

Light-Duty Automotive Technology and Fuel Economy Trends: 1975 through 2006

Executive Summary

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Robert M. Heavenrich

Advanced Technology Division
Office of Transportation and Air Quality
U.S. Environmental Protection Agency

NOTICE

*This Technical Report does not necessarily represent final EPA decisions or positions.
It is intended to present technical analysis of issues using data that are currently available.*

*The purpose in the release of such reports is to facilitate an exchange of
technical information and to inform the public of technical developments.*

Introduction

“Light-Duty Automotive Technology and Fuel Economy Trends: 1975 through 2006” summarizes key fuel economy and technology usage trends related to model year (MY) 1975 through 2006 light-duty vehicles sold in the United States. Light-duty vehicles are those vehicles that EPA classifies as cars or light-duty trucks (sport utility vehicles, vans, and pickup trucks with less than 8500 pounds gross vehicle weight ratings).

Since 1975, the fuel economy of the combined car and light truck fleet has moved through four phases:

1. a rapid increase from 1975 continuing to the mid-1980s,
2. a slow increase extending into the late-1980s,
3. a gradual decline until the mid-1990s, and
4. a period of relatively constant fuel economy since then.

MY2006 light-duty vehicles are estimated to average 21.0 miles per gallon (mpg). This average is the same as last year and in the middle of the 20.6 to 21.4 mpg range that has occurred for the past fifteen years, and five percent below the 1987 to 1988 peak of 22.1 mpg. After over two decades of steady growth, the market share for light trucks has been about half of the overall light-duty vehicle market since 2002. Most of this growth in the light truck market has been led by the increase in the popularity of sport utility vehicles (SUVs), which now account for more than one-fourth of all new light-duty vehicles. MY2006 light-duty vehicles are estimated, on average, to be the heaviest, fastest and most powerful vehicles than in any year since EPA began compiling such data.

The fuel economy values in this report are based on ‘real world’ estimates provided by the Federal government to consumers and are about 15 percent lower than the values used by manufacturers and the Department of Transportation (DOT) for compliance with the Corporate Average Fuel Economy (CAFE) program. Because it has been over two decades since the current procedures for determining real world fuel economy estimates were established and because both vehicle technology and vehicle driving patterns have changed, EPA has proposed changes to the methodology for calculating real world fuel economy estimates and expects to finalize a new methodology by the end of 2006.

Since MY1990, the CAFE standard for cars has been the value set by Congress, i.e., 27.5 mpg. The truck CAFE standards, as set by DOT, for MY2006 and MY2007 are 21.6 and 22.2 mpg, respectively. For MY2008 to 2010, the truck CAFE standards give manufacturers the option of choosing to comply with standards of 22.5 mpg for MY2008, 23.1 mpg in MY2009 and 23.5 mpg in MY2010, or choosing to comply with a reformed standard based on a relationship between vehicle size (footprint) and fuel economy. Starting in MY2011, truck CAFE standards will be based on the reformed system.

Importance of Fuel Economy

Fuel economy continues to be a major area of public and policy interest for several reasons, including:

1. Fuel economy is directly related to energy security because light-duty vehicles account for approximately 40 percent of all U.S. oil consumption, and much of this oil is imported.
2. Fuel economy is directly related to the cost of fueling a vehicle and is of great interest when crude oil and gasoline prices rise.
3. Fuel economy is directly related to emissions of greenhouse gases such as carbon dioxide. Light-duty vehicles contribute about 20 percent of all U.S. carbon dioxide emissions.

Characteristics of Light-Duty Vehicles for Four Model Years

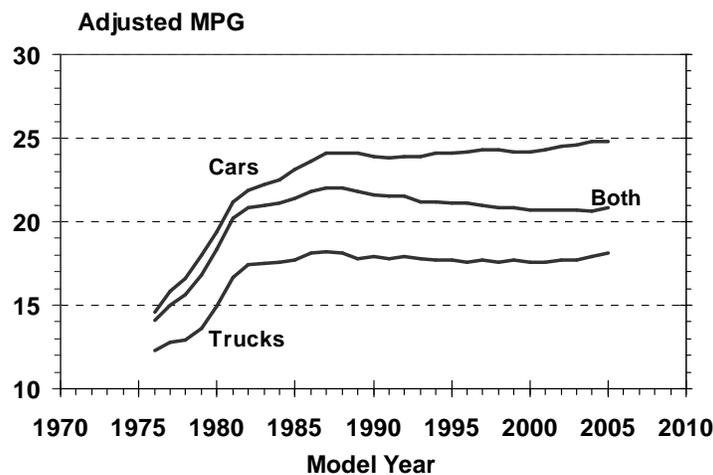
	1975	1987	1997	2006
Adjusted Fuel Economy	13.1	22.1	20.9	21.0
Weight (pounds)	4060	3220	3727	4142
Horsepower	137	118	169	219
0 to 60 Time (seconds)	14.1	13.1	11.0	9.7
Percent Truck Sales	19%	28%	42%	50%
Percent Four Wheel Drive	3%	10%	19%	29%
Percent Manual Transmission	23%	29%	14%	8%

Highlight #1: Overall Fuel Economy Has Been Relatively Constant For Many Years, While Light Truck Fuel Economy Has Increased for Two Years.

After a decline from 22.1 mpg in 1988 to 21.0 mpg in 1994, overall fuel economy has been relatively constant for a decade. The average fuel economy for all model year 2006 light-duty vehicles is estimated to be 21.0 mpg, the same value as achieved in 1994 but five percent lower than the peak value achieved in 1987-88.

Since 1975, the fuel economy of the combined car and light truck fleet has moved through several phases: (1) a rapid increase from 1975 to the mid-1980s, (2) a slow increase extending into the late 1980s, (3) a decline from the peak in the late 1980s until the mid-1990s, and (4) since then a period of relatively constant overall fleet fuel economy. Viewing new cars and trucks separately, since 1996, the three-year moving average fuel economy for cars has ranged from 24.2 to 24.8 mpg, while that for trucks has ranged from 17.6 to 18.1 mpg, and that for all light-duty vehicles from 20.7 to 21.1 mpg. MY2006 cars are estimated to average 24.6 mpg and are near the high end of their mpg range since 1996. For MY2006, light trucks are estimated to average 18.4 mpg, 0.7 mpg, about four percent, above their MY2004 average of 17.7 mpg. The recent increase in truck fuel economy is likely due, at least in part, to higher truck CAFE standards. These slight upward trends for both cars and trucks were accompanied by an increasing truck share of the market that continued through the early 2000s, and this has resulted in the recent flat trend in overall sales-weighted fleet fuel economy.

**Adjusted Fuel Economy by Model Year
(Three Year Moving Average)**

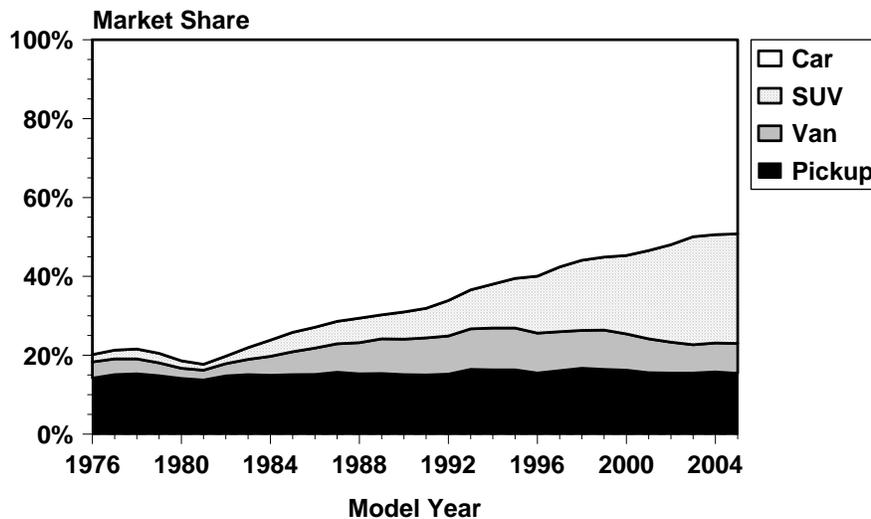


Highlight #2: Trucks Represent About Half of New Vehicle Sales.

Sales of light trucks, which include sport utility vehicles (SUVs), vans, and pickup trucks, have accounted for about 50 percent of the U.S. light-duty vehicle market since 2002. After two decades of constant growth, light truck market share has been relatively stable for five years.

Growth in the light truck market was primarily due to the increase in the market share of SUVs. The SUV market share increased by more than a factor of ten, from less than two percent of the overall new light-duty vehicle market in 1975 to over 25 percent of vehicles built each year since 2002. Between 1975 and the 1990, the market share for vans more than doubled, increasing from less than five percent to more than ten percent, but it has since dropped slightly. By comparison, the market share for pickups has remained relatively constant. Between 1975 and 2006, market share for new passenger cars and station wagons decreased by over 30 percent. For model year 2006, cars are estimated to average 24.6 mpg, vans 20.6 mpg, SUVs 18.5 mpg, and pickups 17.0 mpg. The increased market share of light trucks, which in recent years have averaged more than six mpg less than cars, accounted for much of the decline in fuel economy of the overall new light-duty vehicle fleet from the peak that occurred in 1987-88.

**Sales Fraction by Vehicle Type
(Three Year Moving Average)**

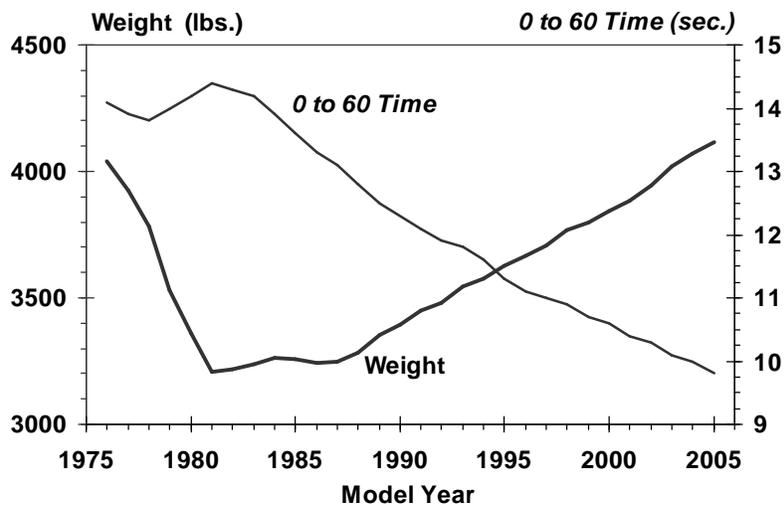


Highlight #3: As a Result of Technological Innovation, Vehicle Weight Has Increased and Performance Has Improved, While Fuel Economy Has Remained Constant.

Automotive engineers are constantly developing more advanced and efficient vehicle technologies. Automotive manufacturers continue to apply technological innovations to increase new light-duty vehicle weight and acceleration performance.

Vehicle weight and performance are two of the most important engineering parameters that determine a vehicle’s fuel economy. All other factors being equal, higher vehicle weight (which can be a proxy for some vehicle utility attributes) and faster acceleration performance (e.g., lower 0 to 60 time), both decrease a vehicle’s fuel economy. Improved engine, transmission, and powertrain technologies continue to penetrate the new light-duty vehicle fleet. The trend has clearly been to apply these innovative technologies to accommodate increases in average new vehicle weight, power, and performance while maintaining a relatively constant level of fuel economy. This is reflected by heavier average vehicle weight, rising average horsepower, and faster average 0-to-60 mile-per-hour acceleration time. MY2006 light-duty vehicles are estimated, on average, to be the heaviest, fastest and most powerful vehicles than in any year since EPA began compiling such data.

**Weight and Performance
(Three Year Moving Average)**



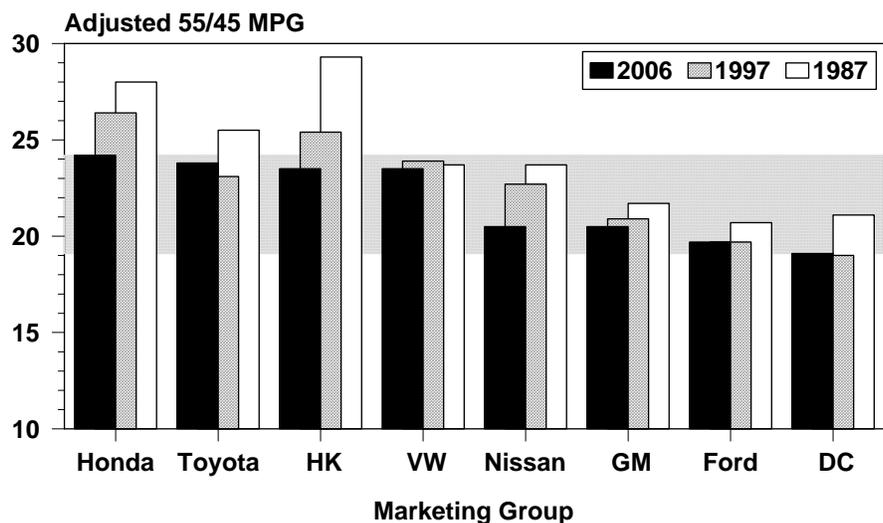
Highlight #4: Differences Between Marketing Group Fuel Economies are Narrowing.

In 1987, when industry-wide fuel economy peaked, some marketing groups had average fuel economies 6 to 8 mpg higher than other marketing groups. For MY2006, the maximum difference between marketing groups is estimated to be 5 mpg, with a typical difference between higher and lower fuel economy marketing groups being 3 to 4 mpg.

For MY2006, the eight highest-selling marketing groups (that account for over 95 percent of all sales) fall into two fuel economy groupings: Honda, Toyota, Hyundai-Kia (HK), and Volkswagen all have estimated fuel economies of 23.5 to 24.2 mpg, while General Motors, Nissan, Ford, and DaimlerChrysler all have estimated fuel economies of 19.1 to 20.5 mpg.

Each of these marketing groups has lower average fuel economy today than in 1987. Since then, the differences between marketing group fuel economies have narrowed considerably, with the higher mpg marketing groups in 1987 (e.g., Hyundai-Kia, Honda, and Nissan) generally showing a larger fuel economy decrease than the lower mpg marketing groups (e.g., Ford and General Motors). Two marketing groups (Toyota and DaimlerChrysler) show a slight increase in average fuel economy since 1997. For MY2006, the six top-selling marketing groups all have truck shares in excess of 40 percent; only Hyundai-Kia and Volkswagen have a truck market share of less than 40 percent and the Hyundai-Kia truck share is increasing rapidly.

Marketing Group Fuel Economy for Three Model Years



Important Notes With Respect to the Data Used in This Report

Unless otherwise indicated, the fuel economy values in this report are based on laboratory data and have been adjusted downward by about 15 percent, so that this data is equivalent to the real world estimates provided to consumers on new vehicle labels, in the EPA/DOE *Fuel Economy Guide*, and in EPA's *Green Vehicle Guide*. These adjusted fuel economy values are significantly lower than those used for compliance with CAFE standards. In addition to the 15 percent downward adjustment for real world driving, they also exclude credits for alternative fuel capability, including the ability to use E85 fuel, and test procedure adjustments for cars that are included in the CAFE data reported by the DOT. In addition, there typically are a few cases each model year where the methodology used for classifying vehicles for this report results in differences in the determination of whether a given vehicle is classified as a car or a light truck.

The data presented in this report were tabulated on a model year basis, but several of the figures in this report use three-year moving averages which effectively smooth the trends, and these three-year moving averages are tabulated at the midpoint. For example, the midpoint for model years 2002, 2003, and 2004 is model year 2003. All average fuel economy values were calculated using harmonic, rather than arithmetic, averaging.

The source database used to generate the tables and graphs in this report for all years was frozen in December 2005. When comparing data in this report with those in previous reports in this series, please note that revisions are made in the data for some recent model years for which more complete and accurate sales and fuel economy data have become available.

Through model year 2004, the fuel economy, vehicle characteristics, and sales data used for this report were obtained from the most complete databases used for compliance purposes for CAFE and the "gas guzzler" tax on cars. For model year 2005, EPA used data that included confidential sales projections submitted to the Agency by the automotive manufacturers, but updated the sales data to take into account information reported in trade publications. For model year 2006, EPA has exclusively used confidential projected sales data that the auto companies are required to submit to the Agency.

Over the last several years, the final fuel economy values have varied from 0.4 mpg lower to 0.3 mpg higher compared to the original estimates based exclusively on projected sales.

For More Information

“Light-Duty Automotive Technology and Fuel Economy Trends: 1975 through 2006” (EPA420-R-06-011) is available on EPA’s Office of Transportation and Air Quality (OTAQ) Web site at:

www.epa.gov/otaq/fetrends.htm

Printed copies are available from the OTAQ library at:

U.S. Environmental Protection Agency
Office of Transportation and Air Quality Library
2000 Traverwood Drive
Ann Arbor, MI 48105
(734) 214-4311

A copy of the *Fuel Economy Guide* giving city and highway fuel economy data for individual models is available at:

www.fueleconomy.gov

or by calling the U.S. Department of Energy at (800) 423-1363.

EPA's *Green Vehicle Guide* providing information about the air pollution emissions and fuel economy performance of individual models is available on EPA’s web site at:

www.epa.gov/greenvehicles/

For information about the Department of Transportation (DOT) Corporate Average Fuel Economy (CAFE) program, including a program overview, related rulemaking activities, research, and summaries of individual manufacturer’s fuel economy performance since 1978, see:

www.nhtsa.dot.gov/cars/rules