

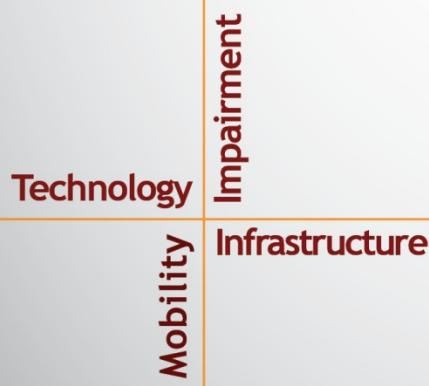


Tips for Sharing the Road with Commercial Motor Vehicles

A Web-Based Approach

Naomi J. Dunn • Stephanie A. Baker • Myra Blanco

Submitted: January 11, 2016



Housed at the Virginia Tech Transportation Institute
3500 Transportation Research Plaza • Blacksburg, Virginia 24061

ACKNOWLEDGMENTS

The authors of this report would like to acknowledge the support of the stakeholders of the National Surface Transportation Safety Center for Excellence (NSTSCE): Tom Dingus from the Virginia Tech Transportation Institute, John Capp from General Motors Corporation, Lincoln Cobb from the Federal Highway Administration, Chris Hayes from Travelers Insurance, Martin Walker from the Federal Motor Carrier Safety Administration, and Cathy McGhee from the Virginia Department of Transportation and the Virginia Center for Transportation Innovation and Research.

The NSTSCE stakeholders have jointly funded this research for the purpose of developing and disseminating advanced transportation safety techniques and innovations.

The Government and others acting on its behalf shall have unlimited rights to obtain, reproduce, publish or otherwise use the data developed in the performance of this cooperative agreement pursuant to 49 CFR Part 19.36.

TABLE OF CONTENTS

LIST OF FIGURES.....	iii
LIST OF ABBREVIATIONS AND SYMBOLS	v
CHAPTER 1. INTRODUCTION.....	1
PURPOSE OF THE STUDY	3
CHAPTER 2. WEBSITE DESIGN	5
IDENTIFICATION OF VIDEO CLIPS.....	5
VOLUNTEERS.....	6
RECRUITMENT	6
ADDITIONAL INFORMATION	6
WEBSITE LAYOUT	7
<i>Homepage</i>	7
<i>Don't Hang Out in the No-Zone</i>	7
<i>Don't Cut Trucks Off!</i>	9
<i>Maintain a Safe Following Distance</i>	10
<i>Properly Passing a Truck</i>	12
<i>Don't Get Squeezed!</i>	13
<i>Crash Photos</i>	15
CHAPTER 3. CONCLUSIONS	17
APPENDIX A. PHONE SCRIPT FOR PARTICIPANT RECRUITMENT.....	19
APPENDIX B. INFORMED CONSENT FORM AND COVER LETTER	21
REFERENCES	25

LIST OF FIGURES

Figure 1. Screenshot. The camera views from a truck NDS conducted by VTTI.....	3
Figure 2. Screenshot. Website homepage.	7
Figure 3. Screenshot. Section of the “Don’t Hang Out in the No-Zone” page.....	8
Figure 4. Screenshot. Section of the “Don’t Cut Trucks Off” page.	9
Figure 5. Screenshot. Simulator screenshots of improper and proper merging.	10
Figure 6. Screenshot. Section of the “Maintain a Safe Following Distance” page.....	11
Figure 7. Screenshot. Section of the “Properly Passing a Truck” page.....	12
Figure 8. Screenshot. Section of the “Don’t Get Squeezed!” page.	14
Figure 9. Screenshot. The “Crash Photos” page.....	15

LIST OF ABBREVIATIONS AND SYMBOLS

ATA	American Trucking Association
CMV	Commercial Motor Vehicle
CVSA	Commercial Vehicle Safety Alliance
FAST DASH	Federal Motor Carrier Safety Administration's Advanced System Testing Utilizing a Data Acquisition System on Highways
FMCSA	Federal Motor Carrier Safety Administration
ICF	Informed Consent Form
NSTSCE	National Surface Transportation Safety Center for Excellence
NDS	Naturalistic Driving Study
SCE	Safety-Critical Event
VTTI	Virginia Tech Transportation Institute

CHAPTER 1. INTRODUCTION

The National Surface Transportation Safety Center for Excellence (NSTSCE) has sponsored two recent research projects focused on investigating light-vehicle driver education programs and the methods utilized to instruct young drivers on how to share the road with heavy vehicles.^(1,2,3) These projects were initiated in response to research findings showing that light-vehicle drivers are at fault in a majority (approximately 78%) of light-vehicle/heavy-vehicle interaction incidents.⁽⁴⁾ These findings may be a result of inadequate light-vehicle driver education training with regard to heavy vehicle dynamics and how to share the road safely with heavy vehicles. Accordingly, a possible solution may be the development of driver education methods, particularly for new generations of drivers, to inform light-vehicle drivers about the capabilities and limitations of commercial motor vehicles (CMV).

To investigate the content of light-vehicle driver education programs, researchers from Virginia Tech Transportation Institute (VTTI) conducted a survey of administrators and teachers of light-vehicle driver education programs in each state in the U.S.^(2,3) The main goal of the survey was to assess driver education curricula content and presentation methods as they pertained to heavy vehicles, and to determine the perceived effectiveness of this material. The survey targeted instructors and administrators of individual state driver education programs. The survey results indicated that over 90% of the respondents included at least one component about how to safely share the road with heavy vehicles in the driver education program they provided. The top two instructional methods used were classroom-based and behind-the-wheel (i.e., on-road training), with approximately 82% of respondents indicating that the instructional methods (or combination of methods) used were effective.

Further qualitative analysis of information found in the open-ended survey questions revealed two major issues: 1) students need hands-on experience with heavy vehicles as part of a driver education program; 2) instructors need up-to-date materials when teaching students how to share the road with heavy vehicles. These results indicate that, while a large proportion of driver education programs included a component on sharing the road safely with trucks, instructors also recognized that there might be room for improvement.^(2,3)

As a follow up to this research, the VTTI research team developed a supplemental practices document to be used in tandem with the textbooks currently employed by driver education professionals.⁽¹⁾ This supplemental practices document was designed to provide driver education professionals with key information for use in teaching students to safely share the road with trucks, as well as guidance on how to best convey this information to students.

The research team also conducted an evaluation of two different components of a light-vehicle driver education program aimed at sharing the road with heavy vehicles to determine what type of content would lead to the best knowledge retention. The first component was a DVD developed by the Commercial Vehicle Safety Alliance (CVSA) titled *Teens and Trucks*, which contained a series of recommended practices for safely sharing the road with trucks (e.g., don't cut trucks off, stay out of blind spots). The second component was a hands-on truck experience program developed by VTTI researchers, which demonstrated proper procedures for sharing the road with trucks, and danger areas around a heavy truck.

Students rated both components as helpful; however, the hands-on truck experience was rated as the more helpful of the two, as students could talk to the truck driver, and sit in the driver's seat to experience the blind spots firsthand. Focus group discussions conducted after students completed the driver education program revealed that the majority of students preferred kinesthetic learning approaches when learning driver-education information. Kinesthetic learning refers to learning by example and experience or via watching videos showing real driving situations.⁽¹⁾ Thus, supplementing driver education materials, such as textbooks, with hands-on experiences may be an effective way of teaching critical sharing-the-road information. One possible way for schools to implement this type of program would be to team up with commercial CMV fleets from their area and organize hands-on demonstrations throughout the school year. If hands-on demonstrations and experiences with trucks cannot be organized or are unavailable, then DVDs depicting real driving situations may also be helpful.

Building on the findings from these previous NSTSCE research projects, the *Tips for Sharing the Road with Commercial Motor Vehicles* website (<http://www.cmvroadsharing.org>) incorporates video clips of real-world driving events captured during one of VTTI's naturalistic driving studies. A naturalistic driving study (NDS) involves installing cameras and sensors on vehicles to record the drivers' day-to-day driving activity. The typical camera placement used in a truck NDS provides a view of the forward roadway, the driver's face (i.e., the camera is attached to the windshield), and back along the trailer on both sides of the truck (see Figure 1). Additional sensors and output from the vehicle network provide information on other variables, such as speed, acceleration, brake use, throttle position, seat belt use, and many other elements.

Rather than focusing solely on improper driving behavior when sharing the road with trucks, the *Tips for Sharing the Road with Commercial Motor Vehicles* website also provides examples of proper road sharing behavior. The rationale for providing examples of both types of behavior was that effective education of drivers, especially those who are young and inexperienced, needs to show not only "what not to do," but should also illustrate the alternative "correct" road sharing behavior. The naturalistic driving video clips shown on the website are all from the truck driver's perspective to highlight the difficulties these drivers face on the road every day due to other drivers' improper road sharing behavior.

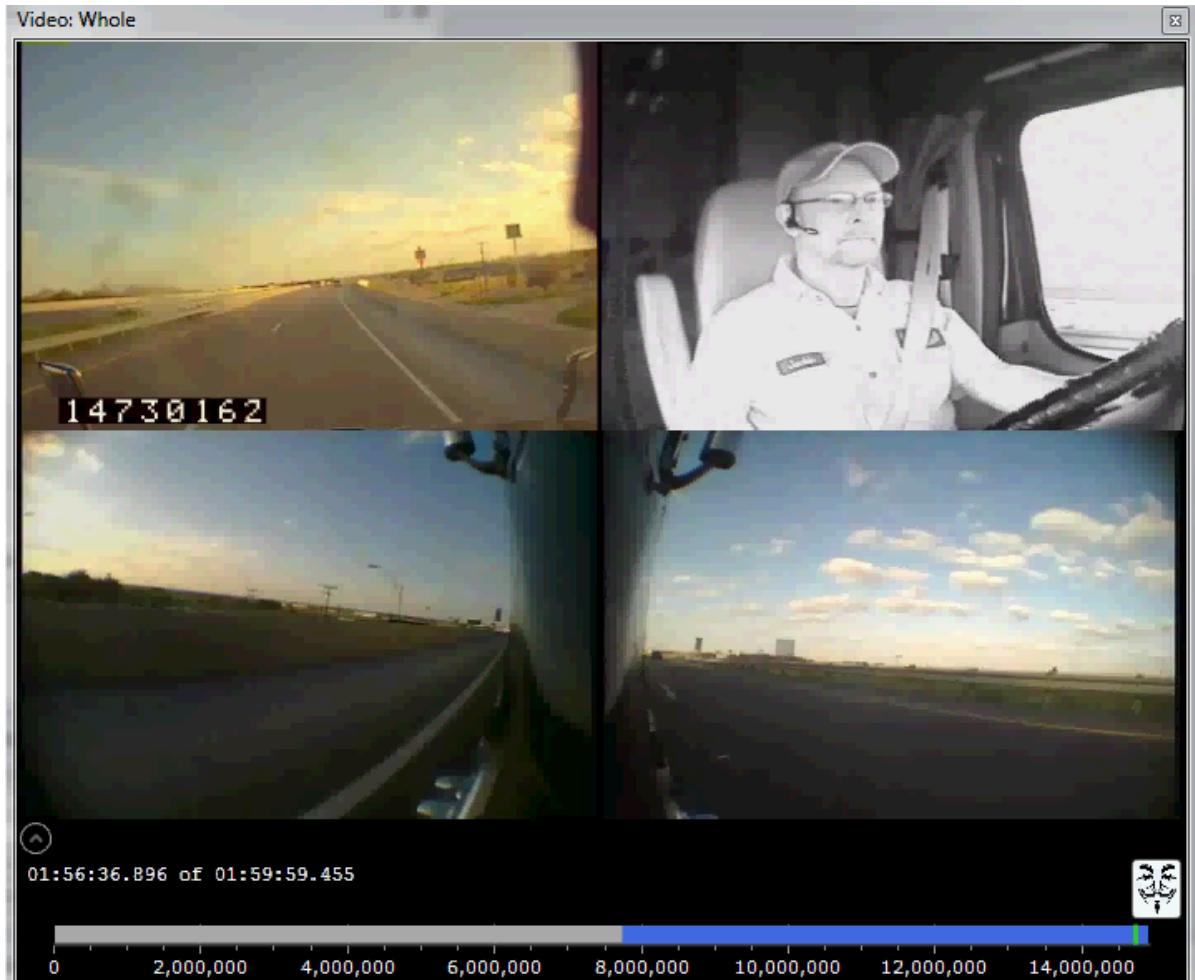


Figure 1. Screenshot. The camera views from a truck NDS conducted by VTTI.

PURPOSE OF THE STUDY

The purpose of this project was threefold: (1) to educate light-vehicle drivers about the importance of proper road sharing behavior; (2) to raise awareness about the key areas of concern when sharing the road with trucks; (3) to teach light-vehicle drivers some handy tips and rules of thumb to help them practice proper road sharing behavior.

The *Tips for Sharing the Road with Commercial Motor Vehicles* website was designed to cover five key sharing-the-road scenarios, including the following:

- Don't Hang Out in the No-Zone
- Maintain a Safe Following Distance
- Don't Get Squeezed
- Properly Pass Trucks
- Don't Cut Trucks Off

This website is based on naturalistic driving data, and will act as a publicly accessible supplemental driving tips training program.

CHAPTER 2. WEBSITE DESIGN

The website was designed to raise awareness of the key areas of concern when sharing the road with trucks, as well to as provide drivers with some handy tips and rules of thumb to help them practice proper road sharing behavior. The website combines naturalistic driving video clips, simulator screenshots, scenario descriptions, short tips and facts, as well as photographs of actual crashes between light and heavy vehicles to convey the importance of proper road sharing behavior.

IDENTIFICATION OF VIDEO CLIPS

The video clips included on the website were identified in one of VTTI's previously collected naturalistic truck driving data sets. The chosen data set was collected as part of the Federal Motor Carrier Safety Administration's (FMCSA) Advanced System Testing Utilizing a Data Acquisition System on Highways (FAST DASH) program, which is a multi-year cooperative agreement funded by FMCSA that currently comprises three distinct projects. The goal of the FAST DASH program is to conduct a fast turnaround and independent evaluation of promising safety technologies aimed at commercial vehicle operations.⁽⁵⁾ Although the naturalistic driving data had already been collected for FAST DASH's first project—an evaluation of a blindspot warning system—and driver consent for that project had previously been obtained, additional consent from the individual CMV drivers was required to permit the research team to display the video clips on a publicly available website. Since the FAST DASH project had been recently completed, the decision to focus the data mining efforts on this data set was reinforced, as the drivers would be easier to both contact and recruit.

Video data from the FAST DASH Blindspot Warning System project was reviewed to identify examples of events that demonstrated light-vehicle/heavy-vehicle interactions covered by the five key sharing-the-road scenarios. Further information on how the data was collected for the FAST DASH Blindspot Warning System project can be found in that project's Final Report.⁽⁶⁾ Specifically, the research team searched for examples of proper and improper road sharing behavior for the following scenarios:

- Merging in front of a truck and changing lanes in front of a truck, both of which fall into the “Don’t Cut Trucks Off” category (four video clips identified in total)
- Right no-zone (There is only one video clip identified for this category; there is no “proper” example, as drivers should never pass a truck on the right.)
- Left no-zone (two video clips identified)
- Passing a truck (two video clips identified)
- Right hand squeeze (two video clips identified)

Therefore, it was determined that a total of eleven video clips would be used to illustrate all of the scenarios of interest. The arrangement of cameras installed on the trucks that participated in FAST DASH Blindspot Warning System project did not allow for recording of footage depicting following distance. Thus, the research team filmed video footage related to the “Maintain a Safe Following Distance” tip on the Virginia Smart Road at VTTI.

VOLUNTEERS

The volunteer pool comprised approximately 20 CMV drivers (all males) who had participated in the FAST DASH Blindspot Warning System project. Potential volunteers for the website were not contacted by the VTTI research team until their video data had been reviewed and a safety-critical event (SCE) of interest had been identified. Thus, not all drivers from the FAST DASH Blindspot Warning System project were contacted to participate in the current study. Initially, six drivers were recruited to provide video clips for the website; however, one driver dropped out due to health issues before he could complete the consent procedure. Therefore, the final 11 naturalistic driving video clips displayed on the website came from 5 drivers in total.

RECRUITMENT

Once a relevant video clip was selected, the CMV driver from the FAST DASH Blindspot Warning System project was contacted by phone to seek their permission to include the video clip on the website (see Appendix A for phone script). Only drivers who had agreed to be contacted for future studies were included on the initial contact list. Once contact was made, the driver was briefed about the purpose of the study and the purpose of the call. If the driver indicated he was interested in participating in the study, he was informed that he would be given the opportunity to view the relevant video clip (or multiple clips for some drivers) through a secure site before he decided whether to release it for the study. Drivers' contacted were also informed that they would receive a compensation of \$100 per clip used on the website.

Upon agreeing to participate, drivers were sent an information packet by mail containing two informed consent forms (ICF), a W-9 payment form, a self-addressed stamped envelope, and a cover letter with instructions on how they could view their clip(s). Appendix B presents the ICF and cover letter the participants received. Once a participant had viewed his video clip(s), he was required to mark the appropriate checkbox in the "Participant's Acknowledgement" section on the ICF and sign and print his name in the "Participant's Permission" section. The driver then mailed the completed ICF and W-9 payment form back to VTTI using the self-addressed stamped envelope provided. Once the research team received the completed forms, compensation (\$100 per clip) was mailed out to the driver in the form of a check.

ADDITIONAL INFORMATION

In addition to the naturalistic driving video clips, other useful information, tips, and crash photos were gathered from a variety of sources. A request for crash photos involving conflicts between heavy vehicles and light vehicles was submitted to Roanoke County Police and Virginia State Police, both of whom provided a number of useful photos for inclusion on the website. Other information, statistics, and tips were sourced from previous research conducted by VTTI,^(1,2,3) CVSA,⁽⁷⁾ FMCSA,⁽⁸⁾ and the American Trucking Association (ATA).⁽⁹⁾

WEBSITE LAYOUT

Homepage

The website comprises a total of seven sections. The homepage, shown in Figure 2, provides a summary of the purpose and goals of the website and also a brief explanation of the different kinds of material viewers can expect to see on each page.

The screenshot shows the homepage of a website dedicated to road safety. At the top, there is a dark red navigation bar with white text containing links to 'HOME', 'DON'T HANG OUT IN THE NO-ZONE', 'DON'T CUT TRUCKS OFF', 'MAINTAIN A SAFE FOLLOWING DISTANCE', 'PROPERLY PASSING A TRUCK', 'DON'T GET SQUEEZED!', and 'CRASH PHOTOS'. Below the navigation bar, the main title 'TIPS FOR SHARING THE ROAD WITH COMMERCIAL MOTOR VEHICLES' is displayed in a large, bold, dark red font. Underneath the title, there is a section of text providing an overview of the website's purpose and the types of content available. This includes information about the video clips being from a naturalistic driving study at Virginia Tech Transportation Institute (VTTI), the simulator used to record driving activities, and the inclusion of both improper and proper road sharing behavior examples. It also mentions the availability of crash photos. A list of five key areas addressed on the website follows, which correspond to the links in the navigation bar. At the bottom of the page, there is a footer area featuring the logos for Virginia Tech Transportation Institute and the National Surface Transportation Safety Center for Excellence (NSTSCE). The footer also includes a copyright notice: '© Virginia Tech Transportation Institute 2015. All Rights Reserved.'

Figure 2. Screenshot. Website homepage.

Don't Hang Out in the No-Zone

The “Don’t Hang Out in the No-Zone” page provides details about blind spots, which are also called “no-zones.” As Figure 3 shows, the first section of this page illustrates the no-zone locations, the dangers of traveling in the no-zones, as well as a “rule of thumb,” which is essentially a short, useful tip to help people drive safely when sharing the road with large trucks. For example, the rule of thumb provided on the “Don’t Hang Out in the No-Zone” page is: “*The larger the vehicle, the larger the blind spot. If you can’t see the truck driver in his/her mirrors, then the truck driver can’t see you!*”

DON'T HANG OUT IN THE NO-ZONE

You might assume that truck drivers have a better view of the road because they sit up so much higher than other cars and have large side mirrors. In fact, the size and height of a truck actually creates four main blind spots around the truck that other drivers should avoid. These blind spots are also called "no-zones" and are located at the:

- Front of the truck,
- Back of the truck,
- Left side of the truck, and
- Right side of the truck.

When your vehicle is in a no-zone, it essentially "disappears" from the truck driver's view. One-third of fatal crashes between cars and trucks occur in these four blind spots, so consider them to be danger zones.

RULE OF THUMB: THE LARGER THE VEHICLE, THE LARGER THE BLIND SPOT. IF YOU CAN'T SEE THE TRUCK DRIVER IN HIS/HER MIRRORS, THEN THE TRUCK DRIVER CAN'T SEE YOU!

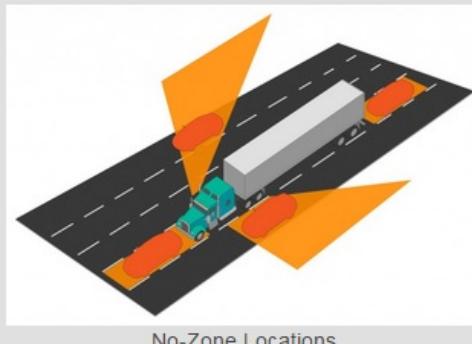


Figure 3. Screenshot. Section of the “Don’t Hang Out in the No-Zone” page.

The remaining subsections of the “Don’t Hang Out in the No-Zone” page provide information about the two no-zones on either side of the truck. The first subsection, titled “No passing in the right no-zone,” outlines the dangers of the blind spot on the passenger’s side of the truck and why trucks should never be passed on the right. Included is an NDS video clip illustrating the dangers of passing on the right. The second subsection on this page, titled “Pass steadily through the left no-zone,” outlines the dangers of the left blind spot, located on the driver’s side of the truck, while reiterating that drivers should pass steadily and safely through the left no-zone and not linger. Included are two NDS video clips, one depicting improper road sharing behavior (i.e., a vehicle traveling alongside the truck in the left no-zone for an extended period of time) and the other illustrating proper road sharing behavior (i.e., a vehicle passing through the left no-zone at a steady pace).

Don't Cut Trucks Off!

The “Don’t Cut Trucks Off” page provides a breakdown of the dangers of the front no-zone, located in front of the truck (see Figure 4). There is also a rule of thumb: “*Look for the entire front of the truck cab—from the bumper to the top of the cab—in your rearview mirror before changing lanes in front of a truck. Don’t put yourself and others in harm’s way. Stay out of the front no-zone!*” This is accompanied by a figure depicting the reflection of the entire front of a truck in a rearview mirror.

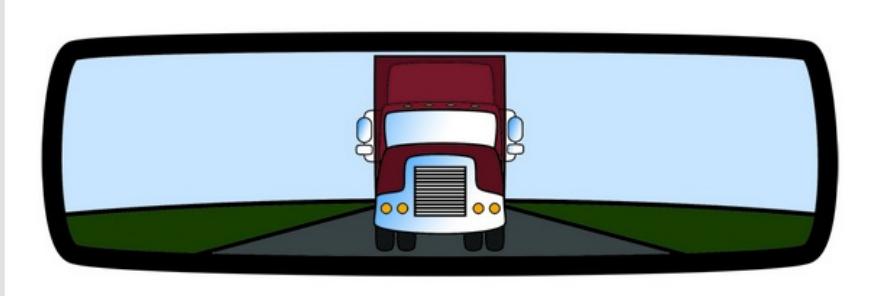
DON'T CUT TRUCKS OFF! STAY OUT OF THE FRONT NO-ZONE

The front blind spot, or no-zone, is located in front of the truck and should be avoided for two reasons:

- Due to the size and height of the truck, your vehicle can completely disappear from the truck driver's view when you enter the front no-zone. If you cut into the front no-zone and hit the brakes, the truck driver won't see you and you'll cause a crash.
- Trucks need plenty of room to brake or slow down. If you're in the front no-zone and traffic comes to a stop or slows down quickly, the truck won't have enough time to stop, and approximately 80,000 pounds of truck will slam into the back of your car.

Remember, unpredictable and unexpected things happen ALL THE TIME when you're driving. Animals can run out on the road; there may be debris or other objects on the road that need to be avoided; another driver may cut you off, causing you to slam on your brakes.... If any of these things were to happen while you were in a truck's front no-zone, chances are it would end in tragedy for you and your passengers.

RULE OF THUMB: LOOK FOR THE ENTIRE FRONT OF THE TRUCK CAB – FROM THE BUMPER TO THE TOP OF THE CAB – IN YOUR REARVIEW MIRROR BEFORE CHANGING LANES IN FRONT OF A TRUCK. DON’T PUT YOURSELF AND OTHERS IN HARM’S WAY. STAY OUT OF THE FRONT NO-ZONE!



Truck in rear view mirror

Figure 4. Screenshot. Section of the “Don’t Cut Trucks Off” page.

The remaining two subsections on the “Don’t Cut Trucks Off!” page provide further information and details about the scenarios that may result in drivers cutting trucks off. The first scenario is “Changing Lanes in Front of a Truck,” which is essentially when a driver changes lanes without leaving sufficient room for the truck to slow down or stop, if necessary. The following caption from this section of the webpage explains exactly why this is so dangerous:

Under NO CIRCUMSTANCES should you EVER cut in front of a truck, especially if the traffic is slowing or stopped ahead! Large trucks have much longer stopping distances than passenger vehicles. At 55 mph, it can take a large truck more than the length of a football field to stop. In 2013, four out of every five people killed in a crash involving a large truck were occupants of other vehicles. In other words, you're risking your life and the lives of your passengers by being impatient and not allowing the truck to pass safely. PLEASE BE PATIENT and wait for a more suitable gap in traffic.

This section provides NDS video clips and simulator screenshots depicting a birds-eye view of improper road sharing behavior (i.e., a vehicle cutting into the front no-zone of a truck) and proper road sharing behavior (i.e., a vehicle passing a truck and leaving plenty of space before signaling and changing lanes in front of the truck).

The second scenario on the “Don’t Cut Trucks Off!” page is “Merging in Front of a Truck.” Much like changing lanes in front of a truck, improper merging is dangerous because trucks require a significantly longer stopping distance than light-vehicles. This section also provides NDS video clips and simulator screenshots of improper and proper road sharing behavior. An example of the simulator screenshots is shown in Figure 5.

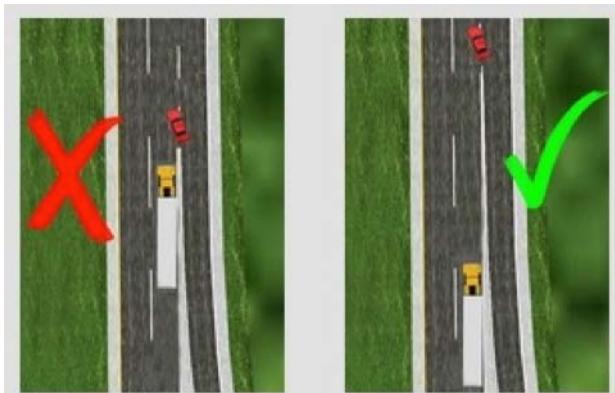


Figure 5. Screenshot. Simulator screenshots of improper and proper merging.

Maintain a Safe Following Distance

The “Maintain a Safe Following Distance” page provides details of a truck’s rear no-zone and outlines the reasons why following too closely behind a truck is so dangerous (see Figure 6). The following caption from the webpage explains the dangers:

Following too closely behind a truck is dangerous for a number of reasons. First, you have no idea what's in front of the truck on the road ahead. If the truck driver passes over debris on the road, like a truck tire, you won't see it in time to safely avoid hitting it. Secondly, trucks carry cargo that may move and fall from the truck onto the road. If you're following too closely, you'll have no room to avoid colliding with anything that falls in front of you. Finally, by following too closely to the back of a truck, you cut off your own view of the traffic flow ahead. If the truck driver has to brake suddenly - for instance, if another driver cuts in front of the truck - you won't have enough time and space to avoid crashing into the back of the truck.

MAINTAIN A SAFE FOLLOWING DISTANCE – STAY OUT OF THE REAR NO-ZONE

The rear blind spot, or no-zone, is located behind the trailer of the truck and results from the truck driver having only side rearview mirrors to rely on. The rear no-zone extends nearly 200 feet from the back of the truck, which is roughly the length of half a football field. If you are any closer than this to the back of a truck then you are following too closely and are essentially invisible to the truck driver.

Following too closely behind a truck is dangerous for a number of reasons. First, you have no idea what's in front of the truck on the road ahead. If the truck driver passes over debris on the road, like a truck tire, you won't see it in time to safely avoid hitting it. Secondly, trucks carry cargo that may move and fall from the truck onto the road. If you're following too closely, you'll have no room to avoid colliding with anything that falls in front of you. Finally, by following too closely to the back of a truck, you cut off your own view of the traffic flow ahead. If the truck driver has to brake suddenly – for instance, if another driver cuts in front of the truck – you won't have enough time and space to avoid crashing into the back of the truck.



Crashing into the back of a truck results in a specific type of crash called an "underride," where the front end of the car is pushed under the rear of the truck's trailer. This type of crash can be especially dangerous if the truck isn't equipped with an adequate underride guard, as the bottom rear of the trailer is about head-level for an adult seated in a car. This means the only thing between your head and the rear of the trailer is the car's windshield, which will obviously provide zero protection from such an impact.

This is NOT a scenario you want to find yourself in so STAY BACK!!

RULE OF THUMB: LOOK FOR THE TRUCK DRIVER'S MIRRORS AS YOU ARE FOLLOWING. IDEALLY YOU WANT TO BE FAR ENOUGH BACK TO SEE THE MIRRORS ON BOTH SIDES OF THE TRUCK. BUT, AT A MINIMUM, YOU SHOULD SEE THE MIRRORS ON THE LEFT DRIVER'S SIDE.

Figure 6. Screenshot. Section of the “Maintain a Safe Following Distance” page.

This page provides a rule of thumb: “*Look for the truck driver’s mirrors as you are following. Ideally you want to be far enough back to see the mirrors on both sides of the truck. But, at a minimum, you should see the mirrors on the left driver’s side.*” Also included are simulator screenshots of improper and proper following behavior along with a video clip. The video clip on this page, however, is different from the others on the website as it was filmed on the Smart Road at VTTI to specifically show a car following a truck too closely. The clip provides multiple views of the scenario, including, for example, views from the car driver’s perspective and from the back of the truck’s trailer, so viewers can get a better feel for the scenario.

Properly Passing a Truck

The “Properly Passing a Truck” page (see Figure 7) combines a number of key points covered in other sections including the following:

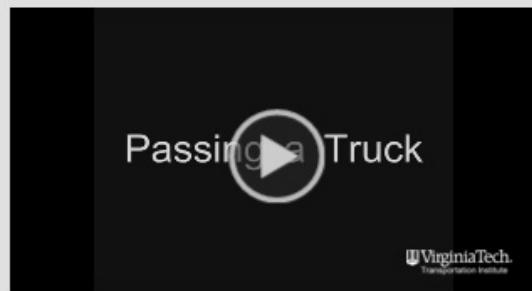
- *NEVER pass a truck on the right.*
- *DO NOT linger next to the truck, ESPECIALLY in the truck driver’s blind spot.*
- *DO NOT change lanes in front of a truck until you can see the entire front of the truck in your rearview mirror. NEVER change lanes in front of a truck then brake or slow down suddenly.*

PROPERLY PASSING A TRUCK

When sharing the road with trucks it is EXTREMELY important to practice proper passing behavior. We've already covered most things to remember for proper passing. To recap...

- NEVER pass a truck on the right. Pass a truck in the left lane as that's the side where the truck driver can see your vehicle for the longest period of time as you're passing.
- DO NOT linger next to the truck, ESPECIALLY in the truck driver's blind spot. Remember, if you can't see the truck driver in his mirror then he can't see you. Lingering next to a truck creates a dangerous situation where you may be sideswiped by the truck if it swerves or attempts to change lanes. Move at a safe and steady speed until you are far enough past the truck to change lanes.
- Most importantly, DO NOT change lanes in front of a truck until you can see the entire front of the truck in your rearview mirror. NEVER change lanes in front of a truck then brake or slow down suddenly.

The following clip shows an extremely dangerous improper passing scenario. Notice the black pickup truck speeding up from behind and passing the truck in the passenger's side right no-zone blind spot. In the forward roadway view, you can see that the traffic ahead is stopped so when the pickup changes lanes in front of the truck, directly into the front no-zone, then stops quickly, the truck driver has to slam on his brakes, only narrowly avoiding smashing into the back of the pickup.



This clip illustrates pretty much everything you should NEVER do when passing a truck. The pickup recklessly speeds up behind the truck and passes on the passenger's side of the truck, then cuts dangerously close in front of the truck and stops suddenly. All of these elements combined create an incredibly dangerous situation that could easily have ended in tragedy if not for the truck driver's quick reaction. PLEASE DO NOT drive recklessly when sharing the road with trucks. Remember to exercise caution when passing trucks on the road. It could save your life and the lives of your passengers!

Figure 7. Screenshot. Section of the “Properly Passing a Truck” page.

The “Properly Passing a Truck” page also includes two NDS video clips depicting improper and proper passing behavior.

Don’t Get Squeezed!

The “Don’t Get Squeezed!” page (see Figure 8) provides details about a particularly dangerous scenario related to trucks making right-hand turns at intersections or into driveways. The following is a caption from the webpage explaining the right-hand squeeze scenario:

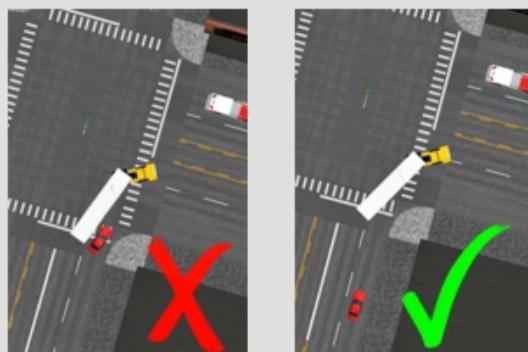
Most people don’t realize how much extra room trucks need to maneuver safely on the road, particularly when turning at an intersection or into a driveway. For example, when preparing to turn right, a truck driver needs to first swing wide to the left, and sometimes even briefly move into the left lane, away from the curb to get their trailer around the corner safely without driving over the curb or the sidewalk. This is because during a turn, the rear wheels of the truck follow a shorter path than the front wheels, so the rear of the trailer cuts much closer to the curb. When a truck driver moves over to the left before a right-hand turn, it may be tempting to squeeze past on the right between the truck and the curb. But you should NEVER put yourself in this situation as you can get crushed. Remember, attempting to pass on the right will also put your vehicle in the trucks passenger side blind spot and the truck driver will have no idea that your car is there.

This page includes simulator screenshots and two NDS video clips depicting improper and proper road sharing behavior in a right-hand turn scenario. The “Don’t Get Squeezed!” page also provides a rule of thumb:

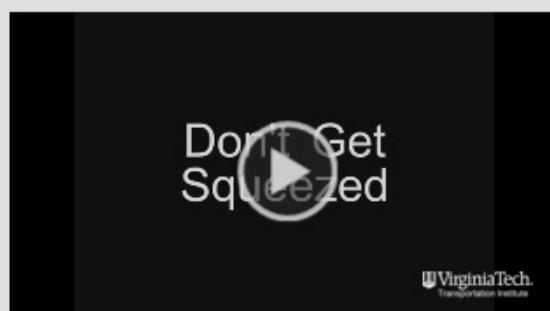
Avoid passing trucks while they are turning and never attempt to cut in along the right side of a turning truck. Wait to assess the truck driver’s intent before passing. Remember, trucks don’t operate like regular vehicles and need more room to maneuver safely on the road so please be patient and give them the time and space they need.

DON'T GET SQUEEZED!

Most people don't realize how much extra room trucks need to maneuver safely on the road, particularly when turning at an intersection or into a driveway. For example, when preparing to turn right, a truck driver needs to first swing wide to the left, and sometimes even briefly move into the left lane, away from the curb to get their trailer around the corner safely without driving over the curb or the sidewalk. This is because during a turn, the rear wheels of the truck follow a shorter path than the front wheels, so the rear of the trailer cuts much closer to the curb. When a truck driver moves over to the left before a right-hand turn, it may be tempting to squeeze past on the right between the truck and the curb. But you should NEVER put yourself in this situation or you could get crushed by the trailer. Remember, attempting to pass on the right will also put your vehicle in the truck's passenger side blind spot and the truck driver will have no idea that your car is there.



The first clip provides an example of improper road sharing behavior in a right-hand turn scenario. In the forward roadway view, you'll notice that the truck driver moves into the left hand lane as he approaches the intersection to make a right-hand turn. A dark grey minivan approaches from behind the truck into the right no-zone and squeezes past just as the truck driver is starting to make the right-hand turn. Luckily, the minivan driver makes it through without incident. But if you keep watching the passenger's side blind spot view you'll see how far the rear of the trailer cuts over into that right-hand lane. Had the minivan not made it past the turning truck and been in that lane during the turn, it would have been crushed by the rear of the truck trailer.



RULE OF THUMB: AVOID PASSING TRUCKS WHILE THEY ARE TURNING AND NEVER ATTEMPT TO CUT IN ALONG THE RIGHT SIDE OF A TURNING TRUCK. WAIT TO ASSESS THE TRUCK DRIVER'S INTENT BEFORE PASSING. REMEMBER, TRUCKS DON'T OPERATE LIKE REGULAR VEHICLES AND NEED MORE ROOM TO MANEUVER SAFELY ON THE ROAD SO PLEASE BE PATIENT AND GIVE THEM THE TIME AND SPACE THEY NEED.

Figure 8. Screenshot. Section of the “Don’t Get Squeezed!” page.

Crash Photos

The final page on the website is “Crash Photos,” which depicts photographs of actual crashes between cars and trucks (see Figure 9). As the page explains, the sole purpose of the photographs is to show the potentially devastating outcome of a collision with a truck. The following caption from this page sums up the main message of the website:

Remember, one simple mistake, one bad decision, one moment of impatience or recklessness, one second of poor judgment, is all it takes for crashes like this to occur. Be patient and use good judgment when sharing the road with trucks. It could save your life and the lives of your passengers!

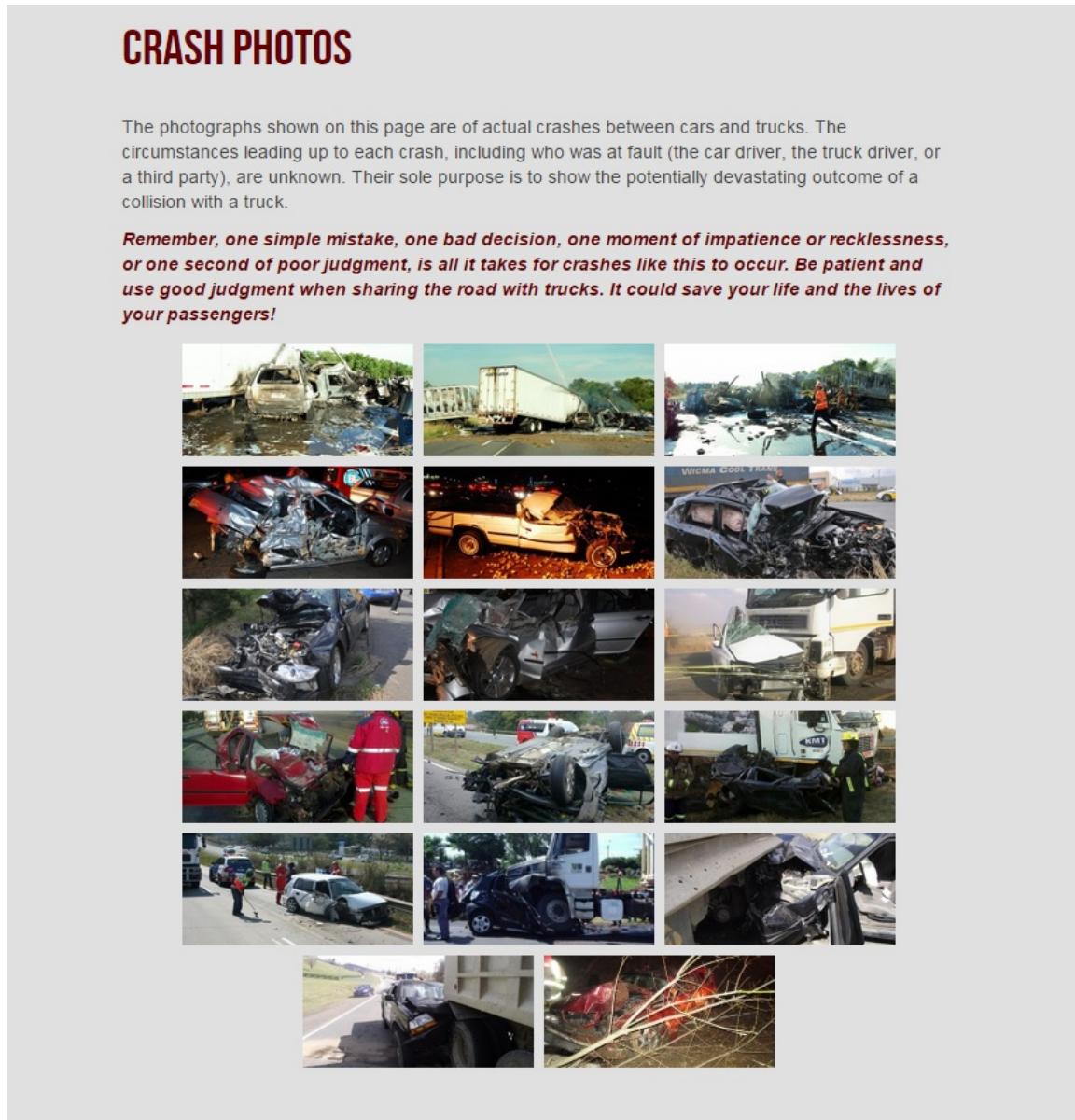


Figure 9. Screenshot. The “Crash Photos” page.

CHAPTER 3. CONCLUSIONS

The website has received positive feedback from reviewers thus far. As part of the outreach program with NSTSCE, the website is currently available at <http://www.cmvroadsharing.org>.

APPENDIX A. PHONE SCRIPT FOR PARTICIPANT RECRUITMENT

Name _____ Male/Female _____
Phone Numbers _____
Best Time to Call _____
Screener _____

Note to Researcher:

Initial contact between participants and researchers will take place over the phone. Please read the following Introductory Statement, followed by the purpose of the study and consent procedure.

Introductory Statement:

Hello. My name is _____ and I am a researcher at the Virginia Tech Transportation Institute in Blacksburg, VA. I am contacting drivers who participated in the FAST DASH study to request their additional consent to use their video data on a public website for driver training purposes. This website will act as a supplemental driving tips training program that would be accessible to the public and be based on naturalistic driving data.

Purpose of the Study:

The purpose of this study is to develop a website dedicated to providing video examples of real-world scenarios involving light-vehicle/heavy-vehicle interactions, as well as proper sharing-the-road driving behavior. It is important to highlight that the video examples selected focus on particular scenarios where heavy vehicle drivers are performing the scenario correctly, with the surrounding light vehicles performing poor sharing-the-road behavior.

For this study, we reviewed and selected X of your video data clip(s) as suitable for this study. For using the video clips, we will pay you \$100 per clip as compensation. I am contacting you to seek your consent to use your video data clip(s) on public website. Does this sound like something you would be interested in?

If they indicate that they are not interested:

Thank you for your time.

If they indicated that they are interested:

That's great. I would like to tell you more about the nature of the video data clip(s) and the consent procedure.

Video Data and Consent Procedure: *Your video data clip(s) may demonstrate your behavior in response to a critical safety event such as a near crash/crash or an avoidance maneuver in response to a critical incident. Note that before you provide your consent, you will have the opportunity to review your video data clip(s) and also the consent document which you will sign and return to us if you are interested in participating. If you are interested in participating, I will send you a package of materials that will walk you through the process of reviewing your videos and giving your consent to participate.*

In any case, you are free to refuse the use of your video clip(s) without any penalties.

Does this sound like something you would like to participate in?

If they indicate that they are **not** interested:

Thank you for your time.

If they indicated that they **are** interested:

That's great.

Before we get off the phone I would like to verify your full name and the mailing address, as I will be sending the study documents to you.

First: _____ Last: _____

Address: _____

Thank you!

Please note that we will soon mail you some documents which will include detailed instructions for how to review the videos of you that we have selected, two informed consent forms, one form for you to sign and return to us as proof of your consent and the other form for you to sign and keep it for your own records. There will also be a W-9 form that you need to complete in order to receive your payment. Upon completing the paperwork please mail the documents back to us in the self-addressed, stamped envelope that we provide.

Do you have any questions?

If they answer “yes”:

Answer their questions.

If they answer “no”:

Thank you for your time. If you have any questions regarding this study, please feel free to contact me during business hours at 540-231-XXXX.

APPENDIX B. INFORMED CONSENT FORM AND COVER LETTER

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY

Informed Consent for Participants of Investigative Projects

Title of Project: Tips for Sharing the Road with Commercial Motor Vehicles: A Web-Based Approach

Investigators: Naomi Dunn and Stephanie Baker

I. The Purpose of this Research/Project

The goal of this project is to develop a website dedicated to providing video examples of real-world scenarios involving light-vehicle/heavy-vehicle interactions, as well as proper sharing-the-road driving behavior. Light-vehicle driver education that contains content about sharing the road with heavy vehicles may be helpful in reducing future light-vehicle/heavy-vehicle interactions.

II. Procedures

During the course of this experiment you will be asked to perform the following tasks:

- 1) Log in to VTTI's secure website.
- 2) Review your video clip(s) for which the consent is required; alternatively, if you do not want to review the video clips, you can consent to our use of the clips without reviewing them.
- 3) Log out of the website.
- 4) Provide your consent to use your video clip(s) for the sharing the road website by:
 - a. Marking the appropriate checkbox in the 'Participant's Acknowledgement' section on page 3 of this document, and
 - b. Signing and printing your name in the 'Participant's Permission' section on page 3 of this document.
- 5) Mail the completed informed consent form back to VTTI using the self-addressed stamped envelope.

III. Risks

There are risks or discomforts to which you may be exposed by providing your consent for this research. They include the following:

- 1) Your video clip(s) will be accessible to the general public via the internet.
- 2) Your video clip(s) will show your face, the forward view, side views, and your actions in response to the driving situation as demonstrated through the video.
- 3) Through your video clip(s), you may be identified by those who know you.

The following precautions will be taken to ensure minimal risk to you:

- 1) The video clip(s) will be posted on the website in "view-only" format. This limits one's ability to save the video content to their computer hard-drive.
- 2) The video clip available on the website will be free of content that may create any undue risk to your identification. For example, specific areas in the video that may reveal your truck company name, your name tag, etc., will be edited out/concealed.

- 3) Your video clip(s) will not reveal your name or your affiliation to your employer.
- 4) All reasonable and appropriate security and website design measures will be taken to minimize the risk of the website being breached by an outside party.

IV. Benefits of this Project

While there are no direct benefits to you from this research, you may find the study and its goals interesting. Light-vehicle driver education that contains content about sharing the road with heavy vehicles may be helpful in reducing future light-vehicle/heavy-vehicle interactions. No promise or guarantee of benefits is made to encourage you to participate.

V. Extent of Anonymity and Confidentiality

The researchers will release only that data that you consent to use on the public website. If you choose to not give your consent, VTTI will not turn over the digital video of your image to anybody.

VI. Compensation

You will be paid \$100 per video clip that is used. Upon receiving the signed consent document and completed W-9 form, VTTI will mail a check to you. If your payments are in excess of \$600 in any one calendar year, then by law, Virginian Tech is required to file Form 1099 with the IRS. For any amount less than \$600, it is up to you as the participant to report any additional income as Virginia Tech will not file Form 1099 with the IRS. Also note that you must provide your social security number on the W-9 form to allow us to process your payment. For tax recording purposes, the fiscal and accounting services office at Virginia Tech requires that all participants provide their social security number on the W-9 form to receive payment for participation in our studies.

VII. Freedom to Withdraw

If you feel you need to withdraw from this study, you are free to do so without any penalty. Once the website is finalized, it will be publically available; thus, we will have no control over who views your video(s). If at a later time you decide you would like your video(s) removed from the website, you may contact Naomi Dunn at the Virginia Tech Transportation Institute at 540-231-1064 and every effort will be made to remove your video clip(s) from the website.

VIII. Approval of Research

Before data can be collected, the research must be approved, as required, by the Institutional Review Board for Research Involving Human Subjects at Virginia Polytechnic Institute and State University. You should know that this approval has been obtained. This form is valid for the period listed at the bottom of the page.

IX. Subject's Responsibilities

If you voluntarily agree to participate in this study, you will have the following responsibilities:

1. You will have the opportunity to review your video clip(s) online using the secure website.
2. On the website, you may review your video clip(s) as many times as you like.

- Upon reviewing the video clips, you will complete this informed consent document by marking the appropriate check-box in the ‘Participant’s Acknowledgement’ section and signing and printing your name in the ‘Participant’s Permission’ section below.

X. Participant's Acknowledgments

Check the following:

- I **do not** have any objections to VTTI using my selected video clip for this project and I've been informed of the possible risks of signing this consent form.
 - I do **have objections** to VTTI using my selected video clip(s) on the public website and I do not wish to give my consent to participate in this study.

XI. Participant's Permission

I have read and understand the Informed Consent and conditions of this project. I have had all my questions answered. I hereby acknowledge the above and give my voluntary consent for participation in this project and understand that I must provide a copy containing my signature in a manner indicated above. If I participate, I may withdraw at any time without penalty and request that my video clip(s) be removed from the website.

By signing and printing my name below along with today's date I provide my consent to VTTI to use my video data and I agree to abide by the rules of this project.

Participant's Signature Participant's Name (Print) Date

Experimenter's Name (Print) **Initial** **Date**

Should I have any questions about this research or its conduct, I may contact:

Naomi Dunn 540-231-1064
Myra Blanco 540-231-1551
David Moore (Institutional Review Board Chair) 540-231-4991

Cover Letter to potential participants

[DATE]

Subject: Instructions to participate in the Tips for Sharing the Road with CMVs website.

Dear [Participant's Name]:

The Virginia Tech Transportation Institute would like to thank you for agreeing to review these materials for our "Sharing the Road with CMVs" study. The purpose of this study is to develop a webpage dedicated to providing video examples of real-world scenarios involving light-vehicle/heavy-vehicle interactions, as well as proper sharing-the-road driving behavior. This webpage will be accessible to the general public.

To view your video clip(s), please go to www.secure.vtti.vt.edu and log in to this website by entering the following information in the username and password fields:-

Username: XXXX

Password: XXXX

After logging in, you will be given instructions for how to review your video(s) and indicate whether you are willing for it/them to be on the website.

If you wish to give your consent for use of your videos without reviewing them, you have the option to do so. Please just complete and return the informed consent form provided.

Enclosed you will find two copies of Informed Consent Form that was mentioned during our telephone conversation. One copy of the informed consent form is for you to keep and the other copy is for you to send back to us. Please read the Informed Consent form and complete it by marking the appropriate check box either allowing/declining use of your video clip(s) on the public website. Also enclosed is a W-9 form that you will need to complete in order to receive your payment.

Once these forms have been completed, please use the self-addressed stamped envelope provided to mail them back to us. Again, thank you for your time. If you have any questions please feel free to call me at 540-231-1064, or email me at ndunn@vtti.vt.edu and I will be happy to answer your questions.

Sincerely,

Naomi Dunn

REFERENCES

1. Baker, S.A., Schaudt, W.A., Joslin, S., Tidwell, S., and Bowman, D. (2014). *Evaluation of Light-Vehicle Driver Education Programs Targeting Sharing the Road with Heavy Vehicles: A Case Study Analysis* (Report # 14-UM-029). Blacksburg, VA: National Surface Transportation Safety Center for Excellence.
2. Baker, S., Schaudt, W.A., Freed, J.C., and Toole, L. (2012). A survey of light-vehicle driver education programs on sharing the road with heavy vehicles. *Journal of Safety Research*, 43(3), 187-194.
3. Baker, S., Schaudt, W.A., Freed, J.C., and Toole, L. (2011). *A Survey of Light-Vehicle Driver Education Programs to Determine the Prevalence of Curriculum on Sharing the Road with Heavy Vehicles* (Report # 11-UF-014). Blacksburg, VA: National Surface Transportation Safety Center for Excellence.
4. Hanowski, R.J., Hickman, J.S., Wierwille, W.W., and Kiesler, A. (2007). A descriptive analysis of light vehicle-heavy vehicle interactions using *in situ* driving data. *Accident Analysis and Prevention*, 39, 169-179.
5. Federal Motor Carrier Safety Administration. (2015). *Federal Motor Carrier Safety Administration's Advanced System Testing Utilizing a Data Acquisition System on Highways (FAST DASH) Program*. Retrieved from <http://www.fmcsa.dot.gov/research-and-analysis/technology/federal-motor-carrier-safety-administrations-advanced-system-testing>
6. Schaudt, W.A., Bowman, D.S., Hanowski, R.J., Olson, R.L., Marinik, A., Soccolich, S., Joslin, S., Toole, L., & Rice, J.C. (2014). *Federal Motor Carrier Safety Administration's Advanced System Testing Utilizing a Data Acquisition System on Highways (FAST DASH): Safety Technology Evaluation Project #1 Blindspot Warning: Final Report* (Report # FMCSA-RRT-13-008). Washington, D.C.: Federal Motor Carrier Safety Administration.
7. Commercial Vehicle Safety Alliance. *Teens and Trucks Share the Road Program*. Retrieved from http://www.cvsa.org/programs/teens_and_trucks.php
8. Federal Motor Carrier Safety Administration. (2015). *Analysis Brief: Occupant Fatalities in Crashes Involving Large Trucks, 2013*. Washington, D.C.: U.S. Department of Transportation. Retrieved from http://ntl.bts.gov/lib/54000/54900/54924/14-010-Occupant_Fatalities_v15-5082_.pdf
9. American Trucking Association. *Share the Road Highway Safety Program*. Retrieved from http://www.trucking.org/Share_the_Road.aspx