

The Monthly Magazine  
for All Model  
Radio Control  
Car Enthusiasts

# Radio

# Race Car

*International*

June 1988 • Price £1.35 (UK) • \$3.00 (USA)

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Full report  
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**.21**

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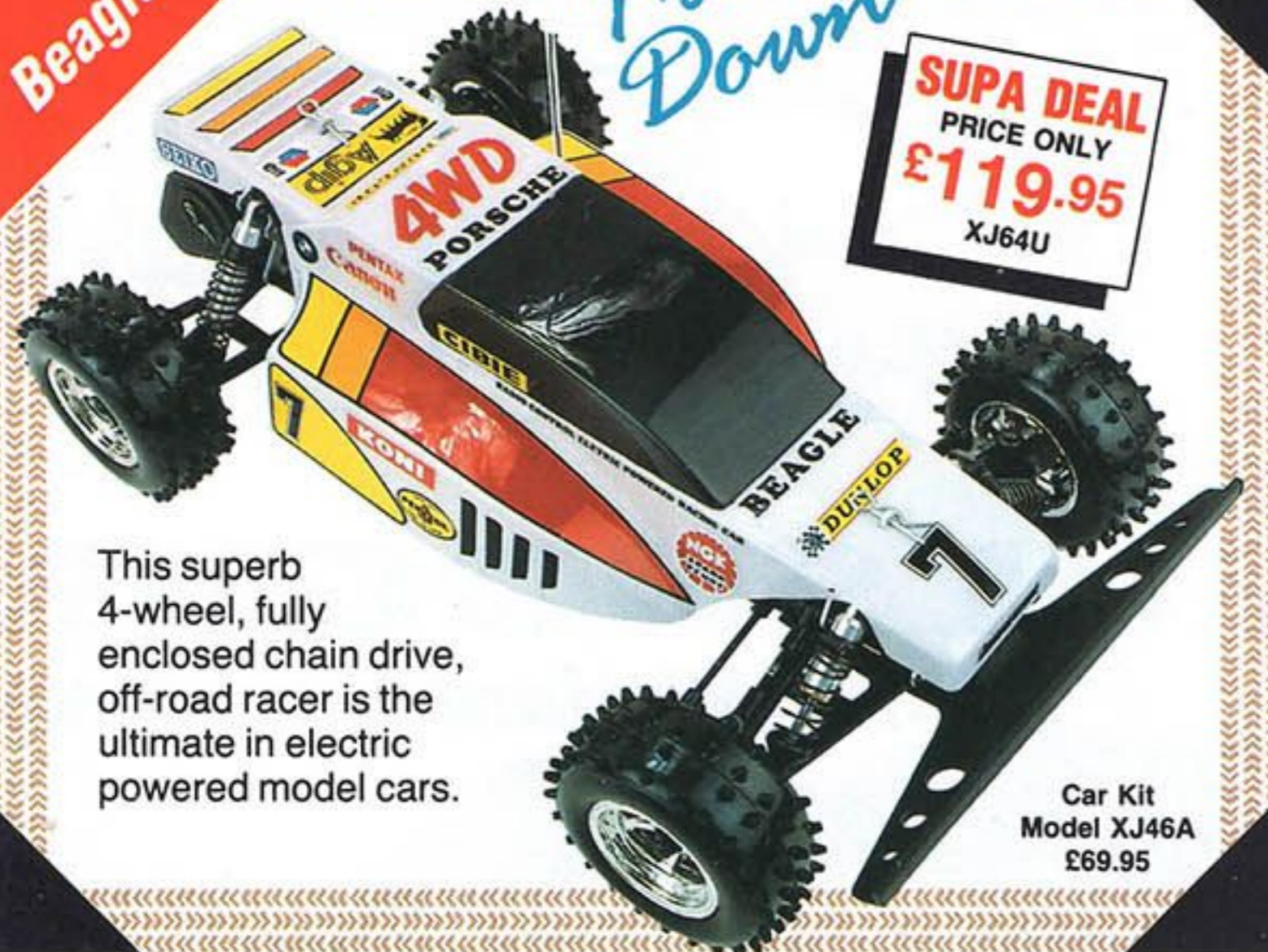


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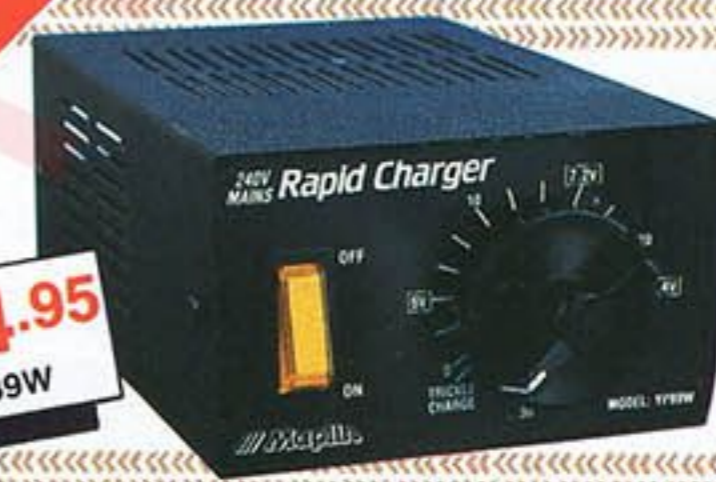
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# Radio Race Car International

## C O N T E N T S

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Jim Davey • Bob Errington • Mike Billinton**

### EDITORIAL

Unfortunately we must begin this month's editorial on a sour note. John Shaw, whilst competing at the Romsey International had most of his equipment stolen from his car, at home, overnight. Missing items were as follows: two Optima Mid 4s, a Parma MRX, an Ultima and a Maxima. Two Shinwa motor dressers, one Futaba 2EGX, a JR Beat 2 and several motors. All cars were white with black windows. A £500 reward is being offered for the recovery of the equipment, or information leading to the arrest of the thieves.

Anyone who wishes should contact John Shaw on 01 568 0727 during office hours. Let's hope John receives some information shortly regarding this mindless act of theft, meanwhile keep your eyes open around the circuits for John's cars.

Well it's Reedy time again, see inside for full report, also this month it's your chance to win Tamiya's new Avante. All in this month's great RRC.

### Front Cover

Front cover photo features two of the latest cars from Japan, Marui's Shogun and Hirobo's Invader.



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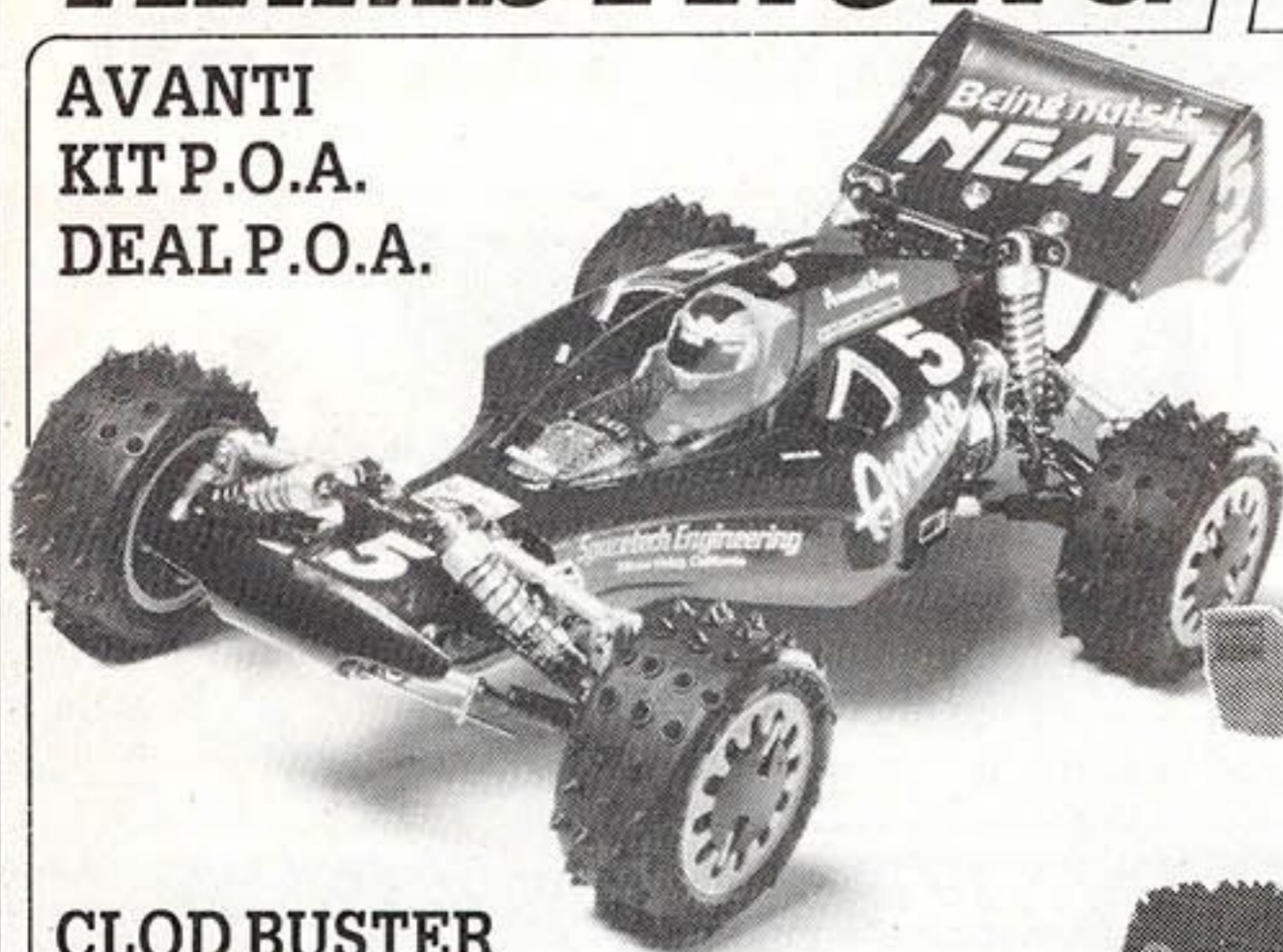
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- TL6054 Revolution 'Oval' — £39.95 (17 Triple)**  
(A fast yet, safe motor to drive, offering punch and speed.)
- TL6056 Revolution 'Insane' — £39.95 (15 DBL)**  
(Awesome acceleration and top end speed suitable for large, open, fast high traction grass tracks.)

- NEW TL6057 Revolution Brutus — £39.95 (16 triple)**  
This new wind produces excellent raw horse power. It has excellent mid range & top end power and has better running time than the Insane.
- TL6101 Revolution Wet Mag II — £39.95** (The latest modified motor design, incorporating wet magnets and extra heat sink on the end bell for improved performance.)
- TL6102 Revolution Wet Mag IV — £39.95** (Slightly hotter wind than II.)

- NEW 1/12 MOTORS!!**
- TL6060 1/12 Stock 35T **£13.50**
- TL6121 1/12 Small Track 6 cell quad — **£39.95**
- TL6122 1/12 Med. Track 6 cell quad — **£39.95**
- TL6123 1/12 Large Track 6 cell double — **£39.95**
- (Join the many buggy 1/10 racers who have enjoyed success with Revolution motors, by trying our new 1/12 range today. Quality guaranteed.)

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- TL6059 Motor Safe **£1.95**
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**PANASONIC SCR**  
Panasonic Magnum SCR— Matched SCR cells, computer tested for voltage capacity and internal resistance. Comes built with leads and connector.

**PRIME SC CELLS**  
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**£21.95**  
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Spur gears with ratio chart **£4.25 each**. 96, 100, 104, 108  
48DP Spur Gears now available in sizes 78T and 86 Tooth. Pinion available soon from 14-26T.

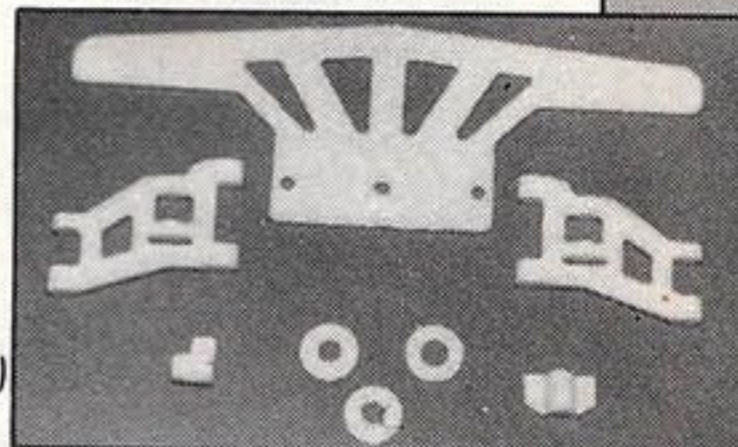
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- (For more information see Novak advert in this issue.)



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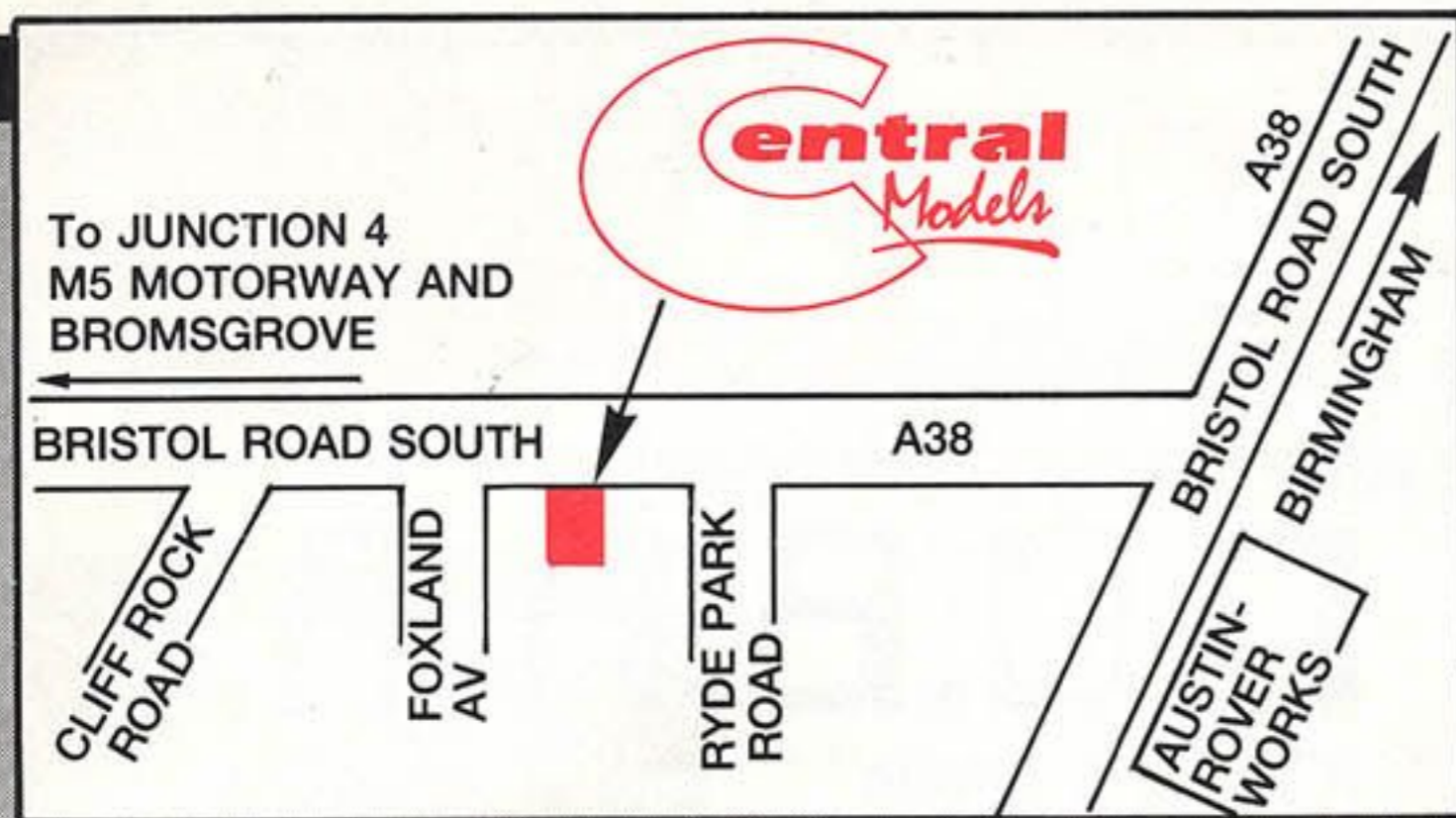
- RC10 Wide Front Bumper **£4.25**
- Ultima Wide Front Bumper **£4.25**
- RC10 Short Front Bumper **£3.25**
- Ultima Short Front Bumper **£3.25**
- Renegade Clear Lexan Bodyshell **£9.95**  
(fits RC10, Ultima, Optima etc)
- Renegade Stage 2 — **£9.95**  
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- Longnose Renegade **£9.95**
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(Widen your RC10 the right way, and improve handling and cornering ability.) Body Saver **£1.50**  
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- Lightweight antenna mount **£1.25** (Mounts antenna from the chassis.)
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- RC10 Rear Arms and items for Optima Mid 4 call for details. **£7.95**
- Now in stock



- NEW LOSI PRODUCTS**
- TL4008 Pinion Wrench (for 540 pinion grub screws) **£3.95**
- TL4009 Replacement Bit — **£2.25**
- Don't forget the items for your RC10 in 2WD
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(Diff tube with ball bearing eliminates slop on the diff shaft)
- TL7008 Bell Crank w/bush **£12.95**  
(Replaces original steering set up with alloy bell cranks and steel posts with bushes.)
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- Cat Top Pulley **£13.95**
- Cat Front Pulley **£8.95**  
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Now available Standard Sanyo SC yellow sticks, the old favourites are back. Limited supply complete with Tamiya connector **£17.95**



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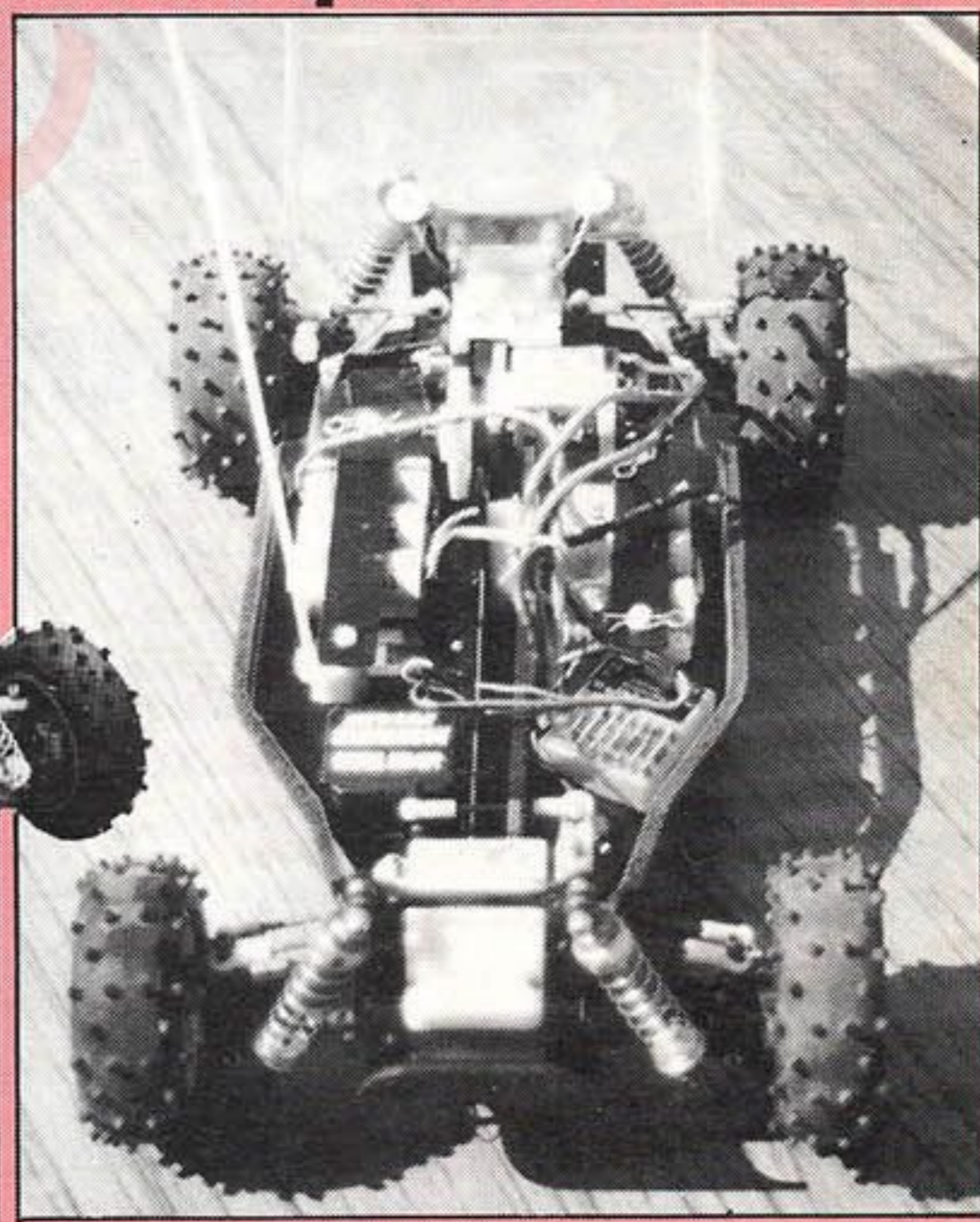
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**1021/1024 Diamond** (Diamond tread for 2WD, suits low profile wheels, Fox, etc. (1024) and RC10 stock hubs (1021))

**1003 Knobby** (small knobbles for tight control suits Hornet, 1.5 inch rims etc.)

**1018 Knobby** (small compact tread comprising of small knobbles for excellent control. Used by many drivers on RC10, direct replacement on stock hubs.)

**1023 Knobby** (completing the range this tyre again has small tight knobbles and suit large 2.0 inch rims, Fox, Wild One etc. Excellent control with 2WD cars).

All the above tyres are £6.50 pair.

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**1025 Champion** (Excellent rear tyres for all low profile wheels, Hotshot, Cat etc. superb on loose surfaces.) £6.75

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Full range of wheels in stock for all cars from Cat, Mid 4 to Hornet, Falcon etc.

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**2517 Tamiya 2WD Rear Wheel** (fits Wild One, Falcon etc.)

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**2519 Associated RC10 Rear Wheel** (direct replacement)

**2520 Yokomo Wheel**

**2521 Tamiya 4WD Wheel** (fits Hotshot, Boomerang, PB)

**2522 Tamiya Front Rim** (star design for Fox, Wild One etc.)

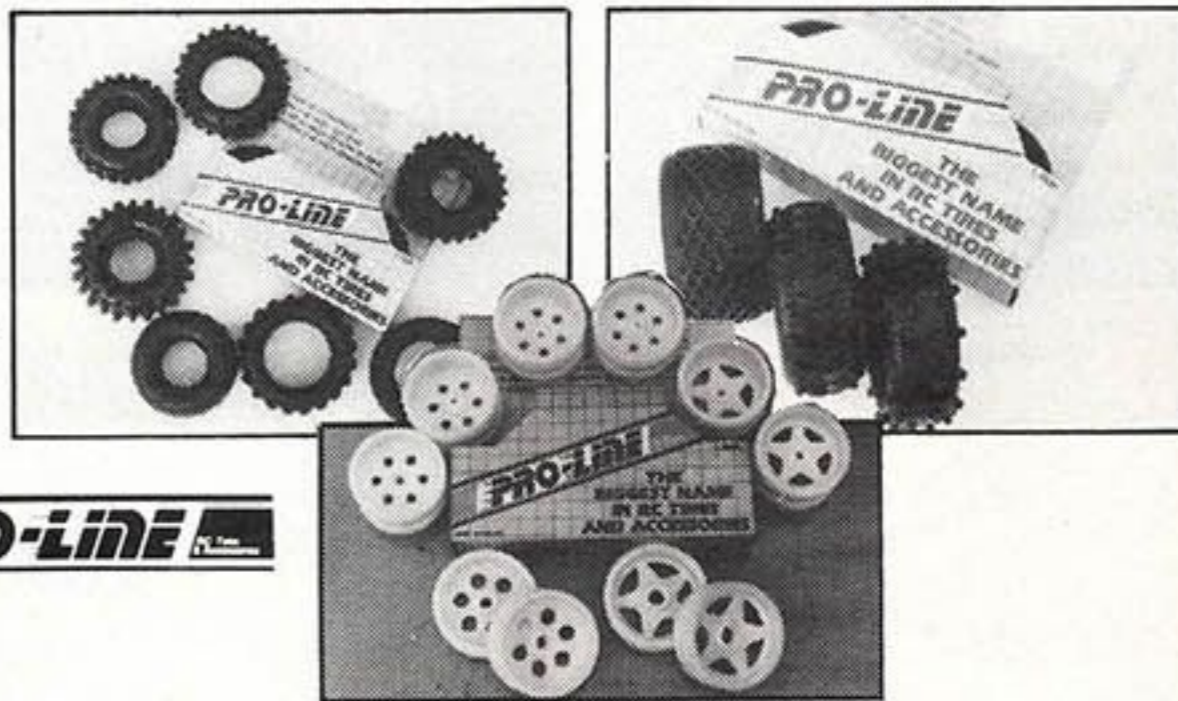
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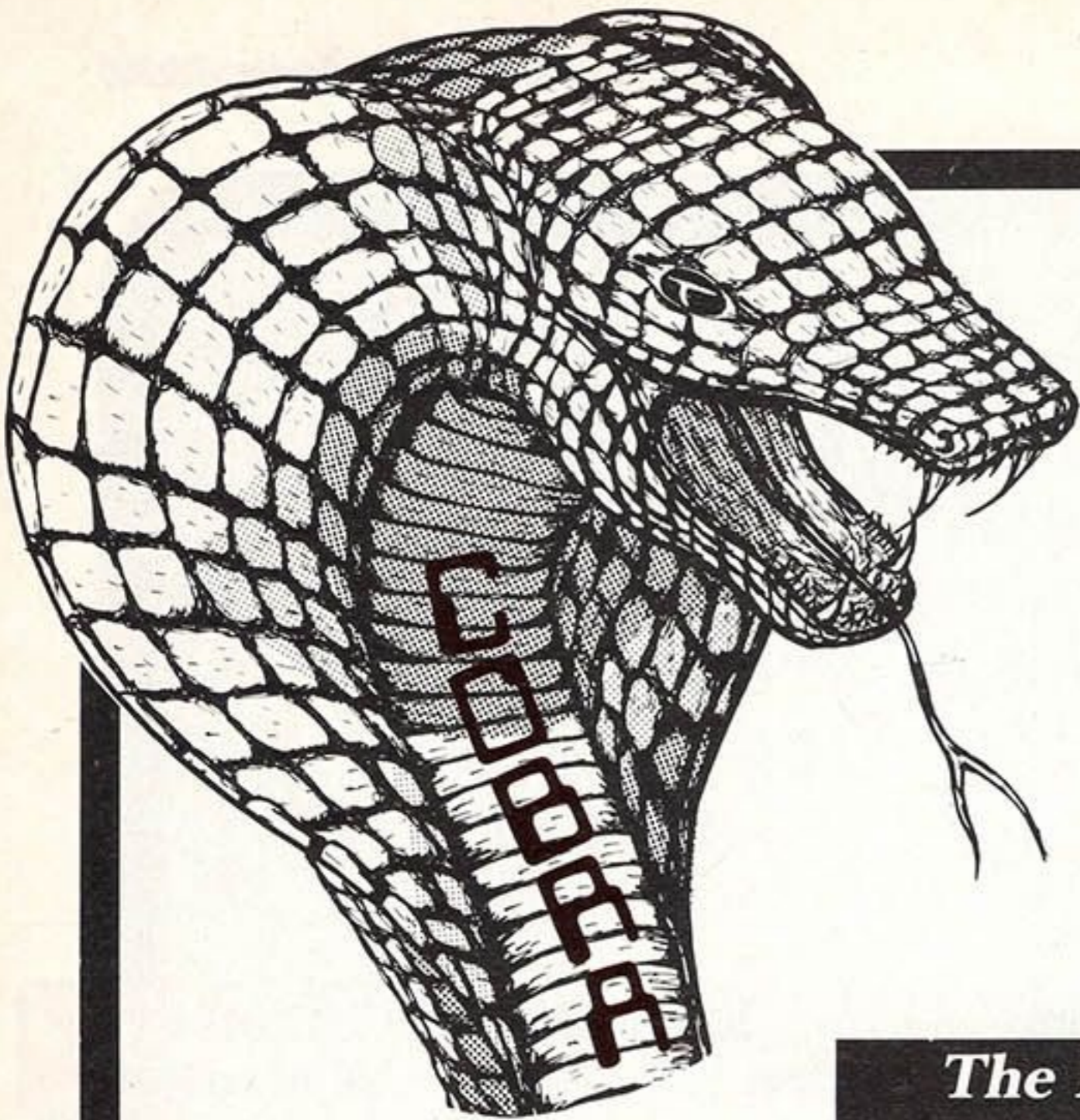
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**18th – 19th JUNE 1988**

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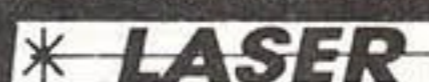
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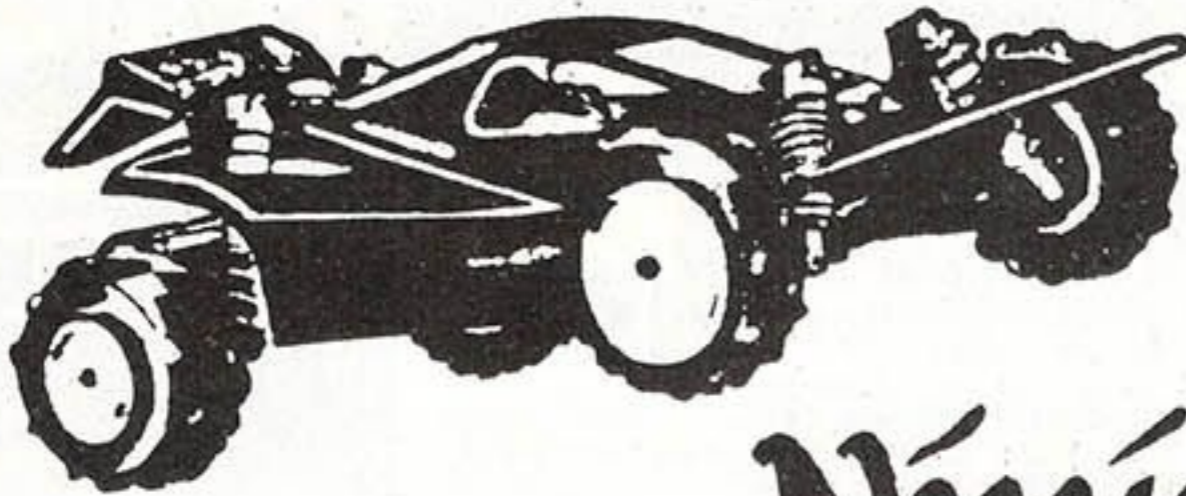
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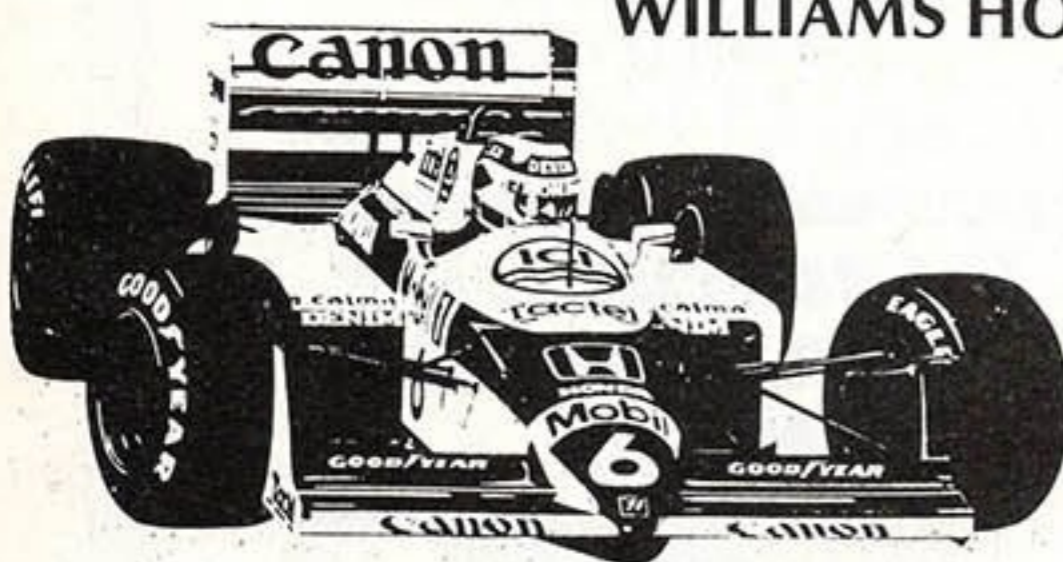
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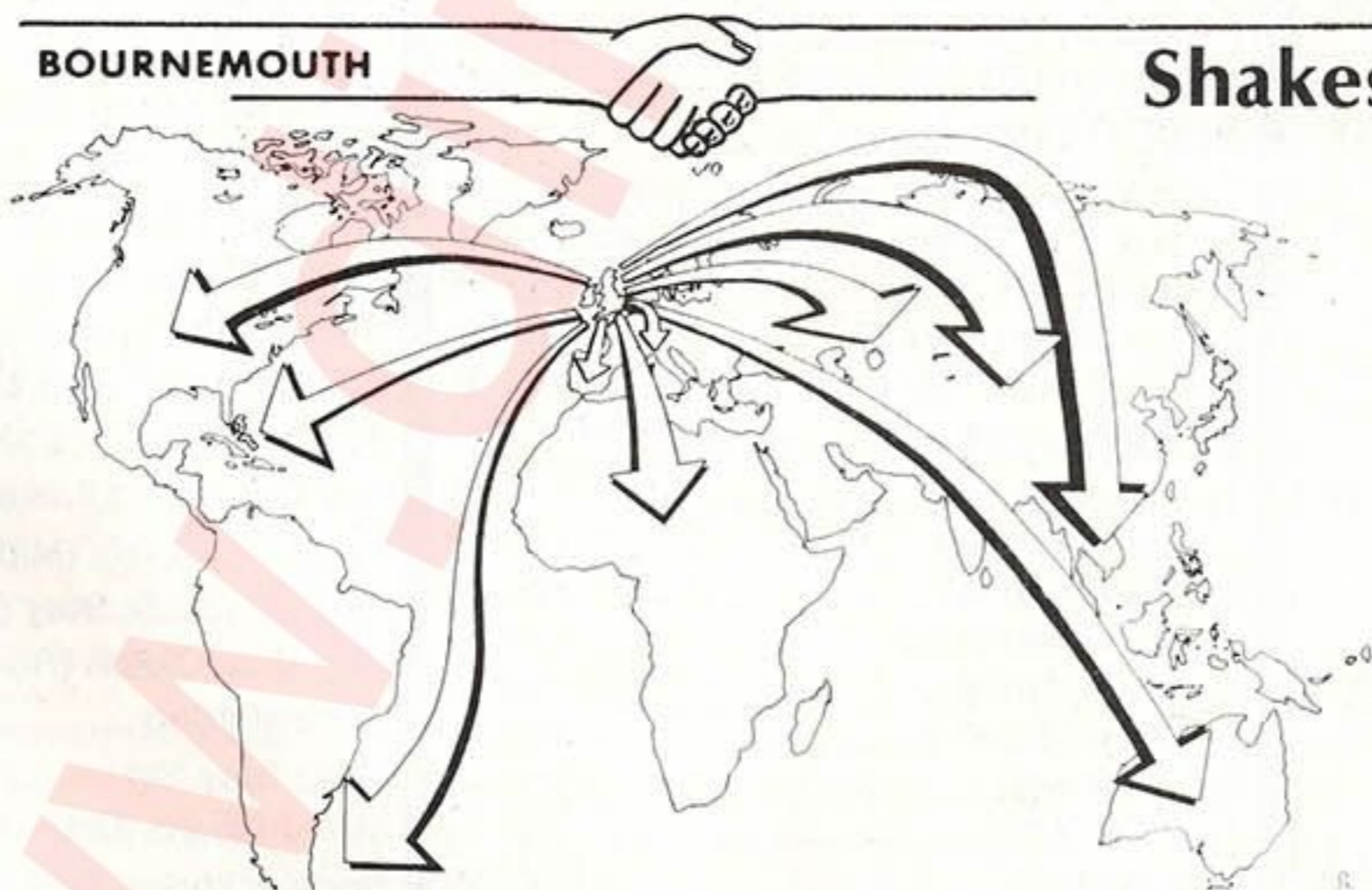


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Spa 240 WS	£39.95
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Ball Diff Rear (Ultima)	£17.50
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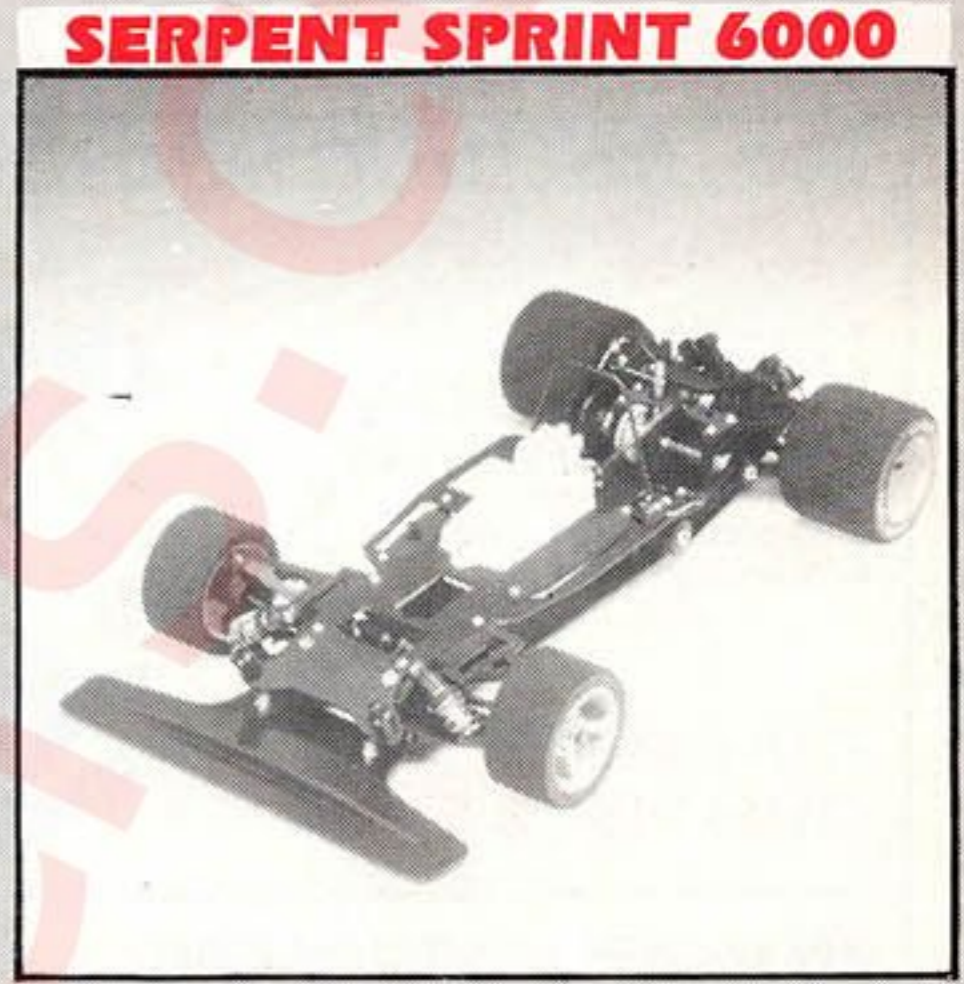
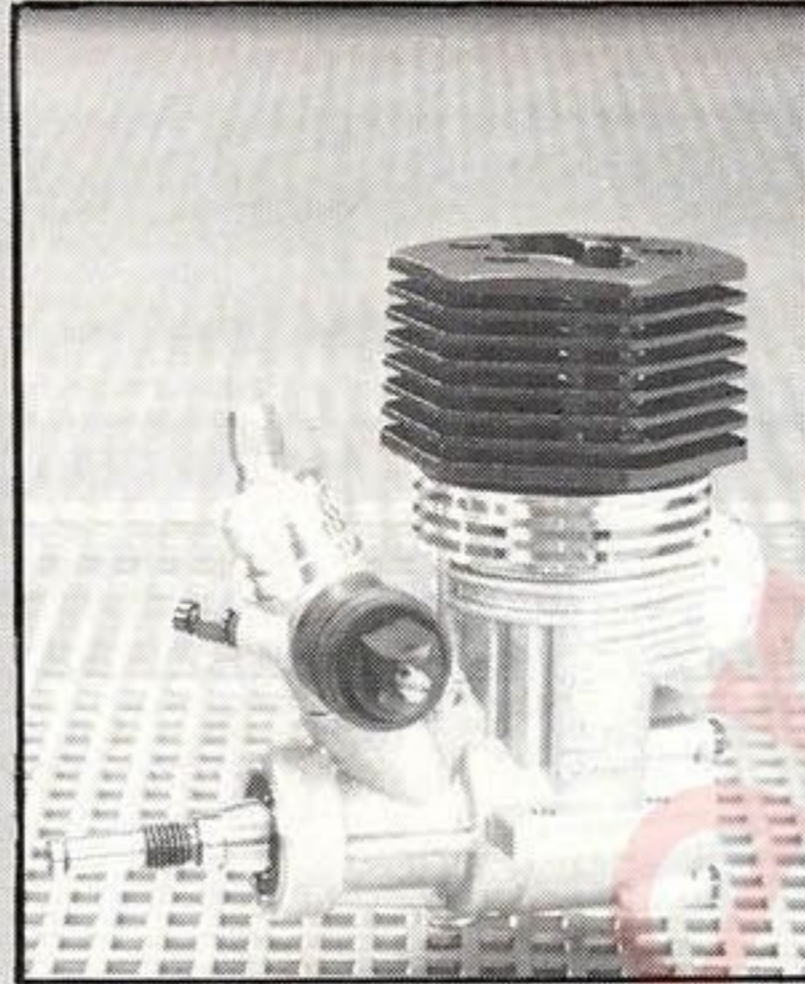
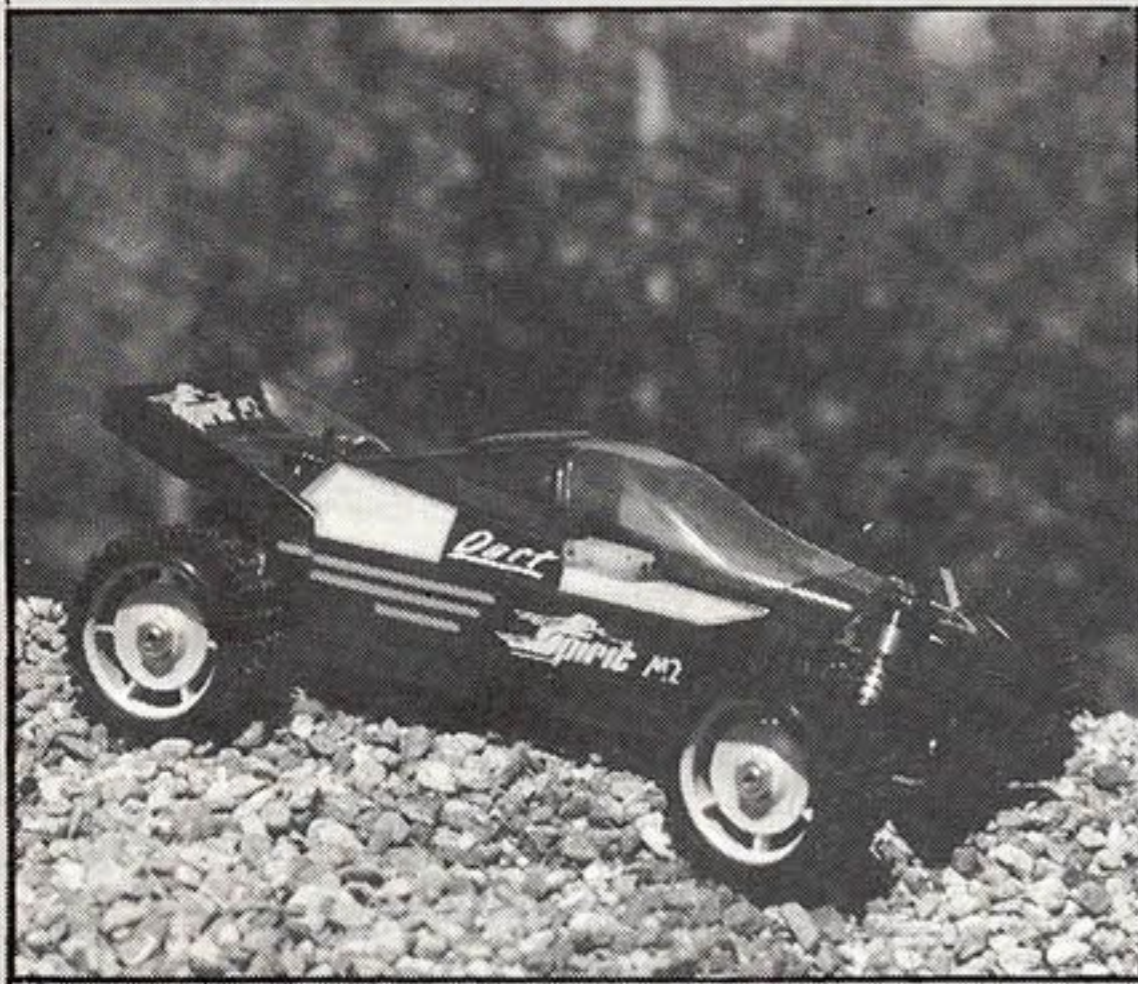
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# Serpent 1988



**WORLD CHAMPIONS, EUROPEAN CHAMPIONS, BRITISH NATIONAL CHAMPIONS**



Latest version of the successful Cobra, completely redesigned, renamed and comes complete with the new Dart bodyshell. The Spirit was F.T.D. at the 1987 British Grand Prix, driven by Steve White. Kit price **£255.00**. Also available Kit No. 5006 with 3 differentials (geared). **£285.00**

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NEW LOW PRICE ON JAPS 30°, 35°, 40° only **£8.95 pair**. Full trade terms available on Jap tyres S-Power plugs, pipes, manifolds, air filters available

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It's here, what you've all been waiting for, a completely new car (not a copy of someone else's). A superb new design, featuring the tried and tested Quattro suspension geometry, plus a host of sparkling new features inc. coil over shocks, adjustable shocker damping via internal valves, lightweight aerofoil section wishbones, inboard disc brakes, Kevlar drive belts designed exclusively for Serpent, new lightweight wheels, designed by Ronnie Ton, produced by Berton, tested by Rody Roem. Not a model car but a racing car in miniature, once again Serpent puts you on the front row in model racing technology, even the box it comes in turns into a plastic carry case that holds 16 pairs of wheels and tyres, how about that for ingenuity. The only thing about the car that remains unchanged is the price. **Still only £325.00**

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**1/10 SCALE**



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**1/8 SCALE**

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TURBO OPT-MID (BEAT THAT)	£145.00
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Big Brute	£79.95
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Deals on above — just add £60.00

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## ELITE MODELS Serpent U.K.

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## 4WD OFF-ROAD RACER

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- Special rod set front and rear
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- No motor, no speed controller



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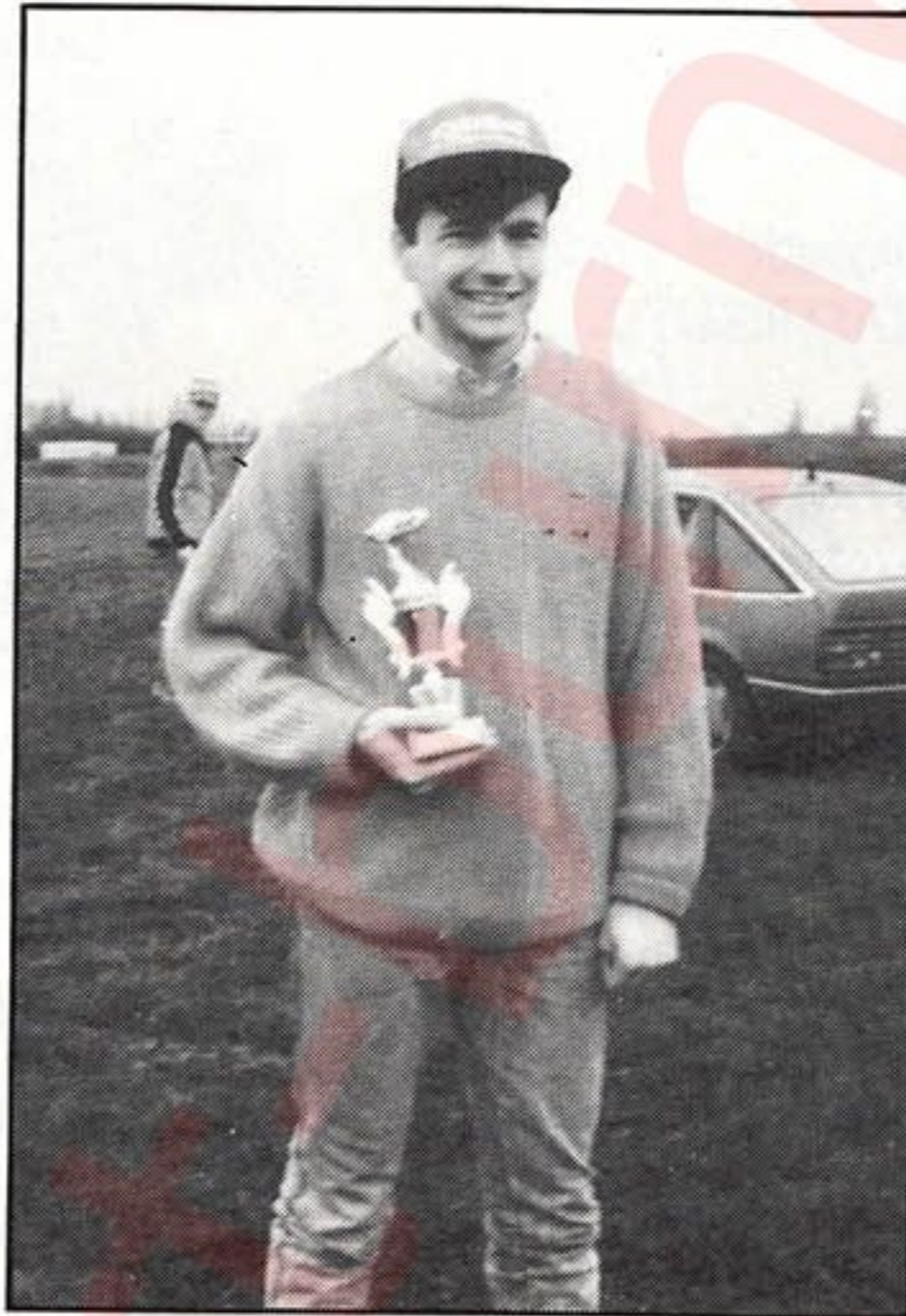
# RALLY CROSS

by Paul Leach

After days of rain the morning started bright and dry for the first round of the BRCA 1/8 Rallycross Championship. The weeks of preparation and anticipation were over and we were pleased to arrive at the Remote World track to find the recent rumours that this was going to be an excellently prepared meeting were not unfounded. The Remote World Club members had obviously put a lot of effort into getting this new venue ready and although certain finishing touches have yet to be added the track must already rate as one of the best in the country.

The track is obviously one of the biggest in the country consisting of two long straights and an infield of a variety of bends. The surface was mostly smooth grass although undulating it was not too bumpy. This meant a high average speed resulting in lap times around 30 seconds. On site facilities included permanent toilets, and refreshments were readily available which was much appreciated as the weather deteriorated during the afternoon.

Being the first meeting it was interesting to see some new cars on the scene and some already well proven last season. The



A good start to the season for Alan Harman.

main manufacturers being represented were PB, Siccom and Kyosho. Amongst the more experienced people driving these cars were James Weedon, David and Michael Allison (PB X13), Richard and Mark Stitson, John Chainbelain and Ralph Allum (Siccom Magnum Force), Alan Harman, Stuart Wilcox and Mick Marney (Kyosho Burns).

The PB X13 now a well proven performer this season should benefit from up grading features ie:- fibreglass, radio and top plates (to reduce weight) and universal shafts (to improve drive efficiency). Some drivers had also carried out their own lightening mods.

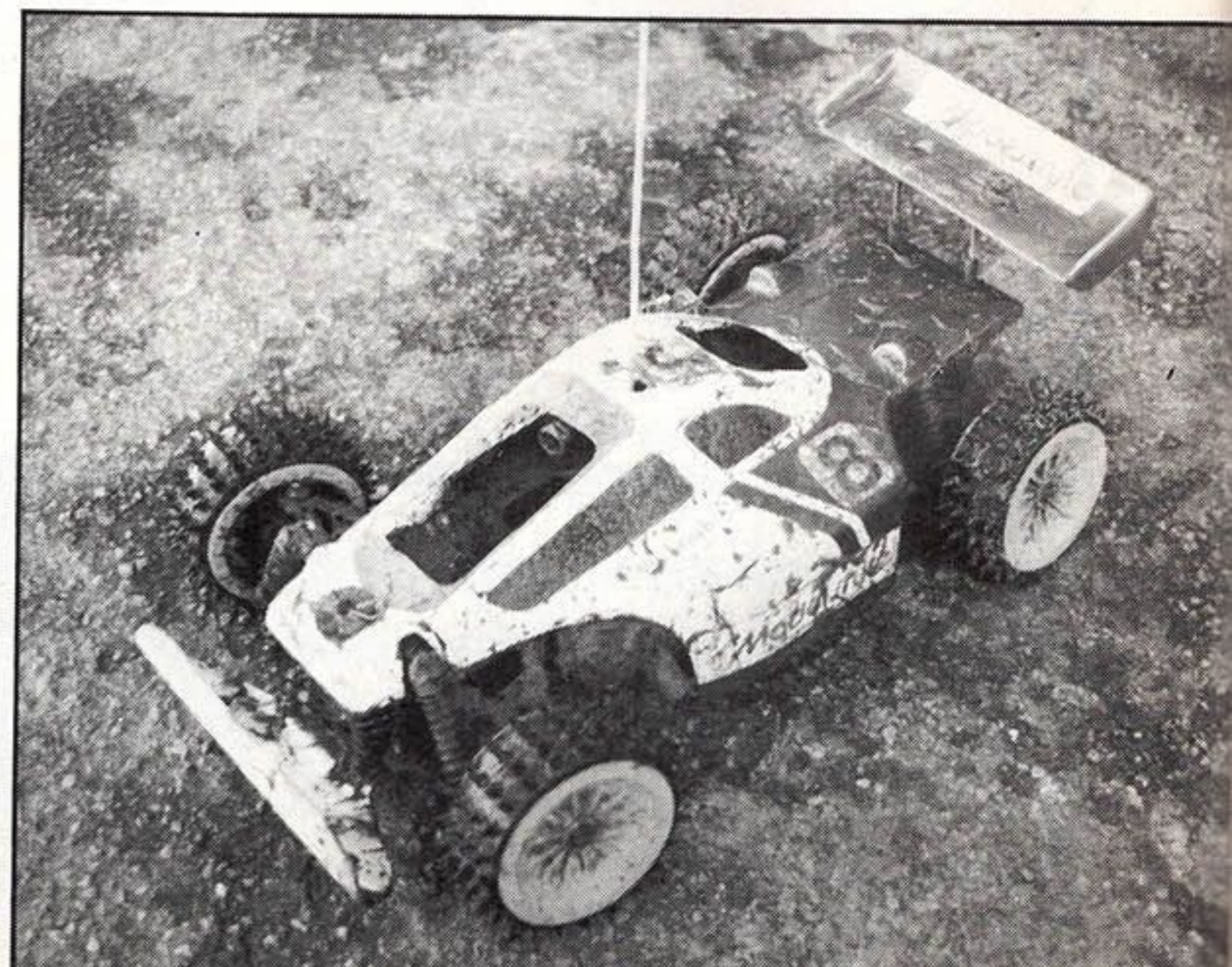
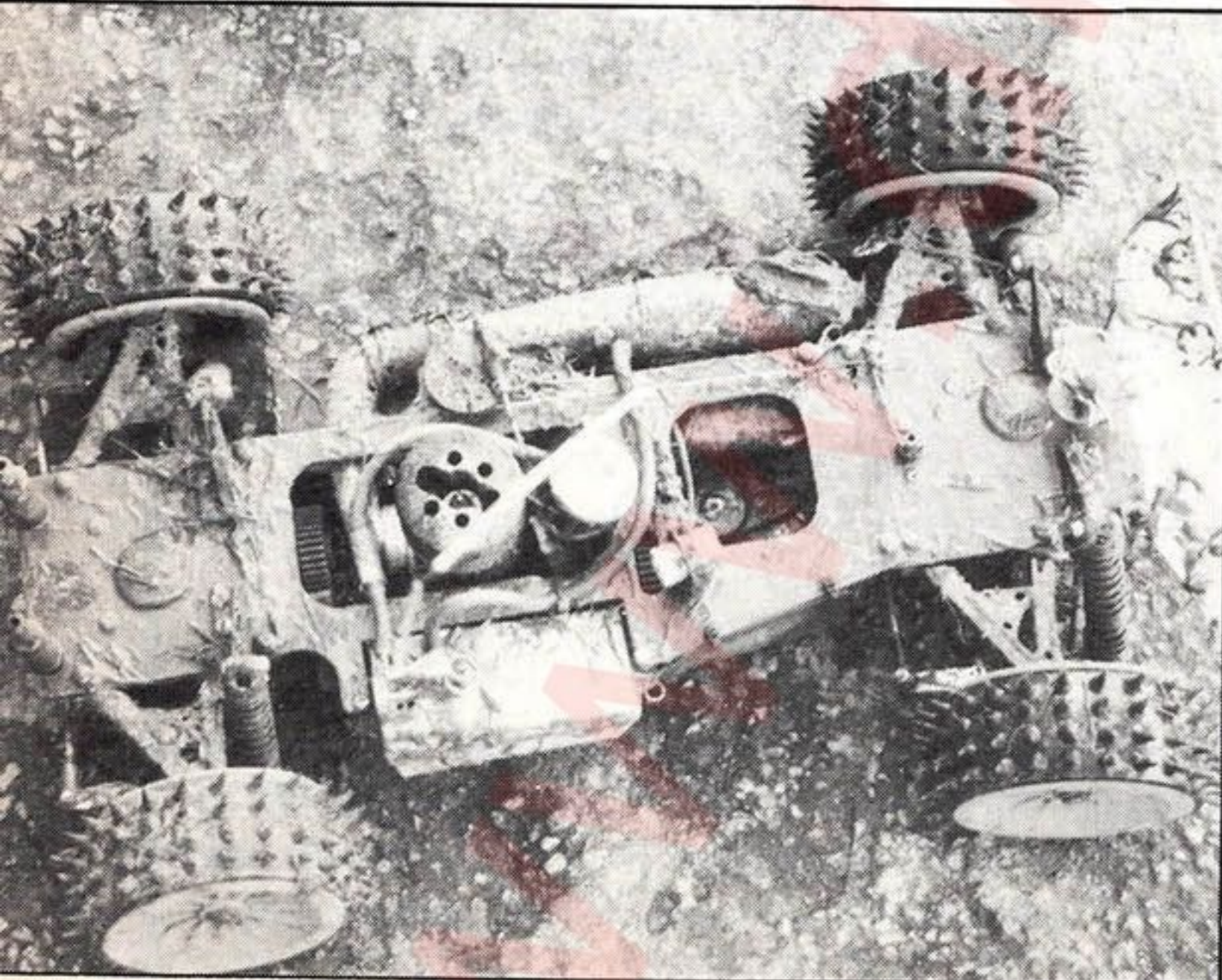
Siccom have a new car for 1988 called the Magnum Force and although it is possible to alter the old Magnum to the new Force specification it is in essence a new car because of the amount of alterations done, most noticeably the positioning of the engine and radio gear to put most of the weight over the front wheels. A new comer on the scene this year is the Kyosho Burns, a very light weight and well designed car which should prove it to be competitive, it will obviously benefit from its manufacturers pedigree!

The popularity of the Slough meeting was confirmed by the 67 entries, this was one of the best entries for a long time and evidence of the growing popularity of the 1/8 Rallycross, lets hope this trend continues.

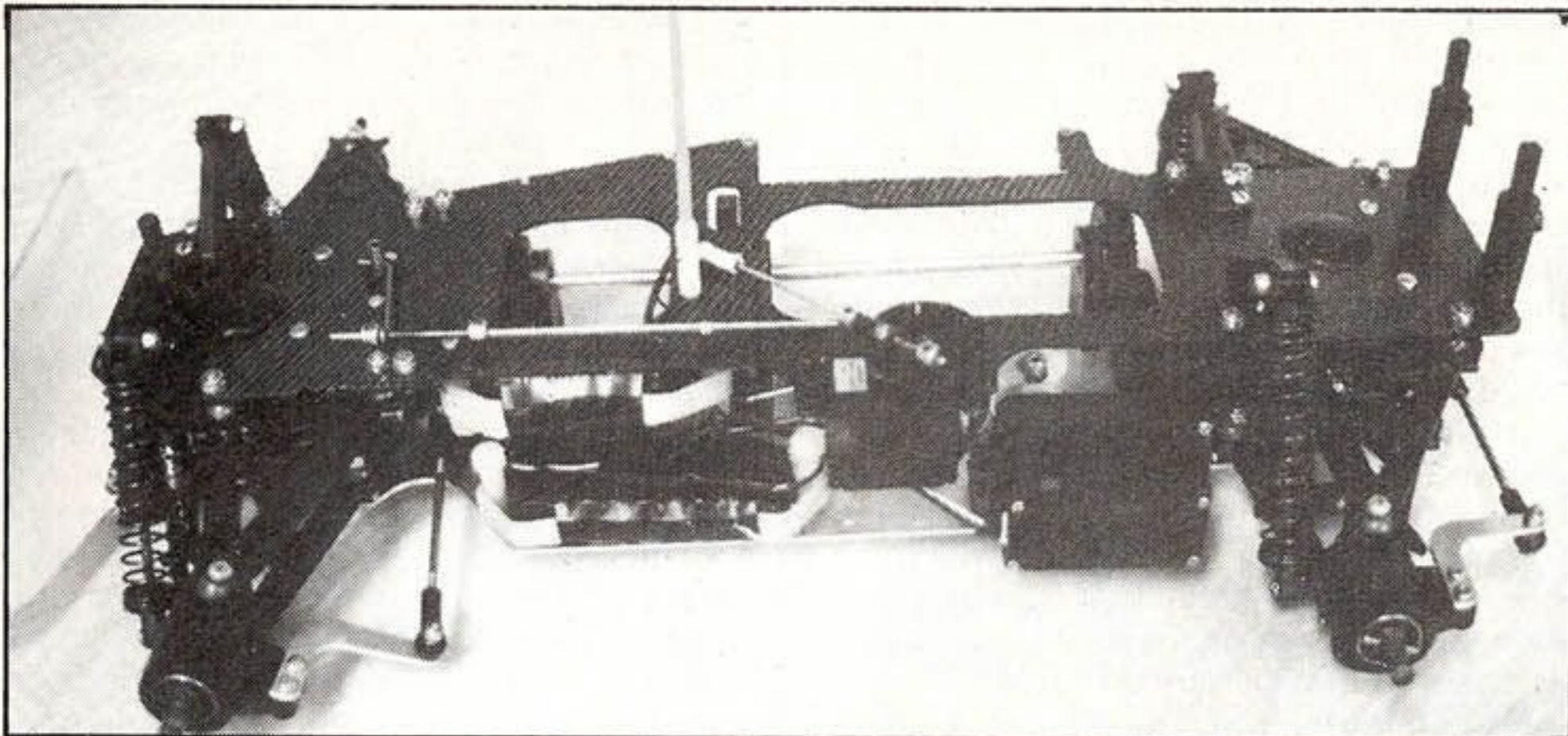
The heats got underway at 10 am as organised, after a stern drivers briefing by race organiser, Richard Stitson. The track at this point had dried out nicely, the high grip of the grass surface causing some problems with the cars rolling over.

The first heat resulted in 10 laps scores but this was improved by M. Stevenson in the second heat with a good run which he also achieved in the second round giving him a place in the 'B' Final. The '11' was again achieved by James Green in Heat 4 in both rounds, nice to see these drivers doing well. Others to join the ranks were Darren Wharburton (Heat 5), Ralph Allum (Heat 6), Michael Allison, Mick Harney and Adrian Fulcher (Heat 7). In Heat 8 John Chamberlain broke the barrier and achieved a 12 lapper and James Weedon quickly followed this in Heat 9 to again get

Pauls own Modelstyle X13 after 30 minutes in the Slough mud.







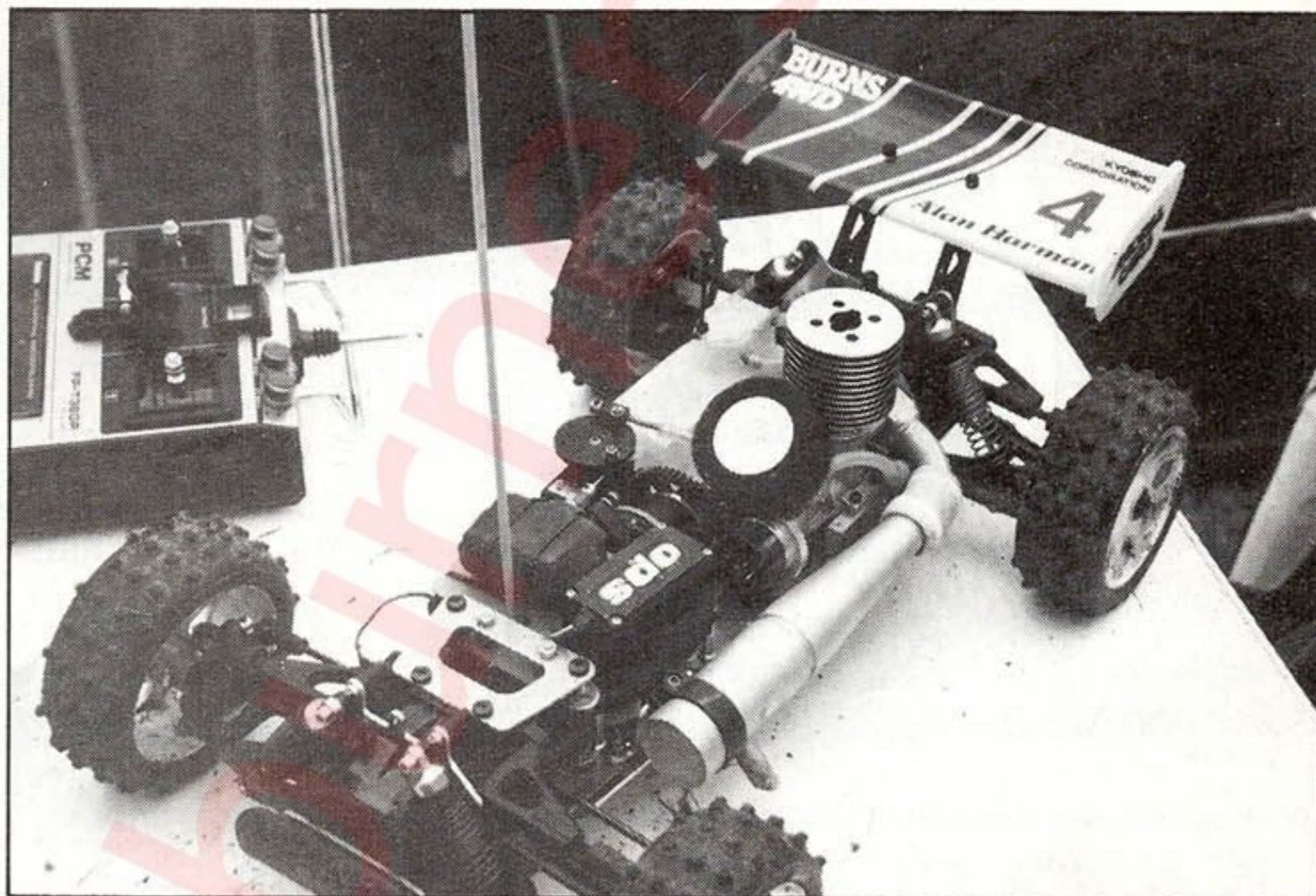
FTD as we saw so often last season. In Round 2 Roger Giles, David Chung, Tony Miller, Tommy Chung, Stuart Wilcox and Mike Brinkworth all achieved 11 laps (including yours truly). This round also saw Richard Stitson improve to a 12 lapper followed by David Allison, Alan Harman and yours truly (in Round 3).

At the end of qualifying there was only a matter of seconds separating the drivers with some people on 11 laps only going into the C Final, showing how close the racing was and how high a standard was being set for the start of the season. The track was very fast and racing was hard although by now grip was better but the rain was setting in and making conditions more slippery for the finals. The top three qualifiers James Weedon, Richard Stitson and David Allison had held these positions from Round 2 but Alan Harman, Tony Miller and Michael Allison moved up followed by Mick Harney achieving a good 5th place and Tommy Chung 10th.

As the finals got under way with the 'D' Final it was obvious conditions were not going to improve so a good careful drive was necessary. This Final was won by Steve Naylor with 28 laps after 3 drivers had to drop out by the 16th lap. In the 'C' Final times were better with only one car going out early, Mike Brinkworth dropped out towards the end with a seized carburettor. The final was won by Steve Weatherley with a good 30 laps closely followed by

**Results After 1st Round**

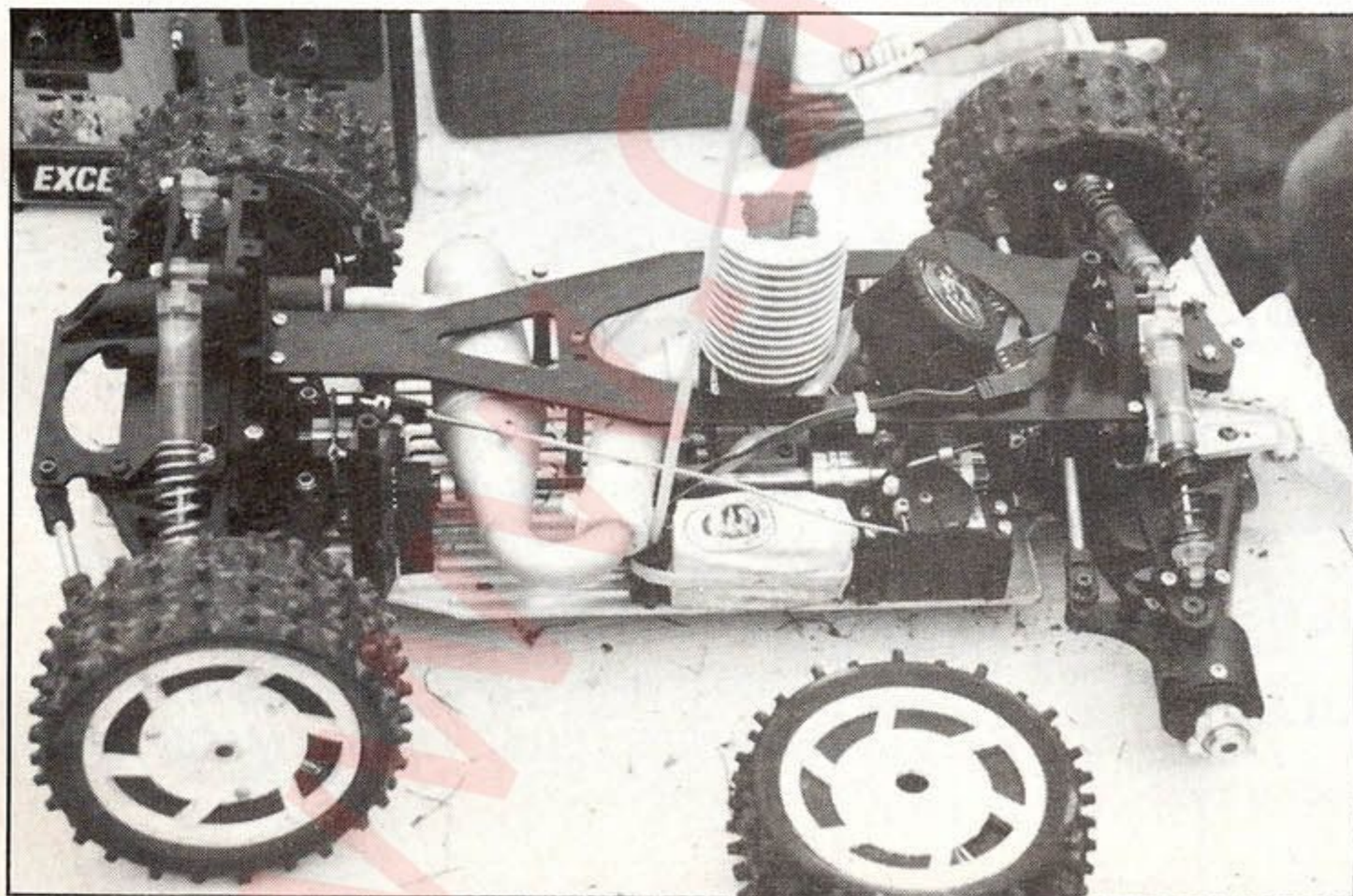
Top Ten		Points
1	A. Harman	41
2	J. Weedon	39
3	P. Leach	38
4	T. Chung	37
5	M. Harney	36
6	T. Miller	35
7	J. Chamberlain	34
8	M. Allison	34
9	D. Allison	32
10	R. Stitson	31



*Top, Paul Leach's new X13, use of carbon fibre saves a lot of weight.*

*Above, Alan Harman's new Kyosho Burns, a car to watch this season*

*Below, The new Siccom Magnum Force is beautifully engineered note the milled out-chassis and simplicity of design.*



Roger Giles on same lap and in 3rd place James Dyson, a good result for a lad who has only done 3 meetings during last season, 'well worth getting up at 4.30 am to come from Scarborough' said Dad. The 'B' Final was set to be a good battle between Justin Mackay and Stuart Wilcox with David Chung showing good form. Three drivers dropped out early on. After a good race Justin came out on top with 44 laps which proved to be a faster pace than the 'A' Final although not as quick as qualifying. Stuart came 2nd and David Chung a good third (now driving a PB).

By the 'A' Final the rain had set in making driving difficult and umbrellas were appearing again on the rostrum. John Chamberlain got a good start off the line and took up an early lead with the Siccom Force, followed by Alan Harman and James Weedon. the pace was fast considering the conditions. After being involved in a first bend pile up your scribe moved back up through the field to take the lead from John. Unfortunately John had problems of an unusual nature, water had dropped off an umbrella (being held for him) onto his transmitter after about 10 mins which affected his radio gear. Although Richard Stitson (who had only done 3 laps due to servo failure) tried in vain to help by squirting WD-40 on the transmitter, after about 15 mins John decided it was best to pull out rather than cause damage to someone else. That left your scribe in a good lead but unfortunately during the 3rd

fuel stop at 18 mins the engine cut, due to plug failure, resulting in 2 mins off the track rejoining in 3rd place behind the consistently driven Kyosho Burns of Alan Harman and the PB X13 of James Weedon. That was how it finished at the end with 4th place going to Tommy Chung who had showed his ability to mix it with the best in such bad conditions to give him a good start for this season. Mick Harney and Tony Miller were coming to grips with their new Kyoshos to give them 5th and 6th position. The Allison's had an unfortunate day with one dropping out with servo failure and the other stopping on the straight when someone collided with rear of car resulting in extensive damage to gearbox.

A good debut for the Kyosho Burns with a win for Alan Harman showing it will be a

quick car to be watched out for this season. For its first appearance it was very reliable but showed it suffered a bit in handling on the tight bends of the track but made up for this in speed on the straights. I am sure the drivers will be working to sort out these deficiencies for the next meeting. Alan showed once again his ability to cope with any conditions and come out a good winner. James Weedon (61 laps) backed up his FTD with second place with the PB X13 showing the car is still a good performer. This was backed up by your scribe and Tommy Chung coming 3rd and 4th with this car. As expected the new Siccom Force showed great promise and will obviously be one of the main cars this year.

Around the track there were a lot of complaints about failure of steering (brick) ser-

vos with eight reported to have failed including yours truly. This will obviously have to be looked into with the manufacturers.

It was good to see such a good turn out including 11 members of the Stotfold Club and 6 from East Suffolk as well as the Maidstone lads who will be organising a meeting later in the year. It was nice to see Paul and David Hill, with Dad as mechanic, back after a lay off at the end of last season. Even though the weather turned for the worse as the day progressed this did not take away our enjoyment of a good days racing and our thanks go to Richard and the Remote World Club for an excellently prepared and ran meeting. Lets hope the season will continue to this standard. Hope to see you trackside.

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## CHARGERS

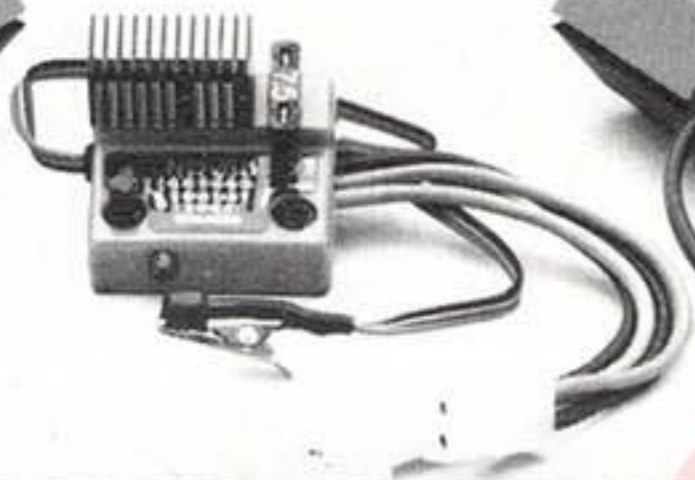
### NEC-2

PEAK CHARGER



### NEC-1

TEMPERATURE CHARGER



### NEC-3

PEAK PLUS



## SPEED CONTROLS

### NESC-1X



ELIMINATOR

### NESC-4



ECONO - II

### NESC-1



PRO - II

## RECEIVER

### NER-2S



## SERVO

### NES-1A



**NEC-1** TEMPERATURE SENSING FOR ACCURATE CHARGING • ADJ. CONSTANT CURRENT OUTPUT (1.5 TO 5.5 AMPS) • 1.50"L X 1.35"W X 1.15"H (1.5 OZ) • CHARGES 6 TO 7 CELL PACKS FROM 12 VDC CAR BATTERY OR 12 VDC POWER SUPPLY

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POWER CONSUMPTION	20mA at 7.2V	20mA at 7.2V	20mA at 7.2V
PLUGS INSTALLED	FUT.G, FUT.J, KO, AIRTR.	FUT.G, FUT.J, KO, AIRTR.	FUT.G, FUT.J, KO, AIRTR.

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# Everybody's Got To Learn Sometime

PART SEVEN

By now you should (hopefully) be able to drive your car and be able to compete on equal terms against drivers of the same ability as yourself. Your car should be able to last the duration of a 5 minute race without either dumping or falling to pieces and you should be enjoying the competitive side of our hobby, if you satisfy all these criteria why not try a meeting other than your local club.

I would recommend any proficient newcomer to try a national event as he knows he will take part in a final against eight drivers who on the day are of equal ability and as trophies are usually given for the top three places in each final other than the A or B, you could well pick up your first national trophy. Your first national trophy is the one you will remember above all others and the meeting will give you a chance to see national named drivers use their vast array of racing expertise.

Your favourite magazine:— Radio Race Car International contains within diary dates, BRCA news and the R.R.C. series more than sufficient alternative venues and meetings for the hardened travelling racer, let alone the beginner. There are other meetings to attend, for example, Tamiya run a series, in the south east there is a regional competition known as the South of Watford League and in the south west the Sward Championship. Which ever part of the country you live in you will find you are spoilt for choice of an alternative meeting.

Once you have decided which extra meeting or meetings you wish to attend how do you obtain entry? There are two basic methods, when a date is given for a meeting there will be a location shown, it is usually the actual venue but not always, so beware, for example there is only one Donnithorpe Miners Welfare at Gillingham or even Eastbourne in Sussex so you could be in for a drive of 70 miles more than you bargained, it is therefore important to know exactly where the event is to be held.

The two basic methods of obtaining entry are by writing or phoning the contact person.

## Method One, Phoning

When you phone remember the contact man will be dealing with perhaps as many as 120/150 drivers per meeting, and that the club may be holding more than one large meeting in the year. Have consideration for the person on the other end of the phone as he has a home life as well as you, and every time the phone rings it is heard by all members of his household. Just because you are up at seven in the morning he needn't be and although you have been watching the late film he may have been in bed for a couple of hours, so phone early evening. If a wife or child answers the phone, remember they will not necessarily



be as enthusiastic about model car racing as either you or the contact man.

Once you are speaking to the contact man tell him which meeting it is you are interested in, and if there are any places left available to book in. For example "I am interested in entering the Standard Two Wheel Drive Class for your R.R.C. round being held on May 29th this year, do you have any places left?" If the answer is no it is not worth enquiring if a reserve list is being compiled. If the answer is yes the next question is "Would you please tell me how I may enter". Telephone bookings can vary, some clubs will accept your details over the phone and hold your place open provided they receive your race fee within a certain period of time, others will put you on their list and post you an entry form, others will give you an address to write to so that you can be sent the entry forms, the latter method requires an sae (stamped addressed envelope) to be sent with it. It may be obvious, but sae means the envelope has your address written on it, this saves the club the expense of 120 stamps, the contact man writing 120 different envelopes and eliminates the possibility of any mistake in the address when given over the telephone. When a booking is taken by phone the contact man needs to know your name, whether 2WD or 4WD, standard or modified, what crystals you have and your driving ability.

When assessing your ability it is no good aiming too high. Although you may be the best driver amongst your group of friends on a national basis you could be classed as an intermediate/novice. The reason for the need to know your ability is to try and make each heat competitive with drivers having equal ability so they can enjoy their heat much more. Remember when grading yourself the only person you kid is you, as it is on the track where your driving ability will be on display. My particular club grades drivers on a scale of 1-10 with 1 being an expert, 5 being an intermediate and 10 being a beginner. In replies to this year R.R.C. we have had the very modest and expert in everyones eyes except himself Mark Chaplin rate himself as Grade 4

and the more self opinionated driver who at club level would struggle to make a 'C' final rate himself as Grade 1 (expert), so be fair to yourself and the organisers.

Some drivers grade themselves lower than they merit because they feel it takes themselves out of the limelight and they can come through from the back. Once the first round is published it is that list other drivers look at and not who is in which heat. Another reason for drivers grading low is that they feel in a heat of lesser drivers there will be more breakdowns and therefore less traffic. The theory may be partly true but it does mean more overtaking and the lesser driver is more unpredictable when you undertake this manoeuvre. One crash more than outweighs any apparent advantage grading low may appear to give you.

## Method 2, By Letter

When replying by letter a sae must be included this will be used by the contact man to reply to you. If you know the race fee for the event have a cheque made out to XXXXXX Radio Controlled Car Club and enclose a letter stating the event you wish to enter, your name whether 2 or 4 WD, standard or modified, what crystals you have, your driving ability, junior or senior and your R.R.C. number if it is a R.R.C. round plus any other information you feel may be useful. Keep the information short and to the point preferably on one sheet of paper. Remember the contact man needs the facts not a novel of your past successes down to the gearing and track conditions last time you raced.

On receipt of your letter the contact man can do one of two things, he will accept your letter and cheque or send you the official entry forms in your sae having reserved you a place at the meeting (provided there are places left). Large events are so popular that places are taken quickly so if you intend to enter write or phone immediately and on receipt of entry forms fill them in and return them straight away to ensure your place. This enables the organiser to plan his meeting and return joining instructions to the drivers at least two weeks prior to the meeting.

## A Successful Application

About two weeks before the meeting your sae will appear on your door step. Inside you will find details of the meeting. There will be a map or directions of how to get to the venue, it will tell you your heat number what crystals you have to have in your transmitter and car and should contain your race numbers which need to be affixed to your car. Use the numbers provided by the organiser and not your own as the persons doing the lap counting will be used to their particular type. Ensure the numbers are placed on your car so they can be easily seen by the lap scorers, if not it is you that will suffer if a lap is missed.

The letter will hopefully contain other useful information such as times set aside for practice, drivers briefing time and the start of the first race.

Information such as the availability of hot food, toilets, overnight accommodation and if camping adjacent to the track is permissible may be included.

## Unsuccessful Application

About two weeks before the meeting your sae will arrive on your door step. Inside

you will find your cheque and maybe an explanation to why you were not successful, without exception it will be that the meeting was oversubscribed and your application arrived too late.

**The Race Day**

On arrival at the track let the organisers know you have arrived, there may well be a specific time stated to do this. Arrive early enough to have a practice, there maybe as many as fifteen other drivers who on the day will be on the same crystal colour as yourself so you may have to queue. If you are unable to practice at least walk round

the track to see if there is any part that you can foresee may give you problems, for example there may be a jump of chicane or a surface you have not experienced before. Next item on the agenda is the drivers briefing which is important you attend as the rules of the meeting will be explained. The organisers will explain their start procedure, penalties, marshalling, method of protest, scrutineering and any local rules they have. Questions from the drivers will be invited so if you have one do not be shy to ask. Once the drivers briefing is over you will then be on your own, normally there will be a heat every seven minutes so have your car ready before the end of the heat

previous to the one you are racing in. At a large meeting the organisers have a tight schedule and with drivers having travelled long distances they need to finish early and in daylight so they will not wait for you if you are not quite ready. Remember the race will take place whether or not you are on the line.

**Automatic Lap Counting**

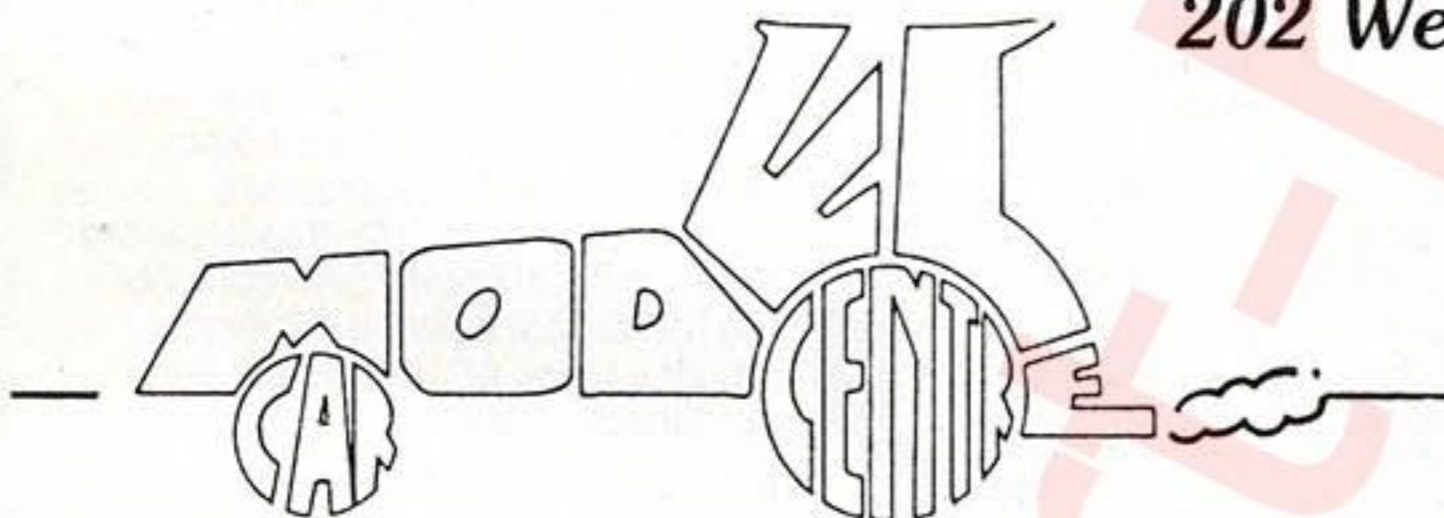
Unless you come from a very rich club you will have not come across the system. Its simple in theory, each car is fitted with a small (about the size of a 2p) transponder which signals to the lap counter computer each time you complete a lap. The transponders cost about £18.00 each and therefore there are not sufficient to give each driver one at the start of the meeting so they have to be fitted before each race and taken off when the race is over. The device is fitted to the car body after a 5 mm hole has been drilled in it. The hole is drilled by the organisers and the transponder held in place with a body clip. It is essential you have yours fitted to your car whilst the heat prior to yours is in progress and your car returned immediately your race is complete to have it removed. You should leave your car whilst this is happening as you will be required to marshal.

**Final Advice**

Any large event gives you at least a hour between heats so don't worry about your car whilst marshalling just concentrate on your particular section of track, above all enjoy your day and if you win a trophy I can assure you it is the one you will remember throughout your racing career.



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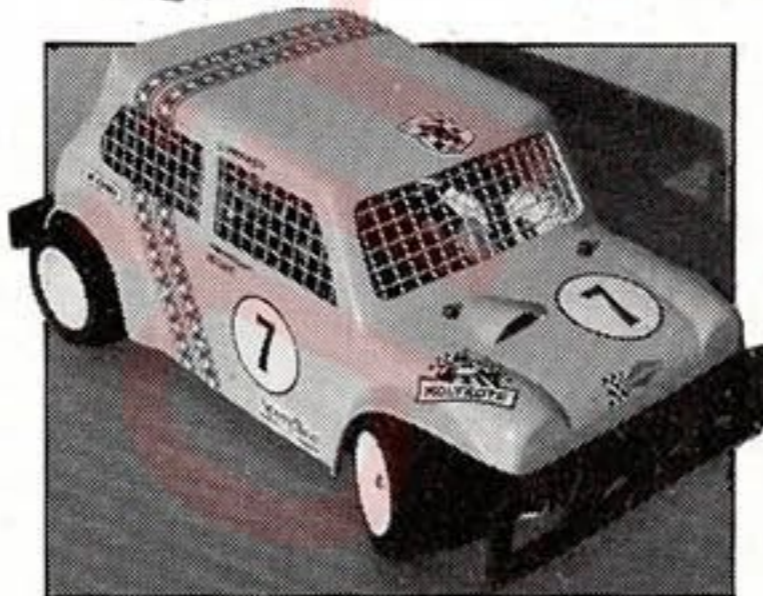


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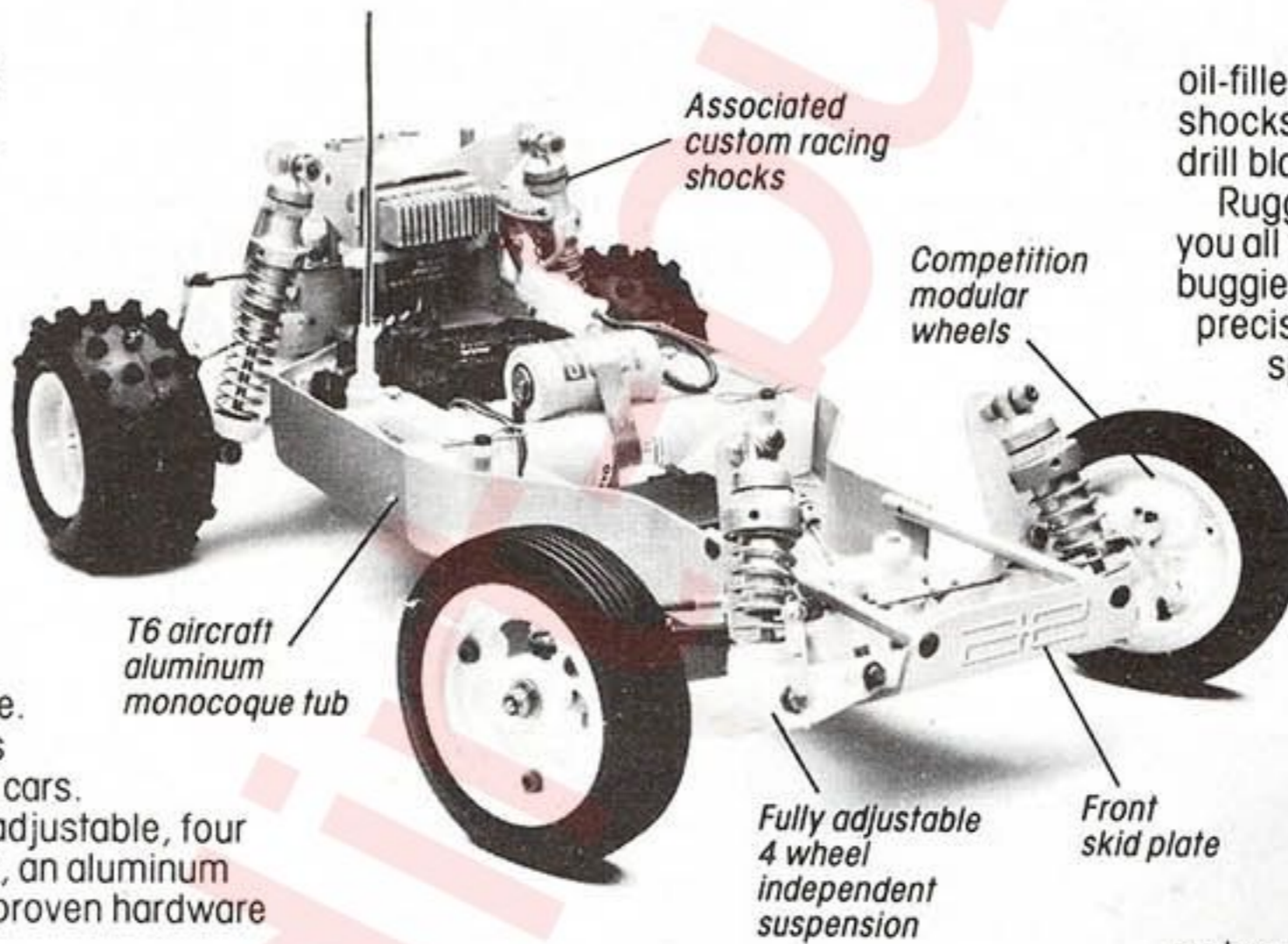
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RK4 Front Gear Box ..... £3.50  
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RK7 Knuckle Arm Set ..... £5.95  
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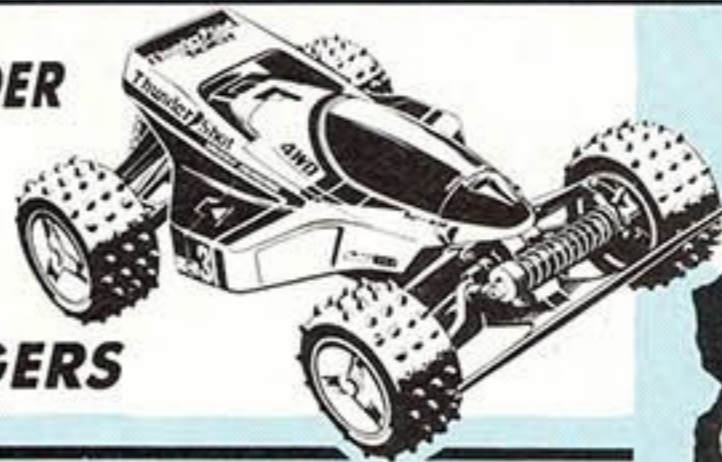
Prices correct at time of going to press, but prices charged will be those ruling on date of despatch

# OTLEY Modelsport

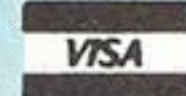
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Falcon	£64.00	£124.00	£130.00	—
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Meteor (Comp.)	£53.00	£113.00	£119.00	—
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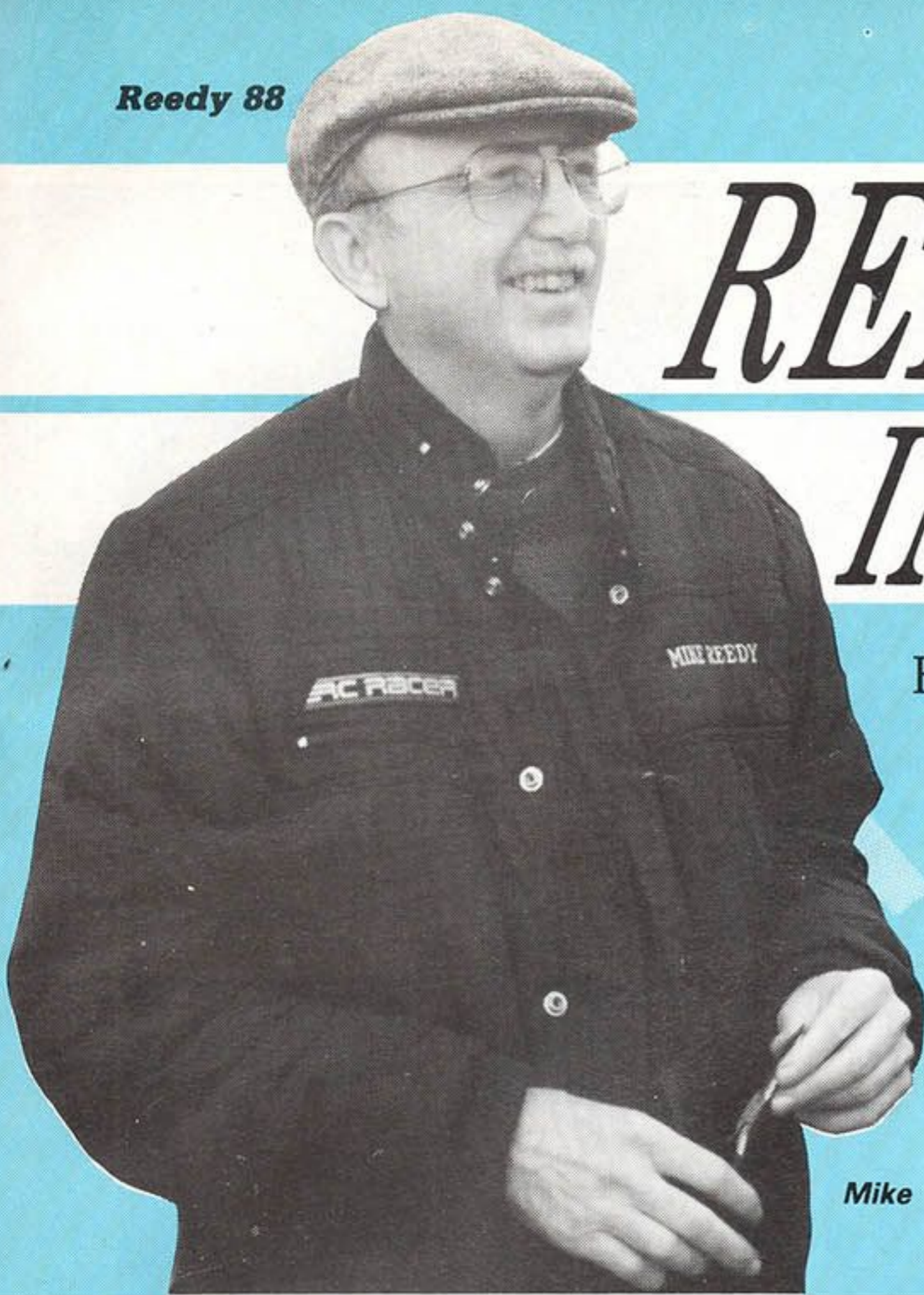
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# REEDY SPRING INTERNATIONAL



Radio Race Car reports from the Reedy Spring International at Romsey.

Mike "motor man" Reedy himself, the events sponsor.

vered a very simple solution to all this, the soil surface was actually bound together with old engine oil and oil and water as everybody knows just doesn't mix. In fairness it must be said that as the rain fell then so did the sawdust, this dried the track out and gave the extra grip that some were searching for. By this stage Masami Hirosaka had unveiled the new Yokomo 4WD car and given it an airing, both he and it looked very, very good!

### Thursday, Friday, Saturday

Thursday dawned and qualifying heats began with 2WD rounds, the track was giving a modicum of grip and lap times for the leaders were very high, Mark Mainey doing brilliantly to finish the day in sixth position, watch out for Mark in future Radio Race Car rounds, he's really going well at the moment. Round two saw little change and at midday the first round finished with one lap separating the top twenty drivers, that's close!

### Positions After Two Rounds — 2WD

1	Masami Hirosaka	16	308.95
2	Pete Stevens	16	317.58
3	Cliff Lett	16	318.60
4	Steve Haynes	15	304.06
5	Jamie Booth	15	305.03
6	Mark Mainey	15	306.10
7	Kris Moore	15	307.00
8	Craig Drescher	15	307.13
9	Klaus Wilhelm	15	307.55
10	Eustace Moore	15	309.08
11	Rory Cull	15	309.13
12	Glyn Pegler	15	311.30
13	Christian Keil	15	312.23

Once again the most spectacular European international event of the year was hosted by the Romsey Off Road Buggy Club. The event in question, the Reedy Spring International.

Driving at Romsey really is a test of both driver and machine. First and major problem is the track surface, generally the surface is hard packed soil with a liberal coating of fine dust or grit, as you can imagine this makes traction a little difficult and is rather like trying to find grip on a mixture of ball bearings and ice. However, after heavy rainfall the track is liberally coated with sawdust to soak up the rain, this does give excellent traction and most drivers set their best times whilst the track was in this condition.

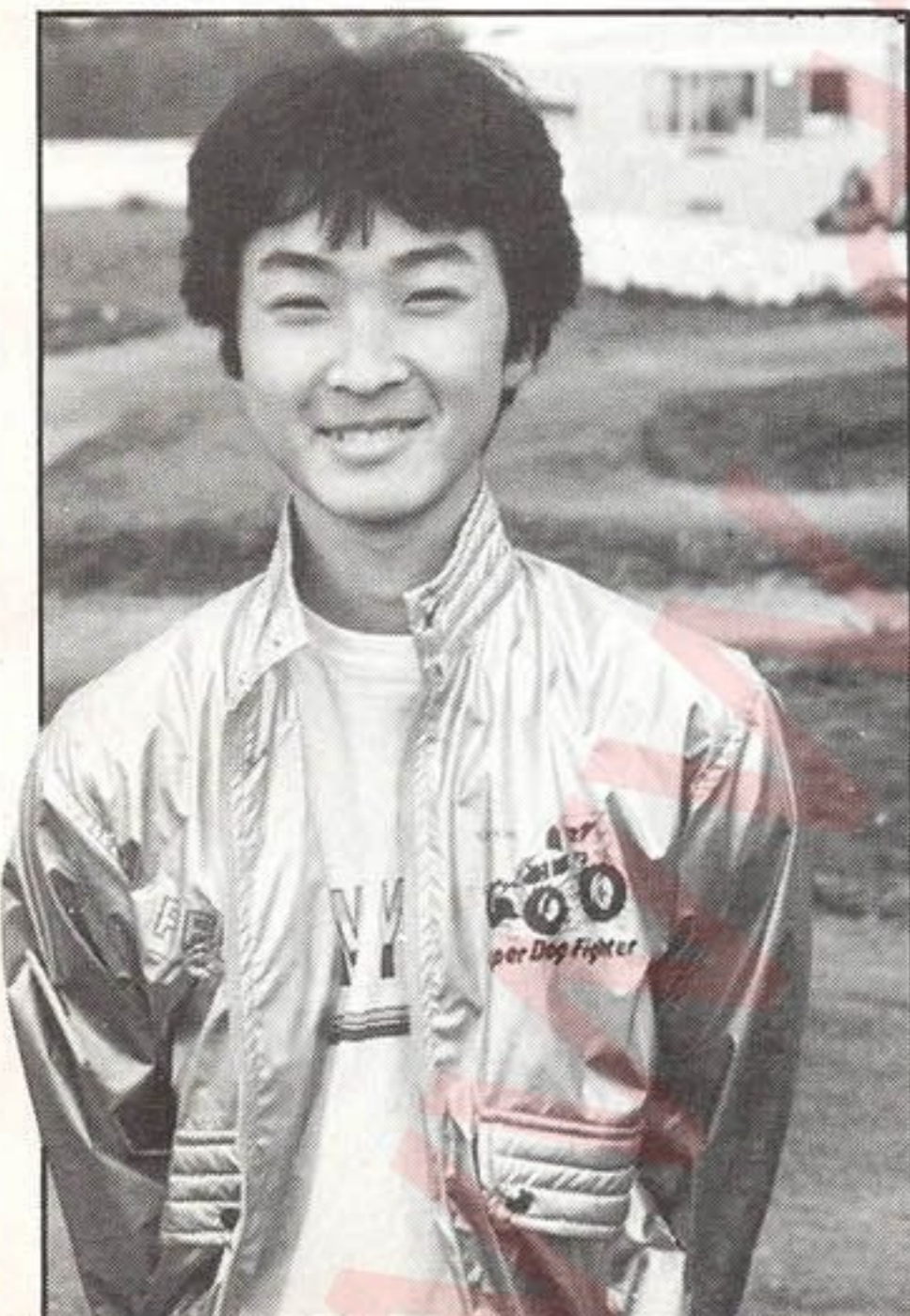
### Seven Days makes One Week?

The event began with three complete days of open practice, Monday and Tuesday saw glorious weather and a dry track, most drivers took the chance to try several combinations of tyres on the slippery Romsey surface, it also gave all present a chance to find the right line around a very different Romsey circuit to that which the World Championship was run on.

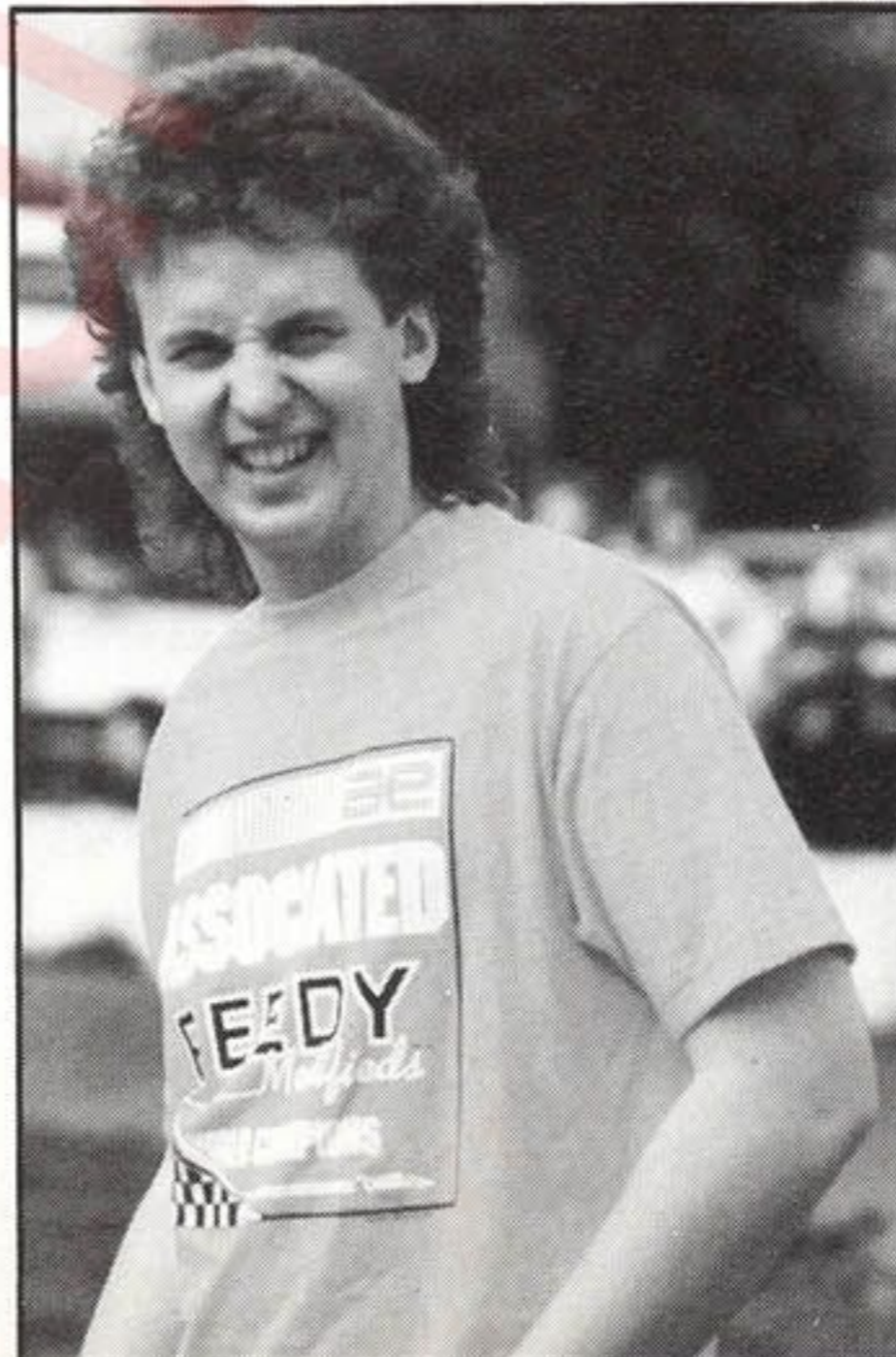
### Wednesday

Wednesday again was practice day, it also saw the arrival of rain, or at least drizzle. This produced an answer to most drivers questions concerning the amount of extra grip on a wet track, there wasn't any. In fact it was worse, there was, we later disco-

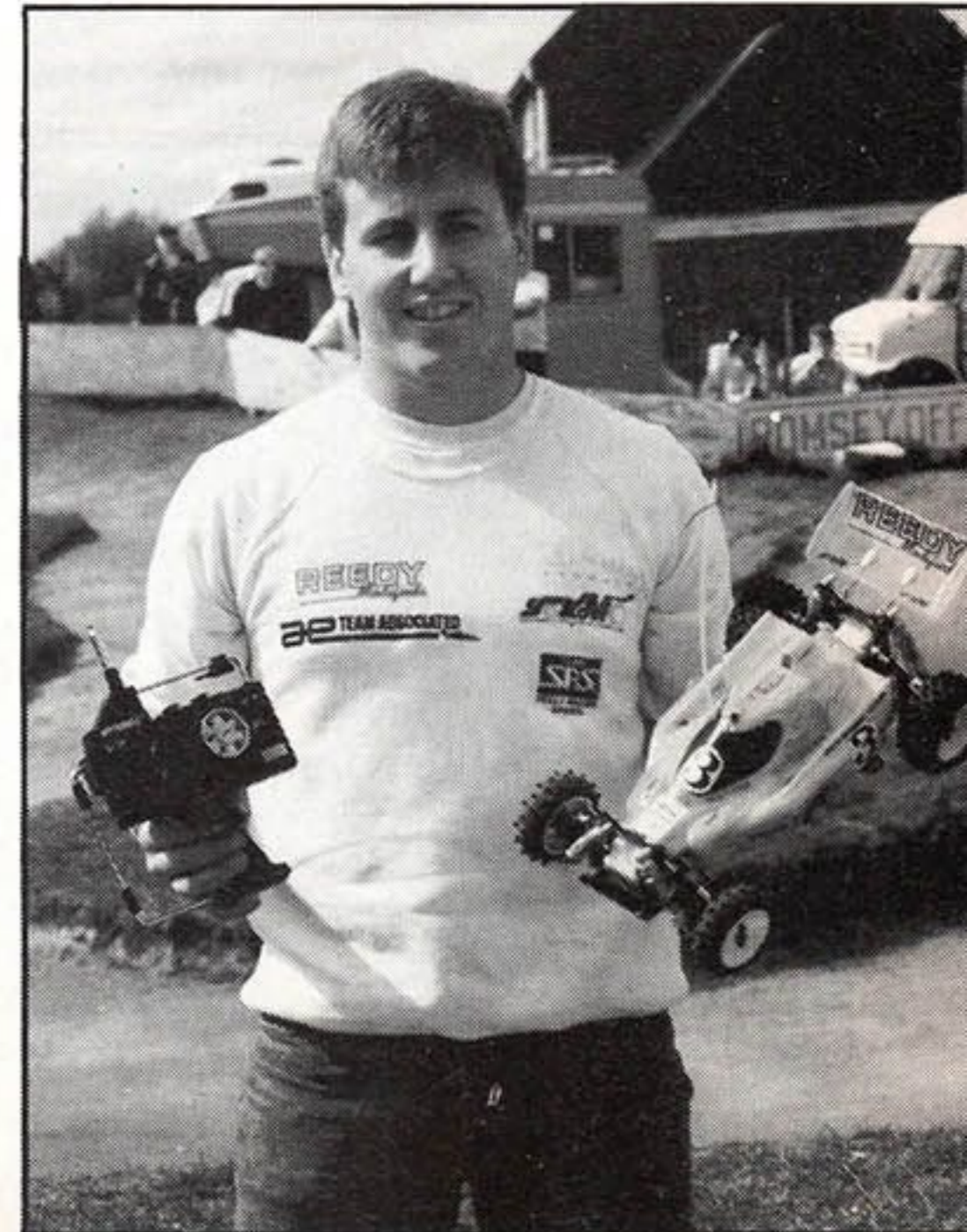
Masami Hirosaka, the master.

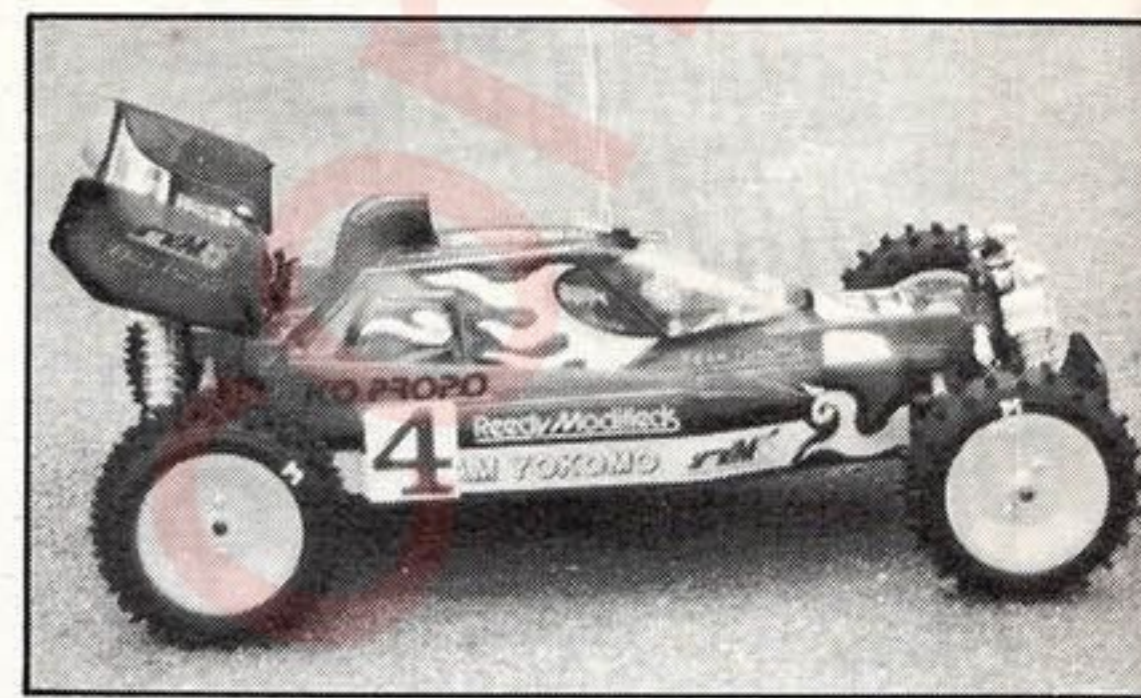


Jamie Booth, whats he thinking here?



Butch Klobner, always smiling.





Above, all the conquering Yokomo sporting a superb paint job. Left, 2WD A finalists left to right Pete Stevens, Masami Hirosaka and Cliff Lett. Below, 4WD A finalists left to right Jamie Booth, Masami Hirosaka and Butch Klober.

14	Mike Burnette	15	312.81
15	Lawrence Harris	15	313.63
16	Andrew Langdon	15	314.03
17	Tony Wells	15	314.20
18	Richard Isherwood	15	315.45
19	Phil Davies	15	315.65
20	Butch Klober	15	315.83

4WD rounds began at 1 pm and straight away times were fast with fifteen and sixteen laps from the word go, there were exceptions to this with four drivers turning the magic seventeen laps, those drivers were Jason Varley, Butch Klober, Jamie Booth and Masami Hirosaka. Final positions after day one were;



**Positions After Two Rounds — 4WD**

1	Masami Hirosaka	17	306.26
2	Jamie Booth	17	316.40
3	Butch Klober	17	321.53
4	Jason Varley	17	321.73
5	Cliff Lett	16	300.41
6	Jürgen Lautenbach	16	301.48
7	Jürgen Metz	16	303.38
8	Glyn Pegler	16	303.85
9	Kevin Moore	16	304.70
10	Klaus Wilhelm	16	306.73
11	Tony Wells	16	307.28
12	Pete Stevens	16	308.33
13	Richard Isherwood	16	308.81
14	Michael Bridges	16	309.25

15	Steve Haynes	16	309.30
16	Mark Mainey	16	309.86
17	Jason Green	16	310.96
18	Kris Moore	16	311.05
19	Lawrence Harris	16	311.13
20	Andrew Langdon	16	313.71

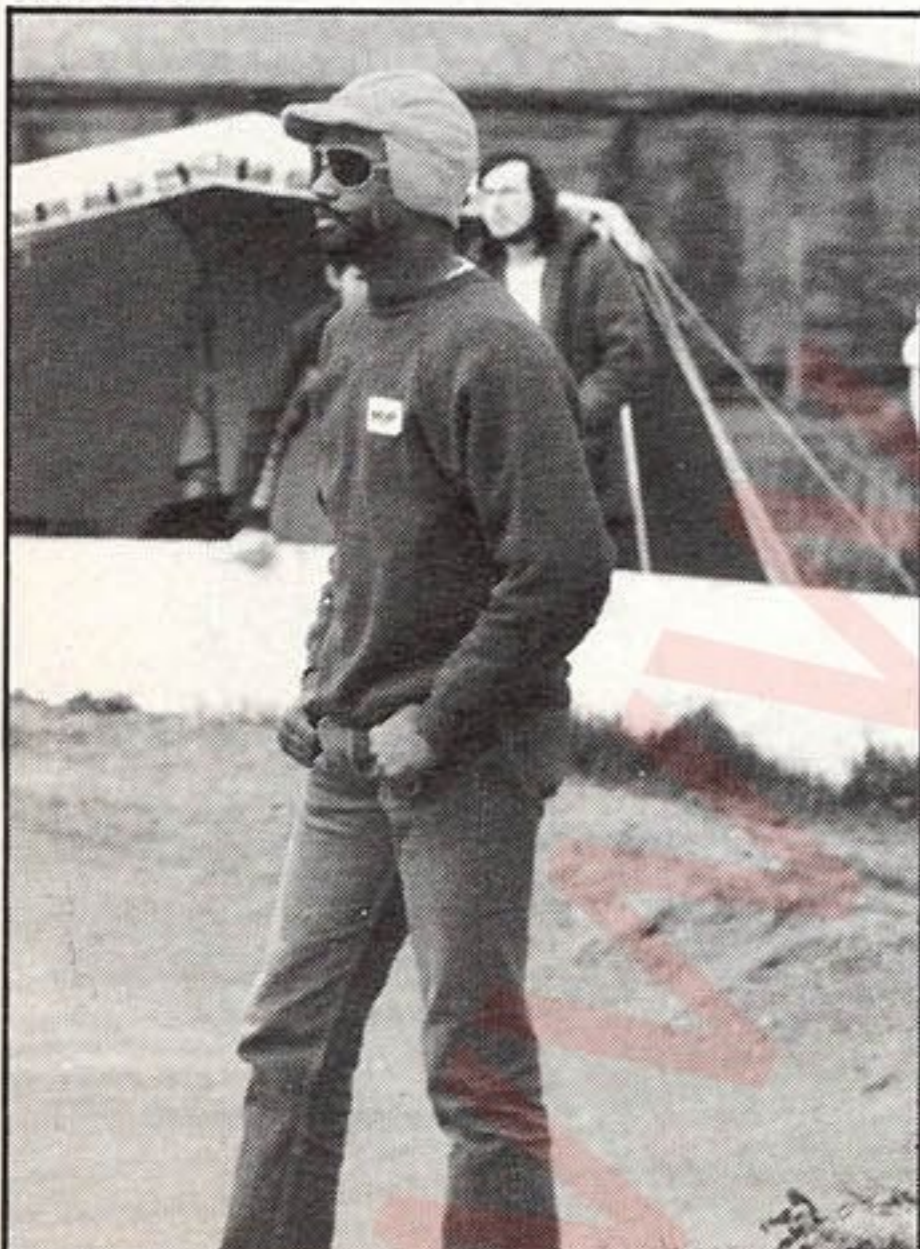
Friday continued much the same with most drivers improving their times if not their positions, still the seventeen lap club only had four members.

**Positions After 4 Rounds — 2WD**

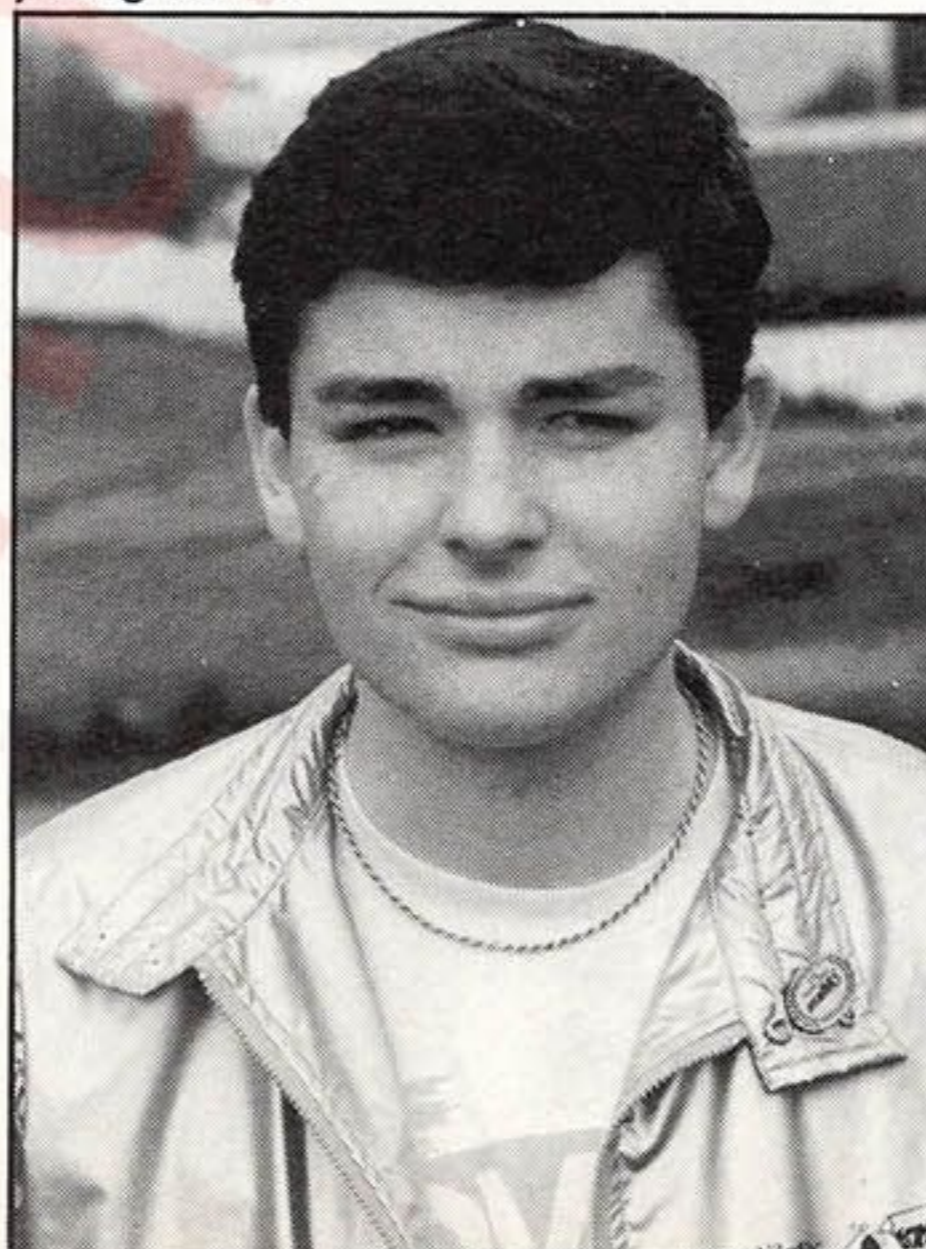
1	Masami Hirosaka	16	308.95
2	Pete Stevens	16	317.58

3	Cliff Lett	16	318.6
4	Steve Haynes	15	304.06
5	Kris Moore	15	304.85
6	Jamie Booth	15	305.03
7	Mark Mainey	15	306.10
8	Craig Drescher	15	307.13
9	Klaus Wilhelm	15	307.55
10	Euastace Moore	15	309.08
11	Rory Cull	15	309.13
12	Glyn Pegler	15	311.30
13	Christian Kiel	15	312.23
14	Mike Burnette	15	312.81
15	Lawrence Harris	15	313.63
16	Andrew Langdon	15	314.03
17	Tony Wells	15	314.20

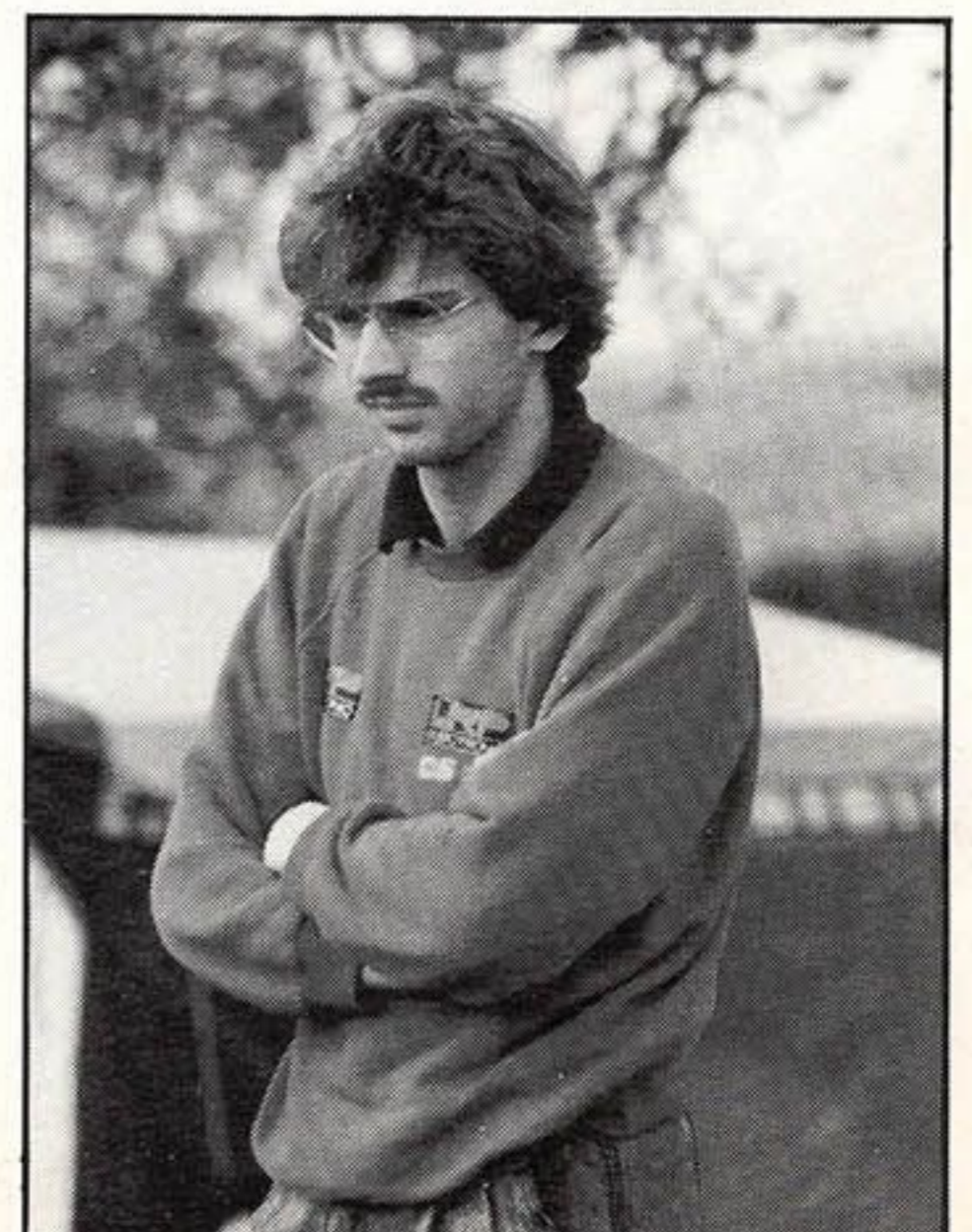
Eustace Moore complete with head warmer.

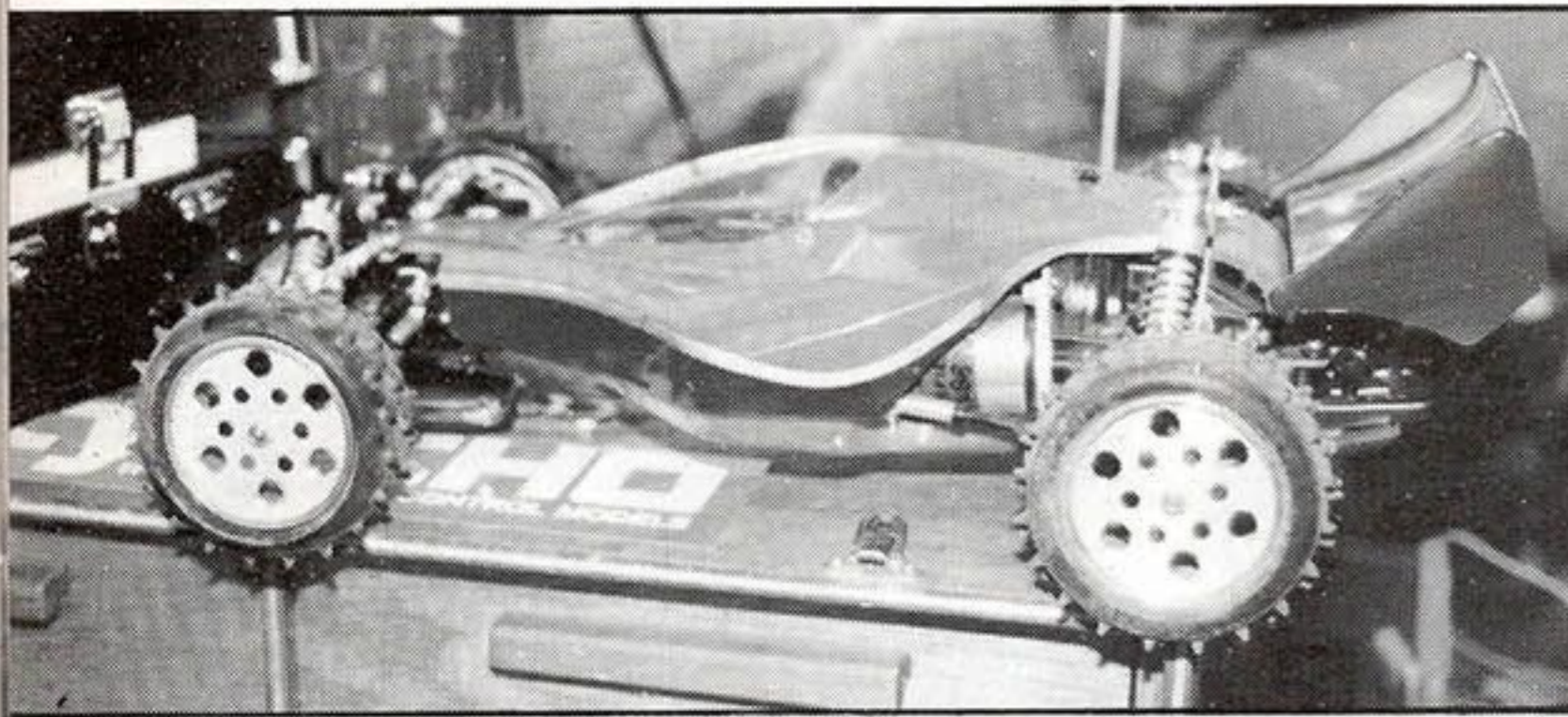


Jason Varley a great achievement for this young driver.

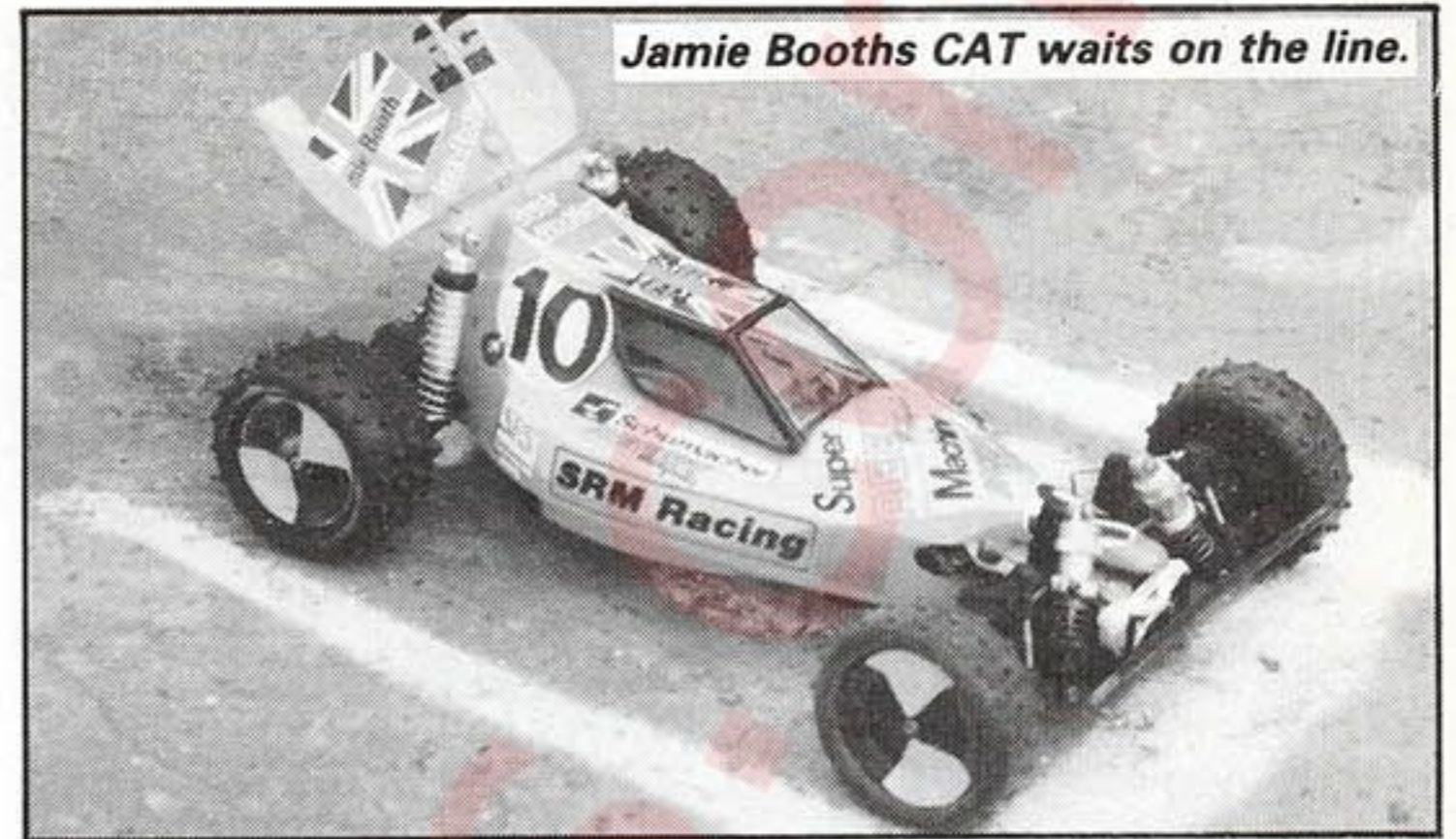


Jürgen Lautenbach in pensive mood.





Tamiyas latest car the Avante was put through its paces for the first time on a UK circuit.



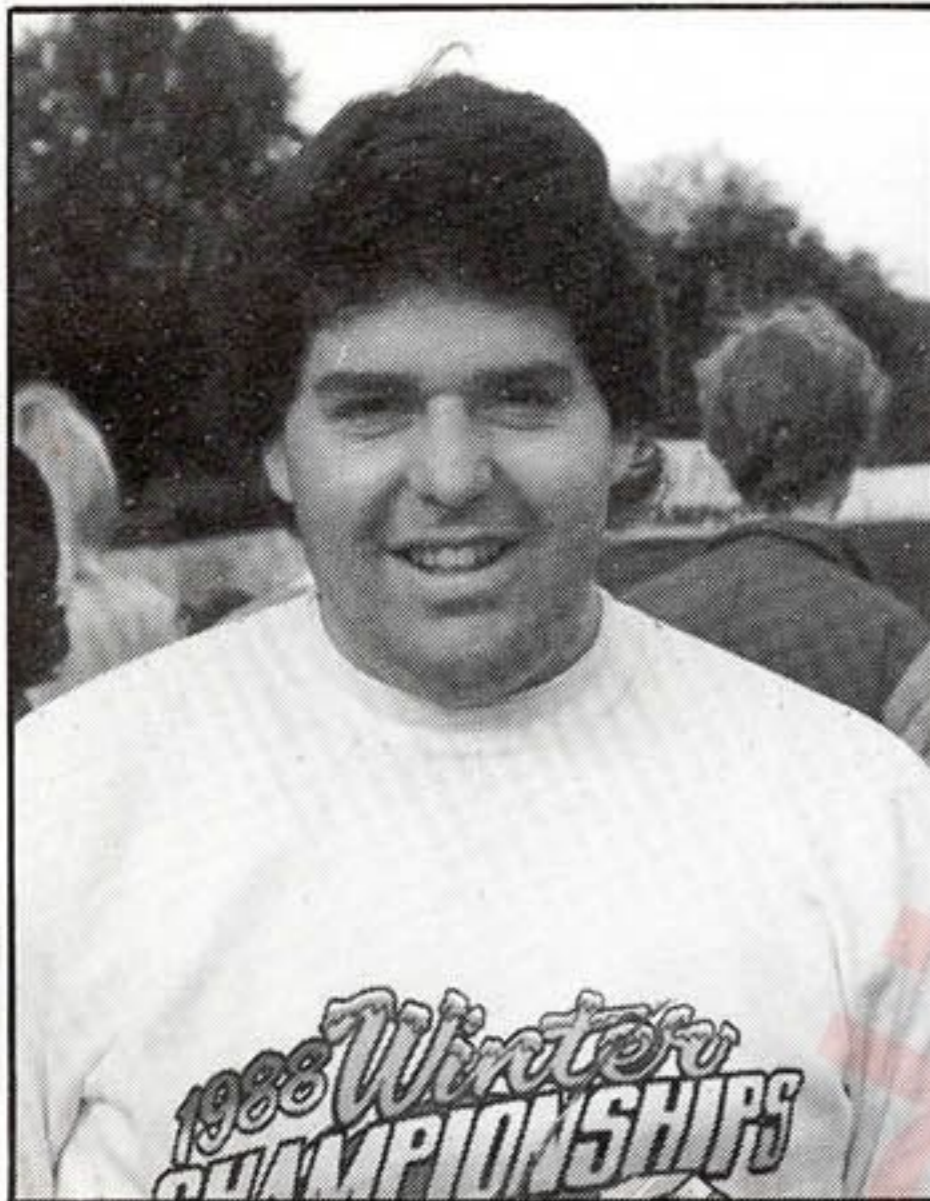
Jamie Booths CAT waits on the line.

18	Nino Athanasiou	15	314.83
19	Richard Isherwood	15	315.45
20	Phil Davies	15	315.65

**Positions After Four Rounds — 4WD**

1	Masami Hirosaka	17	306.26
2	Jamie Booth	17	316.40
3	Butch Klober	17	321.53
4	Jason Varley	17	321.73
5	Cliff Lett	16	300.41
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9	Klaus Wilhelm	16	306.73
10	Jürgen Lautenbach	16	307.05
11	Tony Wells	16	307.28
12	Pete Stevens	16	308.33
13	Richard Isherwood	16	308.81

Kris Moore current 2WD World Champion.



14	Michail Bridges	16	309.25
15	Steve Haynes	16	309.30
16	Jason Green	16	310.96
17	Kris Moore	16	311.05
18	Lawrence Harris	16	311.13
19	Andrew Langdon	16	313.71
20	Tim Walden	16	313.80

Saturday and rain had set in to the point where the dreaded infield section was under water by about three inches, infact someone began sailing an R/C boat! It must be mentioned here that most people believed the days racing would be abandoned, however not Bill Jones, he promptly hired a pump to move the worst of the water, swept off the rest of the track, applied liberal amounts of sawdust and away we all went now that cant be bad. The sawdust did improve the grip, strangely enough though times remained about the same and Sunday saw the top drivers qualify in following A Final positions.

**Sunday, Finals Day**

Once again dry weather brought a low grip circuit. 2WD finals were held first with a crowd of onlookers already starting to grow. As usual in this type of event the A Final was held over three legs with ten points to the winner running down to one point for tenth place.

**Result Of Three Leg A Finals 2WD**

1	Masami Hirosaka	16
2	Cliff Lett	15
3	Pete Stevens	15
4	Michael Bridges	15
5	Steve Haynes	14
6	Klaus Wilhelm	14
7	Darron Harris	14
8	Lawrence Harris	14
9	Kris Moore	14
10	Butch Klober	13

1	Masami Hirosaka	16
2	Butch Klober	15
3	Kris Moore	15
4	Steve Haynes	15
5	Cliff Lett	15
6	Lawrence Harris	14
7	Pete Stevens	14
8	Darron Harris	14
9	Michael Bridges	14
10	Klaus Wilhelm	13

1	Masami Hirosaka	15
2	Pete Stevens	15
3	Kris Moore	15
4	Cliff Lett	15
5	Klaus Wilhelm	15
6	Steve Haynes	15
7	Butch Klober	15
8	Darron Harris	13
9	Lawrence Harris	04
10	Michael Bridges	04

**Final Positions**

Masami Hirosaka	30 Points
Pete Stevens	21 Points
Cliff Lett	20 Points
Steve Haynes	18 Points
Kris Moore	18 Points
Butch Klober	14 Points
Klaus Wilhelm	12 Points
Mike Bridges	10 Points
Darren Harris	10 Points
Lawrence Harris	10 Points

**Result of Three Leg A Finals 4WD**

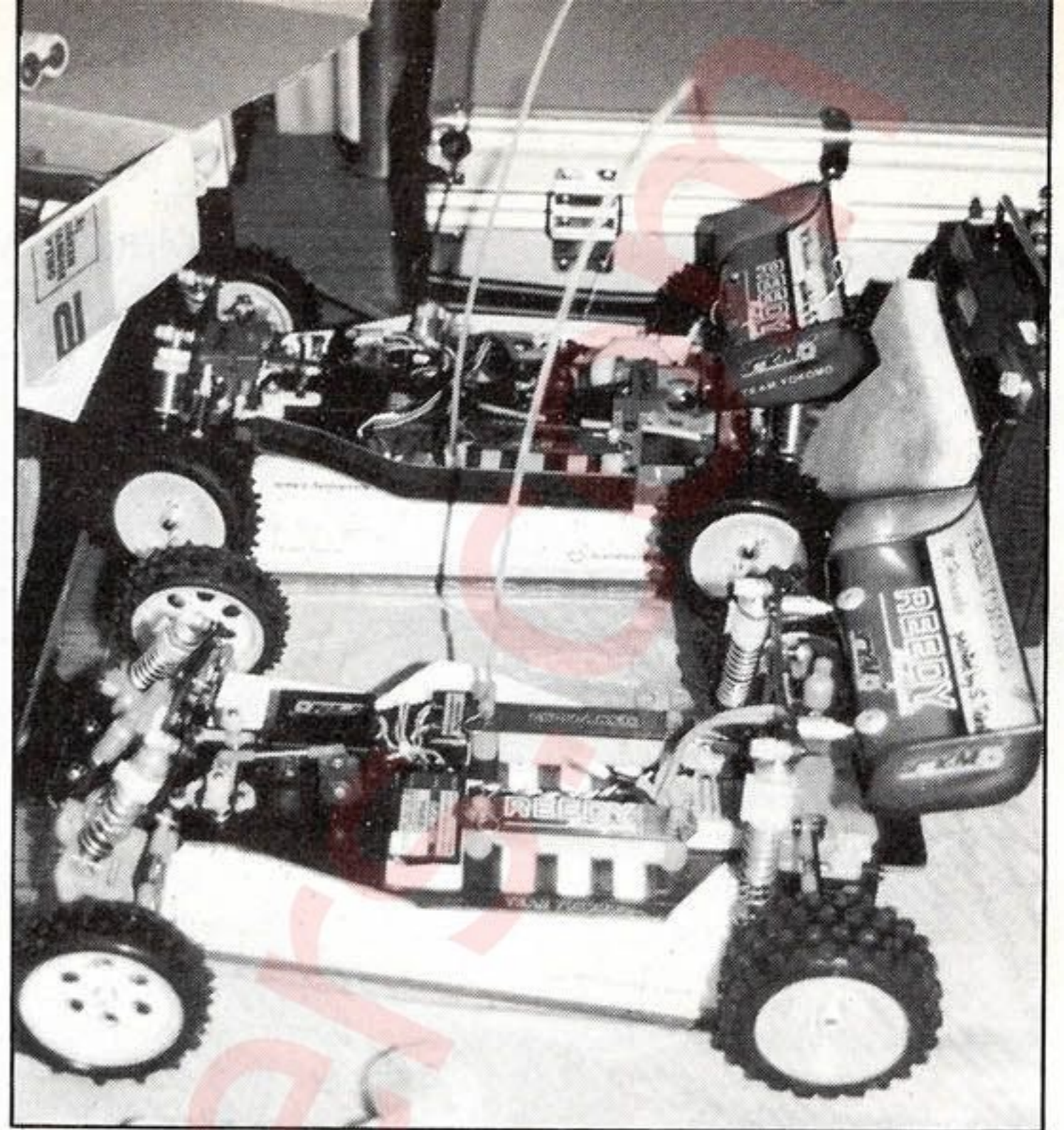
1	Jamie Booth	16
2	Butch Klober	16
3	Masami Hirosaka	16
4	Cliff Lett	16
5	Jason Varley	16
6	Klaus Wilhelm	16
7	Jürgen Metz	16
8	Jürgen Lautenbac	15
9	Glyn Pegler	15
10	Kevin Moore	15



A clean start as seven cars make it around the first bend.



**Reedy 88**



*Hirosaka may well smile, after all he cleaned up taking 4WD, 2WD and overall winner trophies and these are the cars that did it for him the legendary RC10 and the new legend the 4WD Yokomo.*

1	Masami Hirosaka	17
2	Butch Klober	16
3	Klaus Wilhelm	16
4	Jamie Booth	16
5	Jürgen Lautenbac	16
6	Jason Varley	16
7	Glyn Pegler	15
8	Jürgen Metz	15
9	Kevin Moore	15
10	Cliff Lett	11
1	Cliff Lett	16
2	Masami Hirosaka	16
3	Jamie Booth	16
4	Kevin Morre	08
5	Jürgen Metz	15
6	Jason Varley	15
7	Jürgen Lautenbac	15
8	Glyn Pegler	15
9	Klaus Wilhelm	15
10	Butch Klober	12

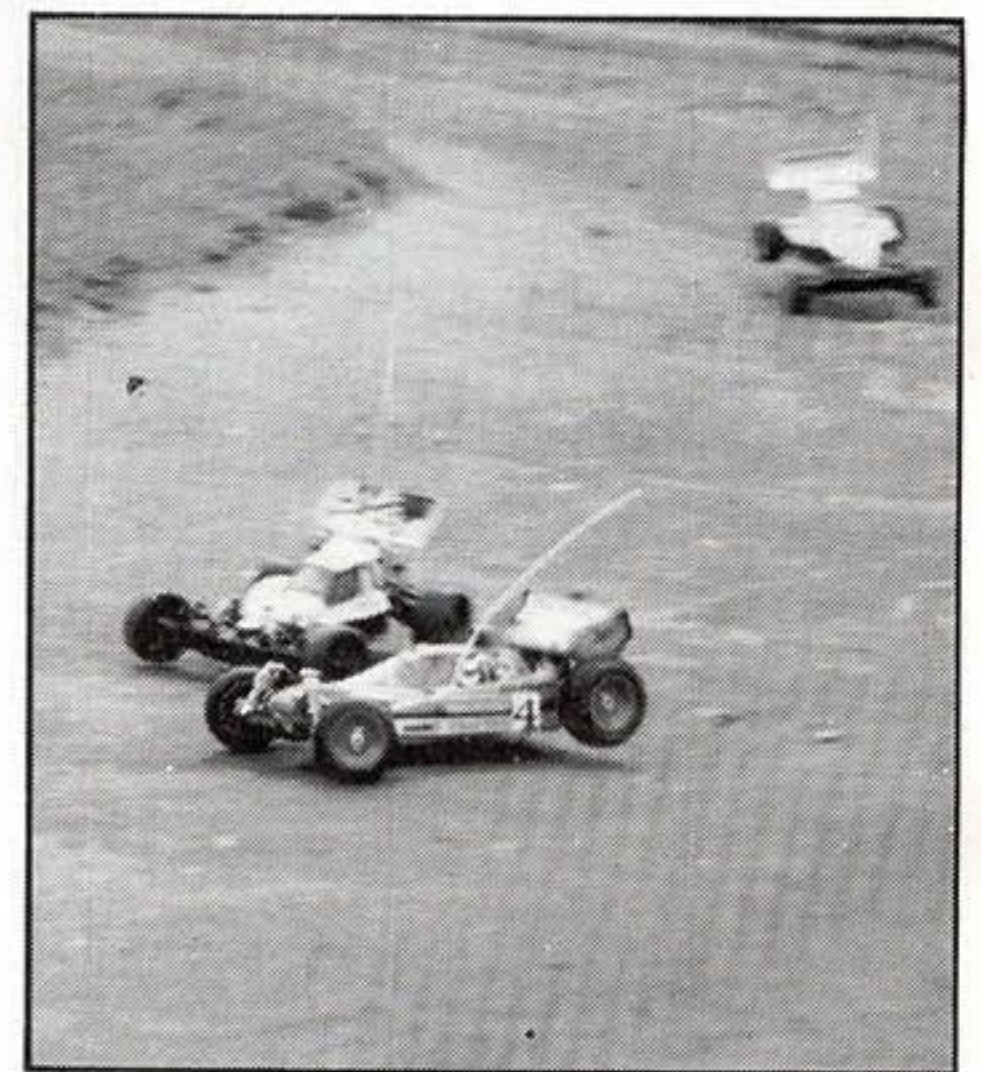
So ended a great weeks racing. There were several points worthy of note first the drivers, Hirosaka was of course brilliant driving cleanly and with genius all week, the same must be said of Jason Varley, Jamie Booth and Butch Klober after all they all turned in seventeen laps at one stage, anyone who can do that on the Romsey surface has got talent.

The cars, well the giant killer at Romsey was without doubt the new Yokomo 4WD

wonder Dogfighter, Klober's, Varleys and Hirosakas all looked so stable and controlled on the Romsey track. It is also worthy to note that several mid 4s were tried, tested and replaced with CAT's! Masami Hirosaka will be with us all for some time yet, he is without doubt a worthy Champion, taking both 2 and 4 WD titles. Results also show other, younger names to watch out for, you have been warned!

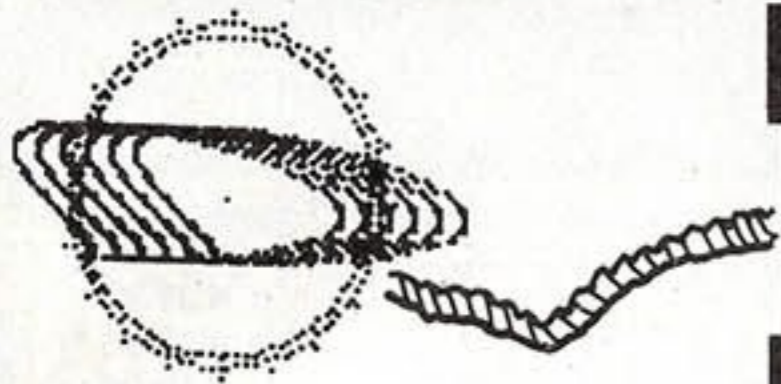
**Final Positions**

Masami Hiroshaka	27 Points
Jamie Booth	25 Points
Butch Klober	19 Points
Cliff Lett	18 Points
Jason Varley	16 Points
Klaus Wilhelm	15 Points
Jürgen Metz	13 Points
Jürgen Lautenbac	13 Points
Kevin Moore	10 Points
Glyn Peglar	9 Points



**Tech Chart — Reedy Spring International 4WD**

Driver	Car	Cells	Motor	4WD Speedo	Servo	Tyres F	Tyres R
Masami Hirosaka	Yokomo	SCE	Reedy	KO	KO & Doubler	Yokomo	Yokomo
Jamie Booth	CAT	Schumacher	Reedy	Demon	131 SH	CAT	CAT
Cliff Lett	CAT	SCE	Reedy	Novak	131 SH	CAT	CAT
Butch Klober	Yokomo	SC's	Reedy	Novak	Airtronics	Yokomo	Yokomo
Jason Varley	Yokomo	Prime Time	Reedy	Novak	131 SH	Yokomo	Yokomo
Jürgen Lautenback	CAT	CS SCR's	LRP Blue/s	CS Rocket	131	CAT	CAT
Jürgen Metz	Optima	Kiel Pushed	Reedy	CS	Futuba 700	Kyosho	Kyosho
Glyn Peglar	LWD Optima	Lazer	Twister	Lazer	131	Kyosho	Kyosho
Kevin Moore	CAT	SCE	Reedy	Demon	131 SH	CAT	CAT
Klaus Wilhelm	UNAVAILABLE FOR COMMENT						



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HOTSHOT  
RC10

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for  
HOTSHOT  
WILD ONE

TS-2213  
Rear Tyre  
for  
FROG - HORNET  
GRASSHOPPER

TS-2214  
Rear Tyre  
for  
RC10 YOKOMO  
SCORPION MARUI

TS-2216 TS-2217 TS-2218  
Front Tyre  
for  
FROG - HORNET  
GRASSHOPPER RC10



TS-3311  
Front Tyre for  
HOTSHOT  
RC10



TS-3312  
Rear Tyre for  
HOTSHOT  
WILD ONE



TS-3313  
for  
TAMIYA FROG HORNET  
GRASSHOPPER  
SUPERCHAMP etc.



TS-3314  
for  
YOKOMO  
ASSOCIATED  
RC10



TS-2212S  
Rear Tyre for  
HOTSHOT KYOSHO

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for  
Tamiya RC10



WS-662  
Rear Wheel  
for  
RC10



WS-663  
Front Wheel  
for  
Hotshot PB



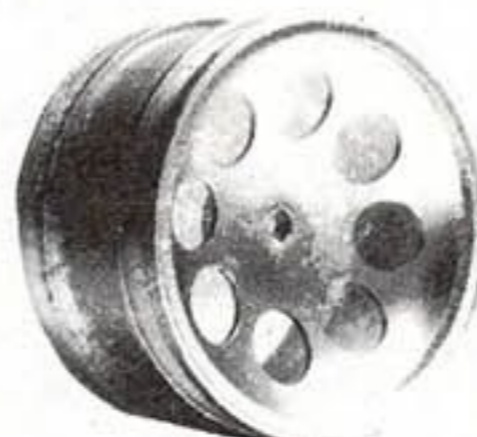
TS-2219  
On Road Rear Tyre  
for  
Frog Hornet  
Grasshopper



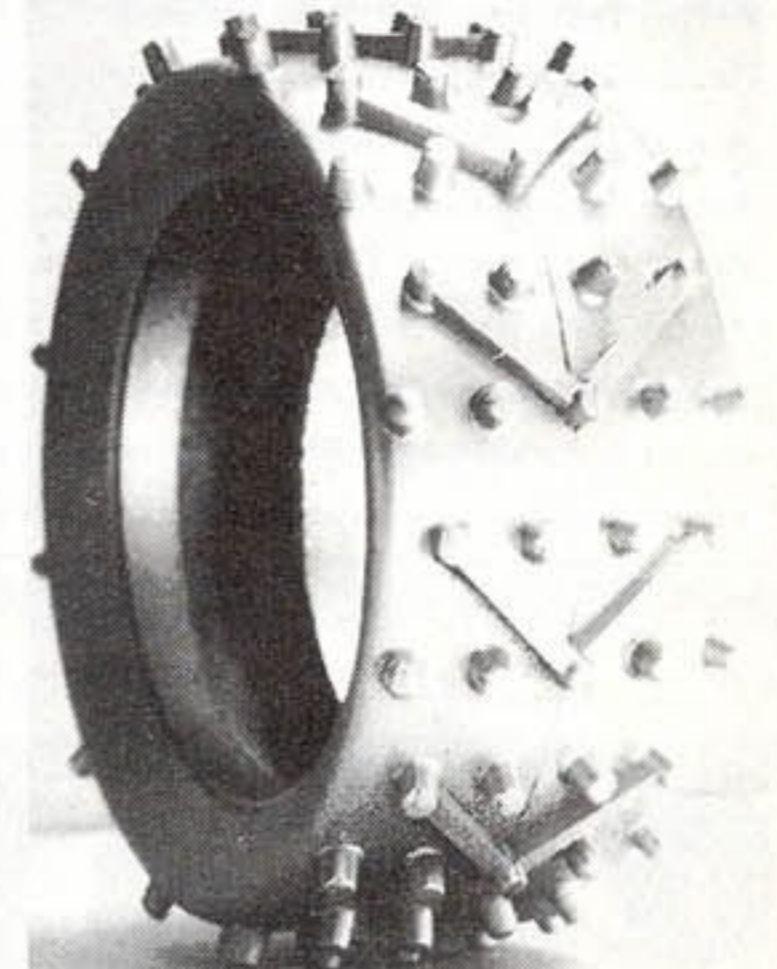
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Rear Wheel  
for  
Hotshot



WS-665  
Rear Wheel  
for  
Tamiya



WS-666  
Rear Wheel  
for  
Kyosho RC10



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3/16" x 5/16" O.D. S	3mm I.D. x 8mm O.D. S
3/16" x 5/16" O.D. F&S	4mm I.D. x 8mm O.D. S
1/4" x 3/8" O.D. S	4mm I.D. x 8mm O.D. F&S
1/4" x 3/8" O.D. F&S	5mm I.D. x 8mm O.D. S
1/4" x 1/2" O.D. F&S	5mm I.D. x 10mm O.D. S
	5mm I.D. x 11mm O.D. S
	6mm I.D. x 10mm O.D. S
	6mm I.D. x 10mm O.D. F&S
	6mm I.D. x 12mm O.D. S
	6mm I.D. x 13mm O.D. S

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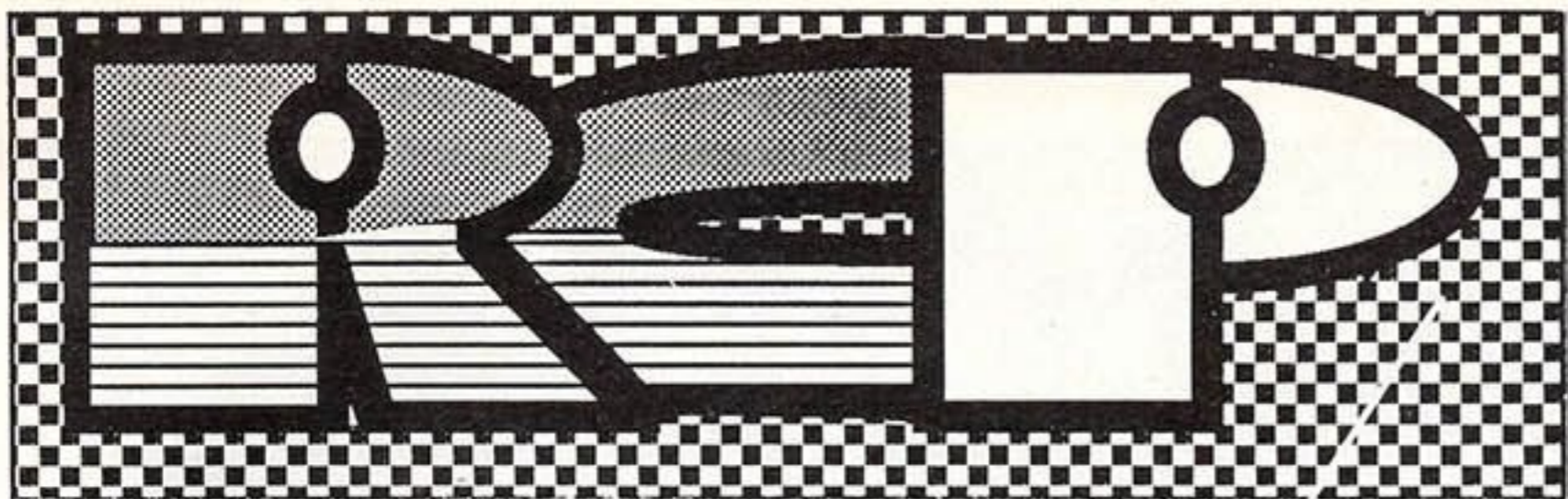


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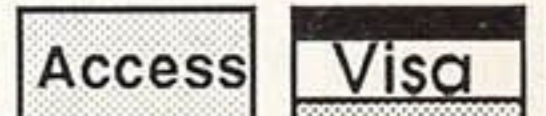
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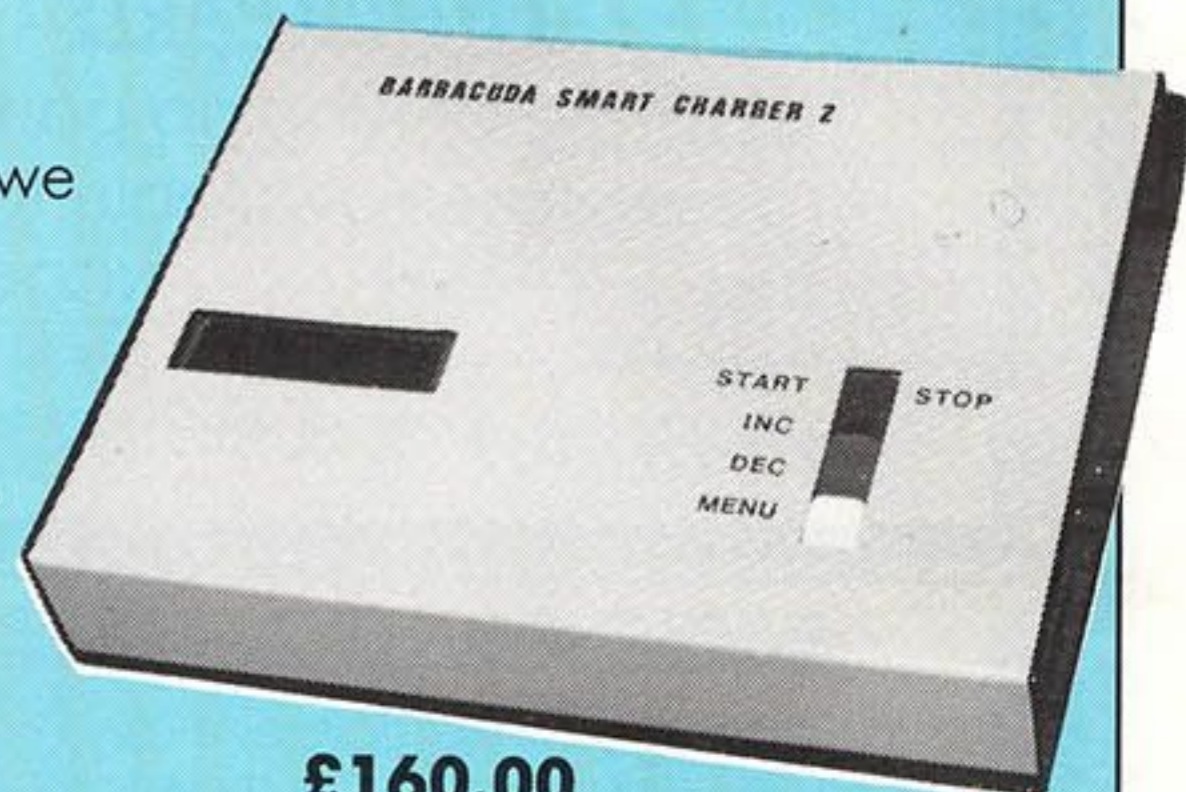
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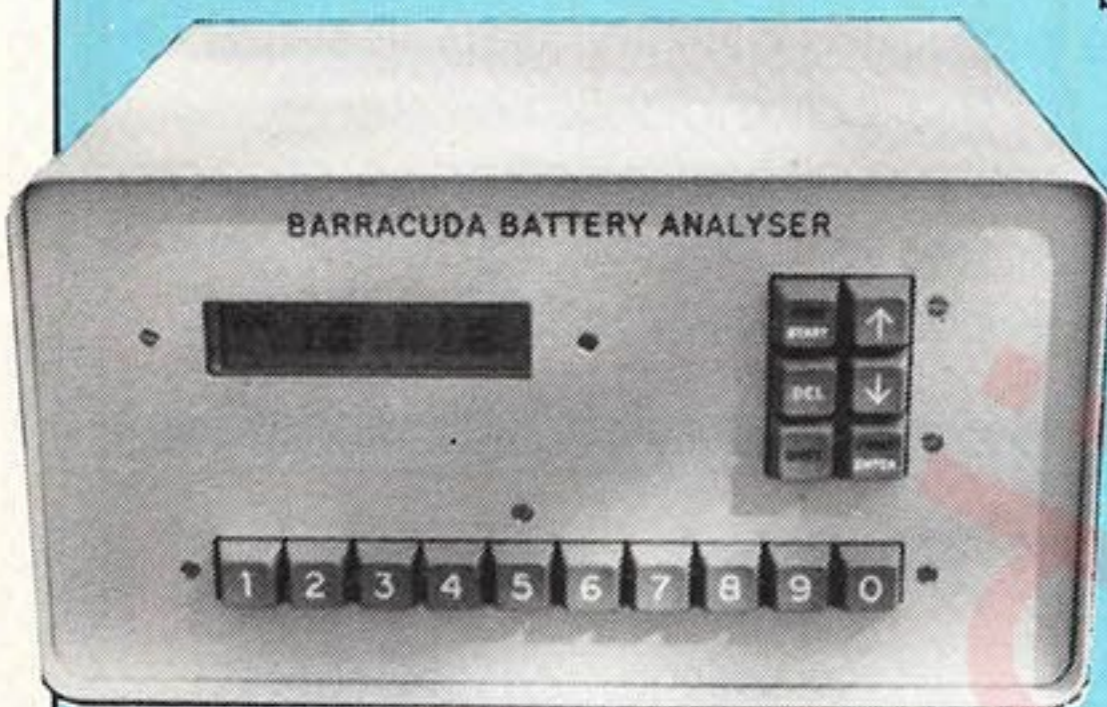
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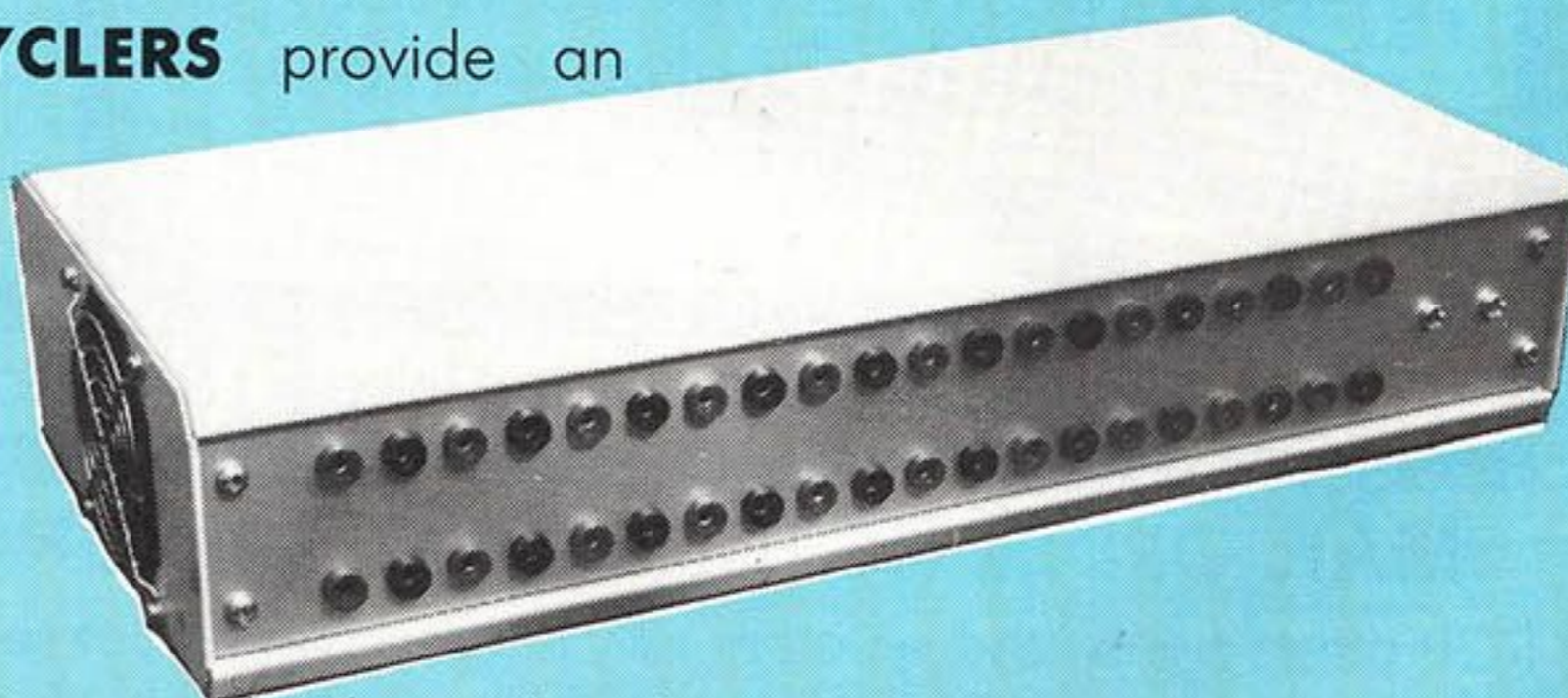
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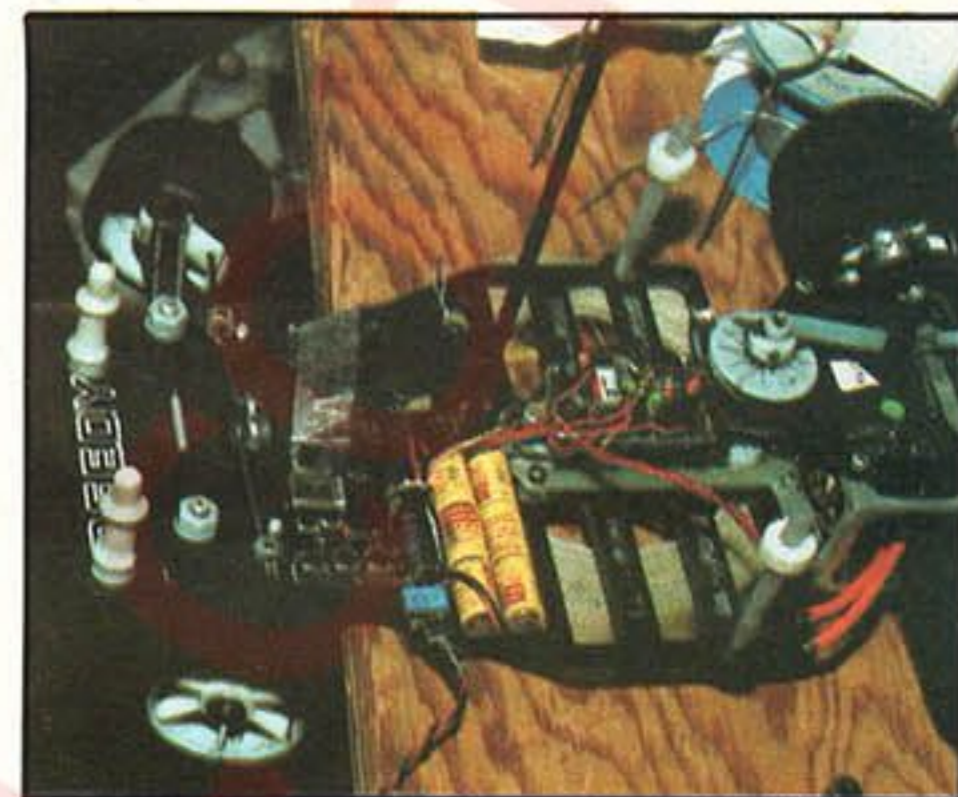
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# TRACK TALK

by Chris Evans



1987 Eurochampions car of Christian Kiel, once again winning no prizes for neatness.

cells (1200 mAh) we have at the moment. I believe all the new cells at present are from Tamiya, designated the EX, with some advertisements quoting 20%+ more capacity. If in the future the cells realise this extra capacity, and still provide the punch, I believe the whole face of 1/12 racing will



The victorious drivers; 1st (centre) Phil Davies, 2nd (left) Anders Nilsson, 3rd (right) Jürgen Lautenbach at the Eurochamps.

This "snip-it" of information should have gone into last month's issue but let me put the record right for everyone. No doubt you all know that a new Sanyo nicad has been developed, called the SCE. These new cells have a 1700 mAh capacity, compared to our normally rated 1200 mAh SC and SCR cells. At present there is a lot of

Winners of the junior event; 1st (centre) Søren Christiansen, 2nd (left) Peter Harder, 3rd (right) Boris Küntzler.

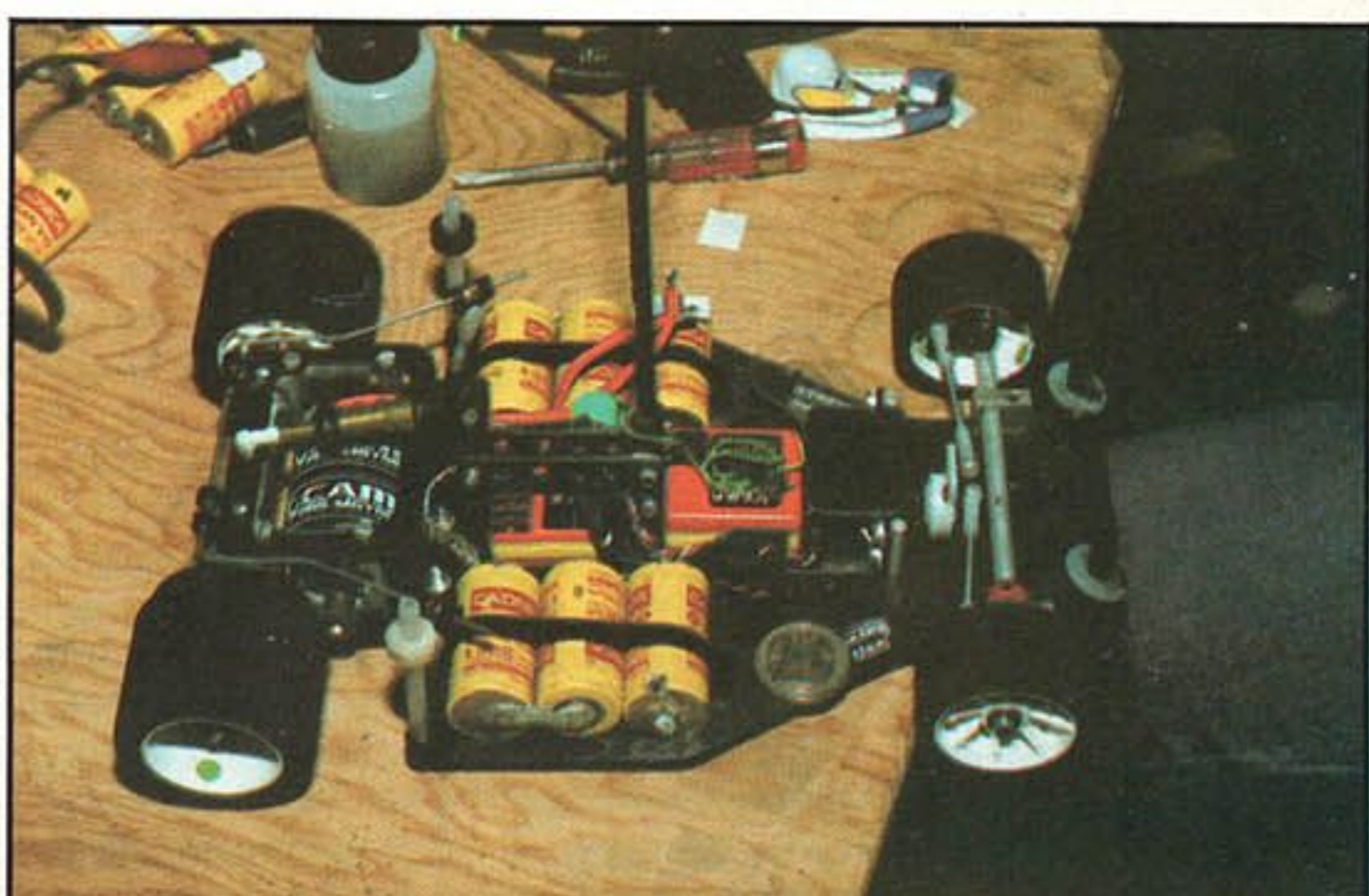
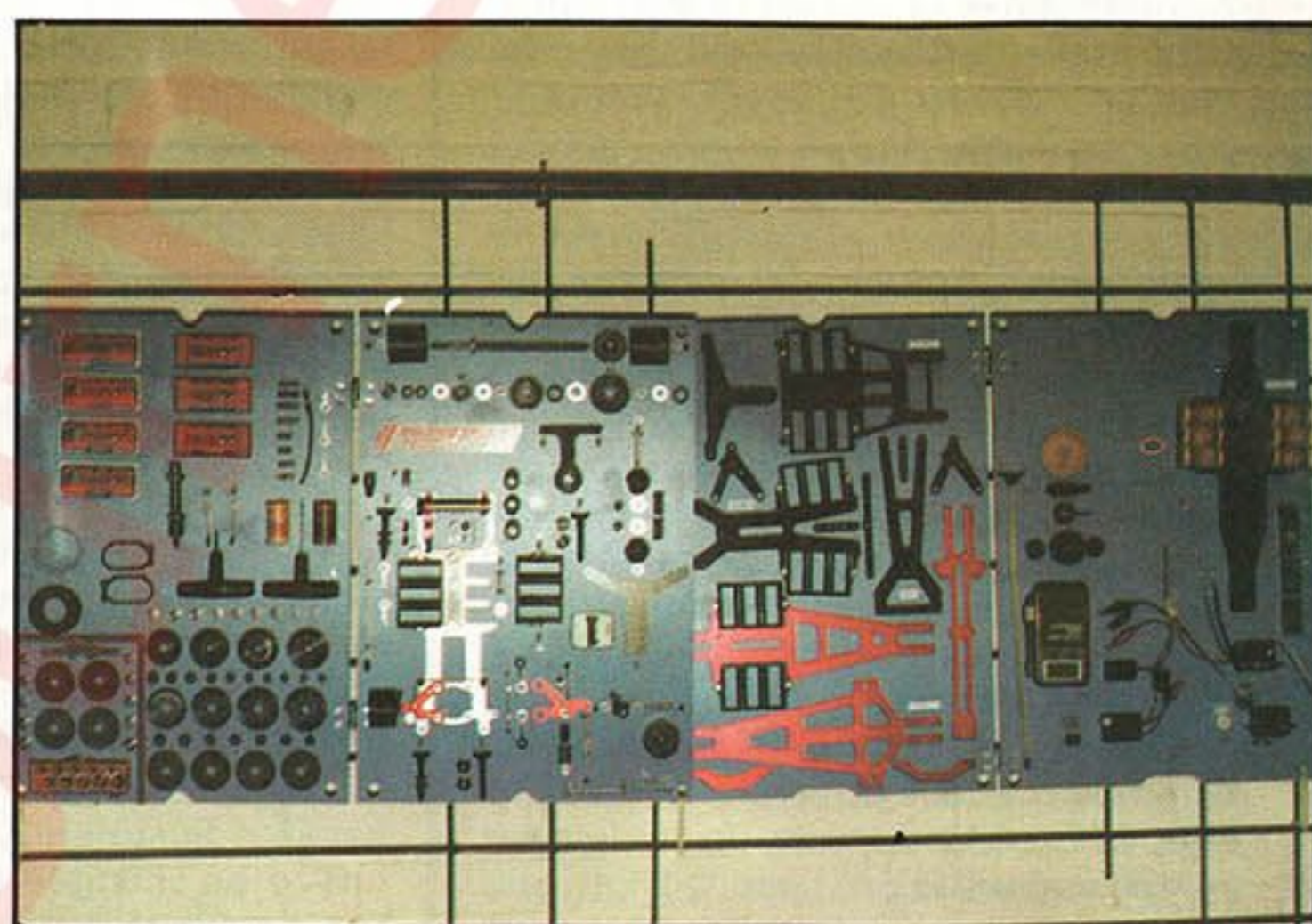
rumour and speculation about the new cells performance, ie. stacks of duration put no punch and so on. However, let us say the cells do give out virtually the same punch but give greater duration then these cells will obviously make our present SC's and SCR's obsolete, and much investment will be needed to replace cells but unfortunately this is the price of technology and you will never stop it.

At the moment, only a few selected outlets have the cells and it will take a few months yet before certain people get a large batch and start selecting and matching them and then a proper comparison can be drawn from them against the best

PK's impressive display of Corally item's and tune up parts for other brands of cars.

change. Just consider the last Nantwich National; everyone turns up on Saturday for modified, the grip is a bit low and the track bumpy and now you all have 20% extra power, and we are talking "Deathrace 2000" because even the most experienced driver with a well set up car is going to struggle to handle the extra power with our normal chassis set ups, which will I think see the development of some four wheel drive 1/12 cars or at least four wheel independent suspension.

Ron Schuur's interesting TRC car.



As I've said before, the last bit is purely a personal opinion and we have to wait to see how good the new SCE's really are, however at the last Watford Carpet League on February 20th, a majority of the 1/12 area representatives, together with Chairman, John Ford and Secretary, Rob Roy felt a decision should be made on the SCE's use. At the moment there is no limit on the cells capacity (this rule was removed some years ago), only on its size with Sub C cells only, and therefore the SCE's are legal. However all of the committee present felt that at National level, it would be better, considering that we are half way through a season to suspend their use until the 1/12 conference in the summer when the situation can be reviewed and in an attempt to stop Joe Public rushing out to buy new packs of cells which he feels he needs to be competitive which might turn out to be less than up to his expectations.

As a final note, a meeting of EFRA representatives which took place at the European Championships in Denmark, also decided to put a 90 day hold on them until more information is available and hopefully the cells availability will have increased.

### EFRA News

Having just received my latest EFRA (European Federation of Radio-Operated Model Automobiles) news letter, there are a few procedural changes that you might be interested in.

1. At European Championships, the delayed start procedure (AMB) will be used to start the heats. At 30 seconds all cars must be released by the mechanics at the start line. The start line will be 2 metres before the finish line (AMB loop). Cars must start in order as directed by the race director.
2. At EFRA Grand Prix's, if the delayed start procedure is not used, a 2 line grid start must be used with 2 metres between lines. Cars will alternate odd's and even's.

The 1/12 International Calendar for 1988 at present is as follows.

Austrian Grand Prix	Portschach	May 14/15
Dutch Grand Prix	Baarn	June 11/12
World Championships	Baarn	Aug 15-20
British Grand Prix	Gateshead	Sept 10/11
French Grand Prix	Paris	Oct 29/30

### Schumacher SP'C' Track Test

So there I had it, one Schumacher SP'C' rolling chassis, sitting next to my faithful Associated RC12L. The first thing that strikes you is the shortwheel base on the Schumacher car, being about half an inch shorter than the 12L and I certainly started to panic about radio and speed controller installation. Fortunately this worrying was unnecessary as the Schumacher car has the steering servo positioned much further forward in relation to the kingpins than the 12L and so my Trans Am speed controller and Multiplex 9 channel, yes I said 9 channel receiver were neatly positioned on the chassis in front of the cells.

Even though the car was to be used at a club meeting on a small track, one of my best modifieds was fitted with cells to match to push the car to the limit straight away. In the kit the cells have to be clamped in with reinforced tape but the facility is available to have two nicad retaining straps fitted. With the completed chassis ready, I paused for thought.

Now with everything fitted the flexibility



Two new products from Germany LRP modified motors produced by Jürgen Lautenbach and replacement alloy rear ends for the RC12L and Schumacher 'C' car produced by Stephan Oberle.

of the chassis supplied was much in evidence, bringing back memories of the lexan cars of the early Eighties. It was plainly obvious that whatever chassis setting used would still mean plenty of chassis distortion under racing conditions but as this was the review kit I had to get on with it. In an attempt to reduce any undue stress on the chassis, I used the softest setting on the T piece, ie. the two 'O' rings together on the centre pivot. Finally before setting the tweak, the springs were adjusted on the front end so that when the car was sitting on the track, the wheels were sitting squarely. The final job is to set the tweak which is done by adjusting the two outer screws on the rear strap which holds the T piece to the chassis. Unlike the RC12L tweak system which only functions as a tweak adjustment, and rear roll stiffness has to be changed by changing the T bar, the Schumacher Tweak adjustment doubles as a rear roll stiffness adjustment. To enable the roll stiffness to be adjusted and set, a set-up "wedge" or "ramp" needs to be made. This is simply done using a small strip of aluminium or similar (Fig. 1), approximately 1.5 mm thick and 20 mm wide. The important part is to calibrate the top surface of the ramp and this is best done by either scribing the lines directly on to the aluminium or to prepare the scale on a piece of paper which can then be stuck to the ramp. A final word on ramp preparation is if you use the latter method of marking, put a layer of selotape over it as 'wet' tyres will soon make a mess of your calibration.

Once your ramp is prepared, take one car, complete with well trued tyres, both pairs having the same diameter and one flat surface. Lift one of the rear wheels off the ground and slide the ramp under, in line with the axle until the tyre rests on the ramp around the 9 position. The corresponding front wheel will now be off the ground. Spin the front wheel and slowly withdraw the ramp and record the figure. Repeat the process on the opposite side of the car and the "name of the game" is to get the same reading from both sides. For example you try this first on the right hand side of the car and you get a reading of 5 on the ramp. When the left hand side of the car is tried the reading is only 4. To get both sides of the car to read 5, the tweak adjustment screw on the left should be loosened and vice versa.

Team Schumacher recommend a setting of between 3 and 4 for the 'C'-car and between 4 and 6 for the SPC and due to the flexible nature of my chassis I set the roll stiffness at 8, nothing like an extreme.

As a final tweak check, sit the car on a flat surface with the front of the chassis just overhanging the edge. Using a sharp point such as a needle or blade of a modelling knife, lift the front of the car up at a point in the centre of the chassis. Spin both front wheels and now lower the car until the tyres "ground" and again you are aiming to get both sides the same, hitting the ground at exactly the same time.

That was the car done and so it was off to the 1/12 club at Ashby for the last part of the review. The circuit is small, tight and a little bumpy in places, not forgetting a slightly damp area on the carpet on the sweeper. For the first run I only treated the inner 1/4 of each front tyre, as theoretically the car should generate more front end bite itself due to a more forward weight distribution compared to the 'C' car. Unfortunately this gave far too much understeer for the roll stiffness of 8 and treatment was increased to half the front tyres and away we went. The car was extremely responsive and would bite well into the sharpest of corners without any understeer or tendency to throw the rear end out and to be honest, an equal to my 12L and handled perfectly for the remaining rounds and final. Further comments on the chassis should be left at that since we all have different preferences for handling characteristics.

Overall, this latest Schumacher development is a step in the right direction, not just producing a new arrangement to keep up with fashion. Apart from the minor difficulties in construction, the car is fairly easy to maintain but regular replacement of glassfibre components is necessary to keep the car in "tip top" condition. In fact the chassis supplied, which was 0.075 in. (1.95 mm) did have a tweak in it after the car was stripped down after the race although Schumacher reliably inform me that all the latter chassis' are thicker. My original chassis is to be traded in for a thicker item, and a different, silicone 'O' ring roll stiffness configuration will be tried as this is the configuration Phil Davies used to become 1988 European Champion. At approximately £99 for a rolling chassis the SP'C' will compete with the best on the market so the final choice is yours.

**1988 European Championships**

This year saw the Championship held at the Herning Congress Centre, home of the Danish International and the site of the World Championships in 1984. Although the event was held over three days, plenty of time was necessary for travel as the ferry crossing alone takes about twenty hours.

Instead of previous years with a convoy of cars, this year Nigel Piltz had booked a coach for the whole team to travel together which also kept the cost down. The fun started on Wednesday morning with the coach picking everyone up on route down the M6, M1, then finally at Harwich, after a few too many detours round some dubious country lanes when we left the M1, its a good job no one argues with a coach.

The team consisted of Cecil Schumacher, Mick Langridge (Team Manager), Rob Roy, Chris Evans, David Gale, Glyn Pegler, Phil Davies, Pete Farmer, John Reid, Paul Ash, John Ash, Matt Ford, Ian Spashett and his partner Knowle who recorded the whole event on video, Nigel Piltz, Dave Towell, Chris Hardisty, Mike Haswell, Pete Riley, Mark Jewitt, Tim Dakin and parents and the driver Sam. Tony Wells and Richard Isherwood were also attending but they were making their own way over.

Unfortunately, when we reached Harwich at about 5 pm we were told the ferry was about seven hours late and so with "time to kill" we headed to the "coastal hive of activity" of Frinton-On-Sea, where the only action to be found was in the local tea shop. When we returned to the port at about 7 pm we were ushered to the Hospitality Suite but when we were still in there past midnight it was soon dubbed the Hostility Suite. The five hours were wasted away by free coffee, a pole position game on the Schumacher motor testing computer and a big discussion on the 'pro's and con's' of SCE cells.

At around 12.30 am we were finally on the ferry and given a free meal and then it was straight to the bar to off set the thoughts of sea sickness. The next morning brought some unpleasant news as Mick Langridge and Ian Spashett had had £400 and £300 taken respectively from their rooms during the night, actually while they were asleep in their rooms. Fortunately the money or Ian's credit cards were recovered and according to the Danish Police, its quite a regular occurrence.

The rest of the morning was spent in the cinema watching the film Inner Space which centred around two special transistors for a miniaturisation and enlargement process which had much more than a passing resemblance to a couple of Parma anodised pinions, which brought much amusement.

The remainder of the crossing was once again spent in the bar where John Ash won the musical quiz, a sign of good things to come.

Passport control at the port was having a day off and we rolled straight off and about 1½ hours later we were in Herning. The hall was not open so we all checked in to the Motel Herning, then hit the town for a meal.

The next morning, it was business as normal as we got to the hall for the first rounds of controlled practice. The track that awaited us was far smaller than some of our larger national events and marked with approximately 2 in. square planks of timber, securely anchored to the carpet. At the registration, each driver was given a

rough provisional time schedule and also a memento of the meeting. The morning saw two rounds of controlled practice in heat formation, followed by the first technical inspection which was carried out by Lars Bucholtz.

Round one saw our own Phil Davies at the top of the leader board with 33 0.7, closely followed by '86 champion Mika Leppalahti (Associated), on 33 2.7 and Ander Nilsson (Corally) with 33 2.8. Phil, Mika and Anders all failed to improve in Round Two and it was Ulf Ebenhardt who managed to clip a tenth of a second off Phil's time, demoting him to second with his 12L, with Jurgen Lautenbach (SPC) moving into third spot with 33 2.1 and Dave Gale holding sixth with 33 3.4. In Round Three, Jurgen managed a 34 17.7 with Mika improving to 33 0.2 leaving Ulf and Phil in third and fourth respectively.

The next round saw four 34 lappers but fastest now was Ulf with 34 11.7, Mika still held second with 34 12.1 with Christian moving into third with 34 14.6. Jurgen slipped to fourth with his third round 34 17.7 while Phil held onto fifth with a 34 20.2. The final round though saw Phil fly round to turn a 34 10.2 although Ulf unfortunately had his car trod on by Mika during his last run but still finished up second. Mika held onto third with his 34 12.1 with Christian still in fourth while Kurt Steinbuchel moved up to fifth with a 34 13.8.

The A final filled out as follows:

1st	Phil Davies	34 10.2
2nd	Ulf Ebenhardt	34 11.7
3rd	Mika Leppalahti	34 12.1
4th	Christian Kiel	34 13.1
5th	Kurt Steinbüchel	34 13.8
6th	Stephan Oberle	34 14.4
7th	Jürgen Lautenbach	34 18.5
8th	Ander Nilsson	33 1.5

**Remaining British**

9th	David Gale	33 3.4
14th	Tim Dakin	33 6.0
16th	Matt Ford	33 8.4
24th	Rob Roy	33 13.9
25th	Pete Farmer	33 14.4
26th	Glyn Pegler	33 14.5
35th	Jamie Booth	32 0.5
40th	Chris Evans	32 5.4
43rd	Peter Riley	32 8.9
49th	Richard Isherwood	32 13.1
53rd	Mark Jewitt	32 18.0
61st	John Reid	31 2.5
65th	Tone Wells	31 4.1
67th	Nigel Piltz	31 7.2
73rd	Chris Hardisty	31 10.1
74th	Paul Ash	31 10.5
77th	Dave Towell	31 18.6
97th	Ian Spashett	29 10.3
101st	Mike Haswell	29 13.6
105th	Mick Longridge	28 1.3

On the equipment front there were a few new items. Jürgen Lautenbach of LRP Electronic had some modified motors on show. According to their catalogue the motors are especially developed and handwound for high competition races, balanced, trued, run in and timing adjusted but apparently the prices would be over our £40.00 price limit in this country. Mick Langridge did manage to get hold of one of the modifieds that they could supply within the price limit but believe me, this was rough, as closer inspection showed no balance or comm true and the wind looked no more than a factory 27 turn buggy armature. The LRP motors Jürgen and Stephan used were the LRP red, No. 5111, although no infor-

mation on wire gauge or turn was available, only that the motor was a good all rounder, both on tight and fast tracks.

Stephan was exhibiting complete alloy rear ends for the Schumacher 'C' car and 12L, shortly to be available from SRM racing with myself, Rob Roy, Dave Gale and Glyn Pegler using them, full review next month. For the 12L differential, a ballrace can now be fitted to the spur gear, similar to the SRM conversion. Stephan was also offering a Schumacher diff. incorporating use of fine pitch gears and stiffened hubs so the wheels run 100% true.

The Corally SP11 was on show, with two making the 'A' Final and this will be reviewed soon, as will a conversion for the Associated RC 12L.

Ron Schurr from America, is at present working in Denmark and was running the latest TRC car, comprising of a graphite chassis similar to the RC 12L, alloy beam front end as on the Delta and rear end using the 'C' car blocks and torque tube.

Running along side the main championship was a Youth championship, although there were only nine entrants. The youngest driver was Miki Jensen from Denmark who was only seven. The eventual winner was Søren Christiansen, despite Dave Gale stopping his car dead at full speed at the end of the straight with a fine piece of foot work, as if trained at the F.A.'s School of Footballing Excellence.

Apart from the 'A' Finals which had three runs with the best two to count, the rest of us only got one run at a final.

In the 'L' Final, Ian and Mike could only manage 5th and 6th with 29 6.7 and 29 16.5 respectively while Patric de Busscher won with 30 5.7. The next Brit up was Dave Towell in the 'J' Final but he went out after only six laps with Geir Bakken winning with 30 5.3.

The 'I' Final saw our first win by Paul Ash with 31 11.7 with Chris Hardisty 6th with 30 7.8.

Our next success was John Reid winning by over a lap in the 'H' Final with a 32 4.2 with Nigel Piltz and Tony Wells 6th and 7th with 31 19.0 and 28 0.0 respectively.

The 'G' Final featured Mark Jewitt but Mark 'blew-it' with 7th place with a 30 12.5 while a 32 7.2 was enough to win for Claus Holst.

In the 'F' Final, Peter Riley and Richard Isherwood could only manage 30 8.9 and 30 17.0 for 6th and 7th places with the honours going to Anders Ljungkvist with 33 10.2.

The 'E' Final saw 1/10 star Jamie Booth win with a 33 9.7 with myself in sixth with a 32 20.9.

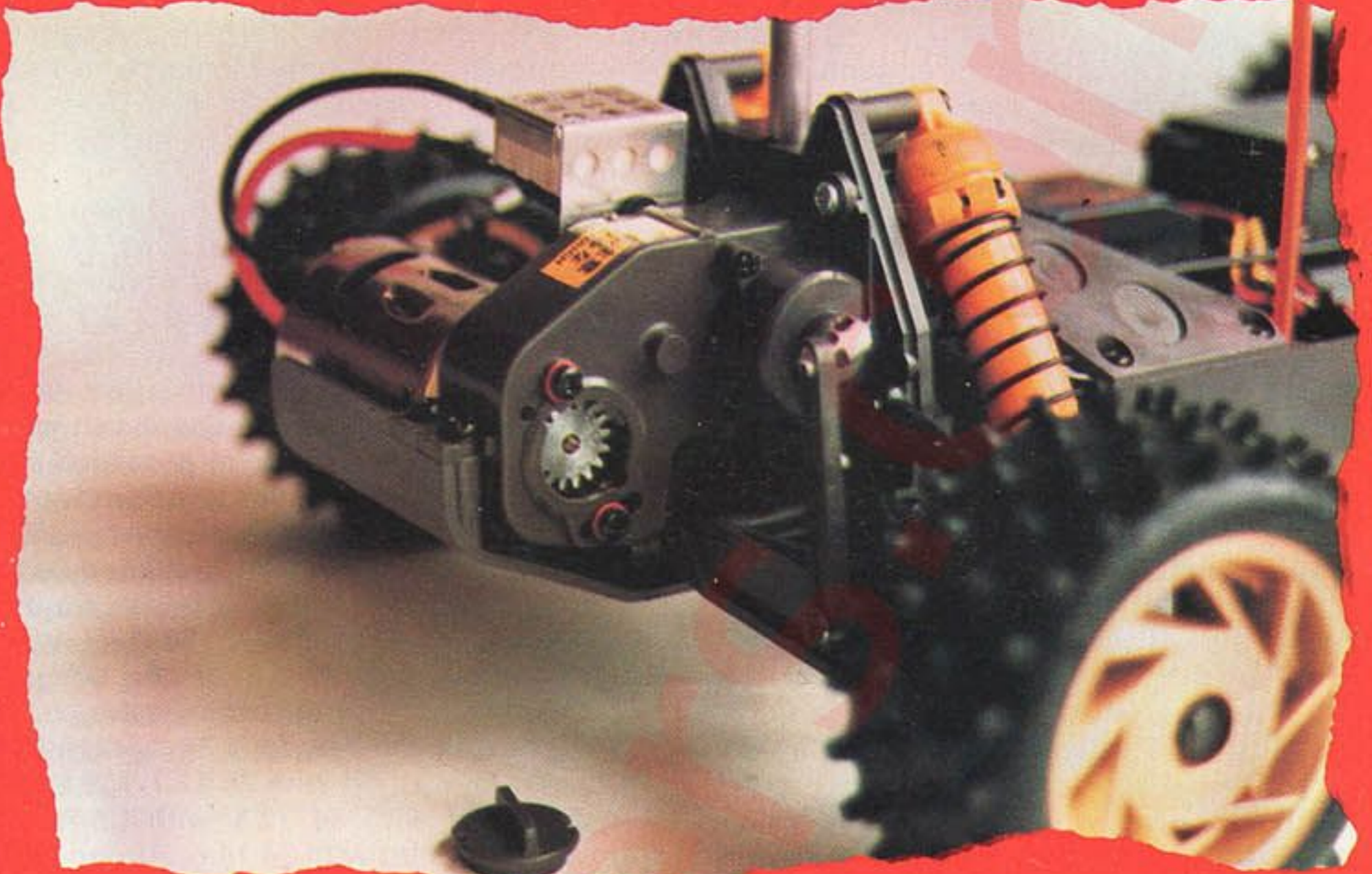
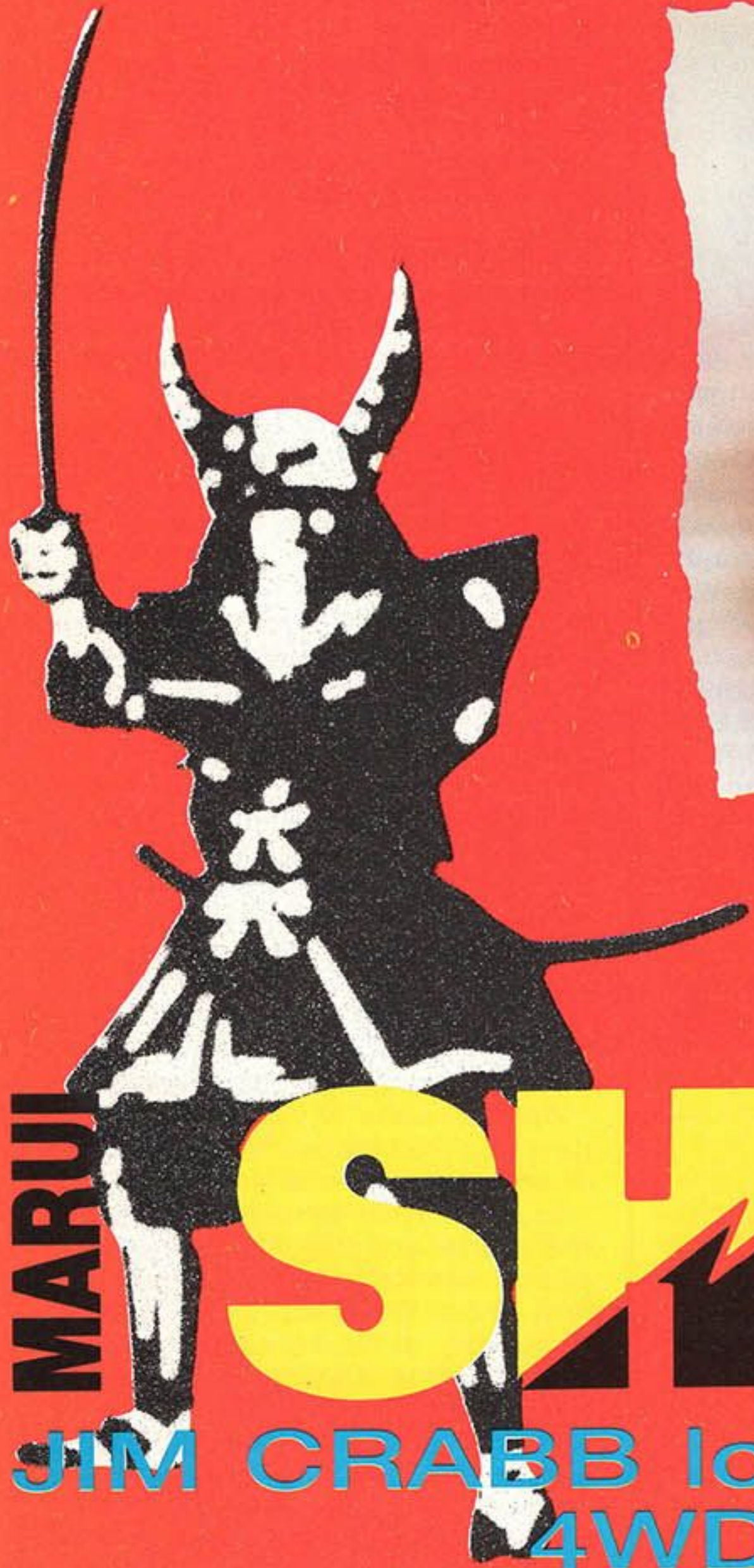
The 'D' Final saw us once again take 6th and 7th place with Glyn Pegler (30 3.5) and Pete Farmer (29 0.0) with Jean Michel Fraise winning with a 33 6.5.

Rob Roy unfortunately dumped in the 'C' Final, needing a push across the line (illegal, but taken in good spirit) as the race had finished a minute earlier and managed 3rd with a 32 0.0, while Constant Paul won with a 33 9.9.

The 'B' Final saw an excellent three way dice with Jose Rosas, David Gale and Tim Dakin, with the order finishing as this with times of 34 9.6, 34 11.6 and 34 17.2.

**A Finals**

Phil held his pole position, followed by Ulf and Stephan. Within the next 2 laps Stephan passed Ulf but made an error on a corner which held up the chasing pack

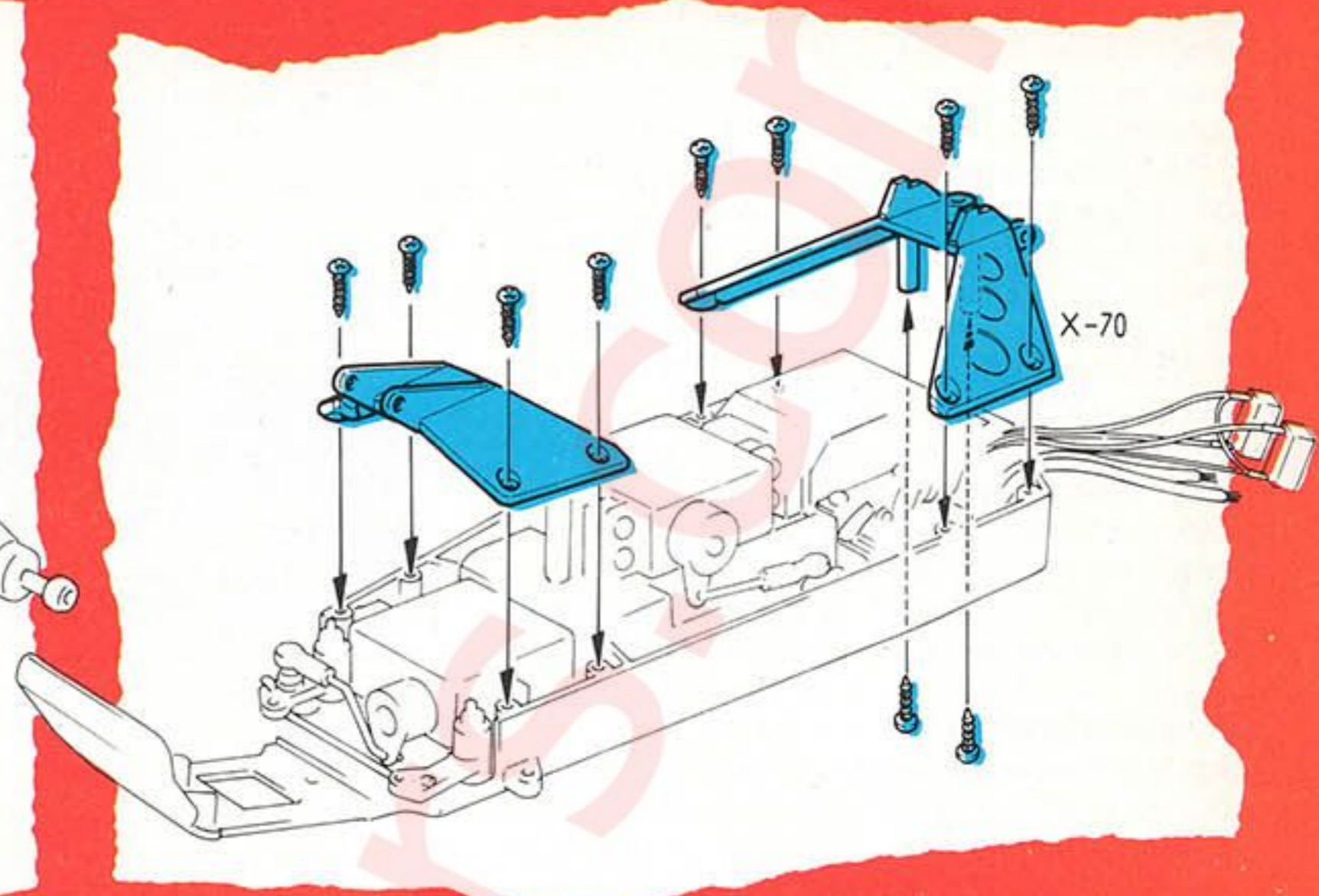
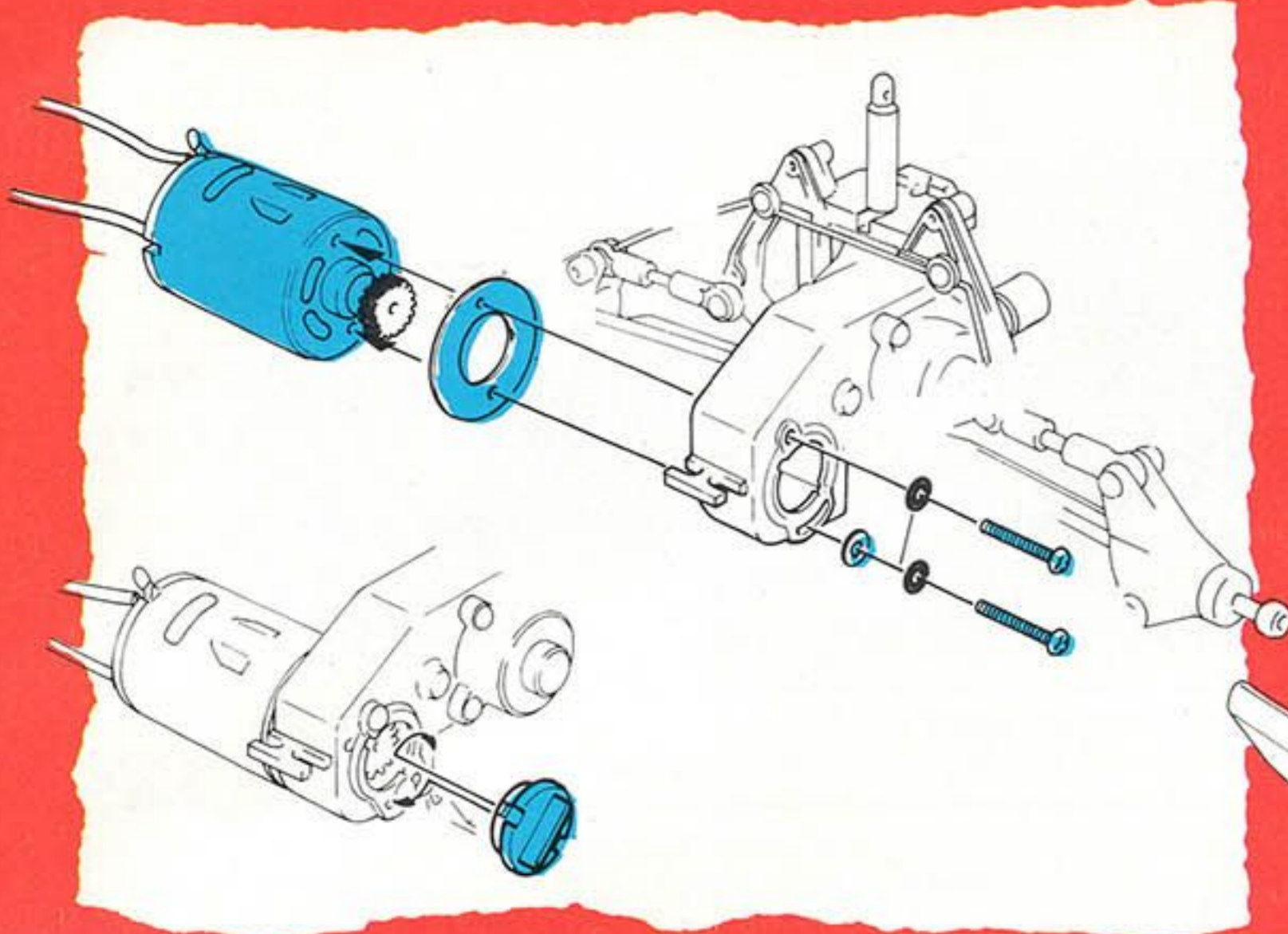


Above, 1/4 turn is all that is required to expose motor pinion to check motor mesh.

# MARUI SHOGUN

JIM CRABB looks at Marui's Latest 4WD Contender



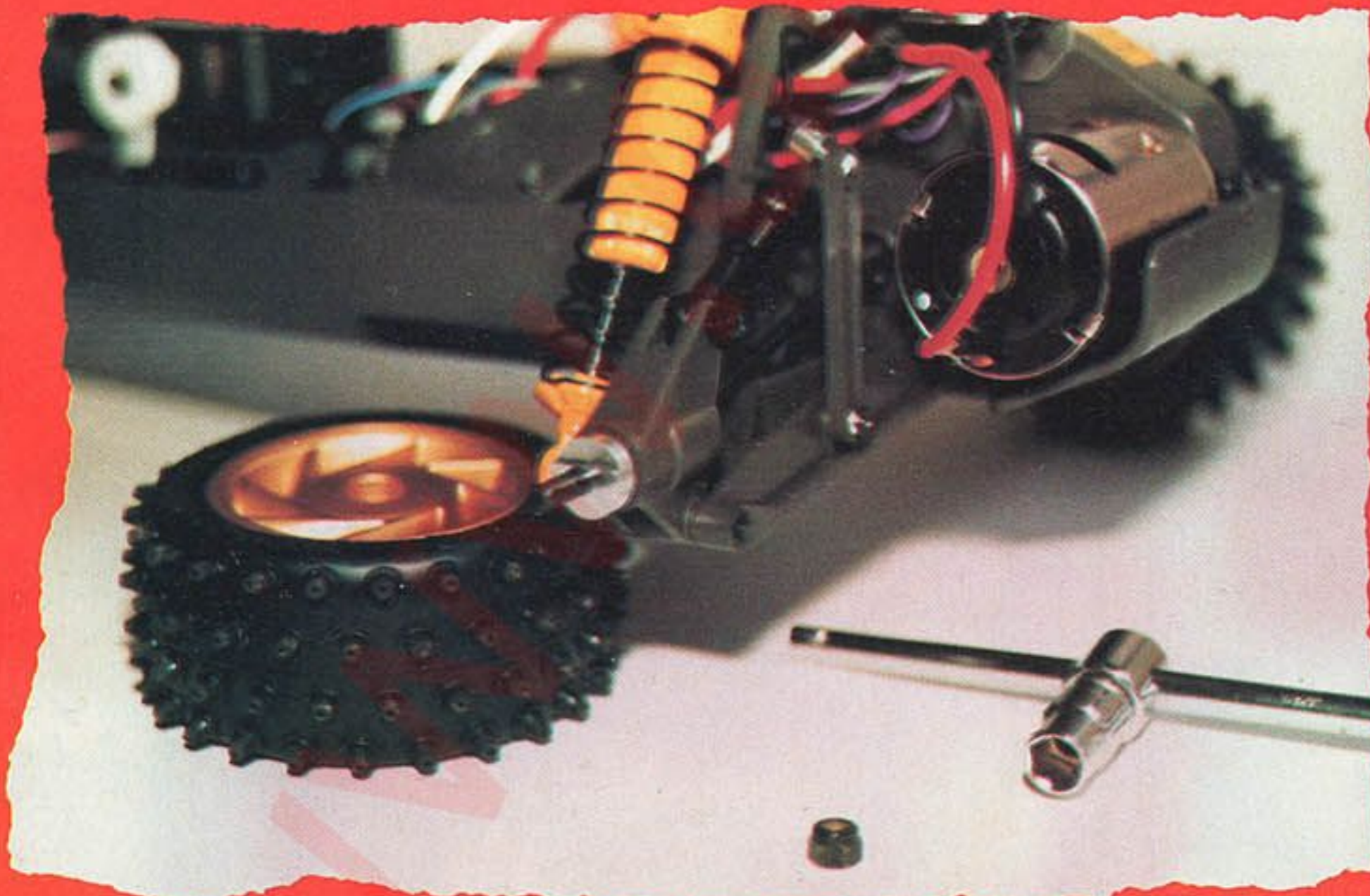


Even the most casual reader of the model car press cannot have failed to notice the amount of column space that has been given to which car will reign supreme in 1988. Whilst all these hypothetical comparisons have been taking place, the Shogun has appeared on the scene very quietly most probably over-shadowed by the blaze of publicity about two of the new "super cars" for this seasons racing. The shogun was featured at both this years Earls Court and Nürnberg Hobby Fairs and looked very smart and interesting in an all black paint scheme to go with its martial arts name. Once again Marui have chosen a name from Japanese history this time using that of a line of hereditary military dictators who held power for over seven hundred years. The car has a good pedigree being descended from the Ninja of last year, out of the Samurai of '85 which was designed to win that years world championships. There was a very interesting story attached to the Samurai at the time and that was although the car did well at the championships it was the driver that failed to win not the car so he was sacked, makes a change from the usual moans one hears from drivers because they always feel its the car that has let them down. I cannot vouch for the authenticity of the



*Above, long travel rear dampers very smooth plastic chassis see reflection of damper. High grip tyres.*

*Below, rear of car with wheel removed to show slot drive to hub.*



story but it shows how dedicated the manufacturer was to winning.

**Technical Specification**

Four wheel drive with independant suspension it has a damper on each corner and a gear differential both front and rear. Drive is via a gearbox to the rear differential with shaftdrive to the front differential. The standard motor is mounted at the rear of the car outside the rigid bathtub chassis. Single wishbones are used on each wheel with upper adjustable tie bars for camber angle adjustment to give a good degree of suspension dialability. Ground clearance of the car is adjustable both front and rear with four adjustable positions on each set of wishbones. Damping is provided by Yellow plastic oil filled coil over shock absorbers with a choice of two different pistons to give soft or harder damping using the oil provided in the kit. An anti-roll bar is supplied for the rear. All the electrics and radio gear are mounted within the bathtub chassis which should give very good weather protection. Battery location is lengthwise in a compartment within the chassis with access via a tight fitting cover which is on the underside. The compartment will take either a 8.4 V or 7.2 V battery pack. Speed control is a 3 step forward one reverse resistor unit with linear action as

used in other Marui cars (see interesting bits). The tyres are low profile spikes fitted to a one piece light weight hub. Similar wheels are used both front and rear.

Metal is the material for both the small (3 off) bevel gears in each differential and the large bevel gears for the power take off. Two motor pinions 18 and 16 teeth of 32 DP are supplied which give a gear ratio of 7.72:1 and 8.68:1 respectively for the kit Mabuchi RS540SH motor. The body in light weight Lexan should give better than normal protection against debris ingress. Good protection for the front end is provided by a full width bumper.

Rear end protection is via a wrap round motor guard and under tray.

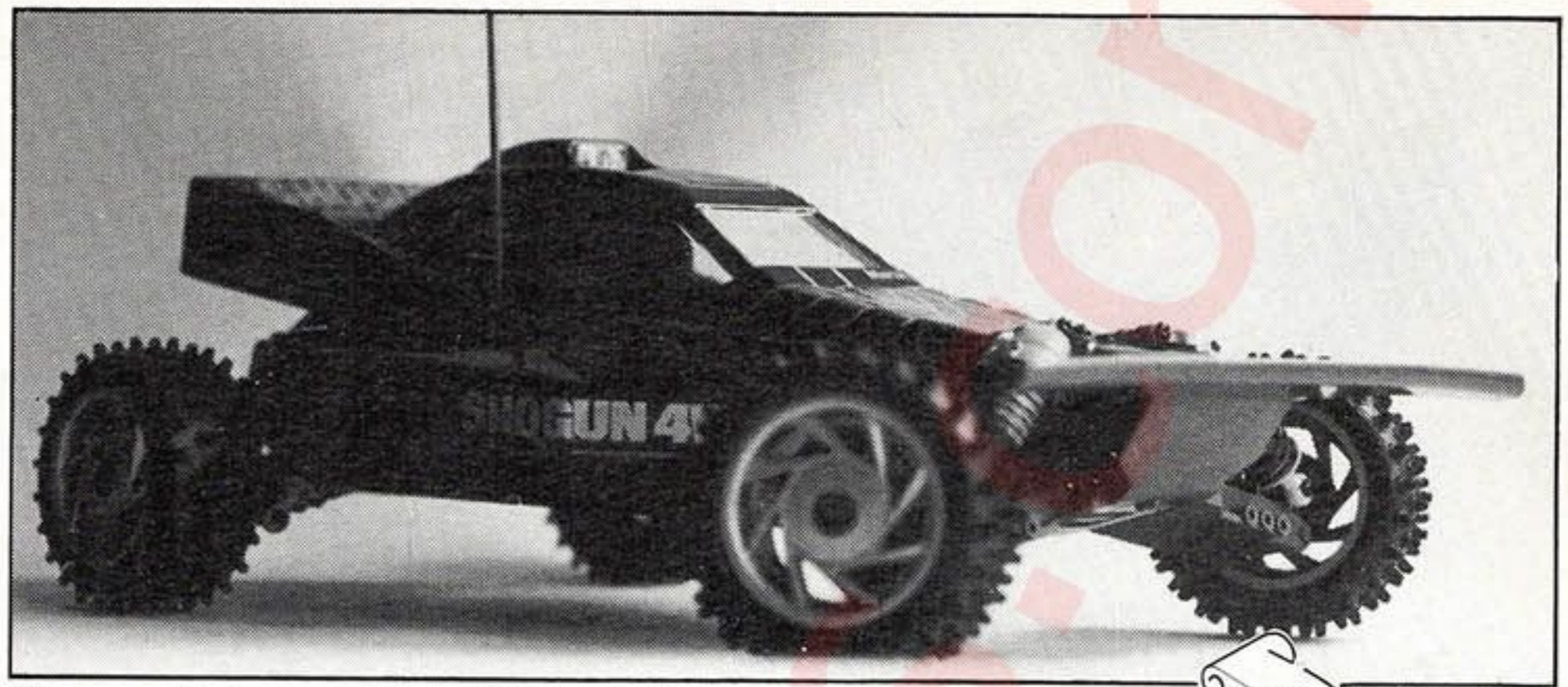
**Presentation**

As is expected from any major Japanese manufacturer, presentation is first class. A comprehensive instruction manual of 20 pages, together with a supplementary sheet which has a drawing of and a description of each part. The manual has a similar layout to that of Tamiya's where the right side of the page details the construction and the left hand margin lists each item to be used at that point of construction and the left hand margin lists each item to be used at that point of construction. Inside the box the more impressive goodies are displayed in a vacuum pack with the other smaller items in numerous plastic bags. My first reaction was why so many bags, until I examined one only to find once again each individual item was listed on the packet with a drawing of that item in full size. As there are quite a few different lengths, diameters and types of screw used during construction it should avoid any confusion.

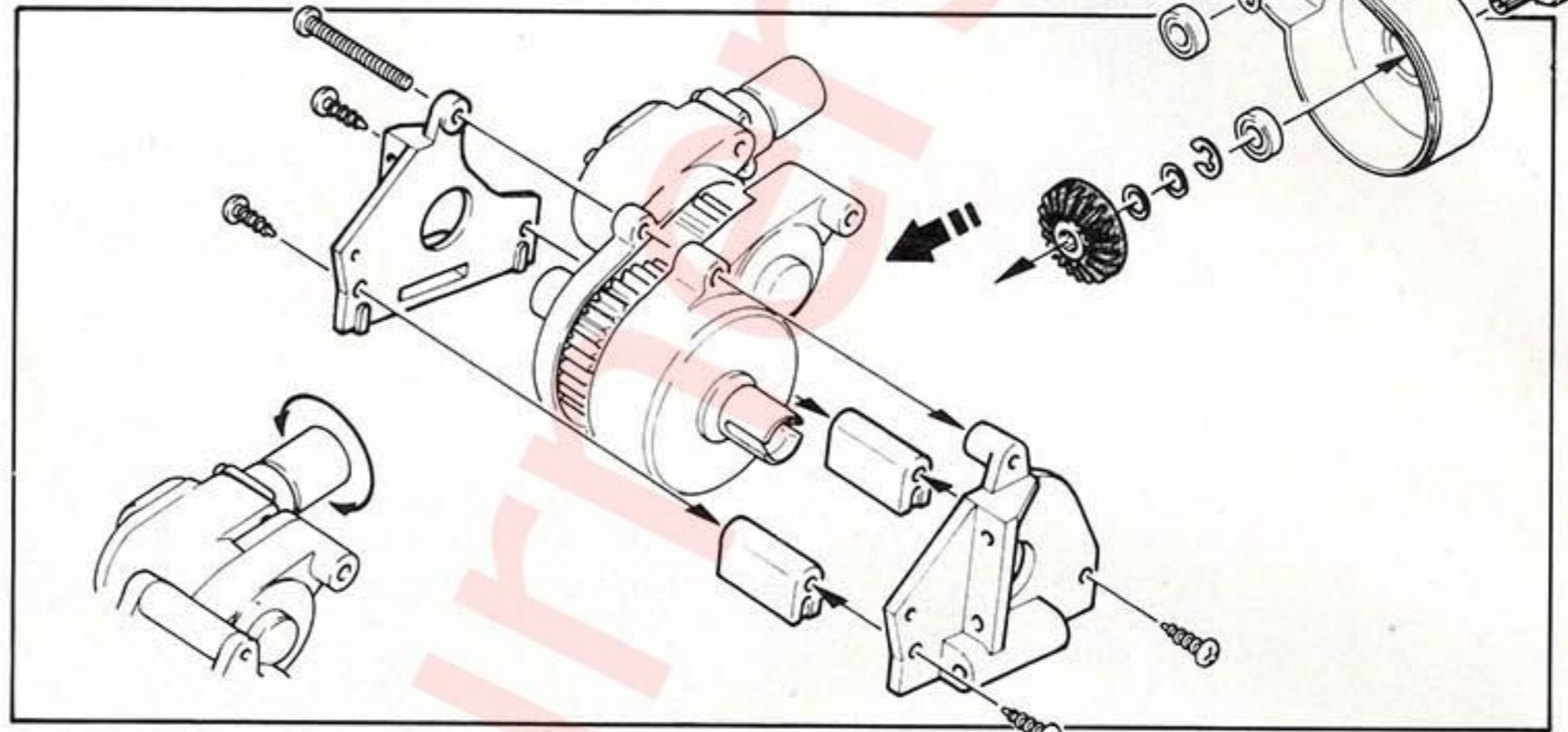
The same attention to detail also applied to the packets of bolts, nuts and washers. Maybe Marui knew I was going to review the car as the grub screw used to locate the motor pinion is referred to as the "crab" screw, it gave me some amusement.

**Interesting Bits**

The speed controller is a mechanical type pioneered by Marui a couple of years ago, it has a linear action and is totally enclosed although it can be opened up for the routine maintenance of internal contact cleaning. The speed controller can be used with transmitters not fitted with servo reverse by the use of an extended arm which connects to the operating servo.



Mean and Lean, note additional front damper positions.



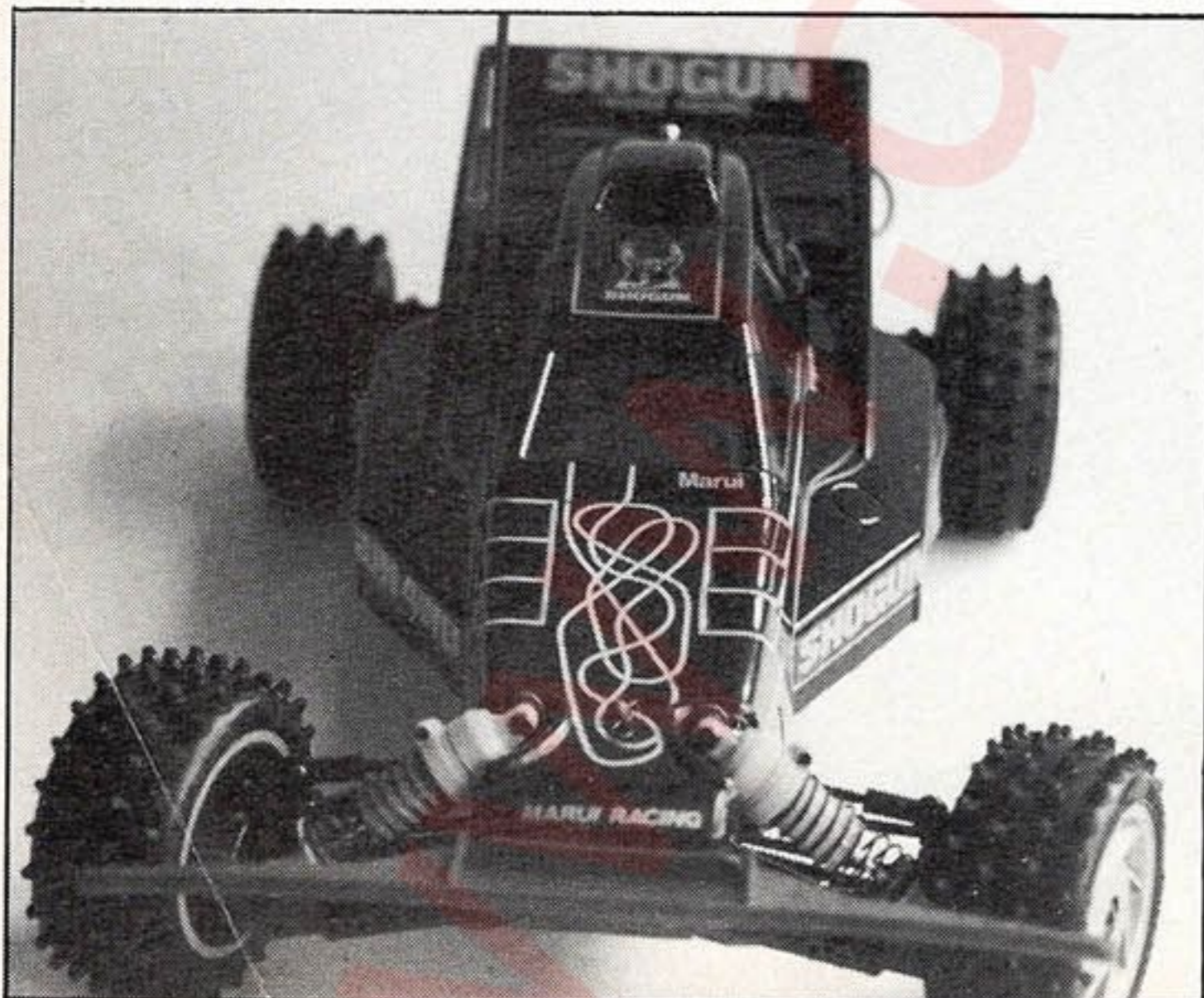
The wheels are gold in colour and are of the "Flying Spoke" design, they are very attractive so it is particularly important you do not mix the left and the right hand wheels up or you will have them "flying" in opposite directions!! Although the tyres are quite tight a fit when pulled over the hub Marui suggest they are also glued, a small hole is pre drilled in the hub to allow air access to the tyre.

Access to check gear mesh between the motor pinion gear and the driven gear is via a cap in the gearbox case, all that is required is a quarter turn to the right to lock the cap in position. This facility is partly required because the pinion is fitted to the motor prior to offering it up to the gearbox and it is infinitely easier at the trackside than having to undo small screws to take off the gearbox covers which are found on other cars. The track rod ends are heavy

duty 5.8 mm units and if care is taken to put them with the face with a circle uppermost when fitting them to the knuckle arm and the bell crank they cannot pop off.

**Tools For Construction**

Two tools are supplied in the kit, an Allen key for the 3 mm grub or "crab" screws and a "T" bar box wrench very similar to that most prized possession I have referred to in the past and that's the Tamiya "T" bar. The "T" bar is suitable for four different size nuts 2, 2.6, 3 and 4 mm. Additional tools you will require are longnosed pliers for the circlips and a small and medium sized Phillips screwdriver for the self tapping and machine screws. A model knife and scissors are required for body trimming. Grease is supplied but both thread lock and super glue are also required during construction to help make the car "bul-



Another fine paint job from Mr. Airbrush Pete Dorwell. A full width bumper will protect it!

Front differential with shaft drive, collar needs to be secured during construction (see text).





let proof".

**Construction**

Although the instructions suggest one starts with the rear gear box and differential, I built up the dampers and then all the tie rod links first just to use up some of the numerous parts before I started on the packets of different length screws.

The dampers are straightforward and I elected to go for the "softer" damping with the two hole ported piston. All the track rod ends have a 5.8 mm pillow ball fitted, its a system I prefer to the type where the track rod clips onto a fixed ball.

Both gearboxes are a beautiful piece of engineering and go together quite easily especially if you take note of the advice I give in "Construction Tips" when I came to fit the last bearing during the construction of the front gearbox, I found I had lost one of the bearings, my heart sank, Allan Bond was expecting the car to be ready to photograph and I wanted to track test it on the Sunday, my bacon was saved by the discovery that the 14 smaller bearings used in the car are the same size as the small bearings used by Kyosho, as I had a spare I was able to continue.

prior to fitting the quick release cover. Once the rear underguard is fitted the back of the car is complete.

**Two Part Complete The Third To Go**

The third item is the chassis, first part to be fitted is the speed controller and dependant upon you having a servo reverse so depends the way you fit it.

Steering is via the twin bell crank type linkage which should eliminate any bump steer, a servo saver is supplied in the kit for the steering servo and the speed controller servo, they are quite different and cannot be confused. Final electrical item is the receiver, the speed controller comes with a dropping diode so if you do not have a BEC (Battery Eliminator Circuitry) receiver it does not matter as you will have a regulated supply for receiver and servo's. If your system has BEC just cut off the diode and use the BEC system connector which is in the kit. The suggestion in the kit for connecting the wiring is to twist them together and then use heat shrink, I suggest solder is used as it makes a far better connection, then complete the joint with the heat shrink. The receiver is located in place with

double sided tape and the aerial run up the inside of a brightly coloured antenna tube, a nice touch of attention to detail is a cap which fits on top of the tube to prevent damage to the aerial should you crash and the car turn over. A front skid plate and two bracing parts complete the chassis.

**Final Completion**

Fit the two gearboxes to the chassis not forgetting the drive shaft between the two of them, put on the wheels, dampers and body and apart from a charged battery the car is ready to go.

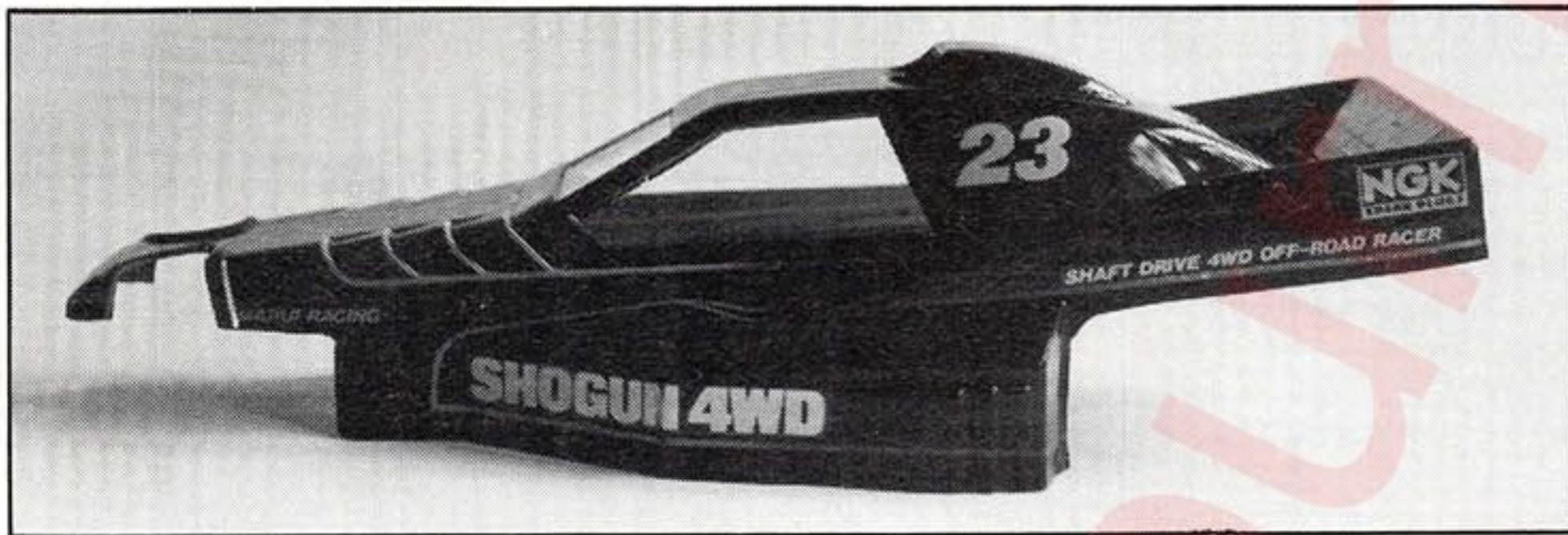
**The Body**

Mr "Airbrush" Pete Darwell did the paint work for me and although there is a driver doll figure supplied I did not fit it thinking it would save a little weight. Peter left the windows clear in case with concours in mind I'd fit him at a later date. The driver figure plays no part in the rigidity of the car.

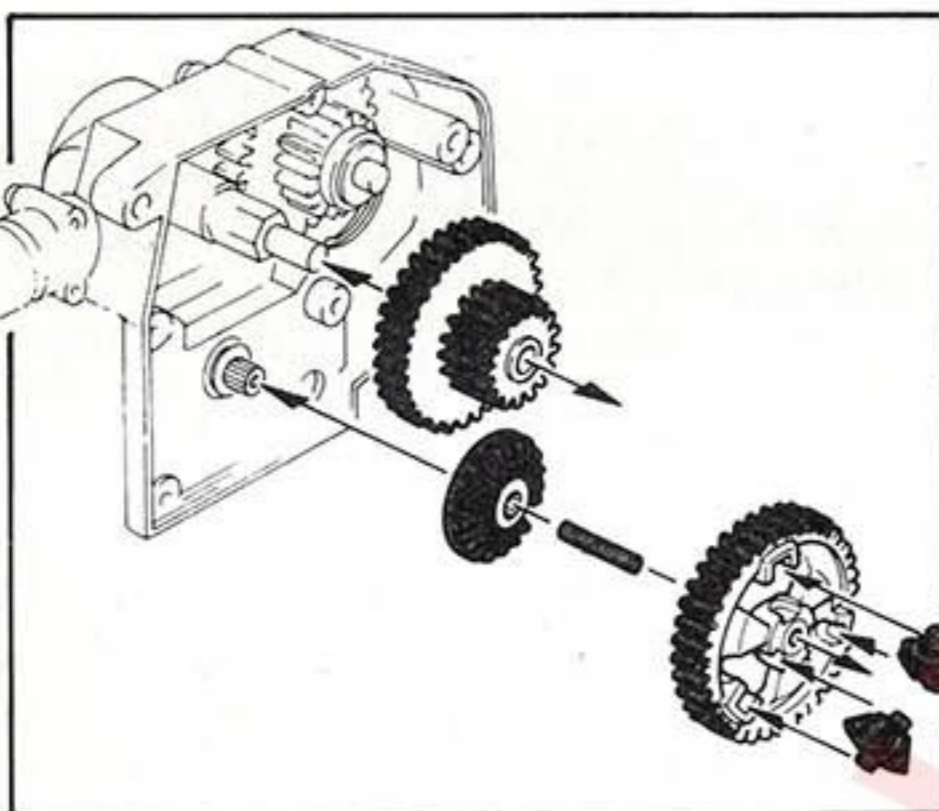
Peter achieved the squiggly lines on the bonnet and the sides of the car by using microline masking tape on the inside of the shell prior to painting it black. Once the black was dry the masking tape on the bonnet was removed and the gold colour used then the straight lines of tape removed and the red colour sprayed on.

**Construction Tips**

When constructing both front and rear differentials it is possible for the drive joint for the shaft drive to fall out of the differential. On the end of this drive joint and inside the gearbox is a counter bevel gear and a thrust washer. Once the drive joint comes out the bevel gear and thrust washer fall into the gearbox and differential and a strip down is required to retrieve the two parts. I found a piece of adhesive wrapped around the drive joint and onto the gearbox cover prevented any movement until the two gearboxes were offered up to the chassis and the shaft installed between them. On completion of the front differential it was found to be very tight, the instructions for the front differential show two shim washers on one output drive and only one on the other side whereas only one is used on either side of the rear differential. By removing the extra shim the differential ran quite free, both of these points once you are aware of them will save considerable frustration and help speed the building process.



Body shell, note the strengthening moulding around the front shock absorber cut-outs.



Beautiful lines and "flying spoke" wheels make sure both "fly" in the same direction (see text).

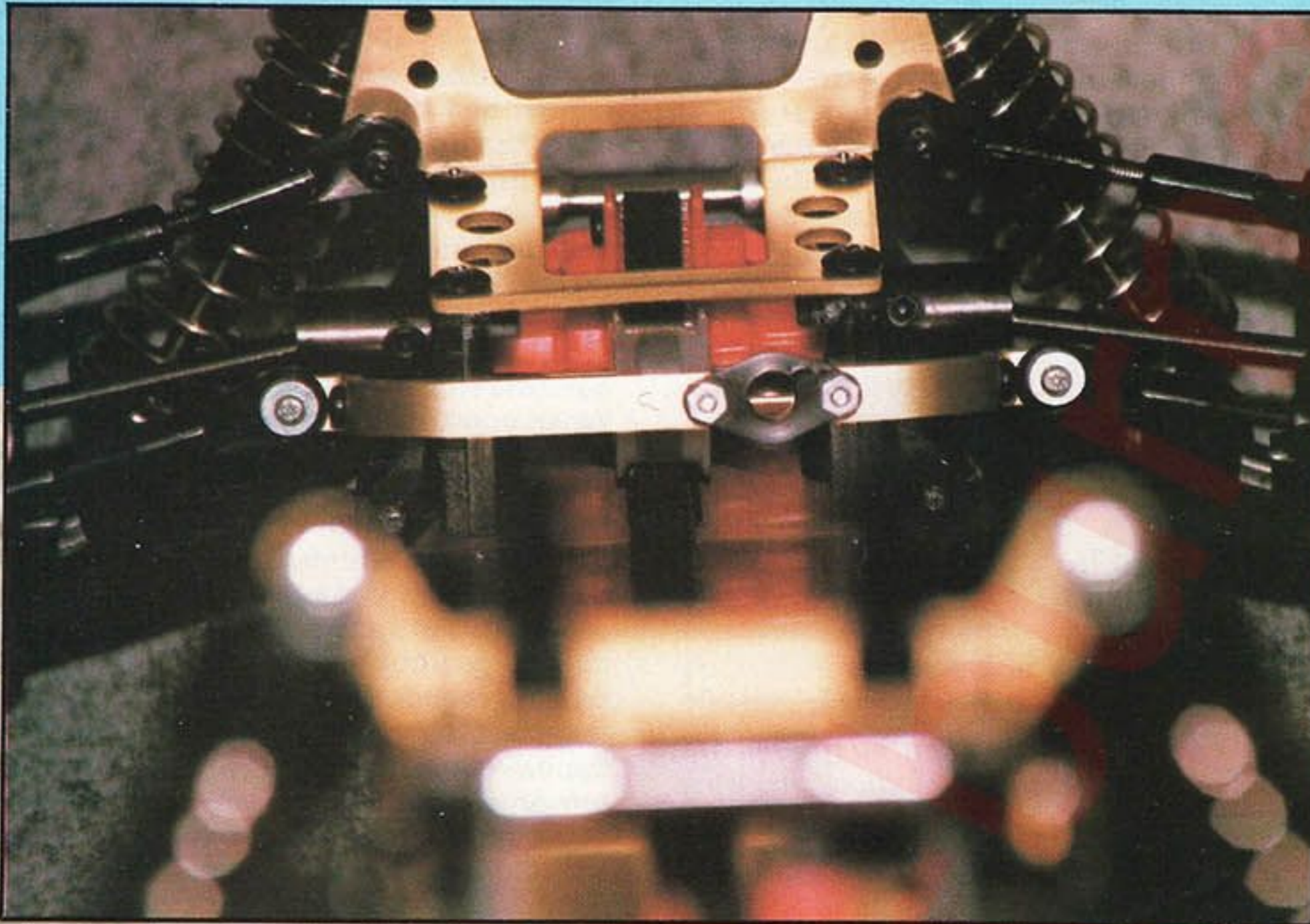
Once both gearboxes are complete the suspension is hung from them. The wishbones are very similar but they are labelled F & R because they are not exactly the same with the front ones being slightly narrower, it is very obvious if you offer up the wrong one. The complete rear and front of the car is built up before either is fixed to the chassis which makes construction easy because you work on three major items; front gearbox, rear gearbox and chassis and then just join the three together. Prior to fitting the drive shafts in situ, a small black "O"-ring is fitted in the drive cup, it takes up some of the slack due to suspension movement and stops a lot of the "chattering" associated with dog-bone drive shafts.

The motor location is at the rear of the gearbox and I elected to use the lower gearing of 8.68:1 using the 16 tooth pinion supplied (an 18 tooth pinion is also supplied), meshing is easily adjusted by viewing and altering the pinion position



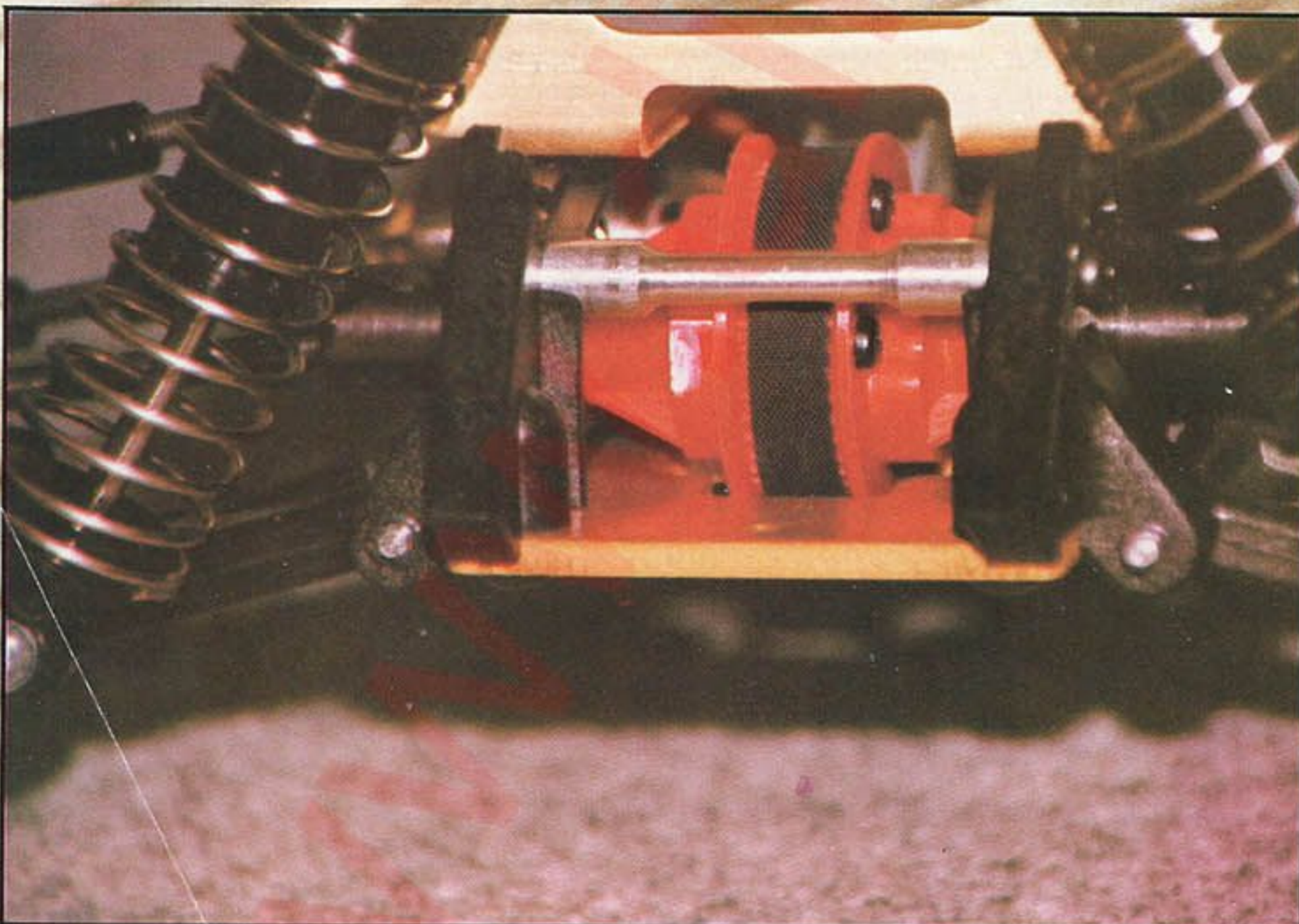
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# I N V A D E R



Front gearbox from inboard showing the tension pulley running on the tie rod shaft, a neat and very efficient way to do things.

Simplicity is the keyword to the Invaders design, this photograph shows the sum total of moving parts and the belt passing around the drive.



Having cut my 4WD teeth on Hirobo's Alien and driven it into the ground over the last eighteen months, the point was reached whereby the car had to be retired or rebuilt. Stripping the car down revealed the cause of the problem, the problem being that the drive belt kept jumping the forward diff pulley, was the chassis. The chassis is constructed from injection moulded plastic and the stresses of racing had proved just too much, consequently the car had become floppy allowing the naturally taught belt to slacken and slip the front diff. All else was irritatingly perfect! It was therefore decided that an aluminium chassis be constructed and the Alien be allowed to run another season.

### **Funny How Events Overtake You Isn't It?**

As the old chassis was being measured the latest news from Japan arrived, it was rumoured that a new car from Hirobo was about to make an appearance. Several letters, two phone calls and a telex later confirmed the fact that there was a new Hirobo car about to be released, it was to be called the Invader.

Eventually photographs of the car arrived and guess what, the chassis was now aluminium. An Invader was quickly ordered and eventually arrived.

### **Hallelujah, Heavens to Betsy**

It was love at first sight as the bodyshell was lifted from the box, if there were Oscars or Grammys or gold medals to be handed out then the Invaders body styling would take them all, never was such a sleek beastie seen before. Enough of the rambling, technically the Invader can be summarised as a mid engined, belt driven 4WD racing car, its heritage lies deep in the technology of helicopters, its parent company, Hirobo, have been manufacturing high class helicopters for years, the odd car being thrown in for good measure. Having said that, Hirobo cars have always shown the highest degree of engineering standards and technical excellence, the Invader is no exception.

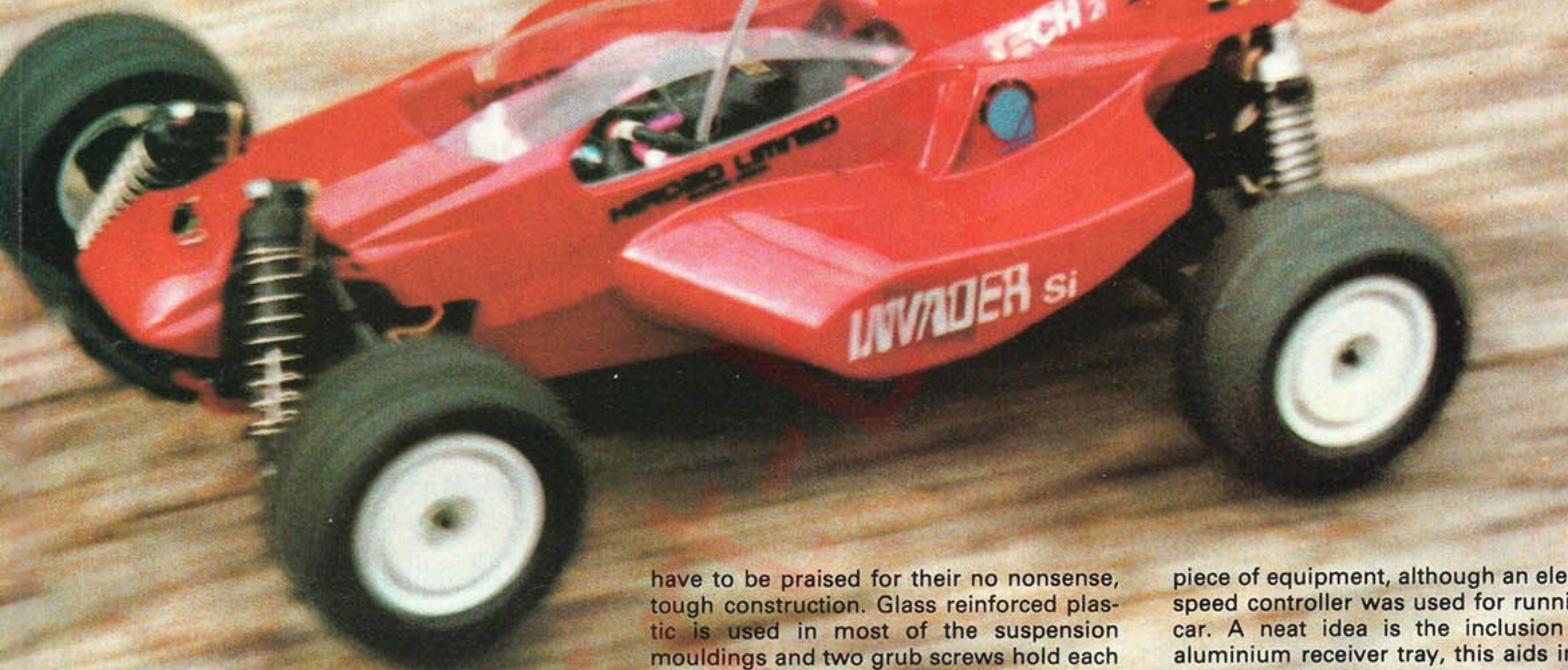
### **Bits And Pieces**

The drive train is a simple arrangement, both front and rear diffs are enclosed, bevel, planetary type manufactured from high grade steel. Both diffs are encased in

# REVIEW

## Hirobo's mid engined, belt driven, 4WD car is reviewed by Dave Pearson

engineering nylon and do come assembled from the factory although it wouldn't hurt to add a little more grease of your own. Bearings and drive cups are fitted and both are then ready for assembly into the gearbox mounting points, between the diffs runs the drive belt. Two pulleys main-



tain the tension on the belt, the front pulley runner plays a double roll acting as a steering shaft, this eliminates the need for steering posts and allows a very smooth steering action to be achieved. The steering shaft needs to be well greased as the bushes it runs in can cause a small amount of binding.

Once the front and rear gearboxes are complete the temptation to bolt the chassis and undertray in place must be overcome, the bottom wishbones have to be fitted first as they are partially enclosed by that voluptuous undertray. Both lower wishbones are held in place with hardened steel pins, the pins are held in the mounting blocks by e rings, now you can fix the gearboxes, drive and upper belt cover to the gold, anodised chassis and undertray.

### The Bits That Hold The Wheels On

Front and rear knuckle arms are both constructed in the same manner and take literally minutes to assemble. Again Hirobo

have to be praised for their no nonsense, tough construction. Glass reinforced plastic is used in most of the suspension mouldings and two grub screws hold each of the four wheel bearings in place.

Shock absorbers are of the CVA type and are supplied with three different pistons allowing different damping rates to be used. Spring stoppers are also included allowing some fine tuning to be done. Both front and rear shocks are attached at the top mounting points and swivel on ball joints at the bottom. The shock absorbers are the only part of the Invader to cause concern, the front set are acceptable but the rear are a little too hard and would benefit from softer springs. In fairness the car is set up for the flatter, faster USA circuits, where this type of shock setting would be perfect. Brimod, Associated, Schumacher or Tamiya soft springs should cure this giving a more progressive return.

### Motor, Radio And Other Important Pieces

Supplied in the kit is a Mabuchi 540 Vz modified motor, this makes certain that the Invader doesn't hang around, in fact the motor has a large amount of advance straight from the box. The speed controller is of the Kyosho type and is again a quality

piece of equipment, although an electronic speed controller was used for running the car. A neat idea is the inclusion of an aluminium receiver tray, this aids installation no end and allows a neat job to be done at the same time.

### The Proof of The Pudding

After the body was sprayed and fitted the car was ready to go. So far so good! What then have we got, in essence the Invader is everything the serious racer wants, mid engined, belt driven, 4WD, beautifully engineered, precision made, and most importantly she looks beautiful. All the aluminium parts are anodised gold and fit perfectly, all the plastic shows no signs of any separation or false weld marks. All parts fit straight from the box without any modification except one and strangely enough the one problem area is the chassis, this can only be explained as an oversight on Hirobos part, or we had a pre production kit.

After the car was built it was found to be making some horrible noises, the sight of three grown men listening to graunching noises is quite funny, believe me. Eventually the noise was traced to the drive belt, this was found to be too loose and no ad-

justment had been designed for. Several options were evaluated and the easiest solution found, simply by elongating the rear gearbox mounting points allowed the tension on the belt to be taken up, just a small hiccup but one which is strange considering the extremely high quality of the rest of the car. Future Invader owners take note! Check to see if your car is the same as ours, if it is modify it before it modifies your drive belt.

**Driving**

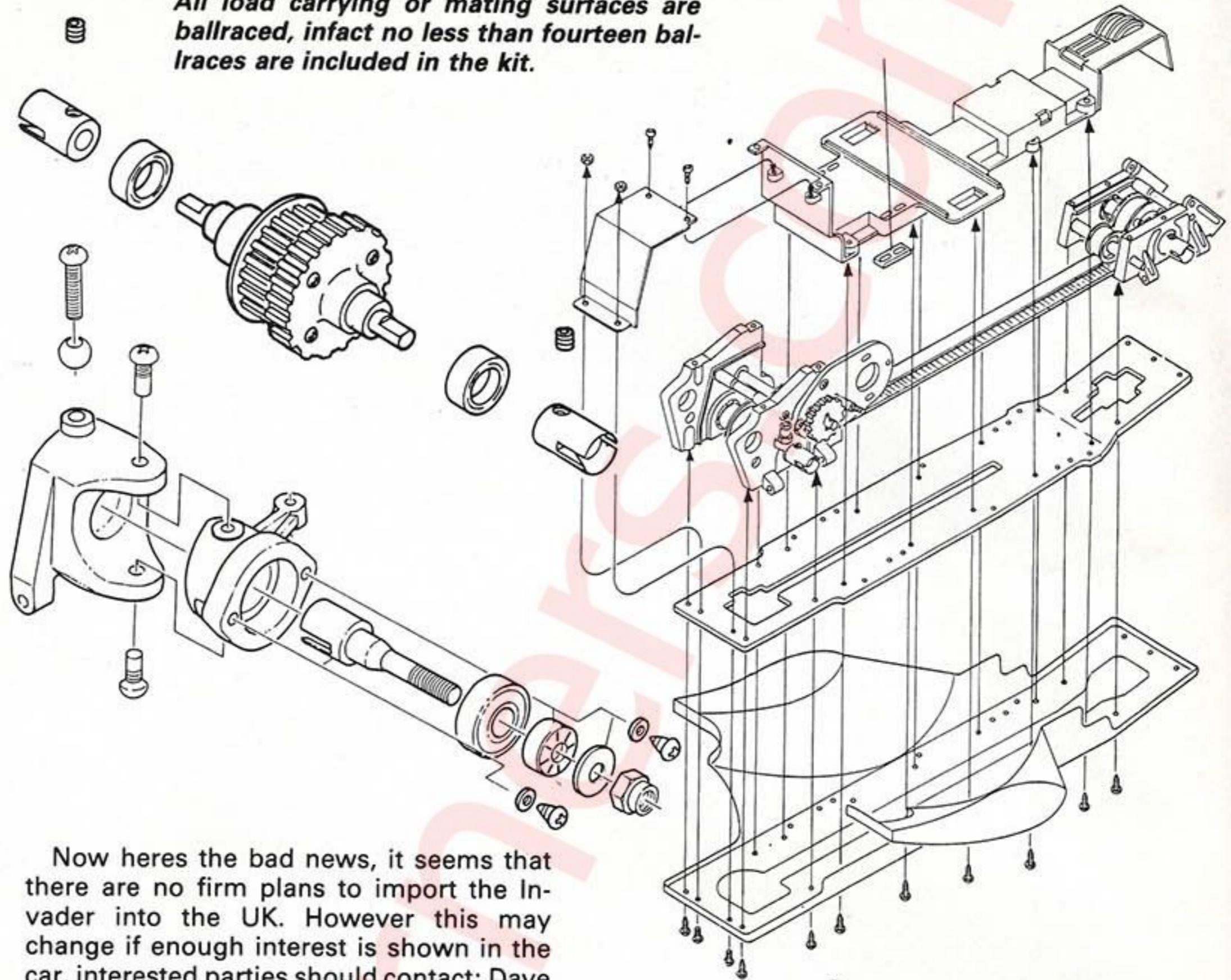
As yet the chance to race the Invader has not yet occurred, unfortunately. However, a great amount of against the clock time has been put in on rather strange surfaces. Considering that this is Spring and a certain International race meeting is looming, can you blame me?

As already stated both shockers front and rear are a little hard for the UK circuits however all propriety brands can be fitted as replacement units, again no problems as most drivers appear to replace their shockers anyway.

The Invader is the easiest, most stable car it has been this reviewers pleasure to look at, it doesn't spring any surprises and goes exactly where you point it, consequently you can take vital seconds off each race by being able to choose the tightest racing line available.

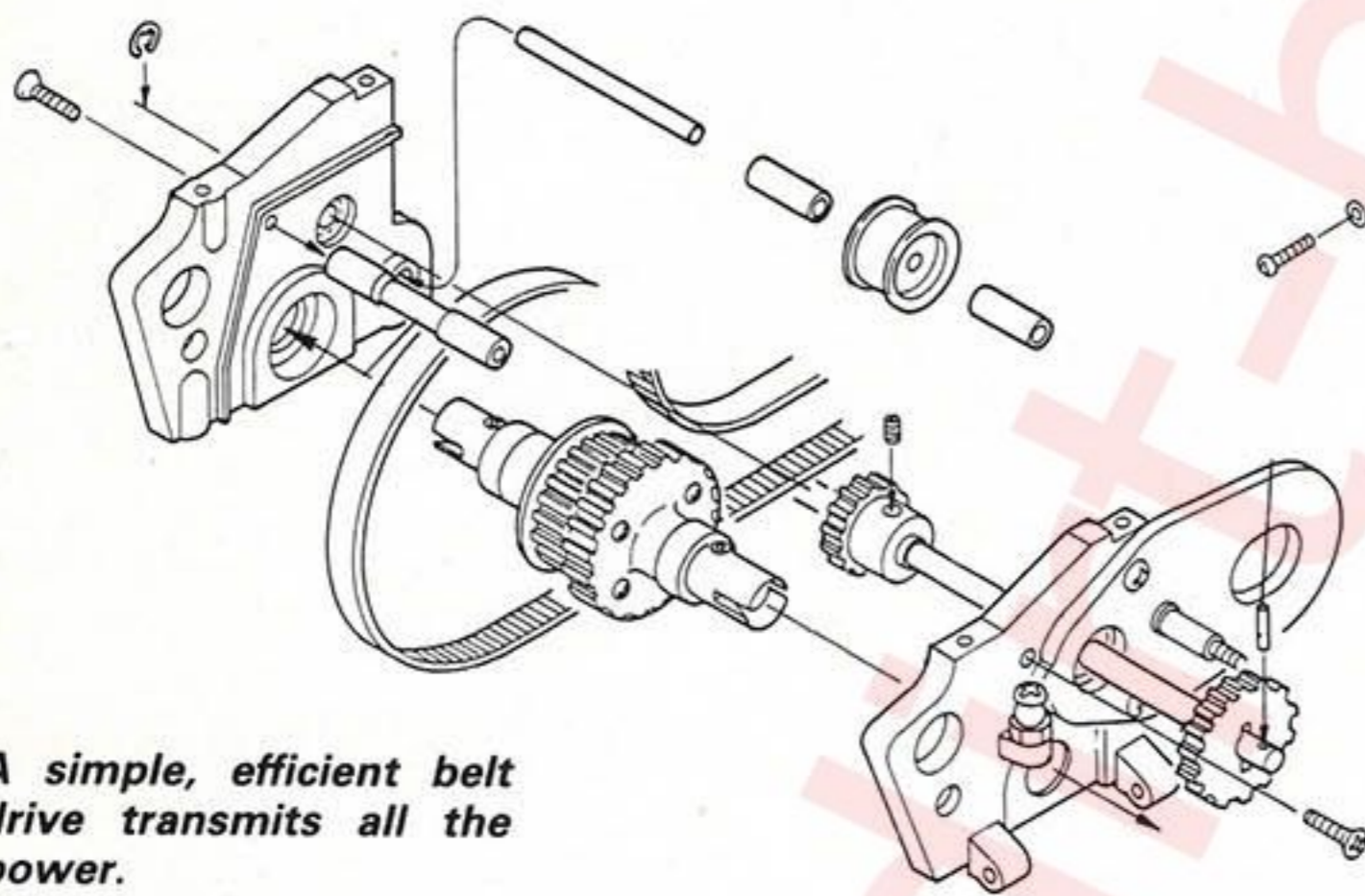
Maintaining the Invader is no problem, everything is easily accessible and quick to replace, the anti belt brigade would say that if the belt breaks then you have no option but to pack up and go home, well you can change the Invaders belt in twelve minutes, it does take practice but you can do it honestly!

**All load carrying or mating surfaces are ballraced, infact no less than fourteen ballraces are included in the kit.**

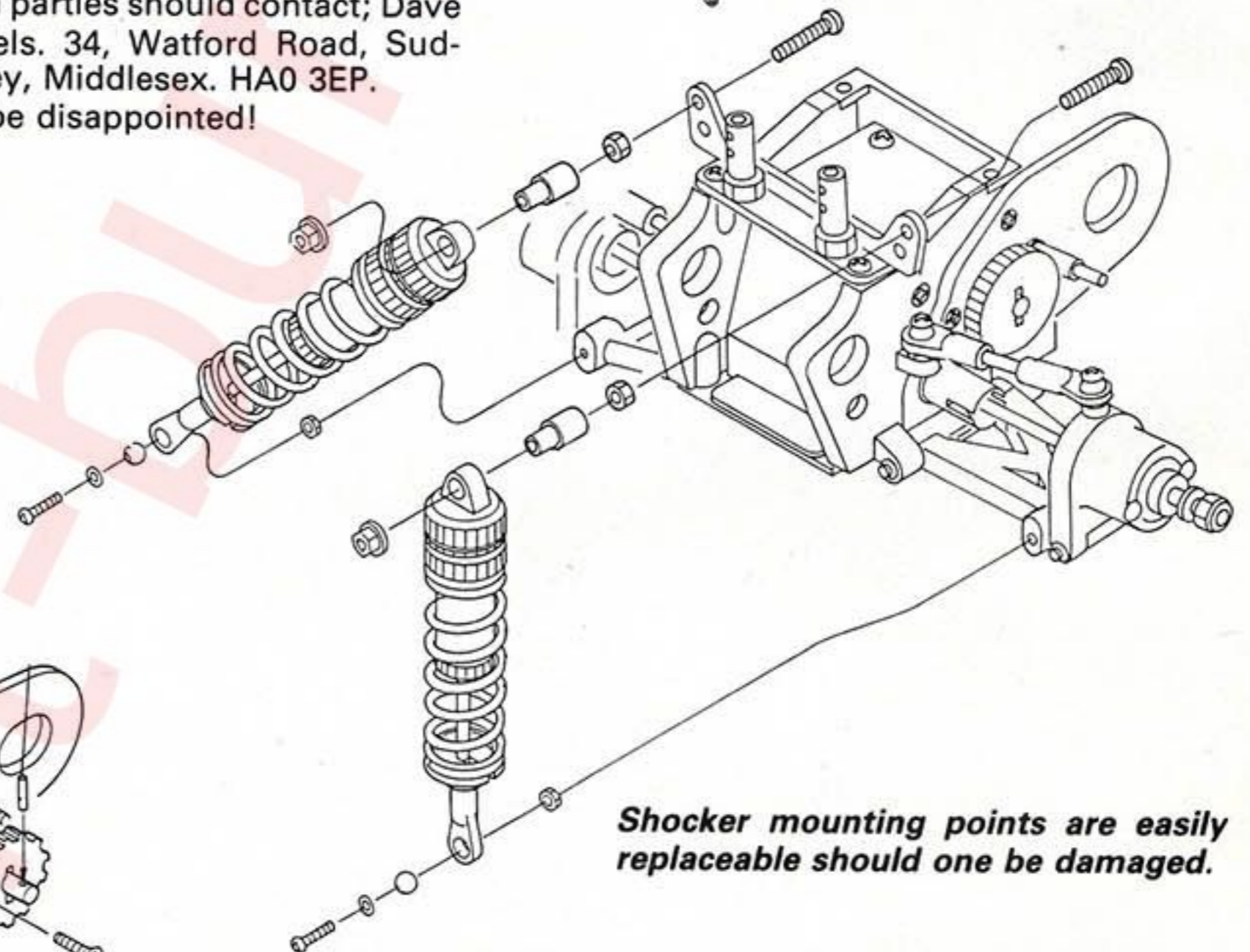


Now heres the bad news, it seems that there are no firm plans to import the Invader into the UK. However this may change if enough interest is shown in the car, interested parties should contact; Dave Nieman Models. 34, Watford Road, Sudbury, Wembley, Middlesex. HA0 3EP.

You won't be disappointed!

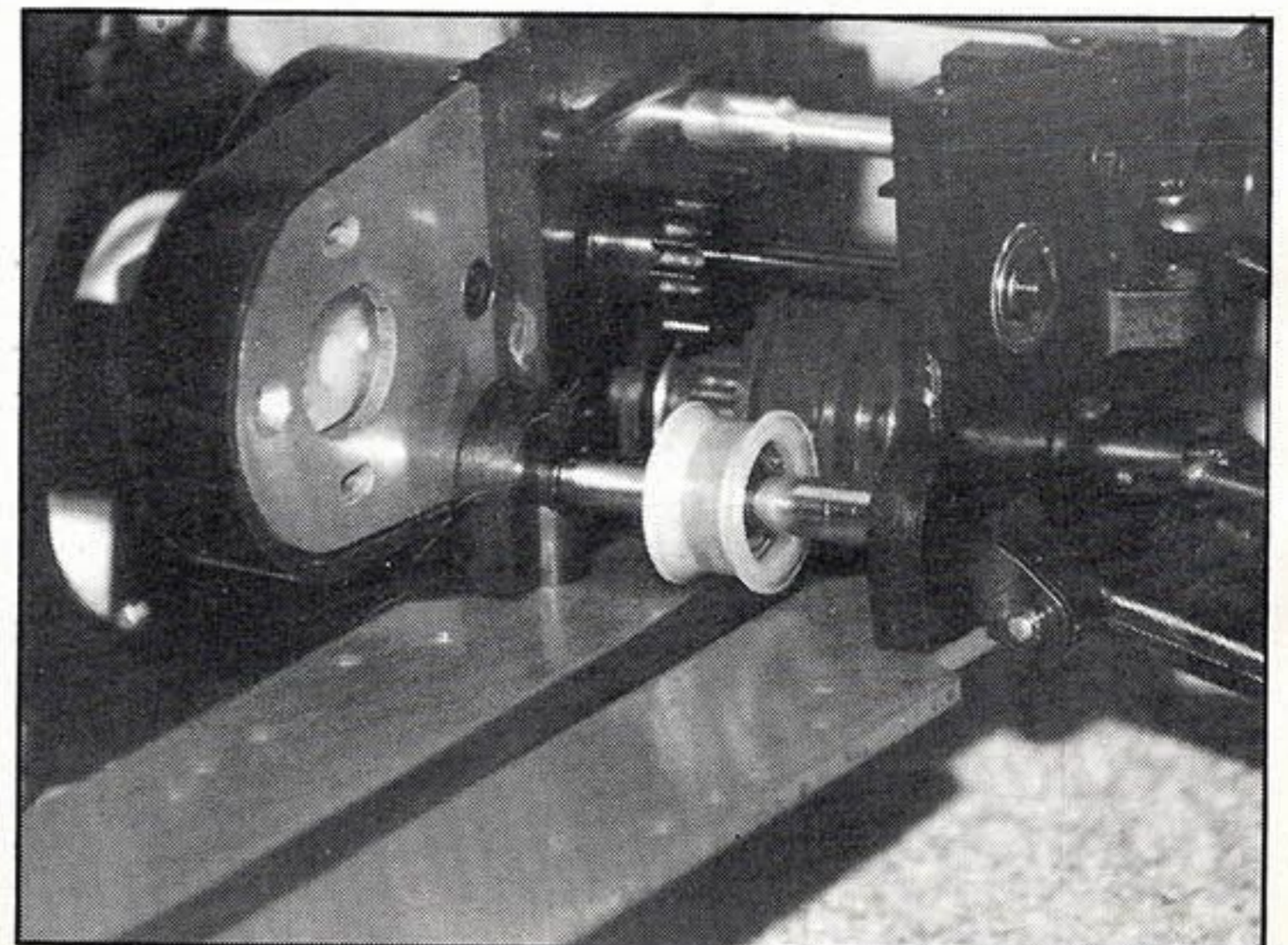
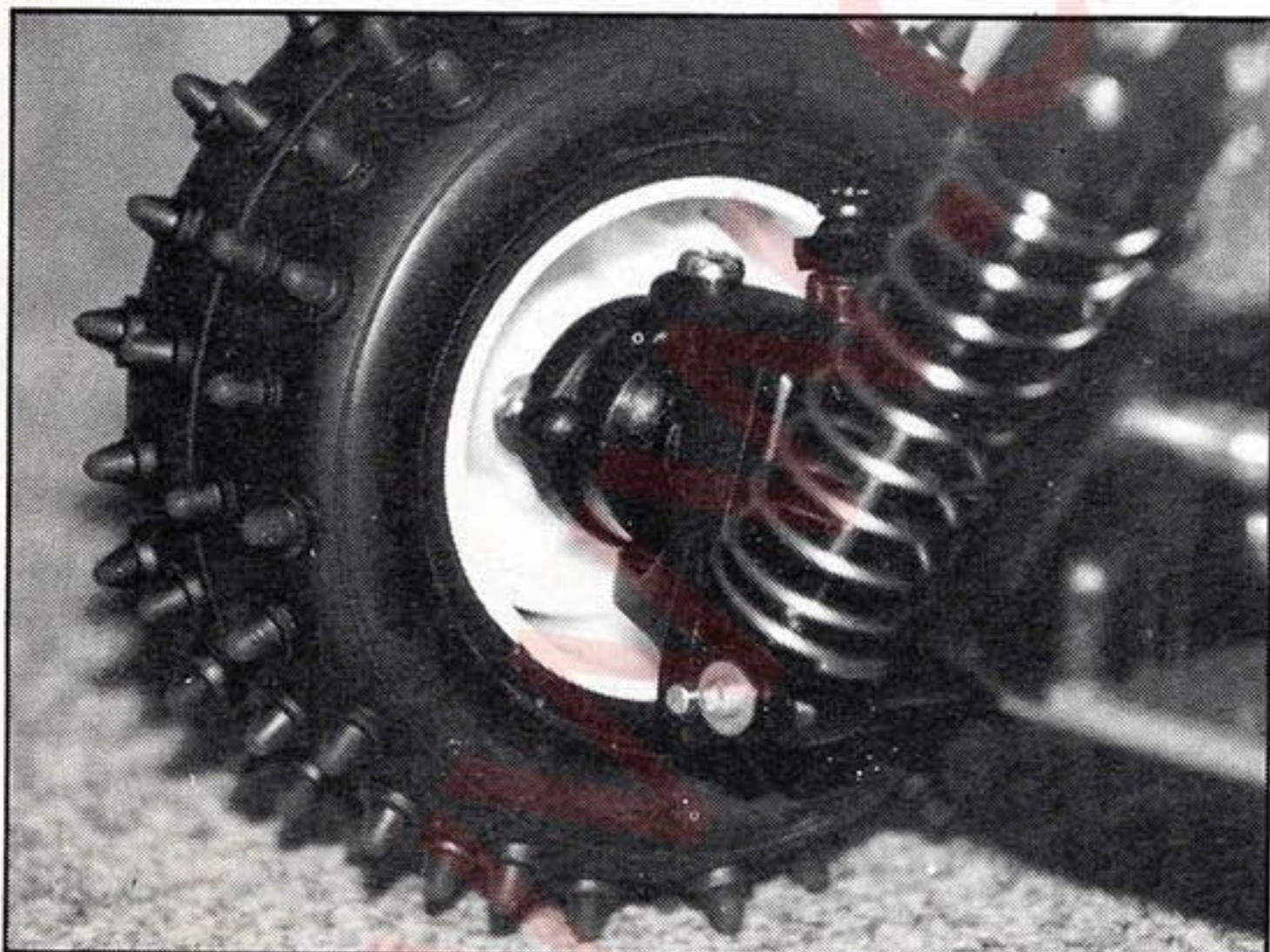


**A simple, efficient belt drive transmits all the power.**



**Shocker mounting points are easily replaceable should one be damaged.**

**Summing up the Invader is easy, simplicity has been the design watchword, followed to the letter.**



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# POWER CURVE

by Mike Billinton

Still actively consolidating their current position as the major UK manufacturer of 2 stroke model engines, Irvine Engine's .21 cu. in. Rear exhaust engine specifically

adds weight to the well-known adage that 'competition improves the breed' because the main design influence of this engine has been provided by that successful competitor Pete Halman, whose dominance of C/L speed (aircraft) in UK's FAI 2½ cc and 3½ cc Formula .21 classes has been quite marked over several years now.

The earlier side exhaust Irvine .20 owed much to his influence, but transition to the Rear exhaust layout (to meet the dictates of the typical C/L speed model and its Tuned exhaust system) has allowed a full expression of the engine's capabilities to the point where Pete Halman's 3½ cc engine proved capable of securing for this country the 5 cc C/L speed World record at velocity of 194 mph late in 1986 — a feat which still stands. In addition his engine also holds the UK Formula .21 3½ cc C/L speed record at 174 mph — a speed reduction due to in the main to mandatory .4 mm flying wires of higher drag than those used for the World record.

Not content with that, a prototype of the Halman designed Irvine 15 R/E (hoped for production in mid 1988) also holds the UK FAI 2½ cc record at 176 mph. This fearsome engine utilizes 198° Exhaust timing, and releases a nice and easy 1.7 HP at 39,000 RPM on Methanol. As can be seen there is a definite connection between these record speeds and unusually high power levels, and in the case of Pete's 3½ cc engine, the chosen way was also the 'raised Exhaust/higher RPM' route to achieve more HP. In the standard production form the Irvine 21 R/E uses 164° exhaust timing for the Car engine and around 172° for the Marine version, but for maximum effect, this was raised for the record runs to a high 190° (that's over half the piston stroke given over to the open exhaust port!). With appropriate changes to pipe length this then allows good effective resonance to occur at the much higher RPM of 36,000 which together with virtually the same level of Torque at 52 oz. ins. means an automatic HP increase on RPM grounds alone (HP equals Torque times RPM). Pete's figures on his Dyno. were 1.9 HP using 20% Nitro and a 7 mm carb. Of interest is the surprisingly low effective compression ratio used both on the record engines and in standard production.

This amounts to around 4½/1 for the 190° timed engine and 5/1 for standard production and is the ratio from the point where exhaust port is closed upward travel of pis-

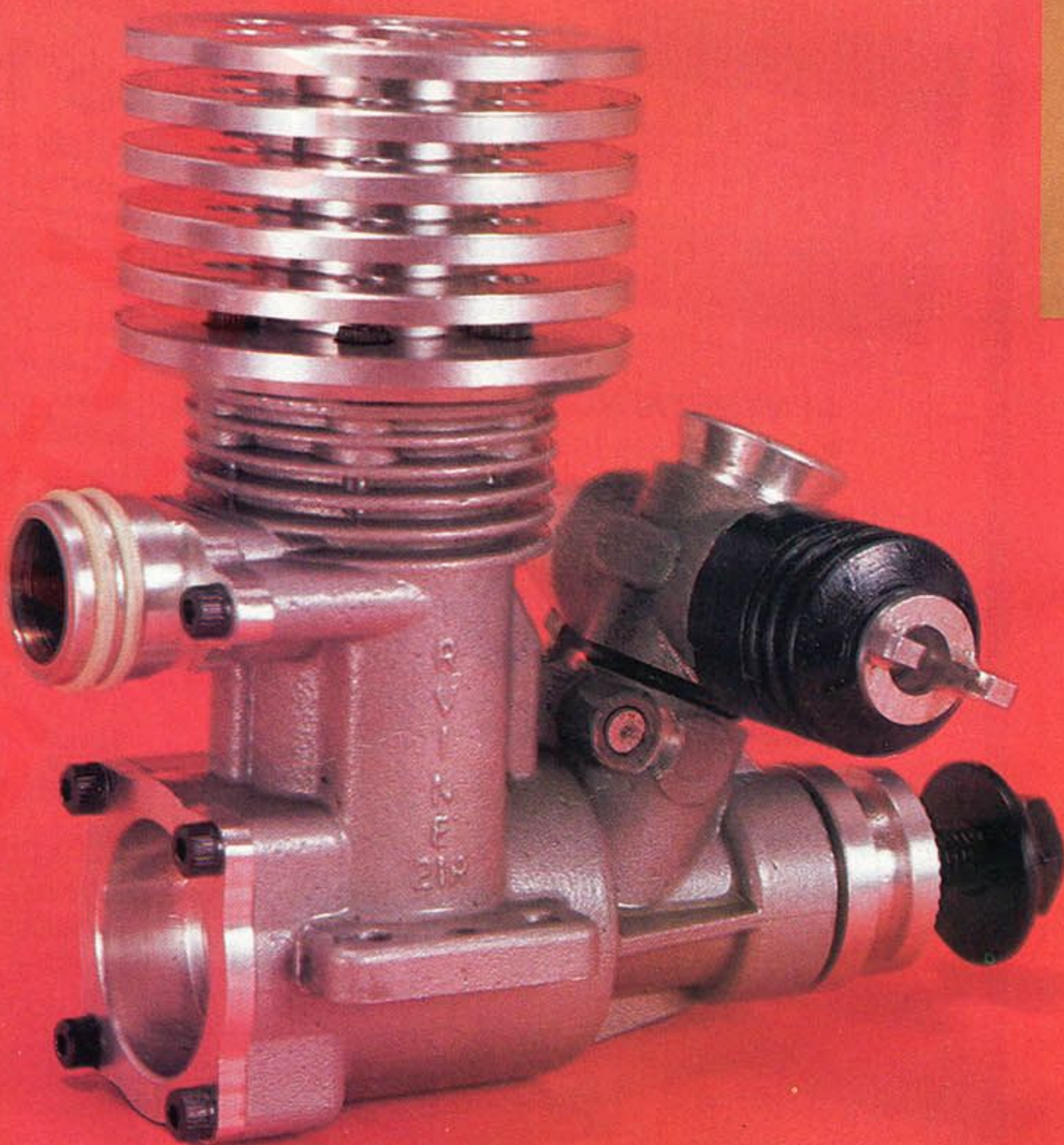
ton. The actual figures are deceptive though, because, as was surely the case in the record flights, the tuned pipe is working so well and effective cylinder pressures raised to an extent that a relative 'backing off' of the head compression is called for —

and is equally a feature of the full-sized super-charged 4 stroke dragster engine of 8 litres and 3000 HP also being reduced down to lower compression ratios around 6/1 on high Nitromethane fuels.

That the same engine can be persuaded to release the same Torque, but at a point some 18,000 RPM higher up the RPM scale compared with the Open exhaust result indicates that the idea that increasing mechanical friction as RPM increased places some stop to automatic HP rises with RPM needs some qualifying — whereas the significance of gas flow restrictions as RPM rises (volumetric Efficiency loss) is the major factor which the pipe overcomes. This is however a more alarming possibility — that mechanical friction does indeed rise somewhat with RPM, but the massive pipe 'supercharge' is so marked that it overcomes (or masks) that increasing loss, and were this friction loss to be remedied in some way at source, then the true value of the pipe 'supercharge' would be more clearly revealed — and that maybe the 1 HP per 1 cc engine

would become a reality! However, the likelihood is that Mechanical friction does not rise in such a manner and that Volumetric efficiency is the main determinant.

Readers may well wonder at the relevance of all this to the car engine? Well, the



**MIKE BILLINGTON  
REVIEWS THE IRVINE  
.21 R/E**



'pedigree' aspect is always of interest in any area of I.C. engine developments — whilst the fact of operation at almost 2 HP whilst rotating at 36,000 RPM speaks loudly

of the resulting reliability levels when the Irvine R/E is working at the lower power levels and lower RPM's of the standard production engine. The other point raised by the brief 'history' above is that operations at high Exhaust timings and high RPM's are usually a more critical, narrower RPM band affair, and thus less suited to the model 1/8 scale circuit car which demands a fair spread of Torque to provide good acceleration from low-speed corners. Lastly of specific interest to the car enthusiast is that the information concerning high HP being introduced by appreciable raising the exhaust timings almost certainly made for certain 3 1/2 cc car engines during the last 3 years or so — the implication being that the figures were reached, but using the high timing method which was not necessarily taken across to normal production runs — just as in this Irvine .21 case.

As can be seen from the power graph, the RPM spread provided by the 164° exhaust timed engine is reasonably wide in the Tuned pipe form, whilst in Open Exhaust form the HP spread is unusually flat.

**Mechanical Detail**

In most respects the Irvine .21 R/E is mechanically laid out in conformity with established current practice for 3 1/2 cc racing engines, ie:-

1. Crankshaft Induction through front housing for overall reliability at very high RPM (separate rear discs or drums

have a hard life in the post 30,000 RPM area).

2. One-piece die-cast crankcase (joining together cylinder/piston and

crankshaft in one rigid piece for maximum reliability and friction-free operation).

3. ABC piston/liner set-up (giving best combination of heat dissipation/freedom from friction/maximum compression seal).

4. Large heat sink head (to ensure adequate in-car cooling — but also the

large area controls excessive variation of head and exhaust temperatures which then would vary acoustic velocity in the pipe and thus its effective length and RPM point for best resonance).

Within that overall standard package however, the Irvine .21 R/E has certain individual points of some significance:-

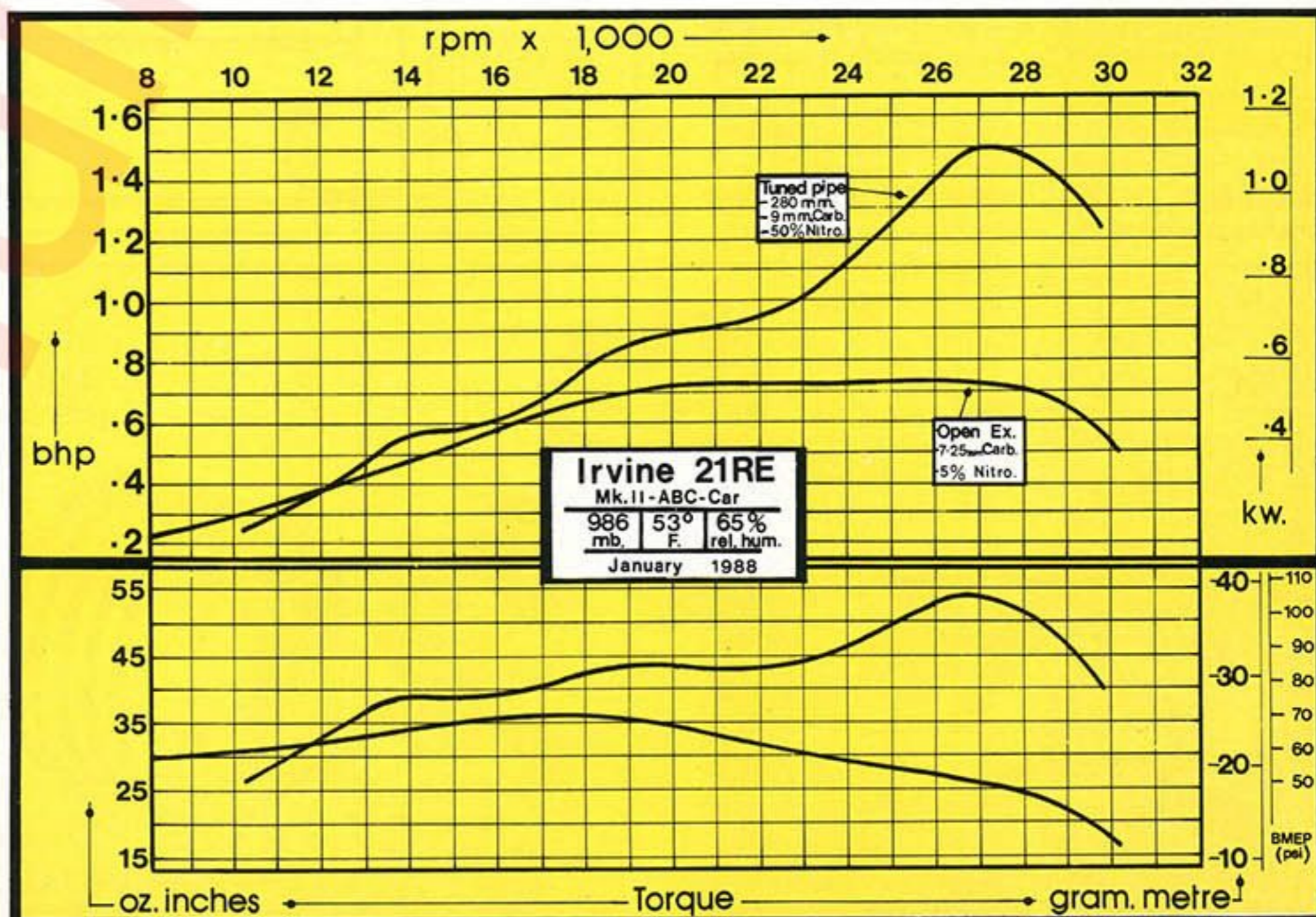
1. Piston is not through-bored for the gudgeon pin, and the resultant 'blind' hole at exhaust port side eliminates need for the often troublesome gudgeon pin retaining circlip which has been known to self eject at high RPM with interesting results. Additionally the method conveniently allows the use of a hollow tubular gudgeon pin.
2. Connecting-rod is a very solid machining from high-duty HE15 aluminium alloy.
3. The remarkably low compression ratio has been commented on earlier.
4. A neat practical point is that all Allen bolt fixings (4-40 ANC.) are the same size and length — this goes down well on competition days!
5. A last apparently 'negative' though realistic point is that no carburettor is supplied as standard, it being a matter of observation that open car competitors are an individualist breed who usually throw the standard carb. away in order to achieve a unit of greater bore and/or greater installation convenience.

**Power Tests**

In keeping with previous procedures, an open exhaust test was undertaken following a brief period of running on 2 standard propellers — all of which served to complete the quite limited running-in needed for today's ball-race ABC engines.

Additionally the Open exhaust findings

give indication of the likely best place to operate the engine when fitted with a tuned pipe. In general it has been found (during this writer's test at least) that keeping open exhaust peak and tuned pipe peaks in a similar RPM (by use of a specific length of tuned pipe) usually gives best tuned pipe HP result. However, the large 15 cc marine racing engines have not yet fit-



ted this — whilst it would also be enlightening to know just where the Irvine .21 R/E peaks in its open exhaust form when fitted with 190° Exhaust timing!

Clearly there are questions which this writer has yet to find an answer for — though the possibility is that really effective tuned pipe operation (which has the capacity to overcome this provisional 'finding') is the factor.

**Test 1**

In open exhaust form, and using 5% Nitromethane, and a small bore 7.25 mm carburettor (from ST S21 car engine), this rear exhaust engine gave results no more powerful than that of the earlier side exhaust engine tested mid 1983, though there was some significance in its ability to prolong the HP peak much further on from the similar 21,000 RPM peak onto 28,000 RPM.

**Test 2**

Based on the open exhaust findings then, the next test used a pipe length likely to generate maximum resonance and power at any RPM point near to the upper end of that wide band of open exhaust HP.

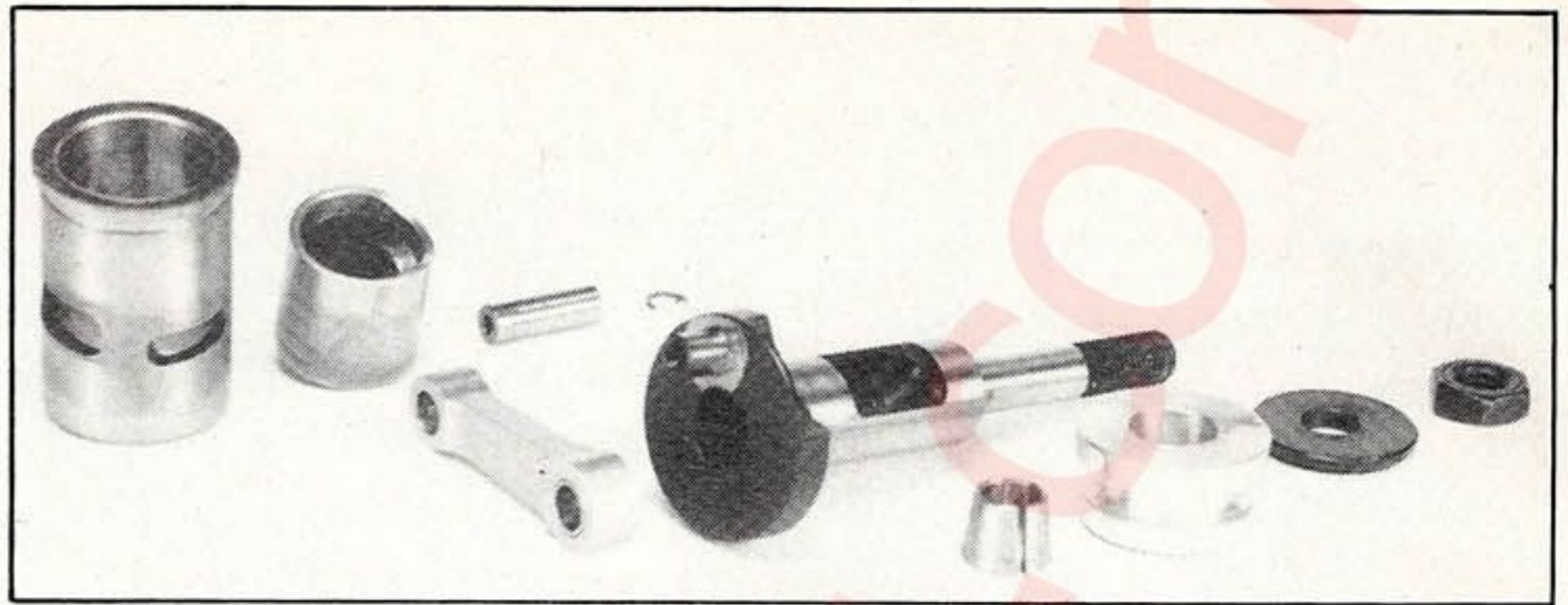
Using 50% Nitromethane and an OPS 9 mm slide carburettor, the OPS pipe's operating length was fixed at 280 mm from plug to end of rubber can. The result proved conveniently almost spot on, such that no more tests were felt necessary to further establish the point of 'the right length' to use. In any event, the OPS 300 glow-plug finally disintegrated at the last measured Torque point at 29,829 RPM, and its partial entrapment in piston surface terminated the test slightly prematurely. So there is some chance that further optimising of pipe length may just have increased power a little — maybe up to 1.6 HP say, though a large increase is unlikely without recourse to the higher exhaust timings mentioned earlier.

At 1.5 HP the Irvine R/E both exceeds the earlier side exhaust engine's figure of 1.17 HP at 29,000 HP (using similar equipment) by a significant margin, and also establishes itself amongst the current best figures being reached worldwide by normal production 3½ cc engines.

**Summary**

During testing, the Irvine .21 R/E was completely trouble-free and as vibration-free as any so far tested by this writer. It is clear

**Backplate is 'O' ringed for consistent crankcase seal.**



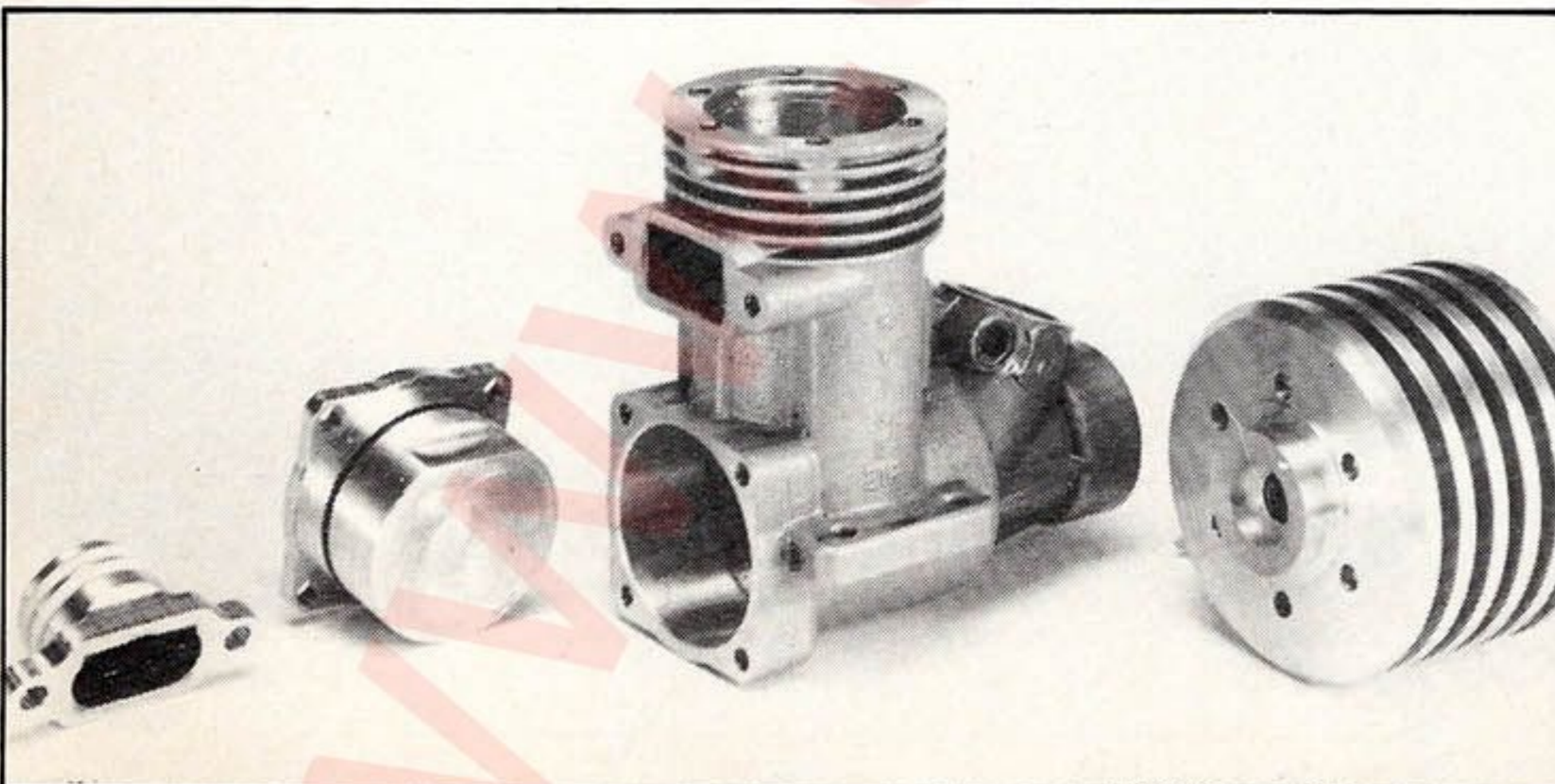
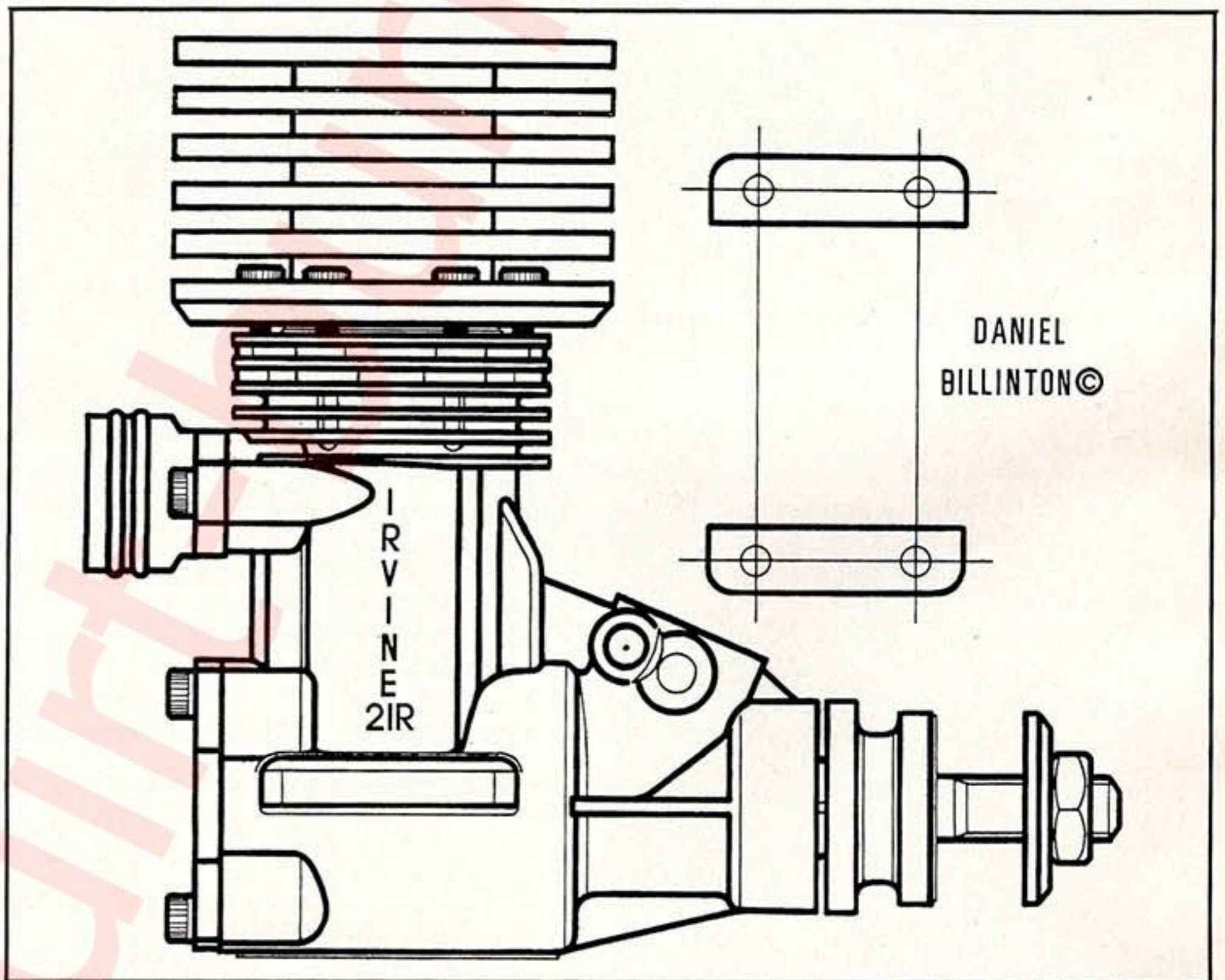
**Substantial connecting-rod is noteworthy. Note also piston not through-bored for gudgeon pin.**

that the aircraft competition background has resulted in a much more powerful engine having considerable reserves of reliability, and its overall qualities seem likely to benefit the 1/8 car user in economic terms at the very least.

**Dimensions and Weights**

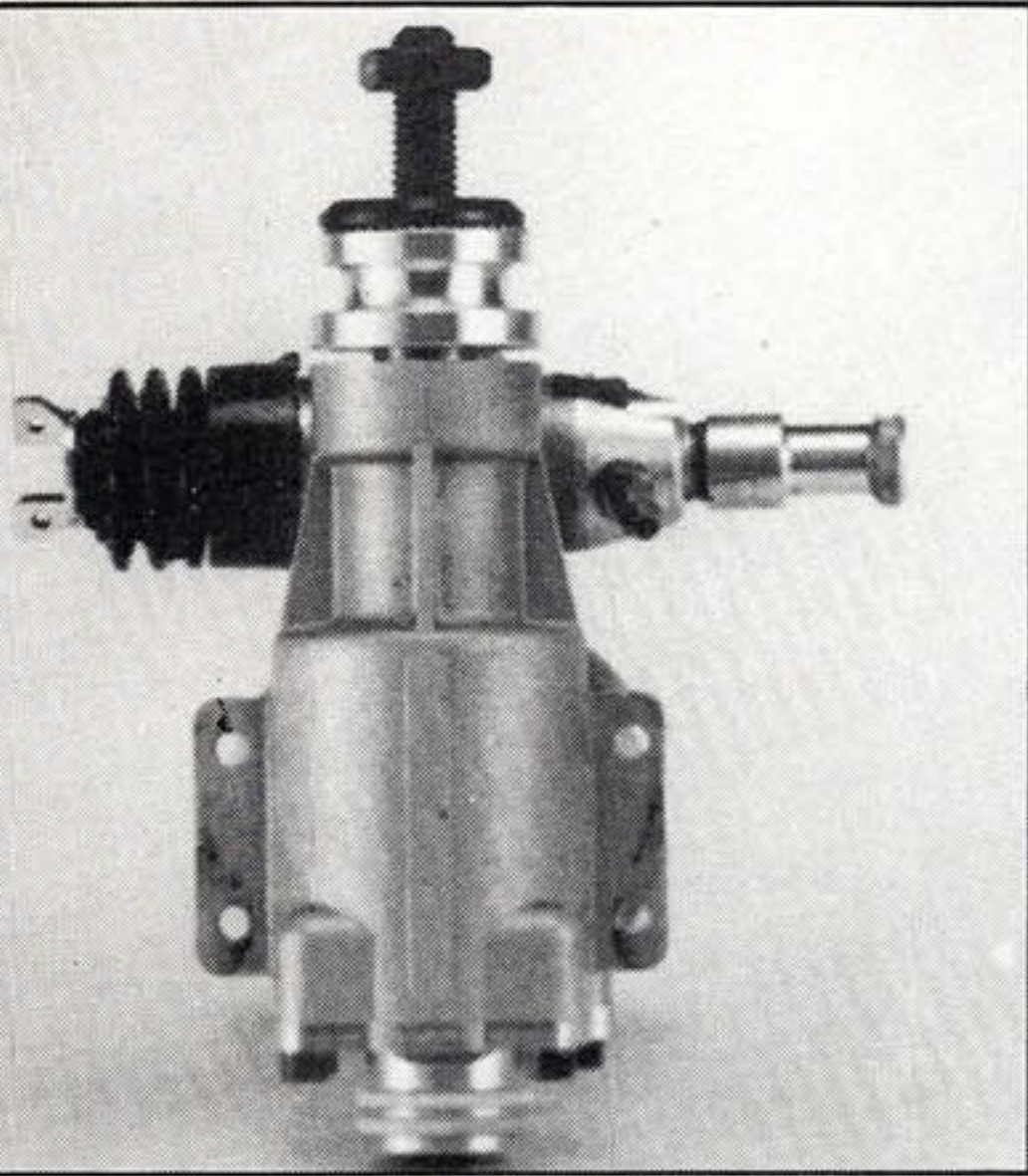
- Capacity — .2123 cu in (3.48 cc).
- Bore — .650 in (16.51 mm).
- Stroke — .6395 in (16.24 mm).
- Stroke/Bore ratio — .983/1.
- Timing Periods:
  - Exhaust — 164°.
  - Transfer — 130°.
  - Boost — 122°.
- Front Induction:
  - Opens — 41° ABDC.
  - Closes — 58° ATDC.
  - Total period — 197°.
  - Blowdown — 17°.
- Exhaust port height — .227 in (5.8 mm).

**Drawn full size below, the new 21R.**



- Combustion chamber volume — .5 cc.
- Compression ratios:
  - Effective — 5.486/1.
  - Geometric — 7.96/1.
- Cylinder head squish — .028 in (.70 mm).
- Squish band angle — 5°.
- Squish band width — .133 in (3.4 mm).
- Crankshaft dia — .472 in (12 mm nominal).
- Crankshaft induction bore — .332 in (8.4 mm).
- Crankshaft nose thread — .248 in x 28 TPI (¼ UNF).
- Crankpin dia. — .1868 in (4.74 mm).
- Connecting rod centres — 28.7 mm.
- Mounting holes — 16 mm x 36.7 mm x 3 mm holes.
- Width between bearers — 30 mm.
- Length — 2.92 in (74.2 mm) — front prop. driver to backplate.





Height — 3.59 in (91.1 mm).  
 Width — 1.70 in. (43.2 mm) — across lugs.  
 Frontal area — 5.01 sq. in.  
 Overall weight — 8.9 oz (252 gms) — without carb. (10 oz with carb).  
 Piston weight — .15 oz (4.25 g).  
 Crankshaft weight — 1.3 oz (36.8 g).

**Performance**

**Max BHP:**

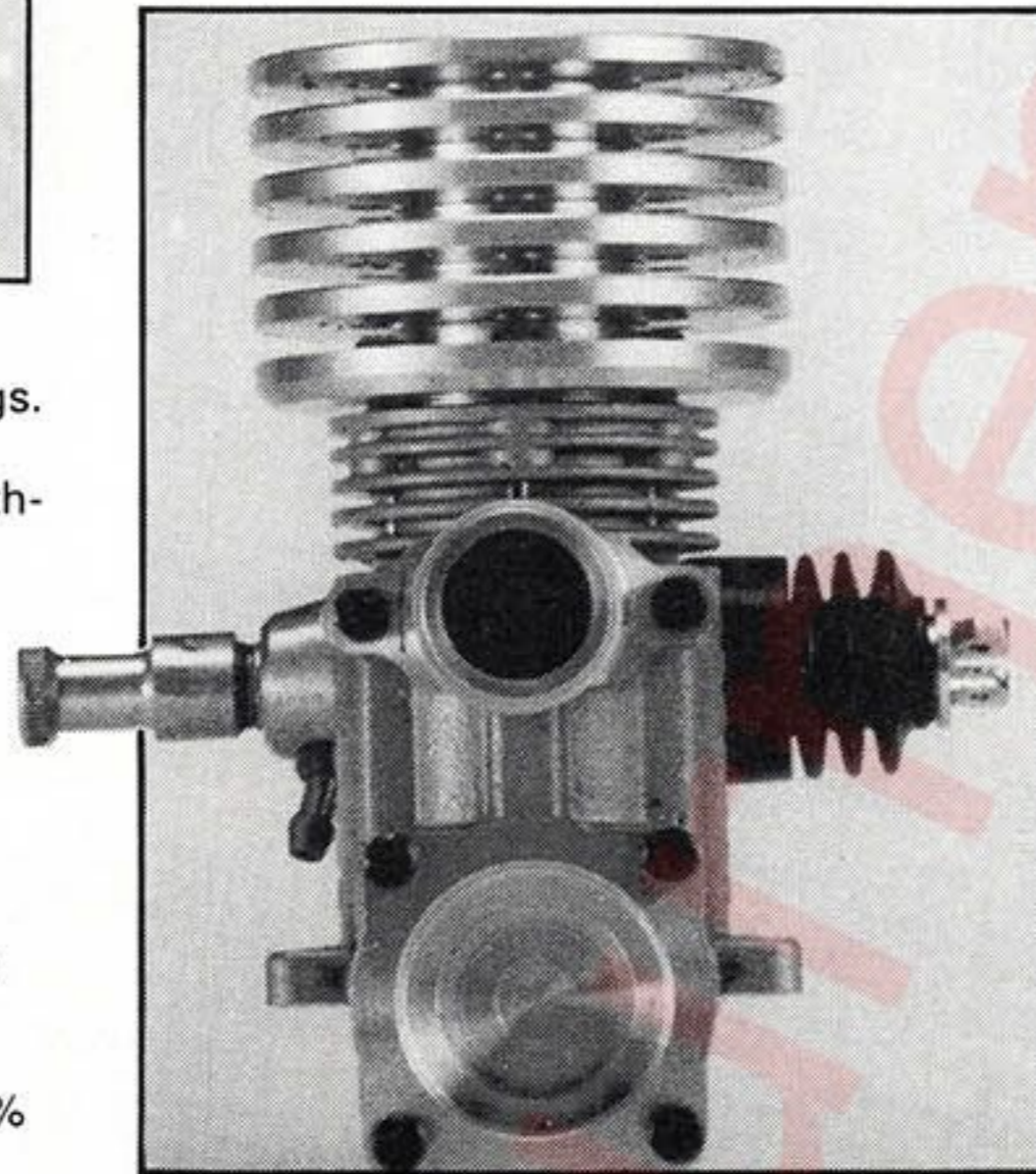
- 1.50 @ 27,300 RPM (OPS pipe/50% Nitro/9 mm carb.).
- .72 @ 26,800 RPM (Open exhaust/5% Nitro/7.25 mm carb.).

**Max Torque:**

- 54 oz in @ 26,800 RPM (OPS pipe/50% Nitro).

- 36 oz in @ 17,800 RPM (Open ex./5% Nitro).
- RPM Standard Propellers:**
- 7 x 6 Taipan — 16,603 (Open ex./5% Nitro).
- 7 x 6 Taipan — 18,701 (OPS pipe/50% Nitro).
- 7 x 4 Taipan — 20,869 (Open ex./5% Nitro).
- 7 x 4 Taipan — 25,187 (OPS pipe/50% Nitro).

Left shows the underside whilst below the rear of the 21R is clearly shown.



- BHP/cu. in. — 7.06
- BHP/cc — .43
- Oz in/cu in — 254
- Ox in/cc — 15.5
- Gm. metre/cc — 11.1
- BHP/lb — 2.37
- BHP/kilo — 5.24
- BHP/sq. in frontal area — .299

**Manufacturer**

Irvine Engines Ltd.  
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 New Southgate,  
 LONDON. N11



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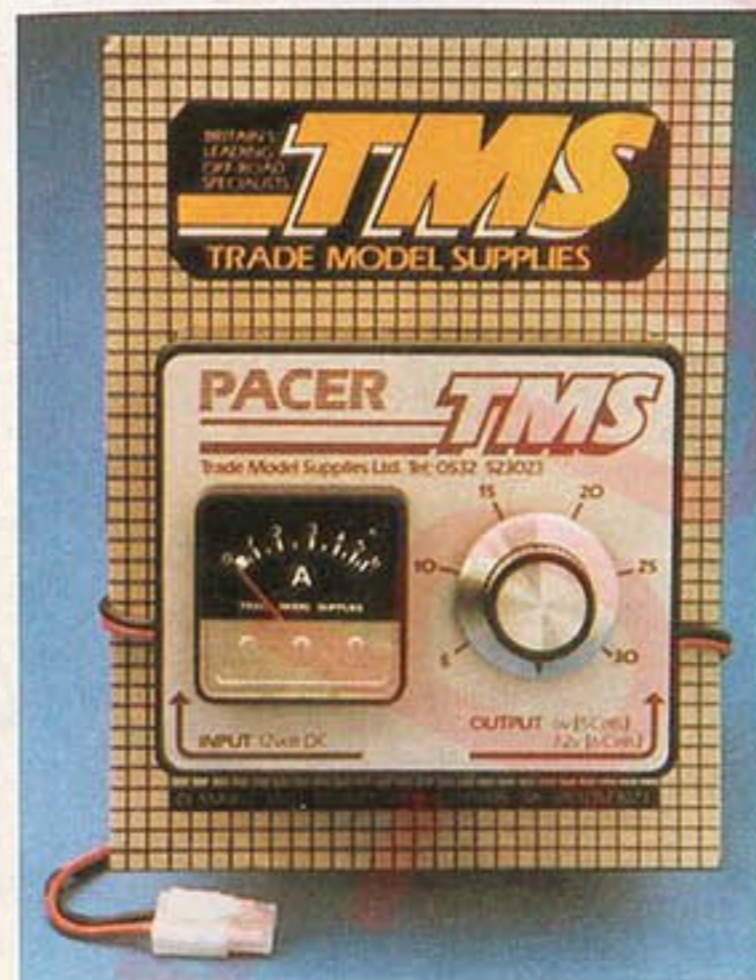
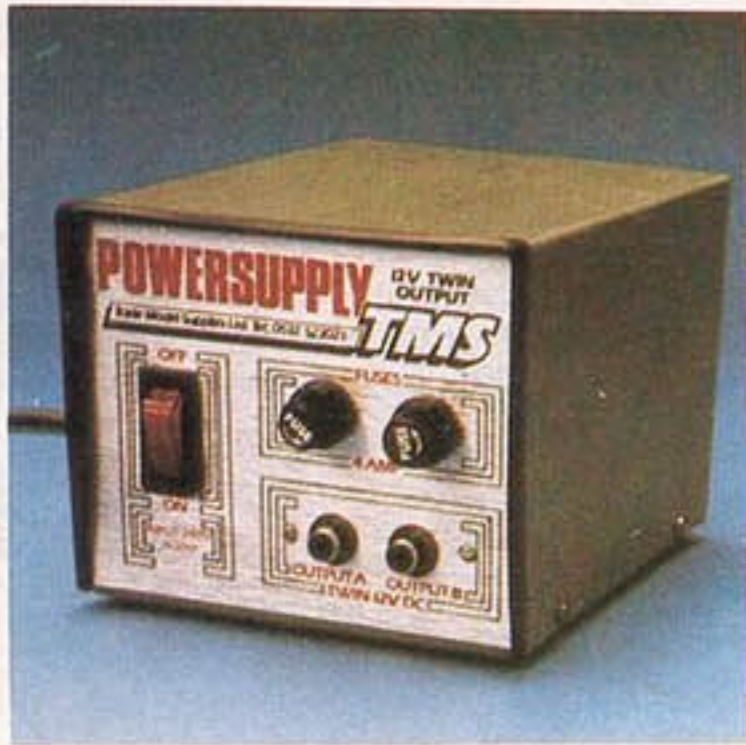
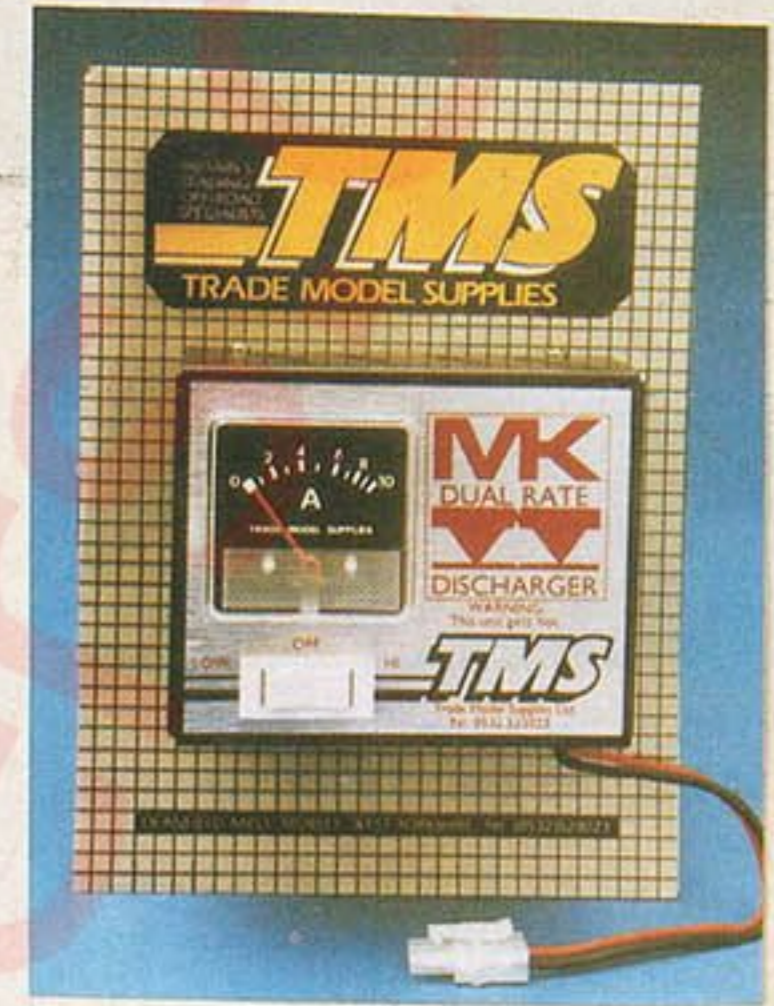
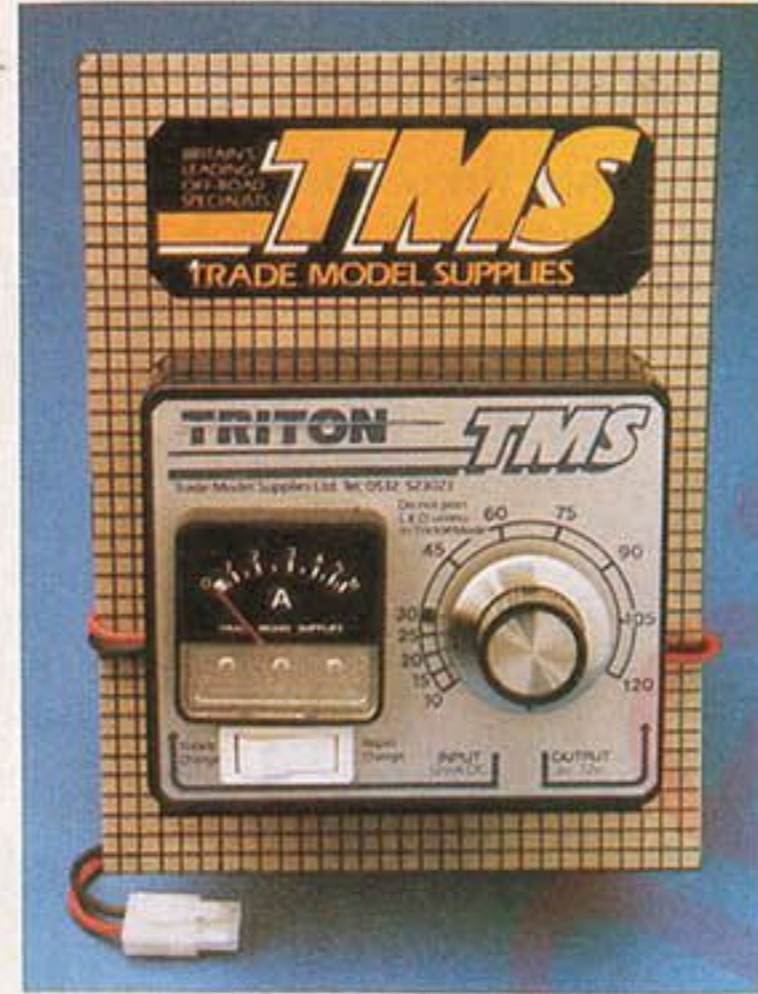
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- OT66 Rear Tyre (pr) ..... £6.95
- OT72 Resistor Heat Sink . £1.25
- SC26 Front Tyre (pr) ..... £4.95
- SC67 Speed Controller Set £10.00
- SC79 Speed Controller

**OPTIMA SPARES**

- OT1 Gearbox ..... £4.95
- OT2 Chain ..... £4.95
- OT3 Wheel Set (4) ..... £4.95
- OT4 King Pin (4) ..... £2.45
- OT6 Swing/Drive Shaft (pr).£5.00
- OT7 Rear Plate Set ..... £6.65
- OT8 Front Side Plate (pr) . £2.10
- OT9 Shock Stay Set ..... £2.75
- OT10 Bushing Set (10) ..... £2.35
- OT11 Suspension Shafts (pr) £2.75
- OT12 Radio Plate ..... £4.65
- OT13 Suspension Arm Set (pr) £2.75
- OT14 Underguard ..... £2.10
- OT15 Front Bumper ..... £2.10
- OT16 Fr. Knuckle Arm Set...£3.90
- OT17 Front Shaft (pr) ..... £3.50
- OT18 Rear Shaft (pr) ..... £3.50
- OT19 Drive Washer (4) ..... £2.10
- OT20 Chassis ..... £5.90
- OT21 Screw/Nut Set ..... £7.45
- OT22 Body Washer (10) ..... £2.10
- OT23 Pinion Gear (12t) ... £2.10
- OT25 Body ..... £13.20
- OT26 Driver ..... £3.50
- OT27 Sprocket Gear Set . £5.95
- OT28 Differential Gear Set £5.90
- OT29 O ring (10) ..... £1.75
- OT30 Tyres (pr) ..... £7.00
- OT31 Pillow Ball (10) ..... £2.75
- OT32 Ball 5.8mm ..... £2.10
- OT33 Ball Nut (10) ..... £2.10
- OT34 Plate Set ..... £2.35
- OT35 Upper Rod Set (8) .. £2.95
- OT36 Pillow Ball (10) ..... £2.75
- OT37 Motor Leads ..... £3.10
- OT38 Silicon Grease (2) ... £2.75
- OT39 E-rings (10) ..... £1.10
- OT41 Final Pinion Gear ... £2.50
- OT42 Servo Saver Set ..... £2.75
- OT43 Rear Damper Set .. £11.65
- OT44 Decal Set ..... £2.35
- OT45 Rear Hub Set ..... £1.55
- OT46 Chain Guide Set .... £2.35
- OT47 Front Hub Set ..... £1.95
- OT48 Battery Holder Set . £1.95
- OT49 Gear Cover Set ..... £1.95
- SC40 Motor Cover ..... £2.95
- SC67 Speed Controller .. £10.00
- SC78 Speed Cont. PCB ... £3.75
- SC89 Tie Rod Set ..... £3.75
- W5005 Special Rod Set . £11.95
- OT057 Special Shock SxTay £3.25

# BRITAIN'S TOP CHARGER RANGE OFFERS UP TO THE MINUTE STYLING

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## MAINS INPUT CHARGERS

### POWERTWIN

Single or tandem fast-slow mains operated charger.  
Spec includes: 30 minute timer: integral fuse: mains on neon: slow charge indicators: switchable fast-slow charge: twin ammeters: 7.2volt connectors fitted: internal thermal cutout: output for 6v-7.2v-8.4v batteries.

### POWERTRON MK2

Fast-slow mains operated charger.  
Spec includes: 30 minute timer: mains on switch: neon indicator: 7.2volt connector fitted: integral thermal cutout: output for 6v-7.2v-8.4v batteries.

### POWERSUPPLY

FOR ADAPTING 12v CHARGERS FOR USE ON MAINS 240volt SUPPLY.

SPEC INCLUDES: Mains on switch: neon indicator: dual output facility: phono plugs and sockets: separate output fuses for overload protection: internal thermal cutout: up to 4amp output.

## 12 VOLT INPUT

### TRITON MK2 \*NEW VERSION

Fast-slow field charger for use from 12volts, probably the most popular fast charger on the market.

Spec includes: 6 amp ammeter for rapid current readout: 30 minute timer: switchable fast-slow charge: LED indicator for slow charge: 7.2v connector fitted to output lead: internal fuse: output for 6v-7.2v-8.4v batteries.

### PACER \* NEW VERSION

An economical version of the Triton MK2, automatic slow charge after fast mode has been completed can be used as a fast or slow charger: output for 6v-7.2v batteries.

### TRITON SUPERTWIN

Single or tandem fast-slow charger.  
Spec includes: twin ammeters for rapid charge current readout: 30 minute timer: switchable fast-slow charge rate independent for each battery: LED indicators for slow charge: 7.2 volt plugs fitted: output for 6v-7.2v-8.4v batteries.

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Bob Errington's

# PIT PATTERN

Hi out there once again! Well after what has seemed like a long and wet winter, we are finally into the long and wet summer. The only difference is that the racing season has now started and the sale of MRC wet tyres has again rocketed skywards. So we must be in Britain eh!

This year really has got under way early, some say too early, as most of the new cars had not arrived in England. The opening BRCA round at Southampton, over the Easter weekend, was missing several top drivers for a variety of reasons, although it was nice to see some old faces returning to the sport.

The previous weekend had seen an East Midlands League meeting held at the now much improved Lilford circuit with all present commenting on how improved it was. Colin Straus had been giving his new Kyosho an airing and it was showing to be quite competitive although it appeared to be a little slower on the straight. Further testing is under way though to improve this. Dave Ashton made a welcome return to racing, this time with a Serpent Quatro and his form had improved as well. Nigel Sayles had modified his SG Space to direct steering, in advance of the official version, and that too was going well. The meeting was led though by Steve White with his faithful Serpent, taking FTD and the final to boot.

For those of you who don't know, direct steering is where the track rods connect at one end on the front axle block, and at the other end, direct onto a Kimborough type servo saver affixed to the steering servo. In

other words, the conventional bell crank sitting in the middle of the chassis, has been replaced. Most of the '88 models have gone for this idea including PB Serpent and SG.

Also tried at Lilford for the first time was the Ford Cosworth class which unfortunately was not very successful. Either there was great difficulty in getting the cars running on straight fuel, or the cars didn't handle too well without the normal full size wing. Still its early days yet. For those that are running on straight fuel, you should remember that the head clearance must be reduced to around 8 to 12 thou (0.2 to 0.3 mm), otherwise you won't achieve a suitable combustion. Carburettor adjustments are also much more critical and if you are experiencing difficulties then do ask someone for advice.

Also due for track improvements is the old Bournemouth circuit where word is that it will actually be re-surfaced in June or July this year. This really is good news even if a trifle long in coming. The Bournemouth circuit shape was liked by many and the notorious chichane always a true test of car control and handling. The track was last used in 1985 and the outright lap record was 18 laps dead, on what was a quite bumpy surface. We will wait and see the result of the re-surfacing but hope that once again Bournemouth's name will appear on the calendar.

**Forthcoming Events April 30th/ May 1st, 2nd**

British Grand Prix at Aberdeen. This event

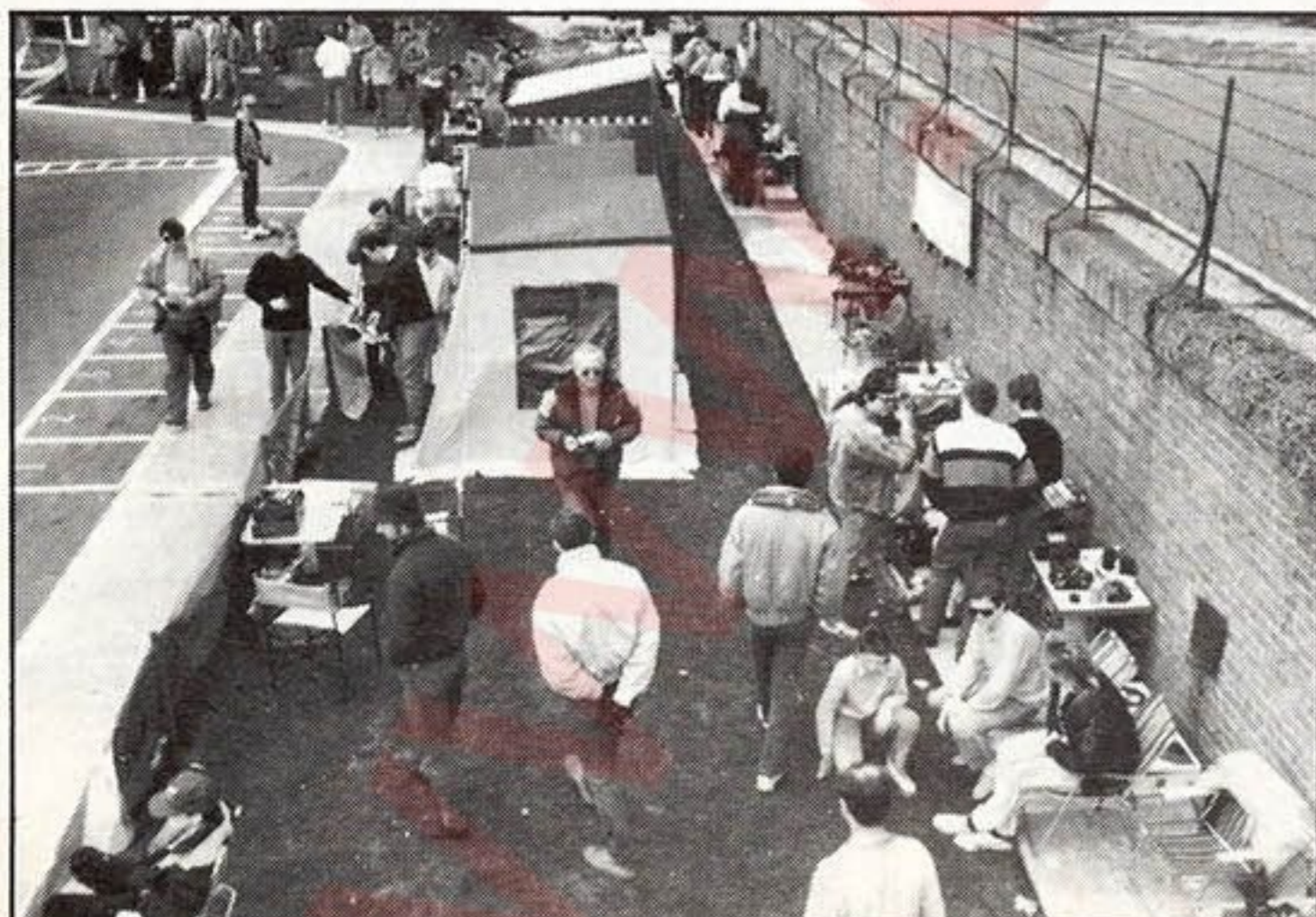
is being sponsored by British Telecom and promises to be one of this years premier events. Qualifying commences on Saturday morning with four rounds of heats, followed by the normal BRCA 'A', 'B' and 'C' finals. Sunday is the day of Christmas tree type finals starting with the lowest and culminating in the Grand Final of some forty five minutes duration and the title "British Grand Prix Champion 1988".

Monday is a BRCA Saloon meeting and is one not to be missed as it is a possible points scorer for next years European Saloon Champs which is also being held in Aberdeen.

**Other Dates**

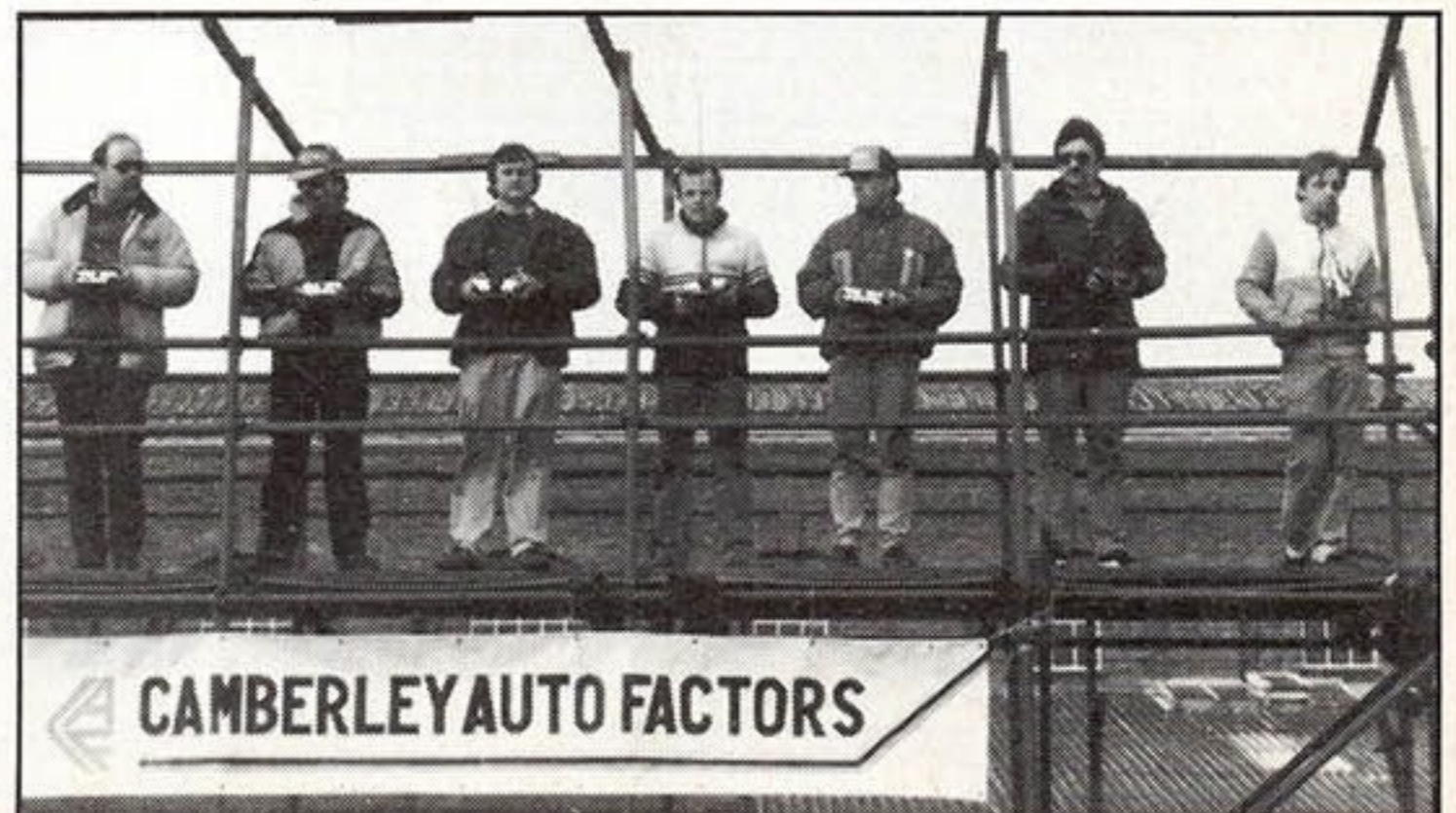
- May 8th — Southampton Sports Club Round.
- May 14th/15th — Crystal Palace BRCA Round 3.
- May 22nd — Mendip Saloon Club Round.
- May 22nd — Southampton Saloon Club Round.
- May 22nd — Aberdeen Club Round.
- May 28th/29th/30th — Tibshelf BRCA Round 4.
- June 5th — Mendip Sports Club Round.
- June 5th — Southampton Sports Club Round.
- June 5th — Aberdeen Club round.
- June 11th/12th — Wrexham BRCA

**Murray Collins concentrates hard to get top spot for the Saloon 'A'.**



Southampton Pits.

The Saloon Open Finalists.





John Russell wins the first Ford Cosworth Race.



Steve Hart, Sports 'A' Final winner.

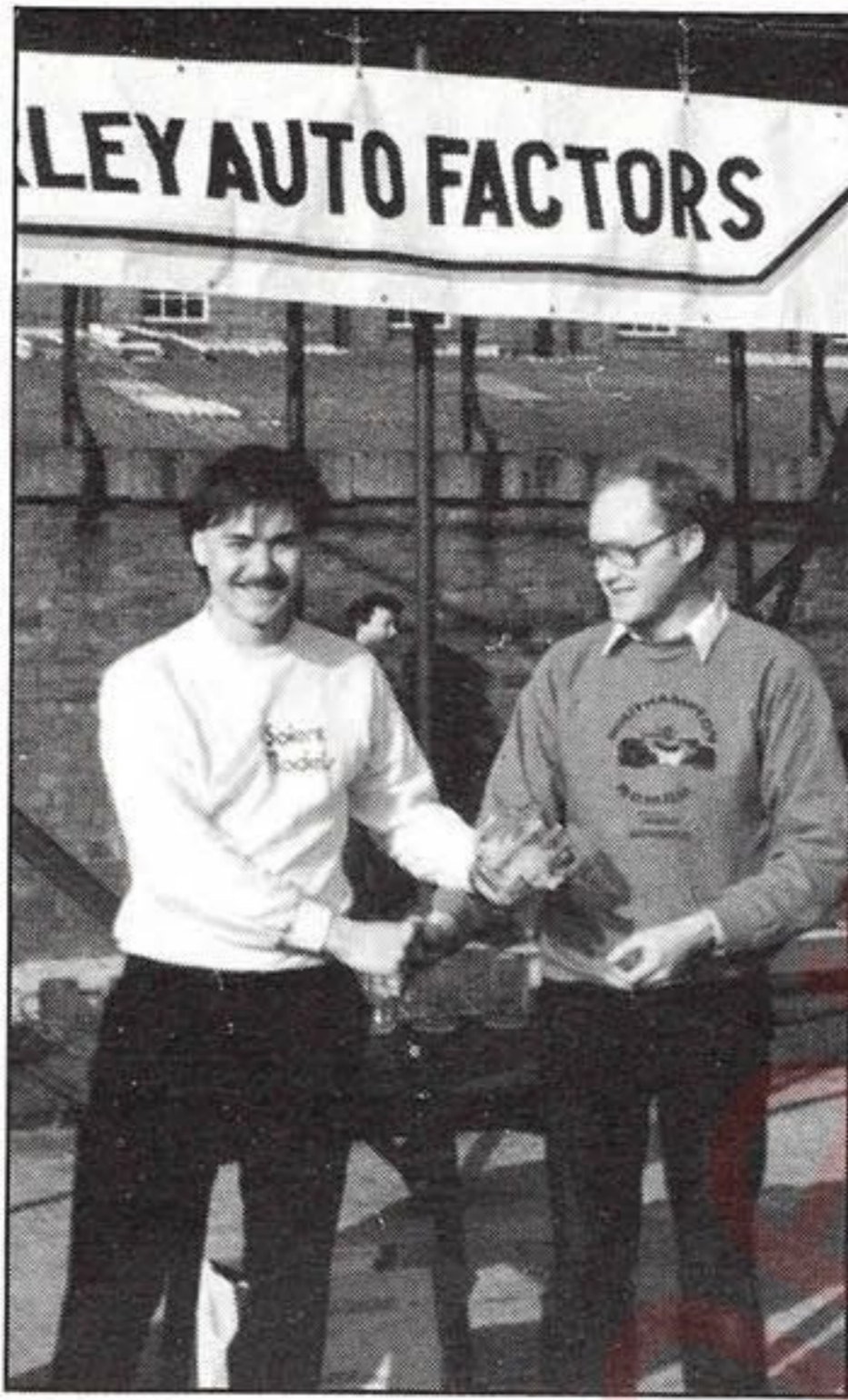


Ian Anderson Saloon 'B' final winner.



Young Steve Cole wins the first Renault Five meeting.

Dennis Jones takes a well deserved win in the 'B' after all his work on the computer.



Chris Wilkinson Sports 'B' Final winner.



Dave Preston wins the Saloon 'A' Final on his Debut return to racing.



Steve White with a Double win in Saloon and Formula.

Dave Haskell achieves the Triple, winning the 'C' Final on all three days!



Round 5.

June 19th — Mendip F1 Club Round.

June 19th — Southampton Saloon Club Round.

The Aberdeen meeting, weather permitting, should see the '86 lap records broken, both currently held by Gary Culver. The Sports record being 19 laps in 5 mins and 2 secs, whilst the Saloon is 19 laps in 5 mins and 12 secs.

Tibshelf on the other hand, has proved elusive for some years now. Gary Culver holds the Saloon record when in 1986 his Serpent scored 21 laps in 5 mins 11 secs, whilst the Formula record is held by the two wheel drive SG Columbia of Bob Errington with 21 laps in 5 mins 12 secs recorded back in 1984 when also the sports record was made by Debbie Preston who drove her 2 wheel drive PB Nova round to notch 22 laps in 5 mins 13 secs, a score so far not ever been closely approached.

Wrexham has the honour of the most number of laps on any of the circuits with 24 laps in 5 mins 12 secs to Chris White with his Nova X4 in 1985, and to Gary Culver in Sports with his 86 Serpent in a similar 24 laps in 5 mins 11 secs. An average lap time of just 13 seconds!

**BRCA Handbook**

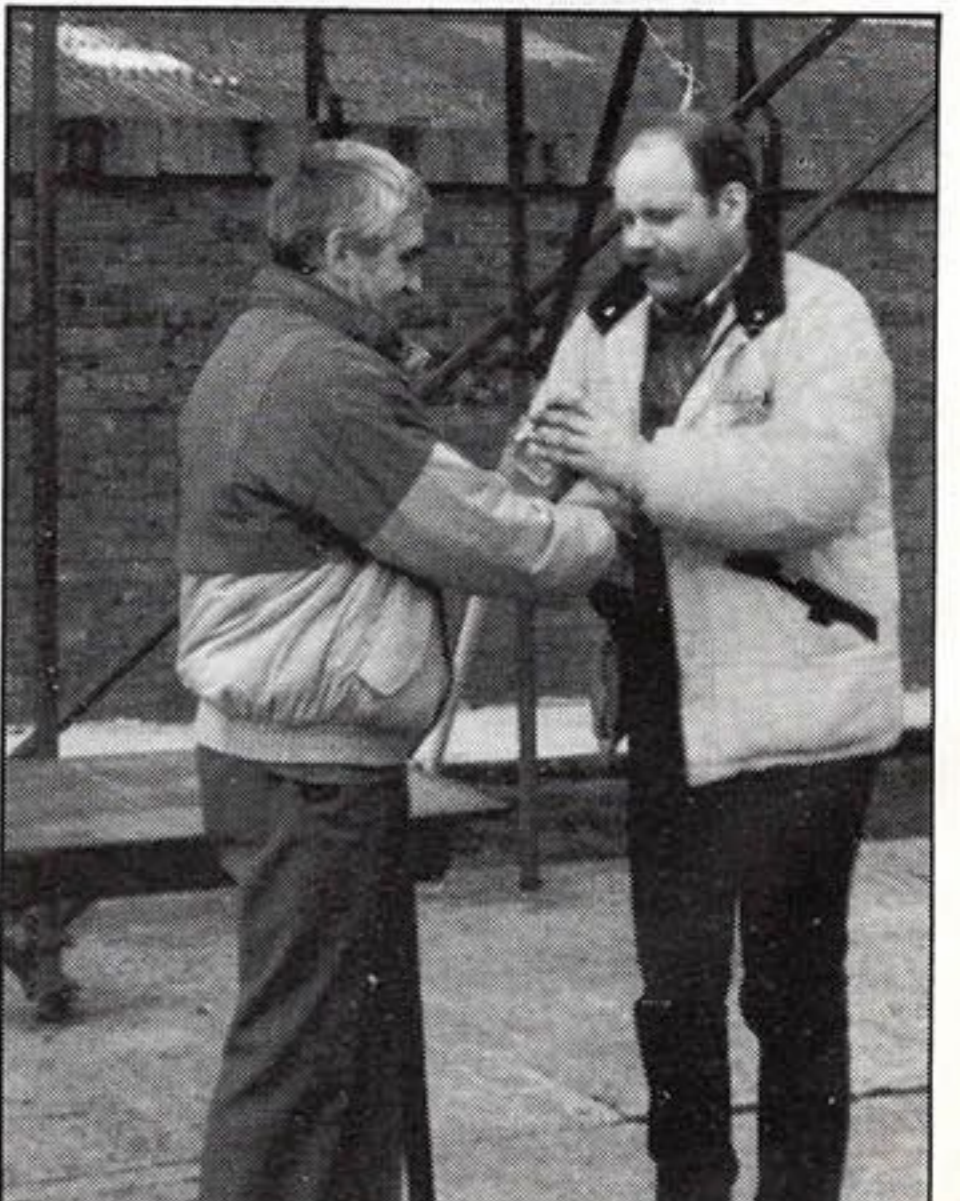
As promised, the BRCA handbook arrived at the end of January (spelt M-A-R-C-H) but does include a couple of mistakes apart from the insufficient number of Entry Forms.

Rule 5a, iv, should in fact be deleted as this no longer applies. Note that the supporting class finals are of 15 minutes duration, also, that a final will only be run if more than four people are involved.

The other change is on page 11 under the minimum dry weight rule which should now read 2.5 Kg for Four wheel drive cars and is effective from May 88. Ballast weight is only acceptable if it is securely attached to the car.

Be warned. If a "normal" part of the car was to get detached during the race and the car was then weighed, this normal part could be included. However, if a ballast weight became detached then it could not be included when the car was weighed!

Dave Dixon, no wins but two FTD's.





Debbie fuels Garys car in the Saloon Final.



Chris White, Sports Final winner.

Colin Straus proudly shows his Kyosho, note the slightly slanted eyes!



**Easter At Southampton**

Easter for many people is the first indication as to the fortunes for the coming season. Many had forecast that Gary Culver would continue in the form he had during 1987. Many had also shown doubts about the new PB Pheonix and to a lot of people, Easter was just too early this year.

The most significant change in the rules since last year was the weight rule which had been raised to the then EFRA standard of 2.6 Kg. This weight was to be enforced over the Easter weekend but is to be brought into the new EFRA/IFMA standard of 2.5 Kg for all future events (see elsewhere in this article). The new official scales were on hand for the first time and all cars were weighed before the start of the meeting, all with no fuel and with small tyres.

The majority of cars present were as expected over this minimum weight and thus OK. A lot of drivers had lightened their cars and some of these had to add a little weight back on. Some cars were extremely light weighing in at around 2.4 Kg and consequently had a fair amount to add. What was surprising was the weight of the new PB Pheonix which could very well be under the new 2.5 Kg mark even in a kit standard trim — surely something that PB will have to amend.

The result of being on 2.6 Kg meant that huge chunks of lead strip were being added by the team drivers to the light Phoenix which in some cases looked quite ridiculous!

In practice, before the weight was added, Gary Culvers car was flying round as we had come to expect. He also had a few laps with, soon to be Father-in-law, Dave Preston's new Serpent, which was simply electric in terms of speed and turn in ability.

The actual meeting started quite leisurely at around 10.00 o'clock with the Saloon meeting. Colin Straus had elected to run his new Kyosho car in order to give it a fair comparison with the other makes where as most of those present did not consider it a serious threat due to the different configuration of the car in terms of suspension layout and metal gear drive. It was also losing some ground on the



Tony Gilson formula 'A' Final winner.

straight which was thought to be connected with the metal gears.

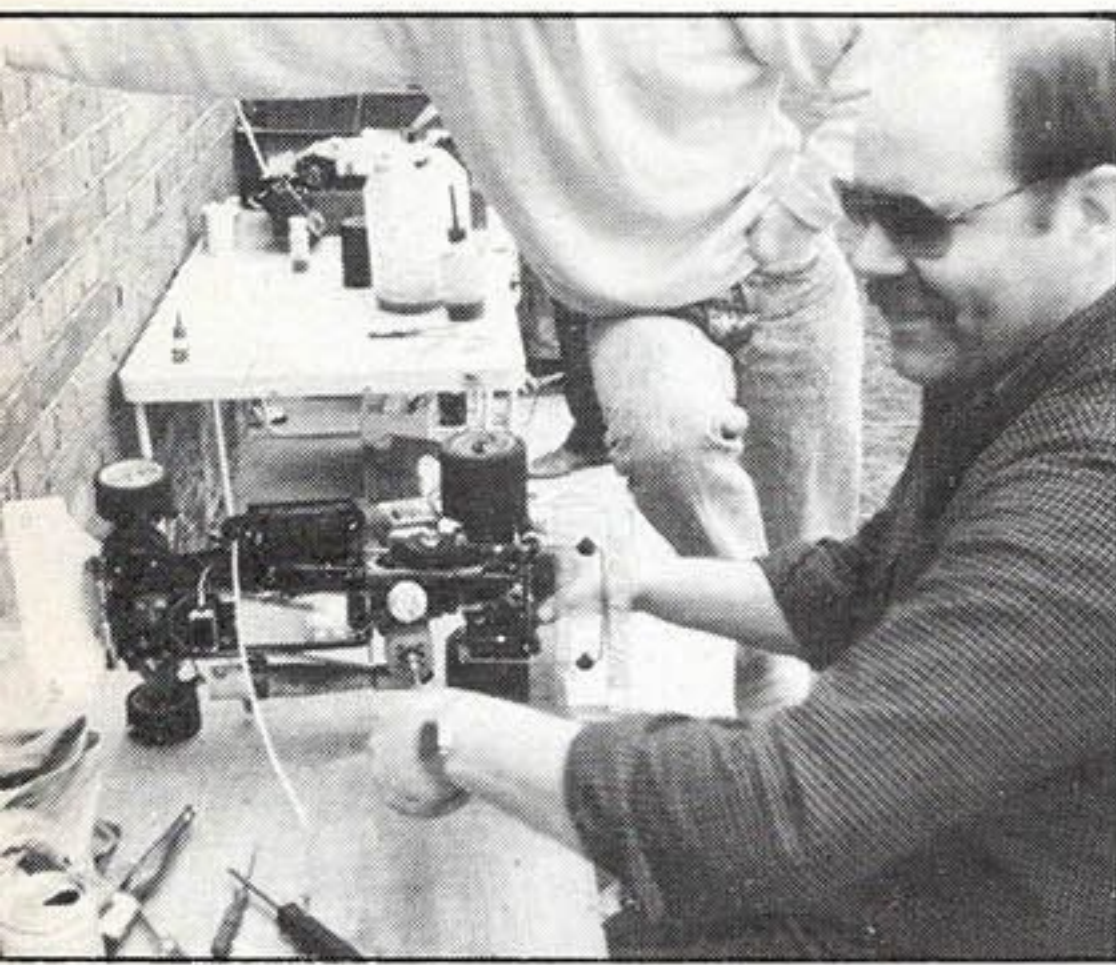
The first round of heats saw Steve White on FTD with a good opening score of 16 laps in 5 mins 12 secs and the track gradually getting grippier.

The second round finished with Nigel Sayles on top with his SG just pipping Steve to record 16 in 5 mins 11 secs. Dave Dixon had been flying round in his heat but had a wheel come off his PB. Quick work by the marshalls though, had him going again and finish with a creditable 16 in 5 mins 13 secs. Colin Straus with the Kyosho was going well though and had improved to 15 laps in 5 mins 3 secs.

The third round, as expected, was the quickest and most drivers improved. The last but one heat had Dave Dixon's car rocket off the line and lead the heat to take one second off of last years lap record and so at the end of the three rounds Dave was on pole position with 16 in 5 mins 3 secs, Steve white was second with 16 in 5 mins 9 secs, Nigel Sayles third with 16 in 5 mins 11 secs and Gary Culver fourth with 16 in 5 mins 13 secs, his car no longer quite so nimble. Colin Straus finished in 5th spot

Our Dutch Visitors added a nice addition.





Dave Dixon works on his new Phoenix.

with a 16 in 5 mins 14 secs which was very pleasing for him.

After a short time the finals were announced and the 'C' final duly got under way with Tim Dicks leading off and Dave Haskins in pursuit. Which is how it stayed for most of this final but with Dave Haskins coming out the ultimate winner by five seconds from Tim Dicks in second and George Dziejdic (from London would you believe), a lap down in third.

The B final had Jethro Tull, under his alias of Ian Anderson, win with a two lap cushion over Colin Carter in second and a further three laps up on Charles Baldry in third.

The A final was perhaps the most exciting of the days finals as pole position man, Murray Collins, led off with his SG from Dave Swift, Mike Hooper and Dave Preston, making his first final on return to racing.

Murray makes a mistake and Dave Swift takes up the lead from Mike Hooper and Dave Preston. Shaun Leake starts to move up the field, first into third place, then second, then, as Dave Swift parks his car into the catch fencing, Shaun takes the lead with Murray second and Dave Swift back in third. Murray rolls his car through the esses and Shaun gets stuck on the grass thus letting Dave Swift move up to second about five seconds behind Shaun.

For some laps Dave Swift is making steady progress but then he gets into trouble in the esses, gets hit by another car and the engine cuts and that puts paid to his progress. At the end of the twenty minutes

it is Shaun Leake with his Serpent, who wins by just seven seconds from Dave Preston, whose car was not extremely low on the ground and starting to get sparks off the chassis a la Formula. Dave Cole took the third spot some two laps behind with Murray fourth, Dave Swift fifth, Mike Hooper sixth, Ray Killgallon seventh and Mark Stockford eighth with only 8 laps on the score sheet.

The Open Final was the last event of the day and as usual all gathered round the circuit to watch. In the warm up it was once again clear that Gary Culvers car was not as agile as last year. Steve Whittings new PB was having gearbox problems and was not on the grid when the race started.

They're off and Dave Dixon shoots out in front followed by Gary and Steve White in third. Then Dave rolls the Phoenix allowing Steve White to take the lead from Gary in the confusion, with Dave back in third. Steve starts to pull away whilst Dave looks for a way to pass Gary which he duly does at the end of the straight in impressive style. Dave is obviously tight on fuel with this extremely rapid Nova Rossi, and pits early leaving Steve leading from Gary, Chris White and Nigel Sayles.

After all the leading drivers have pitted the position returns to close combat but as Steve Whites car rolls over, so Gary and Dave slip past. Dave then runs into more trouble and slips back whilst Gary pulls out a small lead even if his tyres are extremely small. Dave gets his car going well again and starts to "charge". However in his anxiousness to pass Gary and with Gary's car not handling quite as good as Dave's, they clash and Gary gets rolled, but worse, the motor cuts effectively handing the lead to Steve with Dave in second, and that is how it stayed to the end with the final result like this:-

**Saloon Open Final**

1st	Steve White	Serpent	92 Laps
2nd	Dave Dixon	PB	91 Laps
3rd	Nigel Sayles	SG	90 Laps
4th	Gary Culver	Serpent	90 Laps
5th	Chris White	PB	88 Laps
6th	Steve Hart	Serpent	76 Laps
7th	Colin Straus	Kyosho	70 Laps
8th	Steve Whiting	PB	10 Laps

**Formula Day**

Sunday again dawned bright and promised to be a fine day with practice well underway by half past eight. An early morning special conference had been called to sort

out the weight problem and was also used to modify the rules regarding the Ford Cosworth and 'Renault Five' series, by allowing the use of Formula size wings provided that they were touching the bodyshell. The first heat of the day was also the first ever heat of the new supporting classes and John Russell and Colin Straus (with his Serpent), gave a good demonstration of the potential of these cars by running round nose to tail for the full five minutes.

At the end of the First complete round of heats it was Steve White once again on FTD with 16 laps in 5 mins 5 secs from Nigel Sayles, second, with 16 in 5 mins 10 secs and Gary Culver, third on 16 in 5 mins 12 secs. John Russel headed the Cosworth class with 13 laps in 5 mins 15 which improved in the second round to 14 laps in 5 mins 20 secs, whilst Gary took over Pole with a marginally quicker 16 in 5 mins 5 secs and Dave Dixon slotted into third with another almost equal time.

In the third round Colin Straus set out to see just how quick his Serpent/Cosworth could be and finished with a most impressive 14 laps in 5 mins 6 secs. There were no changes to the FTD though which stayed with Gary albeit about 10 seconds down on last years time.

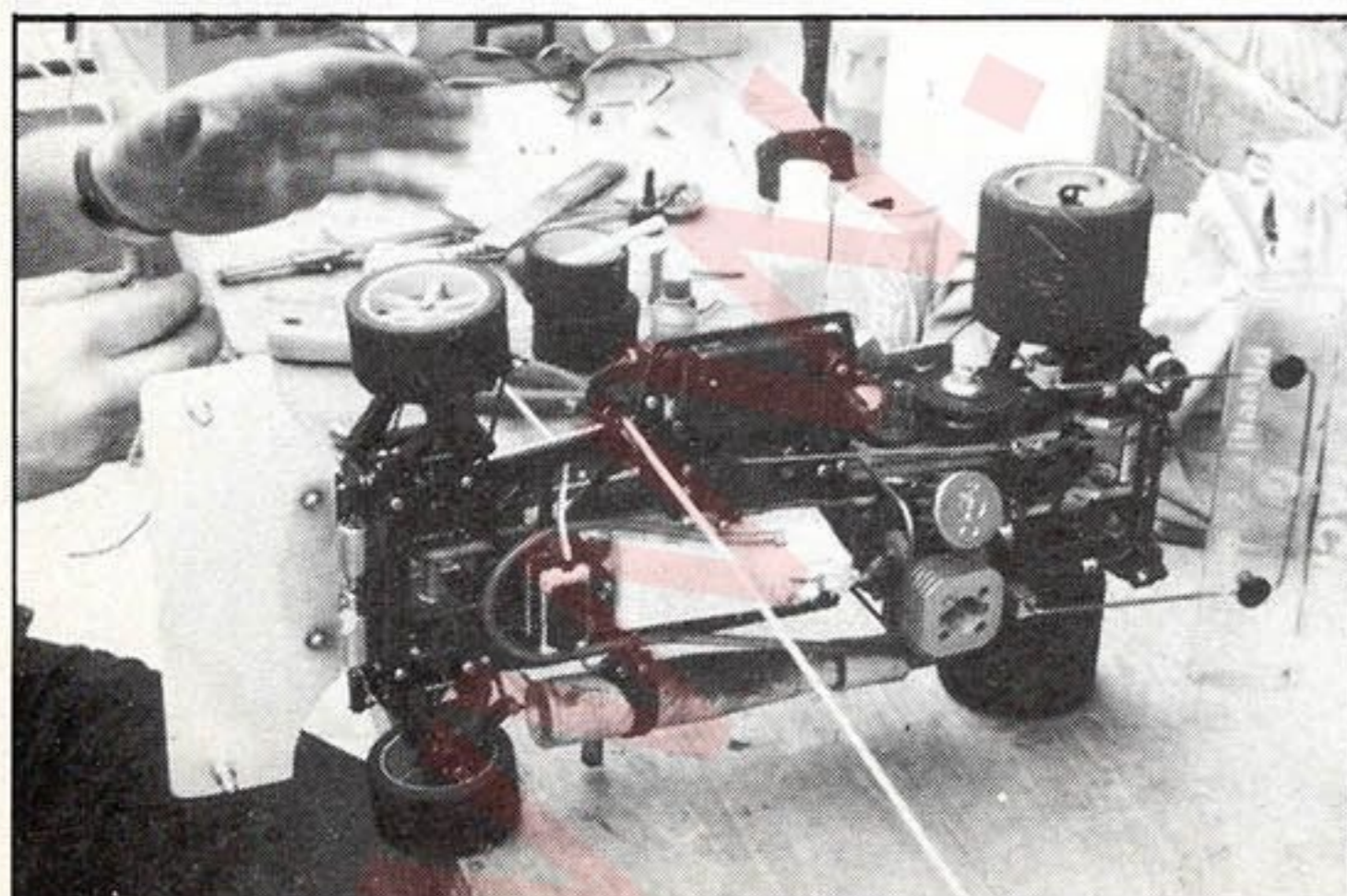
The first ever Cosworth final had just six drivers and was able to include young Steve Cole who had missed the heats due to a bad early morning crash and caused father, Dave, a lot of work to reinstate it to its former glory. Colin Straus led away and looked set for a win but a crash caused some problems and allowed John Russell to take the honours with 37 laps from Colin on 35 and young Steve Cole third with a good steady drive and thirty laps to his credit.

The 'C' Final had a repeat win for Dave Haskell on 41 laps, from one of our Dutch visitors R. Oldenburg second with 40 laps and that George Dziejdic third with 38 laps.

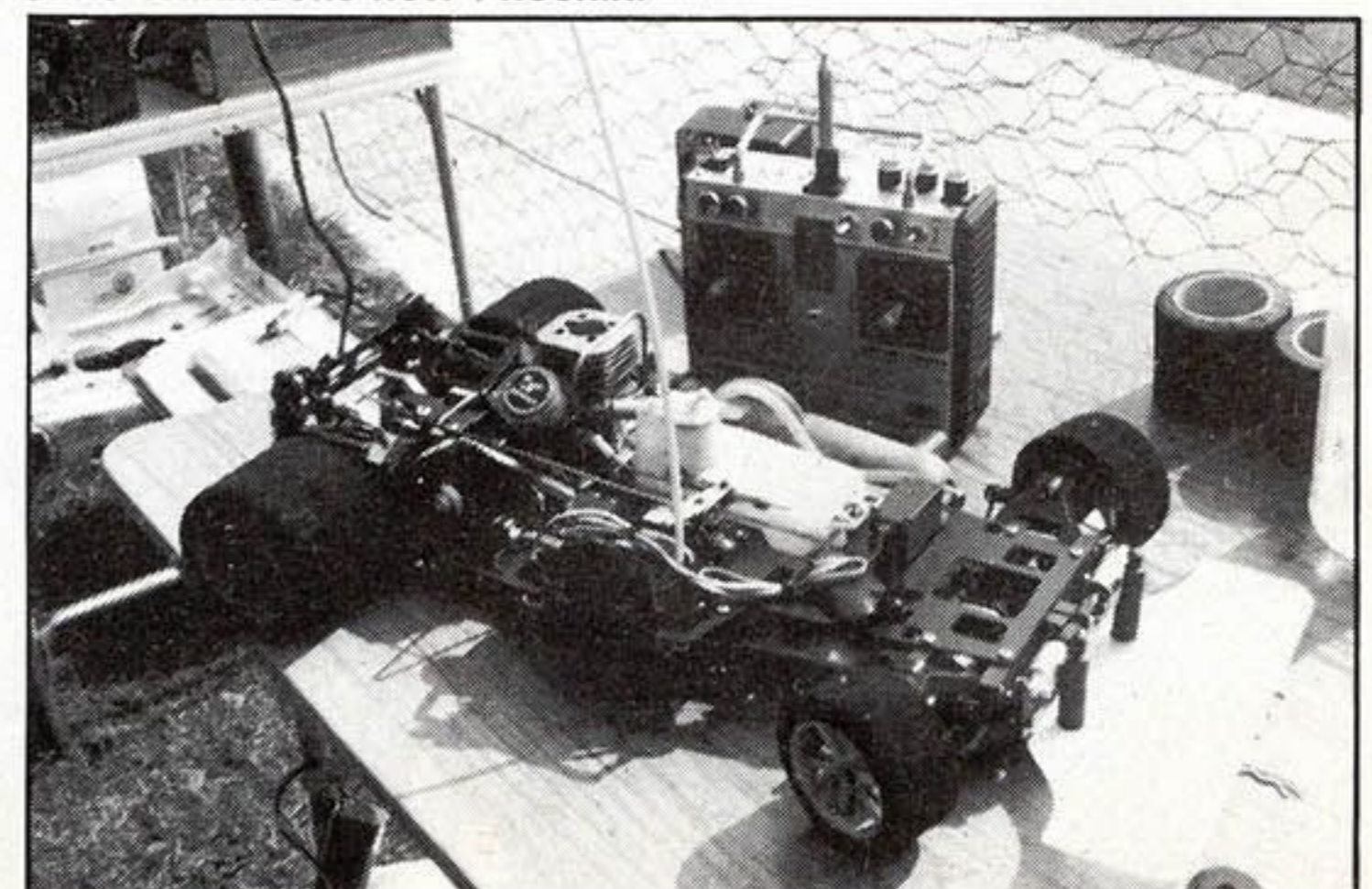
The 'B' Final turned out to be just as rewarding for computer man Dennis Jones who, after a ten minute dice with Maurice Cox, came out winner on 39 laps to Maurices 36 and third place James Wilkinson with his Associated on 35 laps.

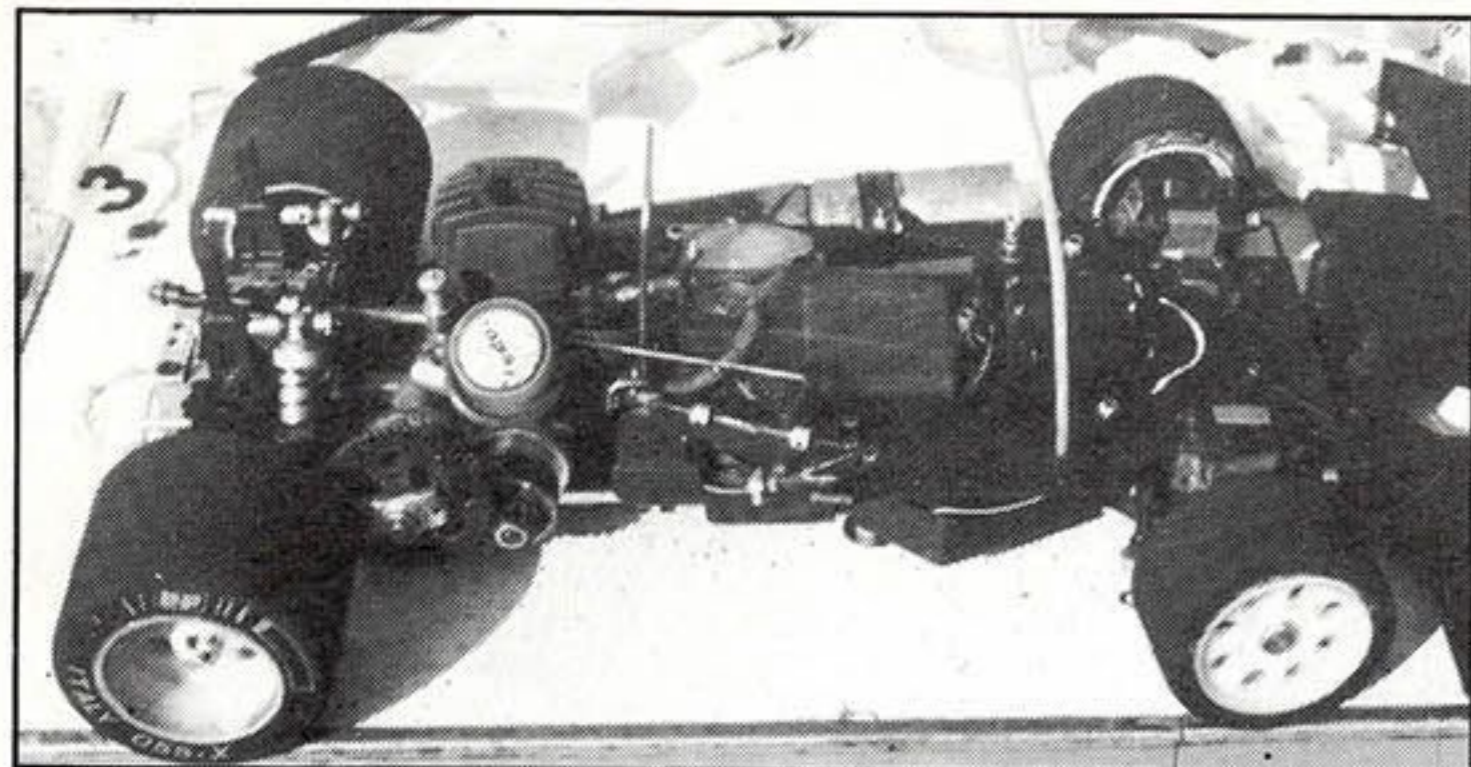
The 'A' Final was another close race and after the twenty minutes it was Southampton driver Tony Gilson who squeezed out a ten second lead over clubmate Gareth Bell to score 59 laps to Gareths 58 and Dave Preston two laps back on 56. Top qualifier for this group, Dave Swift, again had minor problems dropping him back

Dave Dixons Phoenix.



Chris Wilkinsons new Phoenix.





Start of the Saloon Final.

Ah So! Koy O Show car unveiled.

into sixth place with 49 laps.

The Open Final was not good for Gary Culver or Bob Errington as Gary suffered loss of range with his radio gear and Bobs radio transmitter just switched off even though the switch was still in the on position (later also to 'blow-up' the very last of those three year old motors). Steve White cleaned up again showing the rear end of his car to the others to score 93 laps, one more than the day before, whilst some of the opposition seemed to suffer. Final result then:-

**Formula Open Final**

1st	Steve White	Serpent	93 Laps
2nd	Steve Hart	Serpent	91 Laps
3rd	Nigel Sayles	SG	85 Laps
4th	Dave Dixon	PB	80 Laps
5th	Chris White	PB	78 Laps
6th	Bob Errington	SG	61 Laps
7th	Gary Culver	Serpent	37 Laps
8th	Shaun Leake	Serpent	32 Laps

So far there is a double win for Steve White and all still looking good for the Monday as a friendly gesture from Colin Straus was to allow Bob Errington to run Colin's Kyosho now that Bob was out of engines.

**Sports Day**

Monday started dry but very cold and there was more of a sense of urgency as this was a qualifying round for next years World Champs in Holland. James Haydon was one of those who had only entered for the sports and was thus keen on qualifying. The pace was fast though and by the end of the first round there were four drivers on 16 laps in 5 mins dead only separated by 0.5 second. Dave Dixon was not one of them though as a blown motor had cost him the first heat. Bob Errington was holding sixth spot with his inaugural run with the Kyosho. The car turned in very fast but was slow on the straight. Large tyres were fitted for the second round which improved things, enabling it to be in third spot as one of the four cars notching up the magic 17 laps. Colin Straus it was though holding that magic pole position.

The third round saw Dave Dixon get a clean heat to equal last years lap record and take the pole position. Dave Ashton on his return to racing also notched a Seventeen lapper to show he could mix it with the best. In all five drivers scored 17 laps and a further fifteen clocked 16 laps. James Haydon finished up ninth qualifier and thus just missed the final (should have raced on the other days eh Jim!).

The Renault Five final was a bit strange as all the cars sported Ford Cosworth Bodies due to no Renault Fives being yet available. Steve Cole showed his worth to come home an easy winner with 34 laps

from Roy Douch in second.

The 'C' Final made it a clean sweep for Dave Haskell as he picked up this title as well this time for 42 laps from Paul Davey in second with 39 laps and Tim Dicks third on 38 laps.

The 'B' Final saw a return for Chris Wilkinson who got his new PB going right to score 44 laps and victory from Ian Anderson and James Wilkinson in third, both with 43 laps.

The 'A' Final was very much a Southampton Club benefit as four club members made the final, Gareth Bell finishing eighth but the others finished first, second and third with Steve Hart, Tony Gibson and Phil Jones scoring 62, 61 and 59 laps respectively.

The Open Final promised so much in the opening laps but gradually all seemed to suffer some problem. Dave Dixon led for so long but a stripped gear dropped him back. Colin Straus retired early with a main drive problem, Steve White developed serious handling problems and Bob Erringtons borrowed Kyosho blew the pressure ripple out of the non Japanese manifold. Even Chris White who eventually won, was circulating quite slowly in the final stages. The final results being:-

1st	Chris White	PB	90 Laps
2nd	Dave Ashton	Serpent	88 Laps
3rd	Dave Dixon	PB	81 Laps
4th	Gary Culver	Serpent	78 Laps
5th	Dave Swift	PB	68 Laps
6th	Steve White	Serpent	61 Laps
7th	Bob Errington	Kyosho	57 Laps
8th	Colin Straus	Serpent	16 Laps

**Reflections**

Well a victory for PB and Chris White with the new Pheonix and what looks like a more promising season for them. Early days yet though to be too confident, remembering the ill fated shaft drive SG which faired well at Southampton if nowhere else.

Many drivers are undoubtable waiting for the new Serpent Sprint which may be available by the British Grand Prix meeting in Scotland.

Finally, it was nice to see Alan Harman from 'Model Cars' magazine at Southampton, especially as he was talking of racing 1/8 probably at Tibshelf and either with a Phoenix or a Kyosho.

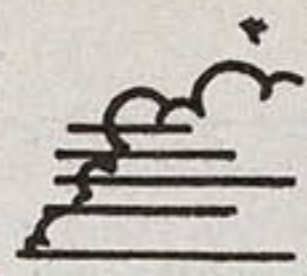
I wonder which magazine will publish a picture of him first?

See you soon!

How about this for speed then Bob? (Ed).

**The Saloon 'A' finalists.**





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*Roger Mears*  
MEARS

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### Final Thoughts On Construction

Well thought out car, enjoyable to build and quite within the capabilities of the first time buyer. Off putting at first, the different length screws when chosen with care proved no problem but a little rationalization and perhaps opting for a 10 mm standard length instead of 8, 9, 10 and 12 mm would certainly have made construction easier.

### Track Test

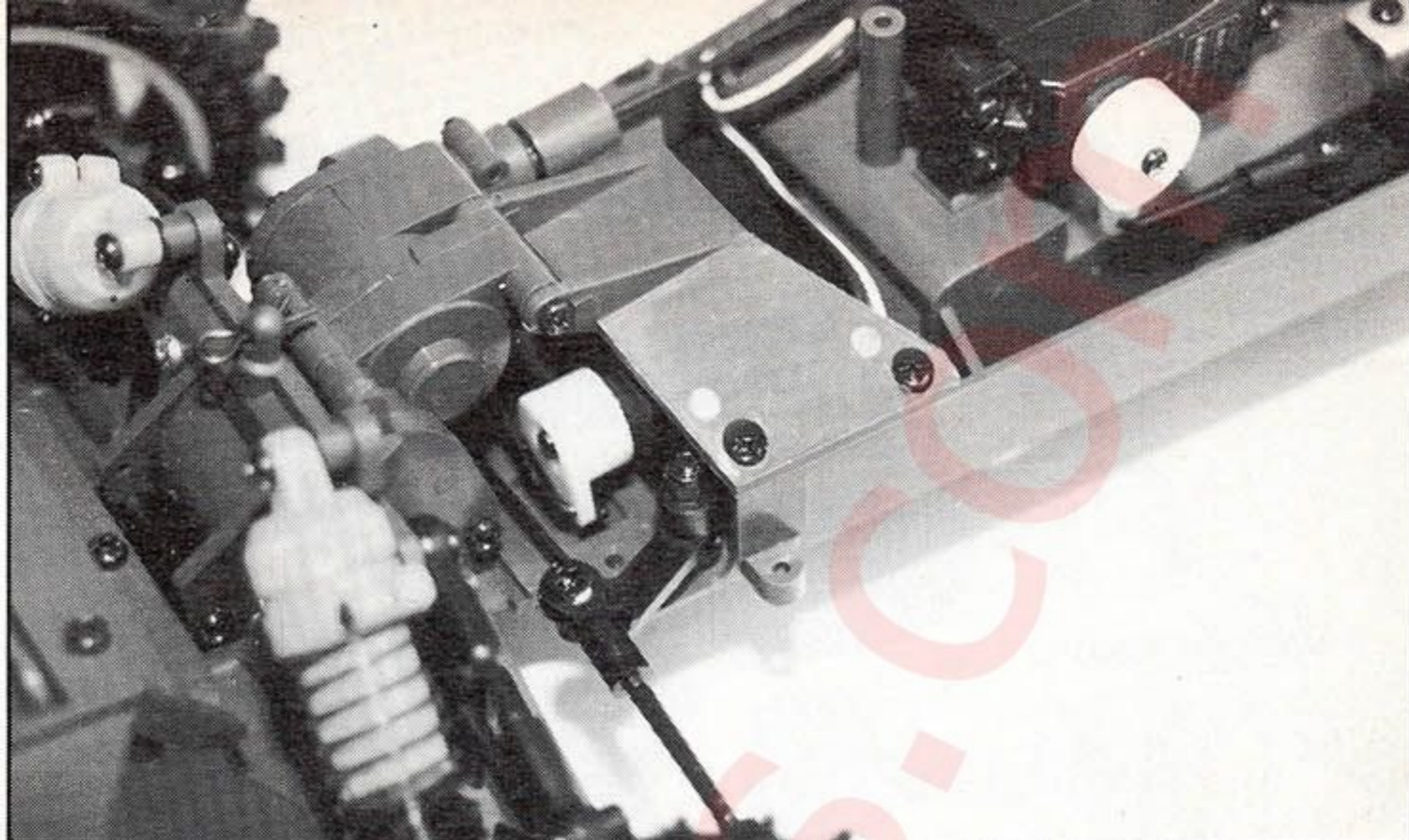
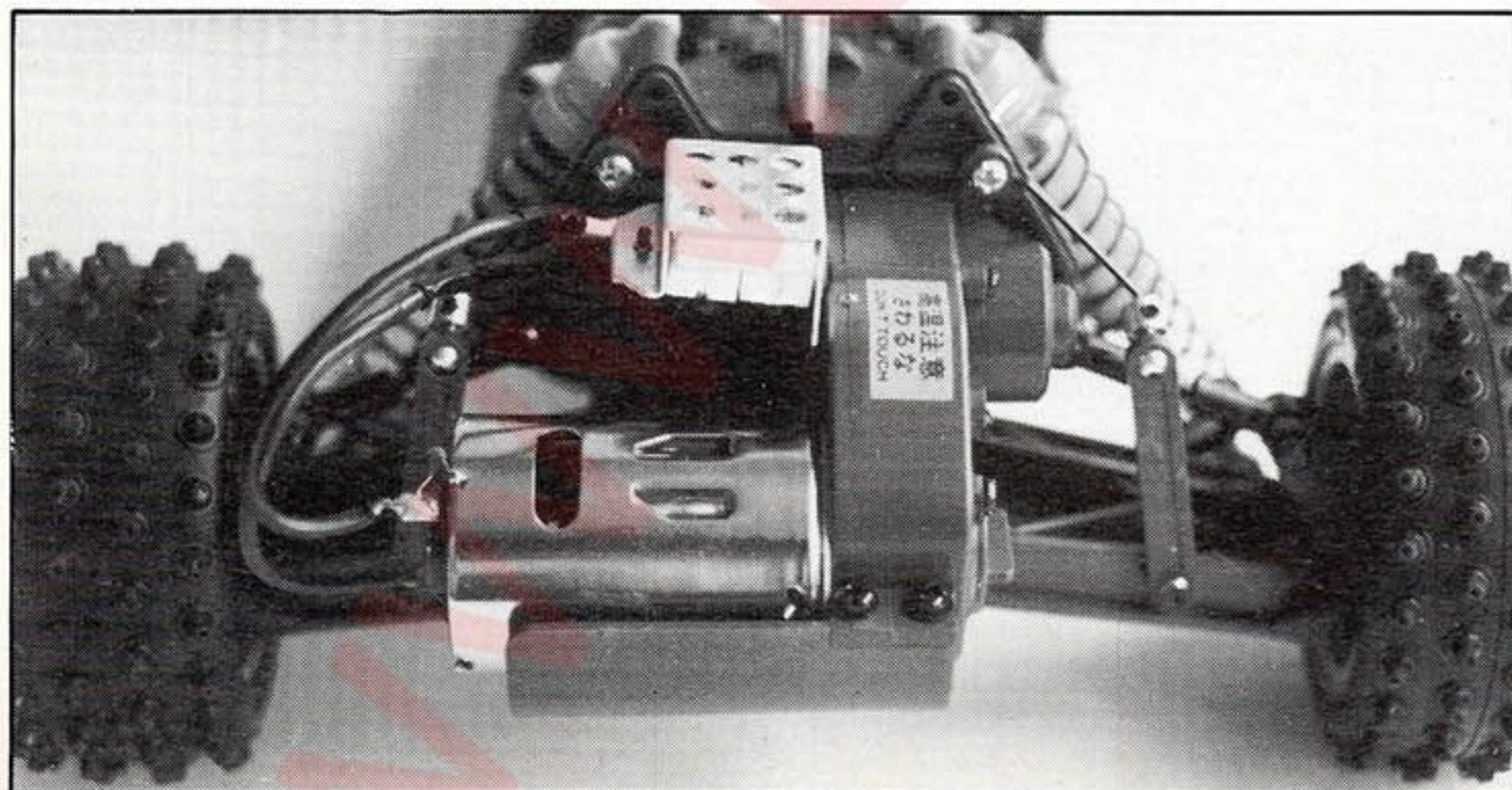
If you intend to race competitively the weight of the car is important and most drivers will remove parts of their cars structure they feel were not required so as to bring the weight down to the legal minimum of 3½ lb for a 4WD car. With the Shogun you do not have this problem you have to add 3 oz!!

The car is incredibly light, weighing 3 lb 5 oz with radio gear and battery. Ballraces are quite heavy and the Shogun needing 22 would have its weight increased by about 2 oz if they were fitted so perhaps the drivers doll will be fitted to bring the weight up! When weight has to be added to a car it does give the driver a chance to add it where he finds it advantageous to his driving style, most drivers will opt to put it on the front to help with the steering and grip on the front end.

Track testing took place in dry conditions on very short grass with two large bumps, a 6 inch jump onto asphalt then a very long straight up a ramp and back onto grass. If the car had been photographed 24 hours earlier it would have been in racing with other cars but unfortunately we just had to race against the clock.

The initial testing was with the smaller 16 tooth pinion which gave good acceleration and a very reasonable top speed especially remembering the car was not ballraced and had a standard motor. The car is very stable has no body-roll what so ever and will turn at full speed and on full lock without loosening the back end or rolling over. Robert (my son) try as he might could not get it to step out of line, the car took the bumps well and landed after the jump without bottoming out. Duration on the lower gearing was in the region of 9½ minutes. A second pinion is supplied with the kit (18 tooth), this was tried next and really showed the cars capabilities. The car handled the extra speed well and it was noticeable on the asphalt how good it held a straight line. Robert then managed at last

*Rear protection for motor is good, note wide rear track and anti-roll bar.*



*Two servo savers supplied in kit externally similar but with different intervals.*

(as it was getting a challenge for him) to roll the car. At full speed on grass with new grippy spikes he gave it full left stick, I was not suprised it rolled and I suggested he try the same trick with his "super car" to see if that would survive such harsh treatment!

Duration on the higher gearing was just over a minute less than with the lower gearing. During the high speed testing a screw came out of the pillow ball on the steering knuckle arm to give exactly the same symptom you get when a track rod end pops off, normally one loses a drive shaft but on the "Shogun" it is retained by the upright, a very good plus point.

I had not used thread lock on the screw in question nor as it turned out had I had glued the tyres on but they gave no problems.

Roberts verdict was that it is a very stable car, has very precise handling with a small turning circle which gives no tendency to roll or understeer, he felt the car was more predictable than his own "super car". His one criticism was the very noisy gearbox. He said the car was easy to sum up:- Quite impressive!!

### Improvements

It runs well out of the box with a nice suspension set up and a good speed controller, the only thing it lacks for racing is ballraces. They are a necessity once you start to race seriously for two main reasons, one is wear and the other battery duration.

Nylon or plain metal bearings pick up debris and if oil is added although lubricating the bearing surface it also acts as a grinding paste by keeping the dust and grit in

contact with both bearing surfaces, hence the high rate of wear. Plain metal or nylon bearings are not as efficient as ballraces so the increased friction reduces battery duration. When ballracing if you cannot afford a complete set (cost approx. £29.00) and you decide to progressively improve your car start with the gear box, then the differentials and finally the wheels. The ballraces for the wheels need a 1 mm shim behind them as there is not a exact equivalent ballrace to that of the nylon bearing (the bearing is 5 mm wide and the ballrace 4 mm). It did not prove a problem on the Ninja and therefore should not on the Shogun. No other improvements are necessary at club level.

### Is This For Me

There is a vast potential market of drivers who budget for their hobby, there is also the driver who wants a competitive and complete car with both motor and speed controller in the original price. The Shogun will satisfy the needs of both drivers as it will be competitive out of the box and all that is needed to race is the radio gear and a set of ni-cads. As a package it represents good value for money in both its technical specification and the way it is engineered this is one of several cars that you do not have to spend in excess of £200 to be competitive with although I doubt very much if you will win the "A" Final with it at a larger club. The reason being it will be competing against the £200 super car with perhaps another £100 of go faster goodies on it, even so it could be very competitive against them and should show a clean pair of heals to some of the similarly priced opposition. So, if you want a reasonably priced ready to race from the box car without the extra expense of motor and speed controller it could be the car for you, if you have a limited budget and want to compete with the "super car" it could also be the car for you, can you imagine the pleasure you would get from beating a car costing more than twice as much as yours. I can assure you it gives a very great inner feeling of satisfaction.

### Summary

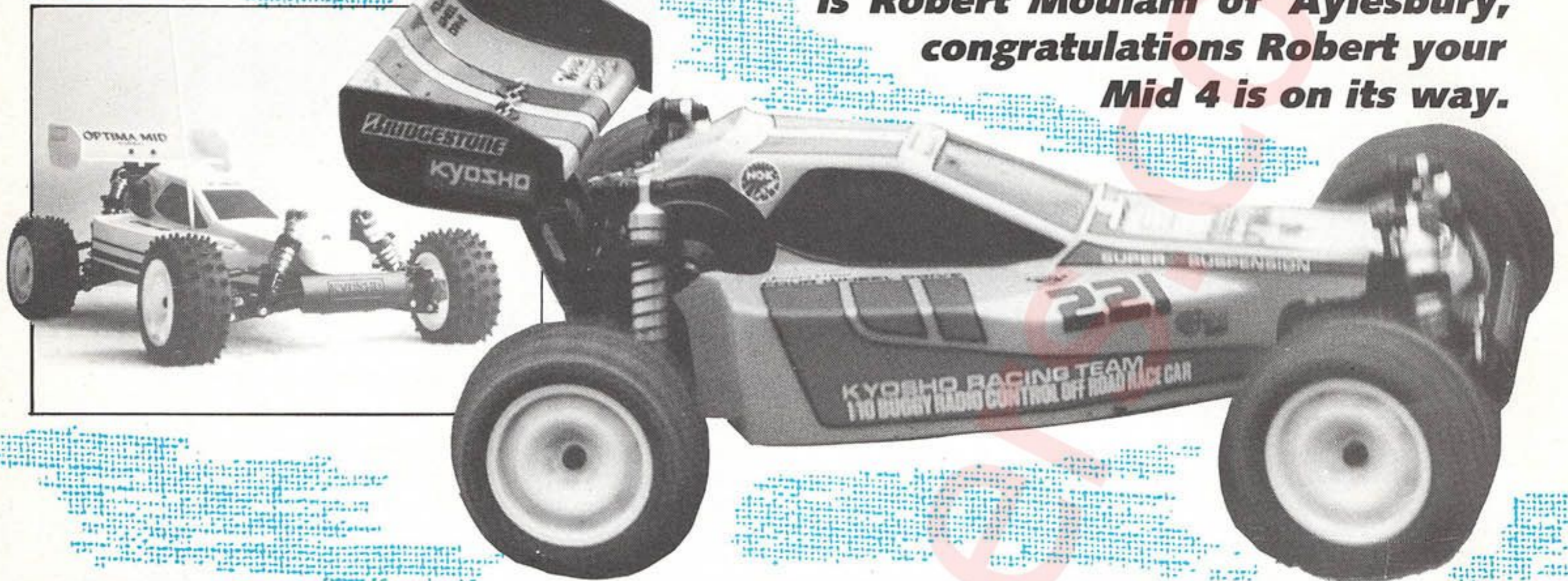
Very good club racer and excellent value for money with no extras to buy except perhaps ballraces, I will watch with interest its progress and performance on the tracks this summer.

Many thanks to Allan Bond, Pete Darwell and Amanda Jane Smith in their help in the preparation of this report.

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# KYOSHO MID 4 WINNER

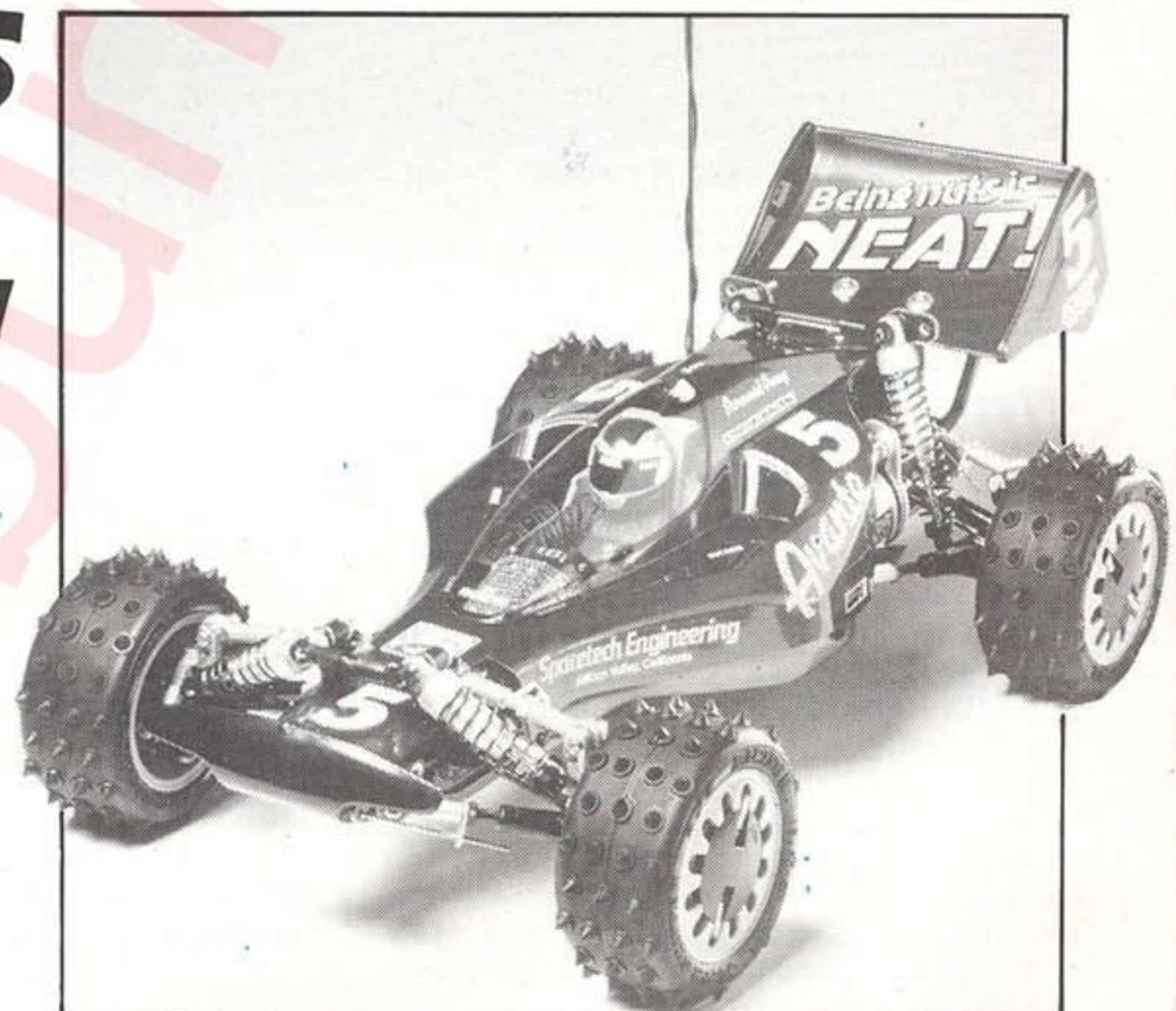
The winner of the Kyosho Mid 4 competition is Robert Moulam of Aylesbury, congratulations Robert your Mid 4 is on its way.



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# R.R.C. OFF ROAD SERIES ROUND TWO

**Max Throttle, Wilma Cargo and Dave Pearson report from Round 2 of the R.R.C. 4WD series.**

The sun shone over the Easter Bank Holiday as round two of the Radio Race Car '88 Series got underway. The track had been laid in an effort to make the racing fast and open and to a large extent this proved to be the case, unfortunately the dreaded ten car heats that were organised by the WMBC let this attempt down, future organisers take note!

A concourse event was held and twenty plus cars were laid down to be judged, the winner was Kevin Griffin, his Optima mid having a superb paint job, courtesy of Mrs Griffin.

Three heats of racing were held for standard and modified and then as the finals were being sorted the worst possible problem occurred, the computer broke. Consequently there was a long delay whilst the finals were sorted by hand. At least it gave a time for reflection on the day, although the sun only shone for a few, brief hours it had been dry, dry enough for some tyre testing to take place, Mardave spikes and Cat mini spikes seem to work extremely well on hard, dusty surfaces. It is also becoming clear that a well set up CAT is a match for the Optima mid, last years Optimas fitted with a belt drive can also prove effective al-

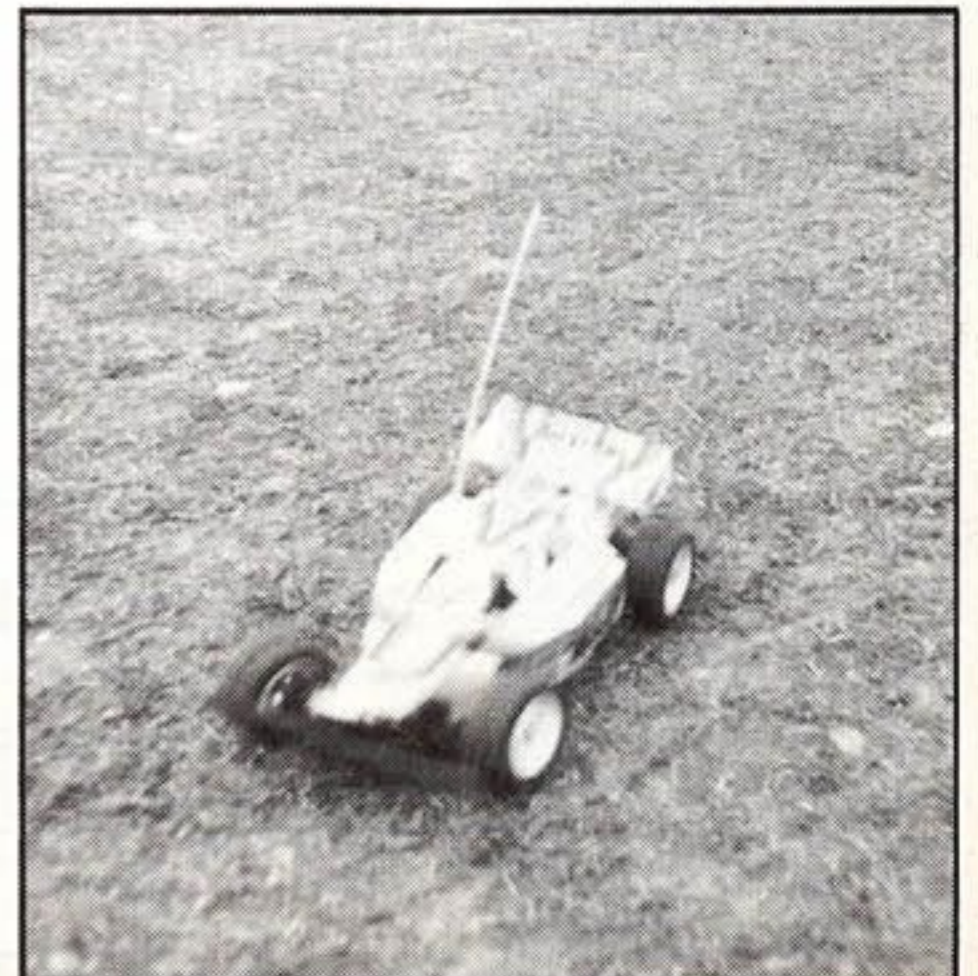
though not quite effective enough.

Team checkpoint motors are deadly and appear to be faster than anything else on wheels at present, more news on these motors as we get it. Final comment must be the gap between standard and modified times is getting shorter, anybody else noticed this?



*Above, Mrs Griffin proudly displays her cup winning artwork.*

*Below, all action on the track and a great display of trophies.*



**Radio Race Car 1988 Position Table. Standard Motors — Top Sixty Positions**

1	Warren Dawson	Radio Race Car	4001	198
2	Micheal Wray	Private	4151	196
3	Tony Bretton	Basildon Buggy Club	4016	190
3	Nathan Ralls	Medway Off Road Club	4069	190
5	Ross Cole	Dangerous Bros	4098	186
6	Mathew Williams	Oakdale RCCC	4011	178
7	Chris Heath	TNT Publicity	4061	172
8	Richard Barton	Aylesbury Off Road C	4009	170
9	Stuart Perry	Basingstoke Radio CC	4039	168
10	Kevin Griffin	Macartneys Models	4002	164
11	Tony Meech	Abergavenny RCCC	4013	155
12	Steve Cook	Aylesbury Off Road C	4026	158
13	Andrew Rose	Abergavenny RCCC	4013	155
14	Sam Durbin	Oakdale RCCC	4042	153
15	Philip Heath	TNT Publicity	4060	147
16	Roy Kelly	Basingstoke Radio CC	4015	142
17	Richard Peters	Worcester Model Car	4057	138
18	Dave Pearson	Radio Race Car	4028	127
19	Mark Mainey	Dowty Radio CMC	4181	100
20	Mark Tasmitt	Team Apex Models	4094	99
21	Neil Tamsitt	Team Apex Models	4095	98
22	Steve Swan	Orton Racers	4062	97
23	Robert Hopkins	Kidderminster MCC	4182	95
24	Mark Rogers	Basingstoke Radio CC	4014	92
24	Andy Pierce	RCP	4003	92
26	Steve Pike	Basingstoke Radio CC	4079	91
26	Colin Steele	RCP	4027	91
28	Cy Lapwood	Basildon Buggy Club	4012	90
28	Wayne Irish	Kidderminster MCC	4040	90
30	Mark Ashton	Rushden Buggy Club	4006	88
31	E. Youd	Private	4183	87
32	Andrew Beesly	Private	4152	86
33	Stuart Anderson	Basingstoke Radio CC	4021	85
34	Roy Rogers	Ludlow Radio Car C	4184	84
35	Steve Allen	Private	4153	83
36	Paul Broyd	West Mids Buggy Club	4147	81
37	Chris Grange	Private	4154	80
37	Brian Pierce	Kidderminster MCC	4004	80
39	Simon Beale	Private	4155	79
40	Matthew Trump	Thatcham Radio CC	4031	78
41	P. Watson	Private	4185	77
41	Justin De'ath	Private	4156	77
43	L. Creigh	Private	4186	75
44	Nicholas Tulip	Thatcham Radio CC	4005	74
44	Matthew French	Horspath Buggy Club	4176	74
46	Martin Bishop	Basingstoke Radio CC	4107	73
47	J. Watson	Private	4188	72
48	Matthew Cooper	West Mids Buggy Club	4084	70
49	Phillip Walden	Heathrow	4017	69
50	Jason Simmons	Private	4157	68
50	Stephen Gibbons	Nene Car Club	4136	68
52	Stuart Ashford	Private	4158	67
52	Graham Warder	Chesham Off Road C	4092	67
54	Richard Clements	Private	4159	66
55	Lee Butcher	Private	4160	65
56	M. McGuire	Private	4161	64
56	Richard Clements	Dangerous Bros	4097	64
58	C. McGuire	Private	4162	63
58	D. Broad	Private	4189	63
60	C. Yeoman	Private	4190	62

**Radio Race Car 1988 Position Table. Modified Motors — Top Sixty Positions**

1	John Zottle	Basingstoke Radio CC	5001	197
2	Alexander Page	Puma Racing	5028	189
3	Nick Cochrane	Private	5215	187
4	Mark Hewitt	Team Laser	5158	181
5	Brennan Ralls	Medway Off Road Club	5093	179
6	David Searle	Private	5214	177
7	Chris Davidson	Racestore	5005	168
8	Paul Rouse	Bournemouth	5007	167
8	S. Evans	Private	5217	167
10	Brian Burrows	Private	5218	165
11	D. Bruton	Private	5219	164
12	Eddie Williams	Cardiff	5169	156
13	Duncan Wood	Dowty Radio CMC	5086	155
14	John Robert Fryer	Private	5163	151
15	Gary Cutler	West Mids Buggy Club	5037	149
15	Paul Evans	Private	5220	149
17	Daryl Firth	Private	5222	148
18	John Iliffe	Dowty Radio CMC	5126	140
19	Stuart Yates	Chiltern Model Car C	5119	133
20	John Clark	Private	5224	128
20	Adam Green	Brimod	5225	128
22	Les Hewitt	Team Laser	5159	125
23	Mike Billitt	Chippenham Model CC	5020	124
24	Dale Dickinson	Worcester Model CC	5077	116
25	Philip Agg	Dowty Radio CMC	5079	105
26	Paul Green	Blakehall	5036	101
27	Rory Cull	Team Reedy	5211	100
28	Paul Lisseter	Team FTD	5044	99
28	Andrew Langdon	Swindon Off Road C	5045	99
30	Dave Eggleton	Sandwell Can Am	5010	98
30	Edward Walden	Crawley/Heathrow	5014	98
30	Ben Sturnham	Racestore	5164	98
33	Paul Jorgensen	Club Heathrow	5016	96
33	Chris Boakes	Chesham Off Road C	5087	96
35	Paul Hartstone	Rolls Royce	5022	95
35	Steve Legg	Private	5212	95
37	Mark Chaplin	Tamiya	5076	94
37	Chris James	Private	5106	94
37	Jason Varley	Central Models	5213	94
40	Richard Adams	JS Racing	5204	92
40	Elliott Stevens	Brimod	5226	92
42	Mark Mainey	Dowty Radio CMC	5075	91
43	Jason Barnes	Worcester Model CC	5074	90
44	Colin Paytes	Private	5023	88
44	B. Stewart	Model Motor Sport	5269	88
46	Dave Richards	Wellingborough BC	5178	87
46	Nick Daman	Medway Off Road Club	5216	87
48	Jonathon Vale	Alcester Buggy Club	5112	86
49	Jason Hogston	Private	5088	85
50	P. Brown	Private	5270	84
51	Mike Stevenson	Private	5122	83
52	Alan Garrington	Swindon Off Road C	5186	82
53	Jason Billett	Chippenham Model CC	5021	80
54	Clive Roper	Power Products	5255	79
55	R.C. Carless	Swindon Off Road C	5040	78
55	Chris Eades	Shrewsbury BC	5078	78
57	Lee Timmins	Timmins Electrical	5154	77
57	Paul Ash	Private	5221	77
59	Trevor Deakin	Team FTD	5072	76
60	A. Barber	Private	5267	74

**4WD MODIFIED**

**4WD STANDARD**

Driver	Car	Cells	Motor	4WD Speedo	Modified Servo	Tyres F	Tyres R	Pos
P. Lisseter	Mid Optima	Overlander	MG 15D	Star	JR 4051	Cat	Cat	1
A. Page	Cat	SCE	Trinity 18Q	Nosram	131 SH			6
J. Zottle	Cat	Laser	MG 17Q	Novak	131 S			5
M. Chaplin	Avante	Schumacher	Technigold	Laser	131 S	Kit	Kit	3
P. Harlstone	Cat	Laser	Revolution 16T	Intronics	132 S	Cat	Cat	4
M. Hewitt	Mid Optima	Laser	Twister 501	Laser	130 SH			2
N. Cochrane	Cat	Nosram	Revolution 16T	Nosram	131 SH			8
C. Davidson	Cat	Nosram	MG 16T	Speedmaster Gold	131 SH			7
W. Dawson	Mid Optima	Magnum	Revolution	Nosram	131 SH	Kit	Kit	6
N. Ralls	PB Maxima	Parma	MG	Laser	131 SH	Cat	Cat	5
S. Swain	Cat	Laser	Trinity	Laser	131 SH			3
R. Hopkins	Salute Belt	Magnum	Demon	Futaba	131 SH			7
M. Mainey	Mid Optima	Prime	Revolution	Nosram	131 SH	Eagle	Eagle	1
R. Cone	RC 10 Concept	SCR	Twister	Intronics	131 SH	Cat	Cat	8
M. Wray	Cat	Overlander	MG	Photon	131 SH			2
T. Bretton	Optima Mid	MIH	MG	Photon	128	Optima	Optima	4



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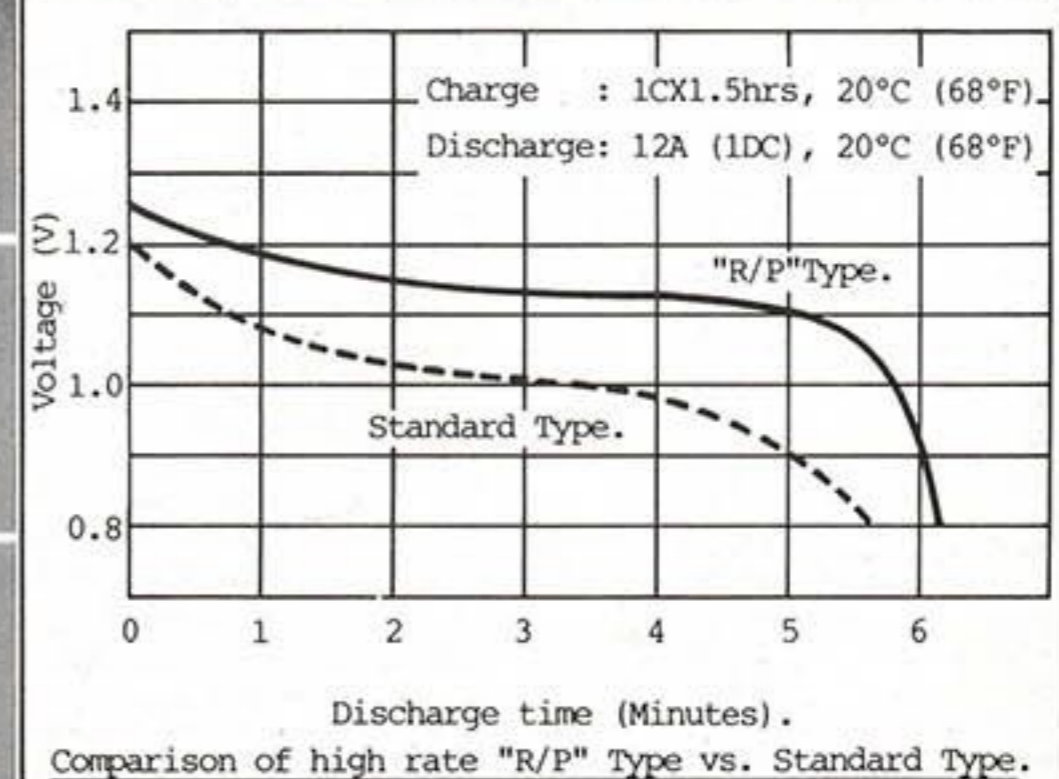


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R Parts Rear Wishbones	£2.75
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2213 Dynamite Rear Frog, Hornet, S/Champ	
2214/5 Dynamite Rear RC10, Lancia, Optima	
2216 Dynamite Front Spiked Hornet	
2217 Dynamite Front Ribbed Hornet	
2218 Dynamite Front Spikes & Ribs Hornet	
2219 Dynamite Rear Tamiya (road)	
2220 Dynamite Front Fox, Wild One	
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which allowed Phil to build a comfortable lead. At 1 minute down Phil had about a 20 yard lead and after 1½ minutes the order was Phil, Ulf, Jürgen, Stephan and Christian. At 2½ minutes the Jürgen passed Ulf and so did Stephan 30 seconds later and at half distance the order was Phil, Jürgen, Stephan, Christian, Ulf.

At 5½ minutes Christian had caught Stephan and overtook him when Stephan ran wide on the sweeper, but at 6 minutes Phil was well clear.

This order of Phil, Jürgen, Christian remained the same to the end, and even though Phil started to dump in the last 45 seconds, he still hung on to win by seven seconds.

**2nd Run;** Once again Phil got the start and an immediate pile up on the first corner gave him an easy first lap. After lap 1 the order was Phil, Jürgen, Christian and Stephan and shortly after, having clipped a corner, Phil still held the lead. At the 1 minute stage Jürgen made a move which knocked Phil off line as well as leaving himself stuck on the track markings giving Christian the lead, so at 1½ minutes it was Christian from Phil, Anders and Stephan. Christian's car didn't look as good as Phils around the corners but the punch his motor was developing from the corners was awesome but Phil was still managing to "hang in there". At 6¼ minutes Phil was really pressurising Christian but Christians

punch through the infield kept an adequate gap. With 1 minute to go they were still going strong but 20 seconds later Christian had a mega dump and although Phil overtook him, he made an error which not only allowed Christian to still win, but allowed Anders and Jürgen to take 2nd and 3rd respectively.

**3rd Run;** Unfortunately Christian had speed controller problems at the start and although the Race Director and the drivers agreed to give him 5 minutes in an attempt to trace the fault, this was to no avail and the 1987 Champion did not start in the last run, which obviously removed some pressure from Phil.

Anyway, once again Phil got the start, followed by Mika who was being chased by Jürgen and Stephan. With 1 minute down Phil was slowly increasing his lead and 1 minute later he had the lead of the straight and the sweeper. At 2½ minutes, Jürgen passed Mika but by now Phil had a 6 second lead, and a 4½ minutes Jürgen was struggling to make an impression.

At the six minute mark Phil went a bit wide after passing a backmarker and spun off the circuit which cut his lead down to the length of the straight. Moving into the final minute, Phil had once again pulled away from Jürgen dumping with 20 seconds to go with the final finishing order being Phil, being 4 seconds ahead of Mika with Jürgen a further 4½ seconds behind

and this was enough for Phil to become the 1988 European Champion.

Even though Phil was announced the winner as Phil Greeno, nothing could hide his pleasure and a great touch was the playing of the National Anthem when Phil had been presented with his trophy which brought a lump to everyone's throat.

Thanks must go to the members of Midtjydsk R/C Racing for an extremely smoothly run meeting, especially to the organising committee of Jan Juul, Kirsten Hansen and Hugo Hansen, the Race Director Jan Pieler and his assistant Finn Storgaard. The International referee was Fer Van Helden of Holland and the National referee was Jan Juul. Other assistance was provided by Karsten Schultz of KS-Data for result processing, Kirsten Hansen and Rajmond Jensen for the lap-timing, Dennis Hansen for Transmitter and Transponder control and Ole Gadegaard, the bilingual speaker.

1	Phil Davies	GB	345.5	34	13.0	34	1.0	
2	Anders Nilsson	S	337.3	34	7.2	34	13.8	
3	Jürgen Lautenbach	D	34	12.8	34	11.7	34	9.5
4	Christian Keil	D	33	2.1	34	3.9	00.0	
5	Mika Leppalahti	SF	33	7.0	33	13.8	34	5.0
6	Stephan Oberle	D	33	5.6	34	13.9	33	11.7
7	Kurt Steinbüchel	DK	33	3.3	32	0.3	33	1.2
8	Ulf Ebenhardt	S	33	9.3	32	8.6	33	6.8

Driver	Car	Motor	Ratio (mm per rev)	Tyres	Battery	Speed Controller	Body	Any Other Information
Phil Davies	Schumacher SPC	Reepy Brown Dot	35.6	TRC Green	Laser SRM SCR's	Schumacher FWD only	SCH Joj	
Ulf Ebenhardt	Assoc 12C12L	Sping/ Homebrew	NA	Assoc Green	Gates (GEC)	Andersson FWD only	SCH Toj	Receiver batt pack thick T peice
Mika Lappalati	Assoc RC12L	Reedy Green Dot	34.91	Assoc Green	Keil pushed SC	J8J laser	Assoc Toj	Thin T peice made from graphite
Christian Kiel	Assoc RC12L	Reedy Green Dot	36	Keil pushed Green	Ralph SC	Assoc Helbing	16 gauge Toj	Front Spring Thin T piece
Stephan Oberle	Schumacher SPC	LRP Red 'S'	34.0	CS'C' Greens	CS SC	CS Rocket	SCH Toj	Oberle Diff & rear end
Kurt Steinbüchel	Corally SP2	Steiner 25 Double Special	41.56	UFRA	Pk activated SC	CS Rocket	KIR COL	Note that gear ratio! a mild wind
Jürgen Lautenbach	SCHU SPC	LRP Red 'S'	33.0	CS'C' Greens	CS SC	CS Rocket	SCHU Toj	Oberle diff & rear end
Anders Nilson	Corally SP2	PK 23 Quad	34.05	TRC Greens	PK Activated SC	PK	Assoc Toj	

All non reverse

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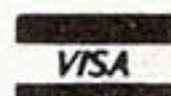
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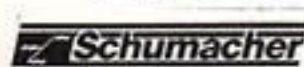
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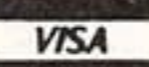
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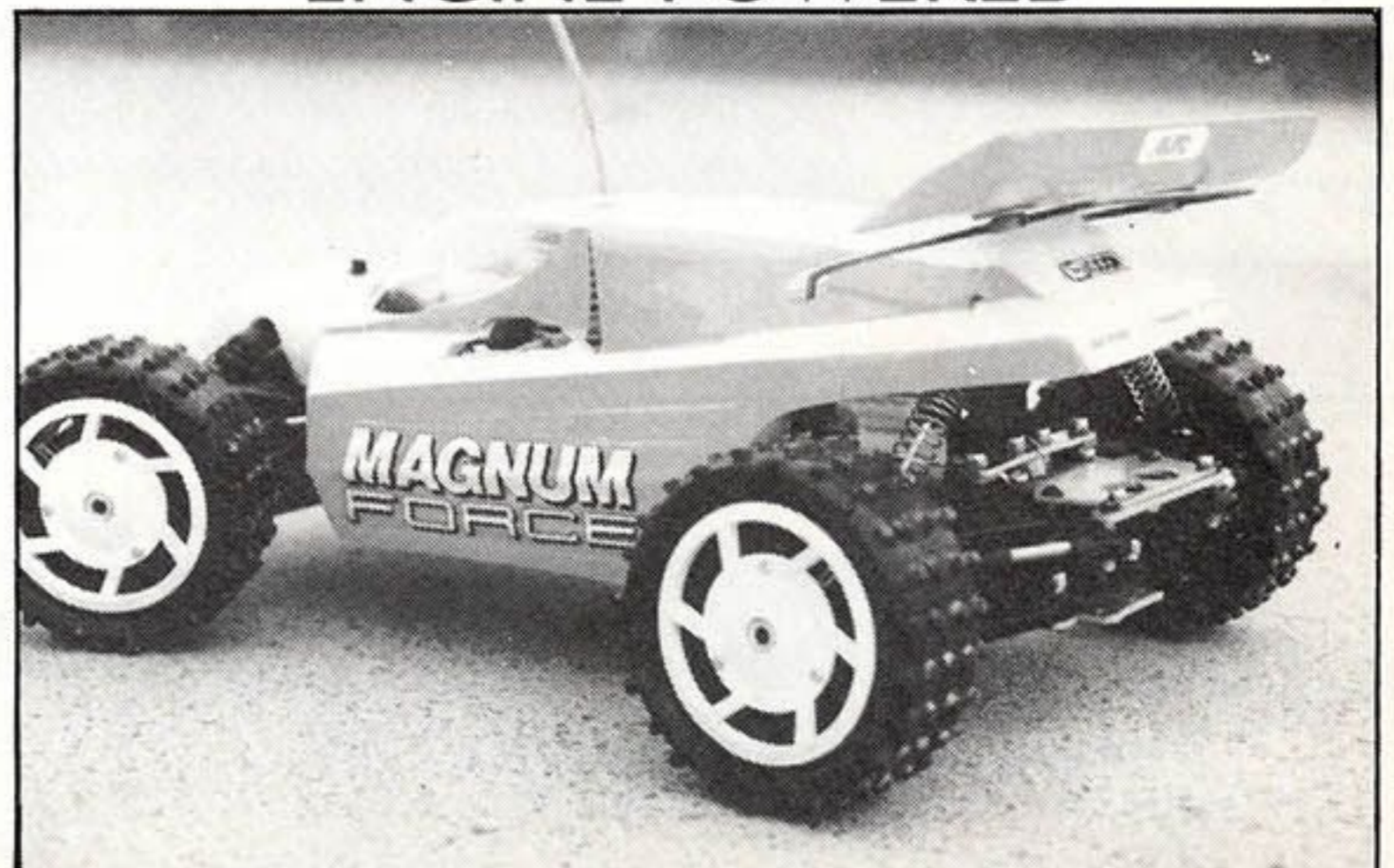
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**NEW MAGNUM FORCE**  
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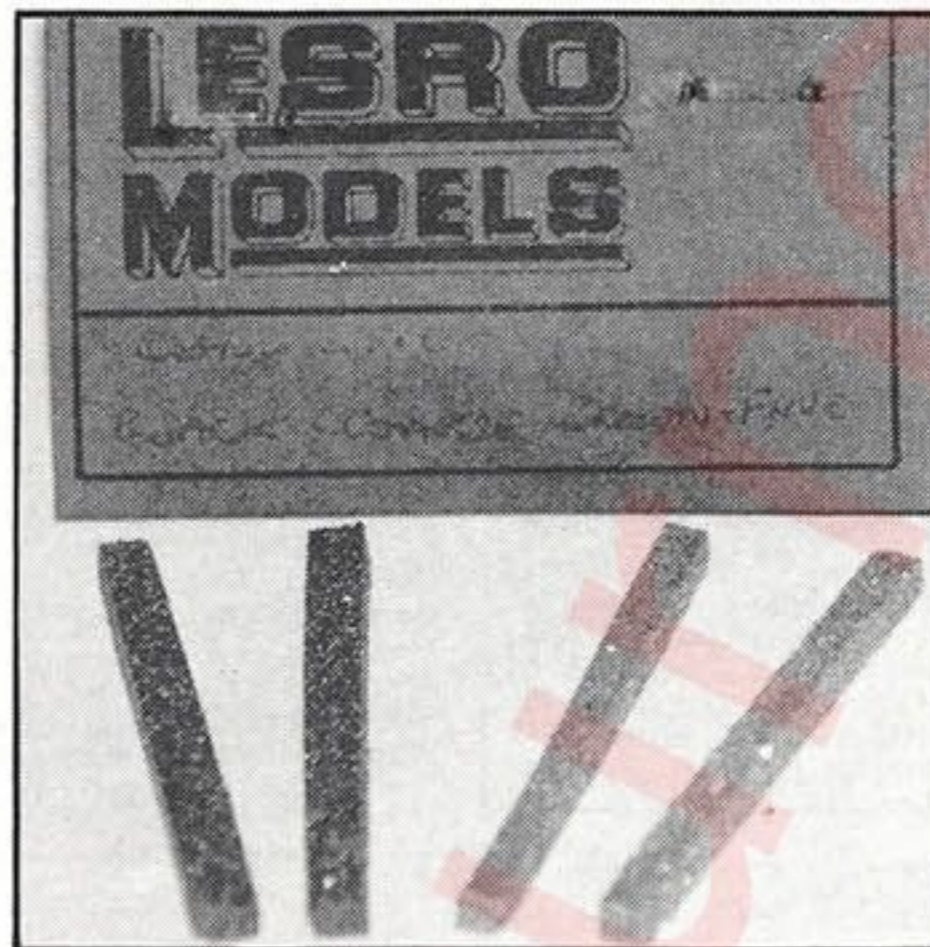
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Also, a Verco sealed pocket for extra crystals. An attractive looking case in heavy duty black nylon and a metallic silver screen print.

A product the radio manufacturers overlooked. The original idea comes from many requests by top name racers like Tony Niesinger. The racers wanted a case for their radio when it had to be left in an impound area at the races.

Needless to say, Advanced Impound Case protects your radio investment from dust, bumps, scratches, and moisture, etc.

Dealer inquiries invited, buy manufacturer direct and save. Tel: (818) 706-8052.



## Lesro Com Sticks

Increase your motor efficiency with these new comm cleaning sticks from Lesro. Insert the comm cleaner into the brush tube, rotate the comm and it really does work, bringing the comm polish out like new.

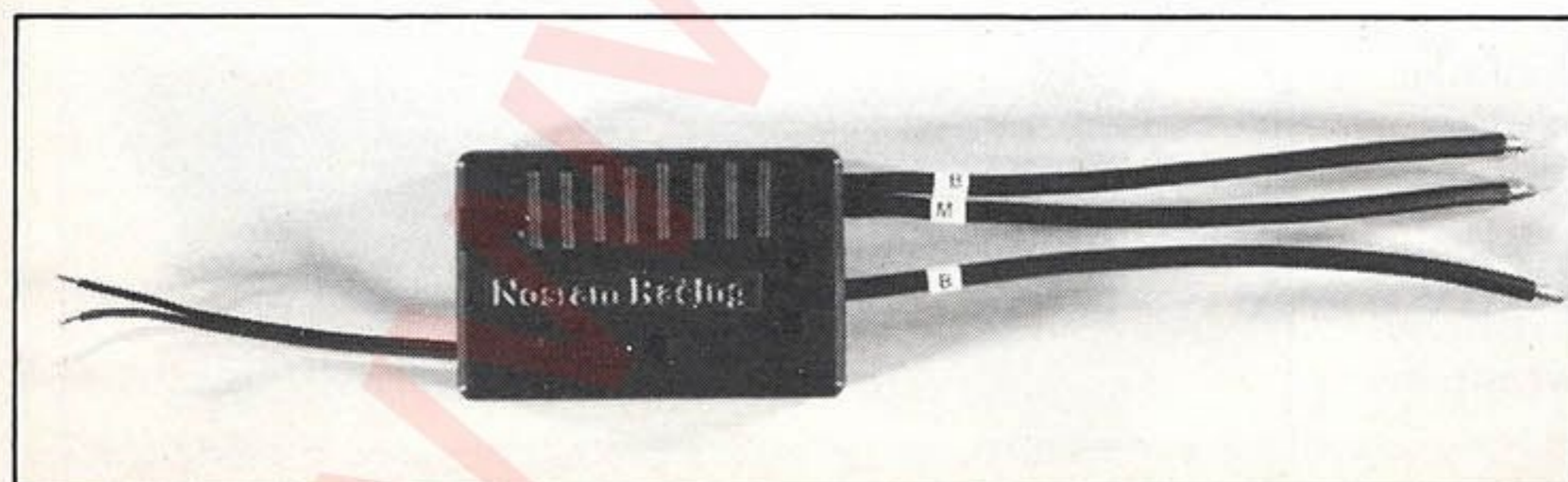
Lesro comm sticks available from Lesro Models Stony Lane, Christchurch, Dorset. Tel: (0202) 476902.

## D.N.S. Speedo

new from D.N.S. comes the Nosram International speed controller, the first obvious upgrade is the neat, weather proof plastic case. This addition affords extra protection as well as making the controller easier to fix in place.

Technically the Nosram International controller is as follows. Eight high spec Fets, fully proportional forward and brake, voltage multiplying circuitry for increased F.E.T. efficiency, independent rate adjustment, electrical interlock circuitry for F.E.T. protection under fault conditions, all this weighs only 34g, thats got to be good!

Nosram speed controllers are available from Malvern Models or any D.N.S. stockists.

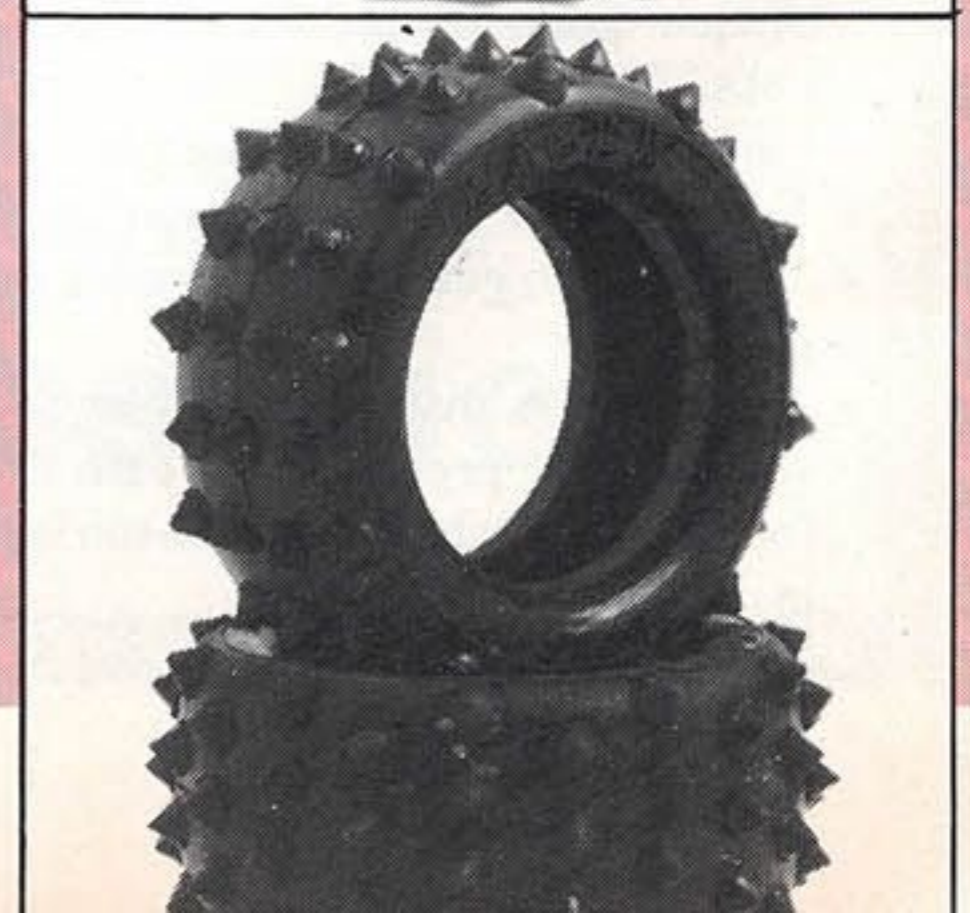
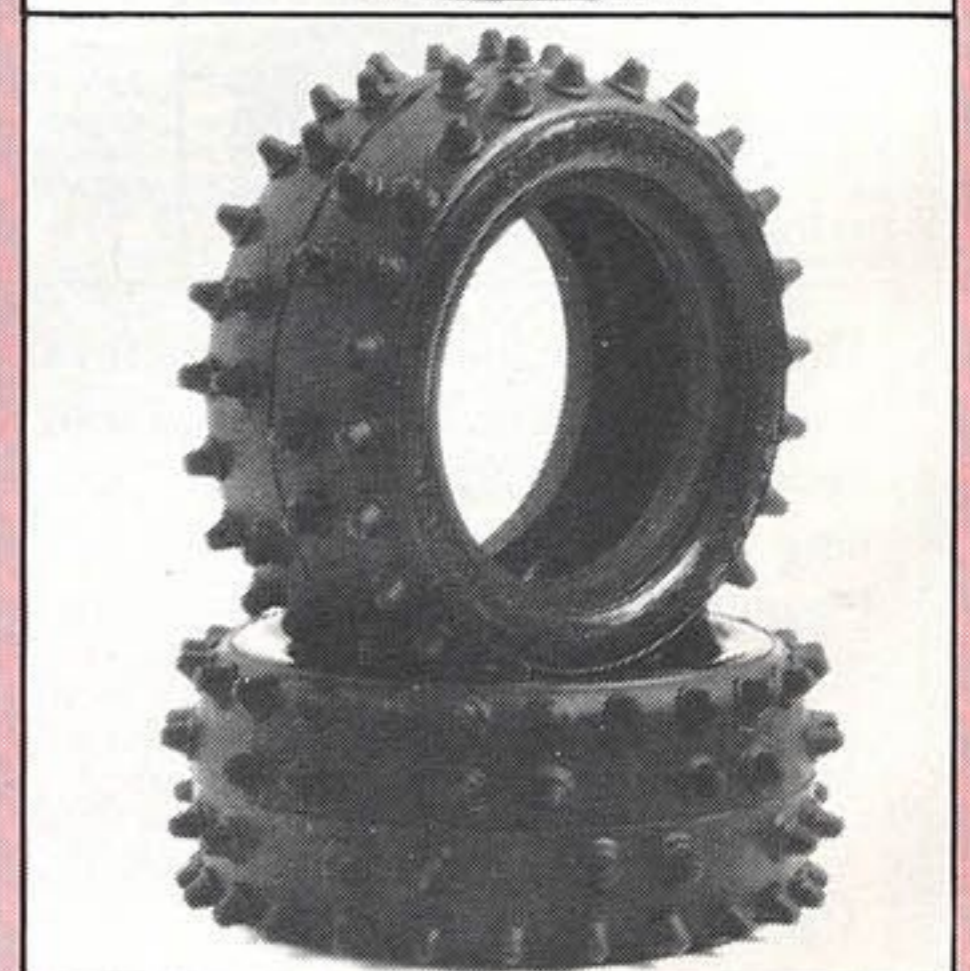
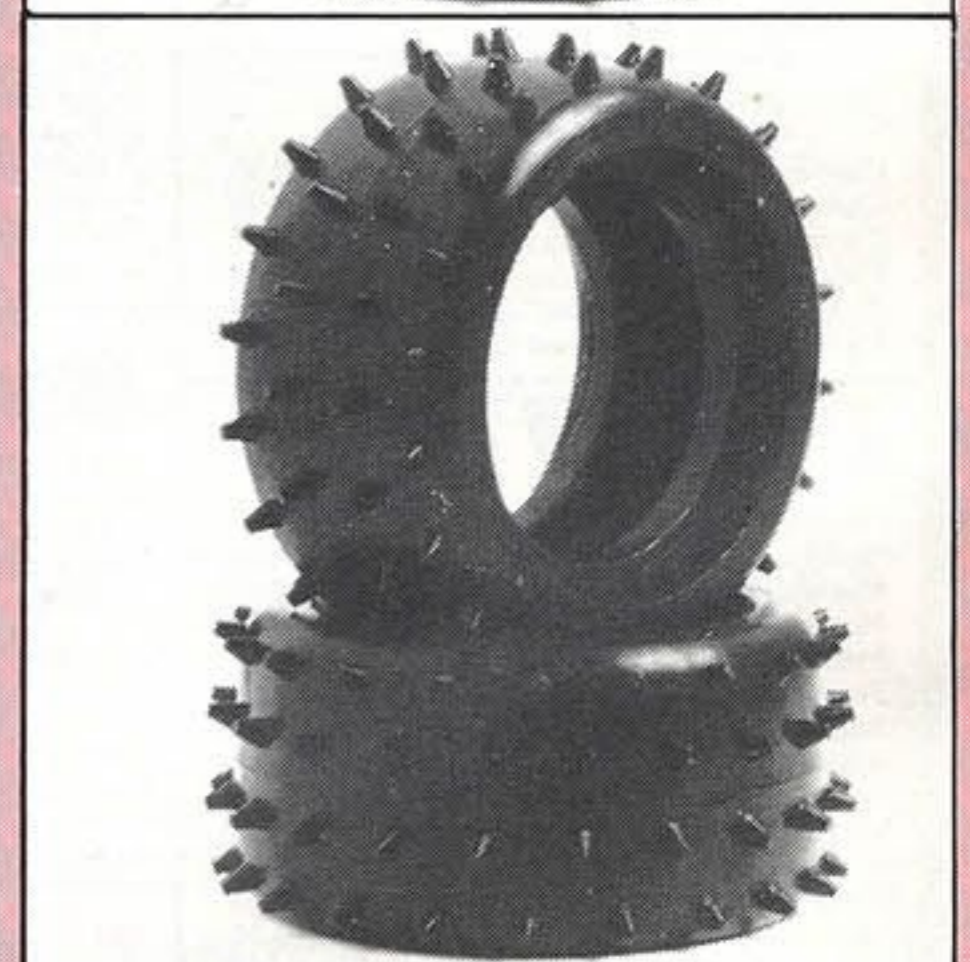
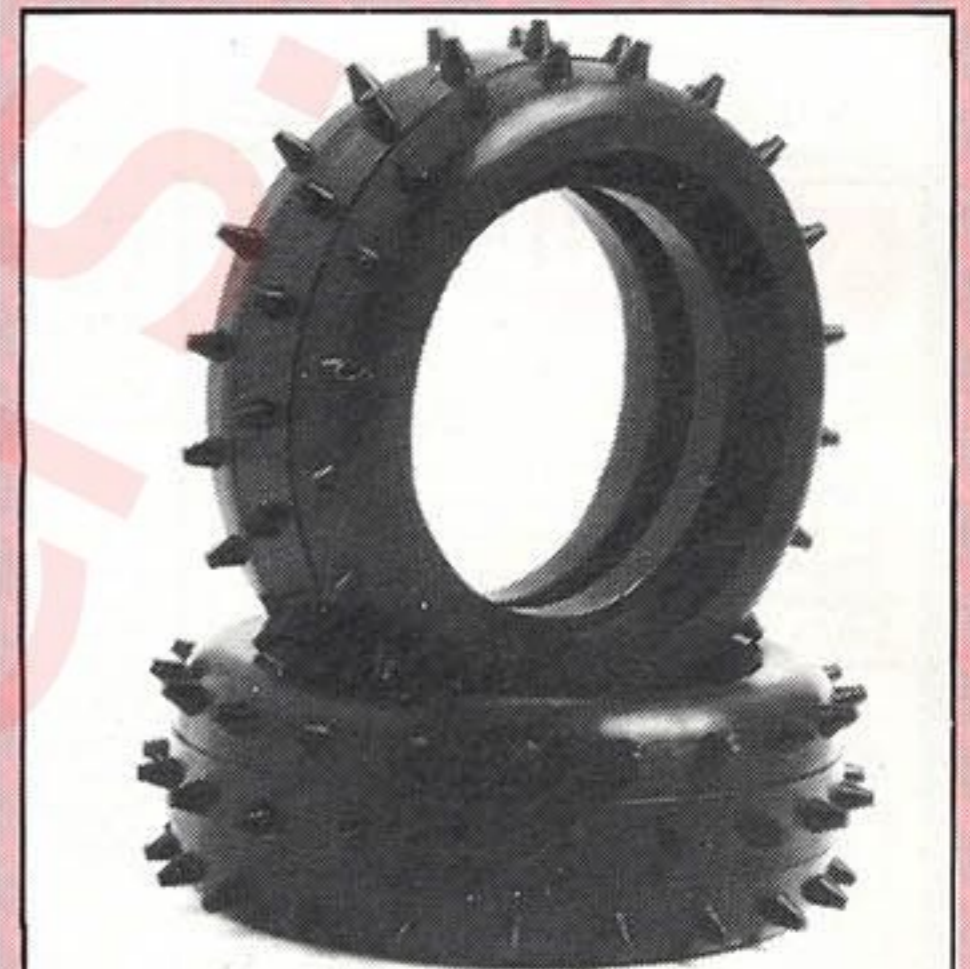


## Custom Racing Products

A new range of CRP racing tyre will be available from June 1st. Front and rear spikes for the Schumacher CAT with three row fronts and four row rears. Both fronts and rears are hard compound for added tyre life and increased traction.

The staggered tread pattern rear is designed to give extra grip in soft loose dirt, finally from CRP comes rears with pin spikes giving increased traction in medium to hard dirt.

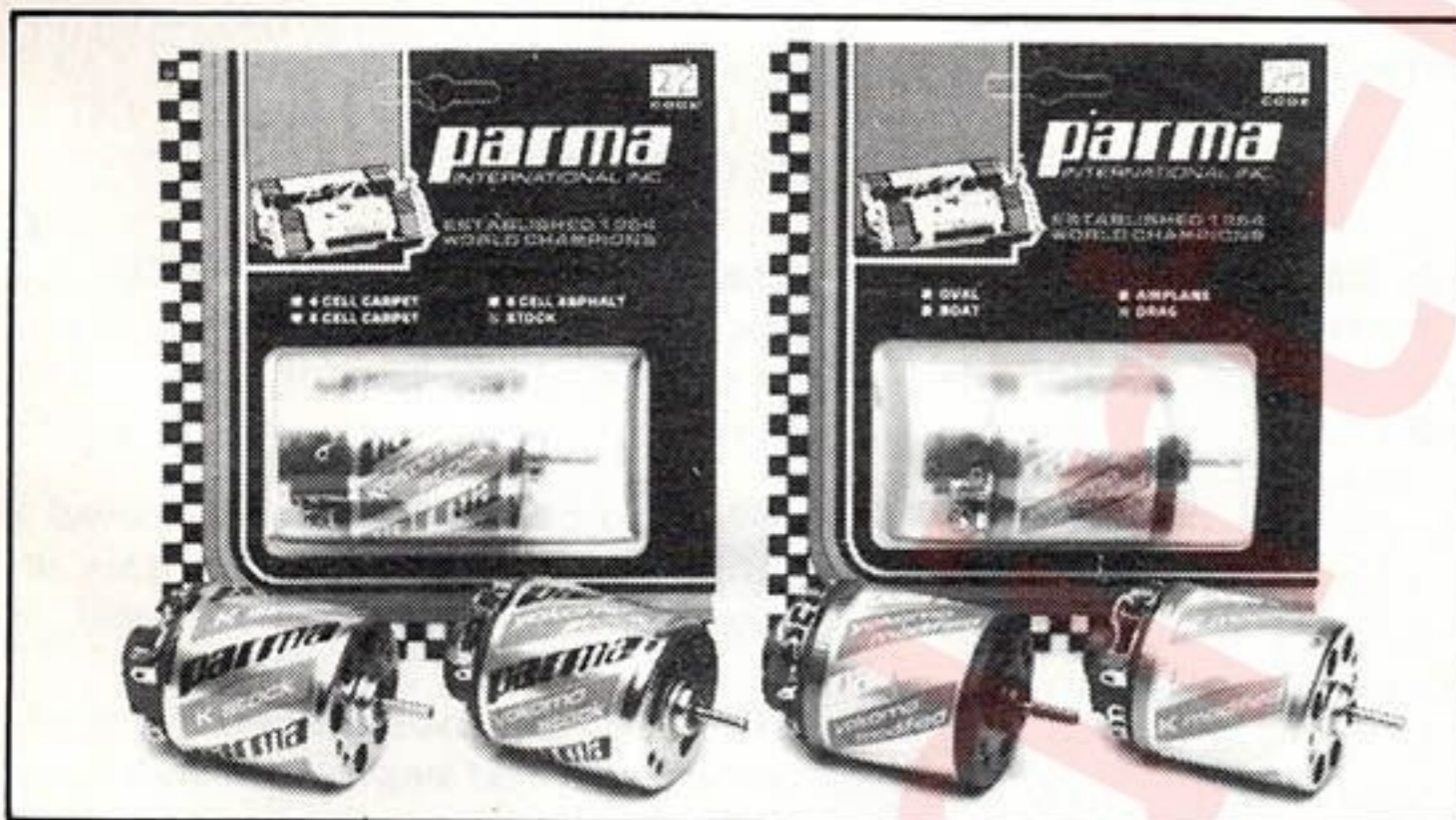
Available from your nearest CRP dealer.



**Parma**

Once again this month a host of new releases from Parma. Firstly three body shells for 1/10 scale cars, the 34 delivery Sedan, the mud bus and the beautiful 49 Mercury. A new look to Parmas motors that is very eye catching should soon be seen at your local Parma dealer, Parmas motor range has recently been expanded to cover boats and aircraft. To compliment the motors, a range of Panasonic selected cells with either Tamiya or Kyosho connectors. Finally a flexible antenna for Futabas Magnum series of transmitters, the antenna has the same range and keeps your aerial from obstructing other drivers vision.

All items available from your nearest Parma dealer.



# Radio Race Car

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The Monthly Magazine for All Model Radio Control

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Kyosho Tomahawk .....	RRC 21	Tamiya Striker .....	RRC 43
Kyosho Toyota Hilur .....	RRC 17	Tamiya Subaru Brat .....	RRC 18
Kyosho Ultima .....	RRC 45	Tamiya Superchamp .....	RRC 14
Mantua Manta 1/8th suspension .....	RRC 18	Tamiya Tamtech Cars .....	RRC 42
Mantua Nevada de luxe .....	RRC 16	Texas Wild Baja .....	RRC 10
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 Issue 30-35 £1.15 inc. P&P  
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*We regret that Issues 1, 2, 8, 12, 20, 31 and 34 are no longer available.*

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# STOCK AND OVAL

by Mike Smith

The choice of engine for the I.C. Stockcar is almost limitless providing they are 3.5 cc and don't exceed the £150.00 top limit then you can fit what you like, this freedom of choice is the start of expensive experimentation, to others it heralds the beginning of the end for limited cost racing.

The proof of the pudding will be shown on the ovals this year.

On the same theme I have managed to obtain an O.P.S. Competition side exhaust engine, in the next issue I shall be reporting on the pit falls if any of fitting this power mill into a Mardave Stockmaster chassis, but for the moment lets have a look at the engine choice.

## O.P.S.

As we are going to test the O.P.S. next issue we will start here.

The O.P.S. Competition, retails at £114.25 and sits in the middle of the O.P.S. Pro. costing £125.45.

These engines are not widely used in this country but are more prolific on the continent as are all the O.P.S. range, this is not down to unsuitability but due to the fact that up to this year they have been on the exclusion list set up by the BRCA.

Both the Competition and the Pro engines are, according to O.P.S. tests, supposed to develop 1.52 bhp at 28,500 revs with tuned pipe and running on 25% nitro. The Sport 1.3 bhp at 27,000 revs. They call the sport a more softer engine it is not sure under what conditions the 1.3 bhp was produced according to the engine importers

*The Irvine 20 ABC and the Cipolla Buggy.*

MacGreagor Industries they would think that this was tested on 5% or 10% nitro, without the use of a tuned silencer.

The cost of replacement Piston and liner is £36.95.

The cost of replacement crankcase is £36.30.

## Irvine .20 A.B.C.

The Irvine is the stockcar drivers most popular engine with a long service record and more than enough wins to its credit to never be discounted.

The A.B.C. retails at £52.25 and according to test reports develops 0.9 bhp at 26,000 revs this is on a low nitro content, the Irvine produces most of its power at the bottom end of the rev range making it a great performer on the oval circuits in this country, it does appear however to lose out a little on the very large European circuits.

The cost of a replacement piston and liner is £18.62.

The cost of a replacement crankcase is £13.14.

## O.S. .21

The O.S. .21 has always been a popular choice for the Stockcar driver proving very reliable on the oval circuits, the current price for the side exhaust engine is £92.20, but it would appear that new engine or engines are on the way in this class, which will retail at £101.20.

According to Irvine Engines, the O.S. importers, the new engine will have a different porting arrangement.

We only have a test report on the new O.S. which according to the manufacturers will be produced in two forms an O.S.

Buggy developing 1.2 bhp at 28,000 revs and the O.S. circuit 1.5 bhp at 29,500 revs.

The cost of a replacement piston and liner is £39.94.

The cost of a replacement crankcase is £19.54.

## Cipolla 3.5 Buggy

The standard crank Cipolla Buggy engine retails at £71.95, and is distributed by Sailplanes Int. This engine became popular last year on the oval circuits, possibly due to a Mike Billington test report in RRC and the follow up that Stock and Oval did on the suitability of the Cipolla as a Stock motor.

The liner in this engine is given a Tetrabora finish which makes it very long lasting. The Mike Billington report put the maximum bhp on 10% nitro with a O.P.S. pipe at .97 bhp at 22,000 revs and .79 bhp open exhaust at 16,700 revs.

The cost of a replacement piston and liner is £19.12.

The cost of a replacement crankcase is £19.12.

There it is for this month I hope to have more on the Engine Choice in the next issue and hopefully try some of the above mentioned on the oval which is really the only place to find out if they meet the mark.

The BHP figures quoted apart from the Cipolla are from the manufacturers themselves and it must be said that they do have some weird and wonderful ways of coming up with the best results. The Cipolla results were taken from a RRC report and can be taken as factual.

## Metafix Industries

Metafix could be the answer to the Oval racers dream, trade in your tired but serviceable engine for a new one. Metafix are offering this unique service on the Irvine 20 and the Bluebird .21 FSR.

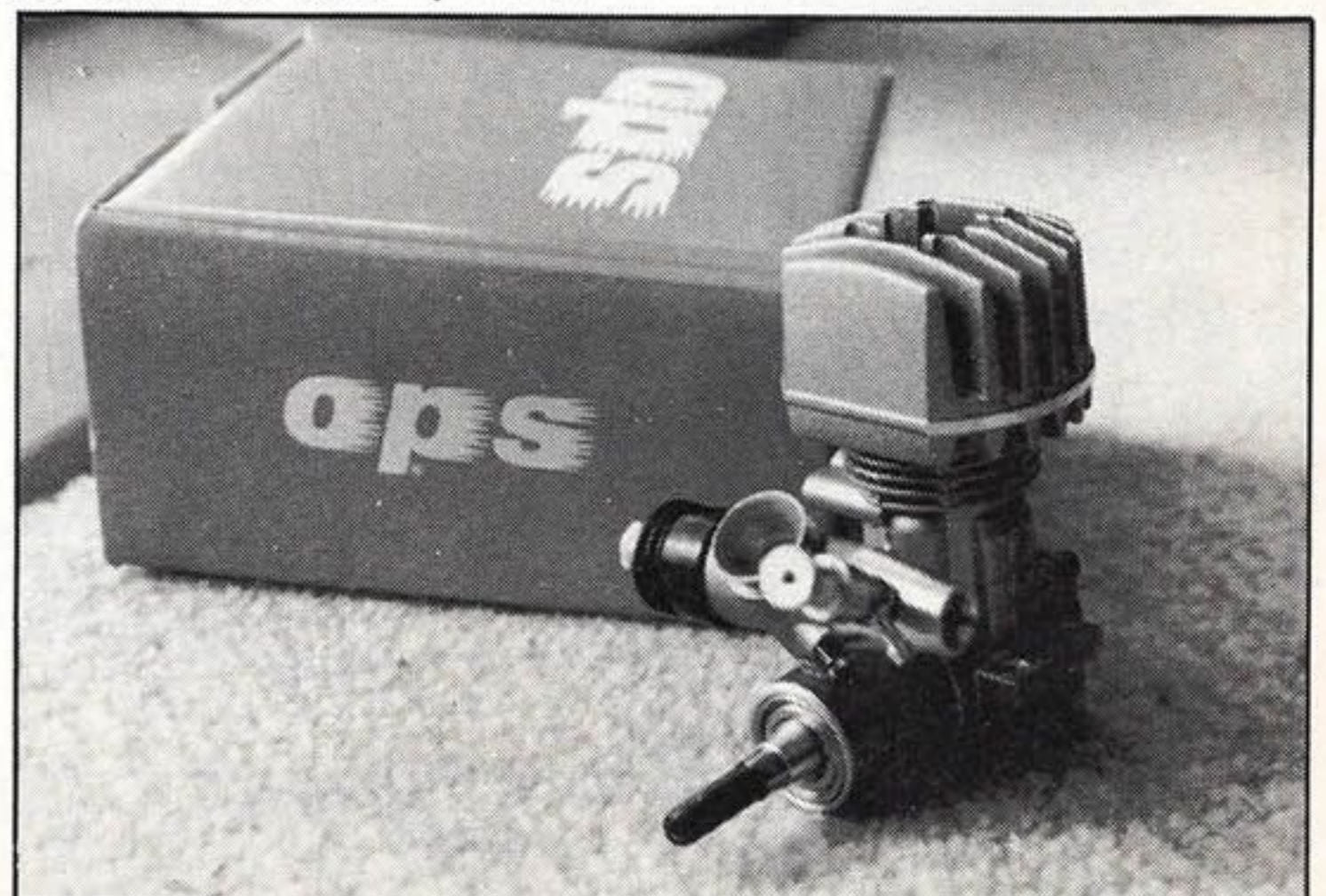
The exchange price for what is termed the Metafix Irvine 20SE (stage 3) is £49.95 and for the Bluebird .21 (stage 3), £47.00. Contact (0252) 20657.

## Kingsway Kar Komponenten

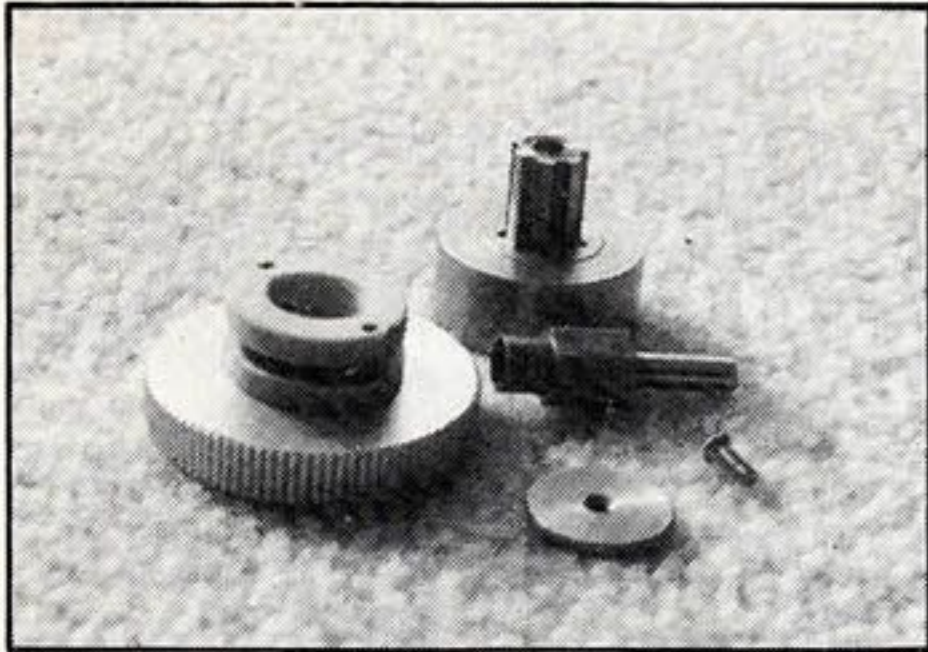
This Leicester based firm are producing an endless stream of goodies for the Stock Car enthusiast.

*The OPS Competition to be featured in next issue as a Stockcar engine, this is a very well put together power mill for £114.25.*

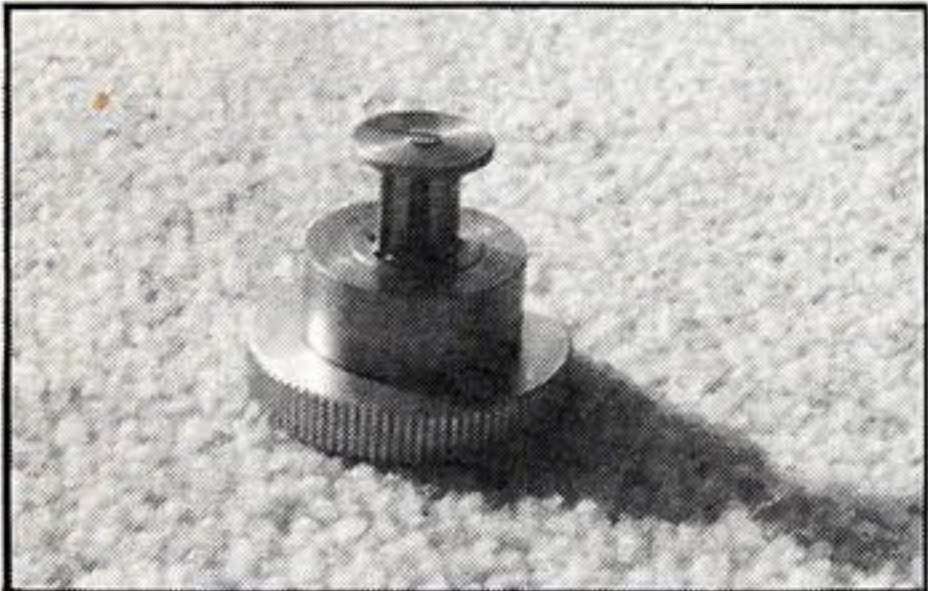
*The OPS has the most expensive crankcase of the selected engines in this issue, the OS has the most expensive Piston and Liner.*







The inside of the clutch shows how the 'O' ring is neatly out of harms way, this is a very neat clutch unit which comes with a 7 tooth clutch bell.



The Kingsway Kar Komponenten twin bearing clutch unit priced at £14.00.

The twin ball raced clutch is a very nice piece of engineering as is all of their components. The clutch costs £14.00 and is available in either 1/4 unf or 6 mm thread and either 3/8 or 1/2 in. drive.

They are also now offering a new wide rear axle to suit the latest rules at £1.70.

Contact K.K.K., 203 Kingsway, Leicester. LE3 2PP. Tel: (0533) 895361.

**Newcomers Corner**

If you purchase either the Mardave or Puma 1/8 I.C. Stockcar kits, you will find as a newcomer that all fits together with ease. In fact so easy is the building of these cars that the Ovalkeeni can be left with the feel-

Side Exhaust Engines	Recommended Retail Price £	Piston and Liner £	Crankcase £	B.H.P. *	Type of Carburettor
O.P.S. Competition	114.25	36.95	36.30	1.52	Slide Type
Cipolla Buggy	71.95	19.12	19.12	0.97 22,000 PRC Test	Slide Type
OS 21 New Buggy	101.20	39.94	19.54	1.50 29,500	Barrel Type
Irvine 20 A.B.C.	52.25	18.62	13.14	0.90 26,000	Barrel Type

\*Manufacturers Figures

substance into a mean macho menace of the oval.

The most time is spent on the body and Ovalkeenies can spend literally hours styling their paint work to look like a work of art. I have seen the body art go from one extreme to the other, resembling on one hand page 3 of the Sun to a clip from 'Star Wars'.

If you are a budding Rembrant then you may wish to have a livery second to none but remember Stockcar racing is a physical sport that I have always thought that a working body should be dressed for the occasion not too flash but clean and mean.

When preparing a body shell out of fibreglass or A.B.S. plastic you are going to require one or two items not supplied with the kit, namely paint, masking tape, scissors, files and a drill, it is always advisable to also have a breakfast cereal packet and a well ventilated area in which to work, I also like to have at hand a hairdryer, more of that later.

Before you can paint your jelly mould you have to turn it into a bodyshell, this means removing an amount of the plastic

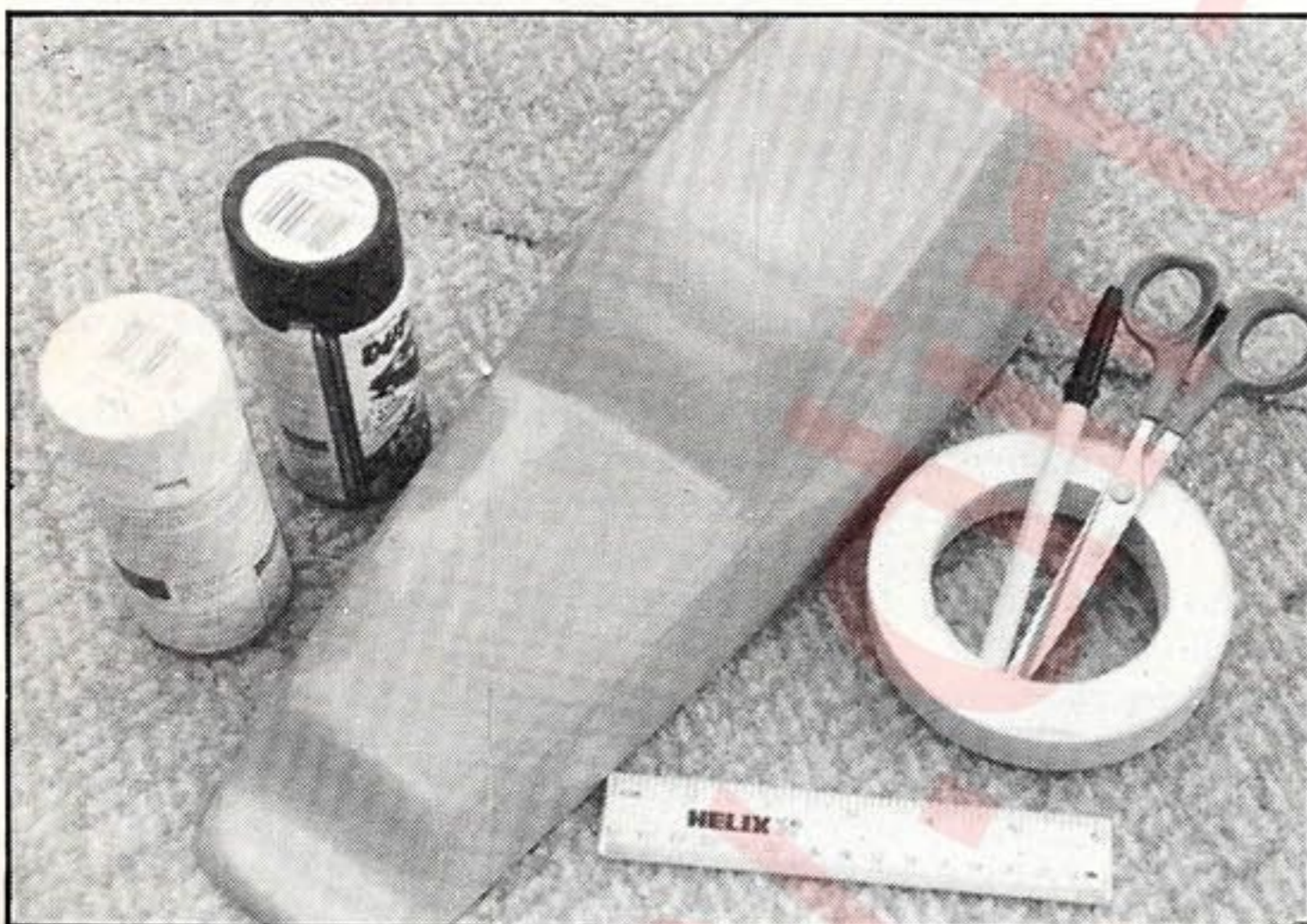
lights, quarter lights, windscreen, etc., so as not to confuse the none drivers amongst us as well as myslef. Lights to me are the things you flash and not look out of.

The front window should be as large as possible to allow air to pass through the shell and aid the cooling process of the engine, likewise the rear opening should be large enough to let the air out the back.

Once the four openings have been sketched onto the shell the process of removing the plastic begins, one should also make note that all Stockcars at some time will end up on their roof and slide for what will seem like eternity down the circuit. A marshall will eventually turn you back on your wheels after the second attempt, the first being aborted as another competitor decides to use the sharpest part of the car to de boot the marshall and to see if he can remove your roof and probably your cylinder head in one go. Before cutting make sure that you leave enough plastic to keep the roof over your head.

**Cut And finish**

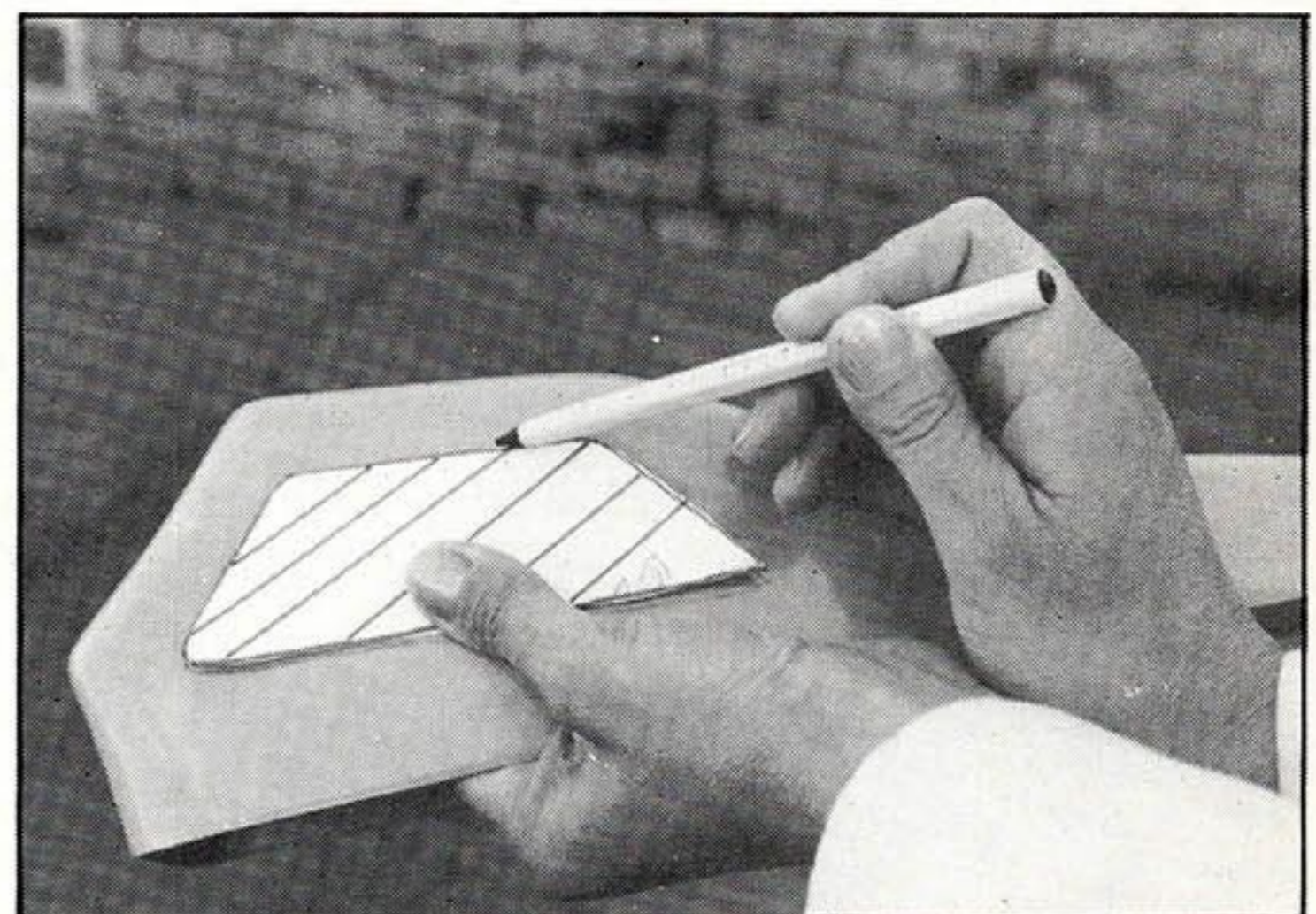
Using the piece of cardboard draw the



Paint, scissors, tape, marker, plus the Body shell, are the main ingredients for a mean machine, rough and tough means no room for cissy paint work.

ing of doubt as to why things are so simple, remember the engineering term; 'Simple is efficient', thats why you soon have a competitive car in your hands after a very short construction time.

Things are perhaps not as straight forward when you come to the body, which resembles a plastic jelly mould, it is then up to you to turn the vac formed synthetic



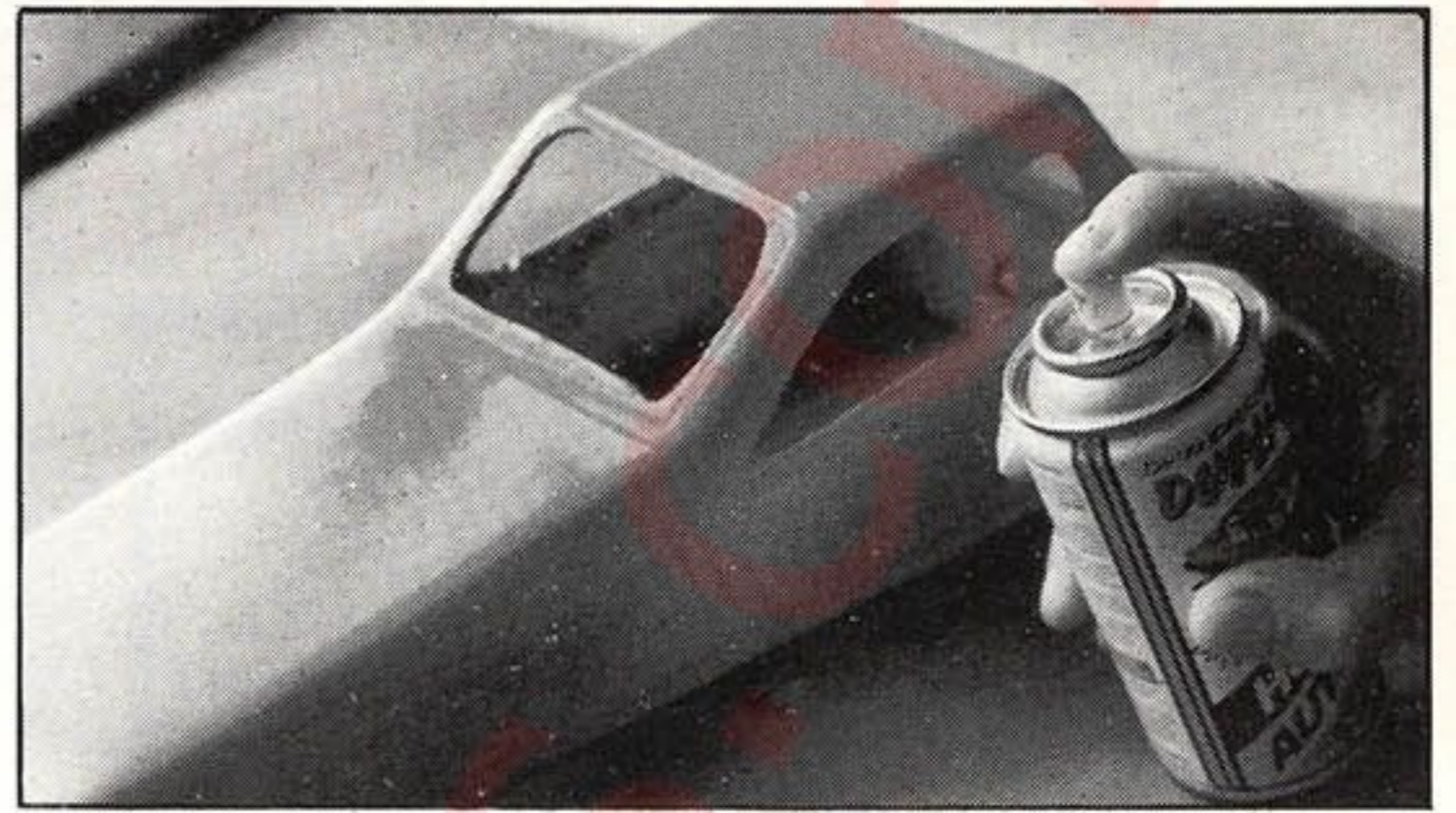
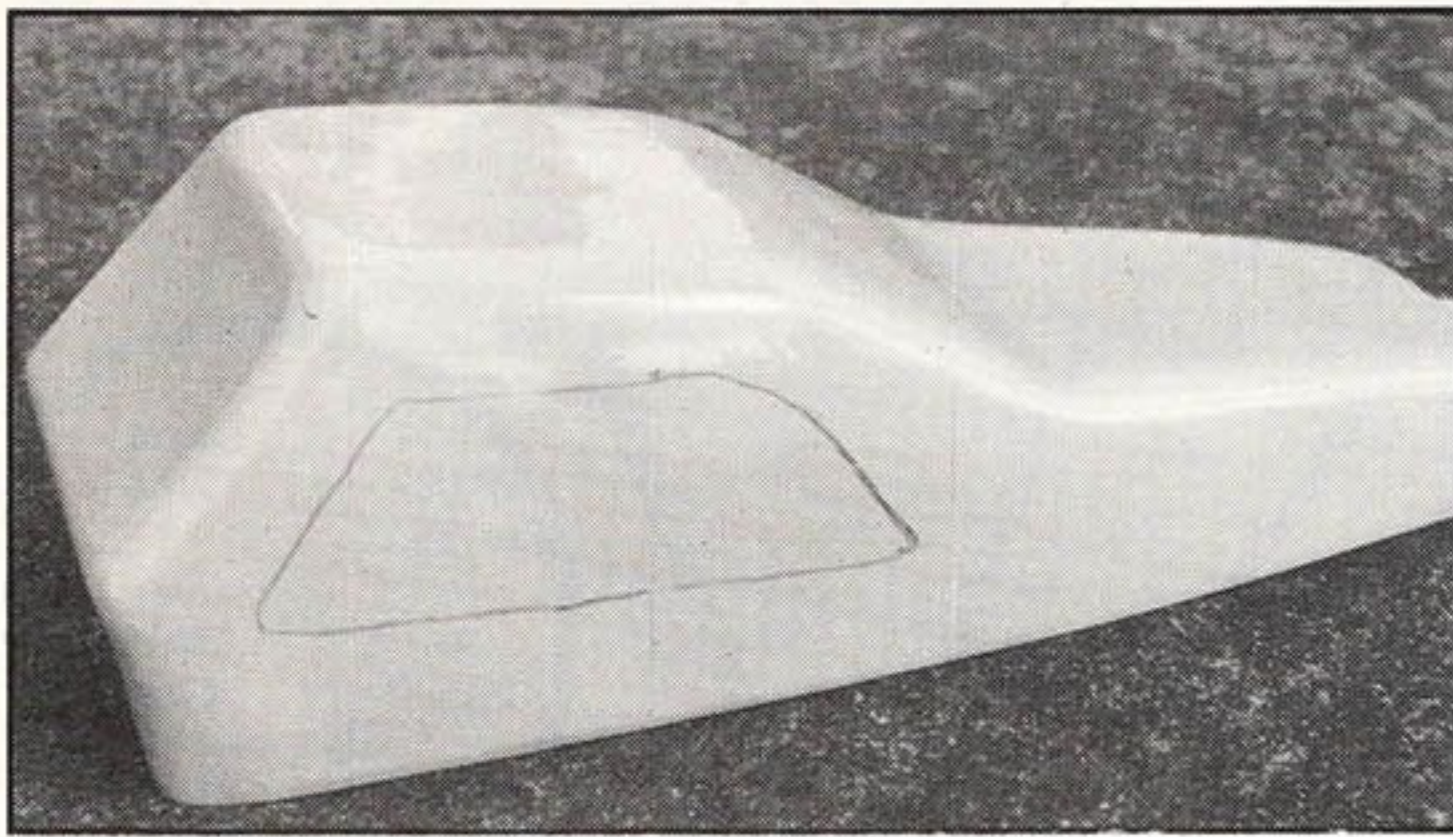
Using a template cut from a piece of cardboard you can make a design for your windows, the template reversed will allow for the same proportion of window either side of the body.

Remember when designing you require air to pass through the car to help with engine cooling but you also need to keep a roof over your head or in this case the heatsink head of the engine, always leave enough plastic to support the roof for when you skate down the straight with your wheels facing heaven.

where you would anticipate the windows to be, you also need to drill holes for the body mount studs.

**From Jelly Mould To Shell**

Before you hack away with your drills and files it is well worth planning the shape of the windows with the aid of a template cut from a piece of cardboard hence the cereal packet. Both near side and off side windows should be of the same proportion one template will do both sides, I am calling these openings windows and not side



When you are happy with the design you can then remove the plastic, you can use a number of implements for the purpose but I have always drilled around the inside of the marked area then joined the holes with a junior hacksaw blade finishing off with a half round file for quickness then a nail file for those extra smooth finishes.

shape of the openings that you think will look the best, cut them out to use as a template, you can either hold them firmly on the shell whilst you mark with a pencil or use a small amount of Bluetack to keep them in place, when you are satisfied with the window design you can start to remove the plastic, or as they say on Blue Peter 'here's one I prepared earlier'.

When cutting either A.B.S. or fibreglass it is quite simple to drill holes large enough to allow the use of a hacksaw blade to join up the drill holes. You should always cut to the inside of the line in order to finish to the line with a file, a quite large file will remove the rough edges very quickly finishing off with a nail file to give that last final touch.

When using the files to remove plastic it is advisable not to inhale the dust created as this is not too good for you.

When you are satisfied that the windows are well proportioned, remembering that enough plastic should be left to support the roof as well as having the openings large enough to allow the air to pass over the cylinder head.

**Removing the masking tape after the second colour has been applied, you can make some very effective designs using one or two colours, but stick to just two on your first attempt, you can see in the picture how the white paint has crept in between the masking tape, I did this purposely to show you (if you believe that), if this little mistake happens you can hopefully turn the hic up to your advantage with a decal or name sticker.**

You should at this point think about the access for the glo plug lead, as most engines have their glo plugs incarcerated inside a cylindrical heatsink head, a long tubular glo lead is necessary to get at them, this means that access through the roof is necessary for starting the car with the body in place. There are those who prefer to start the car then fix the body leaving the roof intact, whilst others cut a circular hole in the roof to allow the car to be started with the body attached.

**Paint Away**

When you have cleaned the shell and removed all the rough edges it is time to paint.

The simplest paint to use is normal car spray, which can be purchased from most car accessory shops, you can buy special modelling paints but I have always found car paint sprays cheap and effective.

According to the BRCA rules governing Stockcars, the roof should be painted down to the waist line with your grade colour, ie; Red, Blue, Yellow, White, it is always an advantage to maintain your roof grade for as long as possible, this stops you having to keep changing your colour scheme.

Before you start to paint you should be very careful with the paint, you need to be in a well ventilated place and make sure the paint nozzle is pointing away from you when you depress, keep it out of your eyes and off your skin.

It is as well to think about how the finished body will look, you need only use one colour but this can be a little boring.

Two colours give a striking effect, especially if stripes are incorporated in the scheme.

I have used two colours, red and white, red is for the roof and stripes and the white for the rest of the body.

After setting out a good area to paint and planning where the stripes will go it's time

**The BRCA rules about grading on Stock cars states that you should paint your roof down to the waist line with the colour of your grade, this is the colour that you would normally start with, painting the roof allowing the paint spray to move along the body where you are going to have the odd stripe.**

**ALWAYS SPRAY IN A WELL VENTILATED AREA AND DO NOT INHALE THE SPRAY. It is always a good idea to be in the garage or even outside, you can quite easily change the colour scheme of the dining room if you are not careful.**

**I always use an old hairdryer to warm the paint work to help it bloom if the conditions are not perfect.**

for the first coat.

To get the best finish from spray cans you should spray at around room temperature, with a well shaken can, this is not always practical as the smell and risk of getting paint all over are normally too much of a risk, mums and wives tend to take a dim view of multicoloured dining tables.

To overcome this problem the garage is the best place, to compensate for the less than ideal temperature I use an old hair dryer to dry the paint giving a super finish.

First off the roof is painted in several thin coats each time using the old hairdryer to aid the drying, I wanted stripes in red to match the roof so in the area I planned for the stripes I sprayed with red paint.

**The finished shell, the body used was a Mardave Clayfield classic, you can use this very simple but effective method on all types of body's except those made from lexan.**

**After this simple design you may like to try something more ambitious, providing you allow time for the different colours to dry before you mask them out, you could even paint a Union Jack, but remember no cissy stuff.**



After several coats of paint and drying this part of the operation was complete, it was now time to put the body safely to one side for at least 24 hours to properly dry.

The next operation was to mask the roof and the area of the stripes, a plain sheet of paper was used to mask the roof and masking tape for the stripes, don't use newspaper as if you damped this with paint the print can come off onto your roof.

Once masked, the white paint was applied in the same manner as before, with the stripes being red the overlay of the spray means that to cover this successfully with white, thin coats have to be applied and let dry this slow build up gives a good finish, when the body is completed you leave the paint to dry before removing the tape, be very careful when removing the masking tape so as not to disturb the new paint underneath, also when spraying the top coat try to avoid a ridge of paint to build up along side the masking tape as this will leave an uneven finish.

Once the body is complete your name and a few stickers can be adorned to give that final touch, you can of course finish the body with a fuel proofing lacquer to ensure that the paint will not deteriorate when it comes in contact with either fuel or exhaust gunge, I haven't bothered as the people I race with are more frightening than a bit of fuel.

**M.R.C.**

Moulded Research Company (M.R.C.) is to be sold to an American company, lock, stock and barrel.

This trans-Atlantic switch for the company, who will be trading in the States

under the MRC name, had been brought about by the ill health of Graham Bell, the man who took the modelling world by storm with his high tec inovative racing tyres.

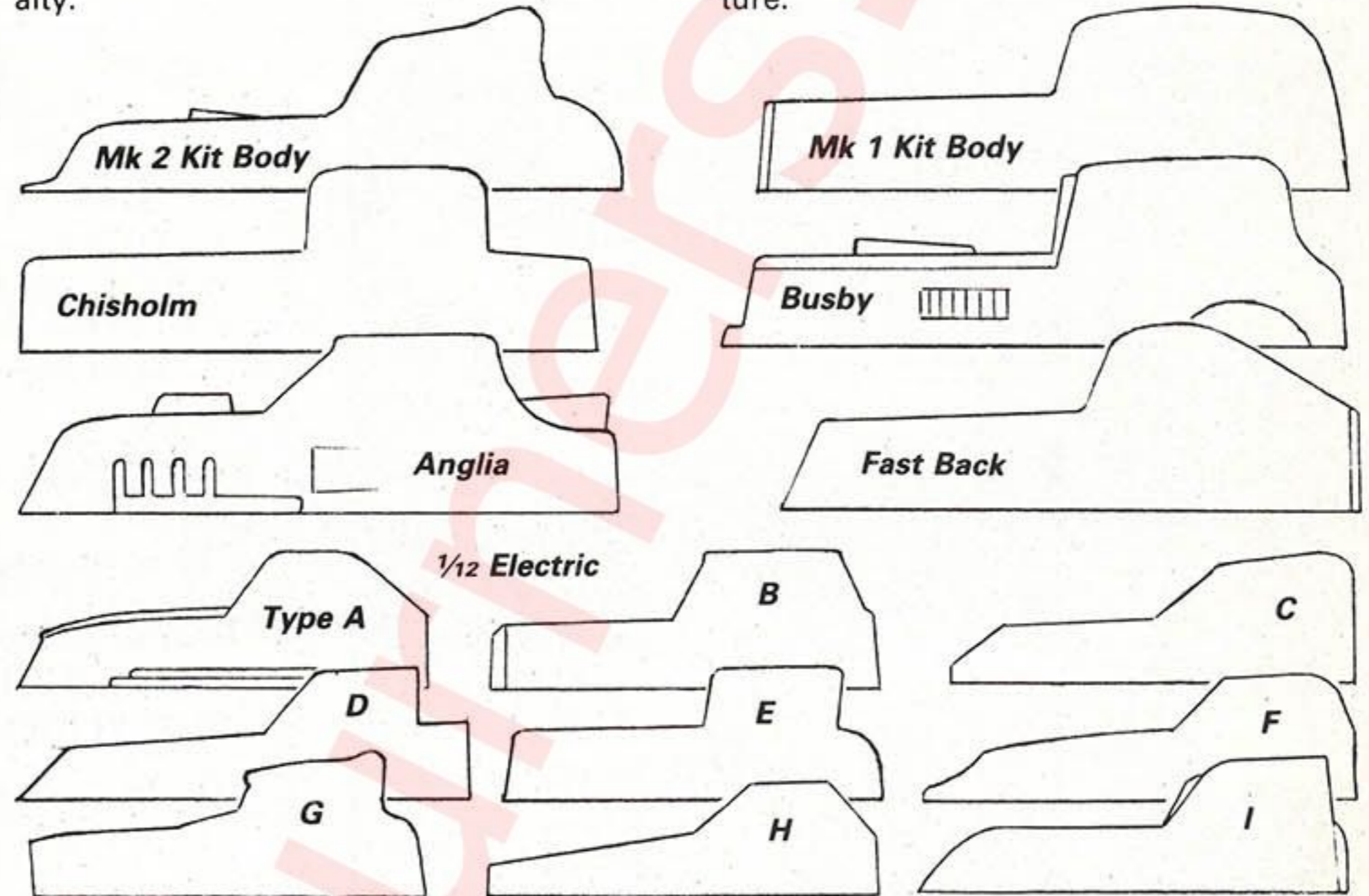
MRC will be concentrating on the American market which will unfortunately leave a short coming for the British, this should be only for the interim transition period but it looks very much like the T9 low profile slicks used by the stockcar zealots will be phased out, at the moment stocks are good but as the UK side of operations are slowly wound down, the T9 will be an early casualty.

We wish Graham all the best for his operation and wish him a speedy recovery.

Graham is already setting up a new company under the name of Bellsport, which will be a key distributor of modelling products including the American MRC tyres.

**Mardave Body Shells In Stock**

There are a number of different body shells for both the 1/12 and 1/8 stockcars, the problem is knowing which one will suit your needs, here are a few of the shells available for Mardave. We hope to have an update on the new shells for the 1/8 in the near future.



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OT106 Body only	£11.95
OT107 Wing	£3.50
OT111 Decals	£1.95
OT112 Screw set	£7.25

### ROCKY SPARES

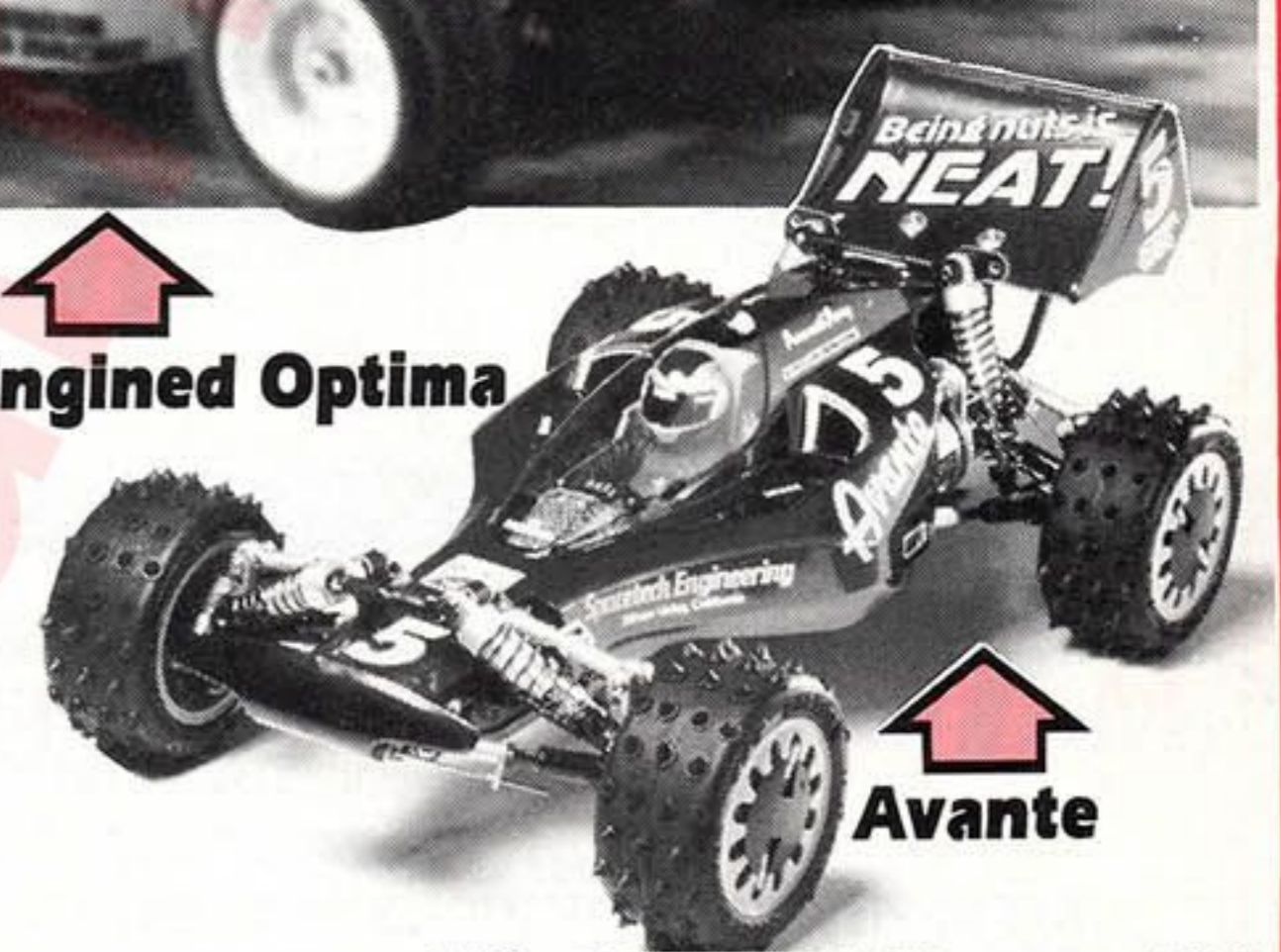
RK06 Suspension Set	£3.95
RK10 Hub Set	£3.95
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**Thunder Shot**



**Mid Engine Optima**



**Avante**

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 Stick battery packs (blue) 70p; Speed Controllers 70p; 1/4" 2 red + 2 black 4" lengths 65p

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Thinners, jar	to clear £1.25
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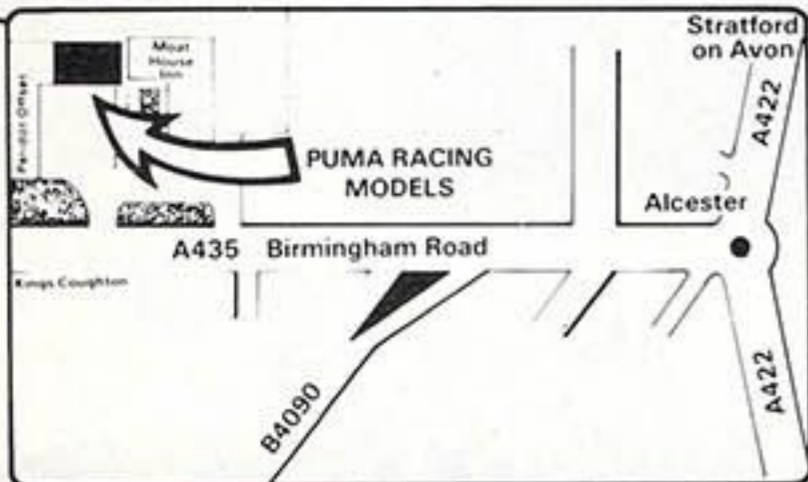
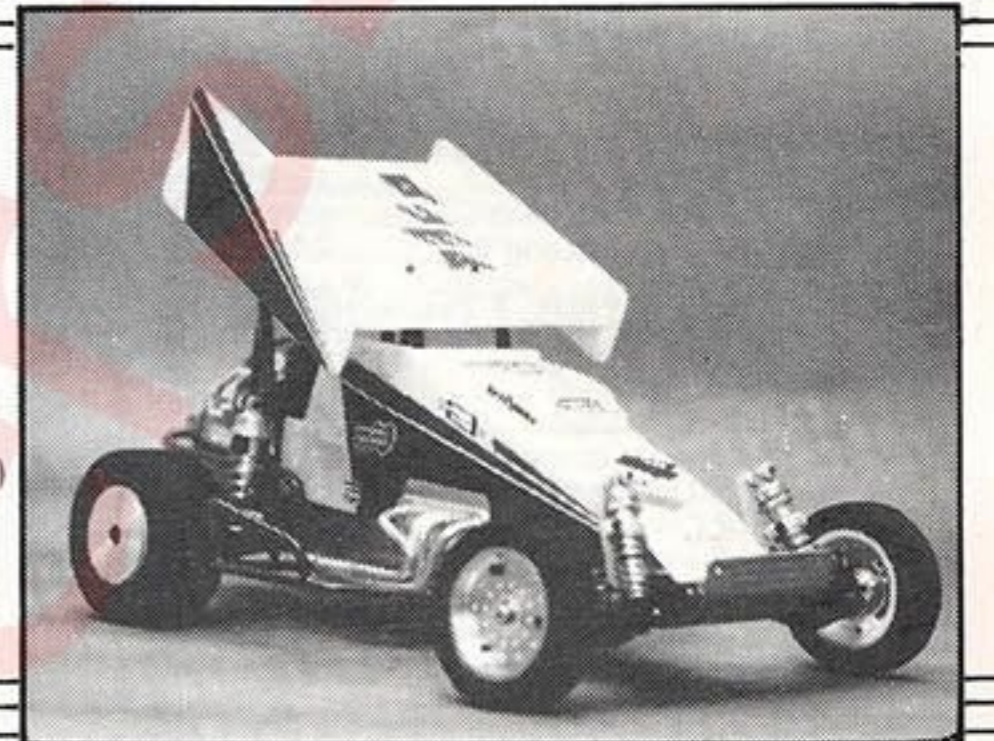
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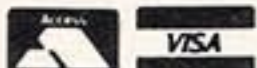
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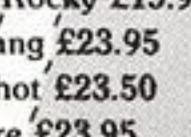
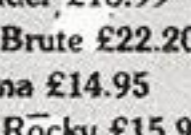
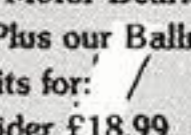
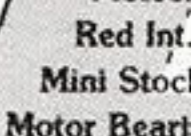
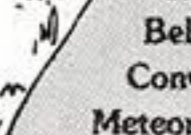
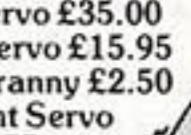
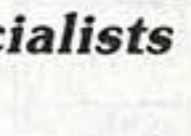
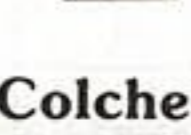
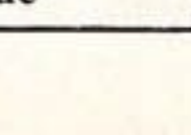
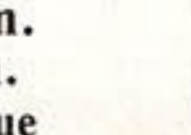
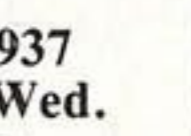
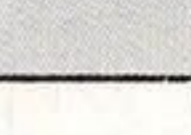
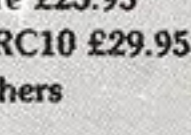
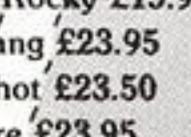
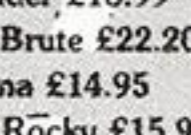
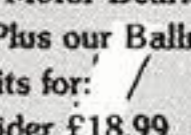
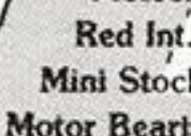
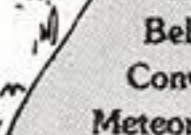
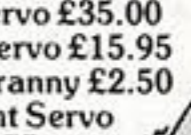
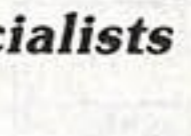
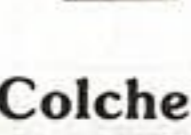
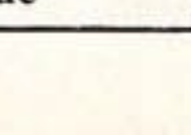
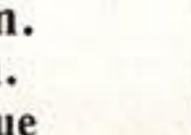
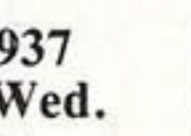
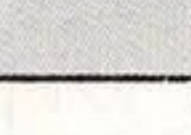
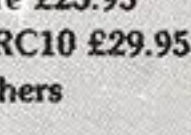
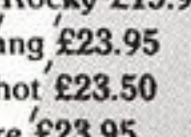
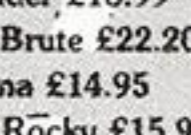
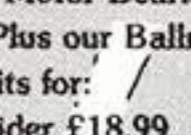
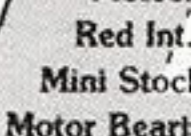
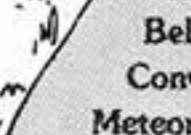
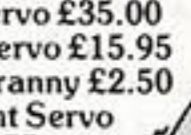
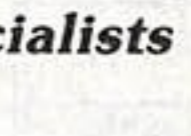
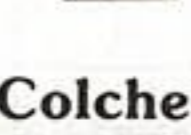
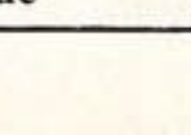
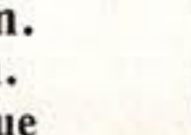
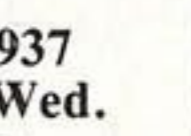
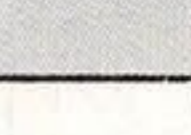
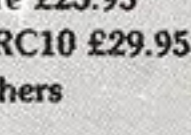
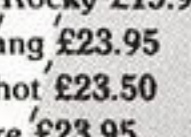
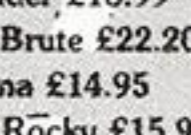
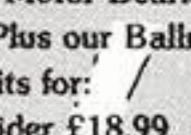
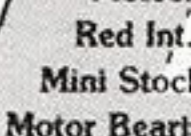
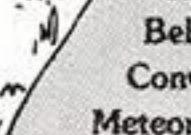
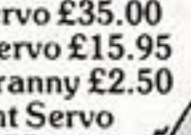
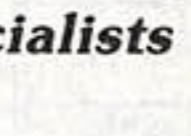
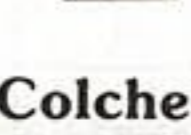
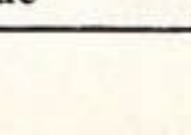
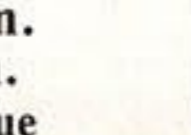
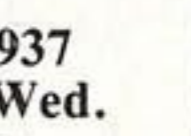
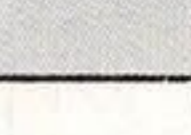
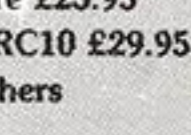
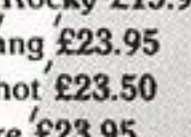
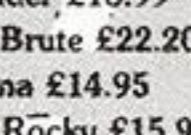
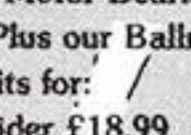
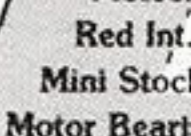
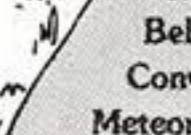
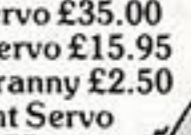
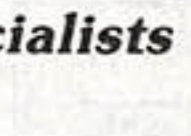
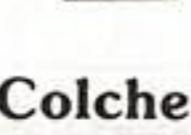
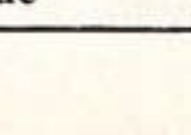
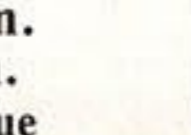
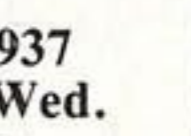
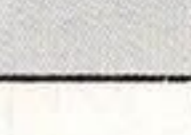
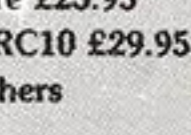
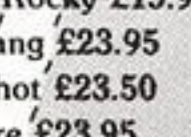
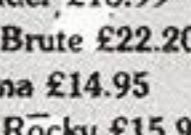
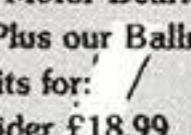
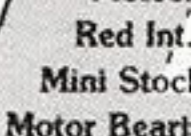
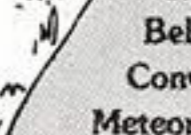
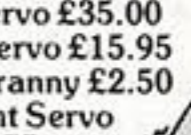
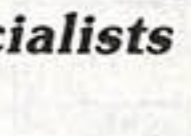
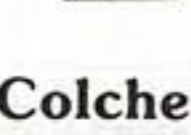
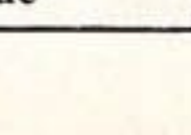
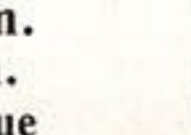
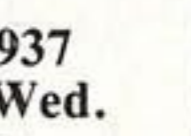
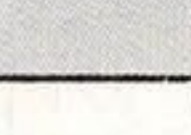
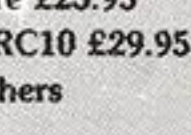
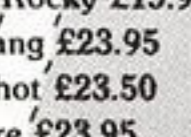
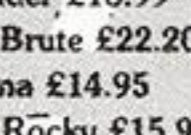
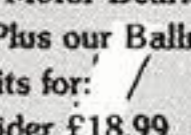
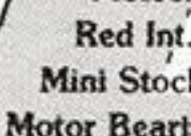
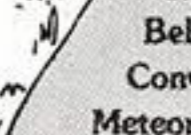
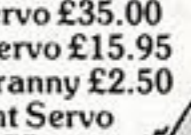
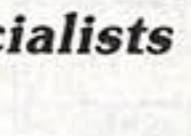
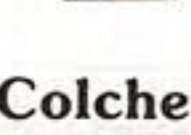
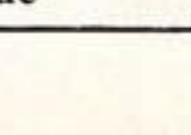
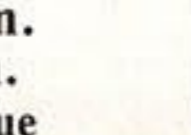
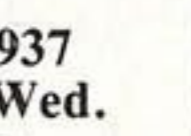
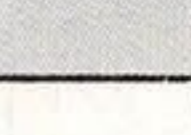
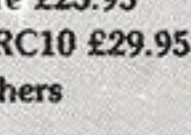
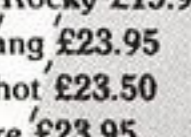
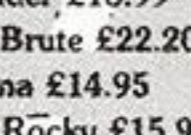
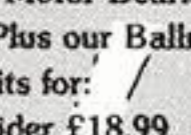
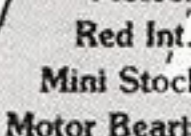
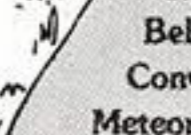
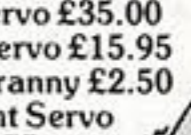
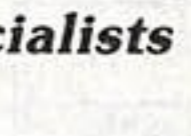
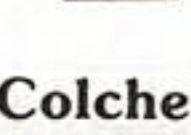
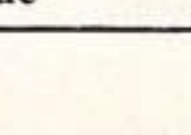
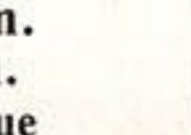
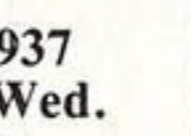
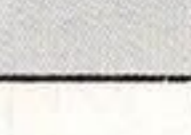
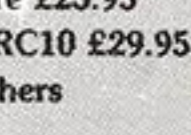
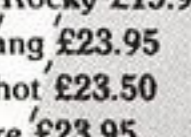
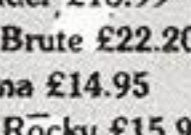
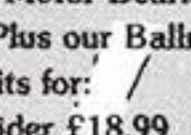
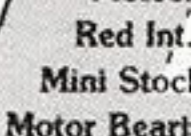
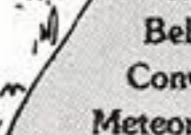
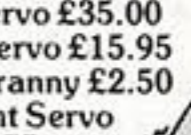
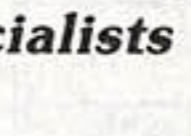
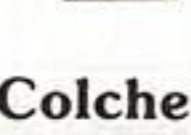
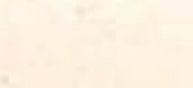
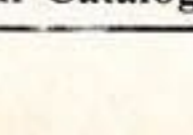
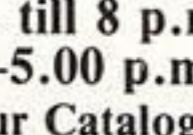
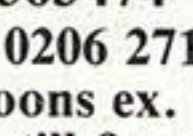
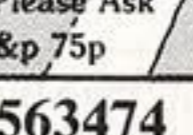
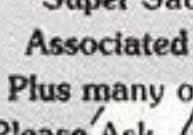
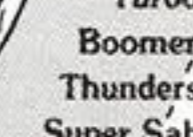
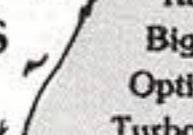
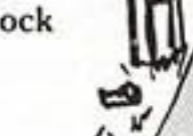
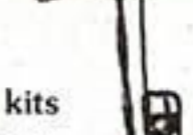
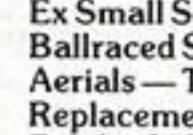
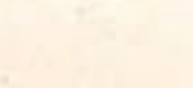
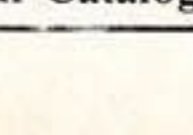
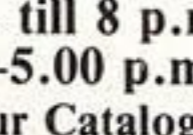
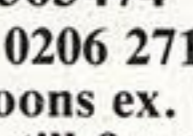
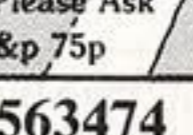
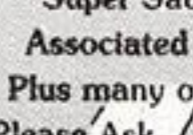
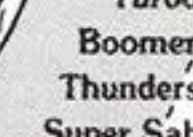
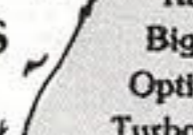
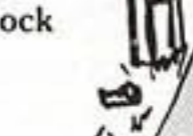
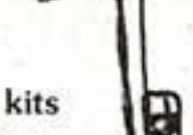
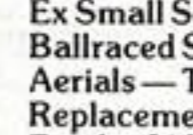
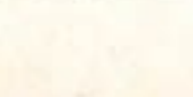
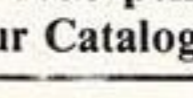
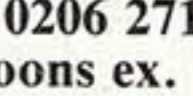
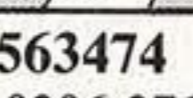
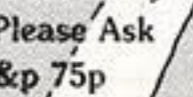
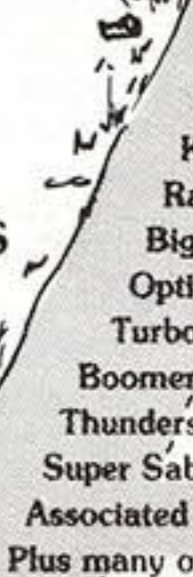
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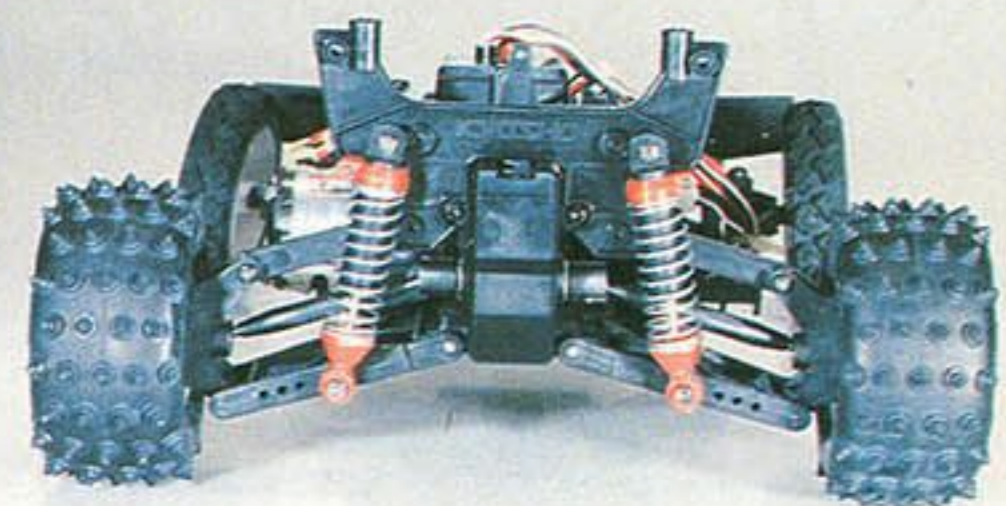
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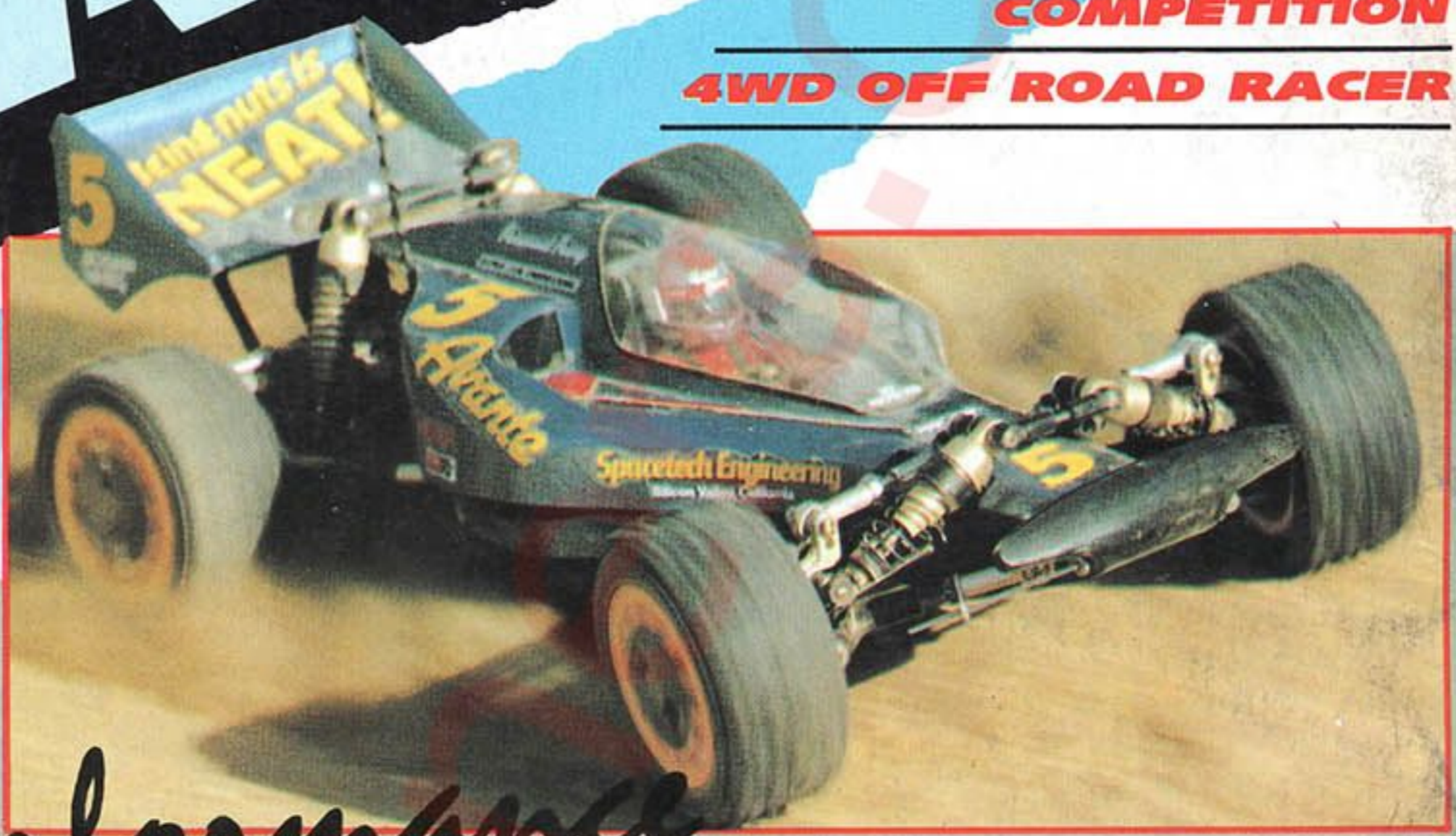
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1/10

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