BRAKING NOTES FOR THE MGA TWINCAM

I am jotting these notes down in response to various people that are using their MGA Twincams in some sort of competition and have been wondering how to make their brakes work their best under those conditions.

First, the good news is that the Twincam 4 wheel Dunlop disc arrangement is one of the very best braking specifications to come out of the 1950s and in proper order will out-brake many cars 20 years younger. Second (the 'catch') is that the system has certain idiosyncrasies that must be addressed to optimise the braking performance of the cars.

MECHANICAL ISSUES:

The Dunlop system was the first disc brake system to be made available for street car use, and had been pioneered in racing versions in the early 1950s on the Jaguar race cars that ran at Le Mans and elsewhere. Similar units were used on the Austin Healey 100S, the Jensen 541 R (the first 4 wheel disc production car) and the Jag XK 150.

Racing versions were quite different than later production versions, using round pucks held captive in odd looking callipers that needed to be removed for pad changes. Even the early XK150 used round pads, switching later in production to the more familiar square pad used in the Twincam.

The first hurdle that Dunlop ran straight into when working with Jensen in the early 50s on the 541 was horrendous pad kick-back on both front and rear brakes. They quickly nailed this down to excessive bearing end float and managed to keep it under control by carefully minimising running clearances. What had been happening was that the bearings allowed the rotors and hubs to move in and out under cornering forces, pushing the pads and pistons back in the cylinders, with the often scary result that the first time you hit the brakes after coming out of a series of corners you'd navigated without braking, the first push of the pedal was used up just getting the pads back out near the discs.

Anyone racing a Twincam should emulate the Jensen factory and check front and rear bearing end float, using suitable shims in the rear to eliminate any excess, and in the front being careful not to go too tight lest the heat generated by racing use close the clearances and cause bearing damage or seizure. It is not just Dunlop callipers that experience this phenomenon – some Formula classes attempted to battle the same problem by using coil springs inserted behind the pistons that would bring the pads out near the rotor again after being pushed away, without the driver needing to use the pedal to do so.

WHAT CAN GO WRONG:

Next up is what design problems (and there are always a few, as witness the kick-back issue above) need to be addressed to prevent problems in racing use – in other words, figuring out how the system can possibly screw up and modifying to eliminate or reduce that possibility.

You will of course rebuild your brakes before racing, and will replace the steel lines that bridge the calliper halves. When doing so, you should be aware that some people have experienced failure of these lines from vibration where they enter the calliper because the lines are able to move and vibrate thus work hardening and eventually failing. Anything

that can be done to secure the lines and/or damp vibration is worth considering. This isn't usually much of a problem on street cars and simply replacing these lines every season or two may be sufficient. Be aware that the lines run very close to the wheels and if they touch they will wear through and leak at the most inopportune time.

The Dunlop brake is a bit unusual in that instead of having a rubber seal in a groove in the cylinder against which the chrome piston moves, it has a seal on the piston itself that moves in the smooth steel bore of the cylinder. This gives rise to problems in old cars because you can't just replace pistons as you would in a Lockheed system, you need to maintain the cylinder walls in pristine condition as the sealing rubbers ride against them and any leaks must be eliminated. You can replace calliper halves – easier to find on the front as they shared parts with some Japanese cars and one can source NOS parts made under license by Sumitomo. You can sleeve the cylinders. Or you can choose the more expensive but in my view better and more permanent solution and machine out the old corroded surface of the original cylinder, hard chrome it, and then have it remachined to size again. This gives you a smooth wall that is much more resistant to any future corrosion and also eliminates any possibility of any movement or leakage that is always a concern if you sleeve a cylinder (as White Post and others do).

With the cylinders out of the way, we next look to the pistons themselves. The original Twincam used a brass piston with a flat rubber seal sandwiched to it by an aluminum plate held to the piston by two small oval head machine screws and dished star washers. One might think that this would be fool proof, but one would be wrong and I have a door with an Armco rip in it to prove it. What can happen is that the washers can crack, the screws can back out and once the pads are sufficiently worn to allow it, a screw can drop out behind the piston when the piston is pushed out under hard braking. This jams that piston maintaining braking force on that calliper only when you release the pedal, which will cause you to spin and crash.

Fortunately there is a solution that doesn't require any machining as the brakes built slightly later in the early 1960s for Jaguars used a different method for retaining the seal – a plate peened to the back of the piston. Anyone seriously racing would do well to switch to those later pistons (they fit the original MG cylinders) in order to eliminate the possibility of this unlikely but very inconvenient failure mode.

While you are in there, you may as well break the little pin off the back of the cylinder, or if you are still using the early pistons with removable alloy plate, take it off and remove the little bush that rides on it. The bush and pin are a mechanism intended to pull the pads back from the discs and prevent rubbing and wear in normal use, and we have already established that our problems don't lie in that direction. You can also remove the rear handbrake calliper sections on a race car as they won't be needed and are just added unsprung weight.

ROTORS:
It seems a fad to fit cross drilled or grooved brake rotors to production cars and you can but these ready to fit for MGBs from the usual outlets. The practices were developed on race cars where every last possible advantage is sought. I have to laugh when I see these Sunday driver MGBs with many dollars worth of faux race stuff on them, as the only thing they accomplish is the lightening of an imprudent owner's wallet. In other words, no, you don't need drilled discs. Will it do any good? Probably not. Will it do any harm? Possibly so as each new hole may be the site of s stress riser that can result in fracture of

the disc. Why take the risk unless you need that last degree of brake performance – which no MGA that still has an MG engine ever will?

Similarly, modifying the rotors for thickness (the maximum the calliper will take is represented by the Jaguar versions) really doesn't get you anything.

PADS:

Here is the crux of braking performance – can we shed the heat and can we make the chosen pad material work with whatever heat we can't get rid of? On the Twincam we don't have the simple modification of being able to remove an inner splash shield as they never used them – the rotor is out in the air already (the splash shields were fitted to some cars, including late Mk 2 Lockheed braked cars, to keep grit off the inner disc surface, a wear issue, and to prevent water splashing – a possible warp issue, neither of which concerns us in racing).

The pads on these cars are odd in the sense that they are not material bonded to a metal backing plate that slots into the calliper. The pad material is much thicker than normal pads (which can make finding blanks to create special application pads problematic) and has a thin sheet metal piece bonded to the back of them. This sheet metal piece slides over a small grooved post that sticks out of the piston and secures the pads to the pistons so that they don't rattle, but rather move in and out in unison with the piston.

We always used to use Ferodo DS-11 material on the Twincam. I had no problem with street pads when running a very stock pushrod class, but with an improved engine, closing speeds rose significantly and mandated a better non-fading pad material and in the old days, DS-11 was IT. Problem was that the DS-11 didn't work until it was hot, which meant that your stopping distance on the first lap was much greater than on the ensuing ones. This resulted in me often waving the tail off the first hard corner of the first lap in an undignified attempt to slow down before the pads were warm enough to work properly. Once warm, they would absolutely not fade no matter how hard you tortured them, and the local track was one of the hardest on brakes I've seen.

Segue to today – we can no longer get DS-11 (existing stocks are dwindling and they no longer make the asbestos based materials), and synthetics are the only option. I went to a Porterfield carbon Kevlar material, the R1, and have never looked back. It is just as good as the DS-11 ever was at fade resistance, and it also stops well first time at lower temperatures. It is offered in several flavours now, vintage, street/race etc. and any Twincam should be able to use one or the other. There are probably other brands, but these guys http://www.porterfield-brakes.com cater to all sorts of racing including vintage and you don't even have to ask for early XKE pads, they actually know that an MGA Twincam existed.

Conclusion – yes, you can fit ventilated rotors, modern 4 piston callipers and Formula 1 style pads to a Twincam, but I am not confident that it would result in one iota better braking, and in most cases it would be illegal for vintage racing. We have one of the very few vintage race cars that do not need radical modification for adequate braking, and if you do the things I've suggested, you'll be able to run with anything you'll see on the track. My car has out braked Porsche 911/912/914, Formula V, any other English car I can think of except the Lotus Elan and Lotus 7, and pretty much every Alfa (to my

delight). If your Twincam isn't braking to that level, it is an issue with system condition, not the system itself. Diagnose it, clean it up and you should be back on form.

A final comment aimed at those that want to convert pushrod cars to Twincam brakes. There are two objections to that, the first of which is that this practice robs real Twincams of parts they may need for restoration. But if you do spend the rather large amounts of money needed to buy a set of brakes and Twincam wheels, you have saddled yourself with a handbrake that requires more attention to function properly and that will never equal the effectiveness of a rear drum set up. I made the conscious decision to use front disc/rear drums on my MGA Jamaican project (brakes are a matter of importance on an MGA with double the stock power) for that reason.

The hardest braking race course in my area was Westwood BC with a very fast downhill hairpin. The pictures show my MGA out-braking a Lotus Elan, Porsche 356 and Alfa GTV 2 litre into that corner with the Twincam brakes. Of course the darned things would later catch me on the straight and I'd have to do it all over again the next lap (I was running a fairly stock engine at the time).