

## COMPARATIVE SPECIFICATIONS FOR FULL SIZE SUVS AND PICKUPS (1999 MY)—Continued

Make and model	GVWR (kg)	Length (cm)	Height (cm)	Width (cm)
Toyota Landcruiser .....	3,111	489	186	194
Mitsubishi Montero .....	2,268	453	168	178
Land Rover Range Rover .....	2,250	471	182	189
Average .....	2,958	496	181	189
Full Size Pickups:				
Ford F-250 4-door .....	3,992	577	194	203
Dodge Ram 2500 Club Cab .....	3,992	620	185	201
Chevy 3500 Crew Cab .....	4,536	637	188	239
Toyota Tacoma Xtracab .....	2,040	516	158	169
Average .....	3,640	588	181	203

The average GVWR of SUVs was 2,958 kg, with the Ford Excursion and Chevrolet Suburban being the highest. Both had a GVWR of 3,901 kg. The average GVWR of pickups was 3,640 kg, with the Chevrolet 3500 Crew Cab (with dual rear wheels) being the highest at 4,536 kg. The Hummer's greater GVWR is said to be attributable to heavy-duty features such as its drive train and its reinforced frame. While the GVWR of the Hummer is significantly greater than many full size SUVs and pickups, it is comparable in size.

AM General stated that it is not aware of any studies or data available in either this country or any other countries that suggest that its recommended amendment would adversely impact motor vehicle safety. It also states that several countries already have similar requirements. ECE Regulation No. 46, June 1997, permits a wide-angle exterior rearview mirror on vehicles with a GVWR that is less than 7,500 kg. Canadian Standard No. 111 allows vehicles with a GVWR of greater than 4,536 kg to have a passenger-side convex mirror as long as it is at least 323 cm<sup>2</sup> in area. Australian Design Rule 14/02 allows vehicles to have a passenger-side convex mirror if the reflective surface area is equal or greater than that of a flat mirror that meets its field of view requirements.

#### Mirror Research

On March 13, 1996, the agency convened a public meeting in Romulus, Michigan, to seek information from interested parties on the safety of mirror systems and suggestions for actions to enhance safety. A **Federal Register** notice announcing this meeting [61 FR 4624] also invited written comments. Of the 12 commenters, all stated that there should be a change in the requirements of Standard No. 111, or at least research should be conducted to determine if a change is needed. Attendees at the workshop also identified future human

factors research needed for determining rearview mirror performance and design requirements that would insure that drivers could use rearview mirrors safely and effectively. These suggestions are outlined in a technical report titled "Workshop on Rearview Mirror Human Factors Research Needs: Summary of Recommendations," [DOT HS 808 486]. The main thrust of the comments was that the agency should consider amending the standard to allow non-planar mirrors on the driver side of the vehicle. These mirrors are currently used on the driver side of some vehicles in Europe, Japan, and South Africa.

Consistent with these suggestions from the industry, the agency initiated research on non-planar driver side mirrors. The agency contracted with the TNO Human Factors Research Institute (TNO) in the Netherlands to conduct this research. The resulting paper, titled "Non-planar Driver's Side Rearview Mirrors: A Survey of Mirror Types and European Driver Experience and a Driver Behavior Study on the Influence of Experience and Driver Age on Gap Acceptance and Vehicle Detection," [DOT HS 809 149] examined European drivers' use of non-planar driver side mirrors. The study was conducted on European drivers because only flat driver side mirrors are permitted in the U.S. The sample of vehicles in the study consisted of 43 percent with planar driver side mirrors, 34 percent with convex mirrors, and 23 percent with aspherical mirrors. The passenger-side mirrors were predominantly convex (92 percent). The study found that drivers' experience with aspheric mirrors on the driver's side did not generally compensate for the negative effect of accepting smaller gaps, with the exception of drivers who were accustomed to convex mirrors on the driver's side. In addition, there was no increase in the visual workload required to process information in non-planar mirrors. The conclusion was that the

relative benefits of using aspheric mirrors on the driver's side could outweigh the possible negative effects.

The agency contracted with the Scientex Corporation (Scientex) to assess different driver side mirror designs and compare them to the standard flat mirror. The report, titled "Simulator-based Assessment of Driver side Mirrors for Passenger Cars," [DOT HS 808 807] examined four non-planar mirrors: (1) Spherically convex, (2) a side-by-side design where 40 percent of the inboard area was spherically convex and the remaining outboard area was aspherically convex, (3) an over-under design that was flat on top and spherically convex below; and, (4) a side-by-side design where 75 percent of the inboard area was spherically convex and the remained outboard area was aspherical. The primary study variables were the size of the field of view, image distortion, and driver age. The test subjects were placed in a laboratory driving simulator and asked to use each mirror type from the perspective of a stationary observer waiting to merge. The subjects were also to use the mirrors as moving observers in a dynamic simulation of a lane change scenario on a freeway. The study found significant effects of mirror type and driver age on lane change decisions and decision times. For slower moving targets, the test data revealed a sharp increase in the size of the gap older drivers found acceptable for making a safe lane change when using a flat mirror, relative to the non-planar mirrors. For the faster moving targets, there was only a small increase in the size of the gap older drivers found acceptable for a safe lane change when using a flat mirror, relative to the non-planar mirrors. Also, the older drivers generally relied on the mirrors more rather than glancing over their shoulders. Scientex believed that this was due to lack of head and neck mobility. Moreover, it showed that there