

## **ENGINE & UNDERBONNET**

**Includes hardware, associated components, and accessories for performance tuning and appearance improvements. The customising scope deals with modifications that do not involve changes to the internal components of the engine. Includes airflow, engine management, header/extractors, turbo/supercharging and relocating/hiding engine bay components.**

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Like any project, it must begin with end goal, a plan and a budget. A realistic goal is very important, as this must reflect both the performance gains you wish to achieve and your budget. You must also decide whether you want performance, cosmetics or a combination of both, as this may affect some component choices. Depending on the desired performance gains the plan may be executed in stages or done in one step.

Where you start will obviously depend on what type of car, engine and aspiration (forced induction or natural) you have, and the degree of modification. Some homework on your particular vehicle to determine what mods are best suited is very important. For most car/engine combinations you should be able to find examples of modifications and the subsequent performance gains to help in your planning. If not, or you just want to start fresh, I suggest what we call a "Dyno assessment". Your car is placed on a chassis dynamometer and a number of tests are carried out to determine what modifications will best suit your car and budget. A small expense up front that could save you thousands on unnecessary modifications.

There are some general rules that apply to all engines. As the internal combustion engine is based on an air pump, that is, drawing air in through an intake and pushing hot gases out of an exhaust, ensuring that it can do this efficiently is where you would normally start. Most production cars do not have an ideal intake or exhaust system for performance. The intake mods required may be as simple as modifying your existing air box or a full replacement of the entire intake system may be required. Same goes for exhaust systems; some may require only a muffler change and others, a full system. With such modifications it would not be necessary to modify cooling system, driveline or fuel system components.

If you are after maximum performance without changing internal engine components, or the "show stopping" impact of a custom twin turbo installation, then you may consider forced induction (turbo or supercharging). Most factory engines will tolerate 5-10 psi boost without falling apart. However, you will need to pay some attention to your drive line, as forced induction will dramatically increase the torque produced by your standard engine. For manual transmissions you will need to upgrade your clutch and for automatic transmissions an increase in line pressure and altered shift points may be

required. In most late model vehicles this can be achieved through reprogramming the PCM (Power train Control Module) or TCM (Transmission Control Module). Your fuel system will also need upgrading. The cost to turbo or supercharge your engine will vary dramatically depending on the degree of custom fabrication required. If a kit is available for your application it will be cheaper than a custom installation but may not have the appearance or performance that you desire.

The final step in any engine performance build up is engine tuning. This can make or break your performance package (literally!!!) If you have a preferred engine tuner then I would suggest a consultation before you start to ensure that the tuning of your package will work and fit the budget. With the growing availability of 'Piggy-back' processors, chip tuning and ECU reflashing software it is now possible to accommodate most engine performance upgrades without the need to replace the ECU. There are advantages and disadvantages associated with some methods so it is essential that the method of tuning used covers all the functions your package requires.

In summary, for your performance upgrade to be successful it must meet your expectations and budget. Never be afraid to ask questions and discuss your ideas with a professional. Make sure that each component or modification is compatible with the next.