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The E-Type Jaguar and its Influence on Car Design

By

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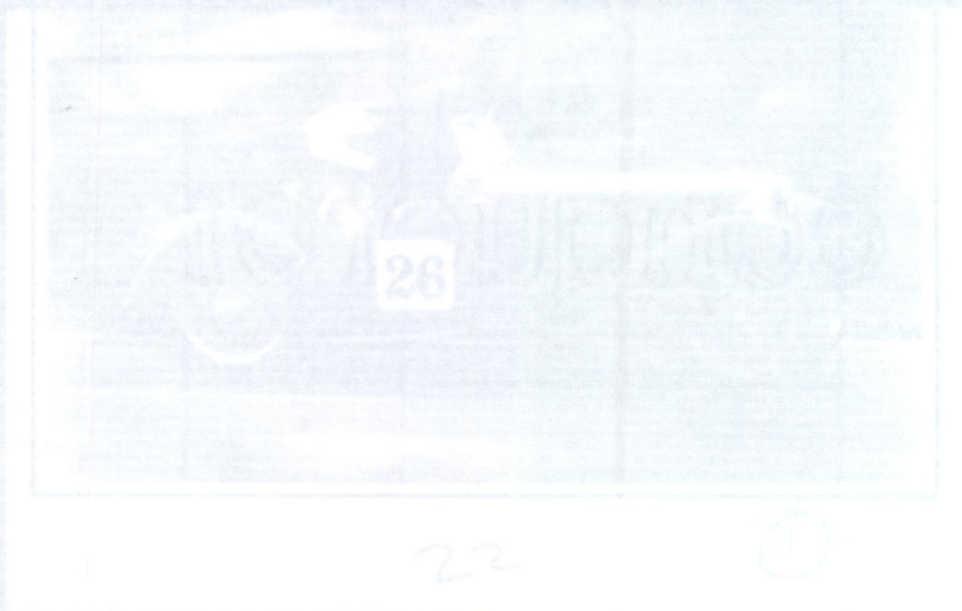
Introduction

I think that cars of today are almost the exact equivalent of the great Gothic cathedrals; I mean the supreme creation of an era, conceived with passion by unknown artists, and consumed in image if not in usage by a whole population which appropriates them as a purely magical object (Bayley, 1986, p.7).

The motor car was invented just over a century ago, it has become an indispensable part of modern living. The car is more than just a means of transport, it is a status symbol and an expression of our identity. This thesis will analyse the development of one car in particular; the E-Type Jaguar, outlining the factors which led to the production of one of the most auspicious sports cars of all time. It will examine how William Lyons (1901-1985) the founder of the Jaguar motor company which produced cars that achieved success both on the road and track, and were to influence the course in design of the car for the next thirty five years.



Figure 1 1961 E-Type Jaguar Roadster.



The E-Type Jaguar's forerunners were the XK Series and the D-type. By examining these cars the evolution of the design of the E-Type may be demonstrated. The influence of American design, and in particular the work of Raymond Loewy with his concept of streamlining is important when trying to understand the design influences of the E-Type, even though this concept was formulated in 1937 with the introduction of Loewy's S-1 locomotive these characteristics filtered through subsequent design in the automobile industry and indeed in many other areas of design also, but this idiosyncrasy is clearly visible in the design of the E-Type Jaguar. The E-Type Jaguar is a symbol of British design awareness and the consumerism of the 1960s, it forms a link between the ideals of the American culture and the changing attitudes of the British public.

The thesis will attempt to ascertain why the E-Type Jaguar was successful in the 1960s and what were the underlying factors which made it so successful in America, and why had it so much impact on the design of later cars. In 1953 Chevrolet introduced the Corvette roadster, this was the first 'all American sports car' (Foulis, 1988, p.52), it epitomised the life-style of the American people at the time, which was fast moving and care-free. Loewy's influences are clearly visible within this car's design. Cars such as the Corvette form a design link between American cars and those designed in Britain and Europe, and it is these influences that this thesis will examine. During the 1950s there was a strong swing in design towards this 'Americanisation', it was characterised by the merging of cultures and the common bond was the growth of consumerism. The shape of the cars were to reflect the pace of life, they represented speed and affluence. The now familiar flowing curves and the long, low, streamlined body embodied a myth of the glamour of speed and freedom with a romantic fanaticism. The E-Type Jaguar was to be the symbol of this change in Britain as it captured the imagination of the public and represented their new born 'freedom'.

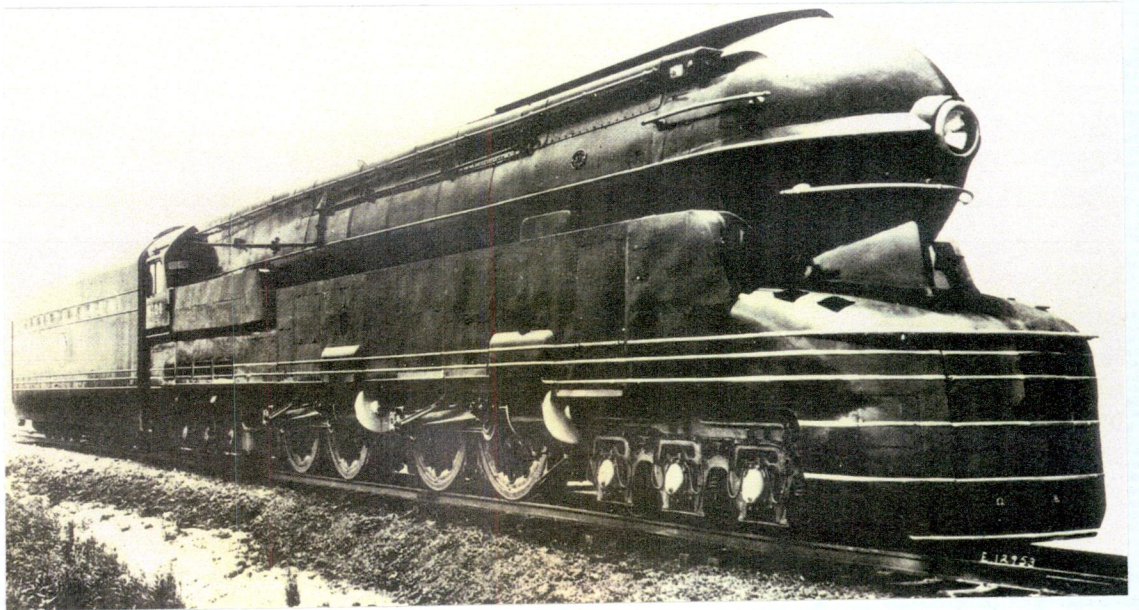


Figure 2 Raymond Loewy's S-1 Locomotive 1937.

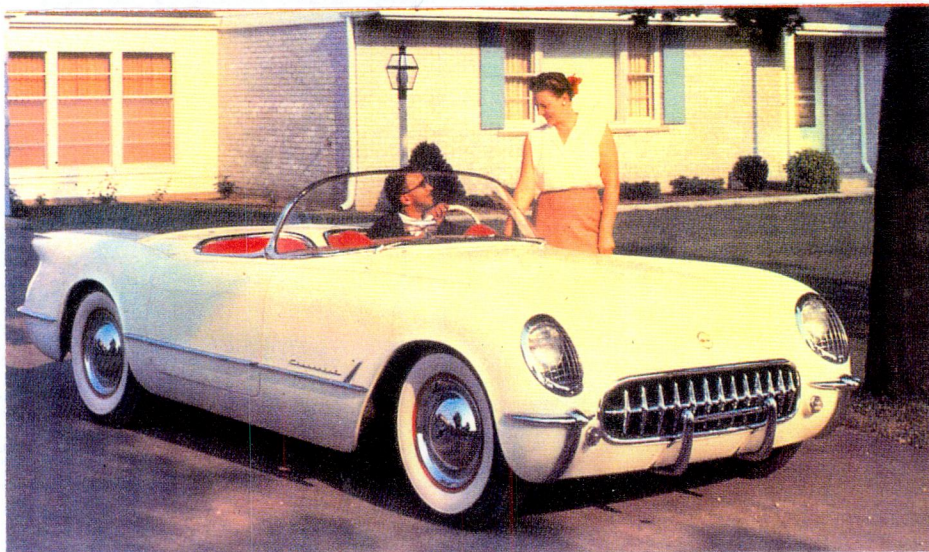


Figure 3 1953 Chevrolet Corvette Roadster.

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The E-Type Jaguar had a great influence on subsequent design in the car industry, many manufacturers tried to create their own interpretation of what this car stood for, with varying success, here the Jaguar stood alone. In order to identify these influences this thesis will look at three cars whose design characteristics may be traced back to the E-Type Jaguar, it will look at the most obvious traits of their design and compare them to that of the E-Type's. The first of these cars is the Datsun 260-Z ; produced in 1978, it bares a striking resemblance to the Jaguar both in overall body form and in subtle detail. The Mazda MX-5 is another car which one may see the influences of the E-Type, it is a much later design (1984), but it consolidates the importance of the Jaguar and the great impact it had on future design. The final car which will be looked at is the Caterham 21, a kit car which is only in the prototype stage but will be produced in small numbers to fill a gap in the market. This car is totally new but we can still identify the characteristics evident within its design which may be traced back to such cars as the E-Type Jaguar.

The significance of this car in design terms is poorly documented in the literature on design generally. In The Motor Car (an Illustrated International History), which is a chronology of the 'Car' from 1690-1976 Burgess Wise does not mention the E-Type at all, the only reference to Jaguar are two pictures, one of the XK-140 and the other of the XJS. Bayley in his Sex, Drink and Fast Cars briefly mentions the E-Type Jaguar but his comments are far from constructive, he believed that the success of the car was attributed to the fact that it was a 'phallic symbol'. In the most comprehensive account of Jaguar Cars Andrew Whyte's book, Jaguar, the Definitive History of a Great British Car, allocates only one page of text out of some two hundred and sixty eight which investigates the importance in the evolution of Jaguar's identity. It is difficult to formulate ideas from this kind of literature, but fortunately the contemporary journals provide a better insight to the attributes of the E-Type. However it is through periodical literature that the most information can be gathered

which provide much in the way of material on the design of this car. Periodicals such as Car and Driver and Autocar show the car being road tested and give a comprehensive documentation of all its features. In an article in the special edition of Autocar "Jaguar sports" (Garnier, 1975, pp 1-76) the second in a series of portfolios of contemporary road tests, descriptions, drawings and photographs from the pages of Autocar through the years. It documents each model which Jaguar produced commencing with the 1935 SS-100, displaying the entire XK range and also showing some of the E-Type models also. It is from such information as this that we can formulate an analysis of the design.



Figure 4 Car and Driver, 1961, Jaguar Sports, 1975.



Figure 5 Autocar and Motor, 1991, Autocar, 1971.

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Chapter 1 The Early Years

A background to Jaguar Cars Ltd., the E-Type's predecessors the XK-120, XK-140, XK-150 and the D-Type Jaguar.

William Lyons was born in Blackpool in 1901. By the age of 17 he had developed a great interest in motorcycles, he organised events and gained a favourable reputation throughout the motor-cycling field. Having decided to pursue a career in this area, Lyons teamed up with Bill Walmsley, the son of a coal merchant and a skilled craftsman and by 1920 they were producing the Swallow Sidecar and transforming this humble passenger into a work of art. In 1922 Swallow were producing ten side-cars a week (selling at £28). Their business continued to prosper and in 1926 they moved to larger premises to facilitate the increased production (Whyte, 1990, pp14-34).

The Lyons design flair was soon put into practice, he was at this time driving an early Austin 7 motor-car, and saw in this car a great scope for development in its design. He set about designing a car to fit on the chassis of the Austin 7, and saw great scope for development in its design, this culminated in the production of the Austin Swallow. Lyons explored designs of other manufacturers chassis, these included: Fiat, Standard and Morris, but quickly moved to a close relationship with Standard Motors placing attractive bodies on mundane chassis and mechanical components.

Lyons company was called 'SS Cars' by now, and this year (1931) saw the launch of the SS1, Lyons's first true car in that it was his own design from the ground up, except for its engine which was manufactured by Standard. This engine was modified by SS cars, with the inclusion of a supercharger with the initials 'SS' cast beautifully into the unit. Later they used Harry Weslakes over-head valve conversion instead.

The 'SS' inspired and influenced much of the designs of SS Cars for the next few years. Lyons strived to achieve a design which had an expensive and stylish look at an affordable price, he admired cars that had a 'low look' ie. their body-work close to the ground due to the flattening of their leaf springs and suspensions. This lowered the car and improved its centre of gravity which was becoming more and more important as the speed at which cars were travelling at was rapidly increasing. Lyons achieved fluidity in his early designs, compound curves and flowing lines were visible, but most of all he had the ability to achieve an overall balance and proportionate these characteristics into a unified design. The main factor in the success of his cars was his ability to manufacture them at an affordable price. The SS1 cost £325 which astonished the public and to some degree had a negative effect as it would appear that there was some catch, but this was short-lived.

Lyons felt that a change of name for the company was needed, he was looking for an image which would convey strength, reliability and performance. Having asked some of his staff for their ideas they decided on the name 'Jaguar,' a name which coincidentally Lyons himself had already considered and the company was renamed 'SS Jaguar'. This changed again in 1945 to 'Jaguar Cars Ltd', the SS was dropped.

Lyons had a great skill in communicating his ideas to others who in turn could generate them into three dimensional form. Together with the help of Cyril Holland he was able to translate the characteristics of power, performance, style and flowing lines to his cars, and all this lead to the development of the SS100 in 1936 the first car designed by Lyons to be universally recognised. This car exemplified the sport cars of the 1930s : a long bonnet, wire wheels with huge drum brakes, its handling matched its performance, and proved to be a serious contender in competition against the most formidable opponents (Whyte, 1990, pp 101-111).

It was now 1948 and Jaguar needed to create their own engine. Harry Weslake, Bill Haynes and Wally Hassan developed a four cylinder in-line engine, it had a sturdy cast

iron block and an ingenious cylinder head assembly. Over-head cams ran down both sides of the block and were driven by double drive belts, not only did the design prove strong and reliable but it was aesthetically pleasing as Lyons felt that the engine should look 'glamorous'. The only criticism which Lyons could make with the engine was that it was noisier than he felt a 'Jaguar' should be, so it was agreed that the number of cylinders should be increased to six to give better balance and smoothness. This engine has proved itself to be a fine piece of engineering, providing the heart for thousands of cars right up to the present day, it has been said that it was probably the most reliable engine ever produced. The engine block was so strong that it could accommodate no less than five capacities: 2.4, 2.8, 3.4, 3.8 and 4.2. This was to be the heart of the new XK-120 (Daniels, 1971, pp 34-44).

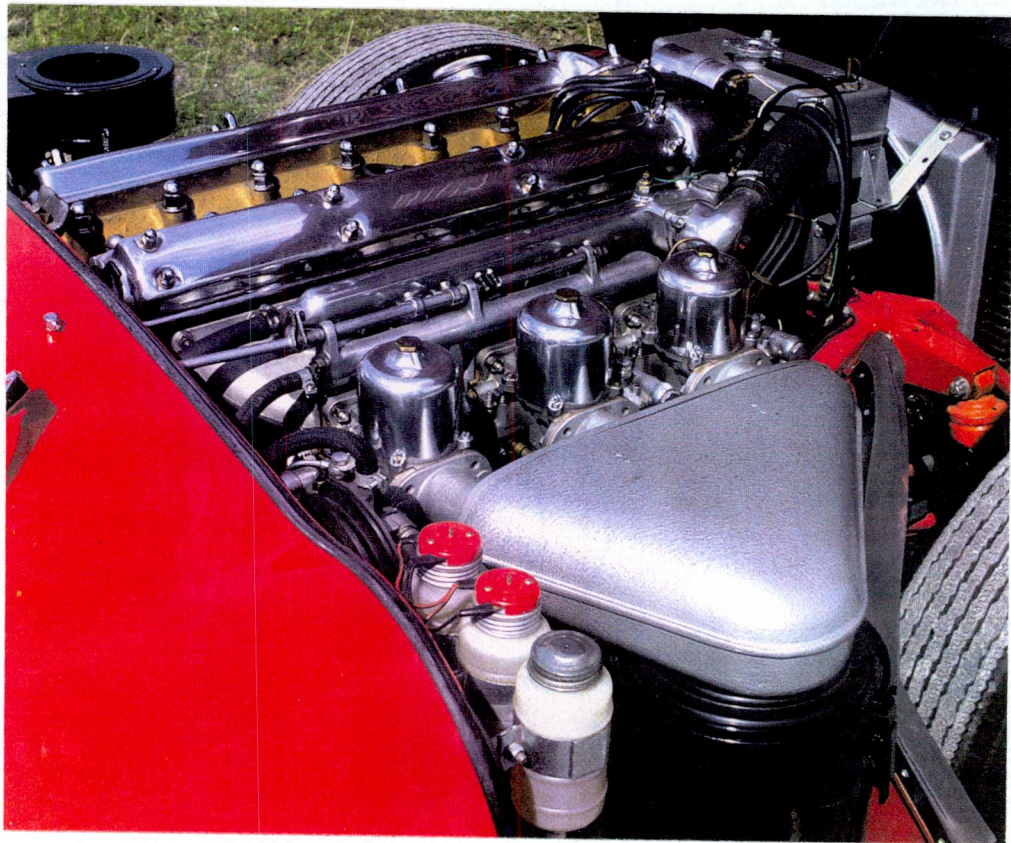


Figure 6 XK 3.8lt. Engine.

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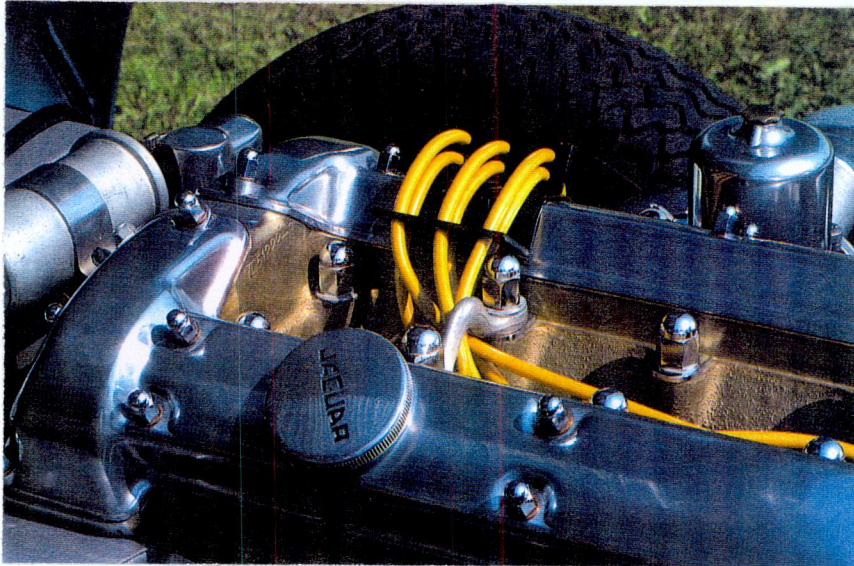


Figure 7 XK 4.2lt. Engine.

After World War II in about 1948, the British Motor industry was faced with possible extinction, their only hope of survival was to export. It was in this year that Jaguar introduced the XK-120, a sleek looking sports car. It was first exhibited at the 1948 Earls Court Motor Show. The Jaguar stand attracted much attention from the public and the XK-120 was an immediate success.

The XK-120 was a two-seater with sensuous curves. It contained the six cylinder engine having a cubic capacity of 3442. With the use of the SU carburettor it developed 160 bhp. Originally the engine had been produced for a new high performance saloon, but unfortunately the body which had been designed did not meet the standards with which the engine and chassis did. Thus, the decision was taken to use a shortened version of the chassis and the new engine in a beautifully designed sports car - the XK-120.

The introduction of this car was more a stop gap measure by Jaguar than a long term strategy. But it was subsequently to have far reaching consequences as it became the



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forerunner to a range of sports cars that were to lead directly to the most famous of all Jaguar sports cars - the E Type.

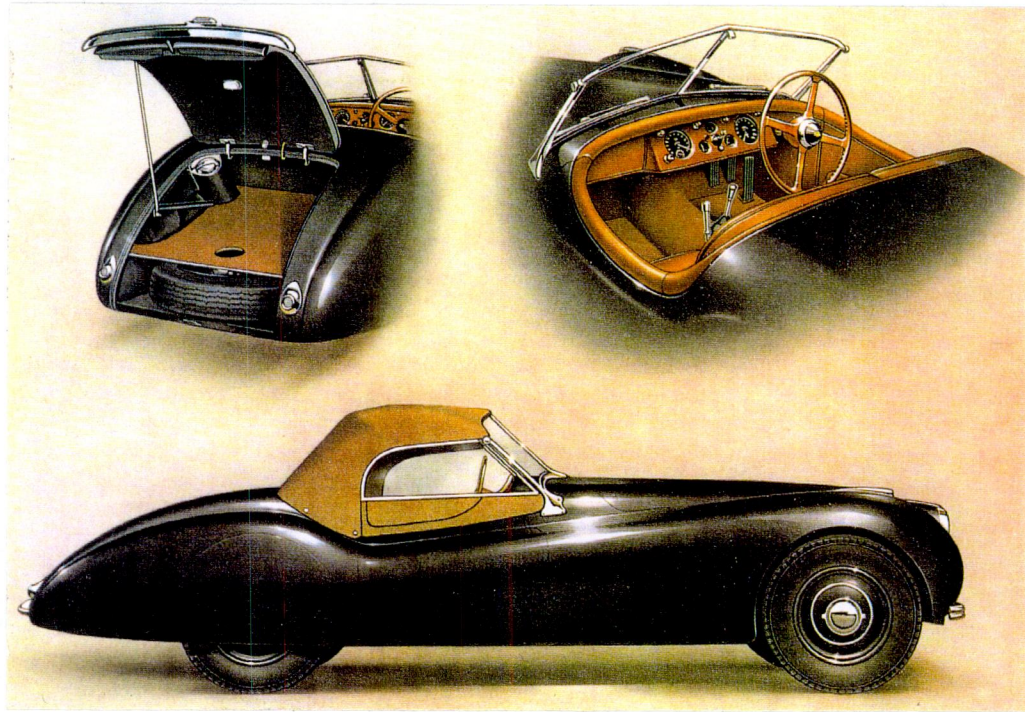


Figure 8 Jaguar XK-120 1951.

During the post-war years the concept of body and chassis as one was in its infancy, and the XK-120 was based on a conventional, extremely rigid separate chassis with a live axle at the rear suspended by a pair of semi-elliptical springs. The front however, included an independent suspension arrangement which consisted of a double wishbone on each side with torsion bar springing.

The body of the XK-120 was initially to be built from aluminium and mounted around an ash framework but the demands for the car were so great this method of production would have hindered output, subsequently pressed steel panels were used, being stronger and more easily manufactured. The car itself was a two seater open roadster



12-1-1961
TO DIRECTOR

with graceful sweeping front wings which swept back through the doors to blend with the curved and tapered rear wings (Morland, 1991, pp7-12).

The XK-120 enjoyed immediate success on both that road and track. Three XK-120s competed in the Le Mans 24 hour endurance race in their first year of production, they did not win, but their performance inspired the designer to produce the XK-120 C Type specifically for racing. It had the engine and front suspension of the road car but with a light weight tubular frame, covered with aluminium body parts.

This model had the rear axle sprung by a transverse torsion bar which improved stability on the track. This combination proved to be the correct one as in 1951 the Jaguar XK-120 won the 24 hour Le Mans. This victory for Jaguar really put them on the map, it proved their reliability and engineering quality.

In 1954 the XK-120 was replaced by the XK-140 which was a more refined version of the earlier car and developed more horse power. 1956 saw the introduction of an automatic transmission and manual versions were supplied with an overdrive. There was a keen sense of competitiveness within the Jaguar company, they wanted to prove their cars on the track to confirm their performance and reliability and let the public see that they were a force to be reckoned with. Jaguar specifically developed the D-Type in 1954 for the Le Mans race. This car also was a two seater and had an aluminium monocoque body with a tubular subframe to carry the engine and front suspension. The body had sleek flowing lines, there was a small oval radiator inlet, the headlights were flaired over with clear plastic covers, there was a one piece tilt front with a long, low hump in the bonnet to clear the dohc in line six cylinder engine, a wrap around plastic windscreen and drivers headrest that was faired back into the body-work.

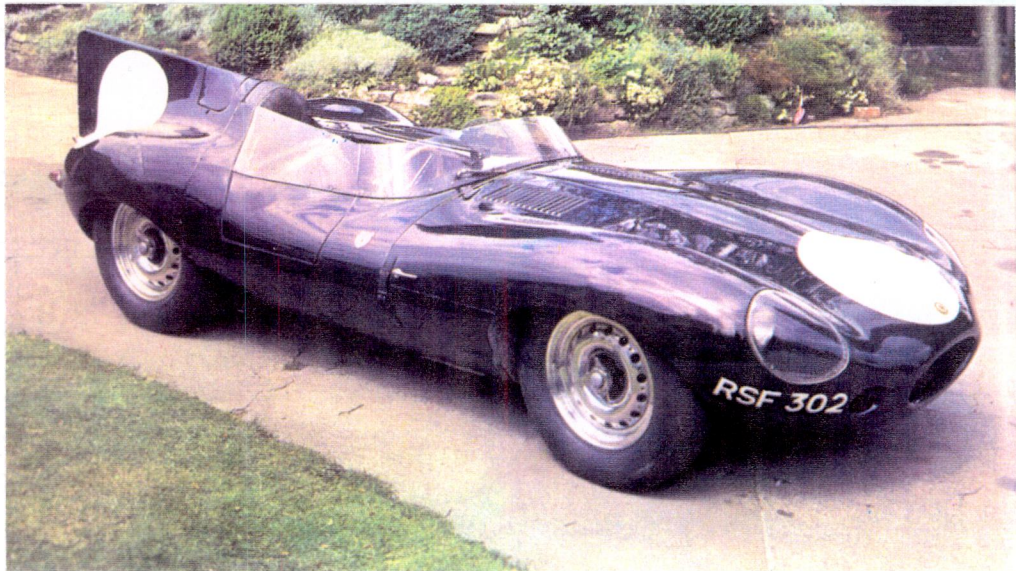


Figure 9 D-Type Jaguar 1957.



Figure 10 Jaguar XK-SS 1957.

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In 1957 Jaguar took the first four places and sixth in the 24 hour Le Mans with this D-Type. This year also saw the introduction of the XK-150, the replacement for the XK-140. This car had new body styling, although it was clearly derived from the earlier XK cars. The most obvious change was the much higher line of the front wings where they flowed back through the doors to blend into the rear wings. This car remained very similar mechanically to the previous model.

Jaguar modified their purpose built D-Type for road use, being sold under the name XK-SS. This model was to have the most direct influences on the later E-Type, but the most direct link of all between the D-Type and E-Type was the E1A, this was the E-Type prototype and it was never made public. It was smaller and lighter than the D-Type and was fitted with the XK 2.4 litre engine.

Chapter 2 The Unveiling

The Introduction of the E-Type, 1961.

When the covers came off the E-Type in Geneva on 20th June 1961, it became an immediate success and proved to be the star of the show. Lyons chose this venue because it was then the most glamorous motor show in Europe. He also wanted to disassociate it from the traditional British sports car at the time and give it the send off that he felt it truly deserved.

The E-Type's timing was perfect. It slotted into an era in which people could appreciate, and most of all, afford. Prior to this a sleek looking sports car was a part of ones dreams, but because Jaguar was able to produce these sports cars at an affordable price, they were no longer an aspiration, but a reality.

When one examines the E-Type one would have expected it to be emerging from the design studio of some famous Italian manufacturer, but it wasn't, it was the brainchild of Malcolm Sayers, a man if you were to have met, you wouldn't have expected him to be the instigator of the 'sexiest' car of the sixties. He was a intelligent man and knew a lot about aerodynamics and he felt that implementing this knowledge into car design would lead it to something beautiful, and so it did, firstly with the D-Type in the fifties and then the E-Type in the sixties.

In the late fifties there were prototypes of the E-Type in existence but it was all kept very secret, this created an air of excitement prior to its launch. The M1 motorway had just opened and there were rumours circulating that Norman Davis (Jaguar's test engineer) had achieved the almost unbelievable speed of 150 mph on this motorway, it all led to great anticipation within the Jaguar factory.

There was also an air of cautiousness hanging over the E-Type in its development, the question was being asked, 'Would it be profitable?' Nearer to its completion Lyons gained more confidence in this creation and gave it his undivided attention and ensured that much attention was given to the smallest of details. For it was this attention that set the car apart from so many others.

Much thought went into the early advertising campaign. Lyons had invited a select few journalists to come and visit the factory and view the E-Type throughout its development. This is unlikely to happen today in such a competitive industry, but it worked well for Lyons and created a great sense of mysticism prior to its launch.

Jaguar could sense that they were on to something special, and at the Geneva Motor Show it was not until the fourth day of the show that they unveiled the E-Type. It had been concealed in a large box, which had prolonged the public's curiosity. But when the box was removed on the forth day, there stood the most beautiful sports car, onlookers stood in silence as they couldn't have imagined that what they saw could have exceeded their wildest expectations. The car became an immediate success. Later that year, in October (1961) at The Earls Court Show there was a great excitement around the Jaguar stand, people came almost on pilgrimage to pay their respects to a truly amazing British sports car which stood before them.

When Jaguar provided the first E-Type so as it could be tested, it is now known that this car was specially prepared, it was known as the '9600 HP' and probably the most famous of all E-Types, for it was the car that achieved this formidable speed of 150 mph. This had not been done before by many manufactures and caused quite a stir in the automobile industry. The 9600 HP had been lightened in order to achieve this speed, the standard E-Types fell just short of the 150 mph, achieving 147 or 148 mph, which still was a formidable speed for a production car.



Figure 11 Earls Court Motor Show, 1961.

By now Jaguar was learning fast about advertising and how important that it was for selling their cars. The E-Type had a head start in this area as its forerunner the D-Type had proven itself on the track. Many advertisements simply showed a picture of the car with limited technical facts and where one could purchase one. But Jaguar also used celebrities as a sales tactic in their advertisements. People such as the Beatles and Twiggy were shown driving their own E-Types, a clever tactic by Jaguar as these people were the forefront of the social scene at the time. Jaguar felt by portraying their cars with celebrities that their image, and the public's interpretation of this image would be of a car with great social importance and reflected the true sense of British culture.

It would be untrue to say that the E-Type was adored by all sectors of society. There was a group that believed that what this car stood for was all wrong. One would imagine that it was the same sort of conservatism which opposed the introduction of Rock and Roll, but these people are entitled to their opinion and we must not forget that. Some people reckoned that the car was ahead of its time and that the general public wasn't ready for a car with such performance. At this time people were in general happy with a car that could achieve a top speed of just half that of the E-Type. The Morris Minor was the most common car then and its maximum speed was a mere 60 mph, this being a very acceptable speed for the time.

The E-Type goes to America.

Britain in the late 1950s was somewhat conservative in design terms. It was compelled to hold on to its cultural heritage and background due to the demise of the British colonial empire and the inevitable fall of the Commonwealth. This proved to be the underlying factor that formed the basis of that which the British held so dear to themselves. It was this feeling of betrayal that prompted an urgency to protect all that was 'British.'

It was this stigma that was associated with the British that proved to be one of Britain's biggest exports, reaching deeper and deeper into the roots of societies

worldwide. In particular, the Americans embraced this new found culture and welcomed it open-heartily.

The E-Type may have been misunderstood somewhat in Britain, but it was an overnight success in America as they welcomed it with open arms. They loved the car and what it stood for. In sixties America, Britain was associated with sophistication and class. The Rolls Royce car portrayed this sophistication admirably was a prime example of all that they stood for. The Americans saw these traits in the E-Type Jaguar. It was portrayed as a fashion accessory and a social statement. The Americans being accustomed to the earlier XK-120, 140 and 150 models were reluctant to drop the 'XK' name, so to them it was known as the 'XK-E'.

This car in America was a fun thing to have in that it epitomised all that was 'British', giving that sense of upstanding grandure. Images of people going to work in their traditional American cars, and once home they would disguard the more mundane automobile and slide into their E-Type, let lose and enjoy all it stood for.

The performance of the E-Type was very suited to the American roads, for one could appreciate the car to its full potential, and many drivers were not afraid to give them plenty of 'right foot' to which they reacted favourably.

It was ironic that the Americans, who so loved this car were responsible for killing it off. As a result of the Nader Report which was a road safety and pollution investigation, cars had to comply to strict emissions and safety regulations. With the USA being the largest market for the E-Type, this report meant that the Jaguar Company had to implement radical changes to its cars. This all culminated in the extinction of this beautiful 'cat'. It had reigned supreme for so long, looking as though it was impregnable and because of these circumstances it had to face an untimely death.

The E-Type Jaguar was an inexpensive car in its class, selling at £2095 for the open top and £2194 for the coupé, there were no other manufacturers that could provide such quality and performance at this price. There were however cars that could match the E-Types on road capabilities, these included the Aston Martin DB-4, some Mercedes and Ferraris. None of these cars however could come close in terms of price to the E-Type, there it stood alone.



Figure 12 Aston Martin DB-4 1959.

Chapter 3 The E-Type Jaguar.

An analysis of the E-Type Jaguar.

Jaguar had intended that the E-Type should only appear in an open two seater 'Roadster' form. William Lyons felt that an open car fitted better into society at the time as it was a symbol of change, offering a sense of freedom and capturing the imagination of the motoring public. It incorporated the influences of the far outreaching American motor industry that encapsulated the freedom of spirit portrayed in the streamlining and design of these cars, harbouring the essence of both speed and beauty. In Lyons's opinion the symbolism of an open, sexy, two-seater portrayed the correct image of what a British sports car should represent. It was Bob Blake a sheet metal craftsman who visualised the E-Type in the form of a coupé, he believed that 'skinning' the cockpit in the classic 'fast back' fashion would create a beautiful shape. Contrary to many of his fellow workers Blake persisted with his belief and set about mocking up the shape he visualised. When almost complete Lyons entered the workshop and stood looking at the car silently, after this silence, which seemed like an eternity for Blake, Lyons announced that he liked it and that they would manufacture it. This was a tribute to Bob Blake for out of the 15,490 Series I E-Types sold between 1961 and 1964, almost half of them were coupés.

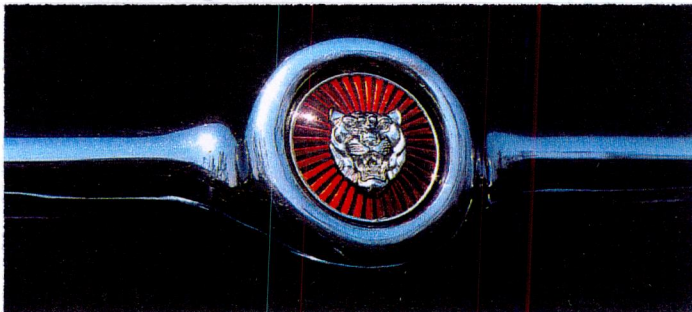


Figure 13 Series I Emblom.



Figure 14 Headlamp Fairings.

The Series I E-Type was a beautiful creation, its long elegant curves seemed to go on for ever. One characteristic which disappeared on later models was the 'fairings' which covered the headlamp cavities to help the fluidity and aerodynamics along the curves of the bodywork. These fairings appeared on the earlier D-Type and functioned well. They followed the compound curves of the front wings and were surrounded by a chrome border which in turn was rivited to the bodywork. It amalgamated the headlamp in a subtle way into the front wings of the car. These fairings were difficult to manufacture, they were made of glass and the company 'Triplex' were responsible for producing them, and indeed still do today, but at a cost of £80 for a pair they are not cheap. One wonders had there been the availability of modern plastics then, would these features have remained on the later models. Behind these fairings were mounted the headlights, on approaching a car from the front one can almost imagine being stared at by the eyes of that most gracious cat to which the car borrows its name.

Below the headlights and set slightly to the side are the indicators and the side lights. These together form a long cylindrical shape with tapered ends. Their positioning on the car between the headlamp and the bumper could almost be described as being an afterthought for they appear to be lost in the extensive curves of the body-work. We are today more familiar with flush fitting lights to create more fluent lines. The back light cluster also, looked as though it was placed as an afterthought upsetting the wonderful curves which swept around from the doors to the rear of the car. This cluster was designed for function primarily, but when one examines it closely one can appreciate the elegance of its construction. The cylindrical reflector housing blends gracefully into the brake and indicator lenses which tapers off in the same manor as the front cluster.

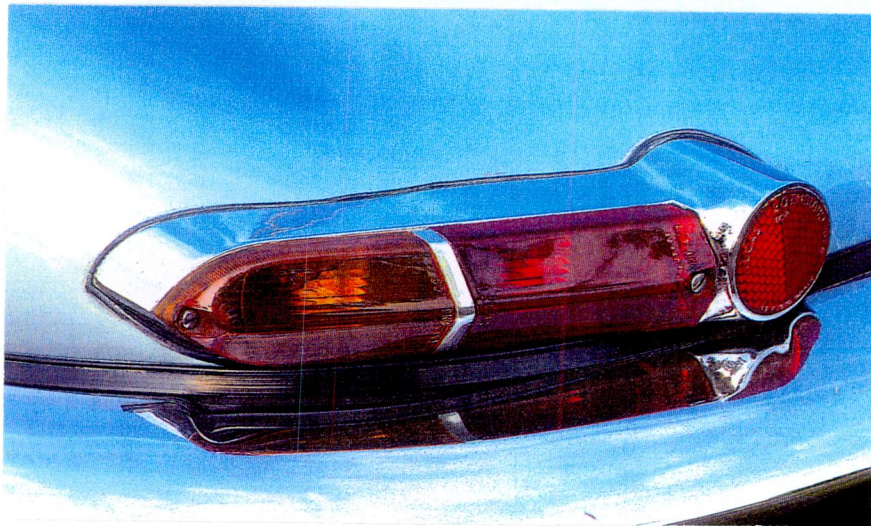


Figure 15 Rear Light Cluster.

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Figure 16 Front Light Cluster.

Due to increased emphasis on vehicle safety in the late 1960s, a major revision of the Series I E-Type was needed and this culminated in the Series II which was introduced in October 1968. With this revamp both front and rear light clusters were enlarged and placed beneath the bumpers. Jaguar still did not succeed in blending them into the body-work very well, even when the Series III was introduced. Another change that took place in the Series II was the exclusion of the headlight covers, the lamps were now moved slightly forward so that they protruded from the oval recesses in the front, loosing the superb fluidity of the Series I.

Another characteristic of the E-Type Jaguar was its large elliptical air intake at the front. Its pouting lips were only divided by a subtle chrome strip whose only function was to hold the circular Jaguar emblem in the centre of this open space. It did however aesthetically work well as it linked the two short bumper sections on each corner of the car's front, making it almost appear as though it were part of the bumper and had structural strength.

The earlier models had been prone to over-heating so it was probably for this reason that they increased the size of the air intake. It made those already 'pouting lips' seem as though they were yawning. The centre bar which held the now oval emblem was also increased in size and in some way helped to balance this now vast expanse of open space. With the arrival of the Series III in 1971, Jaguar felt by now that they needed to upgrade this 'open mouth', so they installed a grill using horizontal and vertical bars which filled this expanse with elongated rectangles. It greatly improved the overall look of the front of the car and Jaguar also took the opportunity of designing a new emblem to be placed on the centre of this new grill. An air deflector was now installed beneath the front grill to increase the cooling capacity still further. It fitted directly into its place but upsets the curves of the previous models.

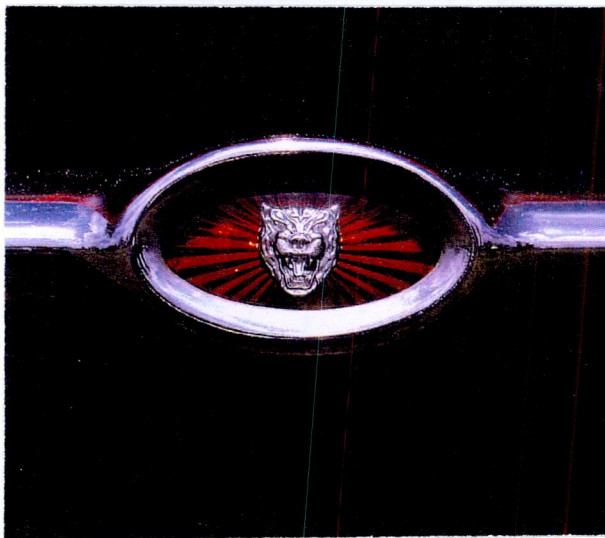


Figure 17 Series II Emblom.



Figure 18 Series II Coupé, 1969.

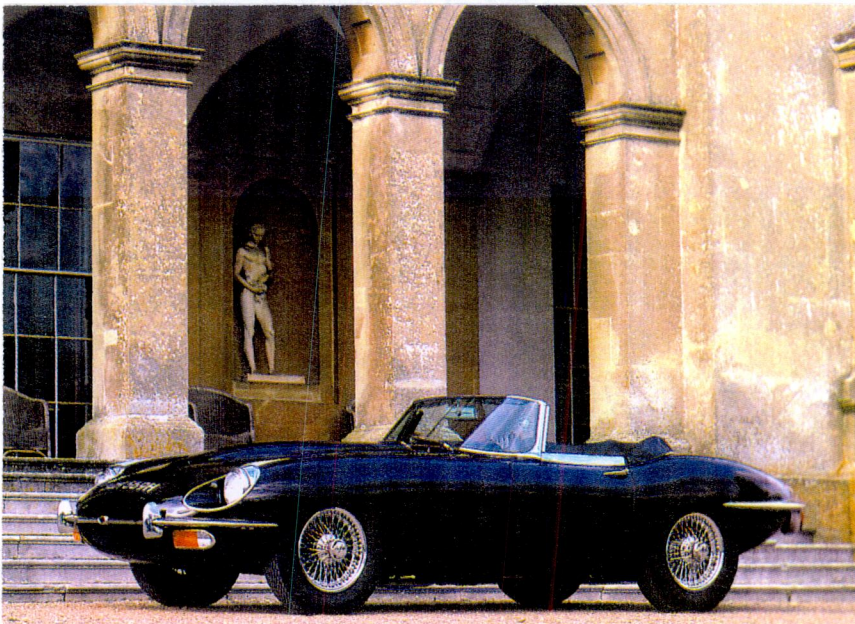


Figure 19 Series II Roadster, 1968.

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Due to the design of the front grill there was no convenient place to put a number-plate. This maybe because, being so closely related to a racing car which had no need to display a registration number, a number was placed on the bonnet to identify the number to the driver and car. Jaguar managed to overcome the illegality problem and continued the trend of the number being stuck on the front of the bonnet. It was somehow out of place and one feels that the car would be so much better without it.

The bonnet of the E-Type was long and curvaceous and extended in a seemingly endless manor from the base of the windscreen right down to the bumper. When seated in the car it was often difficult to judge the length of the vehicle due to the low positioning of the seats and this resulted in numerous minor abrasions being inflicted on the cars. There is a distinctive longitudinal bulge in the centre of the bonnet dividing it into two distinct regions, this bulge provides the much needed space for the 3.8 litre dohc in-line straight six cylinder engine. In side profile it is difficult to imagine how Jaguar fitted such a large engine so neatly into this slender shape. On each side of this longitudinal bulge appears two sets of louvres. These are as much functional as aesthetic since the car had a tendency to overheat. These two columns of fourteen louvres give both texture and a false appearance of colour as a result of the reflection of light and the creation of shadows. The tilting bonnet provided superb access to the engine compartment allowing great freedom to work on all the components within.

The windscreen, long and narrow rises gracefully up from the bonnet to meet the roof. Its length required three wipers on the earlier models, but this was subsequently reduced to two which worked much better aesthetically. When viewed at a glance from the side the windscreen seems to be somewhat vertical, but on a closer inspection one realises that it is the corner pillars with which the windscreen sweeps around to meet, that make it appear more upright than it really is.



Figure 20 Series III 1971, Showing longitudinal bulge on the bonnet .

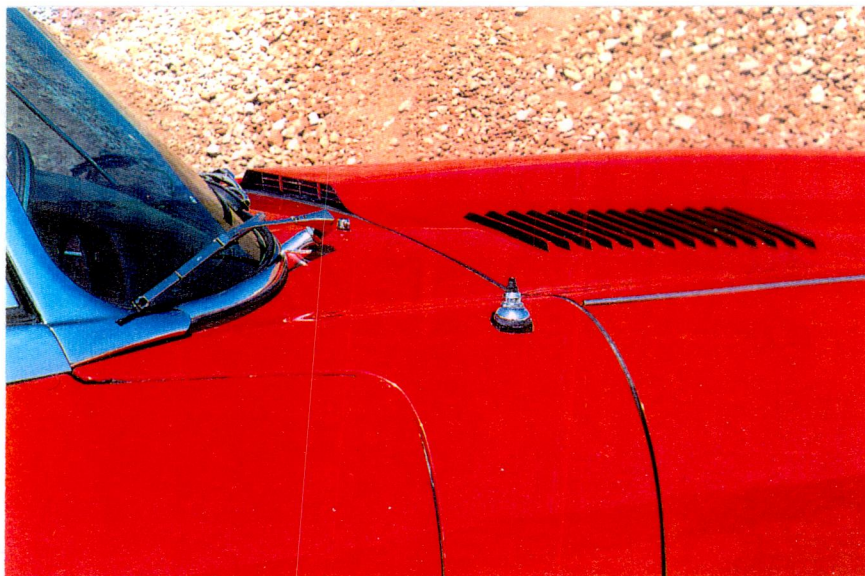


Figure 21 Louvres on bonnet.



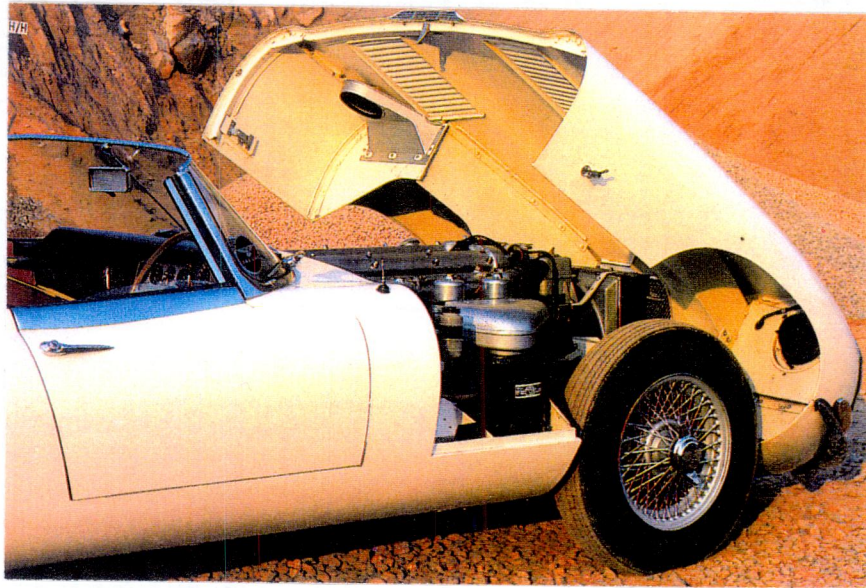


Figure 22 Bonnet lifts forward for easy access.

The bumpers on the E-Type are sleek in appearance and are fitted closely to the body-work, they sweep around the sensuous curves of the car and act as a dividing line between the upper and lower sections, making a subtle division. They appear triangular in cross-section, tapering off gently until they meet with the opening of the wheel arches. Like many bumpers on cars of this era they are chromium-plated and provides an ornamental characteristic, but being of slender form they do not detract from the car's styling. Today we are more familiar with plastic bumpers, and more recently many manufacturers have integrated these bumpers as part of the body-work to achieve maximum aerodynamics. These bumpers invariably appear colour coordinated to the rest of the vehicle, rendering an overall uniformity in shape.

On the Series I both front and rear bumpers did not continue complete from wheel arch to wheel arch, they were interrupted by the air intake in the front and the number plate mounting at the rear. On the Series II, the rear bumper was one complete unit being only interrupted by the two 'over riders', and the number plate mounting was then placed between the newly positioned lights. This change improved the lines of the car at the rear and this styling remained the same on the Series III with only the introduction of some more added ornament in the form of rubber buffers which appeared on the over riders.

4

Wire wheels were de rigeur for any serious sports car at this time. All Series I E-Types came with centre lock wire wheels as standard. These wheels, handcrafted in appearance were the result of much engineering skill and together with the central hubs were a focal point on the car. It wasn't until the launch of the Series III that there was an alternative to these wire wheels. This was in the form of an almost totally solid wheel centre with only ten small ventilation ports to aid in the cooling of the brakes. These wheels however did not epitomise the E-Type Jaguar.



Figure 23 Jaguar Wire Wheels.

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The single, central locking nuts are beautifully crafted, its two symmetrical fin like wings attached so cleanly to the central structure. The name 'Jaguar' is stamped precisely onto this centre lock and each lock is separately marked for each wheel. White rimmed tyres were optional on all models, but the car did not need this extra decoration and subsequently these tyres became uncommon.

The doors on the E-Type were of adequate size to facilitate access into the car, however in some instances a larger person might have been restricted with the coupé model. Today we acknowledge the Japanese for their engineering quality and seemingly invisible shut lines around their doors, but Jaguar succeeded admirably in fitting the doors so well into the E-Type. The door handle is in keeping with the bumpers and the lights. There is a similarity in design between the back lights on the Series I and the door handles. The cylindrical shape of the button and lock tapers off into a point providing the handle to grip, again being made of chrome they provide a contrast against the paintwork.

The neat spring-loaded door on the nearside rear quarter panel conceals the fuel tank filler cap (tank capacity 14 imperial gallons). It is unobtrusive and one would have to look closely to find it.

The E-Type's shape stunned the motoring public when it appeared and even today is still a head-turner. The side panels curve smoothly beneath the car, and at the rear of the car the body panels taper up to meet the back bumper in an almost cigar like shape. The twin exhaust system follows the contour close to the underside of the car, neatly appearing under the numberplate. This smoothness of form beneath the car gave good aerodynamics and quieter running. The tapering rear underside would be considered impractical today as there is a necessity to provide adequate storage space for luggage. The design of our cars today is influenced by our lifestyles and our wants and needs.

A feature which doesn't appear on the earlier E-Type is a wing mirror. Jaguar introduced a driver's side mirror on the Series II, one feels that this stemmed from

necessity rather than want, they must have felt that this object protruding from the side of the car would in some way upset the fluidity of the curves on the car.

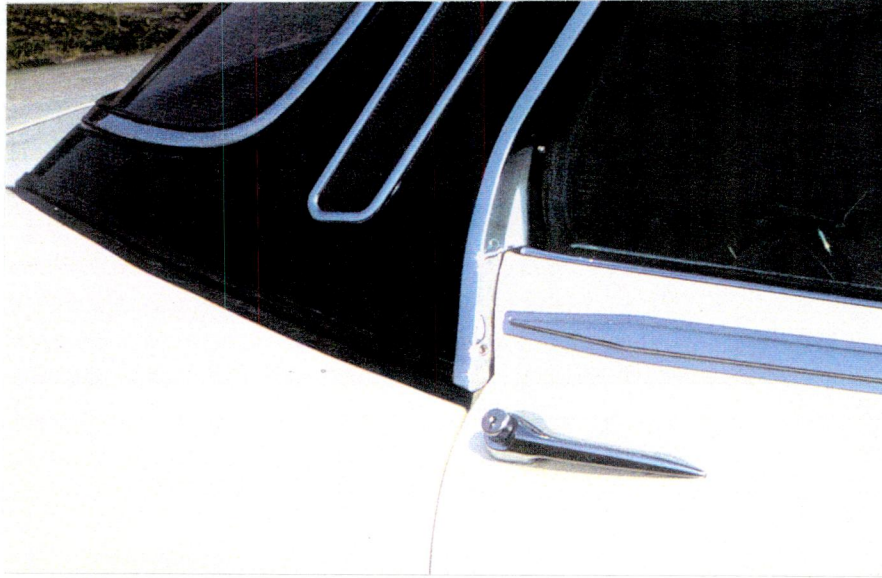


Figure 24 Door Handle.



Figure 25 Fuel Tank Filler Door.



The interior of the car was dominated by a large wooden steering-wheel, which was in true sports car tradition, but it was necessary to gain leverage to turn the 15 inch diameter cross-ply tyres. With the introduction of power steering in the Series III, this was no longer a problem. This wooden wheel was supported by three punched aluminium spokes radiating from the centre which contained the Jaguar emblem. Behind the steering-wheel lie two large dials, one for road speed and the other for engine speed. Within the dials the bold white numbers stands out vividly against the black background. An analogue clock was positioned delicately within the rev. counter for ease of viewing.

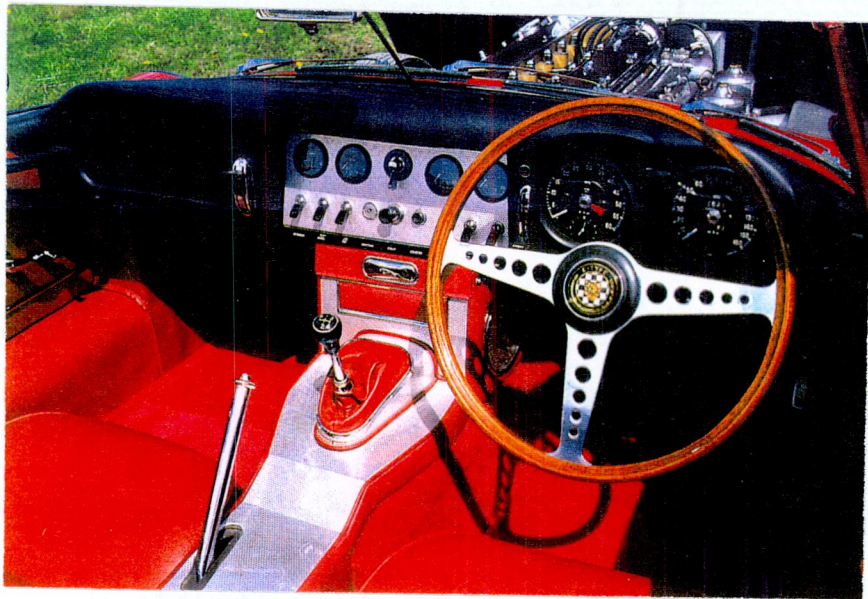


Figure 26 Series I Interior.

The centre console stretches from between the driver's seat right up to the dashboard. It is finished in polished aluminium with a dotted texture, an unusual finish for a car's interior, but it created a focal point in the centre of the car and provided the perfect background to emphasise the rows of auxiliary instruments and toggle switches. The ashtray which is finished in the same colour as the car's interior provides a break from



this instrument panel and lower section and the radio slots in neatly below this. Between the seats the slender chrome handbrake rises from the console through a narrow opening. Its simplicity of design is at one with the car. The gearstick lies on a raised platform in a strategic position, its short chrome shaft was crowned by a spherical knob displaying the gear positions.

With the introduction of the Series II the aluminium console disappeared only to be replaced by a black plastic one, the toggle switches were also replaced due to their vulnerability by rocker switches. The clock was moved from within the rev. counter to the centre console. These changes dramatically altered the look of the car's interior and in some way lost its original charm. The one feature which remained unaltered was the famous wooden steering-wheel which lasted throughout the lifetime of the Series II, but disappeared on the Series III in lieu of a more modern and simplified leather gripped wheel. The introduction of power steering also influenced this change.



Figure 27 Series III Interior.

The bucket seats of the early 3.8 litre E-Types came under criticism for their lack of support on long journeys and also for their lack of adjustment as they were secured in a permanent position. This problem was not rectified until the advent of the 4.2 litre engine in 1965.

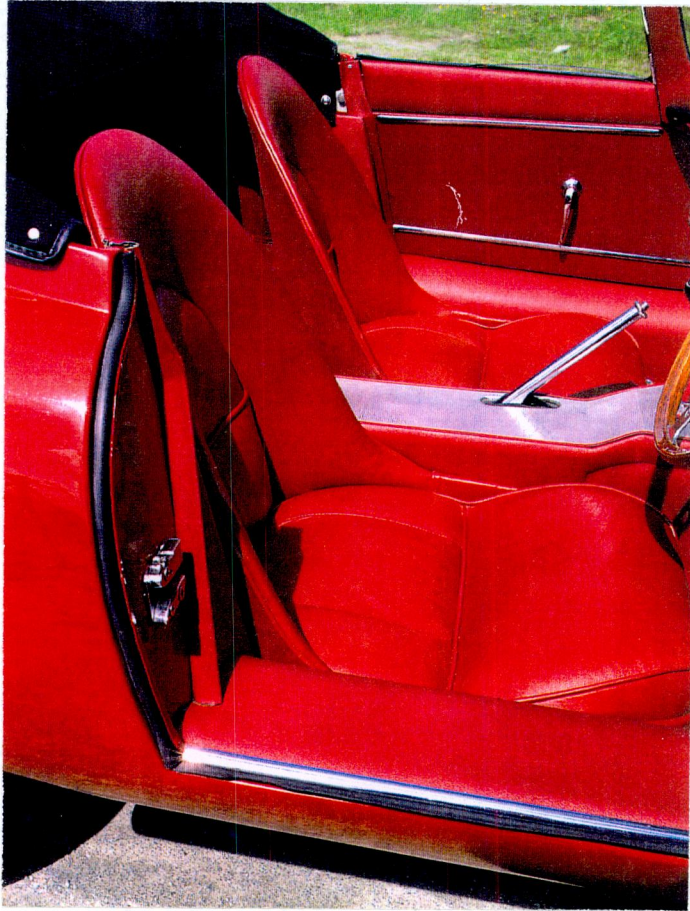


Figure 28 Seats of the Series I.

One criticism with the first E-Types would be their gearboxes, they were sticky, noisy and lacked synchromesh on first gear, however they proved themselves to be very reliable. With the introduction of the 4.2 litre XK engine came a much more refined and totally synchromeshed gearbox. This 4.2 litre engine was no different to the 3.8 litre except for the larger bore which developed more torque.



It was in the year 1966 that the first major changes came about in the E-Type Jaguar. It was mainly public demand and increased competition which forced these changes, and from this year on the car lost its original balance and proportion. There had been a strong demand for a 'family E' and this forced Jaguar to lengthen the car by nine inches and raise the roof two inches higher. This enabled two small seats to be installed in the back, however due to their impracticable size they were really only suited for children. These changes added weight to the car and therefore an upgraded suspension was required and subsequently fitted. The higher roofline made the windscreen appear more upright, this was rectified in the Series III when its base was moved forward to create a less severe angle. This helped to restore its original proportions.

This new E-Type was known as the '2+2', and was then available with automatic transmission due to the extended wheelbase length. Much of the changes at this time were unavoidable and governed by safety requirements, for example the brakes were upgraded from Lockheed to Girling, interior door handles were recessed into the door and under the bonnet changes were made to meet the 'US emission control regulations'.



Figure 29 Series I Coupé Rear Hinged Hatch.

The hinged rear hatch remained unaltered throughout the lifetime of the car. It was originally fitted to the Series I Coupé and was a great asset for providing access to the luggage compartment. It was hinged from the left hand side, these hinges and the locking mechanism were cleverly concealed within the car, so all that was visible from the exterior was a fine shut-line around this invaluable door.

The last radical change which Jaguar made to the E-Type came in 1971 when they introduced the massive 5.3 litre V12 engine. Throughout the 1950s the idea of success at Le Mans was a great driving force at Jaguar. Their successes, won from the 12-cylinder Ferraris by squeezing more and more power from the 3.4 litre XK engine, culminated in the victory of 1957 - their fifth Le Mans win. At this point it was obvious that a bigger engine would be needed if the run of success was to continue. The decision was taken to start work on a Vee-12, which for various reasons never

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1881

1881

saw racing service, however it formed the basis of a new Vee-12 production engine. The racing engine was of course different in many ways, it had two camshafts per bank and produced more than 500bhp. Claude Bailey was its designer, supervised by William Heynes. Walter Hassan was the man responsible for modifying this new engine into a production unit. This engine was very successful for Jaguar owing to the upgrading of the suspension, chassis and brakes which was inevitable due to the extra power and weight.

The car was road tested by Autocar when it was introduced in 1971. Jeffrey Daniels gave it a very comprehensive review and spoke most favourably about it, "performance up to expectation; exceptionally quiet and civilised; very high handling limits" (Daniels, 1971, p.47). In his opinion he felt that the car did indeed live up to its anticipated overall road performance and handling. Proved as a sports car, the E-Type Jaguar similarly impressed by living up to the British ideal of what a true motor car should be, offering both class and civility to its owners.

One must not overlook the importance of the suspension system of the E-Type Jaguar. A component not altogether visible, but so important as it had such tremendous power to deal with. The new E-Type independent suspension system allowed for superb handling on both the road and track. The rear suspension was mounted in a steel cage that was bolted to the floor plan. Essentially a double-wishbone arrangement, it utilised the drive shafts as the upper wishbones. Lower wishbones ran from the base of the differential to the cast aluminium hub carriers, while on each side a pair of coil spring damper units was attached between these lower wishbones and the top portion of the cage. Additional paddle like radius rods ran forward from the lower wishbones to mountings beneath the floor. The front suspension included twin wishbones using torsion bars rather than the usual coil springs, this clever arrangement complimented the rear suspension perfectly.

Chapter 4 The Influences.

The Datsun 260-Z, Mazda MX-5 and the Caterham 21 and the influence of the E-Type Jaguar.

The E-Type Jaguar had a relatively long lifespan, it appeared in 1961 and reigned supreme until the end of 1974 when the last fifty commemorative models were built. The cars' influence on future design was immense and this chapter is going to look at three completely different cars and try to analysis their design in comparison to the famous E-Type.

The Datsun 260-Z

The Datsun 260-Z is a car which bears remarkable similiarities to that of the E-Type Jaguar in its overall body form. It appeared in 1978 after its predecessor the 240-Z. It achieved 'Sports car of the year' in the USA that same year which proved its instant popularity and worth. In the form of a 2+2, its profile resembles the E-Type with its long sloping bonnet and the now familiar central bulge providing adequate room for its 2.6 litre, six cylinder, twin carburettor engine. The two recessed headlights pay tribute to the original styling of those on the E-Type, though somewhat impractical they became a styling feature in many sports cars of this time.

Again the indicators on the 260-Z appear to be almost an after-thought. There are four in the front, two circular ones mounted with brackets to the front bumpers and two rectangular ones positioned on the front wings beside the headlights. The rear indicators are bland, being rectangular in shape they are more functional than aesthetic.

The roof and sloping back hatch almost mirrors that of the E-Type, hinged on the top the hatch opened vertically with the assistance of two gas filled rams. Datsun

favoured the idea of having the release button on the exterior of the hatch and provided more glass for better visibility.



Figure 30 Datsun 260-Z 1978, front quarter view.



Figure 31 Datsun 260-Z 1978, rear quarter view.



The Datsun 260-Z incorporated slender chrome bumpers which swept around the front and back corners of the car portraying a similiar cross section to that of the E-Type. These bumpers were fitted with strips of black rubber primarily as decoration but also protected the expensive chrome from minor scratches and abrasions.

The side door windows and the smaller back door window mimic those of the E-Type, only the smaller rear window is interrupted by a sharp corner at the top. One feels that this is not in keeping with the lines of the car. This car in keeping with the true sports car tradition bears the same low centre of gravity that is also evident in that of the E-Type. This is an essential quality for a car's handling and performance where so much power is available. The Datsun 260-Z, following in the footsteps of the successful Jaguar E-Types formed the link between Jaguar's 1961 creation and America's present day ideal of a 'romantic roadster', namely the Chevrolet Corvette.

Inside, the Datsun 260-Z shows great similiarity to that of the E-Type. Behind its three spoke perforated steering wheel lies those already familiar large twin dials which are set deeply into the dash. All the pre-mentioned cars bears this same characteristic which provides the optimum clarity which is essential when driving a 'real' sports car.

Behind the front seats lie the two smaller back seats which like the E-Type are really only suited for children, but Datsun have provided better access to them by incorporating a longer door and a second release mechanism at the rear of this door making it possible for the back passenger to open it without having to stretch over the front seats.

The Mazda MX-5

The Mazda motor company was making radical changes in their design concepts through the 1980's. This turn about was mostly due to the input of Mr. Tom Matano, who in 1983 moved to Mazda from BMW to become Executive Vice President - Design Division for Mazda in North America. It was the result of his ingenuity that laid the foundations for the design of their cars today.

One such car is the Mazda MX-5, which was launched in 1989. At a glance one may not see any immediate resemblances between this car and the E-Type Jaguar, but on a closer inspection various similar elements are visible.



Figure 32 Mazda MX-5, 1990.

The overall shape is curvaceous and full of long, sweeping, sensuous curves. The front bonnet contains that all familiar central bulge, protruding along its centre as if to tell us that there is some mighty power source trapped beneath it, waiting to be unleashed.

When viewed from the front the now familiar pouting lips of the air-intake may be seen lurking beneath the now slender and aerodynamic bumpers. Like the E-Type the

MX-5 is available in both roadster and hardtop versions, but again it is the roadster that one feels is the model that gives the car the most appeal.

Mazda have also included as an option what they term as there 'new style alloy rims', these were in fact designed to simulate the wire wheels like those that were so common to the E-Type.

If one examines some of the early concept sketches of the MX-5 and examine the front headlights, there is a strong similarity in how they emerge from the body-work to that of the E-Type, although in later drawings and indeed the current model the headlights are totally recessed to allow no interruption in its flowing curves. This is in stark contrast to the almost obtrusive indicator and sidelight clusters that appeared on the E-Type models, which did in fact upset the flowing curves and broke the harmony of its uniformity.

Nowadays with the great numbers of cars on the roads and the increasing awareness of safety, manufacturers are obliged to comply with certain safety regulations. All vehicles on European roads must carry the ISO 9002 certificate and comply with the standards set before them by the European Road Safety Council. It was such regulations that forced all major car manufacturers such as Jaguar to rethink their concepts of safety within there designs.

One of the most obvious exterior features that became a mandatory accessory on all cars was to be the introduction of drivers side and off-side 'wing mirrors', previously excluded on the E-Type. Traditionally these mirrors appeared mainly in a chrome finish as seen on the Series II E-Type, however these appeared more functional than aesthetic in contrast to those of today which are ergonomically sculpted to compliment the overall form of the car.

Again we see how aerodynamics and ergonomics have played their part in the way Mazda have dealt with the sculpting of the fuel filler cap and incorporating it flush and

discretely into the back quarter panel similar to method used on the Jaguar E-Type models.

Mazda have fallen into the same trap as Jaguar did almost thirty years ago in that they have positioned a rear fog lamp almost as an after-thought beneath the rear bumper. This upsets the flowing contours at the rear of the car.

Mazda, like most other Japanese car manufacturers have achieved a standard of excellence in their craftsmanship to which the Western World must take second place. This is obvious in the way in which they deal with the shutlines of their cars which seem to blend so well into the bodywork. Jaguar had already achieved a very high standard in this area during the production of their E-Type.

There are many similarities that appear within the car itself, the two large circular clocks (the rev. counter and the speedometer) have a remarkable resemblance to that of the E-Type. Both in positioning and in style they are the focal point behind the steering wheel, and Mazda like Jaguar have given them pride of place. The central console also bears a strong resemblance in that it sweeps down from the dashboard between the two seats creating two independent cockpits for both driver and passenger.

The Mazda MX-5 is a compact and sporty little car, but with a retail price of £23,695 it does not provide the great value for money that the E-Type once did. The MX-5 marked a new generation of major design change within the Mazda company and opened the gates for greater and better things to come.



Figure 33 Mazda MX-5, 1994.

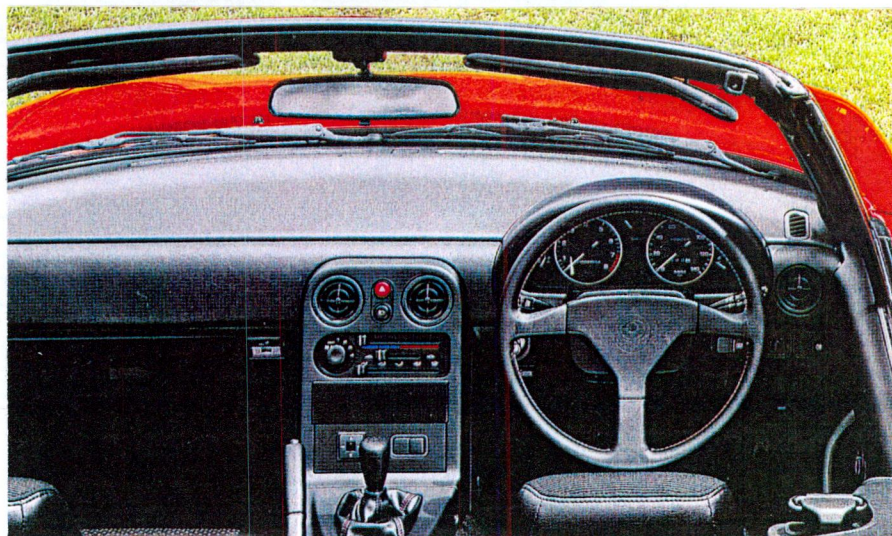


Figure 34 Mazda MX-5 Interior.

The Caterham 21

The Caterham 21 could be described as a hybrid, its prototype which was only launched in November 1994 will be sold as a 'kit car' and contains components of other car manufacturers. This is what makes this car so interesting, to see how its designers have sculpted such a beautiful shape and have carefully chosen components from other cars which they feel compliment the wonderful flowing lines of their design.

Caterham is a company that few people may have heard of. They are a British company that design and manufacture 'kit cars' for a niche market. It is fitting that the '21' received its name when the company realised that the car's debut would be 21 years after Caterham took over Super 7 production from Lotus, and the 21 was to be the successor of the Super 7.

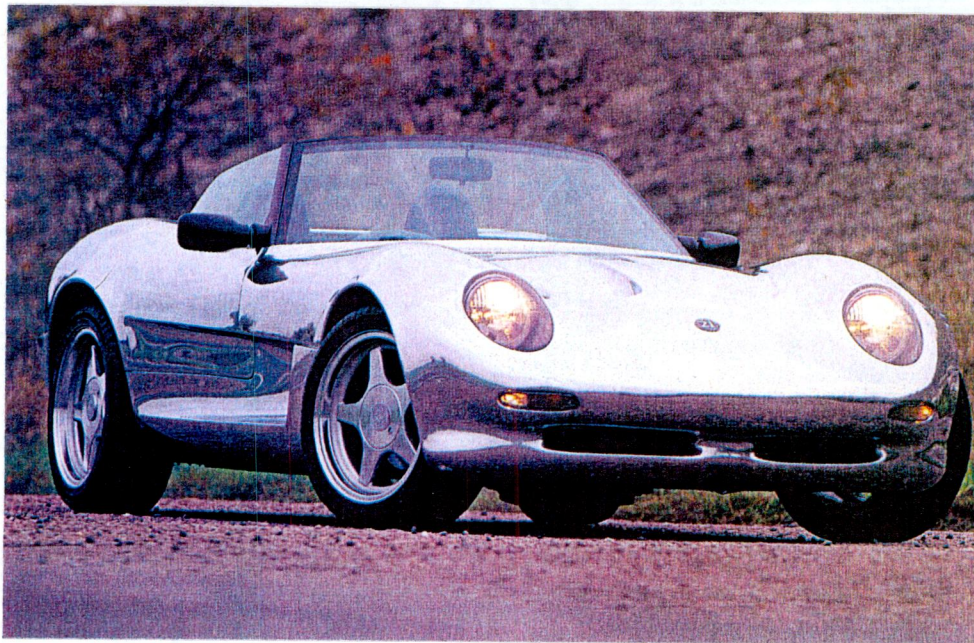
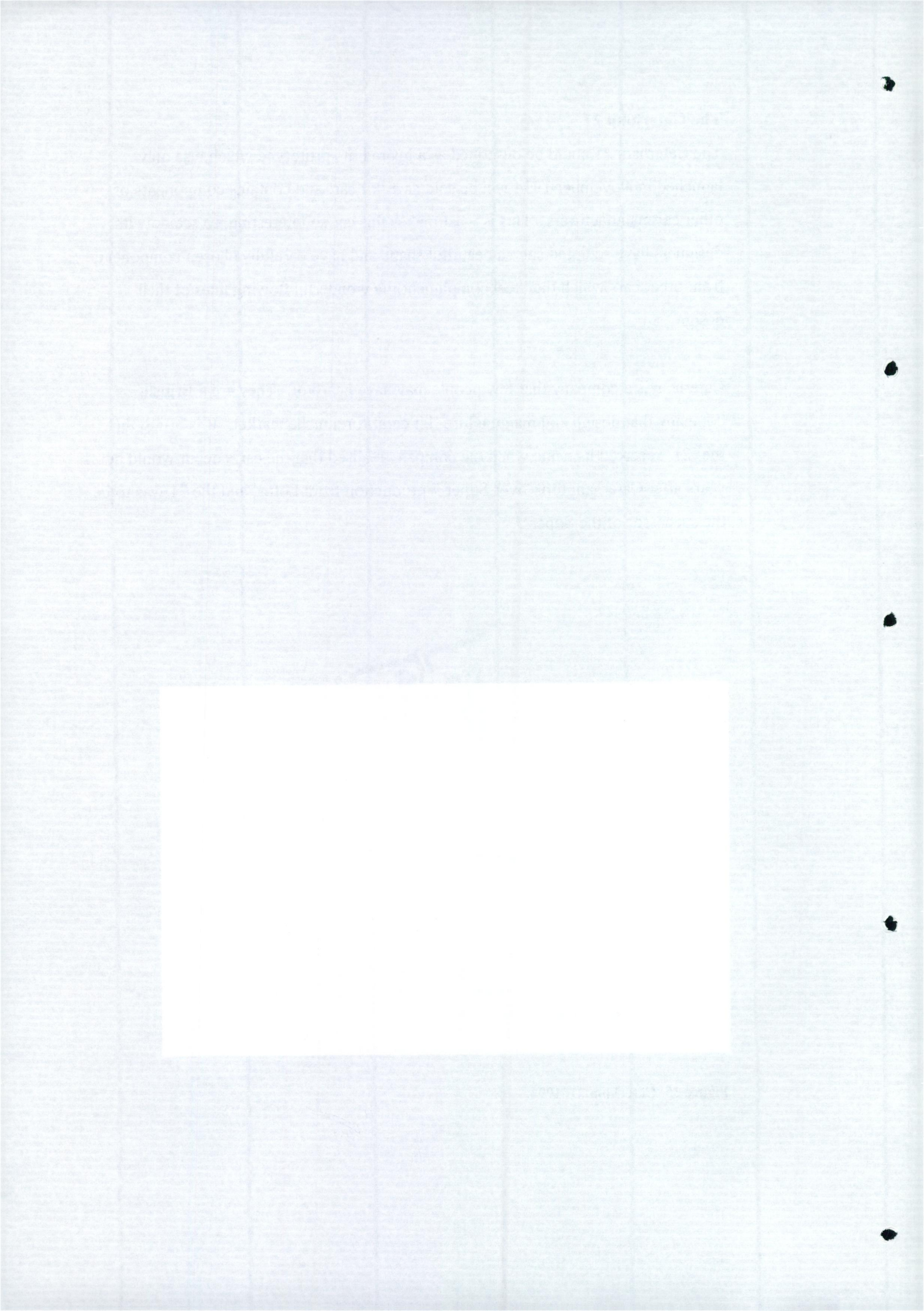


Figure 35 Caterham 21, 1994.



Unveiled at the Birmingham Motor Show in 1994, the Caterham 21 appeared showing its exquisitely engineered bodywork of polished aluminium. Initially the 21 commenced its life as one big block of modeling foam. "It's in there somewhere, all we have to do is find it!" were the words of Caterham's technical director Jez Coates (Robertson, 1994, p.23).

When this car appeared on the front cover of Autocar in November 1994 it straight away was an eye catcher, like the E-Type Jaguar it caused a sensation at its unveiling during the Birmingham Motor Show, crowds stood in awe of its polished aluminium nakedness. The 21 shows remarkable resemblances to the E-Type although it was designed almost four decades later.

The front headlights, beautifully sculpted into the bulbous front wings are protected in the same manner as those of the E-Type to provide maximum aerodynamics. The car appears as an endless maize of sweeping curves and rounded corners. Caterham have opted for no bumper at all in the front and only a hint of one in the bodywork at the rear, for one feels that it might upset those smooth lines of the car. The air intake at the front of the car appears as an elongated mouth stretched almost the full width of the car, only to be divided into two sections by a small central pillar which provides more structural strength to the lower elements of the body work. This section has been cleverly designed and shaped as an air scoop, providing maximum air flow to the heated regions of the engine. This air flow region extends through the corners and is only lost when it reaches the front wheel arches. The over emphasised side air ducts interrupts the sweeping curves along each side of the car. One would feel the designers have been slaves to fashion in their decision to include these features.

The 'central bulge' along the bonnet of the 21 has been tackled in a different way by Caterham. It almost appears as though they have milled two slots along the bonnet to create this feature. They are however functional, as they allow the hot air to escape

and enter the slipstream of the car. This replaces the concept of the louvres that are to be seen on the E-Type Jaguar.

The Suzuki indicators and side lights fit cleanly into the front corners of the car, and the rear Ford Mondeo clusters fit so precisely into the back quarter pannels as if designed to fit the shape of the car and not vise versa.

Like the E-Type Jaguar the Caterham 21's designers claim a top speed of over 150 mph with their standard HPC engine and an estimated speed of 171 mph from the Vauxhall JPE 2.0 litre engine which develops a mean 250 bhp which will propell the car from 0 - 60 mph in just four seconds (Robertson, 1994, pp18-23).

Behind the three spoke steering wheel lies the now familiar clocks. The centre console is slim and uncomplicated, resembling the early aircraft cockpit design. This console sweeps back between the two seats dividing the two cockpits similiar to that of the E-Type's design. The seats of the 21 bear a striking resemblance to that of the Series 1 E-Type, their slender profile wrap around the shoulders of its occupent, securing them firmly.

In many ways the Caterham 21 resembles the latest Jaguar sports car, the XJR-15. It posseses a similiar body form and sleek appearance. This sports car was designed specifically by Jaguar as a racing saloon, but will be available shortly to the public in the form of a XJ220 road car for the vast sum of £500,000.



Figure 36 Interior of Caterham 21.

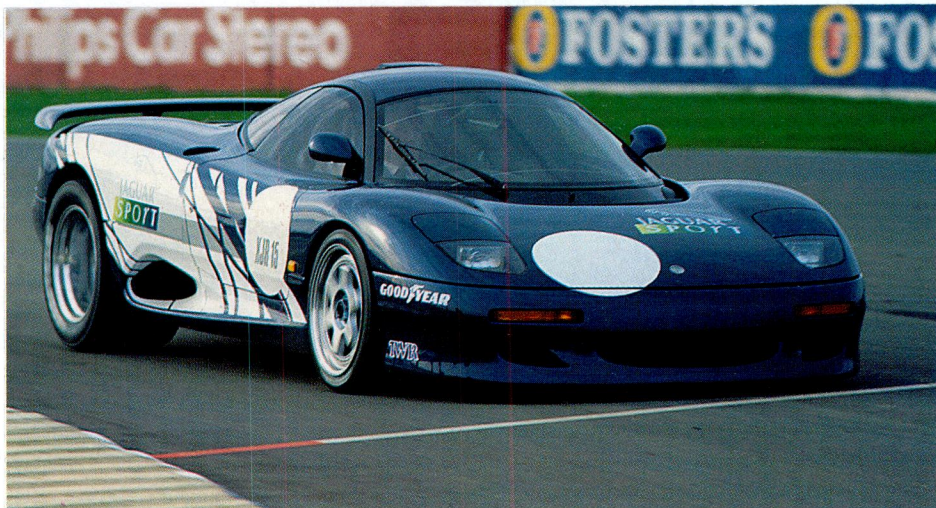


Figure 37 Jaguar XJR-15.

Within the Caterham 21 functionality is the main priority, no gimmicks are included, just the bare essentials for the person that appreciates the raw power and beautiful body form and not the extra 'frills' that are all too evident on many of today's cars, put there purely to encourage sales. The XJR-15 only contains the minimum amount of interior instrumentation, this is a feature which makes the cars so appealing to many people. It is on this hypothesis that the Jaguar Company produced the first E-Types, and it remained their ideal throughout the era in which the Jaguar E-Type reigned supreme. The Caterham 21's interior, though in many ways bland, epitomises the deepest influences of the E-Type's design and could almost be deemed as being the Jaguar's younger brother. Both cars, despite being a generation apart express the same freedom of spirit that was so evident and alive in society of the early sixties and again now in the nineties. This spirit is only re-born when designers such as Iain Robertson and Jez Coates allow their imaginations drift both forward and back in time, for it is only by looking to the future that we see what must be, and to the past for the foundations that must be built on to succeed.

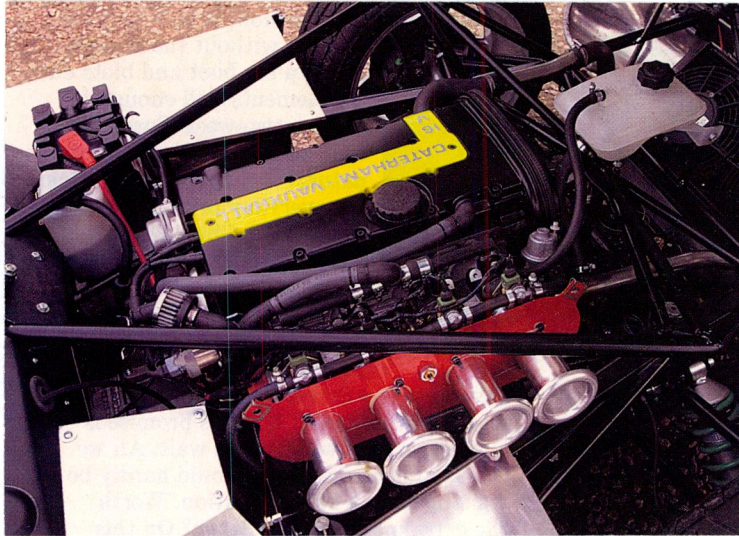


Figure 38 Two-litre 'JPE' Engine of the Caterham 21.



Figure 39 Steering Wheel of Caterham 21 and Instrument Panel.

Conclusion

In this analysis of the E-Type Jaguar the following factors have been identified which influenced the design of one of the most significant sports cars of all time. It has documented the cars which were most directly influenced by the design of this car. The Jaguar Motor Company had from its commencement produced cars of quality, they also reflected an air of 'class' and sophistication and managed to combine performance with refinement and prestige and continued to reflect 'all that was British' by portraying the mood of the British culture in their design.

Three cars have been documented : the Datsun 260-Z, the Mazda MX-5 and the Caterham 21, their influences and idiosyncrasies have been traced back to the E-Type Jaguar, the credit alone must not be attributed to the E-Type as car design is a combination of influences springing from many directions and combining ideas and ideals from many people in the design process. The public's attitude to design change is hesitant, this remains a feature of human nature and makes the whole area of design unpredictable, but it is this unpredictability which makes design exciting and challenging.

In car design there is no designing from first principles, this is clearly visible if one looks back to the introduction of the first automobiles, their designers had no idea of what a 'Car' should look like, so it was inevitable that the first automobiles should take on the appearance of the horse drawn carriages which were the principle form of transport at the time. Car design is like this today in many ways, the designers are always looking back to successful designs of earlier periods to get inspiration and ideas to incorporate them into their new designs. Cars such as the Datsun 260-Z, Mazda MX-5 and the Caterham 21 reflect this influence in many aspects of their design, these influences stem from the E-Type Jaguar and indeed other cars too. One can appreciate from this thesis that there is no such thing as a completely 'original' car which is designed from first principals, all automobile design is in some way related to

what has gone before. The designers of today are no different to those who were responsible for the introduction of the car as we know it, they have borrowed concepts and features from previous designs and incorporated them into new designs. This is not a factor confined only to automobile design, it is apparent in all aspects of the design world. It are these influences which form an important part of the design process.

The American influence in the design of the E-Type Jaguar is very significant. The British car industry at the time of the introduction of the E-Type was producing cars that reflected the British social life, they were conservative and traditional. The introduction of the E-Type reflected the aspirations and attitudes of the American people which was evident in the design of the American cars of the time. The American car industry was influenced greatly by the concept of streamlining pioneered by Raymond Loewy in the 1930s. This streamlining conveys a sense of freedom, speed, power and elegance in the design of the cars, it changed the whole thinking behind the design of the automobile.

The E-Type Jaguar was a symbol of its time, it portrayed a sense of freedom and sophistication, it had an association with affluence and British culture. It was this association with the 'British' that helped make the car so successful in America. The Americans loved this association with the British, and by driving this 'true British sports car' they could be part of their culture.

The E-Type Jaguar is a very special car and represents a period in the British car industry where attitudes and emotions of the public and manufacturers was changing. It captured the empathy of the public both in Britain and America and displayed the air of elegance and finesse associated with American design. There was no successor to the E-type Jaguar, it remains a unique example to which designers of today can procure inspiration. Its long flowing curves and sculpted form are a monument to automobile design in Britain and the rest of the world.

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Appendices



Figure 40 Autocar Road test, July 1973, The V-12 E-Type.



Figure 41 Autocar road test, April 1971, The V-12 E-Type.

Q40. 1940 17 128 0131 H 40-12

40

Q40. 1940 20 128 0131 H 40-12

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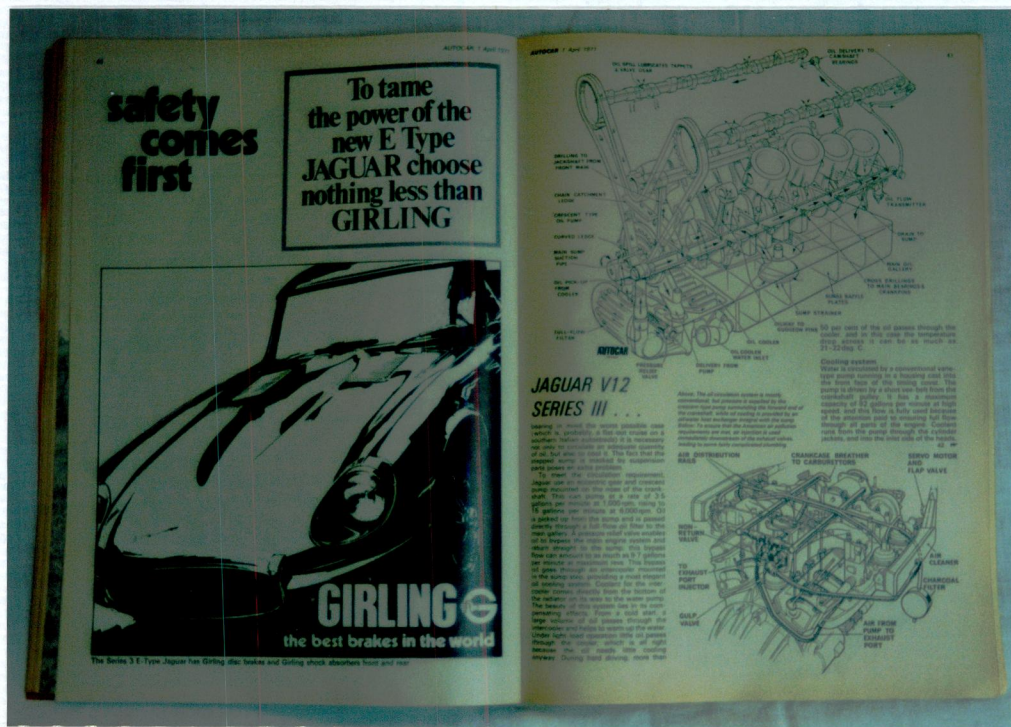


Figure 42 Autocar, 1971.

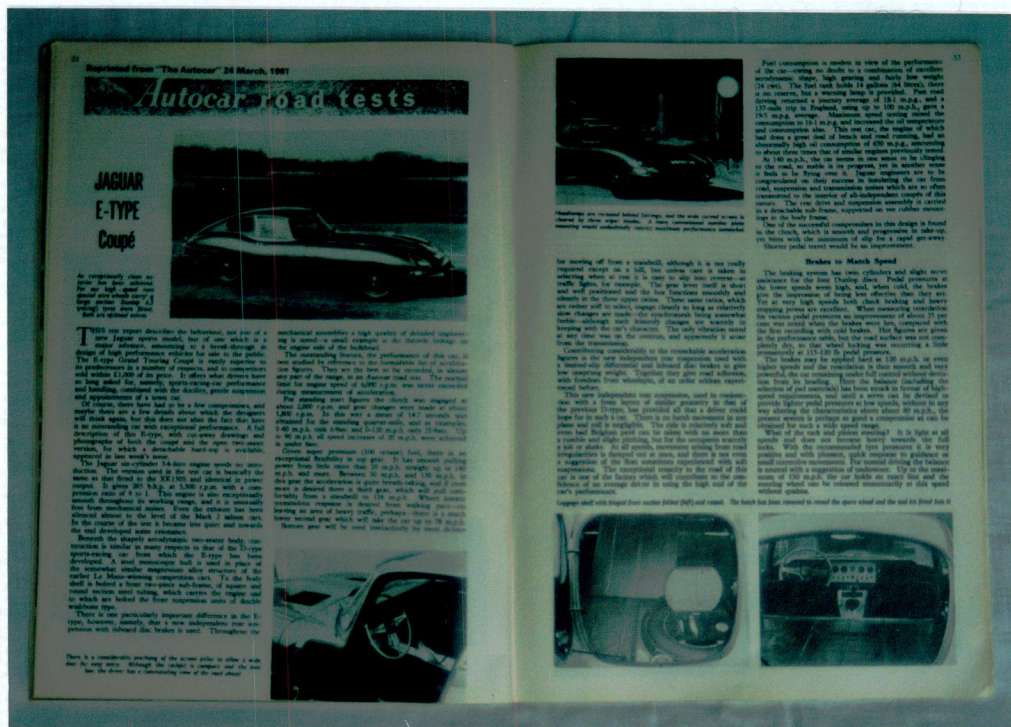


Figure 43 The Autocar, March 1961.

060.2041-21 127 0131 N H 1-2

060.1041-11 127 0131 N H 1-2

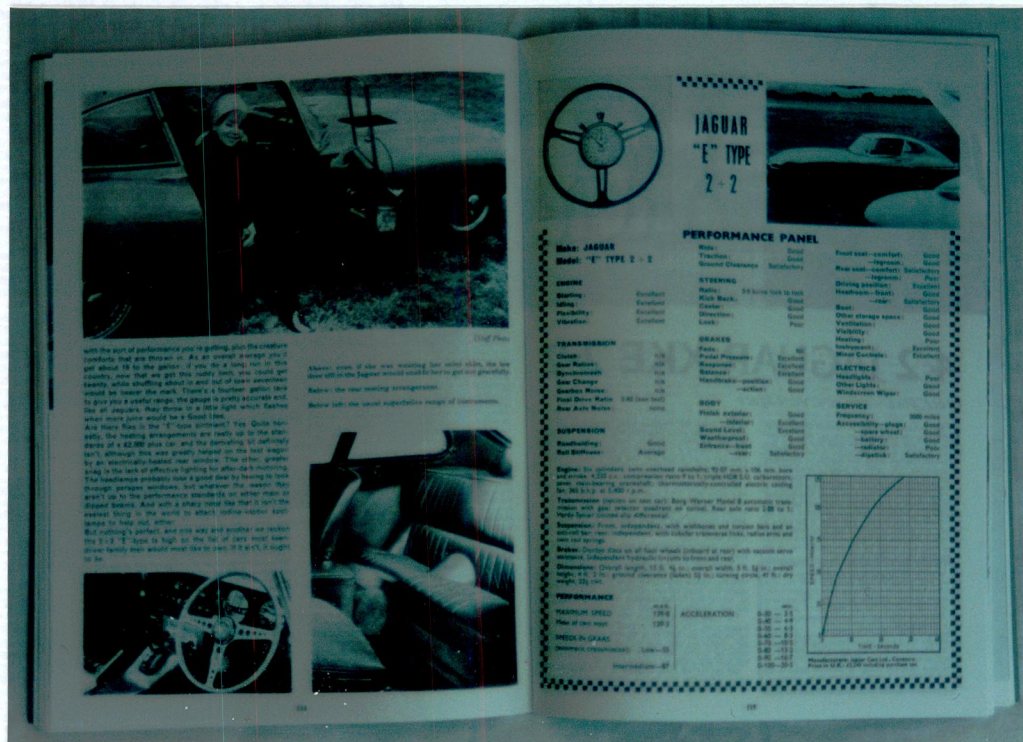


Figure 44 Autocar road test (Jaguar E-Type 2+2), 1966.

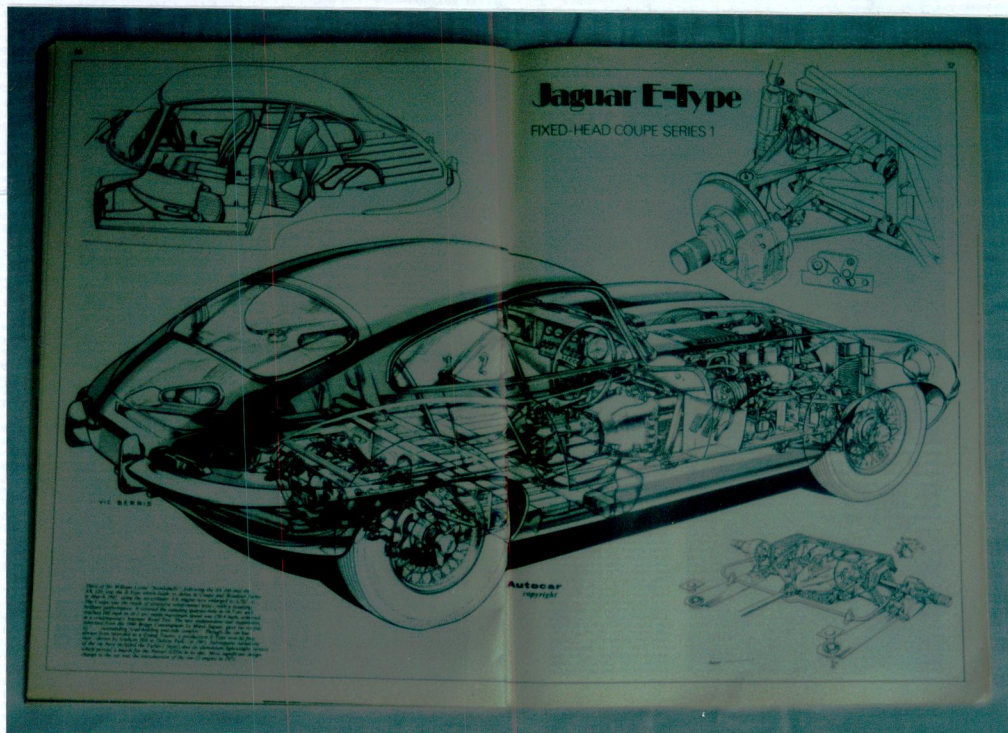


Figure 45 Detailed drawing of E-Type Jaguar, Autocar, 1961.



046-1243 22 129 0131 N N-1-1



046-1243 18 129 0131 N N-1-2

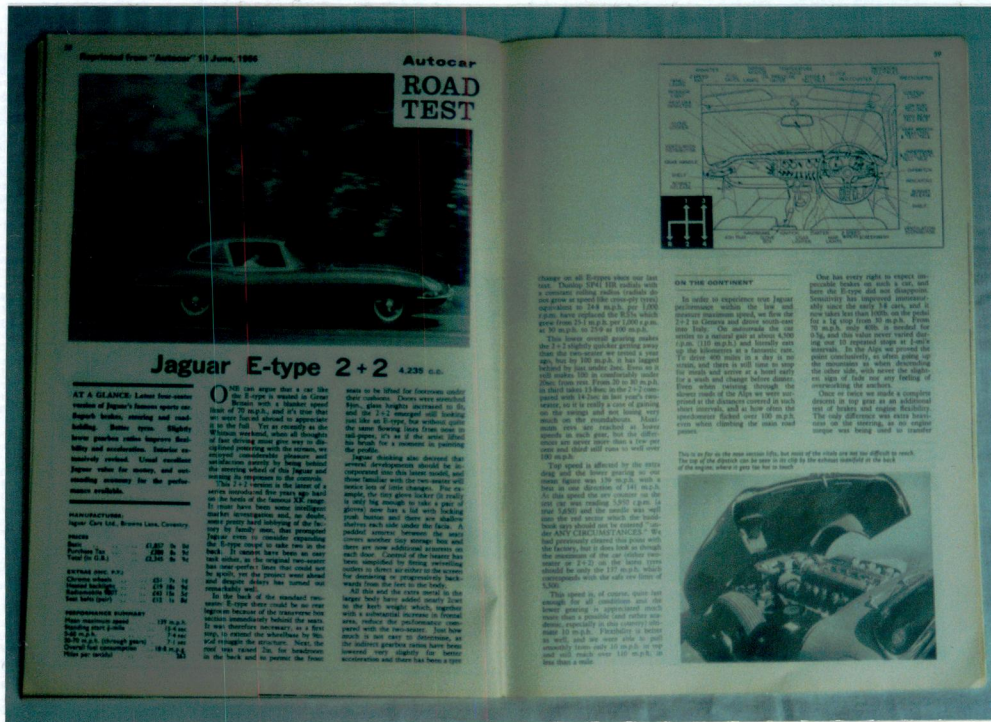


Figure 46 Jaguar E-Type 2+2 road test, Autocar, 1966.

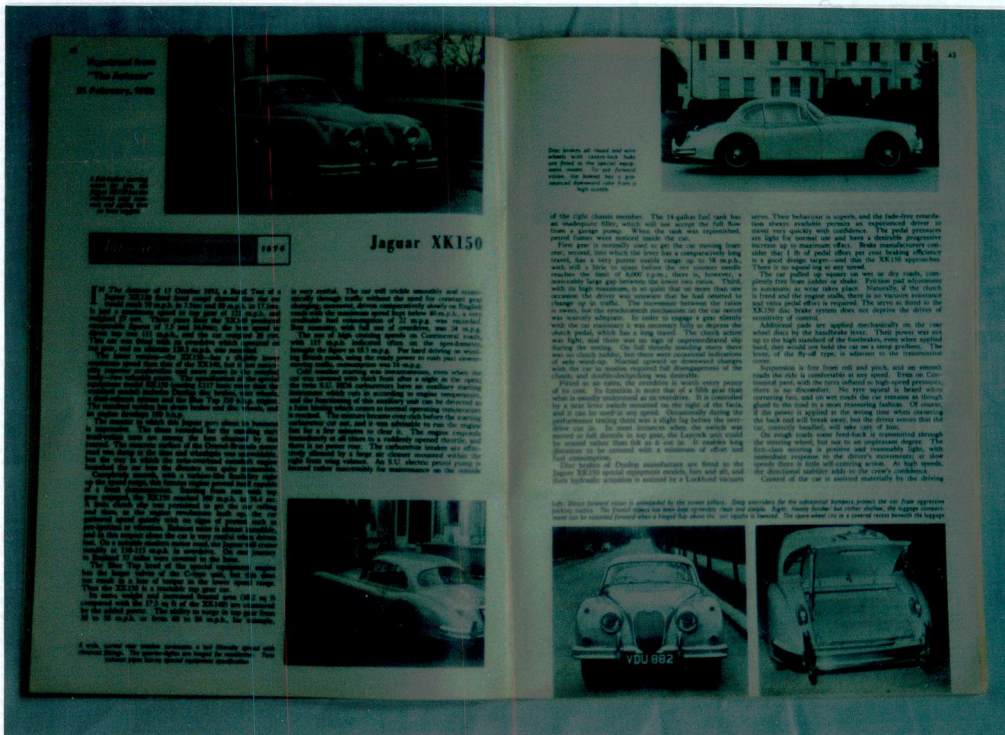


Figure 47 Jaguar XK-150 road test, Autocar, Feb. 1958.

000. 130 14 129 0131 N N H 12

000. 701 00 129 0131 N N H 12