Section 6
COMBINATION VEHICLES

This Section Covers

- **Driving Combination Vehicles Safely**
- **Combination Vehicle Air Brakes**
- **Antilock Brake Systems**
- **Coupling and Uncoupling**
- **Inspecting a Combination Vehicle**

This section provides information needed to pass the tests for combination vehicles (tractor-trailer, doubles, triples, straight truck with trailer). The information is only to give you the minimum knowledge needed for driving common combination vehicles. You should also study Section 7 if you need to pass the test for doubles and triples.

6.1 – Driving Combination Vehicles Safely

Combination vehicles are usually heavier, longer, and require more driving skill than single commercial vehicles. This means that drivers of combination vehicles need more knowledge and skill than drivers of single vehicles. In this section, we talk about some important safety factors that apply specifically to combination vehicles.

6.1.1 – Rollover Risks

More than half of truck driver deaths in crashes are the result of truck rollovers. When more cargo is piled up in a truck, the "center of gravity" moves higher up from the road. The truck becomes easier to turn over. Fully loaded rigs are ten times more likely to roll over in a crash than empty rigs.

The following two things will help you prevent rollover--keep the cargo as close to the ground as possible, and drive slowly around turns. Keeping cargo low is even more important in combination vehicles than in straight trucks. Also, keep the load centered on your rig. If the load is to one side so it makes a trailer lean, a rollover is more likely. Make sure your cargo is centered and spread out as much as possible. (Cargo distribution is covered in Section 3 of this manual.)

Rollovers happen when you turn too fast. Drive slowly around corners, on ramps, and off ramps. Avoid quick lane changes, especially when fully loaded.

6.1.2 – Steer Gently

Trucks with trailers have a dangerous "crack-the-whip" effect. When you make a quick lane change, the crack-the-whip effect can turn the trailer over. There are many accidents where only the trailer has overturned.

"Rearward amplification" causes the crack-the-whip effect. Figure 6.1 shows eight types of combination vehicles and the rearward amplification each has in a quick lane change. Rigs with the least crack-the-whip effect are shown at the top and those with the most, at the bottom. Rearward amplification of 2.0 in the chart means that the rear trailer is twice as likely to turn over as the tractor. You can see that triples have a rearward amplification of 3.5. This means you can roll the last trailer of triples 3.5 times as easily as a five-axle tractor-trailer.

Steer gently and smoothly when you are pulling trailers. If you make a sudden movement with your steering wheel, your trailer could tip over. Follow far enough behind other vehicles (at least 1 second for each 10 feet of your vehicle length, plus another second if going over 40 mph). Look far enough down the road to avoid being surprised and having to make a sudden lane change. At night, drive slowly enough to see obstacles with your headlights before it is too late to change lanes or stop gently. Slow down to a safe speed before going into a turn.

6.1.3 – Brake Early

Control your speed whether fully loaded or empty. Large combination vehicles take longer to stop when they are empty than when they are fully loaded. When lightly loaded, the very stiff suspension springs and strong brakes give poor traction and make it very easy to lock up the wheels. Your trailer can swing out and strike other vehicles. Your tractor can jackknife very quickly. You also must be very careful about driving "bobtail" tractors (tractors without semitrailers). Tests have shown that bobtails can be very hard to stop smoothly. It takes them longer to stop than a tractor-semitrailer loaded to maximum gross weight.

In any combination rig, allow lots of following distance and look far ahead, so you can brake early. Don't be caught by surprise and have to make a "panic" stop.

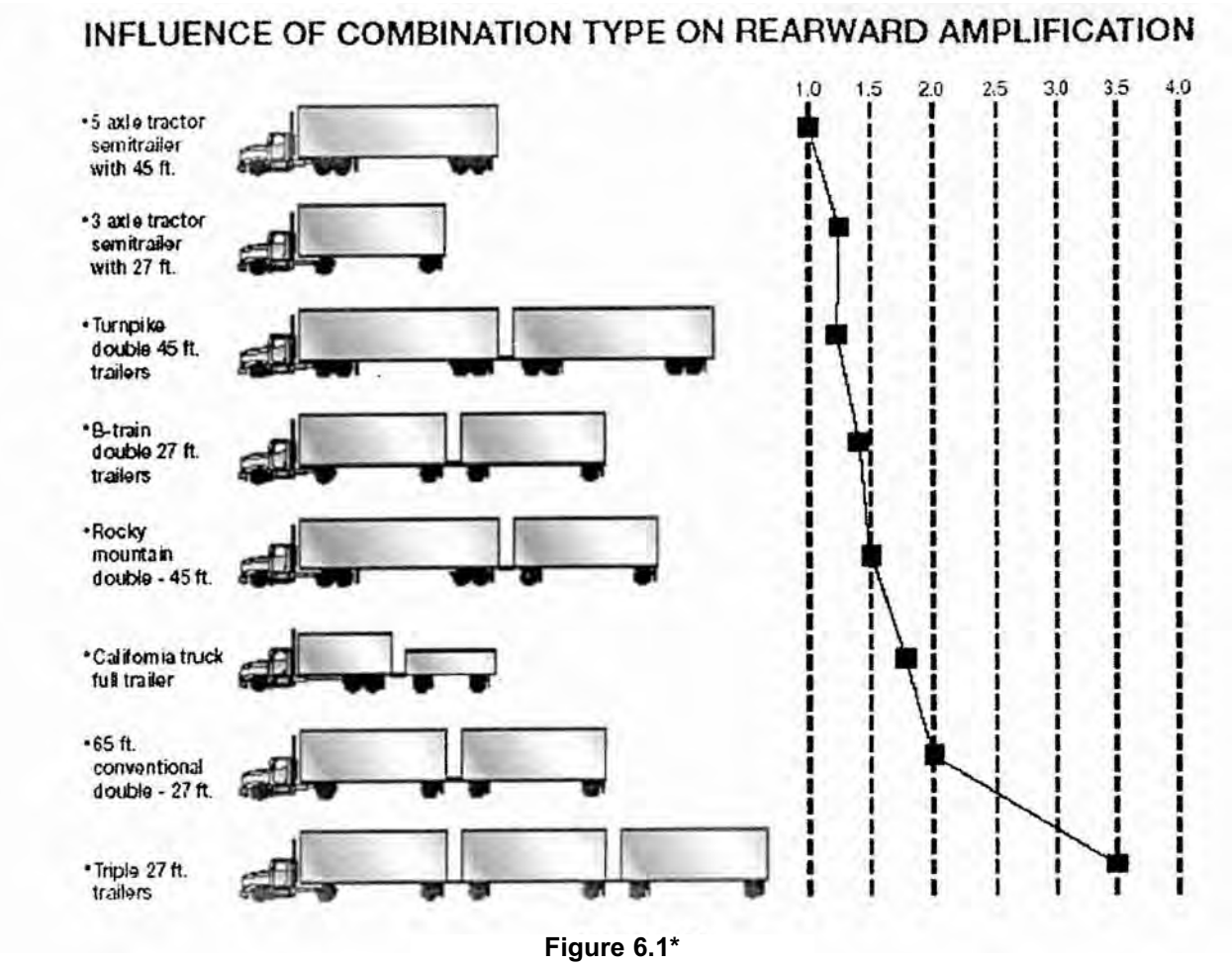

Figure 6.1*

* (From R.D. Ervin, R.L. Nisconger, C.C. MacAdam, and P.S. Fancher, “Influence of size and weight variables on the stability and control properties of heavy trucks, “University of Michigan Transportation Research Institute, 1983).

6.1.4 – Railroad-Highway Crossings

Railroad-highway crossings can also cause problems, particularly when pulling trailers with low underneath clearance.

These trailers can get stuck on raised crossings:

- Low slung units (lowboy, car carrier, moving van, possum-belly livestock trailer).
- Single-axle tractor pulling a long trailer with its landing gear set to accommodate a tandem-axle tractor.

If for any reason you get stuck on the tracks, get out of the vehicle and away from the tracks. Check signposts or signal housing at the crossing for emergency notification information. Call 911 or other emergency number. Give the location of the crossing using all identifiable landmarks, especially the DOT number, if posted.

6.1.5 – Prevent Trailer Skids

When the wheels of a trailer lock up, the trailer will tend to swing around. This is more likely to happen when the trailer is empty or lightly loaded. This type of jackknife is often called a "trailer jackknife." *See Figure 6.2.*

The procedure for stopping a trailer skid is:

Recognize the Skid. The earliest and best way to recognize that the trailer has started to skid is by seeing it in your mirrors. Any time you apply the brakes hard, check the mirrors to make sure the trailer is staying where it should be. Once the trailer swings out of your lane, it's very difficult to prevent a jackknife.

Stop Using the Brake. Release the brakes to get traction back. Do not use the trailer hand brake (if you have one) to "straighten out the rig." This is the wrong thing to do since the brakes on the trailer wheels caused the skid in the first place. Once the trailer wheels grip the road again, the trailer will start to follow the tractor and straighten out.

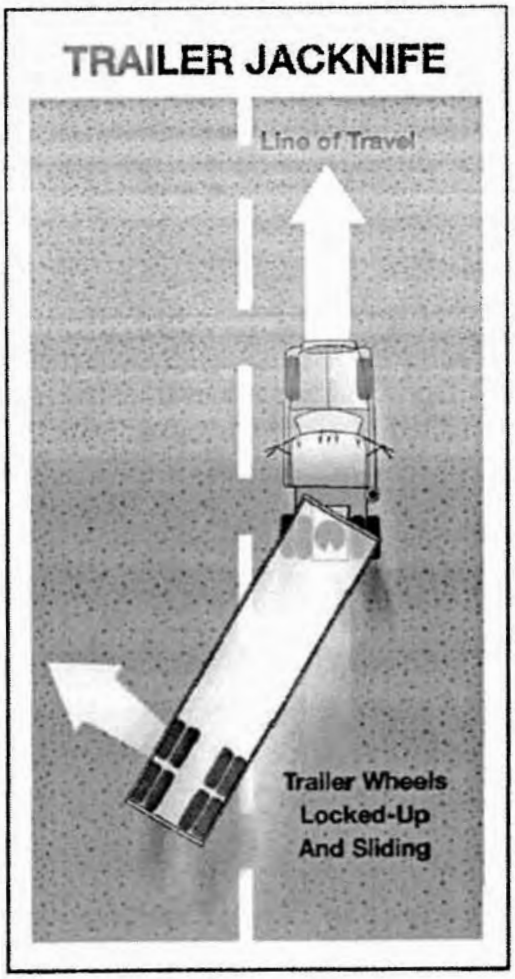

Figure 6.2

6.1.6 – Turn Wide

When a vehicle goes around a corner, the rear wheels follow a different path than the front wheels. This is called offtracking or "cheating." Figure 6.3 shows how offtracking causes the path followed by a tractor to be wider than the rig itself. Longer vehicles will offtrack more. The rear wheels of the powered unit (truck or tractor) will offtrack some, and the rear wheels of the trailer will offtrack even more. If there is more than one trailer, the rear wheels of the last trailer will offtrack the most. Steer the front end wide enough around a corner so the rear end does not run over the curb, pedestrians, etc. However, keep the rear of your vehicle close to the curb. This will stop other drivers from passing you on the right. If you cannot complete your turn without entering another traffic lane, turn wide as you complete the turn. This is better than swinging wide to the left before starting the turn because it will keep other drivers from passing you on the right. *See Figure 6.4.*

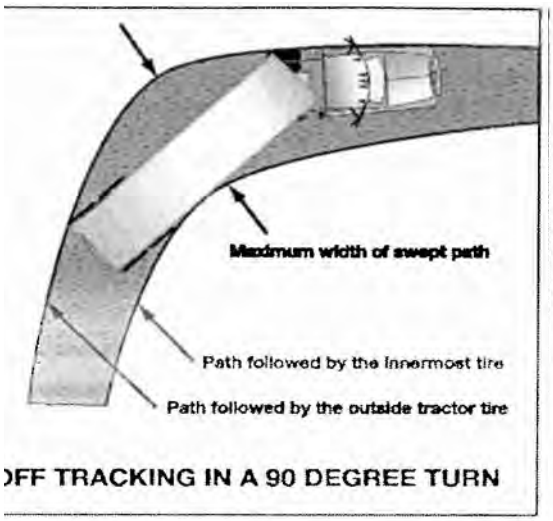

Figure 6.3

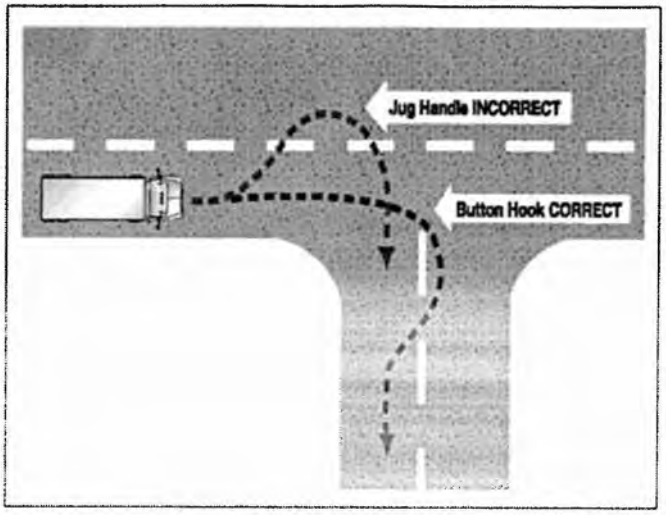

Figure 6.4

6.1.7 – Backing with a Trailer.

Backing with a Trailer. When backing a car, straight truck, or bus, you turn the top of the steering wheel in the direction you want to go. When backing a trailer, you turn the steering wheel in the opposite direction. Once the trailer starts to turn, you must turn the wheel the other way to follow the trailer.

Whenever you back up with a trailer, try to position your vehicle so you can back in a straight line. If you must back on a curved path, back to the driver's side so you can see. *See Figure 6.5.*

Look at Your Path. Look at your line of travel before you begin. Get out and walk around the vehicle. Check your clearance to the sides and overhead, in and near the path of your vehicle.

Use Mirrors on Both Sides. Check the outside mirrors on both sides frequently. Get out of the vehicle and reinspect your path if you are unsure.

Back Slowly. This will let you make corrections before you get too far off course.

Correct Drift Immediately. As soon as you see the trailer getting off the proper path, correct it by turning the top of the steering wheel in the direction of the drift.
Pull Forward. When backing a trailer, make pull-ups to reposition your vehicle as needed.

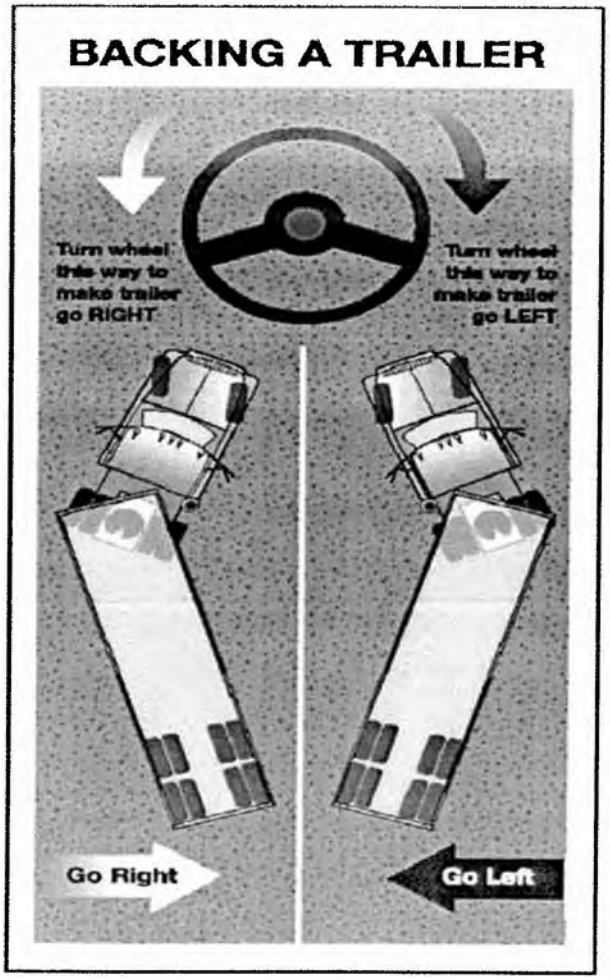

Figure 6.5

Subsection 6.1
Test Your Knowledge

1. What two things are important to prevent rollover?
2. When you turn suddenly while pulling doubles, which trailer is most likely to turn over?
3. Why should you not use the trailer hand brake to straighten out a jackknifing trailer?
4. What is offtracking?
5. When you back a trailer, you should position your vehicle so you can back in a curved path to the driver's side. True or False?
6. What type of trailers can get stuck on railroad-highway crossings?

These questions may be on your test. If you can't answer them all, re-read subsection 6.1.

6.2 – Combination Vehicle Air Brakes

You should study Section 5: Air Brakes before reading this. In combination vehicles the braking system has parts to control the trailer brakes, in addition to the parts described in Section 5. These parts are described below.

6.2.1 – Trailer Hand Valve

The trailer hand valve (also called the trolley valve or Johnson bar) works the trailer brakes. The trailer hand valve should be used only to test the trailer brakes. Do not use it in driving because of the danger of making the trailer skid. The foot brake sends air to all of the brakes on the vehicle (including the trailer(s)). There is much less danger of causing a skid or jackknife when using just the foot brake.

Never use the hand valve for parking because all the air might leak out, unlocking the brakes (in trailers that don't have spring brakes). Always use the parking brakes when parking. If the trailer does not have spring brakes, use wheel chocks to keep the trailer from moving.

6.2.2 – Tractor Protection Valve

The tractor protection valve keeps air in the tractor or truck brake system should the trailer break away or develop a bad leak. The tractor protection valve is controlled by the "trailer air supply" control valve in the cab. The control valve allows you to open and shut the tractor protection valve. The tractor protection valve will close automatically if air pressure is low (in the range of 20 to 45 psi). When the tractor protection valve closes, it stops any air from going out of the tractor. It also lets the air out of the trailer emergency line. This causes the trailer emergency brakes to come on, with possible loss of control. (Emergency brakes are covered later.)

6.2.3 – Trailer Air Supply Control

The trailer air supply control on newer vehicles is a red eight-sided knob, which you use to control the tractor protection valve. You push it in to supply the trailer with air, and pull it out to shut the air off and put on the trailer emergency brakes. The valve will pop out (thus closing the tractor protection valve) when the air pressure drops into the range of 20 to 45 psi. Tractor protection valve controls or "emergency" valves on older vehicles may not operate automatically. There may be a lever rather than a knob. The "normal" position is used for pulling a trailer. The "emergency" position is used to shut the air off and put on the trailer emergency brakes.

6.2.4 – Trailer Air Lines

Every combination vehicle has two air lines, the service line and the emergency line. They run between each vehicle (tractor to trailer, trailer to dolly, dolly to second trailer, etc.)

Service Air Line. The service line (also called the control line or signal line) carries air, which is controlled by the foot brake or the trailer hand brake. Depending on how hard you press the foot brake or hand valve, the pressure in the service line will similarly change. The service line is connected to relay valves. These valves allow the trailer brakes to be applied more quickly than would otherwise be possible.

Emergency Air Line. The emergency line (also called the supply line) has two purposes. First, it supplies air to the trailer air tanks. Second, the emergency line controls the emergency brakes on combination vehicles. Loss of air pressure in the emergency line causes the trailer emergency brakes to come on. The pressure loss could be caused by a trailer breaking loose, thus tearing apart the emergency air hose. Or it could be caused by a hose, metal tubing, or other part breaking, letting the air out. When the emergency line loses pressure, it also causes the tractor protection valve to close (the air supply knob will pop out).

Emergency lines are often coded with the color red (red hose, red couplers, or other parts) to keep from getting them mixed up with the blue service line.

6.2.5 – Hose Couplers (Glad Hands)

Glad hands are coupling devices used to connect the service and emergency air lines from the truck or tractor to the trailer. The couplers have a rubber seal, which prevents air from escaping. Clean the couplers and rubber seals before a connection is made. When connecting the glad hands, press the two seals together with the couplers at a 90 degree angle to each other. A turn of the glad hand attached to the hose will join and lock the couplers.

When coupling, make sure to couple the proper glad hands together. To help avoid mistakes, colors are sometimes used. Blue is used for the service lines and red for the emergency (supply) lines. Sometimes, metal tags are attached to the lines with the words "service" and "emergency" stamped on them. *See Figure 6.6.*

If you do cross the air lines, supply air will be sent to the service line instead of going to charge the trailer air tanks. Air will not be available to release the trailer spring brakes (parking brakes). If the spring brakes don't release when you push the trailer air supply control, check the air line connections.

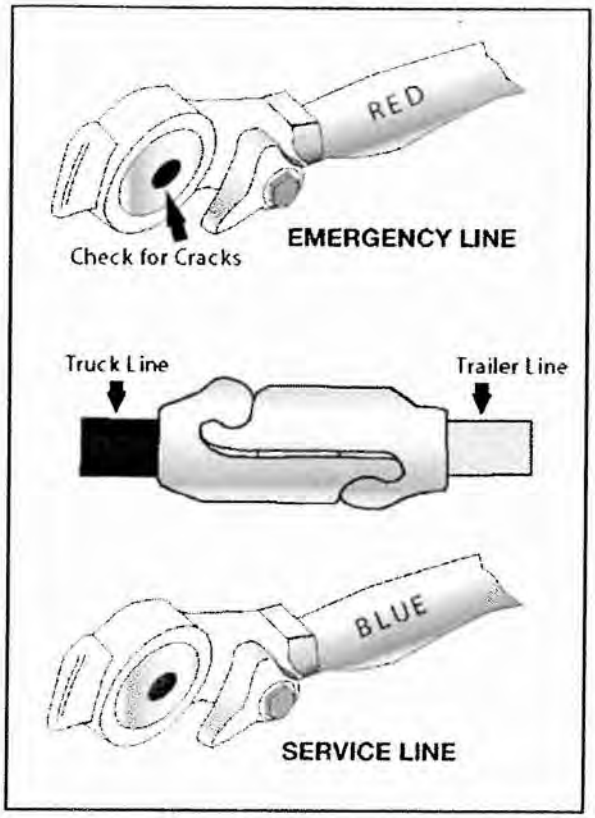

Figure 6.6

Older trailers do not have spring brakes. If the air supply in the trailer air tank has leaked away there will be no emergency brakes, and the trailer wheels will turn freely. If you crossed the air lines, you could drive away but you wouldn't have trailer brakes. This would be very dangerous. Always test the trailer brakes before driving with the hand valve or by pulling the air supply (tractor protection valve) control. Pull gently against them in a low gear to make sure the brakes work.

Some vehicles have "dead end" or dummy couplers to which the hoses may be attached when they are not in use. This will prevent water and dirt from getting into the coupler and the air lines. Use the dummy couplers when the air lines are not connected to a trailer. If there are no dummy couplers, the glad hands can sometimes be locked together (depending on the couplings). It is very important to keep the air supply clean.

6.2.6 – Trailer Air Tanks

Each trailer and converter dolly has one or more air tanks. They are filled by the emergency (supply) line from the tractor. They provide the air pressure used to operate trailer brakes. Air pressure is sent from the air tanks to the brakes by relay valves.

The pressure in the service line tells how much pressure the relay valves should send to the trailer brakes. The pressure in the service line is controlled by the brake pedal (and the trailer hand brake).

It is important that you don't let water and oil build up in the air tanks. If you do, the brakes may not work correctly. Each tank has a drain valve on it and you should drain each tank every day. If your tanks have automatic drains, they will keep most moisture out. But you should still open the drains to make sure.

6.2.7 – Shut-off Valves

Shut-off valves (also called cut-out cocks) are used in the service and supply air lines at the back of trailers used to tow other trailers. These valves permit closing the air lines off when another trailer is not being towed. You must check that all shut-off valves are in the open position except the ones at the back of the last trailer, which must be closed.

6.2.8 – Trailer Service, Parking and Emergency Brakes

Newer trailers have spring brakes just like trucks and truck tractors. However, converter dollies and trailers built before 1975 are not required to have spring brakes. Those that do not have spring brakes have emergency brakes, which work from the air stored in the trailer air tank. The emergency brakes come on whenever air pressure in the emergency line is lost. These trailers have no parking brake. The emergency brakes come on whenever the air supply knob is pulled out or the trailer is disconnected. A major leak in the emergency line will cause the tractor protection valve to close and the trailer emergency brakes to come on. But the brakes will hold only as long as there is air pressure in the trailer air tank. Eventually, the air will leak away and then there will be no brakes. Therefore, it is very important for safety that you use wheel chocks when you park trailers without spring brakes.

You may not notice a major leak in the service line until you try to put the brakes on. Then, the air loss from the leak will lower the air tank pressure quickly. If it goes low enough, the trailer emergency brakes will come on.

Subsection 6.2
Test Your Knowledge

1. Why should you not use the trailer hand valve while driving?
2. Describe what the trailer air supply control does.
3. Describe what the service line is for.
4. What is the emergency air line for?
5. Why should you use chocks when parking a trailer without spring brakes?
6. Where are shut-off valves?

These questions may be on your test. If you can't answer them all, re-read subsection 6.2.

6.3 – Antilock Brake Systems

6.3.1 – Trailers Required to Have ABS

All trailers and converter dollies built on or after March 1, 1998, are required to have ABS. However, many trailers and converter dollies built before this date have been voluntarily equipped with ABS.

Trailers will have yellow ABS malfunction lamps on the left side, either on the front or rear corner. *See Figure 6.7.* Dollies manufactured on or after March 1, 1998, are required to have a lamp on the left side.

In the case of vehicles manufactured before the required date, it may be difficult to tell if the unit is equipped with ABS. Look under the vehicle for the ECU and wheel speed sensor wires coming from the back of the brakes.

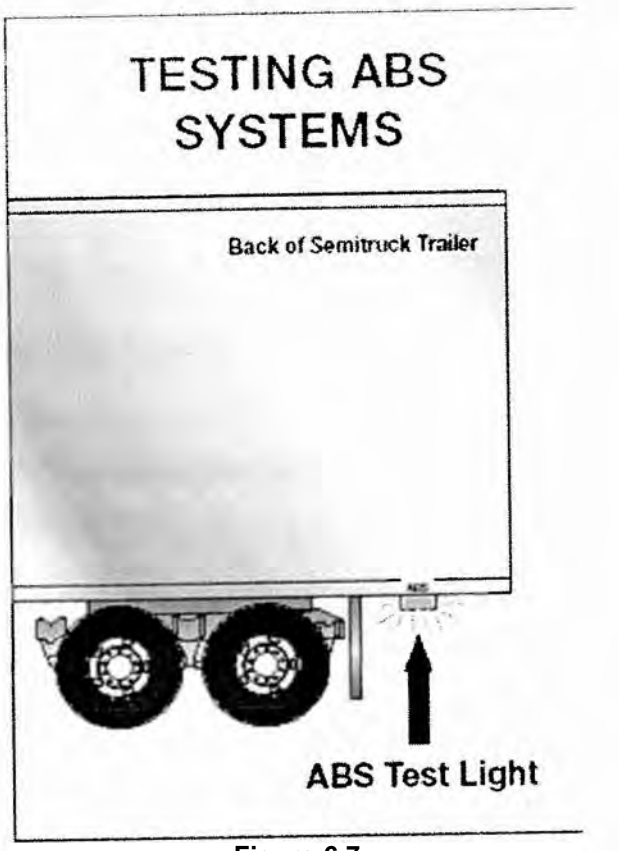

Figure 6.7

6.3.2 – Braking with ABS

ABS is an addition to your normal brakes. It does not decrease or increase your normal braking capability. ABS only activates when wheels are about to lock up.

ABS does not necessarily shorten your stopping distance, but it does help you keep the vehicle under control during hard braking.

ABS helps you avoid wheel lock up. The computer senses impending lockup, reduces the braking pressure to a safe level, and you maintain control.

Having ABS on only the trailer, or even on only one axle, still gives you more control over the vehicle during braking.

When only the trailer has ABS, the trailer is less likely to swing out, but if you lose steering control or start a tractor jackknife, let up on the brakes (if you can safely do so) until you gain control.

When you drive a tractor-trailer combination with ABS, you should brake as you always have. In other words:

- Use only the braking force necessary to stop safely and stay in control.
- Brake the same way, regardless of whether you have ABS on the tractor, the trailer, or both.
- As you slow down, monitor your tractor and trailer and back off the brakes (if it is safe to do so) to stay in control.

Remember, if your ABS malfunctions, you still have regular brakes. Drive normally, but get the system serviced soon.

ABS won't allow you to drive faster, follow more closely, or drive less carefully.

6.4 – Coupling and Uncoupling

Knowing how to couple and uncouple correctly is basic to safe operation of combination vehicles. Wrong coupling and uncoupling can be very dangerous. General coupling and uncoupling steps are listed below. There are differences between different rigs, so learn the details of coupling and uncoupling the truck(s) you will operate.

6.4.1 – Coupling Tractor-Semitrailers

Step 1. Inspect Fifth Wheel

- Check for damaged/missing parts.
- Check to see that mounting to tractor is secure, no cracks in frame, etc.
- Be sure that the fifth wheel plate is greased as required. Failure to keep the fifth wheel plate lubricated could cause steering problems because of friction between the tractor and trailer.
- Check if fifth wheel is in proper position for coupling.
  - Wheel tilted down toward rear of tractor.
  - Jaws open.
  - Safety unlocking handle in the automatic lock position.
  - If you have a sliding fifth wheel, make sure it is locked.
  - Make sure the trailer kingpin is not bent or broken.

Step 2. Inspect Area and Chock Wheels

- Make sure area around the vehicle is clear.
- Be sure trailer wheels are chocked or spring brakes are on.
- Check that cargo (if any) is secured against movement due to tractor being coupled to the trailer.

Step 3. Position Tractor

- Put the tractor directly in front of the trailer. (Never back under the trailer at an angle because you might push the trailer sideways and break the landing gear.)
- Check position, using outside mirrors, by looking down both sides of the trailer.

Step 4. Back Slowly

- Back until fifth wheel just touches the trailer.
- Don't hit the trailer.

Step 5. Secure Tractor

- Put on the parking brake.
- Put transmission in neutral.

Step 6. Check Trailer Height

- The trailer should be low enough that it is raised slightly by the tractor when the tractor is backed under it. Raise or lower the trailer as needed. (If the trailer is too low, the tractor may strike and damage the trailer nose; if the trailer is too high, it may not couple correctly.)
- Check that the kingpin and fifth wheel are aligned.

Step 7. Connect Air Lines to Trailer

- Check glad hand seals and connect tractor emergency air line to trailer emergency glad hand.
- Check glad hand seals and connect tractor service air line to trailer service glad hand.
- Make sure air lines are safely supported where they won't be crushed or caught while tractor is backing under the trailer.

Step 8. Supply Air to Trailer

- From cab, push in "air supply" knob or move tractor protection valve control from the "emergency" to the "normal" position to supply air to the trailer brake system.
- Wait until the air pressure is normal.
- Check brake system for crossed air lines.
  - Shut engine off so you can hear the brakes.
  - Apply and release trailer brakes and listen for sound of trailer brakes being applied and released. You should hear the brakes move when applied and air escape when the brakes are released.
  - Check air brake system pressure gauge for signs of major air loss.
- When you are sure trailer brakes are working, start engine.
- Make sure air pressure is up to normal.

Step 9. Lock Trailer Brakes

- Pull out the "air supply" knob or move the tractor protection valve control from "normal" to "emergency."

Step 10. Back Under Trailer

- Use lowest reverse gear.
- Back tractor slowly under trailer to avoid hitting the kingpin too hard.
- Stop when the kingpin is locked into the fifth wheel.

Step 11. Check Connection for Security

- Raise trailer landing gear slightly off ground.
- Pull tractor gently forward while the trailer brakes are still locked to check that the trailer is locked onto the tractor.

Step 12. Secure Vehicle

- Put transmission in neutral.
- Put parking brakes on.
- Shut off engine and take key with you so someone else won't move truck while you are under it.

Step 13. Inspect Coupling

- Use a flashlight, if necessary.
- Make sure there is no space between upper and lower fifth wheel. If there is space, something is wrong (kingpin may be on top of the closed fifth wheel jaws, and trailer would come loose very easily).
- Go under trailer and look into the back of the fifth wheel. Make sure the fifth wheel jaws have closed around the shank of the kingpin.
- Check that the locking lever is in the "lock" position.
- Check that the safety latch is in position over locking lever. (On some fifth wheels the catch must be put in place by hand.)
- If the coupling isn't right, don't drive the coupled unit; get it fixed.

Step 14. Connect the Electrical Cord and Check Air Lines

- Plug the electrical cord into the trailer and fasten the safety catch.
- Check both air lines and electrical line for signs of damage.
- Make sure air and electrical lines will not hit any moving parts of vehicle.

Step 15. Raise Front Trailer Supports (Landing Gear)

- Use low gear range (if so equipped) to begin raising the landing gear. Once free of weight, switch to the high gear range.
- Raise the landing gear all the way up. (Never drive with landing gear only part way up as it may catch on railroad tracks or other things.)
- After raising landing gear, secure the crank handle safely.
- When full weight of trailer is resting on tractor:
  - Check for enough clearance between rear of tractor frame and landing gear. (When tractor turns sharply, it must not hit landing gear.)
  - Check that there is enough clearance between the top of the tractor tires and the nose of the trailer.

Step 16. Remove Trailer Wheel Chocks

- Remove and store wheel chocks in a safe place.

6.4.2 – Uncoupling Tractor-Semitrailers

The following steps will help you to uncouple safely.

Step 1. Position Rig

- Make sure surface of parking area can support weight of trailer.
- Have tractor lined up with the trailer. (Pulling out at an angle can damage landing gear.)

Step 2. Ease Pressure on Locking Jaws

- Shut off trailer air supply to lock trailer brakes.
- Ease pressure on fifth wheel locking jaws by backing up gently. (This will help you release the fifth wheel locking lever.)
- Put parking brakes on while tractor is pushing against the kingpin. (This will hold rig with pressure off the locking jaws.)

Step 3. Chock Trailer Wheels

- Chock the trailer wheels if the trailer doesn't have spring brakes or if you're not sure. (The air could leak out of the trailer air tank, releasing its emergency brakes. Without chocks, the trailer could move.)

Step 4. Lower the Landing Gear

- If trailer is empty, lower the landing gear until it makes firm contact with the ground.
- If trailer is loaded, after the landing gear makes firm contact with the ground, turn crank in low gear a few extra turns. This will lift some weight off the tractor. (Do not lift trailer off the fifth wheel.) This will:
  - Make it easier to unlatch fifth wheel.
  - Make it easier to couple next time.

Step 5. Disconnect Air Lines and Electrical Cable

- Disconnect air lines from trailer. Connect air line glad hands to dummy couplers at back of cab or couple them together.
- Hang electrical cable with plug down to prevent moisture from entering it.
- Make sure lines are supported so they won't be damaged while driving the tractor.

Step 6. Unlock Fifth Wheel

- Raise the release handle lock.
- Pull the release handle to "open" position.
- Keep legs and feet clear of the rear tractor wheels to avoid serious injury in case the vehicle moves.

Step 7. Pull Tractor Partially Clear of Trailer

- Pull tractor forward until fifth wheel comes out from under the trailer.
- Stop with tractor frame under trailer (prevents trailer from falling to ground if landing gear should collapse or sink).

Step 8. Secure Tractor

- Apply parking brake.
- Place transmission in neutral.

Step 9. Inspect Trailer Supports

- Make sure ground is supporting trailer.
- Make sure landing gear is not damaged.

Step 10. Pull Tractor Clear of Trailer

- Release parking brakes.
- Check the area and drive tractor forward until it clears.

Subsections 6.3 and 6.4
Test Your Knowledge

1. What might happen if the trailer is too high when you try to couple?
2. After coupling, how much space should be between the upper and lower fifth wheel?
3. You should look into the back of the fifth wheel to see if it is locked onto the kingpin. True or False?
4. To drive you need to raise the landing gear only until it just lifts off the pavement. True or False?
5. How do you know if your trailer is equipped with antilock brakes?

These questions may be on your test. If you can't answer them all, re-read subsections 6.3 and 6.4.

6.5 – Inspecting a Combination Vehicle

Use the seven-step inspection procedure described in Section 2 to inspect your combination vehicle. There are more things to inspect on a combination vehicle than on a single vehicle. (For example, tires, wheels, lights, reflectors, etc.) However, there are also some new things to check. These are discussed below.

6.5.1 – Additional Things to Check During a Walk-around Inspection

Do these checks in addition to those already listed in Section 2.

Coupling System Areas

- Check fifth wheel (lower).
  - Securely mounted to frame.
  - No missing or damaged parts.
  - Enough grease.
  - No visible space between upper and lower fifth wheel.
  - Locking jaws around the shank, not the head of kingpin. *See Figure 6.8.*
  - Release arm properly seated and safety latch/lock engaged.
- Check fifth wheel (upper).
  - Glide plate securely mounted to trailer frame.
  - Kingpin not damaged.
- Air and electric lines to trailer.
  - Electrical cord firmly plugged in and secured.
  - Air lines properly connected to glad hands, no air leaks, properly secured with enough slack for turns.
  - All lines free from damage.

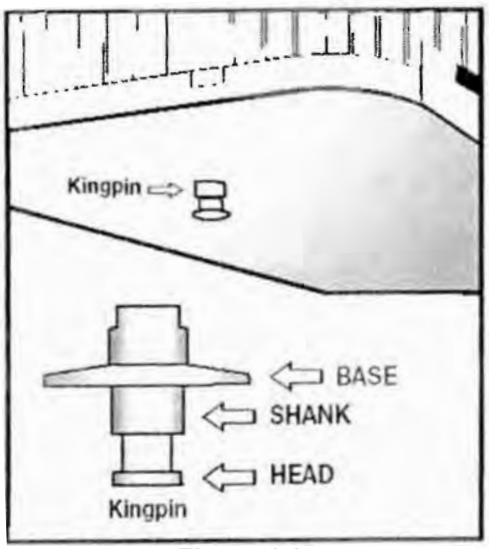

Figure 6.8

- Sliding fifth wheel.
  - Slide not damaged or parts missing.
  - Properly greased.
  - All locking pins present and locked in place.
  - If air powered--no air leaks.
  - Check that fifth wheel is not so far forward that tractor frame will hit landing gear, or the cab hit the trailer, during turns.

Landing Gear

- Fully raised, no missing parts, not bent or otherwise damaged.
- Crank handle in place and secured.
- If power operated, no air or hydraulic leaks.

6.5.2 – Combination Vehicle Brake Check

Do these checks in addition to Section 5.3: Inspecting Air Brake Systems.

The following section explains how to check air brakes on combination vehicles. Check the brakes on a double or triple trailer as you would any combination vehicle.

Check That Air Flows to All Trailers. Use the tractor parking brake and/or chock the wheels to hold the vehicle. Wait for air pressure to reach normal, then push in the red "trailer air supply" knob. This will supply air to the emergency (supply) lines. Use the trailer handbrake to provide air to the service line. Go to the rear of the rig. Open the emergency line shut-off valve at the rear of the last trailer. You should hear air escaping, showing the entire system is charged. Close the emergency line valve. Open the service line valve to check that service pressure goes through all the trailers (this test assumes that the trailer handbrake or the service brake pedal is on), and then close the valve. If you do NOT hear air escaping from both lines, check that the shut-off valves on the trailer(s) and dolly(ies) are in the OPEN position. You MUST have air all the way to the back for all the brakes to work.

Test Tractor Protection Valve. Charge the trailer air brake system. (That is, build up normal air pressure and push the "air supply" knob in.) Shut the engine off. Step on and off the brake pedal several times to reduce the air pressure in the tanks. The trailer air supply control (also called the tractor protection valve control) should pop out (or go from "normal" to "emergency" position) when the air pressure falls into the pressure range specified by the manufacturer. (Usually within the range of 20 to 45 psi.)

If the tractor protection valve doesn't work right, an air hose or trailer brake leak could drain all the air from the tractor. This would cause the emergency brakes to come on, with possible loss of control.

Test Trailer Emergency Brakes. Charge the trailer air brake system and check that the trailer rolls freely. Then stop and pull out the trailer air supply control (also called tractor protection valve control or trailer emergency valve), or place it in the "emergency" position. Pull gently on the trailer with the tractor to check that the trailer emergency brakes are on.

Test Trailer Service Brakes. Check for normal air pressure, release the parking brakes, move the vehicle forward slowly, and apply trailer brakes with the hand control (trolley valve), if so equipped. You should feel the brakes come on. This tells you the trailer brakes are connected and working. (The trailer brakes should be tested with the hand valve but controlled in normal operation with the foot pedal, which applies air to the service brakes at all wheels.)

Subsection 6.5
Test Your Knowledge

1. Which shut-off valves should be open and which closed?
2. How can you test that air flows to all trailers?
3. How can you test the tractor protection valve?
4. How can you test the trailer emergency brakes?
5. How can you test the trailer service brakes?

These questions may be on your test. If you can't answer all of them, re-read subsection 6.5.