

Vehicle stability Do we over complicate it?

Vehicle stability is a technical skill that has been carried out at road traffic collisions for many years using very similar equipment across the globe.

But do we over complicate / engineer a technical application that can actually be very simple to achieve?

Firstly lets look at the reasons we stabilise a vehicle following an impact or in cases of medical episodes where some form of vehicle structure or internal fixing relocation is needed.

1. To prevent further unwanted movement of the vehicle
2. The creation of a safe and solid working platform
3. Good stability also disperses forces experienced when metal is relocated down through the blocks and into the ground reducing the impact on the occupant/s (force dispersal)

These are the key reasons we stabilise a vehicle, with the prime mover being the casualty/s we need to make sure we reduce further impact on them during rescue operations. To achieve this, good, effective and simple stability is required, with the exception to rapid removal or extrication being needed to allow for evasive life saving interventions that can only be achieved at the roadside.

A key point that I will repeat, is this “the vehicle is either stable or it isn’t” if it isn't do something about it!

Quite often during training we hear the terms 4, 5, 6 and 9 point stabilisation, etc. what does this really mean, do we brief our crews “I want this vehicle stabilised with 6 point stabilisation”? (perhaps you do, if thats what works for you) Yes, we know we need to stabilise in 6 locations, but where? where are the 6 points in relation to the incident, what is 6 point in relation to the plan, what is the plan?

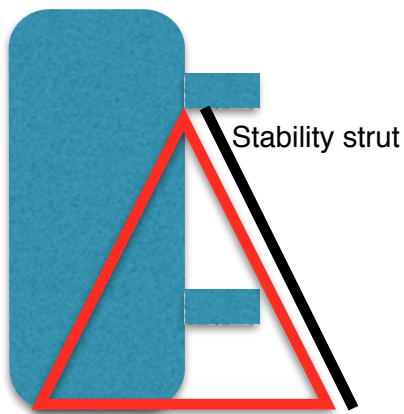
The points (4,5,6,7,9) of stability are only relevant to the plan and that can only be brought to fruition if the OIC (officer in charge) has completed a logical and systematic assessment (360°) of the situation and based the stability on their plan and other unforeseen issues that may arise. This then needs to be passed on to the crews carrying out the technical aspects of the rescue.

Do we need to stipulate how many points are needed or just brief the crew to stabilise the vehicle? If the OIC decides that additional space creation is needed that will affect the stability being carried out, they can brief the crew on the plan progression so that they can stabilise taking this into account.

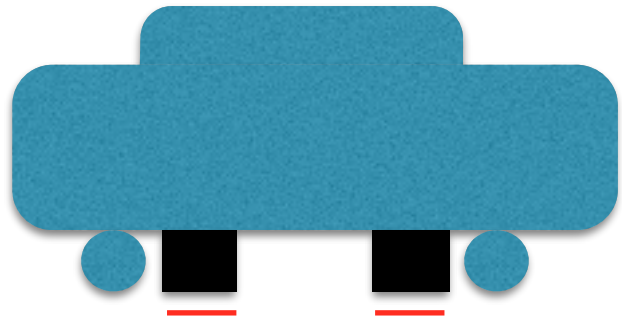
For example; emergency plan, ‘dash relocation to free entrapment, full roof removal for extrication” the crew now know to stabilise as normal but also to put in additional stability for a dash relocation.

So how does stability work?

To obtain maximum stability, in most cases all we need to do is increase the surface area contact of the vehicle with the ground, for side resting vehicles we just increase the foot print area with the use of struts, etc. The more surface area contact with the load and ground the more stable it will be, it also reduces point load and spreads the load over a greater area, especially effective on soft ground.



Increased foot print



Increased surface area contact with the ground

You can see in the diagrams the basic principles of how stability works, it's the same for any vehicle in most situations, wheel, roof or side resting. There will always be the more testing situations where stability needs to be thought out against the situation and operational objectives along with equipment limitations.

So that leads us on to equipment choice.

The choice for side and roof resting vehicles will in most cases be the use of struts, I'm not going to go into the types available or pros and cons for each. For those that don't have struts the conventional use of a small extension ladder section or long pieces of timber secured with either ratchets or rope will suffice.

Now we will look at some standard vehicle positions:

Vehicle resting on its wheels; standard practise for most, but we do see some very questionable stability techniques. (these are just my personal observations and text that I have read)

The use of step blocks, blocks and wedges, which is best? A good question!

Remember its either stable or it isn't. However we need to factor in equipment inventory, trip hazards, casualty access and egress, blocking or preventing doors from opening through poorly placed step blocks, speed v effectiveness, short cuts or incomplete stability are just a few of the common failings we see.

Blocks and wedges can be as quick to place with a well trained crew, they offer greater surface area contact and reduce trip hazards, if the amount of these available is low only use them in the main work zone (casualty side) of the vehicle and use step blocks etc in other areas.

Step blocks are effective where greater height needs to be achieved for vehicles with a high sill or vehicles that end up in a position that leaves a greater clearance between the vehicle and the ground. They are often preferred as they are quick to use, but with this can come complacency, 'quickly placed but not effectively positioned' they can become loose quickly and need rechecking more frequently. They also offer less surface area contact with the ground, the reason for this is, with the use of a wedge to raise the block it leaves less surface area contact as it is only the point loads of the step block on the wedge and the tip on the ground.

Step blocks upside down are great for side and roof resting vehicles but for vehicles resting on their wheels I see that as a quick fix with little effectiveness, sometimes just used that way as its quick and easy, they will need regular checking and come loose very quickly, again offering very little surface area contact with the ground.

Some thoughts for discussion perhaps?

The 5th point of stability, we all know this one! The 5th point is the additional stability put in place at the rear of a vehicle resting on its wheels, predominantly to give additional stability for when the casualty is removed on a longboard out of the rear of the vehicle. It helps prevent additional downward movement as they get carried out of the rear. It's usually placed against the underside of the boot / luggage compartment.

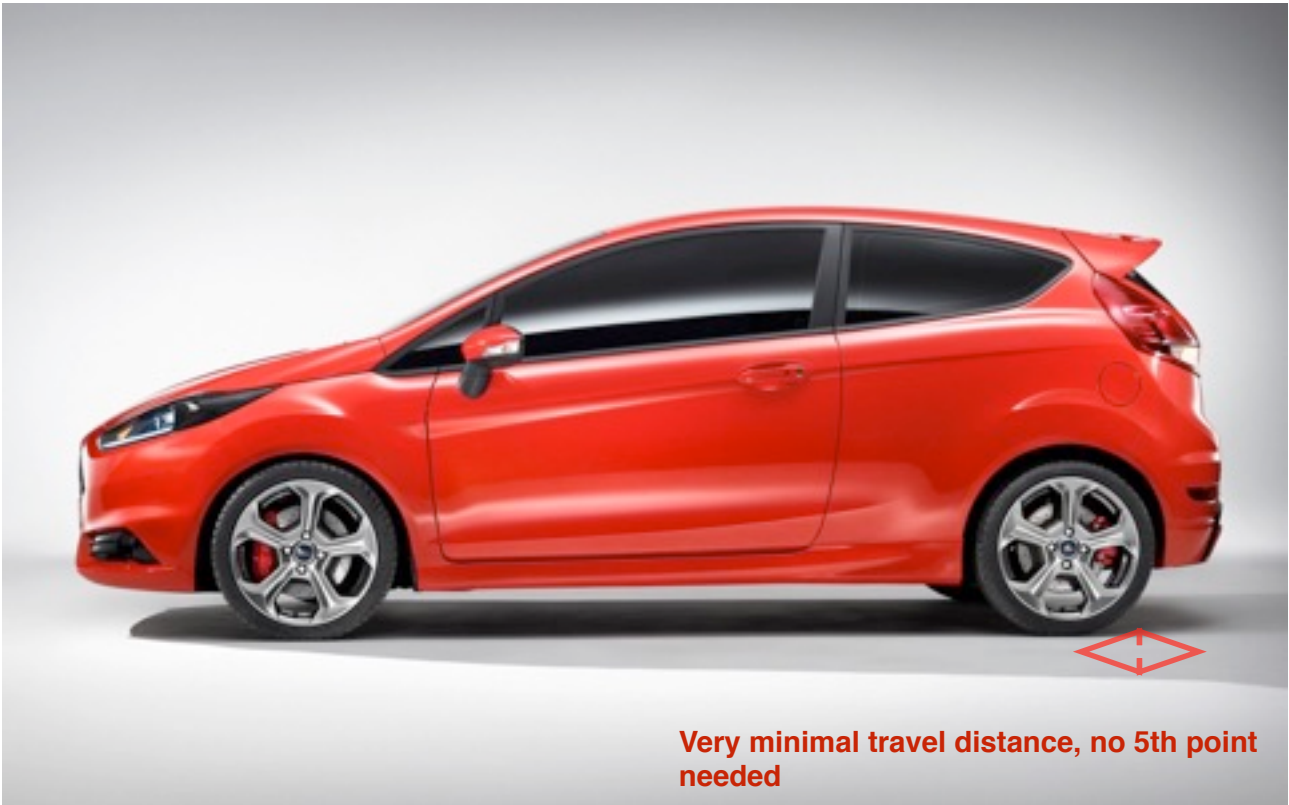
Do we always need it? I here some say yes as it only take a few seconds to put in place, even if its deemed not necessary. So the point is, if you don't need it don't place it, it takes up time, (even seconds add up on scene) it uses up equipment and delays the next phase of the rescue.

When we stabilise a vehicle we need to think, **does it benefit the rescue, if so, of course do it, if not, then don't do it.....** don't waste time carrying out tasks just because or we've always been told to do that, change, modernise. Just because we have always done it that way does not mean its right!

A 5th point in most cases only works well on a vehicle such as an estate where there is a lot of travel distance between the rear axel and tailgate as there is more chance of some flexion of the vehicle as the longboard is removed. It would be fare to say we would want a 5th point here.



Remember a 5th point is only needed if we are to remove the casualty from the rear of the vehicle, if they are coming out of another opening, such as the side, we then need to question the need for this stability.



We have briefly discussed a vehicle resting on its wheels, remember every incident is different so the decision to stabilise and the techniques used must reflect the situation and bring progression in a casualty centered approach throughout the incident.

Wedges, think about using the narrow wedges for wheel chocking and the wider ones for stability as they improve surface area. If using blocks and wedges use a wide wedge for surface area contact and place it on the bottom as this tilts the stack slightly against the sill which also helps against lateral movement, top or bottom either way as long as its effective. try to avoid using narrow wedges on the bottom as this may cause the blocks on top to roll as the narrow wedge will act like a fulcrum.

A side resting vehicle; as stated I'm not going to discuss the different types of equipment.

One thing to think about is the need to chock under the A, B and C pillars or the next best place depending on crash damage and casualty location. This stability allows the struts to force the vehicle on the blocks as the struts are tensioned creating a solid platform.

The blocks also absorb the cutting forces as the pillars are cut above, they also support the cant-rail as it will tend to drop as the structural strength is removed when the upper pillars or roof are cut.

When tensioning struts, do not over tighten them as they will eventually push the vehicle over, get a rescue team member to sight the vehicle from one of the ends so that as soon as movement is spotted they can call a stop (rest) to prevent any further unwanted movement, usually by this stage the vehicle is now suitably stabilised.

Roof resting vehicle; there is the thought that a roof resting vehicle is already stable, unless the engine is missing or it's a hybrid. With that said once we arrive on scene (fire service) we should be bringing a level on control and stability to the incident, so we must always consider the stability and control of the vehicle regardless of personal preference, but this must be made from sound logic and reasoning.

Why hybrids, or indeed (EV, duel fuel, LPG etc) there will be additional weights within the vehicle such as battery packs in the base of the vehicle or in rear seat backs, this applies to a side resting vehicles as well, as these factors will affect stability and how we carry out this phase of the rescue.

In most cases blocks and wedges work well on a roof resting vehicle, this is based on the extrication path and orientation of the casualty, these alone will impact the space creation techniques used.

Basically if the casualty is coming out of the side blocks and wedges work well, if they are coming out of the rear and the roof is to be dropped down then struts will work well as the weight of the vehicle will need to be supported,

If there is heavy structural damage to the supporting pillars, A<B<C due to a rollover etc then the use of struts would be a preferred option as the risk of further pillar collapse is an unknown and blocks and wedges may not be suitable.

Again there will be a lot of factors that dictate what we can and cant do stability wise. The key points here are.

- Do not over engineer the task
- Its either stable or it is not, do something about it
- Do not put things in place that are not needed
- Choose the right method that benefits the rescue
- Work as a team and share ideas
- Maximise the surface area contact with the ground
- Don't do what you have always done if it isn't the best option, modernise and develop
- Train regularly
- Do not take shortcuts

Thanks for taking time to read this article, as always these are just my thoughts, please share any ideas you have.

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