Advanced Research for Integrated Active Transportation System
- In Revised Role, Vision, & Approach -

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Advanced Research for IATS
- Overview -

- **Future Program with A Strategic Vision**
  - Transportation Problems, Means, and Performance
  - Revised Role and Vision

- **A New Transportation System Concept, IATS**
  - Fatality Causes (all safety modes) by Transportation Components
  - Approach to Transportation Components by Technologies
  - Real Time Response for A New Transportation System
  - Needed Technologies for Real Time Response: Advanced Research

- **A Strategic Action Plan: IATS Roadmap with ITS**
  - Four Phase Plan Development and Implementation

- **Expand the Concept to All Transportation Issues**
  - Safety, Mobility, Energy, Environment, and Productivity
A. Future Program with A Strategic Vision

- Strategic Approach -

Current Transportation Problems

- Safety
- Congestion
- Energy
- Environment
- Productivity

System Performance
A. Future Program with A Strategic Vision
- Strategic Approach -

Future

Transportation Problems
• New Energy Sources for Vehicles
• New Technologies
• More Vehicles
• More Complicated Human Factors
• New Transportation Concept, etc.

Future System Performance
A. Future Program with A Strategic Vision
- Implementing The 4E’s -

- **Education & Enforcement**
  - Non-users of safety belts
  - Impaired / drunk drivers
  - Teens and young adults
  - Commercial vehicle / other trucks
  - Non-users of motorcycle helmets

- **Engineering & Operations**
  - Run-Off-Road, Speed-Related, Intersection, and Pedestrian/Bike Crashes
  - Design for special populations (Older Drivers, etc)

- **Emergency Services**
  - “First Responders” to Crashes
A. Future Program with A Strategic Vision
- 2005 FARS DATA -

<table>
<thead>
<tr>
<th>Fatality Data</th>
<th>Nationally</th>
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<tbody>
<tr>
<td>Fatalities</td>
<td>43,443</td>
</tr>
<tr>
<td>Fatal Rate (per 100M VMT)</td>
<td>1.47</td>
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<tr>
<td>Crash Costs</td>
<td>$230.6 B</td>
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<tr>
<td>Cost/Population</td>
<td>$819</td>
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<tr>
<td>SVROR Fatal Crashes</td>
<td>59%</td>
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<tr>
<td>Intersection Fatal Crashes</td>
<td>21%</td>
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<tr>
<td>Speed Related Fatal Crashes</td>
<td>30%</td>
</tr>
<tr>
<td>Alcohol Related Fatal Crashes</td>
<td>39%</td>
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</tbody>
</table>
A. Future Program with A Strategic Vision
- Revised Role and Vision -

• Means to reach the Vision of
  *all drivers, all vehicles, all roads, all times in real time*
• Longer Time Frame
• Greater Integration of All Goal Areas
• Greater Integration of All System Components
  (driver-vehicle-road-environment)
• Significant use of new (some to be invented)
  sciences, technologies, and communications
B. A New Concept of Transportation System, IATS
- All Safety Modes by Transportation Components -

– **Connected vehicle**
  - Vehicle to vehicles within safety zones
  - Vehicle to infrastructure
  - Communicate appropriately with driver

– **Real time information**
  - All roads
  - All modes
  - All the time

Source: ITS: Now and the Future
B. A New Concept of Transportation System, IATS - Approach to Transportation Components by Technologies -

- Required Technical Information
  - Vehicle to the Road
  - Vehicle to Vehicles
  - Driver to the Road
  - Driver to the Vehicle
  - Weather/Emergency to Vehicle Operations

- Needed Technology: Active Transp. System
  - Reliable Positioning
  - Advanced Sensing
  - Processing & Integration
  - Intelligent Transp. Components

- Strategic Advanced Research
  - Dynamic Positioning
  - Vehicle Stability on the Road
  - Information Tech: Sensing & Telecomm
  - Human Factors: Psych., Error, Behave
  - NANO Material, Mechanics, Electronics

- IATS Initiatives
  - Transp. Information To the Driver
  - Warning To the Driver
  - Warning To adjacent Drivers
  - Automatic Vehicle Control
  - Traffic Signal & Infrastructure Control
  - Stop Vehicle Operation
B. A New Concept of Transportation System, IATS
- Real Time Response by A New Transportation System -

*Over 360 Fatality Causes will be reduced systematically through Four Strategic Safety Research Themes with considerations of three major safety components, Driver, Vehicle, and Infrastructure*

**The IATS Concept**
1. Consider: All Transportation Components
   All Safety Modes
2. Predict: Active Safety System
3. Prevent: Real Time Response

**Advanced Research & Tech**
1. Intelligent Infrastructure
2. Intelligent Vehicle
3. Advanced Sensing of Human Factors
4. Real Time Response

*Intelligent:
   Information Gathering, Analysis, Decision*
B. A New Concept of Transportation System, IATS
- Needed Technologies for Real Time Response -

- **Strategic Advanced Research**
  - Positioning accuracy and reliability
  - Five types of Sensing and advanced Processing
  - Information Integration of all system components
  - Information Management
  - Artificial Intelligence for real time response

- **Future Research**
  - NANO concept development along with sciences
  - Wireless Telecommunication System

- **Basic Science Research**
  - Scientific base for Physical and or Chemical Phenomena
C. A Strategic Action Plan
- IATS Roadmap with ITS -

1. The Concept of Integrated Active Transportation System
   Entire Safety Components
   Preventive Safety Actions
   Real Time Response

2. Current ITS Applications extended to IATS
   Vision, Concept, Strategy, Objectives,
   Adv Research, Technology, Process, and Deployment

3. IATS Roadmap with considerations of ITS Applications

**IATS vs. ITS**
1. ITS Initiatives deploy Technologies, while IATS Initiatives create Technologies.
2. Scope of IATS initiatives requires full buy-in and processes for the program:
   Vision, Strategy, Information, Technologies, Objectives, R&D, and Deployment
C. A Strategic Action Plan
- Four Phase Development for Vision and Objectives -

1. Predictable Fatality Reductions
2. By-Product of National Competitiveness in Science & Technology

**Vision**

**Ph.1**
- Strategic Approach: Effective & Efficient
- Concept: IATS
- Active Safety System
- Passive Safety System

**Ph.2**
- Planning
- System Requirements
- Available Technologies

**Ph.3**
- Fill Gaps: Strategic Adv R.
- Technology Transfer: Application R.
- IATS Initiatives
- ITS Initiatives
- Predictable Fatality Reduction

**Ph.4**

**Other Mobility, Environment, Energy & Revenue Goals**

**Other Goal Areas**

**Other Actions**

**Fill Gaps**

**New System Performance**

**National Competitiveness in Science & Technology**
C. A Strategic Action Plan
- Four Phase Plan Implementation -


- Feasibility
- Value of The IATS Concept
- Introduce Active Safety System
- Benchmarking from ITS Applications
- IATS Development Plan

Ph. 2. Advanced Research: 2009 - 2019

- Required Tech Information
- Needed Technology
- Research to create Real Time Response
- Safety Decision Process Research
- Five Safety System Initiatives Research

Ph. 3. Technology Transfer (Application Research): 2016 - 2021

- Software Development
- Hardware Development
- Prototype Performance
- Prototype Quality
- Prototype Reliability

Ph.4. Technology Deployment: 2019 - 2024

- Deployment Tactics: Case Study
- Deployment Tactics: Functionality
- Deployment Tactics: Quality/Reliability
- A new System Development
- System Performance

Revise dates as Discussed in Nov.
D. Expand the Concept to All Transportation Issues
- Safety, Mobility, Energy, Environment, and Productivity -

1. By means of technologies
2. For a new transportation system
3. For National Competitiveness in Science & Technology

The IATS Concept

- FHWA
  - Infrastructure
  - Safety
  - Revenue/Cost Recovery
- ITS/JPO
- Operation
- DOE: Energy & Environment
- FMCSA
- NHTSA
- Research Institutes
- The Auto Industry
- States & Outside Stake Holders

FHWA Office of Safety R&D
Meeting The Challenge, Together!