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Vehicle Data Sources for Accident Reconstruction

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Engineering Dynamics Corp.

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ABSTRACT

A major component in reconstructing motor vehicle accidents is the use of accurate data about the vehicles involved in the accident. Whether the reconstruction is done manually or with the aid of computers, the accuracy of the reconstruction is directly proportional to the accuracy of the vehicle data. Unfortunately, the vehicle data is not always available from the actual vehicles involved in the accident. In these instances, the reconstructionist must obtain data that best approximates the original vehicles. In lieu of finding, measuring, and weighing identical vehicles, the data is available through publications, trade associations, and other common sources. This paper describes these sources and how the information can be obtained.

THE RECONSTRUCTION of motor vehicle crashes is of major importance to the American society. Crashes on America's highways in 1985 accounted for 45,700 deaths and 5,044,000 injuries [1]*. The costs, both human and economic, are staggering. Estimates of the economic loss for 1985 due to motor vehicle accidents have been over \$76 billion [2]. The reason for a crash reconstruction is to determine the human, vehicle and environmental factors causing the accident. This information, in turn, is used to help prevent future crashes.

*Numbers in brackets designate references at the end of the paper.

Crashes are reconstructed by several groups, ranging from the Government (National Accident Sampling System, National Transportation Safety Board) to local and statewide law enforcement agencies, insurance companies, or private consultants. Information from the reconstruction is ultimately for improving vehicle standards or litigation which frequently results from serious crashes.

Any individual, company or agency that reconstructs motor vehicle crashes requires detailed information about the vehicles involved in the crashes. The source of this vehicle data is thus of major importance to accident investigators.

TYPES OF VEHICLE DATA

Accident investigators are interested in three types of vehicle data: dimensional properties, inertial properties, and exterior structural properties (stiffness coefficients). These data are shown in Figure 1. Other information re-

1. Dimensions
 - a. overall length
 - b. overall width
 - c. wheelbase
 - d. track width
 - e. front overhang
 - f. rear overhang
2. Inertias
 - a. vehicle weight
 - b. moment of inertia
3. Crush resistance
 - a. structural stiffness

Figure 1 - Types of Vehicle Data

quired for specific types of parametric studies may also be necessary. This information includes tire cornering stiffness, suspension properties, aerodynamic drag, rolling resistance, and drive-train properties.

The purpose of this paper is to identify several sources of vehicle data useful to accident investigators. Additionally, the paper describes the contents of these documents and how to obtain them. The scope is primarily limited to the types of data previously shown in Figure 1.

PROCEDURE

Several sources of data known to the authors were identified. The following procedure was then used to evaluate the data:

1. All identified data sources were evaluated on the following:
 - a) frequency of updates
 - b) price
 - c) listed data
 - d) source of original data
 - e) vehicle years available
 - f) ordering information

Additional comments about ordering or distribution were also documented.

2. Sources of additional information were also summarized. This typically was data used in parametric studies.

3. As an independent means of checking the data, a random vehicle was obtained from the population of vehicles in use. The vehicle was measured using a plumb-bob approach. All measurements were recorded to the nearest quarter of an inch. The vehicle was weighed on a certified truck scale accurate to the nearest 10 pounds.

RESULTS

Two types of data sources for vehicle specifications used in accident reconstruction were identified. The more common vehicle measurements, such as wheelbase and curb weight, are readily available from a list of primary sources. Less frequently referenced material, such as parametric data or tractor-trailer information, was classified as additional sources. Both of these sources are described in the following sections.

PRIMARY SOURCES

The primary sources documented in this paper are listed in Table 1. The documentation for each source includes the frequency of update, costs, contents, ordering information, and additional comments.

TABLE 1 - Primary Sources of Vehicle Data

<p>Automotive News Bailey & Associates Car & Driver Consumer Reports Detroit Public Library Engineering Dynamics Corp. - EDVAP Appendix - Vehicle Crush Coefficients Kelly Blue Book MVMA Parking Dimensions Owner's Manual Road & Track Transport Canada Ward's Automotive Yearbook U.S. and Foreign Passenger Car Specifications</p>

The following is a detailed description of the data sources identified in Table 1:

Automotive News

<i>Frequency</i>	Annual April - "Market Data Book" (all vehicles) March - imports only October - domestic only
<i>Cost</i>	\$25 - "Market Data Book" \$50 - annual subscription (includes "Market Data Book") \$1.25 - weekly issue
<i>Data Source</i>	Manufacturers
<i>Listed Data</i>	See Table 2 and Figure 2
<i>Vehicle Years</i>	1982 - present
<i>Ordering Info</i>	Automotive News Circulation Department 965 E. Jefferson Avenue Detroit, Michigan 48207
<i>Phone</i>	(800) 992-9970
<i>Comments</i>	The <i>Automotive News</i> is a weekly publication. However, the data for all vehicles is only published in the special April edition, called the "Market Data Book".

TABLE 2 - Reconstruction Data Available by Source.

Source	Overall Length	Width	WB	Track Width	Overhang Front	Rear	Weight	Inertia	Struct. Stiff.	Notes
<i>Automotive News</i>	X	X	X	X			X			1
Bailey & Assoc.	X	X	X				X			
<i>Car & Driver</i>	X	X	X				X			2
<i>Consumer Reports</i>	X	X	X				X			3
Detroit Library	X	X	X	X	X	X	X			
<u>EDVAP</u>				X			X	X		1,3,4
<i>Vehicle Crush Coef.</i>							X		X	5
<u>Kelly Blue Book</u>			X				X			
<i>MVMA Park. Dimens.</i>	X	X	X	X	X	X	X			1,2,6
Owners Manual	X	X	X				X			6
<i>Road & Track</i>	X	X	X	X			X			1,9
Transport Canada	X	X	X		X	X	X			1,7
Ward's <u>Yearbook</u>	X	X	X	X			X			1,9
<i>U.S. and Foreign Passenger Car Spec.</i>	X	X	X	X			X			1,8,9

NOTES:

1. Track width is given for both front and rear axles.
2. Some values are entered as ranges (i.e. overall length and weight).
3. Front and rear weight is also given.
4. Data is given in the form of empirical formulas; actual values are not given.
5. Weight for vehicle includes test equipment.
6. Does not always include weight.
7. Data is metric; lengths are in centimeters and weights are in kilograms.
8. Data available for 1966 - 1982 vehicles only.
9. Track width is not available on earlier vehicles (usually prior to 1972).

Bailey & Associates

Frequency Annual
Cost \$450 for program
\$30 per year for updates
Data Source Manufacturers and periodicals
Listed Data See Table 2 and Figure 3
Vehicle Years 1963 - present (cars)
1973 - present (light trucks)
Ordering Info Bailey & Associates
324 Wildwood Lane
Dallas, Georgia 30132
Phone (404) 445-9972
Comments The data is in the form of a program that operates on an IBM PC with 256K memory. The program also performs some accident reconstruction calculations.

Car & Driver ("Buyers Guide")

Frequency Annual
"Buyers Guide" - December or January
Cost \$3.95 per issue
\$16.98 per year subscription
Data Source Manufacturers
Listed Data See Table 2 and Figure 4
Vehicle Years 1982 - present
Ordering Info Local news stand or
Car and Driver
Attn: Customer Service
P.O. Box 2886
Boulder, Colorado 80302-2886
Phone (800) 525-0643
Comments The *Car & Driver* magazine is published monthly; the *Car & Driver* "Buyers Guide" is a special issue that contains data for vehicles in the coming year.

Consumer Reports

Frequency Annual
"Annual Auto Buying Guide" - April
"Annual Buying Guide Summary" - Dec.
Cost \$2 per issue
\$5 per issue (back issues)
\$18 per year subscription
Data Source Manufacturers and direct measurements
by Consumer Reports
Listed Data See Table 2 and Figure 5
Vehicle Years 1936 to present
Ordering Info Back Issue Department
Consumer Reports
P.O. Box 53016
Boulder, Colorado 80322-3029
Phone (914) 667-9400

Consumer Reports (continued)

Comments Only the past 11 months are available from Consumer Reports; prior issues can usually be obtained at your local library. Major cars introduced in the year are summarized in the April issue; other monthly issues review a specific vehicle or group of new car types (i.e. vans).

Detroit Public Library

Frequency n/a
Cost \$7 (average per vehicle for photocopy)
Data Source Either manufacturers or:
Automotive News
MVMA
Wards
Listed Data See Table 2
Vehicle Years All
Ordering Info Attn: Ronald Grantz
National Automotive Historical
Collection
Detroit Public Library
5201 Woodward
Detroit, Michigan 48202
Phone (313) 833-1456
Hours: 1-5 pm. Tuesday - Saturday except
5-9 pm. Wednesday
Closed Sunday and Monday
Comments Requests for data can be made in writing or over the phone. This is an historical library and has actual blue-prints of some older vehicles.

Engineering Dynamics Corp. (EDVAP Appendix)

Frequency n/a
Cost n/a
Data Source Calspan Corporation [3]
Listed Data See Table 2 and Figure 6
Vehicle Years n/a
Ordering Info Engineering Dynamics Corporation
1026 Lund
Lake Oswego, Oregon 97034
Phone (503) 636-0427
Comments The EDVAP program manual is included with the purchase of any of the EDVAP accident reconstruction programs, but can be purchased separately. Specific data by vehicle is not quoted, rather formulas developed by Calspan on pre-1975 vehicles are shown.

Engineering Dynamics Corp. - Vehicle Crush Stiffness Coefficients

Frequency Variable
Cost \$225 - detail (Pub. #1042)
\$95 - summary (Pub. #1043)
Data Source Engineering Dynamics Corp. and U.S. Department of Transportation
Listed Data See Table 2 and Figure 7
Vehicle Years 1870 - 1984
Ordering Info Engineering Dynamics Corporation
1026 Lund
Lake Oswego, Oregon 97034
Phone (503) 636-0427
Comments The detail version (Publication #1042) includes an IBM PC-formatted diskette containing the published data. A computer program was developed by Engineering Dynamics to compute the stiffness coefficients from barrier crush data provided by the U.S. Department of Transportation. The formulas are found in the publication.

Vehicle crush stiffness coefficients are empirical factors used in the calculation of total dissipated energy and ultimately the velocity change for vehicular collisions. These factors define the force-deflection relationship or crush resistance of the vehicles's exterior. The values can be used in some accident reconstruction programs, such as EDCRASH.[4]

Kelly Blue Book

Frequency Bi-monthly beginning January First
Cost \$41 per year subscription
\$9 per issue (1981-1987 vehicles)
\$14 per issue (1874-1980 vehicles)
Data Source Manufacturers
Listed Data See Table 2 and Figure 8
Vehicle Years 1974 - present
Ordering Info Kelley Blue Book
P.O. Box 19691
Irvine, California 92713
Phone (800) 826-4424 (U.S. outside Calif.)
(800) 231-1743 (N. Calif.)
(714) 770-7704 (S. Calif. & foreign)
Comments Vehicle data is included for domestic and foreign cars, trucks, and vans. The *Blue Book* can usually be found at a local car dealer or financial institution. Although this book is not sold directly to the public, vehicle data can be obtained by asking.

Motor Vehicle Manufacturers Association - Parking Dimensions

Frequency Annual (January or February)
Cost Free
Data Source Manufacturers
Listed Data See Table 2 and Figure 9
Vehicle Years 1983 - present
Ordering Info Attn: Mr. Jim Steiger
Technical Affairs Division
Motor Vehicle Manufacturers Association
300 New Center Building
Detroit, Michigan 48202
Phone (313) 872-4311
Comments Only data for certain years are still available. Requests should be in writing and once requested, MVMA will mail the annual *Parking Dimensions* at no cost.

Owner's Manual

Frequency n/a
Cost Varies, usually \$2.50 - \$5.00 per manual
Data Source Manufacturers
Listed Data See Table 2 and Figure 10
Vehicle Years All
Ordering Info Varies by vehicle make. Contact your local dealer for information on obtaining copies of the particular Owner's Manual.
Comments The contents of individual owner manuals varies in complexity by manufacturer and vehicle model.

Road & Track

Frequency Annual
"Index" issue - March (contains summary of specifications on all imports and mid-size to large domestic cars.)
Cost \$2.50 per issue
\$19.94 per year subscription
Data Source Manufacturers and measured by Road & Track
Listed Data See Table 2 and Figure 11
Vehicle Years 1984 - present
Ordering Info Road & Track
P.O. Box 1126
Redlands, California 92373
Phone (800) 345-8112 (Non-Calif. residents)
(800) 331-6363 (California residents)
Comments Although *Road & Track* is noted for extensive reviews on exotic cars, the March Summary also contains specifications on most other vehicles.

Transport Canada

Frequency n/a
Cost Free
Data Source Measured on test vehicles and compared to other sources
Listed Data See Table 2 and Figure 12
Vehicle Years 1970 - present
Ordering Info Transport Canada
Vehicle Investigation
Box 8880
Ottawa, Ontario, Canada
K1G 3J2
Phone (613) 993-9851
Comments No regular publication is available. Statistics are kept for internal use by Transport Canada. However, information is printed if requested for a specific make and model and if they have the information.

Ward's Automotive Yearbook

Frequency Annual (June 1)
Cost \$95
Data Source Manufacturers
Listed Data See Table 2 and Figure 13
Vehicle Years 1950 to present
Ordering Info Wards Communications, Inc.
28 West Adams Street
Detroit, Michigan 48226
Phone (313) 962-4433
Comments The Yearbook is very comprehensive including numerous statistics on Canadian, import, and domestic cars and trucks. The book also includes information on all sizes of trucks, buses, recreation vehicles, farm and construction vehicles.

U.S. and Foreign Passenger Car Specifications

Frequency Not updated since 1982
Cost \$15.00
Data Source Reproduced by permission from Motor Vehicles Manufacturers Assoc. and *Automotive News*. Data was originally obtained from manufacturers.
Listed Data See Table 2 and Figure 14
Vehicle Years 1966 - 1982
Ordering Info Engineering Dynamics Corp.
1026 Lund
Lake Oswego, Oregon 97034
Phone (503) 636-0427
Comments This is a reprint of the last issue printed by MVMA. The publication contains vehicle dimensions and engine specifications.

ADDITIONAL SOURCES

Several other sources of vehicle specifications used in analyzing accidents were found. The description of these sources is described below:

Chilton Company (Automotive Industries)

Ordering Info Reprints
Automotive Industries
2600 Fisher Building
Detroit, Michigan 48202
Phone (312) 649-5303
Comments *Automotive Industries* April issue contains the vehicle specifications for all major domestic and import vehicles (trucks, tractors, and vans included) to be released that year. Most libraries have *Automotive Industries* and back issues are available. If not, small volume reprints or information on specific vehicles can be obtained by calling or writing *Automotive Industries*.

Chilton Company (Commercial Car Journal)

Ordering Info Reprint Editor
Commercial Car Journal
Chilton Company
Chilton Way
Radnor, Pennsylvania 19089
Phone (215) 964-4000
Comments *Commercial Car Journal's* October issue contains truck and tractor specifications for all major manufacturers introduced in the coming year. Included are wheelbases, GVW, GCW, and specifics for major components. Reprints of the 32 page section are available at \$0.35.

Machine Design

Ordering Info "Mechanics of Vehicles"
by J.J. Taborek, 1957
Reprints obtained from:
University of Microfilm (UMI)
Article Clearing House
300 N. Zeeb Road
Ann Arbor, Michigan 48106
Phone (800) 732-0616 or
(800) 521-0600 or
(313) 761-4700
Comments This was a series of articles published in *Machine Design* describing the rolling resistance and aerodynamic drag on various surfaces for passenger and truck tires. UMI has permission to reprint this series from The Penton Publishing Company.

Fleet Owner

Ordering Info Fleet Owner
 P.O. Box 530
 Highstown, New Jersey 08520-9990
Phone (609) 883-3500
Comments The October issue lists truck and tractor dimensions and specifications.

Popular Science Track Tests

Ordering Info For annual indexes:
 Popular Science Indexes
 P.O. Box 2027
 Latham, NY 12111
Phone (518) 445-0573
 For microfilm copies:
 UMI
 Microfilm Serial Bid Coordinator
 300 N. Zeeb Road
 Ann Arbor, Michigan 48106
Phone (800) 732-0616 or
 (800) 521-0600 or
 (313) 761-4700
Comments Annual indexes to the magazine list the vehicles reviewed in prior issues. Each monthly issue of the magazine lists vehicle dimensions and specifications on selected vehicles. Indexes are available for \$5.00 per 5 year index.

Truck Index

Ordering Info Truck Index, Inc.
 P.O. Box 10291
 Santa Ana, California 92711
Phone (714) 835-3061
Comments **Truck Index** is updated annually and comes in two volumes: one for gasoline trucks and one for diesel trucks. Besides truck dimensions and specifications, the set includes weight and load ratings, chassis diagrams, and wheel and tire sizes. Pickups are included. The cost is \$20 per year for the two volumes, including updates.

DATA SOURCE EXAMPLES

A 1984 Chevrolet Celebrity 4 door station wagon was used as a base vehicle when obtaining information from the primary sources. Some sources had no information on this vehicle and a similar vehicle was used to illustrate data from the source. The following pages contain examples of the types of data found in each of the primary sources.

1988 SPECS

1988-model U.S. passenger car specifications

Make and Model	Dimensions										Engines						Capacities			Miscellaneous			
	Wheelbase (in.)	Overall Length (in.)	Overall Width (in.)	Overall Height (in.)	Curb Weight (lbs.)	Front-end Hoodroom (in.)	Front-end Legroom (in.)	Front Tread (in.)	Rear Tread (in.)	Type	Belt and Sash	Displacement (liters/cu. in.)	Configuration	Compression Ratio	Max HP at RPM	Max Torque (ft. lbs.) at RPM	Fuel Tank (U.S. gal.)	Cooling System with Fuel (gal.)	Cooling System with Water (gal.)	Anti-Lock (ABS)	Drive System	Wheel Diameter (in.)	Curb-Curb Turning Circle (dia. in. ft.)
BUNCK-Skyhawk 2-dr.	101.2	179.3	65.0	54.0	2,349	37.7	42.2	55.6	55.2	L-4	3.39 x 3.39	2.0/121	EFI	8.8:1	96 @ 4,800	118 @ 3,600	13.6	7.8	4.7	3.45	F	13	34.5
Skyhawk 4-dr.	101.2	181.7	65.0	54.0	2,409	38.6	42.2	55.6	55.2	L-4	3.39 x 3.39	2.0/121	EFI	8.8:1	96 @ 4,800	118 @ 3,600	13.6	7.8	4.7	3.45	F	13	34.5
Skyhawk Wagon	101.2	181.7	65.0	54.4	2,476	38.3	42.2	55.4	55.2	L-4	3.39 x 3.39	2.0/121	EFI	8.8:1	96 @ 4,800	118 @ 3,600	13.6	7.8	4.7	3.45	F	13	34.5

Figure 2 - Automotive News

Accident Reconstruction Programs Copyright 1982 - 1987

1966 - 1987 Automobiles

* * * Vehicle Data Files * * *

Year/Make : 1984 CHEVROLET Model : CELEBRITY WAGON

Weight : 2856 Pounds

Wheelbase : 104.9 inches 8.74 feet

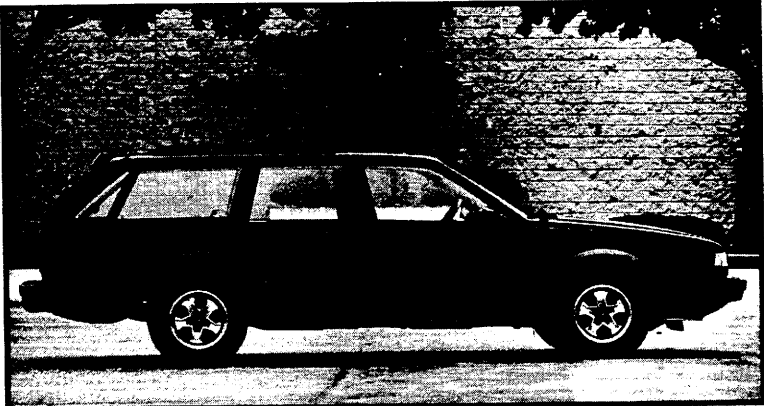
Length : 190.8 inches 15.90 feet

Width : 69.3 inches 5.77 feet

(Vehicle Data is Based on Manufacture's Published Data)
(Weight Listed is Shipping Weight)

Figure 3 - Bailey & Associates

CHEVROLET CELEBRITY



Manufacturer: Chevrolet Motor Division
30007 Van Dyke Avenue
Warren, Michigan 48090

Base price: \$9995-10,672
Vehicle type: front-engine, front-drive
Body styles: 2-door sedan, 4-door sedan, 5-door wagon

DIMENSIONS

Wheelbase	104.9 in
Track, F/R	58.7/57.0 in
Length	188.3-190.8 in
Width	69.3 in
Height	53.9-54.3 in
Curb weight	2800-3100 lb
Fuel-tank capacity	15.7-16.6 gal

ENGINES
2.5-liter 4-in-line, 2.8-liter V-6

TRANSMISSIONS
5-sp man, 3-sp auto, 4-sp auto

SUSPENSION
F: ind, strut, coil springs
R: rigid axle, coil springs

BRAKES
F: vented disc
R: drum

EPA ESTIMATED FUEL ECONOMY
City 19-22 mpg

Few cars have had as hard a time living up to their names as this one. A few years ago, the Celebrity would have been an overnight sensation, given its specifications. But today it's one of many front-drive sedans smack in the middle of the family-car segment.

Slowly but surely, though, the Celebrity is gaining the recognition it deserves. This is undoubtedly one of the best GM cars to come along in some time, a car with a special harmony. The Celebrity is the successor to the mid-sized Malibu line, which was retired a few years back, and it provides the same brand of room and comfort in a decidedly more compact and fuel-efficient front-wheel-drive package.

The Celebrity line is carefully planned to appeal to a variety of domestic-car buyers, and a few considering imports. The motivation menu ranges up to a fuel-injected 2.8-liter V-6. Two sedans and a wagon are available. And you can dress the Celebrity in plain, fancy, or Eurosport trim. All this has made the Celebrity one of the most popular cars in the land, if not exactly a *cause célèbre*.

Figure 4 - Car & Driver

	Buick Century Custom	Chrysler Le Baron Town & Country	Mercury Marquis
DIMENSIONS			
Wheelbase (Inches)	105	100	106
Overall length (Inches)	191	180	197
Overall width (Inches)	69	69	71
Maximum rated load (pounds)	1200	1050	900
Road clearance with maximum rated load (Inches)	4.6	3.3	3.8
Front-seat shoulder room (Inches)	56.0	55.5	56.0
Maximum front-seat leg room (Inches)	42.5	41.5	41.5
Front-seat head room (Inches)	3.5	3.5	4.5
Rear-seat shoulder room (Inches)	56.0	55.5	56.0
Rear-seat fore-and-aft seating room (Inches)	29.0	27.5	30.0
Rear-seat head room (Inches)	4.0	4.0	5.0
Door top to ground (Inches)	50.0	51.0	50.5
Luggage capacity (2-suiters + weekend cases)	0+1	0	0
Turning-circle diameter (feet)	41	37	43
Steering factor (power)	0.75	0.82	0.88
WEIGHT AND TIRES			
Curb weight (pounds)	3165	2820	3285
Percent weight, front/rear	61/39	62/38	54/46
Tire size	185/75R14	185/70R14	185/75R14

DIMENSIONS. External dimensions as furnished by manufacturer. Other dimensions as measured by CU. Road clearance is distance from level road surface to lowest part of car likely to strike road. Head room is measured between the car's headliner and the head of a 5-foot-9-inch, 150-pound CU tester. Turning circle is diameter of the path of the outermost tip of front bumper with wheels turned full left. Steering factor is number of turns of steering wheel needed for turn of 30-foot radius.

WEIGHT AND TIRES. Curb weight includes fuel, oil, and water. Weights are to nearest 5 pounds.

Figure 5 - Consumer Reports

Copyright 1984 by Consumers Union of United States, Inc., Mt. Vernon, NY 10553. Excerpted by permission from Consumer Reports, May, 1984.

Given a wheelbase, L (in):	
1. Total Weight	5. Sprung Weight
$W_t = 2.451 \times 10^{-3} L^3$ (lb)	$W_s = W_t - W_{ut}$ (lb)
2. Total Unsprung Weight	6. Total Weight on Front Wheels
$W_{ut} = 126.6 + 0.111 W_t$ (lb)	$W_{ft} = [(62.727 - 0.0629L) / 100] W_t$ (lb)
3. Front Unsprung Weight	7. Total Weight on Rear Wheels
$W_{uf} = 0.385 W_{ut}$ (lb)	$W_{rt} = W_t - W_{ft}$ (lb)
4. Rear Unsprung Weight	8. Percent Weight on Front Wheels
$W_{ur} = W_{ut} - W_{uf}$ (lb)	$P_f = 100(W_{ft} / W_t)$

Figure 6 - Engineering Dynamics Corp. - EDVAP Appendix (example of 54 formulas)

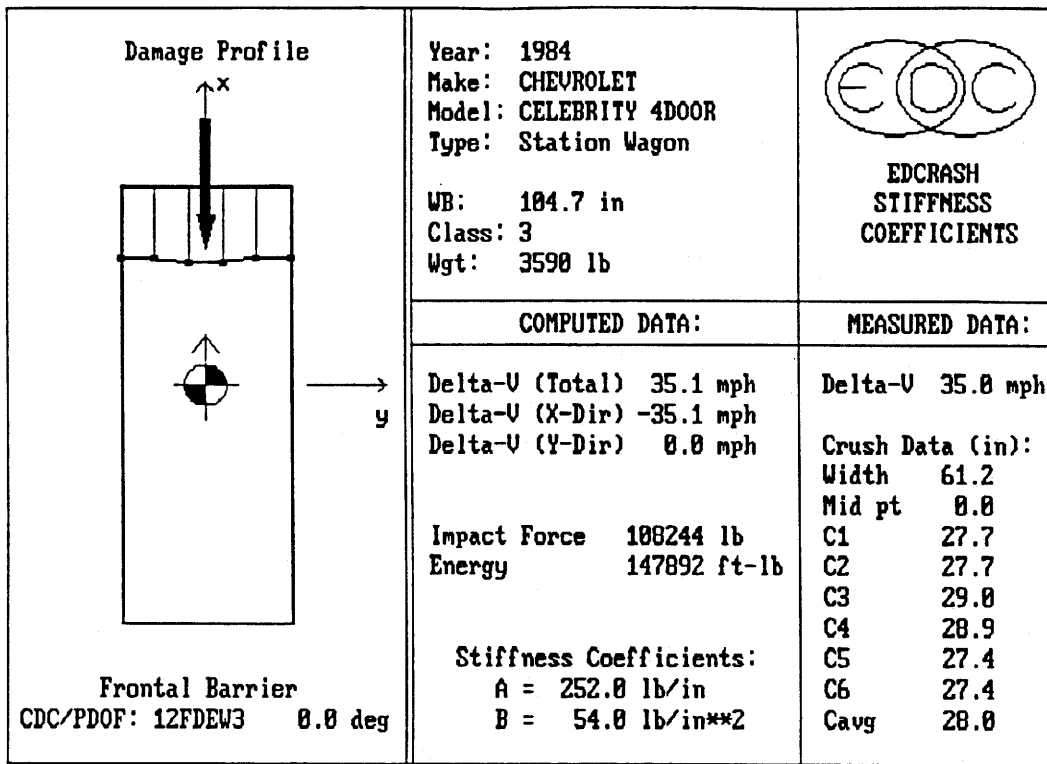


Figure 7 - Engineering Dynamics Corp. - Vehicle Crush Coefficients

1984 CHEVROLET

Body Type	VIN	Wh.	List	Wholesale	Retail
CELEBRITY—4-Cyl.—Equipment Schedule B					
W.B. 104.9; CID 151.					
Sedan 4D	W19R	2823	9304	4300	5810
Coupe 2D	W27R	2587	8855	4200	5625
Wagon 4D	W35R	2771	9358	4500	6063

Figure 8 - Kelly Blue Book

DIMENSIONS

Models	Metric Measure	U.S. Measure
Length — Coupe & Sedan	4783mm	188.3"
— Station Wagon	4847mm	190.8"
Width — All Models	1760 mm	69.3"
Height — Sedans	1365mm	53.7"
— Coupe and Station Wagon	1379mm	54.3"
Wheelbase — All Models	2664mm	104.9"

Figure 10 - Owner's Manual

OVERALL DIMENSIONS - 1984
 (Figures in Inches)

Models	Wheelbase L101	Overall Length L103	Overall Width W103	Overall Width -Doors Open W120	Overall Height H101	Minimum Running Ground Clearance H156
American Motors Corporation						
Alliance 95, 96	97.8	163.8	65.0	126.0-142.0	51.3	4.72
Encore 93, 99	97.8	160.6	65.0	142.0	51.3	4.72
Eagle MPV 35, 38	109.27	180.94	72.34	139.22	54.35	6.85'

FRONT OF CAR DIMENSIONS - 1984
 (Figures in Inches)

Models	Bottom of Front Bumper to Ground H102	Height Bottom of Front Door to Ground H133	Cowl At Rear to Ground H114	Length		Width Tread W101
				Upper Structure L123	Overhang, Front L104	
American Motors Corporation						
Alliance 95, 96	13.4-15.4	10.39	34.56	93.35	30.98	55.19
Encore 93, 99	13.4-15.4	10.39	34.56	---	30.98	55.19
Eagle MPV 35, 38	16.83'	12.66-12.97	39.52-39.62	96.29	33.50	59.60

Figure 9 - Motor Vehicle Manufacturers Association (Parking Dimensions)

Country	Manufacturer	Model(s)	Body Type(s)	Seats	Chassis*	Engine Type /valves per cylinder	Bore x Stroke, mm	Displacement, cc/cu in.	Compression Ratio (1:1)	Carburetion or Fuel Injection*	Power @ rpm, bhp SAE net	Torque @ rpm, lb-ft SAE net	Transmission(s) ^y
J	ACURA	Integra RS ¹ , LS	30 ¹ , 50	5	IS	L4 dohc/4	75.0 x 90.0	1590/97	9.3	Honda PGM-FI	113 @ 6250	99 @ 5500	5M, 4A
		Legend	40	5	IS	V6 sohc/4	84.0 x 75.0	2494/152	9.0	Honda PGM-FI	151 @ 5800	154 @ 4500	5M ¹ , 4A
I	ALFA ROMEO	Graduate, Spider Veloce, Quadrifoglio	Cv	2	IS	L4 dohc/2	84.0 x 88.5	1962/120	9.0	Bosch Motronic	115 @ 5500	119 @ 2750	5M
		Milano	40	5	IS	V6 sohc/2	88.0 x 68.3	2492/152	9.0	Bosch L-Jetronic	154 @ 5600	152 @ 3200	5M

Gear Ratios (1:1)	Final Drive Ratio (1:1)	Engine Position/ Driven Wheels*	Front Suspension/ Springs*	Rear Suspension/ Springs*	Rear Disc Brakes*	Anti-lock Braking*	Tire Size (std equip)	Curb Weight, lb	Wheelbase, in.	Track, Front/Rear, in.	Length x Width x Height, in.	Steering Type*	Power-assisted Steering	Steering Turns, Lock-to-lock	Turning Circle, ft	Fuel Capacity, U.S. gal.
3.18/1.94/1.34/1.03/0.84	4.21	FT/F	strut/tors	beam/coil	S	NA	195/60R-14	2326	96.5	55.9/56.5	168.5 x 64.9 x 52.9	r & p	S	3.6	30.8	13.2
2.92/1.78/1.25/0.96/0.75	4.20	FT/F	UA/coil	strut/coil	S	NA	205/60R-15	3077	108.7	59.1/57.5	169.4 x 68.3 x 54.7	r & p	S	3.4	36.1	18.0
3.30/1.99/1.35/1.00/0.79	4.10	F/R	UA/coil	live/coil	S	NA	195/60HR-15	2550	88.6	52.1/50.1	168.8 x 64.1 x 48.8	w & r	NA	3.3	34.5	12.2

Figure 11 - Road & Track

MODEL	Centimeters						KG's					
	A	B	C	D	E	F	G	WB	OL	OW	OH	CW
CAVALIER TYPE 10 2 DR HB & TBI HB	134	116	37	64	115	91	91	257	438	168	131	1097
CAVALIER TYPE 10 CP	134	70	37	64	115	91	91	257	438	169	132	1073
CELEBRITY 2 DR CP	142	93	38	68	120	107	108	266	478	176	137	1204
CELEBRITY 4 DR SD	142	93	38	68	120	107	108	267	478	176	137	1225

Figure 12 - Transport Canada

MAKE & SERIES	WHEEL- OVERALL SIZE				CURB WGT. (lbs.)	STANDARD ENGINE						AVAILABLE ENGINE by Liter, Type, Fuel System		
	BASE (ins.)	Length (ins.)	Width (ins.)	Height (ins.)		Cyl. & Type	Size (cid)	Fuel System	Bore x Stroke (ins.)	Comp. Ratio	Net HP @ RPM		Est. MPG	
CHEVROLET DIV.														
Chevette 2-Door H'back	94.3	161.9	61.8	52.8	2,047	OHC-4	98	1.6	2 bbl.	3.23x2.98	9.0:1	65 @ 5200	31	Chevette: 1.8, OHC-4, Diesel.
Chevette 4-Door H'back	97.3	161.9	61.8	52.8	2,110	OHC-4	98	1.6	2 bbl.	3.23x3.98	9.0:1	65 @ 5200	31	
Chevette 4-Door H'back Diesel*	97.3	164.9	61.8	52.8	2,282	OHC-4	111	1.8	IDI	3.31x3.23	22.0:1	51 @ 5000	43	
Cavalier 4-Door Sedan	101.2	174.3	66.3	53.8	2,389	L-4	121	2.0	SP-FI	3.50x3.15	9.0:1	88 @ 4800	28	Cavalier: None.

Figure 13 - Ward's Automotive Yearbook

1981 U.S. Passenger Car Specifications

Make and Model	Dimensions								Engine					Capacities		Miscellaneous						
	Wheelbase (in)	Overall Length (in)	Overall Width (in)	Overall Height (in)	Curb Weight (lbs)	Front-seat headroom (in)	Front-seat legroom (in)	Front Tread (in)	Rear Tread (in)	Type	Bore and Stroke (in)	Displacement (liter/cu in)	Carburetion	Compression Ratio	Net HP at RPM	Net torque (ft lbs) at RPM	Fuel Tank (U.S. gals)	Cooling system w/water (gals)	Crashcase w/filler (gals)	Axle Ratio (standard)	Tire Size	Curb-to-Curb Turning Circle (dia in ft)
AMERICAN MOTORS	96	187	72	51.8	2621	38.1	40.8	58.1	57	L4	4 x 3	2.5/1511	2V	8.3	NA	NA	21	6.5	4	3.08	P1857SR14	31.5
Spirit Liftback 6	96	187.2	71.9	51.5	2754	38.1	40.8	58.1	57	L8	3.75 x 3.9	4.2/2580	2V	8.3	NA	NA	21	11	5	2.37	P1857SR14	31.5
Concord Sedan 4	108	185	71	51.3	2822	38.1	40.8	57.6	57.6	L4	4 x 3	2.5/1511	2V	8.3	NA	NA	22	6.5	4	3.08	P1957SR14	34.9
Concord Wagon 6	108	185	71	51.6	2948	38.1	40.8	57.6	57	L8	3.75 x 3.9	4.2/2580	2V	8.3	NA	NA	22	11	5	2.37	P1957SR14	34.9
Eagle Sedan 4	109.3	184	71	55.1	3272	38.1	40.8	59.6	57.8	L4	4 x 3	2.5/1511	2V	8.3	NA	NA	22	14	4	3.54	P1957SR15	35.5
Eagle Wagon 6	109.3	184	71	55	3401	38.1	40.8	59.6	57.8	L8	3.75 x 3.9	4.2/2580	2V	8.3	NA	NA	22	14	5	2.73	P1957SR15	35.5
Eagle SX-4 4	97.2	164.6	73	55	3060	38.1	40.8	59.6	57.8	L4	4 x 3	2.5/1511	2V	8.3	NA	NA	21	6.5	4	3.54	P1957SR14	32.6
Eagle Kamback 6	97.2	164.4	73	54.7	3132	38.1	40.8	59.6	57.6	L6	3.75 x 3.9	4.2/2580	2V	8.3	NA	NA	21	14	5	2.73	P1957SR14	32.6

Figure 14 - U.S. and Foreign Passenger Car Specifications

VALIDATION

To verify the primary sources of data, a 1984 Chevrolet Celebrity V6 automatic station wagon was measured and weighed with an empty gas tank. A comparison of these measurements with those obtained from each of the primary above sources is compared in Table 3 - Comparison of Specifications by Source.

In reviewing the data obtained from the various sources, a large disparity in the curb weight was noted. The curb weight varied from as low as 2701 to as high as 3590 pounds. This can be attributed to the options added or removed from the base vehicle or the weight of the test equipment on the vehicle. A more specific weight can sometimes be obtained by referring to the manufacturer's weight for the appropriate options.

TABLE 3 - Comparison of Specifications by Source. All measurements are in pounds and inches.

	Wheel Base	Overall- Width	Overall- Length	Over-hang Front	Over-hang Rear	Track-width Front	Track-width Rear	Weight Front	Weight Rear	Total	Crush A	Stiff. B
Control	105	68.5	191.75	41.25	45.5	58.25	57.0	1900	1120	3020		
<i>Auto. News</i>	104.9	69.3	190.8			58.7	57.0			2903		
Bailey	104.9	69.3	190.8							2856		
<i>Car & Driver</i>	104.9	69.3	188.3 - 190.8							2800 - 3100		
<i>Consumer Reports</i>	105	69	191					1930	1235	3165		
<u>EDVAP</u>						56.5	56.2	1592	1245	2837		
<i>Vehicle Coefficients</i>	104.7									3590*	252.0	54.0
<u>Blue Book</u>	104.9									2771		
MVMA	104.9	67.8	188.3 - 192.9	40.7- 41.7	41.9- 47.1	58.7	57.0					
Owners Manual	104.9	69.3	190.8									
<i>Road & Track</i>	104.9	69.3	188.3			58.7	57.0			2715		
Transport Canada	105	69	188	40.5	42.5					2701		
Ward's	104.9	69.3	190.8							2851		

* Vehicle weight includes test instrumentation.

CONCLUSION

A variety of sources are available to the accident reconstructionist for identifying vehicle dimensions and specifications. The accuracy and contents of each source may vary, but knowing the publisher's source and degree of accuracy can impact the ultimate accuracy of the reconstructionists' results.

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