The MRX Project

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Abstract

Chapter 1

Pre-Reading

- MR2 Mk2 Roof Racks

  http://www.mr2oc.com/showthread.php?t=396411

Chapter 2

Changelog

Chapter 3

Exterior

3.1 Body

This section can be applicable to both interior and exterior as it affects both, but mainly exterior. The problem here is that the likelyhood of finding a Mk1 Toyota MR2 in very good condition or better is highly unlikely and expensive. With the advent of 3D metal printing, a better situation *could* be to find a good body and re-print the body panels. To go even further, I could find a completely different car body, strip it down to the body and custom build it from there. From then on, finding a car with a body similar to that MR2 style is less trivial than ripping apart an actual model. For instance, Volvo bodies are boxy, but too long. If the added length is acceptable, that could be an option. A Fiero body could also work, but its age might work against it. There are not many cheap 2 seater or small new FWDs being produced and newer means more expensive. The Mk1 MR2 was built on an FWD body, so that isn't a problem; most FWDs are being produced as roundy looking aerodynamic blobs of ugly; I will have to deal with the roof since it determines part of the shape.

Another point I would like to make is that if the body has a rear windshield and is a 4 seater, I would remove the glass windshield, install a metal grate-like sloping component where the glass used to be, seal off part of the back compartment with heat shield and find a windshield that fits above the heat shield and seals the top. Obviously, a 4 seater would involve much more work.

3.2 Lights

All light bulbs should be replaced with efficient LEDs that are bright enough and legal to change over to. While decreasing electrical requirements very slightly, it will help in case of burnt out or non-functional bulbs due to redundancy.

3.3 Vents

The MR2 Mk1 has a few vents placed in various locations on the vehicle that allow for heat dissipation and air intake. Increasing the number of vents on the vehicle allows for up to 3 special cases in the MRX:

- Cooling for radiators
- Airflow (increase aerodynamics, releasing pressure areas, preventing buildup of hot air)
- Air Intakes for the engine or intercooler

3.4 Doors

Doors should be custom made, or stripped out to save weight. I do not require windows to be rolled down, but if that is the case I should develop a moonroof that can easily be removed in case of an accident.

Doors will be modified as scissor doors, opening upwards instead of outwards. This is to prevent dings when opening, as well as to look flashy and sporty. If windows do not open, then opening the door is similar in effect.

3.5 Dual Side Air Intakes

The original MR2 Mk1 has one air intake on the passanger side of the vehicle with a fan and attached radiator / cooling system. This is used to cool the engine bay and coolant systems. For the 100HP 4-AGE engine, this is adequate and there have been no heat issues during the lifetime of my MR2 ownership. However, replacing an engine with up to 2.4x more horsepower and lesser fuel economy may raise overall heat in the bay. This heat issue may be solved with a radiator above the engine similar to the Supercharged MR2 Mk1 version, where radiator is right below the engine lid (that has vents carved into it) to allow heat dissipation.

The point of having a secondary Air Intake on the Drivers-side of the body (where the fuel cap is located) is to enable either dual cooling systems or to enable a turbo air intake. The bay is rather small, so while a rotary engine would allow for more space, it still leaves little room for a turbo or additional cooling system. If cooling can be satisfied with an undercarriage cooling system and/or top engine radiator, or if the front radiator (where most conventional car radiators are located) was connected to the engine bay, twin turbos could be a very real possibility. If that's the case, I would have two smaller, responsive turbos installed to reduce turbo lag as much as possible while boosting engine performance.

In the event that one intake (or bits of both) are used to cool the engine with air, if the exhausts are piped out right behind the engine and out the back of the vehicle, that air cooling can be directed over the exhaust pipes to cool them.

See Engine Section "Ram Air Intake"

Chapter 4

Interior

4.1 Dashboard

This will be custom made using the same odometer/tach/gauge box, but styled after a jet cockpit. All Dials should face the driver in a sharp, angular way. See the image

4.2 Lights

Strips of LEDs covered by a thin film (translucent, to prevent glare and blinding light) that can be dimmed should be placed in the cab:

- Around the moonroof
- On the doors
- Around switches and components, such as engine latch, arm rest, and above the footwells facing down to the floor.
- Strips on both sides of the gearbox facing the doors

4.3 Switches

In the interior, I want a panel of flip switches with steel-etched labels for each switch.

Switch: Engine Warmer As I may be using the car in winter, having a switch to enable the engine's heat to speed up engine bay heating would allow smoother operation in below-zero temperatures. Currently, mid-engines are not very comfortable in the cabin when low temperatures are met; some electronics do not work well without warming up. *My dash would make funny noises and the speedometer would show inaccurate speeds when cold*

Chapter 5

Performance

5.1 Engine

5.1.1 Rotory Bearings and Eccentric Shaft

Any shaft component that is lighter and stronger than a default OEM Eccentric Shaft is one that potentially can increase overall rpm and longevity in an engine, particularly in high pressure turbo engines.

5.1.2 Intercooler

Because of the inefficiencies in a rotory engine regarding total fuel combustion and heat, placing an intercooler between the engine and airfilter (or replacing airfilter altogether if cooler provides a filter) could increase fuel economy and environmental factors that are more of an issue with the engine. *RESEARCH*

Placement of the intercooler if on behalf on the engine would go in one of the dual side air intakes. If used as an air conditioner for the cab, it could be modified to work with the radiator or be placed in a hood scoop position.

Final Note Intercoolers without turbos may decrease the total amount of horsepower due to energy requirements.

5.1.3 Turbo Configuration

Turbos, especially in a rotory engine, are effective. However, turbo lag is one feature I despise. There are a few possible options, none of which are optimal.

- **Supercharged** - Less complex mechanism with no lag, uses more fuel and engine must be built well to handle additional horsepower, both from mechanical energy reduction from running the supercharger and from additional horsepower.
- **Small Turbo** - Great power at low rpms (a problem with rotary engines), but has limited use in the entire range. With high rpms being a selling point of the rotory engine, this negates benefit and engine becomes more complicated to maintain.

- **Large Turbo** - More lag and low power at low rpms. Unacceptable.
- **Twin Turbo Configuration** - With two turbos that split exhaust, this covers the entire range but as with turbos, will change dynamic of the car, still have some (minor) lag and much additional complexity.
- **Two Stage Turbo** - Two turbos in sequence, best option for using turbos but still has the issues of complexity, cost and heat.
- **Twin Charged** - Supercharger and Turbo in use, expensive and inefficient although power output and response would be astounding.
- **Naturally Aspirated** - While keeping low rpms fairly weak, the engine would be in a much lighter body, modified to be lighter and perhaps rev higher. Torque would be less of an issue and horsepower per tonne would be increased. Response would still be great, least amount of complexity (unless intercooler was connected) and turbos can always be added later. This is the best option until I have more experience in what I want.

5.1.4 Ram Air Intake

Ram Air Intakes are air intakes that use vehicle movement to cut and force air into an intake which allows for higher oxygen content due to air physics. Efficiency gains will be in single digit percentages as Ram Air Intakes do not change the atmospheric pressure in a great way below super sonic speeds.

These air intakes are not usable on carbarated engines unless the design accomodates the air intake.

5.2 Bore

Bore is not applicable here. bores. Stroke

Chapter 6

Environmental Impact

Glossary

bore The diameter of an engine's cylinder. 6