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The Perils of Metal (and plastic) fatigue

The general public and even many motor mechanics simply fail to appreciate the severe danger that can arise from the deterioration of components over time. This article attempts to provide a simple explanation of the causes, what to look for and what precautions to take to radically enhance your safety.

Actually, there are two main culprits, namely *fatigue* when a component fails over time, due to stresses imposed by heat, movement or both and *porous casting* and similar poor manufacturing techniques. These illustrations show the difference:

The left picture clearly shows failure through metal fatigue, caused by the bolt being stressed under load. The right hand picture is an example of a porous casting, the voids being caused by bad manufacturing.It is noteworthy that not only metals can be affected by fatigue, with plastic and rubber components being high on the “suspect” list.

The author of this article has personal experience of these problems that the following horror stories demonstrate:

a) *Metal fatigue*. Without any prior symptoms, the 10 year-old Range Rover started to exhibit vibration in the drive train. An immediate check of the tyres and wheel bearings (considered the most likely source) failed to indicate the cause. Half an hour later, at 110 KPH on the expressway, there was a loud bang and the vehicle ground to a halt, literally incapable of forward motion. The flange connecting the front prop-shaft to the transfer case had split, throwing the end of the shaft and the universal joint across the road. The other end of the shaft remained connected to the differential, so it made a few revolutions before jamming against the road surface. We hate to think of the consequences had it been the *front* flange that failed, because the shaft would probably have been driven *into* the road surface with potentially fatal results.

b) *Porous casting*. On a Range Rover Classic, also at expressway speed, a loud bang from under the bonnet resulted in immediate engine failure. Removal of the rocker cover showed one rocker had snapped in half, very obviously being caused by the “violet crumble bar” consistency of the casting.

c) *Plastic fatigue*. A cooling fan literally exploded, destroying the cowl and radiator, also creating a large and unsightly bulge in the front hood. The repair bill came to over $1000

What to look for:

Any reputable service centre will *automatically* look for potential problems when a vehicle is being serviced. However, there is a limit to the time a mechanic can spend looking for potential area of failure unless specifically requested to do so – it just will not happen consistently, if at all. Also, service centres are well accustomed to owners rejecting their advice to rectify faults until they become obvious to the driver. To be fair, some rip-off shops will *invent* or at least exaggerate faults to pad the bill, so some scepticism on the part of owners is understandable.

The answers are to deal only with trustworthy suppliers *and* for YOU to take personal responsibility for having safety checks made. Even a new vehicle is not immune from manufacturing defects, but with fatigue, inspection can identify many of the potential problems. Better to pay for half an hour of professional inspection, than to save the 40 bucks and kill yourself

High-risk items:

Plastic cooling fans	Any cracked or damaged blade means the fan is on its last hours of life and should be changed
Plastic radiator expansion tanks	Watch for signs of coolant around seams or outlets
Radiator hoses	Change them at the first sign of softening or delamination
Prop shafts & universals	Inspect for cracks, especially if there is any vibration when the vehicle is moving
Tie rod ends & other steering joints	Check for loose bushes and replace if necessary
Link-to-chassis and other under-body bushes	Check for loose bushes and replace if necessary
Shock turrets	Check for cracks, especially if the vehicle is used off-road.
Bonnet locks	A bonnet slamming upwards into the windscreen can spoil your day. Have the locks inspected and if necessary, add supplementary restraints
Exhaust system straps	A vehicle trailing the exhaust may look amusing, unless it is yours.
Engine mounts	Not likely to cause immediate failure, but certainly creates strain and potential damage of the drive train

Survival may well be credited to a large extent to the diligence of the GCA mechanics, along with personal experience of other mechanics ranging from the brilliant to the homicidally negligent.

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