

AV TAKES TO THE RAILS

Operation Lifesaver offers installation challenge.

BY DAVID R. READ

Project Manager Steve Koehle, of Claysburg PA-based Lightner Electronics, Inc. (LEI, www.lightnerelectronics.com), related to *Sound & Communications* how he and his team recently completed a project that most likely would have flown under the radar for the typical AV systems integrator. Norfolk & Southern Railway (www.nscorp.com) charged Lightner Electronics Owner Matt Lightner with the responsibility of designing, fabricating, installing and commissioning an AV system into railway passenger cars to support the Norfolk & Southern Railway's Operation Lifesaver program, along with several other cars in the executive train fleet.

Project Scope

Early in the project, Koehle met with W.L. (Bill) Baringer, Jr., Director Grade Crossing Safety, at Norfolk Southern. The design criteria required that each car stand alone as a complete conference room, and also that all cars link together as a cohesive system. Passenger cars NS-28 and NS-29 are the primary coaches used for Operation Lifesaver. In the event of mechanical

All photos:
Stephen H. Koehle



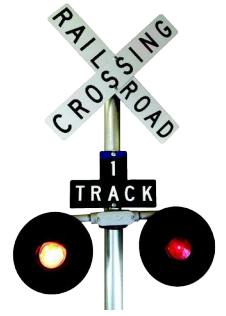
Two views of the custom camera case mounted on the nose of the locomotive. The solar panel on the top maintains the batteries during wireless camera use.

problems with either NS-28 or NS-29, a third coach, NS-26, had to be set up to operate in their place. The AV systems had to be rugged, simple to use and reliable. (Note that cars NS-23 and NS-26 were completed in 2012, NS-23 being the first AV-equipped coach designed by Lightner Electronics to take to the rails.)

The current project involved the installation of flatpanel displays with RF tuners and accompanying audio systems in the two vintage passenger coaches. Along with the DVI input for the local PC (with a solid state hard drive), HDMI and VGA inputs, these displays show full-motion video from a camera mounted on the nose of the lead locomotive. The primary purpose of the video is to provide the view from the locomotive engineer's perspective for educational purposes. Thus, invited guests riding onboard NS-28 and NS-29 can view real-time high-definition video of what the engineer is seeing from his cab's window.

Inasmuch as locomotives exhibit a rather hostile environment for rather delicate devices, such as TV cameras, a specially designed and fabricated portable enclosure had to

be provided to withstand the rigors of travel and allow for removal for safekeeping when not in use. This custom camera case includes a solar panel to charge the two batteries that power the camera and a future wireless transmitter for the entire trip. The camera provides both HD-SDI and H.264 or MJPEG IP streams that are recorded for archival use.



Standalone Conference Rooms

Each car is designed to act as a standalone, full function, "conference room." Inputs for laptops, a DVD player and GPS mapping are provided. Using RF modulation and distribution, a training session in one car can be seen in several cars. Safety announcements can also be routed to several cars. This system provides maximum flexibility because each car generates its own RF channel. For simplicity, the channel number is the same as the car number; so, if you want to watch what is going on in NS-29, you select channel 29.

Each car has its own 480-volt generator along with the ability to get power from the locomotive or the "on line" UPS system that is also installed in each car. This UPS powers not only the equipment in the rack, but all of the displays, as well.

There were many challenges to the installation, including drilling and cutting the stainless steel car bodies and very thick steel plating. Finding cable pathways presented another challenge because the ceiling space in most cases incorporates the ventilation ducts. The installation was completed by LEI lead installers Jimmy Brian and Wes Layton. They were assisted by Jeff Mountain handling the many terminations. The project was a good fit for the Lightner team because of the additional skill sets and resources its crew has in fabrication of wood and metal for custom projects.

Rack Locations

LEI worked with William E. (Bill) Jones Jr., Gang Leader at NS Special Equipment Shop, to come up with a plan for the equipment rack locations and fabrication. LEI provided the design for the cabinets and coordinated construction and installation with the carpenters and electricians at the Juniata shops. Koehle said, "The skill set of the men at the Norfolk South-

Contributing Editor R. David Read, in addition to writing about AV technology and its history, is also a railroad buff.





This is the operator control space for the AV systems in NS-28, and also shows one of the seven 32-inch displays in the car.



This typical junction box, located on each of the four outside corners of the cars, provides interconnection for audio, video, RF distribution and network.

Equipment

Norfolk Southern NS-28 Powhatan Arrow

Audio

- 2 Audio Technica BP892c headworn mics
- 7 JBL Control 24CT Micro overhead speakers
- 1 Shure 514B omnidirectional low z PTT mic
- 2 Shure UA221 passive antenna splitters
- 1 Shure ULX1 body pack transmitter
- 1 Shure ULX2/BETA87A handheld transmitter
- 1 Shure ULXP4D wireless mic receiver

Video

- 1 Delorme GPS BU353 GPS antenna for Delorme GPS software
- 1 HP Compaq 8200 Elite personal computer
- 7 Samsung H32B 32" displays
- 6 Snap AV SM-ART-1M wall mounts
- 1 Snap AV SM-THIN-M tilt wall mount
- 1 Sony BDP-S590 Blu-ray player
- 1 ViewSonic VT1601LED VS14862-1M 16" monitor

Audio/Video Processing, Control

- 1 AMX Enova DVX -2150-T AV switcher
- 1 AMX NXD-7001-MB touchpanel control
- 1 Extron MLS 100A 4-channel audio switcher

Video Processing

- 1 Contemporary Research QMOD HDSC QUAM TV modulator
- 1 Hall Research SP-HDMI-2A 1x2 HDMI DA
- 2 Hall Research UH-2C-3S 1X3 HDMI over 2xCat6
- 6 Hall Research UH-2C-R 2xCat6 to HDMI receivers
- 1 Marshall Electronics OR-XDI SDI to HDMI converter

Control/Routing

- 1 C2G 29341 USB superbooster/extender
- 1 D-Link DGS-1008P 8-port gigabit network switch
- 1 Interlink Electronics VP4350 presentation remote
- 1 Interlink Electronics VP6499 USB RF receiver
- 1 Microsoft Desktop 3000 wireless keyboard, mouse

Power Distribution, Switching

- 2 Cyber Power PDU15BV16F power distribution units
- 1 Tripp Lite SU1500RTXL2Ua uninterruptable power supply

Equipment Rack

- 1 Middle Atlantic SRSR X16 16-space rack

Norfolk Southern NS-29 Powhatan Arrow

Audio

- 2 Audio Technica BP892c headworn mics
- 6 JBL Control 24CT Micro overhead speakers
- 1 Shure ULXP4D wireless mic receiver
- 1 Shure ULX1 body pack transmitter
- 1 Shure ULX2/Beta87A handheld transmitter
- 2 Shure UA221 passive antenna splitters
- 1 Shure 514B omnidirectional low z PTT mic

Video

- 1 HP Compaq 8200 Elite personal computer w/solid state drive
- 1 Panasonic DMP-BDT220 Blu-ray player
- 7 Samsung H32B 32" displays
- 4 Snap AV SM-ART-1M wall mounts
- 3 Snap AV SM-THIN-M tilt wall mounts
- 1 ViewSonic VT1601LED VS14862-1M 16" monitor

Audio/Video Processing, Control

- 1 AMX Enova DVX -2150-T AV switcher
- 1 AMX NXD-7001-MB touchpanel control
- 1 Extron MLS 100A 4-channel audio switcher

Video Processing

- 1 Contemporary Research QMOD HDSC QUAM TV modulator
- 1 Hall Research UH-2C-3S 1x3 HDMI over 2xCat6
- 3 Hall Research UH-2C-R 2xCat6 to HDMI receivers
- 1 Hall Research SP-HDMI-2A 1x2 HDMI DA

Control/Routing

- 1 C2G 29341 USB superbooster/extender
- 1 D-Link DGS-1008P 8-port gigabit network switch
- 1 Interlink Electronics VP4350 presentation remote
- 1 Interlink Electronics VP6499 USB RF receiver
- 1 Microsoft Desktop 3000 wireless keyboard, mouse

Power Distribution, Switching

- 2 Cyber Power PDU15BV16F power distribution units
- 1 Tripp Lite SU1500RTXL2Ua uninterruptable power supply

Rack

- 1 Strong SR-SKEL-21U-20IN 16-space rack

List is edited from information supplied by Lightner Electronics.

ern Juniata shops is amazing. They can provide or make anything we need. For example, we mounted 10 flatpanel displays above the baggage racks in the two cars. LEI fabricated a prototype mount and provided drawings; NS shops produced all 10 of the mounts. No two mounts were the same height!”

The vibration of trains running down the rails also presented some problems. Some of the equipment had to be modified to increase reliability. The vibration of the rails and the banging during the coupling and uncoupling process means that every connection has to be secure. All cables are routed and dressed so they cannot come unplugged.

Several of the cars are equipped with specifically designed interconnect panels mounted in weatherproof boxes on the exterior at each corner of each car. The interconnect panels are used to patch video RF and network connectivity from car to car. They hope to go completely wireless in the future, as wireless technology advances.

In addition to the recently completed NS-23, NS-26, NS-28 and NS-29, a fifth car, NS-1 Virginia (an office car), is slated for renovations in the immediate future.

Observation Car

NS-23, Buena Vista observation car, was formed from what was formally an observation lounge car. The rear of the car was sliced off and a plate glass window was fitted from bulkhead to bulkhead and from floor to ceiling. Passengers in this car are seated in the 28 theater-style tier-raised chairs with a rearward view. NS26, New York coach car, is outfitted with three displays and a complete AV system compatible with NS-28 and NS-29.

The NS Executive Car Fleet, including the Operation Lifesaver cars, now totals about 37 vintage rail passenger cars gleaned primarily from predecessor N&W and Southern Railway. These cars are headquartered at Juniata shops in Altoona PA and, probably constitute the largest collection of intact vintage cars existing on any North American railroad. Under the watchful eyes of Dennis Pennabaker,



During training in NS-29, half of the displays show the camera image from the locomotive, the other half show the Operation Lifesaver PowerPoint presentation.

Bill Jones and their crew of dedicated machinists, pipefitters, electricians, carpenters, metal workers and carmen, the cars are serviced and meticulously maintained at the ready for whatever goals might be forthcoming. In addition, two sets of first-generation diesel locomotives (4270 and 4271), built by EMD (Electromotive Division of General Motors in 1951), form the motor power for the Executive Train Sets.

Originally, the motive power for the Powhatan Arrow were class J-1 (4-8-4) steam locomotives. These engines are often reputed by rail buffs to be the most handsome, well-appointed and finest running locomotives of the steam era. Built by N&W in their Roanoke VA shops between 1941 and 1946, they served the N&W until the demise of steam. The Virginia Museum of transportation has announced the FIRE/UP611 campaign, a fundraising operation to restore and maintain Number 611, the sole survivor of the J class era.

Operation Lifesaver cars NS-28 and NS-29 were originally constructed by Pullman-Standard in 1949 to outfit the then newly inaugurated Powhatan Arrow, which ran as a daily, all-coach train over the 1000-mile route from Newport News VA to Cincinnati OH. In their 20-year service in regular passenger revenue, each of these cars logged some 15,000 miles per month. After having been retired from regular service, they were used in a variety of

ways. It is not inconceivable that these cars have logged 150-million miles of regular service.

NS-28 and NS-29 are two of the newest cars in the fleet. The oldest in the Executive Train set was out-shopped by Pullman in 1911 as an office car for the Southern Railway; others date to the 1920s. All have been rehabbed to conform with AAR (Association of American Railroads) current standards and are capable of being operated at track speed.

Having worked for the Southern Pacific RR and the Santa Fe Railway, this writer saw a fair share of mishaps and close calls. Some of the following incidents will perhaps illustrate how a 10-second lapse of attention or a sustained period of abject stupidity can have dire consequences:

I had been working as a telegrapher/interlocker tower-man for SPRR in and around the San Francisco Bay area when I was called to provide relief vacation for the regular 2nd trick (4:00pm to midnight) tower operator at Fruitvale, some 12 miles south (railroad east) of Oakland pier. Fruitvale Boulevard crossed the SP track at grade that consisted of eight tracks. This was a tough neighborhood and the local residents were disdainful about being delayed by the frequently passing trains. As I was quick to learn, incidents in which motorists would duck around the crossing gates were all too common.

In addition to lining up the switches



Mounting each display was especially challenging in these railroad cars. Mounts were custom fabricated, with prototypes being tested. This mount also allowed the displays to swing and face the other direction, if needed.

and signals for trains, my responsibilities also involved engaging the crossing warning lights and gates. After watching too many close calls, I had taken to engaging the lever for the gates and turning my back to avoid witnessing mayhem in the making. One evening, I followed my customary routine as a passenger train sped toward the tower. The next thing I heard was the grating sound of metal on metal. The steel rod that stopped the downward travel of the gate had pierced the hood of a late-model Buick

The car's irritated driver was out of his vehicle and waving a fist in my direction. I was not about to point out to him that I had probably saved his life. When the railroad's special police officer arrived and surveyed the scene, he instructed me to reverse the gate signal lever, which ripped off the hood, air filter and other parts. After the Buick had been towed to wherever harpooned Buicks go to die, the special officer and I had a good chuckle. I doubt the Buick's owner saw it in quite the same light.

Later, I was sent to Davis Tower,

some 20-miles west of Sacramento to relieve the 2nd trick telegrapher. When my assignment ended, I arranged with the train crew of Number 9 to watch out for me and I would swing on board as it slowed for the west leg of the WYE.

Everything worked fine and I clambered up the ladder and swung aboard the engine. I settled back and started to doze off for the 60-mile ride to my home when I heard the fireman shout to the engineer, "Watch him!" I could see an automobile racing the train on the adjacent highway. Did he intend to turn in front of us at the next grade crossing? The engineer had a decision to make. Would he apply the emergency braking operation and risk derailing the train or, if the train stayed on the track, how many passengers in the trailing cars would be killed or injured? He wisely braked to slow us, but not bring us to an abrupt halt. Sure enough, the car had made a turn in front of us at the next available grade crossing. As we swept by, the locomotive headlights revealed that there was a man and probably his wife and two kids in the car. If there

had been another coat of paint on that Chevrolet we would have had him.

Bob Burr, a trick train dispatcher in Bakersfield CA, was on his way home one afternoon when he made a fateful mistake that sent him to an early grave. He drove a diminutive Crosley into which he could barely fit his 6'3", 250-pound frame. He halted a grade crossing to let an eastbound freight snake its way into Bakersfield yard. With eight tracks, the grade crossing was too wide to be adequately protected by crossing gates and signal lights; a flagman was assigned to provide warning of train movements.

What he was thinking, we'll never know, but when the caboose cleared the crossing, Burr put his car into motion. Ten seconds later, he was broadsided by a westbound train; he died instantaneously. For a seasoned railroader, this was inexplicable; for inexperienced motorist, it is understandable how this could happen.

This safety program has been in place for more than 20-years and is embraced by most of the major rail carriers in North America concentrating on educating the general public about how to avoid accidents when involved with movement around railroad operations. Grade crossing accidents have reduced considerably; however, there are still far too many resulting from ignorance on the part of the motoring public. The railroads have spent vast sums of money and used untold hours of voluntary labor to try and get this point across: "Trains do not get off the tracks and chase you: You have to get out in front of them to get hit."

For more information about how you can participate in this program or how you can arrange to ride a Lifesafers train, contact Norfolk Southern or any other major railroad that operates in your geographical area. You can also visit them online at <http://oli.org>.