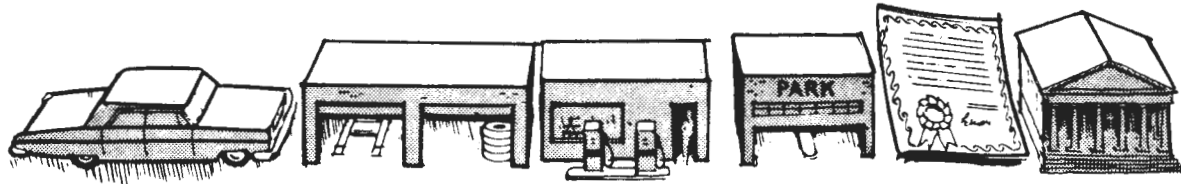


COST OF OPERATING AN AUTOMOBILE

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CENTS PER MILE



ORIGINAL VEHICLE
COST DEPRECIATED

MAINTENANCE,
ACCESSORIES,
PARTS & TIRES

GAS & OIL
(EXCLUDING
TAXES)

GARAGE,
PARKING,
& TOLLS

INSURANCE

STATE &
FEDERAL
TAXES

TOTAL
COST

STANDARD
SIZE

4.2¢

3.4¢

3.2¢

2.0¢

1.6¢

1.5¢

15.9¢

COMPACT
SIZE

2.9¢

2.7¢

2.6¢

2.0¢

1.5¢

1.2¢

12.9¢

SUBCOMPACT
SIZE

2.3¢

2.5¢

2.0¢

2.0¢

1.5¢

.9¢

11.2¢

TL
151.5
.U54
1974
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U.S. DEPARTMENT OF TRANSPORTATION
Federal Highway Administration
Office of Highway Planning
Highway Statistics Division
April 1974

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COST OF OPERATING AN AUTOMOBILE

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Introduction

The 101 million automobiles registered in 1973 traveled more than 1 trillion miles and used over 76 billion gallons of gasoline. About 11 million of these automobiles were purchased new during the year at a cost of more than \$27 billion. Many of the owners of these new cars, who bought vehicles costing \$2,500 or more, probably did not realize that they were making the second most expensive purchase a person makes during his life. In fact, most owners probably are not aware of how much their cars cost to own and operate. The purchase price is only the first in a series of costs incurred in the automobile's approximate 10-year, 100,000-mile trip from the assembly line to the junkyard. *To examine this trip and the vehicle costs, one geographic location, suburban Baltimore, Maryland, was chosen as the study site. The study data are for that location only, and are not national averages.*

As was the case in the 1972 study, three cars have been chosen to compare the costs incurred, and to show the various costs in relation to the highway-user taxes paid. Earlier editions of this report¹ considered costs for only one vehicle, a standard size "big 3" four-door sedan operated from a home in the Baltimore, Maryland, area. The current study is also based in the Baltimore, Maryland, area in order to retain comparison with data from prior reports.

The vehicles chosen for study are a standard size "big 3" four-door sedan (table 1), an American-made compact (table 2), and a subcompact (table 3). The modern American subcompact cars have not been in existence long enough so that accurate data can be obtained on anticipated repairs and maintenance costs. Therefore, assumptions had to be made concerning

¹ Studies were published in 1950, 1967, 1970, and 1972. Copies of the 1972 study are available, but supplies of the earlier editions have been exhausted.

some of these factors. All assumptions will be discussed later.

During the 10-year study period, assuming current rates, the standard-size car owner will pay \$4,032 for some 7,700 gallons of gasoline. He will pay \$2,940 to keep the vehicle maintained and in repair, \$1,618 to insure it, and \$1,960 for garaging, parking, and tolls. His State and Federal automotive tax bill, most of which goes to support the roads he drives on, will amount to \$1,509—about 9.5 percent of total costs. Many ownership and operation costs for the typical compact and subcompact cars are not comparable to those of the standard-size car because of the assumed items of optional equipment on each car and their effect on costs. However, the automotive tax portions of the costs for each car should be comparable. These taxes total \$1,158 for the compact car, and \$925 for the subcompact car—9 percent and 8.3 percent respectively of total costs.

During the 24-year period, 1950–1974, the State and Federal tax component of automobile costs has varied less than 1.5 percentage points (10.9 percent in 1950 to 9.5 percent in 1974). The taxes shown in this report for the standard-size automobile are 9.5 percent of total costs, down from the 9.7 percent shown in 1972. Many local jurisdictions tax motor vehicles and their use in a manner similar to the State registration taxes and motor-fuel taxes. Also, several States levy personal property taxes on motor vehicles. None of these taxes were levied in the study area, but any computations of the cost of owning and operating an automobile in an area where such taxes exist should include them.

The "Cost of Operating an Automobile" report has been updated and published as changes in costs and vehicle characteristics have warranted additional study. The most recent prior edition was issued in April 1972. The text, method, and coverage of the current report borrows freely from former reports.

Study Factors and Assumptions

A description of the vehicles included in the study, the repairs, the repetitive maintenance operations, replacement items, insurance, and other costs that were included in the study and the values of factors used to compute these costs are listed in the tabulation titled, "Automobile Operating Costs—Bases for Estimates." The costs and rates for suburban Baltimore, shown in this table, can be compared easily with costs and rates for other localities. Then, estimates of automobile operating costs for vehicles in those other localities can be made using this study as a guide. For example, the price of gasoline used in this study, as shown in the "Bases for Estimates" table, was 52.1 cents per gallon. If the price of gasoline in another locality were 54.1 cents per gallon, persons living there, and wishing to estimate their own automobile operating costs, could adjust the gasoline cost figure in this study to reflect the 2 cents per gallon higher price. Other costs and rates would have to be checked, and any necessary adjustments made.

The vehicles considered here are from the same manufacturers as those used in the 1972 study, but there are base price differences between the cars for each of the years.

In prior studies, the list or "sticker" price of the basic automobile plus optional equipment was considered to be the purchase price. In the current study the purchase price of the car was considered to be the "sticker" price of the vehicle including optional equipment less the average discount allowed on that car, as reported by a number of dealers. Consequently, even though the list price of the 1974 model standard-size car is several hundred dollars more than the price of the comparable vehicle used in the 1972 study, the *purchase price* shown for the 1974 model is less. The amount of discount a dealer allows depends on the size of dealership, his inventory situation, time of year, and the ability of the buyer to negotiate a good deal.

The costs shown in this report are not taken from records of specific vehicles nor are the amounts of usage, fuel consumption rates, or any other factors necessarily presented as averages. However, the vehicle and operation cost factors probably are typical for cars of these sizes in the study area. Nationwide sales records of the 1974 model standard-size car, and the compact show that 90 percent or more had power steering, over 94 percent had automatic transmissions, 90 percent had radios, and 85 percent of the standard-size cars had air conditioners. For the subcompacts the number with power steering was negligible, 27 percent had air conditioning, 57 percent had automatic transmissions, and 83 percent had radios. The factors used here were selected on the basis of available

statistics, discussions with automobile industry personnel, and assistance from service managers of major automobile dealers.

In order to estimate car operating costs, it was necessary to make a series of assumptions concerning tire and battery replacements, wheel alignments, light bulbs, fan belts, brake linings and parts, lubrications, and other repair and maintenance items. The need for repairs was estimated from data gathered during discussions of repair experience with car service personnel, and from the authors' knowledge. They include such items as starter repair, carburetor overhaul, replacement of fuel pump, radiator hoses, muffler, tail pipes, and shock absorbers, and what must seem to the owner to be a pretty long list of other repairs. Several of these repairs must be made more than once during the life of the car. No costs were included for repairs or replacements that would have been covered by warranties. The mechanical features on the vehicles in this study are similar to those in the prior study, so changes in costs are due mainly to increases in charges for parts and labor. Maintenance and repair costs reflect a 3-year increase in parts prices over those used in the 1972 study. The 1972 study was based on 1971 prices. In the current study the costs for all repairs are based on 1974 prices.

The assumed vehicle life of 100,000 miles during a 10-year period has been questioned by some persons as being too long, and others who believe it to be too short. Vehicle survival data developed on popular brand, standard-size cars show that half of those automobiles were still on the road at the end of 10 years. This finding appears to be applicable to the compact cars also, but there is still not enough evidence to establish a survival rate for subcompacts. Odometer readings were taken recently from subcompact cars ranging from 1 to 3 years old, and the indicated miles traveled are consistent with the mileage assumptions for the standard-size and compact cars.

It has been assumed that each car was bought new, without a trade-in, and that the purchaser did not have to pay full sticker price. The intent is to trace each vehicle and its costs through a 10-year life as developed from odometer records of vehicles of these kinds. Usually an automobile passes through two, three, or more owners during its life, but we have not included any change of ownership costs in our figures. A person's demand for transportation tends to be relatively stable from year to year, so it would be unlikely that he would operate his only car successively fewer miles each year. However, a 9-year old car is typically operated fewer miles during the year than a new one or a relatively new one. Therefore, it can be assumed that the older car has become the second or third car in a family, or for some other reason it is operated at a much reduced rate.

Not all cost items are listed in detail in the tables, but sufficient information is included to assist those who wish to make recomputations to fit other geographic areas, or other types of operation. The costs are computed for suburban Baltimore, Maryland. If the suburban costs had been computed for Boston, New York, or San Francisco, they probably would have been higher, and if they had been computed for Jacksonville, Montgomery, or Fort Worth, they would have been lower. Rural running costs in most parts of the United States probably would not differ greatly, but there could be noticeable differences in vehicle registration fees, and in gasoline taxes because of the variance in rates among States. The running costs (gasoline, tires, oil, repairs, and maintenance, etc.) for the vehicles in rural operation tend to be lower than for comparable cars in suburban use, because there are fewer traffic control devices, less congestion, and the opportunity for accidents with other vehicles is less frequent.

The costs that are most likely to change in the short range, and are likely to need adjustments from one geographic location to another are: gasoline price and tax, registration fee, repair labor rate, insurance premium, toll charges and parking charges. Also, the remaining value of a car differs from region to region, so the used car value guide should be consulted for the owner's area in order to adjust the amount for depreciation.

Automobile financing charges are not included in the tables of costs shown in this report. However, they can be computed easily for given automobile sales prices and interest rates. A car buyer must pay interest on money borrowed from a bank or other financial institution or forego interest he would have earned if he elects to use his savings or other investments and pay for the car outright. On a 36-month loan covering three-fourths of the purchase price, the interest charge in suburban Baltimore at a 10-percent annual rate, and its cost per mile for the 3-year period, would be \$517 or 1.3 cents per mile for the standard-size car. It would be \$356, or 0.9 cents per mile for the compact, and \$291 or 0.7 cents per mile for the subcompact. On the other hand, if the purchase were financed by a savings withdrawal rather than by borrowing, and the amount withdrawn were paid back in 36 equal monthly installments, the net interest lost (at 5½ percent) in the account would be \$286 or 0.7 cents per mile for the standard-size car, \$197 or 0.5 cents per mile for the compact, and \$161 or 0.4 cents per mile for the subcompact. There can be important cost differences in alternative methods of financing a new car purchase, and the merits of different plans should be weighed carefully before a particular one is selected.

The garaging cost is computed to be the value of any arrangements made by the car owner for off-street storage of the car at his residence. It may be an attached or detached garage, a carport, or it may be a paved parking apron or gravel surfaced space beside his house. Parking costs include metered curb parking, and costs of temporary storage in lots or parking buildings away from the owner's residence.

In some areas of the United States tolls and garaging would cost less than in the study area, but an automobile owner traveling south, or west, or north from Baltimore customarily would encounter major toll routes. Also, he would spend more for garaging and parking than residents of small towns or rural areas. To go to New York City, 185 miles to the north and return, he would pay \$8.10 in tolls, not counting the \$1.20 Baltimore Tunnel fee. This is substantially more than persons living in Atlanta, New Orleans, or St. Louis would have to pay in making similar length trips from their localities.

Oddly enough, many automobile owners do not seem to be aware of many of their automobile costs. It is only when a motorist is confronted with a substantial monetary outlay for new tires or for major mechanical repairs that he shows much concern about car expense. Much of the time he drives his car and seems to conclude that his trips are costing him very little. The average automobile is sold or traded three or more times during its life, usually through new or used car dealers. The need for repairs usually causes owners to trade-in their cars, and the dealers serve as the quality control judges of the used vehicle trade. They wholesale the ones that require too much attention, and make the repairs on the remainder prior to resale. But whether the automobile needing repairs is owned by an individual or is being repaired by a dealer for resale, the money spent eventually becomes a part of the cost of owning and operating the car. Battery and tire replacements, brake linings, radiator repairs, body work, and numerous other replacements and repairs are included in the used car reconditioning programs of many dealers. The additional work that is done under dealer warranties does not impose direct out-of-pocket expenditures on the car owner. These costs are submerged in each automobile's purchase price, and no effort has been made to separate them.

Numerous factors such as individual driving habits, climate, garage facilities, type of road used, purpose for which the car is used, and sometimes luck can affect service life and costs of operating a car. As previously stated, the standard-size car appears to have an average life of about 10 years, and the compacts appear to be surviving at about the same rate. The current American subcompacts have been on the market nearly 4 years so their survival history is beginning to develop. Odometer checks of a limited

sample of these subcompacts show an average annual mileage for the first 3 years of 13,000 miles. This is consistent with the mileage of the larger vehicles. Other vehicles that were generally of this size (the early Falcons, Valiants, Corvairs, and Ramblers, as well as many imports) appear to be on the highways in sufficient numbers to warrant the following assumptions. For ease of comparison among vehicle sizes and uses, all of the study vehicles have been assumed to have a 10-year, 100,000-mile life. It has been assumed that a normal travel pattern would be 14,500 miles in the first year, and a decreasing number of miles each year thereafter until the vehicle is driven only 5,700 miles in its 10th year. These assumptions are reasonably consistent with available travel data.

Other Applications for Study Data

A person's choice of an automobile—standard size, compact, or subcompact—is dependent on several considerations. For the motorist who needs the space provided in the standard-size car because of a large family, carpool needs, or equipment that must be carried, the economies and size advantages of the compact and subcompact must be foregone. If he finds that those needs are not compelling, the smaller cars offer several advantages. Parking in curb space is easier, some parking lots have lower rates for small cars, repair costs are not as expensive, registration fees in some States are lower, tires cost less, and saving in gasoline cost over the life of the car will be enough to pay a substantial amount toward the cost of a new car. Comparing gasoline cost alone between the standard-size car and the subcompact there can be a saving during 100,000 miles of travel of about \$1,600 by using the subcompact. This is two-thirds of the new car cost for another subcompact. If a person customarily buys a car every 3 years, the gasoline cost savings by using a subcompact rather than a standard-size car would be over \$600, or about one-fourth of the cost of a new subcompact. A comparison between the standard-size car and the compact-size car does not provide as large a difference, but it is worthwhile when you consider that compacts have most of the advantages of the large cars, and at the same time provide most of the advantages of the subcompacts.

Another question that motorists frequently ask is, "When should I trade-in my car?" There is no answer that fits everyone, because monetary consideration is only a part of the problem. Vehicle style, size, interior decor, mechanical features, availability of money, and many other things may be important to the car owner in making his decision of which vehicle to buy, and when to buy again. However, most people probably are concerned mainly with the money difference when they ask the question. The

"annual trader" drives a current model car all of the time, but depreciation for his standard-size automobile over a 10-year period costs him about \$10,460 (10 times the first year depreciation). The "two-year trader" pays about \$8,465 in depreciation (5 times the depreciation for the first 2 years). This is a savings of \$1,995 from the annual trader's costs, and he can save even more by becoming a "three-year trader." However, after the first year he faces a series of outlays for tire replacement, repairs, and incidentals that begin to offset his savings in depreciation. The obvious flaw in trying to use these tables to determine when to "trade-in" a car is that a person's annual auto usage tends to be constant from year to year, and does not follow the pattern shown for the life of a car. If he customarily drives 14,500 miles per year, it is unlikely that he would drive fewer miles the second year and still fewer the third year. Therefore, by the end of the third year he will have driven 43,500 miles ($3 \times 14,500$ miles) instead of the 39,000 miles obtained by accumulating the mileage shown for the first 3 years on table 1. By the end of the fourth year he will have traveled 58,000 miles while table 1 shows this to be the mileage on a 5-year old car. Therefore, it appears that the mileage traveled can be as important to a car's condition and remaining value as the car's chronological age. But, using total miles traveled as the only determinant of a car's condition can be misleading. Some long trips can put a lot of "easy" mileage on a car, while many short trips to the store and around the neighborhood, with a lot of stop-and-go driving, can put fewer, but "very wearing" miles on a car.

The total vehicle cost per mile is lower for the high-mileage drivers, because depreciation in the early years of a car's life is determined more by age than by miles, and because some of the annual or non-recurring charges, such as garaging and insurance, do not increase in proportion to mileage. A low-mileage driver sustains about the same depreciation, insurance, and garaging costs, but they are distributed over fewer miles and result in a higher cost per mile. Most insurance companies charge lower rates for private and recreational uses of vehicles, and higher rates for vehicles used directly for work or in relation to business. In addition, many companies apply a surcharge for high-mileage drivers in both categories. To some degree, the purpose for which a car is used, and the circumstances of its use will dictate the vehicle cost pattern. Once an owner determines his vehicle-use pattern, he may be able to relate his costs to those shown in this report and decide when it will be most advantageous to him to trade his car. The high-mileage driver may find some repairs and tire replacements moved to earlier years than those shown in this study. Of course, comfort, dependability and appear-

ance are important to most car owners, and weigh heavily in the automobile purchasing decision.

Reimbursement by an employer of the costs for an employee's use of his car for business purposes is a fairly common occurrence today. The question uppermost in the mind of each of the parties is, "How much should the reimbursement be?" If an employee uses his automobile only occasionally and incidentally for business purposes, an amount necessary to cover out-of-pocket costs, tire wear, and general wear on the vehicle should be sufficient. At today's prices 7 to 9 cents per mile should be enough. If the extent or type of use affects his insurance rate, or if it subjects the automobile to unusual loads or operating conditions, the reimbursement should be adjusted upward accordingly. Tolls and parking or storage costs incurred in the course of such use should be paid separately and in full, regardless of per-mile reimbursement. If an employee's job is dependent on his obtaining and using his car in his employer's behalf, reimbursement on the basis of the employee's overall costs per mile seems fair. If, in addition, the employee's frequency of car purchases, the type of automobile bought, or other factors of ownership or upkeep are substantially affected by the employer's requirements, the reimbursement should be sufficient to cover all outlays that exceed what the employee would normally spend for his own nonbusiness automobile transportation. For complete information concerning reimbursement for private automobile use, there are business travel advisory services that can be consulted. These are commercial advisory services that have made studies of costs for specific vehicles and groups of vehicles under various conditions of use.

Discussion of Costs

When an automobile is operated 100,000 miles there are 400,000 miles of tire wear. For the vehicles in this report it was assumed that fiberglass bias-belted tires would be used. Therefore, the automobiles would each wear out the original 5 tires and require 11 additional replacements, which would include 7 regular tires and 4 snow tires. If the automobiles are driven with reasonable care, and the wheels are kept properly alined, this number of tires should be adequate for the standard-size car. The compact and subcompact should turn 100,000 miles and have usable tread left on the tires.

If the standard-size automobile were purchased with radial tires having a 40,000 mile tread-wear guarantee, it is likely that only 5 tire replacements would be necessary. The cost of replacement fiberglass tires would be \$386 while the replacement radials would cost \$350. The saving of \$36 would be enhanced by additional savings in gasoline, since the gasoline con-

sumption rate is improved by about 5 percent when radial tires are used.

Depreciation is the greatest single cost of owning and operating a standard-size automobile, and the second highest cost for the compact and subcompact. In the great majority of cases the age of a car is more important than its mileage in determining its resale or trade-in value. Such factors as brand popularity, body style, size, and to some degree, color, are also considered in determining value. For the standard-size car, by far the greatest dollar depreciation in its value occurs in its first few years, while for the smaller cars the depreciation is more evenly distributed over their years of use. Since newer cars are driven more miles than older cars, the depreciation on a per-mile basis is held down the first few years. For example, consider depreciation for the standard-size car in this report. If the car were bought new for \$4,251 and sold or traded at the end of the first year, when it had been driven 14,500 miles, depreciation would be \$1,046. This depreciation cost divided by the 14,500 miles driven the first year amounts to 7.2 cents per mile. By the end of the second year, when the car has been driven 27,500 miles, depreciation would total \$1,693, which divided by the 27,500 miles would compute to 6.2 cents per mile. Year by year as the car gets older depreciation decreases, but the outlay for maintenance and repairs rises. As time passes it becomes increasingly difficult and expensive to keep a car in satisfactory operating condition.

Modern highways with limited access, such as the Interstate System, make possible long trips at sustained speeds. To do this safely requires a well maintained car. Although added safety features are being incorporated in the highways and the new vehicles are being equipped with lap and shoulder belts, impact resistant bumpers, side guard beams in the doors, etc., there also must be a policy of continuous, high-standard maintenance of the vehicles to help make highway travel safe. A charge of \$12 an hour or more for shop labor is not unusual, and this is a major factor in the 2.9 cents per mile cost for repairs and maintenance for the standard-size automobile. The encouragement of the public to buy compact and subcompact cars is based on substantially better gasoline mileage and the relative simplicity of the vehicles. For those persons who might like to do some of their own minor repairs and maintenance, the smaller cars afford that opportunity. Replacement of spark plugs, windshield wiper blades, fan belts, radiator hoses, etc., are simple and there are indeed savings to be realized. When trained mechanics do these jobs, vehicle owners must pay professional wages. Although there are increasing numbers of "at home" mechanics, repair garage experience shows that the public generally is not ready to assume this responsibility.

The gasoline expense is the highest cost for the compact and subcompact, and second only to depreciation for the standard-size car. Until gasoline shortages began to occur in 1973, the price of gasoline had changed very little for 20 or more years. However, the gasoline price has risen more than 14 cents per gallon in the study area since early 1972, with practically all of the increase occurring in the few months of late 1973 and early 1974. There was a 2-cent State gasoline tax increase in mid-1972, so the remaining 12 cents of the increase is all price, and is a 32 percent rise.

Automobiles are continuously exposed to the possibility of damage, whether on the highway or parked. The large numbers of vehicles on the roads and streets, and the relatively uncontrolled traffic in shopping center parking lots make cars highly susceptible to accident involvement. Controlled crash tests on cars produced through 1973 showed that they were not able to escape unmarked from any sort of collision. Automotive designs had been developed with little or no regard for safety, and some even contributed unnecessarily to automotive damage with the attendant higher repair costs and higher insurance. One insurance company executive commented that until the volume of accidents is cut, or until cars are built so they are cheaper to repair, there is not much that can be done about rates. The 1974 models were manufactured with energy absorbing bumpers that were designed to protect against impacts up to 5 miles per hour without damage to the vehicles. As a result, several major insurance company spokesmen have stated that up to a 20-percent discount in collision insurance premiums can be expected on these vehicles.

The insurance coverage includes \$50,000 combined public liability, full comprehensive fire and theft, uninsured motorist, and personal injury protection with first-party medical and wage benefits of \$2,500. The latter is no fault insurance and is now compulsory in Maryland. Also included is \$100 deductible collision insurance, which is dropped after the first 5 years. If an owner is "at fault" in an accident during the first 5 years, the first \$100 damage to his automobile is out-of-pocket cost to him, but from the sixth through the tenth years he must pay the entire cost for repairing his automobile. Accidents could, therefore, increase the cost of owning and operating a vehicle above the amounts shown in the accompanying tables.

The quality of roads—grades, surfaces, and curves—has been improved substantially in recent years. The Interstate Highway System is approaching completion, with 84 percent open to traffic, another 7 percent under construction, and 7 percent with engineering or right-of-way work in progress. These roads are more than living up to the expectations for them. Highway authorities point out that the newer highways of the

Interstate System design provide opportunity for sustained safe speeds and comfort for the motorists. Accident records show that the Interstate System accident rate is about half that of the remainder of the primary highways in the United States. Savings in accident costs from the Interstate System alone are counted in billions of dollars.

The development of local shopping centers, suburban residential areas, and employment centers, as well as the dispersal of recreational opportunities has made transportation very important in the American life pattern. Where public transportation is not well developed, the automobile must be used. Sales records of new vehicles show increased purchases of compact and subcompact cars in preference to the larger models. In many cases this is a reaction to the gasoline shortages that have plagued parts of the United States during the last few months. It is interesting to note, however, that a high percentage of the smaller than standard-size cars being purchased have air conditioners, automatic transmissions, power steering and other optional equipment. There appears to be no shortage of money to buy cars, and people still want to travel. The lack of adequate roads can cause car running costs to rise. When traffic is not free flowing, there is greater fuel consumption, higher fuel cost, more pollutants are released into the air, there is greater opportunity for accidents, and there is much higher per-mile wear on engine parts, brakes, tires, etc. Also, poorly maintained roads may develop pot holes, broken slabs, obliterated traffic lines, damaged or missing signs, etc. Any or all of these could contribute to damage to a motor vehicle and the safety of those riding in it. So the problem is to maintain an adequate highway system that will save money on operating and maintenance costs. However, putting highway costs into proper perspective is difficult at times.

Highway-user taxes are the major source of revenues for highway building and maintenance. In paying them the motorist is, in a very real sense, paying for the roads he is using. For some motorists it will come as a surprise that for the standard-size car only 9.5 cents of their vehicle owning and operating dollar goes to pay for the roads. For the smaller cars it is even less.

Financing highway construction and maintenance has become increasingly difficult over the years, because automotive taxes are generally applied as unit charges. The gasoline tax at a certain number of cents per gallon, and the registration fees at a flat rate per vehicle, are not sensitive to price changes. As the cost of labor and products used for highway construction and maintenance rise, the gasoline tax and registration fees do not yield comparably higher revenues. Therefore, except for the possibility of

added revenues caused by greater use of gasoline and more vehicles being registered, highway construction and maintenance must be accomplished with tax money that is continuously losing value. Relief occurs only when States raise their tax rates to try to offset inflated costs. Sensitivity to changes in costs would be possible if these taxes were applied on the value of the product, like sales taxes.

During the first year of operation the three study cars would have daily owning and operating costs of \$6.65 (standard size), \$4.30 (compact), and \$3.52 (subcompact). In the second year daily costs would drop by \$1.70 for the standard-size car to \$4.95; by 38 cents to \$3.92 for the compact; and by 33 cents to \$3.19 for the subcompact. The daily costs continue to drop, and the differences in these costs between car sizes narrow as the years pass. By the time each of

the cars has accumulated nearly 60,000 miles, the daily costs are relatively close. They remain close during the next 25,000 miles of travel, so the economic advantage of having a small car during that period would not be great. Other factors that might influence the choice of a vehicle during this time might be the availability of gasoline, miles per gallon obtained, parking convenience, maneuverability in traffic, the ability to transport large numbers of persons or bulky materials, and environmental considerations.

The bases for estimating the operating costs for each of the study automobiles follow, in modified tabular form, in order to emphasize the factors that differ and those that are the same for the three vehicles. The annual costs and per-mile costs shown in tables 1, 2, and 3 are self-explanatory.

AUTOMOBILE OPERATING COSTS - BASES FOR ESTIMATES

ITEM	STANDARD SIZE AUTOMOBILE	COMPACT SIZE AUTOMOBILE	SUBCOMPACT SIZE AUTOMOBILE
Automobile Description	1974 model 4-door sedan Equipped with: V-8 engine, automatic transmission, power steering and brakes, air conditioning, tinted glass, radio, clock, white-wall tires, wheel covers, and body protective molding. Purchase price - \$4,251.	1974 model 2-door sedan Equipped with: 6 cylinder engine, automatic transmission, power steering, radio, vinyl top, wheel covers, and body protective molding. Purchase price - \$2,910.	1974 model 2-door sedan Equipped with: Standard equipment plus radio, wheel covers, and body protective molding. Purchase price - \$2,410.
Repairs and Maintenance	Includes routine maintenance such as lubrications, repacking wheel bearings, flushing cooling system, and aiming headlamps; replacement of minor parts such as spark plugs, fan belts, radiator hoses, distributor cap, fuel filter, and pollution control equipment; minor repairs such as brake jobs, water pump, carburetor overhaul, and universal joints; and major repairs such as a complete "valve job." Costs were calculated using 1974 parts prices and a \$12 per hour labor rate.		
Replacement Tires	Purchase of 7 new regular tires and 4 new snow tires during the lives of the cars was assumed.		
Accessories	Purchase of floor mats the first year, seat covers the sixth year, and miscellaneous items totaling \$2.20 per year was assumed.		
Gasoline	Consumption rate of 12.92 miles per gallon and a gasoline price of 52.1 cents per gallon including taxes were used.	Consumption rate of 15.97 miles per gallon and a gasoline price of 52.1 cents per gallon including taxes were used.	Consumption rate of 21.43 miles per gallon and a gasoline price of 52.1 cents per gallon including taxes were used.
Oil	Consumption was associated with gasoline consumption at a rate of 1 gallon of oil for every 159 gallons of gasoline. A price of \$1.00 per quart was used.	Consumption was associated with gasoline consumption at a rate of 1 gallon of oil for every 150 gallons of gasoline. A price of \$1.00 per quart was used.	Consumption was associated with gasoline consumption at a rate of 1 gallon of oil for every 135 gallons of gasoline. A price of \$1.00 per quart was used.
Insurance	Coverage includes \$50,000 combined public liability (\$15,000/\$30,000 bodily injury, and \$5,000 property damage), \$2,500 personal injury protection, uninsured motorist coverage, and full comprehensive coverage for the 10-year period. Deductible collision insurance was assumed for the first 5 years (\$100 deductible).		
Garaging, Parking, and Tolls	Includes monthly charges of \$11.00 for garage rental or indirect cost of the owner's garaging facility; plus parking fee average of \$57.00 per year, and toll average of \$7.00 per year, both of which were assigned in proportion to annual travel.		
Taxes	Includes Federal excise taxes on tires (10 cents per pound), lubricating oil (6 cents per gallon), and gasoline (4 cents per gallon); plus the Maryland tax on gasoline (9 cents per gallon), titling tax (4 percent of retail price), and registration fee (\$20.00 for 3,700 pounds or less shipping weight, or \$30.00 for vehicles over 3,700 pounds).		

TABLE 1 - ESTIMATED COST OF OPERATING A STANDARD SIZE 1974 MODEL AUTOMOBILE 1/

Office of Highway Planning
Highway Statistics Division

(Total costs in dollars, costs per mile in cents)

ITEM	FIRST YEAR (14,500 miles)		SECOND YEAR (13,000 miles)		THIRD YEAR (11,500 miles)		FOURTH YEAR (10,000 miles)		FIFTH YEAR (9,900 miles)	
	TOTAL COST	COST PER MILE	TOTAL COST	COST PER MILE	TOTAL COST	COST PER MILE	TOTAL COST	COST PER MILE	TOTAL COST	COST PER MILE
Costs Excluding Taxes:										
Depreciation	1,046.00	7.21	647.00	4.98	550.00	4.78	404.00	4.04	294.00	2.97
Repairs and Maintenance	122.96	.85	158.01	1.21	333.42	2.90	442.36	4.42	326.76	3.30
Replacement Tires	18.63	.13	16.71	.13	28.98	.25	42.09	.42	42.80	.43
Accessories	3.53	.02	3.39	.03	3.25	.03	3.11	.03	3.10	.03
Gasoline	438.70	3.03	393.35	3.02	347.99	3.03	302.63	3.03	299.51	3.03
Oil	20.00	.14	19.00	.15	20.00	.17	19.00	.19	21.00	.21
Insurance	205.00	1.41	192.00	1.48	192.00	1.67	177.00	1.77	177.00	1.79
Garaging, Parking, Tolls, etc.	224.80	1.55	215.20	1.65	205.60	1.79	196.00	1.96	195.36	1.97
Total	2,079.62	14.34	1,644.66	12.65	1,681.24	14.62	1,586.19	15.86	1,359.53	13.73
Taxes and Fees:										
State:										
Gasoline	100.98	.70	90.54	.70	80.10	.70	69.66	.70	68.94	.70
Registration	30.00	.21	30.00	.23	30.00	.26	30.00	.30	30.00	.30
Titling	170.04	1.17	-	-	-	-	-	-	-	-
Subtotal	301.02	2.08	120.54	.93	110.10	.96	99.66	1.00	98.94	1.00
Federal:										
Gasoline	44.88	.31	40.24	.31	35.60	.31	30.96	.31	30.64	.31
Oil 2/	.30	-	.29	-	.30	-	.28	-	.32	-
Tires	1.45	.01	1.30	.01	2.26	.02	3.27	.03	3.34	.04
Subtotal	46.63	.32	41.83	.32	38.16	.33	34.51	.34	34.30	.35
Total Taxes	347.65	2.40	162.37	1.25	148.26	1.29	134.17	1.34	133.24	1.35
Total of All Costs	2,427.27	16.74	1,807.03	13.90	1,829.50	15.91	1,720.36	17.20	1,492.77	15.08

ITEM	SIXTH YEAR (9,900 miles)		SEVENTH YEAR (9,500 miles)		EIGHTH YEAR (8,500 miles)		NINTH YEAR (7,500 miles)		TENTH YEAR (5,700 miles)		TOTALS AND AVERAGES FOR TEN YEARS (100,000 miles)	
	TOTAL COST	COST PER MILE	TOTAL COST	COST PER MILE	TOTAL COST	COST PER MILE	TOTAL COST	COST PER MILE	TOTAL COST	COST PER MILE	TOTAL COST	COST PER MILE
Costs Excluding Taxes:												
Depreciation	264.00	2.67	252.00	2.65	250.00	2.94	248.00	3.31	246.00	4.31	4,201.00	4.20
Repairs and Maintenance	379.81	3.84	570.45	6.00	224.05	2.63	346.92	4.62	35.20	.62	2,939.94	2.94
Replacement Tires	53.39	.54	53.71	.57	51.61	.61	43.47	.58	34.60	.61	385.99	.38
Accessories	9.43	.09	9.14	.10	8.42	.10	7.67	.10	6.36	.11	57.40	.06
Gasoline	299.51	3.03	287.39	3.03	257.28	3.03	227.17	3.03	172.43	3.02	3,025.96	3.03
Oil	22.00	.22	23.00	.24	19.00	.22	20.00	.27	12.00	.21	195.00	.19
Insurance	135.00	1.36	135.00	1.42	135.00	1.59	135.00	1.80	135.00	2.37	1,618.00	1.62
Garaging, Parking, Tolls, etc.	195.36	1.97	192.80	2.03	186.40	2.19	180.00	2.40	168.48	2.96	1,960.00	1.96
Total	1,358.50	13.72	1,523.49	16.04	1,131.76	13.31	1,208.23	16.11	810.07	14.21	14,383.29	14.38
Taxes and Fees:												
State:												
Gasoline	68.94	.70	66.15	.70	59.22	.70	52.29	.70	39.69	.70	696.51	.70
Registration	30.00	.30	30.00	.31	30.00	.35	30.00	.40	30.00	.52	300.00	.30
Titling	-	-	-	-	-	-	-	-	-	-	170.04	.17
Subtotal	98.94	1.00	96.15	1.01	89.22	1.05	82.29	1.10	69.69	1.22	1,166.55	1.17
Federal:												
Gasoline	30.64	.31	29.40	.31	26.32	.31	23.24	.31	17.64	.31	309.56	.31
Oil 2/	.33	-	.34	-	.29	-	.30	-	.18	-	2.93	-
Tires	4.15	.05	4.17	.05	4.01	.05	3.38	.05	2.70	.05	30.03	.03
Subtotal	35.12	.36	33.91	.36	30.62	.36	26.92	.36	20.52	.36	342.52	.34
Total Taxes	134.06	1.36	130.06	1.37	119.84	1.41	109.21	1.46	90.21	1.58	1,509.07	1.51
Total of All Costs	1,492.56	15.08	1,653.55	17.41	1,251.60	14.72	1,317.44	17.57	900.28	15.79	15,892.36	15.89

1/ This estimate covers the total costs of a fully equipped, medium priced, standard size, 4-door sedan, purchased for \$4,251, operated 100,000 miles over a 10-year period, then scrapped for \$50. Baltimore area prices, considered to be in the middle range, were used.

2/ Where costs per mile are less than 1/20 cent, a dash (-) appears in the column.

TABLE 2 - ESTIMATED COST OF OPERATING A COMPACT SIZE 1974 MODEL AUTOMOBILE 1/

Office of Highway Planning
Highway Statistics Division

(Total costs in dollars, costs per mile in cents)

ITEM	FIRST YEAR (14,500 miles)		SECOND YEAR (13,000 miles)		THIRD YEAR (11,500 miles)		FOURTH YEAR (10,000 miles)		FIFTH YEAR (9,900 miles)			
	TOTAL COST	COST PER MILE	TOTAL COST	COST PER MILE	TOTAL COST	COST PER MILE	TOTAL COST	COST PER MILE	TOTAL COST	COST PER MILE		
Costs Excluding Taxes:												
Depreciation	400.00	2.76	372.00	2.86	329.00	2.86	300.00	3.00	286.00	2.89		
Repairs and Maintenance	108.48	.75	186.38	1.43	237.19	2.06	310.03	3.10	319.78	3.23		
Replacement Tires	15.42	.10	13.83	.11	20.88	.18	34.83	.35	38.65	.39		
Accessories	3.53	.02	3.39	.03	3.25	.03	3.11	.03	3.10	.03		
Gasoline	355.03	2.45	318.27	2.45	281.52	2.45	244.77	2.45	242.42	2.45		
Oil	17.00	.12	16.00	.12	17.00	.15	16.00	.16	17.00	.17		
Insurance	190.00	1.31	180.00	1.38	180.00	1.56	166.00	1.66	166.00	1.68		
Garaging, Parking, Tolls, etc.	224.80	1.55	215.20	1.66	205.60	1.79	196.00	1.96	195.36	1.97		
Total	1,314.26	9.06	1,305.07	10.04	1,274.44	11.08	1,270.74	12.71	1,268.31	12.81		
Taxes and Fees:												
State:												
Gasoline	81.72	.57	73.26	.57	64.80	.56	56.34	.56	55.80	.57		
Registration	20.00	.14	20.00	.15	20.00	.18	20.00	.20	20.00	.20		
Titling	116.40	.80	-	-	-	-	-	-	-	-		
Subtotal	218.12	1.51	93.26	.72	84.80	.74	76.34	.76	75.80	.77		
Federal:												
Gasoline	36.32	.25	32.56	.25	28.80	.25	25.04	.25	24.80	.25		
Oil 2/	.26	-	.24	-	.25	-	.24	-	.26	-		
Tires	1.18	.01	1.06	.01	1.60	.02	2.68	.03	2.98	.03		
Subtotal	37.76	.26	33.86	.26	30.65	.27	27.96	.28	28.04	.28		
Total Taxes	255.88	1.77	127.12	.98	115.45	1.01	104.30	1.04	103.84	1.05		
Total of All Costs	1,570.14	10.83	1,432.19	11.02	1,389.89	12.09	1,375.04	13.75	1,372.15	13.86		
ITEM	SIXTH YEAR (9,900 miles)		SEVENTH YEAR (9,500 miles)		EIGHTH YEAR (8,500 miles)		NINTH YEAR (7,500 miles)		TENTH YEAR (5,700 miles)		TOTALS AND AVERAGES FOR TEN YEARS (100,000 miles)	
	TOTAL COST	COST PER MILE	TOTAL COST	COST PER MILE	TOTAL COST	COST PER MILE	TOTAL COST	COST PER MILE	TOTAL COST	COST PER MILE	TOTAL COST	COST PER MILE
Costs Excluding Taxes:												
Depreciation	278.00	2.81	269.00	2.83	228.00	2.68	212.00	2.83	186.00	3.26	2,860.00	2.86
Repairs and Maintenance	325.78	3.29	499.65	5.26	234.80	2.76	102.83	1.37	40.61	.71	2,365.53	2.36
Replacement Tires	41.01	.42	49.43	.52	45.09	.53	41.39	.55	30.24	.53	330.77	.33
Accessories	9.43	.10	9.14	.09	8.42	.10	7.67	.10	6.36	.11	57.40	.06
Gasoline	242.42	2.45	232.65	2.45	208.01	2.45	183.77	2.45	139.59	2.45	2,448.45	2.45
Oil	19.00	.19	20.00	.21	16.00	.19	17.00	.23	12.00	.21	167.00	.17
Insurance	130.00	1.31	130.00	1.37	130.00	1.53	130.00	1.73	130.00	2.28	1,532.00	1.53
Garaging, Parking, Tolls, etc.	195.36	1.97	192.80	2.03	186.40	2.19	180.00	2.40	168.48	2.96	1,960.00	1.96
Total	1,241.00	12.54	1,402.67	14.76	1,056.72	12.43	874.66	11.66	713.28	12.51	11,721.15	11.72
Taxes and Fees:												
State:												
Gasoline	55.80	.56	53.55	.57	47.88	.56	42.30	.56	32.13	.56	563.58	.56
Registration	20.00	.20	20.00	.21	20.00	.24	20.00	.27	20.00	.35	200.00	.20
Titling	-	-	-	-	-	-	-	-	-	-	116.40	.12
Subtotal	75.80	.76	73.55	.78	67.88	.80	62.30	.83	52.13	.91	879.98	.88
Federal:												
Gasoline	24.80	.25	23.80	.25	21.28	.25	18.80	.26	14.28	.26	250.48	.25
Oil 2/	.29	-	.30	-	.24	-	.25	-	.18	-	2.51	-
Tires	3.14	.04	3.80	.04	3.46	.04	3.18	.04	2.33	.04	25.41	.03
Subtotal	28.23	.29	27.90	.29	24.98	.29	22.23	.30	16.79	.30	278.40	.28
Total Taxes	104.03	1.05	101.45	1.07	92.86	1.09	84.53	1.13	68.92	1.21	1,158.38	1.16
Total of All Costs	1,345.03	13.59	1,504.12	15.83	1,149.58	13.52	959.19	12.79	782.20	13.72	12,879.53	12.88
<p>1/ This estimate covers the total costs of a medium priced, compact size, 2-door sedan, purchased for \$2,910, operated 100,000 miles over a 10-year period, then scrapped for \$50. Baltimore area prices, considered to be in the middle range, were used.</p> <p>2/ Where costs per mile are less than 1/20 cent, a dash (-) appears in the column.</p>												

TABLE 3 - ESTIMATED COST OF OPERATING A SUBCOMPACT SIZE 1974 MODEL AUTOMOBILE 1/

Office of Highway Planning
Highway Statistics Division

(Total costs in dollars, costs per mile in cents)

ITEM	FIRST YEAR (14,500 miles)		SECOND YEAR (13,000 miles)		THIRD YEAR (11,500 miles)		FOURTH YEAR (10,000 miles)		FIFTH YEAR (9,900 miles)			
	TOTAL COST	COST PER YEAR	TOTAL COST	COST PER YEAR	TOTAL COST	COST PER YEAR	TOTAL COST	COST PER YEAR	TOTAL COST	COST PER YEAR		
Costs Excluding Taxes:												
Depreciation	283.00	1.95	265.00	2.04	255.00	2.22	252.00	2.52	243.00	2.46		
Repairs and Maintenance	97.69	.67	150.55	1.16	131.60	1.14	351.63	3.52	297.37	3.00		
Replacement Tires	13.64	.09	12.23	.09	15.71	.14	30.81	.31	33.67	.34		
Accessories	3.53	.03	3.39	.03	3.25	.03	3.11	.03	3.10	.03		
Gasoline	264.32	1.82	236.95	1.82	209.97	1.82	182.60	1.82	180.64	1.83		
Oil	14.00	.10	13.00	.10	14.00	.12	13.00	.13	14.00	.14		
Insurance	177.00	1.22	169.00	1.30	169.00	1.47	158.00	1.58	158.00	1.60		
Garaging, Parking, Tolls, etc.	224.80	1.55	215.20	1.65	205.60	1.79	196.00	1.96	195.36	1.97		
Total	1,077.98	7.43	1,065.32	8.19	1,004.13	8.73	1,187.15	11.87	1,125.14	11.37		
Taxes and Fees:												
State:												
Gasoline	60.84	.42	54.54	.42	48.33	.42	42.03	.42	41.58	.42		
Registration	20.00	.14	20.00	.15	20.00	.17	20.00	.20	20.00	.20		
Titling	96.40	.66	-	-	-	-	-	-	-	-		
Subtotal	177.24	1.22	74.54	.57	68.33	.59	62.03	.62	61.58	.62		
Federal:												
Gasoline	27.04	.19	24.24	.19	21.48	.19	18.68	.19	18.48	.19		
Oil 2/	.21	-	.20	-	.21	-	.19	-	.21	-		
Tires	.90	.01	.80	.01	1.03	.01	2.02	.02	2.21	.02		
Subtotal	28.15	.20	25.24	.20	22.72	.20	20.89	.21	20.90	.21		
Total Taxes	205.39	1.42	99.78	.77	91.05	.79	82.92	.83	82.48	.83		
Total of All Costs	1,283.37	8.85	1,165.10	8.96	1,095.18	9.52	1,270.07	12.70	1,207.62	12.20		
ITEM	SIXTH YEAR (9,900 miles)		SEVENTH YEAR (9,500 miles)		EIGHTH YEAR (8,500 miles)		NINTH YEAR (7,500 miles)		TENTH YEAR (5,700 miles)		TOTALS AND AVERAGES FOR TEN YEARS (100,000 miles)	
	TOTAL COST	COST PER MILE	TOTAL COST	COST PER MILE	TOTAL COST	COST PER MILE	TOTAL COST	COST PER MILE	TOTAL COST	COST PER MILE	TOTAL COST	COST PER MILE
Costs Excluding Taxes:												
Depreciation	236.00	2.38	229.00	2.41	217.00	2.55	203.00	2.71	177.00	3.10	2,360.00	2.36
Repairs and Maintenance	327.85	3.31	324.15	3.41	303.84	3.58	96.37	1.29	38.56	.68	2,119.61	2.12
Replacement Tires	35.67	.36	45.86	.48	44.41	.52	40.93	.55	29.79	.52	302.72	.30
Accessories	9.43	.10	9.14	.10	8.42	.10	7.67	.10	6.36	.11	57.40	.06
Gasoline	180.64	1.83	173.21	1.82	155.23	1.83	136.84	1.82	104.01	1.82	1,824.41	1.82
Oil	16.00	.16	17.00	.18	13.00	.15	14.00	.19	10.00	.18	138.00	.14
Insurance	127.00	1.28	127.00	1.34	127.00	1.49	127.00	1.69	127.00	2.23	1,466.00	1.47
Garaging, Parking, Tolls, etc.	195.36	1.97	192.80	2.03	186.40	2.19	180.00	2.40	166.48	2.96	1,960.00	1.96
Total	1,127.95	11.39	1,118.16	11.77	1,055.30	12.41	805.81	10.75	661.20	11.60	10,228.14	10.23
Taxes and Fees:												
State:												
Gasoline	41.58	.42	39.87	.42	35.73	.42	31.50	.42	23.94	.42	419.94	.42
Registration	20.00	.20	20.00	.21	20.00	.24	20.00	.27	20.00	.35	200.00	.20
Titling	-	-	-	-	-	-	-	-	-	-	96.40	.09
Subtotal	61.58	.62	59.87	.63	55.73	.66	51.50	.69	43.94	.77	716.34	.71
Federal:												
Gasoline	18.48	.19	17.72	.19	15.88	.19	14.00	.19	10.64	.19	186.64	.19
Oil 2/	.24	-	.25	-	.20	-	.21	-	.15	-	2.07	-
Tires	2.35	.03	3.02	.03	2.92	.03	2.69	.03	1.97	.03	19.91	.02
Subtotal	21.07	.22	20.99	.22	19.00	.22	16.90	.22	12.76	.22	208.62	.21
Total Taxes	82.65	.84	80.86	.85	74.73	.88	68.40	.91	56.70	.99	924.96	.92
Total of All Costs	1,210.60	12.23	1,199.02	12.62	1,130.03	13.29	874.21	11.66	717.90	12.59	11,153.10	11.15
<p>1/ This estimate covers the total costs of a low priced, subcompact size, 2-door sedan, purchased for \$2,410, operated 100,000 miles over a 10-year period, then scrapped for \$50.</p> <p>2/ Where costs per mile were computed to be less than 1/20 cent, a dash (-) appears in the column.</p>												

