

**The Driver Alcohol Detection System  
for Safety (DADSS) Project  
A Cooperative Research Effort  
Between Industry and Government**

Lifesavers 2009 Conference  
March 30, 2009, Nashville, TN

**Susan A. Ferguson, Ph.D.**  
ACTS



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**Outline**

- Driver Alcohol Detection System for Safety (DADSS)
- How DADSS came about
- Cooperative Agreement
- DADSS Program Status
- Alcohol Absorption and Elimination
- Potential DADSS Technologies
- Next Steps
- Public acceptance and Policy Issues



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**DADSS**

- 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



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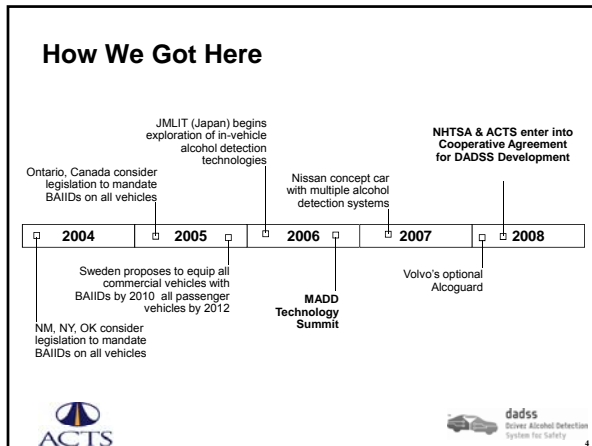
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### Cooperative Research Agreement February 8, 2008

- ACTS and NHTSA have 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 program 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
- Blue Ribbon Panel of Experts provide guidance

Logos: ACTS, dadss (Driver Alcohol Detection System for Safety)

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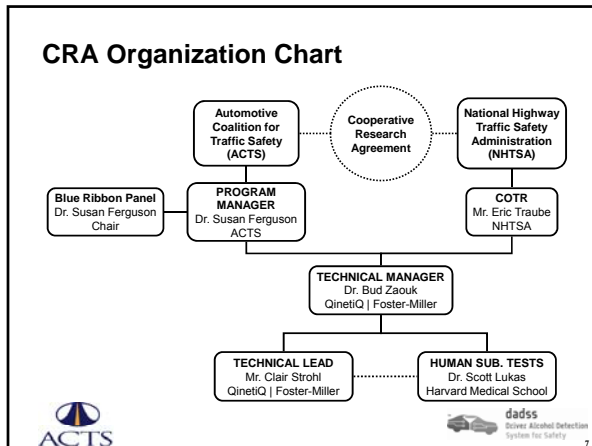
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- ### DADSS Blue Ribbon Panel
- BRP appointed by ACTS and works in an advisory capacity
  - Comprised of experts from various disciplines, including
    - ◆ Auto manufacturers
    - ◆ Suppliers
    - ◆ Alcohol toxicology
    - ◆ Impairment
    - ◆ 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
- Logos: ACTS, dadss (Driver Alcohol Detection System for Safety)

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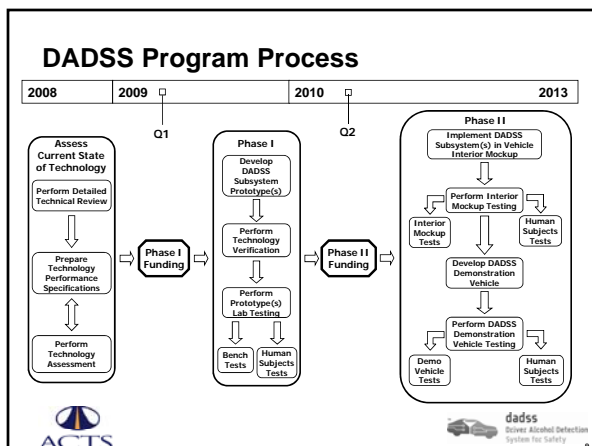
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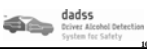

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Impaired Driving and the DADSS Project

## DADSS PROGRAM STATUS



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### Tasks under the Cooperative Agreement

**Period of Performance:  
February 8, 2008 – February 8, 2013**

- Task 1 – Kick off meeting (Completed)
- Task 2 – Program Management Plan (Completed)
- Task 3 – Technology review and criteria development (Completed – On-going Continuously)
- Task 4 – Technology assessment (In-Progress)
- Task 5 – Technology development and verification
- Task 6 – Demonstration testing
- Task 7 – Final project report



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### DADSS Program Status

#### Task 2 – Program Management Plan (PMP)

- PMP includes:
  - ◆ Technical objectives
  - ◆ Detailed project schedule
  - ◆ Deliverables
  - ◆ Budget plan
- PMP posted on DADSS website



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**DADSS Program Status**

**Task 3 – Tech. Review & Performance Specifications**

- Patents and Literature Review
- Performance Specifications
- Request for Information (RFI)
  - ◆ To perform technology scan and provide initial understanding of the level of interest among technology developers
  - ◆ RFI posted April 3, 2008 on FedBizOpps, DADSS website, etc.



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**DADSS Program Status**

**Task 4 – Determine Priority Candidates for DADSS**

- Request For Proposals
  - ◆ Invited bids from selected vendors for the development of DADSS Subsystem
  - ◆ Phase I – develop proof-of-principle prototype (1 year)
    - RFP distributed November 24, 2008; Proposals received January 30, 2009
  - ◆ Phase II – develop a demonstration vehicle (3 years)
    - Awards will be based on the results of Phase I efforts



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**ALCOHOL ABSORPTION AND ELIMINATION**



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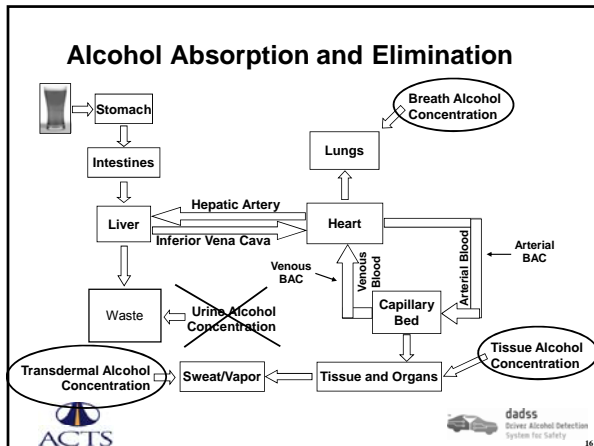
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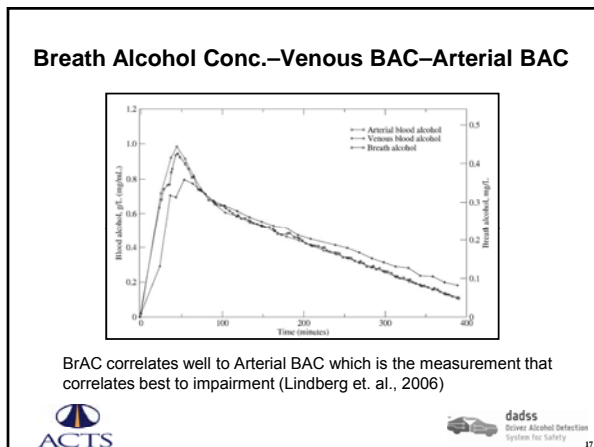
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BrAC correlates well to Arterial BAC which is the measurement that correlates best to impairment (Lindberg et. al., 2006)

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## POTENTIAL DADSS TECHNOLOGIES

ACTS dadss  
Driver Alcohol Detection  
System for Safety

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## Potential DADSS Technology Types

- **Tissue Spectrometry**
  - ◆ TS systems allow estimation of BAC by measuring how much light has been absorbed at a particular wavelength from a beam of Near-Infrared (NIR) reflected from the subject's skin
  - ◆ Touch-based systems that require skin contact
- **Distant Spectrometry**
  - ◆ NIR 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
- **Electrochemical**
  - ◆ Chemical-reaction-based devices such as transdermal and breathalyzer-based systems
  - ◆ Alcohol in the presence of reactant chemical will produce colorimetric changes measured by spectral analysis or semi-conductor sensor
- **Behavioral**
  - ◆ Detects impaired driving through objective behavioral measures
  - ◆ Includes ocular, gaze, eye movement, and driving performance measures
  - ◆ Does not measure BAC directly



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## Tissue Spectrometry

- Currently user's forearm is illuminated with NIR light, but future approaches may utilize the hand
- Development testing with human subjects has verified the viability of this approach to measure BAC
- Future versions of the technology for vehicle application could scan tissue in the hand



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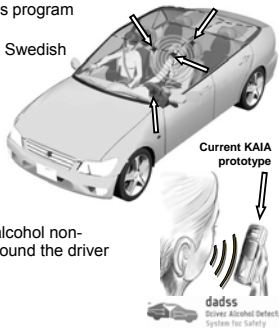
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## Distant Spectrometry – KAIA

- KAIA is a cooperative project within the Intelligent Vehicle Safety Systems program in Sweden
  - ◆ Federal co-financing from the Swedish Road Administration
- KAIA approach key features
  - ◆ Ease of operation
  - ◆ Contactless expiration measured by IR sensor
  - ◆ No sensor degradation through product life cycle
  - ◆ Potential to measure breath alcohol non-invasively through sensors around the driver



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### Electrochemical – Volvo AlcoGuard™

- Volvo has developed an integrated BAID that is being offered in Sweden as optional equipment
  - ◆ The Volvo AlcoGuard™ is based on an active breath alcohol measurement, with an Electrochemical sensor
  - ◆ Integrated into the vehicle and has a wireless communication to the vehicle's Central Electronics Module



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### Electrochemical – Transdermal

- Measures alcohol in perspiration through contact with the skin
  - ◆ Currently used to continuously monitor alcohol offenders to ensure they're not drinking
- Intrinsic pharmacokinetics lag time
  - ◆ Alcohol levels do not rise as quickly as BrAC and BAC
    - A time delay on the order of 60 minutes
  - ◆ Using existing transdermal sensors, alcohol begins to arrive at the skin surface in quantities the sensor can detect in approximately 30-45 minutes



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### NEXT STEPS



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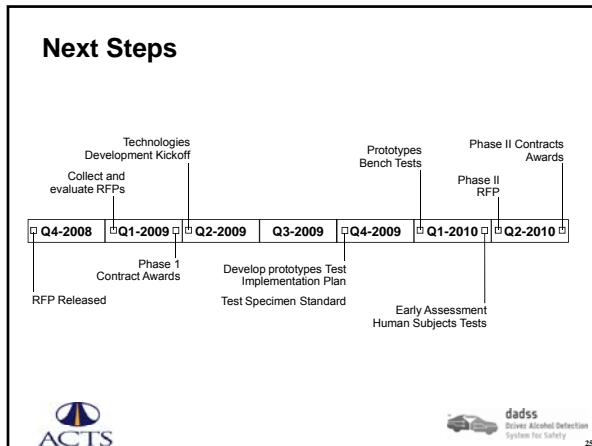
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## PUBLIC ACCEPTANCE AND POLICY ISSUES

ACTS logo | dadss Driver Alcohol Detection System for Safety logo

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### 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)
  - ◆ 37 percent of U.S. public supports requiring all new drivers to use equipment that tests them for alcohol before starting their car (AAA Foundation survey, 2007)

ACTS logo | dadss Driver Alcohol Detection System for Safety logo

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### Driver acceptance of the technology

- Driver acceptance will be affected by
  - ◆ Perceived intrusiveness of the measurement system
    - the manner in which alcohol measurements are made
  - ◆ System speed, accuracy, durability, and reliability
  - ◆ Understanding of how the system works
  - ◆ Trust that the system will work as designed, each and every time
  - ◆ Costs vs. perceived benefits
  - ◆ Attitudes toward in-vehicle technologies
  - ◆ How consumers view the autonomy of the passenger vehicle – their “right to drive”



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### Consumer buy-in is critical

- Design considerations likely to influence consumer acceptance and mitigate concerns only to a degree
- Other considerations include:
  - ◆ Whether they drink alcoholic beverages
  - ◆ Whether they drink and drive, how often, and how much
  - ◆ Belief that drunk driving should be addressed by society collectively, not only by those who drive drunk
  - ◆ Knowledge about the affects of alcohol on driving and the relationship of number of drinks to BAC will influence the kinds of interaction with the DADSS system



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**But regardless of what we do...**

**Among some consumers, philosophical concerns about “big brother” and “freedom of choice” likely will remain**



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## 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?




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## What do we need to do to address consumer acceptance?

- More widespread use of breathalyzers by convicted drunk drivers
- Assess current levels of consumer understanding of DADSS, and levels of acceptance
- Monitor publics' acceptance levels over time and willingness to adopt the technology on their vehicles
- Assess what technology solutions might prove the most acceptable and how they might best be implemented
  - ◆ Include alternative measurement technology, time to measurement, and accuracy concerns
  - ◆ Weigh the importance of different operational features
- Educate the public about the alcohol-impaired driving problem and potential technological solutions
- Work with advocates to build broad public and institutional acceptance




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## Communicating with the Public

- A website has been launched to provide public information:

[www.dadss.org](http://www.dadss.org)

### Content

- ◆ A "go to" site to provide project details,
- ◆ Answer key questions about technology development and drinking and driving
- ◆ A way to communicate with developers




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## Conclusions

- The DADSS project has made great strides in the last year
- Technologies have been identified and proposals have been received
- Awards will be made in the next few months to fund development of promising technologies
- Before it is widely applied DADSS technology must be ready for "prime time"
- The public must be knowledgeable about the system and see its benefit in their vehicles
- Need to have a continuing dialogue with policy makers and other key stakeholders to ensure their support



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### QUESTIONS?

<http://www.dadss.org>

### CONTACT INFORMATION:

Susan Ferguson  
sferguson@dadss.org



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