

Martin O'Malley, *Governor*  
Anthony G. Brown, *Lt. Governor*



John D. Porcari, *Secretary*  
Neil J. Pedersen, *Administrator*

Maryland Department of Transportation

December 19, 2008

The Honorable Thomas V. "Mike" Miller, Jr.  
President of the Senate and  
Chairman, Legislative Policy Committee  
State House  
Annapolis MD 21401-1991

The Honorable Michael E. Busch  
Speaker of the House and  
Chairman, Legislative Policy Committee  
State House  
Annapolis MD 21401-1991

Dear President Miller and Speaker Busch:

The Maryland Quiet Vehicle and Pedestrian Safety Task Force has completed its findings and recommendations as required in Senate Bill 276/House Bill 1160, Chapters 384 and 385, Acts 2008. We thank you for your support of this study and recommend our findings for your consideration as you decide what measures Maryland should move forward with to assist the blind community with this increasingly serious dilemma.

The legislation that established this Task Force directed that:

- "(f) The Task Force shall:*
- (1) study:*
    - (i) the effects of vehicle sound on pedestrian safety; and*
    - (ii) all available technology that may enhance the safety of blind pedestrians;*
  - (2) review all available research regarding the effects of vehicle sound on pedestrian safety;*
  - (3) consult with:*
    - (i) consumer groups representing individuals who are blind, other pedestrians, and cyclists; and*
    - (ii) advocates for the safety of children;*
  - (4) as appropriate, contract for additional research and studies to be*

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- conducted;*
- (5) *conduct hearings to accept testimony from:*
- (i) experts on acoustics, automobile design, environmental quality, orientation and mobility for blind people, pedestrian safety, and other relevant fields; and*
  - (ii) interested members of the public; and*
- (6) *make recommendations concerning:*
- (i) a minimum sound level and the nature and characteristics of the minimum sound to be required for all new vehicles sold and licensed in the State; and*
  - (ii) the use of technology to enhance the safety of blind pedestrians.*

*(g) The Task Force is not required to specify the method or technology through which automobile manufacturers must implement the recommended sound standard.*

*(h) On or before December 31, 2008, the Task Force shall report its findings and recommendations to the General Assembly, in accordance with § 2-1246 of the State Government Article.*

*SECTION 2. AND BE IT FURTHER ENACTED, That this Act shall take effect June 1, 2008. It shall remain effective for a period of 7 months and, at the end of December 31, 2008, with no further action required by the General Assembly, this Act shall be abrogated and of no further force and effect."*

The issue of quiet vehicles is in its infancy. As such, the primary focus of the Task Force was to develop a report outlining the problem, current research and policy recommendations on international, national, and state levels, conclusions on the issue of quiet cars, and recommendations for next steps. It is important to note that no minimum vehicle sound standards have been recommended. The Task Force did not think enough research had been conducted to warrant specific sound standards.

Additionally, the Task Force is aware of developing research by the automotive industry and others aimed at accomplishing much of what was specified in Senate Bill 276 and House Bill 1160. Most of these efforts are due to be completed by 2011. However, one recommendation requests a reauthorization of this Task Force to continue to study the issue of quiet cars. The Task Force would oversee the above research activities as well as examine strategies specifically aimed at more immediate results for State and local government vehicles.

The report contains fourteen conclusions on the issue of quiet cars and five recommendations for next steps. The substance of the report is separated into the following sections:

- Background
- Scope of Quiet Car Concern
- Research
- Legislative and Regulatory Activity
- Currently Available or Expected After-Market Technology

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The Honorable Michael E. Busch  
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- Conclusions
- Recommendations

If you have additional questions or concerns regarding this report, please do not hesitate to contact me at (410) 787-4092.

Sincerely,

A handwritten signature in black ink, appearing to read "Edward T. Paulis, Jr.", with a stylized flourish extending to the right.

Mr. Edward T. Paulis, Jr.  
Office of Traffic Safety,  
State Highway Administration and  
Chairman of the Maryland Quiet Vehicles  
and Pedestrian Safety Task Force

Attachment

cc: Secretary John D. Porcari, Maryland Department of Transportation  
Mr. Neil Pedersen, Administrator, State Highway Administration  
Members of the Maryland Quiet Vehicles and Pedestrian Safety Task Force

The Honorable Thomas V. "Mike" Miller, Jr.

The Honorable Michael E. Busch

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bcc: Ms. Sarah Albert, Library Associate, Mandated State Agency Reports, Library & Information Services Division, Department of Legislative Services (5 copies - Note: MSAR #6863)  
Mr. Joseph C. Bryce, Chief Legislative Officer, Governor's Office  
Mr. Jack Cahalan, Director, Office of Public Affairs, Maryland Department of Transportation  
Ms. Jaclyn Dixon, Legislative Analyst, Office of Policy Analysis, Department of Legislative Services  
Mr. John F. Favazza, Chief of Staff, Speaker's Office, Maryland General Assembly  
Mr. Bruce W. Gartner, Director, Office of Policy and Governmental Affairs, Maryland Department of Transportation  
Mr. David Grossman, Budget Analyst, Department of Budget and Management  
Ms. Victoria Gruber, Legislative Assistant to the President, Maryland General Assembly  
Mr. Martin L. Harris, State Legislative Officer, Maryland Department of Transportation  
Mr. Thomas Hicks, Director, Office of Traffic and Safety, State Highway Administration  
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Deputy Secretary Beverley Swaim-Staley, Maryland Department of Transportation  
Mr. Jeff Tosi, Legislative Analyst, Maryland Department of Transportation

**A Report to the Maryland General Assembly**

**regarding**

**Findings, Conclusions, and Recommendations of the Maryland  
Quiet Vehicle and Pedestrian Safety Task Force**

(Senate Bill 276 / House Bill 1160, Chapters 384 and 385, Acts 2008)



**The State Highway Administration  
The Maryland Department of Transportation**

**December 2008**

**Findings, Conclusions, and Recommendations of the Maryland  
Quiet Vehicles and Pedestrian Safety Task Force**

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\*COVER PHOTO: A Cadillac CTS undergoes low-speed sound emissions testing in an anechoic chamber at the General Motors Proving Grounds located in Milford, MI.

# Findings, Conclusions, and Recommendations of the Maryland Quiet Vehicles and Pedestrian Safety Task Force

(Senate Bill 276 / House Bill 1160, Chapters 384 and 385, Acts 2008)

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## Quiet Vehicles and Pedestrian Safety Task Force Membership

Edward T. Paulis, Jr., Chair	Maryland Department of Transportation, Maryland State Highway Administration
Marco Carranza	Blind Industries and Services of Maryland
Richard Chambers	One Less Car
Glenn DiChiera	Maryland School for the Blind
Michael Gosse	National Federation of the Blind
Patrick Sheehan	American Council of the Blind and the Maryland Bicycle and Pedestrian Advisory Committee
Rob Strassburger	Alliance of Automobile Manufacturers
Marcia Ways	Maryland Department of the Environment, Air Radiation and Management Administration
John Wetmore	Perils for Pedestrians

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## FOREWORD

Organizations of and for persons who are blind or have low vision have expressed concerns that some motor vehicles, such as hybrid electric vehicles, may not be audibly detectable by the blind when the vehicle's internal combustion engine is not operating. Blind pedestrians make decisions about crossing streets when they can hear vehicles in their environment. The blind use the sounds of passing vehicles in a number of ways to help them travel. In response to this concern, in 2008, the General Assembly adopted and Governor Martin O'Malley signed into law Senate Bill 276, which established the Maryland Quiet Vehicles and Pedestrian Safety Task Force. The Task Force is charged with:

- studying the effects of vehicle sound on pedestrian safety;
- studying all available technology that may enhance the safety of blind pedestrians;
- reviewing all available research on the effects of vehicle sound on pedestrian safety and consult with consumer groups and safety advocates;
- conducting research, as appropriate;
- conducting hearings to accept testimony from experts and the public; and
- making recommendations concerning:
  - a minimum sound level and the nature and characteristics of the minimum sound standard to be required for all new vehicles sold and licensed in the State; and
  - the use of technology to enhance the safety of blind pedestrians.

Senate Bill 276 took effect June 1, 2008 and terminates December 31, 2008. The Task Force must submit a report by December 31, 2008 to the General Assembly. This is that report.

### ***Minimum Sound Requirements for Motor Vehicles***

To date, no state or municipality or the federal government have adopted minimum sound level requirements applicable to motor vehicles but some of these jurisdictions have enacted maximum sound emission requirements applicable to some motor vehicles.

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## Federal Law

Under authority of the Noise Control Act of 1972 (P.L. 92-574), the U.S. Environmental Protection Agency (EPA) has promulgated maximum sound emission standards for vehicles with a Gross Vehicle Weight Rating (GVWR) in excess of 10,000 pounds. The EPA standard sets a maximum sound emission level of 80 dB(A) for these vehicles. See 40 CFR § 205.52. EPA has not established maximum sound emission standards for vehicles under 10,000 pounds GVWR, i.e., passenger cars, SUVs, or light trucks. Some states and municipalities have enacted a variety of noise control laws and regulations which apply to motor vehicles sold or offered for sale in and/or operating within their jurisdictions.

## Maryland Law

Maryland Vehicle Law contains provisions establishing maximum limits for vehicle sound. See Transportation Article, §22-601, Annotated Code of Maryland. As implemented, a new motor vehicle, including motorcycles, may not produce a sound level greater than 80 dB(A)<sup>1</sup> when measured under the moving vehicle test site procedures established by regulation. See 11.14.07.13 Code of Maryland Regulations. Except for specific items of motor vehicle equipment such as a horn, minimum sound levels are generally not addressed in Maryland's statutes and regulations. Motor vehicles offered for sale in the state must be equipped with a horn, "*capable of emitting sound audible under normal conditions from a distance of not less than 200 feet.*" See Transportation Article, §22-401, Annotated Code of Maryland.

## Trends in Vehicle Sound Emissions

Road traffic sound comprises a number of factors: vehicle-emitted sound and driving practices; road structure; road surface quality and conditions; the status of traffic flow; and factors pertaining to the roadside environment, such as roadside terrain characteristics and the extent of development. Reductions in road traffic sound may be achieved through upgraded road infrastructure and road surface quality (e.g., the use of rubberized asphalt or better roadway drainage), changes in the environment and changes to the vehicle. Societal concerns about the adverse effects of noise, in addition to the policy directives described above, have caused automakers to steadily

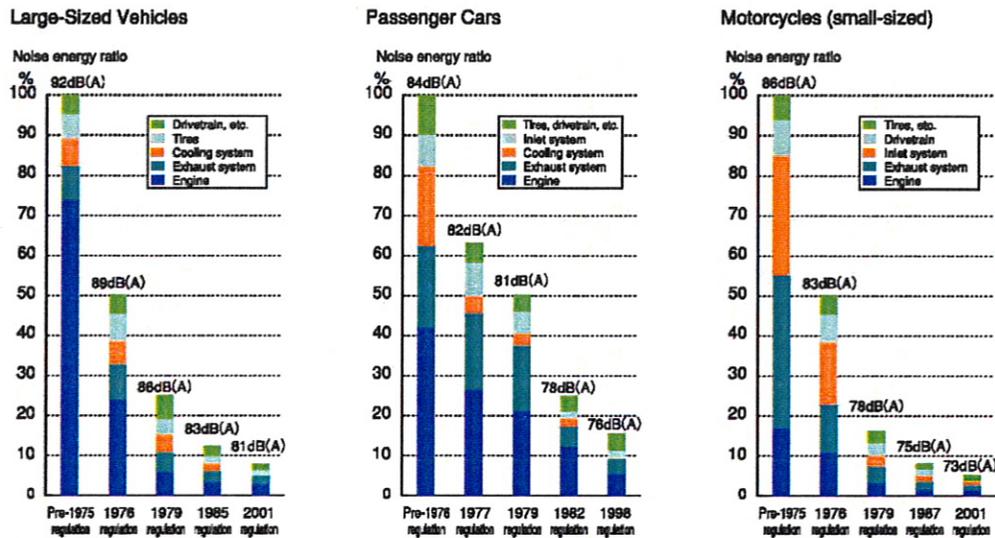
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<sup>1</sup> The **decibel** (abbreviated **dB**) is the unit used to measure the intensity of a sound. On the **decibel scale**, the smallest audible sound (near total silence) is 0 dB. A sound 10 times more powerful is 10 dB. A sound 100 times more powerful than near total silence is 20 dB. A sound 1,000 times more powerful than near total silence is 30 dB. See <http://science.howstuffworks.com/question124.htm>, accessed on November 6, 2008.

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reduce automobile-emitted sound. As a result of these efforts, motor vehicles manufactured today are significantly quieter as illustrated on the next page.



The figure above illustrates that sound emissions of modern motor vehicles are in the sub-80 dB(A) range. This figure also illustrates that sound is emitted from several areas of the vehicle. These are: tires, drive train, inlet system, exhaust system, and engine. It is important to note that the sound emitted by the engine no longer dominates. To aid readers' understanding of the magnitude of the noise emitted from modern motor vehicles, the noise levels of some common sounds are given in the table below<sup>2</sup>.

150	Firecracker
120	Ambulance siren
110	Chain saw, Rock concert
105	Personal stereo system at maximum level
100	Wood shop, Snowmobile
95	Motorcycle
90	Power mower
85	Heavy city traffic
60	Normal conversation
40	Refrigerator humming
30	Whispered voice

<sup>2</sup> See <http://www.nidcd.nih.gov/health/hearing/ruler.asp>

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## **Introduction**

Until recently, independent travel for the blind has been a relatively straight forward matter, once a blind person has been trained in travel techniques and has learned to use a white cane or to travel with a guide dog. Blind persons are able to listen to the sound of automobiles to determine the direction, speed, and pattern of traffic. Sound from traffic tells blind pedestrians how many vehicles are near them and how fast they are moving; whether the vehicles are accelerating or decelerating; and if the vehicles are traveling toward, away from, or parallel to them. With all of this information, blind persons can accurately determine when it is safe for them to proceed into an intersection or across a driveway or parking lot. The information obtained from listening to traffic sounds allows blind persons to travel with complete confidence and without assistance.

Over the past few years, however, vehicles that are virtually silent when in certain modes of operation have come on the market, and more such vehicles are expected to be produced in the near future. These vehicles are designed to produce lower emissions in order to protect the environment from harmful pollutants but the vehicles do not necessarily need to be silent in order to achieve the intended positive environmental affects. Currently the most popular of these vehicles is the gasoline-electric hybrid (which alternates between running on a gasoline engine and on battery power), although there have been a few electric automobiles on America's roads and new all-electric models are planned. In addition to these new vehicle technologies, the engines and power trains of traditional motor vehicles have also grown quieter, meaning that even some vehicles with internal combustion engines cannot be heard by pedestrians.

The environmental benefits of new vehicle technologies have prompted municipalities, states, and the federal government to establish incentives in order to increase the sale and purchase of vehicles that employ them. The Maryland General Assembly passed legislation in 2008 creating this task force to study the dangers posed to pedestrians by vehicles which produce insufficient sound cues and recommend solutions. This report sets forth the findings and recommendations of the task force.

## **Background**

### ***A Brief History and Overview of Travel by the Blind***

In order for blind people to live independent, productive lives, they must master certain skills. One of the most important is the ability to travel safely and independently using a white cane or a guide dog. The blind have used canes to detect obstacles in their path

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for centuries, but the modern white cane and the techniques for its use began to take shape when blinded veterans returned from the battlefields of World War I. Accounts differ as to when the first white cane was created, but by the early 1930s, Lions Clubs International was promoting the white cane as a symbol identifying a blind person and some municipalities had ordinances recognizing it as such and providing that blind pedestrians carrying a white cane had specific rights. The white cane was considered advantageous to blind people because it could be easily seen by motorists and other pedestrians, thereby alerting them to the presence of a blind person on the street or sidewalk. After World War II, Dr. Richard Hoover and others began to develop and refine techniques to make the white cane more effective as a travel aid. By the time Congress passed a joint resolution on October 6, 1964, authorizing the President of the United States to issue an annual proclamation declaring October 15 as "White Cane Safety Day," the white cane was recognized both as a symbol identifying blind people and as a tool for allowing them to travel independently. Early orientation and mobility courses for the blind emphasized memorizing and traveling fixed routes from one place to another. In the late 1950s, however, a new approach began to take shape that emphasized learning to use information provided by the white cane and other cues in the environment to travel anywhere safely and independently, whether a blind individual had previously visited the place or not. This model is now known as the "structured discovery" method of teaching cane travel. It is currently taught to orientation and mobility teacher candidates studying at the Professional Development and Research Institute on Blindness at Louisiana Tech University, and other training programs for teachers of orientation and mobility for the blind are increasingly recognizing its effectiveness and adopting all or part of the approach.

Guide dog schools began to appear in the United States in the 1920s; today there are thirteen such schools training guide dogs and handlers. Most of these schools require blind applicants for guide dogs to have at least some skill in traveling with a long white cane, since the basic techniques for using a white cane and a guide dog are similar in many respects. Contrary to popular mythology, a guide dog's job is not to "lead" a blind person but simply to guide him or her around obstacles; the blind handler is still responsible for navigation.

Whether a blind person uses a white cane or guide dog, the primary purpose of both travel tools is to help the blind traveler identify and/or avoid obstacles in his or her path using the sense of touch. In the case of the white cane, the cane acts as an extension of the hand and arm; when it comes into contact with obstacles, the blind traveler can take evasive measures. The cane is also kept close to the ground to warn of curbs, steps, and other variations in the walking surface. With a guide dog, the dog watches out for obstacles, curbs, steps, and so forth, and alerts the blind person to their presence through the harness. The remaining information needed by a blind person to travel safely and independently is provided through the other three senses, primarily the sense of hearing. This is particularly true with regard to the safe navigation of

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intersections. By listening to the traffic, a blind traveler can determine the way it flows at a given intersection and, by moving when the traffic flow is parallel to him or her, safely cross the street. The sound of vehicles also alerts blind travelers to the location, speed, and direction of individual vehicles even in situations where the traffic flow is not high. For example, a blind person moving through a parking lot can hear and avoid vehicles entering or exiting the lot or looking for parking spaces; a blind person walking through a neighborhood can hear when a neighbor is backing out of a driveway. For all of these reasons, the ability to hear vehicle sounds is critical to the ability of a blind person to travel to work, to school, to church, or to any other location.

## ***Effect of Silent Vehicle Technology***

As hybrid gas-electric vehicles began to appear on America's roadways, the blind noticed that these vehicles are inaudible when operating at low speeds. The National Federation of the Blind conducted informal tests with volunteers at its national convention in 2006, and these tests established that the blind participants could not hear these vehicles even in a quiet parking lot. The National Federation of the Blind also organized a day-long conference where similar tests were conducted, and through its Committee on Automobile and Pedestrian Safety, began to reach out to automobile manufacturers, regulators, pedestrian groups, electric vehicle advocates, and others to try to find a solution to the problem.

Meanwhile, independent research began to verify what the blind community had been saying about new silent vehicle technology, affirming that pedestrians cannot hear hybrid vehicles and that they therefore pose a danger not only to the blind but to others. The Society of Automotive Engineers and the Alliance of Automobile Manufacturers began to work with blind advocates to find solutions to the problem (see later sections of this report for additional information). Anecdotal information has begun to emerge about accidents and near-accidents involving the blind and others. Most recently, in Minnesota an eight-year-old boy on his bicycle collided with a Toyota Prius that he did not hear.<sup>3</sup> While it is difficult to confirm whether any serious injury or fatality has been directly attributable to the inability of the blind or others to hear a hybrid vehicle, the fact that these vehicles cannot be audibly detected is undisputed even by their manufacturers. As the number of silent vehicles on the roadways of Maryland increases, it is reasonable to assume that there will be a corresponding increase in the number of pedestrian injuries and fatalities.

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<sup>3</sup> Retrieved 24 November 2008, from [http://kare11.com/news/news\\_article...aspx?storyid=510106](http://kare11.com/news/news_article...aspx?storyid=510106)

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## **Scope of Quiet Car Concern**

### ***Federal Government Crash Databases***

The federal government, through the National Highway Traffic Safety Administration (NHTSA) National Center for Statistics and Analysis (NCSA), is currently involved with a number of major data collection efforts. Notable among these are the Fatality Analysis Reporting System (FARS) and the National Automotive Sampling System (NASS). FARS provides police-reported information augmented by data gathered from other sources for the fatal crash situation. The NASS program, which has been active since 1979, involves the statistical sampling of traffic crashes, and documents a considerable amount of vehicle information. In the current implementation, the collection program has been modified to yield the General Estimates System (GES), which collects information to provide a national sample of important crash measures.

FARS contains data derived from a census of fatal traffic crashes within the fifty states, the District of Columbia, and Puerto Rico. To be included in FARS, a crash must involve a motor vehicle traveling on a traffic way customarily open to the public and result in the death of a person (occupant of a vehicle or a non-motorist) within thirty days of the crash. FARS was conceived, designed, and developed by the National Center for Statistics and Analysis (NCSA) of the National Highway Traffic Safety Administration (NHTSA) in 1975 to provide an overall measure of highway safety, to help identify traffic safety problems, to suggest solutions, and to help provide an objective basis to evaluate the effectiveness of motor vehicle safety standards and highway safety programs.

Data for the NASS-GES come from a nationally representative sample of police reported motor vehicle crashes of all types, from minor to fatal. The system began operation in 1988, and was created to identify traffic safety problem areas, provide a basis for regulatory and consumer initiatives, and form the basis for cost and benefit analyses of traffic safety initiatives. The information is used to estimate how many motor vehicle crashes of different kinds take place, and what happens when they occur. Although various sources suggest that about half the motor vehicle crashes in the country are not reported to the police, the majority of these unreported crashes involve only minor property damage and no significant personal injury. By restricting attention to police-reported crashes, the NASS-GES concentrates on those crashes of greatest concern to the highway safety community and the general public.

These accident reports are chosen from sixty areas that reflect the geography, roadway mileage, population, and traffic density of the U.S. NASS-GES data collectors make weekly visits to approximately four hundred police jurisdictions in the sixty areas across

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the United States, where they randomly sample about fifty thousand police accident reports (PARs) each year. The collectors obtain copies of the PARs and send them to a central contractor for coding. No other data are collected beyond the selected PARs.

## ***Pedestrian Fatalities and Injuries Overall***

According to federal government data, in 2007, 4,654 pedestrians were killed in traffic crashes in the United States and 70,000 pedestrians were injured. Most pedestrian fatalities in 2007 occurred in urban areas (73%), at non-intersection locations (77%), in normal weather conditions (90%), and at night (67%). More than two-thirds (70%) of the pedestrians killed in 2007 were males. Pedestrians (age 70+) account for 16 percent (721) of all pedestrian fatalities and an estimated 6 percent (4,000) of all pedestrians injured in 2007. In 2007, one-fifth (20%) of all children between the ages of 5 and 9 who were killed in traffic crashes were pedestrians. Children age 15 and younger accounted for 8 percent of the pedestrian fatalities in 2007 and 23 percent of all pedestrians injured in traffic crashes. 36 percent of the 354 young (under age 16) pedestrian fatalities occurred in crashes between 3 p.m. and 7 p.m. Nearly one-half (48%) of all pedestrian fatalities occurred on Friday, Saturday, and Sunday (16%, 17%, and 15%, respectively). Alcohol involvement—either for the driver or for the pedestrian—was reported in 49 percent of the traffic crashes that resulted in fatalities. Of the pedestrians involved, 35 percent had a blood alcohol concentration (BAC) of 0.08 grams per deciliter (g/dL) or higher. Of the drivers involved in fatal crashes, 14 percent had a BAC of 0.08 g/dL or higher. In 6 percent of the crashes, both the driver and the pedestrian had a BAC of 0.08 g/dL or higher. The number of pedestrian fatalities, the percentage of the total and the fatality rate per 100,000 population for select states is given in the table below<sup>4</sup>.

STATE	PEDESTRIAN FATALITIES	PERCENT OF TOTAL	PEDESTRIAN FATALITIES PER 100,000 POPULATION
Arizona	154	14.4	2.43
California	640	16.1	1.75
Hawaii	27	19.6	2.10
Kentucky	44	5.1	1.04
<b>Maryland</b>	<b>116</b>	<b>18.9</b>	<b>2.06</b>
New York	278	20.9	1.44
Virginia	88	8.6	1.14
U.S. Total	4,654	11.3	1.54

<sup>4</sup> “Pedestrians: Traffic Safety Facts, 2007 Data,” National Center for Statistics and Analysis, National Highway Traffic Safety Administration, DOT HS 810 994.

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## ***Pedestrian Fatalities and Injuries Attributable to “Quiet” Cars***

Limitations in the data collected by NASS-GES and FARS which are structured to look at all crashes not just those involving certain vehicles such as hybrid and blind pedestrians suggests that the use of these crash databases to quantify the potential scope of the blind pedestrian safety problem is not likely. Quantification of the scope of the problem may be limited to anecdotal data or incidents. This will complicate the task of both identifying potential countermeasures in traditional terms (e.g., number of fatalities or injuries) as well as evaluating the potential effectiveness of those countermeasures.

## ***Other Indicators of the Exposure to Risk That May Suggest Action is Needed***

### **The Blind in the U.S.<sup>5</sup>**

There are an estimated 1.3 million legally blind adults ages 18 and older living in the United States. Legal blindness is defined as corrected eyesight no better than 20/200 for either eye or restricted field of vision less than 20 degrees wide. Most blind adults are older than the general population; their average age is 62 and one out of three is over the age of 75. Half of the blind adults are male and half are female. Most blind adults—78 percent—live in an urban area. More blind adults—35 percent—live in the South. The rest are almost evenly distributed in the other three regions: Northeast, Midwest, and West. Rural and urban adults do not differ in terms of age or sex. Approximately one in four blind adults—28 percent—use visual “equipment.” The most common choices are white canes (12 percent), telescopic lenses (9 percent), and Braille (5 percent). Less than 1 percent (7,000) use a guide dog. Annually, 1,500 individuals graduate from a dog-guide user program. According to the National Federation of the Blind (NFB), every year approximately 75,000 Americans become blind.

### **Hybrid Electric Vehicle & Advanced Technology Vehicle Trends in the U.S.**

The desire to reduce greenhouse gas emissions and the need to reduce U.S. dependence on foreign oil will continue to drive demand for hybrid electric vehicles (HEVs) and advanced technology vehicles. Nationwide registrations of HEVs totaled nearly one million (997,604) at the end of 2007<sup>6</sup>; compared to total light vehicle

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<sup>5</sup> Zuckerman, D M, “Blind Adults in America: Their Lives and Challenges,” National Center for Policy Research for Women & Families, Washington, DC, February 2004.

<sup>6</sup> See <http://www.hybridcars.com/market-dashboard/dec07-overview.html>, accessed November 14, 2008.

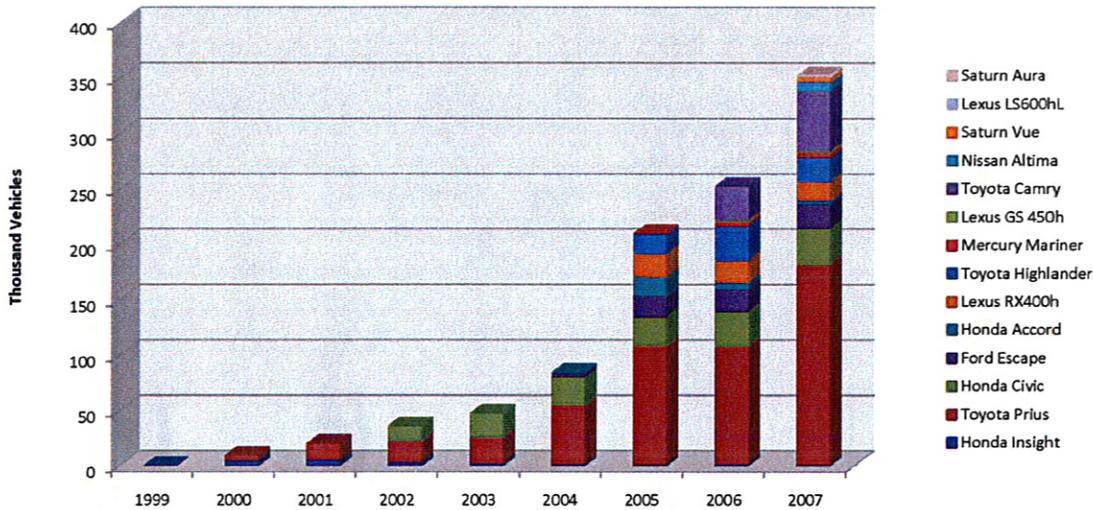
# Findings, Conclusions, and Recommendations of the Maryland Quiet Vehicles and Pedestrian Safety Task Force

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registrations of 257,708,000. In a year when total light vehicle sales declined by 2.5 percent, HEV sales grew by 38 percent to 350,000 units compared with 250,000 in 2006. Ninety-seven percent of the increase came from two vehicles: The Toyota Prius and the Toyota Camry. In 2007, the Toyota Prius accounted for over half of the HEVs sales in the U.S. See figure below<sup>7</sup>.

www.eere.energy.gov/afdc/data/

**U.S. HEV Sales**



California leads the nation in HEV registrations, followed by Florida, New York, Texas, and Illinois. Hybrid sales in 2007 and the number of new hybrids per 1,000 residents for select states are given in the table on the next page<sup>8</sup>.

State	2007 Sales		New Hybrids per 1,000 Residents	
	Number	Rank	Number	Rank
Arizona	7,852	10	1.322	10
California	74,737	1	2.068	1
Hawaii	na	na	na	na
Kentucky	na	na	na	na
<b>Maryland</b>	<b>7,345</b>	<b>12</b>	<b>1.312</b>	<b>11</b>
New York	14,580	3	na	na
Virginia	10,037	7	1.326	9
U.S. Total	414,396	--	1.37	--

<sup>7</sup> See <http://www.eere.energy.gov/afdc/data/index.html>, accessed November 14, 2008.

<sup>8</sup> See <http://www.hybridcars.com/market-dashboard/dec07-overview.html>, accessed November 14, 2008.

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The top five global hybrid markets are the U.S., followed by Japan, the United Kingdom, Canada, and Germany. In 2007, 75 percent of the hybrids sold globally were in the U.S.

Advanced technology that is intended to improve fuel economy and reduce greenhouse gas emissions from vehicles fueled by conventional fuels such as gasoline may also have an impact on blind pedestrian safety. Start-stop technology shuts a car's engine down when stopped at a red light or sitting in gridlock, but automatically restarts the engine when the vehicle operator lifts their foot from the brake pedal. Some automotive technology analysts believe that one in five cars (20 percent) will use start-stop technology by 2015<sup>9</sup>. Start-stop technology would eliminate one sound cue used by the blind who use the sound of idling vehicles lined up in front of a crosswalk to identify where that crosswalk is located.

## Research

### *University of California at Riverside*

Dr. Lawrence Rosenblum, professor of psychology at the University of California–Riverside, is conducting an ongoing research project on hybrid cars and the ability of the blind and other pedestrians to hear them.

Initial findings released in March 2008 found that even in the absence of ambient sounds, a hybrid car needed to be about 40 percent closer than a combustion-engine car before the subjects could determine whether it was approaching from the left or right.

Dr. Rosenblum made audio recordings of hybrid and combustion-engine cars in a quiet parking lot. The vehicles moved no faster than five miles per hour to assure that the hybrid car operated only with its electric motor. Subjects in a lab listened to the recordings and indicated when they could hear from which direction the car approached. Subjects could make these judgments sooner when listening to the combustion-engine car than when listening to the hybrid car.

In another study by Dr. Rosenblum, the background sounds of two quietly idling combustion-engine cars were added to simulate the noise of a parking lot. With these stimuli, the hybrid needed to be 74 percent closer than the combustion-engine car before the subjects could hear from which direction the cars approached.

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<sup>9</sup> "Start-Stop Technology Gets Another Boost – and Some Efficiency as Well," *Wired*, April 29, 2008.

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“Subjects could correctly judge the approach of the combustion car when it was about 28 feet away,” Dr. Rosenblum said in a statement about his findings. “But they could only judge the hybrid’s approach direction when it was seven feet away.” This means that a pedestrian would not be able to correctly determine the hybrid’s approach until it was one second away, he said. Those findings have implications for pedestrians who are blind, small children, the elderly, runners, cyclists, and others, he said.

At speeds above 20 to 25 miles per hour hybrid cars likely generate enough tire and aerodynamic noise to make them sufficiently audible, Dr. Rosenblum said.

## ***Society of Automotive Engineers, Inc.***

The Society of Automotive Engineers (SAE) is an independent organization made up of members from most of the major automotive manufacturing companies. Its purpose is to develop and recommend standards for the automotive industry. SAE operates through more than six hundred committees and a host of subcommittees.

After careful deliberation SAE established the Subcommittee on Vehicle Sound for Pedestrians (VSP) under the Safety and Human Factors Committee. The subcommittee is composed of automotive engineers, academicians, and members of blindness organizations, as well as a government liaison. It has formed three task forces to examine various facets of the issue. Task Force 1 on audience identification is working to determine which segments of the population will be most negatively affected by quiet cars. Task Force 2 is studying crash problem definition and scenarios, using data collected by the National Highway Traffic Safety Administration (NHTSA) and analyzing anecdotal accounts of accidents and close calls. The third task force is focused on countermeasure performance evaluation and test procedure. By the close of calendar year 2008 the VSP subcommittee plans to complete a report on its findings. This report will include recommendations for a testing standard for determining whether a vehicle meets a specified minimum sound standard. Completion of this phase of work by the SAE will facilitate follow-on research to proceed as preliminarily illustrated in the figure on the following page.

## ***International Activities***

In November 2008, the United Nations World Forum for Harmonization of Vehicle Regulations agreed to address the concern that some vehicles may not emit sufficient sound cues to allow the blind to travel safely and independently.

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## **LEGISLATIVE AND REGULATORY ACTIVITY**

In 2003 blind advocates first expressed alarm regarding the danger that hybrid and other silent vehicle technologies would pose to blind people. The two reasons for this concern were that people who cannot see must use hearing when traveling and that hybrid and other automotive technologies are quieter than traditional internal combustion engines. Initially only blind people expressed any concern about the effect of reduced sound from automobiles on pedestrians. Neither the automotive industry nor federal and state governments took steps to address these concerns. Meanwhile, governments at all levels actively developed a vast array of incentives to encourage the manufacture and purchase of hybrid and other low-emission or zero-emission vehicles. These include tax credits for manufacturers and purchasers of such vehicles, permitting drivers of these vehicles to use high occupancy vehicle lanes (even with one occupant) for more rapid commutes during periods of high traffic, and most recently allowing manufacturers to borrow up to \$25 billion for factory upgrades to facilitate more rapid manufacture of alternative energy vehicles including hybrid and electric automobiles. The growing popularity of these automobiles, which is the result of these incentives in combination with aggressive marketing by the automotive industry, has led the blind community to seek the enactment of legislation and regulations to assure the safety of blind pedestrians.

### ***Federal Legislation***

The Pedestrian Safety Enhancement Act of 2008 (H.R. 5734) was introduced by Democrat Edolphus Towns of New York and Republican Clifford Stearns of Florida on April 9, 2008. During the 110th Congress, over eighty Democrats and Republicans joined the original sponsors. The legislation was not enacted before the session adjourned; however, it is extremely likely that the bill will be promptly introduced again in the 111th Congress and that it will receive substantial bipartisan support.

The Pedestrian Safety Enhancement Act would require the U.S. Secretary of Transportation to:

- Commence a study, within ninety days of its enactment, to determine the most practical means of assuring that blind and other pedestrians receive essentially similar information to that which they now receive from sound emitted by internal combustion engines;
- Determine the minimum amount of sound necessary to offer sufficient information for blind pedestrians to make safe travel judgments;

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- Determine whether a minimum sound standard or some other solution would best provide the needed information;
- Review available research, conduct additional research as needed, receive consultation from groups representing the blind, other pedestrians, cyclists, children, and the automotive industry or its representatives;
- Take no more than two years to conduct the study and provide a report of the findings to Congress;
- Promulgate a motor vehicle safety standard to address the needs of blind and other pedestrians either requiring a minimum level of sound or an equally effective means of providing essential information for the blind to travel safely and independently within ninety days after conclusion of the study; and
- Apply the standard to all motor vehicles manufactured or sold in the United States beginning no later than two years after the date it is promulgated.

## ***Legislative Activity in Maryland***

In the legislative session of 2007, the General Assembly enacted the Maryland Clean Cars Act of 2007. This legislation was a high priority of the newly elected Governor Martin O'Malley and the culmination of several years of intense effort.

The legislation as originally introduced did not take account of the concerns of blind Marylanders that to comply with this legislation, hybrid and other silent vehicles would become increasingly more prevalent in this state, thus increasing the danger to blind pedestrians. Blind Marylanders were also keenly aware that none of the other states that enacted similar legislation demonstrated any knowledge of these concerns. Maryland's blind community contacted Delegate James Malone and Senator Norman Stone, both avid supporters of the legislation, to seek the addition of language acknowledging its concerns. The enacted legislation requires state administrative agencies, when developing implementing regulations, to "consider the needs of individuals with visual impairments."

The Maryland Department of the Environment (MDE) was the primary agency responsible for the regulations for the Maryland Clean Cars Program. In adopting the regulations, MDE considered this issue internally and determined that it falls in the safety arena rather than emissions regulation, the primary focus of the Clean Cars Program, and that this important safety concern must be addressed at the national level and independent of the Clean Cars Program. Additionally, MDE had no authority to enact safety standards for automobiles. Notwithstanding this determination, MDE supports the objective of providing safe vehicles and did take steps outside the

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regulatory process to address this important concern. MDE contacted the major automobile manufacturers and asked them to provide information on whether a solution was being sought within the industry. The industry response cited the SAE and NHTSA efforts that are now underway. For these reasons, MDE believed it acted in accordance with the directive and did not include a minimum sound standard in the final regulations.

The National Federation of the Blind did not agree with MDE and did not believe the Department fulfilled the directive of the Maryland Clean Cars Act to consider the needs of the individuals with visual impairments. As a result, blind advocates contacted Delegate Malone and Senator Stone, and each introduced new legislation in their respective chambers. The intent of this legislation was to establish a task force to study the concerns expressed by blind people. The Maryland Quiet Vehicles and Pedestrian Safety Task Force and this report are the result of that effort..

## ***Legislative Activity in Other States***

In 2008, six other states, in addition to Maryland, considered legislation to address the concerns of the blind. These were: Arizona, California, Hawaii, Kentucky, New York, and Virginia. A brief summary of the actions by each of these states is given in the table below.

STATE	LEGISLATION		ACTION		CURRENT STATUS/ DISPOSITION
	BILL NUMBER	SUMMARY	LAST	NEXT	
Arizona	HB 2780	Establish Minimum Sound Standard	2/14: Referred to House Committees of jurisdiction	6/23: Failed on adjournment	Failed
California	SB 1174	Establish Task Force	9/18: Presented to Governor	9/30: Vetoed	Vetoed
Hawaii	SB 2550	Establish Minimum Sound Standard	1/23: Referred to Senate Committee of jurisdiction	5/1: Failed on adjournment	Failed
Kentucky	HB 732	Establish Minimum Sound Standard	3/5: Referred to House Committee of jurisdiction 3/11: Hearing held	4/15: Failed on adjournment 10/7: Legislative Research Commission hearing	Failed/Referred to Legislative Research Commission
Maryland	SB 276 HB 1160	Establish Task Force	5/13: Enacted into law	10/28: First Task Force meeting 11/18: Second Task Force meeting	Passed/ Enacted
New York	SB 7151 AB 10248	Establish Minimum Sound Standard	3/12: Referred to Senate Committee of jurisdiction 6/10: Hearing in House	11/18: Special Session on budget	Pending
Virginia	SB 739	Establish Minimum Sound Standard	1/24: Referred to Joint Commission on Technology and Science (JCOTS)	3/13: Failed on adjournment 8/14: First JCOTS meeting	Failed/Referred to JCOTS

Governor Schwarzenegger, in his veto message, indicated that he, *“recognize(d) the challenges that the blind and visually impaired must overcome when interacting with the motor public.”* He further expressed his belief that, *“there is value in creating conforming standards throughout the nation <and> this issue should be handled at the federal level.”* Finally, Governor Schwarzenegger observed that the NHTSA, SAE, and the automotive industry are collaborating on research to address this problem. The Virginia Joint Commission on Technology and Science (JCOTS), recognizing the need

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for a national solution, has recommended that a letter be sent to the National Conference of State Legislatures and the American Legislative Exchange Council (both organizations are comprised of state legislators from all 50 states) to study this issue.

## ***Federal Regulatory Activity***

Experts agree that the National Highway Traffic Safety Administration (NHTSA) is empowered to establish a safety standard relating to silent vehicles and that no legislative grant of authority is required. However, without legislation mandating NHTSA action, that agency has complete discretion regarding whether or not to act. Blind activists first met with NHTSA officials in December 2007 and those officials stated that there was no clear statistical evidence that quieter vehicles were responsible for any death or injury among blind pedestrians. In fact only a statistically insignificant number of blind people were killed or injured in auto pedestrian crashes.

The blind community, influential members of Congress, and others called upon NHTSA to take a more active role in addressing concerns of the blind and other pedestrians. Therefore, the agency scheduled a listening session in June 2008. Testimony was provided by blind people, individuals researching possible sonic solutions, automotive representatives, and others. NHTSA claimed following that meeting that it would propose a research strategy in the *Federal Register* and seek comments regarding a timeline of steps NHTSA would take to conduct and facilitate needed research. To date there has been no such activity.

## **Currently Available or Expected After-Market Technology**

### ***Enhanced Vehicle Acoustics***

Enhanced Vehicle Acoustics (EVA) is a start-up company founded by a group of Stanford University graduate students in 2007 to develop an add-on sound-emitting device for hybrid vehicles. The device consists of four small speakers mounted in the vehicle's wheel wells. The speakers emit a computer-generated sound when the vehicle operates silently on battery power. EVA is working closely with Dr. Lawrence Rosenblum, a perceptual psychologist at the University of California–Riverside, to determine a sound that will be effective in alerting pedestrians and cyclists to the presence of silent vehicles and at the same time will be inoffensive to the general public. The EVA device will soon be available for purchase by car owners.

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## ***Lotus Engineering***

Lotus Engineering, the automotive consultancy division of sports car manufacturer Lotus, has developed technologies to synthesize external sound on electric and hybrid vehicles. A simulation of a real engine sound is used on the “Safe & Sound” Hybrid technology demonstrator vehicle, making it possible for a pedestrian to recognize instantly that the vehicle is in motion.

The Lotus “Safe & Sound” Hybrid technology demonstrator uses a standard Toyota Prius, one of the most popular and most advanced hybrid vehicles, to demonstrate the sound synthesis application and compensate for the lack of engine sound emitted by the vehicle when running on its electric motor.

To synthesize the engine sound, a road speed signal is taken from the vehicle and a corresponding sound is emitted through a waterproof loudspeaker system positioned adjacent to the radiator, allowing the sound to emanate from the front of the vehicle. When the car is operating on the electric motor only, throttle- and speed-dependent synthesized sound projects a realistic engine sound in front of the vehicle. The technology was designed around the behavior of a conventional engine, using an existing engine sound that makes it instantly recognizable. As with a traditional vehicle, the pitch and frequency help to identify vehicle distance and speed. If the hybrid’s combustion engine starts operating, as it does at higher speeds or throttle demands or lower battery levels, the control system automatically stops the external synthesis. When the power train control system switches the car back to running on the electric motor only, the synthesis controller instantaneously sets the system running again. The system is completely automatic and the driver hears almost none of the additional sound.

The Enhanced Vehicle Acoustics and Lotus Safe & Sound devices are just two examples of after-market technologies being developed to solve the problem of silent vehicles. While after-market solutions have been designed in the face of concerns about hybrid vehicles, which are currently the most popular low-emission vehicles on the roadways of Maryland and the United States, these solutions are technology-neutral and could be applied to other silent vehicle technologies, such as electric vehicles, or to traditional vehicles with extremely quiet engines and power trains. Furthermore, these devices can be adjusted to accommodate any sound level standard once such a standard has been determined by appropriate research and study.

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## **Conclusions**

1. Most internal-combustion vehicles provide sound cues from which vehicle position, speed, and direction can be determined.
2. All pedestrians use the sound of traffic in combination with other techniques to travel safely.
3. Blind people depend on the sound of traffic to travel independently and safely.
4. The Maryland Clean Cars Act of 2007 provides regulatory oversight, which may lead to hybrid and other low-emission vehicles being prevalent on roadways in Maryland.
5. Blind persons are able to listen to the sound of automobiles to determine the direction, speed, and pattern of traffic, making the sound of traffic essential to allowing the blind to travel safely, independently, and confidently.
6. The desire to reduce greenhouse gas emissions and the need to reduce U.S. dependence on foreign oil will continue to drive demand for hybrid electric vehicles (HEVs) and advanced technology vehicles.
7. Without adequate sound cues, blind persons have more difficulty detecting and predicting the movement of vehicles and are at added risk as pedestrians with quieter vehicles on the roadways.
8. Federal crash databases are not currently structured to allow for the quantification of the scope of the problem posed by vehicles that do not provide sufficient sound cues.
9. Sufficient anecdotal evidence exists to warrant action being taken on this issue.
10. While efforts are underway by the federal government and by the automotive industry as well as internationally to solve this problem, it is not clear whether these efforts will result in a solution by the time the Maryland Clean Cars Act goes into full effect in 2011.
11. Any minimum sound standard should not raise ambient noise levels.

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12. Unless immediate action is taken, blind Marylanders and other pedestrians will be at increased risk of being struck by vehicles that do not provide sufficient sound cues.
13. Maryland is the first state to enact legislation to study the effects of vehicle sound on pedestrian safety and technology available to enhance safety of the blind and other pedestrians and is therefore demonstrating leadership in this area.
14. Therefore it is imperative that the state of Maryland act.

## **Recommendations**

The Maryland Quiet Vehicles and Pedestrian Safety Task Force recommends that:

1. The Maryland General Assembly adopt a resolution encouraging this state's congressional delegation to support federal legislation directing the Secretary of the United States Department of Transportation to study and establish a motor vehicle safety standard that provides for a means of alerting blind and other pedestrians of motor vehicle operation.
2. The Governor of Maryland write a letter to the United States Secretary of Transportation requesting that National Highway Traffic Safety Administration study and prescribe a motor vehicle safety standard that provides for a means of alerting blind and other pedestrians of motor vehicle operation.
3. The National Federation of the Blind, American Council of the Blind, and other interested organizations representing all pedestrians continue to support the adoption of regulations at the federal level to ensure that quiet cars make sufficient sound to allow detectability by pedestrians.
4. The Maryland General Assembly extend the term of the Maryland Quiet Vehicles and Pedestrian Safety Task Force as authorized by SB 276 and HB 1160 (2008 session) to December 31, 2010:
  - a. To oversee and coordinate with government (federal and state) and industry efforts to ensure satisfactory progress towards adopting a minimum sound level and the nature and characteristics of that sound level for all new vehicles sold;

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- b. To conduct an evaluation of existing and anticipated technology to determine the appropriateness of adopting a system to be installed on state and local government purchased vehicles; and
  - c. To identify potential technologies for evaluation, install those technologies on an appropriate number of state-owned vehicles, and to evaluate the efficacy of these technologies.
5. The President of the Maryland Senate and the Speaker of the Maryland House of Delegates each choose one member from their respective chambers to serve on this task force.