By Martin Donnon

fto turbo

The Mitsubishi FTO is one of many modern, small-capacity V6-powered coupes that look great, but don't quite have the grunt to keep up with the likes of the 200SX. Here is a turbocharged solution for these cars that won't cost the earth

Think of the FTO as the natural enemy of the Celica, with a smallish revvy engine trapped inside a weighty body to hamper anything that could be regarded as sparkling performance. The FTOs aren't totally slow, with good examples capable of high 15-second quarters, but the torque-less nature of the engine gives the driver the overwhelming impression of needing to ring the FTO's neck at every opportunity to get serious forward progress.

Tim from RPM knew this well, and wasn't particularly surprised when approached by the owner of the car pictured here with the request being to "give it some real low-rev power". This immediately discounted any sort of normally aspirated engine modification, as the process of changing camshafts and porting cylinder heads would only effectively make more power higher in the rev band.

Supercharging was briefly considered – and I say briefly – due to the massive fabrication required to sit a positive-displacement blower on top of the Mitsubishi inlet manifold. Many hours of cutting and aluminium welding would be required – not desirable when the customer was on a sensible budget.

There was only one price-conscious way of addressing the situation and adding some low-end shove. No prizes for guessing that this would be the addition of a turbocharger. The MIVEC V6 mounted transversely in the snoot of the swoopy diamond star posed some interesting challenges for turbo installation, though. Far from being a straightforward 'bolt up and drive away', this one was going to require a little thought.

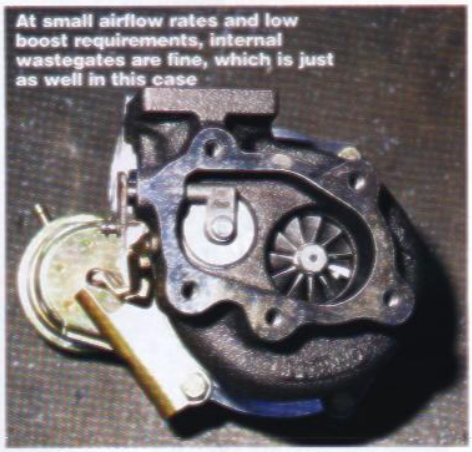
The first issue was fitting the turbocharger in the engine bay. There was no conventional way of

In stock form, the MIVEC 2-litre engine is a revvy device and, for its capacity, quite powerful ... it's just that for serious performance, the engine is simply too small for the body it's inserted in

Some basic modelling showing where the turbocharger was going to have to sit

Compact compressor dimensions of the Garrett T25 roller-bearing turbocharger make it capable of 300hp-plus worth of flow

At small airflow rates and low boost requirements, internal wastegates are fine, which is just as well in this case



hanging this from one bank and then utilising a traditional crossover tube – there was simply no room.

The second and most critical problem was the fact that the Mitsubishi engine came endowed from the factory with such high compression – around 10.5:1. This discounts the possibility of running high boost and making some serious power. The high compression also dictates that the engine management system would require substantial change to cope with forced induction, particularly as the Mitsubishi software contains reasonably advanced ignition maps (some 25 degrees total at full rpm) to make the most of its camshafts.

PICKING A SPOT

Finding a place in the engine bay to mount a turbocharger is not as simple as it first might seem. Not only do you need to have a physical hole large enough for the snail, but you also need to make sure all of the thermal issues are addressed. Brake lines, induction lines and such hate heat. You also need to be able to run the compressor discharge out the front of the car to the intercooler, and then back into the throttle body.

The only possible place for the turbocharger on the FTO was between the engine Vee, off to the left-hand side of the engine bay. This required the manufacture of a branched pipe from the standard cast manifolds to feed the turbocharger.

The only snag was that the battery had to be moved, requiring that the power lead from the alternator be lengthened, and that a new earth point be found. Mounting closer to the passenger compartment requires that some safety issues be addressed, such as fitting the battery inside a proper 'battery box'. In the event of an accident, it won't become a projectile, spraying acid and lead around the interior of the car.

TURBOCHARGER SELECTION

Tim and his RPM crew have always been big fans of Garrett roller-bearing turbochargers, and with good reason too. Advanced aerodynamics, compact packaging and immense reliability are trademarks of these aftermarket turbos, which were effectively spawned from an original-equipment design exercise.

One of the keys for the FTO application was the adoption of a turbocharger that was fairly efficient at low-pressure ratios (boost pressure)

and airflow rates. A T25-style ball-bearing core with compressor and turbine designed to support 320hp was the answer. Thankfully, this combination is also small enough to fit in the space provided.

INTERCOOLER

Without a huge budget, and 'only' aiming for 150kW at the wheels rather than stratospheric figures, there was no need for fancy custom intercoolers. A Supra core from the wreckers would be fine and, as luck would have it, sit in the stock nosecone opening almost perfectly.

The only modification required would be to cut the 'one end in, one end out' tank design and come in and out on the same side. A brief stint down at the aluminium welders soon fixed this and, for a budget price, an intercooler capable of working with some efficiency at 150 front-wheel kilowatts was created.

MANAGEMENT

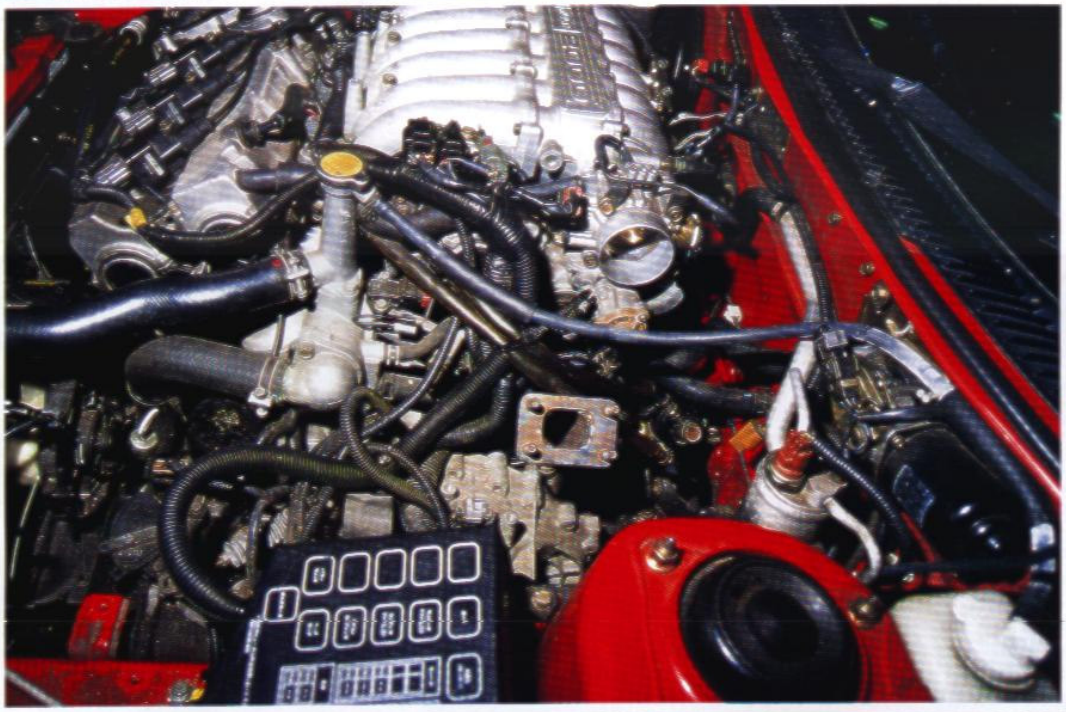
Getting any aftermarket management system to run the Mitsubishi engine in a manner as refined as the stocker was always going to be difficult. With the phasing of the MIVEC system, the linking of transmission control, and even the crank trigger arrangement, this was always a big ask. Rather than delete the factory management altogether, Tim chose to piggyback his chosen Microtech MTX12 rather than try a stand-alone-style installation.

With this piggyback approach, some passive signals are shared between the factory and aftermarket management system, while the

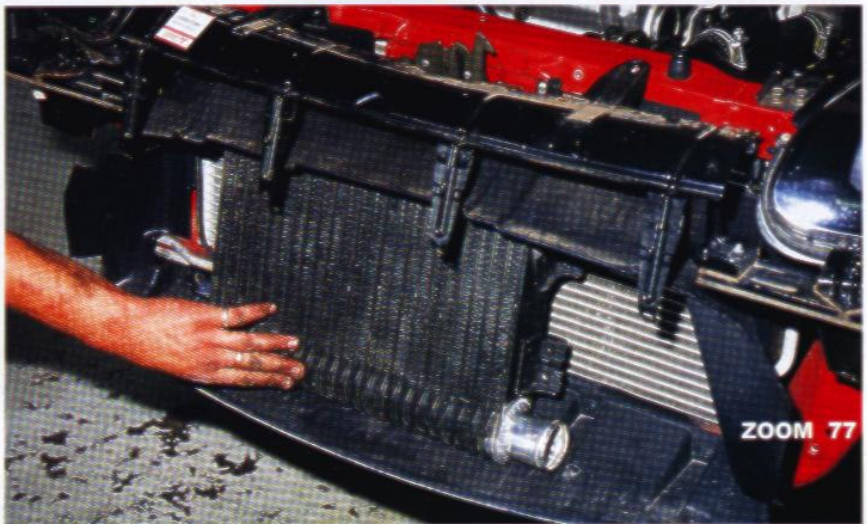
Microtech have an interface mode to allow their MTX12 computer to interface directly to the FTO ignition system and drive the DFI coils correctly

Fabricating the turbo pipework is a labour intensive job, adding to the cost of the excercise

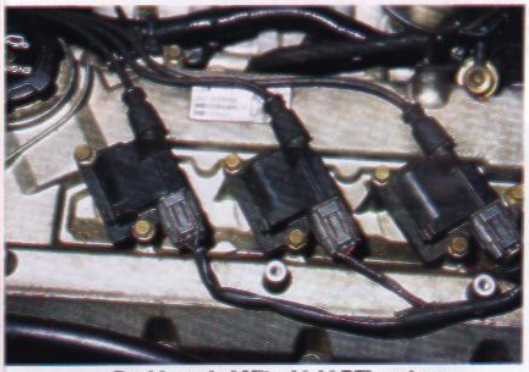
Fitting the turbo pipe is tricky too!



The turbo mounting flange can be seen here, poking out from the depths of the engine bay



Modified Supra intercooler is a perfect fit for the front of the FTO



Double-ended Mitsubishi DFI system uses three coils with two outlets each

The small turbo was mounted above the bellhousing. Note the mass of pipes and wiring in the vicinity

The creators of this FTO tried a low-mount set-up, but had problems with oil return and water ingestion

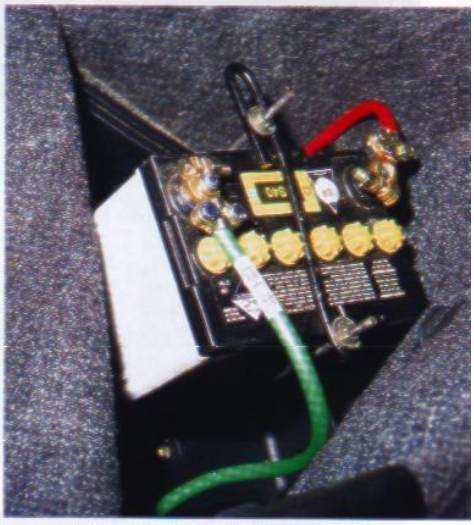
outputs – such as ignition and injectors – are driven directly off the Microtech. By doing so, some of the niceties like the idle air-control valve, the transmission and even some of the dashboard functions of the FTO can work just as they did stock.

This task requires a couple of hours spent with the multimeter chasing the factory wiring loom and identifying the key wires. Tim achieved this, and then topped the cake by ordering a Microtech computer already configured to run the direct-fire-style ignition coils of the MIVEC in full sequential mode.

NEXT UP

The next part of the conversion will cover the tuning of the Microtech and the determination of the boost control. Compounding the complexity of this is the fuel system sizing, which Tim believes may just have the capacity to produce the power through the stock injectors ... providing that the fuel pump is attended to.

Tim is still adamant that the target figure of 150kW is only just achievable with this sort of configuration. This is impressive when you consider that a standard FTO makes around 79kW on the dyno.



The battery dummied in the boot, before being placed in the box and finally mounted

MIVEC Muscle

Mitsubishi's attempt at doing a 'VTEC' has never been totally popular in Australia. Not because there is anything wrong with it, but simply because the MIVEC family of engines has been kept from our shores by an overly conservative parent company.

The system itself, though, is quite good. It offers all the advantages of the pioneering Honda system without any of the drawbacks, such as the stepped power delivery and thrashy operation.

A step ahead (in its day) of the variable valve timing and lift-control systems of yore, the MIVEC bug bit real hard in Japan, with kids by the thousands adopting the MIVEC 1600cc-equipped Mirage hatch as their weapon of choice. It was a natural selection too, with the lightweight and well-laid-out Mirage proving to be an absolute rocket ship with over 110kW propelling its stripper-style body.

The MIVEC infection of the Mitsubishi range didn't stop there, with undoubtedly the companies mid-sized flagship being the swoopy-looking FTO equipped with a V6 2-litre version of what is a small Magna engine, plus the MIVEC valve control.