Chapter 10
Regulation of Light-Truck Fuel Economy

Because light trucks make up a rapidly growing proportion of the passenger vehicle fleet, and consumers can readily find transportation alternatives to new cars in the light-duty truck fleet, fuel economy regulations must address light-truck fuel economy to assure an effective reduction in total fuel use. Proposed legislation generally recognizes this necessity and sets standards for trucks similar to those for automobiles. For example, S.279 proposes that light trucks attain the same 20- and 40-percent fuel economy increases (by 1996 and 2001, respectively) as automobiles.

Although light trucks are commonly used for passenger travel, they must remain capable of performing tasks seldom expected of automobiles. Dissimilarities between light trucks and automobiles create differences in the fuel economy improvement potential of these vehicle classes, as well as differences in the way the two classes might best be treated using standards based on vehicle capability (such as interior volume). Because of diversity in capability and purpose among classes of light trucks and among truck fleets of various manufacturers, a uniform-percentage-increase approach to fuel economy appears problematic.

FUEL ECONOMY POTENTIAL

Light-duty-trucks include those vehicles classified as pickups, vans, and utility vehicles with a gross vehicle weight under 8,500 lb. These trucks have become an important source of fuel consumption as their sales now constitute 30 percent of light-duty (cars plus light trucks) vehicle sales. Although their fuel economy potential has not been analyzed as comprehensively as for cars, there are significant similarities between technologies available to improve car fuel economy and those available to improve light trucks. This is because most light trucks utilize drivetrains derived from car drivetrains, and vehicle structure-related improvements can follow similar trends. However, some limitations prevent light-truck fuel economy from improving at the same rate forecast for cars.

First, load carrying requirements for light trucks are significantly higher than for all but the largest cars. With a much larger proportion of total loaded weight being payload, there is less opportunity for “flowthrough” weight reductions from initial weight reductions due to engine downsizing or use of advanced materials.

In addition, load carrying requirements of trucks do not favor front-wheel drive, because loading a truck decreases traction with a front-wheel-drive configuration, whereas a rear-wheel-drive truck achieves increased traction when carrying a heavy load. Generally, front-wheel drive is used only in small vans.

Second, aerodynamic drag reduction is necessarily limited by the open cargo bed for pickups and by the large ground clearance needed for utility vehicles. However, because of previous lack of attention, there is room for significant improvements in truck aerodynamic design even within these limitations.

Third, the benefits of a four-valve engine are smaller for trucks than for cars because the low rpm torque tradeoff places greater limits on how much the engine can be downsized. Moreover, high rpm characteristics of the four-valve are wasted to some degree on a truck, making it less attractive from a marketing standpoint.

Fourth, trucks and cars currently do not have the same safety and emission requirements, but these are converging. As a result, future light-truck fuel economy penalties associated with safety and emissions standards will be proportionately larger than for cars.

These limitations are partially offset by the generally less-advanced technology applied to most light trucks, including their inferior aerodynamic design, less sophisticated engines and transmissions, and more limited use of weight-saving materials and design. This lack of technological sophistication allows more "headroom" for further advancement in some areas. Also, conflicting performance requirements for passenger use and heavy hauling can yield opportunities for powertrain components that can handle both load regimes efficiently (e.g., multispeed transmissions with load-sensitive final drive ratios).

A preliminary estimate by EEA suggests that a maximum technology scenario for light-duty trucks will have a fuel economy increase potential 5-to 7-percent lower than the increase calculated for cars. In 1988, domestic trucks averaged 20.2 mpg, and a "maximum technology" scenario for 2001 suggests domestic trucks can attain 26.0 mpg. At the same time, it should be noted that this forecast excludes diesels, which could be as popular in the 6,000-to 8,500-lb range of trucks as they are in the 8,500-to 10,000-lb range currently not covered by CAFE legislation. Use of diesel engines could raise the 26.0 mpg forecast by 1 to 2 mpg if diesel market penetration increases to 10 or 20 percent.

DEFINING AN EFFECTIVE FORMAT FOR A LIGHT-TRUCK FUEL ECONOMY STANDARD

The debate on CAFE suggests the widespread belief that current uniform mpg standards penalizes many manufacturers while rewarding others. Current CAFE standards for light trucks are set for two-wheel drive and four-wheel-drive trucks separately, although manufacturers have the option of meeting a combined standard. In 1993, separate standards will be eliminated and manufacturers will have to meet a combined standard. Some observers have suggested that light trucks should be integrated into any new schemes proposed for cars, since consumers utilize these vehicle types interchangeably. Among new schemes proposed for cars is an interior-volume-based standard. OTA concludes that a volume average fuel economy (VAFE) or similar approach can work well for autos, but VAFE does not allow light trucks to be integrated into the calculation in a straightforward way.

Since light-duty trucks cover a variety of vehicle types, no single measure of consumer attributes such as interior volume provides a useful index for future fuel economy regulation. Light-duty trucks can be subdivided by body style into pickups, vans, and utility vehicles; these three main types of light trucks offer different consumer attributes.

Of the three, vans used for carrying passengers (as opposed to cargo vans) are very similar to passenger cars. Interior volume maybe a good measure of consumer attributes for passenger vans. The relatively high roof of a van exaggerates the useful interior volume for passengers, but (possibly) not for luggage. Hence a "corrected" or reduced passenger volume index can allow passenger vans to be integrated into the VAFE calculation for cars.

Utility vehicles also have passenger-car-like interiors, but most are four-wheel-drive vehicles suitable for rough terrain use. Four-wheel drive imposes a weight penalty as well as an increased drivetrain friction penalty. Moreover, the ability to traverse rough terrain requires good ground clearance, resulting in poor aerodynamic drag coefficients. All of these factors cause a utility vehicle of the same interior size as a passenger car to have much poorer fuel economy. Such vehicles can be integrated into a VAFE calculation for cars if they are provided an mpg credit for rough-terrain capability. The credit must be on the order of 15 to 20 percent for integration into a passenger-car VAFE calculation.

Pickup trucks and cargo vans are purchased ostensibly for cargo carrying capability rather than passenger room. Of course many purchasers simply like the image of a pickup truck and rarely utilize its load carrying capacity. Surveys by DOT in the late 1970s and early 1980s found that weight capacity was rarely a limiting factor, but cargo size often was (i.e. typical loads have large volumes but not high weights). Hence, cargo floor area or total cargo volume (for vans) is an important attribute, but weight carrying capacity may be a factor if it is too low. Many customers use their trucks to tow a trailer or boat, and towing capacity has been suggested as an important attribute to many customers. The ability to carry a heavy load is related to the towing capacity as well, so that there is correlation between these two attributes. One index of truck attributes may be cargo area x load capacity, with some measure like "square foot-tons" used to regulate fuel economy rather than cubic feet of space. Of course payload tons alone can be utilized, but this does not capture the size requirement. For example, many compact trucks have the same payload capacity as the basic full-size pickup truck (1,200 to 1,400 lb), but offer a small cargo bed making it difficult to carry construction materials. Hence, a "square foot-tons" measure appears superior to a payload-only measure (such as "tons") as an attribute index for pickups and cargo vans.