Virginia Department of Education

Module Nine Transparencies

Driver Responsibilities: Vehicle Functions

Topic 1 -- Vehicle Functions/Malfunctions

Topic 2 -- Anti-Lock Braking Systems

Topic 3 -- Vehicle Performance

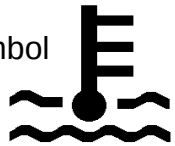
Topic 4 -- Highway Transportation System Agencies

Provided in cooperation with the Virginia Department of Motor Vehicles

Dashboard Warning Symbols

Temperature light or gauge

symbol



light

gauge

- warns you when the coolant in the engine is too hot or too low
- when the temperature warning light comes on or the gauge reads too hot, pull off the road and get professional help

Caution: never attempt to remove the radiator cap when the engine is hot. The pressure and hot steam can cause severe upper torso and facial burns.

Oil Pressure light or gauge

symbol

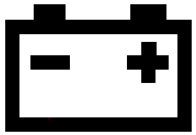
light

gauge

- warns you when the oil is not circulating at the proper pressure or there is not enough oil
- when the oil warning light comes on it is recommended that you stop at the nearest service center and have the oil level checked

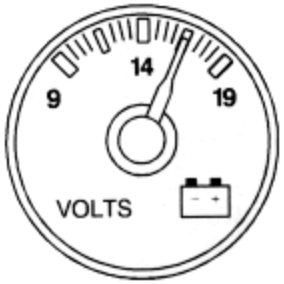
Dashboard Warning Symbols

Alternator/Generator light or gauges



symbol

light



gauge

When the “ALT” light comes on or the gauge shows “discharge” while the engine is running, the vehicle’s electrical system is in trouble.

- The alternator is not generating enough electricity to charge the battery.
- The engine must now use electricity stored in the battery.
- Turn off as many electrical devices as possible. (i.e., the radio, heater/AC, etc.)

Caution: when the battery is drained the engine may stall without warning.

Brake System light

This warning light serves two purposes:

(1) to indicate the parking brake is set; and

(2) to alert you that part or all of the braking system is not working properly; or, in some vehicles, the brake fluid is too low.

Dashboard Warning Symbols

ABS light

With an anti-lock brake system, this light comes on when you start the vehicle and may stay on for several seconds before turning off. This is a normal function for this warning system. If the light stays on, or comes on when you are driving, it is warning you that there is a problem in the ABS system and should be checked by a qualified mechanic.

Air Bag light

The light should flash for a few seconds and then go out indicating the system is activated. If the air bag readiness light stays on or comes on while you are driving, it is warning you there is a problem. If the air bag system in your vehicle is not working properly it can be extremely dangerous. The air bags:

- may NOT inflate in the event of a crash; or
- may inflate while driving without being involved in a crash.

Dashboard Warning Symbols

Service Engine Soon light

The SERVICE ENGINE or CHECK ENGINE light should flash for a few seconds when you start the engine and then go out. If the light stays on it indicates there may be a problem.

Door Ajar light

This warning light will illuminate when starting the engine and then go out. If this light remains on, one or more of the vehicle doors is not completely latched. If it comes on while driving, someone has opened a door or the door latch was not properly fastened. In either case, it is dangerous and you should pull off the road as soon as possible to secure the door.

Low fuel light

symbol

light

gauge

The fuel gauge shows the driver how much fuel is in the vehicle's fuel tank. When the fuel level is very low, the low fuel warning light will come on and stay on until you add more fuel to the tank.

Vehicle Failures

- Tire Blowout
- Accelerator Failure
- Engine Failure
- Steering Failure
- Car Catches on Fire

Tire Blowout

Vehicle Failures —

Tire Blowout

A Tire Blowout is a rapid deflation of air from the tire. This sudden loss of air could occur by:

- hitting a sharp object that punctures the tire;
- having a defective tire; or
- having an under-inflated tire that loses its seal to the rim while the tires are rotating.

If a front tire blows out, the vehicle will pull sharply in the direction of the blowout.

If a rear tire blows out, the vehicle will wobble, shake and pull slightly in the direction of the flat tire.

If a blowout occurs:

- ✓ Grip the steering wheel firmly.
- ✓ Take your foot off the accelerator.
- ✓ DO NOT BRAKE. Braking may cause the vehicle to swerve.
- ✓ Allow the vehicle to slow on its own, or brake gently.
- ✓ Check traffic around you and turn on emergency flashers.
- ✓ Drive to a protected location and pull off the roadway.
- ✓ Have the tire replaced.

Accelerator Failure

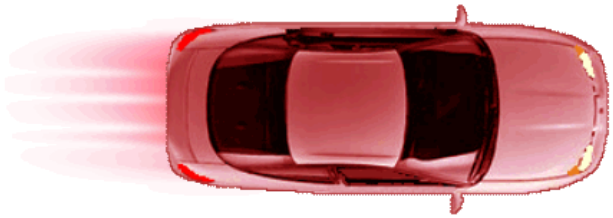
- Woman's Car Speeds Out of Control!

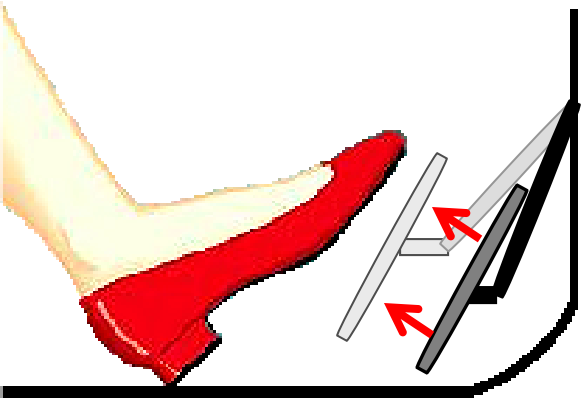
- What You Should Do If It Happens To You

Vehicle Failures — Accelerator Failure

The accelerator will not return to idle when you release it, and the engine is racing.

Accelerator failure is caused by either a broken spring or the pedal getting stuck in the down position. In either case, you no longer have control over the vehicle's speed. **Follow these steps:**





Accelerator Pedal STUCK in down position

- ✓ Shift to Neutral (engine may race but no harm done).
- ✓ Search for an escape path.
- ✓ Steer smoothly and brake gently.
- ✓ Pull off the roadway and park.
- ✓ Turn off the vehicle. **Caution — DO NOT** turn the ignition off while the vehicle is moving--this may lock the steering wheel.
- ✓ Have the pedal repaired at a service center before driving again.

Vehicle Failures — Engine Failure

Engine failure can happen with little warning and for various reason (engine becomes flooded, or overheats). Whatever the reason, when the engine stalls the steering mechanism will still work but will require much more effort.

If your engine stalls, follow these steps:

- ✓ **Shift to Neutral.**
- ✓ **Look for an escape path.**
- ✓ **Slow down and try to restart.**
- ✓ **If unsuccessful, pull off the roadway (apply more pressure on the pedal).**
- ✓ **Stop; Try to restart the engine.**
- ✓ **If unsuccessful, raise the hood and turn on your emergency flashers.**
- ✓ **Call for assistance.**

Vehicle Failures — Steering Failure

Total Steering Failure

- ✓ Communicate to others by using the horn and emergency flashers.
- ✓ **Stop** as quickly as possible. **DO NOT lock** the brakes as the vehicle could swerve sharply.
- ✓ Shift to a lower gear.
- ✓ Call for assistance.

Power Steering Failure

Occurs when the engine stops, if the power steering fluid level is too low in the pump, and/or if the drive belt slips or breaks.

NOTE: The vehicle can still be steered, but it will require much more effort on the driver's part to change direction.

Vehicle Failures — Brake Failure

Total Brake Failure — Pump the brake pedal. This action may build up enough brake pressure to stop. After three or four pumps you will know if the brakes are going to hold. **If this does not work:**

- downshift to a lower gear. This uses the braking power of the engine to slow the vehicle. Look for an escape route.
- activate the hazard lights to warn others.
- apply the parking brake gradually. Hold the release button. Release the parking brake if the vehicle begins to skid, and reapply as needed. Select a safe path of travel while the vehicle slows down.

Power Brake Failure — is the loss of power when the booster unit assisting the brakes no longer functions.

- ✓ **Apply the brakes--they may function normally for one more application of the pedal.**
- ✓ **Modulate pressure without releasing the brake.**
- ✓ **You will have to press harder on the brake pedal to stop the vehicle.**

Vehicle Failures — Fire

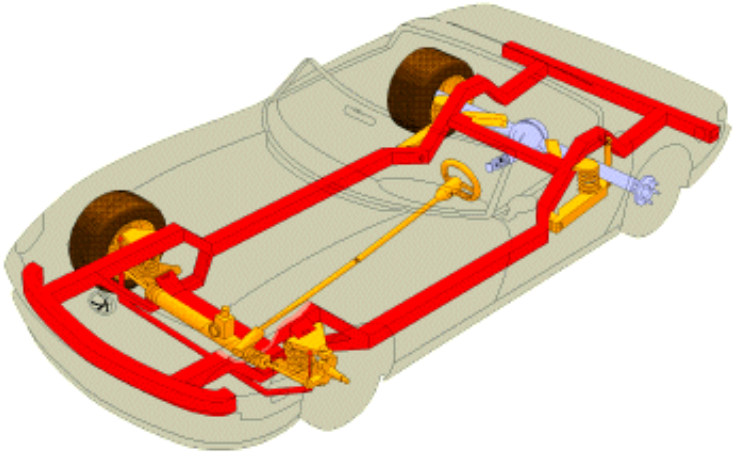
Car Catches Fire

- Quickly steer the vehicle out of traffic and away from buildings and people.
- Get everyone out of the vehicle and have them move at least 100 feet away.
- If the engine is on fire, call the fire department and leave the hood closed.
- If the passenger compartment is on fire, smother it, use a fire extinguisher, or call the fire department.

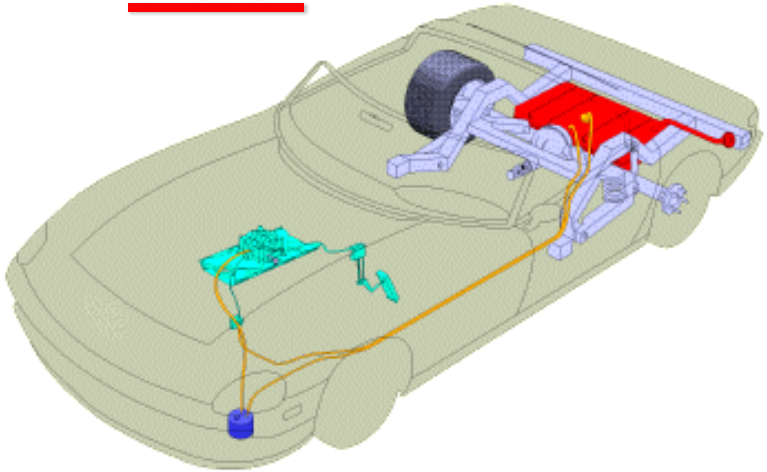
NEVER use water on an engine fire — water will NOT put out an oil or fuel fire; in fact it may even aid in the fire spreading! Use an A-B-C-type fire extinguisher.

Vehicle Systems

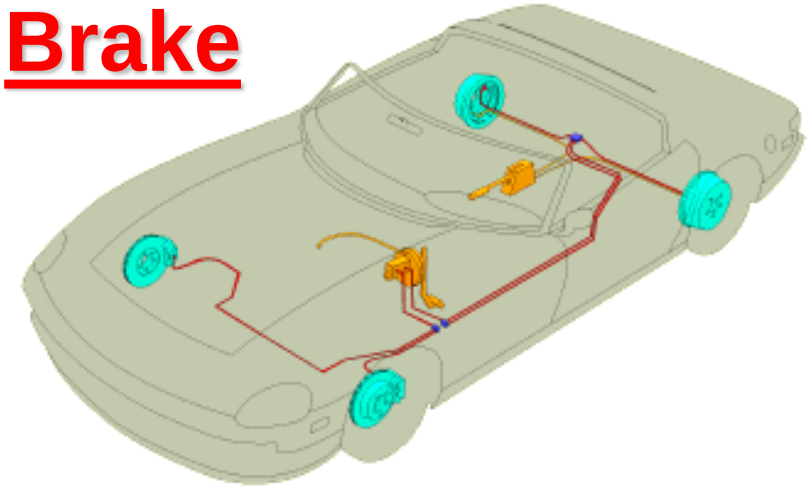
Steering and Suspension



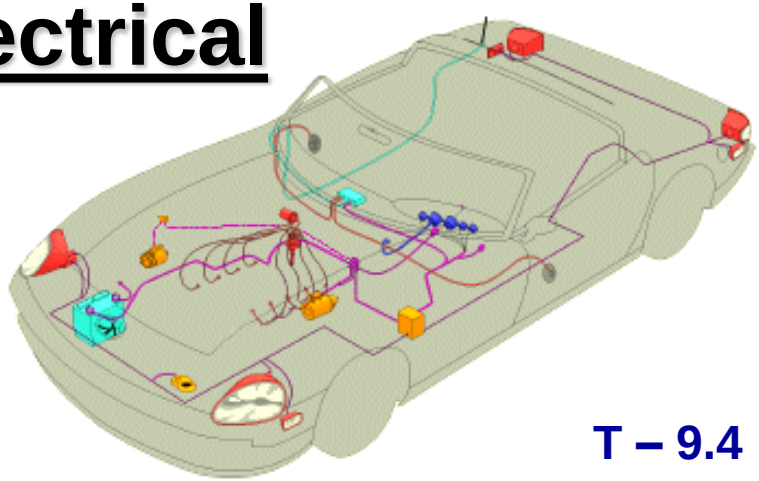
Fuel



Brake



Electrical



Vehicle Systems

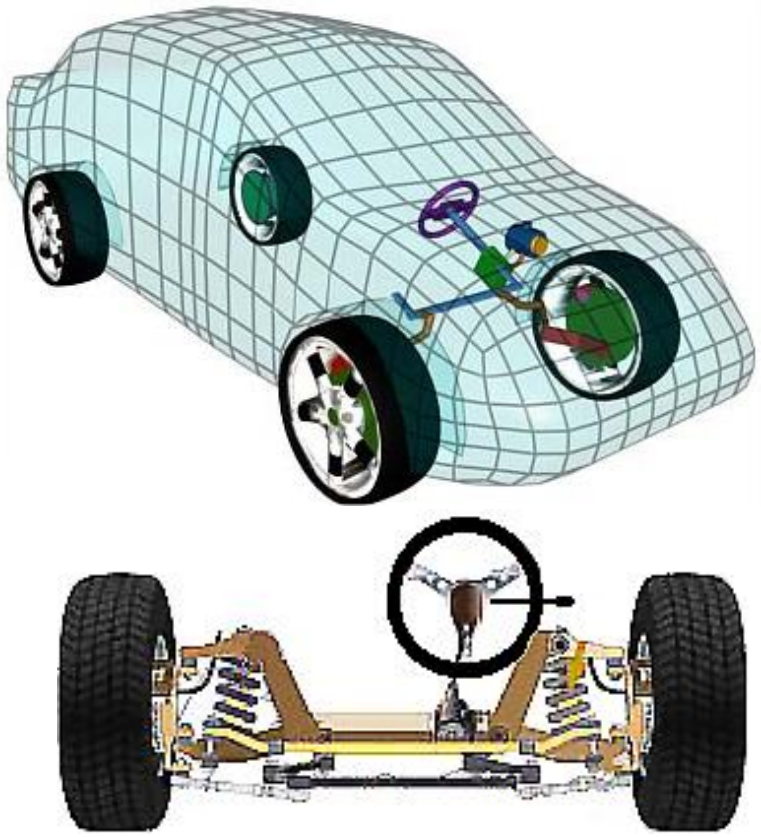
Steering and Suspension Systems

The basic function of suspension and steering systems is to keep the vehicle stable, while allowing the wheels to maintain contact with the road and move independently of the car.

The Steering System — controls the position of the front wheels and allows the driver to change vehicle direction.

General Steering Wheel System Operation:

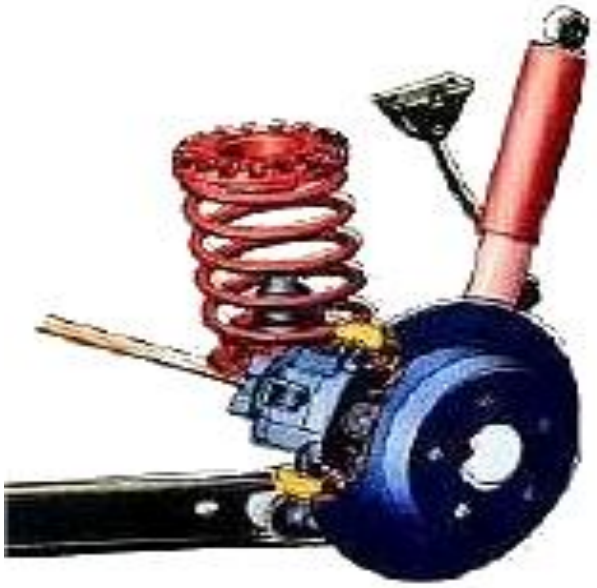
- ***Avoid turning the steering wheel when the vehicle is not moving;*** this causes wear on the steering system.
- ***Never force the steering to the limit of travel;*** you will hear a screeching sound if you have gone too far. Back off slightly and the wheels will still be fully turned. Forcing the system to the limit of travel causes unnecessary wear and early failure.
- ***Avoid deep potholes, curbs, and any other sudden or hard impacts*** that may cause damage to the steering components. Have the steering system aligned at least once a year and after any serious impacts.
- ***Periodically inspect*** the power steering pump belt and check the power steering fluid. (Consult the owner's manual for exact locations.)



Vehicle Systems

The Suspension System

The suspension system is engineered to keep the vehicle's wheels in firm contact with the road and pointed in the direction the driver is steering. Plus it helps provide a comfortable ride for all vehicle occupants. The system includes a series of rods, bars, springs, and other components. These components:



- ✓ **support the weight of the vehicle;**
- ✓ **absorb the shocks caused by road irregularities; and**
- ✓ **provide flexibility while ensuring vehicle stability.**

Vehicle Systems

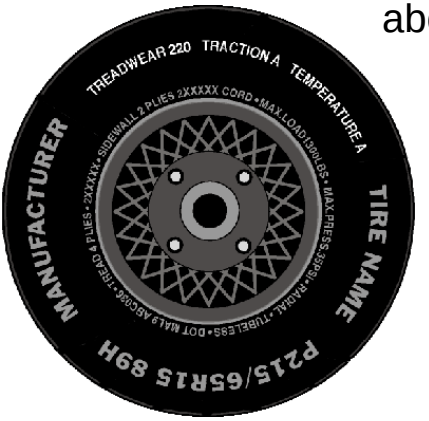
Tires and Traction Control

Tires perform two basic functions.

1. **Absorb shocks caused by road hazards — tires are air-filled cushions** designed to reduce the effect of road hazards and irregularities on the vehicle. Tires are made to flex and give as they meet the road surface.
2. **Provide Traction — tires grip the road.** Traction enables drivers to accelerate, brake, and steer their vehicles.

Tires are rated on the Uniform Tire Quality Grading System. Ratings are indicated on the sidewall of the tire.

Traction — is measured by the ability to stop a car in straight-ahead motion on a wet surface Tires which are graded **A** have the best traction performance, **B** grading is an above average rating, and **C** grading indicates the tire meets government standards.

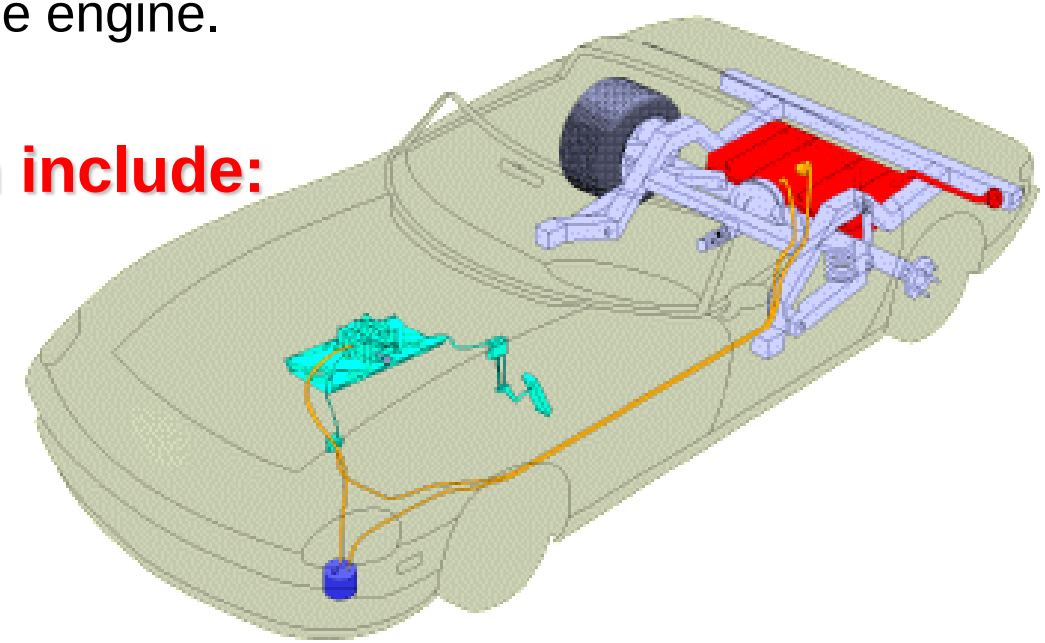


Temperature — indicates the tire's ability to withstand heat. Tires which are graded **A** are the most heat-resistant and less likely to suffer a blowout under the same conditions as tires with grades of **B or C.**

Treadwear rating — the higher the treadwear rating the greater the mileage. A tire with a treadwear rating of 150 is expected to last 50 percent longer than one graded at 100.

Vehicle Systems — Fuel System

The purpose of the fuel system is to provide a mixture of fuel and air to the engine of the vehicle. The air-fuel mixture must be in proportion to the speed and load placed on the engine.

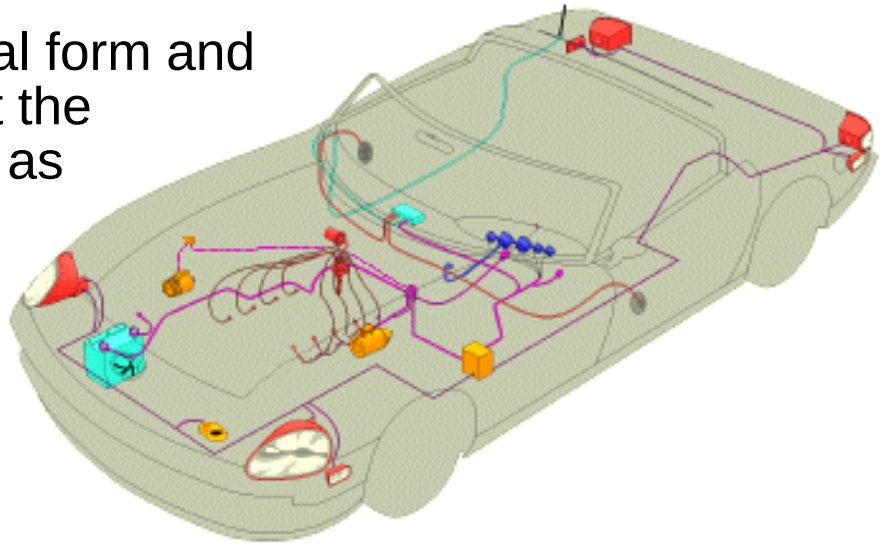


Major parts of the system include:

- ✓ **fuel tank and cap**
- ✓ **emission controls**
- ✓ **fuel line**
- ✓ **fuel pump**
- ✓ **fuel filter**
- ✓ **carburetor or fuel injectors (fuel injection system)**
- ✓ **intake manifold**
- ✓ **fuel gauge**

Vehicle Systems — Electrical System

A vehicle requires an elaborate electrical system of circuits to produce, store, and distribute all the electricity required for operation.



- **Battery —** energy is stored in chemical form and is used to supply the electricity to start the engine and run auxiliary devices such as clocks, radios and alarms
- **Starter Motor —** starts the engine
- **Ignition Coil —** increases the 12-volt current to many thousands of volts needed to start the engine
- **Distributor —** distributes electrical surges to the spark plugs
- **Spark Plugs —** produce spark to ignite the air-fuel mixture in the engine combustion chambers
- **Alternator —** recharge + power the electrical system

A device called the **voltage regulator** keeps the power level stabilized, and the **fuse box** keeps minor problems from becoming major ones.

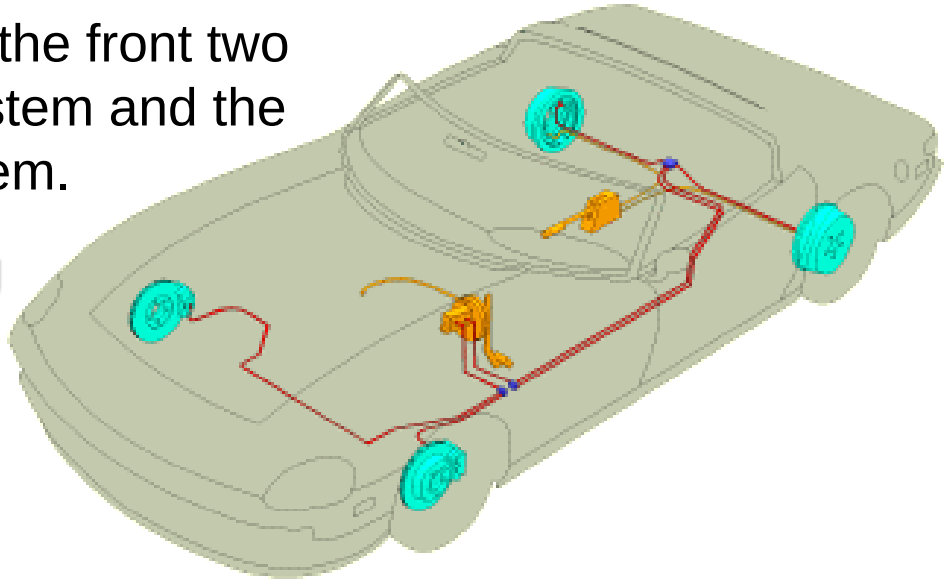
Vehicle Systems — Brake Systems

Brakes are actually energy conversion devices. When you step on the brakes, they convert the **kinetic energy** (momentum) of your vehicle into **thermal energy** (heat). Thousands of pounds of pressure are applied on each of the four brakes, permitting the driver to slow or stop the rotation of the tires. The friction of the tires against the road surface will then slow and/or stop the vehicle.

Vehicles are equipped with two braking systems:

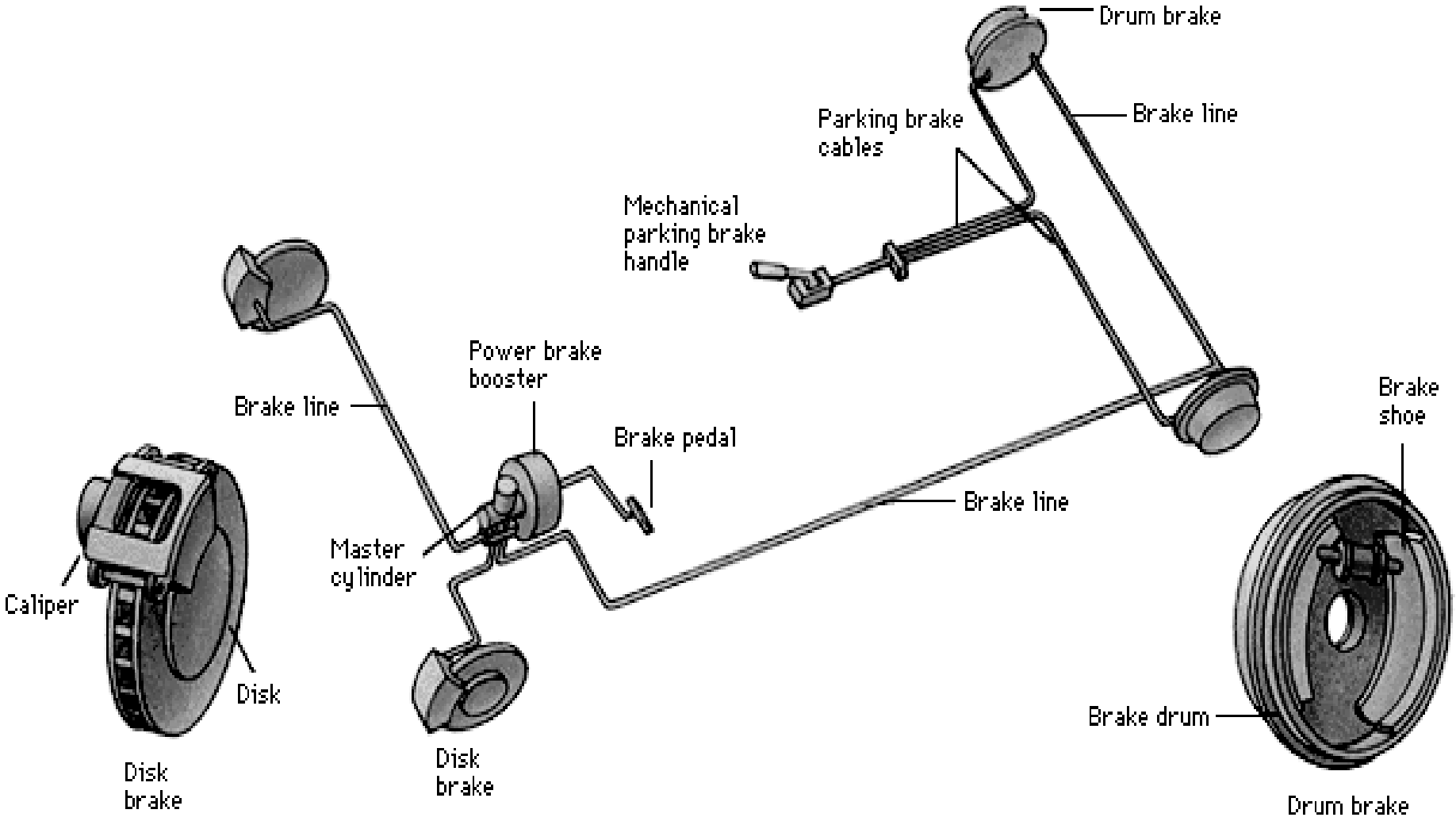
1) **A dual hydraulic brake system —** the front two wheels are controlled by one subsystem and the rear two wheels by another subsystem.

2) **Mechanical brake system** (parking or emergency brake) — a lever or foot pedal that mechanically activates the rear brakes only.



Vehicle Systems — Brake Systems

Components of Brake System



Vehicle Systems — ABS Brake System

Anti-Lock Braking System (ABS)

ABS was developed to assist driver braking actions by preventing tires from sliding and to keep them rotating slowly to allow steering.

Vehicle Systems — ABS Brake System

ABS Development

- *When was the ABS technology available?*
- *On what vehicles was the first commercial application?*
- *When did ABS become available for passenger vehicles?*
- *What road vehicles were first required to install ABS?*

Vehicle Systems — ABS Brake System

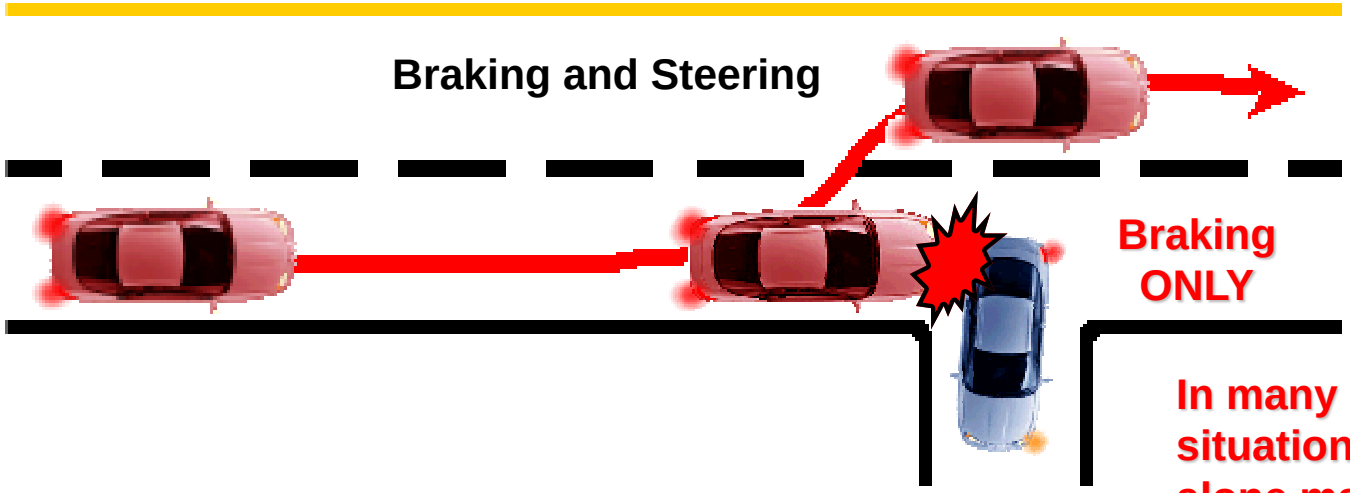
Critical Tire Traction Depends On:

- ✓ Road Surface
- ✓ Weather Conditions
- ✓ Tire Tread and Inflation
- ✓ Braking Techniques
- ✓ Speed
- ✓ Steering Inputs

Vehicle Systems — ABS Brake System

ABS Advantages

- ✓ Enhanced Braking Action
- ✓ Enhanced Vehicle Steerability



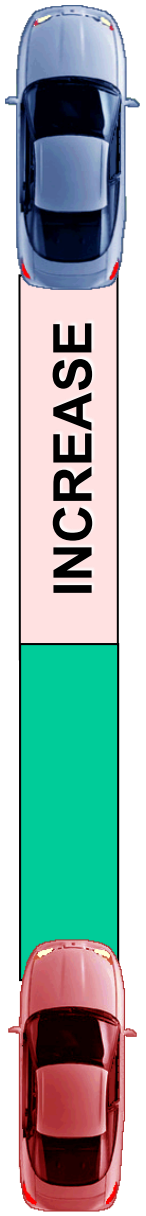
In many emergency situations braking alone may not prevent a collision.

- ✓ Increased Vehicle Stability
- ✓ Reduced Stopping Distance

Vehicle Systems — ABS Brake System

With ABS…

- Increase your following distance in bad weather
- Practice using ABS
- Keep your foot firmly on the brake even if it vibrates
- Check owner's manual for special concerns



Vehicle Systems — ABS Brake System

With ABS, Do Not

- Drive More Aggressively
- Pump the Brakes

- Steer Too Much
- Be Alarmed by ABS Noise or Vibration

Vehicle Performance

Trains

Cars

Trucks

Motorcycles

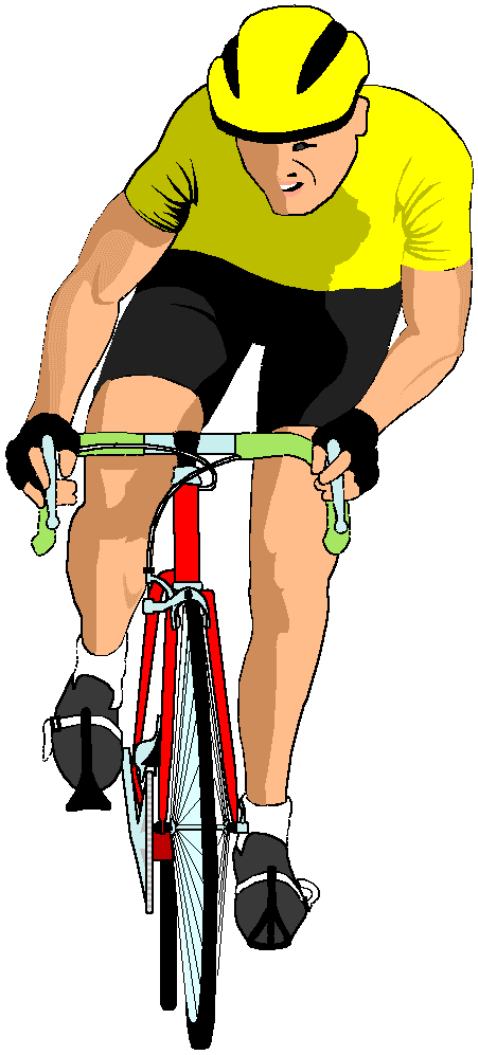
Sport Utility Vehicles (SUV)

Recreational Vehicles (RV)

Vehicle Performance

- Bicycles, Mopeds, Scooters
- Construction Vehicles
- Oversize Vehicles
- Farm Machinery
- Horse-drawn Vehicles

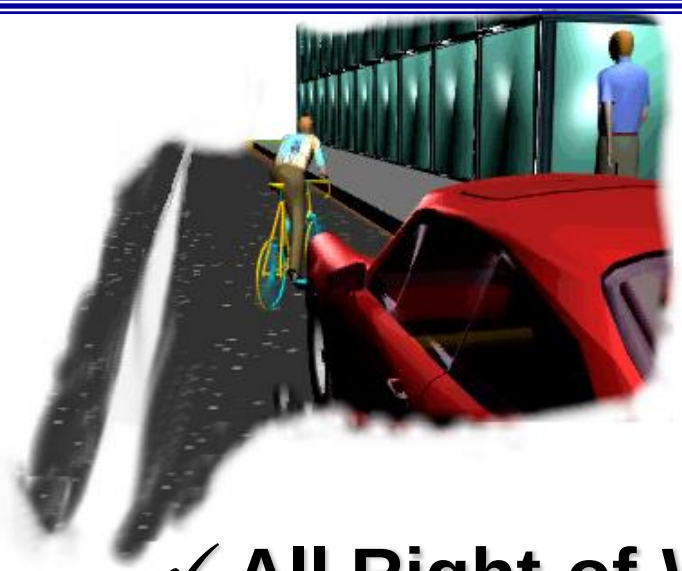
Bicyclist Responsibilities

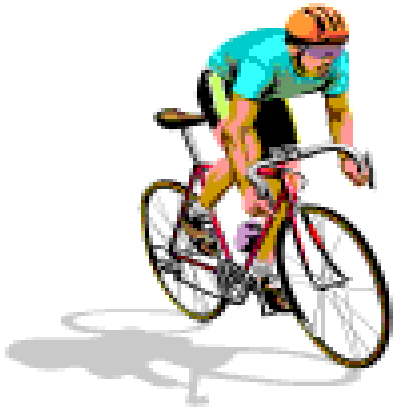


Cyclist Responsibilities

- ✓Ride on the right side of the lane
- ✓Signal slowing, stopping or turning
- ✓Obey all traffic laws
- ✓Yield to pedestrians
- ✓Wear Helmet
- ✓Use light at night

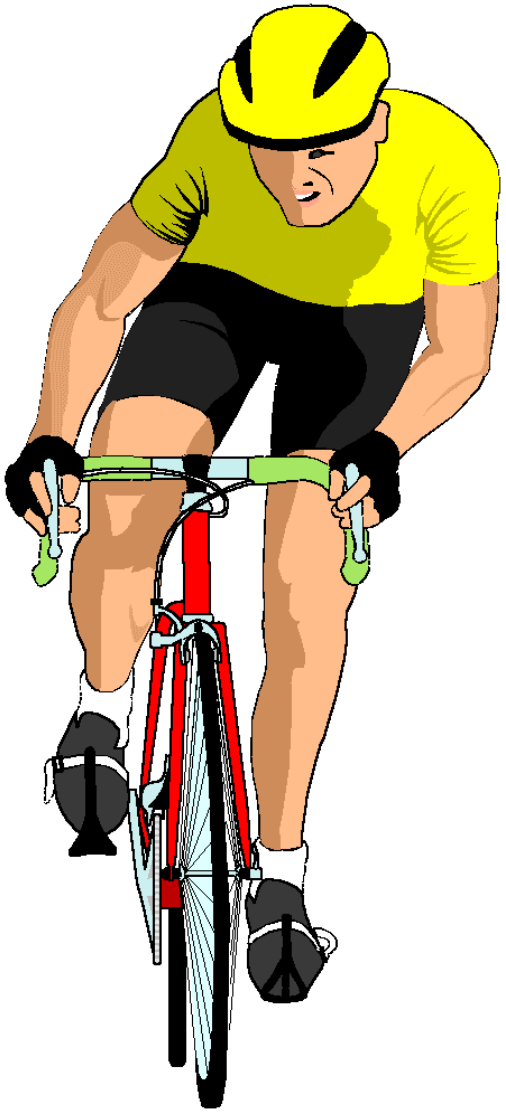
Sharing Roadway with Bicyclists





- ✓ All Right-of-Way Rules Apply
- ✓ Merge with Bicycle Traffic Flow Turning Right
- ✓ Beware of Oncoming Cyclist Turning at Intersections
- ✓ Use Extra Precaution When Interacting with Young Cyclists

Bicycle Safety Issues



Know or Use:

- ✓ Traffic Laws
- ✓ Safety Equipment
- ✓ Wet Weather Riding Dangers
- ✓ Common Motorist Errors
- ✓ Basic Bicycle Maintenance
- ✓ How to Maneuver on Uneven Surfaces
- ✓ Evasive Riding Techniques

Sharing Roadway with Trucks

- No Zone
- Passing
- Following
- Wide Turns
- Backing
- Maneuverability

Sharing Roadway with Motorcyclists

Motorcycle-related conflicts are most likely to occur in the following situations:

- **Left Turns**
- **Vehicle Blind Spot**
- **Motorcyclists Riding in Groups**
- **Hazardous Road Conditions**
- **Adverse Weather Conditions**
- **Strong Winds**
- **Around Large Vehicles**

Sharing Roadway with Motorcyclists

Unlike four-wheel vehicles, motorcycles are small two-wheeled vehicles that accelerate quickly and are often not seen by drivers of larger vehicles.

Motorcycle Awareness

When driving near a motorcyclist:

- **increase your following distance, and**
- **be aware of all the zones around the vehicle.**

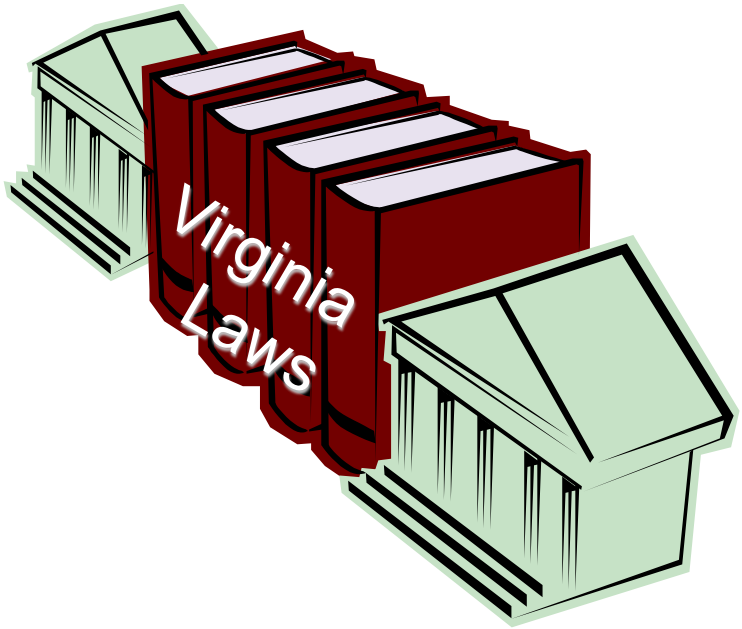
When being followed by a motorcycle:

- **check the rear-view mirror often, and**
- **avoid making sudden stops.**

Contributors to Transportation Safety

Virginia General Assembly

House & Senate Members



Governor's Office

- Secretary of Transportation
- Secretary of Safety
- Secretary of Education

Enforcement Agencies

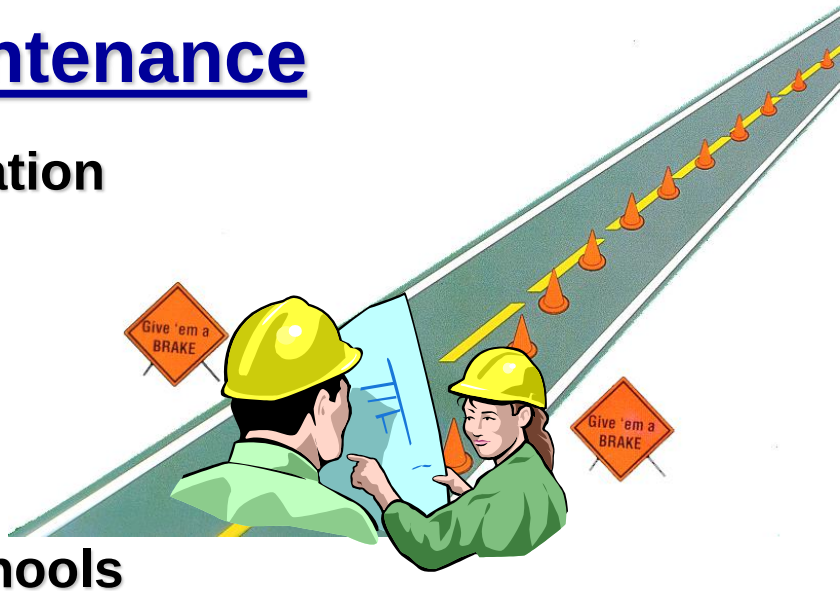
- Virginia Department of Motor Vehicles
- Virginia Alcohol Beverage Control Board
- Virginia State Police
- Local Law Enforcement Agencies
- Game and Inland Fisheries

Contributors to Transportation Safety

Virginia Court System

- State Supreme Court of Virginia
- Court of Appeals of Virginia
- Circuit Courts
- General District Courts
- Juvenile + Domestic Relations Courts

Traffic Engineering and Maintenance



- Virginia Department of Transportation
- Local Roadway Maintenance

Education

- Department of Education
- Public, Private, & Commercial Schools