

# Positive Train Control Systems: Will the promise be realized this time?

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before the  
National Transportation Safety Board  
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# Disclaimer

I am appearing in my own behalf at the request of the Board.

The views stated are my own. They are offered with the desire to advance public and employee safety and for no other purpose.

This testimony may not be attributed to my former employer or to any entity for which I have provided consulting services as an independent contractor.

Should I comment on actions taken at the FRA while I was employed there, my testimony reflects my best memory of how the events unfolded (subjective intent). The official record of actions taken and the basis for those actions is contained in the files and publications of the FRA (objective intent).

# Overview

- Background
- General Chronology
- Amtrak PTC Systems
- RSIA mandate 2008
- Initial regulations (2009-2010)
- Failure to request funding
- Initiatives withdrawn
- Pace of implementation
- Do we need more time?
- What benefits can we anticipate?

# Background

- 1922-
  - Serious collisions led the ICC to issue order 13413 requiring 49 railroads to install either a trainstop or train control system on at least one division over which passenger trains were operated
  - Other orders followed
- Post WWII
  - Most intercity passenger service ended and many ATS/ATC systems were removed
  - ACS/ATC remained on NEC and ACS or ATS systems remained on a few other lines

# Chronology

- 1971: First NTSB recommendation--ACS on all trains, speed control (ATC) on passenger trains
- 1982-3:
  - AAR/RAC initiated development of Advance Train Control Systems (ATCS), an open-architecture, integrated platform to serve business and safety needs
  - BN initiated development of the Advanced Railway Electronics System (ARES)
- 1987: NTSB recommends FRA require PTS
- 1986-1995:
  - ATCS successfully demonstrated on temporary test beds (CN, CP)
  - ARES successfully demonstrated on BN's Iron Range

# Chronology

- 1991: NTSB asks for ATCS timetable
- 1993: BN abandons ARES for ATCS, except RF infrastructure
- 1994: FRA issues report to Congress giving thumbs up to ATCS, coins “PTC” to refer to the capabilities that communications-based train control (like ATCS or ARES) could offer, i.e.,
  - Positive train separation
  - Protection of roadway workers
  - Enforcement of speed restrictions (including temporary, civil)
- 1995: AAR pulls support for ATCS

# Chronology

- 1994-1998: UP and BNSF developed and tested PTS; project discontinued
- 1998: NAJPTC program begins with objective to provide interoperability standards and demonstrate technology suitable for HSR on UP line in Illinois, including flexible block
- 1999: FRA's RSAC issues consensus report on PTC systems, calling for interoperability standards by the end of 1999
- 2006: NAJPTC downgraded to TTCI test;
  - Revenue test bed demonstration aborted,
  - Interoperability standards not delivered

# Chronology

- 2005: FRA issues final rule on Performance-Based Train Control Systems, authorizing but not requiring innovative solutions and providing safety case methodology later adapted for use under the PTC mandate
- *Meanwhile* in the late 1990's-2008
  - BNSF, CSXT, UP, NS and Alaska RR pursue their own train control projects, initially using waivers to test and then new Performance-Based standards
  - BNSF ETMS was demonstrated most extensively and remains in limited revenue service on certain lines, upgraded based on lessons learned
  - Only Alaska RR demonstrated a full commitment to system-wide implementation (aided by Federal funding)

# Amtrak PTC Systems

## ACSES

- Early 1990's: Amtrak seeks guidance from FRA on train control required to achieve 150 mph on NEC
- 1998: FRA order requires installation on NEC from New Haven to Boston (CONDOT, P&W, CSXT, MBTA) and authorizes build-out south of NYC
- 2001: ACSES cutover for revenue service New Haven-Boston and on high-speed tracks in MD and NJ
- 2010: FRA grants type approval under RSIA
- Scheduled completion on NEC: Pending

# Amtrak PTC Systems

## ITCS

- 1994: MI DOT and Amtrak began development of the Incremental Train Control System (ITCS)
- 1999: ITCS placed in service under waiver on Amtrak's line in Michigan, governing both passenger and NS freight operations
- 2012: ITCS conditions adjusted for 110 mph operations; FRA grants ITCS type approval under PTC mandate

# RSIA 2008

Sept. 12, 2008, Chatsworth, CA

Rail Safety Improvement Act of 2008 signed by President Bush Oct. 16, 2008:

“‘positive train control system’ means a system designed to prevent—

- train-to-train collisions,
- over-speed derailments,
- incursions into established work zone limits, and
- the movement of a train through a switch left in the wrong position.”



# RSIA 2008

FRA final rule Jan. 15, 2010; amendments Sept. 27, 2010

**This is the high-water mark of Federal policy  
on Positive Train Control**

# Initial FRA Rule Compromises

- Limited protection within terminals
  - In passenger terminals, practical necessity to maintain fluid operations
  - Issue has returned in freight context re: yard switching that encroaches on main line
    - Here the issue appears to be which locomotives will be equipped with PTC required to be operative
    - Should be resolved with consideration for maximum authorized speeds on main lines and ability to use the signal system to hold equipped trains out

# Initial FRA Rule Compromises

- Reliance on signal system to protect movements over switches where monitored
  - Good safety rationale; alternative ~\$1 billion in additional cost

# Initial FRA Compromises

- “Main line” exceptions where passenger service was infrequent (capital cost vs. revenue stream; recognition of reality); compensating safety measures required
- Exceptions for “*de minimis*” risk re: PIH traffic
  - First such expressly recognized exceptions in the history of railroad safety legislation (1893-)
  - Urged by industry; supported by prior writings of then-OIRA director
  - Initially limited to truly “*de minimis*” circumstances
    - Accordingly, not welcomed by industry

# Initial FRA Rule Compromises

- Rear-end collisions at restricted speed excepted
  - Lack of strong safety case when decision was made (not now)
  - Explicit concession made since “**Available PTC technology does not track the rear end of each train as a target that another train must be stopped short of but instead relies on the signal system to indicate the appropriate action.**”
  - Tacit recognition that, if the Dec. 31 2015 target was to be met, **available technology** would probably have to do.
  - Explicit recognition that when technology was available, the rule should be strengthened.
  - Subsequent industry/FRA action provides means to plug that gap, which should lead to supplementary FRA rulemaking.

# Failure to Request Funding

- RSIA included authorization of \$50 million annually for 5 years for rail technology grants, including PTC
  - Could have been important mechanism for resolution of remaining issues
  - By directing at passenger/freight interoperability issues, could have somewhat eased capital burden on Amtrak and commuter authorities
- Administration failed to request the funds; Congress appropriated \$50 million for FY2010 anyway, but nothing thereafter

# Initiatives Withdrawn

- RSIA required each Class I, intercity and commuter railroad to install PTC on—
  - “(A) its main line over which intercity rail passenger transportation or commuter rail passenger transportation...is regularly provided;
  - “(B) its main line over which poison- or toxic-by-inhalation hazardous materials...are transported; and
  - “(C) **such other tracks as the Secretary may prescribe by regulation or order**

# Initiatives Withdrawn

- “Such other tracks” were understood by many of us to be other heavily used lines where risks to crews, the public and the environment, were substantial, e.g.,
  - Major coal routes with high mgt,
  - Lines with significant ethanol, crude oil, or flammable compressed gas traffic
  - Dark territory approaching its capacity limits, with lots of meets and passes, endangering crews
- Note that, over the years, loss of life among crews and as a result of release of hazmat ***other than*** TIH has exceeded loss of life from release of TIH products.

# Initiatives Withdrawn

- But FRA did not affirmatively require “other lines” to be categorically included in railroads PTC implementation plans.
- Rather, FRA used the concept defensively.
- Why? Because FRA recognized that, as of 2008 TIH traffic was found on most of the core of the rail system, but by 2015 that might not be the case.
  - The major freight railroads were already trying to find ways of ridding their networks of high liability TIH shipments.
  - A very effective way of doing so would be to convince the STB that all PTC installation/maintenance cost allocable to a line segment on which TIH was carried should be loaded on the TIH shipper.
  - But except where product substitution could be accomplished, doing so would be an immense public dis-benefit.
    - diversion to highway, or
    - loss of domestic economic activity.
- The defensive use was called the “residual risk” test.

# Initiatives Withdrawn

- But AAR sued
- The “residual risk” test was removed from the regulation,
  - Leaving the public and railroad employees at risk on lines that could be stripped of passenger or TIH traffic; and
  - potentially leaving passenger railroads and TIH shippers to share 100% of PTC costs



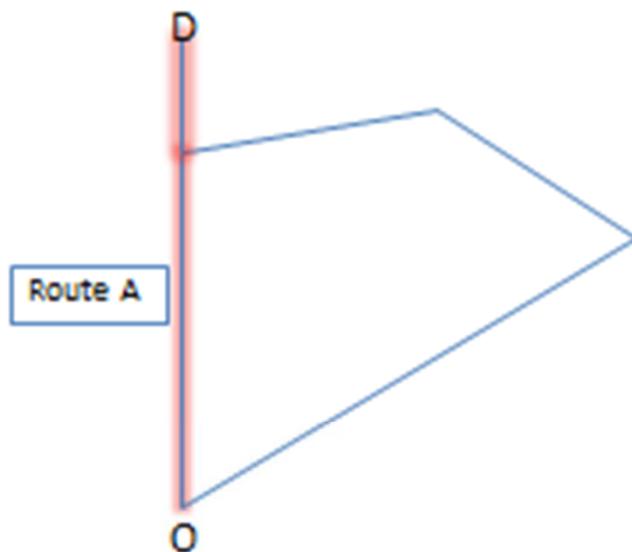
# Initiatives Withdrawn

- FRA also removed the “alternative routing” test
- The result is that TIH routings will be more circuitous in the future and thus riskier than if the alternative routing analysis had been retained in the rule.

# PIH Route Vulnerability

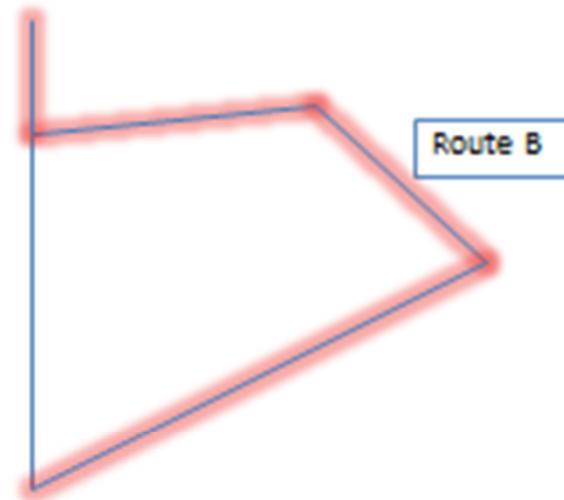
PTC will eliminate ~30% of PIH-related risk on a line segment. By selecting where to put PTC, a railroad could determine routing. Railroads have said they want to do this to consolidate traffic and hold down PTC cost. On average, this can only lead to greater circuitry in PIH routing and potentially more switching of the traffic en route. Could nullify gains from Rail Routing Rule.

## 2008-2015 routing



This is the most simple and most common case—most O/D pairs are the same in 2008 and after the routing analysis

## 2016 w/PTC on B only



2016 routing with PTC on both lines would be Route A, but railroad wishes to avoid the investment. Route B segments carry other PIH traffic, so they would have to be equipped anyway.

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# Initiatives Withdrawn

- These changes were justified exclusively based on the need to lower costs.
- FRA never explained why the safety analysis was abandoned.

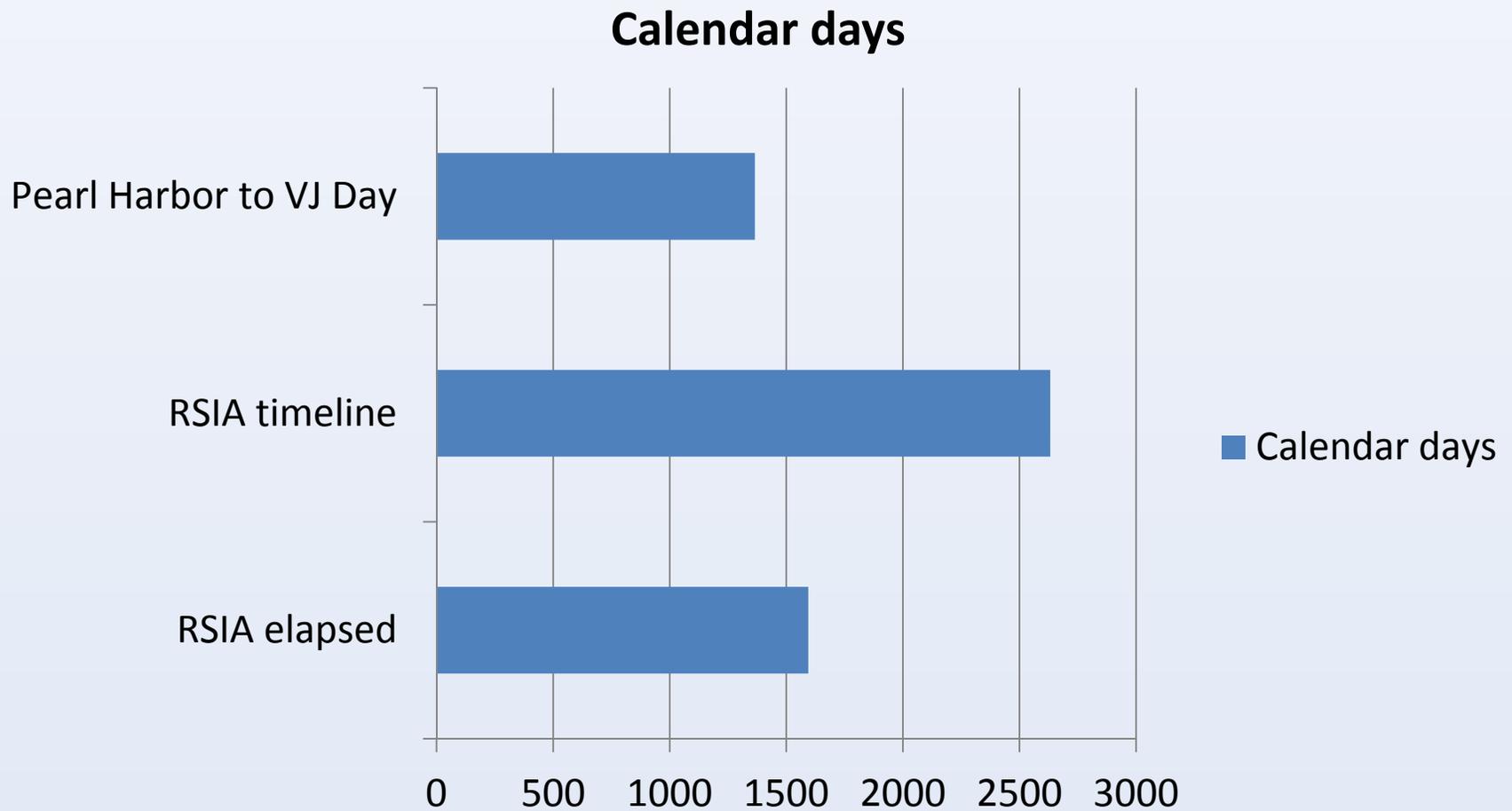
# Initiatives Withdrawn

- In a second round of backtracking, FRA now proposes to liberalize its “*de minimis*” test, which was thought to be as far as the agency could reasonably go when the initial final rule was issued

# Initiatives Withdrawn

- Saving money is a good reason to limit regulatory burdens
- Saving money is not a legitimate reason to—
  - Dilute the response to a legislative mandate; or
  - Create market distortions that will increase social costs elsewhere in the economy, at least not without seriously studying what those costs are.

# Pace of Implementation



# Pace of Implementation

ACSES is providing safety on much of the NEC today for Amtrak passenger operations and all freight/passenger trains from New Haven to Boston-- but can't be made interoperable or extended to other railroads until I-ETMS is ready

ITCS is providing safety on Amtrak's Michigan line (freight and passenger trains)



# Pace of Implementation

Interoperable Electronic Train Management System  
(freight/passenger choice outside NE)

- Standards development—reasonably mature, but not complete
- Technology readiness—communications said to work well, ETMS core is well tested, balance unknown until revenue test bed is installed and utilized
- Safety case status—not yet submitted
- Miles of I-ETMS installed and operative—  
00,000 of ~60,000

# Do we need more time?

- In discussions leading up to the RSIA passage, FRA senior staff recommended to the committees that additional time be provided (through the end of 2018), or at least that FRA be given the ability to extend the time if truly necessary.
- However, based on the status of BNSF's proven ETMS technology, most of us expected faster action on I-ETMS standards, demonstration and certification.
- FRA's 2012 report to Congress provides a spirited defense of the complexity of the issue.

# Do we need more time?

This is not the time to talk about more time.

- ✓ It's time to see remaining I-ETMS specifications adopted by AAR.
- ✓ It's time to demonstrate interoperable train control on revenue lines.
- ✓ It's time for the Congress to help with passenger funding needs.
- ✓ It's time to cut over some revenue miles with lots of trains running equipped and establish the reliability of the system.

# Do we need more time?

- When all of that is accomplished, then it will be time to talk about how many more days will be needed to satisfy the mandate.
- At that point, we will be confident that, this time, PTC will become a reality.
- At that point, we will better understand how much more time is required to finish the job.

# What Benefits Can We Hope to Achieve?

The greatest benefits will come from integration of technology, yielding synergistic power—

- Positive Train Control (PTC) systems
- Electronically Controlled Pneumatic (ECP) brakes
- Distributed Power (DP)
- Train Energy Management Systems (TEMS)
- Advanced Traffic Planning Systems (i.e., strategic and tactical movement planners)
- Other on-board and wayside technologies that can be plugged into the larger system.
- Variety of communications pathways, proprietary and commercial

These are not futuristic ideas; most are ready today, and progressive railroads are starting to make us of them.

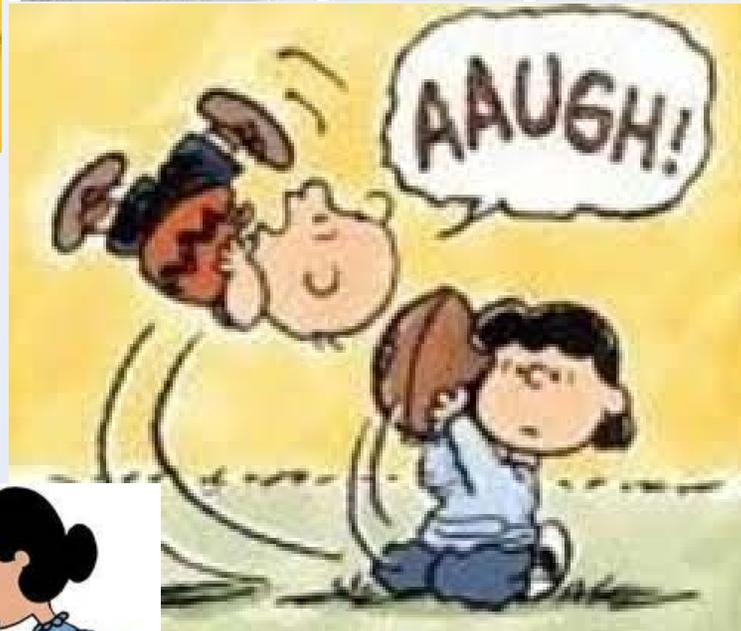
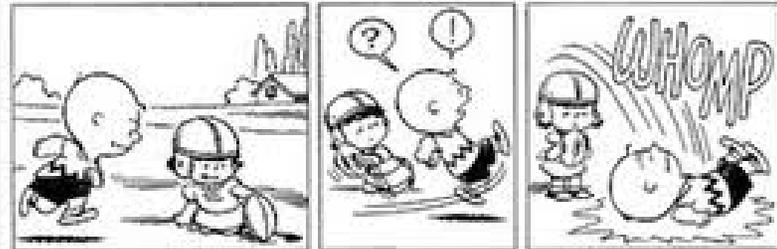
# What Benefits Can We Hope to Achieve?

	PTC	ECP	TEMS	DP	Advanced T.P.
Safety	Green	Green	Yellow	Green	White
Service Reliability	Green	Green	Yellow	Green	Green
Fuel savings	Green	Green	Green	Green	Green
Asset utilization	Green	Green	Yellow	Green	Green
Capacity	Green	Green	Green	Green	Green
Reduced emissions	Green	Green	Green	Green	Green

**Assumptions: Integrated System, Mature State**

# Who will enjoy the benefits?

- Freight railroads
- Shippers and their customers
- Intercity and commuter passengers, including users of new HSR service not otherwise possible
- Communities through which railroads travel
- Travelers on the roads and highways
- Participants in our national economy
- The earth and its inhabitants



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Apologies to Charles Schultz