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January 21, 2007

The Honorable Nicole R. Nason, Administrator
National Highway Traffic Safety Administration
400 Seventh Street, SW
Washington, DC 20590

PETITION FOR RULEMAKING

Dear Ms. Nason:

The Center for Auto Safety (CAS) petitions the National Highway Traffic Safety Administration (NHTSA) to take action to restrict the availability of two-way communication features through in-vehicle telematic systems while a vehicle is in motion. The purpose of this petition is to make the driving environment safer by reducing the availability of devices that have been proven to be traffic hazards.

According to NHTSA spokesman Rae Tyson, "Our recommendation is that you should not talk on the phone while driving, whether it's a hand-held or hands-free device."[1] It is time for NHTSA to put the results of extensive research and its own recommendation into action.

Background

The automotive industry has long been aware of the dangers posed by talking on a cell phone while operating a motor vehicle. Cellular telephones are an important resource for drivers who encounter emergency situations and pull off the road to make calls. However, when cell phones are used while driving, they are a significant cause of highway crashes. Many existing in-vehicle technologies, originally designed to promote safety by providing emergency road-side assistance or by notifying emergency responders in the event of an accident, are being expanded to offer cellular telephone service to drivers. What was once an essentially helpful technology is becoming a source of dangerous driver distraction by the addition of personal communication features that are available to a person while driving.

In search of new profit centers, major auto companies are marketing vehicle-in-motion telematic options that degrade the safety value of the Automatic Crash Notification (ACN) originally installed in motor vehicles. For example, General Motors, which was a leader in ACN with its OnStar system, began degrading safety by including personal cell phone use as an integral part of OnStar. GM once tried expanding the scope of in-vehicle telematic systems to allow drivers to receive email, movie listings,

[1] Reinberg, S. "Driving while on cell phone worse that driving while drunk," *HealthyDay News*. June 29, 2006.

personalized news, sport reports and weather while driving.[2] The potential distraction is similar to permitting television monitors in the front seats of passenger vehicles, a practice that is not permitted by state law in most, if not all states. These communication systems are becoming standard in-vehicle features from auto manufacturers that include: Tele Aid in Mercedes-Benz vehicles; OnStar in GM vehicles; and On Call in Volvos.

The largest and most dangerous use of OnStar is its use as a handsfree cell phone while driving. Chet Huber, President of OnStar, a wholly owned subsidiary of GM, recognizes the marketing potential of OnStar as an extended cell phone: "Through our relationships with the world's largest automaker and the nation's leading wireless provider, we are able to respond to our subscribers' requests to offer increased mobile connectivity. The availability of this handheld option is a natural extension of OnStar's industry leadership in the delivery of safety, security and communications inside the vehicle."[3] OnStar's wireless provider is Verizon whose website promotes its use in as the OnStar service provider as shown in Appendix A.[4]

Not to be outdone by GM and OnStar, Ford has teamed up with Microsoft to add the dangers of a personal in-vehicle cell phone capability without the safety advantages of Automatic Crash Notification. On January 7, 2007, Ford announced:

> "[T] the launch of a new factory-installed, in-car communications and entertainment system that is designed to change the way consumers use digital media portable music players and mobile phones in their vehicles. The Ford-exclusive technology based on Microsoft Auto software, called Sync, provides consumers the convenience and flexibility to bring into their vehicle nearly any mobile phone or digital media player and operate it using voice commands or the vehicle's steering wheel or radio controls. Ford owners will not need to worry about whether their car or truck is compatible with the latest phone or music player that hits the market. Sync seamlessly integrates the vehicle with the popular portable electronic devices of today and is upgradeable to support the devices and services of tomorrow."[5]

Research Studies

Research has consistently shown that operating a motor vehicle while talking on a cell phone – whether hand-held or hands-free – increases the risk of an accident to three to four times the experience of attentive drivers.[6] The general consensus of the scientific community is that there is little, if any, difference in crash rates involving hands-free versus hand-held cell phones. The two-way conversation on a cellular phone, not the task

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[2] Regan, K. "GM Drivers Will Get Stock in Traffic," *ECT News*. 14 Feb. 2001. For a while in 2001, OnStar teamed with Fidelity Investments and allowed drivers to trade stocks in real-time behind the wheel of the car but the option was eventually dropped. Frakes, D. "Fidelity Investments Expands In-Vehicle Investment Service Availability Through OnStar," *OnStar Communications,* PR: 17 May 2001.

[3] Verizon Wireless Introduces the America's Choice(SM) with OnStar Plan, PR Newswire, June 16, 2005.

[4] http://www.vzwshop.com/onstar/.

[5] The full text of the Ford announcement is found in Appendix B.

[6] Klauer, S., Dingus, T., Neale, V, Sudweeks, J. and Ramsey, D. 2006.

of holding the phone, causes a cognitive distraction. This distraction induces "inattention blindness," inhibiting drivers' abilities to detect change in road conditions.[7]

State Legislation

Spurred by this apparent danger, several states have worked on a variety of ways to remedy this source of driver distraction. The highest standard – enacted by District of Columbia, Connecticut, New Jersey and New York – prohibits the use of any handheld cellular phone but permits drivers to use hands-free wireless devices. Eight states have recognized the importance of banning hand-held and hands-free cell phone when it comes to the safety of children. In Arizona, Arkansas, Connecticut, Illinois, Massachusetts, New Jersey, Rhode Island and Tennessee, school bus drivers are prohibited from talking on any type of cellular device.[8]

Many cities have encountered difficulty enforcing bans because of the high number of violations. In 2004, a NHTSA study estimated that at any given moment in daylight hours, 8% of all drivers are operating a vehicle while talking on a cell phone. This is two times the estimated number of drivers talking on a cell phone in the year 2000. Continuing to integrate cellular technology into vehicles will allow this statistic to continually grow.[9] The total number of cell phone calls from 1996-2001, 326 billion, shows the enormous potential exposure of cell phone use in vehicles.[10]

Even if states were to extend the regulations against the use of hand held cell phones to hands free cell phones as the inevitable increase in traffic casualties mount in proportion to their use, enforcement against hands free cell phone use is a Herculean task at best. While traffic officers can see if drivers are using hand held cell phones, it is virtually impossible for an officer to see a driver using a hands free cell phone. The solution to stopping talking and driving hands free in a motor vehicle with an integrated cell phone is through a Federal Motor Vehicle Safety Standard prohibiting the use of cell phone communications while the vehicle is in motion.

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[7] This is the general consensus of NHTSA reviews of literature in this area (Dragutinovic, N., and Twisk, D., 2005; Caird, J., Scialfa, C., Ho, G., and Smiley, A., 2004). This conclusion is also supported by all recent laboratory and driving simulation studies (Hahn, R., and Prieger, J., 2005; Harbluck, J., and Lalande, S., 2005; Rakauskas, M., Ward, N., Bernat, E., and Cadwallader, M., 2005; Ranney, T., and Harbluck, J., 2005; Stanley, L., Kelly, M., and Lassacher, S., 2005; Strayer, D., Drews, F., Crouch, D., and Johnston, W., 2005, Mazzae, E., Ranney, T., Watson, G., and Wightman, J., 2004;), closed-track road studies (Ranney, T., and Harbluk, J., 2003), and open-road studies (Mazzae, E., Goodman, M., Garrott, R., and Ranney, T., 2004; Harbluk, J., Noy, Y., and Eizenman, M., 2002). Attachment A is a bibliography of the extensive research on the hazards of cell phone use.

[8] Attachment B is a compendium of state laws on cell phone use.

[9] Glassbrenner, D. "Driver Cell Phone Use in 2004," NHTSA. Feb 2005. [HS 809 847]

[10] Source, CTIA- The Wireless Association, email from John Paul Edgette, CTIA to Tyler Patterson, CAS, July 21, 2006.

Exemplary Vehicle Crashes

No one can deny that cell phones have resulted in traffic crashes, deaths and injuries. Leona Greif and Marcia Nathans were both killed when drivers, talking on cell phones, struck their vehicles while they were stopped at a stop light. Nathans was killed, and her son sustained critical injuries when their vehicle was struck by an inattentive driver who ran through two red lights at 65 mph in a 45 mph zone.[11]

Patricia Pena was driving on a weekday afternoon with her two-year old daughter Morgan in a child safety seat in the rear. Another driver, distracted by a cell phone, missed a stop sign and struck the Penas' vehicle at 45 mph. Patricia watched as her daughter was rushed to an intensive care unit as a result of injuries sustained from the crash. Two-year old Morgan Pena passed away sixteen hours after the crash.[12]

There are hundreds of cases like that of Gregory Davis,[13] Richard McKeefery,[14] John and Carole Hall,[15] all of whom died at the hands of a driver talking on a cell phone. These accidents will increase in number if NHTSA does not move quickly to limit the availability of in-vehicle cellular technology. NHTSA has known from the time of the first head of the agency, William Haddon, M.D., that the most effective public health strategy is one that is passive: in this case not permitting cell phone technology to be so readily available.

Conclusion

It is tragic that auto makers are continuing to integrate and promote hands-free cellular telephones in vehicles. These systems are a distraction and affect the driver's ability to perform properly. It is time for the government to intervene on this dangerous practice, to ensure basic protection for those who use public roads and sidewalks. As cognitive engaging technology makes its way into standardized automotive features, driver distraction will increase. It is essential to start regulating now to address driver distraction in order to keep our roadways safe.

An additional reason for government action is that, in the absence of regulation, manufacturers will be caught between the competitive pressure to offer these communication features and the potential for product liability exposure when crashes are caused by the use of cell phones installed by them.

The Center for Auto Safety therefore petitions NHTSA to initiate rulemaking to prohibit the use of integrated cellular telephones and other interactive communication and data transmission devices that can be used for personal conversations and other interactive personal communication or messaging while a vehicle is in motion. As a first

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[11] Neff, E., and Manning, M. "Clark County Cell Phone Use Heaviest in the Nation," *Las Vegas Sun*. 07 Feb 2003.

[12] Kobe, G. "Death by Distraction," *Automotive Industries.* 05 May 2000.

[13] Magliozzi, T. "Drive Now, Talk Later," *San Jose Mercury News*. 13 May 2001.

[14] Karp, D. "Driver won't be charged in crash," *St. Petersburg Times*. 17 Aug. 2001.

[15] Stockwell, J. "Phone Use Faulted in Collision." *Washington Post*. 6 Dec. 2000: B1.

step, the Center petitions NHTSA to issue a notice of proposed rulemaking which would amend FMVVSS 102 to add a new provision reading:

> *Any vehicle integrated personal communication systems including cellular phones and text messaging systems shall be inoperative when the transmission shift lever is in a forward or reverse drive position.*

In addition, the Center petitions NHTSA to issue an advanced notice of proposed rulemaking to consider subjecting other vehicle integrated telematic systems that significantly increase vehicle crash rates to be included in the scope of the above proposed amendment to FMVSS 102.

Finally, because the accident experience of drivers using cell phones has been shown to be similar to that of drunk drivers (a major NHTSA priority), we request that NHTSA increase its efforts to support state programs to limit cell phone use by drivers in moving vehicles in the same manner NHTSA supports state programs against drunk driving. From a traffic crash perspective, there is no difference between drinking and driving or talking and driving – both increase the risk of a vehicle crash and casualty by a factor of four.

Sincerely

Clarence M. Ditlow
Executive Director

Tyler Patterson
Vehicle Safety Intern

Appendix A

Make OnStar Hands-Free calls for less using your Verizon Wireless Family SharePlan minutes.

- Add your vehicle as a second line to a Verizon Wireless America's Choice Family SharePlan for more value and convenience.
- Make and receive hands-free, voice-activated calls on the road easily at the touch of a button.
- Get unlimited nights and weekend minutes, and with National IN Calling get unlimited calls to other Verizon Wireless customers without using plan minutes.
- Enjoy the simplicity of one plan, one package of minutes, and one bill for all of your calls.
- Forward your calls from your Verizon Wireless phone to your OnStar Hands-Free calling to enjoy the convenience of hands-free calling while driving.
- With Verizon Wireless you'll get the Nation's most reliable wireless network.

With our world moving faster than ever, staying connected can be a challenge.
But now there's the America's Choice Plan with OnStar, the smart, simple and most comprehensive way to stay in touch-- on and off the road.

Appendix B

FORD SYNC™ – TODAY'S DRIVERS DEMAND STAYING CONNECTED
SYNC MY RIDE VIDEO

DETROIT, Mich., Jan. 7, 2007 – Ford Motor Company today announced the launch of a new factory-installed, in-car communications and entertainment system that is designed to change the way consumers use digital media portable music players and mobile phones in their vehicles.

The Ford-exclusive technology based on Microsoft Auto software, called Sync, provides consumers the convenience and flexibility to bring into their vehicle nearly any mobile phone or digital media player and operate it using voice commands or the vehicle's steering wheel or radio controls.

Ford owners will not need to worry about whether their car or truck is compatible with the latest phone or music player that hits the market. Sync seamlessly integrates the vehicle with the popular portable electronic devices of today and is upgradeable to support the devices and services of tomorrow.

"Sync is what today's generation and today's drivers demand in connectivity," says Derrick Kuzak, group vice president, product development, Ford Motor Company. "Not only does it offer hands-free phone operation and iPod®, Zune or MP3 player connectivity, it's built on a software platform that is upgradeable and will allow us to offer new features by simply upgrading the software."

Sync offers consumers two ways to bring electronic devices into their Ford, Lincoln and Mercury vehicles and operate them seamlessly through voice commands or steering wheel controls:

- Bluetooth, for wireless connection of phones and phones that play music.
- A USB 2.0 port for command and control and charging of digital media players – including the Apple iPod and Microsoft Zune – as well as PlaysForSure music devices and most USB media storage devices. Supported formats include MP3, AAC, WMA, WAV and PCM.

The ability to upgrade Sync, control all portable electronic devices via voice commands, offer a USB port to connect storage devices and recharge electronics puts this technology well beyond technology available today – including Bluetooth, hands-free offerings or portable music device connections.

"More than 80 percent of U.S. households use cell phones, and 60 million digital music devices have been sold. That's a 50 percent increase from just 2005," Kuzak said. "With such market growth led by consumers' needs, Sync is the right new technology at the right time for Ford, Lincoln and Mercury vehicles."

Sync will debut this calendar year on the 2008 Ford Focus, Fusion, Five Hundred, Edge, Freestyle, Explorer and Sport Trac; Mercury Milan, Montego and Mountaineer; and Lincoln MKX and MKZ. The technology will be on all Ford, Lincoln and Mercury vehicles in the near future.

"Ford and Microsoft share a vision for a future where drivers are safely connected to the people, information and entertainment they care about while they are on the road," said Bill Gates, Chairman, Microsoft Corporation. "Built on Microsoft Auto technology, Ford Sync delivers an in-car system that is an important step toward achieving this vision. Using software that bridges the automotive and consumer electronics industries, Sync will help revolutionize the driving experience by providing a simple system that intelligently connects mobile phones, music players, and more."

Sync Features:

- ***Voice-activated, hands-free calling***: Simply press the "Push to Talk" button on the steering wheel, and then say the name of the person you wish to call. Sync will automatically connect with the names in the mobile phone's contact list.
- ***Uninterrupted connections:*** No need to hang up in the middle of a cell phone call as you enter your vehicle. Simply touch the Telephone Button on the steering wheel, and Sync will instantly connect to a Bluetooth phone.
- ***Audible text messages:*** Sync will convert text messages from your phone to audio and read it out loud. The system is even smart enough to translate such commonly used text messaging expressions as "LOL" and J. You can choose to reply from any of 20 predefined responses.
- ***Advanced calling features:*** Sync includes the same features offered on mobile phones, including caller ID, call waiting, conference calling, a caller log, a list of contacts, a signal strength icon, and a phone battery charge icon – all conveniently located on the radio's display screen.
- ***Voice-activated music:*** Browse the music collection on your digital media player, mobile phone or USB drive by genre, album, artist and song title using simple voice commands, such as "Play genre Rock," "Play ," or "Play Track ."
- ***Instant voice recognition***: Sync's advanced voice recognition technology means when you're ready to use your phone or digital music player, just speak simple voice commands.
- ***Ring tone support***: For supported phones, Sync will play personal ring tones. If you've configured unique ring tones to identify specific callers, Sync will automatically play those, too.
- ***Automatic phonebook transfer***: Sync will automatically and wirelessly transfer all the names and numbers in a mobile phonebook.
- ***Multilingual intelligence***: Sync is fluent in English, French and Spanish.

Objective	To conduct in-depth analyses of driver inattention using the driving data collected in the 100-Car Naturalistic Driving Study and establish direct relationships between driving behavior, crash and near-crash involvement.				
Features	**Population**	**Method**	**Analysis**	**Outcome**	**Recommendations**
Hands-Free / Hand-Held Hands-Free, Hand-Held Setting: Simulator / Lab / Road Road Study Duration 18 month period	Numbers Data was collected on 109 cars Location Metropolitan area	Data collected using the 100-Car Study *event database* that consisted of the reduced crashes, near-crashes, and incidents; and the *baseline database*. Databases contained data from sensing and video subsystems installed in vehicles.	Risk was calculated (odds ratios) using both crash and near-crash data as well as normal baseline driving data for various sources of inattention. The corresponding population attributable risk percentages were also calculated to estimate the percentage of crashes and near-crashes occurring in the population resulting from inattention.	Drivers engaging in visually and/or manually complex tasks have a three-times higher near-crash/crash risk than drivers who are attentive.	It is more dangerous to engage in secondary tasks when the driving environment is visually cluttered, with a lower sight-distance, or demanding traffic (intersections, entrance/exit ramps, curved roadways) and in poor weather or roadway conditions (rainy weather, icy or wet road surfaces).
Reference	**Klauer, S., Dingus, T., Neale, V., Sudweeks, J. and Ramsey, D. (2006).** *The Impact of Driver Inattention on Near/Crash Risk: An Analysis Using the 100-Car Naturalistic Driving Study Data.* (DOT HS 810 594). Washington, DC: U.S. Department of Transportation, National Highway Traffic Safety Administration (NHTSA). pp. 1-224.				

Objective	To conduct a literature review of various road safety studies focusing on the effects of mobile phone use on driving performance and traffic safety.				
Features	**Population**	**Method**	**Analysis**	**Outcome**	**Recommendations**
Hands-Free / Hand-Held Hands-Free, Hand-Held Setting: Simulator / Lab / Road Simulator, Lab, Road Study Duration Studies written from 1999-2005	Numbers 17 studies reviewed Location n/a	All studies used met established criteria and were classified and summarized by simulator, lab and road.	n/a	The level of complexity of the phone conversation (its cognitive demands) is the important factor that determines the extent of the effect of the phone conversation on driving performance. The vast majority of studies report that hands-free phoning does not have a significant safety advantage over handheld phoning. Although handheld units add to the driving task due to the need for manipulation, the most important negative factor of mobile phone use is the same for both types of phone – the diversion of attention from driving to the conversation itself.	These negative effects on driving performance are caused by physical, visual, auditory and cognitive distraction as a result of mobile phone use. Although the physical distraction could be reduced or even limited by various 'technical' aids like hands-free phones, speed dialing, voice activation, etc., the cognitive distraction remains the main problem involved in concurrent mobile phone use. This is why hands-free mobile phones do not have significant safety advantages over handheld mobile phones.
Reference	**Dragutinovic, N., and Twisk, D. (2005).** Use of mobile phones while driving – effects on road safety. R-2005-12, pp. 1-55.				

Objective	To estimate the relationship between cell phone use while driving and accidents and allow for the direct estimation of the impact of a cell phone ban while driving.

Features	**Population**	**Method**	**Analysis**	**Outcome**	**Recommendations**
Hands-Free / Hand-Held Hands-Free, Hand-Held	Numbers 20,287 survey respondents	Survey data was collected via the internet and a paper mailing. Study also used data collected from previous similar studies.	Risk was calculated using various equations.	Accident risk from hand-held and hands-free cell phones is equal, which calls into question bans on hand-held usage such as the ones passed in Connecticut, New York, New Jersey, and Washington, D.C. Study estimates the reduction in accidents from a ban on cell phone use while driving are both lower and less certain than some previous studies indicate.	Policy makers should factor into their decisions that we find no significant impact of a cell phone ban or a hands-free requirement on accidents. Furthermore, because we find there is more uncertainty than previously suggested in the relationship between cell phone use while driving and accidents, cost-benefit analyses of proposed bans should reflect this uncertainty. Results do not imply that nothing should be done to regulate drivers while using cell phones, rather, study provides additional evidence that policy makers should consider before regulating.
Setting: Simulator / Lab / Road Lab	Location n/a				
Study Duration n/a					

Reference	**Hahn, R.W., and Prieger, J.E. (2005).** *The Impact of Driver Cell Phone Use on Accidents* (Paper No. 05-20). Washington, DC: The AEI-Brookings Joint Center for Regulatory Studies. pp. 1-56.

Objective	To estimate the relationship of various speech-based tasks on visual detection.

Features	**Population**	**Method**	**Analysis**	**Outcome**	**Recommendations**
Hands-Free / Hand-Held Hands-Free Setting: Simulator / Lab / Road Simulator Study Duration n/a	Numbers 12 drivers Location n/a	Drivers listened and responded to e-mail messages presented in a human voice and two types of synthetic speech (concatenative and formant) while driving a simulator. Their performance for visual event detection, vehicle control, and message responses was assessed.	Risk was calculated using various equations.	Drivers were poorer at detecting visual changes when either of the synthetic speech systems was used. Drivers detected fewer visual changes during the difficult messages than during the baseline driving and were less accurate when responding to messages presented in synthetic speech compared with a recorded human voice. Ratings indicated that listening to the synthetic speech requires more mental effort than listening to the recorded human voice. Preference ratings for the interfaces decreased as mental effort increased. Although drivers were not required to direct their attention away from the road, using the speech-based interfaces reduced drivers' visual event detection and their response accuracy to messages themselves.	As the use of speech-based systems increases for automotive use, it is important that the safety impacts of both text-to-speech and voice recognition systems are addressed.

Reference	**Harbluk, J. and Lalande, S. (2005).** Performing E-Mail Tasks While Driving: The Impact of Speech-Based Tasks on Visual Detection. *3rd International Driving Symposium on Human Factors in Driver Assessment, Training, and Vehicle Design*. pp. 311-317.

Objective	To compare driving performance while talking on a hands-free cellular phone with performance during conversations with 'considerate' and 'inconsiderate' passengers.

Features	Population	Method	Analysis	Outcome	Recommendations
Hands-Free / Hand-Held	Numbers	Participants were asked to drive through a road containing four driving scenarios. A working memory digit recall and sentence verification task were used to simulate conversation in three conversation conditions. A silent condition was also used as control.	Performance was analyzed by counting the proportion of items recalled in the correct order (serial recall), the proportion of digits recalled from the list, regardless of position (item recall), as well as counting item errors, order errors and omissions. The 'considerate passenger' condition was not included in the analysis since this conversation took place during the filler road sections.	Impairments in the driving performance measures, and interruptions in the conversation task, were both found to be greatest during the more difficult driving conditions. These findings support the suggestion that mobile telephone conversations are most disruptive in difficult driving conditions, and especially when the attention demand from the telephone conversation itself is also quite high.	n/a
Hands-Free	24 drivers				
Setting: Simulator / Lab / Road	Location				
Simulator	n/a				
Study Duration					
n/a					
Reference	**Merat, N., and Jamson, H. (2005).** Shut up I'm Driving! Is Talking to an Inconsiderate Passenger the Same as Talking on a Mobile Phone? *Proceedings of the Third International Driving Symposium on Human Factors in Driver Assessment, Training and Vehicle Design.* pp. 426-432.				

Objective	To compare driver performance while conversing on a hands-free cell phone to conditions of operating common in-vehicle controls (e.g., radio, fan, air conditioning) and alcohol intoxication.				
Features	**Population**	**Method**	**Analysis**	**Outcome**	**Recommendations**
Hands-Free / Hand-Held Hands-Free Setting: Simulator / Lab / Road Simulator Study Duration n/a	Numbers 53 male drivers Location n/a	Participants performed two sets of secondary-tasks: In-Vehicle tasks and Cell Phone conversation. Tasks were completed while sober and intoxicated (alcohol). Participants were told to do their best on the secondary-tasks, but the main focus was to drive safely.	Results were analyzed through the use of various tests including Anovas, Mann-Whitney tests and chi-squared tests.	Conversations using hands-free cell phones demonstrated significant impairment compared to baseline driving without any distraction. Distraction from in-vehicle tasks resulted in the most impairment. Secondary-task distraction resulted in more impairment than did alcohol intoxication. Intoxicated drivers were less impaired than sober drivers when distracted. Higher workload was found for the secondary-tasks on the subjective scale. Faster heart rate was present for both secondary-tasks and especially during the cell phone conversations, which has also been found in cell phone driving studies in the real world as a sign of higher mental effort load	It is essential for drivers to limit their own usage and recognize what the consensual risks within their limits and the sanctioned risks they must not overstep. The combination of navigating verbally through a phone menu, as is done with the 511 traveler information system, may impair driving in that it may utilize cognitive resources needed for safe driving performance.
Reference	**Rakauskas, M., Ward, N., Bernat, E., and Cadwallader, M. (2005).** *Driving performance during cell phone conversation and common in-vehicle tasks while sober and drunk.* (Mn/RC 2005-41). HumanFIRST Program, University of Minnesota. pp. 1-203.				

Objective	To assess the difference in distraction caused by the use of a hands-free wireless phone interface versus that associated with the use of a hand-held interface.

Features	**Population**	**Method**	**Analysis**	**Outcome**	**Recommendations**
Hands-Free / Hand-Held Hands-Free, Hand-Held Setting: Simulator / Lab / Road Simulator Study Duration n/a	Numbers 68 drivers Location n/a	The approach to this research involves the simulation of voice communications in a variety of common driving situations with controlled variation of task demand levels. A series of integrated scenarios was developed in which driving and communication task objectives were combined such that drivers are required to use wireless phones.	Results were analyzed through the use of various tests.	There were no reliable differences between interface conditions.	n/a

Reference	**Ranney, T., and Harbluk, J. (2005).** *Examination of the Distraction Effects of Wireless Phone Interfaces Using the National Advanced Driving Simulator – Final Report on a Freeway Study.* (DOT HS 809-787) Washington, DC: U.S. Department of Transportation, National Highway Traffic Safety Administration (NHTSA). pp. 1-144.

Objective	To explore the safety and usability of the 511 user interface in the context of a mobile phone user who has the added workload of driving a vehicle.

Features	Population	Method	Analysis	Outcome	Recommendations
Hands-Free / Hand-Held	Numbers	Subjects first went through three to five-minute scenarios in the simulator. Training began with relatively gentle drives. As subjects proceeded through the training, scenarios became longer, more challenging, and more visually complex. Subjects were then trained and given practice using the Montana Dept. of Transportation's 511 highway information line, with the voice understanding system. Following training, subjects completed a, questionnaire on any SID symptoms they might have experienced.	Results were analyzed through the use of various tests analyzing driving performance and the follow-up questionnaires.	Performance on the primary driving task (e.g., lane keeping and speed control) was not affected by use of the 511 traveler information system. Driving tasks that required urgent attention (e.g., responding to unexpected traffic conflicts) were degraded by using the 511 travel system regardless of the type of phone used. Drivers using either cell phone to interact with the 511 information system were found to have a higher number of collisions and less situation awareness than those not interacting with the 511 system. Drivers using a hand-held cell phone were also found to have a higher frequency of braking responses.	Study found, at most, marginal safety benefits for the hands-free interface. Performance on the primary tasks of driving (e.g., lane and speed maintenance) were found to be unaffected by interacting with the cell phone. The tasks that require more prompt response times (e.g., avoiding collisions during unexpected conflicts) were degraded by the use of a cell phone, regardless of the type of instrument used. Drivers were less aware of their surroundings when interacting with the 511 traveler information system while using a cellular phone and driving.
Hands-Free, Hand-Held	36 drivers				
Setting: Simulator / Lab / Road	Location				
Simulator	n/a				
Study Duration					
n/a					

Reference	**Stanley, L., Kelly, M., and Lassacher, S. (2005).** Driver Performance While Interacting with the 511 Travel Information System in Urban and Rural Traffic. *Proceedings of the Third International Driving Symposium on Human Factors in Driver Assessment, Training, and Vehicle Design*. Bozeman, Montana. pp. 486-492

Objective	To summarize laboratory data that addressed questions related to cell phone use while driving including: safety issues of hand-held v. hands-free phones, memory tasks and inattention blindness.

Features	**Population**	**Method**	**Analysis**	**Outcome**	**Recommendations**
Hands-Free / Hand-Held Hands-Free, Hand-Held Setting: Simulator / Lab / Road Simulator, Lab Study Duration n/a	Numbers 64 drivers Location n/a	To contrast the use of hand-held and hands-free cell phone conversations on responses to traffic signals in a simulated driving environment, control groups were used who either listened to the radio or listened to a book on tape while performing the driving task. As participants performed the driving task, occasional red and green lights were flashed on the computer display. If participants saw a green light, they were instructed to continue as normal. However, if a red light was presented they were to make a braking response as quickly as possible.	Results were analyzed through the use of various tests analyzing driving performance. The driver response time variable was included to determine how quickly participants could react to the red light as well as to determine the likelihood of detecting simulated traffic signals under the assumption that these measures would contribute significantly to any increase in the risks associated with driving and using a cell phone.	The data indicates that the phone conversation itself results in significant slowing in the response to simulated traffic signals, as well as an increase in the likelihood of missing these signals. Hand-held and hands-free cell phones resulted in equivalent dualtask deficits, which indicate that the interference was not due to peripheral factors such as holding the phone while conversing. These findings also rule out interpretations that attribute the deficits associated with a cell phone conversation to simply attending to verbal material, because dual-task deficits were not observed in the book-on-tape and radio controls. Active engagement in the cell phone conversation appears to be necessary to produce the observed dual-task interference.	Research indicates that the use of cell phones disrupts driving performance by diverting attention from the info processing directly associated with the safe operation of a motor vehicle. Similar patterns of interference were observed for hand-held and hands-free cell phones. Policies that restrict hand-held devices but permit hands-free devices are not well grounded in science. The safest course of action is to pull over and park in a safe location before one makes or takes a call. Regulatory issues are best left to legislators who are provided with the latest scientific evidence. As more cognitively engaging technology makes its way into the vehicle, the potential for even more severe driver distraction will increase. In the long run, skillfully crafted regulation and better driver education addressing driver distraction will be essential to keep our roadways safe.
Reference	**Strayer, D., Drews, F., Crouch, D. and Johnston, W. (2005).** Why do Cell Phone Conversations Interfere with Driving? In W. Walker and D. Herrmann (Eds.) *Cognitive Technology: Essays of Thought and Society.* pp. 51-68.				

Objective	To conduct a meta-analysis of various epidemiological and driver performance studies focusing on the effects of mobile phone use on driving.

Features	**Population**	**Method**	**Analysis**	**Outcome**	**Recommendations**
Hands-Free / Hand-Held Hands-Free, Hand-Held Setting: Simulator / Lab / Road Lab Study Duration n/a	Numbers 84 Studies Location n/a	Where there were sufficient studies, meta-analyses were carried out to combine study results to answer the above questions. Where there were not sufficient studies, the results of individual epidemiological (i.e., crash risk) and performance (i.e., reaction time and driving variables) studies were reviewed. In addition, because of the availability of a large number of studies, a quantitative analysis of reaction time, as affected by cell phone characteristics, cell phone tasks, driving tasks and driver age was carried out.	Results were analyzed through meta-analysis.	Based on the available data, performance did not differ between hand-held and hands-free cell phones. A single epidemiological study found an unexpected effect of a slightly higher risk for hands-free use. This may be confounded by exposure to driving as well as exposure to phone use while driving which may differ between drivers using hand-held versus hands-free phones. Most driving performance studies found no difference between hands-free and handheld phones.	n/a

Reference	**Caird, J., Scialfa, C. and Ho, G. (2004).** Effects of cellular telephones on driving behaviour and crash risk: Results of meta-analysis. University of Calgary: CAA Foundation for Traffic Safety. pp. 1-74. **Caird, J., Scialfa, C., Ho, G. and Smiley, A. (2004)**. A meta-analysis of driving performance and crash risk associated with the use of cellular telephones while driving. *Proceedings of the Third International Driving Symposium on Human Factors in Driver Assessment, Training and Vehicle Design.* pp. 478-485.

Objective	To investigate the question of how driving while talking on a cell-phone differs from driving while conversing with a passenger.				
Features	**Population**	**Method**	**Analysis**	**Outcome**	**Recommendations**
Hands-Free / Hand-Held Hand-Held Setting: Simulator / Lab / Road Simulator Study Duration n/a	Numbers 97 Participants Location n/a	After providing informed consent, subjects answered questionnaires assessing their mood and driving attitudes. Next, participants were familiarized with the driving simulator using a standardized 20-minute adaptation sequence. After finishing the familiarization, one participant was randomly selected to drive the vehicle, the other, based on condition was either the passenger or talking on the cellphone to the driver from a different location.	Equations analyzed tasks accomplishments and situation awareness.	The analysis of the conversation data suggests that the driver and the passenger are more frequently talking about the surrounding traffic and that the traffic and driving task become part of the conversation, as indicated by the fact that pairs spent more conversational turns on the traffic topic in the passenger condition. This indicates that the passenger supports the driver in his task of driving by directing attention to the surrounding traffic when necessary and by supporting the driver in devoting attention to the traffic rather than the storytelling. Thus, the better driving performance of participants in the passenger condition is partly due to the fact that the driver and the passenger share situation awareness.	Despite the fact that there is more and more evidence indicating the validity of driving simulator based findings with regard to real driving, additional research investigating passenger conversations and cell-phone conversations in real driving would be important to show that the current findings can be generalized beyond simulated driving.
Reference	**Drews, F., Pasupathi, M. and Strayer, D. (2004).** Passenger and cell-phone conversations in simulated driving. *Proceedings of the 48th Annual Meeting of the Human Factors and Ergonomics Society.* pp. 2210-2212.				

Objective	To assess the impact of wireless phone use on driving behavior and performance.				
Features	**Population**	**Method**	**Analysis**	**Outcome**	**Recommendations**
Hands-Free / Hand-Held Hands-Free, Hand-Held Setting: Simulator / Lab / Road Road Study Duration 6-weeks	Numbers 10 drivers Location Public Roads	Participants drove for two weeks with each of three types of wireless phones: hand-held, hands-free headset, and hands-free with voice dialing. Participants were instructed that the study sought to assess a state-of-the-art data acquisition system and also gather drivers' opinions about new in-vehicle technologies. Every two weeks, the phone interface configuration was altered and participants were instructed on the use of the wireless phone interface that would be present in the vehicle for that period. Drivers were instructed that they were free to use the wireless phone provided to them (rather than their own personal phone) and the test vehicle in their normal, daily routine. Thus, the test vehicles were to take the place of participants' normal vehicles during the course of their participation in the study.	Observation over a period of time during normal, unrestricted driving provided the gathering of naturalistic driving data with a minimum of experimental artifacts. This method also provided insights into frequency of use, duration of use (e.g., conversation), and driving situations during use as a function of the technology. However, this unrestricted driving led to highly variable driving conditions that complicated data analysis.	Research findings highlighted the impact of wireless phones on driving performance and behavior. The results of the on-road study indicated that phone use alters drivers' attention, as evidenced by changes in patterns of eye glance behavior. However, the variability of driving conditions observed in this study hindered the identification of specific patterns of degraded driving behavior. Although hands-free interfaces allow drivers to steer using both hands, in practice drivers were observed to steer using two hands quite infrequently during routine driving as well as during hands-free phone use. In the more controlled laboratory study, we found that phone use degraded driving performance, including measures of vehicle control and car following. There were also differences between interfaces. Specifically, handheld phone interfaces were shown to interfere with steering and lane position variability more than hands-free interfaces, however the hand-held interface was associated with faster dialing times and fewer dialing errors than the hands-free interfaces.	n/a
Reference	**Mazzae, E., Goodman, M., Garrott, R., and Ranney, T. (2004).** *NHTSA's Research Program on Wireless Phone Driver Interface Effects.* (Paper Number 05-0375). Washington, DC: U.S. Department of Transportation, National Highway Traffic Safety Administration (NHTSA). pp. 1-7.				

Objective	To examine the effects of phone interface type on driving performance and drivers' ability to perform phone tasks.

Features	**Population**	**Method**	**Analysis**	**Outcome**	**Recommendations**
Hands-Free / Hand-Held Hands-Free, Hand-Held Setting: Simulator / Lab / Road Simulator Study Duration n/a	Numbers 54 Drivers Location n/a	An experiment was conducted in which participants drove a 17-mile freeway scenario on the NADS while performing phone tasks. The scenario consisted of straight segments of divided highway with moderate traffic and interchanges that required exiting and merging behavior. This route was driven once for each phone interface. Simulated phone conversations were staged to coincide with selected driving situations to ensure that all participants used the phone under comparable driving conditions.	Questionnaire results were analyzed to determine the participants' preferences among the three wireless phone interface conditions. The pattern of preferences was compared with performance differences for initiating and terminating phone calls, as well as for performance on the conversation task while driving. All inferential analyses were conducted using the SAS System for Windows.	Results showed that in most cases participants overestimated the ease of use afforded by hands-free phone interfaces. In general, participants considered the hand-held interface to be most difficult to use, followed by the headset hands-free and voice dialing hands-free interfaces, respectively. However, significant differences among interfaces were evident for dialing and hanging up. The hand-held interface was associated with the fewest dialing errors and significantly faster dialing times than the two hands-free interfaces for all three age groups.	Findings concerning the time taken to dial and answer are directly applicable to real world driving since a real phone connection was used in the study. No differences were found among interface conditions in phone conversation task performance, including judgments about the sentences and recall of sentence subjects or objects.

Reference	**Mazzae, E., Ranney, T., Watson, G. and Wightman, J. (2004).** Hand-held or hands-free? The effects of wireless phone interface type on phone task performance and driver performance. *Proceedings of the Human Factors and Ergonomics Society 48th Annual Meeting*. Santa Monica, CA: Human Factors and Ergonomics Society. pp. 2218-2221.

Objective	To further explore the consequences of hands-free cellular phone conversation for visual performance in a change detection task and to find sources of interference.				
Features	**Population**	**Method**	**Analysis**	**Outcome**	**Recommendations**
Hands-Free / Hand-Held Hands-Free Setting: Simulator / Lab / Road Simulator Study Duration n/a	Numbers 28 Drivers Location n/a	Observers were asked to search for changes within complex traffic scenes, in which flicker of the display was used to mask the local transients produced by the changes under single and dual task environments.	Various equations were used to summarize results.	Found that a naturalistic hands-free phone conversation could disrupt change detection, thereby degrading the encoding of visual information and increasing the frequency of undetected changes. Data also revealed a tendency for conversation to impair knowledge driven orienting of attention in older adults. Also found that an attentive listening task produced no such effects. Actual or potential applications of this research include the design of displays and interventions to minimize the effects of cognitive distraction on human performance.	n/a
Reference	**McCarley, J., Vais, M., Pringle, H., Kamer, A., Irwin, D. and Strayer, D. (2004).** Conversation Disrupts Change Detection in Complex Traffic Scenes. *Human Factors*, Vol. 46, pp. 424-436.				

Objective	To collect information useful in the assessment of 1) the distraction potential of wireless phone use while driving, and 2) the difference in distraction caused by the use of a hands-free wireless phone interface versus that associated with use of a hand-held interface.

Features	Population	Method	Analysis	Outcome	Recommendations
Hands-Free / Hand-Held Hands-Free, Hand-Held Setting: Simulator / Lab / Road Simulator Study Duration n/a	Numbers 54 Drivers Location n/a	The approach to this research involves the simulation of voice communications in a variety of common driving situations with controlled variation of task demand levels. A series of integrated scenarios was developed in which driving and communication task objectives were combined such that drivers are required to use wireless phones. Monetary incentives are used to establish priorities with respect to primary (driving) and secondary (phone communication) task performance. The method requires making and receiving phone calls while driving. Wireless phone use was scheduled to coincide with selected driving situations to ensure that all participants use the phones under comparable driving conditions.	Analyses were conducted to examine the effects of age, gender, phone interface, and practice on Baddeley task scores.	No differences were found for interface condition, nor for the interaction of age, gender, and interface condition. For judgment, no differences were found between age or gender groups. Participants performed consistently well on this aspect of the task, with most scores falling between 21 and 24. For recall, significant differences were found for age and gender. Regarding gender, females recalled significantly more words on average than did males. Follow-up analyses for age revealed that the young group recalled significantly more words than did the middle and older groups.	n/a

Reference	**Ranney, T., Watson, G., Mazzae, E., Papelis, Y., Ahmad, O. and Wightman, J. (2004).** *Examination of the distraction effects of wireless phone interfaces using the National Advanced Driving Simulator-Preliminary report on freeway pilot study.* (DOT HS 809 737). Washington, DC: U.S. Department of Transportation, National Highway Traffic Safety Administration (NHTSA). pp. 1-63.

Objective	To simulate real driving conditions by providing a simulated driving task with repeated experiences of simulated driving and talking and two different phone tasks with different proximities to real conversations.

Features	Population	Method	Analysis	Outcome	Recommendations
Hands-Free / Hand-Held Hands-Free, Hand-Held Setting: Simulator / Lab / Road Simulator Study Duration n/a	Numbers 30 Drivers Location n/a	To simulate the cellular phone demands, two hands-free dual tasks consisting of listening and responding to verbal questions were used. All of the information was given through a dedicated speaker installed on the dashboard to the left of the steering wheel.	Various equations were used to summarize results, including ANOVA.	In the course of five sessions of driving and using the phone, there was a learning effect on most of the driving measures. In addition, the interference from the phone task on many of the driving tasks diminished over time as expected. Finally, the interference effects were greater when the phone task was an artificial math operations task than when it was an emotionally-involving conversation, when the driving demands were greater, and when the drivers were older. Thus, the deleterious effects of conversing on the phone are very real initially, but may not be as severe with continued practice at the dual task, especially for young or middle-age drivers.	n/a

Reference	**Shinar, D., Tractinsky, N., and Compton, R. (2004).** *Effects of practice from an auditory task while driving: A simulation study.* (DOT HS 809 826). Washington, DC: U.S. Department of Transportation, National Highway Traffic Safety Administration (NHTSA). pp. 1-54.

Objective	To compare voice-based v. visual/manual interfaces, to examine the effects of performing tasks of differing complexity, and to evaluate the potential of eye-tracking technology in today's driving environment.				
Features	**Population**	**Method**	**Analysis**	**Outcome**	**Recommendations**
Hands-Free / Hand-Held Hands-Free, Hand-Held Setting: Simulator / Lab / Road Road Study Duration n/a	Numbers 21 Drivers Location Track	Subjects performed one set of laps with each of two interfaces, voice-based and visual/manual. Secondary tasks comprised three categories including baseline tasks (radio tuning, phone dialing), simple tasks (message retrieval plus voice memo creation), and complex tasks (simple task components plus phone dialing and information retrieval from automated phone systems). Measures of driving performance, target detection, secondary task performance and eye movements were recorded.	Analyses were conducted to determine whether the voice-based interface reduced the relative distraction potential for secondary tasks of varying complexity. Performing secondary tasks while driving resulted in significant decrements to vehicle control, target detection and car-following performance.	The voice-based interface helped reduce the distracting effects of secondary task performance. Improvements were relatively minor and limited to vehicle control and visual performance measures. There was no effect on car-following measures, suggesting the voice interface had little effect on cognitive distraction. The results suggest that voice interfaces may not provide enough help to overcome the cognitive distraction associated with secondary tasks of increasing complexity, particularly in driving situations that require time-space judgments and tactical decision-making.	The data from the PDT analyses suggest that there may be some benefits associated with the voice-base interface. Compared with when they used the visual/manual interface, drivers using the voice-based interface spent a greater proportion of their time looking at the PDT, made more glances (per 10 s interval) to the PDT, and made longer glances to the PDT. This increased inspection of the PDT was reflected in their performance: greater and faster target detection with the voice-based interface. These results suggest that the voice-based interface may have safety benefits in that it leads to better event detection. Overall the analyses of visual behavior suggest that there are safety concerns associated with the use of both interfaces, although the voice-based interface appears to have some benefits.
Reference	**Ranney, T., and Harbluk, J. (2003).** *The Effects of Voice Technology on Test Track Driving Performance: Implications for Driver Distraction.* (DOT HS 809-525) Washington, DC: U.S. Department of Transportation, National Highway Traffic Safety Administration (NHTSA). pp. 1-78.				

Objective	To examine the effects of hands-free cell phone conversations on simulated driving.				
Features	**Population**	**Method**	**Analysis**	**Outcome**	**Recommendations**
Hands-Free / Hand-Held Hands-Free Setting: Simulator / Lab / Road Simulator Study Duration n/a	Numbers 40 Drivers Location Highway	When participants arrived for the experiment, they completed a questionnaire assessing health status, psychometric information, and their interest in potential topics of cell phone conversation. Participants were then familiarized with the driving simulator using a standardized 20-min adaptation sequence. Participants then drove four 10-mile (16.1-km) sections on a multilane highway. The duration of each scenario was approximately 10 min but varied as a function of the driving speed of each participant. Half of the scenarios were used in the single-task driving condition and half were used in the dual-task (i.e., driving and cell phone conversation) condition.	Various equations were used to summarize results, including ANOVA and MANOVA.	The driving performance of both younger and older adults was influenced by cell phone conversations. Compared with single-task (i.e., driving only) conditions, when drivers used cell phones their reactions were 18% slower, their following distance was 12% greater, and they took 17% longer to recover the speed that was lost following braking. There was also a twofold increase in the number of rear-end collisions when drivers were conversing on a cell phone. These cellphone-induced effects were equivalent for younger and older adults, suggesting that older adults do not suffer a significantly greater penalty for talking on a cell phone while driving than compared with their younger counterparts. Interestingly, the net effect of having younger drivers converse on a cell phone was to make their average reactions equivalent to those of older drivers who were not using a cell phone.	It is also important to note that performance decrements for cell-phone drivers were obtained even when there was no possible contribution from the manual manipulation of the cell phone. Therefore, legislation that restricts handheld devices but permits hands-free devices (e.g., State of New York Laws of 2001, Chapter 69, Section 1225c) is not likely to eliminate the problems associated with using cell phones while driving because these problems can be attributed in large part to the distracting effects of the phone conversations themselves.
Reference	**Strayer, D. and Drews, F. (2003).** Effects of cell phone conversations on younger and older drivers. *Proceedings of the 47th Annual Meeting of the Human Factors and Ergonomics Society*. Santa Monica, CA: Human Factors and Ergonomics Society (HFES).				

Objective	To compare the performance of cell-phone drivers with drivers who are legally intoxicated.				
Features	**Population**	**Method**	**Analysis**	**Outcome**	**Recommendations**
Hands-Free / Hand-Held Hands-Free, Hand-Held Setting: Simulator / Lab / Road Simulator Study Duration n/a	Numbers 41 Drivers Location n/a	Participant's followed a braking pace car. When the participant stepped on the brake pedal in response to the braking pace car, the pace car released its brake and accelerated to normal highway speed. If the participant failed to depress the brake, they would eventually collide with the pace car. In the alcohol session, participants drank a mixture of orange juice and vodka (40% alcohol by volume) calculated to achieve a blood alcohol concentration of 0.08 wt/vol. Blood alcohol concentrations were verified using infrared spectrometry breath analysis. Participants then drove in the car-following scenario while legally intoxicated. In the cell-phone session, three counterbalanced conditions were included: single-task baseline driving, driving while conversing on a hand-held cell phone, and driving while conversing on a hands-free cell phone. In both cell-phone conditions, the participant and a research assistant engaged in naturalistic conversations on topics that were identified on the first day as being of interest to the participant. To minimize interference from manual components of cell phone use, the call was initiated before participants began driving.	Various equations were used to summarize results, including ANOVA an MANOVA.	When drivers were conversing on either a hand-held or hands-free cell-phone, their reactions were sluggish and they attempted to compensate by driving slower and increasing the following distance from the vehicle I immediately in front of them. By contrast, when drivers were legally intoxicated they exhibited a more aggressive driving style, following closer to the vehicle immediately in front of them and applying more force while braking. When controlling for driving difficulty and time on task, cell-phone drivers exhibited greater impairment than intoxicated drivers.	Data calls into question driving regulations that prohibit hand-held cell phones and permit hands-free cell phones, because no significant differences were found in the impairments to driving caused by these two modes of cellular communication.
Reference	**Strayer, D., Drews, F., and Crouch, D. (2003).** Fatal distraction? A comparison of the cell-phone driver and the drunk driver. *Proceedings of the Second International Driving Symposium on Human Factors in Driver Assessment, Training, and Vehicle Design*. Park City, Utah. pp. 25-30.				

Objective	To examine the impact of cognitive distraction on drivers' behavior.				
Features	**Population**	**Method**	**Analysis**	**Outcome**	**Recommendations**
Hands-Free / Hand-Held Hands-Free, Hand-Held Setting: Simulator / Lab / Road Road Study Duration n/a	Numbers 21 Drivers Location n/a	A one-way repeated measures design was used. The order of presentation of task conditions was counterbalanced across participants. After a brief description of the procedures and what to expect, a consent form was completed. The participant, the experimenter and research assistant then drove to the start of the route. Prior to the actual recorded drive, the participant received instructions concerning the specific procedure, the tasks, and the eye tracker. The participant wore the eye tracker (uncalibrated) and drove a practice route for approximately 15 minutes in order to become acquainted with the vehicle, eye tracker, and tasks required. The test route was a 4km stretch of a busy 4-lane city road on which the driver drove north and south for a total of 8km per condition. The posted speed limit was 50 km/h. Each participant completed three runs, each under one of the following conditions: easy addition (e.g., 6+9), difficult addition (e.g., 47+38) or no additional task. A research assistant at a remote location conversed with the driver using the cell phone, asked the addition questions and recorded the answers. At the conclusion of the test trials, each participant was interviewed to solicit their opinions about perceived safety.	Various equations were used to summarize results, including an analysis of Saccades.	Drivers' visual behavior revealed that, under conditions of increased cognitive load, they made fewer saccades, spent more time looking centrally and spent less time looking to the right periphery. Less time was spent checking instruments and the rear view mirror. Many drivers changed their inspection patterns of the forward view when performing the most demanding tasks. The increase in cognitive load induced by the addition questions was reflected in drivers' increased ratings of workload and distraction as well as reduced ratings of driving safety.	The results of this study indicate that even when in-vehicle devices are hands-free, significant changes in driver behavior may result due to the cognitive distraction associated with their use. A better understanding of the ways in which drivers interact with these devices should result in improved designs that minimize the amount of distraction.
Reference	**Harbluk, J. L., Noy, Y. I., & Eizenman, M. (2002).** *The Impact of cognitive distraction on driver behaviour and vehicle control*. (No. 13889 E). Ottawa: Transport Canada. pp. 1-29.				

Objective	To summarize findings on distracted driving (including cell phone use) and drowsy driving.				
Features	**Population**	**Method**	**Analysis**	**Outcome**	**Recommendations**
Hands-Free / Hand-Held Hands-Free, Hand-Held Setting: Simulator / Lab / Road Road Study Duration n/a	Numbers 21 Drivers Location n/a	A The data come from a pair of studies undertaken by National Highway Traffic Safety Administration (NHTSA) to better understand drivers' behaviors and attitudes regarding speeding, unsafe driving, distracted and drowsy driving. This report, Volume I:Findings National Survey of Distracted and Drowsy Driving reports respondent's behaviors and attitudes on various topics related to distracted and drowsy driving. Volume II:Findings Speeding and Unsafe Driving presents the data on those topics, while Volume III:Methods Report describes the methods used to conduct the interviews and analyze the data, and also contains the questionnaires. The data will be used to help identify the extent to which potentially distracting behaviors are undertaken by drivers and to understand the characteristics of those engaging in these behaviors so that programs can be developed to reduce these behaviors where they have been shown to be dangerous.The data come from two surveys each conducted among nationally representative samples of drivers during the Spring of 2002. Interviews were conducted with a total of 4,010 drivers in the U.S.	Various equations were used to summarize results, including an analysis of Saccades.	Drivers' visual behavior revealed that, under conditions of increased cognitive load, they made fewer saccades, spent more time looking centrally and spent less time looking to the right periphery. Less time was spent checking instruments and the rear view mirror. Many drivers changed their inspection patterns of the forward view when performing the most demanding tasks. The increase in cognitive load induced by the addition questions was reflected in drivers' increased ratings of workload and distraction as well as reduced ratings of driving safety.	The results of this study indicate that even when in-vehicle devices are hands-free, significant changes in driver behavior may result due to the cognitive distraction associated with their use. A better understanding of the ways in which drivers interact with these devices should result in improved designs that minimize the amount of distraction.
Reference	**Royal, D. (2002).** *National Survey of Distracted and Drowsy Driving.* (DOT HS 809 566). Washington, DC: U.S. Department of Transportation, National Highway Traffic Safety Administration (NHTSA).				

Attachment B

Cell Phones: 2007 Legislative Update

Existing State Laws Regarding Cellular Phone Use while Driving

State or Jurisdiction	Provision	Hands-free Mandate	Statute or Rule
Alabama			
Alaska			
Arizona	Prohibits school bus driver's use of cellular telephones while the school bus is in motion.	School bus driver	17 AAC 9-104
Arkansas	Prohibits use of all types cellular phones while operating a school bus. Allows use during emergency situation: a call to an emergency system response operator or 911 public safety communications dispatcher; a hospital or emergency room; a physician's office or health clinic; an ambulance or fire department rescue service; a fire department, fire protection district, or volunteer fire department; or a police department; to call for assistance if there is a mechanical breakdown or other mechanical problem impairing the operation of the bus; or when the school bus is parked.	School bus driver	6-19-120
California			
Colorado	Bans any person who holds a temporary instruction permit or a minor's instruction permit from using any mobile communication device while operating a motor vehicle. Allows for use during an emergency and to contact a public safety official.	Temporary instruction permit or minor's instruction permit	42-4-239
Connecticut	Prohibits the use of hand-held cellular phones while operating a moving motor vehicle unless the telephone or device is equipped with a hands-free accessory. Allows for the use of a hand-held mobile telephone for the sole purpose of communicating with any of the following regarding an emergency situation: an emergency response operator; a hospital, physician's office or health clinic; an ambulance company; a fire department; or a police department. Prohibits use of all cellular phones, including hand-held and hands-free, while operating a school bus. Allows bus driver to place calls in an emergency situation as defined above. Bans any person less than eighteen years of age from using all types off cellular phones, while operating a moving motor vehicle on a public highway. Allows a driver to use a cellular device in emergency situations.	School bus driver Driver under the age of 18	14-296aa

Delaware	Prohibits use of all types of cellular phones while operating a school bus. Allows for communications to be made to and from a central dispatch, school transportation department or its equivalent when the bus is not equipped with a functioning 2-way radio. Also permits calls placed in an emergency situation. Prohibits drivers with a level 1 learner's permit or a driver's education learner's permit from using any type of cell phone while operating a motor vehicle. Allows use of cell phone if driver is stopped and pulled to the side of the road.	School bus driver Level 1 learners permit or driver's education permit	21 § 4176b 21 § 2710
District of Columbia	Prohibits the use of all hand-held cellular phones while operating a moving motor vehicle unless the telephone or device is equipped with a hands-free accessory. Permits usage in emergency situations, including calls to 911 or 311, a hospital, an ambulance service provider, a fire department, a law enforcement agency, or a first-aid squad. Also permits use of a mobile telephone by law enforcement and emergency personnel or by a driver of an authorized emergency vehicle, acting within the scope of official duties.		§ 50-1731.04
Florida			
Georgia	Prohibits school bus drivers from using all types of cellular telephones or two-way radios while loading or unloading passengers and while the bus is in motion.	School bus driver	40-6-165
Hawaii			
Idaho			
Illinois	Prohibits school bus drivers from operating a school bus while talking, or listening to or dialing a cellular radio telecommunication device capable of sending or receiving communications. It allows for the use of citizen bans radios, citizens band radio hybrids or any cellular device with a digital two-way radio service capability owned and operated by the school district when that device is being used as a digital two-way radio. It allows for the use of cellular radio telecommunication devices for the purpose of communication during an emergency situation with any of the following: an emergency response operator; a hospital; a physician's office or health clinic; an ambulance service; a fire department; or a police department. It also allows for the use of a cellular device when a school bus is parked.	School bus driver	625 ILCS 5/12-813.1
Indiana			
Iowa			
Kansas			

Kentucky			
Louisiana			
Maine	Prohibits any person who has been issued an instruction permit, or any driver under the age of 18 from using a device used to access a wireless telephone service.	Driver under the age of 18 or instruction permit	29A § 1304, 1311
Maryland	Prohibits drivers under the age of 18 with learner's instructional permits or provisional driver's licenses from using any wireless communication device, hand-held, hands-free or text messaging, while operating a motor vehicle. Allows for drivers to call 9-1-1 in an emergency situation.	Driver under the age of 18 with a learner's instructional permit or a provisional driver's license	21-1124
Massachusetts	Bans anyone from operating a moving school bus while using a mobile telephone except in the case of an emergency: that the school bus is disabled; that medical attention or assistance is required for a passenger on the bus; that police intervention is necessary for the personal safety of a passenger or to otherwise ensure the safety of the passengers; and the presence of a disabled vehicle or an accident in the roadway.	School bus driver	90 § 7B
Michigan			
Minnesota	Prohibits drivers with provisional licenses or instructor's permits from using all types of cellular telephone while operating a motor vehicle. Allows for the use of a cellular phone during an emergency situation.	Provisional license or instructor's permit	171.05, 171.055
Mississippi			
Missouri			
Montana			
Nebraska			
Nevada			
New Hampshire			
New Jersey	Prohibits the use of hand-held phones while driving, allows for the use of a hands-free device. Allows for the use of hand-held phones during emergency situations.	School bus driver	39:4-97.3
New Mexico			
New York	Prohibits the use of hand-held phones while driving on a public highway while a vehicle is in motion, but allows for the usage of a hands-free device. Permits the use of hand-held phones during emergency situations.		1225-c

North Carolina			
North Dakota			
Ohio			
Oklahoma			
Oregon			
Pennsylvania			
Rhode Island	Bans the use of cell phones by school bus drivers, while the bus is transporting children except in the case of an emergency.	School bus driver	31-22-11.8
South Carolina			
South Dakota			
Tennessee	Prohibits drivers possessing a learner's permit or intermediate driver licenses from operating a motor vehicle on any highway while using a hand held cellular telephone, cellular car telephone, or other mobile telephone. Allows for use of cell phone during an emergency and deems communications with custodial parents as an emergency and does not violate the statute. Prohibits school bus drivers from using a hand-held mobile telephone while the bus is in motion and transporting children. Allows for all communications between central dispatch, school transportation department or its equivalent. Allows for calls to be placed on a hand-held cellular device in emergency situations.	Learner's permit or intermediate driver's license	55-50-311 55-8-192
Texas	Prohibits use of a wireless communication device while operating a passenger bus with a minor passenger on the bus except in case of emergency or if the passenger bus is not in motion.	School bus driver	545.425
Utah			
Vermont			
Virginia			
Washington			
West Virginia			
Wisconsin			
Wyoming			