



SHRP II Safety

**Making a Significant Improvement in
Highway Safety**

SHRP II Safety Research Symposium
August 16-17, 2006

TRANSPORTATION RESEARCH BOARD
OF THE NATIONAL ACADEMIES

Symposium Objectives

- Describe proposed SHRP II Safety Research Program
 - The two research “tracks”
 - The multi-year plan
 - The first-year projects
- Review preliminary research questions for both tracks
 - What is missing
 - Can these questions be answered?
 - If so, what analysis methods are appropriate

Symposium Objectives (cont)

- Review and discuss pertinent state-of-the art research methods
- Discuss critical issues that will arise
 - Definition and validation of crash surrogates
 - Analysis of extremely large data sets of events (e.g., sampling?)
 - Etc.
- Summary
 - This is *new, different, and exciting* safety research
 - We will present what we know, and ask you to help frame the RFPs and future research efforts



SHRP II Safety Research Symposium

Safety Research Plan

TRANSPORTATION RESEARCH BOARD
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Preparations for a Future SHRP (F-SHRP)

- 1998: **TEA-21** request ® ***Special Report 260***
- 2001: **AASHTO** resolution → Interim planning in partnership with **FHWA**
- 2002-03: Interim planning → Detailed research plans
- 2005: **SAFETEA-LU** ® Authorized a new **SHRP, SHRP II**

Strategic Focus Areas

- Making a Significant Improvement in Highway Safety (Safety)
- Accelerating the Renewal of America's Highways (Renewal)
- Providing a Highway System with Reliable Travel Times (Reliability)
- Providing Highway Capacity in Support of the Nation's Economic, Environmental, and Social Goals (Capacity)

Oversight Committee

- Meet a least twice a year
- Approve annual work program
- Modify work program as needed
- Approve contract awards
- Create technical coordinating committees
- Approve organizational procedures
- Prepare annual report

Technical Coordinating Committees

- Develop work plan and budget for area
- Monitor progress on contracts
- Report to Oversight Committee and recommend program modifications
- Facilitate coordination with other SHRP II areas and outside research programs
- Facilitate transfer of results into use

Expert Task Groups

- Develop detailed RFPs based on scopes and directives of TCC
- Review proposals for technical quality and responsiveness
- Recommend awardee(s) to Oversight Committee
- (Potentially) Review research results and reports

SHRP II Staff

Budget

(millions of dollars, 4 focus areas)

	Proposed	Authorized	Expected
Annual	75	51.25	37.5 (avg)
Years	6	4	4
Total	450	205	150

Research contracts: \$113 million

Safety Technical Coordinating Committee

First Meeting: June 12-13, 2006

Membership: 5 State DOT reps (Safety, Traffic or Research)
3 Roadway Research Engineers
4 Human Factors Specialists
1 Private User-Agency Rep
Liaison members: AASHTO, NHTSA, FHWA,
Transport Canada, TRB

Overview of Proposed Safety Research Program

- Overall goal: Greatly increased knowledge of *driver behavior*
 - How the driver interacts with and adapts to the roadway, traffic environment, traffic controls, weather, etc.
 - Differences in *crash risk* associated with these interactions
 - Proposed countermeasures based on the findings

Overview of Proposed Safety Research Program

- Proposed safety research program now has two “tracks”
 - Naturalistic Driving Study – instrument 2,000-3,000 vehicles and observe and record *driver behavior*, roadway, surrounding traffic, environment, etc.
 - Site-based Risk Study – instrument series of locations (e.g., intersections, curves) and observe and record *vehicle interactions* under different roadway, traffic, and traffic control/warning conditions

Importance of Site-Based Video Study

- Original budget reduction eliminated retrospective and prospective before/after evaluations
- If it works (Year 1 study), and if surrogates can be identified, this method will allow us to do before/after (with/without) studies of safety-related treatments we may never study adequately with crash data
 - Changes in signal phasing variables
 - New warning markings/signs at curves and intersections
 - Site communications based on weather changes (e.g., automated “bridge icy” warnings)
 - Site treatments based on vehicle speeds (e.g., automated ramp-rollover warnings based on truck speeds)
- Could be used by State and local DOTs to conduct evaluations of their own experimental treatments

Overview of Proposed Safety Research Program

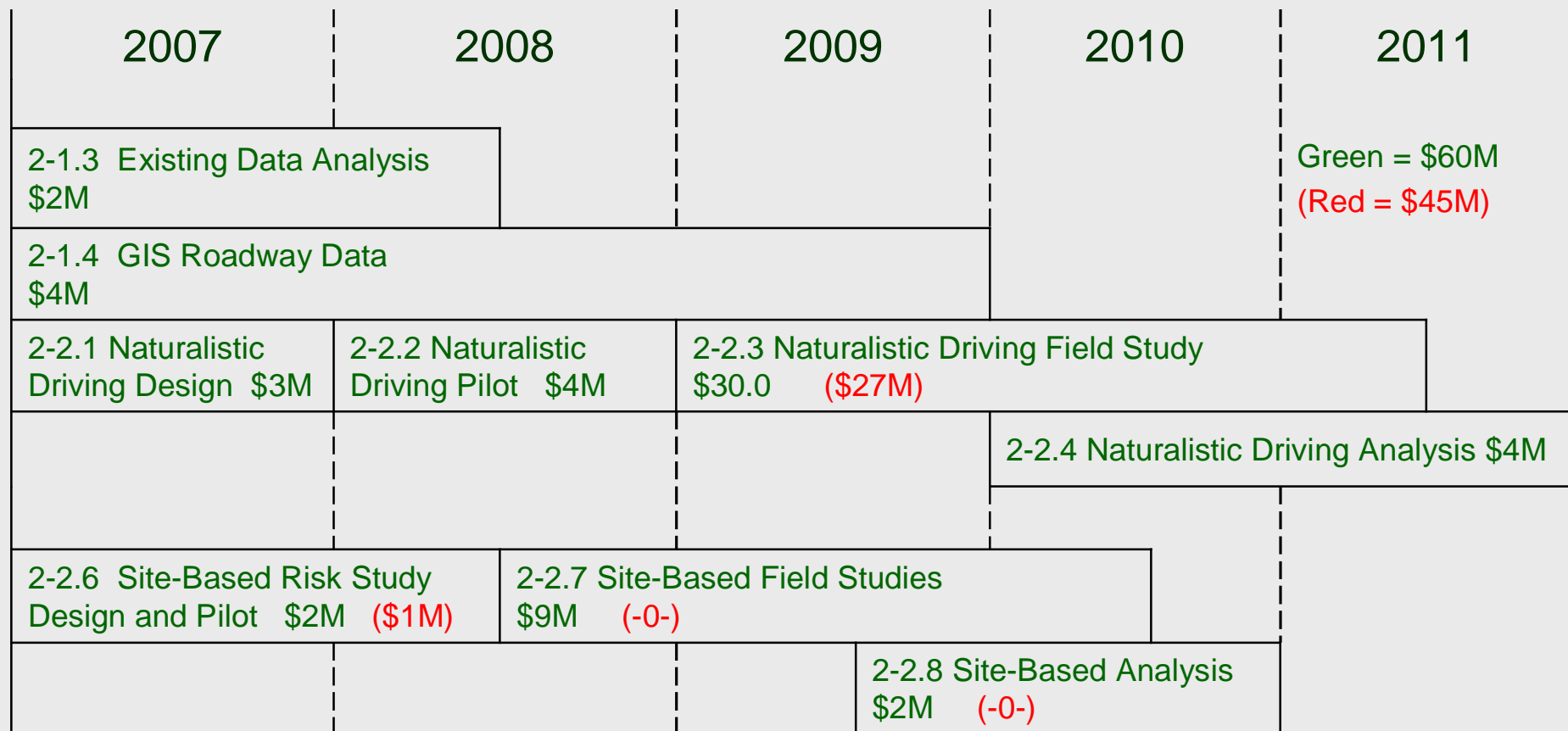
- **Major challenges**

- New technologies are required
- New measures of safety risk (i.e., crash surrogates)
- Need improved roadway inventories where instrumented vehicles will operate
- Huge datasets produced, requiring new statistical methods and automated data processing (e.g., video processing of vehicle pairs and driver glance direction)
- Privacy issues with volunteer drivers
- Size of instrumented vehicle fleet to be equipped and operated
- Etc., *all under reduced budget*

Safety Technical Coordinating Committee Recommendations

- \$60 Million – Retain both “tracks” (highly recommended)
- \$45 Million – Reluctantly eliminate site-based track, except for one preliminary study

Revised SHRP II Safety Plan Timeline and Reduced Budgets



SHRP II Safety First-Year Projects

2007	2008	2009	2010	2011
2-1.3 Existing Data Analysis \$1.5M	2-1.3 Year 2 \$0.5M			
2-1.4 Roadway Data Van \$1.5M	2-1.4 GIS Roadway Data Year 2 Collection \$2.5M			
2-2.1 Naturalistic Driving Design \$3M	2-2.2 Naturalistic Driving Pilot \$4M	2-2.3 Naturalistic Driving Field Study (\$27M)		
			2-2.4 Naturalistic Driving Analysis \$4.0M	
2-2.6 Site-Based Risk Study Design and Pilot (\$1M)	2-2.7 Site-Based Field Studies (-0-)			
			2-2.8 Site-Based Analysis - (-0-)	

Project 2-1.3: Development of Analysis Methods using Existing Data

Objective: Develop analytic methods for SHRP II risk studies using data from recent field studies

Year 1: 3-4 separate studies (\$1.5M)

Year 2: Integrate year 1 results and produce the analysis plan for SHRP II risk studies (\$0.5M)

Products: Preliminary findings
Analysis plan for the F-SHRP field study

Project 2-1.4: Development of Comprehensive Roadway Information in a GIS Database

- Objective:** Develop a GIS database with added data elements and greater coverage of roads that will be linked using GPS location with the naturalistic driving study.
- Year 1:** Acquire a digital highway measurement van (\$1.5M)
- Years 2-4:** Collect roadway information in the naturalistic driving study areas
Merge with existing roadway data
Link with naturalistic driving data
(\$2.5M)

Project 2-2.1: Naturalistic Driving Study Design

- Objective:** Overall coordination and design of the naturalistic driving study including the data package, all subject procedures, legal/privacy issues, automated video analysis tools, database design, etc.
- Scope:** 18 months (\$3M)
- Coordination:** Study design is coordinated with roadway data collection and analysis plan and leads to the pilot study.

Project 2-2.6: Site-Based Video Study Design

- Objective:** Conduct additional hardware/software development to achieve the SHRP II project objective to estimate conflict severity incrementally as vehicles move through the site.
- Scope:** 18 months (\$1M)
- Products:** The resulting method and hardware will have applications to countermeasure evaluation beyond SHRP II even if it is not employed within SHRP II

Immediate Schedule

- May/June: TCCs developed Year 1 program
- July 19: OC approves Year 1 program
- August ETGs prepare RFPs
- Sept 11: RFPs advertised
- October: TCCs develop Year 2 program
- October 26: Proposals due
- November: ETGs evaluate proposals
- Nov 29: OC approves Year 1 awards and Year 2 program
- TRB 2007: Announce Year 1 awards and Year 2 program

Annual Schedule, 2007 +

- March & September: TCCs meet
- April and October: OC meets
- May & November: ETGs meet
- June & December: RFPs advertised
- December 15: annual plan due to FHWA
- January: annual plan announced at TRB Annual Meeting



SHRP II Safety Research Symposium

Research Questions

Why is this on the Agenda?

1. It will be useful to know what these RFPs are supposed to accomplish.
2. What have we missed?
3. Think about whether the studies presented would support the SHRP II questions

Research Questions

(Vision from SR 260)

SR 260

Employ new technologies to produce the necessary understanding of the relationship of multiple factors (human, vehicle, roadway and environmental) to the risk of collisions and casualties to support future countermeasure development and achieve substantial reductions in traffic crashes and casualties.

Research Questions (shortest version)

Develop an understanding of the interaction of driver behavior with the roadway, vehicle and environment to improve safety

Target of Opportunity

- Objective exposure-based collision risk measures
- Surrogate measures of collision risk
- Address driver behavior
speeding, inattention, fatigue, age, gender, etc.
- More detailed roadway data with greater coverage

Broad Areas

- Evaluation of crash surrogates
- Individual variability and systematic variation with age, gender and vehicle type
- Relation of driver behavior and roadway characteristics
- Lane-keeping/road departure
- Intersection characteristics/control and collision risk

Road Departure

Sample Research Questions

- How do lane-edge markings affect lane-keeping?
- How does driver behavior (speeding) affect lane-keeping?
- How do driver factors such as inattention or fatigue affect lane-keeping performance?
- Does lane-keeping performance vary with driver age and gender or vehicle type?
- How does grade, curve and other road design factors affect lane-keeping?
- How do rumble strips change driver behavior?
- Do rumble strips on the right shoulder increase deviations to the left?
- What is the influence of surrounding traffic on lane-keeping?

Road Departure Risk Analysis

Risk Measures

Road departure collisions

Road departure surrogates

road departure (w/o collision)

time-to-road departure from lane-edge sensor

Independent Variables

Road: grade, curve, shoulder, rumble strip

Vehicle type: car, van, SUV

Driver: age, gender, fatigue, inattention, speed

Environment: light, weather

Product

Relate road departure risk to driver, vehicle, roadway and environment factors

Intersection Collisions

Sample Research Questions

- What is the relative risk of different intersection maneuvers?
- How much do left/right-turn lanes and/or signal phases reduce the collision risk of turns?
- How do turn lanes change the pattern of conflicts?
- What is the role of illegal maneuvers?
- How does the relative risk of different intersection maneuvers vary with driver age and gender?
- How does driver behavior (speeding, aggressive driving) affect the risk of intersection maneuvers?
- What is the role of inattention, distraction?
- How does the pattern of conflicts vary with traffic volume?

Intersection Risk Analysis

Risk Measures

Group data by traffic maneuver (conflict)

Crash surrogates

 Near-collisions/traffic conflicts

 Crash margin measures

Independent Variables

Intersection: design, signing, markings, signals, visibility

Driver: age, gender, fatigue, inattention, distraction, speed, illegal actions

Environment: light, weather

Product

Relate collision and conflict risk to driver, vehicle, intersection and environment factors