MONOPOSTO RACING CLUB F3 CLASS – ENGINE REGULATIONS

Proposal for discussion

Abstract

This document is to start a process, and discussion, on creation of a power unit roadmap for the Monoposto F3 Class.
It currently only covers the Mono F3 class, it is envisaged that further documents are created to cover the other Monoposto classes.

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Monoposto F3 Class – Engine Regulations

Background

We have seen a golden era for the Mono 2000 / Mono F3 class over the last 16 years. The rules that have been in place for this time have given us a choice of reliable, competitive engines that have been easily and cheaply available. We have seen 2000cc engines from Vauxhall, Toyota, Ford and Volkswagen win Mono races outright in this period.

Other that a relatively small change to the regulations in 2010 to allow fuel injection, the stability of the regulations has been seen to be very beneficial to the membership.

Unfortunately, these engines are now getting long in the tooth, base engine and parts availability for some of them is becoming difficult. This situation of parts availability is not going to improve over time.

This availability problem has not yet become critical, we should use this time we have available to look at the future regulations for the class. This time gives us the possibility to formulate, discuss and implement a regulations roadmap for the largest of the Mono classes without the need for emergency measures.

What do we want?

When developing this roadmap we should bear in mind what we, the racers, want from these regulations, what does an ideal engine(s) look like for a current or potential member.

The following requirements, if satisfied in full would give us an excellent way forward

- Engines shall be freely available in UK
- Engines shall be easily installed in a F3 chassis from 1997 to 2012
- Dry sump systems shall be freely available for the engines
- Engine parts shall be freely available in UK
- The maximum power output in 'Mono' trim shall be 200BHP
- Engines shall be reliable (!!!)
- Engines shall have relevant technical information available to the club
- Engines shall be easily inspected for regulations compliance by a MSA Scrutineer
- Engines and parts shall be available for acceptable cost

So all we have to do is find an engine that satisfies all of the above and we have the problem solved!

Easy!

Unfortunately, reality is not quite so simple.

Timing

We have declared that there will be a move to newer generation F3 chassis from the 2017 season onwards, this means that we will be able to use the F305 – 307 chassis from next year. There is a stability period planned so that the next update in chassis to the next generation will not be until 2021 at the earliest. So the F308-311 chassis will not be eligible for Mono until then.

The club likes to give as much notice as possible to the members for potentially significant changes such as this. I would recommend that any changes to the engine regulations would have a 2 year

notice period, and a further 5 year stability period beyond that. We must develop a very robust strategy, so this will take some time and is likely to need some investigation to validate our assumptions and ideas.

Suggested timing

December 2016 – Initial release of discussion paper to the membership, request for feedback

February 2017 – Feedback widow closes

April 2017 – Formal proposal shared with membership

June 2017 – Formal release of notification of changes

January 2020 – Implementation of new regulations

January 2025 – End of stability Period

} Dependant on solution

What are the facts?

There are certain parameters that are a given to us

Car installation

Dallara have engineered various fitting kits for their F3 cars, in the timescales we are looking at, we expect the majority of Mono F3 class cars to be Dallaras.

The following fitting kits are available

Dallara Model Engine type	F397-398	F399-301	F302-304	F305-307	F308-311	Notes
Fiat Novamotor	✓	✓	✓			
Alfa Twinspark	✓	✓				
Honda Mugen XH	✓	✓	✓	✓		Based on H22A
Opel Spiess (XE)	✓	✓	✓			
Renault Sodemo	✓	✓	✓			Different Models available
Toyota Toms	✓	✓	✓	✓	✓	
Mitsubishi HKS	✓	✓				
BMW Novamotor		✓				Listed but no info found
VW Bertils		✓				US Only
Ford Swindon			✓			
Nissan Tomei			✓	✓	✓	
Honda Mugen XJ				✓	✓	Based on H22A
Mercedes HWA				✓	✓	
Opel Spiess (Baby)				✓	✓	
VW Spiess					✓	
Toyota Piedrafita		✓		✓	✓	

It must be noted that although the Dallara parts manual list these options, in reality some of these parts will be very scarce.

Whilst fitting an engine to a car that is not using major parts of the above fitting kits is possible, the engineering effort required will be extremely costly. Older F3 cars like the Ralt RT3 had large engine bays, the engines were not stressed members and installing an engine was more straightforward. With anything from the late 80's onward the job gets significantly harder, look at some of the

current F3 Cup cars, the engine installations are works of art, truly lovely engineering. These are all designed on high end 3D CAD systems and most parts CNC produced. For amateurs, or even smaller engineering companies, to replicate this will be very hard, and certainly very expensive.

Engine Technology

Since the early 2000's most engines for mass produced vehicles have had their focus moved from power to economy and emissions. The European regulations that mass market automotive companies have had imposed on them has meant a fundamental change in the technologies employed in the base engine design. Variable valve timing, direct gasoline injection and turbocharging has become almost standard in the last few years.

Whilst this has meant a significant benefit in fuel economy and emissions whilst maintaining power and torque, it has led to major increases in cost and reliance on electronics and fine calibration.

These technologies when used in a controlled environment are very beneficial, when used in an open environment that we have on our Mono cars then the technology can be problematic for us.

If we took a more modern normally aspirated 2L engine with the above technologies employed, installed it in a single seater with an open exhaust, dry sump, open inlet and fully remappable electronics power outputs of 280+bhp would be possible.

The cost involved in mapping an engine with direct injection and/or variable valve timing will be way higher than a current session on the rolling road, it will almost certainly need to be done on a full engine dyno, with very capable electronics needed. Knock control will be almost mandatory to stop expensive detonation on part throttle scenarios. Mapping for full power with wide open throttle will be fairly straightforward. However all the part throttle with variations in load will be a very long winded task, long is expensive.

Parts availability

Motor manufacturers are mandated to supply spare parts for their vehicles for 10 years after the final production finishes, beyond that it is down to commercial considerations. If a part regularly wears or breaks, it was used on a wide variety of applications and is easy to store, it is likely to be made available for many years. If the call is low, it is expensive and difficult to store, then availability is likely to be significantly worse.

The good news is that engine development is eye wateringly expensive even for a large car company, so the manufacturers will do all they can to continue with the same parts as long as possible. The bad news is that the EU will continue to mandate ever more stringent regulations that will need constant development to meet.

It's a lottery, there is no real way to predict what parts availability will be like in the future.

Continued use of existing engines

Whatever the route forward is decided, it must include a way for existing cars to remain eligible, and preferably not at a significant disadvantage in power.

Possible solutions

Continue with what we have

We are starting to see parts becoming unavailable. For example the piston for the Volkswagen 2.0L 16V ABF engine is no longer made by Mahle. No other sources of a standard spec part has been found.

But discussions with suppliers in the industry has shown that they are confident parts are still available for our most popular engines, the Toyota and XE, though the longer term availability is unknown.

The base engines are now mostly 20 years old, we have to make plans for options for the members.

We could take a more flexible approach with parts usage, allowing parts from the aftermarket tuning industry to be used, but mandate specifications that limit horsepower and costs within reasonable bounds.

Allow more modern engines with variable cam timing and/or direct injection

This will clearly break the 200bhp requirement, this is one of the needs I feel is very important. Upping the power significantly will cause a multitude of problems with the cars breaking and wearing out. They are thoroughbred designs, they were designed to a power and torque in period and going outside these parameters will cause failures and significantly increase wear for brakes, tyres, clutches, Etc.

I also know of some Mono drivers I don't really trust with 190bhp never mind 280+! But that might be just me.

We could allow just the variable cam timing, but fix the timing at a predetermined point. This will only address some of the issue. If the cam is fully advanced, the full power will be available.

The introduction of a restrictor for these types of engine could be a way forward, but selection of a restrictor that covers a variety of engine types and architectures would be a significant undertaking. The restrictor required for a Honda F20C (S2000) to achieve the nominal 200bhp will be quite different to the Toyota 3S-GE Gen 4 (BEAMS).

Use a bespoke engine specification

This gives us control of what we get. We can allow more modern engines but define exactly what parts can be used and what the likely power output of this assembly will be.

Selection of a base engine can be tailored to availability and ease of installation in the likely target vehicles.

The technical inspection of an engine will be straightforward as we will be able to supply all the critical characteristics

It will however restrict the choice of what can be used, the choice of VX vs Toyota vs BMW vs V6 will disappear.

Choice of the base engine, what parts are used and what restrictor, if any, will be a significant task. It will need good knowledge of the engines available and the impact of any changes to a standard specification.

The specification must include a restrictor so that balancing performance in the future can be achieved in a simple and straightforward manner

It is likely that a cost will be incurred in investigation of the best specification for our needs, this needs to be understood and a suitable funding route found.

More unconventional approaches

We can take a view that there is no easy way to mandate engines that meet the requirements stated earlier, therefore a more open approach may be beneficial. If it is key that the output power is controlled, then make this parameter we control. As seen in some race series, they take cars and 'rolling road' test them and the power output is measured and then fixed. If we take this view, then the engine used to achieve this max specified horsepower is free for the member to decide. It would need a controlled environment to be agreed and a series of special measures taken to control mapping and modifications in season. This would very much fit in with the traditional Monoposto values with many ways of finding an engineering solution being possible.

Conclusion

There is clearly no easily identifiable solution to satisfy the class's needs for the next generation of engines.

We would like to get the feedback of the membership, and all related stakeholders, before any further work is undertaken. As always, the club are open to constructive comment and proposals.