UKRO

LGV & PSV Air Brake Systems: Firefighter Safety

UNITED KINGDOM RESCUE ORGANISATION

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THE CHIEF FIRE OFFICERS ASSOCIATION

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The professional voice of the UK fire and rescue service

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1. Introduction

When we consider the amount of commercial traffic on the roads these days, it is inevitable that operational firefighters will at some stage come into contact with vehicles of this type whether as a result of fire, chemical leak/ spillage, road traffic collisions or entrapments.

One of the initial considerations for the Officer-in-Charge in their dynamic risk assessment must be the condition of the vehicle's braking and suspension systems.

To ensure the safety of their crew and any casualties involved, the OIC as part of the initial DRA and safety brief, must satisfy themselves that the vehicle's parking brakes are applied.

In the United Kingdom, vehicles with a gross vehicle weight of 7.5 tons or more will be fitted with air brakes. This is due to the increased pressure and force required to bring a high mass vehicle like a large goods vehicle to a standstill. This level of braking force cannot be produced by hydraulic braking systems as utilised in light vehicles.

These air brake systems do have similarities in design to their hydraulic counter-parts - especially around the areas of brake disc and pad technology, but it is with the operating system that differences lie and in particular the parking brake system (handbrake).

2. Air Brake Overview

Air brake circuits consist of an engine-driven compressor which produces compressed air as the operating medium in the brake circuit. This air is then cleaned and dried to remove contaminants and moisture that can cause problems further on in the circuit such as valve damage and internal icing in low temperatures.

The air is then stored in tanks (10 bar) for use by the vehicle's brake and auxiliary circuits (air suspension/drivers seat etc). There are numerous pneumatic control valves fitted in the system to ensure that when the driver applies the foot brake the amount of air sent to the vehicle or trailer brakes is regulated according to vehicle load and the rate of deceleration required.

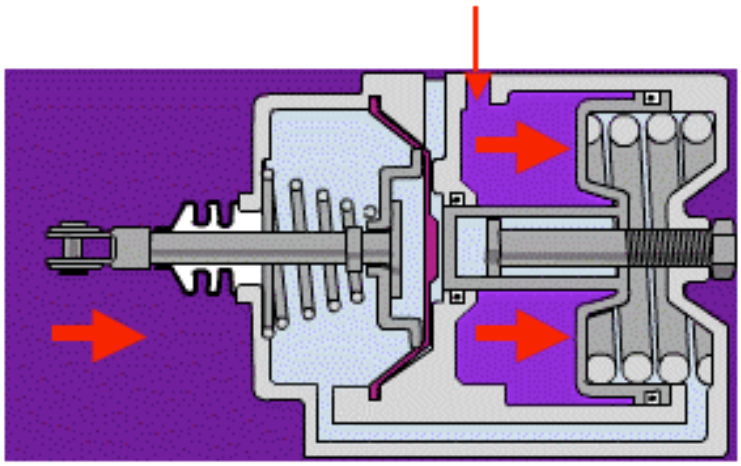
When we consider the parking brake (handbrake) on a light vehicle, the brake shoes/ pads are held against the disc/drum via tension placed in the handbrake cable and mechanism by the driver's hand. The tension is held by a ratchet/quadrant and released via the thumb button.

Commercial vehicles use a large mechanical spring to provide the force required to lock the road wheel for the parking (hand) brake.

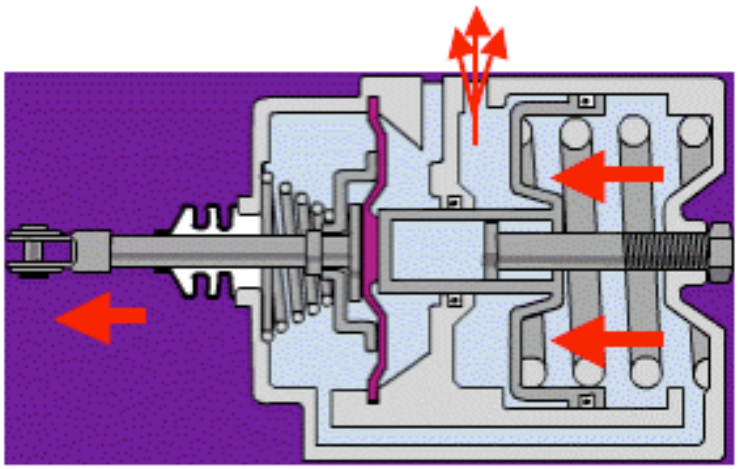
When the driver decides to move off, air is supplied from the hand valve (hand brake lever). It enters the chamber behind the parking brake spring and diaphragm and pushes the spring backwards into the casing compressing it. This releases the pressure on the push rod to the brake shoes/ pads thus releasing the brake and allowing the wheel to rotate freely.

Parking/Spring Brake Chamber

Air supply from hand valve releasing parking brake (handbrake off)



Air released when hand valve operated applying parking brake (handbrake on)



To apply the parking brake the opposite applies, operation of the hand valve to the on position will vent to atmosphere the compressed air holding back the main parking brake spring allowing the spring to extend and apply significant force to the operating pushrod, applying the parking brake.

3. Considerations

Following a road traffic collision involving an LGV or coach/ bus, firefighters may be unable to gain access to the driving compartment or cab to check the hand valve (handbrake) to ensure the vehicle's parking brakes are applied. This may be due to a number of reasons including a trapped driver (with suspected spinal injuries) through to substantial cab intrusion or damage preventing access.

In all instances Incident Commanders and operational crews need to satisfy themselves that the vehicle's spring (parking) brakes have been applied before working in the vicinity.

There are a number of techniques which can be employed to ensure the air pressure in the parking brake circuit is reduced/ removed significantly enough to ensure the parking brakes operate.

- Applying trailer parking brake button. This will apply the trailer parking brakes (found on trailer chassis).
- Removing the emergency air line between the tractor unit and trailer, (Black air line with Red collar identification and female connection). This also applies the trailer parking brakes.
- With the engine off, continual operation of the driver's foot valve (foot brake pedal) until low pressure warning buzzer operates (approx 4 bar) or air is fully drained.
- With the engine off, vehicle's air tanks drained until low pressure warning buzzer operates (approx 4 bar) or air is fully drained.

An additional measure that should be carried out simultaneously as the air brakes are being managed, is the fitting of a set of dedicated heavy vehicle wheel chocks. (On the flat a chock placed on either side of a wheel, on any gradient the chocks are placed on the downhill side).

N.B. A large number of modern LGV trailers carry a set of wheel chocks mounted in a bracket on the chassis. These can be employed in addition if available.

The use of wedges from RTC stabilisation kits should not be considered as sufficient. The substantial increase in vehicle weight and wheel diameter of a commercial vehicle will easily overcome the wedge on any gradient of note.

The assessment and subsequent managing of a commercial vehicle air braking system should be implemented immediately following the OIC's dynamic risk assessment on arrival. It is imperative to ensure the risk of the vehicle moving while crews are working around it is removed for the safety of all concerned.