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Projection of Light-Truck Population to Year 2025

Prepared by
Lindsey-Kaufman Company
Under Purchase Order No. ORNL-19-X-14285V

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PROJECTION OF LIGHT-TRUCK POPULATION TO
YEAR 2025

Prepared by
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53 Hamilton Place
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Purchase Order No. ORNL-19-X-14285V

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CONTENTS

	<u>Page</u>
FOREWORD	v
ABSTRACT	vii
1. INTRODUCTION	1
1.1 Definitions	1
1.2 Significance of the Subject	1
2. SUMMARY/METHODOLOGY	3
3. PROJECTION I: THINGS GET BETTER	8
3.1 Population Assumptions	8
3.2 Economic Assumptions	9
3.3 Motor Vehicle Transportation Assumptions	9
3.4 Fuel Situation Restrictions	11
3.5 Lifestyle Assumptions	12
3.6 Projection of Light Truck Ownership (Model I)	13
3.7 Changing Patterns of Personal Use of Light Trucks	14
3.8 Changing Patterns of Nonpersonal Uses	14
4. PROJECTION II: BIRTH RATES LOW BUT GNP UP	21
4.1 Population Assumptions	21
4.2 Economic Assumptions	21
4.3 Motor Vehicle Transportation Assumptions	22
4.4 Fuel Situation Restrictions	25
4.5 Lifestyle Assumptions	25
4.6 Projection of Light Truck Ownership (Model II)	26
4.7 Changing Patterns of Personal Use of Light Trucks	27
4.8 Changing Patterns of Nonpersonal Use	27
5. PROJECTION III: ERA OF MODERATE GROWTH	30
5.1 Population Assumptions	30
5.2 Economic Assumptions	30
5.3 Motor Vehicle Transportation Assumptions	31
5.4 Fuel Situation Restrictions	32
5.5 Lifestyle Assumptions	32
5.6 Projection of Light Truck Ownership (Model III)	33

	<u>Page</u>
5.7 Changing Patterns of Personal Use	35
5.8 Changing Patterns of Nonpersonal Use	35
6. PROJECTION IV: THINGS GET WORSE	38
6.1 Population Assumptions	38
6.2 Economic Assumptions	38
6.3 Motor Vehicle Transportation Assumptions	40
6.4 Fuel Situation Restrictions	41
6.5 Lifestyle Assumptions	42
6.6 Projection of Light Truck Ownership (Model IV)	43
6.7 Changing Patterns of Personal Use	43
6.8 Changing Patterns of Nonpersonal Use	45
7. INTERVIEW PROGRAM	47
7.1 Respondents	47
7.2 Summary of Interviews Among Manufacturers	49
7.3 Interview with Dr. Colin J. Loxley	52
BIBLIOGRAPHY	55

FOREWORD

This report is one of a series of subcontract reports. Each report represents a specific topic directed at research related to a basic concept in transportation energy consumption. Projection of Light Truck Population to Year 2025 is the result of work done by Lindsey-Kaufman Company* under ORNL Purchase Order No. 19X14285V. The work was done in support of Oak Ridge National Laboratory's transportation energy program, which is an area of study for the Data Management and Analysis Group of the Energy Division and is under the direction of Dr. Andrew S. Loeb1.

This document was prepared under subcontract to Oak Ridge National Laboratory. The assumptions, views, and conclusions expressed in the document are those of the authors and are not to be interpreted as those of ORNL, Union Carbide Corporation, Nuclear Division, or of the Department of Energy.

The report provides forecasts of the light truck inventory which vary with the underlying economic scenarios. In all but one case (corresponding to virtual economic stagnation), the forecasted inventory increases dramatically. By 1980, Lindsey-Kaufman forecasts 28×10^6 to 30×10^6 light trucks. These figures represent average annual growth rates of 9.5% and 11.4%, respectively, for the period 1976-1980. This can be contrasted with a historical 13-year average of 6.2% (1963-1976), a high of 9.4% (1972-1973), and a 2-year average of about 5.1% (1974-1976). (One must always remember that post-1972 inventories are estimates not based on surveys. However, the 1963-1972 average growth rate is also 6.1%.) By the year 2000, the number of light trucks forecasted is about 36×10^6 to 40×10^6 ; and by the year 2025, the range is forecasted to be 41×10^6 to 60×10^6 .

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ABSTRACT

The recent growth in the number of light trucks is a matter of considerable interest in that it may have far-reaching implications for gasoline consumption. This paper, by an expert observer of the automobile/truck market, is a forecast of the number of light trucks in the years to 2025. The forecast is based on economic scenarios developed by SRI International. Except for the case of the most dismal economic forecast, the number of light trucks is predicted to increase monotonically and to show the greatest rate of increase between 1973 and 1980.

1. INTRODUCTION

1.1 Definitions

Light trucks are trucks of up to 10,000 lb gross vehicle weight (GVW). These include class 1 trucks (less than 6,000 lb GVW) and class 2 trucks (6,001 to 10,000 lb GVW).

The most numerous type of light truck is the pickup. According to the 1972 "Truck Inventory and Use Survey" conducted by the Census Bureau, pickups accounted for 84.6% of the total light truck population. However, the fastest growing type of light truck is the panel truck, commonly referred to as a "van." Other types of light trucks include multistop delivery vans, service station wreckers, and four-wheel drive "Jeep-type" vehicles.

Traditionally, light trucks have been used for a variety of delivery and service tasks in wholesale and retail trade, agriculture, construction, and manufacturing. Since the end of World War II, the space, versatility, and ruggedness of light trucks have made them increasingly popular for personal transportation, serving in place of sedans, station wagons, and car/trailer combinations.

1.2 Significance of the Subject

Light trucks are the fastest growing segment of the total vehicle population. The rate of growth has amazed even executives of the motor vehicle industry. In a July 11, 1977, article in *Business Week* ("A Truck Boom That Won't Stop"), it was noted that Chevrolet Division of General Motors now sells one light truck for every 1.8 automobiles. In 1960 the ratio was one truck for every 6.3 cars.

The Lindsey-Kaufman Company study entitled *The Aftermarket for Vans/Light Trucks*, published by Frost & Sullivan, Inc., September 1976, noted that the total light truck population increased from 14.6 million in 1972 to 19.3 million in 1975 — an average annual increase of 9.7%. For the period 1975 to 1982, we estimated a growth rate of 7.2% per year. In contrast, the passenger car population is increasing at about 2.7% per year.

From the standpoint of transportation energy conservation, the growth of the light truck population can represent both a problem and an opportunity.

Light trucks, nearly all powered by gasoline engines, average about 10 miles per gallon of fuel. To the extent that these vehicles are used in place of lighter weight cars for one-occupant personal transportation, the trend is probably negative. However, there are growing applications for light trucks and in particular, vans, for multipassenger transportation. Used as a "minibus" to transport students and commuting workers, and to transfer travelers between terminals and hotels, the light truck can represent an efficient use of fuel.

Because the federal government has to evaluate the possibility of other modes of transportation over periods of thirty to fifty years, it is appropriate to obtain a long-term perspective on the light truck trend as well.

2. SUMMARY/METHODOLOGY

Figure 1 shows five alternate projections of the light truck population in the United States between 1975 and 2025. Growth is measured in terms of millions of light truck registrations.

The purpose of Projections I and IV is to establish broad boundaries to truck population estimates with Projection I representing the "best case" and Projection IV representing the "worst case." These limits are relatively narrow in the 1975 to 1985 period but diverge considerably by the turn of the century and are very widely divergent by 2025.

Projection I assumes relatively rapid growth in numbers of people in the United States, based on the Census Bureau's Series I projection and rapid growth in per capita measures of wealth based upon SRI's *Success* scenarios for 1975 to 2025. Projection I assumes that the United States will make good progress in finding solutions to the energy problem. With faster growth in numbers of people and in per capita gross national product (GNP) and personal consumption expenditures (PCE), and with no severe limitations in terms of the cost and availability of energy, this projection visualizes that the light truck population will reach 40 million by 1995 and 59.1 million by 2025.

Projection IV assumes relatively slow growth in numbers of people based on the Census Bureau's Series III projection and a stagnating economy based on SRI's *Distress* and *Foul Weather* scenarios. These scenarios contemplate an "Energy Bust," that is, a complete lack of success in finding solutions to the energy problem, compounded in the *Foul Weather* scenario by the return of a "Little Ice Age", a long cycle of harsh winters and droughts.

With declining birth rates, declining per capita wealth, and limited availability of fuel, Projection IV assumes an average annual increase in the light truck population of only 0.75% in the 1975 to 2025 period, reaching a level of only 28.9 million trucks by 1995 and actually declining to 27.7 million by 2025. However, in this, the most doleful scenario, we nevertheless expect that the growth of the light truck population will be at least twice as great as the growth in human population, and three

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Fig. 1. Projections of Light Truck Population Growth 1972-2025.

times as great as the growth of the passenger car population. The main reason: the energy economy of light trucks used as minibuses.

It is interesting to consider that a society which is trying desperately to conserve scarce energy could take measures to restrict the growth in numbers of passenger cars and in usage of trucks for private recreational purposes, and at the same time, promote the use of vans as multipassenger carriers.

In our judgment the growth of the light truck population between 1975 and 2025 will occur within the narrower limits established by Projections II and III.

Projection III assumes moderate growth in numbers of people, based on the Census Bureau's Series II projection, which falls between the extremes of its Series I and III projections, and moderate growth in per capita measures of wealth based on SRI's *Transformation* scenario. Projection III also assumes that the United States will make some progress in solving the energy problem but that the cost and availability of fuel are still major questions. After rising rapidly in the early 1980s, light truck population growth subsides in the latter 1980s, reaching only 33.8 million by 1990, 35.1 million by 1995, and 41.3 million by 2025. Nevertheless, for reasons similar to those discussed above with reference to Projection IV, the growth of the light truck population is considerably faster than the growth in numbers of people and growth in numbers of cars.

Projection II, a variant of Projection III, assumes that between 1975 and 2025 growth in numbers of people will be quite moderate. Levels of 240 million people in 1995 and 280 million people in 2025 are derived from SRI's *Success* scenario. These population growth estimates are quite conservative compared to the Census Bureau's Series II projections. However, Projection II assumes that relatively slow population growth is offset by relatively rapid gains in per capita wealth. These assumptions are based on SRI's *Success* scenario for 1995 and its *Transformation* scenario for 2025.

Projection IIA represents our best judgment on the light truck growth pattern between 1990 (when Projections II and III diverge) and 2025. This projection visualizes a light truck population of nearly 34 million in 1990, rising to about 36 million in 1995, 37.5 million in 2000, and 45

million in 2025. Projection IIA is based on the judgment that the growth pattern between 1990 and 2025 will more closely resemble Projection III than Projection II. Projection III assumes that the ratio of light trucks to people will level off in the mid 1980s and that from 1985 on there will be a constant ratio of 0.14 trucks per head of population.

Projection II assumes that the ratio will continue to increase with real increases in GNP. It is assumed that the truck/people ratio will rise to 0.16 in 1995 and to 0.18 in 2025. In our judgment it is more realistic to expect that there will be some slowing down in the ratio of light trucks to people in the final years of this century and the first quarter of the 21st century.

Table 1 summarizes the assumptions on economic growth and human population growth which underlie four projections of light truck registration to the years 1995 and 2025.

Population estimates for Projection II and estimates of per capita GNP, PCE, and personal disposable income were all derived from various scenarios of Stanford Research Institute presented in *Transportation in America's Future*. The total economic values were obtained by multiplying SRI's per capita estimates and population estimates obtained, with the one exception cited, from recent Bureau of the Census projections.

Because applications for light trucks overlap passenger car applications, we felt it advisable to examine long-term projections of the car population and the changing ratios of cars to people, as well as the ratio of light trucks to people.

No attempt was made in this brief, preliminary study to construct a highly detailed econometric model.

The procedure used to develop Projections I, III, and IV included the following:

1. a comparison of actual growth in numbers of people and car registrations for the years 1940 to 1972;
2. calculation of car/people ratios for selected years in the 1940 to 1972 period;
3. examination of Bureau of the Census data on total light truck registrations and estimated number used for personal transportation in 1972;

Table 1. Macroeconomic Models

Indicators	Year 1975	Year 1995				Year 2025			
		I	II	III	IV	I	II	III	IV
Population, millions	211.9	266.6	240	251.1	240.9	369.3	280	294.7	252.3
GNP:									
Per capita, 1975 dollars ^a	7,100	12,500	12,500	8,900	6,500	29,000	16,000	16,000	10,000
Total, billions of 1975 dollars	1,504.5	3,332.5	3,000	2,234.8	1,565.9	10,709	4,480	4,715.2	2,523
PDI:									
Per capita, 1975 dollars ^a	5,063	8,800	8,800	6,475	4,600	20,600	11,675	11,675	5,550
Total, billions of 1975 dollars	1,072.9	2,346.1	2,112	1,625.9	1,108.1	9,947.7	3,269	3,440.6	1,400.3
PCE:									
Per capita, 1975 dollars ^a	4,558	7,950	7,950	5,830	4,120	18,500	10,500	10,500	5,660
Total, billions of 1975 dollars	965.8	2,119.5	1,908	1,463.9	992.5	6,832.1	2,940	3,094.4	1,261.5
Light truck registrations, millions	19.3	40.0	38.4	35.1	28.9	59.1	50.4	41.3	27.7
Ratio per millions of dollars of GNP	0.0128	0.0120	0.0128	0.0157	0.0185	0.0055	0.0113	0.0088	0.0109
Personal light truck registrations, millions	11.5	24.0	23.0	20.1	16.9	40.6	34.0	23.6	15.1
Ratio per millions of dollars of PCE	0.0119	0.0113	0.0120	0.0137	0.0170	0.0059	0.0116	0.0076	0.0120

^aPer capita projections derived from *Transportation in America's Future: Potentials for Next Half Century*, by Stanford Research Institute.

3. PROJECTION I: THINGS GET BETTER

3.1 Population Assumptions

This projection, based on the Census Bureau's Series I projection, assumes that birthrates will rise from the levels of the 1960s and 1970s and that the U.S. population will grow at the relatively rapid rate of 1.1% per year in the 1975 to 2025 period. If the Series I projection proves accurate, there will be 280 million people in the United States in 2000; this is 22 million more than projected by Series II and 35 million more than the Series III projection.

During the last decade we have experienced a marked slowdown in marriages and births because of radical changes in the values and lifestyles of young people in the childbearing years. For this reason, the Series I projection may appear to be the least plausible of the three Bureau of the Census projections. It is certainly the least plausible in terms of *present* attitudes. However, we do have to consider that people in the 1980s and 1990s are likely to be no more bound by the attitudes of the 1970s than were young people in the 1950s bound by the attitudes of the 1930s. The Series I projection assumes that marriage and family life will become more fashionable than they were in the 1960s and early 1970s. In the 1950s it was fashionable for young people to marry as early as possible after completing their education and to rear three or more children. It is not expected that we will see a repeat of the 1950s style population growth. However, the Series I projection does contemplate an increase, from current levels, in the number of women who bear two children.

The Bureau of the Census does not provide detailed scenarios underlying its assumptions on population growth. One of the assumptions that appears implicit in the Series I projection is that the economy will be relatively prosperous in this period. We assume, for the purpose of this projection, that an increasing number of women will find it desirable, or expedient, to combine child rearing and careers.

3.2 Economic Assumptions

Projection I assumes that the economy will grow (in 1975 dollars) from 1.5 trillion in 1975 to 3.3 trillion in 1995, and to 9.9 trillion in 2025. This is an optimistic projection, even more optimistic than SRI's *Success* projections because it assumes that the high per capita GNP and income envisioned by SRI will be applied to a population base considerably larger than SRI believes likely.

The rationale for rapid growth in real per capita GNP and income in the *Success* scenario for the 1990 to 2000 period is that the United States will successfully meet the challenge of the energy problem. The *Success* scenario assumes that the United States meets growing demand for energy by "aggressive development of coal resources (including synthetic liquid oil and gas derivatives), shale oil, off-continental shelf (OCS) oil and gas, and nuclear energy, accompanied by continued large imports of foreign petroleum and intensive energy conservation efforts."

Implicit in this scenario is the idea that the United States will actually become stronger as a result of its efforts to achieve energy independence — economically stronger, that is, in the sense of creating new industries and employment opportunities. The *Success* scenario assumes that the United States will have no difficulty in raising the investment capital required for vast new enterprises. Also assumed are

- (1) consistent economic growth, with essentially full employment;
- (2) an average annual growth rate in productivity per man-hour of 2.3%;
- and (3) more equitable distribution of wealth through sweeping tax reforms.

3.3 Motor Vehicle Transportation Assumptions

The author of this report differs with the authors of *Transportation in America's Future* on the assumptions about demand for automobiles by the year 2025 under ideal economic conditions. Stanford Research Institute's *Success* scenario envisions that "demand" for automobiles by 2025 will be three times as great as 1975 levels. Since there were 106.5 million auto registrations in the United States in 1975, this suggests that auto registrations will exceed 300 million by 2025. However, this is not what SRI has in mind. Its *Success* scenario

contemplates an automobile ownership ratio of "0.62 car per person vs 0.51 now." The *Success* scenario envisions a U.S. population of 280 million people by 2025. Applying the 0.62 factor produces an estimate of 173.6 million auto registrations.

The SRI *Success* scenario assumes that the automobile remains dominant in personal transportation and that demand for automobiles is high "as a result of increased industrial and economic activity and higher personal disposable incomes for personal travel." This scenario assumes that there are no government imposed restrictions on automobile ownership and use because vehicle manufacturers are successful in developing vehicles that have an "auto fleet fuel economy" of 32 mpg vs 13.5 mpg in 1975. It is assumed that this efficiency is achieved by the development of new types of engines: Stirling engines, turbines, electric, hybrid electric/internal combustion, etc.

We agree that the automobile is likely to be the dominant form of personal transportation in a successful future and that the motor vehicles of the future are likely to be far more efficient than those of 1975. However, we believe that in any future — good, bad, or indifferent — there is likely to be a slowing down in the car/population ratio. We envision a larger car population in 2025 than is implied by the *Success* scenario (198.6 million auto registrations in Projection I), but this is the result of a much larger human population base: 369 million people in our projection vs only 280 million people in the SRI projection.

For 1975, we have calculated an automobile ownership ratio of 0.50, one car registration for every two people in the United States. This ratio has risen tremendously over the last three decades, and it could continue to increase over the next several years. The Federal Highway Administration forecast of 136.6 million car registrations by 1990 implies an ownership ratio of 0.54 car per person.

However, at some point in the future the ratio is likely to decline. Even in a future in which the private automobile remains the dominant form of personal transportation, an assumption which appears quite sound to us, the automobile will feel the impact of other modes of transportation, including

1. increased use of buses everywhere;
2. rail-based rapid transit systems in some densely population areas;
3. increased use of light trucks as multipassenger vehicles for commuters;
4. increased use of light trucks as all-purpose vehicles, displacing some of the functions now performed by larger sedans and station wagons; and
5. the possibility that some functions of the automobile -- local travel and very short distance commuting -- will be displaced by newer types of vehicles, including (1) electric vehicles similar to today's motorized golf carts; (2) motorized tricycles with space for two occupants, or one occupant and baggage, in a streamlined, all-weather pod (a type of vehicle actually used for a time in Europe after World War II); and (3) highly economical motorized bicycles (mopeds).

Therefore, as we view the future in the projection, the factors that are likely to result in a slowing down in the use of automobiles are likely to result in increased use of light trucks. It is possible to envision a family of the 1990s which has *no* family car, as we know it today, but has instead:

1. a small, battery-powered "buggy" used for travel between home and shopping centers;
2. a two-passenger motorized tricycle used as a commuting vehicle by one wage earner in the family; and
3. an all purpose vehicle -- similar to today's camper body-pickup truck -- used as the family's means of travel between its metro area high-rise apartment and its weekend country home.

Judgments about motor vehicle transportation over the next few decades will be complicated by definitional problems: car-like trucks, car-like motorcycles, etc.

3.4 Fuel Situation Restrictions

SRI's *Success* scenario visualizes relative abundance of motor fuel by the year 2025 with retail gasoline prices of \$1.05 per gallon (in 1975 dollars) vs about \$0.60 per gallon in 1975. The rationale for this estimate is the assumption that the United States is successful in

developing new sources of petroleum off shore as well as synthetic petroleum from coal and shale oil.

Our Projection I also assumes that the United States is successful in developing *renewable* sources of liquid energy such as methane gas from recycled wastes, alcohol from distilled vegetation, and hydrogen from seawater processing plants. We also assume that battery-powered vehicles will find increasing use in such applications as route deliveries (typical post office and milk delivery uses) and motorized shopping vehicle uses.

Projection I assumes that although the United States is able to produce and import all the energy it needs for a growing economy, the conservation ethic remains important. Therefore, although citizens are not restricted from personal travel by government action, they are encouraged to use vehicles in an efficient manner. Public policy encourages the use of all-purpose vehicles for commuter pools and discourages their use for one-occupant local driving.

3.5 Lifestyle Assumptions

SRI's *Success* scenario envisions a future in which there is a substantial shift in population from the older northeastern metropolitan areas to newer population centers in the south and west. Significantly, from a transportation standpoint, this scenario visualizes a more widely dispersed population, one which is very much dependent, therefore, on personal transportation. The shift from the northeast to the southwest is accompanied by significant changes in housing patterns. The *Success* scenario envisions that the bulk of the population is housed in high- or mid-rise apartments located in suburban rings of metropolitan areas. The *Success* scenario anticipates that economic growth and improvement in real living standards result in increased emphasis on leisure and recreation. By 2025 the work week is only four days long, so many households have the time as well as the income to enjoy the ownership of weekend country retreats.

Projection I assumes that the working population of the future will attach even more importance to weekend recreation and vacations than the 1970's generation because the pressures of modern life will be

intense — even greater than at present. We envision a prosperous economy but not necessarily one which grows steadily and evenly. Instead, Projection I visualizes a continuation of some trends which followed World War II: rapid expansion of some new industries accompanied by periodic contractions resulting from product obsolescence and cyclical downturns in the economy. Economically, many two-wage-earner households will be able to bear the strain of periodic unemployment of one or another of the partners. Psychologically, there will be great stress caused by the uncertainties of employment in industries subject to rapid obsolescence. As a result, many couples will find relief by cultivating recreational interests, including outdoor sports, camping, and travel.

3.6 Projection of Light Truck Ownership (Model I)

The Lindsey-Kaufman Company study entitled *Light Truck Aftermarket* noted that the light truck population had increased at an average annual rate of 9.7% in the 1972 to 1975 period. We anticipated that growth would inevitably decelerate, and we estimated an average annual increase of 7.2% for the 1975 to 1982 period. It is reasonable to assume that in the 1975 to 2025 period the growth rate will continue to decelerate.

The Model I projection indicates that growth in light truck registrations for the 1975 to 2025 period will be at the average annual rate of 2.3%. This growth rate, more than twice as fast as the growth rate in numbers of people, is sufficient to result in a nearly three-fold increase in the light truck population between 1975 and 2025. The light truck population is destined to grow much faster than the car population. In 1975 there was one light truck for 5.5 cars; Model I anticipates that there will be one light truck for 3.3 cars by 2025.

This projection assumes that personal uses of light trucks will continue to increase more rapidly than nonpersonal uses. In the 1972 to 1975 period, personal transportation uses of light trucks grew at the average annual rate of 13.8%, based on our earlier study. For the 1975 to 1982 period, we estimated a growth rate of 8.9% per year. Our estimate for the 1975 to 2025 period is that the growth in personal uses will decelerate to 2.6% per year.

Traditional applications for light trucks in agriculture, commerce, and industry grew at an estimated 3.4% per year in 1972 to 1975. Because of new uses for light trucks as "people movers" and "mobile work rooms", our earlier study estimated a growth rate in nonpersonal uses of 4.6% per year for the 1972 to 1982 period. The Model I projection anticipates that growth in nonpersonal uses will decelerate to 1.8% per year in the 1975 to 2025 period.

3.7 Changing Patterns of Personal Use of Light Trucks

Columns (7) and (8) in Table 2 show that there were about 7.8 million light trucks used for personal transportation in 1972, or 0.04 light truck per head of population. By 1975 personal use of light trucks rose to an estimated 11.5 million units, or 0.05 truck per person.

For the future, Model I contemplates that the ratio of light truck ownership per person in the United States will rise to 0.09 in the 1980 to 1995 period, to 0.10 in the 1995 to 2010 period, and to 0.11 by 2025.

This projection is based on the assumptions of increased economic activity and growth in real disposable income, a trend to shorter work weeks, more emphasis on leisure travel, and the availability of fuel at prices consumers are willing to pay. It is also assumed that the light truck will displace some of the functions that have been performed by passenger cars because automobiles continue to shrink in carrying capacity and power.

3.8 Changing Patterns of Nonpersonal Uses

The *Truck Inventory and Use Survey* conducted in 1972 by the Bureau of the Census provided estimates on the number of light trucks in personal transportation and in nine categories of nonpersonal use. These official government estimates are shown in the column (2) of Table 3. In *Light Truck Aftermarket* we estimated that nonpersonal uses grew from 6.8 million trucks in 1972 to 7.8 million in 1975. Column (3) of Table 3, prepared for this report, provides our estimates on the breakdown of nonpersonal applications in 1975. Columns (4) and (5) present our projections to the years 1995 and 2025. The rationale for the Model I projections follows below.

Table 2. Things Get Better

Year	U.S. population (thousands)	Automobile registrations (millions)	Automobile/ population ratio	Light truck registrations (millions)	Truck/population ratio	Personal use (millions)	Personal use/ population ratio
Actual							
1940	132,594	27.5	0.21				
1950	149,767	40.4	0.27				
1960	177,830	61.7	0.35				
1965	191,889	7.52	0.39				
1970	202,677	89.3	0.44				
1972	207,057	96.9	0.47	14.6	0.07	7.8	0.04
Estimated ^a							
1975	211,901	106.5	0.50	19.3	0.09	11.5	0.05
1980	221,495	117.5	0.53	29.0	0.13	19.9	0.09
1985	238,878	127.4	0.53	33.4	0.14	21.4	0.09
1990	251,583	136.6	0.54	37.5	0.14	22.6	0.09
1995	266,598	141.3	0.53	40.0	0.15	24.0	0.09
2000	280,137	148.5	0.53	42.0	0.15	28.0	0.10
2010	311,507	162.0	0.52	49.8	0.16	31.2	0.10
2025	369,253	198.6	0.52	59.1	0.16	40.6	0.11
Average annual increase, 1975 to 2025							
	1.1%	1.3%		2.3%		2.6%	

^aSeries I population projection of the Bureau of the Census.

Table 3. Projections of Nonpersonal Light Trucks,
1972 to 2025 (Model I)

Major use	Number per year (thousands)				Average annual increase, 1975 to 2025
	1972	1975	1995	2025	
Agriculture	2,920	3,100	4,000	4,800	0.8%
Services	1,109	1,400	4,300	5,200	2.7
Construction	994	1,200	2,250	2,350	1.4
Wholesale and retail trade	896	1,100	2,800	3,200	2.2
Utilities	365	400	1,000	1,250	2.3
Manufacturing	190	200	760	850	2.9
For hire	88	80	160	200	1.9
Forestry and lumber	73	100	200	300	2.2
Mining	29	40	80	150	2.7
Other uses	175	200	450	600	2.3
Total	6,839	7,800	16,000	18,900	1.8%

Sources: U.S. Bureau of the Census, *Truck Inventory and Use Survey, 1972*. Projections for 1975 to 2025 by Lindsey-Kaufman Company.

Agriculture. In 1972, farm uses accounted for 20% of the total light truck population. This has been the largest application for light trucks aside from personal uses. Agriculture is destined to be a declining application for light trucks in relative terms. By 1982 we expect that farm uses of light trucks will account for only 10.5% of the light truck population. The reason: a long-term trend toward fewer but larger farms. The number of light trucks in farm use will continue to increase in real terms because successful farmers tend to be multi-truck owners. Therefore, a persistent decline in the number of farms is offset to some extent by an increased ratio of trucks per farm.

In the 1960 to 1974 period the number of farms in the United States declined from 3,693,000 to 2,830,000. This represents an average annual decrease of 2.3%. In the 1971 to 1974 period the decline slowed down to 0.7%. For the 1974 to 1982 period, we estimate that the number of farms will decrease at the rate of 1.0% per year.

In 1972 there were 4,258,000 trucks of all sizes on American farms, an average of 1.48 per farm. Of these, 2,920,000 were light trucks, an average of 1.02 per farm. By 1982 we expect that there will be 2,621,000 farms using an average of 1.85 trucks per farm, or 4.8 million trucks of all sizes. Approximately 69% of these trucks will be light trucks. Therefore, farm use of light trucks will amount to about 3.3 million units, vs 2.9 million units in 1972 — a growth rate of 1.1% per year for the 1972 to 1982 period.

For 1975 to 2025, Model I contemplates that agricultural uses of light trucks will increase at the average annual rate of 0.8%. We anticipate that agriculture will remain the slowest growing of all nonpersonal applications.

Judgments about farm applications can be affected by future definitions of "farm" and the trend toward a shorter work week. It is conceivable, for example, that a growing percentage of the urban population will take to the idea of operating a working farm on a three day per week basis. Distinctions between country retreats and family farm may become blurred. Our estimates exclude part-time farms. We categorize weekend farms as recreation, and vehicles used for traveling to weekend farms as personal transportation, not agriculture. Nevertheless,

we have to note that this will be a growing application for light trucks during the next two or three decades. Ownership of a small subsistence farm provides a good rationale for use of one or more all-purpose vehicles. During a time when the conservation ethic is important and citizens are subject to criticism for using "gas guzzling" trucks for personal transportation, it is reasonable to assume that numerous truck owners will claim that their trucks are really *farm* vehicles, not merely substitutes for station wagons.

Services. Service applications for light trucks include use by hospitals as mobile emergency units, and "people movers" used by hotels, motels, limousine services, and car rental agencies. We view this as one of the fastest growing nonpersonal applications for light trucks, particularly for vans designed to operate as small buses and substitutes for taxi cabs.

The rationale for this judgment is based upon these factors:

1. The government's OBERS projection and other long-term economic projections indicate that services will be the fastest growing sector of the economy.
2. A trend toward decentralization of major business firms means that the need for transportation and transportation-related services (airlines, hotels, car rental agencies) will grow more rapidly than the economy as a whole.
3. As we have seen in recent years, vans are well suited to serve as multipassenger feeder vehicles, shuttling people between hotels and airlines and airlines and car rental stations.
4. In addition to "feeder" applications, we anticipate that vans will find growing application as commercial minibuses, providing shuttle service between neighborhoods and shopping centers and scheduled service between neighborhoods and office complexes.

Construction. This has been the third largest application for light trucks. An increase in population growth rates and a continuing shift of population to new centers in the south and west means that there will be strong demand for construction and construction-related equipment in some parts of the United States at certain periods in the coming half century. However, we anticipate that the long-term average growth in

construction applications for light trucks will be less than every nonpersonal application other than agriculture. Model I contemplates a 1 to 4% increase in construction uses of light trucks vs 1.8% for all nonpersonal uses.

Wholesale and retail trade. Model I contemplates above-average growth for these applications. We see new and growing uses for vans as mobile work rooms. Good Humor Division of Thomas J. Lipton Company has plans to replace its familiar open front "jingle wagons" with little ice cream stores on wheels. One reason for this is that drivers who remain inside the vans, passing merchandise and change through windows, are less vulnerable to robbery. Sears Roebuck makes extensive — and growing — use of custom-fitted vans as mobile appliance service units. The design flexibility of vans permits them to be used in a wide variety of direct-to-consumer retailing and service applications as well as traditional applications by wholesalers in providing deliveries to retail establishments.

Utilities. This area of use includes service applications of telephone companies, electric, and gas utilities. These are traditionally high-growth businesses. Historically, the electric utility industry doubles in size every ten years. Model I projects that demand for light trucks by utilities will grow at the rate of 2.2% per year vs 1.8% for all nonpersonal uses.

Manufacturing. Model I contemplates that this application will grow very rapidly on the relatively small 1975 base. The manufacturing sector of the economy used only 190,000 light trucks in 1972. Expectations in this projection of a more than four-fold increase are based on new uses in manufacturing. During the last three years we have seen the beginnings of a trend among very large corporations (3M Corporation, Hoffman-LaRoche, etc.) to provide vans at low cost to groups of commuting employees. This is viewed as good public relations — a contribution toward energy conservation — good employee relations, and good management. Encouraging employees to commute by van saves valuable parking space, sometimes facilitating expansion of plants and office buildings. Van pooling offers so many advantages to corporations and employees that we anticipate a significant increase in manufacturer-sponsored programs. This projection does not consider the possibility of government stimulus for such programs

in terms of favorable tax treatment. If tax concessions are offered, the trend to employer-sponsored van pooling programs might be even greater than shown in Table 3.

Forestry and lumber mining. These are relatively small applications for light trucks which appear likely to increase rapidly on their small 1972 bases.

4. PROJECTION II: BIRTH RATES LOW BUT GNP UP

4.1 Population Assumptions

In this projection we consider the possibility suggested by SRI's *Success* and *Transformation* scenarios, that the United States is successful, or reasonably successful, in meeting the economic and technological challenges of the next half century but that population growth is slower than envisioned by the Bureau of the Census in its middle-of-the-road Series II projection and much slower than the maximum Series I projection.

Projection II is based on the assumptions of the *Success* scenario that population rises to 240 million people by 1995 (about the same as the Census Bureau's minimum Series III projection) and to 280 million people by 2025.

4.2 Economic Assumptions

Projection II assumptions for 1995 are identical with those of SRI's *Success* scenario because they are based on this scenario's assumptions on both population and per capita measures of GNP, disposable income, and consumption expenditures. The *Success* scenario contemplates a \$3.0 trillion economy in 1995 with personal consumption expenditures slightly in excess of \$1.9 trillion.

For the year 2025 we have applied SRI's more conservative *Transformation* estimates on per capita GNP, income, and expenditures to a population of 280 million. SRI's *Transformation* scenario visualizes a population of only 250 million people in 2025, about the same as the Census Bureau's minimum Series III projection for 2025. The Projection II assumption of \$4.48 trillion GNP for the year 2025 is reasonably close to the *Transformation* scenario estimate for \$4.0 trillion.

The assumptions underlying SRI's *Success* scenario have been described in Sect. 3.2. The *Transformation* scenario visualizes a future in which the United States achieves moderate success in coping with the problems of living within limited resources. This is accomplished by achieving a society, after 1995, with split values, "70% expousing the traditional ideals of material achievement, power, and plenty, and 30% attempting to

live in a way outwardly simple and inwardly rich. The result is two coexisting and complementary societies: a centralized, efficient achievement sector using high technology, and a decentralized voluntary simplicity sector using intermediate technology, frugal in its consumption habits, fiercely conservationist, and much concerned with personal development." The SRI team that developed the *Transformation* scenario produced separate population and economic projections for the dominant "achievement sector" and the smaller but significant "voluntary simplicity sector."

There is some precedent in U.S. history for the notion of a voluntary simplicity sector. At various times during the past three hundred years communes have been established on a religious or idealistic basis. Some faded in a generation or less, others like the Amish, and Amana communities, exist to this day. A broad definition of "voluntary simplicity" might include the flourishing Mormon church. At no time in American history did a voluntary simplicity sector amount to 30% of the population (we assume that early religiously motivated settlers led involuntarily simple lives) but, on the other hand, this country has not seriously considered the problem of living with finite resources until comparatively recent times. It is interesting to speculate that, in a condition of limited success in finding solutions to energy and raw materials problems, a partial solution may be found in a rising percentage of people who voluntarily opt to consume less.

However, for our purposes it is not absolutely necessary to consider the emergence of a voluntary simplicity sector. The *Transformation* scenario is useful to us in presenting a picture of the future under conditions of partial economic success.

4.3 Motor Vehicle Transportation Assumptions

The *Transformation* scenario pictures the world in 2025 as having a GNP of \$4.0 trillion vs \$1.5 trillion in 1975, and as having personal consumption expenditures increase at 2.0% per year to reach \$2.6 trillion vs \$0.97 trillion in 1975, but automobile ownership is no greater than in 1975. The SRI team assumes, for the purpose of this scenario, that

the car/population factor declines from 0.51 in 1975 to 0.40 by 2025. Applying this factor to the *Transformation* scenario estimate of 250 million people in 2025 results in an estimated car population of 100 million. In 1975 automobile registrations reached 106.5 million. Thus, this SRI scenario contemplates an absolute decline in car ownership over the next half century. It is possible to imagine such a circumstance in a highly controlled, economically frail, energy-short future (the sort described by SRI's *Disciplined Society* scenario) but is hard to visualize in a relatively free and relatively prosperous society. The *Transformation* scenario indicates a growth in number of buses from 50,000 in 1975 to 150,000 in 2025. It is conceivable that 100,000 additional buses could satisfy the demands of a 38 million-people increase in the population between 1975 and 2025 (250 million people by 2025 according to *Transformation*).

However, it is difficult to imagine a free, largely achievement-oriented society, as depicted by *Transformation*, in which there is no growth in automobile usage over a fifty-year period.

Our assumptions on automobile ownership ratios differ from those of the *Transformation* as well as the *Success* scenarios. Table 4 shows that we expect the car/people ratio to increase to 0.53 by 1995 before declining to 0.52 in 2025. This results in an estimated car population of 145.6 million by 2025. Projection II suggests that the growth rate in numbers of cars and the growth rate in numbers of people will be the same: 0.6% per year in the 1975 to 2025 period.

The *Transformation* scenario visualizes that "microcars" and "all-purpose vehicles" (today's light trucks) will dominate the personal transportation scene. One reason for the expected increase in all-purpose vehicles is their popularity among "voluntary simplicity" people who shuttle between part-time employment in high-technology industry and communal life in rural areas.

We assume, simply, that the long-term shift to smaller cars is accompanied by a countertrend toward all-purpose vehicles among a fraction of the population which needs and can afford more carrying capacity and power. Projection II shows the light truck population rising from 19.3 million in 1975 to 38.4 million in 1995 and to 50.4 million in 2025.

Table 4. Model II: Moderately Slow Population Growth, Good Economic Growth

Year	U.S. population (-thousands)	Automobile registrations (millions)	Automobile/ population ratio	Light truck registrations (millions)	Truck/population ratio	Personal use (millions)	Personal use/ population ratio
Actual							
1940	132,594	27.5	0.21				
1950	149,767	40.4	0.27				
1960	177,830	61.7	0.35				
1965	191,889	75.2	0.39				
1970	202,677	89.3	0.44				
1972	207,053	96.9	0.47	14.6	0.07	7.8	0.04
Estimated ^a							
1975	211,931	106.5	0.50	19.3	0.09	11.5	0.05
1995	240,000	127.2	0.53	38.4	0.16	23.0	0.09
2025	280,000	145.6	0.52	50.4	0.18	30.8	0.11
Average annual increase, 1975 to 2025	0.6%	0.6%		1.9%		2.0%	

^a1995 and 2025 projections of population derived from scenarios developed by Stanford Research Institute.

4.4 Fuel Situation Restrictions

Projection II assumes that the United States will achieve a moderate degree of success in developing more efficient engines for motor vehicles, in finding new sources of motor fuel from gasification of coal, and in finding renewable sources of fuel such as methane and alcohol. Prices, in real terms, rise because of increased costs of production, but the supply is adequate for those willing to pay the price. The *Transformation* scenario suggests that the price of gasoline will rise to \$1.50 per gallon in 2025 (in 1975 dollars).

The *Transformation* scenario implies some restrictions on the use of automobiles; this is intended to shunt people from private transportation to mass transit. Cars are not allowed to park in most central business districts, nor are they allowed to operate on transit routes. "Automobiles decline in importance for personal mobility and are often shared. People walk more and use bicycles more for local travel."

The Projection II scenario differs from the *Transformation* scenario in these respects:

1. Although cheap motor fuel is a thing of the past, we assume that supplies are generally adequate to support a growing motor vehicle population.
2. Although people make greater use of mass transit and shared transportation so that there is a decline in personal vehicles, ownership of personal vehicles continues to have important psychological and sociological value to the majority of Americans in the car-driving years of 15 to 74.
3. Because of these attitudes, the motor vehicle population continues to grow at a modest rate, only slightly affected by the development of mass transit alternatives and restrictions on the use of vehicles in densely populated areas.

4.5 Lifestyle Assumptions

All of the scenarios in *Transportation in America's Future* picture a significant shift in population from the northeast to the south and west. It is possible to visualize a world of the future in which an

energy-conscious society creates new population centers designed around mass transit facilities: rail-based transit, buses, trolley-buses, and minibuses. Nevertheless, for the psychological and sociological reasons noted in Sect. 4.4, we expect that private vehicle ownership will remain important. We see the four-day work week becoming an important factor. People in densely populated areas *can* be encouraged to commute in multi-passenger vehicles. However, on weekends many people want the freedom of travelling in their personal vehicles.

A shorter work week can mean not only more leisure time but greater personal disposable income. Even today we see school teachers and civil servants who "moonlight" for a period of years in order to afford a second home or third vehicle. With a general movement toward a work week of 25 to 30 hr it is possible to envision a large increase in the number of people who want and can afford second homes. Weekend travel between urban or suburban apartments and country cottages can be important in sustaining demand for private vehicles, in particular, small trucks which are useful in hauling provisions to a cabin or cottage remote from shopping centers.

Projection II assumes, as does Projection I, that the world of the future will be characterized by economic and psychological stresses as great or greater than those of the 1970s. Under such conditions, people attach great importance to making periodic "getaways" from urban centers.

4.6 Projection of Light Truck Ownership (Model II)

This projection assumes modest growth in numbers of people and automobiles and a somewhat slower growth rate in the light truck population than is contemplated in the Model I projections. The Model II projection sees the light truck population growing from 19.3 million in 1975 to twice that number in 1995, and to more than 50 million in 2025. The average annual increase for 1975 to 2025 is 1.9% — more than three times the rate of growth in people and cars.

The rationale for this growth rate is based on two main factors:

1. continued growth in personal transportation applications stimulated by shorter work weeks, and
2. growing nonpersonal applications for light trucks or minibuses and commuter pool vehicles.

4.7 Changing Patterns of Personal Use of Light Trucks

Projection II assumes a continued deceleration in the growth rate of light trucks used for personal transportation. The growth rate for 1975 to 2025 is only 2.0% per year vs 13.8% for 1972 to 1975, and 8.9% for the 1975 to 1982 period. Nevertheless, use of light trucks for personal transportation is viewed as increasing much more rapidly than the growth rate in automobiles. Projection II visualizes that light trucks will be increasingly used as substitutes for passenger cars, or at least, for some of the longer distance travel for which cars are now used.

This projection envisions a future in which the public is encouraged to make more rational use of motor vehicles. Shortages of parking space and restrictions on parking discourage drivers from using light trucks for routine trips to shopping plazas and for one-occupant commuting. On the other hand, drivers are encouraged to use multipassenger vans as commuter pool vehicles. We envision no restrictions, other than costs of equipment and fuel, on the use of light trucks for weekend travel. As demand for second homes in the country increases, a growing number of people are drawn to rural and forest areas away from major highways. This stimulates demand for rugged, four-wheel-drive vehicles similar to today's jeeps.

4.8 Changing Patterns of Nonpersonal Use

Projection II envisions a near doubling in the number of light trucks used for nonpersonal purposes between 1975 and 1995 (Table 5). For the 1995 to 2025 period we anticipate considerable slowing down in the growth rate. The average annual increase for the 1975 to 2025 period is 1.5%.

Most of our assumptions on the various categories of nonpersonal use are the same as those for Projection I and are listed below.

Agriculture in terms of real, working farms — will be a slow growth application for light trucks. However, city people who take up abandoned farms as weekend retreats may wish to describe their use as "farming."

Table 5. Projections of Nonpersonal Light Trucks,
1972 to 2025 (Model II)

Major use	Number per year (thousands)				Average annual increase, 1975 to 2025
	1972	1975	1995	2025	
Agriculture	2,920	3,100	3,900	4,150	0.6%
Services	1,109	1,400	4,200	4,400	2.3
Construction	994	1,200	2,200	2,300	1.3
Wholesale and retail trade	896	1,100	2,700	2,800	1.9
Utilities	365	400	950	1,100	2.0
Manufacturing	190	200	650	700	2.5
For hire	88	80	150	160	1.4
Forestry and lumber	73	100	200	250	1.8
Mining	29	40	50	120	2.3
Other uses	<u>175</u>	<u>200</u>	<u>370</u>	<u>420</u>	<u>1.5</u>
Total	6,839	7,800	15,400	16,400	1.5%

Sources: U.S. Bureau of the Census, *Truck Inventory and Use Survey, 1972*. Projections for 1975 to 2025 by Lindsey-Kaufman Company.

Services will be the most significant area of growth because of the continued expansion of service businesses, in particular, transportation-related services. We see good, if not especially steady, growth in demand for vans as people movers by airlines, hotels, motels, and car rental agencies. Growth will not be steady because business travel is a very cyclical activity. Nevertheless, growth expectations long term are good because the decentralization of business increase demand for long distance transportation.

Manufacturing applications for vans as employee commuter pool vehicles will increase rapidly.

5. PROJECTION III: ERA OF MODERATE GROWTH

5.1 Population Assumptions

This projection is based on the Census Bureau's middle-of-the-road Series II projection. It assumes, basically, that the pattern of decelerating growth that began in the 1960s will continue through the middle of the 21st century.

During the 1940s and 1950s the United States grew at an accelerating rate. The early 1940s were characterized by population increases of 1.0% to 1.4%. The postwar 1940s saw rates of 1.7% per year, and during the 1950s annual increases were either 1.7% or 1.8%. The 1960s saw rates falling from 1.7% in 1961 to 1.0% in 1969. This process has continued in the 1970s; rates fell from 1.1% in 1970 to 0.8 at the beginning of 1975.

The Series II projection envisions a temporary upturn to rates of 0.9% and 1.0% in the 1980 to 1985 period. Following that, however, the projection sees a steady decline in annual growth rates: 0.6% for 2000, 0.5% for 2015, 0.3% for 2025, and 0.2% for 2050.

5.2 Economic Assumptions

The economic assumptions that underlie Projection III are derived from SRI's *Transformation* scenario for 1995 and 2025. *Transformation* assumes that GNP rises from \$1.5 trillion in 1975 to \$2.1 trillion in 1995 and \$4.0 trillion in 2025, a real growth rate for the 1975 to 2025 period of 2.0% per year.

Our estimates of total GNP, PDI, and PCE for 1995 and 2025 differ slightly from those of the *Transformation* scenario because we have applied *Transformation's* per capita estimates to the Series II population projections, which are higher than those estimated by the SRI team.

Projection III describes a future in which the United States is partially successful in meeting its economic and technological challenges. New industries are created to develop additional sources of energy, and there is a continuation of expansion in the services sector of the economy. On the other hand, the United States does not achieve the

relatively rapid growth envisioned by Projection I and the *Success* scenario because of periodic economic crises, resulting, in part, from a lack of capital needed for investment in more efficient facilities.

By 1995 per capita disposable income (in 1975 dollars) reaches \$6,475 vs \$5,063 in 1975. However, this is only 73.5% of the per capita PDI the United States would have reached in the *Success* scenario. The Era of Moderate Growth means that per capita personal consumption expenditures in 1995 and 2025 are \$5,830 and \$10,500 rather than \$7,950 and \$18,500 visualized by Projection I.

5.3 Motor Vehicle Transportation Assumptions

In 1940 the United States had a ratio of 0.21 car per person, about one car for every five people. Over the years there has been a steady increase in the car/population ratio; it reached 0.39 in 1965, 0.47 in 1972, and 0.50 in 1975. Because of a lack of alternatives to the automobile in the near term, we expect that the ratio will continue to rise for a while, reaching 0.53 by 1980.

Projection III assumes that the car/population ratio will remain at the 0.53 level between 1980 and 1990. During this period development of mass transit alternatives and car pooling will have enough impact to curtail increases in the car/population ratio if not enough to cause actual declines.

After 1990, Projection III assumes that there will be a gradual decline in the car/population ratio: the ratio will fall to 0.51 by 2000 and to 0.50 by 2025.

SRI's *Transformation* scenario, as we have noted in Sect. 4.3, calls for the car/population ratio to decline to 0.40 by 2025. Assuming that there is a huge increase in the numbers of buses and bus routes and shared transportation arrangements, it is possible to consider a decline to a 0.40 car/population ratio. However, we reject this idea for Projection III as well as for Projection II. The basic reason, also noted in Sect. 4.3, is the belief that Americans will always attach high value to owning their own vehicles even if transportation alternatives are available.

Projections II and III assume that alternatives are not only available, but that they are increasingly used for the journey to work and for local shopping trips. Nevertheless, it is assumed that a trend toward the four-day work week sustains private ownership of motor vehicles. Even if people commute to work by bus or other multipassenger vehicle, they cherish the privilege of using their own vehicles on their time off from work. Therefore, even if mass transit alternatives tend to put a ceiling on average miles travelled annually, desire for private ownership will remain high.

Projection III assumes that the light truck/population ratio will continue to rise from the 0.09 truck per person level of 1975, reaching 0.13 in 1980 and 0.14 in 1985. However, after 1985 the ratio remains stable at 0.14, neither rising nor falling. The light truck population will increase more rapidly than the car population. An important factor will be substitution of light trucks for cars for weekend and recreational travel.

5.4 Fuel Situation Restrictions

The Projection III assumptions on fuel are similar to those of Projection II: The United States achieves a moderate degree of success in developing more efficient engines and new sources of motor fuel, but the increased costs of production cause the retail price to rise to \$1.50 per gallon (in terms of 1975 dollars).

Although supplies of motor fuel are ample enough to avoid the necessity of rationing, the price of imported oil continues to impose a burden on the U.S. economy. Therefore, the conservation ethic remains important, and frivolous uses of motor vehicles are restricted by parking regulations and requirements for driving permits in zones served by mass transit facilities.

5.5 Lifestyle Assumptions

Projection III assumptions are similar to those of Projection III — a shift from older population centers in the northeast to new towns in the south and west and an important trend, stimulated by shorter work

weeks, toward the two-home family. Today, the summer home or weekend cottage is a possession of relatively affluent families: professionals, executives, and skilled craftsmen. Projection III contemplates a future in which many more families attach importance to owning a second home. One reason for this is the judgment that the towns which will be constructed around the new industrial centers will be more compact than those of the 1950s in order to save valuable land, materials, and energy. There will be less suburban sprawl and more apartment complexes. People who long for a house surrounded by trees and grass will have to settle for a weekend cottage, and they will have to be prepared to drive a considerable distance from town to reach it.

5.6 Projection of Light Truck Ownership (Model III)

Projection III visualizes somewhat faster growth in numbers of people than does Projection II. On the other hand, it assumes a slower rate of economic growth in the 1975 to 1995 period. It is assumed that slower growth in per capita GNP, PDI, and PCE will be felt in a lower ratio of light trucks per people. For example, Projection II visualizes the light truck/people ratio climbing from 0.07 in 1972 and 0.09 in 1975 to 0.16 in 1995 and to 0.18 in 2025. Projection III assumes that this ratio reaches 0.14 by 1985 and remains at that level through the first quarter of the 21st century.

It is assumed that demand for light trucks continues to increase rapidly until 1985, despite an uncertain economy, because of a lack of mass transit alternatives and because of the value of light trucks, vans in particular, as efficient people movers. After 1985, the growth rate is pulled down both by deceleration in the growth of numbers of people and by development of mass transit and other alternatives to the use of privately owned motor vehicles.

Table 6 shows the light truck population increasing by 1.4% per year in the 1975 to 2025 period. This growth rate is twice as fast as the rate of growth in numbers of people and cars. In contrast, Projection II suggests that the light truck population will increase more than three times as fast as people and cars.

Table 6. Model III: Era of Moderate Growth

Year	U.S. population (-thousands)	Automobile registrations (millions)	Automobile/ population ratio	Light truck registrations (millions)	Truck/population ratio	Personal use (millions)	Personal use/ population ratio
Actual							
1940	132,594	27.5	0.21				
1950	149,767	40.4	0.27				
1960	177,830	61.7	0.35				
1965	191,889	75.2	0.39				
1970	202,677	89.3	0.44				
1972	207,053	96.9	0.47	14.6	0.07	7.8	0.04
Estimated ^a							
1975	211,901	106.5	0.50	19.3	0.09	11.5	0.05
1980	220,232	117.5	0.53	28.6	0.13	19.8	0.09
1985	230,692	122.3	0.53	32.2	0.14	20.8	0.09
1990	241,463	128.0	0.53	33.8	0.14	21.7	0.09
1995	251,051	130.5	0.52	35.1	0.14	20.1	0.08
2000	258,933	132.1	0.51	35.5	0.14	20.7	0.08
2010	273,750	136.9	0.50	38.3	0.14	21.9	0.08
2025	294,715	147.4	0.50	41.3	0.14	23.6	0.08
Average annual increase, 1975 to 2025							
	0.7%	0.7%		1.4%		1.1%	

^aSeries II population projection of the Bureau of the Census.

5.7 Changing Patterns of Personal Use

Projection III assumes that the ratio of personally owned light trucks to numbers of people rises to 0.09 by 1980 and remains at that level through 1990. After 1990 the growth rate in personal use is pulled down by both deceleration in growth of the "people" population and a decline to 0.08 in the ratio of privately owned light trucks to people.

Private uses of light trucks remain the major use, but the dominance is not so pronounced after 1990. The rationale for this view is that under conditions of moderate economic growth light trucks will continue to increase in nonpersonal applications as people movers — in effect, an extension of mass transit — but private purchases may be retarded by slower growth in disposable income.

5.8 Changing Pattern of Nonpersonal Use

Projection III differs from Projections I and II in showing a higher growth rate for nonpersonal uses, as opposed to personal uses, for the whole 1975 to 2025 period. Whereas Table 6 shows a 1.4% per year growth rate for all light truck applications and a 1.1% rate for personal uses, Table 7 shows a 1.6% per year rate for all nonpersonal uses.

The rationale for relatively faster growth in nonpersonal uses after 1995 was discussed in Sect. 5.7.

Our assumptions about the specific categories of nonpersonal use for this projection are similar to those presented for Projections I and II.

In brief, we see agriculture as the slowest growing application for light trucks (although we suspect that numerous owners of second homes may claim agricultural status for their vehicles), and we believe that construction will be a relatively slow-growing application. The fastest growing application in relative terms will be manufacturing, because of the use of van fleets as employee pool vehicles, and the fastest growing major use will be in services. In addition to applications by motels, car rental agencies, and the like, we anticipate that there

Table 7. Projections of Nonpersonal Light Trucks,
1972 to 2025 (Model III)

Major use	Number per year (thousands)				Average annual increase, 1975 to 2025
	1972	1975	1995	2025	
Agriculture	2,920	3,100	3,850	4,400	0.7%
Services	1,109	1,400	4,180	4,850	2.5
Construction	994	1,200	2,100	2,300	1.3
Wholesale and retail trade	896	1,100	2,600	3,000	2.0
Utilities	365	400	900	1,200	2.2
Manufacturing	190	200	630	780	2.8
For hire	88	80	130	180	1.6
Forestry and lumber	73	100	180	280	2.1
Mining	29	40	80	140	2.5
Other uses	<u>175</u>	<u>200</u>	<u>350</u>	<u>570</u>	<u>2.1</u>
Total	6,839	7,800	15,000	17,700	1.6%

Sources: U.S. Bureau of the Census, *Truck Inventory and Use Survey, 1972*. Projections for 1975 to 2025 by Lindsey-Kaufman Company.

will be a growing service industry; something between a subsidized scheduled bus service and a suburban taxi service, based on the design versatility of vans.

Unless there are radical changes in our economic structure, we expect that wholesale and retail trade and utilities will continue to represent significant, growing applications for light trucks.

The other, relatively small applications will increase relatively rapidly on their small bases.

The for hire application does not refer to car rental services; this is the Bureau of the Census designation for commercial trucking applications. Presumably, these light trucks are used as maintenance and service vehicles by operators of heavy duty truck fleets.

6. PROJECTION IV: THINGS GET WORSE

6.1 Population Assumptions

This projection is based on the Census Bureau's Series III projection. This is the Bureau's most negative view of population growth prospects over the next half century. Series III assumes that the pattern of deceleration will continue, at a more rapid pace than in Series II, until zero population growth is reached in 2020. However, the population will not stabilize at the 2020 level (253 million people) but commence an accelerating decline. In this projection the Bureau contemplates population decreases of 0.1% in 2025, 0.2% in 2030, and 0.4% in 2040 and 2050.

Projection IV contemplates a population of 240.9 million in 1995, vs 235 million in the *Distress* scenario, and a population of 252.3 million in 2025, about the same as in SRI's *Foul Weather* scenario.

6.2 Economic Assumptions

Projection IV assumes a worsening economy in the 1975 to 1995 period and very slow recovery in the 1995 to 2025 period. These "worst case" assumptions are based on SRI's most pessimistic scenarios: *Distress* and *Foul Weather*.

This is how SRI views 1975 to 1995 in *Distress*:

The nation has been gripped for 20 years by extended periods of ever-deepening economic recession, ebbing faith in the ability of technology to reverse conditions, and a growing disillusionment with free enterprise. By 1995, the classic signs of a depression are still present — declining GNP, unemployment around 20%, falling birth rates, increasing poverty, drug addiction, crime, alcoholism, and mental illness — on a scale equal to that of the 1930s. Despite the depression, the cost of living has been rising. The failure to reach economic goals was due to a combination of resource shortfalls and the failure of

technology to produce needed energy breakthroughs.

This was exacerbated by periods of poor weather.

The *Distress* scenario assumes an Energy Bust in which the United States encounters a succession of failures and disappointments:

1. Energy supplies drop in the 1980s because of OPEC stretch-out production policies, the reduction of U.S. foreign trade surpluses for petroleum purchases and disappointments in (1) developing improved nuclear plants, (2) finding domestic off-shore oil reserves, and (3) locating major new oil fields elsewhere in the world.
2. Fuel prices are forced upward by pollution control costs for coal liquefaction and shale oil extraction, and the high cost of scarce investment capital.

It is hard to accept such an unrelievedly black picture of the next two decades. However, it cannot be said that SRI's worst case assumptions are implausible, either. After all, in the 1930s the world experienced a similar protracted depression. Some economists of the "long wave" school have predicted another major depression beginning either in the late 1970s or early 1980s. It is possible to imagine such a depression being precipitated by an energy/foreign exchange crisis.

The SRI team visualizes the United States emerging from the trauma of a lengthy depression about the year 1995, to be confronted by a long period of climatological disasters.

SRI's *Foul Weather* scenario pictures a world of the future in which the energy problem is compounded by the return of a "Little Ice Age" such as this planet experienced in the 14th to 18th centuries. Some climatologists believe that the weather patterns of the North Temperate Zone during the past two centuries have been unusually mild from a long-term historical point of view and that we are due for a long period of much colder and variable weather. Apparently, all that is necessary for the return of a Little Ice Age is for average winter temperatures to drop by 1.5°C. A few decades of harsh winters and severe summer droughts could

result in the loss of vast amounts of agricultural production in the Soviet Union, Northern Europe, Canada, and in the northern plains states of the United States.

The *Foul Weather* scenario considers that the United States is relatively well off, geographically, in that it possesses large amounts of land in southern states which would be less affected by a return of a Little Ice Age. *Foul Weather* assumes that the overall growth of the economy is retarded by net losses in agricultural production.

Our assumptions on per capita GNP, PDI, and PCE for 1995 are based on the *Distress* scenario. This contemplates an actual decline in real per capita income and expenditures from the levels of 1975. The assumptions for 2025 are based on *Foul Weather*. For the 1975 to 2025 period, Projection IV envisions that real per capita GNP rises by only 0.7% per year.

6.3 Motor Vehicle Transportation Assumptions

Projection IV assumes that very slow growth in numbers of people and in the economy results, inevitably, in slow growth in private motor vehicle transportation. Our assumptions differ, by degree, from those of the authors of the SRI scenarios. The *Foul Weather* scenario assumes that by 2025 the automobile ownership ratio drops to 0.39 per person, from about 0.50 in 1975. *Foul Weather* assumes that there are 250 million people in the United States in 2025, indicating a car population of only 97.5 million vs 106.5 million in 1975. This scenario assumes that "car pooling is the common mode for work and shopping" and that the nation's fleet of buses increases from 51,000 in 1975 to 75,000 in 2025. In contrast, Projection IV visualizes that the automobile ownership ratio increases slightly to 0.51 by 1980 — because of a lack of transportation alternatives near term — and then declines to the 0.50 level in 1980 to 1990; to the 0.49 level in 1990 to 2000; and to the 0.48 level in 2000 to 2025. The assumption of very slow growth in the 1975 to 2025 period — this projection suggests an increase in the car population of 0.25% per year — appears more realistic to us than SRI's assumption of absolute as well as relative decline in the car population. Projection IV assumes,

incidentally, that the growth of the automobile population is slower than growth in numbers of people in the 1975 to 2025 period.

This projection assumes that the forces which retard the growth of the automobile population will also retard the growth of the light truck population, and particularly the personal transportation uses of light trucks. Nevertheless, because light trucks — especially vans — have value as efficient people movers in industry and in private commuter pools, it is assumed that the light truck population will increase much more rapidly than the car population.

6.4 Fuel Situation Restrictions

Projection IV assumes a tight supply of motor fuel and relatively high retail prices. The *Foul Weather* scenario suggests that the price of gasoline in 2025 reaches \$1.75 per gallon, in terms of 1975 dollars. *Foul Weather* assumes, pessimistically, that the average efficiency of the automobile fleet in 2025 is only 25 miles per gallon. This is about 100% higher than the 1975 level but not sufficient to reduce this nation's dependence on foreign sources of energy and in improving engine efficiency results in a decline in per capita auto ownership to about the 1975 level: "Auto use is restricted by price and fuel rationing."

Granting that the SRI assumptions are plausible — that we are still heavily dependent on foreign petroleum for motor fuel in 2025 and make no real headway in finding substitutes for gasoline and gasoline engines — it is difficult to quarrel with SRI's logic. We *could* be faced with fuel rationing and government restrictions on auto use. Government restrictions *could* mandate an absolute as well as a relative decline in private motor vehicle ownership. This, after all, is a *worst case* assumption. However, the worst case assumptions of Projection IV are not quite as severe. We assume that a stagnating economy *and* negligible growth in numbers of people *and* high prices of motor fuel *and* high taxes on sales of motor vehicles are quite enough to retard growth in automobile ownership and use. It is not necessary for our purpose to assume that the federal government accepts the political and economic hazards of fuel rationing. Present day Europe may provide a model of the future. There,

countries which have even less petroleum than we do, and which are even "socialistic" by U.S. standards, have been content to restrict automobile usage only by means of sales taxes and high prices at the pump. Motorists in Italy today pay as much for gasoline as SRI envisions Americans will pay in 2025. Although high prices have compelled Europeans to drive automobiles that are much smaller, lighter, and more fuel-efficient than American sedans of the early 1970s, demand for automobile ownership is high, and the European car population continues to increase.

6.5 Lifestyle Assumptions

What kind of assumptions can we make about American lifestyles in the 1975 to 1995 period if we assume "ever-deeping economic recession"? SRI's *Distress* scenario assumes that a protracted depression will result in "... increasing poverty, drug addiction, crime, alcoholism and mental illness on a scale equal to that of the 1930s." The sentence sounds plausible; there can be no denying that crime and misery are related to poverty. However, drug addiction was not as serious or widespread a problem in the 1930s as it became in the prosperous "soaring sixties." It is probable that crime rates in inner city neighborhoods were not as high in the 1930s as they became in the 1960s.

The 1920s and 1960s were relatively prosperous and relatively hedonistic decades which tended to place greater value on self expression and individual pleasures than on group loyalty. The 1930s were characterized by mass movements. People, not the passive majority but significant numbers in a variety of splinter groups, tended to seek survival and ultimate purpose by identification with ideals of a particular group. In some cases people affiliated on the basis of religion or moral philosophy. However, the significant mass movements of the 1930s were the extremist political parties. Germany in 1930 is remembered for clashes between gangs of Nazis and Communists. It is less well remembered that there were similar clashes in France and Britain, similar in fact to those which took place in Britain in 1977 after months of unemployment.

If the 1930s provide an example of what happens to a society after years of economic stress, we can assume, for purposes of Projection IV, that people will turn to groups which offer some hope for survival.

The groups may be extremist revolutionary parties like those of the 1930s, or they may be gentle, idealistic communes of the "Voluntary Simplicity" type envisioned by SRI in the *Transformation* scenario. In either case, the group will have considerable influence in shaping the recreational interests of its members. The Projection IV future is characterized more by group discussion, group sports, and group gardening than by individualistic touring and weekend "getaways" to country homes suggested by our other scenarios.

6.6 Projection of Light Truck Ownership (Model IV)

Projection IV visualizes that the light truck/people ratio rises to 0.12% by 1980 and remains at that level until 2000, falling to 0.11% in the 2000 to 2025 period (Table 8).

This projection anticipates very slow growth in the light truck population after 1990, a slight decline in the number of light trucks after the year 2000, and a growth rate of 0.75% per year for the whole 1975 to 2025 period.

This projection assumes that the light truck population continues to increase relatively rapidly until 1980 when a ceiling is imposed on the light truck/people ratio because of worsening economic conditions. Growth is further retarded by a very slow rate of increase in numbers of people after 1980.

6.7 Changing Patterns of Personal Use

In 1972 personal uses accounted for 53.4% of all light truck registrations. Projection IV assumes that personal uses will continue to increase more rapidly than total uses until 1980, when they account for nearly 60% of registrations. After 1980 the growth of personal uses will be even more retarded by worsening economic conditions than are the nonpersonal uses. Whereas total registrations of light trucks are expected to increase by 0.75% per year, Projection IV assumes that the personal uses will increase by only 0.55% per year in the 1975 to 2025 period. It is assumed that personal use of light trucks increases more rapidly than that of cars in 1975 to 2025, because of the value

Table 8. Model IV: Things Get Worse

Year	U.S. population (thousands)	Automobile registrations (millions)	Automobile/ population ratio	Light truck registrations (millions)	Truck/population ratio	Personal use (millions)	Personal use/ population ratio
Actual							
1940	132,594	27.5	0.21				
1950	149,767	43.4	0.27				
1960	177,330	61.7	0.35				
1965	191,389	75.2	0.39				
1970	202,577	89.3	0.44				
1972	207,357	96.9	0.47	14.6	0.07	7.8	0.04
Estimated ^a							
1975	211,301	106.5	0.50	19.3	0.09	11.5	0.05
1980	219,321	111.9	0.51	26.3	0.12	17.5	0.08
1985	227,258	113.6	0.50	27.3	0.12	15.9	0.07
1990	234,904	117.5	0.50	28.2	0.12	16.4	0.07
1995	240,984	118.0	0.49	28.9	0.12	16.9	0.07
2000	245,213	120.2	0.49	29.4	0.12	17.1	0.07
2010	250,472	120.2	0.48	27.6	0.11	15.0	0.06
2025	252,261	121.1	0.48	27.7	0.11	15.1	0.06
Average annual increase, 1975 to 2025							
	0.35%	0.25%		0.75%		0.55%	

^aSeries III population projection of the Bureau of the Census.

of vans as commuter pool vehicles. A trend toward group movements, suggested by the lifestyle assumptions in Sect. 6.5, could also support demand for multipassenger vans. It is possible to visualize a future in which people who cannot afford to own automobiles individually, pool their resources in order to enjoy part ownership of a minibus.

6.8 Changing Patterns of Nonpersonal Use

The assumptions of Projection IV are similar to those of Projection III: somewhat faster growth for nonpersonal uses than personal uses in the 1975 to 2025 period as a whole, and in particular, relatively fast growth for service applications as opposed to other nonpersonal uses (Table 9). Services includes transportation services such as taxi/jitney/bus services. These applications for vans will increase even under the worst assumptions that can be made about general economic conditions and the availability of motor fuel. In fact, in an energy short, economically weak society, minibus applications of light trucks can have even greater importance than in a relatively affluent society.

As in the other scenarios, agriculture is viewed as a slow growth application for light trucks. The *Foul Weather* scenario suggests the possibility of serious disruption of agriculture in the northern plains states because of changing weather patterns. It is assumed that commercial applications (manufacturing, wholesale and retail trade) will increase somewhat faster than total nonpersonal uses.

Table 9. Projections of Nonpersonal Light Trucks,
1972 to 2025 (Model IV)

Major use	Number per year (thousands)				Average annual increase, 1975 to 2025
	1972	1975	1995	2025	
Agriculture	2,920	3,100	3,370	3,400	0.2%
Services	1,109	1,400	3,500	3,700	2.0
Construction	994	1,200	1,500	1,600	0.6
Wholesale and retail trade	896	1,100	2,150	2,200	1.4
Utilities	365	400	550	600	0.8
Manufacturing	190	200	350	400	1.4
For hire	88	80	160	120	0.8
Forestry and lumber	73	100	130	140	0.7
Mining	29	40	50	60	0.7
Other uses	<u>175</u>	<u>200</u>	<u>300</u>	<u>380</u>	<u>1.3</u>
Total	6,839	7,800	12,000	12,600	1.0%

Sources: U.S. Bureau of the Census, *Truck Inventory and Use Survey, 1972*. Projections for 1975 to 2025 by Lindsey-Kaufman Company.

7. INTERVIEW PROGRAM

In its proposal to Oak Ridge National Laboratory dated July 7, 1977, Lindsey-Kaufman Company proposed to establish hypotheses on long-term growth prospects of the light truck population and to test these hypotheses by means of interviews.

This section summarizes the findings of interviews conducted among the three leading motor vehicle manufacturers and another consulting firm now engaged in making a long-term projection of the passenger car and light truck population.

The objectives of the interview program were:

1. to identify any other data that have been developed on the very long-term prospects for motor vehicles in the United States; in particular, any long-range studies conducted by motor vehicle manufacturers themselves;
2. to obtain comments on the assumptions, judgments, and estimating techniques described in the preceding sections; and
3. to identify important issues which could not be covered in a brief preliminary study such as this, and which are worthy of more detailed and exhaustive examination.

7.1 Respondents

In-depth interviews in the field were conducted on September 19 and 20, 1977, with representatives of General Motors, Ford Motor Company, and Chrysler Corporation — the major producers of cars and light trucks in the United States — and on September 23 with Dr. Colin J. Loxley, of Wharton Econometric Forecasting Associates, Philadelphia, Pennsylvania.

The ground rules for discussions with the representatives of the motor vehicle companies provided that we are permitted to disclose the identities of the respondents but not to quote them directly. Therefore, the comments presented in Sect. 7.2 represent a consensus of viewpoints among motor vehicle manufacturers' spokesmen.

4. review of our estimates of total light truck registration and personal use for 1975;
5. calculation of the ratios of light trucks to people for 1972 and 1975;
6. review of alternate projections of number of people made by the Bureau of the Census for selected years from 1980 to 2025;
7. a review of long-range projections of the passenger car population which have been made by the Federal Highway Administration, various consulting organizations, and automobile manufacturers;
8. a projection of car/people ratios based on alternate assumptions on economic growth and restrictions on travel;
9. estimation of light truck/people ratios based on assumptions also considered for car/people ratios, plus consideration of factors affecting the ratio of light trucks to cars;
10. calculation of car and light truck registration estimates by applying estimated ratios to alternate population estimates;
11. calculation of average annual growth rates for the 1975 to 2025 period for alternate projections, and comparison with historical growth rates; and
12. for the years 1995 and 2025, comparison of projected light truck figures with projections of GNP and PCE, and calculation of ratios per millions of dollars of GNP and PCE.

The procedure used to develop Projection II differed from the other projections in this respect: the population estimates were derived from SRI scenarios rather than from Bureau of the Census projections.

An essential step in the methodology of this study was a series of interviews among long-range planners in the automotive industry and consulting organizations to review the projections and the assumptions on which they are based.

The sections that immediately follow present the rationale for Projections I, II, III, and IV.

The respondents are listed below.

1. GENERAL MOTORS

- a. W. R. Pochiluk, Corporate Marketing Planning
- b. Mark H. Bauer, Industry-Government Relations
- c. Pratap Mohan, Supervisor, Truck Forecasting

NOTE: Author was informed that a meeting between GM's marketing planning/forecasting personnel and an outside consultant on a government-sponsored study was unprecedented.

2. FORD MOTOR COMPANY

- a. Mark Erskine, Capital Financing, Analysis Department
- b. John Steigmann, Research Economist
- c. William Blakely, Office of the Controller, North American Operations (long-term forecasting analyst)

3. CHRYSLER CORPORATION

- a. Ron McCreight, Corporate Manager, Consumer Marketing Research
- b. Jack Merritt, Corporate Manager, Market and Environment Planning
- c. Dick Harper, Corporate Director, Marketing Planning Services

4. WHARTON ECONOMETRIC FORECASTING ASSOCIATES

- a. Dr. Colin J. Loxley

7.2 Summary of Interviews Among Manufacturers

7.2.1 Other long-range projections

None of the vehicle manufacturers attempt to project demand for either cars or trucks to the end of this century. One company has projected demand (in terms of vehicle sales) to 1986. Two of the manufacturers were aware that the U.S. Department of Transportation had recently awarded a contract to Wharton Econometric Forecasting Associates for the purpose of modeling the car population to the year 2000.

7.2.2 Comments on this study

None of the manufacturers disagree with a fundamental conclusion of

this study: Under any economic scenario, the light truck population is destined to increase much faster than the car population. None of the manufacturers have their own estimates for the years 2000 or 2025. However, one company which has attempted to project light truck demand to 1986 believes that the Lindsey-Kaufman Company study projections are generally conservative. This company believes that light truck population growth will not level off until 40 to 45% of U.S. households own a light truck. By their estimate, the Lindsey-Kaufman Company Projection IIA figures suggest that 30% of U.S. households will own a light truck.

The other companies, who offer no opinions of their own on demand in the 1990s or in the next century, had these comments about the methodological problems of very long-term forecasting:

1. It is risky because of the difficulty in obtaining accurate long-term population projections. "Projections up to 1990 are okay because all of the drivers then are in the population *now*. Beyond 1990 you are gambling on fertility rates."
2. Projections of the light truck population for any time period are complicated by definitional problems; that is, what is called a car now may be called a light truck in the future.
3. It is risky to project the personal segment of the light truck population because of the problems in predicting tastes, values, and lifestyles of future generations.
4. One company objects to the technique used in this study to project nonpersonal uses because the overall projection of light truck population is based upon growth in numbers of people. Since the need for light trucks may not be related to the population as a whole, one observer commented this technique is suspect. However, another "Big 3" company uses a technique similar to ours to project nonpersonal uses to 1986.

7.2.3 Issues raised by manufacturers

7.2.3.1 Motivation for light truck ownership. Manufacturers know that the motivations for ownership of a van are different from those of ownership of a pickup truck or of a four-wheel-drive vehicle. Nevertheless, they lack data on reasons for purchase and use of these vehicles and

believe that it would be appropriate for the federal government to explore this question. It is generally believed that a factor in motivation for light truck ownership has been "downsizing" of passenger cars. However, this is not the sole factor and may not be even the dominant factor.

7.2.3.2 Downsizing. To an indeterminate extent, actions of the federal government have stimulated demand for light trucks as personal vehicles. Two manufacturers commented that sales of vans and pickups have increased because of a decrease in the size of standard and intermediate sedans. This results from design changes imposed on manufacturer in an effort to meet federal standards for fuel economy. One spokesman commented, "After 1981 we anticipate that downsizing will be a much greater factor. To meet the 27.5 mpg goal, car manufacturers will have to make further reductions in size which may not be acceptable to some car buyers. We expect a very substantial shift from cars to light trucks as family vehicles."

7.2.3.3 Emissions control. It is believed that one of the motivations for personal use of light trucks has been federal requirements that new cars use catalytic converters and nonleaded gasoline. These factors have caused an indeterminate number of car buyers to opt for purchase of a light truck not encumbered by passenger car emissions control standards. Truck buyers have been willing to accept higher fuel costs in order to gain "peppier," more responsive engines.

7.2.3.4 Definitional problems. Some vehicles that are sold as trucks are actually built on passenger car chassis, and vice versa. Manufacturers agree that the distinction between cars, station wagons, and light trucks is very blurred. Vehicles that are classified as cars in the United States are sometimes classified as trucks in Canada. These problems make it difficult to project the personal side of the light truck population. One company assumes that there will continue to be very rapid increase in light truck demand because downsizing of cars will cause a huge shift to light trucks. This assumption takes into consideration the possibility that all light trucks will be subject to the same emissions control and fuel economy standards as cars.

7.2.3.5 Personal vs nonpersonal uses. If light trucks are subjected to the same fuel economy standards as cars, manufacturers will have to consider downsizing trucks just as they do cars, in order to meet federal goals. This might displease personal operators who want more space than is available in a small sedan; worse, it might impose a real hardship on commercial owners of light trucks who have an economic *need* for spacious light trucks. The spokesmen have no views on solution to this problem.

7.3 Interview with Dr. Colin J. Loxley

Wharton Econometric Forecasting Associates (WEFA), headquartered at 4025 Chestnut Street, Philadelphia, Pennsylvania, has a contract with the U.S. Department of Transportation to construct a model of passenger car and light truck ownership to the year 2000. The Project Manager, Dr. C. J. Loxley, graciously consented to discuss WEFA's views and approaches on this subject.

WEFA uses vehicles in use as the measure of growth rather than vehicle registration figures. As pointed out in the preface of the *Transportation Energy Conservation Data Book*, registration figures are usually about 10% higher than estimates of numbers of vehicles in actual use. Whereas this study uses vehicles per capita data as a basis for projecting vehicle population [as does the Stanford Research Institute (SRI) study *Transportation in America's Future*], WEFA bases its estimates on vehicles per family unit. They define "family unit" as (1) people in one household who are related, and (2) single people living alone.

Under the WEFA definition of family unit, there were about 1.3 cars per family unit in 1975: this amounted to 96.7 million cars in use. They believe that vehicle ownership is approaching saturation and that the ratio of cars to family units in 1985 is likely to remain at the 1.3 level. Based upon their estimate of numbers of family units in 1985, this indicates a car population (cars in use) of 116.1 million. Since estimates of cars in use are about 10% lower than registration-based projections, the WEFA projection of cars in use for 1985 is quite comparable to this study's Model I projection, which shows 127.4 million registrations for 1985 (Table 2).

Our Model I projection assumes that the ratio of cars to people increases until about 1990. After 1990, this projection assumes that the availability of transportation alternatives (mass transit and light trucks as substitutes for passenger cars) will begin to pull down the ratio of cars to the population. WEFA assumes, instead, that the ratio of cars to family units will remain constant after the saturation level is reached. They reason that mass transit alternatives may reduce actual usage (miles travelled annually) but not the desire for ownership.

(Note: Author believes that WEFA reasoning on the future ratio of cars to people may be sounder than that of Stanford Research Institute. SRI assumes sharp differences in per capita ownership of cars for different assumptions on per capita gross national product. Our assumptions are closer to those of WEFA than to SRI.)

A breakdown of light trucks by weight class is desirable because the thrust of government regulatory action has been by gross vehicle weight (GVW) class. WEFA will analyze prospects in these GVW classes:

1. under 6000 lb,
2. 6000 to 8500 lb, and
3. 8500 to 10,000 lb.

WEFA intends to analyze data by the following body types:

1. pickups,
2. passenger vans,
3. cargo vans,
4. utility (four-wheel-drive) trucks,
5. suburban passenger (truck-based station wagons), and
6. step vans.

Dr. Loxley commented on three limitations of the present study (recognized as a brief, preliminary effort) which WEFA hopes to deal with in its study for the U.S. Department of Transportation:

1. Analysis of the effect of income growth. "The study should be able to discern different income elasticities between cars and trucks."
2. Per capita estimates of use. "These are too aggregate from our point of view — the need for transportation can vary by family size, age, race, and sex."

3. Trade-offs between owning a car and owning a truck. The present study deals with this subject in a *qualitative* way (advantages of space, engine performance, etc.). WEFA hopes to deal with the subject in a quantitative way.

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