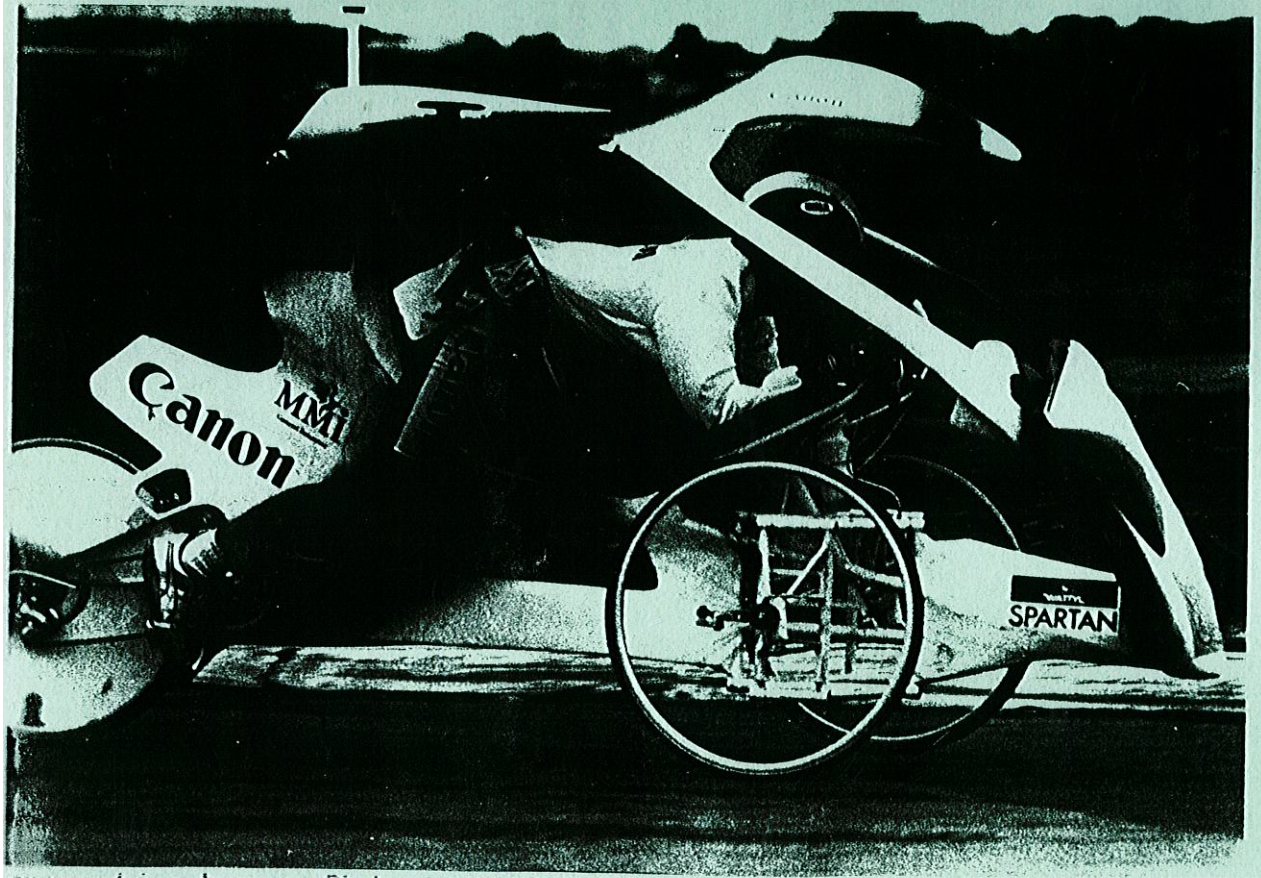
Cannon sponsored University of Adelaide design school entrant in tthe South Australian Pedal Prix - a fibre wrapped tubular frame utilising a linked front end to allow tilting into corners - rider



suspened in a harness. Photo supplied by PA Carter , Lockleys A few readers have enquired about the SWB bike on the last cover - it is the english Kingcycle -the caption fell off

HUMAN POWER IN MOTION VOL 4 1987

PEDALPOWER

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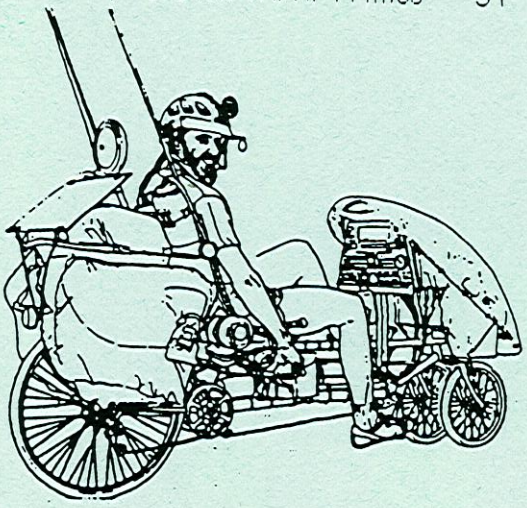


Welcome to another late HPVTimes - still this time I don't feel guilty as this issue is much larger and hopefully better than the previous issues. A number of articles on utilitarian cycles have been carried forward, and I hope to get a report on the Human Propulsion Workshop held in Sydney in December for the Autumn edition. This year's Pedal Prix (SA) saw bad weather as Peter Good describes in Letters to the Editor, but the event is beginning to produce some fast and robust trikes that will really fly in good conditions. The HPV Challenge was lots of fun this year, with an increasingly diverse range of vehicles in the event. I have yet to make the low carrier bike I mentioned in last issue, instead making a larger trailer to carry garden tools and compost.

You will all probably be aware of the increased price of HPVTimes - I was producing issues at about $1.70 cost plus postage which basically meant I was paying about ten cents over the cost of the subscription for every newsletter I sent out. I'm generous but not that generous!

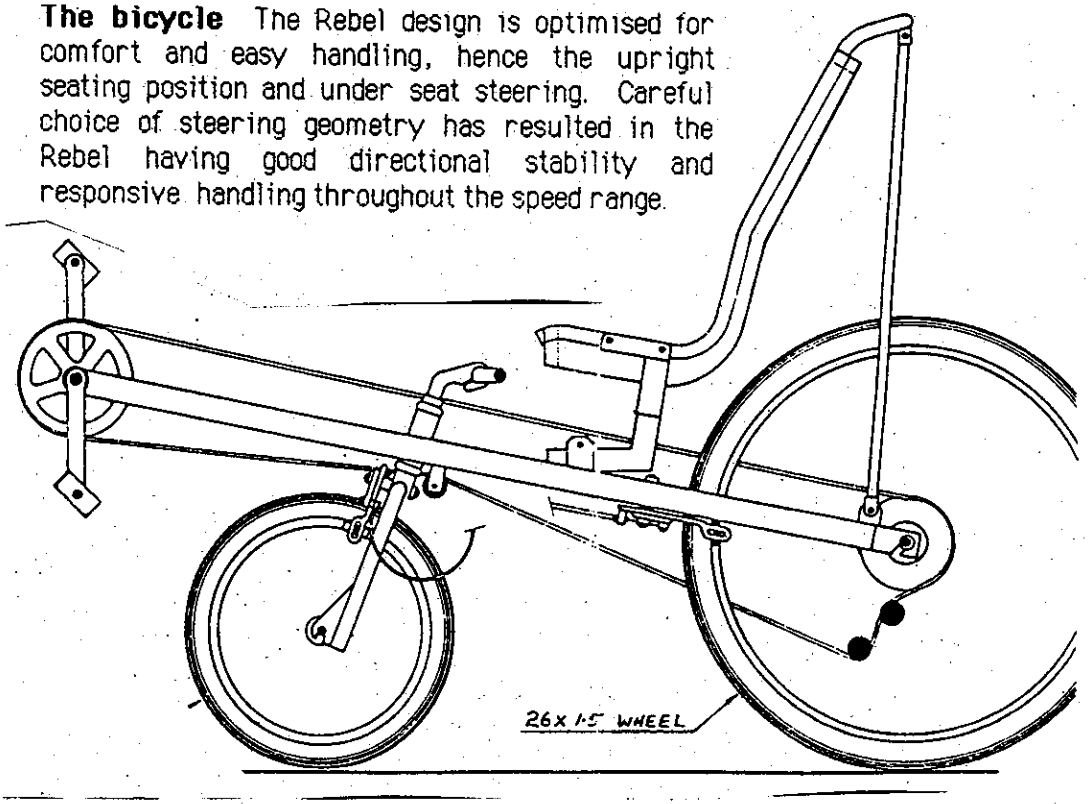
I hope everyone managed to have a bit of a break, and that you enjoy the new format. Feel free to contact me if you would like to contribute or would like to suggest items for the magazine.

Regards
Wayne Kotzur

REBEL CYCLES

The Rebel is a short wheelbase commuter designed and built by Tony Woodroofe, keen hpver and secretary of HPV New Zealand. The bike has direct steering, a clean line and a comfortable position. Tony also produces a semi-enclosed fairing for weather protection and to streamline the vehicle. The following information was supplied last year by Tony, who is happy to supply just plans or a partially assembled frame (with forks) that is ready to take standard cycle components. Pre-fabricated parts such as seat frame, chainwheel bosses and steering heads can also be supplied.

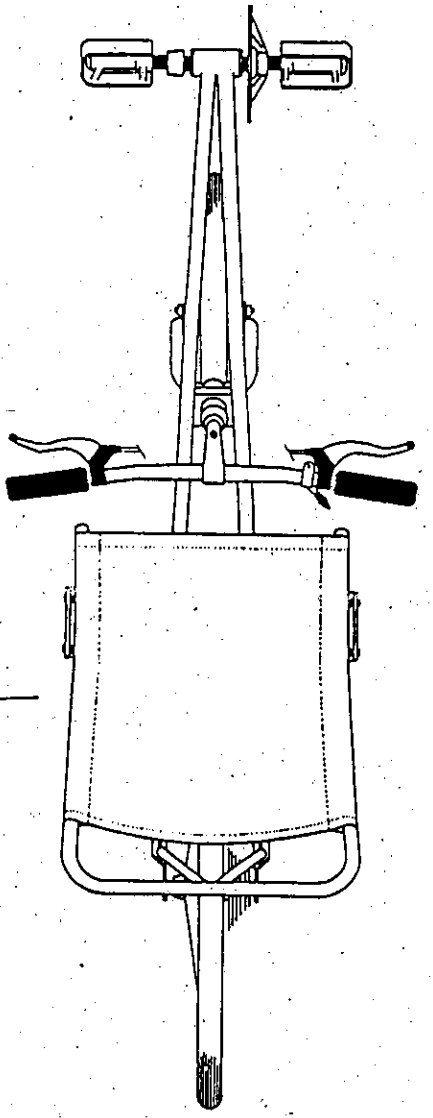
The bicycle The Rebel design is optimised for comfort and easy handling, hence the upright seating position and under seat steering. Careful choice of steering geometry has resulted in the Rebel having good directional stability and responsive handling throughout the speed range.



The ergonomic seat design comprises a cloth sling fitted over a tubular steel perimeter frame, and is readily removed for cleaning. The seat frame is attached to a centre pedestal which gives full under-seat clearance for handlebar movement and an unobstructed line for the drive chain. The pedestal can slide fore and aft for seat adjustment through a clamp on the frame. Twin rear stays, which form a bracing "A", locate the rear of the seat.

The bicycle frame is made of rectangular hollow section (RHS) steel tube arranged in a simple "A" frame which joins all the frame elements in a straight line. This construction results in high torsional stiffness and light weight. Apart from the seat pedestal (which is TIG welded) the frame is brazed lugless.

Standard bike components are used for all running gear, including the 16" BMX forks. Larger section tyres (16x2",26x1.5") were chosen for comfort rather than speed, and a six speed gear range of 34 to 84 inches has proved more than adequate for most situations. However, a multiple front chainwheel set and derailleur post may be fitted if requested.



The fairing. Composed of a cloth cover stretched over a rigid aluminium tubing frame, with a sheet aluminium nose, the fairing is pivoted at the front edge. This allows easy entry and exit, and the fairing can be set partially open to enable access to the handlebars when parking. The cloth is attached by velcro ties so it can be removed. Tony explained that it could be used in winds of up to 20 knots, and doesn't compromise normal handling.

Rebel Cycles can provide an information pack (full description, photos, general drawings and price list) for $5.00 NZ (o/s airmail). For more details write to

Rebel Cycles Ardmore Airfield Private Bag Papakura Auckland NZ

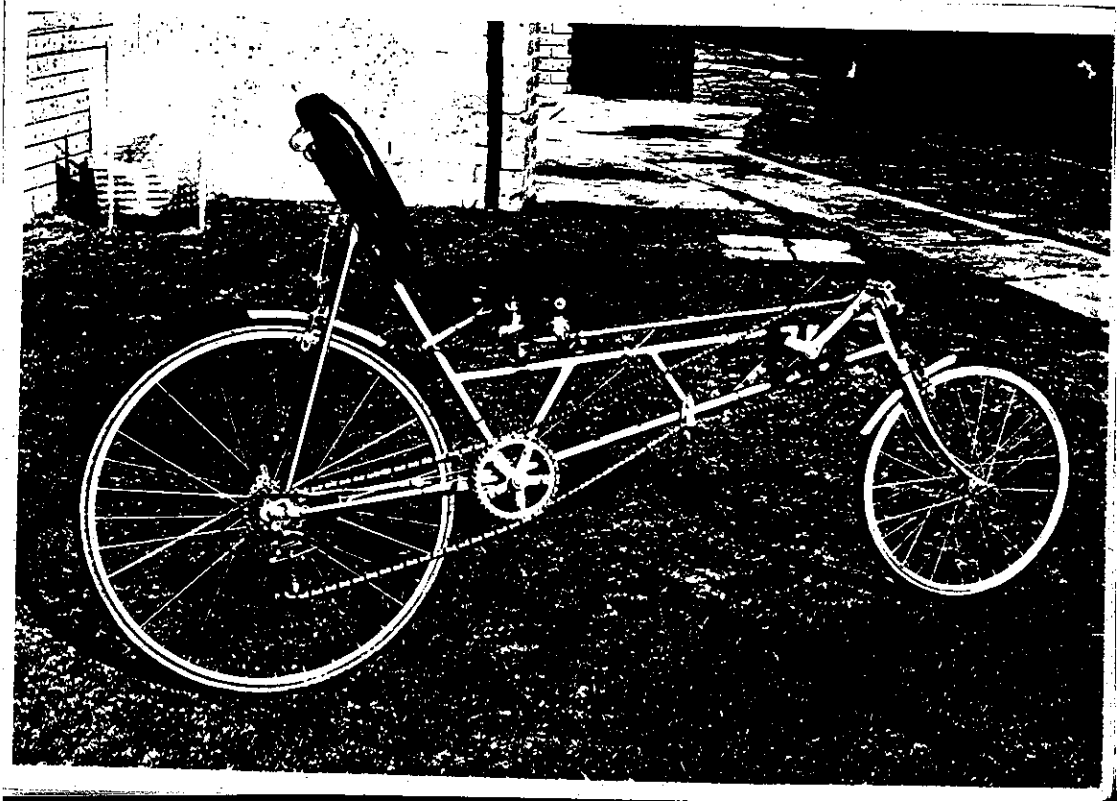
MY CYCLE

Leonard G Oates

Dear Wayne, finally I am sending you some details of my recently completed LWB cycle. This letter has been delayed several weeks as I have had a bad case of shingles, and only people who have had them can realise how they effect a person.

The bike has been completed for some time up to the try-out stage - and having done that I then stripped it down and had it sprayed, then reassembled it - to what you see in the prints, taken with my trusty Nikon which must be somewhere near 25 years old.

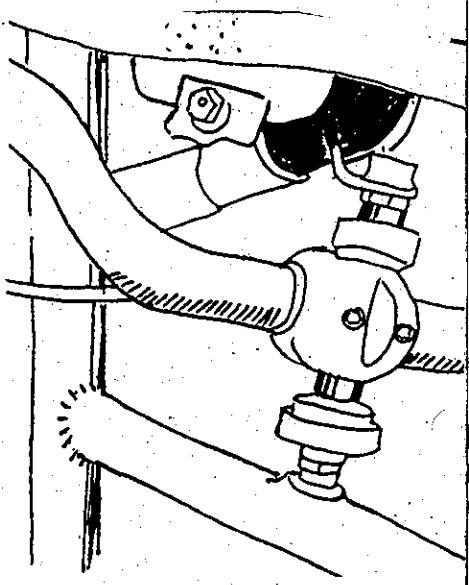
As you will see, the rear frame is from a ten-speed racer, to which I have added a forward extension and head piece, this was then locally welded for the meagre sum of $20.00. The front extension is made from 25mm x 18 gauge seamed tubing which was difficult to find in my area. Many of the parts have been home manufactured utilising my lathe and drill press.



The rear wheel I built myself using stainless steel spokes to combat the sea air hereabouts. Both wheels have alloy rims. The cranks are alloy, and the brake levers which are 10 speed but reshaped to suit the straight bars. The front chain tensioner has a ball race inserted to ensure long life. The idler chainwheels have been reworked by cutting off the crankarm and then turning it to reshape it. Wider spacers were also required to space the chains further apart, also new studs were made as the original ones were too short. The left hand side of the axle was cut off flush also.

The forward axle has lip-sealed ball races (non-adjustable) and a high tensile axle of my own making. The rear wheel has this type of ball race also, with a plain unthreaded shouldered axle.

The back rest is supported by a standard seat pillar, and has a shaped alloy back upholstered with foam and covered with vinyl. The seat tube has been drilled though the down bar as you can see and held in an alloy clamp. This is also supported at the front by a vertical axle screwing into the top bar, which has a brazed in thread insert. The steering pivot has been turned from alloy with cups, cones and spindle from a front wheel hub. A clamping block holding the handlebars is part of this assembly and a steering arm and ball-race fitted tie-rod effects the steering to the head piece.
Further items may be observed from the prints. Specifications are as follows...



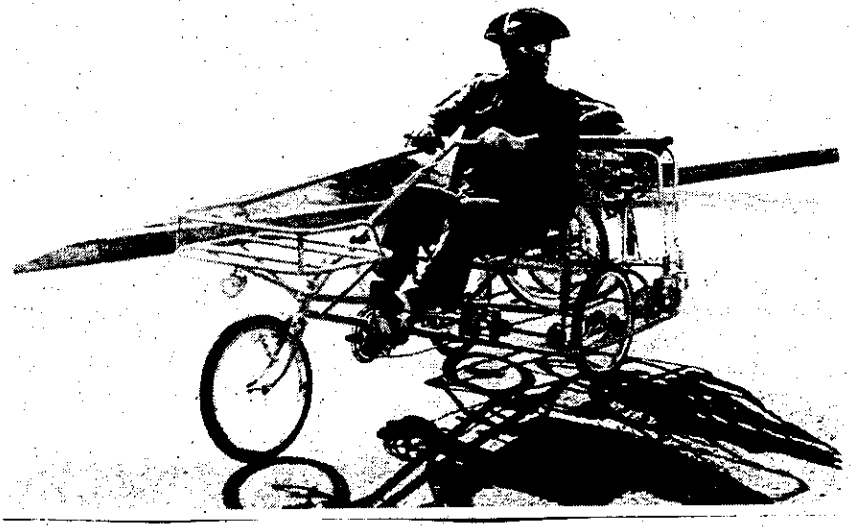
Overall length 2.0m
Wheelbase 1.42m
Seat height 76cm
Seat back height 1.08m
Crank centre to down bar 70cm

Head angle 71degrees
Gear ratios 40,47,54,63,71,81"
Weight approx 14kg
Wheels f. 20x1 1/8 85psi
r. 27x 1 1/8 100psi

Hoping this is all of some interest to you and many thanks for your help.

ROBERT's FREEWHEELING SPIRIT

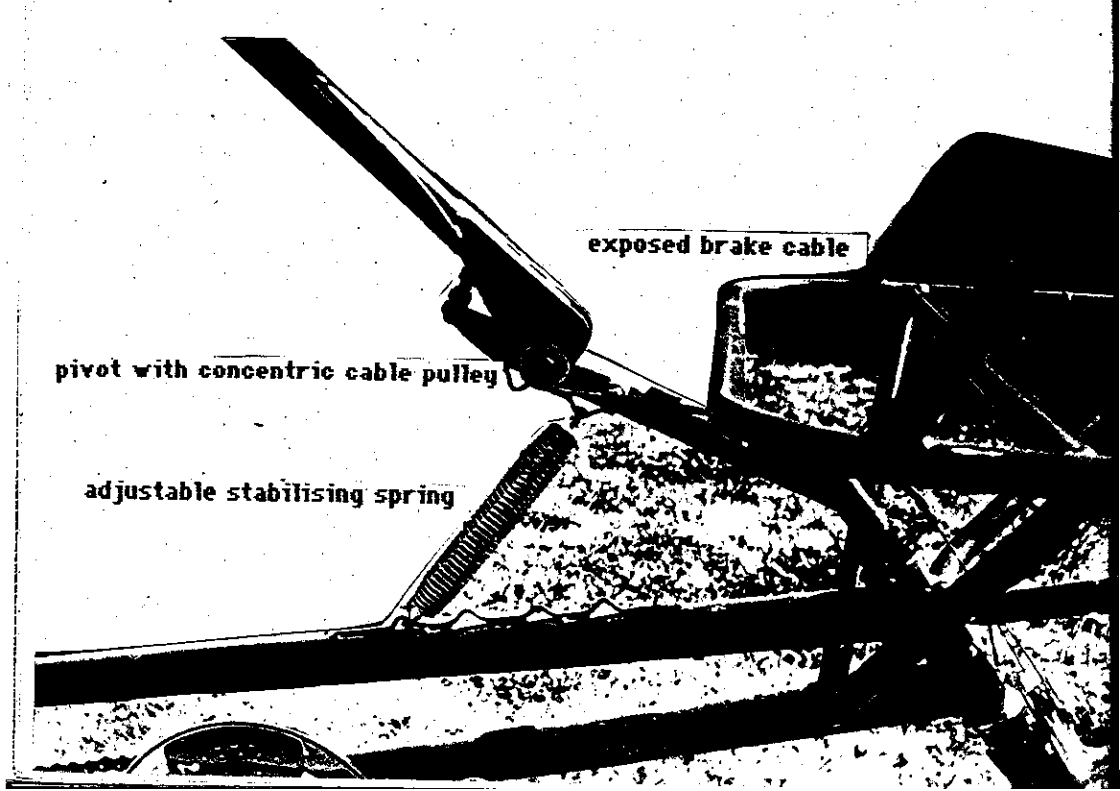
Robert Harper is a large and gregarious man, and a bit of a lair. Handicapped by his very size and cerebral palsy he gained when crushed by a race-horse he was training, Robert has been confined to a specially reinforced wheelchair since 1981. Unconscious for ten weeks, the accident has created balance and mobility problems that have only now been addressed. He came to Canberra 5 1/2 years ago and moved into a DARE (Disabled Adults Residential Establishment) house. In an effort to give Robert more independence, the DARE welfare officer, Malcolm Nightingale, approached the ACT Technical Aid to the Disabled to see if a better human powered vehicle could be built. They in turn contacted me, on the recommendation of local bike shops, as a framebuilder and as a member of APACE (Appropriate Technolgy & Community Education).

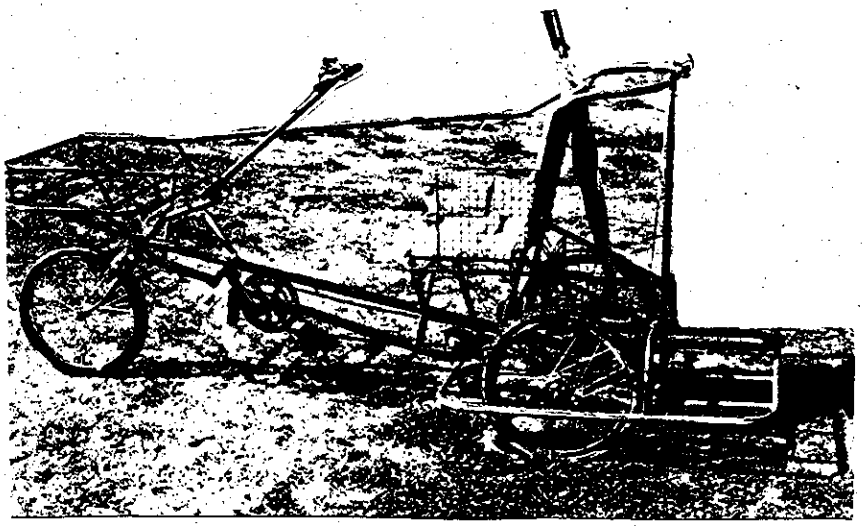


TADACT Newsletter

We soon had a full blown committee formed, some funding arranged and over a couple of afternoon visits to my humble workshop the basic needs were set down on paper. It would fall to me to design the eventual vehicle, modify the drawings to everyone and their dogs' satisfaction and then build the thing. Things look so simple on paper. The basic requirements were flexibilty of positioning and good stability, combined with massive load capacity, simple and bike-shop- serviceable componentry, lockable and weatherproof braking (to create a still stable platform for Robert to brace himself against when out of the chair), somewhere to sort letterbox deliveries, and ease of entry and exit. Oh, it had to have three wheels, fit through an ordinary side gate or cyclepath barrier and be blue.

As weight was relatively unimportant (Robert is very strong and the area is flat) compared to robustness, I started from the ground up - choosing 20 x 1.75 wheels. They are relatively cheap and very strong against side loads which any trike generates on slopes or turning. Basically most trikes are either twin-frontsteering/single rear drive or single-front steering/double rear drive. As we were working to a $1000 budget I opted for the option that would produce the lest complicated steering - the use of a single front steering wheel mounted in a conventional fork - and an extended stem. There was lots of room beneath Robert's seat to fit some form of chain rear drive, so the next decision was the wheelbase. Robert hadn't been a cyclist and it was difficult to convey the need to have the crank position fairly definite early on in the planning. I had to consider the degree of rebuild necessary if his vague indications proved incorrect after he got used to the vehicle. So the crank bracket would need to provide both full high leg extension and alternatively a lower closer position. This dictated how far forward the pedals would run and hence the location of the wheel. Robert is 200cm (6ft7in) tall so the trike would have a rather long wheelbase ! If I could have been more definite on the crank position then it may have been possible to design it with the cranks ahead of the wheel and hence produced a much more compact machine. This would however be more prone to tipping with sharp steering turns.

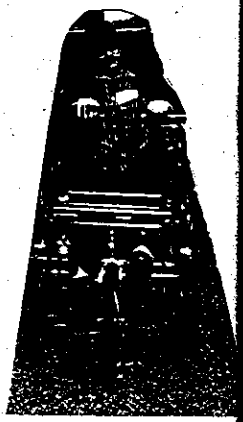




The simplest front frame would be a triangle made from oversized tubing (35mm round x 1.2mm wall) that can rigidly support the head and enable a sliding crank housing to fit on either tube. This then gives a flexible mounting position for the cranks, especially as the housing can be run above or below each tube. A standard headset and front BMX fork were fitted, and the steering angle set back enough to place the extended stem close to Robert's arm (he preferred a chopper type location for the bars as this is the position where he has maximum control over his shaky muscle movement). As the frame tubes were low he had no problem getting onto the seat, and to assist Robert's access I placed a pivot about one third up the stem. The bars could then be pushed up out of the way to mount, and then pulled down to steer. I then realised it would be possible to utilise this action to lock on the front brake as the bars are raised. In conjunction with twin rear brakes on a parking-brake lever, the raising of the bars would still the trike effectively for Robert to move in and out. As the front lock-on device just works by lenthening the cable travel, a normal strong mountain bike lever can still be used for normal stopping. To further the convenience of the bars I fitted an adjustable spring to return the bars to ahead when released.

That pretty much left the rear to be decided. To simplify the drive system I used only straight runs of chain, opting for an intermediate or jack shaft with oversized axle and bearing so it would never need to be replaced. The chain would run from the cranks back to a three speed Shimano hub (' cause the innards are modular and can be replaced easily) which is connected to the jack shaft with a short length of chain. From the jack shaft runs two completely standard rear drives (chains & freewheels). All the cogs in the system are standard and replaceable - so the ratios can be changed and worn

cogs replaced cheaply. The jack shaft is located in self-aligning bearing races, and normal chain wear is allowed for by moving the wheels back, and the 3 speed intermediate forward. The freewheels on the rear wheels enable both to drive when moving straight, but enable the outer wheel on a turn to move fast than the inner. The various ballrace housings and axle slots are fitted onto a roughly rectangular rear tray of 25mm Reynolds 531 that also functions as a loading platform for the folding wheelchair (didn't I tell you the trike needed to carry a wheelchair?).



The front and rear frames are braced by the seat framing of 25mm mild steel (20gauge), over which a kangaroo leather reinforced, double superdux canvas seat is tensioned. A smaller secondary steel mesh bay sits behind the seat, and a folding tray swings down to armchair height on the left for sorting mail. Located on the right is a small automotive handbrake that activates the two rear Sturmey Archer sealed drum hubs, which can be used for normal braking as well as parking.

A perimeter rail on three sides to help Robert manoeuvre when off his chair and trike, a large front tray and generator lights complete the monster. Robert, appropriately gets the last words...

"Now I'm not stuck in one place, I can get around anywhere. I just put the wheelchair in the back and go...It's real nice, I reckon if you use a battery operated trike it makes you too damn' lazy"

CALENDAR

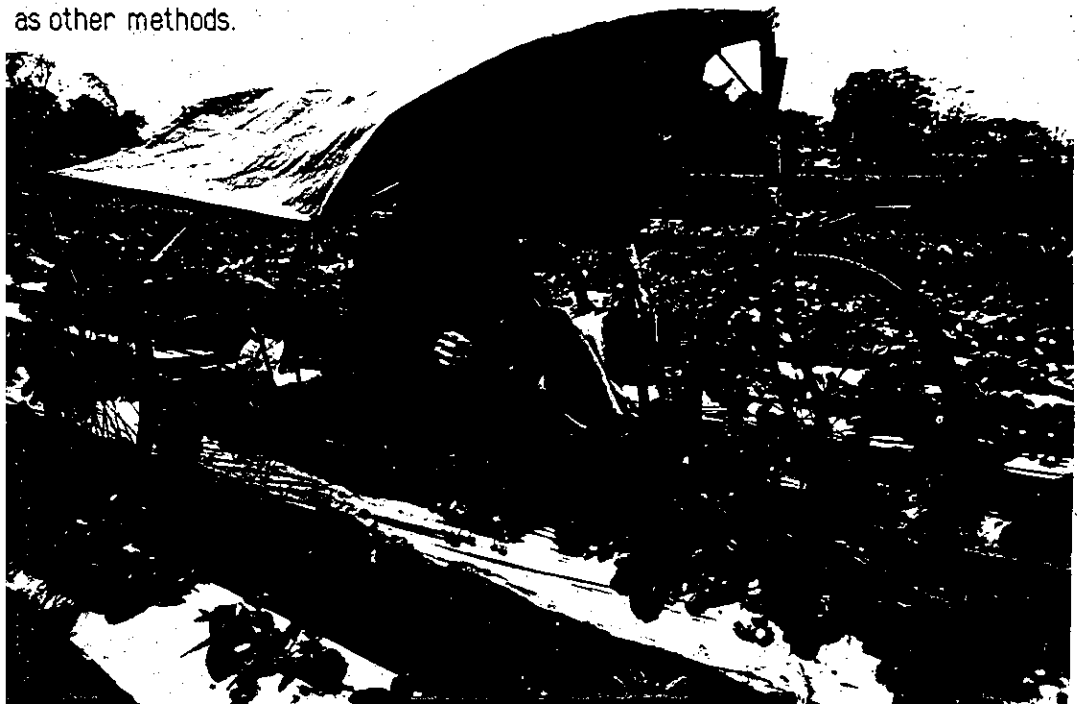
HUMAN PROPULSION 5-6 DECEMBER 1991 Sydney
ENERGY 92 19-26 JANUARY Sydney
ENERGY CHALLENGE 92 22-23 JANUARY Sydney
AUSBIKE 92 CONFERENCE 22-25 MARCH Melbourne
PEDAL PRIX SEPTEMBER 92 Adelaide
HPV CHALLENGE NOVEMBER 92 Canberra
WORLD SOLAR CHALLENGE OCTOBER 1993 NT & SA

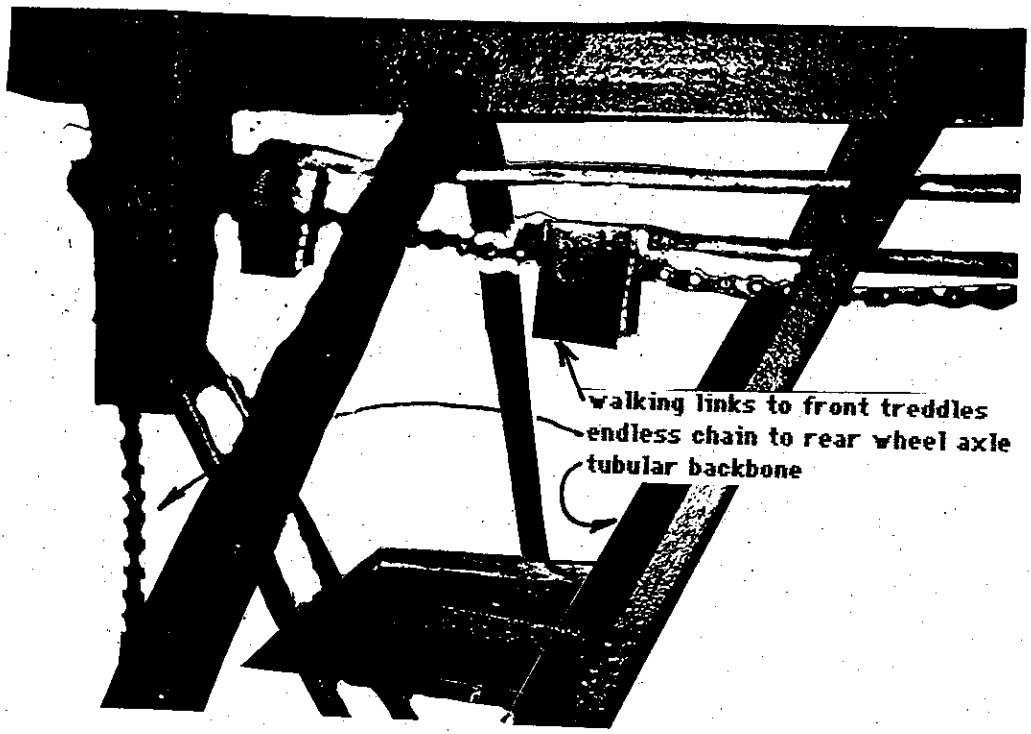
FARMING ON THE QUIET

I lived on a farm for eighteen years, and my most vivid winter memory is driving the tractor into a cold southerly with the almost welcome warmth of the diesel fumes pouring over me. Bonnie MacDonald of Sydney, a keen cyclist with a interest in the uses of pedal power, recently sent me some interesting details of a farm where you can lie down all day, and never need worry about powerplant fumes.

Bonnie has been visiting the northern Queensland farm of Geoff Bowcock who harvests strawberries by trike. The trikes admittedly are not marvels of grace, but the workers are not complaining. The trikes are equipped with all the necessities for a long day under the tropical sun. Initially designed to operate at a track width more sensible for strawberries than those available on horticultural tractors, the design has proved to be effective and popular.

The basic trike consists of two rear wheels and a front wheel with a small amount of steering action. The main frame of square tubing is built above the rider who sits with bum and legs parallel to the ground. This forms the basis for a slung tarp sun shade . The rear section is built quite solidly, so that trays of strawberries can be stored on either side and behind the rider. This makes the trike efficient as the pickers don't have to return to unload as often as other methods.

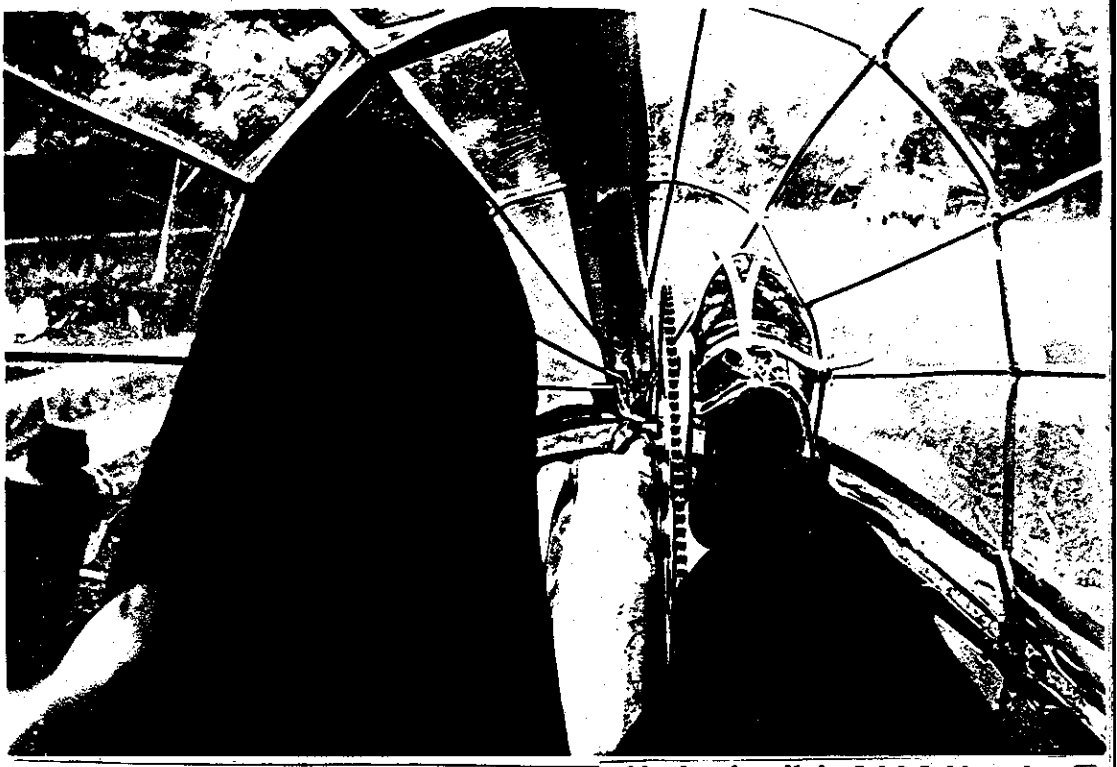




The drive mechanism is rather ingenious. The large rear axle that connects the two wheels has a central sprocket, over which runs an endless bicycle chain. This chain is driven forward by two pulling arms that engage the chain by some form of ratcheting pall at their end. These two arms are connected to a long lever, one end pivoted at the frame and the other forming the pedals. Old large 26 - 28 inch backpedal brake wheels are used as the drive wheels as this enables the trike to clear the strawberry beds. In fact, he is always on the lookout for certain brands as these are interchangeable with what he currently uses.

The front wheel has a steering arm welded to the fork, and this continues forward presumably for steering the trike when standing. The strawberries are collected into two small boxes on outriggers that can be emptied into the main trays.

Anyone passing through the north may like to drop in and have a look at a simple idea that has been thoroughly tested over 25 years, and of course buy a few strawberries. Geoff Bowcock can contacted at Box 44 Tolga, Qld 4882 ph (070) 954 383



rider's view Uni of Adelaide entry

HPV CHALLENGE 91

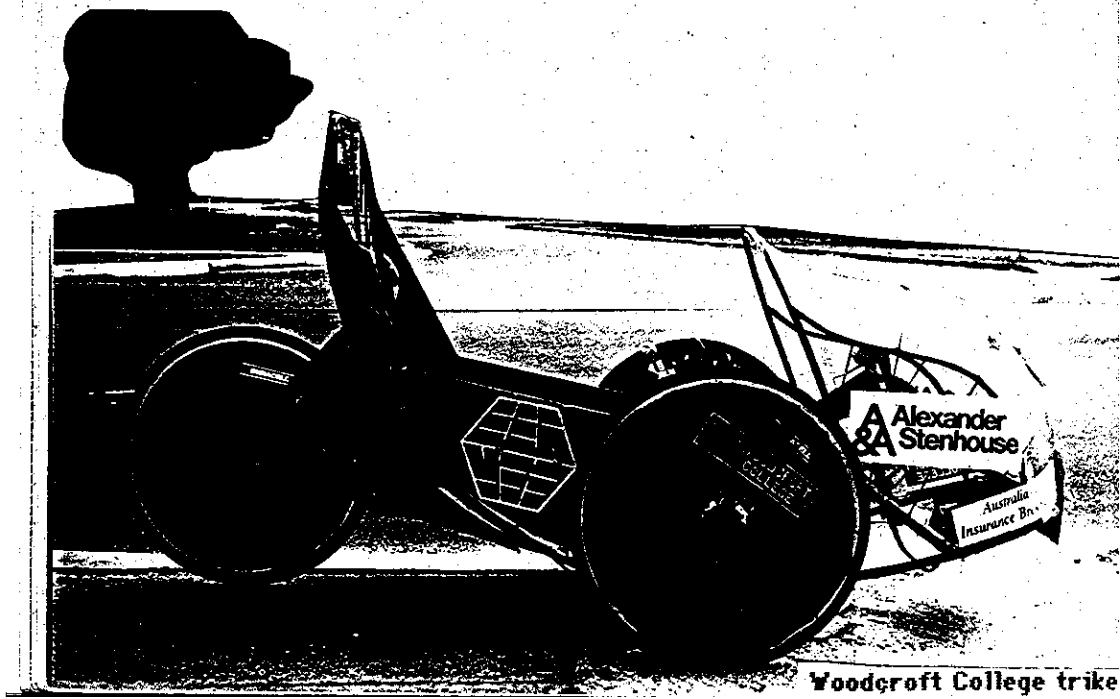
1991 again saw the growth of Australia's only open HPV event. Conducted as part of Pedal Power ACT's Bike Week programme, the event was organised and conducted chiefly by your very own editor, Wayne Kotzur. I had some very capable assistance from the Canberra Bike Museum and two subscribers, as well as friends and Pedal Power members.

The HPV Challenge was conceived as an alternative to the fairly regimented Pedal Prix, which for safety and uniform competition restricts competitors to trikes of certain dimensions. The Challenge is not a single event but a series of events over a weekend, giving the various vehicles a chance to display their strengths and weaknesses. The events at the 91 Challenge were...

- # 200m sprint with unlimited runup
- # Hill circuit with a long moderate hill on half the circuit
- # Hill coast with walking push onto a flat road
- # Road Race of 22.8km over moderately hilly course
- # Criterium with maximim no of laps in twenty minutes
- # Static practical vehicle competition.

As usual we encouraged as wide a range of vehicles and competitors as possible. The youngest riders were less than eleven, and the heaviest vehicles weighed more than 25 kilograms. A number of very fit and keen racing cyclists also entered - chiefly Neil Irvine, editor of *Australian Cyclist*, and Martin Renwick, winner of the Sydney-to-the Gong timetrial. This, plus the perfect weather, gave the weekend a great flavour. Last year the Challenge was dominated by conventional cyclists, using the small commercially manufactured 'Zipper" fairing, whose experience and training outstripped the enthusiastic amateurism of the recumbentists. This year we have begun to see full time HPV riders, fully confident of their vehicles and fitness. While we only had a few fully streamlined vehicles the obvious improvements that the fairings produce caused much discussion and I confidently predict many more vehicles will be faired next year.

The HPV Challenge was held over the first weekend of Bike Week, and this time all events were at the same venue, rather than cause out-of-towners to be doomed to forever ride Canberra's roundabouts. A central meeting point became the focus of the days' competition, with spectators test-riding the vehicles and riders relaxing in the shade. Ian Simms, of Greenspeed, provided a commercial angle with a display of his complete HPV range of bikes and trikes. Ian had come equipped with much literature and was always the last to leave the site - patiently talking to the interested and demontrating his bikes and trikes. I understand he sold three to the Canberra Bike Museum.

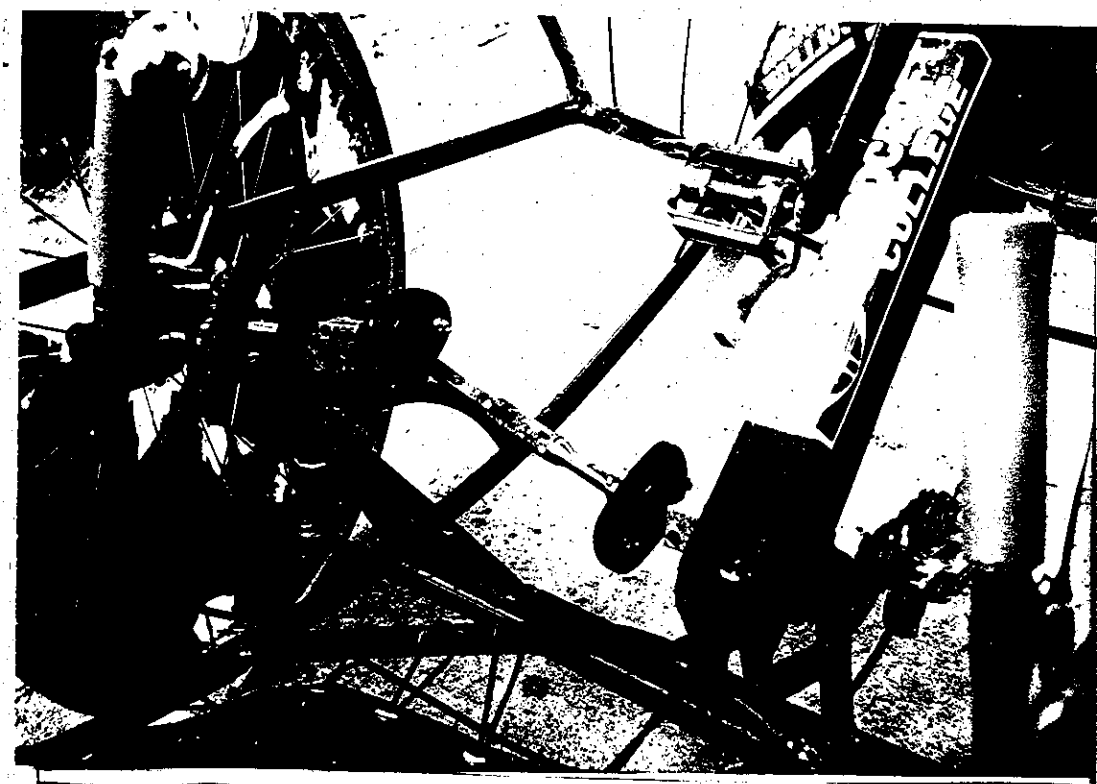


Woodcroft College trike

The majority of the Challenge vehicles were bikes and most of those were short wheelbase bikes with underseat steering. Several optional layouts were present - an extended stem connected to the h'bars or fork or a second 'head' with h'bars pivoting in this, and connected to the steering head by a tierod and rodend bearings. Two had elevated handlebars, directly telescoped into the fork steerer tube. Most of the trikes were conventional twin steering front wheels and single drive rear wheel utilising a single long chain. A form of cross over step-up was used by Russell Moore's **Big Red.** Ross Lyle (**White Trike**) and Peter Holloway (**Tailwind**) used an idler right-side mounted freewheel to provide a very wide selection of gears. No alternatives to the chain drive were on offer, although Ian Simms of the **Greenspeed** stable does offer custom oval rings made by Chris Bell (EGG rings) of Wales UK. (See Egg rings in Useful products section)

An unusual steering mechanism was fitted to **Lead Belly,** by Wayne Meyer. This mimicked a conventional steering bar in many ways, giving the same angular movement, but in a manner parallel to the seat edge - this gives a narrower steering width. I have spoken to Wayne a few times by phone (he lives in Sydney) and every time he had a different steering mechanism. He has become somewhat of an expert in modifying his medium wheelbase bike, which is designed to be very adjustable. Head and seat angle, wheelbase, h'bar position, crank and seat height and steering type can be altered chiefly by sliding brackets and multiple bolt positions. Once all these have been selected, Wayne will be back with a much lighter beast (the current testbed frame weighs 15 kg).

A vehicle no one got to ride was a front driving and steering trike offered by Woodcroft College (Adelaide) as a static display. Perhaps they felt it would be damaged, but I testrode it (to see it had survived the road-freight trip) and found that it was light and easy to steer. The basic concept of a single left driving wheel that is part of a normal twin steering trike seems proved. The transmission consisted of a standard drivechain system driving to a freewheel mounted just below and forward of the seat. The freewheel shaft was connected to the left hand hub axle via two universal joints which in this case were made of reinforced rubber plates sandwiched between offset shaft projections. A small sliding joint in the system took care of the length variations caused by steering and universal action. The wheel axle exited through a bearing that was rotated by the normal trike steering mechanism. When held off the ground the slight variations in wheel speed could be seen as the pedals rotated (constant velocity joints would be needed for high stress applications) but no shudder was detected when riding. Whether the extra



weight and complexity was balanced by the saved chain weight and simple driveline components remains to be seen. Still, the vehicle appeared practical and the young builders must be congratulated on such a professional construction.

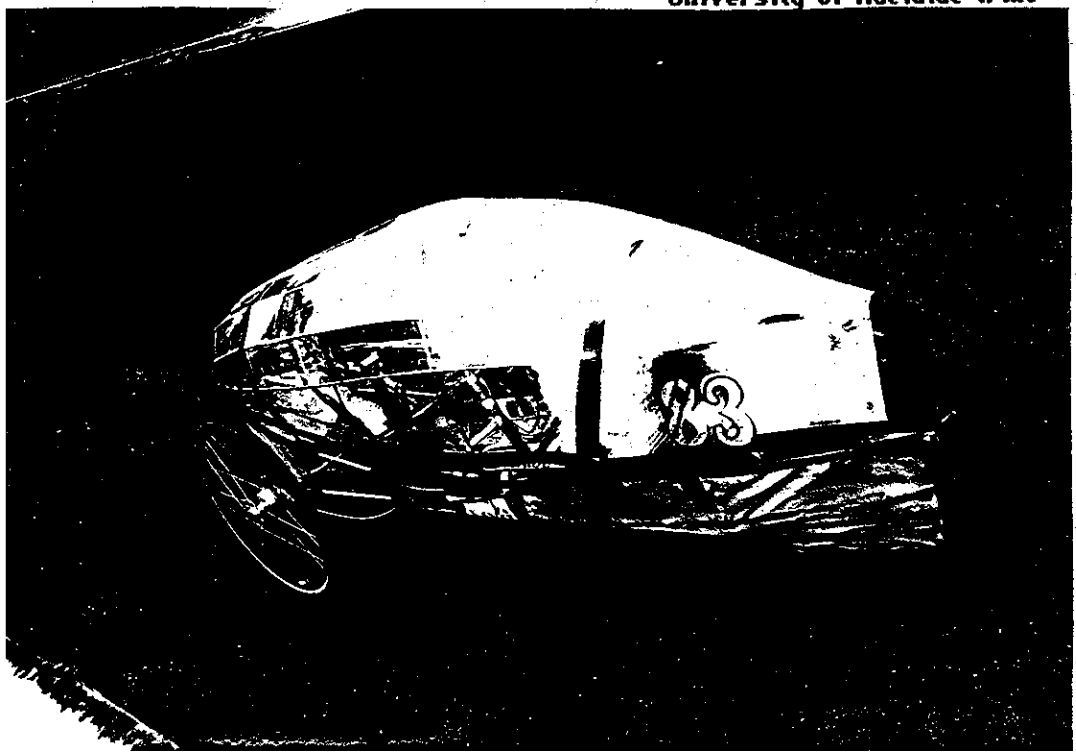
Most vehicles were built of steel, often of a mild composition, and welded. Most used a simple tubular frame (the only spaceframe was my own; which was damaged the night before and didn't even make it to the course), although some trikes like the **Fun cycle** and **White Trike** had a partial wrap-around frame. Several **Sinclair**s (British electric - assist trike),which have a light pressed steel yoke as a frame, were supplied by the *Canberra Times* cycling correspondent Arthur Jones. The frame can be built quite light and by having wide flanges can be rendered sufficiently strong. A modified model (by me to Arthur's request) which was equipped with multiple gearing and a sliding seat - both are fixed on the original - felt quite zippy. It's obviously time that someone grasped the nettle and methodically measured the rolling resistance of all the common smaller tyre sizes used by HPV builders. It is no use designing practical or racing vehicles around tyres you think are fast, only to find that the 12 x 2 inch plastic wheels fitted to the **Sinclair** may be just as fast, cost less and be strong enough!

Sorry... I got a little waylaid. The only custom bike not to use steel was the **Tailwind,** designed by Peter Holloway of Melbourne, which was a shortwheelbase bike of welded aluminium. The main frame was a single tube pierced for the headtube, and the rear wheel was supported by two identical and parallel struts that were hinged by a pin on the end of the main frame. A small amount of suspension was provided by having a second locking pin set inside a rubber bush. Aluminium was also used for the seat frame and clamp -on handlebar stem with integral bar.
Two **Moulton** riders who hoped to come to show off Mr Moulton's Reynold 531 spaceframes with vertical fairing and lycra body sock missed the boat.

Anyway, enough of the technical details over which I lovingly dwell, and onto the competition. As I mentioned earlier, last year's racing was really between the racing cyclists themselves, and amongst the recumbentists. This year the level of improvement of HPVs and their riders meant that competition was between all riders and all the better vehicles. It was only in the final tallying of points did an overall winner become apparent. And this year the overall winner was Peter Holloway and his fully faired aluminium SWB bike - a recumbent finally!

front drive/steering mechanism Woodcroft Trike

University of Adelaide trike



RESULTS

NAME & ORDER OF PLACE	200M kph	CRITERIUM laps	HILL circuit min	HILL coast metres	ROAD RACE Min
Peter Holloway	68.9	22	4.08	1646	36.07
Neil Irvine	59.5	25	4.05	870	36.04
Paul Segal	56.2	22	4.40	899	42.0
Martin Renwick	-	25	4.46	814	42.02
Russell Moore	69.0	20	4.16	1650	47.43
Don Thomas	55.5	21	5.10	777	47.24
Ross Lyle	52.1	18	5.25	845	51.03
Alan Lyle	52.5	18	5.34	828	51.32
Ray Hembrow	40.3	13	5.54	777	51.24
Steven Driver(JNR)	42.4	2'30""	-	380	-

Peter Holloway: light alloy shortwheelbase direct-steered faired bike
Neil Irvine: partially faired racing bike
Paul Segal: partially faired racing mountain bike
Martin Renwick: sometimes on unfaired Greenspeed trike
also on unfaired racing bike
Russell Moore: fully faired long wheelbase low bike, joystick steering
Don Thomas: elevated short wheelbase direct steering bike
Ross Lyle: low rear-drive tiller-steered trike
Alan Lyle: tri-athalon racing bike
Ray Hembrow: indirect steering shortwheelbase bike
Steven Driver: small Greenspeed trike

GENERAL OBSERVATIONS

This year is the first time that sufficient numbers of different vehicles entered to make some general conclusions about cycle layout possible. With more fairings expected next year the performance of the trikes can expect a significant boost, and the levelling off of the difference between the bikes and trikes will occur. As with overseas experience, familiarity and pre-training will probably have a more significant role than that of a high-tech vehicle with an inexperienced rider. Obviously having both is necessary for record breaking.

* Low weight is important in all events that require rapid acceleration and changes of line. Narrow and light standard bikes proved superior in the criterium where tactics and quick movements allowed an edge over heavier bikes and wider trikes.
* Rolling resistance seemed not that significant between the same class with recumbent and std bikes rolling to the same rough distances. The additional tyre resistance of the trikes with the wider ATB type (mainly the 20 x 1.75) meant they coasted to a stop much quicker than the rest of the field, although the better tyred low trikes out-coasted the standard and recumbent bike field.
* Aerodynamic profile is very important in speed and coast events. Faired bikes out-coasted all others by a ratio of almost two to one, and produced a speed gain on the flat of at least 10kph. Practical fairing design for everyday use will be the major challenge of the HPV movement, since the bunched results for unfaired HPVs and traditional bikes are not that dissimiliar. Trikes need fairings if their inherent stability is to balance against their extra weight and rolling resistance.
* Careful attention needs to be placed on reliability and practicality. We were blessed this year without major incident, but many splendid vehicles are frustrated by chain derailments, poor access and last-minute construction. Wayne Meyer stressed the value of building a proto-type to get a good position first.
* It appears that elevated fairings on bikes are preferable to ground-hugging designs from the point of view of cross-wind stability, allowing some airflow beneath the vehicle. With the increased chance of crashing, some thought should be given to fairing survival on bikes. Solid reinforced fibre can be virtually impact- and sliding -proof, but is much more complicated and hazardous to make. Simple stretch fabrics and heat shrink mylar over stringers (aluminium, plastic, wood etc) are much more fun to make and quicker and cheaper but not that crash-proof (although the Adelaide University entry survived a launch and roll with only mylar damage at last years Pedal Prix). A rollbar or sidebars can stiffen the fairing and protect the rider somewhat.
* Arising out of several test rides, I would suggest that if a tie-rod and second steering head is fitted to any HPV then the increase in dampening can neutralise to some degree the self-centring action of the forks. This leads to the situation where the vehicle must always be steered, as the natural balancing action of the rider isn't sufficient. This should be avoided if possible by keeping friction low and perhaps increasing the trail to over-ride the dampening..

NEXT YEAR.....

This year has been fun and worth the effort. Next year the Challenge will be larger and it is time to commence planning - the effort will be beyond the sole resources of HPVTimes and Canberra Bike Museum. I would welcome any feedback from competitors and subscribers, in terms of organisation and events Several women have suggested a novice women's event, Ian Simms is keen on a straightline standing start "drag" race and perhaps the english realistic shopping expedition (carrying luggage, negotiating obstacles etc) could be copied. As someone interested in the connection between cycles and art, I would also encourage a kinetic sculpture race, such as is staged in USA. This year, at the lunchtime ride destination (Lake Ginninderra) we had several **Seabikes** which proved how ideal Canberra would be for a short water-borne cycle event. Perhaps even a multi-media race where vehicles must be able to cross sand, water, mud and race on the road. Ultimately I would like to see the HPV Challenge and Bike Week become a huge festival of Human Power, taking advantage of Canberra's 'central' location and bike-friendly environs to present the full range of foot and arm powered machines used throughout history.

The Challenge will grow slowly of it's own accord, but if the event is to be professionally advertised and organised then major changes - such as sponsorships - and paid organisers will be needed ultimately. If you have any comments on the HPV Challenge and it's future please contact HPVTimes by writing and we can begin the dialogue.

I would like to publically thank Annemarie Driver, Glen Stickley, Ray Hembrow, Ian Simms and Don Thomas forthe work put into the HPV Challenge, and Arthur Jones for promoting and videoing the event.

PEDAL PRIX QUEENSLAND

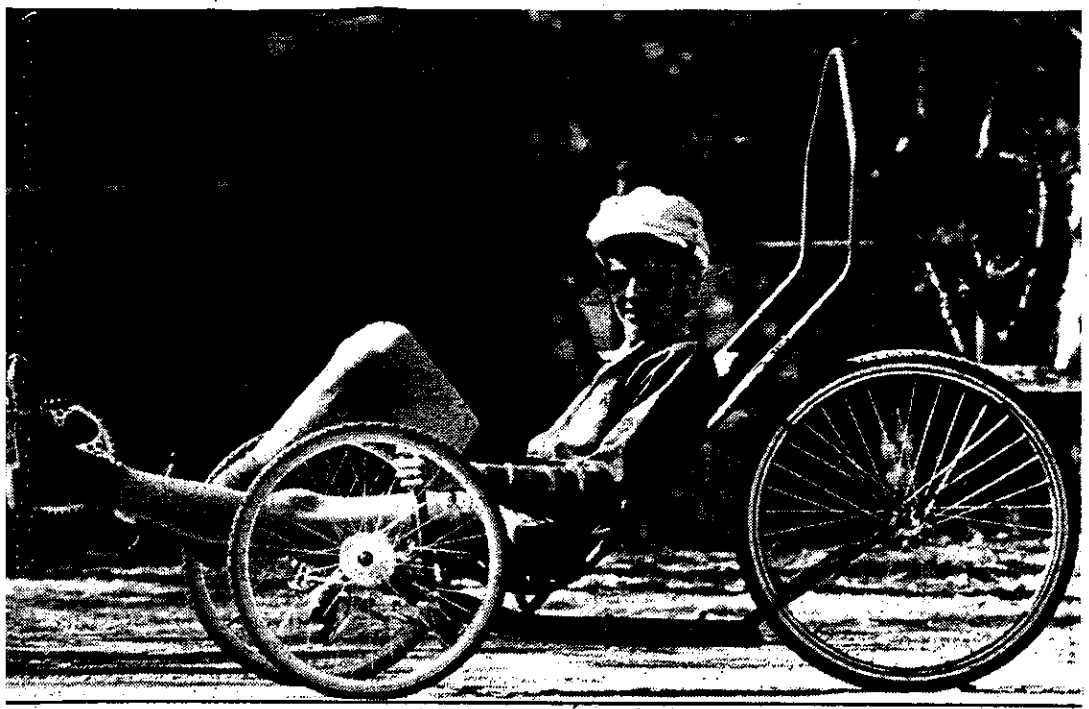
Ray Hembrow

This event is organised by the Queensland Education Department (South Coast region) and supported by the QLD Manual Arts Teachers' Assosiation (South Coast region). The Young Technologists Awards/Pedal Prix was held at Mount Cotton Driver Training Centre on Brisbane's southside, on August 3rd 1991.

Vehicle entries, representing 15 schools, were constructed as part of their school curriculum, and team participation was encouraged in the design, construction and final vehicle presentation. Teachers were available to assist, but students were encouraged to take a major part in design and construction.

Vehicles were scrutineered prior to the event to ensure that they complied with competition rules, which are similiar to the rules produced for the South Australian Pedal Prix.

All vehicles , except one, were without fairings in the true sense of design - although many used a rule of front protection as a windbreak. The most contentious vehicle had a very bicycle-like appearance. The rider was strapped to a seat, positioning the rider with his back horisontal. The front wheels were two 20" poly wheels connected into a parallelogram arrangement to assist when leaning the trike during cornering. The rear wheel was a 24" poly wheel driven by a standard type drive train. This vehicle also had a fairing to streamline the rider. In my opinion, this vehicle must have been very uncomfortable to ride because the riders were supprted by a chest pad which would have restricted breathing.



• *Stuart Toonen of Year 10 applied power to the pedals for Toowong State High School's entry in the Pedal Prix.*

The event was run as an eight hour endurance ride, over a circuit approximately one kilometre in length including a small hill section.

Race day saw clear skies, ideal for the event. Starting a little after 8 am the teams commenced their first session of real competition. Leads in laps scores were established, and the various characteristics of the vehicles became apparent. An early leader - No. 2, crewed by Coobabah, was constructed of square section aluminium and positioned the rider in an almost supine position. The vehicle was a front steering/rear drive tri-cumbent with 24 inch front wheels and 700C rear wheel. A variety of similiarly laid-out trikes took up positions behind No.2, with the tail of the field comprising a couple of rather heavy three and four wheeled vehicles.

The hill section of the course was to sort out many of the vehicles, and show the merits of particular designs and gearing selections. This was particularly noticeable with the heavier four wheeled vehicle which had some difficulty ascending the short hill on the course.

At 11am the event was halted for the running of the Celebrity Race over 5 laps. Half the vehicles were ridden by local identities selected by the schools. This race was won by racing driver Tony Longhurst (vehicle No,2).

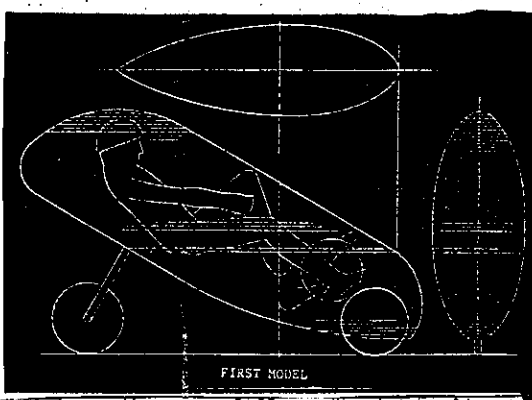
The main event then resumed for the lap counts and time period. The resulting lap count for the fastest vehicle was tallied minus penalties to decide the winner. Final lap tallies for the top six places were....

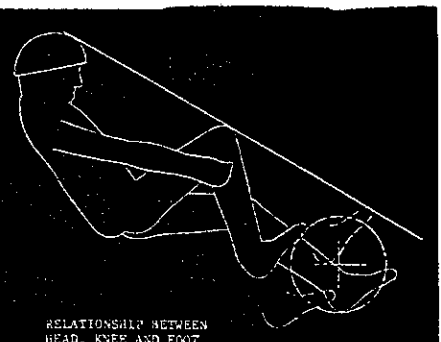
COOMBABAH	357 laps
SHAILER PARK	304 "
NERANG	300 "
MARSDEN	298
TOOWONG	291 "
BENOWA	289 "

Trophies were then presented by the director of the south coast region, Mr Steve Burchill, to the first three places in the endurance Race. Prizes awarded for the best Design & Construction, Best Presented Vehicle and Crew, Innovation and Best Presented Folio were then presented.

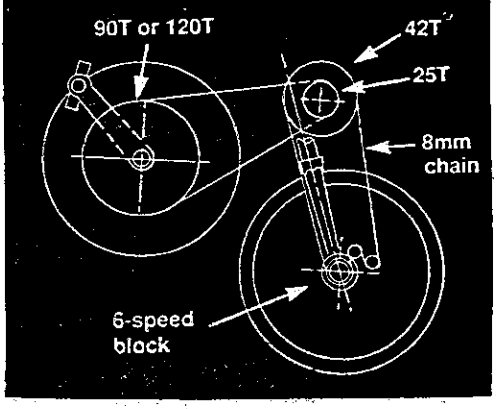
HPV NZ Visiting recumbentist Nancy Sanford from Florida describes the pleasant recollections she has of using her 9 ft WATERBUG. Designed and built by Gary Hoyt (ex-Freedom Yachts owner), the three seater has proved remarkably sea-worthy, suffering 4 ft seas or surfing in on 3 ft waves. A number of models were made - a single seater as well as the multiples - but all are out of production. There is some hope they will again be produced. Nancy describes the sleeping as somewhat cramped but the joy of settling down on the water with the evening sunset and celebrating the dawn with the seabirds as memorable.

NEW CYCLIST (May/June 91) Miles Kingsbury (KINGCYCLE) devoted a couple of pages to his development of the "Bean", a fully faired recumbent that holds the officially recognised one hour record of 46.96 mph. (Sept 8th 1990) Dubbed the Bean since its fairing shape is similiar to an inclined harricot bean, the vehicle is a two wheeler with the front wheel (mounted on a conventional fork) both driving and steering.

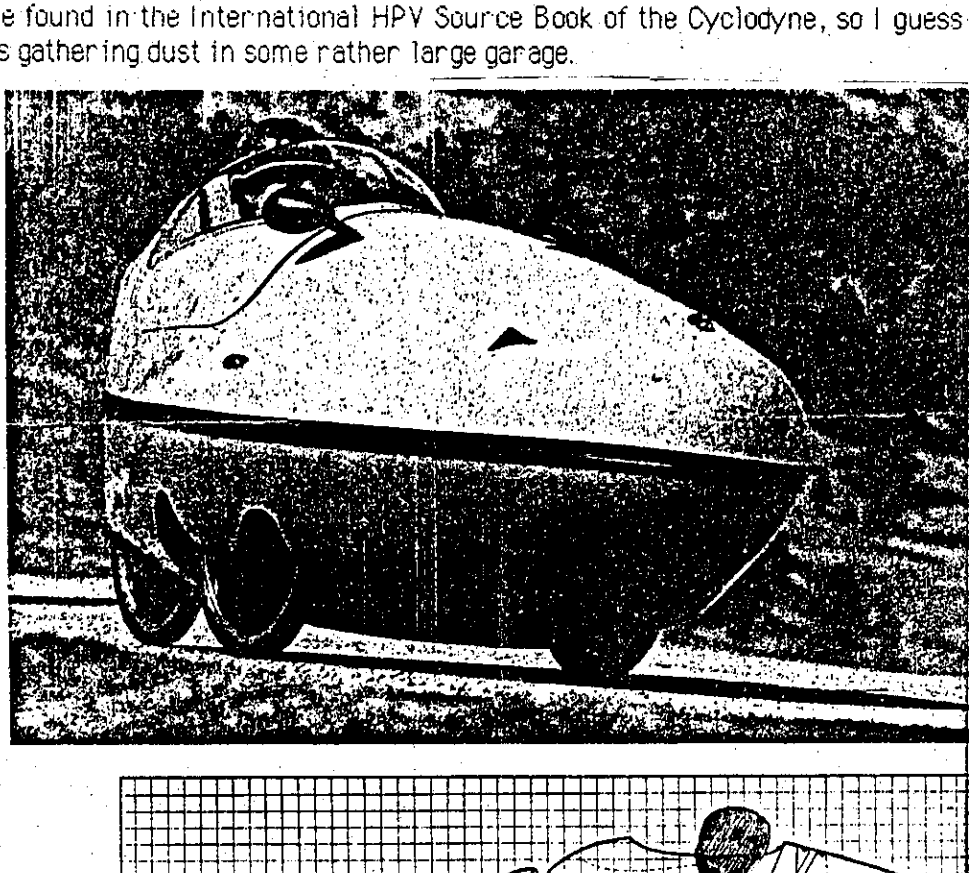


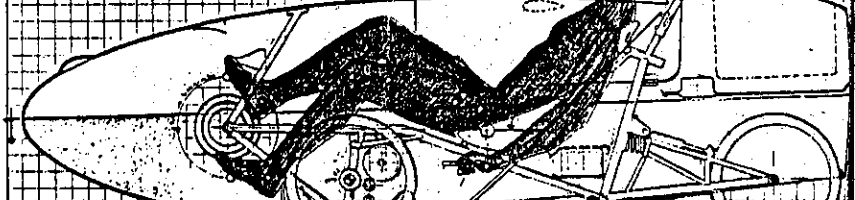


Using the usefully straight line established by the head, knee and foot, Miles built a windtunnel prototype (1/3rd scale) that had a coefficient of drag of 0.07 (usual CofD for a standard crouching cyclist is 1.08). The final cycle was a tubular steel frame enclosed by a single skin glass fibre fairing. It used Moulton 17x 1 1/4" tyres, a step-up gearing system and a special 8mm pitch final chain drive to enable the steering front drive as much flexibility as possible.



POPULAR SCIENCE (Undated copy sent in by a reader) David Kenned reviews the Cyclodyne, a fully hard-shelled trike produced by Cyclodynami Inc (6367 Arapahoe Ave, Boulder, Colorado 80303). The trike features tw front wheels, both steering and driving via a step-up differential un beneath the rider's knees. A wide range of gearing is provided (partially i' sure to compensate for the 68lbs total weight). Twin disc brakes are fitted the front, and the steel frame has a suspended rear swingarm. No mention ca be found in the International HPV Source Book of the Cyclodyne, so I guess is gathering dust in some rather large garage.





Braking and steering act on the front wheels, controlled from a bar below the reclining rider. Most power-train parts are standard: Triple chain whe ahead and seven-sprocket freewhe behind front wheels allow 21 speed

LETTERS TO THE EDITOR 24

Dear Wayne

I have constructed a recumbent bike from the article by Morgan Caldwell (Australian Cyclist Dec90-Jan91 ERGO-BIKE -ed.) and my own ideas.

The bike has been made lower than Morgan's bike and so the chain had to be "bent", this in turn causing a slight vibration and noise in drive, even though I am using tandem jockey wheels and the return chain is tensioned.

Is there any other way round the problem as many bikes must be similiar; and looking at the Vector and Speedy they seem to have some type of wheel?

thanking you Brian Heady Mullaloo WA

Dear Brian, most chain routing wheels are made of plastic (such as nylon) and in the form of a grooved cylinder. The use of small toothed jockey wheels is a source of annoying noise, and unless the chain is continually taut and well aligned, they can also drop the chain occasionally (when you're running late). They can be machined up by most engineering shops from plastic stock and made to fit commercially available ball races. Perhaps you should contact Ian Simms of Greenspeed (69 Mountain Gate Rd Ferntree Gully 3156 ph[03] 758 5541) to see whether he has spares for sale. Why not send a photo of your bike for inclusion in HPVtimes' My Cycle' section?

ROULANDT REVISITED

I Have been riding a Roulandt Recumbent for about six years now. Many people have not been impressed by the Roulandt, and I was among them for a while. It took me a couple of years to sort it out, but eventually I became happy. I rebuilt the front wheel with an Arai drum brake, which means it will stop, as in STOP on just the front wheel alone which came in handy as I was belting down Malcolm Street and the rear cable broke. I rebuilt the rear wheel, getting rid of the extremely fragile Sachs Huret 2-speed drum brake and using a Sturmey-Archer drum brake hub and 26x2.00" mountain bike rim with 12 gauge spokes. As well as being a much stronger wheel, it also reduced the overall height of the machine by a couple of inches and marginally reduced the frontal area by changing the angle that the rider leaned back at. It seemed to improve the handling a bit as well.

For the frame, I initially had trouble with frames tearing at the sea mounting, (I tore three frames in two years) but I had some braces fitte from the seat mounting bracket to the rear wheel drop-outs which seems t have solved the problem. I have fitted a 28/38/48 Biopace chainwheel set but have not worked out a satisfactory method of mounting the derailleur, so mounted a six speed mountain bike cluster (13-38) which gives a wide though not totally comfortable range. I can simply change by hand if I know I am going to be doing a fair bit of hill climbing or there is a tailwind o whatever. With that combination, low-low gear is so low as to be useless but at least I have a large choice. The other alternative is the Powe Cam,which sports a 42/60 chainset. I normally ride on the 42, but in fla conditions with no wind I can wind it right out and maybe push somethin even bigger. I would be interested in fitting a streamliner of some sort an see how it goes.

Joe Blake , Daglish WA

PEDAL PRIX SOUTH AUSTRALIA

Dear Wayne,

This letter is certainly overdue .... but after the big event... I have been i bed with this most virulent virus that has me incapable of little more tha drinking and sleeping. A direct result of the gruelling marathon of the pas Today is the beginning of an even bigger marathon - to catch up on all that ha been sidelined by the Pedal Prix.

After our latest HPV, I feel more confident in the making of this step toward further communication. **Spectra #2** is our first real step into the realm phase three vehicles, #1 being more of an adult toy than anything else. Not run it down at all, it's still a viable vehicle, that will be competitive in an event that calls for maneuverability and good handling, but speed is what all seems to be about right now. Speed means aerodynamics, ergonomics an mechanical efficiency. #2 is an attempt at those things.

This year's Pedal Prix was moved to desolate, windswept Adelaid International Raceway with its open roomy track (before the organisers g to it), an absolute must for aerodynamics. Working with Peter Schwartze we generated the shape of a turbulent flow fairing and half the team made

their responsibility to reproduce the numbers in the form of a timber, veneer string and plaster monstrosity that had the neighbours buzzing and kept the backyard free of cats for weeks. After far too much time, the "wooden whale" was sent off to be transformed into a fibreglass wonder like an ugly bug into a butterfly. And it was! The results had us enthused.

It then took all 8 of us 3 weeks of 15 hours days to complete the frame, steering, seat, fitting and fairing preparation . We all rode it for the first time on Thursday night (no fairing) and only once more before the race, on Friday. Our lead rider wasn't around during construction, concentrating on his chosed area of input, keeping fit. He hadn't even ridden it before his first race stint!

The build up to the event was huge. Everyone worked overtime to make the deadline to the point everyone was strung out by race day but none more so than me.

The event was grey, wet, windy and cold in every possible sense, and had it not been for the superhuman efforts and patience on behalf of our six intellegent riders, I wouldn't be writing to you now. Despite loosing 45 minutes after rolling the vehicle in the middle of the night and coping constantly with traffic congestion and the head wind down the straight, we completed 717.338 km (at an average speed of 29.98kph with a (race) fastest lap of 43.05 kph), pipping our opposition by a mere 9km. That's supposed to be a world record but we know we are capable of far more given better conditions. 1000 km would be relatively easily attained!

Our next big event is at the Australian Fórmula One Grand Prix ..we'll be doing lots of preparation before now and then!!!!!!!!!

Peter Good **Thorogood Cycles** Kensington Park SA

27 MILEAGE MARATHON

Stewart Clode

Lake Tuggeranong College has been involving students in the 'economiser vehicles' project for two years now. The quest at first glance appears to be relatively simple - to design and construct vehicles capable of achieving the highest possible fuel economy in accord with the "Mileage Marathon" regulations - in reality it is not that easy, it is a challenge of resources and implementation of ideas - in essence a 'brain sport'.

There are two basic categories. There is a virtually unrestricted single seat vehicle category, the other is a two seat 'commuter' category that has numerous requirements.
All vehicles must be powered by a heat energy engine that operates on 96 octane unleaded petrol. They must have 3 or 4 wheels, minimum track of 0.5m and a minimum wheelbase of 1.0m. Two independent brake systems must be fitted. Drivers and passengers must be over the age of fourteen years.

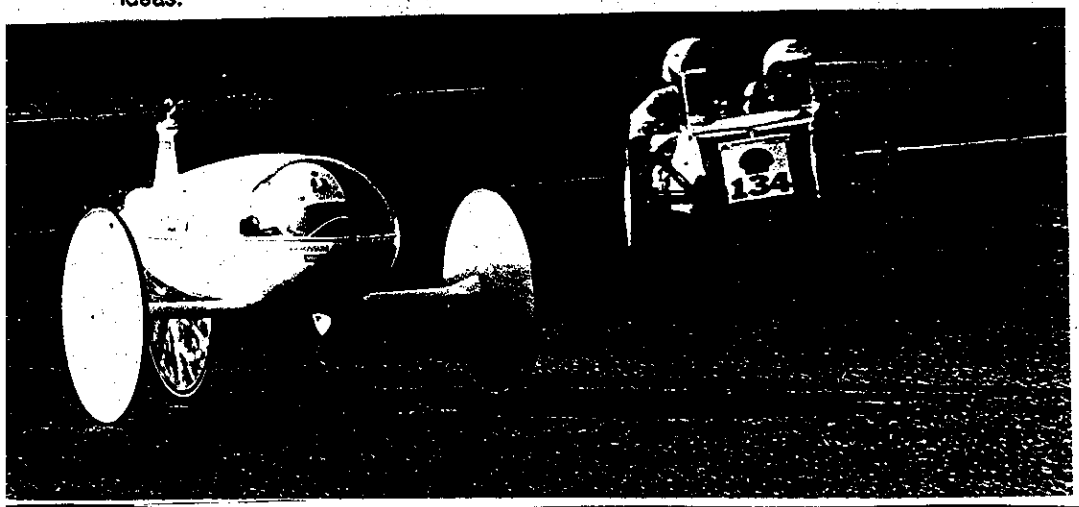
The single seat category is an international standard. Competitions are held in the UK, USA, Canada, France and Japan for these vehicles. The drivers position is free, the engine does not have to operate continuously, there is no suspension required and there is no weight limit.
Ford Australia held the world record for five years with an eventual figure of 5107 mpg obtained in 1985. A Honda based team from Japan eventually broke that record in the UK event at Silverstone in 1988 with 6409 mpg. This team in subsequent years has not been able to better 4800 mpg - unfortunately at this level the weather conditions on the day have a large influence.

The two seat 'commuter' vehicle category is a home-grown Australian affair. Extra design and operating regulations apply. The driver and passenger must sit side by side, the seats must not be inclined more than 45° back, must have a minimum backrest length of 500mm, minimum width of 300mm and minimum length of 300mm. The engine must operate continuously. The vehicle must have a minimum suspension travel of 25mm up and down (a total of 500mm minimum) with driver and passenger seated. The braking systems cannot be rim mounted, therefore internal drums or discs that are hub mounted.

The current trends in design of vehicles has been to incorporate many technologies from bicycle construction given that vehicles of the lightest possible weight tend to have an advantage - providing that the driver performs correctly and the gearing/engine configurations have been optimised. The use of hi-tech materials and construction does appear in some vehicles. Carbon fibre, kevlar and mylar materials. Ceramics have been incorporated into some engines (not many!). Fuel injections systems of varying designs are almost mandatory for record breaking vehicles.

Lake Tuggeranong College vehicles have been designed to be a compromise between strength, weight and ease of construction. Our single seat vehicles, of which we have two, have been made from 19 x 1.6 and 12.7 x 1.2 ERW tube - not exactly light ,however very easy to fabricate. The frames weigh in at 10kg each - total all up weight including battery is 26kg. Our drivers weights range from 42 - 48kg.
The engines in the singles are modified, single cylinder, 20cc 4 stroke "O.S." model aeroplane engines. Camshafts have been ground by hand to produce maximum power at 4500rpm. In standard form these engines produce 1.75 kW at 12,000 rpm. These engines are not ideal because of there 'oversquare' nature. For next year we intend to design and build our own long stroke engines around 25cc, with possibly ceramic coated piston crowns.

The commuter car built this year weighed in 10kg lighter than the 1990 vehicle at 50kg all up. The vehicles are made of standard grade ERW tube, round , square and rectangular. Torsional rigidity is a very important aspect in the design of commuter, particularly in the rear end if one wants the drive chain to stay on!. The thought of incorporating chromium-molybdenum alloy steel or aluminium into the frame has been entertained, however our students don't have the skills and we don't have the equipment to fabricate it, maybe sometime in the future. Because of the suspension in the vehicle they tend to be a little heavier that the singles. There are varying opinions on the optimum design, steering and suspension. Our new commuter for next year will have some aspects from the first and second vehicles, plus some new ideas.



The engines we use for the commuters are Honda 50cc, motorcycle engines. The gearbox and original clutch mechanisms are removed, our own design centrifugal clutches are used as well as our own electronic ignitions. Large flywheels are used in an attempt to lower the idle speed and smooth out the power pulses from the engine. Again we resorted to regrinding the camshafts in order to bring the torque lower down in the engine operating range (and to improve economy via reduced overlap!). Our engine's produce around 3kW at 3000rpm. The engine in standard form gives the same power at 8000rpm.

We believe we have the varying resistances to motion covered reasonably well. The roll potential of all the vehicles is superb. One of our single seaters rolled past the overall event winner on the course. We have found that the vehicles can roll over 75% of the course (about 0.5 km of the 7 km) and will drop at the worst down to 25km/h from 30 km/h. Our aerodynamics and wheels are doing the job well.
We have Wayne Kotzur to thank for our wheels. We consulted Wayne on tyre and rim combinations: Front wheels used Avocet 'time trial' slicks, Velocity aero rims and standard Failshaw wheelchair hubs - the bearings in the hubs were removed, original mineral based grease removed and replaced with a very thin smear of Molykote 44 Silicon grease. The rear wheels had IRC 'Forte' kevlar tyres, Velocity aero rims and high quality Suntour sealed bearing hubs.

We employ a straight gear reduction drive from engine crankshaft to rear sprocket. We make our own sprockets - a good 10-12 hour project for a student. The singles used a 240 tooth rear, the commuters use a 192 tooth rear. The sprockets are made from 6mm standard mill finish aluminium plate. The chain we use is 1/4" pitch which is generally scavenged from old photocopiers. This small section lightweight chain uses less energy to propel it in comparison with bicycle chain. Our sprockets are mounted onto a Suntour 22 tooth BMX freewheel sprocket.

There are some schools and others in the open category that design and build vehicles of exceptional light weight. Because our drivers are not experienced by any stretch of the imagination we believe that the ultra light vehicles are too fragile and not worth the worry. Given that the circuit has concrete and armco barricade walls for 50% of its length - minor indiscretions by drivers could be disastrous. We believe our vehicles would still be drivable after an altercation. Obviously wheels may need to be replaced.

The driving position in the singles is fully reclined with less than perfect vision. We use two-way radio contact, as well as pit boards, to convey information to the drivers. Information on overtaking drivers is very critical especially when trying to choose optimum driving lines on the course. All vehicles have Cateye CC-7000 cycle computer to provide the drivers with speed and lap time information.

The project to date has involved around sixty students and expended around $6000 over two years. About $5000 has come from sponsorship with about $1000 raised by student enterprise. Our college is not quite two years old - our resources and equipment levels are well below a poorly equipped high school anywhere in Australia. What we do have is enthusiastic students and a project that motivates.

We attracted the attention of Hans Tholstrup at this years Mileage Marathon and have been invited to enter the "1992 Energy Challenge" with our commuter vehicles. We intend to modify one slightly and build a new one better suited to the task of completing the 70km around the environs of Sydney. Given that Sydney roads are less than smooth we intend to pay more attention to wheel/tyre combinations, torsional rigidity and gearing options. We are hopeful of giving the Diahatsu Charade and Mira in the improved petrol vehicles class a shock. We are aiming for a minimum of 250-300 mpg. Real life driving is very different from 522mpg we obtained in controlled track conditions - the traffic can't be any worse though!.

This year there were just under 140 entries of which about 100 were schools. Our vehicles were placed 4th, 8th, 12th, and 15th. The four days we spent at Amaroo Park Raceway will stay in our students memories for ever. The day after the event I had no less than four students ask if we were starting the new vehicles that week. At present I'm trying to find out if my wife remembers who I am. I'm afraid it's in the bloodstream and I'm addicted.
If anyone is interested in finding out more about the annual 'Mileage Marathon' please do not hesitate to contact me at the College on (06) 293 5423 or Fax (06) 293 5450. Regulations and event instructions can be had from Mary Packard and Associates, P.O.Box 11, Drummoyne, 2047, NSW.

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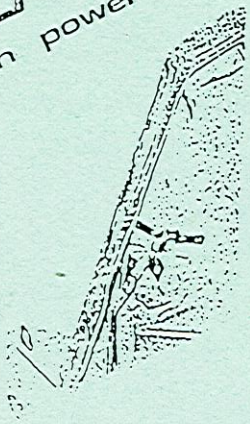

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