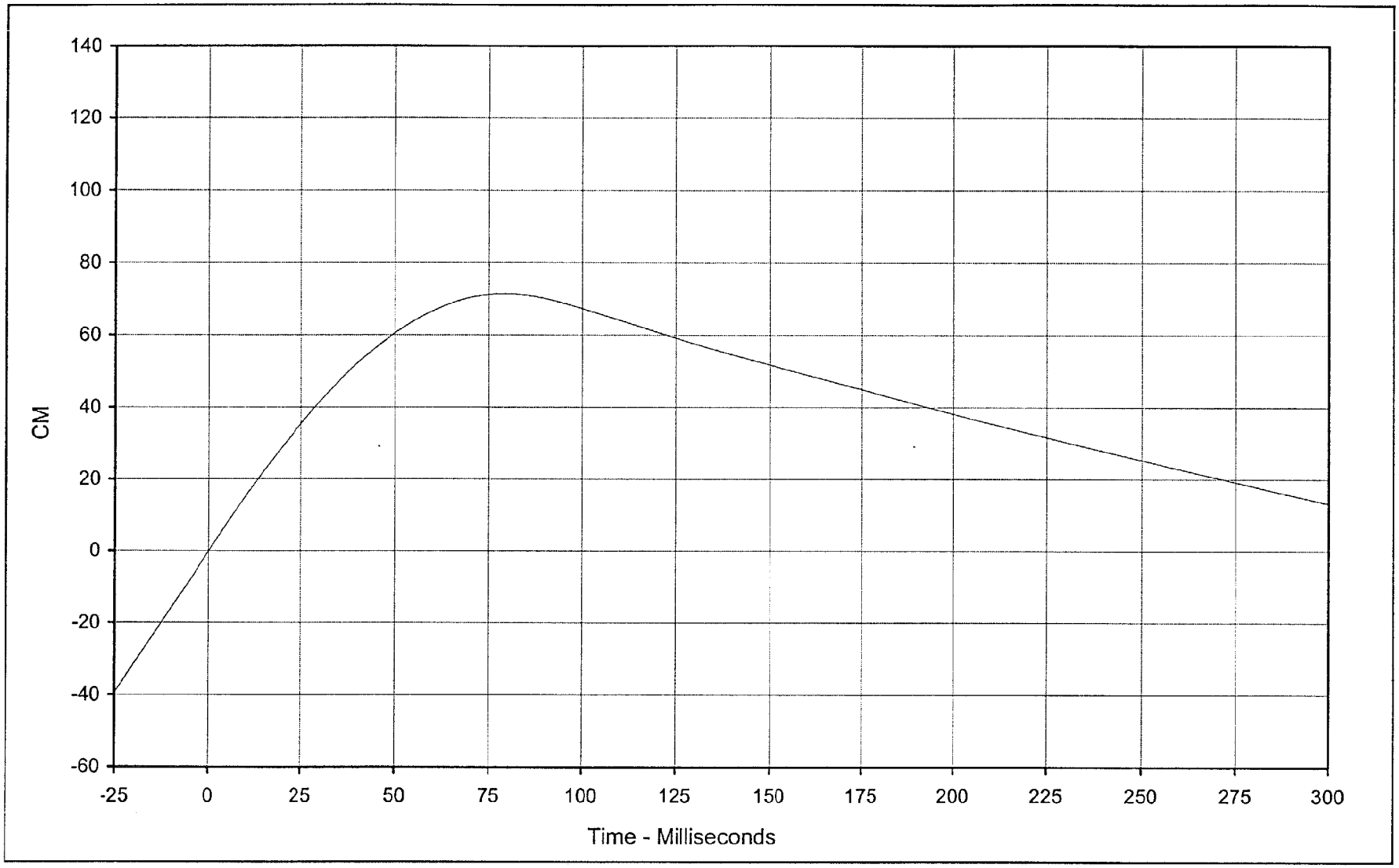
Date of Test: 11/21/97

Curve Number: IN1-090

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

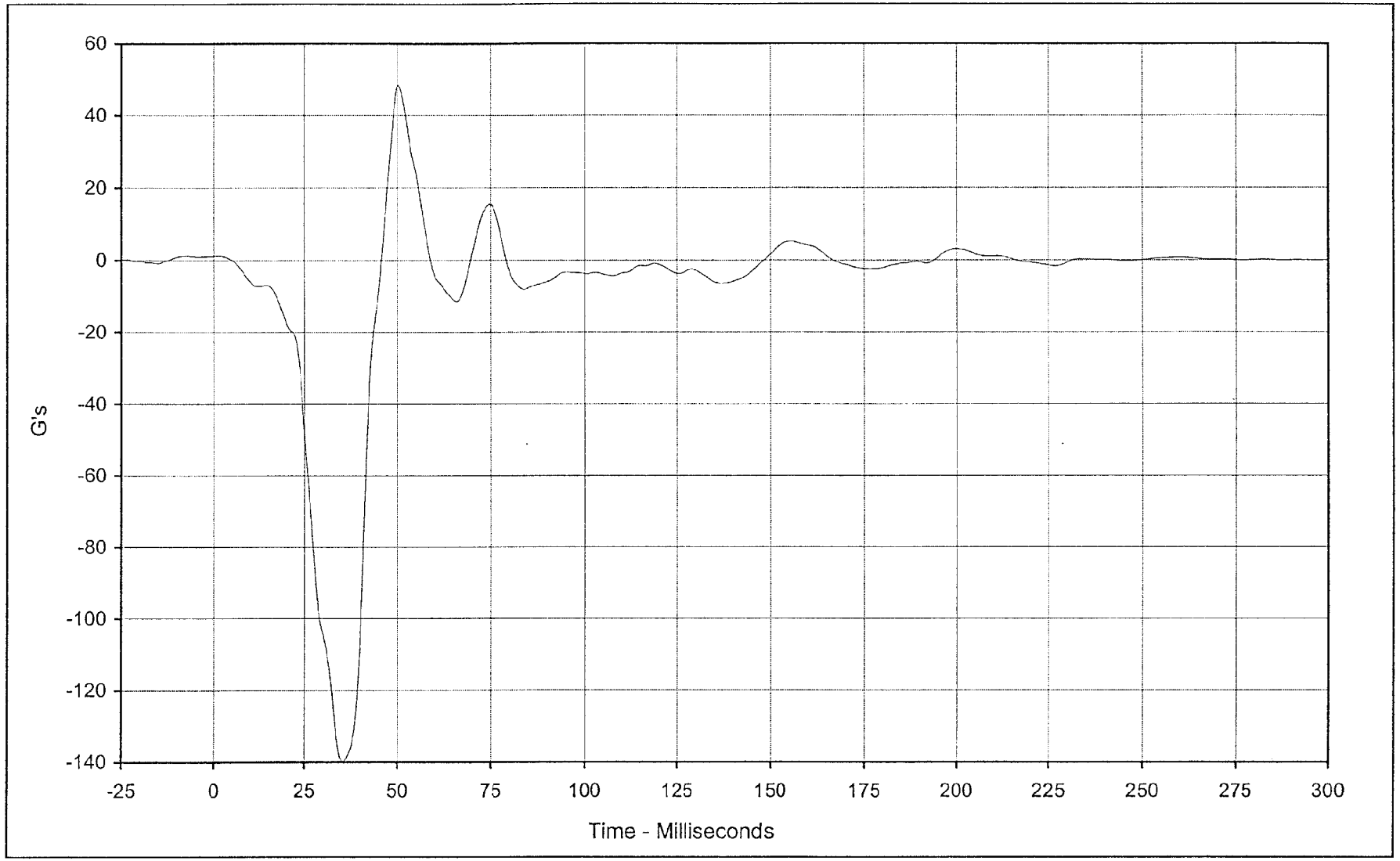
KARCO Engineering



Curve Description:	Vehicle Right Rear Primary Displ.			
Maximum Value:	71.4	at	79.2	Milliseconds
Minimum Value:	-0.1	at	0.0	Milliseconds
SAE Filter Class:	180			
Date of Test:	11/21/97			
Curve Number:	IN2-090			

Testing Program	1998 NHTSA 35 mph NCAP No.: MW0106
Test Vehicle:	1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description: Vehicle Engine Top X

Maximum Value: 48.4 at 50.3 Milliseconds

Minimum Value: -139.9 at 35.2 Milliseconds

SAE Filter Class: 60

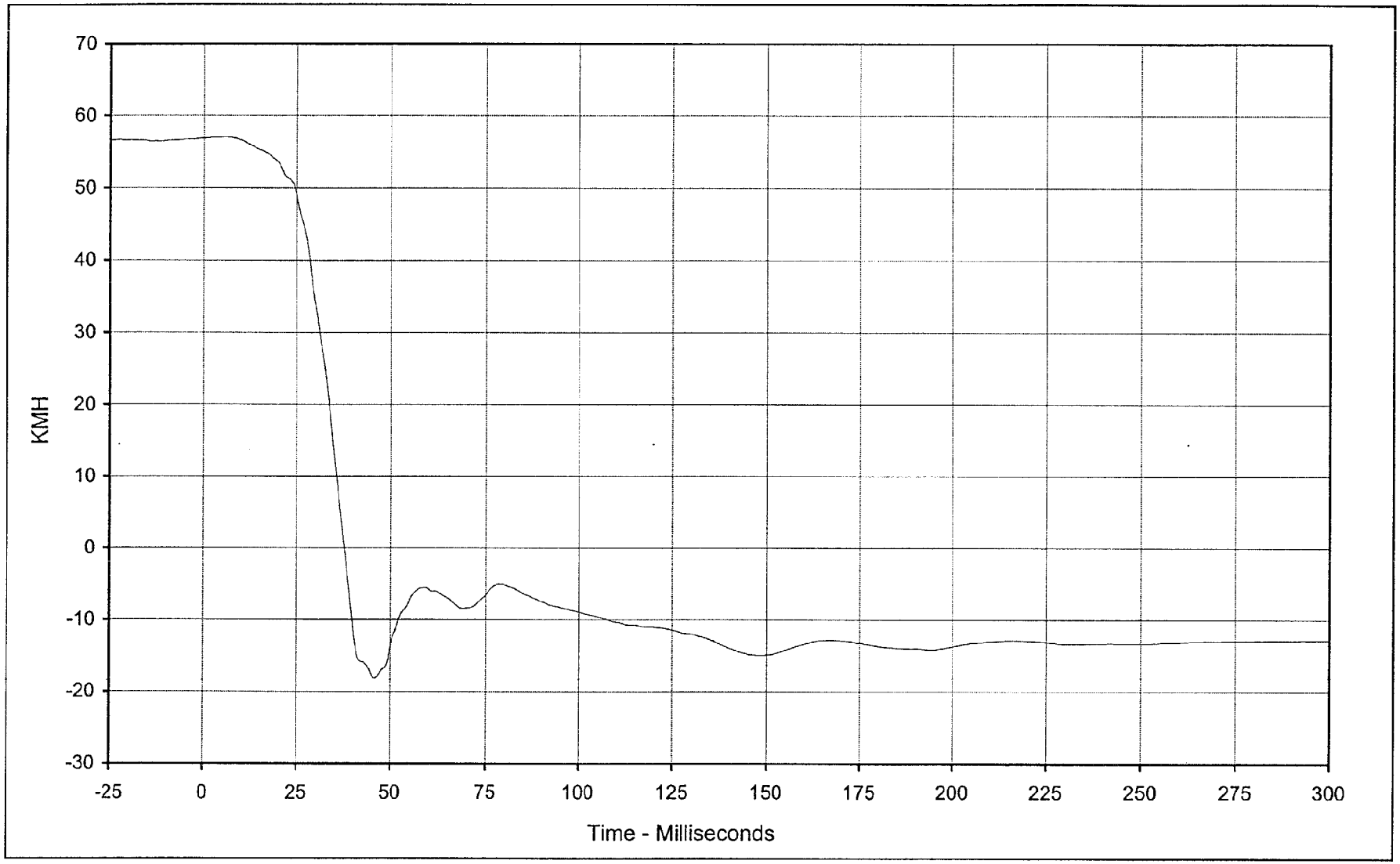
Date of Test: 11/21/97

Curve Number: FIL-091

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description: Vehicle Engine Top Velocity X

Maximum Value: 57.0 at 5.7 Milliseconds

Minimum Value: -18.2 at 45.8 Milliseconds

SAE Filter Class: 180

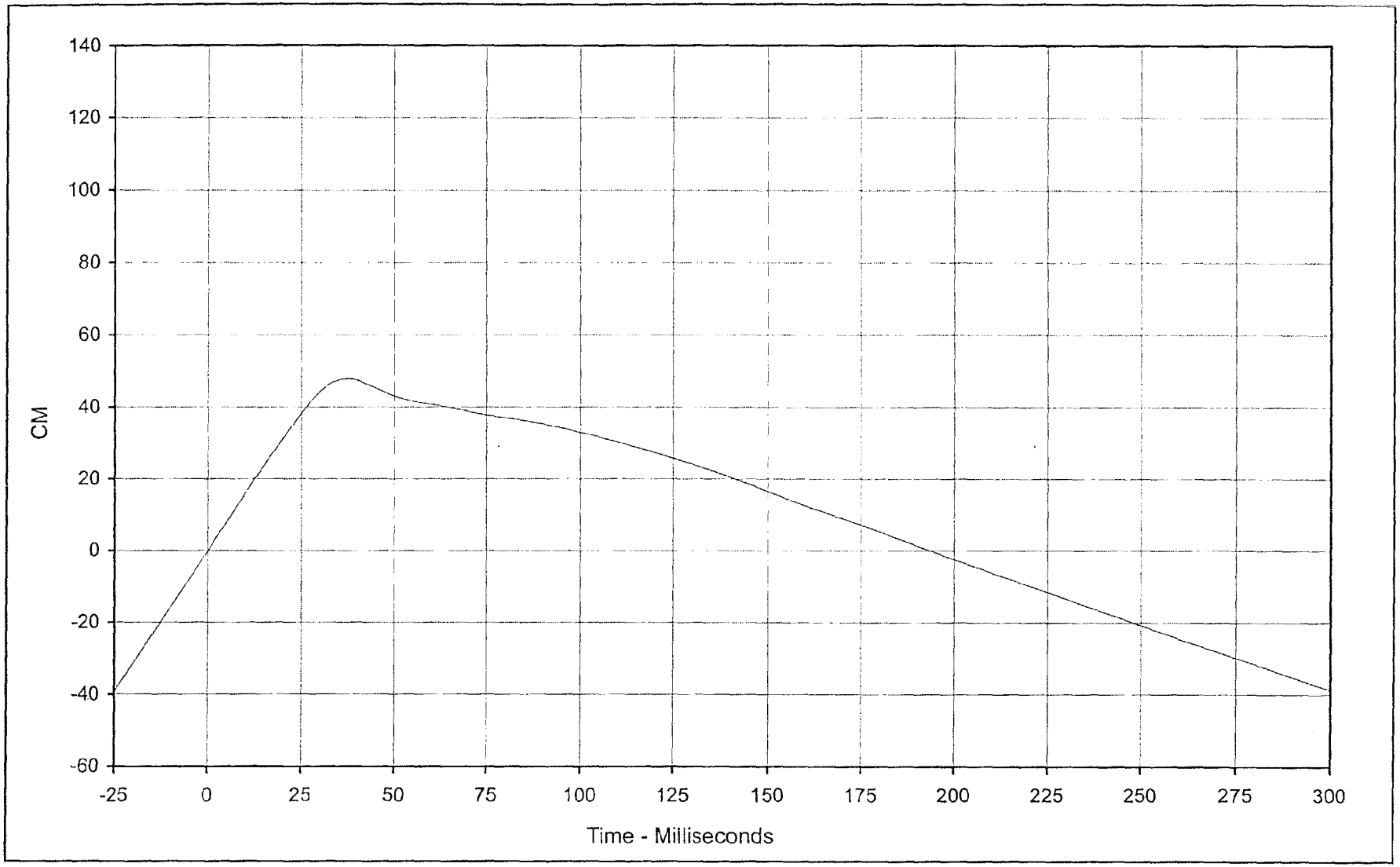
Date of Test: 11/21/97

Curve Number: IN1-091

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering

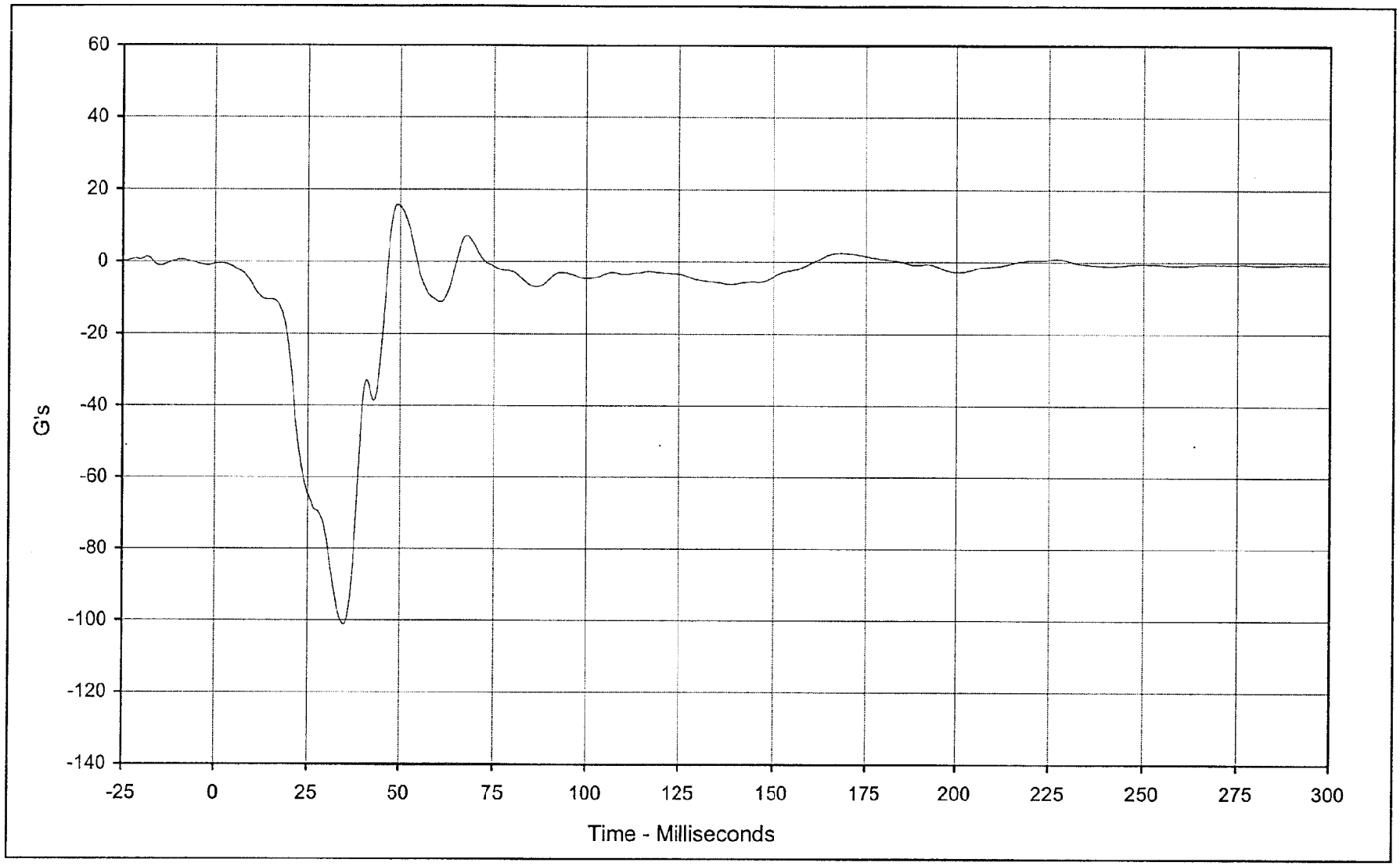


Curve Description:	Vehicle Engine Top Displ.				
Maximum Value:	47.8	at	37.7	Milliseconds	
Minimum Value:	-38.7	at	299.9	Milliseconds	
SAE Filter Class:	180				
Date of Test:	11/21/97				
Curve Number:	IN2-091				

Testing Program: 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description: Vehicle Engine Bottom X

Maximum Value: 15.7 at 49.4 Milliseconds

Minimum Value: -101.1 at 34.8 Milliseconds

SAE Filter Class: 60

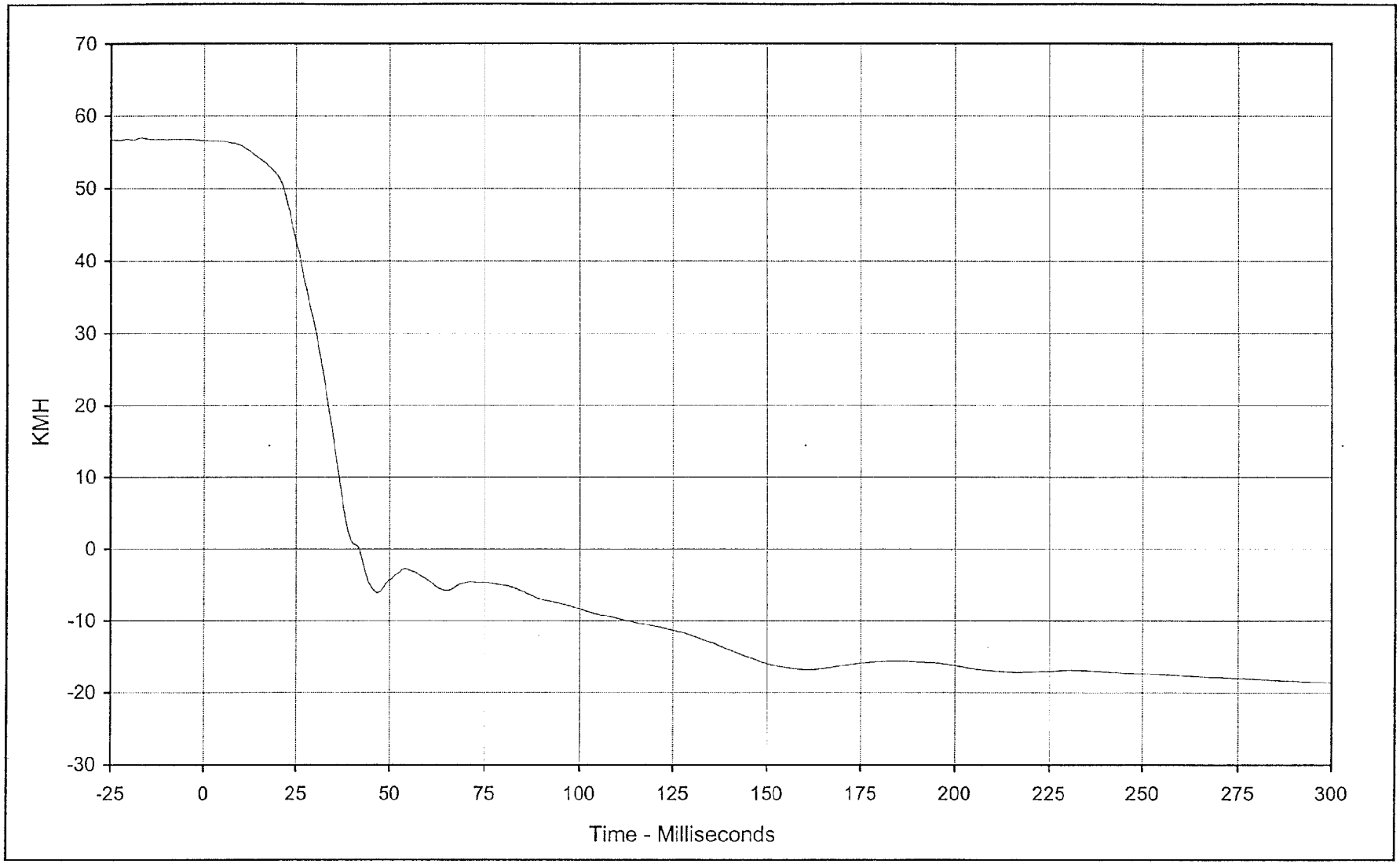
Date of Test: 11/21/97

Curve Number: FIL-092

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

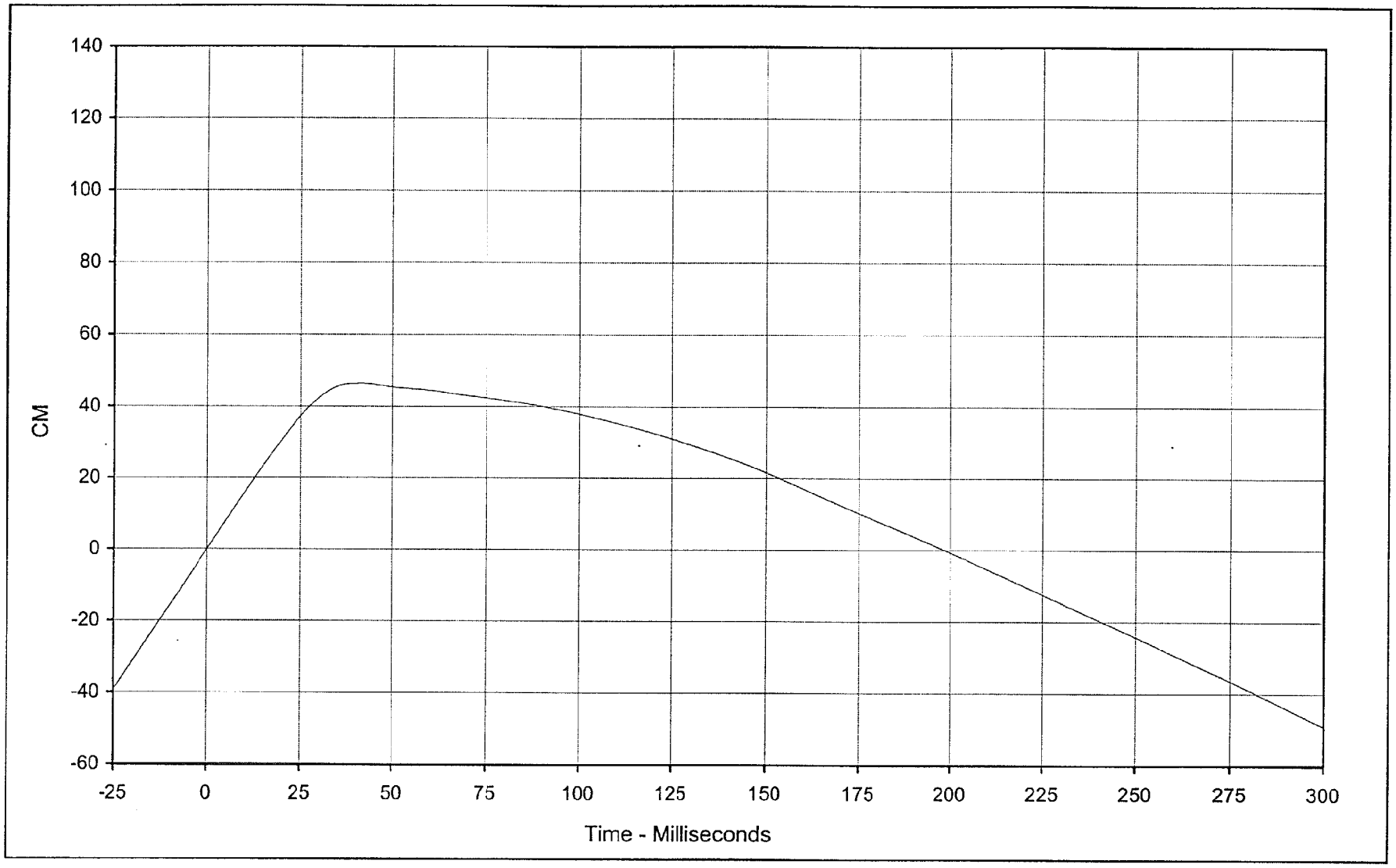
Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description:	Vehicle Engine Bottom Velocity X			Testing Program	1998 NHTSA 35 mph NCAP No.: MW0106
Maximum Value:	56.6	at	0.4 Milliseconds	Test Vehicle:	1998 Chevrolet Malibu 4 Door Sedan
Minimum Value:	-18.6	at	299.9 Milliseconds		
SAE Filter Class:	180				
Date of Test:	11/21/97				
Curve Number:	IN1-092				

KARC Engineering

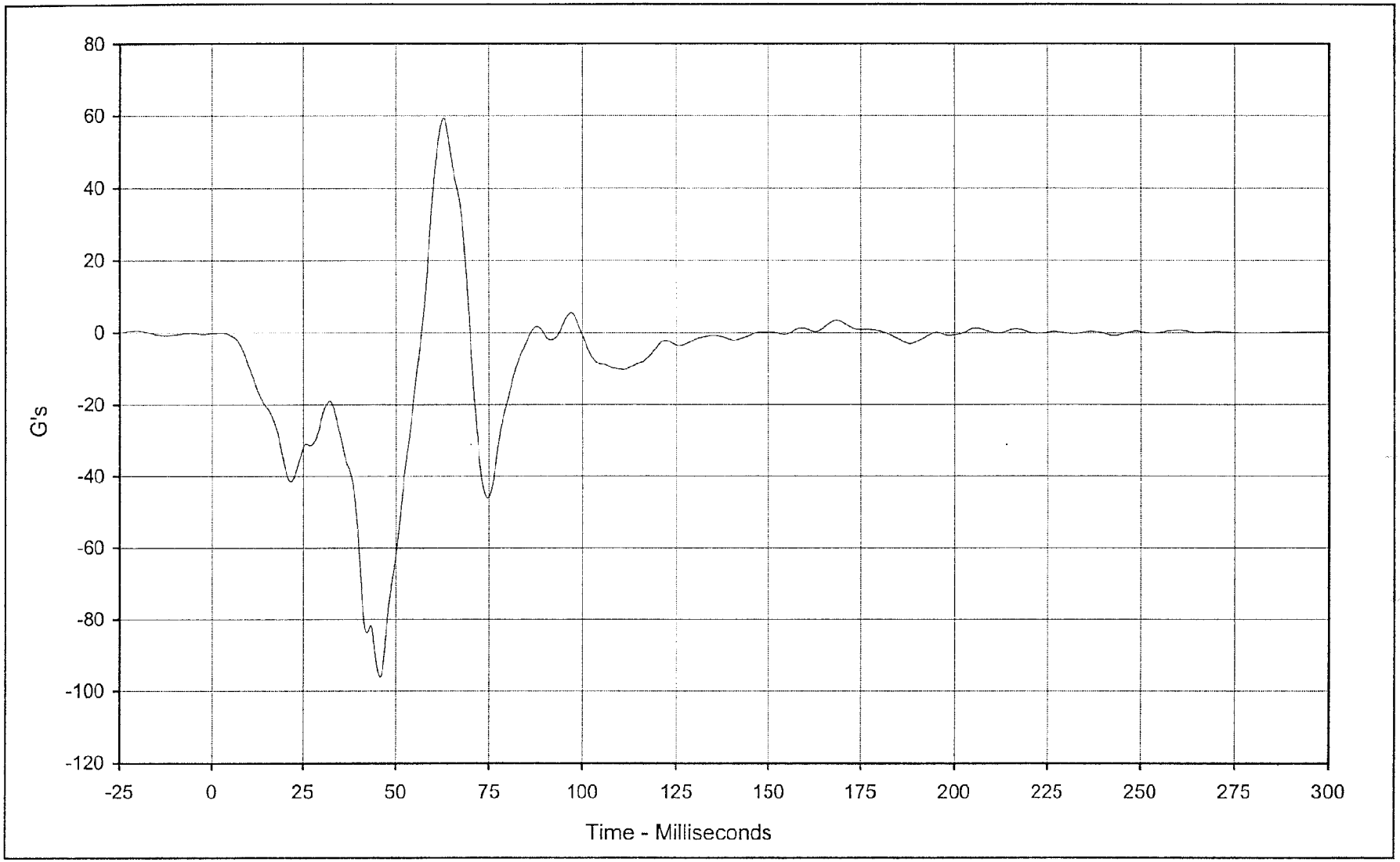


Curve Description:	Vehicle Engine Bottom Displ.			
Maximum Value:	46.4	at	41.6	Milliseconds
Minimum Value:	-49.1	at	299.9	Milliseconds
SAE Filter Class:	180			
Date of Test:	11/21/97			
Curve Number:	IN2-092			

Testing Program: 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering

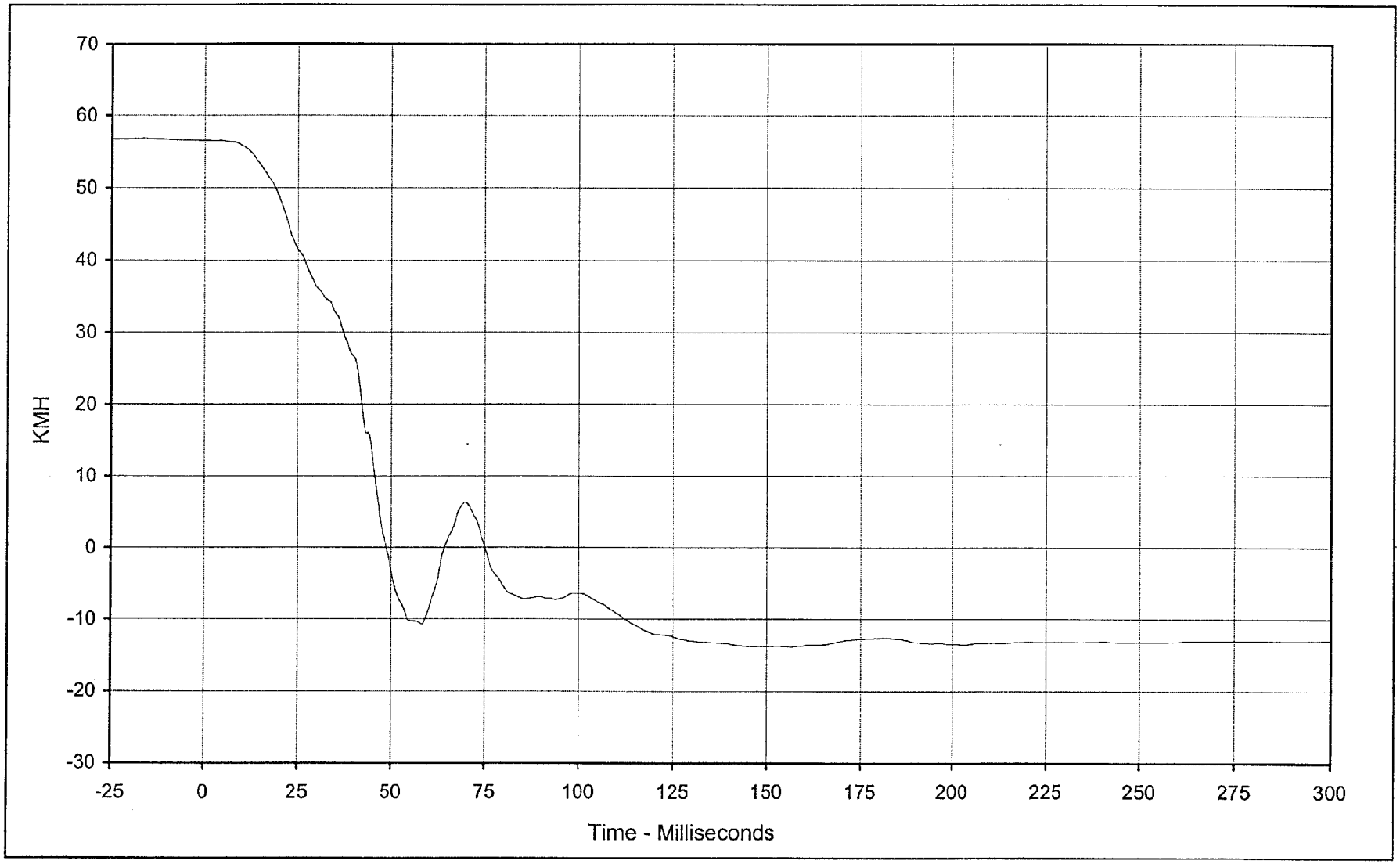


Curve Description:	Vehicle Left Brake Caliper X			
Maximum Value:	59.3	at	62.7	Milliseconds
Minimum Value:	-96.1	at	45.7	Milliseconds
SAE Filter Class:	60			
Date of Test:	11/21/97			
Curve Number:	FIL-093			

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description: Vehicle Left Brake Caliper Velocity X

Maximum Value: 56.6 at 0.0 Milliseconds

Minimum Value: -13.8 at 156.4 Milliseconds

SAE Filter Class: 180

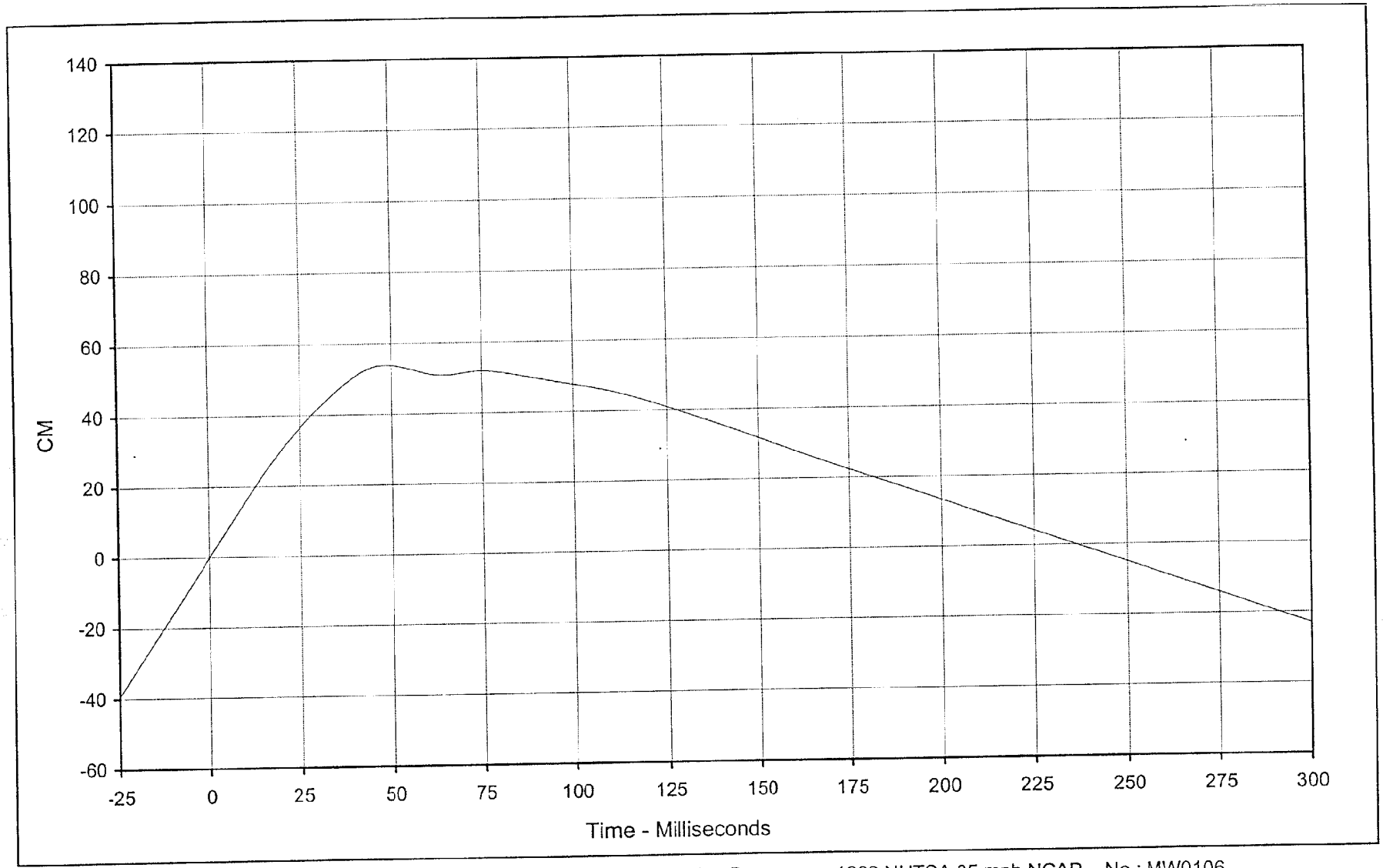
Date of Test: 11/21/97

Curve Number: IN1-093

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description: Vehicle Left Brake Caliper Displ.

Maximum Value: 53.8 at 48.7 Milliseconds

Minimum Value: -23.0 at 299.9 Milliseconds

SAE Filter Class: 180

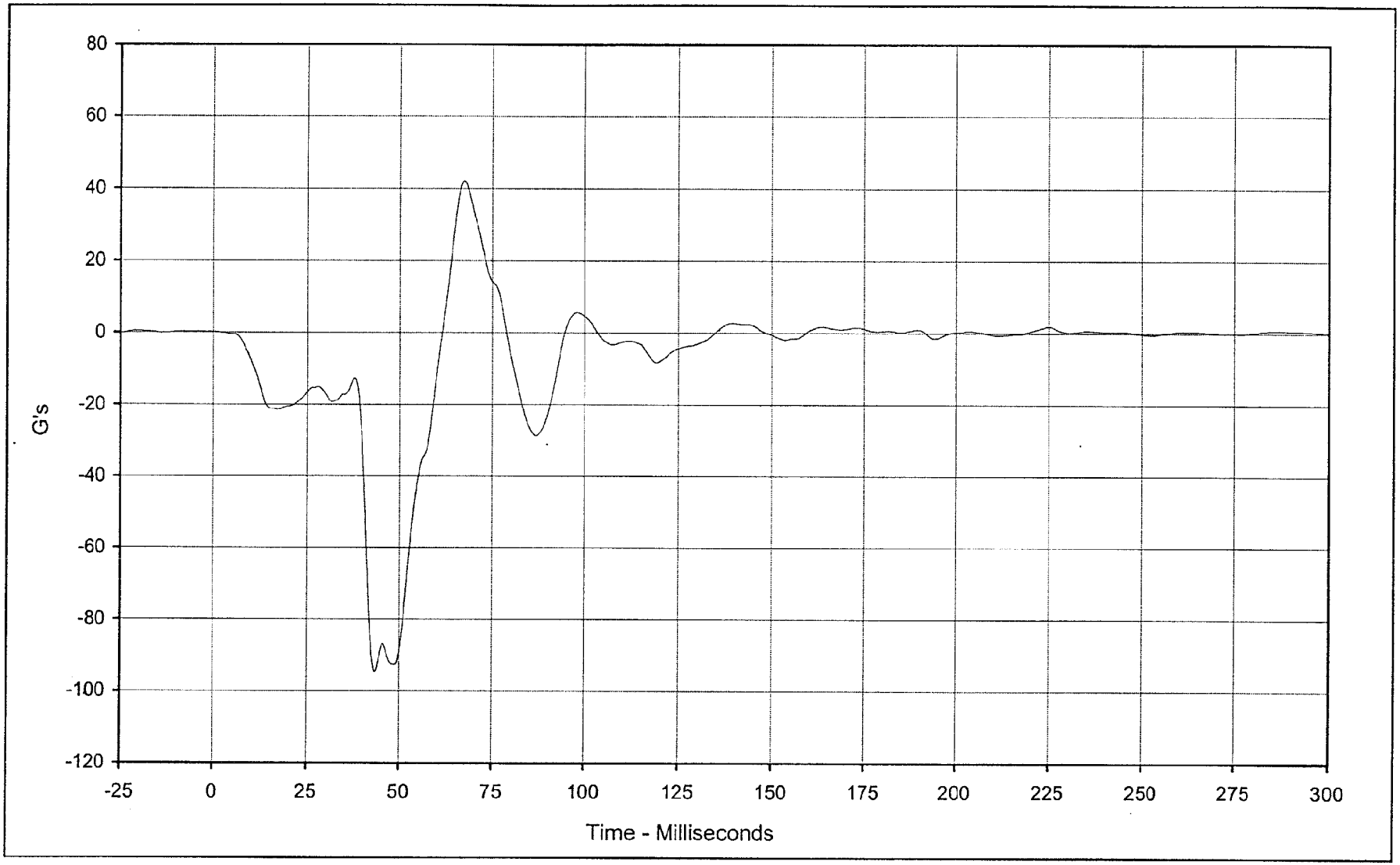
Date of Test: 11/21/97

Curve Number: IN2-093

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description: Vehicle Right Brake Caliper X

Maximum Value: 42.0 at 67.3 Milliseconds

Minimum Value: -94.6 at 43.4 Milliseconds

SAE Filter Class: 60

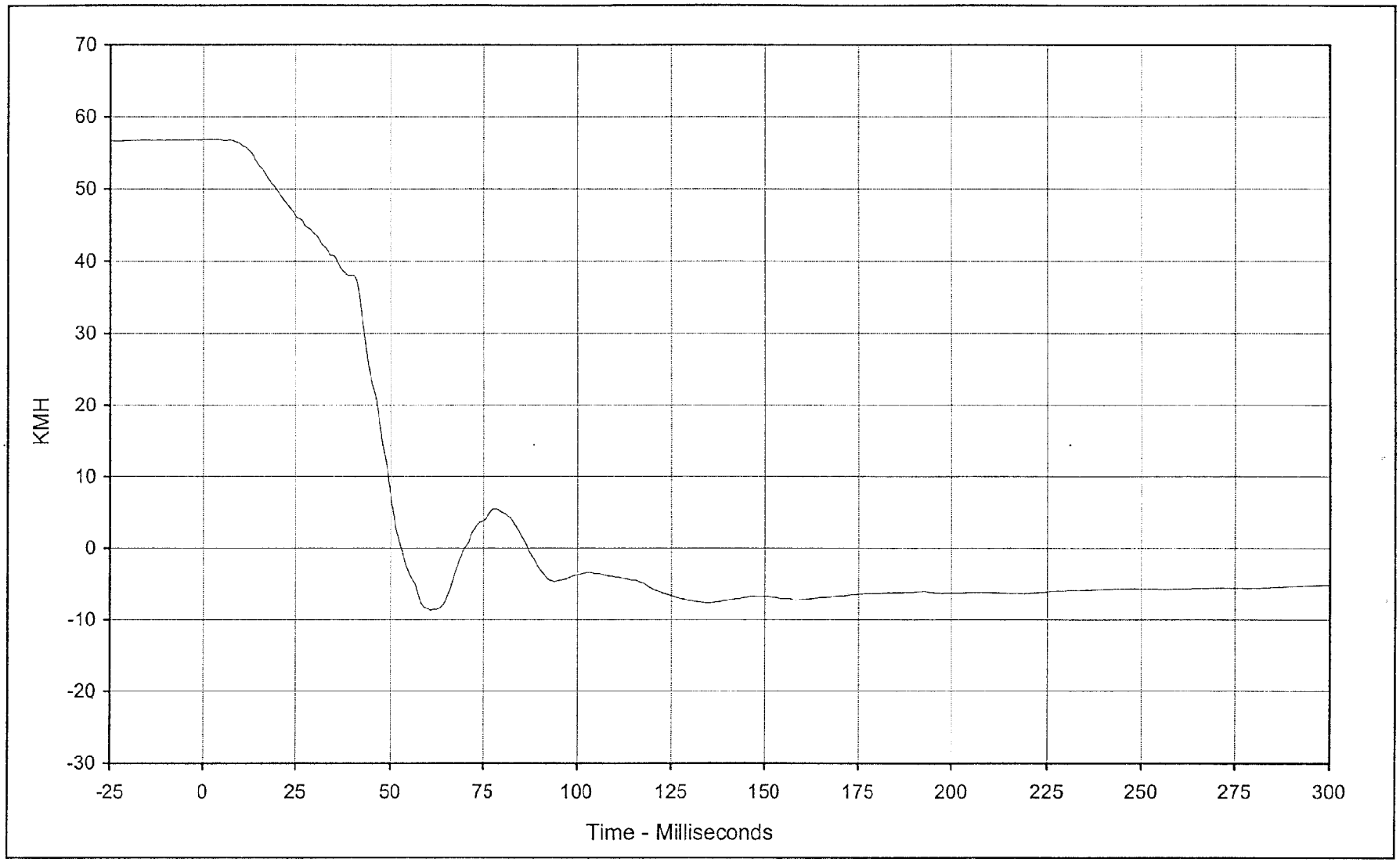
Date of Test: 11/21/97

Curve Number: FIL-094

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

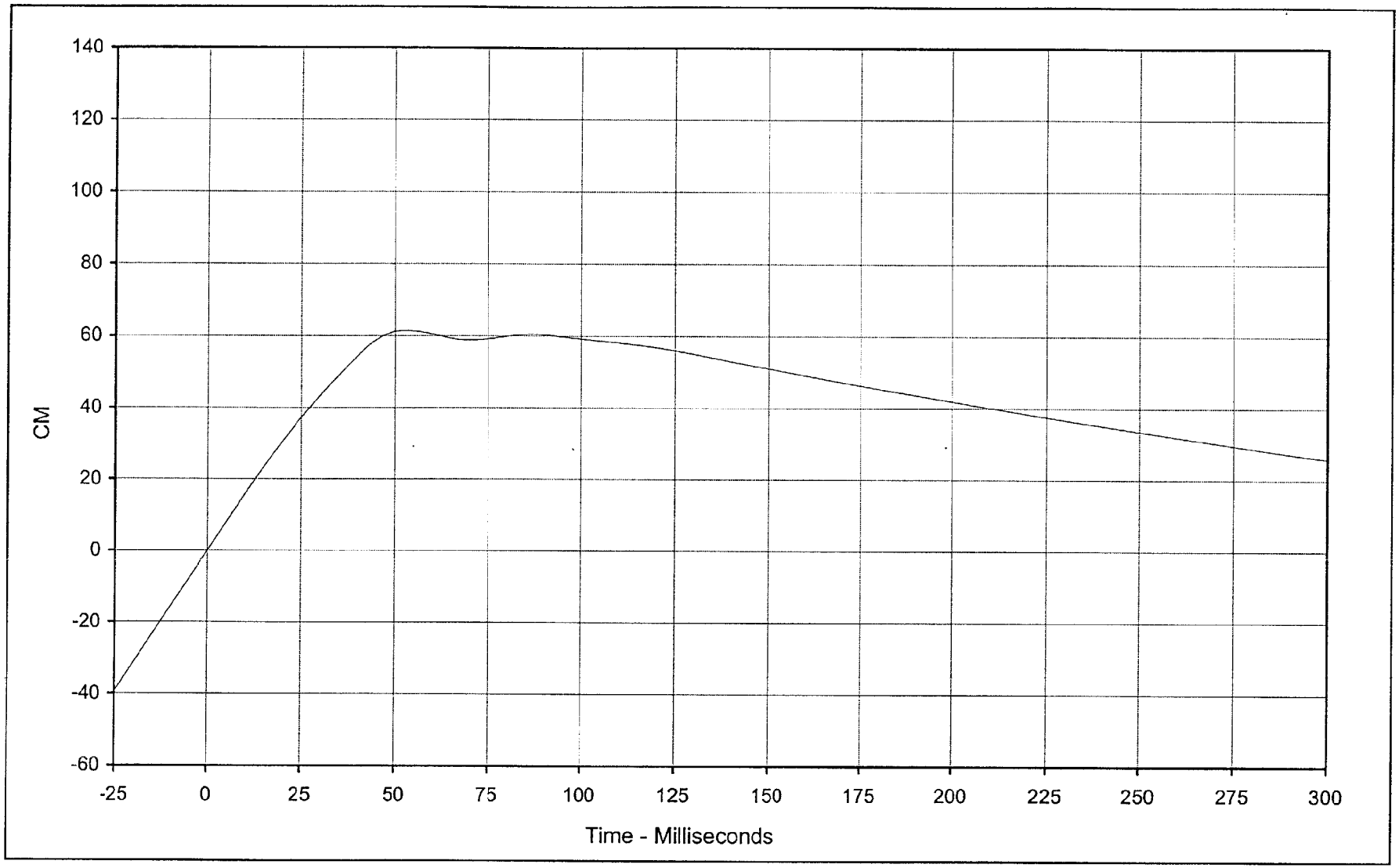
Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description:	Vehicle Right Brake Caliper Velocity X			Testing Program	1998 NHTSA 35 mph NCAP No.: MW0106
Maximum Value:	56.8	at	2.6 Milliseconds	Test Vehicle:	1998 Chevrolet Malibu 4 Door Sedan
Minimum Value:	-8.7	at	60.8 Milliseconds		
SAE Filter Class:	180				
Date of Test:	11/21/97				
Curve Number:	IN1-094				

KARCO Engineering

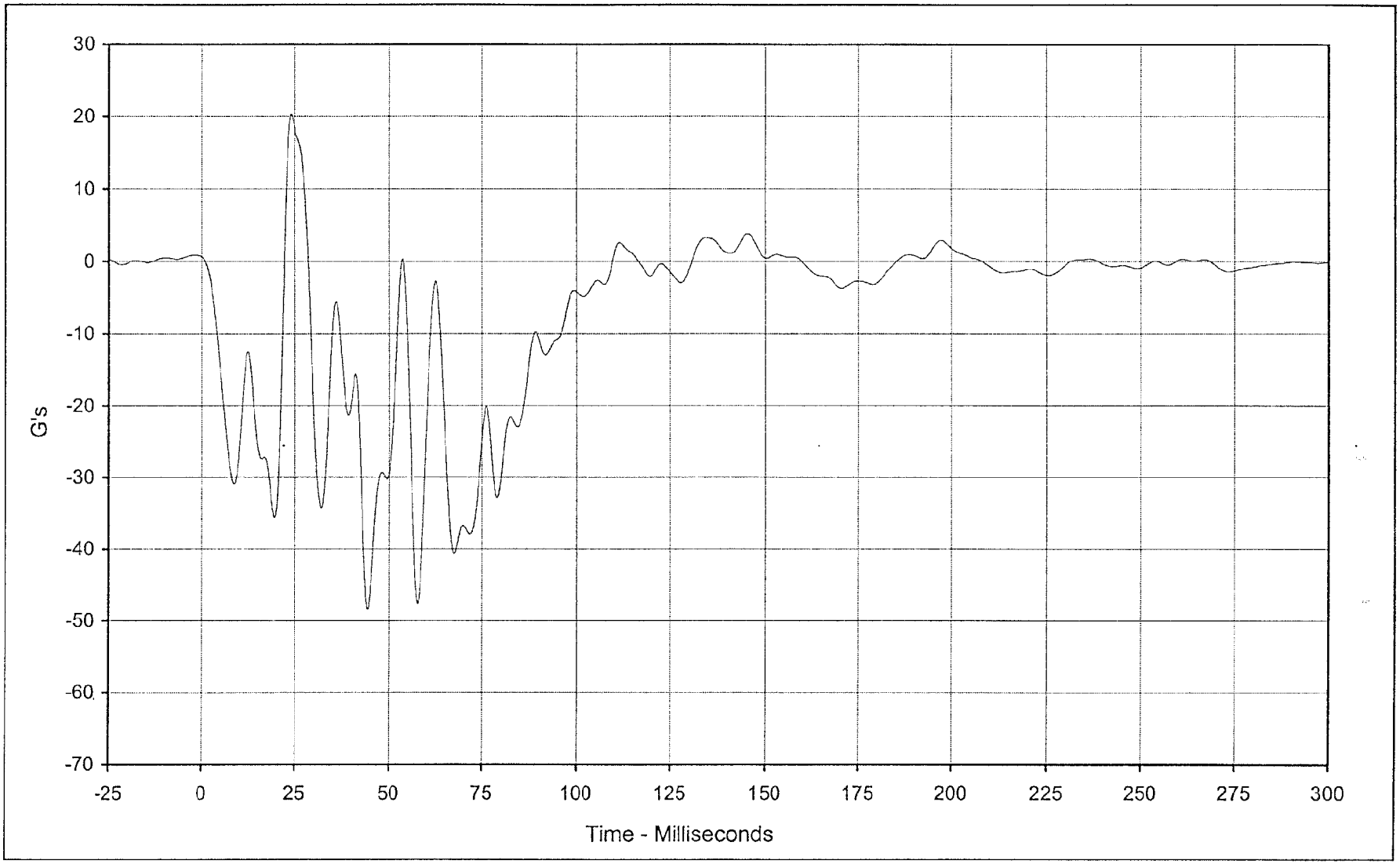


Curve Description:	Vehicle Right Brake Caliper Displ.			
Maximum Value:	61.5	at	52.9	Milliseconds
Minimum Value:	0.0	at	0.0	Milliseconds
SAE Filter Class:	180			
Date of Test:	11/21/97			
Curve Number:	IN2-094			

Testing Program: 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering

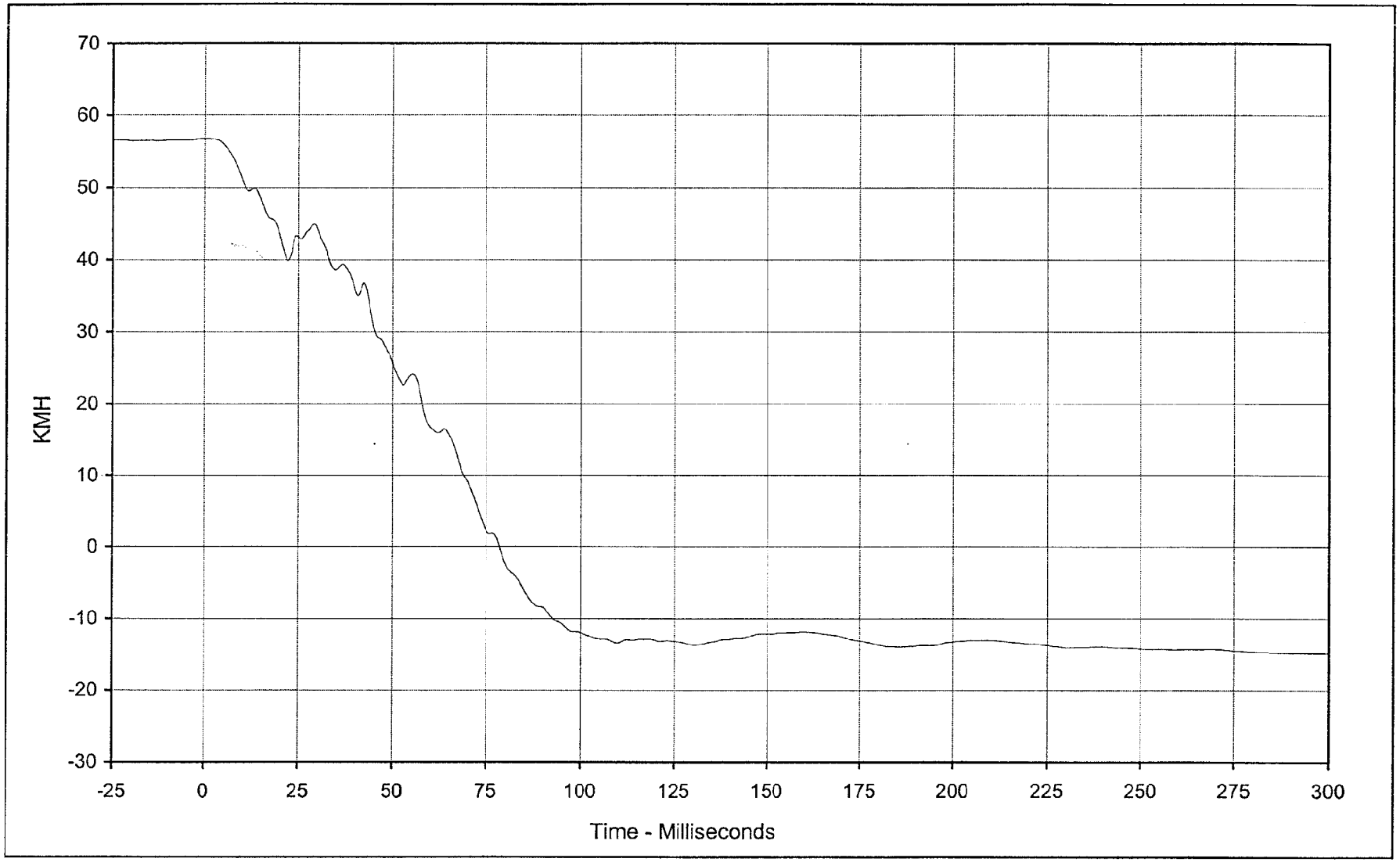


Curve Description:	Vehicle Instrument Panel X			
Maximum Value:	20.3	at	24.1	Milliseconds
Minimum Value:	-48.4	at	44.4	Milliseconds
SAE Filter Class:	60			
Date of Test:	11/21/97			
Curve Number:	FIL-095			

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

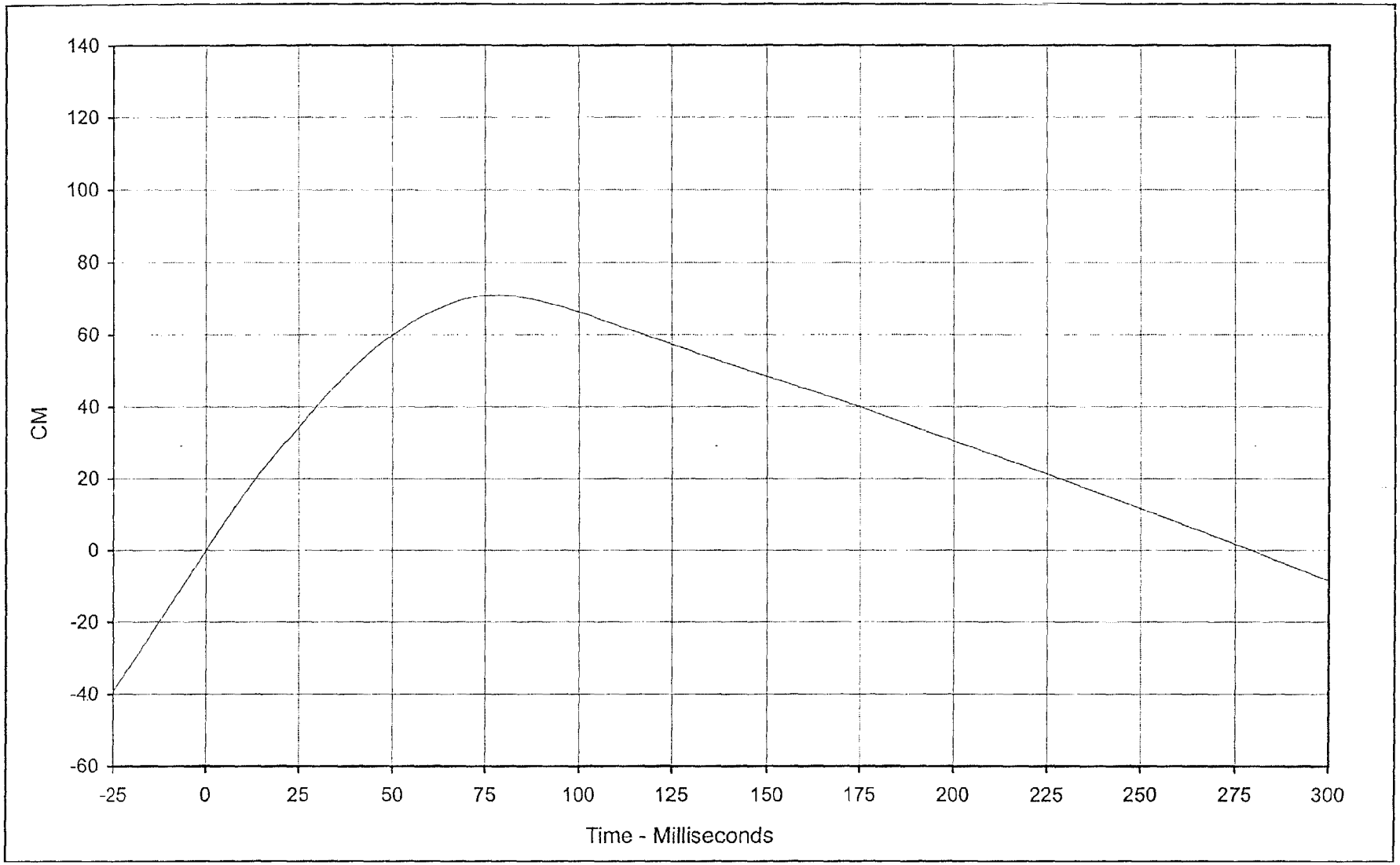
Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



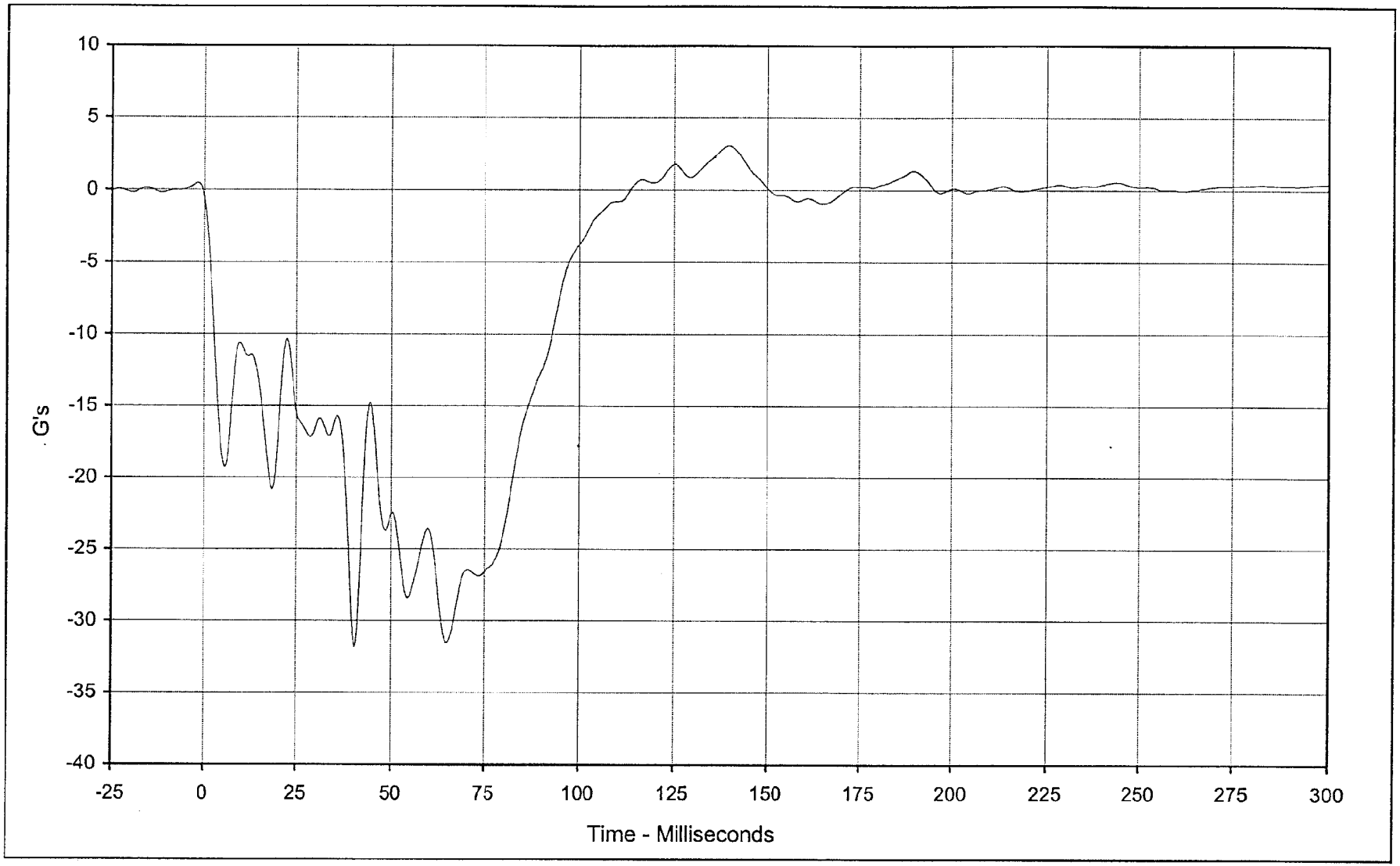
Curve Description:	Vehicle Instrument Panel Velocity X			Testing Program	1998 NHTSA 35 mph NCAP No.: MW0106
Maximum Value:	56.7	at	0.1 Milliseconds	Test Vehicle:	1998 Chevrolet Malibu 4 Door Sedan
Minimum Value:	-14.8	at	299.9 Milliseconds		
SAE Filter Class:	180				
Date of Test:	11/21/97				
Curve Number:	IN1-095				

KARC Engineering



Curve Description:	Vehicle Instrument Panel Displ.			Testing Program	1998 NHTSA 35 mph NCAP No.: MW0106
Maximum Value:	71.0	at	78.6 Milliseconds	Test Vehicle:	1998 Chevrolet Malibu 4 Door Sedan
Minimum Value:	-8.5	at	299.9 Milliseconds		
SAE Filter Class:	180				
Date of Test:	11/21/97				
Curve Number:	IN2-095				

KARCO Engineering



Curve Description: Vehicle Left Rear Redundant X

Maximum Value: 3.0 at 139.8 Milliseconds

Minimum Value: -31.8 at 40.2 Milliseconds

SAE Filter Class: 60

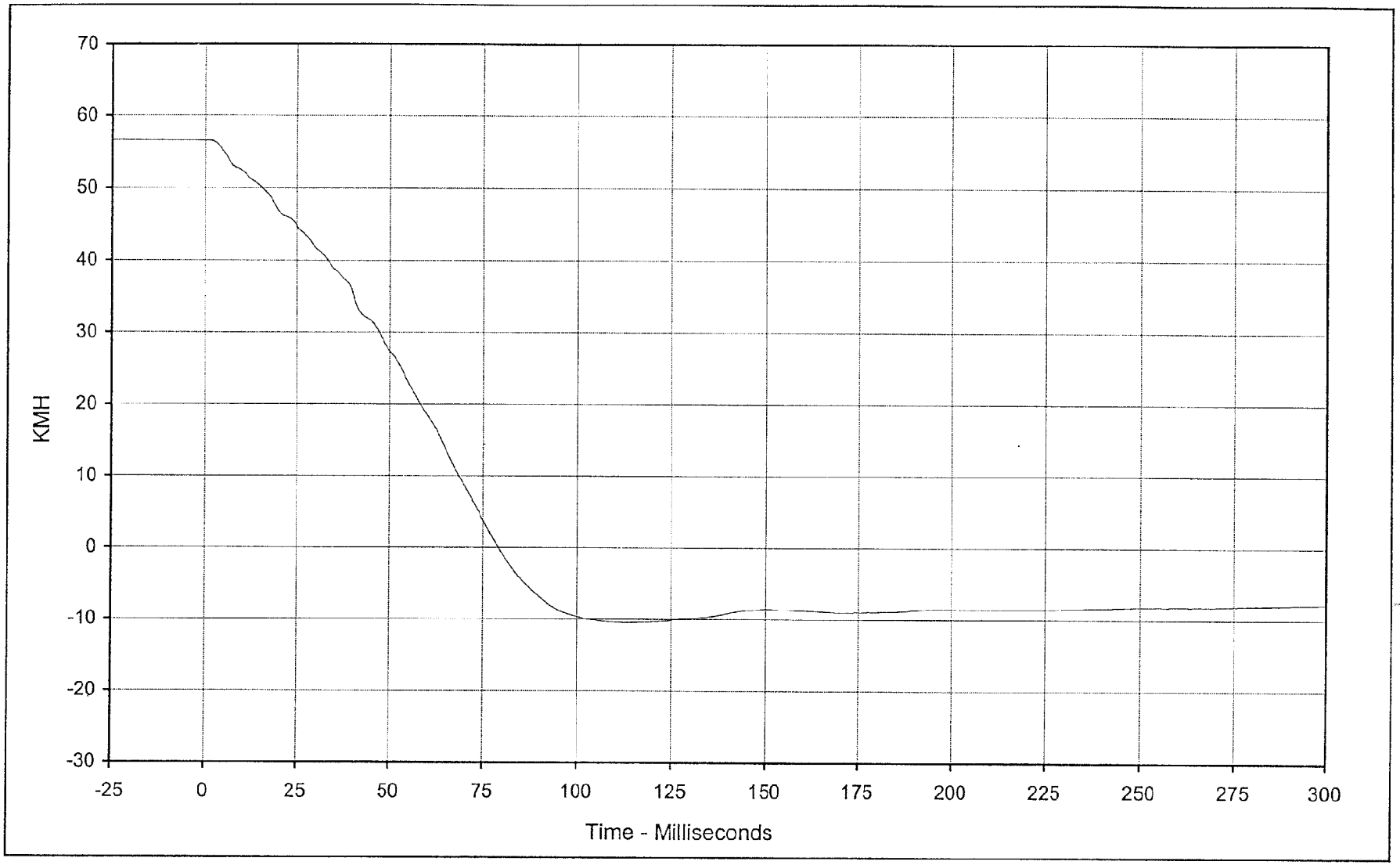
Date of Test: 11/21/97

Curve Number: FIL-096

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description: Vehicle Left Rear Redundant Velocity X

Maximum Value: 56.6 at 1.0 Milliseconds

Minimum Value: -10.4 at 113.0 Milliseconds

SAE Filter Class: 180

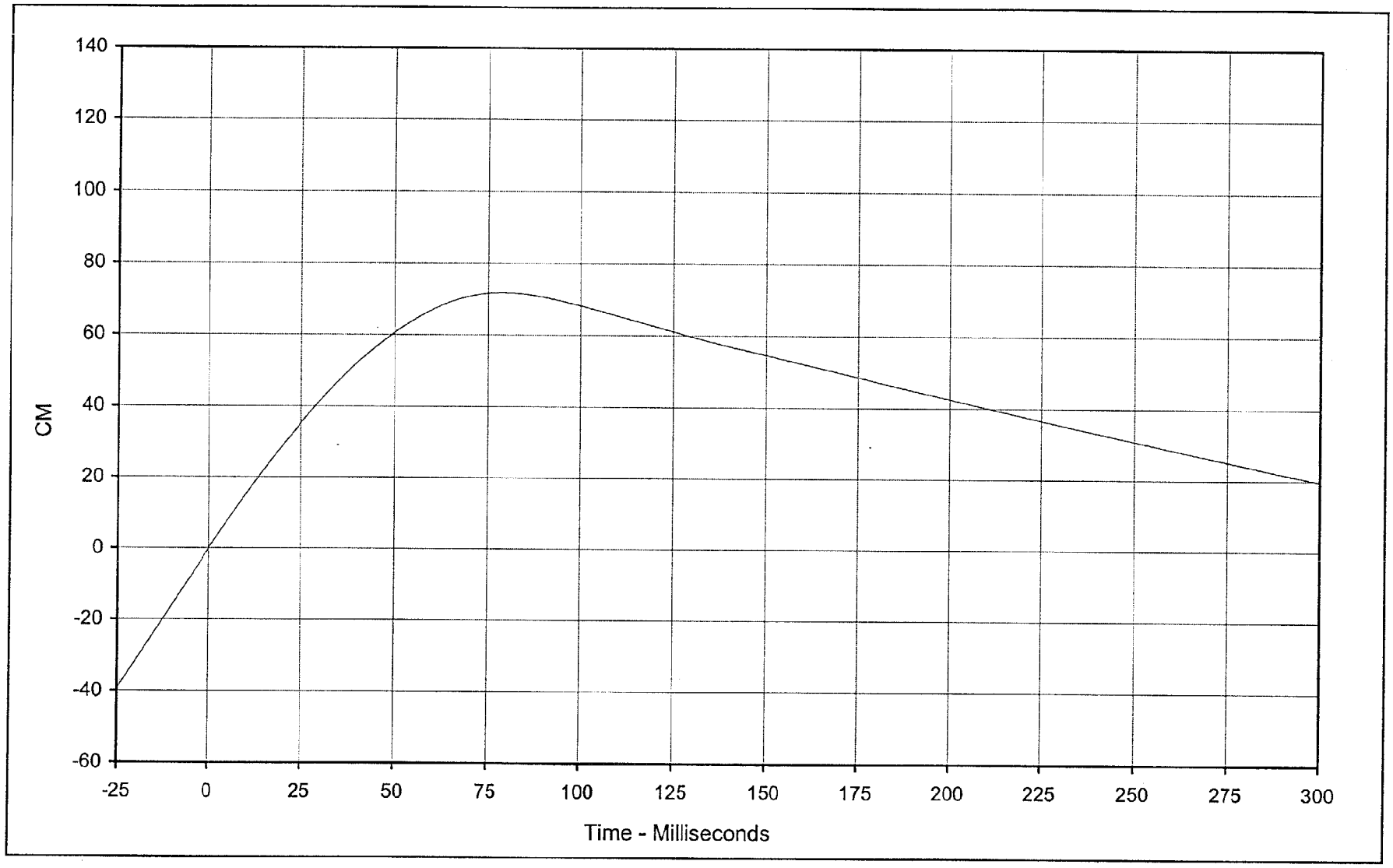
Date of Test: 11/21/97

Curve Number: IN1-096

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering



Curve Description: Vehicle Left Rear Redundant Displ.

Maximum Value: 71.8 at 79.1 Milliseconds

Minimum Value: -0.1 at 0.0 Milliseconds

SAE Filter Class: 180

Date of Test: 11/21/97

Curve Number: IN2-096

Testing Program 1998 NHTSA 35 mph NCAP No.: MW0106

Test Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

KARCO Engineering

APPENDIX C

LOAD CELL BARRIER INFORMATION (NOT APPLICABLE FOR THIS TEST)

APPENDIX D

INSTRUMENTATION DATA CHANNEL ASSIGNMENTS

Ncap Test With Hybrid III Male 50th Pecentile ATD
Instrumentation Data Channel Assignments
Driver A.T.D Serial Number 34
Test Date: 11/21/97
Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

CH.	LOCATION	AXIS	IDENT. NO.	DESCRIPTION	MFR	MODEL	UNITS
1	HEAD, PRIMARY	X	KEAC039	Accel.,1/2 bridge	Endevco	7264-2000	G
2	HEAD, PRIMARY	Y	KEAC038	Accel.,1/2 bridge	Endevco	7264-2000	G
3	HEAD, PRIMARY	Z	KEAC027	Accel.,1/2 bridge	Endevco	7264-2000	G
4	HEAD, REDUNDANT	X	KEAC031	Accel.,1/2 bridge	Endevco	7264-2000	G
5	HEAD, REDUNDANT	Y	KEAC032	Accel.,1/2 bridge	Endevco	7264-2000	G
6	HEAD, REDUNDANT	Z	KEAC026	Accel.,1/2 bridge	Endevco	7264-2000	G
7	NECK FORCE	X	GPUN02FX	Load cell, six axis neck	R. A. Denton	1716A	N
8	NECK FORCE	Y	GPUN02FY	Load cell, six axis neck	R. A. Denton	1716A	N
9	NECK FORCE	Z	GPUN02FZ	Load cell, six axis neck	R. A. Denton	1716A	N
10	NECK MOMENT	X	GPUN02MX	Load cell, six axis neck	R. A. Denton	1716A	N.m
11	NECK MOMENT	Y	GPUN02MY	Load cell, six axis neck	R. A. Denton	1716A	N.m
12	NECK MOMENT	Z	GPUN02MZ	Load cell, six axis neck	R. A. Denton	1716A	N.m
13	CHEST , PRIMARY	X	GPAC031	Accel., 1/2 bridge	Endevco	7264-2000	G
14	CHEST , PRIMARY	Y	GPAC024	Accel., 1/2 bridge	Endevco	7264-2000	G
15	CHEST , PRIMARY	Z	GPAC029	Accel., 1/2 bridge	Endevco	7264-2000	G
16	CHEST , REDUNDANT	X	KEAC023	Accel.,1/2 bridge	Endevco	7264-200	G
17	CHEST , REDUNDANT	Y	KEAC022	Accel.,1/2 bridge	Endevco	7264-200	G
18	CHEST , REDUNDANT	Z	KEAC024	Accel.,1/2 bridge	Endevco	7264-200	G
19	CHEST DISPLACEMENT	X	GPRP002	Potentiometer, Rotary	Servo	14CBI	MM
20	PELVIS, PRIMARY	X	GPAC009	Accel., 1/2 bridge	Endevco	7264-2000	G
21	PELVIS, PRIMARY	Y	GPAC017	Accel., 1/2 bridge	Endevco	7264-2000	G
22	PELVIS, PRIMARY	Z	GPAC018	Accel., 1/2 bridge	Endevco	7264-2000	G
23	LEFT FEMUR FORCE	Z	KEFF003	Load cell, Femur	R.A. Denton	2121	N
24	RIGHT FEMUR FORCE	Z	KEFF002	Load cell, Femur	R.A. Denton	2121	N

Ncap Test With Hybrid III Male 50th Pecentile ATD
Instrumentation Data Channel Assignments
Driver A.T.D Serial Number 34
Test Date: 11/21/97
Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

CH.	LOCATION	AXIS	IDENT. NO.	DESCRIPTION	MFR	MODEL	UNITS
25	UP. TIBIA LEFT MOM.	X	GPUT03MX	2 ch., Upper tibia gage	R. A. Denton	1583	N.m
26	UP. TIBIA LEFT MOM.	Y	GPUT03MY	2 ch., Upper tibia gage	R. A. Denton	1583	N.m
27	UP. TIBIA RIGHT MOM.	X	GPUT04MX	2 ch., Upper tibia gage	R. A. Denton	1583	N.m
28	UP. TIBIA RIGHT MOM.	Y	GPUT04MY	2 ch., Upper tibia gage	R. A. Denton	1583	N.m
29	LWR. TIBIA LEFT FORCE	Y	GPLT03FY	3 ch., lower tibia gage	R. A. Denton	1584	N
30	LWR. TIBIA LEFT FORCE	Z	GPLT03FZ	3 ch., lower tibia gage	R. A. Denton	1584	N
31	LWR. TIBIA LEFT MOM.	X	GPLT03MX	3 ch., lower tibia gage	R. A. Denton	1584	N.m
32	LWR. TIBIA RIGHT FORCE	Y	GPLT04FY	3 ch., lower tibia gage	R. A. Denton	1584	N
33	LWR. TIBIA RIGHT FORCE	Z	GPLT04FZ	3 ch., lower tibia gage	R. A. Denton	1584	N
34	LWR. TIBIA RIGHT MOM.	X	GPLT04MX	3 ch., lower tibia gage	R. A. Denton	1584	N.m
35	FOOT LEFT	X	KEIC003X	Accel., Foot Triax	I.C. Sensor	3031-500	G
36	FOOT LEFT	Y	KEIC003Y	Accel., Foot Triax	I.C. Sensor	3031-500	G
37	FOOT LEFT	Z	KEIC003Z	Accel., Foot Triax	I.C. Sensor	3031-500	G
38	FOOT RIGHT	X	KEIC004X	Accel., Foot Triax	I.C. Sensor	3031-500	G
39	FOOT RIGHT	Y	KEIC004Y	Accel., Foot Triax	I.C. Sensor	3031-500	G
40	FOOT RIGHT	Z	KEIC004Z	Accel., Foot Triax	I.C. Sensor	3031-500	G
41	LAP BELT FORCE	X	KELC003	Load cell, Seat belt	Lebow	3371	N
42	SHOULDER BELT FORCE	X	KELC004	Load cell, Seat belt	Lebow	3371	N
43	SHOULDER BELT SPOOL	X	KEPP001	Pullout pot	Celesco	PTX101-0030	MM
44	SHOULDER BELT ELONG.	X	KEEP001	Linear pot., belt stretch	E.T.I.	LCP8-10 10K	MM/CM

Ncap Test With Hybrid III Male 50th Pecentile ATD
Instrumentation Data Channel Assignments
Passenger A.T.D Serial Number 35
Test Date: 11/21/97
Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

CH.	LOCATION	AXIS	IDENT. NO.	DESCRIPTION	MFR	MODEL	UNITS
45	HEAD, PRIMARY	X	GPAC027	Accel., 1/2 bridge	Endevco	7264-2000	G
46	HEAD, PRIMARY	Y	GPAC002	Accel., 1/2 bridge	Endevco	7264-2000	G
47	HEAD, PRIMARY	Z	GPAC003	Accel., 1/2 bridge	Endevco	7264-2000	G
48	HEAD, REDUNDANT	X	GPAC032	Accel., 1/2 bridge	Endevco	7264-2000	G
49	HEAD, REDUNDANT	Y	GPAC021	Accel., 1/2 bridge	Endevco	7264-2000	G
50	HEAD, REDUNDANT	Z	GPAC026	Accel., 1/2 bridge	Endevco	7264-2000	G
51	NECK FORCE	X	GPUN01FX	Load cell, six axis neck	R. A. Denton	1716A	N
52	NECK FORCE	Y	GPUN01FY	Load cell, six axis neck	R. A. Denton	1716A	N
53	NECK FORCE	Z	GPUN01FZ	Load cell, six axis neck	R. A. Denton	1716A	N
54	NECK MOMENT	X	GPUN01MX	Load cell, six axis neck	R. A. Denton	1716A	N.m
55	NECK MOMENT	Y	GPUN01MY	Load cell, six axis neck	R. A. Denton	1716A	N.m
56	NECK MOMENT	Z	GPUN01MZ	Load cell, six axis neck	R. A. Denton	1716A	N.m
57	CHEST , PRIMARY	X	GPAC005	Accel., 1/2 bridge	Endevco	7264-2000	G
58	CHEST , PRIMARY	Y	GPAC011	Accel., 1/2 bridge	Endevco	7264-2000	G
59	CHEST , PRIMARY	Z	GPAC010	Accel., 1/2 bridge	Endevco	7264-2000	G
60	CHEST , REDUNDANT	X	GPAC034	Accel., 1/2 bridge	Endevco	7264-2000	G
61	CHEST , REDUNDANT	Y	GPAC023	Accel., 1/2 bridge	Endevco	7264-2000	G
62	CHEST , REDUNDANT	Z	GPAC020	Accel., 1/2 bridge	Endevco	7264-2000	G
63	CHEST DISPLACEMENT	X	GPRP001	Potentiometer, Rotary	Servo	14CBI	MM
64	PELVIS, PRIMARY	X	GPAC025	Accel., 1/2 bridge	Endevco	7264-2000	G
65	PELVIS, PRIMARY	Y	GPAC022	Accel., 1/2 bridge	Endevco	7264-2000	G
66	PELVIS, PRIMARY	Z	GPAC019	Accel., 1/2 bridge	Endevco	7264-2000	G
67	LEFT FEMUR FORCE	Z	KEFF001	Load cell, Femur	R.A. Denton	2121	N
68	RIGHT FEMUR FORCE	Z	GPLC001	Load cell, Femur	G.S.E.	2430	N

Ncap Test With Hybrid III Male 50th Pecentile ATD
Instrumentation Data Channel Assignments
Passenger A.T.D Serial Number 35
Test Date: 11/21/97
Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

CH.	LOCATION	AXIS	IDENT. NO.	DESCRIPTION	MFR	MODEL	UNITS
69	UP. TIBIA LEFT MOM.	X	GPUT01MX	2 ch., Upper tibia gage	R. A. Denton	1583	N.m
70	UP. TIBIA LEFT MOM.	Y	GPUT01MY	2 ch., Upper tibia gage	R. A. Denton	1583	N.m
71	UP. TIBIA RIGHT MOM.	X	GPUT02MX	2 ch., Upper tibia gage	R. A. Denton	1583	N.m
72	UP. TIBIA RIGHT MOM.	Y	GPUT02MY	2 ch., Upper tibia gage	R. A. Denton	1583	N.m
73	LWR. TIBIA LEFT FORCE	Y	GPLT01FY	3 ch., lower tibia gage	R. A. Denton	1584	N
74	LWR. TIBIA LEFT FORCE	Z	GPLT01FZ	3 ch., lower tibia gage	R. A. Denton	1584	N
75	LWR. TIBIA LEFT MOM.	X	GPLT01MX	3 ch., lower tibia gage	R. A. Denton	1584	N.m
76	LWR. TIBIA RIGHT FORCE	Y	GPLT02FY	3 ch., lower tibia gage	R. A. Denton	1584	N
77	LWR. TIBIA RIGHT FORCE	Z	GPLT02FZ	3 ch., lower tibia gage	R. A. Denton	1584	N
78	LWR. TIBIA RIGHT MOM.	X	GPLT02MX	3 ch., lower tibia gage	R. A. Denton	1584	N.m
79	FOOT LEFT	X	KEIC002X	Accel., Foot Triax	I.C. Sensor	3031-500	G
80	FOOT LEFT	Y	KEIC002Y	Accel., Foot Triax	I.C. Sensor	3031-500	G
81	FOOT LEFT	Z	KEIC002Z	Accel., Foot Triax	I.C. Sensor	3031-500	G
82	FOOT RIGHT	X	KEIC001X	Accel., Foot Triax	I.C. Sensor	3031-500	G
83	FOOT RIGHT	Y	KEIC001Y	Accel., Foot Triax	I.C. Sensor	3031-500	G
84	FOOT RIGHT	Z	KEIC001Z	Accel., Foot Triax	I.C. Sensor	3031-500	G
85	LAP BELT FORCE	X	KELC001	Load cell, Seat belt	Lebow	3371	N
86	SHOULDER BELT FORCE	X	KELC002	Load cell, Seat belt	Lebow	3371	N
87	SHOULDER BELT SPOOL	X	KEPP001	Pullout pot	Celesco	PTX101-0030	MM
88	SHOULDER BELT ELONG.	X	KEEP001	Linear pot., belt stretch	E.T.I.	LCP8-10 10K	MM/CM

Ncap Test With Hybrid III Male 50th Pecentile ATD
Instrumentation Data Channel Assignments
Vehicle Accelerometers
Test Date: 11/21/97
Vehicle: 1998 Chevrolet Malibu 4 Door Sedan

CH.	LOCATION	AXIS	IDENT. NO.	DESCRIPTION	MFR	MODEL	UNITS
89	LEFT REAR PRIMARY	X	KEVA005	Accel., Vehicle block	I.C. Sensor	3031-500	G
90	RIGHT REAR PRIMARY	X	KEVA006	Accel., Vehicle block	I.C. Sensor	3031-200	G
91	ENGINE TOP	X	KEVA001	Accel., Vehicle block	I.C. Sensor	3031-500	G
92	ENGINE BOTTOM	X	KEVA002	Accel., Vehicle block	I.C. Sensor	3031-500	G
93	LEFT BRAKE CALIPER	X	KEVA010	Accel., Vehicle block	I.C. Sensor	3031-500	G
94	RIGHT BRAKE CALIPER	X	KEVA004	Accel., Vehicle block	I.C. Sensor	3031-500	G
95	INSTUMENT PANEL	X	KEVA007	Accel., Vehicle block	I.C. Sensor	3031-200	G
96	LEFT REAR REDUNDANT	X	KEVA011	Accel., Vehicle block	I.C. Sensor	3031-200	G

APPENDIX E

DUMMY CALIBRATION DATA

Hybrid III Calibration Data Sheet
50TH Percentile Male
Left Knee Impact Test

ATD Serial No.: 34 Part Serial No.: N/A Test I.D.: MK010

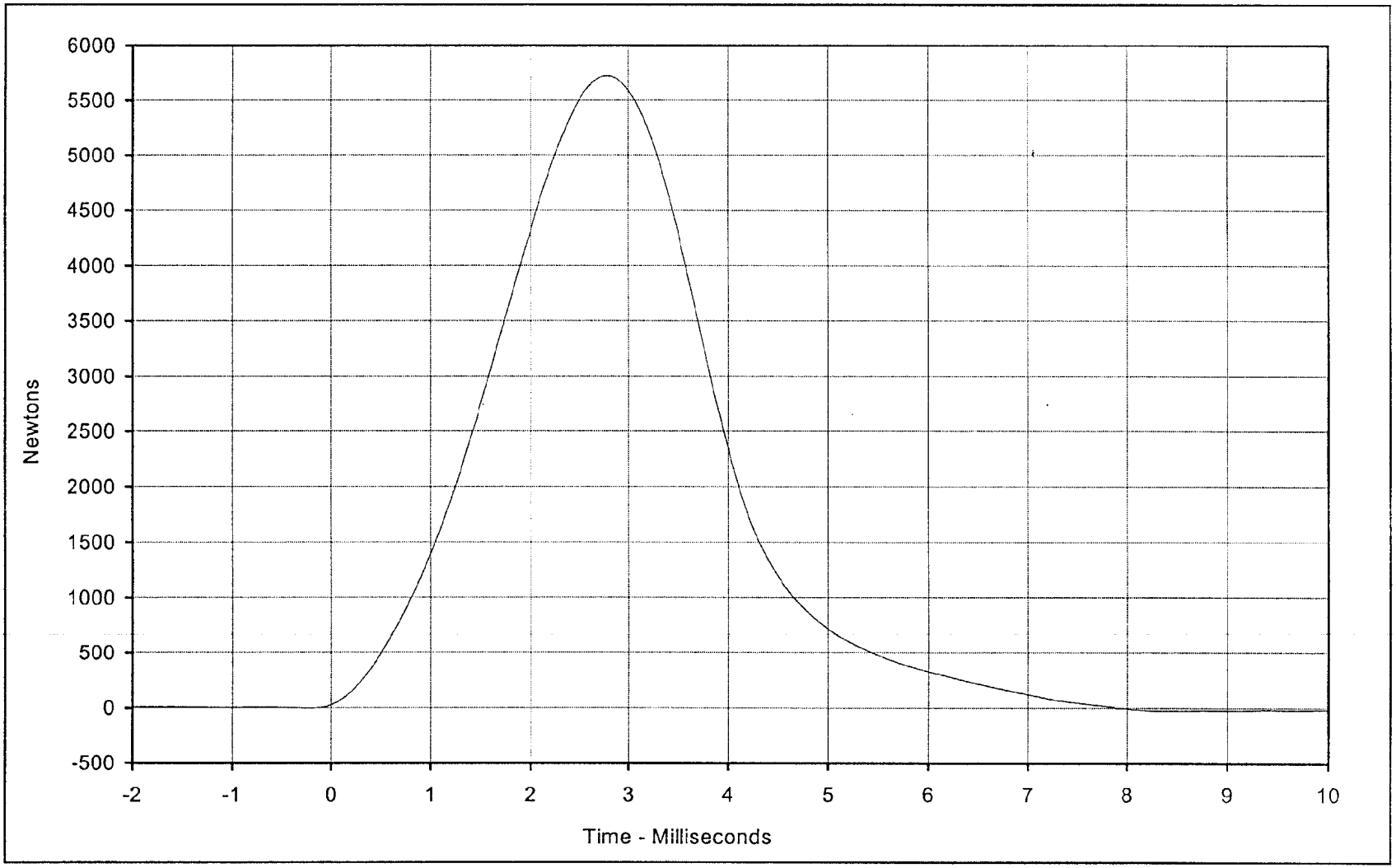
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	18.9 to 25.5	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Probe Velocity	m/s	2.073 to 2.134	2.103	Pass
Peak Probe Force	Newtons	4715 to 5782	5720.4	Pass
		Overall Test Results		Pass

Laboratory Technician

September 18, 1997
Test Date

Approved By

9/18/97
Date



Curve Description:	Probe Force			
Maximum Value:	5720.4	at	2.8	Milliseconds
Minimum Value:	-8.0	at	8.0	Milliseconds
SAE Filter Class:	600			
Date of Test:	9/18/97			
ATD Serial No.:	34			

Testing Program: Hybrid III Left Knee Impact Test

Test Information: Part S/N: N/A Test I.D.: MK010

KARCO Engineering

Hybrid III Calibration Data Sheet
50TH Percentile Male
Right Knee Impact Test

ATD Serial No.: 34 Part Serial No.: N/A Test I.D.: MK007

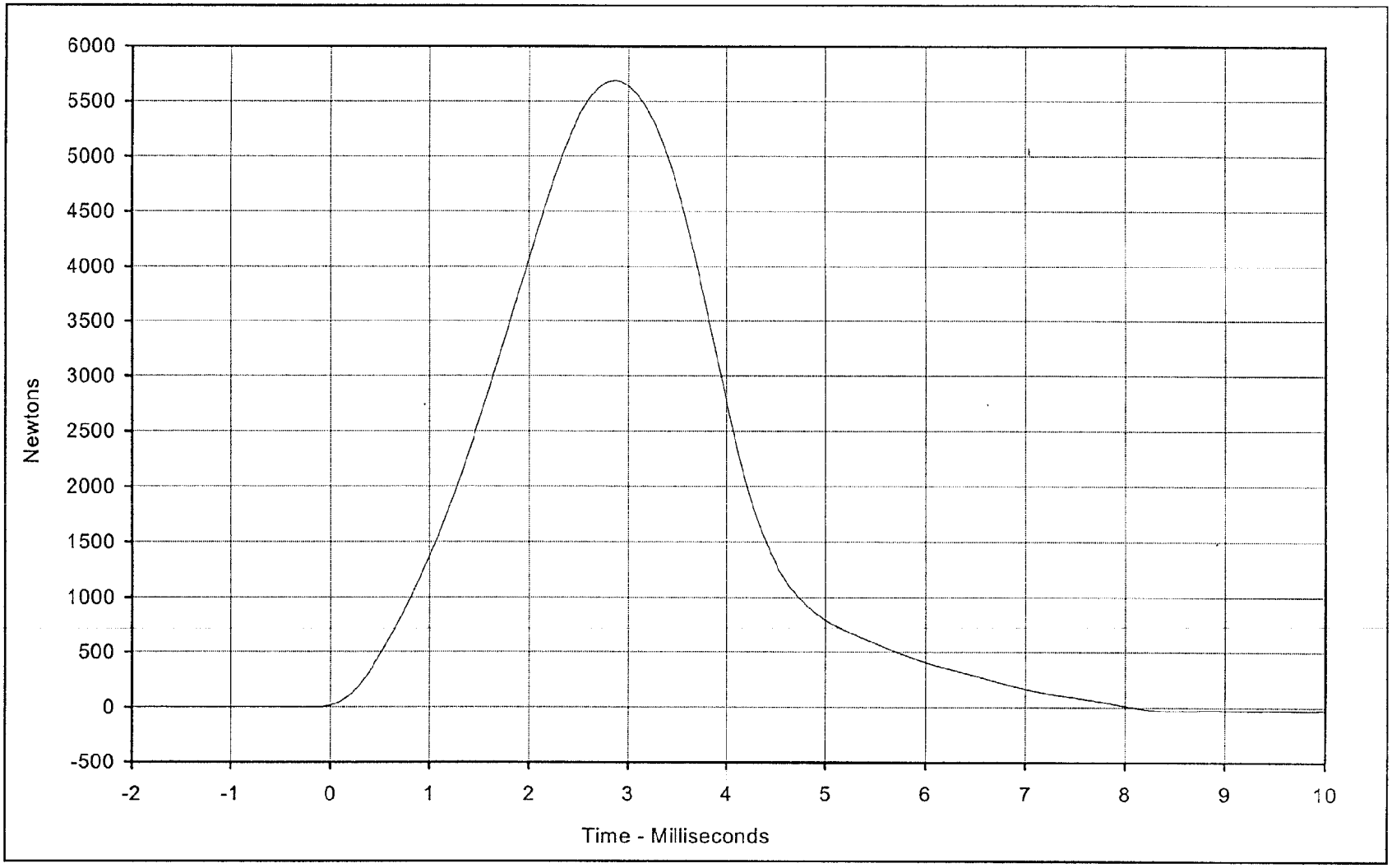
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	18.9 to 25.5	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Probe Velocity	m/s	2.073 to 2.134	2.091	Pass
Peak Probe Force	Newtons	4715 to 5782	5680.9	Pass
		Overall Test Results		Pass

Laboratory Technician

September 18, 1997
Test Date

Approved By

9/18/97
Date



Curve Description:	Probe Force				Testing Program:	Hybrid III Right Knee Impact Test
Maximum Value:	5680.9	at	2.9	Milliseconds	Test Information:	Part S/N: N/A Test I.D.: MK007
Minimum Value:	0.0	at	-0.2	Milliseconds		
SAE Filter Class:	600					
Date of Test:	9/18/97					
ATD Serial No.:	34					

KARCO Engineering

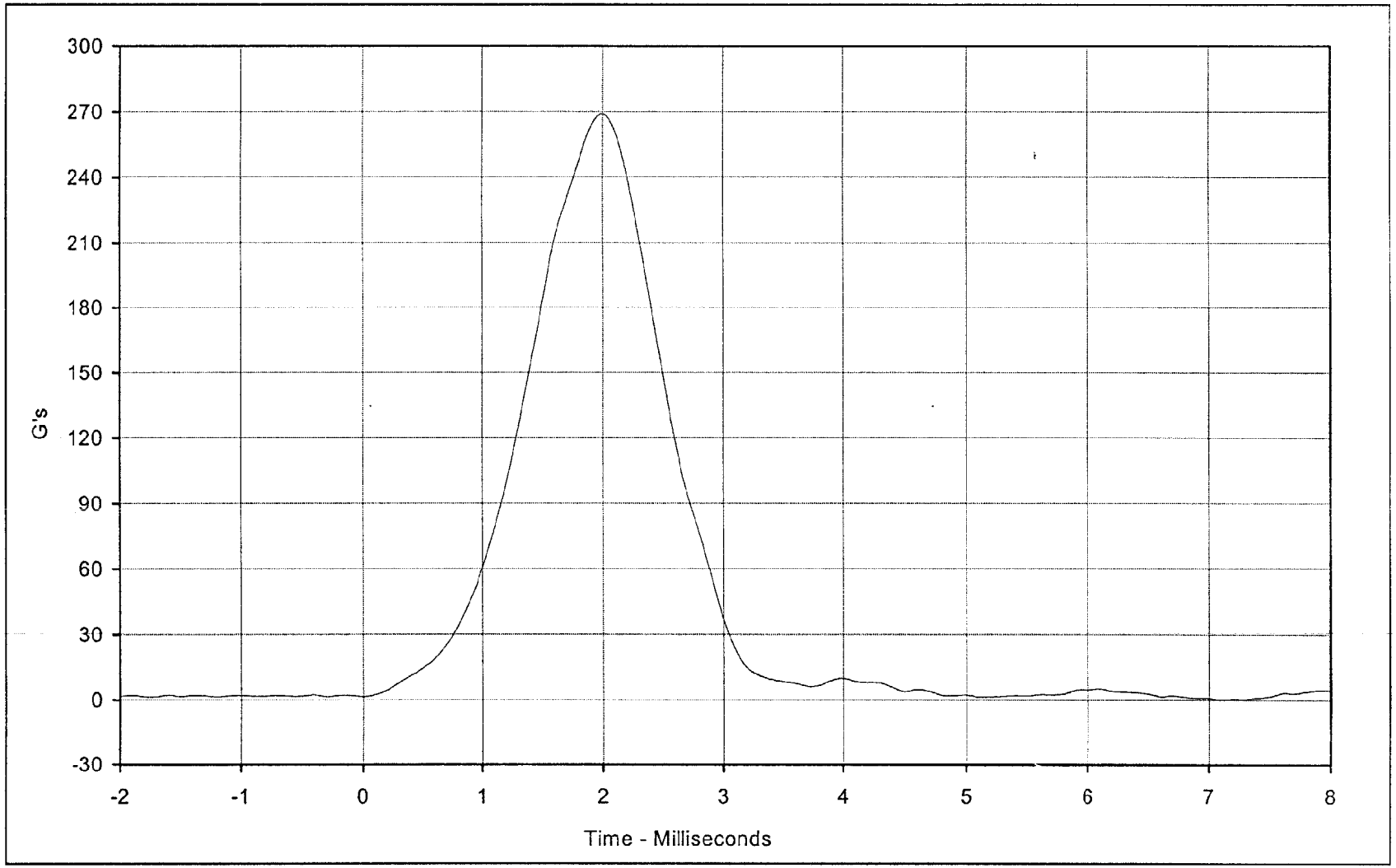
Hybrid III Calibration Data Sheet
50TH Percentile Male
Head Drop Calibration

ATD Serial No.: 034 Part Serial No.: N/A Test I.D.: MH009

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	18.9 to 25.6	20.6	Pass
Laboratory Relative Humidity	%	10 to 70	35	Pass
Peak Resultant Acceleration	G's	225.0 to 275.0	269.0	Pass
Peak Lateral Acceleration	G's	≤15.0	10.8	Pass
Is Acceleration Unimodal?	Yes/No	Yes	Yes	Pass
		Overall Test Results		Pass

Laboratory Technician — September 16, 1997 (Test Date)

Approved By — 9/16/97 (Date)



Curve Description: Head Resultant Acceleration

Maximum Value: 269.0 at 2.0 Milliseconds

Minimum Value: 0.4 at 7.1 Milliseconds

SAE Filter Class: 1000

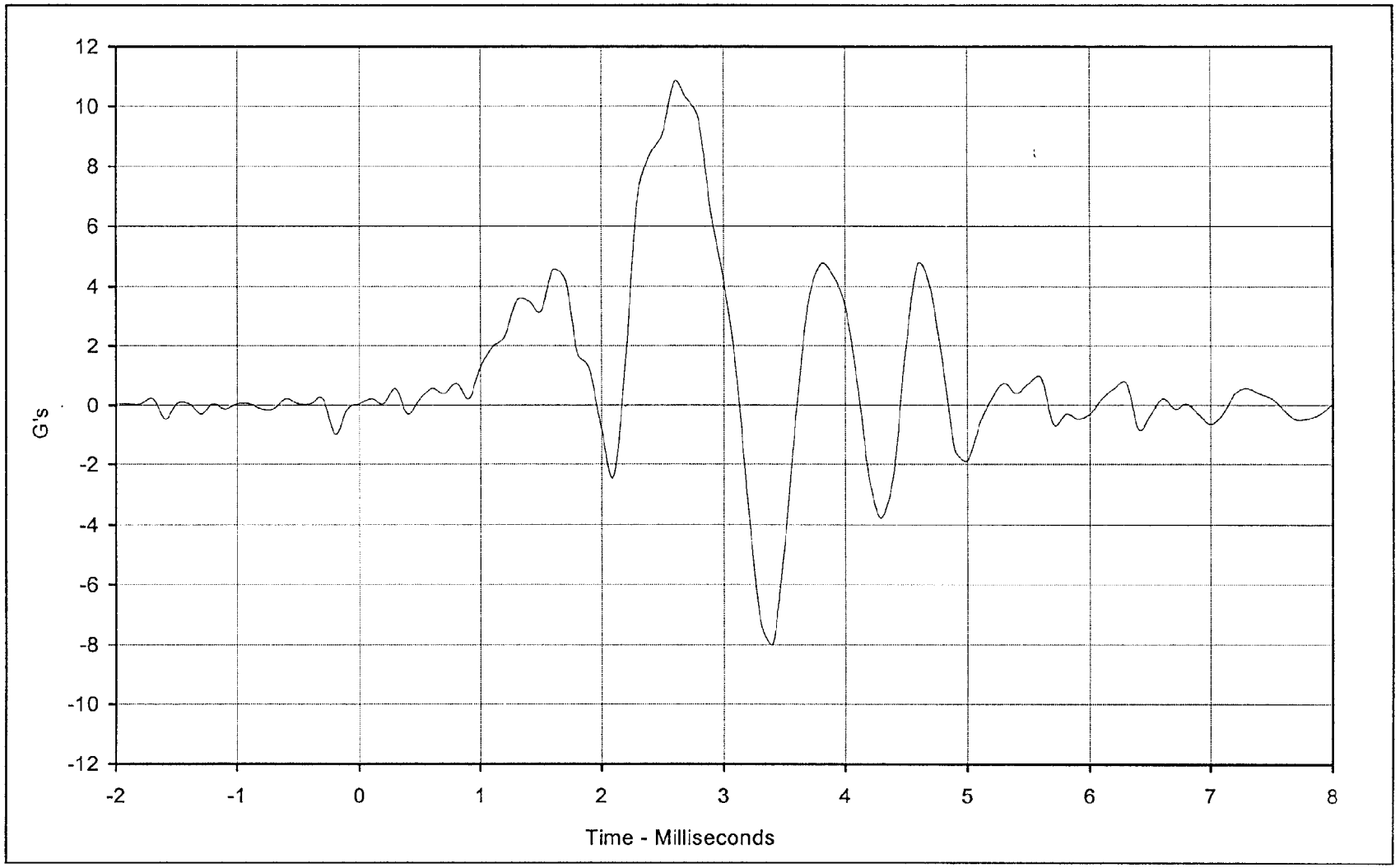
Date of Test: 9/16/97

ATD Serial No.: 034

Testing Program: Hybrid III Head Drop Calibration (Male)

Test Information: S/N of Part: N/A Test I.D.: MH009

KARCO Engineering



Curve Description:	Head Acceleration Y Axis			
Maximum Value:	10.8	at	2.6	Milliseconds
Minimum Value:	-7.9	at	3.4	Milliseconds
SAE Filter Class:	1000			
Date of Test:	9/16/97			
ATD Serial No.:	034			

Testing Program: Hybrid III Head Drop Calibration (Male)

Test Information: S/N of Part: N/A Test I.D.: MH009

KARCO Engineering

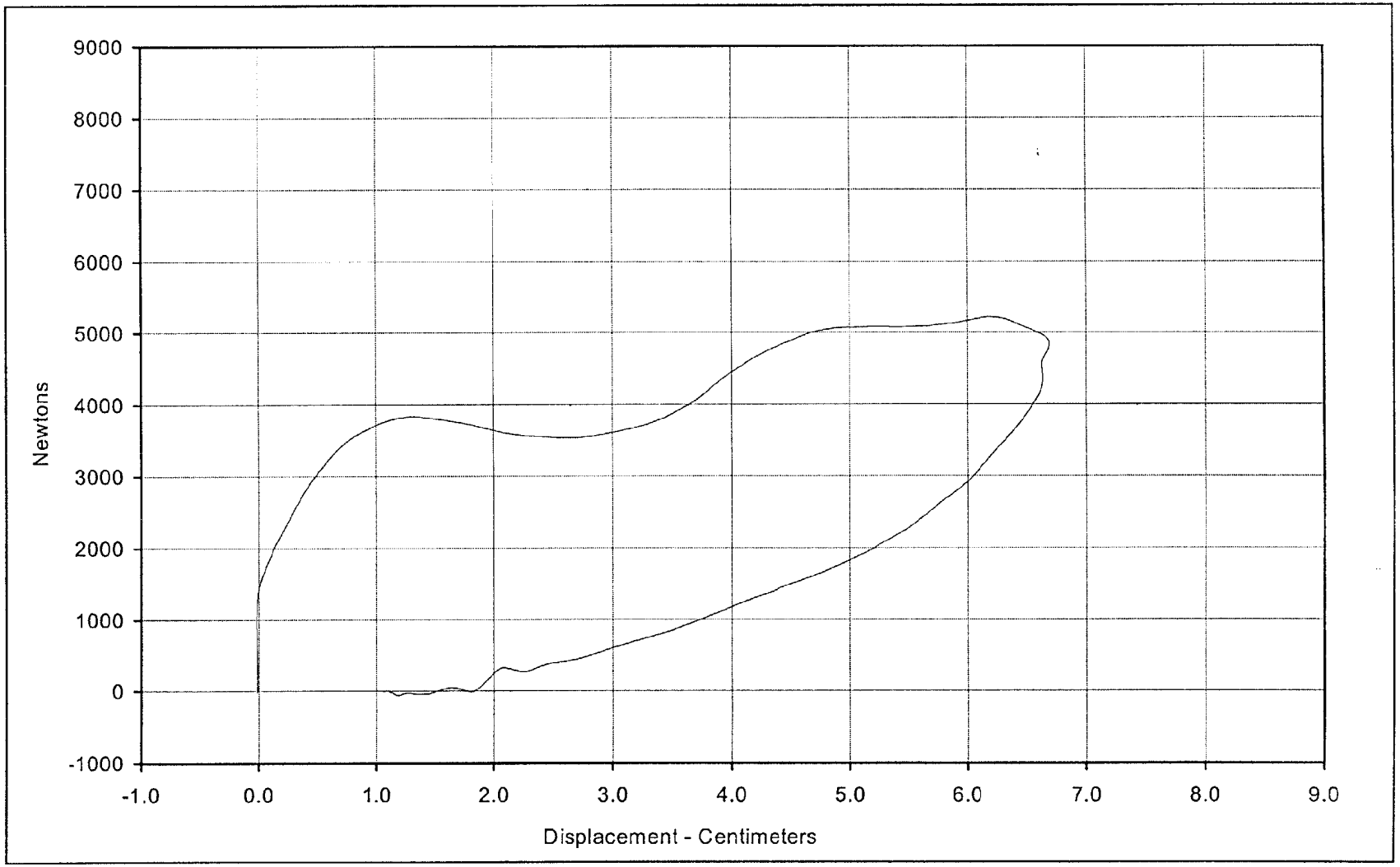
Hybrid III Calibration Data Sheet
50TH Percentile Male
Thorax Impact Test

ATD Serial No.: 034 Part Serial No.: N/A Test I.D.: H3C01

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	40	Pass
Probe Velocity	m/s	6.58 to 6.82	6.77	Pass
Peak Probe Force	Newtons	5159 to 5893	5215	Pass
Peak Sternum Displacement	CM	6.35 to 7.26	6.69	Pass
Internal Hysterysis	%	69 to 85	75.7	Pass
		Overall Test Results		Pass

Laboratory Technician — October 10, 1997 (Test Date)

Approved By — 10/10/97 (Date)



Curve Description: Probe Force vs. Chest Displacement

Probe Force: 5215.5 Newtons

Chest Displ.: 6.69 Centimeters

SAE Filter Class: 180

Date of Test: 10/10/97

ATD Serial No.: 034

Testing Program: Hybrid III Thorax Impact Test

Test Information: S/N of Part: N/A Test I.D.: H3C01

KARCO Engineering

Hybrid III Calibration Data Sheet
50TH Percentile Male
Neck Flexion Test

ATD Serial No.: 34 Part Serial No.: N/A Test I.D.: MNF09

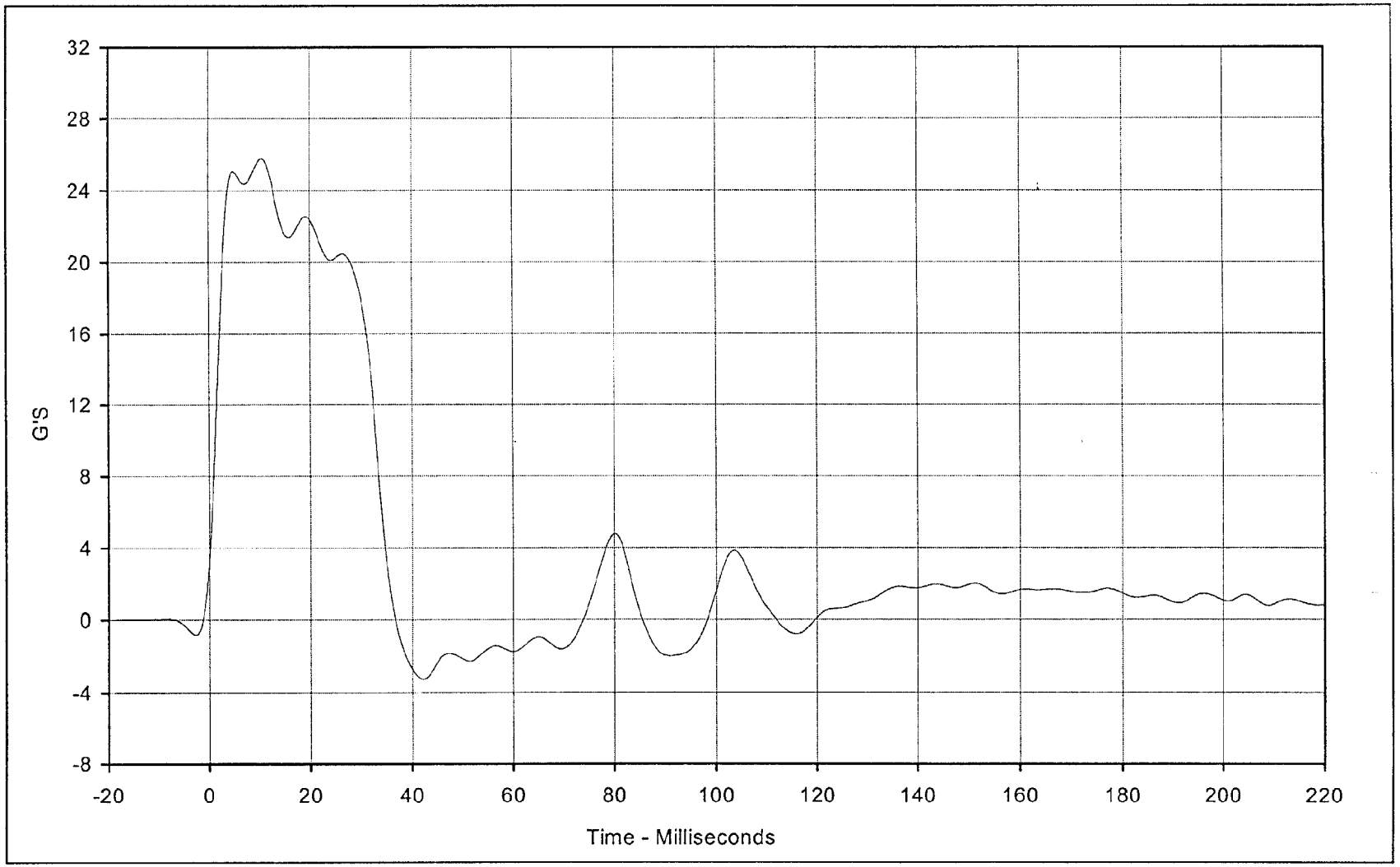
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	36	Pass
Pendulum Velocity		m/s	6.89 to 7.13	6.94	Pass
Pendulum Deceleration	10 Msec.	m/s	22.5 to 27.5	25.7	Pass
	20 Msec.	m/s	17.6 to 22.6	22.4	Pass
	30 Msec.	m/s	12.5 to 18.5	17.7	Pass
Peak Pendulum Decel. after 30 Msec.		G's	≤ 29.0	17.7	Pass
Deceleration Decay, Time to Cross 5 G's		Msec.	34.0 to 42.0	34.4	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	64.0 to 78.0	77.6	Pass
	Time	Msec.	57.0 to 64.0	60.3	Pass
"D" Plane Rotation Decay, Time To Zero Crossing		Msec.	113.0 to 128.0	121.2	Pass
Moment About Occipital Condyle	Maximum	N • m	84.1 to 108.5	100.4	Pass
	Time	Msec.	47.0 to 58.0	55.1	Pass
Positive Moment Decay, Time To Zero Crossing		Msec.	97.0 to 107.0	105.7	Pass
			Overall Test Results		Pass

Laboratory Technician

September 19, 1997
Test Date

Approved By

9/19/97
Date



Curve Description: Pendulum Deceleration

Maximum Value: 25.8 at 10.5 Milliseconds

Minimum Value: -3.3 at 42.1 Milliseconds

SAE Filter Class: 60

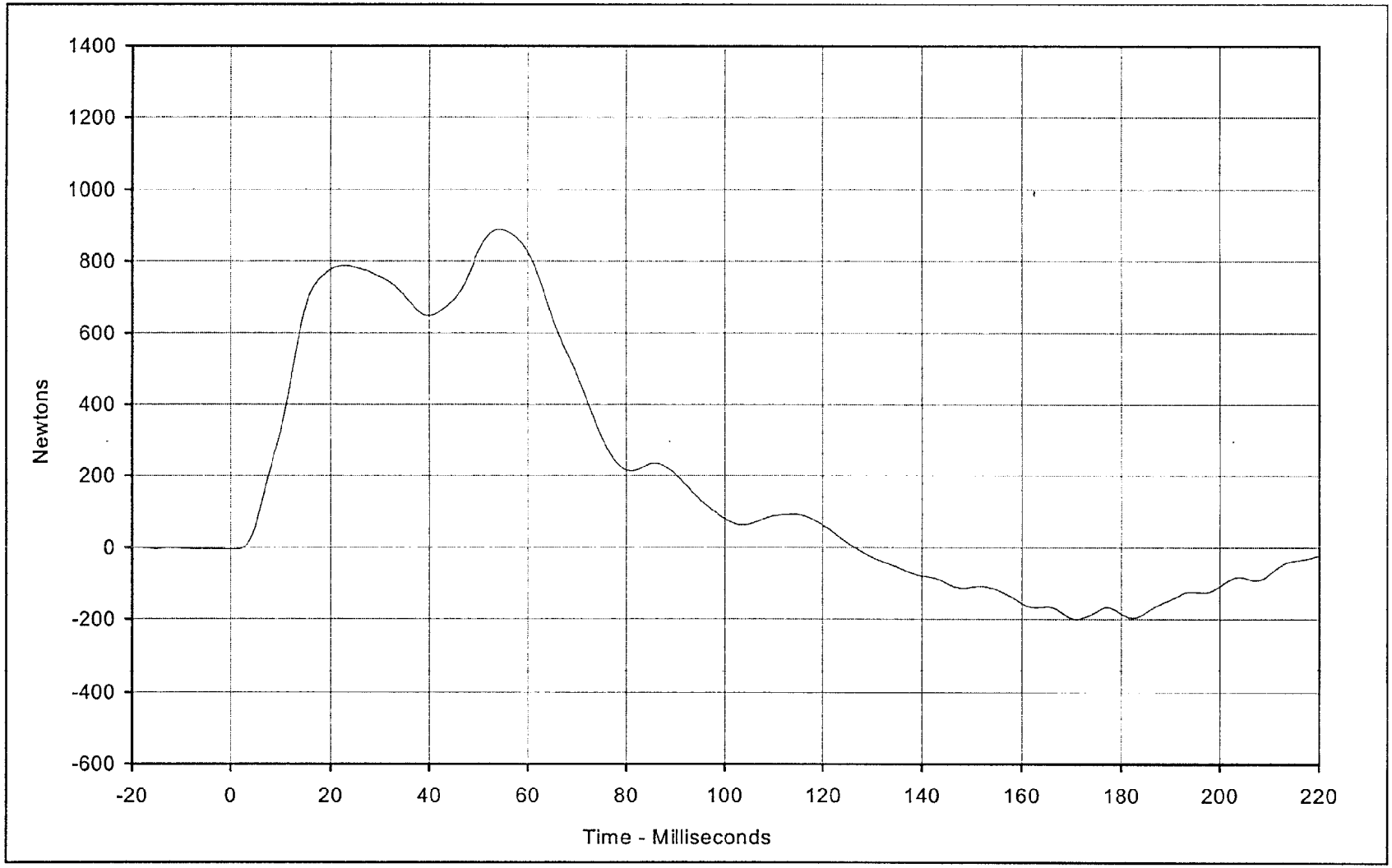
Date of Test: 9/19/97

ATD Serial No.: 34

Testing Program: Hybrid III Neck Flexion Test (Male)

Test Information: S/N of Part: N/A Test I.D.: MNF09

KARC Engineering

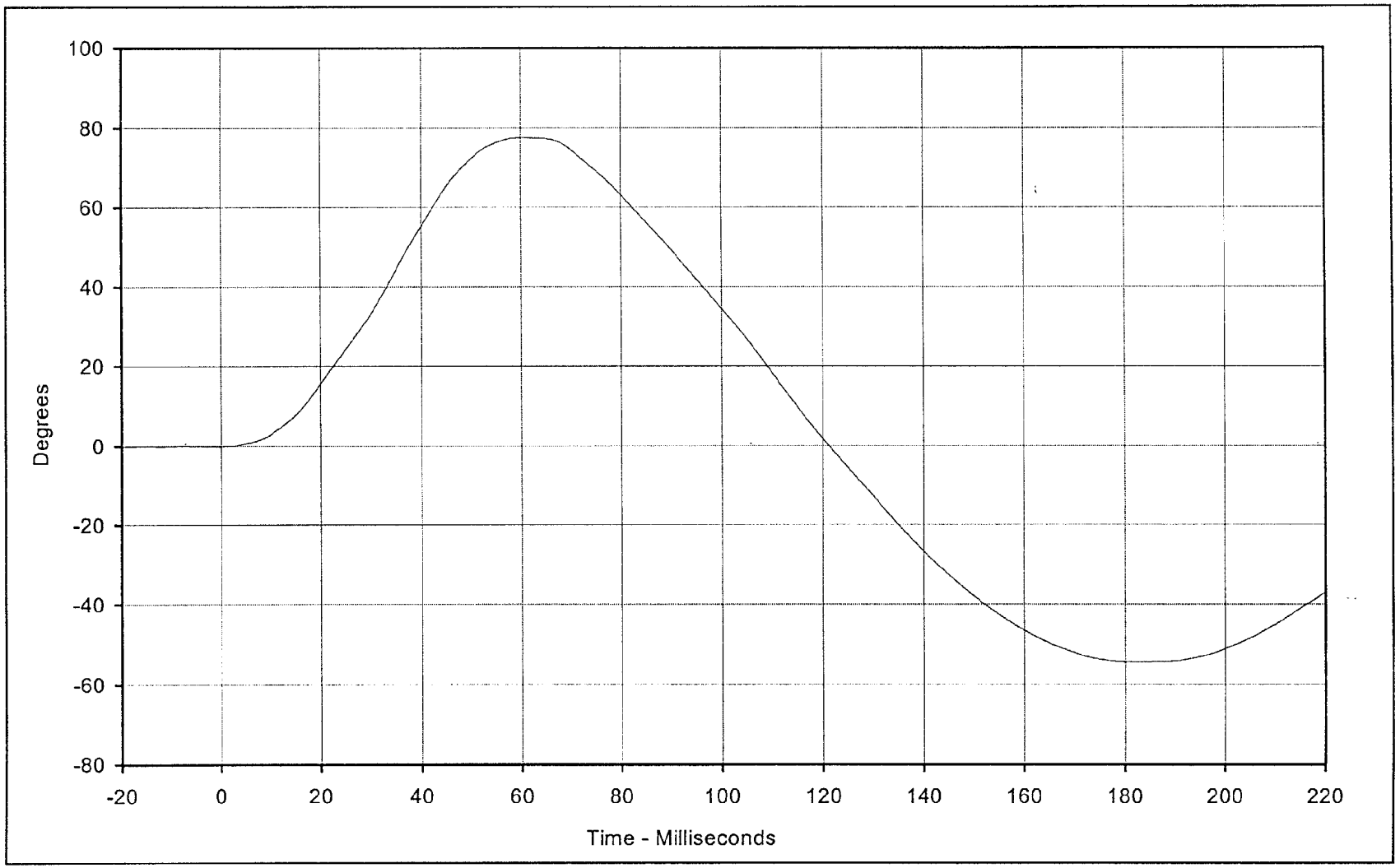


Curve Description:	Neck Force X				
Maximum Value:	888.9	at	54.3	Milliseconds	
Minimum Value:	-199.2	at	170.9	Milliseconds	
SAE Filter Class:	60				
Date of Test:	9/19/97				
ATD Serial No.:	34				

Testing Program: Hybrid III Neck Flexion Test (Male)

Test Information: S/N of Part: N/A Test I.D.: MNF09

KARCO Engineering



Curve Description: "D" Plane Rotation

Maximum Value: 77.6 at 60.3 Milliseconds

Minimum Value: -54.3 at 181.6 Milliseconds

SAE Filter Class: 60

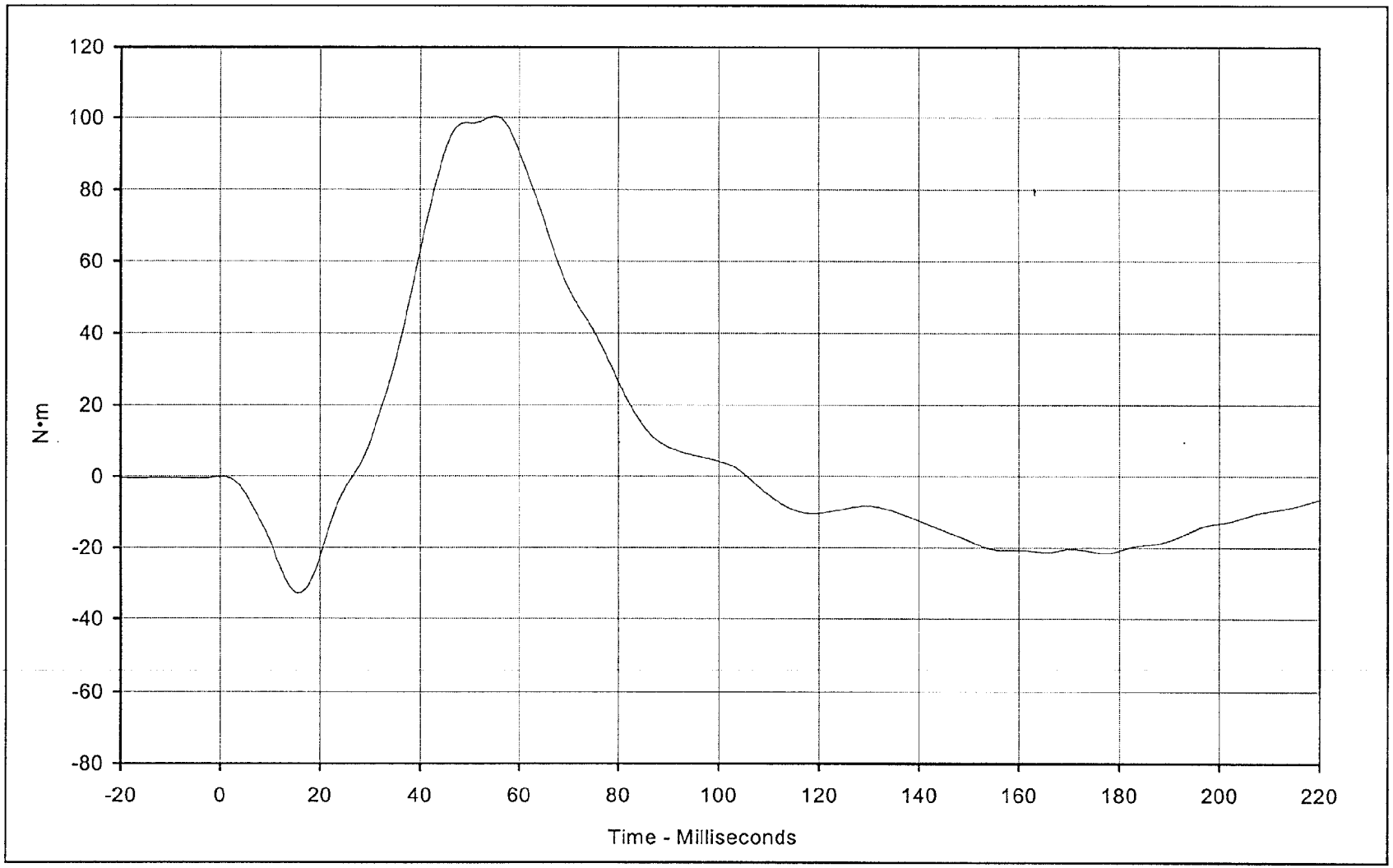
Date of Test: 9/19/97

ATD Serial No.: 34

Testing Program: Hybrid III Neck Flexion Test (Male)

Test Information: S/N of Part: N/A Test I.D.: MNF09

KARCO Engineering



Curve Description:	Moment About Occipital Condyles			
Maximum Value:	100.4	at	55.1	Milliseconds
Minimum Value:	-32.9	at	15.7	Milliseconds
SAE Filter Class:	60			
Date of Test:	9/19/97			
ATD Serial No.:	34			

Testing Program: Hybrid III Neck Flexion Test (Male)

Test Information: S/N of Part: N/A Test I.D.: MNF09

KARCO Engineering

Hybrid III Calibration Data Sheet
50TH Percentile Male
Neck Extension Test

ATD Serial No.: 034 Part Serial No.: N/A Test I.D.: NE001

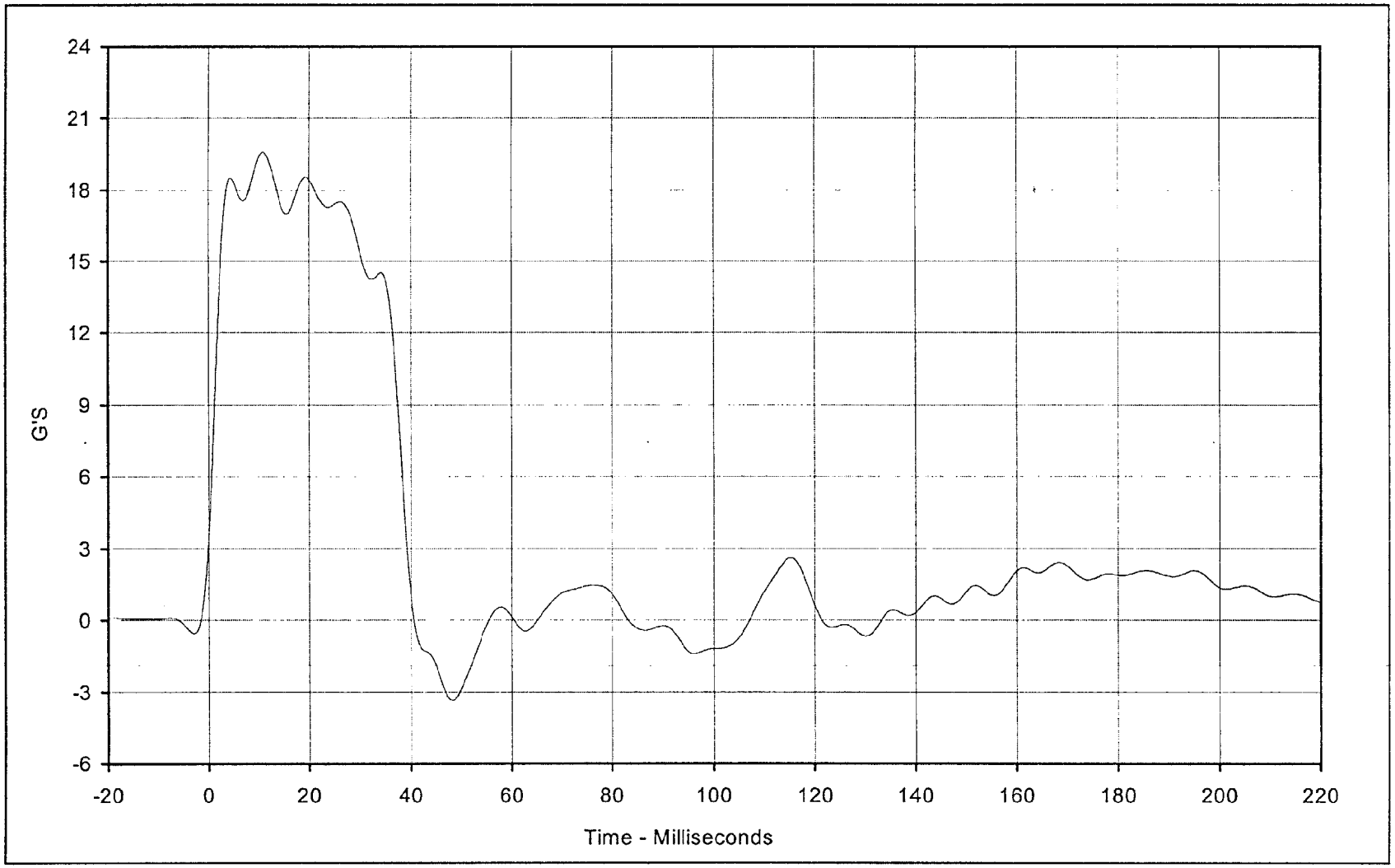
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	36	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.08	Pass
Pendulum Deceleration	10 Msec.	G's	17.2 to 21.2	19.4	Pass
	20 Msec.	G's	14.0 to 19.0	18.4	Pass
	30 Msec.	G's	11.0 to 16.0	15.2	Pass
Peak Pendulum Decel. after 30 Msec.		G's	≤ 22.0	15.2	Pass
Deceleration Decay, Time to Cross 5 G's		Msec.	38.0 to 46.0	38.6	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	91.5	Pass
	Time	Msec.	72.0 to 82.0	73.4	Pass
"D" Plane Rotation Decay, Time To Zero Crossing		Msec.	147.0 to 174.0	153.4	Pass
Moment About Occipital Condyle	Maximum	N • m	-52.9 to- 79.9	-66.1	Pass
	Time	Msec.	65.0 to 79.0	68.9	Pass
Negative Moment Decay, Time To Zero Crossing		Msec.	120.0 to 148.0	123.9	Pass
			Overall Test Results		Pass

Laboratory Technician

September 19, 1997
Test Date

Approved By

9/19/97
Date



Curve Description: Pendulum Deceleration

Maximum Value: 19.6 at 10.7 Milliseconds

Minimum Value: -3.4 at 48.1 Milliseconds

SAE Filter Class: 60

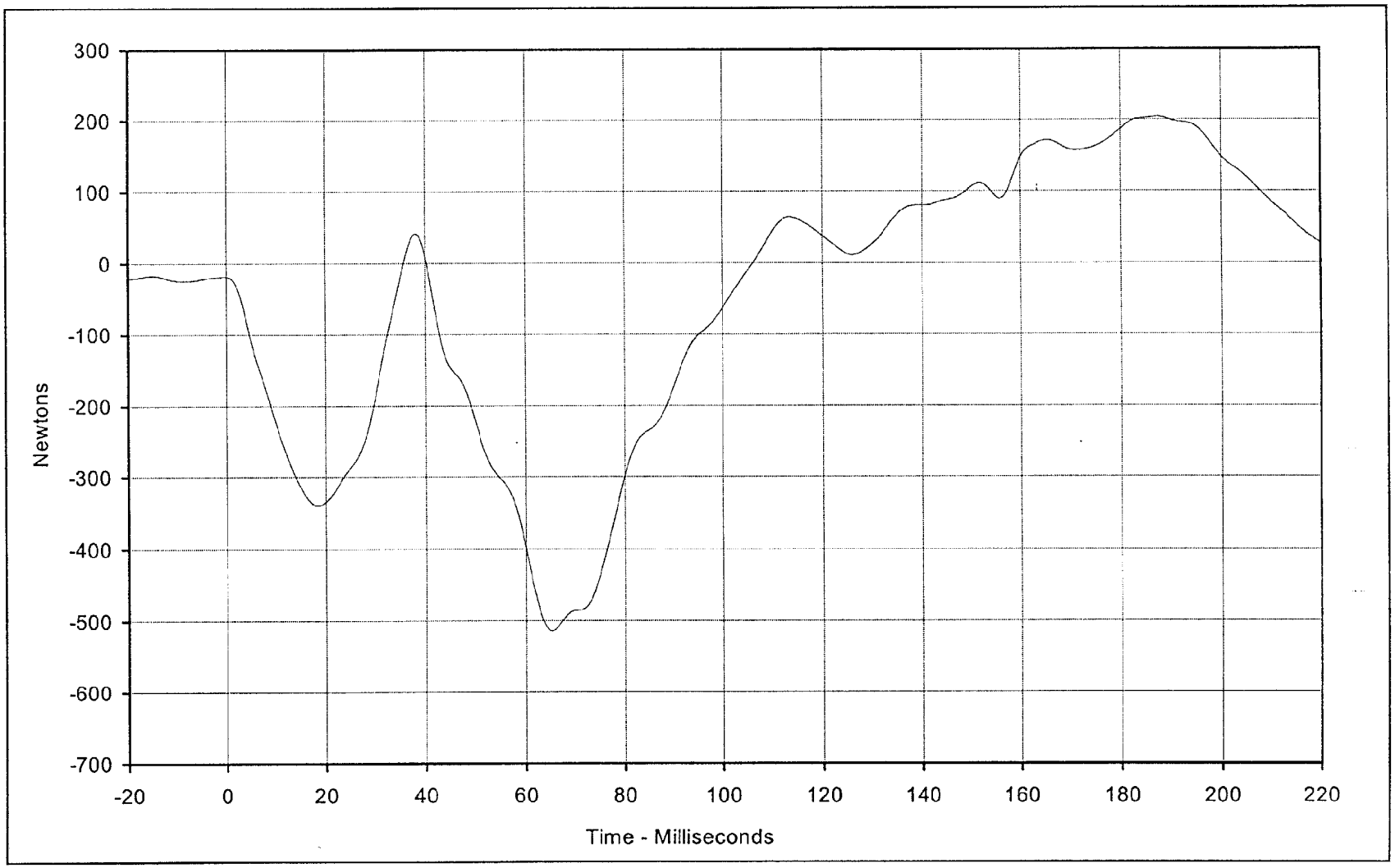
Date of Test: 09/19/97

ATD Serial No.: 034

Testing Program: Hybrid III Neck Extension Test (Male)

Test Information: S/N of Part: N/A Test I.D.: NE001

KARCO Engineering



Curve Description: Neck Force X

Maximum Value: 204.2 at 187.4 Milliseconds

Minimum Value: -513.6 at 65.1 Milliseconds

SAE Filter Class: 60

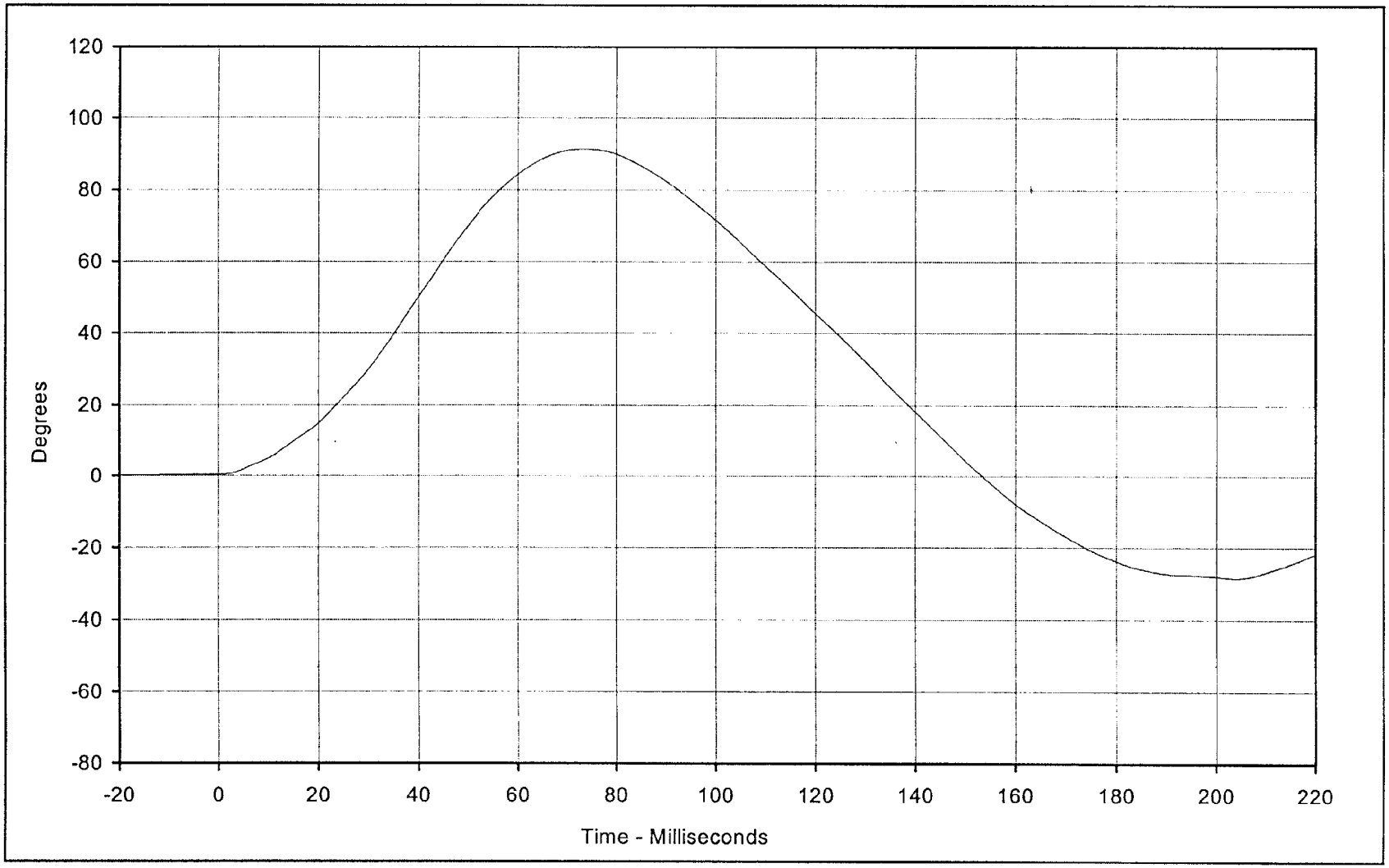
Date of Test: 09/19/97

ATD Serial No.: 034

Testing Program: Hybrid III Neck Extension Test (Male)

Test Information: S/N of Part: N/A Test I.D.: NE001

KARCO Engineering



Curve Description: "D" Plane Rotation

Maximum Value: 91.5 at 73.4 Milliseconds

Minimum Value: -28.6 at 203.9 Milliseconds

SAE Filter Class: 60

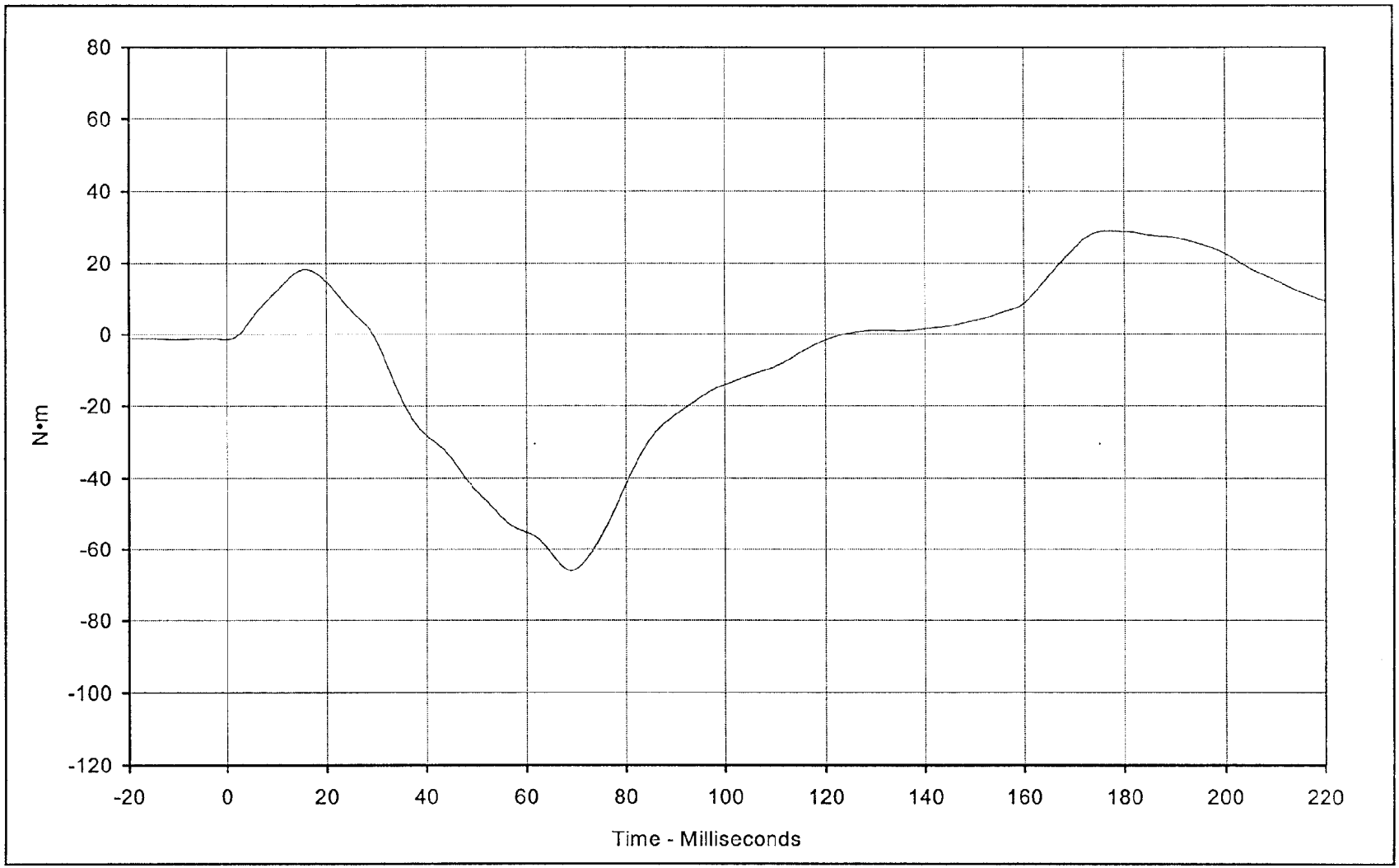
Date of Test: 09/19/97

ATD Serial No.: 034

Testing Program: Hybrid III Neck Extension Test (Male)

Test Information: S/N of Part: N/A Test I.D.: NE001

KARCO Engineering



Curve Description:	Moment About Occipital Condyles			
Maximum Value:	28.9	at	176.7	Milliseconds
Minimum Value:	-66.1	at	68.9	Milliseconds
SAE Filter Class:	60			
Date of Test:	09/19/97			
ATD Serial No.:	034			

Testing Program:	Hybrid III Neck Extension Test (Male)
Test Information:	S/N of Part: N/A Test I.D.: NE001

KARCO Engineering

Hybrid III Calibration Data Sheet
50TH Percentile Male
External Measurements

ATD Serial No.: 034 Part Serial No.: N/A Test I.D.: N/A

External Measurement Data				
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory temperature	°C	20.4 to 22.1	20.9	Pass
Laboratory relative humidity	%	10 to 70	43	Pass
A - Total sitting height	mm	878.8 to 889.0	880.0	Pass
B - Shoulder pivot height	mm	505.5 to 520.7	510.7	Pass
C - "H" point height	mm	83.8 to 88.9	87.7	Pass
D - "H" point from seat back	mm	134.6 to 139.7	137.5	Pass
E - Shoulder pivot from back	mm	83.8 to 94.0	84.0	Pass
F - Thigh clearance	mm	139.7 to 154.9	147.0	Pass
G - Elbow back to wrist pivot	mm	289.6 to 304.8	300.1	Pass
H - Skull cap to back line	mm	40.6 to 45.7	44.0	Pass
I - Shoulder to elbow length	mm	330.2 to 345.4	340.1	Pass
J - Elbow rest height	mm	190.5 to 210.8	209.0	Pass
K - Buttock to knee length	mm	579.1 to 604.5	595.0	Pass
L - Poplipteal length	mm	429.3 to 454.7	444.0	Pass
M - Knee pivot height	mm	485.1 to 500.4	490.7	Pass
N - Buttock poplipteal length	mm	452.1 to 477.5	467.0	Pass
O - Chest depth	mm	213.4 to 228.6	216.0	Pass
P - Foot length	mm	251.5 to 266.7	259.7	Pass
V - Shoulder breadth	mm	421.6 to 436.9	430.0	Pass
W - Foot breadth	mm	91.4 to 106.7	99.0	Pass
Y - Chest circumference	mm	970.3 to 1000.8	999.0	Pass
Z - Waist circumference	mm	835.7 to 866.1	861.0	Pass
AA - Location for chest circumference	mm	429.3 to 434.3	433.0	Pass
BB - Location for waist circumference	mm	226.1 to 231.1	229.0	Pass
		Overall Test Results		Pass

Laboratory Technician — October 12, 1997 (Test Date)

Approved By — 10/12/97 (Date)

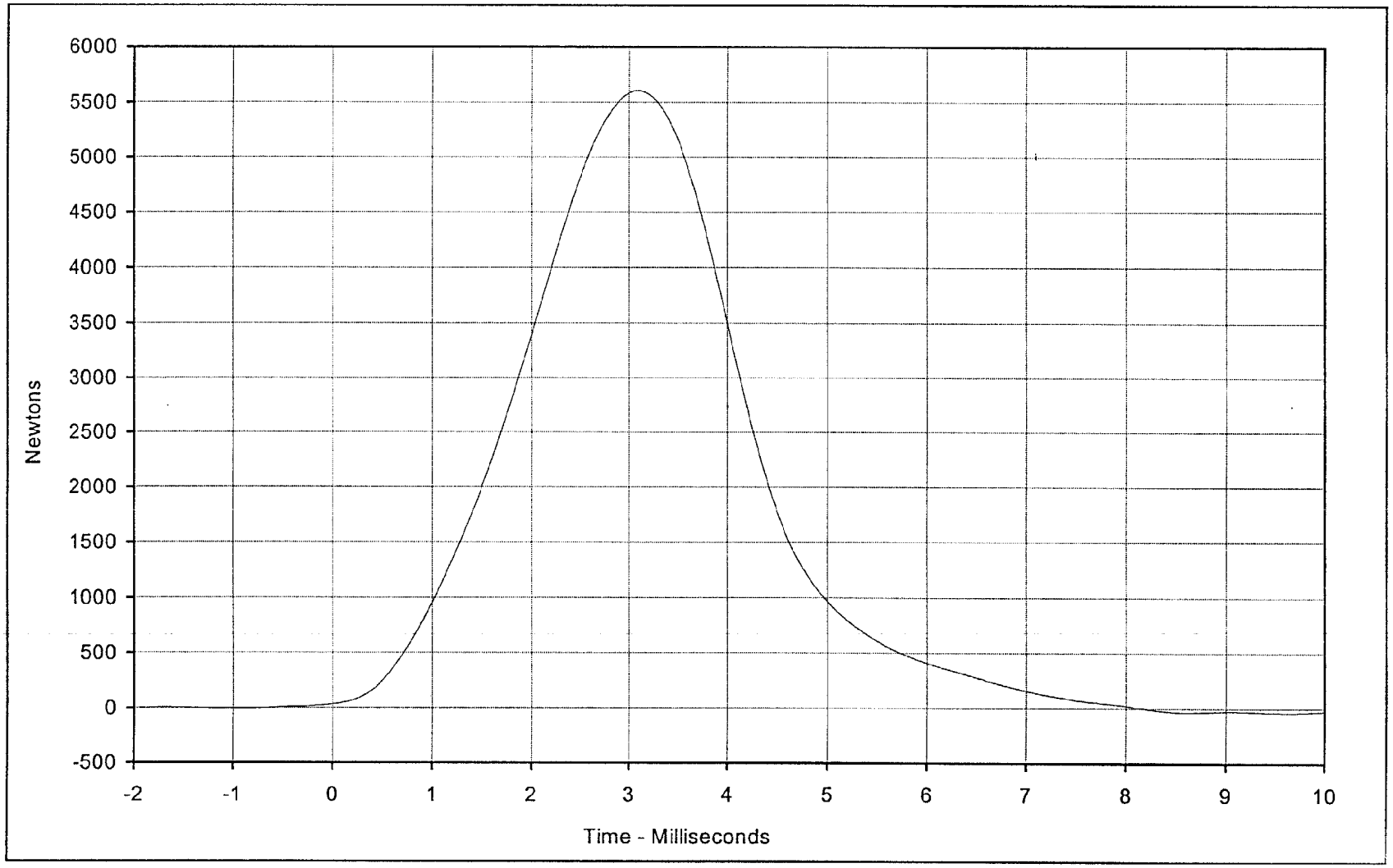
Hybrid III Calibration Data Sheet
50TH Percentile Male
Left Knee Impact Test

ATD Serial No.: 35 Part Serial No.: N/A Test I.D.: MK005

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	18.9 to 25.5	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Probe Velocity	m/s	2.073 to 2.134	2.105	Pass
Peak Probe Force	Newtons	4715 to 5782	5605.8	Pass
		Overall Test Results		Pass

Laboratory Technician — September 18, 1997 (Test Date)

Approved By — 9/18/97 (Date)



Curve Description: Probe Force

Maximum Value: 5605.8 at 3.1 Milliseconds

Minimum Value: -4.1 at -0.9 Milliseconds

SAE Filter Class: 600

Date of Test: 9/18/97

ATD Serial No.: 35

Testing Program: Hybrid III Left Knee Impact Test

Test Information: Part S/N: N/A Test I.D.: MK005

KARCO Engineering

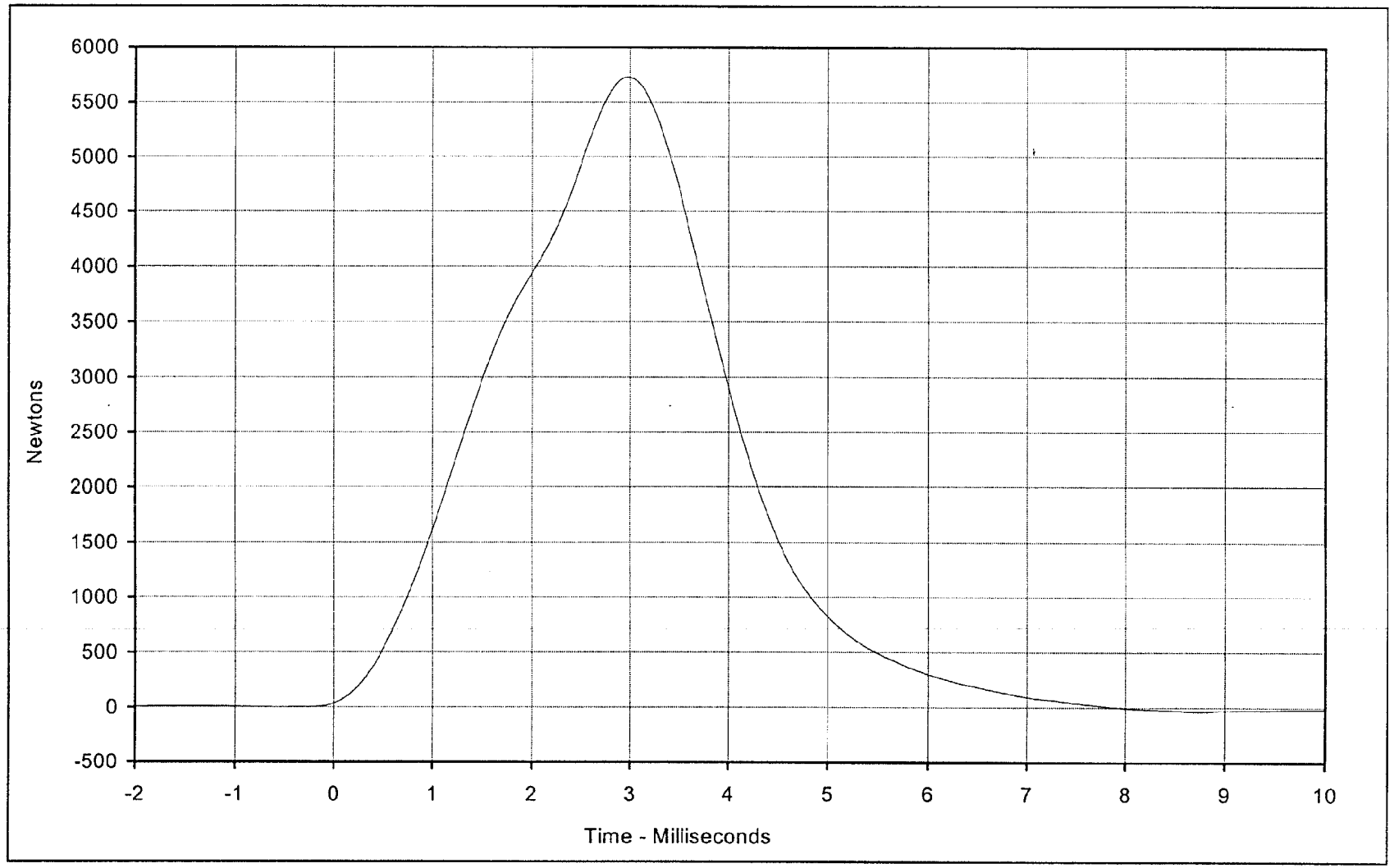
Hybrid III Calibration Data Sheet
50TH Percentile Male
Right Knee Impact Test

ATD Serial No.: 35 Part Serial No.: N/A Test I.D.: MK001

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	18.9 to 25.5	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Probe Velocity	m/s	2.073 to 2.134	2.108	Pass
Peak Probe Force	Newtons	4715 to 5782	5726.1	Pass
		Overall Test Results		Pass

Laboratory Technician — September 17, 1997 — Test Date

Approved By — 9/17/97 — Date



Curve Description: Probe Force

Maximum Value: 5726.1 at 3.0 Milliseconds

Minimum Value: -4.6 at 8.0 Milliseconds

SAE Filter Class: 600

Date of Test: 9/17/97

ATD Serial No.: 35

Testing Program: Hybrid III Right Knee Impact Test

Test Information: Part S/N: N/A Test I.D.: MK001

KARCO Engineering

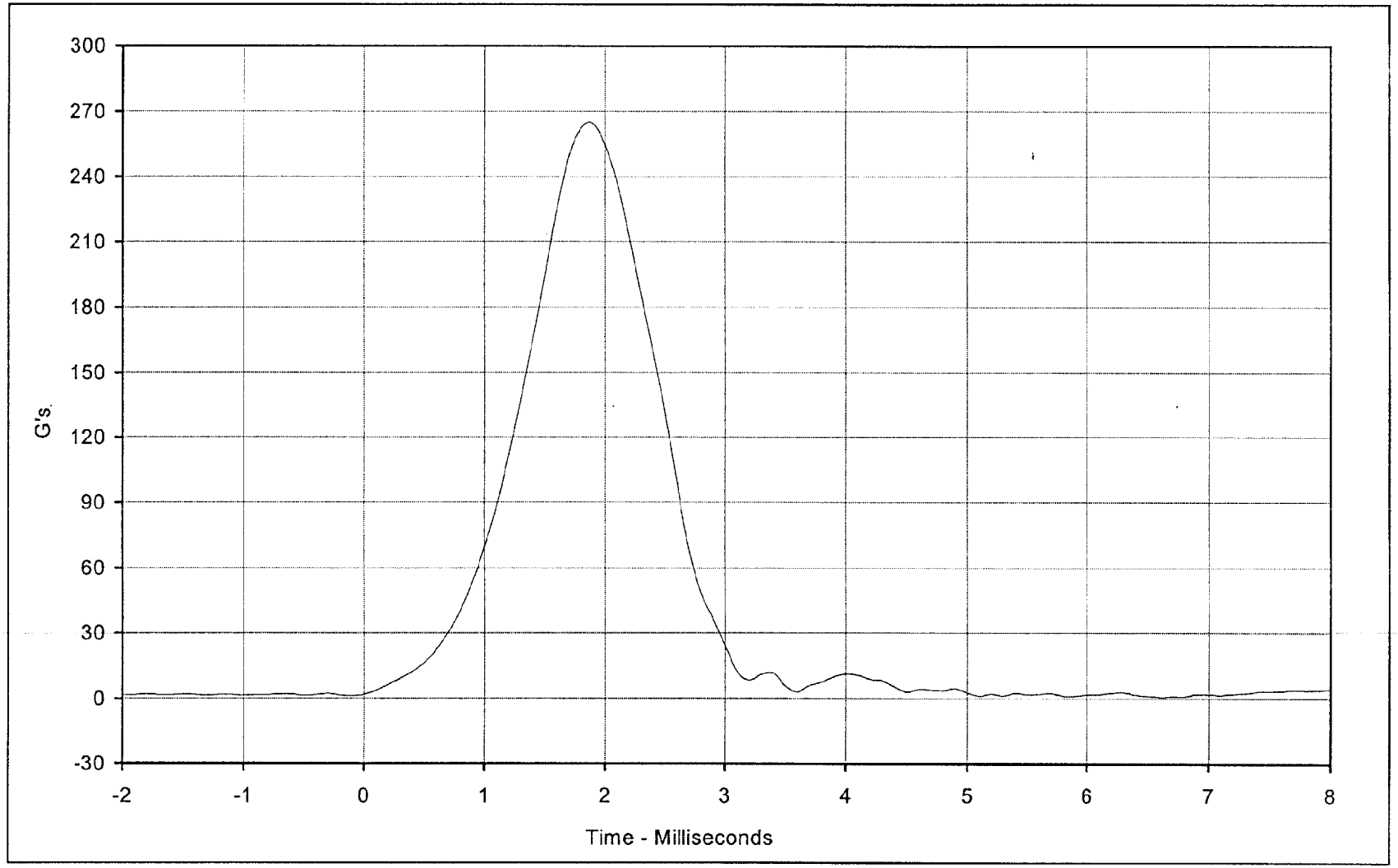
Hybrid III Calibration Data Sheet
50TH Percentile Male
Head Drop Calibration

ATD Serial No.: 035 Part Serial No.: N/A Test I.D.: MH006

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	18.9 to 25.6	20.6	Pass
Laboratory Relative Humidity	%	10 to 70	35	Pass
Peak Resultant Acceleration	G's	225.0 to 275.0	264.6	Pass
Peak Lateral Acceleration	G's	≤15.0	9.2	Pass
Is Acceleration Unimodal?	Yes/No	Yes	Yes	Pass
		Overall Test Results		Pass

Laboratory Technician — September 17, 1997 (Test Date)

Approved By — 9/17/97 (Date)

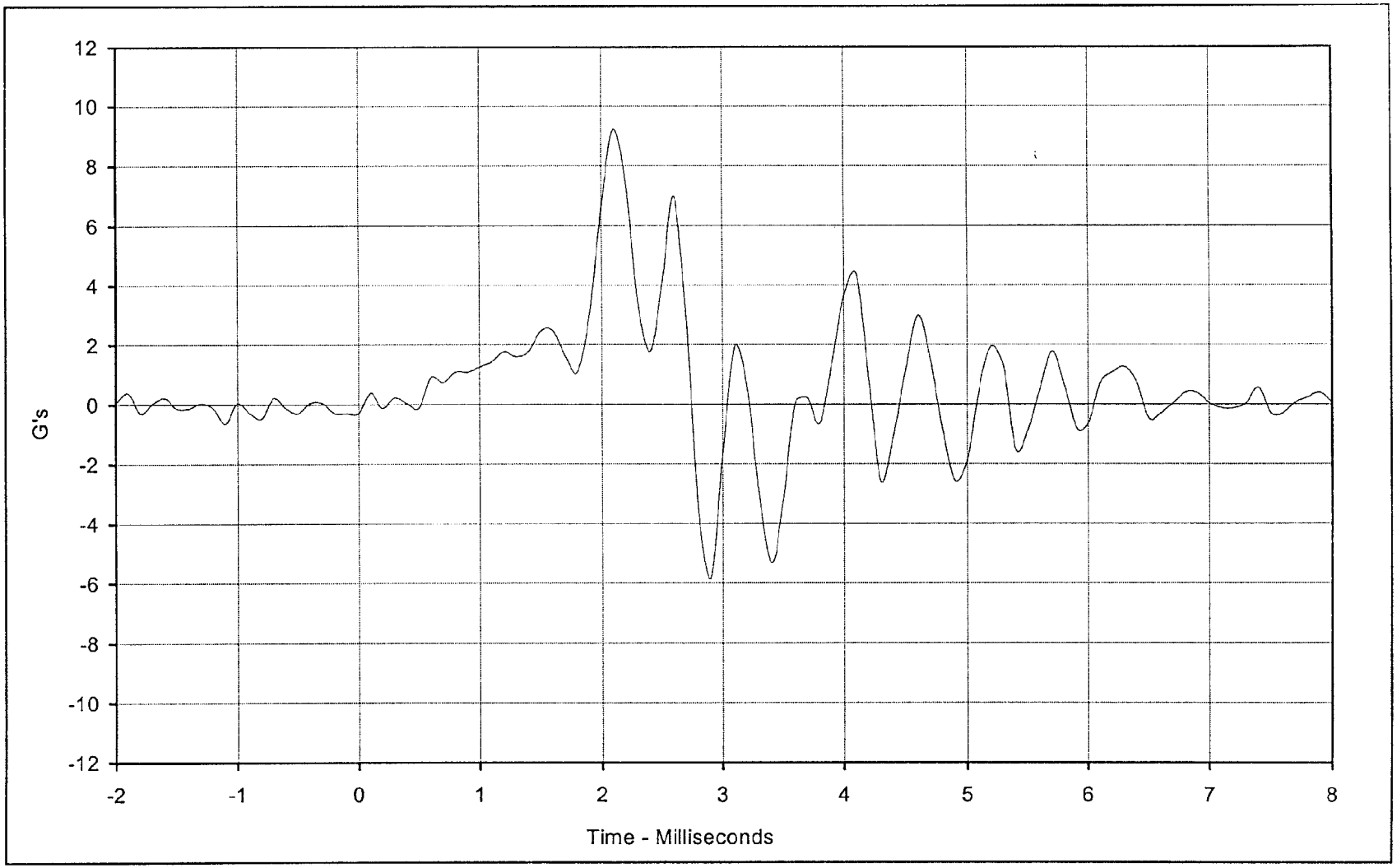


Curve Description:	Head Resultant Acceleration			
Maximum Value:	264.6	at	1.9	Milliseconds
Minimum Value:	0.8	at	6.6	Milliseconds
SAE Filter Class:	1000			
Date of Test:	9/17/97			
ATD Serial No.:	035			

Testing Program: Hybrid III Head Drop Calibration (Male)

Test Information: S/N of Part: N/A Test I.D.: MH006

KARCO Engineering



Curve Description: Head Acceleration Y Axis

Maximum Value: 9.2 at 2.1 Milliseconds

Minimum Value: -5.8 at 2.9 Milliseconds

SAE Filter Class: 1000

Date of Test: 9/17/97

ATD Serial No.: 035

Testing Program: Hybrid III Head Drop Calibration (Male)

Test Information: S/N of Part: N/A Test I.D.: MH006

KARCO Engineering

Hybrid III Calibration Data Sheet
50TH Percentile Male
Thorax Impact Test

ATD Serial No.: 35 Part Serial No.: N/A Test I.D.: H3CH1

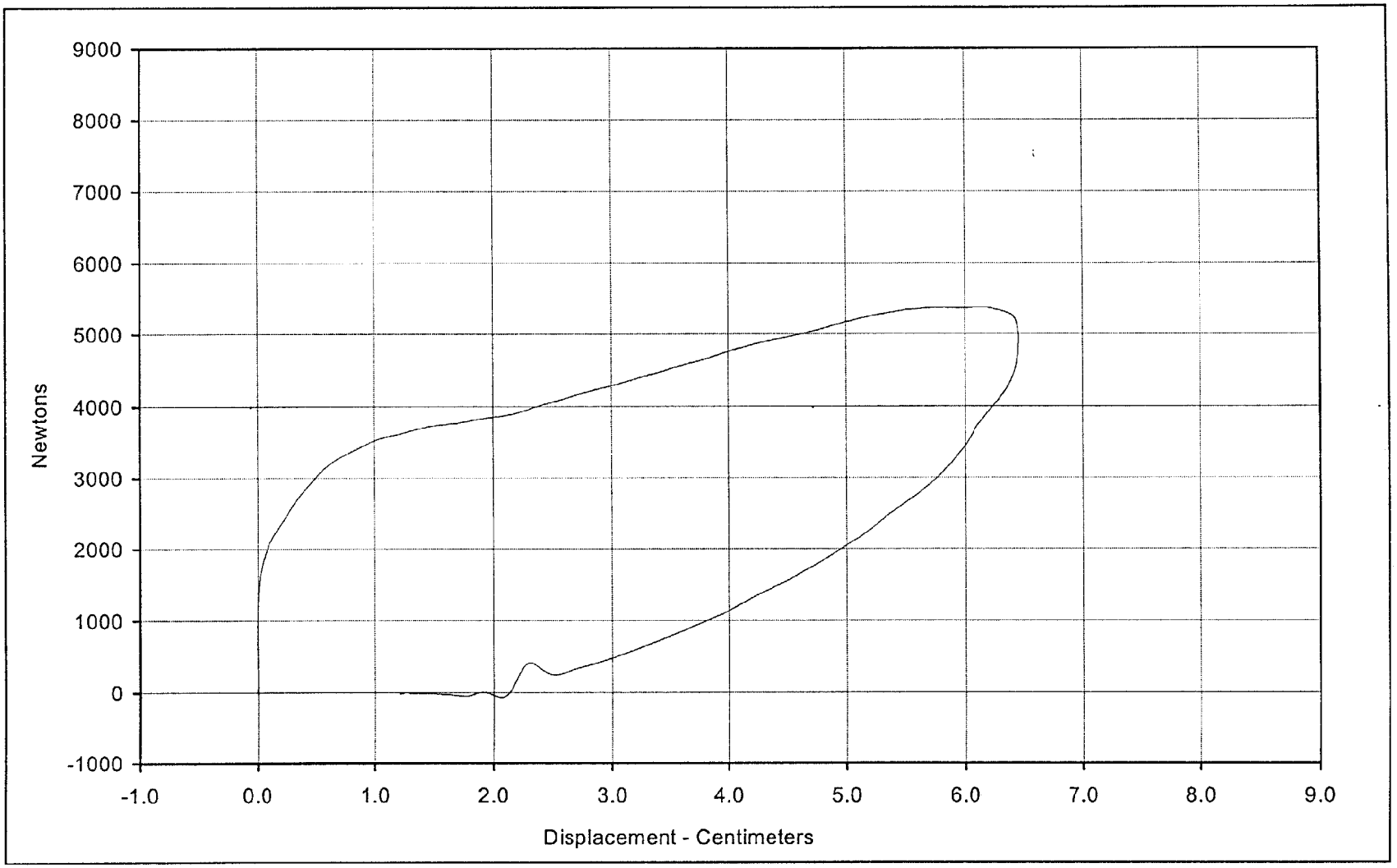
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	39	Pass
Probe Velocity	m/s	6.58 to 6.82	6.64	Pass
Peak Probe Force	Newtons	5159 to 5893	5370	Pass
Peak Sternum Displacement	CM	6.35 to 7.26	6.46	Pass
Internal Hysterysis	%	69 to 85	76.8	Pass
		Overall Test Results		Pass

Laboratory Technician

October 10, 1997
Test Date

Approved By

10/10/97
Date



Curve Description: Probe Force vs. Chest Displacement

Probe Force: 5370.0 Newtons

Chest Displ.: 6.46 Centimeters

SAE Filter Class: 180

Date of Test: 10/10/97

ATD Serial No.: 35

Testing Program: Hybrid III Thorax Impact Test

Test Information: S/N of Part: N/A Test I.D.: H3CH1

KARCO Engineering

KARC Engineering

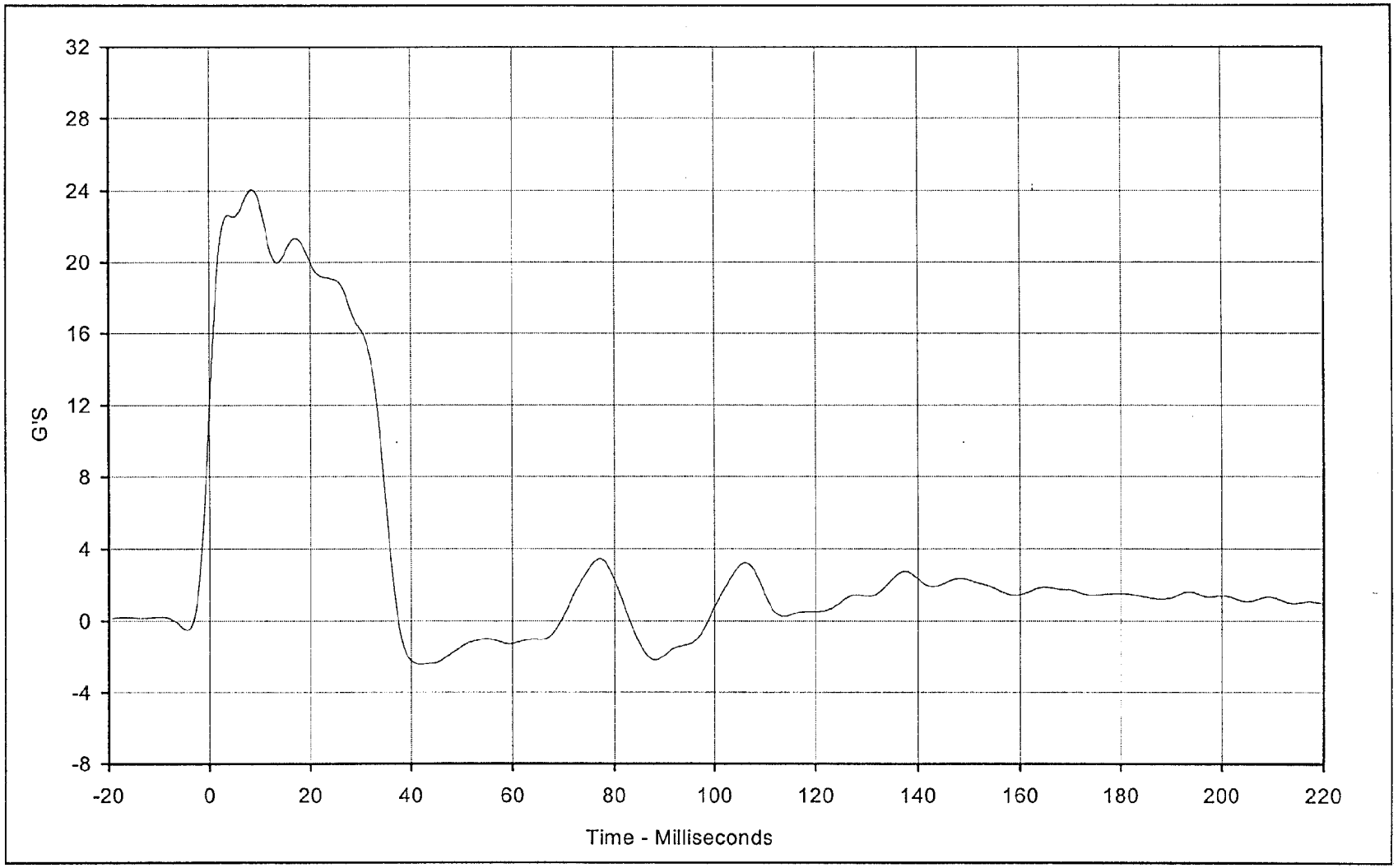
Hybrid III Calibration Data Sheet
50TH Percentile Male
Neck Flexion Test

ATD Serial No.: 35 Part Serial No.: N/A Test I.D.: MNF03

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	36	Pass
Pendulum Velocity		m/s	6.89 to 7.13	6.94	Pass
Pendulum Deceleration	10 Msec.	m/s	22.5 to 27.5	23.2	Pass
	20 Msec.	m/s	17.6 to 22.6	20.0	Pass
	30 Msec.	m/s	12.5 to 18.5	16.2	Pass
Peak Pendulum Decel. after 30 Msec.		G's	≤ 29.0	16.2	Pass
Deceleration Decay, Time to Cross 5 G's		Msec.	34.0 to 42.0	35.7	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	64.0 to 78.0	72.3	Pass
	Time	Msec.	57.0 to 64.0	59.9	Pass
"D" Plane Rotation Decay, Time To Zero Crossing		Msec.	113.0 to 128.0	115.3	Pass
Moment About Occipital Condyle	Maximum	N • m	84.1 to 108.5	94.7	Pass
	Time	Msec.	47.0 to 58.0	53.3	Pass
Positive Moment Decay, Time To Zero Crossing		Msec.	97.0 to 107.0	106.5	Pass
			Overall Test Results		Pass

Laboratory Technician — September 19, 1997 (Test Date)

Approved By — 9/19/97 (Date)

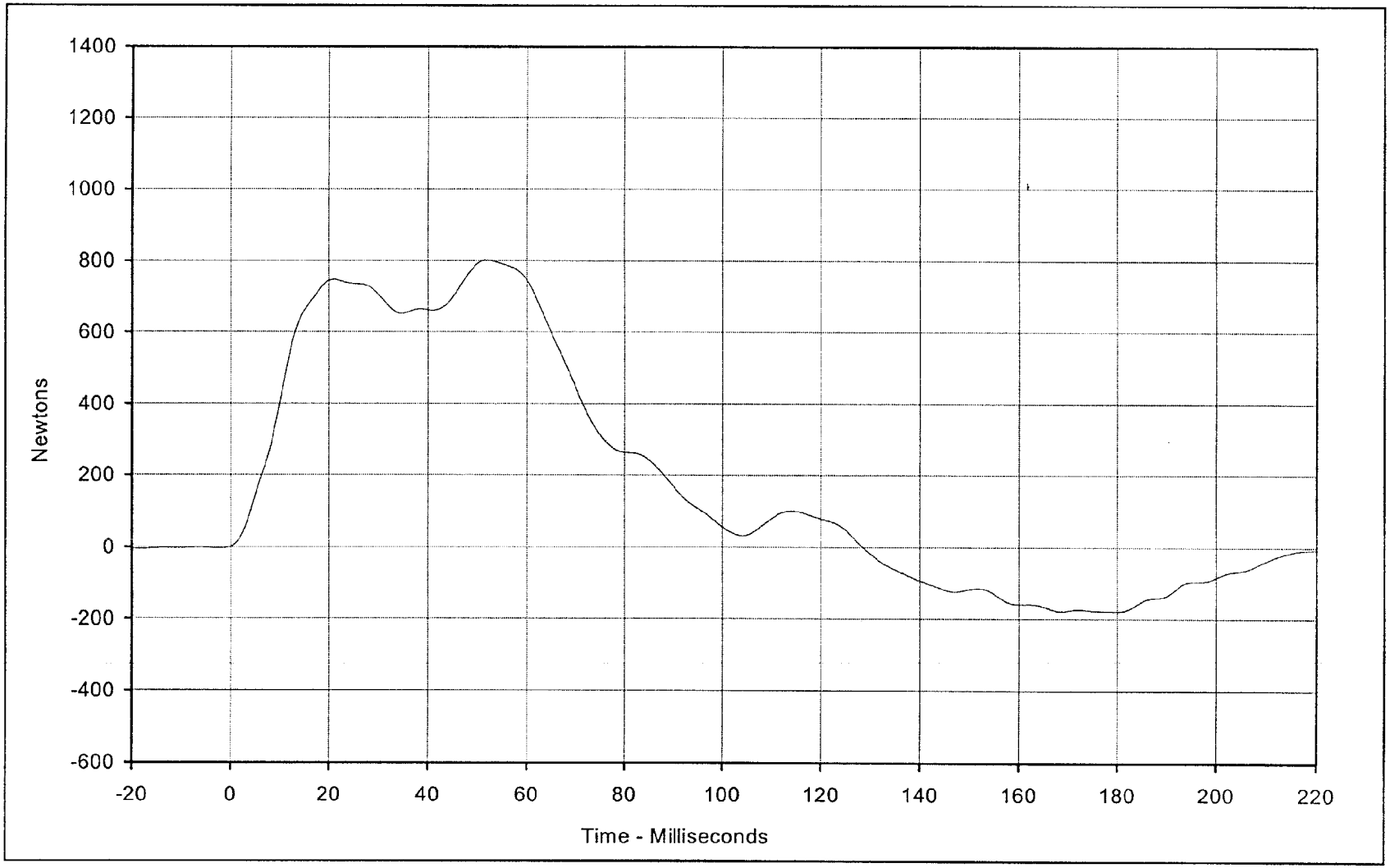


Curve Description:	Pendulum Deceleration			
Maximum Value:	24.1	at	8.4	Milliseconds
Minimum Value:	-2.4	at	41.9	Milliseconds
SAE Filter Class:	60			
Date of Test:	9/19/97			
ATD Serial No.:	35			

Testing Program: Hybrid III Neck Flexion Test (Male)

Test Information: S/N of Part: N/A Test I.D.: MNF03

KARCO Engineering



Curve Description: Neck Force X

Maximum Value: 801.7 at 52.0 Milliseconds

Minimum Value: -179.2 at 179.8 Milliseconds

SAE Filter Class: 60

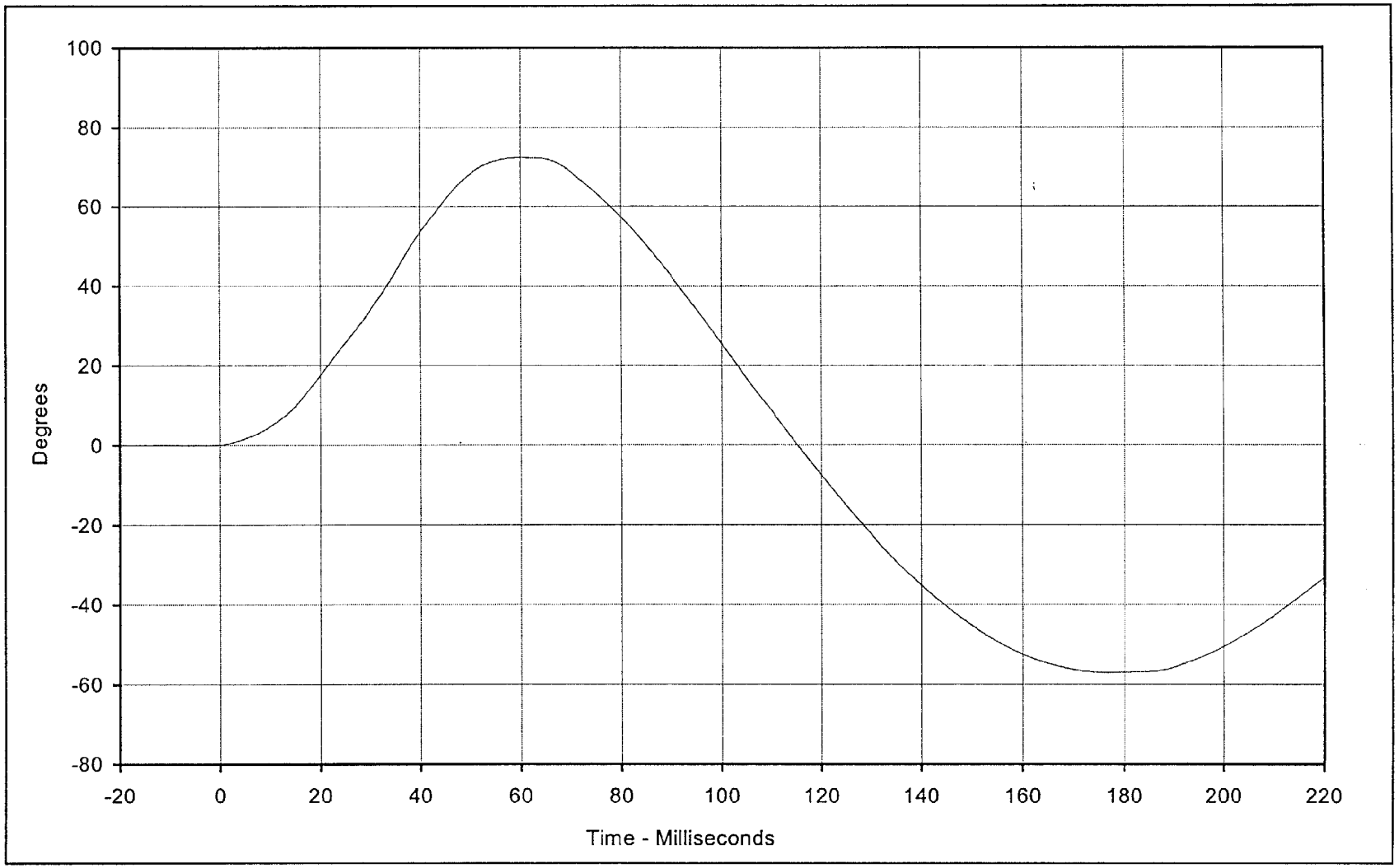
Date of Test: 9/19/97

ATD Serial No.: 35

Testing Program: Hybrid III Neck Flexion Test (Male)

Test Information: S/N of Part: N/A Test I.D.: MNF03

KARCO Engineering



Curve Description: "D" Plane Rotation

Maximum Value: 72.3 at 59.9 Milliseconds

Minimum Value: -57.1 at 176.5 Milliseconds

SAE Filter Class: 60

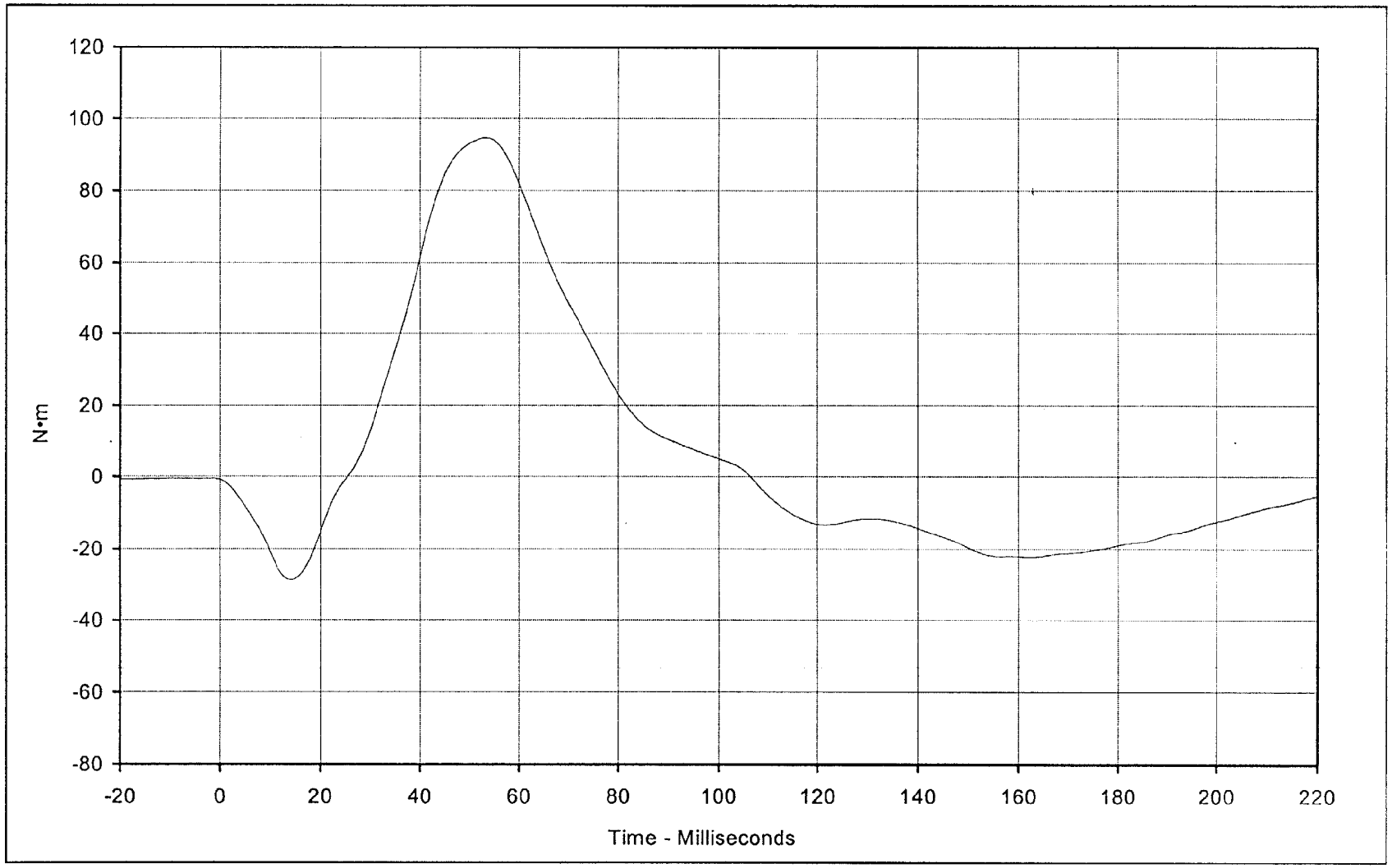
Date of Test: 9/19/97

ATD Serial No.: 35

Testing Program: Hybrid III Neck Flexion Test (Male)

Test Information: S/N of Part: N/A Test I.D.: MNF03

KARCO Engineering



Curve Description: Moment About Occipital Condyles

Maximum Value: 94.7 at 53.3 Milliseconds

Minimum Value: -28.7 at 14.2 Milliseconds

SAE Filter Class: 60

Date of Test: 9/19/97

ATD Serial No.: 35

Testing Program: Hybrid III Neck Flexion Test (Male)

Test Information: S/N of Part: N/A Test I.D.: MNF03

KARCO Engineering

KARCO Engineering

Hybrid III Calibration Data Sheet
50TH Percentile Male
Neck Extension Test

ATD Serial No.: _____ Part Serial No.: 35 Test I.D.: NE002

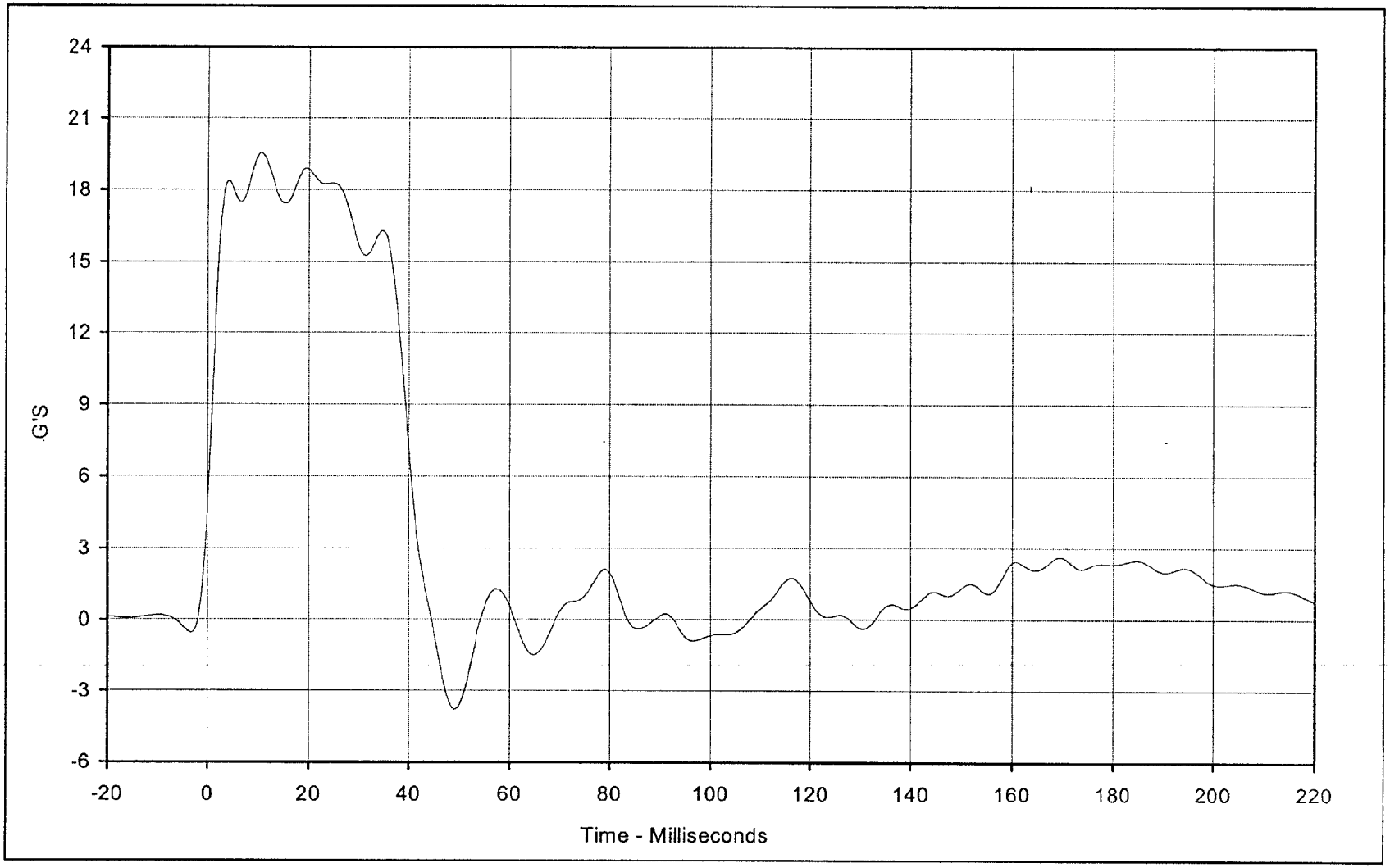
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	36	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.08	Pass
Pendulum Deceleration	10 Msec.	G's	17.2 to 21.2	19.5	Pass
	20 Msec.	G's	14.0 to 19.0	18.8	Pass
	30 Msec.	G's	11.0 to 16.0	15.6	Pass
Peak Pendulum Decel. after 30 Msec.		G's	≤ 22.0	16.3	Pass
Deceleration Decay, Time to Cross 5 G's		Msec.	38.0 to 46.0	40.9	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	101.8	Pass
	Time	Msec.	72.0 to 82.0	76.1	Pass
"D" Plane Rotation Decay, Time To Zero Crossing		Msec.	147.0 to 174.0	156.6	Pass
Moment About Occipital Condyle	Maximum	N • m	-52.9 to- 79.9	-65.3	Pass
	Time	Msec.	65.0 to 79.0	70.7	Pass
Negative Moment Decay, Time To Zero Crossing		Msec.	120.0 to 148.0	127.8	Pass
			Overall Test Results		Pass

Laboratory Technician

September 19, 1997
Test Date

Approved By

9/19/97
Date



Curve Description: Pendulum Deceleration

Maximum Value: 19.5 at 10.4 Milliseconds

Minimum Value: -3.8 at 49.0 Milliseconds

SAE Filter Class: 60

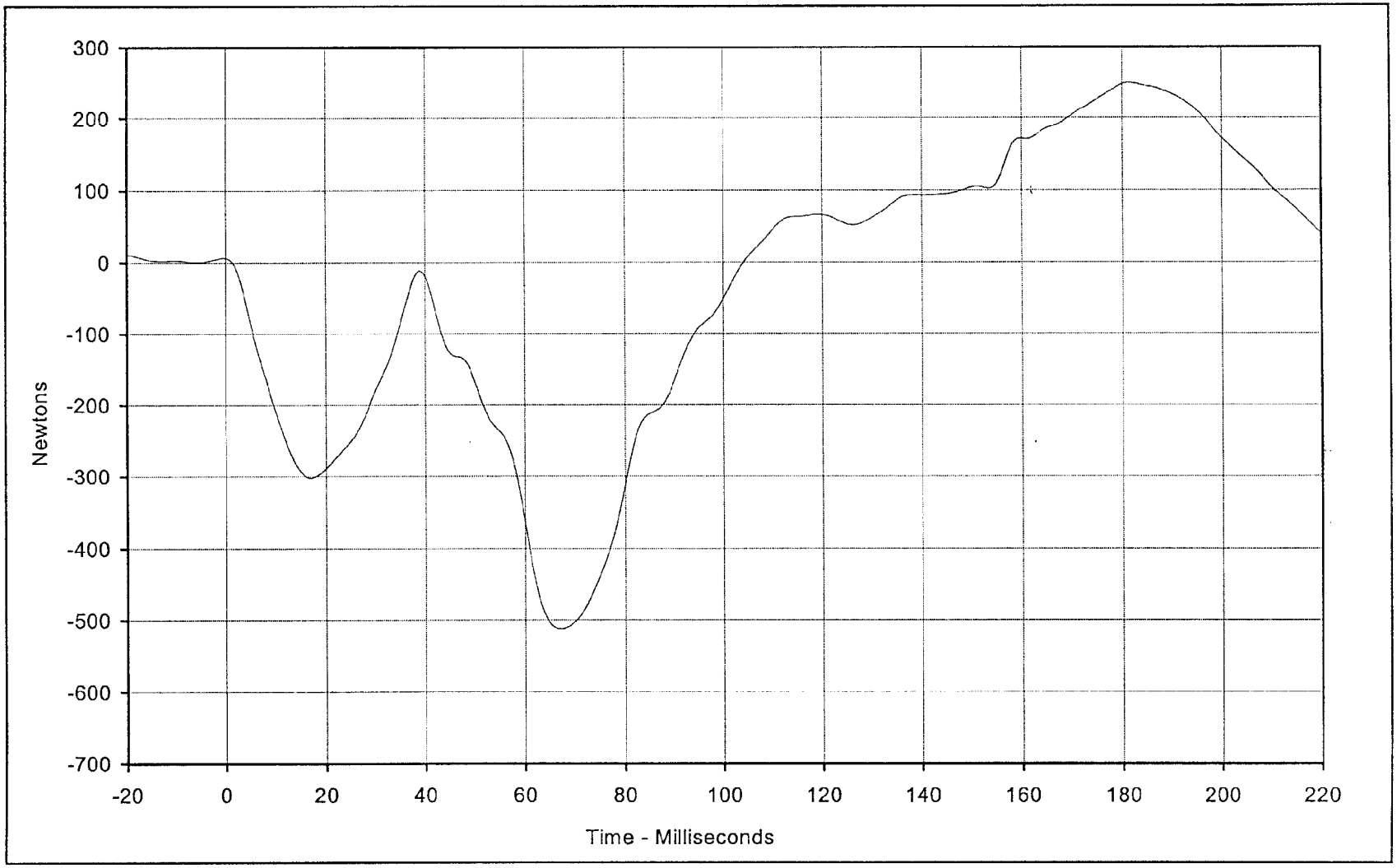
Date of Test: 9/19/97

ATD Serial No.:

Testing Program: Hybrid III Neck Extension Test (Male)

Test Information: S/N of Part: 35 Test I.D.: NE002

KARCO Engineering



Curve Description: Neck Force X

Maximum Value: 249.1 at 181.3 Milliseconds

Minimum Value: -511.9 at 66.8 Milliseconds

SAE Filter Class: 60

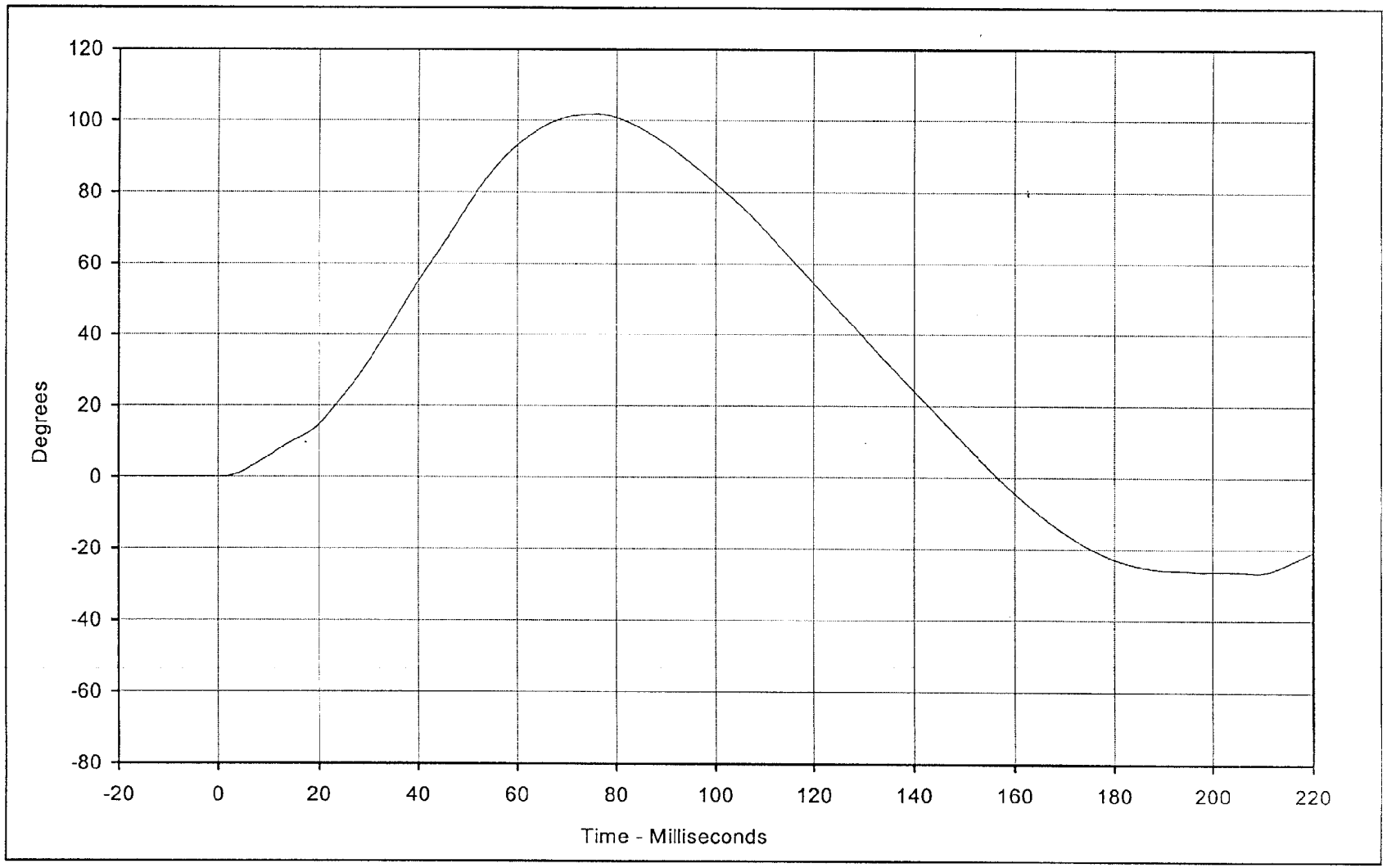
Date of Test: 9/19/97

ATD Serial No.:

Testing Program: Hybrid III Neck Extension Test (Male)

Test Information: S/N of Part: 35 Test I.D.: NE002

KARCO Engineering



Curve Description: "D" Plane Rotation

Maximum Value: 101.8 at 76.1 Milliseconds

Minimum Value: -26.6 at 208.8 Milliseconds

SAE Filter Class: 60

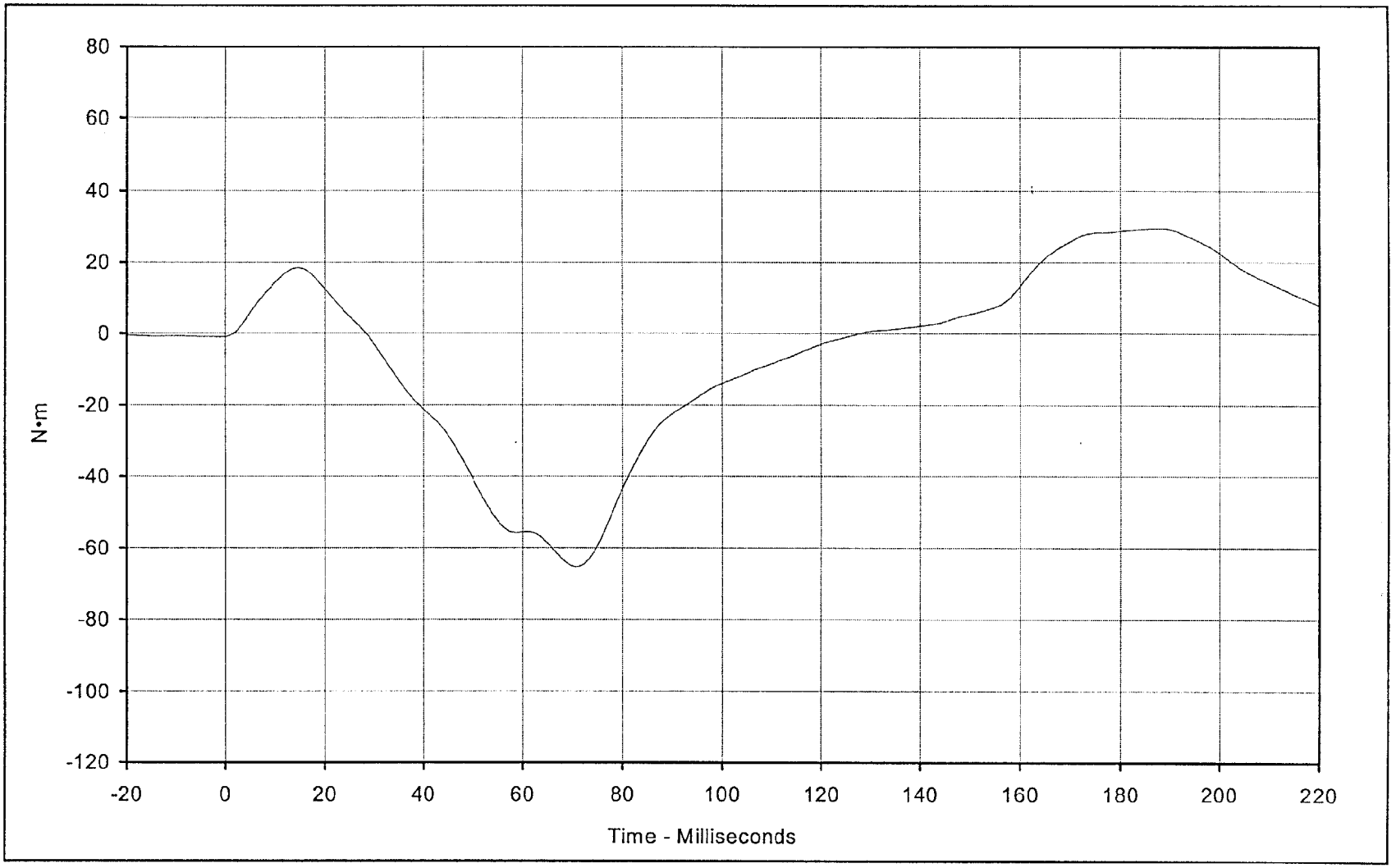
Date of Test: 9/19/97

ATD Serial No.:

Testing Program: Hybrid III Neck Extension Test (Male)

Test Information: S/N of Part: 35 Test I.D.: NE002

KARCO Engineering



Curve Description:	Moment About Occipital Condyles			Testing Program:	Hybrid III Neck Extension Test (Male)
Maximum Value:	29.4	at	187.7 Milliseconds	Test Information:	S/N of Part: 35 Test I.D.: NE002
Minimum Value:	-65.3	at	70.7 Milliseconds		
SAE Filter Class:	60				
Date of Test:	9/19/97				
ATD Serial No.:					

KARC Engineering

Hybrid III Calibration Data Sheet
50TH Percentile Male
External Measurements

ATD Serial No.: 035 Part Serial No.: N/A Test I.D.: N/A

External Measurement Data				
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory temperature	°C	20.4 to 22.1	20.9	Pass
Laboratory relative humidity	%	10 to 70	43.0	Pass
A - Total sitting height	mm	878.8 to 889.0	882.0	Pass
B - Shoulder pivot height	mm	505.5 to 520.7	515.0	Pass
C - "H" point height	mm	83.8 to 88.9	88.0	Pass
D - "H" point from seat back	mm	134.6 to 139.7	138.1	Pass
E - Shoulder pivot from back	mm	83.8 to 94.0	85.0	Pass
F - Thigh clearance	mm	139.7 to 154.9	150.0	Pass
G - Elbow back to wrist pivot	mm	289.6 to 304.8	300.0	Pass
H - Skull cap to back line	mm	40.6 to 45.7	44.0	Pass
I - Shoulder to elbow length	mm	330.2 to 345.4	341.0	Pass
J - Elbow rest height	mm	190.5 to 210.8	209.0	Pass
K - Buttock to knee length	mm	579.1 to 604.5	590.0	Pass
L - Poplipteal length	mm	429.3 to 454.7	441.0	Pass
M - Knee pivot height	mm	485.1 to 500.4	490.7	Pass
N - Buttock poplipteal length	mm	452.1 to 477.5	467.0	Pass
O - Chest depth	mm	213.4 to 228.6	215.0	Pass
P - Foot length	mm	251.5 to 266.7	260.0	Pass
V - Shoulder breadth	mm	421.6 to 436.9	431.0	Pass
W - Foot breadth	mm	91.4 to 106.7	99.0	Pass
Y - Chest circumference	mm	970.3 to 1000.8	998.0	Pass
Z - Waist circumference	mm	835.7 to 866.1	860.0	Pass
AA - Location for chest circumference	mm	429.3 to 434.3	430.0	Pass
BB - Location for waist circumference	mm	226.1 to 231.1	229.0	Pass
		Overall Test Results		Pass

Laboratory Technician — October 12, 1997 (Test Date)

Approved By — 10/12/97 (Date)

APPENDIX F

VEHICLE OWNER'S MANUAL

OCCUPANT RESTRAINT INSTRUCTIONS

To close the split folding rear seat, push the seatback up until you hear a click. Then pull on the seatback to make sure it is secure.

Safety Belts: They're for Everyone

This part of the manual tells you how to use safety belts properly. It also tells you some things you should not do with safety belts.

And it explains the Supplemental Restraint System (SRS), or air bag system.

⚠CAUTION:

Don't let anyone ride where he or she can't wear a safety belt properly. If you are in a crash and you're not wearing a safety belt, your injuries can be much worse. You can hit things inside the vehicle or be ejected from it. You can be seriously injured or killed. In the same crash, you might not be if you are buckled up. Always fasten your safety belt, and check that your passengers' belts are fastened properly too.

⚠CAUTION:

It is extremely dangerous to ride in a cargo area, inside or outside of a vehicle. In a collision, people riding in these areas are more likely to be seriously injured or killed. Do not allow people to ride in any area of your vehicle that is not equipped with seats and safety belts. Be sure everyone in your vehicle is in a seat and using a safety belt properly.

Your vehicle has a light that comes on as a reminder to buckle up. (See "Safety Belt Reminder Light" in the Index.)

In most states and Canadian provinces, the law says to wear safety belts. Here's why: They *work*.

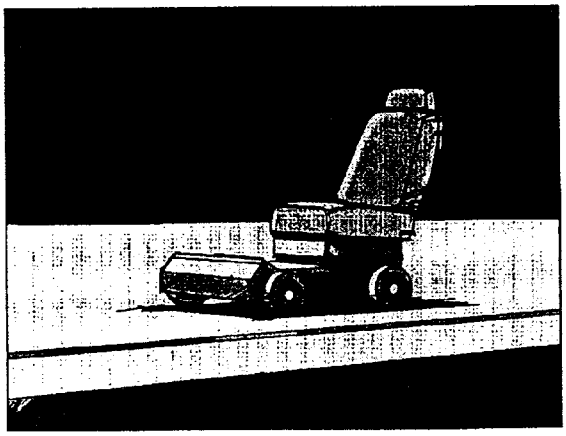
You never know if you'll be in a crash. If you do have a crash, you don't know if it will be a bad one.

A few crashes are mild, and some crashes can be so serious that even buckled up a person wouldn't survive. But most crashes are in between. In many of them, people who buckle up can survive and sometimes walk away. Without belts they could have been badly hurt or killed.

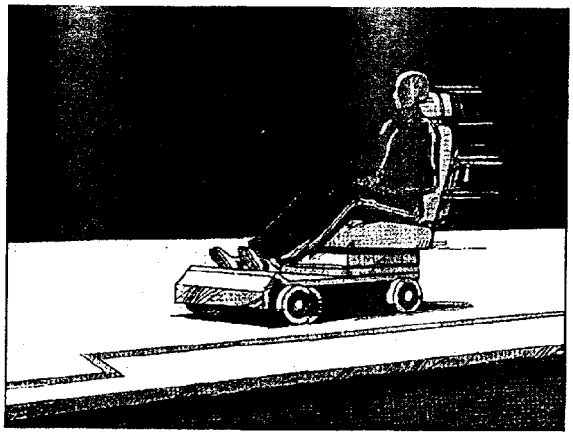
After more than 30 years of safety belts in vehicles, the facts are clear. In most crashes buckling up does matter . . . a lot!

Why Safety Belts Work

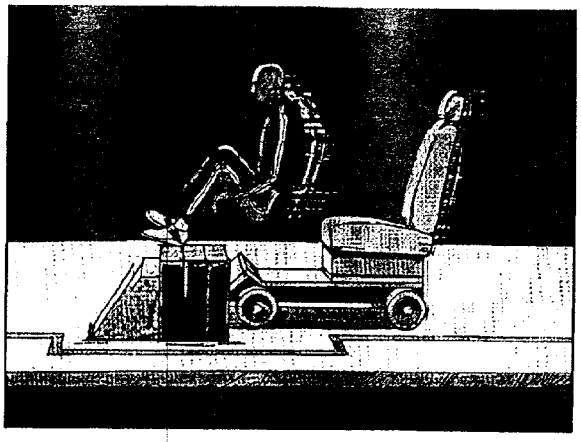
When you ride in or on anything, you go as fast as it goes.



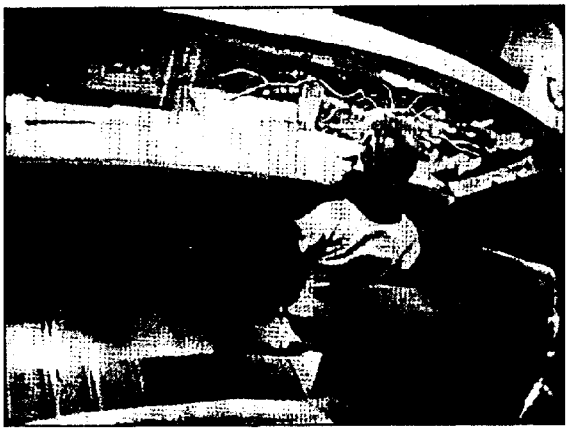
Take the simplest vehicle. Suppose it's just a seat on wheels.



Put someone on it.

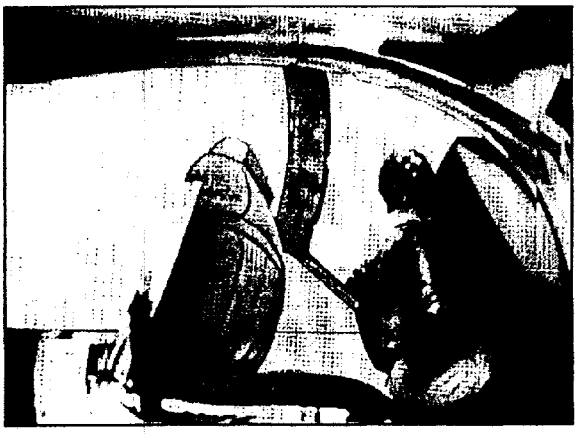


Get it up to speed. Then stop the vehicle. The rider doesn't stop.

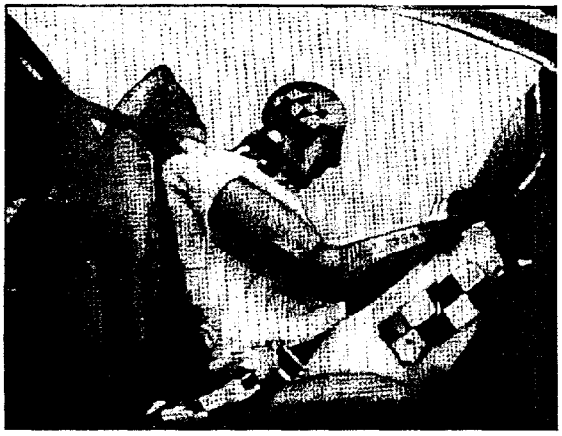


The person keeps going untiil stopped by something.

In a real vehicle, it could be the windshield ...



or the instrument panel ...



or the safety belts!

With safety belts, you slow down as the vehicle does. You get more time to stop. You stop over more distance, and your strongest bones take the forces. That's why safety belts make such good sense.

Here Are Questions Many People Ask About Safety Belts -- and the Answers

Q: Won't I be trapped in the vehicle after an accident if I'm wearing a safety belt?

A: You *could* be -- whether you're wearing a safety belt or not. But you can unbuckle a safety belt, even if you're upside down. And your chance of being conscious during and after an accident, so you *can* unbuckle and get out, is much greater if you are belted.

Q: If my vehicle has air bags, why should I have to wear safety belts?

A: Air bags are in many vehicles today and will be in most of them in the future. But they are supplemental systems only; so they work *with* safety belts -- not instead of them. Every air bag system ever offered for sale has required the use of safety belts. Even if you're in a vehicle that has air bags, you still have to buckle up to get the most protection. That's true not only in frontal collisions, but especially in side and other collisions.

Q: If I'm a good driver, and I never drive far from home, why should I wear safety belts?

A: You may be an excellent driver, but if you're in an accident -- even one that isn't your fault -- you and your passengers can be hurt. Being a good driver doesn't protect you from things beyond your control, such as bad drivers.

Most accidents occur within 25 miles (40 km) of home. And the greatest number of serious injuries and deaths occur at speeds of less than 40 mph (65 km/h).

Safety belts are for everyone.

How to Wear Safety Belts Properly

Adults

This part is only for people of adult size.

Be aware that there are special things to know about safety belts and children. And there are different rules for smaller children and babies. If a child will be riding in your vehicle, see the part of this manual called "Children." Follow those rules for everyone's protection.

First, you'll want to know which restraint systems your vehicle has.

We'll start with the driver position.

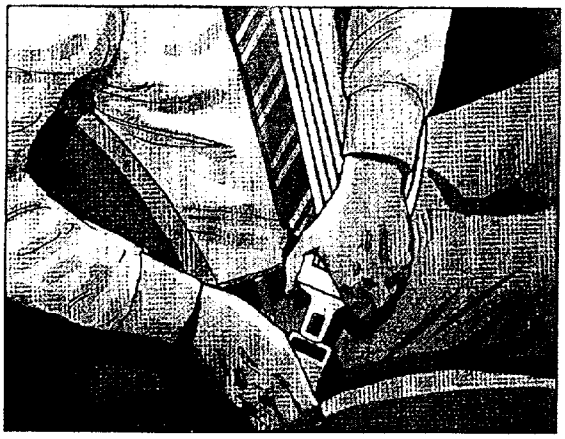
Driver Position

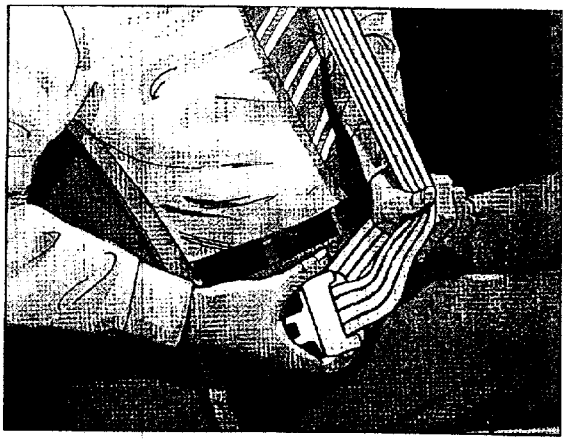
This part describes the driver's restraint system.

Lap-Shoulder Belt

The driver has a lap-shoulder belt. Here's how to wear it properly.

1. Close and lock the door.
2. Adjust the seat (to see how, see "Seats" in the Index) so you can sit up straight.





3. Pick up the latch plate and pull the belt across you. Don't let it get twisted.

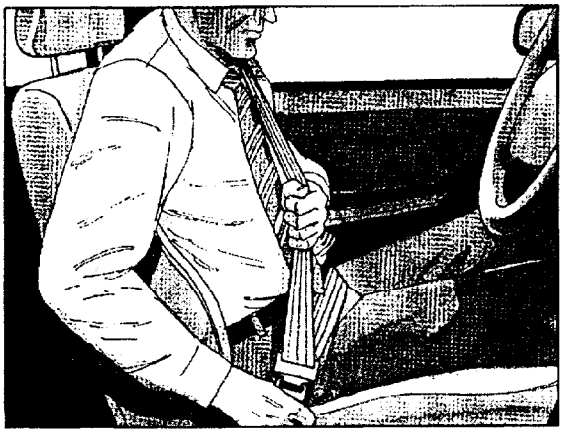
   The shoulder belt may lock if you pull the belt across you very quickly. If this happens, let the belt go back slightly to unlock it. Then pull the belt across you more slowly.

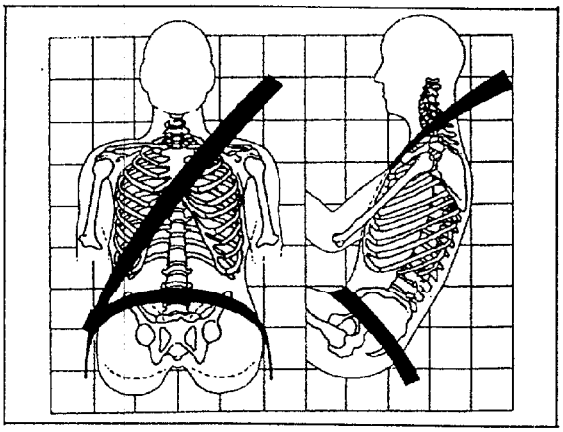
4. Push the latch plate into the buckle until it clicks.

If the belt stops before it reaches the buckle, tilt the latch plate and keep pulling until you can buckle the belt.

Pull up on the latch plate to make sure it is secure. If the belt isn't long enough, see "Safety Belt Extender" at the end of this section.

Make sure the release button on the buckle is positioned so you would be able to unbuckle the safety belt quickly if you ever had to.





5. To make the lap part tight, pull down on the buckle end of the belt as you pull up on the shoulder belt.

The lap part of the belt should be worn low and snug on the hips, just touching the thighs. In a crash, this applies force to the strong pelvic bones. And you'd be less likely to slide under the lap belt. If you slid under it, the belt would apply force at your abdomen. This could cause serious or even fatal injuries. The shoulder belt should go over the shoulder and across the chest. These parts of the body are best able to take belt restraining forces.

The safety belt locks if there's a sudden stop or crash, or if you pull the belt very quickly out of the retractor.

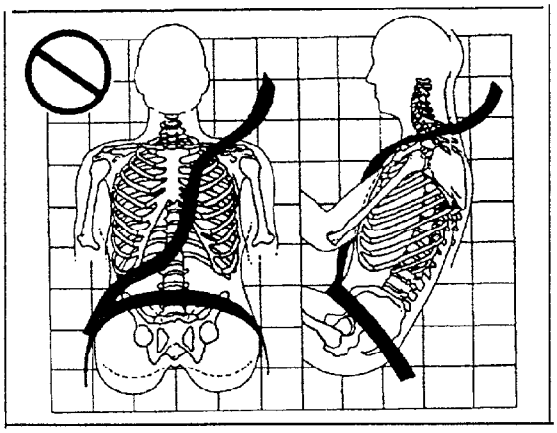
Shoulder Belt Height Adjuster

Before you begin to drive, move the shoulder belt adjuster to the height that is right for you.

To move it down, squeeze the release button and move the adjuster to the desired position. You can move the adjuster up just by pushing up on the shoulder belt guide. After you move the adjuster to where you want it, try to move it down without squeezing the release button to make sure it has locked into position.

Adjust the height so that the shoulder portion of the belt is centered on your shoulder. The belt should be away from your face and neck, but not falling off your shoulder.

Q: What's wrong with this?

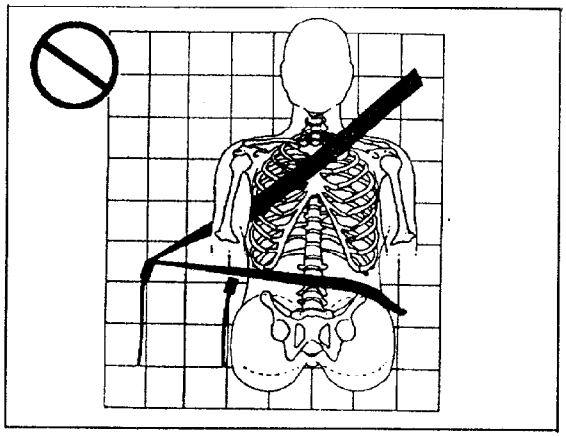


A: The shoulder belt is too loose. It won't give nearly as much protection this way.

⚠CAUTION:

You can be seriously hurt if your shoulder belt is too loose. In a crash, you would move forward too much, which could increase injury. The shoulder belt should fit against your body.

Q: What's wrong with this?

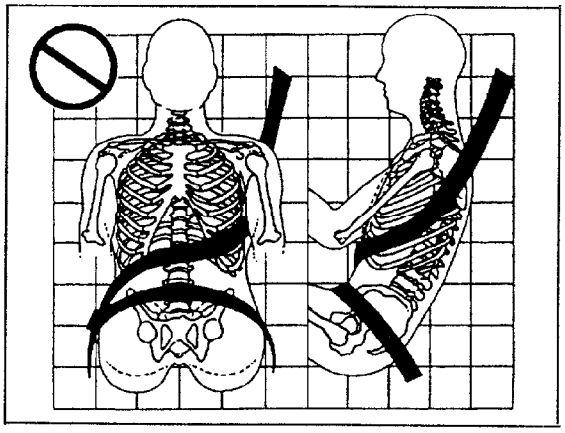


A: The belt is buckled in the wrong place.

⚠CAUTION:

You can be seriously injured if your belt is buckled in the wrong place like this. In a crash, the belt would go up over your abdomen. The belt forces would be there, not at the pelvic bones. This could cause serious internal injuries. Always buckle your belt into the buckle nearest you.

Q: What's wrong with this?

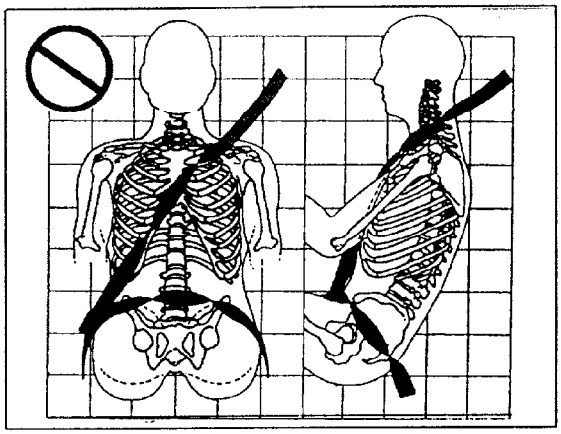


A: The shoulder belt is worn under the arm. It should be worn over the shoulder at all times.

⚠CAUTION:

You can be seriously injured if you wear the shoulder belt under your arm. In a crash, your body would move too far forward, which would increase the chance of head and neck injury. Also, the belt would apply too much force to the ribs, which aren't as strong as shoulder bones. You could also severely injure internal organs like your liver or spleen.

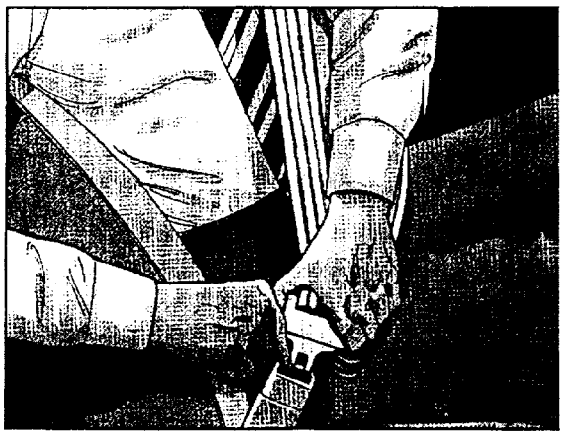
Q: **What's wrong** with this?



A: The belt is twisted across the body.

⚠ CAUTION:

You can be seriously injured by a twisted belt. In a crash, you wouldn't have the full width of the belt to spread impact forces. If a belt is twisted, make it straight so it can work properly, or ask your dealer to fix it.

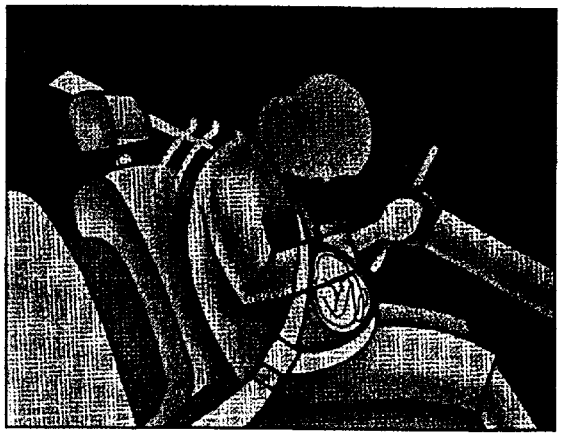


To unlatch the belt, just push the button on the buckle. The belt should go back out of the way.

Before you close the door, be sure the belt is out of the way. If you slam the door on it, you can damage both the belt and your vehicle.

Safety Belt Use During Pregnancy

Safety belts work for everyone, including pregnant women. Like all occupants, they are more likely to be seriously injured if they don't wear safety belts.



A pregnant woman should wear a lap-shoulder belt, and the lap portion should be worn as low as possible, below the rounding, throughout the pregnancy.

The best way to protect the fetus is to protect the mother. When a safety belt is worn properly, it's more likely that the fetus won't be hurt in a crash. For pregnant women, as for anyone, the key to making safety belts effective is wearing them properly.

Right Front Passenger Position

The right front passenger's safety belt works the same way as the driver's safety belt. See "Driver Position" earlier in this section.

Supplemental Restraint System (SRS)

This part explains the Supplemental Restraint System (SRS) or air bag system.

Your vehicle has two air bags -- one air bag for the driver and another air bag for the right front passenger.

Here are the most important things to know about the air bag system:

A! CAUTION:

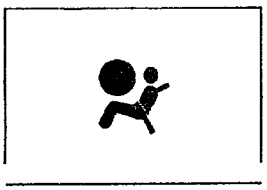
You can be severely injured or killed in a crash if you aren't wearing your safety belt -- even if you have air bags. Wearing your safety belt during a crash helps reduce your chance of hitting things inside the vehicle or being ejected from it. Air bags are "supplemental restraints" to the safety belts. All air bags are designed to work with safety belts, but don't replace them. Air bags are designed to work only in moderate to severe crashes where the front of your vehicle hits something. They aren't designed to inflate at all in rollover, rear, side or low-speed frontal crashes. Everyone in your vehicle should wear a safety belt properly -- whether or not there's an air bag for that person.

⚠CAUTION:

Air bags inflate with great force, faster than the blink of an eye. If you're too close to an inflating air bag, it could seriously injure you. Safety belts help keep you in position before and during a crash. Always wear your safety belt, even with air bags. The driver should sit as far back as possible while still maintaining control of the vehicle.

⚠CAUTION:

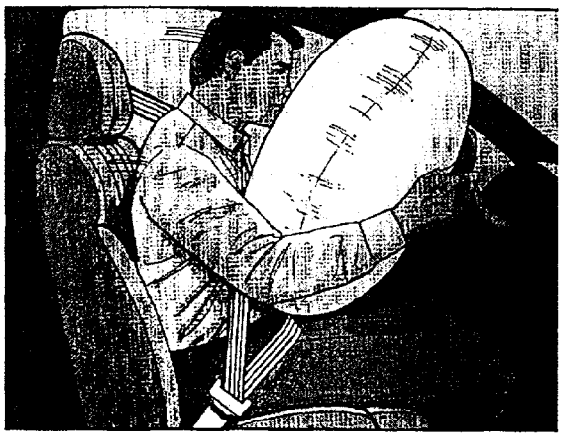
Children who are up against, or very close to, an air bag when it inflates can be seriously injured or killed. Air bags plus lap-shoulder belts offer the best protection for adults and older children, but not for young children and infants. Neither the vehicle's safety belt system nor its air bag system is designed for them. Young children and infants need the protection that a child restraint system can provide. Always secure children properly in your vehicle. To read how, see the part of this manual called "Children" and see the caution labels on the sunvisors and the right front passenger's safety belt.



There is an air bag readiness light on the instrument panel, which shows the air bag symbol.

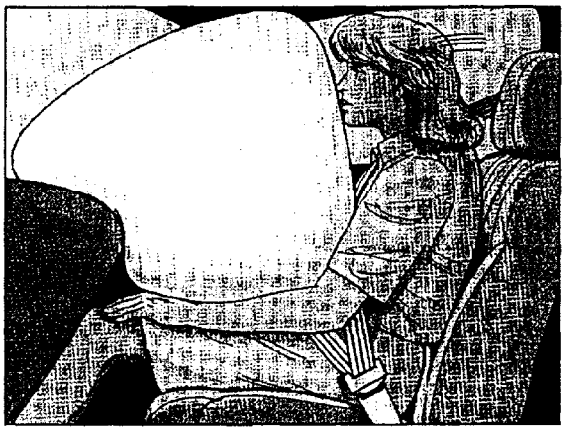
The system checks the air bag electrical system for malfunctions. The light tells you if there is an electrical problem. See "Air Bag Readiness Light" in the Index for more information.

How the Air Bag System Works



Where are the air bags?

The driver's air bag is in the middle of the steering wheel.



The right front passenger's air bag is in the instrument panel on the passenger's side.

⚠CAUTION:

If something is between an occupant and an air bag, the bag might not inflate properly or it might force the object into that person. The path of an inflating air bag must be kept clear. Don't put anything between an occupant and an air bag, and don't attach or put anything on the steering wheel hub or on or near any other air bag covering.

When should an air bag inflate?

An air bag is designed to inflate in a moderate to severe frontal or near-frontal crash. The air bag will inflate only if the impact speed is above the system's designed "threshold level." If your vehicle goes straight into a wall that doesn't move or deform, the threshold level is about 9 to 14 mph (14 to 23 km/h). The threshold level can vary, however, with specific vehicle design, so that it can be somewhat above or below this range. If your vehicle strikes something that will move or deform, such as a parked car, the threshold level will be higher. The air bag is not designed to inflate in rollovers, side impacts or rear impacts, because inflation would not help the occupant.

In any particular crash, no one can say whether an air bag should have inflated simply because of the damage to a vehicle or because of what the repair costs were. Inflation is determined by the angle of the impact and how quickly the vehicle slows down in frontal or near-frontal impacts.

What makes an air bag inflate?

In an impact of sufficient severity, the air bag sensing system detects that the vehicle is in a crash. The sensing system triggers a release of gas from the inflator, which inflates the air bag. The inflator, air bag and related hardware are all part of the air bag modules inside the steering wheel and in the instrument panel in front of the right front passenger.

How does an air bag restrain?

In moderate to severe frontal or near-frontal collisions, even belted occupants can contact the steering wheel or the instrument panel. Air bags supplement the protection provided by safety belts. Air bags distribute the force of the impact more evenly over the occupant's upper body, stopping the occupant more gradually. But air bags would not help you in many types of collisions, including rollovers, rear impacts and side impacts, primarily because an occupant's motion is not toward those air bags. Air bags should never be regarded as anything more than a supplement to safety belts, and then only in moderate to severe frontal or near-frontal collisions.

What will you see after an air bag inflates?

After an air bag inflates, it quickly deflates, so quickly that some people may not even realize the air bag inflated. Some components of the air bag module -- the steering wheel hub for the driver's air bag, or the instrument panel for the right front passenger's bag -- will be hot for a short time. The parts of the bag that come into contact with you may be warm, but not too hot to touch. There will be some smoke and dust coming from vents in the deflated air bags. Air bag inflation doesn't prevent the driver from seeing or from being able to steer the vehicle, nor does it stop people from leaving the vehicle.

⚠CAUTION:

When an air bag inflates, there is dust in the air. This dust could cause breathing problems for people with a history of asthma or other breathing trouble. To avoid this, everyone in the vehicle should get out as soon as it is safe to do so. If you have breathing problems but can't get out of the vehicle after an air bag inflates, then get fresh air by opening a window or door.

In many crashes severe enough to inflate an air bag, windshields are broken by vehicle deformation. Additional windshield breakage may also occur from the right front passenger air bag.

- Air bags are designed to inflate only once. After they inflate, you'll need some new parts for your air bag system. If you don't get them, the air bag system won't be there to help protect you in another crash. A new system will include air bag modules and possibly other parts. The service manual for your vehicle covers the need to replace other parts.
- Your vehicle is equipped with a crash sensing and diagnostic module, which records information about the air bag system. The module records information about the readiness of the system, when the sensors are activated and driver's safety belt usage at deployment.
- Let only qualified technicians work on your air bag system. Improper service can mean that your air bag system won't work properly. See your dealer for service.

NOTICE:

If you damage the covering for the driver's or the right front passenger's air bag, the bag may not work properly. You may have to replace the air bag module in the steering wheel or both the air bag module and the instrument panel for the right front passenger's air bag. Do not open or break the air bag coverings.

If your vehicle ever gets into a lot of water -- such as water up to the carpeting or higher -- or if water enters your vehicle and soaks the carpet, the air bag controller can be soaked and ruined. If this ever happens, and then you start your vehicle, the damage could make the air bags inflate, even if there's no crash. You would have to replace the air bags as well as the sensors and related parts. If your vehicle is ever in a flood, or if it's exposed to water that soaks the carpet, you can avoid needless repair costs by turning off the vehicle immediately. Don't let anyone start the vehicle, even to tow it, unless the battery cables are first disconnected.

Servicing Your Air Bag-Equipped Vehicle

Air bags affect how your vehicle should be serviced. There are parts of the air bag system in several places around your vehicle. You don't want the system to inflate while someone is working on your vehicle. Your dealer and the Malibu Service Manual have information about servicing your vehicle and the air bag system. To purchase a service manual, see "Service and Owner Publications" in the Index.

⚠CAUTION:

For up to 10 minutes after the ignition key is turned off and the battery is disconnected, an air bag can still inflate during improper service. You can be injured if you are close to an air bag when it inflates. Avoid yellow connectors. They are probably part of the air bag system. Be sure to follow proper service procedures, and make sure the person performing work for you is qualified to do so.

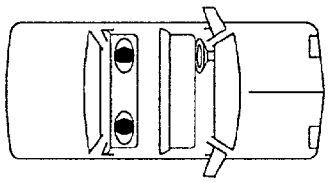
The air bag system does not need regular maintenance.

Rear Seat Passengers

It's very important for rear seat passengers to buckle up! Accident statistics show that unbelted people in the rear seat are hurt more often in crashes than those who are wearing safety belts.

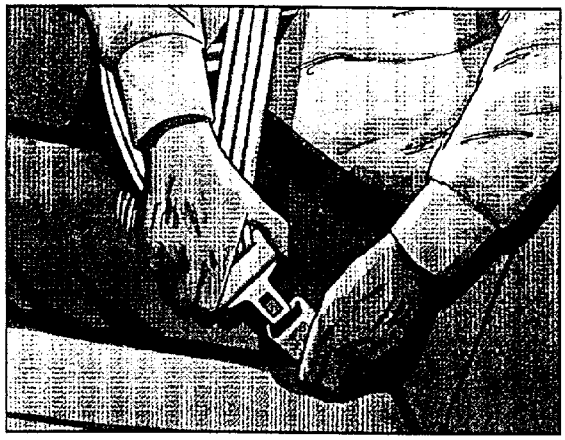
Rear passengers who aren't safety belted can be thrown out of the vehicle in a crash. And they can strike others in the vehicle who are wearing safety belts.

Rear Seat Outside Passenger Positions



Lap-Shoulder Belt

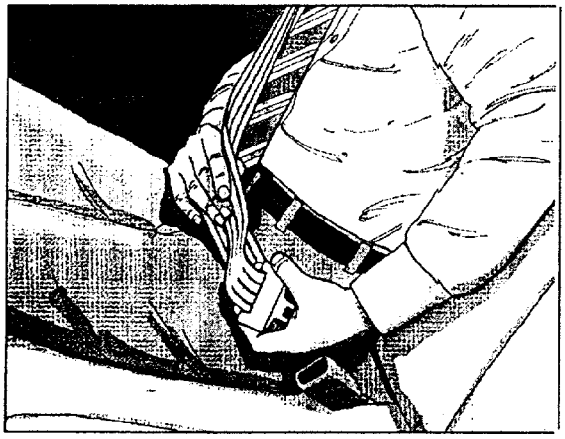
The positions next to the windows have lap-shoulder belts. Here's how to wear one properly.

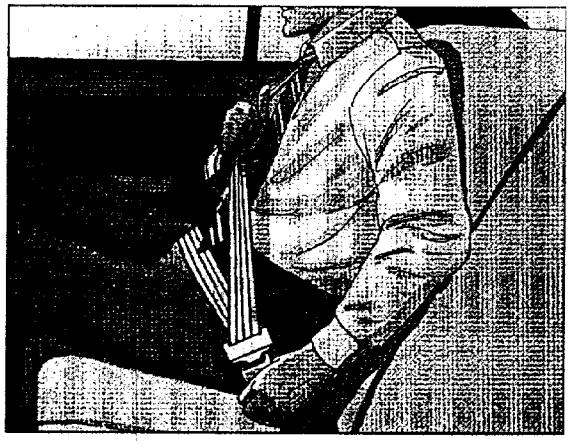


1. Pick up the latch plate and pull the belt across you. Don't let it get twisted.

   The shoulder belt may lock if you pull the belt across you very quickly. If this happens, let the belt go back slightly to unlock it. Then pull the belt across you more slowly.

2. Push the latch plate into the buckle until it clicks.



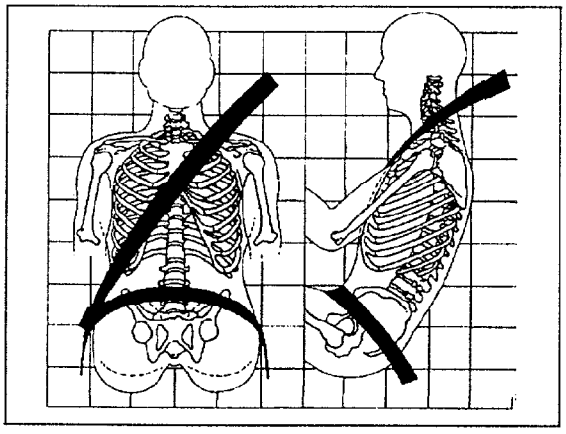


If the belt stops before it reaches the buckle, tilt the latch plate and keep pulling until you can buckle it.

Pull up on the latch plate to make sure it is secure.

If the belt is not long enough, see "Safety Belt Extender" at the end of this section. Make sure the release button on the buckle is positioned so you would be able to unbuckle the safety belt quickly if you ever had to.

3. To make the lap part tight, pull down on the buckle end of the belt as you pull up on the shoulder part.

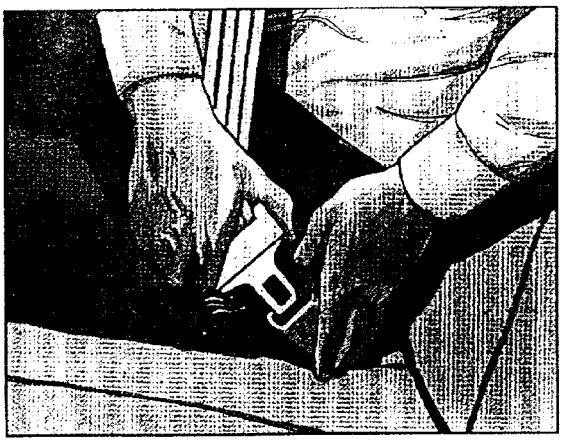


The lap part of the belt should be worn low and snug on the hips, just touching the thighs. In a crash, this applies force to the strong pelvic bones. And you'd be less likely to slide under the lap belt. If you slid under it, the belt would apply force at your abdomen. This could cause serious or even fatal injuries. The shoulder belt should go over the shoulder and across the chest. These parts of the body are best able to take belt restraining forces.

The safety belt locks if there's a sudden stop or a crash, or if you pull the belt very quickly out of the retractor.

⚠CAUTION:

You can be seriously hurt if your shoulder belt is too loose. In a crash, you would move forward too much, which could increase injury. The shoulder belt should fit against your body.

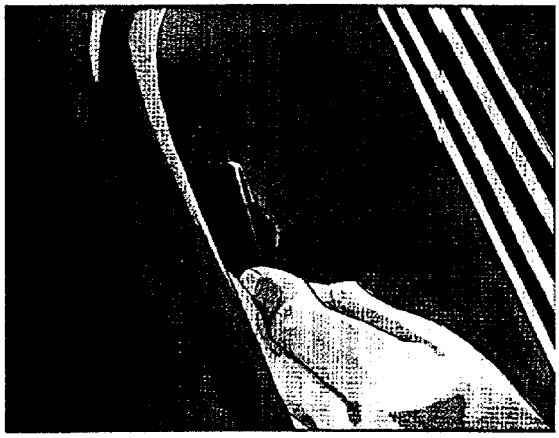


To unlatch the belt, just push the button on the buckle.

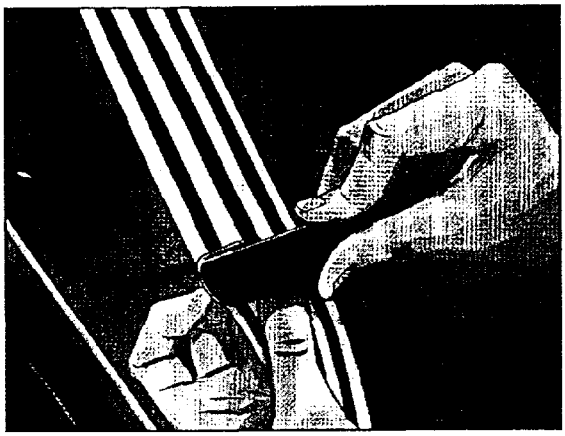
Rear Safety Belt Comfort Guides for Children and Small Adults

Rear shoulder belt comfort guides will provide added safety belt comfort for children who have outgrown child restraints and for small adults. When installed on a shoulder belt, the comfort guide pulls the belt away from the neck and head.

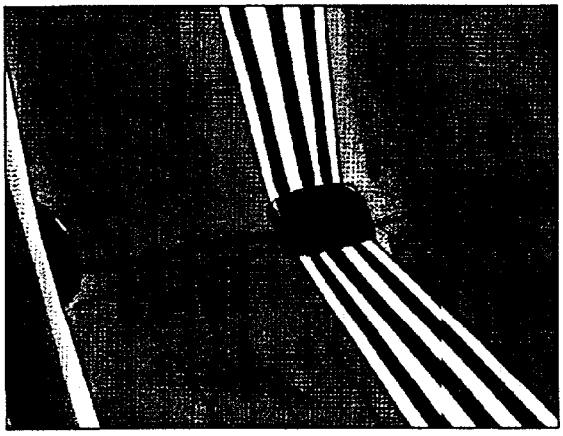
There is one guide for each outside passenger position in the rear seat. To provide added safety belt comfort for children who have outgrown child restraints and for smaller adults, the comfort guides may be installed on the shoulder belts. Here's how to install a comfort guide and use the safety belt:



1. Pull the elastic cord out from between the edge of the seatback and the interior body to remove the guide from its storage clip.



2. Slide the guide under and past the belt. The elastic cord must be under the belt. Then, place the guide over the belt, and insert the two edges of the belt into the slots of the guide.

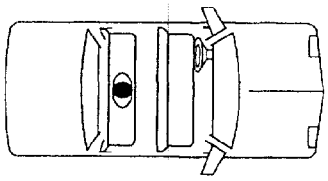


3. Be sure that the belt is not twisted and it lies flat. The elastic cord must be under the belt and the guide on top.

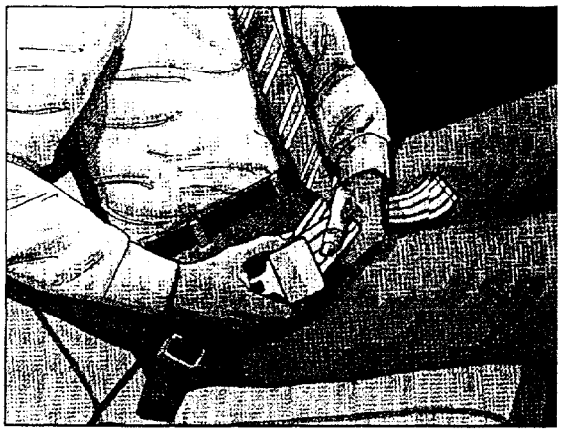
4. Buckle, position and release the safety belt as described in "Rear Seat Outside Passenger Positions" earlier in this section. Make sure that the shoulder belt crosses the shoulder.

To remove and store the comfort guides, squeeze the belt edges together so that you can take them out from the guides. Pull the guide upward to expose its storage clip, and then slide the guide onto the clip. Rotate the guide and clip inward and in between the seatback and the interior body, leaving only the loop of elastic cord exposed.

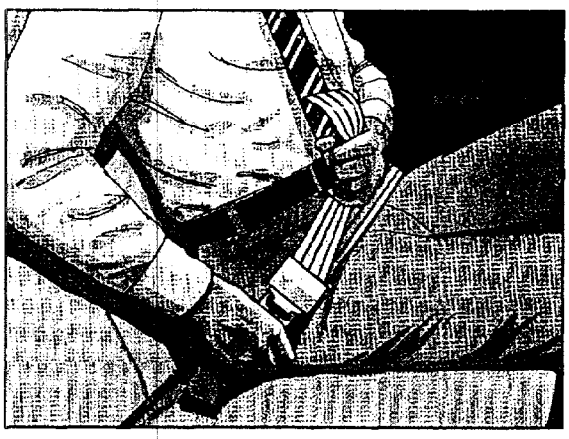
Center Passenger Position



Lap Belt



When you sit in the center seating position, you have a lap safety belt, which has no retractor. To make the belt longer, tilt the latch plate and pull it along the belt.



To make the belt shorter, pull its free end as shown until the belt is snug.

Buckle, position and release it the same way as the lap part of a lap-shoulder belt. If the belt isn't long enough, see "Safety Belt Extender" at the end of this section.

Make sure the release button on the buckle is positioned so you would be able to unbuckle the safety belt quickly if you ever had to.

Children

Everyone in a vehicle needs protection! That includes infants and all children smaller than adult size. Neither the distance traveled nor the age and size of the traveler changes the need, for everyone, to use safety restraints. In fact, the law in every state in the United States and in every Canadian province says children up to some age must be restrained while in a vehicle.

Smaller Children and Babies

⚠CAUTION:

Children who are up against, or very close to, an air bag when it inflates can be seriously injured or killed. Air bags plus lap-shoulder belts offer the best protection for adults and older children, but not for young children and infants. Neither the vehicle's safety belt system nor its air bag system is designed for them. Young children and infants need the protection that a child restraint system can provide. Always secure children properly in your vehicle.

⚠CAUTION:

Smaller children and babies should always be restrained in a child or infant restraint. The instructions for the restraint will say whether it is the right type and size for your child. A very young child's hip bones are so small that a regular belt might not stay low on the hips, as it should. Instead, the belt will likely be over the child's abdomen. In a crash, the belt would apply force right on the child's abdomen, which could cause serious or fatal injuries. So, be sure that any child small enough for one is always properly restrained in a child or infant restraint.

Infants need complete support, including support for the head and neck. This is necessary because an infant's neck is weak and its head weighs so much compared with the rest of its body. In a crash, an infant in a rear-facing restraint settles into the restraint, so the crash forces can be distributed across the strongest part of the infant's body, the back and shoulders. A baby should be secured in an appropriate infant restraint. This is so important that many hospitals today won't release a newborn infant to its parents unless there is an infant restraint available for the baby's first trip in a motor vehicle.

⚠CAUTION:

Never hold a baby in your arms while riding in a vehicle. A baby doesn't weigh much -- until a crash. During a crash a baby will become so heavy you can't hold it. For example, in a crash

CAUTION: (Continued)

CAUTION: (Continued)

at only 25 mph (40 km/h), a 12-lb. (5.5 kg) baby will suddenly become a 240-lb. (110 kg) force on your arms. The baby would be almost impossible to hold.

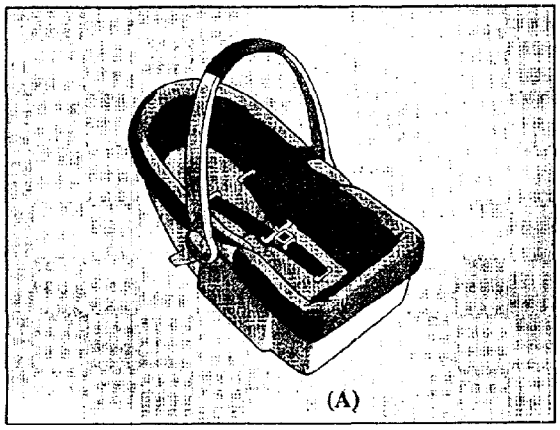
Secure the baby in an infant restraint.

Child Restraints

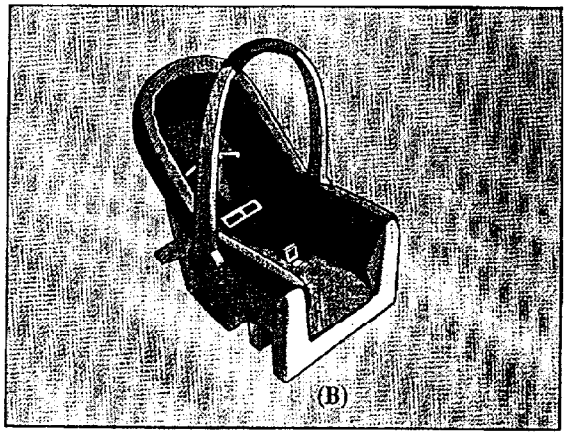
Every time infants and young children ride in vehicles, they should have protection provided by appropriate restraints.

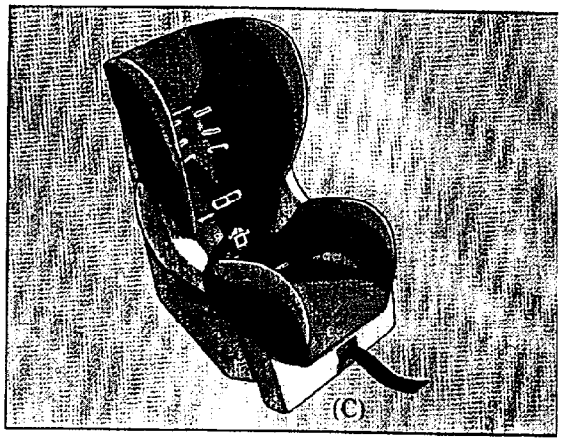
Q: **What are the different types of add-on child restraints?**

A: Add-on child restraints are available in four basic types. When selecting a child restraint, take into consideration not only the child's weight and size, but also whether or not the restraint will be compatible with the motor vehicle in which it will be used.

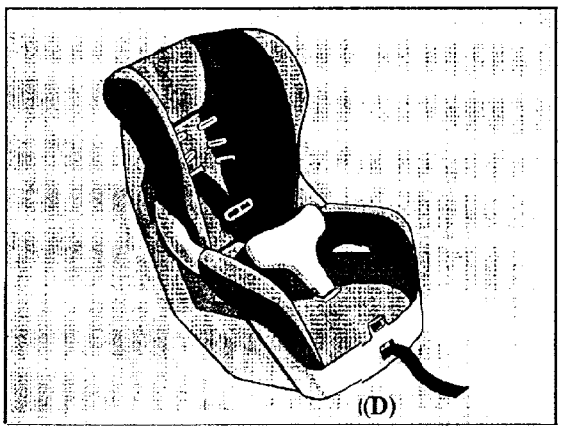


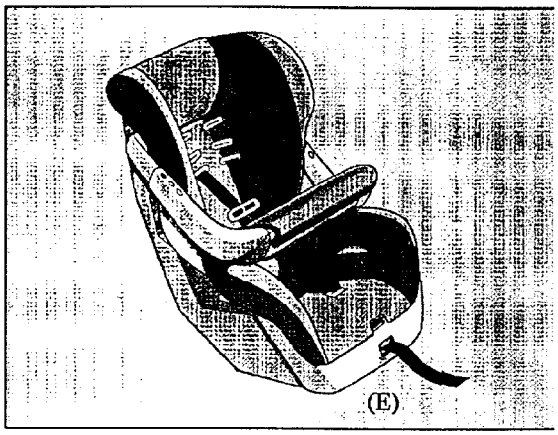
An infant car bed (A) is a special bed made for use in a motor vehicle. It's an infant restraint system designed to restrain or position a child on a continuous flat surface. With an infant car bed, make sure that the infant's head rests toward the center of the vehicle.



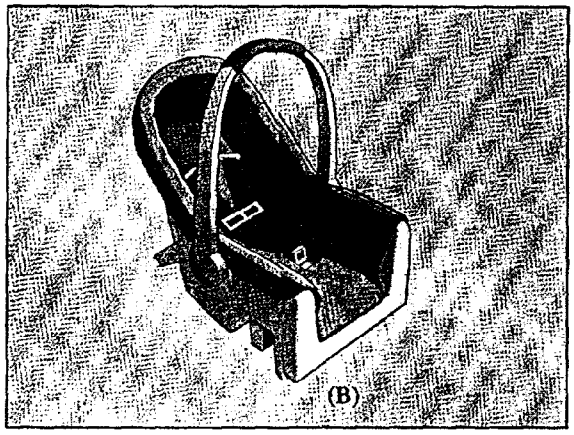


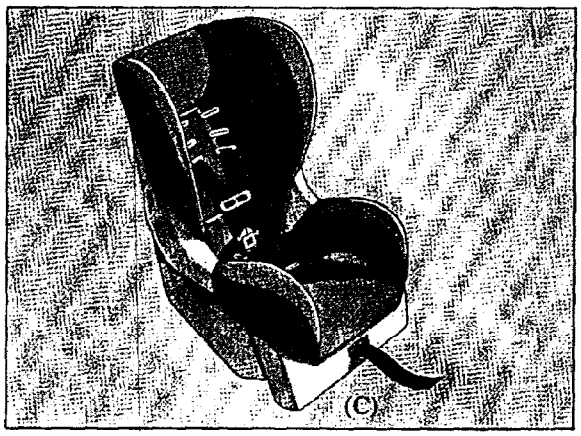
A rear-facing infant restraint (B) positions an infant to face the rear of the vehicle. Rear-facing infant restraints are designed for infants of up to about 20 lbs. (9 kg) and about one year of age. This type of restraint faces the rear so that the infant's head, neck and body can have the support they need in a crash. Some infant seats come in two parts -- the base stays secured in the vehicle and the seat part is removable.



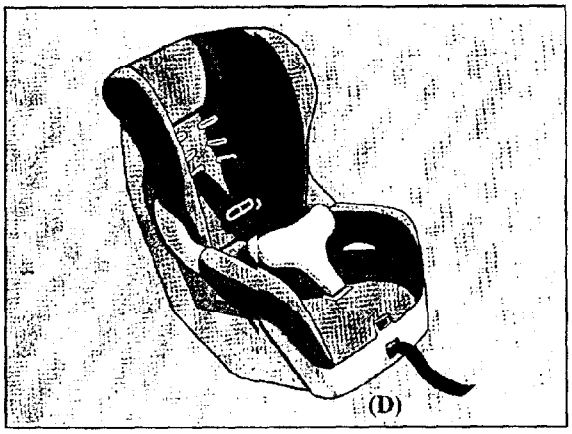


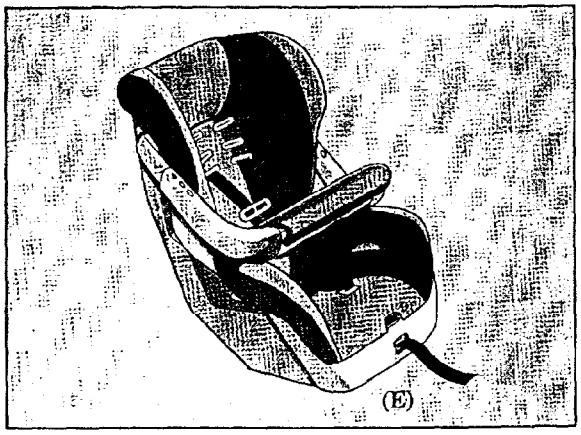
A forward-facing child restraint (C-E) positions a child upright to face forward in the vehicle. These forward-facing restraints are designed to help protect children who are from 20 to 40 lbs. (9 to 18 kg) and about 26 to 40 inches (66 to 102 cm) in height, or up to around four years of age. One type, a convertible restraint, is designed to be used either as a rear-facing infant seat or a forward-facing child seat.



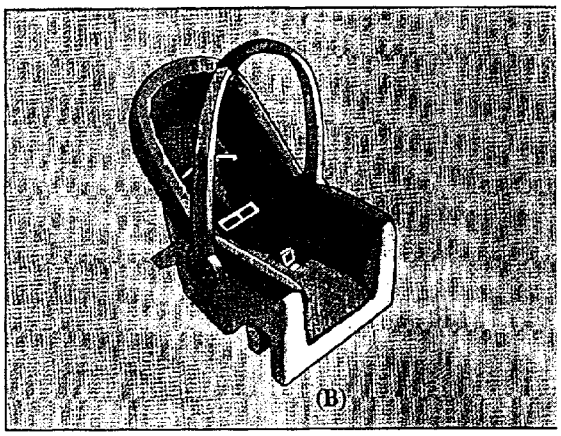


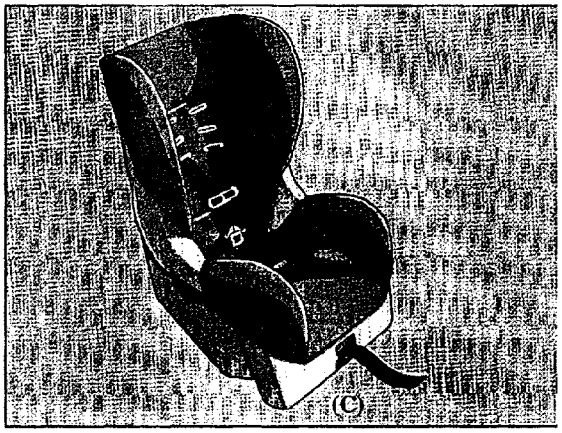
A rear-facing infant resstraint (B) positions an infant to face the rear of the vehicle. Rear-facing infant restraints are designed ffor infants of up to about 20 lbs. (9 kg) and aboutt one year of age. This type of restraint faces the rear so that the infant's head, neck and body can havee the support they need in a crash. Some infant seatss come in two parts -- the base stays secured in thee vehicle and the seat part is removable.



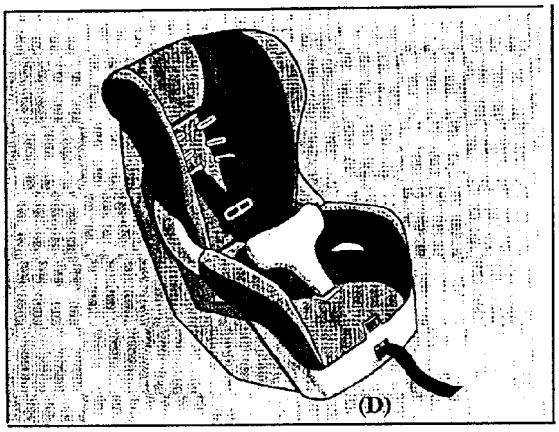


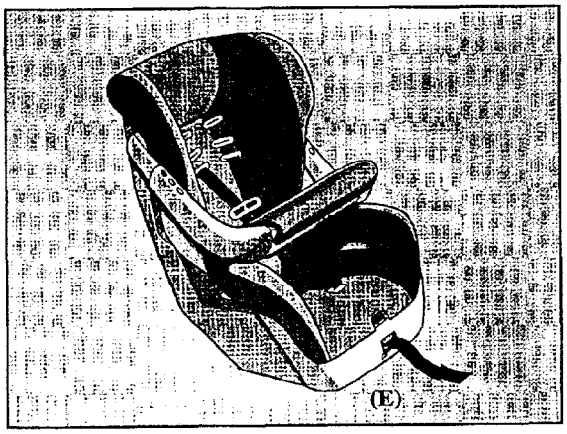
A fforward-facing child restraint (C-E) positiions a chiild upright to face forward in the vehicle. TIhese forrward-facing restraints are designed to help prootect children who are from 20 to 40 lbs. (9 tto 18 kg) and about 26 to 40 inches (665 to 102 cm) in height, or up to around four ;years of tage. One type, a convertible restraint, is dessigned to be used either as a rear-facing infaant seaat or a forward-facing child seat.



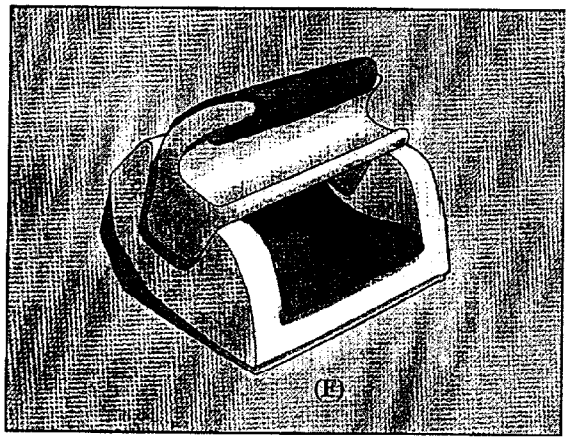


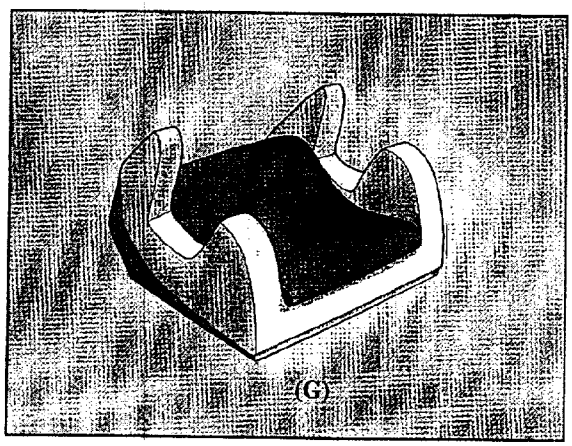
A rear-facing infant restraint (B) positions an infant to face the rear of the vehicle. Rear-facing infant restraints are designed for infants of up to about 20 lbs. (9 kg) and about one year of age. This type of restraint faces the rear so that the infant's head, neck and body can have the support they need in a crash. Some infant seats come in two parts -- the base stays secured in the vehicle and the seat part is removable.





A forward-facing child restraint (C-E) positions a child upright to face forward in the vehicle. These forward-facing restraints are designed to help protect children who are from 20 to 40 lbs. (9 to 18 kg) and about 26 to 40 inches (66 to 102 cm) in height, or up to around four years of age. One type, a convertible restraint, is designed to be used either as a rear-facing infant seat or a forward-facing child seat.





A booster seat (F, G) is designed for children who are about 40 to 60 lbs. (18 to 27 kg) and about four to eight years of age. It's designed to improve the fit of the vehicle's safety belt system. Booster seats with shields use lap-only belts; however, booster seats without shields use lap-shoulder belts. Booster seats can also help a child to see out the window.

When choosing a child restraint, be sure the child restraint is designed to be used in a vehicle. If it is, it will have a label saying that it meets Federal Motor Vehicle Safety Standards.

Then follow the instructions for the restraint. You may find these instructions on the restraint itself or in a booklet, or both. These restraints use the belt system in your vehicle, but the child also has to be secured within the restraint to help reduce the chance of personal injury. The instructions that come with the infant or child restraint will show you how to do that. Both the owner's manual and the child restraint instructions are important, so if either one of these is not available, obtain a replacement copy from the manufacturer.

Where to Put the Restraint

Accident statistics show that children are safer if they are restrained in the rear rather than the front seat. We at General Motors therefore recommend that you put your child restraint in the rear seat. Never put a rear-facing child restraint in the front passenger seat. Here's why:

⚠CAUTION:

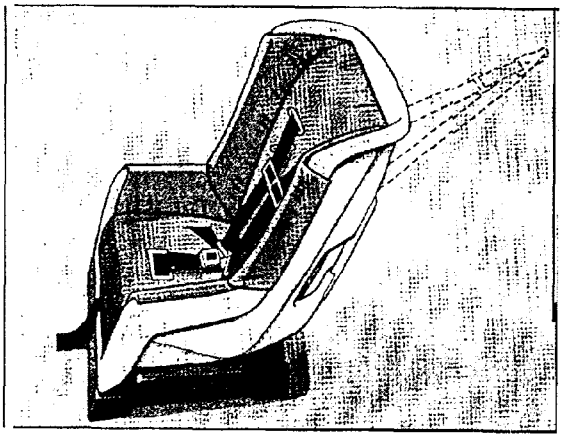
A child in a rear-facing child restraint can be seriously injured if the right front passenger's air bag inflates. This is because the back of a rear-facing child restraint would be very close to the inflating air bag. Always secure a rear-facing child restraint in the rear seat.

You may, however, secure a forward-facing child restraint in the right front seat. Before you secure a forward-facing child restraint, always move the front passenger seat as far back as it will go. Or, secure the child restraint in the rear seat.

Wherever you install it, be sure to secure the child restraint properly.

Keep in mind that an unsecured child restraint can move around in a collision or sudden stop and injure people in the vehicle. Be sure to properly secure any child restraint in your vehicle -- even when no child is in it.

Top Strap

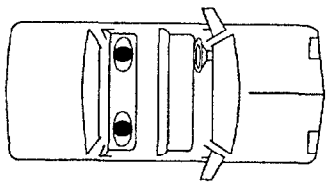


If your child restraint has a top strap, it should be anchored. If you need to have an anchor installed, you can ask your Chevrolet dealer to put it in for you. If you want to install an anchor yourself, your dealer can tell you how to do it.

Canadian law requires that child restraints have a top strap, and that the strap be anchored.

If your child restraint has a top strap, your dealer can obtain a kit with anchor hardware and installation instructions specifically designed for this vehicle. The dealer can then install the anchor for you. In Canada, this work will be done for you free of charge. Or, you may install the anchor yourself using the instructions provided in the kit.

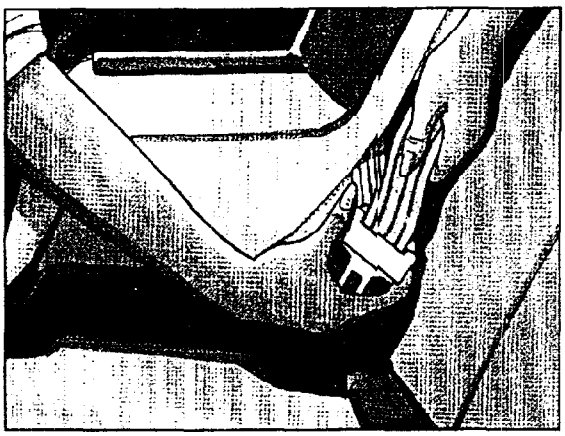
Securing a Child Restraint in a Rear Outside Seat Position



You'll be using the lap-shoulder belt. See the earlier part about the top strap if the child restraint has one. Be sure to follow the instructions that came with the child restraint. Secure the child in the child restraint when and as the instructions say.

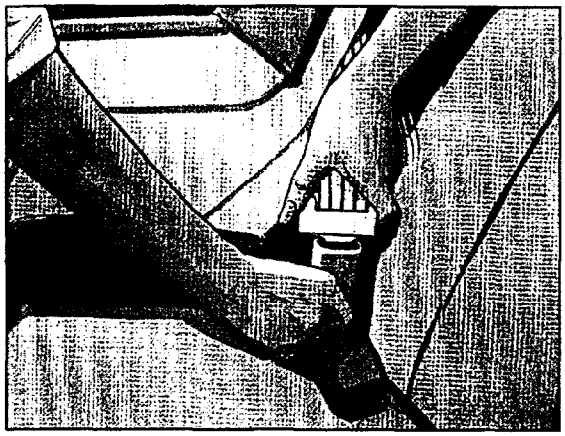
1. Put the restraint on the seat.

2. Pick up the latch plate, and run the lap and shoulder portions of the vehicle's safety belt through or around the restraint. The child restraint instructions will show you how.

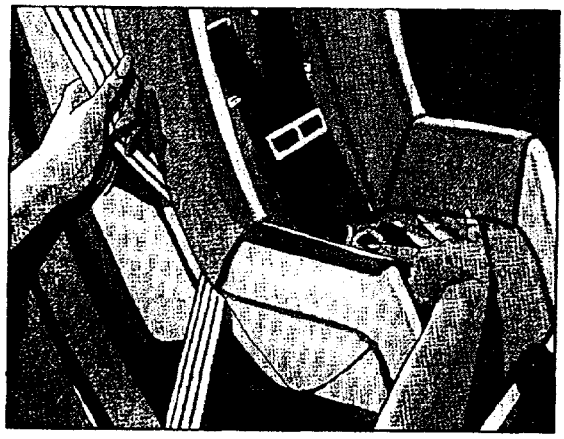


Tilt the latch plate to adjust the belt if needed.

If the shoulder belt goes in front of the child's face or neck, put it behind the child restraint.



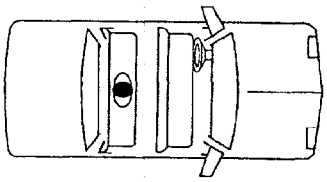
3. Buckle the belt. Make sure the release button is positioned so you would be able to unbuckle the safety belt quickly if you ever had to.



4. To tighten the belt, pull up on the shoulder belt while you push down on the child restraint. If you're using a forward-facing child restraint, you may find it helpful to use your knee to push down on the child restraint as you tighten the belt.
5. Push and pull the child restraint in different directions to be sure it is secure.

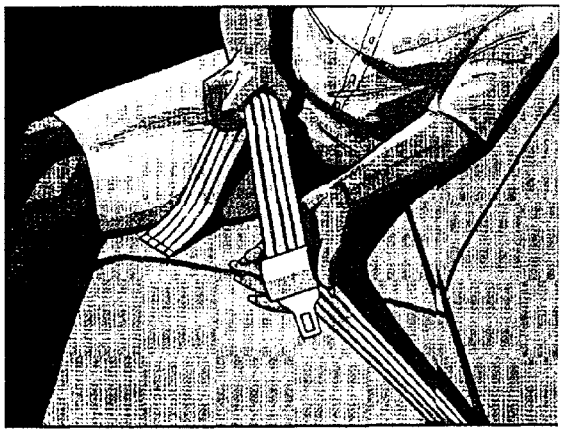
To remove the child restraint, just unbuckle the vehicle's safety belt and let it go back all the way. The safety belt will move freely again and be ready to work for an adult or larger child passenger.

Securing a Child Restraint in the Center Rear Seat Position

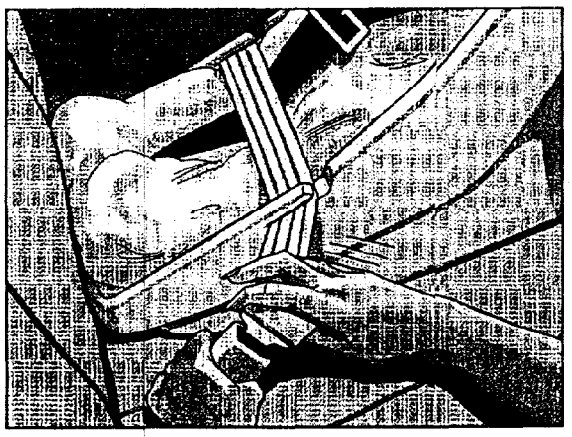


You'll be using the lap belt. Be sure to follow the instructions that came with the child restraint. Secure the child in the child restraint when and as the instructions say.

See the earlier part about the top strap if the child restraint has one.



1. Make the belt as long as possible by tilting the latch plate and pulling it along the belt.
2. Put the restraint on the seat.
3. Run the vehicle's safety belt through or around the restraint. The child restraint instructions will show you how.

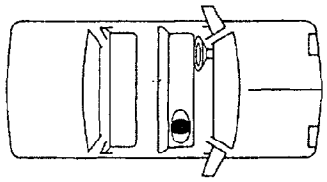


4. Buckle the belt. Make sure the release button is positioned so you would be able to unbuckle the safety belt quickly if you ever had to.
5. To tighten the belt, pull its free end while you push down on the child restraint. If you're using a forward-facing child restraint, you may find it helpful to use your knee to push down on the child restraint as you tighten the belt.

6. Push and pull the child restraint in different directions to be sure it is secure.

To remove the child restraint, just unbuckle the vehicle's safety belt. It will be ready to work for an adult or larger child passenger.

Securing a Child Restraint in the Right Front Seat Position



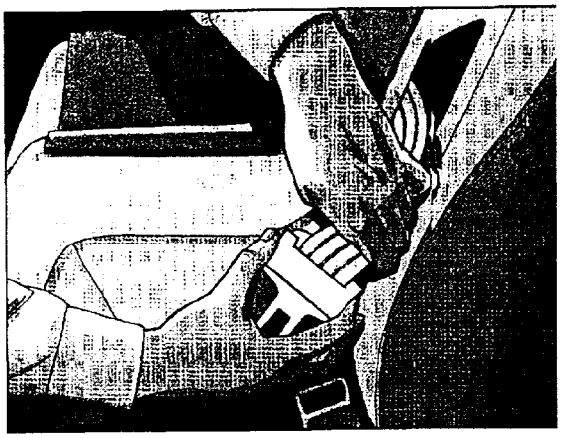
Your vehicle has a right front passenger air bag. Never put a rear-facing child restraint in this seat. Here's why:

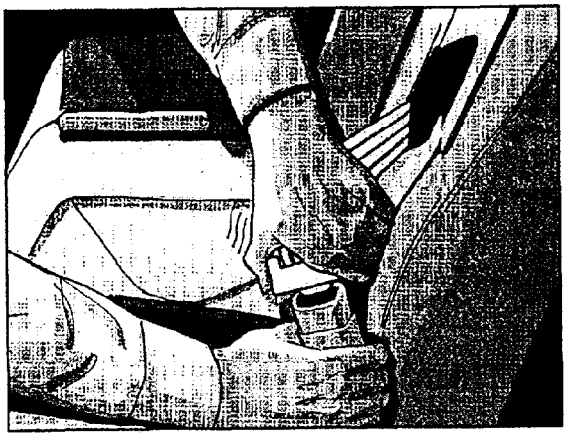
⚠CAUTION:

A child in a rear-facing child restraint can he seriously injured if the right front passenger's air hag inflates. This is because the back of a rear-facing child restraint would be very close to the inflating air bag. Always secure a rear-facing child restraint in the rear seat.

You'll be using the lap-shoulder belt. See the earlier part about the top strap if the child restraint has one. Be sure to follow the instructions that came with the child restraint. Secure the child in the child restraint when and as the instructions say.

1. Because your vehicle has a right front passenger air bag, always move the seat as far back as it will go before securing a forward-facing child restraint. (See "Seats" in the Index.)
2. Put the restraint on the seat.
3. Pick up the latch plate, and run the lap and shoulder portions of the vehicle's safety belt through or around the restraint. The child restraint instructions will show you how.

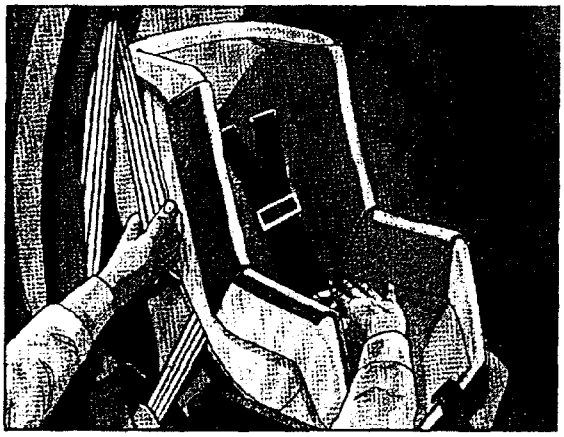




Tilt the latch plate to adjust the belt if needed.

If the shoulder belt goes in front of the child's face or neck, put it behind the child restraint.

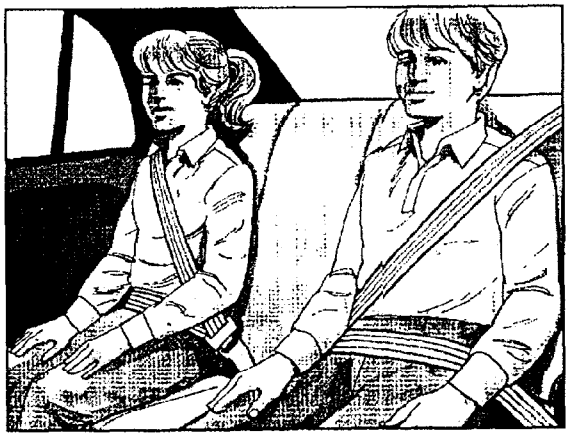
4. Buckle the belt. Make sure the release button is positioned so you would be able to unbuckle the safety belt quickly if you ever had to.



5. To tighten the belt, pull up on the shoulder belt while you push down on the child restraint. You may find it helpful to use your knee to push down on the child restraint as you tighten the belt.
6. Push and pull the child restraint in different directions to be sure it is secure.

To remove the child restraint, just unbuckle the vehicle's safety belt and let it go back all the way. The safety belt will move freely again and be ready to work for an adult or larger child passenger.

Larger Children

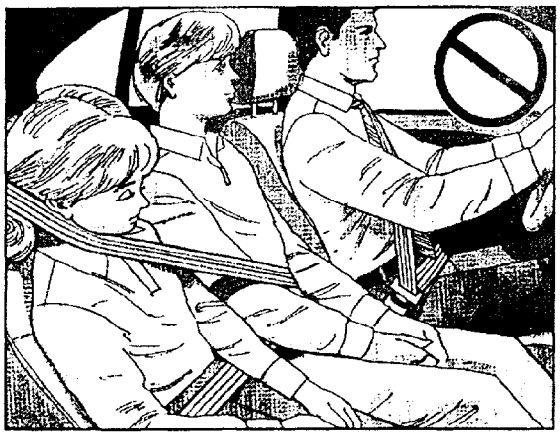


Children who have outgrown child restraints should wear the vehicle's safety belts.

If you have the choice, a child should sit next to a window so the child can wear a lap-shoulder belt and get the additional restraint a shoulder belt can provide.

Accident statistics show that children are safer if they are restrained in the rear seat. But they need to use the safety belts properly.

- Children who aren't buckled up can be thrown out in a crash.
- Children who aren't buckled up can strike other people who are.



⚠CAUTION:

Never do this.

Here two children are wearing the same belt. The belt can't properly spread the impact forces. In a crash, the two children can be crushed together and seriously injured. A belt must be used by only one person at a time.

Q: **What if a child is wearing a lap-shoulder belt, but the child is so small that the shoulder belt is very close to the child's face or neck?**

A: Move the child toward the center of the vehicle, but be sure that the shoulder belt still is on the child's shoulder, so that in a crash the child's upper body would have the restraint that belts provide. If the child is sitting in a rear seat outside position, see "Rear Safety Belt Comfort Guides" in the Index. If the child is so small that the shoulder belt is still very close to the child's face or neck, you might want to place the child in the center seat position, the one that has only a lap belt.

⚠CAUTION:

Never do this.

Here a child is sitting in a seat that has a lap-shoulder belt, but the shoulder part is behind the child. If the child wears the belt in this way, in a crash the child might slide under the belt. The belt's force would then be applied right on the child's abdomen. That could cause serious or fatal injuries.

Wherever the child sits, the lap portion of the belt should be worn low and snug on the hips, just touching the child's thighs. This applies belt force to the child's pelvic bones in a crash.

Safety Belt Extender

If the vehicle's safety belt will fasten around you, you should use it.

But if a safety belt isn't long enough to fasten, your dealer will order you an extender. It's free. When you go in to order it, take the heaviest coat you will wear, so the extender will be long enough for you. The extender will be just for you, and just for the seat in your vehicle that you choose. Don't let someone else use it, and use it only for the seat it is made to fit. To wear it, just attach it to the regular safety belt.

Checking Your Restraint Systems

Now and then, make sure the safety belt reminder light and all your belts, buckles, latch plates, retractors and anchorages are working properly. Look for any other loose or damaged safety belt system parts. If you see anything that might keep a safety belt system from doing its job, have it repaired.

Torn or frayed safety belts may not protect you in a crash. They can rip apart under impact forces. If a belt is torn or frayed, get a new one right away.

Also look for any opened or broken air bag covers, and have them repaired or replaced. (The air bag system does not need regular maintenance.)

Replacing Restraint System Parts After a Crash

If you've had a crash, do you need new belts?

After a very minor collision, nothing may be necessary. But if the belts were stretched, as they would be if worn during a more severe crash, then you need new belts.

If belts are cut or damaged, replace them. Collision damage also may mean you will need to have safety belt or seat parts repaired or replaced. New parts and repairs may be necessary even if the belt wasn't being used at the time of the collision.

If your seat adjuster won't work after a crash, the special part of the safety belt that goes through the seat to the adjuster may need to be replaced.

If an air bag inflates, you'll need to replace air bag system parts. See the part on the air bag system earlier in this section.

NOTICE:

If you damage the covering for the driver's or the right front passenger's air bag, the bag may not work properly. You may have to replace the air bag module in the steering wheel or both the air bag module and the instrument panel for the right front passenger's air bag. Do not open or break the air bag coverings.

If your vehicle ever gets into a lot of water -- such as water up to the carpeting or higher -- or if water enters your vehicle and soaks the carpet, the air bag controller can be soaked and ruined. If this ever happens, and then you start your vehicle, the damage could make the air bags inflate, even if there's no crash. You would have to replace the air bags as well as the sensors and related parts. If your vehicle is ever in a flood, or if it's exposed to water that soaks the carpet, you can avoid needless repair costs by turning off the vehicle immediately. Don't let anyone start the vehicle, even to tow it, unless the battery cables are first disconnected.

Servicing Your Air Bag-Equipped Vehicle

Air bags affect how your vehicle should be serviced. There are parts of the air bag system in several places around your vehicle. You don't want the system to inflate while someone is working on your vehicle. Your dealer and the Malibu Service Manual have information about servicing your vehicle and the air bag system. To purchase a service manual, see "Service and Owner Publications" in the Index.

⚠CAUTION:

For up to 10 minutes after the ignition key is turned off and the battery is disconnected, an air bag can still inflate during improper service. You can be injured if you are close to an air bag when it inflates. Avoid yellow connectors. They are probably part of the air bag system. Be sure to follow proper service procedures, and make sure the person performing work for you is qualified to do so.

The air bag system does not need regular maintenance.