Pavement Surface Characteristics Relationship to Crashes Overview

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Pavement Surface Characteristics Relationship to Crashes Overview

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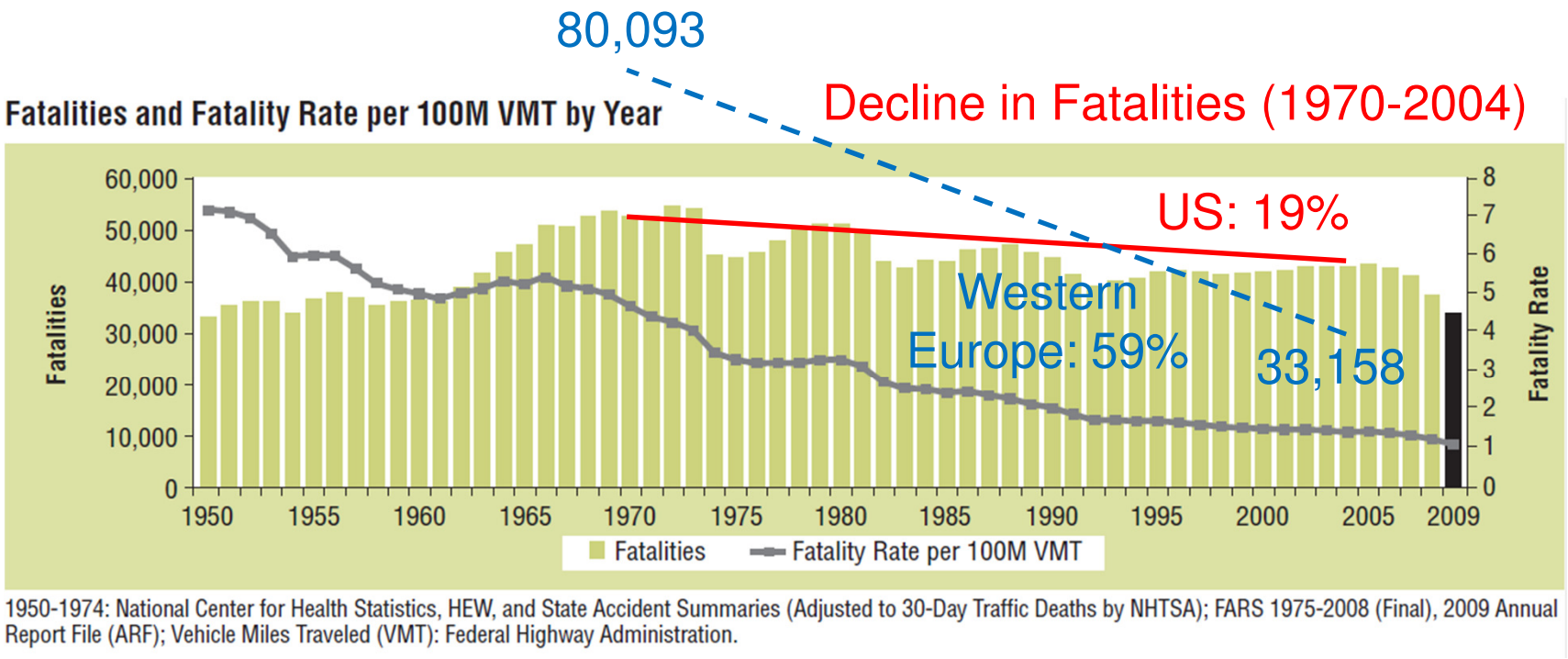
Presentation Overview

- Background
- Project objectives
- Work approach
- Synthesis report
- Other project deliverables

Background

- U.S. highway safety
  - Historical crash trends
  - Performance goals
- Crash costs
  - Annual costs
  - Crash factor categories and costs

U.S. Highway Safety



NHTSA Traffic Safety Facts (Aug 2010)

New Goal: Cut fatalities in half by 2030

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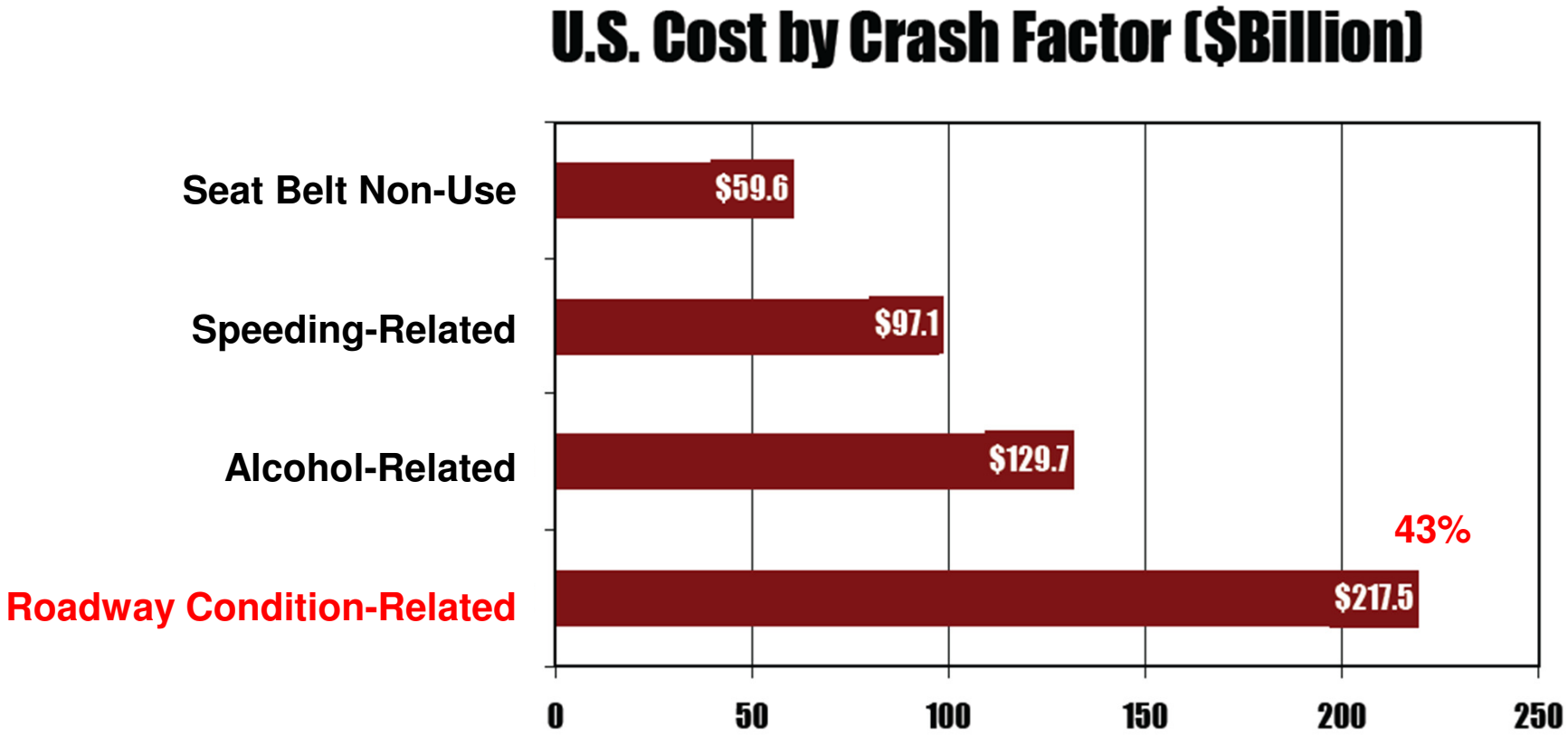
Crash Costs

- Crash factor categories
  - Road user/driver behavior
  - Vehicle conditions
  - Roadway conditions
- *On a Crash Course: The Dangers and Health Costs of Deficient Roadways* (Miller & Zaloshnja 2009)
  - Estimated total crash costs (2006): $504 billion
  - Roadway conditions a contributing factor in:
    - 31% of total crashes
    - 52% of fatalities (resulting from crashes)
    - 38% of non-fatal injuries (resulting from crashes)
  - Cost of crashes 2.5X cost of congestion in urban areas

Crash Costs (cont)



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Miller & Zaloshnja 2009

Reasons for Study

- Major safety research efforts underway or recently completed.
  - Role of engineering safer road surfaces underemphasized
  - Most emphasis placed on driver, vehicle, roadway geometrics, and traffic safety features.
- FHWA FALCON 4 Priority Gap 3—Lack of documentation on the contribution of pavement friction in reducing the number and severity of vehicle crashes.

Project Objectives

- Document the effect of improved PSCs (primarily friction and texture) on reduced vehicle crashes.
- Conduct a review of legal issues surrounding the collection and retention of PSC data by highway agencies.
- Prepare an annotated bibliography covering literature related to the work on first two objectives.

Work Approach

- Comprehensive literature search and compilation
- Detailed literature review
- Synthesis of information

Literature Search, Compilation, and Review

- State, national, and international levels
- General highway safety and pavement-related safety
- Crash reporting and analysis
- PSC measurement and reporting
  - Primarily friction and texture
  - Other PSCs(roughness, distress, hydroplaning potential, splash/spray)
- Over 300 documents collected and reviewed

A Wealth of Information…Organize and Synthesize It!!!

Synthesis Report

- Initiated October 2009
- Nearly completed (target Oct 31, 2010)
- Topic areas
  - General highway safety and pavement-related safety
  - Measurement and reporting of friction and texture
  - Pavement friction design
  - Crash data collection and analysis
  - Development of desirable levels of friction and texture

General Highway Safety and Pavement-Related Safety

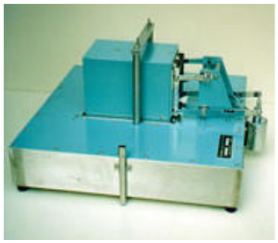
- Highway safety statistics and trends
- Safety legislation, policies, and programs
- Safety information, guidance, and tools
- On-going and planned safety activities

Safety Information, Guidance, and Tools

- FHWA
  - Technical Advisories T5040.36 (*Surface Texture for Asphalt and Concrete*) and T5040.38 (*Pavement Friction Management*)
  - Highway Safety Improvement Program (HSIP)
  - Asset Management and Safety Position Paper (2008)
- AASHTO/NCHRP
  - AASHTO *Guide for Pavement Friction* (2008)
  - AASHTO Strategic Highway Safety Plan (SHSP) and NCHRP Project 17-18 products (NCHRP Reports 500 and 501)
  - AASHTO *Highway Safety Manual*, 1st Edition (2010)
  - NCHRP syntheses/reports

Measurement and Reporting of Friction and Texture

- State-of-the-practice (AASHTO *Guide for Pavement Friction*, FHWA Tech Advisories T5040.36 & T5040.38)
  - Friction/texture measurement equipment/methods
  - Friction and texture reporting parameters
- Key technical issues
  - Role of micro/macrotexture in overall friction assessment and improved ways of measuring these properties
  - Continuous friction and texture measurement
  - Movement from FN to IFI



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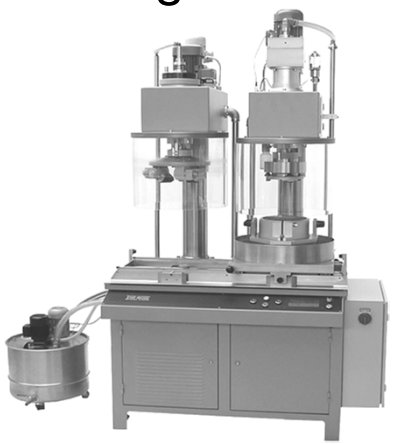
Pavement Friction Design

- State-of-the-practice design (AASHTO *Guide for Pavement Friction*, FHWA Tech Advisory T5040.36, OH Blended Aggregates & Accelerated Polishing studies*)*
  - Asphalt-surfaced pavements (agg quality, mix types/designs)
  - PCC pavements (agg quality, mix design, texturing techniques)
  - Preservation treatments
- Key technical issues
  - Lab tests to evaluate friction and texture during mix design
  - Friction performance prediction models



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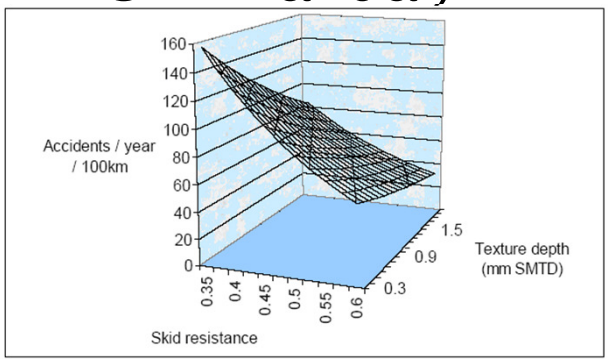
Crash Data Collection and Analysis

- State-of-the-practice (AASHTO *Highway Safety Manual*, FHWA Tech Advisory T5040.38, FHWA HSIP Manual)
  - Data collection/compilation
  - Preliminary analysis and reporting
  - Analysis of crash rates and road data
- Key technical issues
  - Use of W/T crash ratio as flag for general pavement condition
  - Quantify roles of friction, texture, roughness, distress in safety
  - Quantify benefits of pavement preservation on safety



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Development of Desirable Levels of Friction and Texture

- State-of-the-practice (AASHTO *Guide for Pavement Friction*, MD hot-spot studies, OH Friction study, UK and NZ Skid Resistance Policy studies)
  - Investigatory and intervention friction and macrotexture levels
  - High friction surfaces
- Key technical issues
  - Appropriate flagging of pavement segments with potential safety and/or friction issues

Site category and definition		Investigatory level at 50km/h							
		0.30	0.35	0.40	0.45	0.50	0.55	0.60	0.65
A	Motorway class								
B	Dual carriageway non-event								
C	Single carriageway non-event								
Q	Approaches to and across minor and major junctions, approaches to roundabouts								
K	Approaches to pedestrian crossings and other high risk situations								
R	Roundabout								
G1	Gradient 5 to 10% longer than 50m								
G2	Gradient >10% longer than 50m								
S1	Bend radius <500m – dual carriageway								
S2	Bend radius <500m – single carriageway								

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On-Going and Planned Safety Activities

- FHWA
  - PSC IDIQ
  - TPF-5(099) Low-Cost Safety Countermeasures
  - TPF-5(141) Pavement Surface Consortium
  - High Friction Surfaces
  - Splash/Spray Assessment Tool Development Program
  - Pavement Friction Management Demonstration
- NCHRP/AASHTO
  - NCHRP 1-46 (*Handbook on Pavement Design, Construction, and Management*)
  - AASHTO Develop National Strategic Highway Safety Plan
  - AASHTOWare *SafetyAnalyst* program

Synthesis Recap

- Focus attention on designing, constructing, and maintaining pavement surfaces to help achieve the FHWA fatality reduction goal
- Accomplished by synthesizing state-of-the practice information and identifying key technical challenges regarding:
  - Friction/texture measurement equipment/methods
  - Friction design procedures
  - Friction management approaches
- Identified on-going and planned studies to further advance PSC-related safety

Project Deliverables

- 3-volume project report
  - Volume 1: Synthesis report
  - Volume 2: Annotated bibliography/reference file
  - Volume 3: Legal issues executive report

Annotated Bibliography/ Reference File

- Comprehensive listing and descriptions of compiled literature, grouped by subject area:
  - Highway safety/crash prevention
  - Pavement friction/texture
  - Pavement friction design/texture selection
  - Pavement friction management
  - PSCs (general)
  - Hydroplaning potential
  - Splash/spray
  - Legal issues
- Internal links

Legal Issues Executive Report

- Examines the legal issues surrounding the collection and retention of surface characteristics data by highway agencies
- Provides best practices and recommendations for limiting agency risk of safety-related lawsuits

Questions??

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On-Going/Planned Research Activities

- Friction and texture measurement
  - Photographic-based systems
  - 3D finite element analysis
- Friction design
  - Aggregate quality
  - Mix evaluation
- Crash data collection and analysis
  - FHWA Low-Cost Safety Countermeasures
  - FHWA High Friction Surfaces
- Desirable Levels of Friction and Texture
  - FHWA Friction Management Demonstration project