VII Initiative for Improved Roadway Safety and Mobility

Ralph Robinson
AASHTO Annual Meeting

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VII Goals

Reduce Societal Costs of CRASHES

- 43,000 deaths per year
- 3 million people injured per year
- $230 billion in property damage
- Lost time, wages, higher insurance premiums

Reduce societal costs of CONGESTION

- Personal and business hours lost in traffic
- Inconvenience of missed flights, meetings, schedules
- Gasoline wasted
- Freight costs higher, lost productivity
# Effectiveness of Crash Avoidance

<table>
<thead>
<tr>
<th></th>
<th>Avoidance Possible</th>
<th>Pre-crash (crash is imminent)</th>
<th>Crash</th>
<th>Post-Crash</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. Lives saved</td>
<td>HIGHEST</td>
<td>HIGH</td>
<td>HIGH</td>
<td>LOW</td>
</tr>
<tr>
<td>No. Injuries reduced</td>
<td>HIGHEST</td>
<td>HIGH</td>
<td>HIGH</td>
<td>N/A</td>
</tr>
<tr>
<td>Reduced Property damage</td>
<td>HIGHEST</td>
<td>none</td>
<td>none</td>
<td>none</td>
</tr>
</tbody>
</table>

- Active controls
- Alerts / Warnings
- Situational Awareness
- Active Seat belts
- Airbags
- Seatbelts
- Accident Notification
Vehicle Infrastructure Integration (VII)

- Control & Map DataBase
- Private Sector Uses
- Traffic Management Center (TMC)
- Satellite to Vehicle (GPS)
- DSRC Vehicle-to-Vehicle
- Hot Spot
- DSRC Vehicle-to-Roadside

Uses: GPS, DSRC
Key Initial Use Cases

1. Signal Violation Warning
2. In-Vehicle Signage
3. Dynamic Traffic Information
4. Roadway Conditions (weather and potholes)
5. Traffic Management and Control
6. Alternative Route Guidance
7. Payment Transactions (tolls, gasoline, parking)
8. Provisioning and Security management
Example of Vehicle-to-Vehicle Communications

Emergency Vehicle Warning

DaimlerChrysler Research & Technology North America, Inc.
The Strategic Approach
VII Function vs Density

Traffic Info
Traffic Management
Safety Warnings
Crash Avoidance
Roadway Situational Awareness
Active Controls

Crashes

0% — VII Equipped Vehicles — 100%

2010
Timeline
2030

Increasing Automation?
VII-Equipped Vehicle Population Projection

Assumes:
- 250 million vehicles on road
- 16 million built each year
VII Technologies Enabling Cooperative Highways

• Critical SAFETY Technologies
  – *DSRC radio* for fast, interactive communications (Vehicle-to-Infrastructure and Vehicle-to-Vehicle)
  – Accurate and fast *vehicle positioning* sensing
  – Precision *roadway map database*

• Critical MOBILITY Technologies
  – *Real-time probe* vehicle data (speed, direction, location, situational variables)
  – Data processing and information dissemination
DSRC Radio Enabler

- In 1999, FCC allocated 75 MHz of bandwidth for transportation safety
  - Final Rule & Order on licensing (Dec 2003)
  - Other uses allowed on a lower priority basis
- Standards developed for Dedicated Short-Range Communications (DSRC) protocol and message format
  - Variation of WiFi radio (802.11p)
  - Optimize communications protocol for transportation safety purposes (high-speed, low-latency)
  - Establish common message formats for vehicle data parameters
RSE Installation Illustrations

Slide provided by Raytheon
POC Testbed RSE Locations

North-West Detroit; 57 RSEs; over 32 sq. miles
The Program
VII Program Initiation

• One of nine major initiatives announced by USDOT in 2004
  – Vision:
    “Nationwide deployment of a communications infrastructure on the roadways and in all production vehicles could improve transportation and the quality of American life in ways not imagined a generation ago.”
    (source: USDOT ITS Joint Programs Office)

• National VII Coalition established to oversee program to assess deployment feasibility
National VII Coalition Relationships

Existing Government and Industry Policy Makers

National VII Executive Leadership Team

National VII Working Group

Light-Duty Vehicle Manufacturers

USDOT

State & Local DOTs
VII Consortium

- Industry consortium founded to develop pre-competitive safety technologies
- Michigan 501 (c6) non-profit
- Eight (8) light-duty vehicle manufacturers
  - BMW
  - DaimlerChrysler
  - Ford Motor
  - General Motors
  - Honda
  - Nissan
  - Toyota
  - Volkswagen
- USDOT and VIIC Cooperative Development Program - $50m/5 years
VII Consortium Organization

VIIC Board
- ELT
- Deployment Decision

Policy Committee
- Policy Coordination

Membership Comm.
- Organizational oversight
- Strategic planning
- External Relationships

Program Oversight Comm.
- Coop. Agreement oversight

Business Mgr
- Contract Services
- Legal
- Financial

Office Admin
- Clerical
- IT support
- Receptionist

Program Management
- Schedule
- Costs
- Resources
- Project compliance
- Reports/Reviews

Systems Engineering
- Requirements
- System Integration
- System analysis
- System Testing

Work Order #1

Work Order #2

Work Order #…

Work Order #12
VIIC Program Work Tasks

- WT1 – Program Management
- WT2 – Systems Engineering
- WT3 – Radio (DSRC)
- WT4 – Deployment Analysis & Policy Support
- WT5 – OBE System
- WT6 – Application Development
- WT7 – Positioning
- WT8 – Security
- WT9 – Testing and Lab Facilities
- WT10 – Field Operational Test
- WT11 – Alternative Studies
- WT12 – Network Services
Targeted Milestone Timing

- DSRC frequency allocation 2003
- USDOT adopted VII as major initiative 2004
- VII Consortium founded 2004
- USDOT/VIIC Cooperative Agreement 2005
- VIIC Proof-of-concept testing 2006-2008
- Field Testing TBD
- VII Deployment Feasibility Determination Dec 2008
Policy Requirements
Must Address Public Concerns and Policy Issues

- A VII system that is technically and economically sound must also be socially and politically acceptable
  - VII must preserve privacy and civil liberties protections
    - Anonymity preserved for non-optional services
    - Secured from unauthorized access
    - Authorized access subject to legal due process
  - Liability issues addressed
  - Deployment framework meets public standards for good governance
Conditions for Deployment

- Substantial DSRC coverage of major US roadways
- High reliability and network availability
- Predictable, stable and cost-effective access
- National consistency:
  - Policy/legal governance same nationwide (no variability state-to-state, city-to-city)
  - Uniform deployment of standardized, non-proprietary technology
Questions?