

How to Drive a Formula 2 Car

How to Drive a Formula 2 Car by Rick Luff

My first taste of real speed on the road was when I was fortunate to be asked to enter my XJ-S in the Classic Adelaide Rally for 2007. The deal was that our Navigator would be from one of the companies that sponsor the event, so I had the pleasure of spending the time with a different person each day. My original article on that event has recently been resurrected for CM, so have a pause here if you haven't read it then come back and we will carry on. ([See page 22](#))

The Racing Bug

I entered again in 2008, but was feeling somewhat frustrated as my category was limited to the posted speed limit, which I naturally adhered to religiously. The reasons were fair enough though, as we weren't driving rally prepared racing cars with all the associated safety equipment. We weren't racing drivers ourselves and were likely to wrap ourselves around a gum tree when the 'red mist' got the better of us. So, I thought I'd ask someone if I could borrow a priceless classic race car. Mmm, perhaps not. Okay then, if I can't borrow one, I'll just have to build one, and that's what I did, with the help of club members and my son.

The XJ-S

I purchased a late 70's Jaguar XJ-S and set about stripping the inside out, fitting racing seats, a tiny steering wheel and a 5-point harness. Removing the bumpers and other unnecessary stuff dropped 250kg from the car. Safety first of course, so I found an old plank of wood to serve as a back bumper (it looked like I had backed into somebody's fence), and I was off.

I flogged it around the track for a bit and had the inspiration that I might paint the car my-self, after all it was only a racing car so it didn't have to look that good. But what colour? How about the same colours as the TWR XJ-S that won Bathurst in 1985? So, I bought the best spray gun on eBay that you could get for \$16.38 (yes, that's what it really cost) and shortly the car and parts of my car port were both resplendent in a rather fetching green with white stripes. Stickers were brilliantly done by a professional from



our club and the result turned out quite well. In fact, I recently saw a metal XJ-S placard for sale on eBay purporting to show the real car (now owned by Mike Roddy). The car on the metal plate was actually my one, so it fooled at least one person.

The Formula 2 Race Car

So, there is a bit of background, but real purpose of this article is to describe what it feels like to own and drive the car that replaced my TWR XJ-S. And that car was a yellow and black historic Formula 2 race car from England. I called the team (ie, me) Wasp Racing on account of that's what the car looked like.

It would take an entire book to detail the story and technology behind this car, so I'll be as brief as I can. One other thing to state before I carry on is that I don't set myself up to be a super-doooper racing driver. I'm just a guy who wanted to go fast and, in the process, learned a lot about the techniques you need to drive quickly, and in the process became a better driver, both on and off the track. You could do this too.

Okay, so what makes this an F2 rather than an F3 or an F1 car. Basically, F3 cars are limited to 1300cc, F2 cars are limited to 1600cc and F1 cars are limited by your budget - a huge budget.

Car's History

The exact history of my car is a bit hazy, but it was built by Argo Racing in the British Mid-lands to a design by Swiss engineer Jean Marquet. While officially that is recorded as 1984, my research suggests it was closer to 1980.

It was so crap that it was returned to the manufacturer, who sold it on to John Raffo and John Bradshaw, and it is from there that it gets the name of Argo Raffo. The Mk 8/9b part springs from the various revisions to the chassis over the next few years. The tub was lengthened to add torsional stiffness, but it still wasn't a winner. Engine was increased to 1600cc, but still no cigar. It was when the deck was reshaped and RALT RT-4 ground effect side pods were added that the winning combination was found and it won its class in the UK and two here in Australia.

Design Features

Let's talk about the chassis and various aerodynamic features, which is what differentiates this formula car with other race cars, even Formula Fords which while similar in appearance, don't have the benefit or baggage of aerodynamics.

When air goes over an aircraft wing there is resultant force, which is upwards. On a race car the wing or wings are upside down, so instead of lifting the car up it pushed it down onto the road. Think of lightly drawing circles on a piece of paper with a pencil rubber. Now push harder and see what happens. More grip (and torn paper). For a car it means it can brake better and turn into a corner quicker than without aerodynamic aids. Races are won by how fast you can corner, not so much how fast you can go in the straights. My car has two wings at the front either side of the nose and a two-piece rear wing. Also, out of view in the side pods are venturies that work like inverted wings in boxes.

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You can't feel downforce as such, but to give you an idea, I have had a man stand on each corner of the chassis and the springs compressed far less than on the track when the aero is working. In slow corners the aero does nothing and is just a bunch of junk you are dragging along with you. But get the lift/drag balance right then it's worth the extra weight.

Now onto The Car Itself

The first thing you'll notice is that there is only one seat, and it raced in the Mono Posto class, which means just that. The Italians call the driver Piloti and we do it all in a Cockpit (best to leave that one alone I think). This car has a seat, albeit very thin, but some cars have you sitting literally on the floor. This is not a car you get into, rather you put it on like a coat. The six-point harness connects you with the chassis so that you feel everything it and the suspension and tyres are doing. Why six-point and not five? Well there

are two straps between your legs rather than one so as to better accommodate your Gentleman's Bits. A good idea in sudden frontal decelerations such as hard braking or contact with concrete walls.

Right, so now you are seated and strapped in, the HANS (head and neck support) is on your shoulders under the straps and clipped to your helmet. You will be wearing up to three layers of FIA approved Nomex fire resistant suit, fire resistant Long John under-wear, Nomex socks, shoes, gloves and balaclava. This is quite toasty when the weather is 15 degrees, more so when it is 38 and you are held in Form-Up for 20 minutes in the hot sun.

Behind the Driver's Seat

But what can you see from where you are sitting? Firstly, you can't see the front of the car and its wings, but you need to know exactly where they are. What you

can see are two fat tyres uncomfortably close to your face. Your side mirrors, which you have to move your head to use, show two more tyres way down the back, and that's it for outside. It's like sitting in the middle of a large spider. And you must be very aware of the perimeter of your car, not only on the track but also driving out the paddock gates. It would be embarrassing to tear a corner off your car at 7kph!

Instruments

What's inside the car varies according to the car, but some things are fundamental. Front and centre is the Tachometer. This tells you the engine revs and is important for a variety of reasons. My red line arrow is set for 7000 rpm. Power and torque drop off quickly after that in this engine, so there is not point going past there and risk bending something in the motor. (We will talk about the motor shortly).

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Oil pressure and water temperature gauges nestle either side and there are an array of switches including ignition, fuel pump, start button, bar fridge, digital engine block temperature, rain light, and fire system test and arm. I have changed the original circular steering wheel for an open top one so that I can see the entire range of the gauges. Unlike when using our domestic cars, all the instruments need to be scanned regularly and by that, I mean each lap. I pick a point on the track where there is slightly less driver effort needed, say passing the grandstand on a long straight, and make that part of my routine.

But wait, there's more. To the left inside the cockpit there is a knob to adjust the front/rear brake bias and another to adjust the front anti-sway bar. I leave these alone as the car set up feels good as it is and I don't know what I'm doing anyway. Besides I find it beneficial to look outside the cockpit when I'm doing 220kph. There is also a toggle that is connected by a cable to the master electrical cut off switch. The car has no fuse box.

To the right is the stubby gear lever which selects five forward and one reverse gear using an 'H' pattern similar to, but not the same as a normal car. On the floor under your thighs is the fire extinguisher bottle which, when activated, sprays foam into the cockpit and onto the carburettor side of the engine, putting out the fire and making a helluva mess. Best not to leave the system armed when the car is on displays as the big red button would be an irresistible magnet to a child. Clutch, brake and throttle pedals are where you

would expect them to be, but left foot braking is not possible in this car due to the steering column getting in the way.

The Engine

All this and we haven't even started the engine yet. Let's talk about the motor now. The engine is sited right behind your head, so even with a helmet on you will have no trouble hearing it. Mine is the same Ford Kent pushrod block found in the Ford Anglia or Escort, where its rated power could be as low as 39 bhp at the flywheel. While fundamentally the same, my engine has a number of modifications including two twin barrel Weber carburettors set to run on 100-102 octane racing fuel. This all ups the power to 132 bhp at the rear wheels, all on a car that weighs 490kg, so it's quite nippy. It would be even nippier if it had a lighter weight driver.

Right, so let's start the engine:

1. Master electrical switch ON
2. Fuel pump ON
3. As fuel pump primes and ticking slows turn pump OFF
4. Press throttle 4 times
5. Ensure neutral is selected
6. Press START button
7. As engine fires turn fuel pump ON
8. Ensure oil pressure builds. It should start at 80 psi and drop to around 40 psi when the engine is warmed up
9. Keep revs below 2000 until water temp reaches 40 degrees Celsius

This would have been done previously during engine check and warm up so starting a warm engine is much simpler.

The car has no alternator or thermo fan in order to save weight and not sap engine power. I plan to add a thermo fan (which would only weigh the same as a Mallala hamburger) so as to aid cooling when slowly driving back to the garage at the end of a race.

I realise this sounds complicated and needs a flight engineer to operate, but it's not. Think about all the individual actions you need to start your own car and pull out of the driveway and you will find that you are mastering a large number of things. "But it's easy", you say and you'd be right - because you've done it 25,000 times. Same with the race car and for exactly the same reason.

Start Your Engines

What follows is my description of driving the car at pace on a circuit rather than a race, situation, otherwise I'll sound like I'm calling the 3:30 from Globe Derby Park. So, let's go.

With all instruments reading okay, and on the signal from your pit crew chief (what pit crew?), you select first gear, increase you revs and try not to stall the late biting clutch. These cars don't do 'slow' and you slightly kangaroo hop along Pit Lane, so as not to go too fast. Idle revs on my car equates to over 30 kph road speed, so periodic dipping of the clutch is needed to keep the pace down.

Tyres and Brakes

You pass the Marshal at the end of the lane and you can go as fast as you like. But not yet. First let's talk about tyre and brake temperatures.

Race brakes need to be hot to work, the hotter the better within reason. We have all seen the rotors on race cars on TV glowing red hot. That's not a problem for them, so long as they are ducted for cooling. On my XJ-S I bought my cooling duct products from Bunnings (really). Alan Baker once gave me the sage advice of "I don't care how fast you can go Rick; I'm interested how fast you can stop"! Thanks Al.

You heat them up by acceleration and braking hard at slow speed in the warm up lap. The same with the tyres. This is done during the on/off braking phase



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and also weaving side to side. But no matter what you do, your tyres won't be warm enough for a few laps unless you have tyre warmers (F1 tyre warmers heat the tyres to nearly 100 degrees C!).

I spun my car at turn 1 at The Bend once doing a speed I can jog at (read really slow). The day was 9 degrees and so were the tyres. When they are fully warm and sticky you could push a golf ball onto the surface at the front and it would not fall off. Hot tyres are sticky tyres. Sticky tyres are grippy tyres. Grippy tyres mean fast corners.

So how do you know if your brakes and tyres are hot enough? Well it's all by feel. Remember I said earlier that you wear the car and, while trying not to sound existential, you become one with it. In more easy to understand terms, you know the tyres are warm when you can turn in to a corner harder with less understeer (that is when the car wants to go straight ahead when the direction of the front wheels are pointing somewhere else), while at the same time the rear of the car does not want to oversteer (swap ends). Having said that, if you find that the front is understeering into a corner

you can, counter-intuitively, increase the power and have the rear oversteer a bit to point you where you want to go. This is called throttle steering and is a standard skill amongst rally drivers. But on the track, it will cost you time, so a slower entry speed is a better idea or a different car set up.

As for the brakes, when up to temperature, they feel like they are biting more, so after a few laps you can brake later and harder. Based on my experience and a load of advice, here is how I brake the car, say at the end of the straight. Now ideally you are either accelerating or braking; there is no coasting. So, I lift off my foot from full throttle to the brake pedal, give it a slight pressure to let the tyres know what I'm planning, apply hard pressure which I slowly release as I enter the corner. Note that I don't take all the pressure off as I turn in. This is called trail braking and increases weight on the front tyres, enabling better grip and a tighter turn (remember the pencil rubber analogy). As I'm doing this, I dip the clutch, shift from 5th to 2nd gear, blip the throttle with the side of my foot in order to match the engine revs with the lower gear, release the clutch and the

brake pedals at the same time and feed in throttle judiciously until the car is almost straight then increase to full power. That's how it is supposed to be done, and from time to time I get it right.

After a few laps, the brakes and tyres feel good, you feel good and you haven't crashed. From here on you start to test the limits of adhesion by going faster, braking later and turning in harder. This is where you become more assertive with the car, and it borders on aggression. Faster harder tighter, you feel the g-forces on acceleration, braking and especially when you corner. You try not to tense up but it is unavoidable, as the car does not have powered clutch, brakes or steering and the car just wants to go straight ahead and you have to wrestle with the tyres and their phenomenal grip, while all the time at-tempting to do this in a smooth and relaxed manner.

And you do this until you spin; and you **'will'** spin. This is not a sign of poor driving; it is all about learning the adhesion limits of your car and this knowledge increases with seat time to the point that you can often recognise the onset of a spin and stop it before it starts. For the record, a car with this much aero

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holds on like you can't imagine. That is until it doesn't, and it happens so quickly that you are facing the other way before you can blink twice. Try it. Blink twice.

Eventually you will start to drive by what the car is saying to you, not what your road driving brain is saying to you. And what it is saying is "You've got to be mad to take a corner at this speed. You won't make it". And if you don't go fast enough, the aero won't work and your brain will be right. But it takes a long time to convince yourself of this and be confident enough to do it. And when you do, you feel like punching the air with your fist, but you can't 'cos you need both hands on the wheel.

The Racetrack

At this point you are flogging around the track and having learned more about the car, it's time to learn the track. I bet you are thinking "What does he mean. Surely you just follow the black stuff". Well yes and no. 'Yes' if you want to go for a dawdle, but 'No' if you want to go fast.

A track is made up of a series of corners connected by straights of various lengths. Some tracks are flat and you can see well ahead and around the corners. Some are either naturally hilly or constructed

in such a manner as to obscure this panoramic vista.

For each corner you need to work out the ideal racing line, that is the line that will allow you to get around it in the least amount of time. And this line is not necessarily the shortest distance. Added to that you need to figure out when and how hard to brake and where to do it, what gear to be in and where to be in it, and lastly when to turn the car in. You need to do all this for each and every corner in a variety of track and weather conditions. The Mallala Circuit has 8 corners. The new track at Tailem Bend West Circuit has 12. Its International Circuit has 18 and the full GT Circuit has a whopping 35! And you need to learn them all. In fact, you need to be thinking about and looking for the next corner before you finished with the current one.

It's about here that your fun starts. You know the car, you know your current abilities, you have assessed the conditions and you know the corners. From here on it's about refinement, smoothness and driving the car as fast as it can possibly be driven, which is a whisker this side of losing control. This is the Nirvana that we who drive these cars seek. It's a bit like playing golf. Most days you get the job

done ok but you were a bit ham fisted on some holes, you lacked concentration on others and the greens were just not right. But occasionally, just occasionally, the planets align and everything fall into the slots you have forged through constant practice over many years. Those days are priceless, no matter if it be golf course or race course.

Epilogue

And that, dear reader, is why you go racing.

If you feel exhausted just reading this, then I've achieved my aim. I could waffle on for hours about technical stuff but I wanted you to get a feel for what driving a race car of this type at speed is all about. So next time you are watching car racing and think "Hell, I could do that". Maybe you could. There's only one way to find out.

**Cheers
Rick Luff**

