INTRODUCTION

Chris Liles, Stag Owners Club Norfolk Area Co-ordinator

Back in July 1983, I received my first contact with Brian and Sheena Bayliss, being a phone call from Brian seeking technical advice on how to overcome a clutch problem on a Stag belonging to their friend. Anyone who knows me will vouch that I'm a talkative soul and, as usual, this subsequently stood me in very good stead! It excited me to quickly discover that on my doorstep was a Senior Designer and Project Engineer responsible for our beloved Stag.

In addition to being talkative, I rarely miss an opportunity and can also be quite persuasive! So eventually, on 14th January 1984, Brian addressed around 30 Stag devotees who had descended on a hotel in Thetford, to potentially expand their knowledge of Stags. 1 can tell you that Brian had prepared extensively for the talk, yet was terrified when he realised the size and intensity of our group. However, a few "milk shakes" later, he commenced his long and fascinating account of the early days of Stags, from an insider's viewpoint.

John Clayton (at present Kent Area Deputy Co-ordinator) had travelled up especially and brought his tape recording equipment with him. Naturally, we sought Brian's permission to record the talk which he eventually (after another milk shake) agreed to. The talk proved very stimulating and we realised John's forethought had captured a piece of Stag history for posterity. Brian would accept no remuneration for his epic speech so eventually our Club Chairman of the time, Mike Wattam, wrote a letter of thanks and bestowed upon Brian and Sheena the rare privilege of life-time Honorary SOC members.

Over the following years, I gently sought Brian's approval to publish the transcript of his talk for the benefit of the Club. Due to some contentious areas, Brian was understandably reluctant, but eventually agreed to edit the printed transcript himself - a mammoth task which became "bogged -down". However, yet another of my attributes is persistence, so, in 1994, Brian re-started his editing and later that year I made contact to ask him to effect a mini version of his talk at one of our Kings Lynn Noggin ‘n’ Natters.

At this stage I was shocked when Brian told me he had just been diagnosed as suffering from lung cancer. Despite this, he insisted on addressing our meeting as requested, which he did in October 1994, despite failing health.

Accordingly, it was with immense sadness that I received the news from Sheena, in March 1995, that Brian had passed away.

Sheena has since been most supportive in helping to create this article aimed as a tribute to Brian and, on the Club's behalf, I wish to thank her.

Thanks also go to John Clayton both for recording and computerising the transcript and Ronnie Todd who laboured over a typewriter to produce the original 26-page document.

It must be accepted that in places I have had to make some changes in order to transpose the spoken word into "readable" format and have made assumptions about Brian's intended phraseology. No liability will be accepted by any party involved in the event of any inaccuracies since, after all, this is a second-hand reporting of one man's personal views.

This is particularly relevant regarding the frequent mention of James Taylor's Triumph Stag *Super Profile* book. We acknowledge that some initial alleged inaccuracies may have been resolved in a later reprint, also some misinterpretation seems evident on Brian's part in a few instances. Nevertheless, this excellent book proved invaluable in sparking Brian's ideas to produce his historic talk - which I will now encourage you to enjoy.

April 1996

TRIUMPH STAG
CONCEPTION, DEVELOPMENT & BIRTH

I think it was in early 1967 when I first saw a vehicle in Triumph's Styling Studio which turned out to be something like the Stag. I was convinced, until a short time ago, that this vehicle was in fact the Michelotti styling model that had been brought over from Italv. Well, I recently read the book Triumph Stag - *Super Profile* (by James Taylor) and spotted a picture in there of what is claimed to be the Michelotti car. Well, I never saw that car there, in any shape or form. The one in the book seems to have the same wheelbase as the Triumph 2000 and is quite a simple conversion. Not only didn't I see that car, but was not aware that a vehicle of that cost was ever under consideration.

The first Stag I saw certainly had a shortened wheelbase, a roll bar and concealed lights. It did not look, from a styling point of view, similar to the Stag that we know today. Also it had a six-cylinder engine. I read in the *Super Profile* book that the first specification for a Stag included a 2.5 litre, in-line six cylinder engine' - well, it never did as far as we were concerned. However, the car I saw certainly did have one, but I think only by virtue of the fact that it was more convenient for the car to actually be driven around. So it may be true this was the original car which Harry Webster (Triumph's Managing Director) saw I'm not sure. Certainly as far as I'm concerned, the car in the picture never appeared at the Triumph Motor Company, at least not early in I967.

The car in the Styling Studio looked very nice I must admit, it had the roll bar and the hood half up in a Coup de Ville version and looked very smart. Looking at the picture in the *Super Profile* book, I'm glad they did shorten the wheelbase. If you've seen this picture, I hope you'll agree with me, since it wouldn't have been anywhere near the same sort of motor car that we now know the Stag to be. There may have been another reason why they shortened the wheelbase, but I don't think it likely.

At that time (I967) we were starting to run into propshaft troubles with the Triumph 2000. The length and diameter of the propshaft that we had was causing considerable problems and really we were on the absolute limit of its' abilities. I suspect that if we'd been talking about the same length of propshaft for the Stag, without any variation whatsoever to the underfloor of the car, it just wouldn't have been feasible. The only way we could have done it successfully would have been to put in a far larger propshaft or to create a centre bearing and split propshaft - which would have been out of the question.

So maybe there was something about that problem which prompted the decision to shorten the propshaft - I don't know. In any case, I think the looks of the car definitely benefited from having the shorter wheelbase. The other reason, personally, why I think that a full four-seater never really was in Harry Webster's mind at all, is that he had an absolute fixation with Mercedes and he was always moaning and groaning, "Why on earth can't we produce a car like Mercedes?" He had seen their 280 SL, and fallen in love with it saying, "This is the motor car that we should be producing."

Again, the other thing I've heard and also read in the *Super Profile* book is that Harry happened to see this Styling model that Michelotti had made. Harry never "happened" to see anything at all. He did everything by design and I am quite convinced that, forgetting about the problems he may have had with the Board to get authorisation for it, he intended to present them with a fait accompli. I am convinced Harry went out to Michelotti and said, "You produce something that is going to compete with the Mercedes 280 SL but using as many Triumph 2000 components as you can," which is what Michelotti subsequently came up with.

Now if you look at that picture again of the (apparently) four-seater Stag in the *Super Profile* book, believed to be the four-seater that Michelotti came up with, you cannot compare it with the Mercedes 280 SL. So I am convinced that Harry gave Michelotti the brief to produce a 2-plus-2 using as many Triumph 2000 components as he could and Michelotti worked on those lines. Harry didn't just wander in there one day and say, "Oh, what a beautiful motor car, I will buy that." I am quite convinced that did not happen!

Harry had tremendous freedom of action at that time, something that his successor lost completely later on. He could do such things through being the real old-fashioned style of boss who was able to take any action. He made decisions and could sway the Board whichever way he wanted at the end of the day.

The object of the exercise, I am quite convinced, was to be able to show the Board a beautiful motor car and convince them they were going to get this car "on the cheap". That, in fact, all the running gear was going to be Triumph 2000 as was the structure and underfloor - except for chopping a piece out to shorten the wheelbase. All we needed was a few hard skin panels plus someone to tidy up the interior trim and we were there. We'd have a car that primarilv could compete in America - again I disagree with *Super Profile* about the initial production being for this country. There is a reason why the author said that, I'm sure, but this motor car was primarily intended to compete with the Mercedes 280 SL out in the States. That is where the 280 SL was selling and Harry wanted to get a car out there to compete with it as quickly as he could.

Harry Webster persuaded the Board to give the go-ahead for the project, still with no name. Despite what some people say it was never known as TR6 and never intended to be a Triumph Roadster type of vehicle.

Finally, again early in I967, we on the Design side, received a specification for the Stag, which had a shorter wheelbase than the Triumph 2000 but I honestly can't remember whether it started off being six inches shorter. I think the wheelbase of the Stag varied somewhat before it was finally fixed at what it is today. The Stag always was intended to be a 2-plus-2 (never a four eatr) with a 2.5 litre V8 engine. The front end structure and the underfloor were to be exactly the same as the Triumph 2000, as was all the running gear, suspension, brakes, steering, etc. The one refinement that Harrv added (again I think it was to compete with Mercedes) was a fully adjustable steering column. He had no idea what troubles it was going to lead us into later on as far as complying with American regulations was concerned, but that's another story.

He wanted up-market trim - which he got - and we had a specification for pressed steel wheels (with cast allov and wire wheels as options), manual and power steering, a 14 gallon petrol tank plus manual/ overdrive or automatic gearboxes as options.

When we received the Stag's specification there were obviously a few problems but nothing major. It was really an engine development exercise which had to be speeded up because the V8 had been neglected. There was, however, an installation problem because we were trying to put this great big V8 engine into a space where we'd only had a straight six before. Another problem was complying with the ever-increasing American and European regulations, which became a worse and worse task. It was like trying to hit a target that was heading away from you faster than you were approaching it! Every time you got one regulation completed you'd find that they'd introduced another three.

These kept changing from model year to model year so you can imagine it caused quite a delay in the introduction of the Stag. We aimed to have the Stag ready for the I969 model year and then found that in fact it was going to be I970, eventually it became I971. The changes that took place as far as Regulations were concerned during that period were quite considerable and caused us huge headaches. So much for it just looking like a simple installation and styling exercise initially!

Although we had a brief for the structure and underfloor of the car, as far as I'm aware, there was never any rules laid down that we must use as many Triumph 2000 skin panels as we could. I think what may confuse people is, in the end, we used a number of the Stag skin line panels on the Triumph 2000 Mark II. Again as far as I'm aware, there was no restriction from the body point of view that we had to use any Triumph 2000 skin parts.

0ne of the initial problems we found when we started drawing out the schemes for the engine, was the "body drop" and Production were really up in arms about this. The procedure is that on the Triumph 2000 (as on the vast majority of cars) the whole of the running gear is assembled on its' own track. The body then comes down through the roof, drops over the top of this assembly, spikes go up through the various location holes and thus the body is attached to the remainder. However, we couldn't do that on the Stag because the engine wouldn't pass through the

longitudinal members and Production didn't like this at all! It meant the engine had to be fed in from the top and dropped down into the body (I'm sure some of you have done that exercise on a few occasions). This wasn't at all popular with Production since they'd got their massive and beautiful track which they couldn't use in this instance. There was no wav we could get over this problem of body drop since the longitudinal members were sacrosanct - nobody was going to change them.

Another problem we experienced was the battery, because the location which was suitable for the in-line six was not suitable for the V8 - so we just moved the battery to where it is now big problem was that all of the existing schemes drawn up to install the battery were for an engine with manual steering - in other words without a power steering pump. Initially we had bags of clearance for this battery because manual steering was in fact the specification for the Stag, with power assistance as an optional extra. So everyone said, “Well, hard lines on those people who choose power steering," since it wasn't until later that power steering became standard. I’m afraid there is a tendency (only a small one because we're car owners as well) that, when designing a car, you don't really consider when it has to have a service. Your main problem is getting a quart into a pint pot and, if you can do it, you are quite happy and leave other people to look after the rest.

I think probably at this stage we ought to what we mean by "clearance" from a design of view. Some of you might think your car is a precision instrument. (Having had four years glassfibre experience as a manager at Lotus Cars I suppose I shouldn't grumble at what goes on when you're talking about pressed steel.) However, if you've got a body structure finally assembled by these fantastic robots, basically you've always got tolerances which build up through the car. These tolerances on abody structure, between longitudinal members for instance, could vary by plus or minus a quarter of an inch. That might seem a lot but believe it or not, there are precision machine castings assembled on which you can still get (especially on a raw casting) an overall tolerance of plus or minus an eighth of an inch. So really you're looking for three-eighths of an inch either side of the centre of the dimension. Apart from that, of course, you have to make allowance for the fact that the guys have got to physically get the bits in and, when those bits are there, then the bits have got to be able to move. So you are basically looking all the time for a minimum clearance between a moving part and a stationary part of at least an inch, more probably an inch and a quarter.

We had a famous gentlemen who achieved a very, very senior position with British Leyland. He used to say, "Well, yeah three-eighths of an inch is plenty," and he became known as "Three-eighths Bates". However, we had to change the tolerance every time because, when the car went outside, we had the sump banging on the cross member, the manifold banging against the longitudinals or the bell housing banging against the scuttle - all due to this famous three-eighths clearance. From a design point of view, you always aim for at least an inch and if you can, one and a quarter inches. However, what might happen on a V8 engine mounting is not so bad because it's a very smooth engine but, with an inline six or similar, it can almost rock itself off the mountings and bang against all sorts of things.

So, if you remember when you look at your motor car and think, "Bloody idiots, why did they do that? They've got plenty of room to do such and such," clearance is probably the reason why. We sometimes found there wasn't really as much room there as we expected. A major problem we encountered was a hard foul of the bell housing on the scuttle area. No matter what happened, it couldn't be overcome. Very, very, very begrudgingly, Harry Webster agreed that we could modify the scuttle panel. That was the first panel to change and, as you probably know, there were many more after that. So, we'd moved away from his original brief that everything had to be the same as the Triumph 2000, and this was the first change that had to be made. There was no way round it, but as soon as it happened the till started ringing up. Of course when you modify press tools these days, you're not talking about £l0 or £l0,000, you're talking about £l00,000.

Other problems we encountered were regarding regulations which were coming in fast and furious around l967. We had obviously been aware of the increasing emission regulations in America and the safety regulations, not only there but also in Europe. I'll go through some of them now and, later on, I'll be able to define what we did to actually comply with these and how they complicated the design of the car.

There was the 30 mph front impact regulation and they'd just introduced one for 30 mph rear impact. There was steering column penetration (which was really part of the 30 mph front end impact in any case) and ground clearance stipulations from our famous Italian friends they brought out regulations that nobody else had ever thought of! This really complicated matters and it was made even worse when we had to go to a bigger exhaust system.

The exhaust system seemed quite simple. Initially just two pipes ran straight the way down to the back and out either side of the car. We didn't feel there was any big problem there. The last thing you want to do with an exhaust system is to put bends in it (especially ones that go round at 90 degrees), so we made it nice and simple. However, other regulations we encountered included roll-over, fuel system integrity and the actual outlet of the exhaust pipe (which was introduced by our Swedish friends). This is probably why you've got your two pipes on one side rather than one on either side as you may expect from a V8.

There was a tyre roll-off problem where the car had moved up a category and they were concerned about the tyre actually rolling off the rim during high-speed cornering. This was something that people had just latched on to and we were doing a tremendous amount of work with various shaped rims to prevent the tyre actually rolling off the rim and falling into the well, causing immediate deflation. We did a lot of work on rim shape: lengthening it, putting humps into it and all sorts of things to comply with this regulation.

Another two regulations were evaporation loss control and fuel expansion. You couldn't any more vent a petrol tank into fresh air as most cars did in those days. You used to have a pipe leading up from the tank and as the fuel went in, displaced air either came out of the filler cap or it went down a pipe and came out into fresh air. Now you couldn't. In fact, you couldn't have a filler cap which had a vent hole in it either. So we had to vent it in some other way which caused complications to come about at a later stage.

Incidentally, I designed the exhaust manifold for the Stag and you can imagine what a problem it caused - no, it's not a manifold I'm at all proud of, but if you look at your Stag then maybe you'll have every sympathy with me. You'll be able to see exactly how little space was available to get the exhaust manifold in and I'm sure if you look at it now, you'll find it is very, very close to the longitudinal members. It must be about the worst designed exhaust manifold ever, the gas flow is absolutely impossible. If you could make up a welded manifold you could twist it this way and that to do what you like with it. However, if you're designing a casting you are controlled by the mere fact that it is a casting and so must consider the way it is made. It may be a very poor manifold, but we were stuck with whatever we could possibly get into the space available, produced by casting techniques. I apologise to you for your manifold - maybe I shouldn't even admit I designed it, perhaps I should have said it was somebody else!

Time for another little bit about Harry Webster. Within the Engineering Workshop area, they would produce a seating block which is a wooden framework roughly resembling (from a height and location point of view) the actual seats that would be in the car. Within it, is set a steering column and pedals, but they don't attach to anything. Engineering just move them about where they want them to go, putting the steering column in first, then positioning the steering wheel. We used to go through the same exercise on every car we designed in that Harry would say, "Okay, the tallest, smallest, fattest, shortest: get 'em in there," and they'd mark a datum point on the steering column.

They'd take a young girl, sit her in the seat and say, "Adjust the seat to where you want it ... now adjust the steering wheel to where you want it to go" - both of which she would do. Engineering would then measure up the height of this datum point, then measure it again from one of the lines and plot it. Maybe 50 or 60 people would go into the Engineering Department to go through this exercise of sitting in the seating block. All the plots varied to a degree but you could bet your bottom dollar that when plotted, they would fall within a square probably about three by two inches. Having gone through all this exercise, Harry would sit in the seating block himself, adjust the wheel to where he wanted it, and say, "That's where we're having it!" If, in fact, his reference point happened to fall in that square you were okay, but if it fell outside, well, that was tough luck. That was where Harry wanted it, so that was the end of the matter!

The upper steering column limit was fixed by the dashboard. The amount of clearance down on the left- or right-hand sides of the engine fixed your lower steering column position. The problem was that you finished up with an extreme joint angle and Torringtons (who manufactured the joints) said, "Goodness gracious, what's going on?" So we did a fair amount of work with Torringtons regarding the joint angle in the column till it was overcome. At a later stage we had to overcome the problem of meeting the American regulations with that type of column. We'd never dealt with this type before, as far as steering column penetration was concerned. It had always been straight and we knew exactly where we were but now we'd got a different kettle of fish.

We tried all sorts of things, including a Saginor tube - that's like a corrugated tube designed for a controlled collapse - but it wasn't terribly successful. Various other people, including GKN, were getting in on the act and they came up with their super-duper design to overcome the problem. I went out to the GKN plant in the Black Country on numerous occasions during the various tests - again results were never terribly satisfactory. We tried break-off capsules and all the usual things, trying to make sure that the steering column would comply with American regulations. It did eventually, with exactly the design that we've got now. Once it was decided, as far as I'm aware, I don't think it was ever changed.

All these things that are now commonplace, as far as meeting safety regulations are concerned, were all new at that time. We hadn't the techniques nor the know-how to overcome them easily, quite simply because they were all new.

Having got the engine and steering column in and achieved agreement for the odd modification to the scuttle, we then suddenly found that the clutch master cylinder wanted to go where the right-hand bank of the engine was - so we thought, "Well, we'll have to move the master cylinder." The point was, that the only place we could move it to was the offside of the steering column. So we got it as far over as we possibly could and that's why you've got your offset pedals on the Stag.

As you know the clutch pedal is cranked quite dramatically and the Production people didn't really want to know about that. They said, "You know we're going to scrap as many pedals as we make." The one thing that I think they were concerned about was, in fact, the strength of the pressing, so they put a small closing plate across. We went as far as we possibly could with the bend in that pressing which then fixed our clutch pedal position. Again one of Harry Webster's specials was, "Four inches between the centre-line of pedals," so from the clutch pedal you went four inches and you got the brake pedal, then another four and you got the accelerator. Well, we had to compromise a little bit because the accelerator pedal then wanted to come where the trim was! It didn't look nice and I thought the driving position didn't feel right. I found it most uncomfortable, when I first drove a Stag, but I'm sure you've all got used to it by now!

Underneath the dash you've got a darn great big pressing which is the pedal bracket. That was an existing pressing which again Harry said we were not under any circumstances to alter and really, in the end, we didn't. You only have to look at the clutch master cylinder position on that pressing to know that we were "scratting".* The clutch master cylinder was right up against the inside wall of the pressing and we just couldn't go any further. The problem soon got worse when they increased the size of the brakes -still, I'll mention that later.

The intention, at the time, was to double skin the wheelarches. Again, because of something that happened later on, this never occurred (although we did build a couple of prototype vehicles with double skin wheelarches).

It was at this stage that we went to a gear driven water pump. I think everyone threw up their hands in shock and horror at this; no-one was at all happy about it. However, by virtue of what we were left with, there was no real alternative. It caused mutterings all round the office, everyone thought it was a really retrograde step. In fact, I feel (again my personal opinion) it led to further problems which you have probably all encountered.

** Brian's term for coping with a severe lack of clearance*

The first true prototype of the vehicle was, to the best of my recollection, completed around the end of I967. The hidden headlights had gone by then and the front looked very similar to what you have now.

Any thoughts of having a power hood had been thrown out and there were still minor styling changes taking place at that time. I think that was the first time I saw the kind of roll bar cage, as I tend to call it, in the form that you've got at the moment. It was built into the car as, I think, a very nice styling feature.

The V8 engine development was going ahead quite well with no signs of any serious mechanical problems at that time. However, the designing was very much compromised by the amount of work that had preceded it on the slant four engine. They had laid out the production line for this engine and actually purchased in the region of £4 million of transfer machinery to produce it. The design work on the V8 engine was initially around carburettors, moving to fuel injection at a later date - not very successfully as you well know.

I don't know why the decision was made to go to Bosch fuel injection. Everyone seemed to be starting to think of moving to fuel injection or to at least consider it at that time, but in any case the decision was made that we'd go for the Bosch. Although I wasn't directly involved in that side, my colleagues became very frustrated with what was happening. I've had involvement with several other engines since then, using Bosch fuel injection including a V8 and a V6, basically with exactly the same results.

The V6 was the PRV engine installed in the De Lorean car. We spent years on that V6 PRV engine, trying to get Bosch fuel injection to work, without any success whatsoever, and we couldn't get any consistency regarding emissions. Readings went all over the place; one car would pass and another would fail on hydrocarbons, then the next one would fail on knocks and so on until we went round and round in circles. We could never get a balance between one bank of cylinders and the next, and even in the end could never rely on any result from one cylinder being the same or repeating itself time after time.

With the V8 that I was involved with, yet again, we had massive problems with Bosch. In the end we went to Lucas and their electronic fuel injection. The only successful Bosch system that I've been involved with was in fact on a four cylinder engine.

I don't know whether there is something peculiar about a "V" engine linked to Bosch fuel injection that causes problems, but I've never had any success with Bosch so it won't surprise you that we didn't with the Stag either. When the Bosch idea was finally ditched, I think everyone breathed a sigh of relief.

Harry Webster had a fixation about petrol tanks and wanted them as big as he could possibly get. We had a major problem with the Triumph 2000 Estate petrol tank because we managed, on the Triumph 2000 itself, to get, I think, a 12.5 gallon tank in and to achieve this, Harry had us working like mad for months. If he had something on his mind, then all the section worked on it, no matter what else was going on. His fixation was that he wanted 14 gallon capacity for the Triumph 2000 tank and it had to be two identical pressings that could be just roller welded together.

Well, it never happened since we could never get it in. When we did the Triumph 2000 Estate car, of course, the tank had to go under the floor and poor Harry wept tears when the largest we could get in was 11.5 gallons. So believe you me, Harry would never have sanctioned that the Stag had a petrol tank of 11.5 gallons as he had been forced to do with the Triumph 2000 Estate. In the end the Stag's tank was entirely different, based roughly on the same shape as the 2000 Estate's.
Tank problems concerned evaporation loss and expansion. What happens in America (well, not only there but anywhere with the same sort of climatic conditions) is that they draw cold fuel up from down in the ground and put it into a car where the temperature may be somewhere in the region of I00 degrees higher. The driver then parks the car outside his house in the sun, and gradually all this cold petrol starts expanding like mad and spews itself all over the place.

Environmental laws dictated that it musn't happen any more; so they said, "Right, with that sort of volume of petrol, how much would it expand for a certain temperature increase?" They calculated it at one and a quarter gallons expansion and that is exactly the difference they state the petrol tank changed, ie from 14 gallons to 12¾ gallons. It was the same petrol tank; don't let anyone kid you that someone designed a new one. We put a little expansion tank in there which took a gallon and a quarter. In the Haynes manual they show a diagram of one of the early American models where there was a small tank stuck on the top of the wheelarch on the offside of the car and a mass of pipes coming from all over the place, connected to this tank.

Another thing we had to allow for, was that someone might park their car at this angle or that angle, or up there or down there, and whatever happened in each of the corners of the tank it had to be able to vent into the expansion tank.

We then had the problem that we had to have a sealed filler cap - so how were we going to vent this thing? Well it was achieved by a pipe going all the way forward through a charcoal canister. Every time there was a depression on the manifold, it purged the charcoal canister. However, it was an expensive item and also looked absolutely diabolical. So we fiddled around and finally decided we would locate the breather pipe at a certain level down within the tank, which meant, in fact, that when you filled it, you shut off the breather and couldn't fill it any more because it just came back out of the filler. So we said, "Ah well, that's alright but what do we do now about breathing it?" So, in the line which goes to the charcoal canister, we put a little metal restriction with a very small hole in it which would allow breathing through the small hole. When you'd displaced the air by filling the tank, it wouldn't allow that air to pass through it at the same time. We spent a lot of time on this which I recall was quite enjoyable because it was a beautiful sunny day and we were outside fiddling around with this filler. We made it last a couple of days as a break from sitting in the office!

Another problem we had with the petrol tank was rear end impact. It's an expensive game running a motor car into a big concrete block so we thought, "Well, we can't afford to keep writing these cars off at a rate of knots, banging them into the wall, then turning them round and banging them the other way into the wall." When they failed (which they did frequently), you had to go away and start from scratch again. So we designed a big rig which was stuck outside, with a huge swinging pendulum on it, and we stuck the back end of the Stag out there, with the petrol tank in position, then hoisted up the big pendulum and down it came -wham - and hit the back of the car. The criteria were (a) the petrol tank shouldn't burst, and (b) the filler cap shouldn't spring open. We effected these tests on numerous occasions and we'd all go out to watch. Down would come the pendulum - wham - the filler cap would spring open and you'd get showered with petrol or else the petrol tank would split and petrol would flow out onto the floor.

So it was a rather dramatic exercise actually designing the tank and providing some protection for it so that on the 30 mile-an-hour rear impact testing (which we did at MIRA) we had a good chance of getting through. We did fail on a couple of occasions, even on the MIRA test, but at least a lot of the hard graft had been taken out of it by the rig that we had built at Triumph.

All of those problems, or apparent problems, were part of designing a motor car. Everyone was sold on the Stag throughout the project, it was a beautiful looking car and was one of those projects where everyone became really enthusiastic - just like you are!

Now I come to around I968/69, exactly when it was I can't remember. British Leyland had come into being and, I'm afraid,people being what they are, it became more important for them to secure their place in this new structure. Certainly, within the design area, the impression was that senior management were all trying to make sure they got their feet on the appropriate rung. It became a very big political era with people vying for jobs. Now when you start worrying about your job, you lose some interest in the engineering side and enthusiasm tends to die away.
Austin Morris at that time were in diabolical trouble with the Maxi gearbox. The head of the company at that stage was Donald Stokes, a salesman by profession. He was one of those who finally approved the styling of the TR7 and I'll never forgive him for that! George Turnbull was the Managing Director of Triumph Motor Company. Having impressed Donald Stokes, George was moved over to Austin Morris. Fairly soon afterwards, unfortunately for us, Harry Webster also went to Austin Morris as Engineering Director. He took with him quite a number of senior

engineering people as well, to try to sort out the problems they'd got there. We acquired a gentleman called Mr Spencer (Spen) King.

Anyway, back to the Stag. Eventually, the decision was made that we would go away from fuel injection to 175 Stromberg carburettors. That would beef up the performance and give us far better torque figures than we had previously been getting. The only problem was, at the very beginning, our technical office had said the brakes and the clutch for the Stag were really marginal. Of course as soon as we went up to three litres, with resultant increased performance, it wasn't a case of it being marginal any more, there was just no chance we'd be able to use these brakes and clutch.

Now I'd spent a lot of time and effort designing - maybe styling is a better word - the cast wheels for the Stag and had been backwards and forwards to Stirling Metals trying to sort out the design. These nice I3 inch cast wheels were approved by everyone, but as soon as we uprated the engine we had to have bigger brakes. As soon as we went to bigger calipers we couldn't get them in the I3 inch rim - so in came the I4 inch wheel. This meant bigger tyres, which meant the minimum clearance that we'd achieved before, as far as the bump, rebound and front and back lock were concerned, had disappeared. So we went to a low profile tyre and just about got away with it. If you have ever gone through the exercise of watching the front wheel move through bump and rebound on back lock and full lock you'll see, certainly on the earlier cars, you're very, very close everywhere to the eyebrow of the wheelarch, the panel itself, the strut, spring and spring panel.

Not only did we have to increase the size of the calipers but also the size of the servo and master cylinder. They wouldn't go any further over because the servo was hard up against the side valance of the engine bay. Instead, they had to come inboard, into the space where the clutch master cylinder was, but we couldn't push the clutch master cylinder any further in that direction because it was hard up against the steering column. So there was this poor clutch master cylinder being crunched between the steering column on one side and the servo on the other side. If you look at the minimal clearance between the servo and clutch master cylinder you will see what I mean.

You'll also see the clutch master cylinder body has two nice little recesses cut into it. They're not there by chance, they are born of sheer desperation! I think you've got about an eighth of an inch clearance there. In doing that, where the actual clutch master cylinder comes through the pedal bracket (that beautiful pedal bracket which was sacrosanct to Harry!), it's right up against the wall. In fact, the hole that the master cylinder passes through actually cuts through the radius of the bend of the pressing. That should never have been done but we had no option. As some of you may already have guessed, we should really have had a far bigger clutch master cylinder in there than we actually ended up with. You have a clutch pedal where the pedal effort is far higher than we would ideally want and the stroke of the pedal is enormous. Well, those are the reasons why.

Incidentally, at around this time we were working on the Triumph 2000 Mark II which was known within the company as "Innsbruck". It was getting ready for production and we were utilising some of the Stag styling features for the panels on that car as well.

With the uprating of the Stag engine, we had to go to larger diameter exhaust pipes which complicated the manifold to a degree. We also had to re-route the offside pipe so it came across the back of the car and out on the nearside. The reason for this was a Swedish regulation which stipulated that the point of exhaust emissions had to be a certain distance from the side of the road. If I remember rightly, the Triumph 2000 Mark II has its' exhaust outlet in a difference position to the Mark I - again due to this Swedish regulation. A design feature we had on the 2000 was that the pipes always went through the rear subframe members to avoid a ground clearance problem and this was continued on the Stag too.

We did look, at this stage, at fitting the Borg Warner 65 automatic transmission to the car but it meant fairly drastic panel changes to accommodate this box, so in the end we stayed with the 35. However, I'm glad to see that, at a later stage, they did go to the 65 since I never really thought the 35 was adequate for the Stag.

By this time we were starting to get quite a few engine problems - bearing failures, had problems with the crankshaft and were encountering overheating. Again, in the *Super Profile* book, I read that overheating never became a problem till the cars were second-hand and came into the hands of people who didn't treat them as well as their original owners. Not true, we had an overheating problem soon after uprating the engine to three litres. We went to a bigger radiator and to a larger fan without ever really overcoming the problem, but at that stage we thought we were keeping it within limits. I can't remember whether we went to the big fan with I6 blades and the Holset coupling before or after running into overheating problems in America.

When we looked at the state of the two litre six cylinder engine, which went into production for the Triumph 2000, everyone was petrified and thought, "My God, we are going to run into a load of trouble with this because it's a diabolical engine." It became a far better engine as you now know. Probably we had the same sort of apprehension about the V8 but no-one at that time really anticipated we were going to have the troubles eventually encountered.

Again I read in the *Super Profile* book, the first three months production was intended for the home market and then the American market followed on. Now as I recollect it, that really wasn't true. The car was primarily intended for the American market and all the regulations we were working from were for the I97I model year for the USA.*

Triumph introduced a publicity stunt by letting the car out to 200 people to drive around and see what they felt about it, before letting it loose on the general public. The only problem was of course that a lot of people wanted the Stag since it was a beautiful looking, prestige motor car and those that got the car were the ones with a lot of influence. It suited the company, at the time, that these types of people should be seen driving this particular motor car. We were trying to capture the Mercedes and Alfa Romeo market and wanted that sort of owner to buy the Stag. The only problem was, of course, when things started to go wrong, these same influential folk were in a position to raise merry hell. We became involved in buy-back campaigns and all sorts of things which are the fear and dread of the motor car industry. The initial bunch of Stags went onto the home market but there was no real intention to put it on general sale there - the market they were aiming at was the USA.

Whenever we introduced a new model at Triumph the first production build always took place during shutdown in July. That is when the rest of the factory were on their annual holiday and the track was empty. This gave us three weeks, during July I970, in which to iron out all the problems and start teaching the senior superintendents and senior foremen. I don't think in those three weeks one Stag went down that track complete!

If people are going to say to me, "I've got a car that was definitely registered or produced before then," well you may have, since there were certainly a large number of cars manufactured on a pre-production build basis. We had a special area where all the processes were compiled and they would pass cars down there - basically, they were handbuilt. If you've got one of those, apart from other problems, you might have got a good car. Press cars were manufactured in this way and were one-offs, passed down through a special line within Engineering. So there were a number of cars around before the first ones started to go down the track. It was probably about November I970 before people in this country started to get Stags but I can't remember to within a matter of weeks. However, it was definitely a I97I model year introduction to the USA.

By the middle of I97I, we were getting complaints from all over the place. There were big problems in America, in fact, they reckoned we were losing £I,000 on every car sold in the States. We could bank on an almost automatic engine change within a matter of two or three thousand miles. We could rely on overheating problems like you've never heard of before, soft tops letting in water, water getting into the boot and loads of other problems. We were also getting similar problems, though not quite so severe, from cars that had been sold on the home market.

** Factual note: the Super Profile book actually says "but right from the earliest days ... North American acceptance had been seen as crucial . . ." page 8, centre column.*

Poor old Harry Colley * was more or less on his own in solving the major problems which gained the car such an initial bad reputation. Surprisingly enough, whilst everyone appreciated there was a problem, there seemed to be no emphasis put on it really. You would have expected a large amount of time, money and people to be involved in trying to sort the problems out, but this never seemed to happen for some reason.

Whilst other people were trying to sort out the problems at home, Harry went out to America and spent time running around in Death Valley and similar places where the temperature gets up to II0 degrees Fahrenheit, trying to sort out the problems.

We put in a bigger radiator and went to yet a larger fan with more blades, finishing up with this massive thing with I6 blades, linked to the Holset coupling. We put the coolant system pressure up and up and up, until in the end the hose and gasket manufacturers said, "Hey, you'd better stop." We were at the stage where they were telling us, "If the pressure goes up any higher we'll have to manufacture a new set of hoses which will be to a far more expensive specification than the existing" - which wasn't feasible. To be quite honest, we kept bringing the pressure up to stop it from boiling, and it did overcome the problem, up to a point.

There have been many stories about when the Rover V8 was first installed in the Stag and someone said, "Those crafty Triumph engineers, way back then they were secretly fitting a Rover V8 into the Stag." Not to my knowledge they weren't. I can't be absolutely specific but at least within Engineering it didn't happen. There might have been some side shop somewhere that was doing that type of work but nothing I was aware of. Normally we knew of everything that went on, but certainly within the design area of Engineering, there was never any attempt, at any stage, to fit the Rover V8 into the Stag.

However, about this stage was the first time within the Engineering workshop there were some lash-up installations done. When I say "lash-up", they were knife-and-forked, if you understand that term, i.e. they weren't designed in. Members were cut and welded and so on, to fit the Rover V8 into the Stag. I think there were three of these actually built and three of the directors of the company had these. We thought at the time that undoubtedly it would result in the Rover V8 being put into the car, but it never happened. There was never anything said and no further comment at all made about the Rover V8. Maybe a great pity - we shall never know.

Regarding Stag variants, we did produce one or two oddballs. The only one I can positively remember is the fastback version that you can see in the *Super Profile* book. It says two prototypes may have been produced but I can only ever remember one which was used as a shop hack in the end, running around picking bits up from here, there and everywhere. This one I recall as being a light coloured vehicle.

These things happened all the time and they never came directly through Engineering. With any prototype vehicle you don't pay any tax on it. The car is registered under special circumstances and the Customs and Excise are quite insistent that when a prototype vehicle has finished it's working life, then officially someone from Customs and Excise is there when they get a blow-torch out and chop it up. That's an absolute rule. Now I'm not disputing that an odd one or two styling exercises may have got through the net and are still around. Yes, I would agree that there's certainly one - there may even be two but they were never known as "Lynx". When we eventually got round to "Lynx", no-one ever thought of that as a Stag replacement. It was an entirely different motor car and an entirely different concept. Since it happened to be a 2+2, lots of people translated that to be a variant of, or a replacement for, the Stag but it never happened that way.

Again in the *Super Profile* book, it implies that overheating was due to blockage of the water passages and to the use of inferior materials on the cylinder head. No way will I accept this remark that it was inferior materials. I've worked with a number of companies and as far as material specification was concerned, use of the right material, and the tremendous amount of research that was involved, you'd have a job to beat Triumph. It overheated purely and simply

** Senior Development Engineer responsible for development of the Stag from first prototype until I974.*

because, within the design, there was insufficient capacity to get rid of the heat that was being generated. It's as simple as that.

One of the last engines, I was involved with was a big four litre V8 which was developing somewhere in the region of 350 bhp. We really had to go to town, mainly because I'd got the Stag experience in my mind. We did a tremendous amount of research on water circulation, both round the block and the heads on that engine. In the end we were having to push 80 gallons a minute through the engine to get rid of the heat that was being generated. Now I can't honestly remember the figure for the Stag, but I've got an idea it was l6 gallons and you just couldn't get any more through it.

This week, I've rung up a couple of my mates from Triumph, one retired and one still there, and said, 'What happened about the thermostat?" We couldn't remember. Again, with this big four litre V8, we could not get anyone who manufactured thermostats to produce one which could pass that amount of water through. Whether removing it completely would help in any way, I don't know, since the restrictions within the block and the head would still be there.

Triumph were not the best engine designers in the world, by any stretch of the imagination, but they weren't idiots. I do think, from my experience on other engines since then, that once they knew they had a problem with overheating, possibly a lot more effort should have gone into finding out how they could improve the water flow through the block and the head. I think that should have happened but the problem was the time and money factor.

Originally, when the Stag first went into production I think everyone thought, "Well, it ain't marvellous but we should get away with it." I think this was typical of the British motor car industry of that time. They designed a car and said, 'Well, it's running perfectly alright here," but no-one really went to the trouble to take it to Death Valley, California, or areas like that and do the development needed. They had a home market so why should they bother about these people abroad? You have to go out there now, to do altitude and climatic testing to meet all the regulations today but in those days you didn't have to.

I don't remember any serious valvegear failures, certainly during the first 12 months of Stag. Maybe none of the engines had done sufficient mileage to start failing, but from what you tell me they can fail fairly early on, as far as the timing chain is concerned. Certainly the hydraulic chain tensioner is absolutely useless - the rubber pad comes away and the tensioner jams. I think if they'd had the opportunity they would have changed it, but they didn't have the will to do anything about it. I'm quite convinced that at that stage, unfortunately, someone had made up their mind that the Stag was a dead duck and they were not going to spend any more money or time on it than they had to.

I think the problem was the Stag was conceived at the wrong time. If it had been conceived a bit later, it would definitely have been an abortion. If it had been conceived a bit earlier it probably would have been successful because we wouldn't have been in the BL rat race. Harry Webster would still have been there and made sure his baby was a good 'un.

The Slant 4 was already in production for Saab. They'd got this massive line producing the engines and any changes were going to cost a lot of money. They weren't prepared to spend the money so we had to put up with what we'd got.

I've always had a very soft spot for the Stag because it's a beautiful looking motor car. Maybe if it had been more successful you people wouldn't be here tonight. I reckon you must all be masochists!