OFFICE OF RESEARCH & DEVELOPMENT

2012 R&D REVIEW

Train Control & Communication (TC&C) Research Division

U.S. Department of Transportation

Federal Railroad Administration

SAM ALIBRAHIM, P.E.
Chief, Train Control and Communications
Office of Research and Development
Office of Railroad Policy and Development

Program Area & Risk Matrix

Train Control & Communication (TC&C) Research Division

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

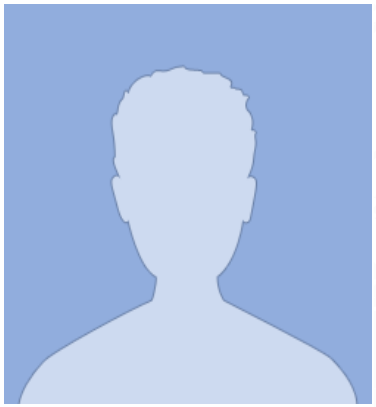
TC&C Research Team

Sam Alibrahim, P.E.
Train Control & Communication Research Division Chief

Jared Withers
Intelligent Transportation Systems Program Manager

Tarek Omar
Grade Crossing Protection & Trespass Prevention Program Manager

Kenneth Orr
Train Control & Communication Program Manager



FRA.RPD-2012-0034 (Gov Wide)
FRA.RPD-2012-0035 (CATRAT)
GS-12 General Engineer
Open May 18th Close June 7th

TC&C Research Division's Major Programs and Projects

Train Control

Positive Train Control

- Freight Advanced Enforcement Algorithm
- Passenger Brake Model
- Employee-In-Charge Remote Terminal
- Locomotive Interface Gateway
- Alternative Broken Rail Detection
- Positive Train Location/ Train Consist Integrity
- High Accuracy GPS Test Site Upgrade
- Positive Train Control Test Bed
- Caltarin PTC/CBOSS
- Loss of Shunt Prevention Study

Communication

220 MHz Development

- Railway Cognitive Radio
- Interoperability Protocol Development

Intelligent Transportation Systems (ITS)

- Proof of Concept
- Highway-Rail Feasibility Analysis

High Frequency Communication

- WiFi/WiMax Development

Modeling & Simulation

Simulation

- Generalized Train Movement Model

Modeling

- GradeDec.Net grade crossing online tool

Grade Crossing Protection

Crossing Technology Research

- PTC-based Train Detection & Warning
- Automated Lidar Grade Crossing Data Extraction
- Radar-Based Vehicle Detection at Grade Crossing

Technology Evaluation

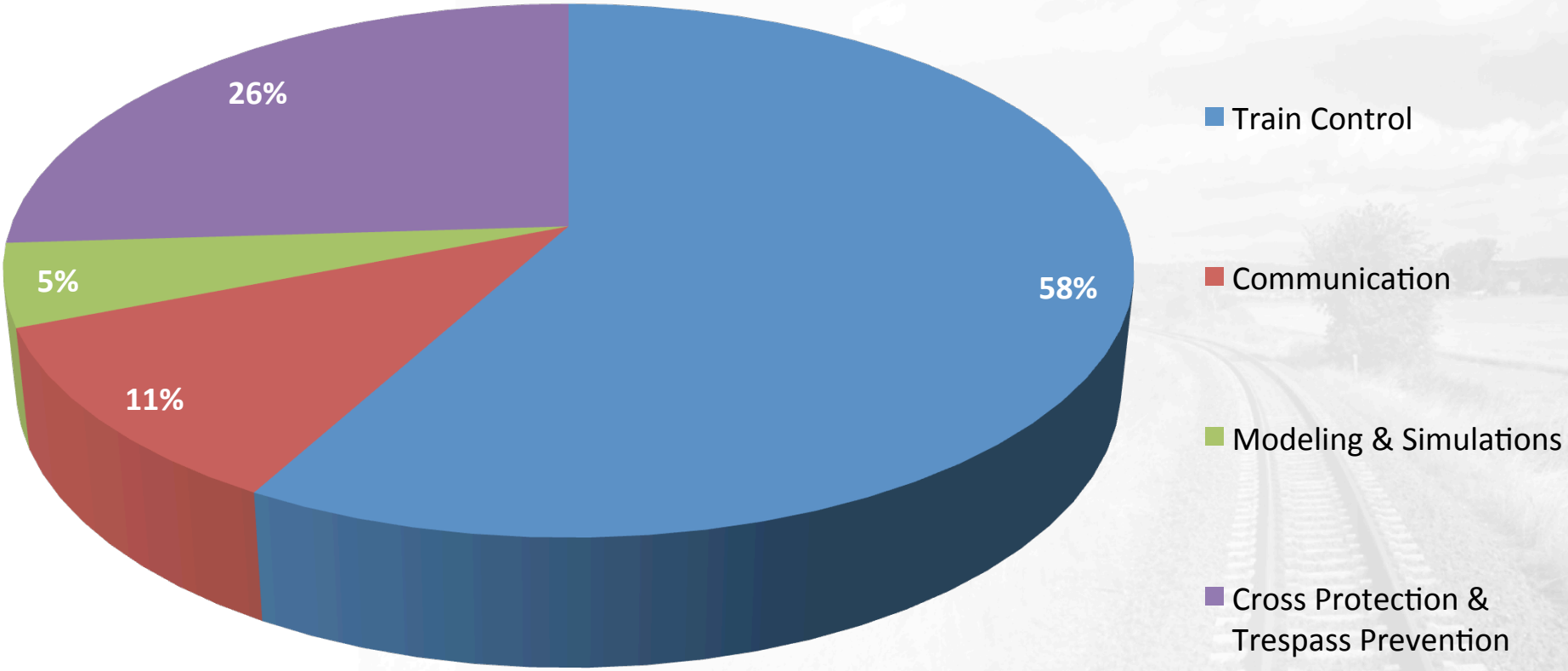
- Second Train Warning
- Anti-Trespass technology

Trespass Prevention

Human Factors Studies

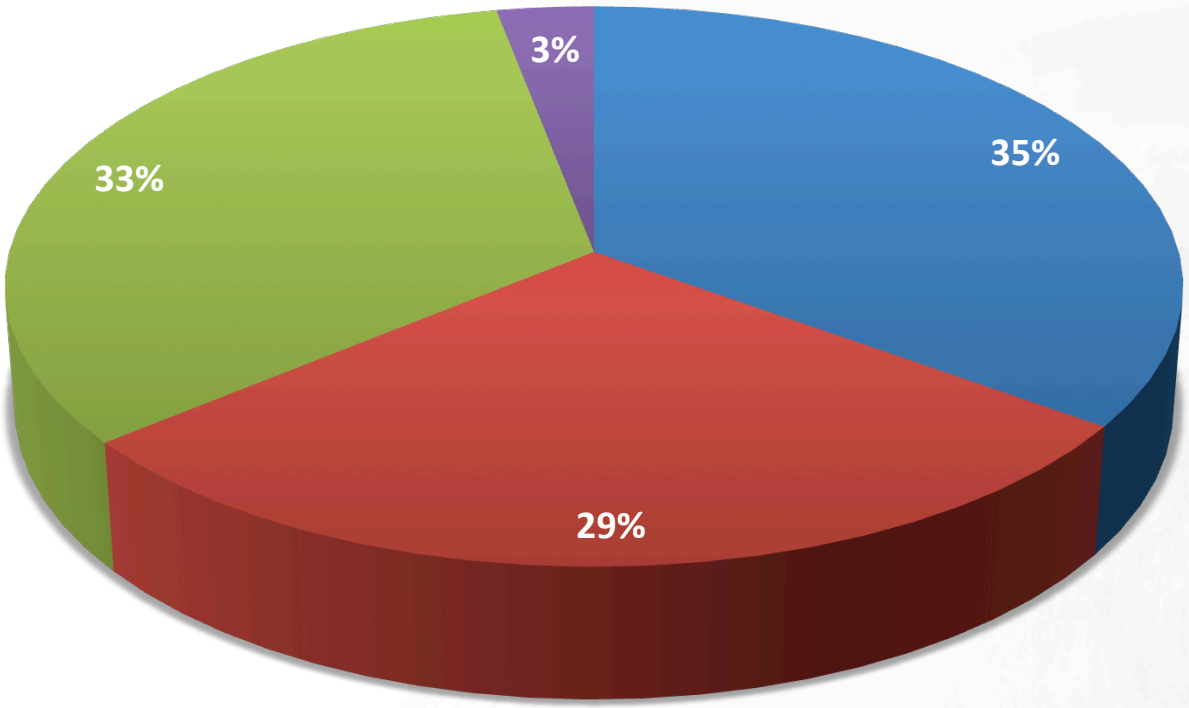
- Driver Behavior Analysis

TC&C Research Division Program Budget Allocation



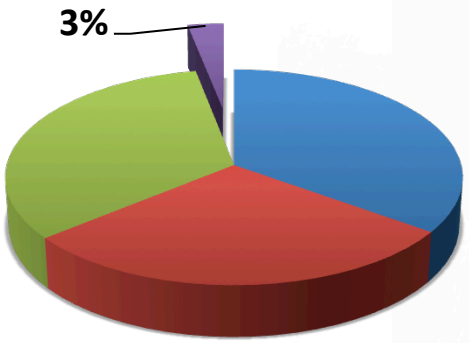
Current Program Funding $15,900,000

TC&C Research Partners with Current Active Projects



FRA-Funded University Projects under TC&C Research Division

Percentage of TC&C Research Resources



- **University of Nebraska, Lincoln**
  - WiFi/WiMax Development
- **Virginia Tech**
  - Railway Cognitive Radio
- **George Mason & Howard University**
  - Evaluation of PTC Security Mechanism
- **University of Michigan**
  - Automated Extraction of Lidar Data

University of Nebraska Lincoln

University of Michigan

HOWARD UNIVERSITY 1867

GEORGE MASON UNIVERSITY

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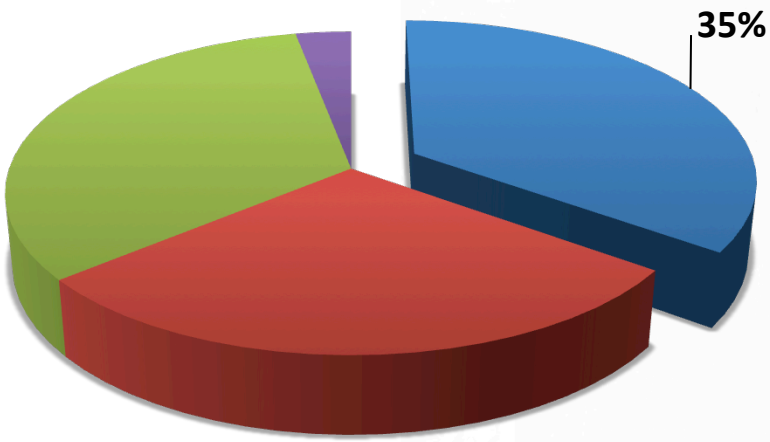
FRA-Funded TTCI Projects under TC&C Research Division

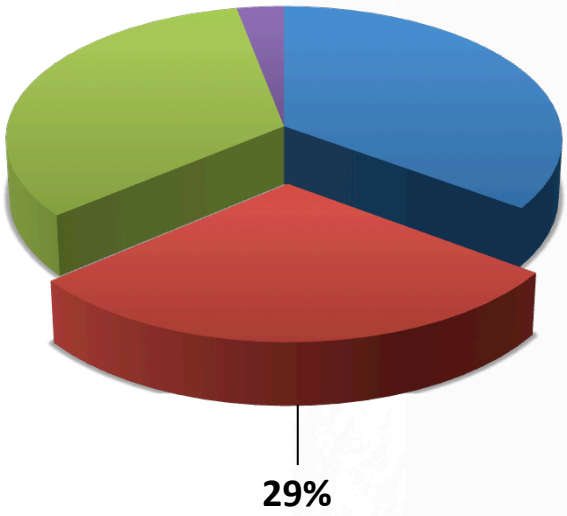
Percentage of TC&C Research Resources



- Advanced Enforcement Algorithm
- Employee-in-charge Portable Terminal
- Vital Consist determination/Positive Train Location
- PTC/Communication test Bed Upgrade
- High-Accuracy NDGPS site upgrade

FRA-Funded VOLPE Projects under TC&C Research Division

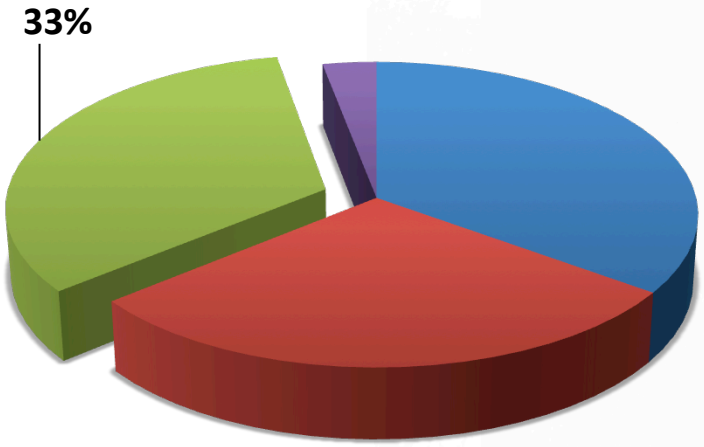
Percentage of TC&C Research Sources



- Trespass Prevention Research Study
- Second Train Warning for Motor Vehicle Drivers
- PTC-Based Grade Crossing Train Detection and Warning System
- Program Management, Quick Response, and Special Studies
- Evaluation of Education and Outreach Strategies and Methods
- Driver Behavior Analysis Using Field Operational Test Data
- Anti-Trespass Technology Demonstrations

FRA-Funded Industry Projects under TC&C Research Division

Percentage of TC&C Research Resources

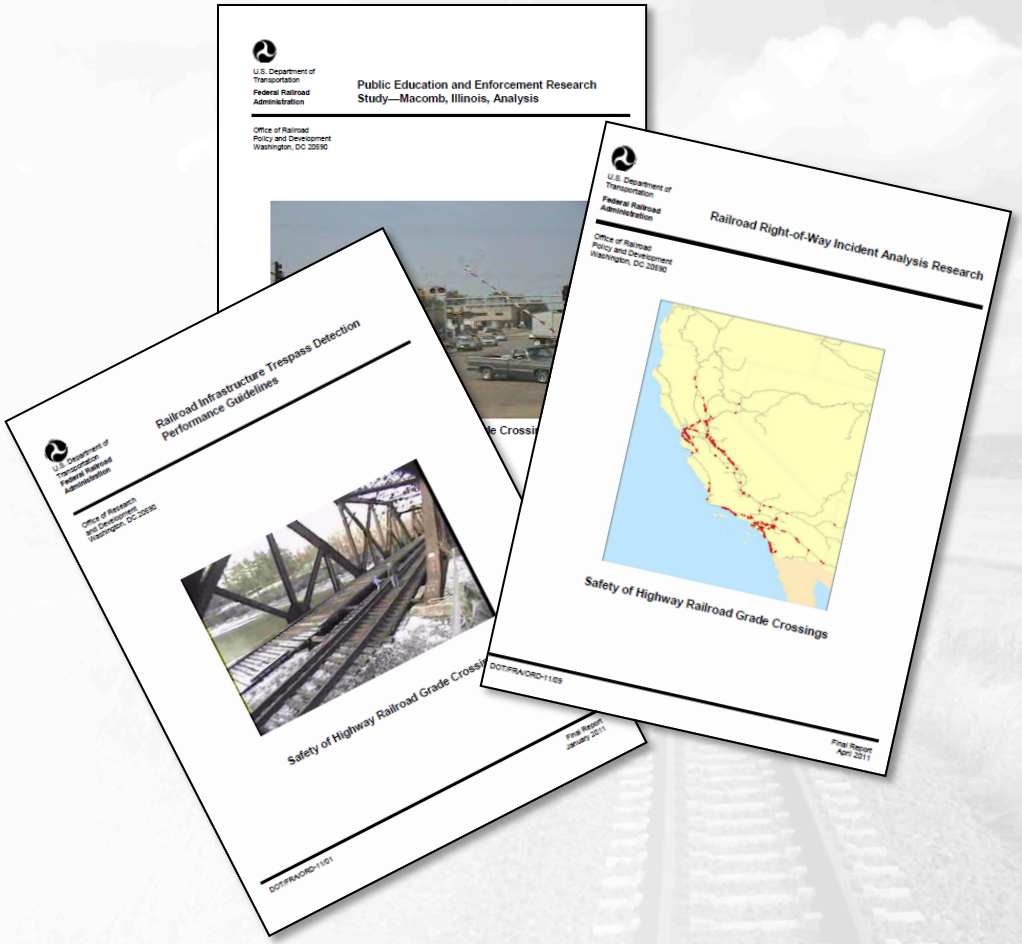


- Interoperability Protocol Development (RRF/ITC)
- Locomotive Interface Gateway (GE, EMD))
- Higher Performance Digital Radio (RRF/TTCI)
- Alternative Broken Rail Detection (ENSCO)
- Generalized Train Movement Model (DecisionTec)
- PTC System Development (Earmark CalTrain, Metrolink)

Dissemination of Research Results

Publications

- Final Reports
  - ✓ Public Education and Enforcement Research Study—Macomb, Illinois, Analysis
  - ✓ Railroad Right-of-Way Incident Analysis Research
  - ✓ Vital Positive Train Control Research and Development
  - ✓ Passenger Train Braking Model Development—Phase I
- Research Results
  - ✓ Testing Algorithms for a Passenger Train Braking Performance Model
  - ✓ Evaluation of Education and Outreach Programs
  - ✓ Low-Cost Warning Device Industry Assessment
  - ✓ Data Analysis of Grade Crossing Incidents
  - ✓ Success Factors in the Reduction of Highway-Rail Grade Crossing Incidents



Conferences

- Joint Rail Conference (JRC)
- AREMA Annual Conference & Expo
- Transportation Research Board (TRB) Annual Conference
- FRA Research & Development Research Review

Summary

- R&D funding has been essential for advancement of rail safety technologies, particularly during initial phases of development.
- Office of R&D with contractor support has successfully introduced a number of new technologies that are widely used by FRA Office of 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.