



***AAR's TECHNOLOGY DRIVEN TRAIN  
INSPECTION***

**Mechanical Association Railcar Technical  
Services**

**Chicago, IL**

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# *Technology Driven Train Inspection*

## ***Overall Objective:***

Enhance the quality & efficiency of the train inspection process through technology



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# *Technology Driven Train Inspection*

## ***General Approach:***

Leverage emerging technology to achieve an equivalent (***at a minimum***) or enhanced level of railroad safety



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# Technologies

- ◆ Wayside Detectors
- ◆ Machine Vision
  - ◆ FactIS™ (Fully Automated Car Train Inspection System)
  - ◆ University of Illinois



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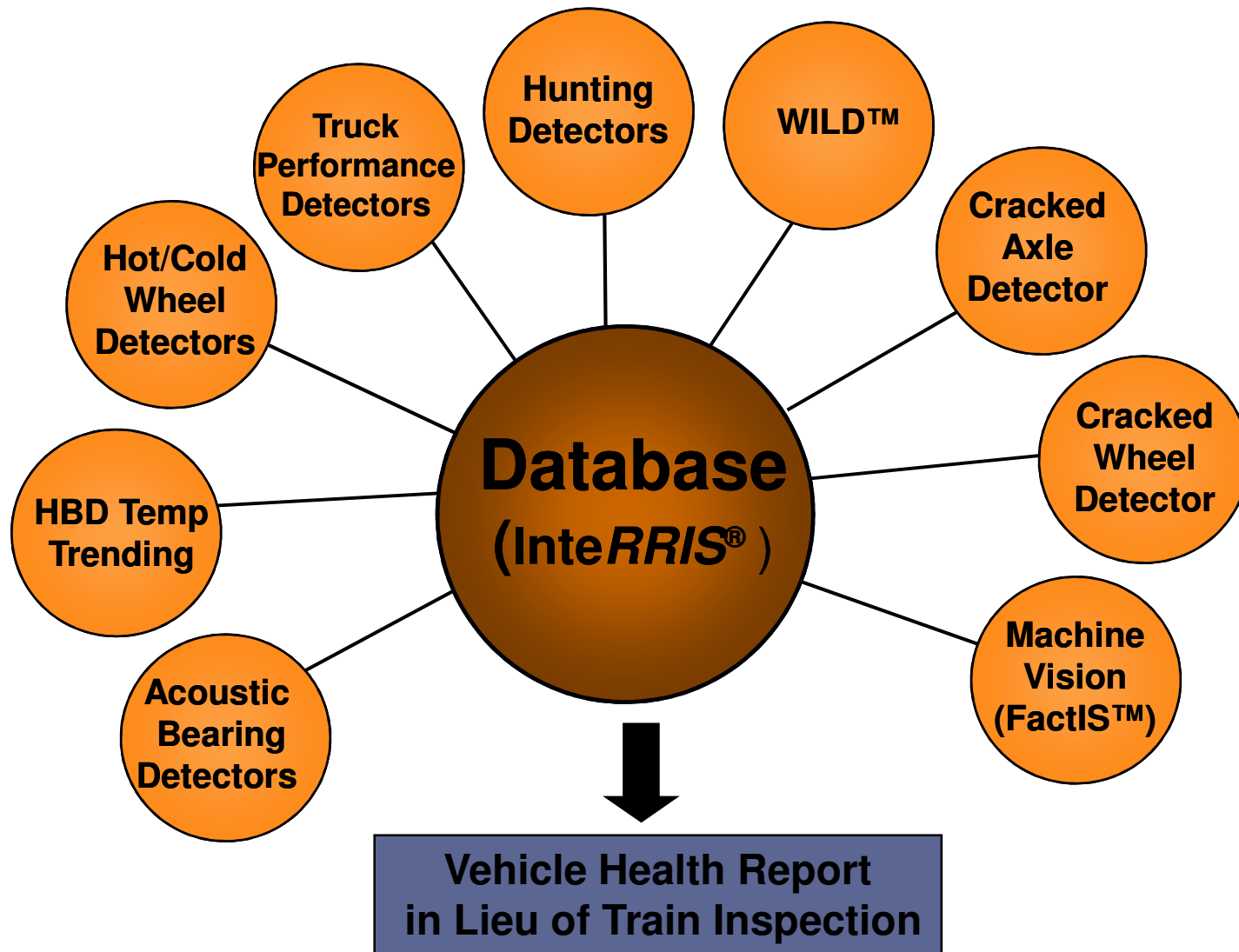
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# TDTI Task Force Direction

Final product will involve multiple detector systems in concert with AAR's ATSI (Advanced Technology Safety Initiative)



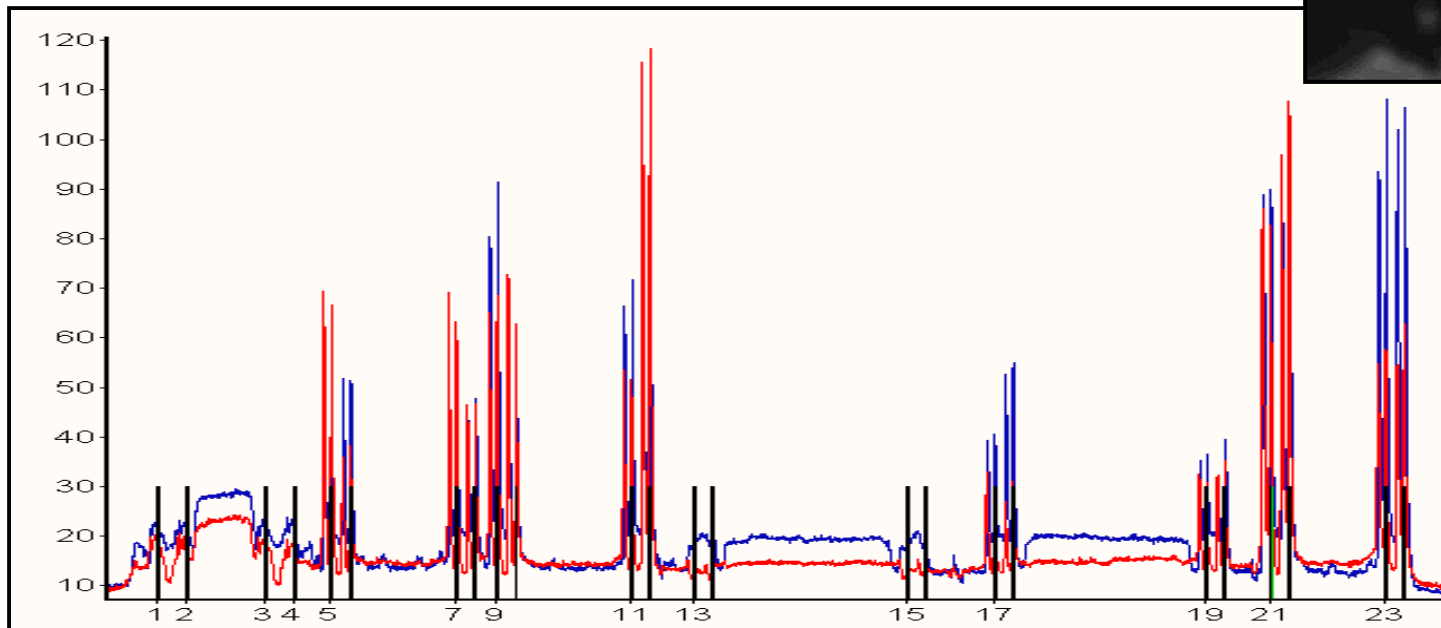
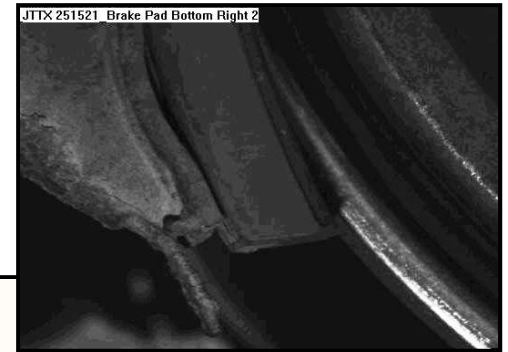
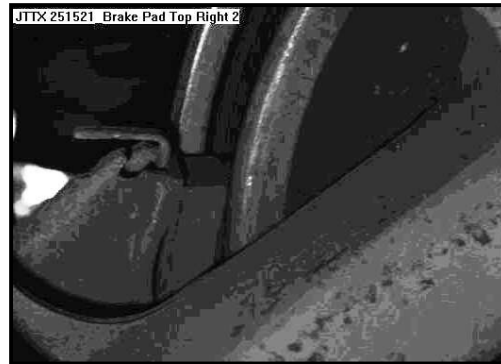
# *Current Automation Technologies*

- ◆ **Systems Used For Many Years:**
  - ◆ **Hot Bearing Detectors (HBD)**
  - ◆ **Wheel Impact Load Detectors (WILD)**
  - ◆ **Dragging Equipment Detectors (DED)**
  - ◆ **Hot Wheel Detector (HWD)**
  - ◆ **Cold Wheel Detector (CWD)**
- ◆ **Recently Deployed Technologies (past 6-8 yrs):**
  - ◆ **Truck Performance Detector (TPD)**
  - ◆ **Acoustic Bearing Detector (ABD)**
  - ◆ **Truck Hunting Detector (THD)**

# Class IA Brake Test Demo

## Sample Test Results

Brakes applied on consist,  
one car w/inoperative brakes



## *Technology Development Needs:*

- ◆ Complete development of laser ultrasonic-based wheel & axle crack inspection systems
- ◆ Integrate existing detectors as ATSI progresses (WILD™, TPD, TADS, etc.)
- ◆ Develop performance-based inspection modules:
  - ◆ Brake Condition Monitoring
  - ◆ Truck Performance
- ◆ Develop FactIS™ Safety Appliance Module using Univ. of Illinois research results
- ◆ Develop Car Features Database
- ◆ Develop FactIS™ carbody / underframe module



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## *Technology Development Status: Short-term, 2006*

- ◆ **Test/evaluate Class IA/1,000-mile brake inspection system**
- ◆ **Develop/test coupler and draft systems module**
- ◆ **Evaluate viability of performance-based truck inspection using truck hunting & wheel set geometry modules with TPD**
- ◆ **Continue development of laser/ultrasonic-based wheel & axle crack inspection systems**
- ◆ **Continue University of Illinois efforts for developing a car safety appliance database**



## *Technology Development Status: Long-term Planned for 2007 and Beyond*

- ◆ Complete development of laser ultrasonic-based wheel & axle crack inspection systems
- ◆ Complete University of Illinois efforts for developing a car safety appliance database
- ◆ Develop FactIS™ Safety Appliance Module
- ◆ Continue efforts with FRA for rule changes to allow performance-based inspections
- ◆ Develop performance-based inspection modules:
  - ◆ Brake Condition Monitoring
  - ◆ Truck Performance
- ◆ Develop Car Features Database
- ◆ Develop FactIS™ car body / underframe module
- ◆ Integrate existing detectors as ATSI progresses (WILD, TPD, TADS, etc.)



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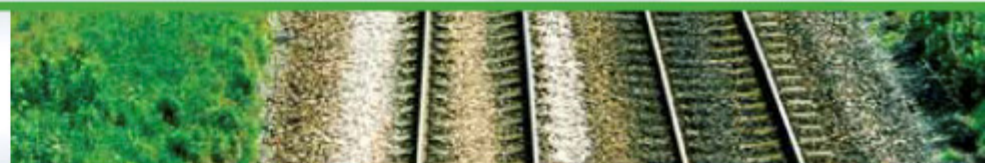
## *TDTI Task Force Direction*

Final product will require acceptance & approval of performance-based regulations by FRA which achieve an equivalent or enhanced level of safety; e.g.:

- ❖ TPDs for truck suspension performance
- ❖ WILD™

And some regulatory modification; e.g.:

- ❖ 232.205c(4): 100% Operative Brake Requirement (potential USC Section 20303 statutory issue)
- ❖ 232.15: Movement of Defective Equipment



## *TTDI Task Force Direction*

**Final product will require substantial funding: \$15 million?**

- ◆ **Inspection of safety appliances will be expensive, long lead time item**
- ◆ **Possible funding sources:**
  - ◆ **AAR research program**
  - ◆ **FRA research funding**
  - ◆ **Government security funding**

**Go/No Go decision milestones will be developed and defined**



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# *TDTI TF – Parts 215, 231, & 232 Review*

## **Administrative/Procedural Issues**

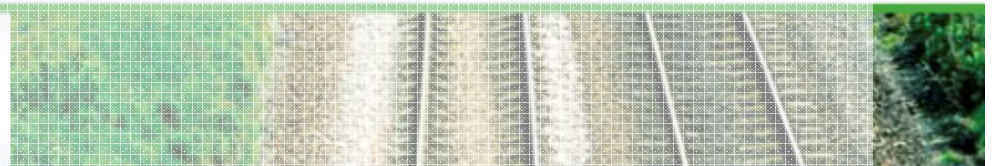
- ◆ Current set of inspection criteria assumes a human inspector; some criteria are not meaningful for automated inspection.
  - ◆ **49 CFR 232.203 governs training and testing requirements of ‘qualified persons’ required for testing of brakes.**
  - ◆ **49 CFR 232.207(b)(2) requires that the inspector take ‘positions on each side of each car’ to inspect the brake system.**





## ***Regulatory Modifications: General Approach***

- ◆ **Networked vehicle health monitoring systems provide not just an equivalent level of safety but an *enhanced level of safety***
- ◆ **U.S. operations should enjoy same operational flexibility as Canadian RRs (NAFTA harmonization issue); ultimately Mexican SCT regulations as well**
- ◆ **Industry approach: in lieu of current FRA requirements *NOT* an overlay system**
- ◆ **Safety Regulation Working Committee to determine nature of modifications or “relief” (e.g. waiver, new rules, revisions to existing regulations) on an item-by-item basis**



## ***TDTI Task Force Direction***

Regulatory modifications or relief will be requested as the technologies mature, are proven, and implemented

- **This will be a gradual, iterative process**
  - **Waivers**
  - **Requests for Rulemaking**



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## ***Regulatory Modification: Rationale***

### **An iterative approach:**

- ◆ **Builds comfort level & acclimation to new inspection paradigms**
- ◆ **Recognizes interdependency of Power Brake Regulations (Part 232), Freight Car Safety Standards (Part 215) and Safety Appliance Standards (Part 231)**
- ◆ **Consistent with FRA's new "*Railroad System Oversight*" Approach**





## *TDTI TASK FORCE: Regulatory Interface*

- ◆ **1/17/06: AAR & TTCI introduced TDTI to FRA Associate Administrator, Office of Safety, and Office of Railroad Development**
- ◆ **3/15/06: FRA office of Safety & Office of RRD Overview & FactIS® Demonstration**
- ◆ **5/2/06: Roy Allen send Shared Funding Estimate to FRA Office of RRD**
- ◆ **7/13/06: Day-Long Overview and FactIS® Demonstration to FRA Office of Safety (Associate Administrator, 2 Directors, 8 Regional Administrators) + Associate Administrator for Finance, HR & Administration + Office of Chief Counsel**
- ◆ **7/26/06: Presentation to FRA & Transport Canada Joint Meeting**
- ◆ **8/3/06: Presentation to FRA MP&E Staff & Regional Specialists' Annual Conference (UP followed with equipment performance monitoring via wayside detection in practice)**



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## 49 CFR MAPPING

- ◆ BRAKE PIPE LEAKAGE < 5 PSI *or* AFM < OR = 60  
CFM:LOCOMOTIVE CONTROLS: NO CHANGE
- ◆ INSPECT FROM POSITION ON EACH SIDE of  
CAR:HOT/COLD WHEEL DETECTOR;TECHNOLOGY;  
PERFORMANCE-BASED
- ◆ BRAKES SHALL APPLY on EACH CAR:  
CAR:HOT/COLD WHEEL DETECTOR;TECHNOLOGY;  
PERFORMANCE-BASED



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## 49 CFR MAPPING

- ◆ BRAKE RIGGING PROPERLY SECURED & DOES NOT BIND OR FOUL: DRAGGING EQUIPMENT DETECTORS(PARTIALLY); PERFORMANCE-BASED
- ◆ ALLPARTS PROPERLY SECURED: DRAGGING EQUIPMENT DETECTORS (PARTIAL); PERFORMANCE-BASED
- ◆ VERIFY BRAKES RELEASE on EACH CAR: HOT/COLD WHEEL DETECTOR;TECHNOLOGY & PERFORMANCE-BASED



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