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Volkswagen Audi CAR

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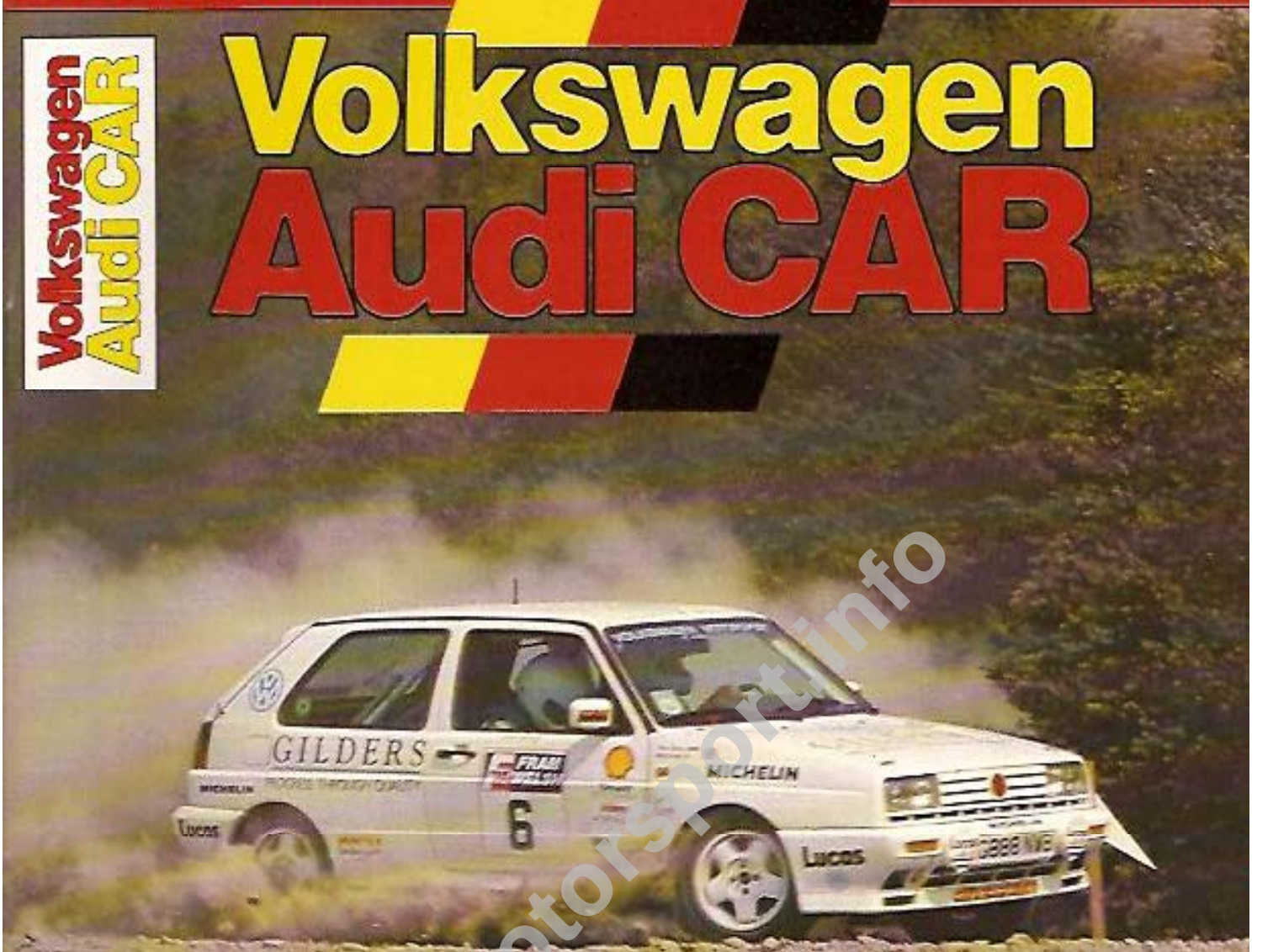

Anatomy of a 240 bhp Rallye Golf

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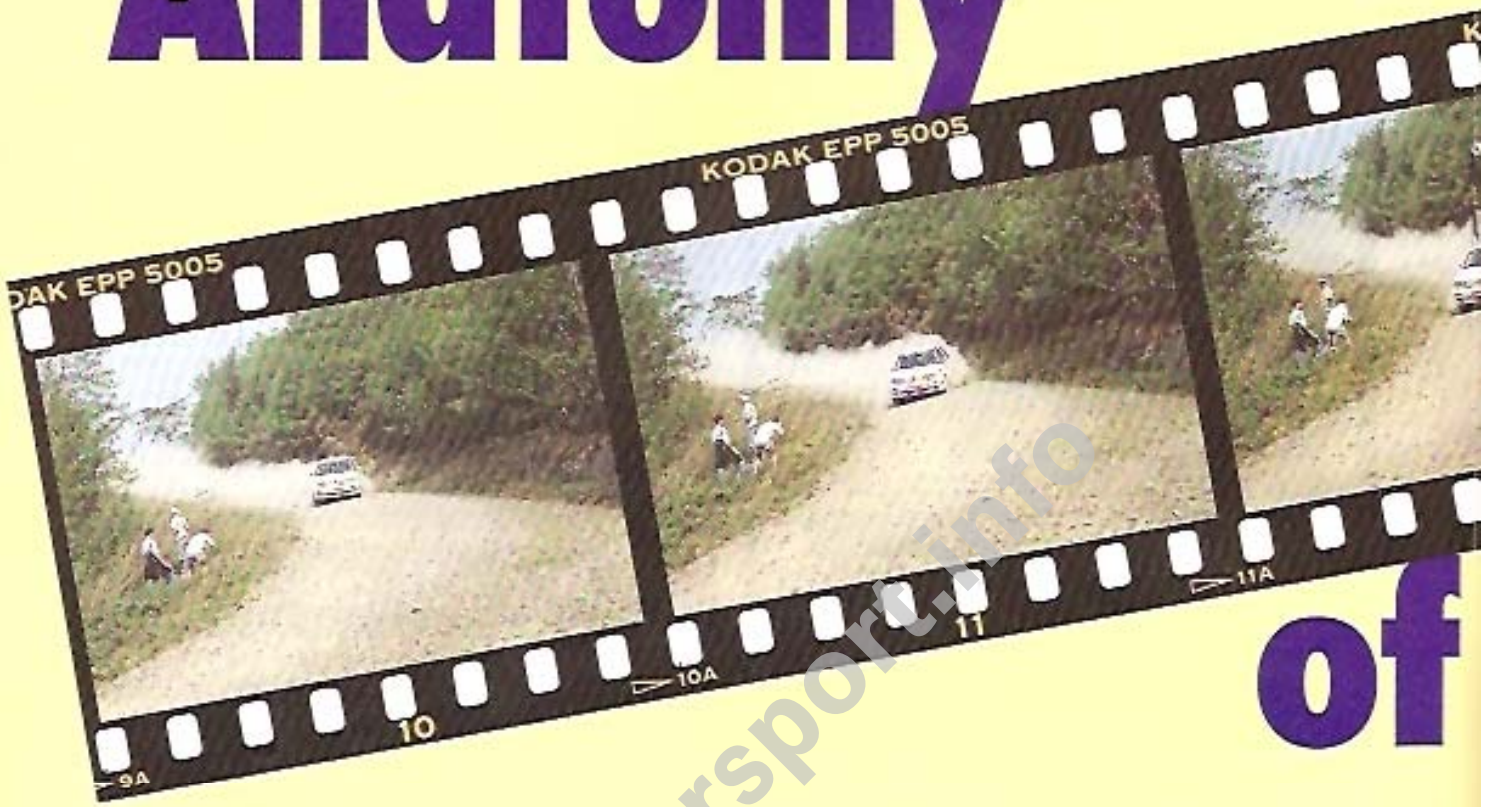
Anatomy of



The Group A Rallye Golf driven this season by Mark Lovell and sponsored by VAG dealers Gilders of Sheffield, is a good example of how even a potent production car has to be modified and developed to achieve success

ALTHOUGH MANY OF THE MODIFICATIONS to Gilders' car are designed to improve its dynamic performance, the majority serve two particular purposes: reliability and ease of servicing. Both aspects are very important. Rally cars take a tremendous beating, even on short stages and it is essential that components can cope with the loads involved and that parts can be replaced as quickly as possible.

The Gilders car has been developed and serviced by Brian Gillibrand's Rugby-based River Farne, a company with a wealth of experience in the competition field.

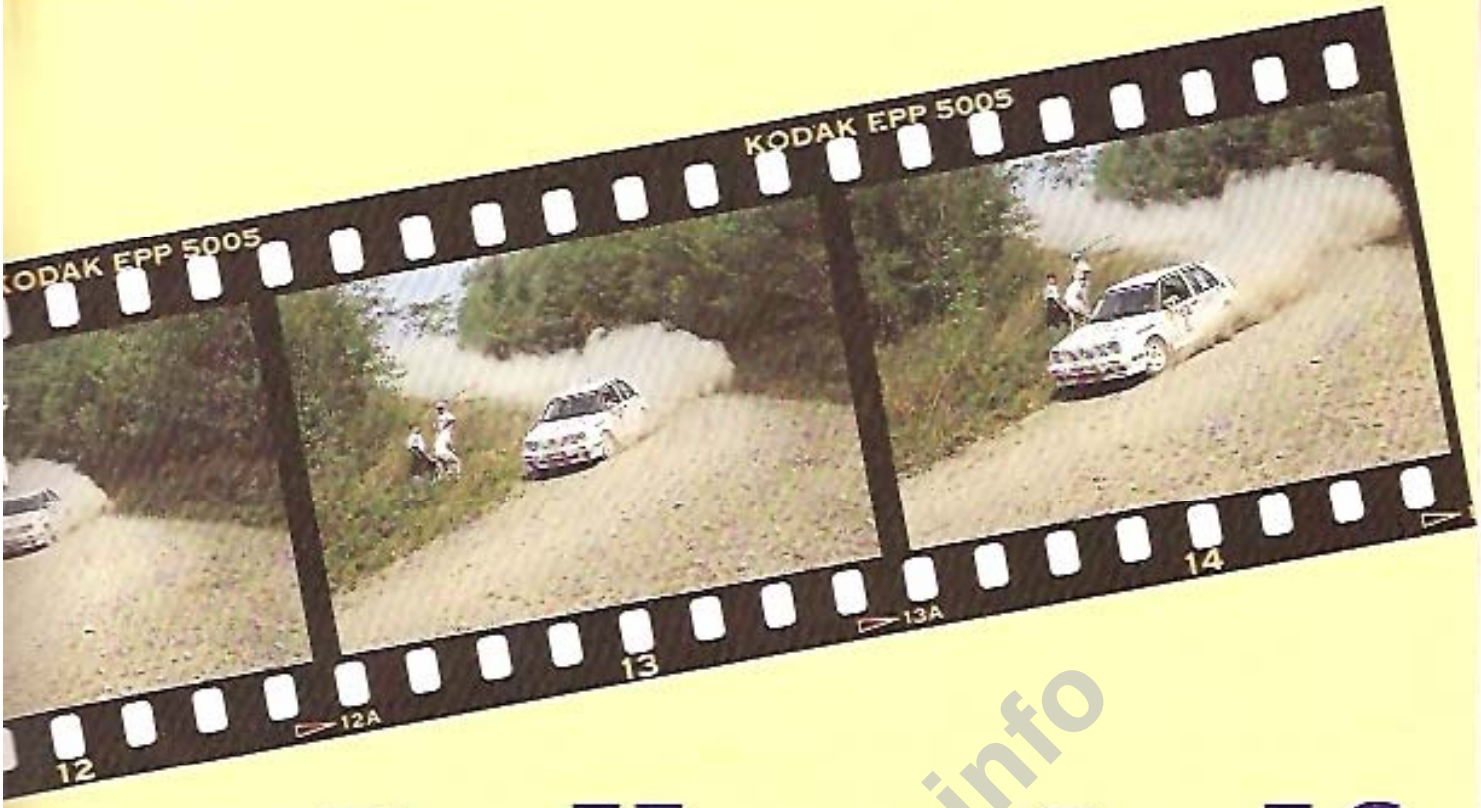
In charge of the Rallye Golf project is Brian's colleague Alistair Sutherland and the two mechanics who carry out the work are David Fitzgerald and Roy Fuller.

ENGINE: Standard output of the G60 supercharged engine is around 190 bhp but this has been increased to more than 240 by a variety of means.

Internally, the engine is blueprinted with particular emphasis on balancing and matching the weights of all the components. Nominal compression ratio is 8.0:1 but measurement showed that this was actually 7.8:1. An immediate increase in power occurred as a result of bringing it to the proper value.

The cylinder head has been ported and polished and the manifolds carefully smoothed and matched dimensionally to improve gas glow. The extent to which the ports can be opened out is governed by the homologation regulations.

These changes allow the gases to flow in and out of the combustion chamber more effectively. Even greater gas flow is brought about by changes to the G-charger. Normally, this spins at around 10,000 rpm when the engine is at its maximum limited speed of 6,200 rpm. By raising the rev limit to 7,000 rpm and reducing the size of the rotor pulley, the supercharger's maximum speed is increased to 15,000 rpm. This is high for a rotating device which is inherently out of balance but, so far, the team has only



a Rallye Golf

had one G-charger failure. The supercharger is fitted with uprated bearings to cope with these higher speeds.

Net result is a boost of 1.2 bar at peak revs with 1.0 bar available from quite low down. This means that plenty of torque is available low down. The pressure from the supercharger is such that the dump valve is fully open until the engine reaches peak revs.

River Fame originally experimented with Piper and Schrick camshafts but are now on something like the sixth version of their own design. They have been progressing, slowly increasing lift and dwell a little each time and every change has seen an increase of about 20 bhp with virtually no negative side effects.

The original Digifant electronic control unit (ECU) is retained with a secondary ECU developed by Power Engineering superimposed on it. The basic unit controls all normal functions with the secondary ECU increasing fuel flow and ignition advance as the revs increase. This piggyback system means that the characteristics can be modified without having to replace the original chip each time.

The standard gear ratios are retained but the final drive ratio has been lowered. Raising the engine's rev limit to 7,000 and using the original final drive would have resulted in a theoretical top speed of 160 mph. The lower ratio gives a maximum of 145 mph and, in fact, the car has been exceeding 140 on forest stages.

The exhaust system is largely a straight-through 2½ in. pipe with one silencing box at the rear end. A catalytic converter can be included when necessary.

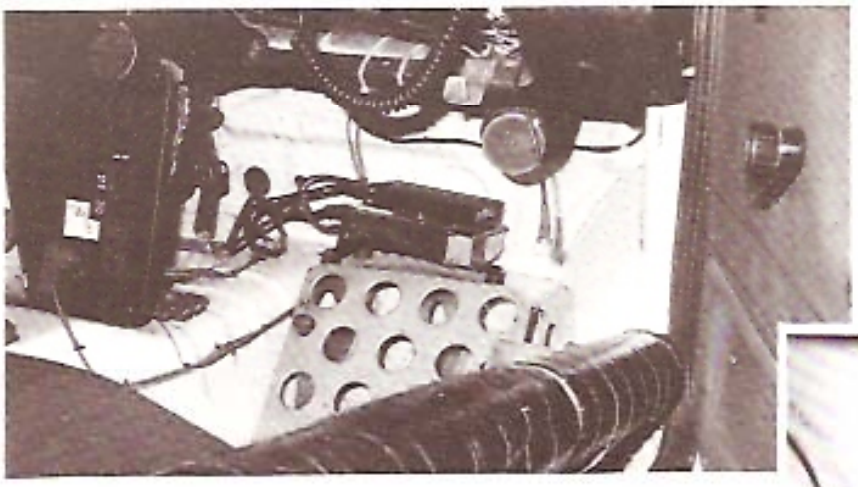
Cooling is extremely important. A radiator with 30 per cent higher capacity is linked to a standard GTI header tank rather than one for the G60—the former holds more coolant. Mounted in front of the radiator is a 13-row gearbox oil cooler and a 19-row engine oil cooler. A larger intercooler cannot be used as this is governed by homologation rules.

The throttle linkage consists of paired cables, just in case one breaks. They are linked to a new accelerator pedal constructed from metal.

The clutch is the same size as normal but uses a sintered bronze plate and an uprated diaphragm spring cover.

The stock air filter, which restricts air flow by between 8 and 12 per cent is replaced by one from K&N.

The most intriguing feature about the engine is the way in which it is mounted. Golf and Corrado engines are normally mounted quite softly on a transverse pressed steel sub frame. This allows the engine/gearbox unit a great deal of back and forth movement with dire results for the gearchange. On the Gilders car, new engine mountings have been built on either side of the compartment, the chassis legs built up with plate to accommodate them. The mountings themselves are actually resilient bushes from the rear spring shackle eyes of a Ford Escort RS 2000 fitted into steel sleeves. The sub frame is retained to



Normal engine control unit is repositioned above co-driver's footrest. Power Engineering ECU module is piggybacked on top (left). Engine mountings are built out from chassis side members (below).

Lightweight battery and re-engineered gearchange mechanism.

CV joints and a new front end for the prop shaft (above right). Front strut has adjustable spring mount and Bilstein damper insert (right).

brace the front end. The mountings permit very little movement and gear selection is much improved during dramatic torque changes.

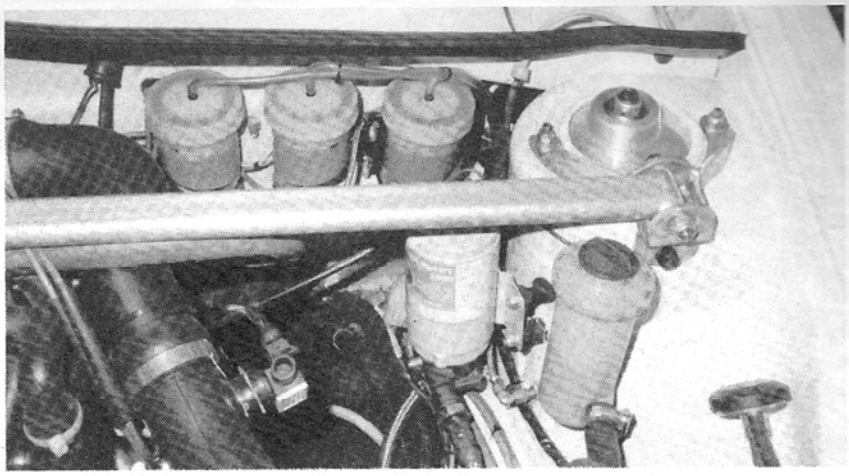
GEARBOX: The gearbox of the Rallye Golf is common to both Passat and Corrado and has the ability to cope with very high torque. The cable gear selection linkage is not ideal, however, and much work has been done by River Fame mechanics to make it more positive. The rubber bushes and plastic shafts at the ends of the cables have been changed to metal and the shafts are properly located by split pins. These changes, combined with the reduced amount of gearbox movement, make for a much more positive selection, even during very hard acceleration.

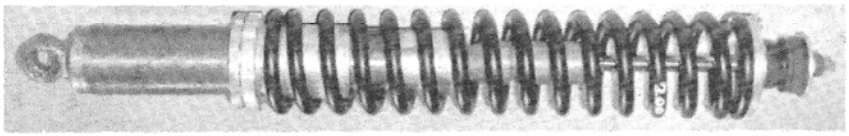
The prop shaft is modified for strength, with CV joints rather than normal universal joints and a modified front end makes replacement much easier.

The transmission is filled with Mobil SHC 75/90. At the back, the free-wheel built into the rear diff is done away with so that the unit acts as a conventional (not limited slip) differential.

SUSPENSION: A tremendous amount of work has gone into uprating the suspension, which is essentially MacPherson strut at both ends with wishbones at the front and semi-trailing arms at the rear. Both wishbones and trailing arms are heavily reinforced and most of the bushes are replaced by Uniball joints. At the rear, the mountings of the trailing arms use steel instead of

Top mounting for front strut incorporates a Uniball joint.

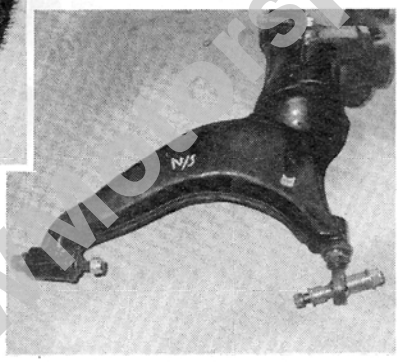




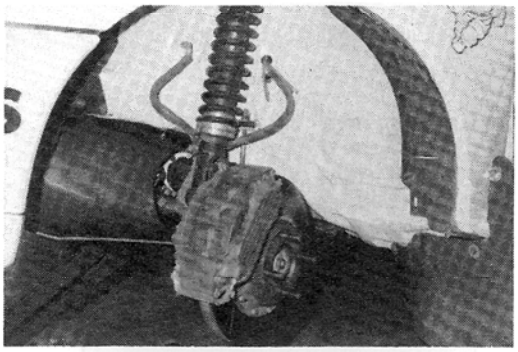
Separate reservoirs for each master cylinder and brace between strut towers (above). Bilstein rear damper with adjustable spring mount (left).

Michelin 14/62-15 rally tyres on 6 in. Revolution rims (above).

Rear semi-trailing arm has steel inboard bush and Uniball outer joint. Note the provision to alter rear toe.



Calipers are four-pot AP all round.



resilient bushes and the bolts are split-pinned.

Bilstein dampers are used all round in conjunction with UK-sourced coil springs. Each strut is topped by a machined plate which incorporates a Uniball joint rather than the conventional ball bearing.

Suspension travel is increased by 60 per cent—from four inches to seven. This provides the car with its ability to travel quickly over very rough surfaces but there is a danger if the suspension drops too far. If the driveshaft angle exceeds 18 degrees, considerable stress occurs in the joints so droop bars limit the downward movement of the wishbones and trailing arms.

The standard power steering is retained but the rack is rather low geared and the team is investigating a faster unit from VW Motorsport.

BRAKES: Brakes are by AP all round with four-piston calipers front and rear. Separate master cylinders are used, ¾ in. at the front and ⅞ in. at the rear with mechanical balancing of the brake pedal between the two. The brake pads come from the USA and are based on a carbon and metallic particle compound.

These changes to the Rallye Golf are only part of the story. It has to be serviced, driven and sponsored and we'll look at these aspects in our next article. ■