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REPORT NO. TRC-90-N09

NEW CAR ASSESSMENT PROGRAM (NCAP)
FRONTAL BARRIER IMPACT TEST

NISSAN MOTOR COMPANY, LTD

1991 NISSAN 300ZX

3-DOOR HATCHBACK

NHTSA NO MM5201

TRC TEST NO 910408

PREPARED BY

THE TRANSPORTATION RESEARCH CENTER OF OHIO

10820 STATE ROUTE 347

EAST LIBERTY, OHIO 43319



APRIL 30, 1991

FINAL REPORT

PREPARED FOR

U S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION

OFFICE OF MARKET INCENTIVES

ROOM NO. 5313 (NRM-22)

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WASHINGTON, D.C. 20590

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16. Abstract A 35 mph frontal load cell barrier impact test was conducted on a 1991 Nissan 300ZX 3-door hatchback, NHTSA No. MM5201, at the Transportation Research Center of Ohio on April 8, 1991. This test was conducted to obtain new car assessment and research data indicant of FMVSS No 208 performance. The barrier impact velocity was 35.0 mph. The vehicle's maximum crush was 23.6 inches. The ambient temperature was 74° F. The driver's head injury criteria (HIC) was 765. The driver's maximum chest deceleration over three (3) milliseconds was 54.1 g. The driver's maximum left and right femur forces were 1495 pounds and 1415 pounds, respectively. The passenger's head injury criteria (HIC) was 1235. The passenger's maximum chest deceleration over three (3) milliseconds was 47.2 g. The passenger's maximum left and right femur forces were 1668 pounds and 1552 pounds, respectively.			
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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

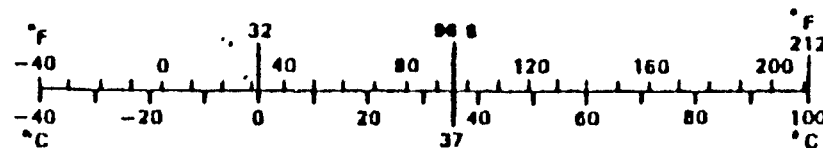


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SECTION 1.0

PURPOSE AND TEST PROCEDURE

PURPOSE

This 35 mph frontal barrier impact test is part of the New Car Assessment Program (NCAP) conducted for the National Highway Traffic Safety Administration's (NHTSA) Office of Market Incentives by the Transportation Research Center of Ohio (TRC) under Contract No DTNH22-90-D-22121

The purpose of this test was to obtain new car assessment and research data for vehicle crashworthiness and occupant restraint system performance for the subject vehicle, a 1991 Nissan 300ZX 3-door hatchback, NHTSA No MM5201, at an impact speed in excess of the current 30 mph FMVSS 208 requirements.

TEST PROCEDURE

This test was conducted in accordance with NHTSA's Laboratory Indicant Test Procedure, New Car Assessment Program, dated January 1, 1990. Data was obtained indicant of FMVSS 208, "Occupant Crash Protection" performance.

The test vehicle was instrumented with seven (7) accelerometers to measure longitudinal axis accelerations and two (2) accelerometers to measure vertical axis accelerations. The driver's and passenger's restraint systems were instrumented with four (4) seat belt load cells to measure lap belt tension and shoulder belt tension, two (2) string potentiometers to measure shoulder belt displacement, and two (2) linear potentiometers to measure shoulder belt stretch. The vehicle impacted a frontal load cell barrier instrumented with thirty-six (36) barrier face load cells. The vehicle's specified impact velocity range was 34.5 to 35.5 mph.

The test vehicle contained two (2) Part 572 B 50th percentile adult male anthropomorphic test devices (dummies). The dummies were positioned in the front outboard designated seating positions according to the dummy placement procedures specified in Appendices VII and VIII of the Laboratory Indicant Test Procedure.

Both dummies were instrumented with head and chest accelerometers to measure longitudinal, lateral, and vertical accelerations, and with left and right femur load cells to measure axial forces.

The sixty-nine (69) data channels were multiplexed and recorded on two (2) 14-track tape drives. The data was digitally sampled at 8000 samples per second and processed per section IP11 of the Laboratory Indicant Test Procedure.

The crash event was recorded by one (1) real-time panning motion picture camera and sixteen (16) high-speed motion picture cameras. The pre- and post-test conditions were recorded by one (1) real-time motion picture camera.

The vehicle, occupant, and load cell barrier data are presented in Section 2 0 The vehicle, occupant, and camera measurements are presented in Section 3 0 Appendix A contains the still photographic prints Appendix B contains the dummy, vehicle, and load cell barrier data plots Appendix C contains the dummy certification data Appendix D contains miscellaneous test information Appendix E contains the restraint system instructions from the owner's manual

SECTION 2 0

FRONTAL BARRIER IMPACT TEST SUMMARY

TEST RESULTS SUMMARY

This frontal load cell barrier test was conducted at TRC on April 8, 1991

The test vehicle, a 1991 Nissan 300ZX 3-door hatchback, NHTSA No MM5201, was equipped with a 3.0 liter longitudinal engine, manual transmission, power steering, and power brakes. The vehicle's test weight was 3733 pounds. The vehicle's impact speed was 35.0 mph. The vehicle sustained 23.6 inches of static crush during the impact.

The driver's head injury criteria (HIC) was 765. The driver's maximum chest resultant acceleration over three (3) milliseconds was 54.1 g. The driver's maximum left and right femur forces were 1495 pounds and 1415 pounds, respectively.

The passenger's HIC was 1235. The passenger's maximum chest resultant acceleration over three (3) milliseconds was 47.2 g. The passenger's maximum left and right femur forces were 1668 pounds and 1552 pounds, respectively.

No fluid spilled from the vehicle's fuel system following the crash test event.

DATA ACQUISITION EXPLANATIONS

The right front passenger's seat belt extension potentiometer, SBED2, data was lost after 125 milliseconds due to the potentiometer's cable being damaged

TABLE 1 CRASH TEST SUMMARY

NHTSA NO : MM5201 TEST TYPE. Frontal Load Cell Barrier

TEST DATE. 04/08/91 TEST TIME 1547 AMBIENT TEMP (°F): 74

VEHICLE YEAR/MAKE/MODEL/BODY STYLE 1991/Nissan/300ZX/3-door hatchback

VEHICLE TEST WEIGHT (LBS). 3733 .

IMPACT ANGLE (DEG)*: 0

IMPACT VELOCITY (MPH)**. PRIMARY = 35 0 SECONDARY = 35 0

MAXIMUM STATIC CRUSH (IN). 23.6

AVERAGE REBOUND (IN): 14 6

DUMMIES	Driver #713	Passenger #826
TYPE.	Part 572 B	Part 572 B
LOCATION.	Left front	Right front
RESTRAINT.	Driver's airbag and 3-point unbelt	3-point unbelt

NUMBER OF DATA CHANNELS. 69

NUMBER OF CAMERAS HIGH-SPEED 16 . REAL-TIME 2

*With respect to tow track centerline

**Speed trap measurement ($\pm$.05 mph accuracy)

TABLE 2 TEST VEHICLE INFORMATION

VEHICLE MANUFACTURER Nissan Motor Co , Ltd

MAKE/MODEL Nissan/300ZX VIN JN1RZ24H6MX500737

BODY STYLE 3-door hatchback MODEL YEAR 1991

NHTSA NO MM5201 COLOR Grey

ENGINE DATA TYPE Longitudinal CYLINDERS 6 DISPLACEMENT 3 0 liter

TRANSMISSION DATA 5 SPEED, X MANUAL, AUTOMATIC, FWD, X RWD, 4WD

DATE VEHICLE RECEIVED: 02/08/91 ODOMETER READING: 96 0

DEALER'S NAME AND ADDRESS Al Castrucci Nissan
3013 Mall Park Drive
Dayton, OH 45459

ACCESSORIES

POWER STEERING	Yes	AUTOMATIC TRANSMISSION	No
POWER BRAKES	Yes	AUTOMATIC SPEED CONTROL	Yes
POWER SEATS	No	TILTING STEERING WHEEL	No
POWER WINDOWS	Yes	TELESCOPING STEERING WHEEL	No
TINTED GLASS	Yes	AIR CONDITIONING	Yes
RADIO	Yes	ANTI-SKID BRAKE	No
CLOCK	Yes	REAR WINDOW DEFROSTER	Yes
OTHER	Driver's airbag		
	Bose audio system		

REMARKS

- 1 IS THE VEHICLE STOCK THROUGHOUT? Yes
- 2 DOES VEHICLE SHOW EVIDENCE OF PRIOR ACCIDENT HISTORY? No
- 3 DOES VEHICLE SHOW ANY SIGNIFICANT CORROSION? No
- 4 CONDITION OF THE FRONT/REAR BUMPER AND FRAME Good

CERTIFICATION DATA FROM VEHICLE'S LABEL

VEHICLE MANUFACTURED BY Nissan Motor Co , Ltd

DATE OF MANUFACTURE 08/90 VIN JN1RZ24H6MX500737

GVWR 3795 LBS

GAWR FRONT 1960 LBS , REAR 1835 LBS

TABLE 2 TEST VEHICLE INFORMATION CONT'D

TIRES ON VEHICLE (MFR., LINE, SIZE): Michelin Sport XGTV P225/50R16

TIRE PRESSURE WITH MAXIMUM CAPACITY VEHICLE LOAD: FRONT: 44 PSI
REAR: 44 PSI

SPARE TIRE (MFR , LINE, SIZE): Bridgestone Foldflex Favorite 165/80 15 FS

TYPE OF SEATS FRONT Bucket
REAR: None

TYPE OF FRONT SEAT BACKS: Manually adjustable

MAXIMUM WIDTH: 70 9 INCHES

WHEELBASE: 96 5 INCHES

LOCATION OF LABEL STATING TIRE & CAPACITY DATA:

The label was located on the inside of the console lid.

TIRE & CAPACITY DATA FROM VEHICLE'S LABEL.

RECOMMENDED TIRE SIZE: P225/50R16 91V

RECOMMENDED COLD TIRE PRESSURE: FRONT: 33 PSI; REAR: 36 PSI

DESIGNATED SEATING CAPACITY: 2 FRONT 0 REAR 2 TOTAL

VEHICLE CAPACITY WEIGHT. 390 LBS. .

TEST VEHICLE ATTITUDE (ALL MEASUREMENTS ARE IN INCHES).

DELIVERED ATTITUDE: LF 26 5; RF 26.6; LR 26.4; RR 26.4

PRE-TEST ATTITUDE: LF 26.6; RF 26.8; LR 26.0; RR 26.0

POST-TEST ATTITUDE: LF 27.8; RF 27.0; LR 24 9; RR 25 4

TABLE 2 TEST VEHICLE INFORMATION CONT'D

WEIGHT OF TEST VEHICLE AS RECEIVED (WITH MAXIMUM FLUIDS):

RIGHT FRONT	749 LBS	RIGHT REAR	914 LBS
LEFT FRONT	759 LBS	LEFT REAR	902 LBS
TOTAL FRONT WEIGHT	1508 LBS	(45 4% OF TOTAL VEHICLE WEIGHT)	
TOTAL REAR WEIGHT	1816 LBS.	(54 6% OF TOTAL VEHICLE WEIGHT)	
TOTAL DELIVERED WEIGHT 3324 LBS			

CALCULATION OF TEST VEHICLE'S TARGET TEST WEIGHT

RCLW = RATED CARGO AND LUGGAGE WEIGHT*

UDW = UNLOADED DELIVERED WEIGHT (3324 LBS)

VCW = VEHICLE CAPACITY WEIGHT (390 LBS)

DSC = DESIGNATED SEATING CAPACITY (2)

$RCLW* = VCW - 150 (DSC) = 390 - 150(2) = 90 \text{ LBS}$

$TARGET \text{ TEST WEIGHT} = UDW + RCLW* + (NO \text{ OF HYBRID II DUMMIES} \times 164 \text{ LBS/DUMMY})$

$TARGET \text{ TEST WEIGHT} = 3324 + 90 + 328$

$TARGET \text{ TEST WEIGHT} = 3742 \text{ LBS}$

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND 81 LBS OF CARGO WEIGHT

RIGHT FRONT	946 LBS	RIGHT REAR	920 LBS
LEFT FRONT	963 LBS	LEFT REAR	904 LBS
TOTAL FRONT WEIGHT	1909 LBS	(51 1% OF TOTAL VEHICLE WEIGHT)	
TOTAL REAR WEIGHT	1824 LBS	(48.9% OF TOTAL VEHICLE WEIGHT)	
TOTAL TEST WEIGHT	3733 LBS	(0.2% UNDER TARGET TEST WEIGHT)	

WEIGHT OF BALLAST SECURED IN VEHICLE CARGO AREA 0 LBS

COMPONENTS REMOVED TO MEET TARGET TEST WEIGHT Hatch lid, rear bumper, right muffler

CG = 52 2 INCHES REARWARD OF FRONT WHEEL CENTERLINE

*Cargo weight for multi-purpose passenger vehicles, trucks, and buses is the vehicle's rated cargo and luggage weight from the vehicle's label or 300 pounds, whichever is less.

TABLE 3 POST-IMPACT DATA

TEST NUMBER. 910408 NHTSA NO. MM5201
TEST DATE. 04/08/91 TEST TIME. 1547
TEST TYPE Frontal load cell barrier IMPACT ANGLE 0°
AMBIENT TEMPERATURE AT IMPACT AREA 74° F
TEMPERATURE IN OCCUPANT COMPARTMENT: 74° F
IMPACT VELOCITY. PRIMARY = 35 0 MPH SECONDARY = 35 0 MPH
(SPECIFIED RANGE = 34 5 TO 35.5 MPH)

DISTANCE FROM VEHICLE TO BARRIER: ENTERING VELOCITY TRAP = 26.0 IN
EXITING VELOCITY TRAP = 2 0 IN

TEST VEHICLE STATIC CRUSH (ALL MEASUREMENTS ARE IN INCHES).

OVERALL LENGTH OF TEST VEHICLE. PRE-TEST. L 164.4; C 168 6; R 164.4
POST-TEST. L 145 8; C 145 0; R 143.9
TOTAL CRUSH. L 18.6; C 23.6; R 20.5
AVERAGE CRUSH: 20 9

TEST VEHICLE REBOUND FROM FLAT BARRIER (ALL MEASUREMENTS ARE IN INCHES).

DISTANCE FROM TEST VEHICLE TO BARRIER. L 14 8; C 14.6, R 14 5, AVG 14 6

NHTSA NO . MM5201

—

2000

223

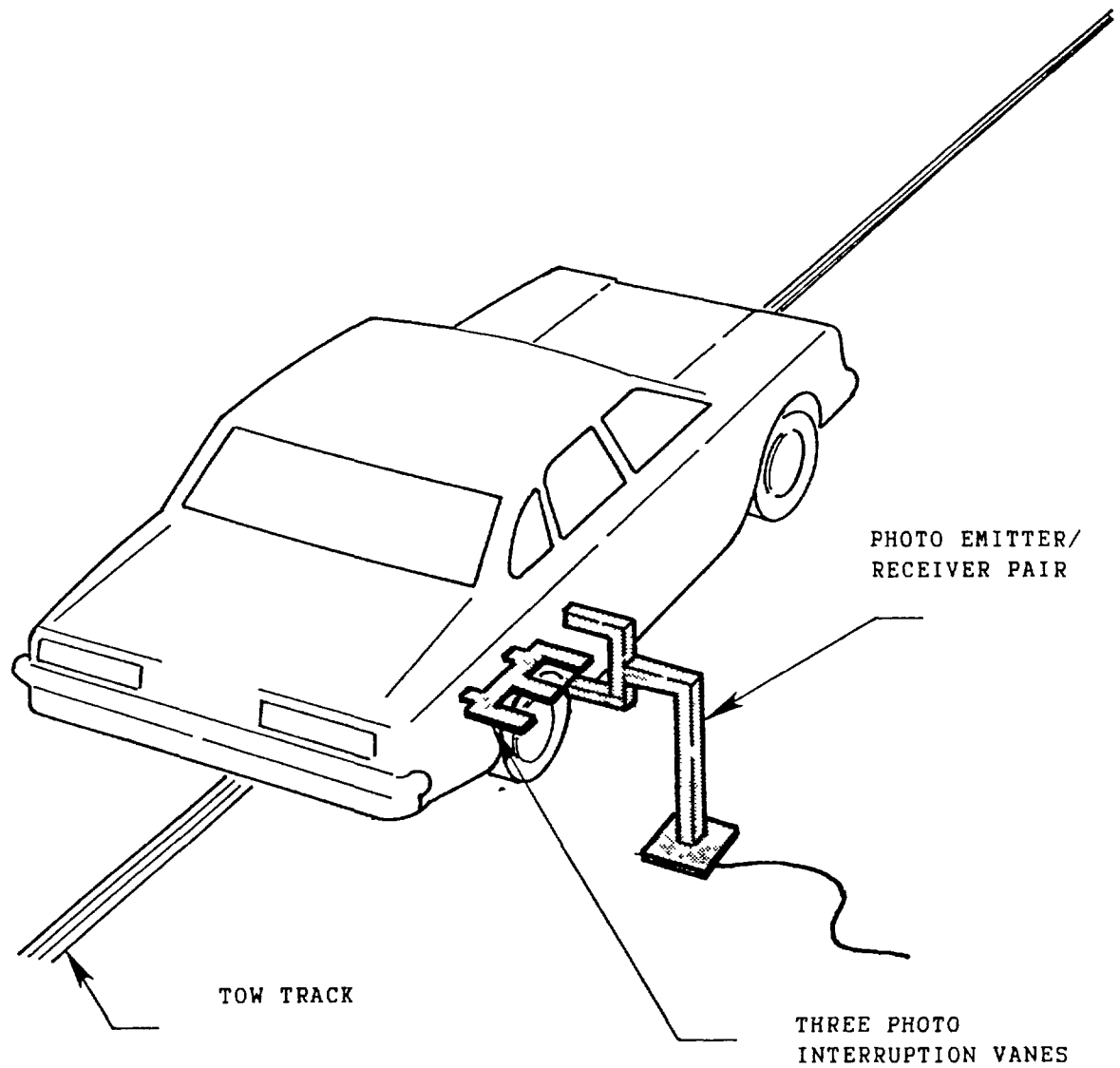
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Keywords:

FUEL INJECTION. Yes

—

FIGURE 1 IMPACT VELOCITY MEASUREMENT SYSTEM



The final vane clears emitter/receiver two inches before impact

The vanes have one foot spacing

FIGURE 2 ACCIDENT INVESTIGATION DIVISION DATA
FOR 35 MPH FRONTAL BARRIER IMPACT

VEHICLE MAKE/MODEL/BODY STYLE: Nissan/300ZX/3-door hatchback
 VEHICLE NHTSA NO MM5201, VIN. JN1RZ24H6MX500737
 MODEL YEAR: 1991, BUILD DATE: 08/90; TEST DATE 04/08/91
 VEHICLE SIZE CATEGORY: Two seaters, TEST WEIGHT 3733 LBS
 VEHICLE WHEELBASE 96 5 INCHES
 MAXIMUM WIDTH 70.9 INCHES
 FRONT OVERHANG: 36 3 INCHES

COLLISION DEFORMATION
 CLASSIFICATION (CDC) CODE: 12FDEW3

CRUSH DEPTH
 MEASUREMENTS

C1 =	<u>18 6</u>	INCHES
C2 =	<u>23 4</u>	INCHES
C3 =	<u>23 5</u>	INCHES
C4 =	<u>23 5</u>	INCHES
C5 =	<u>23 2</u>	INCHES
C6 =	<u>20 5</u>	INCHES

MIDPOINT OF DAMAGE: D ☒ VEHICLE CENTERLINE
☐ (LONGITUDINAL)

LENGTH OF DAMAGED
 REGION: L = 47 0 INCHES

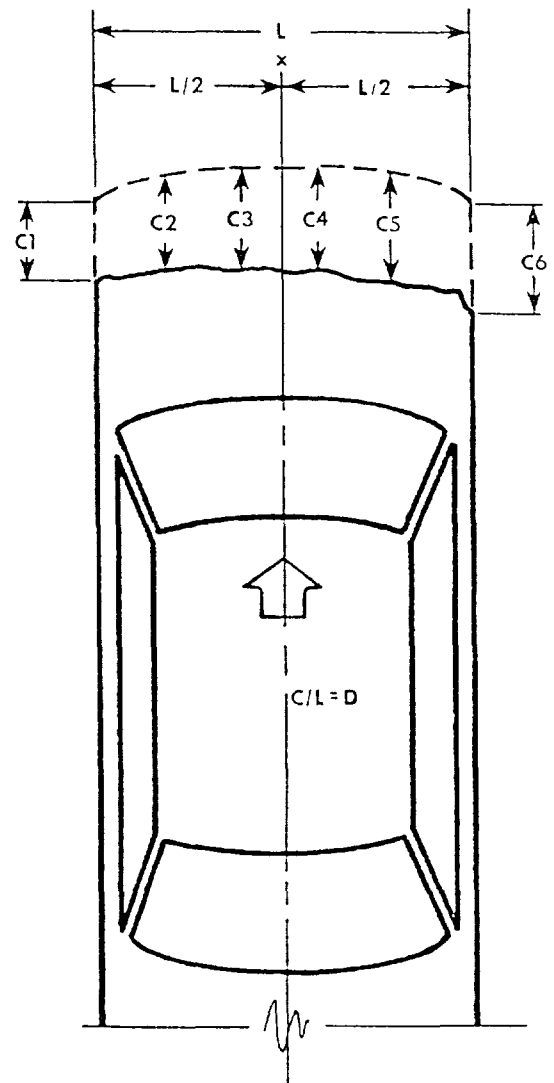
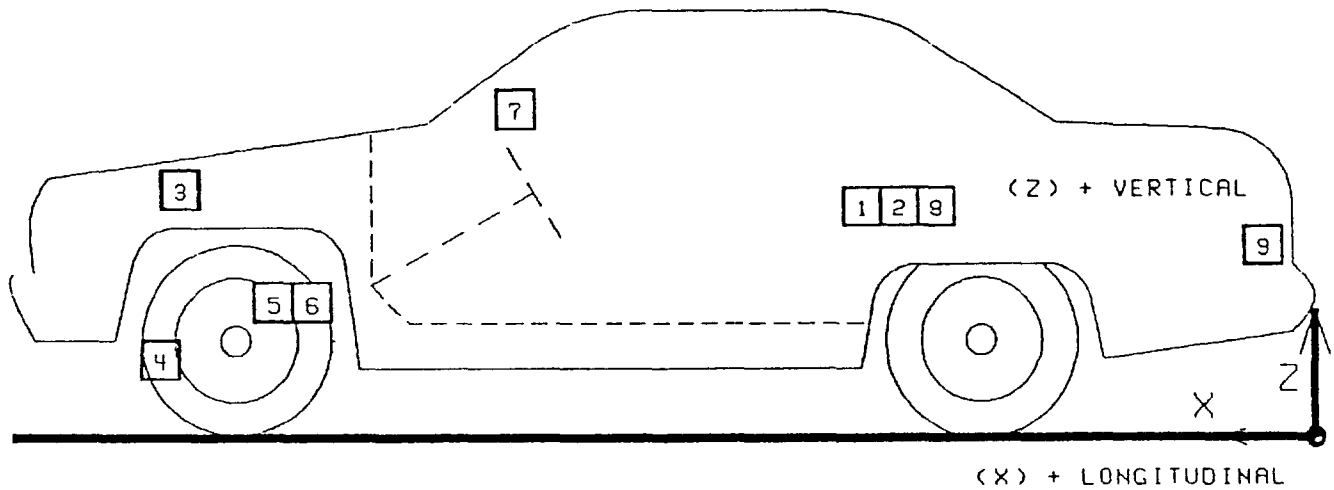
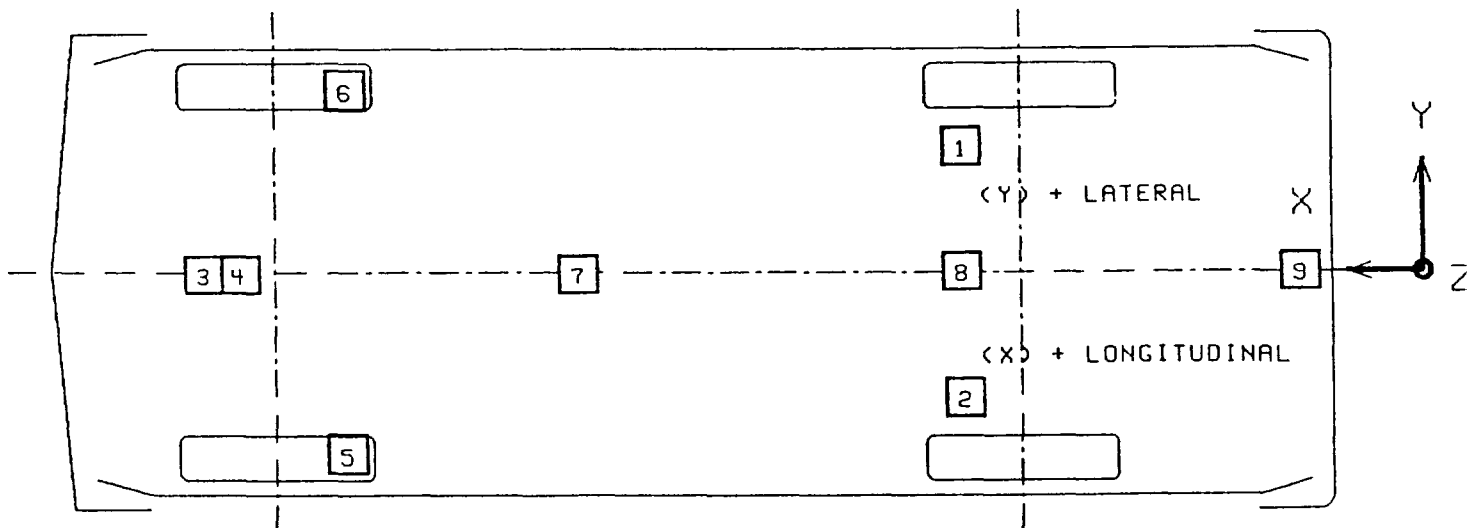


FIGURE 3
VEHICLE ACCELEROMETER PLACEMENT



SIDE VIEW



BOTTOM VIEW

TABLE 5

VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY

TEST NUMBER 910408

No	LOCATION	X*	Y*	Z*	POSITIVE DIRECTION MAX G MSEC		NEGATIVE DIRECTION MAX G MSEC	
1	LEFT REAR SEAT CROSSMEMBER LONGITUDINAL	109 2	24 1	13 0	2 2	114 5	36 7	53 4
2	RIGHT REAR SEAT CROSSMEMBER LONGITUDINAL	111 5	-23 5	13 0	2 8	155 0	39 6	62 8
3	ENGINE TOP LONGITUDINAL	39 9	-12 0	31 0	19 7	56 8	79 8	43 0
4	ENGINE BOTTOM LONGITUDINAL	45 2	7.0	5 8	31 3	60 9	94 3	45 0
5	RIGHT BRAKE CALIPER LONGITUDINAL	30 6	-26 4	14 7	6 0	70 4	50 0	52 0
6	LEFT BRAKE CALIPER LONGITUDINAL	30 4	26 6	14 6	33 2	66 1	60 8	35 5
7	INSTRUMENT PANEL CENTER LONGITUDINAL	64 0	0 0	32 6	21 7	103 0	88 7	76 5
8	REAR SEAT CROSSMEMBER CENTER VERTICAL	110 9	0 0	16 5	28 8	55 5	32 6	60 1
9	VEHICLE REAR CENTER VERTICAL	158 1	0 0	30 5	36 1	70 9	48 5	86 6

* ALL MEASUREMENTS OF ACCELEROMETER LOCATIONS ARE IN INCHES X-AXIS
LOCATIONS ARE MEASURED REARWARD FROM THE FRONT BUMPER

REFERENCE X + FORWARD ACCELERATION
Y + LEFT FROM VEHICLE CENTERLINE
Z + UP FROM GROUND LEVEL

TABLE 6 POST-IMPACT DUMMY/VEHICLE DATA

VISIBLE DUMMY CONTACT POINTS.

	DRIVER #713	PASSENGER #826
HEAD	<u>Airbag</u>	<u>Chest</u>
CHEST	<u>Airbag</u>	<u>None</u>
ABDOMEN	<u>None</u>	<u>None</u>
LEFT KNEE	<u>Instrument panel</u>	<u>Instrument panel</u>
RIGHT KNEE	<u>Instrument panel</u>	<u>Instrument panel</u>

DOOR OPENING.

	LEFT	RIGHT
FRONT	<u>Tools required</u>	<u>Tools required</u>
REAR	<u>NA</u>	<u>NA</u>

SEAT MOVEMENT

	SEAT BACK FAILURE	SEAT SHIFT
FRONT	<u>None</u>	<u>None</u>
REAR	<u>NA</u>	<u>NA</u>

GLAZING DAMAGE:

The entire windshield was cracked upon impact

OTHER NOTABLE IMPACT EFFECTS.

None

TABLE 7 FMVSS 208 DATA SUMMARY

VEH YR /MAKE/MODEL/BODY STYLE: 1991/Nissan/300ZX/3-door hatchback

VEH NHTSA NO MM5201; TEST DATE 04/08/91

	DRIVER	PASSENGER
<u>MAXIMUM ACCELERATIONS (G)</u>	<u>DUMMY #713</u>	<u>DUMMY #826</u>
HEAD X-AXIS	-58 6	-33 0
HEAD Y-AXIS	-12 8	-4 0
HEAD Z-AXIS	-55 2	-90 3
HEAD RESULTANT	75 6	91 5
CHEST X-AXIS	-54 9	-49 8
CHEST Y-AXIS	-6 0	-11 4
CHEST Z-AXIS	9 3	-7 7
CHEST RESULTANT*	54 1	47 2
CHEST RESULTANT TIME INTERVAL (SEC)*	003	003

HEAD INJURY CRITERIA (HIC) VALUES

HIC**	765	1235
HIC STARTING TIME (SEC)	063	081
HIC ENDING TIME (SEC)	098	117
AVG HEAD RESULTANT ACCEL DURING		
HIC TIME INTERVAL (G)	54 1	65 1

MAXIMUM CHEST DEFLECTIONS (IN).

CHEST X-AXIS	NA	NA
MAXIMUM CHEST DEFLECTION TIME (SEC)	NA	NA

MAXIMUM COMPRESSIVE FEMUR FORCES (LBS)

LEFT FEMUR	1495	1668
RIGHT FEMUR	1415	1552

MAXIMUM SEAT BELT FORCES (LBS).

LAP BELT	213	595
SHOULDER BELT	1706	1914

NOTE ALL VALUES LISTED MUST BE OCCURRING DURING PRIMARY IMPACT EVENT
(HEAD ACCELERATIONS LISTED MUST BE DURING HIC TIME INTERVAL)

*0 003 SEC MINIMUM DURATION

**THE MAXIMUM HIC TIME INTERVAL IS 36 MILLISECONDS

DUMMY KINEMATIC SUMMARY

DRIVER DUMMY

Upon impact, the driver dummy translated forward on the seat impacting both knees into the instrument panel. The dummy's head rotated forward as the dummy's head and chest were restrained by the driver's airbag and the dummy's torso was restrained by the three-point unbelt. The dummy's head rotated rearward into the head restraint as the dummy rebounded into the seat back. The dummy came to rest seated in the driver's seat, restrained by the three-point unbelt.

RIGHT FRONT PASSENGER DUMMY

Upon impact, the right front passenger dummy translated forward on the seat impacting both knees into the instrument panel. The dummy's head rotated forward and contacted the dummy's chest as the dummy's torso was restrained by the three-point unbelt. The dummy's head rotated rearward into the head restraint as the dummy rebounded into the seat back. The dummy came to rest seated in the right front passenger's seat, restrained by the three-point unbelt.

TABLE 8 SEAT BELT PERFORMANCE ASSESSMENT TEST DATA

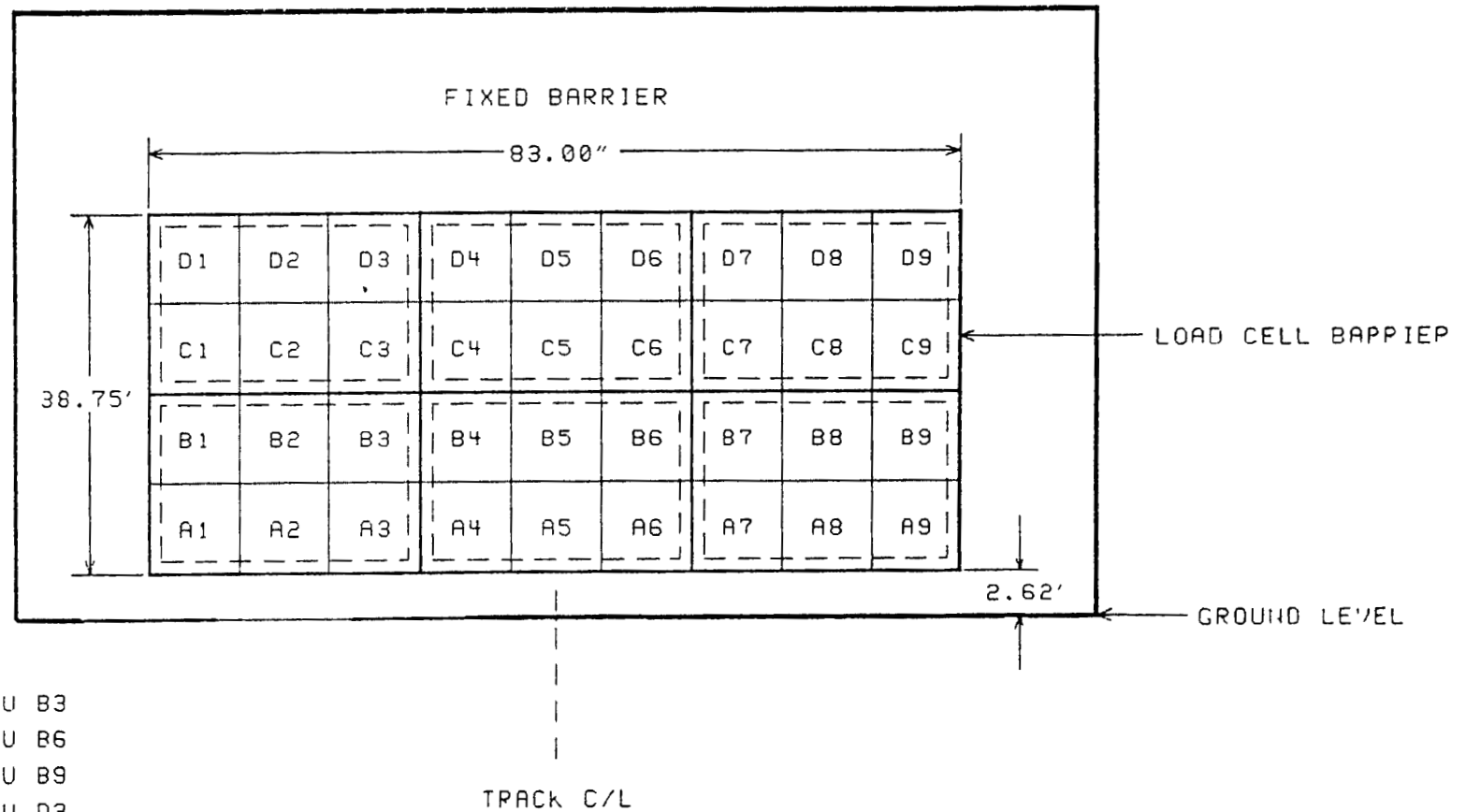
	DRIVER	PASSENGER
<u>BELT LENGTH DATA</u>		
BELT LENGTH FROM TRIM PANEL EXIT TO BOLT HOLE ANCHOR POINT FOR CONTINUOUS WEBBING SYSTEMS	157 0	154 2
SHOULDER BELT LENGTH AS MEASURED ON PART 572 DUMMY	50 8	51 6
LAP BELT LENGTH AS MEASURED ON PART 572 DUMMY.	22.1	24 2
<u>SHOULDER BELT SPOOL-OFF LENGTH</u>		
AS DETERMINED BY FILM ANALYSIS	3.0	2 0
AS DETERMINED MECHANICALLY	2 3	2 2
AS DETERMINED ELECTRONICALLY	3 4	2 4
<u>BELT STRETCH LENGTH (IN/FT)</u>		
AS MEASURED MECHANICALLY	0 13	0 12
AS MEASURED ELECTRONICALLY	0 98	1 20 Y
<u>RETRACTOR LOCK-UP TIME (MS)</u>		
AS DETERMINED BY SHOULDER BELT SPOOL-OFF	40	44

ALL MEASUREMENTS ARE IN INCHES UNLESS OTHERWISE NOTED.

Y See DATA ACQUISITION EXPLANATIONS

FIGURE 4
LOAD CELL BARRIER CONFIGURATION
FRONT VIEW

36 LOAD CELLS
4 ROWS
9 COLUMNS



GROUP 1: A1 THRU B3
GROUP 2: A4 THRU B6
GROUP 3: A7 THRU B9
GROUP 4: C1 THRU D3
GROUP 5: C4 THRU D6
GROUP 6: C7 THRU D9

TABLE 9
LOAD CELL BARRIER DATA SUMMARY

TEST NUMBER 910408

LOCATION	POSITIVE DIRECTION LB MSEC	NEGATIVE DIRECTION LB MSEC
TOTAL GROUP 1	390 218 0	27879 34 6
TOTAL GROUP 2	320 218 0	59190 48 6
TOTAL GROUP 3	304 197 4	24572 26 1
TOTAL GROUP 4	274 186 4	6961 49 9
TOTAL GROUP 5	453 3 3	22488 49 6
TOTAL GROUP 6	436 186 3	5137 63.1
TOTAL LOAD CELL FORCE	1774 218 3	125530 49 0
TENSION IS POSITIVE		
COMPRESSION IS NEGATIVE		

SECTION 3.0

VEHICLE, OCCUPANT, AND CAMERA MEASUREMENTS

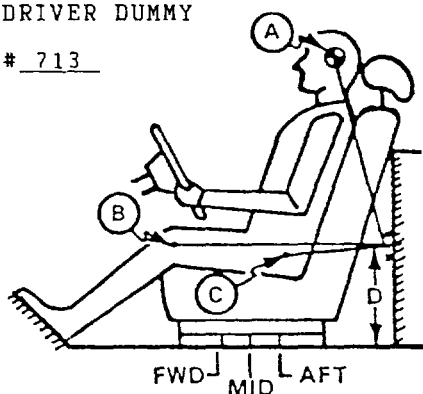
FIGURE 5 DUMMY AND SEAT POSITIONING DATA

TEST NO : 910408 ; VEHICLE Nissan 300ZX

SEAT TYPE.	ADJUSTER TYPE	FRONT SEAT BACK TYPE
<u> </u> BENCH	<u> X </u> MANUAL	<u> </u> NON-ADJUSTABLE
<u> X </u> BUCKET	<u> </u> POWER	<u> X </u> ADJUSTABLE RECLINING
<u> </u> SPLIT BENCH		

DRIVER DUMMY

713

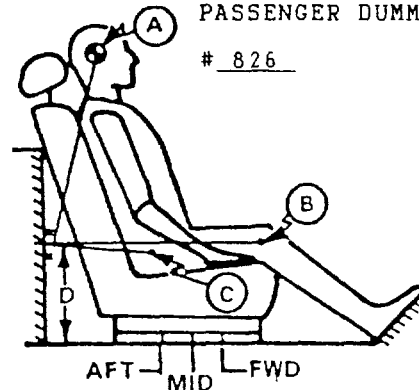


MEASUREMENT
LOCATION

- A - HEAD TARGET
- B - KNEE JOINT
- C - APPROXIMATE 'H' POINT
- D - SILL TO DOOR STRIKER REFERENCE POINT

PASSENGER DUMMY

826

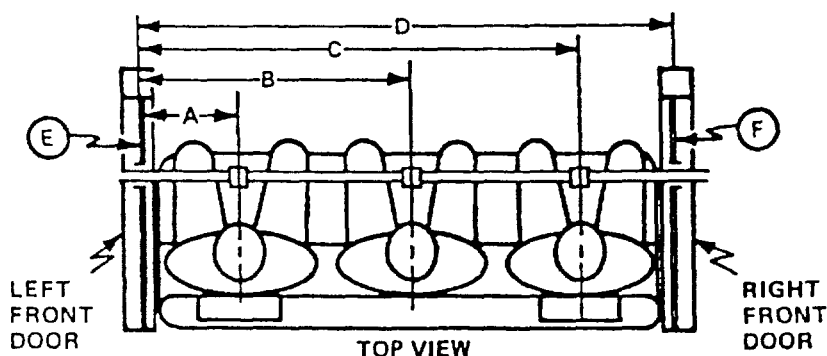


A = 18.1 IN. 20 DEGREES
B = 28.2 IN. 97 DEGREES
C = 13.0 IN. 128 DEGREES
D = 11.1 IN

A = 17.4 IN. 12 DEGREES
B = 28.8 IN. 94 DEGREES
C = 15.9 IN. 123 DEGREES
D = 11.1 IN

SEAT TRACK REARWARD 10 NOTCHES

SEAT TRACK REARWARD 10 NOTCHES



A = LEFT DOOR TO DRIVER CENTERLINE	<u>13.9</u> IN
B = LEFT DOOR TO CENTER PASSENGER CENTERLINE	<u>NA</u> IN
C = LEFT DOOR TO RIGHT PASSENGER CENTERLINE	<u>43.5</u> IN
D = LEFT DOOR TO RIGHT DOOR	<u>56.2</u> IN.
E, F = WINDOW GLASS HEIGHT (RIGHT AND LEFT MUST BE EQUAL)	<u>6.9</u> IN

ALL ANGLES ARE RELATIVE TO VERTICAL PLANE THROUGH DOOR STRIKER

FIGURE 6 DUMMY IN-VEHICLE POSITIONING DATA

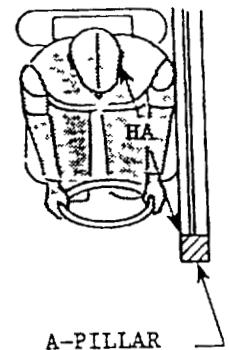
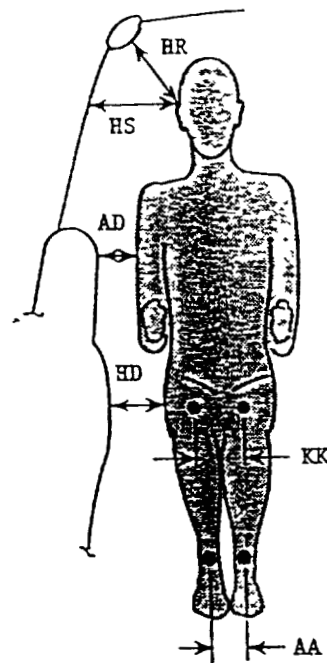
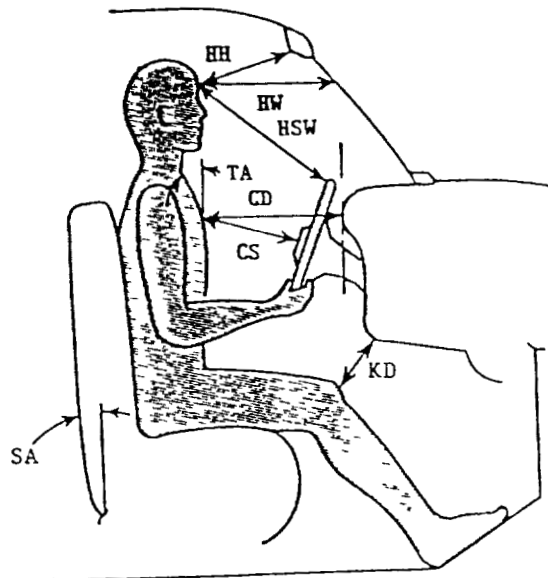
	DRIVER	PASSENGER
HH	16 1	15.8
HW	21 7	25 7
CD	23 5	24 2
CS	14 4	NA
KDL	5.2	5 6
KDR	6 9	5.7
TA	22°	23°
SA	23°	23°
HSW	20 4	NA

	DRIVER	PASSENGER
HR	4 8	5 4
HS	10 6	10 5
AD	3 8	5 2
HD	5.2	5.0
KK	10 4	7 5
AA	12 0	7 0
HA	22 7	27.7

KNEE OUTER BOLT HEAD TO OUTER
BOLT HEAD SPACING:

DRIVER = 14 5

PASSENGER = 11 8

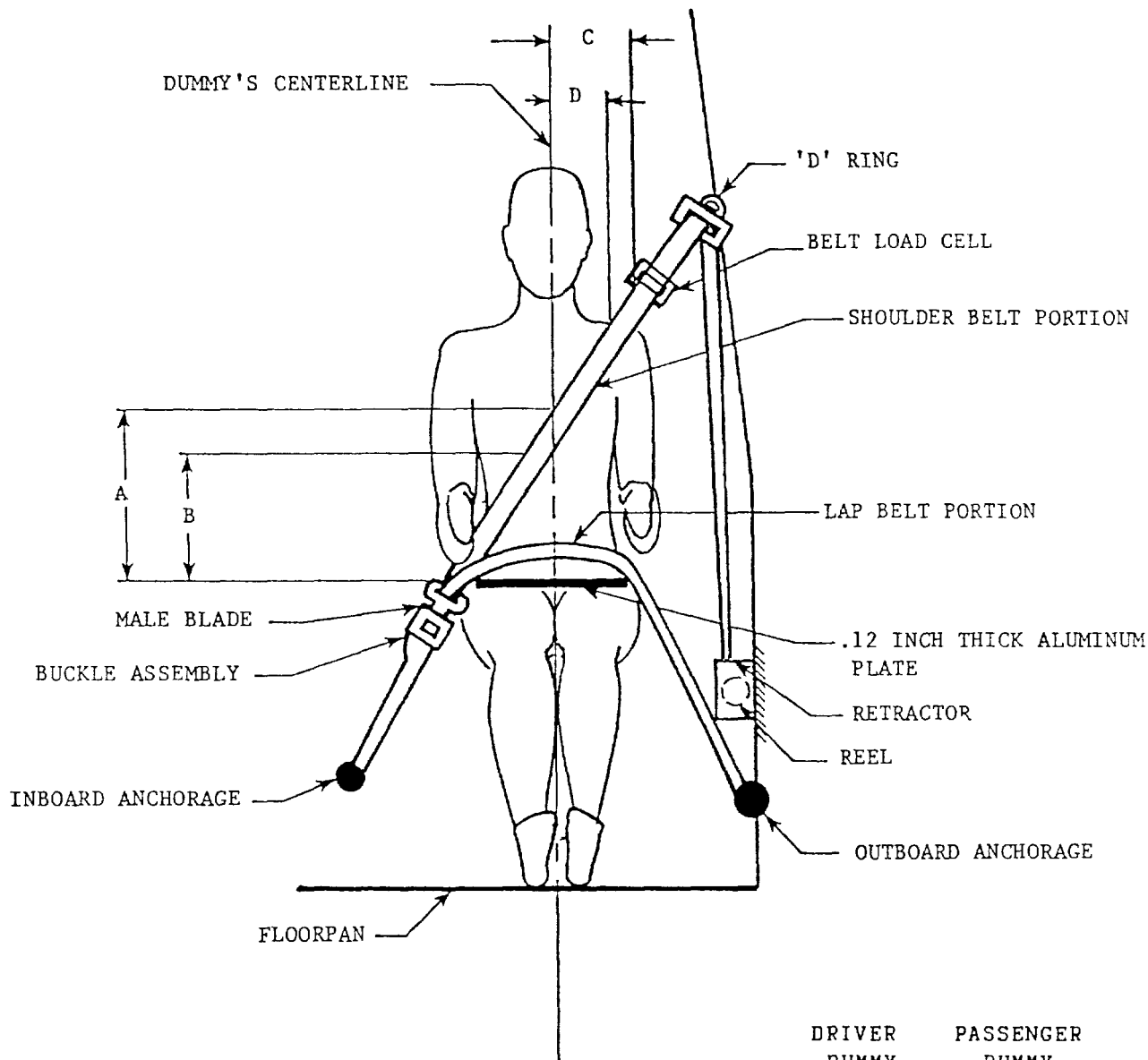


HH = HEAD TO WINDSHIELD HEADER
HW = HEAD TO WINDSHIELD
CD = CHEST TO DASH
CS = CHEST TO STEERING WHEEL
KD = KNEE TO DASH
TA = TORSO ANGLE
SA = SEAT BACK ANGLE
HSW = HEAD TO STEERING WHEEL

HR = HEAD C G. TARGET TO SIDE ROOF HEADER
HS = HEAD C G. TARGET TO SIDE WINDOW
AD = ARM TO DOOR
HD = HIP TO DOOR
KK = KNEE TO KNEE
AA = ANKLE TO ANKLE
HA = HEAD C G. TARGET TO A-PILLAR

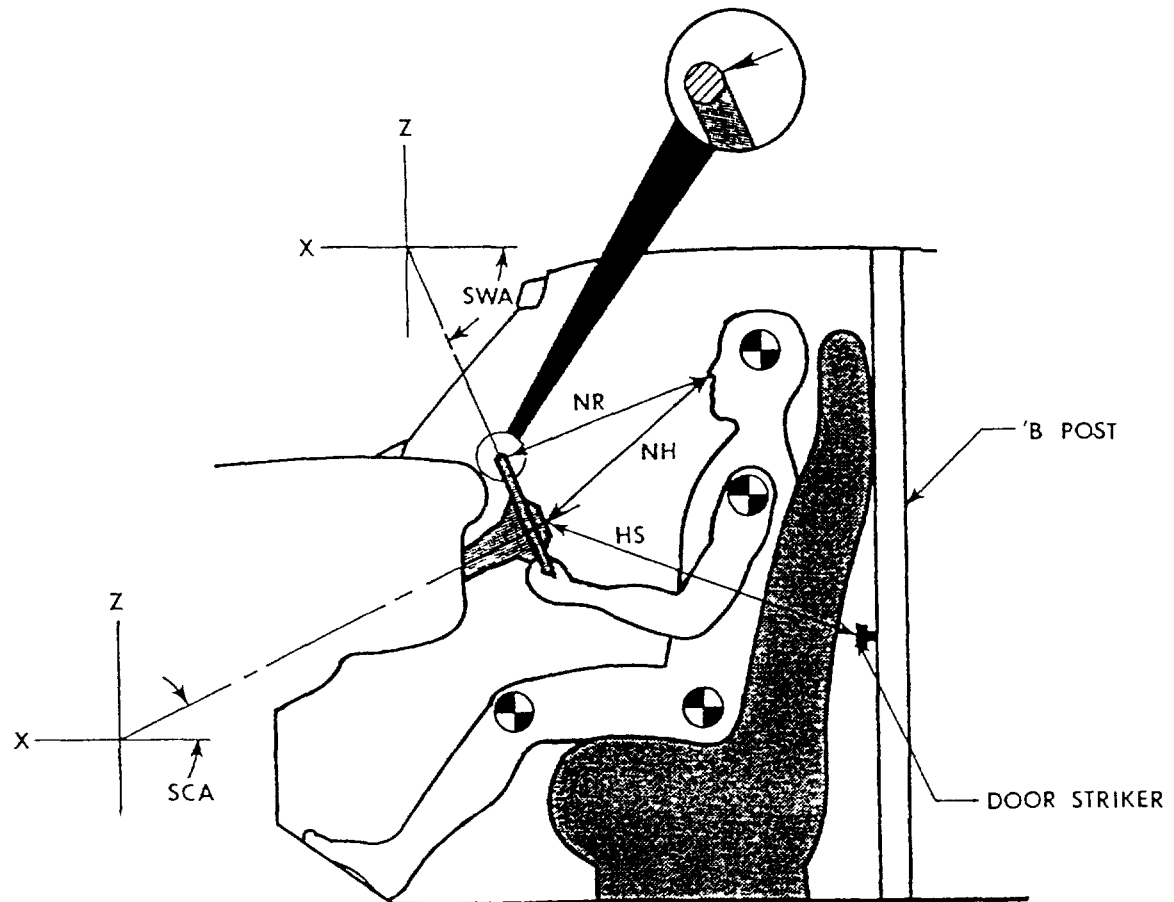
TORSO AND SEAT BACK ANGLES ARE RELATIVE TO VERTICAL
ALL DISTANCE MEASUREMENTS ARE IN INCHES.

FIGURE 7 SEAT BELT POSITIONING DATA



ALL DISTANCE MEASUREMENTS ARE IN INCHES.

FIGURE 8 DRIVER DUMMY TO STEERING COLUMN/WHEEL ASSEMBLY DATA



POSITION OF STEERING COLUMN TILTING AND TELESCOPING ADJUSTMENTS, IF ANY.
The steering column was not adjustable.

MEASUREMENTS

NR	- DISTANCE FROM TIP OF DUMMY'S NOSE TO TOP REAR SURFACE OF STEERING WHEEL RIM	18 0
NH	- DISTANCE FROM TIP OF DUMMY'S NOSE TO CENTER OF STEERING COLUMN HUB.	18 4
HS	- DISTANCE FROM CENTER OF STEERING COLUMN HUB TO THE FORWARD SURFACE OF THE DOOR LOCK STRIKER PIN	28 1
SCA	- ANGLE OF STEERING COLUMN RELATIVE TO THE HORIZONTAL X AXIS	28°
SWA	- ANGLE OF STEERING WHEEL RELATIVE TO THE HORIZONTAL X AXIS	71°

ALL DISTANCE MEASUREMENTS ARE IN INCHES

FIGURE 9
CAMERA POSITIONS

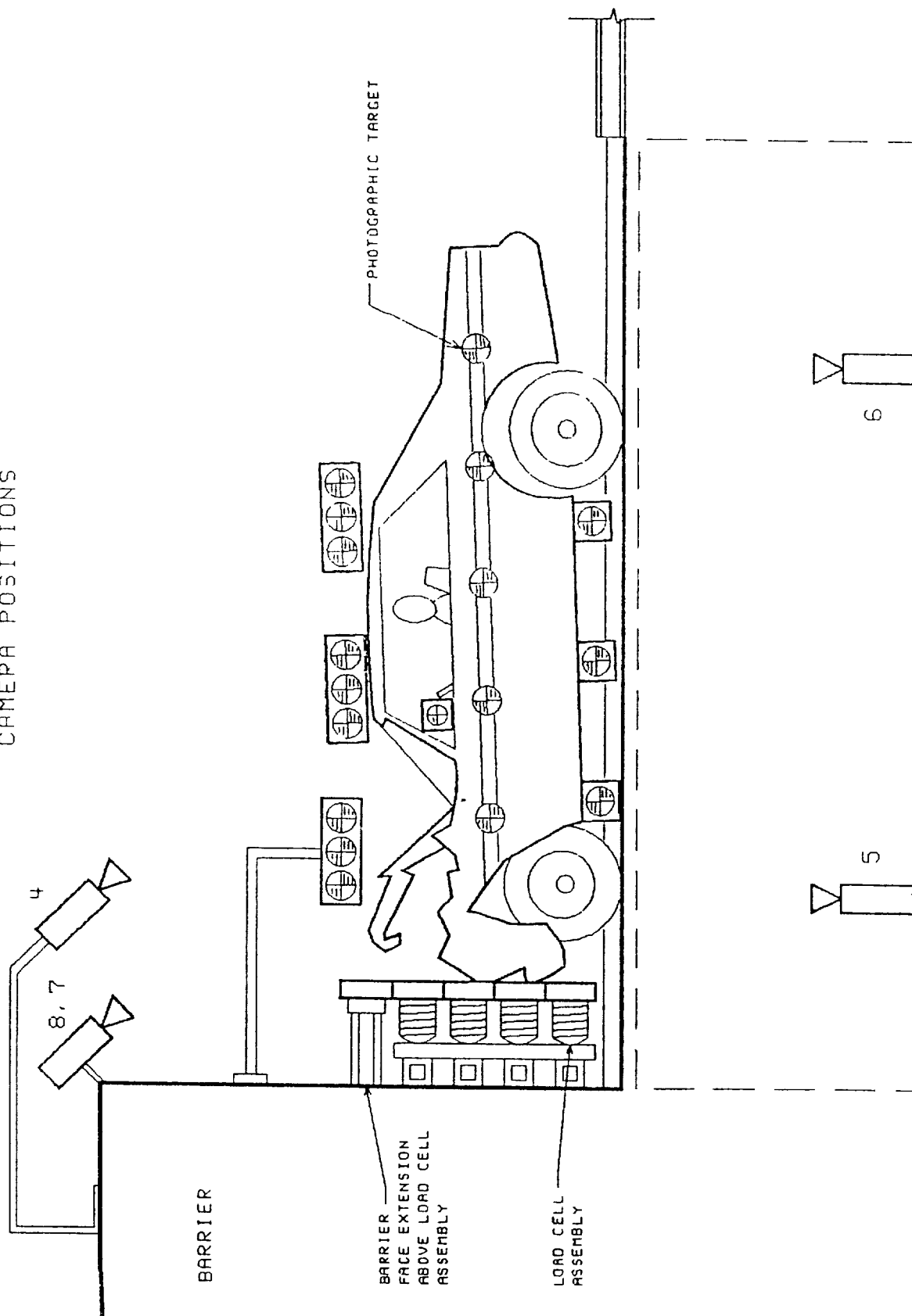


FIGURE 9

CAMERA POSITIONS, CONTINUED

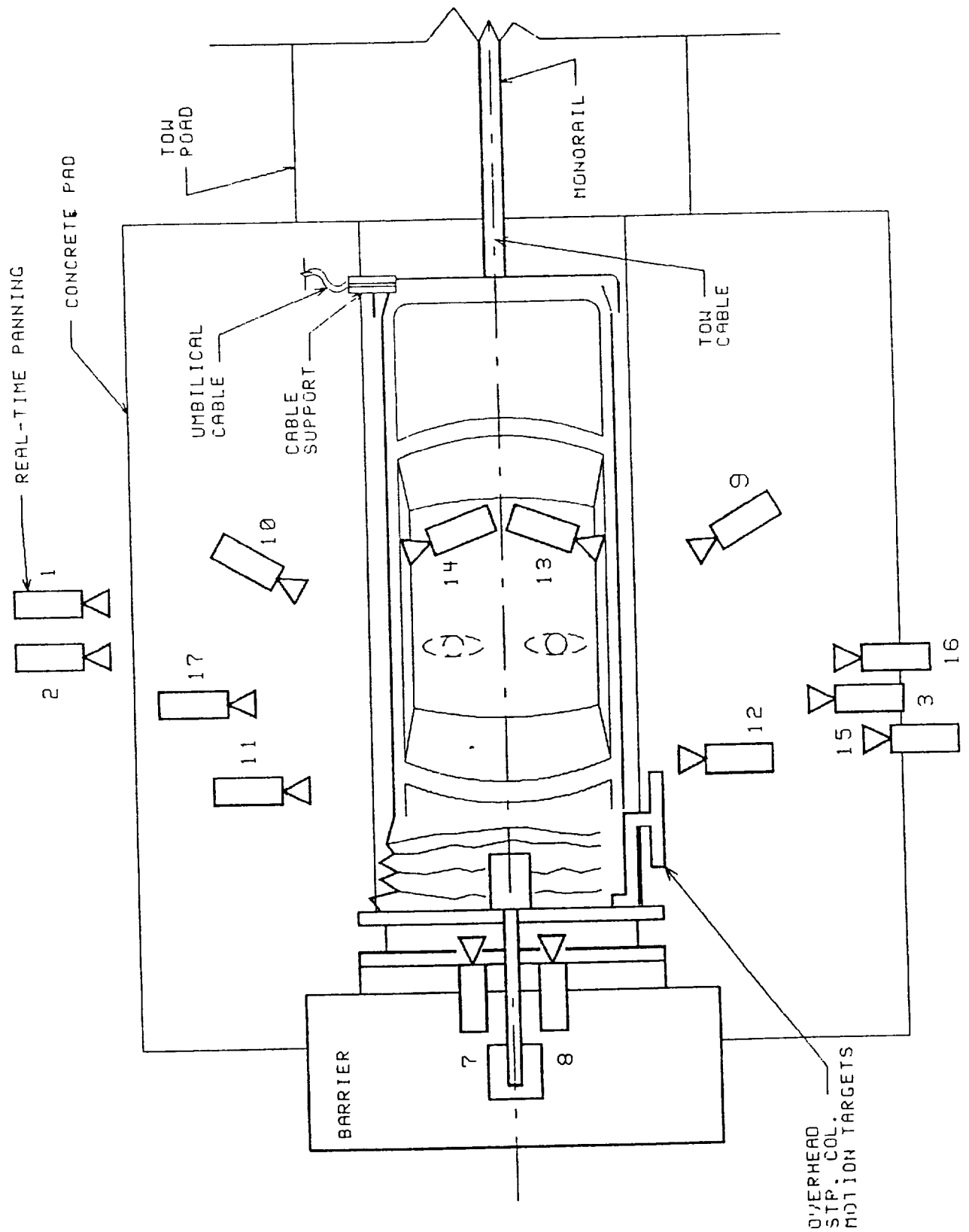


TABLE 10 MOTION PICTURE CAMERA LOCATIONS

TEST NO		VEHICLE						
910408		Nissan 300ZX 3-door hatchback						
CAMERA NO	VIEW	CAMERA POSITIONS (IN)*			ANGLE** (DEG)	FILM PLANE TO HEAD TARGET (IN)		FILM SPEED (FPS)
		X	Y	Z			LENS (MM)	
1	Real-time panning	-142 0	-504.0	61.0	NA	NA	16	24
2	Right side	-81 3	-266.4	37 1	-2	NA	13	488
3	Left side	-41.5	295.0	44.0	-12	232 0	25	498
4	Overhead	-36 4	0 0	98 0	-40	NA	8.5	500
5	Pit - engine	-50 5	0 0	-92.4	90	NA	13	1000
6	Pit - fuel tank	-99 3	0 0	-99.0	90	NA	13	995
7	Front - passenger	-4 5	-13.8	85 0	-40	NA	17	505
8	Front - driver	-6 8	14 5	85 0	-41	NA	17	502
9	Left side - driver	-180 0	73.0	102 0	-27	85.0	25	500
10	Right side - passenger	-184 0	-74.0	100 0	-26	69.0	25	502
11	Right side - A-pillar	-38 1	-306.1	44 0	0	NA	50	498
12	Left side - A-pillar	-53 0	309 4	42.3	0	NA	50	500
13	Onboard - left side	NA	NA	NA	NA	NA	13	500
14	Onboard - right side	NA	NA	NA	NA	NA	13	500
15	Left side - steering column	-99 0	286.0	103 0	-14	NA	25	503
16	Left side - steering column	-99 0	286.0	75 1	-9	NA	25	500
17	Right side - passenger	-38.8	-210 8	45 3	7	247 0	25	510

*+X = Film plane forward of barrier face

+Y = Film plane to left of monorail centerline

+Z = Film plane above ground level

**+Angle = Film plane angled upward from horizontal plane

FIGURE 10

PRE-TEST AND POST-TEST MEASUREMENT POINTS

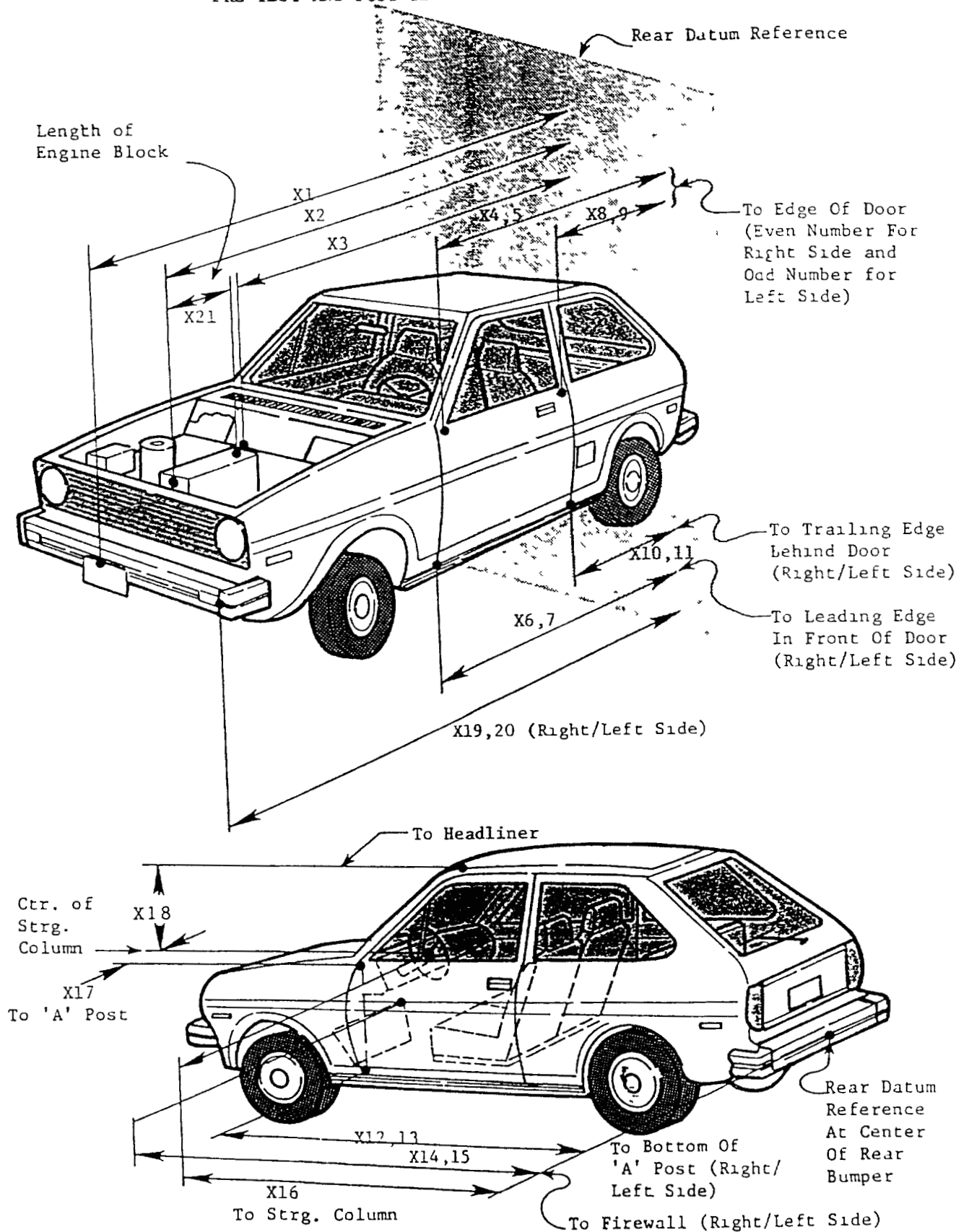


TABLE 11 IMPACTED VEHICLE MEASUREMENTS

VEHICLE MAKE/MODEL: Nissan/300ZX

TEST NUMBER: 910408

ALL MEASUREMENTS ARE IN INCHES

<u>NO.</u>	<u>TYPE OF MEASUREMENT</u>	<u>PRE-TEST</u>	<u>POST-TEST</u>	<u>DIFF.</u>
X1	TOTAL LENGTH OF VEHICLE AT CENTERLINE	168.6	145.0	23.6
X2	REAR SURFACE OF VEHICLE TO FRONT OF ENGINE BLOCK	138.4	132.2	6.2
X3	REAR SURFACE OF VEHICLE TO FIREWALL	117.8	110.5	7.3
X4	REAR SURFACE OF VEHICLE TO UPPER LEADING EDGE OF RIGHT DOOR	107.4	106.6	0.8
X5	REAR SURFACE OF VEHICLE TO UPPER LEADING EDGE OF LEFT DOOR	107.2	107.8	-0.6
X6	REAR SURFACE OF VEHICLE TO LOWER LEADING EDGE OF RIGHT DOOR	108 2	106.9	1.3
X7	REAR SURFACE OF VEHICLE TO LOWER LEADING EDGE OF LEFT DOOR	108 8	107.5	1.3
X8	REAR SURFACE OF VEHICLE TO UPPER TRAILING EDGE OF RIGHT DOOR	55.1	54.0	1.1
X9	REAR SURFACE OF VEHICLE TO UPPER TRAILING EDGE OF LEFT DOOR	55.2	55.5	-0.3
X10	REAR SURFACE OF VEHICLE TO LOWER TRAILING EDGE OF RIGHT DOOR	62 0	60.5	1.5
X11	REAR SURFACE OF VEHICLE TO LOWER TRAILING EDGE OF LEFT DOOR	62.5	61.2	1.3
X12	REAR SURFACE OF VEHICLE TO BOTTOM OF "A" POST ON RIGHT SIDE	106.6	105.1	1.5
X13	REAR SURFACE OF VEHICLE TO BOTTOM OF "A" POST ON LEFT SIDE	107.0	106.4	0.6
X14	REAR SURFACE OF VEHICLE TO FIREWALL - RIGHT SIDE	114.0	111 2	2.8
X15	REAR SURFACE OF VEHICLE TO FIREWALL - LEFT SIDE	115.5	114 5	1.0
X16	REAR SURFACE OF VEHICLE TO STEERING WHEEL CENTER	85 6	85 4	0.2
X17	CENTER OF STEERING COLUMN TO "A" POST	12.0	11.5	0.5
X18	CENTER OF STEERING COLUMN TO HEADLINER	16.1	16.8	-0.7
X19	REAR SURFACE OF VEHICLE TO RIGHT SIDE OF FRONT BUMPER	164.4	143 9	20.5
X20	REAR SURFACE OF VEHICLE TO LEFT SIDE OF FRONT BUMPER	164 4	145.8	18 6
X21	LENGTH OF ENGINE BLOCK	13.0	13.0	0 0

[illegible]

APPENDIX A

PHOTOGRAPHS



Figure A-1. PRE-TEST FRONT VIEW



Figure A-2. POST-TEST FRONT VIEW



Figure A-3. PRE-TEST LEFT SIDE VIEW



Figure A-4. POST-TEST LEFT SIDE VIEW

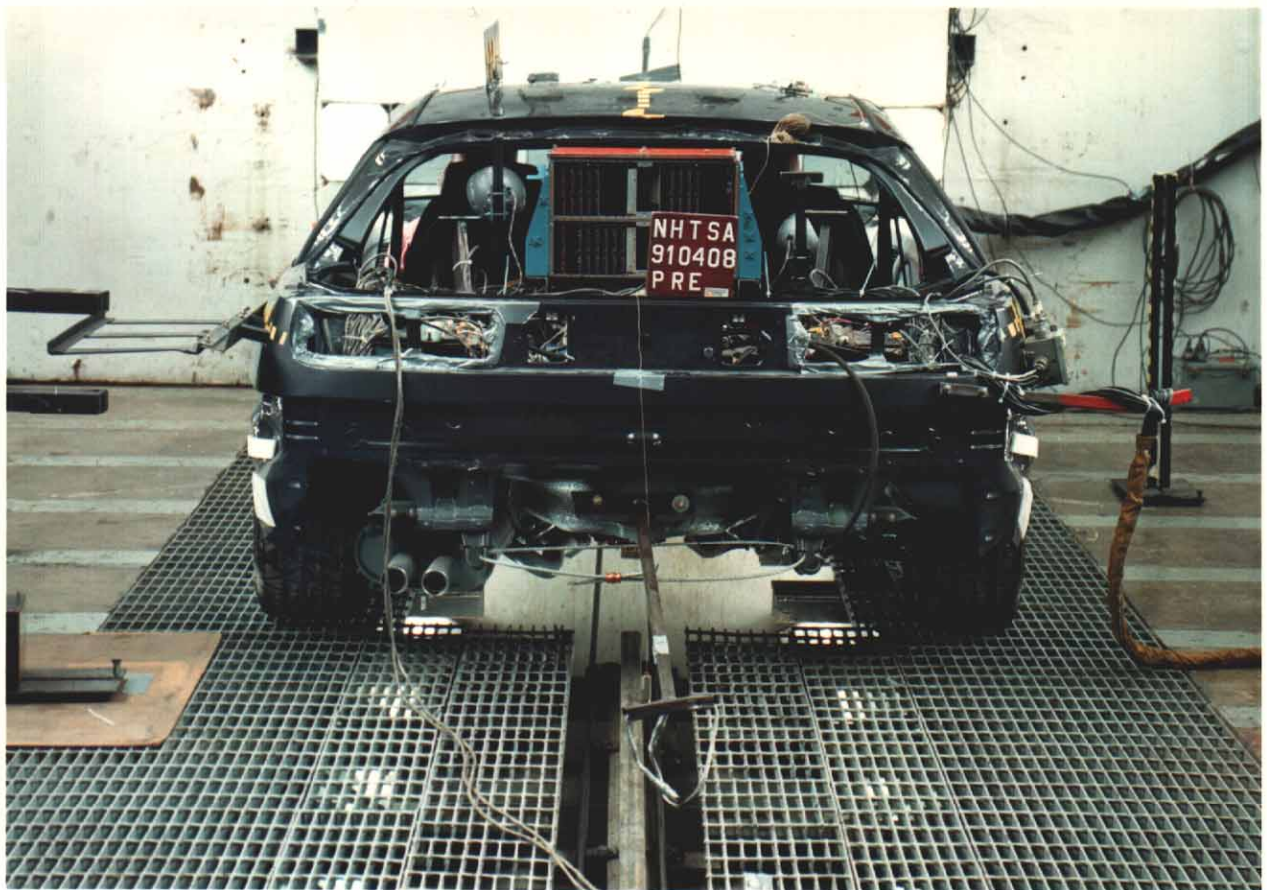


Figure A-5. PRE-TEST REAR VIEW

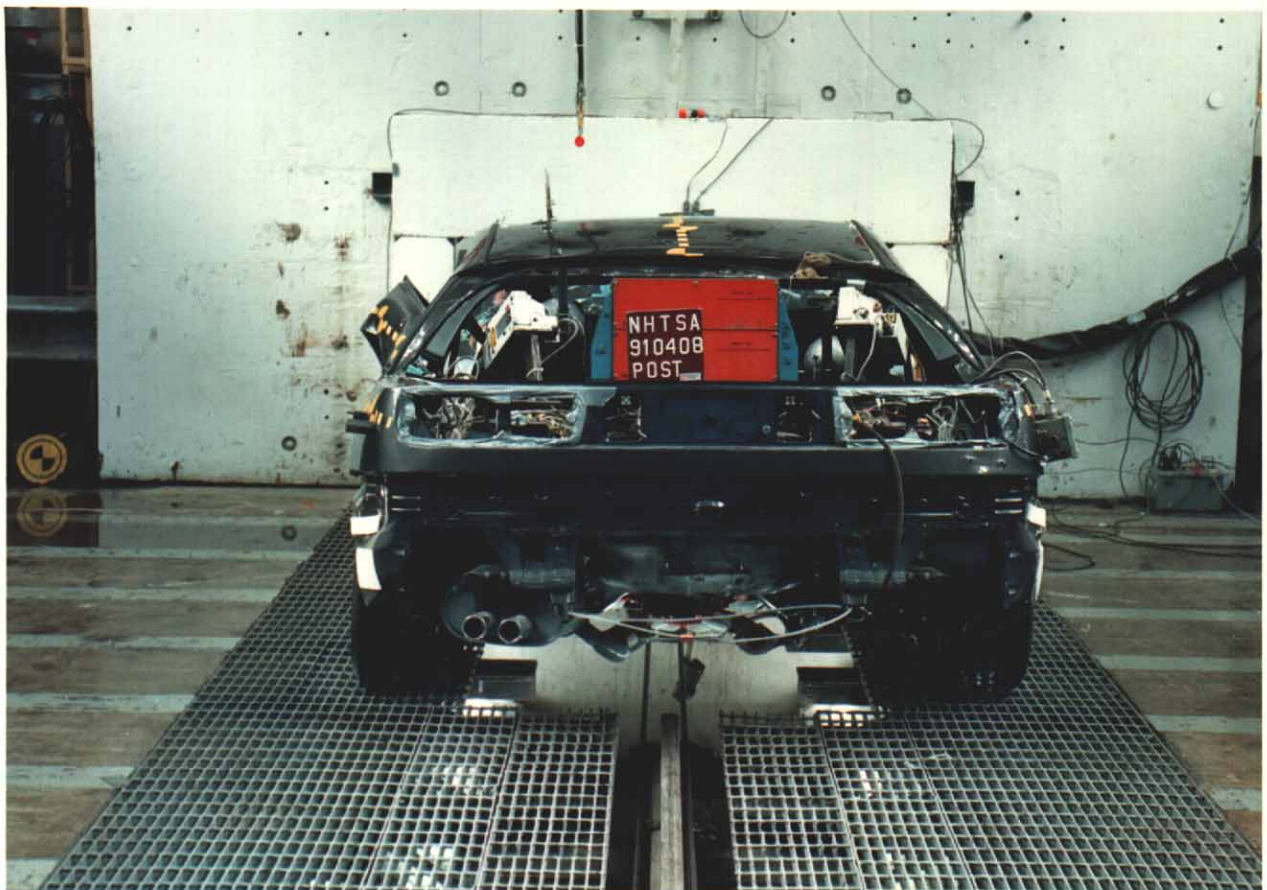


Figure A-6. POST-TEST REAR VIEW



Figure A-7. PRE-TEST RIGHT SIDE VIEW



Figure A-8. POST-TEST RIGHT SIDE VIEW



Figure A-9. PRE-TEST RIGHT FRONT THREE-QUARTER VIEW



Figure A-10. POST-TEST RIGHT FRONT THREE-QUARTER VIEW



Figure A-11. PRE-TEST LEFT REAR THREE-QUARTER VIEW



Figure A-12. POST-TEST LEFT REAR THREE-QUARTER VIEW



Figure A-13. PRE-TEST WINDSHIELD VIEW

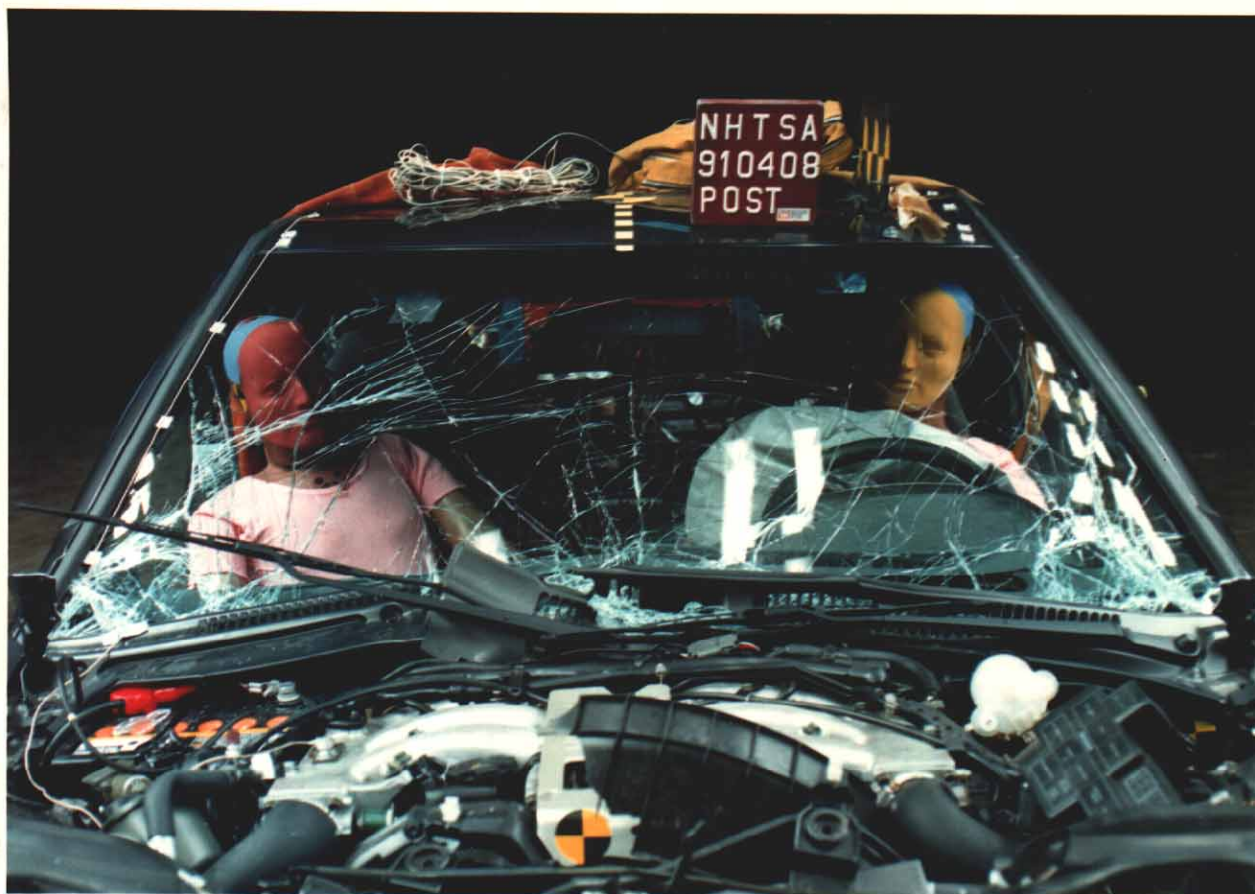


Figure A-14. POST-TEST WINDSHIELD VIEW

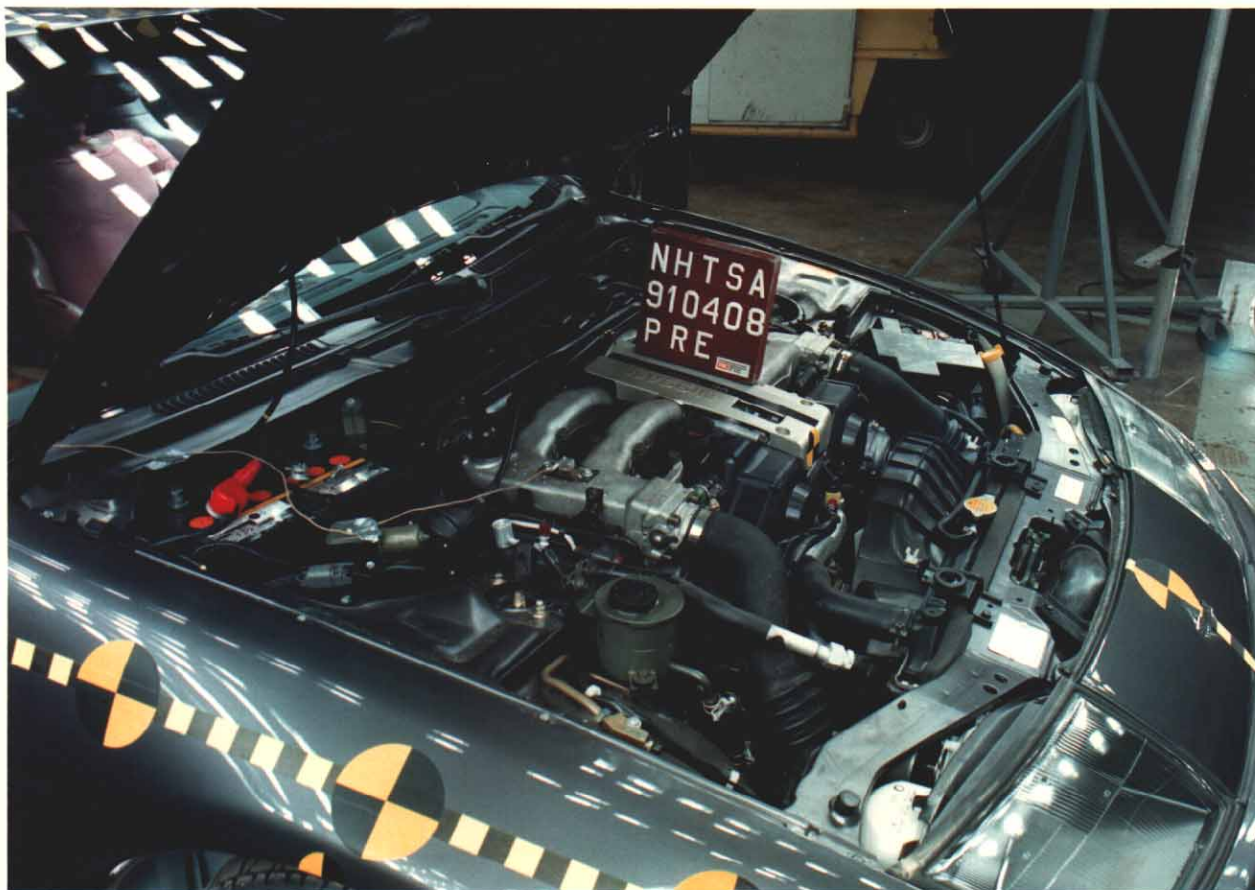


Figure A-15. PRE-TEST ENGINE COMPARTMENT VIEW

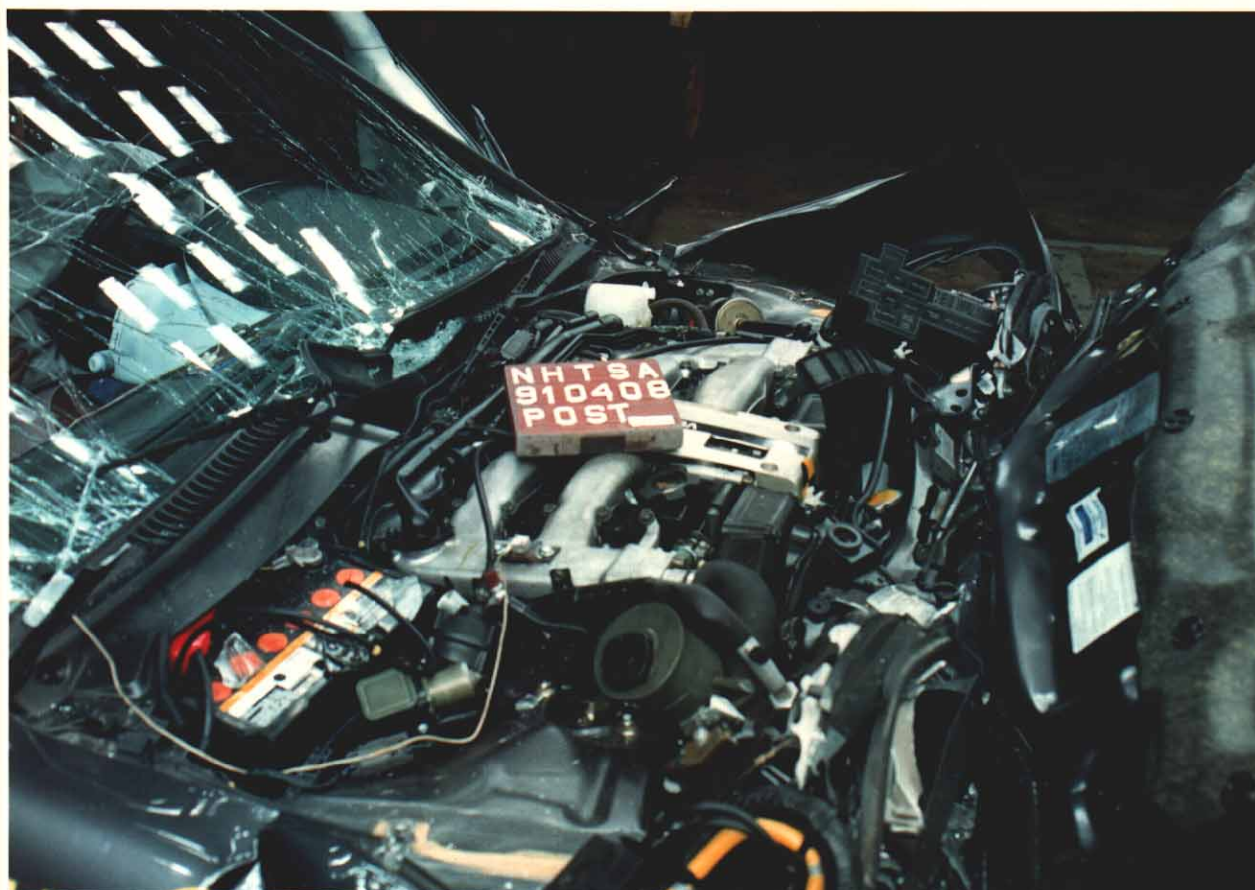


Figure A-16. POST-TEST ENGINE COMPARTMENT VIEW



Figure A-17. PRE-TEST FUEL FILLER CAP VIEW



Figure A-18. POST-TEST FUEL FILLER CAP VIEW

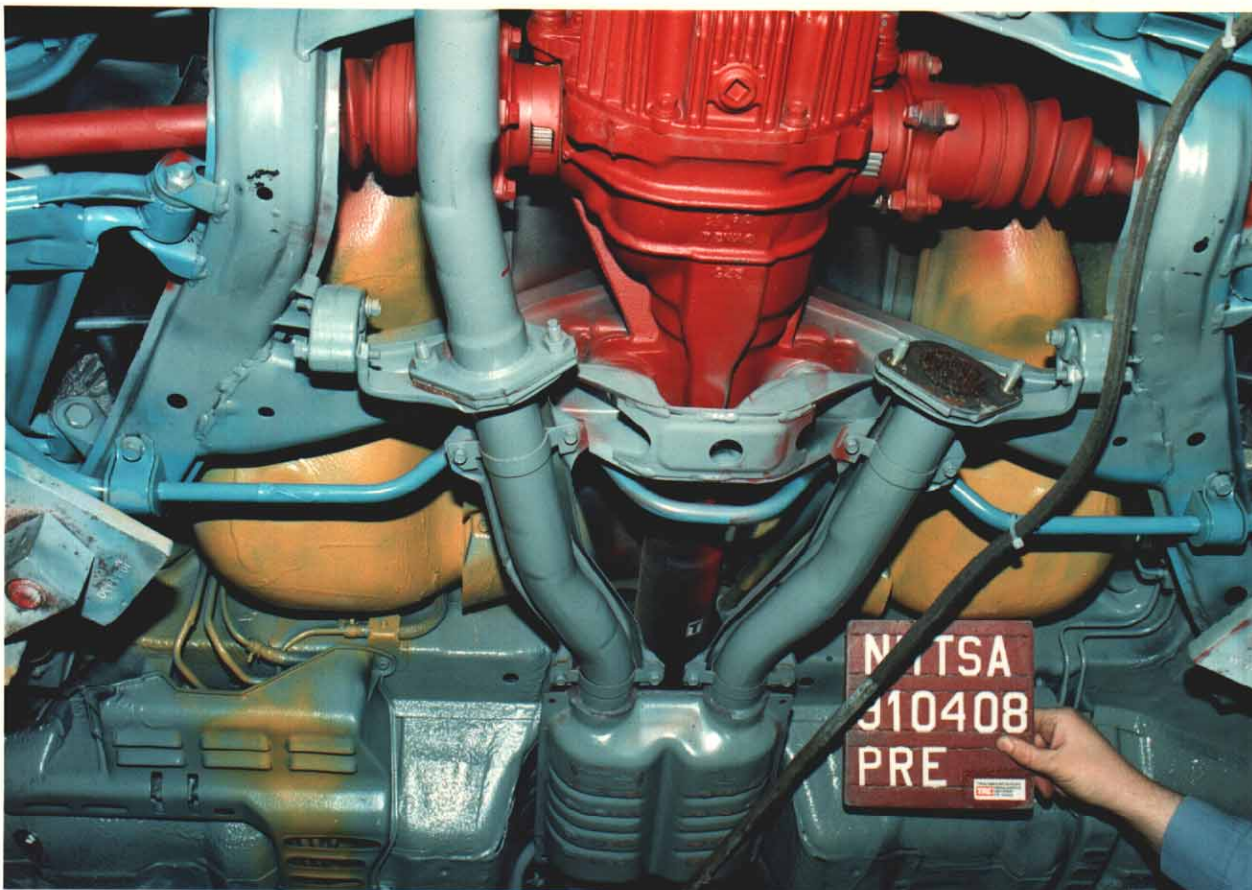


Figure A-19. PRE-TEST FUEL TANK VIEW



Figure A-20. PRE-TEST FRONT UNDERBODY VIEW

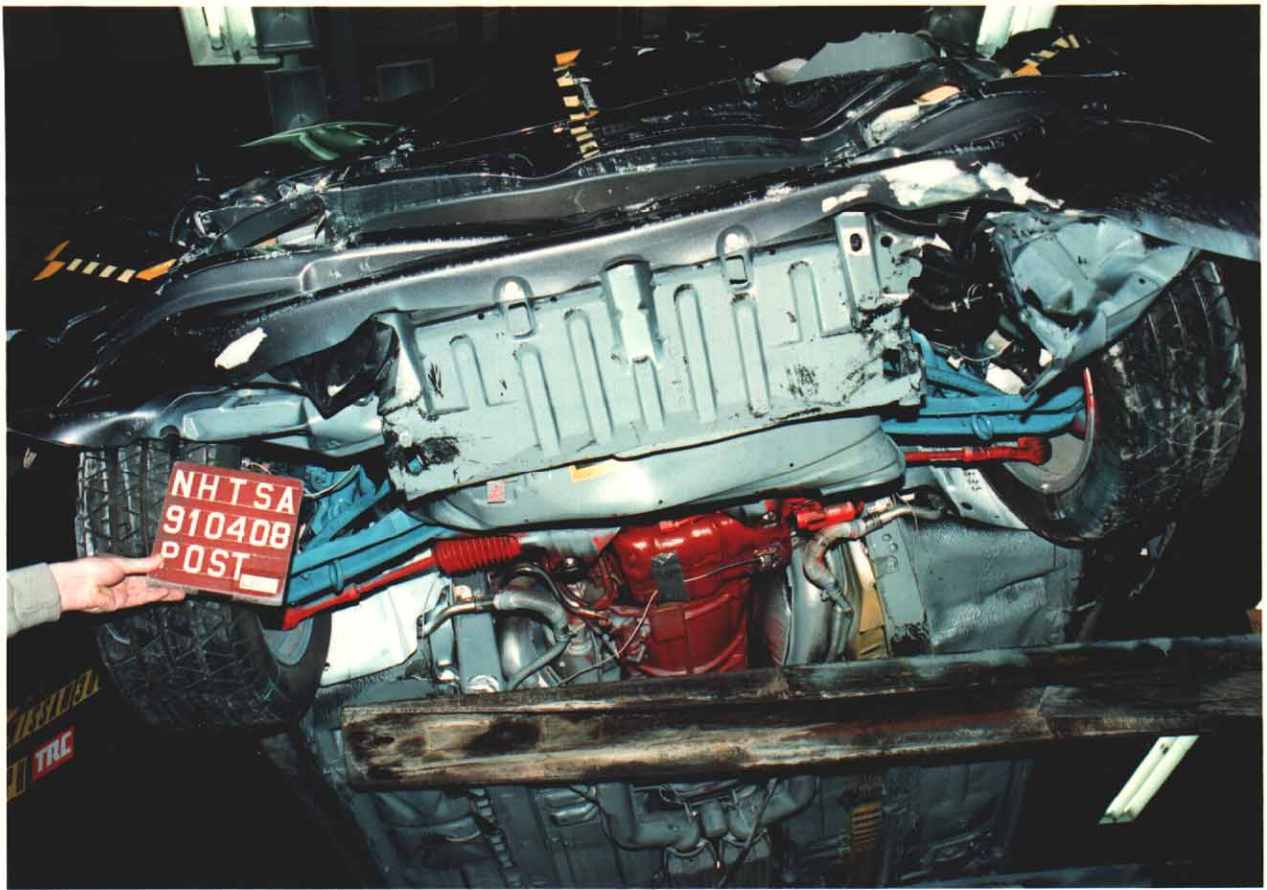


Figure A-21. POST-TEST FRONT UNDERBODY VIEW

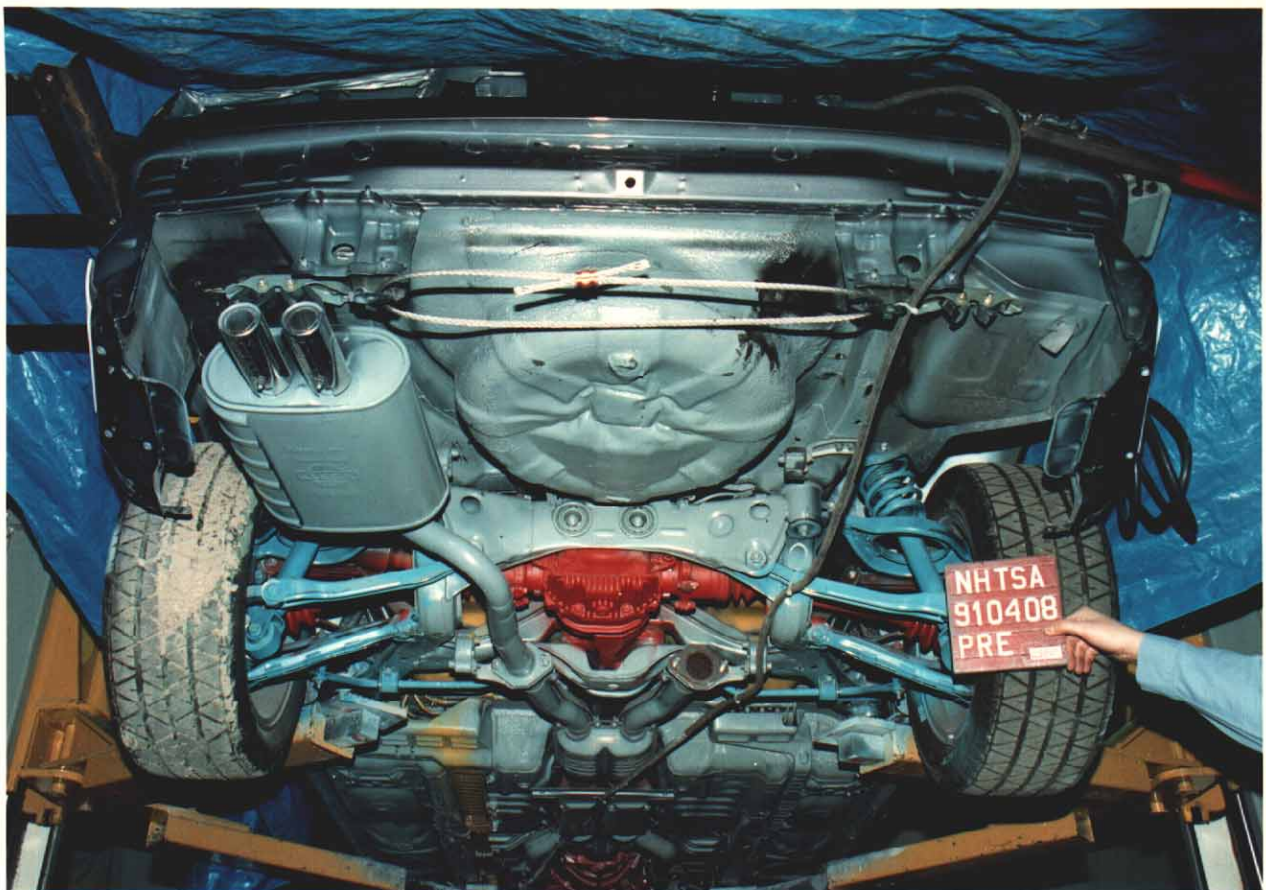


Figure A-22. PRE-TEST REAR UNDERBODY VIEW

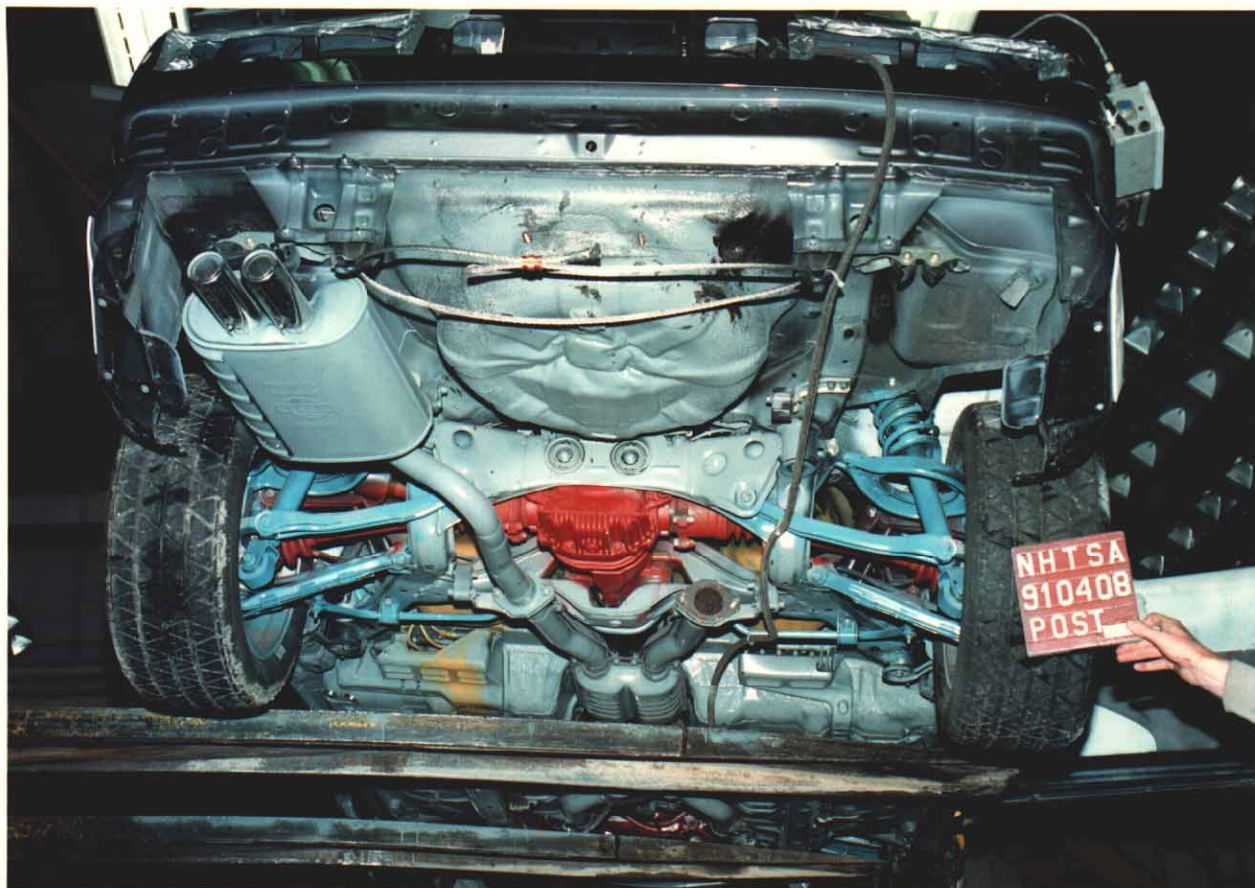


Figure A-23. POST-TEST REAR UNDERBODY VIEW



Figure A-24. PRE-TEST DRIVER DUMMY POSITION VIEW



Figure A-25. POST-TEST DRIVER DUMMY POSITION VIEW

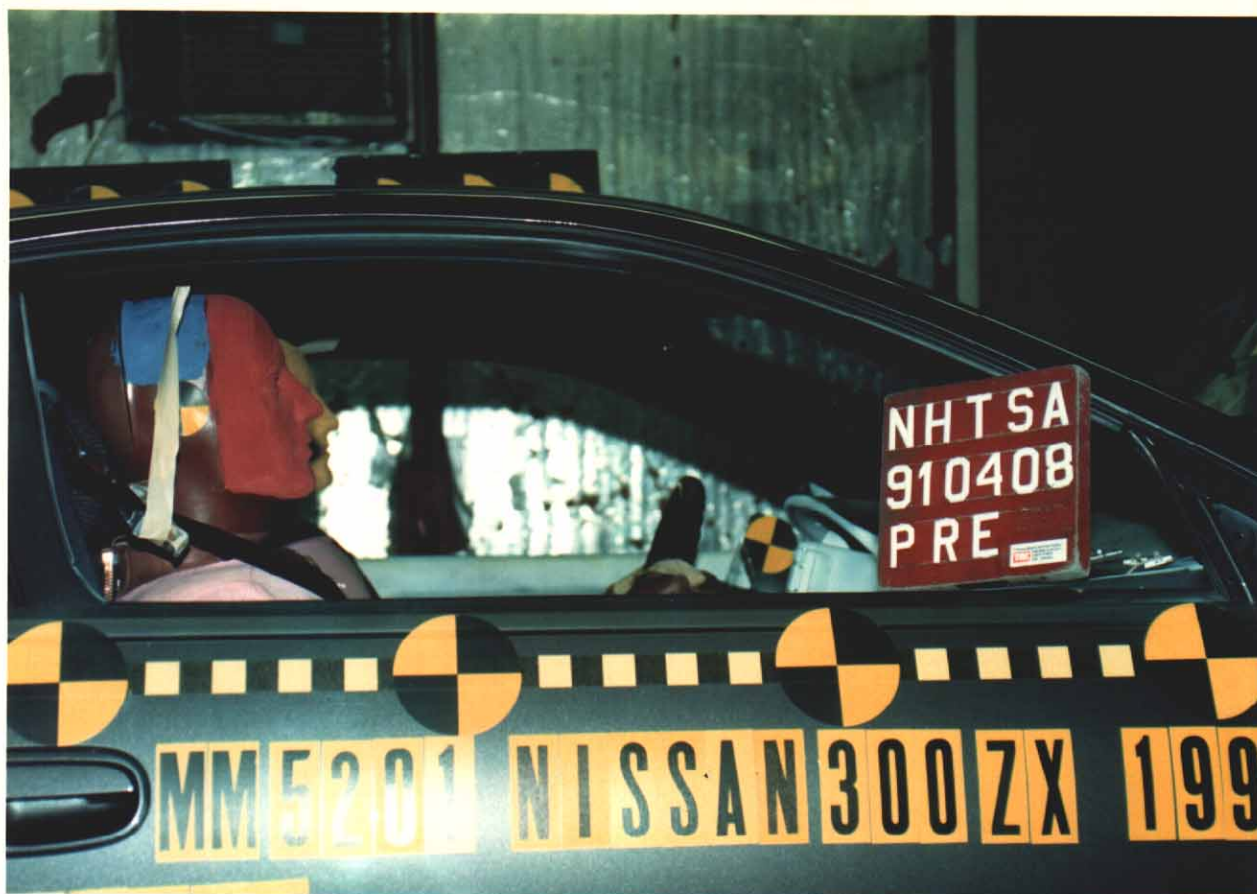


Figure A-26. PRE-TEST PASSENGER DUMMY POSITION VIEW



Figure A-27. POST-TEST PASSENGER DUMMY POSITION VIEW



Figure A-28. PRE-TEST DRIVER DUMMY & VEHICLE INTERIOR VIEW

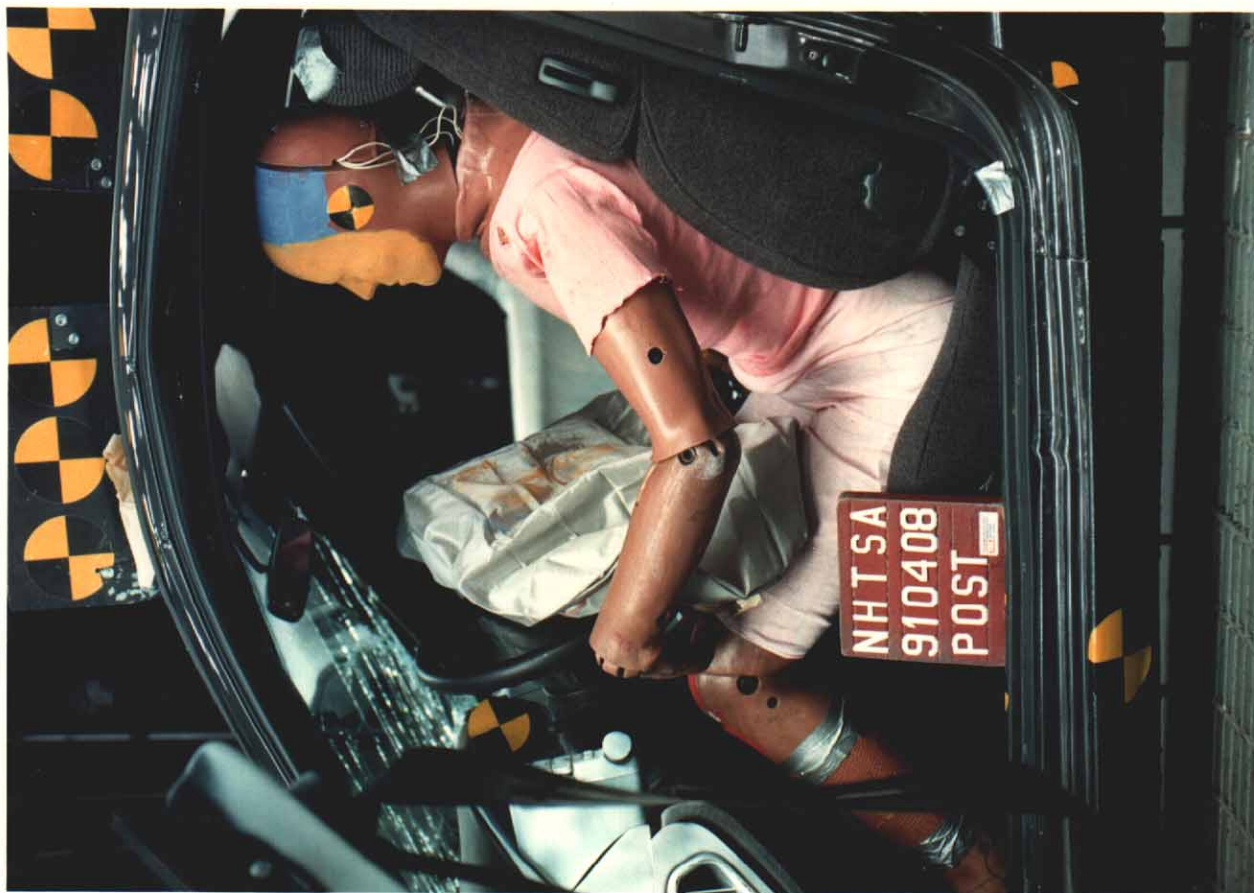


Figure A-29. POST-TEST DRIVER DUMMY & VEHICLE INTERIOR - VIEW 1



Figure A-30. POST-TEST DRIVER DUMMY & VEHICLE INTERIOR - VIEW 2



Figure A-31. POST-TEST PASSENGER DUMMY & VEHICLE INTERIOR - VIEW 1



Figure A-32. POST-TEST PASSENGER DUMMY & VEHICLE INTERIOR - VIEW 2



Figure A-33. POST-TEST DRIVER DUMMY HEAD CONTACT VIEW



Figure A-34. POST-TEST DRIVER DUMMY KNEE CONTACT VIEW



Figure A-35. POST-TEST PASSENGER DUMMY KNEE CONTACT VIEW

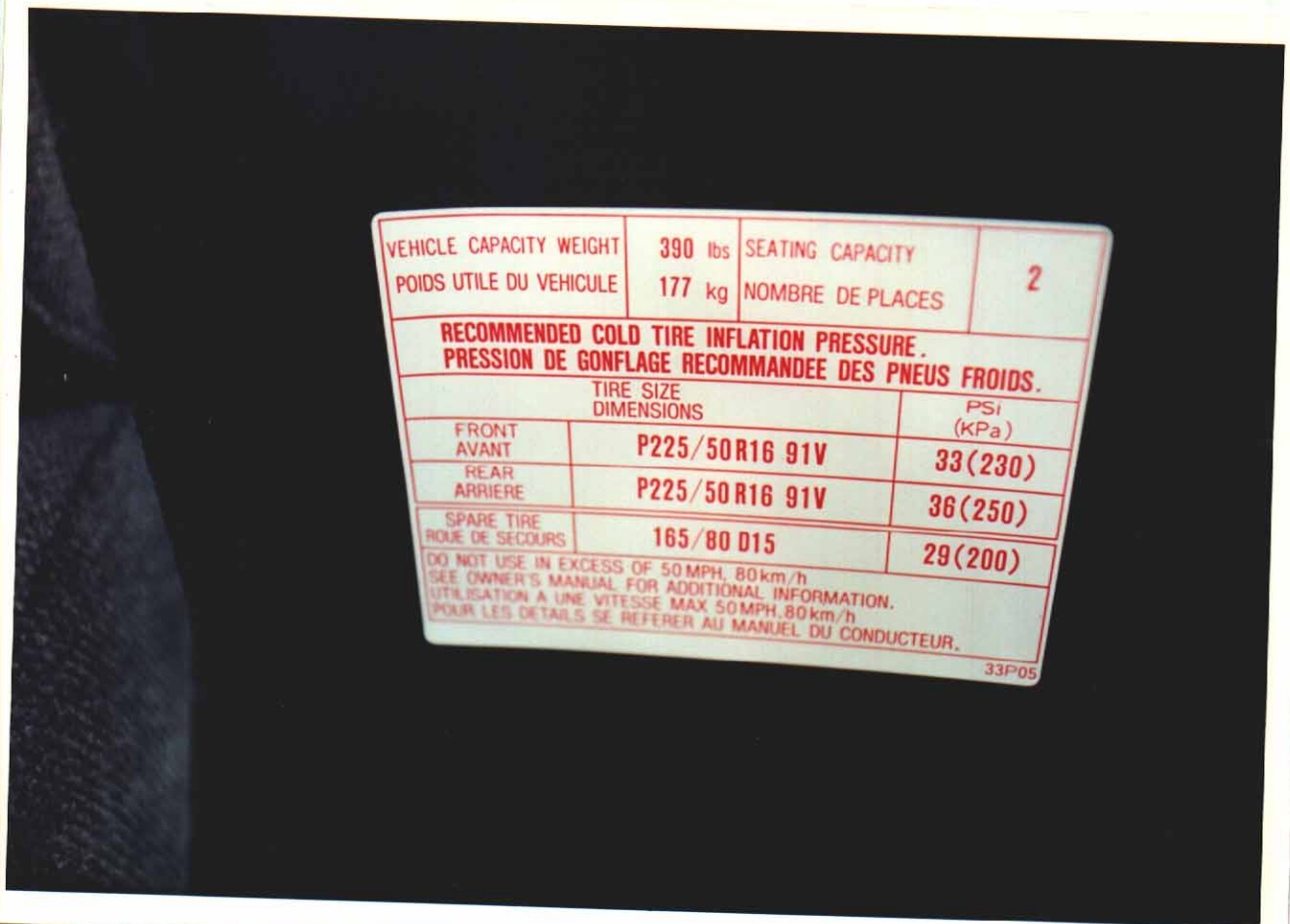


Figure A-36. POST-TEST VEHICLE RECOMMENDED TIRE PRESSURE LABEL VIEW

ACP? ~~(yes/no)~~

Lab TRC Lab Test No. 90485 NHTSA No. MM5201
Test Date 4/8/91 Test Temp. 74 F Test Weight 373.3 lbs
UDW 332.4 "

	HIC	CHEST	FEMUR L/R	CHEST DISPL. (III)
DRIVER	765	54	1495/1415	N/A
PASSENGER	1235	47	1666/1552	

CHECKLIST

Dummy Configuration and Performance Verification ✓

OMI Data Validation

Photographs (28 min.) ✓

Spelling ✓

Vehicle Information In Agreement With Purchase Order ✓

Instrument Calibrations (6 month min.) ✓

Proper Calculation Of Vehicle Test Weight ✓

Dummy Contact Points In Agreement With Film

Numerical Values In Text Match Data Plot Values

Reasonable Values For Dummy Positioning Data ✓

Correlation Between Dummy Positioning Values And Manufacturers
Specifications ✓

Vehicle Target Location Dimensions Sum Correctly ✓

Vehicle Measurements (difference) Pre-Test and Post-Test correct
sign

Verify Camera Location Data ✓

02/13/91

NCAP TEST REPORT REVIEW

ACP? (yes/no) no

1991 NISSAN 300ZX 2dr HB grey
(year) (make) (model) (doors) (color)

Lab TAC Lab Test No. 910408 NHTSA No. mm5201

Test Date 4/8/91 Test Temp. 74°F Test Weight 3733lbs

Data Tape # 1591 UDW 3324lbs

TEST RESULTS

	HIC	CHEST	FEMUR L/R	CHEST DISPL. (III)
DRIVER	765 (791)	54.1 (51)	1495/1415	X
PASSENGER	ND	47.2 (47)	1668/1552	

NO DATA OVER PASS HEAD & ACCIDENT RECONSTRUCTION

Crush (max.) 236' Firewall Intrusion (max.) 7.3' Rebound (max.) 14.8'
Impact Speed 35.0 mph Vehicle Delta V 39.7 mph Impact Force 125524 lbs
Seat Shift (driver) none Seat Shift (pass.) none Vehicle G's (max.) 38.6's
Seat Back Movement none Percent Crush 14% Barrier Contact Duration ~130 ms

Belt Loads:

Driver Lap 213/65 Driver Shoulder 1706
Pass. Lap 595 Pass. Shoulder 1914

Belt Spool-out:

Driver Film 3.0" Driver Elec. 3.4 Driver Mech. 2.3
Pass. Film 2.0 Pass. Elec. 2.4 Pass. Mech. 2.2

Belt Stretch:

Driver Elec. 148.14/5t Driver Mech. .13
Pass. Elec. ND Pass. Mech. .12

Data Collection: No. of Channels 68/69 | (-183) hybrid III

Comments ND PASS. PLOC 5/28/91

Camera Operation: No. of Cameras (11/17)

Comments OK.

VEHICLE INFORMATION

Restraint Sys. (Auto/Manual): Driver (M) (M) (A) Bag? (M) (M) (A) Bag?
Shoulder Lap (M) (M) Pass. (M) (M)

Seat Type Bucket

Engine Data: Cylinders 6 Displacement 3.0 L

Transmission Data: Speeds 5 Manual ✓ Auto ✓

Air Cond. ✓ Power Steering ✓ Power Brakes ✓

Odometer Reading 960 VIN JN1R224H6M50731

Date of Manufacture _____

DUMMY DATA

#	Driver	Pass.
713	826	
Last used		
Cal. date	<u>Nov 8/91</u>	<u>Jan. 28/91</u>

(reviewer) _____ (date) _____

(reviewer) _____ (date) _____

POST TEST Cal. conducted on PASS. as a result of head & done Q & A

(REPORT ERRORS ON BACK)

02/13/91

CHECKLIST

Dummy Configuration and Performance Verification ✓
OMI Data Validation ✓ ASG/TMC 4/24/91 ✓
Photographs (28 min.) ✓
Spelling ✓
Vehicle Information In Agreement With Purchase Order ✓
Instrument Calibrations (6 month min.) ✓
Proper Calculation Of Vehicle Test Weight ✓
Dummy Contact Points In Agreement With Film ✓
Numerical Values In Text Match Data Plot Values ✓
Reasonabl Values For Dummy Positioning Data ✓
Correlation Between Dummy Positioning Values And Manufacturers Specifications ✓
Vehicle Target Location Dimensions Sum Correctly ✓
Vehicle Measurements (difference) Pre-Test and Post-Test correct sign ✓
Verify Camera Location Data ✓

02/13/91

good report ✓
(NISSAN reviewed)

Pass head not released.
Z-AXIS questionable data

FILM ANALYSIS, NCAP TESTS

Year 1991 Make NISSAN Model 300 ZX Doors 2DR HB Color Grey

Laboratory TRC Test Date 4/8/91 NHTSA No. MM5201

Test Temperature 74°F Test Speed 35.0 mph

DRIVER

PASSENGER

HIC Values: 765

N/D

Load Cell Taped To Headliner: yes ☒ no ☐

yes ☒ no ☐

Shoulder Belt Slack: yes ☐ no ☒
(comments)

yes ☐ no ☒

Upper Torso Rotation: none ☒ <45 ☒ >45
(comments) minimal

none ☐ <45 ☒ >45

Head/Face Contact With
Steering Column:
mouth/nose/eyes
top of head
forehead
chin
(comments)

(rim, hub)
no bag

Air bag inflation - 8 from
Full deployment -
Contact bag @ 55

Head To Instrument Panel Contact:

mouth/nose/eyes ☒
top of head ☒
forehead ☒
chin ☒
no contact

Head to Knee Contact:
(comments)

left ☐ right ☐ none ☒

Seat Backs Remained Latched: yes ☒ no ☐

yes ☒ no ☐

Belt Spoolout: ~3" inches

~2" inches

Instrument Panel Rotation: yes ☐ no ☒ minimal

Steering Column Movement: up ☒ down ☐ forward ☐ rearward ☐
left ☐ right ☐

Front Structure: SMd. Crush
(comments)

Camera Coverage: acceptable ☒ underexposed ☐ overexposed ☐

02/13/91

John Smith 7/25/91
(reviewer) (date)
John Smith 07/25/91
(reviewer) (date)