Engineers to get computer help

New York Air Brake’s LEADER system is designed to provide coaching to improve train-handling on a computer screen — that can be customized for any segment of any railroad operating any type of consist.

According to a paper prepared by Michael Hawthorne, director of NYAB’s train dynamics group, and Robert Blank, director of research and the test department for Norfolk Southern, LEADER began as an effort to better understand the performance of end-of-car cushioning devices.

Mathematical and physics models were developed to calculate the forces experienced by cars and locomotives, and this led to the basics of the system. Research expanded to include detailed modeling of the air brake and engine performance, including analysis of fuel usage.

A key element of the technology is the ability to actively "tune" the train by adjusting simulation models to fit the train’s behavior. In simpler terms, the system learns about the performance of the train on that run on that day and incorporates that learning to produce more accurate driver assist prompts. The driver assist prompts, shown on the LEADER display terminal, situated in the locomotive cab where the engineer can easily monitor it, actively assists in train control and handling by advising when and how to apply the brakes or change throttle position.

The pilot project with Norfolk Southern is part of a Federal Railroad Administration-sponsored program to assist engineers in optimizing train handling. Hawthorne said it includes 17 GE Dash 9 locomotives, primarily assigned to unit coal train service on NS’s Winston-Salem District, the former Norfolk & Western “Punkin’ Vine,” so named because of its many twists and turns.

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Managing a mile-long freight train over hilly terrain is a tricky proposition, even for an experienced engineer. Almost always, the person at the throttle can use all the help he or she can get. While nothing can replace years of train-handling experience over a particular route, the right technology can become a valuable assistant.

New York Air Brake, based in Watertown, N.Y., has been developing a train control system called LEADER, which stands for Locomotive Engineer Assist/Display & Event Recorder, and is designed to improve handling and save fuel.

The system has grown from displayed information on a train’s dynamics to an active forecaster of train behavior. In addition, it coaches engineers on when to apply and release brakes and how to manage throttle. All data collected by the system on a trip is automatically transmitted to a base station normally located at an engine terminal where it can be collected and analyzed by LEADER and railroad personnel.

New York Air Brake has been working closely with Norfolk Southern over the past two years to refine LEADER, focusing on the prompts to help the engineer make better train-handling decisions at precise times and locations.

The work with NS, and previous preliminary short-term efforts with Canadian Pacific Railway in British Columbia and North Shore Mining in Minnesota, have enabled New York Air Brake’s system engineers to study railroad operating rules and best practices. That data has led to simple and effective “driver assist” prompts — call-outs that can be customized for any segment of any railroad operating any type of consist.

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The initial 17 Dash 9s are: 9442, 9564, 9722, 9723, 9725, 9726, 9628, 9731, 9733, 9735, 9736, and 9738-9743.

See our Web site for links to photos of some.
The Dash 9s haul trains that originate in West Virginia coalfields and are destined for Duke Power’s Belews Creek power plant in North Carolina. An additional 50 sets of equipment will be installed on NS locomotives by the end of the second quarter of this year. The new equipment will still primarily go into diesels in unit coal train service, although the goal is to eventually expand LEADER to general merchandise trains.

NS and New York Air Brake have worked to interpret the two years of data to create a “golden run” — the ideal combination of existing best practices and LEADER operating techniques. At NS’s direction, this ideal run is focused on fuel usage. However, alternate ideal runs may be more focused on in-train force control or time-to-destination management. Engineers have been trained on the system using a desktop simulator in Roanoke, Va.

But not every crewmember believes the LEADER concept is to his or her benefit, and Hawthorne indicated there has been some resistance, which eventually is overcome, during the training program and early field experience.

“We’re not trying to displace the locomotive engineer,” Hawthorne and his colleagues have explained to the crews, many of whom were initially dubious about the technology. “But once they find it complements their skills and is not in conflict with everything they’ve learned over the years, their comfort level improves.

“But for a few, it’s always going to be a challenge,” he added. “It’s our job to make the system engage the engineer, even the doubters. We learn from the engineer. Collectively, they have the best practices. We make those best practices available to all operators.”

Results to this point, Hawthorne said, have met or exceeded New York Air Brake’s goals and have attracted interest from other big railroads. Two of them have sent representatives to examine the simulator and watch the technology at work. Representatives from one western railroad went along with NS crews on test runs.