Brace yourself!

Tech Talk

Words & photos: Allan Pryer, Southern Tasmania Chapter

I'm not one for drilling holes in my car and have suffered pangs of regret now and then for making a sizeable opening in the firewall for a cold air intake some years ago.

And so it was that I 'ummed and aahed' for many months about the *Flyin' Miata* butterfly brace. Twenty-four holes is a lot and would be another nail in the coffin of my ability to return my Classic Red '93 NA to original.

Now there are many braces out there for MX-5s, some of which attempt to address things that were sorted by the time later models arrived. Amongst these are under-body chassis braces, seat-belt mount braces, front-strut braces amongst the options along with roll-bars and putting the hardtop on permanently!

My home is tucked at the base of the mountains in the northern suburbs of Hobart and the road to it becomes increasingly quaint and decreasingly smooth the closer you get to it. As any owner of a standard NA knows scuttle-shake and general vibrations are always lurking especially when roofless, and as our cars age this is likely to increase as the body "relaxes". At certain points in my area the sealed roads have become corrugated and I would seek out any path that might reduce the annoyance of the associated vibration.

Having studied no engineering I decided that braces that link the two sides of the car together at front or rear are attempting to address a lack of stiffness in the chassis that then allows the suspension structures to move. By applying a brace across these it at least prevents that but still allows twisting of the body as front and rear remain relatively independent. By applying more extensive body stiffening measures much of that should be reduced whilst at the same time at least partly, and at best totally negating the need for strut braces.

I consulted the various MX-5/Miata forums to get a feel for how effective the change was for those fitting either just the frame-rails or both those and the brace. Many said that just fitting the rails gave dramatic results and where the X-shaped cross-brace was added the difference overall was even more so. Now many of these take their MX-5s out for circuit work and these people want stiffness to the max! The rails and brace were often fitted to cars where roll-bars and other bracing were already in place. I was mindful that my use would mostly be out amongst the lovely twisty and undulating back-roads of Tasmania rather than as a track-day hero, and thus needed to know if it would change the nature of that experience too much. There is a school of thought that suggests that removing our cars' natural flexibility alters their behaviour for the worse where corners involve a switch of camber for example, and that some sure-footedness might be lost, especially in the wet. Food for thought, and not being that cheap all of this added to the picture of how worthwhile and what bang-for-buck was on offer.

Photo: Flyin' Miata

Regardless, amongst the other rattles and vibration my car had developed an annoying squeak that was proving extremely difficult to locate, was not reproduceable when stopped and emerged only after driving on bumpy roads like those near my house. It seemed that such issues were only going to become more numerous in the face of all of this vibration.

Damn it! *I would buy the FM Butterfly Brace!*

As mentioned there are several parts to the *Flyin' Miata* butterfly brace kit. There are the two 'frame rails' which fit (all being well) over the existing longitudinal chassis rails that run either side of the drive-line. There is the butterfly brace itself which, as mentioned is essentially an 'X' shape within a trapezoidal frame. This is joined to the rails by additional structures *Flyin' Miata* refer to as "wings" (see left).

Fitting is going to take some time and patience and be prepared to "give a little muscle" and employ various "persuaders". The seats must come out and the carpet is lifted away from the work area although mine decided it wanted a closer look at the job -more later! Get the car up in the air as high as you can – those 24 holes will take some effort and will create a fair amount of turnings. You don't want to be struggling to hold the drill in place and deliver the necessary pressure amongst getting a face full of sharp metal (goggles are a must). As it was mine was only on axle stands, up two holes I think, and it was tight. The MX-5 is so light, beautifully balanced and stiff enough that if there is any height variation in the axle stand positions the car can somewhat unnervingly rock on the diagonal! You want a stable arrangement here to work on and I corrected the relevant stand by shimming the base with thin MDF *(thinks to himself: "if it's stiff enough to do that, why am I fitting this gear?!").*

The fuel and brake lines are also released by removed their brackets. Positioning the rails prior to drilling is critical. There is little forward-back tolerance before the rear-most bolt-holes become too close to, or even bite into the bulkhead behind the seats. As a result they are positioned as far forward as they'll go without being forced away from the flat surface of the floorpan by shaped metal ahead of it. I thought I had my rails well forward but even then there was little room between the bolt heads and that bulkhead. The frame rails should fit snugly over the chassis rails. Mine were in excellent condition but even then it was a tight fit and required a little help with a rubber mallet. Any damage will probably mean some re-shaping with the trusty *"Jeremy Clarkson Universal Tool".*

... continued

Fitting a … Flyin' Miata Butterfly Brace (continued)

tech talk

Positioning the frame rails. Photo: Flyin' Miata

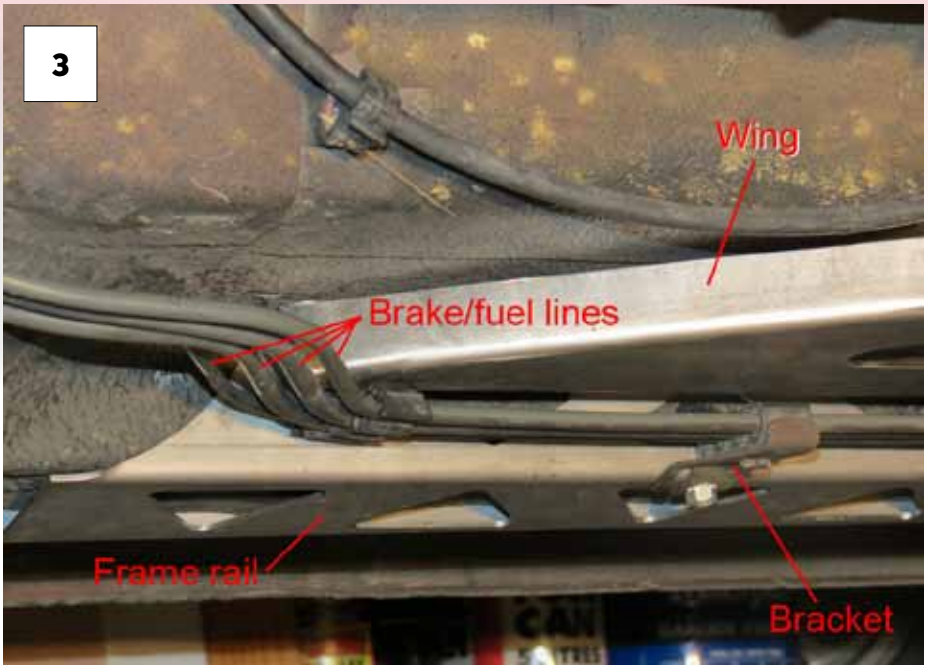
Being a bit anal I agonised over the relative position of the two rails prior to drilling the holes. I didn't want a twisted installation as it were, so out came the vernier calipers as I tried to find reference points elsewhere on the chassis. Once satisfied I took to my baby with the drill. Rather than mark the holes, and after the fun of getting them in place and lined up, I left the frame rails in place. I was very careful not to open up the frame rail holes by catching the drill bit on them as I drilled. Having done that (sounds so easy) I cleaned up the edges of the holes with a file and applied some sealant around them.

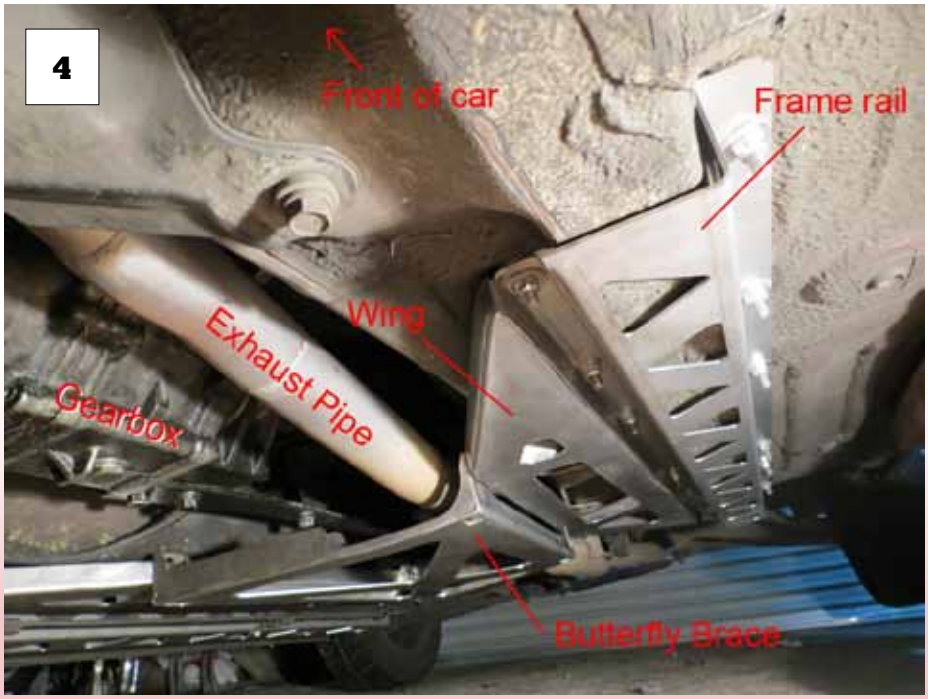
Oh wait! I almost forgot my mate the carpet – drilling a front hole close to the transmission tunnel ultimately involved the fibrous carpet 'underlay'. Unbeknownst to the man underneath, the carpet had sagged back down so that the drill-bit dragged as much of the underlay into it as possible creating a twisted mass. Fortunately the carpet was fine and the underlay could be unwound reasonably well. I learnt my lesson – pull both sides of the carpet up together and clip them over the central hatch.

I then popped in the bolts *(see pic 2)* and gently tightened up the outside of the rails. The inside ones also hold the wings. *Flyin' Miata* suggest fitting the wings and brace as one unit so I bolted them together with the central brace as low as it would go to avoid problems with it fouling on the exhaust etc. when pushing into place. *Flyin' Miata*'s idea was good but created some "excitement" when it came to fitting. The fuel/brake lines get in the way and don't quite nestle into the channel created by the frame rails and wings due to curving around too late at the front. The frame rail has mounts for the original brackets but the latter need their bolting points straightened to fit. A vice and hammer easily provided the necessary force and control to modify these parts with pleasing results *(pic 3)*.

Getting the wing-brace assembly to squeeze into the gap between the frame rails was a major effort. There was no play anywhere else such that loosening the rails would help so it was all about controlled force. Initially I applied the mallet but noted that the brace was bowing due to the pressure from either side. I decided to use two old scissor jacks to force the assembly into place whilst protecting the brace section by positioning them under it specifically. This worked well but a slight bow in the brace remained. I raised it up within the wings' slotted holes as high as it would go without being likely to have exhaust etc vibrate on it – it was hard up on an exhaust hanger mount. This provided more support overall for the brace but a little bow remains. Others in forums have mentioned this and *Flyin' Miata* admit it is a tight fit by design and weren't too concerned -as long as the intended function as a stiffening device is not compromised it should be OK. A voice inside says that whilst there is obviously tension in the system, "springiness" is not in the interests of removing the ability to flex, and I'm thinking it could do with a bit more strengthening *(pics 4 & 5)*.

After everything was tightened, and this is fiddly amongst the fuel/brake lines, I took him for a run? No, I had to wait several days before a chance arrived – *aargh!* I had read that the difference was immediately apparent, but I'm sceptical of such comments and when I finally reversed out of the garage expected nothing to be apparent until some tasty corners were found. They were absolutely right! Even reversing felt strange. The car had a totally different feel. So stiff, so tight on our uneven driveway. As I drove off down the road it was like a different car, a new car.





The first test was the corrugated bit of road. The scuttle shake had not gone altogether but now the juddering and jarring was bearable. The usual array of small rattles bumps had reduced to minimal. However the biggest difference is in cornering. You do feel like you could get one wheel off the ground if the corner was so shaped but the behaviour is so precise and, as alluded to by forum contributors you can confidently put the power down so much earlier. I have KYB AGX adjustable shocks and slightly lower King springs and coupled with this bracing you feel like you can really fire it into corners, achieve excellent turn-in and fire out again early. I might even turn up the shocks now. Having once been firmly in the corner of focussing on optimising engine performance I am a convert of sorting the whole suspension side of things. This cannot be over-rated.

Of course all of that has brought my attention to the brakes and how barely adequate they are when things improve elsewhere in the package.

Has this changed anything for the worse? Firstly the brace section will most likely be the lowest component under the car. I'd rather that than it be the fuel/brake lines, but they do seem a little exposed too. Humps and obstacles are then more likely to cause a problem especially with a heavier passenger on board. That said, with my slightly lowered configuration I was already running a higher risk. I might have to dial in a stiffer "shock" setting to counter!

In the forums there was mention of a greater tendency to "tramline" and relatively speaking I would say there is, but I'm not sure that hasn't come about just because a tighter/newer car would give that impression. How is it in the wet? I sense that this will be interesting with undulating corners where all four feet may be less well planted overall at certain points. As I get used to more aggressive dry cornering it will hard to compare with where I was in relation to this but I might be inclined to soften the suspension settings if I was intending on spirited driving in damp conditions.

Did it fix my annoying squeak? Alas, no, but it is much less likely to occur. (I *will* find the sod!)

At the end of the day I'm a nostalgic type and will always wonder if I've lost some purity of early MX-5 experience and overall I would say that some organic (ie, flexing) nature might have been diminished, but this is now a car which feels (preferably with better brakes) ready to take on anything.

With the even tighter, more direct feel of the handling now, and without all of the old rattling and juddering I won't be going back! ■

Flyin' Miata is a company in Colorado, USA, that specialises in "making Miatas accelerate faster, corner harder and stop shorter".

Find out more at *www.flyinmiata.com*

Please do your own research on the best solution for your car before making a decision on adding after-market bracing.