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16. Abstract <p>Twenty-one compliance-type sled tests were run utilizing the standard bench seat and six different infant restraint systems to compare the impact performance of a modified six-month-old-infant dummy having upgraded neck structure and joint stops to an unmodified dummy. No significant performance differences were noted except for excessive neck elongation on the unmodified, used dummy.</p> <p>Some of the tests included alteration of the restraint system initial back angle to investigate occupant ejections. It was concluded that a maximum back angle of 70° or less, during impact, was adequate to prevent ejection in a frontal impact.</p>					
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1.0 FOREWORD

Improving the durability of the SA1031 6-month-old-infant dummy and then establishing its response in compliance-type testing was the purpose of this project. Humanoid Systems, 747 E. 223rd. St., Carson, CA. 90745, provided a modified six-months-old-infant dummy with modifications based on approximately five years of field experience and feedback plus the information provided by a teardown and inspection of HSRI'S extensively used infant dummy. Twenty-one sled tests were conducted at HSRI comparing the response of an unmodified dummy to the new modified six-month-old-infant dummy using six different types of infant restraint systems. Special attention was paid to the relationship between the restraint initial seatback angle and occupant ejection.

2.0 SUMMARY

The improved SA1031 dummy was subjected to compliance-type testing on the HSRI impact sled to the requirements of proposed standard FMVSS No. 213 — Child Restraint Systems. No significant performance differences were noted between the modified dummy and a used, unmodified dummy using six different commercial restraint systems. Three of these restraints did not meet the 60° maximum angular excursion requirement of the proposed standard. Occupant ejection did not occur with the rear facing restraints when the maximum seatback angle during impact was 70° or less. The vehicle lap belt angle and attachment point relative to the c.g. of the restraint/dummy system was observed to be a significant factor in limiting restraint angular deflection and dummy head excursion during impact.

3.0 METHODOLOGY

3.1 Sled Facility

The HSRI impact sled is a 975-pound test platform, 6.5 foot square, moving on linear bearings along a 45-foot track. The sled is accelerated by a compressed-air-driven ram acting over a ten-foot stroke, and the impact deceleration is produced by impacting a gas pressure programmer which provides the desired severity of impact. This programmer operates on the rebound principle, providing the intended sled velocity change by reversing the sled direction during the test. The standard bench seat developed for testing of child restraint systems was securely fastened to the sled frame in a frontal impact mode for these tests.

3.2 Instrumentation

3.2.1 Transducers

The following transducers were used to obtain the data during testing:

- a. Belt webbing forces: GSE Model 2500 Seat Belt Force Sensor
- b. Sled deceleration: Setra Accelerometer Model 111
- c. Sled velocity: Magnetic pickup with probes on 12" centers

3.2.2 Signal Conditioning

- a. For belt forces: Honeywell Accudata Model 120 Bridge Balance Signal Conditioner
Honeywell Accudata Model 105 D.C. Amplifier
- b. For sled deceleration: Setra Model SCM-1A signal conditioner
- c. For signal filtering: Krohn-Hite Model 3750 filter

3.2.3 Data Recording and Playback

Honeywell Model 7600 14-channel FM tape recorder

3.2.4 Data Presentation

Gould Model 260 brush strip chart recorder

3.2.5 Photo - Instrumentation

- a. For high-speed movies: Two Photosonics Model 16mm-1B, 16mm high-speed movie cameras operating at 1000 F.P.S., providing overhead and right side views.
- b. For Polaroid sequence: Graphcheck sequence camera model 300

3.3 Test Procedure

The infant restraint systems were attached to the standard bench seat with Type 1 lap belts, which were pretensioned from twelve to fourteen pounds force before each run. Pre and post-test photos were taken for each test. Special care was taken to symmetrically position the dummies in the restraint systems, and to ensure that any restraint harnesses were snugly and correctly fitted according to the manufacturer's recommendations.

To study occupant ejection, foam pads were placed under the base of the restraints to tip them forward and thereby produce larger angular excursions during impact. The Test Summary, section 5.1, indicated which restraints were evaluated in this manner, the amount of initial tipping, the resulting maximum angle, and the effect on ejection.

3.4 Restraint Systems

Three of each of the following infant restraints were obtained through retail outlets and used for this test program:

1. Peterson Safety Shell, Model 75 (with insert for frontal installation)
2. Strolee Wee Care Car Seat 5975
3. Kantwet Care Seat, Model 42988
4. Romer Baby-Swinger Car Bed
5. GM Infant Love Seat
6. Bunny Bear Sweetheart II Car Seat, Model 70R

4.0 DISCUSSION

4.1 Dummy Inspection

The teardown of the used HSRI infant dummy confirmed the previously observed joint deterioration findings of Humanoid Systems. The leather neck structure had lost its initial stiffness resulting in excessive looseness of the dummy head. Similar effects were noted in the limb joints along with deformation of the joint stops.

4.2 Revised Dummy

The modified dummy supplied by Humanoid Systems was primarily intended to solve the joint problem, although a teardown at HSRI to inspect the revisions was not performed.

The first modified dummy received was under the specified minimum weight limits. At the direction of the contract monitor, the stitching on the dummy back was opened and lead sheeting inserted to bring the dummy weight into specification. This additional ballast was added in a symmetrical manner that would not change the c.g. of the thorax. Later in the testing a second modified dummy was received from Humanoid Systems properly ballasted and was used for the last six tests.

4.3 Dummy Response

The only observable response difference between the used and modified dummies was greater head excursions with the used dummy, attributable to the weakened neck structure. This neck elongation did not cause the head target to fall outside the specified limits with respect to the restraint in any of the tests, but potentially could prevent certification of a borderline restraint system.

4.4 Restraint Performance

While actual certification was not the intent of this program, it should be noted that two of the restraint systems, the Bunny Bear and Strolee, greatly exceeded the proposed 60° maximum angular excursion of the seatback surface, and the Kantwet restraint marginally exceeded the same 60° angular excursion requirement. Also, the frame tubes of the Strolee would consistently jump out of the locked configuration during impact, and the Bunny Bear seat frame bent somewhat during impact in tests 79K413 and 79K414.

The lowest restraint seatback angular excursion producing occupant ejection was 79.5° for the GM Infant Love Seat in test 79K409 which had an additional 19.5° of induced initial forward tipping. It is felt that limiting the restraint seatback angular excursion to 70° or less will effectively prevent ejection conditions.

It was also noted that restraints which utilized a low attachment point for the vehicle lap belt tended to have larger angular excursions as a result of the tipping moment exerted by the restraint/dummy system center of gravity.

5.0 RESULTS

5.1 Test Summary

Table 1 is a matrix listing the impact tests performed, the test conditions, and the test results.

5.1 Test Summary

INFANT DUMMY TEST PROGRAM

<u>TEST</u>	<u>SEAT</u>	<u>POSITION</u>	<u>DUMMY</u>	<u>SEATBACK INITIAL ANGLE</u>	<u>MAX. ANGLE</u>	<u>INITIAL TIPPING</u>	<u>COMMENTS</u>
79K400	Peterson 75 (new)	Center	New	Front Facing	N.A.	--	
79K401	Peterson 75 (new)	Center	Old	Front Facing	N.A.	--	Dummy ejected on rebound.
79K402	Strolee (new)	Center	New	50°	84.5°	None	Frame adjustment jumped out.
79K403	Strolee (new)	Center	Old	50°	77°	None	Frame adjustment jumped out.
79K404	Kantwet (new)	Center	New	40°	57°	None	
79K405	Kantwet (new)	Center	Old	40°	60°	None	
79K406	Romer (new)	Center	New	Side Facing	N.A.	--	Side retaining zipper tore. Shell cracked.
79K407	Romer (new)	Center	Old	Side Facing	N.A.	--	Side retaining zipper tore. Attaching belt broke.
79K408	GM Infant (new)	Center	New	41.5°	67.5°	6.5°	
79K409	GM Infant (new)	Center	Old	54.5°	79.5°	19.5°	Dummy ejected.
79K410	Peterson 75 (used)	Driver	Old	Front Facing	N.A.	None	Dummy ejected on rebound.
	Peterson 75 (new)	Passenger	New	Front Facing	N.A.	None	
79K411	Strolee (used)	Driver	Old	36°	--	None	Frame adjustment jumped out.
	Strolee (new)	Passenger	New	36°	87°	None	Frame adjustment jumped out.
79K412	Kantwet (used)	Driver	Old	40°	--	None	
	Kantwet (new)	Passenger	New	40°	64°	None	

INFANT DUMMY TEST PROGRAM (cont'd.)

<u>TEST</u>	<u>SEAT</u>	<u>POSITION</u>	<u>SEATBACK</u>		<u>MAX. ANGLE</u>	<u>INITIAL TIPPING</u>	<u>COMMENTS</u>
			<u>INITIAL ANGLE</u>	<u>DUMMY</u>			
79K413	Bunny Bear (new)	Center	38°	New	128.5°	None	Seat rotated about lap belt.
79K414	Bunny Bear (new)	Center	38°	Old	122°	None	Seat rotated about lap belt.
79K415	Kantwet (used)	Driver	60°	Old	--	20°	
	Kantwet (used)	Passenger	45°	New *	60°	10°	
79K416	Kantwet (used)	Driver	80°	Old	--	40°	
	Kantwet (used)	Passenger	63°	New *	64°	30°	
79K417	Strolee (used)	Driver	70°	Old	--	20°	
	Strolee (used)	Passenger	68.5°	New *	116°	10°	
79K418	Bunny Bear (used)	Driver	58°	Old	--	20°	Dummy partially ejected.
	Bunny Bear (new)	Passenger	48°	New *	143°	10°	Dummy ejected.
79K419	Peterson (used)	Center	60°	New *	116°	35°	
79K420	Bunny Bear (used)	Center	New *	New *	N.A.	--	Dummy ejected.

*New dummy, correctly ballasted by Humanoid Systems

5.2 Test Data

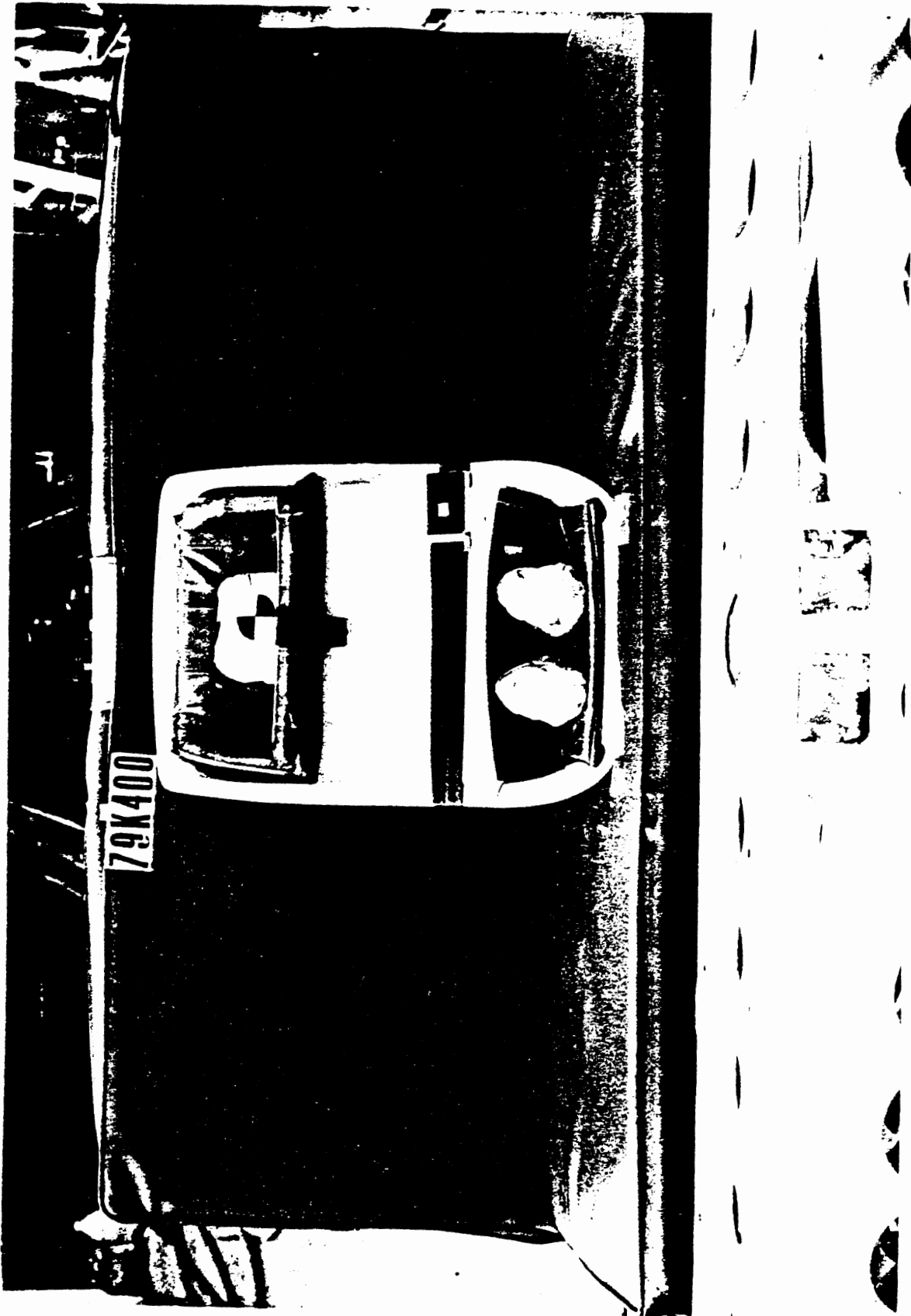
The data for each test is arranged in the following sequence:

- a. Test Description Page
- b. Test Setup Photograph
- c. Graphcheck Sequence Photograph
- d. Post-Test Photograph(s)
- e. Instrumentation Output Signals
- f. High-Speed Movie Motion Analysis

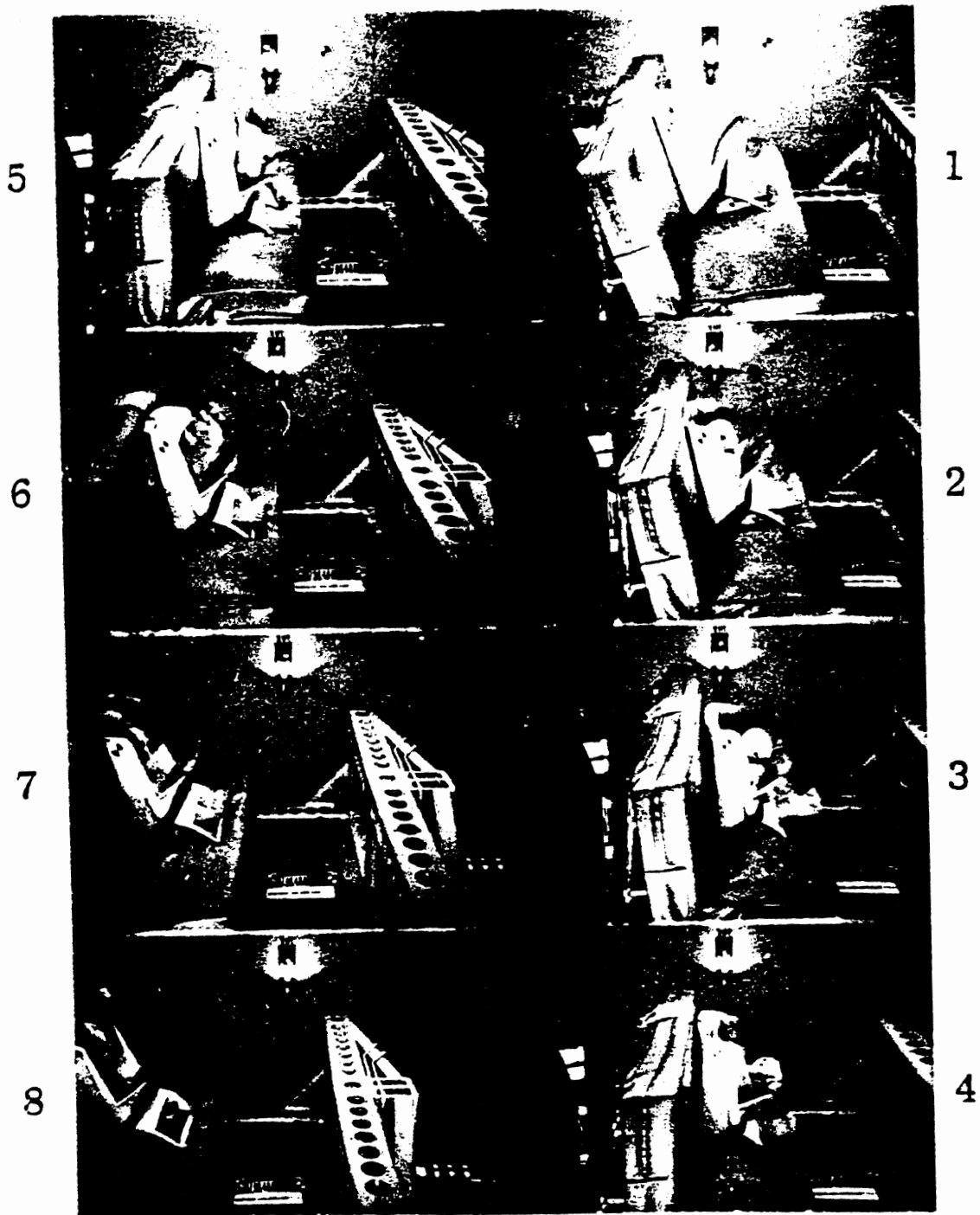
The high-speed film analysis traces the kinematics of the most forward, upper portion of the restraint and the seatback angle, and also indicates the dummy head whenever it becomes visible. The side camera view was used to obtain this information. When two restraints and dummies were involved in a single test, the motions of both are depicted on the same motion analysis tracing.

TEST NUMBER	<u>79K400</u>
RESTRAINT	<u>Peterson 75</u>
DUMMY	<u>New (Ballasted)</u>
RESTRAINT TEST POSITION	<u>Center</u>
INITIAL TIPPING	<u>Front Facing</u>
MAXIMUM ANGLE	<u>Not Available</u>

COMMENTS:

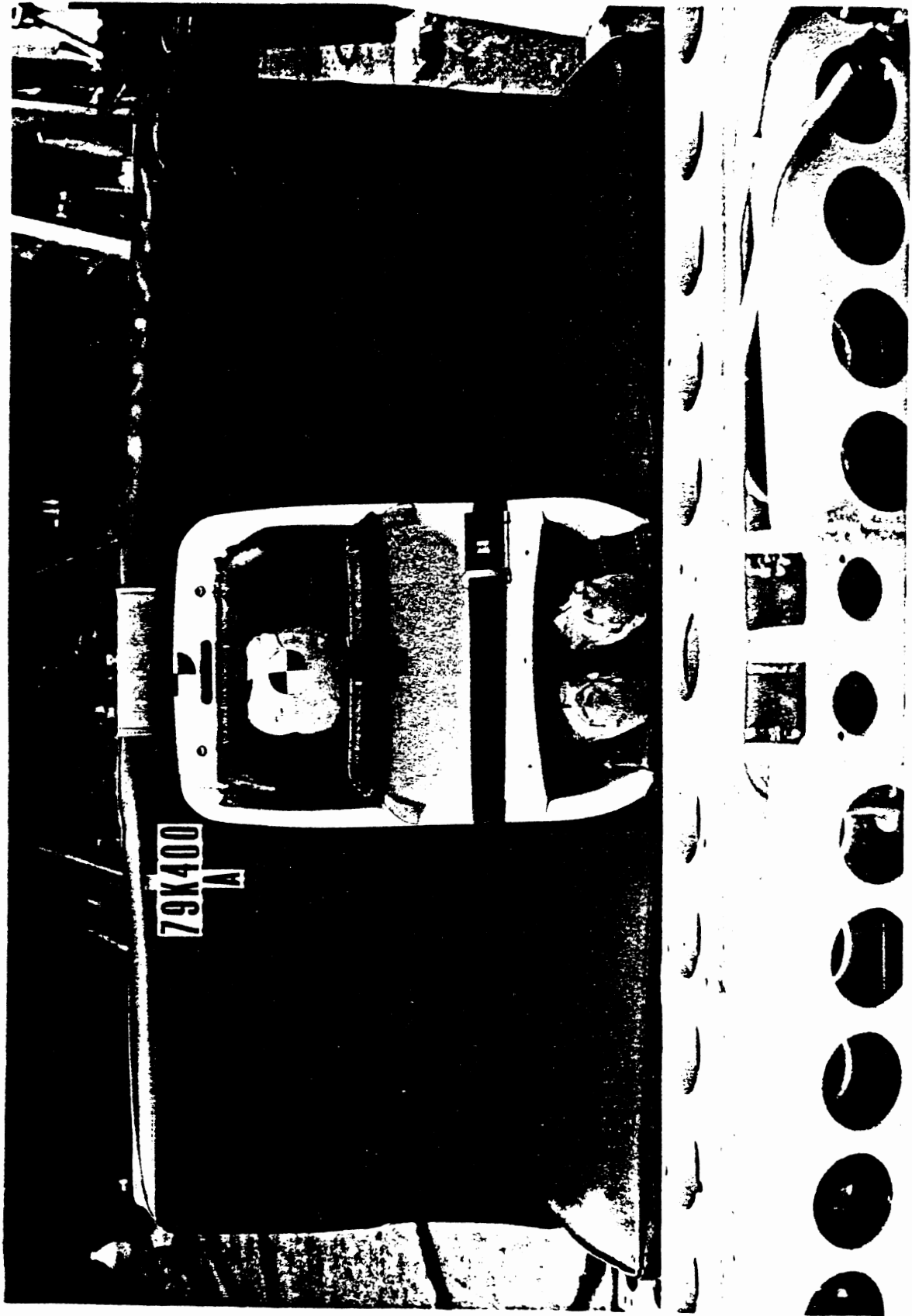


Pre-Test: Peterson 75 Restraint



79K400

Peterson 75 Restraint



Post-Test: Peterson 75 Restraint

SLED TEST RESULTS

6-MONTH-OLD-INFANT DUMMY

TEST NO.: 79K400

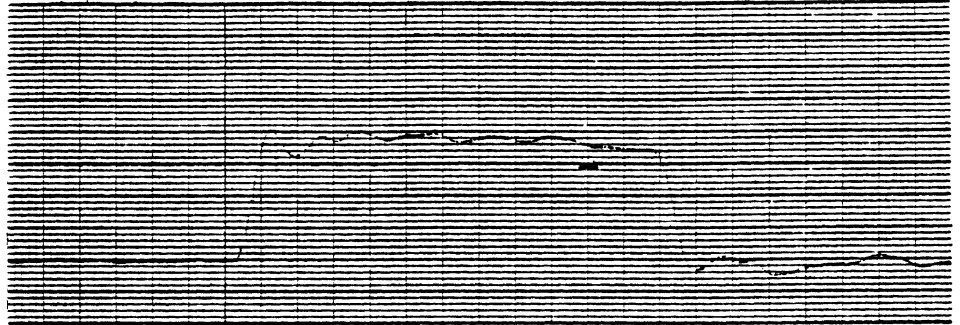
SLED VELOCITY: 29.4 MPH

DUMMY: NEW (ballasted)

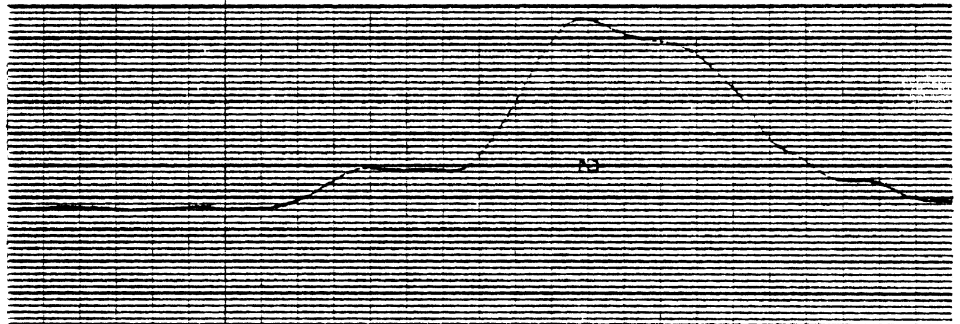
RESTRAINT: PETERSON (new)

TEST CONDITION: FRONT FACING

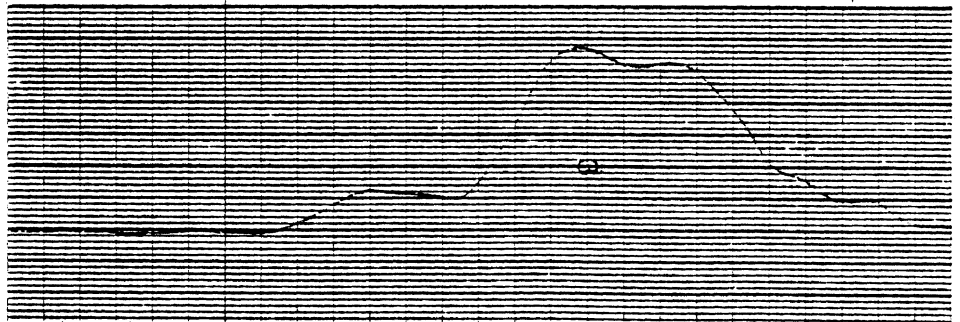
SLED PULSE
1.0 G/DIVISION
FILTERED CHANNEL
CLASS 60



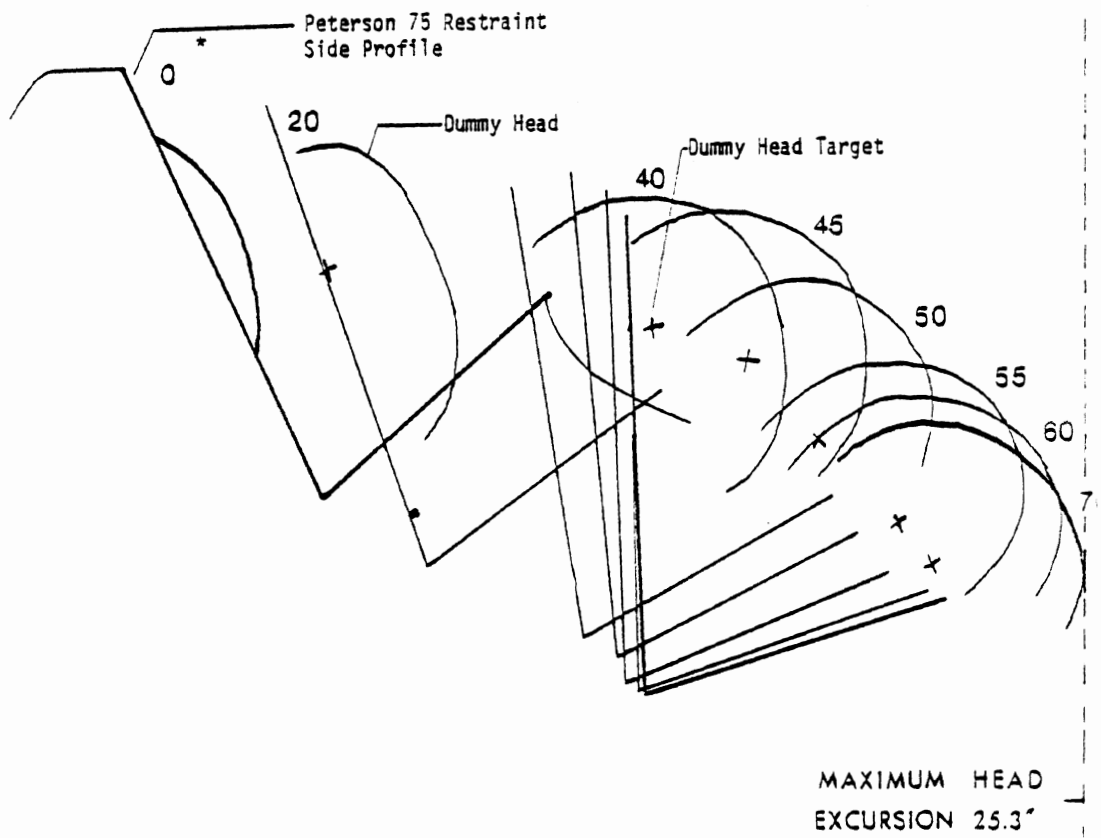
RT. BELT LOAD
CENTER POSITION
20 LB./DIVISION
FILTERED CHANNEL
CLASS 60



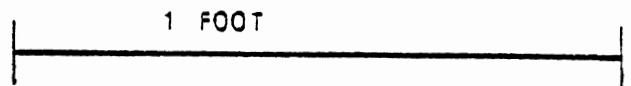
LT. BELT LOAD
CENTER POSITION
20 LB./DIVISION
FILTERED CHANNEL
CLASS 60



TEST 79K 400

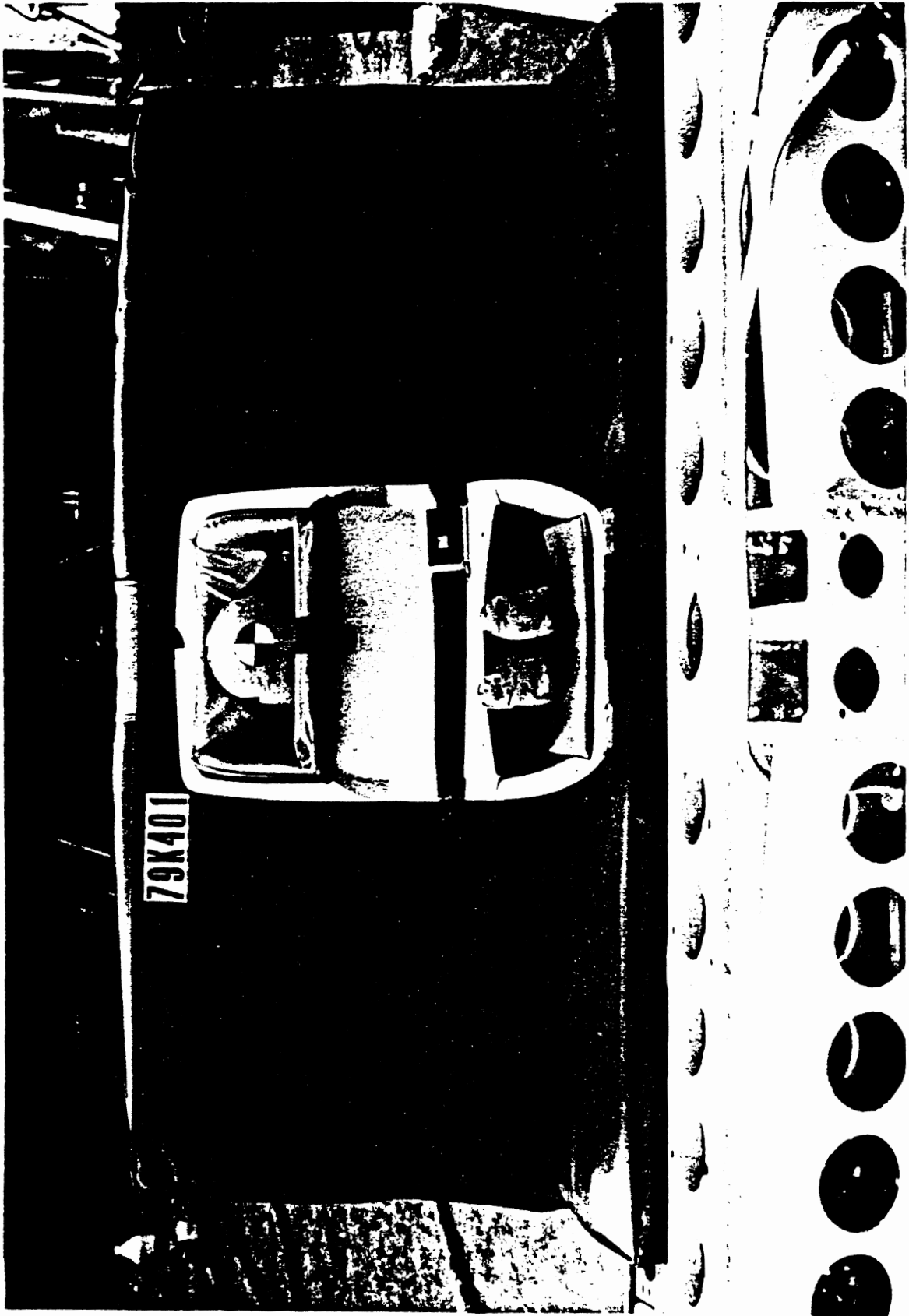


*NUMBERS DENOTE TIME IN MSEC.

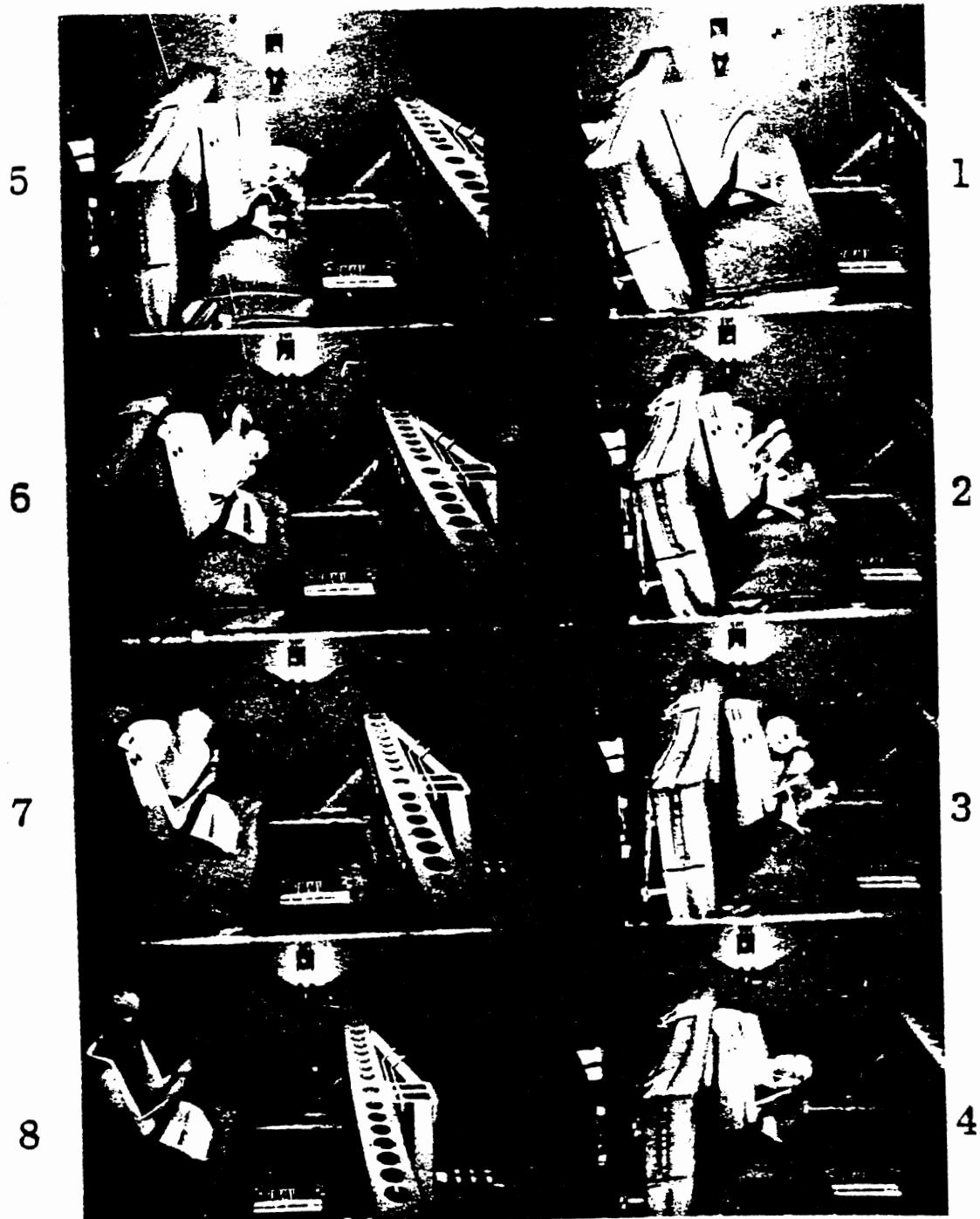


TEST NUMBER	<u>79K401</u>
RESTRAINT	<u>Peterson 75</u>
DUMMY	<u>Old</u>
RESTRAINT TEST POSITION	<u>Center</u>
INITIAL TIPPING	<u>Front Facing</u>
MAXIMUM ANGLE	<u>Not Available</u>

COMMENTS: The dummy was ejected during sled braking after impact.



Pre-Test: Peterson 75 Restraint

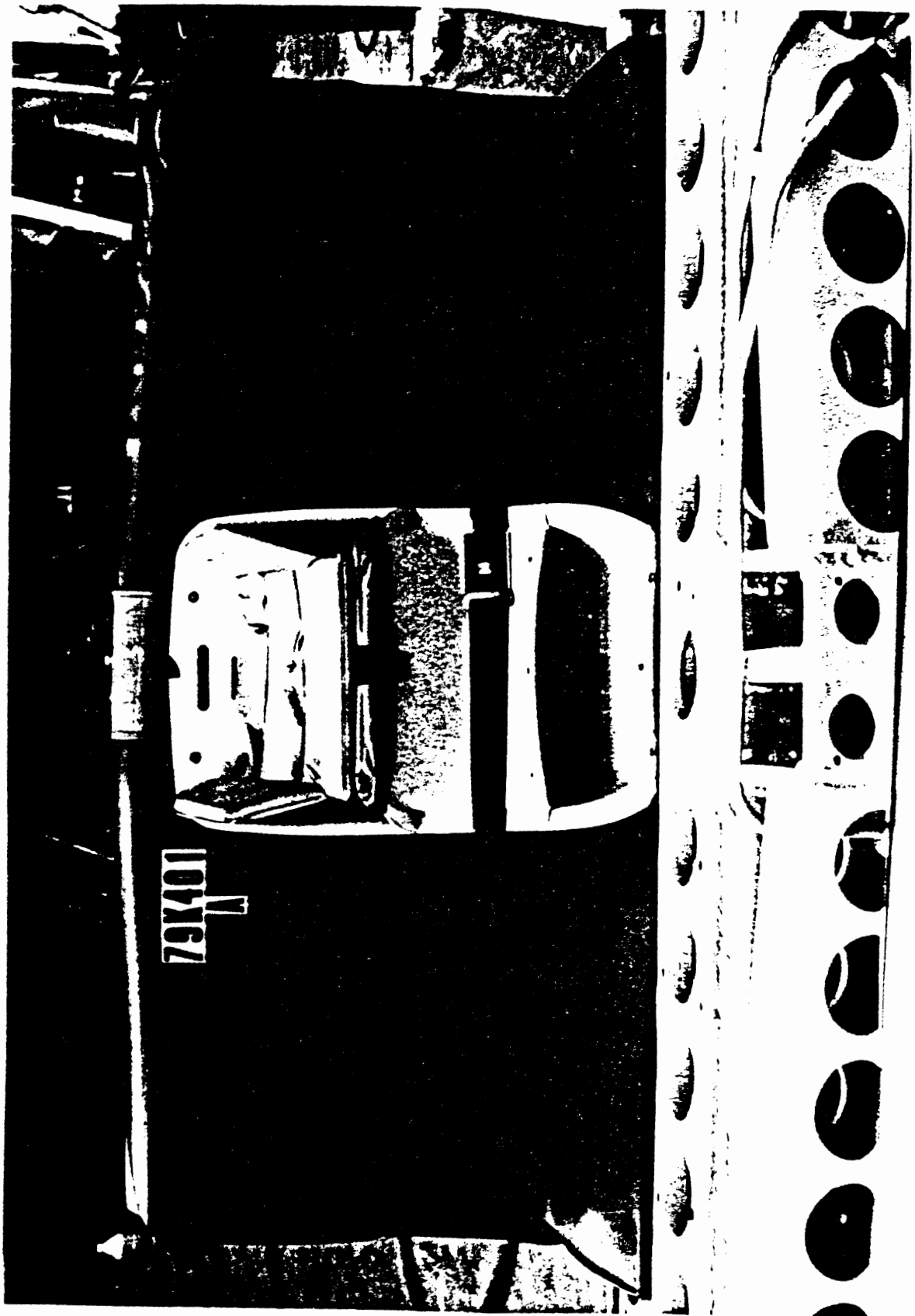


79K401

Peterson 75 Restraint



Post-Test: Peterson 75 Restraint



Post Test: Peterson 75 Restraint

SLED TEST RESULTS

6-MONTH-OLD-INFANT DUMMY

TEST NO.: 79K 401

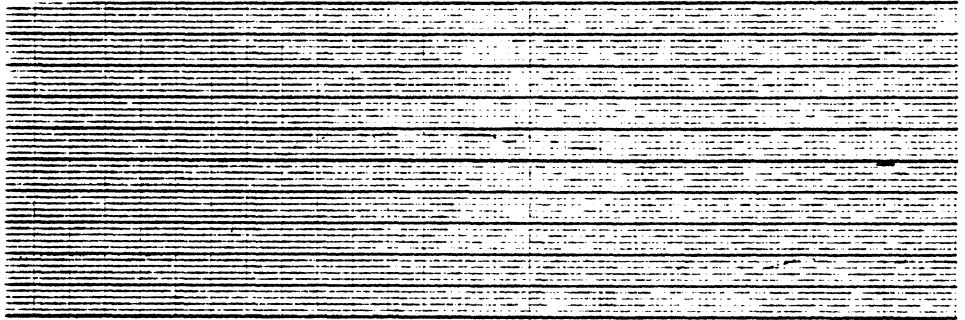
SLED VELOCITY: 30.4 MPH

DUMMY: OLD

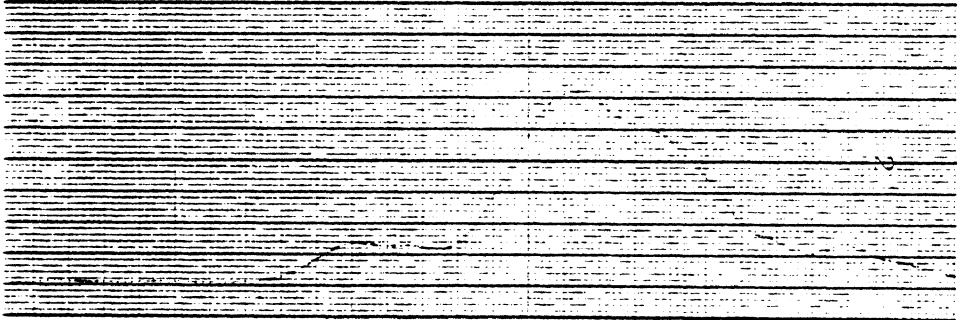
RESTRAINT: PETERSON (new)

TEST CONDITION: FRONT FACING

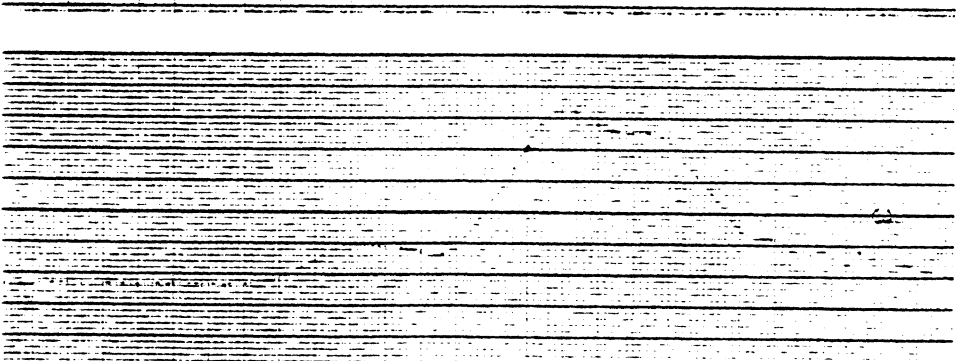
SLED PULSE
1.0 G/DIVISION
FILTERED CHANNEL
CLASS 60



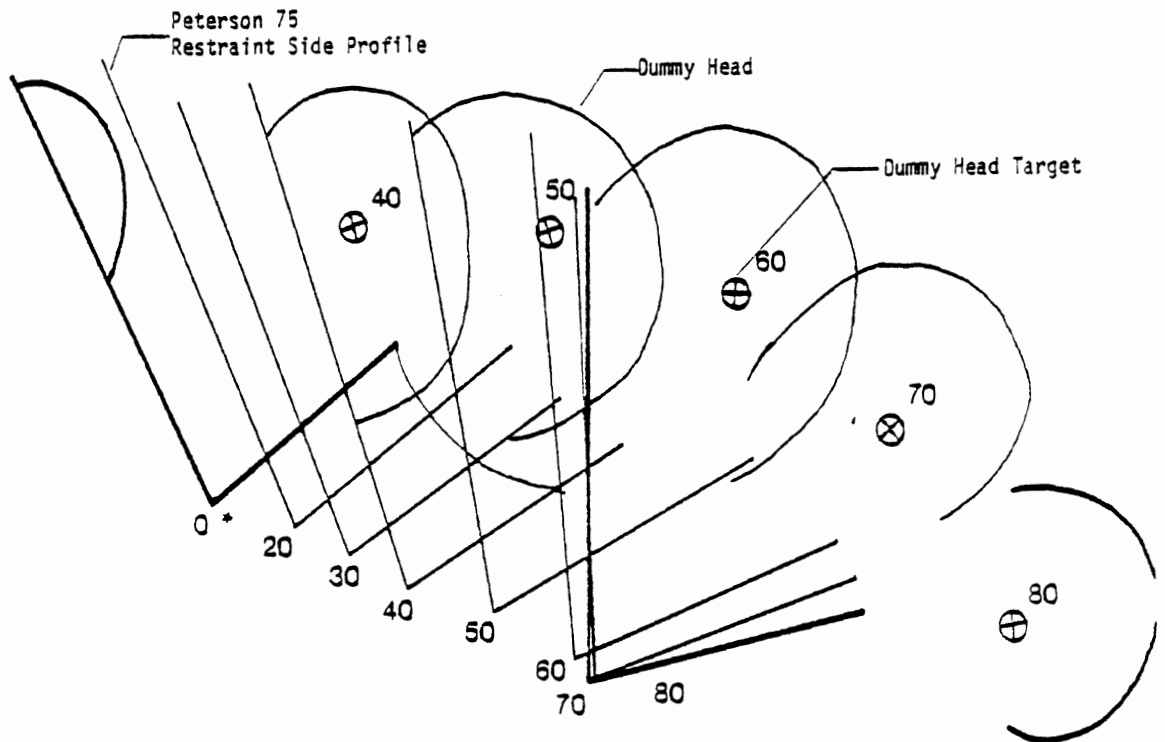
RT. BELT LOAD
CENTER POSITION
20 LB./DIVISION
FILTERED CHANNEL
CLASS 60



LT. BELT LOAD
CENTER POSITION
20 LB./DIVISION
FILTERED CHANNEL
CLASS 60

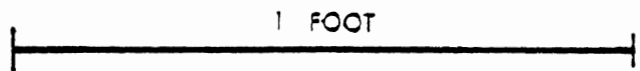


TEST 79K401



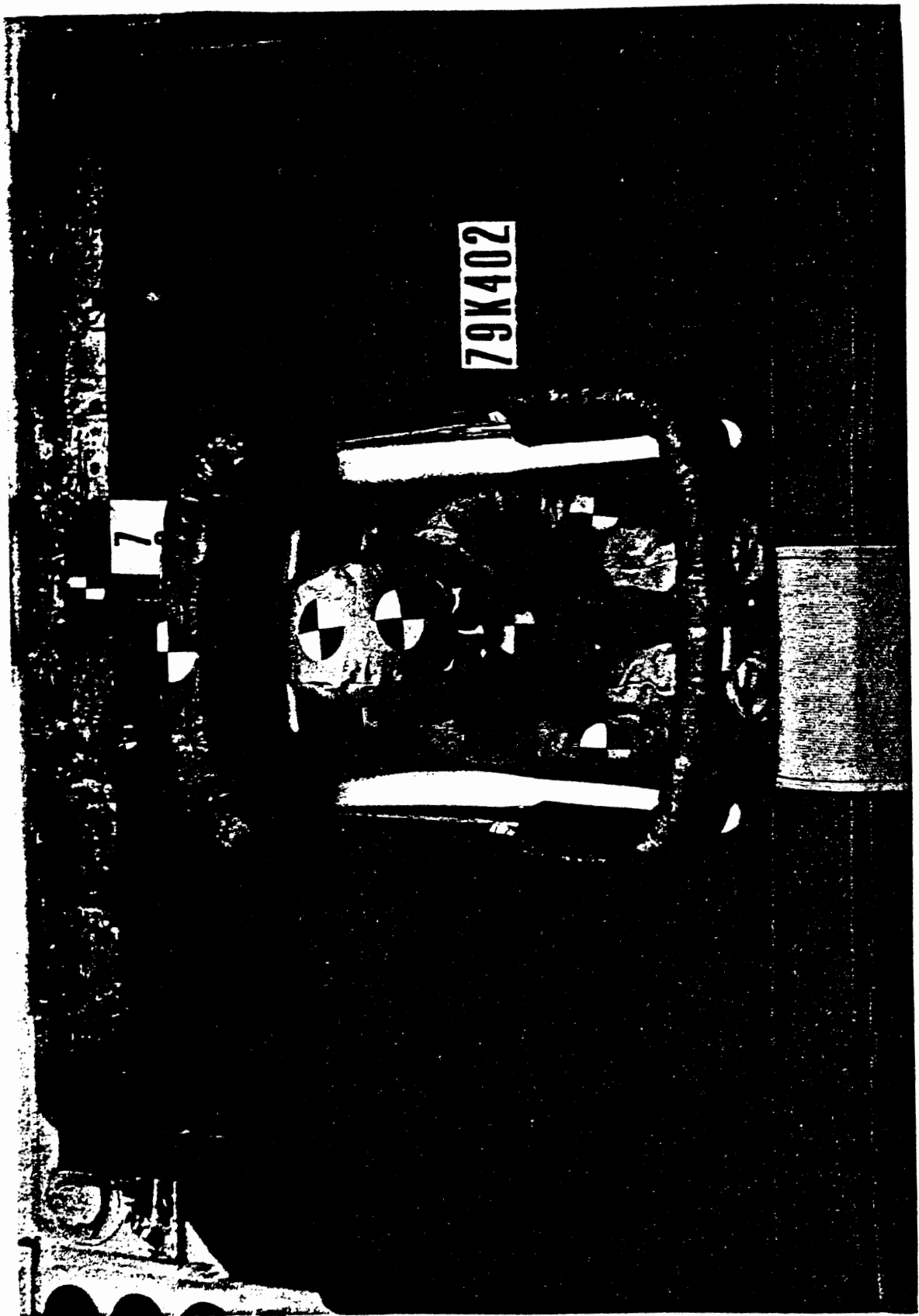
*NUMBERS DENOTE TIME IN MSEC.

MAXIMUM HEAD
EXCURSION 27.8

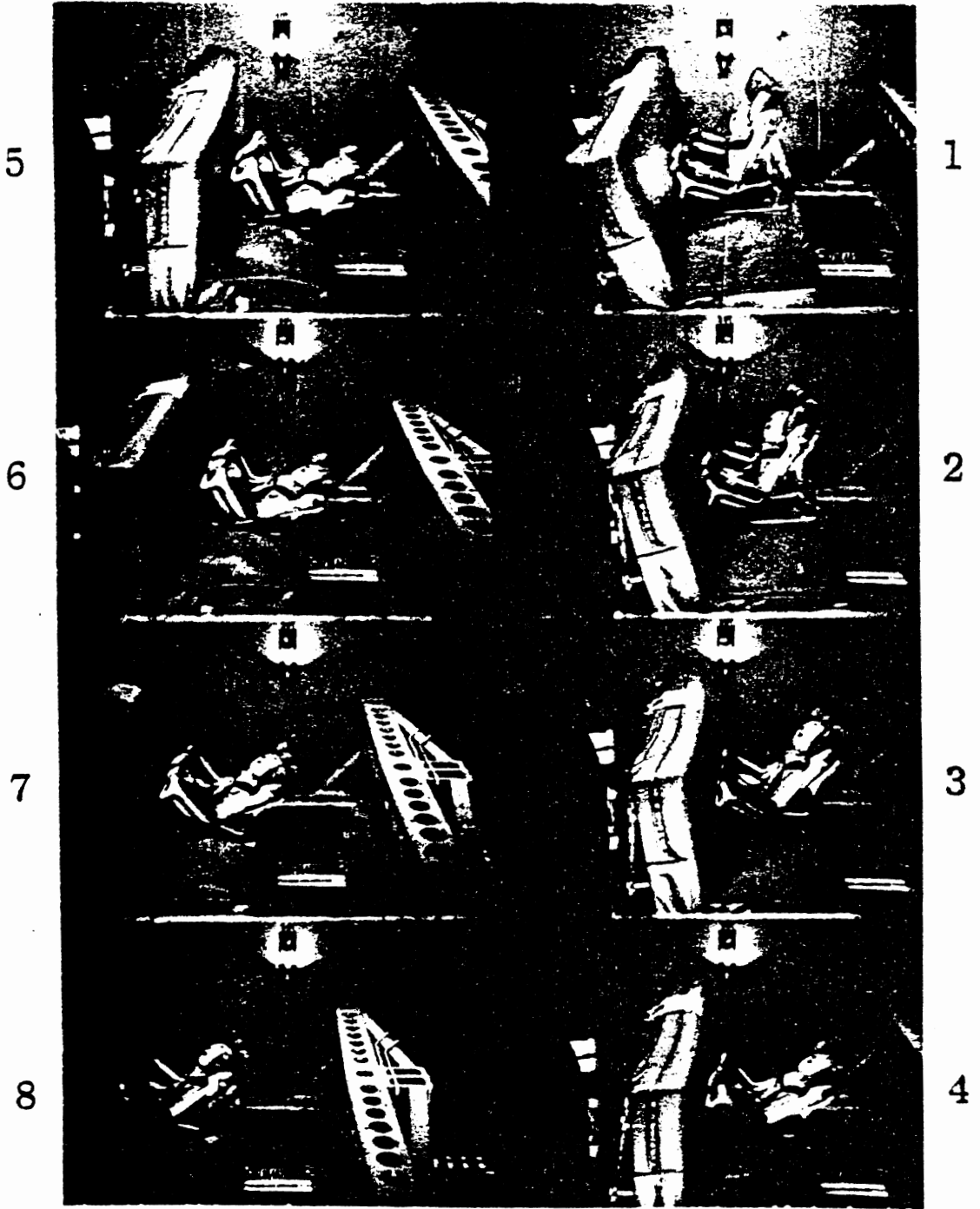


TEST NUMBER	<u>79K402</u>
RESTRAINT	<u>Strolee 5975</u>
DUMMY	<u>New (Ballasted)</u>
RESTRAINT TEST POSITION	<u>Center</u>
INITIAL TIPPING	<u>None</u>
MAXIMUM ANGLE	<u>84.5°</u>

COMMENTS: The seatback elevation support jumped out of adjustment.

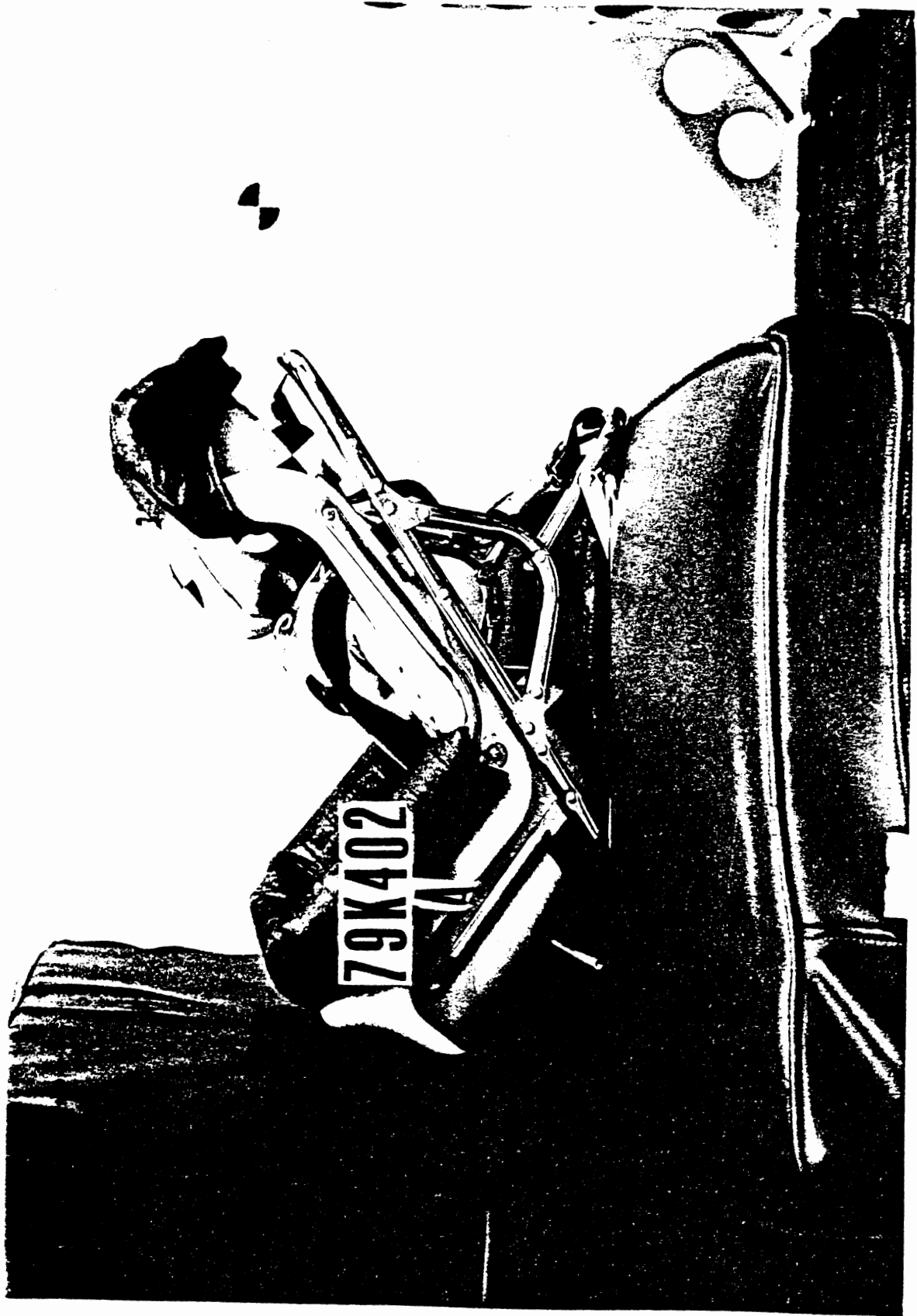


Pre-Test: Strolee 5975 Restraint



79K402

Strolee 5975 Restraint



Post-Test: Strolee 5975 Restraint



Strolee 5975 Post-Test Photograph Showing Dislodged Seat Adjustment

SLED TEST RESULTS

6-MONTH-OLD-INFANT DUMMY

TEST NO.: 79K402

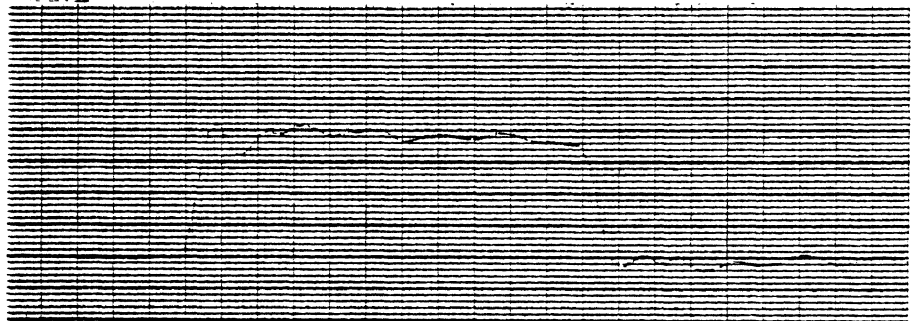
SLED VELOCITY: 29.4 MPH

DUMMY: NEW (ballasted)

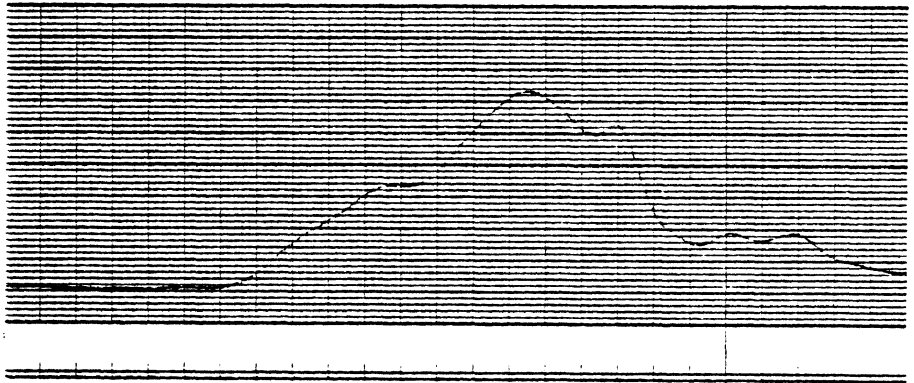
RESTRAINT: STROLEE (new) 5975

TEST CONDITION: REAR FACING

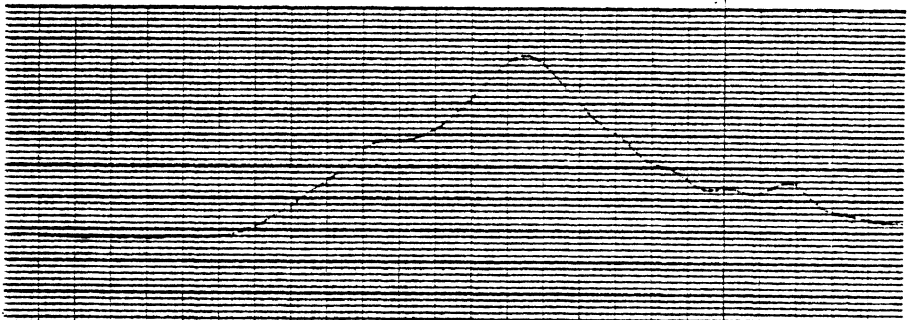
SLED PULSE
1.0 G/DIVISION
FILTERED CHANNEL
CLASS 60



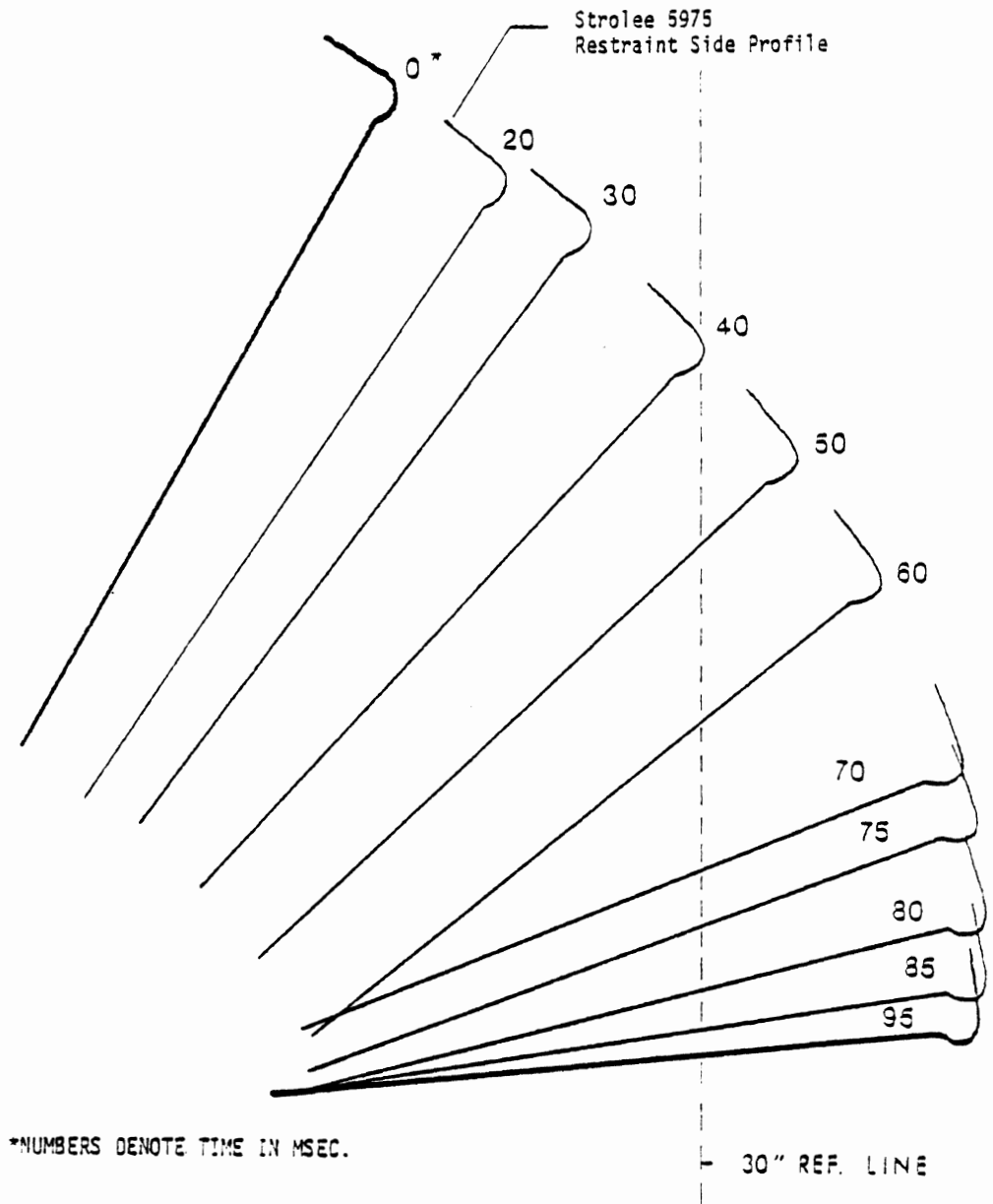
RT. BELT LOAD
CENTER POSITION
20 LB./DIVISION
FILTERED CHANNEL
CLASS 60



LT. BELT LOAD
CENTER POSITION
20 LB./DIVISION
FILTERED CHANNEL
CLASS 60



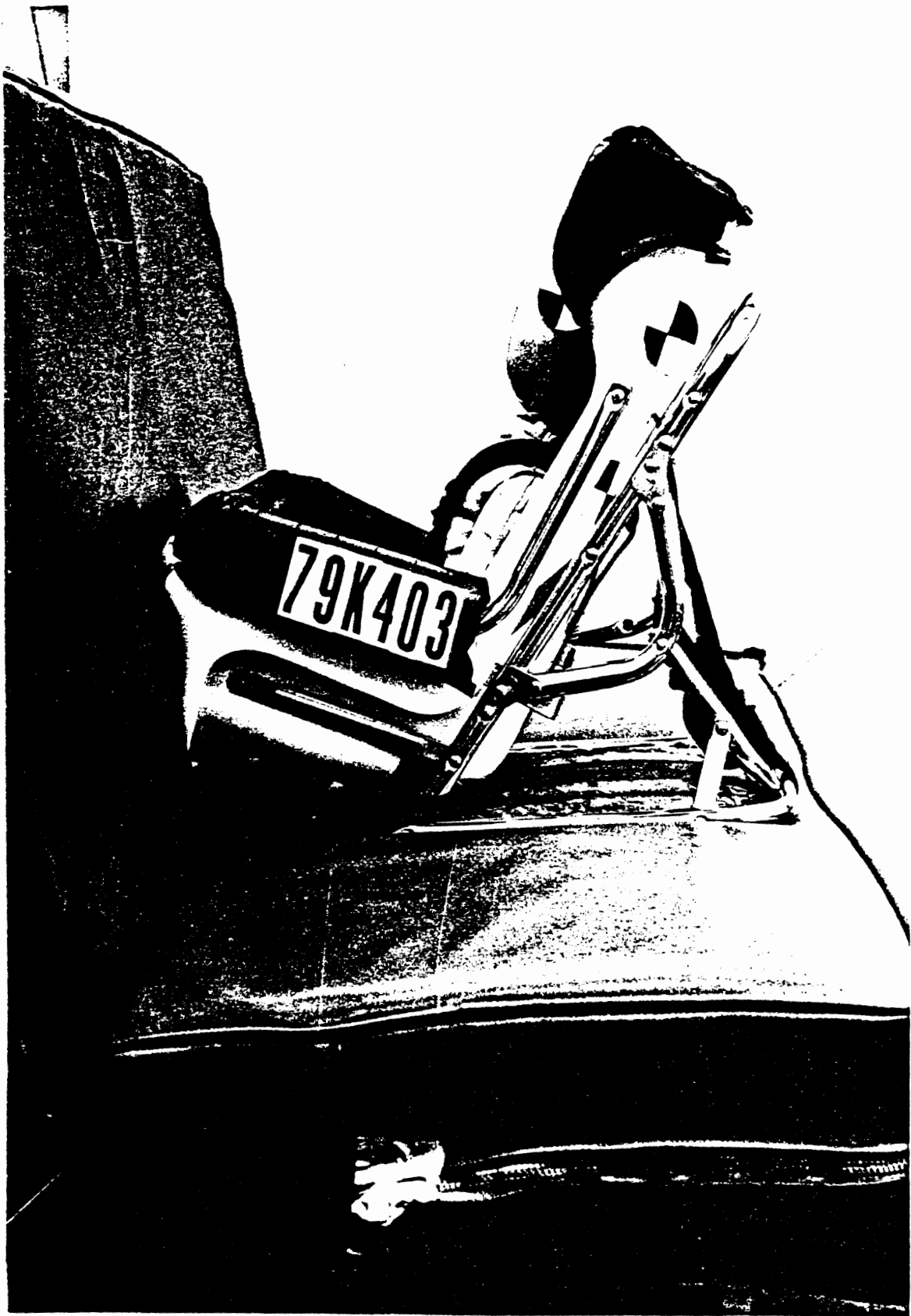
TEST 79K402



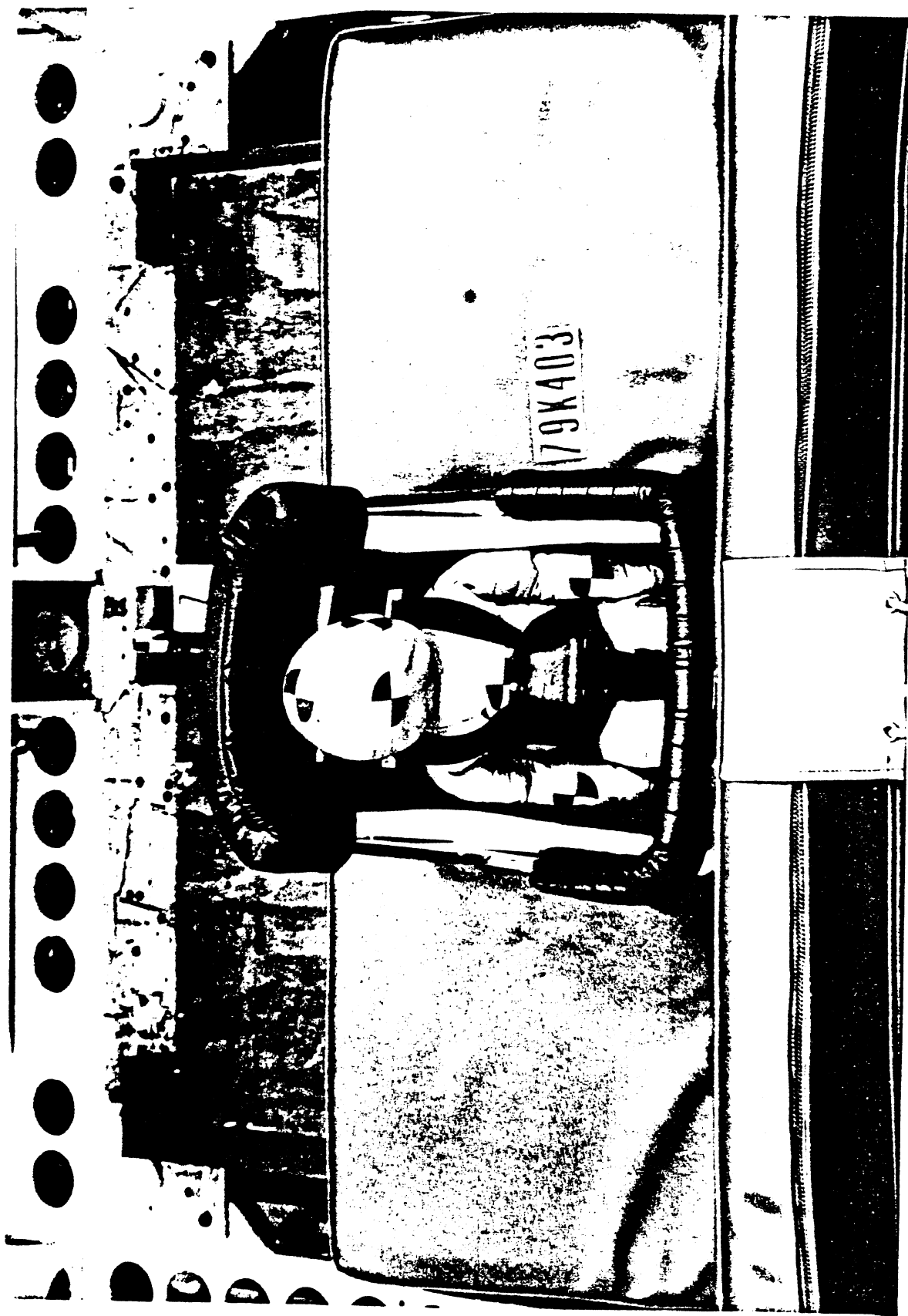
1 FOOT

TEST NUMBER	<u>79K403</u>
RESTRAINT	<u>Strolee 5975</u>
DUMMY	<u>01d</u>
RESTRAINT TEST POSITION	<u>Center</u>
INITIAL TIPPING	<u>None</u>
MAXIMUM ANGLE	<u>77°</u>

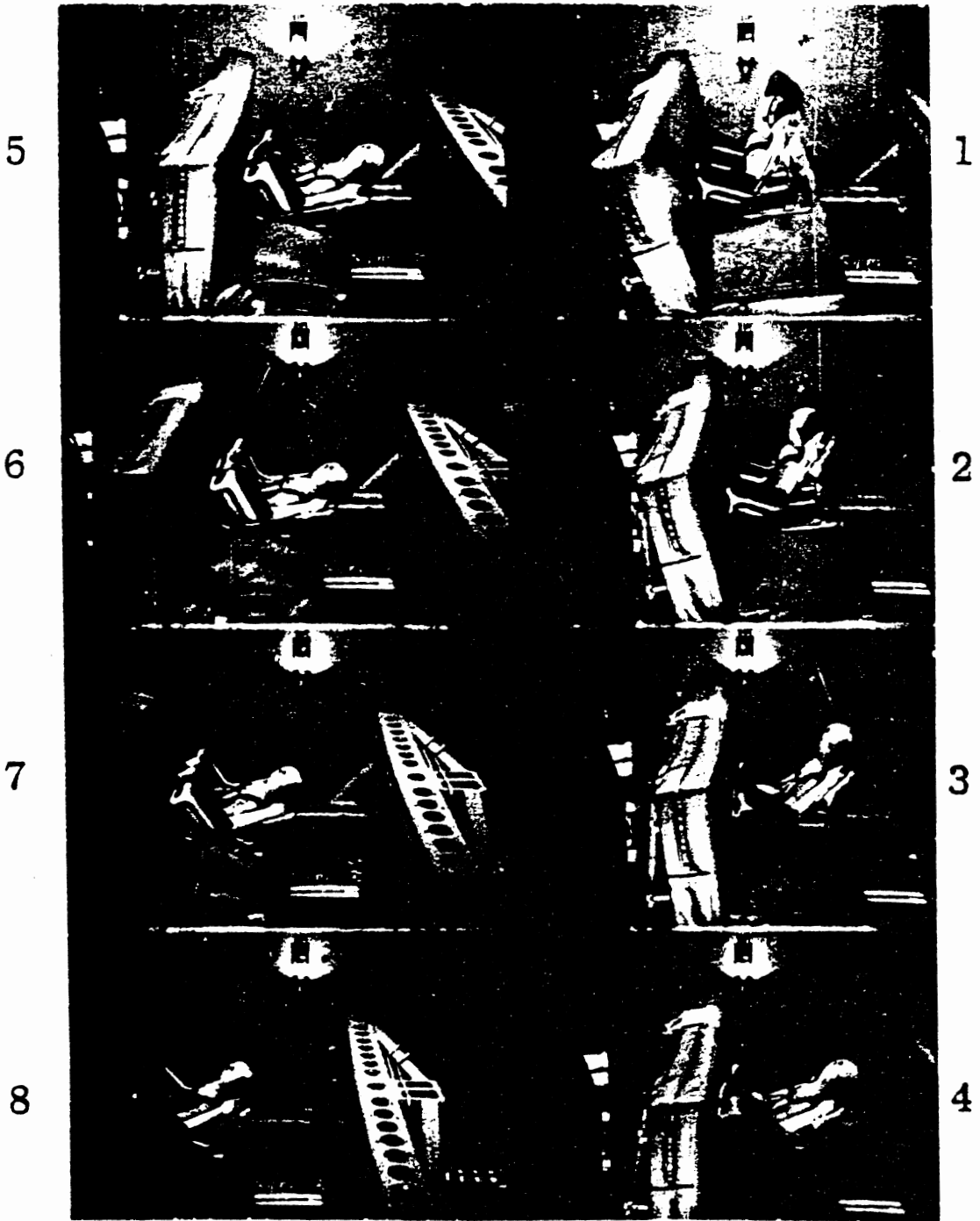
COMMENTS: The seatback elevation support jumped out of adjustment.



Pre-Test: Strollee 5975 Restraint



Pre-Test: Strolee 5975 Restraint



79K403

Strolee 5975 Restraint



Post-Test: Strolee 5975 Restraint a) Support Dislodged

SLED TEST RESULTS

6-MONTH-OLD-INFANT DUMMY

TEST NO.: 79K403

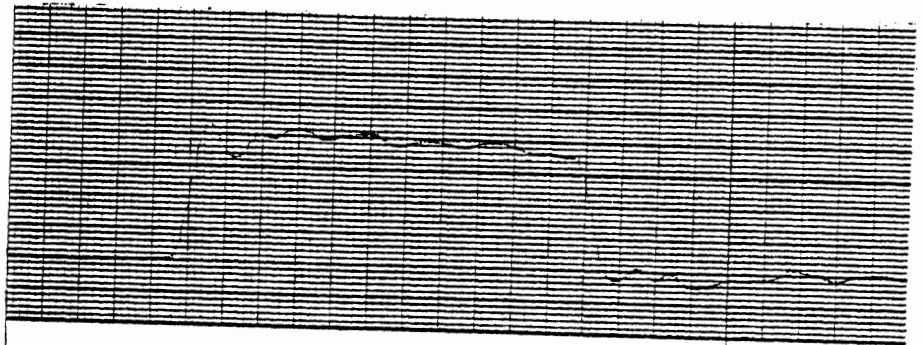
SLED VELOCITY: 29.5 MPH

DUMMY: OLD

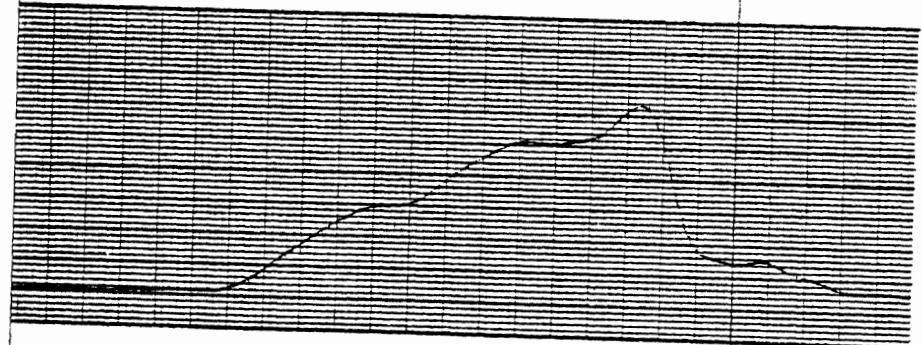
RESTRAINT: STROLEE (new) 5975

TEST CONDITION: REAR FACING

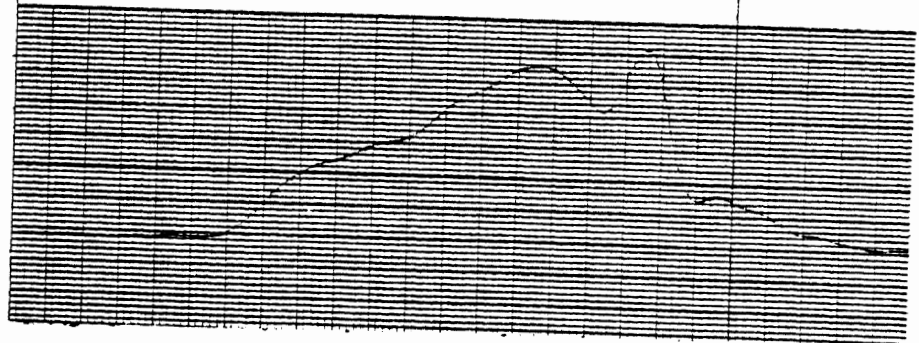
SLED PULSE
1.0 G/DIVISION
FILTERED CHANNEL
CLASS 60



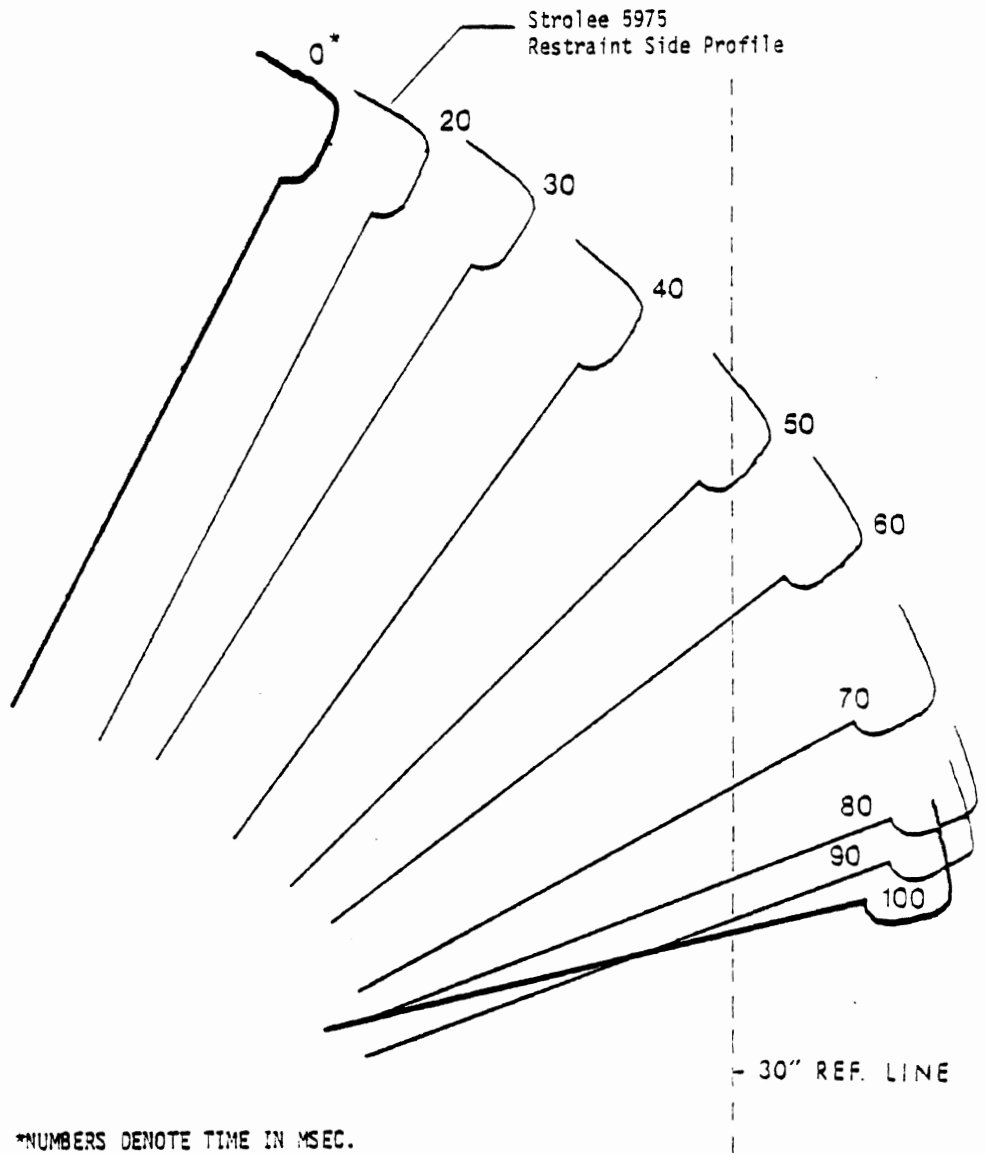
RT. BELT LOAD
CENTER POSITION
20 LB./DIVISION
FILTERED CHANNEL
CLASS 60



LT. BELT LOAD
CENTER POSITION
20 LB./DIVISION
FILTERED CHANNEL
CLASS 60



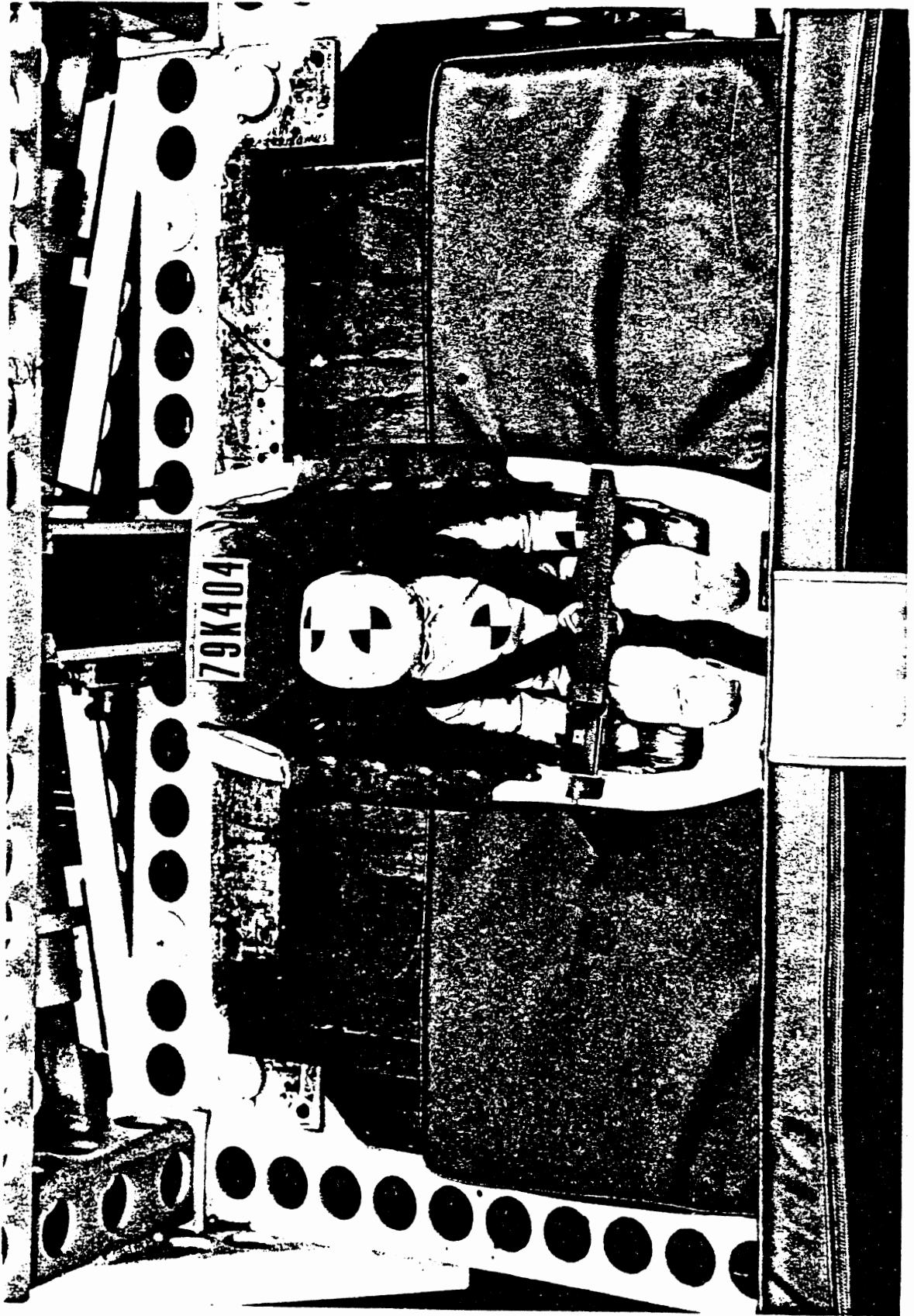
TEST 79K403



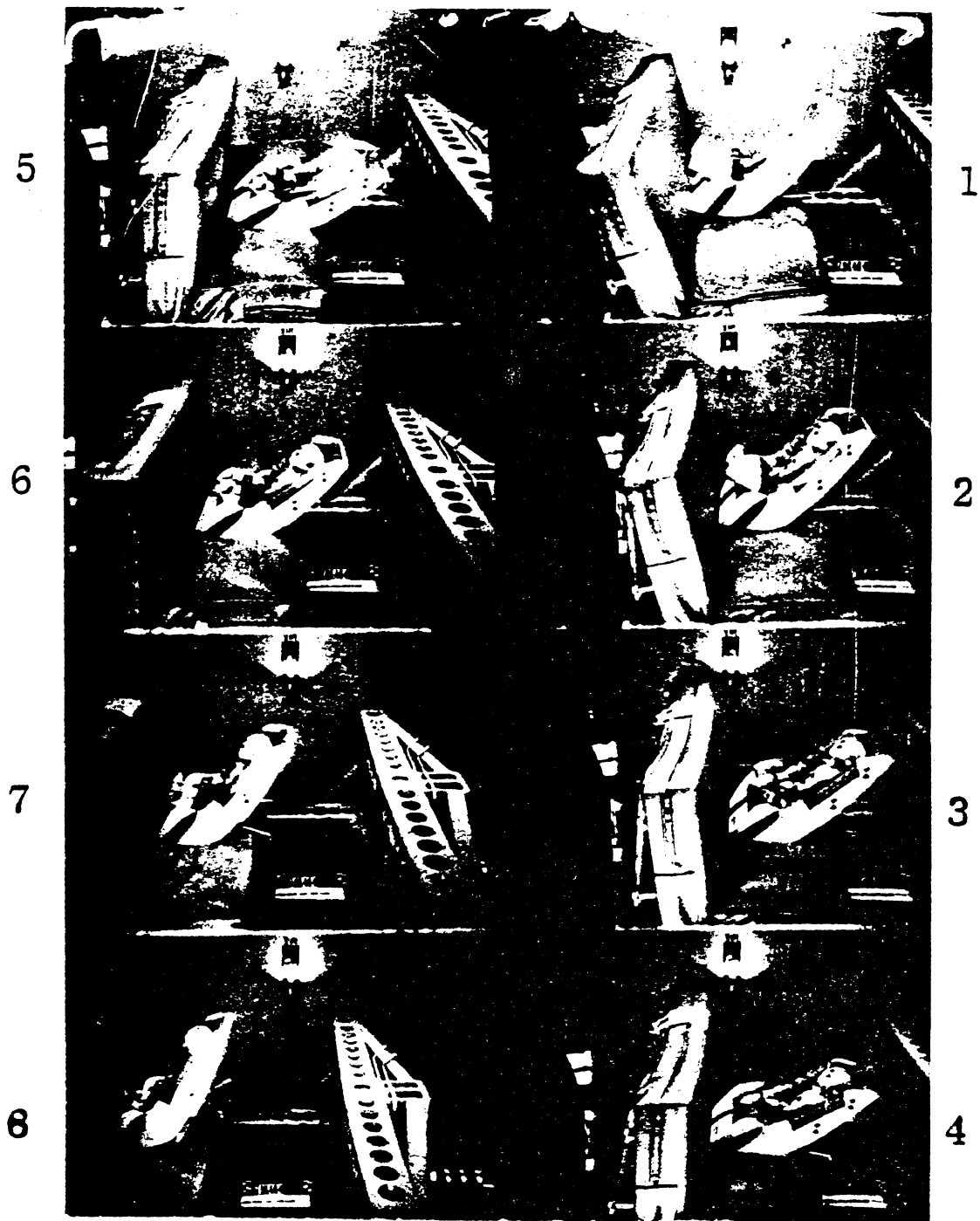
1 FOOT

TEST NUMBER	<u>79K404</u>
RESTRAINT	<u>Kantwet 988</u>
DUMMY	<u>New (Ballasted)</u>
RESTRAINT TEST POSITION	<u>Center</u>
INITIAL TIPPING	<u>None</u>
MAXIMUM ANGLE	<u>57°</u>

COMMENTS:

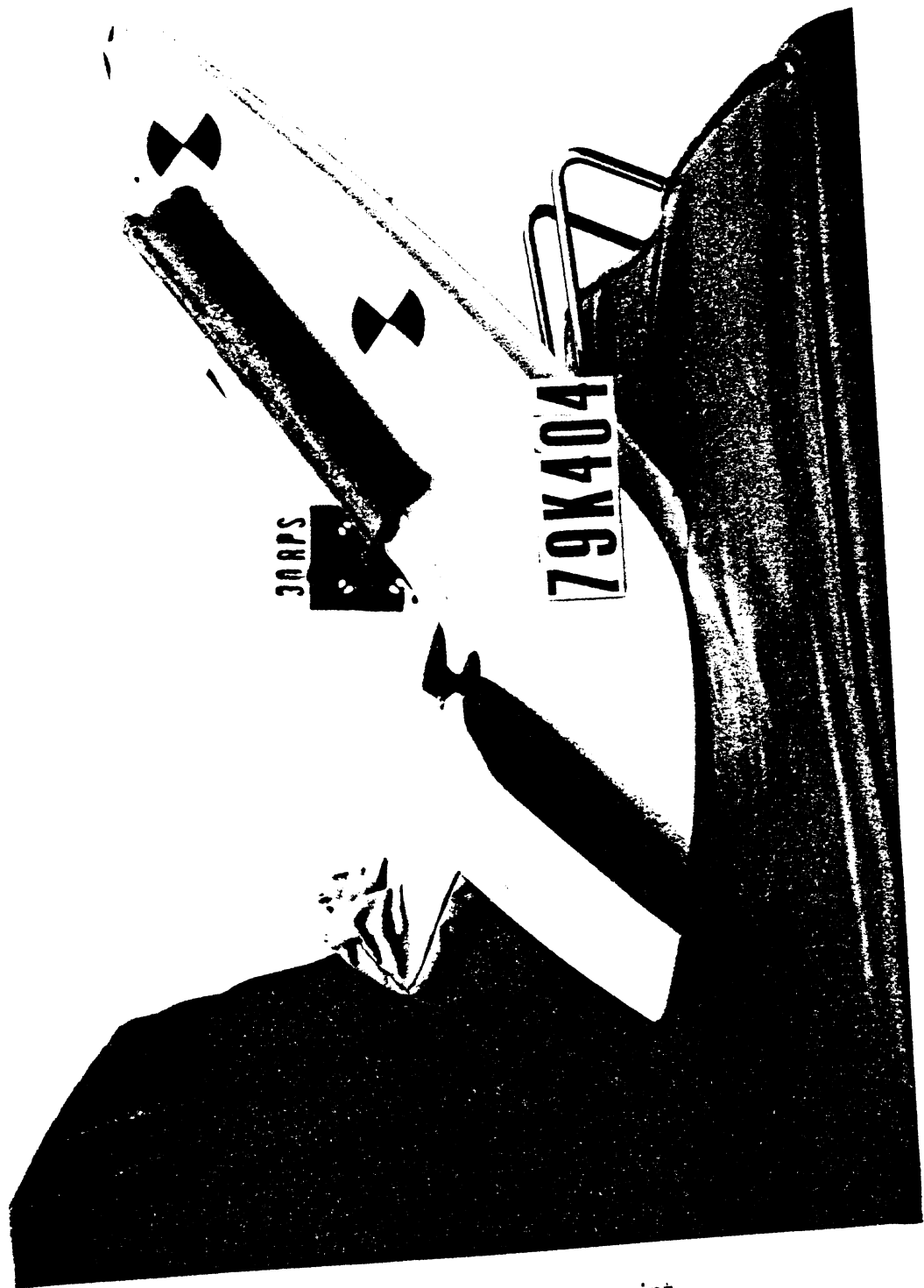


Pre-Test: Kantwet 988 Restraint



79K404

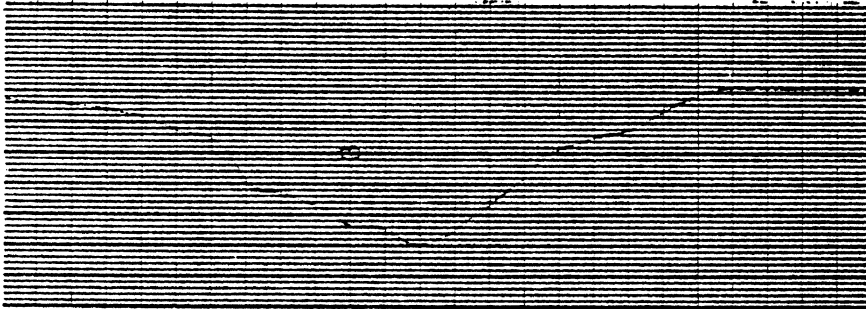
Kantwet 988 Restraint



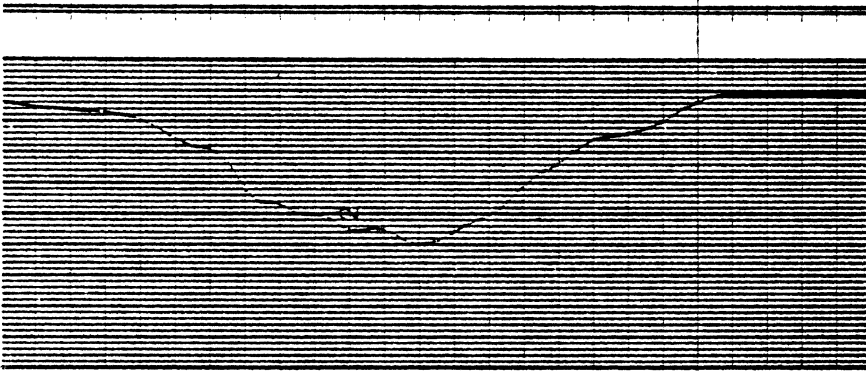
Pre-Test: Kantwet 988 Restraint



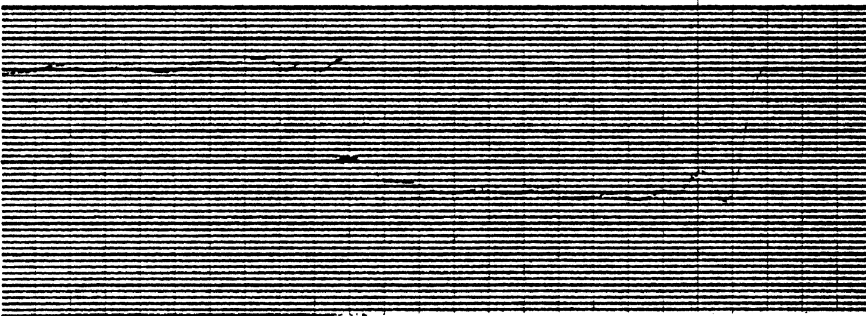
Post-Test: Kantwet 988 Restraint



LT. BELT LOAD
CENTER POSITION
20 LB./DIVISION
FILTERED CHANNEL
CLASS 60



RT. BELT LOAD
CENTER POSITION
20 LB./DIVISION
FILTERED CHANNEL
CLASS 60



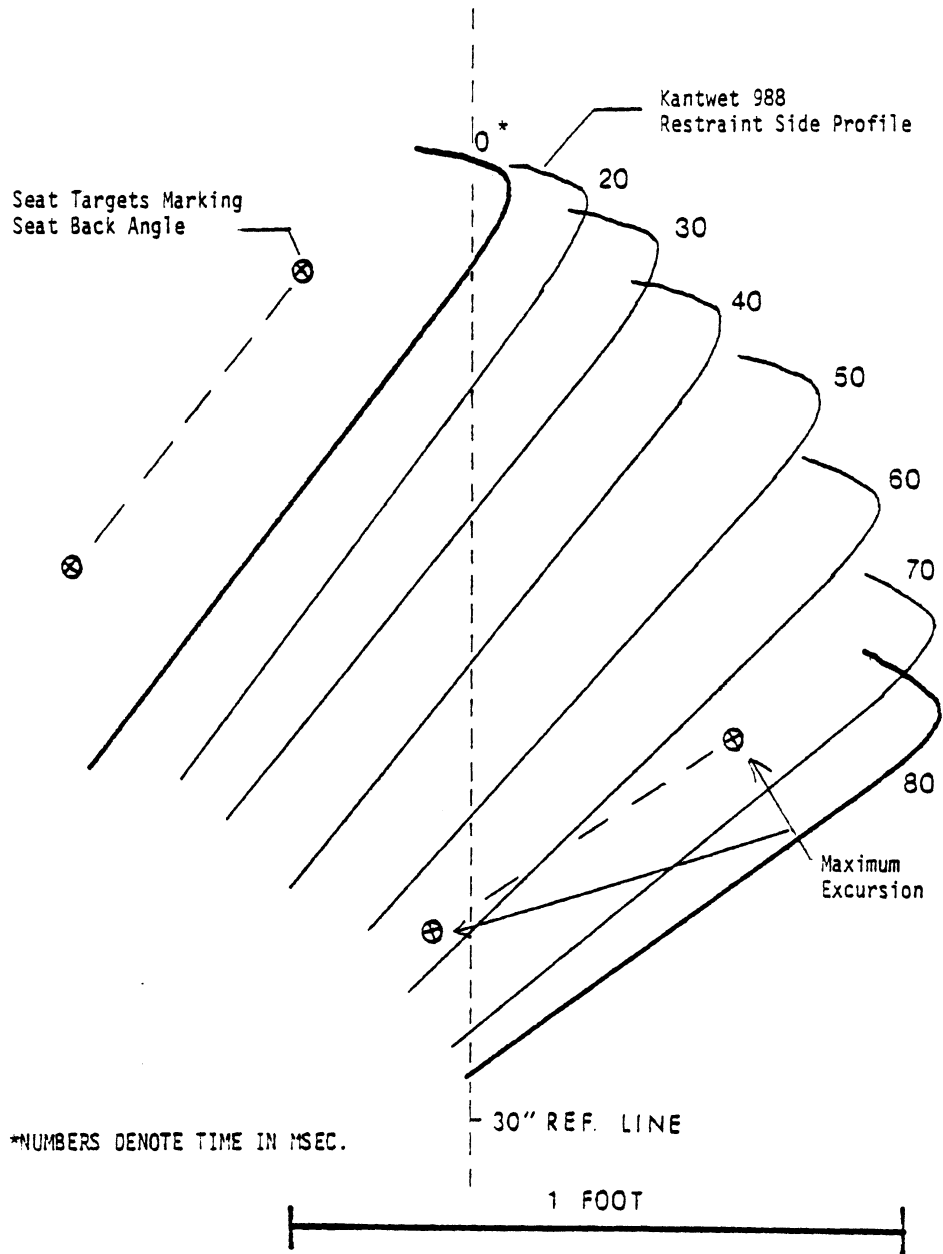
SLED PULSE
1.0 G/DIVISION
FILTERED CHANNEL
CLASS 60

TEST NO.: 79K404
SLED VELOCITY: 29.6 MPH
DUMMY: NEM (ballasted)
RESTRAINT: KANTWET (new) 988
TEST CONDITION: REAR FACING

6-MONTH-OLD-INFANT DUMMY

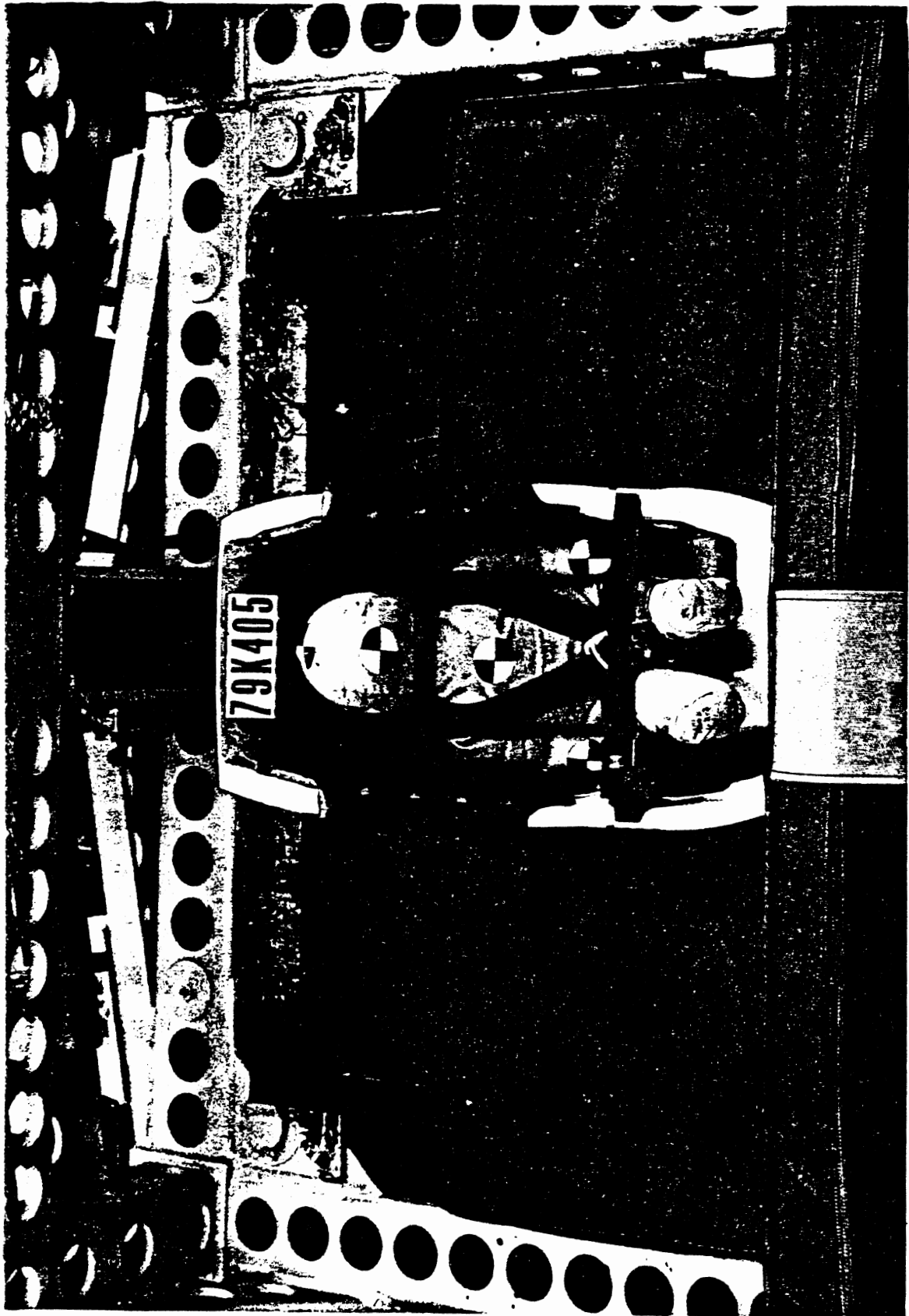
SLED TEST RESULTS

TEST 79K404



TEST NUMBER	<u>79K405</u>
RESTRAINT	<u>Kantwet 988</u>
DUMMY	<u>Old</u>
RESTRAINT TEST POSITION	<u>Center</u>
INITIAL TIPPING	<u>None</u>
MAXIMUM ANGLE	<u>60°</u>

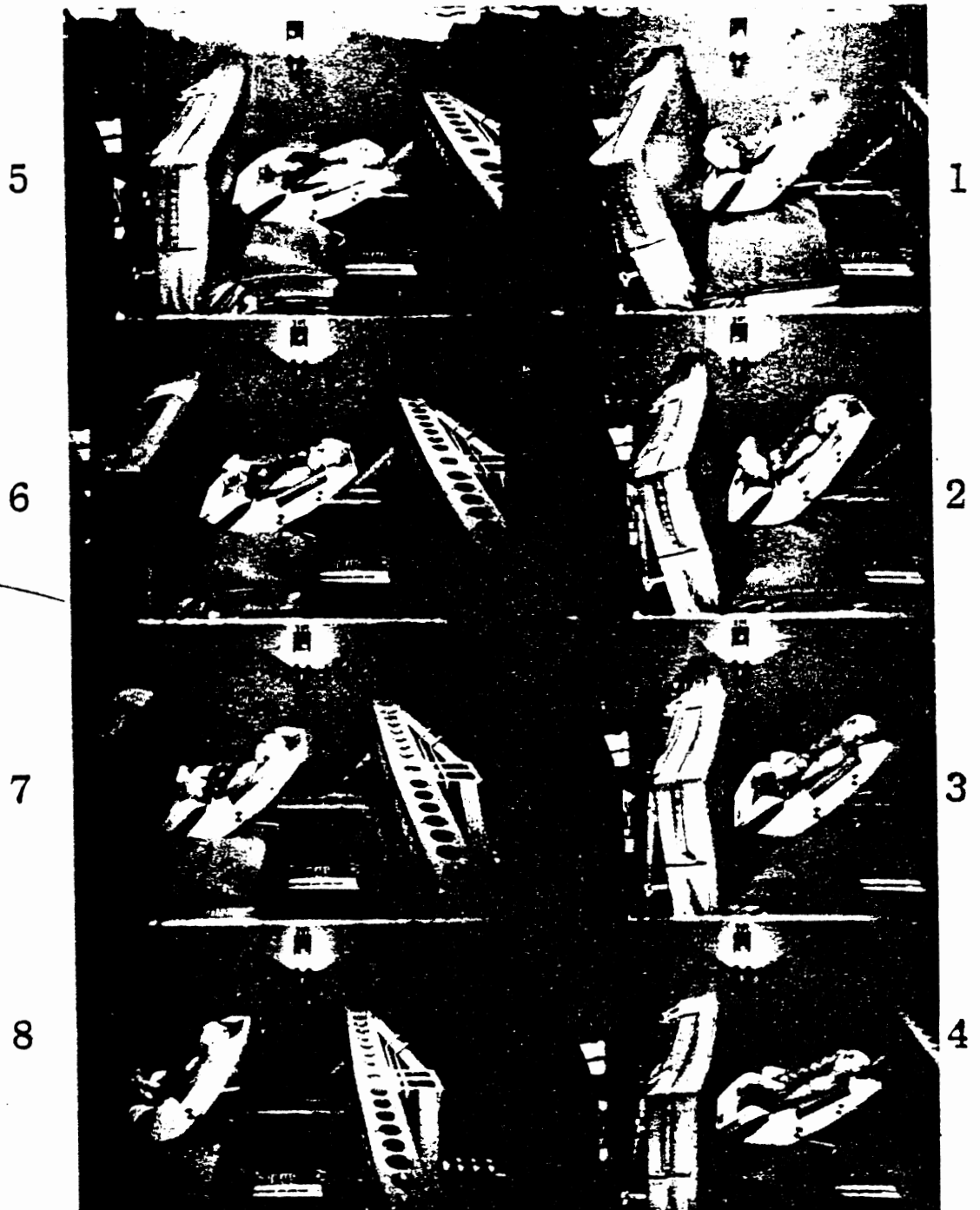
COMMENTS :



Pre-Test: Kantwet 988 Restraint



Pre-Test: Kantwet 988



79K405

Kantwet 988 Restraint



· Post-Test: Kantwet 988 Restraint

SLED TEST RESULTS —

6-MONTH-OLD-INFANT DUMMY

TEST NO.: 79K405

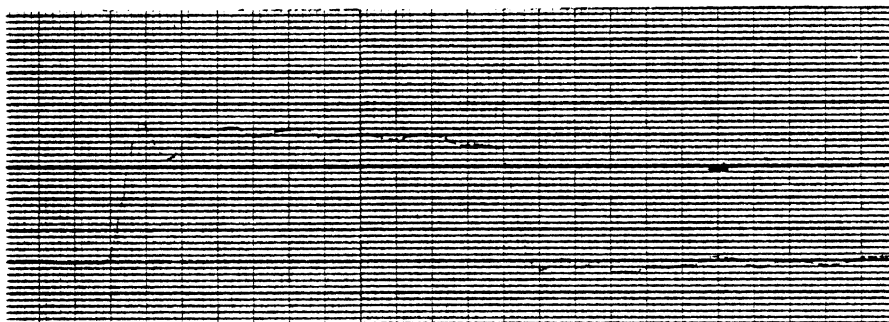
SLED VELOCITY: 29.8 MPH

DUMMY: OLD

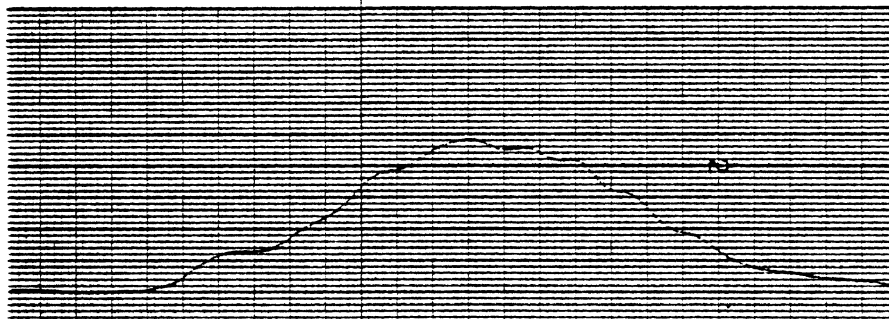
RESTRAINT: KANTWET (new)

TEST CONDITION: REAR FACING

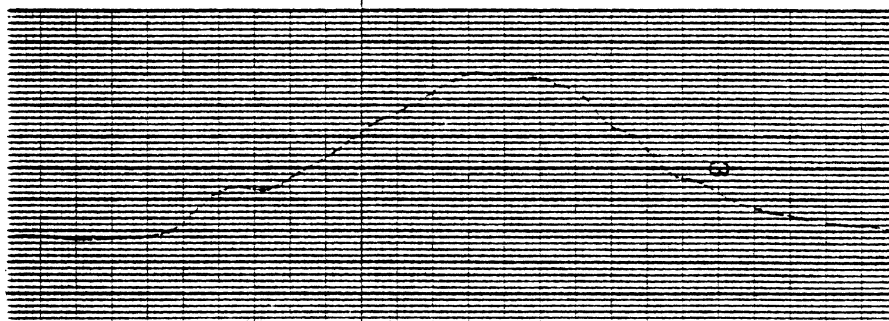
SLED PULSE
1.0 G/DIVISION
FILTERED CHANNEL
CLASS 60



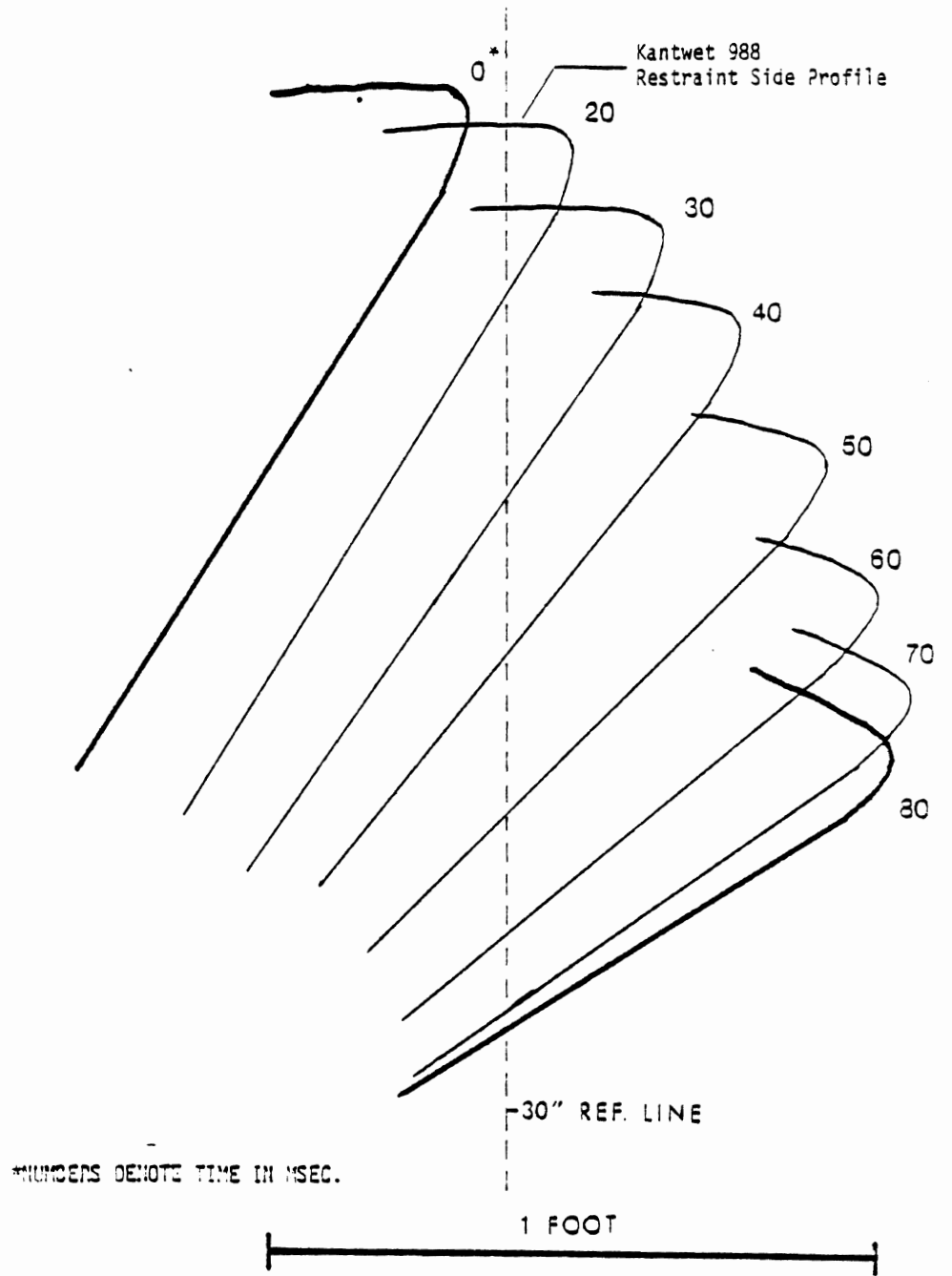
RT. BELT LOAD
CENTER POSITION
20 LB./DIVISION
FILTERED CHANNEL
CLASS 60



LT. BELT LOAD
CENTER POSITION
20 LB./DIVISION
FILTERED CHANNEL
CLASS 60

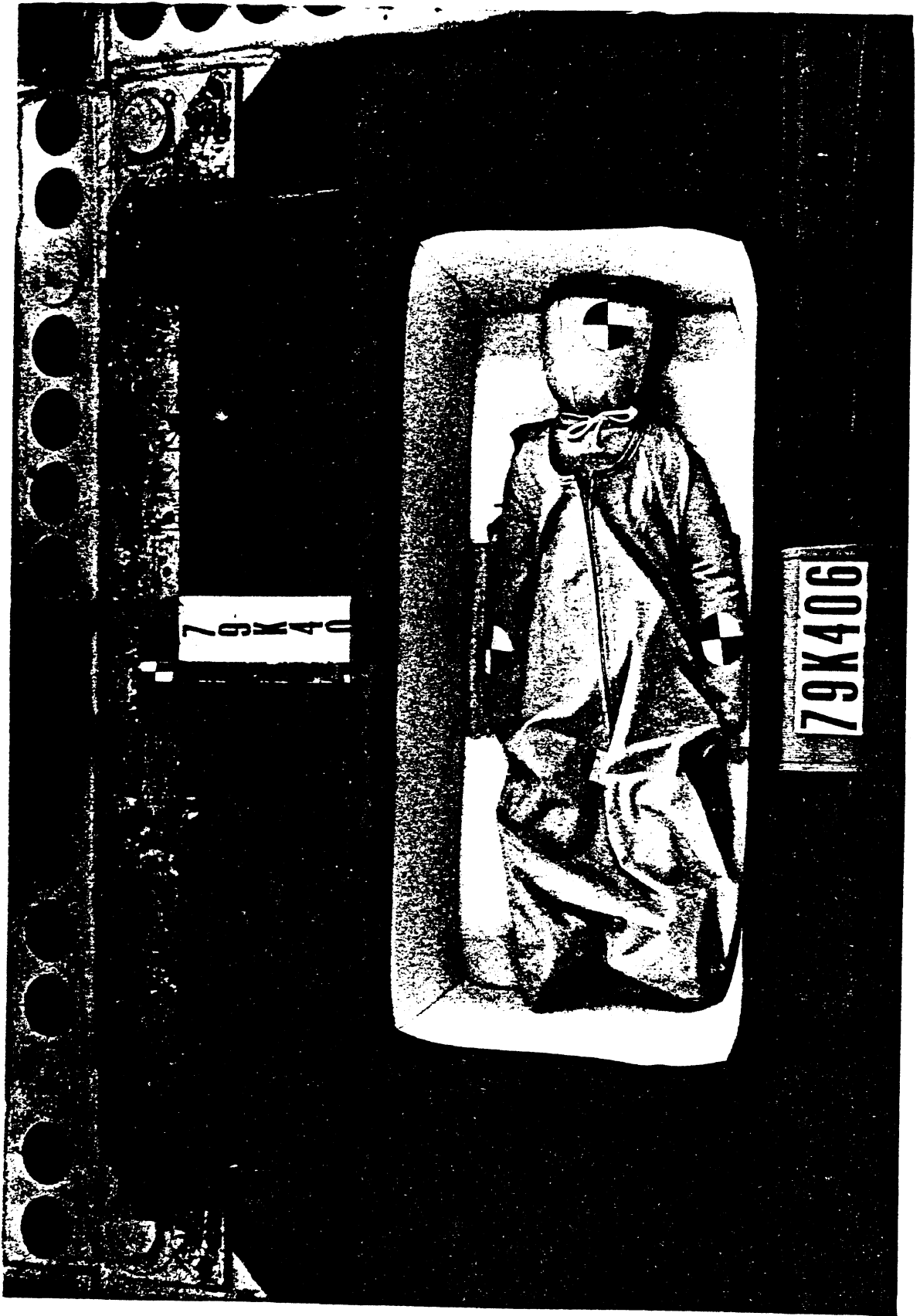


TEST 79K405



TEST NUMBER	<u>79K406</u>
RESTRAINT	<u>Romer</u>
DUMMY	<u>New (Ballasted)</u>
RESTRAINT TEST POSITION	<u>Center</u>
INITIAL TIPPING	<u>Side Facing</u>
MAXIMUM ANGLE	<u>Not Available</u>

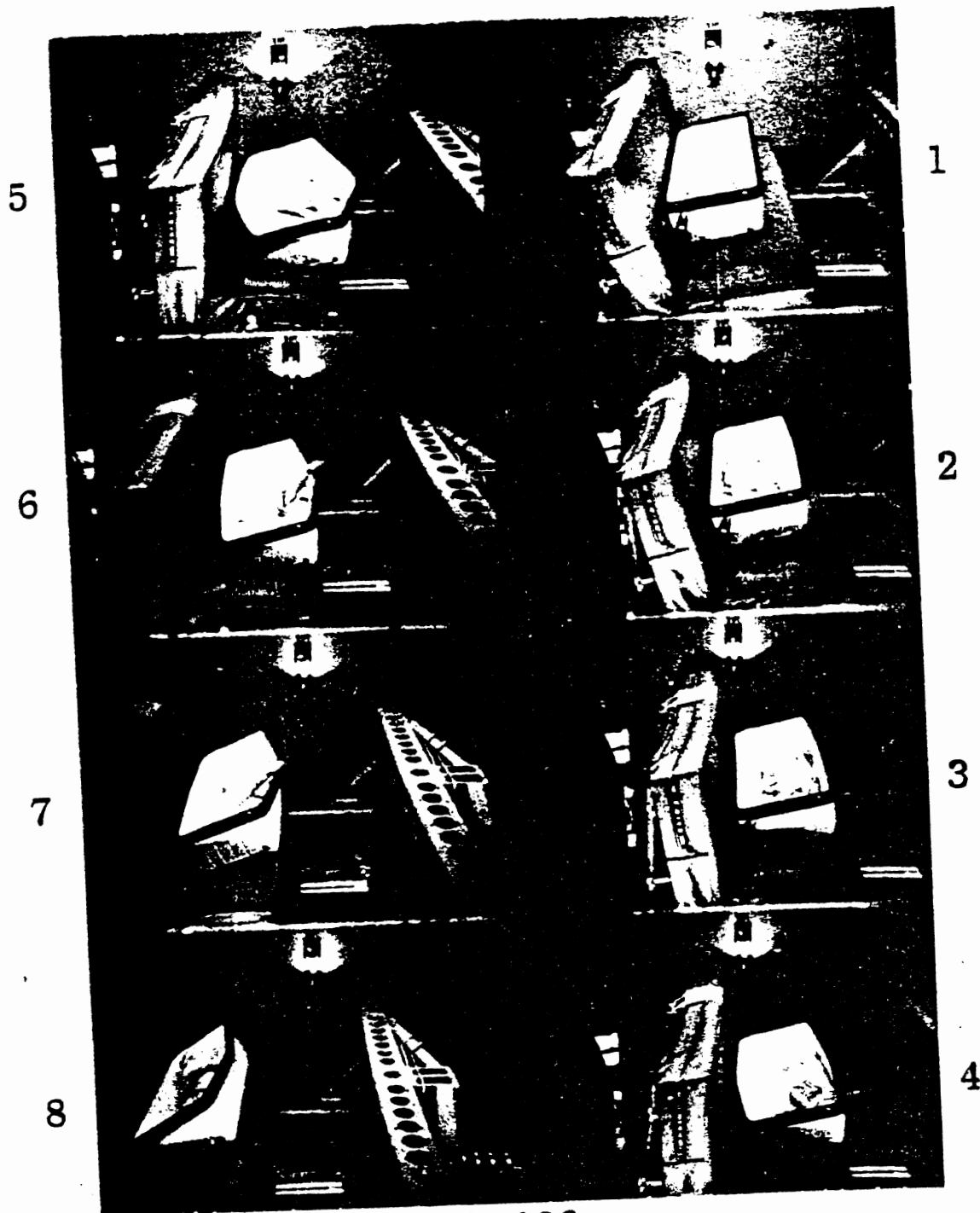
COMMENTS: Restraint zipper tore and shell of restraint cracked.



Pre-Test: Romer Car Bed

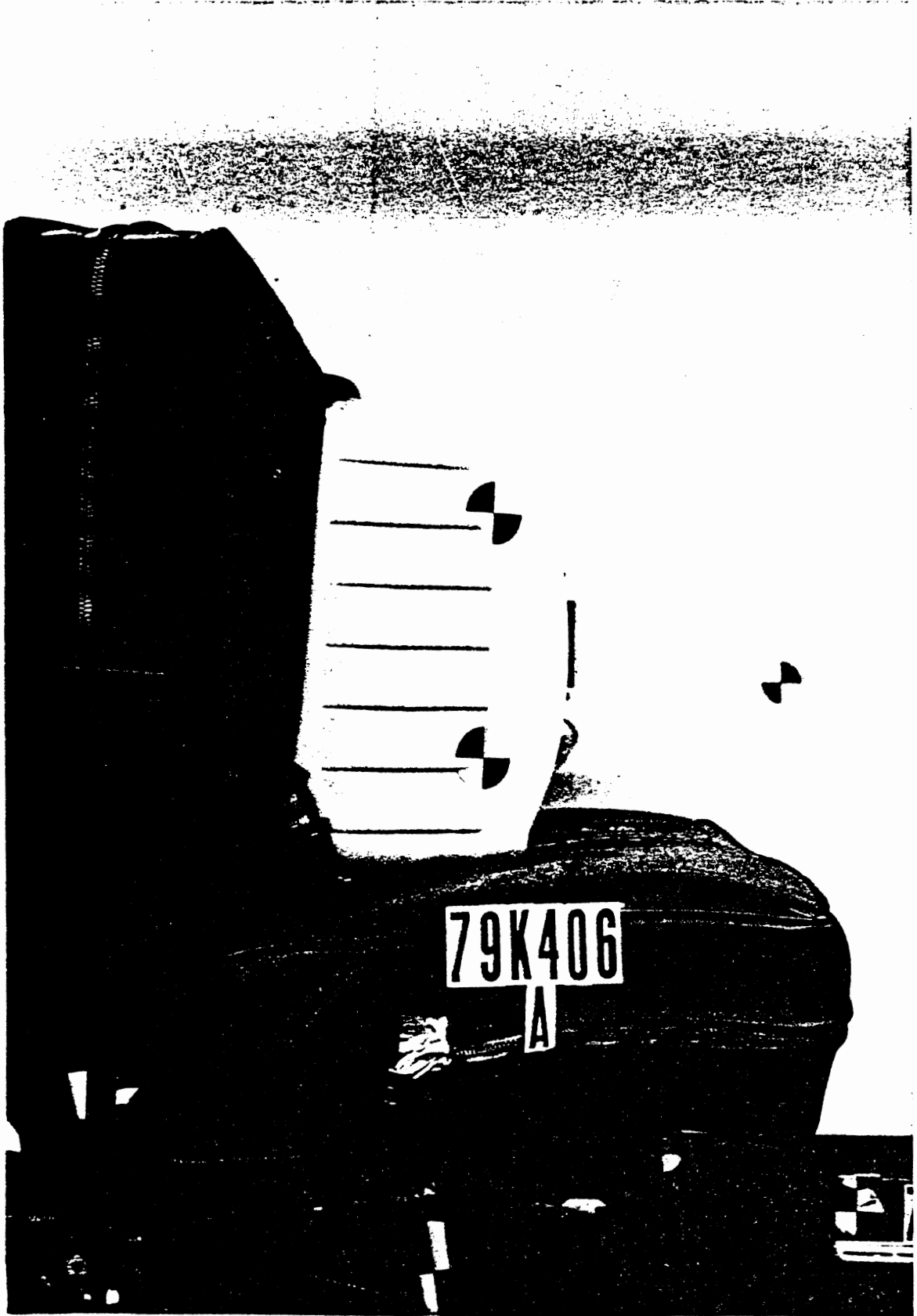


Pre-Test: Romer Car Bed



79K406

Romer Car Bed



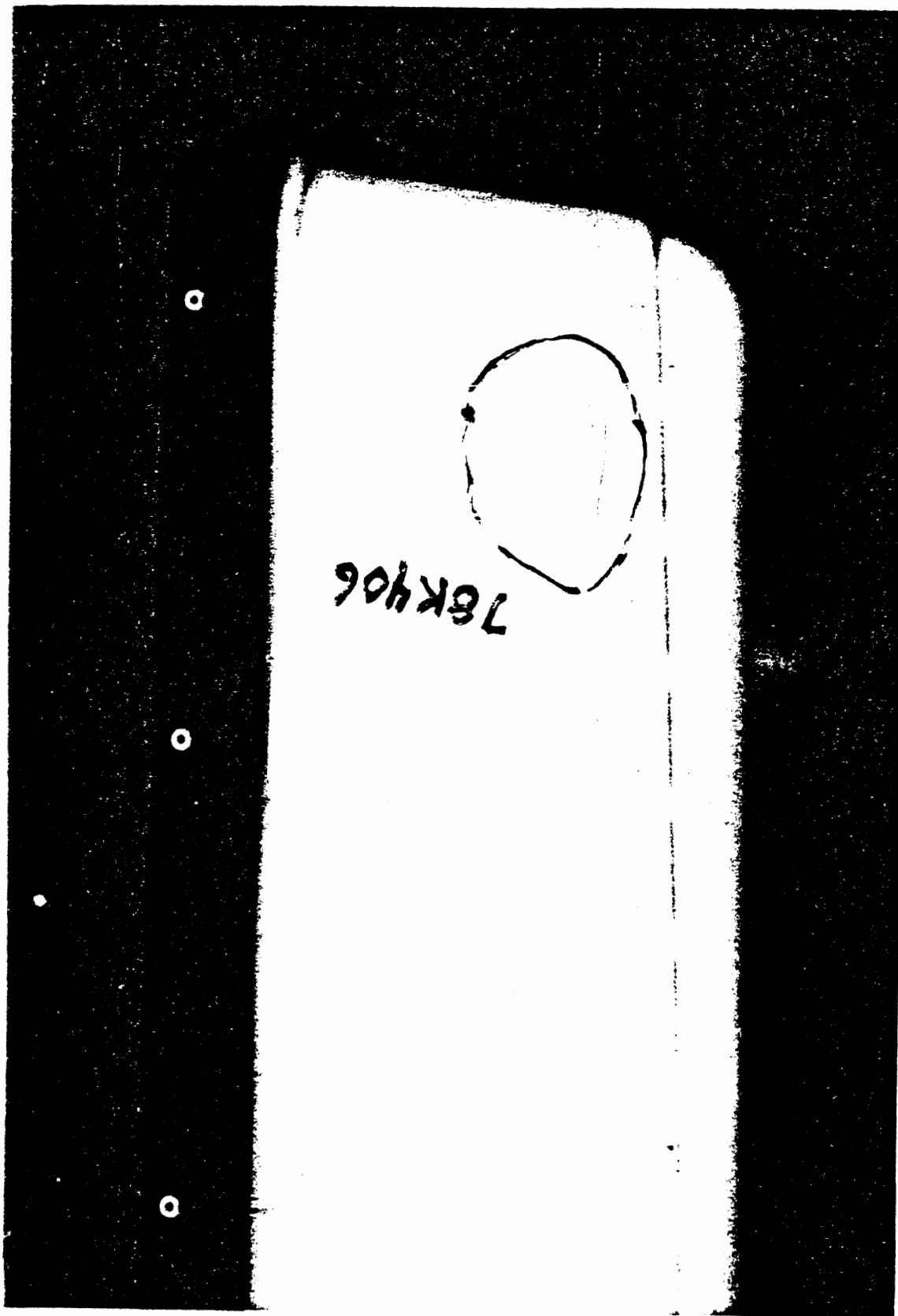
Post-Test: Romer Car Bed



Romer Car Bed Post-Test Photograph Showing Open Zipper



Romer Post-Test Photograph Showing Zipper Tear



Romer Post-Test Photograph Showing Crack in Outer Shell

SLED TEST RESULTS

6-MONTH-OLD-INFANT DUMMY

TEST NO.: 79K406

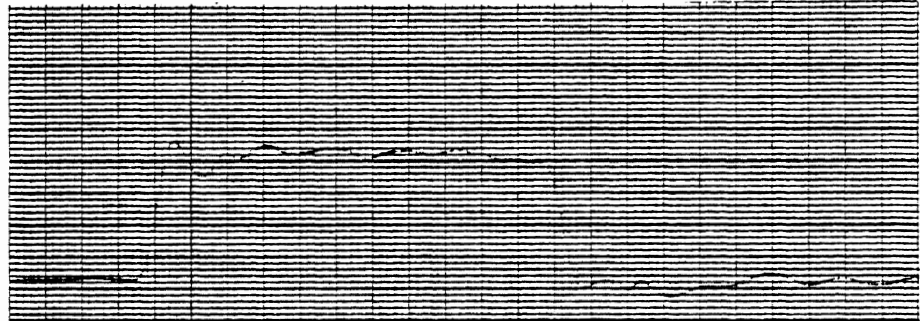
SLED VELOCITY: 29.9 MPH

DUMMY: NEW (ballasted)

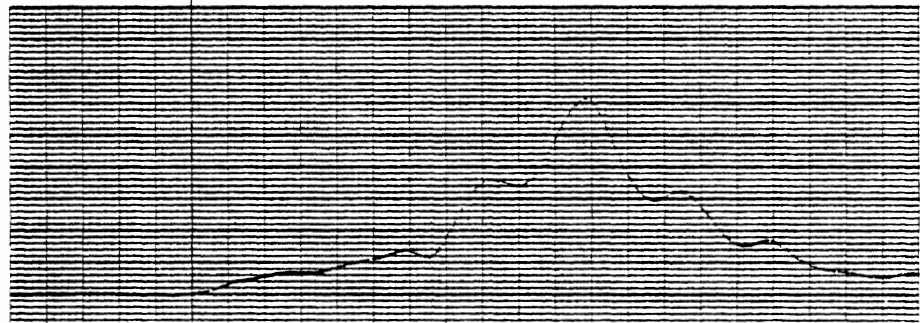
RESTRAINT: ROMER

TEST CONDITION: SIDE FACING

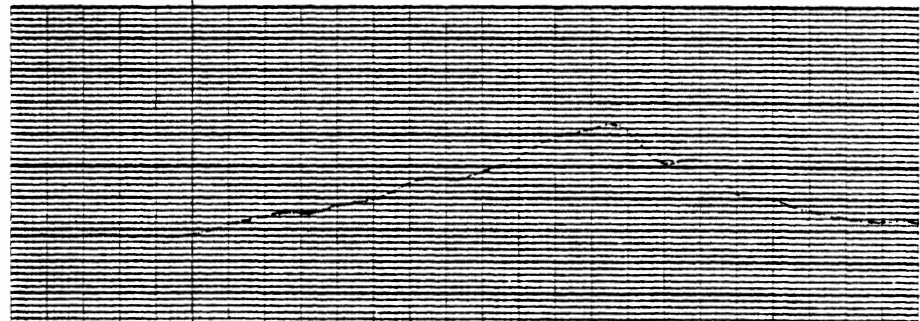
SLED PULSE
1.0 G/DIVISION
FILTERED CHANNEL
CLASS 60



RT. BELT LOAD
CENTER POSITION
20 LB./DIVISION
FILTERED CHANNEL
CLASS 60

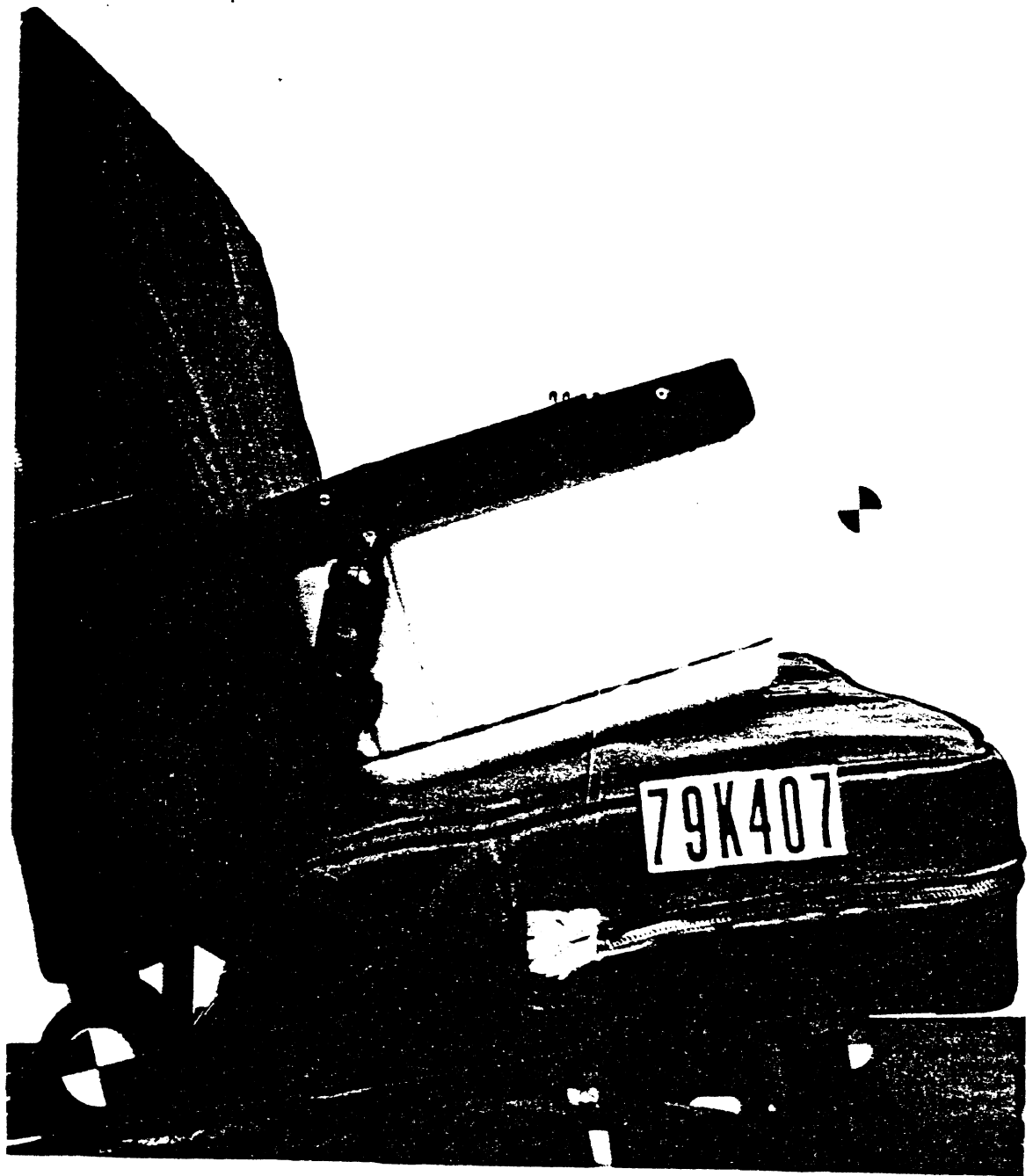


LT. BELT LOAD
CENTER POSITION
20 LB./DIVISION
FILTERED CHANNEL
CLASS 60

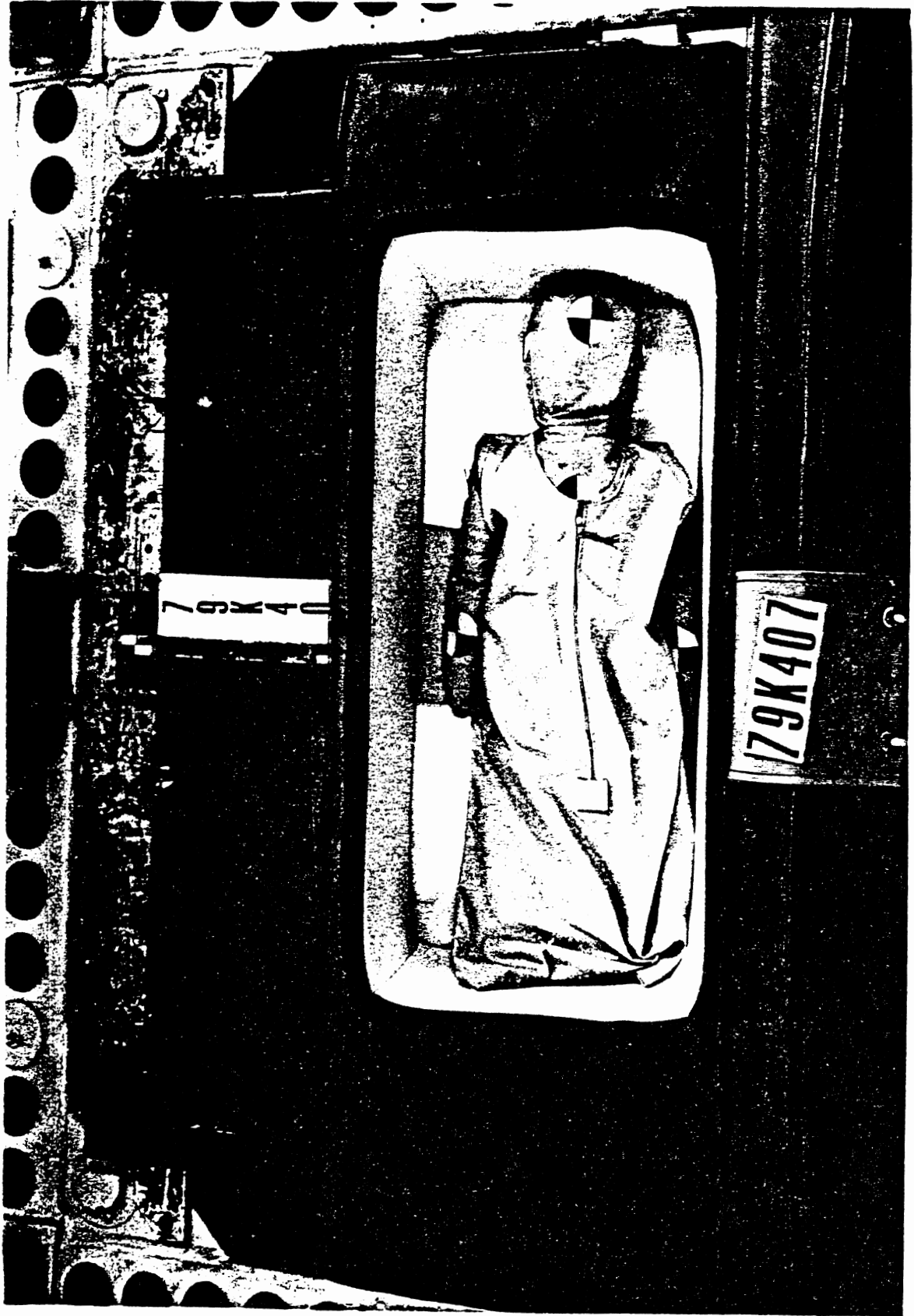


TEST NUMBER	<u>79K407</u>
RESTRAINT	<u>Romer</u>
DUMMY	<u>Old</u>
RESTRAINT TEST POSITION	<u>Center</u>
INITIAL TIPPING	<u>Side Facing</u>
MAXIMUM ANGLE	<u>Not Available</u>

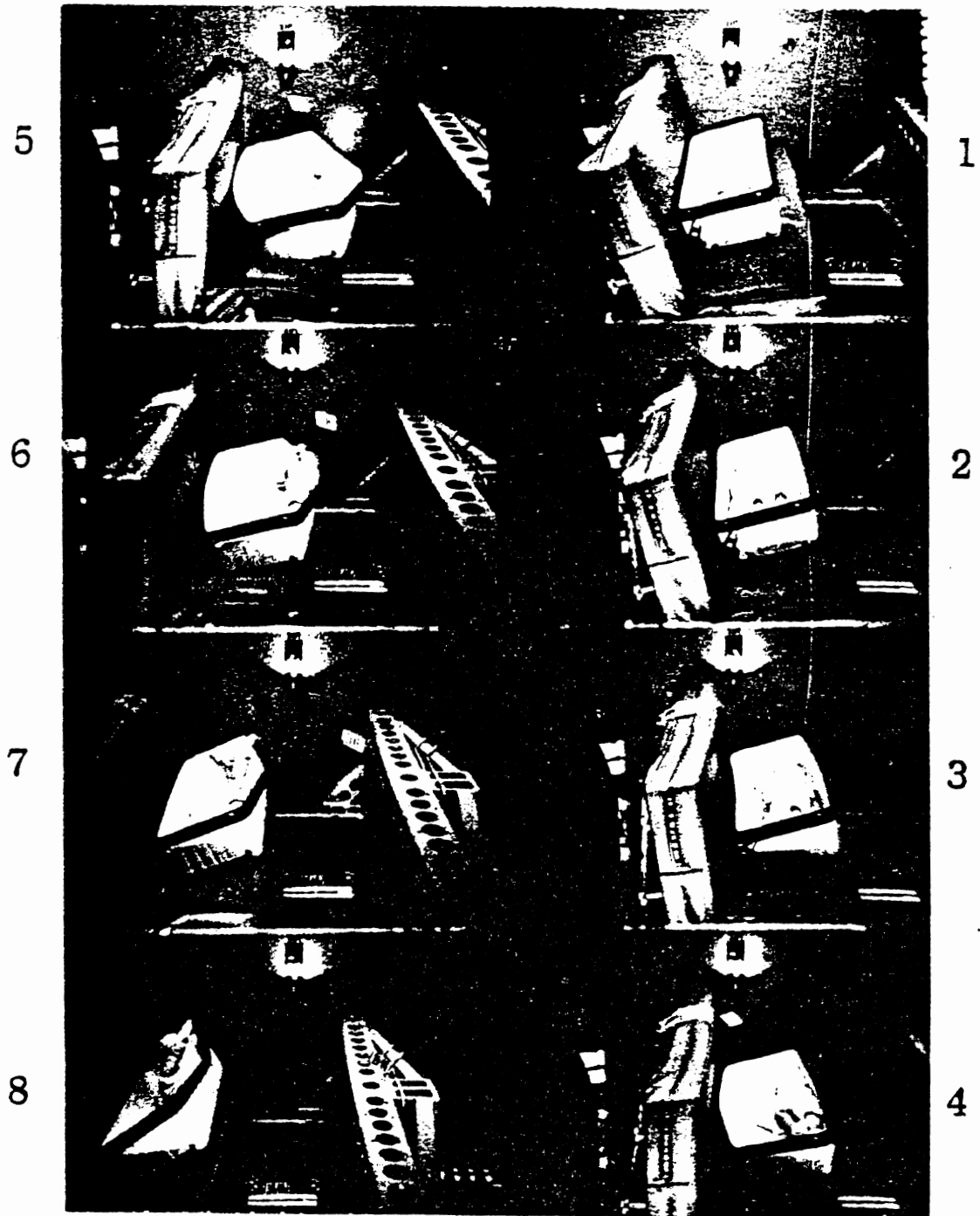
COMMENTS: Zipper in restraint tore completely loose and attaching belt broke.



Pre-Test: Romer Car Bed



Pre-Test: Romer Car Bed



79K407

Romer Car Bed

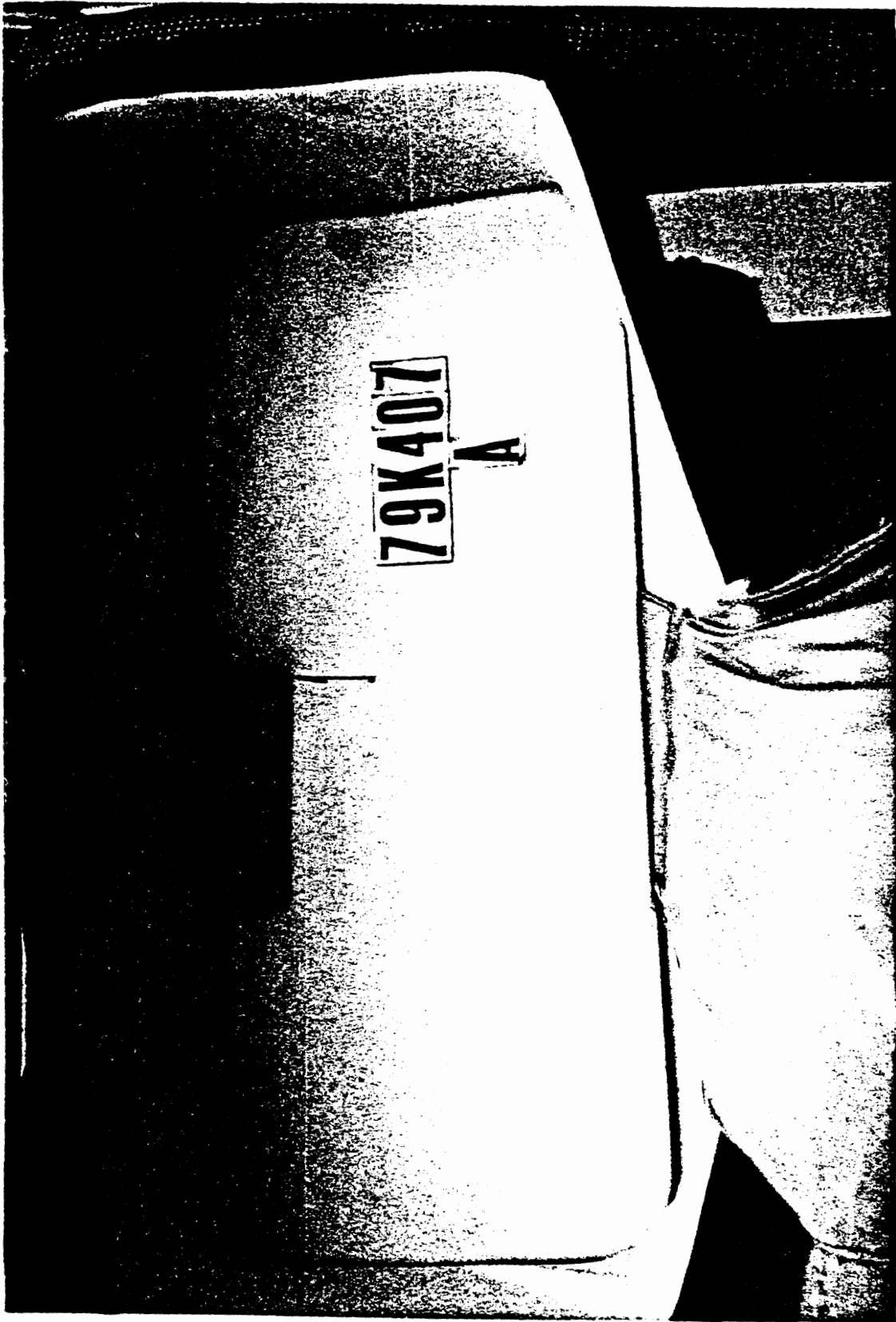


Post-Test: Romer Car Bed



79K407A

Romer Car Bed Belt Failure



Romer Car Bed Held Sideways. Showing the effect of zipper tear.

SLED TEST RESULTS

6-MONTH-OLD-INFANT DUMMY

TEST NO.: 79K 407

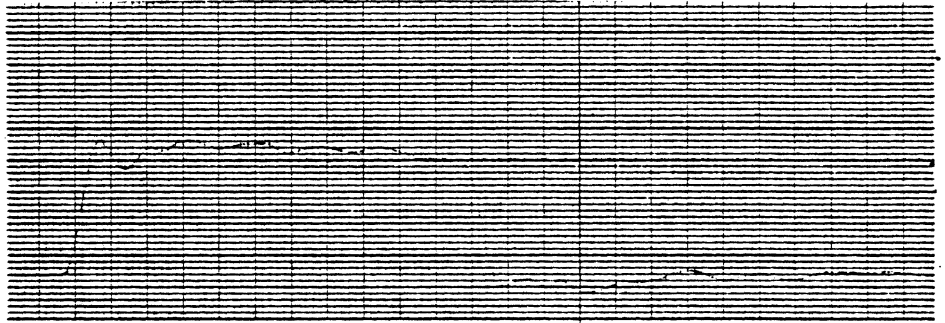
SLED VELOCITY: 30.0 MPH

DUMMY: OLD

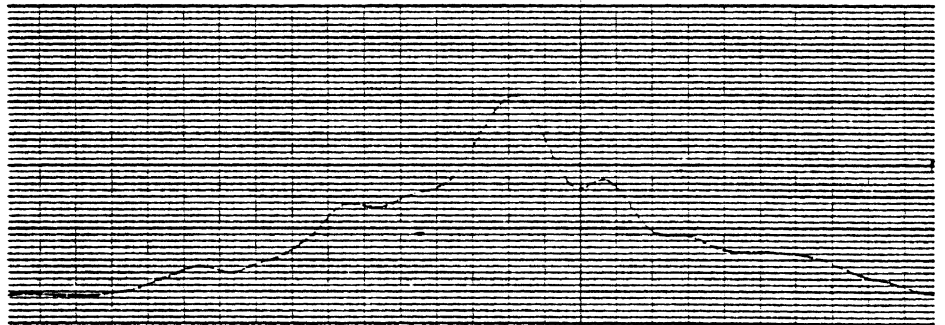
RESTRAINT: ROMER

TEST CONDITION: SIDE FACING

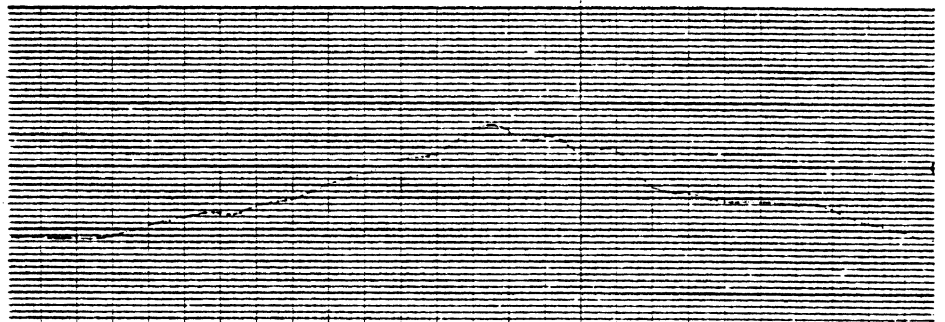
SLED PULSE
1.0 G/DIVISION
FILTERED CHANNEL
CLASS 60



RT. BELT LOAD
CENTER POSITION
20 LB./DIVISION
FILTERED CHANNEL
CLASS 60

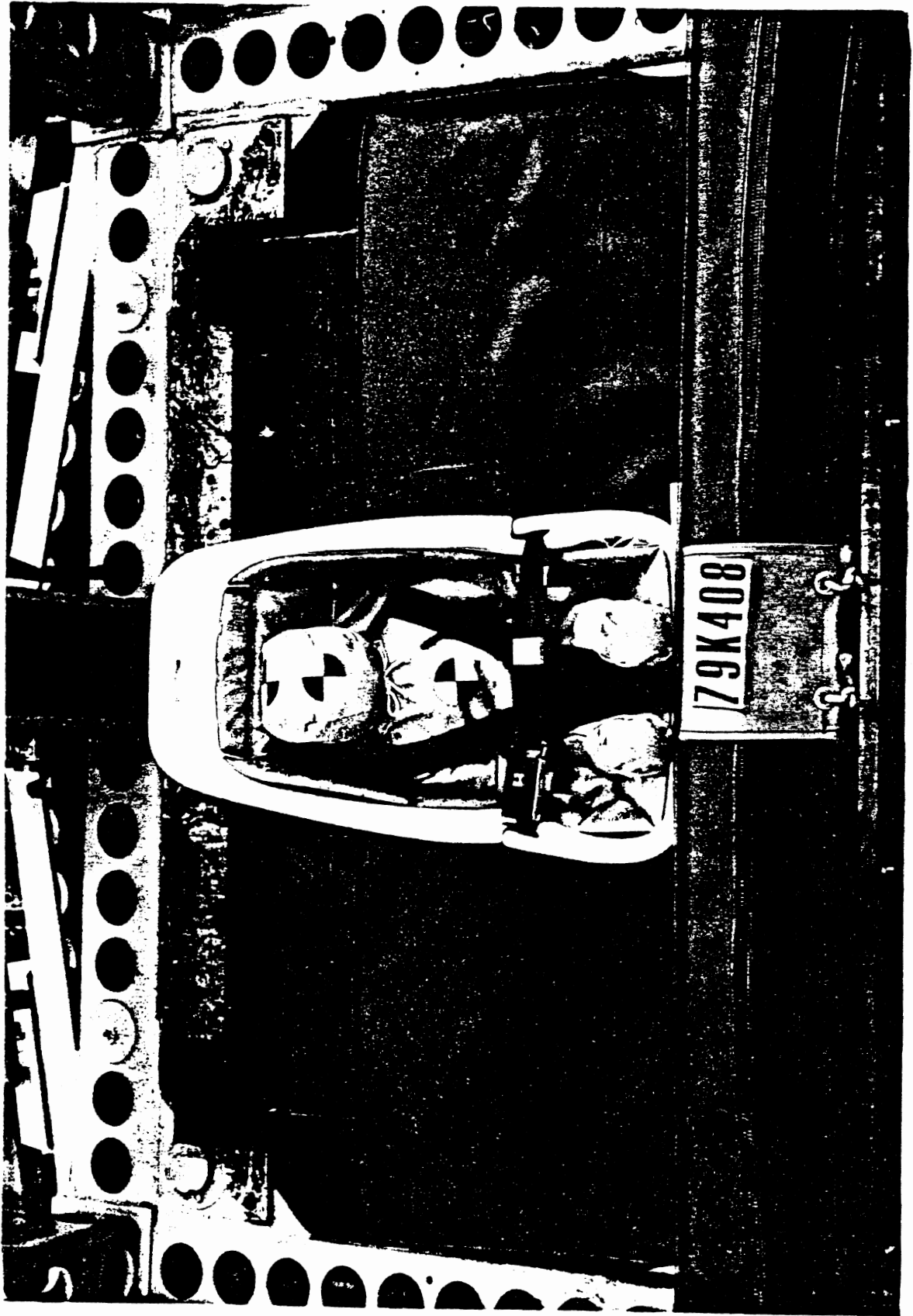


LT. BELT LOAD
CENTER POSITION
20 LB./DIVISION
FILTERED CHANNEL
CLASS 60



TEST NUMBER	<u>79K408</u>
RESTRAINT	<u>GM Infant</u>
DUMMY	<u>New (Ballasted)</u>
RESTRAINT TEST POSITION	<u>Center</u>
INITIAL TIPPING	<u>6.5°</u>
MAXIMUM ANGLE	<u>67.5°</u>

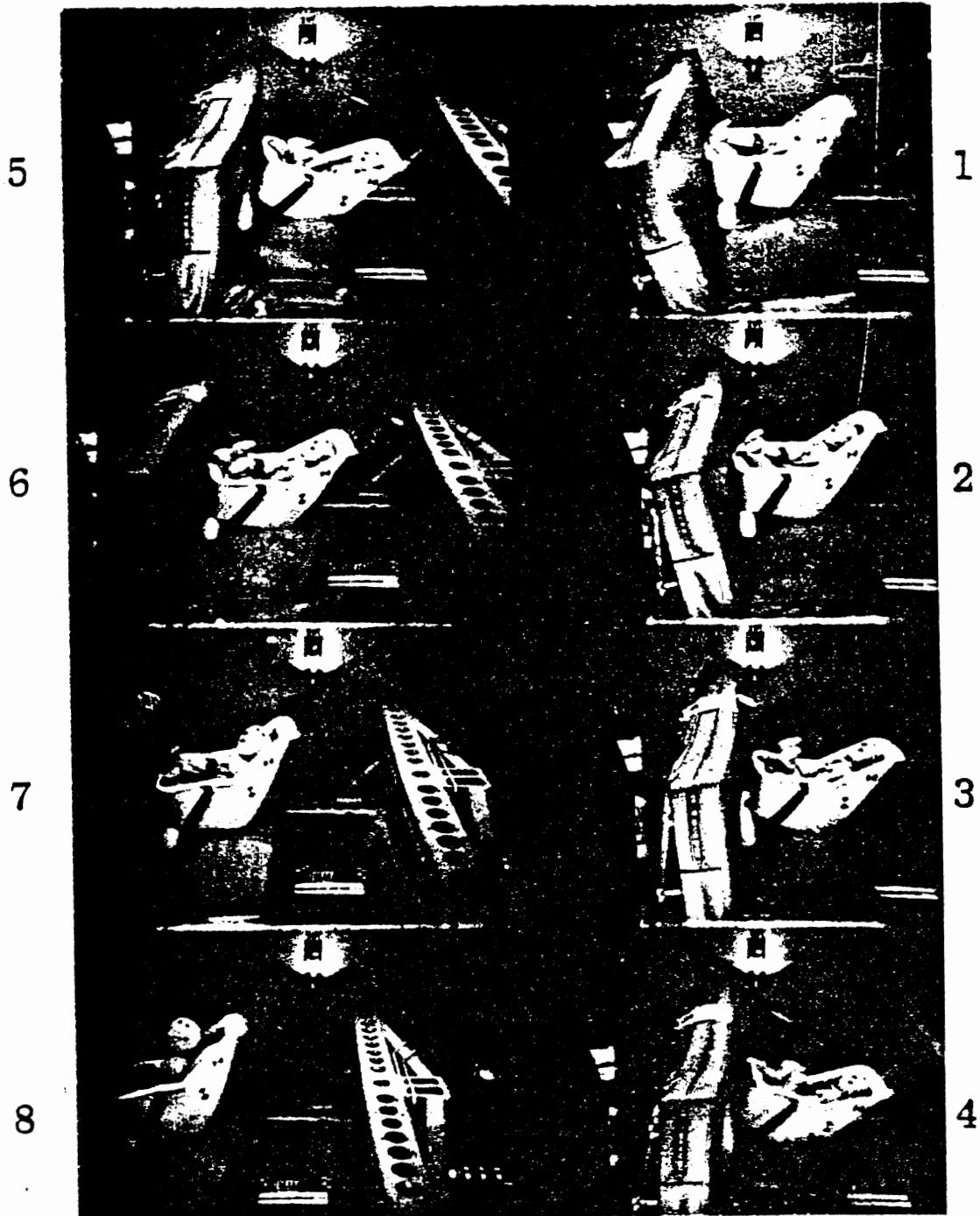
COMMENTS: -



Pre-Test: GM Infant Love Seat



Pre-Test: GM Infant Love Seat



79K408

GM Infant Love Seat



Post-Test: GM Infant Love Seat

SLED TEST RESULTS

6-MONTH-OLD-INFANT DUMMY

TEST NO.: 79K 408

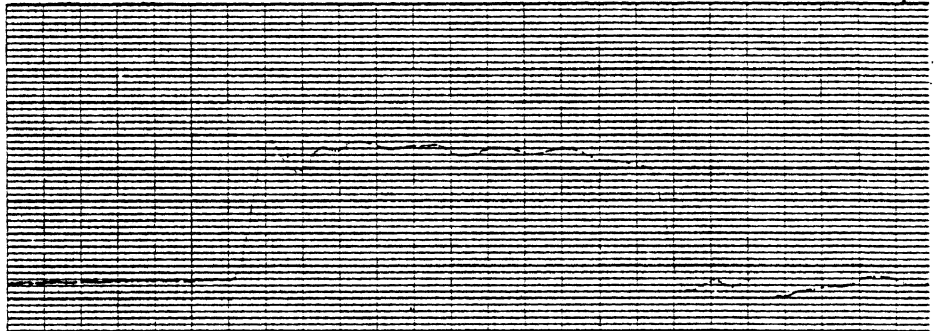
SLED VELOCITY: 30.3 MPH

DUMMY: NEW (ballasted)

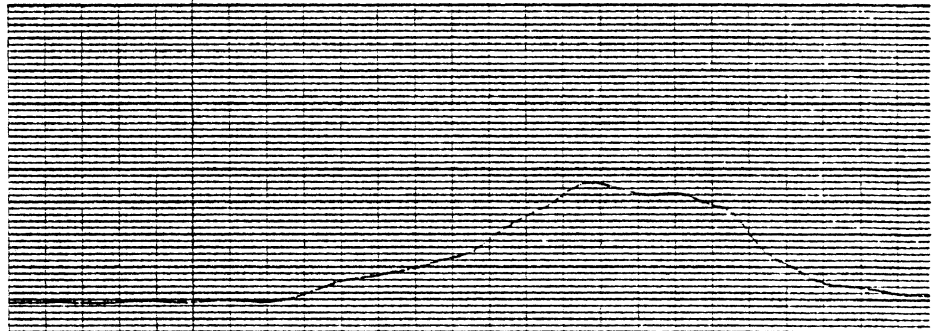
RESTRAINT: GM INFANT (new)

TEST CONDITION: REAR FACING (6.5° INCR. INITIAL ANGLE)

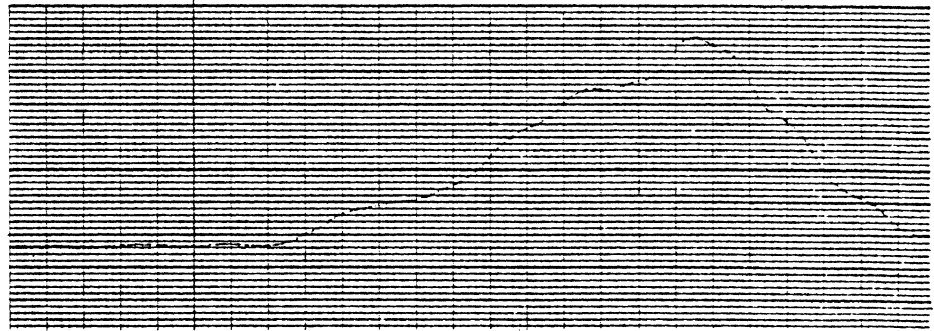
SLED PULSE
1.0 G/DIVISION
FILTERED CHANNEL
CLASS 60



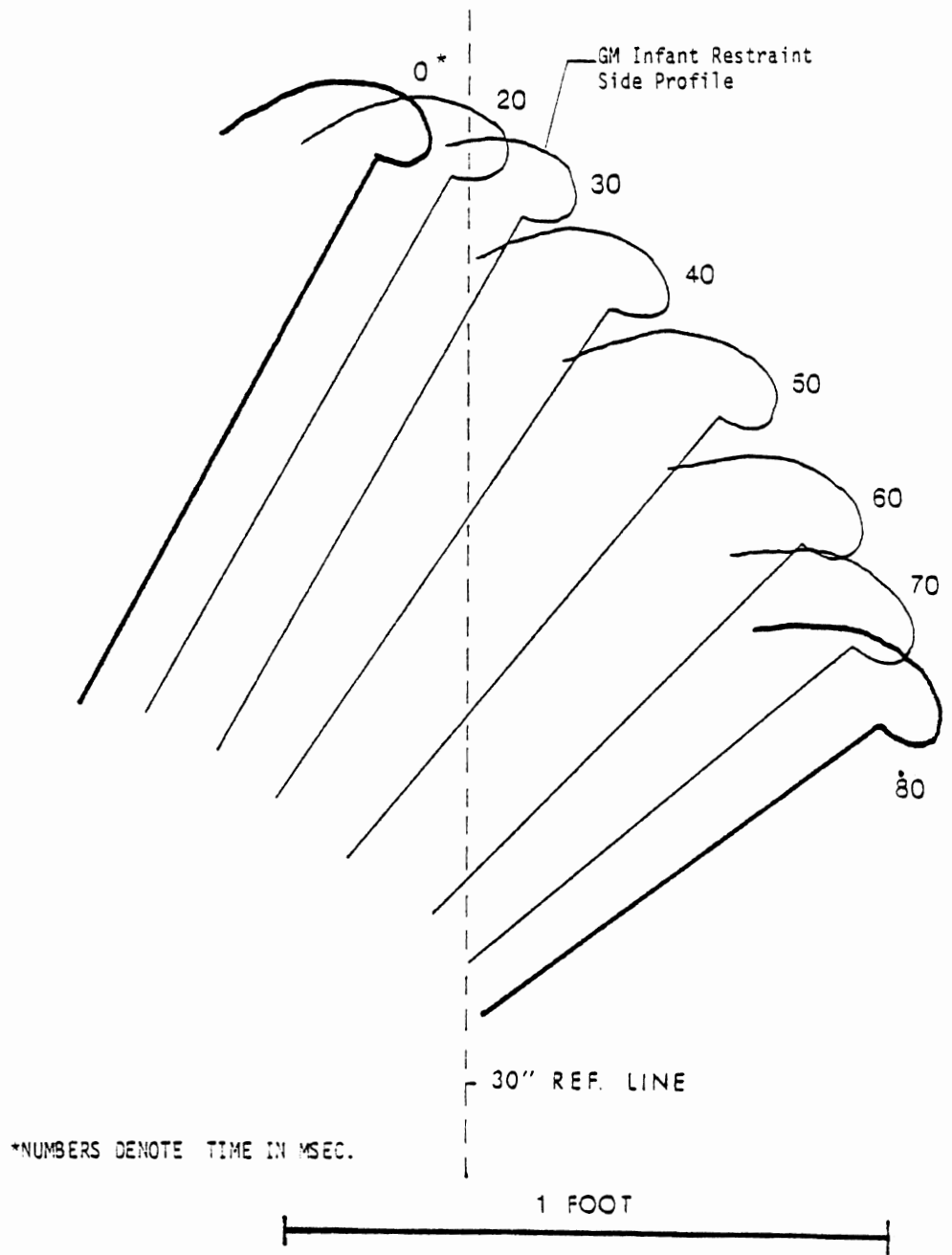
RT. BELT LOAD
CENTER POSITION
20 LB./DIVISION
FILTERED CHANNEL
CLASS 60



LT. BELT LOAD
CENTER POSITION
20 LB./DIVISION
FILTERED CHANNEL
CLASS 60

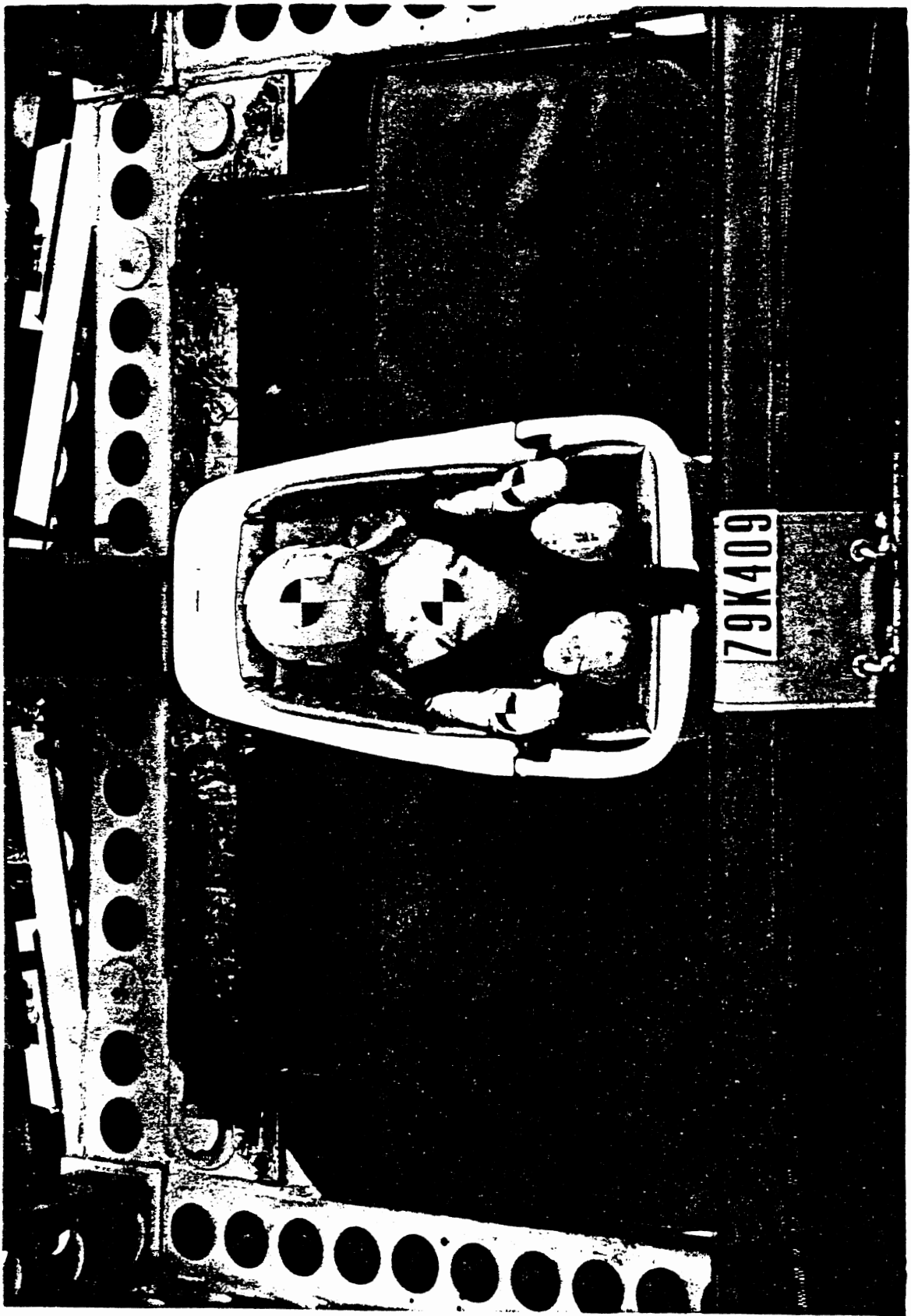


TEST 79K408



TEST NUMBER	<u>79K409</u>
RESTRAINT	<u>GM Infant</u>
DUMMY	<u>Old</u>
RESTRAINT TEST POSITION	<u>Center</u>
INITIAL TIPPING	<u>19.5°</u>
MAXIMUM ANGLE	<u>79.5°</u>

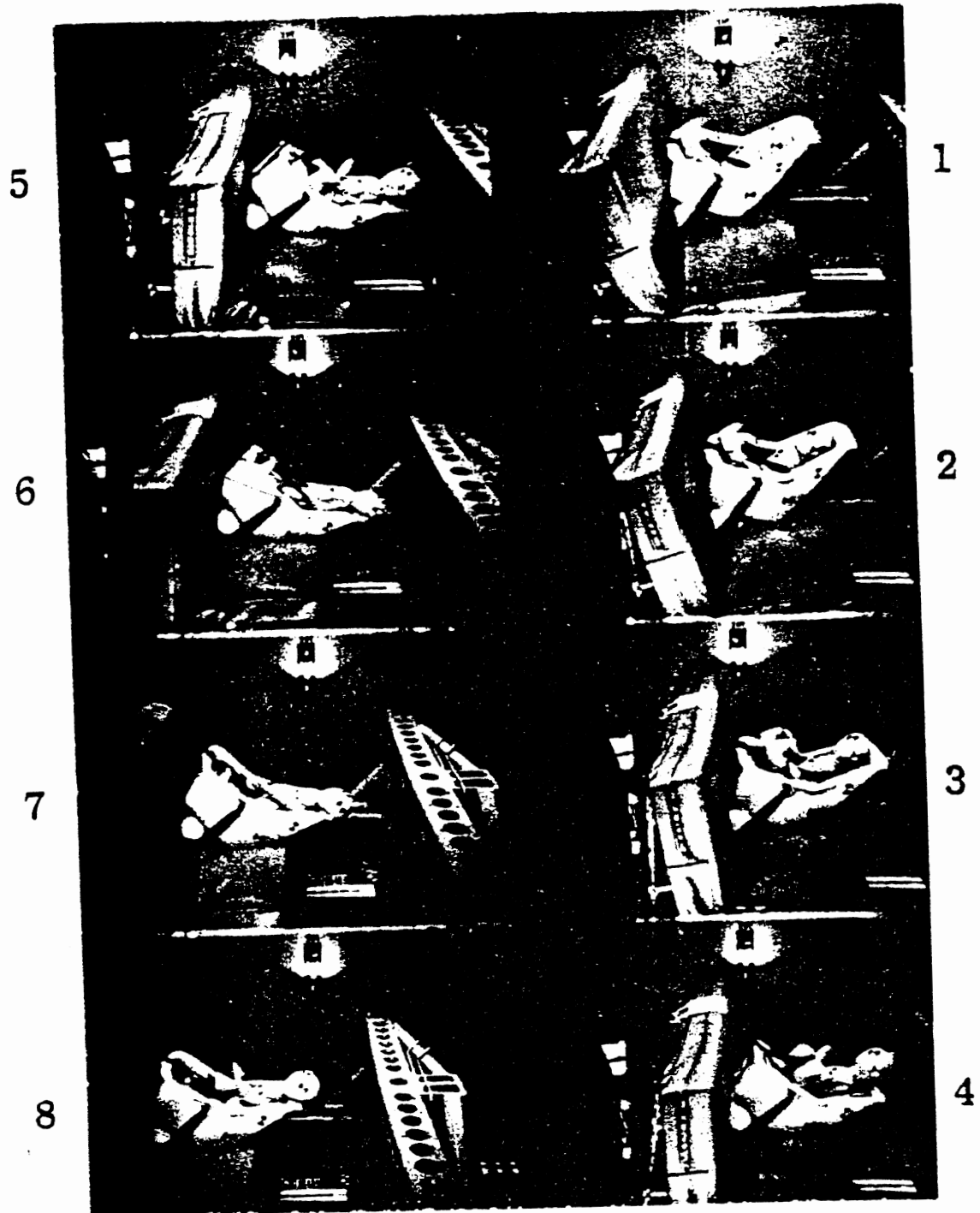
COMMENTS: Dummy would have been ejected during impact except for snagging of tape on its leg with the restraint harness.



Pre-Test: GM Infant Love Seat



Pre-Test: GM Infant Love Seat



79K409

GM Infant Love Seat



GM Infant Love Seat: Post-Test Photograph Showing Tape on Leg Catching on Seat Belt



Post Test: GM Infant Love Seat

SLED TEST RESULTS

6-MONTH-OLD-INFANT DUMMY

TEST NO.: 79K 409

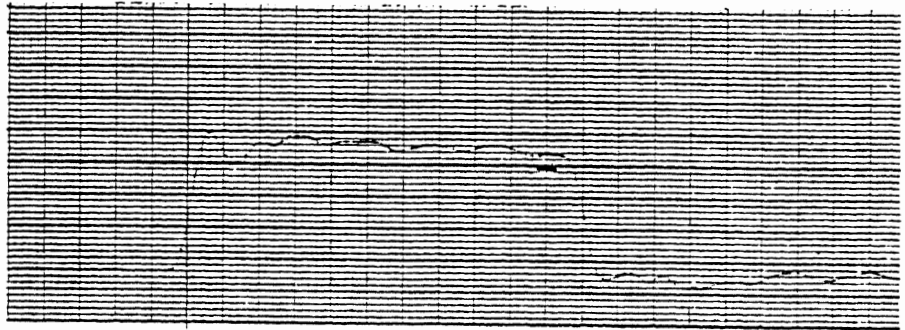
SLED VELOCITY: 29.7 MPH

DUMMY: OLD

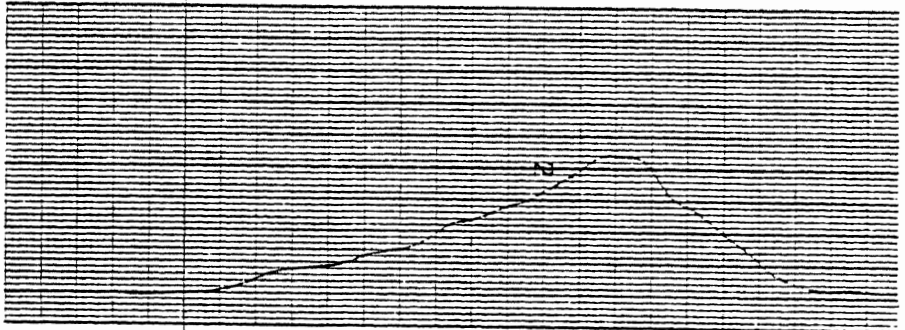
RESTRAINT: GM INFANT (new)

TEST CONDITION: REAR FACING (19.5° INCR. INITIAL ANGLE)

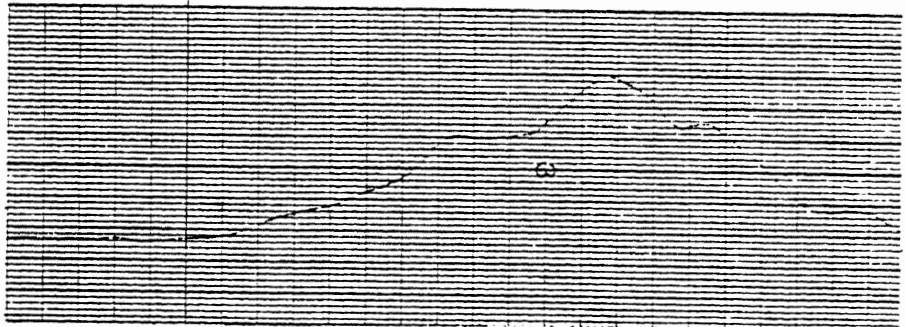
SLED PULSE
1.0 G/DIVISION
FILTERED CHANNEL
CLASS 60



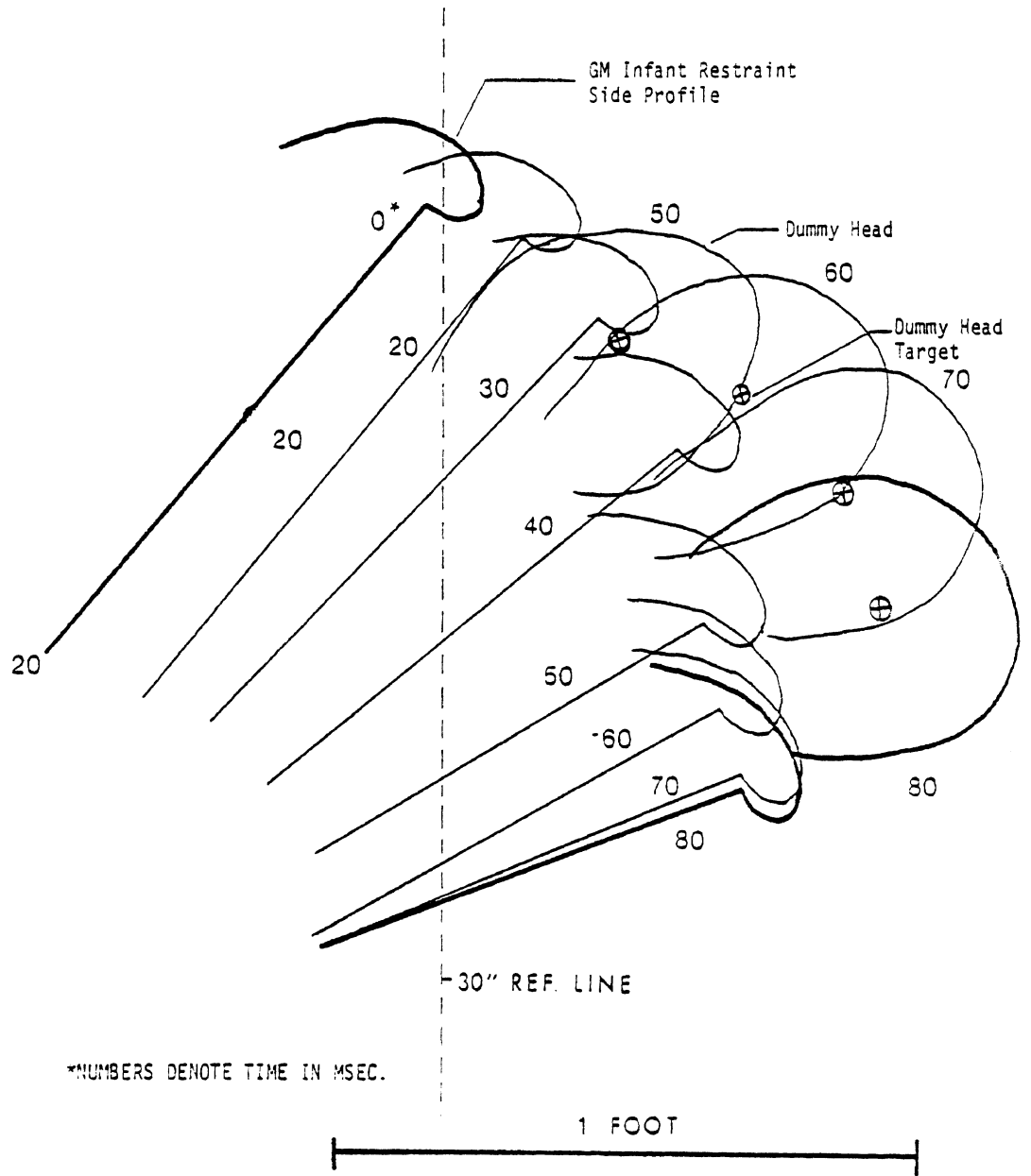
RT. BELT LOAD
CENTER POSITION
20 LB./DIVISION
FILTERED CHANNEL
CLASS 60



LT. BELT LOAD
CENTER POSITION
20 LB./DIVISION
FILTERED CHANNEL
CLASS 60

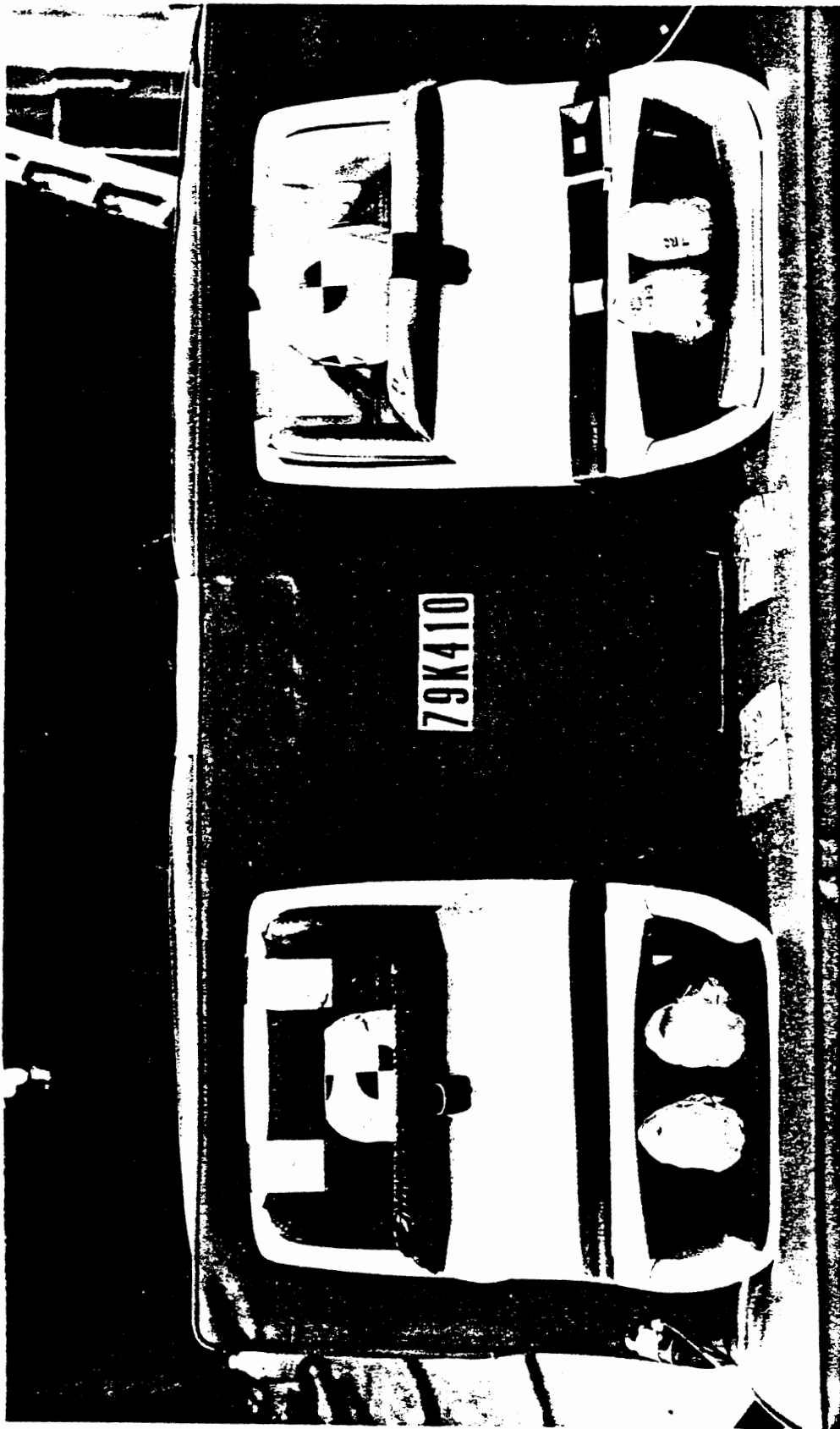


TEST 79K409

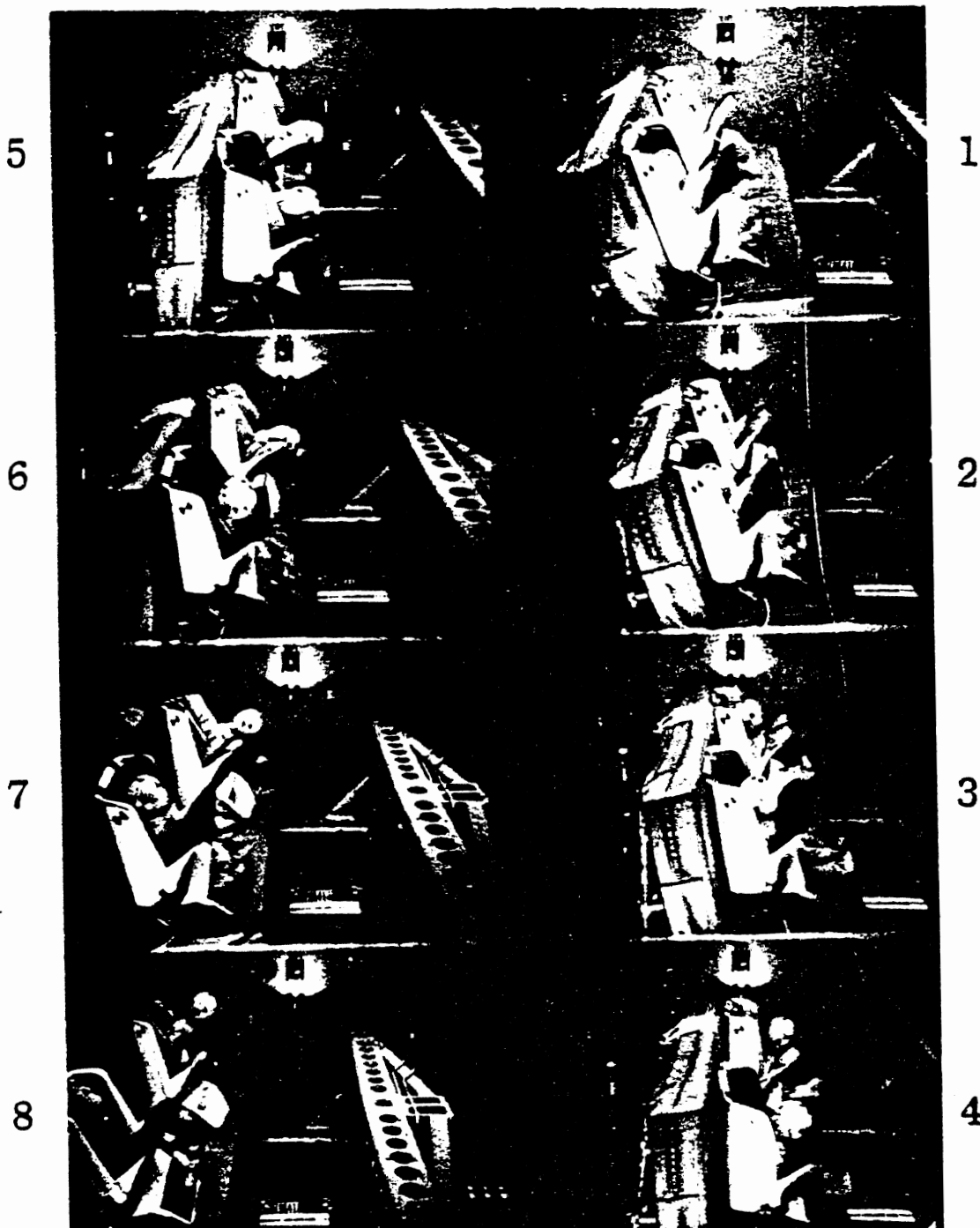


TEST NUMBER 79K410
RESTRAINT Peterson
DUMMY D - Old, P - New
RESTRAINT TEST
POSITION Driver, Passenger
INITIAL TIPPING Front Facing, Front Facing
MAXIMUM ANGLE Not Available

COMMENTS: The old dummy (driver's side) was ejected as the sled rebounded.

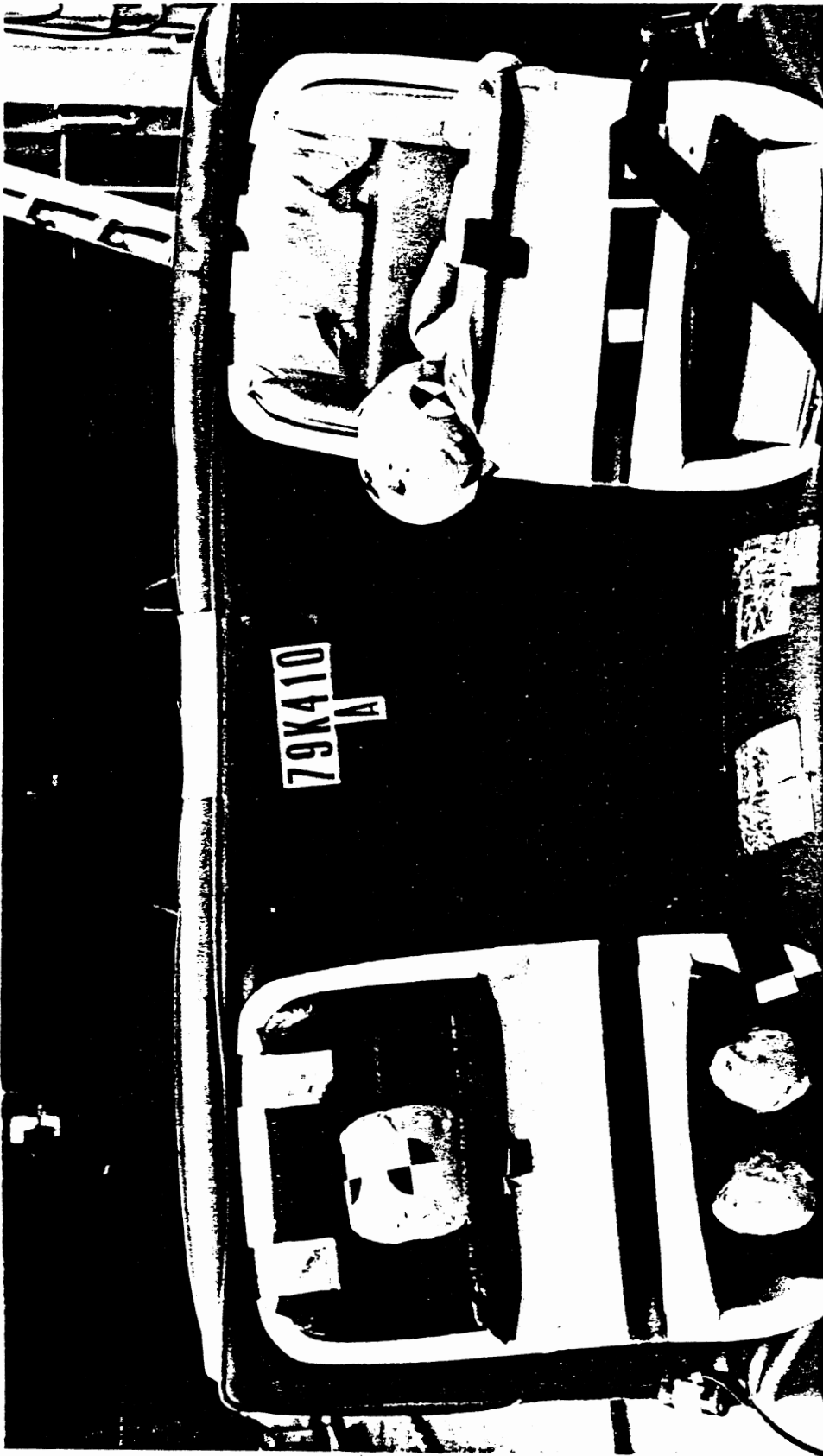


Pre-Test: Peterson 75 Restraints



79K410

Peterson 75 Restraints



Post-Test: Peterson 75 Restraints



Post Test: Peterson Restraints

SLED TEST RESULTS

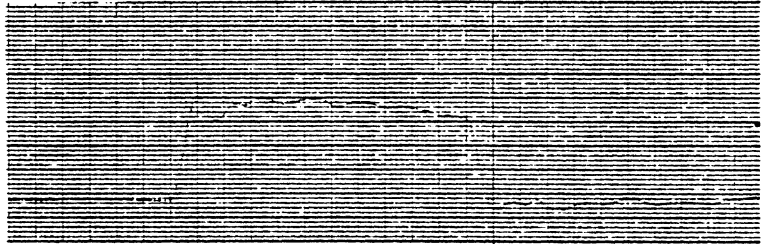
6-MONTH-OLD-INFANT DUMMY

TEST NO.: 79K 410

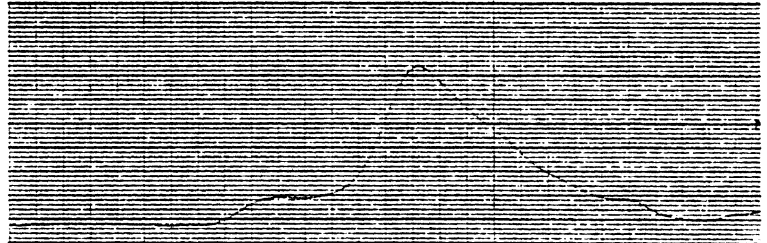
SLED VELOCITY: 29.5 MPH

	<u>PASSENGER SIDE</u>	<u>DRIVER SIDE</u>
DUMMY:	<u>NEW (ballasted)</u>	<u>OLD</u>
RESTRAINT:	<u>PETERSON (used)</u>	<u>PETERSON (new)</u>
TEST CONDITION:	<u>FRONT FACING</u>	<u>FRONT FACING</u>

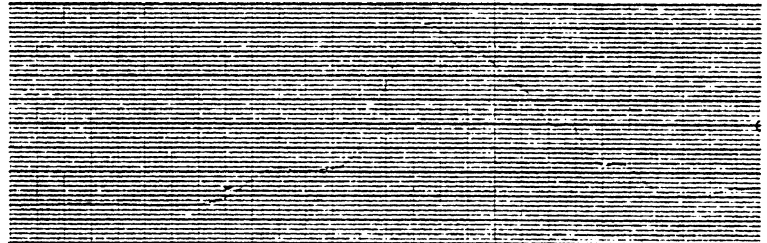
SLED PULSE
1.0 G/DIVISION
FILTERED CHANNEL
CLASS 60



RT. BELT LOAD
PASSENGER SIDE
20 LB./DIVISION
FILTERED CHANNEL
CLASS 60

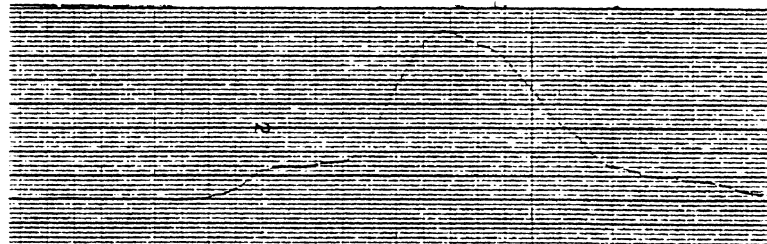


LT. BELT LOAD
PASSENGER SIDE
20 LB./DIVISION
FILTERED CHANNEL
CLASS 60

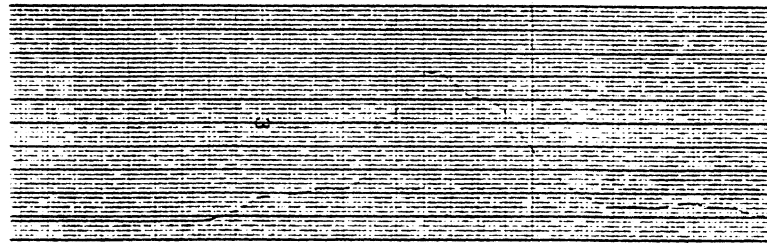


BRUSH AC

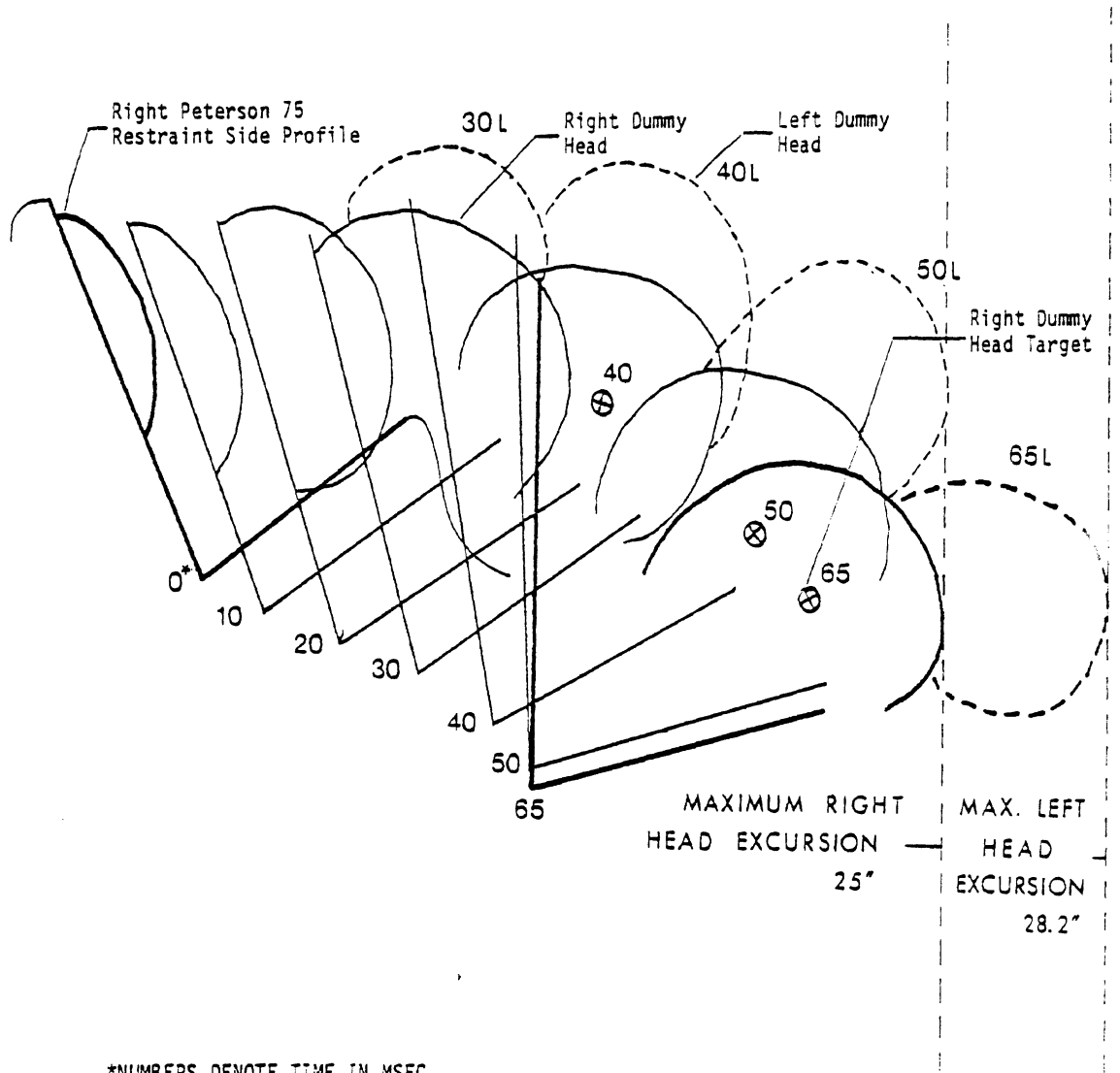
RT. BELT LOAD
DRIVER SIDE
20 LB./DIVISION
FILTERED CHANNEL
CLASS 60



LT. BELT LOAD
DRIVER SIDE
20 LB./DIVISION
FILTERED CHANNEL
CLASS 60



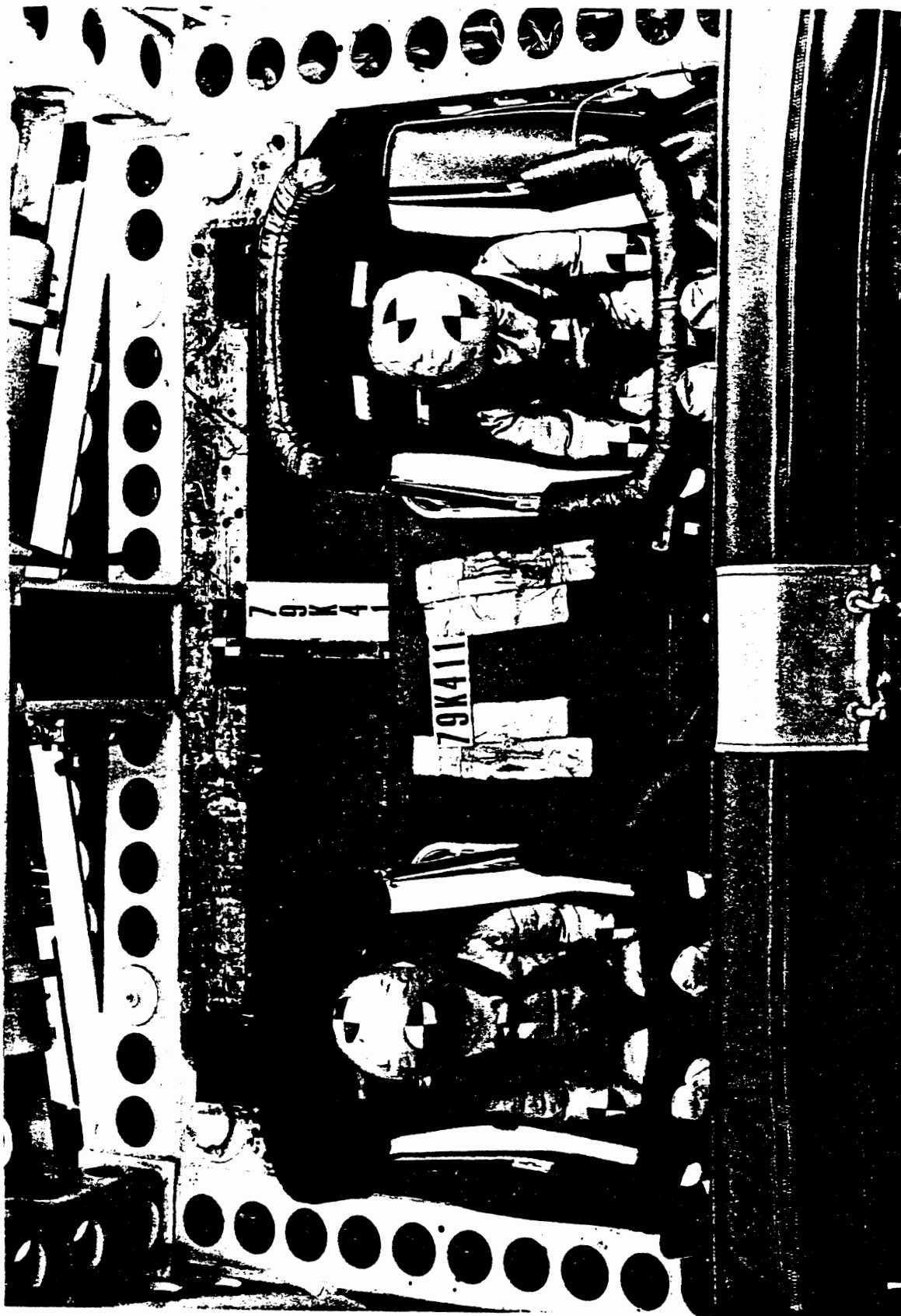
TEST 79K410



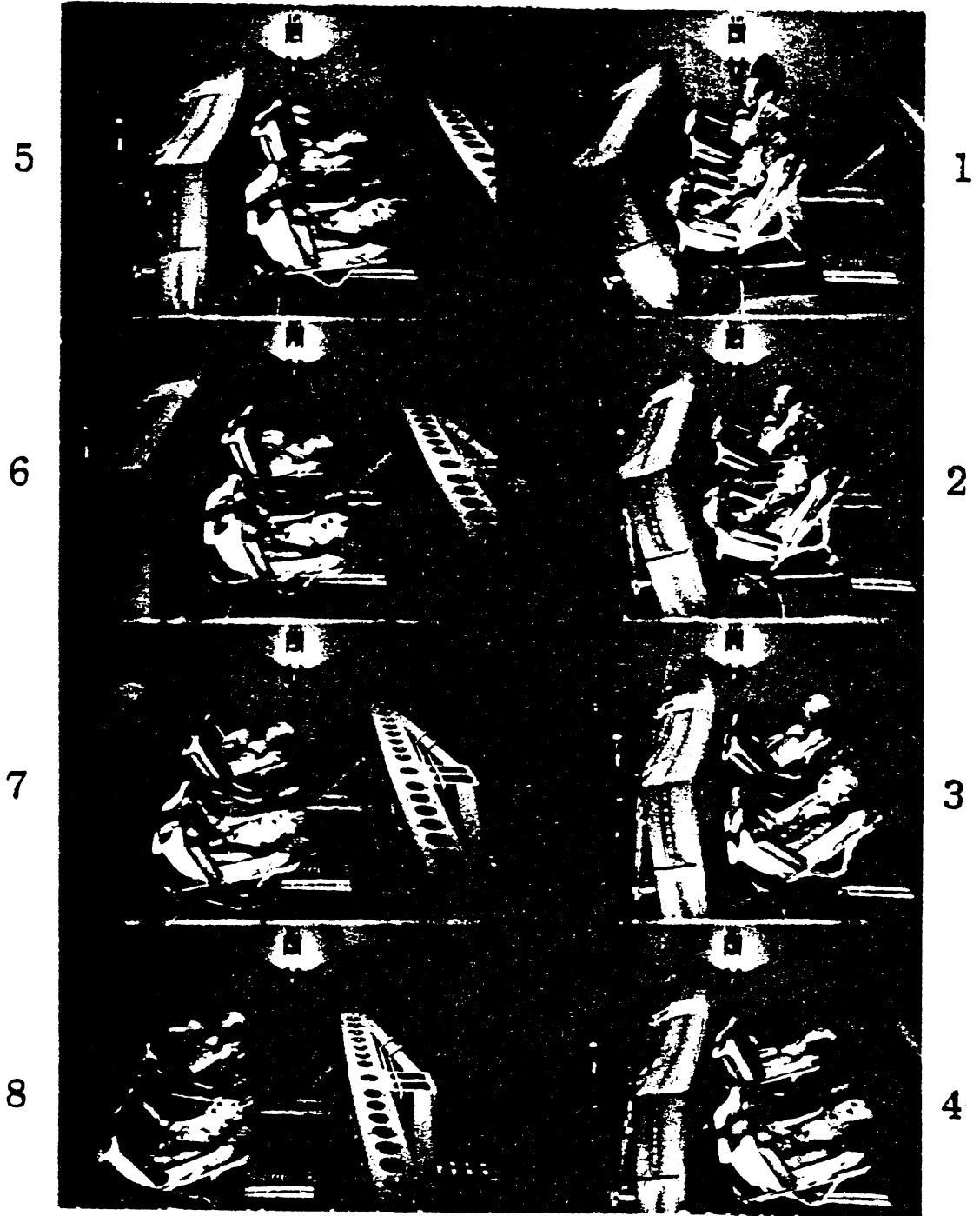
1 FOOT

TEST NUMBER	<u>79K411</u>
RESTRAINT	<u>Strolee 5975</u>
DUMMY	<u>D - Old, P - New</u>
RESTRAINT TEST POSITION	<u>Driver, Passenger</u>
INITIAL TIPPING	<u>None, None</u>
MAXIMUM ANGLE	<u>N.A., 87°</u>

COMMENTS: Both of the seatback elevation supports jumped out of adjustment.



Pre-Test: Strolee 5975 Restraints



79K411

Strolee 5975 Restraints



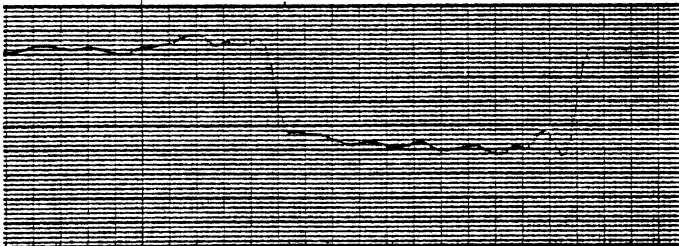
Post-Test: Strolee 5975 Restraints

SLED TEST RESULTS

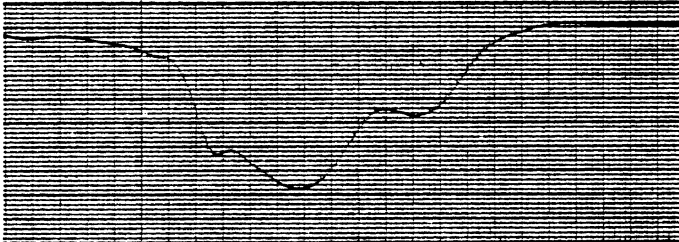
6-MONTH-OLD-INFANT DUMMY

TEST NO.: 79K411
SLED VELOCITY: 29.7 MPH

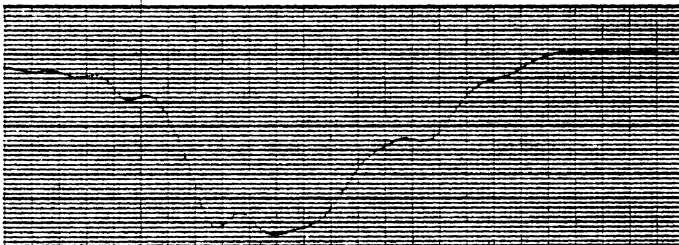
DRIVER SIDE	PASSENGER SIDE	DUMMY:	TEST CONDITION:
OLD	NEW (ballasted)	RESTRAINT:	
STROLEE (new)	STROLEE (used)		
REAR FACING	REAR FACING		



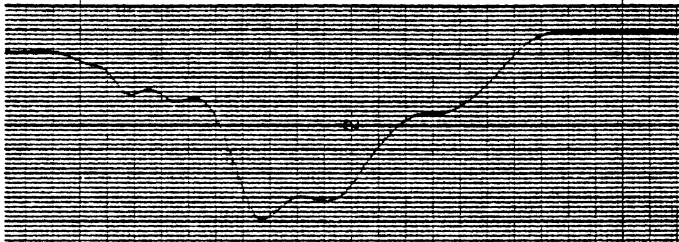
SLED PULSE
1.0 g/DIVISION
20 LB./DIVISION
FILTERED CHANNEL
CLASS 60



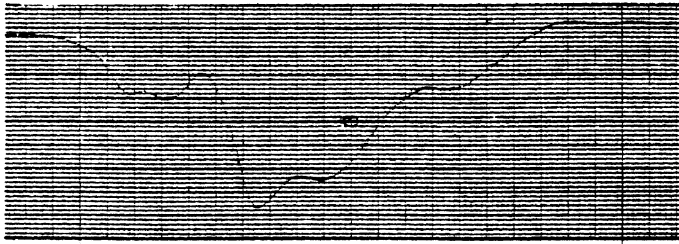
RT. BELT LOAD
PASSENGER SIDE
20 LB./DIVISION
FILTERED CHANNEL
CLASS 60



LT. BELT LOAD
PASSENGER SIDE
20 LB./DIVISION
FILTERED CHANNEL
CLASS 60

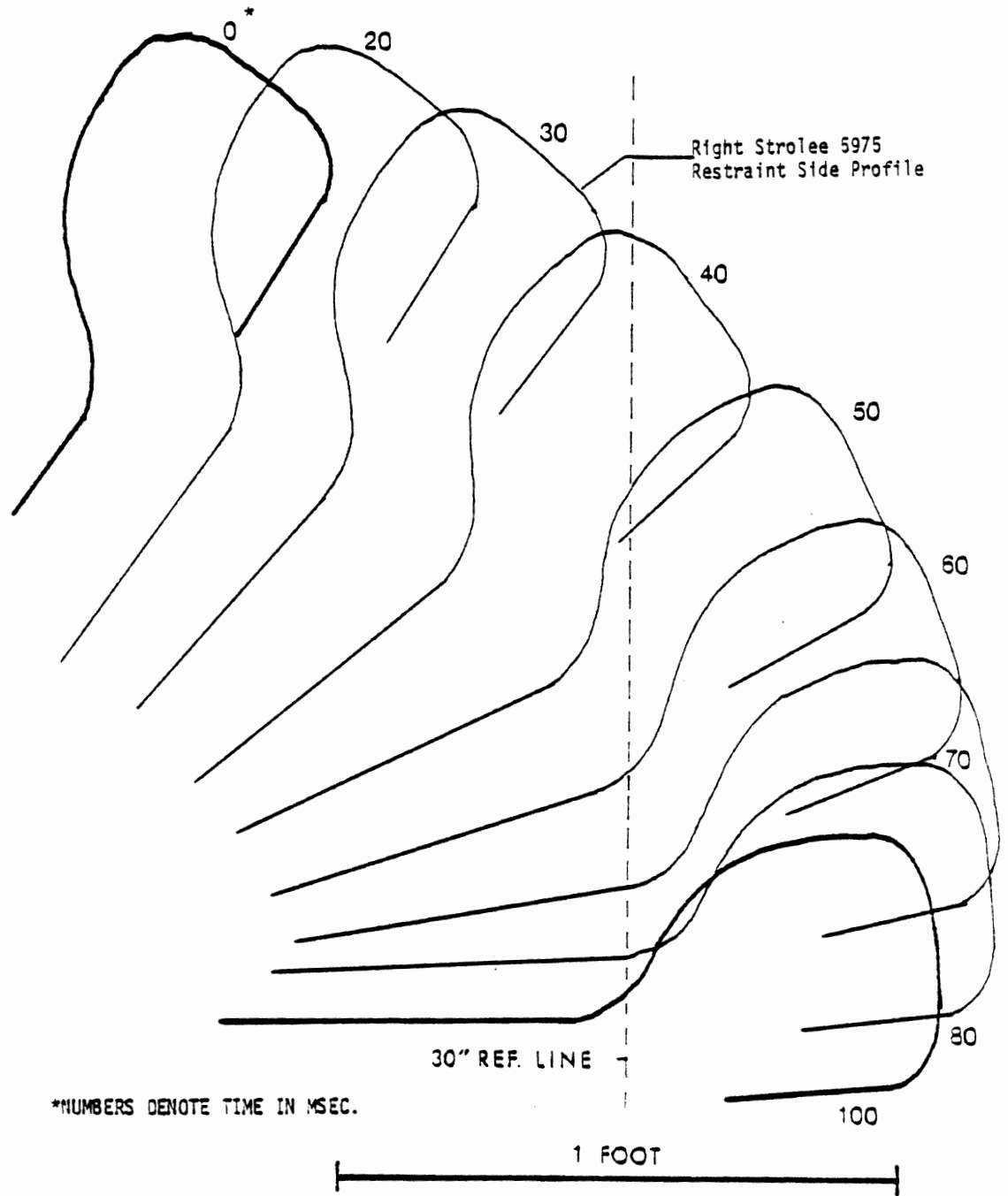


RT. BELT LOAD
DRIVER SIDE
20 LB./DIVISION
FILTERED CHANNEL
CLASS 60



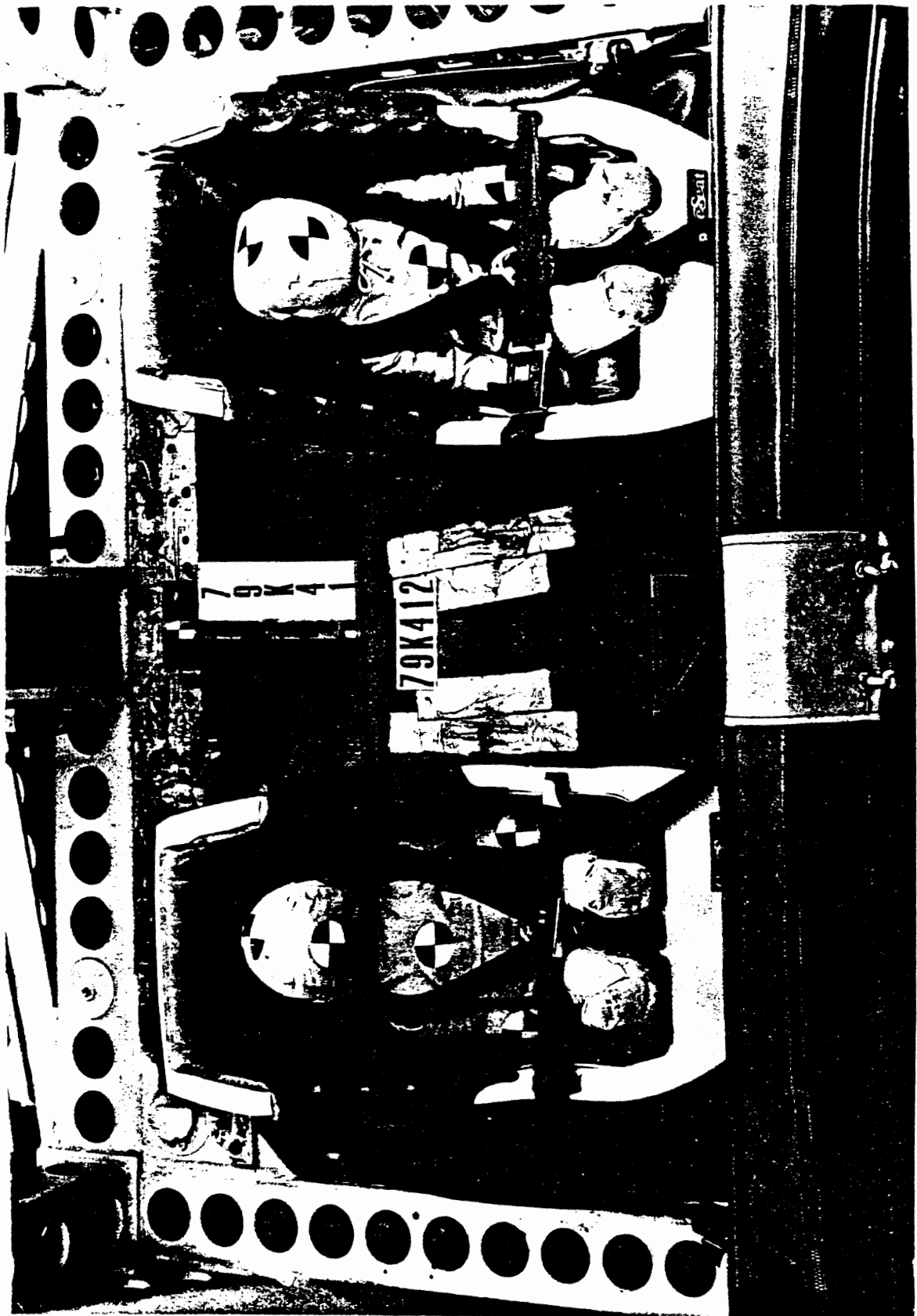
LT. BELT LOAD
DRIVER SIDE
20 LB./DIVISION
FILTERED CHANNEL
CLASS 60

TEST 79K411

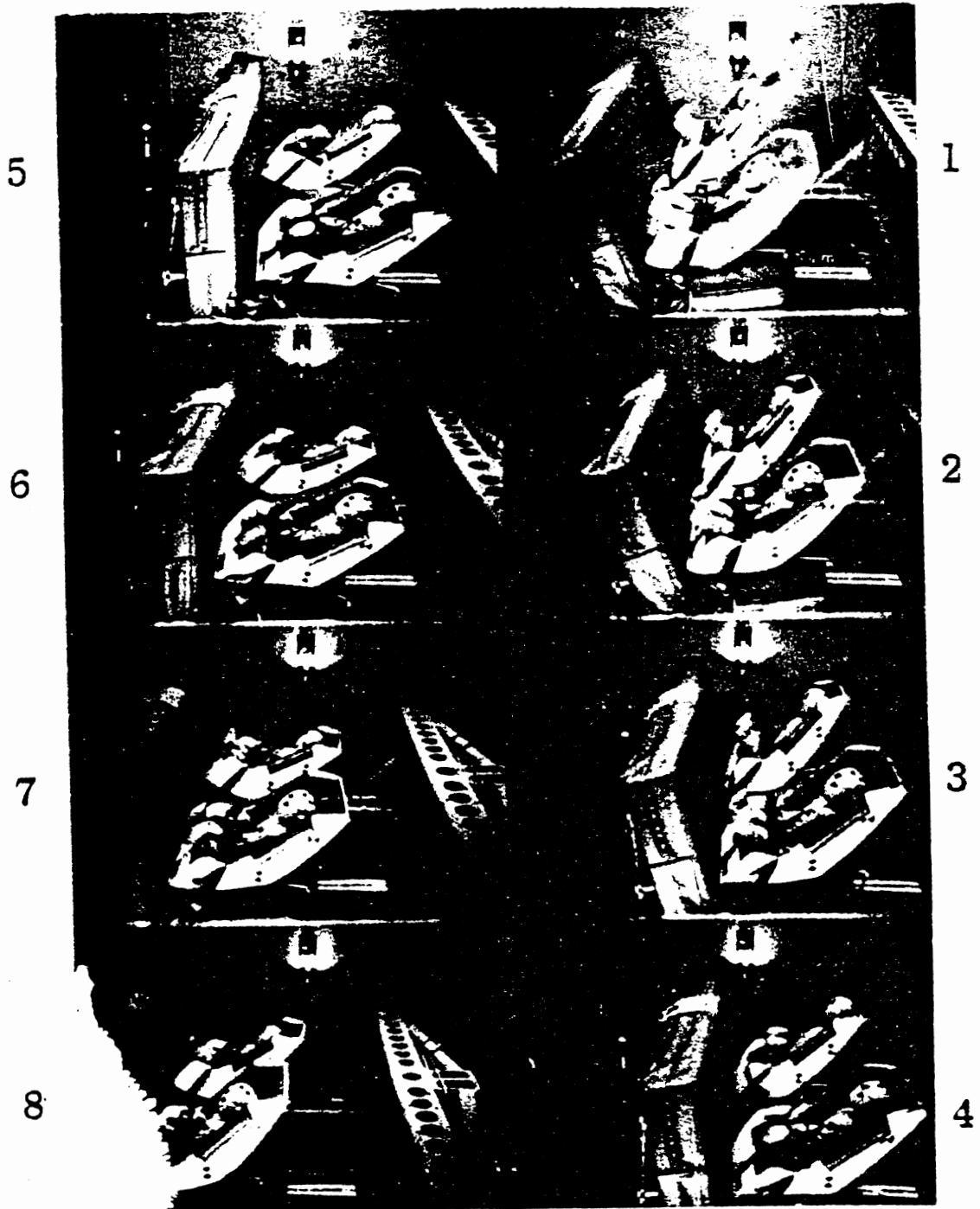


TEST NUMBER	<u>79K412</u>
RESTRAINT	<u>Kantwet</u>
DUMMY	<u>D - Old, - P - New</u>
RESTRAINT TEST POSITION	<u>Driver, - Passenger</u>
INITIAL TIPPING	<u>None, - None</u>
MAXIMUM ANGLE	<u>N.A., - 64°</u>

COMMENTS:

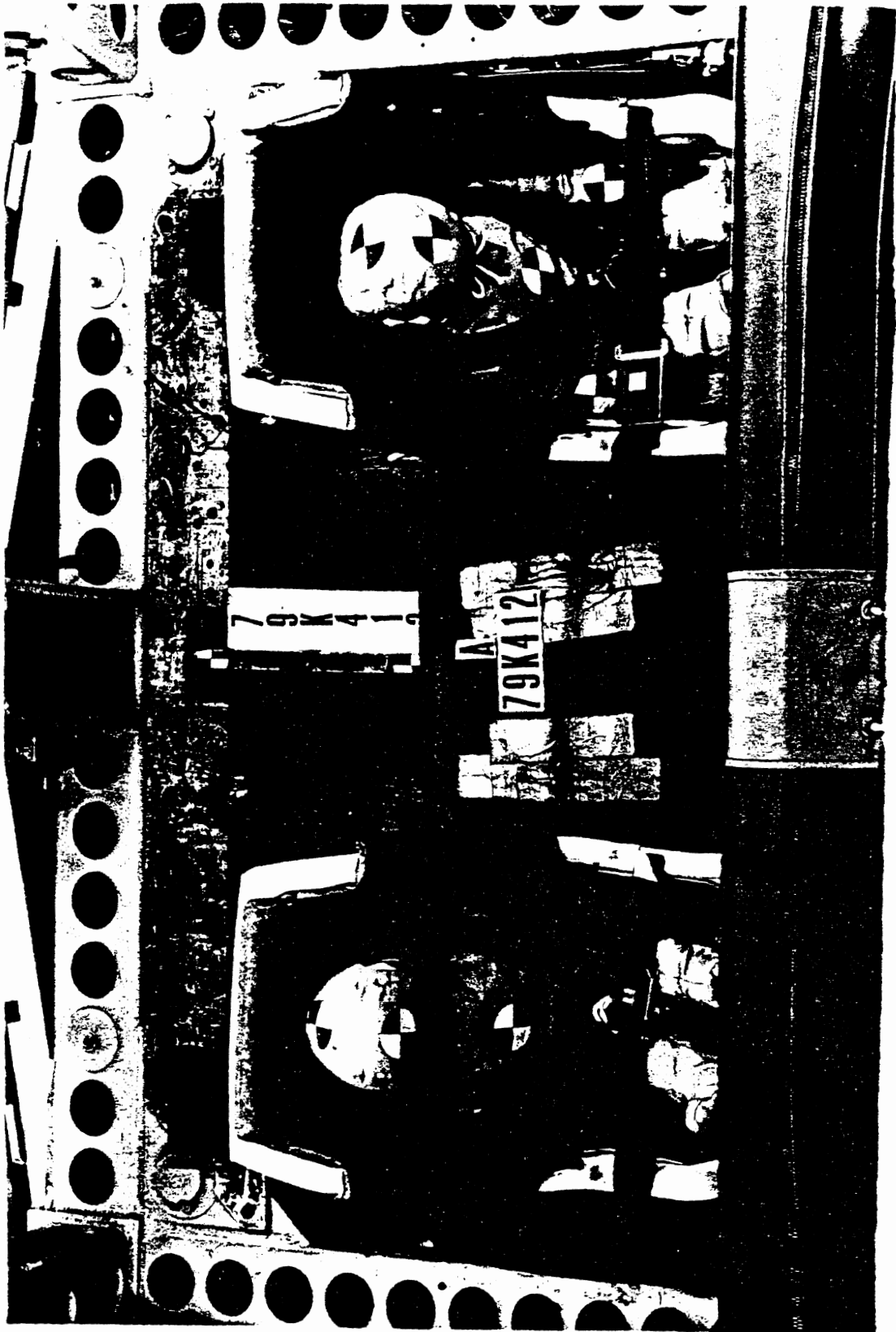


Pre-Test: Kantwet 988 Restraints



79K412

Kantwet 988 Restraints



Post-Test: Kantwet 988 Restraints

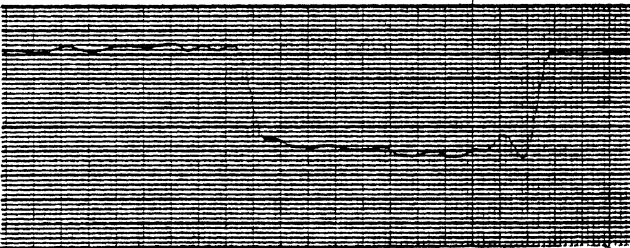
SLED TEST RESULTS

6-MONTH-OLD-INFANT DUMMY

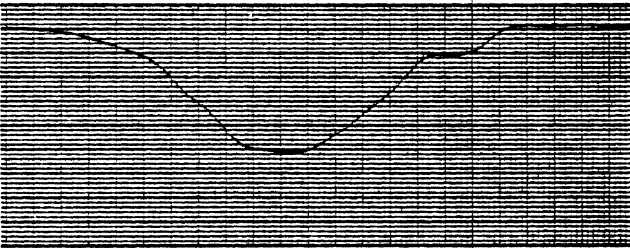
TEST NO.: 79K 412 SLED VELOCITY: 28.0 MPH

DUMMY:	NEW (ballasted)	PASSENGER SIDE
RESTRAINT:	KANTMET (used)	REAR FACING
TEST CONDITION:	KANTMET (new)	DRIVER SIDE
	OLD	REAR FACING

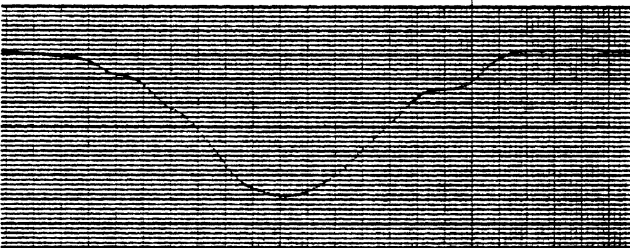
SLED PULSE
1.0 G/DIVISION
CLASS 60
FILTERED CHANNEL



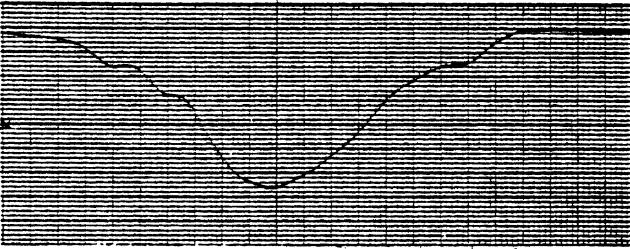
RT. BELT LOAD
PASSENGER SIDE
20 LB./DIVISION
CLASS 60
FILTERED CHANNEL



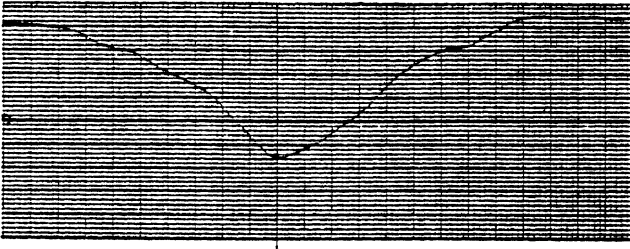
LT. BELT LOAD
PASSENGER SIDE
20 LB./DIVISION
CLASS 60
FILTERED CHANNEL



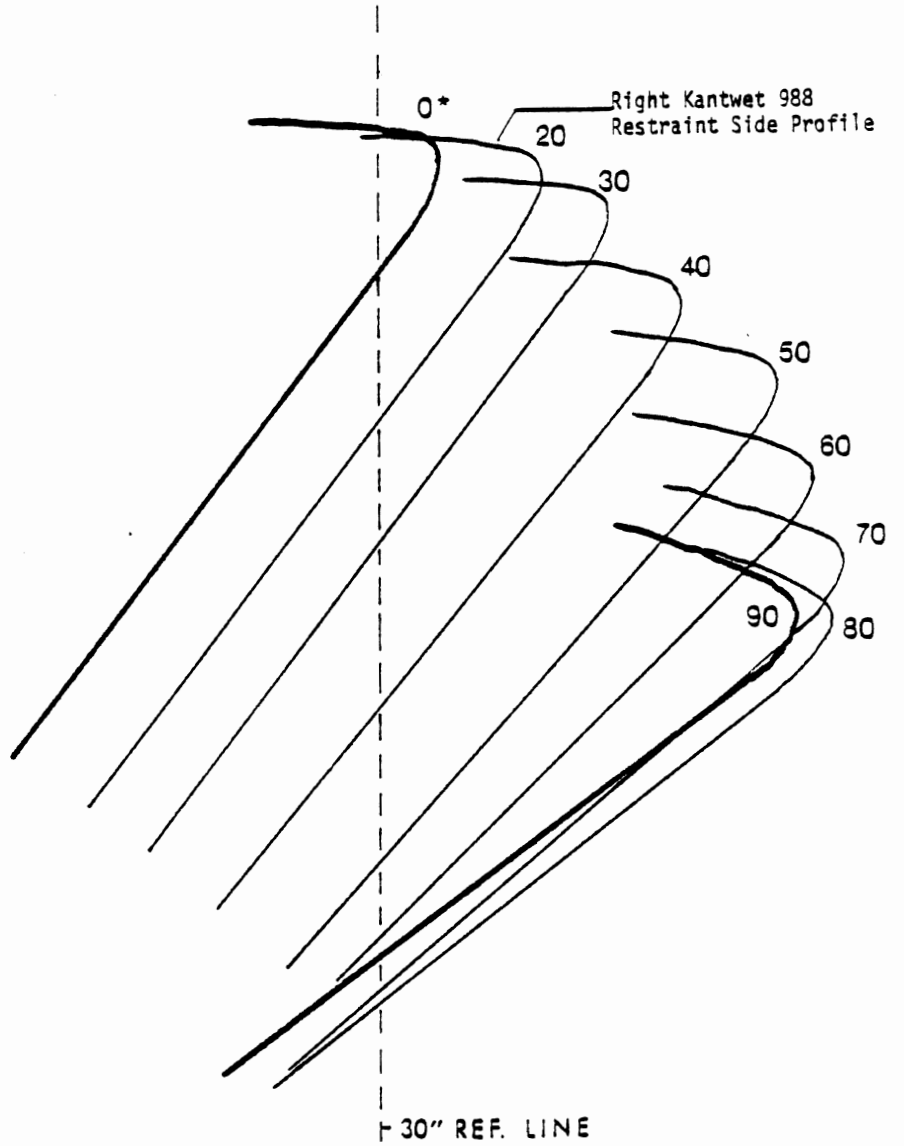
RT. BELT LOAD
DRIVER SIDE
20 LB./DIVISION
CLASS 60
FILTERED CHANNEL



LT. BELT LOAD
DRIVER SIDE
20 LB./DIVISION
CLASS 60
FILTERED CHANNEL



TEST 79K412

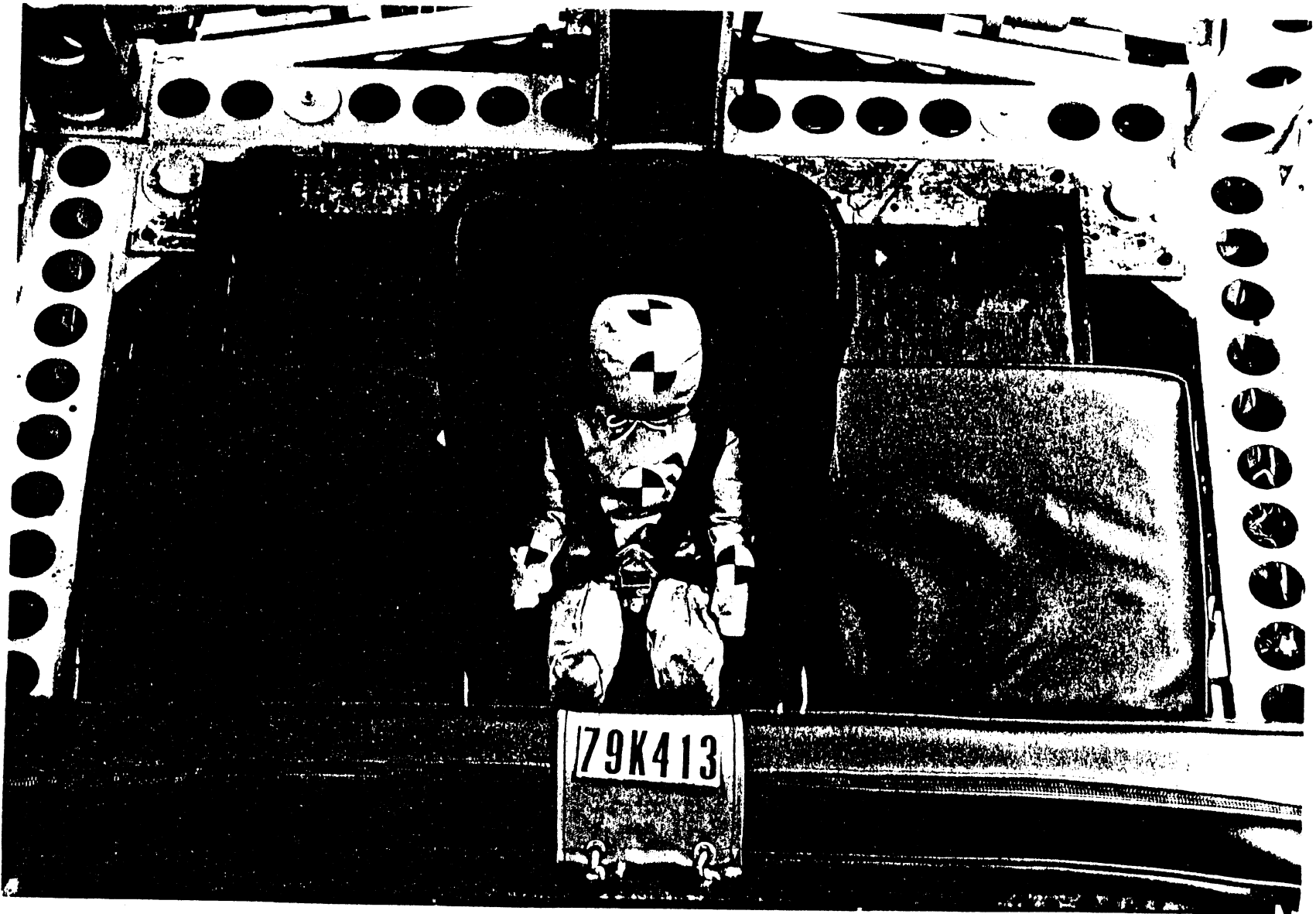


*NUMBERS DENOTE TIME IN MSEC.

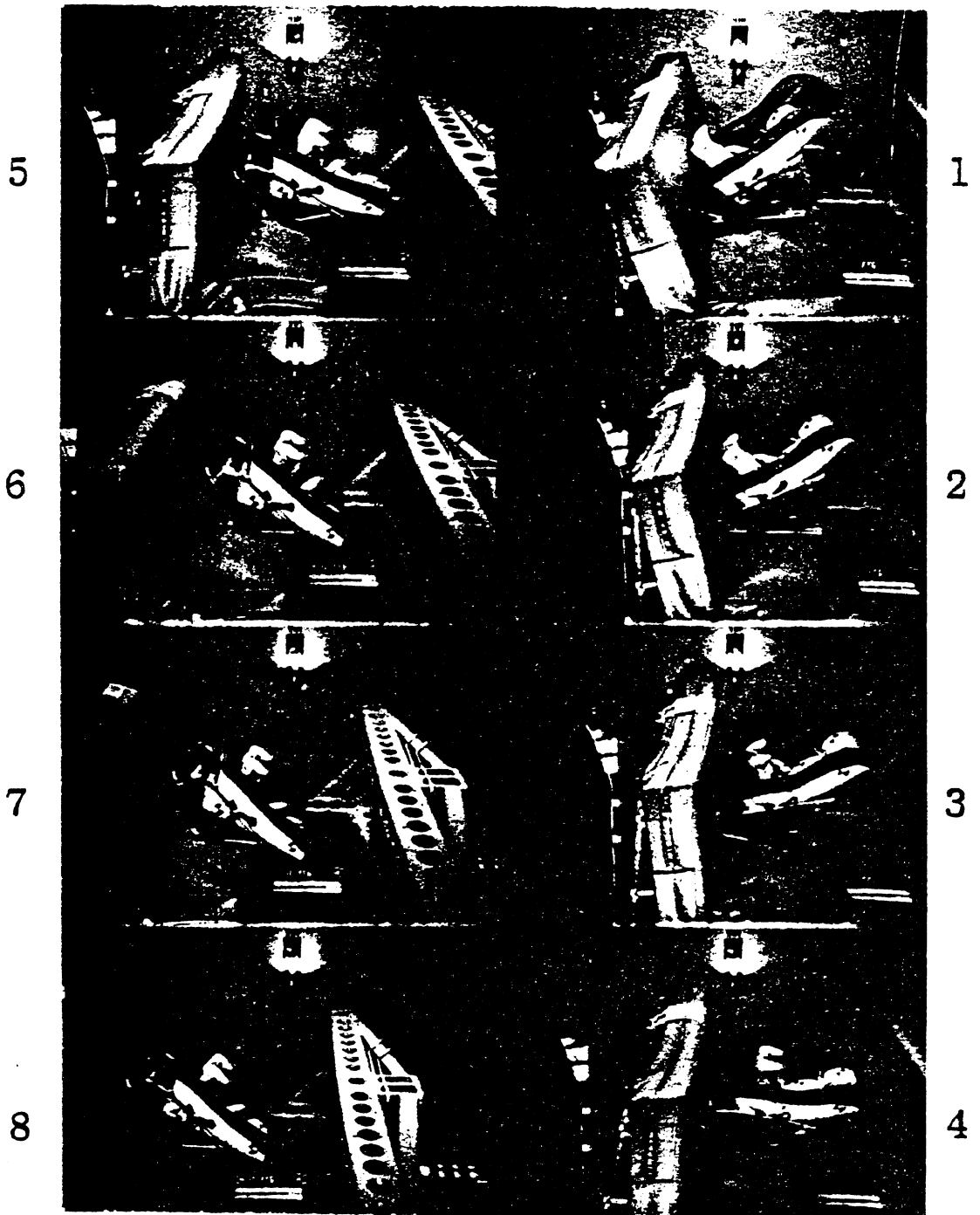
1 FOOT

TEST NUMBER	<u>79K413</u>
RESTRAINT	<u>Bunny Bear</u>
DUMMY	<u>New (Ballasted)</u>
RESTRAINT TEST POSITION	<u>Center</u>
INITIAL TIPPING	<u>None</u>
MAXIMUM ANGLE	<u>128.5°</u>

COMMENTS: One of restraint tubes bent.

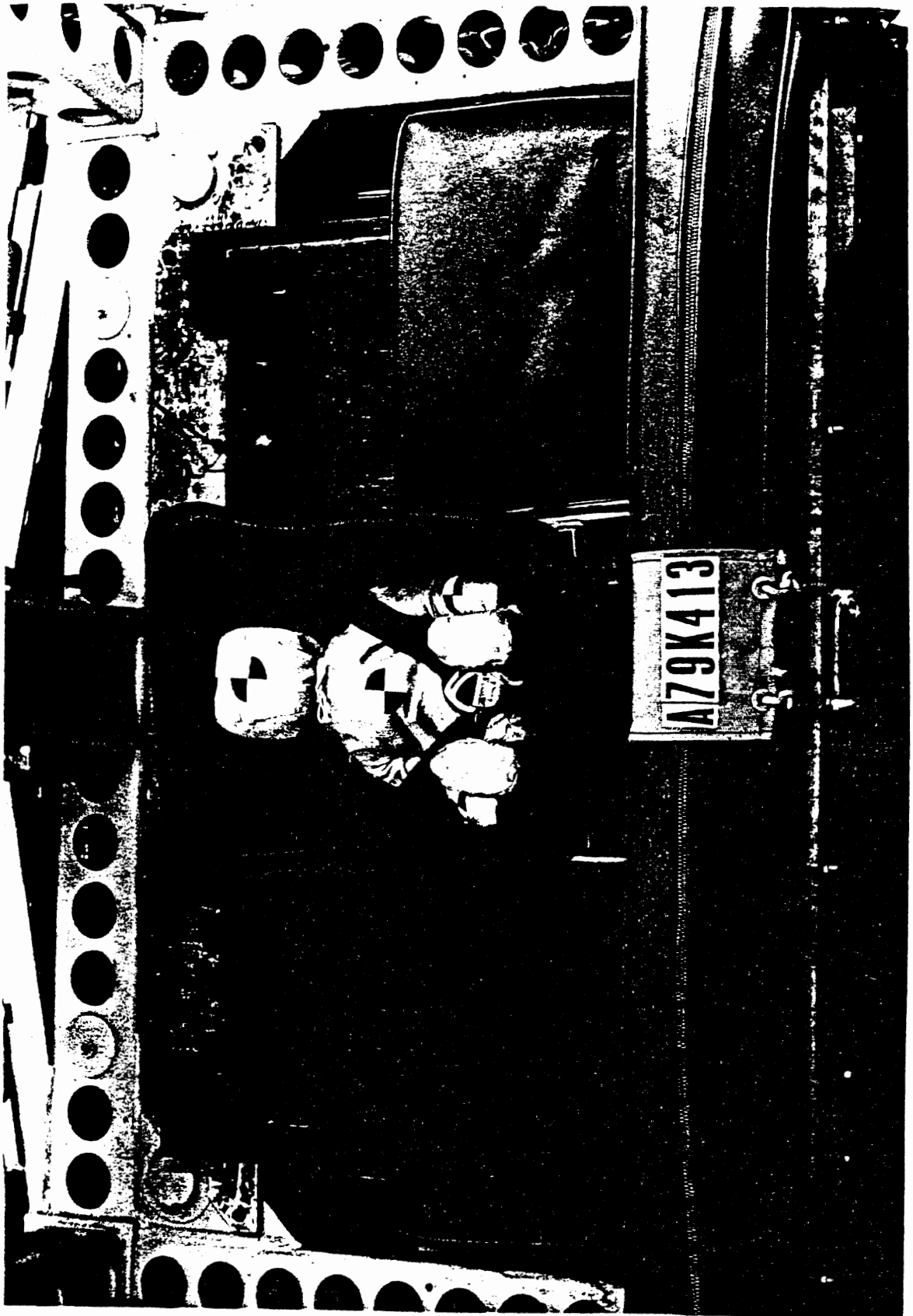


Pre-Test: Bunny Bear Model 70R Restraint



79K413

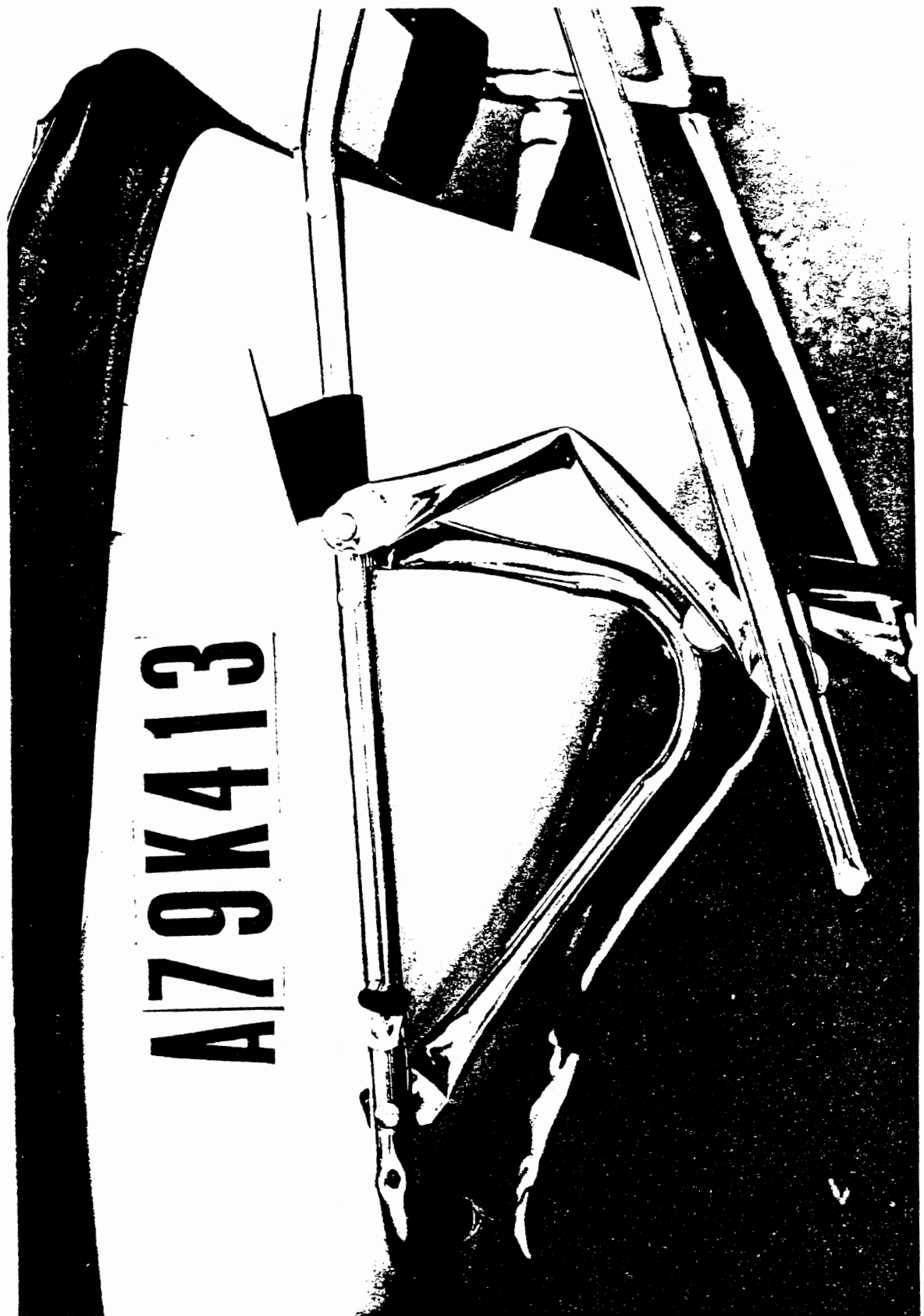
Bunny Bear Model 70R Restraint



Post-Test: Bunny Bear Model 70R Restraint .



Post-Test: Bunny Bear Model 70R Restraint



Bunny Bear Restraint: Post-Test Showing Bent Frame

SLED TEST RESULTS

6-MONTH-OLD-INFANT DUMMY

TEST NO.: 79K413

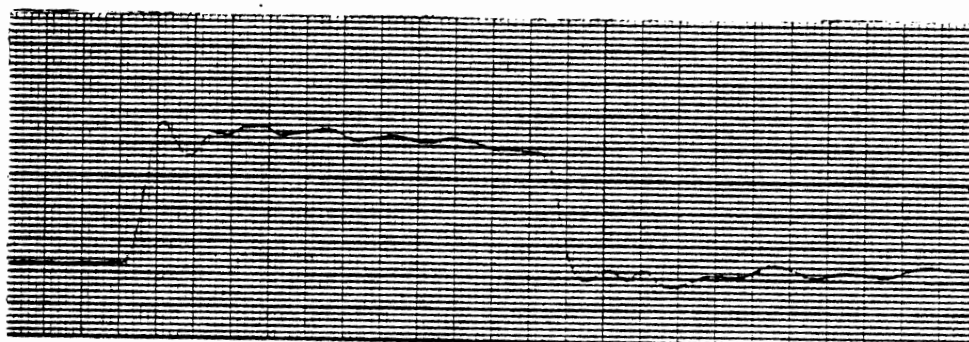
SLED VELOCITY: 30.3 MPH

DUMMY: NEW (ballasted)

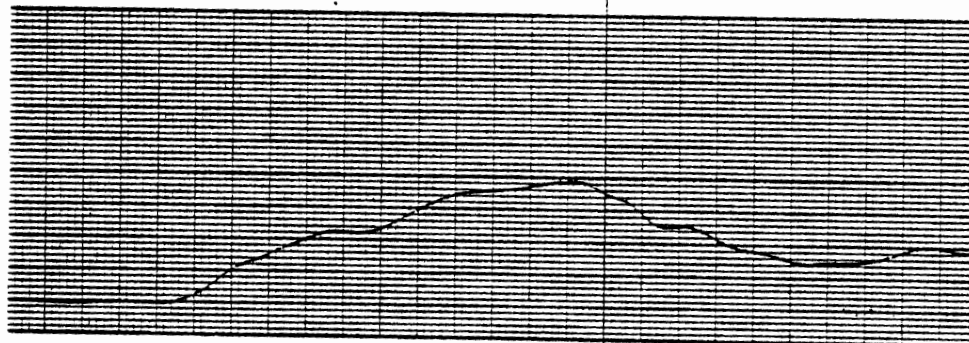
RESTRAINT: BUNNY BEAR (new)

TEST CONDITION: REAR FACING

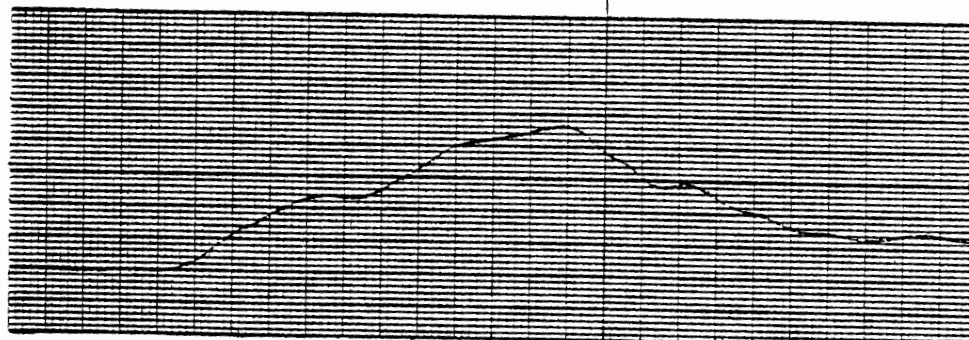
SLED PULSE
1.0 G/DIVISION
FILTERED CHANNEL
CLASS 60



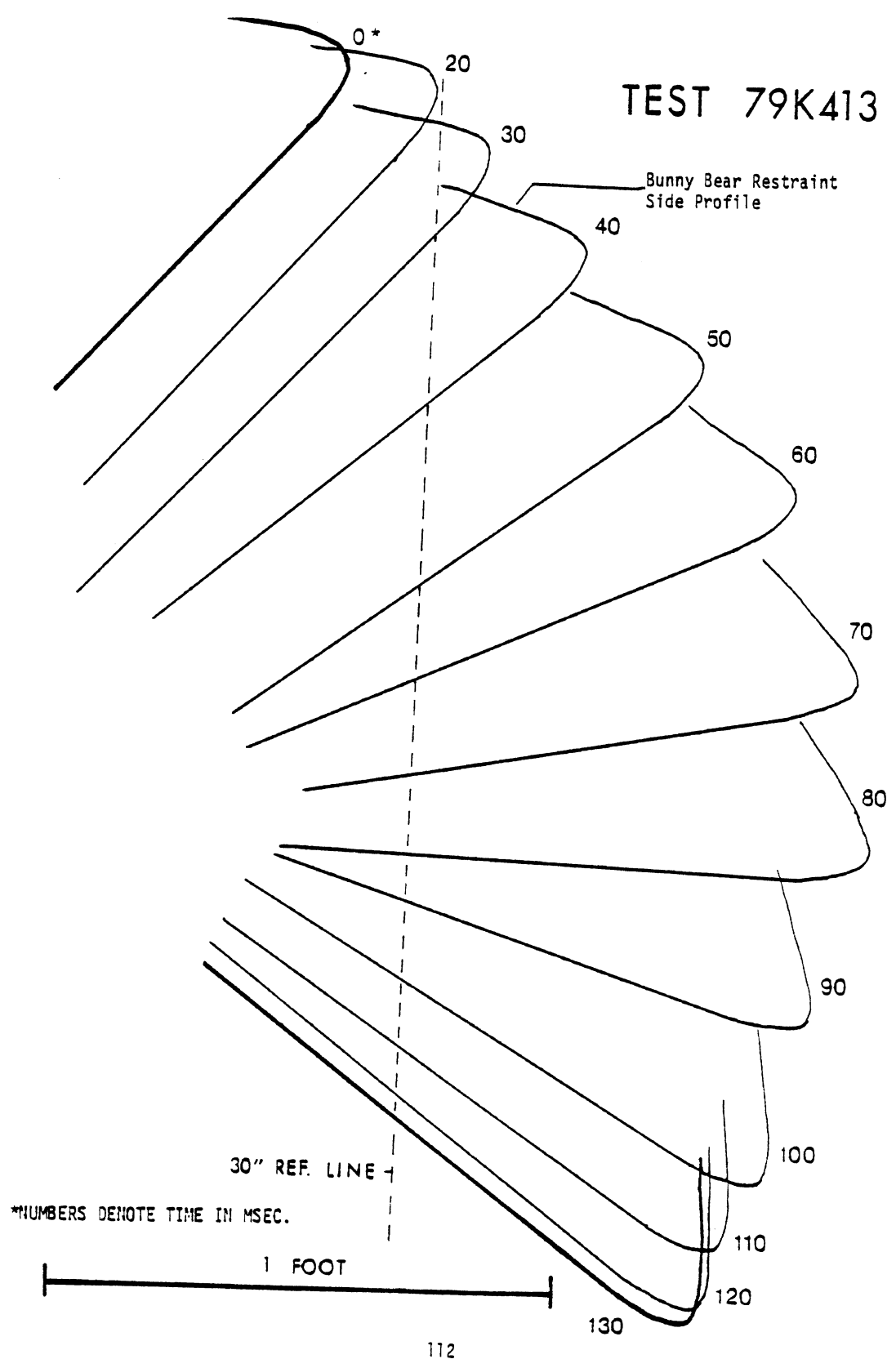
RT. BELT LOAD
CENTER POSITION
20 LB./DIVISION
FILTERED CHANNEL
CLASS 60



LT. BELT LOAD
CENTER POSITION
20 LB./DIVISION
FILTERED CHANNEL
CLASS 60



TEST 79K413

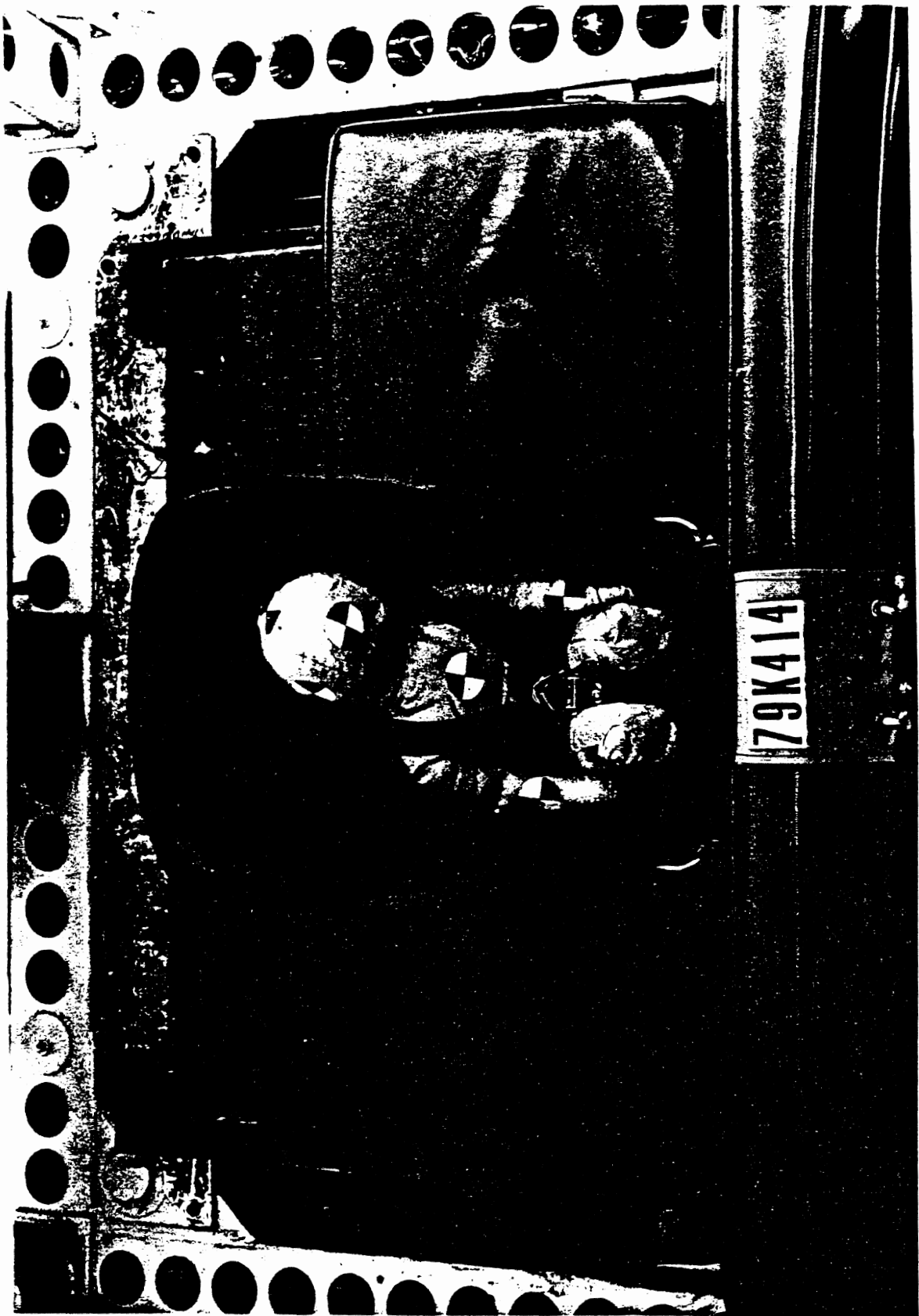


TEST NUMBER	<u>79K414</u>
RESTRAINT	<u>Bunny Bear</u>
DUMMY	<u>Old</u>
RESTRAINT TEST POSITION	<u>Center</u>
INITIAL TIPPING	<u>None</u>
MAXIMUM ANGLE	<u>122°</u>

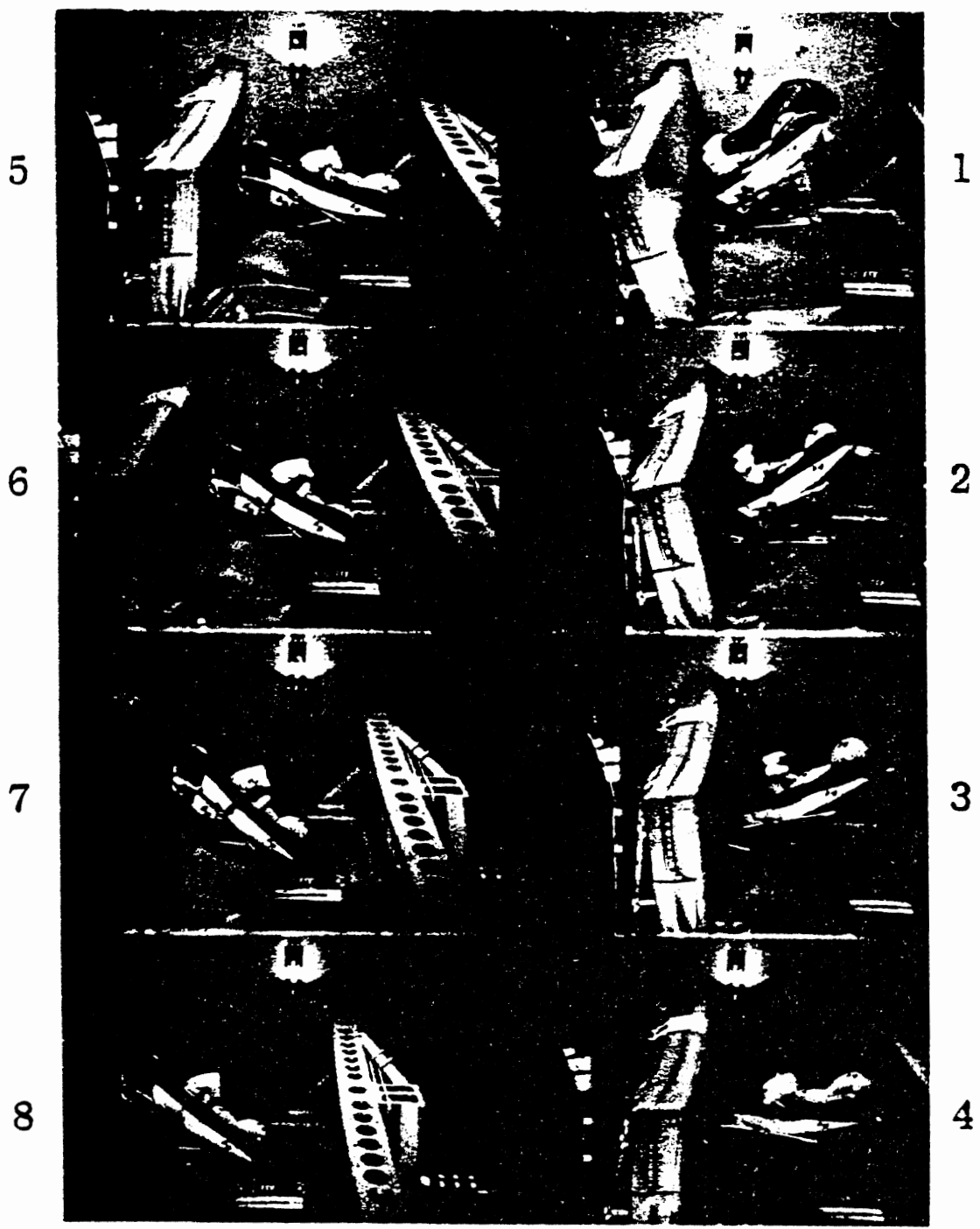
COMMENTS: One of restraint tubes bent slightly.



Pre-Test: Bunny Bear Model 70R Restraint

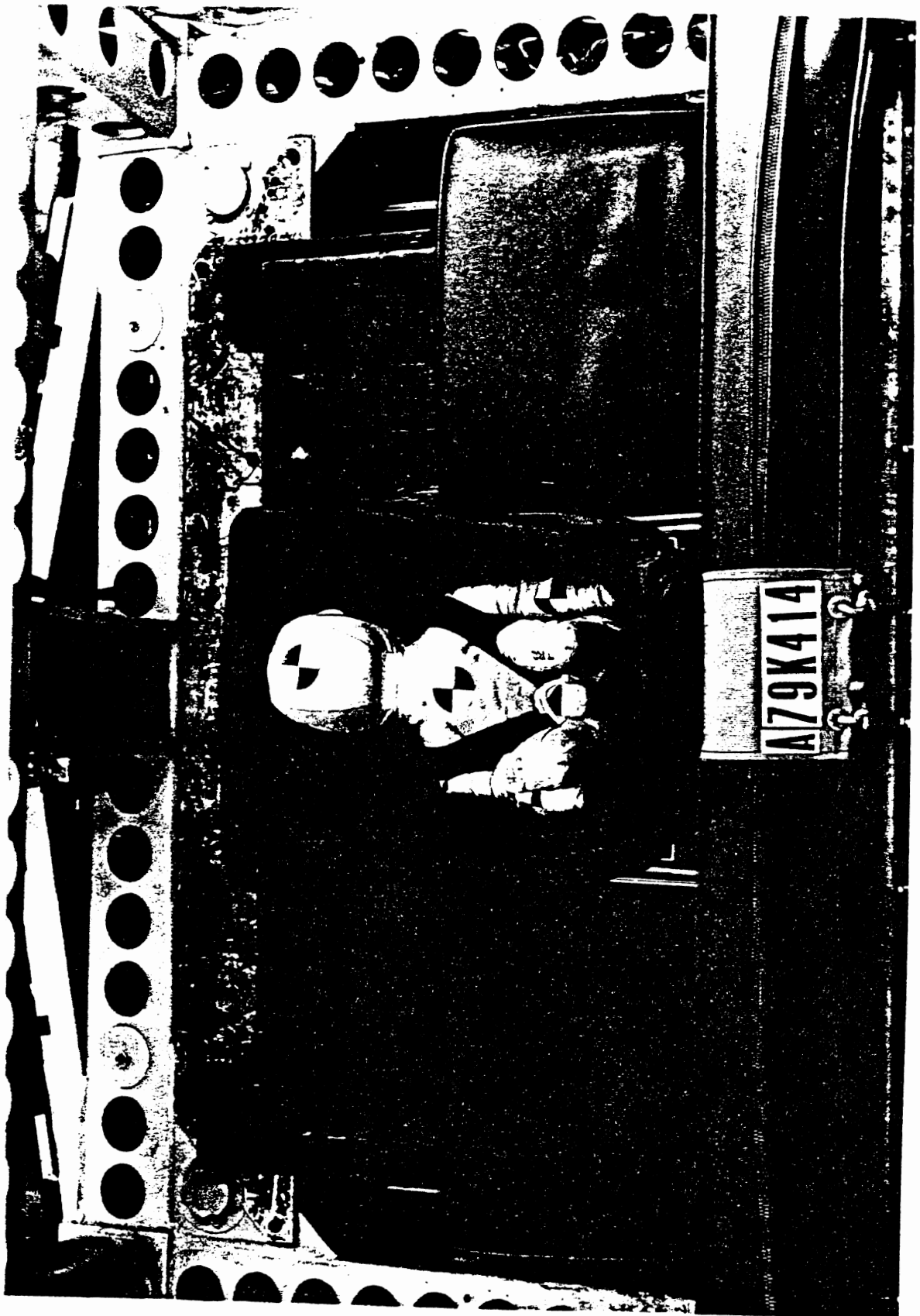


Pre-Test: Bunny Bear Model 70R Restraint

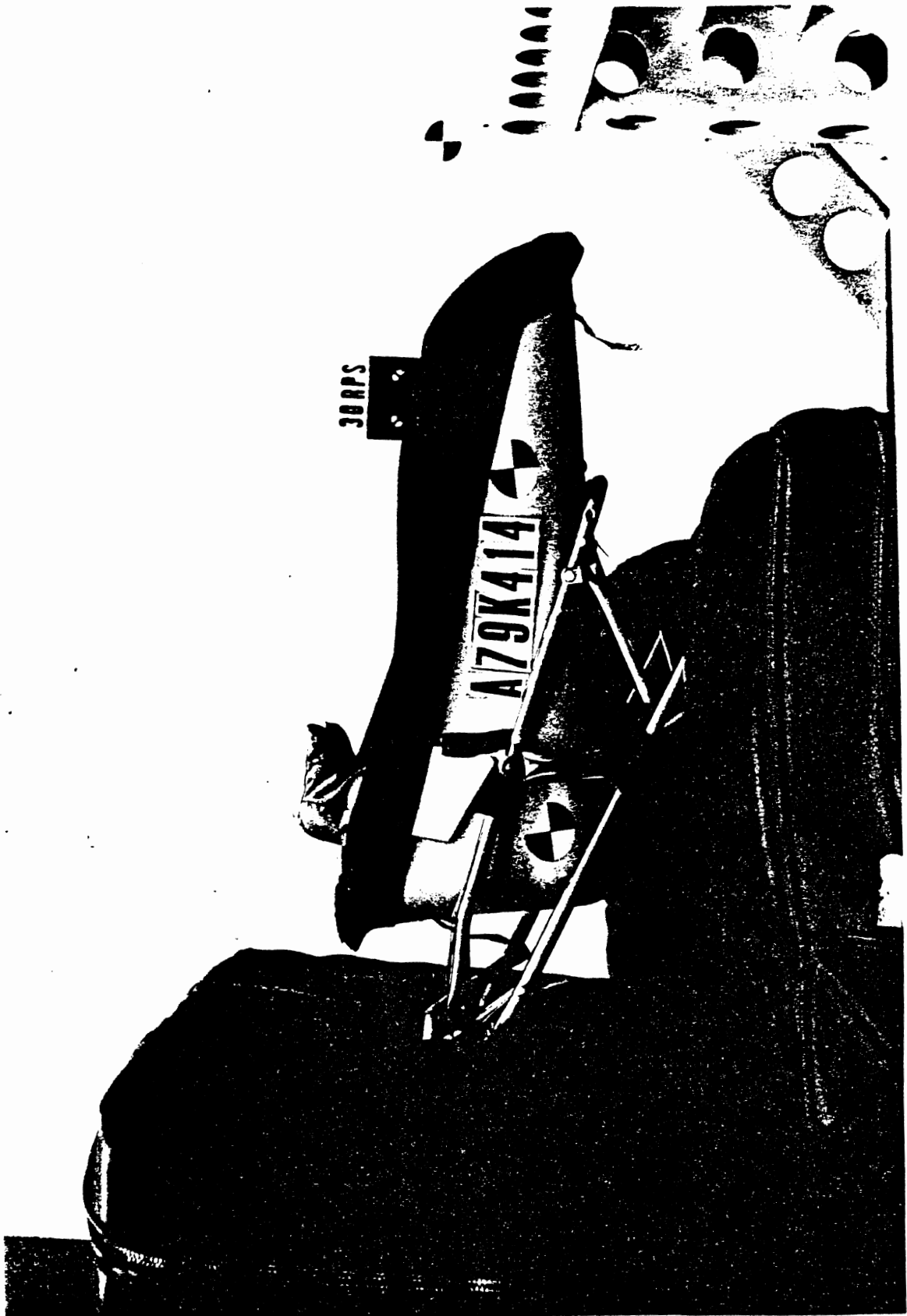


79K414

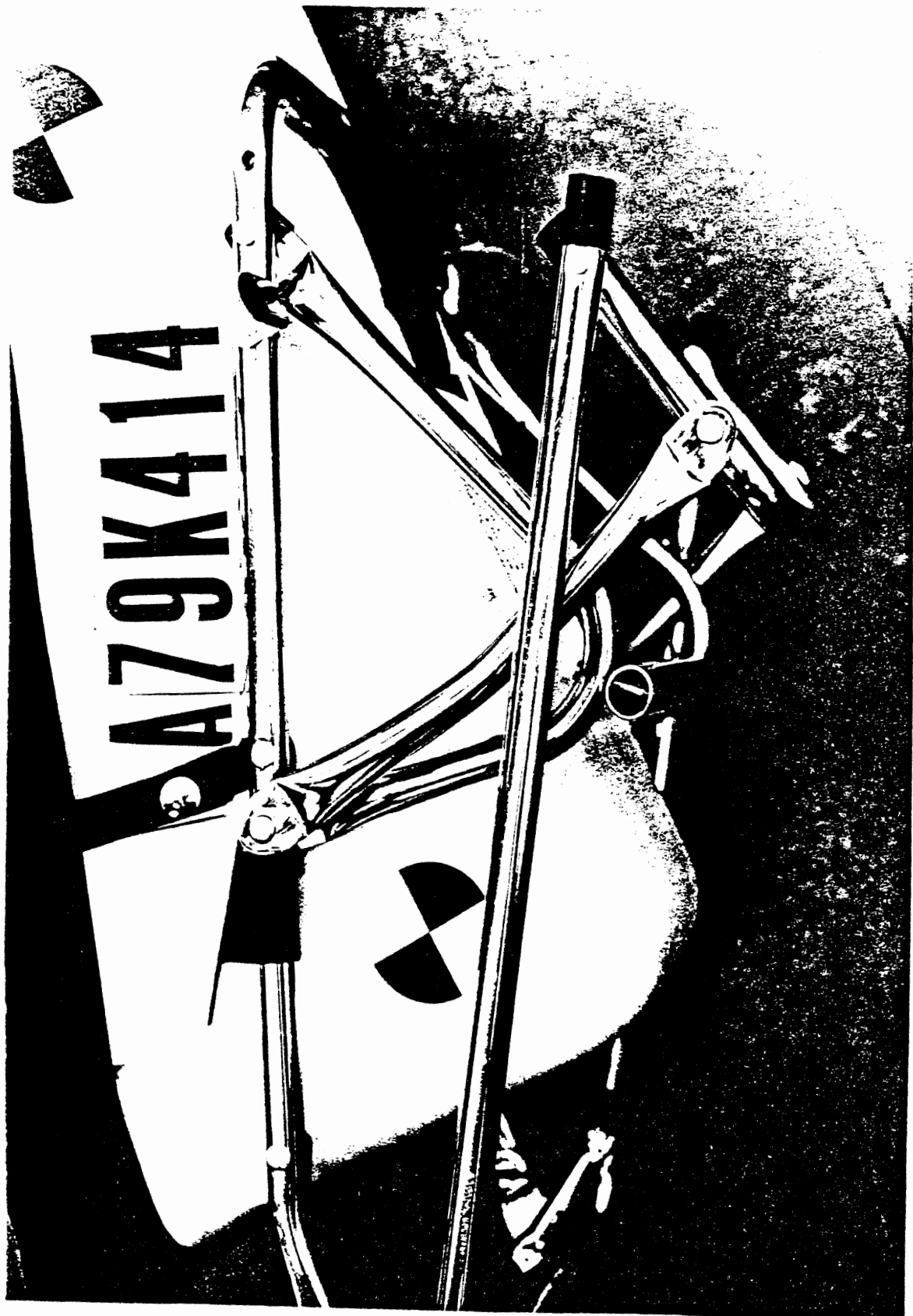
Bunny Bear Model 70R Restraint



Post-Test: Bunny Bear Model 70R Restraint



Post-Test: Bunny Bear Model 70R Restraint



Bunny Bear Model 70R: Post-Test Showing Bent Support

SLED TEST RESULTS

6-MONTH-OLD-INFANT DUMMY

TEST NO.: 79K 414

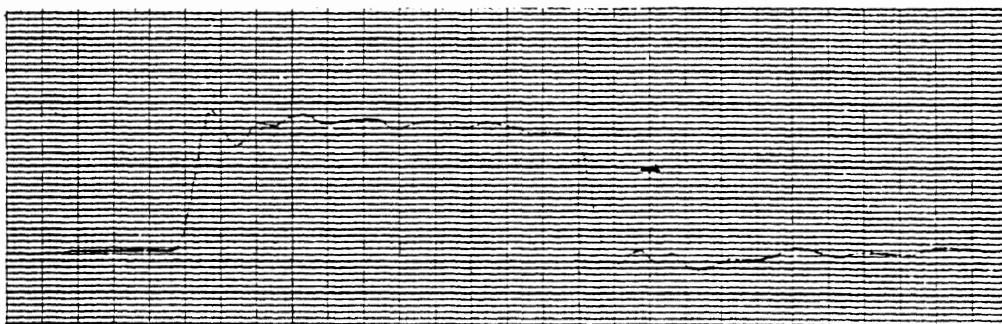
SLED VELOCITY: 30.2 MPH

DUMMY: OLD

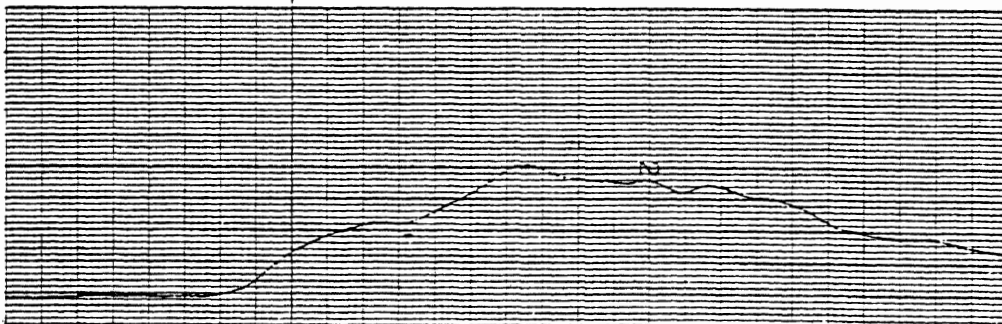
RESTRAINT: BUNNY BEAR (new)

TEST CONDITION: REAR FACING

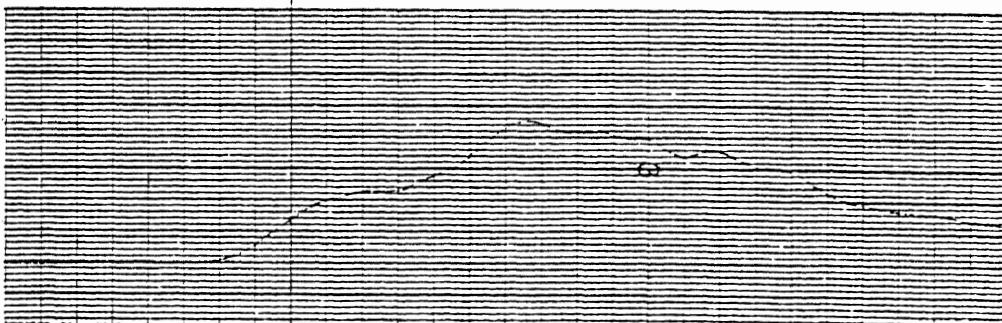
SLED PULSE
1.0 G/DIVISION
FILTERED CHANNEL
CLASS 60



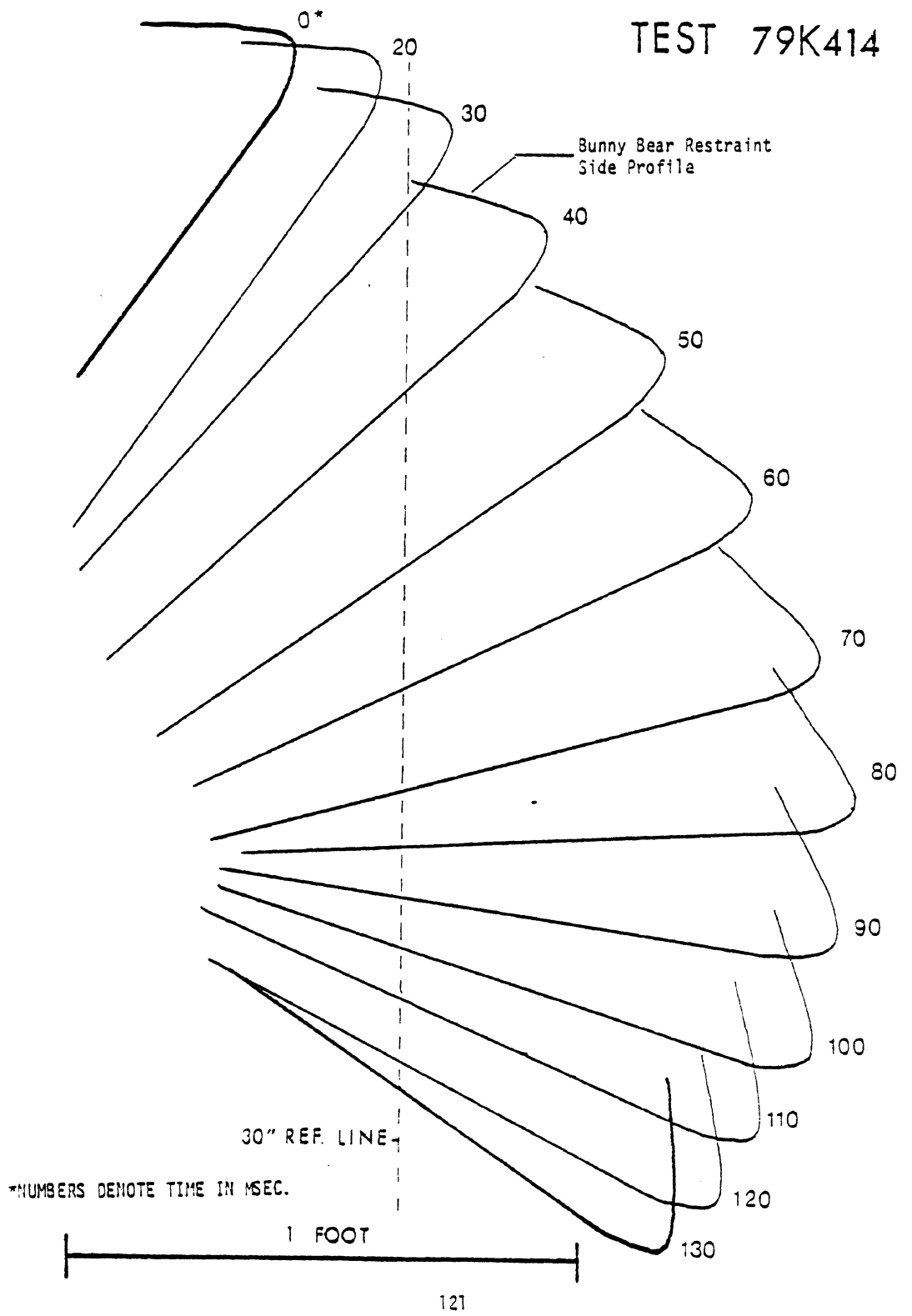
RT. BELT LOAD
CENTER POSITION
20 LB./DIVISION
FILTERED CHANNEL
CLASS 60



LT. BELT LOAD
CENTER POSITION
20 LB./DIVISION
FILTERED CHANNEL
CLASS 60

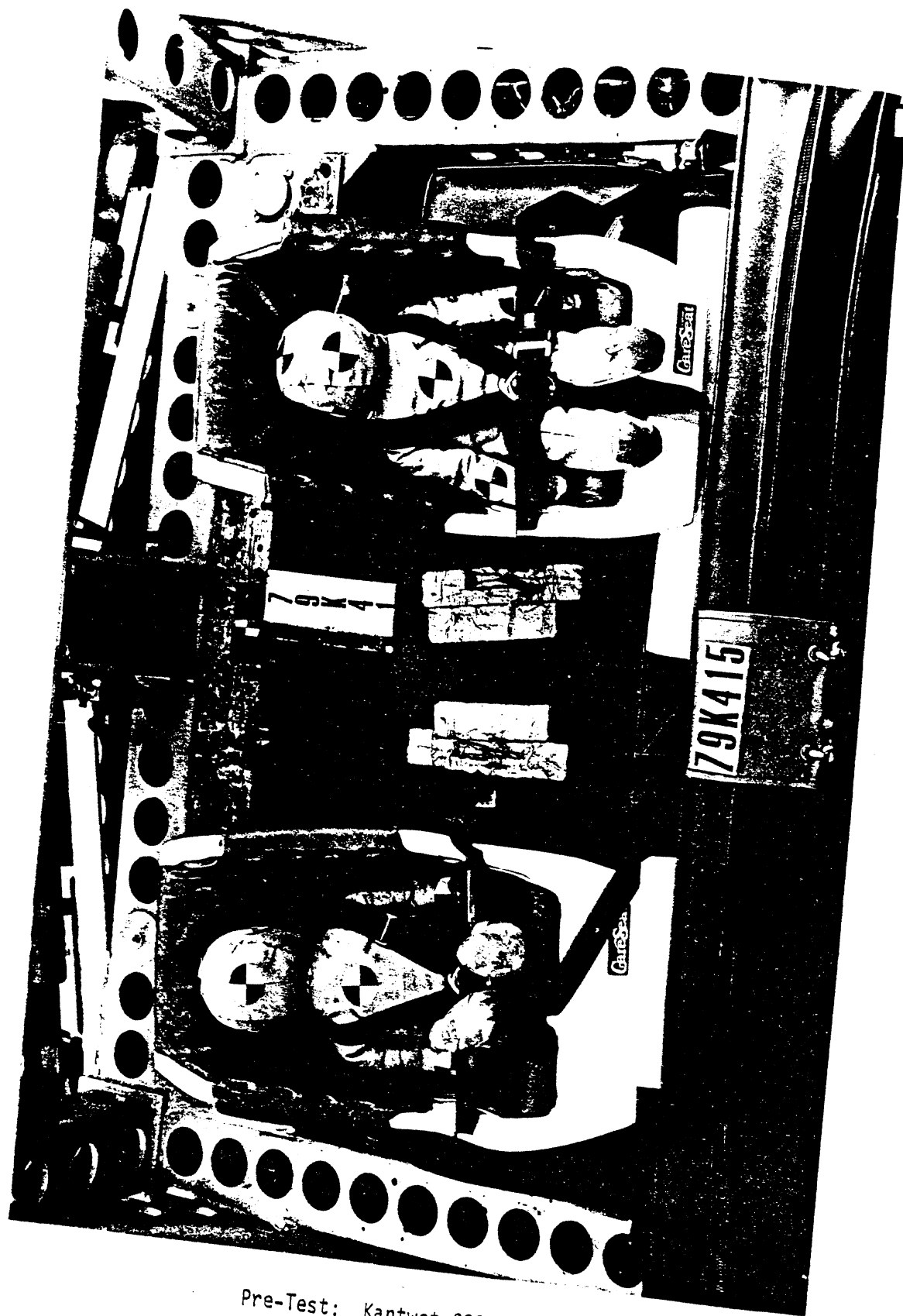


TEST 79K414

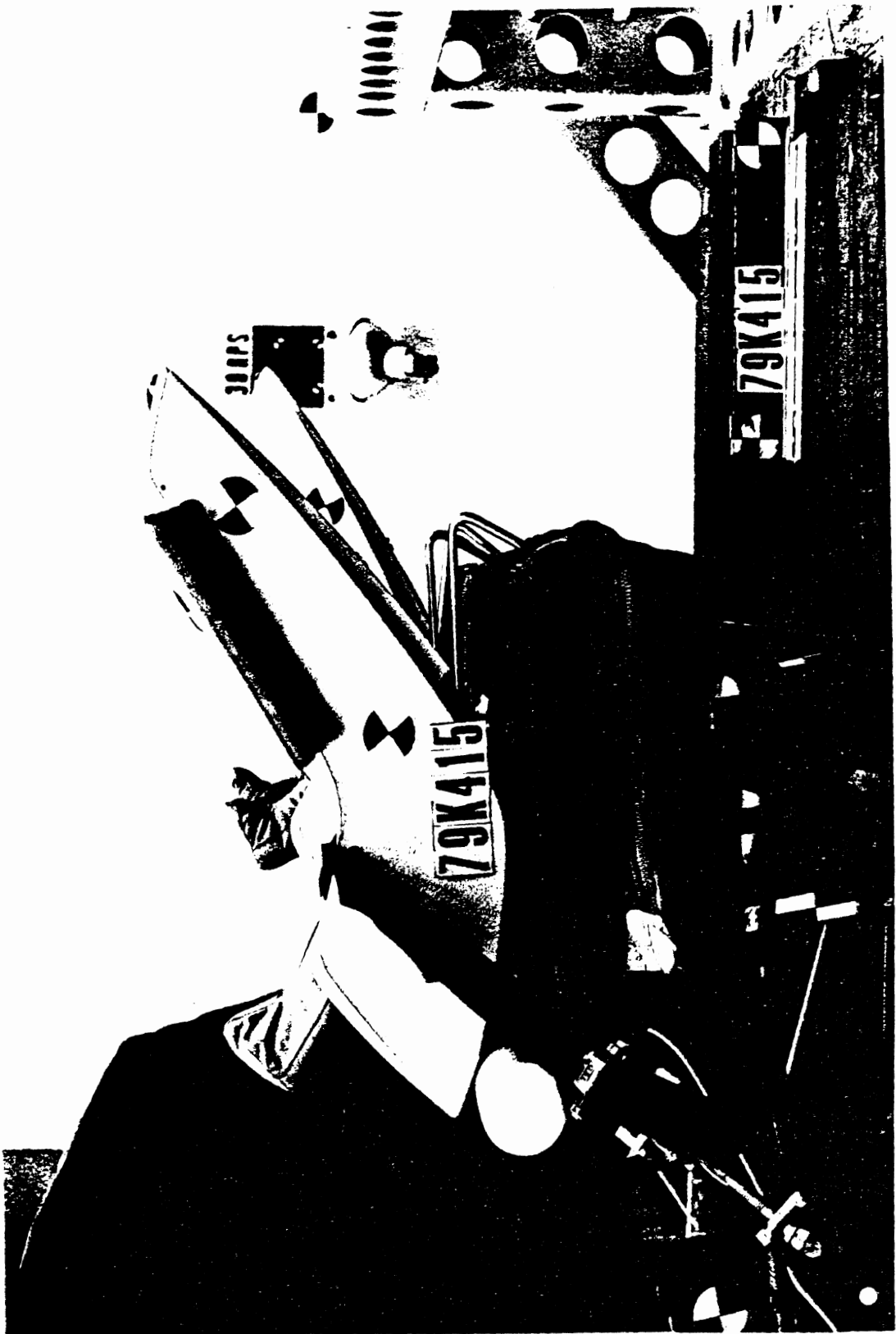


TEST NUMBER	<u>79K415</u>
RESTRAINT	<u>Kantwet</u>
DUMMY	<u>D - Old, P - New</u>
RESTRAINT TEST POSITION	<u>Driver, Passenger</u>
INITIAL TIPPING	<u>20°, 10°</u>
MAXIMUM ANGLE	<u>N.A., 60°</u>

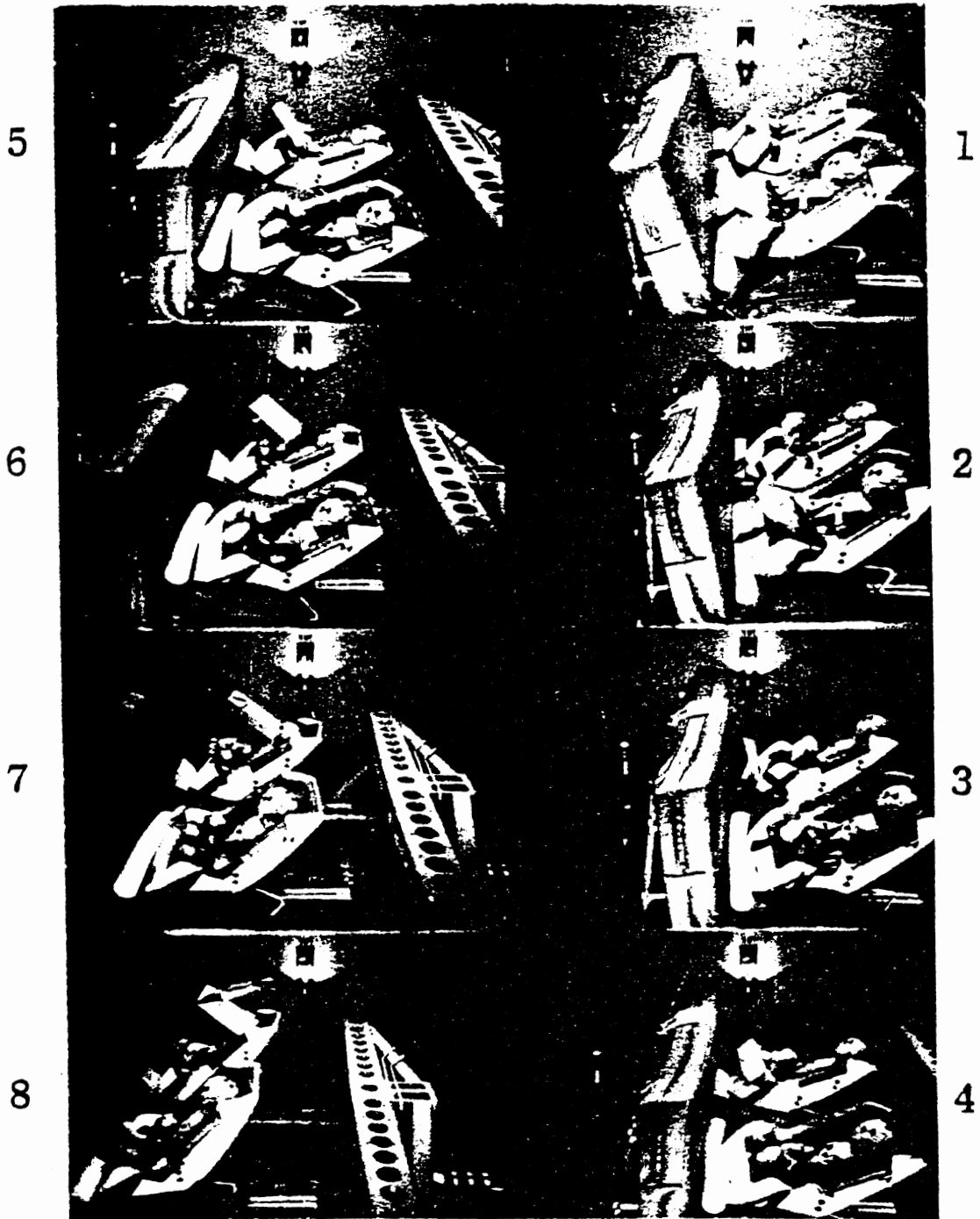
COMMENTS:



Pre-Test: Kantwet 988 Restraints

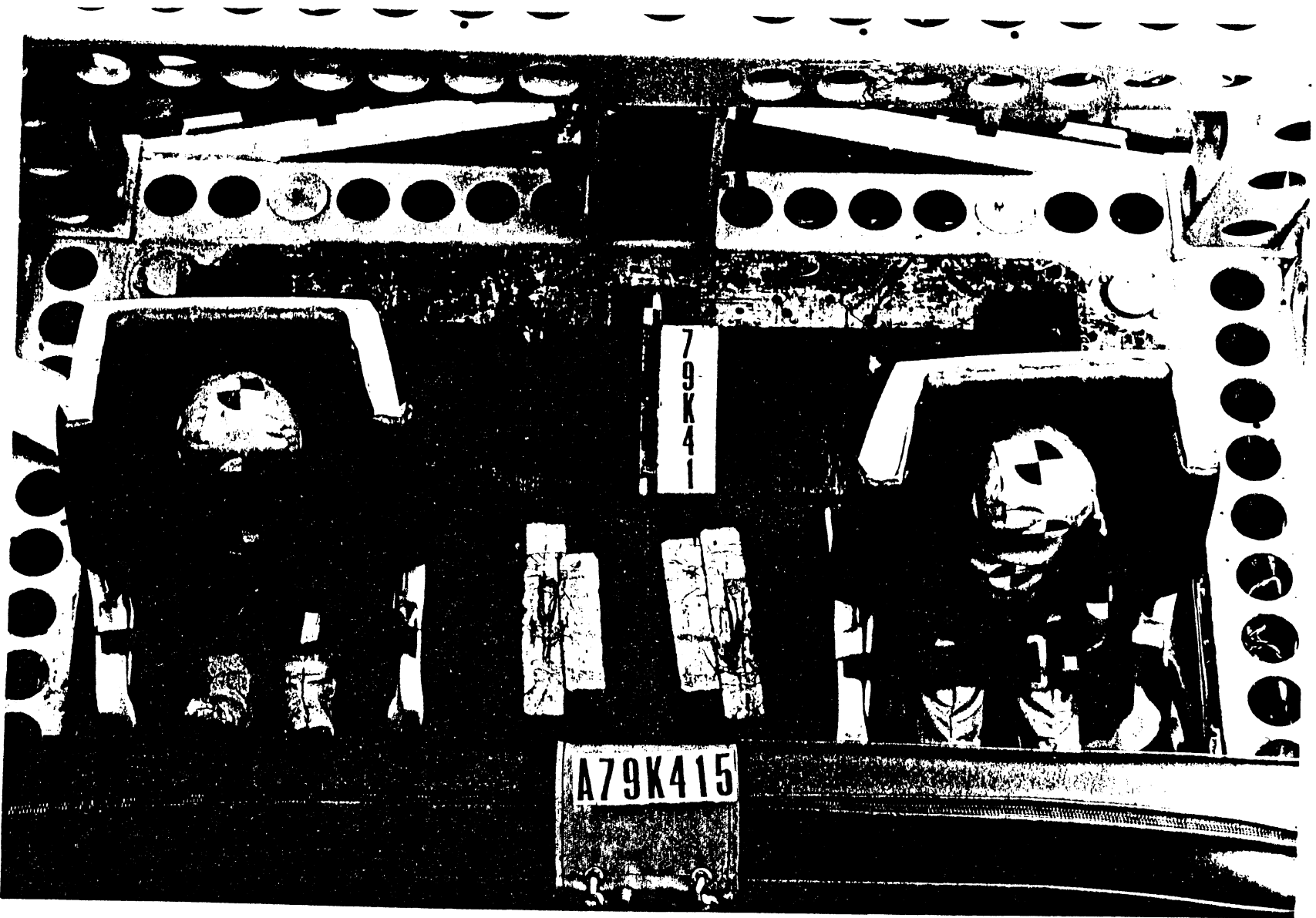


Pre-Test: Kantwet 988 Restraints



79K415

Kantwet 988 Restraints



Post-Test: Kantwet 988 Restraints

SLED TEST RESULTS

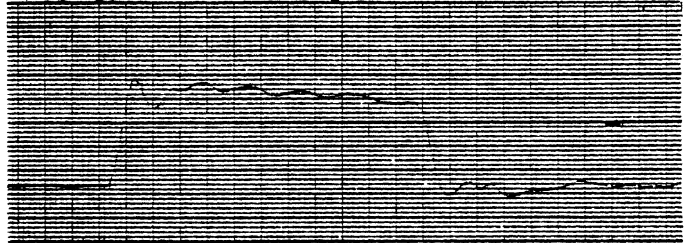
6-MONTH-OLD-INFANT DUMMY

TEST NO.: 79K 415

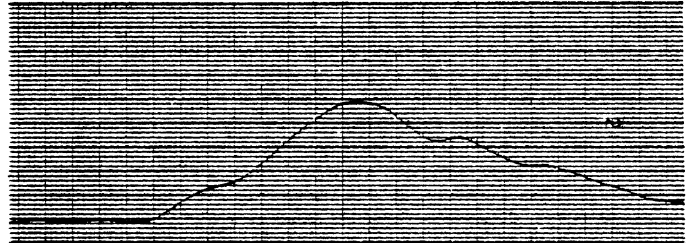
SLED VELOCITY: 30.3 MPH

	<u>PASSENGER SIDE</u>	<u>DRIVER SIDE</u>
DUMMY:	<u>NEW</u>	<u>OLD</u>
RESTRAINT:	<u>KANTWET (used)</u>	<u>KANTWET (used)</u>
TEST CONDITION: REAR FACING	<u>5° INCR. INITIAL ANGLE</u>	<u>20° INCR. INITIAL ANGLE</u>

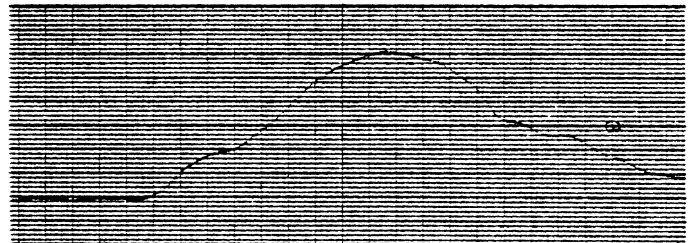
SLED PULSE
1.0 G/DIVISION
FILTERED CHANNEL
CLASS 60



RT. BELT LOAD
PASSENGER SIDE
20 LB./DIVISION
FILTERED CHANNEL
CLASS 60

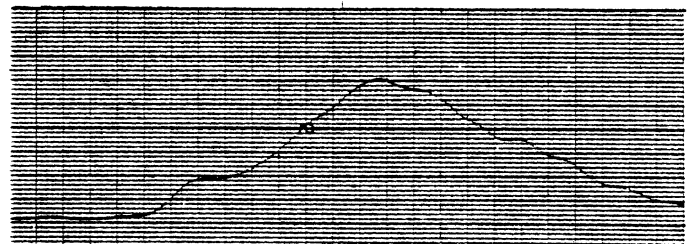


LT. BELT LOAD
PASSENGER SIDE
20 LB./DIVISION
FILTERED CHANNEL
CLASS 60

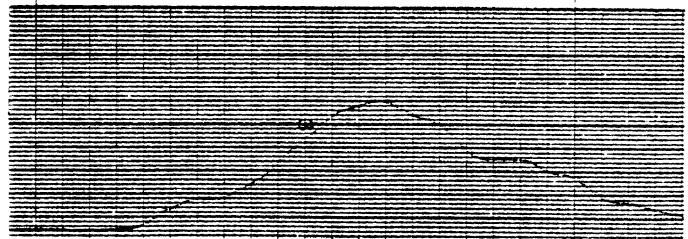


BRUSH ACCUCHART

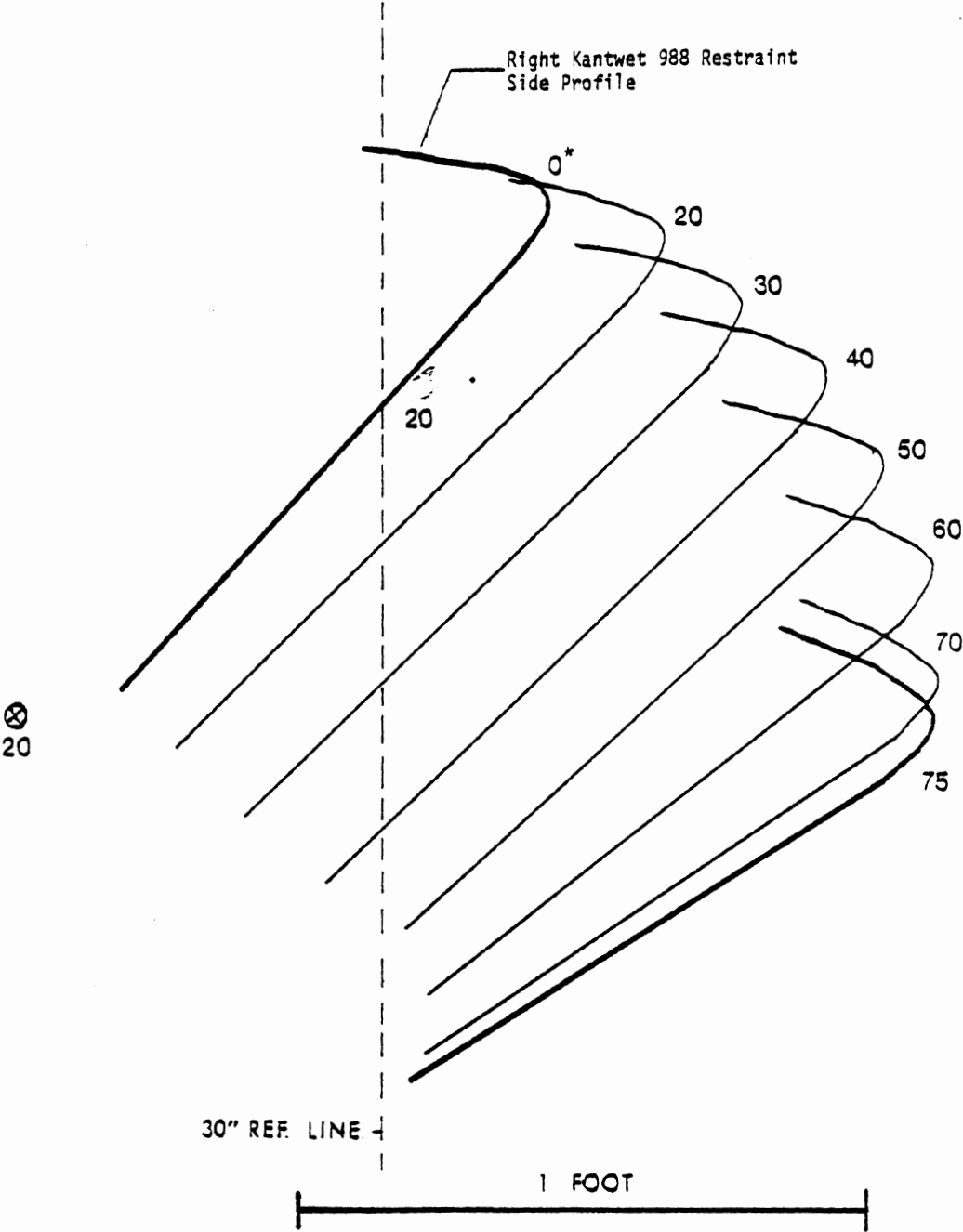
RT. BELT LOAD
DRIVER SIDE
20 LB./DIVISION
FILTERED CHANNEL
CLASS 60



LT. BELT LOAD
DRIVER SIDE
20 LB./DIVISION
FILTERED CHANNEL
CLASS 60



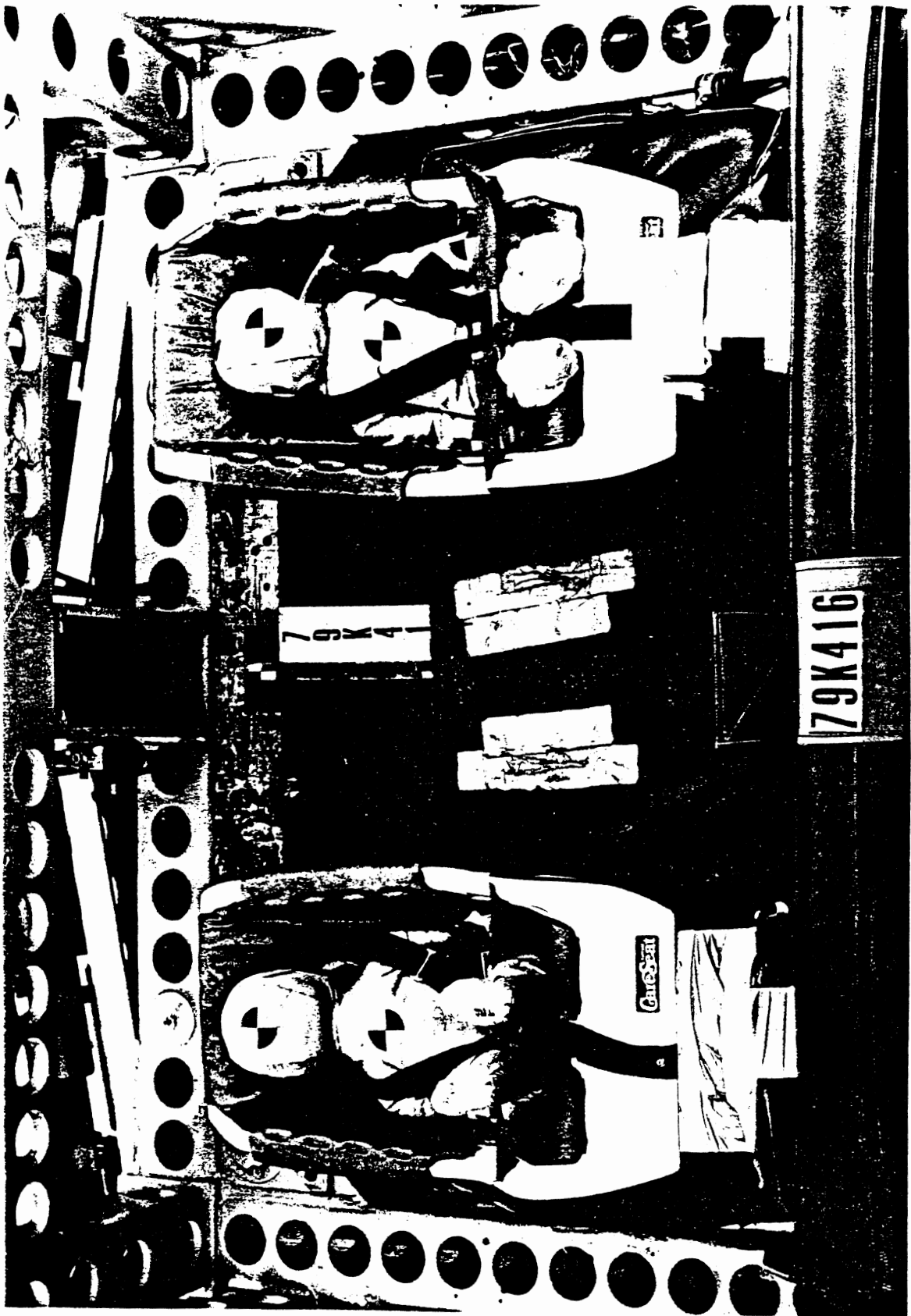
TEST 79K415



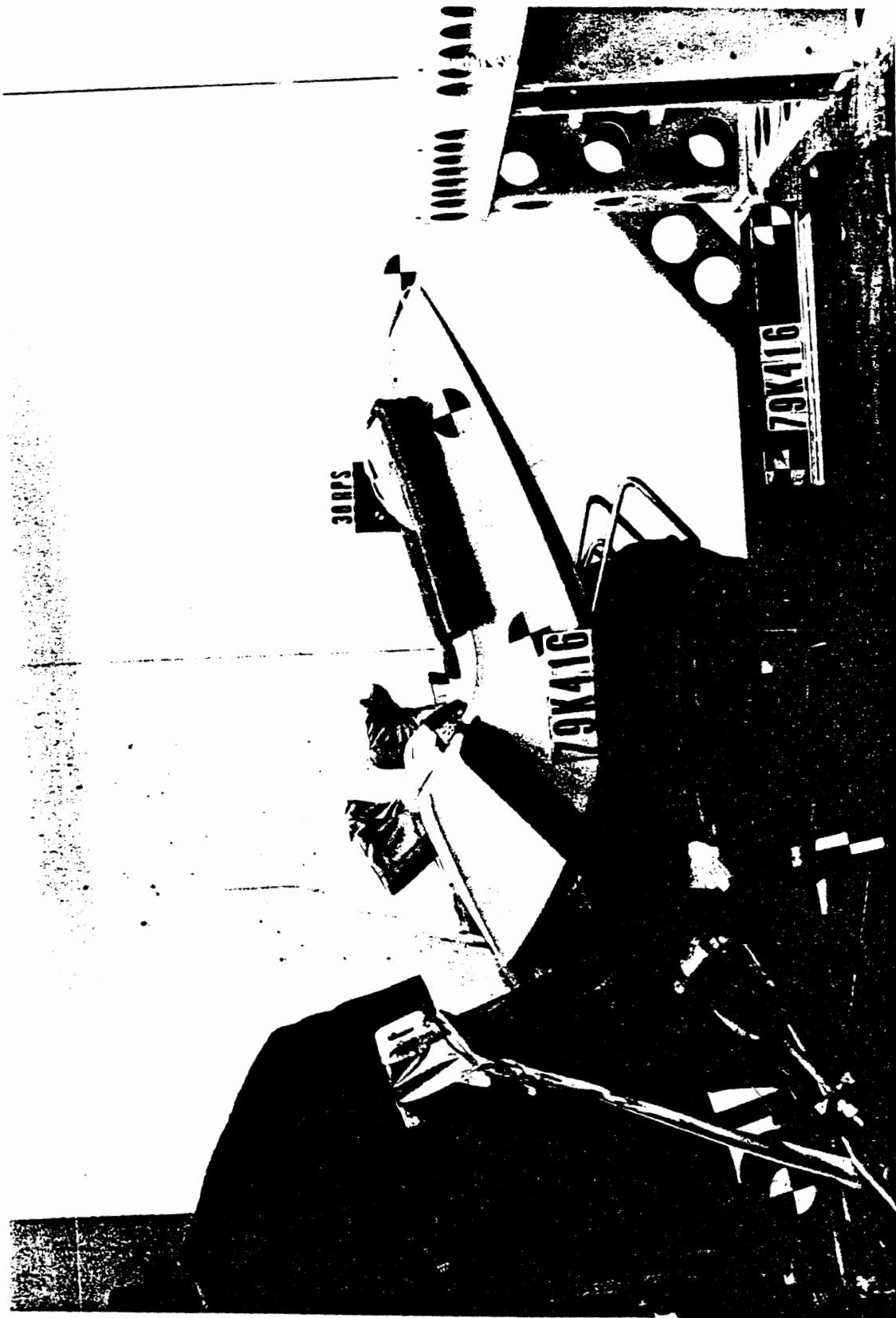
*NUMBERS DENOTE TIME IN MSEC.

TEST NUMBER	<u>79K416</u>
RESTRAINT	<u>Kantwet</u>
DUMMY	<u>D - Old, P - New</u>
RESTRAINT TEST POSITION	<u>Driver, Passenger</u>
INITIAL TIPPING	<u>40°, 30°</u>
MAXIMUM ANGLE	<u>N.A., 64°</u>

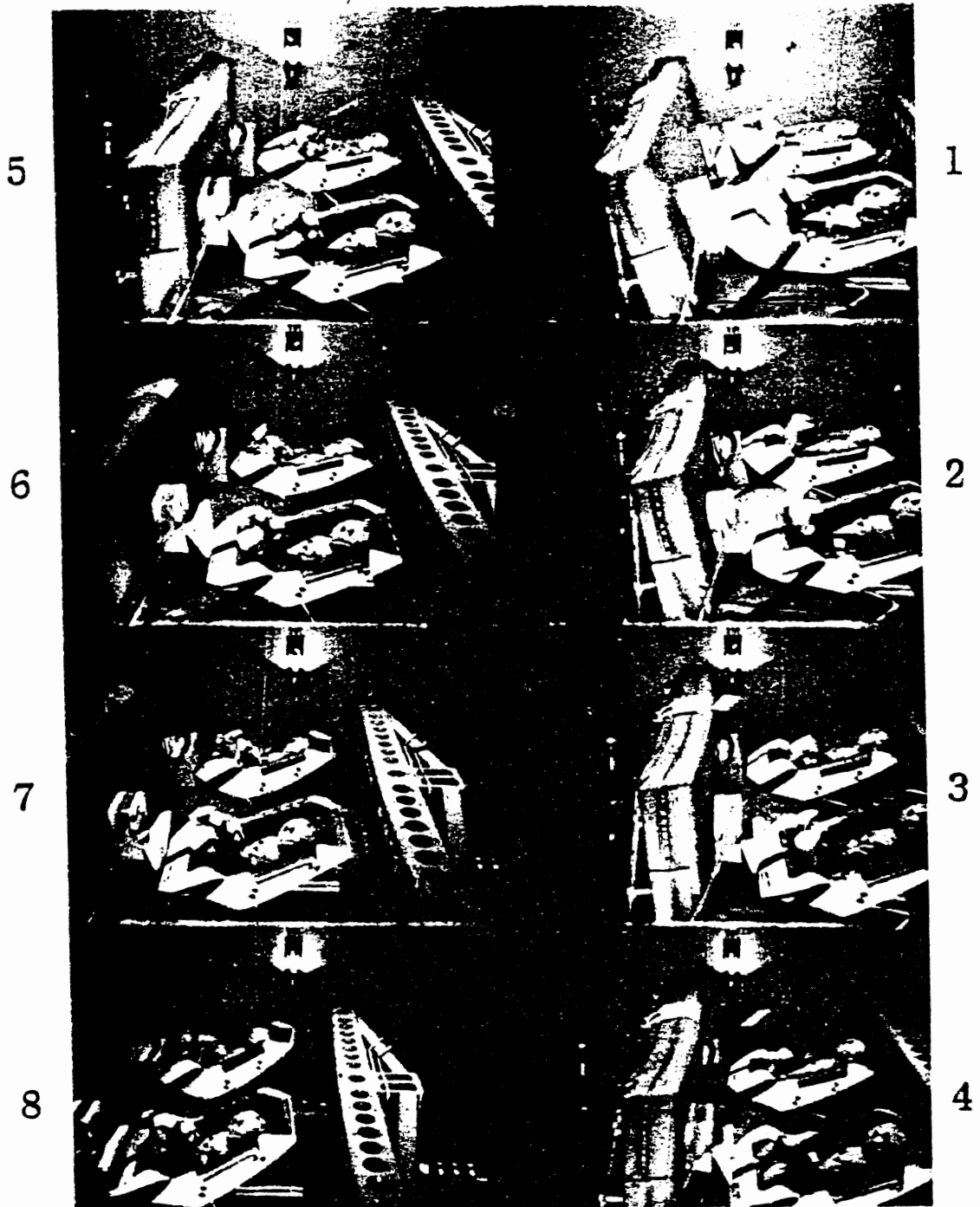
COMMENTS :



Pre-Test: Kantwet 988 Restraints .

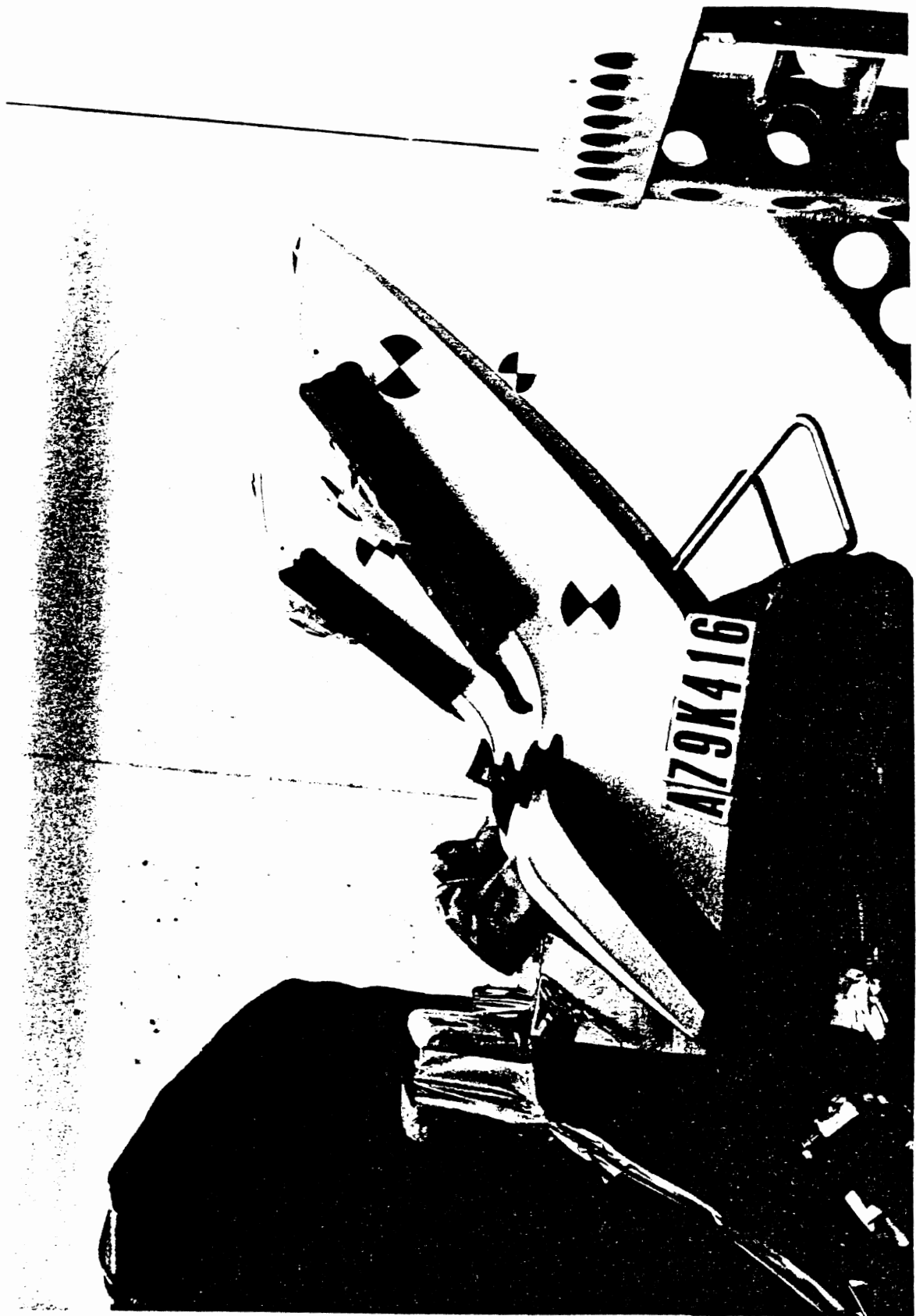


Pre-Test: Kantwet 988 Restraints



79K416

Kantwet 988 Restraints



Post-Test: Kantwet 988 Restraints



Post-Test: Kantwet 988 Restraints

SLED TEST RESULTS

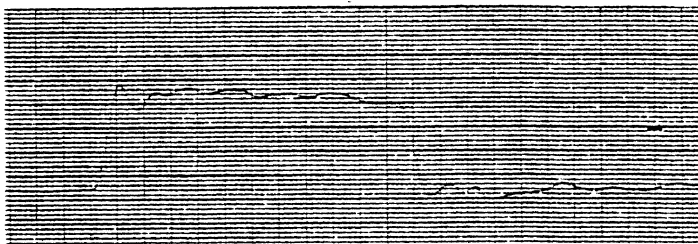
6-MONTH-OLD-INFANT DUMMY

TEST NO.: 79K 416

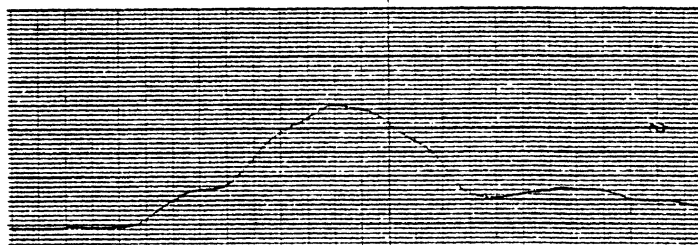
SLED VELOCITY: 30.2 MPH

	<u>PASSENGER SIDE</u>	<u>DRIVER SIDE</u>
DUMMY:	<u>NEW</u>	<u>OLD</u>
RESTRAINT:	<u>KANTWET (used)</u>	<u>KANTWET (used)</u>
TEST CONDITION:	<u>23° INCR. INITIAL ANGLE</u>	<u>40° INCR. INITIAL ANGLE</u>
REAR FACING		

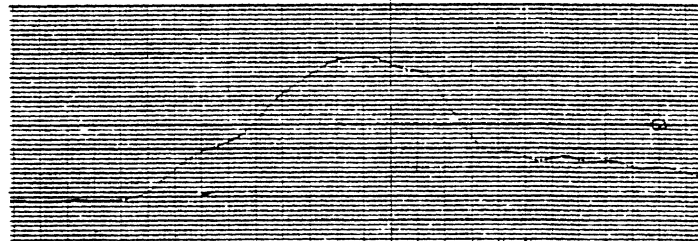
SLED PULSE
1.0 G/DIVISION
FILTERED CHANNEL
CLASS 60



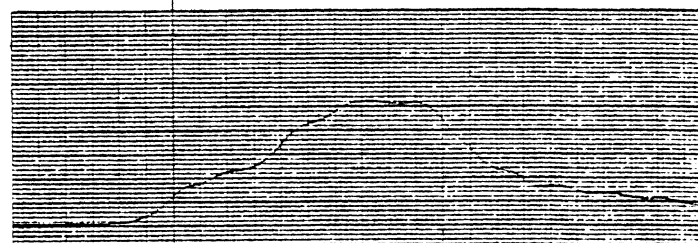
RT. BELT LOAD
PASSENGER SIDE
20 LB./DIVISION
FILTERED CHANNEL
CLASS 60



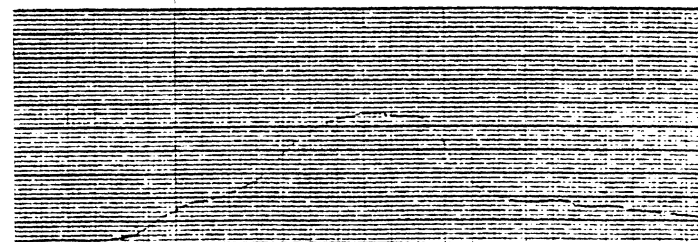
LT. BELT LOAD
PASSENGER SIDE
20 LB./DIVISION
FILTERED CHANNEL
CLASS 60



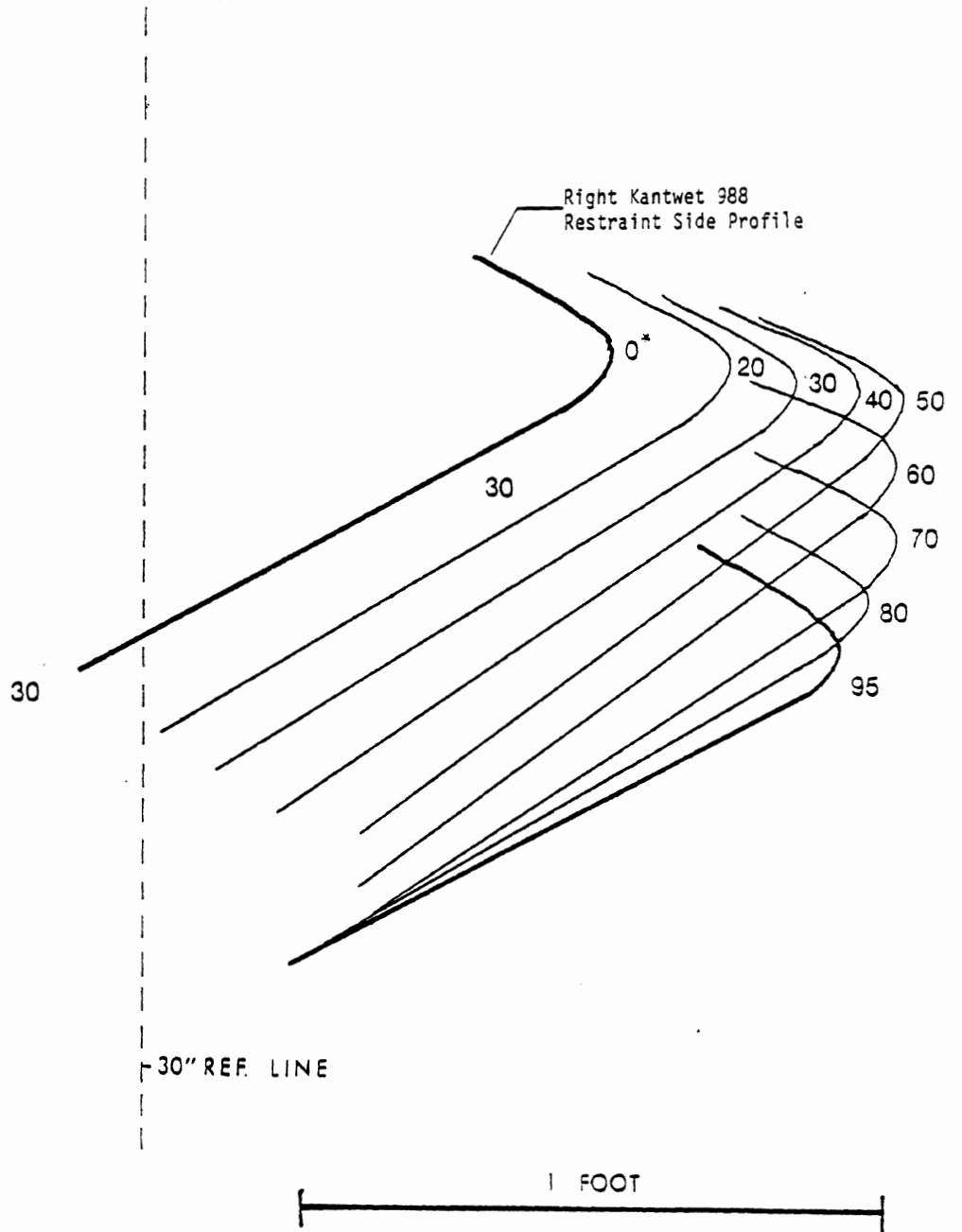
RT. BELT LOAD
DRIVER SIDE
20 LB./DIVISION
FILTERED CHANNEL
CLASS 60



LT. BELT LOAD
DRIVER SIDE
20 LB./DIVISION
FILTERED CHANNEL
CLASS 60



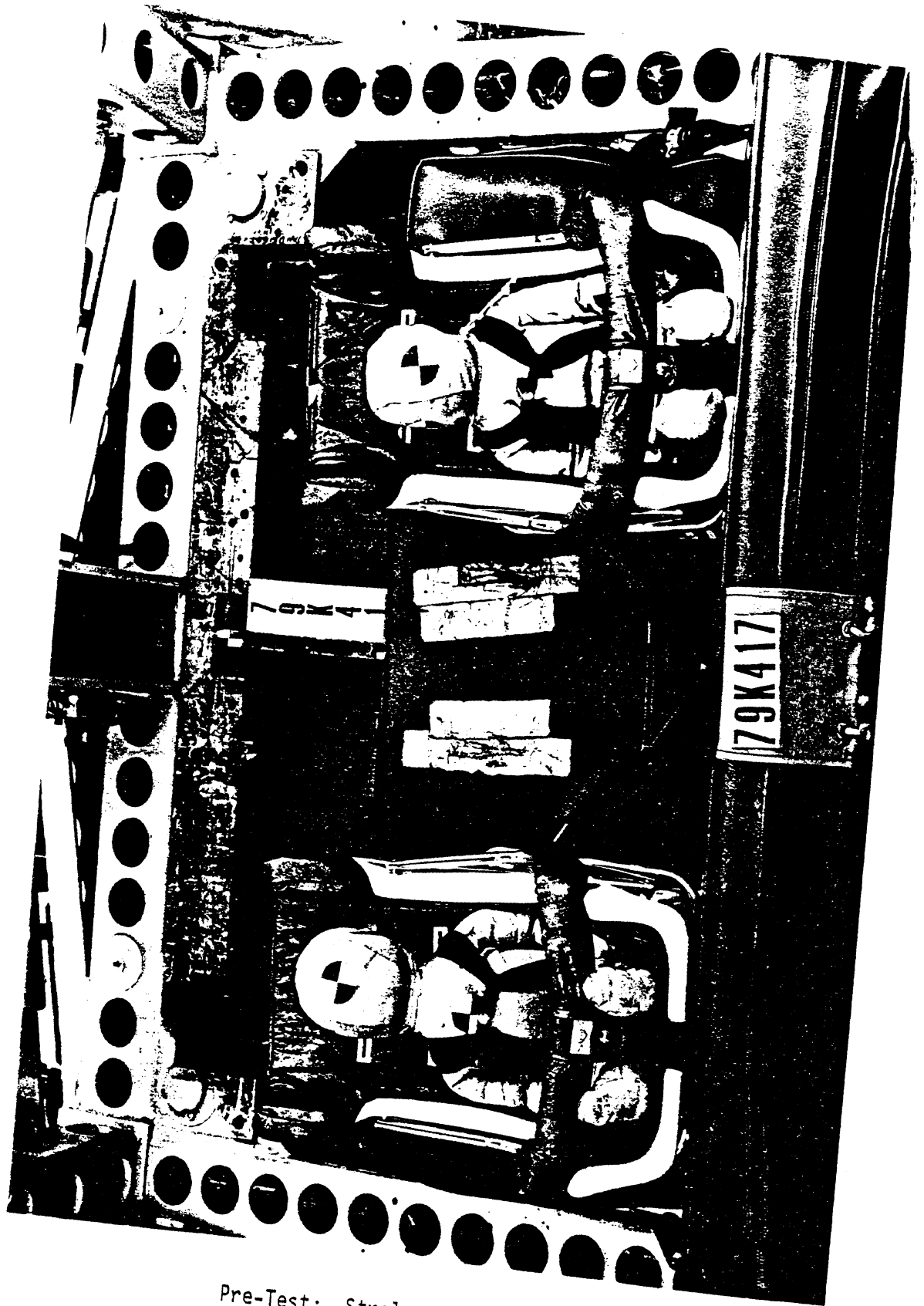
TEST 79K416



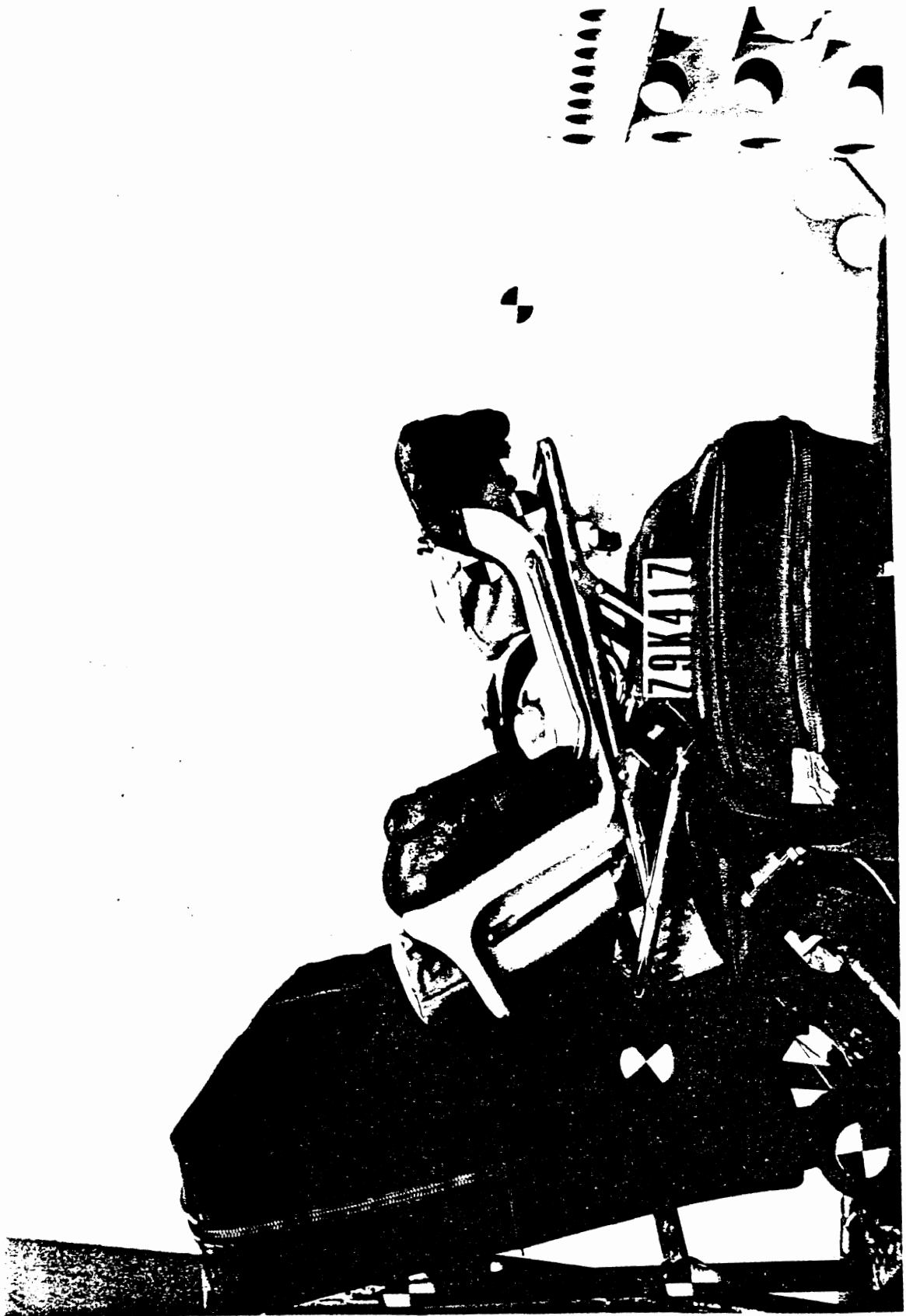
*NUMBERS DENOTE TIME IN MSEC.

TEST NUMBER	<u>79K417</u>
RESTRAINT	<u>Strolee</u>
DUMMY	<u>D - Old, P - New</u>
RESTRAINT TEST POSITION	<u>Driver, Passenger</u>
INITIAL TIPPING	<u>20°, 10°</u>
MAXIMUM ANGLE	<u>N.A., 116°</u>

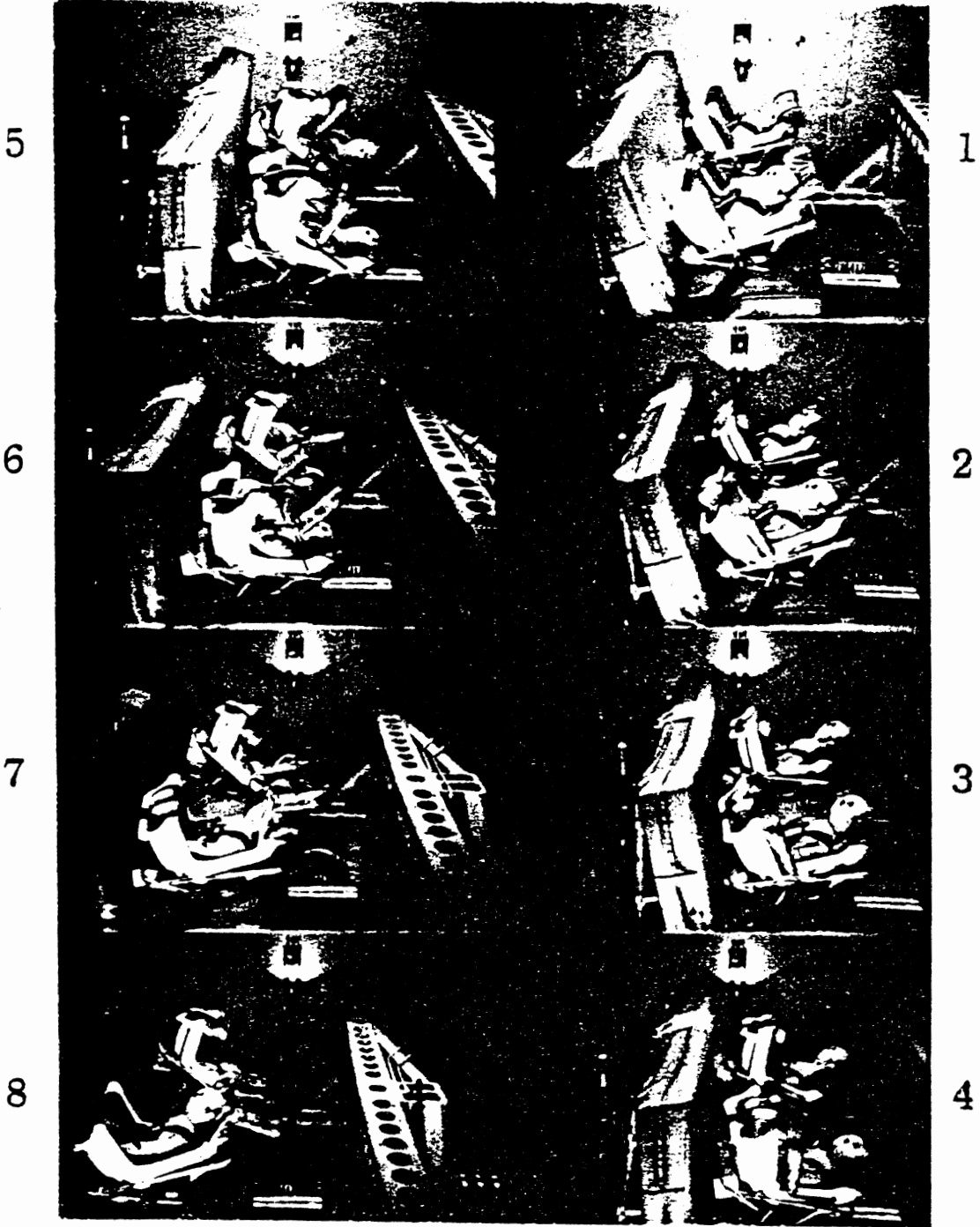
COMMENTS:



Pre-Test: Strolee 5975 Restraints



Pre-Test: Strolee 5975 Restraints



79K417

Strolee 5975 Restraints



Post-Test: Strolee 5975 Restraints

SLED TEST RESULTS

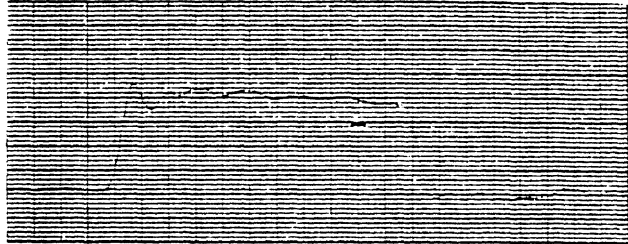
6-MONTH-OLD-INFANT DUMMY

TEST NO.: 79K 417

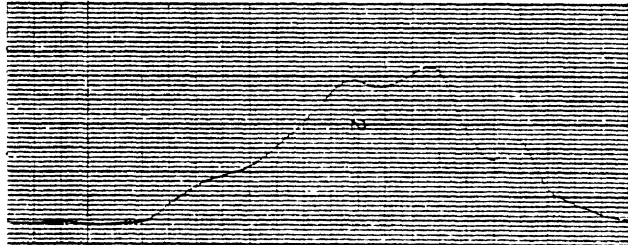
SLED VELOCITY: 29.2 MPH

	<u>PASSENGER SIDE</u>	<u>DRIVER SIDE</u>
DUMMY:	<u>NEW</u>	<u>OLD</u>
RESTRAINT:	<u>STROLEE (used)</u>	<u>STROLEE (used)</u>
TEST CONDITION: REAR FACING	<u>19° INCR. INITIAL ANGLE</u>	<u>20° INCR. INITIAL ANGLE</u>

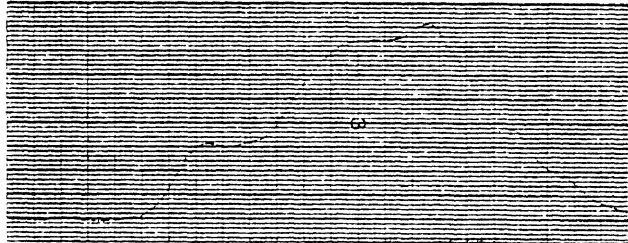
SLED PULSE
1.0 G/DIVISION
FILTERED CHANNEL
CLASS 60



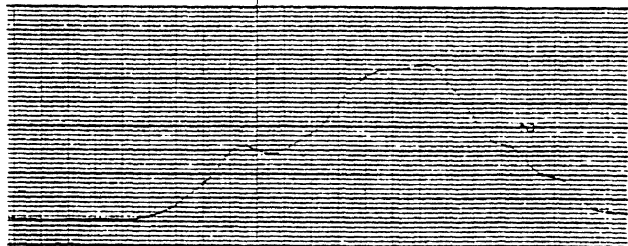
RT. BELT LOAD
PASSENGER SIDE
20 LB./DIVISION
FILTERED CHANNEL
CLASS 60



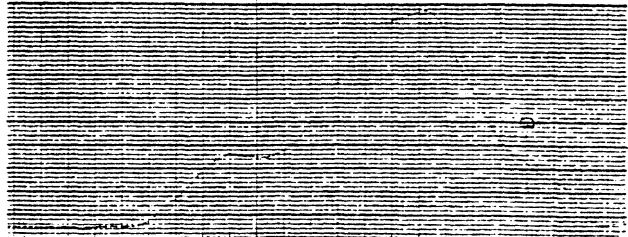
LT. BELT LOAD
PASSENGER SIDE
20 LB./DIVISION
FILTERED CHANNEL
CLASS 60



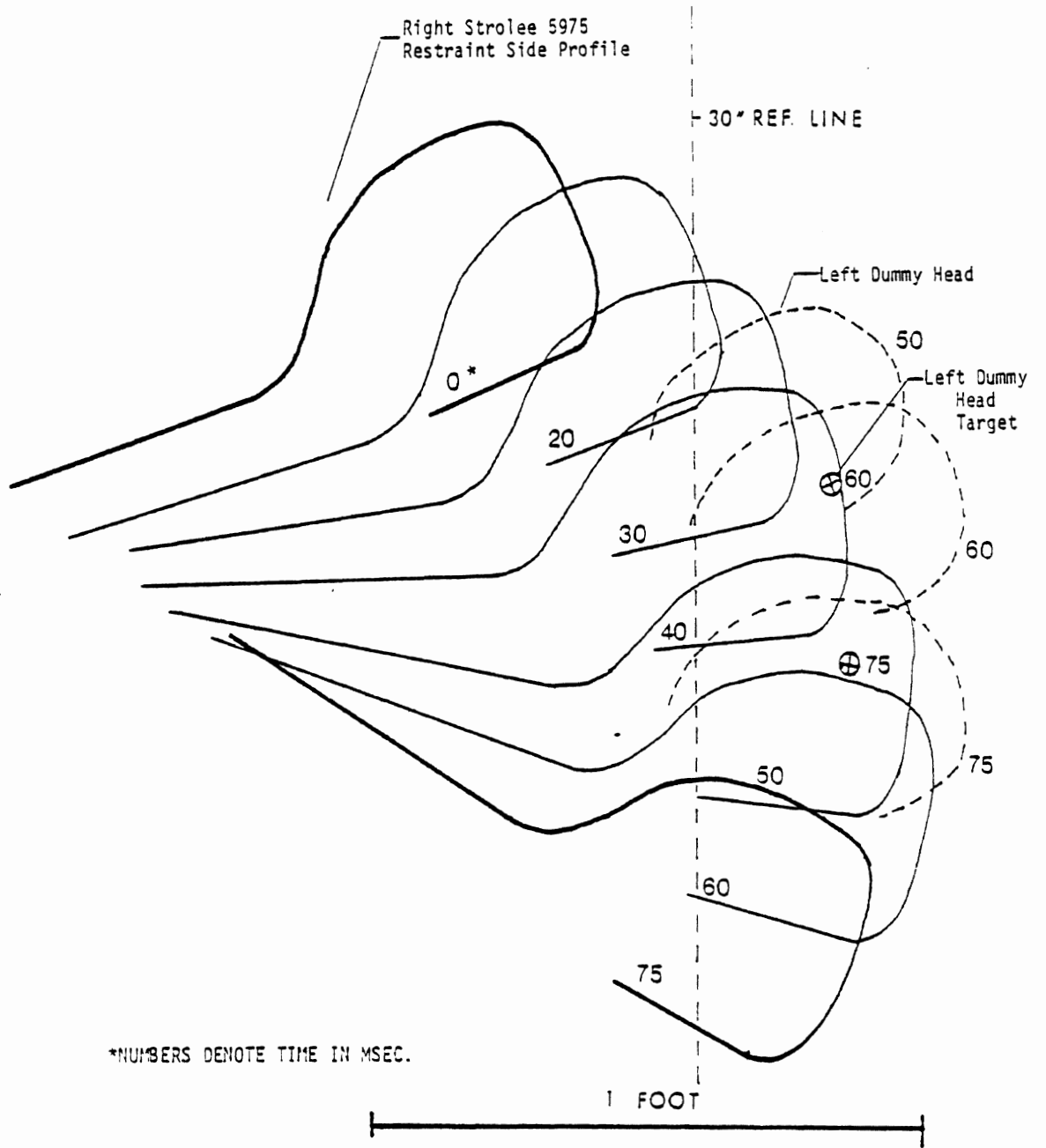
RT. BELT LOAD
DRIVER SIDE
20 LB./DIVISION
FILTERED CHANNEL
CLASS 60



LT. BELT LOAD
DRIVER SIDE
20 LB./DIVISION
FILTERED CHANNEL
CLASS 60



TEST 79K417

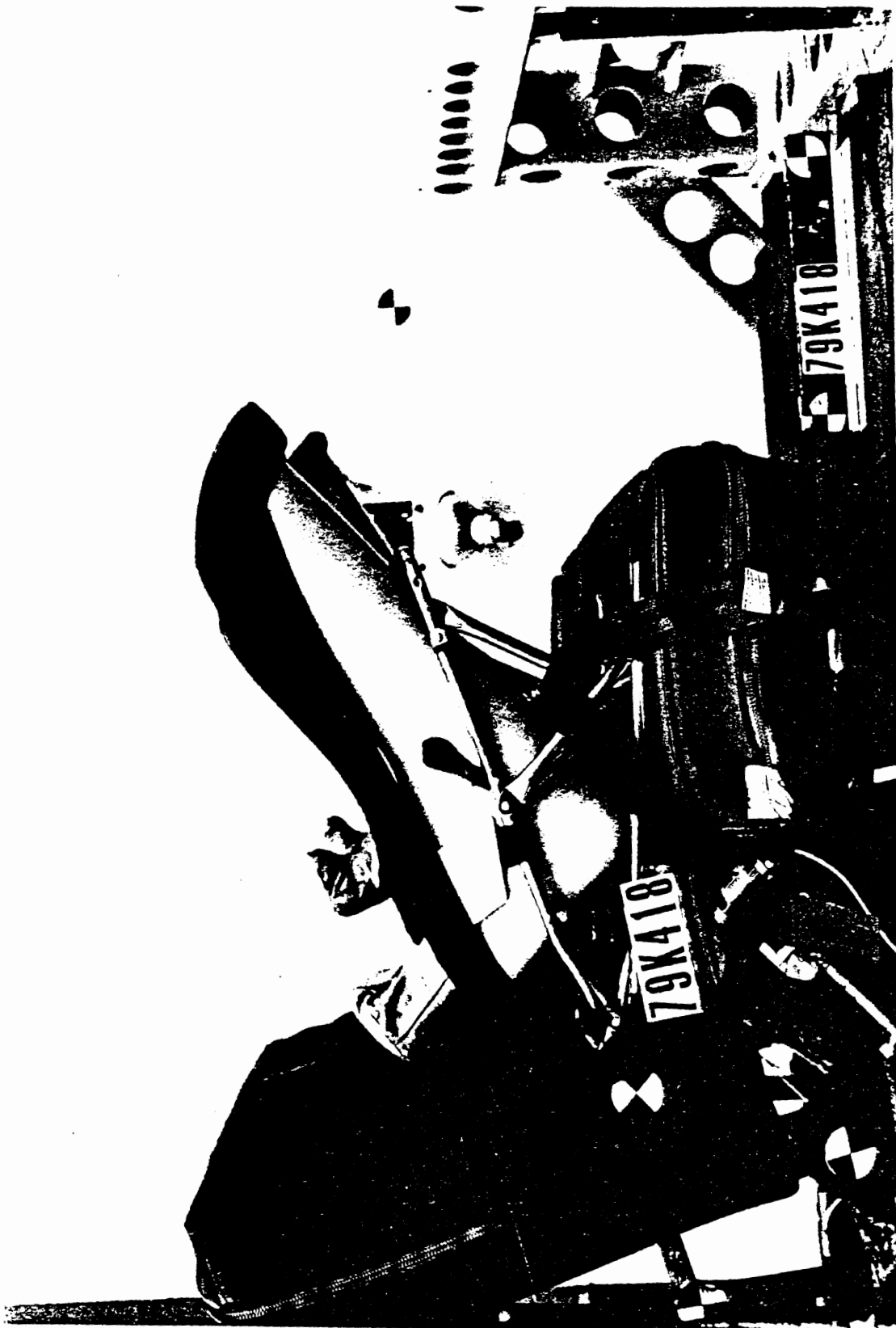


TEST NUMBER	<u>79K418</u>
RESTRAINT	<u>Bunny Bear</u>
DUMMY	<u>D - Old, P - New</u>
RESTRAINT TEST POSITION	<u>Driver, Passenger</u>
INITIAL TIPPING	<u>20°, 10°</u>
MAXIMUM ANGLE	<u>N.A., 143°</u>

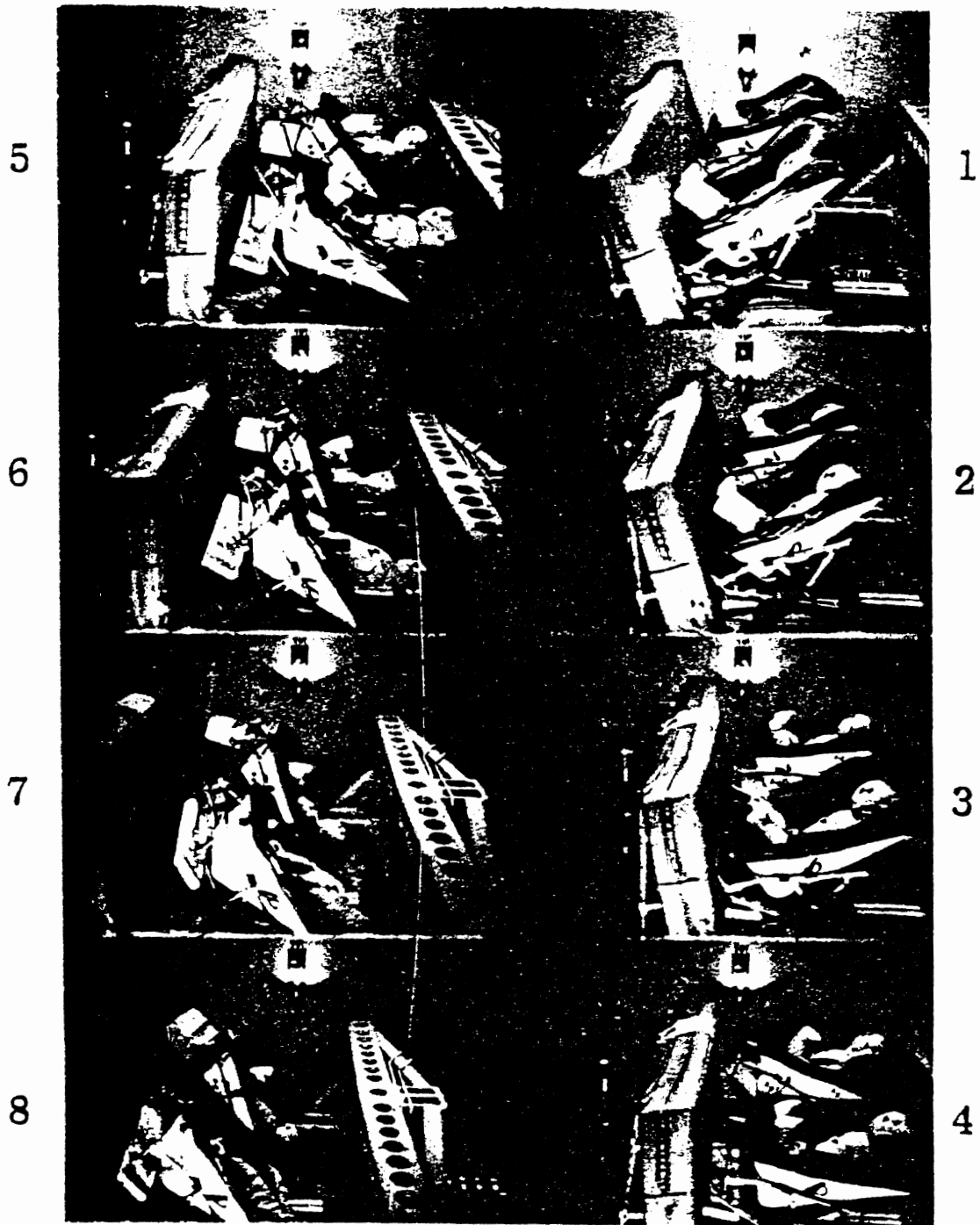
COMMENTS: The new dummy (passenger's side) was ejected and the old dummy (driver's side) was partially ejected.



Pre-Test: Bunny Bear Model 70R Restraints



Pre-Test: Bunny Bear Model 70R Restraints



79K418

Bunny Bear Model 70R Restraints



Post-Test: Bunny Bear Model 70R Restraints



Post-Test: Bunny Bear Model 70R Restraints

SLED TEST RESULTS

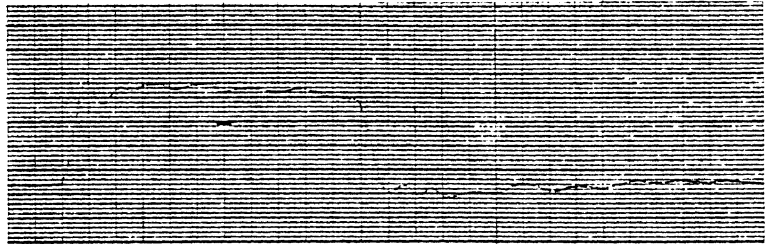
6-MONTH-OLD-INFANT DUMMY

TEST NO.: 79K 418

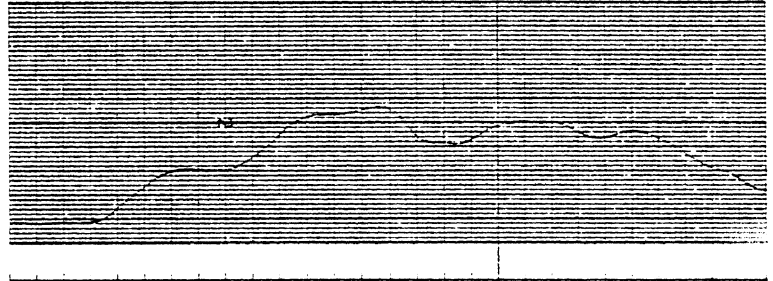
SLED VELOCITY: 29.4 MPH

	<u>PASSENGER SIDE</u>	<u>DRIVER SIDE</u>
DUMMY:	<u>NEW</u>	<u>OLD</u>
RESTRAINT:	<u>BUNNY BEAR (new)</u>	<u>BUNNY BEAR (used)</u>
TEST CONDITION: REAR FACING	<u>10° INCR. INITIAL ANGLE</u>	<u>20° INCR. INITIAL ANGLE</u>

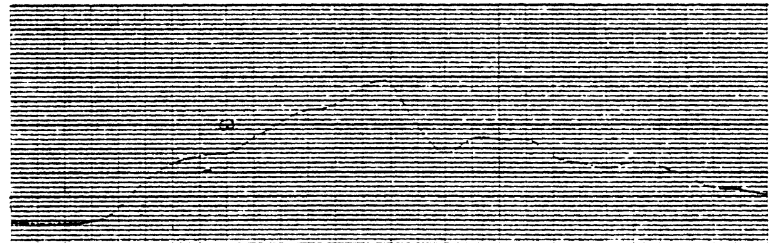
SLED PULSE
1.0 G/DIVISION
FILTERED CHANNEL
CLASS 60



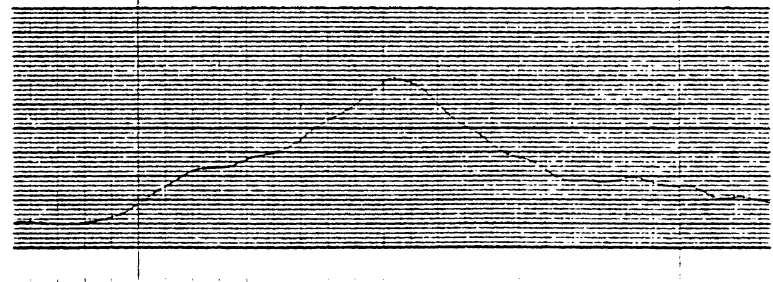
RT. BELT LOAD
PASSENGER SIDE
20 LB./DIVISION
FILTERED CHANNEL
CLASS 60



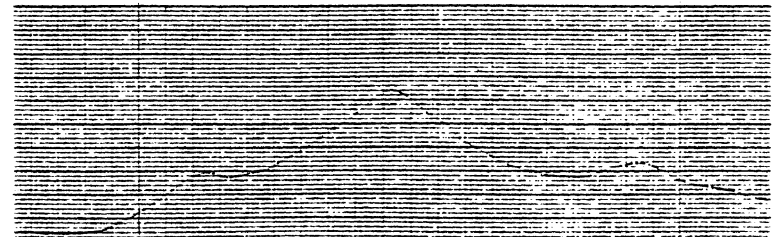
LT. BELT LOAD
PASSENGER SIDE
20 LB./DIVISION
FILTERED CHANNEL
CLASS 60



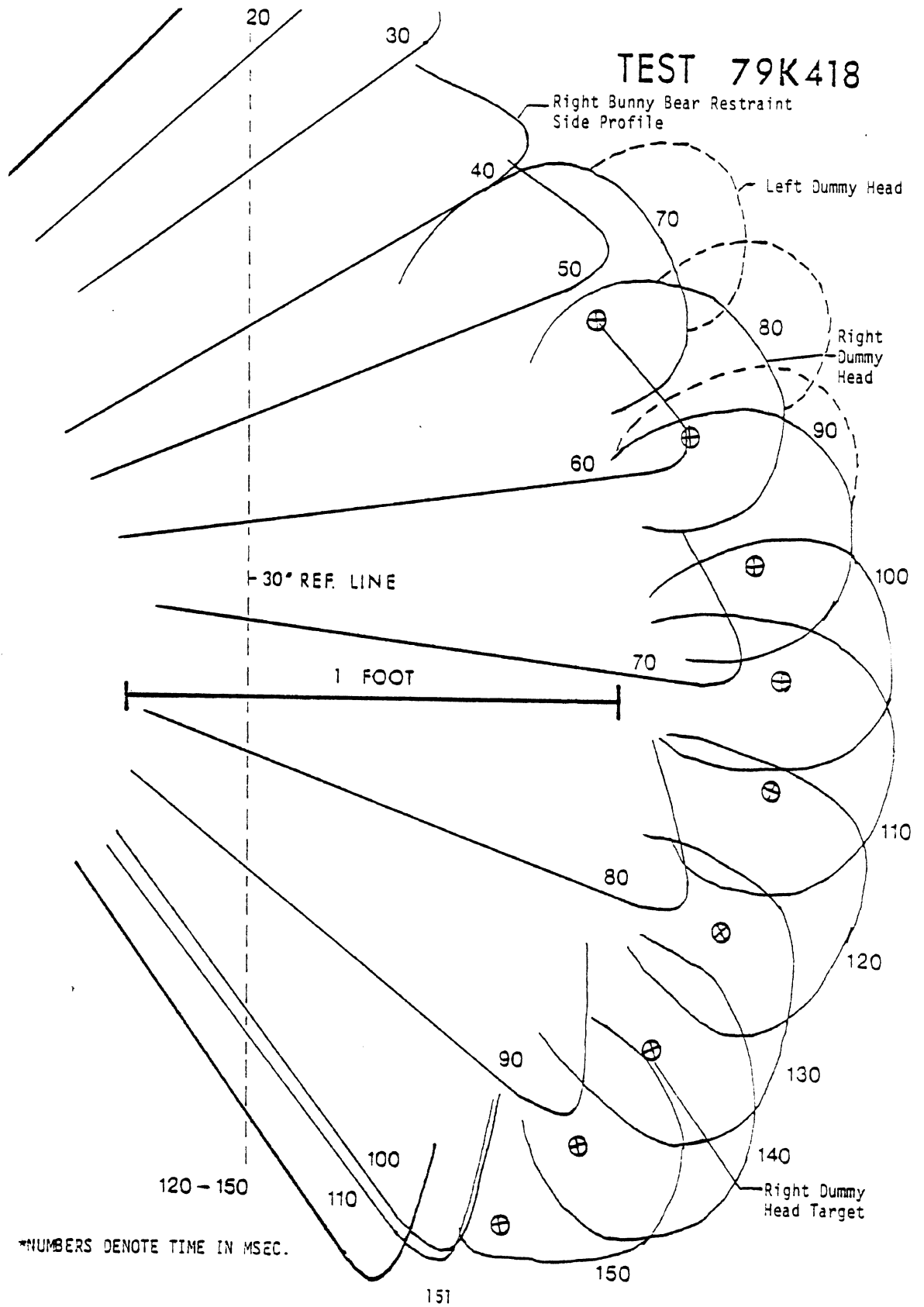
RT. BELT LOAD
DRIVER SIDE
20 LB./DIVISION
FILTERED CHANNEL
CLASS 60



LT. BELT LOAD
DRIVER SIDE
20 LB./DIVISION
FILTERED CHANNEL
CLASS 60

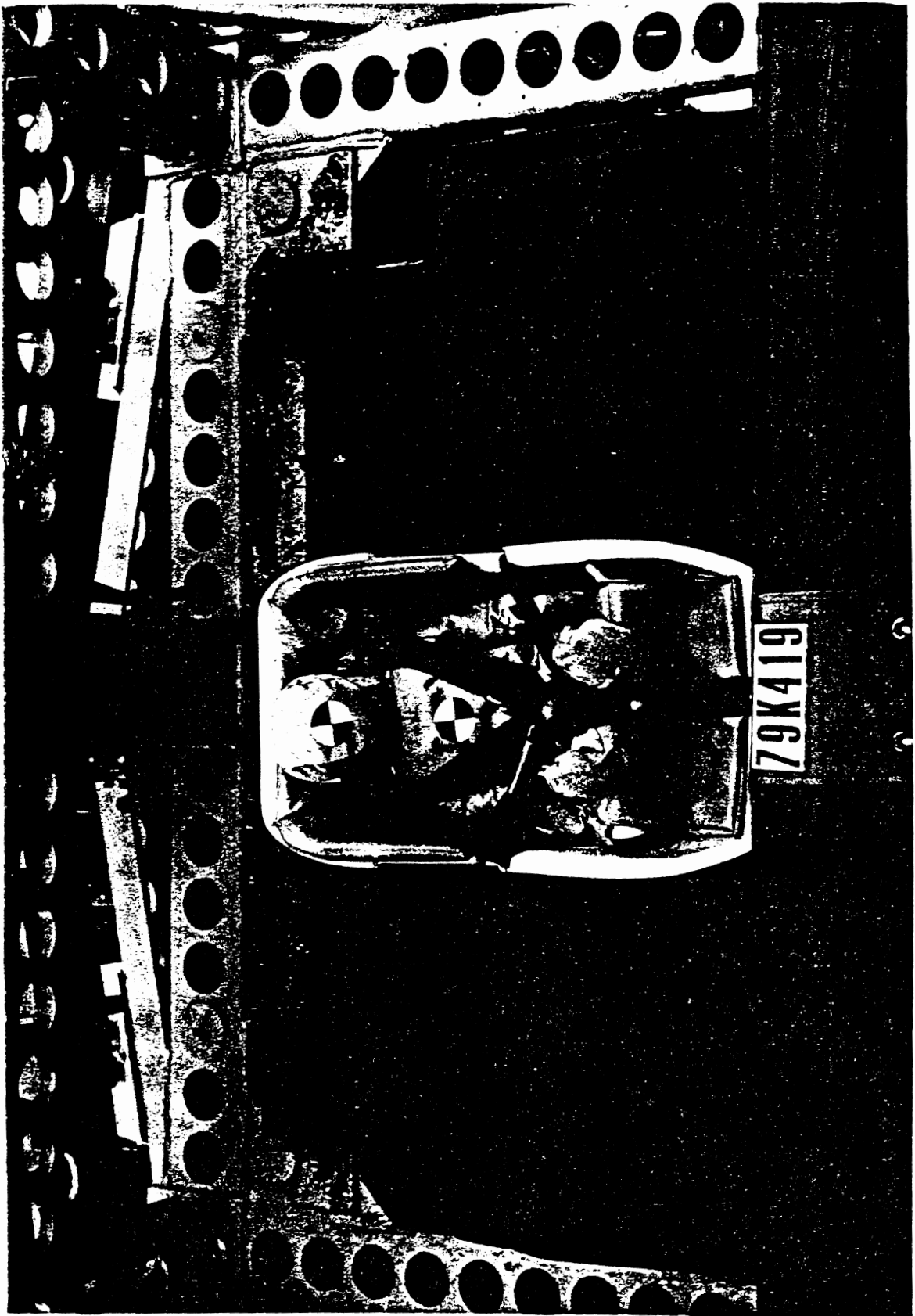


TEST 79K418



TEST NUMBER	<u>79K419</u>
RESTRAINT	<u>Peterson</u>
DUMMY	<u>New</u>
RESTRAINT TEST POSITION	<u>Center</u>
INITIAL TIPPING	<u>35°</u>
MAXIMUM ANGLE	<u>116°</u>

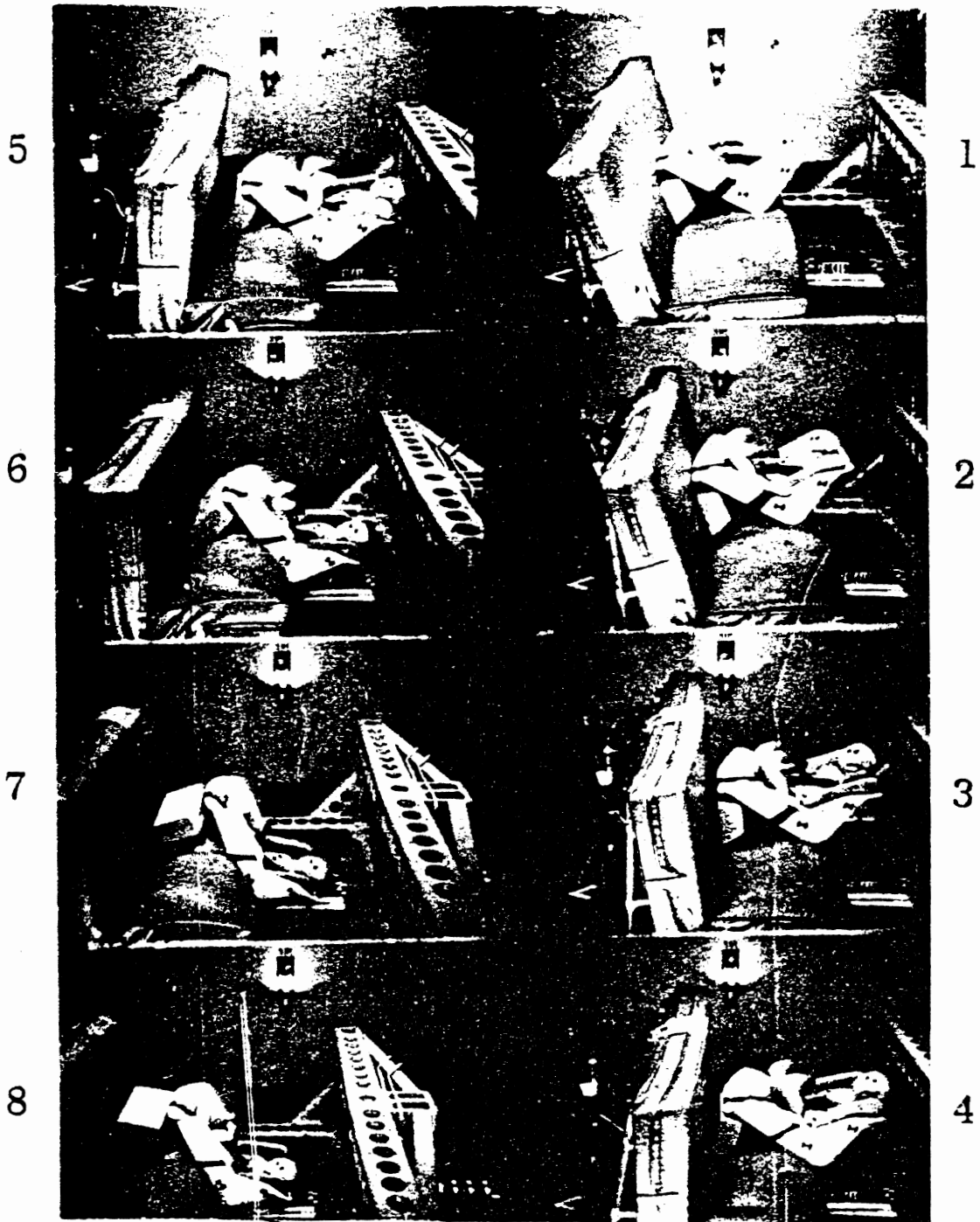
COMMENTS :



Pre-Test: Peterson 75 Restraint

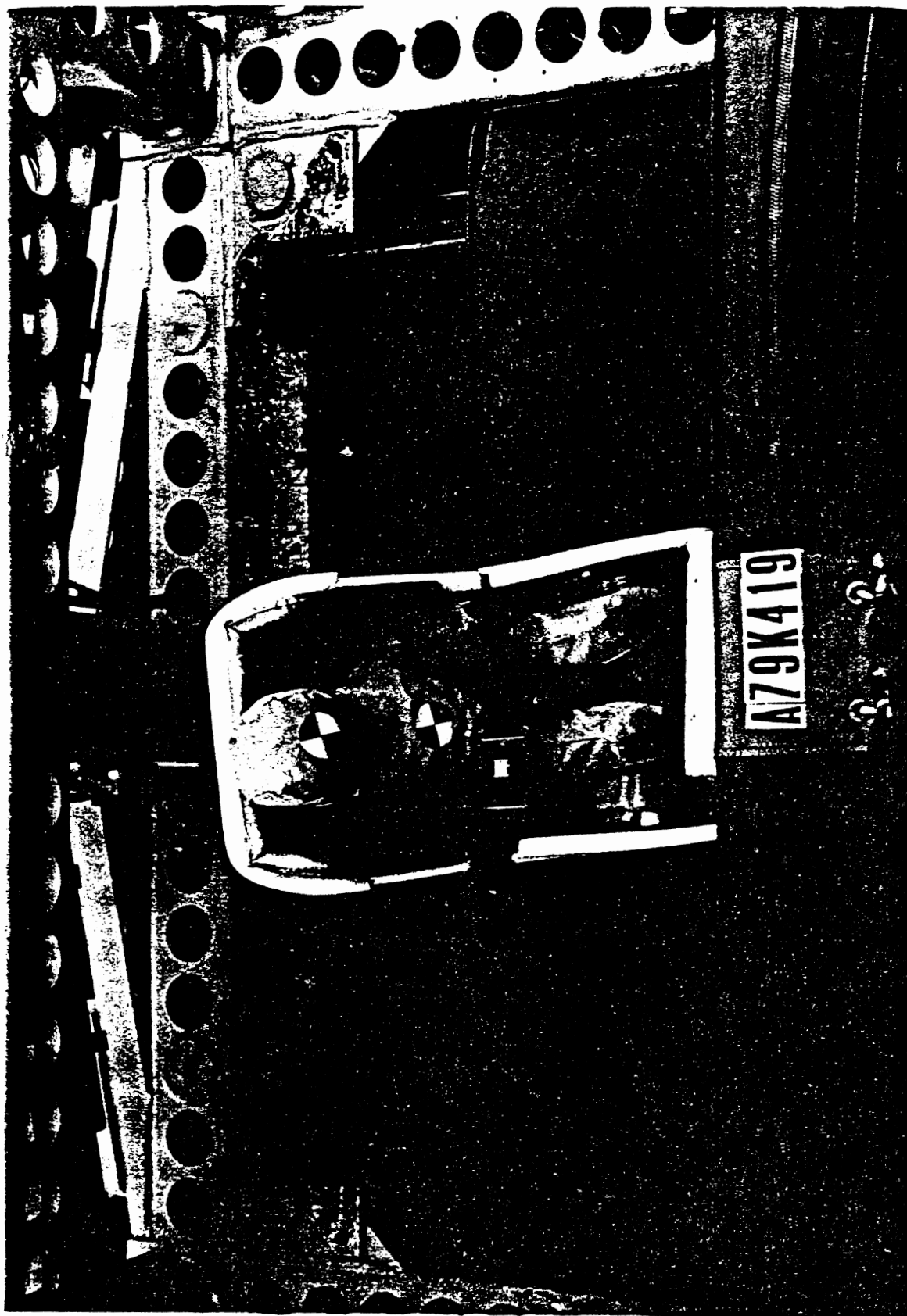


Pre-Test: Peterson 75 Restraint

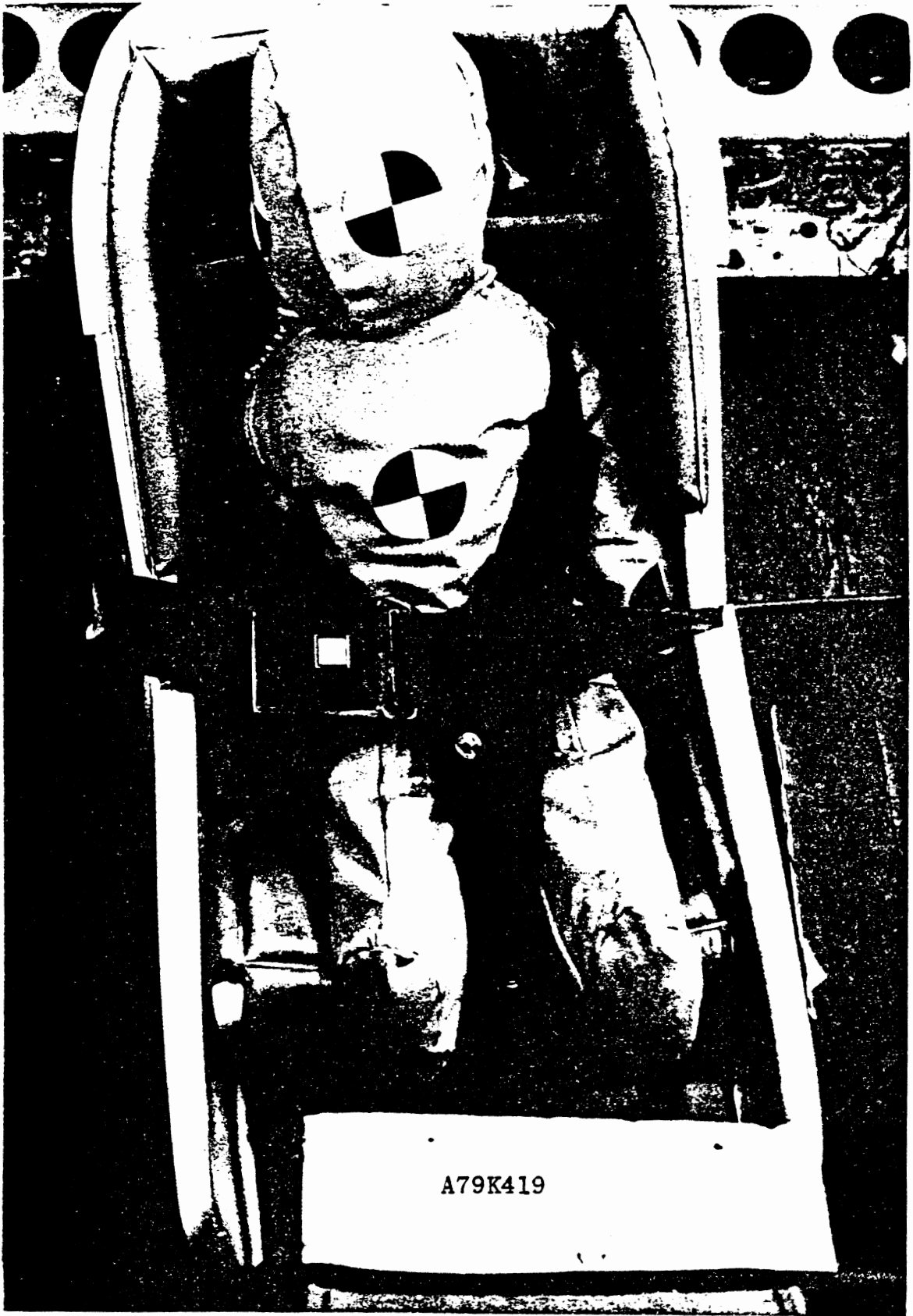


79K419

Peterson 75 Restraint



Post-Test: Peterson 75 Restraint



Post-Test: Peterson 75 Restraint



Post-Test: Peterson 75 Restraint

SLED TEST RESULTS

6-MONTH-OLD-INFANT DUMMY

TEST NO.: 79K 419

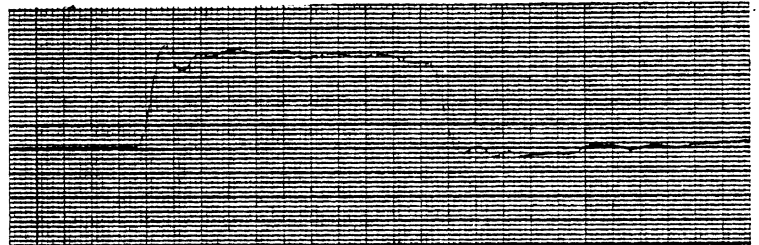
SLED VELOCITY: 29.5 MPH

DUMMY: NEW

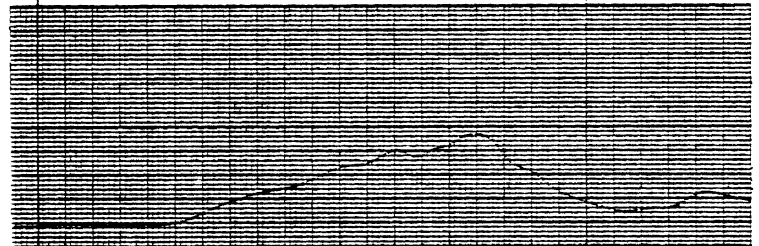
RESTRAINT: PETERSON (used)

TEST CONDITION: REAR FACING (35° INCR. INITIAL ANGLE)

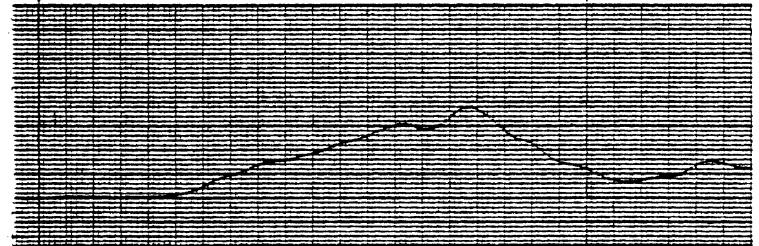
SLED PULSE
1.0 G/DIVISION
FILTERED CHANNEL
CLASS 60



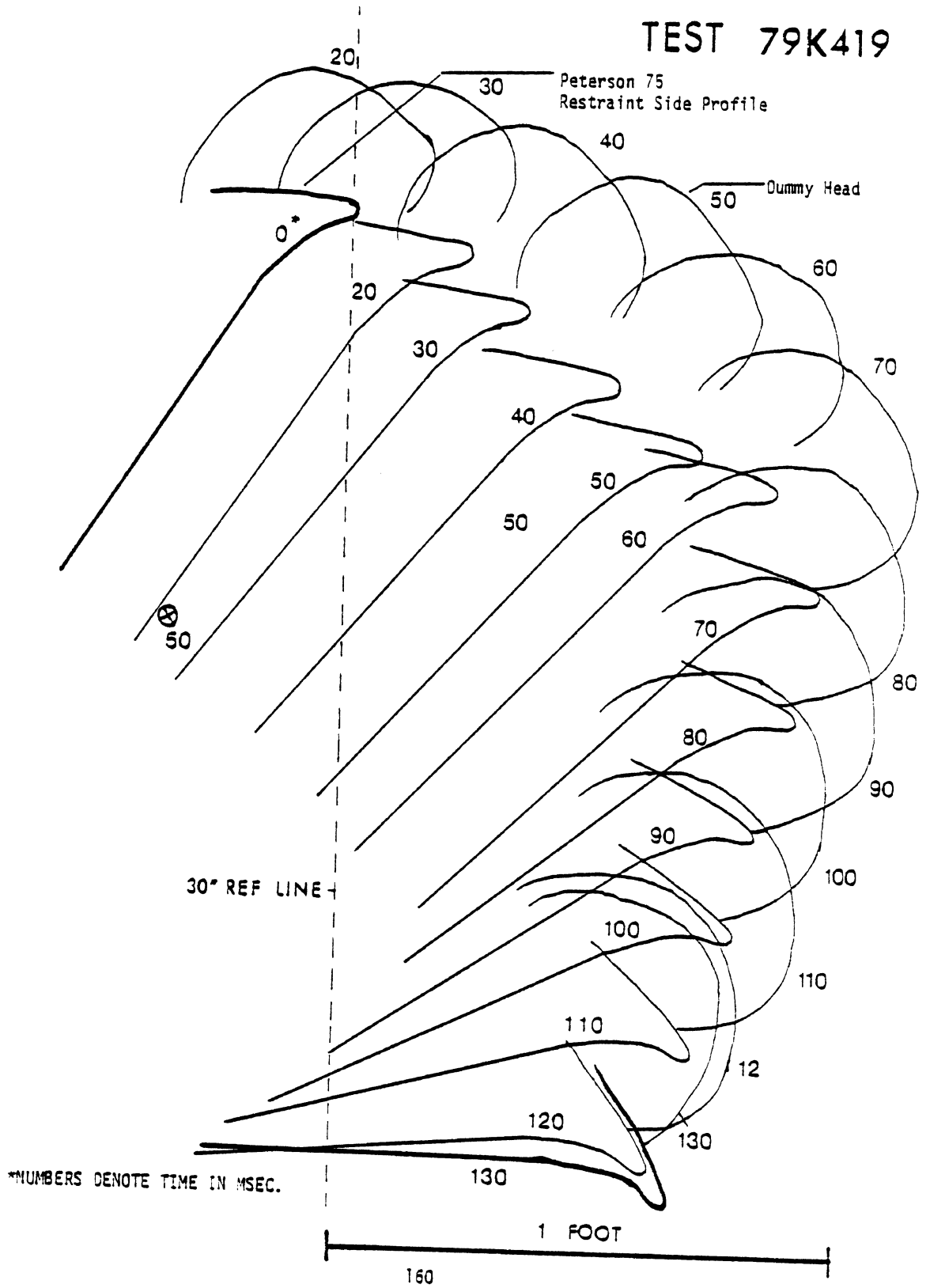
RT. BELT LOAD
CENTER POSITION
20 LB./DIVISION
FILTERED CHANNEL
CLASS 60



LT. BELT LOAD
CENTER POSITION
20 LB./DIVISION
FILTERED CHANNEL
CLASS 60



TEST 79K419



TEST NUMBER	<u>79K420</u>
RESTRAINT	<u>Bunny Bear</u>
DUMMY	<u>New</u>
RESTRAINT TEST POSITION	<u>Center</u>
INITIAL TIPPING	<u>Side Facing</u>
MAXIMUM ANGLE	<u>N.A.</u>

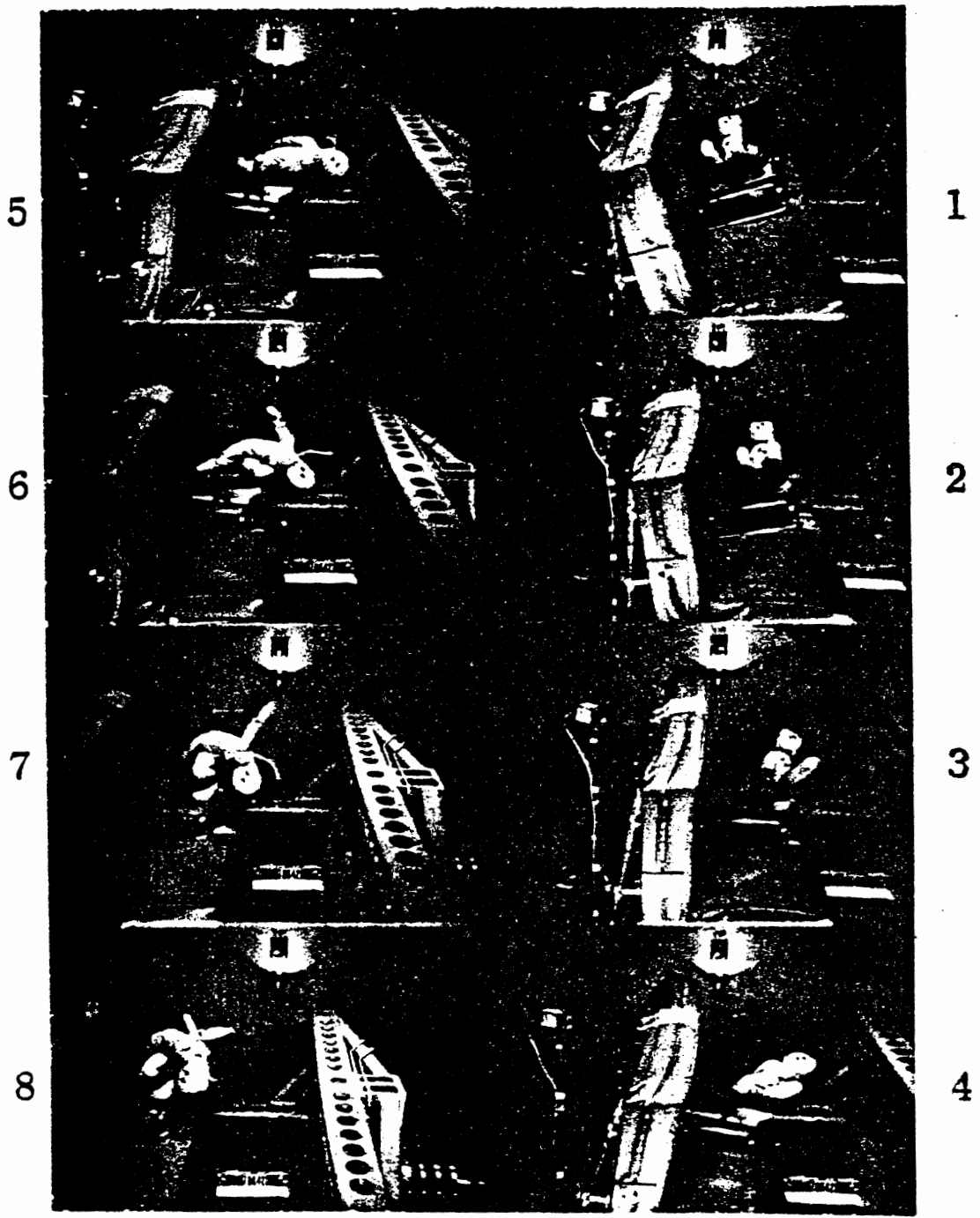
COMMENTS: The dummy was ejected.



Pre-Test: Bunny Bear Model 70R Restraint



Pre-Test: Bunny Bear Restraint



79K420

Bunny Bear 70R Restraint



Post-Test: Bunny Bear Model 70R Restraint

SLED TEST RESULTS

6-MONTH-OLD-INFANT DUMMY

TEST NO.: 79K420

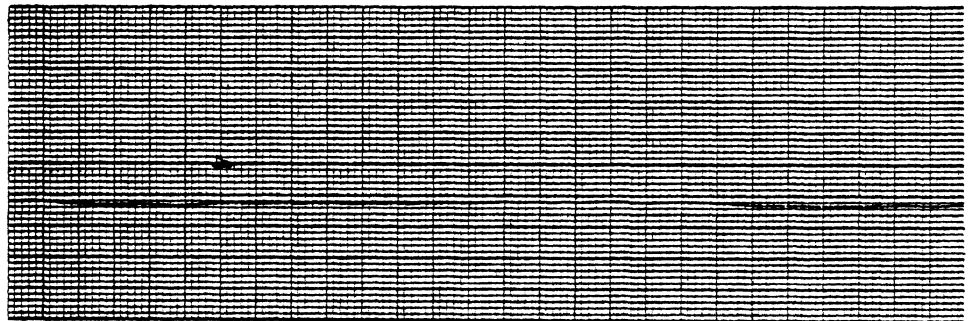
SLED VELOCITY: 29.7 MPH

DUMMY: NEW

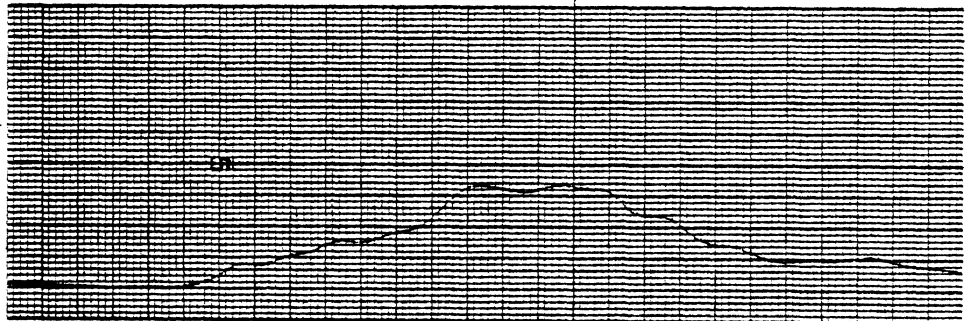
RESTRAINT: BUNNY BEAR (used)

TEST CONDITION: SIDE FACING

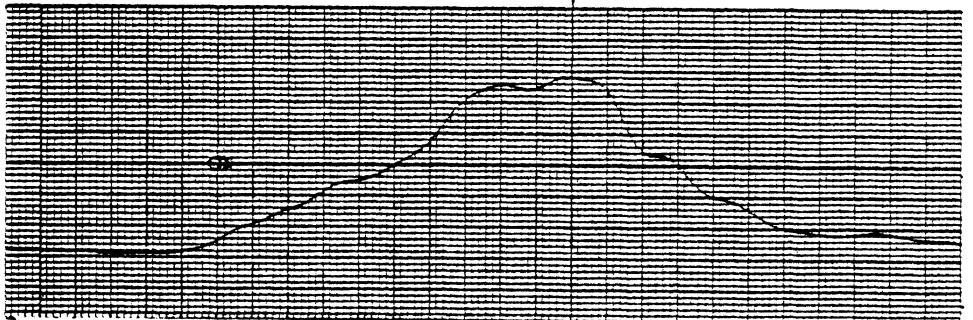
SLED PULSE
1.0 G/DIVISION
FILTERED CHANNEL
CLASS 60



RT. BELT LOAD
CENTER POSITION
20 LB./DIVISION
FILTERED CHANNEL
CLASS 60



LT. BELT LOAD
CENTER POSITION
20 LB./DIVISION
FILTERED CHANNEL
CLASS 60



TEST 79K420

