



Collision Avoidance System

Project Scope

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

The CAS project is comprised of a Computer Aided Dispatch (CAD) system, an on-board computer system, VHF packet data radio technology, and 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

The Collision Avoidance System 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 CAS method of operation and the current method of operation is that the current method allows for

human error that may cause catastrophic results. CAS 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. The proposed 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

The Collision Avoidance System is being implemented into ARRC operations in several phases, in which each step achieves incremental safety benefits. Completion is expected in 2013, and will include the installation of equipment on all of ARRC's locomotives.

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 (CAD) 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 CAS 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, will be done in 2009-2010.

Phase V

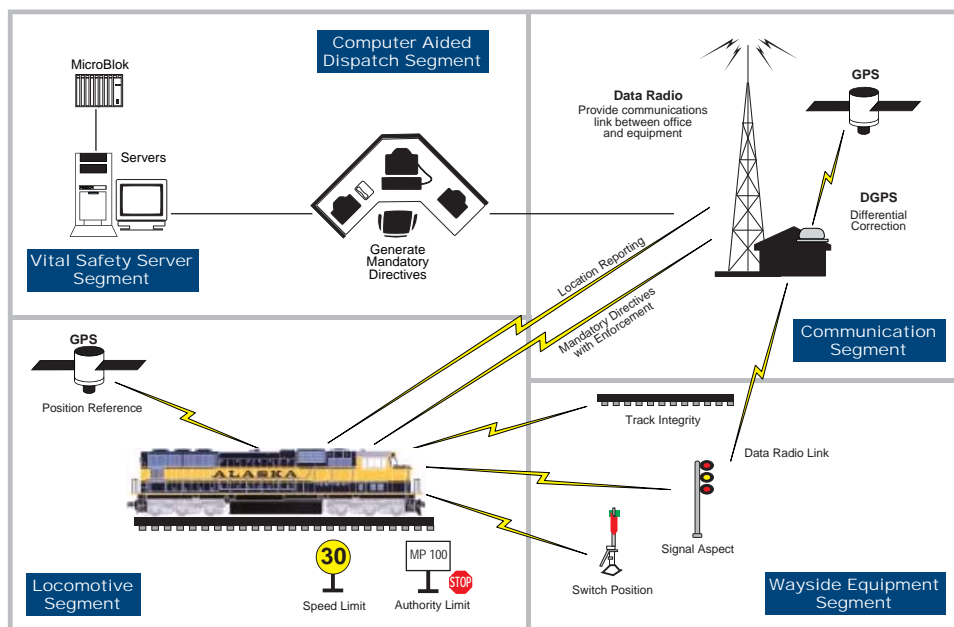
- Phase V will integrate on-track-vehicles (trucks and other vehicles outfitted to drive on the track) into CAS for monitoring, alerting and warning of authority limits and proximity to other maintenance vehicles.

Costs and Funding

The total cost of the Collision Avoidance System is estimated at more than \$70 million. Over the past decade (1999 through 2010), ARRC will have spent about \$42 million on the CAS project.

The Federal Railroad Administration (FRA) funded earlier phases (1999-2005) with \$11 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 \$23.8 million, which includes \$3.275 million in 2010. An additional \$2.5 million was provided to start Phase IV work in 2009-2010; this grant is funded by American Recovery & Reinvestment Act “Stimulus” money and is administered by the FTA.

Collision Avoidance System Overview for Locomotives



Phase IV work in 2009-2010 funded by:



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