Vehicle Infrastructure Integration and Effectiveness of Vehicle Safety Communications Applications

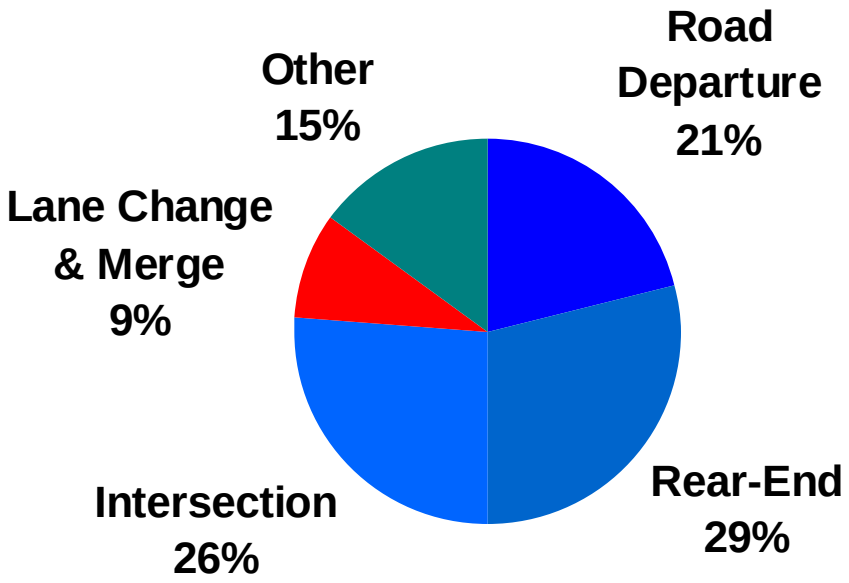
Arthur Carter, NHTSA

SAE®

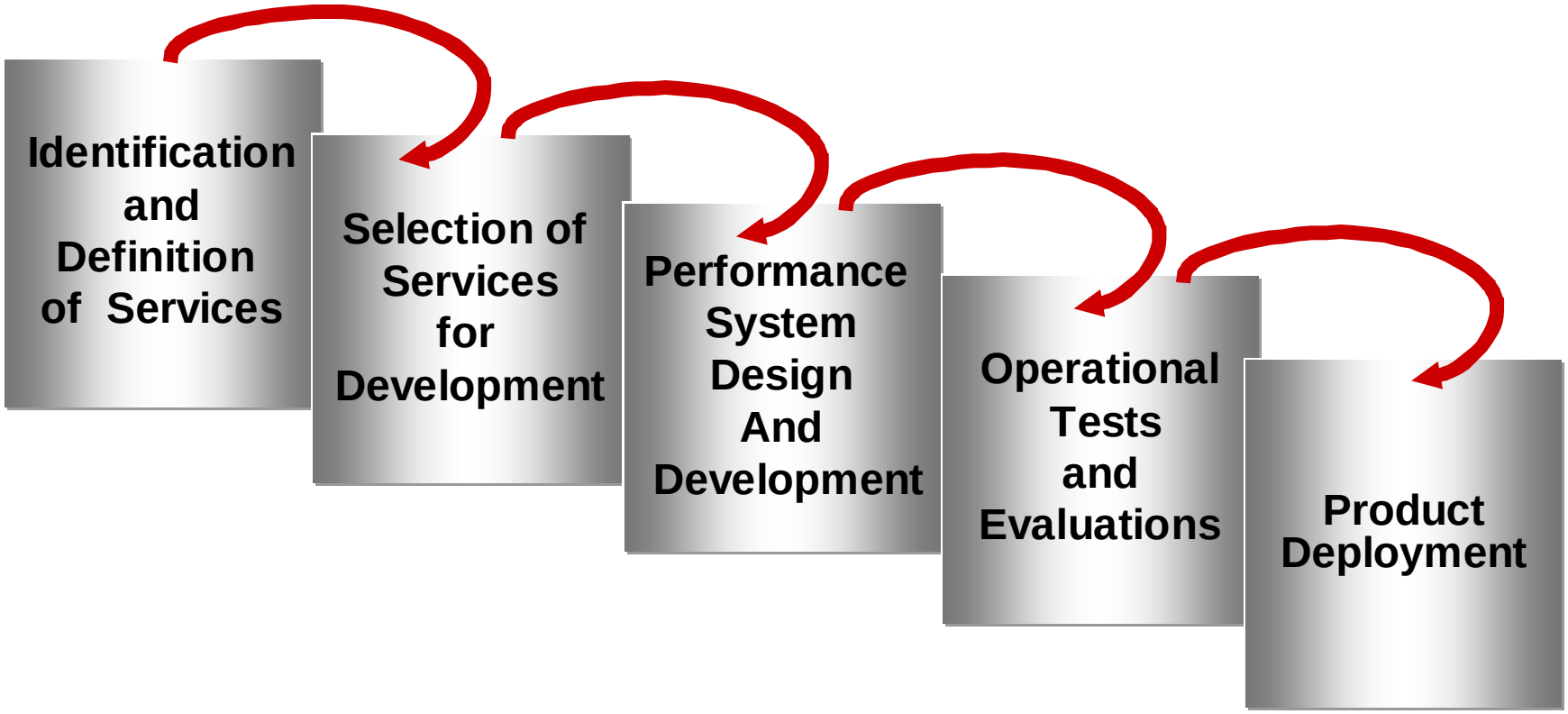
www.nhtsa.dot.gov
nhtsa
people saving people

The Big Picture

- What are the biggest safety problems that are appropriate for DOT involvement and appear to be solvable?
- To what extent can advanced technologies address these problems?



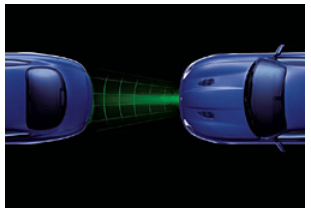
Our Research Process



The New Initiatives

INTELLIGENT VEHICLE INITIATIVE

RDCW•FOT



ACAT

IVBSS

CICAS

VII / EVSCA

SAE®

www.nhtsa.dot.gov
nhtsa
people saving people

Background

Two interrelated projects:

- **Vehicle Infrastructure Integration (VII)**
- **Effectiveness of Vehicle Safety Communications Applications (EVSCA)**

Background - VII

- The VII Program is an Intelligent Transportation System (ITS) Tier-1 Initiative for electronically connecting vehicles and the infrastructure via a nationwide communication infrastructure (using DSRC[1]).

- This new infrastructure will enable many safety applications.

1 Dedicated Short Range Communications @5.9GHz

Problem Definition

- EVSCA is a program to determine if safety applications that utilize DSRC can improve upon the performance of autonomous vehicle-based systems, enable communications-based-only safety applications.
- DOT has conducted extensive research on the effectiveness of vehicle-based collision countermeasures.
- However, the systems have inherent shortcomings that reduce their effectiveness. (e.g. alert timing and false alerts)
- Communications may enable improved system effectiveness by *complementing* or *replacing* vehicle-based sensors.

Program Purpose

Overall Goal: To accelerate introduction of VII and the Vehicle-based Driver Assistance Safety Systems into the Nation's vehicle fleet.

Objectives:

- Develop objective estimates of safety impact for cooperative-applications that address rear-end, road-departure, lane-change crashes.
- Perform the tasks necessary to prepare one of more cooperative active safety applications for inclusion in the VII FOT. Emergency Electronic Brake Lights (EEBL[1]) is envisioned as one of the first applications tested.
- Continue the partnership between the U.S. DOT and the automotive OEMs (via CAMP and the VIIC) involving a wide range of stakeholders
- Facilitate introduction and commercialization of effective VSCA.

1 EEBL's objective is to provide early notification to the host vehicle of an emergency baking event (e.g. -0.6 g deceleration) occurring downstream in traffic, even when the drivers line-of-sight is obstructed by other vehicles.

Quantify the Problem

The most predominant crash type is a rear-end collision; accounting for ~29% of all crashes.

- Based on '02 GES, rear-end crashes accounted for 29% (1,798,000) of all "police-reported" crashes. Based on '02 FARS, rear-end crashes comprised 5% (1,900) of all "fatal" crashes.

- Results of the ACAS FOT indicate that an integrated FCW and ACC system has the potential to prevent 10-26% of all rear-end crashes.

- Shortcomings: 44% of the crash imminent alerts issued by the ACAS were due to out-of-path targets.

Quantify the Problem

Another crash type is the off-road crash where one or more vehicle leaves the roadway.

- Based on '02 GES, off-road crashes accounted for 23% (1,437,000) of all "police-reported" crashes. Based on '02 FARS, off-road crashes accounted for 42% (16,000) of all "fatal" crashes.

- Results from the RDCW FOT indicated that warning systems can prevent ~50% of these crashes.

- Shortcomings: LDW availability varied with road type, from 76% on freeways to 36% on non-freeways. LDW availability also varied with lighting and weather, from 56% during dry days to 4% during wet nights. CSW availability was consistently high, over 95% in most conditions.

Program Teams

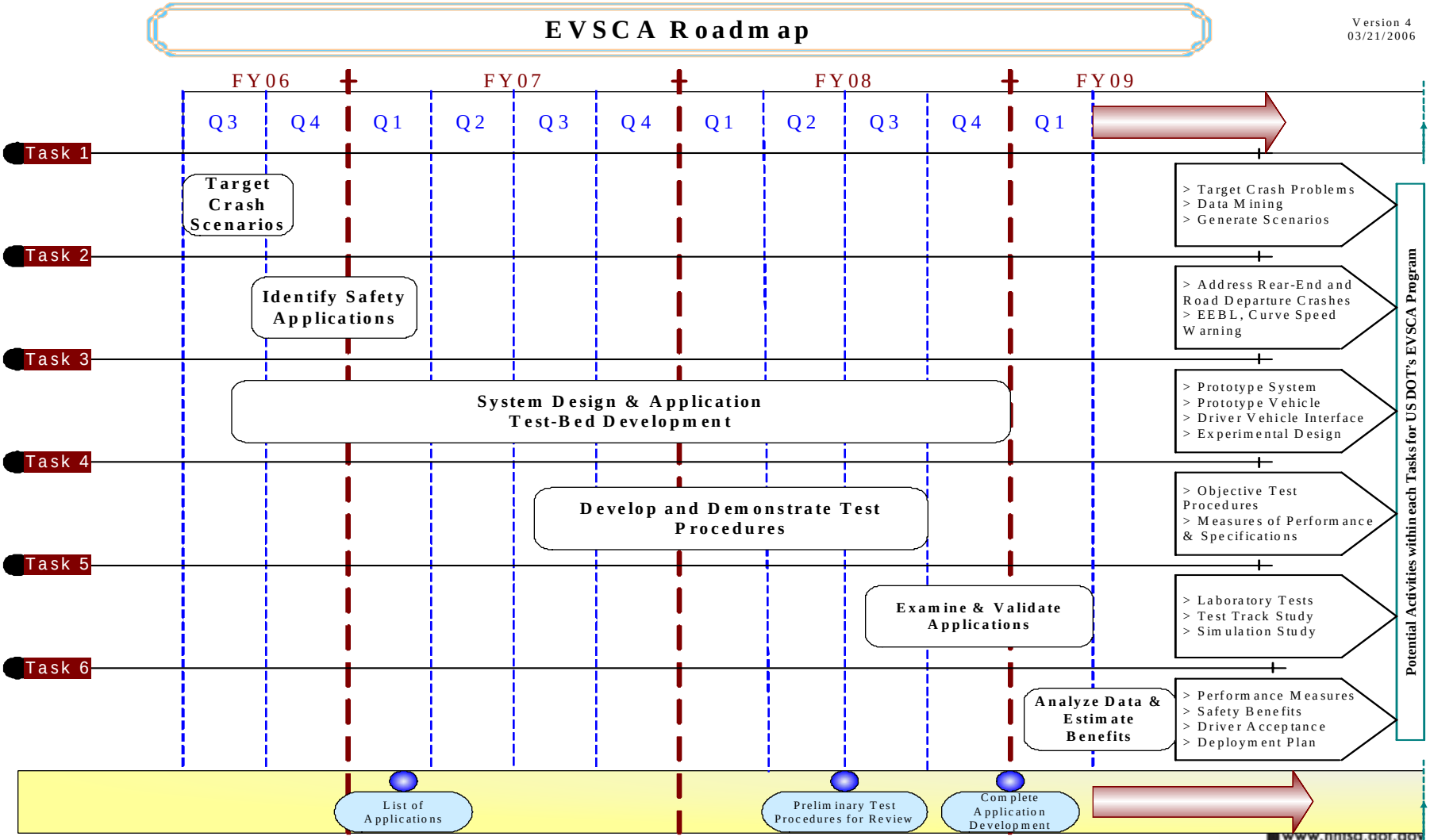
VII

- Government: NHTSA, ITS JPO, FHWA, and Volpe
- Support: BAH: System Integrator, RSU development, and Network Development
- Industry: VII Consortium (**VIIC**)
  - 5 Members: Ford, Nissan, BMW, Honda, DCX
  - Design of In-Vehicle Equipment

EVSCA

- Government: NHTSA, ITS JPO, FHWA, and Volpe
- Industry: Collision Avoidance Metrics Partnership (**CAMP**)
  - 5 Members: GM, Ford, DCX, Honda, Toyota
  - Develop Communications-based Vehicle Safety Applications

Roadmap – EVSCA



EVSCA Program Plan / Approach

The EVSCA Program consists of six tasks:

Task 1: Identify target crash scenarios & critical events, Determine shortcomings of vehicle-based systems from FOT and other sources

Task 2: Identification of Safety Applications that might benefit from inclusion of communications.

Task 3: System Design and Application Test-Bed Development

Task 4: Develop performance specifications and test procedures

Task 5: Examine and Validate Applications, Conduct Verification testing

Task 6: Analyze Data and Estimate Benefits (w/ VOLPE)

Duration of Initiative

Estimated to be 3 years: FY06-FY09

EVSCA Status

- **Project Status**
  - Agreement negotiations / SOW development

- **2006 Milestones**
  - Finalize Cooperative agreement
  - Begin Tasks 1, 2, & 3

Funding

ITS Funding

- **Total Funding** – $8.9M
  - Federal share (80% - $7.1M)
  - Partner share (20% - $1.8M)
- **Annual Funding**
  - 2005 - $750K
  - 2006 - $3.1M (planned)
  - 2007 - $3.2M (planned)
- **Procurement Status**
  - Negotiations between NHTSA and CAMP continue to finalize of Cooperative agreement

Issues for both VII and EVSCA

Programs must be closely coordinated with CICAS-V