

allow for more safeguards and fail-safe systems. These systems are capable, on a limited basis, of overriding the driver's input or lack of input to achieve optimal vehicle performance and safety.

The Honda Insight with the continuously variable transmission, which employs idle-stop technology (IST) and which NHTSA permitted in an interpretation letter of January 17, 2001, highlights the decreasing relevance of the shift lever position in certain situations. IST allows the engine to stop, the transmission to briefly shift to Neutral while the engine is automatically restarting, then allows the transmission to shift back to Drive while the transmission shift lever remains in a drive position. During this procedure, however, service brake pressure is maintained even after the driver has released the service brake pedal. This scenario was not disputed in the Honda interpretation even though it was in conflict with the 1991 interpretation letter to Mr. Reed.

NHTSA intends that the Honda interpretation supersede the Reed interpretation to the extent that, from now on, for all vehicles, when the transmission shift lever is in a forward drive position, the transmission gear may be in another forward drive position or Neutral. When the transmission shift lever is in Reverse, the transmission gear must be in reverse gear. Additionally, when the driver has selected the transmission shift lever "Park" position, the transmission must always be in the Park position. This restriction is necessary to ensure that the vehicle does not start moving when the driver does not expect the vehicle to move, and cause the driver to panic. We are proposing an additional provision for vehicles with systems that allow the engine to start and stop automatically after driver activation of the engine starter which states that when the transmission shift lever is in Park, the engine automatic start/stop system shall not take the transmission out of Park.

B. Safety Importance of Creep Force in Cueing the Driver—Creep Force in Reverse

In ICE automatic transmission only vehicles, creep force is the motive force applied to the vehicle by the idling engine and automatic transmission whenever the transmission shift lever is in a drive position. Creep force occurs in the direction indicated by the automatic transmission shift lever position and provides enough force to cause motion of a vehicle loaded to its Gross Vehicle Weight Rating (GVWR) on a level, paved surface before the service brake pedal is completely released.

Although not required by the Federal Motor Vehicle Safety Standards, creep force exists on virtually all vehicles powered by ICEs and equipped with automatic transmissions.

When the current wording of FMVSS No. 102 was adopted in 1968, vehicles were equipped mostly with ICEs and mechanical/hydraulic automatic transmissions, which have always provided creep force. Today, drivers can rely on creep force to avoid crashes that would result from shifting errors. When a driver places the automatic transmission shift lever in a drive position and reduces service brake pressure slowly by easing up on the service brake pedal, the vehicle begins to move slowly in the direction that has been selected by the transmission shift lever. This creep force in the correct direction cues the driver that when the accelerator is depressed, the vehicle will move in the anticipated direction.

It is important for creep force to initiate motion of the vehicle before the driver's foot leaves the service brake pedal and before the service brakes are completely disengaged. Then, if a shifting error has occurred, the driver's foot is still on the brake pedal and the error can be safely and quickly corrected. For example, if there is no creep force associated with an automatic transmission equipped vehicle and the driver thought he had selected Drive but instead had selected Reverse, when he removes his foot from the brake and depresses the accelerator, the vehicle would unexpectedly move rearward instead of forward. The unexpected movement of the vehicle rearward may cause the driver to further depress the accelerator. By the time the driver realizes his mistake and applies the brake again, the vehicle may have moved rearward a considerable distance and possibly struck a pedestrian or an object, causing injury and/or property damage.

From years of driving ICE-powered automatic transmission vehicles, drivers are familiar with cues in the direction of travel indicated by creep force. Since it is not inherent in hybrid vehicles, it is NHTSA's view that there is a safety need to at least design creep force into the vehicles when in Reverse. Toyota designed the Prius in such a way that allows the electric motor to provide creep force so that it would function like an ICE automatic transmission only vehicle. For vehicles like the Prius that provide creep force in Reverse when the engine is stopped, the changes proposed in FMVSS No. 102 would allow the engine to stop and restart automatically when the transmission shift lever is in Reverse as well as in forward gears. The

opportunity for shifting errors is always present. Drivers experience creep force constantly as a cue, which assures them of what gear they are in. An engine that is stopping and restarting automatically may add to driver confusion, especially when there is an absence of creep force. This proposed amendment has the effect of assuring rearward creep force in all automatic transmission vehicles with engine stop/start systems, either by requiring that the engine remain running in Reverse for vehicles like the hybrid electric Insight/Civic or by virtue of the design of the electric propulsion system for vehicles like the Prius. When there is no creep force or when there is creep force in the forward direction, the driver will know the vehicle is in a forward drive gear, in Neutral, or Park.

In examining the propulsion systems of the Honda Insight and Civic hybrid electric vehicle with IST and the Toyota Prius with the THS, it was noted that the Honda Insight/Civic hybrid electric vehicle did not provide creep force in the forward direction, as there was no possibility of vehicle motion until the service brake pedal was fully released. The Honda system provides creep force in Reverse because IST does not function in Reverse and the engine remains running, allowing the engine/automatic transmission to provide creep force by means of the ICE and automatic transmission. For the Toyota Prius, the engine stops in either the forward or reverse gears, however, when the gasoline engine is off, creep force is provided by the electric motor.

C. The Level of Creep Force Specified

In order to investigate the level of creep force that drivers are used to, and the level of creep force to require of any vehicle that allows the engine to automatically start and stop in Reverse, NHTSA measured the creep force produced by thirteen vehicles, including passenger cars, multipurpose passenger vehicles, and light trucks, that were selected on the basis of their availability. Measurements were made with the vehicle engines running at idle and the vehicle automatic transmissions in Drive, the lowest ratio forward gear (Low) and Reverse.

A record of the vehicles tested and creep forces measured are in Table 1. The creep force must be high enough to be noticeable to the driver. A heavier vehicle requires greater creep force to produce an obvious cue to the driver. The force data in Table 1 represents the amount of creep force that each vehicle's propulsion system produced. The creep force of some of these vehicles may be in excess of what is necessary to be minimally noticeable to