

## February 2009 Volume 12 Issue 1 - Number 61

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The Canberra Mob between a Rock and Wet place

### From El 'ed – Pete Heal

I'm still manning the editor seat of HUFF until Ben has time to help out.

Grateful for the contributions from regular contributors and would always welcome any contributions from members on their projects, rides, tours, whatever.

This issue of HUFF is number 61 produced over the past 12 years.

I've been busy creating an index for all 61 editions and will be making that available to paid up members along with the complete archive of all HUFFs very soon.

Creating the index has been very interesting and there is a very broad collection of useful HPV information in those past issues. Some of the contributors we don't hear a lot from any more although there are at least two serial contributors helping out with this issue.

As usual, this HUFF contains some interesting and varied articles and information covering various aspects of Human Power Vehicles including boats, fibreglass moulding and bike designs which is what we are all about.



### The 2008 Murray Marathon

OzHPV Member, Rick Willoughby from Melbourne recently completed the 2008 Red Cross Murray Marathon.

He reports that this was his third attempt at the race and the first time he has completed the full distance. Heat fatigue caused his demise within 45km of the finish in 2005 and a holed boat took him out on Day2 in 2006. He did not compete in 2007.

Rick uses his highly modified pedal powered boats in the Marathon and says that the organisers and other participants are highly supportive of his boat and achievements. There is a growing acceptance of Rick and his boats as a serious competitor. One of his problems is fielding constant

questions at the start and end of the day while trying to prepare the boat or load it on the car. The entry form now even includes a tick box option for “pedal power” – change can happen!  
1,066 participants and around 8,000 in the Marathon entourage swells local populations and stretches resources as the race moves along the Murray River from Yarrowonga to Swan Hill over the 5 days.



Rick’s official race time for the 404km race was 36:46:48 giving an average of 10.98kph. He finished 49<sup>th</sup> (mid field) on handicap time corrections in the full distance non-relay paddlers. Rick used his modified 7.2m long yellow OC1 vessel which is Version 11 of his boat builds. Rick planned to carry enough water and food to continue to the finish line each day without stopping at any check point. This saves time for the minor disadvantage of carrying a little extra weight. The prop driven boat is at a disadvantage in some instances compared to the paddled boats as the river depth can be as little as 250mm for its full width in some places and there are many submerged obstacles. One log strike bent Rick’s prop at 45 degrees and fortunately he was able to straighten it on the river bank and keep going.

Rick is a leading figure in Human Powered Boat design and improvements at the moment and his design – Version 14 was successfully used by Canadian, Greg Kolodziejzyk to set a 24 hour human power boat record of 245km in September 2008. <http://www.adventuresofgreg.com/index.html>  
Rick’s full write up for the 2008 Marathon is available on the OzHPV Website by clicking this link [http://www.ozhvp.org.au/docs/MM\\_2008\\_RW.pdf](http://www.ozhvp.org.au/docs/MM_2008_RW.pdf)

2008 Murray Marathon final results

[http://www.redcross.org.au/vic/murraymarathon\\_results\\_handicap.htm](http://www.redcross.org.au/vic/murraymarathon_results_handicap.htm)



2009 Speed Trials at Lang Lang – 10<sup>th</sup> to 13<sup>th</sup> April 2009



Steele Bishop's 1984 record vehicle



The above picture is an aerial view of the Lang Lang Motor Vehicle Testing facility where the OzHPV 2009 Speed Trials will be conducted over the Easter break – 10<sup>th</sup> to 13<sup>th</sup> April. The main track we will be using is a banked 5km oval – so there are virtually no corners. There are restrictions being put on us regarding the number of people able to access the site at any time but we are trying to work around this. Participation will be for members OzHPV only and places are limited. Already, organiser Tim Marquardt has received entries from 9 riders/teams and these include:

NAME	VEHICLE	TEAM
Tim Marquardt	Whoops	Whoops
Mick Donmovan	Whoops Clone	Laidback
Tristan Wright	Tspeed Tspeed	
Eric Ball		
Peter Heal	NoCom & NerfCom	Lizard
Simon Watt	Optima Baron	Taper
Jeff Neilsen	Whoops Clone	Trisled
Ian Humphries,	Flying Furniture	Flying Furniture
Daniel Oakman	Baccheta Corsa	Flying Furniture

We are hoping for good weather so the 1984 Steele Bishop/Holden Streamliner record of 85kmh for a flying 200 metres can be significantly bettered.

### Portland Paul's Quest for Speed Continues

Our OzHPV correspondent in the out post of Portland, Victoria, is always seeking that extra bit of speed to beat the "uprights" in his regular riding bunch and get to the coffee shop first. Paul is very critical (some say anal) about getting every extra watt out of the aging engine and every measure of efficiency from the equipment.

The most recent experiment involved a Limar aero helmet as seen below. It is reported that such a helmet can equate to a good set of aero wheels in efficiency over a long time trial. It would seem however that this does not relate to a reclined cyclist on a recumbent bike. Paul thinks his standard helmet and face visor are probably more effective in this position. The Limar may suit the more upright riding position on his P38 recumbent.

You've gotta try these things and as Paul remarks, "the Limar has some psychological advantage - I wonder what that's worth in watts?! :()".



### The Cheap and Not Nasty Mould Method – Ken Houghton

Usually making a fibreglass mould will cost more and take more time to make than the final part that you want. If you only want a few parts, there is a quick and cheap option. The method is a very old one, and I had never done a mould this way before.

The method is called 'Plastic faced Plaster'. This method can build a mould in one day. The photos are from the mould that I made in just one afternoon.

You start with the released shape to be moulded. You also have a support frame that can be wood or metal which will become part of the mould structure. The frame fit is only 'approximate'.



The frame is gently placed into its intended position on the plug (shape being copied).



The correct quantity ( $600\text{g.m}^2$ ) of gelcoat (usually orange tooling polyester resin) is catalysed. This is brushed or sprayed over the plug. It can spread onto the frame without problem. Gelcoat is NOT like paint and should be about 0.5mm thick to cover the plug without any colour show-through.



Next you MUST protect the polyester gelcoat from the water in the plaster that is to follow. This is done with a layer of epoxy resin which can be applied as soon as the gelcoat can be touched without transferring colour to your finger. This can be mixed and brushed over the entire gelcoat surface and near-by frame. I added fibreglass patches to join the frame to the gelcoat, and to create a closed box to cast plaster into by bridging across all the gaps between frame and gelcoat. While this is still wet, the entire surface of the epoxy is sprinkled with cotton flocking to provide the connection between the epoxy and the plaster. Other natural fibres could be used, provided the plaster will penetrate it fully to support the plastic tool face.



The epoxy is allowed to cure. I used West System epoxy with dispenser pumps so that I don't have to measure out small quantities. With the fast hardener the West System cures enough in about one hour.

The fun mess now begins. Buy your plaster from a proper plaster supplier so that a cement size bag only costs about \$9. You mix up Plaster of Paris and water so that you get a smooth, creamy consistency and pour this into the mould. Keep mixing and pouring until you get a thickness of at least 20mm of plaster over the entire surface. I ripped apart Chop strand mat (fibreglass) and embedded it into the outer surface of the plaster to increase strength. This was not required in this small mould, but I intend to do a larger one soon.



The plaster is allowed to cure. This creates a significant exotherm and provides heat to progress the cure of the two resin types. When the plaster cools down, you can separate your new mould from the plug.



This mould was rock hard and rings like a bell when struck (gently). You can prepare the mould conventionally straight away, and could make a part the next day.



## OzHPV Canberra Mob – First Saturday Social Rides



January saw about 14 riders roll out for a social Canberra Mob ride. Riders joined in and peeled off as the group progressed at a leisurely pace southwards. We'll be doing it again on the first Saturday of the month throughout the year.



### OzHPV Canberra - 2009 Stromlo Races

Following the success of the 2008 series the following dates have been booked at the Stromlo Forest Park criterium circuit for Saturday afternoon races.

28<sup>th</sup> February

21<sup>st</sup> March

18<sup>th</sup> April

16<sup>th</sup> May

20<sup>th</sup> June

18<sup>th</sup> July

Races start 1:00pm. Entry fees \$5 members. \$10 non-members (2 race maximum for non members)

Contact: [actracing@ozhvp.org.au](mailto:actracing@ozhvp.org.au) for more details

### Victorian Races

We would love to get regular circuit races running in Victoria.

The first sticking point is a venue / venues.

Suitable locations could be criterium circuits, velodromes, motor tracks, schools or industrial estates, in metro or regional areas. Length would preferably be >800m, but all will be considered. If you have any suggestions for tracks, or have relevant contacts, please post them to the list.

The current thought is for monthly races starting in May. Classes, events and points scoring all need to be determined, so get on board the list and let's start a discussion.

To avoid clutter/irrelevance on the existing lists initial discussion will be at:

[http://groups.yahoo.com/group/OzHPV\\_VicRacing](http://groups.yahoo.com/group/OzHPV_VicRacing)

Just log in with your existing yahoo details and click join.

Eric Ball



### OzHPV Challenge – Wodonga 4<sup>th</sup> and 5<sup>th</sup> April 2009

The 14<sup>th</sup> running of the OzHPV Challenge will take place at the Wodonga Go-kart track once again in 2009 and the committee are busy with it's organisation at the moment.

Full details will be circulated to members and posted on the website when available.

Members wanting to assist with the running of the Challenge can volunteer directly to Tim Marquardt

[secretary@ozhvp.org.au](mailto:secretary@ozhvp.org.au)



## Coming Events

28<sup>th</sup> February 2009 – Casey-Cardinia HPV Cycling Festival <http://www.cchpvcc.org.au/>

28<sup>th</sup> February 2009 – Start of OzHPV Canberra Mob Saturday Race Series

4<sup>th</sup> & 5<sup>th</sup> April 2009 - OzHPV Challenge – Albury/Wodonga

10<sup>th</sup> -13<sup>th</sup> April 2009 – OzHPV Speed Trials on Test Track Lang Lang Victoria,

4th July 2009 – IHPVA World Championship, in Europe.

17th – 19th July 2009 – HPVA Speed Trials on Ford Test Track Arizona USA

14th – 19th September 2009 - WHPSC Battle Mountain

See also <http://racvenergybreakthrough.net/AboutCalendar09.shtml> for a program of HPV School rules racing around the country.



## Memberships 2009

It's that time of year again.

OzHPV Memberships were due as at the 1<sup>st</sup> January 2009.

No change to membership fees has been made and the fees are:

Single Member	\$25
Family Membership	\$35

Newsletters and bulletins are generally circulated to members by email.

If members wish to receive their magazine in hard copy by post an additional \$15 fee is applicable to cover postage and printing costs.

The membership form can be located on the OzHPV website [www.ozhvp.org.au](http://www.ozhvp.org.au)

Please contact the Treasurer for any enquiries about memberships [treasurer@ozhvp.org.au](mailto:treasurer@ozhvp.org.au)



## OzHPV Committee Contacts

President - Eric Ball,	<a href="mailto:president@ozhvp.org.au">president@ozhvp.org.au</a>
Secretary – Tim Marquardt,	<a href="mailto:secretary@ozhvp.org.au">secretary@ozhvp.org.au</a>
Treasurer – Pete Heal	<a href="mailto:treasurer@ozhvp.org.au">treasurer@ozhvp.org.au</a>
Public Officer – Atholl Reid	<a href="mailto:publicofficer@ozhvp.org.au">publicofficer@ozhvp.org.au</a>
Webmaster – Charlie Bell,	<a href="mailto:webmaster@ozhvp.org.au">webmaster@ozhvp.org.au</a>
HUFF Meisters – Ben Goodall & Pete Heal	<a href="mailto:huff@ozhvp.org.au">huff@ozhvp.org.au</a>



## Newsletter Contributions

Always welcome. Please send to [huff@ozhvp.org.au](mailto:huff@ozhvp.org.au)

Next deadline for material end of February 2009.



## Steve's HPV Book

During 2008, long time builder, tinkerer and designer, Steve Nurse has been writing a book on Human Powered vehicles. As yet Steve has not found a publisher but has graciously offered chapters of his work for inclusion in HUFF. So here comes instalment one.

## **RECUMBENT TRIKES**

The 2 basic layouts for recumbent trikes are tadpole (2 wheels at the front) and delta, (single wheel at the front). Unlike bikes, trikes are stable at the lowest speeds and don't need a stand when stopped. Given appropriate gearing, they can be loaded heavily and still climb hills. They do need a park brake to stop them rolling away. The rider has a comfortable chair to sit on, whether they're riding or not. Riding a trike is easy and there is generally no learning to be done. People with cerebral palsy or stroke sufferers can often do well on a recumbent trike despite having difficulties walking.

Bikes lean when cornering and this leaning makes the forces supporting the wheels act in a straight line between the contact point on the tyre and the axle centre. There is no side force on bike wheels.

In contrast, most trike wheels stay perpendicular to the ground when cornering and there is a sideways force on the wheel. For this reason, trike wheels must be built strong. The spoke structure of small wheels makes them stronger than large wheels and its very common to have small (16 or 20") wheels on recumbent trikes. (Figure 7.1)

Trikes are more prone to punctures than bikes as their wheels pick up road muck from 3 tracks as opposed to one. They are more complex than recumbent bikes, can have more gears and command higher prices when new. Examples of gearing on recumbent trikes include

- a 3 speed hub gear combined with a full 24 speed (3 x 8) derailleur drivetrain to give 72 possible gears and an overall gear range of about 900%.
- a Rohloff speed hub combined with a Schlumpf 2.5 times increasing gear system in the bottom bracket giving 28 possible gears and an overall gear range of about 1200%.

## 7.2: Recumbent Trikes

A **velomobile** (Figure 7.2) is an enclosed trike and the shell of the vehicle keeps the rider warm, dry and aerodynamic for travel at cruising speeds of 40 – 50km/h. Power assisted velomobiles offer a very good alternative to the car for longer commutes of 20 to 25 k each way. Famous brands of velomobiles are mainly European and include Flevobike Versatile, Alleweder, Mango, Quest and Leitra. Unlike velomobiles, fully enclosed 2-wheelers (speedbikes) are not stable when stopped (and riders can't reach the ground with their feet!) and are not practical for daily use.

Velomobiles can be “head-out” or “head-in”. Head-in velomobiles have the problems of moisture from the rider's breath condensing and fogging the windscreen and can be slightly claustrophobic. There is a small aerodynamic penalty for having the rider's head out and not inside a smooth shell, but its not much of a compromise and most commercial velomobiles are of the simpler head-out type.

Many young Australians get their first taste of Human Powered Vehicles through their schools where HPV (“**Pedal Prix**”) racing is a sport involving the design, construction and racing of vehicles to a set formula. Races last up to 24 hours with multiple riders taking turns to pedal. The “set formula” includes restrictions on track width and the inclusion of foot-catchers, roll cages and seat belts. All these can be necessary on the track as some teams consider HPV racing to be a contact sport!

The faster Pedal Prix cycles have fairings and from recent media reports it seems that Pedal Prix Cycling is safer than regular cycling and that Pedal Prix Cycling can lead to road and track cycling careers.

Famous races on the Pedal Prix calendar include the Murray Bridge, Maryborough and Wonthaggi 24 hour events. These are huge festivals and the biggest Human Powered Vehicle Events in the country, with thousands descending on the towns to compete, support and officiate.

Manufacturers such as Trisled and Greenspeed race at Wonthaggi and Murray Bridge and supply plans and materials for HPVs to schools. There are several highly competitive teams such as Bendigo Youth Racing and Deakin University which started when keen high school students left school and continued with the sport. Unfortunately it doesn't seem like many kids go on to be enthused about HPVs in the wild and used as transport, otherwise there'd be a lot more HPVs out there!

**Tadpole trikes** have a simple drive mechanism with the cranks up the front driving the back wheel. Unless the rider leans into a corner, weight is shifted to the outside front wheel in cornering and tadpoles are generally stable in turns. Tadpoles usually have a very low seating position and good

aerodynamic characteristics despite the extra wind drag of a third wheel. Both front wheels usually have brakes and they steer to turn the trike. The front wheels are linked so both will turn during cornering. (and ideally lines drawn through the axles of all 3 wheels always meet at a point. Figure 7.3) This linkage must be tuned so that the wheels are not “toed in” or “toed out” as misalignment of this sort can quickly scrub out a tyre tread or lead to extra rolling resistance. (Figure 7.4)

Simple **billy cart** steering is rarely used on recumbent trikes because this type of steering is prone to bump steer, and the small wheels, high speeds and light steering mechanism of the trike all conspire to make the bump steering difficult. A steering damper would improve the bump steer. (Some load carrying trikes use billy cart steering, see chapter 9.)

Tadpoles usually carry loads in a “bikelike” way, starting with a rack for pannier bags mounted over the back wheel.

The most common seat for these trikes is a mesh seat. The frame of the mesh seat can contribute to the structure of the trike and the mesh seat is an easy way to add some suspension to a trike. Some clearance is required for a mesh seat so that a sagging bottom or back doesn't hit the frame. Trikes intended for speed will sometimes have a lighter moulded or composite seat. These “hard shell seats don't need much space, allow the rider to be closer to the ground and won't “give” under pedalling pressure.

Fast tadpole trikes will generally be made light with the front wheels close together, spoke covers on the wheels, and a low and very reclined seat.

**Direct steering** tadpole trikes are controlled by small steerers next to the top of the wheels which can include mounting points for V-brakes. The steering is usually simple and compact. Australian manufacturers Trisled and MR Components make direct steering trikes, and they can be relatively inexpensive (simpler and less expensive components, only 1 steering linkage rod) when compared to indirect steering trikes. (Figure 7.5)

**Indirect steering** on tadpole trikes is quite similar to underseat steering on recumbent bikes and vibration is not transmitted to the rider's wrists. There is no mounting point for a brake above the front wheels which means more expensive drum or disc brakes are used. The front wheels on indirect steering trikes can be relatively wide apart as they must accommodate a steering bar and hands and clearance distances. Greenspeed make Australia's and possibly the world's best known tadpole trikes and they have indirect steering. (Figure 7.6)

## 7.4: Recumbent Trikes

**Handcycles** are usually Delta trikes designed to be driven and controlled solely through the arms and hands. They allow paraplegics to ride at cyclist speeds and to participate in longer tours and events. When hand cranks are in the standard bike arrangement (spaced 180 degrees apart) steering isn't easy so cranks are usually adjacent to each other. Gearing always has a good range and is set low to match arm strength rather than leg strength. There are usually catchers on the front to support the legs, but handcycles are always highly customised to match the abilities and needs of the rider. To my knowledge most handcycling in Victoria is sport-oriented with less emphasis on social riding. (Figure 7.7)

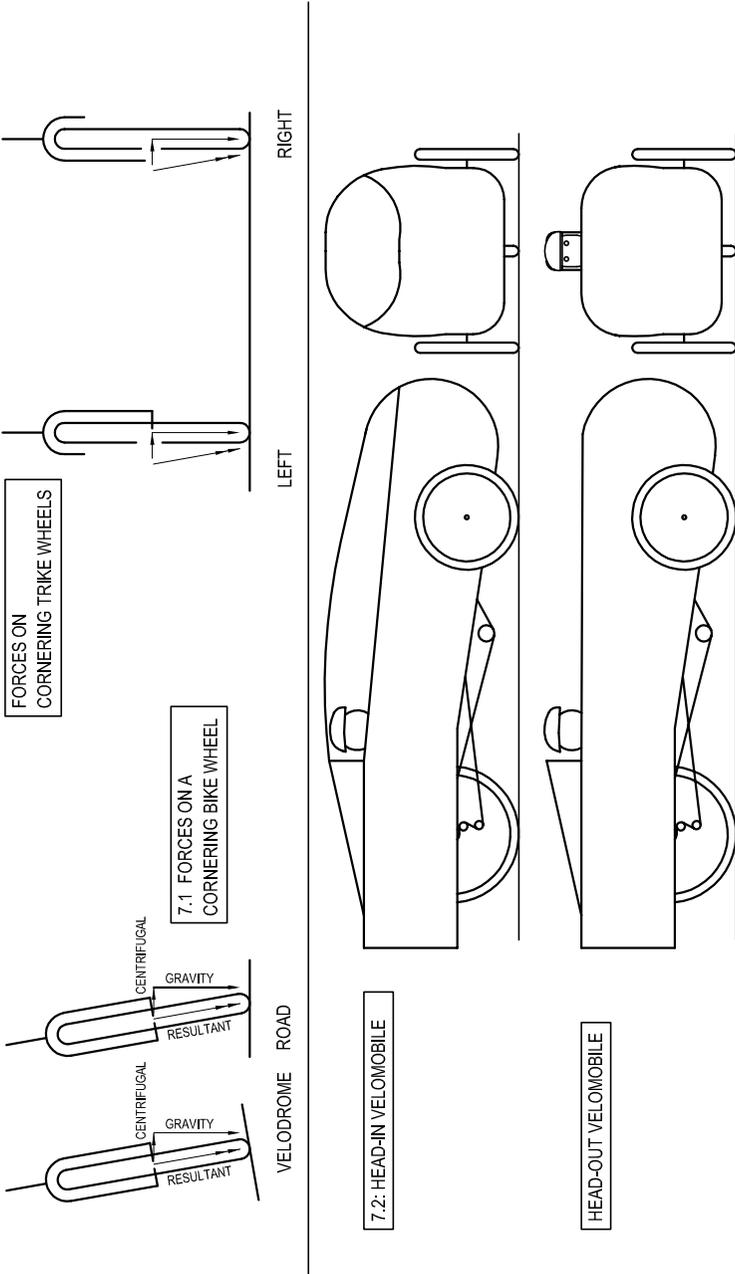
Other **Delta Recumbent Trikes** were rarely seen or available in Australia until recently when Greenspeed started selling their "Anura" and Trisled started bringing in Deltas from Hase, a Germany company. These trikes have a seat height that is high when compared to a tadpole trike but still low when compared to most recumbent bikes. Deltas don't need to be climbed into, they can merely be sat upon and are marketed to older folks who find that appealing. There is a good (unbikelike) spot for lots of luggage behind the seat. The seat height and wheel positions can make them prone to tipping when ridden with gusto. (Figure 7.8)

Delta steering is simple and the line drawn through the axes of the 3 wheels will always meet at a point, however to avoid wheel scrub during cornering, the trike must have

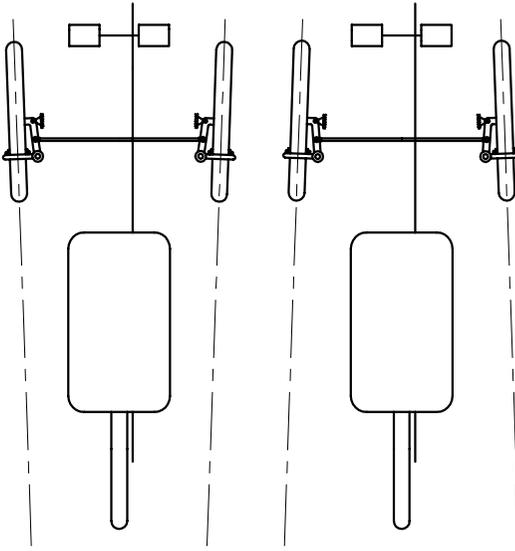
- only one wheel driven, or
- have a differential between the two driven wheels
- or have clutches on both driven wheels

Greenspeed's Anura comes complete with a Schlumpf gear (offering 1x and 1.6x speed ratios) in the bottom bracket, a differential which distributes power to both back wheels and underseat steering linked to the front wheel. Deltas make a good modular tandem and this is described in the chapter on tandems.

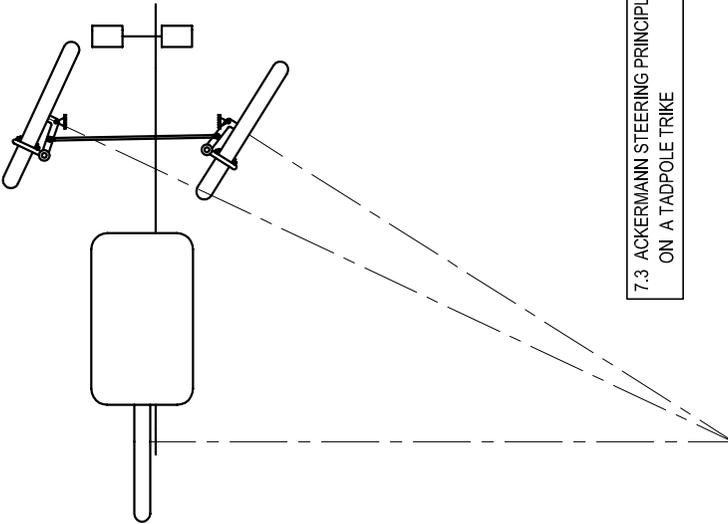
There are **more exotic** trike variations on the market overseas and these include centre steer tadpole trikes (Windcheetah) and lean steer tadpole trikes (Tripendo).



## 7.6: Recumbent Trikes

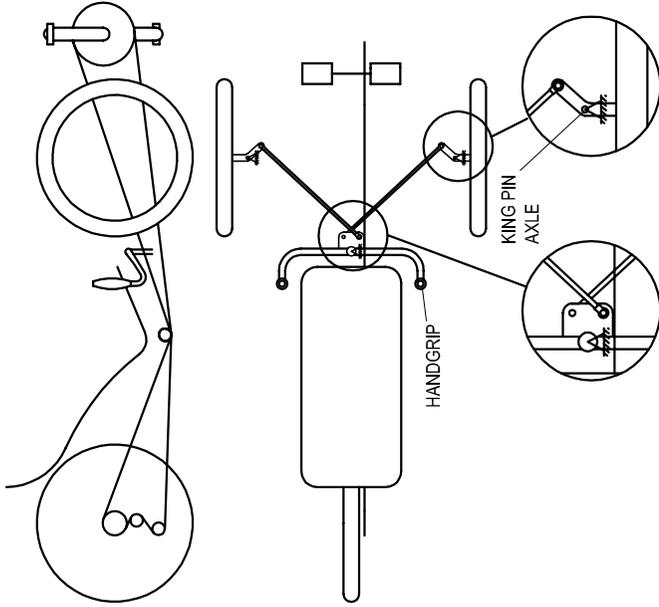


7.4 TOE - OUT AND TOE IN  
ON A TADPOLE TRIKE

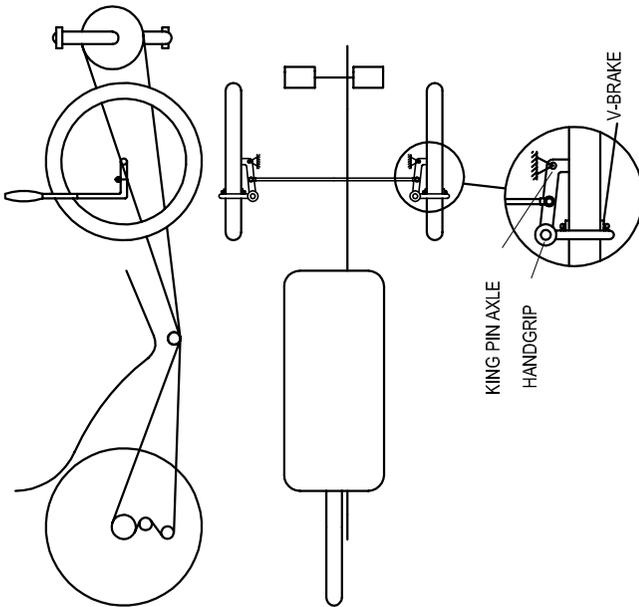


7.3 ACKERMANN STEERING PRINCIPLE  
ON A TADPOLE TRIKE

Recumbent Trikes: 7.7

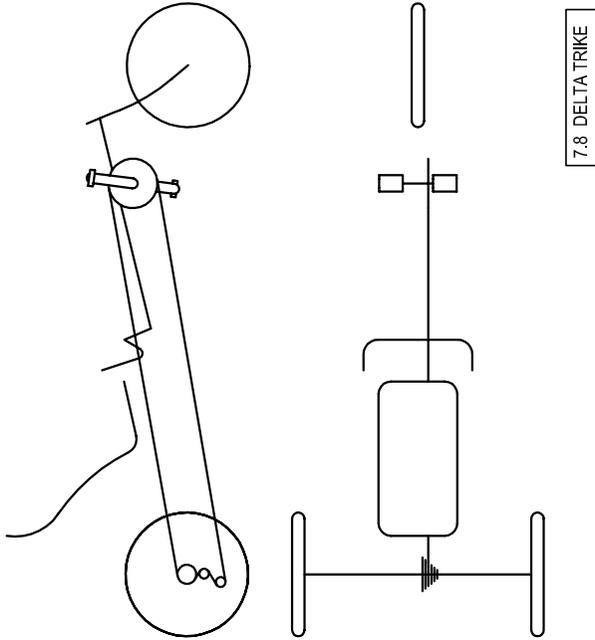


7.6 INDIRECT STEER TADPOLE TRIKE

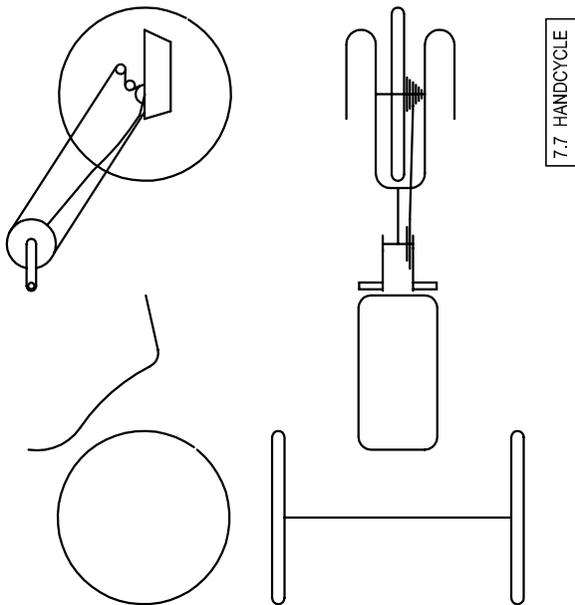


7.5 DIRECT STEER TADPOLE TRIKE

7.8: Recumbent Trikes



7.8 DELTA TRIKE



7.7 HANDCYCLE