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49 CFR Part 571

Federal Motor Vehicle Safety Standards; Accelerator Control Systems; Proposed Rule

DEPARTMENT OF TRANSPORTATION

National Highway Traffic Safety Administration

49 CFR Part 571

[Docket No. NHTSA–2012–0038]

RIN 2127–AK18

Federal Motor Vehicle Safety Standards; Accelerator Control Systems

AGENCY: National Highway Traffic Safety Administration (NHTSA), Department of Transportation (DOT).

ACTION: Notice of proposed rulemaking (NPRM).

SUMMARY: In this NPRM, we (NHTSA) propose to revise the Federal Motor Vehicle Safety Standard for accelerator control systems (ACS) in two ways. First, we propose to amend the Standard to address more fully the failure modes of electronic throttle control (ETC) systems and also to include test procedures for hybrid vehicles and certain other vehicles. This part of today's proposal is related to an NPRM that NHTSA published in 2002.

Second, we propose to add a new provision for a brake-throttle override (BTO) system, which would require that input to the brake pedal in a vehicle must have the capability of overriding input to the accelerator pedal. This BTO proposal is an outgrowth of NHTSA's research and defect investigation efforts aimed at addressing floor mat entrapment and related situations.[1] We propose to apply the requirement for BTO systems to new passenger cars, multipurpose passenger vehicles, trucks and buses that have a gross vehicle weight rating of 10,000 pounds (4,536 kilograms) or less and ETC.

DATES: Comments must be received on or before June 15, 2012.

ADDRESSES: You may submit comments to the docket number identified in the heading of this document by any of the following methods:

- *Federal eRulemaking Portal:* Go to *http://www.regulations.gov*. Follow the online instructions for submitting comments.
- *Mail:* Docket Management Facility, M–30, U.S. Department of Transportation, West Building, Ground Floor, Rm. W12–140, 1200 New Jersey Avenue SE., Washington, DC 20590.
- *Hand Delivery or Courier:* West Building Ground Floor, Room W12–140, 1200 New Jersey Avenue SE., between 9 a.m. and 5 p.m. Eastern Time, Monday through Friday, except Federal holidays.
- *Fax:* (202) 493–2251.

Regardless of how you submit your comments, you should mention the docket number of this document.

You may call the Docket at 202–366–9324.

Instructions: For detailed instructions on submitting comments and additional information on the rulemaking process, see the Public Participation heading of the **SUPPLEMENTARY INFORMATION** section of this document. Note that all comments received will be posted without change to *http://www.regulations.gov,* including any personal information provided.

Privacy Act: Please see the Privacy Act heading under Rulemaking Analyses and Notices.

FOR FURTHER INFORMATION CONTACT: For non-legal issues, Mr. Michael Pyne, Office of Crash Avoidance Standards (telephone: 202–366–4171) (fax: 202–493–2990). Mr. Pyne's mailing address is National Highway Traffic Safety Administration, NVS–112, 1200 New Jersey Avenue SE., Washington, DC 20590.

For legal issues, Mr. William Shakely, Office of the Chief Counsel (telephone: 202–366–2992) (fax: 202–366–3820). Mr. Shakely's mailing address is National Highway Traffic Safety Administration, NCC–112, 1200 New Jersey Avenue SE., Washington, DC 20590.

SUPPLEMENTARY INFORMATION:

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I. Executive Summary

NHTSA is proposing to amend Federal Motor Vehicle Safety Standard (FMVSS) No. 124, *Accelerator Control Systems,*[2] in two ways. First, we are proposing to update the throttle control disconnection test procedures in FMVSS No. 124. This would apply to passenger cars, multipurpose passenger vehicles, trucks and buses, regardless of weight. Second, we propose to add a new requirement for a Brake-Throttle Override (BTO) system. The latter would be applicable to the same types of vehicles with 10,000 lbs. (4,536 kilograms) gross vehicle weight rating (GVWR) or less and that have ETC.

The first part of today's proposal follows up on a previous rulemaking effort. In 2002, NHTSA published an NPRM to update FMVSS No. 124. That proposal was withdrawn in 2004 mainly because the agency concluded that further development was needed on some of the proposed test procedures. Today's proposal revives that effort and resolves test procedure issues raised in the previous rulemaking.

The second part of our proposal, a BTO system requirement, would require that the brake pedal in a vehicle have

[1] Accelerator pedal entrapment is a particular category of ''unintended acceleration.'' The latter is the general term we use to refer broadly to any vehicle acceleration that a driver did not purposely cause to occur.

[2] 49 CFR 571.124.

the capability of overriding input to the accelerator pedal when both are pressed at the same time. This action augments NHTSA's ongoing research and defect investigation efforts aimed at addressing a serious safety situation where a pedal becomes entrapped by a floor mat or no longer responds to driver release of the pedal because of some other obstruction or resistance.

In general, this proposal aims to minimize the risk that loss of vehicle control will be caused by either: (1) Accelerator control system disconnections; or (2) accelerator pedal sticking and entrapment. For both of these safety risks, which can affect vehicles with mechanical as well as ETCs, the purpose of this rulemaking is to ensure that stopping a vehicle is possible without extraordinary driver actions. Accordingly, we believe both aspects of this rulemaking to update FMVSS No. 124 are warranted.

For measuring return-to-idle in the event of a disconnection, this proposal includes updated test procedures carried over from the 2002 proposal including a powertrain output test procedure which, under today's proposal, would be based on measurement of vehicle creep speed.

For situations where the accelerator pedal fails to return after release, this proposal incorporates a new BTO requirement which comprises:

- An equipment requirement to ensure the presence of BTO in each vehicle; and
- A performance requirement using a stopping distance criterion with the accelerator pedal applied.

II. Introduction

Controlling acceleration is one of the fundamental tasks required for safe operation of a motor vehicle. Loss of control of vehicle acceleration and/or speed, so-called ''unintended acceleration'' or ''UA'', can have serious safety consequences.[3] It can arise either from driver error or for vehicle-based reasons including accelerator pedal interference and separation of throttle control components.

To address loss of control of vehicle acceleration, FMVSS No. 124 requires an engine's throttle to return to idle when the driver stops pressing on the accelerator pedal or when any one component of the accelerator control system is disconnected or severed at a single point. The standard was issued under 49 U.S.C. 30111(a), which directs NHTSA (by delegation from the Secretary of Transportation) to prescribe FMVSSs. Section 30111(a) also states that ''Each standard shall be practicable, meet the need for motor vehicle safety, and be stated in objective terms.'' This subsection is also the basis for this proposal.

In recent years, NHTSA has been working to update FMVSS No. 124 to more directly address newer electronic engine control systems and also to address different types of accelerator control safety issues such as those that could be mitigated by BTO technology.

We have evaluated BTO technology to understand its performance characteristics and how it differs among manufacturers using this technology. Based on that evaluation, we believe that light-vehicle manufacturers in the U.S. can implement BTO on vehicles having ETC without significant difficulty or cost.

Currently, there are a few vehicle models that still have mechanical throttle controls, and the manufacturers of those vehicles may lack sufficient lead time at this point and probably would incur significant cost to change their manufacturing plans to install BTO systems within the next one or two model years. This is due to the need to change over from mechanical throttle control to ETC for implementation of BTO. However, we believe in the near future these mechanically-throttled vehicles will be discontinued or replaced with new models having ETC.

Based on compliance information that NHTSA receives from vehicle manufacturers annually, almost all model year 2012 light vehicles sold in the U.S. will have a BTO system. Based on our experience with these BTO systems, we believe they will comply with this proposed rule without significant modification. Consequently, any manufacturer design, validation, and implementation costs associated with this proposal should be minimal. Furthermore, compliance testing costs are expected to be low since the proposed test procedure is nearly identical to existing brake performance test procedures. Tests could be conducted along with existing brake performance tests.

Although we do not have a statistical estimate for the number of fatalities or injuries that could be prevented by brake-throttle override technology, we believe that BTO would prevent a significant number of crashes and thus have a positive impact on motor vehicle safety. In NHTSA's complaint database, over a period of about ten years starting in January 2000, the agency identified thousands of reports of UA events of all types (see Section VIIB of this proposal). Based on NHTSA's review and analysis of a subset of vehicle owner-provided narratives in the complaints, some UA incidents appear to have involved stuck or trapped accelerator pedals, and a portion of those resulted in crashes. We believe brake-throttle override would prevent most crashes where a stuck or trapped accelerator pedal was to blame because, with a BTO system, the driver would be able to maintain control through normal application of the vehicle's brakes. We believe brake-throttle override also could prevent stuck-pedal incidents which do not result in a crash but which may require extraordinary driver actions to avoid a crash.

III. Safety Need for Brake-Throttle Override Systems

One of the specific observations of the NASA in its report to NHTSA on Toyota unintended acceleration stated: ''When the brake can override the throttle command it provides a broad defense against unintended engine power whether caused by electronic, software, or mechanical failures.''[4] In Section A, below, we discuss actual incidents where a brake-throttle override system very likely would have provided a safety benefit. Of interest are driving emergencies in which drivers have extreme difficulty stopping or slowing their speeding vehicle because the accelerator pedal is prevented from returning to its normal rest position. Some of these incidents resulted in crashes and, in rare cases, deaths. These instances involve vehicles both with and without ETC systems. In Section B, we discuss how trapped pedal scenarios may lead to crashes. In Section C, we discuss how loss of power brake boost necessitates greater brake pedal pressure to stop a vehicle. Finally, in Section D, we discuss our conclusion that brake-throttle override systems can effectively prevent crashes involving trapped-pedal and sticking-pedal scenarios, and why we are proposing to require brake-throttle override systems on light vehicles with ETC.

A. Inability to Stop a Moving Vehicle in a Panic Situation

On August 28, 2009, there was a passenger car crash near San Diego, California that resulted in the deaths of

[3] In NHTSA's February 2011 final report ''Technical Assessment of Toyota Electronic Throttle Control Systems,'' the agency defined ''Unintended Acceleration'' or ''UA'' very broadly as ''the occurrence of any degree of acceleration that the vehicle driver did not purposely cause to occur.'' Today's proposal deals mainly with a sub-category of UA which is characterized by accelerator pedals that fail to return because they are stuck or trapped.

[4] See Observation O–2 in section 7.2, page 173, of the NASA report at: *http://www.nhtsa.gov/PR/DOT-16-11*.

four people. NHTSA's Office of Defects Investigation (ODI) inspected the crash site on September 3, 2009, and subsequently both ODI and the NHTSA Vehicle Research and Test Center inspected the vehicle. A report was filed on September 30, 2009.[5] The investigators noted the following:

- The vehicle was a loaned Lexus ES350 traveling at a very high rate of speed that failed to stop at the end of Highway 125.
- The driver was a 19-year veteran of the California Highway Patrol.
- The cause of the crash was ''very excessive speed.''
- A customer who had previously used the same loaner car involved in this crash reported an unwanted acceleration event, experiencing speeds in excess of 80 mph.

Investigating this crash, NHTSA inspectors and the San Diego County Sheriff's Department discovered evidence that floor mats had trapped the accelerator pedal, as it was apparent that floor mats had been stacked in the driver footwell, the floor mat was unsecured, and the mat was not appropriate for the vehicle.

The driver in this crash used the brakes during the prolonged event as evidenced by heat-related destruction of some brake components, but it is apparent that the brake application was insufficient to control the vehicle. It is unknown if the driver and occupants made attempts to use other means to stop the vehicle, including shifting the transmission to neutral and turning off the engine. The passenger car involved in the crash was equipped with a push-button keyless start system and a gated automatic transmission shifter with a manual shift mode. It did not have a BTO feature.

NHTSA's Office of Defect Investigation has received complaints through the Vehicle Owner's Questionnaire (VOQ) of similar situations in which a driver attempted to stop a runaway vehicle. The following examples of this are excerpted from narrative descriptions in VOQs:

> Truck was in cruise control. Accelerated to pass slower traffic. Let off throttle. Truck went to full throttle. Could not get truck to decelerate. Had to stand on brakes to bring to a stop. Truck needs new rotors and pads. *The consumer stated the floor mat and gas pedal can interact. When the all weather mat is not clipped in place, and is moved under the gas pedal, it will become fully depressed. The mat can trap the pedal. *Updated [NHTSA–ODI ID# 10245488]

and;

> I was accelerating on the highway and my car continued to accelerate after I took my foot off the gas. I tried to brake and the pedal was extremely hard to press on. The car was able to slow down a bit but once I took foot off brake pedal the car would speed up again. I took my car in for service and was told they could not duplicate the problem and maybe a floor mat caused the problem. My car continues to have trouble braking. [NHTSA–ODI ID# 10260682]

and;

> While driving on a two-lane road * * * the accelerator became stuck. My car reached speeds of up to 80 mph. I could only reduce the speed to 60 mph by riding the brakes. I finally stopped the car by finding a safe pull-off and shifted into Neutral and then Park. My brakes were completely ruined and required replacement. My car was towed to a Toyota dealer. * * * The service department determined that the faulty acceleration was due to a rubber all-weather mat. The mat had been placed over the standard floor mat. [NHTSA–ODI ID# 10200097]

There are similar examples of these kinds of incidents, with and without crashes, in complaint narratives in the VOQ database. Given our evaluation of brake-throttle override technology and the impact it could have in these types of incidents, we believe a regulation is necessary. Furthermore, this can be done at low cost and with minimal vehicle design impact. Therefore, NHTSA has decided to proceed with this proposal to require brake-throttle override systems.

B. How Trapped-Pedal Scenarios May Lead to Crashes

The possibility of a trapped accelerator pedal has been widely acknowledged by NHTSA, vehicle manufacturers, consumer groups, and in the media as a key contributor to the problem of UA. Based on review of UA complaints in the agency's VOQ data and other sources such as media accounts, we can reconstruct how a pedal entrapment event might lead to a crash.

Based on VOQ narratives, when a pedal entrapment occurs, it often follows an acceleration event such as an overtaking maneuver or a merge onto a highway. Upon completion of such a maneuver, when the driver backs off or releases the accelerator pedal, the pedal may be trapped due to interference caused in many cases by stacked or out-of-position floor mats, but it also can be caused by bunched or worn carpets or foreign objects in the driver footwell. In at least one case, a sharp edge on a plastic pedal snagged on the carpeting at wide-open throttle. We also have seen examples where internal friction in a pedal assembly prevented the accelerator pedal from springing back fully (i.e., to a neutral position).

When pedal entrapment or sticking occurs, the driver is likely to be startled upon realizing that the vehicle is continuing to accelerate or is proceeding without an expected drop in speed, without any action on the driver's part. One possible reaction is to re-apply the accelerator pedal, which may dislodge it. More likely, a driver will attempt to apply the brakes. In doing so, a driver's conditioned expectation is that the brakes will produce quick and deliberate deceleration, responding with the same feel and feedback they provide in everyday driving.

However, because the accelerator pedal is being held down and thus the vehicle is trying to accelerate or maintain speed, normal brake application usually will not result in the expected braking effect. This has been characterized as feeling like a ''tug-of-war'' between the engine and brakes. The problem is exacerbated at higher vehicle speeds where increased stopping effort is necessary. Also, if the brakes are applied with light to moderate force for an extended period, *i.e.,* if the driver ''rides'' the brakes, heat-induced brake fade can result which lessens braking effectiveness. The loss of braking effectiveness may be compounded further by a reduction in brake boost, as described in the next section.

From the perspective of a driver in a vehicle that is accelerating unexpectedly or that fails to slow down in the usual manner when the brake is applied, this may amount to confusing and even frightening vehicle behavior. Depending on the duration of the event, many drivers in this situation may experience panic to some degree, and their subsequent actions may be unpredictable.

Especially in cases involving a high level of throttle input, in order to overcome the racing engine, the driver's application of the brakes has to be forceful and steady enough to produce a strong braking effect, ideally over a short duration to avoid brake fade. It is apparent from the complaint narratives that drivers sometimes do not apply steady, hard pressure to the brake pedal in these situations. Instead, they may ''ride'' the brakes with insufficient pedal force. Or they may release the brakes and repeatedly try to re-apply them, sometimes stabbing at the brake pedal. This kind of driver reaction is evident in incidents investigated by NHTSA and

[5] Memorandum from B. Collins (Investigator and Interviewer, Vehicle Research and Test Center) to K. DeMeter (Director, Office of Defects Investigation), September 30, 2009, available in the docket cited in the heading at the beginning of this notice.

also in complaint narratives, and it may lead to or be a result of a loss of power brake boost, as described below.

C. Loss of Power Brake Boost Requires Greater Brake Pedal Force

Power brakes, as contrasted with manual brakes, provide boost to the brake pedal so that the force a driver must apply to the pedal in order to stop a vehicle is reduced. If the power assist fails, the brakes would still work, but the pedal force required to stop the vehicle would be multiplied. On vacuum-assisted power brake systems, which are by far the most common type in light vehicles, power assist is maintained by negative pressure (i.e., below atmospheric) in the engine's intake manifold.

When an accelerator pedal is stuck with the throttle open, manifold vacuum is diminished.[6] In order to maintain brake boost until the throttle closes and restores vacuum in the manifold, many light vehicle brake systems have to rely on residual vacuum, which usually is very limited.

If the brake pedal is pumped while the throttle is open, a loss of boost can ensue quickly for some vehicles. This depends on several factors including the rate of brake pedal application and how far the pedal is depressed. Brake booster volume and residual capacity are important factors that vary among different vehicles. Some vehicles have an auxiliary vacuum pump to maintain brake boost under low vacuum conditions, but even those systems have limitations. On vehicles with a hydraulic boost system, brake boost is unaffected by manifold vacuum, as are air brake systems in heavy vehicles. If a vehicle is equipped with an anti-lock brake system (ABS), engagement of the ABS provides brake hydraulic pressure to stop the vehicle, but sufficient brake pedal force still must be maintained by the driver, so having ABS does not always mitigate a loss of brake boost.

Even with a loss of boost, a driver can usually bring a vehicle with a stuck accelerator to a stop. If a high enough brake pedal force is applied and held steadily, a vehicle's brakes typically are capable of overpowering its engine, but the force necessary on the brake pedal can be many times greater than that used in daily driving.

In some of the UA complaints in the ODI database, it was reported that the driver eventually was able to stop a vehicle with a stuck accelerator by holding down the brake pedal forcefully. However, presumably because the required pedal pressure was much greater than what those drivers were accustomed to, many complainants stated that the brakes seemed to have failed even in cases where the vehicle was successfully stopped without a crash.

D. Description of Brake-Throttle Override

A BTO is a feature that helps to address UA in trapped accelerator pedal situations and possibly in some other related situations. As reported in the press and to NHTSA, a number of vehicle manufacturers already have adopted brake-throttle override or will be incorporating BTO into their vehicle designs over the next few model years.

Based on our technical review of the technology, brake-throttle override is an electronic function of the engine control system. Generally, it works by continuously checking the position of the brake and accelerator pedals and by recognizing when an acceleration command through the accelerator pedal is in conflict with a concurrent application of the brake pedal. If the BTO system identifies that a pedal conflict exists, it invokes the override function which causes the engine control system to ignore or reduce the commanded throttle input, thus allowing the vehicle to stop in a normal fashion. How this is accomplished depends on the design of the vehicle control system. In some vehicles, BTO engagement may partially close the throttle or return it to idle. In other types of powertrains, it may reduce fuel flow or, in the case of an electric drive system, attenuate the electric current driving the vehicle. Regardless of the specific means used, BTO intervention quickly reduces or eliminates the unintended vehicle propulsion.

If a BTO system uses throttle closure to reduce power, this action may have the additional benefit of preventing loss of brake-boost by maintaining manifold vacuum (see discussion in the previous section).[7]

On a vehicle equipped with a BTO system, if for any reason an accelerator pedal fails to return after the driver stops pressing on it, BTO will engage as soon as the driver applies the brake pedal (there may be a delay built into the system on the order of one second; in some systems, other pre-conditions have to be met for the BTO to engage, as discussed below). By intervening in this way, the BTO system essentially gives the brake pedal priority over the accelerator pedal, allowing for normal braking. Thus, the vehicle can be brought to a stop with an amount of pedal effort that drivers are accustomed to, even though it may be clear that something out of the ordinary has occurred. Without a BTO system, the brakes would have to overcome the propulsive force of a racing engine, and the driver would have to ''fight'' the drivetrain as the vehicle is slowed and brought to a stop.

Because it reduces or eliminates propulsive force and also has the potential to minimize loss of power brake boost, we believe that BTO would be very effective in scenarios like those described in the relevant VOQs where drivers apparently experienced trapped pedals. In those cases, BTO would ensure that normal application of the brake pedal would produce sufficient braking to stop the vehicle. This should minimize panic on the driver's part and very likely would lower the risk of a crash following a trapped pedal event.[8]

Some manufacturers' implementation of a BTO system may include checking for certain prerequisite conditions prior to actuation. The BTO system may check conditions such as vehicle speed, engine revolutions per minute (RPM), brake pedal travel, and pedal sequence (i.e., whether the brake was pressed first and then the gas pedal, or vice versa) to determine if the driver's intention is to stop the vehicle. Based on these conditions, the BTO system may determine that the combined brake and gas pedal inputs are actually intentional, and it would not necessarily intervene in that case. This may occur, for example, if the vehicle is at very low speed and the driver presses on the brake first and then on the accelerator. This behavior is consistent with intentional driving maneuvers which may be used for such things as trailer positioning or similar situations. We believe there is no particular safety issue in these situations, and in fact this type of ''two-footed'' driving capability can be desirable and may be in widespread use. Since there is no reason for the BTO to intervene in this case, today's proposal would not prohibit this kind of BTO design. In fact, our proposal intentionally avoids restricting the specific design aspects of BTO systems so that current BTO systems

[6] The degree of this diminishment depends mainly on throttle position and engine speed.

[7] Loss of brake boost is highly dependent on the type of vehicle propulsion and the design of its braking system.

[8] We note that a BTO system fundamentally relies on brake pedal application. If the brake is not applied, even if all other necessary conditions are met, the BTO system will not engage and the vehicle accelerating force will not be suppressed. For this reason, pure pedal misapplication (meaning that a driver unintentionally steps on the accelerator pedal and does not apply the brake at all) is not addressed by installation of a BTO system.

can be accommodated to the greatest extent possible, because we believe those systems (based on our testing) would address the safety issue at hand.

Although often caused by floor mat interference, the failure of an accelerator pedal to return after release may also result from ''sticky pedal'' situations.[9] Depending on the source of ''stickiness'' in an accelerator pedal, we believe that brake-throttle override will be an effective countermeasure in most instances as it would treat sticky pedals the same as trapped pedals, and thus would prevent any significant vehicle acceleration once the brake pedal is applied.

We note that an ETC system may recognize when a pedal assembly is malfunctioning, and it may be able to invoke some fail-safe action without involving BTO. This would depend on the nature of the malfunction and the design of the control system. For example, an ETC could override the accelerator pedal assembly if signals from the pedal position sensor exceed design limits. This could occur without brake pedal application. This is a desirable response to a broken pedal assembly and meets the need for safety independent of any brake-throttle override capability.

IV. Technical Discussion of Accelerator Control System Safety Issues

A. Accelerator Control System Disconnections

In the past, vehicles had mechanical throttle systems consisting of rods, levers, cables, and springs to translate movement of the driver-operated accelerator pedal into throttle plate rotation. These systems were subject to the possibility of disconnection or separation of its linkages. Without a safety countermeasure such as a spring-loaded throttle plate, a disconnection in a mechanical system could result in a throttle plate that remained open after the driver let off of the accelerator pedal.

Similarly, return springs are susceptible to the possibility of disconnection or breakage, which could lead to an open throttle if the control system lacks a backup spring or other supplemental means of closing the throttle.

There also is the possibility that an accelerator control system could have excessive friction between its moving parts, especially in very cold temperatures. This could inhibit the throttle from immediately rotating back to idle after release of the accelerator pedal.

FMVSS No. 124 has been in place since the 1970s to ensure that disconnections, separations, or severances do not result in an open throttle and potentially a runaway vehicle. The Standard also prohibits ACSs that return the throttle to idle too slowly even with no disconnections, which could be hazardous in severe instances.

These protections against disconnections and slow-returning throttles are carried forward in today's proposal.

B. Electronic Throttle Control

Now that mechanical accelerator controls have been superseded by ETC, the kinds of failures that might occur are somewhat different. In an ETC or ''throttle-by-wire'' system, the driver still uses an accelerator pedal to modulate drivetrain output. However, most of the mechanical components linking the pedal to the throttle on the engine now are supplanted by electronic components including sensors, electric motors, a control module, and connecting wires. Some mechanical parts, particularly springs, are still employed, but the primary connection between the pedal and the engine throttle is electronic.

Disconnections of the kind covered by FMVSS No. 124 are possible in ETC systems, but would involve separation of electrical connectors or severance of connecting wires rather than disconnection of linkages or cables. In official letters of interpretation, NHTSA has asserted that disconnection of power and ground wires in ETC systems, as well as shorting of those wires, are to be considered among the faults covered by the Standard, and the agency has conducted compliance testing accordingly. However, none of these electrical disconnections are explicitly addressed in FMVSS No. 124 currently.[10] As such, today's proposal updates FMVSS No. 124 to incorporate these interpretations so that the standard will now have specific regulatory language to address electronic ACSs.

C. Potential ETC Failures Not Covered

ETC systems generally are designed with fail-safe characteristics such as fault checking and control redundancy to prevent throttles from opening unintentionally. They often have ''limp home'' modes which restrict the throttle opening to a small range when a fault occurs. These fail-safe characteristics limit engine power so that the vehicle is incapable of abrupt acceleration. However, NHTSA understands that manufacturers and suppliers have implemented ETC systems in different ways and have incorporated different fail-safe characteristics in the design of these systems.

Allegations of throttles failing to close after accelerator pedal release, or throttles opening unexpectedly without accelerator pedal input, have been widely publicized, and it has been alleged that some such incidents have been caused by electronic faults such as errant throttle control signals or ambient electrical disturbances. The agency has been carefully evaluating the safety of ETC systems through research and defect analysis, and we engaged the National Academy of Sciences (NAS), an independent scientific body, to study the problem of UA in motor vehicles. The NAS issued a report in January 2012 to broadly address the issue of safety in electronic vehicle control systems. (Note that this study is different from the NASA report released in February 2011 which focused specifically on Toyota ETC systems.)[11]

Until this work is complete, it is premature to propose additional safety requirements at this time. Therefore, the only ETC failures within the scope of this proposal are disconnections of ETC components and wiring which result in open or short circuits, which is consistent with NHTSA interpretations of the current language of FMVSS No. 124.

V. Proposed Update of FMVSS No. 124 Test Procedures

We believe that changes set forth in this proposal are necessary to ensure that the longstanding requirements in FMVSS No. 124 remain relevant for modern ACSs.

[9] This may occur due to a malfunction in the moving parts of an accelerator pedal assembly causing the pedal to lose its ability to quickly spring back to its rest position. The assembly, after it has been in service, may develop excessive internal friction for a variety of possible reasons such as: internal springs or sensing elements can break; seating surfaces and housings can deform or fracture and fragments may lodge in moving parts; or foreign liquids can penetrate and coagulate inside the assembly. Manufacturing variation can play a role, as well as environmental factors like heat, cold, and moisture, which can lead to warping and corrosion. NHTSA has experience with pedal defects of this kind which have led to recalls, most notably the Jan. 2010 recall of accelerator pedal assemblies in Toyota vehicles [NHTSA Recall no. 10V–017].

[10] For a fuller discussion of these letters of interpretation, please see NPRM of July 23, 2002 (67 FR 48117).

[11] The NASA report is available at: *http://www.nhtsa.gov/PR/DOT-16-11.* After ten months of studying Toyota's ETC system, NASA was not able to identify an electronic cause of large, unintended throttle openings.

Although this proposal introduces new test procedures, we believe it does not impose a significant new burden on vehicle manufacturers. In fact, we expect it can relieve certification burden by providing test procedures for different kinds of accelerator control systems and also by accommodating fail-safe strategies other than return of a throttle to a mechanical stop.

We note that this portion of today's proposal is nearly the same as the 2002 NPRM (July 23, 2002, 67 FR 48117), with two exceptions. First, an intake airflow rate criterion has been added to the other disconnection test procedures as a compliance option that may be useful for spark ignition engines. This criterion has been added in response to comments on the 2002 NPRM. Secondly, the powertrain output test we are proposing would use vehicle terminal speed or ''creep speed'' instead of some other parameter like engine speed or torque. This also has been added in response to comments on the 2002 NPRM.

A. Purpose and Scope of FMVSS No. 124 at Present

The scope of FMVSS No. 124 as it currently exists is limited to how quickly a throttle returns to idle, either in normal operation (i.e., without any disconnections) or in the event of a disconnection or severance in the control system. We have sought to maintain the scope of the existing Standard by limiting today's proposal to what was designated in past agency interpretations as being within scope, and by limiting the additional test procedures to the minimum necessary for non-mechanical ACSs. For example, where the present Standard applies to single-point failures such as the disconnection of one end of a throttle cable, today's proposal also is limited to single-point disconnections such as removal of a single electrical connector or severing a conductor at one location.

The current language of the test procedure in FMVSS No. 124 is expressed in terms of the return of an observable moving part, i.e., the throttle plate, to a closed or nearly closed position. It does not prescribe other types of vehicle fail-safe responses besides throttle closure. This neglects the variety of ways in which powertrain output in a vehicle with a modern throttle control system can be reduced to an acceptably benign level, e.g., spark adjustment, even though the throttle plate may be at a non-idle position. It also leads to non-optimal test procedures for hybrid or electric vehicles and diesel-engine vehicles whose drive power may not be governed by throttle position.

The current Standard's stated purpose is to ''prevent engine over-speed.'' The sole performance criterion, expressed in terms of throttle plate closure, does indeed have the effect of limiting engine speed, or more specifically engine torque. That, in turn, limits power output to the drive wheels.

FMVSS 124's focus on control of the throttle was a convenient criterion at the time the Standard was adopted. However, NHTSA does not believe the intent of the Standard should be construed as merely setting a limitation on throttle position. Instead, it is evident that the fundamental safety purpose of the Standard is to prevent a vehicle's powertrain from creating excessive driving force when there is no input to the accelerator pedal. There would be no safety reason whatsoever to require the throttle to close if that did not limit vehicle propulsion.

B. Need for Update of FMVSS No. 124

Even if it is well established that FMVSS 124 does apply to ETC systems, regulating ETC systems by drawing analogies to mechanical systems has undesirable outcomes. This can lead to situations, as we have mentioned, where safe engine responses are discounted, and test methods for some alternative types of vehicle propulsion are not clearly defined.

There are important questions about exactly how the Standard should be applied to ETC. For example, in a request for interpretation, one vehicle manufacturer suggested that merely placing two return springs on the accelerator pedal assembly satisfied the requirement for ''two sources of energy'' capable of returning the throttle to idle. NHTSA responded that, while that approach might be enough to satisfy the need for pedal return, it could not ensure return of the engine throttle itself in the event of a disconnection beyond the pedal.

Another reason that FMVSS 124 needs updating is that powertrain responses that can result from failures in electronic systems are much more varied than with mechanical systems. Fuel injection and ignition timing are among factors that can be varied without any change in throttle position.

For example, we have seen engines with spring-loaded throttles that do not close fully to idle when disconnected from the electrical harness. They assume a default position that is slightly more open than idle. This kind of ''limp-home'' feature presents no safety hazard. In fact, it provides a safety benefit by avoiding engine stalling and allowing the vehicle to be moved out of traffic, which can be critical for preventing a crash. Engines with this kind of design may accomplish the essential fail-safe performance by retarding the ignition timing or restricting fuel delivery so that the engine torque output is limited to a level at or below what is normally provided at idle. A design of this kind thus is able to achieve an equivalent level of safety without full return of the throttle.

Other technology also illustrates the need for this update of FMVSS 124. Modern engines routinely have variable valve lift and/or timing control. In at least one recent engine design, the level of valve control is great enough that the throttle plate no longer throttles the engine during at least part of the engine's operating range. Instead, air intake is throttled to a large extent by the intake valves themselves while the throttle plate stays in an open position. In such a design, requiring ''return of the throttle to the idle position'' would be design restrictive without any safety justification.

Furthermore, the reduced relevancy of the throttle plate removes the most easily observable component for verifying return-to-idle. For some engines such as electronically controlled diesel engines with unitized injectors, assessing compliance cannot be done by simply observing retraction of a traditional fuel rack to a set position. This means that some alternative method of verifying return-to-idle is needed.

In spite of these facts, even the most advanced engines do have an idle state, and it is still possible to identify a measurement criterion for them and to expect these types of engines to return to a safe idle state.

In order to recognize the advancement of engine technology, and to better regulate advanced vehicle propulsion systems, improved regulatory language is needed. This proposal addresses this need with revised regulatory language to include new test procedures that can be applied to a variety of vehicle propulsion systems.

C. Applicability to Electronic Throttle Control Components

NHTSA concluded in published interpretation letters that electrical wires and connectors in an electronic ACS are analogous to mechanical components in a traditional ACS and are therefore subject to the same safety requirements as their mechanical counterparts. We were able to conclude this because the regulatory language, although modeled on mechanical features of carbureted engines, actually is stated in very general terms. It defines the ACS as ''all vehicle components, except the fuel-metering device, that regulate engine speed in direct response to the movement of the driver-operated control and that return the throttle to the idle position upon release of the actuating force.''

NHTSA stated that the ACS does not consist only of the accelerator pedal assembly and the wiring harness connecting it to the engine control module (ECM), but extends beyond the ECM to include connections to the actual throttling device on the engine. We stated that the ACS must extend beyond the pedal assembly because those components are the only link between the engine throttle and the accelerator pedal. Otherwise, if the electrical connection between the ECM and throttle actuator was disconnected for example, no fail-safe action would be required, which would be contrary to the Standard's primary purpose.

There was also the issue of whether the ECM itself should be considered part of the ACS. We concluded in the interpretation letters that the ECM should be considered an ACS component for the purposes of the Standard because throttle control signals originate within it. We stated that the ECM as a whole unit, along with its associated external connective wires, are critical ''linkages'' that in effect form a connection from the gas pedal to the engine throttling device.

On the other hand, it was less clear whether internal circuitry within the ECM or another enclosed electronic module should be subject to ''severances and disconnections.'' If that were the case, the system might have to withstand disruption of internal electronic elements such as the microprocessor without causing loss of throttle control. Instead, we concluded that the internal elements of an ECM, besides serving functions unrelated to throttle control, are analogous to the internal fuel-metering parts of a carburetor, which the existing Standard's ACS definition specifically excludes. Thus, the agency's position has been that severances or disconnections of elements inside of the ECM or another enclosed module in the ACS are outside the scope of Standard No. 124.

The 2002 proposal included new regulatory language to clarify FMVSS 124's applicability to electronic components. It included the following requirement for fail-safe performance:

> Severances and disconnections include those which can occur in the external connections of an electronic control module to other components of the accelerator control system and exclude those which can occur internally in an electronic control module.

The interpretation letters (discussed in the July 2002 NPRM) also recognized that disconnections of wires between electronic components could result in short circuits, not just open circuits. For that reason, the proposed regulation also stated:

> The accelerator control system shall meet [these] requirements * * * when either open circuits or short circuits to ground result from disconnections and severances of electrical wires and connectors.

These requirements are carried forward in today's proposal.

D. Test Procedures of the 2002 NPRM

Of the several test procedures included in the 2002 NPRM, the first was essentially the air throttle plate position of the original Standard, normally applicable to conventional gasoline engines.

A second proposed procedure, new to FMVSS 124, allowed for measurement of net fuel flow rate, and was included primarily for diesel engines, but could be applied to vehicles with other types of powertrains.

A third proposed procedure, also new, allowed for measurement of electric current flow to an electric drive motor, and was intended for electric vehicles and for the electric driven portion of hybrid vehicles.

Finally, the 2002 NPRM proposed a new procedure which would use engine speed to indicate idle state. As conceived, the procedure was to be conducted on a chassis dynamometer in order to simulate a realistic load on the drivetrain. RPM was thought to be a valid idle-state measurement as long as the appropriate amount of load was exerted on the drivetrain of the vehicle so that the engine speed response reflected actual driving conditions. The engine RPM test was considered a multi-purpose test because it could be applied to different powertrain types including those of gasoline, diesel, and possibly electric vehicles.

Under the 2002 NPRM, a manufacturer could choose any one of the proposed test procedures as a basis for compliance, and the choice was to be irrevocable so that failure to comply under the selected procedure could not be negated merely by trying each of the other procedures in hopes of successfully complying.

All of the procedures in the proposal were premised on return to a ''baseline'' idle condition which was the measured idle of the vehicle in normal operation, i.e., without any faults or disconnections in the ACS. Return to the ''baseline'' idle was treated as analogous to return of a throttle plate to the idle position. A tolerance was deemed appropriate to accommodate overshoot and/or fluctuation which are possible responses when disconnections are present in electronically controlled throttle systems. The proposal set the idle state tolerance at 50 percent above the measured baseline value.

E. Powertrain Output Test Procedures and ''Creep Speed''

Early on in the effort to update FMVSS No. 124, comments from industry groups led to the idea that a performance test which measured engine output would be a useful alternative to a throttle position test. Among suggested measurement criteria were engine RPM and drive wheel torque. This idea evolved into using vehicle speed as a measurement criterion, and the term ''creep speed'' was applied to this because it would measure the speed that a vehicle has when it ''creeps'' along. Creep speed describes the condition of a vehicle moving under its own power when it is in gear and has no input to the driver-operated accelerator control. It is defined as the maximum or terminal speed that a vehicle can achieve in that condition both with its ACS intact and with disconnections.

This test had the significant advantage of being ''technology-neutral'' meaning that it would be applicable to all forms of vehicle propulsion. However, measuring vehicle speed as a compliance criterion necessitates testing a vehicle under real or simulated driving conditions. That meant that a chassis dynamometer would be required for a creep speed test, or else the vehicle would have to be tested on a test track.

At the time of the 2002 proposal, NHTSA was persuaded that the creep speed test had merit, but decided that further evaluation of the idea was necessary for a number of reasons. First, it was necessary to verify feasibility of using a dynamometer to measure creep speed since the agency did not have a similar procedure in any other regulation. Second, it would be necessary to determine whether creep speed was a useful and practical performance criterion. Lastly, we wanted to demonstrate the practicability of conducting compliance tests using that approach.

Subsequent to the 2002 NPRM, NHTSA conducted a series of tests using a wheel-driven (chassis) dynamometer at the Transportation Research Center (TRC) in East Liberty, Ohio. A report describing the testing and results is available in the docket number cited in the heading of this notice. Tests were conducted using three ETC-equipped vehicles instrumented with torque wheels on their drive axles for measurement of the net acceleration or deceleration torque. As described in the report, the dynamometer was programmed so that its power absorption simulated the net road force of actual driving conditions, including the effects of tire rolling resistance and aerodynamic drag unique to each test vehicle.[12]

Dynamometer tests were conducted on each vehicle in a variety of operational conditions including both normal operation and with disconnection faults. The testing evaluated vehicle response to the types of disconnections that are possible in electronic ACS systems. Torque output, vehicle speed, and engine RPM were measured parameters of each test. Throttle plate position was also monitored. The latter was useful for determining if a vehicle's design strategy to limit engine power during fail-safe operation was to use throttle control or some other factor. The following are key test results of NHTSA's testing:

ACS CREEP SPEED TEST RESULTS

	Chevrolet pick-up, LT245/75R16	Buick Lacrosse sedan, P225/55R17	Toyota Corolla sedan, P195/65R15
Creep Speed at unfaulted idle	3 mph–4 mph	5 mph	4.9 mph.
Maximum faulted creep speed	9 mph	23.5 mph	23.6 mph.
Fault condition where maximum creep speed occurs.	Disconnection at throttle actuator (whole connector).	Pedal harness disconnect at 40 mph or greater.	Disconnection at throttle actuator (whole connector).

This NHTSA testing indicated that drivetrain torque values were low following each sampled type of ACS disconnection. This was evident in that the test vehicles' engines did not race to a high RPM level and the vehicles decelerated or gradually accelerated (depending on the initial test speed) to their terminal creep speeds. The vehicles behaved as if they were operating either in a normal idle or a ''high idle'' condition, except in a few cases where the result was stalling or rough idling. The vehicles remained easily controllable in terms of being free of any abrupt acceleration. At any point in each test, it was possible to bring the test vehicles to a stop on the dynamometer with only light brake application (equivalent to or only marginally greater than that needed to prevent movement of an in-gear vehicle at a normal idle).

The drivetrain output test procedure that we are proposing today as an alternative to throttle position, fuel delivery rate, air intake rate, or electric power delivery is based on this creep speed methodology. We are proposing that FMVSS No. 124 should allow a maximum creep speed for all vehicles of 50 km/h (31 mph). This is a speed that we concluded would accommodate typical light vehicle responses to ACS disconnections including various limp-home modes. This was based in part on a demonstration of vehicle response to pedal position sensor disconnection using a popular passenger vehicle with ETC. The demonstration was conducted as part of an ex-parte meeting and discussion with vehicle manufacturers as a follow-on to the 2002 NPRM.[13]

Our subsequent laboratory tests, as reported above, showed that this level of speed is equivalent to a relatively small amount of drivetrain torque output. Considering that this speed would be the ultimate terminal speed of a vehicle with an ACS disconnection, it represents a small and easily controllable amount of vehicle acceleration. We believe that it is a reasonable threshold that would ensure safety in the event of an ACS disconnection.

The proposed procedure would measure terminal speed following an ACS disconnection from any initial vehicle speed. It is divided into two parts, corresponding to whether the initial test speed is greater or less than the required maximum of 50 km/h. For initial speeds lower than 50 km/h, the vehicle's terminal speed following an ACS disconnection would have to stay below the 50 km/h threshold. For higher initial speeds, the terminal speed following a disconnection would have to drop to 50 km/h or lower within some specified period of time after the accelerator control is released. We call the latter case the ''coastdown'' procedure. The creep speed and coastdown procedures are discussed in more detail later in this document.

F. Comments on the 2002 NPRM

A number of comments were submitted in response to NHTSA's 2002 NPRM (before it was withdrawn). Commenters included The Alliance of Automobile Manufacturers (Alliance), The American Trucking Associations (ATA), The Association of International Automobile Manufacturers (AIAM), and The Truck Manufacturers Association (TMA). Some individual member companies of those organizations also submitted comments including Blue Bird Body Company, BMW Group, Ford Motor Company, American Honda Motor Company, and Volkswagen of America, Inc.

The comments were generally supportive of NHTSA's effort to update FMVSS 124, but raised a number of important issues. To a great extent, changes we have made in the current proposal vis-à-vis the 2002 NPRM address those issues. The following is a brief point-by-point summary of the comments:

AIAM

- Cancellation of ''limp-off-the-road'' mode by brake pedal application is design restrictive.
- 50 percent idle state tolerance is insufficient and could lead to stalling; range should be defined by manufacturer or some different way.[14]
- Favors having compliance options, but objects to ''irrevocable selection.''
- Suggests fuel delivery and air intake rate tests be done simultaneously (combine S6.2 and 6.3), i.e., measure both quantities at once; vehicle ''passes'' if either measurement meets the specification.
- Recommends allowing optional early compliance with the new standard.

[12] Road force data is available for U.S. vehicles through the Environmental Protection Agency's annual vehicle database which is available on the EPA Web site: *http://www.epa.gov/otaq/crttst.htm.* The EPA measurements are derived using a coastdown technique defined in SAE J2264 ''Chassis Dynamometer Simulation of Road Load Using Coast Down Techniques'' (APRIL 1995).

[13] See docket NHTSA–2002–12845–0014, record of discussion and demonstration held on December 10, 2002, with Toyota.

[14] AIAM did not suggest a specific definition.

BMW

- Favors deleting ''normal operation'' requirement or at least adding appropriate test procedures.
- Increase delay time allowed for return of entire powertrain to idle state in the proposed RPM test.
- Allow manufacturer to define an acceptable range for idle.
- If NHTSA keeps tolerance, 50 percent is not large enough.
- Procedure in S6.2.5, S6.3.5, and S6.5.5 should say ''remove actuating force after at least 3 sec. but before X sec.''
- Concerned with use of ''indefinitely'' with respect to maintaining idle following disconnection.
- The dynamometer-based RPM test procedure would be overly burdensome because manufacturers would have to consider so many permutations of vehicle mass, final drive gearing, and drag.
- Uncertainty in measurement of RPM return time by itself is probably greater than the specified 3 second allowance.

Honda

- Tolerance of 50 percent is too small—high altitude example given; suggests much larger tolerance since even twice the baseline (100 percent tolerance) would still be safe for drivers to handle.
- With automatic transmissions, gear selection is modified after an ETC failure occurs, *i.e.,* the vehicle cannot maintain same gears in failure-mode tests as in baseline tests.
- Favors measuring vehicle speed, not engine speed, in RPM procedure.

Volkswagen

- Favors establishing an overall powertrain output test as main criterion in the safety standard.
- Maximum idle should be defined according to manufacturer, not according to baseline measurement.

Blue Bird

- Supports the 2002 NPRM in full; two year lead-time relieves burden of compliance.

Ford

- Supports NHTSA effort; specific comments included with Alliance and TMA submittals.

ATA

- Recommends that the ''idle state'' definition be consistent throughout the standard.
- Recommends performance-based test for cancellation of ''limp-home'' mode instead of specifying brake application which is too design restrictive.
- Believes that the 50 percent tolerance should be adjusted to account for likely variation in fuel rate at or near idle.

Alliance

- Believes tolerance concept is impracticable and 50 percent is inadequate.
- linking maximum idle to baseline is design restrictive and unnecessary for safety.
- Fail-safe idle state varies too much to achieve stable conditions for comparison to baseline.
- Stalling will result if fail-safe idle is restricted as proposed.
- Standard 124 should be based on a manufacturer-specified maximum idle.
- Suggests technology neutral ''powertrain torque output'' test for fail-safe operation.
- Technology-neutral test should apply to normal operation as well as fail-safe (but not sure what compliance criterion should be used).
- Return to idle should not be required before removal of pedal force after fault inducement.
- Asks for confirmation that manufacturers will be allowed to make running changes in production to ''irrevocable selection''.
- Electronic ''dashpots'' should be treated the same as mechanical ones in current standard (however, this would be unnecessary if NHTSA allows manufacturer-specified maximum idle).
- ''Detection by powertrain control system'' should be added to stop-lamp illumination as an allowable indicant of brake pedal application.
- When air throttle percent-opening is close to zero at idle, 50 percent is meaningless.
- Definition of ''air throttle position'' neglects non-rotating (slide type) throttles; suggests a simplified definition.

TMA

- Anticipates most trucks using fuel rate test to comply; suggests that fuel rate signal, not fuel delivery rate, is the appropriate criterion.
- Severing power to the ECM shuts down processor, which means fuel rate signal goes away, which would necessitate observing some other compliance measure.
- Wants to allow bench test of stand-alone engine instead of whole vehicle but not sure how ''impose test load'' as used in the procedures would apply to a test of a stand-alone engine, *i.e.,* not mounted in a truck chassis.
- Irrevocable selection wording too restrictive.
- Recommends performance-based specification for removal of limp-home mode, not the design-restrictive ''service brake apply'' in the NHTSA proposal.
- Wants return to or below the baseline to be an acceptable response.
- Asks if the tolerance is based on 50 percent of the average, maximum, minimum, or what? Also thinks the term ''indefinitely'' should be defined or quantified.

Generally, these comments have been addressed in today's proposal where appropriate or necessary. We have removed the procedure which specified that a limp-home mode would have to be cancelled by a light application of the service brake. Limp-home modes instead have to fall within the 50 percent tolerance of the applicable idle state indicant, or cannot exceed the allowable creep speed of 50 km/h.

We have not increased the tolerance but left it at 50 percent as proposed in 2002 because commenters did not provide a specific alternative value or any rationale to support changing the tolerance.

We have maintained the ''irrevocable selection'' stipulation given that we want to deter a manufacturer that fails to comply under their chosen test option from claiming compliance under another test option.

In regard to determining the idle state for a test vehicle, we continue to believe that measuring a baseline value for the idle prior to executing any disconnections is a better alternative than requiring the vehicle manufacturer to provide idle state information for each test vehicle. This issue was discussed in the 2002 NPRM, and the reasoning has not changed. Essentially, we believe it is more expedient and practical to ascertain the baseline idle as part of the test methodology.

Among other issues raised in comments on the 2002 proposal, and how we propose to address them, are the following:

- We have elected to leave FMVSS No. 124's ''normal operation'' requirement in today's proposal because it has always been part of the Standard and no compelling reason for removing it was offered by any commenter. It may be relevant for vehicle operation in very cold temperatures.
- Some commenters disagreed with our use of ''indefinitely'' to refer to the required duration of a vehicle's return-to-idle following a disconnection. We believe it is necessary for safety to prohibit a design in which the throttle initially responds to an ACS disconnection by closing but re-opens

after a short time. We would consider alternative suggestions for how to ensure that idle is maintained following disconnection, and we request comment on this issue.

• The tolerance of 50 percent may not be relevant when applied to a throttle position because it is not valid for a closed or nearly closed throttle. In general, engine output is not a linear function of ''percent throttle opening.'' NHTSA requests comment on the best way to evaluate throttle position as it relates to engine output (i.e., angular position, percent of full open, or some other measure) and how the 50 percent tolerance should be applied to throttle position.

• Regarding the comment suggesting how to define throttle position for rotating air throttles, we note that the term ''percent throttle opening'' was not defined in the 2002 proposal even though it was used in one of the proposed compliance criteria. As above, we are requesting comment on how best to define throttle position so that it corresponds with drivetrain output.

• Regarding the comment that, when measuring fuel rate or air intake rate, disconnection of the ECM power might cause the internal processor to stop functioning, and thus the fuel rate or air intake rate signal would cease: We do not view this as a significant difficulty because it can be assumed that the engine would shut down in this case, which would of course qualify as a complying vehicle response since powertrain output would go to zero.

• To the extent that we have not addressed in today's proposal comments that were made on the 2002 NPRM and remain relevant, we request further comment in response to this proposal.

VI. Notice of Proposed Rulemaking

This section explains how we propose to amend FMVSS No. 124 so that crashes and associated injuries or deaths as described previously can be minimized.

Based in part on NHTSA's VOQ data, we propose in this NPRM to address drivers' inability to stop vehicles in stuck-accelerator emergencies by amending FMVSS No. 124 to require a brake-throttle override system on all light vehicles having ETC.

With this requirement, we intend for the effect of the BTO system to be independent of the stopping capability provided by a vehicle's service brakes. That is, even if stopping power alone is sufficient for a vehicle to meet the performance requirement under high-speed, open-throttle conditions, we are proposing that there still must be electronic intervention invoked by brake application to abate drive torque caused by a stuck accelerator pedal.

A. Definition of Electronic Throttle Control System

We propose to define electronic throttle control as an accelerator control system in which movement of a driver-operated control is translated into throttle actuation at least in part by electronic, instead of mechanical, means. Note that in this definition, ''accelerator control system,'' ''driver-operated accelerator control,'' and ''throttle'' are separately defined terms whose definitions are included in the regulatory text. This definition is necessary to identify vehicles to which the BTO requirements would apply, i.e., those having ETC.

B. Brake-Throttle Override Equipment Requirement

We also are proposing an equipment requirement for BTO. This would be included in addition to a BTO performance requirement as described in the next section. We are proposing the requirement in paragraph S5.4.1 of § 571.124.

The equipment requirement also would specify that a BTO system may be designed so that it does not engage at speeds below 10 mph, as discussed below.

This equipment requirement is necessary to ensure that a brake-throttle override capability is installed on each vehicle, and that a manufacturer's certification is not based only on brake system performance. Otherwise, it might be possible for a manufacturer whose vehicle meets the BTO performance test without engagement of a BTO system to avoid installing BTO altogether.[15] Under this requirement, BTO must engage if the powertrain controller determines that inputs to the brake and accelerator pedals are conflicting. This means not just that the pedal inputs are overlapping but also that they probably are unintentional; are unlikely to occur in normal driving; and may create an unsafe operating condition. For example, if a vehicle is travelling at a high rate of speed, and the brake is forcefully applied while accelerator pedal input signal remains high, it is logical to conclude that the driver's intent is to slow the vehicle and that the throttle command should be ignored. On the other hand, if overlap between the accelerator pedal and brake exists only briefly, such as for less than one second, there is no reason to engage an override feature since a vehicle could not accelerate much in such a short time span, and the potential for loss of control would be very small.

This proposed equipment requirement makes BTO engagement optional below 16 km/h (10 mph). We believe this will accommodate most ''two-footed'' driving situations which have legitimate purposes such as maneuvering trailers, pushing other vehicles (as police sometimes do to move stalled vehicles out of traffic), and in off-road driving. These driving scenarios are not considered to be unsafe, and there is no compelling safety reason to prohibit them.

The proposed equipment requirement limits required BTO engagement to ''conflicts'' between the accelerator pedal and brake, so that BTO systems can allow for left-foot braking and other two-footed driving situations as manufacturers see fit to accommodate their customers. For example, a brake-first-then-accelerator sequence of pedal application would not necessarily be considered a ''conflict'' and so would not always have to engage the BTO.

The 10 mph (16 km/h) cut-off is the speed below which initial engagement of BTO is not required. That is, if a pedal conflict initially occurs below 10 mph, the onset of BTO intervention is not required until the vehicle speed reaches 10 mph. Once vehicle speed reaches 10 mph, BTO must engage at that point, assuming other conditions for engagement exist. This does not mean that, if BTO engages at a speed above 10 mph, the BTO can disengage as the vehicle slows to below 10 mph. It must remain engaged until the vehicle has been brought to a stop and remain engaged until either the pedal conflict no longer exists (for example, if the driver releases the brake, or the gas pedal becomes unstuck), or vehicle drive power is removed by another action such as turning off the ignition.

We have considered whether it is appropriate to require that BTO activation be accompanied by a warning or alert to signal to the driver that BTO intervention has occurred. This could be in the form of either a visible or audible alert. We are not proposing that such an

[15] This approach of combining an equipment requirement with a performance test is similar to the approach NHTSA used in establishing FMVSS No. 126, ''Electronic Stability Control Systems.'' In that rulemaking, NHTSA stated, ''An equipment requirement is necessary because it would be almost impossible to devise a single performance test that could not be met through some action by the manufacturer other than providing an ESC system.'' [72FR17238]. In the case of brake-throttle override, whereas the proposed performance test is based on stopping distance requirements in FMVSS No. 135 which many vehicles can meet with a significant margin, it is likely that some vehicles, for instance those with high brake-torque-to-drive-torque ratios, could meet the proposed BTO performance test without actually having a BTO system.

alert be required, but we request comment on this issue, specifically if there is any safety data that would justify such a requirement.

A related issue is whether it should be possible for a vehicle operator to manually turn off the BTO function. For example, a switch or control could be provided for that purpose, similar to on/off switches for disabling Electronic Stability Control (ESC). Alternatively, a manufacturer might design an ''ESC off'' switch so that it also disables the BTO. We are not proposing to prohibit controls that turn off BTO. However, if a vehicle is equipped with a control for turning off BTO, we believe that the driver should be warned that the system is off, and the system should always default to a ''BTO On'' state whenever the ignition is cycled. We request comment on whether a BTO Off function should be allowed and, if so, how it should function.

C. Brake-Throttle Override Performance Requirement

As indicated previously, we are taking the approach in this proposal of including both a performance requirement and an equipment requirement for brake-throttle override systems. We considered establishing a design requirement as the sole requirement for BTO, but the differences among BTO systems currently available from different vehicle manufacturers are significant enough that a design requirement by itself cannot effectively accommodate them all without being overly complex and/or design restrictive. By combining a relatively simple performance test with the basic equipment requirement described above, we can achieve a robust standard which is largely performance-based and minimally costly or burdensome.

We believe this approach is appropriate because, by all indications, existing BTO systems are effective for their intended purpose, and we would not be able to justify a BTO requirement that favors one design over another or compels some manufacturers to go to the expense of re-designing their systems. In fact, NHTSA recently sampled a number of current BTO systems in a brief series of high-speed, open-throttle braking tests.[16] Those tests demonstrated that each of the different BTO designs was very effective. In each test, at speeds up to 99 mph, stopping distances of BTO-equipped vehicles with their accelerator pedal held to the floor typically were less than 5 percent to no more than 15 percent greater than normal (''normal'' meaning in a drop-throttle condition from the same test speed). That was contrasted with open-throttle stopping distances from similar speeds that were about 35 to 70 percent greater than normal for vehicles without BTO. The stopping distance improvement for vehicles with BTO compared to those without BTO was even larger in tests in which the brake pedal was modulated or ''pumped''. When combined with an open throttle, pumping of the brakes increases the pedal force needed to stop a vehicle, and this seems to be a fairly common occurrence in stuck accelerator pedal situations according to complaint narratives in the ODI database.

In order to ensure the effectiveness of new BTO systems, we are proposing an open-throttle stopping distance test. The proposed requirement specifies a stopping distance measurement in which the accelerator pedal is applied at up to 100 percent of pedal travel for the duration of the braking event. The procedure would consist of conventional stopping distance measurements in accordance with specifications found in FMVSS No. 135, ''Light vehicle brake systems.'' Where Standard No. 135 specifies that the throttle is released or the vehicle is placed in neutral, the vehicle would remain in gear with the accelerator pedal held down to as much as 100 percent of its travel. This represents the situation when an accelerator pedal is trapped by a floor mat, with 100 percent pedal application being the worst-case scenario. For the purposes of these tests, we are proposing that the minimum accelerator pedal input would be 25 percent because pedal inputs below that level may not produce significant vehicle acceleration and may not require intervention by the BTO system. (We note that this is merely to facilitate consistent BTO performance testing, and does not mean that BTO systems cannot engage at less than 25 percent accelerator pedal input.)

Test speeds for the proposed BTO procedure would be any speed from 30 km/h (18.6 mph) up to as much as 160 km/h (99.4 mph). The latter is the maximum specified under FMVSS No. 135. The procedure carries over the specification in S7.6 of FMVSS No. 135 that limits test speed to 80 percent of a vehicle's maximum speed, not to exceed 160 km/h.

The required stopping distance would be based on one of two requirements in FMVSS No. 135, depending on whether the test speed was greater or less than 100 km/h, to reflect the fact that FMVSS No. 135 stopping distances are somewhat different for speeds above and below 100 km/h. For test speeds of 100 km/h or below, the stopping distance requirement in S7.5, ''Cold Effectiveness,'' would apply. For speeds above 100 km/h, the stopping distance requirement in S7.6, ''High-Speed Effectiveness,'' would apply.

We propose that the BTO performance test would be conducted at Lightly Loaded Vehicle Weight (LLVW) as defined in S6.3 of FMVSS No. 135. Although the Cold Effectiveness and High Speed Effectiveness procedures in FMVSS No. 135 specify conducting tests at both LLVW and GVWR, the stopping distance requirement is the same regardless of the loading condition. Consequently, we believe it is unnecessary to include the GVWR loading condition in the BTO performance test. We request comments with supporting data on whether there is any safety need for BTO performance to be measured at GVWR.

Under S6.5.3.2 of FMVSS No. 135, for stopping distance procedures specifying multiple test runs, compliance is achieved if any one of the test runs is within the prescribed distance. This applies to the Cold Effectiveness and High Speed Effectiveness procedures, where six test runs are required for each set of test conditions. The vehicle is deemed to comply if at least one stop is within the required distance. We propose using this same methodology for the BTO performance tests.

All other test conditions and procedures would be in accordance with FMVSS No. 135 specifications. This includes ambient environmental conditions, track conditions, and vehicle set-up. This would utilize existing practices to the greatest extent possible, thus reducing test burden and cost.

We are proposing that the stopping distance of a vehicle in an open-throttle condition shall not be more than 5 percent greater than the required stopping distance in FMVSS No. 135, specifically as set forth in S7.5 for test speeds up to 100 km/h and S7.6 for test speeds over 100 km/h. This 5 percent margin allows for any additional stopping distance resulting from the delay that may be needed for the BTO system to engage and during which the brakes have to work against the powertrain drive torque. The stopping distances in FMVSS No. 135 do not account for any such drive torque because they are measured with the vehicle in neutral or with the accelerator pedal released. The 5 percent margin represents approximately the additional stopping distance NHTSA found was needed in

[16] See test summary ''Results of NHTSA Stopping Distance Tests of Production Brake-Throttle Override Systems'' at the beginning of the notice.

our tests of BTO-equipped vehicles (the same tests cited immediately above) comparing their wide-open throttle stopping distance to their drop-throttle stopping distance at maximum FMVSS No. 135 test speeds.

D. Update of FMVSS No. 124 Disconnection Test Procedures

New Creep Speed and Coastdown Test Procedures

We are proposing a new vehicle performance test of powertrain output as an optional test procedure for compliance with the FMVSS No. 124 disconnection requirements. This procedure would measure vehicle speed following an ACS disconnection, so-called ''creep speed,'' as the criterion for compliance. Other criteria such as engine RPM were considered and rejected as a result of comments on the 2002 rulemaking effort. By evaluating vehicle speed and acceleration, the creep speed test will directly measure the fundamental parameter that affects safety with respect to vehicle accelerator controls.

Specifically, the compliance criterion we are proposing is vehicle terminal speed following an ACS disconnection and removal of force on the accelerator pedal. In order to comply, the measured creep speed obtained with no accelerator pedal input would have to fall below a maximum allowable value, which we are proposing should be 50 km/h (31 mph). As mentioned previously in this proposal, this speed was suggested by a vehicle manufacturer and was confirmed as an appropriate level in NHTSA's tests of two passenger cars and one light truck. It would accommodate typical responses of vehicle control systems to ACS disconnections, including limp-home modes. Our tests also confirmed that this level of speed corresponds to a low level of drivetrain torque capability and thus is easily controllable.

Under our proposed requirement, in the worst case of a vehicle whose torque output following an ACS disconnection allows the vehicle to reach a creep speed of exactly 50 km/h, the vehicle would accelerate at a rate only marginally greater than it would with no ACS faults. The vehicle's acceleration would be limited to the equivalent of the aerodynamic and frictional drag forces on the vehicle at 50 km/h which, for light vehicles, is a small fraction of what the powertrain is capable of producing.

Compliance with the creep speed requirement would be evaluated by selecting any accelerator pedal input (including zero input) that results in an initial test speed below 50 km/h. Then, following disconnection of the ACS and release of the accelerator pedal (if it was initially applied), the vehicle's speed would have to remain below 50 km/h. We are proposing a time limit of 90 seconds for this procedure, meaning that the vehicle would comply if its speed does not exceed 50 km/h before 90 seconds have elapsed. If a vehicle is accelerating so slowly that it meets this requirement, then that is sufficient indication that it has an acceptable fail-safe response. The average acceleration rate to reach 50 km/h in 90 seconds is approximately 0.015 g's,[17] which is a very low value considering that conventional passenger cars are capable of well over twenty times that value at low initial speeds. The 90-second time limit also will avoid unnecessarily prolonging the tests to wait for very slowly accelerating vehicles to finally reach a terminal speed. We request comment on whether 90 seconds is an appropriate value and, if not, what time limit should be substituted and why.

For creep speed tests where the initial test speed is above 50 km/h, we are proposing a coastdown procedure which uses as a baseline the coastdown time of the test vehicle with its transmission in neutral. This compliance criterion was suggested by a vehicle manufacturer and appears to be a practical and appropriate specification. Under this procedure, each assessment of compliance would require two test runs as follows:

- The first run would measure the elapsed time required for the test vehicle to coastdown from a selected target speed to exactly 50 km/h in neutral gear. The coastdown time measured in this way should constitute a worst-case since there would be no engine braking (resistance to vehicle motion resulting from engine friction and compression, independent of the vehicle brake system) to decelerate the vehicle. This elapsed time would be a ''baseline'' for comparison to the result of the second test run.
- In the second run, conducted at the same target speed but with the vehicle remaining in gear, coastdown would commence following an induced ACS disconnection and release of accelerator pedal. As in the first run, elapsed time for the vehicle to decelerate to 50 km/h would be the measured value.

Compliance would be determined by comparing the coastdown time in these two runs. The coastdown time in gear, from the second run, would have to be less than the coastdown time in neutral, from the first run. This comparison would verify that the powertrain output of the test vehicle in fact was reduced to a safe level, i.e., a level that produces less than a 50 km/h terminal speed, while at the same time establishing a time limitation to ensure that the rate of deceleration is not unreasonably low.

As NHTSA has not had the opportunity to conduct trials using this methodology, we are requesting comment on any issues related to this proposed coastdown test procedure.

We are proposing that the vehicle creep speed and coastdown time measurements would be conducted using a chassis dynamometer to impose road force through the vehicle's drive wheels. The general test parameters for this type of dynamometer testing are available in an industry standard, SAE J2264, ''Chassis Dynamometer Simulation of Road Load Using Coastdown Techniques.'' We are proposing to incorporate by reference portions of that SAE standard. In NHTSA compliance testing, the vehicle's terminal speed would be measured following an ACS disconnection when using the test procedures and environmental conditions specified in the SAE standard. For testing using a dynamometer, manufacturers would have the option of either measuring a vehicle's road load characteristic directly by use of the procedure in SAE J2264, or by looking up the necessary road load coefficients in an Environmental Protection Agency database.[18]

A potential issue with creep speed and coast-down measurements conducted on a chassis dynamometer is that FMVSS No. 124 includes test temperatures down to as low as minus 40 Celsius (equivalent to minus 40° F). To the best of our knowledge, existing vehicle dynamometer facilities normally cannot achieve ambient temperatures that low. Therefore, we specifically request comment on whether a different lower limit on environmental temperature should be specified in the FMVSS for tests of vehicle ACSs conducted using a dynamometer facility.

We are proposing that the new creep speed test also could be conducted on a test track, to the extent that a suitable test area with adequate straightaway space is available. When starting from a high speed in the coastdown portion of the proposed test procedure, a vehicle may coast for a number of minutes. The

[17] 'G' or 'g' is a unit that refers to the average acceleration produced by gravity at the Earth's surface.

[18] See *http://www.epa.gov/otaq/crttst.htm.*

required length of the test area could easily be on the order of a mile or more. This may limit the feasibility of substituting a track test for a dynamometer test.

For a track test, the test area should meet a maximum slope specification since any significant grade could affect test outcome. Furthermore, in order for the test to be repeatable, wind conditions would have to be light, and air temperature should also be within a limited range because these factors influence aerodynamic drag. We are proposing the following conditions for creep and coastdown speed measurements conducted on a test track:

• Straight course of dry, smooth, unbroken concrete or asphalt pavement with a continuous grade of not more than 0.5 percent in any direction;

• Ambient temperature between 5 C (41 °F) and 32 C (90 °F);

• Average wind speed no greater than 16 km/h (10 mph) with gusts no greater than 20 km/h (12 mph) and with the wind velocity component perpendicular to the test direction no greater than 8 km/h (5 mph).

To the best of our knowledge, these conditions are consistent with current industry practice for this kind of testing. We request comment on these proposed conditions, specifically any information to support why NHTSA should consider different test conditions.

We believe that this new method of compliance is a necessary addition to FMVSS No. 124 that fulfills the need for a ''technology neutral'' test that can be applied to any type of wheel-driven motor vehicle regardless of the type of propulsion system it uses. This procedure is performance-based and uses established vehicle test methods that should be familiar to the industry. Therefore, we believe that this new proposed procedure is both practicable and objective.

New Air Intake and Fuel Delivery Rate Tests

This proposal includes a fuel delivery rate test procedure as in the 2002 NPRM. It also includes a new air intake rate test procedure that was not included in the 2002 NPRM. This procedure was suggested in comments as an alternative that will expedite testing of some vehicles. It is identical to the fuel rate test, but uses mass airflow rate rather than fuel flow rate to quantify the state of vehicle power output and whether the engine is at idle.

These test procedures are logical extensions of the traditional throttle position test. For most existing gasoline engines, throttle position indicates (and in fact controls) the rate of intake of air/fuel mixture into the engine which, in turn, determines engine power output. Since the air/fuel ratio stays relatively constant over the engine's operating range, observing either the fuel intake rate or air intake rate also provides a valid indicant of engine output, and either quantity can substitute for throttle position. In effect, fuel rate, air intake rate, and throttle position are equivalent for FMVSS 124 purposes in that they each can indicate whether the engine is at idle.

For diesel engines, the traditional FMVSS 124 test indicant is the fuel rack position which determines fuel flow. (The fuel rack is the mechanical linkage on older diesel engines that moves back and forth when the accelerator pedal is pressed and released; its operation is analogous to a mechanical throttle linkage on a gasoline engine.) Fuel rack position corresponds to fuel intake rate, so we are proposing that, on modern diesels without a fuel rack, the net fuel delivery rate is the appropriate engine power indicant. Diesels operate on excess intake air unlike a gasoline engine, so power output cannot necessarily be gauged by air intake rate alone. We request comment as to the appropriateness of air intake rate as a measurement criterion for diesel engines, and also whether there are other possibilities for diesels besides those we have considered here.

Components Included in an Accelerator Control System

In interpretation letters on FMVSS No. 124 which responded to questions about which parts of an ETC system are considered ACS components, we treated an ACS as a series of linked components extending from the driver-operated control to the throttling or fuel-metering device on the engine or motor. Electronic systems using wires, relays, control modules, and electric actuators joining the accelerator pedal to the throttle or injectors on the engine are analogous to mechanical systems in which levers, cables, and springs serve the same purpose. We indicated that a severance at any one point in the system should not result in a large increase in engine power, and that this also applies to an ACS that mixes mechanical and electronic components.

Nevertheless, an ETC system is less easily defined than a mechanical one because a variety of components can influence engine speed without being in the direct line of action between the accelerator pedal and the throttling device on the engine. As in the 2002 NPRM, we see two basic approaches for defining the items included in an electronic ACS.

One approach would be to list in the regulatory text of the Standard each and every component, including each conductor, connector, module, etc., which is subject to the fail-safe requirements. This explicit approach would provide a high degree of specificity, but would lack flexibility. It carries a significant risk that a connective component omitted from specific mention in the standard would be excluded from regulation, even if the omission was unintentional.

An alternative approach, and the one that we have chosen to adopt in this proposal, is to specify in general terms the connective components that are regulated. This approach lends a greater degree of flexibility and leaves open the possibility that the regulatory language can be adapted to new technology. The covered ACS parts still would be limited to ''connective components'' only, so we believe that using this general approach does not diverge from the scope of the existing Standard.

We are listing here some common components of an ACS to illustrate the intent of the proposed Standard and to make it widely acknowledged that these components are considered connective components of an ACS. This is not intended to be an all-inclusive list. The following enumerates some of the connective components for both mechanical and electronic systems that we believe must comply with the disconnection requirements of FMVSS No. 124:

• Components of an Air- or Fuel-Throttled Engine

The critical connective components of the ACS are: (1) The springs or other sources of stored energy that return the driver-operated control and the throttle to their idle position; (2) the linkages, rods, cables or equivalent components which are actuated by the driver-operated control; (3) the linkages, rods, cables or equivalent components which actuate the throttle; (4) the hoses which connect hydraulic or pneumatic systems within an ACS; (5) the connectors and individual conductors in the electrical wiring which connect the driver-operated control to the engine control processor; (6) the connectors and individual conductors in the electrical wiring which connect the ECM to the throttle or other fuel-metering device; and (7) the connectors and individual conductors in the electrical wiring which connect the ECM to the electrical power source and electrical ground.

The ECM itself is also included as a single component of an electronic ACS. However, as before, we treat the fail-safe (i.e., disconnection) requirements of the

Standard as pertaining to the external connections to and from the ECM. We consider the internal elements of the ECM to be like the internal elements of a carburetor or throttle body injector, which are not subject to the fail-safe requirements of the Standard. The wiring and connectors between the pedal position sensor and the ECM, the wiring and connectors between the ECM and the fuel or air throttling device on the engine, and the power and ground connections to the ECM all qualify as connective elements rather than internal ones.

• Components of an Electric Propulsion System's ACS

For an electric motor-driven vehicle, the critical connective components of an ACS are: (1) Springs or other sources of energy that return the driver-operated control and the motor speed controller to the idle position; (2) linkages, rods, cables or equivalent components which are actuated by the driver-operated control; (3) linkages, rods, cables or equivalent components which actuate the motor speed controller; (4) hoses which connect hydraulic or pneumatic actuators and components within the ACS; (5) connectors and individual conductors in electrical wiring connecting the driver-operated control to the motor speed controller or motor control processor; (6) connectors and individual conductors which connect the motor control processor to the motor speed controller (if they are separate modules); (7) connectors and individual conductors in the electrical wiring which connect the motor control processor to electrical power and ground; and (8) the connectors and individual conductors in the electrical wiring from the motor speed controller to the electric traction motor.

Definition of Idle State

Based on comments NHTSA received on the 2002 NPRM, manufacturers would prefer that the Safety Standard allow the manufacturers to determine what is an acceptable idle state. Manufacturers consistently commented that the idle state varies according to a number of factors such as engine temperature, accessory load, emission controls, and altitude. It may not be possible to specify fixed values for throttle position, engine speed, fuel rate, etc., because those characteristics can change according to many conditions without any input from the accelerator pedal. They pointed out that limp-home modes can adjust engine operation to prevent stalling and to provide enough power for a vehicle to be moved from an unsafe location in the event of a malfunction.

The current Standard accommodates a range of idle state values by allowing any throttle position ''appropriate for existing conditions.'' In a traditional air-throttled engine which has a mechanical throttle stop that designates the idle position of the throttle, the throttle stop can change position as dictated by operating conditions. For example, it may move to a position of increased throttle opening when the engine is cold. In testing, the throttle stop provides a convenient reference position that makes determination of compliance a simple matter.

Vehicle manufacturers recommended that idle state should be a manufacturer-specified data item provided to NHTSA for each compliance test. Under this approach, each manufacturer would specify a value or range of values for the applicable idle state indicant for each of its vehicles.

After considering the comments, we are not persuaded that this approach is the best solution to the question of how to define an appropriate idle state value. We believe it would be burdensome to have to obtain idle state data from manufacturers for each test vehicle, potentially for numerous possible operating conditions.

Instead, we believe it is easier and more practical to establish a baseline idle state simply by measuring the initial value of the applicable idle state indicant (throttle position, fuel delivery rate, electrical power input, etc.) at the beginning of a compliance test (i.e., immediately before any fault is induced). This initial value would be an appropriate baseline because it would account for whatever operating conditions exist at the time a test takes place. It is convenient because it is measured directly as part of the test procedure, and it does not depend on information provided by vehicle manufacturers.

Once the baseline is established, the value of the idle state indicant at the end of the test is expected to be the same as or close to the baseline value established at the start of the test (within a tolerance range, as defined below). Compliance is indicated by whether or not the idle state returns to the baseline value within the elapsed time specified in S5.3 of the regulatory text.

This approach is valid only if operating conditions such as engine temperature, accessory load, etc., are fairly constant during a test since adjustments made by an electronic control system to compensate for changes in conditions would not be observable but rather would take place within the ECM. Consequently, it could be difficult to distinguish between a permissible increase in idle state and a noncomplying one.

In order to address this, NHTSA's proposal specifies that operating conditions must be held constant to the greatest extent possible during fail-safe tests in order to minimize variations in engine idle that are not due to an ACS disconnection. In a compliance test, the engine must be stabilized and all accessory controls fixed so that conditions that affect idle state do not change significantly during the course of the test. This includes operating the engine long enough to deactivate cold start features as well as to stabilize emission controls. We have specified that the engine must be operated for at least 5 minutes prior to any measurement of idle, as this should be sufficient to achieve a reasonably steady idle state. We request comment whether 5 minutes is an appropriate value.

For some operating characteristics such as ''variable displacement'' or cylinder de-activation modes, we recognize that maintaining a constant operating condition may not be straightforward. It would be acceptable to either prevent engagement of these kinds of features during testing or to ensure that they do not change the idle state during testing. We request comment on what means are available to ensure that features like cylinder deactivation do not influence test results.

Under today's proposal, the baseline value is established by observing the idle state indicant for an engine with a normally functioning ACS. For the ''normal operation'' requirement, the compliance criterion would be the time to return to the baseline value from the moment of release of the accelerator pedal from any position within its full range of movement. For the ''fail-safe'' requirement, the idle state following a disconnection in the ACS is compared to the baseline value to ensure that it is close to (i.e., within the tolerance) or below the baseline. The time elapsed from the moment of the disconnection and pedal release for the measured value to return to the baseline value must be within the Standard's specified time spans (1 second for light vehicles). With the engine operating in a steady state with accessory controls at fixed settings, any difference in the ''before and after'' idle states should be attributable to the induced disconnection.

Two Sources of Energy for Returning Throttle to Idle

At present, FMVSS No. 124 states in S5.1, ''there shall be at least two sources of energy capable of returning the throttle to the idle position'' within the specified time limits from any accelerator position or speed, whenever the driver removes the actuating force on the accelerator pedal. It also specifies that, whenever one source of energy fails, the other shall be able to return the throttle to idle. In the past, springs have been the predominant sources of energy for return to idle. That appears to still be the case for accelerator pedal assemblies of vehicles with electronic accelerator controls and for throttle bodies. These assemblies usually incorporate multiple springs, and testing of fail-safe operation would still include disconnection of each single spring.

However, because the standard requires return-to-idle regardless of whether there are two sources of energy present, this requirement may be considered superfluous. Most if not all manufacturers will continue to provide two or more return springs on accelerator pedal assemblies and throttle bodies whether or not there is an explicit requirement for it because it is a simple way of meeting the ''single-point disconnection'' requirement when one of the springs is disconnected.

As we have noted elsewhere in this proposal, our letters of interpretation have stated that, although having two or more springs on a pedal assembly is a good idea, that alone is not sufficient to ensure compliance with the FMVSS No. 124 fail-safe requirements. For example, dual springs on the pedal assembly would be irrelevant if the assembly's electrical connector was disconnected.

For these reasons, we believe it may be appropriate to delete the requirement for two sources of energy which return the throttle to idle. We request comment on this issue.

Under today's proposal, the single-point disconnection requirement is applicable to any source of throttle return energy connected to the ACS. This includes electric motors and actuators, solenoids, and other electrically powered devices. The electric power source for these components would be considered a ''source of energy'' for closing the throttle, and thus the power and ground leads for these components would be subject to disconnection.

Criteria for Return to Idle in Normal Operation

Engines With a Traditional Throttle Plate

Like the previous NPRM, this proposal retains return of a throttle plate to the idle position as the criterion for normal operation of air-throttled engines with a traditional throttle. This criterion is still valid for many gasoline engines with either mechanical or electronic accelerator controls, and probably will continue to be for the foreseeable future.

Diesel Engines

For diesels (and other fuel-throttled engines), this proposal provides fuel delivery rate (gallons/hour of fuel entering the combustion chambers of the engine) as a measure of idle state. It requires return of the fuel rate to the idle fuel rate as a measure of return-to-idle. For diesel engines, power is controlled directly by controlling fuel flow. The result of rapidly releasing the accelerator control is a rapid return of the fuel rate to the steady idle rate, and there is no need to account for the time lag required for the engine speed to return to idle. In this respect, the fuel rate of fuel-throttled engines is analogous to the throttle position of air-throttled engines.

Engines With Unitized Injectors

An engine with self-contained, integrated fuel injectors (called ''HEUI'' injectors for High Energy Unit Injector), now commonplace in commercial trucks, is potentially problematic with respect to return to idle criteria because it has multiple ''throttles,'' those being its individual injectors, which can operate independently of each other. However, fuel flow rate for these engines generally can still be used to quantify the operational state of the engine. The fuel rate combines the action of the individual injectors and represents the steady effect of all the injectors' dynamic duty cycles (percent open time or pulse width and frequency). It also avoids the problem of the lack of a visibly observable throttle reference position. Fuel rate thus provides a satisfactory return-to-idle indicant for modern diesel engines with electronic fuel systems.

For light vehicles, similar fuel control arrangements may become more prevalent as diesels become more common and direct-injection gasoline engines enter the marketplace. We believe these vehicles will be able to comply by either the fuel rate test or one of the other available test procedures described in this proposal.

For many heavy vehicles, we understand that a fuel rate signal which consolidates the effect of fuel pressure and fuel injector duty cycle is available as a standardized diagnostic channel. For engines without this diagnostic signal, direct measurement of fuel flow in the supply and return lines would be necessary to ascertain the net fuel rate.

Electric Motors

For vehicles which use electric motor propulsion, the electric power input at the drive motor (computed from voltage and current) would be used as the indicant idle state. This measurement responds directly to the operation of the motor controller which, like a unitized electronic fuel injector, is a throttle without a measurable reference position. Since drive torque is directly proportional to the drive motor input current and voltage, this indicant is equivalent to throttle position. Alternative measurement criteria used for non-electric vehicles such as fuel delivery rate are not applicable to electric vehicles, but we request comment on whether there are any other measurement criteria that would be appropriate for electric vehicles.

No Normal Operation Test Corresponding to Creep Speed Method

Unlike the test procedures for throttle position, fuel delivery rate, air intake rate, and electric power delivery, the creep speed test does not have a corresponding normal operation criterion. This was the subject of at least one comment on the 2002 NPRM that suggested that an engine output criterion should be provided for normal as well as fail-safe operation. However, establishing a normal operation requirement based on creep speed would require restricting aspects of vehicle performance such as engine braking effect that have never been part of FMVSS No. 124 or any other NHTSA regulation. For example, a normal operation requirement for creep speed might specify that a vehicle has to coastdown to a speed of 'X' from an initial test speed of 'Y' in 'Z' seconds. This would place restrictions on vehicle rolling resistance and engine-braking that are unrelated to safety. Therefore, a creep speed-based normal operation requirement is not feasible under FMVSS No. 124.

Consequently, if a manufacturer selects the creep speed procedure to certify to the fail-safe requirement, a different procedure would have to be selected to certify to the normal operation requirement.

Response Time for Normal Operation

This proposal maintains the existing requirement that, in normal operation (i.e., without faults in the ACS), return to idle must occur within 1 second after release of the accelerator pedal for light vehicles, and within 2 seconds for heavy vehicles (over 10,000 lb. GVWR). The required response time is 3 seconds if the test vehicle is exposed to temperatures of minus 18 Celsius or lower during any portion of the 24-hour conditioning period, for both light and heavy vehicles.

Fail-Safe Performance Criteria

Because electronic ACSs can use various means to reduce vehicle power in response to an ACS disconnection, our intent in this proposal is to allow manufacturers to take advantage of those possibilities by establishing fail-safe criteria that are performance-oriented rather than design-oriented.

Powertrain Output ''Creep Speed'' Test Option

We have included in S6.5 of the proposed regulatory text a new ''technology-neutral'' powertrain output test performed on a dynamometer or test track, as described previously in this document (see ''New Creep Speed and Coastdown Test Procedures'' under section VI D, above). This test of fail-safe response is performance-based and independent of powertrain design, i.e., it is valid for any type of powertrain in any wheel-driven vehicle. It provides a universal measurement criterion, i.e., maximum vehicle terminal speed, that has direct relevance to the safety purpose of FMVSS 124. The new creep speed and coastdown procedures require that a test vehicle cannot accelerate appreciably if its initial speed is below 50 km/h and must decelerate if its initial speed is above 50 km/h upon release of the accelerator pedal following an ACS disconnection. The new creep speed and coastdown procedures appear in section S6.5 of the regulatory text of this rule which specifies controlled test conditions for accurate exertion of road load on the drivetrain.

Fail-Safe Performance Test for Air-Throttled Engines

For air-throttled engines, return of the throttle plate to the idle position is the least burdensome test for many vehicles in current production. This alternative is identical to the procedure of the present Standard. A second alternative is return of the fuel rate to the idle state. For air-throttled engines, engine power cannot vary substantially from the idle state if the fuel rate is constrained to the value observed at the idle state. Thus, fuel delivery rate is a reliable indicant that engine power is constrained. Similarly, a third alternative is mass airflow rate through the intake manifold. Air intake rate behaves like fuel delivery rate for vehicles whose fuel-air ratio stays relatively constant as operating conditions vary. Thus, air intake rate is also an acceptable indicant of engine power output.

Fail-Safe Performance Test for Fuel-Throttled Engines

Since fuel-throttled engines such as diesel engines may operate with excess intake airflow, neither the position of an air throttle, if one is present, nor the air intake rate would be an accurate indicant of engine power. Fuel delivery rate, on the other hand, is an accurate and sufficient indicant of engine power for these engines in most cases. The same fuel delivery rate criterion specified for evaluating compliance in normal operation of fuel-throttled engines is included in this proposal as an optional test for fail-safe performance.

Some modern diesel and gasoline direct injection engines may inject additional small amounts of fuel during a single injection cycle. This extra fuel does not contribute to propulsion, but is intended to smooth engine operation or to meet emissions requirements. If vehicles with these types of engines could not be adequately tested using the fuel delivery rate procedure, then the optional creep speed procedure would be an appropriate alternative since that test is not sensitive to any particular fuel delivery characteristics.

Fail-Safe Performance Test for Electric Vehicles

For vehicles driven solely by electric motors, we are proposing that an optional test of fail-safe performance be the same as the normal operation criterion, i.e., return of the drive motor electric power input to the idle state. This procedure can also be applied to the electric drive motor of a hybrid vehicle.

Fail-Safe Performance Test for Hybrid Vehicles

For a hybrid vehicle that combines more than one type of propulsion system, the most applicable test procedure would be the creep speed test which would evaluate the net driving effect of the various propulsion systems working together. Alternatively, fail-safe performance of each separate engine's or motor's accelerator controls could be demonstrated independently using test options appropriate for each type of propulsion system. For example, on a gas-electric hybrid, the gas engine might be tested by measuring the throttle position while the electric motor is tested by measuring current and voltage.

Response Time Requirements for Fail-Safe Operation

The required response times for the idle state indicant to return to or near the baseline value following an ACS disconnection are the same as those given in the current Standard and also for normal operation of the ACS. For light vehicles (under 10,000 lb GVWR), return to idle must occur within 1 second after ACS disconnection and release of the accelerator pedal, or, within 2 seconds for heavy vehicles (over 10,000 lb. GVWR). The required response time is 3 seconds if the test vehicle is exposed to temperatures of minus 18 Celsius or lower during any portion of the 24-hour conditioning period, for both light and heavy vehicles.

For the proposed creep speed procedure, compliance is not based directly on the time required for an idle state indicant to return to idle. Instead, for test speeds at or below 50 km/h, compliance is based on whether the vehicle's terminal speed remains below 50 km/h for at least 90 seconds after an ACS disconnection; for test speeds greater than 50 km/h, compliance is based on whether the time required to coast down to 50 km/h is greater or less than the coastdown time in neutral from the same test speed.

E. Compliance Options for Various Vehicles

Our proposal would require manufacturers to specify one of the following criteria as the basis for certifying a vehicle to the requirements of S5.1 (normal operation) and S5.2 (fail-safe operation) of the standard: Throttle position, fuel delivery rate, air intake rate, electric power delivery, and creep speed/coastdown performance. The selection would be at the option of the manufacturer. However, while one of the criteria, creep speed/coastdown performance, could be used for any vehicle, the appropriateness of the other criteria would depend on the nature of the vehicle. For example, an electric vehicle could be certified based on electric power delivery in addition to creep speed/coastdown performance, and a vehicle with a gasoline engine could be certified based on throttle position, fuel delivery rate, and air intake rate, as well as creep speed/coastdown performance. We believe it is appropriate to permit multiple options to manufacturers so long as each option would meet the relevant safety need. We request comments on the appropriateness of each of the proposed options; the possibility of a manufacturer seeking to use an option that might not be appropriate for a vehicle given the characteristics of the vehicle and, if so, the safety consequences; and whether there is a need for the regulation to limit any of the options to vehicles with particular characteristics.

VII. Safety Benefits and Crash Data

A rule based on today's proposal would be expected to prevent most crashes resulting from accelerator pedal entrapment, including floor mat incidents. The accidents that could be avoided are similar to highly publicized crashes that have played a key role in the escalation of UA as a nationally recognized safety problem.

With regard to the ACS disconnection requirements, any benefits associated with the original FMVSS No. 124 safety standard would be unchanged by this proposal.

A. Summary of Crash Data on Accelerator Control Issues

Three of NHTSA's crash datasets were identified as potential sources of information about possible accelerator control issues in passenger vehicles: Fatality Analysis Reporting System (FARS), National Motor Vehicle Crash Causation Survey (NMVCCS), and National Automotive Sampling System—Crashworthiness Data System (NASS–CDS). FARS is an annual census of fatal traffic crashes based upon secondary data sources such as the police accident report. NMVCCS was a one-time three year special study of crashes involving at least one passenger vehicle towed due to damage and investigated by NHTSA with an emphasis on pre-crash factors. NASS–CDS is an annual sample of crashes involving at least one passenger vehicle towed due to damage and investigated by NHTSA with an emphasis on crashworthiness factors. Overall these databases each contain cases involving an allegation of a stuck accelerator or throttle, and the available information is summarized below. However, each of these sources also has limitations that should be considered when using the results.

Fatality Analysis Reporting System (FARS)

FARS is a nationwide census providing yearly data regarding fatal injuries suffered in motor vehicle traffic crashes. FARS records when a pre-existing vehicle defect or condition is noted in police accident report (PAR) as a vehicle related factor. According to the FARS Coding and Validation Manual, ''the report may indicate that a component is inadequate, inoperative, faulty, damaged or defective.'' The FARS Manual also cautions that the presence of a vehicle related factor ''only indicates the existence of the condition(s)'' and that the condition ''may or may not have played a role in the crash.''

The most relevant vehicle related factor in FARS to identify possible accelerator control issues is ''power train.'' The code for ''power train'' includes the following components: universal joint, drive shaft, transmission, engine, clutch and gas pedal. In the 2009 data there were seven light passenger vehicles with the presence of a power train related factor involved in seven fatal crashes resulting in ten fatalities.

Because of the inclusion of many different components and situations in the category of powertrain, researchers must request the PAR from the State and review the narrative sections to extract additional information. However, in this case, analysis of these seven PARs indicated that the police reports did not typically contain useful information for understanding whether the accelerator control was a factor in the crash. Our analysis also indicated that many of the reports with this designation involve vehicles that stalled.

National Motor Vehicle Crash Causation Survey (NMVCCS)

NMVCCS was a nationwide survey of crashes involving light passenger vehicles, with a focus on the factors related to pre-crash events. A total of 6,949 crashes were investigated between January 1, 2005, and December 31, 2007. Of these, 5,470 cases comprise a nationally representative sample. The remaining 1,479 cases are suitable for clinical study. Each investigated crash involved at least one light passenger vehicle that was towed due to damage.

The advantage of NMVCCS over FARS for identifying possible accelerator control issues is twofold. The first is that the data in NMVCCS are based upon the investigation of a researcher trained to focus on pre-crash events rather than exclusively on secondary sources such as the PAR. The second is that NMVCCS contains a more specific vehicle related factor. According to the NMVCCS SAS Analytical Users Manual, the vehicle related factor of ''engine'' in NMVCCS ''documents if the vehicle experienced an engine related problem during the pre-crash phase. Examples of engine related problems include stalling, missing, and throttle problems.'' There were 26 cases that included a vehicle with an engine related problem—20 in the nationally representative sample and 6 among the case studies. After reading the crash narratives associated with these cases, most of them involved engines that stalled or overheated. Only three cases involved a problem with the accelerator control: Case numbers 2005074596262, 2007008450848 and 2007079486127. The first case involved a 1984 Oldsmobile Cutlass that was known to have an accelerator problem before the crash. The driver reported that ''the vehicle would not remain running unless [he] held [his] foot on the gas and then [put] the vehicle into gear'' and that while doing this right before the crash ''the accelerator stuck at full throttle.'' The second case involved a 1994 Chevrolet Corvette that the driver reported was not running properly. The driver ''tried to feather the gas, upon doing so the gas pedal stuck down.'' The driver lost control while braking and steering. The third case involved a 1965 Ford Mustang where the ''accelerator became stuck and the vehicle accelerated to approximately 129 km/h (80 mph).'' The driver lost control and left the roadway after applying the brakes. Only two of these three cases were part of the nationally representative sample, and there are not enough cases to accurately estimate a sample size for the problem.

National Automotive Sampling Survey—Crashworthiness Data System (NASS–CDS)

NASS–CDS is an annual nationally representative sample of traffic crashes involving at least one passenger vehicle towed due to damage. The advantage of NASS–CDS is that many years of data can be examined, and this analysis focuses on the most recent ten years (2000 through 2009). A limitation, however, is that NASS–CDS does not have a coded variable to search for possible accelerator control factors. Instead, the identification of potentially relevant cases is based upon searching the crash narrative for key words. A caveat associated with this search is that the potential accelerator control issue must be mentioned in the crash narrative and the key words must be able to identify these cases.

A search of the crash narrative for ''throttle,'' ''accelerator'' or ''gas pedal'' resulted in 44 cases from 2000 through 2009. However, in many of these cases the person applied the gas pedal rather than the brake. In a few cases the driver's foot struck the accelerator usually because of a medical condition such as a seizure but sometimes because of the foot becoming trapped or wedged. However, eleven cases during the ten-year period indicated an accelerator control issue. Additional searches were conducted for ''racing,'' ''acceleration'' and ''runaway'' to find cases related to racing engines, sudden or UA and runaway vehicles. However, these searches did not produce any additional relevant cases.

The following table summarizes the results, including a brief recap of the accelerator control issue as described in the narrative:

Make	Model	MY	Notes
Chevrolet	Corvette	1995	The PAR reported the throttle had stuck open for some reason.
Oldsmobile	Cutlass	1989	Vehicle throttle stuck open.
Oldsmobile	Ciera	1990	The driver of the vehicle has indicated that his accelerator pedal stuck causing the loss of vehicle control.
Ford	F-Series Pickup	1997	The driver stated the accelerator stuck.
Chevrolet	C/K/R/V-Series Pickup	1988	The driver experienced a problem with the accelerator, attempted to stop at the marked intersection, but was unable to stop.
Buick	LeSabre	1989	The driver stated that the accelerator stuck and he could not stop the vehicle.
Pontiac	Bonneville	2002	The PAR related the driver was driving in lane one of the three-lane, one-way street when the accelerator stuck and the driver took evasive action and steered the vehicle to the left so he would not run out into traffic. But the interview stated the driver was parked on the right side of the road and when he started up the vehicle it took off.
Chevrolet	Cavalier	1990	The vehicle's accelerator stuck depressed.
Chevrolet	Blazer	1996	A portable oxygen tank fell onto the accelerator.
Ford	Bronco	1985	The accelerator of vehicle got stuck.
Infiniti	J30	1993	The driver claimed the accelerator stuck.

Overall it appears that the claims of accelerator control issues span a variety of vehicle models and model years. Also, in most cases, the only information available about the nature of the problem is a claim that an accelerator or throttle ''stuck'' while the vehicle was in motion. In some cases the narrative explicitly mentioned that the driver tried to stop but could not. Two of the eleven cases do not fit the general pattern of a stuck accelerator with little additional information. In one case an oxygen tank fell on the accelerator, and the driver was unable to stop the vehicle. In another case, there were conflicting reports of whether the driver could not stop a moving vehicle or whether the vehicle suddenly accelerated from a stopped position.

There are several reasons that NASS–CDS is not particularly useful for providing national estimates of the incidence of accelerator control issues. As mentioned previously, searching for key words in the narrative requires that the information be recorded in the narrative and that the key words are capturing all of the appropriate cases. A second reason is that the information available in the narrative is usually just the claim of a stuck accelerator or throttle with little additional information to understand the nature of the problem. A final reason is that the sample size of eleven cases over ten years is not sufficient for accurately estimating the problem size. Nevertheless, to the extent that we are able to identify in NASS–CDS some cases where an accelerator pedal became stuck, along with out test track assessment of vehicles with the technology, we believe brake-throttle override would be a solution for mitigating the subsequent crashes that occurred.

Because the FARS, NASS, and NMVCSS data are of limited usefulness for estimating harm caused by ACS-related failures, we cannot estimate the safety problem on a national level. However, based on media reports, our analysis of recent ODI complaint data, observations from NASA's review of certain Toyota vehicles, and NHTSA's history with floormat issues and other types of problems that prevent an accelerator pedal from responding normally, we believe this rulemaking is necessary.

B. Owner Complaint Data

The Office of Defects Investigation (ODI) is the office within NHTSA responsible for conducting defect investigations and administering safety recalls in support of NHTSA's mission to improve safety on our nation's roadways. One important means by which ODI discovers vehicle safety-related defects is self-reporting by vehicle owners. By relating the information over a toll-free hotline or by filling out a VOQ on-line,[19] vehicle owners can provide complaint information that is entered into ODI's vehicle owner complaint database. This information is used with other complaints and information to determine if a safety-related defect trend exists.

Our analysis and discussion of stuck and trapped accelerator pedals in today's notice is exemplified by ODI VOQs because consumers have described crashes or incidents involving a vehicle speeding out of control with a stuck accelerator pedal. These incidents cannot be identified readily from data elements in NHTSA's traditional crash data sources (as discussed in the previous section) or there are too few cases available in those databases. In addition, one of the specific observations made by the NASA in its report to NHTSA on Toyota unintended acceleration stated that some VOQs indicate that drivers may not know or understand the vehicle response when they attempt to control a runaway vehicle, i.e., that the high engine speed resulting from a shift to neutral will not harm the vehicle, or that pumping vacuum-assisted brakes can decrease their effectiveness.[20]

There are important qualifications in the use of VOQs as a data source for conducting rulemaking. Among them are:

• VOQs are self-reported data, meaning that the information they contain is dependent on the description of an incident provided by the driver, another involved party, or someone related.

[19] The VOQ form and other information about filing a complaint can be found at the following NHTSA-administered Web site: *www.safercar.gov*

[20] See Observation O–1 in section 7.2, page 172, of the NASA report at: *http://www.nhtsa.gov/PR/DOT-16-11*.

• There may be no follow up investigation to verify what actually happened or to make an objective analysis of the root cause of a crash. However, in the case of complaints involving UA, ODI did do extensive follow-up work, mostly in connection with defect investigations that were opened, and attempted to confirm, for example, if there was evidence of floor mat interference contributing to a UA incident.

• Important facts about other possible contributing factors in these incidents may be unavailable.

• The crashes and incidents reported are not randomly selected (random selection is a normal prerequisite for statistical analysis.) In the case of UA incidents, selection depended partly on which vehicles were involved in ODI investigations.

• Many relevant incidents may be unreported because the driver or other party chose not to file a complaint or did not know how or where to do so.

• The numbers of complaints relating to any safety problem may either under-represent or over-represent the extent of the problem on a national level.

VOQs can, however, help to identify emerging safety issues and problems that drivers are having, which is appropriate for what we are trying to address with this proposal. NHTSA's analysis and breakdown of UA complaints is available in the February 2011 NHTSA report, ''Technical Assessment of Toyota Electronic Throttle Control (ETC) Systems,'' [21] Section 2. Using a broad keyword search and manual review of the results, NHTSA identified a total of 9,701 UA incidents of all types involving model year 1998–2010 vehicles reported in VOQs between January 1, 2000, and March 5, 2010. It was possible to identify the UA initiation speed in 5,512 of those incidents, and a crash was indicated in 2,039 of the 5,512. Of those crashes, 16 percent had either medium or high initiation speed (defined as at least 15 mph or 45 mph, respectively).

Although we do not know how many of those complaints are attributable to UA resulting from stuck or trapped accelerator pedals, there are many examples of VOQs which indicate that the accelerator pedal was stuck, or something to that effect, including some that specifically mention floor mat entrapment. A few of these go into greater detail, describing harrowing incidents that exceed a minute in duration, include swerving in and out of traffic, and are accompanied by severe heat damage to the brakes. While these are relatively uncommon compared to overall crash/incident risk, they often pose extra danger because of the longer duration of the events and the freeway environment where they often occur which may include evasive action by surrounding vehicles, therefore exposing more people to crash risk.

In any case, it appears that stuck or trapped accelerator pedals present a serious safety problem and occur frequently enough to warrant regulatory action, even if accurate quantification of the problem is not possible at the present time.

VIII. Cost, Lead Time and Other Issues

A. Cost of the Proposed BTO Requirement

We expect the cost of a brake-throttle override requirement for light vehicles to be close to zero for the following reasons. As of model year 2012, all but two light vehicle manufacturers have incorporated brake-throttle override in the ETC-equipped vehicle models that they produce for sale in the U.S. This is based on manufacturer-supplied information that NHTSA receives as part of our annual safety compliance testing program. There are a few specific ETC-equipped models currently without BTO because they are at the end of their product design cycle and which either will be discontinued or will be equipped with BTO in the next design cycle, prior to the effective date of any final rule which results from this proposal.

The proposed BTO regulation would set minimum requirements for existing as well as future light vehicle BTO systems. Based on our experience with them, existing systems will meet the proposed standard without modification. However, if some systems do require changes to meet the proposed standard, we believe the changes would be minimal.

Because of the nearly 100 percent market penetration of the technology, the fact that most if not all systems already would meet the rule, and given that a final rule would not take effect for at least one or two years from the date of today's notice, we expect that manufacturer design, validation, and implementation costs attributable to the proposed brake-throttle override requirement for light vehicles would be close to zero.

Compliance testing costs also are expected to be low since the proposed test procedure is nearly identical to existing brake performance test procedures and could be conducted along with existing brake performance tests.

B. Proposed Lead Time and Phase-In

As discussed in Section V, we believe that current vehicles should be able to comply with the ACS disconnection requirements in this proposal without significant lead time because the updated procedures in this proposal do not change the basic return-to-idle requirement that has applied to motor vehicles for as long as the current standard has been in effect. We are proposing the following lead time for compliance with the disconnection requirements in this proposal as follows:

• Each vehicle shall comply within one year from the next September 1 following the date of publication of the final rule.

We are not proposing a phase-in period for the disconnection requirements because the proposed rule codifies the positions taken by the agency on those requirements that have been promulgated in interpretation letters available for a number of years to industry and the public. Also, our compliance testing of vehicles with ETC has not demonstrated significant compliance issues to date.

We are proposing that lead time for compliance with the new brake-throttle override requirements should be as follows:

• Each vehicle subject to the requirements shall comply within two years from the next September 1 of the date of publication of the final rule.

For example, if a final rule were published on October 1, 2012, the disconnection requirements in the final rule would take effect on September 1, 2013, and the brake-throttle override requirements would take effect on September 1, 2014. We believe that this would give vehicle manufacturers ample time to implement the new requirements at minimal cost.

For the brake-throttle override requirements, we believe a phase-in is unnecessary because a significant portion of new vehicles already are either equipped with a BTO system or will be by the coming model year.

We request comment on the proposed lead time, including specific safety issues or cost and production issues that might influence the effective date of the rule.

C. Vehicles Over 10,000 lb GVWR

In addition to covering light vehicles, FMVSS No. 124 also applies to heavy vehicles, i.e., trucks and buses. Many heavy trucks are diesel-powered. For

[21] The report is available on the internet at: *http://nhtsa.gov/staticfiles/nvs/pdf/NHTSA-UA_report.pdf.*

throttle system disconnection testing on those vehicles, the fuel rate compliance option would be applicable. The creep speed procedure on a dynamometer or test track would be an option also. However, since heavy truck powertrains and chassis often are produced separately by different manufacturers, a given powertrain might have to be certified for several different chassis. Responsibility for certification (assuming it is a multi-stage manufacturing situation) typically would fall to the chassis manufacturer.

For heavy vehicles, a brake-throttle override requirement may or may not be necessary. Trucks and buses already are subject to compliance with FMVSS No. 105, *Hydraulic and electric brake systems* and FMVSS No. 121, *Air brake systems,* so performance tests based on braking distance are practicable. In addition, NHTSA's complaint and crash data reports do not indicate a trapped pedal problem in heavy vehicles.

Furthermore, trucks and buses often operate at full throttle during normal driving, and the acceleration rate of trucks and buses is significantly lower than for light vehicles. Additionally, most trucks have manual transmissions for which the clutch functions as an available countermeasure in the case of a stuck throttle in a truck.

Since there is no apparent safety need for brake-throttle override systems to apply to heavy vehicles, we are proposing that the brake-throttle override requirement would apply only to passenger cars, multipurpose passenger vehicles, trucks, and buses with GVWRs of 10,000 pounds or less. However, we seek comment on this issue, specifically any data related to pedal entrapment or similar issues where BTO might be an effective safeguard.

D. Manual Transmission Vehicles

In the proposed brake-throttle override system regulation, we have not made any distinction for vehicles with GVWRs of 10,000 pounds or less equipped with manual transmissions. There are cogent reasons why manual transmission-equipped vehicles might be less susceptible to crashes resulting from trapped pedals. Primarily, these vehicles have a clutch pedal which disengages the engine from the drive-wheels. This provides an expedient countermeasure for a driver in the event of a trapped accelerator pedal. Furthermore, clutch operation is not influenced by a stuck throttle the way that brake operation may be.

Compared to vehicles with automatic transmissions, pedal placement in a manual transmission vehicle may be different and the brake pedal typically is smaller. We do not know if these factors influence trapped pedal incidents, either positively or negatively.

NHTSA invites comments on this issue. If comments include sufficient justification for excluding manual transmission vehicles from the BTO requirements, and we are convinced that there will be no safety-related consequences, we will consider adopting that exclusion. Otherwise, we would not have any basis for excluding vehicles from the brake-throttle override system requirements based on their having a manual transmission.

E. Proposed New Title for FMVSS No. 124

To reflect the addition of a Brake-Throttle Override requirement, we are proposing that the title of FMVSS No. 124 be changed from ''Accelerator control systems'' to ''Accelerator control and brake-throttle override systems.'' We invite comment on this proposed change.

IX. Rulemaking Analyses and Notices

A. Executive Orders 12866 and 13563 and DOT Regulatory Policies and Procedures

The agency has considered the impact of this rulemaking action under Executive Orders 12866 and 13563 (January 18, 2011, ''Improving Regulation and Regulatory Review'') the Department of Transportation's regulatory policies and procedures (44 FR 11034; February 26, 1979). OMB has advised us that this NPRM is not significant. This action was not reviewed by the Office of Management and Budget under these executive orders. It is not considered to be significant under the Department's Regulatory Policies and Procedures.[1]

This NPRM includes the following proposed changes to FMVSS No. 124: Adds language so the Standard explicitly applies to ETC systems; includes test procedures for hybrids and other vehicles whose propulsion is not governed by throttling of combustion air intake; and adds a new requirement for a brake-throttle override system. We believe that the cost of implementing this proposal, if adopted, would be relatively small. Given the interpretations issued by NHTSA, manufacturers should have been aware for a long time of the applicability of FMVSS No. 124 to ETC-equipped vehicles. Since this proposal does not change the scope of the ACS disconnection requirements and only defines specific test procedures for ETC systems, all vehicles should be able to comply without costly re-design. Also, since this proposal allows new alternative methods of compliance for ACS disconnections, vehicles should not have significant compliance issues.

There would likely be costs associated with certification testing. Those costs might vary somewhat depending on which procedure a manufacturer selects, but they should be similar to the costs of certifying to the current standard. In the case of the powertrain output (i.e., creep speed) test option, we expect the cost would be comparable to that for a single test run conducted for EPA emission or fuel economy purposes in a dynamometer facility or on a test track. These are tests that vehicle manufacturers conduct routinely either in their own facilities or through a commercially available source.

For Brake-Throttle-Override systems, we believe the cost of the rule would be minimal because manufacturers already are incorporating BTO in their light vehicle fleets, and those systems are likely to meet the new safety requirement without modification. This would minimize any costs attributable to a NHTSA rule. There would be compliance testing costs.

B. Regulatory Flexibility Act

Pursuant to the Regulatory Flexibility Act (5 U.S.C. 601 et seq., as amended by the Small Business Regulatory Enforcement Fairness Act (SBREFA) of 1996), whenever an agency is required to publish a notice of rulemaking for any proposed or final rule, it must prepare and make available for public comment a regulatory flexibility analysis that describes the effect of the rule on small entities (i.e., small businesses, small organizations, and small governmental jurisdictions). The Small Business Administration's regulations at 13 CFR Part 121 define a small business, in part, as a business entity ''which operates primarily within the United States.'' (13 CFR 121.105(a)). No regulatory flexibility analysis is required if the head of an agency certifies that the rule will not have a significant economic impact on a substantial number of small entities. The SBREFA amended the Regulatory Flexibility Act to require Federal agencies to provide a statement of the factual basis for certifying that a rule will not have a significant economic impact on a substantial number of small entities.

NHTSA has considered the effects of this rulemaking action under the

[1] Department of Transportation, *Adoption of Regulatory Policies and Procedures,* 44 FR 11034 (Feb. 26, 1979).

Regulatory Flexibility Act. According to 13 CFR 121.201, the Small Business Administration's size standards regulations used to define small business concerns, manufacturers of passenger vehicles would fall under North American Industry Classification System (NAICS) No. 336111, Automobile Manufacturing, which has a size standard of 1,000 employees or fewer. Using the size standard of 1,000 employees or fewer, NHTSA estimates that there are fewer than 20 small business manufacturers of passenger vehicles subject to the proposed requirements.

The Head of the Agency hereby certifies that this proposed rule would not have a significant economic impact on a substantial number of small entities. The basis for this certification is that if made final, none of the proposed changes will require the addition of new systems or equipment on existing vehicles that manufacturers are not already putting on vehicles (i.e., brake-override systems), and costs associated with the proposal will be minimal for all manufacturers, including small businesses.

C. Executive Order 13132 (Federalism)

NHTSA has examined today's proposal pursuant to Executive Order 13132 (64 FR 43255; Aug. 10, 1999) and concluded that no additional consultation with States, local governments, or their representatives is mandated beyond the rulemaking process. The agency has concluded that the proposal would not have sufficient federalism implications to warrant consultation with State and local officials or the preparation of a federalism summary impact statement. The proposal would not have ''substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government.''

NHTSA rules can have preemptive effect in two ways. First, the National Traffic and Motor Vehicle Safety Act contains an express preemption provision:

> When a motor vehicle safety standard is in effect under this chapter, a State or a political subdivision of a State may prescribe or continue in effect a standard applicable to the same aspect of performance of a motor vehicle or motor vehicle equipment only if the standard is identical to the standard prescribed under this chapter.

49 U.S.C. 30103(b)(1). It is this statutory command that preempts any non-identical State legislative and administrative law [22] addressing the same aspect of performance.

The express preemption provision described above is subject to a savings clause under which ''[c]ompliance with a motor vehicle safety standard prescribed under this chapter does not exempt a person from liability at common law.'' 49 U.S.C. 30103(e). Pursuant to this provision, State common law tort causes of action against motor vehicle manufacturers that might otherwise be preempted by the express preemption provision are generally preserved. However, the Supreme Court has recognized the possibility, in some instances, of implied preemption of State common law tort causes of action by virtue of NHTSA's rules—even if not expressly preempted.

This second way that NHTSA rules can preempt is dependent upon the existence of an actual conflict between an FMVSS and the higher standard that would effectively be imposed on motor vehicle manufacturers if someone obtained a State common law tort judgment against the manufacturer—notwithstanding the manufacturer's compliance with the NHTSA standard. Because most NHTSA standards established by an FMVSS are minimum standards, a State common law tort cause of action that seeks to impose a higher standard on motor vehicle manufacturers will generally not be preempted. However, if and when such a conflict does exist—for example, when the standard at issue is both a minimum and a maximum standard—the State common law tort cause of action is impliedly preempted. See *Geier* v. *American Honda Motor Co.,* 529 U.S. 861 (2000).

Pursuant to Executive Order 13132, NHTSA has considered whether this rule could or should preempt State common law causes of action. The agency's ability to announce its conclusion regarding the preemptive effect of one of its rules reduces the likelihood that preemption will be an issue in any subsequent tort litigation.

To this end, the agency has examined the nature (*e.g.,* the language and structure of the regulatory text) and objectives of today's rule. NHTSA does not intend that this rule preempt state tort law that would effectively impose a higher standard on motor vehicle manufacturers than that established by today's rule. Establishment of a higher standard by means of State tort law would not conflict with the proposal announced here. Without any conflict, there could not be any implied preemption of a State common law tort cause of action.

[22] The issue of potential preemption of state tort law is addressed in the immediately following paragraph discussing implied preemption.

D. National Environmental Policy Act

NHTSA has analyzed this NPRM for the purposes of the National Environmental Policy Act. The agency has determined that implementation of this action would not have any significant impact on the quality of the human environment.

E. Paperwork Reduction Act

Before a Federal agency can collect certain information from the public, it must receive approval from the Office of Management and Budget (OMB). Under the Paperwork Reduction Act of 1995, a person is not required to respond to a collection of information by a Federal agency unless the collection displays a valid OMB control number. NHTSA has carefully examined this notice of proposed rulemaking and has determined that there are no Paperwork Reduction Act consequences on motor vehicle manufacturers or any other members of the public if this NPRM is made final.

F. National Technology Transfer and Advancement Act

Under the National Technology Transfer and Advancement Act of 1995 (NTTAA) (Pub. L. 104–113), ''all Federal agencies and departments shall use technical standards that are developed or adopted by voluntary consensus standards bodies, using such technical standards as a means to carry out policy objectives or activities determined by the agencies and departments.'' In today's NPRM, NHTSA proposes to incorporate by reference, in whole or in part, two voluntary consensus standards developed by the Society of Automotive Engineers (SAE): SAE J2264 (APR 95) ''Chassis Dynamometer Simulation of Road Load Using Coastdown Techniques'' and in SAE J1263 (JAN2009), ''Road Load Measurement and Dynamometer Simulation Using Coastdown Techniques,'' the following test conditions: S7.1, ''Ambient Temperature''; S7.2 ''Fog,'' S7.3 ''Winds,'' and S7.4 ''Road Conditions.''

G. Executive Order 12988

With respect to the review of the promulgation of a new regulation, section 3(b) of Executive Order 12988, ''Civil Justice Reform'' (61 FR 4729, February 7, 1996) requires that Executive agencies make every reasonable effort to ensure that the regulation: (1) Clearly specifies the preemptive effect; (2) clearly specifies the effect on existing Federal law or regulation; (3) provides a clear legal standard for affected conduct, while promoting simplification and burden reduction; (4) clearly specifies the retroactive effect, if any; (5) adequately defines key terms; and (6) addresses other important issues affecting clarity and general draftsmanship under any guidelines issued by the Attorney General. This document is consistent with that requirement.

Pursuant to this Order, NHTSA notes as follows. The issue of preemption is discussed above in connection with E.O. 13132. NHTSA notes further that there is no requirement that individuals submit a petition for reconsideration or pursue other administrative proceeding before they may file suit in court.

H. Unfunded Mandates Reform Act

The Unfunded Mandates Reform Act of 1995 requires agencies to prepare a written assessment of the costs, benefits and other effects of proposed or final rules that include a Federal mandate likely to result in the expenditure by State, local or tribal governments, in the aggregate, or by the private sector, of more than $100 million annually (adjusted for inflation with base year of 1995). This NPRM, if made final, would not result in expenditures by State, local or tribal governments, in the aggregate, or by the private sector in excess of $100 million annually.

I. Executive Order 13045

Executive Order 13045 (62 FR 19885, April 23, 1997) applies to any rule that: (1) Is determined to be ''economically significant'' as defined under E.O. 12866, and (2) concerns an environmental, health, or safety risk that NHTSA has reason to believe may have a disproportionate effect on children. This rulemaking is not subject to the Executive Order because it is not economically significant as defined in E.O. 12866. However, since this NPRM, if made final, would require an updated ACS on passenger cars, multipurpose passenger vehicles, trucks and buses, and would require a brake-throttle override system on passenger cars, multipurpose passenger vehicles, trucks and buses with a GVWR of 10,000 pounds or less, it should have a beneficial safety effect on children riding in such vehicles.

J. Executive Order 13211

Executive Order 13211 (66 FR 28355, May 18, 2001) applies to any rulemaking that: (1) Is determined to be economically significant as defined under E.O. 12866, and is likely to have a significantly adverse effect on the supply of, distribution of, or use of energy; or (2) that is designated by the Administrator of the Office of Information and Regulatory Affairs as a significant energy action. This rulemaking is not subject to E.O. 13211.

K. Plain Language

The Plain Writing Act of 2010 (Pub. L. 111–274) and Executive Order 12866 require each agency to write all rules in plain language. Application of the principles of plain language includes consideration of the following questions:

- Have we organized the material to suit the public's needs?
- Are the requirements in the rule clearly stated?
- Does the rule contain technical language or jargon that is not clear?
- Would a different format (grouping and order of sections, use of headings, paragraphing) make the rule easier to understand?
- Would more (but shorter) sections be better?
- Could we improve clarity by adding tables, lists, or diagrams?
- What else could we do to make the rule easier to understand?

If you have any responses to these questions, please include them in your comments on this proposal.

L. Regulation Identifier Number (RIN)

The Department of Transportation assigns a regulation identifier number (RIN) to each regulatory action listed in the Unified Agenda of Federal Regulations. The Regulatory Information Service Center publishes the Unified Agenda in April and October of each year. You may use the RIN contained in the heading at the beginning of this document to find this action in the Unified Agenda.

M. Privacy Act

Anyone is able to search the electronic form of all comments received into any of our dockets by the name of the individual submitting the comment (or signing the comment, if submitted on behalf of an association, business, labor union, etc.). You may review DOT's complete Privacy Act Statement in the **Federal Register** published on April 11, 2000 (Volume 65, Number 70; Pages 19477–78).

X. Public Participation

How do I prepare and submit comments?

Your comments must be written and in English. To ensure that your comments are correctly filed in the Docket, please include the docket number of this document in your comments.

Your comments must not be more than 15 pages long. (49 CFR 553.21.) We established this limit to encourage you to write your primary comments in a concise fashion. However, you may attach necessary additional documents to your comments. There is no limit on the length of the attachments.

Comments may also be submitted to the docket electronically by logging onto the Docket Management System Web site at *http://www.regulations.gov.* Follow the online instructions for submitting comments.

Please note that pursuant to the Data Quality Act, in order for substantive data to be relied upon and used by the agency, it must meet the information quality standards set forth in the OMB and DOT Data Quality Act guidelines. Accordingly, we encourage you to consult the guidelines in preparing your comments. OMB's guidelines may be accessed at *http://www.whitehouse.gov/omb/fedreg_reproducible.*

How can I be sure that my comments were received?

If you wish Docket Management to notify you upon its receipt of your comments, enclose a self-addressed, stamped postcard in the envelope containing your comments. Upon receiving your comments, Docket Management will return the postcard by mail.

How do I submit confidential business information?

If you wish to submit any information under a claim of confidentiality, you should submit three copies of your complete submission, including the information you claim to be confidential business information, to the Chief Counsel, NHTSA, at the address given above under **FOR FURTHER INFORMATION CONTACT**. In addition, you should submit a copy, from which you have deleted the claimed confidential business information, to the docket at the address given above under **ADDRESSES**. When you send a comment containing information claimed to be confidential business information, you should include a cover letter setting forth the information specified in our confidential business information regulation. (49 CFR Part 512.)

Will the agency consider late comments?

We will consider all comments received before the close of business on the comment closing date indicated above under **DATES**. To the extent possible, we will also consider comments that the docket receives after that date. If the docket receives a comment too late for us to consider in developing a final rule (assuming that one is issued), we will consider that comment as an informal suggestion for future rulemaking action.

How can I read the comments submitted by other people?

You may read the comments received by the docket at the address given above under **ADDRESSES**. The hours of the docket are indicated above in the same location. You may also see the comments on the Internet. To read the comments on the Internet, go to *http://www.regulations.gov.* Follow the online instructions for accessing the dockets.

Please note that even after the comment closing date, we will continue to file relevant information in the docket as it becomes available. Further, some people may submit late comments. Accordingly, we recommend that you periodically check the Docket for new material. You can arrange with the docket to be notified when others file comments in the docket. See *http://www.regulations.gov* for more information.

List of Subjects in 49 CFR Part 571

Imports, Motor vehicle safety, Motor vehicles, and Tires.

Proposed Regulatory Text for FMVSS No. 124

In consideration of the foregoing, NHTSA proposes to amend 49 CFR Part 571 as set forth below.

PART 571—FEDERAL MOTOR VEHICLE SAFETY STANDARDS

1. The authority citation for Part 571 continues to read as follows:

Authority: 49 U.S.C. 322, 30111, 30115, 30117 and 30166; delegation of authority at 49 CFR 1.50.

2. Section 571.5 is amended by adding paragraphs (k)(50) and (k)(51) to read as follows:

§ 571.5 Matter incorporated by reference.

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(50) SAE 1263 (JAN2009) ''Road Load Measurement and Dynamometer Simulation Using Coastdown Techniques,'' Sections S7.1 ''Ambient Temperature,'' S7.2 ''Fog,'' S7.3 ''Winds,'' and S7.4 ''Road Conditions.''

(51) SAE J2264 (APR 1995) ''Chassis Dynamometer Simulation of Road Load Using Coastdown Techniques.''

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3. Section 571.124 is revised to read as follows:

§ 571.124 Standard No. 124; Accelerator control and brake-throttle override systems.

S1. *Scope.* This standard establishes requirements for each engine, electric motor, and other motive power source connected to a vehicle's drive wheels to return to idle, within a specified time and a specified tolerance, whenever actuating force on the driver-operated accelerator control is removed and whenever there is a severance or disconnection in the accelerator control system. This standard also establishes requirements for brake-actuated throttle override systems.

S2. *Purpose.* The purpose of this standard is to reduce deaths and injuries resulting from uncontrolled vehicle propulsion caused by malfunctions or disconnections in accelerator control systems and from conflicting inputs to the brake and accelerator controls in a vehicle.

S3. *Application.* This standard applies to passenger cars, multipurpose passenger vehicles, trucks, and buses. Section S6.6 does not apply to vehicles having a GVWR greater than 10,000 lb (4545 kg), or to vehicles without Electronic Throttle Control.

S4. *Definitions.*

Accelerator control system means all vehicle components, including both mechanical and electrical/electronic components and modules, that operate a vehicle's throttle in response to movement of the driver-operated accelerator control and that, upon removal of actuating force on the driver-operated control, return both the throttle and the driver-operated control to their idle or rest positions. For the purposes of this standard, an electronic control module is considered a single component, and the external wiring and connections of each module to other accelerator control system components and to other vehicle components including power and ground connections are subject to severance or disconnection.

Air intake rate means the rate at which combustion air is supplied to an engine.

Air-throttled engine means an internal combustion engine in which output power is controlled primarily through regulation of the air intake rate.

Ambient temperature means the temperature of air surrounding a test vehicle measured at a sufficient distance to not be significantly affected by heat from the test vehicle.

Coastdown means vehicle deceleration which occurs when there is no input to either the brake or accelerator pedals.

Creep speed means the maximum terminal speed that can be achieved when a vehicle in a lightly loaded condition, starting from a standstill or any speed of which the vehicle is capable, is driven in any gear with no input to its driver-operated accelerator control.

Driver-operated accelerator control means any device on a vehicle, such as an accelerator pedal, that a driver uses to modulate engine or motor power, but not including cruise control, locking hand throttles, or any engine or motor control not intended for regulating vehicle propulsion.

Electric power delivery means a power computation (such as wattage) derived from the current and voltage input to an electric motor that drives a vehicle.

Electronic throttle control means an accelerator control system in which movement of the driver-operated control is translated into throttle actuation, at least in part by electronic, instead of mechanical, means.

Engine or motor means any source of motive power in a vehicle, including internal combustion engines and electric motors, connected to the drive wheels and capable of propelling the vehicle.

Fuel delivery rate means the net rate of fuel use (supply minus return) in an engine.

Fuel metering device means the internal parts of a carburetor, fuel injector, fuel distributor, or fuel injection pump, and the internal elements of electronic modules in the accelerator control system such as circuit boards and discrete electrical components contained inside an engine control module, which adjust engine or motor operating variables such as fuel-air ratio and ignition timing.

Fuel-throttled engine means an internal combustion engine in which output power is controlled primarily through regulation of fuel delivery rate.

Idle or idle state means the normal running condition of a vehicle's engine or motor with no faults or malfunctions affecting engine or motor output when there is no input to the driver-operated accelerator control.

Idle state conditions are conditions which influence idle state during normal operation of a vehicle, including but not limited to engine temperature, air-conditioner load, emission control state, and the use of speed setting devices such as cruise control.

Idle state indicant means a vehicle operating parameter which varies directly with engine or motor output, including: throttle position, fuel delivery rate, air intake rate, electric power delivery, and creep speed.

Throttle means the component of an accelerator control system which, in response to movement of the driver-operated accelerator control, modulates vehicle propulsion by varying throttle position, fuel delivery rate, air intake rate, electric power delivery, or other means by which powertrain output is regulated.

S5. *Requirements.* Each vehicle shall meet the requirements of S5.1 through S5.3 when tested in accordance with applicable procedures in S6, at any ambient temperature between minus 40 and plus 50 degrees Celsius and after 12 hours of conditioning at any temperature within that range unless otherwise specified, and with its engine or motor running under any load condition and at any speed of which the engine or motor is capable.

S5.1 *Normal Operation.* The throttle shall return to idle within the time limit specified in S5.3 whenever the driver-operated accelerator control is released from any position when the vehicle is tested in accordance with S6.3.

S5.2 *Fail-safe Operation.* Each vehicle shall meet S5.2.1 or S5.2.2. A fuel metering device is not subject to disconnection or severance under this test procedure.

S5.2.1 In the event of a disconnection or severance at a single point of any one component of the accelerator control system, including disconnection or severance of an electrical component that results in an open circuit or a short circuit to ground, but not a disconnection or severance inside of an electronic module, the throttle shall return to or below idle plus a tolerance of 50 percent, within the time limit specified in S5.3 after release of the driver-operated accelerator control from any position, when tested in accordance with S6.4; or

S5.2.2 When tested in accordance with S6.5, each vehicle's maximum creep speed shall be no greater than 50 km/h (31 mph), and the vehicle shall decelerate continuously from any initial speed greater than 50 km/h of which the vehicle is capable until its speed is reduced to 50 km/h or lower, and the time required to coast down to 50 km/h shall not exceed the time required to coast down to 50 km/h from the same speed in neutral gear without faults in the accelerator control system.

S5.3 *Response Time.* When tested in accordance with S6.3 and S6.4, the maximum time to return to idle as indicated by the throttle position or other selected idle state indicant shall be

(a) Not greater than 1 second for vehicles of 4536 kilograms (10,000 pounds) or less gross vehicle weight rating (GVWR),

(b) Not greater than 2 seconds for vehicles of more than 4536 kilograms (10,000 pounds) GVWR, and

(c) Not greater than 3 seconds for vehicles, regardless of GVWR, that are exposed to ambient air at minus 18 to minus 40 degrees Celsius during a test or any portion of the 12-hour conditioning period.

S5.4 *Brake-Throttle Override.*

S5.4.1 Each motor vehicle under 10,000 lb GVWR having electronic throttle control shall meet the performance requirement of S6.6 and shall be equipped with a throttle-override system that is engaged by application of the vehicle's service brake and that meets the following requirements:

(a) The system shall consist of hardware and/or software components on the vehicle which have the capability of identifying and reacting to conflicts between accelerator pedal and brake pedal inputs;

(b) At vehicle speeds greater than 16 km/h (10 mph), when a conflict exists between the vehicle's accelerator and brake pedals, the override system must engage and must substantially reduce propulsive force delivered to the driving wheels to a controllable level by means of a change in throttle opening, fuel delivery rate, air intake rate, electric power delivery, or an equivalent means;

(c) Once engaged, the override must remain engaged at any speed as long as brake pedal application is maintained at or above the force level or travel which initially engaged the override, and as long as accelerator pedal input is in conflict with the brake application.

S5.4.2 When tested in accordance with the brake-throttle override performance test in S6.6, a vehicle is deemed to comply if at least one of the six stops is made within the prescribed distance. However, in all of the six stops, the brake-throttle override must engage if the system identifies a conflict between the accelerator pedal and brake.

S5.4.3 If a means is provided for the vehicle operator to turn off the brake-throttle override system—

(a) There must be an illuminated alert or message that remains in view of the driver as long as the system is turned off and the vehicle ignition is on, and

(b) The system must default to an active state whenever the vehicle ignition is started.

S6. *Test Procedures.*

S6.1 *Irrevocable Selection.* The manufacturer shall select one of the following criteria upon which it bases its certification to the requirements in section S5.1 and S5.2 in this standard: throttle position, fuel delivery rate, air intake rate, electric power delivery, or creep speed/coastdown performance. This selection is irrevocable and shall be made prior to or at the time of certification of the vehicle pursuant to 49 CFR Part 567, ''Certification.''

S6.2 *General.* For the test procedures in sections S6.3 and S6.4, the ''baseline'' value is the value of the selected idle state indicant measured for an engine or motor operating at idle without accelerator control system faults under the conditions that exist at the beginning of a test and which are held constant during the test.

(a) For idle state conditions that provide a means of driver control, for example air-conditioner setting, the selected setting for testing may be any point within the control range, including ''off.''

(b) The engine or motor is operated for not less than 5 minutes to stabilize the idle state prior to testing.

(c) Vehicles are conditioned and tested at any ambient temperature between minus 40 and plus 50 degrees Celsius, except as specified for creep speed and coastdown test procedures in S6.5.

(d) The time to return to idle in S6.4 is measured first from the instant that a severance or disconnection occurs and then, if necessary, from the instant of release of the driver-operated accelerator control.

S6.3 *Test Procedure for Evaluating Return-to-Idle in Normal Operation*

S6.3.1 Condition the test vehicle to a selected ambient temperature for up to 12 hours.

S6.3.2 Start the vehicle, set controls such as for the air-conditioner, and operate the engine for not less than 5 minutes.

S6.3.3 Measure the baseline value of one of the following idle state indicants identified by the vehicle manufacturer for the test vehicle: throttle position, fuel delivery rate, air intake rate, or electric power delivery.

S6.3.4 Set engine speed and powertrain loading condition by shifting the transmission to neutral or any gear and moving the driver-operated accelerator control to any position, with or without resistance applied to the vehicle's drive wheels.

S6.3.5 After at least 3 seconds, release the driver-operated accelerator control.

S6.3.6 Verify that the measured idle state indicant returns to or below its baseline value determined in S6.3.3 following release of the driver-operated accelerator control within the response time specified in S5.3.

6.4 *Test Procedure for Evaluating Return-to-Idle Following a Disconnection or Severance*

6.4.1 Condition the test vehicle to a selected ambient temperature for up to 12 hours.

S6.4.2 Start the vehicle, set controls such as for air-conditioning, and operate the engine for not less than 5 minutes.

S6.4.3 Measure the baseline idle value of one of the following idle state indicants identified by the vehicle manufacturer for the test vehicle: throttle position, fuel delivery rate, air intake rate, or electric power delivery.

S6.4.4 Set engine speed and powertrain loading condition by shifting the transmission to neutral or any gear and moving the driver-operated accelerator control to any position, with or without resistance applied to the vehicle's drive wheels.

S6.4.5 While continuing to measure the idle state indicant, disconnect one component of the accelerator control system by removing one connector or severing a wiring harness or individual wire, leaving the disconnected or severed component in either an open circuit condition or shorted to ground.

S6.4.6 If there is no change in the idle state indicant after at least 3 seconds, release the driver-operated accelerator control.

S6.4.7 Verify that, following either S6.4.5 or S6.4.6, the idle state indicant returns to and remains at or below a value that is no more than 50 percent greater than its baseline value as measured in S6.4.3, within the response time specified in S5.3.

S6.5 *Alternative Procedure for Evaluating Return-to-Idle Following a Disconnection or Severance, Using Creep Speed and Coastdown*

S6.5.1 This test procedure measures creep speed and coastdown time on a chassis (wheel-driven) dynamometer configured to simulate the correct road load as a function of speed for the test vehicle as determined in accordance with SAE J2264 (APR 95), ''Chassis Dynamometer Simulation of Road Load Using Coastdown Techniques.'' (Incorporated by reference, see § 571.5.) This test procedure also may be performed on a straight road course consisting of dry, smooth, unbroken asphalt or concrete pavement with a continuous grade of not more than 0.5 percent in any direction.

S6.5.2 The test vehicle is lightly loaded (driver-only with no cargo and fuel tank level between one-quarter and full.) Tires are set at cold inflation pressures provided on the vehicle placard and/or the tire inflation label, and all vehicle windows are fully closed. For track tests, ambient conditions are as specified in SAE J1263 (JAN 2009), ''Road Load Measurement and Dynamometer Simulation Using Countdown Techniques'' in section 7, ''Test Conditions'' at S7.1 ''Ambient Temperatures'', S7.2 ''Fog,'' S7.3 ''Winds,'' and S7.4 ''Road Conditions'' (incorporated by reference, see § 571.5).

S6.5.3 Time intervals measured in S6.5.5 and S6.5.6 begin at the instant that a disconnection or severance is induced in the accelerator control system, or from the instant that the accelerator pedal is released or the transmission is shifted to neutral, as applicable, depending on which of those actions initiates a vehicle response. Test vehicle speed versus time are recorded continuously during test runs.

S6.5.4 Start up the test vehicle, set accessory controls such as for air-conditioning, and operate the vehicle for not less than 5 minutes.

S6.5.5 Creep Speed Measurement Procedure

(a) With the vehicle's drive wheels on the dynamometer roller(s) or with the vehicle positioned on the road test course, place the transmission selector in the ''drive'' position. For manual transmissions, select the highest gear (lowest numerical gear ratio) which allows the vehicle to coast without stalling if the clutch is gradually released when there is no input to the accelerator pedal.

(b) With the vehicle operating at idle or at any target speed up to 50 km/h (31 mph), simultaneously release the accelerator pedal (if applied) and disconnect one component of the accelerator control system by removing one connector or severing a wiring harness or individual wire, leaving the disconnected or severed component in either an open circuit condition or shorted to ground.

(c) Note the speed of the test vehicle at 90 seconds after the disconnection and verify that it does not exceed 50 km/h.

S6.5.6 Coastdown Time Measurement Procedure

(a) With the vehicle's drive wheels on the dynamometer roller(s) or with the vehicle positioned on the road test course, place the transmission selector in the ''drive'' position and drive the vehicle up to any selected target speed greater than 50 km/h. For manual transmissions, select any gear appropriate for the selected target speed.

(b) At the target speed, release the accelerator pedal and simultaneously shift the vehicle into neutral. Allow the vehicle to coast without any brake input.

(c) Verify that the vehicle decelerates to or below 50 km/h and record the elapsed time needed for the vehicle to reach 50 km/h.

(d) Repeat the step in S6.5.6(a) and, at the same target speed, simultaneously release the accelerator pedal and disconnect one component of the accelerator control system by removing one connector or severing a wiring harness or individual wire, leaving the disconnected or severed component in either an open circuit condition or shorted to ground.

(e) Record the elapsed time needed for the vehicle to decelerate to 50 km/h, and verify that it does not exceed the elapsed time in the step in S6.5.6(c).

S6.6 *Performance Test for Brake-Throttle Override Systems.*

Measure vehicle stopping distance with the test vehicle's accelerator pedal applied as specified in the following procedure:

S6.6.1 Select a target speed which is greater than or equal to 30 km/h and less than or equal to 160 km/h and which, if greater than 100 km/h, does not exceed 80 percent of the test vehicle's maximum speed. ''Maximum speed'' is used as defined in section S4 of 49 CFR 571.135, ''Light Vehicle Brake Systems,'' (FMVSS No. 135).

S6.6.2 Conduct stopping distance measurements in accordance with the general procedures and test conditions specified in S6 of FMVSS No. 135, and as follows:

(a) Accelerate the test vehicle and, while still in gear, hold the accelerator pedal in any fixed position between 25 and 100 percent of the full range of pedal travel.

(b) At the target speed, without releasing the accelerator pedal from the position as selected in S6.6.2(a), apply the service brake and bring the vehicle to a stop using a brake pedal force of not less than 65N (14.6 lbs) and not more than 500N (112.4 lbs).;

(c) Repeat six times for a total of six test runs at each target speed.

S6.6.3 Verify that the stopping distance 'S' (in meters) for each vehicle speed 'V' (in km/h) is no more than 5 percent greater than the stopping distance specified in either S7.5.3(b) or S7.6.3 of FMVSS No. 135 by meeting one of the following requirements:

(a) For test speeds up to and including 100 km/h: $S \leq 1.05(0.10V + 0.0060V^2)$.

(b) For test speeds greater than 100 km/h: $S \leq 1.05(0.10V + 0.0067V^2)$.

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