



# Rolling down the

“**W**hen wheels become detached from a moving vehicle, they can accelerate up to around 150km/h, going out of control like a bouncing bomb, reaching a height of 50m before colliding with other vehicles or road users – at an equivalent force of 10 tonnes.”

That frightening introduction to the new FTA/IRTE, ATS and SITA UK best practice guide on wheel security, launched at last year's FTA transport engineering conference in Warrington (Transport Engineer, November 2009, page 13), should focus the minds of even the most hard-nosed fleet managers. As the FTA's Andy Mair, head of engineering policy, says: “They're very rare events but, when wheel detachments happen, they can be catastrophic.”

It seems incredible that in 2010 something as fundamental as wheel assemblies being lost from trucks can still be an issue, but the facts speak for themselves. According to a wide-ranging report on the subject by TRL (formerly the Transport and Road Research Laboratory) in 2006 for the DfT,

there are 7,500–11,000 wheel-fixing defects every year in the UK alone. Those result in 150–400 wheel detachments, 50–134 of which result in damage-only accidents, 10–27 injury accidents and between three and seven fatalities.

Comparatively small numbers, yes, but it's hardly a record to be proud of. So, at the start of this New Year, it is incumbent upon all duty holders to quickly renew their knowledge of the real issues, and then verify and/or improve procedures for everyone involved. And that includes technicians in our workshops, tyre contractors and the drivers.

## **VOSA prohibitions**

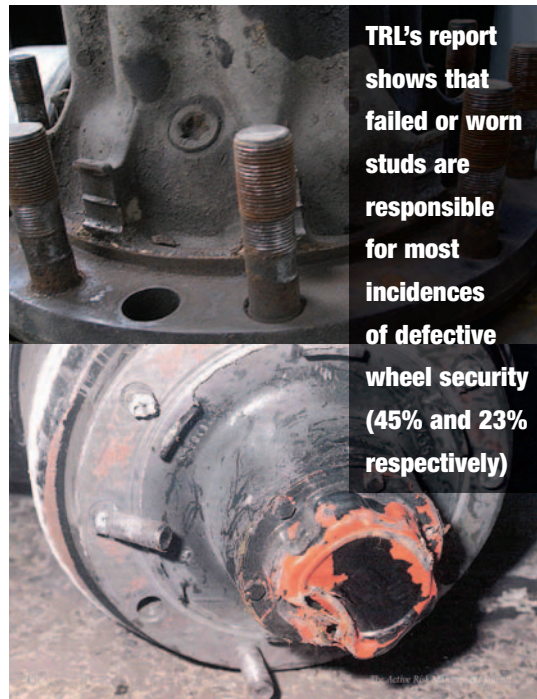
Quite apart from significantly reducing the risk of detachments, getting wheel security under control is the surest route to stopping expensive VOSA prohibitions for suspect wheel-fixings – and the ensuing consequences for drivers, for operators in terms of their OCRS (operator compliance risk score) and for maintenance staff.

So what causes wheels to detach? The new guidelines refer to TRL's 2006 report, which states that wheel fixing designs are adequate, but only

when “all components are in good condition and properly tightened”. Limitations that TRL identifies concern the potential for joint relaxation, torque-to-clamp ratio and component temperature problems, any of which can compromise the clamping force (compression of the wheel(s), hub and drum together) and so affect security of the fastening.

“The point is there’s not a large margin for safety, so it doesn’t take much deterioration – poor maintenance could be enough – before a problem arises,” explains Iain Knight, of TRL’s integrated safety division. Having said which, TRL’s current trials around wheel security, using a DAF 26-tonne, 6x4 tipper, have thus far failed to achieve a detachment. And that’s with the twin driven axles and rough riding to simulate the highest risk groups and “what we would consider pretty poor maintenance practices”.

That said, from this point on, the mechanism of failure is well known. As the guide explains, when the clamping force becomes less than the other forces on the wheel, for whatever reason, the wheel moves relative to the hub. That results in side



**TRL’s report shows that failed or worn studs are responsible for most incidences of defective wheel security (45% and 23% respectively)**

# road

Anyone who has experienced a truck wheel detachment will know the feeling, but all of us should be aware of the consequences. Brian Tinham examines wheel security in light of the new FTA/IRTE guidelines

loadings and loosening of the remaining nuts, leading to elongated stud holes, fatigue failure of the studs, fretting fatigue cracks – and ultimately catastrophic failure and wheel separation.

TRL’s report shows that failed or worn studs are responsible for most incidences of defective wheel security (45% and 23% respectively). But behind those bare statistics are a range of causes, including: settlement; insufficient tightening; over-tightening, leading to stretched or broken studs; and incorrect lubrication of threads and interfaces, leading to friction losses on the wheel nuts. Paul Kendrick, marketing manager for trucks at Michelin Tyre, raises the classic: “One of the problems is technicians who set the torque too high on their pneumatic nut runners, to get the nuts on quickly. Of course, the torque wrench will always click, but they’re risking damage to the threads and, more importantly, distorting the studs.”

The FTA/IRTE guide also refers to: torque wrenches inaccurately calibrated, incorrect nut tightening sequences and brake drum securing screws/bolts loose, causing wheels to be held off hub faces. It even feels the need to mention fitment



of unserviceable or incompatible wheels. A surprise to some, maybe – except that as the document was published the IRTE’s web forum was hosting a discussion started by one operator worrying about stud failures on aluminium and steel wheel combinations on his rear driven twinsets. As Iain Chisholm, IRTE’s head of membership and technical services, says: “Hands may slap foreheads but, yes, it does happen and those involved see no apparent problem in using ‘retro nuts’ to cater for the extra thickness of the alloy wheel rim.”

There is also another potential culprit: it’s an

## Your drivers and your O licence

"Our new guide is an opportunity for operators to benchmark their workshop and roadside procedures against what we believe are best practices – and then to put better wheel security policies in place," says Andy Mair, head of engineering policy at the FTA. "We've expanded on the original IRTE 'Wheel loss: no longer a mystery' booklet, with much more information on the causes and what needs to be done," he adds – making the point that the new guide is founded on proven practice, but with significant additions, particularly for those operations seen to be at greatest risk.

For him and for the IRTE, one point stands out above all others. Operators need to know that drivers must be seen as just as important as fitters in making any wheel security regime robust – and the guide reflects that. Ian Chisholm, IRTE's head of membership and technical services, agrees: "One of the driving forces for this new document was getting driver issues resolved. We have devoted considerable coverage to drivers' responsibilities – from the daily walk-around check and what to look for, to actions needed, tools and training requirements." And he adds: "We also emphasise that any defects should be reported immediately and that vehicles must not be driven until any underlying issues have been investigated and

rectified – and the consequences of failure to do so. VOSA takes wheel security breaches very, very seriously, and its enforcement powers include penalties for operators and for drivers."

Mark Forster, fleet compliance and audit manager for SITA UK, concludes: "For an organisation to reduce the likelihood of wheel loss, it is important that it has a clearly defined wheel security procedure that has been publicised to its drivers and service providers. It is also essential that all relevant personnel play their part in strictly adhering to that procedure. Our guide's advice goes to the heart of road safety standards. It will help to protect companies' O-licenses and is applicable to both large and small operators and service providers."



Above: Andy Mair, head of engineering policy at the FTA

Below: Ian Chisholm, head of membership and technical services at IRTE



ongoing debate, but senior transport engineers blame the lack of left threaded nuts, asserting that in the old days, when they were common, there were fewer detachments. TRL's Knight says the evidence is more subtle: "Our data concerning the prevalence of near side wheel detachments in the UK [and offside in right hand drive countries] leads us to believe that the lack of left threaded nuts has no bearing on wheel nuts becoming loose. However, once loose, it may well be a factor in the rate at which they spin off and cause wheels to detach. We believe that left-hand threads would help to slow that progress – possibly to the point that some events might be avoided."

That said, the new guide warns that although any nut movement should be easy enough to identify, settlement is notoriously difficult to detect visually. However, note that no fewer than 19% of the wheel-fixing problems that are reported by VOSA involved trucks fitted with nut movement indicators and similar devices – so there's no room for complacency.

Plainly, there is no magic here: nailing down this problem has to be first and foremost about adopting and policing robust maintenance regimes around wheel fitting and checking. And that has to do with being clear about engineering and driving realities, responsibilities and also best practice procedures. For example, as the guide points out, there are several wheel fixing types – and although the vast

majority of European truck and trailer manufacturers have standardised on spigot type wheel fixings, there remain two issues. First, older style fixings are still in use. And, second, even on standard fixings, there are different spigot nuts for alloys and steel wheels.

On the one hand, technicians need to be aware of the differences here, but on the other, procedures must be put in place to prevent mismatches, which can easily lead to damaged wheels, hubs, studs and washers – never mind compromised tightening. And much the same applies to the processes around wheel inspection, maintenance, lubrication with light engine oil where appropriate, fitting, tightening and re-torquing.

### Devil in the detail

John Davies, head of UK service and support at MAN, makes the point: "People don't seem to understand, for example, that where you have a spigot-mounted nut, it contains a bearing surface. So, if there's rust or pitting between the washer and the nut, it can be torqued up, but you won't achieve the wheel clamping force. For us, that surface must be clean, sound and lubricated with WD40 or similar so that what needs to turn, does turn. Then, with the wheel fitted properly and re-torqued after 30 minutes or 40–80km, you won't have a problem."

All of which is in the FTA/IRTE guide, although Martyn Edwards, technical services advisor at ATS Euromaster, adds that it's not intended to replace manufacturers' recommendations. "Mercedes, for example, requires dry torque settings, and we acknowledge that. Our concern here has been to draw attention to generic problems, such as corrosion and dirt around wheel assemblies that, if not removed to leave the mating surfaces clean, may lead to material becoming trapped. That will erode in service, resulting in de-tensioning of the wheel fixings."

The point: operators need to know that you can achieve the correct torque value, with a torque wrench, but, ultimately, it may mean nothing.

In the end, knocking wheel security problems on the head is about process, process, process. John Eastman, chair of IRTE's technical and government liaison committee and himself a former fleet manager, puts it thus: "It's too easy to let disciplines slip by the board – mechanics and drivers start taking shortcuts. Every aspect of correct process has to be buttoned down to make your wheel security policy stick."

And remember, there, but for the grace of God, go all of us. **TE**

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