

the vehicle, the propulsion system provides a creep force that must be opposed by the vehicle brake in order to keep the vehicle stopped when the propulsion system is on, the accelerator is released and the transmission is in gear. Creep force alerts the driver to the vehicle's direction of travel while the driver is in the process of releasing the brake pedal and minimizes the chance that the driver will be surprised due to shifting errors when he depresses the accelerator pedal. Creep force is a characteristic inherent to ICE automatic transmission only vehicles.

Later, Honda introduced the IST on the Insight equipped with a continuously variable transmission (CVT) and requested an interpretation similar to the one that NHTSA provided to Toyota. IST is another hybrid/electric low emission, fuel saving system, which allows the gasoline engine to stop and restart automatically while the transmission shift lever is in a drive position. IST also satisfies FMVSS No. 102, S3.1.3's concern about driver shifting errors during driver activation of the engine starter because it renders driver activation of the engine starter inoperative when the transmission shift lever is in a forward or reverse drive position. However, it is not in agreement with the literal meaning of S3.1.3. IST is similar to Toyota's THS relative to starter interlock, but there are significant differences in other areas of operation. IST does not provide creep force when the engine is stopped, and it is employed only in the forward drive gears. From a driver's perspective, IST does not operate quite like an ICE automatic transmission only vehicle. IST does not shut the engine off in Reverse and therefore creep force is retained in Reverse by means of the idling gasoline engine and automatic transmission. In an interpretation of January 17, 2001, we ruled that IST would be permitted under S3.1.2, citing the Toyota interpretation, but because the Insight does not act like an ICE automatic transmission only vehicle, we stated that the Honda situation raised new issues that would necessitate further rulemaking.

This notice proposes that an exception be added to FMVSS No. 102 to accommodate these new hybrid/electric technologies while preserving the safety purpose of the standard. It proposes that for automatic transmission equipped vehicles, after the driver activates the vehicle's propulsion system, the engine may stop and restart automatically while the transmission shift lever is in any forward drive gear. It also proposes that if the vehicle's propulsion system

provides a creep force in Reverse (when the engine is stopped, the accelerator is released, and the propulsion system is on) that has a ratio to gross vehicle weight rating (GVWR) of at least .015, the engine may stop and restart automatically when the transmission shift lever is in Reverse. This amendment permits new technologies that allow the engine to stop and restart automatically with the transmission shift lever in gear, but minimizes the possibility that the vehicle will move in a direction unexpected to the driver upon restart. Automatic engine restarting would be permitted only in forward drive gears so that drivers learn to associate restarting with forward motion. However, automatic engine restarting is allowed for vehicles that provide a rearward creep force in Reverse that must be overcome by driver braking even when the engine is not running. Because such vehicles warn their drivers of impending rearward motion before the driver fully releases the brake (as does an ICE automatic transmission only vehicle with the engine running), restarting in Reverse would also be permitted.

III. How Different Hybrid/Electric Systems Work

So that the reader fully understands the safety need to conduct this rulemaking, and what NHTSA seeks to accomplish in amending FMVSS No. 102, the following describes how the Toyota Prius and the Honda Insight operate. NHTSA considers these two vehicles as examples of the type of electronic control systems that we can expect more of in the future, and that we propose to amend FMVSS No. 102 to accommodate. NHTSA continues to ensure that FMVSS No. 102 meets the need for safety. Significant differences between the Toyota and the Honda approaches are explained, and the consequences of these differences for this rulemaking are discussed.

A. How the Toyota Hybrid System Works—the Prius

As explained further, from the driver's perspective, the THS operates like an ICE automatic transmission only vehicle. The THS, which is currently in use on the Prius, uses both an electric motor and a gasoline engine to provide motive power. The electric motor is the primary source of motive power and is also used to start the engine. The engine is used to provide supplemental motive power and to charge the batteries. Before the driver may start or turn on the vehicle, the transmission shift lever must be in Park. After the vehicle is started or turned on by the driver, the

gasoline engine may or may not start. If the engine is within the range of normal operating temperature and battery power is sufficient, the engine will not start, but the electric motor is immediately available to provide motive power and creep force. If battery power is low or the engine is not within normal operating temperature, the gasoline engine will start in order to warm up the engine and/or charge the batteries (to power the electric motor), then it will shut off. During normal vehicle operation, the engine automatically stops when the Engine Control Unit (ECU) determines that the vehicle does not need the engine to provide additional power (motive power and/or electrical power). Also, the engine automatically restarts when the ECU determines that the vehicle needs extra power (motive power and/or electrical power). When the engine is required, it may start when the transmission and the transmission shift lever are in drive positions.

The THS functions in all forward and reverse drive gears. The THS also provides creep force in all forward and reverse drive gears regardless of whether the engine or electric motor is powering the vehicle at the time. Normally, when the batteries are charged, the engine is within normal temperature range and the accelerator is depressed, the vehicle will begin to accelerate by means of power from the electric motor and will move in the direction both selected by the automatic transmission shift lever and, as previously indicated, by creep force. As the demand for acceleration increases beyond the capability of the electric motor and/or as the vehicle batteries require recharging, the same electric motor will start the vehicle engine (while the automatic transmission/transmission shift lever remain in drive positions), to provide additional motive and/or electrical power. When stopping, the electric motor aids in recharging the batteries through regenerative braking.

B. How Idle-Stop Technology Works—the Honda Insight

Idle-stop technology (IST) is currently used on the Insight and more recently on the Civic hybrid electric vehicle (system is identical to the Insight), but in the future it may be used on other Honda and Acura models that are not hybrids. Both hybrid vehicles are powered by a low-horsepower gasoline engine assisted by an electric motor. When the driver manually engages the starter to start the vehicle's engine, the transmission shift lever must be in Park or Neutral. During vehicle operation, the engine is always running except during