

Increasing Vehicle Fuel Economy without Sacrificing Safety

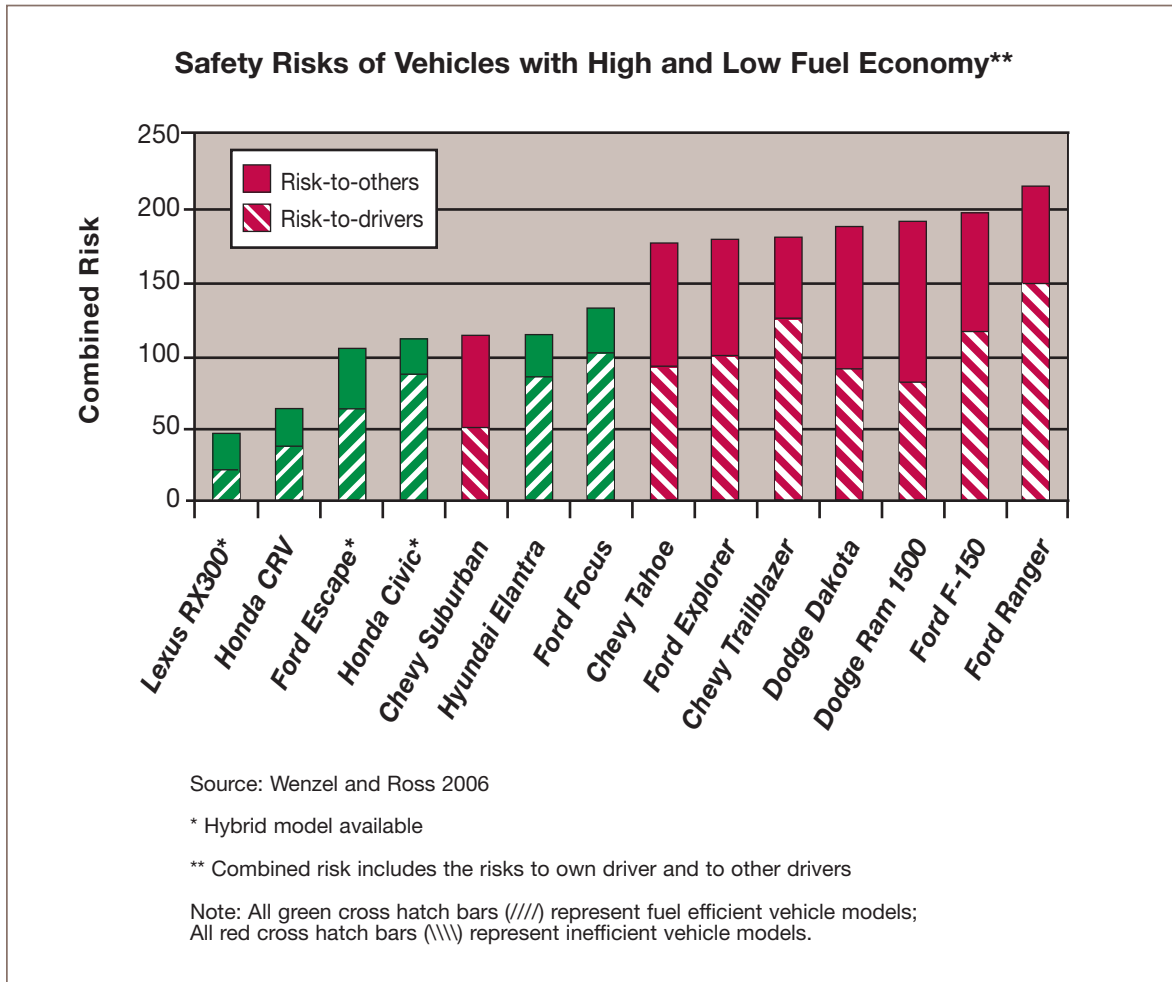
Prepared for the International Council on Clean Transportation¹

This paper provides a brief overview of a May 2007 report, “Sipping Fuel and Saving Lives: Increasing Fuel Economy without Sacrificing Safety,” prepared by Deborah Gordon (transportation policy consultant), David Greene (fuel economy policy expert), Marc Ross (University of Michigan, Department of Physics, emeritus professor), and Tom Wenzel (Lawrence Berkeley National Laboratory). The report is informed by research presented at the Vehicle Safety and Fuel Economy Workshop, October 3, 2006. The full report is available at www.theicct.org.

The public, automakers, and policymakers have long worried about trade-offs between increased fuel economy in motor vehicles and reduced safety. The conclusion of a broad group of experts on safety and fuel economy in the auto sector: **No trade-off is required.** There are a wide variety of technologies and approaches available to advance vehicle fuel economy that have no effect on vehicle safety. Conversely, there are many technologies and approaches available to advance vehicle safety that are not detrimental to vehicle fuel economy.

Congress is considering new policies to increase the fuel economy of new automobiles in order to reduce oil dependence and reduce greenhouse gas emissions. The findings reported here offer reassurance on an important dimension of that work: It is possible to significantly increase the fuel economy of motor vehicles without compromising their safety.

Automobiles on the road today demonstrate that higher fuel economy and greater safety can co-exist. Some of the safest vehicles have higher fuel economy, while some of the least safe vehicles driven today—heavy, large trucks and SUVs—have the lowest fuel economy (*See graph on the next page*).



At an October 3, 2006, workshop, leading researchers from national laboratories, academia, auto manufacturers, the insurance research industry, consumer and environmental groups, material supply industries, and the federal government agreed that vehicles could be designed to simultaneously improve fuel economy and safety.

The experts' studies reveal important new conclusions about fuel economy and safety, including:

- Vehicle fuel economy can be increased without affecting safety, and vice versa.
- Reducing the weight and height of the heaviest SUVs and pickup trucks will simultaneously increase both their fuel economy and overall safety.
- Advanced materials can decouple size from mass (weight), creating important new possibilities for increasing both fuel economy and safety without compromising functionality.

Strategic Design and Optimized Technology: Keys to improving both fuel economy and safety

The key to delivering both safety and fuel economy lies in vehicle design. Poor design decisions and bad technology choices undermine vehicle safety as well as fuel economy. The main factors to consider in vehicle safety include:

- *Crashworthiness*—the ability of a vehicle to protect its occupants in the event of a crash.
- *Crash avoidance*—the ability of a vehicle, through manual and automated handling and braking, to avoid a serious crash altogether.
- *Aggressivity*—design features that make a vehicle incompatible with—and more dangerous to—other vehicles with which it comes into contact.

Technologies exist today that can improve light-duty vehicle fuel economy by up to 50 percent over the next 10 years without reducing the size of vehicles. With gas prices in the vicinity of \$3.00 per gallon, fuel savings alone would pay for these improvements. If these technologies were carefully applied, in accordance with safety and environmental standards, fuel economy could be increased dramatically with no impact on safety. In addition, there are technologies available to improve vehicle safety that would have no effect on fuel economy (*See examples in table*).

Many experts at the workshop agreed that *strategic* weight reduction (that is, using new lightweight materials to reduce weight while holding vehicle size constant and reducing the weight of the heaviest trucks and SUVs to make them less aggressive) could be achieved while maintaining or improving safety. Although some workshop participants disagreed with this conclusion, all participants did agree that there is ample opportunity to improve fuel economy without reducing vehicle crashworthiness and

Some Technology Options for Increasing Fuel Economy and/or Safety

Available Vehicle Technologies	Relative Fuel Economy Gain	Relative Safety Gain
Uni-body Construction/ Advanced High-Strength & Aluminum	+++	+
Low-Friction 6-Cylinder Engine	++	no effect
Direct Injection Engine	+++	no effect
Integrated Starter-Generator	++	no effect
6-Speed Automatic Transmission	+	no effect
Lower Rolling Resistance Tires, improved aerodynamics & accessories	+	no effect
Effective Electronic Seat Belt Reminders	no effect	+++
Stronger Roof and Body Structure	no effect*	+++
Electronic Stability Control	no effect*	++
Rollover-Activated Belt Pretensioners	no effect	++
Window Curtain Air Bags	no effect*	++
Lower Aluminum Bumper Beams	no effect	+
Automated Event Accident Recorders	no effect*	++

Sources: UCS 2006; NRC 2002; German 2006; Authors' estimations. "+" represent degrees of gain for each technology, +++ with the greatest gains. * The additional weight of safety technologies is small and only affects fuel economy on the margin.

occupant safety. Automakers have not consistently optimized their vehicle designs and there are many design and behavioral variables that can affect safety. Nevertheless, select automakers—VW and Honda, for example—are designing their lighter vehicles to be as safe as heavier vehicles and with higher fuel economy. Several manufacturers with strong safety records, especially in Europe, are producing a fleet of lighter, smaller, high-fuel-economy cars.

Research Findings Provide Guidance for Policymakers

Recent peer-reviewed research has concluded:

- Most technologies to increase fuel economy do not affect safety; most technologies to increase safety do not affect fuel economy.
- Reducing car mass while improving vehicle structure, using advanced materials and designs, can simultaneously increase fuel economy and safety.
- Reducing the weight of heavier SUVs and trucks increases fuel economy and improves the safety of all vehicles on the road.

Different researchers have their own specific findings that relate to vehicle safety and fuel economy. Each draws important conclusions that can be used to inform future policymaking efforts (*See full report*).

Policy Strategies for Moving Forward

If the overarching goal is to pursue both safety and fuel economy, then vehicle design is the key. Manufacturers can make tremendous strides with technologies, and consumers can make better purchase decisions if they have complete information on a large selection of safe, high-fuel-economy vehicle models. In addition, there are several policy strategies that can further improve fuel economy and safety:

- Set fuel economy and safety performance goals at cost-effective levels, and allow adequate time for phase-in of vehicle redesigns.
- Develop short-term goals that use existing technological potential and long-term goals to spur continued innovation.
- Apply the same fuel economy and safety standards consistently to all vehicle types (cars, SUVs, and pickup trucks).
- Encourage modification in driver behavior (speed limits, seat belt use, drunken driving laws) to improve fuel economy or safety.

¹ The International Council on Clean Transportation (ICCT) is comprised of regulators and experts from leading auto markets around the world. Participating as individuals, these experts are combining their air quality and transportation experience to support a dramatic improvement in the environmental performance and efficiency of cars, trucks, buses and transportation systems; and to protect and improve public health, the environment, and quality of life. The ICCT was established in 2001, with the publication of the Bellagio Memorandum on Motor Vehicles Policy. This unprecedented consensus document identified preferred government policies for shaping the future of motor vehicle technology and transportation fuels worldwide. The Bellagio Memorandum provides a guide for policymakers who want to speed the transition to clean vehicles and fuels, and for automakers and oil companies working to develop products for the coming decades.