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Turning Circle

TRIUMPH SPORTS SIX CLUB

FEB 1989 No.14

Competition and Tuning

TURNING CIRCLE
Editor: P. J. WILLIAMS

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Pete Williams, Allison Woolly, Ivan Kirk, John Green, Bill Sunderland and Tony Dean.

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THE MEMBERSHIP SECRETARY, TSSC, 121B ST MARY'S ROAD MARKET HARBOROUGH, LEICS. LE16 7DT

PRICE £1.50 Free to Club Members

Editorial

Well as you can see from the above, Turning Circle now appears with a different name wielding the proverbial red pen. Fortunately due the interesting articles sent in, the job has been an enjoyable task. The occasional comment may be mine but the overall style and content belongs to the authors themselves so on behalf of everyone, I'd like to thank all authors featured here for taking the trouble to put *their* pen to paper.

Perhaps a few more of you will be encouraged to start preparing copy for the next edition which will feature *The Vitesse*. It's never too early to send in your articles and a fresh perspective is always welcome as even the most knowledgeable amongst us has always something new to learn. Please drop me a line or give me a call.

Happy Motoring

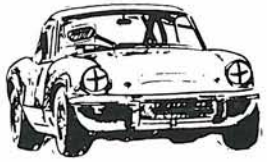
Pete Williams

SO YOU WANT TO RACE?

Tony Lindsey-Dean

Many Club members have been drawn into the thrill of racing, many others have considered it and perhaps you're thinking about it right now. To help you decide if racing's for you, here's a simple guide to racing your Club car be it modified or standard.

Firstly, in order to race or sprint you will requre a restricted race or sprint RAC licence. Application forms can be obtained from the RAC at the address below:-



THE RAC MOTOR SPORT ASSOCIATION LIMITED
MOTOR SPORTS HOUSE
RIVERSIDE PARK
COLNBROOK
SLOUGH
SL3 OHG

The next and one of the most important aspects of racing is safety. RAC approved crash helmets MUST be worn. If you have to buy a new helmet, find a sympathetic stockist who will let you find the latest production helmet, as RAC regulations only allow helmets to be used for 4 years.

Your vehicle should be prepared to a high standard. All areas relating to MOT standards should be checked. Chassis and bodywork should be seen to be in good condition and it is advisable to steam clean engine bays and bulkheads so that scrutineers can check your car without getting filthy. Loose wiring should be taped.

Statutory safety requirements consist of the following:-

LAMINATED WINDSCREEN, ROLLOVER BARS - Convertible cars should consider full cages. Rear rollover bars must have a diagonal bar. SAFETY BELTS - must consist of a 4 or 5 point harness. SEALING - The bulkhead must be sealed so that there are no holes. The petrol tank must also be sealed against fuel leaking into the driver's compartment. The tank or bulkhead can be sealed with aluminium sheeting and fibre glass.

ELECTRICAL - The ignition switch should be clearly marked. Even better, and compulsory on modified cars, is an external cutout switch. Armed with these basic modifications, which are really common sense rules, you can then race.

EXPENSE is another major point of consideration. The cost of equipment such as rollover bars, helmet, windscreen etc. for race preparation will be in the region of £300-350. Entry fees for each race cost about £50 on average and with a race series usually covering 10 rounds, the total cost for a year's racing amounts to about £1000. Obviously, travelling costs must also be considered plus any additional outlay for initial tuning and suspension modifications you may wish to add to your vehicle.

Many people have asked me what is it really like to race, thinking that it might be difficult to cope and that maybe sprinting would be an alternative safe introduction. In general, my view is simply to try. Even driving on the road, you drive within your limits (or ought to!), and when you know a familiar piece of road you may drive faster. The same is true for racing. It takes time to learn the circuits and there have been several Club members who have raced in the championship this year with no previous competition experience. All have enjoyed the thrill and excitement of racing by simply driving at their own pace, Chris Smith being an oustanding example of a new driver entering nearly all the races and improving steadily throughout the season to take a fine class win. So, if you'd like to take the plunge and require further information and advice then drop me a line at the following address:-

Tony Lindsey-Dean
TSSC Competition Secretary
42 Gladstone Avenue Feltham Middlesex TW14 9LL

ROLLING ROAD TUNING

VALUE FOR MONEY?

Russell Cunningham investigates whether or not you're really taken for a ride on a rolling road.

Having a rolling road tune has traditionally been the domain of the engine modifiers/tuners interested in extracting every last horse-power from a power-plant, and in fact it was only because my own modified engine needed setting-up correctly that I considered what I expected to be a very expensive rolling-road tune. I found that conversely it was both far cheaper than I expected and benefits the standard car just as much as the modified.

First of all, a few details of my own car. It is a J-registered MkIV Spitfire fitted with a 2.5 litre 6-cylinder and a 2.0 saloon gearbox with J-Type overdrive. The engine has been fully rebuilt in un-modified form, with the exception of a GT6 camshaft, Stromberg CD150 carburettors, Vitesse distributor and twin-box Triumphtune exhaust. This lot was all bolted together and run-in for a gentle 1000 miles, by which time a noticeable part-throttle mis-fire was becoming evident and I decided that it would benefit from setting-up properly on a rolling-road since no doubt the carb needles needed adjusting for the extra 500cc and big-bore exhaust, the distributor would require accurate timing and for all I knew the GT6 camshaft could be knackering-up the performance all round!

Since Aldon Automotive had re-ground and balanced my crankshaft and supplied bearings and valve springs etc I was very surprised to be told that the cost of a rolling-road tune would be in the order of £40 plus parts which seemed far cheaper than expected and compares very favourably with garages who charge more than this for just changing oil, points and plugs!

Aldon Automotive was formed in 1969 by Alan and Donald (hence ALDON) and an Anglia van and has come on in leaps and bounds since then, now operating from three sites in the West Midlands/Worcestershire. The engineering side is based at Hartlebury (Near Kidderminster) and covers all the major engine re-conditioning and modifying (They are famous for building high-power reliable rallying engines) from full-blown racing engines to everyday block-boring and crankshaft re-grinding, AND they charge similar prices to other re-conditioners, not at prices you would expect from a firm famous for engine modifications. Another site is a shop in Worcester which supplies parts and advice for Weber carburettors and Lucas distributors, for which they are agents, and the third site is Brettall Lane between Stourbridge and Dudley, which houses the new-for-1988 rolling road and workshops. This is the site where I turned up for my rolling-road tune.

Considering what was found it was surprising that my engine ran at all; the distributor needed rebuilding and the jetting was way out. These were quickly rectified while I waited (it took a total of two hours) and the results were certainly impressive. They recorded 92bhp at 5,250 rpm at the wheels which by their estimate meant about 130 bhp at the flywheel (which interestingly enough is more than the standard 2.5 litre with bigger CD175 carbs!) and the cost? £35 plus VAT plus parts (I needed a distributor base-plate and springs) which came to a grand total of £48.30. That must be value for money! Aldon also urged that any standard car can be rolling-road tuned for similar outlay as long as nothing major needs replacing, which must be good news.

Finally, the results are well-worth it. The car is now beautifully smooth (I can now hear all those impossible-to-remove inherent Spitfire rattles!) and the performance is like no other traditional cheap sports car that a British company ever made! My verdict? Get your chariot rolling-road tuned!

I would like to add that I am only too glad to give advice to members who may be contemplating converting their Spitfire to a 2.5 (I learnt the hard way!). *Russell Cunningham 14 Arlington Court, Redhill, Stourbridge DYB INN* ★

MIKE SPENCE HISTORIC RALLY

Breath in the excitement as Allison Woolley navigates both us and husband John around the Mike Spence Historic Rally and shows the rest of the RAC Rally field the way home.

The Mike Spence Historic Rally was held on Sunday 20th November 1988 at Weston Park, near Telford. The event was organised by the Historic Rally Car register and run over the same stage to be used by the RAC Rally later the same day.

As usual with these rallies the event was heavily over-subscribed with entries from all over the country and one from Holland. The maximum entry was forty cars as the rally had to be out of the way before the arrival of Messrs. Kankunen and company at half past five.

The rally attracted a wide variety of entries including Lancias, Austins, Healeys a Jaguar XK120, MGs, Volvos, Saabs and, of course, Triumphs. It was nice to see Alan Petit out in his recently purchased GT6. We first met Alan on this year's Classic Marathon driving a Sunbeam but we believe that we have swayed him in favour of a Triumph for next year's event.

Course opening car was a 1974 Lancia Stratos which our service crew/child sitter said was the only 'proper' rally car there...I must stop him corrupting the children!

The stage consisted of about two miles of tarmac road through the park, finishing on a rougher piece of farm track. There were a couple of tightish cattle grids and a hairpin in front of the house.

Anyone interested in the RAC will know what the weather did on Saturday night....I thought the kids had been playing with the silly foam when I saw the cars on Sunday morning! On arrival at the start there was a light covering of snow and slush on the grass but the road itself was clear.

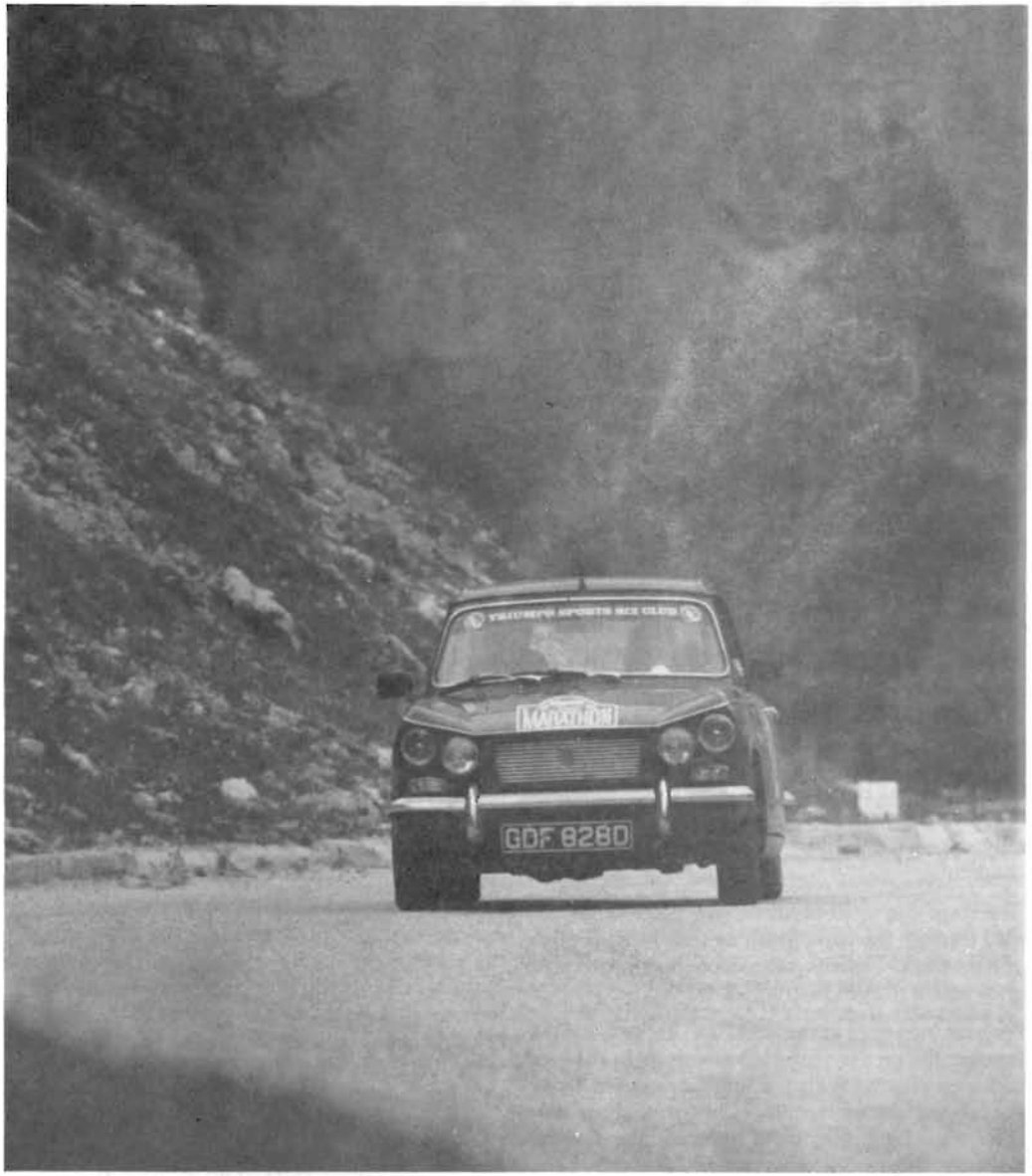
We had expected the road surface to be very slippery due to the weather conditions and consequently John was braking quite early on the bends. However the Vitesse responded very well and we were pleasantly surprised to have the fastest time of 2 mins 02 secs. on the first stage.

"We'll be under two minutes next time" I warned the other competitors waiting to start the second run....but no one was more surprised than I when we clocked 1 min 58 !! I saw the speedo pointing to 90mph on the straight (probably nearer to 80 as it is at least 10% out).

The third stage included the famous (or infamous) watersplash....scene of many a watery end to an RAC rally attempt. Our valiant little Vitesse decided it didn't want to turn off the tarmac and approach the watersplash....and provided our only 'moment' of the rally by trying to carry straight on....towards the straw bales blocking the stage! Luckily the nearside (mine of course) caught on some sheep netting and slowed us up enough for John to stop and turn. Not a very impressive display for the crowds waiting by the watersplash!

Much to our surprise we still had the third fastest time on stage three, and luckily we were far enough ahead of the opposition to still win. We had thought it was the 'kiss of death' to be tipped as likely outright winners but, whatever the reasons, everything held together for us that day and most other people seemed to be having all sorts of problems.

The fourth stage was run as a demonstration run for the top ten cars only, due to lack of time. John managed to knock about seven seconds off our stage three time, which he says means that car was flying!

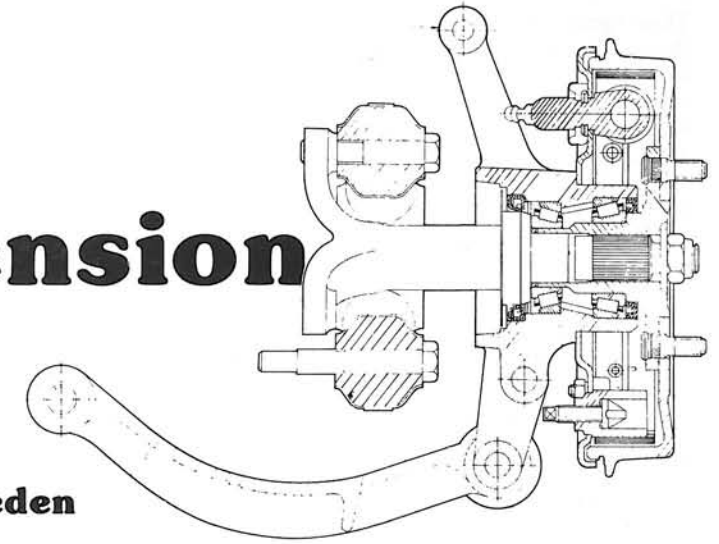


All I know is that we were pretty close to those gate posts once or twice (my side again of course)!

The day ended with a prize-giving in front of Weston House, with prizes presented by the Earl of Bradford assisted by his two young sons. I was suddenly informed that it was the winning navigators duty to make a speech which I did appallingly badly, trying to thank the sponsors and leving half of them out! However it was a great day and I must thank the Earl of Bradford for letting us go there, the sponsors, Mike Spence Classic Restorations, Classic Cars Magazine (whose splendid cup is now on our sideboard) and Paddy Hopkirk, as well as Martin Jubb and Jim Quinn of the Historic Rally Car Register for a terrific event....one we would have enjoyed even if we hadn't won!!

The car is now in the garage for the winter as our next event is not planned until April. Our entry is in for next year's Classic and hopefully we shall continue to give Triumphs a high profile in historic rallies in 1989.

Rear Suspension Talk



C H Eickoff - Sweden

Another head scratching and thought provoking article from the pen of 'Power Curves and Differentials' fame, this time comparing Swing Axle and Rotoflex rear suspension systems.

Brain in gear? Then into first....

No car is better than its suspension system! Without it a car is just not a car and hence, accepting this premise, the beauty of the exterior and interior become relatively unimportant.

So,

"JUST WHAT DO YOU KNOW ABOUT YOUR REAR AXLE?"

During renovation jobs, I'm sure that many more Club members other than myself have asked themselves just why a particular part was made in such and such a way, or whether or not the design is truly definitive. Perhaps with some modification it could be designed better for improved performance and or for greater reliability? To this end, I have analysed the rear axle and suspension of 'our cars' and in doing so have been surprised about the design of some of the integral parts of the assembly. For why, read on.

Firstly, let's look at the original swing axle design employing a standard transverse leaf spring. For example, take the case of a saloon spring being made up of 11 leaves, each 45mm wide and 5.3mm thick with an associated spring constant of 38mm/kNewton, which in Imperial units means that the spring height is reduced by O.687in for every 100lb load added to the centre mounting point. Standing free and unloaded, the spring has an arch height of 165mm (6.5in). Hence in order to straighten the spring, a force of 4200Newtons (943lb load) needs to be applied. In this position, the stress in the spring amounts to 425N/sq mm . Although the quality of the steel is an unknown quantity, experience suggests that 650N/sq mm is the maximum repetitive stress value for the material. From a horizontal axle position, ie. zero degrees in the UJ, the axle is able to move 13 degrees down before it comes to rest against the chassis frame. Hence, in my opinion the spring stress rises over the maximum allowed by the time an 8 degree axle elevation occurs. The total axle angular movement, also here equivalent to the camber change, therefore amounts to 13+8=21 degrees. Incidentally, this figure has been confirmed previously in Turning Circle No.10, page 7.

These figures point to the main disadvantage of the swing axle system which is one of excessive camber change. This is most serious when the car is travelling on uneven roads where one wheel movement is different compared to the other as the rear axle drives the wheel which has the heaviest load at any particular moment. In contrast, an advantage of a swing axle suspension system apart from its low cost (an important consideration to all production engineers, and especially to Standard Triumph of the day -Ed) is that of its relatively low unsprung weight (ie. the mass of the car supported under movement including the weight of the wheel and tyre). Consequently, the tracking between the tyre and road surface is good. Unsprung masses for one side for both swing axle and rotoflex systems are given in table 1 below.

Part	Whole Weight	Unspr.Wght -Swing Axle	-Rotoflex Axle
Leaf Spring	14.05 Kg	1.40 Kg	1.40 Kg
Vertical Link	1.28	1.28	-
Hub Housing Incl. Bearing	4.03	-	4.03
Hub -Rotoflex Axle	1.30	-	1.30
Radius Arm Incl. Bracket	0.655	0.33	-
Radius Arm Adjustable	0.955	-	0.48
Swing Axle	4.41	2.41	-
Hub -Swing Axle	0.915	0.915	-
Back Plate	0.92	0.92	0.92
Brake Drum	2.60	2.60	2.60
Brake Shoes, Cyl. & Adj.	0.80	0.80	0.80
Outer Axle Shaft	1.91	-	1.91
Rotoflex Rubber Donut	1.08	-	1.08
Bolts for above	0.54	-	0.54
Inner Axle Shaft	3.015	-	1.58
Wishbone	2.20	-	1.46
Bolts, nuts	spec	0.195	0.76
Part of Shock Absorber		0.30	0.30
		11.15 Kg	19.16 Kg
Rim, steel 4½J	6.35 Kg		
Tyre	7.65 Kg		

Table 1: Comparison of Swing Axle and Rotoflex Component Unsprung Weights

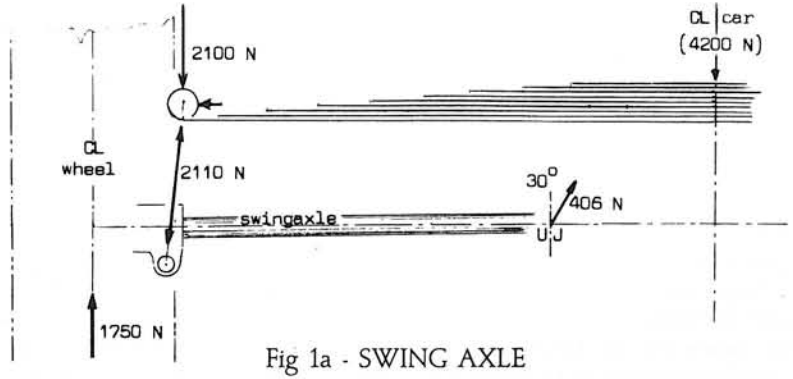


Fig 1a - SWING AXLE

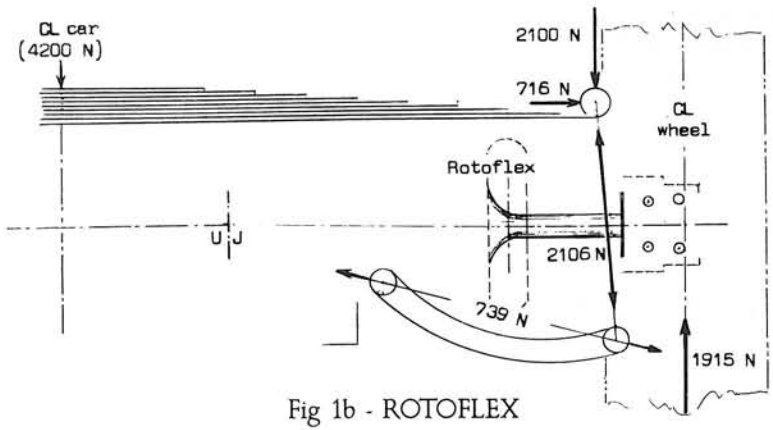


Fig 1b - ROTOFLEX

Comparison of Swing Axle versus Rotoflex suspension systems. As shown and assuming the same spring is used for both, a greater wheel force is required to straighten the spring on a Rotoflex compared to a Swing Axle rear suspension due to the different 'lever arm' geometry involved.

A comparison of swing axle verus rotoflex rear suspension systems is given in figures 1a/b. The measurements used being:

Half length of leaf spring, straight	523mm
Half track width	609.5mm
Distance from car centre-line (CL) to UJ	162mm
Swing axle length, UJ to wheel centre-line	447.5mm
Rotoflex inner axle shaft length	274mm
Distance from outer axle to wheel centre-line	224mm
Wishbone angle for depressed straight leaf spring	14.5°

Table 2

In this article what I'm aiming to do is to analyse the rotoflex design and offer some thoughts as to how it might be improved. Obviously the main aim of the design was to eliminate the excessive camber change of the simple swing axle system. Just how successful is the rotoflex set-up? Looking back to table 1, it might be noted that the rotoflex design is accompanied by 8kg more unsprung mass per wheel than the swing axle design and that's a lot.

In the Turning Circle article referenced above, it was stated that moving to the rotoflex system reduced the camber change from 21 degrees to 7 degrees 21 minutes (60 minutes making 1 degree). That's not really true. Within the limit of the shock absorber, the 7 degree figure is OK, but compared with the movement up and down in the swing axle as giving 21 degrees camber change then the correct value for the Rotoflex system should be 10 degrees 20 minutes (comparable loads and spring forces being considered). The geometry of the system under movement is given in figure 2.

To confirm that my calculations are not just the result of a 'back of an envelope estimate', a friend helped out by bringing his GT6 around (chassis number KC77283) which we duly measured up. We can therefore establish that from the position of camber angle =0 degrees, 13mm of vertical wheel movement will give one degree camber change which corresponds to 10.5mm track divergence.

Looking at the system shows that the above suspension control can be done better. If the wishbone mounting point in the frame bracket is lowered by 60mm then the camber change over the same vertical wheel movement given previously can be reduced to 2.9 degrees. In the original design, a maximum axial offset

i.e. an increase in the effective drive shaft length) of 6.6mm is taken up by the Rotoflex rubber. By lowering the lower wishbone mounting point, this offset can be reduced to 4.0mm. A comprimise leading to practically no axial displacement is possible if the wishbone mounting point is lowered by 44mm. The resulting camber change would then amount to 3.56 degrees, a fairly good value compared to the 10.33 degrees of the original set-up.

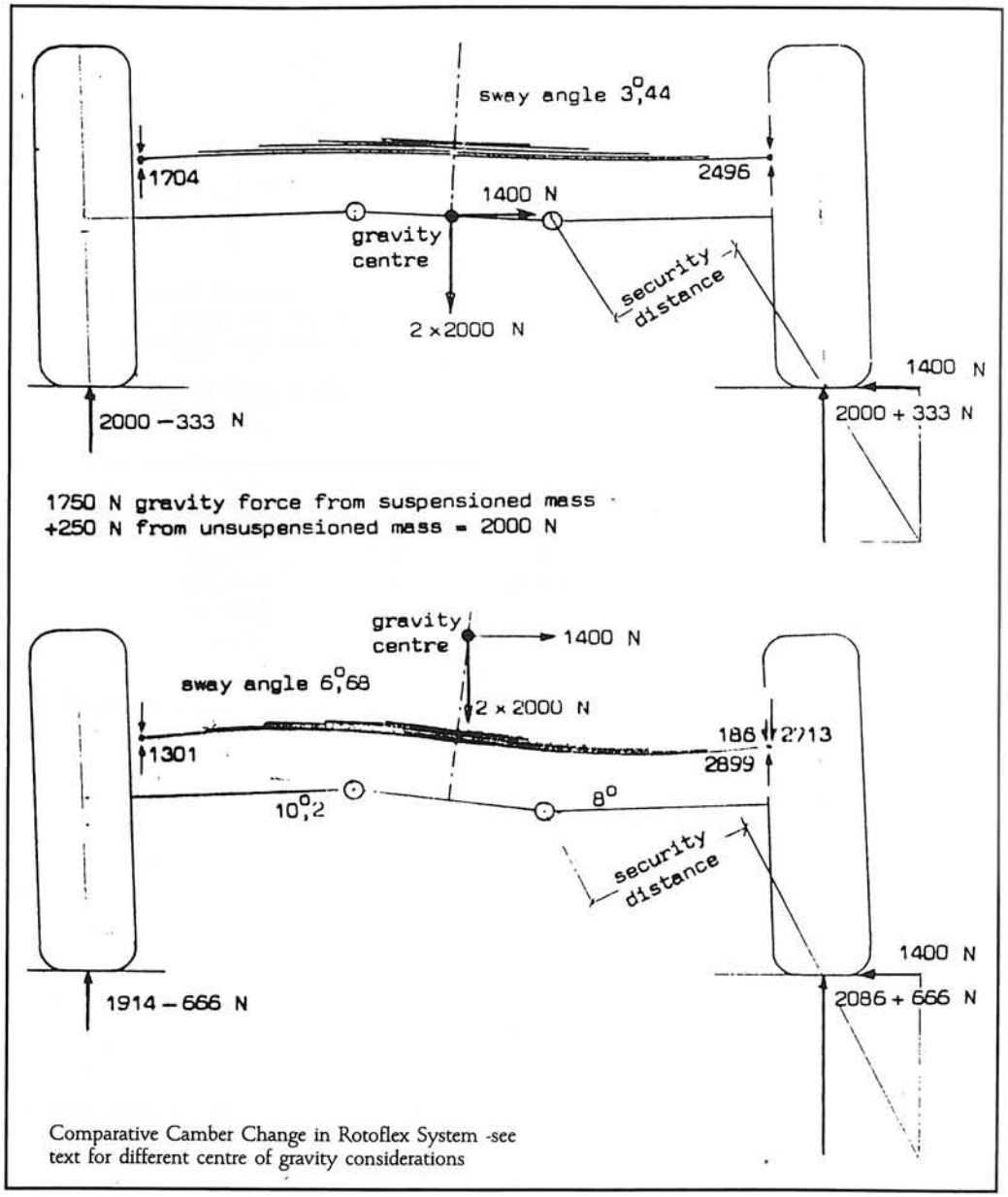


Fig 2.

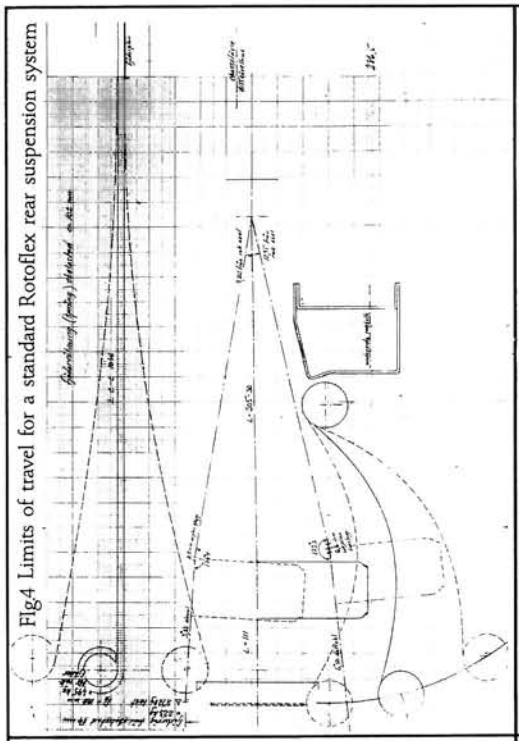


Fig4 Limits of travel for a standard Rotoflex rear suspension system

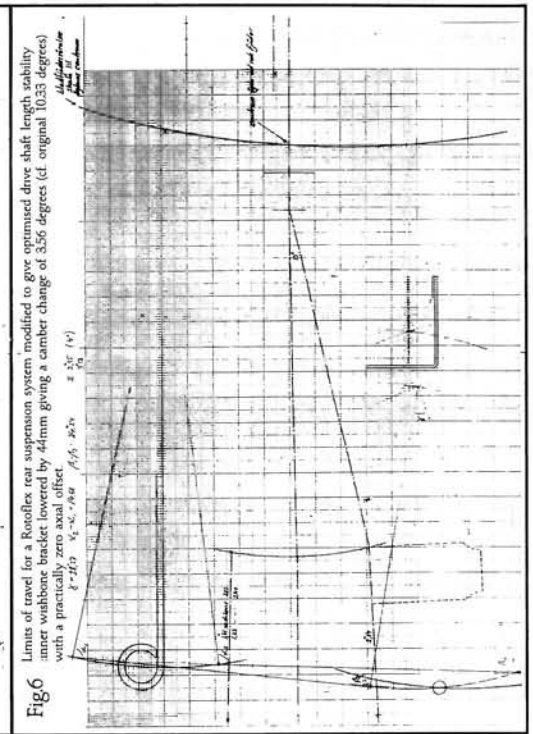


Fig6 Limits of travel for a Rotoflex rear suspension system modified to give optimised drive shaft length stability inner wishbone bracket lowered by 44mm giving a camber change of 3.56 degrees (cf original 10.33 degrees) with a practically zero axial offset

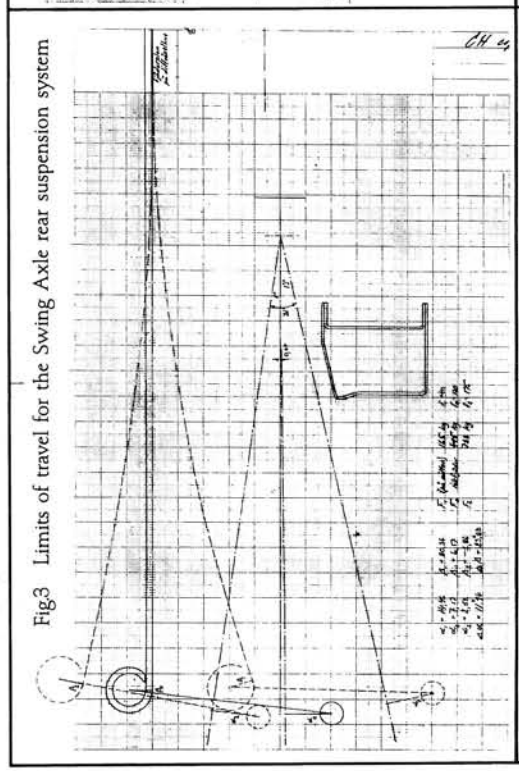


Fig3 Limits of travel for the Swing Axle rear suspension system

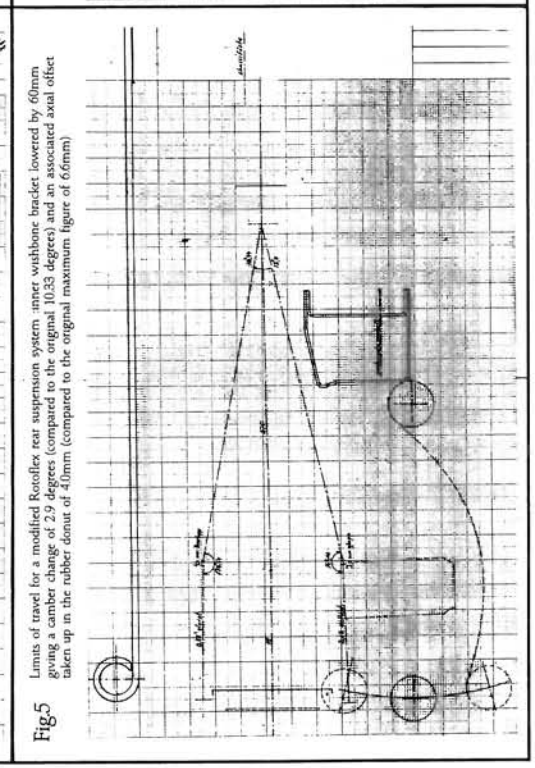


Fig5 Limits of travel for a modified Rotoflex rear suspension system -inner wishbone bracket lowered by 60mm giving a camber change of 2.9 degrees (compared to the original 10.33 degrees) and an associated axial offset taken up in the rubber donut of 4.0mm (compared to the original maximum figure of 6.6mm)

Universal Joint Considerations

The universal joint is also worth looking at. I think the size was selected for the first Herald having an engine giving a torque of about 75Nm (102lb.ft). In first gear, and assuming a back axle ratio of 4.55:1, the UJ has to transmit about thirteen times this amount to the wheels. The joint manufacturers specify that for a life of 2500 hours, only 350Nm can be transmitted at 350 rpm. Shocktorque is the limit for a sharp impulsive force and this is stated to be 1130Nm. Deformation comes at around 1800Nm. We might imagine that the Standard Triumph chassis designer knew that the joints could only have a long life with a careful, very smooth driver -no racing away at traffic lights! This is OK in some respects but not in others. From figure 1(a), it can be seen that a radial force acts on the UJ which it isn't designed to withstand ie. it can carry the dead weight from its own axle but no more. In 'our cars', the swing axle design causes the bearing cases in the UJ to be compressed continously with a 400 Newton force leading to the usual consequence of having to renew the UJ fairly regularly. With later cars with their larger, more powerful engines, it's litle wonder that UJs have a problematical life.

Rotoflex Wheel Bearings

Let's now look at the wheel bearing within a Rotoflex driveshaft. The accompanying diagram (Figure 7) shows the layout with the very closely arranged roller bearings, hub and its fixture to the outer axle shaft.

A lateral pressure from fast cornering must be taken up in these two bearings and I will comment on the forces involved a little later on. The inner smaller bearing (LM67010-LM67048) is specified as being able to take a maximum dynamic force of 31,400 Newtons and a static force of 26,000 Newtons. Following this data, 3,500N will be the maximum static side force on the tyre. That means that if you overturn the car, leaving it standing with its whole weight on the wheels on one side, then the bearings in the rearaxle may be damaged. Perhaps not surprising really. Driving a Vitesse on two wheels is definitely not recommended!!

Following on, the hub detail supports the inner bearing race. The hub and axle are joined by the use of push fit splines, 12mm in length. The push fit is very strong as, with the difference in width between hub and axle diameters being 45 microns (ie. the drive shaft diameter is that much wider), a force of at least one ton is required to press the hub into position. This fact makes it impossible to adjust for correct bearing play. The hub will be expanded and the inner race of the inner bearing is immovably fixed on the hub surface. I have no solution to offer, except to carry out a radical redesign. The Triumph people tried to do it for the 2000 model, the play there can be reduced but not increased if necessary. On my own car I have reduced the 45 micron diameter difference to 15 micron.

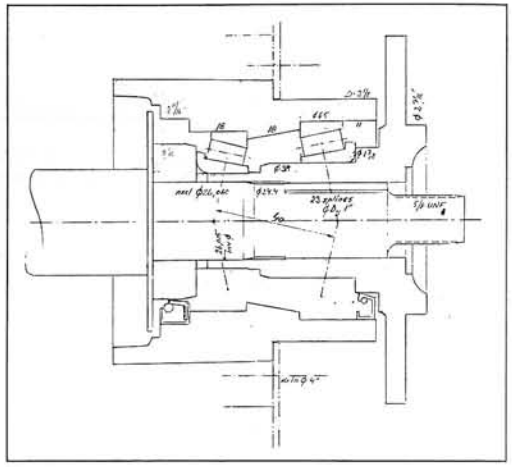


Fig 7.
Schematic of Rotoflex Rear Hub/Wheel Bearings Unit

Nylon Suspension Bearings

Another item on the list for improvement is the nylon bearing between the wishbone and the vertical link: inexplicably named 'trunnion' in the spare parts list. Even, well greased, the bushes have a tendency to bind and it is not difficult to explain considering the different thermal expansion coefficients of-polyamid versus steel:- (102 vs 11.5).10exp-6/Kelvin.

(For general information, Kelvin is THE absolute temperature scale which defines absolute zero as its 'Zero degrees'. A difference in temperature of 1 Kelvin is however exactly the same as that of 1 degree Centigrade or Celsius. It's just that the Centigrade system has the freezing point of water as its 'Zero' which is equivalent to about plus 273 Kelvin -Ed)

A 0.05mm play between bush and spacer tube is eliminated at a temperature of 23 degrees C less than the temperature at which it was put together so on a cold winter's day, binding is inevitable. The angle that the wishbone moves in the frame bracket is a little more than 30 degrees and the correspomding movement between the wishbone and the vertical link is less than 21 degrees so why aren't the Metalastic bushes used

on the inner sleeves also used in the outer end of the wishbones? From the Metalastic catalogue, I've shown the data for the 13/1239 bush used, the ultra duty bush used in the leaf spring eye and also the bush used in the radius arms and front axle suspension.

Part No.	A	B	C	D	Torsional			Axial			Radial		
METALASTIC					Rate	Max. Tque	Defln.	Rate	Max. Load	Defln.	Rate	Max. Load	Max. Defln.
	ins.dia.	ins.dia.	ins	ins	lb.ins /rad.	lb.ins.	deg.	lb.in.	lb.	ins.	lb./in.	lb.	ins.
13/773	.437	1.000	1.750	2.000	480	120	14	3,350	200	.060	60,000	900	.015
13/1309	.375	.812	1.125	1.437	225	55	14				30,000	450	.015
13/1239	.500	1.000	1.375	1.750	500	125	14.5				64,000	1,100	.0173

The wishbone bush specified is used over the deflection limit as shown. Using the same bush in the outer end should not cause problems. The maximum radial load on the inner wishbone bush corresponds to 2800 Newton side force on the tyre and the deflection in the two outer bushes is then 0.2mm: nothing to speak about. I decided to use the bush mentioned. A longer bolt and two small levers to bring about a friction suface on both sides of the bush-tube was the only alteration needed. On this occasion I will emphasise the imperative necessity only to tighten up the bolts through the bushes in the middle position of the moving angle.

Roll Angles

By cornering fast in a car having a swing axle rear suspension like the Triumph Herald, the risk is that the combined force arising from the horizontal friction force exerted between tyre and road (centripetal force) and that of the gravitational force acting through the wheel will result in a force with its direction passing under the universal joint (causing the dreaded tuck under). It is too complicated to illustrate all imaginable positions as load and hence initial axle angle, centripetal force and the height of the car's centre of gravity are all variables. I have therefore chosen one proposition with two centre of gravity heights.

Data as follows: a load on the rearend giving a straight leaf spring as mentioned before, a centripetal force 35% of the gravitational force and centre of gravity heights equal to or alternatively twice that of the height of the wheel centre above the road. Here we're assuming that only the outside wheel has friction against the road. For example, in a 29 metre radius corner, the centripetal force mentioned comes up at a speed of 10 m/s (22.4mph) or for a 182 metre radius corner at 25m/s. The two figures show the forces in action anf their effect on the 'sway' or roll angle. The fact is that a larger roll will give safer cornering!!! So what is the effect of an anti roll bar? On my Vitesse, I have a 17.5mm diameter bar and I have calculated its influence to 15% of all 'antisway' forces. By one degree side declination on the car, the stabiliser increases/reduces the front wheel pressure by 136N.

My conclusion is that with swing axles, it is better having no anti roll bar stabiliser on 'our cars'. An increase in roll from, for example, 2 to 2.35 degrees is difficult to feel, but smoother suspension in the front axle is perceptible. With a stabiliser, the front suspension is in reality not independent, without the torsion bar, shocks are not transmitted from side to side. There is some consolation in that the centripetal force, giving an axial pressure on the UJ in the rearaxle, increase the resulting force on its needle bearings very slight

However, in spite of all the critical judgments I've made....

I Like my Vitesse. ★

INCREASING HERALD PERFORMANCE

on a budget

Enthusiast Ivan Kirk tells of the inexpensive but effective modifications made to his Herald 13/60 Convertible and of his ultimate search for power

Back in the early 1980's I owned a 13/60 Convertible. White, red stripe and red hood, it went very well but the performance didn't really match its looks. It was fitted with 5½J steel wheels and 175/70 tyres which improved the handling no end. The engine was the next job. The order of action being breathing, handling and brakes in an upward spiral as performance improved.

Fitting second hand Spitfire MkIII carbs came first: reconditioning them with new jets and changing the inlet manifold and heater hoses. In setting up carbs be sure they are balanced well. A jet setter, carb gas flow gauge (or listening to the intake hiss with a tube in the ear -ED) and colourtune ensure easy set-up and tuning. Make sure both butterflies open together the same amount. This is especially important on low throttle openings.

At the same time I fitted a MkIII Spitfire head with bigger valves, again second hand. Prior to fitting, the valves were generally reconditioned and the head decoked. The above two modifications gave a definite improvement for a total cost of about £20.

While picking up the head I found a Vitesse Convertible and had all the interior trim, seats and panels for £20. I also fitted a rev counter and 3 small dials for oil, temperature and fuel. This transformed the interior.

I then found an extractor manifold fited to a Toledo in a scrap yard. However, on fitting it to the Herald, the new manifold was found to foul the engine back plate - the Toledo clutch is on the front of the engine as it is FWD. I re-engineered the manifold by firmly bolting it onto an old head and then bending it in the forge at work. A special exhaust down pipe was made and this was then mounted to a 1600 Vitesse exhaust system (straight through box), giving better top end revs and more power.

The ideal time to try these changes then occurred which was a 'Test Day' at Castle Combe. This was great fun and very safe - see Courier June 1984. My Herald was the fastest of the day.

The last change I made was to fit a swing spring which I was given. This lowered the back about an inch and a half and stopped the fear of tuck-in. Although I have only experienced this once in my original 1200 saloon, I have found tuck-in can be prevented by driving the car properly and thinking about going around bends.

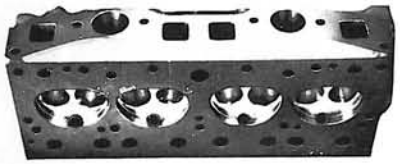
The above modifications made my Herald go faster and handle better all for very little outlay. My future moves would have been to fit a Kenlow and change the engine cam, then uprate the shock absorbers, front springs and brakes but the Herald gave way to loads of power in the form of a GT6 MkIII with triple webers and the works!

On the whole, the modifications made proved very worthwhile, were very cost effective and did not affect the fuel consumption too much.

TUNING IN TIMES PAST

TRIUMPH SPORTS SIX CLUB

MORE POWER
FOR THE TRIUMPH
HERALD, SPITFIRE & VITESSE



WITH THE

S.A.H. MODIFIED and 'FLOWED' HEAD

Modifications include:—
- COMPRESSION RATIO raised (see chart).
- COMBUSTION CHAMBERS modified and polished and "balanced".
- EXHAUST PORTS enlarged to suit "S.A.H." Manifold.
- INLET PORTS enlarged and polished.
- INLET MANIFOLD modified and matched (where applicable).

Our standard of workmanship and finish is second to none—resulting in a fine " mirror " polished surface to porting and accurately balanced combustion chambers—each Head being carefully modified to our " Master " profile.

Modified Cylinder Heads using standard carburation and exhaust offer a power increase of approx. 15%, and even greater improvement can be obtained by using our Extractor Exhaust System.

We can also supply and fit larger (3/32") inlet valves (Spitfire Heads only) which improve " breathing " particularly when used with special carburettors such as the Weber 40DCOE or Solex Twin-Choke. Highly recommended for achieving maximum performance and power output.

COMPRESSION RATIOS

HERALD 1200		HERALD 12/50		SPITFIRE		VITESSE	
St'd	Modified	St'd	Modified	St'd	Modified	St'd	Modified
8 to 1	9 to 1	8.5 to 1	9.5 to 1	9 to 1	9.75 to 1	8.75 to 1	9.2 to 1

When a modified Head is sent in advance on exchange a deposit is charged, this deposit is refunded when we receive your old Head, etc. Only the bare Head, Valve Guides and standard Inlet Manifold are supplied. RHV 2 65

Special High-Lift

CAMSHAFTS

for the Spitfire and Herald Engines

As used on the " S.A.H. " fully modified Engine, which develops over 85 B.H.P. with the Stage I camshaft.

It is recommended that these Camshafts are used in conjunction with our specially modified High-compression and "Flowed" Cylinder Head and our Four-branch Extractor Exhaust Manifold in order to obtain maximum B.H.P. output.

The STAGE I CAMSHAFT is recommended for normal road use.

The STAGE II CAMSHAFT is designed for competition use and gives maximum power in the higher Rev. range.

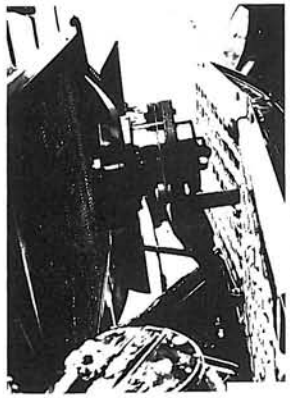
VALVE TIMING

S.A.H.	Inlet	Valve Opens 22 degrees B.T.D.C.	
MODIFIED	Inlet	Valve Closes 62 degrees A.B.D.C.	Lift .045
CAMSHAFT	Exhaust	Valve Opens 62 degrees B.B.D.C.	Extra
(STAGE I)	Exhaust	Valve Closes 22 degrees A.T.D.C.	
S.A.H.	Inlet	Valve Opens 45 degrees B.T.D.C.	
MODIFIED	Inlet	Valve Closes 70 degrees A.B.D.C.	Lift .050
CAMSHAFT	Exhaust	Valve Opens 70 degrees B.B.D.C.	Extra
(STAGE II)	Exhaust	Valve Closes 45 degrees A.T.D.C.	

Supplied in exchange for your old camshaft or can be bought outright.

KENLOWE
"THERMOMATIC" ENGINE COOLING FAN

- ELIMINATES UNNECESSARY POWER LOSS WASTED BY DRIVING CONVENTIONAL FAN
- REDUCES FUEL CONSUMPTION
- FULLY AUTOMATIC
- CUTS OUT FAN NOISE
- REQUIRES NO MAINTENANCE
- TEMPERATURE SETTING AVAILABLE FOR ALL OPERATING CONDITIONS
- DOUBLES THE LIFE OF YOUR FAN BELT
- 12 MONTHS WRITTEN GUARANTEE



Kenlowe Installation on a Triumph Herald with the fan mounted as a "pusher"

EEF/4/TH.
Triumph Herald 948cc.

EEF/4.
Triumph Herald 1200cc.
" " 1250cc.
" TR/2.TR/3.TR/4.

EEF/3/TV.
Triumph Vitesse.

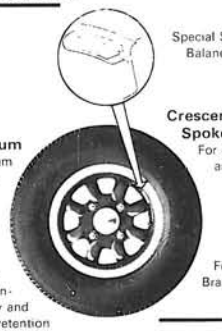
EEF/4 Major.
Triumph 2000.

Complete Kits include:
Thermal Control Hose Adaptor.
Dash Indicator Light and Manual Control.
There is a Kenlowe Fan for every car in the world.

"Minilite" **Magnesium** Wheels

Manufactured by : Tech Del Ltd
Distributed by : S.A.H. Ltd

Reduce that "un-sprung weight" by fitting these High-Quality Engineered **Magnesium** Wheels, and at the same time give YOUR car that Elegant High-Bred Sports Car Appearance.



Special Safety "Minilite" Balance Weights

Crescent Section Spokes
For optimum strength and elegant appearance

Large Spoke Ducts
For increased Brake Cooling

Cast Magnesium
For maximum strength with minimum weight

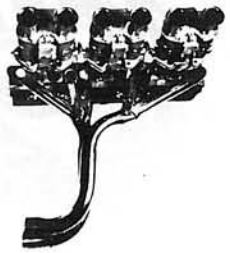
Unique Rim Design
For cornering control, Tyre rigidity and balance-weight retention

Magnesium Alloy Wheels
give the advantage of :-
quarter the weight of steel. Two thirds weight of aluminium.
static and dynamic properties, superior cheap aluminium wheels, pressed steel wire-wheels. **Twice** the strength-to-ght ratio of mild steel and extremely ent.

p.t.o.

EXTRACTOR EXHAUST MANIFOLD
for
VITESSE or TRIUMPH 2000

16 bhp



16 bhp

This Special High-efficiency Extractor type Exhaust Manifold with its "Y" section coupling piece, enables it to be installed with either the Standard or Special "SAH" Silencer Tail-pipe Units on the Triumph 2000 or, in the case of the Vitesse - with the Standard Silencer Tail-pipe assemblies (please state which model and application when ordering).

Greater Acceleration - Increased Top Speed

By using this manifold together with our Special Silencer and Large-bore Tail-pipe Units on the 2000 - an increase of 16 bhp and 8-10 mph.

INCREASE is obtained **on an otherwise standard engine (11 bhp at the rear wheels).**

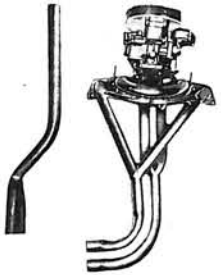
This power output can be further increased with this Manifold when used in conjunction with our other basic Engine Conversions, such as the Gas-flowed Cylinder Head, Camshaft, etc. and Special Carburettor Kits.

Improved Fuel Consumption - Maximum Performance

This Light-weight Fabricated Manifold is supplied in a bright Nickel-plate finish.

Standard or Special Inlet Manifolds can be used in conjunction with this Exhaust System.

S.A.H.
4-branch
Combined Exhaust/Inlet
MANIFOLD
Conversion
for the Solex
Automatic Twin
Carburettor



This high efficiency Manifold conversion kit has been developed, in collaboration with Messrs Solex Ltd., to adapt their latest model performance carburettor for use with the Triumph Spitfire, all Herald models and the Bond Equipe G.T. This kit is ONLY available through S.A.H. Accessories Ltd. who have been appointed sole Distributors.

The Manifold used in conjunction with the " two-carburettors-in-one " Automatic Twin unit by Solex gives vastly improved flexibility, acceleration and " top-end " performance coupled with economy. It gives a power increase of 11 b.h.p. when fitted to the Triumph Herald.

The Manifold is supplied, in attractive heat-resisting Bright-Nickel Plated finish, with Y section for coupling the two downpipes to the existing standard tail-pipe/silencer. For maximum performance our Special Twin-Tail Pipe Silencer Unit is recommended.

The Carburettor is supplied ready for fitting with correct settings, linkage and controls, etc., and no alteration to the normal choke or throttle cable are necessary. A special " pancake " type Air-Filter is available (see price list).

Easily installed by any average owner/handyman—please state model when ordering—or fitted at our works by appointment.

ADDITIONAL INSTRUMENTS by Smiths

Electric TACHOMETER
2 in Diameter Electric or Clockwork CLOCKS

Oil Temperature GAUGE

Oil Pressure GAUGE

Ammeter Gauge KIT

Water Temperature GAUGE

Engine Performance Gauge KIT
Combined Oil Pressure & Water Temp. GAUGE

S.A.H.
COMPETITION
BUCKET SEAT

available with 10°, 17° or 32° rake

additional variation of angle can be obtained from the mounting frame.

LIGHT-WEIGHT GLASS FIBRE

(Approx. 10 lbs. lighter than the Stand

A strongly made and well designed Competition trimmed in special high-flexing and hard-wearin P.V.C.

(other colours to order)

Extremely comfortable, due to its luxuriously padde and good design, giving maximum support to the ba on the hips.

Will fit direct to existing runners on most makes

Special mounting frames are available for direc T.R.2/3, T.R. 4, Spitfire, Herald or Vitesse.

SILENCERS

with Twin Chrome-Plated Tail Pipes

FOR THE

HERALD 948, 1200, 12 50

VITESSE, SPITFIRE or BOND EQUIPE G.T.

Special high efficiency " straight-through " type Silencer with heavily chrome-plated twin tail pipes which will improve the rear end appearance of your car and at the same time increase the efficiency of the exhaust system.

This highly attractive unit is finished in bright Red enamel and can be used as a replacement for the standard tail-end silencer fitted to the Herald 948, 1200 12 50; Vitesse; Spitfire or Bond Equipe G.T. It considerably reduces the back pressure that exists on the standard single tail pipe silencer.

Easily fitted—simply remove the existing unit and bolt-on the new " S.A.H." high efficiency unit.

TUNING

FOR A LITTLE MORE "UHR580J"

John Green

As with not a few of us, John's ambition is to take to the sky in a Spitfire fighter aeroplane but as a short term alternative, he relays how you might make the more down to earth variety really fly.

My wife Sandra and I acquired UHR 580J in October 1979 before we married and began our family. UHRJ was in very good condition bodywise, but close examination revealed that it looked like a major crash repair with tub, chassis, engine and badly fitted bonnet all from different sources.

Sandra used the car until 1982 when our first born, Simon, arrived and from then on it has been used by myself on a daily basis (=60,000 miles).

The car was an impractical rattle-trap, like all Spitfires (keep your head down from now on John! -ED), but it was FUN and enabled me to continue as an "open-topping" fanatic which I became in May 1979 with an old MKII, LKB701E which I restored in one week as a quick "filler and spray" job for the summer.

My main complaint about YHRJ was the sheer lack of it! 0-60 in 14.6 seconds was positively "one legged cow" standard and certainly not sporty, as even our "family car", then a 1600GT MKI Capri, could manage the same 0-60 sprint in 12.6 seconds.

Over the last few years I have set about gradually adding simple go-faster mods as, although I am actually a very sedate "country lanes" driver, I do like to get a little kick in the back for sheer exhilaration.

This article lists the mods carried out, together with performance figures obtained, and makes some attempt to quantify what each mod contributes, starting with a 0-60 of 14.6 seconds for the 61 BHP 1300cc engine.
The speedo was checked as 8% high against the 100 metre motorway posts, so 60 mph was actually 64.5 indicated.

(John achieved his ambition on 11/8/88)

MODIFICATION 1– Air Filters

I was frequently told by many sources to "throw away that air filter and fit a couple of pancakes".

A pair of Speedograph air filters - chrome with wire mesh and foam sponge were duly fitted and this required some enrichment of the mixture which was achieved by unwinding the jet nuts by 4 flats (2/3 turn each), thinking in ignorance that this would effect a satisfactory result throughout the range.

The net result was a noticeable improvement in acceleration (and carburetter "roar") despite the mixture being far too lean at the top end and I would estimate half a second saved on the 0-60, which for an outlay of £7, was very good.

In this condition, running far too lean, the car returned 41 mpg for the next 5 years, with no damage to the valves and seats.

MODIFICATION 2 - Exhaust

Ever since my six months with the old MKII, I had missed that healthy roar - after all it was infinitely preferable to transmission whine and "rattles".

A Peco Big Bore TBB11 was the answer and as soon as I had seen (and heard) one on another Spitfire I simply had to have one.

Another half second off the 0-60 and didn't it sound good! They also last 3 years instead of 2 and so are very good value at £30.

MODIFICATION 3 - Janspeed 4 Branch Manifold

Initially I tried modifying a MKII 4 Branch to suit the inlet manifold and porting holes on the MK4 head, but this was a dismal failure - 2 seconds added to the 0-60! - well the pipes were far too small according to Janspeed and my porting didn't line up very well either so investing £60 odd on a Janspeed 4:2:1 manifold was the only way to find out.

My manifold, supplied by Autotech in Harlow, arrived WITHOUT a Janspeed label - and we are always warned to look for the label - so was it really a Janspeed or not? ("well mate, thats how it came").

Well, it did give a slight improvement in the mid-range power and knocked off another half-second but, on reflection, I felt disappointed and that I had not really got my £60. worth, so I wouldn't recommend it BUT was it really a Janspeed or not?

The 0-60 was now down to close to 13 seconds, with an estimated 66 BHP and the engine very much in need of enrichment at the high end.

MODIFICATION 4 - Richer Needles

By sheer good fortune, a friend had fitted speedograph filters to his wife's 1500 and been told by the "tune up man" that it was not possible to set the mixture up correctly other than at tick over (which I had done). The high end was far too lean.

I had clearly overlooked this on my own Spitfire and decided that rich needles were needed.

I had no idea where to obtain the needles, or even what profile was needed but, as usual (being an engineer), unable to resist some experimentation, I decided that since I would have to buy new needles anyway, I might as well try some re-profiling on the old ones, using a fine grade oilstone and emery paper (!!) - cringe cringe!!

I took care to profile the needles progressively towards the tip so as to give more high end enrichment and initially worked for about 10 minutes on each needle rubbing down, although not much metal was visibly removed.

The result was quite staggering - I had casually reprofiled the needles one Saturday afternoon and forgotten about it. The following Monday morning the car seemed to be rocket powered, and I then remembered what I had done. The car had developed a hitherto unknown "surge" of power and the new 0-60 was 11.7 seconds, an improvement of 1.3 seconds, but the fuel consumption fell to 33 mpg. This was subsequently restored to 37 mpg by re-setting the jets at tick over, with no loss of high end performance. This modification had been successful because all the other modifications to make it effective had already been done. However, I was lucky to get the profiling roughly right by such a hit and miss method and I would advise others to stick to proprietary needles of suitable profile.

MODIFICATION 5 - High Lift Camshaft

Well, having got this far I just couldn't resist trying a highlift camshaft, especially as my engine FH62375HE used the "Tame" 61BHP camshaft (not the earlier 63BHP camshaft as used on MKIII and MKIV up to FH25000HE.

I hoped to recover this 2BHP and add a further 6BHP by this modification which I estimated would reduce the 0-60 from 11.7 to 10.5 seconds.

The KENT TH2 camshaft was ordered and owing to a mistake in the Haynes Manual I ordered the small journal size, which was duly posted back to exchange for the large journal size.

The Royal Mail parcels duly lived up to their motto

of "Test our Strength" by BREAKING IT! - now how on earth do you break a CAMSHAFT?!

After much aggravation I failed to obtain compensation for the broken camshaft and had to pay again for the replacement.

Even more aggravation ensued in fitting when the ignition timing ended up 25° advanced (one tooth out!) and then my head gasket (papier mache and wire mesh "Klinger" variety) blew - DON'T USE ANYTHING OTHER THAN A B.L.GASKET!

After much rebuilding, retiming and gnashing of teeth and wallet, a measly improvement of 0.25 seconds was obtained for all my trouble and expense. A additional 0.25 seconds improvement was then obtained from further high end needle profiling making a grand total of 0.5 seconds vaguely attributable to the camshaft.

Most of the extra power (about 5BHP estimated) was obtained between 5000 & 6000 rpm and the tractability was slightly degraded at 2000 rpm. The tick-over was absolutely abominable and has to be set to at least 1500 rpm to prevent cutout at road junctions. (I now know why Boy Racers blip their throttles at junctions!)

So we were now down to 11.2 seconds (and up to 74 BHP) - which will just match a 1600 Cavalier to 60.

Incidentally the MKIII 75BHP engine power was quoted in S.A.E. units and the early MKIV 63 BHP in DIN (a figure which includes fitted engine ancillaries which are omitted when finding the former figure -ED) and I am told these powers are equivalent, and as far as I can tell the MKIII engine and early MKIV engine differed only in crankshaft journal size but had identical bore, stroke, valves etc.

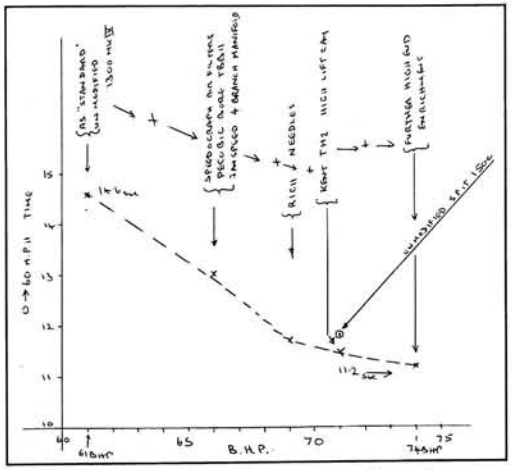
Any further modifications would, I feel, render the car unsuitable for road use so no further tuning is planned however, the power had been increased by 21% with a 37 mpg fuel consumption figure.

My recommendations would be to carry out all the cheap and easy mods:-

Fit: Speedograph Air Filters
Rich Needles
Pec Big Bore Exhaust Box TBB11.

These modifications should knock approximately 2 seconds off the 0-60 time at a cost of £50, less the cost of a standard rear box replacement.

The performance graph shown gives a summary of the progress of modifications. Note how it starts to level off as the performance improves - i.e. as power



Plot of improved performance achieved versus modifications made; Triumph Spitfire Mk.IV

and performance increases, additional expenditure gives relatively less improvement, or in other words, the search for further improvement is met by the law of diminishing returns.

Measurements were not merely 0-60 stopwatch timings (64.5mph indicated with 8% high speedo) but also increase in speed of around 30 - 60 mph over the same marked distance with the acceleration improvement calculated from equations of motion.

$v^2 = u^2 + 2as$ where v^2 = final speed squared
$u2$ = initial speed squared
s = distance (constant)
a = acceleration (relative)

Improvements in BHP are then calculated from:

Force = Mass x Acceleration

Where the Force is analogous to the BHP and Mass is constant.

WHAT NEXT?

With the Spitfire getting a bit long in the tooth and having been re-renovated by me for the third time I decided to retire it to summer use - well it's not the ideal winter car and I want to preserve it forever - so the problem was what could I possibly drive which would vaguely approach the FUN of a Spitfire?

Well the answer came when we were offered a "cheap" (relatively of course), engine fire damaged, insurance write off Porsche 924 (with full targa sunroof) which I have duly restored. But that's another story, of no interest to Triumph owners, other than to say that in its rear window is a black and silver sticker which proudly states

"My other car is a Spitfire".

A Day at the Races

Bernard Robinson
Pictures: Bill Sunderland
Pete Williams

Empty B roads stretching out invitingly before us, our small convoy of GT6s propelled its way to Mallory Park circuit. Did we all enjoy our drive? Well perhaps you can explain why on our arrival everybody unloaded from their cars with a big grin spread from ear to ear. As usual, the trip to the track was disected in detail over a coffee with growing excitement as to what the day would hold. If the adrenalin level could be so raised in cars of 'standard' specification just what would the RACE hold for us!

Making our way to the best vantage point, we were greeted by the sound and smell of engines and cars slipped from the leash. Where to stand? The Hairpin; Devil's Elbow; The S's? Wherever you move to on a race circuit there're cars screaming for your attention in every direction with groups of people pointing and shouting looking for all the world like the Lands End signpost with arms raised to all points on the compass.

Vitesses, Spitfires...

The Tannoy crackled, 'PRACTICE 7 for the Triumphtune and TR Drivers Challenge', and one by one the gladiators appeared. TR5s and 6s, GT6s, Vitesses and Spitfires. All intent on gaining a good lap time to give them the best position on the grid for the race itself still to come. By this time we had all gathered at the 'Elbow' and once in position we ourselves duly started pointing and shouting excitedly,

'Tony!'
'Kevin's on song!'
'Here comes Gareth!'
'Nice one Eddie!'
'!!!!!!!'.

The last exclamation wasn't in recognition of a particular driver but to the cloud of smoke and tyre screams issuing from Dave Lancaster's nicely prepared red MK.3 Spitfire which was spinning out and side swiping the armco around the S's: the event accompanied by much arm waving and pointing with instant expert advice as to why this had occured, none of which turned out to be true. The added excitement continued untill all were assured that the driver was alright.

more Spitfires and GT6 assemble in the pits

Attention was then quickly brought fully back to the track as Gareth Thomas' 'Animal' Vitesse exited the hairpin and, seemingly right on cue, proceeded to dump its unique three box rear exhaust system right at our feet!

The smooth muscles of the TRs flexed easily into pole position but Kevin Ginger's mid engined GT6 kept the flag flying by joining them in the front of the grid being confirmed, after practice times were announced, to be second overall -shown in the practice-times table given below.

PRACTICE TIMES

Pos	No.	Cl	Driver	Car	Time	MPH	Km/H
1	36	B	Richard Morrant	Triumph TR6	0:58.7	82.79	133.20
2	38	6M	Kevin Ginger	Triumph GT6	0:59.5	81.68	131.41
3	8	B	John Ellis	Triumph TR5	1:0.3	80.59	129.67
4	3	4M	Eddie Wilkins	Triumph Spitfire Mk.4	1:0.7	80.06	128.81
5	1	B	Steve Clare	Triumph TR6	1:0.9	79.80	128.39
6	6	6M	Tony Lindsey-Dean	Triumph Vitesse	1:1.2	79.41	127.76
7	16	B	Peter Baker	Triumph TR6	1:2.2	78.13	125.71
8	17	B	Dave Wheeler	Triumph TR6	1:2.2	78.13	125.71
9	68	6M	Ian Nash	Triumph Vitesse	1:3.3	76.77	123.52
10	10	4M	David Lancaster	Triumph Spitfire Mk.3	1:6.8	72.75	117.05
11	11	4M	Nick Bishop	Triumph Spitfire	1:7.0	72.53	116.70
12	5	4M	Chris Smith	Triumph Spitfire	1:7.7	71.78	115.49
13	7	6M	Gareth Thomas	Triumph Vitesse Mk.2	1:10.0	69.42	111.70
14	22	4A	Stefan Antolik	Triumph Spitfire	1:14.3	65.41	105.23
15	43	4M	Jon Low	Triumph Spitfire Mk.2	1:19.6	61.05	98.23

Time to return to the pits but not before Gareth reclaimed his exhaust system from the marshalls stationed at the Elbow who were displaying his trophy only minutes before.

Now, think 'Murray Walker' and some jangly guitar music and the lap board with 'Pit Bits' on it. Got it? OK, here we go.....

YPF 743G, Spit Mk.3, Driver Dave Lancaster, Mechanic Raphael Able: Spun out. The real reason... Oil cooler feed pipe came adrift giving sudden lack of adhesion to rear wheels with engine revving to 7000rpm at the time. Minor body damage.

Inspecting the end of an exhaust pipe really gets the converstation going

AWP 336M, Spit Mk.IV, Driver Nick Bishop, Mechanic Pete Culver: Motor came apart along with the rocker shaft securing screw vibrating loose after retiring with a windscreen full of oil after following Dave Lancaster.

EXD 171J, Vitesse Mk.2 Convertible, Driver Tony Lindsey-Dean, Mechanic: Tony seemed to be doing that for everybody else. He was going very well when a foreign object committed suicide going through his car's radiator.

XKY778M, GT6 Mk.3, Driver Kevin Ginger, Mechanic: When asked, Kevin was brazing a fellow competitor's exhaust manifold - guess who's! Small oil leak but put up second fastest time.

OPL 8E, Vitesse, Driver Ian Nash: No problems

ALP 193S Spit 1500, Driver Chris Smith: No problems

RMV 638H 'Animal', Driver Gareth Thomas, Pit Team Jon Low and team: Lost rear section of exhaust due to hanger snapping. Picked up puncture plus lack of power due to faulty alternator connection

22 Spit Mk.3, Driver Stefan Antolik: No real problems

43 Spit Mk.3, Driver Jon Low: His words,'Most expensive piece of equipment on this car is the tyres. Choice of engine?, the one with no worms in it'.

CVC 872K, Spit Mk.IV, Driver Eddie Wilkins, Mechanic father: Clean drive with no problems

So, there you have it, just wait a sec while I go off for a burger before the race report...

David Lancaster's beautifully prepared Spitfire

Adding a pinch of salt to the culinary art of a cooking engine

A very shy 6-Cylinder engine trying hard to hide beneath the front bulkhead

Tony Lindsey-Dean practising stimulated accupuncture on a weeping radiator core

Gleaming Rockers. Note direct oil pipe to rocker shaft oil feed line -bottom right.

Feeding a 20 foot long pipe back into a 12 foot car can be an exhausting business

Breathing Space

Stefan Antolic...

...and some of the rest of the gang. All show a great comaraderie throughout the day though highly competitive on the track: everyone going out to beat each other and their own previous bests.

THE RACE

Waiting for the OFF!

As expected, the grid lined up with the big TRs fronting, although the lone GT6 of Kevin Ginger in second place was a warming sight - that even the commentator recognised by remembering how Kevin had led and won at a previous meet.

Green light on and everyone watching leapt to their feet. We had taken up station at 'The Elbow', where you can see at least 90% of the action. The TRs and GT6 seemed to stroll away, quickly followed by a hornets's nest of other angry Triumphs roaring up behind. I'm afraid that far from watching the lead cars, my attention was grabbed by the way 'our' cars were pushing themselves, seemingly to the limits of performance, bodies rolling away to the point of lifting, but the power under the right foot dragging them down and through the bends. If, like me, you use one of these cars daily and you watch a 'power' struggle like this, you would probably think that your car would be competitive -forget it!

The race provides fast, close action. Eddie Wilkins leading Tony Lindsey-Dean and Kevin Ginger

Ian Nash powers his fantastic sounding Vitesse with TR alongside

These guys really move and they want to WIN -not giving an inch at all if possible, Sadly reflected by the early retirement of Tony Dean's Vitesse which received a nudge from behind, literally putting him out to pasture.

Kevin too came in early after losing his gearstick but not before showing how competitive a 'sorted' GT6 can be (his car is virtually mid-engined, an alarming sight when first the bonnet is lifted). The big TR on its own now, its companion, chewing the cud with the Vitesse.

I now concentrated on the 'TSSC Challenge', 'Animal' Thomas and Eddie Wilkins setting the pace.

The Wilkins' Spitfire handles superbly, so smoothly, in fact the power difference between the two seems to be swallowed up. Although a lot must be said for sheer driver determination too, the Vitesse to my eye wasn't as tight in the corners but obviously given its head in the straights would power ahead and thus could keep the racing line.

A momentary distraction from this struggle as Dave Lancaster's Spitfire, with an horrendous squeal of brakes, spun out in The Elbow, down over the bank and sideways with a thump into the tyres in the pit lane. This car was immaculate before the start of the days' racing and now had damaged doors to add to the smashed front spoiler collected in practice. Checking the driver was OK, I returned to the race proper. It was still Vit vs Spit. Although the Spit's bonnet was proving it's ability to keep up, it wasn't quite able to squeeze through the gaps being left by the Vitesse, whose only vulnerable point was it's roll-out in the hair-pin. Contact was, I suppose, inevitable, as obviously both these guys wanted to win 'our' class and were doing what we had come to see: MOTOR RACING.

At the finish, the chequered flag came down to the TR, with Gareth second and Eddie third. A special mention here to Stefan Antolik who, with virtually a bog-standard car, set the fastest lap in his class. And now to the official verdict:

RACE RESULTS

MID CHESHIRE-MALLORY

Date: 30-11-88
Start: 16:19
Results Issued: 16:38
...Motorsports Timing

Pos	No.	Cl	Driver	Car	Laps	Time	MPH	Km/H	Best	MPH
1	36	B	Richard Morrant	Triumph TR6	15	14:57.2	81.25	130.72	0:59.1	82.23
2	8	B	John Ellis	Triumph TR5	15	14:58.2	81.16	130.58	0:58.6	82.93
3	7	6M	Gareth Thomas	Triumph Vitesse Mk.2	15	15:41.3	77.44	124.60	1:0.3	80.59
4	3	4M	Eddie Wilkins	Triumph Spitfire Mk.4	15	15:46.9	76.98	123.86	1:0.6	80.19
5	68	6M	Ian Nash	Triumph Vitesse	14	15:16.0	74.27	119.50	1:1.8	78.64
6	11	4M	Nick Bishop	Triumph Spitfire	14	15:31.5	73.04	117.51	1:4.7	75.11
7	5	4M	Chris Smith	Triumph Spitfire	14	15:58.0	71.02	114.26	1:6.0	73.63
8	22	4A	Stefan Antolic	Triumph Spitfire	13	15:54.5	66.19	106.49	1:11.7	67.78
9	43	4M	Jon Low	Triumph Spitfire Mk.2	12	15:20.3	63.37	101.95	1:15.2	64.62

Not Classified

16	B	Peter Baker	Triumph TR6	9	DNF			1:0.9	79.80
66	6M	Tony Lindsey-Dean	Triumph Vitesse	9	DNF			1:0.5	80.33
17	B	Dave Wheeler	Triumph TR6	5	DNF			1:2.0	78.38
38	6M	Kevin Ginger	Triumph GT6	4	DNF			1:0.4	80.46
19	4M	David Lancaster	Triumph Spitfire	1	DNF			1:17.2	62.95

Fastest Laps

8	B	John Ellis	Triumph TR5	0:58.6	82.93	133.43
7	6M	Gareth Thomas	Triumph Vitesse Mk.2	1:0.3	80.59	129.67
3	4M	Eddie Wilkins	Triumph Spitfire Mk.4	1:0.6	80.19	129.03
22	4A	Stefan Antolik	Triumph Spitfire	1:11.7	67.78	109.06

Incidents:

16.22	Car 10 spun (Post 11) hit tyre wall and retired. Straight tow
16.24	Car 68 spun (Post 8), continued
16.25	Cars 3 and 7 touched, both continued
16.30	Cars 66 and 3 touched (Post 5)
16.30	Car 15 off circuit (Post 6), spun, hit barrier. Straight tow
16.31	Cars 3 and 7 touched, both continued (Post 10)

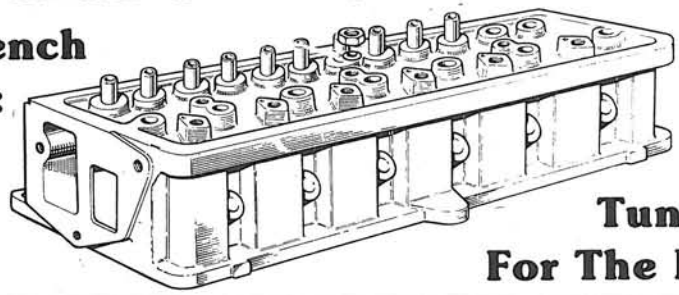
We joined with the drivers and gave our congratulations and comiserations. I must say, I didn't enjoy seeing cars damaged but the drivers sorted that out for themselves in a gentlemanly way and no comment is needed by me as, in the end, it's their cars and their choice and you can bet that they'll be back.

Finally, as a total spectator, I did enjoy the day and would thoroughly recommend any member to attend as obviously you can identify immediately with the machines involved and who knows, maybe one day, I'll be watching you at a...

'Day at the Races'.

Cylinder Head to Head

Flow Bench Testing: Tuning For The Eighties



Tony Lindsey-Dean dons his Kingston SportsCars hat and gives of his experiences in developing improved cylinder heads for high performance Triumphs.

For many years, the accepted modification to a cylinder head for achieving improved performance has been porting and polishing. In basic theory, smoothing out the rough edges in the casting and making the ports the same size as the manifold gasket, followed by polishing was the route to greater efficiency: the rule being that increased power output is directly related to improved efficiency ie. greater air flow.

Nearly all over-the-counter modified heads, regardless of 'stage' are made to the above concept. It is only when the facility of expensive flow bench testing equipment is used that the theory and practices of cylinder head modification can be evaluated: results we have obtained are quite startling. Whereas most ported-and-polished heads can be seen to make improvements in air flow compared to standard heads, a few do not.

Standard Triumph cast iron cylinder heads such as TR3/4, 1300/1500 and 2000/2500Mk.II flow very well in the region of 75-77 cubic feet per minute. Polishing provides only one function, which is to impress the customer. It has been traditional over the last twenty years for over-the-counter modified cylinder heads to be highly polished. This polishing is probably the most expensive part of a modified head. It actually provides little or no gain whatsoever and in many cases robs extra horse power by reducing swirl and atomisation.

"Polishing provides only one function, to impress the customer"

Improvements to the flow of a cylinder head must be considered in stages: first the inlet tract, then chamber shape and then finally the exhaust tract. The air flow into the cylinder head during the first half of the inlet valve's total lift is controlled by the valve and seating area. At greater lifts, the valve shape is important but the shape and dimension of the inlet tract becomes most significant.

By finding the maximum flow rate of an inlet tract, one is in the position to select a cam profile which is most suited to the flow of a particular head. A cam of very high lift which exceeds the flow capability of the inlet tract wastes energy and wears the valve train unnecessarily. The power curve can then be determined by the timing of the inlet cycle in relationship to the exhaust cycle.

The exhaust port, valve and seat do not have

to perform to the same standard as the inlet tract as the piston is pushing the gases out with considerable force. However, consideration of exhaust tract flow modifications shows the requirement for a greater than 70 per cent flow rate factor as compared with the inlet, as exhaust tract flow rates below this will hamper total potential power output. A good extractor manifold with efficient scavenger properties will greatly help exhaust flow and also enable the use of longer duration camshaft timings without the poor idle, hot running cylinder heads and poor tractibility often experiecnced with inefficient manifolds. Fortunately, 4-cylinder Triumphs have good systems available, however, 6-cylinder models have not been so fortunate until more recent times. Below is a picture of the system we prefer. The pipe configuration shown provides mid-range exhaust scavenging lost to alternative 'six unjoined' exctractor systems.

The main lessons to be learnt are that a modified cylinder head of the 'port-and-polish' type will, in general, only give a fraction of the true potential flow. Only a design developed, modified and tested on a flow bench will give race winning output. Furthermore, the choice of camshaft lift should be governed by the flow potential of the cylinder head being used. The finish on the port surfaces is best left unpolished. Particular attention is required in matching the flow rates of the inlet and exhaust manifolds to the modified cylinder head.

"Only a design developed, modified and tested on a flow bench will give race winning output"

Compression ratio again should be governed by the choice of camshaft. Long duration cams require higher compression ratios to perform at their best. Most engine tuners supply camshafts that have been adapted from other profiles. Kent Cams is fairly typical, supplying many 'Triumph' cams which were originally designed for other makes and types of engine. This does not present any major problem provided that the cam is chosen to suit the flow characteristics of the cylinder head.

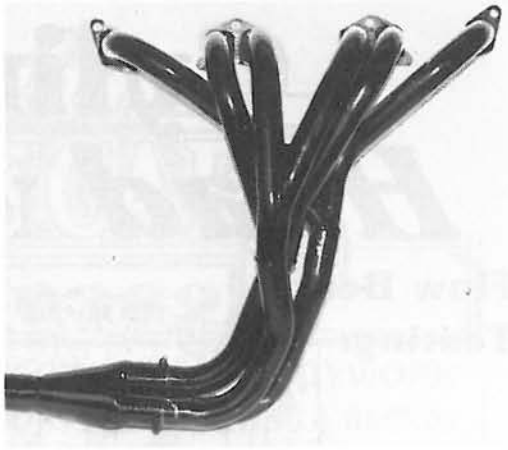


Fig.1
Prefered design of 6-Cylinder Extractor Exhaust Manifold

The size of the inlet port and tract must be carefully modified. A larger port appears to be more capable of passing more gas (just as a large water pipe will carry more volume than a smaller one). However, with an engine, volume is not the whole story. Gas speed is just as important.

"Gas Speed provides the key to good torque"

A smaller port and tract will produce greater gas speed than a larger one. A higher value helps the filling of the cylinder head and is more efficeient than the slower more volumous flow derived from a larger port.

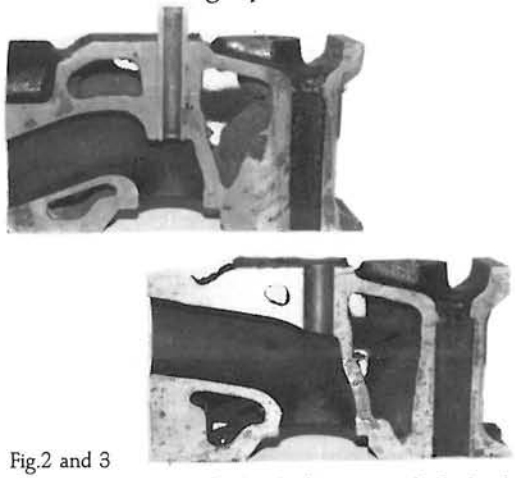


Fig.2 and 3
Cross sectioned ports of a 6-Cylinder engine cylinder head

Good gas speed in a cylinder head produces torque and it has been our experience that poorly modified cylinder heads and induction tracts can cause pinking as result of poor torque characrteristics directly resulting from slow gas speed. The modifications achieved at Kingston SportsCars with the data from the flow bence tests (see graphical comparisons) have produced the best gas speed over the whole port area, eliminating pinking even with 4 star petrol with high compression heads. Also with the improved torque derived from the increased gas speed, the use of ultra light alloy flywheelss has improved throttle response with no reduced low RPM performance or poor tickover.

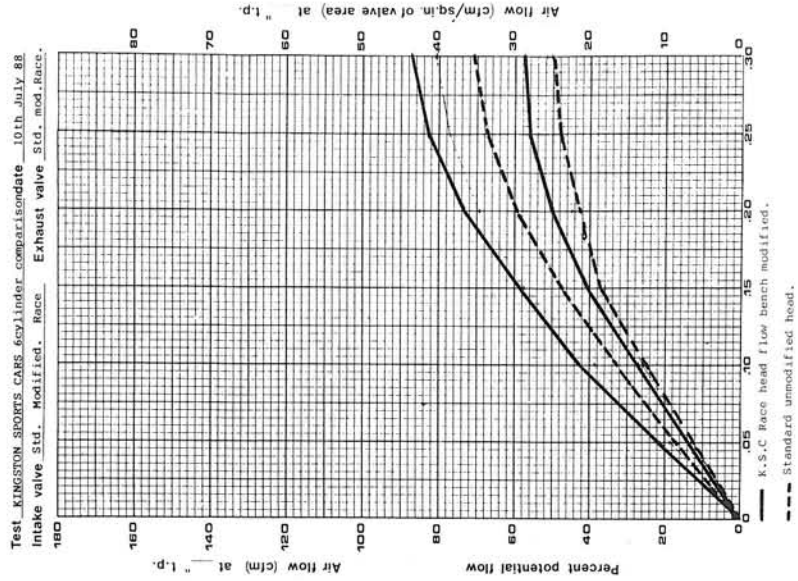


Fig.5
Comparison of flows between standard, modified and flow bench modified race 6-Cylinder engine cylinder heads

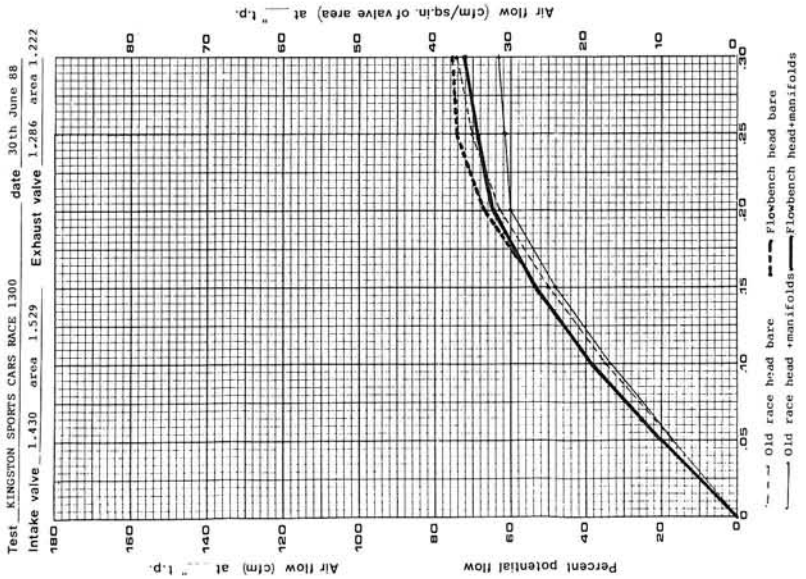
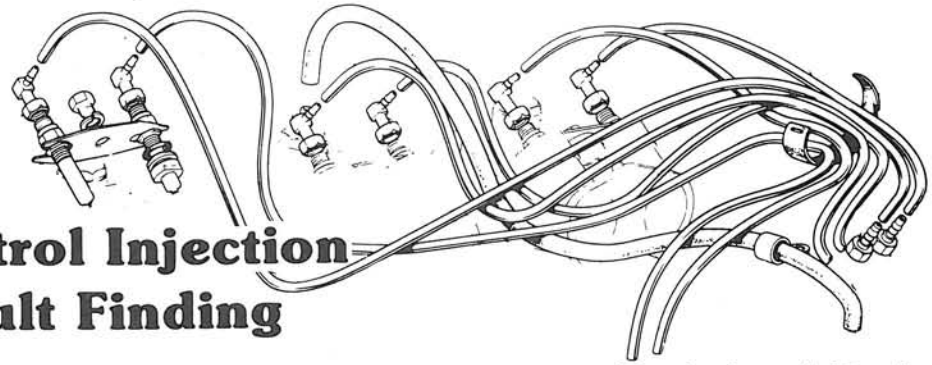
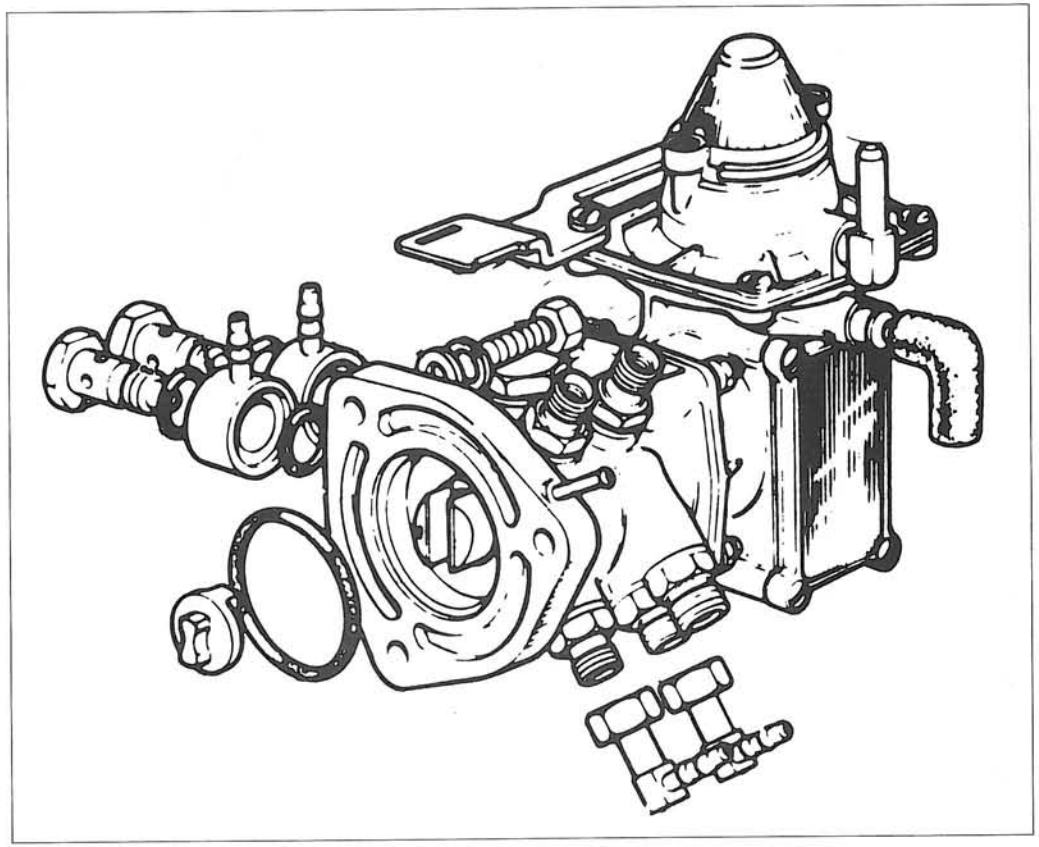


Fig.4
Comparison between a good quality 1300 cylinder head race modified and manifolds/carbs showing a large drop off in flow performance when manifolds fitted. This then further compared with a flow bench modified head with and without manifold/carbs showing the flow bench modified head with manifold flows almost as well as the old type head bare.



Petrol Injection Fault Finding

Fuel injection systems seem to aquire a certain mystique and that they're unreliable, when in fact a properly sorted system should case few problems, and that anything that does go wrong is almost by definition likely to be expensive to rectify. I've certainly read a few reports of even so called experts advising that say the 'injertors' or 'the pump' need changing when in fact the trouble was actually elswhere. Whilst not in any way being knowledgeable on the subject myself, I thought the chart published by British Leyland on Triumph Petrol Injection Systems faults diagnosis was well worthy of reproduction here.



Issued by British Leyland Motor Corporation Group Sales and Service Training centre.

WILL NOT START COLD
WILL NOT START HOT
IDLING ERRATIC
MISFIRE
LACK OF RESPONSE
ENGINE CUTTING OUT
EXCESSIVE FUEL CONSUMPTION
LEAK FROM METERING UNIT CONTROL COVER

EQUIPMENT REQUIRED

1. Pressure Gauge, 0–120 p.s.i.
2. Ampmeter, 0–10 amps., and Voltmeter, 0–20 Volts.
3. 'T' piece with $\frac{3}{8}$ B.S.P. fine male and female connections. (Pressure gauge take-off to suit your own 0–120 p.s.i. gauge.)
4. 10 feet of twin cable 28/012. (2 nipples soldered on one end of cable. Cable connector for connection in series to pump.)

SYMPTOM								CAUSE	CURE
✲	✲							1. No fuel in tank	1. Check fuel level
✲	✲							2. Low battery condition	2. Check condition of battery
✲	✲							3. Ensure inertia switch on	3. Ensure inertia switch in off position
✲								4. Excess fuel lever not operating	4. Check operation over full range
	✲	✲	✲	✲		✲		5. Excess fuel lever not returning	5. Check operation of excess fuel lever
		✲	✲					6. Fuel leaks at injectors & metering unit connections	6. Check for damaged seals and/or loose connections
					✲			7. Blocked tank breather	7. Remove blockage
			✲					8. Cut-out type rotor arm fitted	8. Replace for T. 2000 type
		✲						9. Idle speed too low	9. Set at 850 r.p.m.
✲	✲	✲	✲	✲	✲	✲		10. Ignition and starter system	10. Check working of ignition and starter system
								11. Fuel leaks	11. Check all fuel connections
✲	✲			✲	✲			12. Line pressure i.e. 100/110 p.s.i.	12. See Special Note (12)
✲	✲							13. Poor compressions	13. Check compressions
		✲	✲					14. Butterflies not closed	14. Synchronize butterflies
					✲			15. Fuel starvation	15. S.I.S. 1/157 and 1/161
				✲			✲	16. Metering unit timing	16. See Special Note (16)
✲	✲							17. Fuel pump not working	17. See Special Note (17)
				✲		✲	✲	18. Blocked drain 'A' pipe	18. See Special Note (18)
						✲		19. Fuel from pump drain	19. S.I.S. 1/157 and 1/161
		✲	✲	✲		✲		20. Air leaks	20. See Special Note (20)
		✲	✲					21. Not injecting on one or more cylinders	21. See Special Note (21)
		✲	✲	✲		✲		22. Poor engine tune	22. Tune engine
✲	✲							23. Ensure injection is taking place	23. See Special Note (23)

Petrol Injection System

SPECIAL NOTES

Items 12, 16, 17, 18, 20, 21, and 23 on the check list are not self-explanatory and a further breakdown is required, the information being given below.

12. Line pressure i.e. 100/110 p.s.i. (refer to Distributor if no gauge available).
    - i. **Constant low pressure:**
      (*a*) Partial obstruction in fuel line. (*b*) Relief valve setting. (*c*) Fuel pump inefficient.
      A fault with section (*c*) will be indicated by current consumption, and this should not exceed 5·5 amps. A high reading indicates a tight pump or stalled motor or short-circuit armature windings.
    - ii. **Constant high pressure:**
      (*a*) Relief valve setting or inoperative. (*b*) Relief valve jammed due to overtightening (see S.I.S. 1/166).
    - iii. **Intermittent low pressure on test causing cut-out of engine:**
      (*a*) Vehicles requiring S.I.S. 1/157: 2·5 P.I. or 1/161: TR6. (*b*) If fully modified, intermittent blockage of fuel line inclusive of filter should be investigated, i.e. foreign matter.
    - iv. **No pressure due to petrol vaporization:**
      Normally associated with difficult starting, S.I.S. 1/166 should be referred to, i.e. Fuel Relief Valve.
      NOTE: It is essential to reassemble the valve and strainer body section to a tightness torque of 20–25 lb. ft. MAXIMUM.
16. Metering unit timing.
    Ensure that the engine is set at No. 1 and 6 T.D.C. No. 1 cylinder firing.
    NOTE: Removal of the No. 6 outlet adaptor will show the rotor hole at the START of its injection position. If FULL hole is observed, change timing by one tooth on the pinion gear, i.e. no hole being visible with the engine set at No. 1 and 6 T.D.C. No. 1 cylinder firing.

continued . . .

This fault diagnosis card has been compiled with the co-operation of Joseph Lucas Ltd.

SPECIAL NOTES

17. Fuel pump not working.
    (*a*) No voltage—check supply. (*b*) Excessive current—pump stalled (change). (*c*) Open circuit (change).
18. Blocked drain 'A' pipe (Spill pipe).
    Clear obstruction and ensure that there is no petrol leaking from metering unit side cover.
    If leakage occurs, replace metering unit.
20. Air leaks.
    (*a*) Injector insulating blocks. (*b*) Air balance tubes. (*c*) Signal pipe. (*d*) Metering unit dome cap screws loose.
21. Not injecting on one or more cylinders.
    (*a*) Check pulsations and blow out suspect injectors. (*b*) Bleed. (*c*) Change suspect injector or metering unit outlet connection where necessary.
23. Ensure that injection is taking place.
    Check by pulsations and/or visual inspection of the nozzle.
    No injection.
    (*a*) Check for rotation of metering unit rotor by removing No. 6 outlet and rotating engine. Failure to rotate—change metering unit. (*b*) Remove all injectors and crank engine, observing spray pattern. Then, by using excess fuel lever, repeat engine cranking and observe MARKED increase in spray volume.
    No increase in spray volume will indicate a faulty metering unit.

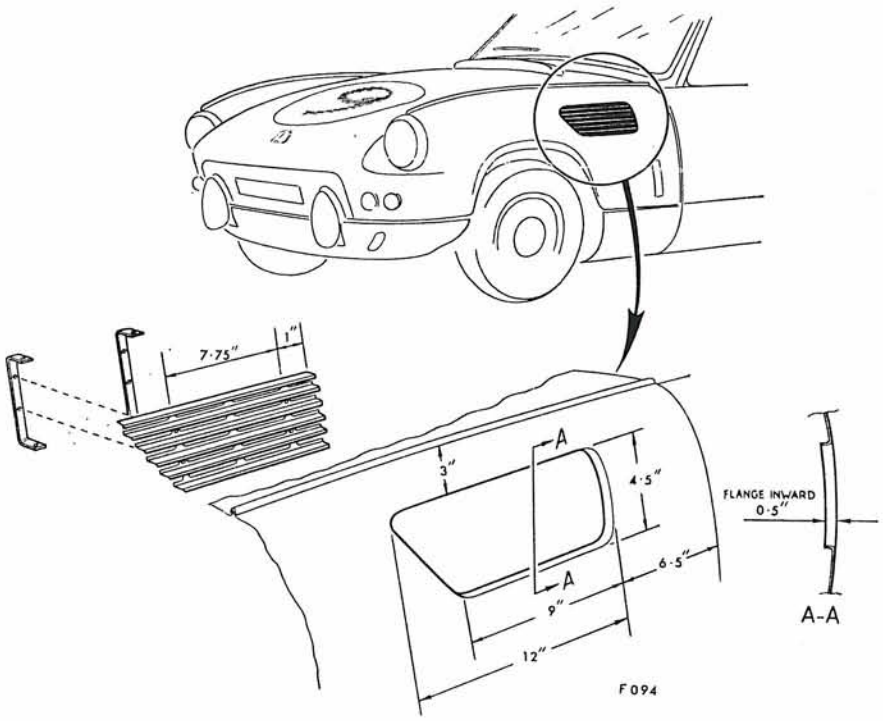
N.B. if metering unit is changed under this section, replace fuel filter element and flush line to metering unit.

Issued by
BRITISH LEYLAND MOTOR CORPORATION
Group Sales and Service Training Centre
Radford, Coventry, England

'LE MANS'

BONNET VENTILATION GRILL

No special parts were made up to form the front wing ventilation grills in the Le Mans Spitfire. Available Standard-Triumph production parts were simply modified to suit their new function as shown below



High under-bonnet temperatures, which may arise during a long distance race or rally, may he considerably reduced by the addition of the "Le Mans" bonnet ventilators.

The figure above details the positioning of the apertures required to be made in the bonnet. Support brackets for the grill piece may be shaped from 18 S.W.G. x 3/4in steel.

The grill piece may be cut from a Triumph 2000 radiator grill part number 807462 (or Herald 948/1200?) and attached to the support bracket by rivets. It may be necessary to relieve the inside portion of the fluted section of the grill piece to clear the windscreen wiper motor when closing the bonnet.

An extract from:- Standard Triumph, " Triumph Spitfire4. Stage Tuning and Competition Preparation"