the Engineer's Perspective

A Final Report: RailView

SEPTEMBER 2010

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STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

INTRODUCTION

In 2003 the Federal Railroad Administration (FRA) issued Broad Agency Announcement 2003-1 indicating the availability of funds for research projects and technology advancements under the Next Generation High Speed Rail Program. The North Carolina Department of Transportation (NCDOT) Rail Division responded to the announcement in October 2003 with a proposal to conduct a Locomotive Digital Video Recording System Demonstration utilizing SAIC's RailView interface. The FRA and NCDOT entered into a cooperative agreement in June 2004 with NCDOT and Norfolk Southern Railroad Company (NSR), subsequently executing a stakeholder agreement for the purpose of monitoring and evaluating highway-rail at-grade crossings and trespasser incidents recorded with the RailView system along the NCDOT Sealed Corridor. The Sealed Corridor consists of 172 public and 46 private at-grade railroad crossings over 173 railroad miles between Raleigh and Charlotte.

PROJECT HISTORY

Since going live in September 2004, the NCDOT has monitored the Amtrak *Piedmont* passenger train service using the RailView system. The *Piedmont* operates wholly within North Carolina and stops at eight stations along the route. They include Raleigh, Cary, Burlington, Greensboro, High Point, Salisbury, Kannapolis, and Charlotte. Travel time from Raleigh to Charlotte is three hours and 12 minutes with train speeds reaching 79 MPH. The *Piedmont* operated two daily trips between Raleigh and Charlotte from 1995 until June 2010. In June the *Piedmont* expanded to include a midday service in each direction, bringing the total daily trips to four.

From project inception until January 2010, the *Piedmont* operated two F59PHI locomotives and one GP40H-2 locomotive owned by NCDOT for its trips between Raleigh and Charlotte. In January 2010 the NCDOT sent its GP40H-2 locomotive in for a full overhaul and, in conjunction, replaced RailView with an internet-based video monitoring system. RailView remains installed on the two NCDOT-owned F59PHI locomotives.

THE RAILVIEW SYSTEM

The NCDOT uses five RailView recorders on a rotating basis. One recorder is installed on each locomotive at all times. Two recorders serve as replacement units. In the event of an incident, the recorder is pulled from the engine and replaced with a reserve recorder. The recorder is run through a diagnostic check to confirm its proper working order at the time of the incident. After diagnostics, the video is downloaded and analyzed by NCDOT. In addition to digital video, RailView also detects train speed, reverser position, horn annunciation, and emergency brake activation. For the NCDOT application, the RailView data recorder is mounted in the short hood, with the camera being installed on the dash of the locomotive at the bottom of the windshield. The microphone is located behind the engineer cabin but is still able to detect the train horn and bell. The photos on the following page show the mounting locations for the recorder and camera.

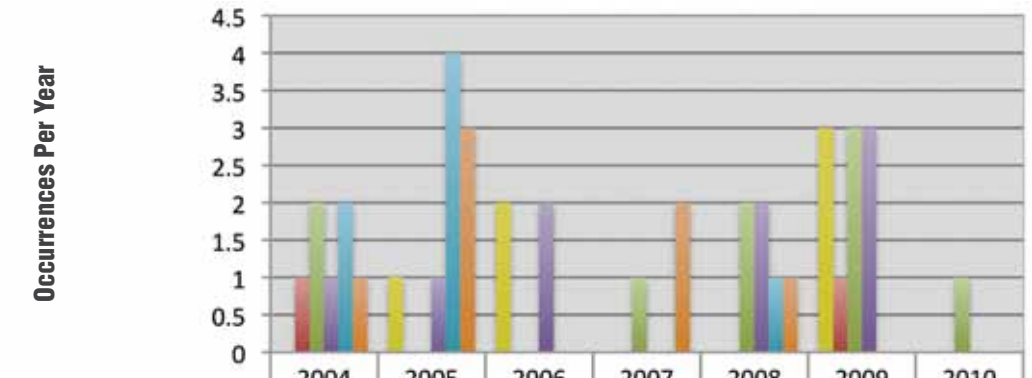
RailView is hardwired into the locomotive to detect reverser position and horn and emergency brake activation. The train speed is determined by connecting to the axle generator and measuring the pulses-per-minute created by the generator. Time and date are set within the recorder unit using the US Naval Observatory Master Clock.

INCIDENTS

RailView has logged 40 on-track incidents since 2004. To date, nine fatalities, 14 close calls, 11 collisions, and six track fouling events have been recorded on the *Piedmont.* The table below shows the year-over-year frequency of each type of incident that occurred.

Additionally, RailView has also recorded two late signal activations and one stop signal overrun during corridor monitoring.

RAILVIEW INCIDENT LOG



	2004	2005	2006	2007	2008	2009	2010
Track Fouling		1	2			3	
Pedestrian Strike	1					1	
Pedestrian Fatality	2			1	2	3	1
Vehicle Strike	1	1	2		2	3	
Pedestrian Close Call	2	4			1		
Vehicle Close Call	1	3		2	1		

Following is a representative set of events selected to highlight the different types of encounters the Piedmont has experienced over the course of study. They are shown in order of occurrence.

TRACTOR-TRAILER CLOSE CALL
Shamrock Road Crossing No. 715 328G

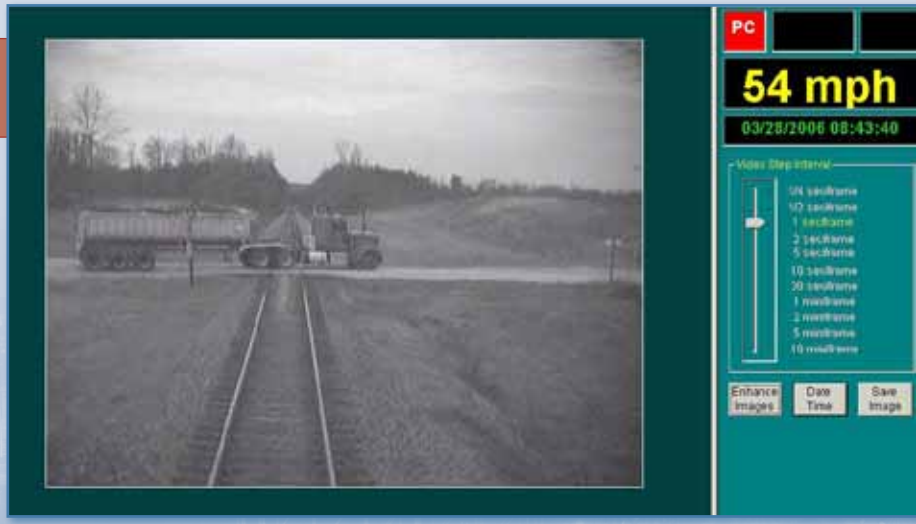
JUNE 29, 2005 // The southbound *Piedmont* caught a tractor-trailer running under the exit gates of this four-quadrant gate protected grade crossing. The engineer threw the emergency brake as a precaution in case the truck did not clear the crossing in time.

LATE SIGNAL ACTIVATION
Henderson Street Crossing No. 715 301X

FEBRUARY 3, 2006 // The northbound *Piedmont* just left the Salisbury station when it caught the late activation of the crossing warning devices. As a result, signal activation timing was adjusted to allow proper warning time of an oncoming train.

DUMP TRUCK COLLISION
Fryar Landfill – Private Crossing No. 722 972N

MARCH 28, 2006 // The southbound *Piedmont* met this gravel-laden dump truck on unsignalized Fryar Landfill access road. The truck failed to yield right-of-way, and the engine struck near mid-trailer.



CONSTRUCTION CREW CLOSE CALL
Private Crossing No. 904 231G

APRIL 11, 2008 // The southbound *Piedmont* had just crossed the Yadkin River Bridge when it encountered this construction crew working in the railroad right-of-way. The crew did not clear the tracks fast enough, and the engineer engaged the emergency brake.

TRACTOR-TRAILER COLLISION
Pharr Mill Road Crossing No. 715 325L

FEBRUARY 4, 2009 // The southbound *Piedmont* struck this tractor-trailer as it failed to yield to warning signals at a four-quadrant gate protected crossing in Harrisburg.

VEHICLE COLLISION
Washington Street Crossing No. 735 448C

February 27, 2009 // The northbound *Piedmont* struck this passenger vehicle in Graham after the signals activated with the truck in the crossing. Instead of proceeding through the crossing, the driver made a failed attempt to back away from the crossing.

CAR HAULER COLLISION
Newell Hickory Grove Road Crossing No.715 348T

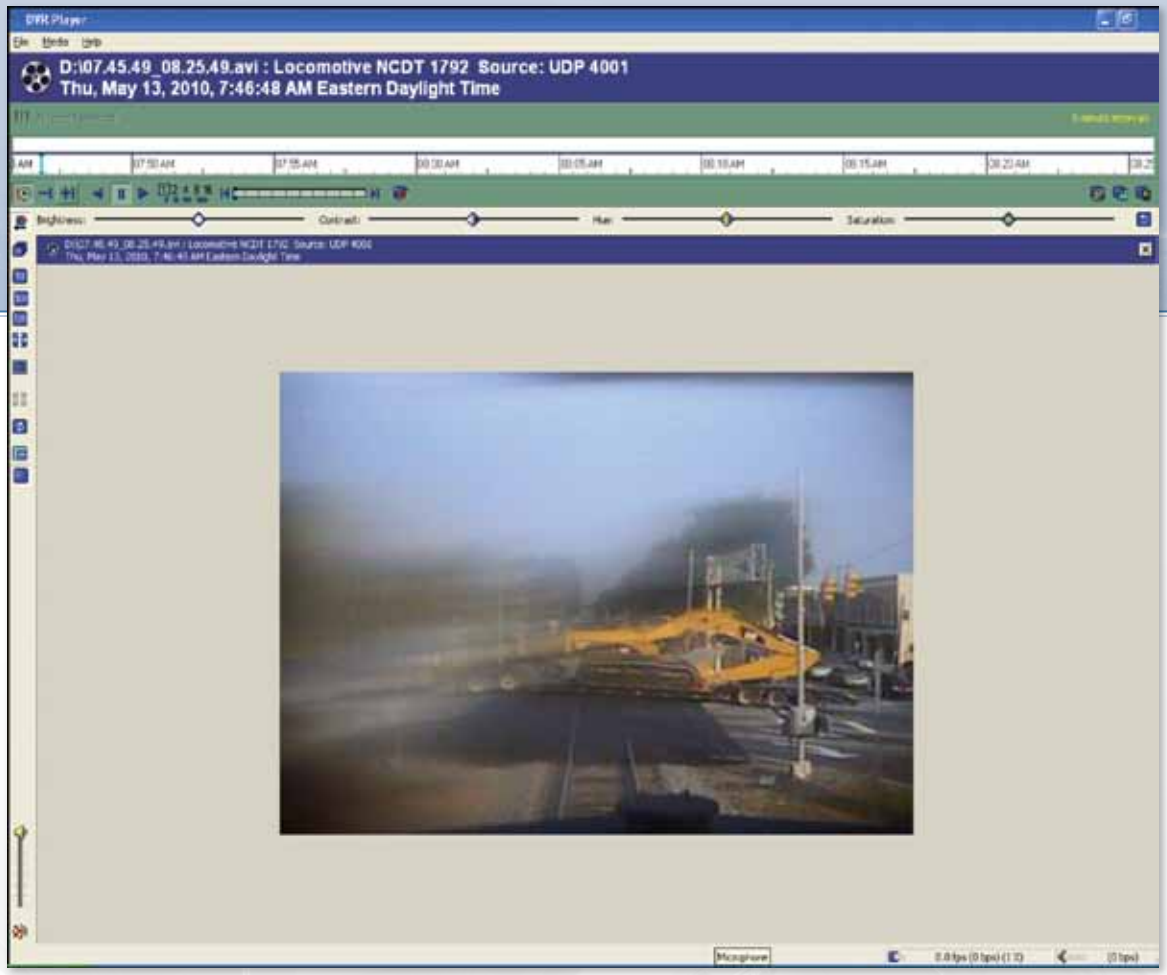
March 20, 2009 // The northbound *Piedmont* encountered a bottomed-out car hauler in Charlotte.

PEDESTRIAN CLOSE CALL
Milepost 14.46

June 3, 2009 // The southbound *Piedmont* grazed this pedestrian near the Joyner Street Crossing in Gibsonville. The pedestrian suffered only minor injuries.

WI-TRONIX: NEW TECHNOLOGY REPLACES RAILVIEW

The NCDOT took delivery of the newly refurbished GP40H-2 locomotive in June 2010. This locomotive was stripped of the RailView system and upgraded with the internet-based Wi-Tronix monitoring system. The Wi-Tronix system integrates the locomotive event recorder, video camera, microphone, GPS, and other critical locomotive subsystems to provide a complete snapshot of train status at any given time. The system utilizes a wireless CDMA uplink to send the data it collects to a central database that is accessible via the internet. For the *Piedmont*, Wi-Tronix is configured to upload data packets to the database every five minutes. The GPS tracking system mounted on the *Piedmont* is designed to locate the locomotive within a sub-three meter range. The forward-facing camera provides color video at 30 frames per second. In the event of a collision, the data can be downloaded and analyzed immediately to determine the nature of the accident and, if any, the failure of highway-rail grade crossing safety measures to activate. The screenshot below was taken from the Wi-Tronix interface. It shows a Lo-Boy tractor-trailer carrying a trackhoe grounded on the crossing. This accident occurred on NC 119 (5th St), Crossing No. 735 472D, in Mebane. The resulting collision caused the engine to derail, and both the engine and the vehicle were total losses.



CREDITS

The North Carolina Department of Transportation and the Rail Division acknowledge the project team—Jason Field, Joe Midgette, Brandon Scott, and Barry Shapiro—for efforts in producing a successful demonstration project and extend appreciation to Brandon Scott for writing the report, to Jane Rogers for report editing and production, and to Herzog Transit Services, Inc., of Raleigh.

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