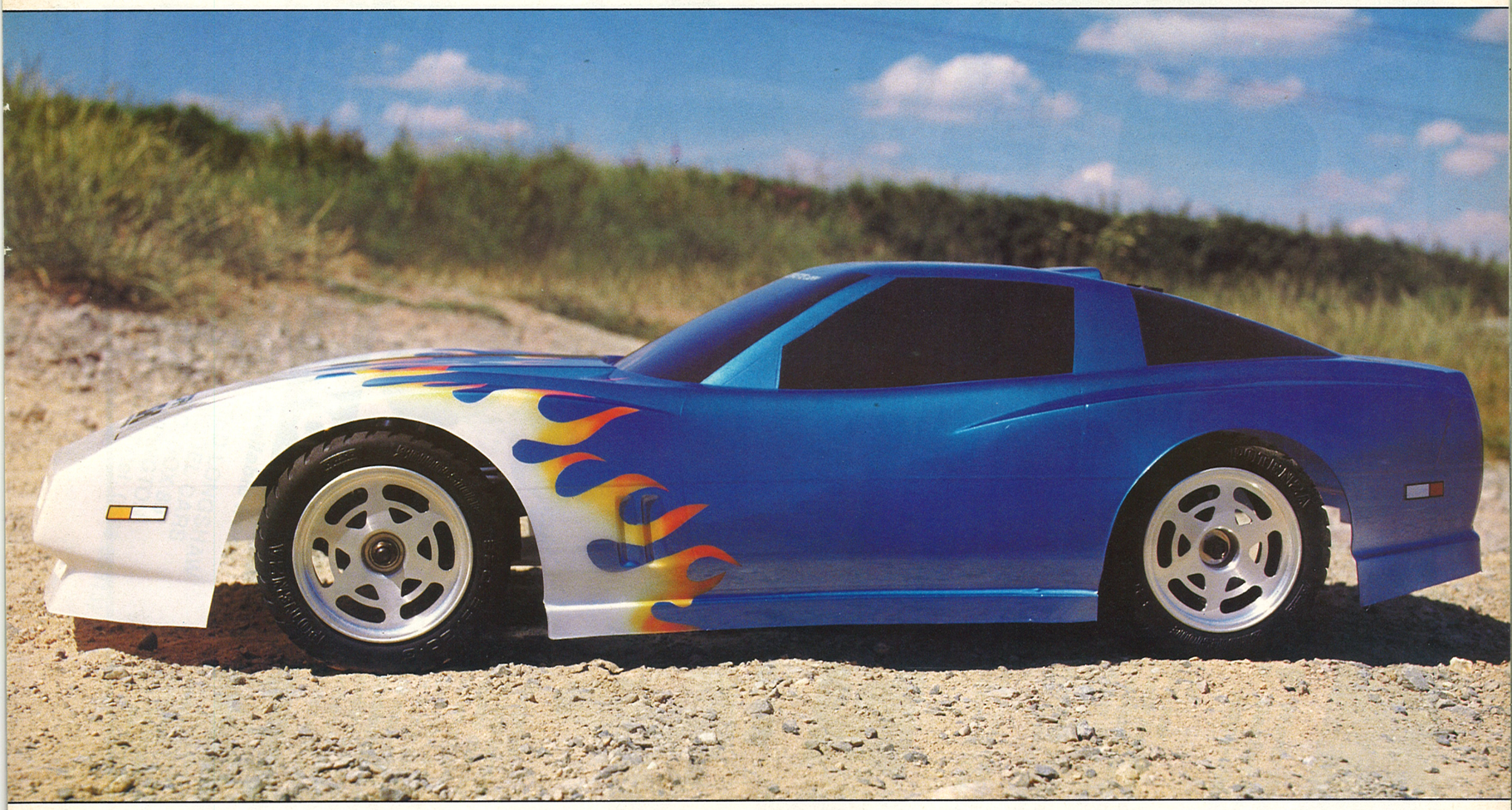
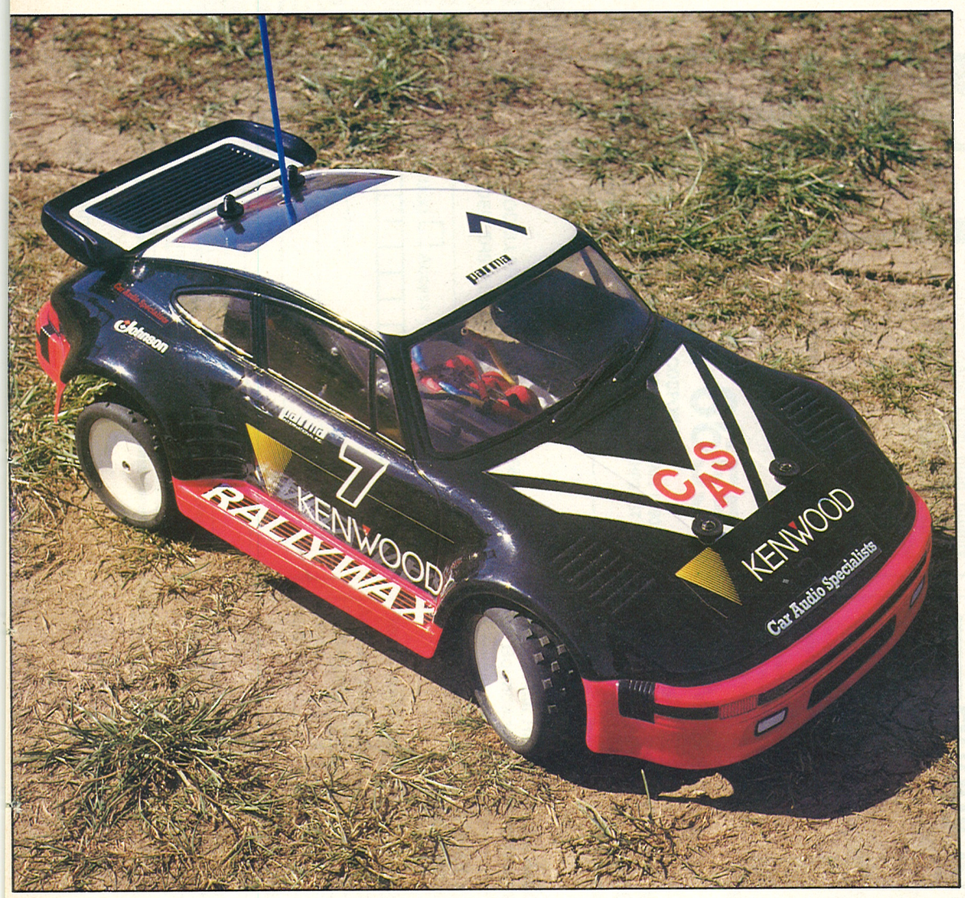


CONCOURS D'ELEGANCE



1:10 RALLYCROSS

RACING SPECIAL

FREE PRINT

EXCLUSIVE

MODELL CARS RACING SPECIAL 1990

READERS OFFER

2 GREAT BRUSH SETS SELECTED BY MODELLERS FOR MODELLERS

As modellers we appreciate that your needs for brushes are different to that of a painter.

So we have carefully selected two sets of brushes chosen to suit modelling purposes.

The ASP Modellers Sable

A set of 5 pure sable hair brushes suitable for fine detail and small area coverage. Sizes 000, 00, 1, 2 & 3.

Made using the finest quality materials, these brushes will last well, ensuring that stray hairs don't paint out of line.

The stock holds just the right amount of paint helping prevent drips or dry-runs.

EXCELLENT VALUE £8.95 inc. P&P

The ASP Modellers 'Flattie'

Four brushes sized 18, 25, 37, & 50mm made from high quality natural hair. They will hold just the right amount of paint in the stock helping you to cover either large areas (using the 50mm) or a smaller area (using the 18mm) quickly and evenly ensuring the desired end result.

SUPERB VALUE £7.95 inc. P&P

0442 66551

PLEASE POST COMPLETED COUPON TO:
MODEL CARS RACING SPECIAL READERS OFFER, DEPT MB/0990, ARGUS HOUSE, BOUNDARY WAY, HEMEL HEMPSTEAD HP2 7ST
Please allow 21 working days for delivery

Please send me
(QTY)
SET(S) ____ ASP MODELLERS SABLE BRUSHES at £8.95 Per Set
SET(S) __ ASP MODELLERS "FLATTIE" BRUSHES at £7.95 Per Set
Total amount £ _____

Please debit my (tick) ☐ Access ☐ Visa

Card No. ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

Expiry date ——/——/——

Signed _____ Date _____

Name _____

Address _____

_____

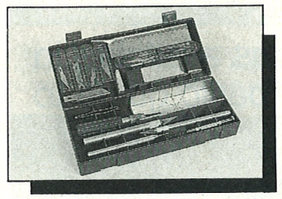
Please return coupon to: Model Cars Racing Special Reader Offer, Dept MB/0990, Argus House, Boundary Way, Hemel Hempstead, Herts. HP2 7ST.
Please note information supplied may be used for marketing purposes

Model Cars Racing Special Reader Offer

Precision Knife Sets

Quality knives and blades for:
Hobbies, Crafts, Models, Arts, Woodcarving and Whittling.

Hobby and Craft Kit



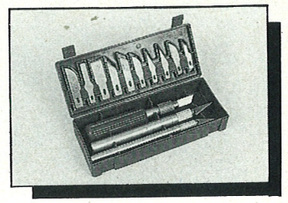
Deluxe Hobby and Craft Tool kit- ideal for all modellers from the beginner to the experienced. This precision made kit includes three knives with blades for cutting, stripping, stencilling, scoring, carving, and grooving. An aluminium Mitre box and mitre saw. A sanding block. One precision screwdriver and a bradawl.

Contents (29 pieces):-
★ Three knives with blades
★ One bradawl
★ One precision screwdriver
★ Seventeen replacement blades
★ Four gauges for general grooving and carving
★ One Mitre saw
★ One aluminium mitre box
★ One woodensanding block

£19.95 inc p&p M.R.P. £22.95

Hobby Knife Set

Precision made knife kit- ideal for modelling. Three knives and blades for general cutting, trimming, slicing, stripping, stencilling and scoring, and smooth wood chiselling.



Contents (13 pieces):-
★ Three knives with blades
★ Ten replacement blades

£12.50 inc p&p M.R.P. £16.00

Credit Card holders
0422 66551
(24 hours)

Model Car Racing Special Reader Offers, Argus House, Boundary Way, Hemel Hempstead, Herts. HP2 7ST.

Please supply.....ROMM5 @ £12.50
ROMM6 @ £19.95 Total £ .....

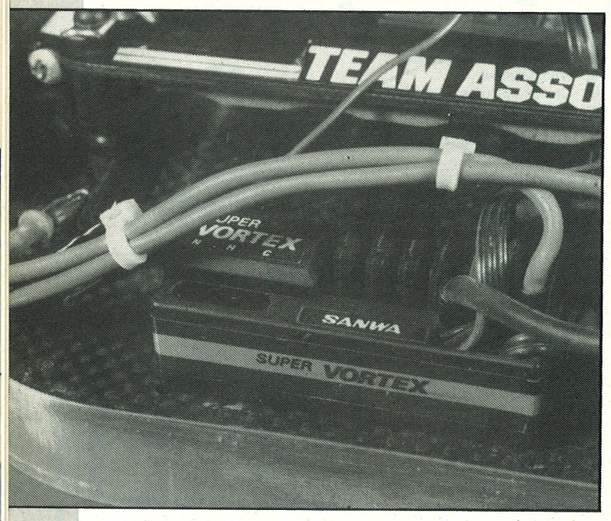
Please make cheque/P.O. payable to A.S.P or debit my
Access/Visa ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐
Signature..... Expiry.....
Name .....
Address .....
.....
.....

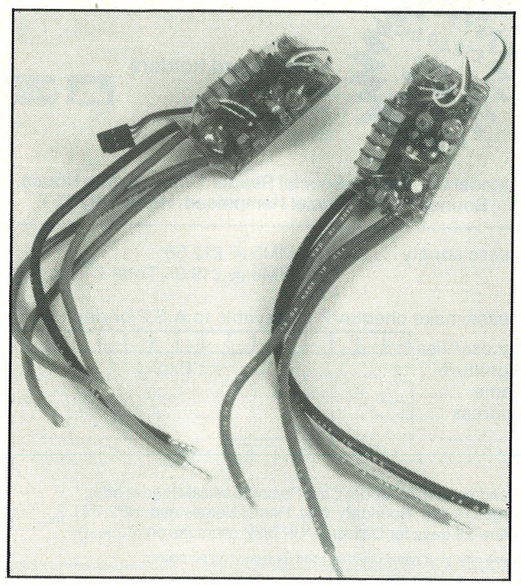
Send coupon to Model Cars Racing Special Reader offer, Argus House, Boundary Way, Hemel Hempstead. HP2 7ST.
Allow 28 days for Delivery (*UK only, overseas on request)

Please note your name could be used for marketing purposes.

Super Speedos

A list of speedos available in the UK with a basic guide to specification





Novak

CML Distribution, 1684 Bristol Road South, Rednal, Birmingham, B45 9TZ.

Manufactured in the USA since 1978. Company president Bob Novak has been keeping his range or RC products on the leading edge of technology with a continual program of development and innovation.
All units feature plastic case, Tempfet's, and an LED indicator for manual adjustments of neutral and high speed pots. All speed controllers are forward and brake.
NESC T4 Econo Model. Continuous current of 176 Amperes
NESC T1 Pro Model. Continuous current of 276 Amperes
NESC T1X Eliminator Model. Continuous current of 576 Amperes

Nosram

Nosram Distribution, 10 Bronsil Drive, Malvern, Worcestershire WR14 1LR.

Nick Marson design, these British made units are to be found world wide with a devoted following.
National. Fwd and reverse uses 5 FETs carrying 100 Amperes
Enhanced. Fwd, brake and reverse uses 8 FETs carrying 180 Amperes
Exterminator. Fwd, brake and reverse uses 11 FET's carrying 270 Amperes
Exterminator Pro. Fwd, brake and reverse uses 11 FET's carrying 450 Amperes
International. Fwd and brake. Uses 8 FET's and carrying 180 Amperes
International Pro. Fwd and brake. Uses 8 FET's carrying 300 Amperes

KO Radio

Wide selection of very small FET speed controllers. Fine quality, all forward and brake but very difficult to get hold of. Most KO units are so small an additional unit is provided for setting up. Very simple just plug in and use adjusting tools supplied. (available from Pete's Awesome Products)

CX 1 Fwd and brake 360 Ampere very small and light.
CX 3 Fwd and brake 510 Ampere
CX 4 Fwd and brake uses tempfets. 300 Ampere
CX 8 Fwd and brake uses tempfets. 280 Ampere
ZX-500 Fwd and brake 204 Ampere

Fleet

Fleet Control Systems, 47 Fleet Road, Fleet, Hants GU13 8PJ.

Specialist UK manufacturer with a smart boxed speed controller.

FPS 24B Fwd and reverse 144 Amperes continuous.

Corally

Intronics, Claerwen, Bexhill Road, Pevensey, East Sussex BN24 5JT.

Dutch company Corally set a new standard in compact torque limiting speed control.

MMS 4-5 minute. Both controllers feature motor management systems
MMS 8 minute. Very slim small design

Speedmaster

Speedmaster, 60 Mancroft Road, Caddington, Luton LU1 4EL.

Extremely reliable range of UK made speed controllers offering a good selection of differing performances. Features MOSFET operation, easy to set up and if required quick repair service.

Silver Star Fwd and reverse 180 Amperes
Turbo Silver Star Fwd and reverse 310 Amperes
Gold Star Fwd only 8 FET's 180 Amperes
Turbo Gold Star Fwd only 8 FET's 310 Amperes

Tekin

Parma Unit 2, 25 Horsecroft Rd., The Pinnacles, Harlow, Essex, CM19 5BH. (available through retail outlets only)
USA made high tech speed controllers are small, light and durable. Easy to set up with LED indicator.

ESC 610 Pro X. Fwd only very small Torque adjust
ESC 310 Pro Fwd only small torque adjust
ESC 250 Best priced model Fwd only.
ESC 700 Top of range racing version torque adjust

Hi Tech

Wasp Products Ltd., 13 Morningside Road, Worcester Park, Surrey KT4 8LQ

USA made fine quality featuring a particularly lightweight forwards only speedo.

SP1500 Fwd and reverse 150 Amperes
SP1802 Fwd and brake 150 Amperes very lightweight

Demon

Demon Products PO Box 12, Aldershot, Hants.

One of the longest established names in electronic speed controllers. Offering 3 models

Pro King Fwd, reverse and brake 8 FET 400 Ampere
Ace Fwd and brake 16 Tempfet 677 Ampere. LED set up
Tekin 700 Torque limiter built in

Racer

Pete's Awsome Products, 316A High Road, Tottenham, London N15 4BP

New range of speedo's from this expanding company. No spec given

Racer Brake adjust and neutral adjust
Racer Special Brake, neutral and power curve adjustment. 6 FET's
Racer II Neutral gains and brake adjust

Sanwa

Available from Irvine Engines stockists

Very popular with top racers
Vortex Fwd only, very small neat design comes with separate set up system.

Laser

Available direct from Laser, Glenorie, Latchford Lane, Great Haseley, Oxford, OX9 7LA. Tel: 0844 279530.

Comfet FTD forward only 215 amps Fet braking.
Mini-Pro forward only very small design 215 amps Fet braking.
Mini-Pro Gold as per Mini-Pro but 300 amps and heavy wiring
GT forward and reverse brakes 215 amps.
TQ forward and reverse 258 amps Fet brakes.
TQ Gold as per TQ 360 amps and heavy wiring.

Futaba

available from Ripmax Stockists. All controllers well made and come pre-plugged.

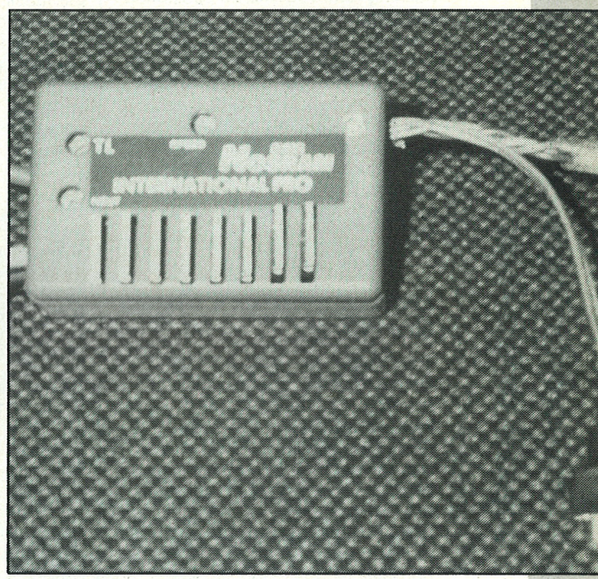
P-MC111B Forward and reverse and brakes 61 grammes
P-MC114 Built in Bec system forward only
P-MC112B Forward and reverse and brakes
P-MC117 BEC system with brakes
P-MC116 Forward and reverse and brakes MOSFETS
P-MC110 Forward and reverse and brakes

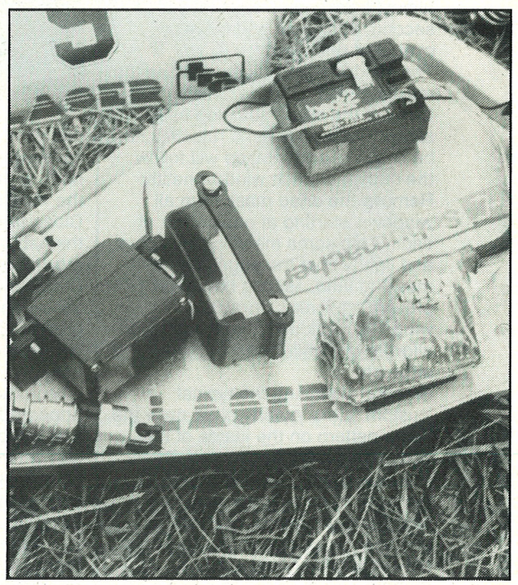
Robbe

as for Futaba, new range soon to hit the UK.

P-RB 82992000 Mini Controller forward and reverse

Opposie page: Sanwa Vortex mini controller, and racer speedos. Above: Tekin 310. Below: latest Nosram. Bottom: Lazer's very popular mini controller.





Continued from page 37

classy look. Go gently with the paint, as too much oversprayed on the white will produce a 'shadow'.

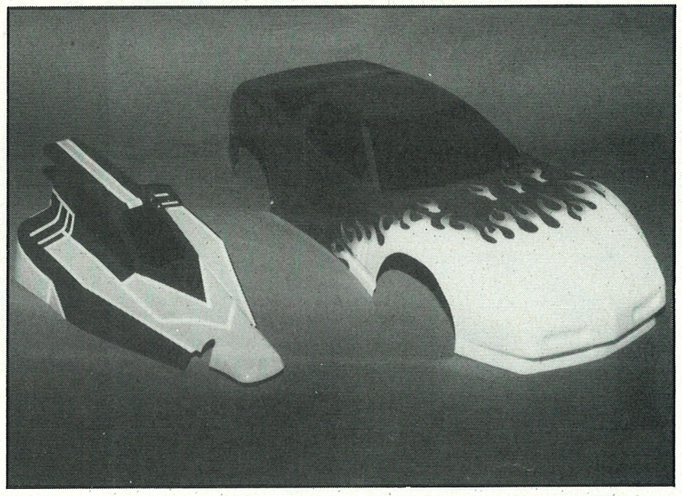
Decal it up!

Use a scalpel to cut all the required decals from their sheet. Make sure that the outside of the body is free from dust and check the position of all decals. Peel the first ¼in of backing paper from the decal and tear it off. Without allowing the exposed 'sticky end' to touch the body, position the decal then press down firmly. Now remove the remainder of the backing and press down. Small decals should have the backing removed and be positioned using the tip of a scalpel blade. Always avoid touching the adhesive side with your fingers as fingermarks will show through the clear decal 'carrier' — especially over black.
The body mounting holes can now be drilled or cut-out using a scalpel. Any paint that has over-sprayed on the outside of the body can be removed with a little T-cut on a soft cloth.

How to paint — the Corvette

The flame paintwork is just as simple to produce as the 'box-top' scheme used on the Cougar; with a little practice, it is quicker too.
Firstly, the body should be trimmed, washed and dried as detailed above. Brush on a *thick* coat of masking fluid, ensuring that all of the inside of the body is covered and allow this to dry thoroughly. When dry, the normally blue fluid will appear almost transparent. Re-coat with a second, thick coat and leave overnight until dry.
The windows are painted first, so the masking fluid must be removed from these. If the body moulding has sharply defined lines, a ruler will not be required and a blade will follow the outline of each window neatly. Remove the dried mask from all windows, starting at one corner of each. Thin some metallic black paint and lightly coat the edges of the masking fluid, sealing them and preventing 'leaks'. Spray the windows black using light coats and allow to dry whilst cleaning the airbrush.
Practice sketching the typical 'custom flame' outline, then draw the flame pattern on the inside of the body using a felt-tipped pen. Try to produce smooth flowing curves at the base of each flame. The next stage is to cut along, or near this pen line. Use a scalpel for this or, to make things very easy, buy a graphic 'swivel knife.' This has a tiny blade that can turn freely in the handle. Used upright the blade can be made to follow the pen line without turning the handle. These are not expensive — less than a fiver — and are available from most art shops. Only use enought pressure to cut the dry masking fluid and not scratch the body. Use the pen-line as a guide only and try to obtain smooth, flowing curves — rather than jagged lines resulting from trying to follow the lines religiously.
Using a scalpel to lift a corner of the mask, peel the front of the car back to the cut-line. If plenty of fluid was used, this should peel away in one piece. If only thin coats were applied the mask will break-up and will have to be rubbed off with a finger or peeled like sunburnt skin... Nasty!
Load the airbrush with thinned red or flourescent red paint and gently spray the tips of the flames. Start by spraying onto the mask and slowly move back to paint the exposed tip. Do not try to achieve a solid colour and work fairly close to the body, always painting from the front to the back to allow the overspray to fall on the masked areas.
Clean the airbrush, then spray thinned orange over the dry red tips, moving further back into the flame. Clean and load the airbrush with yellow and spray over the now orange tips, moving further back to the base of each flame. The rest is easy!
Check that no dry paint dust has appeared in the corners of the body that will be painted in white. Use a soft lint-free cloth to remove any specks of colour from the exposed bonnet then spray with white, covering all the tips of the flames, too. Allow this paint to dry thoroughly, then remove all the remaining masking fluid. Wash the body carefully, inside and out, with washing-up liquid and warm water. Dry with tissue then spray thinned metallic blue from the flames back. Try not to spray too heavily on the tip of the flames as the darker colour will shadow through. It is possible that the blue could be sprayed before the flames but removing the masking fluid from the front of the body, working back to the points at the tips of the flames is easier than working from the back forward.
When the blue has dried it will still be translucent and should be backed with a light coat of silver to brighten the colour. Turn the body over — the paintwork's complete!

Both of the bodies shown being painted here are very simple to copy, with a little patience and care.



Finished shells before decals are applied — windows can also easly be left clear.

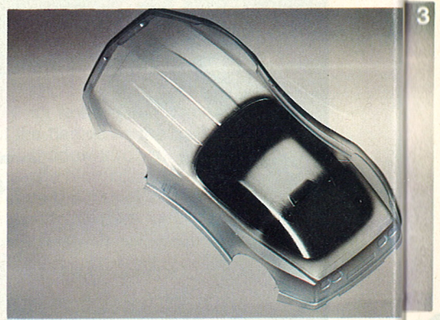
With the decals added in the same manner as detailed above, the body mounting holes may be drilled and the body fitted to the chassis.

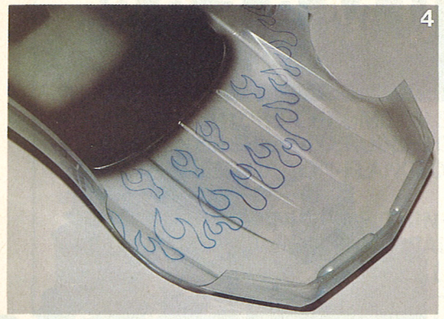
Have a go!

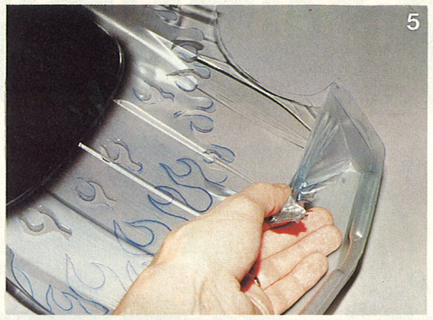
Both of the bodies shown being painted here are very simple to copy, with a little patience and care.
Practice is important, so take all the opportunities to paint. To gain experience, I used to offer to spray all my friend's cars if they supplied the trimmed body and paint — for free! This way, all mistakes can be learned from without ruining a single body of my own...
Experiment with colours and mixing paints to produce different shades and effects. Plan all schemes before picking up the airbrush! If you are unsure that a certain pattern or colour will look effective, photocopy the kit-box artwork and colour it in with felt pens. This way no mistakes are made when actually painting the body and all your efforts can be directed at ensuring that the masking is done neatly and with no colours bleeding through.
Finally, remember these words of wisdom, that still hold true having now painted over one hundred and fifty model car bodies, numerous full-size cars, motorbikes, and model aircraft; If it moves — oil it, if it doesn't — paint it!
Racing Special would like to thank Schumacher, the manufacturer of the Cougar and Ripmax, the distributor of Pactra Paints and the Kyosho Corvette, for supplying the bodies to be painted in this article.

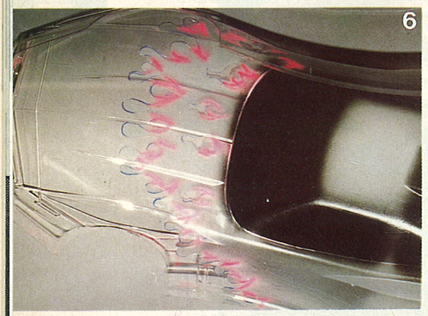
1

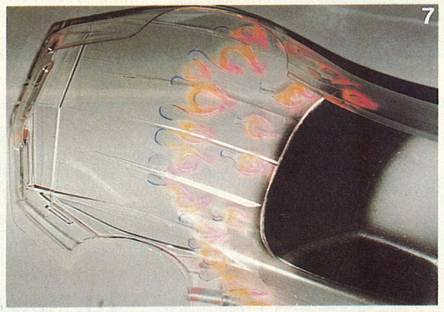
2

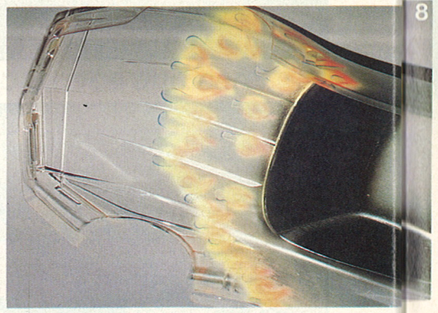

3

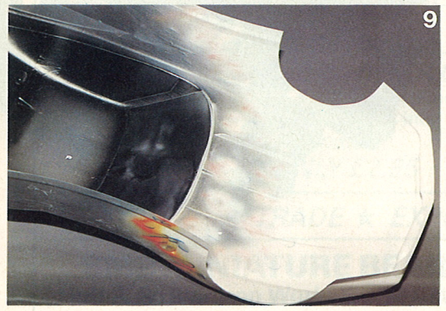

4

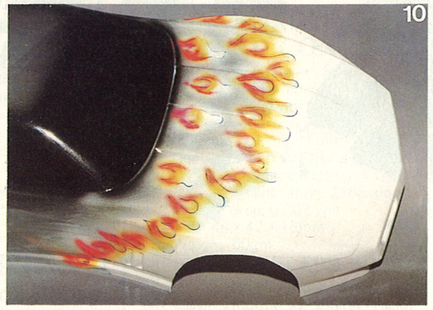

5

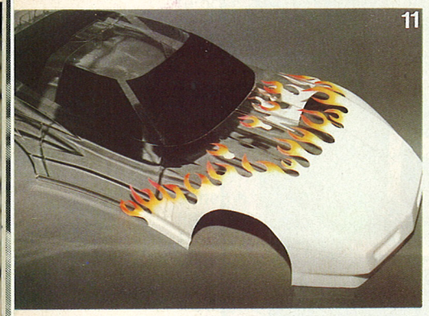

6

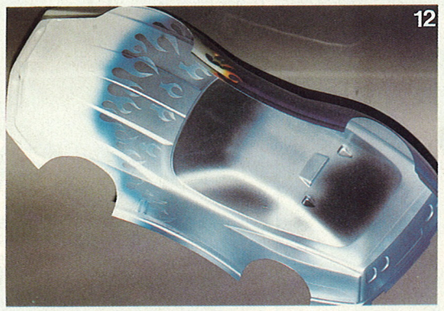

7

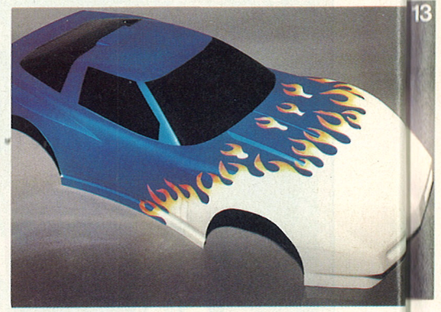

8

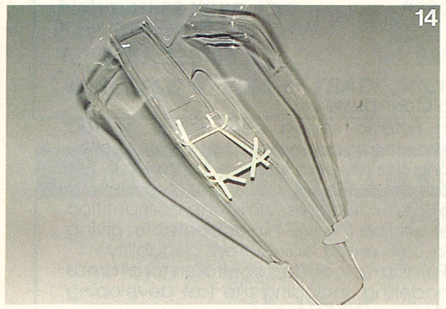

9

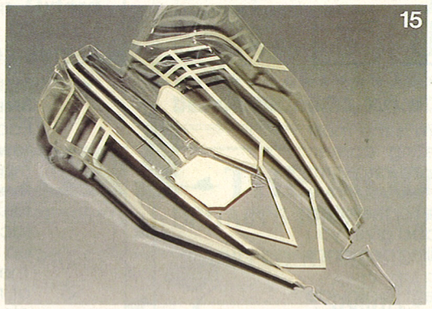

10

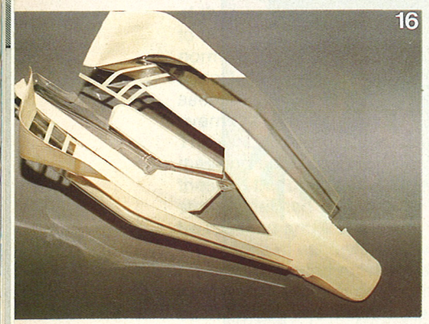

11

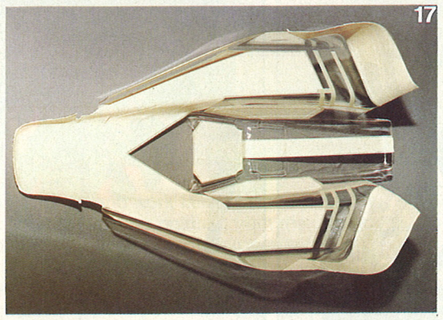

12

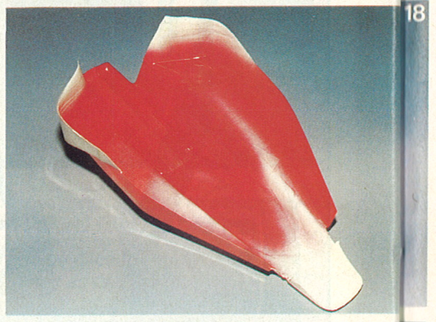

13

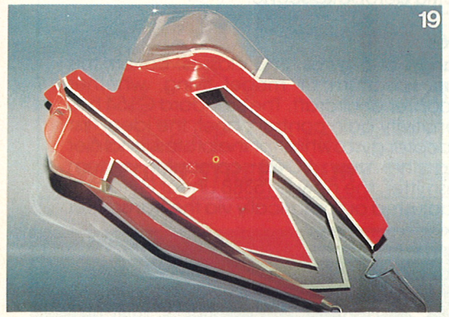

14

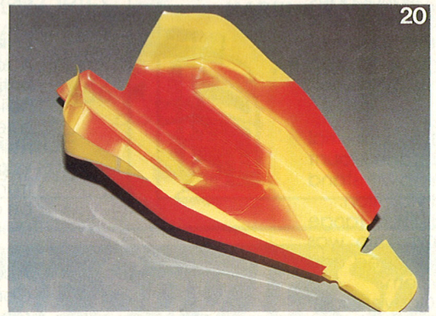

15

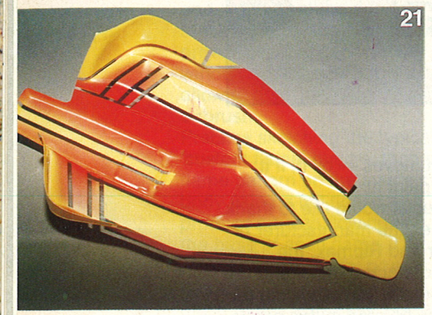

16

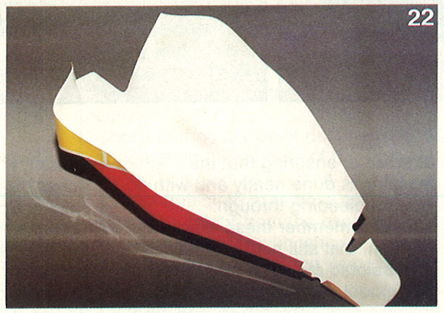

17

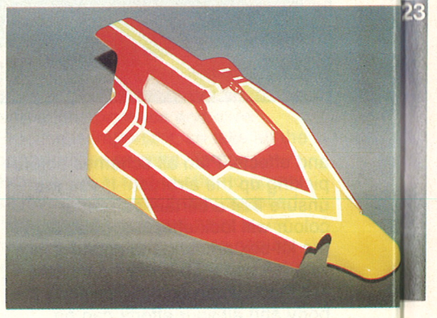

18

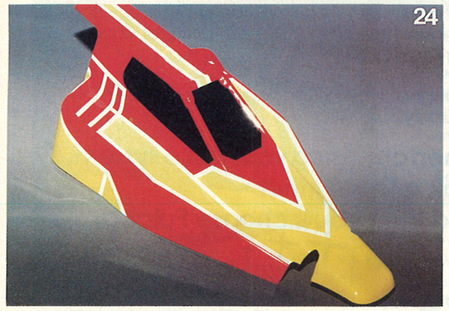

19


20


21


22


23


24

25

Photo 1: Typical tools and materials required to paint Lexan car bodies. Graphic swivel knife shown in the foreground. 2: Trimmed and washed body is coated with brush-on masking fluid. 3: Dry masking fluid removed and the windows sprayed with metallic black. 4: Custom flame outline drawn on the inside of the shell using a felt-tipped pen. 5: Flame outline cut and masking fluid removed from the bonnet. 6: Fluorescent red paint sprayed into the tips of each flame, working from front to back allowing the overspray to fall on the masked areas of the body. 7: Moving further back into each flame with fluorescent orange. 8: Thinned yellow sprayed to the base of each flame, backing the orange and red. 9: After a careful check that no specks of colour have appeared on the bonnet, the front of the Corvette is sprayed white, 10: From the outside, the results can be seen before removing the masking fluid, and after in photo 11. 12: The remainder of the shell is now sprayed with metallic blue and backed with a light coat of silver. 13: Completed paintwork, prior to adding the decals. 14: Masking the Cougar's window outline with Fine Line tape. 15: Windows backed with paper tape and all colour divides and pinstripes masked with Fine Line. 16 and 17: All areas to be painted yellow masked with paper tape. 18: Red sprayed with light, even coats. 19: Paper tape carefully removed from all yellow areas. 20: Exposed body painted with yellow. 21: Allow all paint to dry then remove the Fine Line tape divides. 22: Spray the entire body white, backing the red and yellow. 23: How the body should look at this stage. 24: All remaining tape removed, the windows sprayed black and all decals added.

Useful addresses:
Airbrushes — Badger, Dept DG, 156 Stanley Green Road, Poole, Dorset, BH15 3BE. Tel: 0202 673757.
DeVillbiss, Ringwood Road, Bournemouth, BH11 9LH.
Harden Associates (Powermax), Millet Street, Bury, Lancs.
Paint — Pactra: All Ripmax stockists. In case of difficulty, contact Ripmax, 241 Green Street, Enfield, EN3 7SJ. Custom Colour; All Parma stockists.

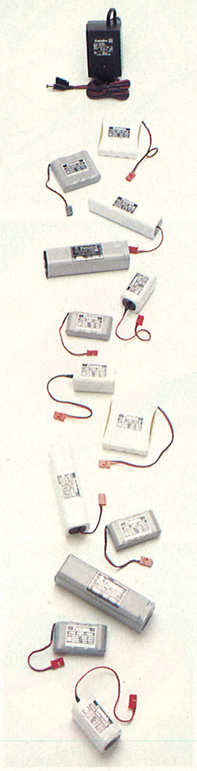
STRENGTH IN NUMBERS

Futaba

A LONG TERM VIEW . . .
Choosing the right radio system is the most important step in any modelling career. Choosing a Futaba System means long term flexibility and adaptability. Whether you have chosen a starter two-channel set or the latest F28 computer system, only Futaba gives you total confidence as your modelling demands change.
Futaba's continuing commitment to provide a range of accessories and optional parts has meant the modeller, at whatever level, is offered the most comprehensive range of additions available.

RECEIVERS
All Futaba receivers are built to Industrial Standards and feature SMT (Surface Mount Technology), enabling each unit to withstand high levels of stress, shock and vibration.
As a pinnacle to their mid and upper range systems the Futaba PCM 1024 Chip was developed - giving 'twice' the speed and resolution of any other PCM system.
Futaba now incorporate Dual Conversion or double Superhet technology. Double mixer stages, filter stages and amplifiers give exceptional protection against interference - and extra safety for your model. And as in all our products, Futaba quality comes as standard.

SERVOS
Together with the world standard S148, Futaba now offer the most comprehensive range of servos ever. Higher speeds, increased torque, metal gears for high impact situations, and coreless motors - all offer greater performance for even the most discerning modeller. Again, SMT electronics are utilised together with surface mount motors giving the edge in quality, performance and service life.



SPEED CONTROLLERS
Each Futaba speed controller is geared towards the specific needs of the modeller, making the range as flexible as possible. For the beginner, the MC112B is simple to use and full of useful features, whilst the competition racer will find the MC116 unbeatable, giving up to 1260 amp peak current capability.
The Futaba range offers controllers for all areas of modelling, including the fast developing electric aerobatic scene.

GYROS
A range of 5 gyros, in 3 classes, covers the entire spectrum of model flying, whether helicopter or aircraft. The standard G154 has a sensitivity gain control panel, the ideal first helicopter gyro, whilst for the professional flier using the new FC-28 computer system transmitter, the new G153BB Linear Gyro can be adjusted automatically via the transmitter stick.

ACCESSORIES
Complimenting the functional units, is a huge range of general accessories - switches, batteries, servo horns, neck straps, and extension leads up to 1 metre (with or without filter).

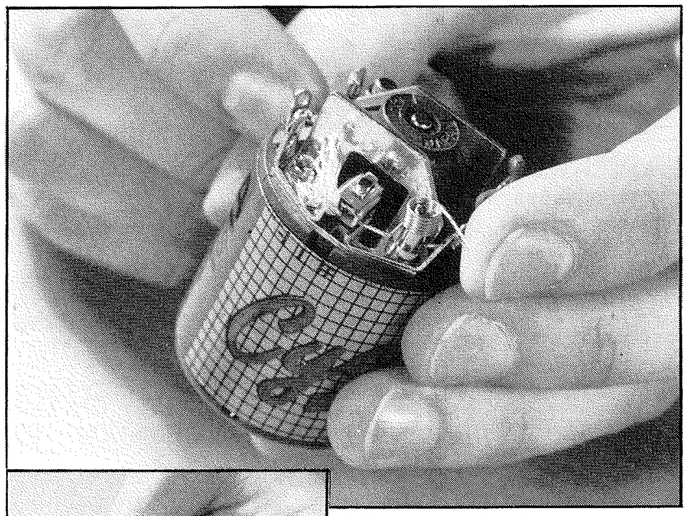
Throughout the entire range, Futaba's hallmark is quality.

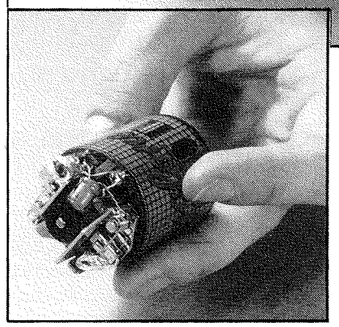
When choosing your radio system, look a little further - and then you'll choose Futaba.

Ripmax

Speed Secrets

Pete Winton tells the facts on how to look after and run your motors . . .





Motor with capacitors correctly fitted.

Motors for electric car racing. This is probably the most difficult subject to write about because the buyer has too much choice. Many people have attempted to provide information on motors, some good, some bad. Yet still there are more people who do the wrong things with motors than do right things. Buyers equate fast lap times with fast motors, and this is a fundamental mistake. This articles on motors will make you better informed, but is designed to save you money. We shall disucss the basics of motors, and the reasons for not buying more and more in that elusive search for more laps per race.

Removing brush springs.

DC (direct current) electric motors work on the principle of magnetism, and electro-magnetism. A permanent magnet has two poles, called north and south. The earth itself has the properties of a magnet, which is why compasses always point to the North Pole, and hence each end of a magnet is called a pole, and they are labelled north and south.

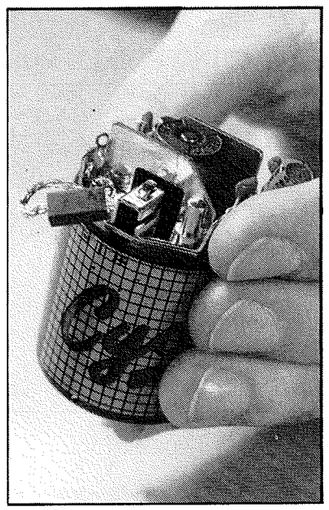
One of the properties of magnets is that they attract ferrous metals (containing iron), and other magnets. Place two magnets together and they will attract each other. The north pole attracts a south pole, and vice versa. More importantly for our use, like poles (eg a south and a south) repel. It is this phenomenon which we use in an electric motor to create rotary motion.

Electro-magnetism is slightly different. When an electric current is passed through a wire, it creates a magnetic field. The wire itself (usually copper) is not magnetic, but if wire is wrapped around an iron rod, the rod is magnetised. This principle is used in Solenoids (for example central locking on cars) and relays.

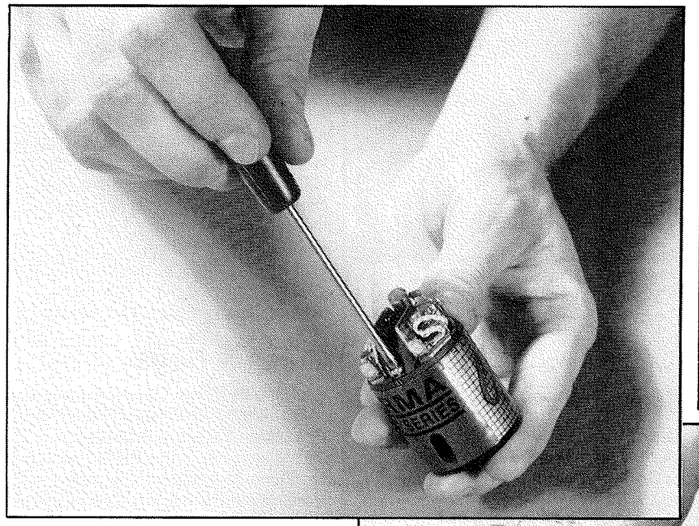
Our dc electric motors have two permanent magnets and three electro magnets. The permanent magnets are inside the can, and the electromagnets are on the armature. When current is passed through the armature, it energises the electro magnets. By controlling this process, we can energise the armature to be a south pole. This is next to a south pole permanent magnet so they repel each other. Since the only movement possible is rotary, the armature moves around, away from the permanent magnet.

The commutator on the end of the armature is so designed to reverse the flow of electricity through the copper wire. As the armature rotates, it is re-energised as a north pole. Now it is sitting next to the north pole permanent magnet, it is repelled again, and rotates. This process is continual, resulting in rotary motion.

That is a very simple explanation, give you a guide to the process in action. However, it contains two key points which must never be



Brushes removed from the guides.



Removing endbell placement screws.

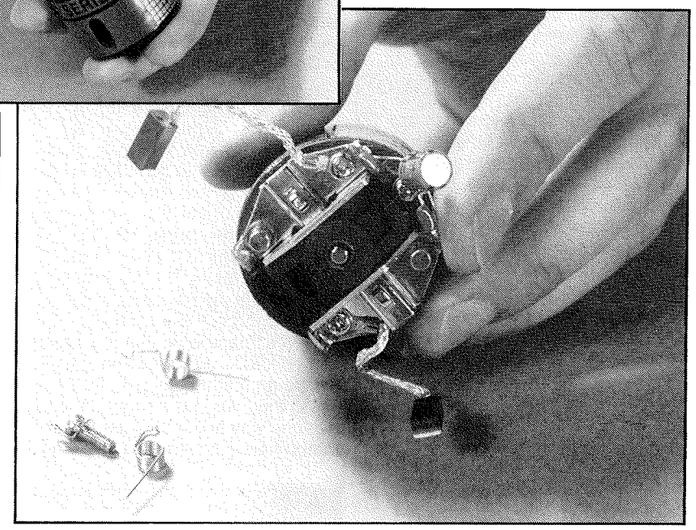
forgotten. Firtly, the strength of the permanet magnets is a factor in motor performance, and secondly the amount of current passing through the armature is variable, thus varying the motor speed.

The theoretical side of electrical current passing through the armature is of most interest. The current (measured in amps) that passes through the armature varies the strength of the electro-magnet field created. The stronger the electro magnetic field, the stronger the performance of the motor. The more current that can be passed through the motor, the greater its performance.

Current Time

The amount of current that can be passed is directly related to the resistance of the copper wire wound around the armature. The more wire there is, the more resistance, the lower the current, the lower the motor performance. However, another factor is the diameter of the wire. The smaller the wire diameter, the more the resistance there is, the lower the motor performance.

Without delving into complicated theory, these physical properties are seen by the motor buyer in two ways. High strength permanent magnets are now in use under the name 'wet magnets'. This has changed the characteristics of our motors from high revolutions per minute (revs) or high speed, to low revs and higher torque. We shall discuss the impact of this later. However, the normal way of expressing the specification of a motor is by the number of turns of wire on each segment (or stack) of the armature.



Springs off-brushes out and screws removed.

The less the number of turns, the less resistance in the armature and the greater the amount of current that can be passed. As we said, more current generally means more performance. A 27 turn motor will not have as much performance on a test bed as a 19 turn motor. The statement of the number of turns is in effect a statement of the motors' anticipated performance. The diameter of wire used is the other factor mentioned, so we can say that in theory, a 19 turn motor using wire 0.75mm diameter will have more performance than a motor of 19 turns using wire 0.6mm in diameter. Larger wire diameters allow more current to be passed, and this improves performance.

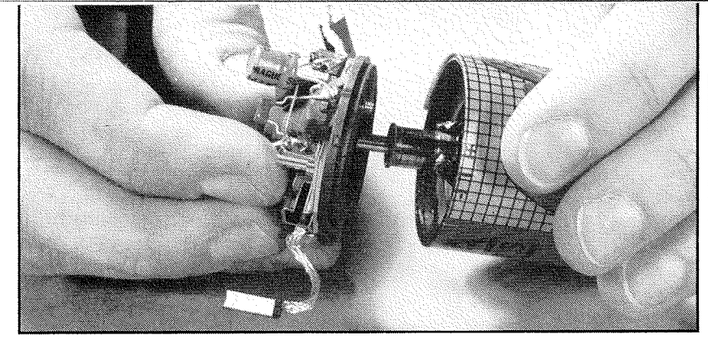
Performance?

Whilst our general measure of likely motor performance is expressed by the number of turns on each stack of the armature, it ignores several other factors which affect the final outcome. It is however, the best and simplest for our needs. We can use it to determine relative factors like acceleration, top speed, and current consumption. The motor buyer needs to understand that more performance is possible with a 19 turn motor than a 27 turn motor, and that is all. We shall deal with the terms single wind, double wind, triple quad and quin at a later time, for now file away the following fact: less turns means more current consumption and higher motor performance.

We shall now think about motor selection. To illustrate much of what follows, here is one of my favourite motor racing stories: Back in the late seventies, David Hobbs was driving a BMW 2002 turbo in the American IMSA series. He was part of the BMW Junior Team, and they recruited the late, great, Ronnie Peterson to guest drive in a race at Watkins Glen. Admittedly overawed by the presence of the outstanding Lotus Formula 1 driver, Hobbs invited Peterson to take the whole practice session himself to set the car up to his liking. Peterson declined, saying that Hobbs had to deal with the car for the rest of the series, and he would be happy to drive with whatever set-up Hobbs determined for the track.

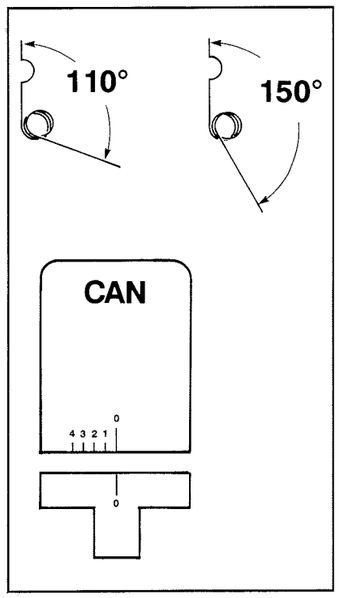
Hobbs worked hard, and thought he had done well to qualify high in his class. Peterson calmly walked over to the car for his run, and within a few laps was recording times 3 second a lap faster than Hobbs. I don't recall the outcome of the race, but Hobbs' comment was 'He's a genius'. The moral of the story is it not what you drive, it's the way you drive it.

The only way you or I will ever make



Carefully removing endbell — keep an eye on washers.

faster lap times is by better driving skill. No amount of horsepower will make the car faster around the circuit if the driver cannot use that power to good effect. The way you drive, and the set-up of your car, are one hundred times more important than the power of your motors.
A high performance motor will always make a car more difficult to drive. Performance motors increase wear on the transmission, cells and tyres. Driving style must change. Every car will have either more horsepower than grip, or more grip than horsepower. Driving cars with more horsepower than grip means early braking, late turn-in to the corner, and delicate application of the throttle. These cars are at their worst on short tracks with lots of corners since their cornering speed is low. Cars which have more grip than horsepower mean late braking, early turn-in and immediate throttle opening. These cars are at their best on short tracks with lots of corners since their cornering speeds are high. If you can raise the amount of grip your car generates in a turn your lap times will be faster using the same motor.

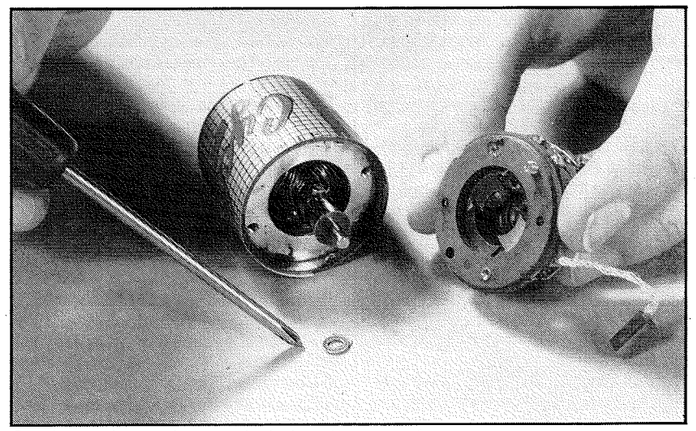


Speed More Speed!

Many drivers buy high-performance motors because they think speed down the straight is important. If all you want is to be the fastest thing on four wheels in a straight line don't let me stop you buying every motor your heart desires. However, most of us seem to want to complete more laps, which means driving faster for the duration of the race, not just on one part of the course. Having bought a super-fast motor to zap down the straight, drivers then wonder why the car spins when accelerating out of a corner!
It seems improbable that this article can conclude without some specific advice on motor selection. Before we get to that, you must grasp the basic reasons why some cars are better than others (chassis, design, tyres etc) and some drivers will always be faster than you are (more skill, better preparation etc). Everyone should have a choice of motors in their box if they want seriously to compete at Regional and National level. On no account should the rest of us buy those same motors and expect to achieve the same lap times.
Motor selection must be based on your ability to control the car you are driving. Motors of 19 or 21 turns are idea for the average club driver, providing a balance between speed and ease of driving. Motors with more turns could be too slow to maximise your driving ability, and motors with less turns will surely tax your skill and patience. Many clubs still run using 27 turn motors (the BRCA standard motor) and have thriving memberships. Like Mr Hobbs and Mr Peterson, your driving skill is far greater in determining lap times; improving your skill costs nothing, motors are £45 a time!

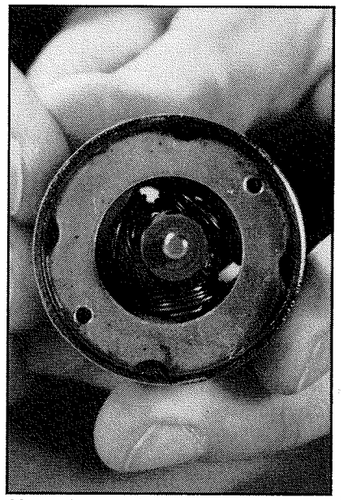
Rules & Regs

The British Radio Car Association sets rules by which the National Championships are organised. Some years ago, the BRCA decided to introduce a class to be raced at Nationals in which the type of motor used would be the same for everyone. The idea was to concentrate on the depth of a driver's skill, not the depth of his pocket. The BRCA introduced a motor specification for 12-C and 10-OR, and called it standard class. Standard class motors have a set specification. For 10-OR it is no less than 27 turns of 23 gauge wire (wire sizes are measured in 'gauges', which relates to their diameter) and for 12-C it is 35 turns of 23 gauge. In both cases only single winds are allowed (more on this next month), and only plain bearings may be used.



Spacing washers — keep track of where they came from.

A standard motor is one of the above specifications depending on which class you race. BRCA standard motors also have a price limit, about £15. Many clubs still use standard motors at all their meetings, and they are an excellent way to teaching that driver skill is more important than motor power. Races at Regional level (10-CR) still use standard motors in most regions. Races at National and International level use modified motors. Again, the BRCA have rules for these. Primarily they state that modified motors must have a maximum price (about £45), must be approved by the BRCA Committee, and must be commercially available. 12-C rules additionally say that modifieds must use the same components (armature blank, can, and endbell) as standard motors, but ballraces, rewinds, different bushes, etc, are allowed.
A standard motor is one of the two types described above, and a modified motor is therefore anything else! As far as we are concerned,



Motor plate as when removed.

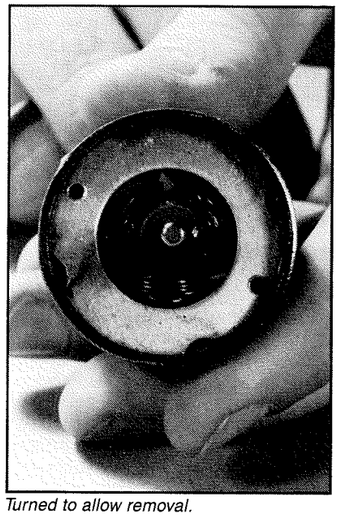
modified motors are of better quality and when properly maintained, will last longer. Despite the price differential, modified motor will last four or five times longer because it can be opened for cleaning and rebuilding. Unless your club run to standard class rules, a modified is cheaper in the long term.
What is basic motor care? It has taken ten years for these suggestions to be complied, and they work. They are cheap, simple and effective. How you implement them is your decision — but you get my drift!
Basic motor care means do nothing — really. If your motor has been correctly set-up, and carefully used, there is nothing to do between rebuilds. We will deal with set-up and rebuilds later on. However, checks must be made to ensure everything is in order, and standard motors will benefit from regular cleaning. Stripping motors between every run and cleaning all the parts is normally a waste of time, and detracts from performance.
Standards first.
Between each race, a standard motor should have the commutator and the brushes cleaned. Unhook the brush spring from the top of the brush holder and swing it anti-clockwise until the short arm clears the slot in the brush holder. Lift the spring off the spring post. (All brush springs are removed this way).

Clean Machine

Get hold of the copper braid (the sluint) which is attached to the brush, carefully pull the brush out of the holder. Soak a cotton bud (for those important little places!) in motor cleaner, push it down the holder, and hold it in contact with the commutator. Rotate the armature back and forth several times.
Remove the cotton bud and inspect the end. If it is very black, repeat the exercise with a fresh bud soaked in motor cleaner. The cotton bud will never be completely clean, but as long as the commutator reveals its copper colour, all is well. Using the side of the cotton bud, wipe across the face of the brush, again repeating this until the brush leaves only a little black mark on the cotton bud. Replace the brush and repeat for the other side. (Use a new cotton bud, or an unused edge of the same bud everyime. Don't use a dirty bud).
Replace the springs.
Standard motors should have their bearing oiled before every race.
Place a very tiny drop of oil on each bearing and rotate the shaft several times. That's it — no more, no less.
Modified motors used in dusty or wet conditions shold be cleaned the same way, but don't oil the bearings. This attracts dust and dirt and will cause increased wear. Only oil ball bearings after cleaning at home.
Modifieds used indoors, or outside on 'clean' tracks, should be inspected after every run. Remove the brushes and look at them. They should be clean, probably shiney, and smooth. There may be little chips at the edges, don't worry. The commutator should be mainly a clean copper colour, with some black marks near the edges of each slot. Check for severe brush damage, and for any score marks in the brush or commutator. If the brushes are badly scored, it is time for a rebuild.
Modified motors should be completely dismantled at home after each meeting. Using a cloth and a small paintbrush, remove all dirt and debris from the can, end bell, and armature. Take care not to touch the commutator at any time, and always put the motor back exactly as it came apart, including the correct rotary position of the end bell. This latter point is most important, and will be dealt with in more detail later.
Once reassembled, place a tiny drop of oil in each bearing.
The reason for cleaning standard motor brushes and commutators, but not modifieds, is the brush material. Standard motor brushes are soft, and easily pick up dust and dirt which is rubbed into the commutator. Also, being soft, the carbon in the brush is more easily liberated, and burns (it's the sparks you see coming from a motor whilst it is running) allowing the residue, which is hard, to get into the brushes and so the same damage as the dirt. This is also the reason for cleaning modifieds in dusty or wet conditions — to remove the dirt and prevent excess damage.

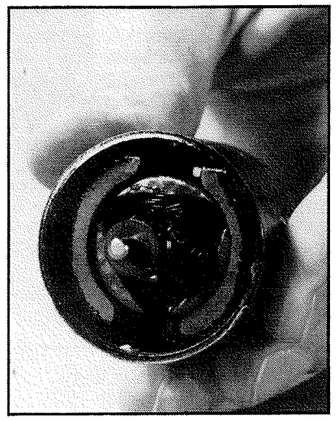
Round Up

So, to sum up basic motor care, clean standards after every run with a cotton bud, and modifieds used in wet or dusty conditions. Dismantle modifieds to remove dirt and debris from all parts afer every meeting, and oil the bearings very sparingly afterwards. Oil standard motor bearings very sparingly before each run. Keep doing this until the brushes are one third worn, or until the brushes are scored for any reason. On standards, replace the brushes once this point is reached. Note that the brush on the positive side of the motor wears faster — no, I don't know why either. Always replace brushes in pairs, never one at a time. On modifieds the motor should be rebuilt if the brushes are ⅓ worn, chipped or scored, never simply replace the brushes.
Now for the list of nevers when it comes to motor care.
NEVER immerse a motor in any liquid whether running or not.



Turned to allow removal.

NEVER touch the commutator. If this happens accidently, use the motor cleaner — soaked cotton bud on the commutator before using the motor again.
NEVER over-oil the bearings, either with too much oil, or by oiling too often.
NEVER put a sharp knife anywhere near a commutator.
NEVER use a motor if you suspect anything is wrong with it.
NEVER squirt motor cleaner into a motor, whether running or stationary.
Improving your driving is the key to fast lap times. This is impossible unless the car runs consistently heat after heat. Only by proper care of motors can tht consistency be achieved. Look after them, and they will look after you.
Motor Selection — This is the most difficult thing to write down so that everyone makes the right choice. The more one knows about motors, the more difficult it becomes to give precise advice. If there were only two motors on the market, it would be easy — there are dozens. We hope this attempt helps.



Motor plate removed with armature showing.

Which Motor?

The first place to start is with your car. If you own a car with an all plastic gearbox, or with a piece of plastic to mount the motor against, then do not buy a Modified motor. Modifieds generate too much heat and too much power for plastic gearboxes and motor mounts, they will cause much expensive damage. A BRCA standard class motor (27 turns) will be more powerful than the majority of motors supplied with these kits, and if the smallest pinion gear is supplied with the kit is fitted to the motor, you will usually get better performance.

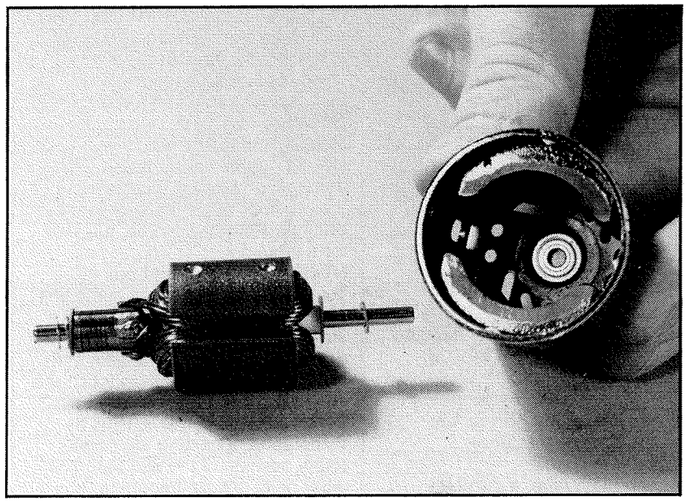
Those of you with cars which have belt drive, metal/nylon/tutnol gears, and most importantly, a metal motor mount, may consider using Modified motors. Before so doing, the car must be in good condition, and must be fitted with ballraces in all the driven axles and gearbox. These bearings must be free moving and clean, and the whole drivetrain must be free moving and correctly adjusted. If there are any faults in the gearboxes or drivetrain, excess friction or binding in the suspension or wheel bearings, then fitting a modified motor will cause major damage. Any of these faults will cause excess current drain, high motor temperatures, and can potentially damage every item in the car; cells, speed controller, and motor. If you are in any doubt, stick to standard motors.

Good Condition?

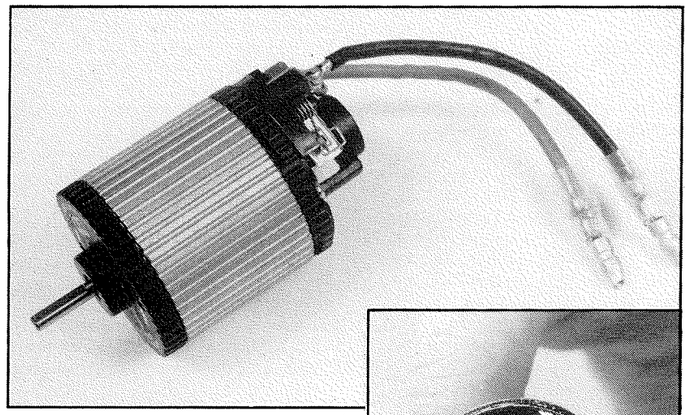
You have the right car, it is in good condition, you want a modified motor — which one? Now is the time to talk single, double, triple, quad or quin. This refers to the number of wires which are on the stack. A single wind uses one wire wrapped around each pole of the stack. A double wind has two wires side by side wraped around each pole, a triple three, a quad four, a quin five. The idea is to increase the amount of wire on the pole whilst keeping the diameter small and easy to wrap around the stack. It also changes the character of the motor. Thus a 19 double has two wires wound together 19 times around each pole (stack) of the armature.
Single winds are noted for their power at high revs. Double have more torque and smoother power delivery. Triples are more like singles, but do have slightly better torque at low revs. If you know enough to pick a quad or quin, you don't really need me to tell you why

Now is the time to talk single, double, triple, quad or quin

they work. New buyers should stick to doubles and triples. Singles can be difficult to tame, and quads and quins are rather like GT stripes on a car — nice talking point, but what are they there for? I have always preferred a double wind, it suits my driving and they are most flexible motors. Not for nothing are they the most popular.
So, how many turns. Back to you and your car. 2WD cars require less power since the have less grip. 4WD cars can cope with more power. As a rule of thumb, never less than 17 turns for a 4WD, or 19 turns for a 2WD. Ideally, if this is your first Modified, choose a 21 turn double for 2WD, and a 19 turn double for 4WD. When it comes to the make of motor then look to your local model shop. Associated/Reedy, Kyosho, Losi, Perma, Twister and Trinity are all good. They are all about the same price, so buy one the shop can recommend. Don't overlook the budget price modifieds from Demon, Tornado (TMS), or Schumacher. Whilst they are more mass produced, they are very good value.
The other point to note is the so-called 'wet-magnet' motor. This refers to the way in which the magnets are made. The 'wet' process produces a magnet with a stronger field (or force), which increases the torque of the motor slightly, and reduces its maximum



Remove arm — note washer that usually remains in can.

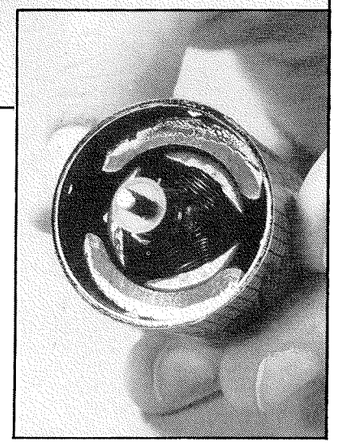


Tamiya dynatech can is ribbed for cooling.

revs. Please don't concern yourself with this aspect too much, it is mostly biology. However, if you use SCE (1700mAh) cells, then you will find the 'wet-magnet' motor easier to set-up. When using SC and SCR (1200mAh) cells, then the possession of a 'wet-magnet' motor is less important. Stick to the number of turns (19, 21 etc) and the type of wind (double, triple etc) as your selection criteria, not the magnet type.

Get The Right Gear

Don't leave the shop just yet. You must buy the single most important item used to the best motor performance, the gears. Your car will normally have two which are interchangeable, a large one call the spur, and a small called the pinion. The spur is attached to the gearbox, and the pinion to the motor. It is absolutely vital that you have the correct gears fitted to the car to suit the motor you have just bought — and I mean vital.
The gearing required is dependent on many factors. The quality of your batteries, the type of track, the type of speed controller, the condition of the motor, the amount of grip available, and, not least, your driving style. It is impossible to give an exact ratio for every motor, but the broad area's should be indicated so that most confusion is removed.
Motors must be run in before being used in anger. This gives the brushes a chance to bed in. When new the brushes have only a small contact area which reduces the current passed and thus the performance. Whilst there are many ways of running in a motor, here is one which works, and which everyone can use. Fit the motor in the car on your selected ratio. Using a freshly charged pack of cells, drive the car gently until the cells are flat.



Note fibre washer which remains on armature.

Accelerate gently, never use the brakes, and never use reverse. Use as much speed as possible, but don't put any strain on the car by driving over bumpy ground, muddy ground, or up hills. A local park or car park is ideal.
After this first run, make the usual checks and clean the motor as advised earlier. During the first two races try to avoid the use of brakes and reverse. After that, everything should be okay. Now you should try and find the right gear ratio for best performance.
The right gear ratio for a motor is almost never the one which uses all the battery power in one race. This is especially trying when using SCE (1770mAh) cells. The right gear ratio is one which allows the motor to accelerate the car quickly and cleanly out of a corner, and which get the car moving at its highest speed about ¼ to ⅓ of the way down the straight. Once the race is over, the motor will be hot, but it should never be too hot to touch, occasionally perhaps too hot to grasp in the hand. The cooler the motor is at the end of the race, the better its performance will be, and will continue to be.
You will know when the right ratio has been found. The car will be lively and responsive, it will be reasonably quick on the straight, and you will probabl find it easy to drive. Before ever saying the car is too slow, take a look at the lap times. The best times will come only when the car feels slow to drive, and you appear to have ample time during cornering. Remember, it is the total laps you score in a race that count, not how fast you are down the straight.
Once you have found a ratio that works for a motor/car combination, don't fiddle with it. You may have to gear up (9.5:1 to 9.0:1 say) for a 'long' track, or down (9.5:1 to 10.0:1) for a short track, to maintain the correct balance of acceleration and speed. Remember, it is the speed between corners which counts. If you can accelerate faster and brake later. You can cover the distance between corners faster than your rivals. Speed around a corner is down to chassis set-up and grip available, not the motor. A motor only really counts in a straight line, so gear yours to get the maximum acceleration between corners that you can, and not the highest speed down the main straight. The main straight is normally less than 20% of the track, so gear for the 80%.
If you find that the car never lasts the race, but the motor performs well and is cool at the end of the race, then you may need better cells. However, once again, look at the lap times before spending your money. Don't forget that every accident you have means more unnecessary acceleration to get back in the race, and more capacity required from the cells. Drive with fewer accidents and you will magically find your cells last longer, and your lap times improve. As we keep saying, driving skill is one hundred times more important than fast motors.
Modified motors must be rebuilt regularly to maintain their condition and performance. This involves retrueing the commutator and fitting new brushes as a minimum for fairly new motors. As time goes on, new bearing may be required. Modified motors will last until there is no metal (copper) left on the commutator!

Hot Stuff

As motors get hot, the metals and plastics used in their construction move. The heat distorts the plastic base of the commutator, and the friction of the brushes wears the copper face of the commutator. The commutator distorts and goes either oval, barrel shaped, or both! This mishapen commutator causes the brushes to bounce on and off its surface as the armature goes round. Clearly when the brushes are

Wet Magnets — do I need a towel??

Whether a magnet is described as wet or dry refers to the method of manufacture. Wet magnets are usually stronger, more resistant to damage from other magnetic fields, heat and impacts. Just because a motor is described as wet magnets is no guarantee of quality, the quality of the motor is still its construction, and the winds used.

The use of wet magnets is quite new, and it is important to understand that a dry magnet motor will draw less current than a wet magnet motor. Since the power of a motor in Watts is equal to the volts fed to the motor multilied by the current (amps) it draws from the cells (Watts = Volts × Amps), one can see that to obtain more power, one needs more volts. Dry magnet motors are therefore best suited to the SCR and SC cells, which deliver slightly higher voltage during discharge. Wet magnet motors draw a higher current due to the need to overcome the higher force of the wet magnets. Therefore, wet magnet motors derive their power from the amps side of the equation and are most suited to the SCE cells. In fact, wet magnet motors are less powerful than dry magnet motors on the whole. They seem faster on the track because they have much more torque, and can sustain a higher top speed due to the gear ratio used with that higher torque.

Take for example the Sierra XR 4×4, and the Peugeot 405 Mi16 4×4. The XR develops 150bhp, and the 405 160bhp. Therefore the 405 is quicker, right? Wrong. The XR develops 170lbsft of torque, and the 405 only 130lbsft. Torque is the ability of a motor to get weight on the move, and power is the ability to sustain high speed against the forces of friction and air resistance. Knowing that lot, you will be unsurprised to hear that the XR reaches 60mph over 1.5 seconds quicker than the Peugeot, that it is quicker through the gears in every situation, and that it loses out on top speed by a slim 5mph. All along, it is only the torque, or muscle of the XR which wins it the battle, not the power output which is less than the 405.

Think of the wet magnet motor as the XR, and the dry magnet motor as the 405, and you get the idea. That is why you see some drivers using 11 and 12 doubles at the top events. This is probably no more effective than the old 13 and 14 doubles in dry magnet form. Never try to emulate these guys by buying such motors, they are a drain on your pocket, your nerves, and your patience. However, if your dry magnet motors are in the 19 to 21 turn range then you will need wet magnet motors from 17 to 19 turns to get equivalent speed from your car on the track. If you use a wet magnet motor with SC and SCR cells, then to get the right speed from the car, it may drain the battery before the end of the race (the speed comes from more amps, and less volts). If you use a dry magnet motor with SCE cells, then you will again be slow since the motor cannot draw all the current available from the higher capacity cells, but it denied the high voltages it needs to develop its power.

Wet magnet motors are not better than dry magnet motors, they are just different. Knowing why should help you to get the best from your choice.

Gear Ratios

Whilst this article concentrates on the care and use of motors, the single most important thing in obtaining the best performance from a motor is the gear ratio. The best tuned and built motor will be either useless, or destroyed, if it is mated to the wrong gear ratio. Surprisingly, the use of motors in the 12th-Circuit and 10th-Circuit is not nearly as critical on gear ratios, as it is in 10th-Off Road.

The Circuit cars are very light, and the tracks always give a similar amount of grip. The correct ratio is therefore the one which gives the best speed along the straights, and lasts the race distance. Too low a gear ratio will give plenty of run time, and make the car slow. Too high a ratio, the car will not last the race distance. The risk of damaging the motor on too low a ratio is much less. Also, the correct ratio for the motor is quite easy to find, you simply ask someone at the track. Almost all the people racing Circuit cars have a good knowledge of gear ratios, and word soon spreads! Also, the gear ratio is frequently altered to take account of tyre wear. Those using Circuit cars should take note of our motor tips, but will find this section of less relevance.

The greatest potential for getting a gear ratio wrong is in 10th-Off Road. Far too many people assume that the correct ratio is the one which exhausts all the battery energy in a five minute race. Nothing could be further from the truth. 10th-Off Road cars are much heavier than Circuit cars, and have to cope with many different types of track. It is very easy to gear the motor too high, and thus overheat it causing severe damage. Remember the point about how the motor behaves under load. If the motor cannot reach and sustain its maximum speed easily, it will draw more and more energy from the cells which is dissipated in the form of heat, not speed.

Whenever one buys a new motor, the most important thing to buy is the correct gears for the car it will be used with.

10th-Off Road cars have a gearbox which reduces the speed of the motor to the axle. The ratio of this gearbox is essential in ratio calculations. The following are a list of cars and their internal ratios.

ProCat/TOPCAT/Cougar	2.428:1
PB Mustang/Maxima	2.208:1
Ultima	2.642:1
Associated RC10	1.85:1

These ratios are used in the calculation of the total gear ratio from the motor to the rear wheels. The following is a suggested point for motors, almost irrespective of their number of turns. These ratios

Motor	2WD	4WD	Ratio
19 double	8.5:1	9.0:1	High
18 double	9.0:1	9.5:1	↑
17 double	9.75:1	10.5:1	|
15 double	10.0:1	10.75:1	|
14 double	10.5:1	11.25:1	↓
13 double	11.5:1	12.5:1	Low

Please, this is not a universal list for all occasions, it is a guide when buying your motors to ensure you get the right gears for the job. Those buying, say, a 19 double (equivalent to a 21 double dry magnet motor) to fit on their RC10, will need to find out which gears are required. Using the 48DP type, with a 90 tooth spur gear fitted, and aiming for the 85:1 ratio suggested, will need to fit a 19 tooth pinion, the following formula applies to calculating the gear ratio:

$$\frac{\text{Spur gear (no. of teeth)}}{\text{Pinion gear (no. of teeth)}} \times \text{internal ratio} = \text{overall ratio.}$$

For the example above, the formula is: $90 \div 19 \times 1.85 = 8.76$

will err on the side of caution, but are given for wet magnet motors using SCE cells:

This is slightly lower than we need, but the 20 tooth pinion would give a ratio of 8.32:1, which may be too high, and we should always err on the safe side. If money is not too tight, then the exact ratio can almost be obtained by using an 88 tooth spur with a 19 tooth pinion which gives us 8.58, very close indeed. The right gear ratio for the good club driver is not too precise, depending on track conditions, driver style, and gears available. As a guide, you may find yourself one whole ratio away from the above suggestions (for the 8.5 ratio you could be 7.5 or 9.5) but that still does not make you wrong. However, when the car is performing at its best, you will normally find it does not use the full capacity for SCE cells, although it may well do so on SC or SCR cells. Whatever ratio you choose, you will know you have it right if you are consistently quick out of the corners, and about the same speed as everyone else on the straight.

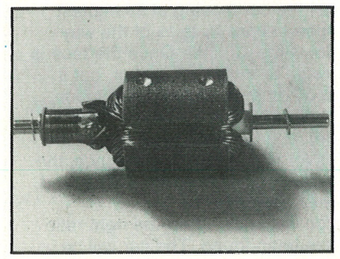
Before ever looking to the motor, sort out the best tyres and suspension setup for the track. Only when the car feels slow (it is easy to drive), has the time come to look for a faster motor in the box. Gear ratios are all a matter of feel, not of fact. Always err on the side of caution. We hate to say it again, but remember Mr Hobbs and Mr Peterson — driving skill is 100 times more important than motor power. And often, that means using a lower powered motor so that you can control the car more easily and find the right line through the corners lap after lap after lap.

bounced off the commutator and lose contact, no current is passed. The same thing happens to standard class motors, but these cannot be dismantled for rebuilding (and BRCA rules do not allow this anyway). Modified motors must be rebuilt when either the commutator gets badly scored, or the brushes get ⅓ worn. As a rule of thumb this is normally between 10 and 20 races depending on use; 5 min races or 8 min, indoors or outdoors, quality of maintenance. Who should rebuild motors? An expert. There are perhaps three people in the country I trust, one is Parma (Helger Racing), the other is MG Model Products, and the third is me. You need about £500 of proper equipment and a lot of machining expertise. Please consider your choice of rebuilder carefully.

Whatever you do, have your motor rebuilt regularly. This should always be a commutator retrue and fitment of new brushes, you should ask for bearings to be checked to the rebuilder. If one is obviously noisy or worn, get it replaced. A rebuild should cost about £5-£7, extra for bearings. Ignore rebuilds at your peril.

We have looked at motor selection, and recommended 21 and 19 turn double winds for general use. We have indicated gear ratios, and covered proper running-in procedures for new motors. Lastly, we looked at gear ratio selection.

The ratio selected must be that which maximises acceleration and braking between the corners, sometimes at the expense of straight line speed. This ratio is independent of the capacity of your batteries; and is adjustable slightly to suit long fast tracks or short slow tracks. Always remember that the speed of your car through the corners is down to its grip and handling, the motor is only important in a straight line.



Arm showing balancing weight removal and spacer washer.

Tips For The Top

We now move on to advanced tips on motor set-up. The most important part of motor set-up concerns timing, and spring pressure.

You will notice that the endbell on a modified motor is not only removable, it can be rotated. An endbell can be fixed in almost any rotary position relative to the magnets. Altering this position changes the point at which electricity (current) is passed into a pole of the armature relative to its position in the magnetic field of the permanent magnets, very similar to ignition timing on road cars. In practice this alters the maximum speed at which the motor will run when it has no load (free running out of the car) but it has another useful by-product we shall discuss later.

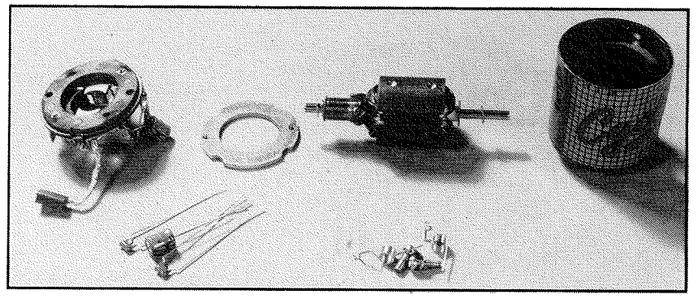
To see this in action, remove a motor from a car and connect it to a set of charged cells. Loosen the two endbell screws slightly and turn the endbell clockwise about 20 degrees whilst the motor is running. The motor speed will increase — if not you have turned it the wrong way or have connected it up the wrong way! Always mark the position of the endbell before trying this, and return the motor to this mark when finished.

The motor speed will increase — if not you have turned it the wrong way

Brush-spring pressure also affects performance. The pressure can be altered by bending the long arm of the spring. Only bend a spring arm once, constant bending to change the pressure weakens the spring and it will not be effective. Two sets of springs are ideal, one set bent to a 110 degrees angle, one set to about 150 degrees. The amount of pressure affects the current that can be passed into the motor. More spring pressure means more current passed. Springs are cheap, so have one set (a pair), bent to each of the angles given, available in your pit box. Each set will fit almost any motor. Make sure each pair has exactly the same angles, and store them as a pair. Never mix different springs on the same motor.

Armed with our two pairs of brush-springs and the ability to alter the rotary position of the endbell, we can set about trying to tune the motor to suit your needs. There are a number of rules as usual. Firstly, unless you are very knowledgeable about motors (and your own motors in particular) no adjustments can usefully be made with the motor free running out of the car. With respect to one rival magazine, anyone who tells you to tune motors by using the amount of current drawn off-load is wasting your time and theirs. DC electric motors have two properties

which are useful, but which mean that the amount of current the motor draws off-load is virtually irrelevant.
A DC electric motor produces maximum torque (turning force, the ability to get weight moving) at its lowest speed. As the motor speed increases (measured in revolutions per minute; rpm) the torque falls off. As the rpm increases the 'power' developed by the motor increases, and is seen as the motor's ability to reach, and sustain, high rpm.
Secondly, the interaction of the field from the permanent magnets with that of the electro magnets (the armature poles) means that a motor will retard under load. Put simply,



The parts that make up the motor.

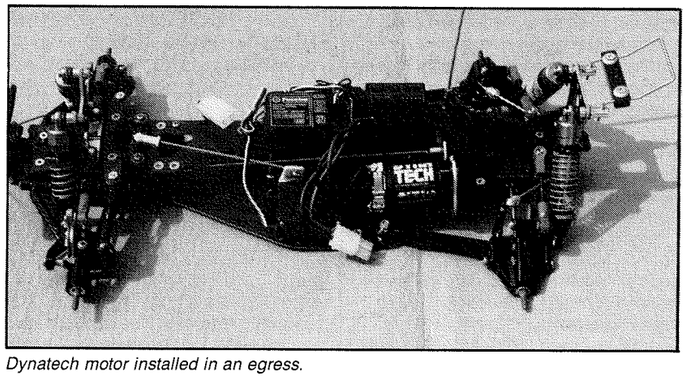
the more you load up a motor the more current it draws, the hotter it gets and the less able it is to reach high rpm — to develop its power.
Both these characteristics have one thing in common — load. It does not take a Newton, Fareday, or Einstein to see that current measured off-load is telling us nothing.

Brush Strokes

The use of brush springs to vary motor performance is relatively simple. Increased spring pressure allows more current to be passed through the motor which increases its torque. However, the increased pressure and higher currents do limit the rpm at top speed slightly, and the increased current consumption will drain more energy from the batteries in a shorter time. The opposite is true of lower spring pressure, torque output is less, current consumption less, top speed rpm slightly higher.
Short, twisty tracks are home for higher brush-spring pressures. Where tight bends require low cornering speeds we need maximum acceleration to get to the next bend in the shortest time, and top speed on a short straight is much less important. Long, open tracks require less acceleration due to higher cornering speeds, so lower spring pressure will give more duration and slightly higher top speed. The difference between the two is subtle, and to a casual by-stander there may be none. To an alert driver, the change of spring pressure may be noticeable, to the less attentive it may not feel any different at all. We are not dealing with a chalk and cheese difference in motor performance because of spring pressure changes, but it is a useful weapon.
Motor timing in set-ups is a little more complicated. We have not yet suggested that the motor timing be altered at all from its factory setting. Each reassembly after cleaning should have resulted in the endbell being replaced in exactly the same position as it was when purchased.
You may have a label which gives the correct position, or have scribed a line on the can and endbell to help correct re-alignment. Whichever you have, now scribe, or mark, a line 3-4mm in a anticlockwise direction (viewed from the endbell) along the can. You should now have two lines, one indicating the factory setting, one just marked. Do not move the endbell further than the limit of these lines.
The line we have just scribed or marked is totally arbitrary. Without expensive equipment it is impossible to tell if this is the limit of possible advance or not. However, how the motor performs, and what the brushes and commutator look like, will determine how close we are to the limit. Alteration in timing will only help in turning a motor to its best for a track. No amount of change will turn a docile motor into a tyre-shredding monster.
We mentioned that a DC electric motor retards under load. The more load you apply the more difficult it is for the motor to achieve a prompt acceleration because it cannot reduce the load, and stays retarded, it takes more time to speed up and reduce the load — vicious circle. In the extreme this is characterised by a car which pulls labouriously out of a corner, and then suddenly accelerates as if in possession of a turbo-charger or after-burner. The motor is over loaded, and its characteristics of low torque and high rpm mean it will have almost a 'step' in its acceleration. This afflicts singles mostly, but such a motor is almost always overgeared (should be 9.5:1 instead of 9.0:1 say). If this extreme is reached, no amount of timing advance will help, you have the wrong motor for the track or the wrong gearing.

Time For A Change

This characteristic is always there to some extent, so you can see that an increase in timing (advance) will help to counteract the retard under load, and give more acceleration out of a corner. Timing advance is achieved by loosening the two endbell screws and turning the endbell clockwise towards the second mark we made earlier. Use timing advance to gain more acceleration out of a corner (you may also get some increase in top speed) but be aware that this will take more current out of the batteries in the same time period. More timing applies to shorter, twistier tracks, and less timing (back toward the factory setting) is better on long open circuits.
Excess timing advance is readily indentifiable. The trailing edges of the brushes become pitted and chipped, and the commutator becomes black over a significant area. Even correct timing will result in a small chipped and pitted edge to the brush, and a black area close to the slots in commutator. Providing the brush is smooth and the commutator clean over most of their area, you are on the right track.
Remember also that the signs of over-advance may appear even when the motor is set on our arbitrary mark; move back toward the factory setting if this happens.
The whole thing is a balancing act between current consumed and acceleration gained. There is no magic formula which gives a perfect result everytime. Experience will show that there is a timing position which works almost everywhere, and most setting up then concentrates on finding the correct gear ratio.
Brush spring pressure is also fairly easy, and can be used last as a fine tuning measure to get the best acceleration for the track.
Keen club drivers who know how to look after motors and make adjustments to them are our target now. We are going to delve into how different motors can be used to get the best lap times on given tracks, and on tricks to help suit a motor to a track.
Having arrived at a new track (which is the worst case) with all your equipment, how can you select a motor to suit the conditions? The first point to make is that having a choice of more than four motors is going to make the problem worse. Although we all see the top international drivers with dozens of motors in their boxes, take it from me that very few of them select a motor correctly. When it comes to top events (World Champs — Euro Champs) they rely on someone else to tell them! If they don't know, how can we tip the odds in our favour?



Dynatech motor installed in an egress.

In Your Box

Firstly, don't posses more than four motors, and I mean modifieds.
Secondly, these motors should be in the range of 16 turns to 21 turns, the type (double, triple, etc) is up to you.
Thirdly, they must all be in good condition, and you should know exactly (or have a record to show) the gear ratio used with each motor on a track you know. Gathering this information takes time. Experiments with timing and spring pressure must result in a set-up for a particular motor which guarantees a known performance. That know performance must be connected to a suitable gear ratio. Eventually every motor you have will be of a known performance and have a known gear ratio.
We have reached the secret of motor selection, and I am quite willing to share it with you because however hard you try, only a few of you will make it work. Knowing what you know about your motors means selecting one for practice, or the first heat, putting into the car on your known gear ratio, and then driving it for a race. During this time you should be able to determine if it is the right motor for the track. Anyone who simply tells you 'this is my fastest motor' has not found the secret. Those who say 'my 16 double (or whatever) works today' has found the secret.
I have a venerable 17 double which is almost always used for practice on an unknown track. Once driven, it is usually possible to go straight to the best motor in my box for that day. Since I only have a choice of four, it limits the margin for error.
Many of you have heard of Mike Reedy, the American whose name is half of the Associated/Reedy motor products. Mike spends as much time getting to know his drivers, as he does deciding on the right motor for a track. Any Reedy driver has first to prove that his car is set up for the circuit before being issued with serious horsepower. As well as using practice to decide on a motor, use it to decide on any chassis improvements.

The whole thing is a balancing act between current consumed and acceleration gained

Here we digress slightly to make the most important point on motor choice for a race. Speed and acceleration in a straight line are about motor power. Speed in a corner is not. Anyone who watched Nigel Mansell take his 'under-powered' Ferrari to victory in Hungary last year will have noticed the Ayrton Senna was mega-quick on the straight, but slower in the turns. Despite a rumoured 50bhp advantage Senna's McClaren could not corner as fast as the Ferrari.
This meant Mansell could brake later, and accelerate earlier, around the turns. Speed between corners depends on how fast you exit a turn, and the more grip and handling advantage you have, the higher your speed out of the turn. Clearly a huge power advantage will tell in the end, but the easier its is to negotiate the turns, the higher your speed will be into the next 'straight'.
In electric car racing, cornering is a split second series of actions, or reactions, to a series of events. The position of the car on the road, braking, turning, accelerating, and the final position of the car as it exits the bend. If the track is technically difficult, one only adds to the probelm by using a powerful motor which needs care under acceleration, and early braking. Since corners make up the majority of our tracks, it is vial to use a motor which can easily be controlled. Having the car set-up to maximise grip and handling gives extra speed around the track without resorting to the motor box.
Mike Reedy is rightly concerned that his drivers have the proper car set-up before using more power. The most powerful motor in the box is useless if the car has poor grip and traction.
The important questions to answer during practice are whether you can improve the handling and grip, and whether more (or less) power will help speed through the turns. Above all, you must be certain that you are fully confident in the car when changes have been made. Too many drivers fail to make the most of changes because they leave the start line uncertain what will happen in the first lap. When you select a motor you must be 99% certain of the outcome, otherwise the change is not worth it. Always concentrate your energies on the set-up of the car first.

Chassis set-up

I often find drivers struggling to get their car to handle, and on occasions advice given has improved matters. Almost without exception that advice relates to chassis set-up. Very rarely does the problem concern the motor used, and when it does it is usually because the motor is too powerful.
Setting motors is a rather delicate and time-consuming business requiring care and thought. Remember that in the main we are looking for clean and prompt acceleration, not the highest top speed. Run the motor in properly when new, and then find the right gear ratio to suit your driving style and cells. Then, and only then, experiment with motor timing to see if there is any worth-while performance improvement. For different tracks, change brush-springs to suit acceleration/top speed requirements.
It is impossible to make radical changes to performance by mild changes in motor timing. Aim to know your motors so well that you can look at a track, pick a motor, pick a gear ratio, and last a five minute race with ease. Never skimp on rebuilds or maintenance, never overgear a motor, and never guy a new motor until you are making only one or two minor mistakes per race. A motor which costs £45 and gives you half-a-second a lap advantage is useless if you make mistakes which cost ten seconds per race. Your driving skill is one hundred times more important than your motor — remember David Hobbs and Ronnie Petersen.
That's about as far as we go for the average reader. If it all seems too little and too simple there is a reason for that — it is.

Demon

Demon Products, PO Box 12, Aldershot, Hants.

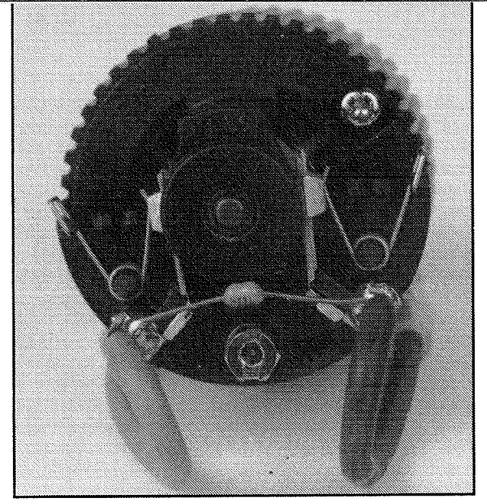
Demon motors are not badge engineered but produced to a high specification with an exclusive design of endbell. Motors are offered with "ceramic, wet or cobalt" magnets. Demon offer three options of magnet strength. All "adjustable" motors are precision balanced by Demon in the UK. Full spares and rebuild service available. Magnetising of magnets, com truing and balancing available for Demon motors.
Standard 27 × 1 BRCA stock motor. 30 deg timing 17 × 1 Fixed timing. Fast for 4WD 20 × 1 fixed timing. Fast for 2WD.
Modified 13 × 1 14 × 1 15 × 1 16 × 1 17 × 1 18 × 1 19 × 1 20 × 1 21 × 1.
10 × 2 also in 3 11 × 2 also in × 3 also in 4 12 × 2 also in × 3 also in × 13 × 2 also in × 3
also in × 4 14 × 2 also in × 3
also in × 4 15 × 2 also in × 3
also in × 4 16 × 2 also in × 3
also in × 4 17 × 2 also in × 3
also in × 4 18 × 2 also in × 3
also in × 4 19 × 2 also in × 3
also in × 4 20 × 2 also in × 3
also in × 4 21 × 2 also in × 3
also in × 4 22 × 2 also in × 3
also in × 4 23 × 4 24 × 4

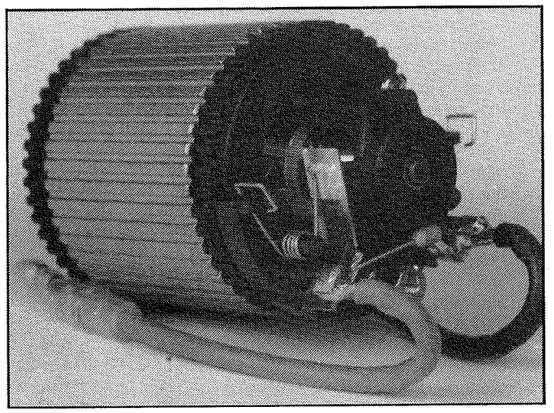
Kyosho

The range of Kyosho motors is large. Some incorporate metal endbells for improved heat dissipation. Kyosho motors carry the designation common in Japan, namely the number of the motor gives an indication of running time in seconds and hence the sort of performance that can be expected. The shorter the run time, the heavier the current consumption the greater the power. It does not follow however that 480 can be guaranteed to run for 480 seconds, it depends on track, driver and of course car and battery.
Lemans 480 Gold 480 S 360 PT 360 ST 240 S 600 E H 240 WS SPA 240 WS 480 WT.

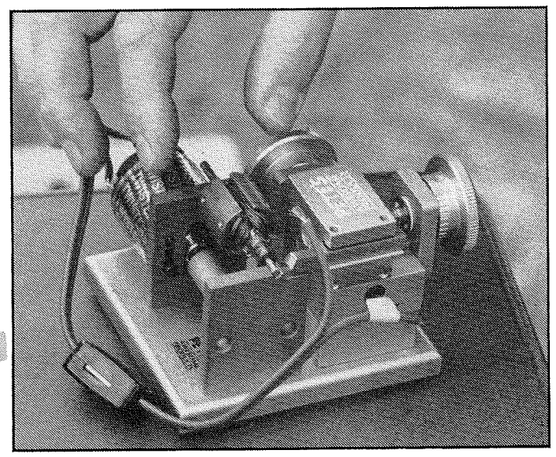
Yokomo

CML. Many companyies buy in Yokomo motors for reworking. These motors have long been the basis from which many variations stem.
Esprit Lightening. Just about any wind can be obtained, but the motors usually reappear with other labels on.





Tamiya Dynatech motor with cooling fan and ribbed can.



Motor Choice

A helpful list of available motors, winds, and applications

Reedy

Considered by many to be the archetype wizard of motor construction and reworks. International success follows Mike Reedy around the World like iron filings to a magnet. The motors start life as Yokomo products but then all is changed. Reedy incorporates exclusive features in his motor reworking program such as cord wrapping around the armature windings to ensure there is no winding movement at high speed. Little information on actual winds from Reedy lists.
Ultra series 21 Silver dot 17 Red dot Pink dot 19 Gold dot 14 Gold star 12 Blue dot 13 Green dot 16 Yellow dot 20 Silver dot 19 Brown dot 27 advanced timing 35 fixed timing Esprit series 17 fixed timing 20 fixed timing 19 × 2 15 23 13 × 2.

Trinity

Trinity offer a fine range of winds and have become extremely popular during the last few years. These Japanese pass through the Trinity US plant on their way to the UK.
Clodbuster 17 RG2012.
17 RC2013 reverse rotation
17 RC2010 19 RC2006
16 RC2030
9 RC1700 Nuclear assault fastest motor
10 RC1701 Big Daddy 2 min run 11 RC1702 Top Fuel drag motor 12 RC1703 Godzilla Oval track motor 13 RC1704 King Kong needs good cells. For 4WD cars 14 RC1705 Maximum Overdrive. Oval track motor. 15 RC1706 Behemouth. Based on World Championship motor. 16 RC1707 Gargantua. Good for on and off road. 17 RC 1708 Magic Speed Joel Johnson Signature. 18 RC1709 Heavy Metal Thunder. 19 RC1710 Tyrannosarus Rex. RC1711 Killer Force Stock motor. 27 RC2020 Reverse monster stock. Suitable for Clodbuster and Hyperdrive systems.
Hand wound armatures from 9 to 20 doubles; 13 to 17 triples and 14 to 16 quad.

Twister

Pete's Awsome Products, 50 Whitby Court, Parkhurst Road, Holloway, London N7 0SU.

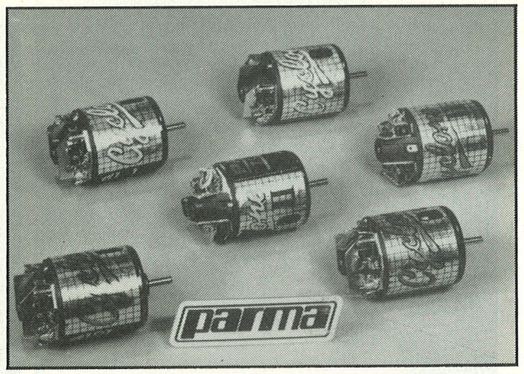
Twister motors have been available from a number of sources over the years. Now a new growing company has taken on the distribution of the motors. Pete's Awsome Products.
19 × 2 Kris Moore special. Championship winner. 19 × 4 Monster truck, easy driving and long run times 17 × 3 Stadium special 2WD cars and trucks. 16 × 3 Dirt Merchant 4WD or high traction circuits 2WD 14 × 2 SCE Special Takes advantage of high capacity SCE 14 × 3 Erik's Express, very fast 44,000 RPM 13 × 1 Cyclone 48,000 RPM on road cars 14 × 1 Titan Championship winner, best in heavier cars 12 × 2 Fast Eddie's Ride Masses of torque 15 × 2 Hurricane Sprint cars 17 × 2 Terminator very flexible 21 × 2 Tornado Tremendous torque and good run time 15 × 3 Formula 10 A 1/10 on road car motor, budget price 19 × 4 Formula 12 1/12 motor 12 × 2 Typhoon Drag, 2/4WD 50,000 RPM hold drag speed record at 74 MPH 11 × 2 Annihilator Hottest motor in the range. 50,000 RPM 13 × 3 Carolina Mountain Mt. Fast dirt motor 14 × 3 Clydesdale Monster truck motor 14 × 3 reverse Clydesdale 13 × 3 Black Max suitable for 6 or 7 cells 14 × 3 Street Racer 27 standard Ultra stock 2WD Cleaned and dyno checked 27 standard Ulta stock 4WD as above 27 standard P.R. Superpro Hotest stock motor 17 standard Pocket Rocket bushes (34,000 RPM) entry level motor 20 standard Pocket Rocket bushes (as above) 15 × 2 Pocket Rocket ball races, adjustable timing 19 × 2 Pocket Rocket ball races, adjustable timing, long life and reliable.

Parma

Parma motors have a high specification and come in good range of winds. They feature hand winds, balanced and epoxied armatures. Parma UK also offer a rebuilding service for all makes and types of motor via their dealer network.
21 × 2 1/12 on carpet motor 20 × 3 1/12 but OK for tarmac 19 × 4 Good all round and monster truck motor 17 × 3 Excellent flat

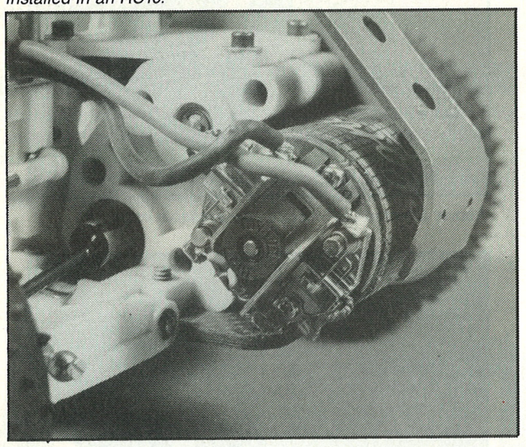
Probably the most successful range of motors ever from the American Reedy company.

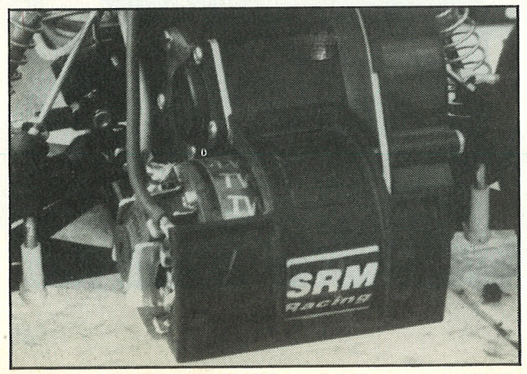
Above: German LRP motors now available in the UK.



Parma's range of Cyclone II motors.

Lesro's range of alternative brushes. Below: Twister motor installed in an RC10.





truck motor 2 or 4WD 16 × 1 Good short track buggy motor 14 × 2 Very fast for 2WD and some 4WD 12 × 3 Smooth and quick for longer tracks 13 × 1 Lots of punch on bendy tracks 8 × 1 Drag racer 30 × 1 Truck and pulling tractors 27 × 1 BRCA stock 25 × 1 Stock type, low price 17 × 1 Ultra stock, non adjustable 18 × 2 Good all rounder, adjustable timing, 2 or 4WD 16 × 2 Good for 2 or 4WD. Lower pinion required 17 × 2 Fully ballraced with adjustable timing. Suitable top to middle range cars 15 × 2 Ball raced and adjustable. Excellent for the more experienced 13 × 2 Very hot, needs a lot of experience to make the best of the performance.

T.M.S.

TMS Ltd, Deanfield Mills, Asquith, Morey, Leeds.

TMS motor brandname is Mikado. They feature good ventilation, wet magnets and dynamically balanced.
13 × 2 14 × 2 15 × 2 19 × 2 21 × 2 14 × 3 16 × 3.

MG

Unit K, Ynysmaerdy Ind Est, Llantrisant, Mid Glam.

MG continue to have many race successes with their brand of motors. They offer full rebuild service of motors (any make) including magnetising, truing and balancing.
Magnum 15 × 2 16 × 2 17 × 2 18 × 2 19 × 2 15 × 3 16 × 3 17 × 3 15 × 4 16 × 4.
Super Magnum/eliminator. Ceramic shaft large heatsink. 10 × 2 11 × 2 12 × 2 13 × 2 14 × 2 11 × 3 12 × 3 13 × 3.
Red dot plus fixed timing ballraced/balanced wet mag. 18 × 1 19 × 1 20 × 1 27 × 1 15 × 2 18 × 3 red dot 18 × 1 20 × 1.
Orange dot. BRCA standard motor wet mags. 27 × 1.

Schumacher

Schumacher have a limited range of motors in addition to Reedy motors that are also offered.
Ultra Stock Pink Power Red Heat Gold Rush Quick Silver 14 × 2 Gold Nova, good bottom and punch.

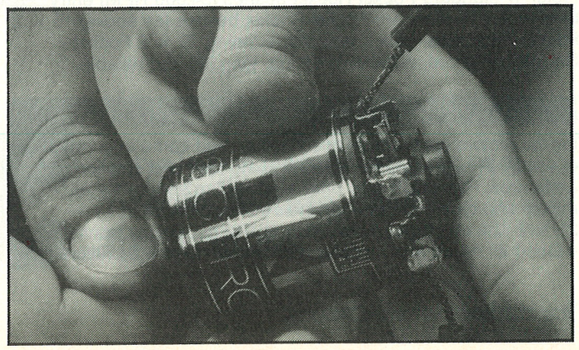
Tamiya

Co-operate with two of the major motor manufacturers in the Far East to produce motors exclusive for Tamiya. Mabuchi, the world's largest producer of small DC motors manufacture two performance motors for Tamiya.
Technigold Techniplus Dynatech 01R Dynatech 02H.

Tanaplan

A relativey new low priced motor on the market showing some excellent race results. Motors have ballraces, diamond trued commutator and with wet magnets.
13 × 2 14 × 2 15 × 2 18 × 2 16 × 3 17 × 3 Handwound motors available in just about any wind you fancy, but at about double the cost.

The LRP Pink SE comes complete with pre-soldered capacitors.



Phil Greeno

Phil Greeno has been entering all types RC racing for many years, his shop in North London has become something of a Mecca for RC enthusiasts in the area. He recently joined the ever growing band of motor distributors with his own brand of good value for money motors for 1/10 on and off road.
Lightning 27 × 1 Fixed timing 14 × 2 15 × 2 17 × 2 19 × 2.

LRP

These German produced motors are used by Jamie Booth with some considerable success in his race winning Tamiya cars. Now marketed by Jamie Booth as he moves from the track to the commercial side of the RC world. Pink E Blue SE.

Revolution

CML Distribution, 1648 Bristol Road South, Redhal, Birmingham B45 9TZ.

USA produced motors with a good range of winds and performance options.
Dry magnets 21 × 2 19 × 2 17 × 3 15 × 2 14 × 2 11 × 4 11 × 3.
Wet magnets 18 × 3 16 × 2 13 × 3 12 × 1 17 × 2 19 × 2. 27 stock motor.

Kawada

Small Japanese company, makers of a 1/12 car MX-1 17 turn MX-1 15 turn.

Speedworks

Buggymaster Endurance motor.

Checkpoint

16 × 2 18 × 2.

Paragon

Holcomac Marketing Ltd, Britannic House, 17A George Street, Stroud, Glos GL5 3DP.

USA produced motor, available in the UK in a limited range of winds.
27 × 1 Stock motor Modified range Eclipse 13 × 3 15 × 2 19 × 2.

STS

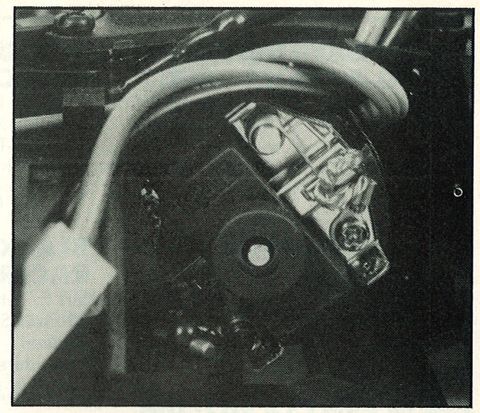
Wasp Products Ltd, 13 Morningside Road, Worcester Park, Surrey KT4 8LQ.

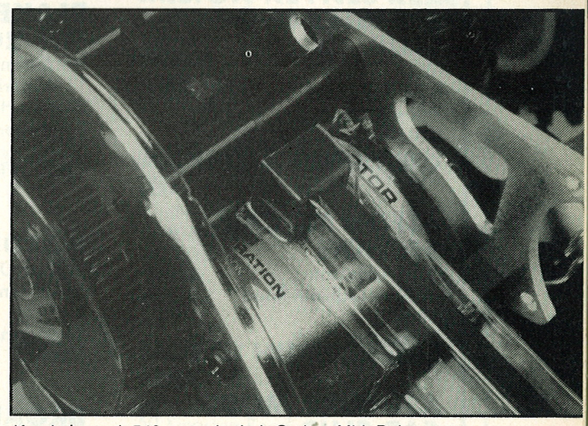
Motors from the USA. Modified motors 19 × 1 20 × 1 21 × 1 13 × 2 14 × 2 15 × 2 16 × 2 17 × 2 11 × 3 12 × 3 Standard 27 turn. Other winds to order.

Laser Lite

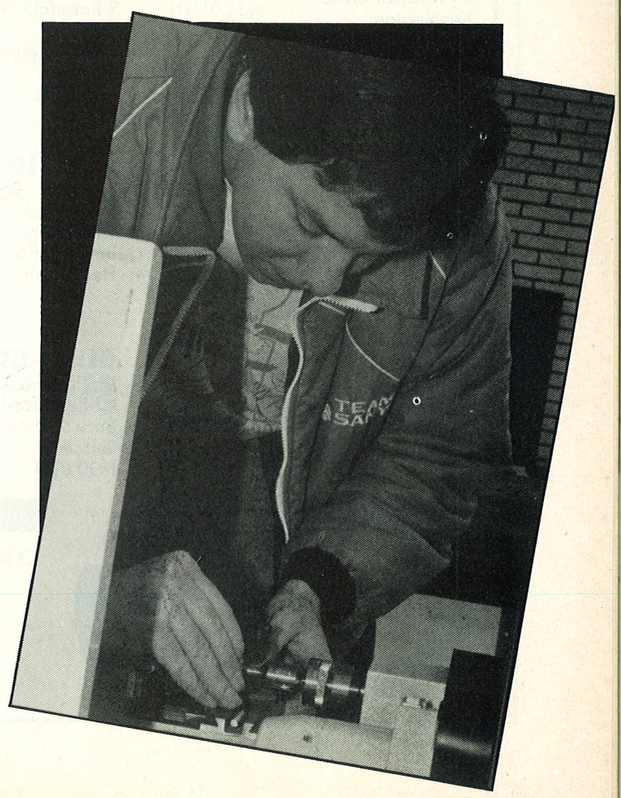
Wasp Products Ltd, 13 Morningside Road, Worcester Park, Surrey KT4 8LQ.

USA produced quality motors from a company with an expanding protfolio.
Modified motors 19 × 1 20 × 1 21 × 1 13 × 2 14 × 2 15 × 2 16 × 2 17 × 2 11 × 3 12 × 3 Standard 27 turn.





Kyosho's stock 540 motor in their Optima Mid. Below: com truer in action.



Club Together

ABERGAVENNY AND DISTRICT RCCC
J. Paridge
The Green
Nern y Cwrt
Raglan
Gwent
NP5 2JG

ADUR MODEL CAR CLUB
Chris Herridge
93 Freshbrook Road
Lancing
West Sussex
BN15 8DE

ALCESTER BUGGY CLUB
Mrs L. Dudley
8 Barrow Close
Winyates East
Redditch
Worcestershire
B98 0NL

ALTON MC CAR SECTION
Scott Adderson
40 New Odhiam Road
Alton
Hampshire
GU34 1QG

ASHFORD MODEL CAR CLUB
Graham Creasey
14 Hillcrest Close
Kennington
Ashford
Kent
TN24 9QT

BALLYMENA MODEL CARS
Neil Blelock
16 Grange Road
Ballymena
Co. Antrim
BT42 2DS

BENTLEY MODEL CAR CLUB
Mark Prince
47 Adlington Road
Wistaston
Crewe
Cheshire
CW2 8PD

BIDDULPH MOOR RCSCC
8 Chapel Lane
Biddulph Moor
Stoke-on-Trent
Staffordshire
ST8 7JZ

BLACKBURN O/R RACERS
Mrs E. Entwistle
20 Essex Street
Darwen
Lancashire

BLAKE HALL OFF-ROADERS
Phil Olson
11 Wisteria Close
Pilgrims Hatch
Brentwood
Essex
CM15 9PR

BORDER RSCSS
William Douglas
64 Queensway
Earlston
Berwickshire
TD4 6EX

BROADLAND BUGGY CLUB
P. E. Gooda
9 Rosedale Gardens
Belton
Great Yarmouth
Norfolk
NR31 9PL

BUNTINGFORD SCC
D. Pettitt
6 Cottered Road
Throcking
Buntingford
Hertfordshire

BURY BUGGY CLUB
David Munnings
42 Raynsford Road
Bury St. Edmunds
Suffolk
IP30 0TN

BURY MODEL SHOP BUGGY CLUB
11 Marlborough Street
Hopwood
Heywood
Lancashire
OL10 2JW

CANTERBURY BURNERS
T. Salvatori
12 Sidney Cooper Close
Rough Common
Canterbury
Kent
CT2 9BQ

CHESHAM OFF-ROAD CLUB
Graham Warder
31 Repton Way
Croxley Green
Hertsfordshire
WD3 3PN

CHESSINGTON RCC
Peter Smith
24 Chetwode Road
Tadworth
Surrey
KT20 5PW

DARLINGTON DISTRICT MCC
Ian Holmes
1 Truro Close
Darlington
Co. Durham
DL1 2XF

DERBY RCMCC
N. P. Seale
55 Holmes Road
Breaston
Derbyshire
DE7 3BT

DODDINGHURST BUGGY CLUB
Mrs L. Burgoyne
5 Nursery Road
Hook End
Brentwood
Essex

DUDLEY RADIO CLUB
Roy Kirkton
230 The Broadway
Dudley
West Midlands
DY1 3DR

DUNFERMERLINE DISTRICT RCC
Colin Leslie
12 Roseberry Grove
Dalgety Bay
Fife
KY11 5YL

EAST GRINSTEAD OFF-ROADERS
R. Driver
Cherry Tree
Handcross Lane
Balcombe
West Sussex
RH17 6PP

EAST SHREWSBURY BRC
Mr D. Pryce
12 Wren Close
Shrewsbury
Shropshire
SY1 4TU

EDEN PARK OVERLANDERS
John H. Cheeseman
64 Overcliffe Road
Lewisham
London SE13 7UA

ELLESMERE PORT OVERRIDERS
D. G. Gordon
3 Mendip Close
Great Sutton
South Wirral
L66 4SE

FRODSHAM MCC
Mrs Elaine Steele
28 Hall Lane
Elton
Nr Chester
Cheshire
CH2 4NY

GRAMPIAN BUGGY CLUB
Lesley E. Ramsey
32 Sanday Road
Aberdeen
AB2 6DT

GWENT MODEL CAR CLUB
Mrs S. Harris
82 Laurel Road
Bassaleg
Gwent

HAWKHURST SCC
Blenheim Way
Flimwell
Wadhurst
East Sussex TN5 7PQ

HAYWARDS HEATH RCSSS
P. R. Arnaud
47 Caterham Drive
Old Coulsdon
Surrey
CR3 1JP

HERMIT OFF-ROADERS
Mike Robinson
1 Spurgate
Hutton Mount
Brentwood
Essex
CM13 2LA

ILKESTON MODEL CAR CLUB
Ray Purdy
15 Glebe Crescent
Stanley
Derbyshire
DE7 6FL

IPSWICH BUGGY CLUB
Barry Thorrington
9 Burnham Close
Trimley St Mary
Ipswich
Suffolk
IP10 0XJ

LEICESTER ELECTRIC STOCK
C. Loughran
36 Glenhills Blud
Eyres Monsell
Leicester
LE2 8UA

LEICESTER JAGUARS
Roger Pettit
37 Westover Road
Leicester
LE3 3DU

LINCOLN RALLYCROSS CLUB
Phil Mansfield
17 Trevose Drive
Lincoln
LN6 8UG

MAIDSTONE MRC
Harvey Clark
Greenfields
Stanley Road
Marden Tonbridge
Kent
TN12 9EL

MEDWAY OFF-ROAD CLUB
Mrs Joan Darwell
51 Reed Street
Cliffe
Rochester
Kent

MENDIP MMRC
Dave Swift
3 Tiledown
Temple Cloud
Bristol
BS18 5DW

MILTON KEYNES RCRC
Barry Capp
3 Bramber Close
Bletchley
Milton Keynes
MK3 7AB

NORFOLK OFF-ROAD BC
Clive Roper
12 Henryward Road
Harleston
Norfolk
IP20 9EZ

NORTH HUMBERSIDE MBC
Mike Wright
50 Kingston Road
Willerby
Nr Hull
HU10 6BH

NORTH WORCESTERSHIRE MCC
Jason Ford
10 Blenheim Crescent
Bromsgrove
Worcestershire
B60 2PQ

NOTTS & DERBY RCSCC
Dave Chambers
65 Addison Drive
Hucknall
Notts
NG15 6NA

OLDHAM RCORC
Mrs Jenny Lomas
8 Lane Brow
Grotton
Oldham
OL4 5RD

OSWESTRY ORBC
Duncan Morgan
35 Windsor Road
Oswestry
Shropshire
SY11 2UB

PARKWOOD PIRATES
L. Spice
86 Felderland Close
Parkwood
Maidstone
Kent
ME15 9YD

R C WHEELS
S. P. Burgess
Elysium
Amersham Road
Chalfont St Peter
Buckinghamshire
SL9 0NZ

RADIO S/C LEICESTER
Andy Lester
19 Parklands Drive
Loughborough
Leicester
LE11 2SZ

ROCKINGHAM BUGGY CLUB
Andy Walker
5 Brunswick Gardens
Corby
Northamptonshire
NN18 9ER

ROSSENDALE MODEL RALLYCROSS
Sue Stiles
c/o Rossendale Models
1c & 1d Bank Street
Rawtenstall
Rossendale
Lancashire
BB4 6QS

ROTHERHAM BUGGY CLUB
J. C. Parker
111 Lidget Lane
Thurnscoe
Rotherham
South Yorkshire
S63 0DA

SAUNDESFOOT RCCC
Ian Sutcliffe
6 Rectory Court
St Johns Hill
Tenby
Dyfed
SA70 8HD

SCARBOROUGH RCMC
D. J. Bradby
17 Ireton Street
Scarborough
North Yorkshire
YO12 7DR

SEETHING RCC
M. W. Sampson
2 Leman Grove
Loddon
Norwich
Norfolk
NR14 6LH

SOUTH LAKELAND MCC
D. S. Aldridge
10 High Sparrowmire
Kendal
Cumbria
LA9 5PD

SOUTHAMPTON RCMCC
10 Dell Close
Fair Oak
Eastleigh
Hampshire
SO5 7JH

SOUTHEND RCCC
Ray Cockman
31 Kensington Road
Southend-on-Sea
Essex
SS1 2SX

SOUTHPORT RCC
T. Hirons
69 East Banks Street
Southport
Merseyside
PR8 1EJ

ST IVES R/C CAR CLUB
David Ormerod
46 Burstellars
St Ives
Cambridgeshire
PE7 6XX

STANWAY BUGGIE CLUB
D. B. King
27 Ploughmans H'land
Stanway
Colchester
Essex

STOCKTON BUGGY CLUB
J. Frank
93 Upsall Grove
Fairfield
Stockton-on-Tees
Cleveland
TS19 7QP

STOKE BUGGY CLUB
Phil Moss
18 Birchover Way
Wedgwood Farm East
Oxford
Nr Tunstall
Stoke-on-Trent
ST6 6UJ

STONEAVON AND DISTRICT RCC
Alan F. Gordon
10 Brimmond Crescent
Westhill
Aberdeen
AB3 6RD

STOTFOLD MRC
Craven Taylor
41 Grovelands Avenue
Hitchin
Hertfordshire

SWANWICK HALL MCRC
24 Castleton Avenue
Riddings
Derbyshire

TAMAR OFF-ROAD CAR CLUB
Kevin Waite
29 Devonport Road
Stone
Plymouth
Devon
PL3 4DJ

TEIFYSIDE MODEL CAR CLUB
J. Williams Esq
Sunnybank
Cilgerran
Cardigan
Dyfed
SA43 2PE

THAMES VIEW S/C CLUB
Garden Cottage
92 Ward Road
Hertford
Hertfordshire
SG13 7HN

THORNTON HEATH OFF-ROADERS
Pauline Diboil
70 Kimberley Road
Beckenham
Kent
BR3 4QU

TIBSHELF RCRCC
Joan Heffer
36 Raven Avenue
Tibshelf
Derby
DE5 5NE

WADHURST R/C CAR CLUB
M. W. Ramsden
Chilten
Stone Cross Road
Wadhurst
East Sussex
TN5 6LR

WEETING MODEL CAR CLUB
H. J. Sherman
70 Castle Close
Weeting
Nr Brandon
Suffolk

WEM BUGGY CLUB
B. Stevenson
120 High Street
Wem
Shropshire
SY4 5TT

WEST BRIDGFORD MCC
Mrs M. Crossland
6 Beaumont Gardens
West Bridgford
Nottingham
NG2 7FW

WORKSOP RADIO RCC
J. Allcroft
8 Oak Close
Crabtree Park
Worksop
Nottinghamshire
S80 1BH

WREXHAM OBC
C. Kelly
7 Bron-yr-Efail
Wrexham
Clwyd
LL12 8JF

YORKSHIRE MODEL SCC
G. Brotherton
20 Park Gardens
Ossett
West Yorkshire
WF5 0LA

YORKSHIRE RCMCRC
A. C. Keeling
Grange Nurseries
Westgate Hill
Bradford
West Yorkshire
BD6 3TN

CRAWLEY AUTO RACERS
A. M. Doherty
151 St Mary's Drive
Round Hill
Crawley
West Sussex
RH10 3BG

BEAUFORD R/C CAR CLUB
A. C. Lees
58 Woodcock Lane
Stonehouse
Gloucestershire
GL10 2EX

Club Together

RALLYCROSS

An exciting New Formula

With the help of Terry Wright & Steve Brace, Rallycross is about to sweep the country. . .

There is one inescapable criticism of 10th-Off Road electric car racing, the cars do not look like anything anyone has ever seen before. However, there are many saloon car bodyshells available in the UK, and when a 10th-Off Road car is fitted with one of these bodies, the criticism is no longer valid, and the fun is increased ten-fold.

Rallycross as a racing class is a product of the 1970's, when racing cars on small closed off-road circuits (autocross) was on the wane, and rallying on long special stage events was difficult to promote through television. Someone had the bright idea to put rally cars designed for mixed surface racing onto closed, single venue, mixed surface tracks. The cars are very powerful, handle well, and are spectacular to watch. With the advent of the Audi Quattro in the early 1980's Rallycross really came of age. Today there are several types of car in use all having four wheel drive, turbo-charged engines, and sophisticated transmissions, as pioneered by Audi.

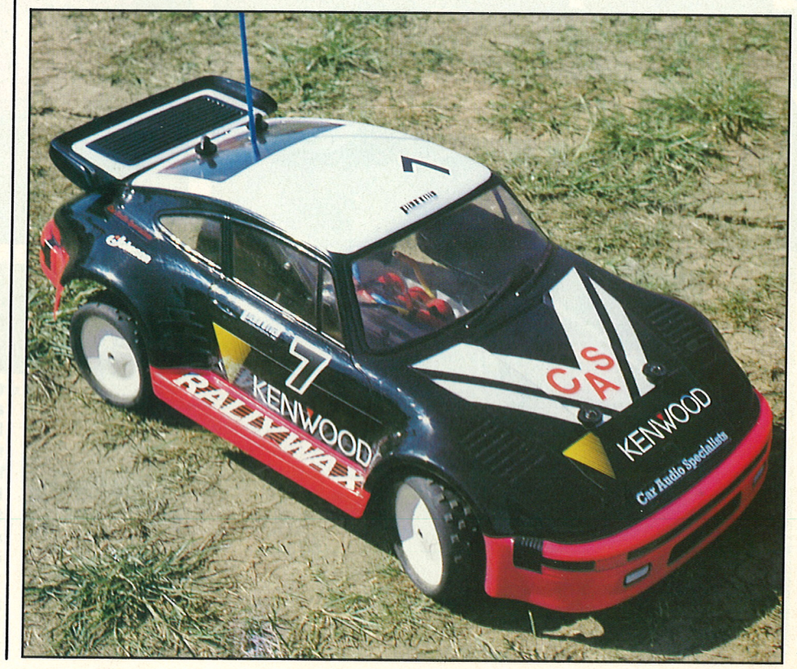
The modern Rallycross car is typified by Matti Alamakis Peugeot 205T16. With about 600 bhp from the engine, four wheel drive, and an xtrac transmission, this (not so little) beast can accelerate from 0-60 mph in a little over two seconds, which is about the same as a Forumla 1 racer! Cars race on tracks such as Brands Hatch and Lydden Hill with a mixture of tarmac, chalk, earth, and concrete surfaces. The racing is very fast, and very furious.

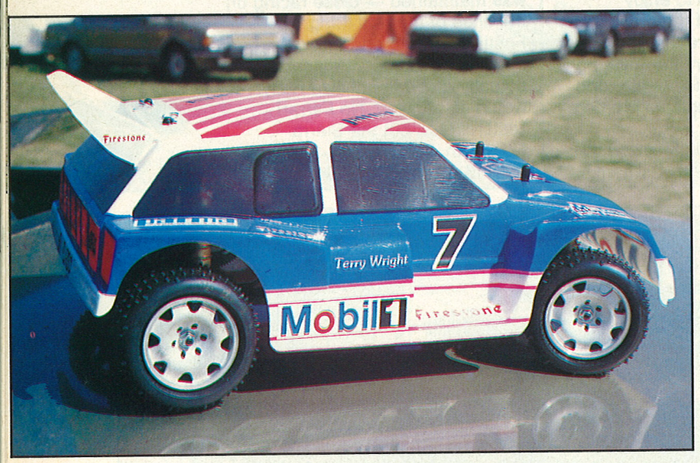
The idea for 10th-Off Road Rallycross came from two people who are ardent Rallycross fans, and keen buggy racers. Terry Wright is the Chairman of the Southend Radio Control Car Club, and Steve Brace is a driver of no mean ability. It occured to them one day, whilst watching their favourite motor sport, that the fitment of a saloon car bodyshell to a 10th-Off Road electric racing car would solve a number of problems that afflict the 10th-Off Road class. Firstly the public could immediately identify with the car. Almost everyone recognises a saloon car, even if they don't know the make or type. Even the moderate enthusiast would have little trouble telling their Porsche 911 from their BMW 3 Series. Secondly, the tracks should be like the full size one's; fairly smooth, a mixture of surfaces, and enough room for cars to race side by side. This would allow the use of car parks, playgrounds, even public parks, thus allowing almost anyone the chance to race an electric R/C car without the need to join a club, or find a purpose built track to race on.

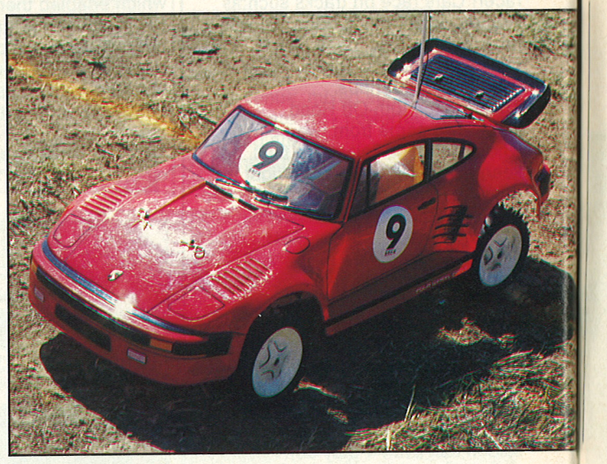
When Terry volunteered the Southend Club for the first meeting, a lot of people sat on the fence to see what would happen. A number of other plus points were immediately apparent. Commentators could actually tell people about things they understood, and refer to the 911 tucking in behind the BMW without raising quzzical looks. Spectators were very interested, and wanted to join in. Drivers loved the lack of competitive edge to the meetings which enabled them to enjoy themselves. Not that the driving was not competitive, more that the meeting did not count for anything more than a large slice of fun, and an excellent opportunity to promote the sport.

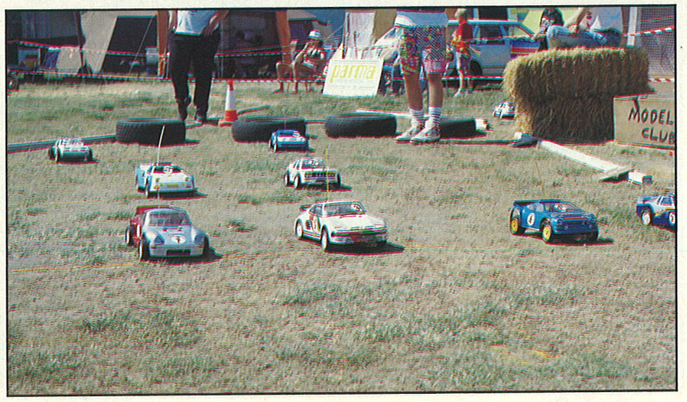
This first meeting was followed by others at Wall Hall and Newham, and then a purpose built track at St. Albans. Every time the cars got on the track, the same thing happened — big smiles, lots of interest, lots of fun. Messrs Wright and Brace took time off from their mutual back slapping to see things on a stage further. They laid down some basic rules to ensure that the objective was maintained — close racing on the lines of the real thing.

Firstly, they decreed that only bodyshells representing cars actually raced in full size Rallycross would be allowed. No Ferrari Testarossa's, but the Sierra Cosworth, Ford RS200, Peugeot 205T16, Lancia Delta S4, and Rally









037, Vauxhall Astra GTE, Audi Quattro, Metro 6R4, Toyota Celica GT4, and BMW M3 only some of the eligible cars. Secondly, they decided that only 10mm of tyre would be allowed to project from the wheel arches to keep things looking good. Next, they turned their attention to the amount of the body which could be cut away. Cars with enclosed bodies such as these do go better if the rear section is completely cut away, but this does not look like the real thing. So, one cannot remove any of the windows, or the rear panel, but up to 12, 8mm diameter, holes may be discreetly drilled in the rear panel of the car to aid airflow.

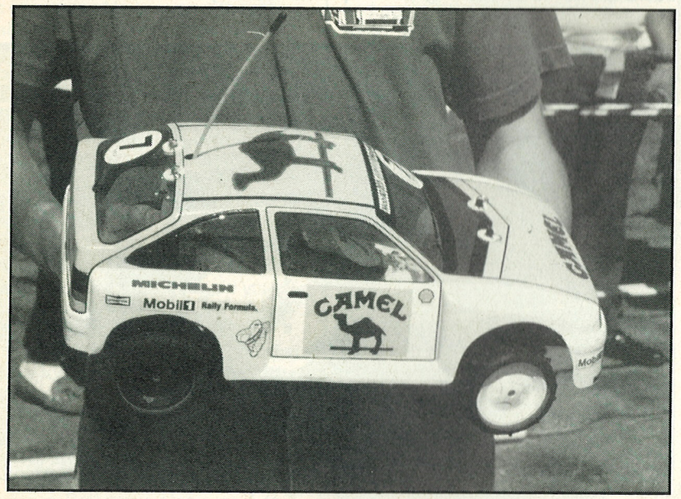
Again, rear wings help handling considerably, so it has been decreed that only the wing supplied with the bodyshell may be used, to prevent huge monstrosities appearing on the rear of cars.

Mounting the body on a standard 10th-Off Road electric car (or buggy) is not too difficult. Schumacher now make mounting kits for their popular ProCat and Cougar cars, and Parma sell a wide range of body mounts and posts for the do-it-yourselfer. Kyosho have body mount kits to suit their new RS200 and these can be bought as spare parts. The golden rule for body shell mounting is to have at least four inches between each post across the car, and to put the posts above, or in front of, the axle line at front and rear. If the posts are too close together, the bodyshell will roll in the corners and touch the ground. If the posts are between the front and rear axles, the bodyshell may vibrate or look unsightly in motion.
Once you have the body mounts securely fixed to the chassis, disconnect all the spring/damper units and allow the car to sit on its belly on a flat surface. Place the body over the chassis as best you can, and mark out the wheel arch positions for cutting. Cut the wheel arches leaving about 5mm clearance around the tyres. Again place the bodyshell over the chassis, and mark the position required for holes to let the body sit over the body posts. Drill the body post holes, and make sure the shell fits neatly over the car. Set the body posts so that that shell is about 3-4mm off the surface of your table. This will be about the correct height to give good clearance when racing. Place some little foam 'washers' on the inside of the shell to cushion the shell against the body post support. This cuts down on noise and makes for a firm but flexible mounting.


Nick, Nick! even the Police are interested in Rallycross.

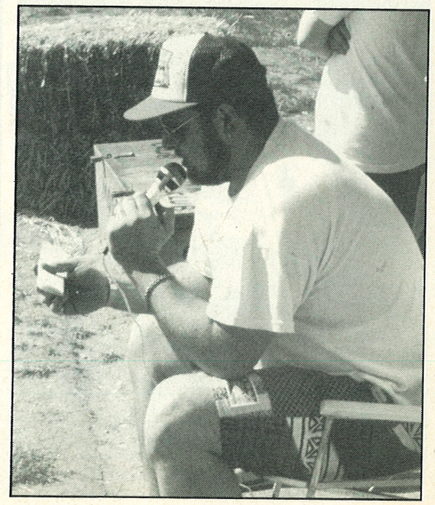
Painting the car is even easier than a 10th-Off Road bodyshell. Quite simply clean the shell thoroughly in washing-up liquid and hot water, then rinse in cold water. Leave overnight in a warm place to dry. Mask off the windows, and any other detail you choose (plenty of room to get large hands inside these shells to do the maskings!) and then spray with a nice bright colour. Remove the masking tape, and fit the shell to the car with the spring/damper units in position. Check that the tyres do not foul the wheel arches in any position of the suspension during its travel. Most importantly, check that the front wheels do not foul the wheel arches whilst they are moving from side to side, at any position in their suspension travel. You may need to trim some of the shell away to get a good clearance.
Now the good bit, grab hold of all the stickers you can find and start sticking. There is so much body area that you can make the car look really special by carefully applying stickers in the right places to a single colour shell. If, on the other hand, you have the manual dexterity of a Terry Wright with the air brush, you can create the most fabulous scale-like Rallycross cars which look like a million dollars both stationary, and on the move.
Your standard 10th-Off Road car to which you have attached this wonderful body, can be raced just as it is, or with a couple of mods.
Retain the standard undertray so as most of the track debris is kept away from the electrics. For maximum protection use a clear, standard, buggy body over the undertray. The new Rallycross body will fit over that, giving a nice appearance and the usual dry and clean electrics. The golden rules are to make certain there is enough clearance between

There is so much body area that you can make the car look really special by carefully applying stickers in the right places to a single colour shell.



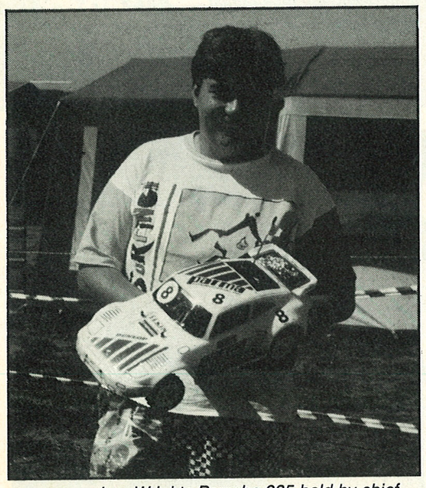
The Parma Astra bodyshell is probably the most popular choice.

A good commentry helps the public understand the race format.

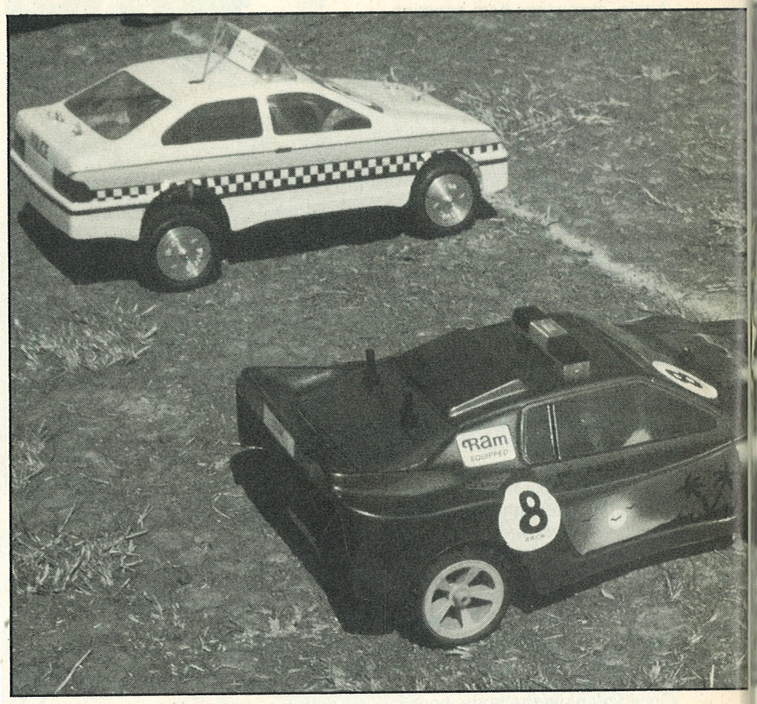


the bodyshell, the wheels, and the ground; and that the body is securely fixed to the chassis so as it does not roll about on cornering.
Down at the track your first practice will reveal the true delights of Rallycross racing. . After overcoming the shock of the different handling, and before you discover the delights of controllable oversteer, opposite-lock, slides, you will have hit the same track marker head-on five times, been severely nerfed about three times, and T-boned the same poor unfortunate on the same turn at least twice. However, you will find there is no damage to the car due to the cushioning nature of the all enveloping bodyshell. You may spend more on the shell and the mounting kit, but you save on the sheared uprights, broken wishbones, and popped driveshafts.
Second practice will reveal something else to your delight, you can race anyone else side-by-side right into the turn, without the car flying off in an unpredictable direction as the exposed wheels

After overcoming the shock of the different handling and before you discover the delights of controllable oversteer, opposite-lock, slides, you will have hit the same track marker head-on five times.

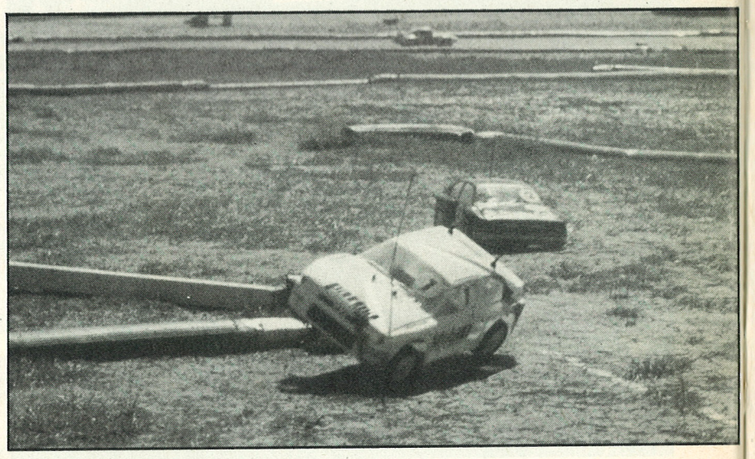


Lee Wrights Porsche 935 held by chief mechanic Ryan.



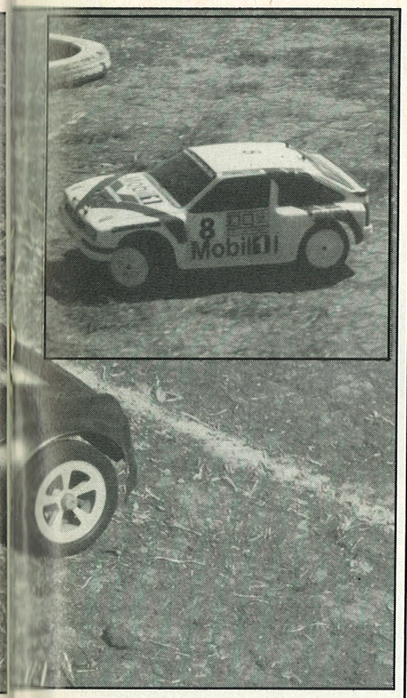
touch. It is much easier to nip down the inside, stand hard on the brakes, and really claim that inside line for yourself, just like Nigel Mansell. Better yet, the smooth nature of the tracks allows more uniform grip

the more fun. Most important is to keep the cars looking like the real things, and to that end make the biggest prize of the meeting available to the best looking car which actually races on the track.



which makes slides easy to control (and the aerodynamics of the body help here too), and braking performance is more acceptable.
Once your club starts a Rallycross class, it becomes addictive. New members appear from almost nowhere, and long established members are more enthusiastic about club night. Remember not to allow anything on the cars which is not made by the manufacturer, keeping them standard makes it all

Once you capture the members, you have all the ingredients to race both competitive 10th-Off Road cars, and Rallycross. Southend, under the guidance of Terry and their Committee, now race Rallycross under floodlights most Thursday nights — it's done their coffers no end of good!
The race format is changed to take account of the new style of car, and the fun element. These saloon bodyshells have a lot more drag



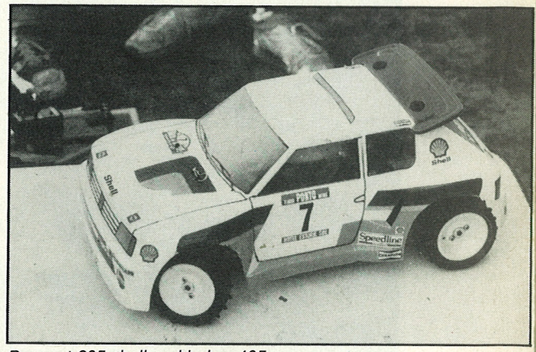
Start line action and left, on the edge!

than the standard 10th-Off Road cars they are based upon, and so it is unreasonable to expect them to race at high speed for five minutes. The race length is shortened to four minutes in general, but it is good fun to shorten it to 3.5 minutes as well. This allows almost anyone to use their motors geared for speed without any worry over duration. Thus the less well-heeled racer can now compete on even terms with the expert since he can find the same speed without too much worry that his batteries may go flat.
As for the race format, again you must try to get the emphasis away from the experts, and to the advantage of the average club drive. Make the best three scores from four rounds count in qualfying, instead of only one score. Alternatively, give the top driver in each round 100 points, the next 99, and so on down to the bottom of the qualifying list.
Full size Rallycross also runs A to Z finals, but they allow the winner of the C Final to progress to the B Final, the winner of the B Final to go into the A Final. This is a bit awkward when charging ni-cad batteries, but it is worth considering as it makes winning the final mean something.
As the heats are only four minutes, there is time to get in more rounds of racing. Southend manage six rounds on a club night, but they have another trick up their sleeve. Heat one drivers use only solid colours on 27MHz, and the 40MHz frequencies from 655 to 825. Heat two drivers use only the split 27MHz frequencies, and the 40MHz from 835 and above. Heat three use the same as heat one, and heat four the same as heat two, and so on all the way down the entry list. Using this method, heat one is still racing while heat two comes to the line, plugs in ready to go, and drivers stand by the rostrum. Immediately heat one finishes, heat two starts (waiting only for the printer to print the results of heat one) and anyone who misses the start has to join in after all the cars have gone. This may sound like hard work, but remember the objective — have fun and learn to drive, not spend all one's time agonising over tyres, suspension settings, motors, and gear ratio's. Leave all that hassle to the real 10th-Off Road races!

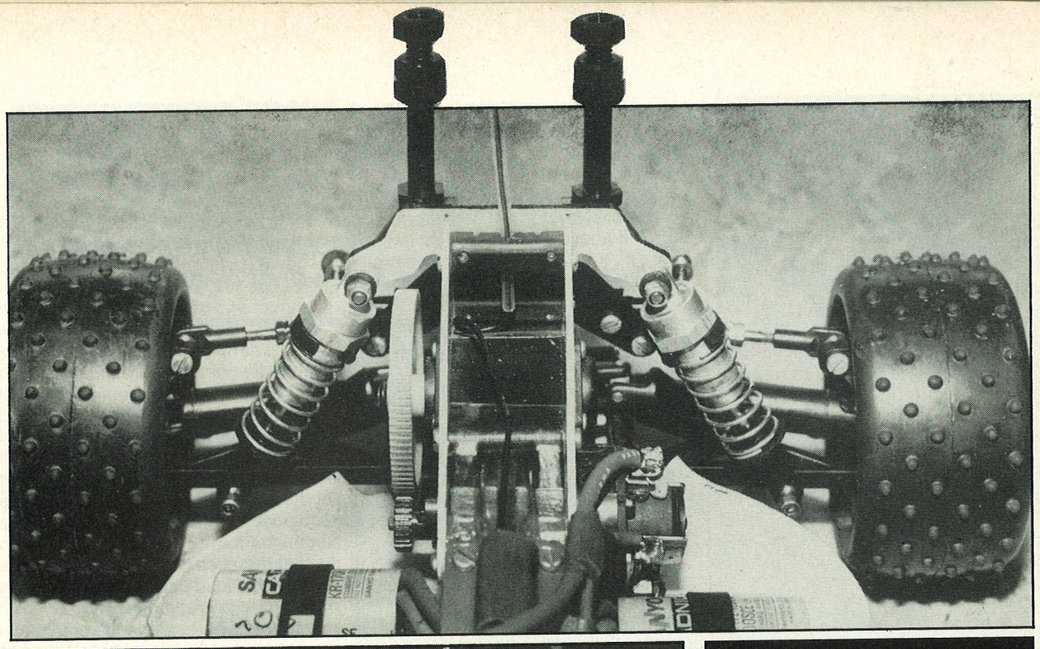
Rallycross is for fun, and promotion of the R/C car hobby. It does not have any written rules or a National Championship, but it doesn't need one. Many clubs are interested because they can use local tarmac and concrete car parks for their winter racing without the worry of tending to a grass track. Smoother tracks mean less damage and easier racing, as well as more fun per

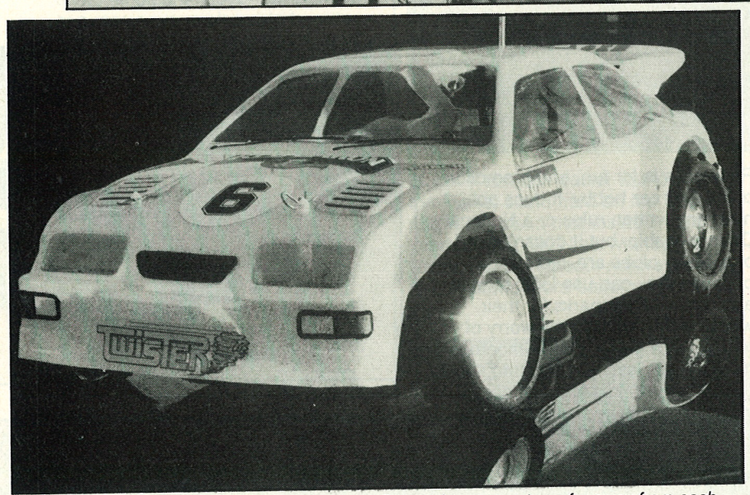
This allows almost anyone to use their motors geared for speed without any worry over duration.

minute driven, and more minutes driving. Also, the formula lends itself ideally to the local shows at Summer Fairs where any old piece of playground, or closely mown flat field, will serve as an ideal place to let the spectators see cars they recognise being raced in a way they understand.
As that removes the major objection to 10th-Off Road cars, you should have no trouble attracting more members to your club, and some of



Peugeot 205 shell and below 405.





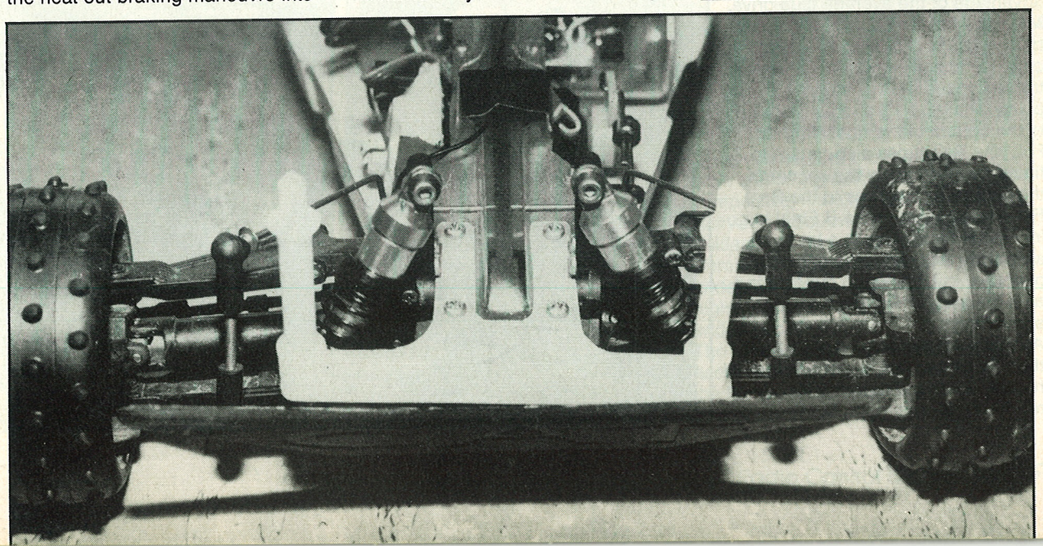
Rallycross Acceptable Bodyshells:

Ford Cosworth 500*
Ford Sierra XR4
Ford XR3i
Ford RS200
Porsche 911*
Porsche 935 (flatnose)*
Porsche 944
Astra GTE
Peugeot 205 T16*
Peugeot 405 T16*
Lancia Delta S4
Lancia Rally 037
Audi Quattro A2
MG Metro 6R4
Toyota Celica GT4
BMW M3
*Allowed only kitwing

For more details contact the Southend Car Club via Terry Wright 0268 552691.

Body mounting posts shown on a Schumacher Procat, keep mounts as far away from each other as possible.

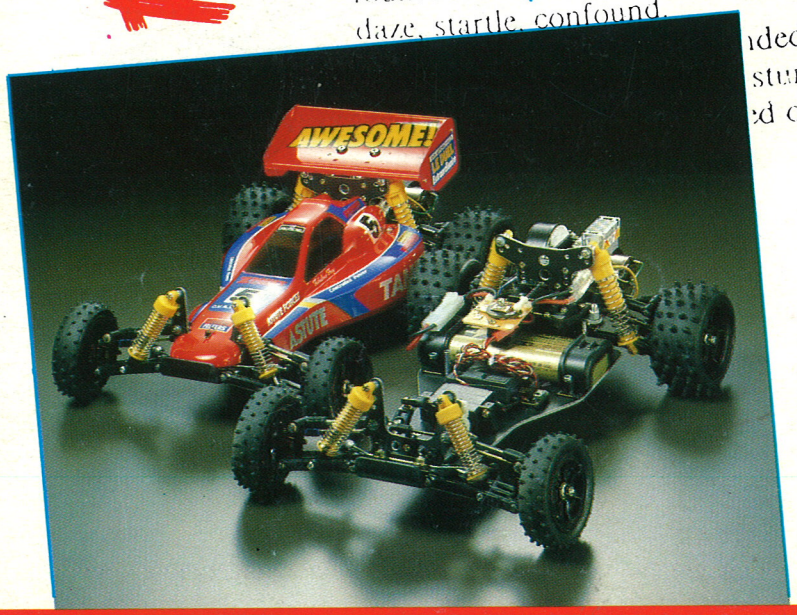
those may turn to full competitive 10th-Off Road as we know it. What have you got to lose? Just imagine the full power slide out of the turn, the neat out braking manouvre into the turn, the roar of the crowd. And what will your friends say when you tell them you are racing your Porsche/BMW/Cosworth this weekend . . . you're hooked already!



ASTUTE

1/10th SCALE HIGH PERFORMANCE OFF ROAD RACER

astute shrewd, cunning, crafty, wily, artful, subtle, knowing, perceptive, intelligent, discerning, sharp, keen, penetrating, adroit, clever, ingenious.



- Ready to assemble R/C model kit
- Sealed gear box with ball type differential
- Front and rear independent double wishbone suspension system
- Oil filled shock absorbers front and rear
- Lightweight and sturdy F.R.P. chassis
- Lightweight one-piece wheels and low profile semi-pneumatic spike tyres
- Front anti-roll stabilizer
- Polycarbonate body, under cowl and wing
- Heavy duty 3 step forward and reverse speed control
- Requires: Tamiya R/C system; BEC radio; or Standard 2ch. R/C equipment plus a Tamiya battery eliminator, and a 7.2v Ni-Cd racing pack battery (available separately)
- For maximum performance use only Tamiya Ni-Cd batteries

RIKO regd.

RICHARD KOHNSTAM LIMITED

13–15a High Street, Hemel Hempsted, Herts. HP1 3AD.

TAMIYA