DANGERS OF DISTRACTED DRIVING

Tony Scotti

INTERNATIONAL SECURITY DRIVER ASSOCIATION, INC,.

43 Riverside Ave, Suite 418 Medford MA 02155

Contents

Introduction 2
Distracted Drivers 2
The Basics 3
The Concept 3
Kill Zone 4
- Simple Kill-Zone Math 4
- Speed and Distance 5
- Practical Use of FPS 6
- The Scenario 7
- Will Billy go through the red light? 8
- A Typical Following-Distance Scenario 10
- The Scenario 10
- Scenario Two 12
- How Much Space Should You Keep in Front of You? 13
- Calculating How Much Space You Have 13

The Reaction Time Process 14
- Surprise vs. Reaction Time 15
- An Example 15
- The Numbers 15
- Scenario 16
- Solutions 16
- Remain Alert 17

Over-Driving Your Headlights 17
- Scenario One – Low Beams 18
- Scenario Two – High Beams 19
- Solution 20

Summary 22

Introduction

Distracted driving is not a new phenomenon, there have been an issue since the age of the Model T, whether a driver was eating a sandwich or talking to a passenger. What is new is the amount of activities that cause distracted driving. Such as

- Texting
- Using a cell phone or smartphone
- Eating and drinking
- Talking to passengers
- Using a navigation system
- Adjusting a radio, CD player, or MP3 player

The best way to end distracted driving is through education, and that is the goal of this publication, to educate the reader to the Dangers of Distracted Driving.

Distracted Drivers

A distracted driver is an individual who is not paying attention to driving tasks. It could be text messaging, talking on the phone, or simply looking at the person in the passenger seat as he is driving. No matter what the cause, the driver is not looking where he is going. To better understand the problem, we must explain some basic concepts regarding a vehicle moving down the road.

The Basics

The first part of this explanation may be simplistic – but bear with me. When you drive, you manage time and distance. If you are distracted, you move through unmonitored space. First, we must develop a way to measure the problem. We can do measure time and distance using a device we are all familiar with, the speedometer. We all know the speedometer measures miles per hour (mph), the time it takes to cover a given distance. It's a natural unit of reference that every driver is familiar with.

But in the interest of safe driving and in analyzing the issue of distracted driving, it is not the best measure of time and distance. If the distraction is caused by reading a text message, the driver would not travel a mile while reading the text message and the driver would not travel an hour. Once the distracted driver looks back to the road and sees a problem, he does not have a mile or an hour to make a decision. The problems happen in feet and in seconds.

The Concept

To better understand the problem of driver distraction, we must convert the standard unit of measurement (miles per hour) to a more practical feet per second - It’s not about how many miles you travel in an hour but rather how many feet you travel in a second. When we conduct security driving programs, students are trained to understand this concept. It is one of the pillars of the training. Why? A vehicle ambush does not take an hour to happen and the space in which it occurs is not measured in miles. The same holds true for the distracted driver. When he returns his eyes to the road and sees an accident-producing scenario in front of him, he doesn't have an hour to react and the space won't be measured in miles. He has mere feet and seconds to get out of the Kill Zone.

Kill Zone

Kill Zone is a phrase often associated with high-risk driving, but it can also describe any scenario that creates an emergency for the driver and passengers. Not looking where you are going definitely falls into that category. A Kill Zone can mean going through a stop sign or driving to close to the car in front of you. But no matter what the scenario is, a Kill Zone is a time-distance relationship. How much time do you have and how close is the problem (distance)? The Kill Zone is directly related to the speed of the vehicle when the incident occurs.

Simple Kill-Zone Math

If you travel at 40 mph, how many feet do you travel in a second? At 40 miles per hour, you are moving 58.8 feet per second. Converting mph to fps requires some elementary arithmetic. Multiply the mph figure by 1.47.

The 1.47 comes from the following: There are 5,280 feet in a mile, and 3,600 seconds in an hour. Divide 5,280 by 3,600 (5,280/3,600). The answer is 1.47.

Speed and Distance

At 20 mph = 29.4 ft. /sec

At 30 mph = 44.1 ft. /sec

At 40 mph = 58.8 ft. /sec

At 50 mph = 78.5 ft. /sec

At 60 mph = 88.2 ft. /sec

If you don't mind a bit of imprecision in your calculations or want an easier way to estimate the conversion, (and don't feel like multiplying by 1.47), round up 1.47 to 1.5. Now to change mph to fps, simply multiply by 1.5. You can easily multiply by 1.5 with a simple trick of addition. If you multiply 20 by 1.5 you take half of 20, which is 10, and add it to 20, which will give you 30. (Half of 20 = 10 and 20 + 10 is 30).

If you are traveling 20 mph, you are moving at approximately 30 fps.

30 mph, half of 30 is 15, 15 + 30 = 45. You are moving 45 fps.

40 mph, half of 40 is 20, 40 + 20 = 60. You are moving 60 fps.

50 mph, half of 50 is 25, 50 + 25 = 75. You are moving 75 fps.

60 mph, half of 60 is 30, 60 + 30 = 90. You are moving 90 fps.

To put a finer point on it:

At 30 mph, in .2 seconds, you travel 9 feet. (30 mph is 45 fps. A tenth of a second [.1 sec.] means you'd travel 4.5 feet and in .2 sec. You would travel 9 feet.)

At 40 mph in .2 seconds you would travel 12 feet.

At 50 mph in .2 seconds you would travel 15 feet.

At 60 mph in .2 seconds you would travel 18 feet.

Why do we use two tenths of a second? Because that is how much time it takes to blink your eyes. When you are driving 40 mph, literally in a blink of an eye, you move 12 feet.

Practical Use of FPS

Now that we understand the concept of fps, it is much easier to explain the danger of distracted drivers. Let's look at an all-too-frequent example. Let's assume Billy is driving to the mall on a bright sunny day. He is driving at 40 mph (or 60 fps). His best buddy John sends Billy a simple and relatively short text message:

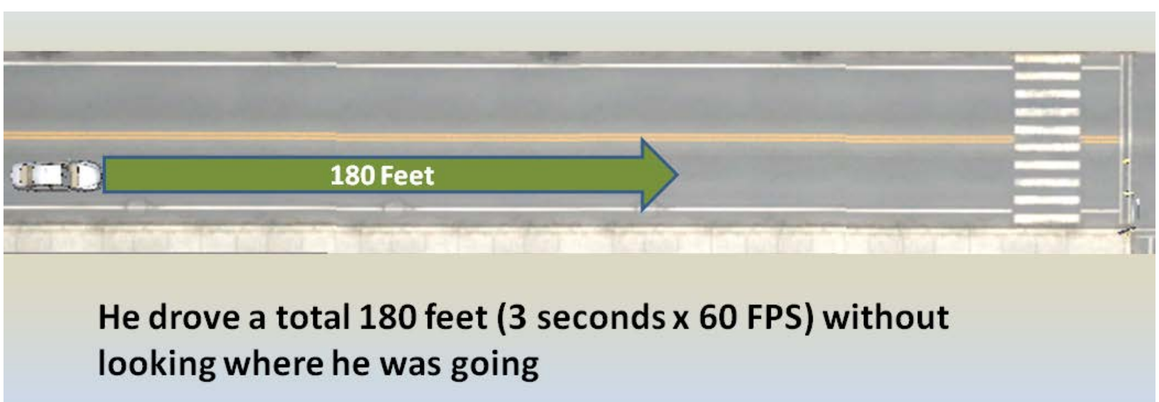
Hey Billy – meet u at the mall at Mc Don – got some good news

That message takes about three seconds to read. That's not long. Look at your watch and count off three seconds, or close your eyes and count to three.

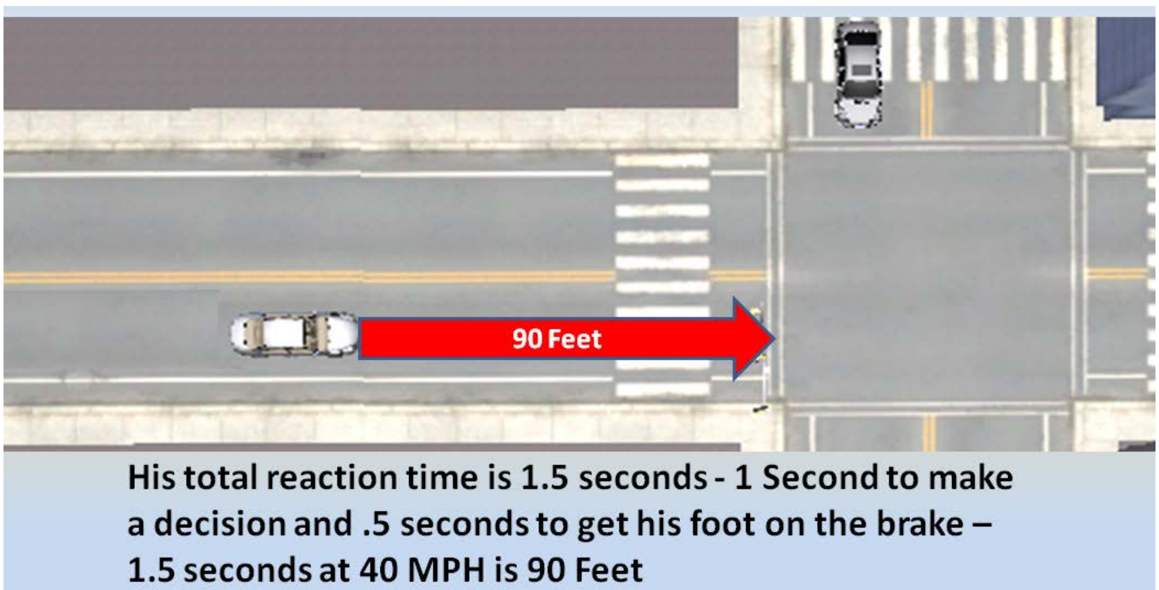
The Scenario

Just as Billy took his eyes off the road to read the text message, a traffic light 300 feet away (the length of a football field) changed from green to yellow. As he read the text message, he was not looking at the road for three seconds while traveling 40 mph. What is about to happen could be a life-changing experience - and it is hard, if not impossible, to describe it in mph terms. Let's take this step by step.

1. As we previously learned, Billy is moving at 60 fps (40 mph X 1.5). That means he drove 180 feet (3 seconds x 60 fps) without looking. Billy was 300 feet from the traffic light, but as he read the text message, he moved 180 feet. When he looked up from the text message, he was 120 feet from the traffic light that has now changed from yellow to red.



3. Billy is 120 feet in front of the red traffic light and closing in at 60 fps. Quick arithmetic tells you that he has two seconds to react.
4. If Billy can get his foot on the brake in a half-second, he will travel 30 feet (half of 60 fps). So at the point of applying his brakes, he is 90 feet from the traffic (the initial 120 feet minus the 30 feet it took to reach for the brake). Billy just applied the brakes.

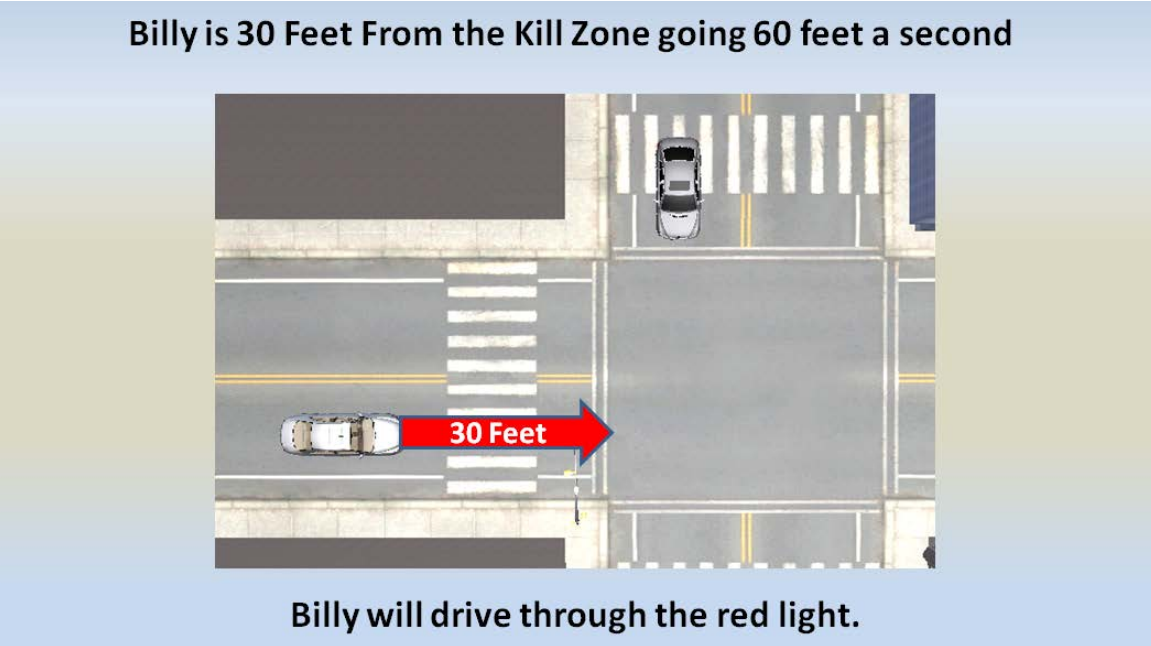


Will Billy go through the red light?

At this point, Billy’s fate depends more on luck than skill. Nothing in Driver’s Ed prepared him for this one moment in time. But there’s more bad news. Our scenario assumes that Billy instantaneously recognized the problem and went for the brake pedal. But that is not practical. What if Billy took a whopping one second to figure out what was going on and then reached for the brake pedal?

The results:

1. That extra second puts him 60 feet closer to the intersection before he responds. He's now approximately 30 feet from the red light, traveling 60 feet a second.
2. Billy will drive through the red light. If another car goes through the green light, there likely will be a collision. The difference between life and death would depend on where that collision occurs.



For Billy and the occupants of the other vehicle, life will forever be changed. WHY? Simply because Billy took his eye of the road to read a text message. Unfortunately, this scenario happens every day.

To get an idea of how far you travel in a few seconds look at the following table

	ONE SEC	TWO SEC	THREE SEC
30 mph	44.1 Ft	88.2 Ft	132.3 Ft
40 mph	58.8 Ft	117.6 Ft	176.4 Ft
50 mph	73.5 Ft	147 Ft	220.5 Ft
60 mph	88.2 Ft	176.4 Ft	264.6 Ft

A Typical Following-Distance Scenario

There is another scenario form applying our newfound knowledge about fps vs. mph. It is a scenario that happens every day: following the car in front you too closely. But, how close is too close?

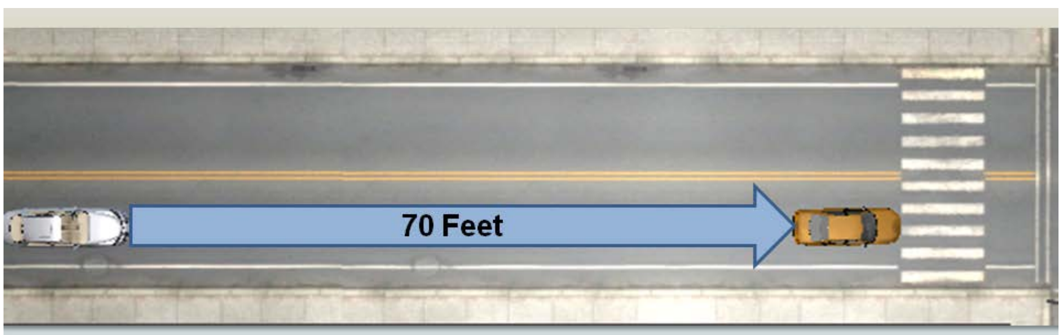
The Scenario

From 30 feet behind, John is driving at 30 mph (45 fps) following a vehicle that is moving at the same speed. Both cars approach an intersection as the traffic light changes to yellow. The motorist in front of John sees the yellow light and applies his brakes. John is not looking at the road. He is looking at the radio to change the station. It takes one full second before John notices the car in front of him is stopping and starts to react. Anyone who has driven for any length of time has experienced this scenario Step by step.

1. Once the first car applies the brakes, it takes approximately 55 feet to stop the car at 30 mph.

2. That means the first car is stopped 85 feet in front of John (55 feet of stopping distance plus the 30 feet of distance between the cars). If John is also moving at 30 mph, he is moving at 45 fps.

3. If the first car is 15 ft. long, some quick arithmetic tells us that the rear end of the stopped vehicle is 70 feet away from John's front end.



4. Assuming a normal reaction time of .75 seconds, 33.75 feet is used up in reaction time (.75 seconds x 45 fps).

5. By adding the time and distance used during John's one-second attention lapse (45 feet), we see he will not get his foot to the brake pedal before

traveling 45 feet + 33.75 feet -- or approximately 79 feet.

6. Since it takes John 79 ft. before he gets his foot on the brake, he will hit the stopped car without ever slowing down -- again, a life-changing experience.

Scenario Two

If we use the same scenario, and add back that one second of diverted attention, an accident still occurs, even with John applying the brakes the instant he saw the tail lights come on in front of him.

1. It still takes John .75 seconds to reach the brake pedal, which is approximately 34 feet. It takes 55 feet to stop the car. Therefore, it takes 89 (34 plus 55) feet to stop the vehicle.

2. The rear end of that vehicle in front is still 70 feet from John's car. The difference between Scenario One and Scenario Two is that, in this scenario, John will collide with the stopped car while his foot is on the brake. The problem? He was following too closely.

ABS or non-ABS braking, throwing out an anchor, dragging your feet, all the fancy braking techniques in the world won't help if you follow other traffic too closely. So, when it comes to following another vehicle, it's simple: Keep a safe distance between you and the car ahead.

How Much Space Should You Keep in Front of You?

One good rule is to keep at least one second for each 10 feet of vehicle length at speeds below 40 mph. For the average 20-foot car, this means if you're driving below 40 mph, you leave two seconds of space between you and the car ahead.

Calculating How Much Space You Have

1. Pick a fixed object on the road (a shadow on the road, a pavement marking, or some other clear landmark).
2. When the car ahead of you passes the marking, count the seconds (one thousand and one, one thousand and two, and so on) until you reach the same spot.
3. Compare your count with the rule of one second for every 10 feet of length.
4. If you pass the landmark before the time is up, you're driving too closely.

After a little practice, you'll soon instinctively know how far behind you should drive. Also remember that when the road is slippery, you need more space to stop.

The Reaction Time Process

One of the major reasons that drivers, especially younger drivers, get into trouble is **overdependence on reaction time.** There are many factors that affect reaction time, but before we talk about them, let's examine Bill's reaction time just before he went through the red light. Reaction time is the sum of the time needed to:

1. Receive information from the senses. In Bill's case, it is what he sees – the red light.
2. Decide what to do next. Bill was moving at 60 fps. If it takes two tenths of a second to decide, Bill has moved 12 feet closer to the red light. Many times, the response is a reflexive reaction that carries a potential for danger. Most drivers rely on their experience to make the decision.
3. Transmit the messages from the brain to the muscles.
4. Enable the muscles to respond.

The most critical portion of the reaction process is Step No. 2. After the senses detect the danger, a decision must be made about what to do with the just-received information. The time-proven example of the interaction between Steps Nos. 2 and 3 are young drivers. They have very fast reflexes that are desirable in Step 3, but that reaction is preceded by the wrong decision in Step No. 2. They can react quickly but often make the wrong decision quickly.

Surprise vs. Reaction Time

The best research on the effects of surprise on reaction time was performed by Dr. Marc Green, who has studied the concept for more than 34 years. I strongly recommend his work. (Just Google his name and you will get many of his articles.) In one article, he discusses the difference between reaction time when the event is expected, (which could relate to an experienced driver) and when the event is a surprise (which could relate to an inexperienced driver).

An Example

When the driver knows he must brake, he can achieve the best possible reaction time. Dr. Green says the best estimate is 0.7 seconds. Of this, 0.5 seconds is required for perception and 0.2 is the time required to release the accelerator and depress the brake pedal.

When the need to brake is a complete surprise, reaction time is substantially different. In this case, Dr. Green suggests the best estimate is 1.5 seconds for an object approaching from the side and a few tenths of a second faster for straight ahead obstacles. Surprise creates a perception time of 1.2 seconds and a movement time of 0.3 seconds.

The Numbers

As noted, John and Bill's emergency was a time-distance relationship. How much time did they have and how much distance did they have. If the decision-making process eats up a big chunk of time, nothing good will happen.

There is a significant difference between a driver who is ready for a problem and a driver who isn't.

Scenario

The weather is bad. A driver is moving at 40 mph (60 fps) into what is perceived by the driver as a hazardous scenario. Again, if you have been driving for any length of time, you have experienced this. The weather is bad and you are ready for a problem. But a vehicle passes you like it's a bright sunny day.

If you are ready for a problem, it takes you .5 seconds to perceive that problem. At 40 mph, that would be 30 fps (40 mph is 60 fps. – .5 times 60 feet is 30 feet). If the driver who passed you at 50 mph (75 fps) encounters the same problem, he would require 1.5 times 75 feet or 112.5 feet.

The difference of either higher speed and/or not expecting to encounter the problem would be 82.5 feet – which could be the difference between surviving and not surviving the incident.

Solutions

Do not rely solely on your reaction time

Because it's not how quick you can move your limbs

It's the time it takes to make a decision

And the quality of the decision

Remain Alert

It's hard to stay alert when driving 100 percent of the time

But when conditions get bad, remain alert

Expect problems to happen - play what if

Over-Driving Your Headlights

It is easy enough to over-drive your headlights, even when you are paying attention. But combine a distracted driver with nighttime driving conditions and you have a disaster waiting to happen. To illustrate the dangers, we will look at scenarios. But we need three numbers: vehicle stopping distance, headlight illumination distance, and reaction time.

- **Reaction Time -** In the last section, we discussed reaction times when the event is a surprise vs. not a surprise. This scenario will use the reaction times for a surprise event. This is appropriate for a driver moving faster than he can see and having an emergency pop into their field of vision. Research has shown that the best estimate in a surprise scenario is a reaction time of 1.5 seconds, which is the figure we will use.
- **Braking Distances** – Every year, the Michigan State Police test police vehicles. For our scenarios, we will use braking numbers from those tests. MSP computed the average stopping distance for a standard police-issued Ford Crown Victoria: 143 feet at 60 mph. We computed the estimated stopping distance for the Crown Vic at speeds other than 60 mph.
    - 40 mph stopping distance: 64 feet

- 50 mph stopping distance: 99 feet
- 70 mph stopping distance: 194 feet

- **Illumination Distance** – We will use average illumination distances for low- and high-beam lights, which are 180 feet and 350 feet, respectively.

With the stopping distance of the Crown Vic, the illumination distances of the headlights, and driver reaction times, we can produce instructive scenarios.

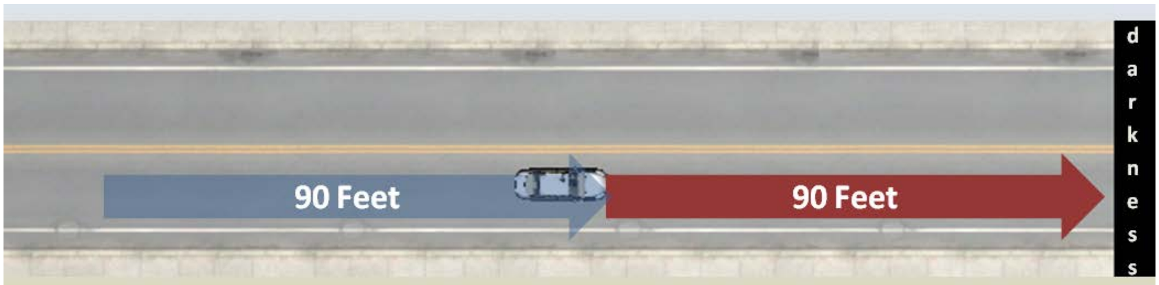
Scenario One – Low Beams

John is driving on a poorly lit country road. With low beams, John has 180 feet of vision to work with.

1. His car requires 64 feet to stop, and he has 180 feet of vision. Think of it as a moving wall that is 180 feet away from John.

2. If the vehicle's speed is 40 mph, it is moving at 60 fps. John confronts an emergency at the edge of his 180-foot field of vision.

3. If his reaction time is 1.5 seconds, he uses 90 feet (60 x 1.5) getting to the brake pedal, leaving him 90 feet (180 – 90) to stop a vehicle that needs 64 feet to stop. Sounds like a lot of room? Considering that, initially, he was moving at 58.8 fps, it's not much of a cushion.



Now, let's look at the same scenario - except that John is distracted for two seconds. The total reaction time is now 3.5 seconds, which, at 40 mph, translates into 210 feet to reach the brake pedal (60 fps x 3.5). John will be 30 feet into the emergency (210 -180) before he ever reaches his brakes.

These numbers change with the speed, vehicle model, and the amount of illumination available. What won't change: when driving on a poorly lit road, there will always be a moving wall in front of your vehicle.

Scenario Two – High Beams

Let's use the same scenario, except John is using his high beams, giving him approximately 350 feet of illumination.

1. Move the speed up to 60 mph or 90 fps. He confronts an emergency at the edge of his 350-foot field of vision. The driver's 1.5 seconds of reaction time will require 135 feet to get his foot to the brake pedal (90 X 1.5).

2. The driver has 215 feet (350 – 135) to stop a vehicle that needs 143 feet to stop, leaving 72 feet (215 -143) to spare. Sounds good – but consider that the initial speed is 88 fps – again not much of a cushion.

Raise John's reaction time 1.5 seconds and the total reaction time is now three seconds, which, at 60 mph, translates into 270 feet to reach the brake pedal (90 x 3). That leaves the driver with about 80 feet (350 - 270) to stop a vehicle that needs 143 feet to stop. John would be driving into the wall at 60 mph without ever touching the brakes.

As mentioned above, there are many variables that change these numbers for the better, but there are many variables that would change the outcome for the worse – such as dirty or misaligned headlights, changes in reaction time, and the braking capability of the vehicle. In a pursuit where the brakes are being used often, you can be assured that the braking capability of the vehicle is decreasing.

Solution

Don't drive faster than you can see. When driving on roads with little or no light, be cautious of reaction time. Assume you will need three seconds to react (experts say you need 2.5 seconds, but I add a half-second as a cushion.)

- At 20 mph, 2.5 seconds is 90 feet.
- At 30 mph, 2.5 seconds is 135 feet.
- At 40 mph, 2.5 seconds is 180 feet.

- At 50 mph, 2.5 seconds is 225 feet.
- At 60 mph, 2.5 seconds is 300 feet.

Do the “Driving into the Black Hole” test:

- Pick an object at the edge of your vision.
- Count to three.
- If you get there before you reach to three, you are driving faster than you can see - slow down.

Summary

If you are distracted, you move through unmonitored space, it is similar to driving with your eyes shut. There is no phone call or text message worth the results When driving, focus on driving, keep in mind that at 60 mph in .2 seconds, you travel 18 feet.

The time to adjust the seats, GPS, mirrors, climate controls is before you move the vehicle.

This has been said many times - don’t use cell phones while driving and never use text messaging,

If for any reason you need to focus on an activity other than driving, pull off the road and stop your vehicle in a safe place.

Pay attention to the driving task and stay safe.