

ALCOHOL DETECTION TECHNOLOGIES: PRESENT AND FUTURE



American Beverage Institute

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OVERVIEW: A COOPERATIVE EFFORT

Ignition interlock advocates have partnered in a coordinated effort to expand the use of interlocks on vehicles throughout Europe and North America. The Driver Alcohol Detection and System for Safety (DADSS), the Automotive Coalition for Traffic Safety (ACTS) and the National Highway Traffic Safety Authority (NHTSA) have a cooperative research and development (R&D) effort to create new interlock and alcohol detection technologies over a 5-year period. NHTSA has pledged at least \$1 million per year towards this end, with ACTS matching or exceeding the amount of NHTSA donations, for a total of at least \$10 million over the 5-year campaign. Funding for ACTS, in turn, comes directly from car manufacturers. The focus of this R&D is to create an

“in-vehicle capability to detect impairment before a vehicle can be operated.”

On May 19, 2009, Robert Strassburger, Vice President of the Alliance of Automobile Manufacturers testified before the Congressional Subcommittee on Commerce, Trade, and Consumer Protection in support of interlock technology research. Members of the Alliance of Automobile Manufacturers include BMW, Chrysler, General Motors, Ford, Jaguar Land Rover, Mercedes Benz, Toyota, Volkswagen, Mazda, Mitsubishi, and Porsche. Mothers Against Drunk Driving (MADD) has requested \$30 million annually in the 2009 Highway Reauthorization Bill in order to finance interlock research.

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DADSS Technology Projects

Tissue Spectrometry (Skin Sensors)

Skin sensors shine light through the skin to determine blood alcohol concentration (BAC). These devices estimate BAC by measuring how much light is absorbed at a particular wavelength from a beam of Near-Infrared (NIR) reflected from the subject's skin.

Skin sensors are touch-based and as such require skin contact. One primary developer of skin sensor technology is [TruTouch Technologies](#). In February, MADD admitted to partnering with TruTouch to develop skin sensor technologies. Data in an [analysis](#) of skin sensor technology use by a TruTouch officer reported that skin sensors have superior accuracy in measuring BAC.



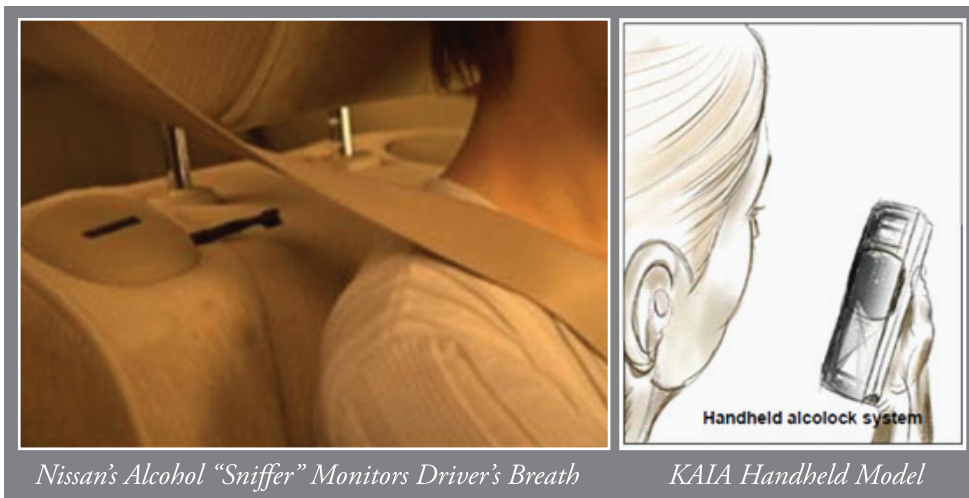
Future versions are expected to work with skin on the hand, such as a finger or hand scan. Lumidigm, a New Mexico-based firm, is developing a [biometric fingerprint](#) device capable of detecting alcohol levels. Toyota has begun developing [a steering wheel](#) that can detect alcohol thru the pores of your skin.

Offset/Distant Spectrometry (Alcohol Sniffers)

Unlike skin sensors, sniffer systems do not require skin contact and can operate at a distance. Sniffers placed in the vicinity of a driver measure the driver's breath or tissue for alcohol. This technology is small enough to be placed into law enforcement [flashlights](#) that can determine if a driver has alcohol on his or her breath or if a drink has alcohol in it.

According to a [NHTSA](#) report, Giner, Inc. conducted tests in vehicles in 2005 and demonstrated that alcohol could be detected in the air of a car, even when the windows were half-down and the air conditioning was on. Giner already has a variety of [sensors](#) that can continuously monitor low concentrations of alcohol vapor.

Nissan's 2007 [concept car](#) showcased how numerous alcohol sensors could be fitted into a car. One sensor in the car was an alcohol sniffer placed in the driver's seat, behind the driver's shoulder.



Nissan's Alcohol "Sniffer" Monitors Driver's Breath

KAIA Handheld Model

Another device in development is the KAIA handheld alcohol detector. Unlike a breathalyzer, which has a tube that people must blow into, the KAIA device can measure breath alcohol concentration from a distance. The device could be integrated with the steering wheel and get a reading from the driver in [2-3 seconds](#).

KAIA is a cooperative R&D project with Intelligent Vehicle Safety Systems in Sweden. The KAIA system is expected to be marketable in 4 to 6 years (2012-2014). Project partners include Autoliv, Volvo, Volvo AB, Hok Instrument AB, IMEGO, and SenseAir. The Swedish Road Administration is co-financing the project.

Researchers in Russia have developed a device that [detects ethanol \(alcohol\)](#) vapor in moving vehicles by shooting a laser beam through the vehicle.

Electrochemical (Breath and Sweat Sensors)

Electrochemical sensor devices come in two types: breathalyzers and transdermal (sweat) sensors. Alcohol in the presence of certain reactant chemicals produces color changes. These sensors work by measuring the changes in color of the reactant chemicals.

Breathalyzer

Breathalyzers are alcohol detection devices that are already in widespread use. The Volvo Alcotest is an example of a breathalyzer-based system. As of May 2008, the Volvo Alcotest is an integrated breathalyzer-ignition interlock that is being offered in Sweden as optional equipment. The device is wirelessly integrated into the vehicle's central electronics/computers. In the near future, Volvo wants integrated systems that [support all drivers in all situations](#).



Vietnamese scientists are currently developing a low-cost detector using specially made [crystals](#) that react to ethanol (alcohol). The prototypes are reported to have excellent accuracy in detecting BAC.

Saab has also developed a cell phone-sized breathalyzer, called [Alcokey](#). The breathalyzer is attached to the car's keys and a driver is required to blow into the device before the engine will start. Field testing of the device began in late 2006 with the [9-5 model](#) vehicle.

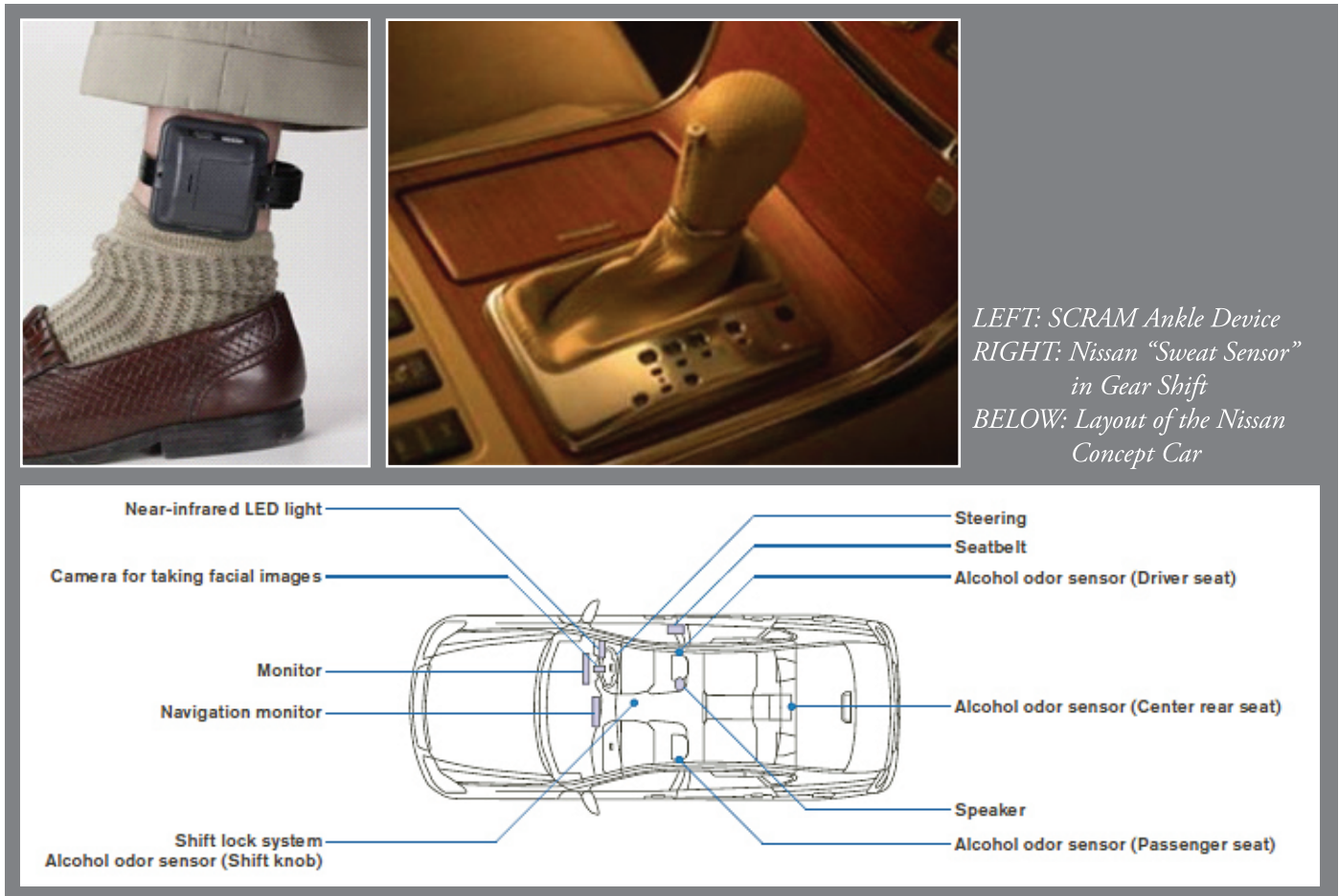
Transdermal (Sweat) Sensors

Transdermal systems are touch-sensors that can continuously monitor drivers' (or non-drivers') BAC levels. When a person drinks alcohol, traces of alcohol are present in the person's sweat. These devices measure BAC based on how much alcohol is present in perspiration.



Currently, sweat sensors are [body-worn](#) perspiration monitors. One brand is the Secure Continuous Remote Alcohol Monitoring (SCRAM) device, prescribed by many U.S. courts for serious alcohol offenders. The SCRAM device is worn around the ankle. Another transdermal alcohol detection device is the [WrisTAS](#) (Wrist Transdermal Alcohol Sensor).

While sweat sensors have primarily been used in body-worn devices, this technology can be transported to vehicles. Drivers would touch a part of the car with their hands, such as the steering wheel, gear shift or radio to detect BAC. Nissan has already [integrated](#) a sweat sensor into the gear shift of a concept car.



Car Companies and Alcohol Detection Technology

Mainstream car companies have already begun researching and developing interlock and alcohol detection technology. Here is a look at what some major companies are doing.

Volvo

Volvo has begun limited marketing of the Alcotest. According to [Volvo News](#), the Alcotest is set to prohibit vehicle operation when BAC is .02 or higher. Blowing a .01 will result in a warning light, and a .02 will result in the engine failing to start. Volvo says on its website that .02 is “an [international standard](#) that ensures safe driving.”

The Alcotest was originally released for [V70, S80, and XC70](#) model Volvo cars in Sweden. An information page about the interlock shows that the number of cars that the Alcotest is compatible with has been expanded to include the 2009 [S40, V50, C30 and C70](#) models. The device is also slated to be fitted to the XC60 model.

The AlcoGuard is displayed and detailed on Volvo's [Finland website](#). However, [the XC70 manual for the United States](#) does not mention the AlcoGuard as an optional accessory.

Nissan

Nissan [prominently features](#) its alcohol detection concept car on its website with a video and pictures of the technology. Website visitors can see demonstrations of the technology as well as a layout of the car showing the different alcohol detectors around the vehicle.

According to [this on-camera interview](#) with a Nissan technology chief, Nissan intends to drive this technology to global markets. A [news report](#) shows the vehicle in action, along with audio alerts if the sensors detect alcohol.

Saab

The Saab Alcokey was initially tested with the [9-5 model](#). In an [interview](#), Ingmar Soderlund, project leader for the Alcokey, stated that the development of the device was driven in part by an emerging market for alcohol detection devices.

Toyota

In 2007, news reports revealed that Toyota is developing a car fitted with [alcohol detection systems](#), similar to Nissan's concept car. [According to Toyota](#), the technology is a steering wheel that can detect alcohol through the pores of your skin. Toyota [plans to install alcohol detection technology in its cars](#) by the end of 2009. However, Toyota currently has not begun advertising or promoting this on their website.

Strategies and Goals of the Pro-Interlock Movement

DADSS 5-Year Plan

DADSS has a 5-year plan for the development of alcohol detection technology. In Phase 1, a proof-of-principle prototype will be completed. Phase 1 began in January 2009 and will last for one year. In Phase 2, a demonstration vehicle will be developed over a 3-year period.

The Sweden Strategy

Interlock advocates have a step-by-step [strategy](#) to make the use of interlocks widespread in Sweden, using a playbook that could be replicated in other countries. This "Sweden Strategy" seeks laws by 2010 that would make interlocks a mandatory condition for driving again after one DUI conviction. Concurrently, the strategy calls for placing interlocks in all professional trucks immediately and in all professional buses starting in 2010. After gradually introducing interlocks in public transport, the strategy calls for requiring interlocks in all new cars. A Swedish government minister has already stated that the Swedish government wants [all new cars](#) to have interlocks by 2012.

Summary: The Road Ahead

DADSS, MADD, and other groups continue to push forward with interlock advocacy and further development of alcohol detection technology. Car companies like Volvo, Saab, Nissan, and Toyota have partnered with interlock advocates and begun researching, developing and promoting their own interlock devices. Each year, millions of dollars are put towards these ends.

The [International Alcohol Interlock Symposium](#) brings together interlock supporters in the policy, advocacy, and technology fields. The annual conference, which will be held in Melbourne in 2009, highlights the successes advocates in each country have had with interlock laws and sheds light on public policy tactics and new technologies under development.

The time it takes for technology to become widespread is shortening. [Moore's law](#) states that growth in computer technology occurs [exponentially](#). Analysts have applied Moore's law to other technology fields, indicating that the time from technology's development until it is widespread in society is [getting shorter](#). Alcohol detection systems may follow a similar pattern as demand grows and use of such devices becomes more prevalent.

As interlocks become more publicly acceptable and widespread, there may be an arms race as car companies and interlock manufacturers look to cash in on the new market. As New Mexico's DWI Czar Rachel O'Conner said, "a race is on nationwide to create smart-car technology that both identifies drivers and determines if they're drunk to respond accordingly."

Based on current and proposed technology, future cars could be capable of monitoring drivers' BAC at any level. Sniffing devices in the cabin and seats could monitor the air, while touch-activated sensors embedded in the steering wheel and gear shift could scan drivers' skin. And with wireless technology, the car's devices could communicate with local authorities if anything undesirable about the driver is detected.

Public polling already shows a base of support for interlock advocates to build on. DADSS and MADD will continue to look at and develop public support for mandatory, universal interlock use in Europe and North America.