

ALASKA RAILROAD CORPORATION



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Alaska Railroad Seeks to Improve Detection of Rail Breaks

ANCHORAGE, Alaska – It happens occasionally – a rail breaks under the tremendous pressure and momentum of heavy locomotives and loaded rail cars as they roll rapidly along the steel bands spanning more than 500 miles. The first step to repairing the rail is to know that the break occurred.

Wanting to be in the know faster, the Alaska Railroad (ARRC) is testing a system for detecting broken rail along track that is not equipped with automatic signals. The Track Integrity System demonstration is a \$409,740 Federal Railroad Administration (FRA) technology demonstration project, with funding through the Next Generation High Speed Rail Program. The FRA is contributing 93% (\$380,993) and ARRC is contributing 7% (\$28,747). Although not on a designated high-speed rail corridor, the Alaska Railroad site was chosen because of its challenging climactic conditions for demonstrating the effectiveness of the Track Integrity System.

The 14-month project calls for ARRC to purchase and install rail break detection, system monitoring and alerting hardware and software. The track integrity test bed will consist of three sections of track and one locomotive. Track locations north and south of Anchorage are being considered, based on track conditions and accessibility. ARRC will test the system during all seasons of the year, document results and evaluate how well it meets FRA fail-safe criteria, as well as rail industry performance requirements.

In “signalized” territory, the rails also function as wires in the signal circuit, with a low voltage current running through each rail. A train has steel wheels connected by a steel axle, so when the train is on the track it effectively links the positively-charged rail with the negatively charged rail, thus causing a “short” in the circuit, which in turn activates a signal along the track (similar to a traffic light). Circuits created in track for signaling purposes can also detect broken rail. In this case, when a rail breaks, the circuit’s electrical current is disrupted.

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Weak electrical current will only travel a finite distance, thus signalized track is made up of consecutive track circuits. On the Alaska Railroad, these track circuits are, on average, about 10,000 to 12,000 feet long (or about 2 miles apart).

However, 85% of ARRC's track corridor is not equipped with signals. In these "dark" areas, rail defects are discovered by frequent track inspections as well as on-going rail and roadbed maintenance. The Track Integrity System being tested is expected to identify rail breaks in dark territory as reliably as breaks detected in signal territory.

The test system will apply electricity to the track to create circuits similar to those in signalized territory. However, the system is designed to make the electrical current travel farther, up to five miles. It is also designed to conserve energy by putting the circuit into a "sleep" or suspended mode until activated by an approaching train. The system is comprised of wayside (along the track), vehicle, and office software, and equipment. Several experienced contractors have been secured to provide these system elements (see attached fact sheet for details).

Test equipment will be installed, and circuits created, at approximately five-mile intervals. As a locomotive approaches, it signals the wayside devices and activates the circuits. If circuits are intact, the wayside device confirms track integrity, and the locomotive proceeds. If the circuit is disrupted, the system feeds this information to a data radio, which then forwards it to an on-board computer display. If the train crew does not respond, the on-board system forces the train to stop, and then allows the train to proceed at a restricted speed. The system will also be used to notify maintenance crews who are dispatched to fix the problem.

Once the project testing and demonstration are complete in late 2005, ARRC expects the system to:

- Create an additional cost-effective layer of safety for "dark" territory.
- Validate and demonstrate the technology for use in freight and passenger train service.
- Create a prototype for system-wide use on the Alaska Railroad.
- Create a prototype for production and use industry-wide.

No doubt FRA is anticipating the same. FRA's Next Generation High Speed Rail technology demonstration projects are intended to advance the implementation of higher speed rail service through demonstration of methods, which will contribute to the safety, and cost-effectiveness of operating at faster speeds. The program also targets techniques for more effectively accommodating freight and higher speed passenger service operating on the same tracks.