Driver Alcohol Detection System for Safety (DADSS)

A Technological Solution to Eliminate Drunk Driving

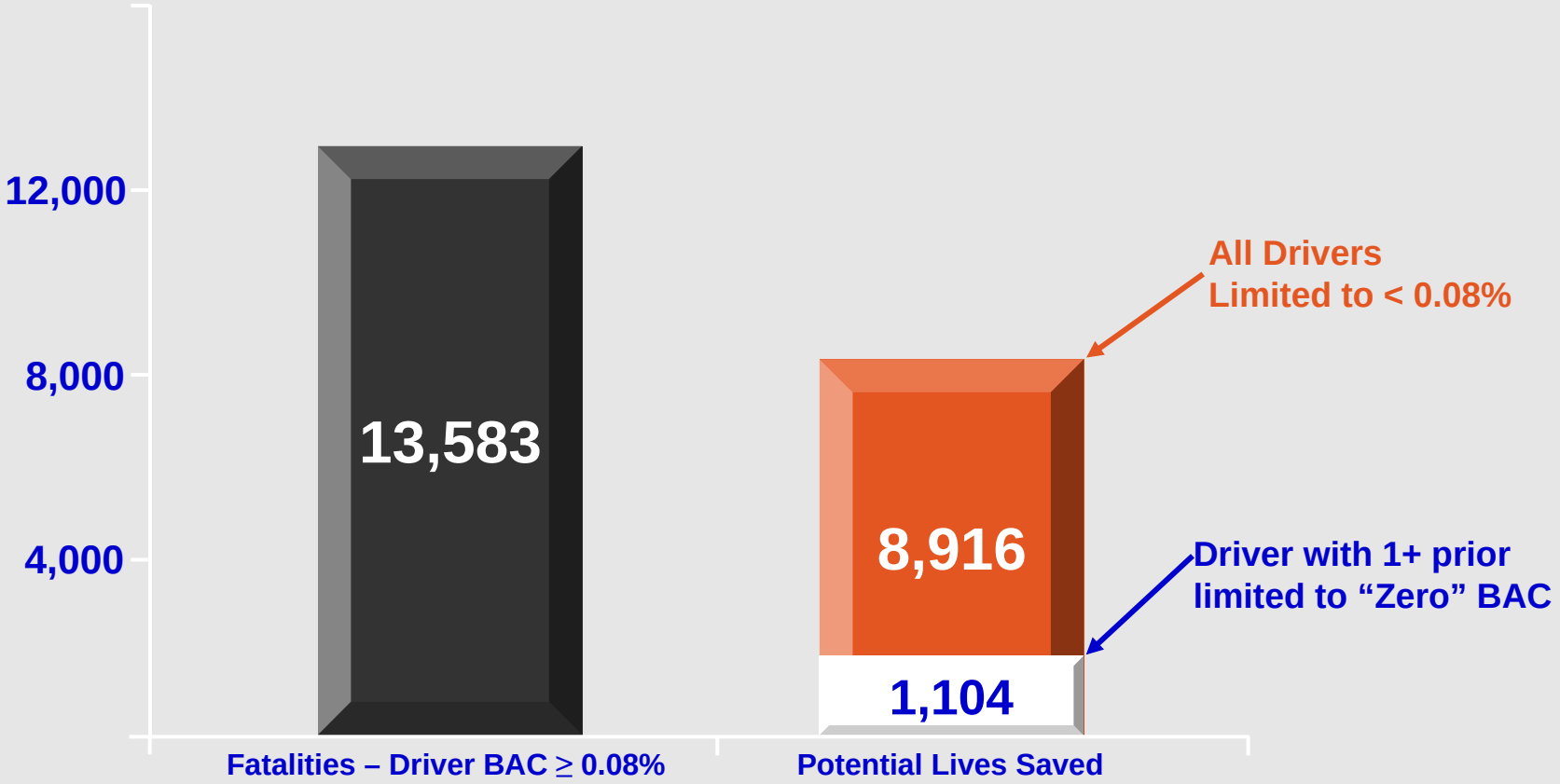
Maria Vegega
March, 2010

Why do we need a technological solution?

NHTSA, 2003

Potential Safety Benefits

- Potential lives saved in the U.S. in 2005 if vehicle technologies limited driver BAC to specified levels



IIHS, 2007

Cooperative Agreement
Signed on February 8, 2008

- American Coalition for Traffic Safety (ACTS) and NHTSA entered into a cooperative research agreement to *"explore the feasibility, the potential benefits of, and the public policy challenges associated with a more widespread use of unobtrusive technology to prevent drunk driving"*
- Five-year, cooperative program between NHTSA and Industry to develop and test prototypes that may be considered for vehicle integration thereafter
- Devices are intended to prevent alcohol-impaired drivers (BAC ≥ 0.08) from driving their vehicles

DADSS Goal and Process

- End Goal: A non-invasive, seamless technology to measure driver BAC and reduce the incidence of drunk driving
  - Development undertaken as a step-by-step, data-driven process to ensure that effective technologies are developed
  - Intended to support a non-regulatory, market-based approach to preventing drunk driving
  - Devices are intended to prevent alcohol-impaired drivers (BAC ≥ 0.08) from driving their vehicles
  - The 5-year goal is a DADSS demonstration vehicle
  - The longer term goal is DADSS in every vehicle

DADSS Blue Ribbon Panel

- Blue Ribbon Panel (BRP) appointed by ACTS and works in an advisory capacity
- Comprised of experts from various disciplines, including
  - Auto manufacturers
  - Suppliers
  - Alcohol toxicology
  - Impairment
  - Ignition interlocks
  - human factors
  - Research scientists
  - MADD
  - IIHS
  - NHTSA
  - Foreign governments
- BRP assigned three working groups to assist in effort
  - DADSS Program Management Plan
  - DADSS Performance Specifications
  - DADSS Public Acceptance and Public Policy

Criteria for acceptable widespread use

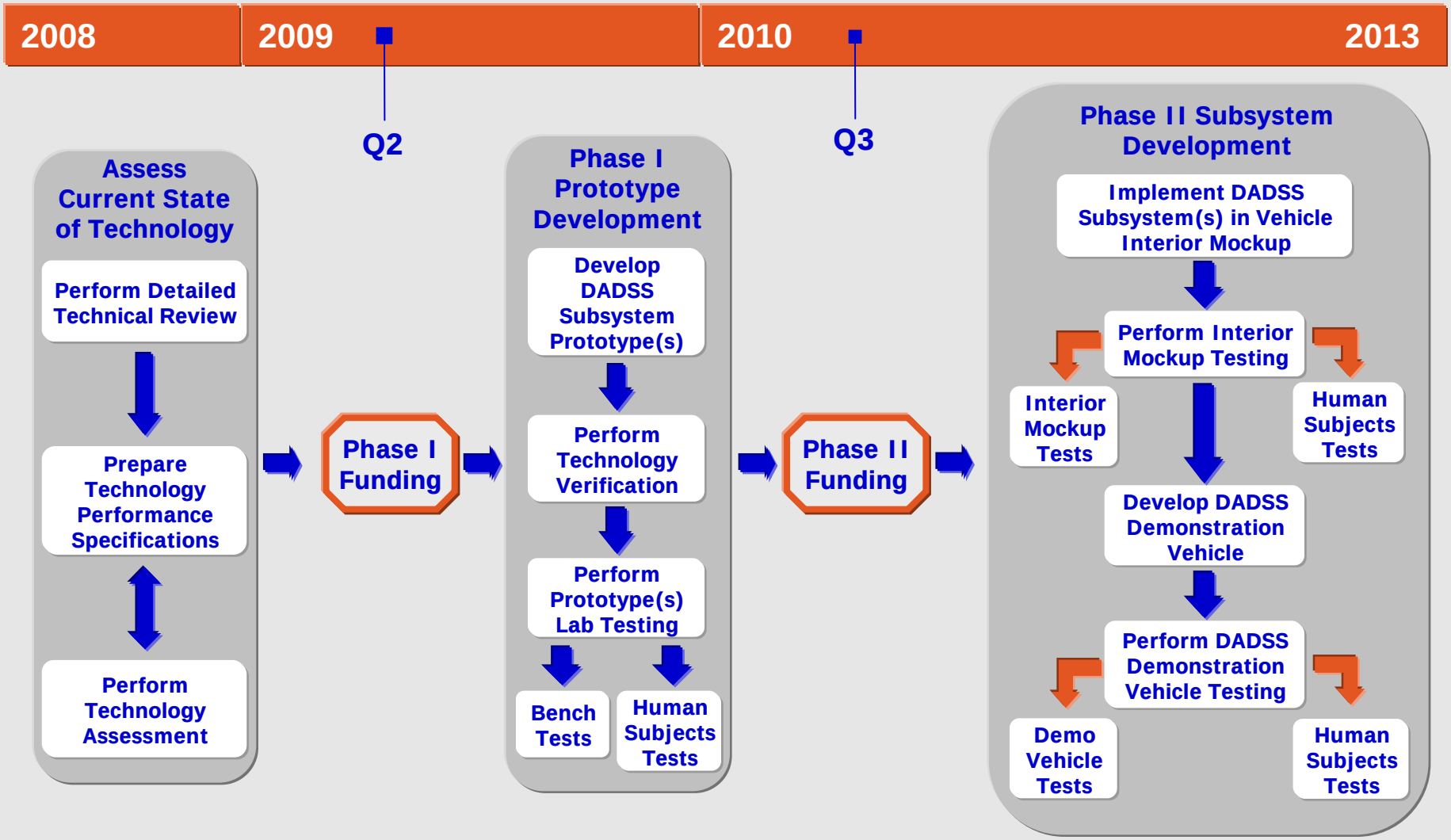
Minimum requirements:

- Quick to use
- Accurate
- Small
- Reliable
- Repeatable
- Durable, robust
- Low cost
- No or low maintenance
- Virtually invisible to sober drivers

Draft Performance Characteristics

- Measure BAC non-invasively
- Capable of sensing driver BACs ranging from 0.01-0.12 g/dL
- High Accuracy
  - BACs 0.07 – 0.09 g/dL; SD and SE 0.0003
- Determine driver BAC in less than 0.5 seconds from activation and recycle
- High Reliability

DADSS Program Process



Contracts Awarded to Develop Prototypes

- Three subcontracts have been awarded to international companies
  - TruTouch Technology—USA
  - Alcohol Countermeasure Systems—Canada
  - Autoliv Development AB—Sweden
- 12-month period of performance
- Prototypes to be received June-July, 2010
  - Bench testing and human subjects testing to be performed June-August, 2010

Technology Types

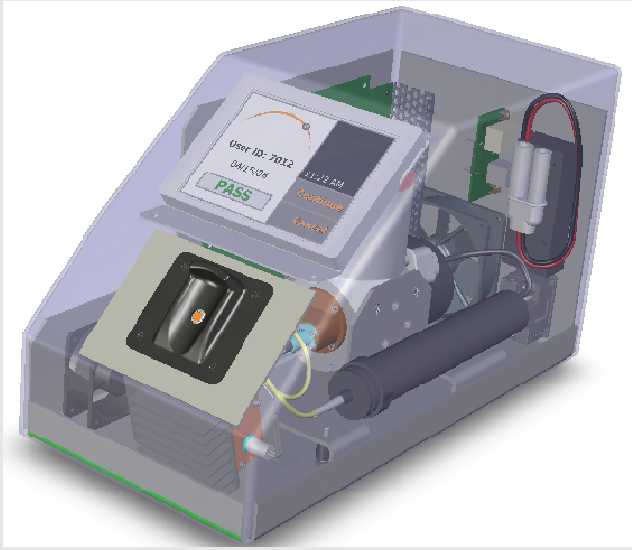
1. **Tissue Spectrometry**
   - TS subsystems allow estimation of BAC by measuring how much light has been absorbed at particular wavelength from a beam of Near-Infrared (NIR) reflected from the subject skin
   - Touch-based systems that require skin contact
2. **Distant Spectrometry**
   - IR or laser light is transmitted to the subject from a source that receives and analyses the reflected and absorbed spectrum, to assess chemical content of tissue or liquid in vapor
   - No skin contact is required

OVERVIEW OF TECHNOLOGIES BEING DEVELOPED

TruTouch Technologies

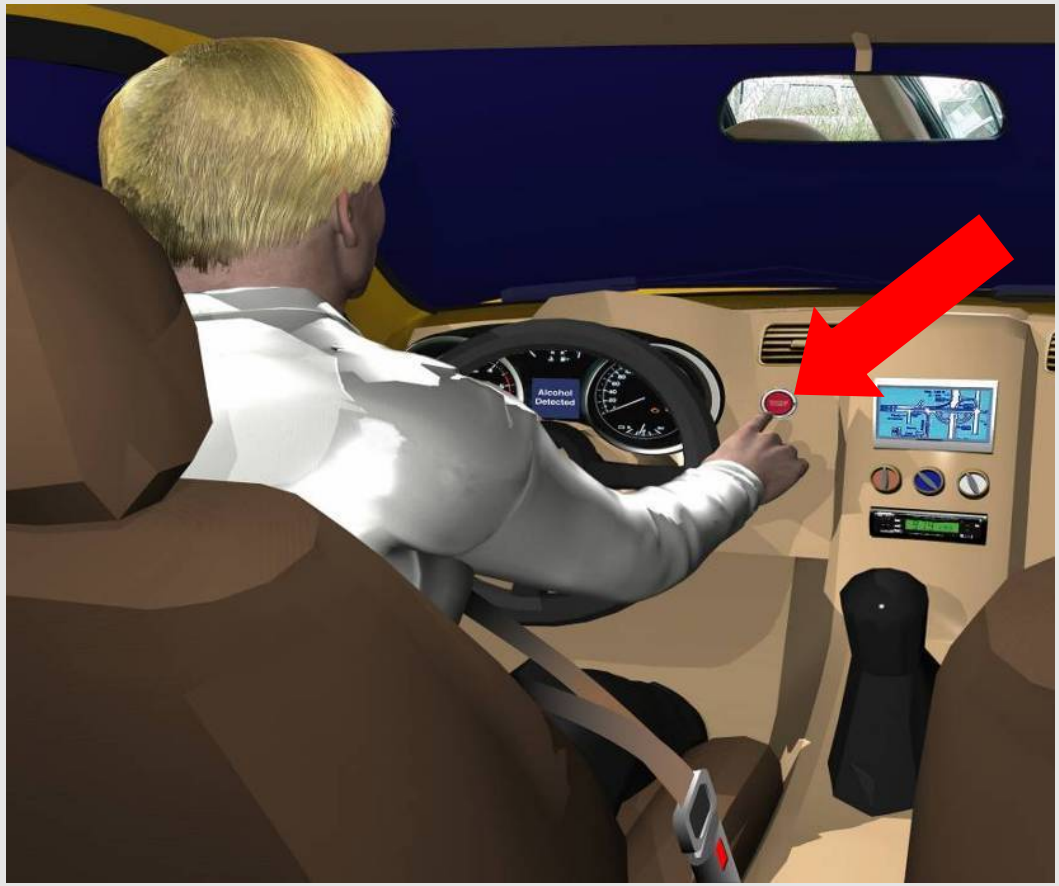
Technology Description

- Previous device: User's forearm illuminated with NIR light
- A new, smaller prototype using a square touch pad has been successfully evaluated and demonstrated
  - Provides 6 times improvement in optical signal-to-noise
  - Reduced measurement time
  - Conducive to BAC measurements using the hand
- Proposed technology is based on miniaturizing the Table-Top square optical touch pad device to meet DADSS requirements
- Evaluated other locations on the hand for vehicle application



Tissue Spectrometry Systems

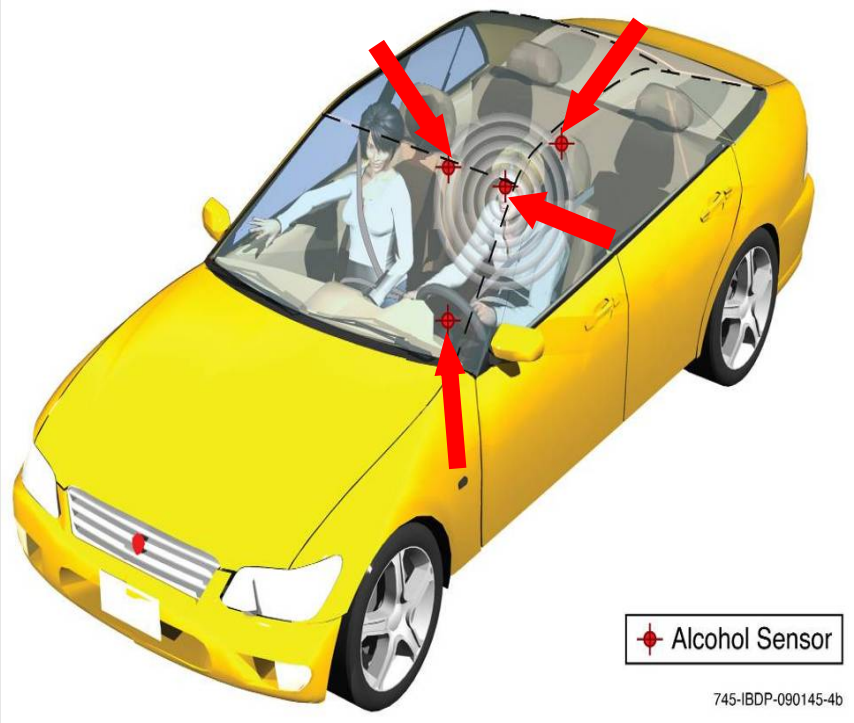
- Illustration shows one potential adaptation in a vehicle using a stop/start button



Distant Spectrometry Contractor - Autoliv AB

Technology Description

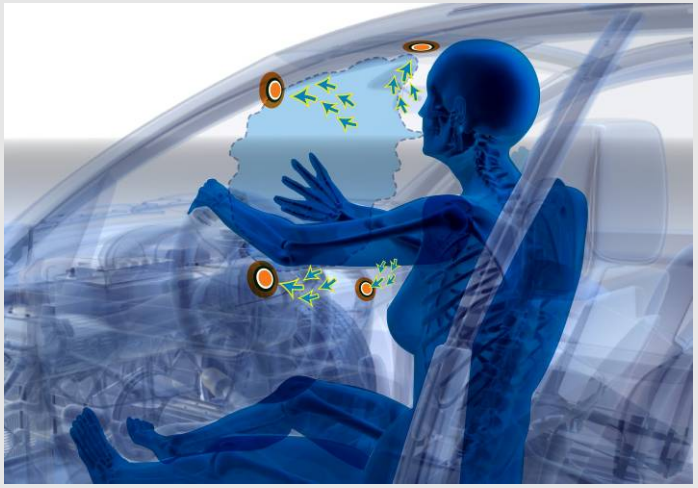
- Proposed system is based on current (developed and already demonstrated) KAIA project technology in Europe
  - Use unobtrusive "sniffer" to detect alcohol in the vehicle
    - Multiple sensors in-vehicle (steering wheel, A-Pillar, etc..)
  - Approach is to **identify and quantify small variations of the air** constitution
    - alcohol concentration in exhaled breath

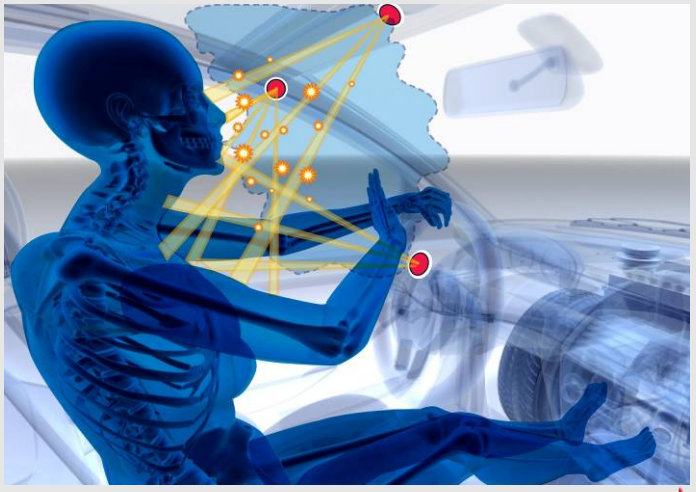


Distant Spectrometry
Contractor - Alcohol Countermeasure Systems

Technology Description

- Similar to Autoliv, proposes to measure concentration of alcohol and carbon dioxide in the cabin air of vehicle
- Method of remote optical sensing of alcohol from facial region of driver
  - Correlate/compare this measurement with cabin air alcohol concentration
  - Determine BrAC of driver using carbon dioxide as correlant



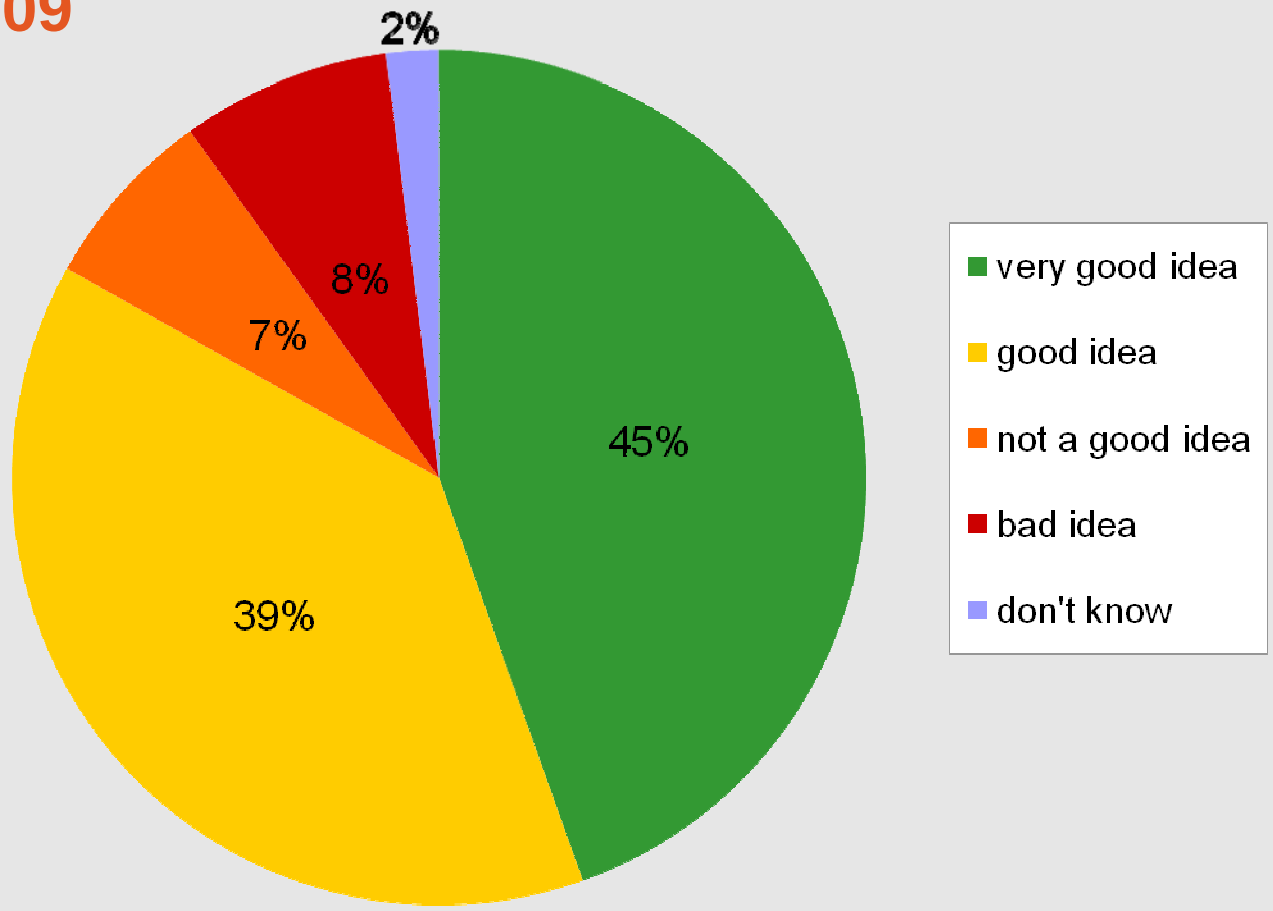


Acceptance among the public and key leaders is critical

- Technology will be effective only if the driving public welcomes and accepts it:
  - 58 percent of the U.S. public say they support smart technology to prevent driver impairment including alcohol-impaired driving (MADD U.S survey, 2006)
  - 56 percent of the Canadian public agree that all new vehicles should be equipped with a device that can detect alcohol in the driver and prevent starting if the driver is over a preset limit (MADD Canada survey, 2007)
  - 64 percent of the U.S. public say they support advanced technology in all vehicles, if its reliable, to prevent anyone with an illegal BAC from driving their car (IIHS, 2009)
  - 78.6 percent of the U.S. public say they support all cars being equipped with devices that won't let the car start of the driver is drunk (AAA Foundation, 2009).

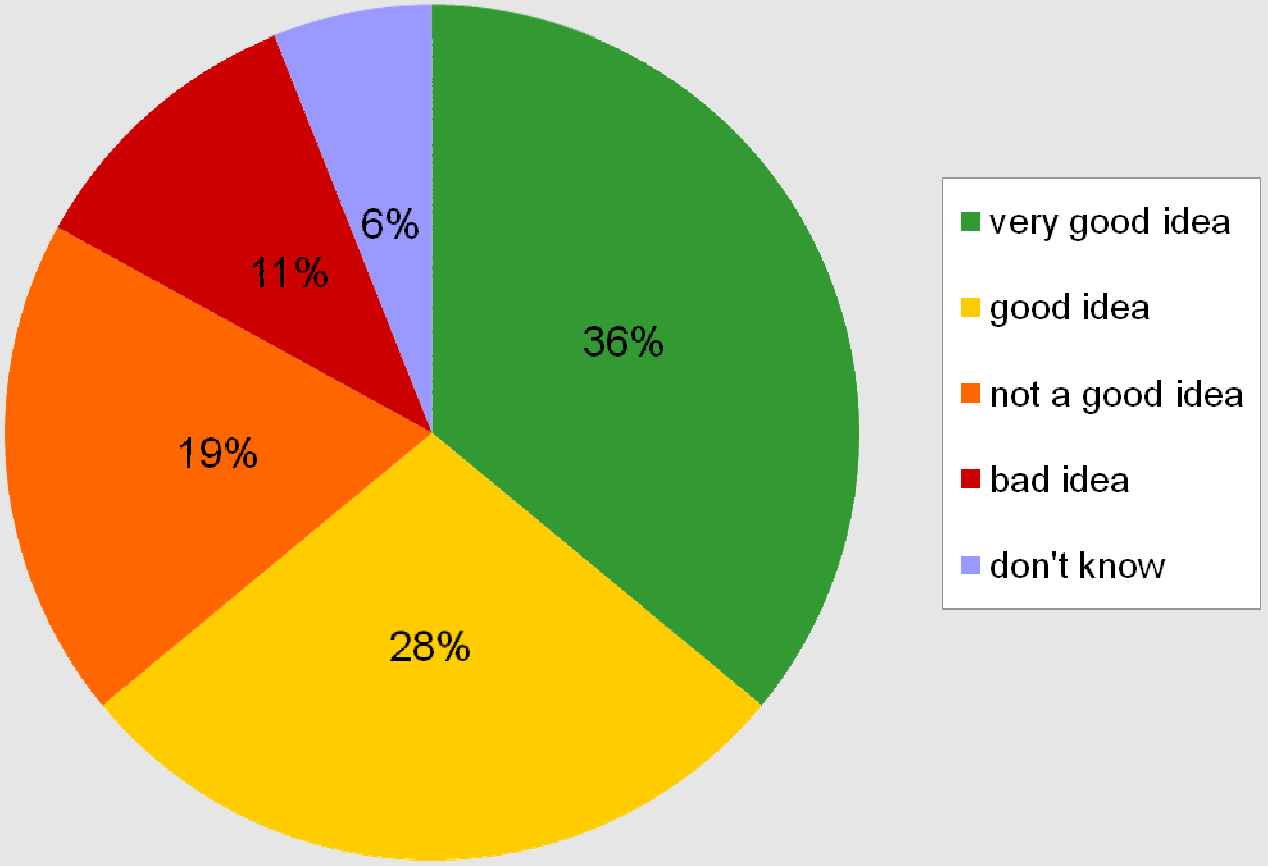
Attitudes toward requiring alcohol ignition interlocks for convicted DWI offenders

IIHS, July 2009



Attitudes toward advanced alcohol test technology in all vehicles, if technology shown to be reliable

IIHS, July 2009



The Challenges

- Developing a reliable and seamless technology that fulfills all the specifications necessary for use in a vehicle environment
  - Has to work each and every time, over the life of the vehicle, and in a variety of challenging environments
- Anticipating and addressing likely circumvention strategies by drivers
  - Some drivers are highly motivated to beat the system
  - Needs to be addressed as part of the system design
- Unintended consequences
  - Are there ways in which longer term driver behavior could be affected that would negatively impact safety in the future?

Next steps

- Test and evaluate Phase I prototypes, June-August 2010
- Phase II Request for Proposals, September 2010
- Develop demonstration vehicles January 2011-November 2013
- Demonstration vehicle bench and human subjects tests, November – December 2013

QUESTIONS?

http://www.dadss.org

CONTACT INFORMATION:

Maria Vegega,NHTSA
maria.vegega@dot.gov

Susan Ferguson, Program Manager
sferguson@dadss.org

Eric Traube, NHTSA
eric.traube@dot.gov