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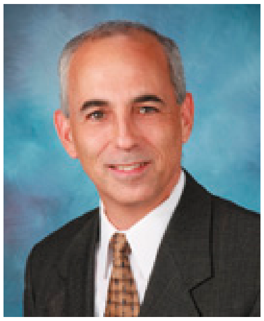
The Complexity of Train Accident Reconstruction



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Dr. Mark Strauss' areas of consulting include accident reconstruction, injury causation, biomechanics, instrumentation, measurement and human factors. Dr. Strauss is an adjunct full professor in the Department of Industrial and Enterprise Systems Engineering at the University of Illinois at Urbana-Champaign and has been teaching engineering there for the past 24 years. His research interests include biomechanics, human factors and truck braking systems and he publishes and presents his research internationally. He received his Ph.D. in biomedical engineering from the University of Texas at Arlington and the Health Sciences Center at Dallas. He also holds an undergraduate degree in mechanical engineering and a master's degree in biomedical engineering. Dr. Strauss is a reviewer of research articles submitted to the Human Factors and Ergonomics Society and the Society of Automotive Engineers, of research proposals submitted to the National Science Foundation and a reviewer for the Department of Defense MIL-STD Design Criteria Standard. Dr. Strauss holds a Class A commercial driver's license with air brake and combination vehicles endorsements.

Reconstructing a train collision can be substantially more complex than a motor vehicle accident reconstruction. The unique operations of trains, combined with the volume of information available surrounding these incidents, can often be overwhelming when analyzed by traditional methods. This increased complexity requires an organized and sophisticated approach to successfully discover what precipitated the loss, and a refined, pedagogic method of explaining the time sequence of events to the jurors.

The analysis of a train collision may utilize data from many sources. In addition to the locomotive event recorder record, there are the Consist Report, the rail car manufacturer specification, the time-stamped recordings of the radio conversations between the train personnel and the dispatcher, and railroad equipment maintenance records.

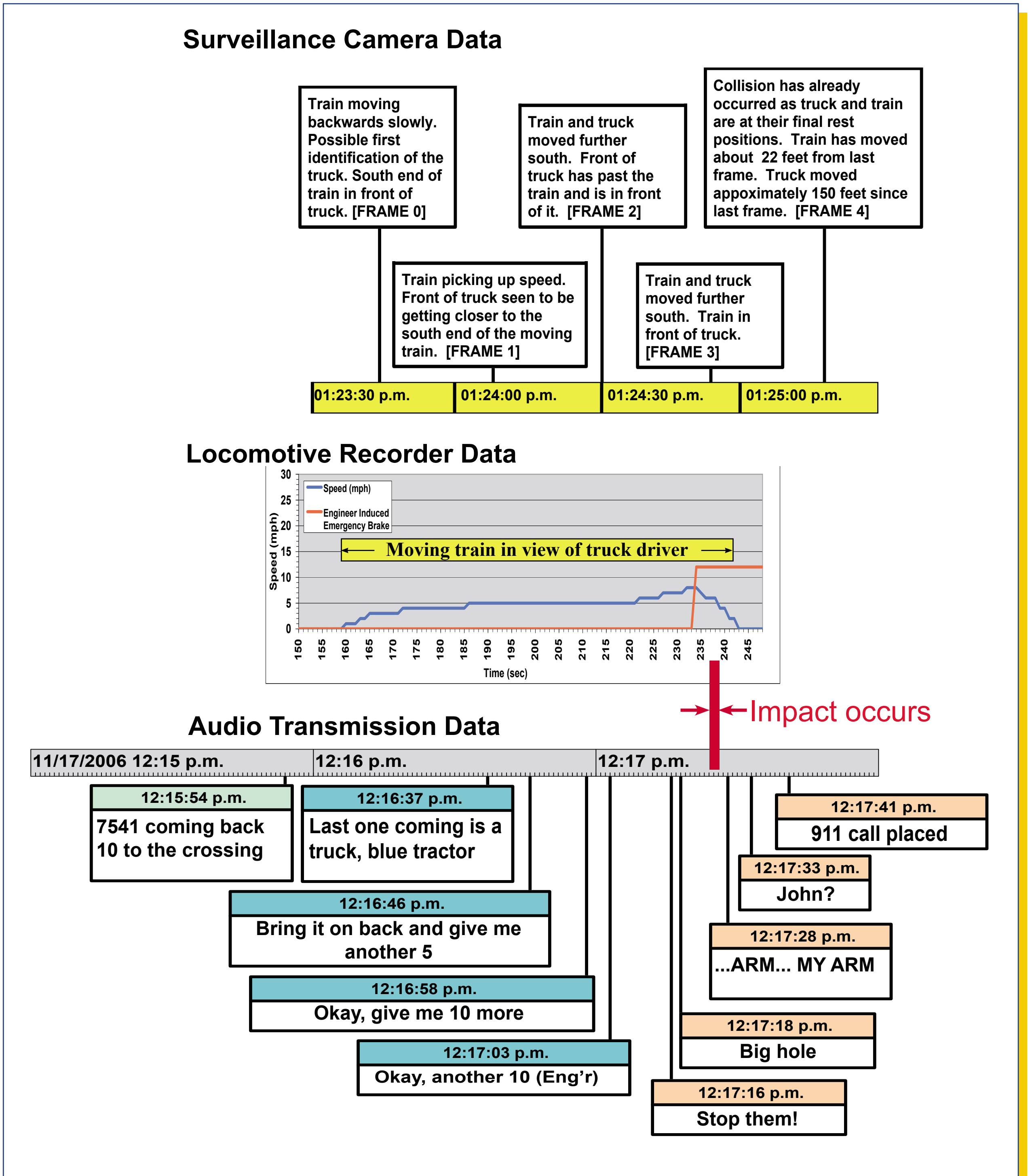
If an on-road vehicle collided with a train, there may be information in its data recorders. A heavy truck engine control module can document pre- and post-crash movements of the tractor-trailer. Cell phone logs, QualComm data and other in-vehicle electronic devices can show if a driver was on the phone or using these devices prior to a collision. Passenger vehicle airbag control modules may record pre-crash speeds and driver actions, as well as the sensed accelerations from the collision. Time stamped receipts for fuel, tolls, food and lodging paint a picture of when and where the driver stopped, and if he violated any applicable FMCSR or had log violations. Inquiring into the hiring and training of commercial vehicle drivers, and maintenance of their vehicles may lead to the discovery of violations. The abundance of video cameras in our environment provides another source of discovery to analyze collisions not available even ten years ago.

The human factors element may be an important element in the analysis. While a road vehicle is under the sole control of the single operator, train operation has multi-user-dependent variables due to the interaction, dependency and communication amongst the crew. For example, the engineer physically operating the controls is often blind to what the conductor sees at the rear of a train when it is backing, and operating commands must be radioed between personnel, increasing reaction times and chances for miscommunication.

If one adds to this the more traditional tools of investigation including aerial photography, road and track surveying, vehicle damage analysis, documenting site lines and distractions, police reports and witness testimony, an incredible volume of data may need to be processed in order to provide a geometric and temporal picture of how the collision occurred. Depending on the type and quality of data available, a reconstruction could determine: the speed and location for each vehicle at key time frames leading up to the collision; where the vehicles were positioned when brakes were applied; what the road vehicle operators, engineer and other railroad personnel could have seen; and how much time was available to react.

On the opposite side of this page you can see an exhibit showing the results of a complex analysis of a train – truck collision. In this instance, a train was reversing onto an industrial rail that crossed a roadway on a diagonal. The corner of the rearmost rail car that was going in reverse struck the right side of the semi-trailer as the truck was crossing the track, causing injury to a member of the train crew.

Ruhl Forensic recreated the accident scenario, performed a visibility study and synchronized the voluminous amounts of data available from numerous sources. We determined that the truck driver had the opportunity to see the train through both the right side window and then the windshield for more than a minute prior to the collision; the engineer applied his brakes 4-6 seconds before the collision; and, the train crew knew the truck was in the vicinity for about 47 seconds before the collision.



Synchronizing data from several sources pinpointed the moment of impact and revealed the actions of the truck driver and train crew immediately prior to the crash.

For more information on this topic, please contact Mark G. Strauss at (800) 355-7800 or mgstrauss@ruhl.com.