



Heavy Vehicle Fires – Causes and prevention

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Causes of Heavy Vehicle Fires

By Peter Hart

Hartwood Consulting Pty Ltd

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Engine compartment fire – Adelaide Hills

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My ordering of the most common causes of fires on trucks:

1. Arcs on the starter (or battery cables), alternator, cabin and trailer supply cable.
2. Fuel line rubs or failures that result in leaks / sprays of fuel onto the exhaust.
3. Lubrication/hydraulic oil line failures near to the exhaust.
4. Turbo charger oil seal failures.
5. Flammable material resting against the turbo charger or the exhaust.
6. Electrical failures from hot terminals causing insulation to burn.
7. After-market fuse problems.
8. Overloaded minor electrical cables and hot relays.

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The most common causes of fires on trailers are:

1. Wheel bearing failures (or seal failures) that result in dragging (drum) brakes.
2. Dragging brakes due to damage to the pneumatic spring brake system.
3. Tyres catching fire because they are flat or poorly inflated or rubbing on hard mudguard surfaces.
4. Friction rubs on mezzanine support brackets.

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Crash on M5 follows earlier truck fire that caused peak hour gridlock

By [Jenny Noyes](#)

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CLARENCE STREET ATTACK

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COURTS

Motorists and commuters on the M5 in Sydney's west have encountered massive delays on Wednesday morning, with a crash now causing westbound headaches after an earlier truck fire resulted in citybound queues of more than 20 kilometres at the height of the morning peak.

Emergency services were initially called about 7am following reports of a prime mover well alight on the M5 near the intersection with the Hume Highway in Casula.



Delays continue. Traffic now back to Denham Court. Northbound traffic on Campbelltown Rd is also heavy and southbound on the M7 getting to the M5.





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Rubs on Main Electrical Cables

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Fire was caused by the alternator cable running over the engine stud.

The split conduit opened up and let the stud in to rub on the cable.

Sparking ignited the polymer conduit.

This cable had no circuit breaker protection.



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Rasping of the conduit and plastic led to a short-circuit.

This fire occurred inside the battery box.

The sparking ignited the polymer conduit.

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A rub on the positive battery cable at a steel-spined clamp point underneath the cabin.

Sparking on main cable ignited the split-plastic conduit.

This cable had no electrical fuse protection.

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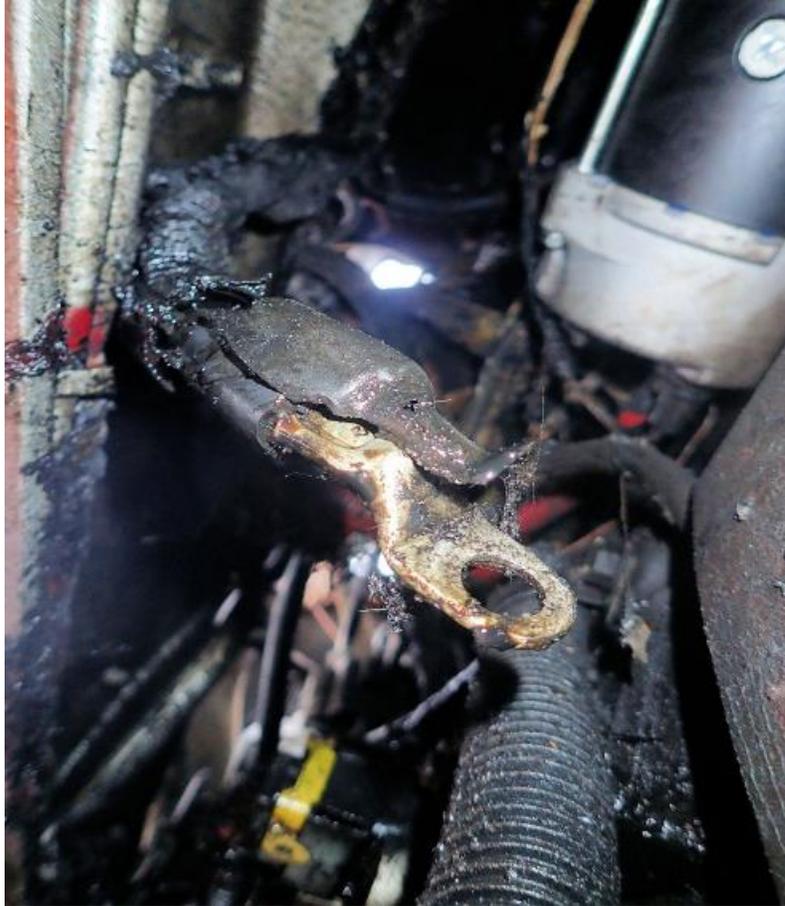
The fire appears to have started in the electrical compartment on the firewall underneath the windscreen.

This is not so!

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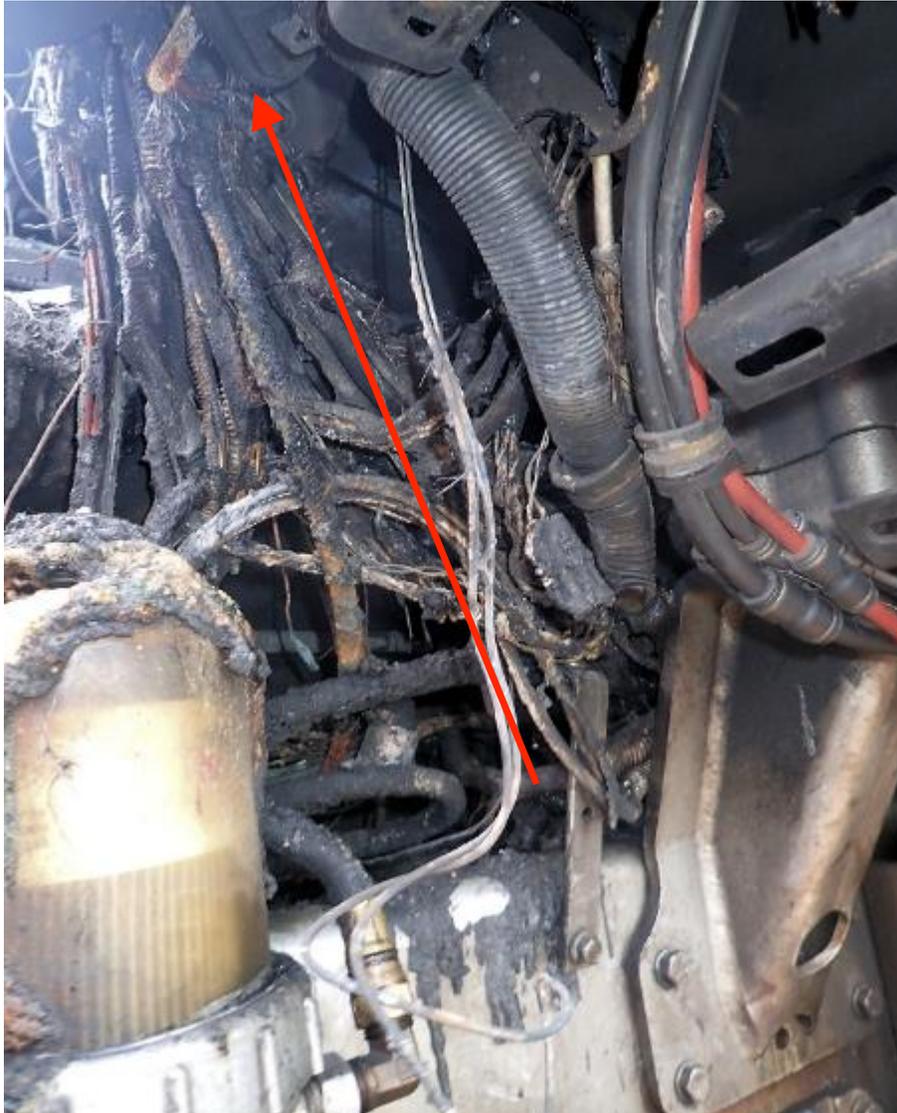
The fire started at a minor link cable between the starter motor and the chassis rails.

Because the main return cable had been left off the starter motor when it was changed, starter motor current returned via a minor cable, which overheated.

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The fire spread from the starter motor region to the cabin electrical installation on the firewall just below the windscreen.

The fire spread via burning conduits.

The plastic conduits provided fuel for the fire and then spread it vertically.



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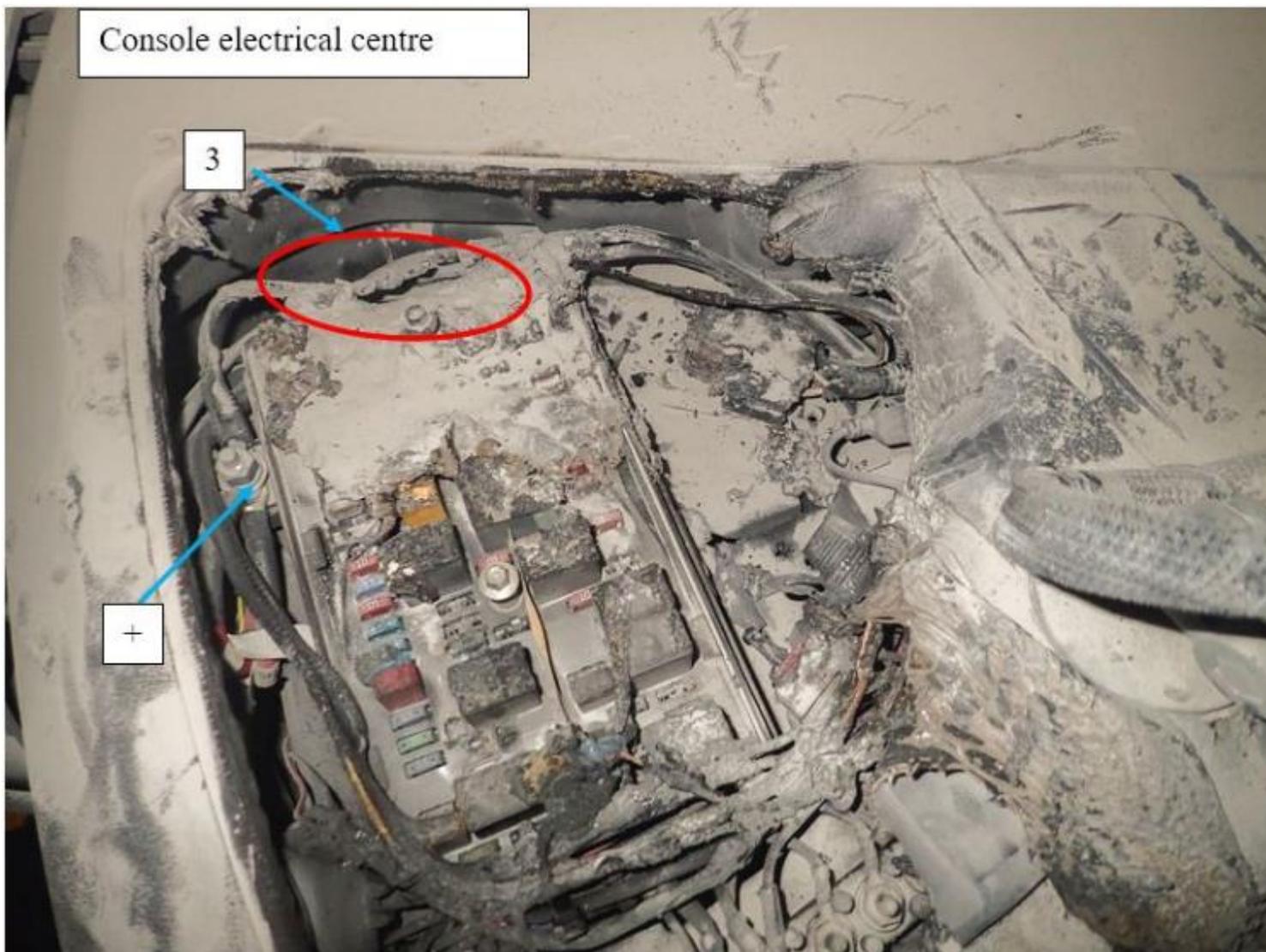
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Faults on Minor Electrical Cables

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This fire started in an after-market fuse holder

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Carbonate filler comes out of the rubber when it gets hot.

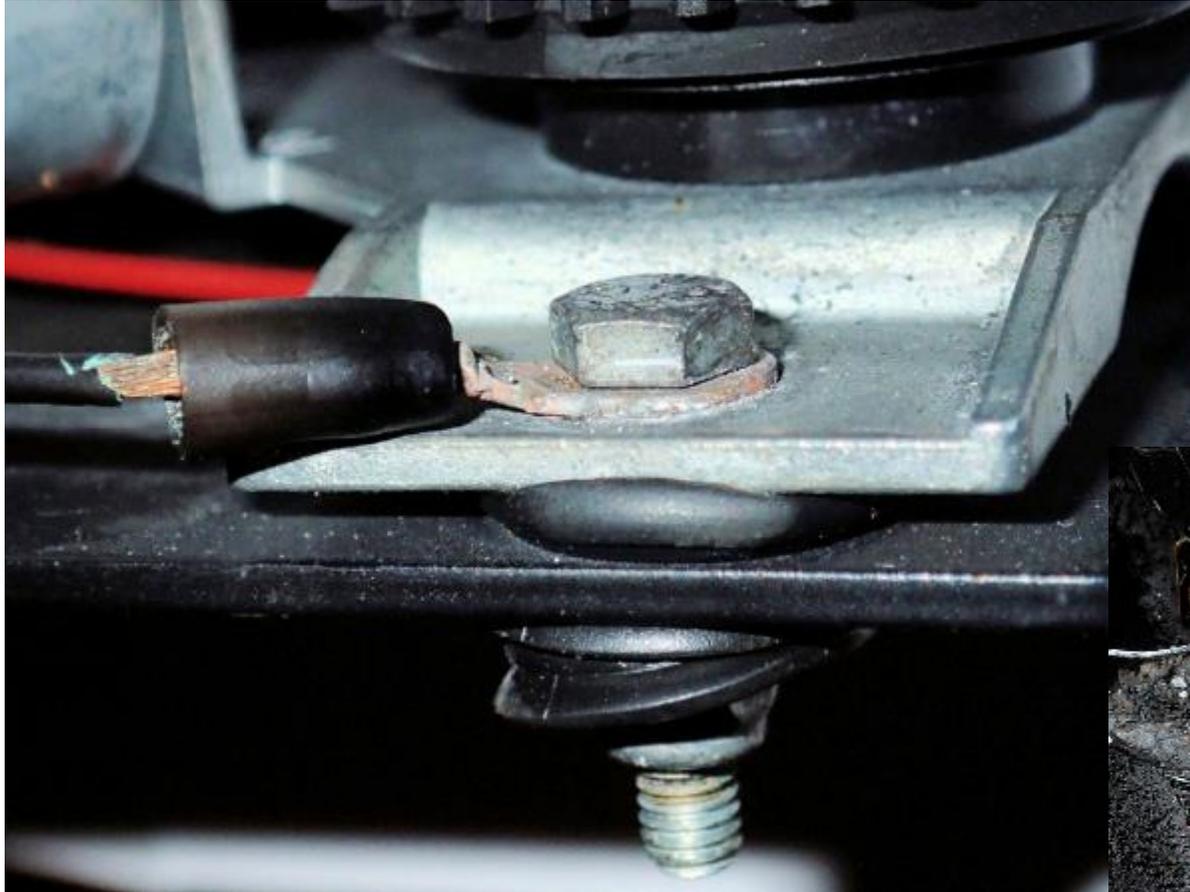
This contaminates the fuse terminals and may result in hot terminals.

Terminal heating = I.I.R

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This fire started in a beacon light on a cabin roof.

The rubber pad is used for vibration isolation.

Fires can start at return electrical connections when there is poor clamping force.

Hot terminals result. Plastics catch fire.



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1. Poor quality connections cause hot terminals.
2. After-market suppliers over-rate electrical terminals. Half the published rating!
3. Lack of fire retardancy standards for after-market electrical equipment.
4. Lack of electrical protection on add-on wiring.
5. Poor quality terminal connections.
6. Starter motor return cable left off.



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Fuel and Oil Line Fires

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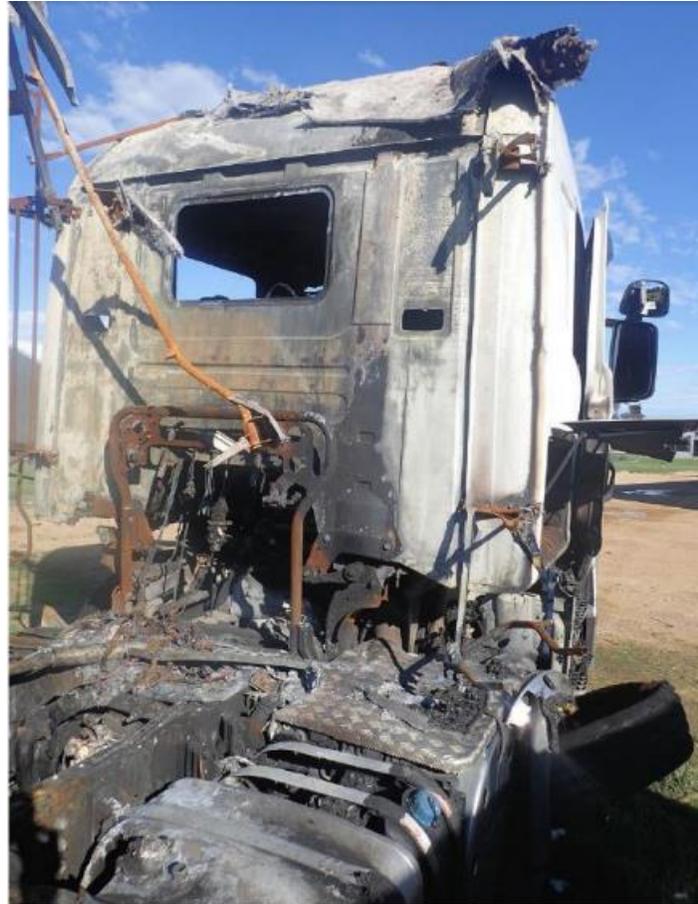


Only the exhaust and turbocharger are hot enough to ignite oil or diesel fuel.

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The fire started outside the cabin on the
RHS just in front of axle 2

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Material Choice For Mezzanine Floor Brackets

Fire is caused by hot metal rubbings from the support brackets accumulating on top of vulnerable freight boxes.

Polyamide or polyurethane U-shaped pads are being trialled to prevent metal-metal rubbing.

Sideways movement is needed to avoid stress points in the metal frame.



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The fuel lines run down the side of the fuel tank.

They are polyamide hoses with poor mechanical protection (spiral wrap).

A leak from the polyamide return line (smaller line) will cause a fuel spray without any change in engine operation.

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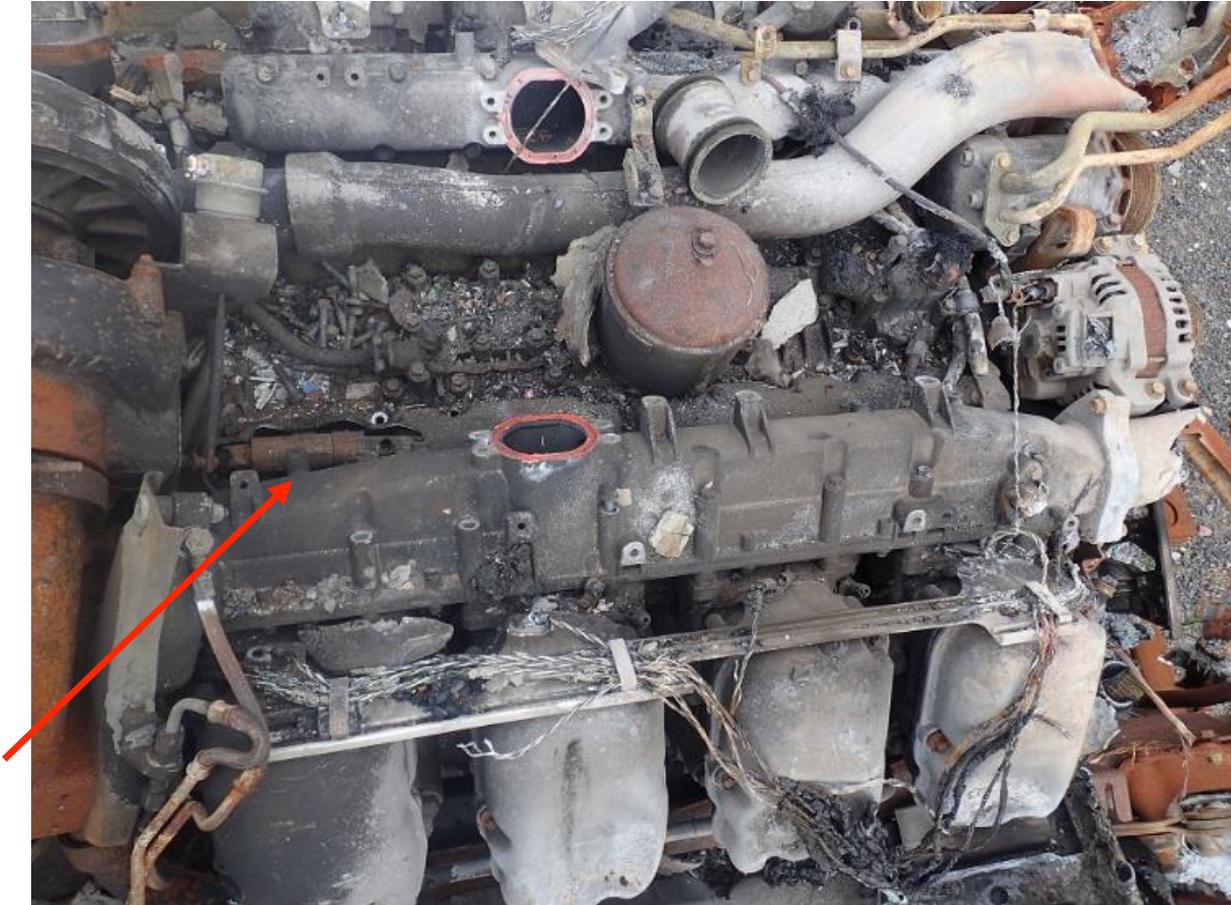
High pressure engine tube cracks.

The cracking and wearing of tubes is the result of vibration due to pressure pulses in the high pressure fuel injection system.

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The engine tappet shaft cover broke because of an internal engine failure.

Engine oil sprayed onto the turbocharger, which is located at the rear of the engine, and started the fire.

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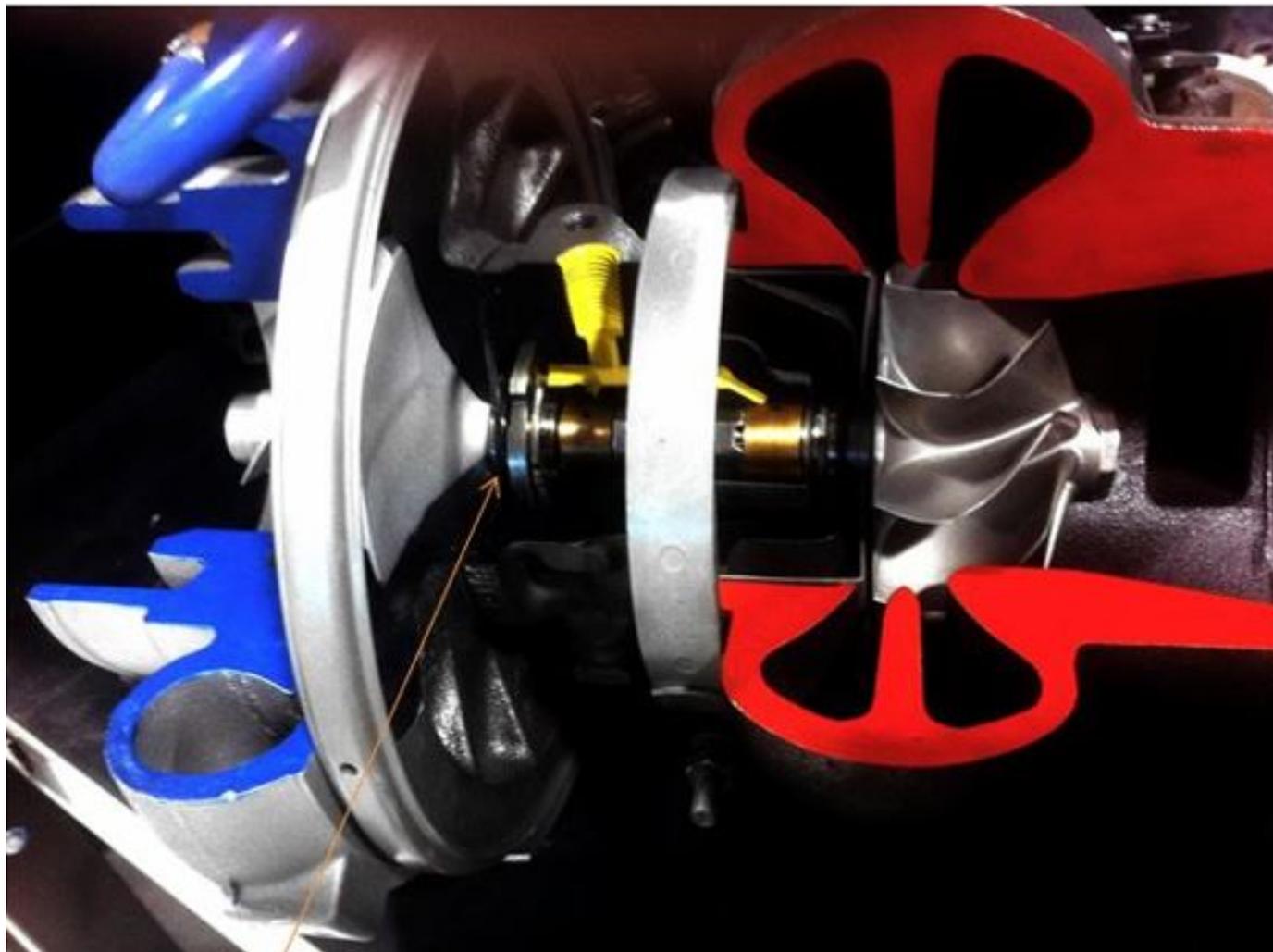
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1. Low pressure fuel hoses too close to exhausts. Minimum spacing should be 250 mm.
2. Low pressure fuel lines sitting on sharp edges, particularly above exhausts.
3. High-pressure fuel line cracks due to vibrations / pulses.
4. Failure 'spray zones' oriented towards exhaust pipes.

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The oil seal on the air-intake side

Turbocharger fires are caused by turbocharger oil seal failure.

The oil seals fail and fire starts on the exhaust side. The fire then spreads to the blower-side via failed oil seals and escapes via the aluminium or rubber air intake pipes.

Risk factors are: hot exhausts and poor oil seal design.

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1. Intercooler air leaks result in low boost. Controllers respond by over-fueling.
2. LPG top-up fueling via the air intake will probably cause the exhaust temperature to be high.
3. Turbochargers fail if the exhaust temperature is extreme.



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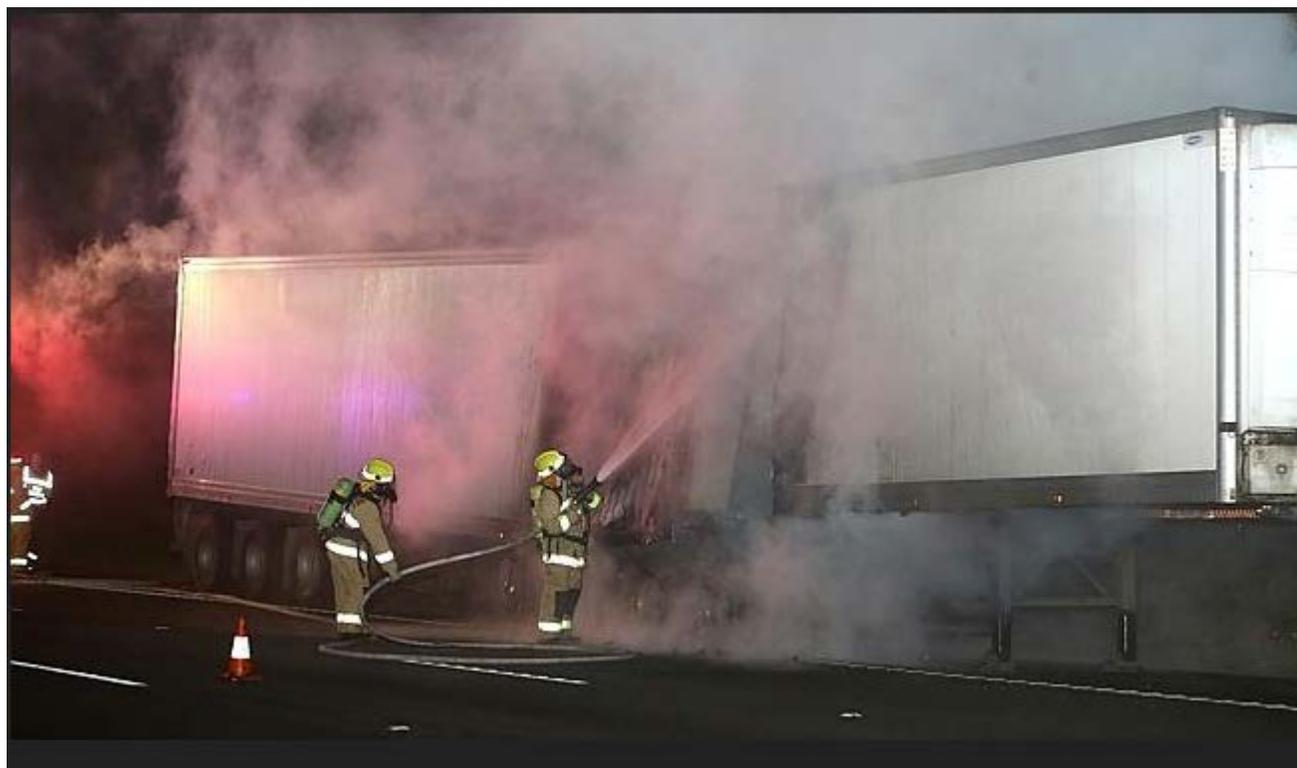
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Wheel Bearing Failures

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This fire closed one side of the M2 in Sydney during the morning peak hour.

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Mechanical failure of the bearings on the front axle is evident.

Note the white edges and crumbling on the brake linings, which witness extreme brake temperature due to dragging brakes because the drum was not centred

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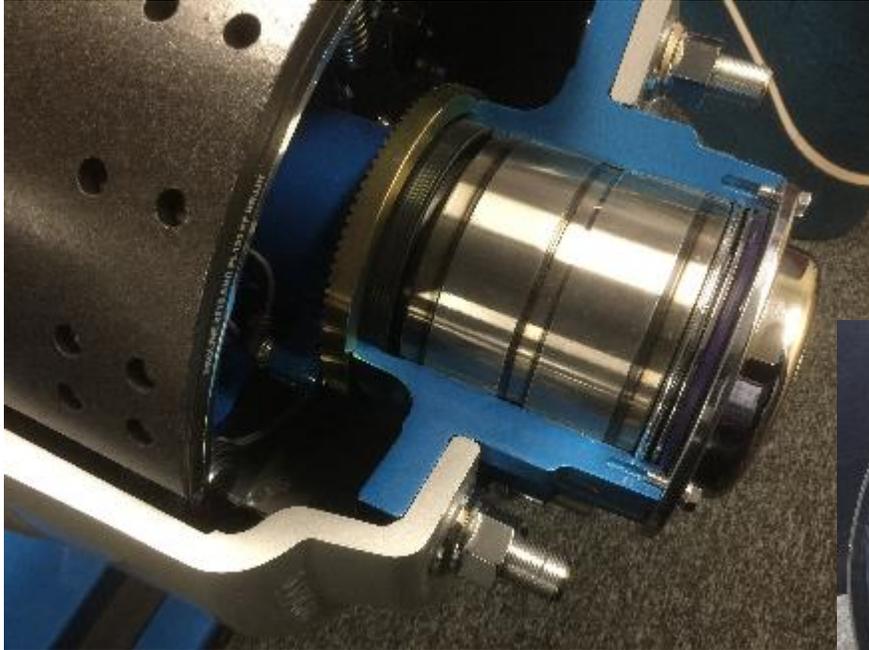
Distressed lubrication on new bearings from axle 2.

Excessive pre-load adjustment caused the early bearing failure.

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Bearings wear out, whether they are unitised or open.

Good practice is to have a replacement policy that reflects the nature of the operation. Bearing manufacturers do not estimate bearing life because of variable operating conditions.





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Dragging Brakes

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Dragging brakes cause extreme brake drum temperature.

Drum heat then spreads to the tyre rim via the aluminium wheel rims.

Dragging brakes are caused by bearing failure or brake system defects.

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1. Fires due to dragging spring brakes mainly occur on drum brakes.
2. Aluminum wheels transmit the heat better than steel rims.
3. Dragging disk brakes can cause the wheel seals to fail causing minor oil fires that can spread to the inner tyre.
4. Low slung brake actuators are vulnerable to road strike.
5. Low-slung spring brake air lines are vulnerable to road strike.
6. Poorly maintained spring brake relay valves are vulnerable to leaks.
7. Carbon particles (from oil) are generated in unloader-type air compressors on long journeys. These carbon particles clog-up air valves.
8. Dragging service brakes rarely occur.



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Tyre Rubs

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The air suspension deflated en-route and the tyres rubbed on the steel mudguard.

The tyres caught fire at the outside.

This was a car-carrying trailer. The mudguards are sturdy to prevent stones being thrown up and reaching the cars.

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Air suspensions will deflate if a supply tube fails.

The driver will see it on the truck but may not see it on a trailer.

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Bracket failures on heavy-duty mudguards.

Rubs on plastic mudguards do not cause fires as the plastic brakes away.



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1. Mainly occur on trailers and not trucks because drivers cannot see developing signs.
2. Principal cause is deflated air suspensions.
3. Secondary cause is deflated inner tyre causing a rub.
4. Occasionally tyres rubbing on heavy duty mudguards cause fires.



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Trailer Mezzanine Fires

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Fire started at support bracket for trailer mezzanine



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Thanks for Listening !