

COST EVALUATION FOR FOUR FEDERAL MOTOR VEHICLE STANDARDS VOLUME I:

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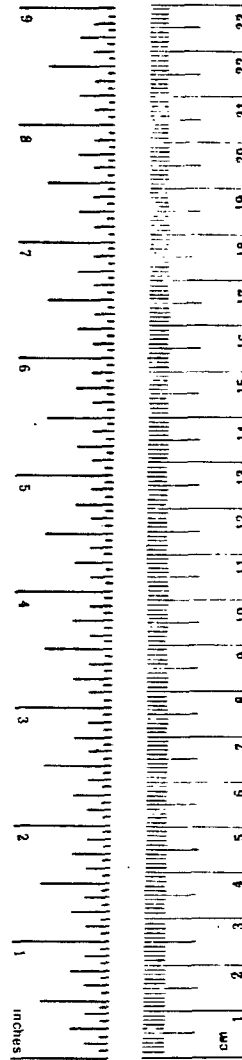
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16. Abstract Total consumer out-of-pocket costs have been estimated for four Federal Motor Vehicle Safety Standards. They are: <ol style="list-style-type: none"> 1. FMVSS 214 - Side Door Strength 2. FMVSS 215 - Exterior Protection 3. FMVSS 301 - Fuel System Integrity 4. FMVSS 208 - Occupant Crash Protection For each standard a representative sample of makes and models of vehicles was established. The parts required to meet the safety standard were purchased and their costs were estimated. The first year of the imposition of the standard and the year immediately preceding it were emphasized. By analysis, the consumer costs attributal to the standard for each make and model were determined. A weighted average was developed from the sample vehicles and applied to the total industry volumes to determine the out-of-pocket cost for the implementation of each standard. The weighted average of weight variance per vehicle due to the implementation of the standard was also determined for FMVSS 214, 215, and 301.					
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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	tonnes	t
VOLUME				
tsp	teaspoons	5	milliliters	ml
Tbsp	tablespoons	15	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	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

¹ 1 in = 2.54 (exactly). For other exact conversions and more detailed tables, see NRS Misc. Publ. 296, Units of Weights and Measures, Price \$2.25, SD Catalog No. C11.10.286



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	tonnes (1000 kg)	1.1	short tons	
VOLUME				
ml	milliliters	0.03	fluid ounces	fl oz
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	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F

PREFACE

The Contractor, The Research and Engineering Division of the John Z. De Lorean Corporation, acknowledges the contributions of its staff who participated in the preparation of this report. The cost estimating techniques employed in the study are based on automotive industry practice and have previously been utilized on other programs by the Contractor.

The listing includes recent and current programs utilizing essentially the same estimating procedures and techniques as those employed in this study:

- Contract NHTSA - DOT-7-01770
Development of a Motor Vehicle Materials Historical, High-Volume Industrial Processing Rates Cost Data Bank - Ford F-100 Truck
- Contract NHTSA - DOT-8-02015
Cost Evaluation of Nine Federal Motor Vehicle Safety Standards
- Contract NHTSA - DOT-7-01770 Amendments 2 and 3
Development of a Motor Vehicle Historical, High-Volume Industry Processing Rates Cost Data Bank - Safety Standards 201, 203 and 204
- Renault USA, Inc.
Consumer Cost Estimate of Renault R-5 and Chevrolet Chevette Vehicles

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COST EVALUATION OF FOUR FEDERAL MOTOR VEHICLE STANDARDS

INTRODUCTION

Under Contract DOT-HS-7-01767, the Contractor conducted a program that developed the out-of-pocket cost to the consumer resulting from manufacturing changes to the motor vehicle in order that it comply with each of the Federal Motor Vehicle Safety Standards under consideration. These Standards were: FMVSS 214, Side Door Strength; FMVSS 215, Exterior Protection; FMVSS 301, Fuel System Integrity; and FMVSS 208, Occupant Crash Protection.

A Sampling Plan was developed and followed to obtain detailed implementation cost data for each of the significant changes of each standard under study. Specimen vehicles were selected that provided a high volume representation of the industry rather than any specific manufacturer.

For each specimen vehicle, component and assemblies required for the implementation of the standard were purchased. Automotive industry teardown and manufacturing cost estimation techniques were applied to develop cost and weight data for the implementation analysis.

Appendix A of Volume I of this report represents a summary of cost elements and weight of components involved in the analysis of implementation cost of the standard. In this study, consumer cost or out-of-pocket consumer cost is defined as the summation of manufacturing cost, tooling cost,

other corporate cost plus profit, and dealer markup. The manufacturing cost incurred by the manufacturer is generally segregated by the cost of materials, the cost of labor, and all other costs associated with manufacturing and assembling the product. A further breakdown of these three main categories is made to identify the cost of each category that vary with the volume of production (variable cost) and those costs that remain constant regardless of the volume of production (fixed costs).

In Figure 1, elements of component cost are shown. The boxes with the solid lines contain data that is related to data sheets in Appendix A. Those with dotted boxes are cost elements considered in the estimating processing and the summarized results are contained in the costs in Appendix A.

The cost development process and teardown procedure requires that each component be weighed, tagged with identification data, and analyzed for general type of material and manufacturing method utilized. Experienced personnel qualified by many years of automotive related production processing were employed to develop the basic data. The processing method, specific manufacturing operation, type of equipment, pieces per hour, number of men, number of machines, general type of material, rough weight of material and tooling costs were all elements of data furnished by the process engineer. The De Lorean Automotive Finite Estimating the Processing Technique utilizes this basic data plus Model Year Economics and Volumes contained in the De Lorean Data Bank to extend the data into the cost items summarized in Appendix A, Volume I.

ELEMENTS OF COMPONENT CONSUMER OUT-OF-POCKET COST

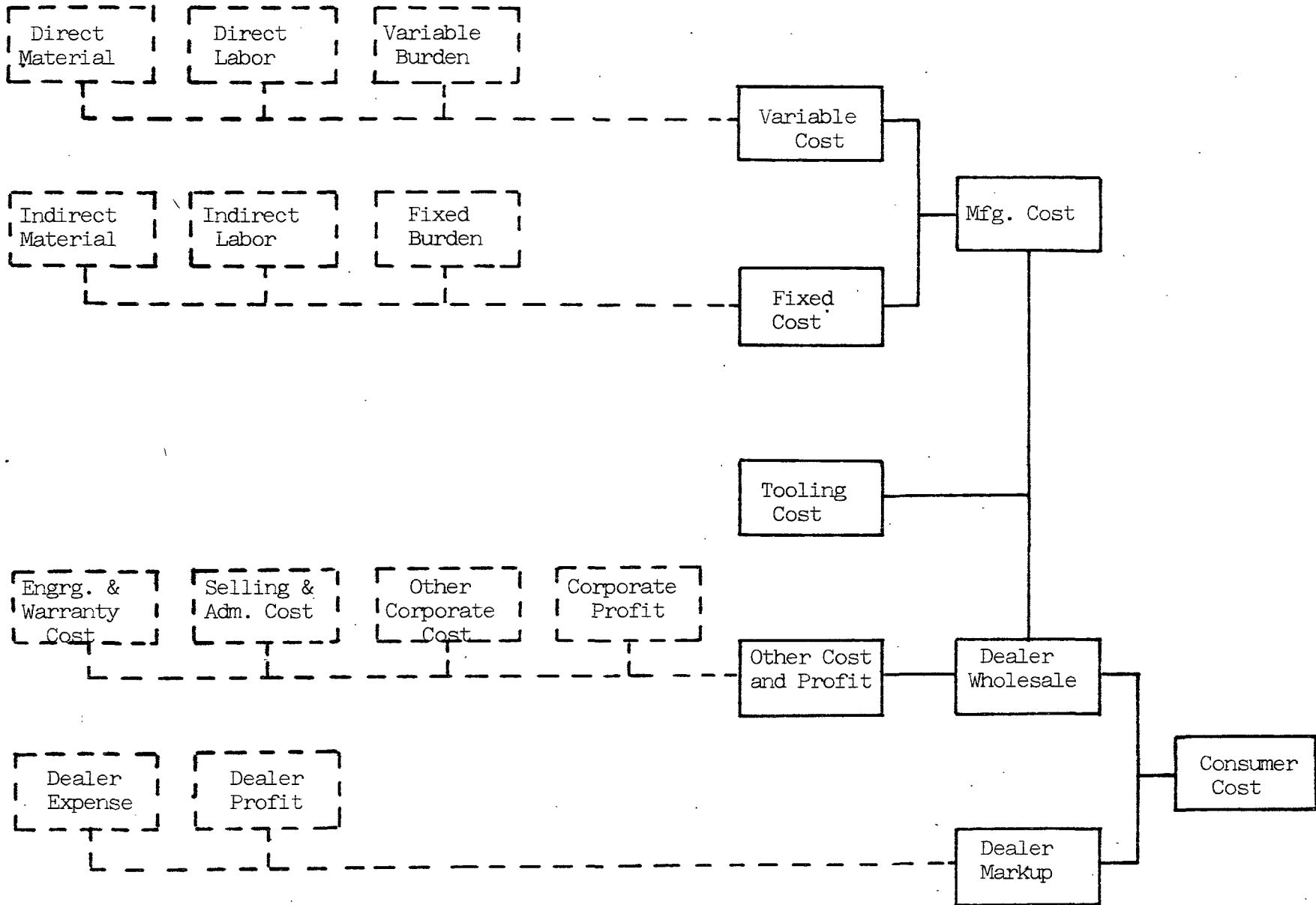


Figure 1

The De Lorean Data Bank contains approximately three hundred operation rates and over sixty materials utilized in the automotive industry and covers eleven model year economics. In this study, the terms "Model Year Economics" and "Model Year Production Volumes" are utilized. The term model year directly relates to a designated year of a car design. Normally in the United States, the model car year starts in retail sales approximately in September. The volume is related to the number of vehicles produced of a specific design year vehicle. The term economics relates to the average cost elements involved in the production of a specific car year. The Model Production Years normally are not related to the calendar year or a Corporation Fiscal Year. For this study, the Contract Technical Manager designated the Model Year Economics and Model Year Production Volumes for each standard. These are designated in the appropriate section of this report.

The costs included in Appendix A are variable cost, fixed cost, manufacturing cost, tooling, other costs plus profit, dealer mark-up, consumer cost and cost per pound.

The variable costs of production of automotive components are those incremental costs associated with that component. The major categorical contributors to variable costs are direct labor, direct materials, and variable burden. Other minor contributors to variable cost such as setup costs, where applicable, are included in the variable burden rate.

Direct labor costs are determined as an average rate depending on the worker classification required to perform

the tasks identified in the process study (e.g., punch press operator, drill press operator, machinist). Average labor rates are determined from Union records, Department of Labor statistics, or a combination thereof. Labor fringe benefits and standard allowance for less than 100 percent labor efficiency are included in the average labor rate.

For each component, the process analysis identified the operation, type of equipment, pieces per hour, number of men, and number of machines. This data when extended by information from the De Lorean Data Bank and all component operations summarized will produce the total direct labor cost per component.

Direct material costs are those costs associated with the purchase of all material required in the production process. Accordingly, direct material costs include the cost of not only the material in the finished component, but also that of the material scrapped minus salvage price, due to material removal or incorrectly worked components that cannot be salvaged.

Variable burden costs are estimated charges that attempt to account for all other expenses due to the production process and that vary directly with the production volume and that contribute to the cost of sales. Examples of sources of such expenses include, but are not limited to, perishable tools (e.g., drill bits, spot welding tips), fuel and power requirements and direct supervision and clerical. The total of all expenses that vary with the production quantity is

estimated, based on a production planning volume. The sum of these expenses is then apportioned to each component on some logical scheme. The amount of apportionment is known as a variable burden rate.

Several methods of applying variable burden have been popularly accepted in the past as well as during current times. Total costs that are apportioned on the number of pieces produced, or material usage, misrepresent true costs whenever parts of different sizes or complexities are produced. Costs apportioned on direct labor misrepresent true costs in a highly automated production process.

This study utilizes a burden rate applied on occupancy time in a given machine, or station, performing a task during the production process. Burden rates are calculated on basis of a combination of machine or station complexity, cycle time, area occupied, and other considerations that more realistically reflect the true rate of apportionment of total variable expenses.

The portion of total manufacturing costs, known as fixed cost, is the accumulation of costs incurred in the manufacturing of a product that does not vary regardless of the volume. Major categorical contributors to fixed cost are indirect labor, indirect materials, and fixed burden.

Indirect labor costs are determined by apportioning the total estimated wages for indirect labor over the planned production volume. Indirect labor is comprised of, but not limited, to, supervisory and management, clerical, janitorial, plant protection, etc. The total cost of such

labor is not affected by variations in the production rate. Total estimated labor costs are a function of specific manufacturing plan manning requirements.

Indirect material costs are determined by apportioning the total estimated costs for all material necessary for the proper functioning of the manufacturing plant and not related to the finished product over the planned production volume. Indirect materials are comprised of, but not limited to, stationery and office supplies, janitorial supplies, maintenance supplies, first aid and medical supplies, etc.

Fixed burden is determined by apportioning the remaining estimated expenses related to the operation of a manufacturing plant over the planned production volume. All such expenses are conveniently accumulated categorically as burden. Such expenses are comprised of, but not limited to, property taxes, insurance costs, depreciation charges on buildings and capital equipment, etc.

Indirect labor, indirect material and fixed burden collectively contribute to a fixed burden rate. As with the variable burden rate, fixed burden is applied on a basis of occupancy time in a machine or station. The application of the burden rate for the proper time intervals results in the fixed cost contribution to the total component cost.

Unit manufacturing cost consists of variable cost and fixed cost. This accounts for all costs exclusive of special

tools that are incurred in the production of the components. Tooling cost in this study is determined by apportioning the total expense by special tooling to manufacture a component over the entire life production volume of that component. This cost factor could vary as the component or sub-component could have several years application beyond the study period of the program. Further, the component or sub-component could be extended over several carlines. Thus the years of amortization and production volumes could have a definite bearing on the tooling cost of the component. With this knowledge, the process engineer was required to use judgment in the application of the amortization and volume factor.

Other cost plus profit category includes items of engineering cost, warranty costs, selling and administrative costs, corporate burden and taxes (excluding factory burden and taxes), corporate depreciation and maintenance (excluding factory depreciation and maintenance), and other corporate costs and profit. The application of a cost factor to the manufacturing cost of each component could be applied by two major methods. As this study was to reflect consumer cost of a system or change in a system of a total vehicle, it was believed the best approach would be to apply in-house knowledge of corporate other costs and profit as they apply to specific car lines and manufacturer. The application of this factor to the manufacturing cost of the components being studied and all other manufacturing costs of the vehicle would produce a total cost that is within reasonable limits of a teardown car cost.

The second method would develop a factor from a macro-analysis study of each vehicle manufacturing company.

The development of a macro-analysis for the years involved in the Four Federal Motor Vehicle Safety Standards under study was outside the cost of this contract. The Contractor did prepare two macro-analysis for the Department of Transportation under contract DOT-HS-5-01081 for the General Motors Corporation and DOT-HS-5-01153 for the Ford Motor Company. The macro-analysis study utilized data obtained from public files, annual financial reports, and the 10K Report filed annually by United States vehicle manufacturers pursuant to Section 13 of the Security Exchange Act of 1934. This data when totally compiled would be used to identify a factor that could be applied to all products of each manufacturer's component manufacturing cost to produce a dealer wholesale cost. This factor is an average cost type factor and if applied to a total car cost study could produce an end cost that could be totally unrealistic. Only those vehicles or components of these vehicles that have actual factors that approach the average of the corporation factor would produce a realistic dealer's wholesale cost. The Contractor elected to use the first method to extend the cost of components in applying a selected factor to the manufacturing cost based upon the carline and manufacturer.

Dealer Markup is the summation of all costs incurred in the operation of a dealership (salaries, taxes, depreciation, advertising, maintenance, etc.) and the dealer's profit. The Contractor was cognizant of a potential problem in attempting to arrive at an equitable dealer markup to apply in the cost calculations. The United States car dealer is an independent business man over whom the manufacturer can exercise only limited controls.

Although each vehicle bears a Federally mandated "price" sticker, the dealer is actually free to bargain with each customer to establish the selling price for a vehicle. For this study it is assumed that the dealer's markup is based upon the full "sticker price" and is reflected in the consumer cost of the system or components studied. Table 1 illustrates typical dealer discount from consumer cost utilized in the component cost study. Dealer discount over a period of years could vary for the same carline.

Variable cost per pound, fixed cost per pound, manufacturing cost per pound, tooling cost per pound and consumer cost per pound for system is presented for reference data in Appendix A.

The Integrated Cost Sampling Plan was established to provide for the selection of vehicles for each standard studied and develop general plans to obtain implementation cost of each standard.

A section of this report has been provided for each safety standard studied. Each section provides the objective of the requirements of the standards, the method of obtaining the implementation cost and conclusion resulting from the study.

Volume II of the program presents a photograph for each system studied. These photographs will provide a quick overview of the various systems and the general changes of components resulting from the implementation of the standards.

TABLE 1

TYPICAL DEALER DISCOUNT FROM CONSUMER COST
UTILIZED IN THE COMPONENT COST STUDY

U.S. VEHICLES	%	U.S. VEHICLES	%
Cadillac	25	Monza	15
Seville	25	Chevette	15
Olds 98	25	Vega	15
Toronado	25	Gremlin	15
Bel Air	23	Mustang II	15
Caprice	23	Pinto	15
Chevrolet	23		
Galaxie	23	TRUCKS	
Ford	23	Ford F-100	20.7
Chrysler	23	Bronco	20.7
Buick	23	Chevy C-10	20.7
Oldsmobile	23	Suburban	20.7
Pontiac	23		
Chevelle	19	IMPORTS	
Torino	19	Toyota	15
LTD II	19	Toyota Pickup	15
Malibu	19	Beetle	15
Grand Prix	19	Rabbit	15
Cordoba	19		
Century	19		
Cutlass	19		
Monte Carlo	19		
Thunderbird	19		
Camaro	17		
Firebird	17		
Cougar	17		
Nova	17		
Maverick	17		
Valiant	17		
Volare	17		
Falcon	17		
Rambler	17		
Fairlane	17		
Fairmont	17		
Aspen	17		
Skylark	17		
Omega	17		
Granada	17		
Monarch	17		
Zephyr	17		
Comet	17		
Pacer	17		

1.0 INTEGRATED COST SAMPLING PLAN

The Contractor developed an integrated cost sampling plan for the Four Federal Motor Vehicle Safety Standards. This plan provided for the selection of specific makes and models of vehicles to be utilized in each standard studied. The makes and models selected were representative of the high volume vehicles in each class. These makes and models in most instances, had similar vehicles in a related car line. This fact was not utilized to develop the weighted average of the sample vehicles.

The Contractor devoted considerable effort to establish the proper size of vehicle fleet to be employed in the development of consumer cost and weight variation. Typical of the selection process, the 1977 model year domestic models are illustrated in Table 2. Knowledge of the practice in the industry of sharing bodies between a particular manufacturer's divisions can be applied to simplify the Table 2 listing. The 1977 body lines usage of General Motors is shown in Table 3 for the five car divisions.

MANUFACTURER	MODEL	CLASS	1977 MODEL PRODUCTION (1000's)
AMC	Pacer	Compact	58
	Hornet	Compact	61
Chrysler	Volare	Compact	383
	LeBaron	Intermediate	55
	Fury	Intermediate	124
	Plymouth	Standard	56
	Chrysler	Standard	157
	Aspen	Compact	313
	Monaco	Intermediate	85
	Dodge	Standard	56
Ford	Pinto	Sub-compact	96
	Mustang II	Sub-compact	153
	Granada	Compact	391
	Maverick	Compact	72
	LTD II	Intermediate	232
	Thunderbird	Intermediate	318
	Ford	Standard	262
	Monarch	Compact	128
	Cougar	Intermediate	195
	Mercury	Standard	148
	Lincoln ¹	Luxury	176
General Motors	Skylark	Compact	113
	Century	Intermediate	328
	Buick	Standard	377
	Cadillac ²	Luxury	313

1. Includes Mark IV/V (80)

2. Includes Eldorado (47)

TABLE 2 MAJOR DOMESTIC MODELS PRODUCED - 1977

MANUFACTURER	MODEL	CLASS	1977 MODEL PRODUCTION (1000's)
	Seville	Luxury Intermediate	45
	Chevette	Sub-compact	133
	Vega	Sub-compact	78
	Nova	Compact	365
	Camaro	Compact	219
	Chevella	Intermediate	346
	Monte Carlo	Intermediate	375
	Chevrolet	Standard	562
	Omega	Compact	64
	Cutlass	Intermediate	633
	Oldsmobile	Standard	386
	Ventura	Compact	91
	Firebird	Compact	156
	LeMans	Intermediate	70
	Grand Prix	Intermediate	288
	Pontiac	Standard	202

TABLE 2 MAJOR DOMESTIC MODELS PRODUCED - 1977 (CONT)

<u>DIVISION</u>	<u>BODY DESIGNATION</u>									
BUICK	A	B	C	H	X					
CADILLAC	C	D	E	K						
CHEVROLET	A	AS	B	F	H	HJ	T	X	Z	
OLDSMOBILE	A	B	C	E	HJ	X				
PONTIAC	A	AS	B	F	H		X			

TABLE 3 1977 GENERAL MOTORS BODY USAGE

Examples of car models and sizes associated with each body model are:

For Chevrolet	A	- Chevelle	- Intermediate
	B	- Caprice	- Standard
	AS	- Monte Carlo	- Intermediate
	F	- Camaro	- Compact Specialty
	H	- Vega	- Sub Compact
	HJ	- Monza	- Sub Compact
	T	- Chevelle	- Sub Compact
	X	- Nova	- Compact
	Z	- Corvette	- Sports Specialty
For Cadillac	C	- Cadillac	- Luxury
	D	- Cadillac Limousine	- Luxury
	E	- Eldorado	- Luxury
	K	- Seville	- Small Luxury

For any given Safety Standard, the weighted average of the industry of consumer costs will be very much a function of the size classification of the vehicles. Therefore, the body sharing by the various manufacturers divisions allows the models of Table 2 to be regrouped and simplified as shown in Table 4.

MANUFACTURER .	CLASS	1977 MODEL PRODUCTION (1000's)
AMC	Compact	119
Chrysler	Compact	696
	Intermediate	264
	Standard	269
Ford	Subcompact	249
	Compact ¹	519
	Intermediate	745
	Standard	410
	Luxury	176
General Motors	Subcompact	211
	Compact	1008
	Intermediate	2040
	Standard	1527
	Luxury Intermediate	45
	Luxury	313

TABLE 4 SIMPLIFIED DOMESTIC MODELS PRODUCED - 1977

1. Maverick not included

The simplified Table 4 lists fifteen body sizes that represents ninety-four percent of the total 1977 model year production. It is from this listing of vehicle sizes that the Contractor selected the specific representative makes and models which were analyzed in these studies.

The major manufacturers of imported vehicles in 1977 are shown in Table 5.

<u>MANUFACTURER</u>	<u>1977 IMPORTS</u>
Toyota	493,048
Datsun	388,378
Volkswagen	260,704

TABLE 5 MAJOR IMPORTS INTO U.S. - 1977

The total import vehicles summarized on Table 5 is 1,142,130 or 55% of the total 2,024,100 vehicles imported during 1977. Analysis of the products of these manufacturers will, in the opinion of the Contractor, be sufficiently representative of the foreign manufacturers' cost for the purposes of these studies. The products of the two Japanese manufacturers, Toyota and Datsun, are so similar that only the appropriate models of one need be analyzed in these studies.

The make and model situation is further simplified by the manufacturer's practice of carrying over a given body size for a number of model years. Once the structural accommodations to FMVSS 214 have been made in a particular

body, for instance, there are generally no significant changes during the useful life of that body, providing that the FMVSS does not change. The body type introductions for General Motors in recent years is shown in Table 6. The other manufacturers follow similar practices, which the Contractor has taken into account in selecting the makes and models for cost estimating.

<u>BODY TYPE</u>	<u>MODEL YEAR</u>									
	69	70	71	72	73	74	75	76	77	78
A					x					x
AS (G)	x				x					x
B			x						x	
C			x						x	
D			x						x	
E			x							
F			x							
H			x							
HJ							x			
K							x			
T								x		
X				x						

TABLE 6 . GENERAL MOTORS BODY INTRODUCTIONS

The various body styles must be considered in any calculation of the cost to the consumer of the FMVSS. Generally, the major body styles offered by the manufacturers in recent years include two-door coupes, sedans, hardtops and

convertibles; and four-door sedans, hardtops and station wagons. The situation has been somewhat simplified in recent years by the near total disappearance of the convertible and hardtop models. However, during the period under consideration for this study, 1968 through 1978, representative makes and models of all body styles must be included. Additionally, the four-door sedans and station wagons generally share identical structure, at least as far as doors and bumpers are concerned. The Contractor has information on the body style breakdown for the model years 1970-1975 for both domestic (Table 7) and foreign (Table 7A) manufacturers.

<u>Percent Mix</u>	<u>MODEL YEAR</u>					
	<u>1970</u>	<u>1971</u>	<u>1972</u>	<u>1973</u>	<u>1974</u>	<u>1975</u>
2-Door Sedan	19.0%	21.0%	18.5%	17.8%	19.1%	16.8%
2-Door Hardtop	<u>34.4</u>	<u>31.2</u>	<u>31.1</u>	<u>33.1</u>	<u>34.3</u>	<u>32.8</u>
Total 2-Door	<u>54.4</u>	<u>52.2</u>	<u>49.6</u>	<u>50.9</u>	<u>53.4</u>	<u>49.6</u>
3-Door Sedan/Hardtop	-	2.4	4.3	4.6	7.9	9.0
4-Door Sedan	20.8	19.8	17.7	14.9	13.9	16.8
4-Door Pillared H.T.	0.3	1.6	4.1	6.8	6.1	6.5
4-Door Hardtop	<u>11.2</u>	<u>9.9</u>	<u>9.9</u>	<u>7.6</u>	<u>5.3</u>	<u>5.0</u>
Total 4-Door	<u>32.3</u>	<u>31.3</u>	<u>31.7</u>	<u>29.3</u>	<u>25.3</u>	<u>28.3</u>
Convertible	2.2	1.5	1.4	1.3	1.3	1.7
Economy Bus	1.1	1.4	1.2	1.2	1.4	1.6
Station Wagon	<u>10.0</u>	<u>11.2</u>	<u>11.8</u>	<u>12.7</u>	<u>10.7</u>	<u>9.8</u>
Total	<u>100.0%</u>	<u>100.0%</u>	<u>100.0%</u>	<u>100.0%</u>	<u>100.0%</u>	<u>100.0%</u>

TABLE 7 BODY STYLE MIX 1970-1975

FOREIGN BODY STYLE MIX

<u>Percent Mix</u>	<u>1970</u>	<u>1971</u>	<u>1972</u>	<u>1973</u>	<u>1974</u>	<u>1975</u>
2-Door Sedan <u>a/</u>	59.5%	53.8%	58.9%	60.2%	51.5%	36.5%
2-Door Hardtop	<u>2.4</u>	<u>5.8</u>	<u>4.6</u>	<u>2.7</u>	<u>6.0</u>	<u>10.1</u>
Total 2-Door	61.9	59.6	63.5	62.9	57.5	46.6
3-Door Sedan <u>b/</u>	-	-	0.4	0.3	6.2	13.6
4-Door Sedan	16.4	20.1	17.2	16.7	17.0	20.2
Convertible	6.5	4.8	6.0	5.9	7.3	6.6
Station Wagon	<u>15.2</u>	<u>15.5</u>	<u>12.9</u>	<u>14.2</u>	<u>12.0</u>	<u>13.0</u>
Total	<u>100.0%</u>	<u>100.0%</u>	<u>100.0%</u>	<u>100.0%</u>	<u>100.0%</u>	<u>100.0%</u>

a/ Includes closed body sports cars

b/ 3-Door mix unavailable for years prior to 1972

TABLE 7A BODY STYLE MIX 1970-1975

The body style mix information was utilized in estimating the weighted average factor of FMVSS 214. The costs of the door beams to satisfy the standard varied according to the vehicle being a two door or four door model. The costs of the other standards were a function of the vehicle class rather than the body type.

The model years for vehicles upon which each of the four standards under consideration were applicable is shown in Table 8. Although three of the standards, FMVSS 214, 208, and 301 became effective on January 1 of the model year in which they were applicable, for purposes of cost accounting, the Contractor will assume that they applied throughout the model year during which they were introduced.

FMVSS	Title	1968	69	70	71	72	73	74	75	76	77
214	Side Door Strength		1	1	1	1	x	x	x	x	x
215	Exterior Protection						x	x ²	x	x	x
208	Occupant Protection	x	x	x	x	x ²	x	x ²	x	x	x
301	Fuel System Integrity	x	x	x	x	x	x	x	x	x ²	x ²

1. Voluntarily installed by certain manufacturers during these years.
2. Major upgrading of standard for this model year.

TABLE 8 MODEL YEAR APPLICABILITY OF FOUR FMVSS

The Integrated Sampling Plan provided the data contained in Tables 9, 16, 19, 26, 32 and 45 relating to the selection of the vehicles for these studies. The procurement of components for specimen vehicles followed the plan.

2.0 FMVSS 214, SIDE DOOR STRENGTH, COST EVALUATION

The Contractor has studied the history of FMVSS 214, Side Door Strength - Passenger Cars. Certain U. S. manufacturers were installing the required side door beam structure by 1969, four years prior to the standard's first effective date of January 1, 1973. The Contractor is of the opinion that it is incorrect to attribute costs to a particular standard outside of its span of applicability. Therefore, the analysis for cost and weight of the side door beam structures has begun with the 1973 models.

The Contractor assumed that the costs associated with the basic structure of a body line relative to a particular FMVSS are fixed throughout the number of model years that the body is employed except for normal inflationary costs (assuming that the requirements of the FMVSS did not change during the period of the body's use).

In addition, the number of makes and models to be considered is reduced by the policies of parts interchangeability practiced by the manufacturers. Thus, four door station wagon door structures are identical to the four door sedans of the same size. In the case of General Motors, the two door "A" body door structures are very similar to the two door "AS" door structures, as are the "B" and "C" bodies, and also the "H" and "HJ" bodies.

The Contractor has established that the vehicle changes required to comply with FMVSS 214 were accomplished by side guard beams in its doors and a redesign or reinforcement of certain body pillars. Therefore, the

implementation out-of-pocket cost and weight per vehicle of the side door strength standard will be for the addition of the side guard beams and modification (if required) of the body pillars.

Table 9 lists the manufacturer makes and models of vehicles selected for the implementation study of FMVSS 214.

Table 10A, 10B, and 10C presents the weight and consumer cost per vehicle listed in Table 9 for the addition of the side guard beams and pillar modification (if required). This data was obtained by purchasing the required parts, processing analysis of the parts, and extending the cost as described in the introduction of this report. In cases involving pillar modifications, the previous year pillar (1972) was obtained to develop a baseline cost.

The Contract Technical Manager selected the 1978 Model Production Year Economics and the 1973 Model Production Year Volume to apply to this study. The resultant data were summarized and presented in Appendix A.

Table 11 presents weighted averages of the out-of-pocket cost and weight for the implementation of FMVSS 214 of the two door vehicles studied by subcompact, compact, intermediate and standard classes.

In Table 12, the weighted average factor derived in Table 11 by classes was applied to the total two door 1973 vehicle volumes by classes to produce a weighted

average for the implementation of FMVSS 214 of all two door 1973 vehicles in the industry.

Tables 13 and 14 accomplished the same as Tables 11 and 12 except these Tables apply to four door vehicles.

Table 15 presents the weighted average of consumer out-of-pocket cost and weight increase per vehicle based on the total 1973 Model Production Year Volume and the application of the weighted average factors contained in Tables 12 and 14. Table 15 indicates that the consumer out-of-pocket cost per vehicle for the implementation of FMVSS 214 is \$30.08 based upon 1978 Model Production Year Economics and the 1973 vehicle designs.

Table 16 lists the additional late model vehicles selected for a trend study.

Tables 17A and B presents the out-of-pocket cost and weight resulting from the implementation of FMVSS 214 on the selected vehicles of the trend study. The 1978 Model Production Year Economics and the selected vehicles model year volumes were utilized for the trend study.

CONCLUSION

Based upon the application of the implemented weighted average out-of-pocket cost and weight of the sample vehicles to the total 1973 Model Production Year Volume resulted in an out-of-pocket cost of \$30.08 and a weight increase of 36.1 pounds per vehicle. In general, for

comparative studies, the data contained in Tables 12 and 14 would be of greater value due to the isolation of costs by two and four door models in all size classifications.

The trend study indicated that the current models did reflect a weight savings and cost reduction for the implementation of FMVSS 214 except in the 1975 Cadillac Seville. These reductions could be a result of vehicle design changes such as downsizing and additional engineering and manufacturing studies that refined the application of the standard to later models.

TABLE 9 FMVSS 214 - SIDE DOOR STRENGTH
 MAKES/MODELS - IMPLEMENTATION STUDY

MANUFACTURER	1973 MODEL
AMERICAN MOTORS	Gremlin 2 door
CHRYSLER	Valiant 2 door Fury 4 door HT
FORD	Pinto 2 door Galaxie 4 door Gran Torino 2 door Maverick 4 door
GENERAL MOTORS	Malibu 2 door HT Nova 2 door Caprice 4 door Olds 98 4 door HT Camaro 2 door Toronado 2 door Monte Carlo 2 door
TOYOTA	Corona 4 door Celica 2 door
VOLKSWAGEN	Beetle 2 door

TABLE 10A

FMVSS 214 - DOOR STRENGTH IMPLEMENTATION WEIGHT AND OUT-OF-POCKET COST
FOR SPECIMEN VEHICLES

MANUFACTURER	MODEL YEAR	MODEL	1973 MODEL PRODUCTION VOLUME	WEIGHT ¹ PER CAR POUNDS	COST ¹ PER CAR \$
AMERICAN MOTORS	1973	GREMLIN 2 DOOR	85,181	33.4	21.24
CHRYSLER	1973	VALIANT 2 DOOR	222,736	21.0	15.99
		FURY 4 DOOR H.T.	62,200	F 33.1 R 29.1	F 22.29 R 23.49
FORD	1973	PINTO 2 DOOR	341,470	25.0	15.69
		TORINO 2 DOOR	156,940	27.8	20.70
		MAVERICK 4 DOOR	76,530	F 15.7 R 10.1	F 16.43 R 14.46
		GALAXIE 4 DOOR	520,600	F 19.8 R 14.2	F 20.41 R 15.39

COST BASED ON 1978 MODEL PRODUCTION YEAR ECONOMICS AND 1973 PRODUCTION YEAR VOLUME

NOTE 1. F-FRONT DOOR R-REAR DOOR

TABLE 10B

FMVSS 214 - DOOR STRENGTH IMPLEMENTATION WEIGHT AND OUT-OF-POCKET COST
FOR SPECIMEN VEHICLES

MANUFACTURER	MODEL YEAR	MODEL	1973 MODEL PRODUCTION VOLUME	WEIGHT ¹ PER CAR POUNDS	COST ¹ PER \$
GENERAL MOTORS	1973	NOVA 2 DOOR	287,490	32.6	21.89
		CAMARO 2 DOOR	96,760	42.0	24.27
		MONTE CARLO 2 DOOR	233,690	62.2 ²	47.75 ²
		MALIBU 2 DOOR H.T.	200,730	61.9 ²	47.81 ²
		CAPRICE 4 DOOR	448,910	F 21.3 R 27.5	F 19.50 R 19.62
		TORONADO 2 DOOR	56,226	32.5	27.36
		OLDS 98 4 DOOR H.T.	73,066	F 21.4 R 19.1	F 21.84 R 19.78

COST BASED ON 1978 MODEL PRODUCTION YEAR ECONOMICS AND 1973 PRODUCTION YEAR VOLUME

NOTE 1. F-FRONT DOOR R-REAR DOOR

2. INCLUDES REVISED BODY PILLARS

TABLE 10C

FMVSS 214 - DOOR STRENGTH IMPLEMENTATION WEIGHT AND OUT-OF-POCKET COST
FOR SPECIMEN VEHICLES

MANUFACTURER	MODEL YEAR	MODEL	1973 MODEL PRODUCTION VOLUME	WEIGHT ¹ PER CAR POUNDS	COST ¹ PER \$
TOYOTA	1973	CELICA 2 DOOR	34,590 ²	30.0	17.82
		CORONA 4 DOOR	28,937	F 20.0 R 11.4	F 13.99 R 11.45
VOLKSWAGEN	1973	BEETLE 2 DOOR	455,600	15.6	16.39

COST BASED ON 1978 MODEL PRODUCTION YEAR ECONOMICS AND 1973 PRODUCTION YEAR VOLUME

NOTE 1. F = FRONT DOOR, R = REAR DOOR

2. FOREIGN CAR VOLUME IS RETAIL DELIVERIES

TABLE 11

WEIGHTED AVERAGE CONSUMER OUT-OF-POCKET COST AND WEIGHT
 INCREASE RESULTING FROM THE IMPLEMENTATION OF FMVSS 214 in 1973
 ON TWO DOOR 1973 CLASS OF VEHICLES STUDIED

(BASED ON 1978 MODEL PRODUCTION YEAR ECONOMICS & 1973 MODEL PRODUCTION YEAR VOLUME)

CLASS	1973 MODEL PRODUCTION YEAR VOLUME STUDIED	STUDY WEIGHTED AVERAGE WEIGHT/VEHICLE (POUNDS)	STUDY WEIGHTED AVERAGE COST/VEHICLE \$
SUBCOMPACT	916,841	21.3	16.63
COMPACT	606,986	29.8	20.10
INTERMEDIATE	591,360	53.0	40.59
STANDARD	56,226	32.5	27.36
TOTAL VEHICLES STUDIED	2,171,413		

TABLE 12

WEIGHTED AVERAGE CONSUMER OUT-OF-POCKET COST AND WEIGHT
INCREASE RESULTING FROM THE IMPLEMENTATION OF FMVSS 214 in
1973 ON TOTAL INDUSTRY TWO DOOR 1973 VEHICLES BASED ON THE 1973
VEHICLES STUDIED AND EXTENDED TO TOTAL VOLUME OF VEHICLE CLASS

(BASED ON 1978 MODEL PRODUCTION YEAR ECONOMICS & 1973 MODEL PRODUCTION YEAR VOLUME)

CLASS	1973 MODEL PRODUCTION YEAR VOLUME IN CLASS	STUDY WEIGHTED AVERAGE WEIGHT/VEHICLE (POUNDS)	STUDY WEIGHTED AVERAGE COST/VEHICLE \$
SUBCOMPACT	2,186,455	21.3	16.63
COMPACT	1,291,521	29.8	20.10
INTERMEDIATE	1,813,813	53.0	40.59
STANDARD	1,359,779	32.5	27.36
TOTAL INDUSTRY VOLUME OF TWO DOOR VEHICLES LESS VEHICLES BELOW	6,651,568		
TOTAL INDUSTRY WEIGHTED AVERAGE OF TWO DOOR VEHICLES LESS VEHICLES BELOW		33.9	26.03
LUXURY*	204,525		
SPECIALTY*	165,332		
TOTAL TWO DOOR VEHICLES	7,021,425		

* NO SAMPLE OF LUXURY AND SPECIALTY VEHICLES WAS STUDIED.

TABLE 13

WEIGHTED AVERAGE CONSUMER OUT-OF-POCKET COST AND WEIGHT
 INCREASE RESULTING FROM THE IMPLEMENTATION OF FMVSS 214 in 1973
 ON FOUR DOOR 1973 CLASS OF VEHICLES STUDIED

(BASED ON 1978 MODEL PRODUCTION YEAR ECONOMICS & 1973 MODEL PRODUCTION YEAR VOLUME)

CLASS	1973 MODEL PRODUCTION YEAR VOLUME STUDIED	STUDY WEIGHTED AVERAGE WEIGHT/VEHICLE (POUNDS)	STUDY WEIGHTED AVERAGE COST/VEHICLE \$
SUBCOMPACT	28,937	31.4	25.44
COMPACT	76,530	25.8	30.89
STANDARD	1,104,776	42.0	38.10
TOTAL VEHICLES STUDIED	1,210,243		

NO SPECIMEN SAMPLE WAS STUDIED OF AN INTERMEDIATE FOUR DOOR VEHICLE

TABLE 14

WEIGHTED AVERAGE CONSUMER OUT-OF-POCKET COST AND WEIGHT INCREASE RESULTING FROM THE IMPLEMENTATION OF FMVSS 214 in 1973 ON TOTAL INDUSTRY FOUR DOOR 1973 VEHICLES BASED ON THE 1973 VEHICLES STUDIED AND EXTENDED TO TOTAL VOLUME OF VEHICLE CLASS

(BASED ON 1978 MODEL PRODUCTION YEAR ECONOMICS & 1973 MODEL PRODUCTION YEAR VOLUME)

CLASS	1973 MODEL PRODUCTION YEAR VOLUME IN CLASS	STUDY WEIGHTED AVERAGE WEIGHT/VEHICLE (POUNDS)	STUDY WEIGHTED AVERAGE COST/VEHICLE \$
SUBCOMPACT	444,161	31.4	25.44
COMPACT	388,322	25.8	30.89
INTERMEDIATE**	797,277	42.0	38.10
STANDARD	2,783,047	42.0	38.10
TOTAL INDUSTRY VOLUME OF FOUR DOOR VEHICLES LESS VEHICLE BELOW	4,412,807		
TOTAL INDUSTRY WEIGHTED AVERAGE OF FOUR DOOR VEHICLES LESS VEHICLE BELOW		39.5	36.19
LUXURY*	193,666		
TOTAL FOUR DOOR VEHICLES	4,606,473		

* NO SAMPLE OF LUXURY VEHICLES WAS STUDIED.

** AVERAGE WEIGHTED COST/VEHICLE AND WEIGHT/VEHICLE ASSUMED TO BE THE SAME AS THE STANDARD VEHICLES FOR THIS REPORT. NO SPECIMEN SAMPLE WAS STUDIED OF AN INTERMEDIATE FOUR DOOR VEHICLE.

TABLE 15

TOTAL INDUSTRY
WEIGHTED AVERAGE CONSUMER OUT-OF-POCKET COST AND WEIGHT INCREASE
RESULTING FROM THE IMPLEMENTATION OF FMVSS 214 in 1973

(BASED ON 1978 MODEL PRODUCTION YEAR ECONOMICS & 1973 MODEL PRODUCTION YEAR VOLUME)

STYLE	1973 MODEL PRODUCTION YEAR VOLUME	WEIGHTED AVERAGE WEIGHT/VEHICLE (POUNDS)	WEIGHTED AVERAGE COST/VEHICLE \$
TWO DOOR	6,651,568	33.9	26.03
FOUR DOOR	4,412,807	39.5	36.19
TOTAL 1973 INDUSTRY LESS BELOW VEHICLES	11,064,375	36.1	30.08
LUXURY FOUR DOOR*	193,666		
LUXURY TWO DOOR*	204,525		
SPECIALTY TWO DOOR*	165,332		
TOTAL 1973 VOLUME	11,627,898		

* NO SAMPLES STUDIED OF THIS CLASS OF VEHICLES

TABLE 16 FMVSS 214 - SIDE DOOR STRENGTH
 MAKES/MODELS - TREND STUDY

MANUFACTURER	MODEL YEAR			
	1975	1976	1977	1978
AMERICAN MOTORS	Pacer 2 door			
CHRYSLER	Cordoba 2 door	Volare 4 door		
FORD	Granada 4 door			Fairmont 2 door
GENERAL MOTORS	Seville 4 door		Caprice 4 door	Malibu 2 door
VOLKSWAGEN	Rabbit 4 door			

TABLE 17A

FMVSS 214 - DOOR STRENGTH IMPLEMENTATION WEIGHT AND OUT-OF-POCKET COST
OF SELECTED VEHICLES FOR TREND STUDY

MANUFACTURER	MODEL YEAR	MODEL	MODEL PRODUCTION VOLUME	WEIGHT ¹ PER CAR POUNDS	COST ¹ PER \$
AMERICAN MOTORS	1975	PACER 2 DOOR	72,158	31.6	23.67
CHRYSLER	1975	CORDOBA 2 DOOR	112,400	20.0	14.95
FORD	1975	GRANADA 4 DOOR	161,310	F 14.3 R 8.4	F 15.93 R 13.91
GENERAL MOTORS	1975	SEVILLE 4 DOOR	16,355	F 32.0 R 41.4	F 31.64 R 28.60
CHRYSLER	1976	VOLARE 4 DOOR	98,460	F 13.4 R 10.3	F 13.41 R 13.01
GENERAL MOTORS	1977	CAPRICE 4 DOOR	448,910	F 17.1 R 10.3	F 17.75 R 15.54
	1978	MALIBU 2 DOOR	200,730	28.6	19.10

COST BASED ON 1978 MODEL PRODUCTION YEAR ECONOMICS AND PRODUCTION VOLUME SHOWN.

NOTE 1. F-FRONT DOOR R-REAR DOOR

TABLE 17B

FMVSS 214 - DOOR STRENGTH IMPLEMENTATION WEIGHT AND OUT-OF-POCKET COST
OF SELECTED VEHICLES FOR TREND STUDY

MANUFACTURER	MODEL YEAR	MODEL	MODEL PRODUCTION VOLUME	WEIGHT ¹ PER CAR POUNDS	COST ¹ PER \$
FORD	1978	FAIRMONT 2 DOOR	146,680	21.8	15.24
VOLKSWAGEN	1975	RABBIT 4 DOOR	174,016	F 13.1 R 10.1	F 15.24 R 15.59

COST BASED ON 1978 MODEL PRODUCTION YEAR ECONOMICS AND PRODUCTION VOLUME SHOWN

NOTE 1. F-FRONT DOOR R-REAR DOOR

3.0 FMVSS 215, EXTERIOR PROTECTION, COST EVALUATION

The Contractor has studied the history of FMVSS 215, Exterior Protection, and has established that unlike FMVSS 214, Side Door Strength, it has undergone considerable revision since it first became effective on September 1, 1972. The major changes in requirements are shown in Table 18.

<u>Model Year</u>	<u>FMVSS 215, Exterior Protection Requirements</u>
1973	5 mph frontal; 2.5 mph rear barrier crash
1974	Horizontal pendulum test added over 115" wheelbase Rear barrier impact increased to 5 mph
1975	Horizontal pendulum test all cars -- Horizontal impacts reduced two front and rear
1976	Corner impact test for cars less than 120" wheelbase
1977	Corner impact tests for all cars

Table 18 Applicability of FMVSS 215, Exterior Protection, by Model Year

The industry has responded to the progressively stringent standards by installing bumper systems of varying degrees of complexity. For instance by 1973:

1. General Motors has typically used reinforced steel bumpers with external rubber guards attached to a pair of energy absorbing hydraulic/pneumatic

- cylinders. Also, one model, the Vega has been fitted with an aluminum face bar.
2. General Motors on a few models has employed a soft elastomeric material which absorbs impact-energy.
 3. Ford has employed reinforced steel bumpers connected to energy absorbing blocks of rubber which act in shear upon impact.
 4. Chrysler has employed a full width steel reinforcement attached directly to the vehicle's frame. The bumper has large rubber blocks attached to it which are energy absorbing.

The Contractor has examined the specific vehicle hardware affected by the bumper standard and has determined that they generally include for both front and rear bumpers the following:

1. Face Bar and Protective Strip
2. Face Bar Reinforcement
3. Bumper Guards and Pads
4. License Plate Bracket
5. Filler and Valance Panels
6. Energy Absorbers
7. Air Deflector (on front)
8. Heat Shield (on rear)
9. Miscellaneous brackets, braces, insulators, shields, spacers, etc.

In addition, the front and rear frame structure of some vehicles may have undergone strengthening in order to absorb the energy imparted by the five-mile-per-hour bumpers without buckling. The investigation of this possible change was beyond the scope of this contract.

In selecting the make and models for cost analysis, the Contractor was guided by the principle that each

manufacturer will generally use the same bumper construction for all of its car lines in any given year. The differences of bumper construction between manufacturers are significant, however. Although a given manufacturer will use the same energy absorption system on all the models it produces, the cost will vary with car size. Additionally, unlike FMVSS 214, each car division differences may be significant in the case of bumpers. This arises because of the specific styling each division employs on its cars; the shape, and cost, of the visible portions of the bumper may vary somewhat from division to division.

The FMVSS 215, Exterior Protection Standard, unlike the 214, Side Door Strength and 208, Occupant Protection Standards, required incremental costs to already existing vehicle hardware - the bumpers. Thus, it is the incremental cost resulting from the standard rather than the total bumper costs which are attributable to the standard. The Contractor analyzed the costs of the pre-standard 1972 vehicles and compared them with the post-standard 1973 vehicle costs. The difference between the two model years are considered the out-of-pocket cost and weight changes for the implementation of the 1973 FMVSS 215. To enable a direct comparison between the 1972 and 1973 systems, the 1972 vehicle components reflected the same model year economics and volumes as the comparable 1973 vehicle components. The Contract Technical Manager selected for this phase of the study the 1973 Model Production Year Economics and Volumes.

Table 19 lists the makes and models selected for the implementation study.

Tables 20A1, 20A2, 20B, 20C and 20D presents the implementation weight and consumer cost per vehicle by class of selected vehicles. The consumer cost data for this study is based on the 1973 Model Production Year Economics and Volume. There are instances in the table indicating a weight reduction or a slight cost savings on certain vehicles. This should not be construed as caused by the implementation of the standard, but could be related to an improved design or manufacturing process. The tolerances of the cost estimating techniques could produce slight cost reductions also.

Table 21 presents the weighted average consumer out-of-pocket cost and weight increase resulting from the implementation of FMVSS 215 of 1973 model year vehicles studied.

Table 22 presents the weighted average of the total industry consumer out-of-pocket cost and weight per vehicle variation resulting from the implementation of the 1973 FMVSS 215. This data was derived by multiplying the weighted average factor of each class of vehicle by the industry total volume by class and then dividing by the total industry volume. This was applied to both weight and cost. The table indicates that the implementation of the 1973 FMVSS 215 resulting in an out-of-pocket cost to the consumer of \$26.54 per vehicle and an increase in weight of 54.3 pounds per vehicle.

Table 23A, 23B, 23C, and 23D presents the implementation consumer out-of-pocket cost and weight increase of

selected vehicles resulting from the 1974 FMVSS 215. The comparison is made between the rear bumper of the 1974 models and comparable 1973 models. For this study the 1973 Model Production Year Economics and Volumes were used.

Table 24 represents a summary by vehicle class of the weighted average of consumer out-of-pocket cost and weight increase resulting from the implementation of FMVSS 215 in 1974 of the 1974 vehicles studied.

Table 25 presents the weighted average of the total industry consumer out-of-pocket cost and weight variation per vehicle resulting from the implementation of the 1974 FMVSS 215. This data was derived in the same manner as in Table 22. The table indicates that the implementation of the 1974 FMVSS 215 resulted in an out-of-pocket cost to the consumer of \$21.93 per vehicle and an increase in weight of 22.4 pounds per vehicle over the 1973 vehicles.

Table 25A presents the weighted average of the Total Industry of the Implementation of the 1973 and 1974 FMVSS. The implementation consumer out-of-pocket cost was \$48.47 and increase in weight of 76.7 pounds per vehicle.

In studying the 1975, 1976, and 1977 FMVSS 215 changes, bumper part numbers for these vehicles were compared with the 1973 and 1974 model year vehicles. A significant number of models were changed, or dropped, and new models introduced. Vehicle styling was probably the most significant factor in the variations of bumper components during 1975, 1976 and 1977 years. Manufacturing cost reduction or improved processing techniques could have accounted for additional part changes. A clearly

defined assignment of implementation cost for the 1975, 1976, and 1977 standard was not possible because of the magnitude of the design changes. The Contractor believes the major cost to the consumer of the implementation of FMVSS 215 incurred in 1973 and 1974.

The Contractor, in order to get an overview of the 1975 through 1977 standard trends, conducted a study of the vehicles listed in Table 26.

In Table 27, the cost and weight per trend vehicle is presented. The consumer out-of-pocket cost is based on the 1973 Model Production Year Economics and the volume of the specimen model year, except the 1977 Caprice and 1978 Malibu. These models relate directly to specific models of the 1973 and 1974 implementation study and the 1973 volumes were used.

The trend study provided only a limited number of samples for a comparison study. The 1977 Chevrolet Caprice and the 1978 Chevrolet Malibu were downsized from the previous years models. The trend study does reflect a reduction of both cost and weight per vehicle in the bumper system when compared to the baseline of the 1973 front bumper system (FMVSS 215-1973) and a 1974 rear bumper system (FMVSS 215-1974) of the original vehicles. Table 28 illustrates the comparison of the consumer out-of-pocket cost and the weight per vehicle.

1977 versus 1973-4 Chevrolet Caprice

	<u>Weight-Pounds</u>	<u>Cost \$</u>
Front Bumper System (1973)	108.57	64.68
Rear Bumper System (1974)	<u>108.00</u>	<u>67.52</u>
Total 1973-4 Bumper System	216.57	132.20
1977 Bumper System	<u>154.47</u>	<u>129.74</u>
Differential resulting from design changes	62.10	2.46

1978 versus 1973-4 Chevrolet Malibu

Front Bumper System (1973)	107.25	66.77
Rear Bumper System (1974)	<u>105.75</u>	<u>68.59</u>
Total 1973-4 Bumper System	213.00	135.36
1978 Bumper System	<u>127.57</u>	<u>95.99</u>
Differential resulting from design changes	85.43	39.37

Table 28 Comparison of Trend Study Vehicles

CONCLUSION

The implementation of the 1973 FMVSS 215 resulted in a consumer out-of-pocket cost of \$26.54 and a weight increase of 54.3 pounds per vehicle over the 1972 pre-standard models.

The implementation of the 1974 FMVSS 215 in addition to the 1973 FMVSS 215 resulted in an accumulative consumer out-of-pocket cost of \$48.47 and a weight increase of 76.7 pounds per vehicle over the 1972 pre-standard models.

Both the 1973 and 1974 studies were based upon the 1973 Model Production Year Economics and Volumes.

The 1975, 1976 and 1977 changes to FMVSS 215, from the study, indicated that the standards were combined with styling changes to such a degree that a clear assignment of cost and weight to either was not feasible. The trend study of the 1977 Chevrolet Caprice and the 1978 Chevrolet Malibu indicated that there was a weight and cost reduction in the bumper system from the baseline 1973 vehicle. The Contractor believes these reductions are a result of the downsizing and styling changes.

TABLE 19 FMVSS 215 - EXTERIOR PROTECTION
 MAKES/MODELS - IMPLEMENTATION STUDY

MANUFACTURER	MODEL YEAR 1972, 1973, 1974 (REAR)
AMERICAN MOTORS	Gremlin 2 door
CHRYSLER	Valiant 4 door Fury 4 door
FORD	Pinto 2 door Maverick 4 door Gran Torino 4 door Galaxie 4 door
GENERAL MOTORS	Vega 2 door Nova 4 door Camaro 2 door Malibu 4 door Caprice 4 door Firebird 2 door
TOYOTA	Corona 4 door Celica 2 door
VOLKSWAGEN	Beetle 2 door

TABLE 20A1

FMVSS 215 - 1973 EXTERIOR PROTECTION IMPLEMENTATION WEIGHT
AND OUT-OF-POCKET COST FOR SPECIMEN VEHICLES STUDIED

(BASED ON 1973 MODEL PRODUCTION YEAR ECONOMICS & VOLUME)

CLASS - SUBCOMPACT		WEIGHT - POUNDS					COST - \$		
MANUFACTURER	MODEL	1973 MODEL PRODUCTION VOLUME	SYSTEM ¹	1972 MODEL	1973 MODEL	IMPLEMENTATION WEIGHT/VEHICLE	1972 MODEL	1973 MODEL	IMPLEMENTATION COST/VEHICLE
AMERICAN MOTORS	GREMLIN 2 DOOR	85,181	F	25.87	58.21	32.34	24.36	55.14	30.78
			R	21.91	40.15	18.24	23.17	38.57	15.40
			T	47.78	98.36	50.58	47.53	93.71	46.18
FORD	PINTO 2 DOOR	341,470	F	20.29	59.64	39.35	20.38	59.35	38.97
			R	23.01	22.31	(.70)	20.22	24.73	4.51
			T	43.30	81.95	38.65	40.60	84.08	43.48
GENERAL MOTORS	VEGA 2 DOOR	395,795	F	20.05	26.85	6.80	16.09	15.04	(1.05)
			R	17.91	19.73	1.82	19.02	19.21	.19
			T	37.96	46.58	8.62	35.11	34.25	(.86)
TOYOTA	CELICA 2 DOOR	34,590	F	9.47	24.30	14.83	13.79	30.71	16.92
			R	10.50	17.41	6.91	16.65	18.54	1.89
			T	19.97	41.71	21.74	30.44	49.25	18.81
	CORONA 4 DOOR	28,900	F	11.86	27.20	15.34	19.72	33.90	14.18
			R	12.39	14.75	2.36	17.79	23.78	5.99
			T	24.25	41.95	17.70	37.51	57.68	20.17

Note 1. F-Front Bumper System R-Rear Bumper System T-Total Vehicle Bumper System

TABLE 20A2

FMVSS 215 - 1973 EXTERIOR PROTECTION IMPLEMENTATION WEIGHT
AND OUT-OF-POCKET COST FOR SPECIMEN VEHICLES STUDIED

(BASED ON 1973 MODEL PRODUCTION YEAR ECONOMICS & VOLUME)

CLASS - SUBCOMPACT		WEIGHT - POUNDS					COST - \$		
MANUFACTURER	MODEL	1973 MODEL PRODUCTION VOLUME	SYSTEM ¹	1972 MODEL	1973 MODEL	IMPLEMENTATION WEIGHT/VEHICLE	1972 MODEL	1973 MODEL	IMPLEMENTATION COST/VEHICLE
VOLKSWAGEN	BEETLE 2 DOOR	455,600	F	17.62	23.03	5.41	11.79	14.34	2.55
			R	21.18	20.51	(.67)	13.83	15.77	1.94
			T	38.80	43.54	4.74	25.62	30.11	4.49
TOTAL SUBCOMPACT VEHICLES STUDIED		1,341,536							
WEIGHTED AVERAGE OF VEHICLES STUDIED						18.1			16.19

Note 1. F-Front Bumper System R-Rear Bumper System T-Total Vehicle Bumper System

TABLE 20B

FMVSS 215 - 1973 EXTERIOR PROTECTION IMPLEMENTATION WEIGHT
AND OUT-OF-POCKET COST FOR SPECIMEN VEHICLES STUDIED

(BASED ON 1973 MODEL PRODUCTION YEAR ECONOMICS & VOLUME)

CLASS - COMPACT					WEIGHT - POUNDS			COST - \$		
MANUFACTURER	MODEL	1973 MODEL PRODUCTION VOLUME	SYSTEM ¹	1972 MODEL	1973 MODEL	IMPLEMENTATION WEIGHT/VEHICLE	1972 MODEL	1973 MODEL	IMPLEMENTATION COST/VEHICLE	
FORD	MAVERICK 4 DOOR	201,393	F	28.75	90.01	61.26	30.88	56.76	25.88	
			R	17.67	23.72	6.05	24.85	28.24	3.39	
			T	46.42	113.73	67.31	55.73	85.00	29.27	
GENERAL MOTORS	CAMARO 2 DOOR	96,756	F	32.99	50.78	17.79	35.66	41.16	5.50	
			R	15.63	15.63	-	19.10	15.76	(3.34)	
			T	48.62	66.41	17.79	54.76	56.92	2.16	
	NOVA 4 DOOR	369,523	F	32.55	61.03	28.48	23.98	34.58	10.60	
			R	30.85	47.45	16.60	20.17	23.25	3.08	
			T	63.40	108.48	45.08	44.15	57.83	13.68	
	FIREBIRD 2 DOOR	46,313	F	65.99	96.38	30.39	41.46	48.58	7.12	
			R	24.43	24.55	.12	33.00	31.53	(1.47)	
			T	90.32	120.93	30.61	74.46	80.11	5.65	
CHRYSLER	VALIANT 4 DOOR	316,837	F	54.75	67.81	13.06	30.10	32.00	1.90	
			R	39.13	45.58	6.45	19.83	21.75	1.92	
			T	93.88	113.39	19.51	49.93	53.75	3.82	
TOTAL COMPACT VEHICLES STUDIED		1,030,822								
WEIGHTED AVERAGE OF VEHICLES STUDIED						38.4			12.25	

Note 1. F-Front Bumper System R-Rear Bumper System T-Total Vehicle Bumper System

TABLE 20C

FMVSS 215 - 1973 EXTERIOR PROTECTION IMPLEMENTATION WEIGHT
AND OUT-OF-POCKET COST FOR SPECIMEN VEHICLES STUDIED

(BASED ON 1973 MODEL PRODUCTION YEAR ECONOMICS & VOLUME)

CLASS - INTERMEDIATE		WEIGHT - POUNDS					COST - \$		
MANUFACTURER	MODEL	1973 MODEL PRODUCTION VOLUME	SYSTEM ¹	1972 MODEL	1973 MODEL	IMPLEMENTATION WEIGHT/VEHICLE	1972 MODEL	1973 MODEL	IMPLEMENTATION COST/VEHICLE
FORD	TORINO 4 DOOR	331,798	F	52.04	132.24	80.20	36.37	68.31	31.94
			R	45.04	53.10	8.06	30.74	37.61	6.87
			T	97.08	185.34	88.26	67.11	105.92	38.81
GENERAL MOTORS	MALIBU 4 DOOR	328,538	F	39.23	107.25	68.02	33.52	66.77	33.25
			R	43.58	82.07	38.49	32.79	42.21	9.42
			T	82.81	189.32	106.51	66.31	108.98	42.67
TOTAL INTERMEDIATE VEHICLES STUDIED		660,336							
WEIGHTED AVERAGE OF VEHICLES STUDIED						97.4			40.73

Note 1. F-Front Bumper System R-Rear Bumper System T-Total Vehicle Bumper System

TABLE 20D

FMVSS 215 - 1973 EXTERIOR PROTECTION IMPLEMENTATION WEIGHT
AND OUT-OF-POCKET COST FOR SPECIMEN VEHICLES STUDIED

(BASED ON 1973 MODEL PRODUCTION YEAR ECONOMICS & VOLUME)

CLASS - STANDARD

MANUFACTURER	MODEL	1973 MODEL PRODUCTION VOLUME	SYSTEM ¹	1972 MODEL	1973 MODEL	IMPLEMENTATION WEIGHT/VEHICLE	1972 MODEL	1973 MODEL	IMPLEMENTATION COST/VEHICLE
FORD	GALAXIE 4 DOOR	857,685	F	55.13	111.18	56.05	37.30	68.09	30.79
			R	46.73	88.69	41.96	40.63	57.13	16.50
			T	101.86	199.87	98.01	77.93	125.22	47.29
GENERAL MOTORS	CAPRICE 4 DOOR	941,114	F	90.67	108.57	17.90	42.93	64.68	21.75
			R	103.69	113.87	10.18	48.72	49.43	.71
			T	194.36	222.44	28.08	91.65	114.11	22.46
CHRYSLER	FURY 4 DOOR	280,330	F	85.53	83.59	(1.94)	51.48	42.24	(9.24)
			R	51.45	78.75	27.30	35.76	47.05	11.29
			T	136.98	162.34	25.36	87.24	89.29	2.05
TOTAL STANDARD VEHICLES STUDIED		2,079,129							
WEIGHTED AVERAGE OF VEHICLES STUDIED						56.6			29.95

Note 1. F-Front Bumper System R-Rear Bumper System T-Total Vehicle Bumper System

TABLE 21

WEIGHTED AVERAGE CONSUMER OUT-OF-POCKET COST AND WEIGHT
 INCREASE RESULTING FROM THE IMPLEMENTATION OF FMVSS 215 in 1973 ON
 1973 VEHICLES STUDIED

(BASED ON 1973 MODEL PRODUCTION YEAR ECONOMICS & VOLUME)

CLASS	1973 MODEL PRODUCTION VOLUME	STUDY WEIGHTED AVERAGE WEIGHT/VEHICLE (POUNDS)	STUDY WEIGHTED AVERAGE COST/VEHICLE \$
SUBCOMPACT	1,341,536	18.1	16.19
COMPACT	1,030,822	38.4	12.25
INTERMEDIATE	660,336	97.4	40.73
STANDARD	2,079,129	56.6	29.95
TOTAL VEHICLES STUDIED	5,111,823		

TABLE 22

TOTAL INDUSTRY

WEIGHTED AVERAGE CONSUMER OUT-OF-POCKET COST AND WEIGHT
INCREASE RESULTING FROM THE IMPLEMENTATION OF FMVSS 215 in 1973

(BASED ON 1973 MODEL PRODUCTION YEAR ECONOMICS & VOLUME)

CLASS	1973 MODEL PRODUCTION VOLUME	STUDY WEIGHTED AVERAGE WEIGHT/VEHICLE (POUNDS)	STUDY WEIGHTED AVERAGE COST/VEHICLE \$
SUBCOMPACT	2,630,616	18.1	16.19
COMPACT	1,679,843	38.4	12.25
INTERMEDIATE	2,611,090	97.4	40.73
STANDARD	4,142,826	56.6	29.95
TOTAL INDUSTRY VOLUME LESS VEHICLES BELOW	11,064,375		
TOTAL INDUSTRY WEIGHTED AVERAGE LESS VEHICLES BELOW		54.3	26.54
LUXURY*	398,191		
SPECIALTY*	165,332		
TOTAL INDUSTRY	11,627,898		

* NO SAMPLES STUDIED OF THIS CLASS OF VEHICLES

TABLE 23A

FVMSS 215 - 1974 EXTERIOR PROTECTION IMPLEMENTATION WEIGHT
AND OUT-OF-POCKET COST FOR SPECIMEN VEHICLES STUDIED

(BASED ON 1973 MODEL PRODUCTION YEAR VOLUME AND ECONOMICS)

CLASS - SUBCOMPACT

MANUFACTURER	MODEL	1973 MODEL PRODUCTION VOLUME	WEIGHT/VEHICLE - POUNDS ¹			CONSUMER COST/VEHICLE - \$ ¹		
			1973 MODEL	1974 MODEL	IMPLEMENTATION	1973 MODEL	1974 MODEL	IMPLEMENTATION
AMERICAN MOTORS	GREMLIN 2 DOOR	85,181	40.15	51.62	11.47	38.57	33.21	(5.36)
FORD	PINTO 2 DOOR	341,470	22.31	44.70	22.39	24.73	36.91	12.18
GENERAL MOTORS	VEGA 2 DOOR	395,795	19.73	54.69	34.96	19.21	40.08	20.87
TOYOTA	CELICA 2 DOOR	34,590	17.41	17.41	-	18.54	18.54	-
	CORONA 4 DOOR	28,900	14.75	14.75	-	23.78	23.78	-
VOLKSWAGEN	BETLE 2 DOOR	455,600	20.51	30.85	10.34	15.77	22.96	7.19
TOTAL SUBCOMPACT VEHICLES STUDIED		1,341,536						
WEIGHTED AVERAGE OF VEHICLES STUDIED					20.3			11.36

Note 1. Rear Bumper System

TABLE 23B

FMVSS 215 - 1974 EXTERIOR PROTECTION IMPLEMENTATION WEIGHT
AND OUT-OF-POCKET COST FOR SPECIMEN VEHICLES STUDIED

(BASED ON 1973 MODEL PRODUCTION YEAR VOLUME AND ECONOMICS)

CLASS - COMPACT

MANUFACTURER	MODEL	1973 MODEL PRODUCTION VOLUME	WEIGHT/VEHICLE - POUNDS ¹			CONSUMER COST/VEHICLE - \$ ¹		
			1973 MODEL	1974 MODEL	IMPLEMENTATION	1973 MODEL	1974 MODEL	IMPLEMENTATION
FORD	MAVERICK 4 DOOR	201,393	23.72	45.27	21.55	28.24	44.12	15.88
GENERAL MOTORS	CAMARO 2 DOOR	96,756	15.63	90.16	74.53	15.76	64.63	48.87
	NOVA 4 DOOR	369,523	47.45	80.74	33.29	23.25	46.16	22.91
	FIREBIRD 2 DOOR	46,313	24.55	53.50	28.95	31.53	84.44	52.91
CHRYSLER	VALIANT 4 DOOR	316,837	45.58	89.50	43.92	21.75	58.70	36.95
TOTAL COMPACT VEHICLES STUDIED		1,030,822						
WEIGHTED AVERAGE OF VEHICLES STUDIED					37.9			29.64

Note 1. Rear Bumper System

TABLE 23C

FVMSS 215 - 1974 EXTERIOR PROTECTION IMPLEMENTATION WEIGHT
AND OUT-OF-POCKET COST FOR SPECIMEN VEHICLES STUDIED

(BASED ON 1973 MODEL PRODUCTION YEAR VOLUME AND ECONOMICS)

CLASS - INTERMEDIATE

MANUFACTURER	MODEL	1973 MODEL PRODUCTION VOLUME	WEIGHT/VEHICLE - POUNDS ¹			CONSUMER COST/VEHICLE - \$ ¹		
			1973 MODEL	1974 MODEL	IMPLEMENTATION	1973 MODEL	1974 MODEL	IMPLEMENTATION
FORD	TORINO 4 DOOR	331,798	53.10	106.94	53.84	37.61	72.77	35.16
GENERAL MOTORS	MALIBU 4 DOOR	328,538	82.07	105.75	23.68	42.21	68.59	26.38
TOTAL INTERMEDIATE VEHICLES STUDIED		660,336						
WEIGHTED AVERAGE OF VEHICLES STUDIED					38.8			30.79

Note 1. Rear Bumper System

TABLE 23D

FMVSS 215 - 1974 EXTERIOR PROTECTION IMPLEMENTATION WEIGHT
AND OUT-OF-POCKET COST FOR SPECIMEN VEHICLES STUDIED

(BASED ON 1973 MODEL PRODUCTION YEAR VOLUME AND ECONOMICS)

CLASS - STANDARD

MANUFACTURER	MODEL	1973 MODEL PRODUCTION VOLUME	WEIGHT/VEHICLE - POUNDS ¹			CONSUMER COST/VEHICLE - \$ ¹		
			1973 MODEL	1974 MODEL	IMPLEMENTATION	1973 MODEL	1974 MODEL	IMPLEMENTATION
FORD	GALAXIE 4 DOOR	857,685	88.69	113.29	24.60	57.13	78.83	21.70
GENERAL MOTORS	CAPRICE 4 DOOR	941,114	113.87	108.00	(5.87)	49.43	67.52	18.09
CHRYSLER	FURY 4 DOOR	280,330	78.75	99.38	20.63	47.05	67.68	20.63
TOTAL STANDARD VEHICLES STUDIED		2,079,129						
WEIGHTED AVERAGE OF VEHICLES STUDIED					10.3			19.92

Note 1. Rear Bumper System

TABLE 24

WEIGHTED AVERAGE CONSUMER OUT-OF-POCKET COST AND WEIGHT
 INCREASE RESULTING FROM THE IMPLEMENTATION OF FMVSS 215 in 1974 ON
 1974 VEHICLES STUDIED

(BASED ON 1973 MODEL PRODUCTION YEAR VOLUME AND ECONOMICS)

CLASS	1973 MODEL PRODUCTION VOLUME	STUDY WEIGHTED AVERAGE WEIGHT/VEHICLE (POUNDS)	STUDY WEIGHTED AVERAGE COST/VEHICLE \$
SUBCOMPACT	1,341,536	20.3	11.36
COMPACT	1,030,822	37.9	29.64
INTERMEDIATE	660,336	38.8	30.79
STANDARD	2,079,129	10.3	19.92
TOTAL VEHICLES STUDIED	5,111,823	-	-

TABLE 25

TOTAL INDUSTRY

WEIGHTED AVERAGE CONSUMER OUT-OF-POCKET COST AND WEIGHT
INCREASE RESULTING FROM THE IMPLEMENTATION OF FMVSS 215 in 1974

(BASED ON 1973 MODEL PRODUCTION YEAR VOLUME & ECONOMICS)

CLASS	1973 MODEL PRODUCTION VOLUME	STUDY WEIGHTED AVERAGE WEIGHT/VEHICLE (POUNDS)	STUDY WEIGHTED AVERAGE COST/VEHICLE \$
SUBCOMPACT	2,630,616	20.3	11.36
COMPACT	1,679,843	37.9	29.64
INTERMEDIATE	2,611,090	33.8	30.79
STANDARD	4,142,826	10.3	19.92
TOTAL INDUSTRY VOLUME LESS VEHICLES BELOW	11,064,375		
TOTAL INDUSTRY WEIGHTED AVERAGE LESS VEHICLES BELOW		22.4	21.93
LUXURY*	398,191		
SPECIALTY*	165,332		
TOTAL INDUSTRY	11,627,898		

* NO SAMPLE STUDIED OF THIS CLASS OF VEHICLES

TABLE 25A

TOTAL INDUSTRY

WEIGHTED AVERAGE CONSUMER OUT-OF-POCKET COST AND WEIGHT
INCREASE RESULTING FROM THE IMPLEMENTATION OF FMVSS 215
IN 1973 (FRONT AND REAR BUMPER SYSTEM) AND 1974 (REAR BUMPER SYSTEM)

(BASED ON 1973 MODEL PRODUCTION YEAR VOLUME AND ECONOMICS)

CLASS	1973 MODEL PRODUCTION VOLUME	WEIGHTED AVERAGE WEIGHT/VEHICLE (POUNDS)			WEIGHTED AVERAGE COST/VEHICLE \$		
		1973 BASIC IMPLEMENTATION	1974 SUPPLEMENTAL IMPLEMENTATION	TOTAL 1973 & 1974 IMPLEMENTATION	1973 BASIC IMPLEMENTATION	1974 SUPPLEMENTAL IMPLEMENTATION	TOTAL 1973 & 1974 IMPLEMENTATION
SUBCOMPACT	2,630,616	18.1	20.3	38.4	16.19	11.36	27.55
COMPACT	1,679,843	38.4	37.9	76.3	12.25	29.64	41.89
INTERMEDIATE	2,611,090	97.4	33.8	131.2	40.73	30.79	71.52
STANDARD	4,142,826	56.6	10.3	66.9	29.95	19.92	49.87
TOTAL INDUSTRY VOLUME LESS VEHICLES BELOW	11,064,375						
TOTAL INDUSTRY WEIGHTED AVERAGE LESS VEHICLES BELOW		54.3	22.4	76.7	26.54	21.93	48.47
LUXURY*	398,191						
SPECIALTY*	165,332						
TOTAL INDUSTRY	11,627,898						

* NO SAMPLE STUDIED OF THIS CLASS OF VEHICLES

TABLE 26 FMVSS 215 - EXTERIOR PROTECTION
 MAKES/MODELS - TREND STUDY

MANUFACTURER	MODEL YEAR			
	1975	1976	1977	1978
AMERICAN MOTORS	Pacer 2 door			
CHRYSLER	Cordoba 2 door	Volare 4 door		
FORD	Granada 4 door			
GENERAL MOTORS	Seville 4 door		Caprice 4 door	Malibu 4 door
VOLKSWAGEN	Rabbit 4 door			

TABLE 27

FMVSS 215 - EXTERIOR PROTECTION - WEIGHT
AND OUT-OF-POCKET COSTS FOR BUMPER SYSTEM
FOR TREND STUDY

(BASED ON 1973 MODEL YEAR ECONOMICS AND PRODUCTION VOLUMES & YEARS SHOWN)

MANUFACTURER	MODEL YEAR	MODEL		WEIGHT	COSTS - \$	VOLUME (YEAR)
AMERICAN MOTORS	1975	PACER 2 DOOR	F	61.87	42.46	72,158 (1975)
			R	58.43	37.94	
			T	120.30	80.40	
CHRSYLER		CORDOBA 2 DOOR	F	96.82	70.77	112,400 (1975)
			R	96.41	71.87	
			T	193.23	142.64	
FORD		GRANADA 4 DOOR	F	93.30	57.52	161,310 (1975)
			R	75.57	52.97	
			T	168.87	110.49	
GENERAL MOTORS		SEVILLE 4 DOOR	F	124.29	175.39	16,355 (1975)
			R	90.42	119.16	
			T	214.71	294.55	
VOLKSWAGEN		RABBIT 4 DOOR	F	30.95	25.40	174,016 (1975)
			R	31.44	21.82	
			T	62.39	47.22	
CHRSYLER	1976	VOLARE 4 DOOR	F	92.85	67.12	98,460 (1976)
			R	96.66	59.60	
			T	189.51	126.72	
GENERAL MOTORS	1977	CAPRICE 4 DOOR	F	79.92	68.23	941,114 (1973)
			R	74.55	61.51	
			T	154.47	129.74	
	1978	MALIBU 4 DOOR	F	67.03	51.24	328,538 (1973)
			R	60.54	44.75	
			T	127.57	95.99	

4.0 FMVSS 301, FUEL SYSTEM INTEGRITY, COST EVALUATION

The Contractor has studied the history of the FMVSS 301, Fuel System Integrity. This history is summarized in Table 29.

<u>MODEL YEAR</u>	<u>FUEL SYSTEM REQUIREMENTS - FMVSS 301</u>
1968	30 mph frontal barrier crash - limited leakage from fuel tank, filler pipes and fuel tank connections during impact to one ounce and after impact to one ounce per minute. Effective January 1, 1968.
1976	Passenger cars required to meet front barrier impact and static rollover test.
1977	Side and rear barrier impact tests added for passenger cars. Other vehicles up to 6,000 pounds GVWR must meet 1976 passenger car tests, & rear impact tests. 6,000 to 10,000 pound GVWR vehicles must meet the front barrier test.
1978	All vehicles up to 10,000 pounds GVWR must meet the 1977 passenger car requirements.

TABLE 29 HISTORY OF FMVSS 301 - FUEL SYSTEM INTEGRITY

In general, the industry has been given adequate notice of changes in the standard and the manufacturers have been able to make orderly changes to meet its requirements. The industry has responded with changes listed in Table 30 to meet the standard. The vehicle components affected by FMVSS 301 are listed in Table 31 with indications of specific components studied as a part of this contract.

MANUFACTURING CHANGES

Fuel tank material and configuration - Generally flat rectangular configurations with rounded corners have been found to be best. Blown high density polyethylene plastic tanks have been extensively evaluated and are beginning to find applications.

Fuel tank anchorage - These have had to be strengthened to absorb the impact forces resulting from the barrier test requirements.

Fuel tank location - In some cases, relocation has been necessary to place the tank at a greater distance from the rear end and sides of the vehicle.

Filler neck and cap - The strength of these elements has had generally to be upgraded. Also, improved clamping devices have proved to be necessary between the filler tube and tank.

Fuel line and vent line - The location, flexibility and fastening of these lines has demanded attention.

Carburetors, fuel pumps, fuel filters - Some minor changes in the design and location of these components has been necessary in order to comply with the fuel leakage requirements after frontal and side barrier testing.

TABLE 30 INDUSTRIES RESPONSE TO MEET THE CHANGES

COMPONENTS

Fuel Tank¹
Fuel Tank Filler Tube¹
Fuel Tank Closure Cap²
Fuel Tank Vent and Fuel Lines³
Fuel Tank Anchors and Straps¹
Rear Frame Structure⁴
Rear Body Floor Structure⁴
Carburetor³
Fuel Pump³
Fuel Filter³
Mounting and Connections³

- Notes:
1. These items were selected as those that could result in weight and cost variations directly attributable to the implementation of the standard.
 2. Caps were examined from several specimens with no significant cost or weight change results.
 3. These items although changed, could not contribute significantly to the implementation cost or weight variations.
 4. Due to the extreme cost, it was agreed that an analysis of these items was beyond the scope of this program.

TABLE 31 VEHICLE COMPONENTS INFLUENCED BY FMVSS 301

The Contractor has identified all of the affected fuel system elements on a particular vehicle. The significant parts were purchased, weighed and analyzed for costs as outlined in the introduction to this report. The fuel system components have been laid out in arrays by vehicle model and have been photographed. This was done for the domestic vehicles classified in Table 32. Also representative models of Volkswagen and Toyota have been analyzed. In each case, costs before application of the standard and those after the implementation of the standard have been determined.

Table 33 indicated the implementation weight and consumer cost for the implementation of FMVSS 301 in 1968 on the vehicles studied. These are based on the study of components listed in Table 31, marked with Note 1. Cost determination for this study was based on the 1968 Model Production Year and Volume. Summarizing breakdown data is contained in Appendix A of Volume I of this report.

Tables 34A, 34B, 34C, and 34D classify the implementation weight and cost of the studied vehicles by subcompact, compact, intermediate and standard classes. A weighted average weight and consumer cost is indicated for each class of vehicle.

Table 35 presents the weighted average of the total industry based upon the weighted average factor by class (Tables 34A,B,C,&D) developed during the study and the class volume of the 1976 Model Production Year. The implementation of the standard in 1968 results in a weight increase of one pound and a consumer out-of-pocket cost of twenty nine cents.

To determine cost of implementation of the 1976 FMVSS 301, a cost and weight analysis was made of vehicle components that would relate to a comparable baseline 1967 vehicle. The consumer cost and weight of this implementation is shown on Table 36A and 36B. These costs are based on 1976 Model Production Year Volume and Economics.

Table 37A, 37B, 37C and 37D summarized the implementation cost and weight of vehicles studied by class of vehicle. The weighted average consumer cost and weight variation to implement the 1976 FMVSS 301 is shown for each class of vehicle.

Table 38 presents the weighted average consumer out-of-pocket cost and weight increase for vehicles resulting from the implementation of the FMVSS 301 in 1976. The total industry weighted average was derived by the application of the weighted average of weight and consumer cost by classes to the 1976 Model Production Volume by classes. The implementation of the 1976 FMVSS 301 resulted in an out-of-pocket cost to the consumer of \$6.89 and an increase in weight of 1.8 pounds.

Table 39 presents 1976 vehicles that were selected for the trend study only. A comparison could be made to similar vehicles in the implementation study.

The 1977 FMVSS 301 that affects the side and rear impact tests for passenger cars resulted in changes to the body and frame. A manufacturing cost study of these

changes would require the purchase of many expensive vehicle body and frame components. It would also be extremely difficult to segregate the cost of standard implementation and design changes in a body and frame comparison. It was, therefore, agreed that this implementation study was out of the scope of the contract.

The 1977 FMVSS 301 has a special requirement of the fuel system of multipurpose vehicles and light trucks. The Contractor has followed the same costing methodology as outlined for passenger cars in the costing of the truck elements.

To assist in the selection of the light truck and multipurpose vehicles, the Contractor has reviewed the 1977 sales figures. The Group 1 (6000 pounds GVWR and less) and Group 2 (6000-10000 pounds GVWR) categories were included in the 1977 sales totals. Table 40 shows the major contributors to the 1977 production. The 2,623,709 trucks listed represent 85% of the total of 3,080,854 Groups 1 and 2 trucks produced during 1977.

<u>MANUFACTURER</u>	<u>1977 PRODUCTION</u>
Chevrolet	1,078,692
Ford	1,036,218
Dodge	385,125
Jeep	<u>123,674</u>
TOTAL	2,623,709

TABLE 40 1977 SELECTED U. S. TRUCK PRODUCTION

Jeep, a division of American Motors, was included because of the high proportion of multipurpose vehicles it manufactures. Therefore, models of light trucks and multipurpose vehicles were selected from the manufacturers listed in Table 40 for fuel system cost analysis. In addition, the fuel system costs for a Toyota light truck was analyzed as representative of import vehicles' costs.

Table 41 presents the implementation of the 1977 FMVSS 301 weight and consumer out-of-pocket cost for light trucks studied. These costs were based on 1976 Model Production Year Volume and Economics.

Table 42 presents weight and consumer cost of fuel system components selected for light truck trend study.

CONCLUSION

The implementation of the 1968 FMVSS 301 resulted in an out-of-pocket cost to consumer of \$.05 and a weight increase of .6 pounds per vehicle.

The implementation of the 1976 FMVSS 301 resulted in an out-of-pocket cost to consumer of \$6.89 and a weight increase of 1.8 pounds per vehicle.

The incremental fuel system costs for vehicles was not like the other three FMVSS presented in this report. The imposition of FMVSS 301 in the 1968 model year did not have any significant change in weight or consumer cost.

The implementation of the 1977 FMVSS 301 as pertains to passenger cars was involved with structural changes and was agreed to be outside of the scope of this contract due to the excessive cost to perform a manufacturing cost study based on actual components.

The light truck studies for 1976 and 1977 model years did not make a clearly defined conclusion on the implementation of FMVSS 301. One selected vehicle indicated a weight and cost increase and the other results in no cost or weight increase.

The 1978 FMVSS 301 requirement was agreed to be outside the scope of this contract as this study was directed primarily to the passenger car.

TABLE 32 FMVSS 301 - FUEL SYSTEM INTEGRITY

MAKES/MODELS - IMPLEMENTATION STUDY

MANUFACTURER	MODEL YEAR		
	1967 & 1968	1976	1977
AMERICAN MOTORS	Rambler 4 door	Gremlin 2 door	
CHRYSLER	Valiant 4 door	Volare 4 door Cordoba 2 door	
FORD	Falcon 4 door Fairlane 4 door Ford 4 door	Granada 4 door Pinto 2 door Maverick 4 door Torino 4 door LTD 4 door F-100	Bronco 2 door F-100
GENERAL MOTORS	Chevy II 4 door Chevelle 4 door Bel Air 4 door Camaro 2 door Olds 98 4 door HT	Nova 4 door Malibu 4 door Caprice 4 door Camaro 2 door Olds 98 4 door HT C-10	Suburban 4 door C-10
TOYOTA	Corona 4 door	Corona 4 door	Pickup
VOLKSWAGEN	Beetle 2 door	Rabbit 4 door	

TABLE 33

FMVSS 301 - 1968 FUEL SYSTEM INTEGRITY IMPLEMENTATION
 WEIGHT AND CONSUMER OUT-OF-POCKET COST FOR VEHICLES STUDIED
 (BASED ON 1976 MODEL PRODUCTION YEAR VOLUME AND ECONOMICS)

MANUFACTURER	1967 MODEL	1976 MODEL	1976 MODEL YEAR PRODUCTION VOLUME	WEIGHT/VEHICLE - POUNDS			CONSUMER COST/VEHICLE - \$		
				1967 MODEL	1968 MODEL	IMPLEMENTATION	1967 MODEL	1968 MODEL	IMPLEMENTATION
AMERICAN MOTORS	RAMBLER	GREMLIN	52,936	19.79	19.79	-	19.11	19.11	-
CHRYSLER	VALIANT	VOLARE	291,959	23.69	25.08	1.39	21.22	21.28	.06
FORD	FALCON	MAVERICK	104,268	19.85	19.85	-	11.81	11.81	-
	FAIRLANE	TORINO	193,096	23.90	23.90	-	20.65	20.65	-
	FORD	FORD LTD	238,974	16.56	16.56	-	23.67	23.67	-
GENERAL MOTORS	CHEVY II	NOVA	334,728	16.56	20.05	3.49	11.44	13.12	1.68
	CHEVELLE	MALIBU	307,970	24.77	23.26	(1.51)	15.43	15.06	(.37)
	BELAIR	CAPRICE	333,976	33.46	35.49	2.03	18.19	18.37	.18
	CAMARO	CAMARO	182,981	22.50	22.50	-	17.98	17.81	(.17)
	OLDS 98	OLDS 98	279,608	29.54	29.54	-	19.69	19.69	-
TOYOTA	CORONA	CORONA	52,032	18.16	18.16	-	14.04	14.04	-
VOLKSWAGEN	BEEBLE	RABBIT	63,830	15.01	15.01	-	20.97	20.97	-

TABLE 34A

WEIGHTED AVERAGE CONSUMER OUT-OF-POCKET COST AND WEIGHT INCREASE
 PER VEHICLE RESULTING FROM THE IMPLEMENTATION OF FMVSS 301 in 1968
 ON SPECIMEN VEHICLES

(BASED ON 1976 MODEL PRODUCTION YEAR VOLUME AND ECONOMICS)

CLASS - SUBCOMPACT

MANUFACTURER	MODEL	1976 MODEL PRODUCTION VOLUME	WEIGHT/VEHICLE (POUNDS)	COST/VEHICLE \$
TOYOTA	CORONA	52,032	-	-
VOLKSWAGEN	BEEBLE	63,830	-	-
TOTAL SUBCOMPACTS STUDIED		115,862		
WEIGHTED AVERAGE OF SUBCOMPACTS STUDIED			-	-

TABLE 34B

WEIGHTED AVERAGE CONSUMER OUT-OF-POCKET COST AND WEIGHT INCREASE
PER VEHICLE RESULTING FROM THE IMPLEMENTATION OF FMVSS 301 in 1968
ON SPECIMEN VEHICLES

(BASED ON 1976 MODEL PRODUCTION YEAR VOLUME AND ECONOMICS)

CLASS - COMPACT

MANUFACTURER	MODEL	1976 MODEL PRODUCTION VOLUME	WEIGHT/VEHICLE (POUNDS)	COST/VEHICLE \$
AMERICAN MOTORS	HORNET-RAMBLER	52,936	-	-
CHRYSLER	VALIANT	291,959	1.39	.06
FORD	FALCON	104,268	-	-
GENERAL MOTORS	NOVA-CHEVY II	334,728	3.49	1.68
GENERAL MOTORS	CAMARO	182,981	-	(.17)
TOTAL COMPACTS STUDIED		966,872		
WEIGHTED AVERAGE OF COMPACTS STUDIED			1.6	.63

TABLE 34C

WEIGHTED AVERAGE CONSUMER OUT-OF-POCKET COST AND WEIGHT INCREASE
PER VEHICLE RESULTING FROM THE IMPLEMENTATION OF FMVSS 301 in 1968
ON SPECIMEN VEHICLES

(BASED ON 1976 MODEL PRODUCTION YEAR VOLUME AND ECONOMICS)

CLASS - INTERMEDIATE

MANUFACTURER	MODEL	1976 MODEL PRODUCTION VOLUME	WEIGHT/VEHICLE (POUNDS)	COST/VEHICLE \$
FORD	FAIRLANE	193,096	-	-
GENERAL MOTORS	CHEVELLE	307,970	(1.5)	(.37)
TOTAL INTERMEDIATE STUDIED		501,066		
WEIGHTED AVERAGE OF INTERMEDIATES STUDIED			(.9)	(.23)

TABLE 34D

WEIGHTED AVERAGE CONSUMER OUT-OF-POCKET COST AND WEIGHT INCREASE
PER VEHICLE RESULTING FROM THE IMPLEMENTATION OF FMVSS 301 in 1968
ON SPECIMEN VEHICLES

(BASED ON 1976 MODEL PRODUCTION YEAR VOLUME AND ECONOMICS)

CLASS - STANDARD

MANUFACTURER	MODEL	1976 MODEL PRODUCTION VOLUME	WEIGHT/VEHICLE (POUNDS)	COST/VEHICLE \$
FORD	FORD	238,974	-	-
GENERAL MOTORS	BELAIR	333,976	2.03	.18
GENERAL MOTORS	OLDS 98	279,608	-	-
TOTAL STANDARDS STUDIED		852,558		
WEIGHTED AVERAGE OF STANDARDS STUDIED			.8	.07

TABLE 35

TOTAL INDUSTRY

WEIGHTED AVERAGE CONSUMER OUT-OF-POCKET COST AND WEIGHT INCREASE
PER VEHICLE RESULTING FROM THE IMPLEMENTATION OF FMVSS 301 in 1968

(BASED ON 1976 MODEL PRODUCTION YEAR VOLUME AND ECONOMICS)

Class	1976 MODEL PRODUCTION VOLUME	STUDY WEIGHTED AVERAGE WEIGHT/VEHICLE (POUNDS)	STUDY WEIGHTED AVERAGE COST/VEHICLE \$
SUBCOMPACT	739,953	-	-
COMPACT	2,478,027	1.6	.63
INTERMEDIATE	2,503,232	(.9)	(.23)
STANDARD	2,049,527	.8	.07
TOTAL U.S. INDUSTRY LESS VEHICLES BELOW	7,770,739		
WEIGHTED AVERAGE OF U.S. INDUSTRY LESS VEHICLES BELOW		1.0	.29
SPECIALTY*	234,125		
TOTAL U.S. INDUSTRY	8,004,864		

TABLE 36A

FMVSS 301 - FUEL SYSTEM INTEGRITY IMPLEMENTATION
WEIGHT AND CONSUMER OUT-OF-POCKET COST FOR VEHICLES STUDIED

(BASED ON 1976 MODEL PRODUCTION YEAR VOLUME AND ECONOMICS)

MANUFACTURER	1967 MODEL	1976 MODEL	1976 MODEL YEAR PRODUCTION VOLUME	WEIGHT/VEHICLE - POUNDS			CONSUMER COST/VEHICLE - \$		
				1967 MODEL	1976 MODEL	IMPLEMENTATION	1967 MODEL	1976 MODEL	IMPLEMENTATION
AMERICAN MOTORS	RAMBLER	GREMLIN	52,936	19.79	19.13	(.66)	19.11	19.82	(.71)
CHRYSLER	VALIANT	VOLARE	291,959	23.69	22.92	(.77)	21.22	19.76	(1.46)
FORD	FALCON	GRANADA	448,784	19.85	21.61	1.76	11.25	25.53	14.28
	FALCON	MAVERICK	104,268	19.85	21.55	1.70	11.81	30.42	18.61
	FAIRLANE	TORINO	193,096	23.90	24.34	.44	20.65	30.84	10.19
	FORD	FORD LTD	238,974	16.56	20.06	3.50	23.67	28.04	4.37
GENERAL MOTORS	CHEVY II	NOVA	334,728	16.56	25.34	8.77	11.44	23.31	11.87
	CHEVELLE	MALIBU	307,970	24.77	28.76	3.99	15.43	20.04	4.61
	BELAIR	CAPRICE	333,976	33.46	32.65	(.81)	18.19	27.28	9.09
	CAMARO	CAMARO	182,981	22.50	23.56	1.06	17.98	21.84	3.86
	OLDS	OLDS 98	279,608	29.54	33.91	4.37	19.69	24.69	5.00

TABLE 36B

FMVSS 301 - FUEL SYSTEM INTEGRITY IMPLEMENTATION
 WEIGHT AND CONSUMER OUT-OF-POCKET COST FOR VEHICLES STUDIED

(BASED ON 1976 MODEL PRODUCTION YEAR VOLUME AND ECONOMICS)

MANUFACTURER	1967 MODEL	1976 MODEL	1976 MODEL YEAR PRODUCTION VOLUME	WEIGHT/VEHICLE - POUNDS			CONSUMER COST/VEHICLE - \$		
				1967 MODEL	1976 MODEL	IMPLEMENTATION	1967 MODEL	1976 MODEL	IMPLEMENTATION
TOYOTA	CORONA	CORONA	52,032	18.16	22.77	4.61	14.04	28.11	14.07
VOLKSWAGEN	BEEBLE	RABBIT	63,830	15.01	16.32	1.31	20.97	27.82	6.85

TABLE 37A

WEIGHTED AVERAGE CONSUMER OUT-OF-POCKET COST AND WEIGHT INCREASE
 PER VEHICLE RESULTING FROM THE IMPLEMENTATION OF FMVSS 301 in 1976
 ON SPECIMEN VEHICLES

(BASED ON 1976 MODEL PRODUCTION YEAR VOLUME AND ECONOMICS)

CLASS - SUBCOMPACT

MANUFACTURER	MODEL	1976 MODEL PRODUCTION VOLUME	WEIGHT/VEHICLE (POUNDS)	COST/VEHICLE \$
AMERICAN MOTORS	GREMLIN	52,936	(.66)	.71
TOTAL SUBCOMPACTS STUDIED		52,936		
WEIGHTED AVERAGE OF SUBCOMPACTS STUDIED			(.66)	.71

TABLE 37B

WEIGHTED AVERAGE CONSUMER OUT-OF-POCKET COST AND WEIGHT INCREASE
PER VEHICLE RESULTING FROM THE IMPLEMENTATION OF FMVSS 301 in 1976
ON SPECIMEN VEHICLES

(BASED ON 1976 MODEL PRODUCTION YEAR VOLUME AND ECONOMICS)

CLASS - COMPACT

MANUFACTURER	MODEL	1976 MODEL PRODUCTION VOLUME	WEIGHT/VEHICLE (POUNDS)	COST/VEHICLE \$
CHRYSLER	VOLARE	291,959	(.77)	(1.46)
FORD	GRANADA	448,784	1.76	14.28
FORD	MAVERICK	104,268	1.70	18.61
GENERAL MOTORS	NOVA	334,728	8.77	11.87
GENERAL MOTORS	CAMARO	182,981	1.06	3.86
TOTAL COMPACTS STUDIED		1,362,720		
WEIGHTED AVERAGE OF COMPACTS STUDIED			1.4	9.25

TABLE 37C

WEIGHTED AVERAGE CONSUMER OUT-OF-POCKET COST AND WEIGHT INCREASE
 PER VEHICLE RESULTING FROM THE IMPLEMENTATION OF FMVSS 301 in 1976
 ON SPECIMEN VEHICLES

(BASED ON 1976 MODEL PRODUCTION YEAR VOLUME AND ECONOMICS)

CLASS - INTERMEDIATE

MANUFACTURER	MODEL	1976 MODEL PRODUCTION VOLUME	WEIGHT/VEHICLE (POUNDS)	COST/VEHICLE \$
FORD	TORINO	193,096	.44	10.19
GENERAL MOTORS	MALIBU	307,970	3.99	4.61
TOTAL INTERMEDIATES STUDIED		501,066		
WEIGHTED AVERAGE OF INTERMEDIATES STUDIED			2.62	6.76

TABLE 37D

WEIGHTED AVERAGE CONSUMER OUT-OF-POCKET COST AND WEIGHT INCREASE
 PER VEHICLE RESULTING FROM THE IMPLEMENTATION OF FMVSS 301 in 1976
 ON SPECIMEN VEHICLES

(BASED ON 1976 MODEL PRODUCTION YEAR VOLUME AND ECONOMICS)

CLASS - STANDARD

MANUFACTURER	MODEL	1976 MODEL PRODUCTION VOLUME	WEIGHT/VEHICLE (POUNDS)	COST/VEHICLE \$
FORD	FORD LTD	238,974	3.50	4.37
GENERAL MOTORS	CAPRICE	333,976	(.81)	9.09
GENERAL MOTORS	OLDS 98	279,608	4.37	5.00
TOTAL STANDARDS STUDIED		852,558		
WEIGHTED AVERAGE OF STANDARDS STUDIED			2.10	6.42

TABLE 38

TOTAL INDUSTRY

WEIGHTED AVERAGE CONSUMER OUT-OF-POCKET COST AND WEIGHT INCREASE
PER VEHICLE RESULTING FROM THE IMPLEMENTATION OF FMVSS 301 in 1976

(BASED ON 1976 MODEL PRODUCTION YEAR VOLUME AND ECONOMICS)

CLASS	1976 MODEL PRODUCTION VOLUME	STUDY WEIGHTED AVERAGE WEIGHT/VEHICLE (POUNDS)	STUDY WEIGHTED AVERAGE COST/VEHICLE \$
SUBCOMPACT	739,953	(.66)	.71
COMPACT	2,478,027	1.4	9.25
INTERMEDIATE	2,503,232	2.6	6.76
STANDARD	2,049,527	2.1	6.43
TOTAL U.S. INDUSTRY LESS VEHICLE BELOW	7,770,739		
WEIGHTED AVERAGE OF U.S. INDUSTRY LESS VEHICLE BELOW		1.8	6.89
SPECIALTY *	234,125		
TOTAL U.S. INDUSTRY	8,004,864		

* NO SAMPLE STUDIED OF THIS CLASS OF VEHICLE

TABLE 39

FMVSS 301 - FUEL SYSTEM INTEGRITY IMPLEMENTATION
WEIGHT AND CONSUMER OUT-OF-POCKET COST OF SELECTED VEHICLES
FOR TREND STUDY

MANUFACTURER	MODEL YEAR	MODEL	MODEL PRODUCTION VOLUME	WEIGHT PER CAR POUNDS	COST PER \$
CHRYSLER	1976	CORDOBA	200,986	26.76	23.57
FORD	1976	PINTO	147,977	18.50	27.95

COST BASED ON 1976 MODEL PRODUCTION YEAR ECONOMICS AND PRODUCTION VOLUME SHOWN

TABLE 41

FMVSS 301 - FUEL SYSTEM INTEGRITY IMPLEMENTATION
 WEIGHT AND CONSUMER OUT-OF-POCKET COST FOR LIGHT TRUCKS STUDIED

(BASED ON 1976 MODEL PRODUCTION YEAR VOLUME AND ECONOMICS)

MANUFACTURER	MODEL	1976 MODEL YEAR PRODUCTION VOLUME	WEIGHT/VEHICLE (POUNDS)			CONSUMER COST/VEHICLE		
			1976	1977	IMPLEMENTATION	1976	1977	IMPLEMENTATION
			MODEL	MODEL		MODEL	MODEL	
FORD	F-100	186,855	30.72	42.45	11.73	29.96	33.89	3.93
GENERAL MOTORS	C-10	323,015	30.97	30.97	-	32.70	32.70	-

TABLE 42

FMVSS 301 - FUEL SYSTEM INTEGRITY IMPLEMENTATION WEIGHT AND OUT-OF-POCKET COST
OF SELECTED VEHICLES FOR TREND STUDY

(BASED ON 1976 MODEL YEAR ECONOMICS AND 1977 MODEL YEAR VOLUMES)

MANUFACTURER	MODEL YEAR	MODEL	MODEL PRODUCTION VOLUME	WEIGHT PER CAR POUNDS 1977	COST PER \$ 1977
FORD	1976	BRONCO	23,929	27.22	46.20
GENERAL MOTORS	1976	SUBURBAN	48,855	33.77	38.14
TOYOTA	1976	PICKUP	83,000	16.10	18.15

5.0 FMVSS 208, OCCUPANT CRASH PROTECTION, COST EVALUATION

The Contractor has studied the history of FMVSS 208, Occupant Crash Protection. This is summarized in Table 43 below.

<u>MODEL YEAR</u>	<u>OCCUPANT CRASH PROTECTION REQUIREMENTS</u>
Pre '68	Lap belts installed on most passenger cars.
'72	Three options - 1) Totally passive system; 2) Lap belt + passive features to meet dynamic impact criteria; 3) Integral lap/shoulder belt - no injury criteria.
'74	Option 3 modified to require ignition interlock feature.
'75	Option 3 modified to eliminate ignition interlock.

TABLE 43 HISTORY FMVSS 208 OCCUPANT CRASH PROTECTION

The manufacturing industry has overwhelmingly responded by adapting Option 3. Only General Motors has offered an optional Option 2 installation consisting of driver and passenger air cushions with seat belts, and Volkswagen has recently offered an optional passive belt system in its Rabbit model which is imported into the U. S.

The vast majority of cars sold in the U. S. today comply with FMVSS 208 by providing combination lap/shoulder belt

assemblies with audible and visual warning devices. The lap/shoulder belts are generally purchased from suppliers. Those major seat belt system suppliers known to the Contractor are listed in Table 44.

Automotive Products Division, Allied Chemical Corp.
American Safety Products Corporation
Hamill Manufacturing Company, Firestone Tire & Rubber Co.
Irvin Industries, Inc.
General Safety Division, Fisher Corporation
Pontonier Division, Gateway Industries

TABLE 44 MAJOR U. S. SEAT BELT SUPPLIERS

In addition, General Motors Fisher Body Division has recently begun to manufacture a portion of that company's needs.

The Contractor is in the unique position of having a wholly owned subsidiary, the De Lorean Motor Company, which is in the process of the design and manufacture of production vehicles. Through the contacts established with seat belt suppliers, the Contractor has obtained original equipment manufacturers (OEM) quotes on complete production seat belt systems. Also, the Contractor has estimated the costs of the belt systems using standard automotive cost estimating procedures.

The cost of the belt assemblies varies little with car model, except as reflected in the number of seated passengers. There are slightly more luxurious belts installed in the luxury cars and these costs have been included.

The general vehicle categories which the Contractor has included in its cost estimates are:

- 1) Four-passenger car with two lap/belts in front and two rear lap belts.
- 2) Five-passenger car with two lap/belts in front and three rear lap belts.
- 3) Six-passenger car with two outboard lap/belts and one center lap belt in front and three rear lap belts.

Both mechanical, inertia locking reels and electronic locking reels have been costed for the 1972 and later models.

The Contractor is in a unique position relative to the costing of restraint system elements. A recent major study entitled The Allstate Aircushion Expenditure/Benefit Study has been prepared by the Contractor and filed in the NHTSA docket on FMVSS 208. In this study, the Contractor carefully estimated the costs of both passive and active restraint systems. Particular attention was paid to the costing of the General Motors air cushion system as it was offered to the public on an optional basis. Both supplier quotations and cost estimating processes were used to arrive at a completely installed cost for the General Motors system. In this study, the Contractor has checked and refined the cost data from the previous study and has included the cost in Table 53.

For the Volkswagen Rabbit passive belt system, the

Contractor has used its costing techniques plus its contacts with overseas suppliers to arrive at a final installed cost. Additionally, we have analyzed two model years of the Japanese Toyota's active belt system. The cost data on the passenger VW restraint system is contained in Table 53.

The actual makes and models for which the Contractor has purchased and analyzed the costs of the belt restraint systems and the passive restraint systems is shown in Table 45.

The reference document entitled Evaluation Methodologies for Four FMVSS, March 1977¹ divided the seat belt retractors into two types-mechanical and electrical. The only system using electrical components in the lap belt retractor and the shoulder belt retractor known to the Contractor is that installed in the Cadillac automobile which is manufactured by General Safety Corporation. In this system, electromagnets are activated automatically during the period of belt application by the front outboard vehicle passengers. The electromagnets neutralize the locking mechanisms of the retractors and allow for easy application of the belts.

1 Evaluation Methodologies for Four FMVSS, March 1977 under contract DOT-HS-802-346-Center for Environment of Man.

The emergency lockup in the Cadillac system is inertially actuated in the Cadillac system as are all other systems both domestic and import known to the Contractor. A sample of the 1975 Cadillac Seville system has been purchased and analyzed for costs and data included in Table 53.

Table 46 summarizes the costs of systems that were analyzed. A weighted average for seat belts was developed from the samples for various positions of the seat belts and reflects the cost of implementation based on 1968 Model Production Year Economics and Volume.

Table 47 applies the weighted average cost factor to the various passenger seating volumes to develop a weighted average cost of two, four, five and six seat systems. This data when extended to the entire industry indicates the cost of implementation of the 1968 FMVSS 208 to be \$14.05 per vehicle.

Tables 48 and 49 are based on the same samples as listed in Table 46 and 47 except the resultant data reflects 1978 volumes. Table 49 indicates the weighted average for the implementation cost based on 1978 Model Year Economics to be \$34.00.

Table 50 presents the cost to the consumer for the implementation of the 1972 FMVSS 208 on selected vehicles.

Table 51 presents the cost to consumers of the implementation of the 1968 FMVSS 208 and the 1972 FMVSS 208.

This data was based on information derived in Table 50. These costs were based on 1978 Model Production Year Economics and 1972 Model Production Year Volume. The weighted average cost per vehicle based on the total industry for the implementation of the 1972 FMVSS 208 and 1968 FMVSS 208 was \$46.46.

Table 52 isolates the additional cost of the shoulder belt system to the original lap belt system. This indicated a cost of \$11.00 per vehicle for the two front seat shoulder belts based on the 1978 Model Production Year Economics. A comparison between the weighted average cost from Tables 49 and 51 would indicate an increase of \$12.46 for the change in seat belt systems between the two years of implementation. However, this cost reflects additional changes in the basic system and does not isolate the cost of the shoulder belt. The cost of \$11.00 is an isolated cost and involves only the front outboard belt systems.

The 1974 and 1975 changes to FMVSS 208 resulted in an implementation and a cancellation. The Contractor believed this study to be only on the active standards and therefore deleted the 1974 and 1975 change implementation from the report.

CONCLUSION

The implementation out-of-pocket cost of the 1968 FMVSS 208 system was \$14.05 per vehicle based on the 1968 Model Production Year Economics.

The implementation out-of-pocket cost of the 1972 FMVSS 208 (shoulder belt) and the 1968 FMVSS 208 (lap belt) was \$46.46 per vehicle based on the 1978 Model Production Year Economics.

A study that isolated the implementation cost of the 1972 (shoulder belt) FMVSS 208 by comparison involving only the front seat systems indicated an out-of-pocket cost of \$11.00 per vehicle.

TABLE 45 FMVSS 208 - OCCUPANT CRASH PROTECTION
 MAKES AND MODELS OF RESTRAINT SYSTEMS STUDIED

MANUFACTURER	MODEL YEAR					
	68	71	72	73	74	75
FORD	Ford 4 door	Maverick 2 door			Ford 4 door	
GENERAL MOTORS	Bel Air 4 door		Bel Air 4 door	Electra ¹ 4 door		Seville 4 door
TOYOTA	Corona 4 door		Corona 4 door			
VOLKSWAGEN	Beetle 2 door					Rabbit ² 4 door

Note 1. Front seat air cushion restraint system - optionally offered

2. Front outboard seat passive belt system - optionally offered

TABLE 46

FMVSS 208 - OCCUPANT CRASH PROTECTION

CONSUMER COST OF IMPLEMENTATION OF FMVSS 208 in 1968 ON SELECT SAMPLES

(BASED ON 1968 MODEL YEAR ECONOMICS AND VOLUMES)

MANUFACTURER	MODEL	PRODUCTION VOLUME	CONSUMER COST - \$				TOTAL SYSTEM
			FRONT		REAR		
			OUTBOARD	CENTER	OUTBOARD	CENTER	
FORD MOTOR CO.	1968 FORD 4 DOOR	540,063	7.40	2.91	5.73	2.87	18.91
CHEVROLET	1968 BELAIR 4 DOOR	739,170	5.79	2.09	3.87	1.93	13.68
TOYOTA	1968 CORONA 4 DOOR	28,100	4.50	-	3.40	-	7.90

WEIGHTED AVERAGE CONSUMER COST OF SAMPLES

FRONT OUTBOARD	(2 BELTS)	\$6.43
REAR OUTBOARD	(2 BELTS)	\$4.63
FRONT CENTER	(1 BELT)	\$2.43
REAR CENTER	(1 BELT)	\$2.33

TABLE 47

TOTAL INDUSTRY

FMVSS 208 - OCCUPANT CRASH PROTECTION

CONSUMER COST OF IMPLEMENTATION OF FMVSS 208 in 1968 BASED ON
APPLICATION OF THE WEIGHTED AVERAGE CONSUMER COST DETERMINED FROM STUDIED SYSTEM

(BASED ON 1968 MODEL YEAR ECONOMICS AND VOLUMES)

MODEL	VOLUME	STUDY WEIGHT AVERAGE ¹ CONSUMER COST/VEHICLE \$
TWO SEATS	26,900	6.43
FOUR SEATS	2,907,500	11.06
FIVE SEATS	825,100	13.33
SIX SEATS	5,344,600	15.82
TOTAL INDUSTRY LESS VEHICLES BELOW	9,104,100	
WEIGHTED AVERAGE OF INDUSTRY LESS VEHICLES BELOW		14.05
ECONOMY BUSES	85,200	
TOTAL INDUSTRY	9,189,300	

TABLE 48

FMVSS 208 - OCCUPANT CRASH PROTECTION

CONSUMER COST OF IMPLEMENTATION OF FMVSS 208 - BASIC SEAT BELTS (1968) ON
SELECTED SAMPLES

(BASED ON 1978 MODEL YEAR ECONOMICS AND VOLUMES SHOWN)

MANUFACTURER	MODEL	PRODUCTION VOLUME	CONSUMER COST - \$				TOTAL SYSTEM
			FRONT		REAR		
			OUTBOARD	CENTER	OUTBOARD	CENTER	
FORD MOTOR CO.	1968 FORD 4 DOOR	304,040	19.03	7.37	14.69	7.34	48.43
CHEVROLET	1968 BELAIR 4 DOOR	630,950	14.60	5.25	9.74	4.87	34.46
TOYOTA	1968 CORONA 4 DOOR	73,980	9.31	-	7.24	-	16.95

WEIGHTED AVERAGE CONSUMER COST OF SAMPLES

FRONT OUTBOARD	(2 BELTS)	\$15.55
REAR OUTBOARD	(2 BELTS)	\$11.05
FRONT CENTER	(1 BELT)	\$ 5.94
REAR CENTER	(1 BELT)	\$ 5.67

TABLE 49

TOTAL INDUSTRY

FMVSS 208 - OCCUPANT CRASH PROTECTION

CONSUMER COST OF IMPLEMENTATION OF FMVSS 208 in 1968 BASED
UPON APPLICATION OF WEIGHTED AVERAGE CONSUMER COST DETERMINED FROM
STUDIED SAMPLES

(BASED ON 1978 MODEL YEAR ECONOMICS AND 1972 VOLUMES)

MODEL	VOLUME	STUDY WEIGHTED AVERAGE CONSUMER COST/VEHICLE
TWO SEAT SYSTEM	26,700	15.55
FOUR SEAT SYSTEM	3,267,500	26.60
FIVE SEAT SYSTEM	1,041,400	32.27
SIX SEAT SYSTEM	6,299,100	38.21
TOTAL INDUSTRY LESS VEHICLES BELOW	10,634,700	
WEIGHTED AVERAGE OF INDUSTRY LESS VEHICLES BELOW		34.00
ECONOMY BUSES	46,900	
TOTAL INDUSTRY	10,681,600	

TABLE 50

FMVSS 208 - OCCUPANT CRASH PROTECTION

CONSUMER COST OF IMPLEMENTATION OF FMVSS 208 in 1972 ON SELECTED SYSTEMS.

(BASED ON 1978 MODEL YEAR ECONOMICS AND VOLUMES INDICATED)

MANUFACTURER	MODEL	PRODUCTION VOLUME	CONSUMER COST - \$				TOTAL SYSTEM
			FRONT		REAR		
			OUTBOARD	CENTER	OUTBOARD	CENTER	
FORD MOTOR CO.	1974 FORD 4 DOOR	304,040	29.86	7.83	17.62	6.60	61.91
CHEVROLET	1972 BELAIR 4 DOOR	630,950	26.41	5.35	9.85	4.93	46.54
TOYOTA	1972 CORONA 4 DOOR	73,980	14.49	-	13.92	-	28.41

WEIGHTED AVERAGE CONSUMER COST OF SAMPLES

FRONT OUTBOARD	(2 BELTS)	\$26.58
REAR OUTBOARD	(2 BELTS)	\$12.49
FRONT CENTER	(1 BELT)	\$ 6.16
REAR CENTER	(1 BELT)	\$ 5.47

TABLE 51

TOTAL INDUSTRY

FMVSS 208 - OCCUPANT CRASH PROTECTION

CONSUMER COST OF IMPLEMENTATION OF FMVSS 208 OF THE BASIC BELT REQUIREMENT (1968) AND THE ADDITIONAL SHOULDER BELT REQUIREMENT (1972). THESE COSTS ARE BASED ON THE APPLICATION OF THE WEIGHTED AVERAGE CONSUMER COST DETERMINED IN THE STUDIED SAMPLE SYSTEM.

(BASED ON 1978 MODEL YEAR ECONOMICS AND 1972 MODEL PRODUCTION VOLUMES)

MODEL	VOLUME	STUDY WEIGHTED AVERAGE CONSUMER COST/VEHICLE \$
TWO SEAT SYSTEM	26,700	26.58
FOUR SEAT SYSTEM	3,267,500	39.07
FIVE SEAT SYSTEM	1,041,400	44.54
SIX SEAT SYSTEM	6,299,100	50.70
TOTAL INDUSTRY LESS VEHICLES BELOW	10,634,700	
WEIGHTED AVERAGE OF INDUSTRY LESS VEHICLES BELOW		46.46
ECONOMY BUSES	46,900	
TOTAL INDUSTRY	10,681,600	

TABLE 52

FMVSS 208 - OCCUPANT CRASH PROTECTION

CONSUMER COST OF THE IMPLEMENTATION OF THE 1972 SEAT-SHOULDER
BELT SYSTEM OVER THE 1968 SEAT BELT SYSTEM OF SELECTED SAMPLES

(BASED ON 1978 MODEL YEAR ECONOMICS AND VOLUMES INDICATED)

MODEL	VOLUME	FRONT OUTBOARD SYSTEM		ADDITIONAL IMPLEMENTATION COST OVER 1968 SYSTEM \$
		1968 SYSTEM \$	1972 SYSTEM \$	
FORD FORD	304,040	19.03	29.86	10.83
CHEVROLET BELAIR	630,950	14.60	26.41	11.81
TOYOTA CORONA	73,980	9.71	14.49	4.78
TOTAL SAMPLES	1,008,970			
WEIGHTED AVERAGE OF SAMPLES				11.00

TABLE 53

TREND STUDY

FMVSS 208 - OCCUPANT CRASH PROTECTION

CONSUMER COST OF SELECTED SEAT BELT SYSTEMS IN VEHICLES WITH VARIOUS SEATING CAPACITIES FOR COMPARATIVE PURPOSES. ALL SYSTEMS ARE BASED ON 1978 MODEL YEAR ECONOMICS AND THE VOLUMES INDICATED.

(BASED ON 1978 MODEL YEAR ECONOMICS)

MANUFACTURER	MODEL	VOLUME (YEAR)	SYSTEM	SEATING CAPACITY	CONSUMER COST OF SYSTEM \$
BUICK	1973 ELECTRA	324,090 (1973)	STANDARD 1972 SYSTEM	6	54.29
BUICK	1973 ELECTRA	100,000 (1973)	AIR BAG FRONT SYSTEM	6	192.11
CADILLAC	1975 SEVILLE	16,355 (1975)	BELT SYSTEM W/ELECTRICAL COMPONENTS	6	110.63
VOLKSWAGEN	1975 RABBIT	19,000 (1975)	PASSIVE BELT SYSTEM	4	79.13
	1968 BEETLE	518,100 (1968)	STANDARD 1968 SYSTEM	4	31.85
FORD	1971 MAVERICK	188,000 (1971)	STANDARD 1968 SYSTEM	4	30.20

FMVSS 214 - SIDE DOOR STRENGTH - BASIC COST & WEIGHT DATA OF SPECIMEN VEHICLES FOR IMPLEMENTATION STUDY

Item DOORS	Req'd. Per Vehicle	Material	Weight	Total Tooling (\$000)	Years Amort.	COST PER VEHICLE							COST PER POUND OF VEHICLE				
						MFG.			Tooling	Oth. Cost + Profit	Dealer Markup	Total Consumer Costs	MFG.			Tooling	Total Consumer Costs
						Variable	Fixed	Total					Variable	Fixed	Total		
1973 GREMLIN - 2 DOOR																	
FRONT DOOR	-	-	33.3750	210.	-	13.0433	2.9191	15.9623	0.4930	1.5962	3.1855	21.2370	0.3908	0.0875	0.4783	0.0148	0.6363
1973 VALLIANT - 2 DOOR																	
FRONT DOOR	-	-	21.0000	200.	-	9.3569	2.5541	11.9110	0.1796	1.1849	2.7191	15.9945	0.4456	0.1216	0.5672	0.0086	0.7616
1973 FURY - 4 DOOR																	
FRONT DOOR	-	-	33.1250	200.	-	12.6234	1.7871	14.4105	0.6431	2.1075	5.1260	22.2872	0.3811	0.0540	0.4350	0.0194	0.6728
REAR DOOR	-	-	29.1250	200.	-	12.3434	2.8827	15.2261	0.6431	2.2217	5.4038	23.4946	0.4238	0.0990	0.5228	0.0221	0.8067
1973 PINTO - 2 DOOR																	
FRONT DOOR	-	-	24.9500	130.	-	10.0784	1.8601	11.9385	0.0761	1.3216	2.3534	15.6897	0.4039	0.0746	0.4785	0.0031	0.6288
1973 GALAXIE - 4 DOOR																	
FRONT DOOR	-	-	19.8210	230.	-	11.1037	2.5915	13.6952	0.0884	1.9297	4.6936	20.4069	0.5602	0.1307	0.6909	0.0045	1.0296
REAR DOOR	-	-	14.2442	210.	-	8.0148	2.2986	10.3134	0.0807	1.4552	3.5394	15.3886	0.5627	0.1614	0.7264	0.0057	1.0803
1973 GRAN TORINO - 2 DOOR																	
FRONT DOOR	-	-	27.7500	210.	-	11.9443	2.8915	14.8358	0.2677	1.6614	3.9325	20.6973	0.4304	0.1042	0.5346	0.0096	0.7458
1973 MAVERICK - 4 DOOR																	
FRONT DOOR	-	-	15.7342	240.	-	8.8486	2.9420	11.7906	0.6275	1.2170	2.7927	16.4277	0.5624	0.1870	0.7494	0.0399	1.0441
REAR DOOR	-	-	10.0576	260.	-	7.6359	2.6155	10.2514	0.6797	1.0713	2.4583	14.4607	0.7592	0.2601	1.0193	0.0076	1.4378
1973 MALIBU - 2 DOOR																	
FRONT DOOR	-	-	43.3950	310.	-	15.8590	2.9976	18.8566	0.3089	2.1082	4.9901	26.2639	0.3655	0.0691	0.4346	0.0071	0.6052
1973 NOVA - 2 DOOR																	
FRONT DOOR	-	-	32.5500	300.	-	13.4537	2.8831	16.3368	0.2087	1.6215	3.7209	21.8879	0.4133	0.0886	0.5019	0.0064	0.6724
1973 CAPRICE - 4 DOOR																	
FRONT DOOR	-	-	21.2700	255.	-	10.3848	2.6716	13.0565	0.1136	1.8438	4.4847	19.4986	0.4882	0.1256	0.6138	0.0053	0.9167
REAR DOOR	-	-	27.5000	250.	-	10.7019	2.4397	13.1416	0.1114	1.8554	4.5129	19.6213	0.3892	0.0887	0.4779	0.0041	0.7135
1973 OLDS 98 - 4 DOOR																	
FRONT DOOR	-	-	21.3900	350.	-	10.2144	2.9501	13.1645	0.9576	2.2595	5.4605	21.8422	0.4775	0.1379	0.6155	0.0448	1.0211
REAR DOOR	-	-	19.1200	325.	-	9.3752	2.5274	11.9026	0.8892	2.0467	4.9462	19.7847	0.4903	0.1322	0.6225	0.0465	1.0348

FVMS 214 - SIDE DOOR STRENGTH - BASIC COST & WEIGHT DATA OF VEHICLES FOR TREND STUDY

Item	DOORS	Req'd. Per Vehicle	Material	Weight	Total Tooling (\$000)	Years Amort.	COST PER VEHICLE						COST PER POUND OF VEHICLE					
							MFG.			Tooling	Oth. Cost + Profit	Dealer Markup	Total Consumer Costs	MFG.			Tooling	Total Consumer Costs
							Variable	Fixed	Total					Variable	Fixed	Total		
1975 PACER - 2 DOOR																		
	FRONT DOOR	-	-	31.6250	300.	-	13.6104	3.4530	17.0635	0.8310	1.7537	4.0243	23.6725	0.4304	0.1092	0.5396	0.0263	0.7485
1975 CORDOBA - 2 DOOR																		
	FRONT DOOR	-	-	19.9850	170.	-	8.3786	2.2312	10.6098	0.3025	1.2004	2.8412	14.9539	0.4192	0.1116	0.5309	0.0151	0.7483
1976 VOLARE - 4 DOOR																		
	FRONT DOOR	-	-	13.3500	220.	-	7.4462	2.2473	9.6935	0.4467	0.9937	2.2804	13.4144	0.5578	0.1683	0.7261	0.0335	1.0048
	REAR DOOR	-	-	10.3100	210.	-	7.0936	2.3119	9.4055	0.4264	0.9635	2.2111	13.0065	0.6880	0.2242	0.9123	0.0414	1.2615
1975 GRANADA - 4 DOOR																		
	FRONT DOOR	-	-	14.3400	190.	-	9.1117	2.6932	11.8049	0.2356	1.1800	2.7078	15.9283	0.6354	0.1878	0.8232	0.0164	1.1108
	REAR DOOR	-	-	8.3500	190.	-	7.5390	2.7375	10.2765	0.2356	1.0302	2.3641	13.9063	0.9024	0.3278	1.2307	0.0382	1.6654
1978 FAIRMONT - 2 DOOR																		
	FRONT DOOR	-	-	21.8264	190.	-	9.2273	2.0366	11.2639	0.2590	1.1292	2.5914	15.2436	0.4228	0.0933	0.5161	0.0119	0.6984
1975 SEVILLE - 4 DOOR																		
	FRONT DOOR	-	-	31.9750	285.	-	12.8649	2.9529	15.8178	3.4756	4.4375	7.9103	31.6412	0.4023	0.0923	0.4947	0.1087	0.9896
	REAR DOOR	-	-	41.3750	285.	-	11.0021	2.9621	13.9642	3.4756	4.0111	7.1503	28.6012	0.2659	0.0716	0.3375	0.0840	0.6913
1977 CAPRICE - 4 DOOR																		
	FRONT DOOR	-	-	17.1300	250.	-	9.1319	2.7488	11.8807	0.1114	1.6789	4.0835	17.7545	0.5331	0.1605	0.6936	0.0036	1.0365
	REAR DOOR	-	-	10.2500	270.	-	7.8462	2.5305	10.3767	0.1203	1.4696	3.5744	15.5410	0.7655	0.2469	1.0124	0.0117	1.5162
1978 MALIBU - 2 DOOR																		
	FRONT DOOR	-	-	28.5500	210.	-	11.4571	2.2630	13.7261	0.2093	1.5329	3.6284	19.0966	0.4013	0.0795	0.4808	0.0073	0.6689
1975 RABBIT - 4 DOOR																		
	FRONT DOOR	-	-	13.0750	170.	-	8.8790	2.8446	11.7236	0.1954	1.0370	2.2863	15.2423	0.6791	0.2176	0.8966	0.0149	1.1658
	REAR DOOR	-	-	10.1000	140.	-	8.9136	3.1177	12.0312	0.1609	1.0607	2.3387	15.5916	0.8825	0.3087	1.1912	0.0159	1.5437

FMVSS 215 - EXTERIOR PROTECTION - BASIC COST & WEIGHT DATA OF SPECIMEN VEHICLES FOR IMPLEMENTATION STUDY

Item	BUMPERS	Req'd. Per Vehicle	Material	Weight	Total Tooling (\$000)	Years Amort.	COST PER VEHICLE						COST PER POUND OF VEHICLE					
							MFG.			Tooling	Oth. Cost + Profit	Dealer Markup	Total Consumer Costs	MFG.			Tooling	Total Consumer Costs
							Variable	Fixed	Total					Variable	Fixed	Total		
1972 GREMLIN																		
	FRONT	-	-	25.8650	331.	-	12.4551	2.5373	14.9924	3.8805	1.8307	3.6536	24.3571	0.4815	0.0981	0.5796	0.1500	0.9417
	REAR	-	-	21.9050	286.	-	12.0545	2.5440	14.5985	3.3581	1.7418	3.4762	23.1746	0.5503	0.1161	0.6664	0.1533	1.0580
1972 VALIANT																		
	FRONT	-	-	54.7500	366.	-	17.4564	4.1460	21.6023	1.1540	2.2301	5.1177	30.1042	0.3188	0.0757	0.3946	0.0211	0.5498
	REAR	-	-	39.1250	302.	-	11.7728	2.2634	14.0362	0.9533	1.4690	3.3710	19.8296	0.3009	0.0579	0.3588	0.0244	0.5068
1972 FURY																		
	FRONT	-	-	85.5280	525.	-	26.8173	6.2046	33.0219	1.7520	4.8684	11.8412	51.4835	0.3136	0.0725	0.3861	0.0205	0.6019
	REAR	-	-	51.4517	331.	-	18.5409	4.4342	22.9751	1.1795	3.3816	8.2251	35.7613	0.3604	0.0862	0.4465	0.0229	0.6950
1972 PINTO																		
	FRONT	-	-	20.2892	443.	-	11.6465	2.6636	14.3101	1.2977	1.7168	3.0573	20.3818	0.5740	0.1313	0.7053	0.0640	1.0046
	REAR	-	-	23.0077	449.	-	11.5562	2.6152	14.1714	1.3144	1.7034	3.0334	20.2227	0.5023	0.1137	0.6159	0.0571	0.8790
1972 MAVERICK																		
	FRONT	-	-	28.7518	404.	-	17.0232	4.3127	21.3359	2.0046	2.2874	5.2491	30.8769	0.5921	0.1300	0.7421	0.0697	1.0739
	REAR	-	-	17.6682	327.	-	13.2535	3.9084	17.1619	1.6258	1.8412	4.2252	24.8541	0.7501	0.2212	0.9713	0.0920	1.4067
1972 GRAN TORINO																		
	FRONT	-	-	52.0356	432.	-	21.3196	3.9201	25.2397	1.3030	2.9197	6.9109	36.3734	0.4097	0.0753	0.4850	0.0250	0.6990
	REAR	-	-	45.0363	448.	-	17.9020	3.1773	21.0792	1.3490	2.4671	5.8397	30.7350	0.3975	0.0705	0.4681	0.0300	0.6824
1972 GALAXIE																		
	FRONT	-	-	55.1254	292.	-	21.0039	3.8517	24.8555	0.3410	3.5275	8.5799	37.3039	0.3810	0.0699	0.4509	0.0062	0.6767
	REAR	-	-	46.7270	394.	-	22.2078	4.7732	26.9811	0.4596	3.8417	9.3441	40.6264	0.4753	0.1022	0.5774	0.0098	0.8694
1972 VEGA																		
	FRONT	-	-	20.0498	337.	-	9.4755	1.9926	11.4681	0.8514	1.3551	2.4132	16.0877	0.4726	0.0994	0.5720	0.0425	0.8024
	REAR	-	-	17.9080	706.	-	10.4889	2.2958	12.7847	1.7831	1.6025	2.8536	19.0238	0.5857	0.1282	0.7139	0.0996	1.0623
1972 NOVA																		
	FRONT	-	-	32.5457	401.	-	14.5353	2.5068	17.0421	1.0840	1.7764	4.0764	23.9789	0.4466	0.0770	0.5236	0.0333	0.7368
	REAR	-	-	30.8473	372.	-	12.3243	1.9192	14.2435	1.0066	1.4945	3.4296	20.1743	0.3995	0.0622	0.4617	0.0325	0.6540

1973 VOLUMES, 1973 ECONOMICS

Item	BUMPERS	Req'd. Per Vehicle	Material	Weight	Total Tooling (\$000)	Years Amort.	COST PER VEHICLE						COST PER POUND OF VEHICLE					
							MFG.			Tooling	Oth. Cost + Profit	Dealer Markup	Total Consumer Costs	MFG.			Tooling	Total Consumer Costs
							Variable	Fixed	Total					Variable	Fixed	Total		
1972 CAMARO																		
FRONT		-	-	32.9934	701.	-	15.7123	3.9603	19.6725	7.2381	2.6911	6.0630	35.6647	0.4762	0.1200	0.5963	0.2194	1.0810
REAR		-	-	15.6299	292.	-	9.0951	2.2960	11.3911	3.0214	1.4412	3.2471	19.1008	0.5819	0.1469	0.7288	0.1933	1.2221
1972 MALIBU																		
FRONT		-	-	39.2348	677.	-	18.1623	4.2371	22.3993	2.0613	2.6907	6.3688	33.5201	0.4629	0.1080	0.5709	0.0525	0.8543
REAR		-	-	43.5824	706.	-	18.1574	3.6191	21.7765	2.1484	2.6317	6.2293	32.7859	0.4166	0.0830	0.4997	0.0493	0.7523
1972 CAPRICE																		
FRONT		-	-	90.6679	881.	-	24.5766	3.4834	28.0599	0.9357	4.0594	9.8736	42.9286	0.2711	0.0384	0.3095	0.0103	0.4735
REAR		-	-	103.6895	785.	-	27.7965	4.2731	32.0697	0.8344	4.6066	11.2044	48.7150	0.2681	0.0412	0.3093	0.0080	0.4698
1972 FIREBIRD																		
FRONT		-	-	65.9945	493.	-	18.2899	2.3518	20.6417	10.6424	3.1284	7.0483	41.4609	0.2771	0.0356	0.3128	0.1613	0.6282
REAR		-	-	24.4322	343.	-	14.1575	3.3297	17.4872	7.4154	2.4903	5.6106	33.0035	0.5795	0.1363	0.7157	0.3035	1.3508
1972 CORONA																		
FRONT		-	-	11.8607	194.	-	7.1945	1.5122	8.7066	6.7100	1.3417	2.9573	19.7152	0.6066	0.1275	0.7341	0.5658	1.6623
REAR		-	-	12.3948	156.	-	7.1897	1.3076	8.4973	5.4120	1.2101	2.6681	17.7875	0.5801	0.1055	0.6856	0.4366	1.4351
1972 CELICA																		
FRONT		-	-	9.4710	137.	-	5.6423	1.1906	6.8329	3.9508	0.9382	2.0686	13.7904	0.5957	0.1257	0.7215	0.4171	1.4561
REAR		-	-	10.4955	160.	-	6.7718	1.6374	8.4092	4.6123	1.1329	2.4978	16.6522	0.6452	0.1560	0.8012	0.4395	1.5866
1972 BEETLE																		
FRONT		-	-	17.6208	203.	-	7.6100	1.1632	8.7732	0.4466	0.8021	1.7686	11.7404	0.4319	0.0660	0.4979	0.0253	0.6691
REAR		-	-	21.1768	267.	-	8.9897	1.2358	10.2256	0.5861	0.9406	2.0739	13.8262	0.4245	0.0584	0.4829	0.0277	0.6529
1973 GREMLIN																		
FRONT		-	-	58.2050	318.	-	34.8310	4.1623	38.9933	3.7312	4.1443	8.2710	55.1397	0.5984	0.0715	0.6699	0.0641	0.9473
REAR		-	-	40.1527	315.	-	22.9931	3.2009	26.1940	3.6939	2.8991	5.7860	38.5730	0.5726	0.0797	0.6524	0.0920	0.9607
1973 VALIANT																		
FRONT		-	-	67.8125	302.	-	19.4085	3.8287	23.2372	0.9533	2.3707	5.4402	32.0015	0.2862	0.0565	0.3427	0.0141	0.4719
REAR		-	-	45.5825	299.	-	12.8816	2.6200	15.5016	0.9433	1.6116	3.6983	21.7548	0.2826	0.0575	0.3401	0.0297	0.4773

1973 VOLUMES, 1973 ECONOMICS

Item	BUMPERS	Req'd. Per Vehicle	Material	Weight	Total Tooling (\$000)	Years Amort.	COST PER VEHICLE						COST PER POUND OF VEHICLE					
							MFG.			Tooling	Oth. Cost + Profit	Dealer Markup	Total Consumer Costs	MFG.			Tooling	Total Consumer Costs
							Variable	Fixed	Total					Variable	Fixed	Total		
1973 FURY																		
FRONT	-	-	83.5854	458.	-	23.1922	3.7060	26.8982	1.6332	3.9944	9.7155	42.2412	0.2775	0.0443	0.3218	0.0195	0.5054	
REAR	-	-	78.7451	575.	-	25.2885	4.4399	29.7284	2.0528	4.4494	10.8221	47.0526	0.3211	0.0564	0.3775	0.0261	0.5975	
1973 PINTO																		
FRONT	-	-	59.6387	664.	-	34.8542	8.8627	43.7168	1.7277	4.9989	8.9018	59.3453	0.5844	0.1486	0.7330	0.0290	0.9951	
REAR	-	-	22.3102	313.	-	14.2833	3.7341	18.0174	0.9179	2.0829	3.7091	24.7273	0.6402	0.1674	0.8076	0.0411	1.1083	
1973 MAVERICK																		
FRONT	-	-	90.0064	643.	-	32.5216	7.5608	40.0824	2.8254	4.2050	9.6496	56.7624	0.3613	0.0840	0.4453	0.0314	0.6306	
REAR	-	-	23.7150	399.	-	15.5817	3.7824	19.3641	1.9794	2.0917	4.8000	28.2351	0.6570	0.1595	0.8165	0.0835	1.1906	
1973 GRAN TORINO																		
FRONT	-	-	132. 2383	712.	-	40.1160	7.8261	47.9421	1.9070	5.4834	12.9792	68.3118	0.3034	0.0592	0.3625	0.0144	0.5166	
REAR	-	-	53.1035	479.	-	22.0617	3.9383	26.0000	1.4448	3.0189	7.1458	37.6096	0.4154	0.0742	0.4896	0.0272	0.7082	
1973 GALAXIE																		
FRONT	-	-	111. 1786	796.	-	36.8068	8.3685	45.1752	0.8154	6.4387	15.6607	68.0900	0.3311	0.0753	0.4063	0.0073	0.6124	
REAR	-	-	88.6875	556.	-	31.8743	6.1627	38.0370	0.5478	5.4019	13.1389	57.1255	0.3594	0.0695	0.4289	0.0062	0.6441	
1973 VEGA																		
FRONT	-	-	26.8499	286.	-	9.5039	1.2934	10.7973	0.7229	1.2672	2.2566	15.0440	0.3540	0.0482	0.4021	0.0269	0.5603	
REAR	-	-	19.7275	706.	-	10.6818	2.2428	12.9246	1.7831	1.6178	2.8810	19.2064	0.5415	0.1137	0.6552	0.0904	0.9736	
1973 NOVA																		
FRONT	-	-	61.0297	463.	-	21.8643	3.0257	24.8900	1.2527	2.5620	5.8793	34.5839	0.3583	0.0496	0.4078	0.0205	0.5667	
REAR	-	-	47.4542	292.	-	15.0459	1.7341	16.7800	0.7915	1.7220	3.9517	23.2453	0.3171	0.0365	0.3536	0.0167	0.4898	
1973 CAMARO																		
FRONT	-	-	50.7839	588.	-	20.7474	4.2362	24.9836	6.0756	3.1059	6.9977	41.1627	0.4085	0.0834	0.4920	0.1196	0.8105	
REAR	-	-	15.6344	226.	-	7.9171	1.6403	9.5574	2.3317	1.1889	2.6786	15.7367	0.5064	0.1049	0.6113	0.1491	1.0078	
1973 MALIBU																		
FRONT	-	-	107. 2461	1109.	-	40.6203	5.3859	46.0061	2.7189	5.3598	12.6866	66.7714	0.3788	0.0502	0.4290	0.0254	0.6226	
REAR	-	-	82.0728	696.	-	23.3386	5.3422	28.6808	2.1193	3.3880	8.0194	42.2076	0.2844	0.0651	0.3495	0.0258	0.5143	

1973 VOLUMES, 1973 ECONOMICS

FMVSS 215 - EXTERIOR PROTECTION - BASIC COST & WEIGHT DATA OF VEHICLES FOR TREND STUDY

Item	Req'd. Per Vehicle	Material	Weight	Total Tooling (\$000)	Years Amort.	COST PER VEHICLE							COST PER POUND OF VEHICLE					
						MFG.			Tooling	Oth. Cost + Profit	Dealer Markup	Total Consumer Costs	MFG.			Tooling	Total Consumer Costs	
						Variable	Fixed	Total					Variable	Fixed	Total			
1975 PACER - 1975 VOLUME																		
FRONT	-	-	61.8691	324.	-	25.6622	1.9443	27.6065	4.4911	3.1456	7.2185	42.4617	0.4148	0.0314	0.4462	0.0726	0.6863	
REAR	-	-	58.4348	299.	-	22.6160	1.9229	24.5389	4.1389	2.8104	6.4494	37.9375	0.3870	0.0329	0.4199	0.0708	0.6492	
1975 CORDOBA - 1975 VOLUME																		
FRONT	-	-	96.8158	906.	-	42.3490	3.1353	45.4843	6.1600	5.6809	13.4466	70.7718	0.4374	0.0324	0.4698	0.0636	0.7310	
REAR	-	-	96.4086	925.	-	42.3214	3.7958	46.1173	6.3297	5.7692	13.6556	71.8718	0.4390	0.0394	0.4784	0.0657	0.7455	
1975 GRANADA - 1975 VOLUME																		
FRONT	-	-	93.2965	607.	-	33.6254	6.4575	40.0829	3.4009	4.2614	9.7791	57.5244	0.3604	0.0692	0.4296	0.0365	0.6166	
REAR	-	-	75.5667	425.	-	31.0533	6.6868	37.7401	2.3020	3.9241	9.0051	52.9713	0.4109	0.0885	0.4994	0.0305	0.7010	
1975 SEVILLE - 1975 VOLUME																		
FRONT	-	-	124.2854	1030.	-	44.6469	5.6968	50.3437	56.6017	24.5974	43.8476	174.3905	0.3592	0.0458	0.4051	0.4554	1.4112	
REAR	-	-	90.4225	658.	-	35.8556	2.8793	38.7350	33.9223	16.7112	29.7895	119.1579	0.3965	0.0318	0.4284	0.3752	1.3178	
1975 RABBIT - 1975 VOLUME																		
FRONT	-	-	30.9476	425.	-	16.5001	1.4263	17.9264	1.9330	1.7278	3.8095	25.3966	0.5332	0.0461	0.5792	0.0625	0.8206	
REAR	-	-	31.4443	394.	-	14.2929	1.0216	15.3145	1.7503	1.4846	3.2734	21.8228	0.4545	0.0325	0.4870	0.0557	0.6940	
1976 VOLARE - 1976 VOLUME																		
FRONT	-	-	92.8450	776.	-	41.6852	3.3443	45.0295	5.7061	4.9721	11.4100	67.1176	0.4490	0.0360	0.4850	0.0615	0.7229	
REAR	-	-	96.6612	696.	-	37.0548	3.0979	40.1527	4.8992	4.4151	10.1318	59.5988	0.3833	0.0320	0.4154	0.0507	0.6166	
1977 CAPRICE - 1973 VOLUME																		
FRONT	-	-	79.9205	1057.	-	41.2963	3.9214	45.1908	0.8937	6.4518	15.6926	68.2289	0.5164	0.0491	0.5654	0.0112	0.8537	
REAR	-	-	74.5480	875.	-	37.3539	3.4884	40.8423	0.7011	5.8161	14.1463	61.5058	0.5011	0.0468	0.5479	0.0094	0.8251	
1978 MALIBU - 1973 VOLUME																		
FRONT	-	-	67.0304	680.	-	32.1336	3.4216	35.5552	1.8387	4.1133	9.7363	51.2435	0.4794	0.0510	0.5304	0.0274	0.7645	
REAR	-	-	60.5355	626.	-	27.9826	2.9983	30.9809	1.6742	3.5921	8.5024	44.7495	0.4623	0.0443	0.5118	0.0277	0.7392	

1973 ECONOMICS

FMVSS 301 - FUEL SYSTEM INTEGRITY - BASIC COST & WEIGHT DATA OF SPECIMEN VEHICLES FOR IMPLEMENTATION STUDY

Item	TANKS	Req'd. Per Vehicle	Material	Weight	Total Tooling (\$000)	Years Amort.	COST PER VEHICLE						COST PER POUND OF VEHICLE					
							MFG.			Tooling	Oth. Cost + Profit	Dealer Markup	Total Consumer Costs	MFG.			Tooling	Total Consumer Costs
							Variable	Fixed	Total					Variable	Fixed	Total		
1967 RAMBLER - 1968 ECONOMICS	1968 VOLUMES	-	-	19.7914	194.	-	5.2699	0.7062	5.9760	0.4756	0.6323	1.4509	8.5348	0.2663	0.0357	0.3020	0.0240	0.4312
1967 RAMBLER - 1976 ECONOMICS	1976 GREMLIN VOLUMES	-	-	19.7914	388.	-	11.4696	1.5105	12.9801	1.4662	1.4157	3.2488	19.1108	0.5795	0.0763	0.6558	0.0741	0.9656
1967 VALIANT - 1968 ECONOMICS	1968 VOLUMES	-	-	23.6918	183.	-	6.7900	0.6122	7.4022	0.4403	0.7686	1.7637	10.3748	0.2866	0.0258	0.3124	0.0186	0.4379
1967 VALIANT - 1976 ECONOMICS	1976 VOLARE VOLUMES	-	-	23.6918	366.	-	14.4768	1.3094	15.7862	0.2510	1.5716	3.6066	21.2155	0.6110	0.0553	0.6663	0.0106	0.8955
1967 FALCON - 1968 ECONOMICS	1968 VOLUMES	-	-	19.8516	143.	-	3.2228	0.5063	3.7292	0.2570	0.3905	0.8965	5.2732	0.1623	0.0255	0.1879	0.0129	0.2656
1967 FALCON - 1976 ECONOMICS	1976 GRANADA VOLUMES	-	-	19.8516	286.	-	7.2978	1.0827	8.3805	0.1272	0.8338	1.6133	11.2547	0.3676	0.0545	0.4222	0.0064	0.5669
1967 FALCON - 1976 ECONOMICS	1976 MAVERICK VOLUMES	-	-	19.8516	286.	-	7.2978	1.0827	8.3805	0.5475	0.8749	2.0078	11.8107	0.3676	0.0545	0.4222	0.0276	0.5949
1967 FAIRLANE - 1968 ECONOMICS	1968 VOLUMES	-	-	23.9008	168.	-	5.2157	1.6984	6.9142	0.1007	0.6875	1.5776	9.2798	0.2182	0.0711	0.2893	0.0042	0.3883
1967 FAIRLANE - 1976 ECONOMICS	1976 TORINO VOLUMES	-	-	23.9008	337.	-	11.6311	3.6310	15.2621	0.3487	1.5299	3.5107	20.6514	0.4866	0.1519	0.6386	0.0145	0.8640
1967 FORD - 1968 ECONOMICS	1968 VOLUMES	-	-	16.5559	168.	-	5.3286	1.8196	7.1482	0.0429	1.0068	2.4487	10.6466	0.3219	0.1099	0.4318	0.0026	0.6431
1967 FORD - 1976 ECONOMICS	1976 VOLUMES	-	-	16.5559	336.	-	11.8140	3.8901	15.7041	0.2810	2.2379	5.4432	23.6663	0.7136	0.2350	0.9486	0.0170	1.4295
1967 CHEVY II - 1968 ECONOMICS	1968 VOLUMES	-	-	16.5568	115.	-	3.2383	0.5853	3.8236	0.1396	0.3884	0.8913	5.2429	0.1956	0.0354	0.2309	0.0084	0.3167
1967 CHEVY II - 1976 ECONOMICS	1976 NOVA VOLUMES	-	-	16.5568	230.	-	7.2565	1.2518	8.5083	0.1375	0.8473	1.9444	11.4375	0.4383	0.0756	0.5139	0.0083	0.6908
1967 CHEVELLE - 1968 ECONOMICS	1968 VOLUMES	-	-	24.7699	126.	-	4.3355	0.5496	4.8851	0.0623	0.5442	1.2882	6.7799	0.1750	0.0222	0.1972	0.0025	0.2737
1967 CHEVELLE - 1976 ECONOMICS	1976 MALIBU VOLUMES	-	-	24.7699	251.	-	9.9174	1.1755	11.0929	0.1633	1.2382	2.9308	15.4251	0.4004	0.0475	0.4478	0.0066	0.6227
1967 BELAIR - 1968 ECONOMICS	1968 VOLUMES	-	-	33.4568	147.	-	4.8141	0.5406	5.3547	0.0237	0.7530	1.8314	7.9628	0.1439	0.0162	0.1600	0.0007	0.2380
1967 BELAIR - 1976 ECONOMICS	1976 CAPRICE VOLUMES	-	-	33.4568	294.	-	10.9526	1.1561	12.1087	0.1761	1.7199	4.1832	18.1878	0.3274	0.0346	0.3619	0.0053	0.5436
1967 CAMARO - 1968 ECONOMICS	1968 VOLUMES	-	-	22.5018	179.	-	5.1504	0.8670	6.0174	0.1625	0.6180	1.3924	8.1903	0.2289	0.0385	0.2674	0.0072	0.3540
1967 CAMARO - 1976 ECONOMICS	1976 VOLUMES	-	-	22.5018	358.	-	11.3241	1.8539	13.1779	0.3912	1.3569	3.0571	17.9832	0.5033	0.0824	0.5856	0.0174	0.7992
1967 OLDS 98 - 1968 ECONOMICS	1968 VOLUMES	-	-	29.5418	139.	-	5.0346	0.5516	5.5862	0.0930	0.9087	2.1960	8.7838	0.1704	0.0187	0.1891	0.0031	0.2973
1967 OLDS 98 - 1976 ECONOMICS	1976 VOLUMES	-	-	29.5418	277.	-	11.3518	1.1794	12.5312	0.1981	2.0367	4.9220	19.6881	0.3843	0.0399	0.4242	0.0067	0.6664
1967 CORONA - 1968 ECONOMICS	1968 VOLUMES	-	-	18.1646	124.	-	3.8541	0.6340	4.4881	0.8803	0.4671	1.0298	6.8653	0.2122	0.0349	0.2471	0.0485	0.3779
1967 CORONA - 1976 ECONOMICS	1976 VOLUMES	-	-	18.1646	247.	-	8.6724	1.3558	10.0282	0.9506	0.9552	2.1060	14.0400	0.4774	0.0746	0.5521	0.0523	0.7729
1967 BEETLE - 1968 ECONOMICS	1968 VOLUMES	-	-	15.0118	213.	-	6.3576	0.6639	7.0215	0.0823	0.6180	1.3627	9.0846	0.4235	0.0442	0.4677	0.0055	0.6052
1967 BEETLE - 1976 ECONOMICS	1976 RABBIT VOLUMES	-	-	15.0118	426.	-	13.6400	1.4197	15.0597	1.3359	1.4264	3.1451	20.9671	0.9086	0.0946	1.0032	0.0890	1.3967

FMVSS 208 - OCCUPANT CRASH PROTECTION - BASIC COST & WEIGHT DATA OF SPECIMEN VEHICLES FOR IMPLEMENTATION STUDY

Item	Req'd. Per Vehicle	Material	Weight	Total Tooling (\$000)	Years Amort.	COST PER VEHICLE							COST PER POUND OF VEHICLE				
						MFG.			Tooling	Oth. Cost + Profit	Dealer Markup	Total Consumer Costs	MFG.			Tooling	Total Consumer Costs
						Variable	Fixed	Total					Variable	Fixed	Total		
1968 VOLUMES																	
1968 FORD - 1968 ECONOMICS																	
FRONT	2	VAR	3.2712	268.	-	3.8251	1.0571	4.8822	0.1150	0.6996	1.7017	7.3985	1.1693	0.3232	1.4925	0.0351	2.2617
FRONT CENTER	1	VAR	0.8729	17.	-	1.5703	0.3869	1.9571	0.0063	0.2749	0.6686	2.9069	1.7989	0.4432	2.2421	0.0072	3.3302
REAR	3	VAR	2.4666	174.	-	4.6257	1.1192	5.7450	0.0644	0.8133	1.9782	8.6009	1.8753	0.4538	2.3291	0.0261	3.4870
1974 VOLUMES																	
1968 FORD - 1978 ECONOMICS																	
FRONT	2	VAR	3.2712	628.	-	9.6199	2.7534	12.3734	0.4789	1.7993	4.3765	19.0281	2.9408	0.8417	3.7825	0.1464	5.8169
FRONT CENTER	1	VAR	0.8729	40.	-	3.9408	1.0077	4.9485	0.0263	0.6965	1.6940	7.3653	4.5146	1.1544	5.6690	0.0301	8.4377
REAR	3	VAR	2.4666	408.	-	11.6956	2.9151	14.6108	0.2684	2.0831	5.0666	22.0289	4.7416	1.1818	5.9234	0.1088	8.9309
1968 VOLUMES																	
1968 BELAIR - 1968 ECONOMICS																	
FRONT	2	VAR	3.4520	126.	-	3.1671	0.7082	3.8753	0.0340	0.5473	1.3312	5.7879	0.9175	0.2052	1.1226	0.0099	1.6767
FRONT CENTER	1	VAR	0.9368	15.	-	1.1959	0.2104	1.4064	0.0040	0.1975	0.4802	2.0881	1.2766	0.2246	1.5012	0.0043	2.2290
REAR	3	VAR	2.7741	149.	-	3.2995	0.5797	3.8791	0.0404	0.5487	1.3347	5.8029	1.1894	0.2090	1.3983	0.0146	2.0918
1972 VOLUMES																	
1968 BELAIR - 1978 ECONOMICS																	
FRONT	2	VAR	3.4520	295.	-	7.9231	1.8447	9.7678	0.0935	1.3806	3.3580	14.5998	2.2952	0.5344	2.8296	0.0271	4.2294
FRONT CENTER	1	VAR	0.9368	35.	-	2.9861	0.5482	3.5344	0.0111	0.4964	1.2073	5.2491	3.1876	0.5852	3.7728	0.0118	5.6033
REAR	3	VAR	2.7741	350.	-	8.2455	1.5098	9.7553	0.1109	1.3813	3.3596	14.0071	2.9723	0.5442	3.5165	0.0400	5.2655
1972 VOLUMES																	
1972 BELAIR - 1978 ECONOMICS																	
FRONT*	2	VAR	6.0370	1189.	-	14.4880	2.9760	17.4640	0.3769	2.4977	6.0752	26.4138	2.3999	0.4930	2.8928	0.0624	4.3753
FRONT CENTER	1	VAR	0.9392	341.	-	2.9602	0.5482	3.5084	0.1081	0.5063	1.2315	5.3543	3.1518	0.5837	3.7356	0.1151	5.7010
REAR	3	VAR	2.7081	340.	-	8.3353	1.5367	9.8721	0.1078	1.3972	3.3983	14.7754	3.0779	0.5675	3.6454	0.0398	5.4560
1974 VOLUMES																	
1974 FORD - 1978 ECONOMICS																	
FRONT*	2	VAR	5.9340	1785.	-	15.8330	3.1637	18.9967	1.1743	2.8239	6.8686	29.8636	2.6682	0.5332	3.2013	0.1979	5.0326
FRONT CENTER	1	VAR	0.8884	358.	-	4.1086	0.9422	5.0507	0.2355	0.7401	1.8001	7.8264	4.6247	1.0605	5.6852	0.2651	8.8096
REAR**	3	VAR	5.0571	1238.	-	12.7423	2.8002	15.5425	0.8145	2.2900	5.5699	24.2168	2.5197	0.5537	3.0734	0.1611	4.7387
1968 VOLUMES																	
1968 CORONA - 1968 ECONOMICS																	
FRONT*	2	VAR	2.8750	64.	-	3.0655	0.0	3.0655	0.4553	0.3063	0.6754	4.5025	1.0663	0.0	1.0663	0.1584	1.5661
REAR	2	VAR	2.1250	55.	-	2.2658	0.0	2.2658	0.3946	0.2315	0.5103	3.4024	1.0663	0.0	1.0663	0.1857	1.6017

* INCLUDES SHOULDER HARNESS ASSY

** CONSISTS OF TWO OUTBOARD BELT ASSYS AND ONE DIFFERENT CENTER BELT ASSY

FMVSS - 208 - OCCUPANT CRASH PROTECTION - BASIC COST & WEIGHT DATA OF VEHICLES FOR TREND STUDY

Item	Req'd. Per Vehicle	Material	Weight	Total Tooling (\$000)	Years Amort.	COST PER VEHICLE							COST PER POUND OF VEHICLE				
						MFG.			Tooling	Oth. Cost + Profit	Dealer Markup	Total Consumer Costs	MFG.			Tooling	Total Consumer Costs
						Variable	Fixed	Total					Variable	Fixed	Total		
1971 VOLUMES																	
1971 MAVERICK - 1978 ECONOMICS																	
FRONT*	2	VAR	2.6250	472.	-	10.4030	2.3617	12.7647	0.5021	1.3001	2.9836	17.5505	3.9630	0.8997	4.8627	0.1913	6.6859
REAR	2	VAR	1.6444	408.	-	7.1635	1.9614	9.1249	0.4340	0.9368	2.1497	12.6454	4.3563	1.1928	5.5491	0.2640	7.6900
1973 VOLUMES																	
1973 ELECTRA (BELTS)1978 ECONOMICS																	
FRONT*	2	VAR	5.4864	1231.	-	13.5695	3.2089	16.7784	0.7596	2.4553	5.9720	25.9654	2.4733	0.5849	3.0582	0.1385	4.7327
FRONT CENTER	1	VAR	0.8506	434.	-	3.0549	0.6940	3.7489	0.2678	0.5623	1.3678	5.9468	3.5915	0.8159	4.4073	0.3149	6.9913
REAR	2	VAR	3.5078	860.	-	8.6391	2.0094	10.6485	0.5307	1.5651	3.8067	16.5511	2.4628	0.5728	3.0357	0.1513	4.7184
REAR CENTER	1	VAR	0.7664	434.	-	2.9660	0.6955	3.6615	0.2678	0.5501	1.3380	5.8175	3.8701	0.9075	4.7776	0.3494	7.5906
1973 VOLUMES																	
1973 ELECTRA (BAGS)1978 ECONOMICS																	
BAGS (ASSYS)	1	VAR	47.6406	3720.	-	116.2921	6.0292	122.3213	7.4400	18.1666	44.1862	192.1141	4.4410	0.1266	2.5676	0.1562	4.0326
1975 VOLUMES																	
1975 SEVILLE - 1978 ECONOMICS																	
FRONT	2	VAR	8.1836	1540.	-	15.5962	2.9226	18.5188	18.7805	8.5788	15.2927	61.1708	1.9058	0.3571	2.2629	0.2949	7.4748
REAR	2	VAR	3.4916	860.	-	8.7311	2.0094	10.7406	10.4678	4.8825	8.7036	34.8145	2.5006	0.5755	3.0761	3.0037	9.9709
REAR CENTER	1	VAR	0.7570	434.	-	2.9462	0.6940	3.6402	5.2927	2.0546	3.6625	14.6499	3.8919	0.9167	4.8087	6.9917	19.3525
1968 VOLUMES																	
1968 BEETLE - 1978 ECONOMICS																	
FRONT	2	VAR	3.7903	591.	-	11.3552	2.1583	13.5135	0.2281	1.1955	2.6360	17.5731	2.9959	0.5694	3.5653	0.0602	4.6363
REAR	2	VAR	2.3806	517.	-	8.8049	2.1657	10.9707	0.1996	0.9718	2.1427	14.2848	3.6986	0.9097	4.6084	0.0838	6.0005
1975 VOLUMES																	
1975 RABBIT - 1978 ECONOMICS																	
FRONT	2	VAR	4.8494	957.	-	17.1524	0.7580	17.9103	10.0737	2.4346	5.3680	35.7866	3.5370	0.1553	3.6923	0.3773	7.3796
KNEE BAR ASSY	1	VAR	17.2500	790.	-	9.5077	2.3271	11.8347	8.3158	1.7531	3.8653	25.7690	0.5512	0.1349	0.6861	0.4821	1.4938
REAR	2	VAR	2.9376	500.	-	8.4760	0.0	8.4760	5.2632	1.1953	2.6355	17.5700	2.8853	0.0	2.8853	1.7917	5.9811

* INCLUDES SHOULDER HARNESS ASSY