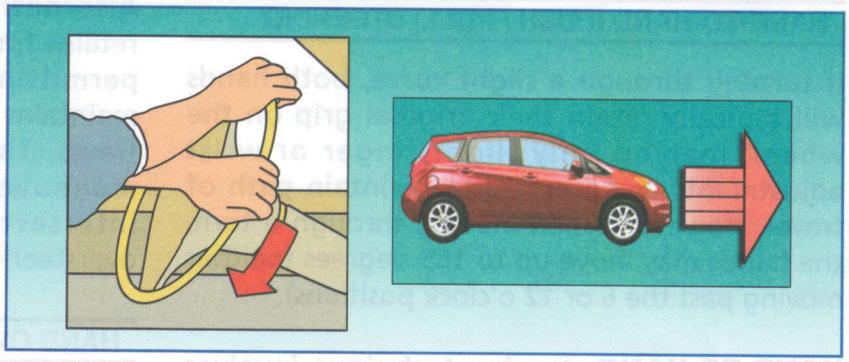
Vehicle Operation & Control

10

Contents

Controlling your vehicle in the HTS requires many skills. Before you can co-operate with other road users, you must first learn to control your vehicle. You must input the correct operational control tasks required for each situation that presents itself while maintaining optimum vehicle balance and control. How do you know what is the best course of action? How do you implement this action without sacrificing risk reduction and safety? As a novice driver, there are many techniques that you must master.

Good or bad habits are acquired through repetition. Familiarity with controls and vehicle control techniques must be acquired. Any other course of action could be fatal. Don't wait for experience to teach you the hard way. Start with the right techniques, and practice until they become second nature.



AFTER COMPLETING THIS CHAPTER, THE STUDENT MUST BE ABLE TO UNDERSTAND THE IMPORTANCE OF AND RESPOND TO:

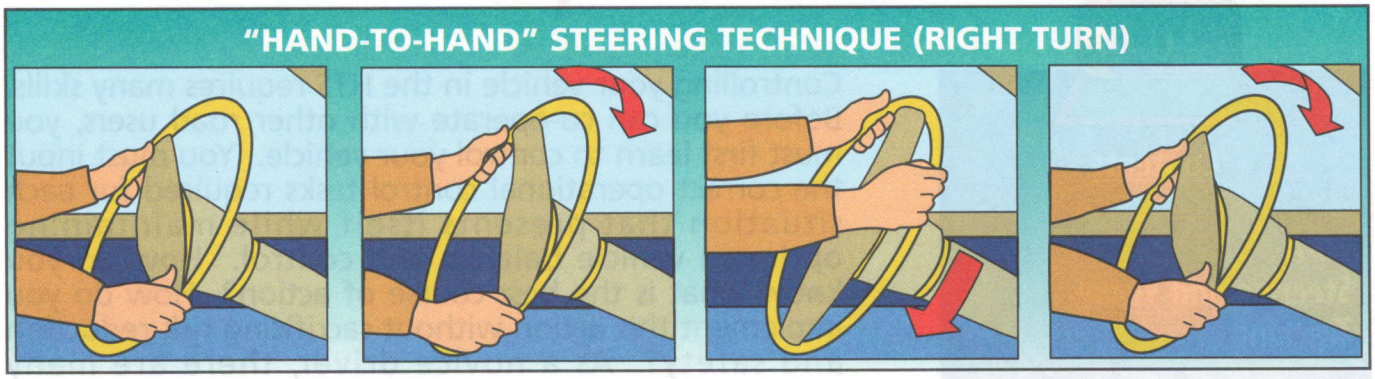
- vehicle operation and control techniques.
- visual tracking.
- steering control.
- braking and acceleration control.

10-A Steering and Visual Tracking

As mentioned in Chapter 7, grip the steering wheel firmly at 9 o'clock and 3 o'clock (or 8 and 4) with your thumbs resting on the steering wheel (palms down toward the wheel).

Look far ahead at the center of the lane where you wish to travel (the path of travel). Even on straight roads, small course corrections will be necessary. Keep your hands on the steering wheel and move the wheel and hands together.

If you are moving the steering wheel often, look further ahead. As much as possible, move the wheel while the vehicle is in motion; avoid "**dry steering**" which causes premature wear of the tires and steering components.



For steering inputs ranging from very minor adjustments (one to two degrees) to major inputs (up to a half turn of the wheel), use the hand-to-hand steering technique. This will also protect you from any risk of injury from the air bag, if it should deploy.

HAND-TO-HAND (PUSH / PULL) STEERING

If turning through a slight curve, both hands will typically retain their original grip on the wheel, making only slight finger or wrist adjustments as necessary to maintain path of travel. However, when moving through a turn, the hands may move up to 165 degrees (neither moving past the 6 or 12 o'clock positions).

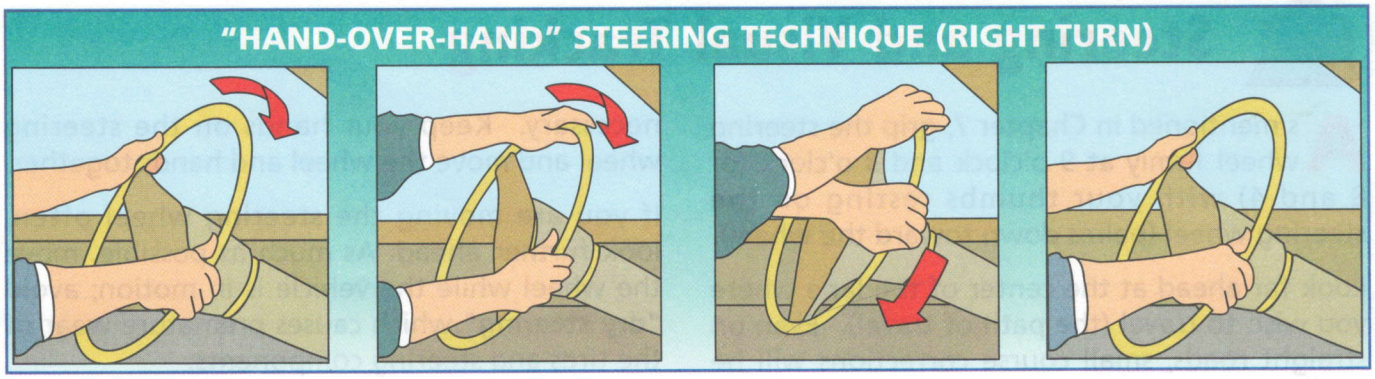
HAND-TO-HAND steering technique involves moving the wheel with a sliding hand movement, one hand at a time. **When steering right for example**, move both hands and the wheel from the neutral position. As the right hand nears the 6 o'clock position and more steering input is required, slide it to the 2 o'clock position while the left hand retains a firm grip.

Continue turning the steering wheel. When the left hand reaches the 10 o'clock position, slide it down to the 6 o'clock position. The process is reversed to return to a straight path. The wheel is not allowed to slip through the fingers to straighten when exiting a turn, and both hands are always on the wheel to make any necessary adjustments.

Alternating back and forth in this manner retains firm steering control by one hand while permitting smooth steering movement and maintains a sense of the neutral position at all times. This technique is ideal for precision maneuvers, when negotiating curves or intersection turns, as it helps prevent oversteering or understeering.

HAND-OVER-HAND STEERING

Hand-over-hand steering is particularly well suited when the speed of the steering input is critical, such as skid recovery (oversteer), or when maneuvering in a space with limited sightlines, such as perpendicular parking in a congested shopping center. Quick movements of the hands are recommended on entry to the maneuver, with smooth, slower inputs when returning the steering wheel while completing the maneuver.



TO TURN RIGHT
From the normal driving position, both hands turn the steering wheel to the right. When the right hand reaches the four o'clock position, release it and continue turning the wheel with the left hand. The right hand crosses over the left arm to grasp the wheel at the twelve o'clock position. Continue turning with the right hand while the left returns to the normal starting position. In extremely tight maneuvers, you may have to repeat these steps to turn the wheel sufficiently.

TO RETURN STRAIGHT
At slow speeds as well as in evasive or emergency maneuvers, return the steering by hand using the same technique. When turning 90 degrees, you may allow the steering wheel to slide through your grip on the wheel while accelerating gently. Be prepared to intervene to correct the final direction of the vehicle. The wheels will straighten with respect to your vehicle, not in relation to the direction you wish to travel.

EVASIVE ACTION STEERING

In evasive maneuvers, the steering input required is rapid and more abrupt than in normal steering maneuvers. To achieve this from the basic steering position, the thumbs should be hooked on the steering wheel (releasing the grip of the fingers - not released from the wheel). A quick steering motion in either direction until the arms touch will permit a 180° steering input (below 45 mph). (Above this speed, a 90° movement as well as thrust acceleration will suffice.)

The resulting front wheel movement and change to the chassis set (suspension settings) will cause the front of the vehicle to move into the next lane. An immediate countersteering motion to arm touch in the opposite direction (360°) will bring the rear of the vehicle into the next lane in a stable manner. A steering movement back to the neutral (starting) position will stabilize the vehicle and maintain the new lane position.

This type of steering input is utilized in rapid evasive maneuvers and permits a maximum of steering input without moving either hand from the original position on the wheel. It also continually provides good information about where the wheel must be turned to achieve the neutral steering position.

This rapid change of direction is not a normal steering input and **should be practiced with an instructor** in order to gain proficiency, skill, and confidence.

ONE HAND STEERING

This technique is reserved for backing maneuvers (Chapter 12), where a change of seating position will require one hand steering input. In reverse, a smaller steering input is required to change direction. When more input is required, hand-over-hand should be used.

TIMING OF STEERING INPUT

All vehicles lag somewhat in responding to steering input. The greater the speed of the vehicle, the longer the distance traveled will become. For this reason, the driver must search ahead in order to have time to evaluate the

SAFETY TIPS

Due to new steering ratios, the reduced effort required to turn the steering wheel, and possible steering wheel air bag deployment, recommendations for lower hand position on the steering wheel are advisable.

driving scene and still input the steering correction or movement prior to the point where the vehicle must change direction.

The amount of steering lag varies from one vehicle to another. Timing must be learned through experience, with the application of lead time, and refined by practice.

Continuous practice of the steering techniques is vital for optimum control of any vehicle. The basic hand position offers the driver maximum steering input while both hands are on the wheel.

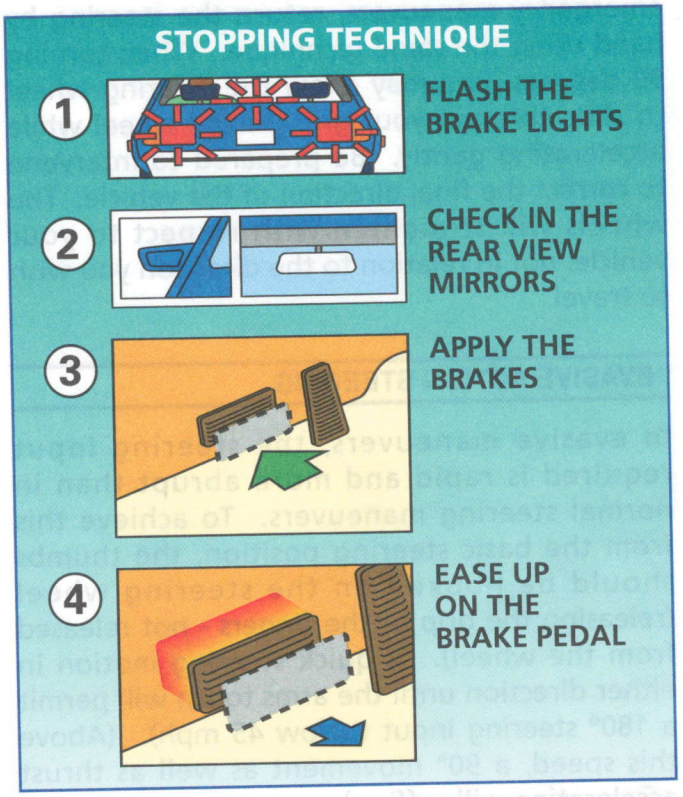
Braking and Acceleration Techniques

The brake system gives the driver the ability to reduce speed or stop. Applying the brake pedal slows or stops tire rotation which, in turn, by means of friction with the pavement, will slow or stop the vehicle. The most efficient method is to brake while traveling in a straight line (the friction available at all four wheels is used for braking).

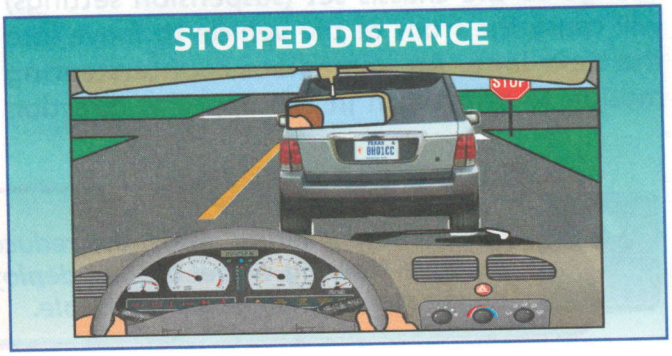
When necessary to slow or stop, tap the brake pedal **(1)** (illuminating the brake lights, communicating your intentions). Check the rear view mirror **(2)**. Position your vehicle, then re-apply the brake pedal firmly **(3)**.

You should:

- Plan to stop earlier than the intended location. You can ease up on the brake later, rather than run out of space. Just prior to a full stop, decrease pressure slightly **(4)** in order to stop smoothly. If possible, keep your heel on the floor while applying pressure on the brake pedal.
- Stop smoothly at least one car length from the stop bar or the vehicle ahead.
- Focus your attention on the rear-view mirror until at least one other vehicle stops safely behind you, providing protection to the rear. You may then ease off the brake and roll up to the stop bar (behind a vehicle, retain at least one-half a car length).
- To remain stopped, maintain pressure on the brake pedal.



- Stop smoothly prior to the stop bar or at least one car length from the vehicle ahead.



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BRAKING TIME AND TOTAL STOPPING DISTANCE

Total stopping distance is much longer than most novice drivers realize. It is not possible to "stop on a dime." From the moment a hazard appears ahead until you bring the vehicle to a stop, time will pass.

TOTAL STOPPING TIME

The time from a hazard appearing ahead until you stop can be subdivided into:

***Perception time:**
The time it takes you to spot the danger. This depends on your mental and physical state, your eye lead time (**SEARCH**), and how quickly you **IDENTIFY** the hazard . In poor visual conditions, reduce speed so that you compensate for your shorter eye lead time. (At slower speeds it will take more time to reach the hazard.)

***Decision-making time:**
The time it takes you to **EVALUATE** (PREDICT - DECIDE) what to do. Your experience, physical and mental state, as well as the attention you give to the driving task will all affect how much time will elapse. If all the factors are at their best, three quarters of a second will elapse during this stage.

***Reaction time:**
The time it will take you to **EXECUTE** your decision; to release the accelerator and to apply the brakes. At best, another three quarters of a second will elapse. Steering input is one quarter of a second quicker.

One and a half seconds in total time, and only now are you starting to slow or stop your vehicle. This total can be much longer, depending on the driver. **One-half second of driver inattention will double the risk of a crash.**

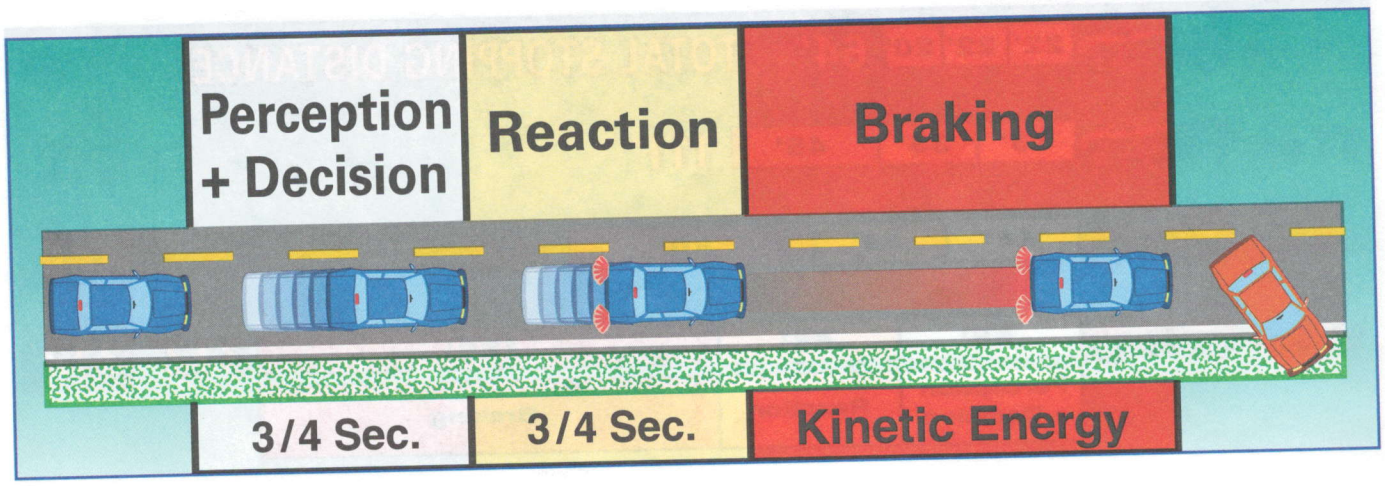
***Braking time:**
The time it takes for your vehicle to come to a stop once the brakes are applied. This time is related to your experience and skill in braking, the kinetic energy of your vehicle, the mechanical condition of your vehicle, and the road conditions.

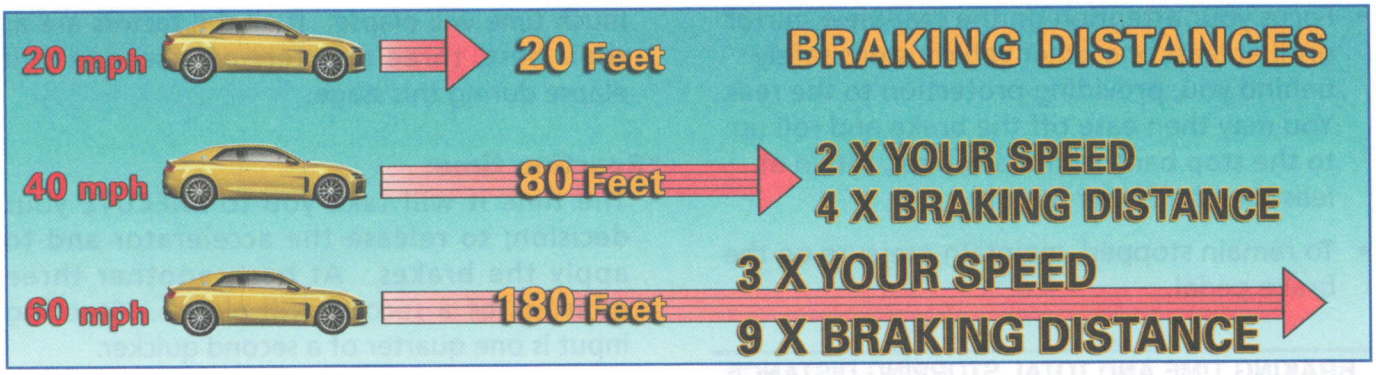
Let's translate these elapsed times into distances.

BRAKING DISTANCE

Compare the braking distances (from the time the brakes are applied until the vehicle stops) at 20 mph and 40 mph. The speed is doubled. The braking distance is ... ?

The answer is **four times longer**. This is a result of **Kinetic Energy** as it applies to braking distance.





Look at the chart above for a comparison of braking distance as it relates to speed (all other factors remaining the same).

Kinetic energy increases by the square of the number of times speed is increased (twice as fast = 2^2 = **4** times the kinetic energy = **four times the braking distance**; three times as fast = 3^2 = **nine** times the kinetic energy and **nine times the braking distance**).

TOTAL STOPPING DISTANCE is the distance your vehicle travels from the moment the hazard appears ahead until you stop. **Look at the chart below.** Compare the total stopping distance at 20 mph to what it becomes as the speed increases.

Remember, these charts refer to ideal driving conditions. Change the road surface or road conditions and the braking distance increases sharply;almost double on wet roads, and up to sixteen times as long on an icy surface.

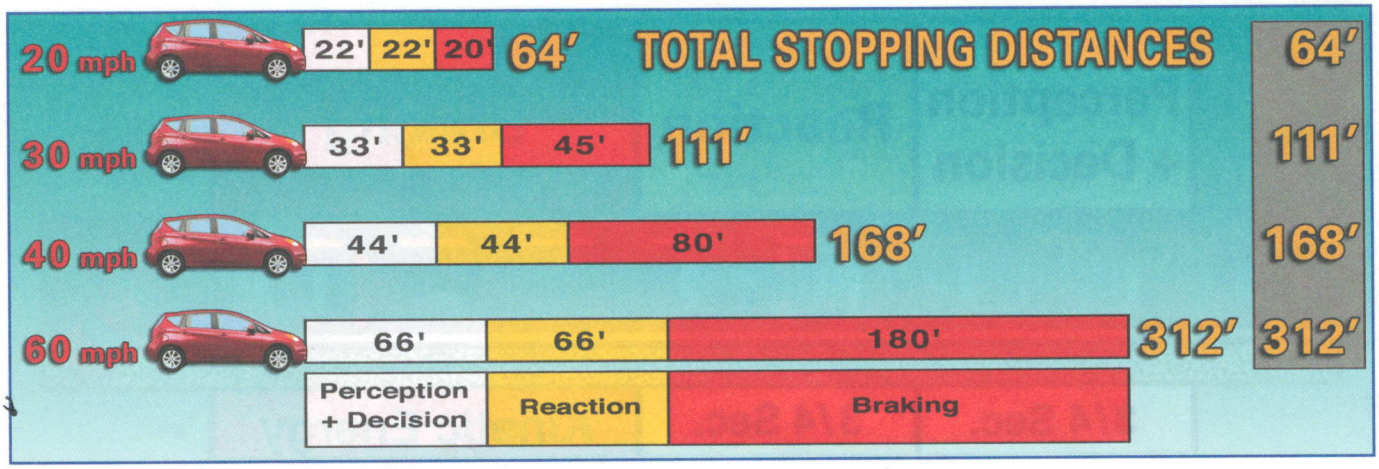
To bring your vehicle to a stop in complete safety, regardless of the many factors involved, there are several techniques to master, depending on circumstances.

CONTROLLED BRAKING

The first and the best method is to constantly monitor your speed, space, and driving conditions. Then you can brake with a steady pressure on the brake as normal; braking in "**GOOD TIME**". This method will keep you out of trouble; but to succeed, this technique is based on the driver - **YOU must think ahead, apply the SIPDE system, and drive proactively**.

THRESHOLD BRAKING:

This method involves applying the brake pedal more firmly, just to the point prior to "**locking the wheels**". Shift to neutral (depress the clutch pedal - standard) to remove the unbalancing effect of the drive wheels and the differential. If the wheels lock, ease up slightly adjusting the pressure to apply as hard as you can without lock-up. As your vehicle slows to a



stop, ease up gradually. Mastering this technique requires practice and skill.

The advantages are:

- the braking distance is shorter
- you maintain steering control
- the tires wear evenly; avoids skidding

The problem is that road surfaces are rarely smooth. On wet, icy, or uneven pavement, the "**lock-up point**" will vary. It requires considerable skill to maintain full braking without skidding.

ANTI-LOCK BRAKING SYSTEMS (ABS)

This system assists the driver; you apply the brakes fully. The onboard computer controls the brake pressure at each wheel, cycling from locked to slightly rolling in a pumping-like action many times per second. You do not have to modulate the pressure on the brake pedal. Look where you want to go, and steer where you want to go. You will reduce speed rapidly and still be able to input steering control.

REMEMBER, BRAKE HARD AND STEER!

Don't defeat the system by easing up or by attempting to pump the brake pedal!

ACCELERATION CONTROL

The speed of your vehicle is controlled by the pressure your right foot exerts on the accelerator pedal. Keep your heel on the floor and depress the pedal with the "ball" of your foot. Vehicle reaction will depend on engine size, the power train, the road surface, and the weight of the vehicle. To develop a "feel" for driving, you must sense the change in body position - kinesthetic sense - and adjust pressure on the gas pedal accordingly.

To increase speed, depress the pedal gradually - **PROGRESSIVE ACCELERATION** - and adjust the pressure by the vehicle reaction. Always change speed smoothly, as this conserves fuel and prevents unnecessary "wear and tear" on the power train components.

Once you attain the desired speed (check the speedometer), ease up slightly and the vehicle will maintain this speed. If you ease up too much, the vehicle will begin to decrease in speed. With practice you should be able to cruise at the same speed effortlessly. Remember that any change in the inclination of the road will require an adjustment of the pressure on the accelerator pedal.

By looking far ahead, you may avoid having to brake firmly. By releasing the gas, the situation may change, and you may return to your cruising speed without having to stop completely.

THRUSTING ACCELERATION (EVASIVE MANEUVER)

A rapid speed change may be the only available option when neither time nor space on either side of the hazard is available. Often, acceleration, in order to create additional space between you and the threatening situation, may be the best or only viable alternative. Extreme care must be taken to separate steering input from either braking or acceleration.

A firm push or thrust on the accelerator pedal in order to elicit an immediate response of rapid acceleration is not a normal technique. In a vehicle equipped with an automatic transmission, this pedal movement will force the transmission to downshift (kickdown) with a resulting sharp increase in torque and acceleration.

This would be desirable when climbing a steep hill, for passing maneuvers, when entering a freeway, changing lanes at high speed, and avoiding a potential hazard in some emergency situations.

Excessive thrust causes unnecessary wear and tear on tires and the vehicle drive train.

DRIVING PLAN

The student formulates a Driving Plan incorporating the knowledge and skills of Module Two (Driver Preparation) to endorse, to promote, and to sustain lifelong legal and responsible reduced-risk driving practices in the HTS.

Module Two Review

VOCABULARY - WRITE A SHORT DEFINITION FOR THE FOLLOWING :

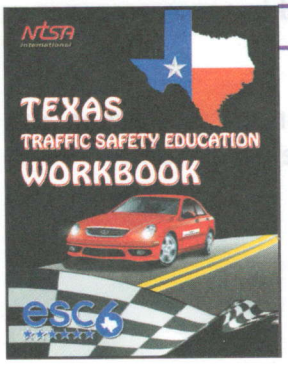
- Blind zone
- Pre-ignition procedure
- "Dead" pedal
- Convex mirror
- Safety belt
- Blind spots
- Driver' s compartment drill
- Instrument panel
- Headlight switch
- Windshield wiper
- Ignition switch
- Accelerator pedal
- Brake pedal
- Clutch pedal
- Parking brake
- Active restraint
- Passive restraint
- Air bags
- Child restraints
- Crumple zones
- Dry steering
- Hand-over-hand steering
- Push / pull steering
- Tap the brake
- Reaction time
- Total stopping distance
- Controlled braking
- Threshold braking
- ABS
- Progressive acceleration

TEST A- ANSWER THE FOLLOWING QUESTIONS.

1. A) **How should you familiarize yourself with the controls and instrumentation?**
   B) **Describe the pre-drive procedures.**
   C) **What are the advantages of driving in each of the three lane positions?**

2. A) **What communication tools are at your disposal when driving?**
   B) **What are the laws in Texas regarding safety belts and child restraints?**
   C) **Describe three improvements in safety technology that make driving safer.**

3. A) **Explain the possible steering techniques you might need to use.**
   B) **What are the advantages of each of the acceleration techniques presented?**
   C) **Describe the different braking techniques.**



TEXAS TSE STUDENT WORKBOOK

Check your comprehension and mastery of the contents of this Module by completing the corresponding exercises that are found in the complement to the TEXAS TSE STUDENT MANUAL:

TEXAS TSE STUDENT WORKBOOK

Complete the assigned questions in the workbook. If necessary, review the chapters when uncertain of an answer and refer to your instructor for further guidance.