Seat Belts in Classic Cars

By John Booth

Fitting seat belts to a classic car is often a disregarded subject. Some say it would distract from the originality of the car. Others can't be bothered or feel that because of the limited use of their car the chances of being involved in an accident are minimal. I had opted to fit seat belts to my 1959 Rover P4 100. I had bought them around a year ago and it was something I would get around to doing one day. What forced this to become a reality very quickly was when I read an article on a Rover rally to Normandy. One of the participants had owned his Rover for many years. He had spent literary thousands of hours servicing the car and keeping it in an immaculate condition. He and his wife were involved in a catastrophic accident. The front end of his beloved Rover suffered severe damage. Both he and his wife were hospitalized. Once the dust had settled he was convinced that had he not fitted seat belts to his car, he and his wife would probably not have survived the crash.

Seat belts in various designs have been around for a while, but mainly restricted to use in racing cars. During the 1950's the Swedish National Electricity supplier were concerned that the majority of deaths within the company occurred while employees were on the road doing company business and not from electricity as one would have expected. They employed two safety engineers who quickly realised that most of the fatalities could have been prevented had the occupants of the vehicles been securely restrained during a crash. Their work was presented to Volvo. Nils Bohlin a Swedish inventor working for Volvo went on to develop the modern three point belt. Despite being given a patent for his design, and in the interests of saving lives he allowed other motor manufacturing companies to use his design at no cost. Volvo introduced it to their vehicles as standard equipment in 1959 and over the coming years Bohlin demonstrated its effectiveness in a study of some 28000 accidents in Sweden. In 1970 Australia was the first country to make it mandatory to wear seats belts. The world followed during the early 1980's.

If we look at the physics of what goes on. In a collision a person's weight increases dramatically. This is relative to how much they weigh, how fast they are going at the point of impact and how fast they stop. A person who weighs around 80kg can exert a force of many times their static weight and unless retrained it is unlikely they would survive. The notion that a person can just put their hand out to break the impact is something that is just not going to happen. You may have a chance if you can bench press some 300kg while someone is violently shaking the bench.

So let's look at how this all works. If you take a cricket ball and you throw it slowly to someone, they catch it no problem. Now take a cricket bat and hit it as hard as you can at that person. If you haven't killed them and they manage to catch the ball they may not be too impressed. At the point of impact with their hand the velocity is rapidly reduced resulting in the weight of the ball increasing substantially with painful consequences. If they are clever they will move their hand back as they catch the ball to reduce the velocity. In so doing reducing the weight of the ball thus preventing hand injury, like crumple zones in a car. Now we do the same exercise with a tennis ball. The person will probably catch the ball without any problems no matter how it is delivered to them. What is critical here is the weight of the ball.

Research shows that by wearing seat belts deaths can be reduced by up to 60%. However overweight or heavy people were around 30% more likely to die in a similar type crash than an average weight person. This percentage climbs in relation to a person's weight. The heavy person becomes the cricket ball and the lighter person becomes the tennis ball. So speed does kill but also unfortunately so does weight. So how heavy, how fast and how quick the stop will dictate the weight at impact. It is often said it is better to hit a brick wall than a tree. Brick walls give, trees don't. I would take my chances on the brick wall….. and hope that its of RDP quality. Better to come to a slow, bumpy but long stop in a field then a quick stop aiming for a tree. Leave the tree alone!!

When looking at my Rover it became apparent that the B post was the weak point in the whole structure. This I think will be the same for most cars not designed to take the three point belt system. A roof may only weigh 30kg and remember in a roll over the doors, A and C posts and glass all add to the strength. The floor on the Rover is thick steel so the B post is the critical point. So you can only do the best you can with what you have and the rest is in the hands of the Gods. Better to have some belt than no belt.

The B post of the Rover is made of thin steel. Though in some parts it has an amalgamation of thin steel plates spot welded together. To bolt a plate across the two slotted holes did not look like a good idea. In an impact I felt the plate would tear the bolt out of the top slotted hole. I did not want to weld in this area. Besides the strength of the weld is only as strong as the thin steel plate it is welded to.

I welded up two rectangular blocks using 6mm flat bar. These would be a tight fit and slot into the B post so act as a wedge. The B post is quite deep so it would take a substantial force to twist it out.

Holes were drilled into the blocks to reduce weight without affecting the structural integrity. I welded on a top plate that would bolt into the top slot of the B post and threaded three holes to bolt on the upper seat belt bracket

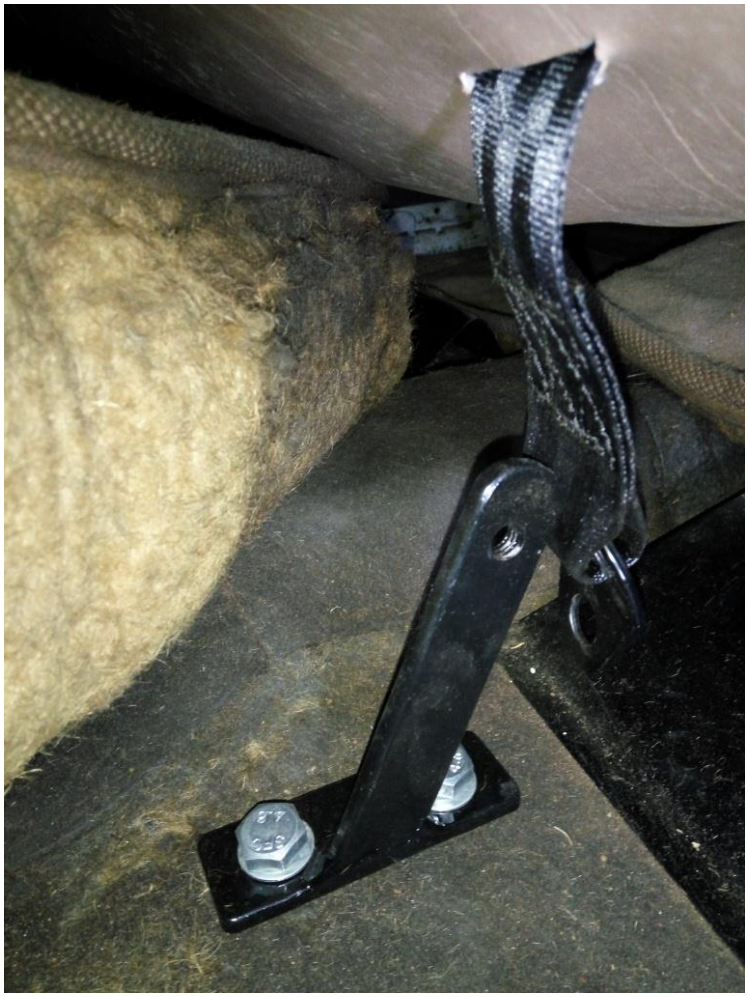
I then welded on the tail section that would bolt into the lower slotted hole.

The bracket bolts between the two slotted holes. The block is a tight fit in the B post and because the force is directed at around 45 degrees, it will try and twist itself out. This way we have an additional locking effect at the load point. This is like a long nut trying to turn a set spanner. The only difference in this case is the nut is held in the spanner with two bolts.

The upper belt bolted in nicely, with the cover piece on, it provides a strong connection.

The Rover floor is quite substantial. This is the bracket I made up to hold the inner seat belt. Under the floor was another bigger plate. This will help to distribute the load in case of a collision. Note the bracket is angled in

the direction of the force applied to it. This will allow the force to be distributed along its length and not try and snap it off at the welded joint. The weld itself is also longer.



The lower belt is bolted on, it does not interfere with the passenger floor space and is very much hidden by the carpet. It is a flexible belt so there is no problem with seat adjustment. The Rover has a bench seat. Cars with individual seats can probably use the rod type connection.

This is the bracket I made for the outer belt and belt spindle. This provides a decent connection at this point. Again a large plate is under the floor. The force needs to be distributed over a large area that a nut and washer on their own will not do.

This looks neat with the carpet covering most of the bracket.

The whole seat belt is in, looks good, comfortable to use and secure. Decided not to do a crash test!! Not saying I don't trust the Gods, but well enough said!!