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ANALYSIS OF PRODUCTION CARS' FUEL ECONOMY

U.S. ENVIRONMENTAL PROTECTION AGENCY
Office of Air and Waste Management
Office of Mobile Source Air Pollution Control
Emission Control Technology Division
Ann Arbor, Michigan 48105

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ANALYSIS OF PRODUCTION CARS' FUEL ECONOMY

by

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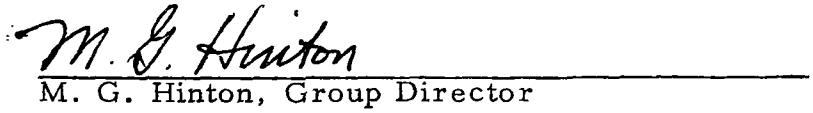
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SUMMARY

Harmonic mean fuel economies, in miles per gallon, were computed for nine carline classes which were common to the California Title 13 Data Base and the U.S. Environmental Protection Agency (EPA) Certification Test Data Base for 1975 and 1976 model years. The following parameters were used to define a carline class: model year, inertia weight, cubic inch displacement (CID), number of carburetor barrels, and transmission type. A class was considered to be acceptable for analysis if it contained at least three cars.

Both urban and highway fuel economies determined from the California Title 13 data were found to be consistently lower (urban: 5 to 19%; highway: 6 to 23%) than corresponding fuel economies determined from the EPA certification data. However, the statistical significance of this result could not be assessed since the test for statistically significant differences is an asymptotic test requiring a larger number of cars per class than were available for analysis in this study.

SECTION 1

INTRODUCTION

The objective of this study was to compare fuel economies from three sources: (1) The California Title 13 Data Base Tests, (2) The U.S. Environmental Protection Agency (EPA) In-Use Compliance Test program, and (3) The EPA Certification Test Data Base.

The California Air Resources Board (CARB) testing of production vehicles, authorized under Title 13 of the California Administrative Code, has as its objective the emission testing of new production vehicles, with primary attention given to those engine families which just barely meet the California emission requirements during the EPA certification tests. Mileage is accumulated on these vehicles prior to testing over an approved durability driving schedule. The CARB permits each manufacturer to specify the mileage accumulation it considers necessary to overcome the "green-engine" effect from an emissions point of view. Typical mileage accumulation varies from 20 to 120 miles compared to the 4000 miles accumulated on the prototype certification test vehicles. The CARB tests about 80 engine families per year.

The In-Use Compliance Test program is conducted by the EPA to monitor the emissions performance of production vehicles as tested after the cars are in operation. This data base consisted of 4950 vehicles covering the 1972 through 1974 model years.

The EPA Certification Test Data Base incorporates the fuel economy data for 1975 and 1976 model year vehicles as determined from the EPA emissions certification test results. This data base includes 759 vehicles for the 1975/1976 model years. Of this total, 277 vehicles were equipped to meet the California emission standards. The remainder were equipped to meet the Federal emission standards.

Data from the first source did not exist in a form suitable for analysis at the beginning of the study. However, an appropriate data base was developed

by hand-transcribing data from test results kept on file at the CARB office in El Monte to keypunch coding forms. A card deck consisting of data on 271 cars for model years 1974 through 1976 was then generated from these forms. Data from the other two sources were supplied by the EPA Project Officer on magnetic tape.

Many factors affect fuel economy. Those which were singled out for this study are as follows: inertia weight, cubic inch displacement (CID), number of barrels in the carburetor (or fuel injection), and transmission type (manual versus automatic). These parameters were used to define an individual carline class. Other parameters, such as axle ratio, number of gears in the transmission, and whether the car is air conditioned, also may have an important effect on fuel economy. However, when additional parameters are used to define a carline class with a relatively small data base, it becomes increasingly difficult to find enough cars which have these parameters in common so that meaningful mean fuel economies can be determined and compared, statistically, with other mean values. In order to assure that the data bases could be compared on a carline basis, three cars per class were considered to be the minimum acceptable number. The dispersion in fuel economy was generally small enough in these classes that mean values could be used to characterize a class. Since the test for differences between harmonic mean values adopted by EPA in the FY 72 Automobile Exhaust Emission Surveillance-Analysis Program (EPA-460/2-74-001, Appendix III) is an asymptotic test, it is not strictly applicable to classes this small in size. However, the test statistics for comparing mean fuel economies (Appendix II) were computed and are tabulated in Section 3 of this report.

The emission control equipment used by various manufacturers, in general, also affects fuel economy. Consequently, cars intended for operation in California were distinguished from those designed for the other 49 states in defining a carline class. Also, since this equipment may change from one year to the next because of changing emission standards, the model year was used to define a carline class.

The data which were available for this study, organized according to model year and California versus the other 49 states, are shown in Table 1-1. It is clear from this table that, given these data, comparisons between data bases can only be made for California cars in model years 1974 through 1976. However, it was found that the comparisons were further restricted by the fact that there was an insufficient number of 1974 model year cars in the EPA In-Use Compliance Test Data Base to compare with corresponding cars in the California Title 13 Data Base. In the In-Use Compliance Test Data Base, the date of purchase was used to determine the model year, while the test site was used to determine the California cars. A carline class could not be identified which contained at least three cars purchased after September 1, 1973 and tested in Los Angeles. Consequently, it was not possible to use the EPA in-use compliance data in this study. As a result, only comparisons between the EPA Certification Test Data Base and California Title 13 Data Base for model years 1975 and 1976 were made.

Table 1-1. Available Data from Three Data Sources

	MODEL YEAR				
STATE	1972	1973	1974	1975	1976
California	In-Use(1)	In-Use	In-Use Title 13(2)	EPA(3) Title 13	EPA Title 13
49 States	In-Use	In-Use	In-Use	EPA	EPA

(1) Data from EPA In-Use Compliance Test programs.

(2) Data from California Title 13 tests.

(3) Data from EPA vehicle certification tests.

SECTION 2

DATA ACQUISITION AND ANALYSIS

The California Title 13 Data Base was constructed from data acquired from the CARB, El Monte, California. A listing and description of this data base is given in Appendix I. Three miles-per-gallon (mpg) values (from repeat tests) were recorded for each car. Arithmetic mean values were used to represent individual car fuel economies. For all carline classes which were common to this data base and the EPA Certification Test Data Base, the mpg values corresponded to the 1975 urban test procedure. Highway values were obtained by the use of the factors supplied by the EPA Project Officer and are summarized in Table 2-1. Composite values were obtained from the following formula:

$$mpg_{composite} = \frac{1}{(0.55/mpg_{urban}) + (0.45/mpg_{highway})} \qquad (1)$$

(The above formula and factors were used only in conjunction with the California Title 13 data since highway and composite fuel economies were supplied directly in the EPA Certification Test Data Base.)

As indicated in Section 1 of this report, four design parameters were used to characterize an individual carline class: inertia weight, cubic inch displacement (CID), number of barrels in the carburetor (or fuel injection), and transmission type (automatic or manual). Those cars whose inertia weights differed by a few pounds or CID by a few cubic inches were grouped in the same class. For example, cars with inertia weights of 5501 lb were grouped together with cars whose inertia weights were reported as 5500 lb. Similarly, cars with a CID of 302, 304, or 305 were grouped together in the same class. With respect to the nine classes considered in this study, the only relevant grouping parameter is the CID; e. g., one California Title 13 class

consists of two Novas (CID = 305), a Camaro (CID = 305), and three Hornet wagons (CID = 305). This class was compared with an EPA certification class consisting of three Monarchs (CID = 302)(Section 3, Table 3-2).

Table 2-1. Highway-Urban Fuel Economy Correction Factors

	MODEL YEAR	
MANUFACTURER	1975	1976
General Motors	1.384	1.399
Ford	1.470	1.380
Chrysler	1.428	1.404
American Motors	1.346	1.352
Volkswagen	1.546	1.498
Toyota	1.489	1.504
Nissan	1.449	1.419

SECTION 3

RESULTS

The nine classes of cars which were identified as common to both the California Title 13 Data Base and the EPA Certification Test Data Base are listed in Table 3-1. The individual models for each class are given in Table 3-2.

Harmonic mean fuel economies for each of the classes are listed in Tables 3-3 through 3-5. The test statistic (Appendix II) listed in these tables can ordinarily be used to determine whether the differences in fuel economies indicated in these tables are statistically significant at a given significance level. For example, if the value of this test statistic exceeds 3.84146 then the hypothesis that the mean fuel economies are the same is rejected at a 0.05 significance level. (The formulas which were used to compute the harmonic mean fuel economies and the test statistics are given in Appendix II.) Since this is an asymptotic test, it is not strictly applicable to the small classes considered in this study. The values given in these tables should therefore be treated with caution. It is apparent, however, from Tables 3-3 through 3-5 that the harmonic mean fuel economies based on the California Title 13 data are consistently lower than those based on the EPA certification data. These values vary from 5 to 19% lower for urban driving and from 6 to 23% lower for highway driving.

These results should be considered preliminary in nature since only a limited number of cars were analyzed in this study. However, the difference in fuel economy between these data sources can be at least partially explained by the "green-engine" effect. As indicated in Section 1, typical mileage accumulation for the cars tested by the CARB varied between 20 and 120 miles compared to the 4000 miles accumulated on the EPA prototype certification test vehicles.

It was the original intent of this study to compare data bases not only on a carline basis, but also by manufacturer and fleet. This was not possible because of the limited number of carline classes and models per class which were available for analysis. For example, there were only two Pintos and two Granadas representing Ford in the California Title 13 Data Base in carline classes which were common to the EPA Certification Test Data Base. These four cars cannot realistically be used to represent the Ford Motor Company.

Even though projected sales data were available by model, it was not used to compute sales-weighted harmonic mean fuel economies for carline classes. In addition to relating mean fuel economies to sales, sales weighting is used to correct for differences in model (or class) mix, and it is clear from Table 3-2 that rarely are the same models being compared in the two data bases. Also, in many cases, only a single car represents a given model.

Table 3-1. Carline Classes Common to Both the California Title 13 Data Base and the EPA Certification Data Base

MODEL YEAR	INERTIA WEIGHT (lb)	CID	CARBURETION	TRANSMISSION
1975	3000	140	2V[1]	Automatic
1975	4500	350	4V	Automatic
1975	5000	440	4V	Automatic
1975	5000	455	4V	Automatic
1975	5500	455	4V	Automatic
1976	4000	250	1V	Automatic
1976	4000	304	2V	Automatic
1976	4500	350	4V	Automatic
1976	4500	360	4V	Automatic

(1) 2V corresponds to two Venturies, or barrels, in carburetor.

Table 3-2. Models in Those Classes Common to Both the California Title 13 Data Base and the EPA Certification Data Base

CLASS*	CALIFORNIA TITLE 13	EPA CERTIFICATION
530014020	Pinto (2), Vega (2)	Mustang II, Bobcat Wgn, Monza, Astre
545035040	Century/Regal (2), Monte Carlo, Cutlass, LeMans	Monte Carlo, Cutlass, LeMans
550044040	Monaco (3), Fury (3)	New Yorker (3)
550045540	Delta 88, 98, Granville	98, Granville (2)
555045540	Electra, Estate Wgn, Granville	Riviera, 98, Pontiac Wgn
640025010	Granada (2), Nova, Ventura	Granada (2), Cutlass (2), Chevelle
640030420	Nova (2), Camaro, Hornet Wgn (3)	Monarch (3)
645035040	Grand Prix, LeMans, Monte Carlo (2)	LeMans (2), Monte Carlo, Century/Regal, Cutlass
645036040	Matador (2), Matador Wgn	Coronet (3)

*Class Code: Digit 1 = Model year, Digits 2-4 = weight/10, Digits 5-7 = CID, Digit 8 = Carburetion, Digit 9 = Transmission (see Table 3-1).

Table 3-3. Production Car Fuel Economy Study - Urban Results

Sales Weighted: No
Minimum Number of Cars Per Class: 3
Critical Value of Test Statistic at .05 Significance Level = 3.84146

	MEAN FUEL ECONOMIES		TEST STATISTIC[1]
CLASS	EPA Cert	Calif Title 13	EPA-Calif
530014020	17.2	15.4	8.8
545035040	11.5	10.6	1.3
550044040	9.2	7.8	35.0
550045440	10.3	9.5	2.3
555045440	9.9	8.8	2.6
640025010	14.6	12.4	17.9
640030420	11.5	10.8	5.7
645035040	13.0	10.5	49.9
645036040	11.3	9.7	14.0

(1) Defined in Appendix II.

Table 3-4. Production Car Fuel Economy Study - Highway Results

Sales Weighted: No
Minimum Number of Cars Per Class: 3
Critical Value of Test Statistic at .05 Significance Level = 3.84146

	MEAN FUEL ECONOMIES		TEST STATISTIC(1)
CLASS	EPA Cert	Calif Title 13	EPA-Calif
530014020	24.3	22.0	7.7
545035040	15.6	14.7	0.3
550044040	13.9	11.1	25.7
550045440	14.3	13.1	1.6
555045440	13.6	12.2	0.8
640025010	19.8	17.2	21.7
640030420	16.3	14.8	9.6
645035040	18.8	14.7	32.1
645036040	17.0	13.1	20.4

(1) Defined in Appendix II.

Table 3-5. Production Car Fuel Economy Study - Composite Results

Sales Weighted: No
Minimum Number of Cars Per Class: 3
Critical Value of Test Statistic at .05 Significance Level = 3.84146

	MEAN FUEL ECONOMIES		TEST STATISTIC[1]
CLASS	EPA Cert	Calif Title 13	EPA-Calif
530014020	19.8	17.8	8.9
545035040	13.0	12.1	0.8
550044040	10.8	9.0	32.1
550045440	11.8	10.8	2.1
550045440	11.3	10.0	1.6
640025010	16.6	14.1	22.8
640030420	13.3	12.3	7.7
645035040	15.0	12.1	46.5
645036040	13.3	11.0	19.1

(1) Defined in Appendix II.

APPENDIX I

CALIFORNIA TITLE 13 DATA BASE

A listing of the California Title 13 Data Base is given in Table I-1. Each line of information corresponds to a different car. The format of these data is given in Table I-2 with additional explanations of the coded information in Table I-3. In some instances, the engine family designation involved more characters than were provided for in the standard format. When this occurred, a code for the engine family was put into columns 76 through 79. That code is interpreted in Table I-4. The occasional "X" which appears in column 80 means that at least one inconsistency in the data was recorded on the original test forms.

Table I-1. California Title 13 Data Base

11C1	76		F6T10Y157695F	2	17.74	18.32	17.96	11110	4C00	140	2750	2	4F
11C1	76		F6R12Z143609	2	12.95	13.25	13.24	11110	0111	171	3500	2	9F
1101	75	2.8	5R11Z104089	2	11.47	11.14	11.09	11110	0011	171	3500	2	
1101	74	2.3L	4R10Y166079	1	14.19	15.22	14.27	11200	C000	140	2750	2	
1101	74	2.3L	4R11Y161237	1	15.03	15.96	15.06	11200	1000	140	2750	2	
1101	75	2.3L	5R12Y142744	2	13.91	14.81	14.01	11110	1000	140	3000	2	
1102	76		F6R02Y131421F	2	17.41	16.77	17.06	11110	4000	140	3000	2	4F
11C2	75	2.8	5R12Z104101	2	12.40	12.03	13.26	11110	0011	171	3500	2	
1102	74	2.3L	4FC3Y243623	1	13.64	14.35	13.49	11200	0111	140	3000	2	
11C2	75	2.3L	5R12Y142711	2	13.87	14.97	15.22	11110	0000	140	3000	2	
11C2	75	2.3L	5R11Y144644	2	14.94	14.38	15.33	11210	0000	140	3000	2	
1103	76		F6R12Y134756F	2	16.15	15.86	16.31	11110	4001	140	3000	2	4F
1103	76		F6R04Z142091	2	12.70	12.92	12.85	11110	4111	171	3500	2	9F
11C3	76		F6R042144176	2	12.39	12.32	12.42	11110	0111	171	3500	2	9F
11C3	75	2.8	5R05Z106935	2	12.37	11.75	12.07	11110	1111	171	3500	2	
11C3	74	2.8L	F4R0ZZ181269F	1	12.12	11.95	11.95	11200	0101	171	3500	2	
11C3	75	302	5R04F145439	2	10.79	10.47	11.05	11110	0111	302	3500	2	
1103	75	302	5R05F144154	2	10.58	10.28	10.96	11110	0111	302	3500	2	
1103	75	302	5R04F145450	2	10.26	10.07	10.90	11110	0111	302	3500	2	
11C4	76		F6K31F521679	2	11.61	11.76	11.71	11110	0111	302	3500	2	10F
1104	75		F5K92L112557F	2	11.34	11.36	11.39	11110	0111	250	3500	1	3F
1104	75		F5K91L115473F	2	10.31	11.32	11.11	11110	0101	250	3500	1	3F
11C4	76		F6K91L141779F	2	12.44	12.52	12.74	11110	0111	250	3500	1	5F
11C4	74	302	4K92F179607	1	10.45	10.90	10.35	11200	0101	302	3500	2	
1104	75	302	5K92F150123	2	8.28	8.69	8.96	11110	0111	302	3500	2	
1105	76		F6W82F227316	2	10.66	10.58	10.68	11110	0111	302	4000	2	10F
1105	76		F6W82F226347	2	11.06	10.86	11.32	11110	0111	302	4000	2	10F
1105	75		F5W81L131128F	2	11.28	11.11	11.59	11110	0111	250	4000	1	3F
1105	76		F6W81L186168F	2	11.52	11.56	11.63	11110	0111	250	4000	1	5F
1105	76		F6W82L187436F	2	12.45	12.48	12.59	11110	0000	250	4000	1	5F
11C5	75	351W	5W84H171089	2	07.50	08.03	07.50	11110	0111	351	4000	2	
1105	75	351W	5W83H178285	2	06.86	08.22	07.58	11110	0111	351	4000	2	
1105	75	302	5W82F200424	2	9.70	9.64	9.95	11110	0111	302	4000	2	
1106	75		F5H31S159281F	2	08.28	08.44	08.63	22210	0111	400	5000	2	6F
11C6	75		F5J63S128932F	2	08.38	08.32	08.34	22210	0111	400	5000	2	6F
11C6	74	351C	4G21H173565	1	8.88	8.90	8.58	01200	0111	351	5000	2	
1108	76		6G21A160112	2	9.63	9.59	9.93	11110	0111	460	5000	4	11F
1109	75		F5J62S129230F	2	08.25	08.33	08.11	22210	0111	400	5000	2	6F
1109	76		6J62H130818	2	9.70	9.71	10.04	11110	0111	351	5000	2	6F
1109	76		6J63H130835	2	9.58	9.56	9.82	11110	0111	351	5000	2	6F
1109	76		6J62H13C093	2	9.92	10.05	10.25	11110	0111	351	5000	2	6F
1109	74	351C	F4J62H142825	1	10.78	8.81	8.36	11200	0111	351	5000	2	
1109	74	400	F4J66G141812	1	8.14	8.09	8.08	11200	0111	400	5000	2	
1109	74	400	F4J565143376	1	8.03	8.54	8.54	11200	0111	400	5000	2	

Table I-1. California Title 13 Data Base (Continued)

1110	74	4CC	4J745144113	1	7.70	7.71	8.16	11200	0111	400	5500	2	
1111	76		F6J87A140551	2	8.76	8.87	8.95	11110	0111	460	5500	4	11F
1111	75	460A	5J87A136730	2	07.62	07.95	09.39	11110	0111	460	5500	4	
1111	74	460	F4J87A157342F	1	07.32	07.24	C7.25	11CC0	0111	460	5500	4	
1111	74	460	F4J87A157796F	1	07.68	07.42	C7.43	11000	0111	460	5500	4	
1111	74	46C	F4J87A158935F	1	07.36	07.39	C7.82	11000	0111	460	5500	4	
1201	75	460A	5Y81A862062	2	08.37	07.91	C7.87	11110	0111	460	5500	4	
1202	76		F6Y89A873583	2	8.69	8.79	9.05	11110	0111	460	5500	4	11F
1202	75	460A	5Y89A861314	2	07.94	07.56	08.02	11110	0111	460	5500	4	
1304	75	351W	5W37H533335	2	07.10	07.83	07.49	11110	0111	351	4000	2	
1304	75	302	5W38F540282	2	9.34	9.41	9.15	11110	0110	302	4000	2	
1311	74	351C	4A93H549155	1	8.62	8.55	8.76	11200	0111	351	4500	2	
2201	75		4S07C52115919	2	14.20	14.05	14.47	01111	0111	231	3500	2	7GM
2203	75		4B27C5L110937	2	12.44	12.68	12.02	01111	0111	231	4C00	2	7GM
2204	75		4H57J5Z122925	2	12.10	11.54	12.10	01110	0111	350	4500	4	13GM
2204	75		4J57J5Z122892	2	10.65	11.12	11.54	01110	0111	350	4500	4	13GM
2204	75		4E37C5Z114962	2	11.80	11.53	11.61	01111	0111	231	4000	2	7GM
2204	74	401-4	4J57J4Z121742	1	09.56	09.39	08.73	11100	0111	350	4500	4	
2204	74	401-4	4J57J4Z212032	1	08.86	09.76	09.25	11100	0111	350	4500	4	
2205	74	402-4	4R45W4C108090	1	06.47	06.92	C6.78	11100	0111	455	5500	4	
2205	74	4C2-4	4R45T4C108362	1	06.21	06.53	06.60	11100	0111	455	5500	4	
2206	74	401-4	4N57J4C108359	1	08.60	09.60	08.80	11100	0111	350	5000	4	
2206	74	402-4	4P57T4C108355	1	06.56	06.47	C6.57	111C0	0111	455	5500	4	
2207	75		4X39T5H441238	2	8.39	8.83	8.87	01011	0111	455	5500	4	2GM
2207	75		4X39T5H441288	2	9.46	9.33	9.41	01011	0111	455	5500	4	2GM
2208	75		4R35T5X112258	2	8.89	9.20	9.05	01011	0111	455	5500	4	2GM
2301	76	61J0	6S69R6Q459495	2	10.43	10.40	11.21	11010	0111	350	4500	0	
2301	76	61J0	6S69R6Q459412	2	10.58	10.82	11.49	11010	0111	350	4500	0	
2301	76	61J0	6S69R6Q459024	2	10.32	10.59	11.21	11010	0111	350	4500	0	
2302	76	61V4	6D47S6Q175543	2	08.82	08.88	C9.04	11110	0111	500	5500	4	
2302	76	61V4	6D47S6Q175378	2	08.59	08.54	C8.71	11110	0111	500	5500	4	
2302	76	61V4	6D47S6Q177463	2	08.95	09.05	08.93	11110	0111	500	5500	4	
2302	74	501-4	6D47R4A205385	1	8.25	8.67	8.84	11200	0111	472	5500	4	
2302	74	501-4	6D47R4A202985	1	7.87	7.89	8.45	11200	0111	472	5500	4	
2302	75	61V43	6D49S5Q192145	2	9.06	8.79	9.18	11111	0111	500	5500	4	
2302	75	61V43	6D47S5Q191381	2	9.33	8.96	9.29	11111	0111	500	5500	4	
2302	75	61V43	6D49S5Q191224	2	9.24	9.24	9.76	11111	0111	500	5500	4	
2303	76	61V0	6D49S6Q193541	2	08.87	08.78	08.97	11110	0111	500	5500	0	
2303	76	61V0	6D47S6Q201523	2	08.18	08.51	08.56	11110	0111	500	5500	0	
2303	76	61V0	6D49S6Q201432	2	08.61	08.85	08.87	11110	0111	500	5500	0	
2304	74	501-4	6B69R4A204980	1	7.84	7.99	8.73	11200	0111	472	5500	4	
2401	76	11W1V	1B08E6Y121584	2	19.29	19.54	19.89	11110	0100	098	2250	1	
2401	76	11W1V	1B08I6Y119520	2	19.24	20.35	20.47	11110	1000	085	2250	1	
2401	76	11W1V	1B08I6Y116399	2	20.96	21.19	21.80	11110	0000	085	2250	1	

Table I-1. California Title 13 Data Base (Continued)

2402	75	11C23	1V77B5C109997	2	16.44	16.40	16.16	11110	0000	140	3000	2	
2402	75	11C23	1V77B5C109965	2	15.76	16.08	15.88	11110	0100	140	3000	2	
2402	74	101-2	1V77B4U298261	1	14.85	15.41	15.90	01200	1100	140	3000	2	
2402	74	101-2	1V77B4U298314	1	16.85	16.00	17.61	01200	1100	140	3000	2	
2402	74	101-2	1V77B4U305492	1	13.73	15.04	14.18	01100	1101	140	3000	2	
2402	74	101-1	1V11A4U301296	1	13.87	13.49	14.33	01200	0000	140	2750	1	
2402	74	101-1	1V77A4U304894	1	18.49	20.28	18.72	01100	1000	140	2750	1	
2402	74	101-1	1V15A4U305225	1	19.19	20.36	19.80	01100	1000	140	2750	1	
2404	75		1M27H5C247321	2	12.31	11.89	12.04	11110	0011	350	3500	2	6GM
2404	75		1M27H5C246824	2	11.14	11.48	11.54	11110	0111	350	3500	2	6GM
2404	75		1M27H5C247552	2	11.69	11.28	11.35	11110	0111	350	3500	2	6GM
2405	75		1X69D5L149260	2	11.37	11.32	10.98	11110	0000	250	4000	1	9GM
2405	76	11G2	1Y69Q6L117092	2	11.06	11.35	.	01110	0111	305	4000	2	
2405	76	11G2	1Y69Q6L117483	2	11.00	11.48	11.47	01110	0111	305	4000	2	
2405	76	11F1	1X27D6L123960	2	13.02	13.65	13.25	11110	0111	250	3500	1	
2405	76	11F1	1X69D6L124136	2	12.49	13.15	13.08	11110	0111	250	4000	1	
2405	74	102-1	1X27D4L195071	1	13.67	13.35	14.14	11200	1000	250	3500	1	
2405	74	102-1	1X27D4L195058	1	11.98	11.98	12.28	11200	0000	250	3500	1	
2405	74	102-1	1Y17D4L194960	1	11.17	11.01	11.20	11200	0001	250	4000	1	
2405	74	104-4	1X27L4L167396	1	09.79	09.41	09.84	11000	0101	350	4000	4	
2406	75		1Q87D5N591513	2	11.92	11.89	12.16	11111	0011	250	4000	1	9GM
2406	76	11G2	1Q87Q6N540239	2	11.36	11.65	11.81	01110	0011	305	4000	2	
2407	75		1D37D5Z454756	2	10.81	11.68	11.14	11111	0111	250	4000	1	9GM
2407	76	11K4	1D35L6Z421918	2	09.48	09.56	09.44	11110	0111	350	5000	4	
2407	75	11K43	1C35L5Z444878	2	9.36	9.72	9.47	11111	0001	350	5000	4	
2409	75	11K43	1N39U5J194043	2	9.41	9.70	9.41	11111	0111	400	5000	4	
2409	74	104-4	1L69L4C149202	1	09.13	08.86	09.34	11000	0111	350	4500	4	
2409	74	104-4	1N69U4C148487	1	07.49	07.39	07.61	11000	0111	400	5000	4	
2409	74	105-4	1L35Y4C148917	1	08.03	07.99	08.11	11000	0111	454	5500	4	
2410	74	105-4	1N35Y4C149132	1	07.89	07.67	07.77	11000	0111	454	5500	4	
2410	74	105-4	1N45Y4C148899	1	07.82	07.72	07.73	11000	0111	454	5500	4	
2412	76	11K4	1H57L6Z422055	2	10.29	10.48	09.94	11110	0111	350	4500	4	
2412	76	11K4	1H57L6Z422028	2	10.04	10.19	10.37	11110	0111	350	4500	4	
2412	75	11K43	1H57L5Z444872	2	9.34	10.13	9.16	11111	0111	350	4500	4	
2502	75		3B69J5L113306	2	11.61	11.64	11.74	01110	0111	350	4000	4	13GM
2502	75		3S27F5L111581	2	11.17	12.36	11.66	01110	0111	260	4000	2	8GM
2502	76	31H2J	3B17F6L103230	2	12.10	.	.	01110	0111	260	4000	2	
2502	74	301-4	3B27K4L122426	1	9.33	9.78	9.45	01100	0111	350	4000	4	
2503	75		3J57F5R140584	2	10.30	10.28	10.65	01110	0111	260	4500	2	8GM
2503	75		3F37F5R140254	2	10.60	10.71	10.63	01110	0111	260	4500	2	8GM
2503	74	301-4	3J57K4R192929	1	9.50	10.01	9.62	01100	0111	350	4500	4	
2503	74	301-4	3J57K4R192559	1	9.50	9.96	9.73	01100	0111	350	4500	4	
2503	75	31J43	3J29K5R154916	2	10.01	10.21	10.97	11010	0111	350	4500	4	
2503	75	31J43	3J57K5R154858	2	10.08	10.15	10.81	11010	0111	350	4500	4	

Table I-1. California Title 13 Data Base (Continued)

2505	75		3N39T5X112369	2	9.78	10.08	9.75	01011	0111	455	5000	4	3GM
2505	75	31J43	3N39K5X132669	2	8.93	9.86	9.54	11010	0111	350	5000	4	
2506	75		3X37T5M196471	2	9.31	9.79	9.53	01011	0111	455	5000	4	3GM
2506	75		3X37T5M171754	2	9.58	10.03	9.96	01011	0111	455	5000	4	3GM
2601	75	11C23	2V77B5C106344	2	18.43	21.24	18.68	11110	1100	140	3000	2	
2604	76	31H2J	2Y27F6L103492	2	11.16	11.11	11.27	01110	0111	260	4000	2	
2604	76	31H2J	2Y17F6L103501	2	11.50	12.03	.	01110	0111	260	4000	2	
2604	76	11F1	2Y69D6L104678	2	11.98	13.02	.	11110	0111	250	4000	1	
2604	74	201-4	2Z17B4L131459	1	9.00	9.78	8.74	01100	0111	350	4000	4	
2604	74	201-4	2Z17B4L131460	1	8.81	8.46	8.59	01100	0111	350	4000	4	
2605	75		2S87E5N515109	2	10.17	10.39	10.49	11010	0111	350	4000	4	1GM
2605	76	21K4	2T87P6N537924	2	11.72	12.04	12.12	11110	0111	350	4000	4	
2606	75		2F37E5P150816	2	9.17	10.02	9.43	11010	0111	350	4500	4	1GM
2606	76	21K4	2F37P6P201204	2	10.62	11.03	11.17	11110	0111	350	4500	4	
2606	74	201-4	2Z17B4L131464	1	9.01	8.79	9.01	01100	0111	350	4000	4	
2608	75		2K57W5P182930	2	8.42	9.07	8.70	01111	0100	455	4500	4	4GM
2608	76	21K4	2J57P6P197482	2	10.70	10.95	.	11110	0111	350	4500	4	
2609	75		2P49S5X135705	2	8.93	8.99	8.97	01011	0111	400	5000	4	1GM
2609	75		2R49W5X148464	2	8.58	9.03	8.64	01111	0111	455	5000	4	4GM
2609	75		2L45W5X148145	2	7.86	8.56	7.93	01111	0111	455	5500	4	4GM
3001	75		SS22N5R266779	2	09.48	08.74	10.19	11110	0111	400	4500	4	4C
3001	75		SS22N5R281690	2	09.58	08.55	09.04	11110	0111	400	4500	4	4C
3001	75	CLA4	SS22J5R130592	2	10.86	10.97	11.31	11110	0111	360	4500	4	
3001	75	CLA4	SS22J5R143299	2	10.31	10.24	10.36	11110	0111	360	4500	4	
3003	75		CS23T5C164482	2	08.31	07.95	08.02	11110	0111	440	5500	4	5C
3003	75		CS23T5C177722	2	08.61	08.22	08.67	11110	0111	440	5500	4	2C
3003	75		CS41TSC191136	2	08.02	08.00	08.05	11110	0111	440	5500	4	2C
3003	74	RB	CS23T4C179422	1	8.92	8.74	8.90	11100	0111	440	5000	4	
3004	75		YM23T5C140115	2	07.72	07.47	07.54	11110	0111	440	5500	4	5C
3005	75		CS46TSC254914	2	07.95	07.92	07.98	11110	0111	440	5500	4	2C
3005	74	RB	CP46T4D197442	1	7.90	7.65	8.02	11100	0111	440	5500	4	
3005	74	RB	CP46T4D205193	1	8.90	9.09	9.08	11100	0111	440	5500	4	
3201	75	CLA2	LL29G5G111638	2	11.00	11.01	10.89	11110	0111	318	4000	4	
3201	75	CLA2	LH41G5R140853	2	10.18	10.16	10.26	11110	0111	318	4500	4	
3202	76		NH41G6B107738	2	10.77	11.01	10.71	11110	0111	318	4000	2	1C
3204	76		WH41G6A136109	2	10.69	10.66	10.39	11110	0111	318	4500	2	1C
3204	75	CLA2	WH41G5A136860	2	10.18	10.27	9.89	11110	0111	318	4500	4	
3205	74	LA-4	WP29J4A140521	1	9.13	9.17	9.49	01100	0111	300	4500	4	
3207	76		WH23G6G113584	2	10.65	10.48	10.73	11110	0111	318	4500	2	1C
3208	75		DK41N5D222030	2	08.88	08.50	08.99	11110	0100	400	5000	4	4C
3208	75		DP43T5D150018	2	07.63	07.79	07.87	11110	0111	440	5500	4	5C
3208	75		DK41U5D191408	2	08.04	08.05	08.30	11110	0111	440	5000	4	3C
3208	75		DK41U5D194301	2	07.70	07.52	08.19	11110	0111	440	5000	4	3C
3208	75		DK41U5D227622	2	07.71	07.71	08.13	11110	0111	440	5000	4	3C

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3301	74	RG	VL29C4B497536	1	13.59	13.44	13.80	011C0	C101	225	3500	1		X
3301	74	RG	VL29C4B473857	1	13.54	13.44	14.18	01100	0101	225	3500	1		X
3301	74	RG	VL29C4B483016	1	15.66	15.61	16.09	011C0	0000	225	3500	1		X
3304	74	LA-4	RK41J4A208873	1	10.09	10.09	10.04	01100	0111	360	4500	4		
3304	74	LA-4	PH41J4D205823	1	9.05	9.04	9.04	011C0	0111	360	5C00	4		
3306	75		DK41U5D232982	2	07.35	07.47	07.40	11110	0111	440	5000	4	3C	
3306	75		PK41U5D225195	2	07.69	07.48	C9.07	11110	0111	440	5000	4	3C	
3306	75		DK41U5D227625	2	07.36	07.61	07.49	11110	0111	440	5000	4	3C	
3306	75	CLA4	PP43J5D134332	2	9.27	9.30	9.28	11110	0111	360	5000	4		
4101	75	N-C82	HLB210589673	2	20.19	22.09	22.30	11110	4010	85	2250	2		
4101	75	N-082	HLB210095057	2	20.45	20.45	19.55	11110	0010	85	2500	2		
4101	75	N-C82	HLB210591450	2	21.58	23.05	21.56	11110	4010	85	2250	2		
4102	75	N-092	JKHL710027284	2	18.19	18.84	19.17	11110	1000	119	2750	2		
4103	75	N-092	JHL710847027	2	16.18	16.13	15.69	11110	1000	119	3000	2		
4103	75	N-092	JHL710847099	2	17.68	17.58	17.67	11110	1000	119	3000	2		
4107	75	N-112	HL530211996	2	14.07	13.09	13.49	01010	0010	168	3000	0		
4107	75	N-112	HL530211943	2	14.08	13.38	14.09	01010	4010	168	3000	0		
4107	75	N-112	HL530211026	2	14.40	13.59	14.33	01010	4010	168	3000	0		
4202	75	2T-C	TE31037186	2	19.14	18.83	18.97	11110	0000	097	2500	2		
4202	75	2T-C	TE37515043	2	18.77	18.C0	18.84	11110	4C00	097	2500	2		
4202	76	2T-C	TE31133646	2	18.04	18.84	18.65	10110	0110	97	2500	2		
4202	76	2T-C	TE31126289	2	17.50	18.36	17.74	10110	4010	97	2500	2		
4202	76	2T-C	TE31126210	2	17.62	17.30	.	10110	5010	97	2500	2		
4203	75	2T-C	TE38013170	2	19.66	19.63	18.74	11110	0000	097	2500	2		
4204	75	20R	RT105010505	2	15.70	15.65	15.77	11110	4010	133	2750	2		
4204	75	20R	RT119C09016	2	15.35	15.29	15.79	11110	0010	134	3000	2		
4204	75	4M	MX13020358	2	14.03	13.65	13.72	11110	0111	156	3000	2		
4204	75	4M	MX23012862	2	14.94	14.92	14.77	11110	0111	156	3000	2		
4204	75	4M	MX29018362	2	13.26	13.82	13.29	11110	0111	156	3C00	2		
4208	75	20R	RA22047938	2	14.74	15.15	14.14	11110	5110	134	2750	2		
4301	75	2	1662014079	2	21.75	20.73	21.27	01110	1000	97	2500	0		
4301	75	2	1152028468	2	20.85	23.03	21.49	01110	0C00	97	2500	0		
4301	75	2	1552014071	2	20.02	19.74	20.70	C1110	1000	97	2500	0		
4304	75	5	2252061012	2	14.76	14.81	15.05	01110	C000	109	2500	0		
4304	75	5	2252062709	2	16.47	15.67	15.06	01110	1000	109	3500	0		
4304	75	5	2252064912	2	15.35.	15.98	15.20	01110	1000	109	3500	0		
4304	74	II	2242140443	1	14.92	15.38	15.39	011C0	0100	109	3500	0		
4305	74	II	4242045771	1	16.92	16.24	16.90	011C0	0000	109	2750	0		
4306	75	31	6252059776	2	20.63	21.45	22.82	11110	4010	90	2500	1		
4306	75	31	3352102636	2	20.17	19.71	19.80	11110	0010	90	2500	1		
4306	75	31	3352102760	2	19.80	19.32	20.30	11110	0010	90	2500	1		
4306	74	4A	3242259933	1	19.94	18.14	18.79	11CC0	1010	90	2500	2		
4306	74	4A	3242254785	1	20.13	19.36	20.82	11CC0	C010	90	2500	2		
4306	74	4A	3242260166	1	20.09	19.65	20.C0	11CC0	C010	90	2500	2		

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43C7	75	32	1753187147	2	18.24	21.02	20.25	11110	0010	90	2250	2
43C8	75	32	5352026772	2	20.20	21.64	21.10	11110	4010	90	2250	2
4308	75	32	5352026754	2	20.91	20.36	20.15	11110	4010	90	2250	2
44C1	76	I-C	A6R465E116741	2	12.57	12.55	12.08	11110	CC01	232	3500	1
4401	76	I-C	A6E465E143525	2	14.07	13.70	14.17	11110	1000	232	3500	1
4401	76	I-C	A6A465E111362	2	12.13	12.22	12.26	11110	0000	232	3500	1
4401	76	I-C	A6A465A247568	2	11.42	11.61	11.62	11110	CC01	258	3500	1
4401	76	I-C	A6C465A107114	2	12.06	12.56	12.49	11110	0111	258	3500	1
44C1	74	IA	A4A465E347260	1	14.28	13.94	14.60	01100	CCC0	232	3000	1
4401	74	IA	A4A465A331873	1	12.13	12.01	12.56	01100	0100	258	3000	1
44C1	75	IC	A5E465E172340	1	15.01	16.08	16.12	11111	1000	232	3000	1
44C1	75	IC	A5A465E137436	1	11.36	12.87	12.18	11111	0111	232	3000	1
44C1	75	IC	A5C465A228191	1	11.48	11.54	12.03	11011	0001	258	3000	1
44C2	76	I-C	A6E667A117267	2	13.53	13.67	15.38	11110	1001	258	3500	1
44C2	76	I-C	A6C667A101782	2	11.68	11.73	11.23	11110	0111	258	3500	1
44C2	76	I-C	A6A667E247765	2	12.25	12.20	12.49	11110	C000	232	3500	1
44C2	76	I-C	A6A667A240208	2	12.26	11.81	11.85	11110	C001	258	3500	1
44C2	76	I-C	A6A667A240127	2	11.30	11.29	11.29	11110	C001	258	3500	1
44C2	76	I-C	A6A667E251866	2	11.34	12.04	12.54	11110	0011	232	3500	1
4403	76	II-C	A6C037H147382	2	11.72	11.71	12.77	11110	0111	304	3500	2
44C3	76	I-C	A6A057A139791	2	11.49	11.79	11.77	11110	0111	258	3500	1
44C3	74	IA	A4A057A330962	1	10.48	10.25	10.76	01100	0101	258	3500	1
44C3	74	II	A4C037H351880	1	11.09	10.82	11.24	11100	0111	304	3500	2
44C3	75	IC	A5A067A131094	1	11.60	12.67	12.44	11111	0101	258	3500	1
44C3	75	IC	A5A037A222602	1	10.93	11.08	11.00	11011	C001	258	3500	1
44C3	75	IIC	A5A057H213876	1	11.25	11.11	13.82	11111	0111	304	3500	2
44C4	76	I-C	A6A087A240706	2	11.50	11.51	11.55	11110	0111	258	3500	1
44C4	76	II-C	A6AC87H229423	2	10.37	10.52	10.41	11110	0111	304	4000	2
4404	76	II-C	A6A087H234716	2	10.05	10.16	10.23	11110	0101	304	4000	2
4404	76	II-C	A6C087H238744	2	10.13	10.43	10.34	11110	0111	304	4000	2
44C4	75	IIC	A5AC87H109672	1	10.61	11.52	11.40	11111	C101	304	3500	2
4405	76	II-C	A6A167H104089	2	11.02	10.96	10.86	11110	0111	304	4500	2
44C5	76	II-C	A6C167H104073	2	11.20	11.41	10.77	11110	0111	304	4500	2
44C5	76	II-C	A6A167H104307	2	10.04	10.03	10.53	11110	0111	304	4500	2
44C5	76	II-C	A6A857H238230	2	10.16	10.46	10.21	11110	0111	304	4500	2
4405	76	II-C	A6A167H240783	2	10.75	10.67	10.96	11110	0111	304	4500	2
44C5	76	II-C	A6A167H229517	2	10.47	10.80	11.01	11110	0111	304	4500	2
4405	76	IV-C	A6A167P219038	2	09.17	09.22	C9.19	11110	0111	360	4500	4
4405	76	IV-C	A6A167P128547	2	10.12	10.27	10.08	11110	0111	360	4500	4
4405	76	III-C	A6A167N111063	2	08.85	08.94	C9.02	11110	0111	360	4500	2
4405	76	III-C	A6A167N209176	2	09.69	09.66	09.63	11110	0111	360	4500	2
4405	76	III-C	A6A167N119534	2	09.66	09.43	C9.74	11110	0111	360	4500	2
4405	74	II	A4A167H350512	1	10.20	10.09	10.34	11000	0111	304	4000	2
4405	74	II	A4C167H350530	1	09.86	10.56	10.10	11100	0111	304	4000	2

Table I-1. California Title 13 Data Base (Continued)

44C5	75	IIC	A5C167H105631	1	09.18	09.98	10.C6	11111	0111	304	4500 2
4405	75	IIC	A5C167H168452	1	11.13	10.85	10.53	11111	0111	304	4500 2
4405	75	IIC	A5A167H206060	1	10.54	10.56	10.36	22212	0000	304	4500 2
44C6	76	II-C	A6A887H233205	2	09.75	09.91	10.01	11110	0111	304	4500 2
44C6	76	II-C	A6A887H233230	2	09.87	10.10	10.35	11110	0111	304	4500 2
44C6	76	II-C	A6A887H233203	2	10.19	10.22	10.17	11110	0111	304	4500 2
4406	76	IV-C	A6A887P226924	2	09.84	09.76	09.86	11110	0111	360	4500 4

0271 CARDS

Table I-2. Format of California Title 13 Data Base

COLUMNS	DATA	
1-4	Model Code*	
6-7	Model Year	
9-14	Engine Family	
16-30	Vehicle ID	
32	Test Type*	
34-38	mpg	Repeat Tests
40-44	mpg	
46-50	mpg	
52	Air	Devices*
53	EGR	
54	EM	
55	CAT	
56	FE	
60	Transmission Type*	
61	Air Conditioned	Accessories*
62	Power Brakes	
63	Power Steering	
65-67	CID	
69-72	Test Weight (lb)	
74	Carburetion*	

*See Table I-3

Table I-3. California Title 13 Data Base Codes

Model Code -	See Below (Ex: Dodge Coronet = 3204)	
Type Test	CVS-I=1 (Urban, 1972) CVS-II=2 (Urban, 1975)	
Devices	Air = Air injection EGR =Exhaust gas recirc. EM=Engine Modification CAT=Catalyst or OC FE=Fuel Evaporization or EFE	0=Not installed 1=Installed 2=Not recorded
Transmission	0=Automatic 1=Manual - undefined 3=Manual 3 speed primary on U.S. cars 4=Manual 4 speed primary foreign, Opt. U.S. 5=Manual 5 speed Optional on foreign, U.S.	
Accessories	0=No 1=Yes 2=Not recorded (no summary sheet)	
Carburetion (Venturi)	0=Fuel Injection 1= 1 BBL 2= 2 BBL 4= 4 BBL 5= Undefined	

Table I-3. California Title 13 Data Base Codes (Continued)

Manufacturer	Division	Model
AMC	AMC	01 Gremlin
4	4	02 Pacer
		03 Hornet
		04 Hornet Wgn.
		05 Matador
		06 Matador Wgn.
		07 Ambassador
		08 Ambassador Wgn.
		09 Javelin
Chrysler	Chrysler	01 Cordoba
3	0	02 Newport
		03 New Yorker
		04 Imperial
		05 Town & Country Wgn.
	Dodge	01 Dart
	2	02 Aspen
		03 Aspen Wgn.
		04 Coronet
		05 Charger
		06 Coronet Wgn.
		07 Charger S.E.
		08 Monaco
		09 Monaco Wgn.
	Plymouth	01 Valiant (Scamp, Duster)
	3	02 Volare
		03 Volare Wgn.
		04 Satellite (1975 Fury)
		05 Satellite (1975 Fury) Wgn.
		06 Fury (1975 Gran Fury)
		07 Fury (1975 Gran Fury) Wgn.

Table I-3. California Title 13 Data Base Codes (Continued)

Manufacturer	Division	Model
Ford	Ford	01 Pinto
		02 Pinto Wgn.
1	1	03 Mustang II
		04 Maverick
		05 Granada
		06 Torino
		07 Torino Wgn.
		08 Elite
		09 Ford (Cust. 500, Galaxy, LTD)
		10 Ford Wgn.
		11 Thunderbird
	Lincoln	01 Continental
	2	02 Continental Mk IV
	Mercury	01 Bobcat
	3	02 Bobcat Wgn.
		03 Comet
		04 Monarch
		05 Montego
		06 Montego Wgn.
		07 Monterey
		08 Monterey Wgn.
		09 Marquis
		10 Marquis Wgn.
		11 Cougar
General Motors	Buick	01 Skyhawk
2	2	02 Apollo
		03 Skylark
		04 Century/Regal
		05 Century Wgn.
		06 Le Sabre
		07 Electra
		08 Estate Wgn.
		09 Riviera

Table I-3. California Title 13 Data Base Codes (Continued)

Manufacturer	Division	Model
General Motors	Cadillac	01 Seville
2	3	02 Calais/Deville.
		03 Eldorado
		04 Fleetwood Brougham
		05 Fleetwood 75
	Chevrolet	01 Chevette
	4	02 Vega
		03 Vega Wgn.
		04 Monza
		05 Nova
		06 Camaro
		07 Chevelle (Malibu, Laguna)
		08 Chevelle Wgn.
		09 Chevrolet (Caprice, Impala, Bel Air)
		10 Chevrolet Wgn.
		11 Corvette
		12Monte Carlo
	Oldsmobile	01 Starfire
	5	02 Omega
		03 Cutlass
		04 Cutlass Wgn.
		05 Delta 88
		06 Ninety-Eight
		07 Cust. Cruiser Wgn.
		08 Toronado
	Pontiac	01 Astre
	6	02 Astre Safari
		03 Sunbird
		04 Ventura
		05 Firebird
		06 Lemans
		07 Lemans Wgn.
		08 Grand Prix

Table I-3. California Title 13 Data Base Codes (Continued)

Manufacturer	Division	Model
		09 Pontiac (Bonneville, Catalina, Grandville)
		10 Pontiac Wgn.
		11 Grand Am
		12 Trans Am
Nissan	Datsun	01 B-210
4	1	02 710
		03 710 Wgn.
		04 610
		05 610 Wgn.
		06 260Z
		07 280Z
Toyota	Toyota	01 Corolla 1200
4	2	02 Corolla 1600
		03 Corolla 1600 Wgn.
		04 Corona
		05 Corona Wgn.
		06 Mk II
		07 Mk II Wgn.
		08 Celica
Volkswagen	Volkswagen	01 Beetle
4	3	02 Ghia
		03 Thing
		04 Van
		05 412
		06 Dasher
		07 Rabbit
		08 Scirocco

Table I-4. Engine Family Code

COLUMNS 76-79	CODE FOR ENGINE TYPE
1C	CD-318-2-P5S
2C	C-RB-CAP-II
3C	C-RB-HP-CAP
4C	C-B4-CAP
5C	C-RB-CAPII
1GM	21K43-F
2GM	41S43/0
3GM	31S43F/0
4GM	21S43E/0
5GM	61V43
6GM	11J23A/0
7GM	41E23/0
8GM	31H23E/0
9GM	11F13A/0
11GM	61JO
12GM	31J43
13GM	41J43/0
3F	250 (ICEE) (Trucks, Vans)
4F	2.3 (ICEF)
5F	250 (1 CEF)
6F	351 m/400 (2 CET)
7F	2.3L
8F	302
9F	2.8L (2CEF)
10F	302 "A" (ICEF)
11F	460 "A" (2CMT)

APPENDIX II

FORMULAS FOR HARMONIC MEAN FUEL ECONOMY AND THE TEST STATISTIC FOR EVALUATING DIFFERENCES IN FUEL ECONOMY

The following was extracted from Appendix III of the U.S. Environmental Protection Agency report EPA 460/2-74-001.

II.1 HARMONIC MEAN FUEL ECONOMY

$$HMFE = \frac{1}{\overline{mpg}} \qquad \text{(II-1)}$$

where

$$\overline{mpg} = \frac{1}{N}\sum_{i=1}^{N}\frac{1}{mpg_i}$$

N = number of cars per class

mpg_i = miles per gallon for ith car in a class

II.2 TEST STATISTIC

It can be shown that the following quantity is distributed as a chi-square with α level of confidence and one degree of freedom:

$$G = \left(\frac{1}{\overline{mpg_1}} - \frac{1}{\overline{mpg_2}}\right)^2 \left(\frac{1}{\frac{S_1^2}{N_1 \times \overline{mpg_1}^4} + \frac{S_2^2}{N_2 \times \overline{mpg_2}^4}}\right) \qquad \text{(II-2)}$$

where

$$S_J^2 = \frac{1}{N_J - 1} \sum_{i=1}^{N_J} \left(\frac{1}{mpg_i} - \overline{mpg_J} \right)^2 \quad , \qquad J = 1, 2$$

N_J = number of cars in Jth class

$\overline{mpg_J} = \overline{mpg}$ for Jth class

TECHNICAL REPORT DATA
(Please read Instructions on the reverse before completing)

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EPA-460/3-76-027		

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15. SUPPLEMENTARY NOTES

16. ABSTRACT

Harmonic mean fuel economies, in miles per gallon, were computed for nine carline classes which were common to the California Title 13 Data Base and the U. S. Environmental Protection Agency (EPA) Certification Test Data Base for 1975 and 1976 model years. The parameters used to define a carline class were: model year, inertia weight, cubic inch displacement, number of carburetor barrels, and transmission type.

Both urban and highway fuel economies determined from the California Title 13 data were found to be consistently lower (urban: 5 to 19%; highway 6 to 23%) than corresponding fuel economies determined from the EPA certification data. These differences may be at least partially explained by the typical mileage accumulation of 20 to 120 miles for the California tested cars compared to the 4,000 miles accumulated on the EPA prototype certification test vehicles.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Motor Cars Fuel Economy		13F

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