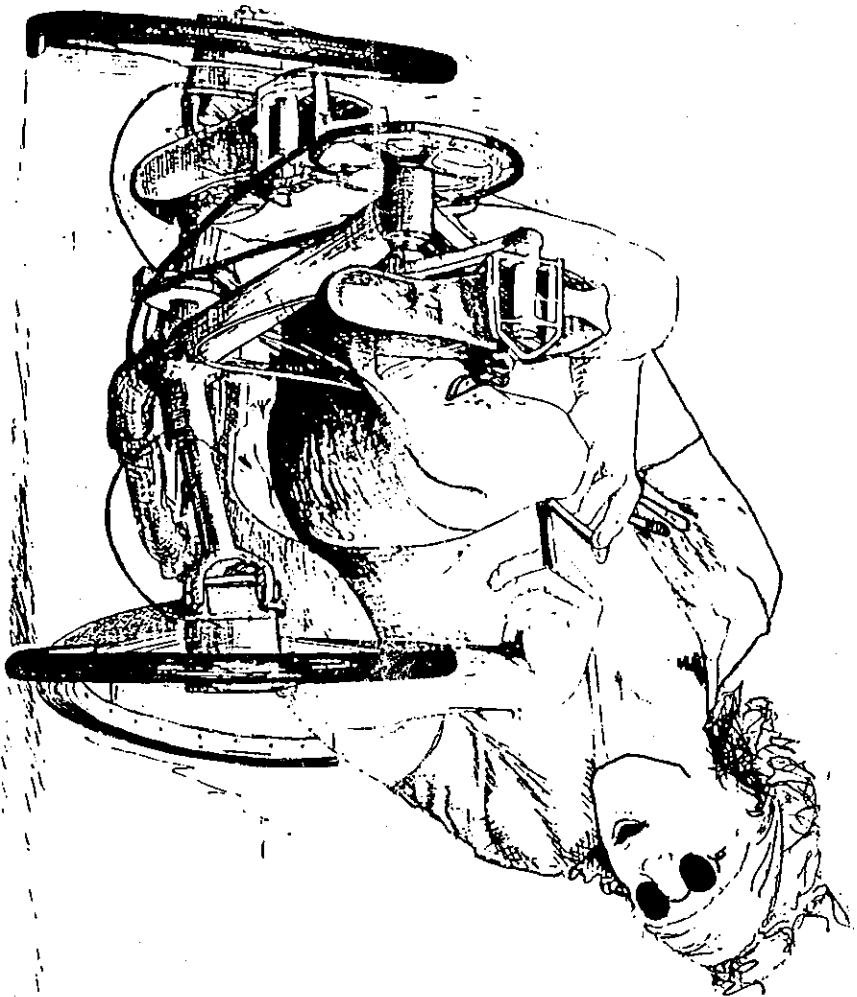


# HPV TUNNERS

H.U.M.A.N. P.O.W.E.R. I.N. M.O.T.I.O.N.

vol 1 2



Pushing a Burrow's Windcheetan to the limit (Richard's)

*Tommy*

# in the editor's seat



Is it my fevered imagination, or is the media looking favourably towards small pedal-,solar- and electric-powered vehicles. In the space of a week, I read in five seperate magazines, articles about the "90 Solar Cup Challenge, the GM Sunrayce USA and the "91 NRAM(!) Energy Challenge. It's ironic how a sudden rash of alternatively-powered vehicles arrives as fuel prices

climb - then disappear faster than desert blooms once the price drops. The cynically minded might feel it is just the automotive giants flexing their corporate dominance, warning away lesser manufacturers who may see it as a possible niche. Considering that smaller and slower vehicles would improve the traffic mix for cyclists, and encourage human powered or assisted vehicles, it is a great shame that the current interest in alternative vehicles may die

company to develop the model - to be called the Zipper - and a trust account with a generous discount for any immediate orders. As the specifications have proved to be quite impressive, perhaps this is the time for richer readers to grasp the nettle.

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Speaking of small cars, I got a very detailed letter this month from Bob Stuart, who has been working on a 'mass' produced replacement for his canadian Car-cycle X4, which has won three US practical vehicle awards. He has set up a

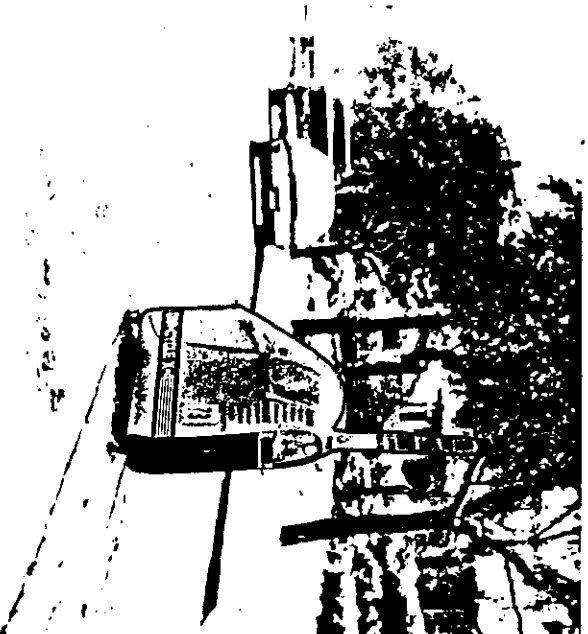
HPVTimes is assembled and distributed by Wayne Kotzur, a long time HPV enthusiast designer and full-time framebuilder

I have been aware of the Car-Cycle X4 for some years, but its gradual evolution into the Zipper has recently been pointed out to me by Glen Stickley of Queensland, a physicist who has been corresponding with the designer, Bob Stuart. I pestered some friends in Canada to testride the vehicle, but unfortunately it was not possible before they returned to Australia. However Bob has sent me a comprehensive slab of information which forms the basis of this article.

# Fast Clean Quiet Healthy Human-Powered

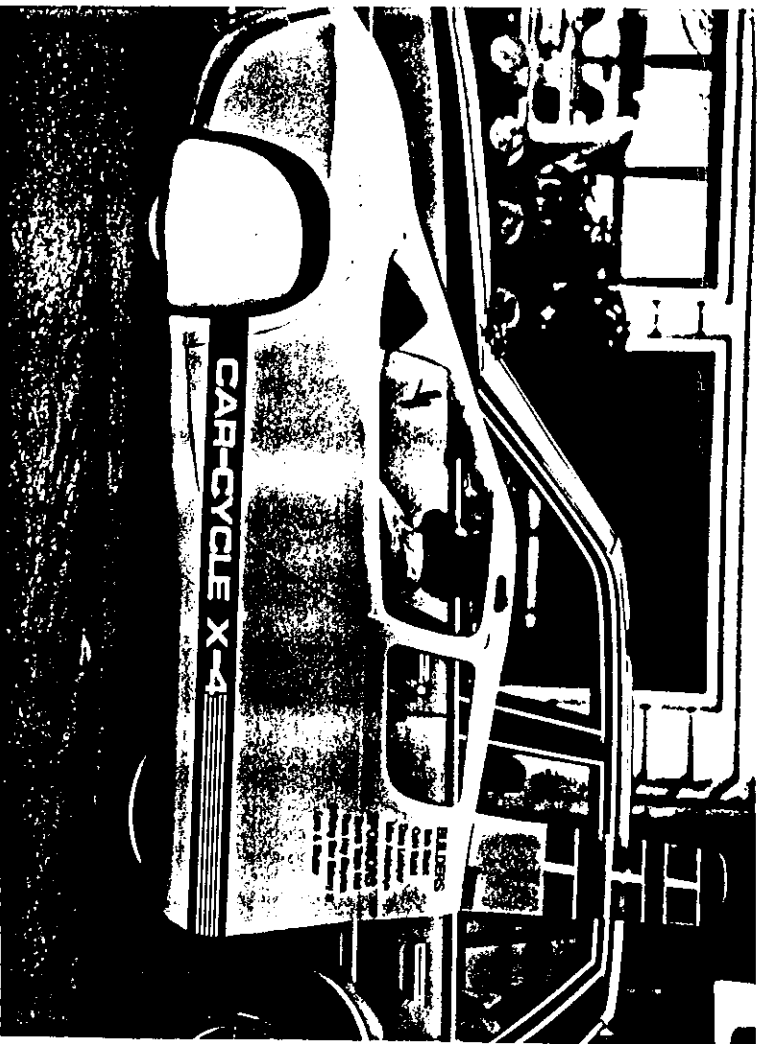
## Original CAR-CYCLE Technology

Inspired by the english Windcheetah (fully faired trike with a cruciform tubular frame) which Bob saw at the 1985 IHPVA Seattle meeting, the X4 was constructed using the same configuration to provide a low and stable triCycle. It could be faired for weather protection against the severe northern winter, as well as augmenting the aerodynamics and luggage capacity. While unsure of the type of terrain he has used, Bob said the air-drag reduction enables the X4 to travel 30% faster than a standard biker expending the same energy. In addition a backseat is provided for a child and luggage up to 45 kg.



Recognising the need for suspension travel to protect the small wheels (Moulton 17") and to provide ride comfort in a reclined seat, the basic frame of hand-laminated fibre incorporates shaped integral suspension wings. The chassis is a kevlar and fibreglass 'tube' that acts as a backbone from the crank axle to the rear swing-arm pivot. Short double-A frames support the front steering wheels, which rotate on the wide laminated spring-hinges of S2 glass and kevlar. A similar suspension system is applied to the seat; and both seat and wheels have friction dampers to control take-up and rebound.

The need to produce a narrow profile on the road, and to enable the turning wheel to clear the cyclist's legs means a slightly restricted turning circle (5m), but this is quite good for its length. The Zipper is intended to have an electrically operated tilting mechanism to provide high speed turning stability over 0.35G. The current X4 is stable up to that limit, and will tend to slide, rather than tumble if suddenly braked while turning at speed. The tilting mechanism would lean the body, the rider and the luggage to a maximum of thirty degrees, which would also provide increased comfort on sloping road verges.



The body shell is largely made up of the plastic equivalent of corrugated cardboard - a two skin polypropylene material called Coroplast which is used in signboarding and lightweight panelling. For safety the doors and roof are made of kevlar/fibreglass laminates. As a visibility aid, a safety tail, incorporating a permanently flashing amber light, sits up to 170cm above the roadway. This is visible above the top of most cars so it should mark the X4 progress quite well. Indicator lights are incorporated into the rooftop. A small rechargeable battery powers the turn and hazard lights, and provides power for a small fan to assist cooling and demisting. A small wind-screen wiper is also fitted.

The windscreen is a single wrap-around lexan sheet that springs up and away to get in and out. Small latches hold the combined door-windscreen in place into a recessed surround.

Reflective heat-mirror film will be considered for the Zipper, in addition to the cooling air from the open wheel cowls, and an adjustable air intake in the nose.



I understand that portions of the roof can be removed for hot conditions and low speeds where air drag isn't a worry.

are attention to detail, and the obvious skills at fabrication that Bob Stuart and his team have developed suggest that the Zipper should be a very interesting vehicle. At the moment, Original Car-Cycle Technology is being incorporated in Canada and is run in a non-hierarchical cooperative manner. All pre-order payments will be held in an independent trust fund until the organisational and technological hurdles are run. Bob writes well and with feeling, and it is easy to be enthusiastic about the Zipper.

At 27kg and initially nearly Can\$5000 (dropping to Can\$3000 as the start-up costs are amortised) the Zipper will appeal to a small niche of HPV enthusiasts, and some people deciding to give away their automotive addiction. Specialised components and dedicated gearing will be supplied as spares; and knock-down kits to be assembled by the user will be available. A franchise system of production and distribution is being considered. I expect it was not developed for very hilly terrain as the weight/average speed trade-off could not be exceptionally good. All criticisms aside, I congratulate Bob and the team on the X4, and wish OCCI well with the Zipper. I trust HPVTimes will keep HPVers up to date with Zipper progress. ■

CALENDAR CALENDAR CALENDAR CALENDAR CALENDAR CALENDAR

NRMA ENERGY CHALLENGE

Sydney see p13

19/20 JANUARY

NSW HPV CHALLENGE

SM Sydney uph111/downh111/fat speed and velodrome events  
contact Russell Moore (02) 608 1125

30/32 MARCH

2ND INT. SUBMARINE RACE

contact Nancy Hussey c/- Perry Foundation 6400 Goldsboro Rd  
suit 207 Bethesda MD 20817 ph 301-229-2503

16-23 JUNE

EUROPEAN HP SPEED CHAMPIONSHIPS

contact John Kingsbury 22Oakfield Rd Bourne End Bucks. SL8 5GR  
ph 06285-28775  
Molverhampton England

5-7 JULY

17th INTERNATIONAL HP CHAMPIONSHIPS

contact Dennis Northey 3533 W. Lapham St Milwaukee WI  
53215 ph 414-671-4560  
West Allis Wisconsin

14-18 AUGUST

PEDAL POWER HPV CHALLENGE

hopefully the merger of the ACT Teachers Technology HPV project  
and Pedal Power's HPV challenge  
contact Hayne Kotzur 26 Hillis St Hackett 2606 (06) 2472585

OCT-NOV

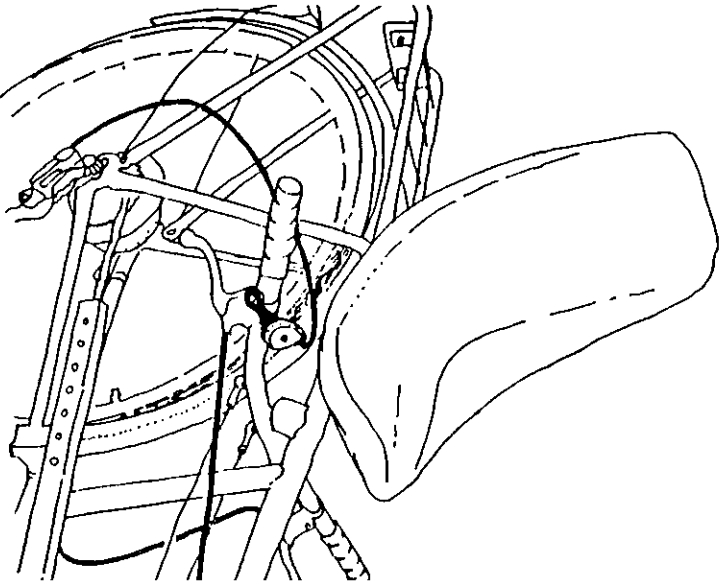
# Roulandt

## test-ride

Having access to a Roulandt recumbent for the last month, I have found it to be my preferred mode of riding within the city and suburbs. I have since found that it is no longer imported by the W.A. distributor; but as it is a good example of a commercial long-wheelbase recumbent I decided that it merits a review.

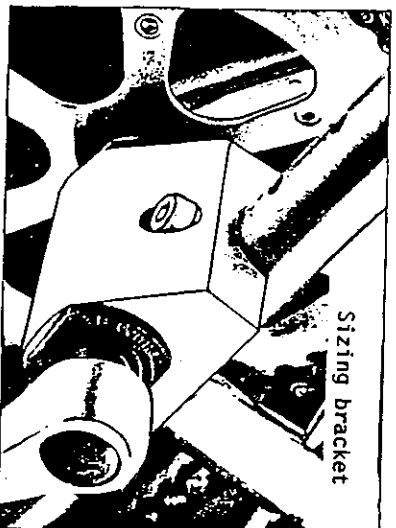
With most recumbents, the novice rider is presented with an eccentric machine that doesn't perform like a normal bike - the crank position feels wrong, the handlebars don't predict where the bike is going to move; and to top it all off you feel very unsafe as you veer amongst the car traffic. Well the Roulandt has none of these faults: if it fits you it usually suits you. The cranks are considerably lower than many models, which makes the transition from an upright bike easier. The handlebars have a good position relative to the seat, and the steering feels tight but direct. The seat is high and visibility and conspicuity are excellent.

Looking closer, we see that the bike is designed for what the Dutch do well - utilitarian commuting. There is no fussy attention to lightweight materials (though the major components are alloy), or day-glow colour schemes. It is a simple tubular steel frame, painted a visible silver, with a quite adequate quality of brazing(perhaps a little inelegant around the dropout tips where the tubing has been squashed to locate the tabs of the dropouts). A colour-matched rack tucks close in behind the seat; and it always feels satisfying to top load the rack, knowing that any bulk will make the bike more

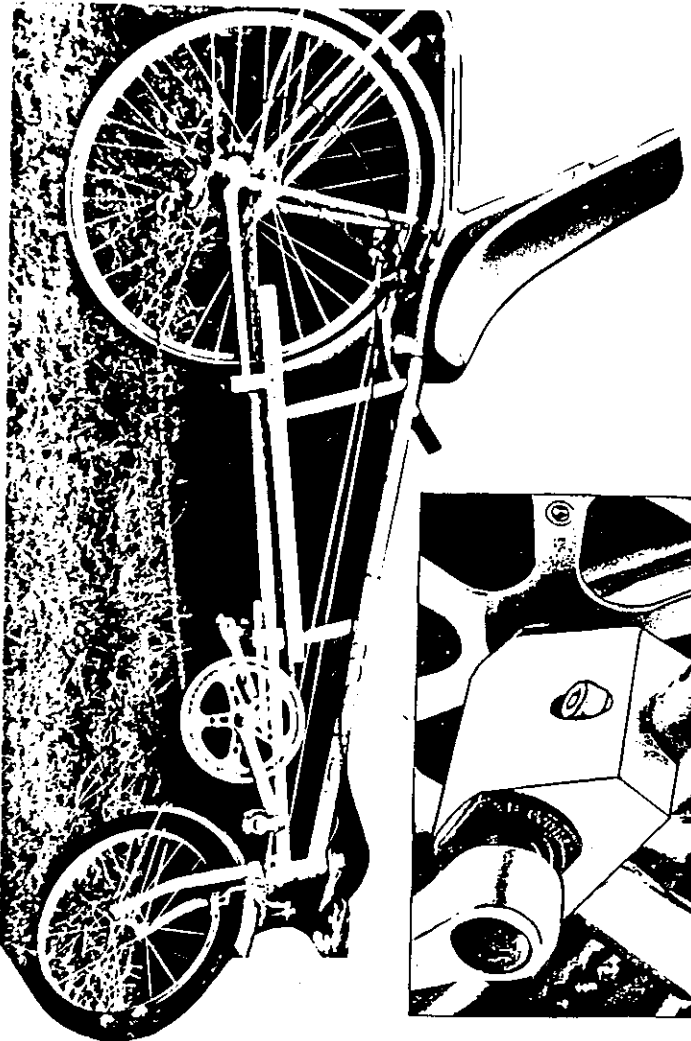


aerodynamic. The various braze-ons to accept the rack, the mudguards and the seat are all well positioned and unobtrusive. The top tube swings up behind the seat and forms the spine of the four ribs of steel stripping that support the fibre-glass seat. The handlebars, again of steel, are straight across but bent up towards the ends to give a more natural hand position. The bars pivot on a pair of industrial bearings fitted over a short vertical centre member. This seems both strong and simple.

There is no adjustment of the handlebars or seat - the sizing variation being made at the cranks. The bottom bracket is welded to a stout steel plate that is allen-keyed robustly to a matching frame plate. This provides about 150mm of travel, the chain being adequate for most of this range. As I'm six foot I had to select the furthest position and inserted an extra three pair of links. This entire change takes about five minutes (I swapped it over between turns of the snags at a Sunday BBQ). There is a similar horizontal adjustment of the generous chainguard to protect the rider's calf from the long chain. There is no tensioner, and the chain can be heard slapping on the lower stays, but at no time did it dislodge.



Sizing bracket





In keeping with the utilitarian theme, the gearing employs a two-speed reduction unit built into the rear hub. This provides an instant 70% drop in the gear, and is very useful for cool drifting, unconcerned with shifting, to the traffic lights; or for that unexpected hill and stop. I did however find the gearing a little high overall. The alloy cotterless chainwheel is 48Teeth, and the 13-26f cassette gives a low gear of 50", with a reduction to 36". Top gear is 100". The gear spread seemed fine, and the indexed levers are both on the right handlebar.

Combined braking under normal conditions is adequate, but the front brake alone has trouble slowing you quickly. This is an ironic turnaround considering most recumbents have extremely quick braking, especially on the front. The cable housing appears to be very compressible and there may not be enough weight on the front. The rear enclosed drum is excellent, positive under all conditions and needed only a light hand action. Protected by the hub shell, mudguard and seat it should provide strong braking in all weathers.

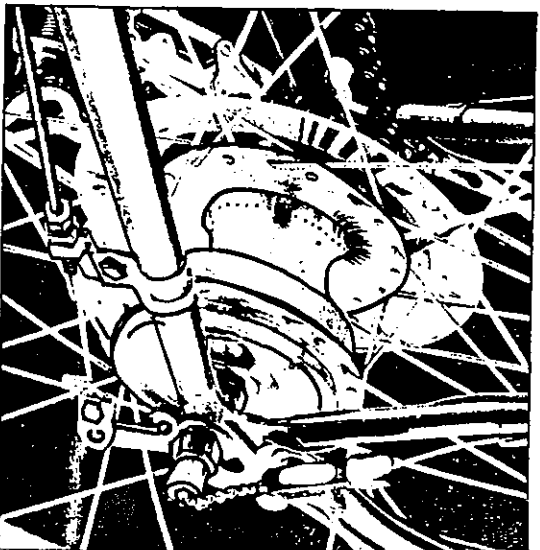
In fact, under normal commuter demands, the Roulandt is well equipped and comfortable. The position seems easy and natural, and the controls are simple to operate. I would have no hesitation in recommending the Roulandt for city work.

If, however, a similar bike was made from scratch, I would like to see a few modifications to remedy some anomalies....

# It should have lower gearing, since recumbents rely more on pedal thrust for starting (no way can you push backwards against the ground) and while the simplest approach would be to fit a wide-range cluster; for hilly terrain a double (or triple) chainwheel set would be better. This may mean fitting an idler pulley to control chain droop.



# The bucket seat, while comfortable for shorter distances with a good back angle, has a high lip that can be annoying to the back of the legs, and traps water. For short riders the seatheight makes it impractical to use; it would need to be considerably lower. Careful padding of thick closed-cell foam, with a gap for the spine, would not go astray; perhaps also a few more drain and ventilation holes. Alternatively a sprung mesh or strap seat could be considered.



Huret-Sach Comm nder hub

# Some attention to the front braking will be necessary. Fitting a cantilever brake with an exposed inner cable stretched between brazed stops would provide a more secure feel. However, be warned that with long wheelbase bikes with city tyres on loose surfaces, braking will induce a front wheel slide - the wheel hasn't sufficient weight to grip and turn the bike. For touring, weight should be kept on the front with low rider panniers on the forks, or custom bags kept in the main frame. A slight forward movement of the rider relative to the wheelbase would also increase the weight on the front wheel. ■

Since reviewing the Roulandt I have been given an updated overseas flyer - I'm pleased to see a lighter and neater bottom bracket adjuster - included lower p7 - and an open and padded seat. Apart from the relatively poor aerodynamics, the Roulandt seat has until now been the worst feature of the bike.

#### SIZING

|              |        |             |              |           |              |           |
|--------------|--------|-------------|--------------|-----------|--------------|-----------|
| Wheelbase    | 1320mm | Weight      | distribution | 73%       | rear         | wheel     |
| Crank height | 380mm  | approx      | Wheels       | F:400x35A | R:700x32C    |           |
| Seat height  | 760mm  | to lip      | Seat angle   | 65°       | Seat adjust. | 750-900mm |
| Head angle   | 72.5°  | Fork offset |              | 32mm      |              |           |

## COMPONENTS

**BRAKES** Atenburger 730 front alloy sidepult  
Huret-Sachs 70mm internal rear drum  
Attenberger straight alloy levers

**GEARING** Huret-Sachs Commander 6speed with 2speed internal  
13-26 freehub cassette  
swagged standard 48T front chainwheel  
indexing Huret-Sachs larger shifters, both mounted on right  
Weimann alloy channel rims (700C, 400A)

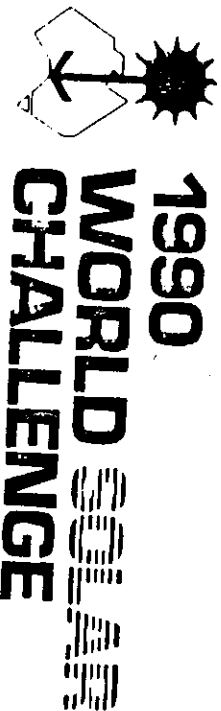
**WHEELS** 14g rustless spokes R;3cross F;2cross

**SEAT** 5mm fibreglass seat mounted on four thin rubber washers

**STEERING** Twin stainless steel 1/8" control cable swaged into universals  
adjustable tensioning  
sealed bearing "headset" swivel  
steel upswept handlebars

**PEDALS** Meco double sided rubber

**ACCESSORIES** Mudguards/Sourbitex side-rub generator lights/tubular  
steel rack/adjustable chainguard



Australia again played host to the 1990 World Solar Challenge, founded by Hans Tholstrup. Thirty six electric cockroaches flashed across the rough desert road and into our televisions. Visually enticing, they must have provided a few minutes of lively discussion about the future of the car before being cut off by yet another ad. The electric vehicles have borrowed a lot of bike technology, so perhaps we should ask what can the Solar Challenge teach the HPV movement?

The race has now moved from proving it can be done to doing it quickly. Much more attention has been paid to the two prime factors in HPV development - increased efficiency through aerodynamic design

- reduced body weight and wheel drag

A third consideration is reliability and stability. Early HPV and Solar races had a high dropout rate - chains fouled, wheels failed and punctured, the vehicles flipped over in corners or winds etc. We shall examine in more detail some of the developments that are shaping solar cars as practical semi-recumbent people movers.

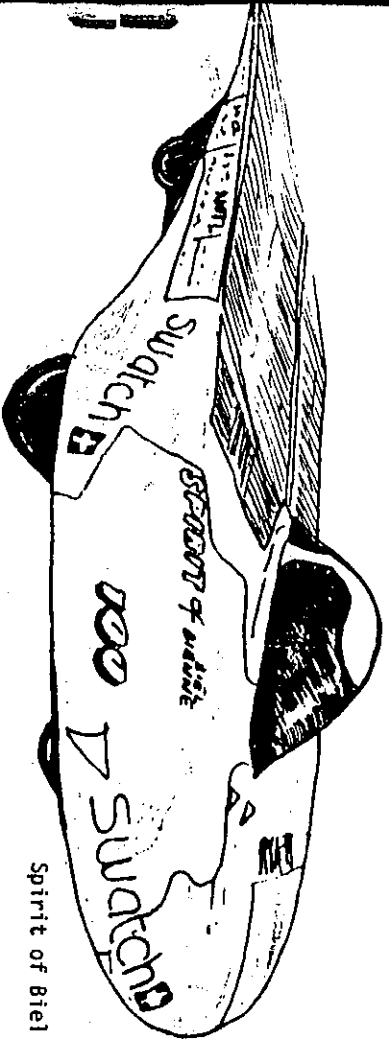
WEIGHT REDUCTION Total weights have been dropping in the Solar Challenge every year. A heavy vehicle is harder to accelerate, increases the rolling resistance of the tyres and places more strain on the chassis and wheels. This threatens the reliability and integrity of the vehicle. The simplest manner to shed weight is to use lighter components, and most SEVs have moved from heavy motorcycle wheels to light mountain and BMX wheels with aluminium rims and hubs. The heavy steel-box chassis has been replaced by stiffer chrom-moly or aluminium space-frames, while the more expensive machines explore monocoque construction where the shell becomes the load bearing element.

ROLLING RESISTANCE Here cycle technology leads the way since we already have highly developed wheel systems - the pre-tensioned bicycle wheel is very weight and strength efficient. The use of slick tyres has become very popular; the high point-loading preventing sliding or aqua-planing and the low contact area and high pressure producing a low rolling drag. We have also seen a movement from four wheels to three wheels - usually two steering front wheels that supply most of the braking, and a single rear driving wheel. This single driving wheel enables standard transmission systems without any additional complexity.



University Michigan's Sunrunner

AERODYNAMIC DRAG Compared to the later SEVs, the early racers looked like bathtubs mounted on wheels. The cars have now gone as low as the rules permit, and have optimised the collector shape to provide a curved and free-flowing airstream. The external wheels have been faired either as wheel discs or by external pods that enclose the wheels. In fact more and more wheels are disappearing into the main body as the complication of providing good air flow with multiple body elements are addressed. Small teardrop cockpits with integral



Spirit of Biel

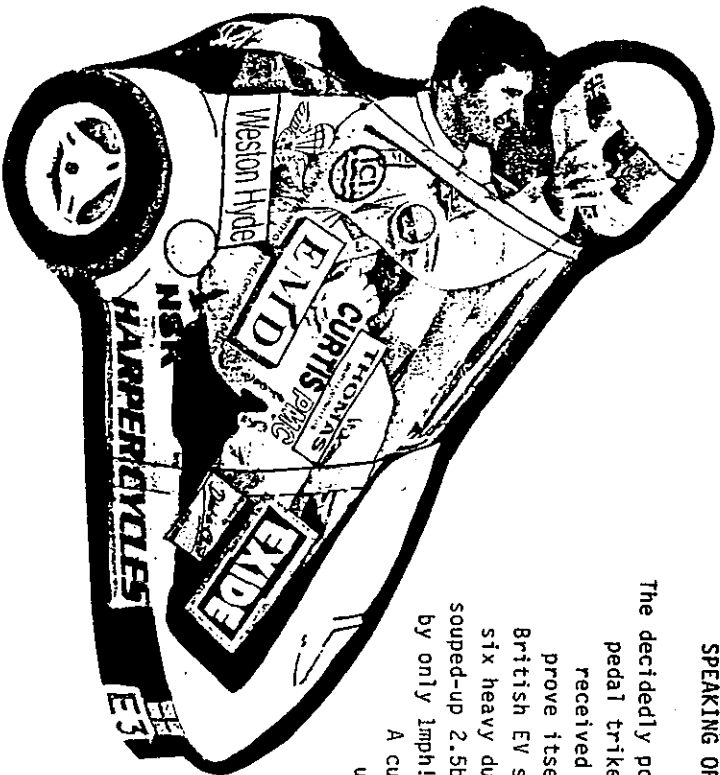
wind-screens and solar-reflective foil are used to provide all-round visibility without needing to raise the whole vehicle height. The coefficient of airdrag of the SEVs is approaching that of HPVs, which indicate the work that has gone into them. This year's winner, the Swiss Biel has a Cd of 0.13 (& frontal area of 1.1sq m) while most fast HPVs have a frontal area of 0.6sq m and a Cd of 0.11-1.12.

SUSPENSION Since most electric vehicles can travel at quite high speeds, and carry a lot of dead weight, it has been found that some suspension system is needed to produce reliable vehicles. Early unsuspended SEVs had immense problems with frame and wheel breakages, as well as vibration that destroyed electrical connections and induced driver fatigue. Properly designed suspension allows the use of lighter wheel elements since full strain is only applied and withdrawn slowly. The suspension harness also allows the distribution of stresses throughout the vehicle frame. HPVs have a more dynamic relationship between dead weight (chassis, wheels & accessories) and payload (that's us and the luggage). They are also very tight so that it is difficult to engineer a suspension that is simple and light. Apart from isolating the rider from road shock via a sprung or padded seat, using simple swing arms like the Moulton or Peer Gynt or the laminated fibreglass leaf-springs of the Zipper, we will have to await new light suspension elements possible, derived for continuing mountain bike development.

SOLAR POWER Solar cell efficiencies are climbing, and cost and mounted weight is dropping. It may become possible to consider using solar cells to provide small amounts of auxiliary power for lighting, cooling and indicators. Sanyo's new Amorton cells are sold as a thin flexible roll (0.12mm thick) that could be incorporated easily into semi-rigid fairings and luggage compartments. Steve Roberts' recumbent will probably be the only bike around with 82 watts of solar power around for a while!

The decidedly poor electric assist pedal trike, the Sinclair C5, received a second chance to prove itself, and better the British EV speed titles. Using six heavy duty batteries and a souped-up 2.5bhp motor it missed by only 1mph! It reached 74mph.

A custom parachute was used as a brake (I imagine the back pedal didn't work.



## Energy Challenge

NEW SOUTH WALES will host the inaugural "Energy Challenge" on the weekend of January 19 and 20, 1991.

Launched by the NRMA and the NSW Department of Minerals and Energy, "The Challenge" is a world first, and seeks to bring together vehicles using a variety of alternative fuels, to test their performance and suitability for road transport.

The event is, however, not restricted to alternative fuels, and any practical method of using traditional, fossil-based fuels more efficiently, may qualify for entry.

Vehicles expected to compete range from exotic solar powered cars from the "World Solar Challenge", through more conventional gas and electric vehicles, to simple people powered transporters.

The NRMA is providing technical direction for "The Challenge", whilst Hans Tholstrup, organiser of the "World Solar Challenge", will be in overall charge of the "Energy Challenge", providing his expertise in running novel and innovative promotions to raise awareness of energy issues.

It is hoped that companies, corporations, universities and private citizens with an interest in developing sustainable, environmentally acceptable transport fuels, will enter the "1991 Energy Challenge".

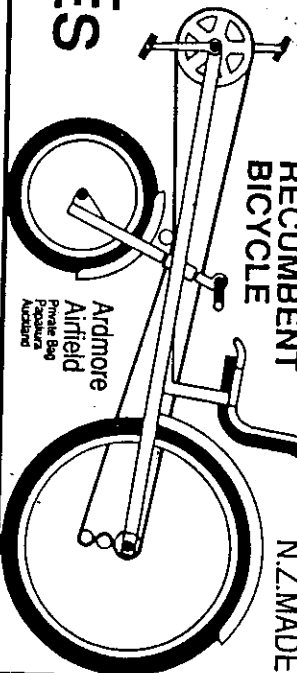
For information on rules and regulations relating to entry into the "Challenge", please contact the NRMA Technical Department on (02) 260-9133 or Toll-free (0)8) 427-423 (for country members only).

The  
Ultimate  
in Comfortable  
Cycling

NEW

**REBEL**  
RECUMBENT  
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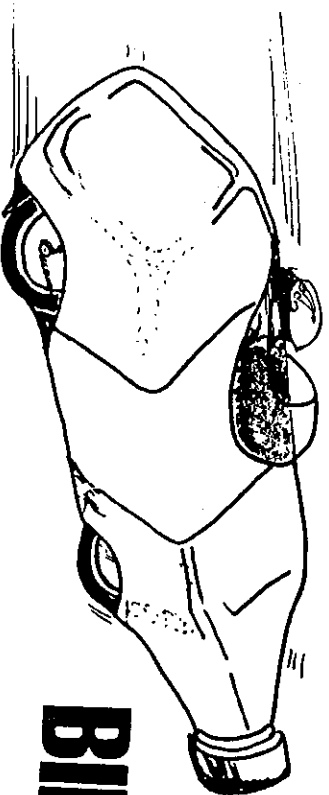


**REBEL  
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To be reviewed in HPVTimes #3



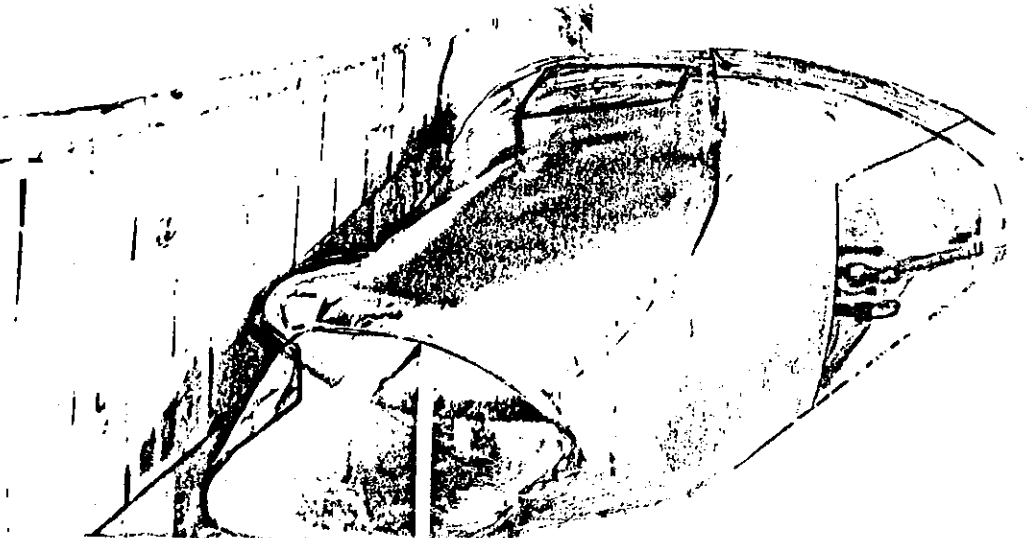
# BIRTH OF BIG RED

When I first heard about an Australian HPV competition, I thought 'what the hell, I've always been an aerodynamic bicycle nut, why not a fully faired recumbent?'.  
.

Now, where does one start? Wayne Kotzur suggested I ride some of the recumbents held at the Canberra Cycle Museum; so off to Canberra (I live in Sydney) for a day. Wayne and I spent a few hours riding a diverse range of stock and custom recumbents. Back home I poured over a lot of old IHVVA Newsletters and old Bicycling magazines. Not all of the US vehicles were top-notch racers - their meetings drew a wide range of HPVs. Some were ultra-high tech, with the latest wiz-bang composite materials (costing heads) like Kevlar-Mylar-Nomex-honeycomb et al - others were decidedly low tech.

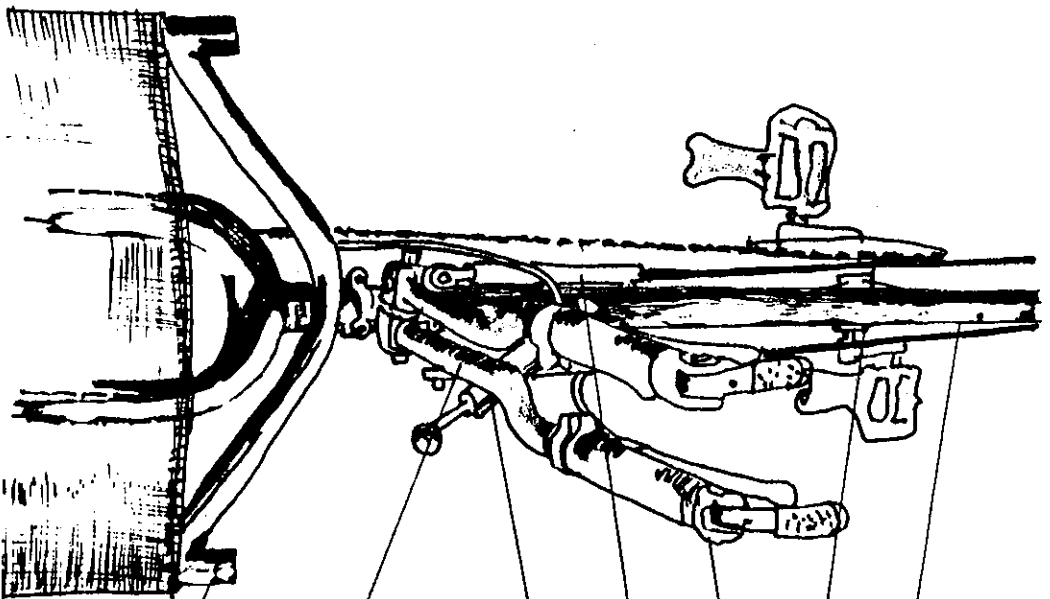
I decided on a variation of the Easy Racer pattern, long wheelbase, small front wheel with a standard rear wheel with the cranks within the wheelbase. It was to have a low seat, and to minimise the width, the steering was going to be a side-to-side joystick mounted on the top-tube. The gear train was to be a cross-over tandem type with a 50% step up system (42T:30T) driving a normal 52-48-26 triple chainwheel set behind feeding an indexed 13-30T cluster. This gave a gear range of 35" to 162"!

After a number of scale drawings and checking the photos of other HPVs a design emerged. The drawing went to Wayne (he will build anything that can be brazed!) for the once over and he came back with a few changes.



Another trip to Canberra some weeks later to pick up the 'baby' left me despondent, the bike seemed unridable, we all kept falling off. The joystick steering and steep steering geometry was axed, and it was changed to twin push/pull steering bars (with rod linkages) and the steering geometry relaxed somewhat. Now it could be ridden for a minute or two before you fall off! So after my third trip to Canberra I, at last, had a recumbent to enter. Unfortunately the bottom bracket had been positioned too close to the seat (frame builders are not always right!), so back to Canberra (by courier this time) to be moved 6 cm forward.





TUBULAR MAIN FRAME

HANDMADE XONEA DRIVE

INDEXED FREEDOM LEVER

ELECTRONIC CONTROL RODS

MTB STEERING DAMPNER

TWIN STEELERS

SQUARED OFF ON RUBBER

SKING MOUNTS

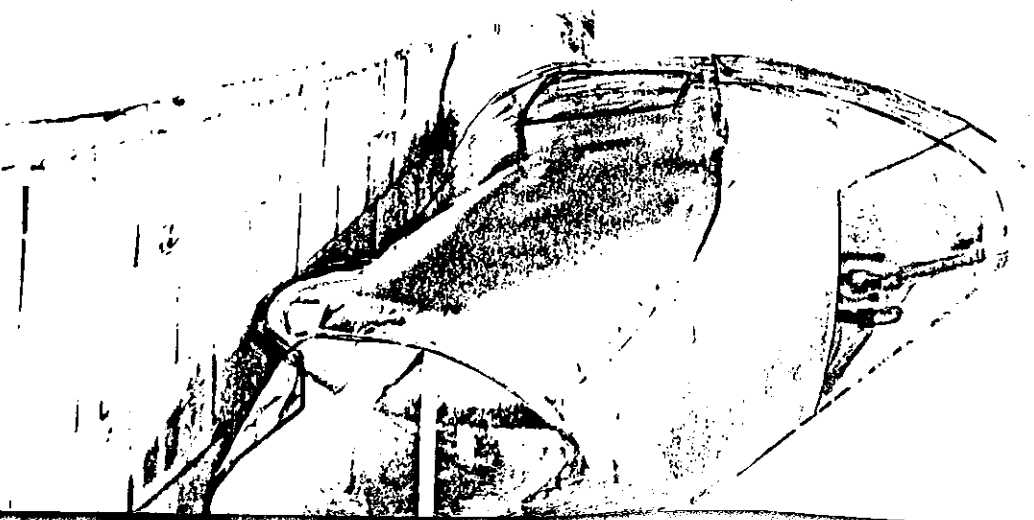
SLIMLINE TUBULAR SEAT

MESH COVERED

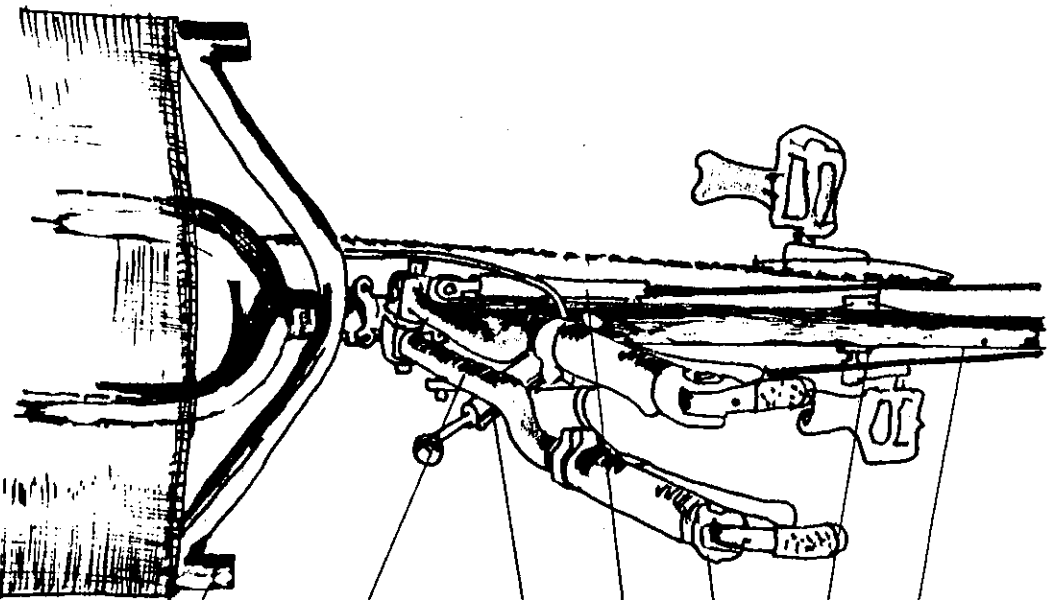
Back home again it felt much better, and with the help of a MTB steering dampner I could at least ride it fairly well. Now the hard part started - a full sleek fairing was needed. My original ideas were converted into a cardboard scale model, about 30cm long. As I lacked the skills for compound bending of plastic materials, I was going to attempt to make to make the fairing out of three 1.2 x 2.4 m sheets of 1.5mm polycarbonate. Polycarbonate is strong and transparent, but not cheap - each sheet was \$176! With some clever bending and cutting, I was hoping to get by with single curves only. Luckily my wife was away on holidays and I soon had the lounge room covered in pieces of polycarbonate, pop rivets, tape and various bits and pieces. What worked well in the cardboard model didn't always work in the full scale, though basically, it seemed to be coming together 'fairingly' well.

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TUBULAR MAIN FRAME  
TAPERED XOVER DRIVE  
INDEXED PLEATED LEAFERS  
ELECTRIC CONTROL RONS  
MTB SPEEDVIC DAMPERS!  
TWIN STEEPLERS  
SUSPENDED ON RUBBER  
SPRING MOUNTS  
SUDANIC TUBULAR SEAT  
MESH COVERED

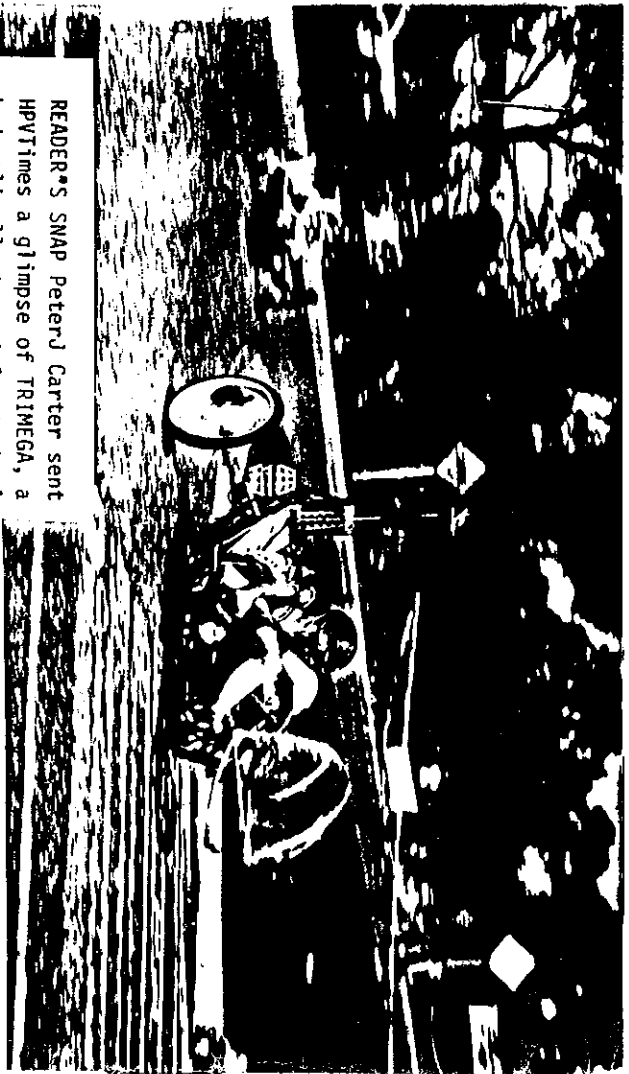
Back home again it felt much better, and with the help of a MTB steering dampner I could at least ride it fairly well. Now the hard part started - a full sleek fairing was needed. My original ideas were converted into a cardboard scale model, about 30cm long. As I lacked the skills for compound bending of plastic materials, I was going to attempt to make to make the fairing out of three 1.2 x 2.4 m sheets of 1.5mm polycarbonate. Polycarbonate is strong and transparent, but not cheap - each sheet was \$176! With some clever bending and cutting, I was hoping to get by with single curves only. Luckily my wife was away on holidays and I soon had the lounge room covered in pieces of polycarbonate, pop rivets, tape and various bits and pieces. What worked well in the cardboard model didn't always work in the full scale, though basically, it seemed to be coming together 'fairingly' well.

The biggest hurdles were the cut-out for the front wheel, (to get enough steering movement) and the swing back canopy. I didn't want to have to be sealed in by helpers, I wanted to be able to 'seal in' and ride off unassisted. This meant having a side trap door on the left, (don't fall to the right) with a magnetic catch so I could get a foot to the ground for stopping and starting.

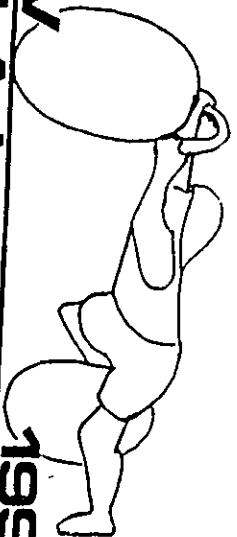
So how has it turned out? Well I would be a lot more careful about painting polycarb; despite the best advice, the painted sections are more brittle than the unpainted. The bike is HEAVY at 29kg (64lb), though this is not as important as is the improved-aerodynamics. I've managed a 51min 40km time trial and have done a flying 200m at 70kph. It is very claustrophobic inside and hot - even with airvents. Side winds are a problem, and passing trucks have the bike swaying from side to side.

Now if I change the front nose cone and nip and tuck the rear section of the fairing and.....

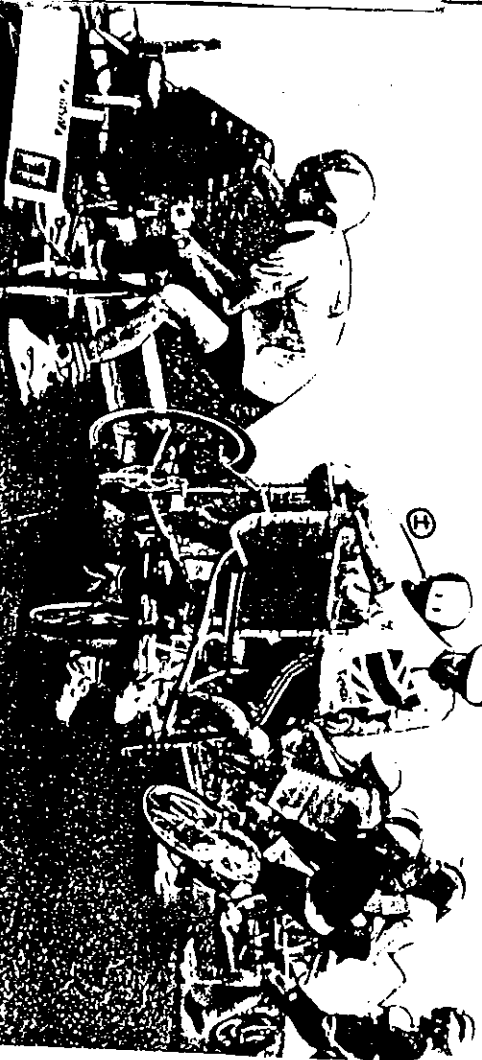
Russell Moore is a well known Audax rider, the organiser of the Green Valley Twin Century and an aerodynamic bike nutter



READER'S SNAP PeterJ Carter sent  
HPVTimes a glimpse of TRIMEGA, a  
hydraulicallysteered front wheel  
trike from this year's PedalPrix



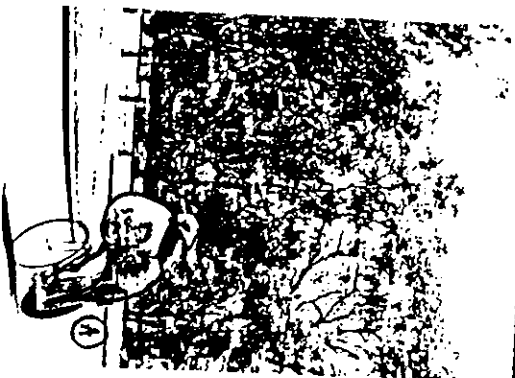
# HPV CHALLENGE 1990

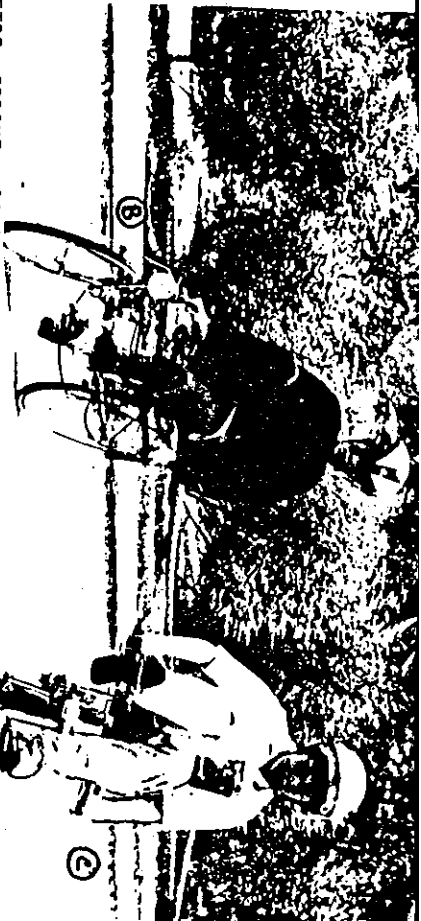


## OFFICIAL RESULTS HPV CHALLENGE CANBERRA 1990

PRACTICAL VEHICLE based on a survey of components safety, access and design

1. Russell Moore Well faired Audax bicycle
  2. Equal placed were
    - ⓑ a. Redback Cycles, Sydney, Commercial Peer Gynt recumbent, suspended seat, all accessories, fairing
    - b. Don Thomas, Sydney, Commercial Rowlandt recumbent, fairing all accessories
  3. Equal placed were
    - a. Neil Irvine, stock racebike
    - b. Stephen Poole Moulton
    - c. Matt Driver stock racebike
- Matt Driver & Jeremy Price semi-recumbent tandem





**ZOOMETRE SPRINT**, unlimited run-up held in very windy conditions with some rain

- |  |          |
|--|----------|
| 1. Racing Editors partly faired tandem | 53.97kph |
| 2. Neil Irvine                         | 46.36kph |
| 3. Paul Segal faired racebike          | 43.27kph |
| 4. Trevor Driver Slingshot trike       | 40.86kph |
| 5. Don Thomas                          | 40.18kph |

**SPECIAL JUDGES' AWARDS.....**

**MOST IMPRACTICAL VEHICLE AT MEETING**

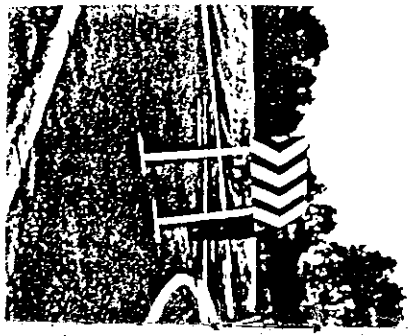
Easily earned by Russell Moore for a very narrow fully faired recumbent with joystick steering. This vehicle would have done the field in the sprint if weather had been calmer.

**MOST PROFESSIONAL CUSTOM VEHICLE**

Designed and built in eight weeks, the very low trike features interchangeable criterium and sprint wheels, excellent construction and the best handling of the weekend.

**GAMEST RIDER**

Must be shared between Russell Moore who dropped down the hill like he was pedalling (you weren't pedalling Russell?), and young Shane Cooper who fell from two different vehicles during the weekend. Thanks to Gary Hill-steiner for getting Shane upright again.





PEDAL PRIX/CRITERIUM based on maximum no. of laps of a tight 800m circuit in 1/2hour

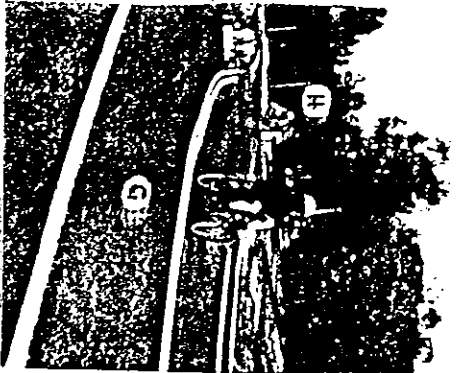
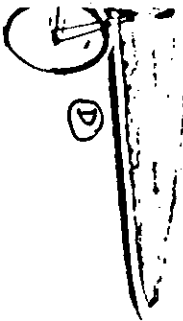
1. Neil Irvine Zipper-faired racing bike('little red') with a total of 20laps (31kph)
2. Russell Moore flexible well faired audax bicycle with 18 laps (28.48kph)
3. Stephen Poole Stock Moulton faired bicycle with 18 laps (28.11kph)
4. Don Thomas 17 laps (26.22kph)
5. Mathew Driver & Jeremy Price 16laps (25.6kph) **(F)**

HILL CLIMB a 1300m stretch of un-used highway with a slope of approx 1 in 14

- |                  |         |
|------------------|---------|
| 1. Neil Irvine   | 2.16min |
| 1. Matt Driver   | 2.32.02 |
| 3. Stephen Poole | 2.48.55 |
| 4. Russell Moore | 2.49.09 |
| 5. Don Thomas    | 3.23.06 |

HILL DESCENT same hill, downhill coast

- |                         |         |
|-------------------------|---------|
| 1. Russell Moore        | 1.32.18 |
| 2. Neil Irvine          | 2.07.58 |
| 3. Ross Lyle <b>(E)</b> | 2.18.27 |
| 4. Stephen Poole        | 2.24.58 |
| 5. Matt Driver          | 2.27.08 |



**FINE PRINT**

Richard's New Bicycle Book

By Richard Ballantine 1989  
Pan Books London

Available by mail order for Bicycle  
Institute of NSW GP0 Box 272 Sydney  
2001 ph (02) 212 5628

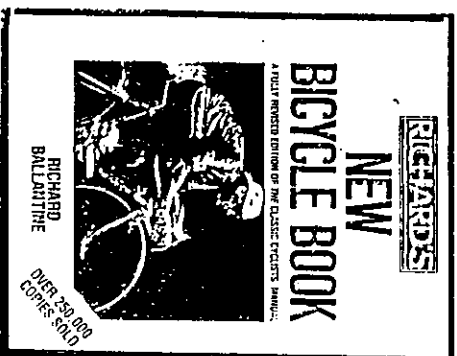
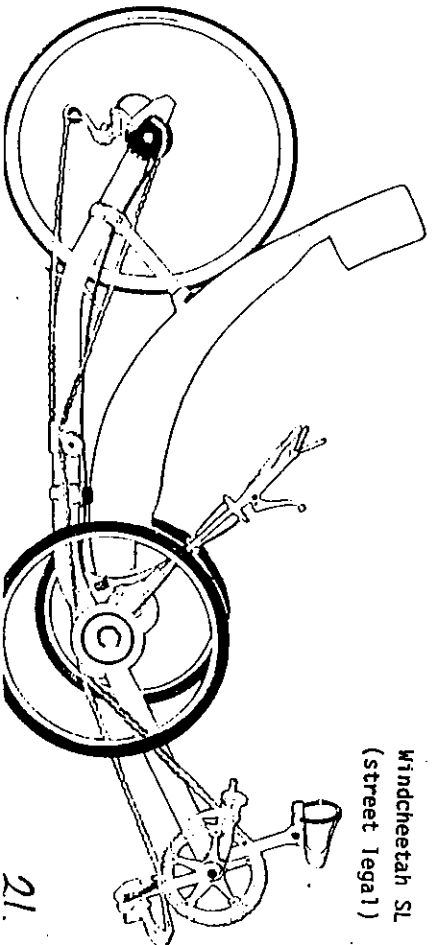
Richard's Bicycle Book has always been a popular and well thumbed member of any cycling library. He manages to inject his enthusiastic presence and feeling for cycling into every page.

It is worth mentioning in HPVTimes since it has the largest section devoted to HPVs I have seen in a best seller. Richard is a HPV buff and appears familiar with most of the european HPVs, including a brief round-up of current production recumbents; and a list of manufacturers chiefly from the USA.

He owns a Burrow's Windcheetah SL ("Speedy") and provides a spirited discussion on the advantages of HPVs as practical vehicles and it's traffic and speed performances. More generally, the book has something to say on most cycling topics - such as pollution, harassment and dogs - as well as over-seas touring-aids and catalogues. The 360pages are well worth acquiring.

\$25 + postage

Windcheetah SL  
(street legal)





# FINE PRINT

So you want to build an HPV

Published by the British Human  
Power Club 22 Oakfield Road Bourne  
End, Bucks, SL83QR

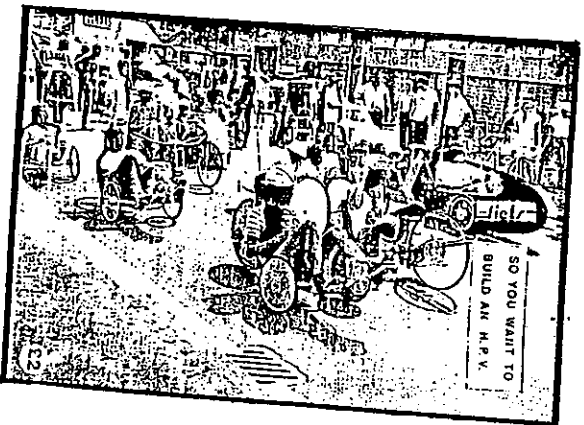
It's not often one gets an opportunity to review a booklet devoted totally to HPVs. The British HPC has produced a compact and factual text that should appeal to both the curious and those who would go further.

A brief preview of HPV history leads into the practical regulations developed by BHPC to encourage practical vehicle evolution; as well as some statutory regulations for those keen to produce an electrically-assisted pedal cycle.

Design and general considerations, such as wheel layout and steering are covered simply, and to emphasise the basic diversity the centre section provides photo's of different styles. A more mathematical treatment of the power requirements for overcoming the various fixed resistances, and for acceleration and air resistance prove quite useful; as you can plp your own figures in to get quick comparisons of different designs. The design section also considers appropriate components, especially wheels and drive layout.

Construction details are not covered in detail. A directory of suppliers for tubing, foam & glass-fibre, cycleparts and bearings is unfortunately only relevant for HPVTimers thinking of relocating to Europe. A neat end-paper is a 1/5th scale pin-together model of a cyclist...ideal for your quick first plans.

I was surprised to hear that the booklet existed, and pleasantly surprised with it's informative and enthusiastic tone when it arrived. In fact, since it impressed me as the basis of an Australian edition I have added my own practical experiences as a long time recumbent builder, updated the supplier directory, and had it reprinted in the original folded A4 format. Enlarged from its 38 pages to encompass the additional 12 pages, it is now available from HPVTimes for \$6.50 including postage.



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human power in traction

Vol 1

HPVtimes

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