



# Positive Train Control

## Project Scope

The Alaska Railroad (ARRC) is developing a multi-phased program to design, develop and implement a communication-based Positive Train Control (PTC) system that uses data radio communications between train dispatchers and train crews, or dispatchers and roadway workers. The PTC system will ensure efficient and safe freight, passenger, and roadway worker operation.

The PTC project is comprised of a Computer Aided Dispatch (CAD) system, an on-board computer system, VHF packet data radio technology, and Global Positioning System (GPS) locator technology. Wayside devices (including signals, switches, track integrity monitoring, and defect detection) are interrogated by approaching locomotives for status. If needed, the train will be stopped prior to moving over the specific device.

## Benefits

Positive Train Control integrates CAD, on-board equipment, and wayside devices with a dedicated communication network and provides ARRC with the tools to:

- Electronically deliver authority (permission to be located on a specified stretch of track), speed restriction between the dispatcher office system and train.
- Stop locomotives/trains from exceeding authority/speed limits.
- Monitor switches for proper alignment.
- Detect broken rail (track integrity).
- Monitor wayside defect detectors.
- Provide an authority/speed limit warning system for on-track vehicles.

The fundamental difference between the PTC method of operation and the current method of operation is that the current method allows for human error that may cause catastrophic results.

PTC will present human operators with improved information for decision-making. It will also detect infrastructure failure and potential violations quickly, and stop the train when necessary. Regulatory-mandated safety enhancements include:

- Generating safe mandatory directives
- Enforcing authority limits
- Enforcing speed restrictions
- Protecting roadway workers within their assigned limits
- Protect against movement over switches left in the incorrect position.

## Status

PTC is being integrated into ARRC operations in several phases. Each step achieves incremental safety benefits. Federal Railroad Administration (FRA) Safety Certification is expected in 2013, and will include equipment installation on all ARRC locomotives. Wayside devices required for monitoring will be complete by Dec. 31, 2015.

### Phase I

The first phase, the communications segment, is installed and consists of mobile and base station packet data radios and GPS receivers on locomotives. Tracking occurs with GPS correction sent from the base stations to the locomotive. The system is operational and provides complete coverage of the railroad on all locomotives.

### Phase II

- The Computer Aided Dispatcher system installed in May 2006 is operational.

### Phase III

- The Office Safety Server Segment is the source of control information and instructions required on-board to perform PTC safety functions. The system validates all authorization and restriction information.

- The Locomotive Segment increases train crew effectiveness, efficiency, and safety. Safety objectives are achieved through several on-board safety functions:
  - On-board display of authorities, speed restrictions, and wayside detection alarms
  - On-board alerts
  - On-board enforcement of authority limits
  - On-board enforcement of speed limits
  - Protect roadway worker work limits
- In 2009, all locomotives (53) had the on-board computer installed.
- Site integration testing began in the second quarter 2008, and field validation testing will begin in 2011. FRA approval of the required PTC Safety Plan is expected in 2013, and this will allow ARRC to use the system in revenue service.

#### Phase IV

- Wayside detection devices will be monitored in Phase IV. These hardware and software applications include track integrity, switch monitoring and detector instrumentation for high load, avalanche and hot wheels. Thanks to the American Recovery & Reinvestment Act (ARRA), switch and track integrity monitoring at seven of 142

locations required by the 2008 Rail Safety Improvement Act, were done in 2009-2010. Work on remaining locations will continue through Dec. 31, 2015.

#### Phase V

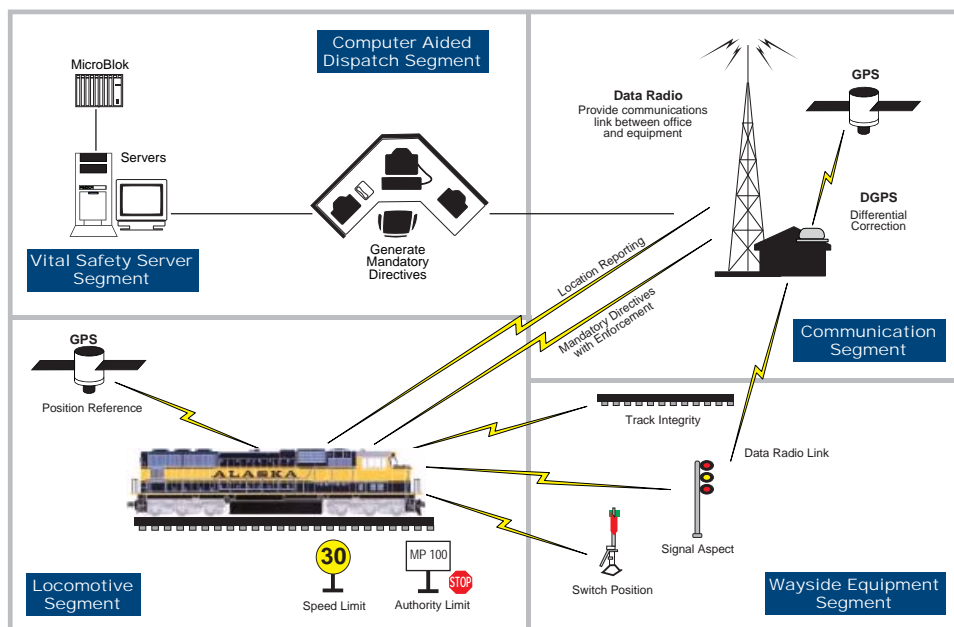
- Phase V will integrate on-track-vehicles (trucks and other vehicles outfitted to drive on the track) into PTC for monitoring, alerting and warning of authority limits and proximity to other maintenance vehicles.

### Costs and Funding


The total cost of the Positive Train Control system is estimated more than \$70 million. Thus far, from 1999 through 2011, ARRC will have spent about \$51 million on the PTC project.

The FRA funded earlier phases (1999-2005) with \$15 million in grants. FRA funded another \$735,000 in 2008. In 2006, approximately \$4.48 million in project funding came from the sale of revenue bonds backed by Federal Transit Administration (FTA) formula funds. Since 2006, FTA grants (funded 91% by the FTA and 9% by ARRC) have accounted for another \$29 million, which includes \$3.6 million in 2011. The PTC project also received a \$2 million ARRA “Stimulus” grant in 2009-2010, which was administered by the FTA.

### Positive Train Control System Overview for Locomotives



Phase IV work in 2009-2010 funded by:



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