



Positive Train Control Implementation Issues

**NTSB Hearing
February 27, 2013
Washington, DC**



Rail Safety Improvement Act



- The Rail Safety Improvement Act of 2008 requires certain freight and passenger railroads, by December 31, 2015, to deploy PTC on their main lines (defined as 5 Million Gross Tons traffic annually) over which:
 - ✓ Intercity rail passenger transportation or commuter rail passenger transportation is regularly provided.
 - ✓ Poison or toxic-inhalation-hazard materials (PIH, TIH) are transported.
 - ✓ Such other tracks as the Secretary may prescribe by regulation or order.



Statutory PTC Functions



- Prevent train-to-train collisions
- Prevent overspeed derailments
- Prevent incursions into established work zones
- Prevent movement of a train through a switch left in the wrong position
- Interoperability

“...means the ability to control locomotives of the host railroad and tenant railroad to communicate with and respond to the positive train control system, including uninterrupted movements over property boundaries.”

PTC Territory Baseline

- Installation Criteria
 - Class I freight railroads
 - 5 MGT Mainlines
 - PIH/TIH traffic
 - All Intercity & Commuter Railroads
 - 7 Class 1
 - ~34 Class 2 & 3
 - ~110 Class 2 & 3 (Power)



- Baseline 2015
 - U.S. Class I railroads operated over almost 162,000 miles of track.
 - PTC on approximately 60,000 to 70,000 route miles total



Scale of Deployment



Items requiring Upgrade or Installation:

- Locomotives ~18,000
- Wayside Interface Units ~38,000
- Signal Installation /Replacement ~12,000
- Signal Modifications ~4,900
- Back Office and Dispatch Systems ~30



PTC Systems



Railroad	System	Type	Status
BNSF	ETMS	Non Vital Overlay	Certified for Use
UP, CSX, NS, CN, CP, KCS, Non NEC Passenger/Commuter	IETMS	Vital Overlay	Type Approved Development
NEC Carriers	ACSES /Cab Signals	Vital Overlay	Certified for Use
AMTRAK (Michigan)	ITCS	Vital Overlay	Certified for Use
PATH	CBTC	Vital Overlay	Development
CALTRAIN	CBOSS/ITCS- ETMS	Vital Stand Alone	Development



PTC Systems



Vital:

System is both reliable and built on failsafe principals.

Non Vital:

System is reliable but not necessarily built on fail safe principals.

Overlay:

System works in conjunction with an existing signal system or a redundant method of operation.

Standalone:

System replaces an existing signal system or method of operation.



PTC Costs



Acquisition Costs

Passenger railroads (commuter and Amtrak)

~\$875 million for initial acquisition and installation of onboard, wayside, and central office equipment.

Installation and Operating Costs

~\$9.55 Billion to \$13.21 Billion (20 year)

~60,000 to 65,000 miles Class I and Passenger/Commuter

>20,000 Locomotives

>125,000 Wayside Interface Units

Safety Benefits

\$440 Million to \$674 Million (20 year)

Source: Cost Benefit Analysis for 49 CFR 236 Subpart I.



Implementation Status



- Full PTC system build out by December 31, 2015 at risk
 - ✓ Railroad's PTC Implementation Plans (PTCIP) represented very optimistic date
 - ✓ Original assumptions (no significant issues) proven to be invalid.
 - ✓ Varying degrees of completion based on ability to successfully address identified technical and programmatic issues including unidentified emergent issues.
- The level of the necessary extension not clear at this time
 - ✓ Current identified issues a subset of larger universe of possible issues.
 - ✓ Limited previous experience (railroads, suppliers, FRA).
 - ✓ Scale of project (largest "signaling" effort ever undertaken).

Issues to Implementation

✓ Architectural Complexity

- 4 Major Subsystems (Wayside, Office, Onboard, Communications)
- 20+ Sub-subsystems
- Not Commercial Off-the-Shelf

✓ Scale of Deployment

- Miles: ERTMS ~ 22,000 U.S. ~ 60,000 to 70,000 miles
- Vehicles: ERTMS ~ 5700 U.S. ~ 18,000 to 22,000 vehicles
- Project Start:
 - ERTMS ~1993 / Public funding
 - U.S. 2009 / Primarily private funding
- Radio Frequency
 - ERTMS - dedicated 8 MHz GSMR / EU government Provided
 - U.S. - 350 KHz “220” MHz / Private Purchased
 - Additional Spectrum / Compete in Secondary Market



Issues to Implementation



✓ 220 MHz Spectrum Availability (217.6 to 222 MHz)

- PTC 220 Limited Liability Corporation (LLC) NS,CSX,UP, BNSF
 - 4x 25 KHz Channels
 - Sufficient for Low Density
 - Sufficient Support for High Density Freight- Near Term
 - Insufficient to Support High Density Passenger and Freight Operations
- Commuter/Passenger Secondary Market
 - 218–220 MHz Interactive Video Data Service (IVDS)
 - 217–218 MHz Automated Maritime Telecommunications System (AMTS)
 - Increased/Unreasonable Cost
 - Uncertainty in Ability to Procure (Bids/Incumbents/FCC Inventory)
 - Legal Encumbrances on Spectrum



Issues to Implementation



-
- ✓ Interoperable Train Control (ITC) Specification
 - All but Systems Management Specifications in ITC/AAR Review Process
 - Non ITC Members Need to Complete Contracting
 - ITC Establish Non Disclosure Agreement (NDA) for Access before Issuing as AAR Recommended Practice
 - ✓ Back Office Server (BOS) and Dispatch
 - Still in Design
 - Complex Functionality – Message Routing and Integrity
 - ✓ Track Database Verification
 - 60,000–70,000 Route Miles
 - 11 Different Critical Attributes (i.e. mile posts, clearance points, signals, etc.)
 - Real Time Configuration Management
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Issues to Implementation



-
- ✓ Component Installation
 - ~18,000+ Locomotives – Multiple Classes
 - ~47,000 Switches
 - ~17,000 Signal Install/Upgrade – Unique Designs
 - Must Keep Railroad Operating
 - ✓ Reliability
 - Performance Issue (Throughput vice Safety Issue)
 - Multiplicative Effect of Elements (100 components @ 99.99% in series yields 90.01% System)
 - ✓ Radios
 - Build on Demand, Small Supplier Base
 - ~100,000 required
 - Large Number for RR Industry, Small Number Compared to Entire Industry
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Issues to Implementation



-
- ✓ Qualified Personal
 - Small Pool of PTC Experienced Personnel
 - Competition between RR, FRA, Suppliers
 - 2–3 years to bring up to speed

 - ✓ Contracting
 - Primary Affects Public Agencies
 - PTC Costs Not in Current Budget
 - Like Federal Government work on 3-year cycle
 - 2012 Executing
 - 2013 Budgeting
 - 2014 Planning
 - Must have \$\$ in hand (Authorization and Appropriation)
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Funding

- American Recovery & Reinvestment Act Grants (FY 2009)
 - \$8 billion appropriated to FRA; Grant applications totaled \$55 billion
 - Status: Awarded
 - High-Speed Rail Program Grants (FY 2010)
 - \$2.0 billion appropriated to FRA; Grant applications totaled \$8.8 billion
 - Status: Awarded
 - Railroad Rehabilitation and Improvement Financing
 - Direct loans and loan guarantees up to \$35 billion
 - Up to \$7 billion is reserved for projects benefiting freight railroads other than Class I carriers.
 - Rail Safety Technology Program Grants (FY 2010)
 - \$50 million appropriated to FRA; Grant applications totaled \$228 billion
 - Program authorized through 2013; No appropriations since FY 2010
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Recommendations to Congress

- Allow for provisional certification of PTC systems.
- Allow for the incremental use of PTC systems.
- Mandate that revisions to PTC Implementation Plans be subject to FRA approval, with sufficient time for review and oversight.
- Approve railroads to use alternative safety technologies on specified line segments, in lieu of PTC.



Implementation “Roll Out” Alternative

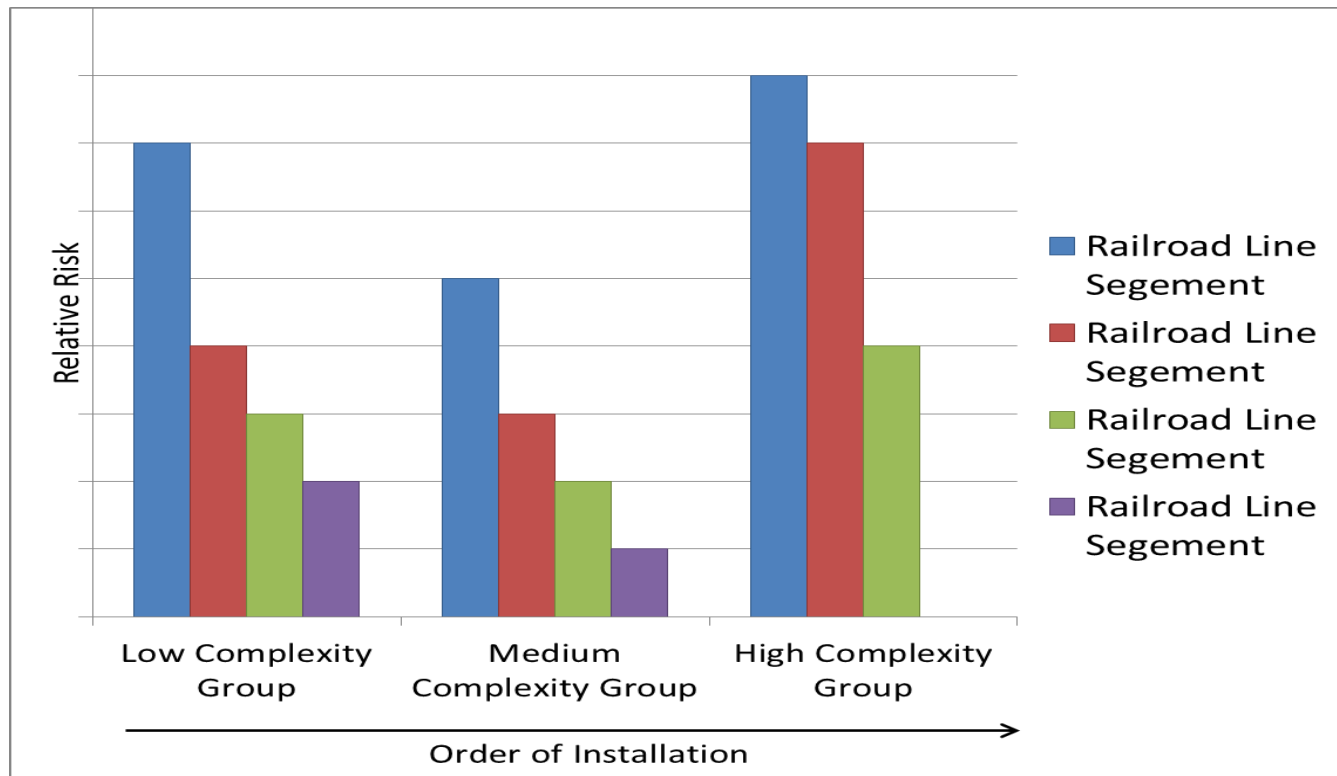


- Railroads propose complexity groupings alternative priority
 - Logically defined
 - Justifiable
 - Criteria for segment inclusion in a group explained
 - FRA must still concur
- Railroads use existing segment risk-based prioritization outlined in initial PTCIP
- Revised PTCIP must be submitted and approved by FRA prior to executing

Implementation Strategy Alternative Priority

Define Multiple Complexity/Risk Groupings

- Lowest Complexity to Highest Complexity
- Within a Complexity Group - Highest Risk to Lowest Risk





Extended PTC Implementation “Revenue Service Demonstration”



- Allows for incremental installation and extended PTC system use prior to gaining full PTC System Certification
- Not a substitute for System Certification
 - Must have successfully completed pilot area testing
 - Must have FRA approval
 - Monitoring and reporting program
 - Waiver of 49 CFR Part 236 requirements
 - Separate waiver requests for other 49 CFR Part requirements and Railroad Safety Board approval
 - FRA additional conditions may be imposed
 - Territory by territory basis (multiple similar territories)
 - Must be consistent with an FRA-approved PTCIP schedule



Additional Information and Questions



Report to Congress

http://www.fra.dot.gov/downloads/08.2012_FRA_Report_to%20Congress_on_Positive_Train_Control.pdf

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