DOT Ø 374

Report Number to be assigned by NHTSA

FMVSS 212/219/301
ELECTRIC VEHICLE TESTING - GROUP V

JET INDUSTRIES INC.

1981 Electrica (Mercury Lynx)

Prepared by:

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November 1981

TEST REPORT

Prepared for:

U.S. DEPARTMENT OF TRANSPORTATION
OFFICE OF PASSENGER VEHICLE RESEARCH
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
WASHINGTON, D.C. 20590

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TECHNICAL REPORT STANDARD TITLE PAGE

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
4. Title and Subtitle FMVSS 212, 219, 301 ELECTRIC VEHICLE TESTING - GROUP V - 1981 ELECTRICA (MERCURY LYNX)		5. Report Date November 1981 6. Performing Orgn Code
7. Author(s) N. Johnson, S. Davis		8. Performing Orgn Rpt No. 3126-81-108/1932
9. Performing Organization Name and Address Dynamic Science, Inc. A Talley Industries Company 1850 West Pinnacle Peak Road Phoenix, Arizona 85027		10. Work Unit No. 11. Contract or Grant No. DOT-HS-9-02274, D.O. #16
12. Sponsoring Agency Name and Address U.S. Department of Transportation National Highway Traffic Safety Administration 400 Seventh Street, S.W. Washington, D.C. 20590		13. Type of Report and Period Covered TEST REPORT October 1981 14. Sponsoring Agency Code
15. Supplementary Notes		

16. Abstract

This report presents the results of an electric vehicle to load-measuring fixed barrier, head-on crash test. This test was conducted to determine if the vehicle would comply with the windshield retention requirements of the Federal Motor Vehicle Safety Standard (FMVSS) 212, the windshield zone intrusion requirements of FMVSS 219, and the fuel integrity requirements of FMVSS 301-75. The standard fixed barrier was replaced by the 36-cell load-measuring fixed barrier. The electric vehicle, a 1981 Electrica (Mercury Lynx), manufactured by Ford Motor Company and altered by Jet Industries Inc., was tested on October 21, 1981 at a speed of 30.34 mph. The 1981 Electrica (Lynx) appears to meet the requirements of FMVSS 212, 219, and 301.

17. Key Words	18. Distribution Statement
Load-Measuring Fixed Barrier, Windshield Retention, Windshield Intrusion, Occupant Response, Electric Vehicle, Fuel System Integrity	Copies available to the public through the National Technical Information Service, Springfield, Virginia 22161

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. Pages	22. Price
Unclassified	Unclassified	92	

Form DOT F 1700.7 (8-69)

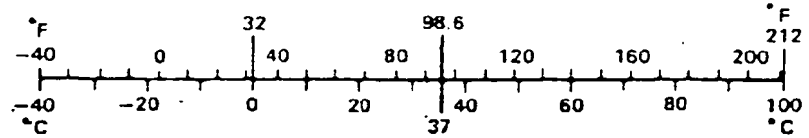
METRIC CONVERSION FACTORS

Approximate Conversions to Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
	LENGTH			
in	inches	2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
	AREA			
in^2	square inches	6.5	square centimeters	cm^2
ft^2	square feet	0.09	square meters	m^2
yd^2	square yards	0.8	square meters	m^2
mi^2	square miles	2.6	square kilometers	km^2
	acres	0.4	hectares	ha
	MASS (weight)			
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	metric ton	t
	VOLUME			
tsp	teaspoons	5	milliliters	mL
Tbsp	tablespoons	15	milliliters	mL
in^3	cubic inches	16	milliliters	mL
fl oz	fluid ounces	30	milliliters	mL
c	cups	0.24	liters	L
pt	pints	0.47	liters	L
qt	quarts	0.95	liters	L
gal	gallons	3.8	liters	L
ft^3	cubic feet	0.03	cubic meters	m^3
yd^3	cubic yards	0.76	cubic meters	m^3
	TEMPERATURE (exact)			
°F	degrees Fahrenheit	5/9 (after subtracting 32)	degrees Celsius	°C

Approximate Conversions from Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
	LENGTH			
mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
m	meters	1.1	yards	yd
km	kilometers	0.6	miles	mi
	AREA			
cm^2	square centimeters	0.16	square inches	in^2
m^2	square meters	1.2	square yards	yd^2
km^2	square kilometers	0.4	square miles	mi^2
ha	hectares (10 000 m^2)	2.5	acres	
	MASS (weight)			
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	metric ton (1000 kg)	1.1	short tons	
	VOLUME			
mL	milliliters	0.03	fluid ounces	fl oz
mL	milliliters	0.06	cubic inches	in^3
L	liters	2.1	pints	pt
L	liters	1.06	quarts	qt
L	liters	0.26	gallons	gal
m^3	cubic meters	35	cubic feet	ft^3
m^3	cubic meters	1.3	cubic yards	yd^3
	TEMPERATURE (exact)			
°C	degrees Celsius	9/5 (then add 32)	degrees Fahrenheit	°F



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1.0 INTRODUCTION

This report presents the results of an electric vehicle to load-measuring fixed barrier, head-on crash test. This test was conducted to determine if the vehicle would comply with the windshield retention requirements of Federal Motor Vehicle Safety Standard (FMVSS) 212, the windshield zone intrusion requirements of FMVSS 219, and the fuel spillage requirements of FMVSS 301-75. The electric vehicle tested was the 1981 Electrica (Mercury Lynx) manufactured by Jet Industries Inc.

Table 1-1 contains a summary of the electric vehicle crash test conditions for Test No. 3126-2.

TABLE 1-1. SUMMARY OF ELECTRIC VEHICLE CRASH TEST CONDITIONS

Test Date	Test Configuration	Vehicle Model/ Dynamic Science Number	Vehicle Weight (lb)	Closing Speed (mph)
10/21/81	Car-to-Load Cell Barrier, Head-on	Electrica (Lynx) DSI 1212	3471	30.34

The load cell barrier face is pictured in Figure 1-1. The barrier consists of a 9 X 4 array of 50 klb load cells each faced with a section of 1-3/4-inch thick plywood. Plywood sections for Rows C and D (upper two rows) each measure ten inches high and nine inches wide. Plywood sections for Rows A and B (lower two rows) each measure nine inches high and nine inches wide. Overall width of the barrier is 83 inches and overall height is 38-3/4 inches. The lower edge of the barrier is 2-5/8 inches above the surface of the ground.

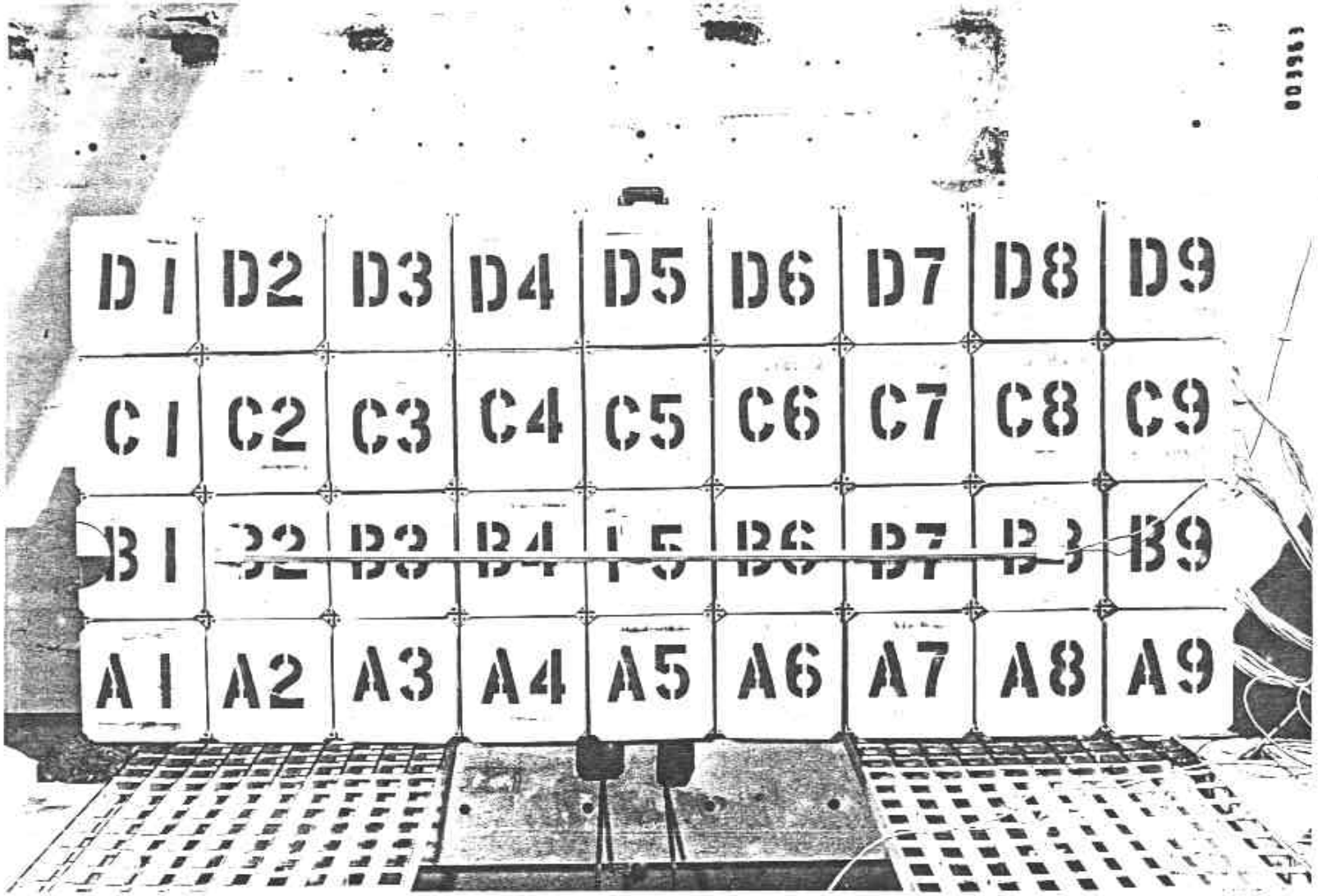


FIGURE 1-1. LOAD CELL BARRIER FACE.

2.0 HIGHLIGHTS OF TEST RESULTS

This section of the report highlights the results of the three compliance tests (FMVSS 212, 219, and 301-75) conducted on the electric vehicle. Paragraphs 2-1 through 2-3 contain general FMVSS test and performance requirements followed by summaries of the Electrica performance. Section 3.0 presents a detailed summary of the structural and dummy performance results obtained.

2.1 FMVSS 212 - WINDSHIELD RETENTION TESTING

FMVSS 212 specifies the following requirements:

> "When the vehicle traveling longitudinally forward at any speed up to and including 30 mph impacts a fixed collision barrier that is perpendicular to the line of travel of the vehicle...the windshield mounting of the vehicle shall... retain not less than 75 percent of the windshield periphery."
>
> (Code of Federal Regulations, Title 49, Section 571.212)

Summary of the Electrica (Lynx) Performance - 212 Test

The windshield showed no loss of retention and the vehicle consequently appears to meet the requirement of FMVSS 212.

2.2 FMVSS 219 - WINDSHIELD ZONE INTRUSION

FMVSS 219 requires that:

> "When the vehicle traveling longitudinally forward at... 30 mph, impacts a fixed collision barrier that is perpendicular to the line of travel of the vehicle...no part of the vehicle outside the occupant compartment, except windshield molding and other components designed to be normally in contact with the windshield, shall penetrate the protected zone template, affixed according to (Standard 219), to depth of more than one-quarter inch, and no such part of a vehicle shall penetrate the inner surface of that portion of the windshield below the protected zone.."
>
> (Code of Federal Regulations, Title 49, Section 571.219)

Summary of the Electrica (Lynx) Performance - 219 Test

During the frontal barrier crash, there was no intrusion into the windshield protected zone. Therefore, the vehicle appears to meet the requirements of FMVSS 219.

2.3 FMVSS 301 - FRONTAL IMPACT FOR INTEGRITY OF MOTOR VEHICLE FUEL SYSTEMS

FMVSS 301 specifies the following compliance requirements:

> "When the vehicle traveling longitudinally forward at...30 mph impacts a fixed collision barrier that is perpendicular to the line of travel of the vehicle...fuel spillage shall not exceed a total of five ounces by weight in the five-minute period following cessation of motion. For the subsequent 25-minute period, fuel spillage during any one-minute interval shall not exceed one ounce by weight."
>
> (Code of Federal Regulations, Title 49, Section 571.301-75)

During the static rollover which follows barrier impact, the following requirements must be met:

> "When the vehicle is rotated on its longitudinal axis to each successive increment of 90 degrees...fuel spillage shall not exceed a total of five ounces by weight for the first five minutes of testing at each successive 90-degree increment. For the remaining testing period, at each increment of 90 degrees, fuel spillage during any one-minute interval shall not exceed one ounce by weight."
>
> (Code of Federal Regulations, Title 49, Section 571.301-75)

Summary of the Electrica (Lynx) Performance - 301 Test

The vehicle impacted the barrier at a speed of 30.34 mph.

In the five-minute period following the barrier impact there was no fuel leakage.

When the vehicle was placed in the static rollover fixture and rotated, there was only a trace of fuel leakage throughout the test. The vehicle thus appears to meet the requirements of FMVSS 301-75.

2.4 ELECTRICA (LYNX) BATTERY SAFETY

During impact the front battery box was pushed rearward and downward underneath the rear battery box in the engine compartment. All batteries remained inside the boxes, although some were broken, resulting in massive electrolyte leakage. There was no leakage into the occupant compartment.

The battery box in the rear of the vehicle remained intact and closed, restraining the batteries in their original positions. No leakage occurred from these batteries until the vehicle was rolled at 180° during the post-test static rollover, then approximately one gallon of electrolyte leaked into the occupant compartment.

A small fire occurred after impact in the high-voltage controller box in the left rear section of the cargo area. It was quickly extinguished with a portable fire extinguisher.

3.0 RESULTS

This section presents all test results without analysis or discussion. Included in this document are: data summary sheets for each Federal Motor Vehicle Safety Standard, summaries of the simulated occupant data including injury criteria values, tabulated pre- and post-test dimensions, and a summary of vehicle accelerometer locations and data. Section 4 contains pre- and post-test dummy and vehicle photographs. High-speed motion pictures were also obtained and have been submitted to NHTSA. Section 5.0 contains Calcomp plots for all vehicle accelerometer data, occupant response data, seat belt loads, and barrier load cell data.

GENERAL TEST AND VEHICLE PARAMETER DATA

PRE-IMPACT DATA

Make/Model: Electrica (Lynx)
Body Style: 3-Door Hatchback Model Year: 1981
NHTSA No.: R&D DSI No. 1212 Color: Light Blue

DATA FROM CERTIFICATION LABEL

Vehicle Manufacturer: Ford Motor Company/Jet Industries Inc.
Date of Manufacture: 7/81 ; VIN: 1MEBP6327BW636367
GVWR: 3790 lb; GAWR: Front = 1686 lb; Rear = 2104 lb

DATA FROM "RECOMMENDED TIRE PRESSURE" LABEL

Vehicle Capacity:	FRONT	REAR	RECOMMENDED	LOAD RANGE:
Tire Pressure:	35 psi	35 psi	TIRE SIZE: P165/80R13	STD

Designated Seating: 2 Front 2 Rear 4 Total
Cargo load = 50 lb Is Spare Tire: Space Saver? No
TOTAL = 650 lb Standard Equipment? No
Engine: Electric
Transmission: 4-Speed Manual, Front-Wheel Drive
Date Vehicle Received by Laboratory: 8/20/81 ; Odometer: 172.8
Dealer Name & Address: Jet Industries Inc.
Austin, Texas

WEIGHT (LB) OF TEST VEHICLE AS RECEIVED (WITH MAX. FLUIDS) = UDW

Right Front = 695 lb Right Rear = 777 lb
Left Front = 708 lb Left Rear = 804 lb
TOTAL FRONT WEIGHT = 1403 lb (47.0 % of Total Vehicle Weight)
TOTAL REAR WEIGHT = 1581 lb (53.0 % of Total Vehicle Weight)
TOTAL DELV. WEIGHT = 2984 lb
TARGET WEIGHT = UDW + Cargo Load + 328 lbs Dummies = 3362 lb

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND 50 lb CARGO:

Right Front = 807 lb Right Rear = 928 lb
Left Front = 796 lb Left Rear = 940 lb
TOTAL FRONT WEIGHT = 1603 lb (46.2 % of Total Vehicle Weight)
TOTAL REAR WEIGHT = 1868 lb (53.8 % of Total Vehicle Weight)
TOTAL TEST WEIGHT = 3471 lb

Weight of ballast secured in vehicle trunk area = None lb

VEHICLE ATTITUDE: (inches)

Delivered Attitude:	RF	29.0	LF	29.0	RR	29.0	LR 29.0
Test Attitude:	RF	28.5	LF	28.3	RR	28.3	LR 28.3

REMARKS: Vehicle modified by Jet Industries, Inc. on 8/81.

GENERAL TEST AND VEHICLE PARAMETER DATA (CONT)

POST-IMPACT DATA

Type of Test: Frontal (0°) Impact
Date of Test: 10/21/81 Time: 1332 Temperature 85 °F
Required Impact Velocity Range: 30.0 to 31.0 mph
Impact Velocity: Primary = 30.34 mph Secondary = 30.30 mph

Distance from the vehicle's front bumper to barrier face entering the vehicle velocity measurement device is 5.0 feet and distance exiting the vehicle velocity measurement device is 1.0 foot.

VEHICLE REBOUND AND CRUSH (in.)

		R	℄	L
Vehicle Length:	Pre-test =	160.9	163.8	160.6
	Post-test =	133.6	137.2	135.8
	Crush =	27.3	26.6	24.8
Distance from front of test vehicle to point of impact:		6.5	4.3	6.0

VISIBLE DUMMY CONTACT POINTS

	Driver	Passenger
Head	Steering wheel rim and hub	Front edge of upper dash
Chest	Steering wheel rim	None
Abdomen	Steering wheel rim	None
Left Knee	Lower dash	Glove box
Right Knee	Lower dash	Glove box

DOOR OPENING	Front		Rear	
	Left	Right	Left	Right
	Tools Required	Tools Required	N/A	N/A
SEAT MOVEMENT				
Seatback Failure	None	None	Seat removed before test	
Seat Shift (in.)	3/4" fwd, left side	3/4" fwd, right side		

GLAZING DAMAGE

Backlight/Windshield: Windshield severely cracked along bottom three inches and left side. Moderate cracking of remainder.

OTHER NOTABLE IMPACT EFFECTS: Extensive buckling of front compartment floor pan, including front and rear seat crossmembers. Both seats rotated approximately ten degrees counterclockwise. All seat mounts bent, lowering the seats. Both doors pushed rearward

OTHER NOTABLE IMPACT EFFECTS (Continued):

over B pillars and both front quarter panels pushed rearward underneath doors. Right door inner and outer panels separated, with outer panel bowing outward. The right sill buckled downward severely approximately 15 inches aft of the A pillar. The left sill and sheet metal buckled between the B pillar and rear wheel well. Both front wheels were pushed rearward and were pinned in the sheet metal. The left rear wheel was also pinned in sheet metal. The floor pan-to-sill welds failed on both sides from the firewall to the front seat rear crossmember.

SUMMARY OF FMVSS 212 DATA

PRE-IMPACT DATA

Make/Model: Electrica (Lynx)
Body Style: 3-Door Hatchback Model Year: 1981
NHTSA No. R&D DSI No. 1212 Color: Light Blue

DATA FROM CERTIFICATION LABEL

Vehicle Manufacturer: Ford Motor Company/Jet Industries Inc.
Date of Manufacture: 7/81 ; VIN 1MEBP6327BW636367
GVWR: 3790 lb; GAWR: Front = 1686 lb; Rear 2104 lb

POST-IMPACT DATA

Type of Test: Frontal (0°) Impact
Date of Test: 10/21/81 Time: 1332 Temperature 85 °F
Required Impact Velocity Range: 30.0 to 31.0 mph
Impact Velocity: Primary = 30.34 mph Secondary = 30.30 mph
Test weight: 3471 lb Static crush: 26.6 in.
Rebound distance: 4.3 in.

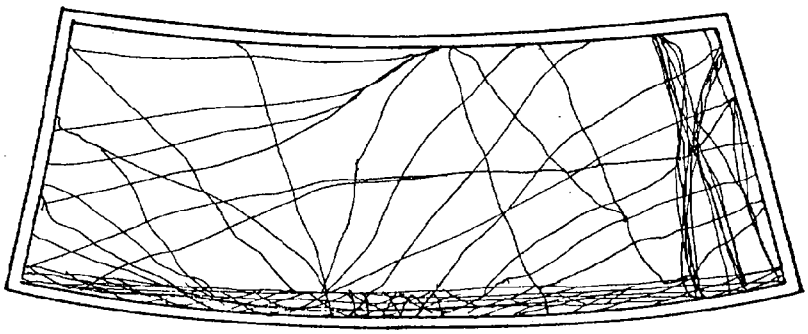
DETAILS OF WINDSHIELD MOUNTING: Windshield is bonded on all sides by black mastic 1.7 inch wide at bottom, 1 inch on sides, 1.3 inch at top. The periphery is overlaid by 5/8 inch wide metal trim. No retainer clips are visible.

	WINDSHIELD PERIPHERY	
	Pre-test	Post-test
RIGHT SIDE	69.5	69.5
LEFT SIDE	69.5	69.5
TOTAL	139.0	139.0

The standard requires that POST-TEST be a minimum of 75 percent of the PRE-TEST 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.

SUMMARY OF FMVSS 212 DATA (CONTD)

AREA OF RETENTION FAILURE: None. Severe cracking in bottom three inches. Entire windshield cracked.



FRONT VIEW

SUMMARY OF FMVSS 219 DATA

PRE-IMPACT DATA

Make/Model: Electrica (Lynx)

Body Style: 3-Door Hatchback Model Year: 1981

NHTSA No. R&D DSI No. 1212 Color: Light Blue

DATA FROM CERTIFICATION LABEL

Vehicle Manufacturer: Ford Motor Company/Jet Industries Inc.

Date of Manufacture: 7/81 ; VIN 1MEBP6327BW636367

GVWR: 3790 lb; GAWR: Front = 1686 lb; Rear 2104 lb

POST-IMPACT DATA

Type of Test: Frontal (0°) Impact

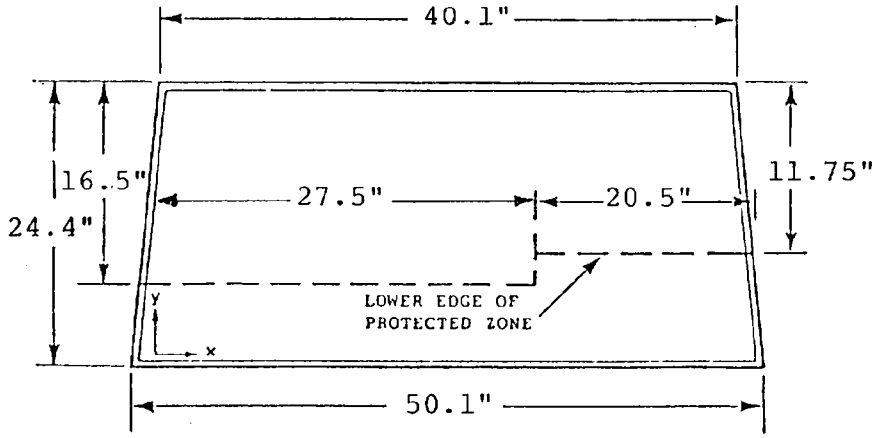
Date of Test: 10/21/81 Time: 1332 Temperature 85 °F

Required Impact Velocity Range: 30.0 to 31.0 mph

Impact Velocity: Primary = 30.34 mph Secondary = 30.30 mph

Test weight: 3471 lb Static crush: 26.6 in.

Rebound distance: 4.3 in.



FRONT VIEW OF WINDSHIELD

A. The area that the "Protected Zone" template was penetrated more than 0.25 inch by a vehicle component other than one which is normally in contact with the windshield.

Coordinates

X	Y
N/A	N/A

B. The area beneath the "Protected Zone" that the inner surface of the windshield was penetrated by a vehicle component.

Coordinates

X	Y
N/A	N/A

PRE-IMPACT DATA

Make/Model: Electrica (Lynx)
Body Style: 3-Door Hatchback Model Year: 1981
NHTSA No.: R&D DSI No. 1212 Color: Light Blue

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Required Impact Velocity Range: 30.0 to 31.0 mph
Impact Velocity: Primary = 30.34 mph Secondary = 30.30 mph
Test Weight 3471 lb Static Crush 26.6 in. Rebound 4.3 in.

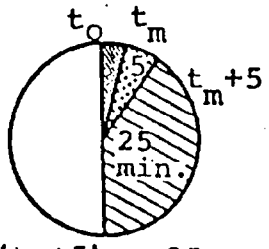
FUEL SYSTEM DATA

Test fluid: Red Stoddard Solvent Specific Gravity: 0.764
Temperature: 70 °F
Kinematic Viscosity: 0.99 centistokes Test Volume: 1.7 U.S. gal

Test vehicle fuel tank filled to 93% of "usable" plus "unusable" capacity with Stoddard Solvent and with electric fuel pump operating (if it will operate without engine operation) until start of static roll.

Details of fuel system: The 2.5-gallon rectangular metal fuel tank is bolted underneath the floor pan in front of the right side of the rear axle. The filler opening is located in the right rear quarter panel aft of the wheel. The fill tube is routed underneath the car into the rear of the tank. The fuel line exits the front of the tank and is routed to the center tunnel and up to the engine firewall and heater.

FUEL SPILLAGE MEASUREMENT



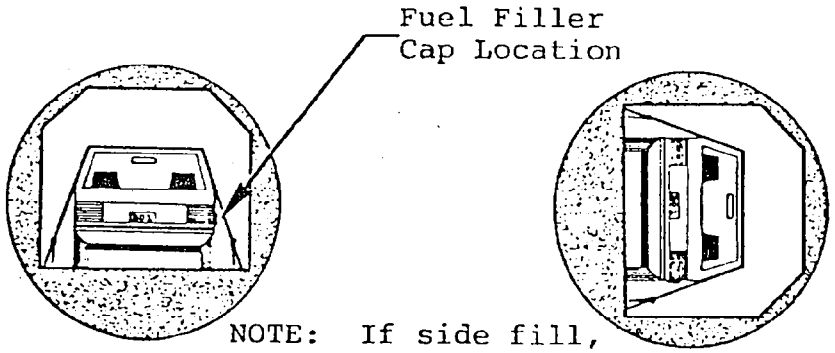
$(t_m+5) + 25$

		ACTUAL	MAXIMUM ALLOWABLE
1.	From impact until vehicle motion ceases. . . .	0	1 oz
2.	For 5-minute period after vehicle motion ceases	0	5 oz
3.	For next 25 minutes. . .	0	1 oz/1 min

SOLVENT SPILLAGE DETAILS: None

FMVSS 301-75 STATIC ROLLOVER DATA SHEET

TEST PHASE: 0° to 90° VEHICLE: Electrica (Lynx)



NOTE: If side fill, rotate so that filler cap is down.

DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time . . = 1 min, 39 sec +
(Spec. Range = 1 to 3 minute)

FMVSS 301 Position Hold Time . . . . . = 5 min, 21 sec =

Total . . . . . = 7 min, 0 sec

FMVSS 301 REQUIREMENTS AND ACTUAL TEST RESULTS:

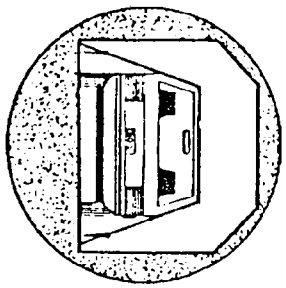
Time Period	First 5 min (from onset)	6th min	7th min	8th min (if req'd)
Maximum Spillage Allowed (oz)	5	1	1	1
Actual Spillage Recorded	0	0	0	--

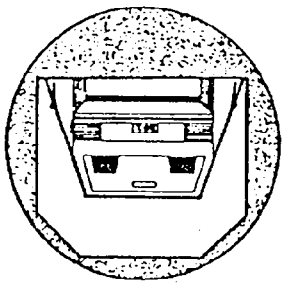
NOTE: Spillage is recorded in whole minute intervals only - as determined above.

SOLVENT SPILLAGE LOCATION(S): None.

FMVSS 301-75 STATIC ROLLOVER DATA SHEET

TEST PHASE: 90° to 180° VEHICLE : Electrica (Lynx)





DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time . . = 1 min, 35 sec +
(Spec. Range = 1 to 3 minute)

FMVSS 301 Position Hold Time . . . . . = 5 min, 25 sec =

Total . . . . . = 7 min, 0 sec

FMVSS 301 REQUIREMENTS AND ACTUAL TEST RESULTS:

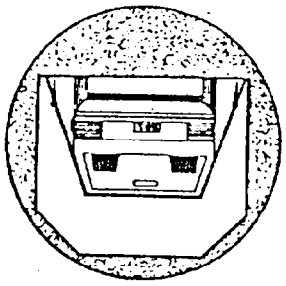
Time Period	First 5 min (from onset)	6th min	7th min	8th min (if req'd)
Maximum Spillage Allowed (oz)	5	1	1	1
Actual Spillage Recorded	0	0	0	--

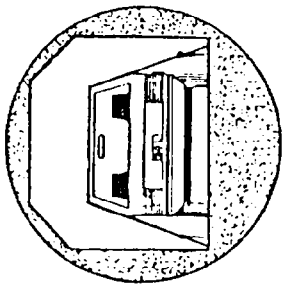
NOTE: Spillage is recorded in whole minute intervals only - as determined above.

SOLVENT SPILLAGE LOCATION(S): None. Approximately one gallon of electrolyte leaked from the rear batteries into the rear occupant compartment.

FMVSS 301-75 STATIC ROLLOVER DATA SHEET

TEST PHASE: 180° to 270° VEHICLE: Electrica (Lynx)





DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time . . = 1 min, 37 sec +
(Spec. Range = 1 to 3 minute)

FMVSS 301 Position Hold Time . . . . . = 5 min, 23 sec =

Total . . . . . = 7 min, 0 sec

FMVSS 301 REQUIREMENTS AND ACTUAL TEST RESULTS:

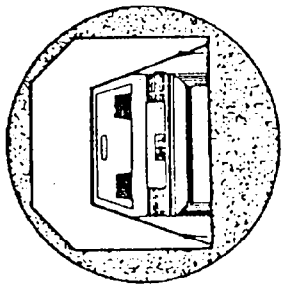
Time Period	First 5 min (from onset)	6th min	7th min	8th min (if req'd)
Maximum Spillage Allowed (oz)	5	1	1	1
Actual Spillage Recorded	0	0	0	--

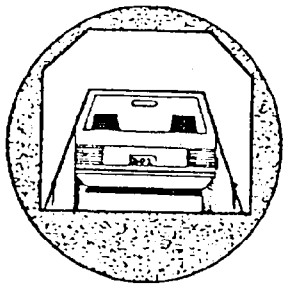
NOTE: Spillage is recorded in whole minute intervals only - as determined above.

SOLVENT SPILLAGE LOCATION(S): None.

FMVSS 301-75 STATIC ROLLOVER DATA SHEET

TEST PHASE: 270° to 360° VEHICLE: Electrica (Lynx)





DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time . . = 1 min, 39 sec +
(Spec. Range = 1 to 3 minute)

FMVSS 301 Position Hold Time . . . . . = 5 min, 21 sec =

Total . . . . . = 7 min, 0 sec

FMVSS 301 REQUIREMENTS AND ACTUAL TEST RESULTS:

Time Period	First 5 min (from onset)	6th min	7th min	8th min (if req'd)
Maximum Spillage Allowed (oz)	5	1	1	1
Actual Spillage Recorded	0	0	0	--

NOTE: Spillage is recorded in whole minute intervals only - as determined above.

SOLVENT SPILLAGE LOCATION(S): None.

PART 572 DUMMY IN-VEHICLE POSITION RECORDING SHEET

PRE-IMPACT DATA

Make/Model: Electrica (Lynx)

Body Style: 3-Door Hatchback Model Year: 1981

NHTSA No. R&D DSI No. 1212 Color: Light Blue

DATA FROM CERTIFICATION LABEL

Vehicle Manufacturer: Ford Motor Company/Jet Industries Inc.

Date of Manufacture: 7/81 ; VIN 1MEBP6327BW636367

GVWR: 3790 lb; GAWR: Front = 1686 lb; Rear 2104 lb

POST-IMPACT DATA

Type of Test: Frontal (0°) Impact

Date of Test: 10/21/81 Time: 1332 Temperature 85 °F

Required Impact Velocity Range: 30.0 to 31.0 mph

Impact Velocity: Primary = 30.34 mph Secondary = 30.30 mph

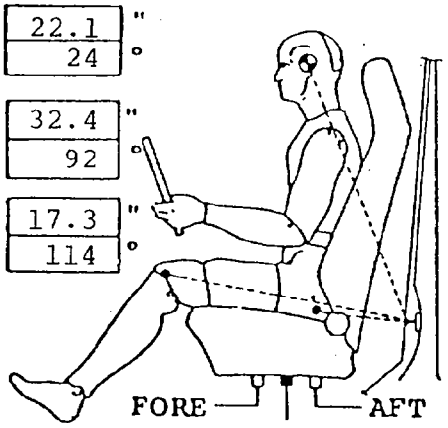
Seat Type: Bucket Adjuster Type: Manual

Bucket Seat Back Type: Fixed

Technicians: N. Johnson, M. Rodack

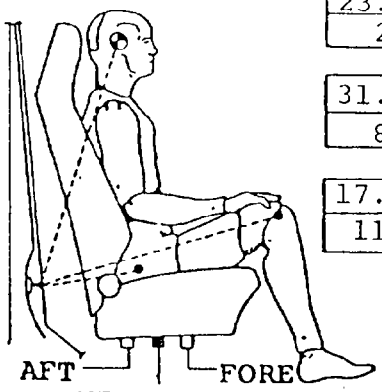
DRIVER DUMMY # A 0 8

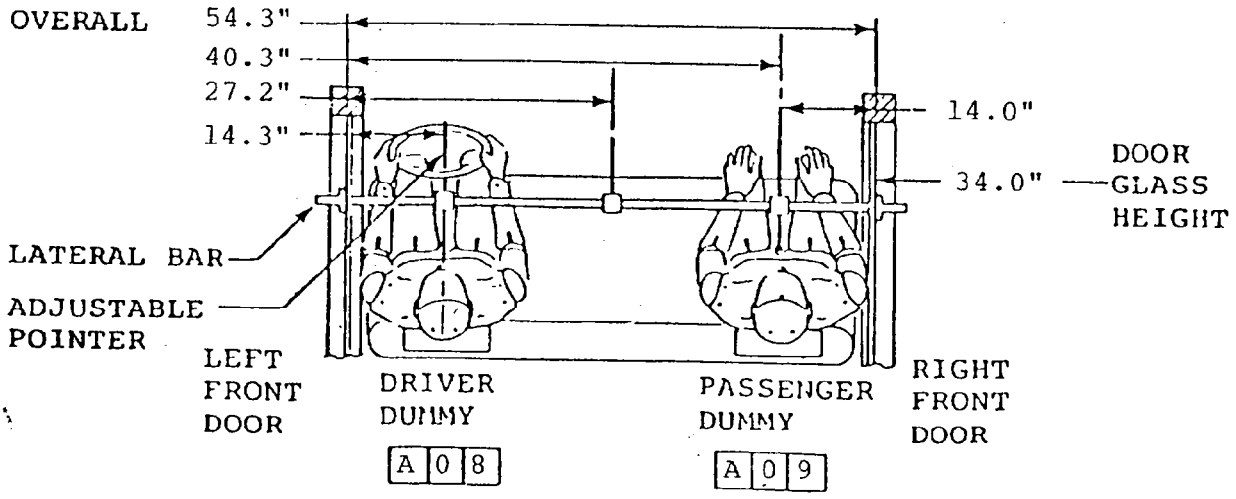
HEAD TARGET	22.1	"
	24	°
KNEE JOINT	32.4	"
	92	°
APPROX-IMATE "H" POINT	17.3	"
	114	°



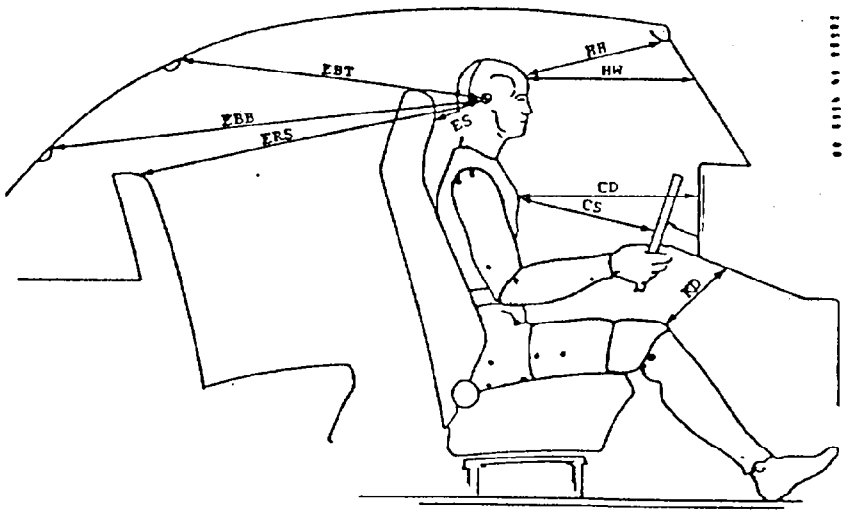
PASSENGER DUMMY # A 0 9

HEAD TARGET	23.0	"
	26	°
KNEE JOINT	31.3	"
	86	°
APPROX-IMATE "H" POINT	17.5	"
	115	°





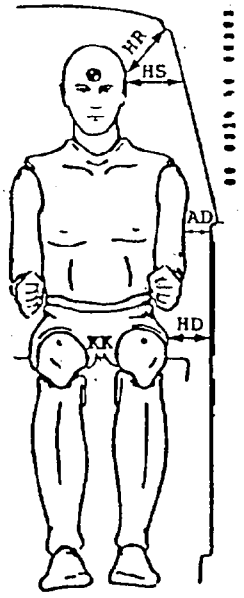
PART 572 DUMMY IN-VEHICLE POSITION RECORDING SHEET - STRUCK VEHICLE (CONTD)



	Driver	Passenger
HH	17.0"	14.3"
HW	21.0"	20.0"
CD	22.0"	20.0"
CS	13.8"	N/A
KD	L-4.3 R-4.0	L-3.5 R-4.3
ES	N/A	N/A
EBT	N/A	N/A
EBB	N/A	N/A
ERS	N/A	N/A
Torso Angle	22°	18°
Seat Back Angle	23°	20°

HH = Head to Windshield Header
HW = Head to Windshield
CD = Chest to Dash
CS = Chest to Steering Wheel
KD = Knees to Dash
ES = Ear to Seat Back
EBT = Ear to Backlight Top
EBB = Ear to Backlight Bottom
ERS = Ear to Rear Seat Back
HR = Head to Side Roof
HS = Head to Side Window
AD = Arm to Door
HD = Hip to Door
KK = Knee to Knee
Torso and seat back angles are relative to vertical.

REMARKS: Dummies positioned according to OVSC recommended procedure for positioning Part 572 dummies in test vehicle.



	Driver	Passenger
HR	6.5	6.5
HS	7.8	8.0
AD	3.5	3.5
HD	6.0	5.9
KK	10.0	10.0
AA	11.0	11.0

DUMMY DATA SUMMARY

	Driver Dummy				Passenger Dummy			
	Positive Direction*		Negative Direction**		Positive Direction*		Negative Direction**	
	Peak (G)	Time (msec)	Peak (G)	Time (msec)	Peak (G)	Time (msec)	Peak (G)	Time (msec)
Head Acceleration								
Longitudinal	36.9	23	220.0	82	15.0	124	46.4	111
Lateral	9.5	41	42.7	77	23.1	109	8.2	125
Vertical	101.3	87	39.8	82	39.6	106	2.3	8
Resultant	224.4	82			60.0	110		
HIC	1237.6 between 81 and 84 msec				269.8 between 62 and 128 mse			
Chest Acceleration								
Longitudinal	4.9	110	33.4	91	3.4	152	30.6	64
Lateral	2.6	88	18.2	95	15.3	58	5.5	83
Vertical	7.5	41	19.5	86	15.4	44	14.7	88
Resultant (Max)	35.0	91			32.6	64		
Resultant (clip)	31.3	67			31.2	62		
TIME > 60 G	0 msec				0 msec			
SEVERITY INDEX	207.3 @ 200 msec				155.9 @ 200 msec			
	Peak (lb)	Time (msec)	Peak (lb)	Time (msec)	Peak (lb)	Time (msec)	Peak (lb)	Time (msec)
Femur Loads								
Left	123.7	48	572.0	41	35.1	22	813.5	44
Right	106.5	51	1380.4	61	56.2	120	402.8	66
Belt Loads								
Lap	Not monitored				514.9	55	6.9	141
Torso	Not monitored				1381.4	62	7.9	8

Vehicle Impact Speed (mph): 30.34

*Longitudinal: Forward
Lateral: Rightward
Vertical: Downward

**Longitudinal: Rearward
Lateral: Leftward
Vertical: Upward

DRIVER - The driver dummy moved straight forward for approximately 65 msec following the impact. The dummy then suddenly dropped (probably when the seat mounts and floor pan-to-sill welds failed) and rotated slightly counterclockwise (as did the entire seat). The steering wheel was pushed rearward and upward approximately three inches just as the dummy's head was starting downward. The dummy hit the top of its forehead on the upper wheel rim and then hit the hub with its face. The dummy rebounded upward and rearward, coming to rest upright in the seat.

PASSENGER - The passenger dummy moved straight forward until approximately 57 msec after impact. The dummy then dropped lower in the car as the right sill, which was buckling, failed. The dummy's head and torso rotated forward and the top of its head struck the front edge of the dash. The dummy disappeared completely from view (below the edge of the window) from 105 to 155 msec. It then rebounded back up and rearward into the seat, coming to rest leaning slightly to its left.

OTHER COMMENTS - The left seat back did not appear to latch during impact. Both seats moved 3/4 to one inch forward and rotated counterclockwise approximately ten degrees.

VEHICLE PROFILE DATA SHEET

PRE-IMPACT DATA

Make/Model: Electrica (Lynx)
Body Style: 3-Door Hatchback Model Year: 1981
NHTSA No.: R&D DSI No. 1212 Color: Light Blue

DATA FROM CERTIFICATION LABEL

Vehicle Manufacturer: Ford Motor Company/Jet Industries Inc.
Date of Manufacture: 7/81 ; VIN: 1MEBP6327BW636367
GVWR: 3790 lb; GAWR: Front = 1686 lb; Rear = 2104 lb

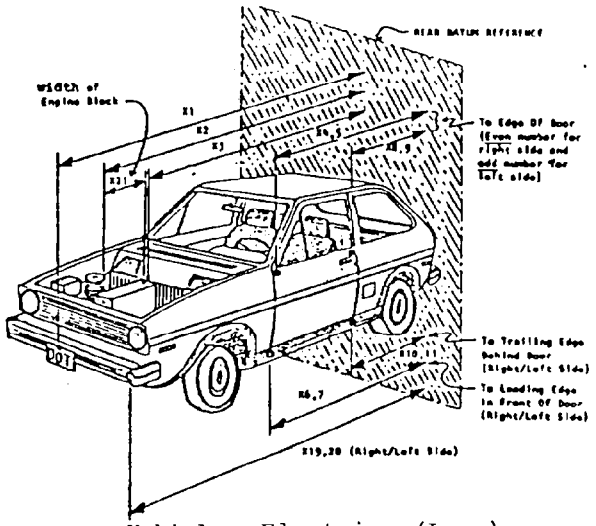
POST-IMPACT DATA

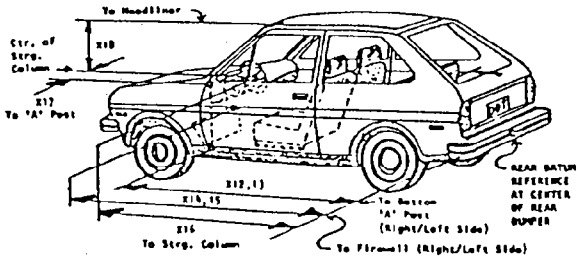
Type of Test: Frontal (0°) Impact
Date of Test: 10/21/81 Time: 1332 Temperature 85 °F
Required Impact Velocity Range: 30.0 to 31.0 mph
Impact Velocity: Primary = 30.34 mph Secondary = 30.30 mph

Measurements Referenced to Plane 14 Feet Forward of Rear Bumper ℄

Location	Height	Vehicle Left (in.)					Vehicle Right (in.)			
		28	24	16	8	℄	8	16	24	28
Pre-test Profile (in.)										
Top of Front Bumper	20.1	7.4	6.8	4.9	4.4	4.3	4.4	4.9	6.5	7.1
Front of Hood	30.9	-	12.8	11.3	10.9	10.8	10.8	11.3	12.8	-
Post-test Profile (in.)										
Top of Front Bumper	19.6	32.3	31.8	30.6	30.8	31.1	31.5	32.0	33.5	34.4
Front of Hood	28.8	-	32.8	32.5	33.0	32.6	33.1	33.5	33.6	-
Post-test Static Crush (in.)										
Top of Front Bumper	0.5	24.9	25.0	25.7	26.4	26.8	27.5	27.1	27.0	27.3
Front of Hood	2.1	-	20.0	21.2	22.1	21.8	22.3	22.2	20.8	-

PRE-/POST-TEST STATIC MEASUREMENT DATA



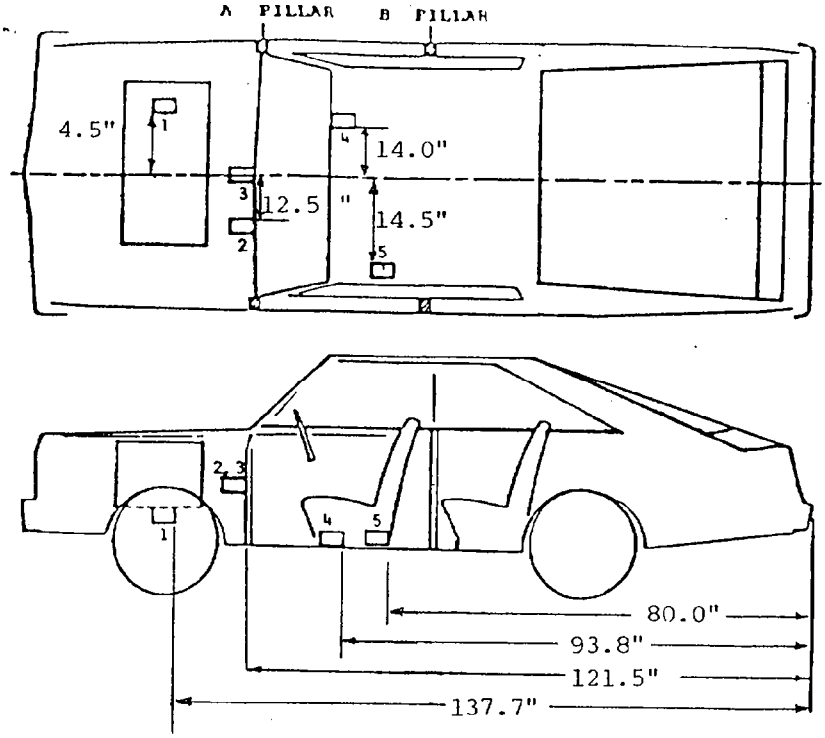


Vehicle: Electrica (Lynx) NHTSA No.: R&D

Test Date: 10/21/81 D.S. No.: 1212

Reference Dimension	Pre-test Measurement	Post-test Measurement	Change
X_1	163.8	137.2	26.6
X_2	138.5	122.7	15.8
X_3	124.3	111.5	12.8
X_4	109.0	101.5	7.5
X_5	108.7	100.1	8.6
X_6	109.5	102.1	7.4
X_7	109.2	101.3	7.9
X_8	64.5	60.1	4.4
X_9	64.2	56.1	8.1
X_{10}	63.0	56.8	6.2
X_{11}	63.0	54.8	8.2
X_{12}	107.3	99.5	7.8
X_{13}	108.0	99.3	8.7
X_{14}	124.0	115.3	8.7
X_{15}	124.2	114.0	10.2
X_{16}	94.5	85.0	9.5
Y_{17}	13.0	12.0	1.0
Z_{18}	15.5	16.8	1.3
X_{19}	160.9	133.6	27.3
X_{20}	160.6	135.8	24.8
X_{21}	6.8	6.8	0.0

VEHICLE ACCELEROMETER LOCATIONS AND SUMMARY



No.	Location Description	Component Direction* X	Y	Z	Data Summary Peak G @ msec X "+"	X "−"	Y "+"	Y "−"	Z "+"	Z "−"
1	Engine (Underside)	✓		✓	34.6 41	99.9 25			15.9 27	26.4 46
2	Firewall (above steering column)	✓		✓	30.5 45	73.2 33			37.1 43	66.5 39
3	Firewall (at Vehicle ℄)	✓		✓	38.5 52	109.0 35			16.2 31	33.7 47
4	Front Seat Front Crossmember	✓			21.9 75	64.6 38			-	-
5	Front Seat Rear Crossmember)	✓		✓	3.7 109	33.0 58			16.3 41	17.7 78

*Positive: X = Forward Y = Rightward Z = Downward
Negative: X = Rearward Y = Leftward Z = Upward

4.0 PHOTOGRAPHIC COVERAGE

This section consists of pre-test and post-test photographs of the overall vehicle, windshield, fuel system, and occupants.

FIGURE 4-1. PRE-TEST FRONT VIEW OF VEHICLE - 1981 ELECTRICA (LYNX).

FIGURE 4-2. POST-TEST FRONT VIEW OF VEHICLE - 1981 ELECTRICA (LYNX).

FIGURE 4-3. PRE-TEST SIDE VIEW OF VEHICLE - 1981 ELECTRICA (LYNX).

FIGURE 4-4. POST-TEST LEFT SIDE VIEW OF VEHICLE - 1981 ELECTRICA (LYNX).

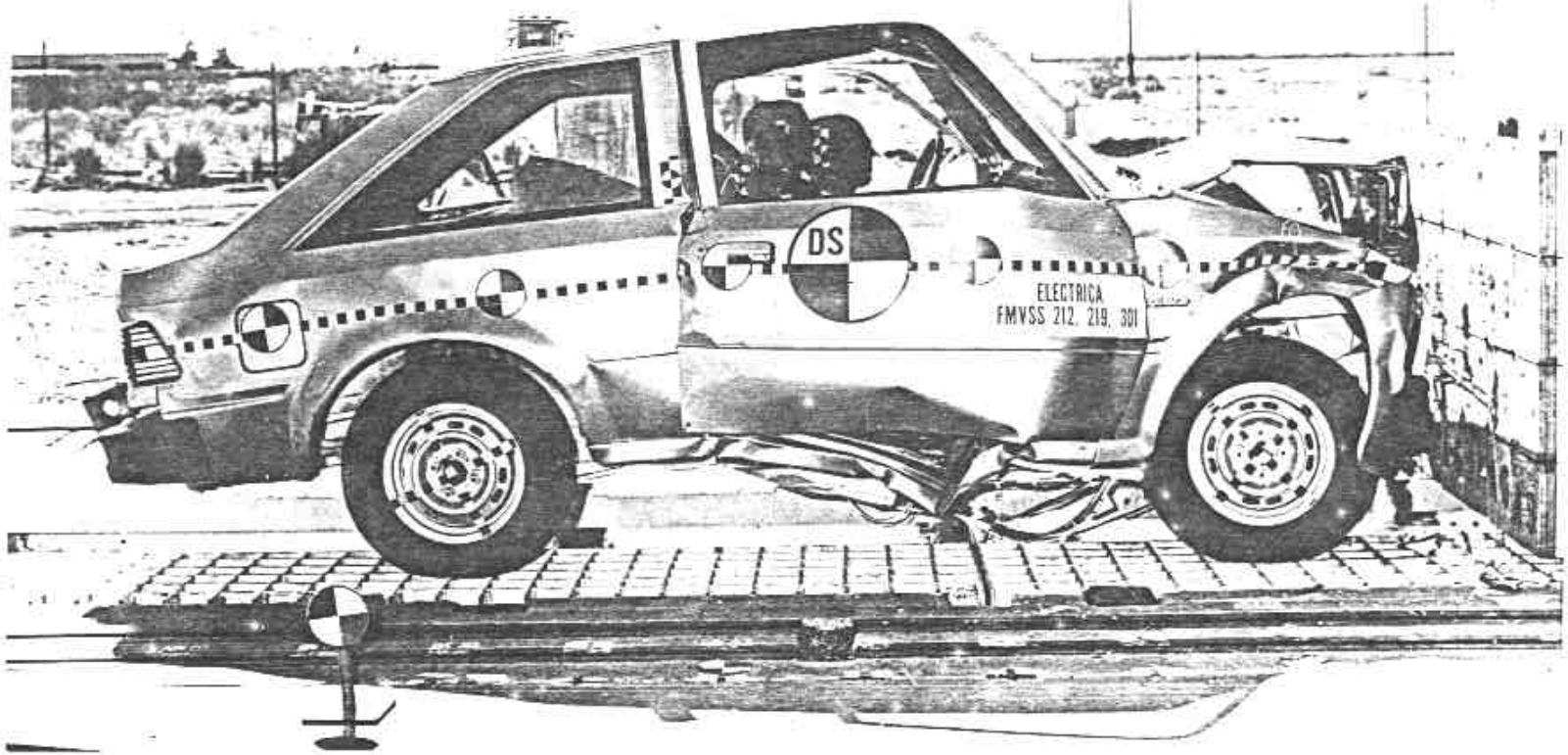


FIGURE 4-5. POST-TEST RIGHT SIDE VIEW OF VEHICLE - 1981 ELECTRICA (LYNX).

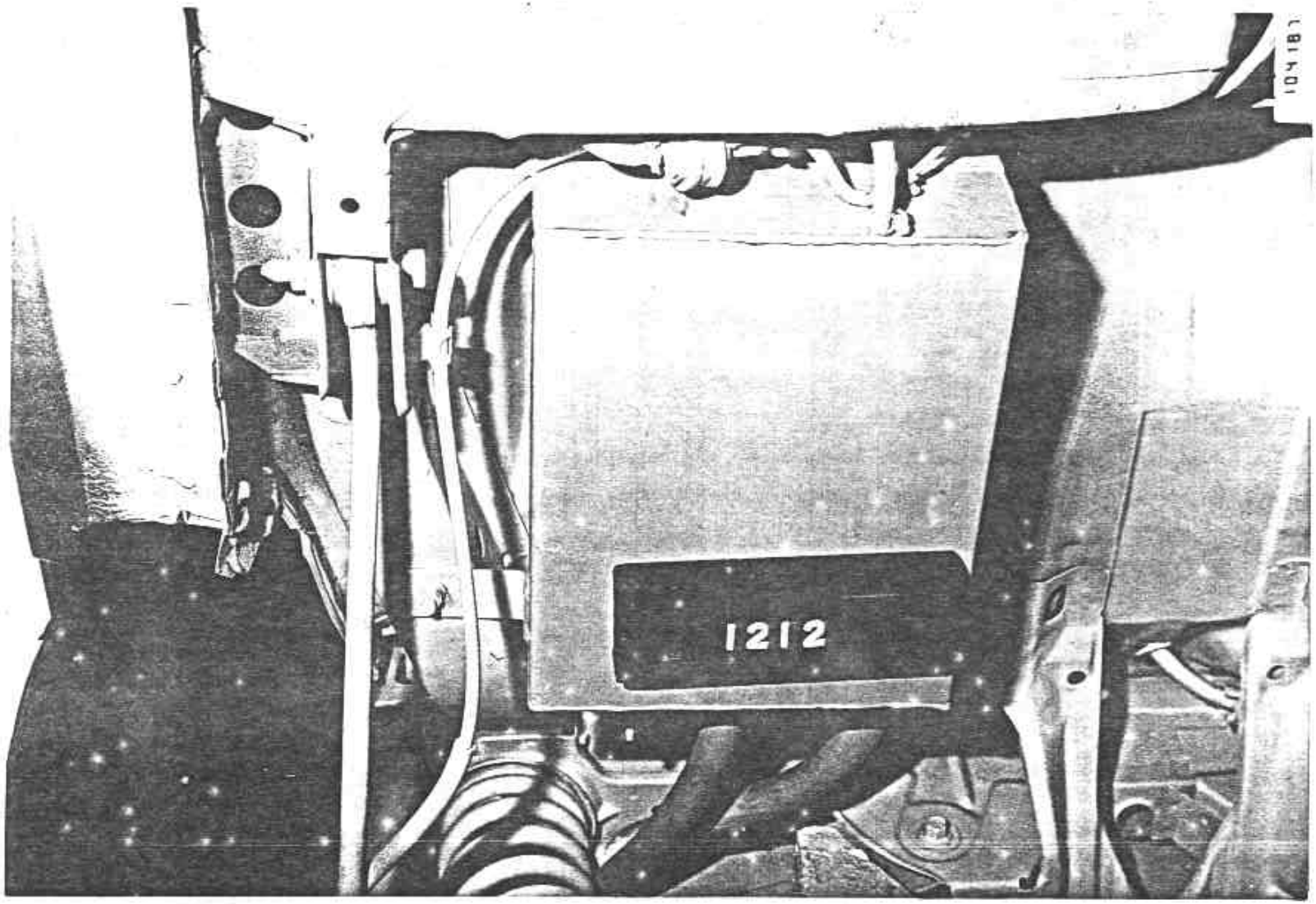


FIGURE 4-6. PRE-TEST VIEW OF FUEL TANK - 1981 ELECTRICA (LYNX).

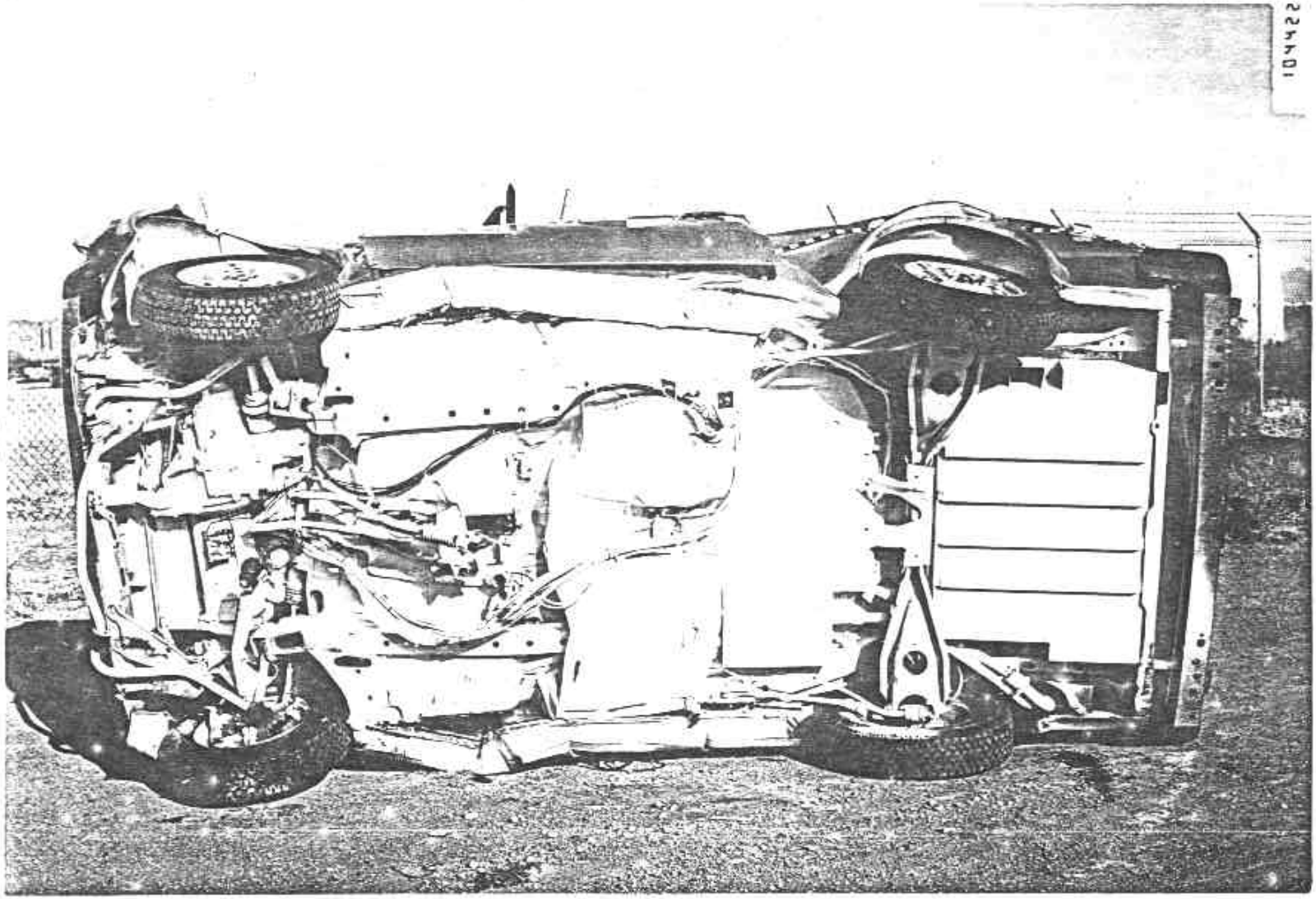


FIGURE 4-7. POST-TEST VIEW OF OVERALL UNDERSIDE - 1981 ELECTRICA (LYNX).

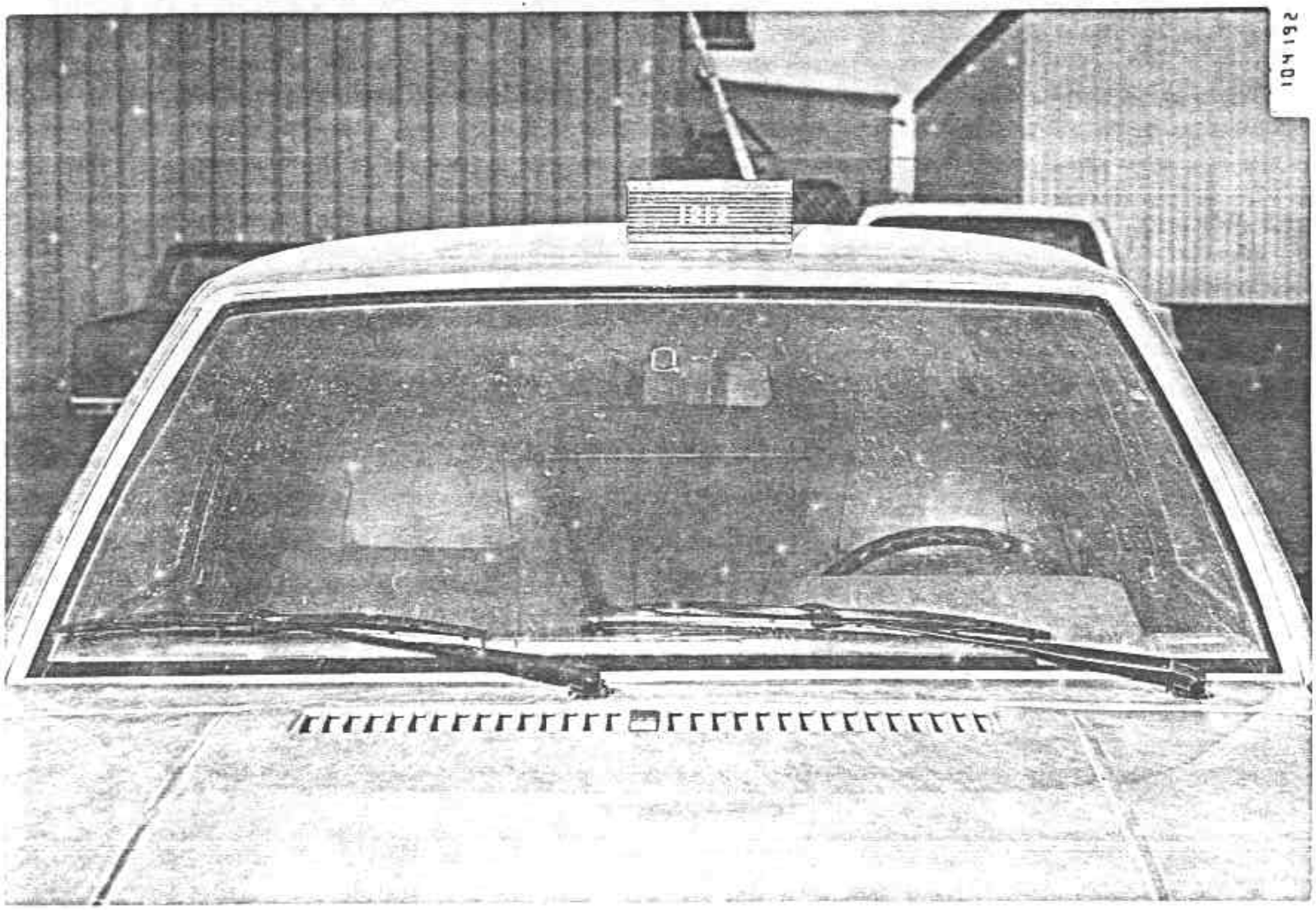


FIGURE 4-8. PRE-TEST VIEW OF WINDSHIELD - 1981 ELECTRICA (LYNX).

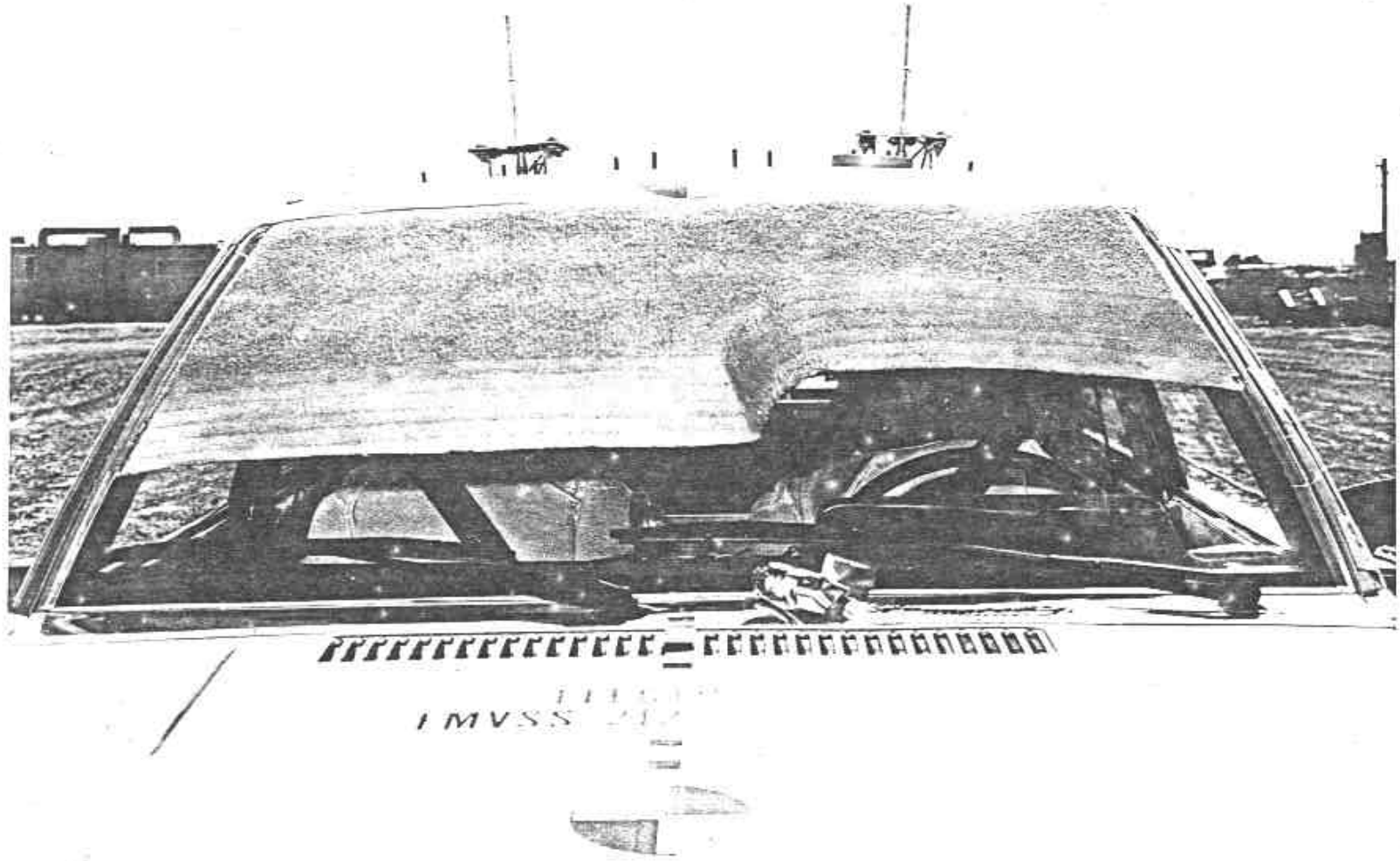


FIGURE 4-9. PRE-TEST VIEW OF WINDSHIELD WITH STYROFOAM - 1981 ELECTRICA (LYNX).

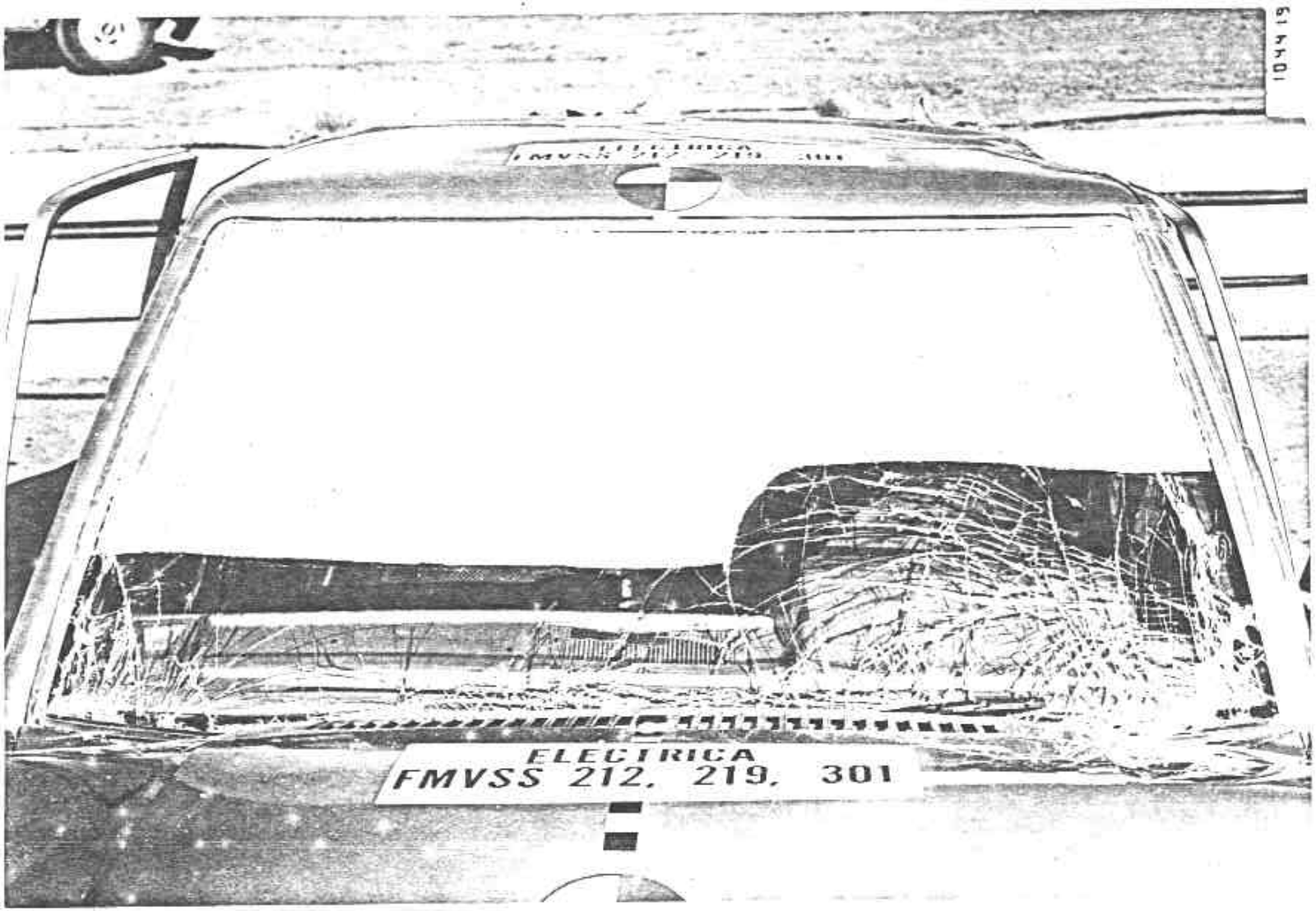


FIGURE 4-10. POST-TEST VIEW OF WINDSHIELD WITH STYROFOAM - 1981 ELECTRICA (LYNX).

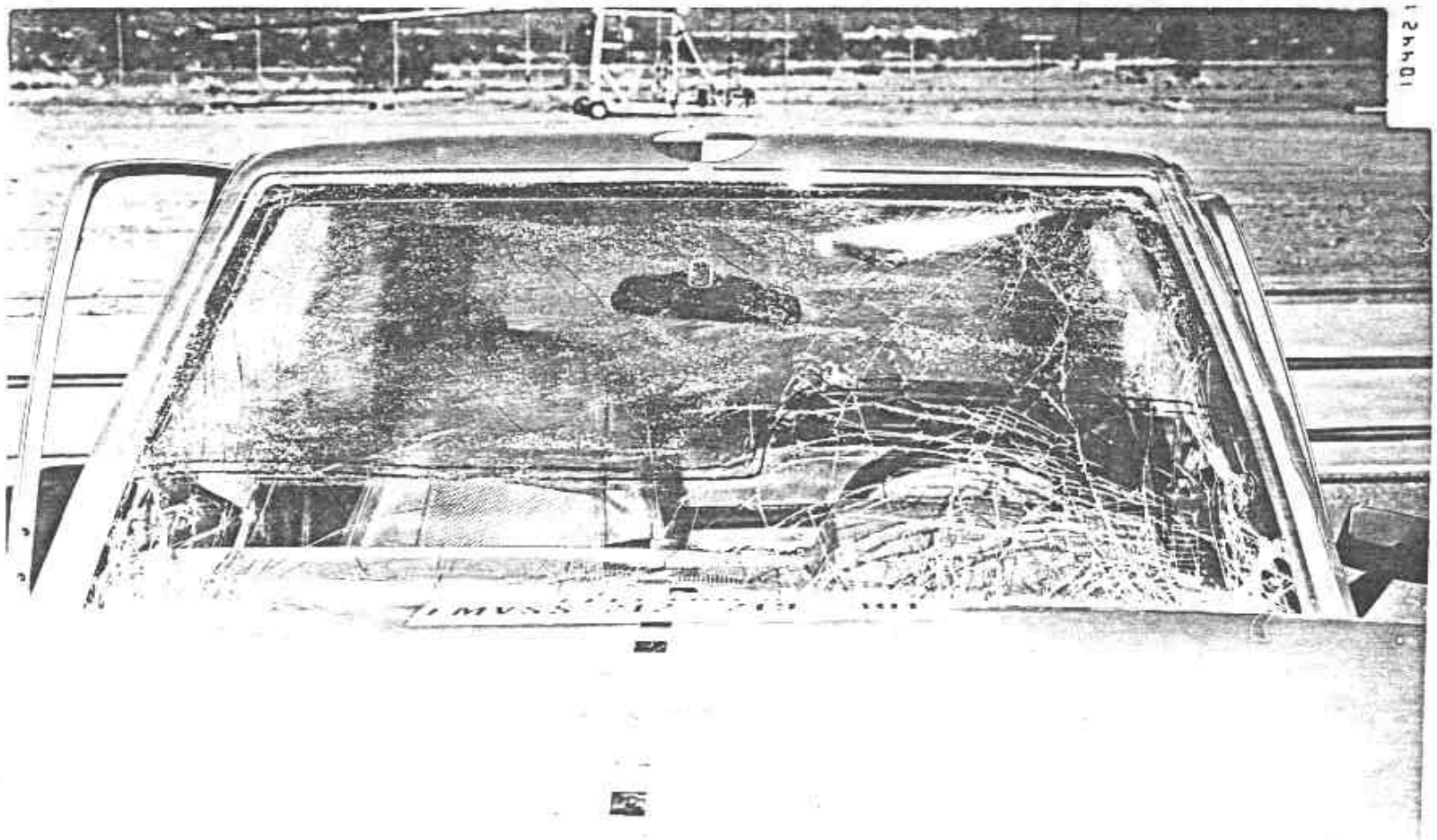


FIGURE 4-11. POST-TEST VIEW OF WINDSHIELD - 1981 ELECTRICA (LYNX).

FIGURE 4-12. PRE-TEST VIEW OF DRIVER DUMMY - 1981 ELECTRICA (LYNX).

FIGURE 4-13. POST-TEST VIEW OF DRIVER DUMMY - 1981 ELECTRICA (LYNX).

FIGURE 4-14. PRE-TEST VIEW OF PASSENGER DUMMY - 1981 ELECTRICA (LYNX).

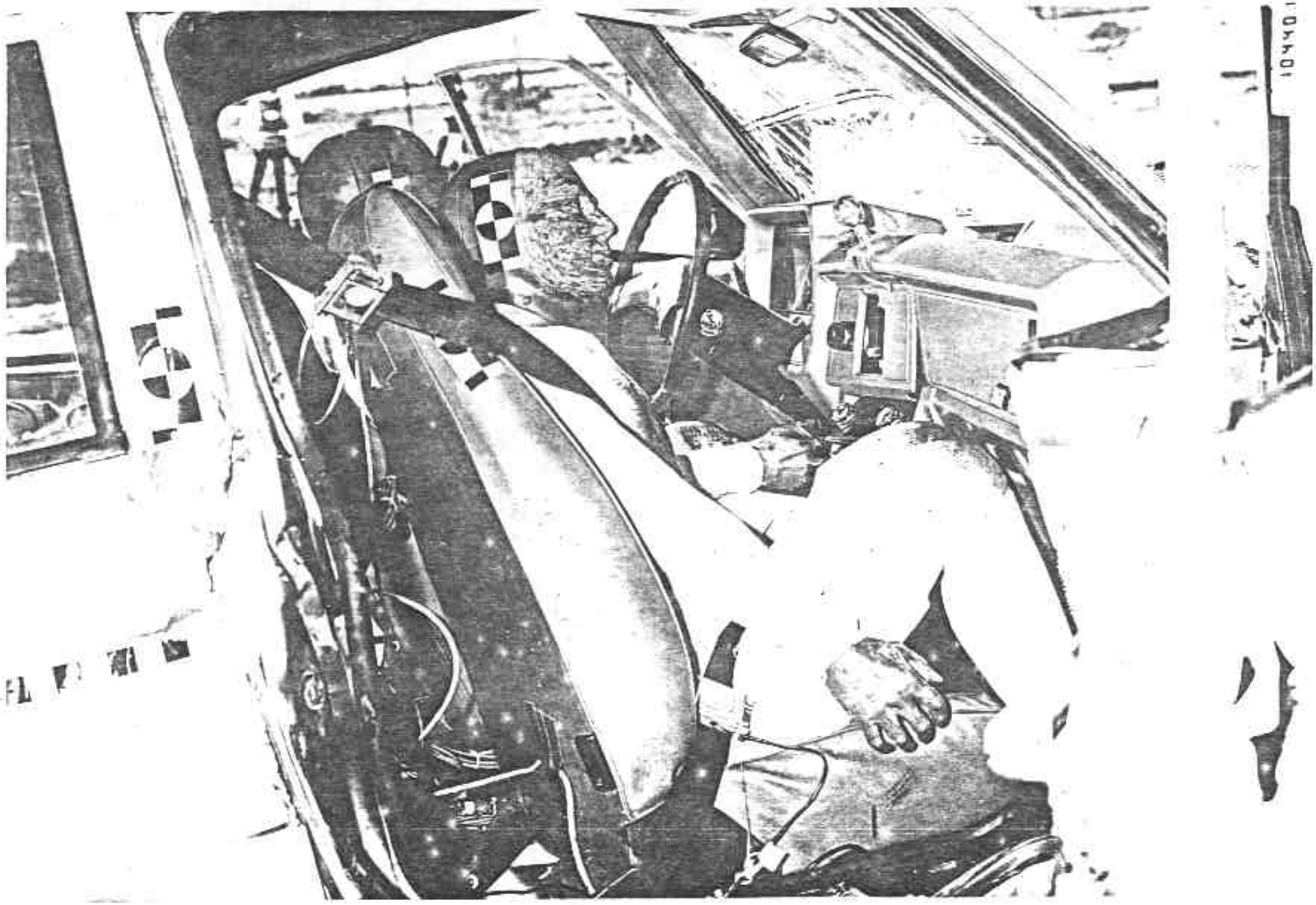


FIGURE 4-15. POST-TEST VIEW OF PASSENGER DUMMY - 1981 ELECTRICA (LYNX).

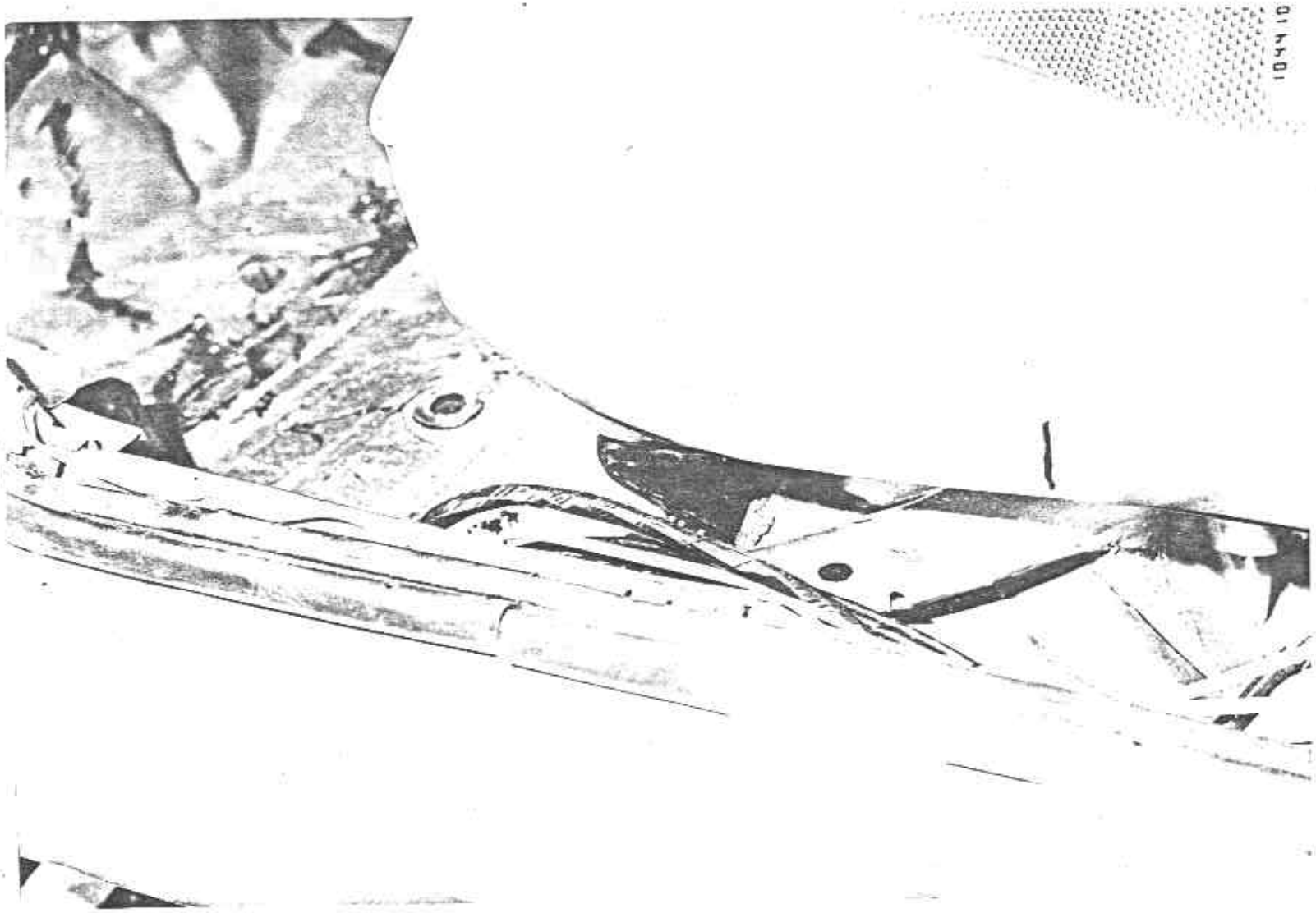


FIGURE 4-16. POST-TEST VIEW OF DRIVER SEAT MOUNTING - 1981 ELECTRICA (LYNX).

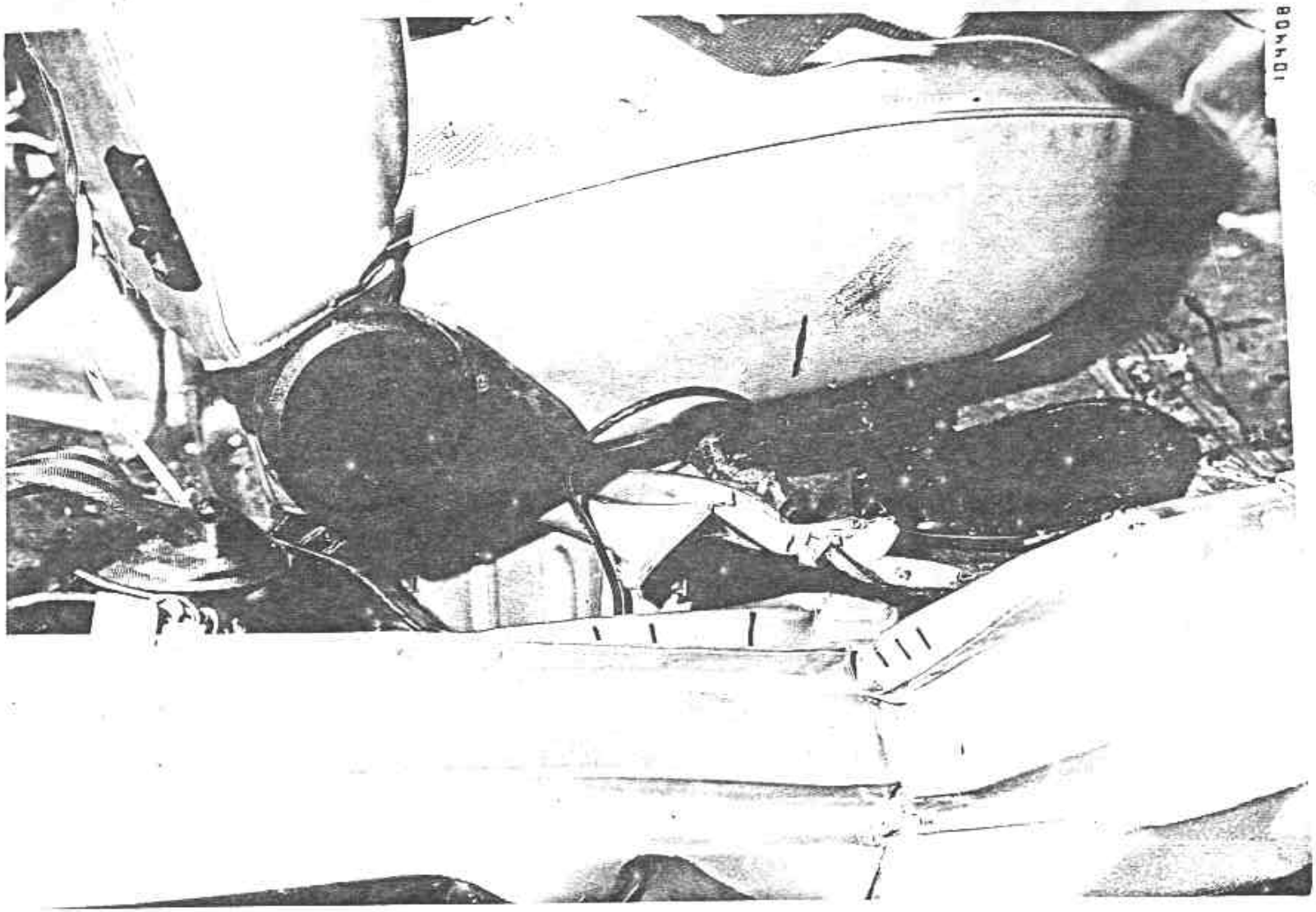


FIGURE 4-17. POST-TEST VIEW OF PASSENGER SEAT MOUNTING - 1981 ELECTRICA (LYNX).

5.0 CALCOMP PLOT PRESENTATION

Calcomp plots generated from the crash test data are presented on the following pages. All data will be recorded on magnetic tape for inclusion in the NHTSA crash test data base system. All data was filtered according to SAE J211. Plot legends and test anomalies are listed below:

PLOT LEGEND

Dummy Data*

Driver	RF Outboard Passenger	Data Description
LF Head	RF Head	Head Acceleration (G)
LF Chest	RF Chest	Chest Acceleration (G)
LF Femurs	RF Femurs	Femur Loads (lb)
	RF Belt Loads	Torso and Lap Belt Loads (lb)

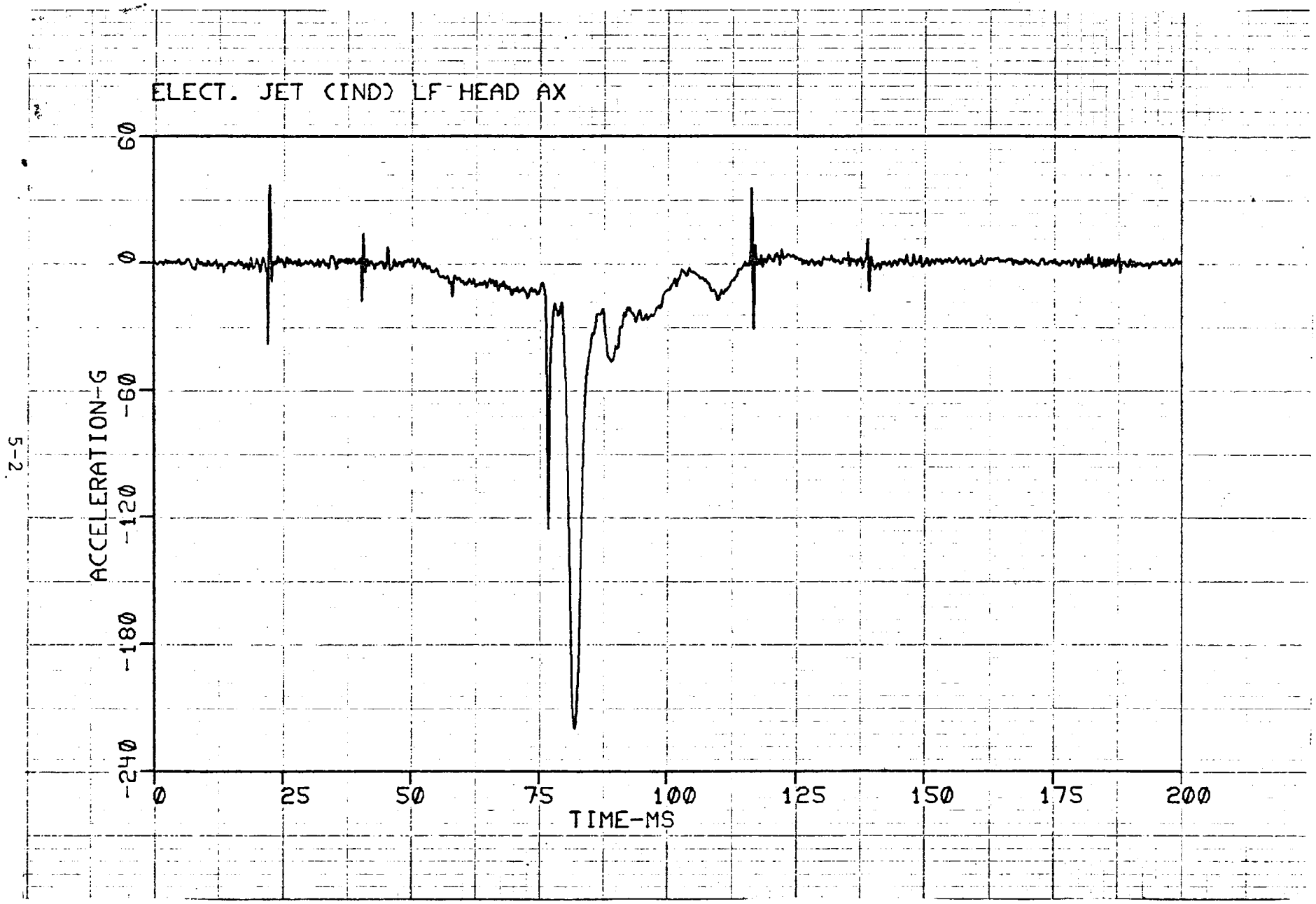
Vehicle Data**

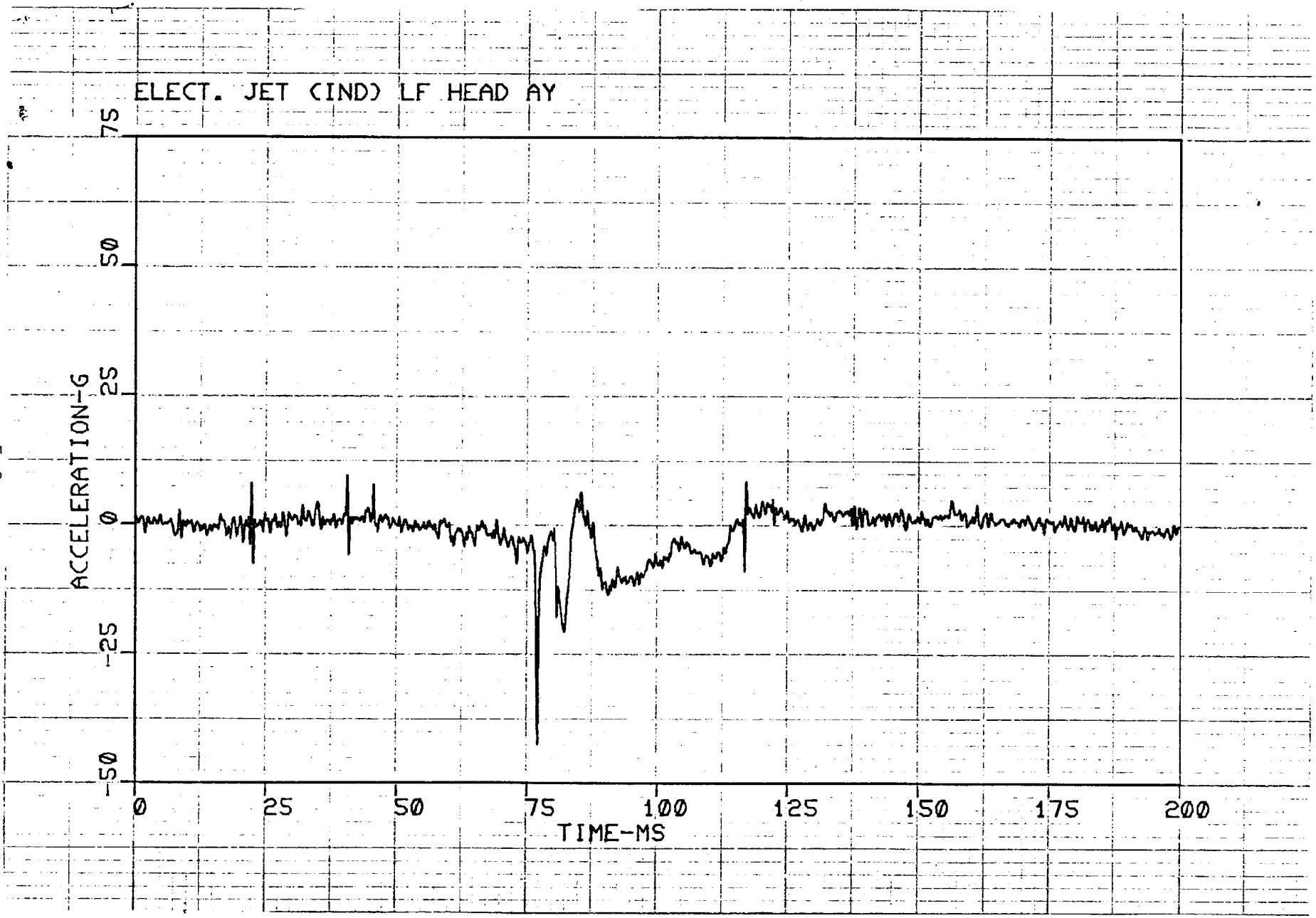
	Location
Loc 1	Engine (Underside) Acceleration (G)
Loc 2	Firewall (Above Steering Column) Acceleration (G)
Loc 3	Firewall (At Vehicle Centerline) Acceleration (G)
Loc 4	Front Seat Front Crossmember (Right Side) Acceleration (G)
Loc 5	Front Seat Rear Crossmember (Left Side) Acceleration (G)

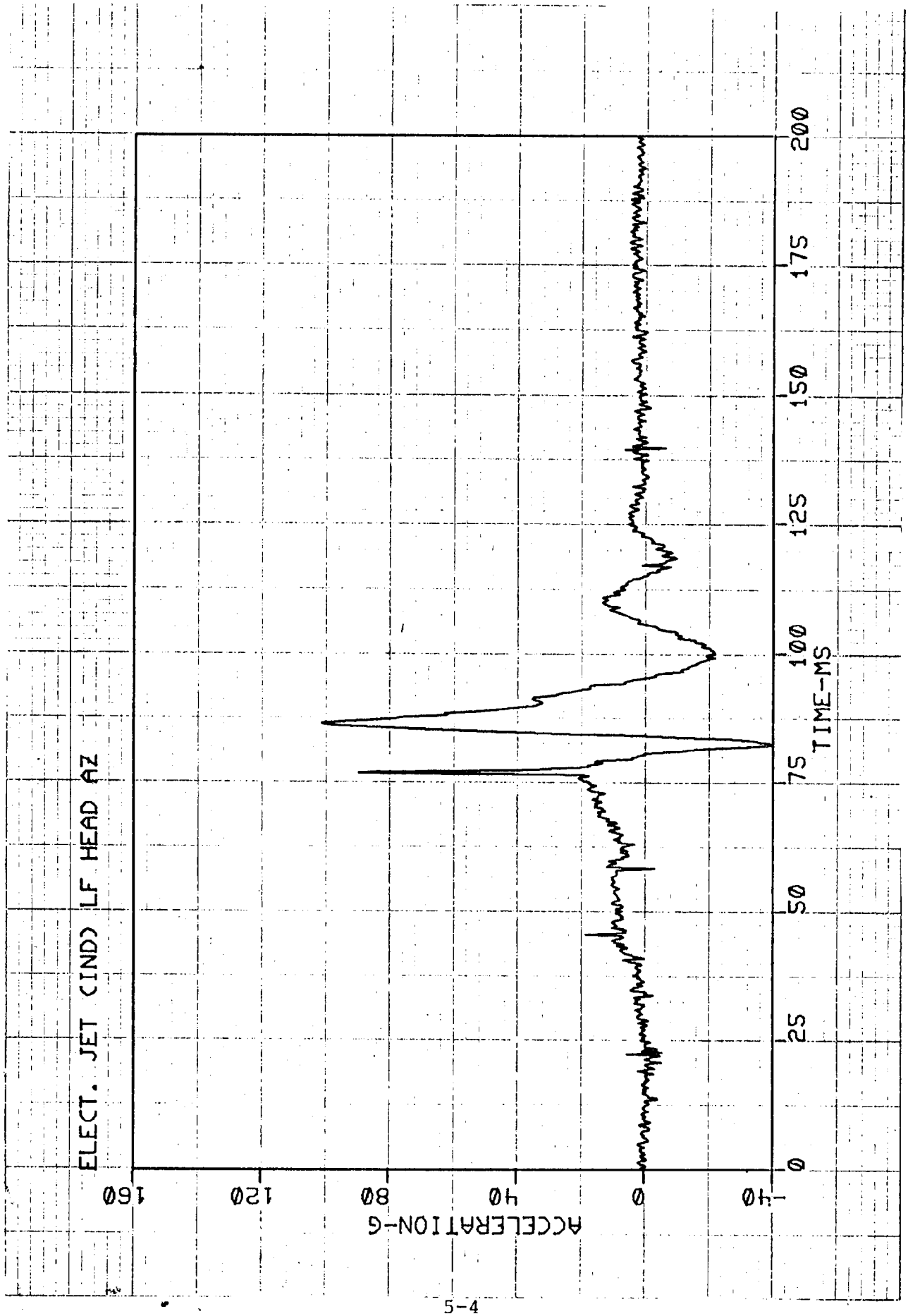
Barrier Data

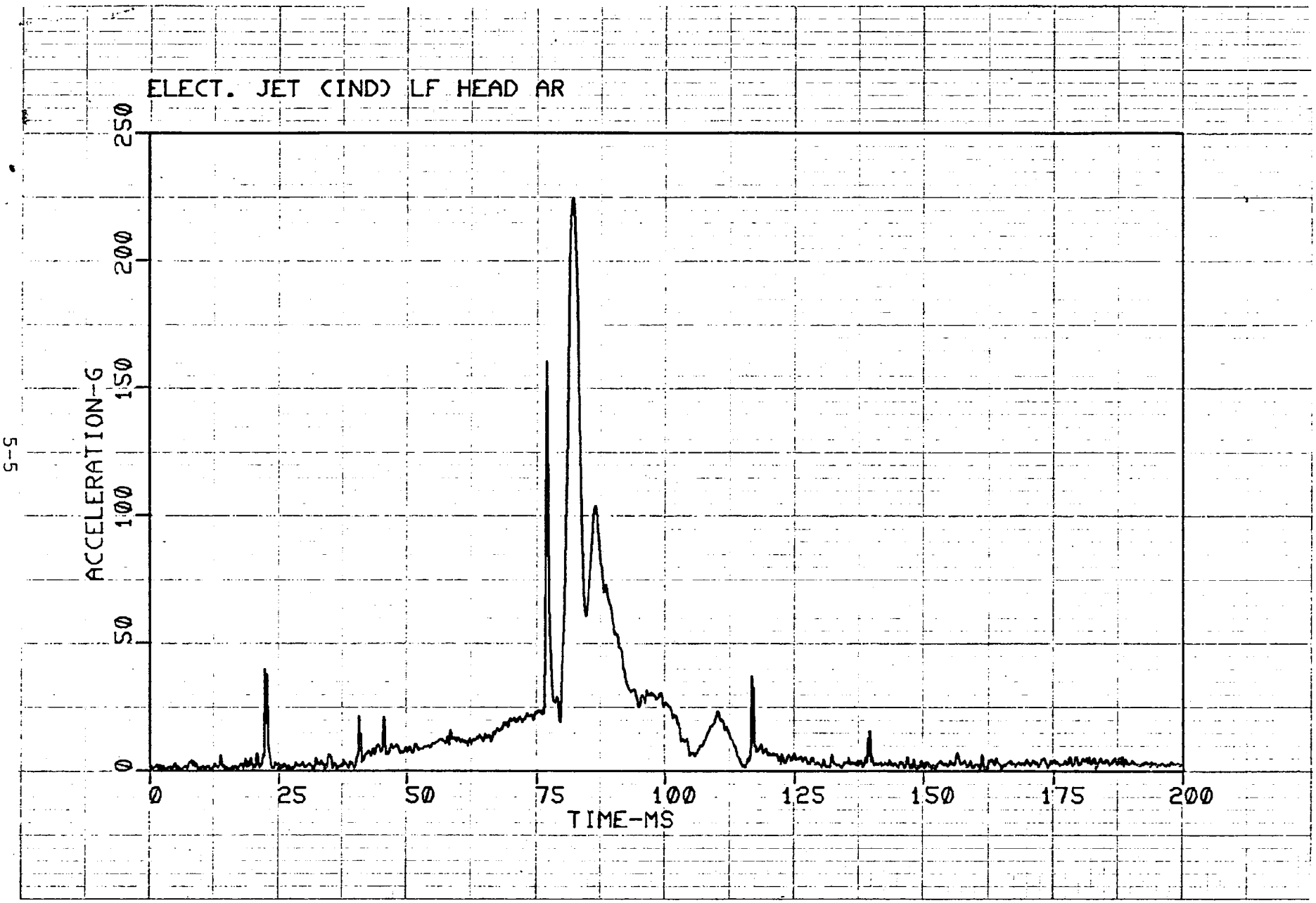
Columns 1-9	Force (lb)
Sum A&B	Force (lb)
Sum C&D	Force (lb)
Total Load	Force (lb)
Total Force	(Barrier) Versus Displacement (Location 5)

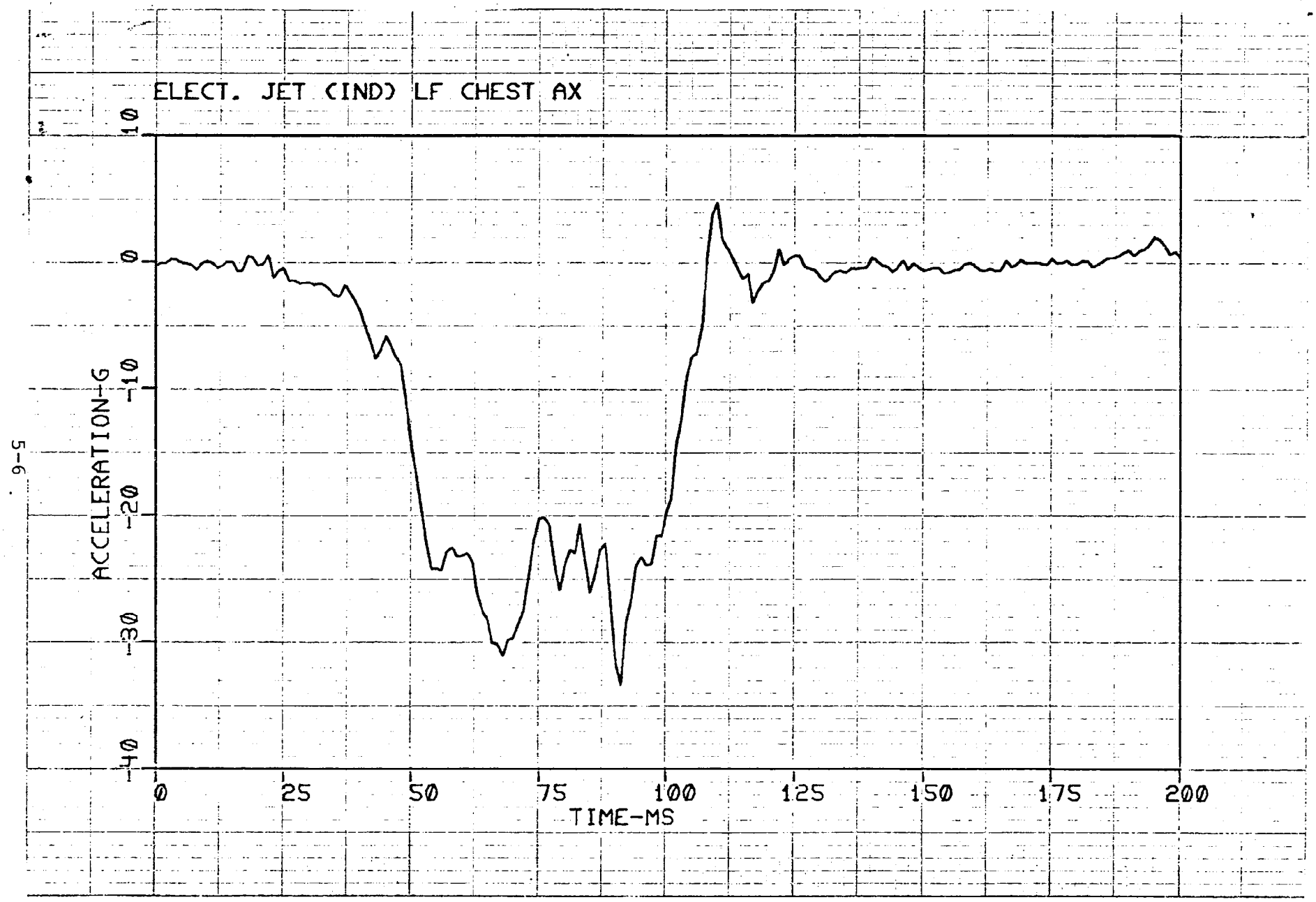
*Dummy Injury Summary presented on pages 3-16 and 3-17.
**Vehicle accelerometer location and data summarized on page 3-20.

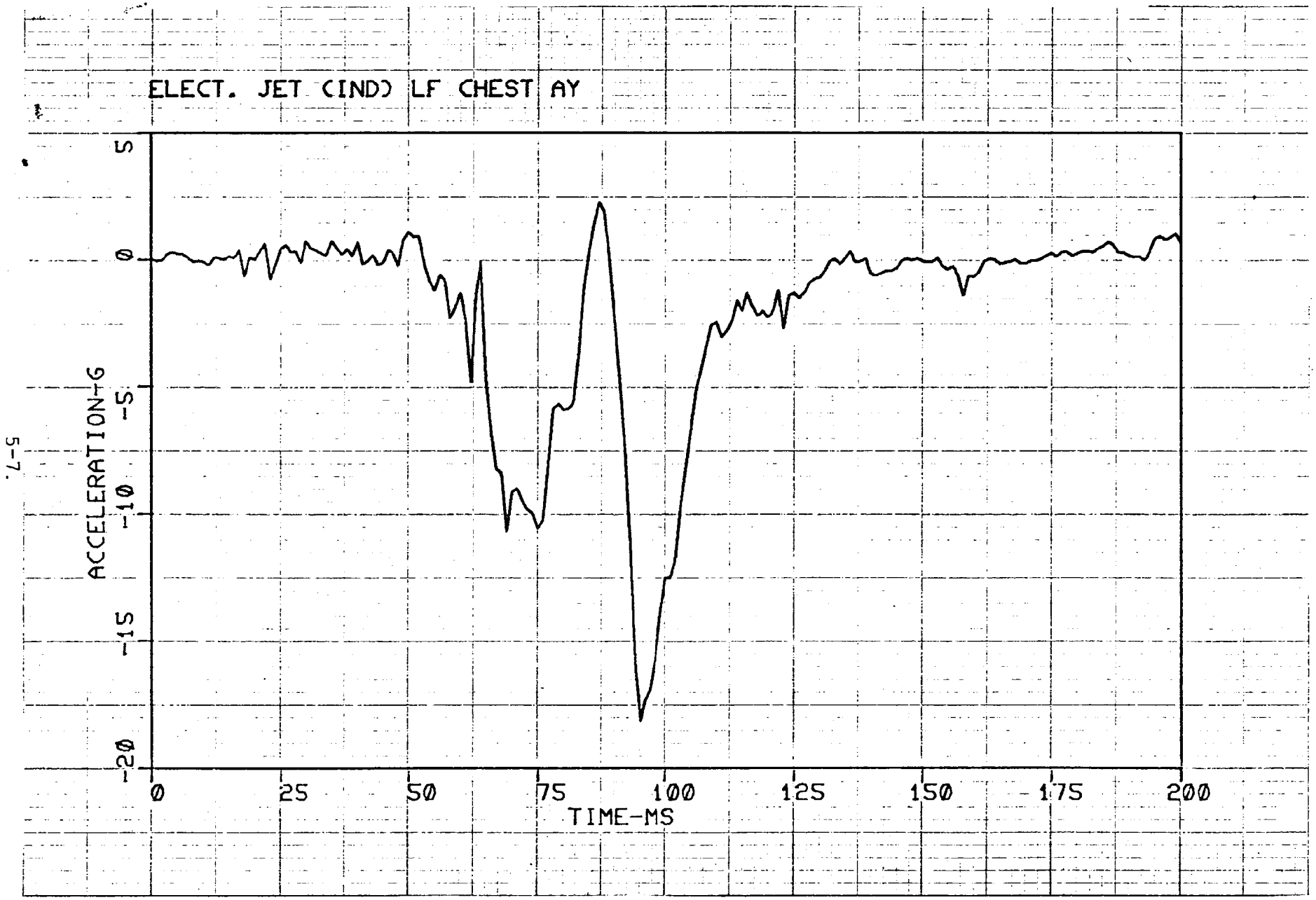

ELECT. JET (IND) LF HEAD AX
60
0
-60
-120
-180
-240
ACCELERATION-G
0
25
50
75
100
125
150
175
200
TIME-MS

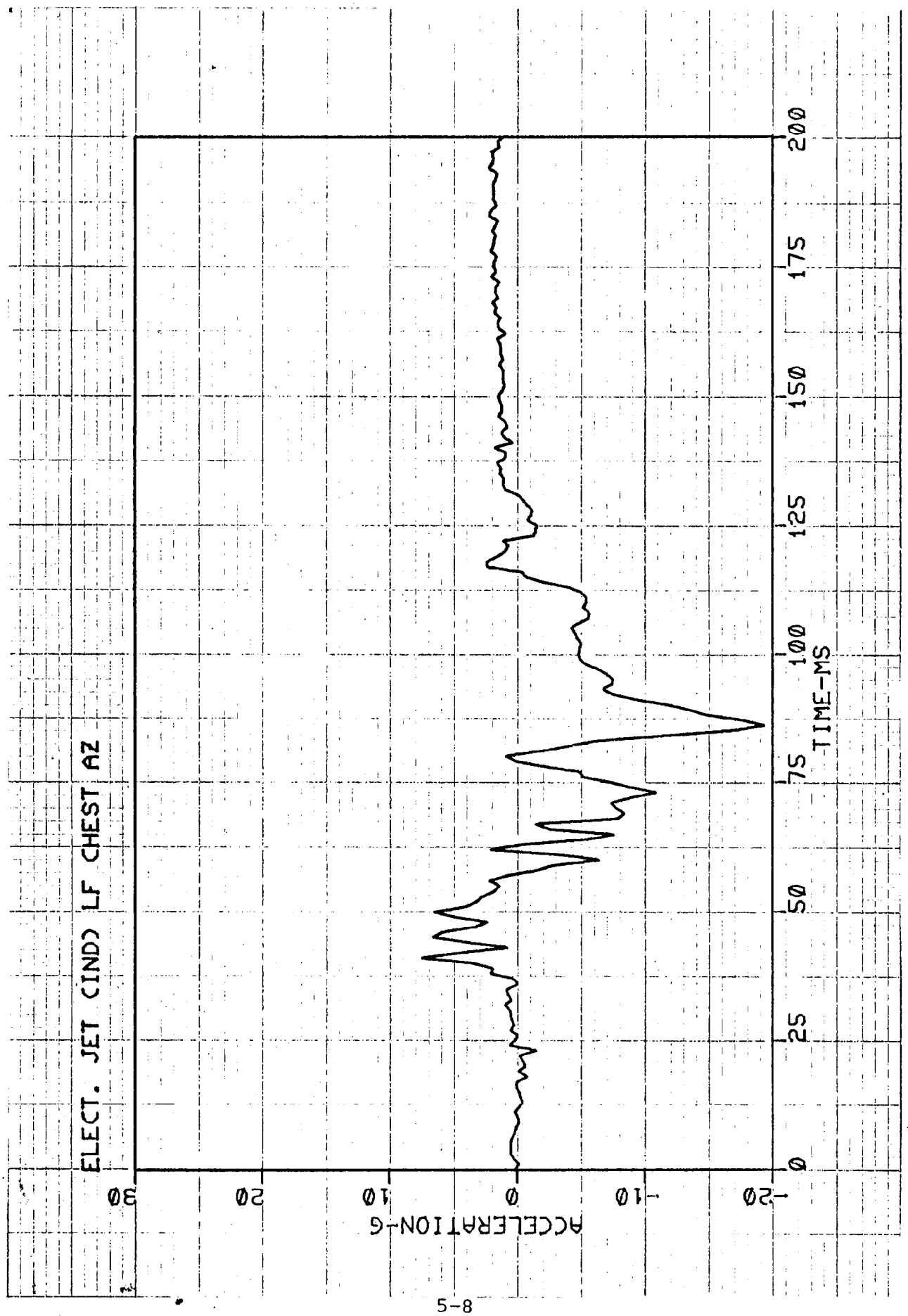

ELECT. JET (IND) LF HEAD AY
ACCELERATION-G
75
50
25
0
-25
-50
0
25
50
75
100
125
150
175
200
TIME-MS

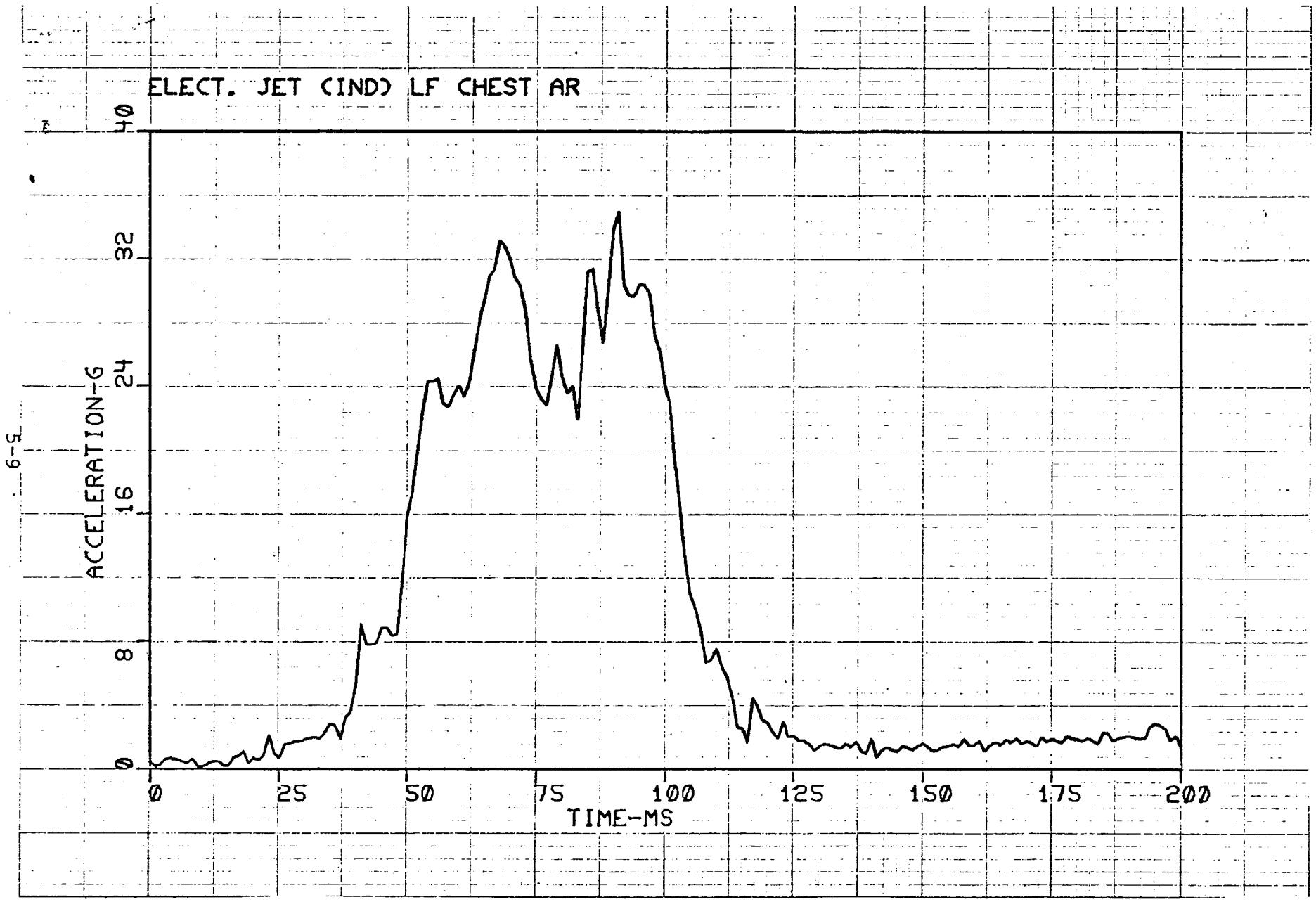

ELECT. JET (IND) LF HEAD AZ
ACCELERATION-G
-40
0
40
80
120
160
0
25
50
75
100
125
150
175
200
TIME-MS

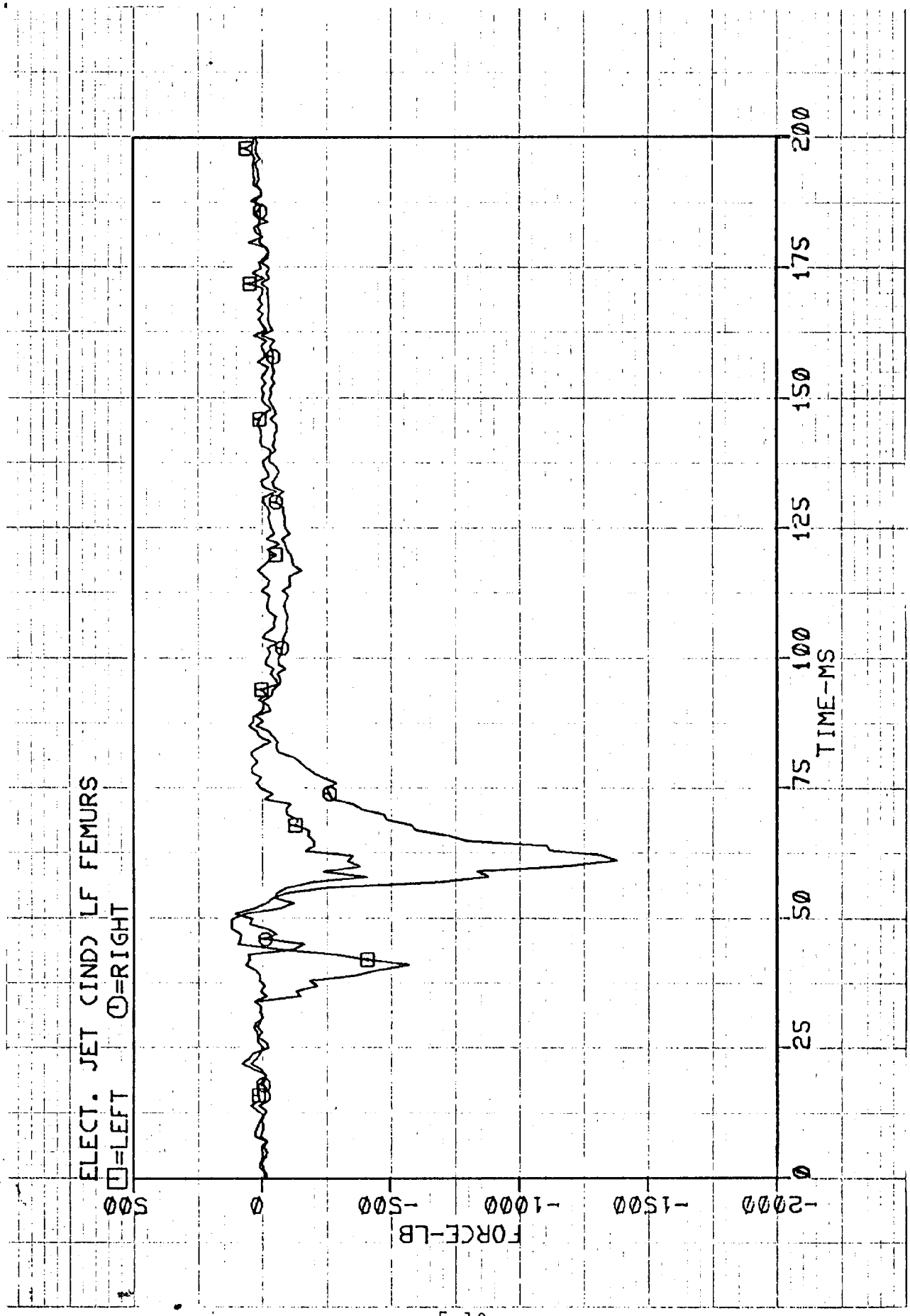

ELECT. JET (IND) LF HEAD AR
ACCELERATION-G
250
200
150
100
50
0
0
25
50
75
100
125
150
175
200
TIME-MS

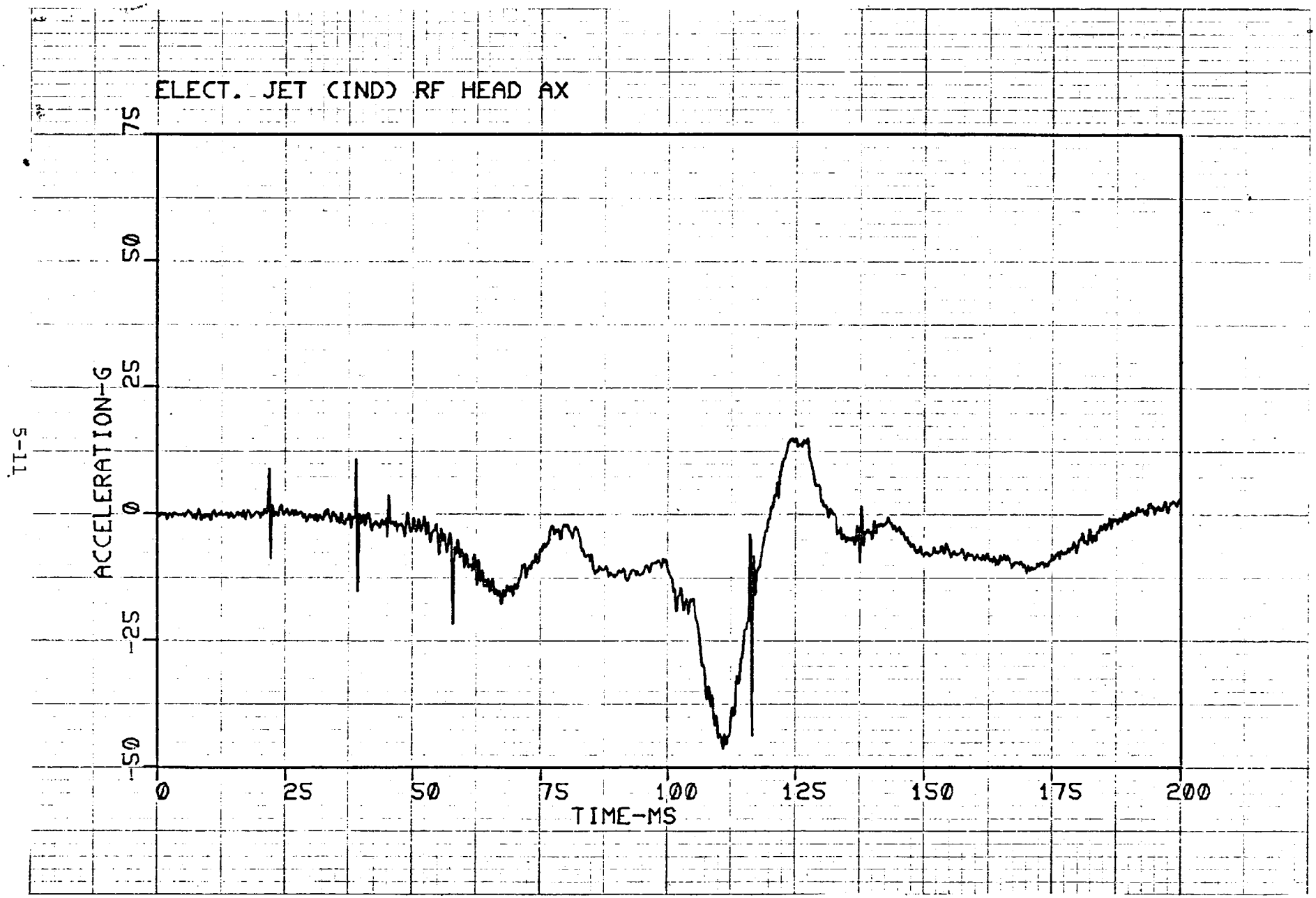

ELECT. JET (IND) LF CHEST AX
10
0
-10
-20
-30
-40
ACCELERATION-G
0
25
50
75
100
125
150
175
200
TIME-MS

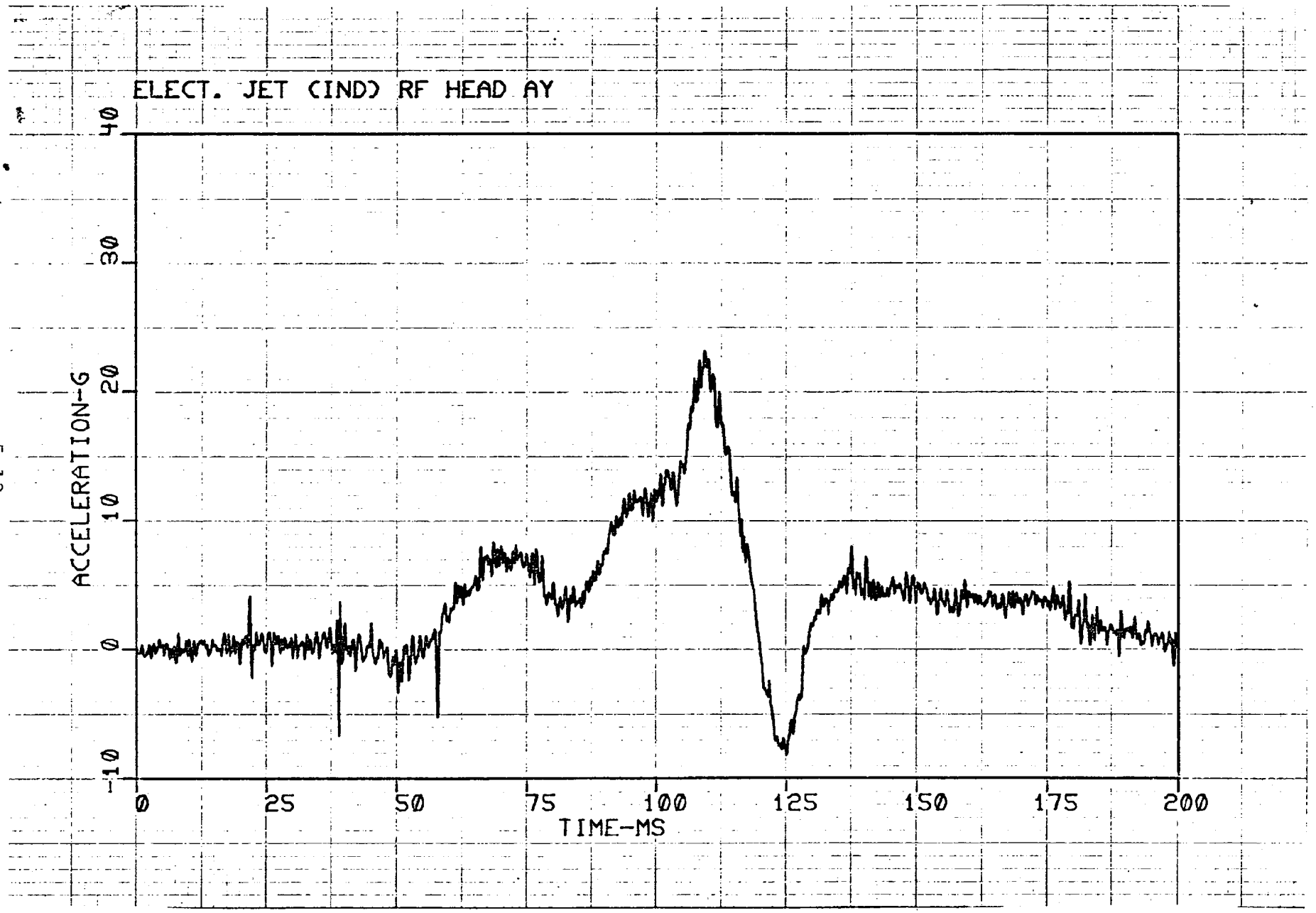

ELECT. JET (IND) LF CHEST AY
ACCELERATION-G
5
0
-5
-10
-15
-20
0
25
50
75
100
125
150
175
200
TIME-MS

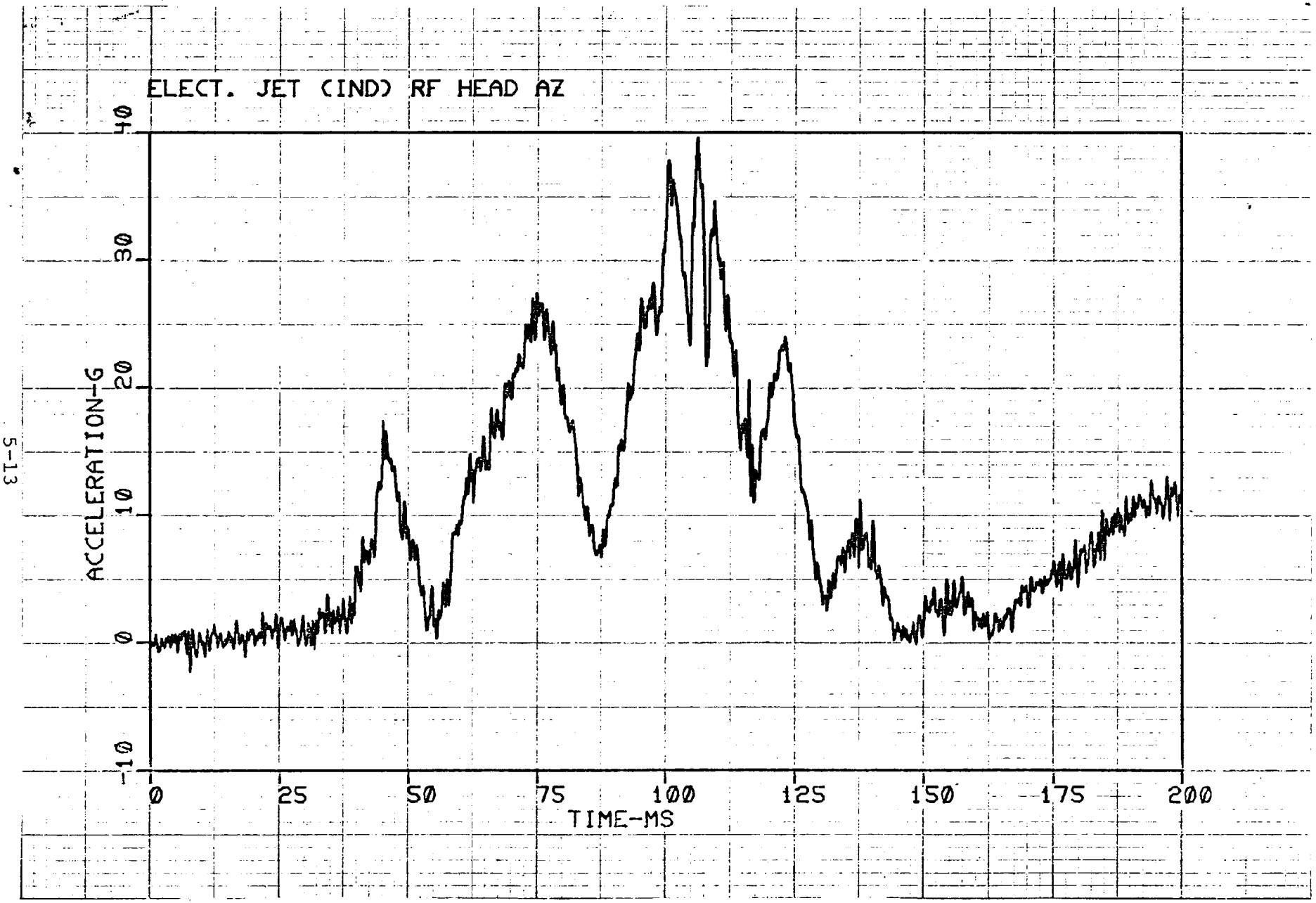

ELECT. JET (IND) LF CHEST AZ
ACCELERATION-G
30
20
10
0
-10
-20
0
25
50
75
100
125
150
175
200
TIME-MS

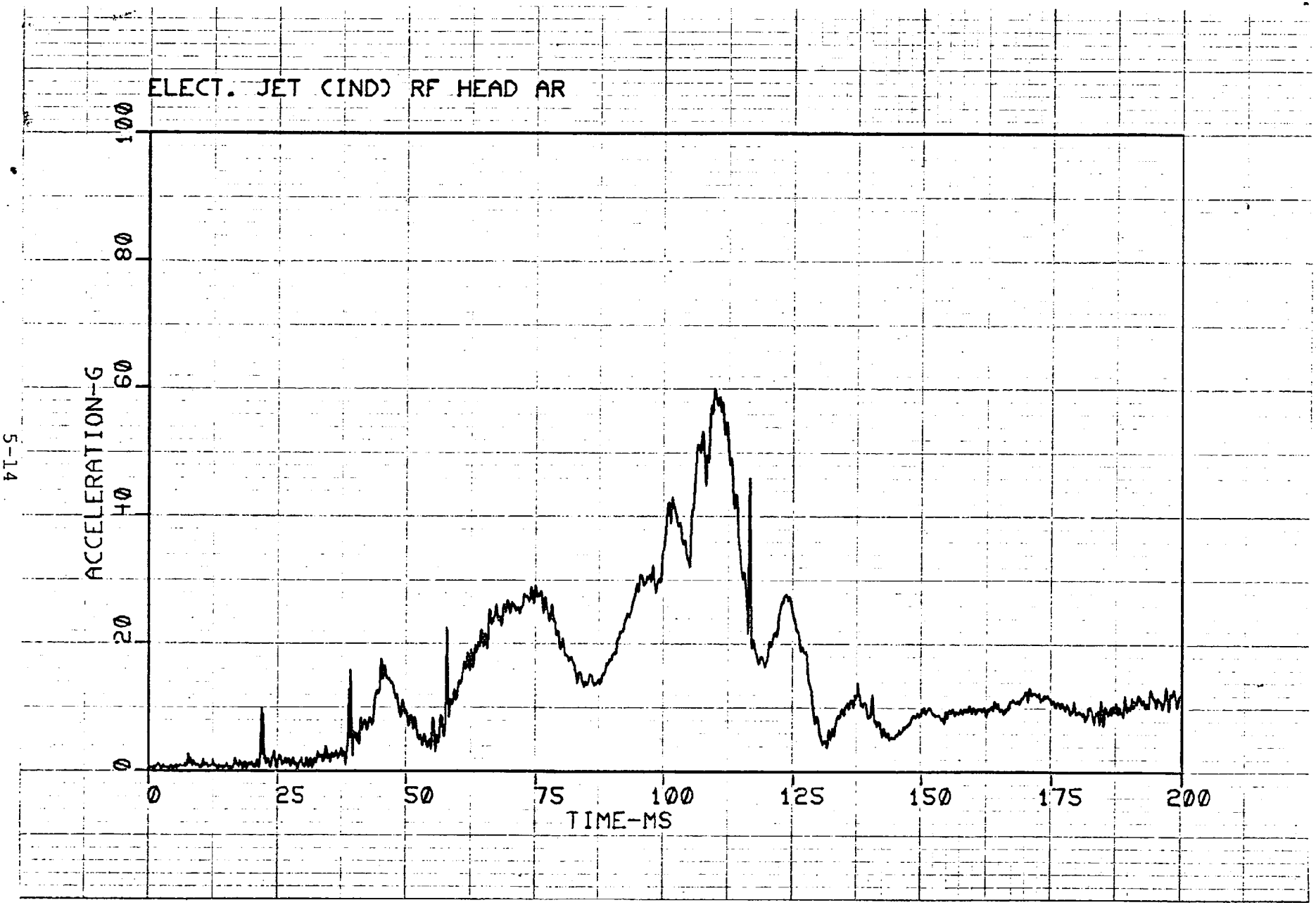

ELECT. JET (IND) LF CHEST AR
ACCELERATION-G
0
8
16
24
32
40
0
25
50
75
100
125
150
175
200
TIME-MS

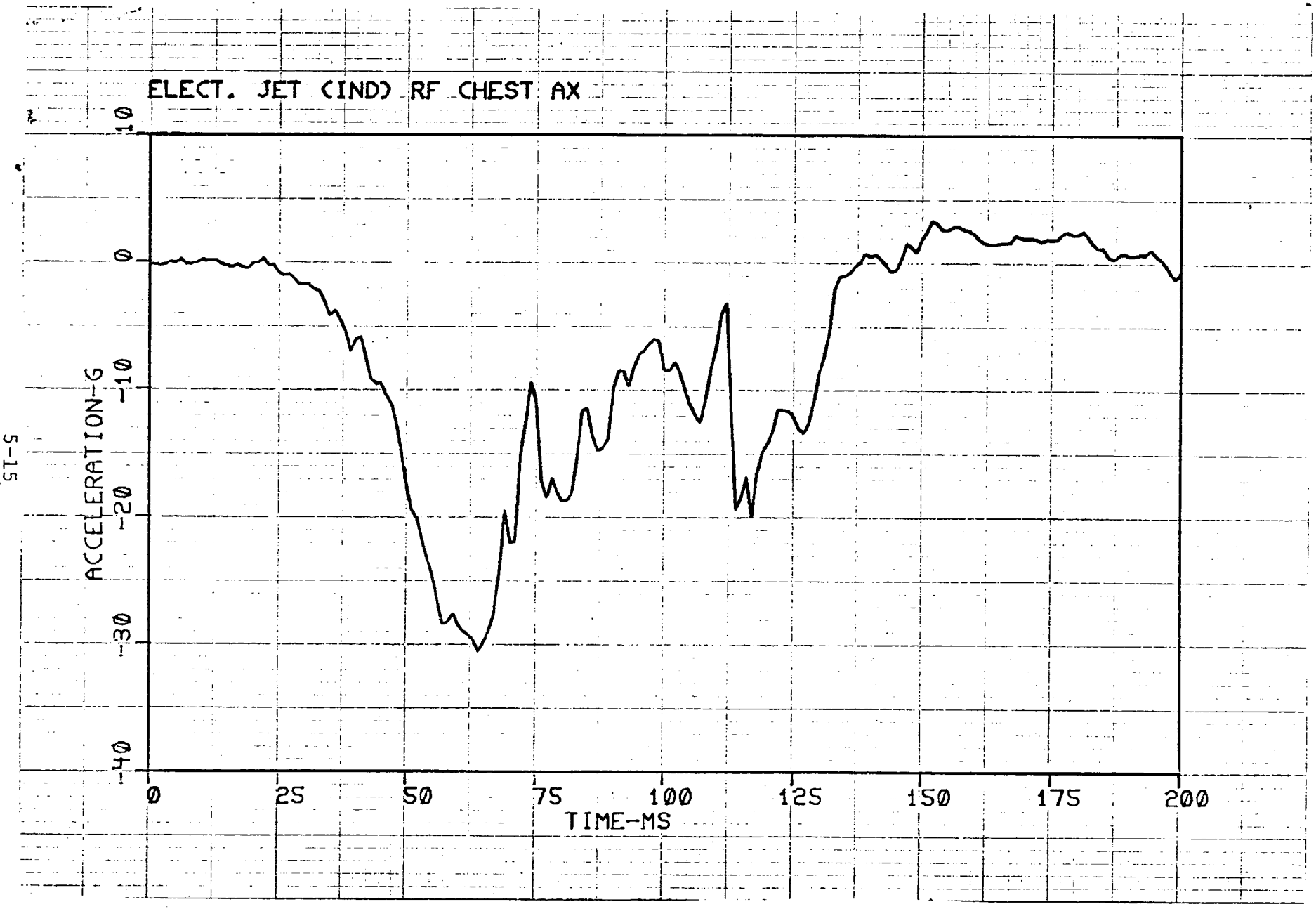

ELECT. JET (IND) LF FEMURS
□=LEFT ○=RIGHT
FORCE-LB
500
0
-500
-1000
-1500
-2000
0
25
50
75
100
125
150
175
200
TIME-MS

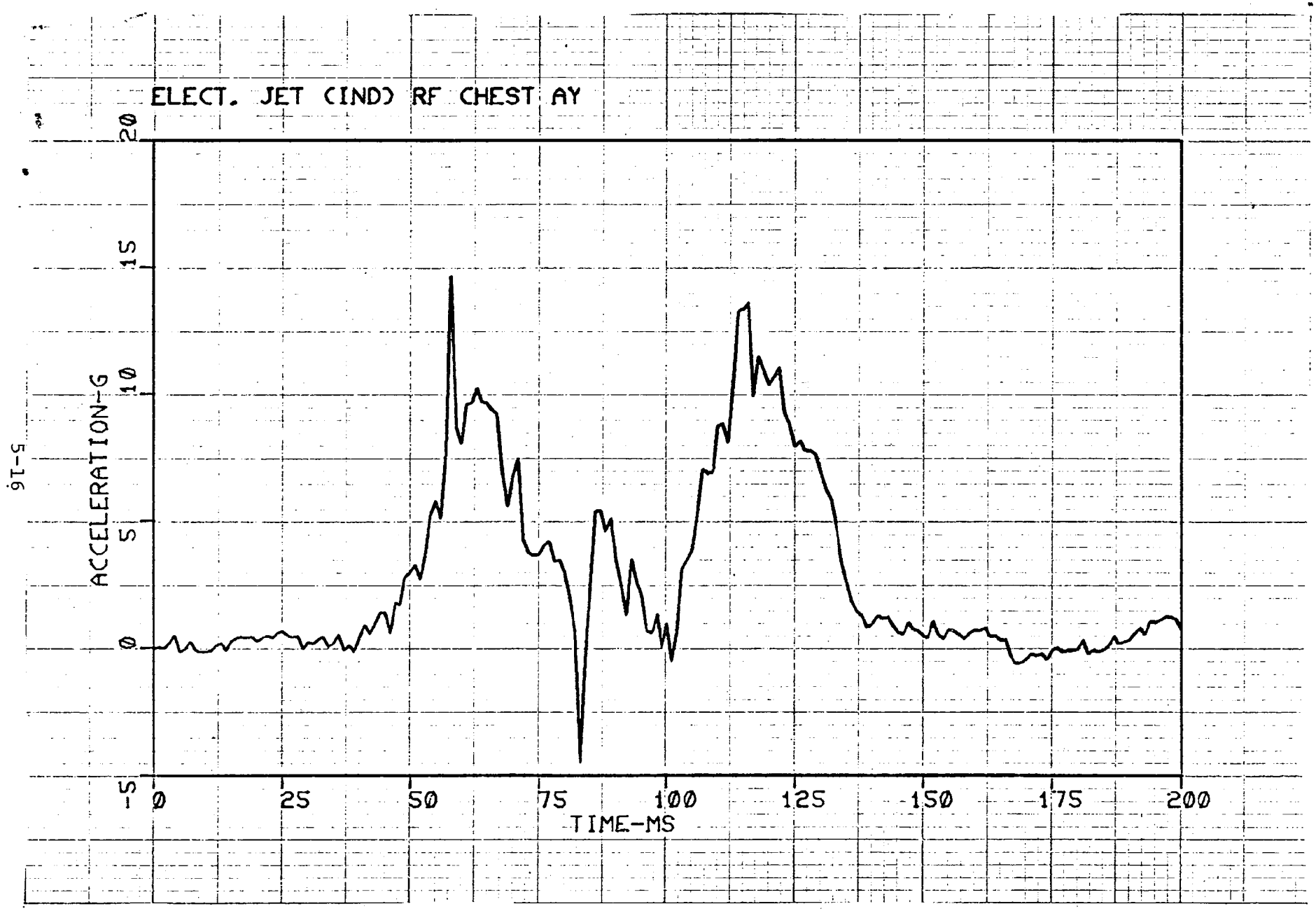

ELECT. JET (IND) RF HEAD AX
75
50
25
0
-25
-50
ACCELERATION-G
0
25
50
75
100
125
150
175
200
TIME-MS

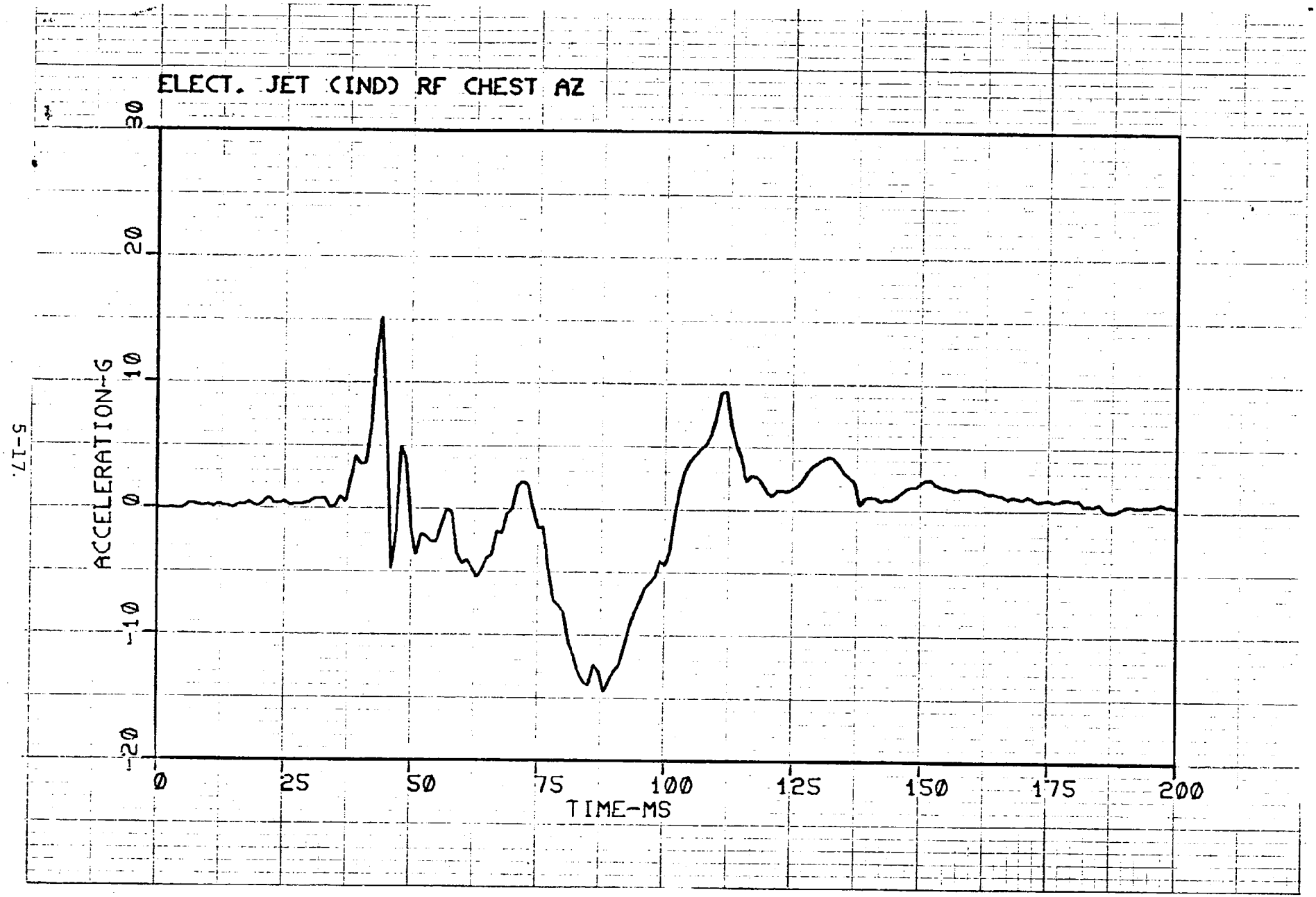

ELECT. JET (IND) RF HEAD AY
ACCELERATION-G
40
30
20
10
0
-10
0
25
50
75
100
125
150
175
200
TIME-MS

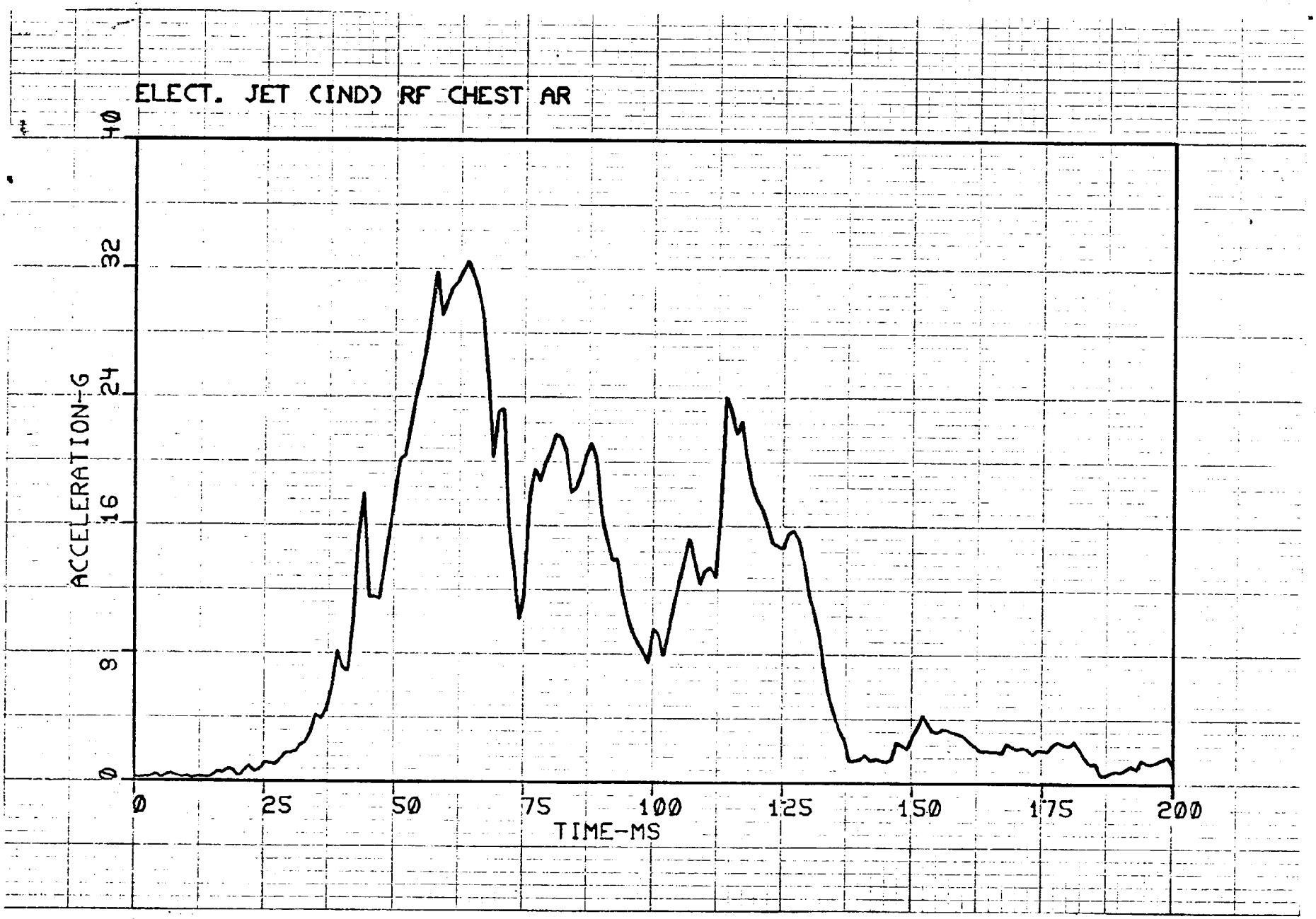

ELECT. JET (IND) RF HEAD AZ
ACCELERATION-G
40
30
20
10
0
-10
0
25
50
75
100
125
150
175
200
TIME-MS

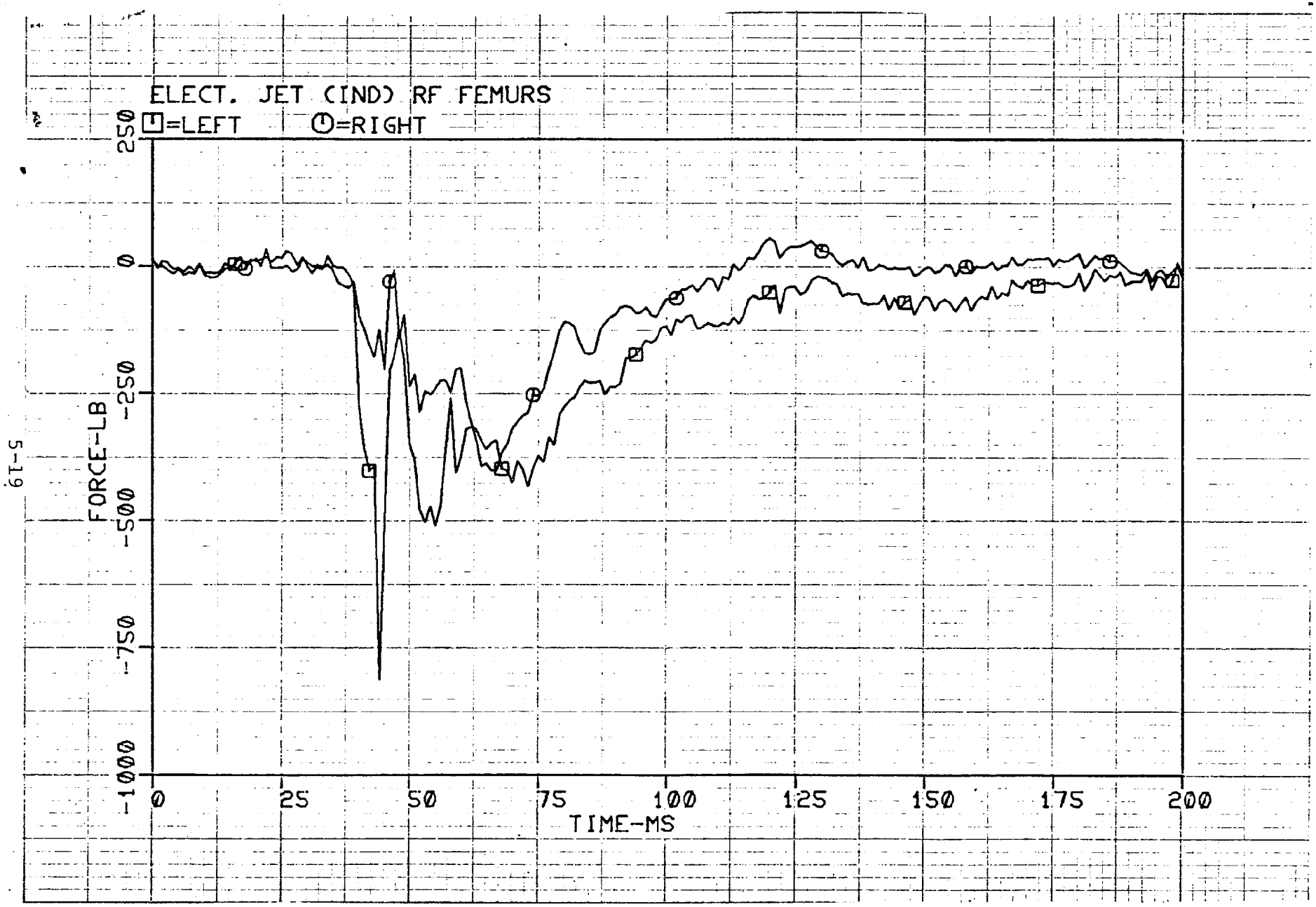

ELECT. JET (IND) RF HEAD AR
ACCELERATION-G
0
20
40
60
80
100
0
25
50
75
100
125
150
175
200
TIME-MS

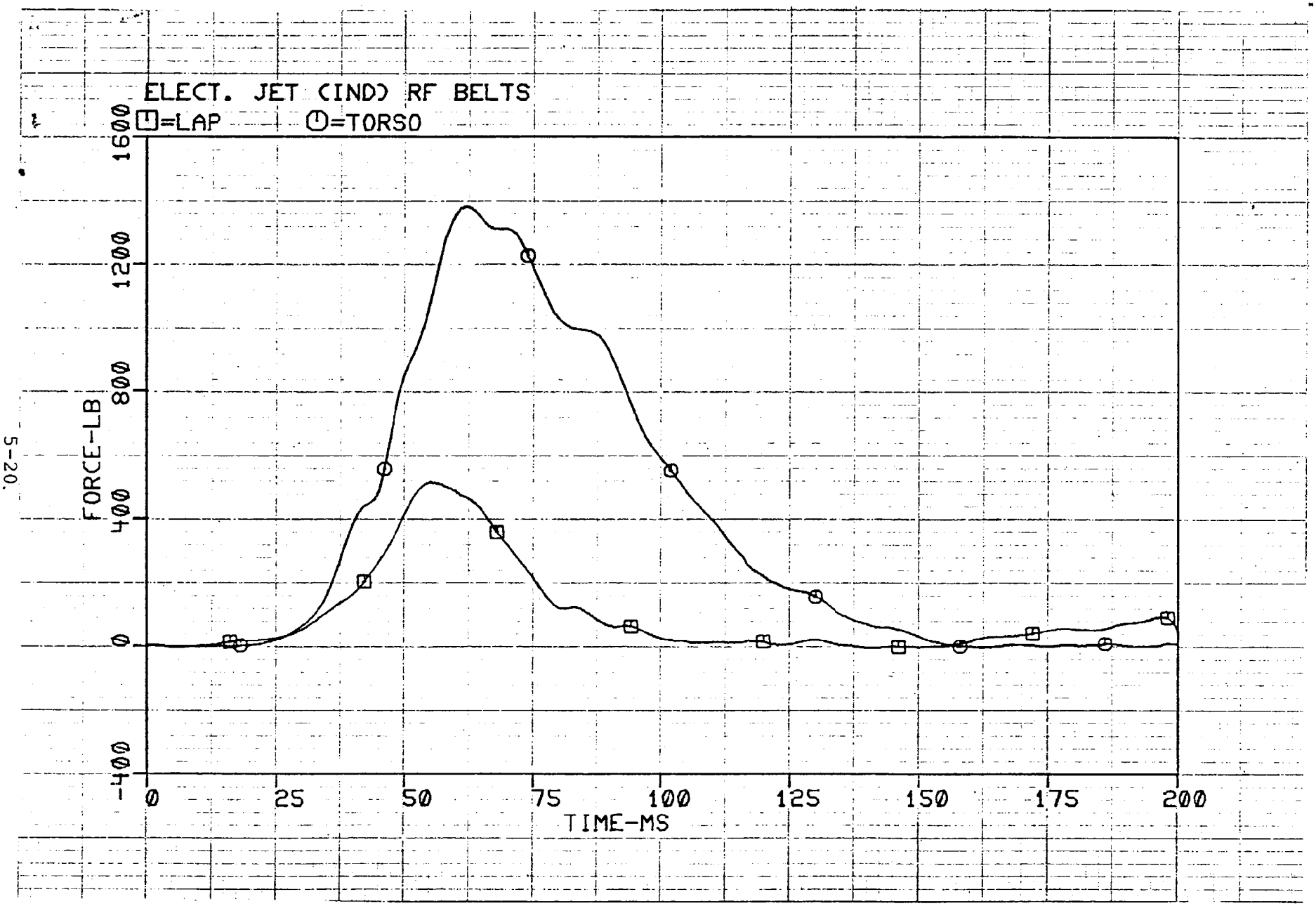

ELECT. JET (IND) RF CHEST AX
10
0
-10
-20
-30
-40
ACCELERATION-G
0
25
50
75
100
125
150
175
200
TIME-MS

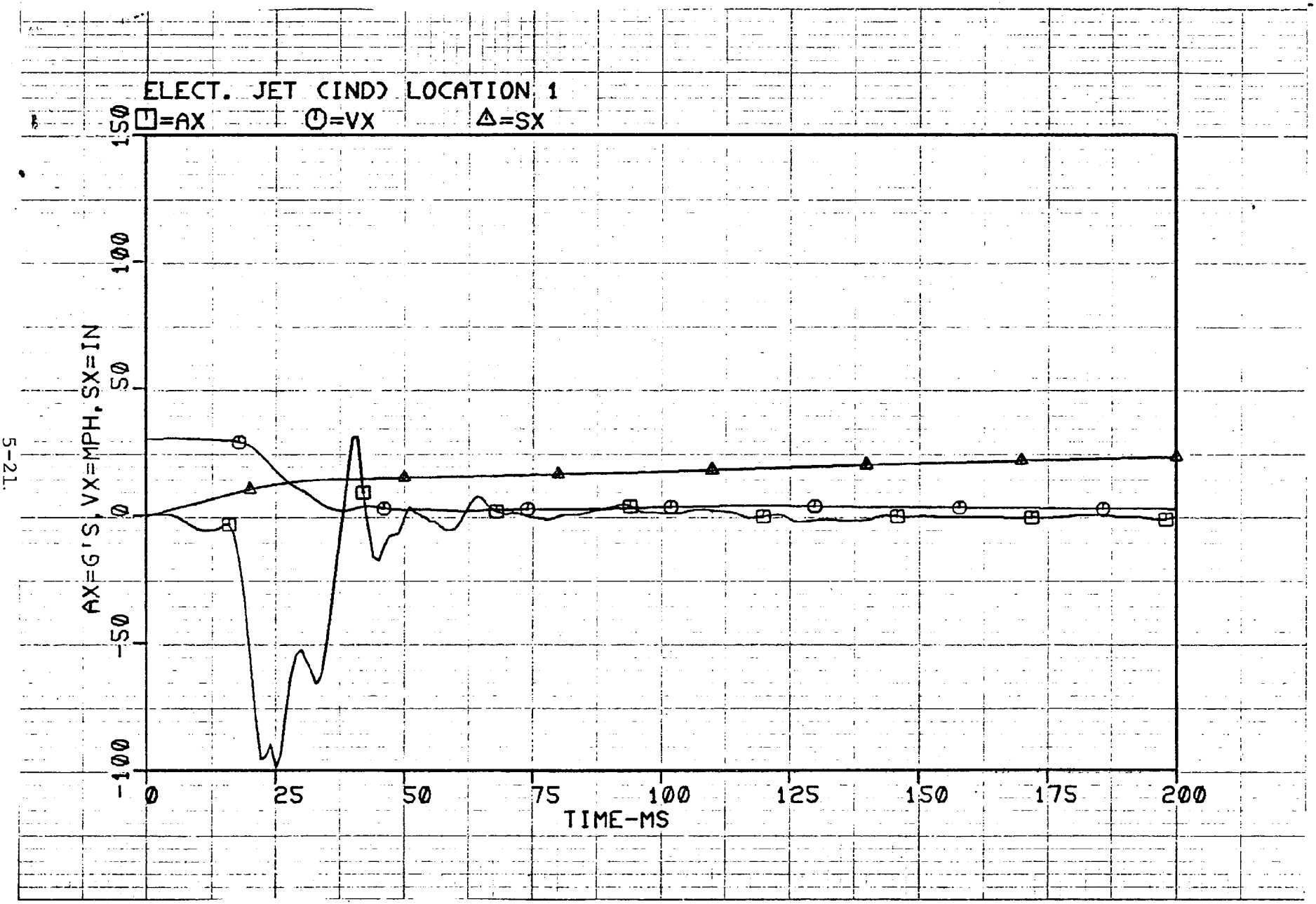

ELECT. JET (IND) RF CHEST AY
ACCELERATION-G
20
15
10
5
0
-5
0
25
50
75
100
125
150
175
200
TIME-MS

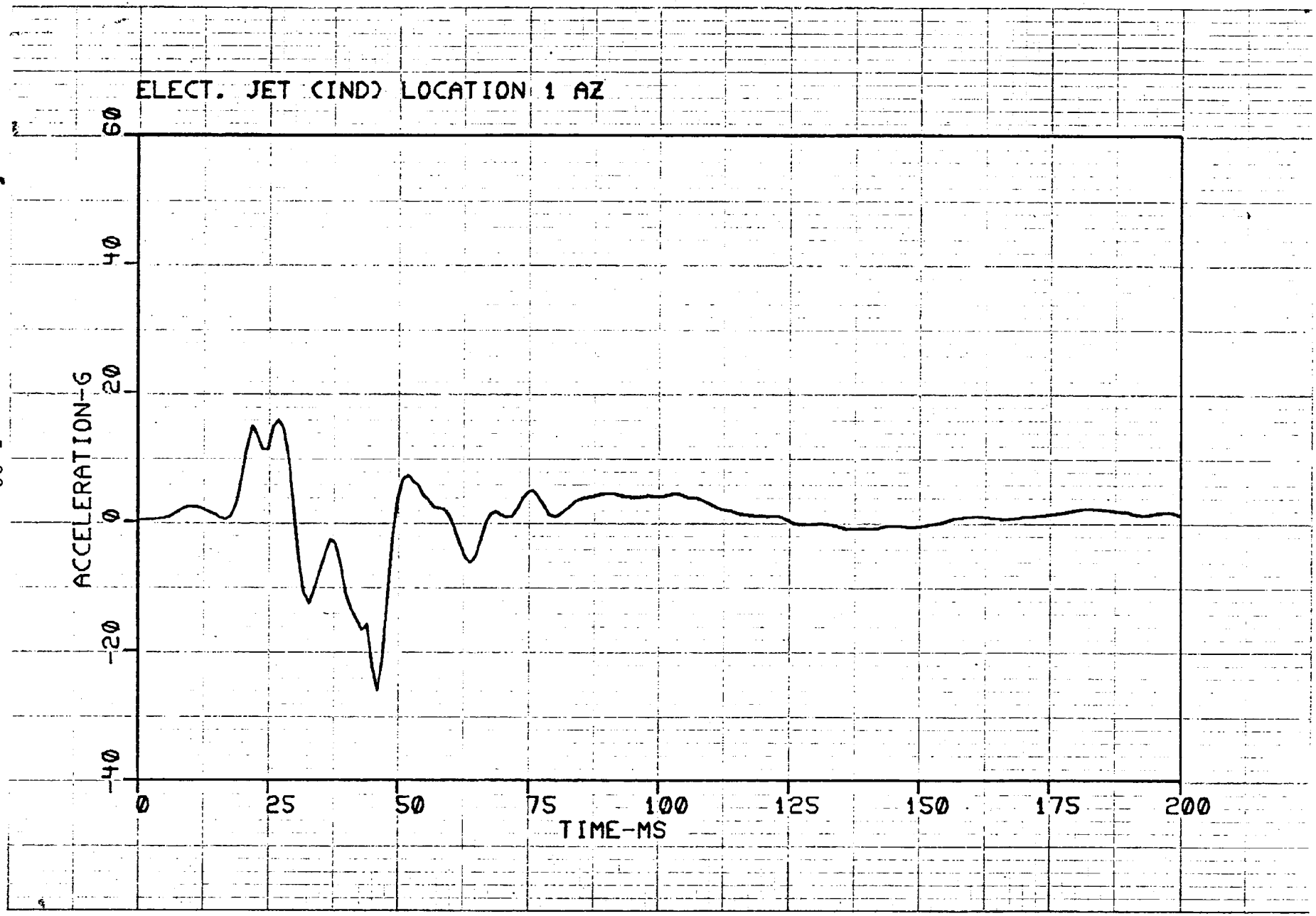

ELECT. JET (IND) RF CHEST AZ
ACCELERATION-G
30
20
10
0
-10
-20
0
25
50
75
100
125
150
175
200
TIME-MS

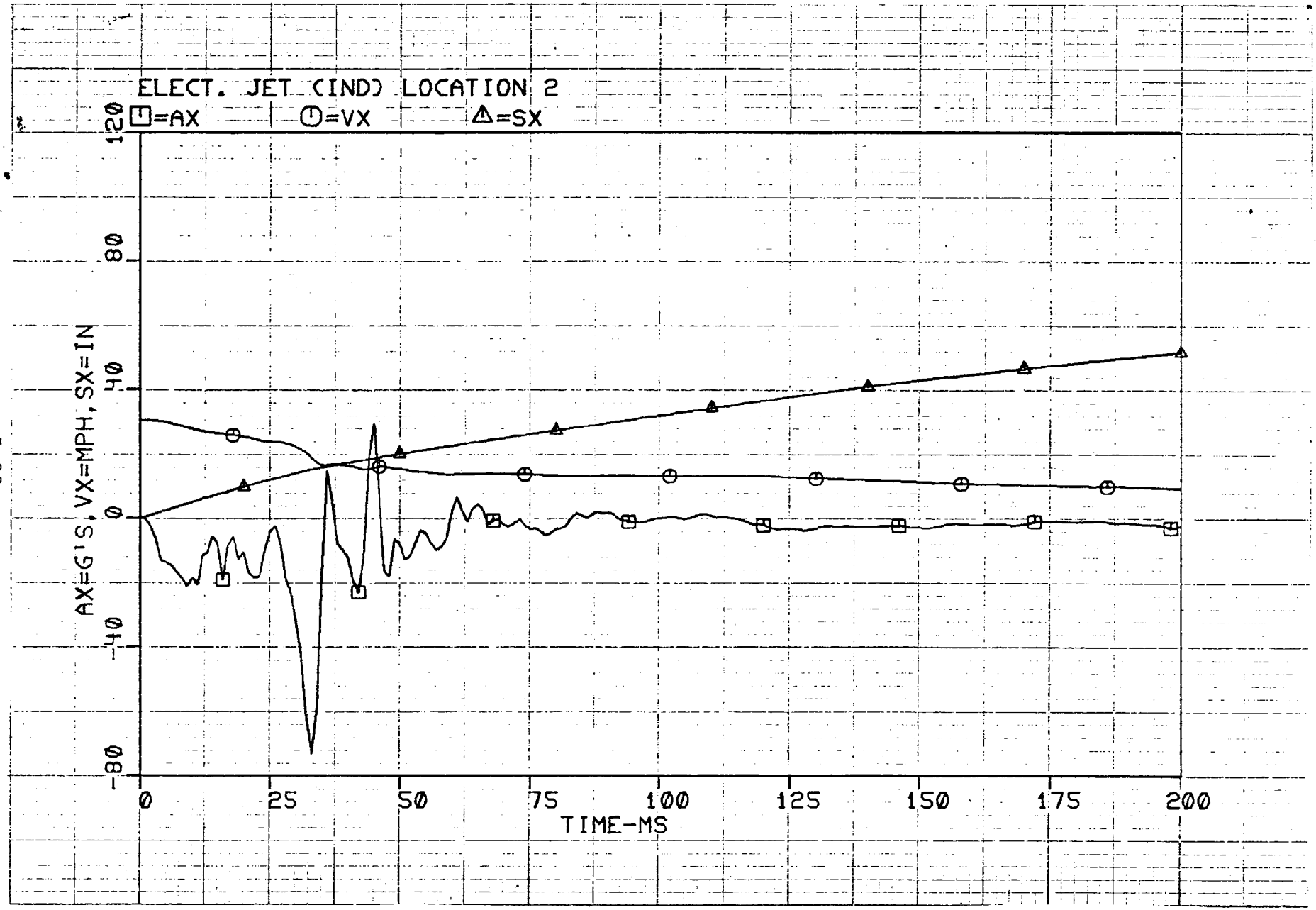

ELECT. JET (IND) RF CHEST AR
ACCELERATION-G
0
8
16
24
32
40
0
25
50
75
100
125
150
175
200
TIME-MS

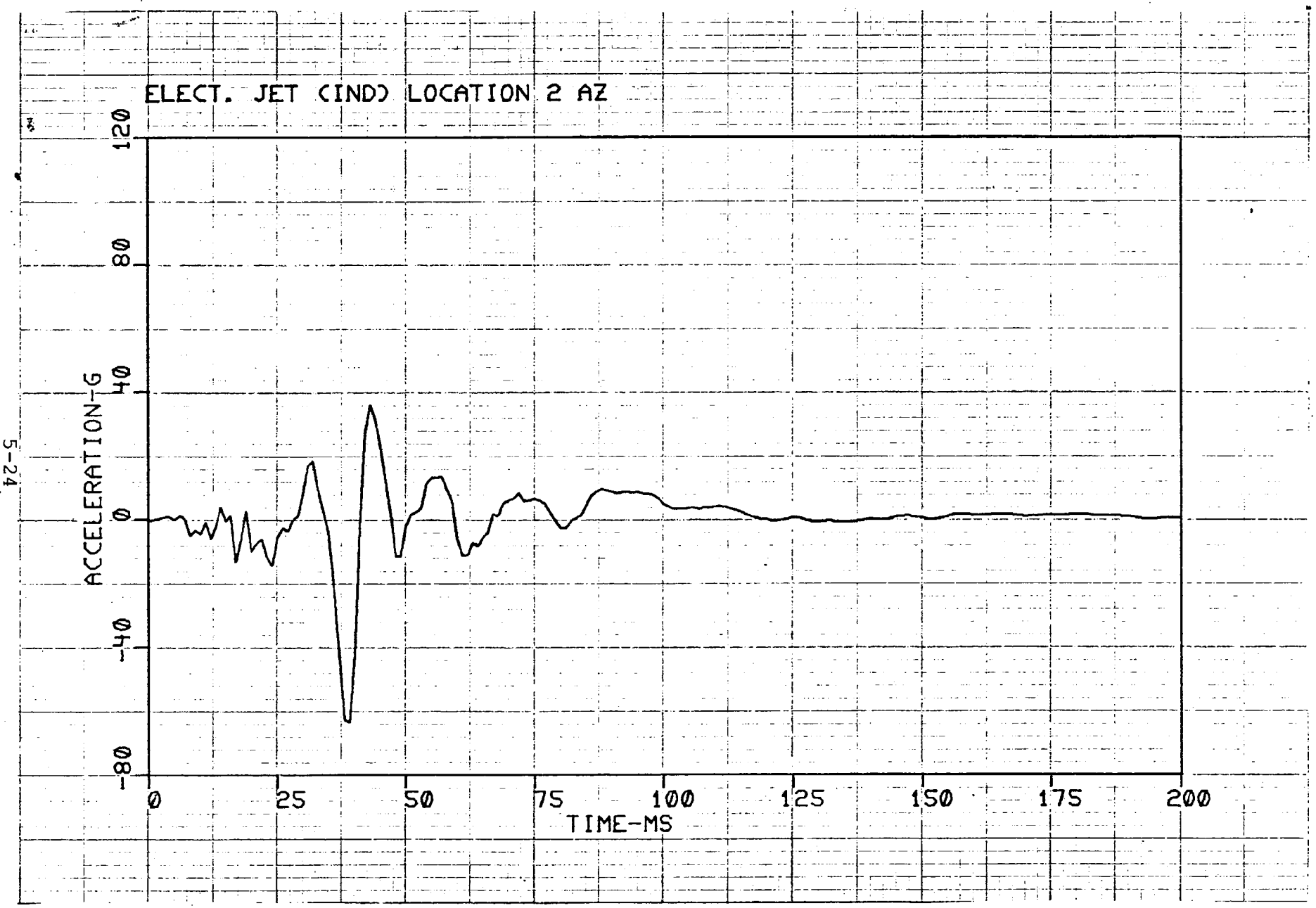

ELECT. JET (IND) RF FEMURS
□=LEFT
○=RIGHT
250
0
-250
-500
-750
-1000
FORCE-LB
0
25
50
75
100
125
150
175
200
TIME-MS

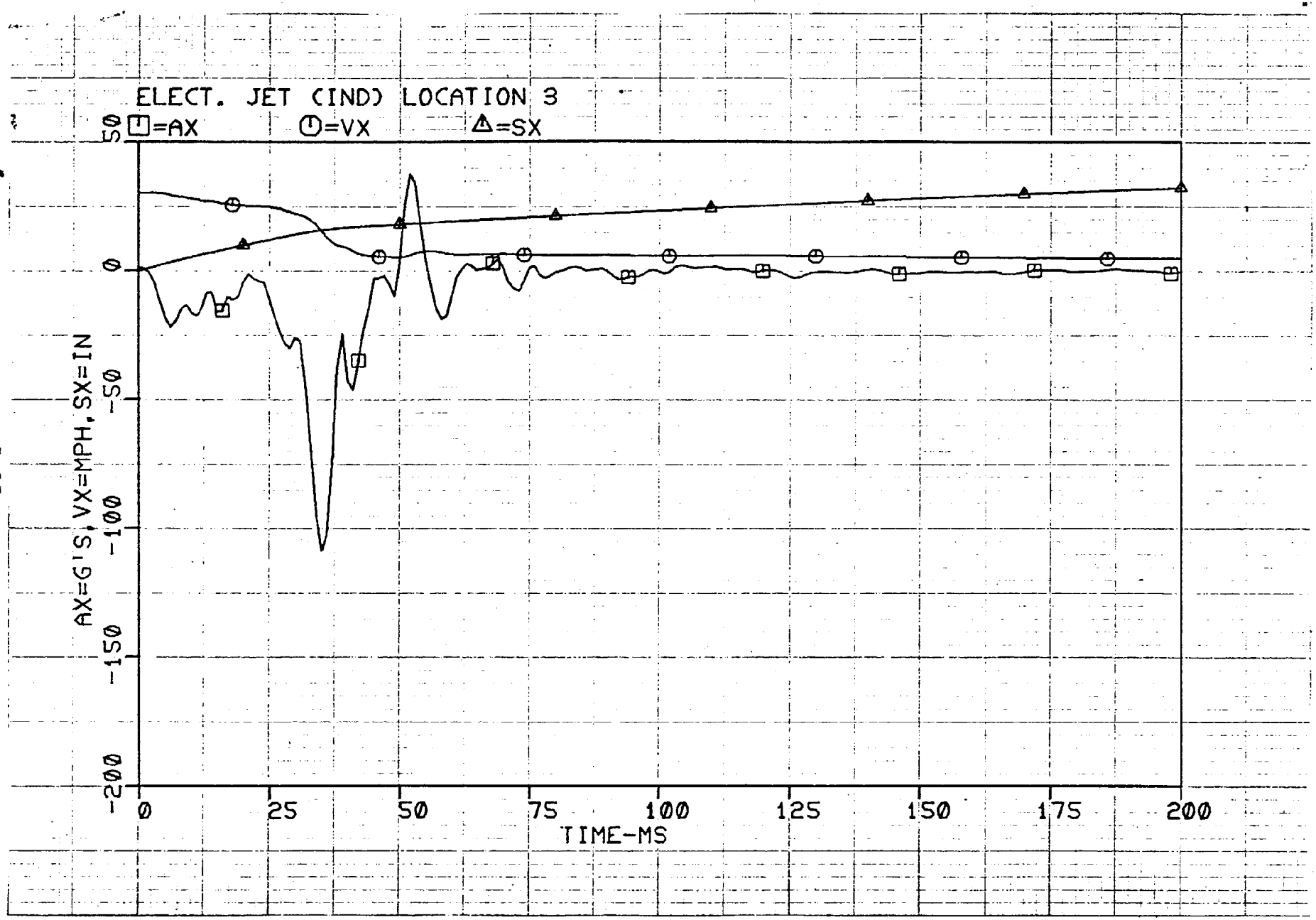

ELECT. JET (IND) RF BELTS
□=LAP
○=TORSO
FORCE-LB
1600
1200
800
400
0
-400
0
25
50
75
100
125
150
175
200
TIME-MS

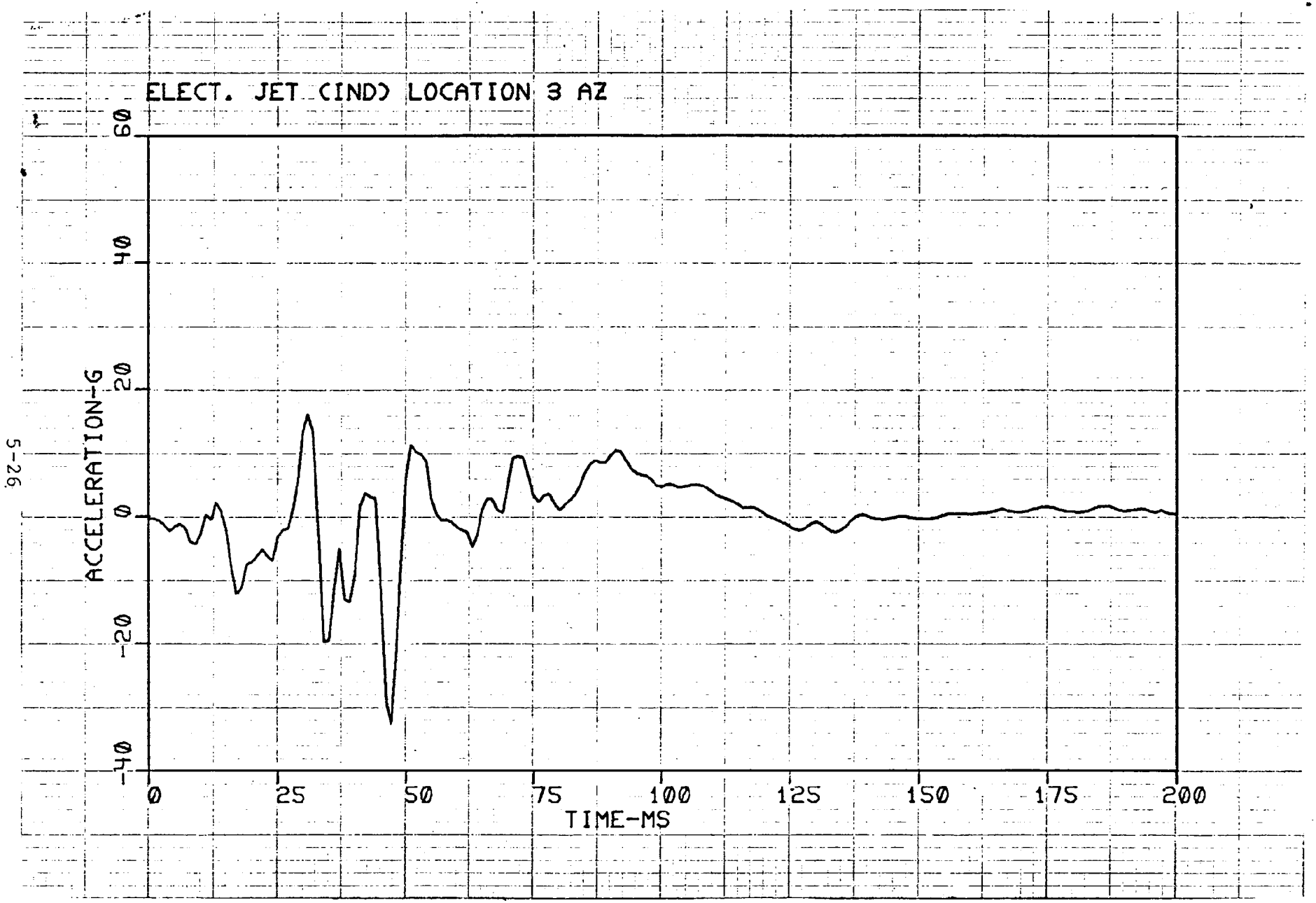

ELECT. JET (IND) LOCATION 1
□=AX
○=VX
△=SX
AX=G'S, VX=MPH, SX=IN
150
100
50
0
-50
-100
0
25
50
75
100
125
150
175
200
TIME-MS

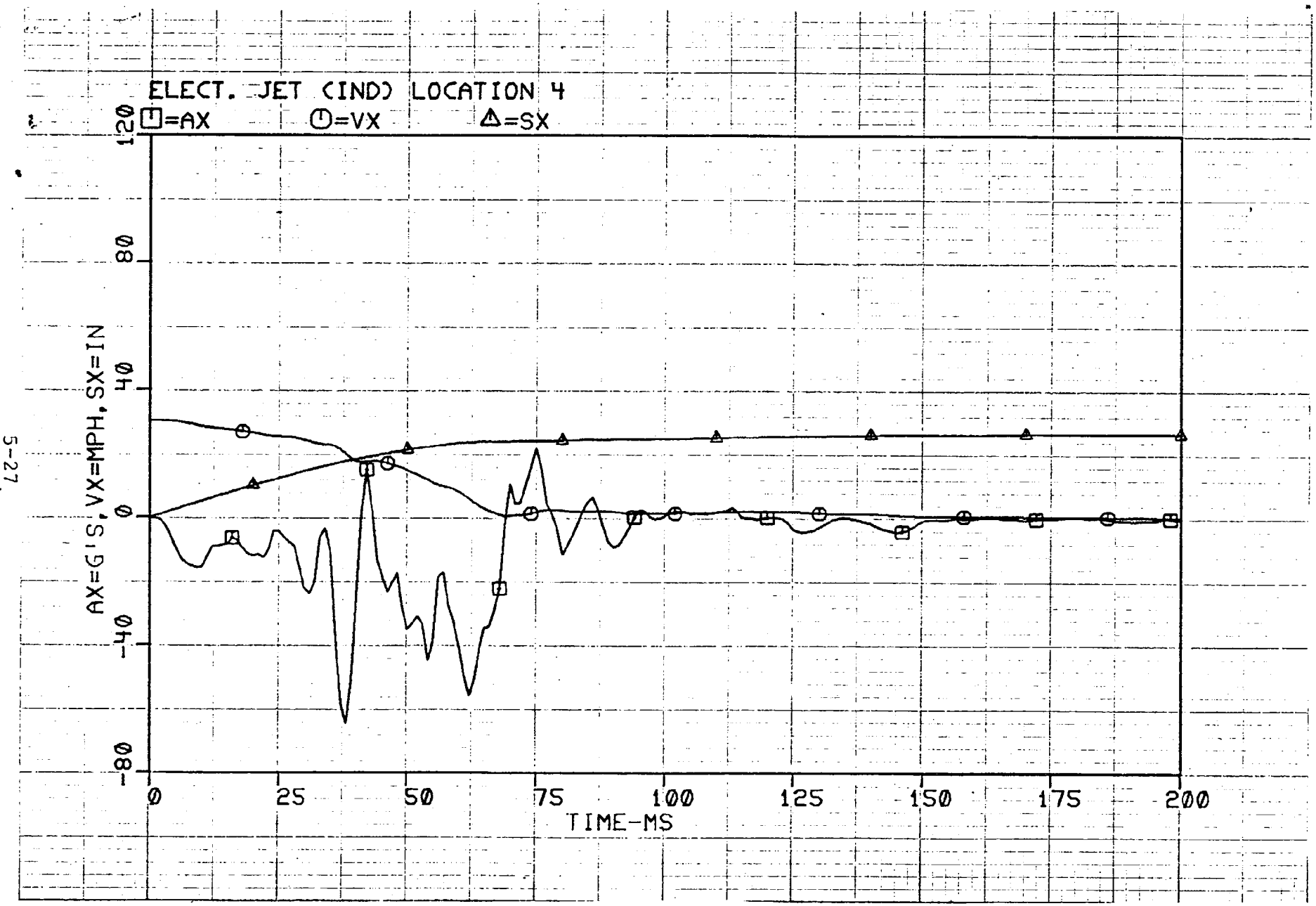

ELECT. JET (IND) LOCATION 1 AZ
60
40
20
0
-20
-40
ACCELERATION-G
0
25
50
75
100
125
150
175
200
TIME-MS

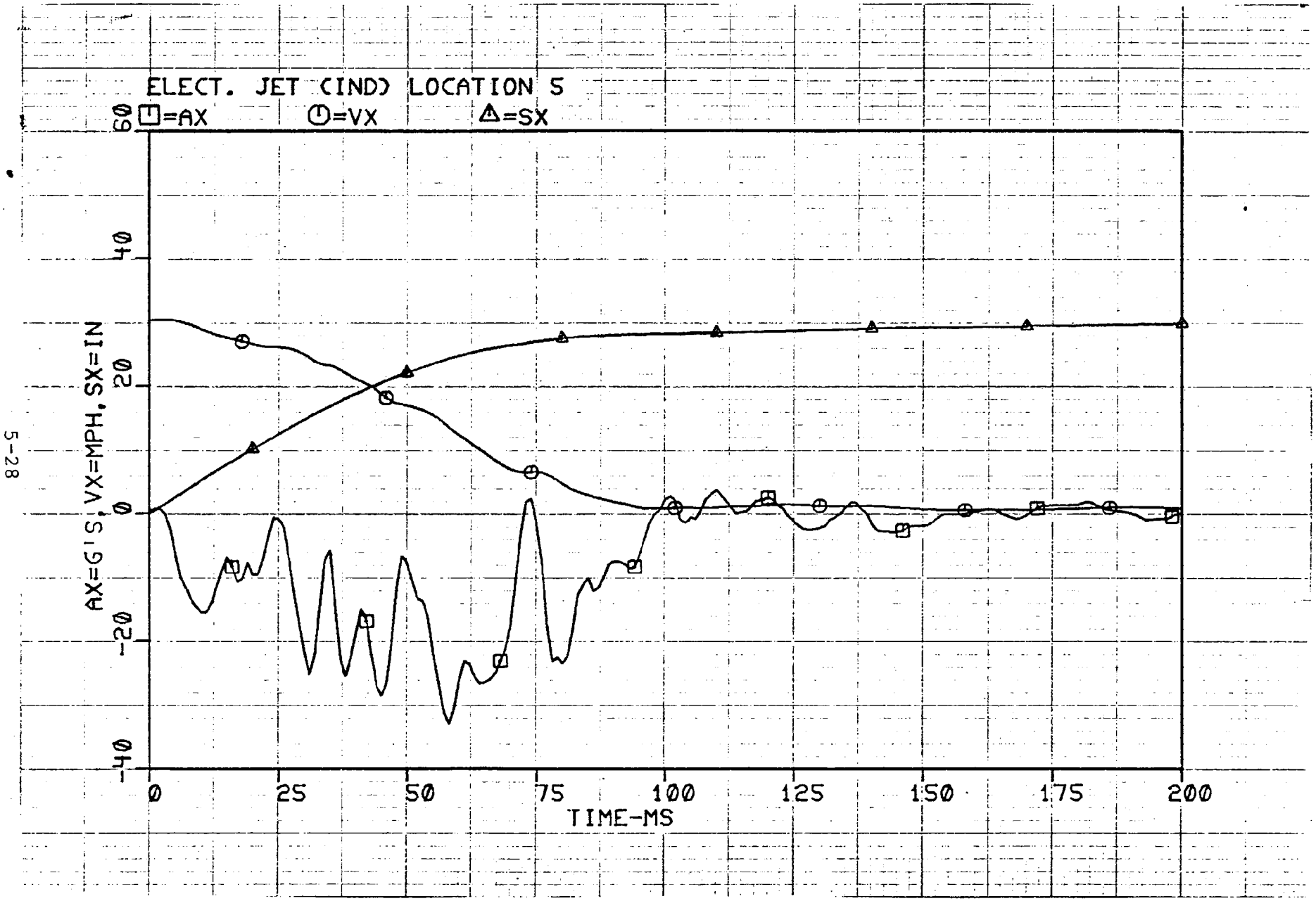

ELECT. JET (IND) LOCATION 2
□=AX
○=VX
△=SX
120
80
40
0
-40
-80
AX=G'S, VX=MPH, SX=IN
0
25
50
75
100
125
150
175
200
TIME-MS

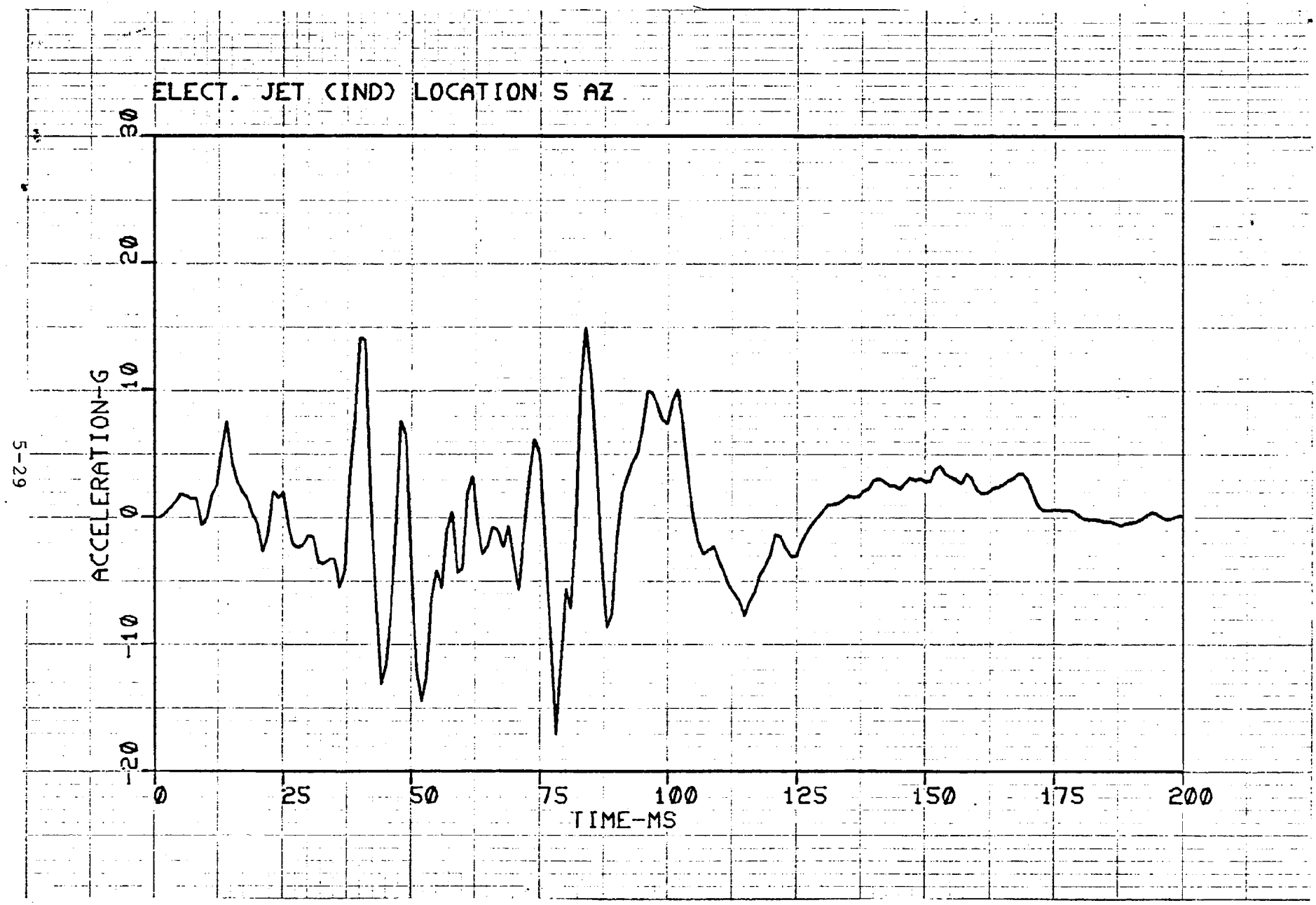

ELECT. JET (IND) LOCATION 2 AZ
120
80
40
0
-40
-80
ACCELERATION-G
0
25
50
75
100
125
150
175
200
TIME-MS

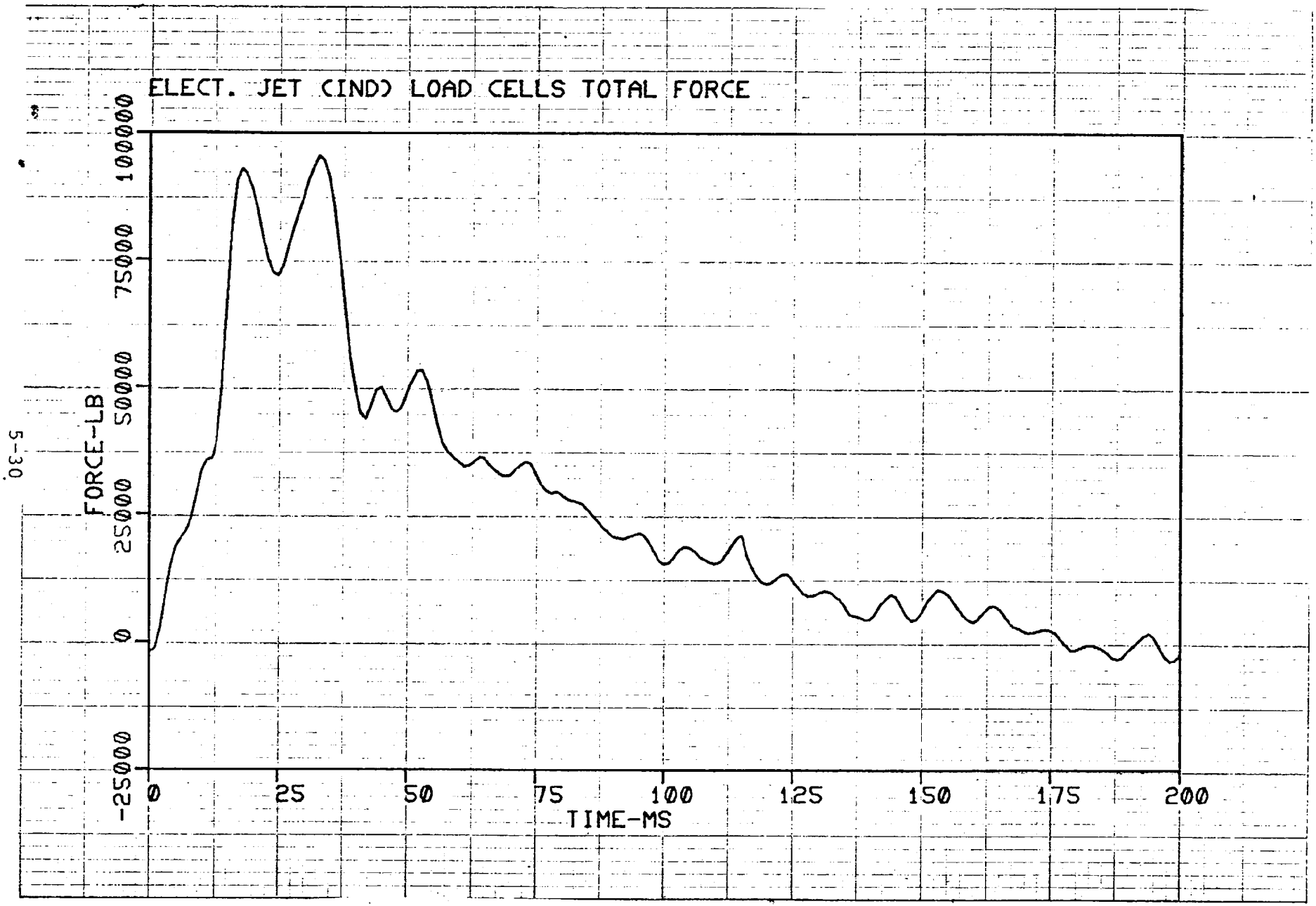

ELECT. JET (IND) LOCATION 3
□=AX
⏲=VX
△=SX
AX=G'S, VX=MPH, SX=IN
50
0
-50
-100
-150
-200
0
25
50
75
100
125
150
175
200
TIME-MS

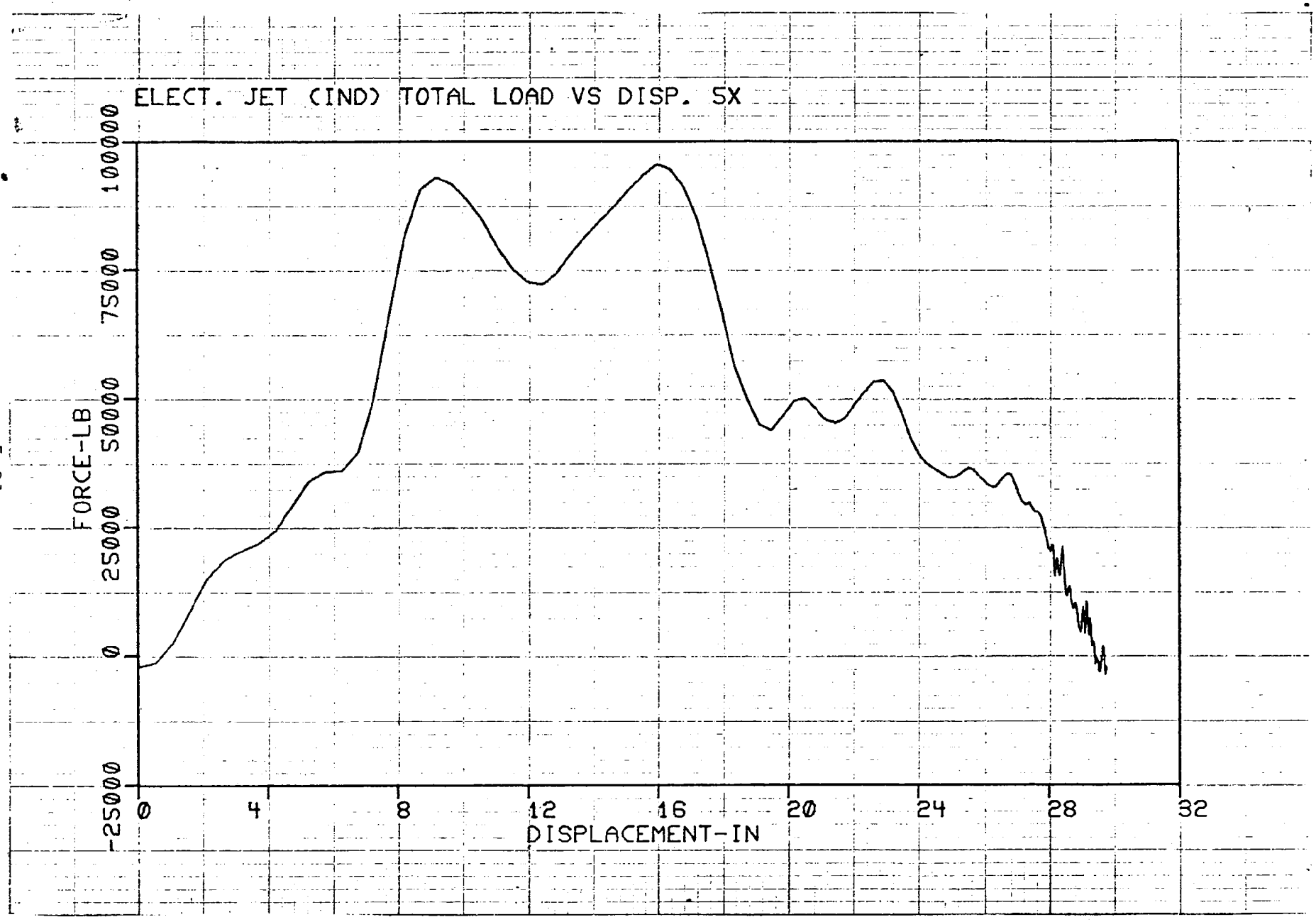

ELECT. JET (IND) LOCATION 3 AZ
60
40
20
0
-20
-40
ACCELERATION-G
0
25
50
75
100
125
150
175
200
TIME-MS

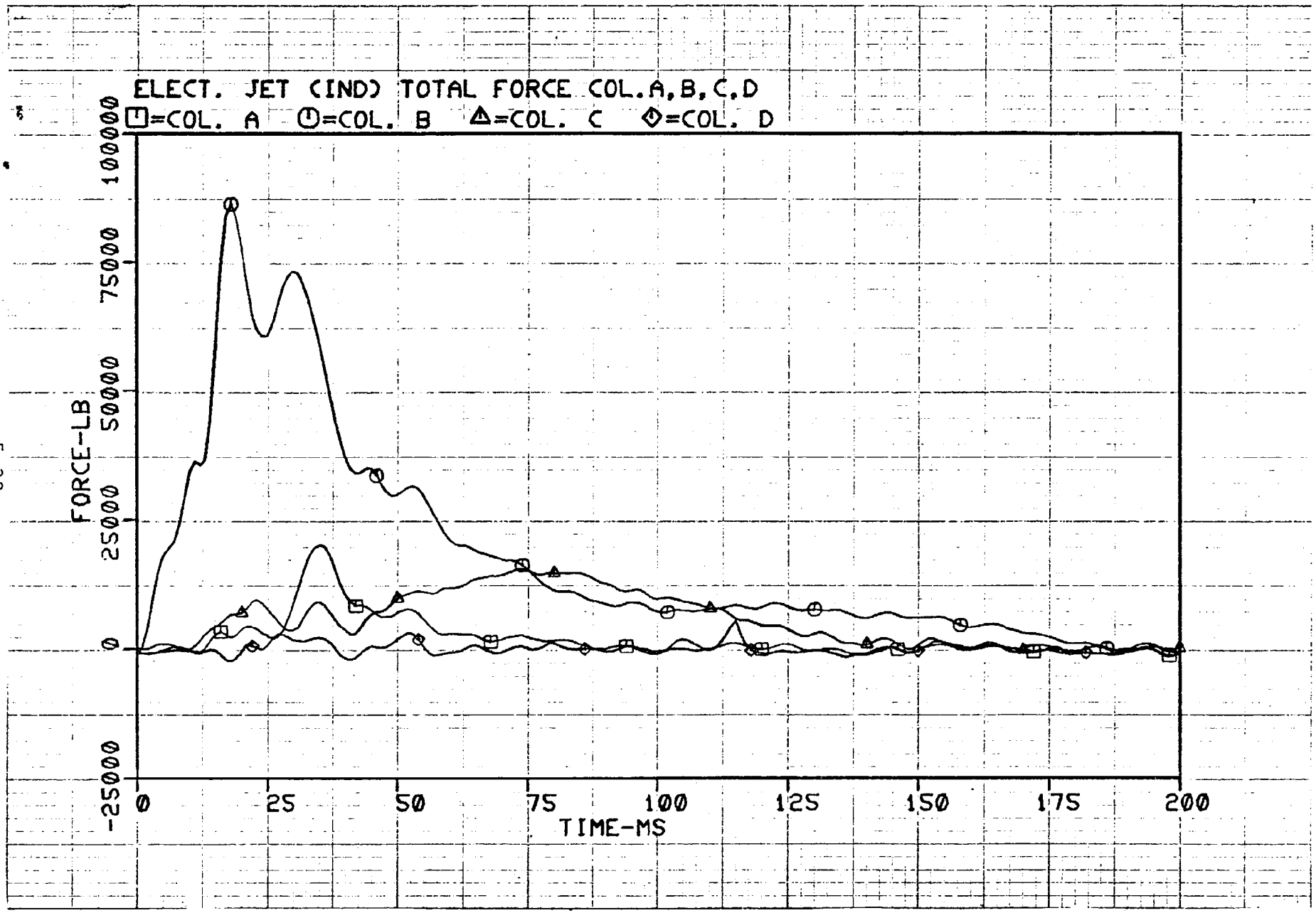

ELECT. JET (IND) LOCATION 4
□=AX
○=VX
△=SX
120
80
40
0
-40
-80
AX=G'S, VX=MPH, SX=IN
0
25
50
75
100
125
150
175
200
TIME-MS

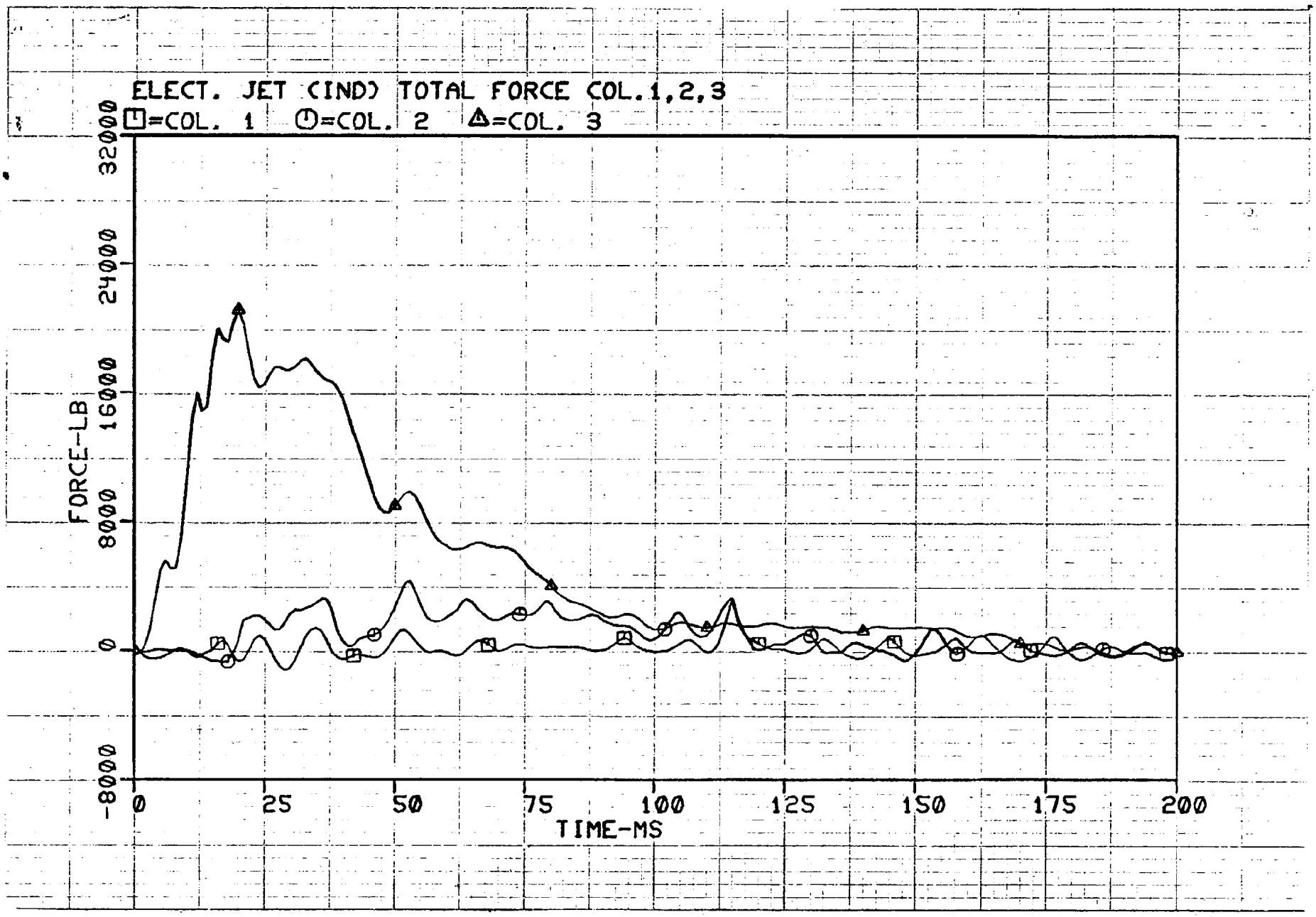

ELECT. JET (IND) LOCATION 5
□=AX
○=VX
△=SX
60
40
20
0
-20
-40
AX=G'S, VX=MPH, SX=IN
0
25
50
75
100
125
150
175
200
TIME-MS

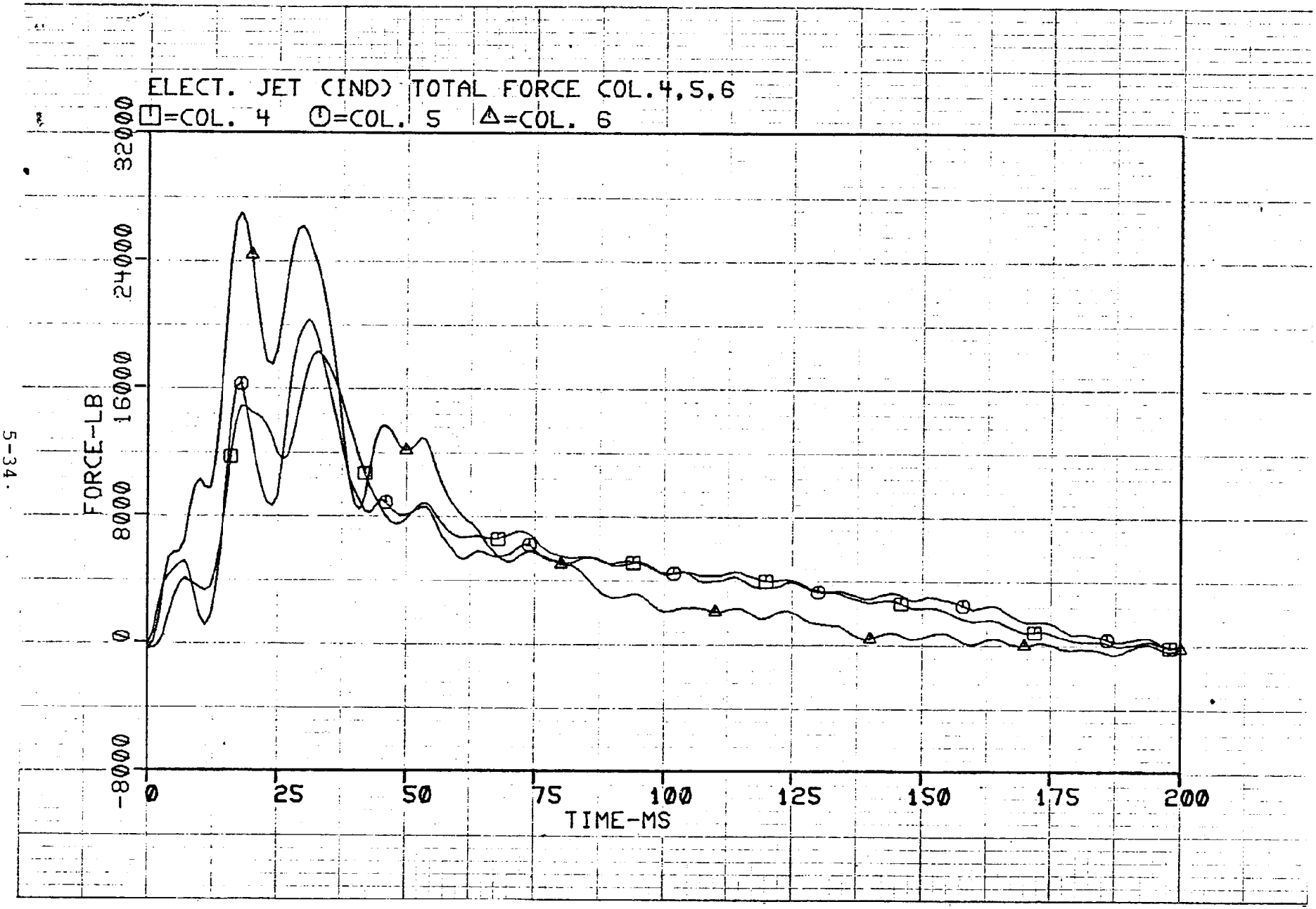

ELECT. JET (IND) LOCATION S AZ
ACCELERATION-G
30
20
10
0
-10
-20
0
25
50
75
100
125
150
175
200
TIME-MS

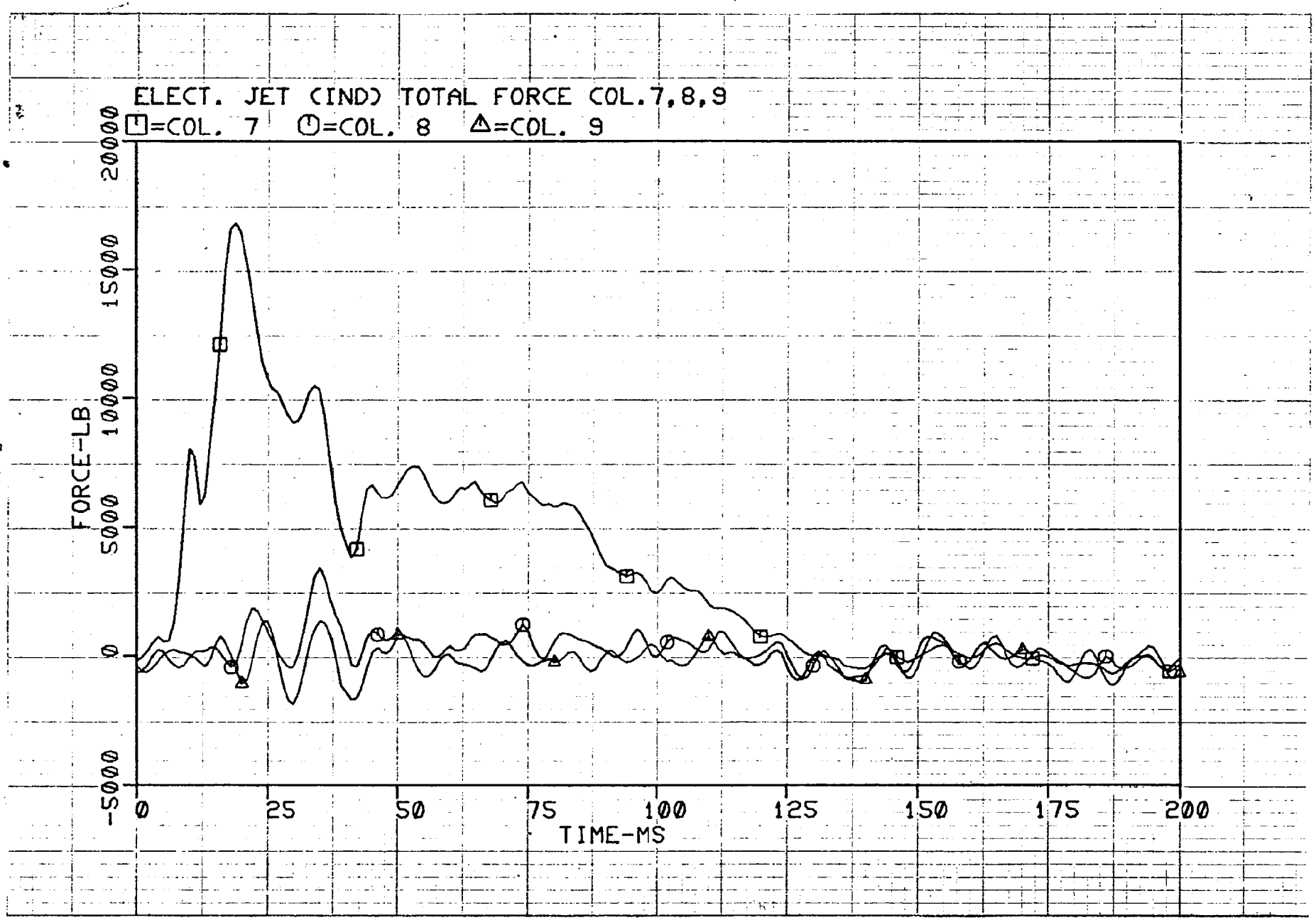

ELECT. JET (IND) LOAD CELLS TOTAL FORCE
FORCE-LB
100000
75000
50000
25000
0
-25000
0
25
50
75
100
125
150
175
200
TIME-MS

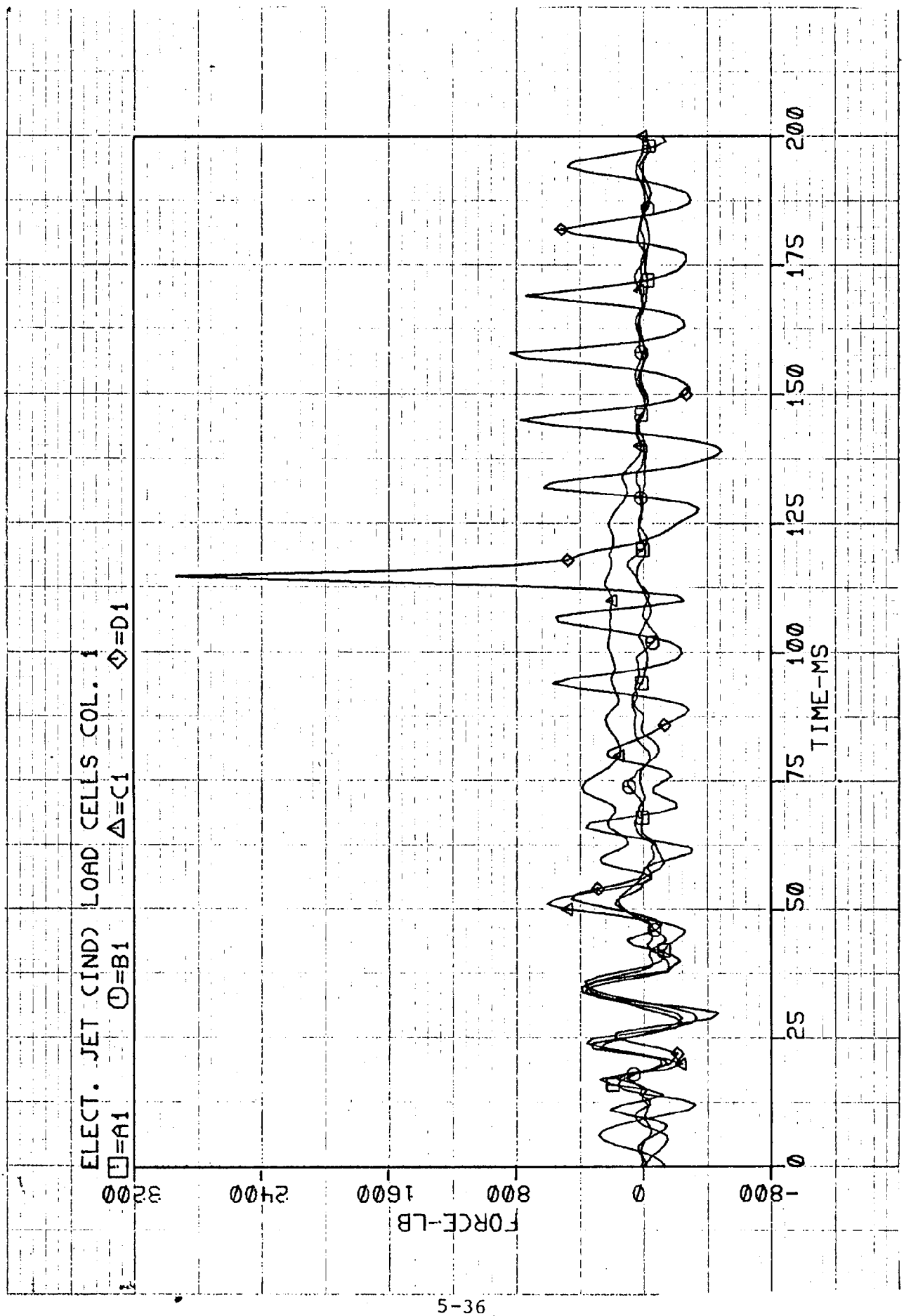

ELECT. JET (IND) TOTAL LOAD VS DISP. SX
FORCE-LB
100000
75000
50000
25000
0
-25000
0
4
8
12
16
20
24
28
32
DISPLACEMENT-IN

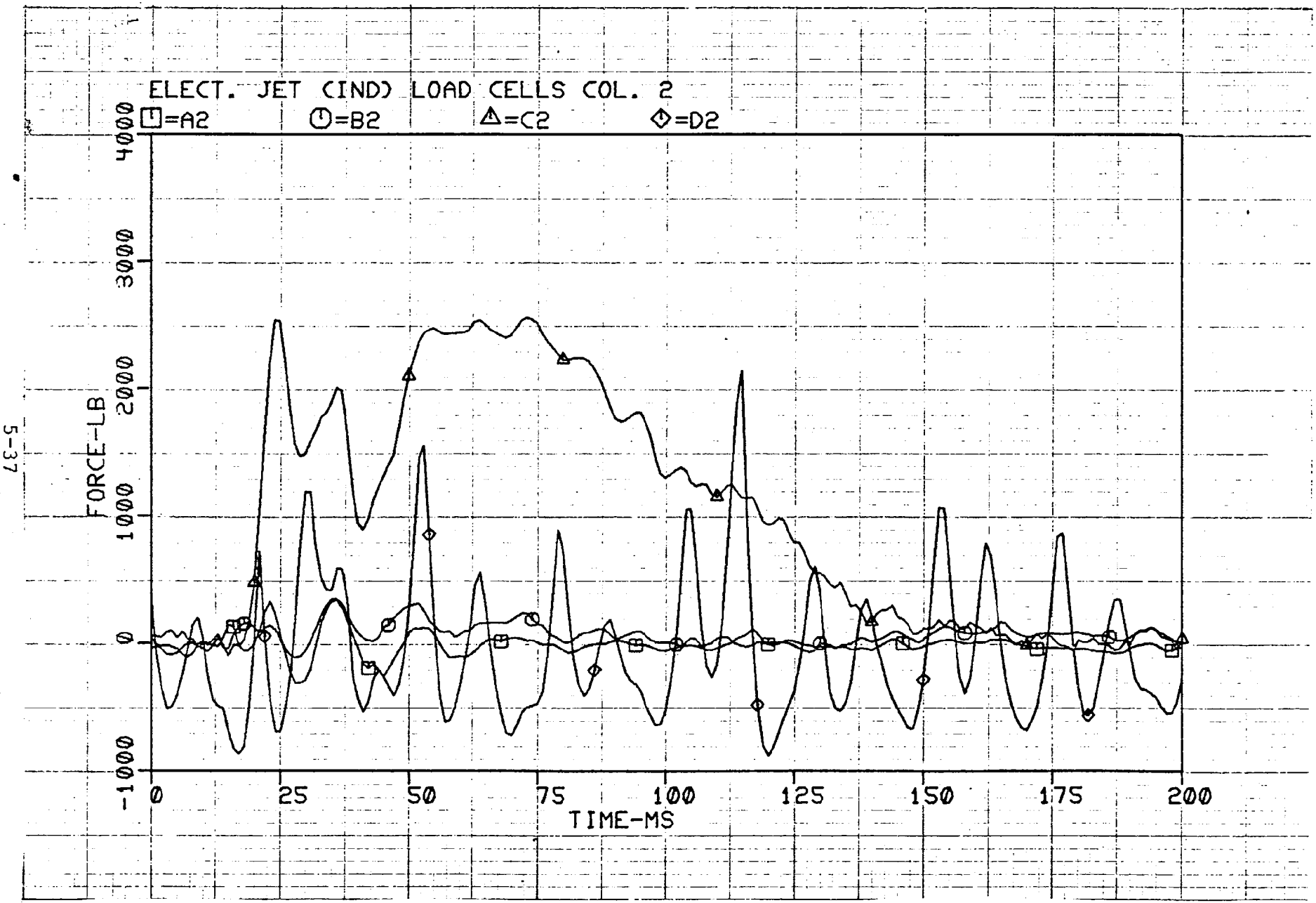

ELECT. JET (IND) TOTAL FORCE COL.A,B,C,D
□=COL. A ○=COL. B △=COL. C ◇=COL. D
FORCE-LB
100000
75000
50000
25000
0
-25000
0
25
50
75
100
125
150
175
200
TIME-MS

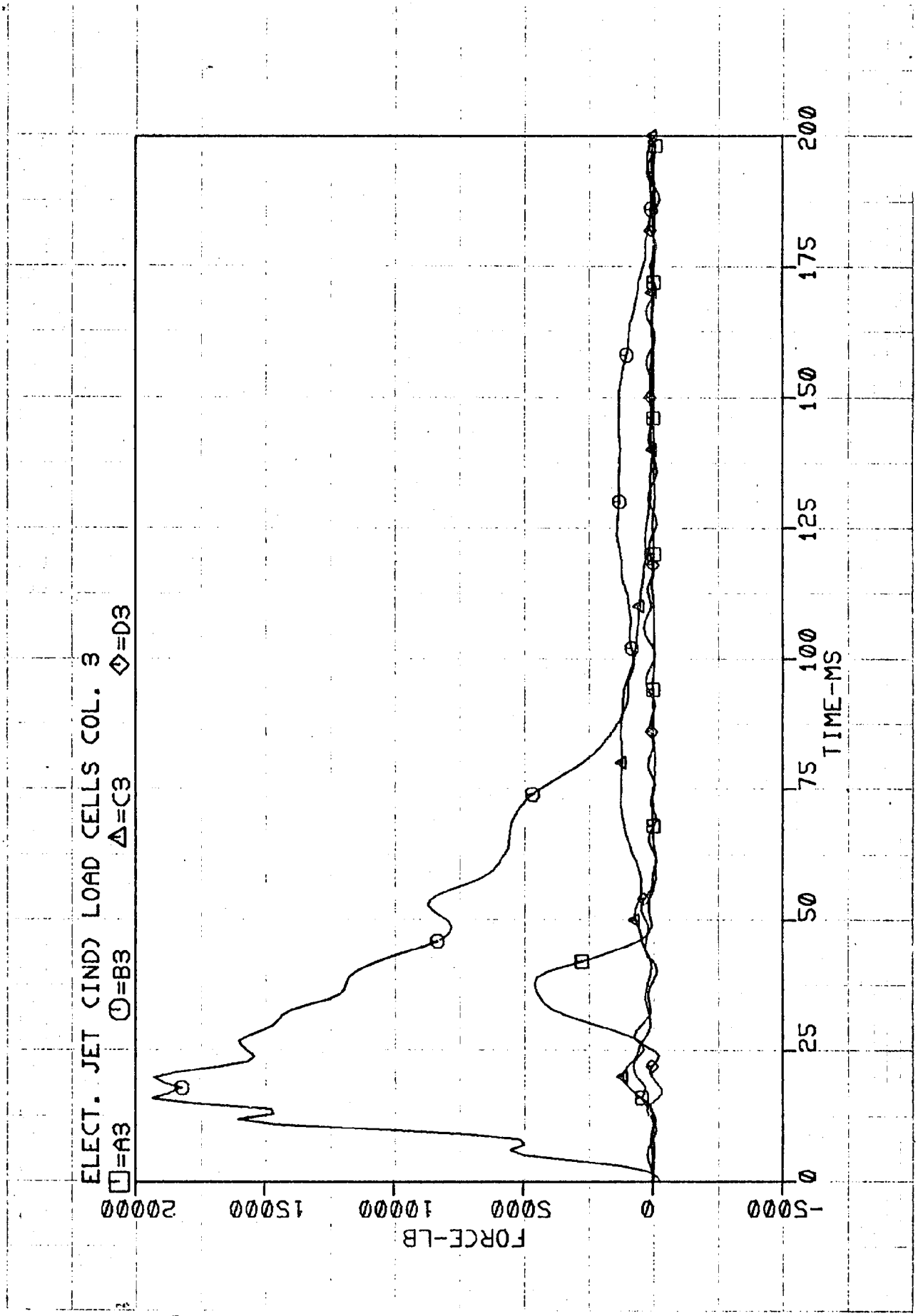

ELECT. JET (IND) TOTAL FORCE COL.1,2,3
□=COL. 1 ○=COL. 2 △=COL. 3
FORCE-LB
32000
24000
16000
8000
0
-8000
0
25
50
75
100
125
150
175
200
TIME-MS

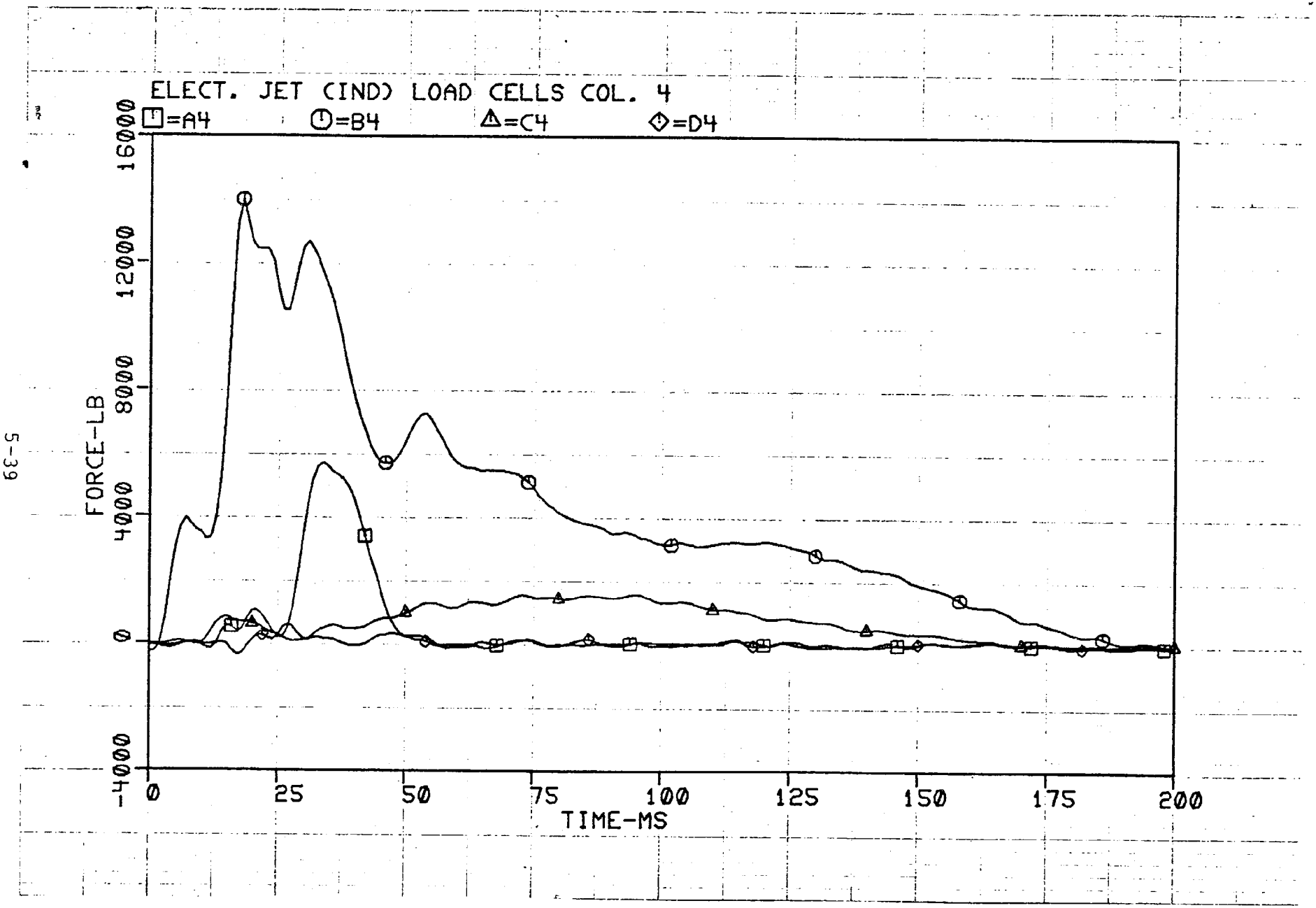

ELECT. JET (IND) TOTAL FORCE COL.4,5,6
□=COL. 4 ○=COL. 5 △=COL. 6
FORCE-LB
32000
24000
16000
8000
0
-8000
0
25
50
75
100
125
150
175
200
TIME-MS

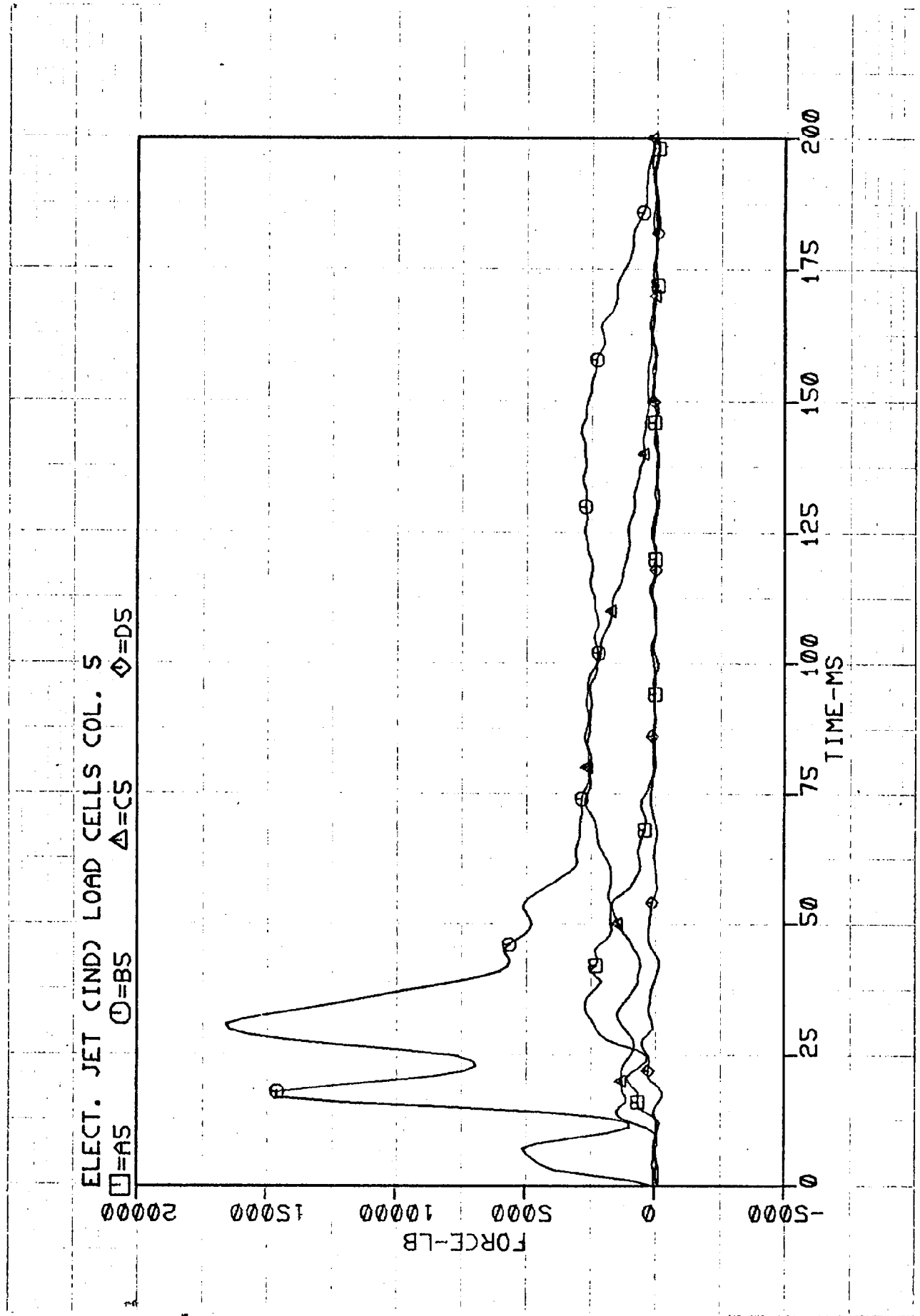

ELECT. JET (IND) TOTAL FORCE COL.7,8,9
□=COL. 7 ○=COL. 8 △=COL. 9
FORCE-LB
20000
15000
10000
5000
0
-5000
0
25
50
75
100
125
150
175
200
TIME-MS

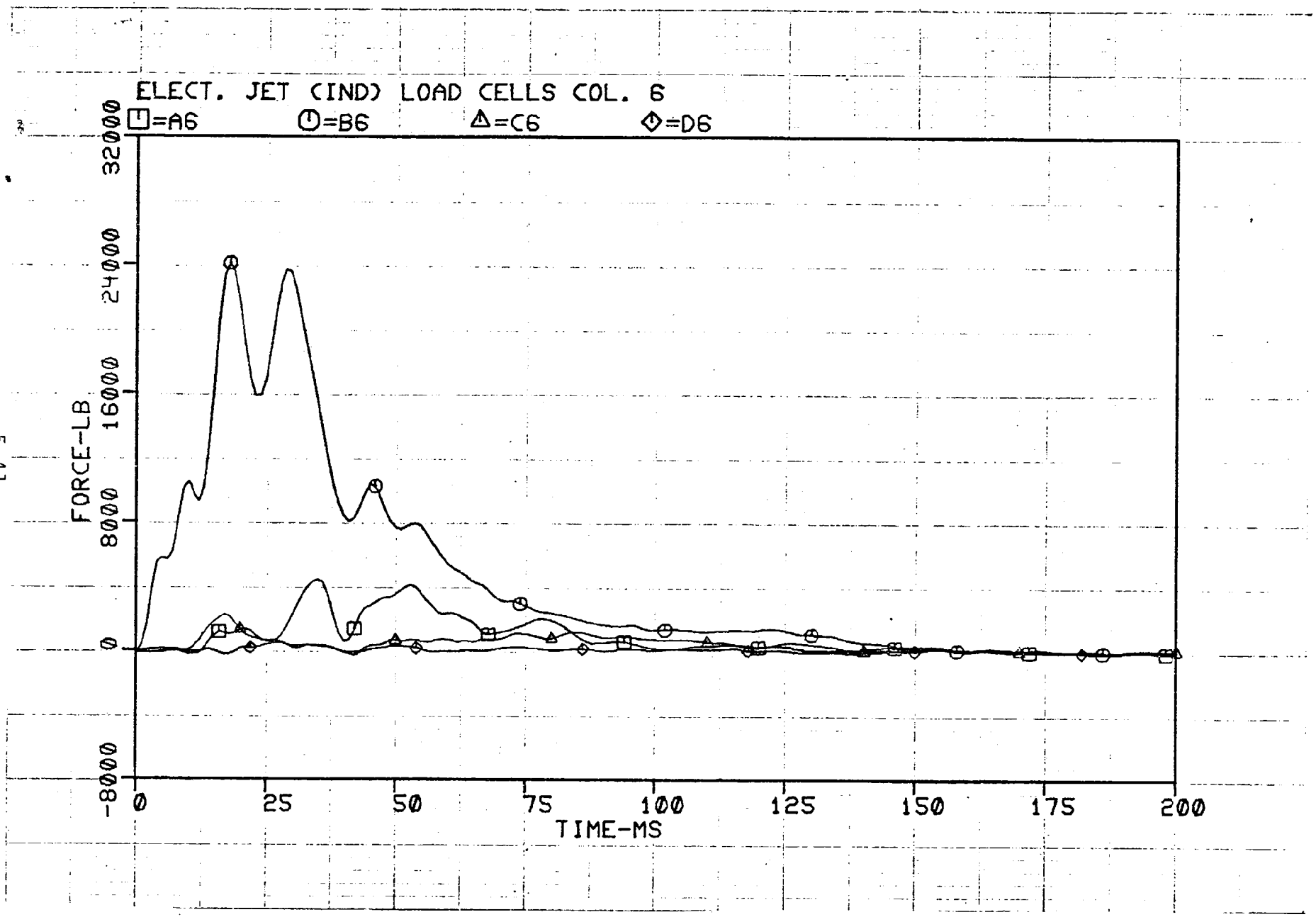

ELECT. JET (IND) LOAD CELLS COL. 1
□=A1
○=B1
△=C1
◇=D1
FORCE-LB
3200
2400
1600
800
0
-800
TIME-MS
0
25
50
75
100
125
150
175
200

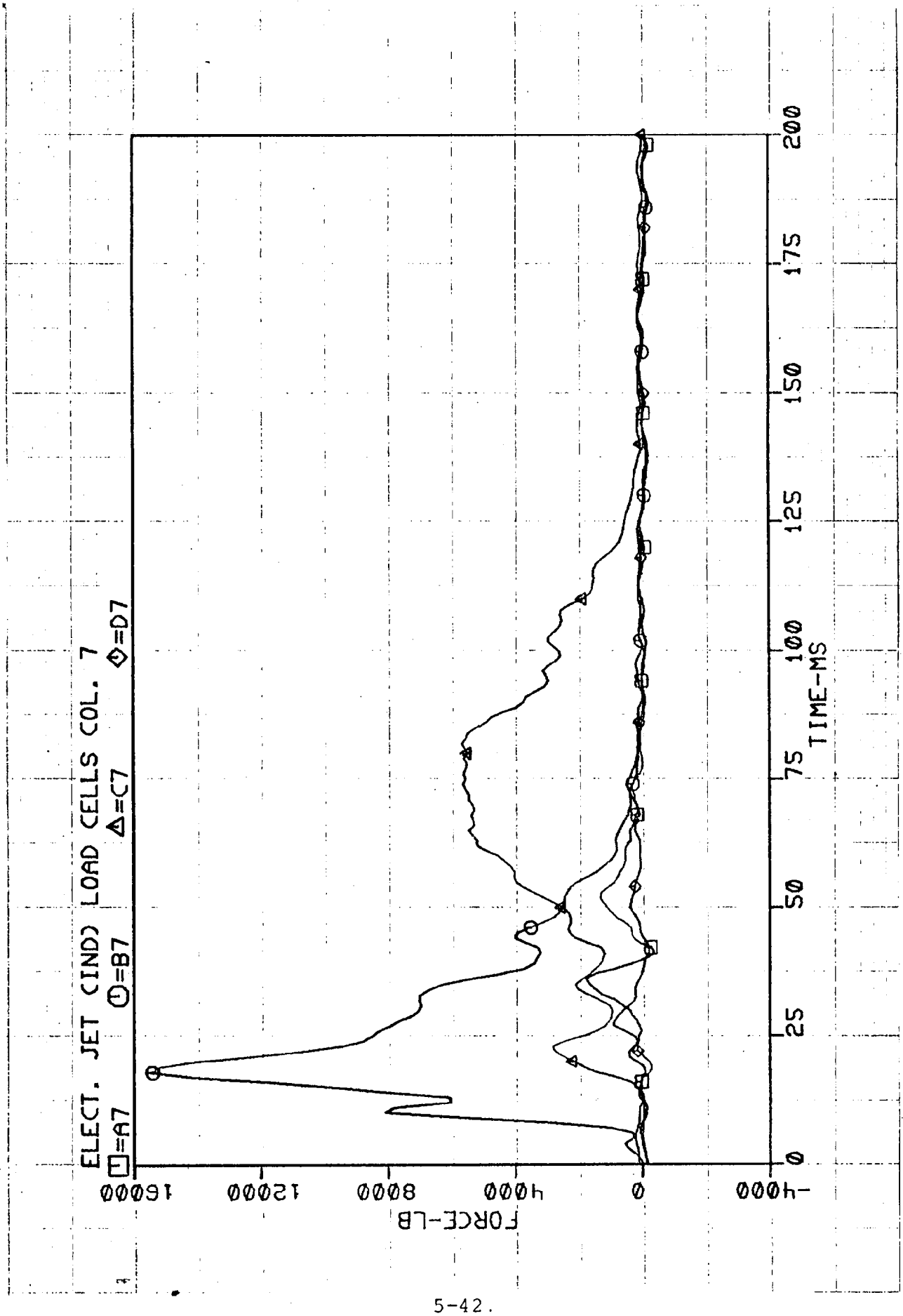

ELECT. JET (IND) LOAD CELLS COL. 2
□=A2
○=B2
△=C2
◇=D2
FORCE-LB
4000
3000
2000
1000
0
-1000
0
25
50
75
100
125
150
175
200
TIME-MS

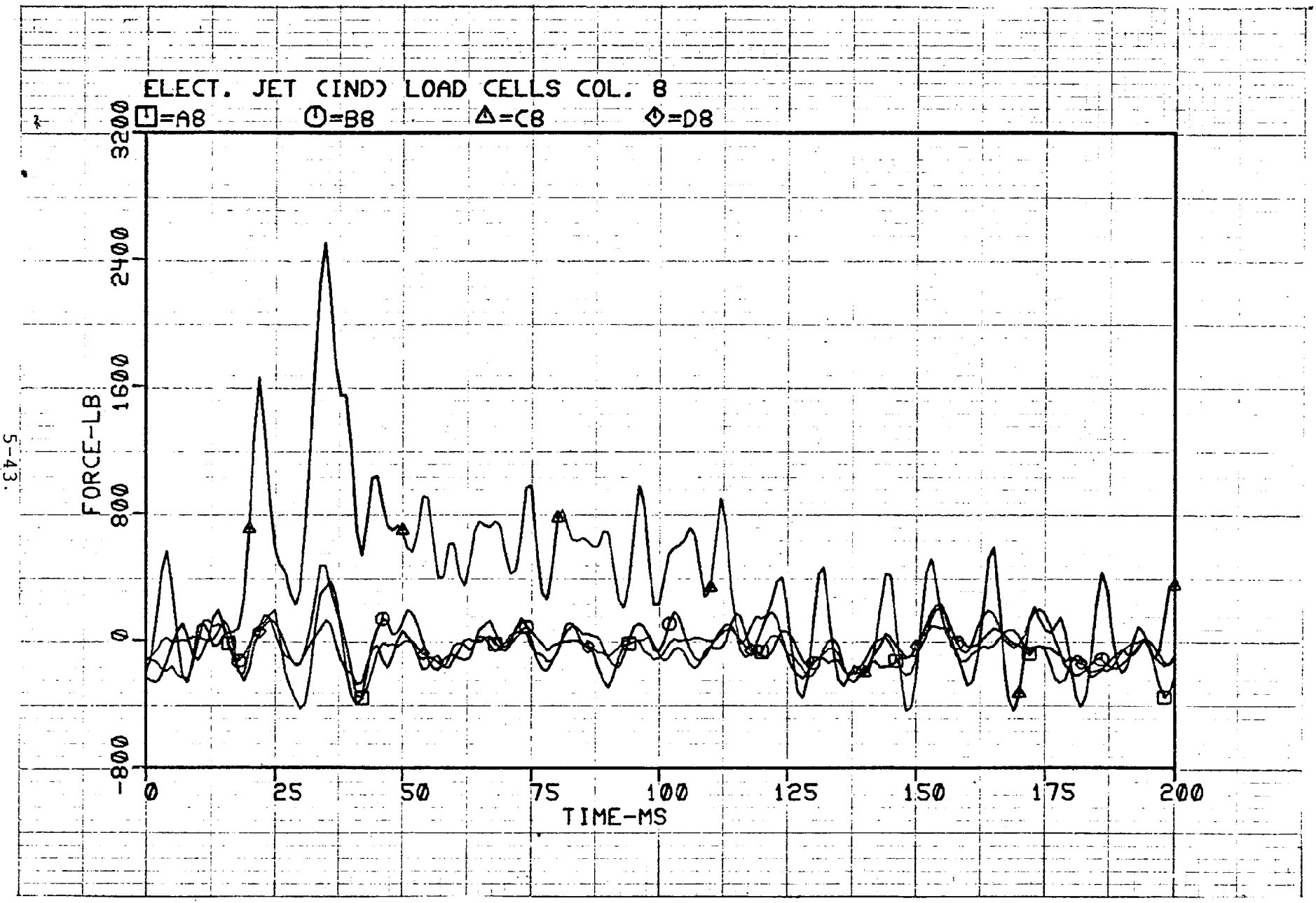

ELECT. JET (IND) LOAD CELLS COL. 3
□=A3
○=B3
△=C3
◇=D3
FORCE-LB
-5000
0
5000
10000
15000
20000
TIME-MS
0
25
50
75
100
125
150
175
200

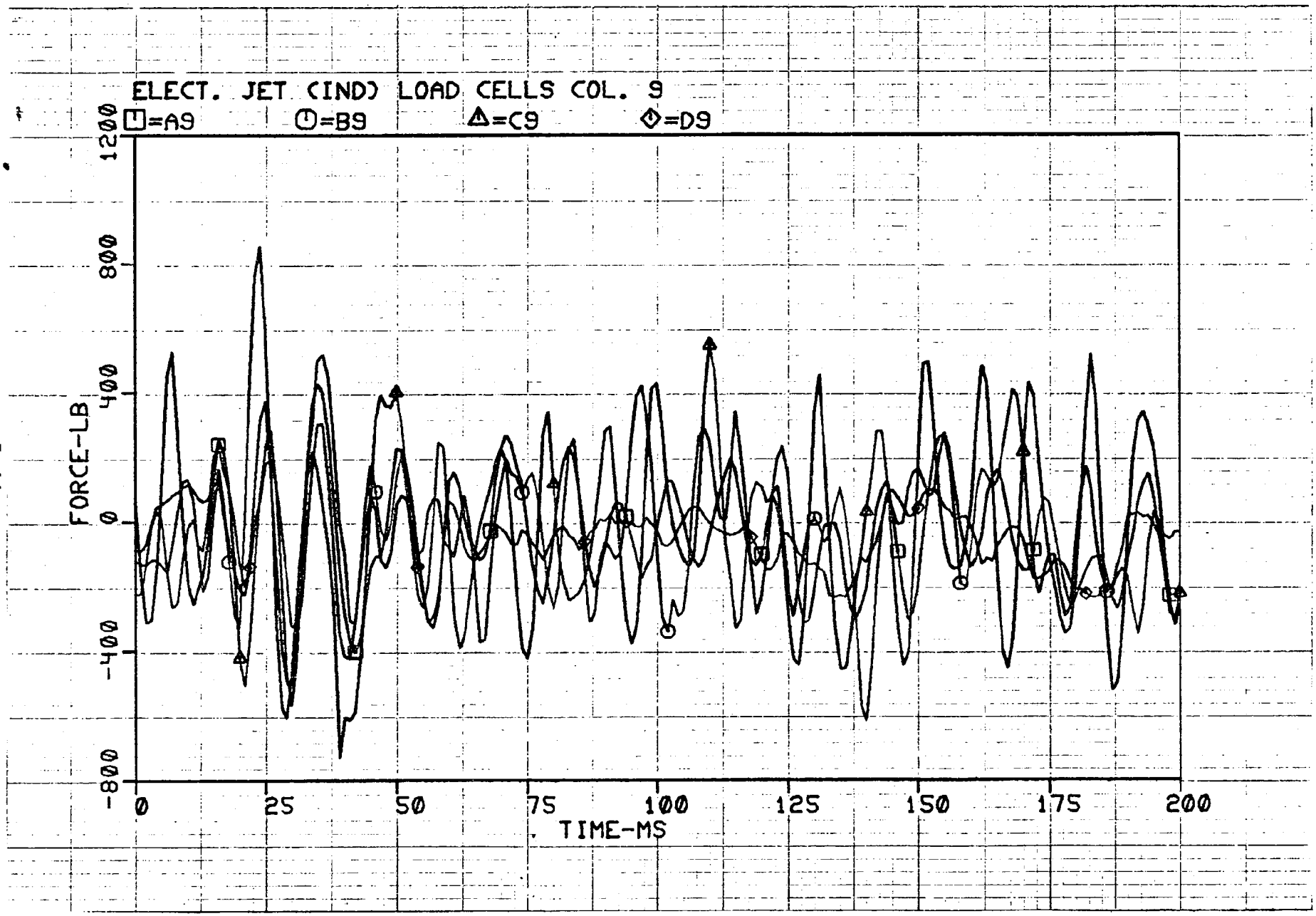

ELECT. JET (IND) LOAD CELLS COL. 4
□=A4
○=B4
△=C4
◇=D4
FORCE-LB
16000
12000
8000
4000
0
-4000
0
25
50
75
100
125
150
175
200
TIME-MS


ELECT. JET (IND) LOAD CELLS COL. 5
□=AS
○=BS
△=CS
◇=DS
FORCE-LB
20000
15000
10000
5000
0
-5000
0
25
50
75
100
125
150
175
200
TIME-MS


ELECT. JET (IND) LOAD CELLS COL. 6
□=A6
○=B6
△=C6
◇=D6
FORCE-LB
32000
24000
16000
8000
0
-8000
0
25
50
75
100
125
150
175
200
TIME-MS


ELECT. JET (IND) LOAD CELLS COL. 7
□=A7
○=B7
△=C7
◇=D7
FORCE-LB
16000
12000
8000
4000
0
-4000
0
25
50
75
100
125
150
175
200
TIME-MS


ELECT. JET (IND) LOAD CELLS COL. 8
=A8
=B8
=C8
=D8
FORCE-LB
3200
2400
1600
800
0
-800
0
25
50
75
100
125
150
175
200
TIME-MS


ELECT. JET (IND) LOAD CELLS COL. 9
□=A9
○=B9
△=C9
◇=D9
FORCE-LB
1200
800
400
0
-400
-800
0
25
50
75
100
125
150
175
200
TIME-MS