



OFFICE OF RESEARCH & DEVELOPMENT

2012 **R&D**
REVIEW

Track Research Division



U.S. Department
of Transportation

Federal Railroad
Administration

GARY CARR

Chief, Track Research Division
Office of Research and Development
Office of Railroad Policy and Development

Program Area & Risk Matrix

Track Research Division

Program Areas	Risk Factors	Trespass	Grade Crossing	Derailment	Train Collision	All Other Safety Hazards
Railroad Systems Issues						
Human Factors						
Track & Structures				X		X
Track & Train Interaction				X		
Facilities & Equipment	X	X	X	X	X	X
Rolling Stock & Components						
Hazardous Materials						
Train Occupant Protection						
Train Control & Communications						
Grade Crossings & Trespass						

Outline

- Track Research Division
- Accident Mitigation Potential
- Program Funding Allocation
- Track & Structures
- Track & Train Interaction
- Operation & Facilities
- Technology and Stakeholder Outreach
- Industry Impact
- Summary

Track Research Team



Gary Carr
Track Research
Division Chief



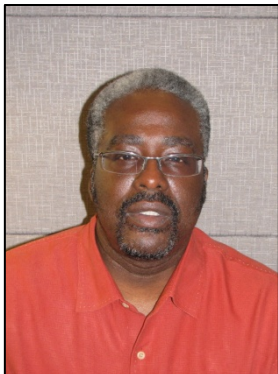
Ali Tajaddini
Track Safety
Standards & Vehicle
Track Interaction



Luis Maal
Onsite Manager at
TTCI



Cam Stuart
Track Inspection
Systems and BAA



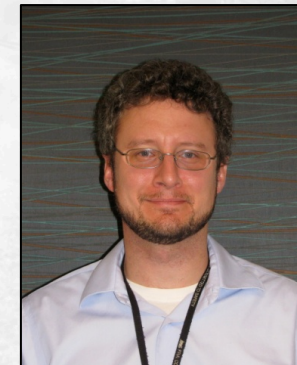
Hugh Thompson
Track Support and
Substructure
Assessment



Mo Fateh
Track and Structures

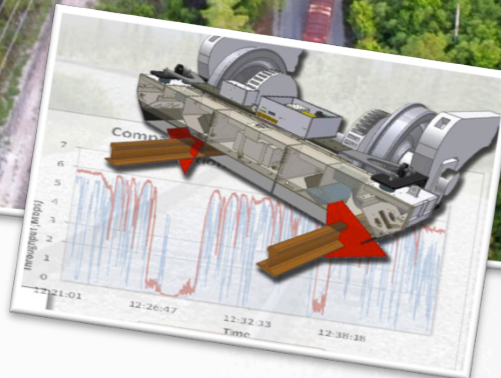
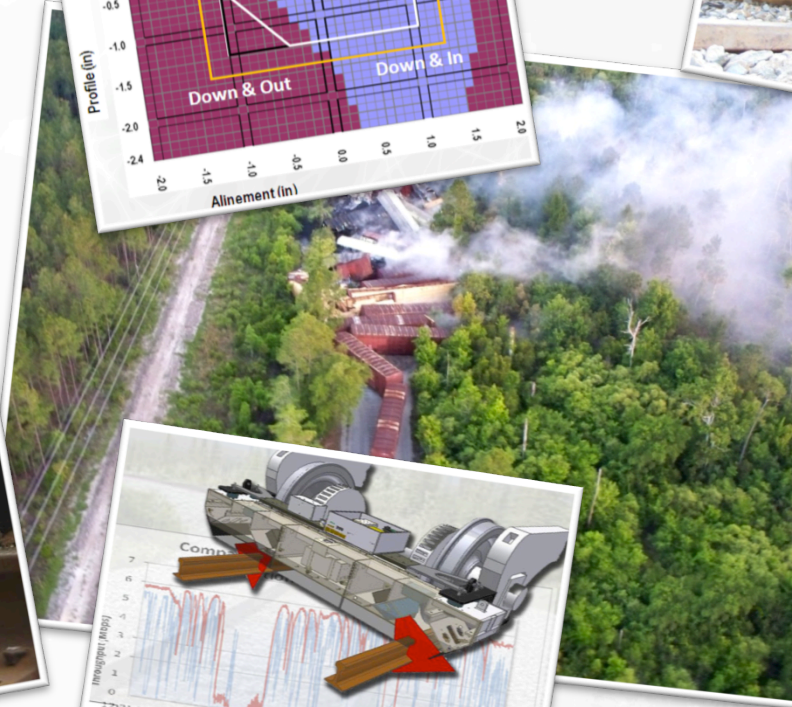
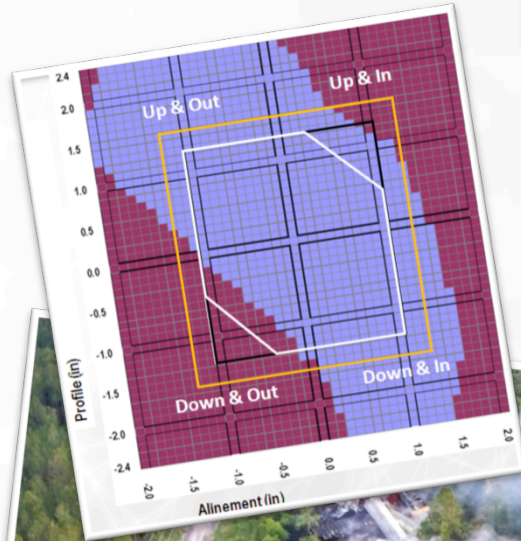


Sung Lee
General Engineer

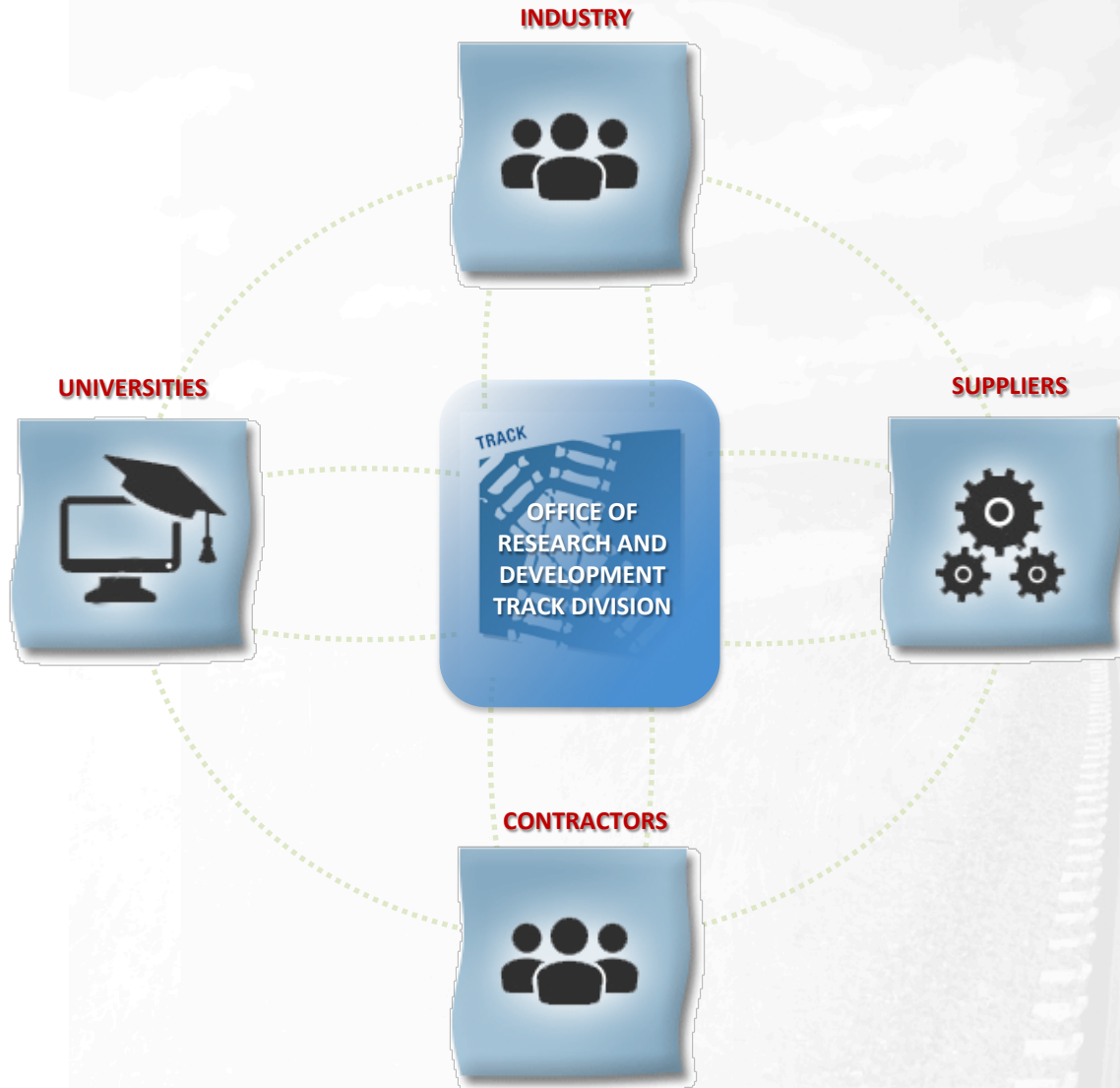


Leith Al-Nazer
Rail Integrity and
Track Buckling

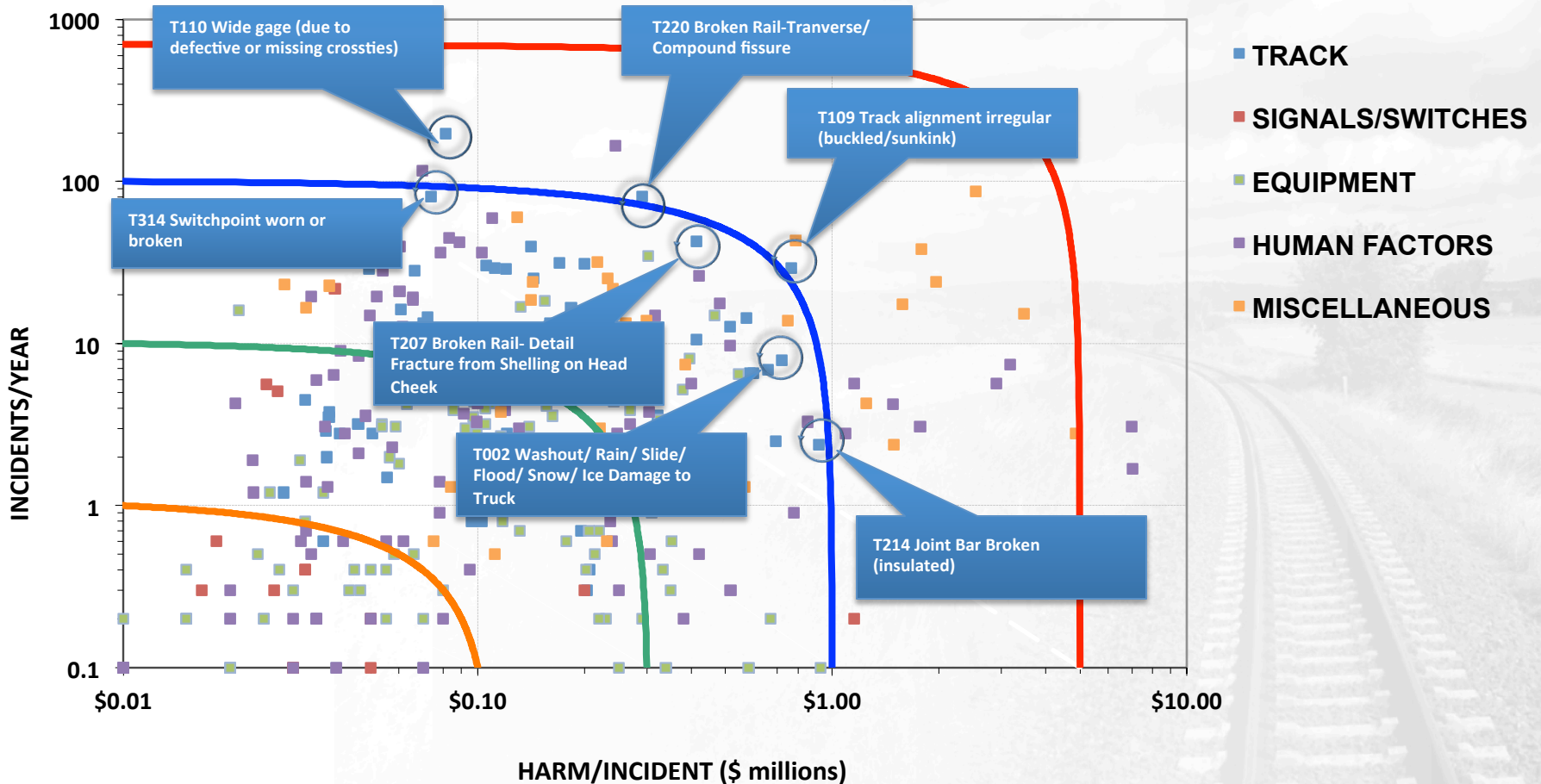
Track Research Division



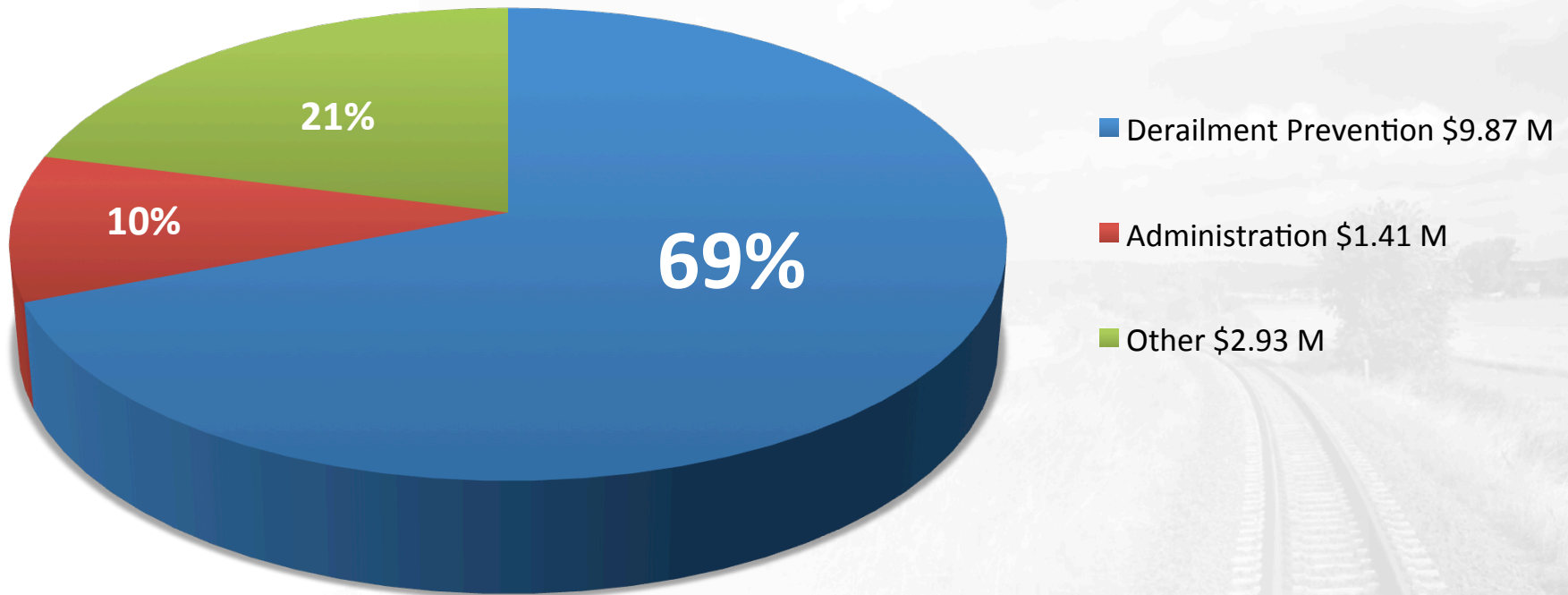
Track Research Technology Collaboration



Accident Derailment Mitigation Potential



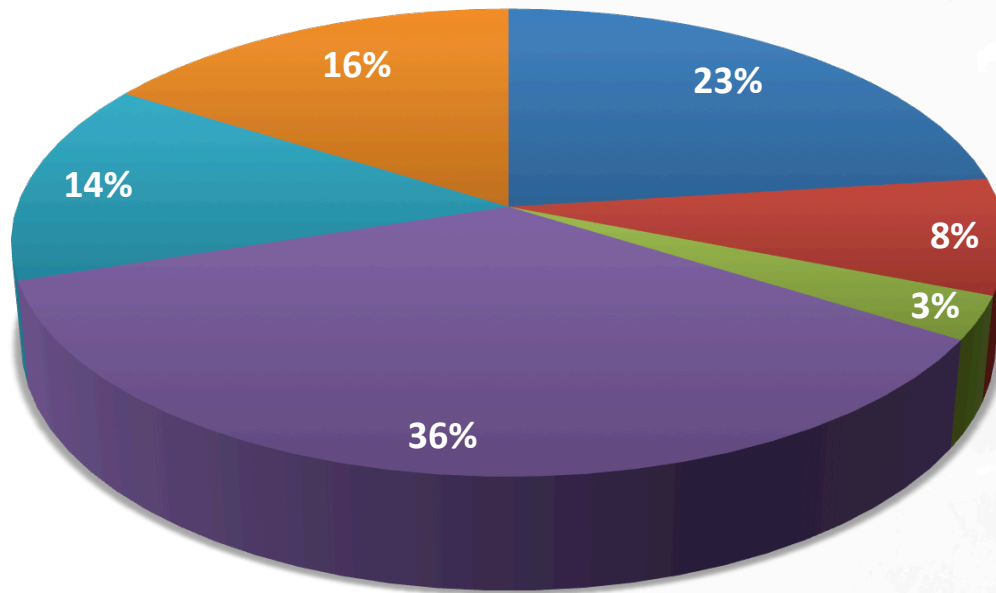
Program Funding Allocation under Track Research Division



"To whom much has been given, much is expected."

-- Bill Gates

Program Funding Allocation under Track Research Division



- Inspection Technologies
- Analysis Track/Structure Design & Performance
- Track Materials & Components
- Track/Train Interaction & Derailment Prevention
- Government Facilities & Operations-TTCI
- Data Management and Administration

Track Research Partners with Active Projects:

- Railroad Industry: 41%
- Volpe: 19%
- TTCI: 14%
- Universities: 16%

Current Program Funding: \$13,500,000

Track & Structures

Inspection Techniques

- Rail Defect Detection
- Rail Flaw Visualization
- Gage Widening
- Portable Track Loading Fixture (PTLF)
- Vertical Track Support
- Ground Penetrating Radar (GPR)
- Autonomous Geometry
- Vision Based Inspection Technologies
- Stress Measurement in Rail

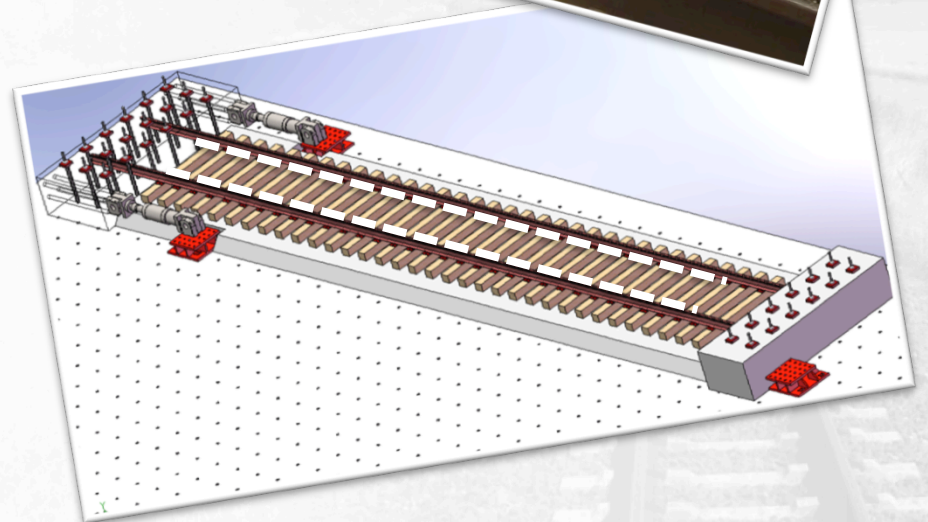


Materials & Components

- Rail Steels
- Ties/Fastenings

Design, Analysis & Performance

- Data Management
- RISview
- Alt. Track Design
- Longitudinal Stress
- Bridges



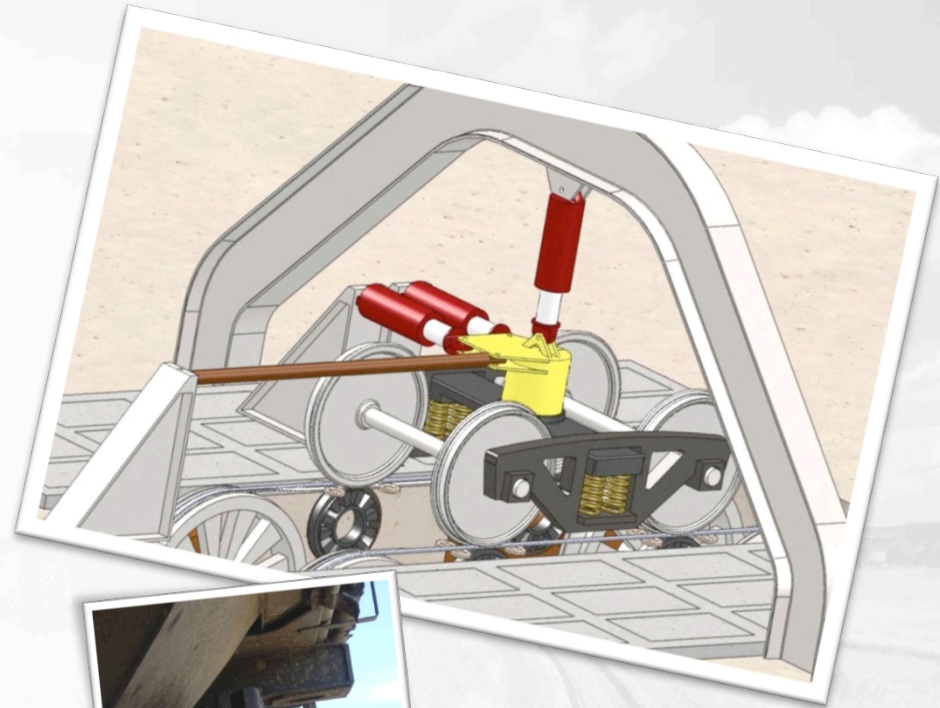
Track & Train Interaction

Derailment Mechanism & Prevention

- Track Geometry
- Wheel/Rail Interaction
- Wheel/Rail Profile Lubrication
- Forces in Special Trackwork

Vehicle & Track Performance

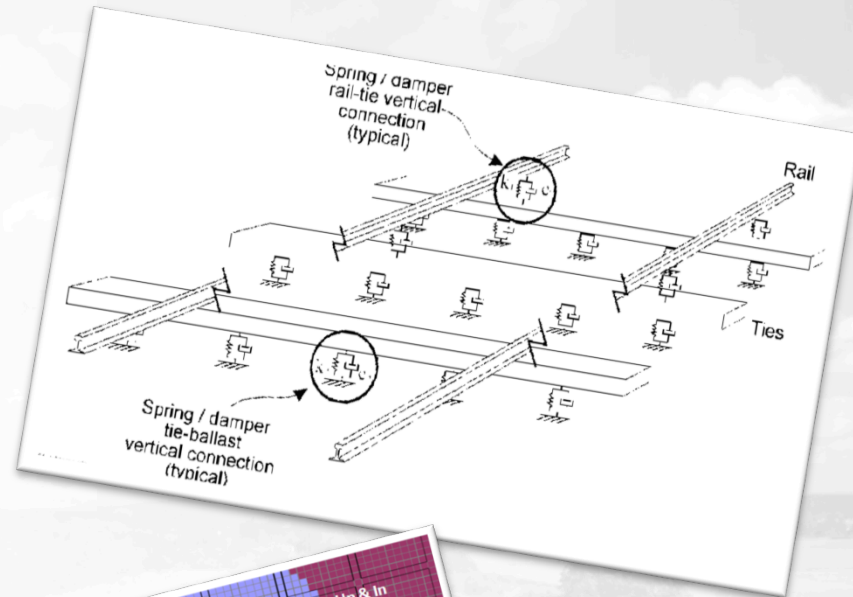
- Vehicle-Track Interaction Safety Standards
- Modeling, Simulation and Testing of Vehicle-Track Interaction and Validation Procedures
- High-Speed Test Track Needs Assessment



Understand the Fundamental Sciences with Modeling

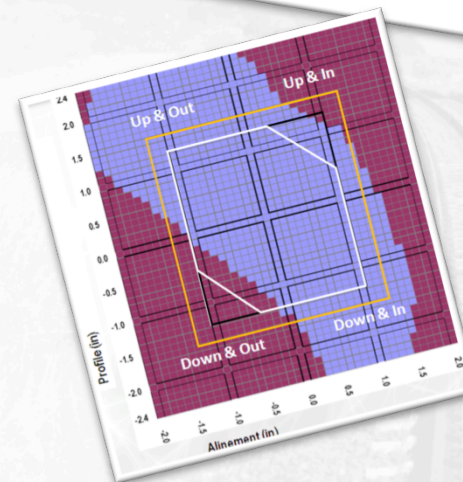
Track Research Modeling

- Concrete Tie Modeling
- Ballast Fouling Modeling
- Derailment Scenario Modeling
- Vehicle/Track Interaction Modeling
- Rail Seat Abrasion



"Essentially, all models are wrong, but some are useful."

- George Box



Operation & Facilities

Operation, Maintenance, and Enhancements of R&D Research Cars

- High Speed Research Car (T-16)
- Gage Restraint Measurement System (GRMS) Car (T-18)
- Hy-Rail Research Truck (R-4)
 - Joint Bar Inspection System, LIDAR Mapping, Laser Rail Flaw



Government Furnished Equipment

- Instrumented Wheel Sets
 - Freight & Passenger

Facilities

- Transportation Technology Center (TTC)



FRA-funded University Projects under the Track Research Division



- Rail Stress Measurement
- Track Modulus Measurement System



Evaluation of Wheel/Rail Contact Mechanics



- Rail Defect Detection System
- Automated Measure of Stress in CWR



Fracture and Fatigue Evaluation of Slot-Welded Railhead Repair



Fouling Assessment Modeling



Simulation of Multi-Body Rail Vehicle/Track Dynamic

Technology Outreach

High Speed Rail Broad Agency
Announcement (BAA)

Transportation Research Board
Innovations Deserving Exploratory
Analysis (IDEA) Program

TRB National Cooperative Rail
Research Program (NCRRP)

Small Business Innovative Research
(SBIR) Support Programs

Stakeholder Outreach

Office of Railroad Safety:

- Rail Safety Advisory Committee (RSAC) Process
- Providing technical data
- Troubleshooting derailments
- Teaching courses to the Office of Railroad Safety (RRS) staff and field inspectors in areas such as:
 - Vehicle Track Interaction (VTI)
 - Subgrade and Ballast
 - New Technologies

Participates in:

- Association of American Railroad (AAR) Committees:
 - Technology Scanning
 - Heavy Axle Load/Embedded Rail Construction (HAL/ERC)
- TRB Committees

Dissemination of Research Results

- Publications
- Workshops
- Social Media
- Conferences
 - Joint Rail Conference (JRC)
 - American Railway Engineering and Maintenance-of-Way Association (AREMA) Annual Conference & Expo
 - Transportation Research Board (TRB) Annual Conference
 - FRA Research & Development (R&D) Research Review
 - Transportation Technology Center (TTCI)/Association of American Railroads (AAR) Research Review
 - Wheel/Rail Interaction Seminar
 - University of Illinois, Urbana-Champaign (UIUC) Concrete Crosstie and Fastening System Symposium
 - American Public Transportation Association (APTA) Rail Conference
 - Railway Tie Association (RTA) Symposium
 - University of Illinois at Chicago (UIC) High-Speed



Industry Impact

Rules and Regulations

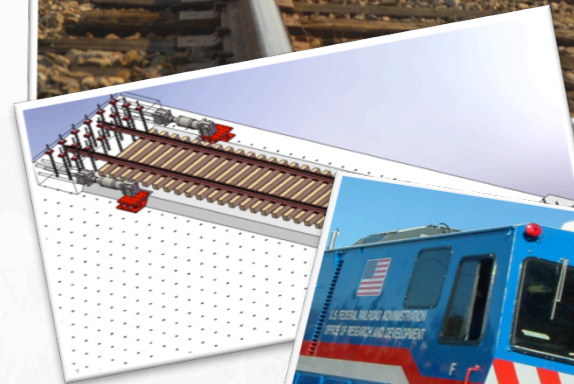
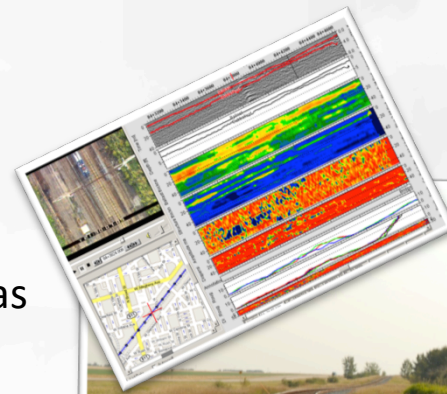
- Vehicle/Track Interaction Safety Standards; High-Speed and High Cant Deficiency Operations
Status: Notice of Proposed Rulemaking (NPRM)
- Track Safety Standards; Rail Integrity
Status: NPRM
- Track Safety Standards; Continuous Welded Rail (CWR)
Status: Final Rule
- Track Safety Standards; Concrete Crossties
Status: Final Rule

Implementation of technologies and practices adopted by the railroads

- Vision-Based Joint Bar Inspection System (JBIS)
- Gage Restraint Measurement System (GRMS)
- Portable Track Loading Fixture (PTLF)
- Vehicle & Track Interaction Monitors (VTI)

Summary

- Research & Development (R&D) funding has been essential for advancement of rail safety technologies, particularly during initial phases of development.
- The Office of R&D, along with contractor support, has successfully introduced a number of new technologies that are widely used by FRA Office of Railroad Safety and throughout the industry for safety inspection and safety assurance/analysis.
- Transition and implementation of technology relies heavily on partnership between stakeholders from governments, railroads and technology providers.



"If we knew what it was we were doing, it would not be called research, would it?" -Albert Einstein