

Precision Scheduled Railroading and Positive Train Control

Could they? Should they? Must they coexist?

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Precision Scheduled Railroading – What is it?

Precision Scheduled Railroading

How Hunter Harrison defined it at CN



- Highly precise planning coupled with disciplined execution, synchronized across many different processes.
- By putting the network first we achieve the highest service reliability at the **lowest operating cost**.
- The Service Plan synchronizes all processes connected to the movement of cars, thus linking operational decisions to the bottom line.
- Balanced train movement is better for crews and improves cost control.

E. Hunter Harrison, *How We Work and Why*, 2005

Precision Scheduled Railroading

How the AAR defines it



- The fundamentals of PSR are to reduce the number of handlings of freight cars and containers. Every time equipment is handled it stops, and when it is stopped it is not being productive.
- Facilities are needed to store equipment when it stops, and it costs everybody money when freight cars are not being moved.
- PSR will reduce the handlings and produce a network which can move with more fluidity and which has some predictability.

John Gray, Senior VP – Policy & Econ, AAR,
Interview in *Logistics Management*, June 13, 2019

Precision Scheduled Railroading

How Norfolk Southern defines it



- PSR calls for shifting the operational focus from moving trains to moving cars.
- Our goal with PSR is service consistency and reliability.
- We want to reduce car miles and improve velocity.
- We have already seen a reduced number of trains on the network, from 5 to 10 percent depending on the day.

Jim Squires, CEO, Interview with *Progressive Railroading* editor
Jeff Stagl, August 2019

Precision Scheduled Railroading

What BNSF said about it



- GROWTH in customer business is our focus; **cost cutting as a PSR theme only goes so far.**
- “Sweating out the Assets” has to be part of a balancing act.
- BNSF balances its management towards benefits among employees, customers, investors, the community at large.
- Disengaging from customers to change internalized BNSF cost savings is not good long-term business strategy.
- De-marketing tactics can result in unanticipated but logical bad public policy outcomes.

Matt Rose, Chmn, Interview with *Railway Age* editor Bill Vantuono,
March 5, 2019

Precision Scheduled Railroading

What Harrison's successor at CN, says



- Under PSR, we've closed hump yards, sold lines, reduced headcount, parked locomotives, parked cars, etc.
- But we can only do so much of that, unless we decide to shrink and stop our growth and just drive the Operating Ratio down.
- But if we do that, we are going to give up return on investment and potential profitable business.

JJ Ruest, CEO, Interview with *Railway Age* editor Bill Vantuono,
January 2019

Precision Scheduled Railroading

What the results of Harrison's tenure at CSX were

- Cut 10,000 labor and management employees from workforce of 31,000
- Converted 7 of 12 hump yards into flat-switching yards
- Closed shops; second tracks torn up
- Reduced car fleet by 30,000 and locomotive fleet by 900
- Fewer, longer trains; train length up 12.5% - bad derailments and collisions occurred
- Closed intermodal terminals and service lanes
- Extreme customer dissatisfaction; special STB hearing called in 2017

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- Closed intermodal terminals and service lanes
- Extreme customer dissatisfaction; special STB hearing called in 2017
- Reduced the Operating Ratio from 69.2 to 57.4
- Significantly higher stock price: \$10 billion in market value added
- Multimillion dollar bonuses to executives

Precision Scheduled Railroading

What customers have to say about it



- Precision Scheduled Railroading is neither “precision” nor “scheduled”.
- Service has deteriorated since PSR was implemented; less frequent set-outs and pick-ups, and they are irregular.
- Railroad charges to customers have increased for demurrage and storage and switching.
- Some customers have to install longer sidings at their own expense to handle larger batches of cars being delivered.
- Some customers, concerned about their supply chains, are shifting to trucks to get better service despite higher costs.

Testimony of shippers at Surface Transportation Board hearings on
May 22 - 23, 2019, Washington, DC

**So, how does a railroad
management team resolve
this situation?**

The railroad industry just spent \$10 billion on positioning, communications, sensor, and computer technologies that provide **continuous real-time information that can enable them run trains on schedule with precision.**

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It's called Positive Train Control

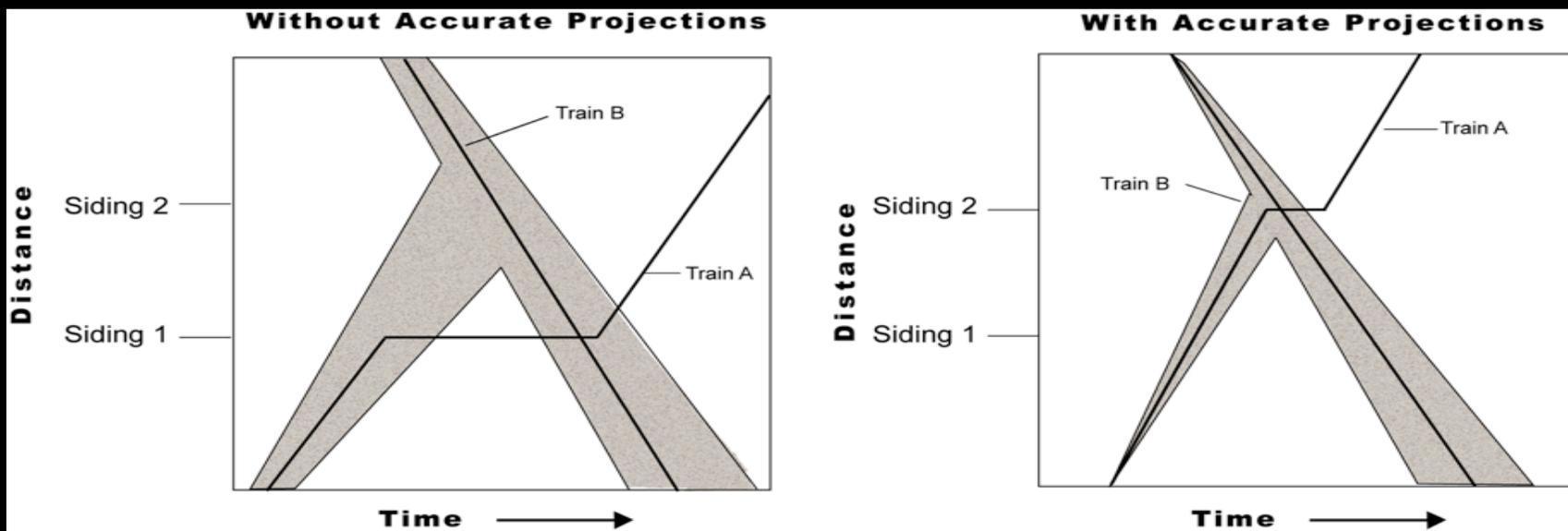
What business benefits had been forecasted for PTC?

In the 1980s and early 1990s, these business benefits were forecasted by BNRR for its ARES PTC project and the AAR for its ATCS PTC project:

- Improved train running times, with reduced fuel consumption and emissions;
- Improved train running time reliability and schedule adherence;
- Improved utilization of assets – locos, cars, crews – and increased track capacity;
- Greater efficiency of track maintenance operations; and
- Better communication of shipment status to customers.

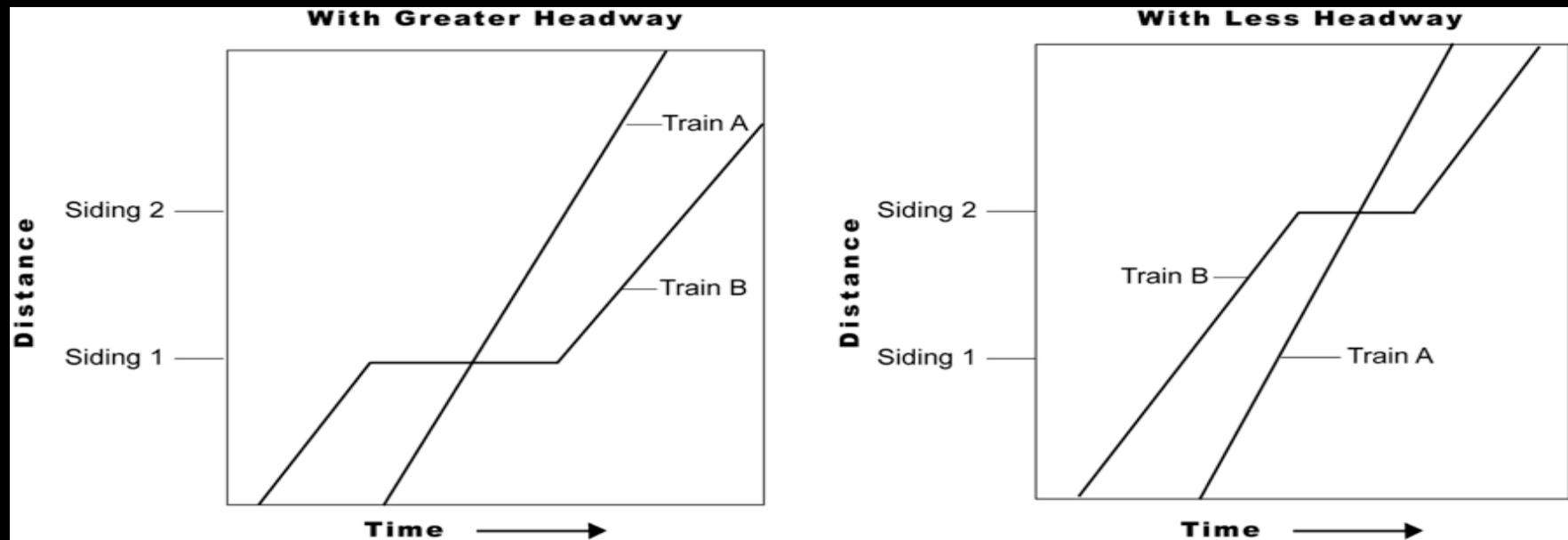
How PTC can permit more efficient train meets and shorten train running times

Accurate projections of train location can reduce delays at meets



How PTC can permit more efficient train passes and shorten running times

The ability to operate with short headways can reduce delays from passes



**What did the Rail Safety
Improvement Act of 2008 require
of PTC systems?**

PTC systems must 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.

These were performance requirements, not design requirements. Railroads could decide how they would implement them and inform FRA. FRA would approve or disapprove.

But then, bad things happened to PTC.

What happened to PTC in 2009?

- Railroad CEOs assigned PTC implementation to their signaling departments.
- The signaling departments decided to replace their wayside signals with new ones, and redundantly overlay PTC on them.
- Railroads appealed to and were granted relief by FRA from certain requirements, like knowing where the ends of trains were located.
- Because the law did not require any efficiency improvements to accompany the safety improvements, the railroads decided not to implement any efficiency improvements.
- As a result, PTC costs doubled and business benefits of the type that BNRR and AAR had forecast 30 years ago disappeared.

PTC systems, as currently being implemented, have shortcomings

- Because PTC is tied to fixed blocks and wayside signals that use relay logic, train spacing is fixed, based on signal spacing.
- PTC authorities are still being conveyed by signal indications, not by digital messages.
- PTC is not being integrated with train consist information from AEI, locomotive health monitoring systems, work order reporting systems, and track forces terminals.
- PTC is not being integrated with tactical and strategic traffic planners and energy management systems.
- BNSF is planning to integrate all these systems with PTC, while some other RRs are implementing some of them but not integrating them with PTC.

**A Digression:
What is FAA's
NextGen Air Traffic Control
program and why are they
doing it?**

The FAA is:

- Shifting air traffic control from analog voice (broadcast) to digital data communications (discretely addressed);
- Shifting from radar to GPS, augmented with WAAS, for aircraft position and speed information;
- Shifting from old to new control center computers and displays; and
- Requiring airlines and aircraft owners to equip their aircraft with on-board positioning system receivers, computers, screens, and sensors.

NextGen ATC uses **continuous real-time information** regarding aircraft location and speed to:

- Increase safety while flying more passengers, more cargo, more types of aircraft;
- Reduce congestion and delays in the air and on the ground;
- Improve the efficiency of airline operations;
- Reduce aircraft fuel consumption, reduce aircraft noise, and reduce emissions; and
- Increase the capacity of the National Airspace System.

- FAA does **not** say that NextGen Air Traffic Control is *just* a system overlaid on radar to improve air traffic safety, or *just* a system to improve airline and airport efficiency.
- FAA says that NextGen Air Traffic Control consists of *integrated* systems that will improve *both* aviation safety and efficiency.

What is NextGen Train Control?

NextGen Train Control is the equivalent of NextGen Air Traffic Control

They both use:

- **Continuous real-time information** transmitted over a digital data link communications network;
- GPS positioning with WAAS augmentation to get 1 to 2 meter positioning accuracy;
- New sensors;
- New on-board and control center computers; and
- Textual as well as graphic cab displays to focus on situational awareness.

Short definition of NextGen Train Control: It's what comes next after PTC

- The railroad and FRA people who worked on PTC defined it as a safety-only non-vital overlay of the wayside signal systems.
- Therefore, I am defining NextGen Train Control as focusing on both:
 - (1) improving on the safety of PTC, and
 - (2) increasing the efficiency, economic viability, and financial success of railroads well beyond the little that is achieved with current PTC systems.

What must railroads do to their PTC systems to achieve NextGen Train Control to improve both safety and efficiency?

To improve *safety*, railroads must:

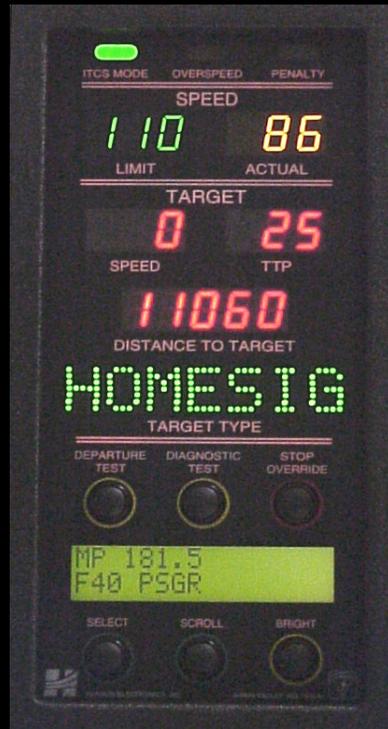
- Make sure that the locations of ends of trains, as well as the fronts, are known to the dispatchers and train crews to prevent rear-end collisions (like at Red Oak, IA) in addition to head-on collisions;
- Add GPS receivers and data radios on m-o-w vehicles and machines to make sure that dispatchers and train crews know where they are (to prevent Chester, PA collisions);
- Install switch position sensors on ALL switches, powered and manual (to prevent Graniteville, SC accidents);
- Incorporate intelligent grade crossings into the PTC systems;

To improve *safety*, railroads must:

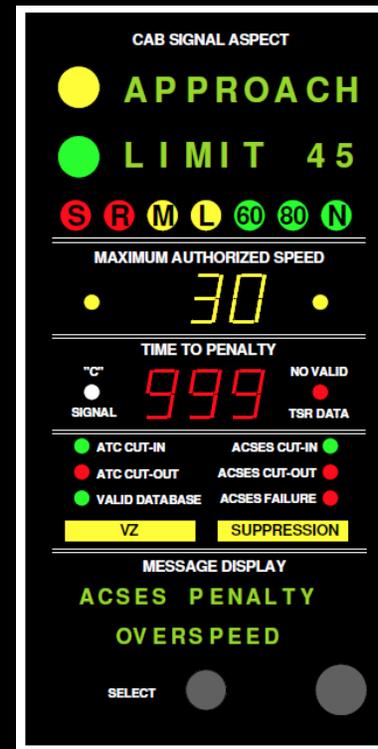
- Write new, simplified rule books for NextGen Train Control – to replace NORAC and GCOR – that reflect the new paradigm of train operations decoupled from fixed blocks and wayside signals that provides **continuous real-time information** on train location and speed;
- Investigate systems for improving detection of broken rails with something other than track circuits; and
- Add on-board cab map displays on passenger locomotives showing track profile and alignment for situational awareness (to prevent Philadelphia, PA overspeed accidents).

PTC cab displays on Amtrak and freight trains on Amtrak trackage

Not much situational awareness here!

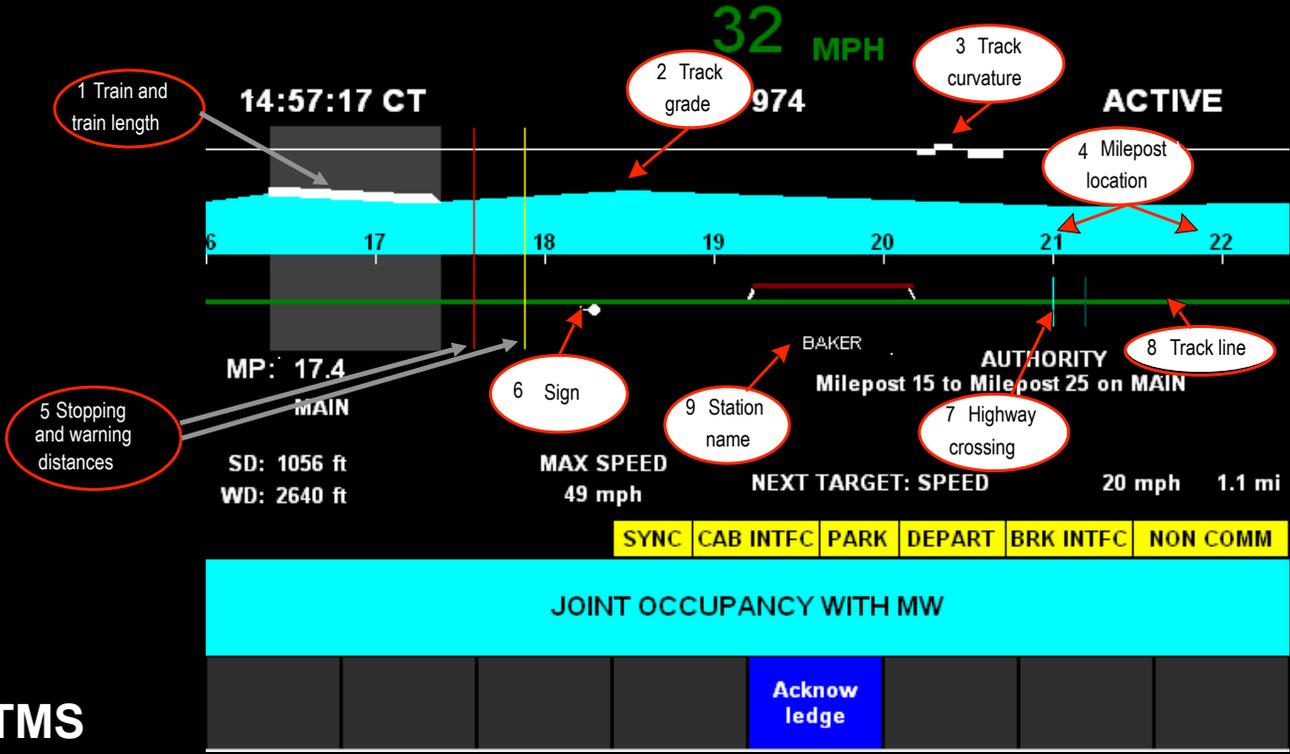


ITCS
Michigan



ACSES
Northeast Corridor

PTC cab displays on Amtrak and freight trains on freight railroad trackage



I-ETMS
Much better situational awareness!

Information and graphics courtesy of Wabtec Railway Electronics of Germantown, Maryland.

To improve *efficiency*, railroads must:

- Integrate PTC with AEI train consist information so that the **continuous real-time information** on location and speed of trains, locomotives, and cars is available to dispatchers and customers;
- Implement track forces terminals so that the **continuous real-time information** on location of maintenance-of-way vehicles and inspectors is to sent to dispatchers so that trains and maintenance-of-way operations can be managed in the same manner, rather than with the different procedures used over the years;
- **Decouple** PTC from wayside signal systems and fixed blocks, and implement moving block operations; and
- Transmit movement authorities digitally, not by signals.

To improve *efficiency*, railroads must:

➤ Integrate PTC with:

- On-board systems:
 - Locomotive health reporting systems
 - Energy management systems
 - Work order reporting systems
- Control center systems:
 - Precision dispatching systems
 - Tactical and strategic traffic planners
 - Locomotive, car, and crew scheduling systems
 - Crew registration and time-keeping systems

Principles of system integration

- Total system performance is singularly important
- Components or parts of system need not be optimized
- Trade-offs between components may enhance or hinder system performance
- Components linked together in a balanced system will produce greater end results than the sum of individual components

The keys to successful implementation of NextGen Train Control

- TOTAL support from the Chairman and CEO
- Include unions in the planning of NextGen Train Control; their people are the ones who will install it, maintain it, and operate it
- An implementation team consisting of representatives from EVERY department that will be affected by NextGen Train Control:

Strategic Planning
Operations Planning
Transportation
Dispatching
Mechanical
Track Maintenance
Signaling
Telecommunications

Marketing & Pricing
Information Systems
Safety & Rules
HR & Training
Purchasing & Materiel
Labor Relations
Finance & Accounting
Corp Communications

What Managers of a Precision Scheduled Railroad Need to Know

- Where mobile assets* **were** (for billing, payments, and analysis)
 - * *Mobile assets = trains and train crews, locomotives, cars, EOTDs, maintenance equipment and track forces*
- **Continuous real-time information** on:
 - Status of mobile assets (i.e., Are they serviceworthy?)
 - Status of fixed assets** (i.e., Is the infrastructure trainworthy?)
 - ** *Fixed assets = track, switches, bridges, tunnels, yards, terminals*
 - Where mobile assets **are** and what they are doing
 - Where mobile assets **need to be** at time t_1 in the future
- Forecasts (based on real-time, not historical, information) of:
 - Where mobile assets **will be** at time t_2 in the future
 - How best to get the mobile assets from where they **are** and **will be** to where they **need to be**
- That the correct instructions are being conveyed to the right crews and vehicles, and that the instructions are being complied with

Final thought...

A properly implemented NextGen Train Control system *will* get the **right information** to the **right people** at the **right time** to run a railroad on schedule with precision, safety, efficiency, and profitability and to support its customers' supply chains with improved visibility and service.

**Questions?
Want more material?
Email me, call me, or talk with me this evening!**

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