

## TECHNICAL: RAISING THE HARD QUESTIONS

Times are a-changin' for those who like to ride higher than the rest. While increased ground clearance provides obvious benefits for many off-road enthusiasts, dramatically raised vehicles with big tyres introduce a good deal of risk also, including reduced braking efficiency, compromised stability, complications with steering and suspension geometry, and increase in potential harm to occupants of other vehicles in a collision. Now that introducing sensible and reasonable technical requirements and testing methodology for this type of vehicle is getting to the top of LVVTA's to do list, here's some background information, and a look at some options of how the risks associated with these vehicles might best be managed.

### The physics of raised vehicles

Despite differing opinions from some off road enthusiasts, there is a very real safety risk associated with raising the height of a motor vehicle. Whether a vehicle is raised via a body lift, suspension lift, increased tyre circumference, or a combination of two or three of those systems, the bottom line remains that the vehicle has been raised, which increases the vehicle's centre of gravity. This in turn reduces the stability of the vehicle – or more correctly - decreases the speed at which (with any given suspension design or spring rate) the vehicle will roll over.

We've heard it said many times by enthusiastic owners, and even some LVV Certifiers, that the combination of increased height through a lift of some sort, and increased spring rate (stiffer springs) has made a vehicle handle 'much better'. This is true to an extent, insofar as the increased stiffness will decrease the suspension compression and extension during cornering, and therefore reduce 'body roll', which makes a vehicle tend to sit 'flatter' in corners. However, you can't overcome the simple physics of inertia and gravity. A raised vehicle's reduced stability is still lurking behind the feeling that the vehicle handles better - masked by the flatter cornering experienced during the speeds and cornering forces that the vehicle can cope with during normal driving - but at a certain point the reduced stability created by the higher centre of gravity will still cause the vehicle to roll, where it wouldn't have rolled at its standard height. That window of inertia between the point at which a standard vehicle will roll and a raised vehicle will roll may be minimal, but the point is that – regardless of how well a raised vehicle responds whilst in its operating comfort zone – its stability has been reduced, and it is less safe than a standard vehicle in an emergency response situation.

Associated with this handling issue is that, even amongst experienced drivers – off-roaders and LVV Certifiers alike – there is a wide variance of expertise and competence behind the wheel, and what one person declares to be a good handling vehicle, is declared by another to be rubbish. We've seen this before, where the opinion of an LVV Certifier with 20 years of circuit racing experience on a vehicle's handling characteristics is quite different than another LVV Certifier who doesn't have that background.

### Why is LVVTA looking at raised vehicles?

The subject of raised vehicles has made its way to the top of LVVTA's to-do pile because of the growing trend in recent years towards people creating road-going 'big-foots' or 'monster trucks'.

The issue is exacerbated by the fact that a large proportion of these people are not off-road enthusiasts at all and are only interested in mimicking the rugged off-road 'look' for their urban commuters. With this trend comes increasing concerns about the safety of raised vehicles.

Again, advocates for raised vehicles claim that there are no statistics to support any need to look at them, but there are two counter-points to that position. One is that there have been a number of incidents and accidents where people have been injured or killed as a result of unstable (or less stable) 4WD vehicles, some on-road and some off-road – in fact the only segment of the vehicle modification hobby in which there has been more accidents is the 'boy racer' or 'performance import' sector.



The second counterpoint to the position that we should only look where the dead bodies are stacking up, is that LVVTA's philosophy on such matters has always been to identify, address, and mitigate a potential safety risk *before* a particular modification trend begins to feature disproportionately in accident statistics, rather than reacting to the issue after it has happened. We know from both history and common-sense that being proactive and putting a sensible fix to a potential problem before it gets a chance to become a high-profile incident prevents a media-fuelled knee-jerk over-reaction, so the end outcome is a much better long-term situation for the affected people. And we might save a life or two by taking a safety-based approach.

An additional side-issue with raised vehicles is the extremely adverse effect that a significantly-raised vehicle will have upon any 'normal height' vehicle with which it might collide. Vehicles with extreme lifts in some cases cause the chassis rail height to be up around the windscreen height of a normal passenger car, and this presents what many people consider to be an unacceptable safety risk for other road users, especially occupants of modern 'normal height' vehicles which are already at a major disadvantage mass-wise in the event of a collision (head-on or side-on) with something like a Nissan Patrol. *(Continued on page 2)*

### Raising the Hard Questions (cont'd)

#### How LVV Certifiers see the raised vehicle situation *(Cont'd from page 1)*

Many of the people who are calling for technical requirements to be put in place to govern or limit the raising of vehicles are very experienced and competent LVV Certifiers. These are the guys who see them and drive them, but maintain the objectivity about them which can sometimes be lacking amongst those who are passionate about such vehicles. The common view we hear from the LVV Certifiers is that, when presented with a vehicle with an extreme lift, they have major concerns with the way in which the vehicle performs as a result of compromises made in relation to the vehicles' steering geometry and suspension geometry, braking performance, and the overall stability issue discussed earlier.

The LVV Certifiers often say they believe that the vehicles may be safe in the hands of an experienced off roader who understands the characteristics and limitations of the vehicle, but questions the safety of the vehicle in the hands of an inexperienced driver – and we all know how often Joe Average driver gets himself into trouble in a vehicle with a high centre of gravity. These are by far the largest group of vehicles involved in single-vehicle accidents.



There is another problem that keeps on cropping up with raised vehicles, which continually gives LVVTA headaches. Whereas a group of LVV Certifiers around New Zealand will (usually) agree on any given technical subject or vehicle-related technical problem, and carry out their LVV certification inspections with a reasonable degree of consistency from Whangarei to Invercargill, in the case of raised vehicles, LVVTA is constantly experiencing dramatically differing opinions over the same vehicle, or vehicle type, amongst equally experienced and competent LVV Certifiers. This LVV Certifier will say that he is entirely happy with the way that this raised vehicle drives, whereas that LVV Certifier will point-blank refuse to pass the same vehicle on the grounds that it is inherently less safe to drive than what it was when in its original condition. A big part of the reason for this lack of consistency is the simple difficulty in determining what is and isn't 'safe' in terms of handling and stability of a raised vehicle, and the absence of a set of clearly prescribed technical requirements for the LVV Certifiers to apply.

#### The LVV Authority Card proposal

So, how best to assess such vehicles, and determine what is and isn't safe? The initial thought was, based on a view that the risks associated with raised vehicles are lower whilst driven by off-road

enthusiasts, were to create a three-tier system based on: - one; setting a basic 'threshold' that allows a vehicle with a very minor suspension and/or tyre lift to be able to be assessed by a WoF inspector without LVV certification being required, and two; a set of LVV technical requirements that say that any vehicle that is raised beyond that 'threshold', but less than a safe and sensible specified maximum amount, may be approved (for any vehicle owner/operator) by the LVV certification process, and three; any vehicle that is raised to such an extent that it exceeds the maximum specified figure may be approved (up to a higher maximum limit) by the LVV certification process provided that it can be established that the user is a bonafide enthusiast who understands the limitations and risks associated with a significantly raised vehicle.

The way in which we proposed to identify a distinction between an urban commuter-type operator and a genuine enthusiast is via an existing system that has worked well for the motorsport and hot rodding movements for 20-plus years, which is based around an 'LVV Authority Card' system, which is tied to a certain person who must be a member of a member club of a national association (which must be an LVVTA Member Association) which will monitor and take responsibility for the behaviour of the card-holders via their national club structure so as to prevent the LVV Authority Card system being abused and falling into disrepute.

Unfortunately, this concept – which had been agreed in principle between LVVTA, the New Zealand Transport Agency (NZTA), and NZFWDA after a lot of time and effort was put into the project – met with disapproval by some Canterbury-based off-roading clubs who were not member clubs of NZFWDA. The Canterbury-based clubs had a number of different reasons for working against the idea, and a common theme seemed to be unwillingness to have membership with NZFWDA as well as their own club or association. Some members lobbied their concerns about the LVV Authority Card system to NZTA, and this caused NZTA to withdraw their support for the LVV Authority Card concept.

The net result of the affected clubs and associations being unable to work together for the greater good – as the motorsport and hot rodding fraternities have done successfully for over 20 years – is that the LVV Authority Card option is now dead in the water. Many off-road enthusiasts view this outcome as a lost opportunity.

#### Setting simple maximum height figures

With the LVV Authority Card system no longer an option, the simple solution for providing sound technical requirements to ensure that raised vehicles remain within safe and sensible limits might, on the surface, appear to be setting some maximum figures beyond which a vehicle cannot be raised. Some enthusiasts advocate setting a figure such as vehicles lifted by 50 mm or less can be issued a WoF without LVV certification, and vehicles that are lifted by more than 50 mm being required to undergo LVV certification with the LVV certification process allowing a maximum figure of 100 mm. Or in other words, you can go up to 50 mm above OE without LVV certification, and up to 100 mm above OE with LVV certification. End of story. However, this is not a technically sound way to deal with the problem; - any experienced off-roader who has driven a lot of 4WD vehicles both on-road and off-road will tell you that there are some vehicles which are safe to operate with a 100 mm lift, perhaps more, whereas there are other vehicles, particularly small 4WD vehicles that already have stability problems in as-manufactured condition – to the extent that some would describe *(Cont'd on page 3)*

### Raising the Hard Questions (cont'd)

(Cont'd from page 2) them as unsafe to drive – that could become even more unsafe with as little as a 20 mm lift.

The NZ Four Wheel Drive Association (NZFWDA) did some good work many years ago that for various reasons never quite gained traction, that takes this basic notion of setting some figures, but they established a series of figures that vary, dependent on the tare, or 'curb weight' (aka 'kurb weight') of the vehicle being assessed. NZFWDA proposed that the maximum unladen chassis height (measured from ground level to a specified point on the underside of the vehicle's chassis or sub-frame rail) could be, say, 350 mm on vehicles with an OEM curb weight of up to 1400 Kg; 380 mm for vehicles of 1400 to 1900 Kg; 420 mm on vehicles of 1900 to 2400 Kg; and 460 mm on vehicles of over 2400 Kg. Although the numbers might need to be fiddled with to get the best result, there is obvious merit in the concept. This at least takes into account that it would be reasonable to assume that the greater the vehicle mass the higher it could be safely lifted, but it doesn't make any distinction between expert off-road vehicle users and the urban commuters, nor does it provide a performance-based outcome for vehicles on an individual basis.

If the ideal solution was determined to be a simple numbers-based regime, something like the NZFWDA proposal could be workable, but as time goes by and more ideas surface on ways to carry out a performance-based test – which, it has to be said, would have to be the best way forward if it can be done in a practical, achievable, safe, and cost-effective way – then the less likely it seems that some simple numbers will provide the best safety-based solution.

There's also a strong argument to say that for any increase in centre of gravity there should be a corresponding increase in track to mitigate the effects of the raised centre of gravity. Then of course, if the track is increased by additional wheel offset or wheel-to-hub spacers to resolve the stability problem, a whole new set of problems is potentially introduced as a result of the wheel offset or spacers, such as increased loadings on wheel studs, and the adverse effects of incorrect scrub radius geometry. Nothing's easy, is it!

#### **Alternative performance-based assessment options**

So, each vehicle is going to have to be assessed via either a simple measurement-based set of parameters (as outlined above), or a performance-based test. With a performance-based assessment now seeming like the best way forward (with emphasis on the fact that a measurement-based system hasn't been discounted, and the proviso that a performance-based test will only be the solution if it can be carried out in a practical, achievable, safe, and cost-effective way), LVVTA is now considering a number of different options by which to assess the stability-performance of each raised vehicle. All of these options will incorporate the common theme that the same assessment process, and technical requirements, will be applied to all vehicle owners, whether the owner is an urban commuter or a genuine off-roader. The technical requirements will be based on the simple principle that such vehicles must be safe for all vehicle owners, regardless of driving skill level and experience.

The stability issues that form a big component of LVVTA's concerns could be addressed by any one, or combination of, the following four assessment processes:

#### Tip-table test

Option one is to assess a vehicle's stability via a physical static roll-

over test, sometimes known as a 'tip-table test', which requires a tilting ramp to which a vehicle could be tied. This system doesn't take into account factors such as axle roll stiffness, tyre grip, and dynamic behaviour of the vehicle, so it has its technical shortcomings. More pertinently, this option isn't really viable because of the access to such a ramp (or cost of building a ramp) for each of the 40 or so LVV Certifiers spread around New Zealand, the risk of harm to the LVV Certifier or damage to the vehicle if something goes wrong with the process, and the high certification costs associated with all of the time involved for the LVV Certifier in carrying out the testing. It would be fine if someone were to build a production run of 20 vehicles and they were all to be assessed in the same way at the same place, but the reality is that in almost all cases, the assessment process will be required on a one-off basis.

#### Accelerometer-based computer programme

Option 2 is based on Christchurch-based Frank Hassam's idea of assessing a vehicle's stability by carrying out a low-speed slalom driving test over a prescribed course and at a specified speed, using a G-sensor type of accelerometer-based computer programme. This idea might sound a bit far-fetched to some, but initial discussions with computer programmers have determined this could be within the realms of possibility, and it could be as simple as modifying an existing programme or developing a new purpose-built programme, both of which could be used as a smart-phone application. Other experts, however, suggest that there could be complications with this system, as a straight accelerometer set up won't identify the difference between changes in 'roll' and 'direction' during the leaning and turning during the slalom test. Having said that, technology is changing rapidly and it could be do-able soon.

#### Static roll-over threshold

Option 3 is to look at the 'static rollover threshold' (SRT) assessment system that NZTA use for the heavy transport sector. The same issues and concerns exist within the heavy truck fleet, particularly when a heavy load is positioned high within a truck's load area. The SRT system takes into account wheel track, load height and load weight, and a series of mathematical calculations will provide a figure that determines whether or not the vehicle can be legally operated – provided of course that the correct assumptions are made and the correct information is entered to begin with. The advantages with this system is that it is a tried and tested process that is known to work well, and there doesn't seem to be any reason why it couldn't be adapted to suit smaller 4WD type vehicles.

#### Load-cell test

Option 4 is an idea offered up by Jason Marsden of Christchurch who has a Physics degree to support his thinking on the subject. Jason's idea is another type of static roll-over test which makes use of digital scales or load cells fitted under each wheel. One side of the vehicle is jacked up, and the weight transfer is used to extrapolate a tip angle, which will work for any vehicle regardless of size, weight, or wheel track. This mathematically-based process works on the principle that just before a vehicle tips over there is zero weight on the underside of the 'uphill' wheels, but calculations can be used to add a safety margin so the vehicle doesn't actually get near the tipping point. The downside of this system is that, while the process would probably be simple, safe, and accurate, there would be costs of \$1000 and \$2000 for the required equipment. LVV Certifiers won't want to be subjected to high expenses unless there is going to be sufficient LVV certification work of this type to make the equipment costs economically-viable. (Cont'd page 4)

## TECHNICAL STUFF

### Raising the Hard Questions (cont'd)

*(Cont'd from page 3)* The positive aspect of any of these performance-based stability assessments is that the requirements can be less prescriptive, meaning that there may be no need to limit the amount by which a vehicle is raised, at least in relation to stability. The problems introduced as a result of the raised chassis height however – such as the impact point with other vehicles, and the changes in relationship between steering and suspension angles – are another separate set of technical challenge which, conversely, might mean that limitations are none-the-less required despite positive results from a stability test process.

#### The next steps

After talking about the issue on and off for over ten years, LVVTA has made a commitment to deal with the raised vehicle issue as a top priority in 2014.

Each year, in addition to the six regional training sessions for LVV Certifiers held throughout New Zealand in April and October of each year, LVVTA now holds a centralised category-based, or subject-based, mid-year training session at its Wellington offices each year. In 2012 the subject was electric vehicles, this year the topic was trikes, and for 2014 the subject will be raised vehicles – or more specifically, a two-day technical workshop will be held on the subject of safety-related technical requirements and stability assessment for raised 4WDs. LVVTA will invite selected hobbyist and industry experts in the field of modified 4WD vehicles, who have particular expertise in the areas of steering and suspension geometry, and stability, to participate in the workshop. The participants will be limited to around 15 people from throughout New Zealand, and the criteria LVVTA will be using to determine who will be invited is that the invitees will have a very strong technical knowledge, vast practical experience, can respect the opinion of others, can work well in a group environment, and – most importantly – will not be motivated by any political or commercial agendas.

The objective of the workshop will be to establish the best way forward in terms of dealing with raised 4WDs, and will focus on determining the preferred method of stability assessment including how the preferred assessment process will work at the ground floor from the LVV Certifiers' perspective, and to agree on a series of technical requirements that will ensure a safe inspection process for all of the typical modifications made to these vehicles. The technical decisions made will ultimately form a series of technical requirements that will be incorporated as a separate section in LVV Standard 195 (Suspension Systems), and this in turn will form the basis of the requirements within the inspection form-set that the LVV Certifiers use to assess each raised 4WD that they LVV certify.

If anyone has an interest in attending this workshop and they are confident that they fit the criteria previously detailed, they are most welcome to register an expression of interest to Linda Washington at [linda@lvvta.org.nz](mailto:linda@lvvta.org.nz).

#### In summary

As time goes by and drafts of the new requirements are developed, they will be made available for viewing and downloading free of charge by anyone, on LVVTA's website [www.lvvta.org.nz](http://www.lvvta.org.nz). Any significant steps forward on this subject will be reported in NZ 4WD Magazine and this LVVTA newsletter, and LVVTA is keen to receive constructive feedback from anyone with a technical interest.

This is a complex problem with no simple answers, and LVVTA must, as always, walk that tightrope of trying to provide enthusiasts with as much freedom and flexibility as possible, whilst at the same time ensuring that safety for the vehicle occupants and other road users is not unreasonably reduced or compromised. It's not always an easy balance, but as always, we'll listen to anyone with a constructive opinion, and do our very best to achieve a workable and satisfactory outcome for the hobby, and the associated industry.

### Sweeping Aside the Issue

Windscreen swept area is a subject that is making its way to the top of the problem pile. Although it only affects a small number of enthusiasts, the technical challenge that achieving a good swept area on a 1920s and '30s vehicle (or replica thereof) presents – mostly because of the predominantly vertical position of the windscreen – is considerable, to the extent that some people feel that their only option is to cheat the system for LVV certification purposes. Closed vehicles are much less difficult to deal with because of the availability of a roof-mounted cable wiping system. LVVTA would like to find a sensible compromise between achieving a reasonable swept area, and encouraging people to engineer a system that will last longer than LVV certification inspection day. Any thoughts? If so, let us know.



*At left is an attempt at achieving a good swept area on a roadster windscreen which is never going to work, primarily because the three wipers are not mechanically connected, and therefore not synchronised, and also because they can't remain in place with the roof on. Interior impact headstrike is also an issue.*

*At right is the swept area achieved by a two-wiper wiping system, that leaves much to be desired in relation to good vision in poor conditions, and does not meet the requirements for swept area specified in 15.12 of the NZ Hobby Car Technical Manual.*



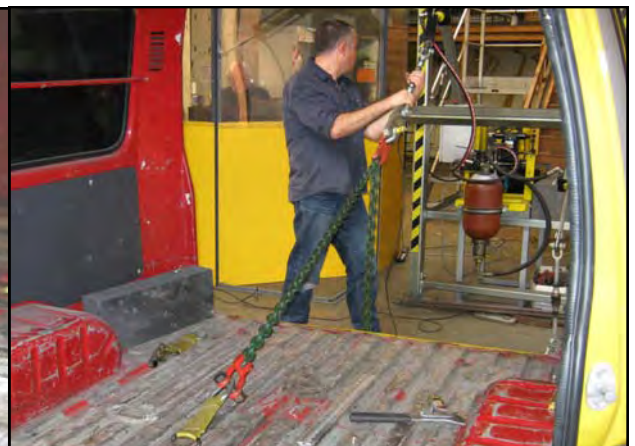
## TECHNICAL STUFF

### Testing of Under-spec Doubler Plates

In the January-May 2013 LVVTA Newsletter (Issue 46) LVVTA drew LVV Certifiers' attention to the existence in the New Zealand marketplace of volume-manufactured seatbelt or seat anchorage doubler plates that did not meet the requirements of LVV Standard 175-00 (Seatbelt Anchorages) or LVV Standard 185-00 (Seats & Seat Anchorages). The two issues were insufficient height of the nut to provide the required amount of thread-depth, and the hole in the top plate being too big (see two photos at right).

Because a number of these doubler plates have been installed in vehicles around New Zealand before the problem was identified, LVVTA carried out a test of the doubler plate system in August of this year to establish whether or not the deficiencies in the plates were such that they would prevent the system from being able to meet the required loads that would be subjected to in a 20G crash. Jackson Enterprises Ltd in South Auckland kindly made their test rig available to LVVTA again, and using the doubler plates attached in the normal manner into the floor of a van body-shell, the test was conducted in accordance with the loads specified within internationally-recognised seatbelt anchorage testing standards (upon which LVV Standard 175-00 is based).

*At right and below are the doubler plates that LVVTA drew to LVV Certifiers' attention in LVVTA Newsletter Issue # 46. These plates feature an oversize hole in the top plate, and undersize nut on the underside of the bottom plate.*



The doubler plate system passed the load applied to it, with some expected deformation to the plates themselves, and some expected upward deformation of the vehicle floor around the area to which the doubler plates were attached, as shown in the adjacent photos.

On that basis, LVVTA has no concerns about the under-spec doubler plates that are currently in service. However, LVVTA reiterates that, because there is a prescribed specification for doubler plates within LVV Standard 175-00 that is based on international best practice, and these doubler plates do not meet that specification, these plates - despite the fact that they did not fail during testing - must not be used any more. LVVTA asks LVV Certifiers to look carefully at all plates in the future to make sure that no more are fitted.



### Feedback on Welding of Castings and Forgings

In the last Newsletter (Issue 47), we explained LVVTA's position on the subject of welding castings and forgings, and the engineering philosophies upon which our position has always been based. Shortly after releasing that newsletter, we received an email from Malcolm Yorston, the Membership & Technical Services Manager of the Imported Motor Vehicle Industry Association (Inc). Malcolm, who has in the past worked within the MoT and LTSA, and has been around automotive engineering for nearly as long as some of the castings and forgings that we're talking about, had this to say:

*"Hi Nikki et al, your lead story is very much topical. In my years of working for the MoT and LTSA I saw the results of welding to cast and forged components, the "OEM" controlled processes gave minimal problems but the uncontrolled processes were the most problematical; even examples from workshops that were generally accepted as being "professional". Your "Type Approval" project has to be a positive solution to an age-old problem but it will have to be strictly controlled to ensure consistency and quality. All the best for the project. Best regards, Malcolm Yorston."*

## TECHNICAL STUFF

### No Throttle Stops Cause Accidents in Australia

LVVTA had been advised that there have been two separate accidents in Australia involving hot rods recently, both involving an aftermarket throttle cable.

One is a blue fully-fendered '32 Ford-based coupe, running a supercharged small-block Ford, and the other is a red fenderless '32 Ford-based roadster powered by a small-block Chev engine.

The blue coupe was involved in an accident at the Lake Mulwala Hot Rod Run, where the throttle stuck wide-open, causing the car to go through some large hay bales and into a tree. The driver, and a club Marshal who was hit, were not badly hurt and the only major damage was to the car.

The return springs and linkages at the carburettor end were all found correct and working as designed, and the problem was centred around the accelerator cable itself. While the inner cable wire was not broken, it was jammed inside the outer cable at the firewall. The outer braided jacket had collapsed and concertinaed back on itself at the firewall connection. So what had scrunched up the outer jacket of the throttle cable? A look inside the cabin revealed that when the throttle was at the fully-open position, there were still several centimetres of space between it and the floor. It seems the pedal had been pushed hard enough to collapse the cable outer jacket and this had jammed the inner wire.

Those involved in the inspection of the blue coupe have stated that with the benefit of hindsight, a throttle stop between the pedal and the floor (set to limit the travel to match the induction end) would have ensured that the cable assembly could not be overloaded by a heavy application of the right foot.

In the case of the red roadster, the accident occurred when the throttle stuck in only a partially-open position, which caused the car to drive off a three foot high wall at 15-20 km's an hour and impact the front end. It would seem that if a throttle stop is not fitted (as recommended in the cable manufacturer's instructions) then during hard throttle application the cable can stretch, compressing the inner Teflon tube and outer braided hose squashing the Teflon tube. At some point in time, the pinched area will bind on the cable even during a small opening of the throttle, and when released the pinch-point wears. In time, the cable will collapse and jamb the throttle to the open position.

A Perth-based parts supplier has heard of four cars doing the same thing in Australia, and all of the cars used the same (reputable) brand of accelerator cable. We've avoided mentioning the brand-name of the cable manufacturer here, because (a) the brand has a very good reputation, and (b) there is another brand that has done a counterfeit of it, manufactured in China, which looks identical, so to mention the brand-name could be to do a great disservice to the long-standing brand name.

The details we have, supplied by different people, are a little sketchy, but it seems that the moral of the story is that care must be taken to ensure that the pedal is against either a throttle stop, or the firewall, at full throttle, and the accelerator cable cannot be placed under tension.

Thank you to our Australian contacts; - we should all spread the word to prevent a similar situation from happening here in New Zealand, and LVV Certifiers will keep a wary eye out.

*Photos at right and below show the blue Ford coupe, with the offending accelerator cable. The cable is routed through the firewall, and wraps around behind the supercharger and up to the carburetors. In the photo below, the collapsed and concertinaed outer cable is visible, causing the inner cable to become jammed inside the outer cable, at the full-open position.*



*Photos above and at right show the red roadster in its resting place after launching down a three-foot drop, and into a solid object, causing major damage to the vehicle. This vehicle's accident was also caused by the inner accelerator cable becoming pinched inside the outer cable. With both vehicles, full throttle could be achieved before full pedal travel was reached.*



## Tyres Stretched Beyond LVVTA's Tyre to Rim Size Compatibility Guide

LVVTA Information Sheet # 01-2009 'Tyre Size to Rim Size Compatibility Guide' was developed and issued with the intention of providing the appropriate rim width for all of the common tyre sizes, to enable LVV Certifiers and vehicle owners to ensure that any tyre to rim fitment is correct, and in accordance with the recommendations of the tyre manufacturers.

Within the Information Sheet, it is stated that "Additionally, where an LVV Certifier is presented with a wheel & tyre combination which is outside the scope of the tables in this info-sheet, LVVTA requires that the guidelines of the tyre manufacturer in question are followed, and verification from the tyre manufacturer is provided by the LVV Certifier when forwarding the LVV plate application".

It seems that all tyre manufacturers are on the same page when it comes to tyre to rim fitments, with the exception of the 'Falken' brand.

An example that has been presented to LVVTA is the Falken 215/40/ZR17 tyre, fitted to a 9.0" rim, which is approved by Falken Tyres. Visually, this fitment looks very stretched, and all other tyre manufacturers state that this size tyre should go on a 7.0" - 8.5" rim (which is reflected in LVVTA Information Sheet # 01-2009). Falken Europe have provided a letter which sets out their recommended tyre to rim fitments, which specifically approves, or recommends, a 215/40/ZR17 tyre on a 9.0" rim. The same document can be found on Falken's website. For added assurance, Justin Hansen contacted Falken direct, and Falken confirmed that they were happy with this fitment (215/40/17 on a 9.0" rim).

LVVTA's issue is that we're concerned about this trend of stretching tyres beyond what is sensible just to achieve the 'drift' look, and we've also seen many cases where they have to run much higher tyre pressures in order to keep the tyre seated on the rim.

To try and gain some clarity on this general subject, we contacted South Auckland's Peter van Breugel of Prestige Automotive Services ([www.prestigeautomotive.co.nz](http://www.prestigeautomotive.co.nz)) to give us an expert opinion, based on his considerable knowledge and experience in the field of performance tyres. Peter is a highly successful race car driver, race engineer, and has been heavily involved in tyres for all of his many adult years. Peter came back to us with the following comments and opinions, which will be of interest to LVV Certifiers.

Here's the basic facts of the matter according to Peter.

- "Every tyre manufacturer lists rim width options for a 215/40-17 as 7.0 – 8.5".
- German standards lists rim width options for a 215/40-17 as 7.0 – 8.5", but they also list 9.0" as a Falken (Germany / Europe) option.

- Falken (originally from the Ohtsu Tyre Group) are a Japanese manufacturer. Falken Japan also lists only 7.0 – 8.5" as rim width options for a 215/40-17 tyre, with no option extension as per Germany/Europe.
- Each tyre manufacturer's recommended rim width options must be specifically for their brand only. This is not generic. For example, only a 215/40-17 Falken tyre can be fitted on a 9"rim, & not, say, a 215/40-17 Nankang tyre. It could be argued by the same logic that it also only applies to the specific tyre pattern in each case.

The above does raise the question as to whether Falken tyres that are manufactured for Germany/Europe are of a different specification to allow fitment to a wider rim, or whether Falken are just being generous on their maximum rim width specification to meet a certain target market."



"I would suggest, that it must be a Falken tyre only fitted in accordance with the Falken Specification Sheet, and it is not acceptable to apply a 'Falken' specification to a 'Nankang' or other branded tyre." (LVVTA notes that, based on other research, it fully agrees with Peter's expert opinion).

"If you have to be 'extreme' it is better to have a smaller width tyre fitted on a larger width rim. The consequences are less drastic than the other way around. The result of fitting a narrow tyre to a wider rim (other than the tyre fitter hating you, as it will be a nightmare to seat) will be a much harsher (but at least somewhat predictable) ride. Both the stretching of the side-wall and the higher tyre pressure required to keep the tyre on the rim, will result in a harsher and somewhat more nervous ride, (less tyre slip angle, less grip, less ability for the vehicle to 'take a set' – will want to 'skate' across the surface) but it will still be relatively predictable."

"There may be some additional side-wall stress, but I feel this relative to other potential stress related issues and not significant. This is all assuming one can reference a specific size and brand back to a specific manufacturer's maximum width recommendation, and not beyond. I struggle with some of the apparent variations 'in same tyre width', (but different aspect ratio) rim width recommendations, but while no tyre manufacturer can give me a logical reason, the 'international tyre fitment bible' does also confirm these fitments. For example, why is it that a DLP 225/40-16 can fit on up to a 9" rim, but a 225/45-16 can only fit on up to a 8" rim?"

In conclusion, I would emphasize again that if a tyre to rim fitment falls outside the LVVTA Information Sheet for tyre to rim fitments, each brand of tyre must be within its own specific tyre manufacturer's rim width recommendations. Cheers, Peter van Breugel."

## AFTERMARKET ALERT

### Bonnet Latching 'Hood Pins'

LVVTA technical staff members have been made aware of a number of occasions where 'hood pins' or 'bonnet pins' have failed. One such example is this set of pins (pictured) that were kindly made available to us from Club Auto Insurance. The plates are 1 mm alloy, branded 'Sytec' (we think unlinked to 'Sytec' fuel pumps and filters, a supplier of 'Walbro'-brand pumps in the UK. Incidentally, a quick internet search showed that there are fake 'Walbro' fuel pumps out there.)

The threaded rod pins are made from aluminium, with a 10 mm diameter and 5 mm thick head, and the threaded section of the pins are destroyed where they mount through the slam panel. This could indicate that either:

1. the rods were loose; or
2. that bonnet movement forced the pins to move about; or
3. the material is so poor that it gave way when tightened; or
4. The nuts were over-torqued.

It is possible that the rods could pull out of the slam panel if the holes are too big, but there's no evidence of scraping along the threads to support this. The hole for the pin to engage in has been deformed, showing how soft it is. This damage probably occurred during bonnet closing when it was not aligned fully. The nuts, ring, and pin look to be made from steel. The pin is 6 mm diameter and on the head it appears to be roughly made, with file marks all over it. The pins are not distorted and don't have wear marks.

In the installed condition the alloy plates don't do much, and the pin shouldn't be able to rattle free from its closed position. LVVTA staff believe that the damage to the alloy plates was done after the bonnet had lifted. It is likely that (as usual) the pins were not connected prior to the vehicle being driven. So, despite the product looking rough and the plate made of thin alloy, it may well be fit for purpose if correctly fitted and used.

LVVTA recommends three things on this subject; one is that vehicle owners take care to buy only from a reputable manufacturer; the second is that the structure to which the pins are attached is of sufficient strength (this is the potential weak point from which a failure could start - the area may need to be reinforced), and the third strong recommendation is that a secondary latch is incorporated when bonnet pins are used on a front opening bonnet in order to reduce the likelihood of the bonnet opening in the event of a hood pin failure, or hood pins not being done up prior to driving.



*Photos show the various components within the 'hood pin' kit that failed. Although the failure may have occurred because the pins weren't secured before driving, the very thin alloy used for the components, and the aluminium pins themselves, highlight the importance of using quality parts.*



### Counterfeit 'AeroCatch' latches on market

AeroCatch - a reputable manufacturer of aftermarket vehicle equipment - has released a 'buyer beware' warning stating that there is a variety of counterfeit products in packaging out in the market which looks identical to their authentic bonnet latch kits. AeroCatch claims that although the counterfeit parts looks identical, the materials and workmanship are second rate and that an independent UK-based testing facility has confirmed that they have far less strength than AeroCatch's components.



## AFTERMARKET ALERT

### More 'Made in China'

Problems with inferior parts, it would seem, isn't restricted to just the aftermarket automotive parts arena, or for that matter the automotive industry. It seems to cross all industries and borders, and the problem is getting bigger and bigger. The following article was released recently by The Press/Fairfax Media NZ, reproduced here with Fairfax's kind permission, is an interesting and worrying insight into the problems that the building industry is experiencing:

*Particular care needs to be taken that unproven or inferior-quality prefabricated steel is not brought into the Christchurch commercial rebuild, warns a structural steel association. Cheap prefabricated structural steel imported from Asia was a threat to the New Zealand industry, Steel Construction NZ manager Alistair Fussell said. The fabricators' association was aware of several projects in Auckland in recent years that used imported prefabricated steel work, which had either failed to meet Australian-New Zealand standards, or failed on-site testing, and had to be removed, he said. New Zealand sourced most of its "hot-rolled" steel for commercial buildings from "quality" mills in Australia, Taiwan and Thailand. It was then prefabricated in Kiwi steel workshops for commercial use. The fabricators added value through welding, coating and putting the sections together on site.*

*Design and build firms needed to be aware of the quality risks associated with imported product, Fussell said. Arrow International has formed a partnership with China State Construction Engineering Corp for the supply of structural steel into the rebuild. The association had visited Arrow worried that its plans to import fabricated steel through the strategic joint venture would be a threat to the industry. The discussions were "amiable", Fussell said. "The issue with China is . . . there are legitimate concerns around quality in terms of materials, workmanship. That's not to say they don't have shops that couldn't do good work, but the trouble is you don't know what you're dealing with."*

*Arrow chief executive Hugh Morrison said the company's venture with the Chinese would not disrupt New Zealand's fabrication industry, which would be needed by the smaller commercial building developers. Arrow had placed an order for prefabricated steel from China, where it had a representative "to bed in the quality procedures that we require for that steel," Morrison said. There were price advantages to larger orders from China.*

*Fussell said New Zealand had invested significantly in research and new technology and was voluntarily moving towards a accreditation system like that used in the European Union, where standards and "third party independent" quality testing was strong. The New Zealand industry capacity, from fabricators like Pegasus Engineering and John Jones Steel, was well in excess of 90,000 tonnes a year. This was double the volume of a decade ago, and that supply had reduced the price of steel. Christchurch had been "a tough nut to crack" prior to the earthquakes due to the cheaper cost of concrete given the good supply of river aggregates. However, the association estimated that steel structures were forming the basis for 60 per cent of the commercial rebuild floor area, above the national average of 50 per cent in New Zealand commercial buildings.*

*"Steel buildings are about 30-40 per cent lighter than a concrete building, and because of the very poor foundation conditions the reduced weight has big savings," Fussell said. New building developments since the quake included the medical centre in Kilmore St that had an innovative "steel rocking frame" to help it straighten or centre following the seismic event. Christchurch buildings completed before the earthquakes, including Ernest Duval's Pacific Tower on Gloucester St and HSBC Tower on Worcester Boulevard had used some innovative steel frames. In the Pacific Tower the eccentric brace designs had been cut and welded for repairs, but in newer designs for other buildings such damaged sections could be simply unbolted and replaced, he said.*

### Faulty Threads on Aftermarket Suspension Arms

Aftermarket suspension arms are a popular modification with Asian import enthusiasts, sometimes used to correct the vehicle's camber when lowering a vehicle, and often to (illegally) enable the excessive negative camber that some owners want.

LVVTA Information Sheet # 01-2012 'Custom Suspension Arm Inspection & Approval' provides guidance for LVV Certifiers when presented with them, and a requirement within # 01-2012 is that such arms are of sound design and good construction.

Pictured at right is a typical adjustable upper control arm for the front of an R32 Nissan Skyline, which are available via the internet, and although the arm doesn't feature any obvious visual deficiencies, the thread on this arm - well-spotted by Auckland LVV Certifier Clint Field - is as bad as we've ever seen. The amount of slop between the male and female threaded sections - even with 20 or so threads mated - has to be seen to be believed.

Why so bad? No idea, but it's another example of why people shouldn't be buying 'no-name' rubbish from the internet, especially for performing critical functions on a motor vehicle.



For LVV Certifiers, the challenge is that this serious safety problem can't be identified without loosening off the jamb-nuts, or possibly completely disconnecting one end of the arm from the vehicle. If a vehicle owner can't provide documented evidence that the arm is from a reputable manufacturer, this is what needs to happen, before approval for LVV certification is given.

## REGULATORY STUFF

### New Definitions for 'Scratch-built' and 'Modified Production'

Late this year the LVV system took a step forward with new definitions for a 'scratch-built' low volume vehicle and a 'modified production' low volume vehicle being passed into land transport legislation via the NZTA's '2013 Omnibus Amendment Rule' process during November 2013, and which take effect on January 1 2014.

The primary reason for the development of the new definitions is to solve a number of problems that have existed with the previous 'scratch-built' definition for many years, and to help owners of genuine old vehicles be able to carry out sensible chassis modifications without the vehicle becoming regarded as a brand new scratch-built vehicle, and as a result having to meet unreasonable and inappropriate standards that would apply to a 2014 vehicle. The previous definition effectively penalised vehicle owners for wanting to improve certain vehicle safety systems, particularly in regard to chassis stiffness and strength.

*This 1928 Model-A Ford can now be fitted with a safer and more rigid reproduction Model-A chassis, with better cross-members, and still remain a 1928 Ford.*



The new definitions will now allow motor vehicle enthusiasts to build reproduction chassis rails that are of a similar design, material specification, and construction method for their vehicles, without being deemed by the definition to become a scratch-built vehicle, and therefore be subjected to some of the technical requirements that are not appropriate for the style of vehicle being built.

A person rebuilding and modifying an original 1932 Ford, for example, can fit a complete reproduction 1932 Ford chassis, such as a 'Kiwi Konnection' chassis, and the vehicle will still remain a modified 1932 Ford (rather than becoming a new scratch-built vehicle). Similarly, a person rebuilding and modifying a 1956 Chevrolet may elect to install a complete 1956 Chevrolet reproduction chassis, such as those supplied by 'Art Morrison Enterprises' (in order to take advantage of power steering, disc brakes, and other steering, braking, and suspension upgrades), and the vehicle will remain a modified 1956 Chevrolet (rather than becoming a new scratch-built vehicle).

The wording provides a degree of scope for using a chassis from a similar period, so that common same-era swaps, such as installing a 1932 Ford chassis under a 1928-31 Ford body, will not cause the vehicle to become a new scratch-built vehicle.

Where there is no predominance of manufacturer between body and chassis, or the body and chassis are out of period – such as a Mitsubishi L300 chassis under a 1941 Willys coupe, or an HQ Holden ute chassis under a 1946 Chevrolet pick-up – the vehicle will immediately become a scratch-built low volume vehicle.

There is no reference to cross-members in the new definitions, so builders are free to construct any style of cross-members.

It should be noted that in every such case where the vehicle is deemed to remain a modified production low volume vehicle, the LVV inspection process for such vehicles will ensure that all important safety aspects of the vehicle such as steering, suspension, braking, steering system collapsibility, chassis engineering, seats, seatbelts, seat and seatbelt anchorages, etc all meet the same level of safety requirements as for a scratch-built vehicle.

The concessions that a modified production vehicle might have over a scratch-built vehicle is in relation to the use of some of its original equipment such as lighting equipment (still with performance requirements), or door retention systems within the vehicle's original timber-framed body.



The new definitions also recognise that the replacement of any part of an old vehicle body with identical direct replacement parts is in fact a repair, and not a modification. In the same way as that which applies to a vintage vehicle, if a hot rod builder chooses to replace a sedan body with a factory or coach-built body that was available for the chassis in question at the time of its manufacture, this will not, on its own, cause the vehicle to become a scratch-built vehicle. A common example of this might be the replacement of a sedan body with a same make, model and year coupe or roadster body.

While the introduction of the new definitions won't affect a large number of people, it will make things a great deal better for some modifiers and builders. LVVTA is very appreciative of NZTA's efforts over recent years to enable these new definitions to be introduced.

A new LVV Information Sheet (# 02-2013 'New 'Scratch-built' & 'Modified production' LVV definitions') has just been produced which introduces and explains the two new legal definitions, and explains the reasons why the new definitions were needed, what the new definitions are expected to achieve, and how the new definitions will affect low volume vehicle builders and modifiers. Anyone can access LVV Information Sheet #02-2013 from LVVTA's website [www.lvvtta.org.nz](http://www.lvvtta.org.nz) free of charge.

## AUTHORISED VEHICLE INSPECTOR'S PAGE

### Inspecting Modified Vehicles with 'Airbag' and 'Hydraulic' Suspension Systems

LVVTA often receives queries from Authorised Vehicle Inspectors (AVIs) asking for advice on what to look for when doing a warrant of fitness inspection on a modified vehicle fitted with a custom or aftermarket 'hydraulic' or 'airbag' suspension system. The same question is often asked by members of the NZ Police, particularly when carrying out a roadside inspection on these vehicles. For non-technical people, or people not familiar with this type of modification, airbag and hydraulic suspension is quite a complicated subject. Its complexity is compounded by the fact that many of the people who install these systems also have a tendency to change the system post-LVV certification, so then the WoF issuer is left in a situation where he may suspect that things have been tampered with since its LVV certification, but doesn't have the knowledge or confidence about these suspension systems to be sure as to whether or not the vehicle remains in its 'as-LVV certified condition'.

Below is a simple checklist on what to look for, that can be applied when carrying out a warrant of fitness inspection by an AVI, or a road-side check by a Police Officer, on an airbag or hydraulic suspension system-equipped vehicle. If an AVI or Police Officer can answer 'yes' to all of the following 9 questions, the likelihood is that the airbag or hydraulic system is in its as-LVV certified condition, and is compliant and safe.

1. Is the vehicle certified, and does it clearly display an LVV Certification plate? (An LVV certification plate on a low volume vehicle must be positioned on the vehicle so that it is both accessible and easy to read, and affixed by pop rivets and adhesive)
2. Does the information on the LVV Certification plate match the vehicle information? (Including: vehicle make and model, VIN or chassis number, year, body style & # of seating positions)
3. Do the modifications on the LVV certification plate match the modifications on the vehicle? (Including: body/chassis, suspension, brakes, steering, wheel size, gearbox, engine capacity, engine make, configuration and induction)
4. Do the heights recorded on the LVV certification plate match the normal ride-height of the vehicle? (Measured from centre of wheel to underside of wheel arch in mms, with the allowance of + or - 5 %)
5. At normal operating ride-height, is there sufficient suspension travel available (& enough clearance at the bump-stops) for the vehicle to be safely driven when fully laden?
6. Is the ride-height or any part of the vehicle's suspension electronically-prevented from being able to be adjusted or changed when the vehicle is travelling over 20 kph?
7. Does the vehicle have adequate clearance between the wheels and tyres, and suspension or bodywork, at any stage during its suspension travel?
8. Does the vehicle have adequate drive-shaft to vehicle clearance when the suspension is fully compressed or extended?
9. Is the vehicle's suspension designed so that the system can only raise or lower the vehicle in the fore-aft and/or side-to-side combination? (The system must not be able to raise an individual corner of the vehicle or enable the vehicle to 'bounce' or 'hop' on its suspension)

If an AVI or Police Officer records a 'no' to any of these questions, it's a reasonably safe bet that something has been changed since the LVV certification plate was issued, and the vehicle is therefore in a non-compliant condition, and may be unsafe.

If any AVIs or members of the NZ Police would like any further information regarding airbag or hydraulic suspension systems, they are welcome to follow this link to 'Chapter 6' of the 'NZ Hobby Car Technical Manual'; [www.lvvt.org.nz/documents.html#hctm](http://www.lvvt.org.nz/documents.html#hctm) Alternatively, they may contact an LVVTA Technical Team member at the LVVTA office in Wellington on (04) 238-4343.



Modified vehicles with 'airbag' or 'hydraulic' suspension systems can be a giant headache for AVIs and Police Officers alike. This page offers a simple check-list to see whether such a vehicle remains in 'as-certified' condition

## LVV Certification Plate Counterfeiting Results in Fraud Conviction

During 2013, some counterfeit LVV certification plates were discovered on some modified vehicles. Despite the high quality of the counterfeit plates, a WoF issuer noticed an LVV certification plate that didn't look quite right during an inspection, notified NZTA, who put the matter in the hands of the Police. The Police acted swiftly and charged a person with a fraud offence. The person charged with fraud is a Wellington-based motor mechanic - known within hot rodding and performance car circles - and was found to be in possession of two counterfeit LVV certification plates. During December 2013, the person was found guilty of the charge, convicted of fraud, and ordered to do 100 hours of community service.

A fraud conviction will have a significant impact on the person's future employment prospects, and ability to live in, and even travel to, some overseas countries. It is believed that the man did not actually produce the counterfeit LVV certification plates; had he done so, he would have been charged with forgery as well, which would have resulted in a much more severe penalty.

LVVTA would very keen to receive any information, anonymously if preferred, about anyone involved in this sort of activity. Remember that people who do this sort of thing undermine the LVV certification system, and jeopardise our long-term ability to modify cars.

## Christmas Cheer from the LVVTA Team!

Pondering the frustration of another hard day at the office, and counting down the remaining few days of work until clocking out for the year, LVVTA Technical Team-member (mechanical) Justin Hansen looks to be well ready for a Christmas break, to restore some cheer and goodwill, and love for his fellow-man. Justin, Dan, Nikki, Frances, Linda, and Tony wish all those we've been involved with during the course of the year a great Christmas, a chilled out new year, and a safe and pleasant holiday period. All the best!



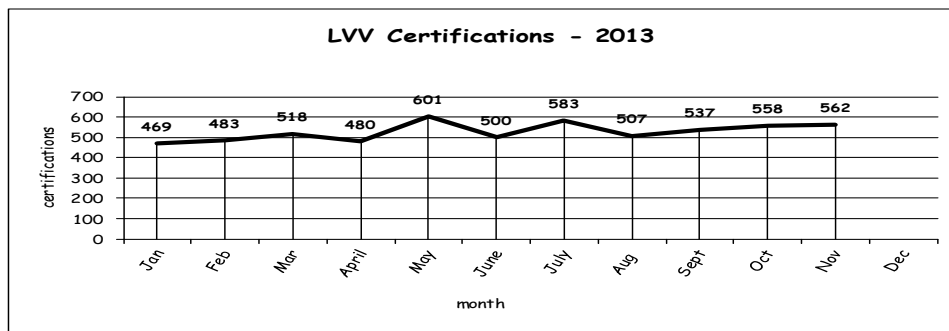
## Why Nikki Works...

Nikki Thomas, LVVTA's Administration Officer in Wellington, is our smiling face at the counter, happy voice on the telephone, general organisational wonder-girl, and baker of extraordinary morning teas and lunches, and this is why she does it all...

Pictured below is Nikki's husband Mark Thomas, piloting his 1956 Ford Customline Top Door-slammer drag car a couple of years ago, on one of his not so good days! In a recent study carried out on the cost of running these beasts, it was established that they cost \$1750 per quarter mile pass, or \$138 per second. No wonder Nikki's always looking for a pay rise...



## LVV Certification Numbers for 2013



The graph at left shows the national per-month LVV certification numbers for all of 2013, excluding December. The monthly average for the first 11 months of 2013 is 527. Given the volume of LVV certifications carried out during December (491 as at the 17th), the monthly average for the full year will be similar to 2012. Yearly averages have been: 521 for 2012, 571 for 2011, 560 for 2010, and 564 for 2009.

Low Volume Vehicle Technical Association (Inc) [www.lvvtta.org.nz](http://www.lvvtta.org.nz) Office & courier: 21 Raiha Street, Porirua City  
E-mail: [info@lvvtta.org.nz](mailto:info@lvvtta.org.nz) Phone: (04)238-4343 Fax: (04)238-4383 Postal: P.O. Box 50-600, Porirua City 5240