



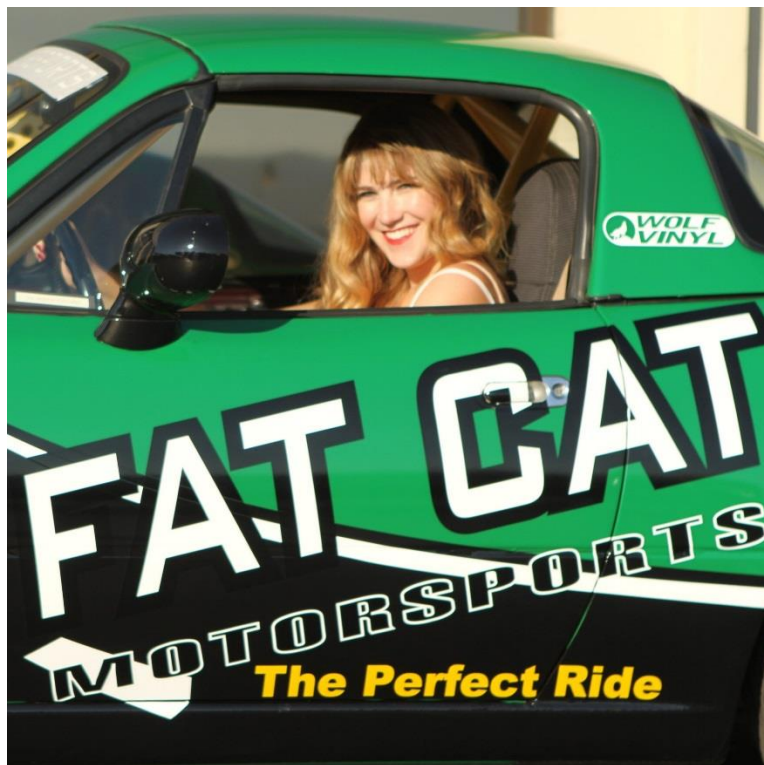
**Meet 'Senna', our 1995 Mazda Miata M-Edition,
'The Perfect Ride'**



In tribute to the brilliant Brazilian Formula 1 champion, Ayrton Senna



Senna with his previous full FCM livery wrap





Senna at work, in the 'Corkscrew' at Mazda Raceway Laguna Seca



Background:

My Miata obsession began in 1996, when as a current owner of a Plymouth Neon Sport Coupe and new to the hobby of autocross, I both envied and despised these ‘girl cars’ for being faster than my higher-horsepower Neon. In fact, Miatas would regularly embarrass many more-expensive sports cars and sport sedans. I didn’t yet understand the allure but knowing they were rear-wheel drive, light, and nimble made them appealing – and maybe even more ‘sports car’ than girl’s car! My research drew me to a few key points of the genius behind the design and tenacity of the Mazda engineers to create a modern Lotus (with actual reliability!):

1. Rear-wheel drive, the hallmark of a true sports car. Your right foot works with the steering to control where you’re going – but working with your foot is more fun!
2. Essentially 50/50 weight distribution. They often end up more like 52/48 but it’s still almost perfect from the stand-point of vehicle balance. Combined with rear-wheel drive, the intelligent distribution lends itself to seamless handling and excellent controllability. The chassis is communicative and works all the tires in harmony to provide grip and control equally well at all corners.
3. Double-wishbone design. This feature is something that Mazda engineers fought tooth and nail to retain despite the objections from the accountants on higher cost. This is also the reason the MacPherson strut-equipped Toyota MR2 never became a cult icon.
4. A well-chosen power steering ratio that provides exceptional feedback once depowered. This is a trick many racers and enthusiasts have used. More on this later.
5. A solid, proven 1.6 liter and (later) 1.8 liter motor based on the venerable turbo-charged Mazda 323 GTX rally car. Given that the Miata’s motor retained the oil-squirters is proof those crafty Mazda engineers knew what they and some fans be doing to the motor one day. This feature plus the overall design of the engine would induce many future enthusiasts (including yours truly) to build 200+ wheel-horsepower Miatas that were fast in a straight-line as well as around corners.
6. Flexibility to install a later ’99-00 VICS (variable intake runner length for better mid range torque and top end power) or an ’01-05 VVT (variable valve timing) cylinder head. Both would mate to the 1.8 short block and give a power and torque boost whether the car was run naturally aspirated or with forced-induction.
7. Excellent Japanese build quality and reliability combined with American design aesthetics - the best possible merger!
8. Certain 1994 to early 1995 1.8L models came with a more-expensive and effective TorSen Type 1 limited-slip differential. Later 1.8L cars (late 95 – 97) and the NB (99-05) used a Type 2 or less sophisticated clutch-type mechanical differential. The characteristics of the two types are explained by my customer and drivetrain expert Pete Rushbrook accordingly:
 - “TorSen Type 1 – a cross-axis gearing setup; it is being effective under acceleration or deceleration; it’s allowing the wheels to tell the differential the speeds they want to go at the same time being connected and driven, and/or non-driven in deceleration mode.”
 - “TorSen Type 2 – the parallel axis only actually engages when you experience wheel spin. So it’s basically an open-differential -> wheel spin -> that axle spins some gears in the center of the diff -> those gears bind into the differential housing itself and slow that



spinning axle down to differential speed of the case (i.e. ring gear speed) so that it can transfer some of the power to the other side and basically then run them both at the same speed - which is NOT what you want in the middle of the corner – you want to be able to differentiate. Under decel, it's just like an open diff.”

Mind you, I didn't know all these facts – only the first 3 – in the beginning of my search for a Miata which was then limited to only new cars. After hating and admiring the cars from afar for a couple years, I stopped by the lot at Oak Tree Mazda in San Jose and took a brand-new white 1997 Miata 'PEP' package for a test drive. The salesman was a kid about as young as me but had a red Miata with roll bar, lowered, etc. I could see the potential was there to do whatever I wanted but I just wanted to know how they felt. “How much time do you have?” It was a bright Saturday in fall and I was in no rush. “All day, what do you have in mind?” He smiled. “Let's head down Highway 17.” I smiled even bigger – that was a familiar road. I already felt the lighter weight and nicely-balanced clutch, steering, and gas. The car was responsive and of course having the top down was a great new experience.

We were approaching the twisty parts of 17 and he said 'let's go up Bear Creek Road.' I nearly died – a couple of Neon buddies lived at the junction of Bear Creek and Hwy 9 in Boulder Creek. I knew this road well. “You got it!” Before we were even at the top of Bear Creek, I was in love. This little car did everything so well - turned, broke, accelerated. Nothing crazy, but just an extension of traversing the ground with playful confidence. Later, I even got bold enough to goose the throttle coming out of turns and catching the tail. We were having a great time and I knew – as he did – that I finally 'got it.' This WAS a real sports car, just an unassuming one.

The rest, as they say, was history. She had 8 miles on her odometer and when we got back it was at 78! I told him “don't let anyone touch her, I'll be back tomorrow with a deposit.” I followed through and eventually had to sell both my Neons but it was worth it. I was ready to step into the world of rear-wheel drive and no better way to do it. I named my first Miata 'Jenny', since Jennifer was my favorite girl's name. She was a great steed although after one autocross when she was new, I did very little official competition driving with her. There was a beauty to being on a winding road that made her a very special machine. I felt connected to her in a way I'd never felt before.





In fact, I bonded with her more on backroads than at the track and the bulk of my driving the next couple years was commuting back and forth to see my girlfriend who lived in Socal, San Fernando Valley. That relationship probably lasted 6 months longer than it 'should have' because of how much I'd look forward to the drive! It took a few weeks dealing with the interminable 'get on 5 and deal with semis' that I looked on Netscape (hah, late 90s!) and found a website called Pashnit. The site was mostly dedicated to bikers but being a Miata owner, we were accepted as a '4 wheel motorcycle.' I discovered a route I still savor to this day – from the SF Bay Area, take 101S to 25S to 198E to 33S over into Ventura and finally back to 101S). Jenny was great fun in stock form with just some Koni Sports (set to full soft – important!) and later I added some Racing Beat sway bars (front and rear), Ground Control coilovers to the Konis but didn't really like driving her so much after that (for reasons I now fully understand!).

I really enjoyed her - top up or down, heading to LA, Lake Tahoe, the beach, driving to graduate school or commuting to work, or just jumping in for a random drive - but she would service as an important teacher of some hard lessons I'd need to learn to paying attention. As a very rude awakening, following a few smaller mishaps, I totaled her on March 1st, 2002. Incidentally, that accident would much more likely have been avoided if I'd had anti-lock brakes (more on that later), which incidentally was a standard feature my '95 Neon Sport Couple. I was learning important life lessons and fortunately many parts from Jenny would later be used as spares. For example, I save the limited slip differential (a TorSen Type 2 which I'd later realize was less effective than the Type 1), the Hard Dog roll bar, and the GC/Koni/Racing Beat suspension parts to put into a future Miata. The majority of her ended up become salvage parts for a Spec Miata racer who helped me literally cut her into scrap. It was humbling, but something I'll never forget - a very important set of experiences for an overly-aggressive 20-something!

As I looked for a replacement, through many test drives I was finding myself drawn to the lighter 1.6 cars (1990-1993) as they felt nimbler than then 1.8s and also were less expensive. Eventually, I found my top candidate – a 1991 British Racing Green 'C package' – and flew to San Diego to buy it from an enthusiastic young man (who also owned a cool SR20DET turbo Nissan Sentra SE-R!) then drove back to the Bay Area. Being an anime fan, I named this Miata 'Roy', after the venerable Robotech / Macross fighter ace. Roy would become the first flagship car as I prepared to found Fat Cat Motorsports. He'd eventually get turbo-charged (see photo below @ Flyin Miata!) and was a fast, fun, and reliable machine putting out over 210 very peaky (didn't accelerate hard until above 4,000 rpm) horsepower.



Roy would see a lot of autocross action, a couple track days, and a good bit of backroad and city driving. This was well before any of the super cool bells and whistles like KBO, Ripple Reducer, or even the influence of gas force came into my awareness. Still, I was learning about shock absorber design and valving, suspension tuning, and experimenting with many aspects of suspension setup. I was advancing the state of the art of my understanding and developing new products like our FCM bump stop and shock mount kit which would be a standard upgrade for Spec Miata racers. In late 2007-2008 I began to offer shock revalves and started working with my first customers in that realm.

Since Roy was often being worked on through the weekend and late into Sunday nights, I looked for another Miata that would remain 'fully operational' come Monday morning. Through a stroke of luck, I found what would become a nearly perfect street car - a very special, Limited Edition 1933 – black with burgundy interior, who my good friend would name 'Graham' after the British racer Graham Hill. Graham would serve as a street Miata seeing very light mods including coil-over suspension. I was intrigued by the differences between our turbo-charged '91 BRG with stiffer springs and softer damping and our newly-acquired '93 LE with softer springs and much stiffer damping. A rough comparison below:

- Both had the same power steering rack but Graham had ABS which let me brake harder, later, and with more confidence than I could in Roy, where I had to attempt to modulate the brakes to stop quickly while not flat-spotting the tires! The ABS was absolutely a superior method.
- Graham, being a 1993 model, as noted before had the early version of the R-package suspension, which would come out in 1994 when Mazda would move all US Miatas to the larger 1.8L engine along with other changes. The R-package suspension came with Bilstein monotube shock absorbers under fairly high gas pressure (about 300 psi giving about 50 lb constant force pushing outward on the shock shaft) and very stiff rebound damping. The bump stops were longer than a standard non-LE (or later non-R-pkg) model and the combination of strong rebound plus long / firm bump stops gave a 'go-kart' like feeling to the suspension. This was fun on smooth surfaces but unfortunately also painful on typical rough Bay Area roads *despite* the springs being quite soft, essentially the same rates as a



standard Miata! In fact, I later realized that the 1993 Limited Edition rode worse than a Spec Miata!

- Graham came with the 'R-package' tie-rod ends, which Roy didn't have. These special ends would space the steering rack up about 3/16" to keep the steering angle from changing as much when encountering mid-corner bumps. I'd later add those parts to Roy since he was definitely lowered, but the subtleties of bump steer (and further corrections) would become very important as I demanded higher grip from both cars.

During this time I had also done some co-driving with a few National-level autocrossers in classes that had more restrictive engine rules. Instead of relying on sheer power, I had to learn to keep up my momentum. Between the two 1.6s I owned vs. driving a '94 Miata base in Street Touring Roadster class (suspension and wider tires but limited engine mods) and a '95 Miata R-package in E Stock, I enjoyed the consistent, higher torque and smoother power delivery of the larger 1.8L motor. It wasn't as frenetic but it was solid and made it easy to know what the engine would do regardless of RPM. I was starting to feel the allure of the '94-97 chassis especially looking at a lighter weight package. Having too much power (in the turbo '91) gave me some bad habits and I reluctantly admitted I could use more driving practice with a 'slower' car to really drive the faster one properly.

While I didn't have much success at the national level in other people's cars, I can proudly say I won a National Tour in a 1999 Sport package Miata in 2006, locally at Atwater Air Force Base near Fresno. That's another story for another time, but it was with some dampers we tuned for autocross and street and they worked amazingly well including in the monsoon we experienced that weekend! I would continue applying what I'd learned to help several customers win trophies and even back-to-back National Championships (2008 and 2009) for Jerry Jenkins!

Jerry Jenkins wins 2nd SCCA Solo E Stock National Championship in a row in his '95 R-package Miata

<https://www.youtube.com/watch?v=1N3bhWpDGs>

I had to do more research (some of which I gave away at the start of this missive) to understand the nuances of the 1.6 vs. 1.8 and the various years for the 1.8. But, with help, empirical testing, and attention to detail, I was able to decipher what the best combinations were and why.

The pull of the 1.8s was too great and it was time to move one of the Miatas out as owning three Miatas would be one too many! Before I made the decision to buy a '94 or '95, I debated and decided the best route was to let go of the ground-pounding '91 BRG. One of my Miata buddies already owned 4 and had room in his heart and ranch for more. He'd use him more as a track car since Roy was more 'race-prepped' than the '93 LE which I honestly still loved too much as a capable street car (nod again to ABS!).

With Roy in his new home, I was ready to get a 1.8L Miata and wanted a solid E Stock autocross car with the TorSen Type 1 limited slip. By then I'd learned the differences between '94-95.5 and 95.6-97, plus the 99-05 Miatas. The newer cars had their allure, but I could later backdate my earlier chassis with new engine or subframe technology while keeping the more classic Miata look that I preferred. Again, since I'd gotten a bit too sloppy tossing Roy around with that peaky turbo, I wanted a very linear power band and more intuitive throttle-to-rear-wheel interaction which I didn't have in the '97 (Jenny with Type 2 TorSen), '91BRG (got Jenny's old diff), or '93LE (viscous or nearly open diff). From seeing how fast a



talented driver could make a stock-powered Miata go, focusing on acquiring a car that really communicated its intentions was the right way to improve my skills and overall driving enjoyment.

After a bit of hunting, I had to expand my search to nearby states and by late October 2009, I found a white '94 R up in Portland, Oregon. Another Miata buddy checked it out for me and with the thumbs up, I flew up, met him, met the car owner, made the deal, and happily drove 'Sophie' home as a late birthday present to myself. She was the spitting image of Jenny, my first Miata, also white, but was both more car and less car. Literally less in that she had no radio, manual windows / mirrors / steering. More in that she accelerated better from the lower weight and - crucially - had the wonderful TorSen Type 1 which I'd only experienced in other people's Miatas up to that point! Sophie felt quite at home in the twisties although one aspect I didn't like was the 'slower' ratio of the manual steering rack vs. the faster ratio power steering I'd gotten used to in Jenny, Roy, and Graham. The heavier response made me feel more tentative 'playing' on backroads when you might come out of a turn in full opposite-lock and needed a HUGE steering correction to stay on the road. She was like a razor - very precise, but not amenable to drift-style fun. I wasn't too disappointed as my main goal was autocross not backroad driving, but I felt I'd not yet found the perfect Miata.

Now I had another interesting basis of comparison - Sophie and Graham. I felt the smooth torque and linear delivery of Sophie's 1.8L motor vs. the lower torque and peakier top end of the 1.6L. I also truly began to hate the viscous differential that did nothing to prevent one wheely peelies! Graham was only good to about 80% of the performance envelope and fell apart when driven harder than that. Also, the '90-93 Miatas while classic were starting to lose their resale value a bit as the 99 Miatas began to come on the market. Much as I would miss aspects of owning Graham, it was time to let him go - but only to a good home because of how special he truly was, beyond just the 'LE' label.

My technician Paul was very much a fan of Graham's look and feel. Paul wasn't as much of a racer as a show-and-go guy so he didn't mind the lower engine output. He had become familiar with the car's nuances and jumped at the chance to buy him. So that done, now I was down to one Miata. This next one would be the last Miata I'd buy for a long time as I wanted to move into other markets and needed an appropriate project for that (enter Christina, our 330i BMW sedan). Each step I'd taken in Miata ownership was based on careful, deliberate moves toward the 'pinnacle' of technology, feel, and sophistication. I had to get just the right fit.

My ultimate Miata chassis: an early 1.8L Merlot Mica M-Edition:

I knew I wanted a 1.8. I also knew only 1994 to 1995.5 would have the TorSen Type 1 which was incomparably better than the TorSen Type 2. I knew from my experience having ABS on Graham vs. not having it on the other 3 Miatas I'd owned* that anti-lock brakes were too important to be without, both for street and competition / track purposes. Also, in 1996 the Miata went from OBD1 to OBD2 and the emissions requirements / checks were more stringent. For registering in California, it was harder to make a modified 96+ pass smog vs. the earlier 94-95.

Having power windows and power steering was nice although I knew the power windows would eventually come out as we turned him into a more dedicated track / high-performance car. However, the power steering ratio was higher than the manual steering and made correction much easier. When



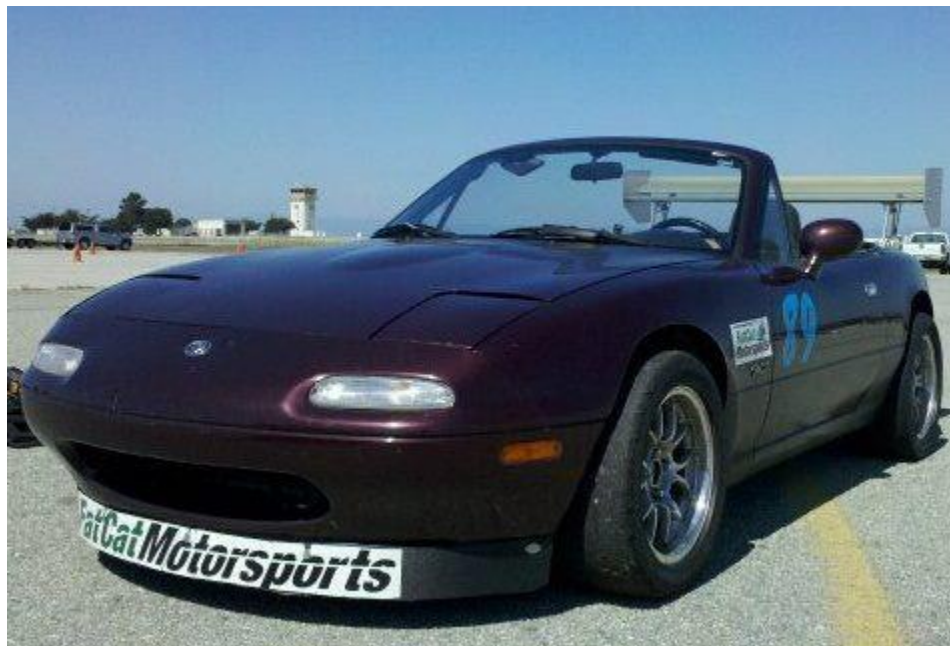
the power steering rack was 'depowered,' (power steering pump removed and lines plugged) you had excellent road feedback of a manual steering rack but also a quicker ratio that the manual rack lacked.

- solid 1.8L motor
- OBD1 diagnostics (easier to work with when modifying the vehicle)
- TorSen Type 1 limited slip differential
- Anti-Lock Brakes standard with superior rear proportioning vs. later '95-97 Miatas
- rare color on a track-prepared high-performance Miata; he'd stand-out in a classy way!

Essentially, I needed a well-cared for, lower mileage 1994 or 1995 M-edition Miata. That's what I found after a good bit of searching and scouring.

**Non ABS car I'd owned included '97 Jenny (totaled under locked brakes), '94 R-pkg "Sophie" (after 2 smaller mountain crashes also totaled under locked-up brakes nearly sliding off the road), and Roy (who I never crashed but flat spotted several Kumho and Hoosier R-compound tires from lack of ABS!).*

Enter 'Ron Burgundy':



Named by my technician Paul (always with a flare for the silly!), our beautiful 1995 Merlot Mica M-Edition had everything I needed and wanted in a Miata. Despite the luxurious appointments (leather seats, power windows, power mirror, A/C, power steering) he was also more driver-friendly and



competition-oriented than even the newer NC Miatas which had an electronic brake assist you couldn't fully disable combined with fairly numb steering response. I had briefly entertained buying an NC, or an NB, but the lighter, still powerful, modification-friendly, and quite capable early 1.8L was a perfect choice!

With the '95 M-Edition, you had a true sports car experience cloaked in a 'keeping it classy' exterior. The ABS was a VERY desirable and important feature which was rare on the earlier Miatas. Having had my fill of flat-spotted tires, clenching my teeth driving through damp or debris-riddled roads, having ABS felt like unlocking a cheat code! It was a god-send and a feature I wouldn't be caught dead without, whether street or track. The TorSen Type 1 differential, familiar from Sophie, our previous '94 R, was just as I'd remembered - a work of engineering art, providing a fluid, seamless connection between throttle input and the car's rear-wheel response. On rapid switchbacks (whether a track, b-road, or autocross), I could really feel him dance – even better than Sophie who had the Type 1 but not the faster steering. Playing on backroads was a pleasure as opposed to the hard work attempting to flick the heavier manual steering '94 R around.