

TL
242
.H382
v.4

COST EVALUATION FOR NINE FEDERAL MOTOR VEHICLE STANDARDS VOLUME IV FMVSS 202 & 207

M. R. Harvey
J. A. Lesczhik
R. F. McLean

De Lorean Motor Company
2401 Elliott Street
Troy, Michigan 48084

Contract No. DOT-HS-8-02015
Contract Amt. \$332,007

DEPARTMENT OF
TRANSPORTATION

JUL 14 1980

LIBRARY



**NOVEMBER 1979
FINAL REPORT**

This document is available to the U.S. public through the
National Technical Information Service,
Springfield, Virginia 22161

Prepared For
**U.S. DEPARTMENT OF TRANSPORTATION
National Highway Traffic Safety Administration
Washington, D.C. 20590**

This document is disseminated under the sponsorship of the Department of Transportation in the interest of information exchange. The United States Government assumes no liability for its contents or use thereof.

1. Report No. DOT-HS-805 318	2. Government Accession No.	3. Report's Catalog No.
4. Title and Subtitle COST EVALUATION FOR NINE FEDERAL MOTOR VEHICLE SAFETY STANDARDS Vol. IV		5. Report Date NOVEMBER 1979
7. Author(s) M.R. Harvey, J.A. Lesczhik, R.F. McLean		6. Performing Organization Code
9. Performing Organization Name and Address DE LOREAN MOTOR COMPANY RESEARCH & ENGINEERING DIVISION 2401 ELLIOTT ST. TROY, MICHIGAN 48084		8. Performing Organization Report No.
12. Sponsoring Agency Name and Address DEPARTMENT OF TRANSPORTATION NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION 400 SEVENTH STREET, S.W. WASHINGTON, D.C. 20590		10. Work Unit No. (TRAFIS)
		11. Contract or Grant No. DOT-HS-8-02015
		13. Type of Report and Period Covered FINAL REPORT 10/78 - 11/79
15. Supplementary Notes		14. Sponsoring Agency Code
16. Abstract The consumer cost was established for the implementation cost of each of the nine Federal Motor Vehicle Safety Standards. The standards study are: FMVSS 105 Hydraulic Brake Systems on Passenger Cars FMVSS 108 Side Marker Lamps FMVSS 122 Motorcycle Brake Systems FMVSS 202 Head Restraints FMVSS 207 Seating Systems FMVSS 213 Child Seating Systems FMVSS 220 School Bus, Rollover Protection FMVSS 221 School Bus, Joint Strength FMVSS 222 School Bus, Seating and Crash Protection For each standard a representative sample of makes and models of vehicles or components was established. The components required to meet the standard were purchased and their costs estimated. The first year of the imposition of the standard and the year immediately preceding it were emphasized. By analysis, the consumer costs attributed to the standard for each make and model or components were determined. A weighted average was developed from the samples and applied to the total industry volumes to determine the consumer cost for the implementation of each standard. The weighted average of weight variance due to the implementation of the standard was also determined. The before and after cost variance was not applied to FMVSS 213 Child Seating Systems and the FMVSS 122 Motorcycle Brake Systems.		
17. Key Words Consumer Cost, Variable Cost, Wholesale Cost, Safety Standards Numbers: 105,108,122,202,207,213 220,221,222 Implementation Cost		18. Distribution Statement
19. Security Classif. (of this report) Unclassified	20. Security Classif. (of this page) Unclassified	21. No. of Pages 85
		22. Price

DEPARTMENT OF TRANSPORTATION
JUL 14 1980
LIBRARY

METRIC CONVERSION FACTORS

Approximate Conversions to Metric Measures

When You Know

To Find

Symbol

Multiply by

To Find

Symbol

LENGTH

inches	*2.5
feet	30
yards	0.9
miles	1.6

AREA

square inches	6.5
square feet	0.09
square yards	0.8
square miles	2.6
acres	0.4

MASS (weight)

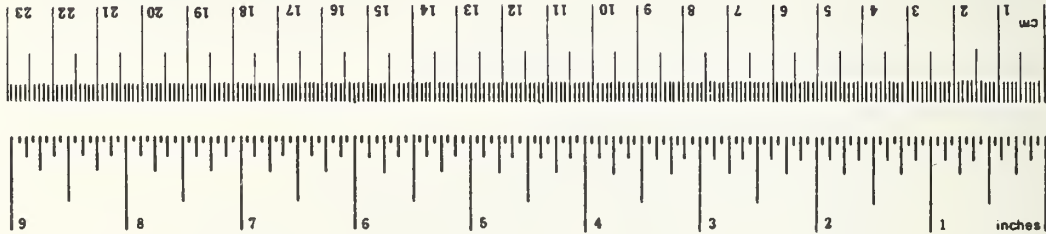
ounces	28
pounds	0.45
short tons (2000 lb)	0.9

VOLUME

teaspoons	5
tablespoons	15
fluid ounces	30
cups	0.24
pints	0.47
quarts	0.96
gallons	3.8
cubic feet	0.03
cubic yards	0.76

TEMPERATURE (exact)

°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C
----	------------------------	----------------------------	---------------------	----



Approximate Conversions from Metric Measures

When You Know

To Find

Symbol

Multiply by

LENGTH

millimeters	0.04
centimeters	0.4
meters	3.3
meters	1.1
kilometers	0.6

AREA

square centimeters	0.16
square meters	1.2
square kilometers	0.4
hectares (10,000 m ²)	2.5

MASS (weight)

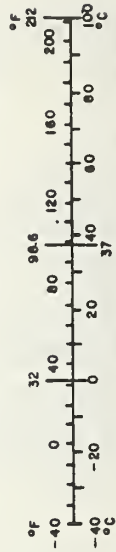
grams	0.035
kilograms	2.2
tonnes (1000 kg)	1.1

VOLUME

milliliters	0.03
liters	2.1
liters	1.06
liters	0.26
cubic meters	36
cubic meters	1.3

TEMPERATURE (exact)

°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F
----	---------------------	-------------------	------------------------	----



* 1 in = 2.54 (exactly). For other exact conversions and more detailed tables, see NBS Misc. Publ. 286, Units of Weights and Measures, Price \$2.25, SD Catalog No. C13-10286.

ABSTRACT

FMVSS 202 HEAD RESTRAINTS FMVSS 207 SEATING SYSTEMS

Under Contract DOT-HS-8-02015 the Contractor conducted a program to determine the consumer cost and weight variance due to the implementation of FMVSS 202 and FMVSS 207. Several 1969 vehicle seats were purchased for the purpose of obtaining adjustable headrests, integral headrests, and seat locks. The standard tear-down cost estimating procedure was used to develop variable cost. The Macro-Analysis Factor was used to develop wholesale and consumer cost for each specimen. A volume weighted average of weight and consumer cost was developed for the integral and adjustable headrests. These weighted averages were applied to the 1979 industry vehicle mix. The implementation of FMVSS 202 resulted in a consumer cost of \$17.68 and an increase in weight of 9.15 per vehicle.

Several lock specimens were examined, cost estimate made, data extended by using the Macro-Analysis Method and average cost of implementation FMVSS 207 was a consumer cost of \$6.81 and an increase in weight of 2.69 pounds. This standard only applies to vehicles with hinge front seats. No additional reinforcement appeared under the area of the seat attachments.

PREFACE

The Contractor, the De Lorean Motor Company, in the presentation of the Final Report on the Cost Evaluation for Nine Federal Motor Vehicle Standards has divided the report into six major categories. Each volume contains the complete study related to the designated standard or standards. The Contractor acknowledges the contribution of its staff, the automotive manufacturing community and the automotive dealers. Special acknowledgement is made to the Contract Technical Manager, Mr. Robert Lemmer of the National Highway Traffic Safety Administration, Department of Transportation, for his contributions and timely reviews throughout the program.

The cost estimating techniques employed in the study are based on automotive industry practice and have been previously used on other programs by the Contractor. The following listing includes recent and current programs using essentially the same estimating procedures and techniques as those employed in this study:

- Contract NHTSA-DOT-HS-7-01770
Development of a Motor Vehicle Materials Historial,
High-Volume Industrial Processing Rates Cost Data
Bank - Ford F-100 Truck

FMVSS 201 Study of passenger car requirements as applied to light trucks and vans.

FMVSS 203 and 204 Study of passenger car requirements as applied to light trucks and vans.

- Contract NHTSA-DOT-HS-8-01767
Cost Evaluation of Four Federal Motor Vehicle Safety Standards.

Cost Review of Pedestrian Safety Modifications.

- Contract NHTSA-DOT-HS-9-02258
Cost Evaluation of Three Federal Motor Vehicle Safety Standards.

- Renault USA, Inc.
Consumer Cost Estimate of Subcompact Vehicles.

- De Lorean Motor Company
Manufacturing Cost Studies of Components of lightweight vehicles.

- Contract NHTSA-DOT-HS-9-02112
Preliminary incremental cost estimating for the implementation of the extension of FMVSS 105 to light trucks, vans and MVTs.

Study the cost and weight change for passenger car pedestrian initial impact protection implementation.

Product feasibility, consumer cost and implementation schedule analysis for implementing brake inspectability requirements.

Cost data developed on this program for automotive standards are based on 1979 Model Year Economics and 1978 macro-analysis of automotive and component manufacturers. For standards related to other than automotive manufacturers,

the data is based on 1979 year economics and macro-analysis factors applicable to the manufacturers. Dealer discount on related automotive products was established at 16.97% for the industry. A dealer discount of 25% was applied to the motorcycle related products. The child seats dealer discounts varied from 40% to 50%. Distributor cost where applicable is reflected in the dealer wholesale cost.

In reviewing this report, the reader is cautioned that the application of an average cost per pound factor that can be developed from the data presented could result in serious cost errors. Cost data can only effectively be developed by using manufacturing processing personnel applying automotive cost estimating technology. For any cost factor to be effective the designs, size, construction, and manufacturing techniques must be nearly the same. In this report a considerable variation can be noted in the cost and weight of what appears to be similar components. Only a detailed review of these components would explain the variation.

PROGRAM INDEX

- VOLUME I - FMVSS 105 HYDRAULIC BRAKE SYSTEMS ON PASSENGER CARS
- VOLUME II - FMVSS 108 LAMPS, REFLECTIVE DEVICES AND ASSOCIATED EQUIPMENT
- VOLUME III - FMVSS 122 MOTORCYCLE BRAKE SYSTEMS
- VOLUME IV - FMVSS 202 HEAD RESTRAINTS
- FMVSS 207 SEATING SYSTEMS
- VOLUME V - FMVSS 213 CHILD SEATING SYSTEMS
- VOLUME VI - FMVSS 220 SCHOOL BUS, ROLLOVER PROTECTION
- FMVSS 221 SCHOOL BUS, JOINT STRENGTH
- FMVSS 222 SCHOOL BUS, SEATING AND CRASH PROTECTION

TABLE OF CONTENTS

VOLUME IV

FMVSS 202 HEAD RESTRAINTS
207 SEATING SYSTEMS

	PAGE
INTRODUCTION	1
INTEGRATED COST SAMPLING PLAN	10
COST EVALUATION HEAD RESTRAINTS	12
COST EVALUATION SEATING SYSTEMS	16
CONCLUSION	19
APPENDIX A - SUMMARY OF COMPONENT CONSUMER COST AND WEIGHT DATA	
APPENDIX B - PHOTOGRAPHS OF SYSTEMS STUDIED	

COST EVALUATION OF NINE FEDERAL MOTOR VEHICLE STANDARDS
VOLUME IV FMVSS 202 HEAD RESTRAINTS
207 SEATING SYSTEMS

INTRODUCTION

Under Contract DOT-HS-8-02015, the Contractor conducted a program that developed the consumer cost and weight variance resulting from the requirement of FMVSS 202 on 1 January 1969 and FMVSS 207 effective 1 January 1968.

An Integrated Cost Sampling Plan was developed, approved by the Contract Technical Manager, and followed to obtain, if any, changes in cost and weight due to implementation of the standard.

Specimen vehicles were selected and components purchased that represent typical system installations of head restraints and seat locks. Automotive industry type teardown and manufacturing cost estimating techniques were applied to develop cost and weight data for the implementation analysis.

Appendix A of this report represents a summary of cost elements and weight of components involved in the study. In Figure 1 elements of component cost are shown. The boxes with the solid lines contain data derived from the cost and weight processing of components of the systems studied. Those with dotted boxes are cost elements considered in the estimating processing and the summarized results are contained in the costs in Appendix A.

In this study, the consumer cost is the summation of the variable cost, corporation other cost and profit and dealer markup. The variable cost is considered as those costs that vary with the volume of production and consist of the cost of direct material, direct labor and variable burden. The Other Cost and Profit consist of those items identified in Figure 1 and are:

- Indirect Material
- Indirect Labor
- Fixed Burden
- Tooling Cost
- Engineering and Warranty Cost
- Selling and Administration Cost
- Other Corporate Costs
- Corporation Profits
- Distributor Cost

The Dealer-Markup consists of the dealers expense and profit.

The costs included in Appendix A are variable cost, dealer wholesale, dealer mark-up, and consumer cost.

The variable costs of production of 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.

ELEMENTS OF CONSUMER COST

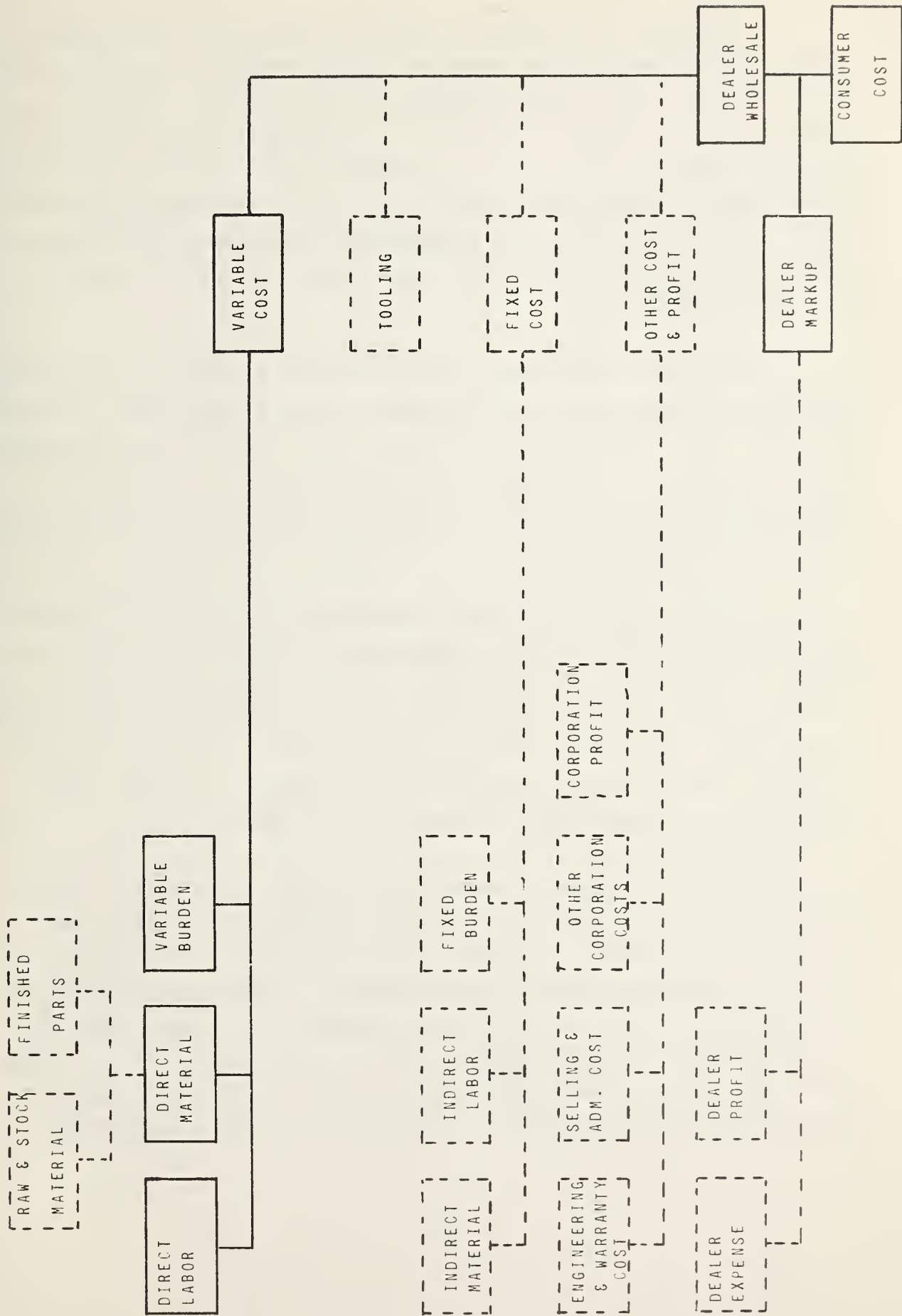


FIGURE 1

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 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

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 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 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. A finite estimating

and processing technique utilizes this basic data plus model year economics and volumes contained in a data bank to extend the data into consumer cost.

The data bank contains approximately six hundred operation rates and over sixty materials utilized in the automotive type industry and covers twelve 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 vehicle design. Normally in the United States, the model 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 to be 1979.

The Dealer Wholesale Cost for this study was developed by use of the Macro-analysis Method. A factor expressing the relationship of the variable cost to the Dealer Wholesale Cost was obtained from studying financial data related to the specific industry or manufacturer of the product. The macro-analysis study utilized data obtained from public files, annual financial reports, the 10K Report filed annually by the United States manufacturers and previous cost studies of similar products. The variable cost multiplied by the factor will produce the dealer wholesale cost.

Although other methods can be used to derive a dealer wholesale cost, it is believed by the Contractor

that the variable cost macro-analysis factor method produces an acceptable average dealer wholesale cost. The macro-analysis factor includes:

- A. Indirect labor - these 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, supervision and management, clerical, janitorial, plant security, etc. The total labor cost is not affected by variations in the production rate.

- B. Indirect material - these 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.

- C. 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.

- D. Tooling Cost - 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 a program. Further, the component or sub-component could be extended over several product lines. 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 would be required to use judgment in the application of the amortization and volume factor.
- E. Other Cost and Profit - include 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 dealer wholesale cost could be derived by the method of applying individual detailed cost factors stated above to the variable cost. This would produce a very accurate dealer wholesale cost. However, the data to accomplish this would not be available publicly or could it be expected that such confidential data would be made available for study groups.

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 dealer is an independent business man over whom the manufacturer can exercise only limited controls. Although manufacturers have suggested retail prices, 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 suggested price and is reflected in the consumer cost of the system or components studied.

Appendix B contains photographs for each system studied. These photographs provide a quick overview of the various systems.

Cost and weight data in Appendix A shows data to four decimal places. This does not indicate the degree of accuracy, but rather the result of the system used to develop the final weight and costs.

INTEGRATED COST SAMPLING PLAN

The Contractor developed an Integrated Cost Sampling Plan that provided for the selection of typical head restraints and seat locking devices. The systems selected are contained in Table 1. Components for cost and weight study of the standard required the purchase of the entire seat of the selected vehicles. A teardown was made of both seat system components and the seat locking devices. A standard automotive cost processing method was used to determine the variable cost. A macro-analysis factor was applied to develop the consumer cost. The implementation cost and weight variance for the adjustable headrest consisted of the headrest, attaching hardware and any structural changes of the seat. The integral head restraint consists of the additional structure and padding related to the exterior of the standard base seat.

Implementation cost and weight variance of the locking device consisted of the locks, lock hardware and any modification of the seat structure related to the installation of the lock unit.

A study was made of the floor structure in the area of seat attachment to determine if the structure was modified.

The cost data obtained for this study is summarized in Appendix A. Photographs of the studied systems and floor structure is presented in Appendix B.

TABLE 1

FMVSS 202 - HEAD RESTRAINTS

FMVSS 207 - SEATING SYSTEMS

MODELS FOR WHICH SEATS WERE PURCHASED ARE STUDIED

MANUFACTURER	1969	REMARKS
AMERICAN MOTORS	HORNET 2 DOOR	
CHRYSLER	VALIANT 4 DOOR	
	POLARA 2 DOOR	
FORD	MUSTANG ^{1,2} 2 DOOR	HIGH BACK (INTEGRAL HEADREST) BUCKET SEATS
	FALCON 2 DOOR	
	LTD 4 DOOR	
	THUNDERBIRD ² 2 DOOR	PASSENGER SEAT WITH RECLINER AND ADJUSTABLE HEADREST
GENERAL MOTORS	NOVA ^{1,2} 2 DOOR	STRATO-BUCKET SEAT WITH ADJUSTABLE HEADREST
	TEMPEST 2 DOOR	
	FIREBIRD ^{1,2} 2 DOOR	HIGH BACK BUCKET SEAT
	CORVETTE ¹	HIGH BACK BUCKET SEAT
	ELDORADO ¹	SPLIT BACK-ADJUSTABLE HEADRESTS

1. INDICATES COMPLETE DRIVERS SEAT ASSEMBLY

2. WILL BE USED FOR ESTIMATING COSTS OF FMVSS 207

COST EVALUATION OF HEAD RESTRAINTS

Passenger car head restraints were required by FMVSS 202 on 1 January 1969. The standard resulted in two design solutions. One was a separate headrest, usually adjustable. The second was a high seat back with an integral restraint. This is normally found on an individual bucket type seat.

Several specimens of the adjustable headrest and one integrated headrest were purchased. The cost estimating process was conducted as described in the introduction of this report. A summary of cost data is presented in Appendix A. Table 2 and Table 3 present the weighted average of the weight variance and consumer cost of the system studied. This data was used as a basis for the extension of 1978 vehicle volumes to derive the weighted average, total industry weight variance and consumer cost per vehicle. This is presented in Table 4.

The cost data is presented on the basis of 1979 Model Production Economics, 1978 Macro-analysis data, and 1978 vehicle classification of seat systems. The 1978 seat systems classification was used due to non-availability of the 1979 data at the time of the report preparation.

The cost and weight of the adjustable headrest system consists of the additional headrest unit, attachments and possible seat reinforcements. The cost and weight of the integral headrest considered only the additional material and labor necessary to provide the increase in seat back size.

TABLE 2

CONSUMER COST AND WEIGHT VARIANCE PER VEHICLE RESULTING
 FROM THE IMPLEMENTATION OF FMVSS 202 IN 1969
 VEHICLE STUDIED WITH INTEGRAL HEAD RESTRAINT

MANUFACTURER	MODEL	1969 MODEL PRODUCTION YEAR VOLUME	WEIGHT/VEHICLE (POUNDS)	CONSUMER COST/VEHICLE (\$)
FORD MOTOR COMPANY	1969 MUSTANG	299,800	3.76	5.64

TABLE 3

WEIGHTED AVERAGE CONSUMER COST AND WEIGHT VARIANCE RESULTING
 FROM THE IMPLEMENTATION OF FMVSS 202 IN 1969
 VEHICLES STUDIED WITH ADJUSTABLE HEAD RESTRAINTS
 (BASED ON 1979 MODEL PRODUCTION ECONOMICS)

MANUFACTURER	MODEL	1969 MODEL PRODUCTION YEAR VOLUME	WEIGHT/VEHICLE (POUNDS)	CONSUMER COST/VEHICLE \$
AMERICAN MOTORS	1969 RAMBLER AMERICAN 2 DOOR	49,408	6.1508	12.76
CHRYSLER	1969 PLYMOUTH VALLIANT 4 DOOR	57,422	13.9838	27.77
	1969 DODGE POLARA 2 DOOR	37,627	13.8776	24.44
FORD MOTOR CO.	1969 FALCON 2 DOOR	38,265	10.8604	28.49
	1969 LTD 4 DOOR	414,987	10.7446	21.82
	1969 THUNDERBIRD 2 DOOR	39,400	8.5670	18.23
GENERAL MOTORS	1969 CHEVROLET NOVA 2 DOOR	147,690	10.6070	21.73
	1969 CHEVROLET CORVETTE 2 DOOR	38,800	6.7896	15.51
	1969 PONTIAC FIREBIRD 2 DOOR	87,700	9.7392	20.06
	1969 CADILLAC ELDORADO 2 DOOR	23,300	10.9870	20.68
TOTAL VEHICLES STUDIED		934,599		
WEIGHTED AVERAGE OF VEHICLES STUDIED			10.47	20.62

TABLE 4

WEIGHTED AVERAGE CONSUMER COST AND WEIGHT VARIANCE RESULTING
FROM THE IMPLEMENTATION OF FMVSS 202 IN 1969
VEHICLES STUDIED WITH ADJUSTABLE HEAD RESTRAINTS
(BASED ON 1979 MODEL PRODUCTION ECONOMICS)

TYPE OF HEAD RESTRAINT	1978* MODEL PRODUCTION YEAR VOLUME	WEIGHT/VEHICLE (POUNDS)	CONSUMER COST/VEHICLE \$
ADJUSTABLE	7,134,971	10.47	20.62
INTEGRAL	1,744,721	3.76	5.64
TOTAL U.S. INDUSTRY	8,879,692		
WEIGHTED AVERAGE OF U.S. INDUSTRY		9.15	17.68

* Incomplete data available for 1979 volumes.

COST EVALUATION OF SEAT SYSTEM LOCKS

The FMVSS 207 Seating Systems standard was first effective on January 1, 1968. The major vehicle design change resulting from its promulgation was the incorporation of a locking device for folding seat backs.

Several seats were purchased and a teardown provided the components necessary for the detailed cost and weight study. Summary data is available in Appendix A for each seat systems studied.

Table 5 presents a weighted average of consumer cost and weight variation of systems studied. This is also the average implementation weight and consumer cost per vehicle resulting from the standard.

A review of the area under the seats was made to determine if reinforcements were required. There was no indication of this in the specimens studied.

Photographs of specimen floor seating are included in Appendix B on pages indicated:

69 Rambler American	B4
69 Valiant	B8
69 Polara	B13
69 Mustang	B17
69 Falcon	B20
69 LTD	B24
69 T-Bird	B28
69 Nova	B33
69 Tempest	B38
69 Firebird	B41
69 Corvette	B44 & B45
69 Eldorado	B50

Appendix B also includes all photographs of all systems studied.

TABLE 5

WEIGHTED AVERAGE CONSUMER COST AND WEIGHT VARIANCE RESULTING
 FROM THE IMPLEMENTATION OF FMVSS 207 IN 1969
 ON SPECIMEN VEHICLES
 (BASED ON 1979 MODEL PRODUCTION YEAR VOLUME)

MANUFACTURER	MODEL	1969 MODEL PRODUCTION YEAR VOLUME	WEIGHT/VEHICLE (POUNDS)	CONSUMER COST/VEHICLE \$
FORD MOTOR COMPANY	1969 MUSTANG 2 DOOR	299,800	2.9548	6.46
	1969 THUNDERBIRD 2 DOOR	39,400	3.3160	7.34
GENERAL MOTORS	1969 PONTIAC FIREBIRD 2 DOOR	87,700	1.0980	2.67
	1969 CHEVROLET NOVA 2 DOOR	147,690	2.9258	9.84
TOTAL VEHICLES STUDIED		574,590		
WEIGHTED AVERAGE OF VEHICLES STUDIED AND STANDARD IMPLEMENTATION WEIGHT AND COST			2.69	6.81

CONCLUSION

A consumer cost of \$17.68 and a weight variance of 9.15 pounds results from the implementation of FMVSS 202.

A consumer cost of \$6.81 and a variance of 2.69 pounds resulted from the implementation of FMVSS 207. This standard was only applicable to vehicles with seat backs that moved.

It was also concluded that no special reinforcement was required in the floors under the seats.

APPENDIX A

SUMMARY OF COMPONENT COST AND WEIGHT DATA

FMVSS - 202 HEAD RESTRAINTS SUMMARY OF COMPONENT COST AND WEIGHT DATA

Item	Req'd Per Vehicle	Material	Weight	Total Tooling (\$000)	COST PER VEHICLE \$						
					VARIABLE COST			Total	Wholesale Cost	Dealer Markup	Consumer Cost
					Material	Labor	Burden				
AMERICAN MOTORS											
1969 RAMBLER AMERICAN 2 DOOR	2	VAR	6.1508	495.	3.5889	1.2165	3.1186	7.9240	10.5968	2.1617	12.7585
CHRYSLER CORPORATION											
1969 PLYMOUTH VALIANT 4 DOOR	2	VAR	13.9838	693.	7.0430	2.6008	7.6037	17.2475	23.0651	4.7053	27.7704
1969 DODGE POLARA 2 DOOR	2	VAR	13.8776	518.	7.3538	2.0812	5.7459	15.1809	20.3014	4.1415	24.4429
FORD MOTOR COMPANY											
1969 FALCON 2 DOOR	2	VAR	10.8604	490.	6.0490	3.2191	8.4233	17.6914	23.6537	4.8264	28.4851
1969 LTD 4 DOOR	2	VAR	10.7446	550.	5.6720	2.4715	5.4060	13.5495	18.1197	3.6964	21.8161
1969 THUNDERBIRD 2 DOOR	2	VAR	8.5670	455.	4.8143	1.9258	4.5847	11.3248	15.1417	3.0895	18.2342
GENERAL MOTORS CORPORATION											
1969 CHEVROLET NOVA 2 DOOR	2	VAR	10.6070	570.	5.2637	2.1731	6.0619	13.4987	18.0518	3.6826	21.7344
1969 PONTIAC TEMPEST 2 DOOR	2	VAR	8.8564	710.	5.4559	1.7020	4.1349	11.2928	15.1019	3.0808	18.1827
1969 PONTIAC FIREBIRD 2 DOOR	2	VAR	9.7392	690.	5.5824	2.1931	4.6834	12.4589	16.6613	3.3989	20.0607
1969 CHEVROLET CORVETTE 2 DOOR	2	VAR	6.7896	445.	3.9031	1.4608	4.2691	9.6330	12.8822	2.6280	15.5102
1969 CADILLAC ELDORADO 2 DOOR	2	VAR	10.9870	520.	6.0548	1.8159	4.9758	12.8465	17.1796	3.5046	20.6842
FORD MOTOR COMPANY (INTEGRAL)											
1969 MUSTANG 2 DOOR	2	VAR	3.7598	155.	2.6115	.2631	.6302	3.5048	4.3790	.9651	5.6431

FMVSS - 207 SEATING SYSTEMS SUMMARY OF COMPONENT COST AND WEIGHT DATA

Item	Req'd Per Vehicle	Material	Weight	Total Tooling (\$000)	COST PER VEHICLE \$				Wholesale Cost	Dealer Markup	Consumer Cost
					VARIABLE COST			Total			
					Material	Labor	Burden				
FORD MOTOR COMPANY											
1969 MUSTANG 2 DOOR	2	VAR	2.9548	295.	1.7992	1.1973	1.0126	4.0091	5.3614	1.0937	6.4551
1969 THUNDERBIRD 2 DOOR	2	VAR	3.3160	358.	1.7612	1.3869	1.4078	4.5559	6.0926	1.2429	7.3358
GENERAL MOTORS CORPORATION											
1969 PONTIAC FIREBIRD 2 DOOR	2	VAR	1.8908	290.	0.9662	0.2929	0.3996	1.6587	2.2182	0.4525	2.6707
1969 CHEVROLET NOVA 2 DOOR	2	VAR	2.9258	460.	2.2936	1.8758	1.9426	6.1120	8.1736	1.6674	9.8410

APPENDIX B

PHOTOGRAPHS

TABLE OF CONTENTS

	PAGE
AMERICAN MOTORS	
1969 AMERICAN RAMBLER	3
CHRYSLER CORPORATION	
1969 VALIANT	6
1969 POLARA	10
FORD MOTOR COMPANY	
1969 MUSTANG	14
1969 FALCON	18
1969 LTD	22
1969 THUNDERBIRD	26
GENERAL MOTORS CORPORATION	
1969 CHEVROLET NOVA	31
1969 PONTIAC TEMPEST	36
1969 PONTIAC FIREBIRD	39
1969 CHEVROLET CORVETTE	43
1969 CADILLAC ELDORADO	47



1969 AMC AMERICAN RAMBLER
HEADREST ASSY & MTG. PARTS



1969 AMC AMERICAN RAMBLER
SEAT ASSY & MTG. SECTION
OF FLOOR PAN



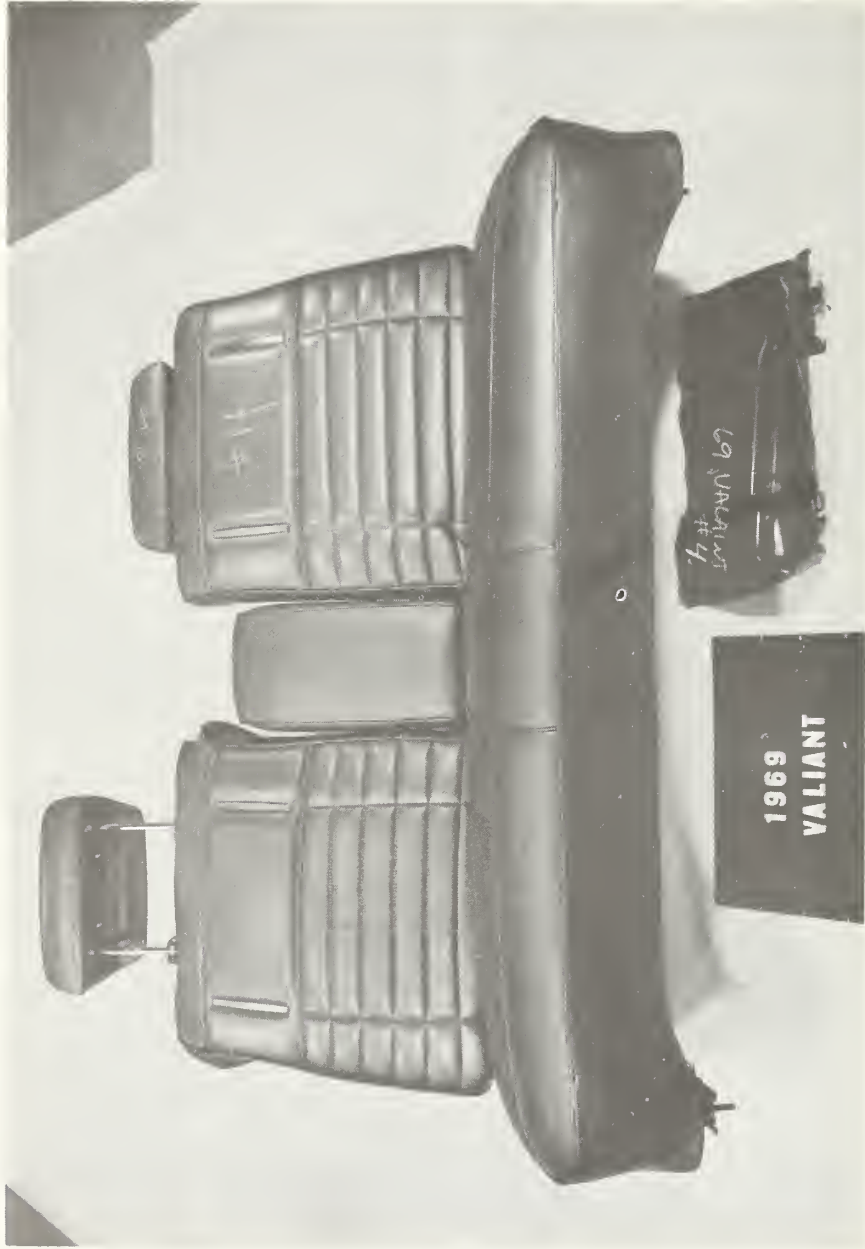
1969 AMC AMERICAN RAMBLER
HEADREST ASSY & MIG PARTS



1969 CHRYSLER VALIANT
HEADREST ASSY & MTG. PARTS



1969 CHRYSLER VALIANT
HEADREST ASSY & MIC. PARTS



1969 CHRYSLER VALIANT
SEAT ASSY & MTG. SECTION
OF FLOOR PAN



1969 CHRYSLER VALIANT
HEADREST SUPT. IN SEAT



1969 CHRYSLER POLARA
HEADREST ASSY & MTC. PARTS



1969 CHRYSLER POLARA
HEADREST SUPT. IN SEAT



1969 CHRYSLER POLARA
HEADREST ASSY & MTG. PARTS



1969 CHRYSLER POLARA
SEAT ASSY & MFG. SECTION
OF FLOOR PAN



1969 FORD MUSTANG
SEAT BACK LOCK ASSY



1969 FORD MUSTANG
UPPER SEAT BACK SUPT. PANEL



1969 FORD MUSTANG
HEADREST SECTION OF SEAT ASSY



1969 FORD MUSTANG
SEAT ASSY & MFG. SECTION
OF FLOOR PAN



1969 FORD FALCON
HEADREST ASSY & MTG. PARTS



1969 FORD FALCON
HEADREST ASSY & MTC. PARTS



1969 FORD FALCON
SEAT ASSY & MTG. SECTION
OF FLOOR PAN



1969 FORD FALCON
UPPER SEAT BACK SUPT. BRKT.



1969 FORD LTD
HEADREST ASSY & MTG. PARTS



1969 FORD LTD
HEADREST ASSY & MTC. PARTS



1969 FORD LTD
SEAT ASSY & MTG. SECTION
OF FLOOR PAN



1969 FORD LTD
UPPER SEAT BACK SUPT. BRKT.



1969 FORD THUNDERBIRD
HEADREST ASSY & MTG. PARTS



1969 FORD THUNDERBIRD
HEADREST ASSY & MTC. PARTS



1969 FORD THUNDERBIRD
SEAT ASSY & MTG. SECTION
OF FLOOR PAN



1969 FORD THUNDERBIRD
SEAT BACK LOCK ASSY



1969 FORD THUNDERBIRD
UPPER SEAT BACK SUPT. BRKT



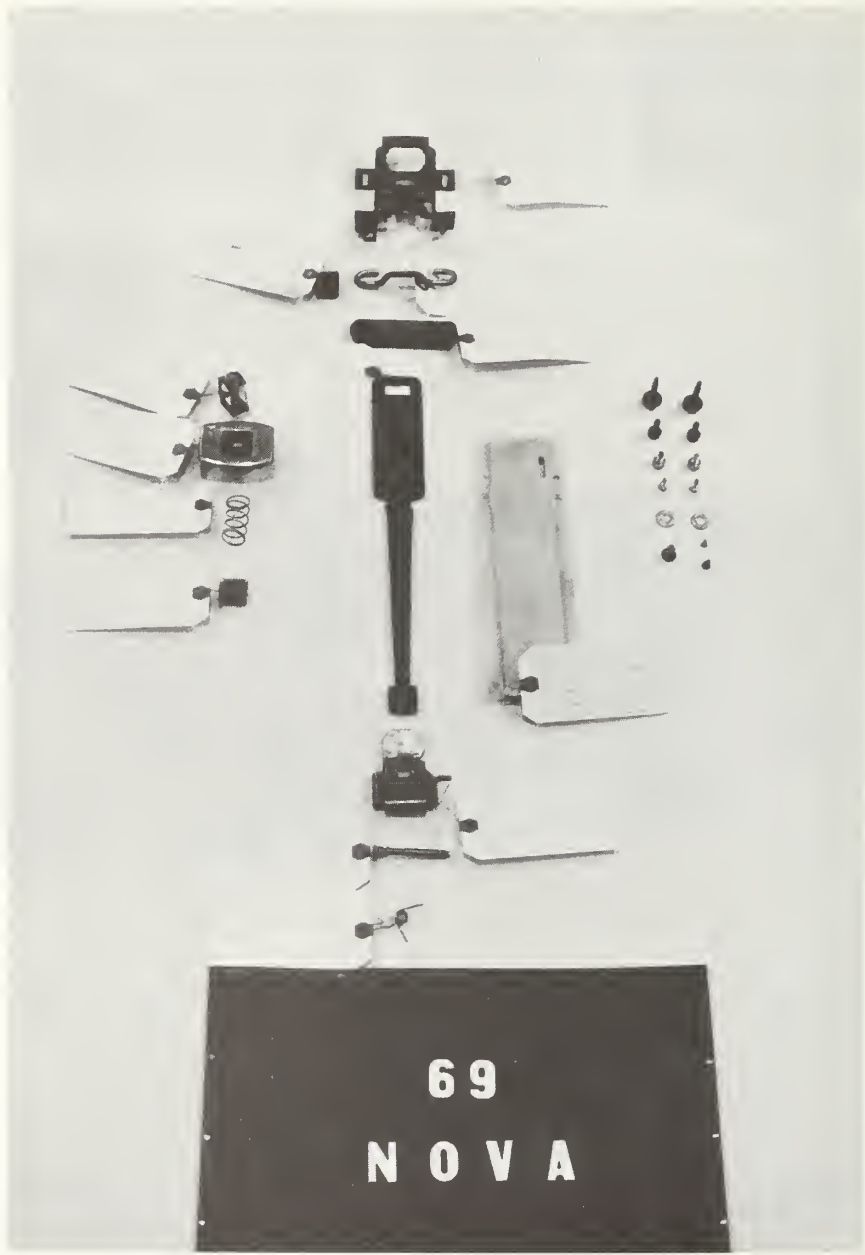
1969 GM CHEVROLET NOVA
HEADREST ASSY & MTC. PARTS



1969 GM CHEVROLET NOVA
HEADREST ASSY & MTG. PARTS



1969 GM CHEVROLET NOVA
SEAT ASSY & MTG. SECTION
OF FLOOR PAN



1969 GM CHEVROLET NOVA
SEAT BACK LOCK ASSY



1969 GM CHEVROLET NOVA
UPPER SEAT BACK SUPT. BRKT.



1969 GM PONTIAC TEMPEST
HEADREST ASSY & MTG. PARTS



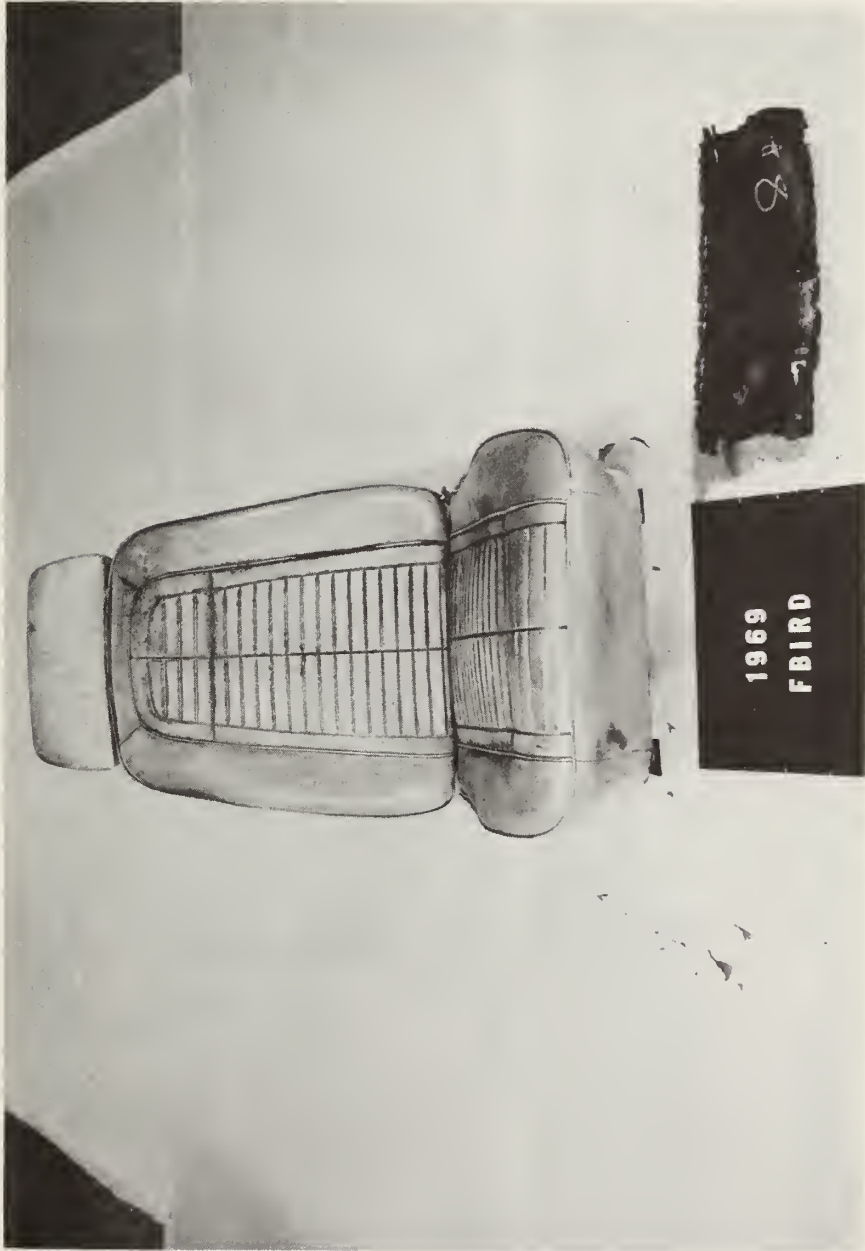
1969 GM PONTIAC TEMPEST
HEADREST ASSY & MTG. PARTS



1969 GM PONTIAC TEMPEST
SEAT ASSY & MFG. SECTION
OF FLOOR PAN



1969 GM PONTIAC FIREBIRD
HEADREST ASSY & MTG. PARTS



1969 GM PONTIAC FIREBIRD
SEAT ASSY & MFG. SECTION
OF FLOOR PAN



1969 GM PONTIAC FIREBIRD
SEAT BACK LOCK ASSY



1969 GM CHEVROLET CORVETTE
HEADREST ASSY & MTG. PARTS



1969 GM CHEVROLET CORVETTE
SEAT ASSY & MTG. SECTION
OF FLOOR PAN



1969 GM CHEVROLET CORVETTE
FLOOR PAN MIG. SECTION FOR SEAT



1969 GM CHEVROLET CORVETTE
SEAT BACK LOCK ASSY



1969 GM CADILLAC ELDORADO
HEADREST ASSY & MIG. PARTS



1969 GM CADILLAC ELDORADO
HEADREST ASSY & MTG. PARTS



1969 GM CADILLAC ELDORADO
HEADREST ASSY & MTG. PARTS



1969 GM CADILLAC ELDORADO
SEAT ASSY



1969 GM CADILLAC ELDORADO
UPPER SEAT BACK SUPT. BRKT.

TL 242 .H382

Harvey, M. P

Cost evaluation
federal motor

~~Harvey~~

Form DOT F 1720
FORMERLY FORM DO

DOT LIBRARY



00092282