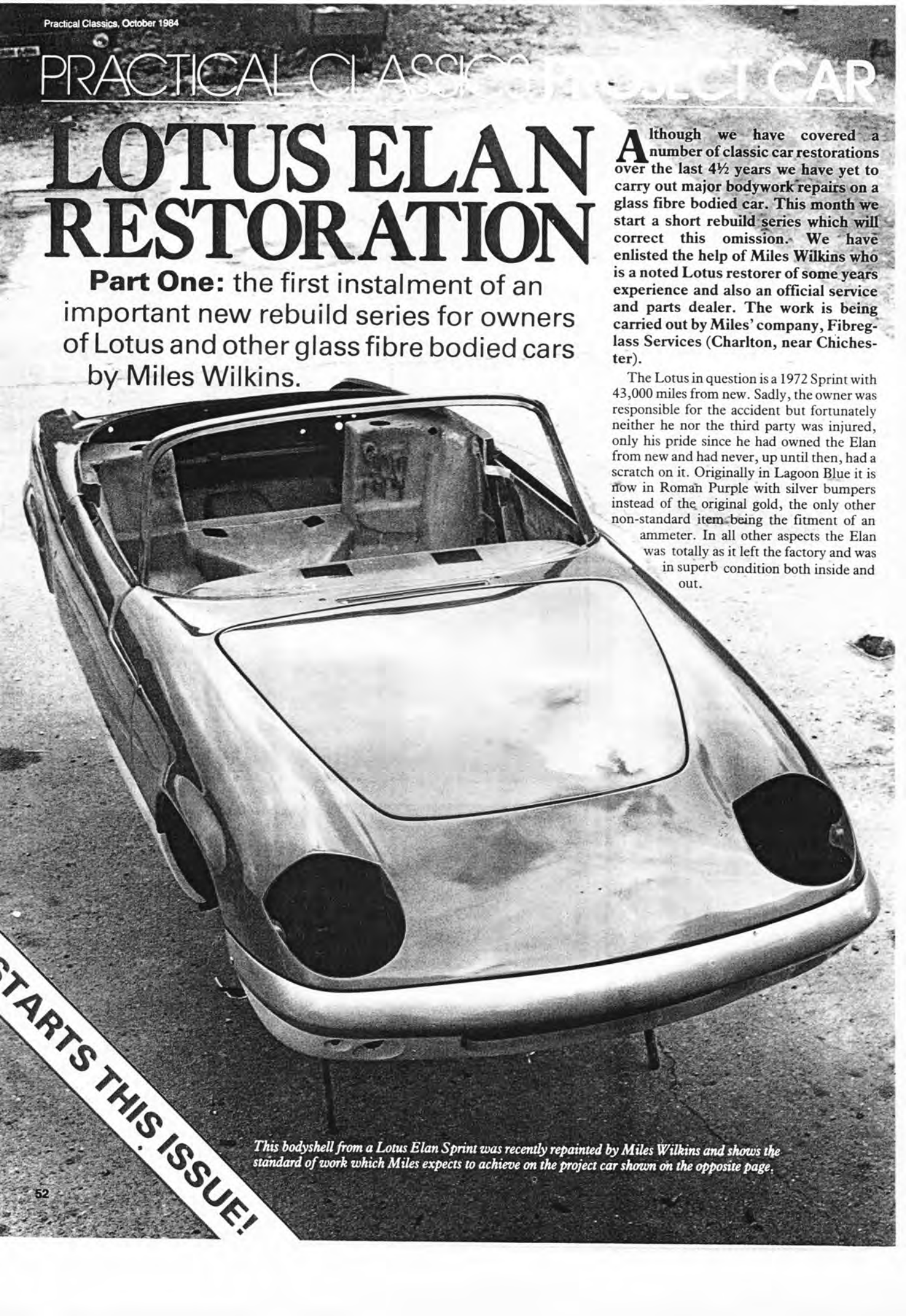
PRACTICAL CLASSICS PROJECT CAR

LOTUS ELAN RESTORATION

Part One: the first instalment of an important new rebuild series for owners of Lotus and other glass fibre bodied cars by Miles Wilkins.

Although we have covered a number of classic car restorations over the last 4½ years we have yet to carry out major bodywork repairs on a glass fibre bodied car. This month we start a short rebuild series which will correct this omission. We have enlisted the help of Miles Wilkins who is a noted Lotus restorer of some years experience and also an official service and parts dealer. The work is being carried out by Miles' company, Fibreglass Services (Charlton, near Chichester).

The Lotus in question is a 1972 Sprint with 43,000 miles from new. Sadly, the owner was responsible for the accident but fortunately neither he nor the third party was injured, only his pride since he had owned the Elan from new and had never, up until then, had a scratch on it. Originally in Lagoon Blue it is now in Roman Purple with silver bumpers instead of the original gold, the only other non-standard item being the fitment of an ammeter. In all other aspects the Elan was totally as it left the factory and was in superb condition both inside and out.



This bodyshell from a Lotus Elan Sprint was recently repainted by Miles Wilkins and shows the standard of work which Miles expects to achieve on the project car shown on the opposite page.

STARTS THIS ISSUE!

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The accident was fairly comprehensive and as can be seen by the photographs the car will require a great deal of mechanical and bodywork. The impact (at over 60mph) was severe enough to send the steering column upwards and break the dash panel in half. With major accidents such as this there is always a doubt that the car will be written off and lost to the owner for ever unless he has a chance to buy the remains as salvage from the Insurance Company. I cannot stress too highly the importance of having an agreed value policy for your Lotus. If you are using the car on a normal policy then change immediately, see a specialist broker (John Scott & Partners or Clarkson Puckle & Head) and obtain an agreed value policy. If you have valued it at say £5,000 and then write it off, £5,000 will be paid to you in full – not the "market value" of £2,000 given to you by most large insurance companies after ringing around their "friends in the trade". No Lotus car in my view should ever be scrapped as they can be re-bodied and re-chassied ad-infinitum. No Lotus should be on third party cover only, if you cannot afford comprehensive cover then don't own it.

The Elan here was covered with an agreed value policy of £5,000 and as the total repair estimate was below ⅓rd of the value (only just I may add) the repair has been authorised and the car has not been written off. The first point to make is this; that without the correct insurance cover this car *would* have been scrapped, so choose your insurance cover with care.

The accident has happened and (leaving all the police details aside), the car will be towed to the nearest garage, or to your home. If the former, get the car away as quickly as possible to your home or nearest Lotus dealer. I have had to tow in Lotus cars that have been left in garages and the "storage" charges are horrific.

Obtain an estimate; many Lotus dealers will travel to your home to do this and if the insurance company insists on two estimates, be careful where you go for the second other than another Lotus dealer. Two points to be

made here, firstly the scale of labour charges vary from £9 to £24/hour. Now at £24/hr the Elan in question would be written off without even putting pen to paper, but at £9/hr it was saved; secondly there are *very few* non-Lotus concerns that actually know what they are doing. This is not "the biased view of an official dealer" but the opinion of someone who time and time again has to put right extremely dangerous workmanship by these so-called specialists.

Once the estimate has been authorised the car will be repaired by the garage elected to carry out the work. If the car *has* been written off then you may have the chance to have a cash settlement and buy the salvage. If this is the case then I would always recommend that you do this, because the car can be rebuilt in your own time to as good as new again. Obviously economics play an important part and you may decide that the wreck will go to someone else or be broken up altogether.

This series of articles is being written for the owner who has the salvage or who wishes to do a normal chassis change or even just stitch on a section after a minor crunch, and in order to assist in this task we at Fibreglass Services have elected to do the whole job outside (without the use of our ramps, jigs etc.) to simulate your doing it in the driveway or a friend's garage without all the special tools

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LOTUS ELAN RESTORATION/Continued

and dodges that we use. So before you start, make sure you can do the task, if not bow out and let a professional do it before you get halfway and cannot continue. It is more costly to re-check someone else's mistakes than to do the job from the beginning. Buy the workshop manual (the official factory one is three times as thick as anyone else's and tells you *all* – £16.50 plus £2 p&p from us – no VAT) and read it from cover to cover. If you have any queries ask, before you go mad undoing everything in sight. The official parts book is available and represents excellent value as well for the Elans and +2's (£8.50 + £2 p&p no VAT). Armed with this you cannot go wrong when ordering the parts. It is just as well to make a list of the obvious parts that you'll need and do understand what you require especially on body parts, for so many people order a full front when all that is needed is a ¼ front section left side – the parts book here gives all the exploded views of the car. Again when considering the new parts please, please buy the genuine articles – yes they may be slightly more expensive but they are correct, they fit and they are guaranteed for 6 months, the body sections are made on the original moulds and are finished in prime-surfacer. I have seen so often spurious parts that will not fit by any stretch of the imagination, body sections with no bobbins in them and other replacement braking and steering components that are lethal. The factory built the cars to a high standard and to do speeds of up to 125 mph in the utmost safety. When doing your rebuild please remember to keep it that way, and at the end of it all you'll have a Lotus to be proud of and it will be able to command the highest price upon re-sale if all original. □

NEXT MONTH
Body off chassis

PRACTICAL CLASSICS **PROJECT CAR**

LOTUS ELAN RESTORATION

Part Two: removing the body from the chassis, by Miles Wilkins.

Removing the body from the chassis is very straightforward and need not be as frightening a task as many owners imagine. In our case the job has been made easier with half of the front being wiped off anyway!

The first thing is to jack the Elan up on axle stands to a height that you can lie under comfortably. Support the car under the chassis cross-member at the front and on the body sills at the rear. Follow the workshop manual and you won't go wrong but we normally start in the engine bay, so remove the bonnet completely, undo all the hose connections to the block and heater hoses, undo all cables (ie accelerator, choke, heater/oil line), servo hoses off manifold, headlamp vacuum piping at the T-piece on the chassis, remove radiator completely, and carburettors, undo the fuel line at the pump, and undo the two front turret bolts.

Having undone everything our body is ready to come off. Note the body being supported on stands along the sills. Chassis has already dropped by a foot.

From inside the car remove seats, heater valance panels, tunnel top and gear lever assembly. Undo the chassis bolts behind the dash panel, and undo the steering clamp. Undo the seat belt anchorage points on the tunnel and on the top mounting plates, and undo the two turret bolts behind the carpet.

Now crawl underneath and undo all the bolts holding the flange of the chassis to the body – the rear two have nuts on them in the boot; whilst doing this support the chassis at the rear on a jack. Unclip the handbrake cable at the rear and pull through, undo adjuster nut on chassis and pull cable clear away. At this stage you're just about there and we all forget something so check again. Have you undone *all* the bolts? What about the reverse light wires? The handbrake cable, fuel line at the tank end, the rear inlet manifold studs – remove those otherwise the body won't go past them (on Stromberg S4's remove the adaptor blocks and all the studs), likewise the heater valve on the other side, coil HT wire, low tension wire and earthing braid to the oil pump. Steering column U/J – have you undone that? And the silencer body mounting as well? One thing most people forget is to undo the clutch bundy pipe to flexible pipe and the bundy pipe from the T-piece on the chassis to the servo unit.

Now the moment of truth has come, so support the front of the chassis with another jack and move two axle stands to the body sills just behind the front wheel arches so now the body is supported at four "corners" with the chassis on two jacks. Manning each jack very gently lower away and hopefully there will be no sickening tearing sound and the chassis should fall away under its own weight, though sometimes a helpful tug will be needed to unstick it from the body. If it won't come down then you've forgotten to unbolt something so look again. When the chassis is on its wheels on the ground, pull away the jacks and find "four good men strong and true" and a few cans of beer. Four of you can lift an Elan body easily (about 5-5½cwt), hold the wheel arches only and lift off; the body has to go a fair height in order to clear the engine. Gently lower the body to the floor or preferably transfer to another set of stands. Alternatively, the body can be jacked up using a plank of wood on each sill and jacked up evenly to clear the chassis. It is essential that extra help is at hand to steady the body; the chassis can then be wheeled out and the body secured on axle stands.

Equipment required

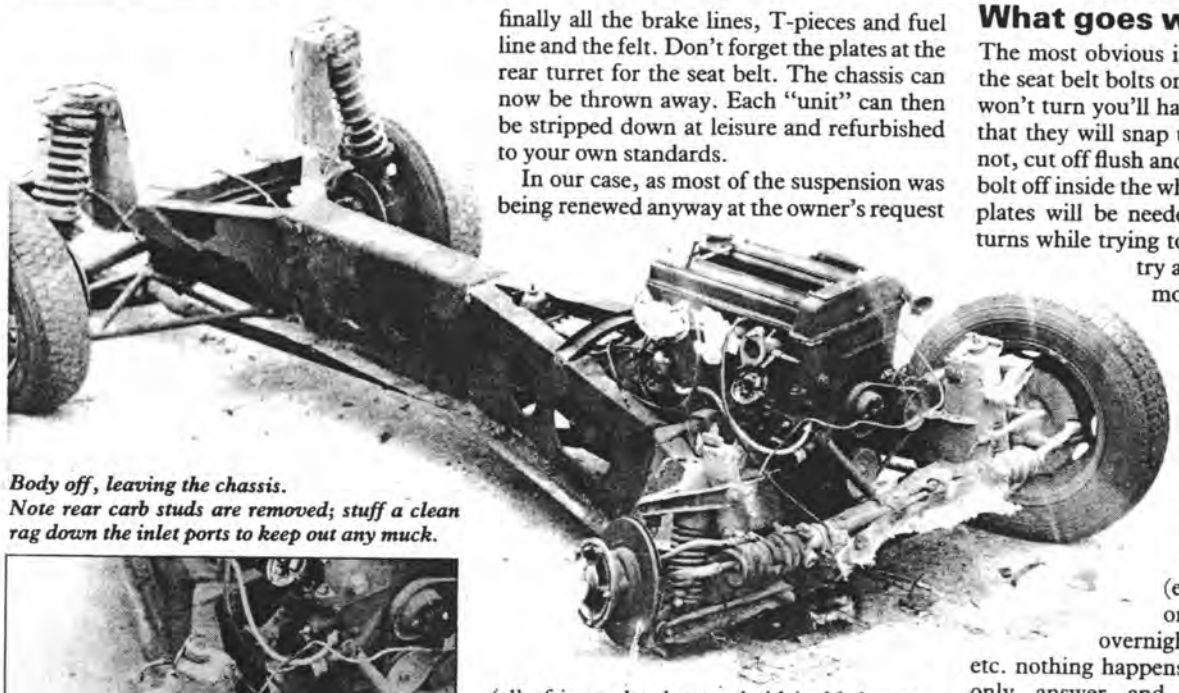
Axles stands x 4 (preferably x 8) or tressels. Jack x 2, ¾ → 1 ton capacity. Engine hoist. Good quality set of spanners and sockets all AF size. Socket set either ⅜" or ½" drive (⅜" more useful when working on Lotus). Screwdrivers etc. Drill. Hacksaw. Pieces of wood. Plus-gas or WD 40.

Lifting the body clear, the back end is heavier even when there is a complete body. Weak ones take the front.

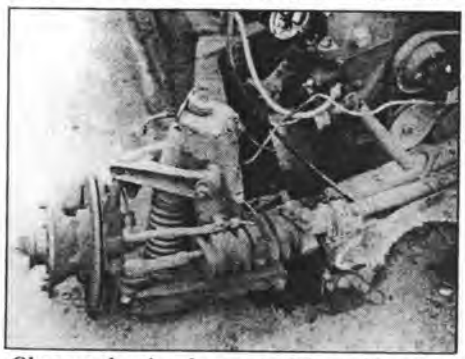
With the denuded chassis before you most of you will be horrified at the thought of having driven 100mph + on split couplings, differential just about falling out, bundy lines all but corroded through — so don't skimp on anything, re-do all the bundy lines with Kunifer, and replace all rubber parts. After all it is so much easier to do with the body off. Any leaking oil seals on diff or gearbox should be changed.

Stripping the chassis is even easier so place on stands and remove the wheels, then set about taking off the four suspension corners, steering rack, differential unit, propshaft then engine and gear box as one unit, and /Continued

LOTUS ELAN RESTORATION/Continued



Body off, leaving the chassis. Note rear carb studs are removed; stuff a clean rag down the inlet ports to keep out any muck.



Close-up showing the extent of the accident damage; turret completely severed at the top, wishbones bent. The vertical link and stub axle, rack and lower column are u/s as well. It is worth noting that the disc has been skimmed before and is too thin, so even if it had not suffered an accident we would not have refitted it.

Part of the front running gear; rack is being replaced as a whole assembly. Note that the anti roll bar bushes have swollen with oil and age – these will be renewed.

finally all the brake lines, T-pieces and fuel line and the felt. Don't forget the plates at the rear turret for the seat belt. The chassis can now be thrown away. Each "unit" can then be stripped down at leisure and refurbished to your own standards.

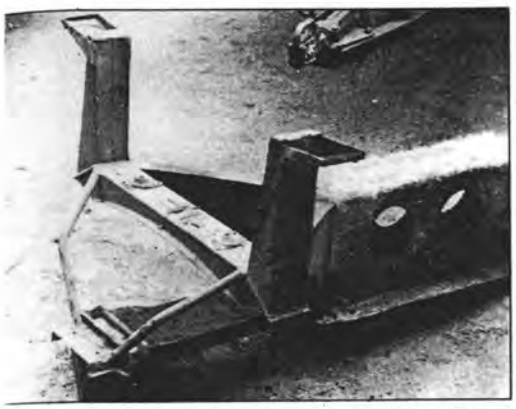
In our case, as most of the suspension was being renewed anyway at the owner's request (all of it on the damaged side) old dampers and mountings can be left on the old chassis to be thrown away with it, and indeed a hacksaw can be a very useful tool to saw the chassis up to remove the engine/gearbox unit quickly as the photograph shows! The time taken by ourselves to reduce the Elan to a heap of bits was exactly 3 hours, but even for the first go you should be able to do this well inside 10 hours.

A sorry sight. As time was of the essence, a hacksaw was thought to be the quickest way to reduce it to a kit of parts. If you're going to replace parts, do not waste time trying to salvage the nuts and bolts, all *these should be renewed anyway.*

What goes wrong?

The most obvious is seized bolts, especially the seat belt bolts on the top plates — if they won't turn you'll have to be brutal and hope that they will snap under heavy leverage. If not, cut off flush and drill out or hacksaw the bolt off inside the wheel arch; either way new plates will be needed. If any body bobbin turns while trying to undo the chassis bolts, try and grip the bobbin with mole grips and drill out the bolt (a new bobbin will have to be laminated in). The heater valve may shear off in the head due to corrosion. If this happens drill out and re-tap the thread, for new valves are still available. Suspension bolts seize (especially the trunnion ones) – so if after soaking overnight in Plus-gas, WD40 etc. nothing happens, then a hacksaw is the only answer and renew whatever you destroy.

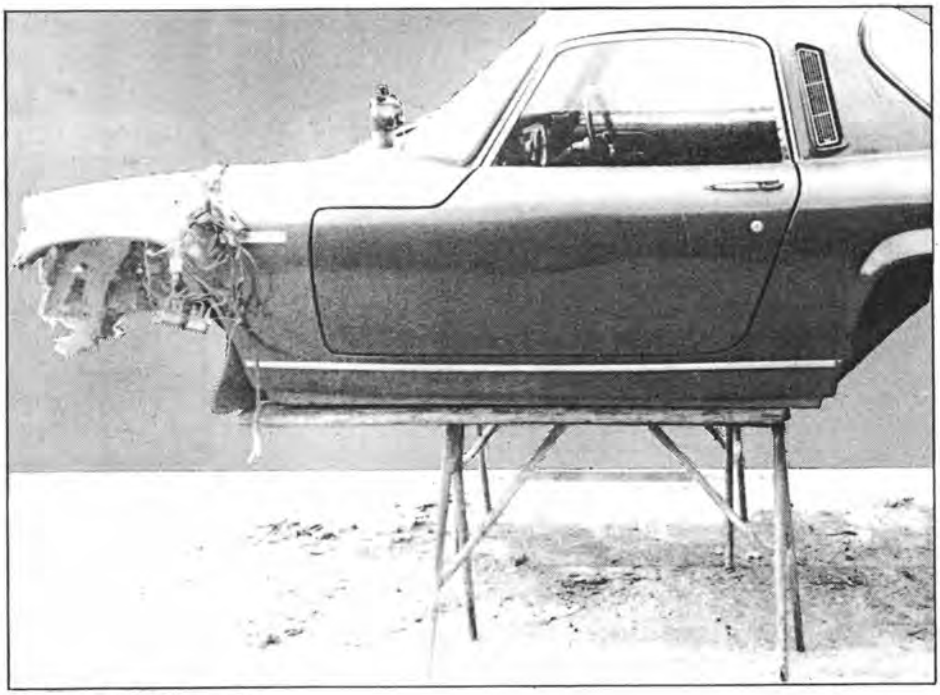
Rear units come out as an assembly which can be stripped down at leisure.



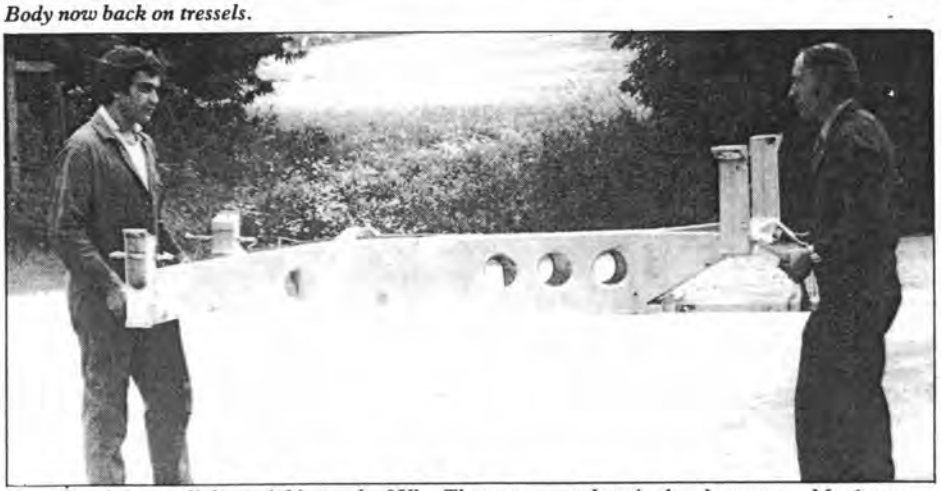
Apart from accident damage the Elan chassis gave no trouble at all, but beware rusting out of the front turrets. Note Lotacone rubbers missing because the seat belt plates have to be retained; if the bolts are solid just drill off the heads. Keep the felt as well to go on the new chassis.

After 13 years and 43,000 miles this Lotacone has cried 'enough'! These should have been changed long before this as they are lifted for about 4 years only.

Note the couplings splitting away from the bolts now that the body is off and the coupling is on full droop. This will have to be renewed; in fact all four were like this.



Body now back on tressels.



New chassis is very light, weighing under 85lbs. They are now galvanised and guaranteed for 6 years.

Heat applied very carefully from a welding torch may help in several cases. If you are extremely unlucky the bolts into the front and rear turrets may shear, in which case you'll have to drill them completely away so that the body can clear. The back is alright as you'll have a clear path but with the front ones you'll be on an awkward angle unless the engine comes out first. If you leave the engine in, the bobbin will be destroyed and a new one will have to be fitted. □

NEXT MONTH

Bonding in the new front body section.

PRACTICAL CLASSICS **PROJECT CAR**

LOTUS ELAN RESTORATION

Part Three: Bonding on the new section by Miles Wilkins.

Last month we left off with the body on trestles and the task this month is to laminate on the new mid-front section and return the Elan to its proper shape once more. The first step then is to remove any remaining fixtures left on the damaged areas which are going to be cut off, namely the headlight relays, washer bottle, pump, coil, and any brackets; in our case all the relays were intact and were just coiled up in the engine bay. If you remove them altogether, do mark on a piece of paper where the wires go.

We left the body on trestles last month, the chassis having been gutted and chopped up.

Offer the new chassis up, not forgetting to lightly stick the felt on from the old chassis. This is essential to provide a platform for the new section when trying to align it. Two of you can lie on your backs and just lift the chassis into place then support it, or alternatively use two jacks and jack it up. Either way, the full body weight must be on it, so just jack it up until the body lifts off the trestles, then lower again until the body is just touching the trestles. It is essential that the chassis is well and truly into its correct place.

The new chassis is offered up into the body recess and held firmly in its correct position. (Don't forget that the felt must be in place).

The new body section and headlight pods and bumper. All come from the factory in primer-surfacer.

Equipment

Jacks x 2.
Drill, Jigsaw, Woolf or Bosch grinderette or a 5" coarse cintride disc on an electric drill.
Hacksaw.
Steel tape measure and felt tip pen.
Production file, cork block, P.80 production paper.
3/32" mild steel strips (or aluminium) to act as clamps.
No. 6 ½" self tapping screws, masking tape.
Solvents, chisel etc. to remove caked-on under-sealants.

Now here of course we cheated and spotted the chassis for drilling and tapping, and did all except the front turret and rack platform (chassis drilling will be detailed in part 5). The new section was then measured and the corresponding mark was drawn with a felt tip pen on the body. When both sides were done, the remaining damaged wings were cut off with a jigsaw using a coarse metal blade (a hacksaw would do but takes a long time. Use a 24 tooth blade). The new section was offered up and little by little was edged up to the body after careful trimming. The chassis also serves as a good guide of course. At this stage before the final alignment the bonnet must be fitted and anchored on its catches. If the section is fitted too 'long' there will be a large gap between bonnet and front panel, too 'short' and there will be no gap so the section will have to be pulled back and you'll have a larger join to make good. Make sure the contours are right in the vertical plane, and there is an even gap between the bonnet and the wings/front panel. Remove the bonnet and use a pilot drill (⅛th) and drill

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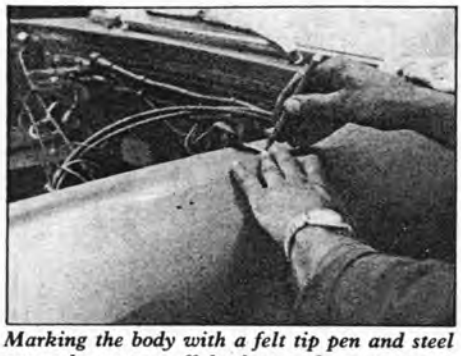
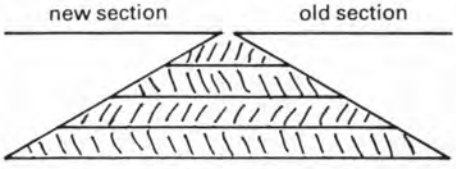
LOTUS ELAN RESTORATION/Continued



Marking the body with a felt tip pen and steel tape where to cut off the damaged part to accept the new section.

through the two front bobbins on the new section, from underneath use a ⅜th drill and carefully drill the chassis. Remove the section and thoroughly clean up all the bonding areas, remove all traces of underseals, paint, dirt and then grind a shallow V about 3" from the cut using the grinderette or cintride disc (coarse) on an electric drill. Grind the other half of the V on the new section and offer the section back up. Bolt the section to the chassis at the front securely and use clamps and self tapping screws to bridge the join on the sides. Make sure the bonnet fitment is still perfect, if not, refit again if necessary, as once you've started to laminate, that's it, the bonnet will never fit. From inside the wheel arch laminate the join using 3-4 layers of 1oz (300gm) matt. After doing both sides, go into the engine bay and do the same there.



4 layers 1oz matt in the 'V'

You'll find the screws from the clamps will help hold up the laminate.

Use of the jigsaw to cut along the dotted line.

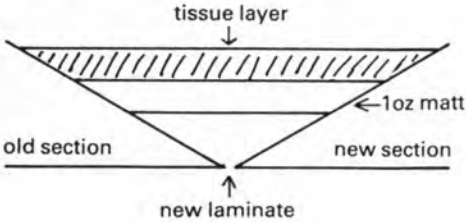
Showing the damaged areas cut away leaving a clean "square" edge.

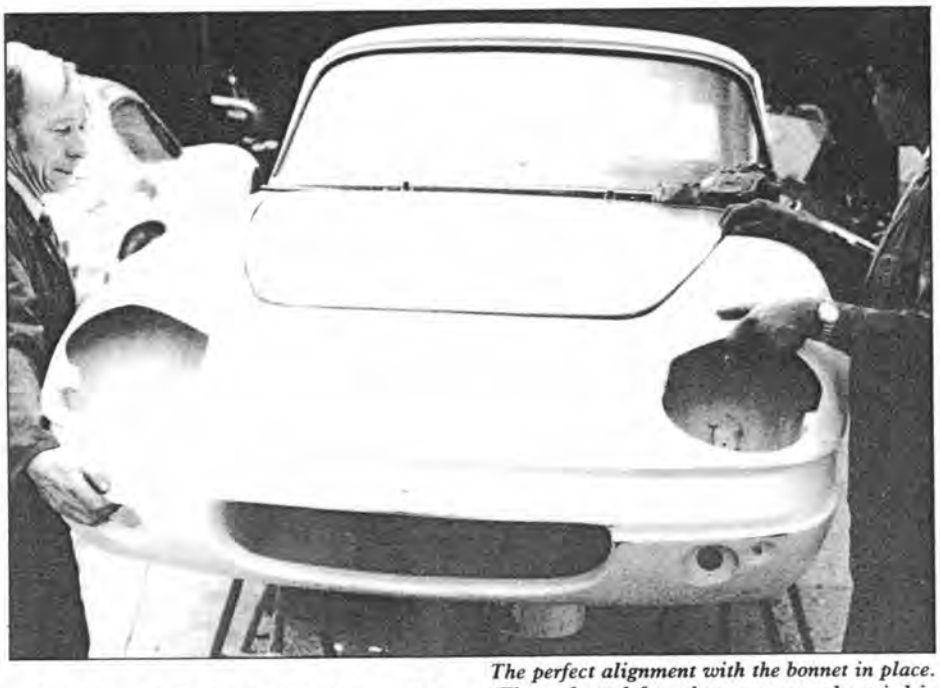
All bonding surfaces must be thoroughly prepared. Use the grinderette here or anything to abrade the surface well. Note master cylinders and hand brake cable have been removed.

Offering the new section up using the chassis as a platform.

True-ing the new section up with the grinderette.

When set, remove the clamps and tape and then 'V' the top surface until you just break into the underside laminate. Go about 3" either side again of the join, feather the paint edges with P.80 paper, and then use 2 layers 1oz matt and finally a layer of tissue, just jiggle the tissue short of the paint edge.





The perfect alignment with the bonnet in place. (The pods and front bumper were also tried in place as well and fitted perfectly). The section is bolted in place to the chassis.

When set, finally spot the front turrets for drilling and tapping, remove the 2 front bolts and remove the chassis. The body is now one again and will be rock solid. Finally spread filler over the tissue on the top wing surfaces and down the inside of the wheel arch and contour to shape using one of the excellent 3M production paper files or a cork block. Two or three applications may be required to get the contours absolutely right. Next month will see the body being prepared for painting.

What goes wrong:-

Not aligning the section correctly.
Making a mess on laminating; always make a neat job with neat edges.
Not taking enough time over preparation, so laminate won't stick to the surface.
Not taking enough time on finishing, so final "join" is still visible through poor contouring, i.e. slight razor edge on the Elan wing line has been obliterated. Any poor finishing will always show immediately on painting.

Time taken for this section from start to finish was 18 hours, and you would never know that a section has been fitted.

Approximate quantities of materials used

1½ metres 1oz (300gm) mat
½ metre tissue
2 litres resin
1kg filler (P.38 or U-pol C)
3 sheets P.80 paper
Masking tape
One 1½" resin brush
½ litre acetone for cleaning.

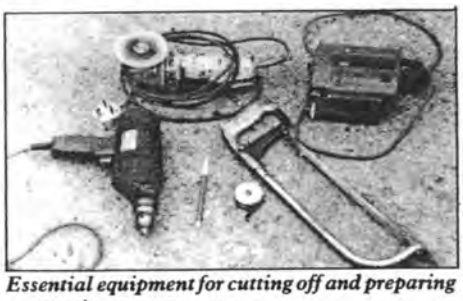
Essential Reading

Fibreglass Bodywork by Miles Wilkins, published by Osprey in the Restoration Series, £6.95.

I make no excuses for plugging my own book as it has been hailed as the definitive volume on the subject. The book covers all aspects from gel cracks to bonding on sections and much more. If difficulty in obtaining, please write to me and I'll send you a copy post free.

Close-up showing the use of clamps to hold the two parts together. The masking tape is just a neat way to prevent resin from dribbling through the join and going everywhere. Clamps are mild steel 3/32nd thick with ½" no. 6 self tapping screws.

Laminating inside the engine bay join. 1oz (300gm) mat is being used.



Essential equipment for cutting off and preparing any section.

NEXT MONTH
Painting the body.

PRACTICAL CLASSICS **PROJECT CAR**

LOTUS ELAN RESTORATION

Part Four: Preparing and painting the bodywork; by Miles Wilkins.

Last month we left the body ready for spraying and before we start the painting process I cannot stress too highly the need for perfect preparation. This of course takes a great deal of time and patience, and so many final results end up looking like the skin on a rice pudding because of the "can't be bothered" or "that'll do" attitude. I spend an awful amount of my time trying to convince people the incredible number of hours a professional respray takes to do the job once only, so that it lasts for at least ten years.

Anybody can do a cheap blow over and watch all the paint crack up, react with the stuff underneath, blister and then do it all again inside two years. Hopefully the message is clear; spend the time on preparation and you'll have a final result to be proud of.

In the paintshop the body has been masked up prior to spraying. Note the extra gel cracks taken out up to the windscreen pillar to allow a perfect finish for the front end.

The join was left in filler and as the photograph shows we removed the few remaining cracks left on the front (unrelated to the accident) to give a perfect finish up to the windscreen; after all, *nobody sprays over cracks do they?!* All the cracks and join areas were contoured to shape using P.80 paper, the next step was to remove these 80 grade marks with 220 wet and dry, wet, and also flat off the new section with this as well (a trick here is to put a little washing up liquid in the water). Then the entire front end was gone over with 360 wet and dry, wet to key the original purple to accept the new primer and colour; even just doing this will occupy many hours and nothing has been sprayed yet. Thoroughly sponge off with clean water and dry off using a clean chamois leather. Make sure all is bone dry and wipe over with a Tak rag (an impregnated cloth that removes any particles on the surface). Spray over the join and repair areas only with spray filler. I.C.I. or Glasurit make it, it is literally filler in spray form and has revolutionised GRP painting techniques. (Lessanol and hi-build primers are *not* the same). After four days the spray filler was flatted off with 220 wet and dry, wet, then thoroughly dried off, and any blemishes remaining were filled using a two pack polyester-stopper and flatted off. The front was re-wiped with a tak-rag and then two coats of hi-build primer were sprayed. This was left for a week then lightly de-nibbed using 800 wet and dry, wet.

Localised spray of I.C.I. spray filler over the join and gel crack areas. Although the new section comes ready in primer-surfacer from the factory, we virtually flat it all off and start again. The photograph may not show this too well.

Materials used

P.80 production paper; 220, 360, 800, 1200 wet and dry; Tak rags; masking tape; 1 litre ICI spray filler; 2 litres hi-build primer; 4 litres Roman purple; ½ litre Silver for bumpers; 1 litre Satin matt black (or aerosols 3 cans); Underseals; Compound — fine; T-cut and wax; Roll of mutton cloth.

Total time taken was 90 hours; though for the front repair only, approx. 45 hours.

Now at last the front was ready for colour. Unfortunately for us the owner decided on having the rest of the car done so the colour would match throughout as the rest of the body had gone slightly milky, but he did not want the "works", so we removed what we could easily, i.e. rear lights, bumper, door handles, rear 'screen and then of course we had to flat off with 360 wet and dry, then primer to bring us up to the standard of the front. The whole body (plus of course the bonnet, headlight pods and bumpers which /Continued

After primering, the first few coats of colour going on. Note the full face mask with its own air supply.

LOTUS ELAN RESTORATION/Continued

The final coats being sprayed over the whole car (see text) — 12 colour coats were done in all. The bonnet, headlight pods and bumper were sprayed separately.

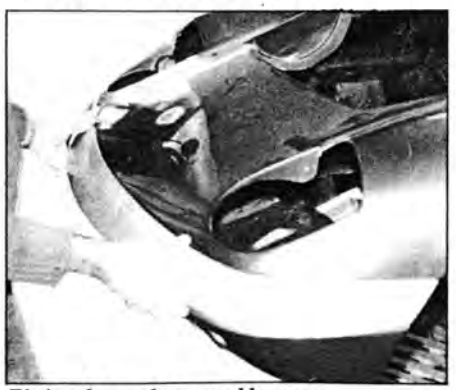
have been receiving the same processes) was thoroughly dried and wiped over with a Tak rag — any traces of moisture can easily ruin the paint surface by being blasted out of a crevice at 50 psi. Do make sure all is dry — and then the colour was applied; we spray four coats (passes) as an undercoat and allow to stand for a week and the flatting process is repeated. Finally the last coats are sprayed and two weeks elapse until we flat off with 1200 and soap — yes soap — and finally compound, T-cut and wax by hand. All this may appear excessive but it is the only way to achieve perfection that will last. The bodyshell featured in colour in part one took 150 hours to do, and thus an excellent professional repaint is never, never cheap. Until you have a go yourself you really won't comprehend the time that goes into it. If undertaking the painting yourself please observe the basic health and safety rules, namely always wear a mask, don't smoke, have good ventilation — especially with spray filler — and don't have naked lights or an open radiant or calor gas type heater. All paints and thinners carry warnings on their cans.

The newly painted body was then masked up so the inside of the engine bay could be sprayed, we used the spray-gun but you can just as easily use aerosol cans in the correct satin matt black, then the wheel arches were sprayed in underseal using either an aerosol or brush. Finally for this month the front bumper and headlight pods were fitted taking great care not to damage the paint.

Masking up the engine bay to spray in the satin matt black.

The inside of the new section was in fact sprayed using the spray gun with satin matt black but you can use an aerosol as the photograph shows.

Making a neat underside using an aerosol underseal spray. This also serves to stop stones piercing the underside of the wing, eventually causing gel cracks (little stars) on the top surface.



Fitting the newly sprayed bumper.

Very carefully bolting in the headlamp pod so as not to damage the new paint surface.

What goes wrong

1. Poor preparation — sanding marks etc. showing through.
2. Poor spraying technique — orange peel, dry spray, no gloss etc.
3. Use of incompatible materials and thinners — always stick to one manufacturer's products i.e. I.C.I. spray filler, polyester stopper, I.C.I. autocolour primers and colours in cellulose or acrylic.
4. Doing everything too quickly so that repairs show up almost immediately — allow plenty of time between stages.

Essential Reading

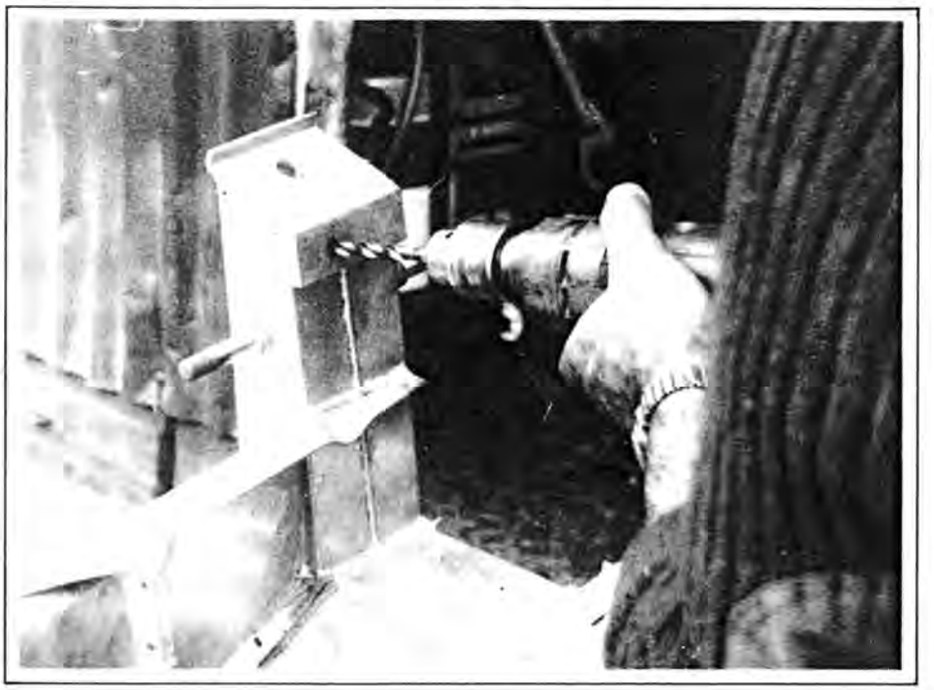
Another plug for my other book "Paintwork", again in the Restoration Series by Osprey £6.95. It tells you all you'll ever want to know about painting GRP and metal bodied cars. Already on second printing. Any difficulty in obtaining, let me know and I'll send one to you post free.

Manufacturers' specification sheets are available from trade paint factors e.g. Brown Bros, Affiliated Factors etc. These contain all paint data, spraying and refinishing details. International are the best, giving data sheets for all their cellulose, acrylic and synthetic enamel ranges. □

NEXT MONTH
Building up the chassis.

PRACTICAL CLASSICS **PROJECT CAR**

LOTUS ELAN RESTORATION



Part Five: building up the new chassis, by Miles Wilkins.

Over the last two months we have seen the body being repaired and painted and whilst this was happening the new chassis was being built up ready to accept the newly painted body. The first thing that has to be done is to drill and tap the chassis and many people frighten themselves silly over this relatively easy task.

As you saw in part three we cheated and 'spotted' the chassis then, but on a normal chassis change follow this procedure; with the body on tressels, fit the felt from the old chassis on to the new (put the fuel line in first because it is clipped to the chassis under the felt) and jack the bare chassis up into the body. Allow the chassis to just take all the weight of the body and make sure the body is well and truly down. From inside the car pull back the carpets and felt to expose the bobbins and with a sharp pilot drill bit mark the chassis down through the bobbin (behind the dash is awkward). We use a 5/16 drill bit for all the bobbins except 7/16 for the rear turrets and 3/8 for the front turrets as these are plain bobbins. When all have been marked, lower the chassis and hopefully you'll see all the marks you have made. Bearing in mind a mark on shiny galvanised may be difficult to see, a useful dodge is to previously spray black paint around the whole area (see photo) so your mark will show up. Once the body is on, the black paint won't show anyway. Next stage is to drill; go through all the marks with an 1/8 drill as a pilot then with a 7/16 on all the flange bolts. Behind the dash and front turrets need 8.5mm for the 3/8 tap and the rear turrets need 10mm for the 7/16 tap. After drilling, tap the thread – front turret and dash 3/8 UNF, rear turrets 7/16 UNF. Use plenty of light oil to assist cutting. Total time for drilling the chassis is 3/4 to 1 hour; easy really!

Drilling the chassis – do remember to drill at right angles to the mark otherwise after tapping the bolt may not start.

Building up the chassis is best done with the chassis placed at a decent working height on tressels. Place the front wishbones on first, followed by the front damper assemblies, fit the stub axle assemblies on, then all the steering gear. You must get the shimming correct in order to avoid bump steer. The value is always marked on the new chassis. If your old shims are no good or the wrong size, make new ones up out of shimming steel (available in 1 to 25 thou sheets in a packet from most ironmongers). Chassis will range from zero to 80 thou. Then fit the cables and brake lines in, always put new lines in now with the body off. Use only Kunifer or copper bundy piping that lasts for ever. We make up our own but several firms do kits for Elans and +2 etc.

Then to the back, fit the diff, propshaft, rear suspension, handbrake tree and rods, finally the gearbox and engine. Fitting the body back on is a direct reversal of taking it off, either wheel the chassis under the body and four of you (one at each wheel arch) lower it gently on to the chassis, or lift the body off the tressels and walk it down and over the chassis. Make sure it is firmly down and then bolt up the two rear turrets, behind the dash and the front turrets, then from underneath bolt up; where there are any gaps between body and chassis put packing washers in the gap, do NOT bend the chassis flange by bolting up solid to the body. Normally only one or two are needed if at all. Whilst still underneath, connect Y piece downpipe and silencer, fit anti-roll bar, fill up gearbox, fit vacuum T pieces and vacuum lines for headlamps. From the top, connect steering U/J, bundy pipe from servo to union, clutch pipe to flexible hose, reverse wires, oil line, heater hoses and cable, refit the rear carb. studs and fit carbs with new O rings and thackery washers, (*do not* bolt solid, they must be flexibly mounted 40 thou gap between the dou-

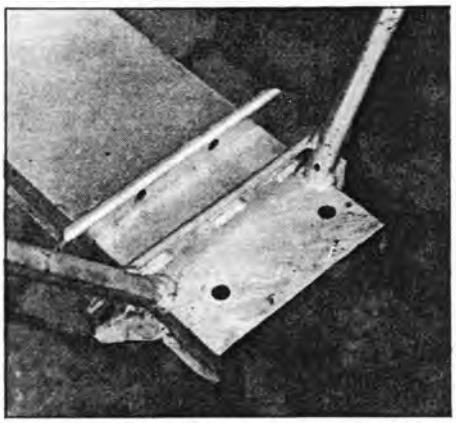
/Continued

Equipment

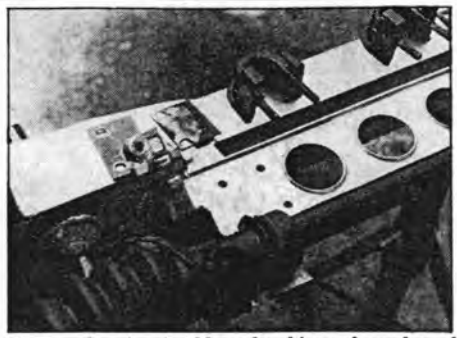
Jacks x 2
Tressels x 2 or axle stands x 4
A.F. socket set (3/8th drive preferably)
A.F. open ended and ring spanners
Drills 1/8th 8.5mm, 10.0mm 7/1th
Taps 3/8 UNF, 7/16 UNF taper
Grease or copper slip
Oils EP90 – diff, EP80 – gearbox
Brake fluid, anti-freeze, glue (for felt)
(Tracking gauge)
Nuts and bolts – various

Tapping – do use a good tapping set and lubricate the hole from time to time to assist cutting.

LOTUS ELAN RESTORATION/Continued

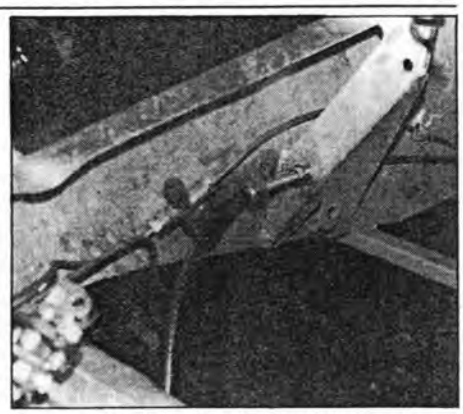


The bottom flanges of the chassis are drilled plain holes. Drill 1/16th to allow for any slight error.

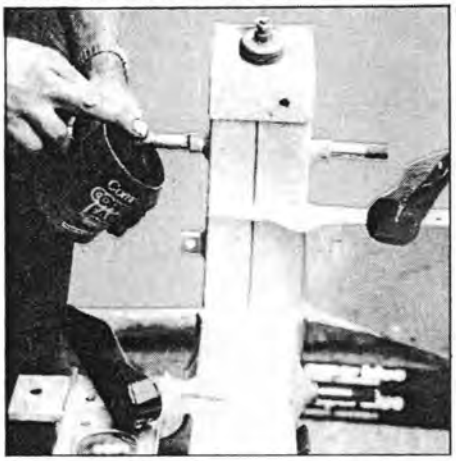


New rack going in. Note the shims, the value of which are stamped on the new chassis – in our case 70 thou each side. Don't forget the earth wire on top of the rack.

Front suspension all completed, anti-roll bar goes on last. Do use all new nyloc nuts; a nyloc nut should never be used twice.

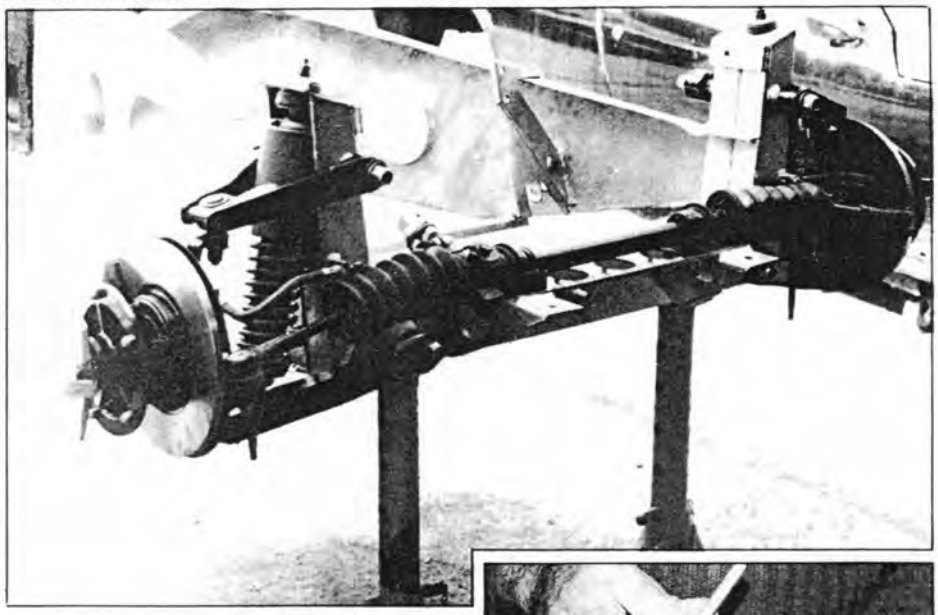


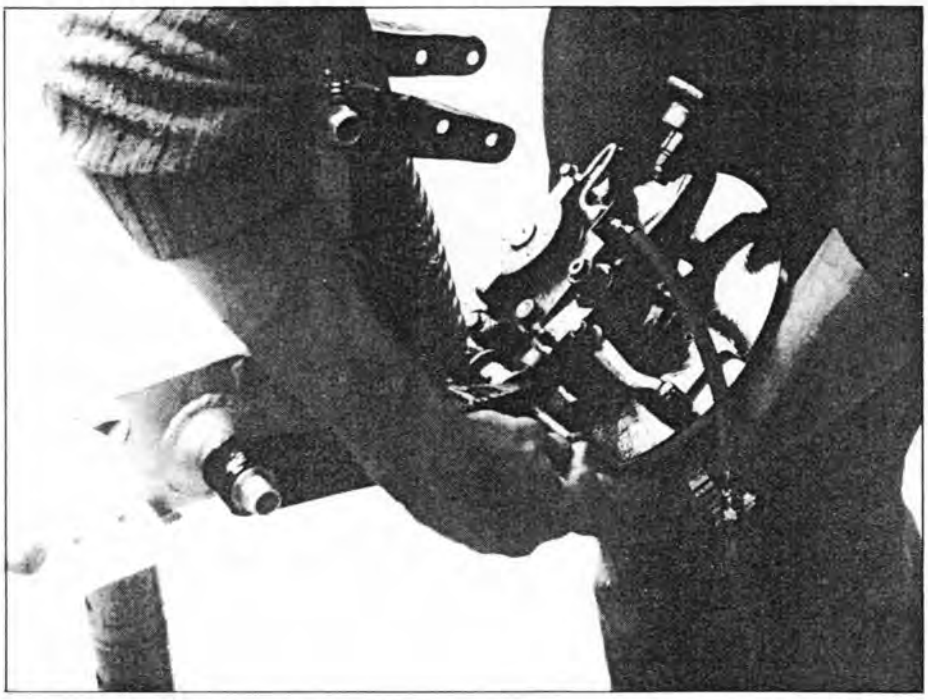
New handbrake cable in, fuel line and new Kunifer brake bundy lines as well. Top breach of 4-way union is plugged as this accepts the line from the servo, fitted when the body is on.



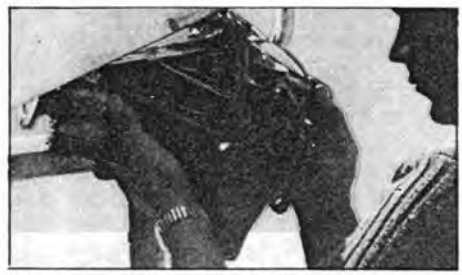
When assembling always use Copper Ease or grease on all the pins, bolts etc. They will be so much easier to take off next time. All new bushes have been pressed into the wishbones.

Fitting the nearside front suspension sub-assembly. Note new bundy line and flexible hose. Fit bottom trunnion bolt in first, then the top swivel bolts.

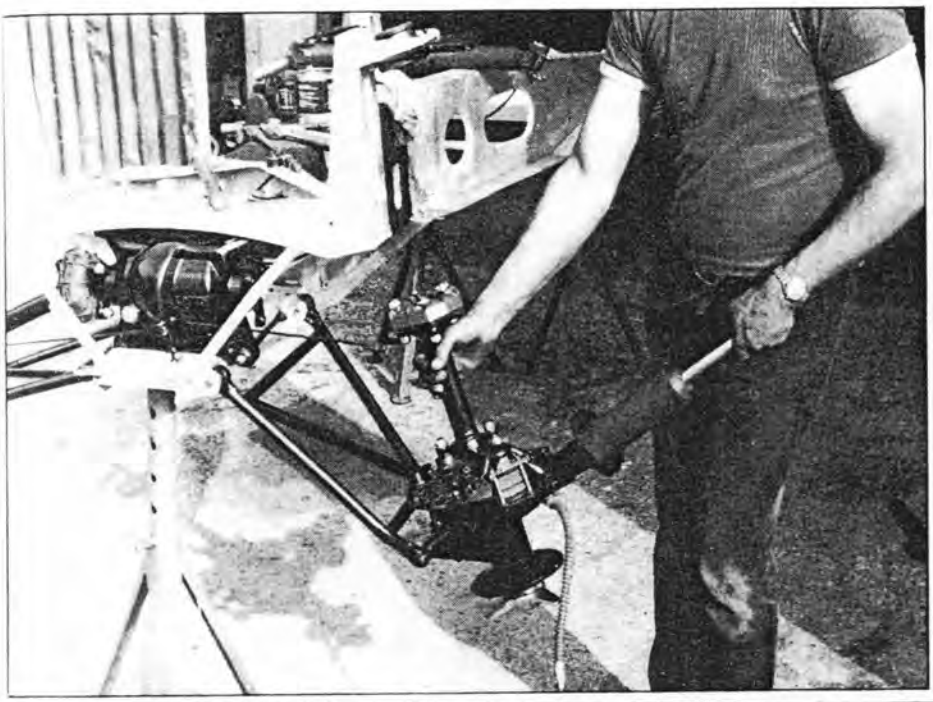




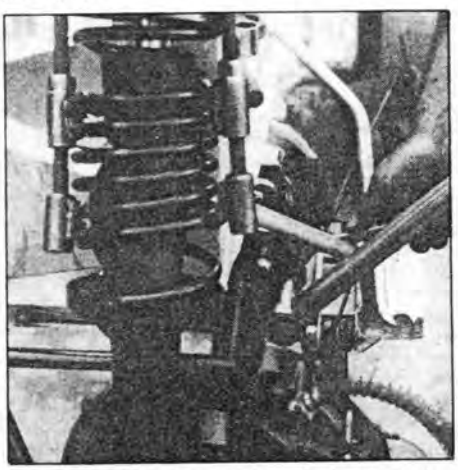
We do all our own brake lines. These brake flaring tools are fairly inexpensive and worth their weight in gold.



Fitting the differential unit. This has to be fitted from the nearside and if the diff brace is fitted (Sprint) then remove it and fit on after the diff is in. It is a very tight squeeze to get it in – a block of wood and hammer sometimes helps!



Diff in, propshaft in, handbrake linkages on. Like the front, the rear suspension units are built up as a sub-assembly. Bolt A-frame to chassis and then compress the spring as shown in the following photograph.

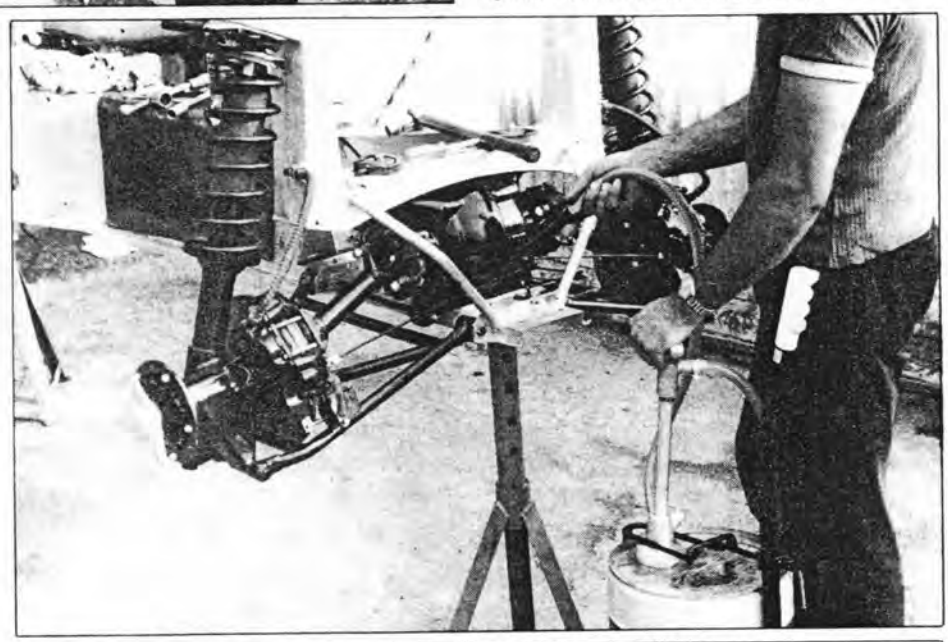


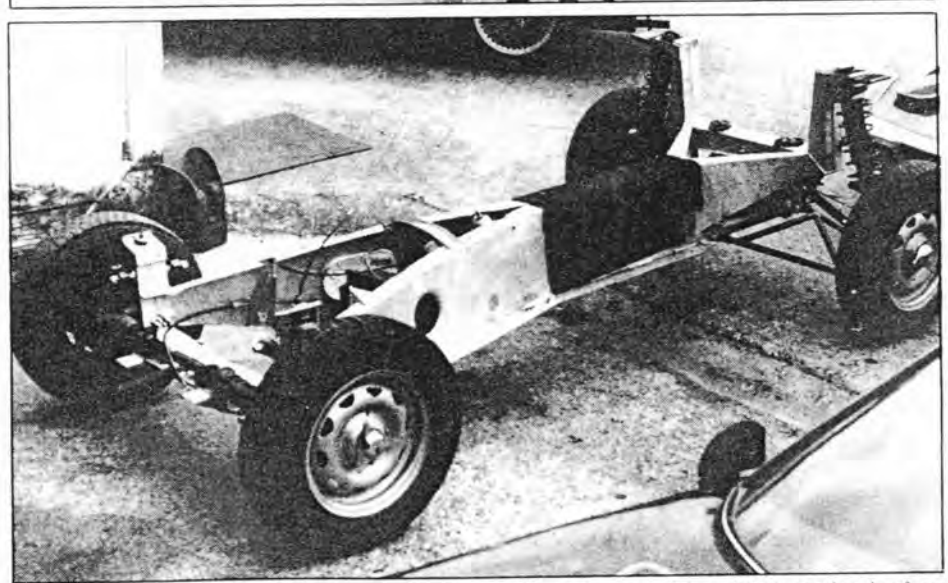
With the spring compressed, push the suspension leg through its arc and put the damper rod up through the mounting. Make sure the damper nut "step" is properly seated. Then still with the spring compressed bolt the coupling up the diff.

Don't forgot to remove the coupling clamps. Many people do.

ble Thackery washers), radiators and hoses. From inside the car refit carpets, trim panels under dash, seats, gearlever and tighten the steering column clamp. Connect fuel line to tank and handbrake cable (if old one) to tree; if new one undo handbrake lever, discard old cable and thread in the new one, rebolt lever. Finally bleed brakes and clutch and torque down all nuts as per manual at ride height and track the front wheels 1/16-3/16 toe in. It is essential that this is done at the correct ride height otherwise the car will be sitting up like a praying mantis. Do note that it will take at *least* 1000 miles before all has bedded down, treat it as a new car and limit to 3000 rpm for a 1000 miles to give any new bearings, dampers, springs a chance to settle and bed in. After 1000 miles, re-check the torque of all nuts on the suspension and it is advisable to recheck the tracking as well as it may alter with settling of the suspension. So many owners wreck a good chassis change by driving like loonies as soon as it is finished and

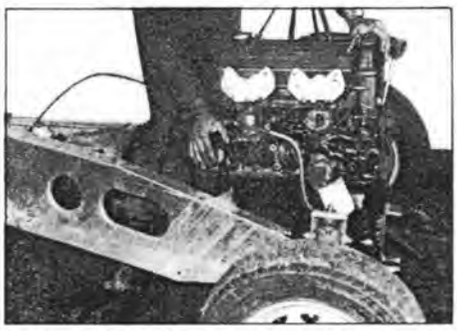
Rear suspensions all in place – easier to fill the diff up now. Make sure the chassis is level.



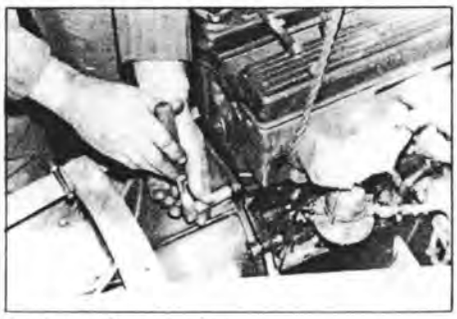


Chassis is now rolling with the gearbox in place.

LOTUS ELAN RESTORATION/Continued



Engine going in. Starter motor is off and also the engine mountings, this is to allow the engine to swing over to get the manifolds in without struggling.



Bolting engine to gearbox.

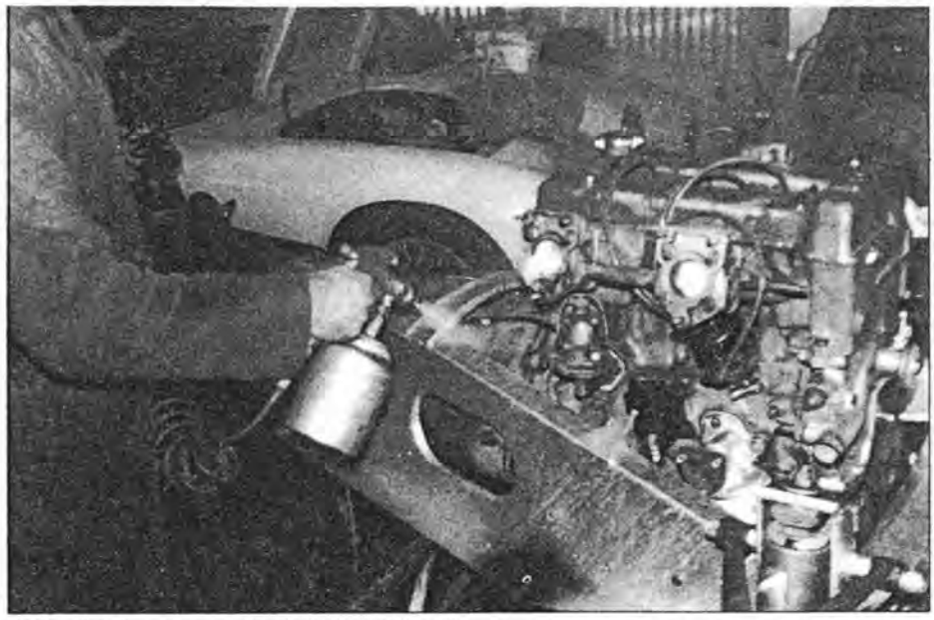
Manifolds are in and are being tightened up. Engine mountings go on next.

bearing life is around 6 months intead of about 6 years. A chassis change is a major job and expensive and should only be done once. The car will be as new again so treat it that way and it should last you for a lifetime.

Useful hints

★ Do always grease (or use Copper Ease) on every bolt that goes on, it makes life easier for the next chap who has to dismantle it.

★ Always replace nyloc nuts with new ones; old ones will eventually work loose especially if soaked in oil (as oil attacks the nylon insert, it goes hard and cracks up).



Before the chassis is mated to the body we Waxoyl the chassis thoroughly. Sprayed at 40 psi and with the galvanising treatment, the new chassis should last a lifetime. Eagle-eyed will spot this is a Stromberg S4 Elan chassis change being done at the same time. Note the black spray on the chassis (bottom of picture) where the drilled hole is — see text.

Chassis is all finished and is ready to go underneath the body, which will be lifted down on to it to bring the two together again.

★ Always replace any rubber part ie. lotacones, diff mountings, gearbox and engine mountings, bushes etc, if still original they've done their job.

★ Replace any leaking seals now, the labour involved is minimal with diff or gearbox on the floor instead of in the car.

★ Build up the four corners as sub assemblies (see photos); replace anything that is suspect. Torn gaiters on rack, top swivel and track rod ends will fail an MoT, as will excessive play in trunnion to vertical link, cracked flexible brake hoses, too thin discs, leaking dampers, perished couplings. It is not worth skimping on these items as I said in part one; if you cannot afford to do it all then wait until you can since putting back worn out components on a new chassis will not make the car any safer and the new chassis will have to suffer more abnormal stresses and strains than it should.

Prices very much depend on what needs replacing but the chassis is the largest item (£350 from us with an 8 year guarantee – Lotus have now gone from 6 to 8 years). Most people average between £600 – £900 on parts. Time taken for this stage 20 hours – again length of time depends on what needs to be replaced. □

Useful reading material

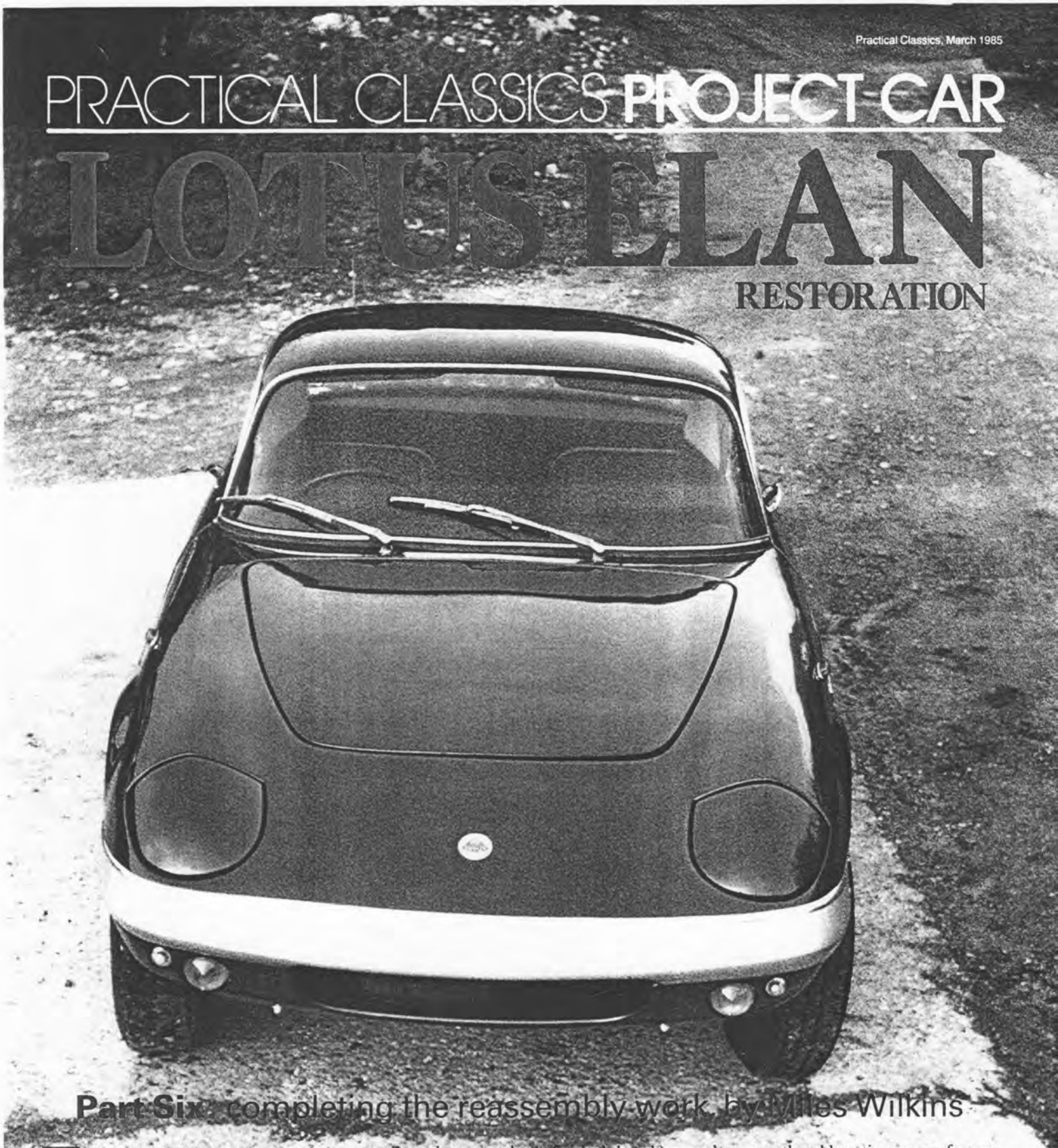
The Elan and +2 Buyers Guide available from GA Publications, Borrow Hall, Dumpling Green, E. Dereham, Norfolk, price £2.95 post free.

If you experience any trouble in doing this work or just want parts to do the job, please 'phone me at *Fibreglass Services, Charlton Saw Mills, Charlton, Chichester, W. Sussex. Tel: 0243 63 320.*

NEXT MONTH
Completion of the rebuild.

PRACTICAL CLASSICS PROJECT CAR

LOTUS ELAN RESTORATION



Part Six: completing the reassembly work, by Miles Wilkins

This is the final instalment of the series and we are left with the major task of removing the damaged dash panel and replacing it with a new one. Before that was done, the rest of the car was fitted up to completion.

So concentrating on the front end, the new side light and indicator light assemblies were fitted, and the relays, washer bottle bracket and brake servo were fitted too (the old section is useful here to see where the holes go! Don't throw any old fibreglass pieces away until you have completely finished the job). The wiring harness was routed correctly and clipped down. Both brake and clutch master cylinders were refitted – and if in any doubt about their condition now is the time to re-seal or re-new completely. The new Kunifer bundy pipe was connected to the master cylinder servo and servo to T-piece, brake circuit now complete. The new headlamp vacuum tanks were fitted with their springs and the undertray drilled to accept them – not too critical here but if the pods are placed too far over the spring will foul the headlamp pod, so use the old section as a reference (both sides should be symmetrical). The tanks are bolted down and then the rod and spring are bolted through the headlamp pod. *Be very careful* when doing this as the coil on the springs points forward and the pressure is tremendous – one slip and the spring will wack itself into the front panel resulting in a superb gel crack on the lovely painted surface. Try and get a helper to hold the spring pressure while you bolt up. As this is a non-fail safe spring, the head-lamp pod now has to

/Continued

LOTUS ELAN RESTORATION/Continued

be held up against the spring pressure to fit the headlight assemblies. I should add that before the lights were fitted, the pod lock stops were adjusted to give a perfect flush fit when closed and when open. To set all the headlamp pieces does take a great deal of time.

The radiator, overflow bottle, air cleaner assembly and air horns were fitted next, then the radiator duct and brake servo vacuum pipe and finally to complete the front end "rebuild" the radiator and fan. From underneath the clutch pipe was fitted to the slave cylinder and both the clutch and brake system were bled – so much easier leaving the carbs off until last. After bleeding, the carbs were fiitted and that completed the car apart from the aforesaid dash.

The dash was a mess, broken in many places, but as we said before all the instruments and switches survived intact, so doing it slowly and logically nothing should go wrong. First of all undo all cables and pull through, namely; heater, choke, bonnet release and water and oil gauge, in our case all were undone anyway, then undo speedo cable, drop the steering column down, remove radio and undo any remaining bolts holding dash to crash pad, very carefully pull forwa.d and undo wires to all the instruments and remove. Then unscrew *all* the switches leaving the wires on them and unscrew the glove box compartment, remove headlamp vacuum switch, ignition switch (if on dash) and by now hopefully the panel should be away. If you have to take wires off do mark on a piece of paper where they go. The fitting of a new panel is of course the direct reversal of dismantling, taking care everything goes back in its right place. Before bolting up in position make sure everything works by connecting the battery — have you put all the earth wires back, are the window switches in upside down etc.? When everything is correct, bolt up along with the steering column. Total time here was 14 hours so allow your-

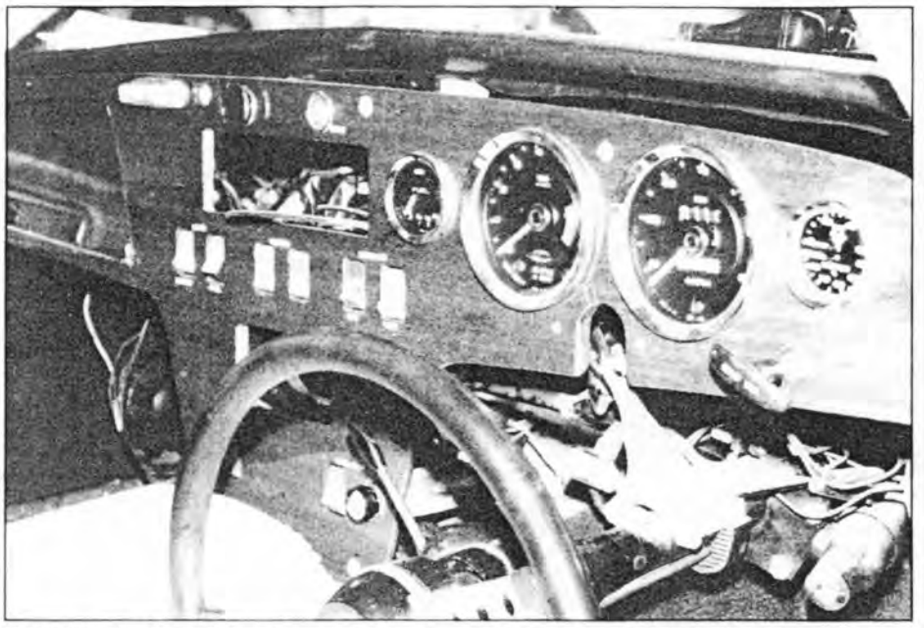
Equipment used

Jacks, axle stands
Usual sockets set and spanners
Electrical connectors and wiring.

The dash panel after the accident.

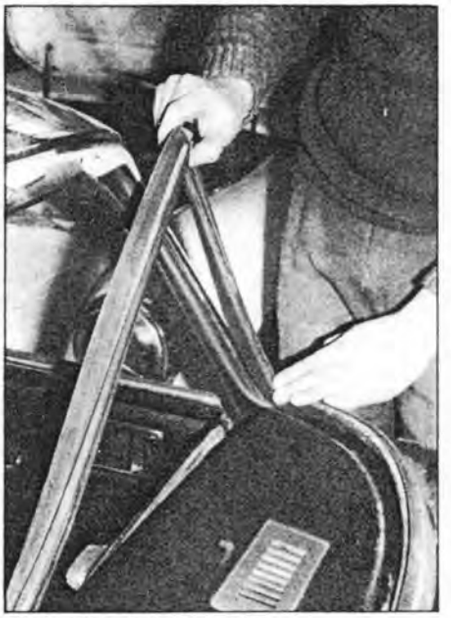
Steering column undone and pushed down, then with all the remaining bolts undone and the cables released, the panel was pulled slowly forward . . . .

. . . revealing all the wires etc.



Everything has been changed over onto the new panel which is now being gently edged into place. When nearly there the steering column is fitted.

Fitting the headlight unit — after the vacuum tanks, etc. have been fitted.



Fitting the windscreen rubber . . .

. . . and then very carefully fitting the windscreen using a blunt screwdriver to assist around the edge.

After running mastic around the rubber the bright strip was inserted using a windscreen tool.

Fitting the front bumper strip; a hair dryer is a must for warming up the strip to bend it into place around the corners.

self at least 20 hours if doing it for the first time. Finally the underdash trims were fitted and the seats replaced, the car given a final wash and polish and on to the road once more.

Postscript

In the writing of this series spread over six months, I have been overwhelmed by your response and it is quite clear that a series like this was well overdue. So many of you have telephoned me to consolidate what I had written in part one and for so many the advice was too late. I shall recap in order that many owners will not fall into the same trap again:-

Firstly insurance, this gave the largest response, for goodness sake *act now*, change from your large combine to a specialist broker and get an agreed value, *do not* wait until you have an accident and watch the car being written off. Most large companies do not even know what a Lotus is and as for agreed values — well.....Three brokers who can be recommended are John Scott & Partners at Farnham, Surrey, Clarkson Puckle, and Footman, James & Company Ltd, both in the West Midlands. Secondly, and this came very close to insurance, trouble with spurious concerns and some Lotus dealers. I am in an extremely difficult position as I well acknowledge the problem being one of the "old school", a dying breed with the appointment of so many new dealers who haven't a clue on what the twin cam range even looks like, let alone work on them. This of course gives rise to many outsiders cashing in on the Lotus name and judging by your response the standard of workmanship is downright dangerous. There are only a very few non-genuine Lotus concerns who are good and so you must be very, very careful indeed about who you use. So often we have to spend hundreds and hundreds on rectification to make the car correct again after being in the hands of a so-called specialist.

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LOTUS ELAN RESTORATION/Continued

All done!

Never ever be taken in by all their fantastic adverts that you see in the motor magazines, after all we are all the best aren't we? The new breed of Lotus dealer that many of you have complained to me about I cannot comment on, save that only a few top management are left at the factory who were with the twin cam era, and with the new, of course, comes change and the policy appears to be going further and further away from the original concept of enthusiastic fun that we all knew Colin Chapman and Lotus to be. However, there are many Lotus dealers who do care most vehemently about all things Lotus and most of the established dealers will be delighted to help you in obtaining the correct part. The factory care as well since the Elan made Lotus — if it had been a flop Lotus would have died there and then. Contrary to popular belief, the factory are still *adding* to the twin cam parts list even though years go by before any of us see them! If in any doubt where to go just telephone (0243 63320), we give free advice and are really just delighted to help out.

There are many books — look in any motor magazine for the Lotus list. But just briefly:-

The Brooklands Book series — road tests etc. **The Elan** by Ian Ward — Osprey. **The Elan/Europa** etc. by J. Bolster. **Elite Elan Europa** by C. Harvey.

Clubs

Well, there are really two main clubs with of course the usual breakaway groups or local area groups. Club Lotus started in 1956 originally, died, then was reborn. Graham Arnold is the ebullient Chairman, and this club caters for all Lotus models (see below), offers a quarterly magazine, seminars etc., helpful advice and so on. Around 3000 members worldwide, address:-

Club Lotus, P.O. Box 8, E. Dereham, Norfolk.

Club Team Lotus is the other major one, run with factory support and produces 12 magazines, in colour, per year containing all the formula one news and news of the factory and historic articles as well — just over 3000 members worldwide:-

Club Team Lotus, Ketteringham Hall, Wymondham, Norfolk NR18 9RS. Tel: 0603-811662.

Three other clubs that cater for specialist Lotus not included in the other two are:-

Club Elite (for all original Elites 1957-63), The Coach House, The Street, Walberton, Arundel, W. Sussex.

H.L.R. (for all sports & single seaters i.e. 9, 10, 11, 12, 15, 19, 23 up to FF.61 etc.), Badgerswood, School Lane, Drayton, Norwich, Norfolk.

And finally the Lotus 7's:-

Caterham Car Sales (they know the lot!), Town End, Caterham-on-the-Hill, Surrey.

The practical ones already mentioned in the series:-

The Workshop Manual, The Parts Book, Buying an Elan — guide GAP publication (£2.95) and my own **Fibreglass Bodywork** Osprey (£6.95), **Paintwork** Osprey (£6.95).

Well, that about covers all your complaints and requests, so armed with all this knowledge your Lotus will now last for ever in the condition it deserves to be in! □