HOW TO
BUILD A
KINETIC SCULPTURE

How to build a Kinetic Sculpture ~ by Elliot Naess

Elliot is an experienced Kinetic Racer who has participated in the Kinetic World Championship and other west-coast races numerous times. You can also find his posts on the Kinetic Forum (***http://www.kineticbaltimore.com/ksr/Forum/index.php***). While Elliot's has extensive experience, of course you are responsible for ensuring your own sculpture follows the laws of the road, the race, and physics!

Introduction

The original idea was actually to call these next few paragraphs "How to build." How silly! That would be like declaring "Everything A Man Should Know About Women." It would be impossible, and still wrong half the time. One of the attractions of this sport is precisely that there are infinite ways of doing most everything. So what we have here are hints and notes, thoughts and ideas—to be revised and added to as experience dictates. Your experience, yes.

Perhaps, one of these days, you and I will meet at a Kinetic Race, inspect each other's machines and speak something profound. But I doubt it. More likely we will laugh our silly heads off, utter Words of Wisdom like "Cool, Dude," then shout "Geronimo!!!!" and charge into Humboldt Bay like drunken ducks. Yes, life can be that good. And should!

Planning

Building a Kinetic Sculpture is much more of a cerebral exercise than you might at first... uh... think. Sure, you can grab two bicycles and a bathtub (total cost at garage sale/flee market/thrift store $16.50), lash them together with broom handles and duct tape ($34.82) and participate. You would be very welcome and you would have good fun. But you would miss out on The Planning. Also, any Contraption so casually built will not likely function well enough to bother to take to a second race. So start by doing some planning.

Planning is not something you need a dedicated office or special clothes to do. Rather, you assign the idle portions of your brain to planning while you are otherwise occupied with routine tasks. Just "keep it in the back of your mind." Take notes while you are eating lunch. Browse thru thrift shops and salvage yards when you happen upon such facilities. Search your memory for favorite toys and adventures from childhood.

Elliot: building

Drunken ducks charge into Bay. in the form of The Rockin'-Fish at the Ventura race.

Cover Art - Duane Flatmo
Graphic Design - Scott Cocking

Nurture this habit for a while, and you will begin to have Ideas. Maybe even Brainstorms! Try to keep the car on the road. Pull over at the next safe place and make a sketch. Now you are building a Kinetic Sculpture! And you haven't even dragged a single junk bicycle home yet.

Some builders then fabricate a tabletop model. Others make detailed drawings. Some just lay Stuff out on the garage floor and start welding. Do it Your Way. There are no NASCAR Templates in this sport!

Number of Wheels

1 wheel

Yes, there is a guy who races a unicycle every year, with an inflatable kayak in his back pack. But I don't think he can Ace.

2 wheels

Some racers simply use a bicycle, and some build very elaborate bicycles. But two wheels behind each other will tip over. At least one cool-looking bicycle-style entry couldn't be ridden in rough terrain. Yes, it was mine. (But somebody else was riding it when it went ass over apple-cart down Dead Man's Drop!)

Two wheels side by side work well. They must be very tall, so the pilot(s) sit in a "basket" suspended from the axle. A rolling porch swing. Yes, there will be a lot of swinging back and forth! And steering is tricky. But two of the most fabulous Kinetic Kontraptions on the Planet are built that way.

3 wheels

The most common layout may be three wheels. This provides reasonable stability, while not requiring any kind of suspension. You can have the single wheel in front or in back.

Bob Durst in his "dicycle" two-wheeler.

Two Ton Tricycle emerges from the hive! Planning includes figuring out how it will fit in the garage. Or not.

4 wheels

Four wheels give you best stability. But you get more rolling resistance, and you need to pay attention to steering geometry and suspension.

5 wheels and more

On a single unit vehicle, this does not sound like a good idea. But you can build a "train" of vehicles, where each car has as few as two wheels, and this is a proven successful concept. To Ace, such a train must remain connected throughout the race.

Number of Pilots

Any number of pilots are allowed. Generally, the more pilots on a vehicle, the less weight each has to propel. Visualize a tandem bicycle—twice the power with only a little bit more metal. But overall quality of design and engineering is more important. And how many friends you have that will trust you with their lives!

Size

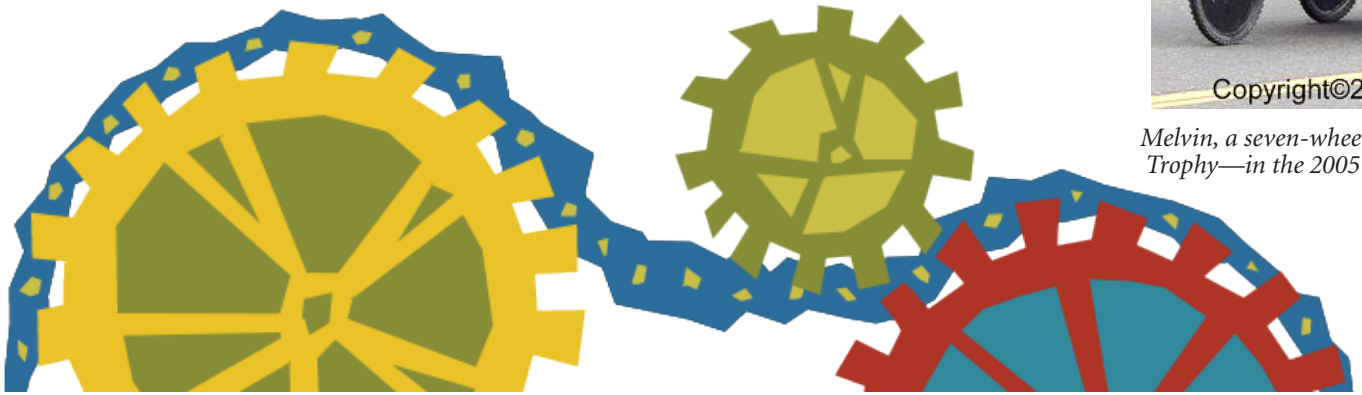
Maximum width eight feet, height 14 feet except in metricized countries where they use some other funny numbers. Some races have a lower height restriction due to low bridges. If it's fabulously long, it will need to bend in the middle to get around corners.

Types of Mechanisms

You should probably plan early on what type of drive train and what type of water propulsion and so forth. We'll get back to most of that.

Four people on four wheels— good stability and high power-to-weight ratio.

Melvin, a seven-wheel, three car train, takes the checkered flag—and the Big Trophy—in the 2005 Grand Championship. Photo courtesy Tony O'Hanlon



Drive Wheels

All wheel drive is best.

Front wheel drive will let you ride back onto land from the water—the wheels hit land first so you get traction. But front wheel drive will easily spin when going up a steep sand dune and the weight transfers rearward.

Rear wheel drive is great for climbing that sand dune. Some racers have trouble keeping the front wheels on the ground! But when you hit the shore, the drive wheels are still in the water and you may not be able to ride onto land. See "Tactics."

Power Flow

One power flow arrangement is to have each pilot drive one wheel. The other is to collect the power from the pilots in a differential and let the differential distribute the power to the wheels. The choice seems to be entirely about personal preference.

What does not work is a solid axle—forcing both drive wheels to turn at the same speed. You would not be able to turn. Been tried. Doesn't work.

A "clever" arrangement that many people try, absent a differential, is to put a freewheel at each drive wheel, and let the outer wheel in the curve spin faster than the inside, driven, wheel. On pavement, this works OK. On slipperier surfaces like sand, the steering tire(s) will skid and you will not turn. What you want for turning in sand, is to power the outside wheel only. This is one reason this writer likes independent drives. The other is, that if the differential breaks, you are stuck. But if one of two individual drives breaks, you may be able to continue.

But differentials seldom break. Get them out of old lawn tractors, or buy them new from Northern Tool. Remember to install bearings right next to the differential, or they will break.

Dragon performs water exit—with some difficulty.

Tall wheels mounted to gunwale of old boat—works great.

Chassis

First of all, you need a chassis. A frame, with wheels and drive mechanism.

You can use bicycles for most of it. Stock up on thrift store bicycles and hacksaw blades. The first time you cut a bicycle in half may "hurt" a little. Such wanton destruction! But you have to break eggs to make an omelet, and you are paying just omelet-money for the bikes. So chop away!

Modern K-Mart-grade "mountain" bikes are cheap and plentiful and are flooding into thrift shops and flea markets. They are generally suitable for our purpose. But the quality is poor, so you may find yourself upgrading to better hardware as you learn what works and what doesn't.

When you shop for bikes, look at the cranks. One piece cranks are good. Schwinn is best—the kind with diamond shaped crank arms. Modern three piece cranks are good. But avoid the old three piece cranks where the crank arms are held onto the crank shaft with a tapered pin or bolt that is round on one end and has a nut on the other. Those break!

You can build a frame entirely from bicycle metal. But most guys buy thin wall steel tubing and build a main frame to support all the other Stuff. Any muffler shop can sell you a limited assortment of steel tubing. For more variety, check the yellow pages under "steel."

EMT—Electrical Metallic Tubing—conduit—is often used. It is cheap and light and available in any hardware store. But it is galvanized, which makes it a hazard to weld the stuff—the zinc gives off toxic fumes. Some other ideas:

- Chrome-moly steel is stronger than mild steel, but costs more.
- Aluminum is light, but requires a TIG welder. Consider bolting and riveting aluminum.
- Some use wood. Successful machines have been screwed together out of plywood and 2x4s.
- If you are handy with fiberglass, you can build a "unibody" structure.
- Or just use an existing structure as your frame—like a boat. The best approach is to use very tall wheels and mount the axle to the gunwale (top rim of the boat).
- Now YOU think up something entirely different!

illustration by: Duane Flatmo

Welding

Most builders need to weld something. You can take the pieces to a local shop and have that done. You may even recruit the guy as a sponsor or partner while you are at it!

But a small welder is not expensive and is easy to use. Beginners should probably buy a MIG welder—also known as a Wire Feed welder. The smallest use Flux Core wire, requiring no shield gas bottle. But these welders tend to be a bit wimpy. Full fledged MIG welders use a bottle of inert gas to shield the molten steel from oxygen during welding. They are reported to be quite easy to learn.

An oxygen-acetylene torch set is a handy thing to have. You can weld stuff, and also heat things for bending.

A good old fashioned "stick" arc welder will work, but tends to burn thru thin steel rather easily.

Top of the heap is a TIG welder, which can also weld aluminum, but it cost quite a bit, and requires some skill.

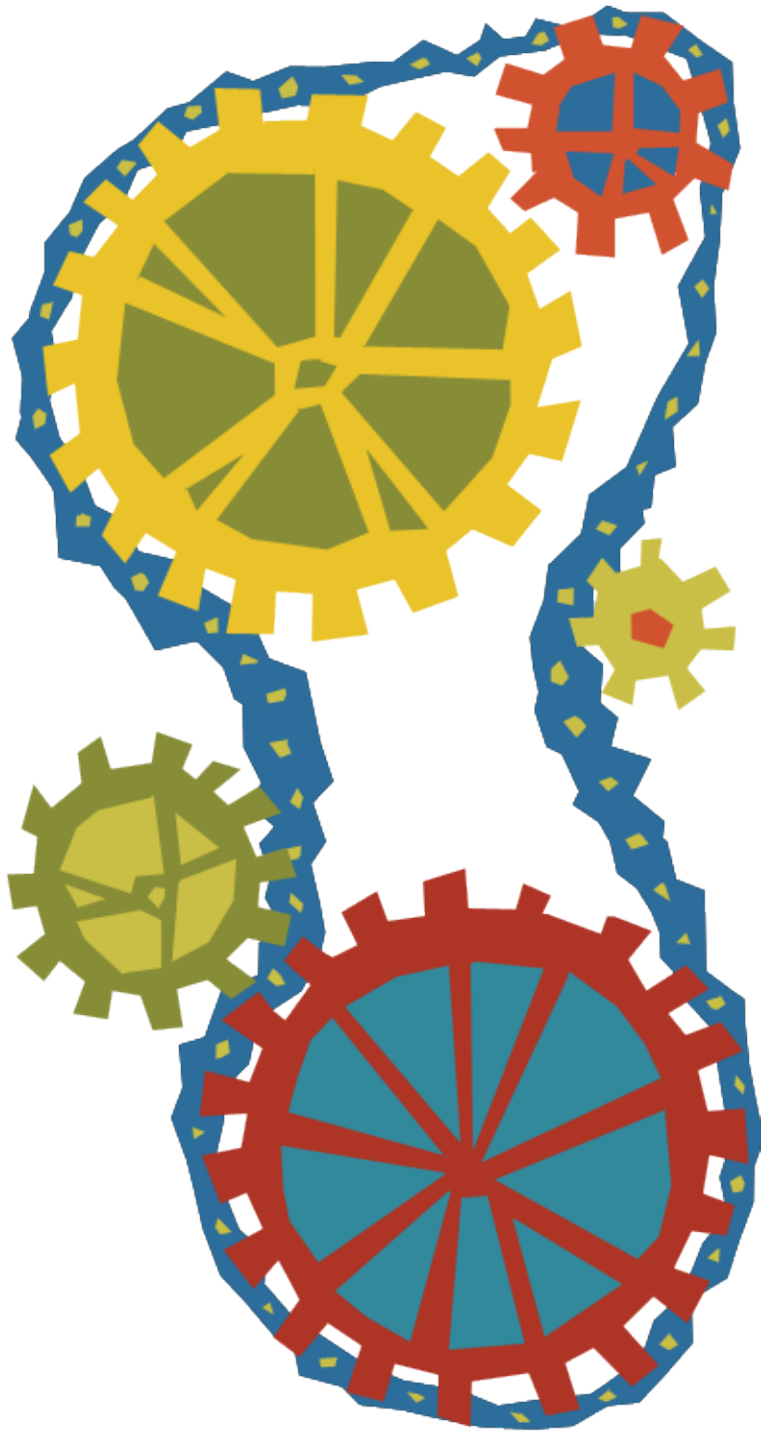
Brazing, with an oxyacetylene torch, works very well.

Buy your welding equipment from a welding supply store—not a "civilian" store. You want to pay the extra buck for the knowledge.

Non-Welding

Lots of stuff can be bolted and riveted together. This writer buys 1/4 inch bolts by the pound in every length offered, keeps them separated in a gazillion old oil cans, and uses them as the Universal Fastening Thingie. And always Ny-Lock nuts that don't fall off!

Rivets also work well. "Pop" is a brand, but of course, everybody calls all blind rivets "pop rivets." Get them at a commercial fastener store—much better strength than the "housewife grade" rivets in the hardware store. Invest in the best quality tool they sell—it's worth it.



Machine Work

If you have a lathe and such machinery in your garage... then you are not reading this. The rest of us make friends with a local machine shop. It's amazing how many problems can be solved with forty dollars worth of turning or milling. Again, recruit the guy to your team. He'll love to show off his handiwork which is normally hidden under tons of machinery at some factory.

Wheels

Kinetic Sculptures run on pavement, dirt, sand, mud and water—and combinations thereof. So, fundamentally, they need wheels and pontoons.

Wheels, conveniently, are everywhere in our society. Anything round can become a wheel. This writer is fond of the big old satellite dishes people used to have in their yards to watch television from Mars.

Barrels are used as both wheels and pontoons on several successful contraptions. "Keep it in the back of your mind" and keep your eyes open on your travels.

Important: Wheels work better the larger they are. Don't even consider anything of smaller diameter than bicycle wheels. And you need width to roll on sand, so use "mountain" bike tires, and lots of them. But look for other kinds of wheels first—bicycle wheels are so common. And not real strong. Kinetic Racers use the word "taco" as a verb. A bicycle wheel will taco if it suffers too much sideways force.

If you are more accustomed to working with wood than metal, consider building wheels from plywood—it's been done very successfully.

Bicycle wheels can be assembled side-by-side into strong units that can roll on sand. You figure out a common axle. Use new thorn resistant tubes with Slime in them—you don't want a flat in the middle of five tires!

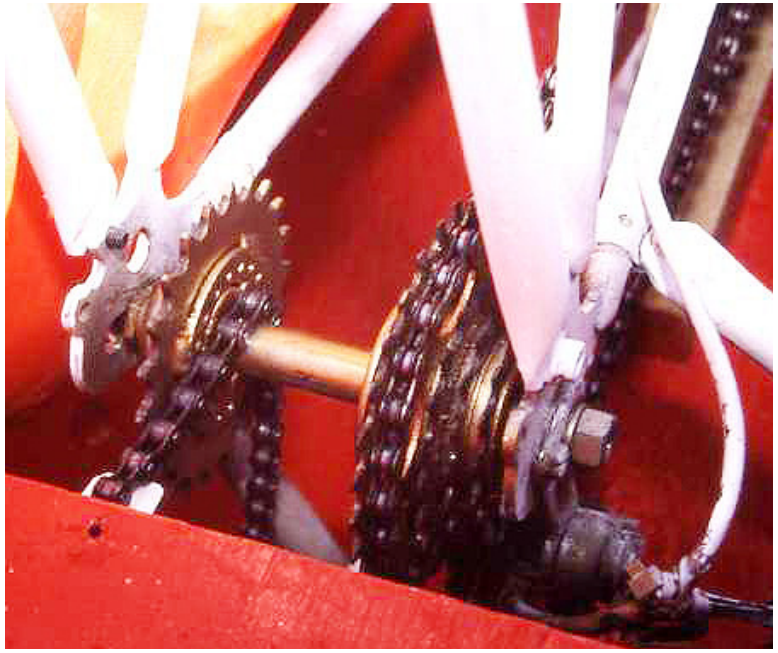
The darndest wheels ever built—Dave Hershberger's fabulous Unwheeldy.

Chain, Chain, Chain—Chain of Fools

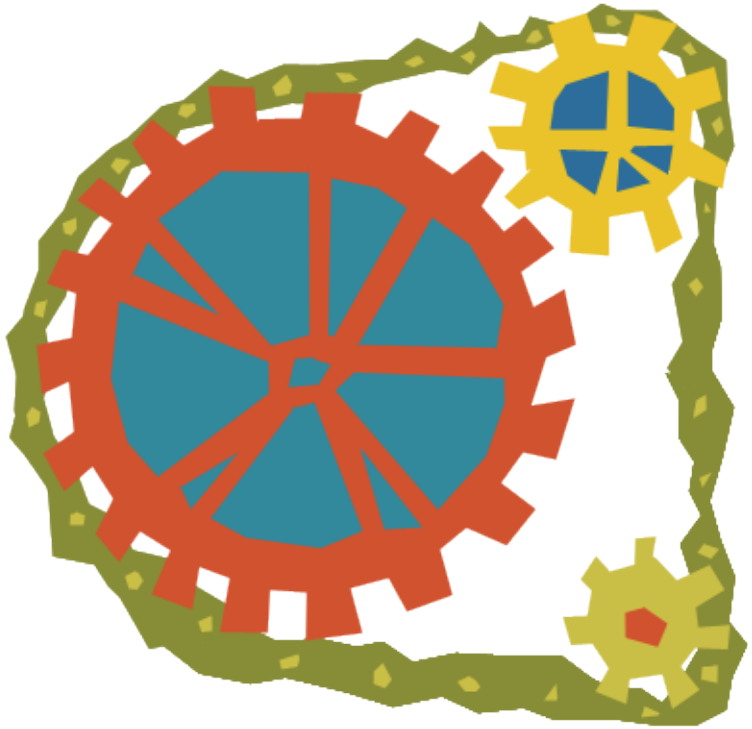
Bicycle chains are a bit flimsy and tend to skip and break. You can manage by building your Contraption light, which is a good thing anyway.

There are several kinds of bicycle chain.

1. The narrowest is the kind that is used with derailleur gear shifting. This has no master link and must be assembled and disassembled with a chain "breaker" tool.
2. Next is single speed chain—also used with hub gears. This uses a master link, which can be installed and removed with any improvised tool like pliers, screwdriver, pocket knife, although you'll still need a "real" tool to cut the chain to needed length.
3. Then there are stronger versions of single speed chain, used by the BMX kids. Availability may be iffy, as these are "fashion" items.
4. The next step up from bicycle chains is industrial/agricultural chain. Remember to ask for Roller Chain, so you don't get the kind you wrap around the tires on your car, or the kind to lift the engine out of it. One size you may want is "Number 40" since it is most readily available. #40 chain is also common on motorcycles. Which means you may be able to use motorcycle wheels, with #40 sprockets already on them. Now you're catching on!



Misaligned sprockets caused this team endless derailments.



Motion transfer methods other than chain have been used. Yes, successfully. Hint: There are no chains on a steam locomotive, yet it goes with gusto.

On the subject of chains, you might come up with a drive arrangement that works OK except that it turns the wrong way. Many racers have solved this by running the chain in a figure-8. It's not ideal, but it works. The tight side must still be straight, and you run the slack side in a gentle zig-zag with plastic guides. The best guide may be a length of plastic pipe, like the lawn-sprinkler stuff. The plastic will wear quickly, but is so cheap that you will be laughing when you replace it after each race. If the chain is long, you may not need a guide at all—some racers just let it rub, and it lasts a season just fine. If the chain is v-e-r-y l-o-n-g, you'll need guides again to keep it from whipping off the sprockets like a run-away jump rope.

We could talk about chain sizes for a long time—which we don't have here.

Do not try using V-belts—too much friction. But cog-belts can work.

Axles of Evil

Remember the infamous Axis of Evil? The year that phrase got around, a Kinetic entry showed up named Axles of Evil.

Axles and shafts can be made from many things. (An axle is a shaft that has a wheel on it.) Once again, I must emphasize that you are supposed to be inventive, try weird ideas, fail a lot, and make use of recycled components when possible. Along those lines, the shaft and bearings in a swamp cooler or other furnace/ventilation "air handler" might work very well.

Those of us who are lazy just go to an industrial supply store and buy new shafting and bearings and hubs and such. The most likely place to find such a store in the Yellow Pages is under Power Transmission Equipment.

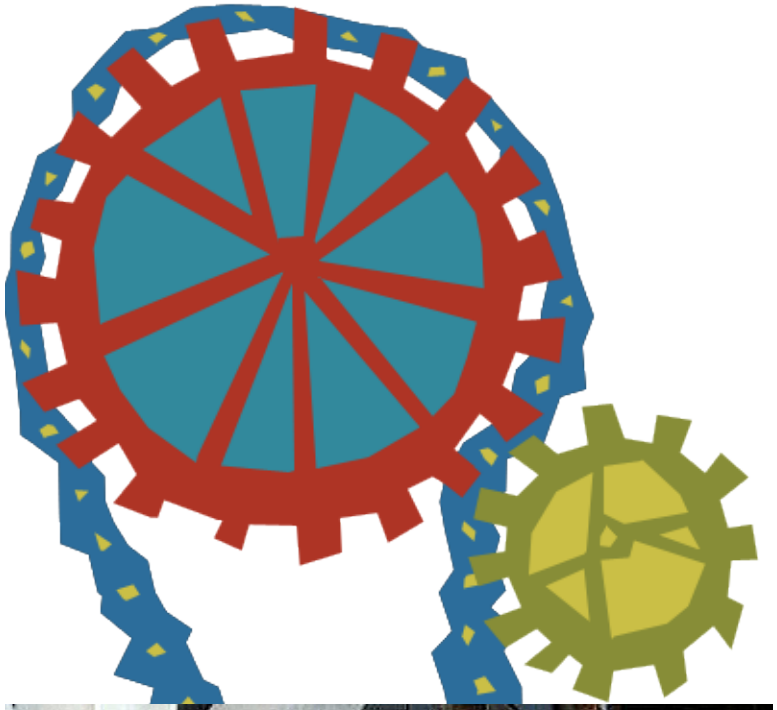
The way you mount something to a shaft is with a hub. The way the hub stays still on the shaft is with a key. A key is simply a little square stick of steel that sits in a groove called a key-way. Actually, there are two key-ways, one in the axle and one in the hub, and the key transfers the power from one to the other by being in both at the same time.

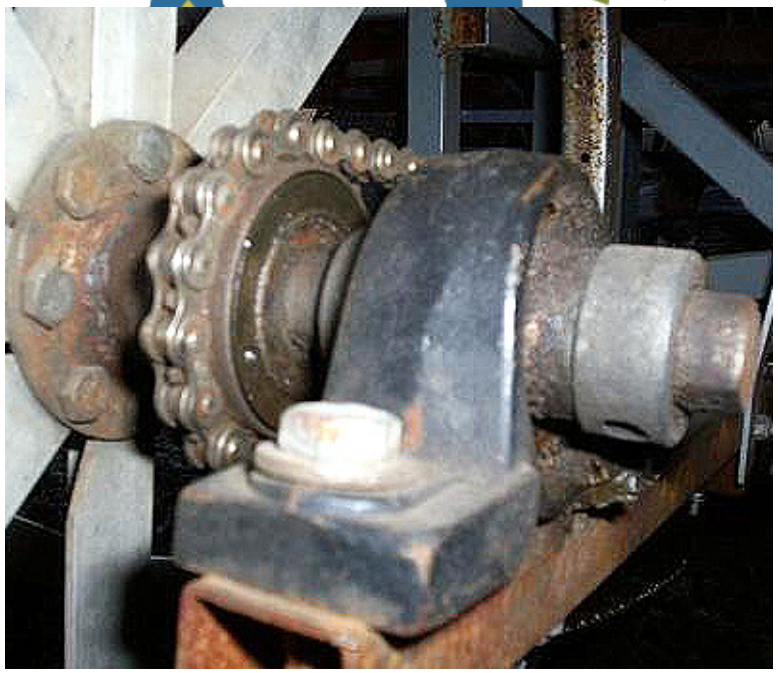
If you scavenge the major components, but have no key, just go to the nearest hardware store and ask for key stock.

A really handy type of part is the mix-n-match, weld-it-yourself kind of hubs and sprockets. One brand is named Weld-a-sprocket! These can be found in farm and ranch supply stores, since farmers often repair their tractors and implements themselves. Walk into any Tractor Supply Company store, find the tractor and implement parts, and drool.

Bearings

Bearings can be purchased ready mounted in handy general purpose housings/brackets. The two most popular kinds are Pillow Block Bearings and Flange Bearings. You just bolt them to your frame.





The big Omega shaped lump with the bolt thru the front of it, is a pillow block bearing. The other bolt is on the other "leg" of the Omega.

Sprockets

There's a lot of stuff you can do with bicycle sprockets. By the way, the one up front at the pedals is called the Chain Ring. The cluster of several sprockets on the rear wheel is called a Cassette. Bicycle chain is half-inch pitch—the length of one link, and so is that #40 motorcycle/industrial chain. So you can sandwich two bicycle sprockets together and run a #40 chain on it.

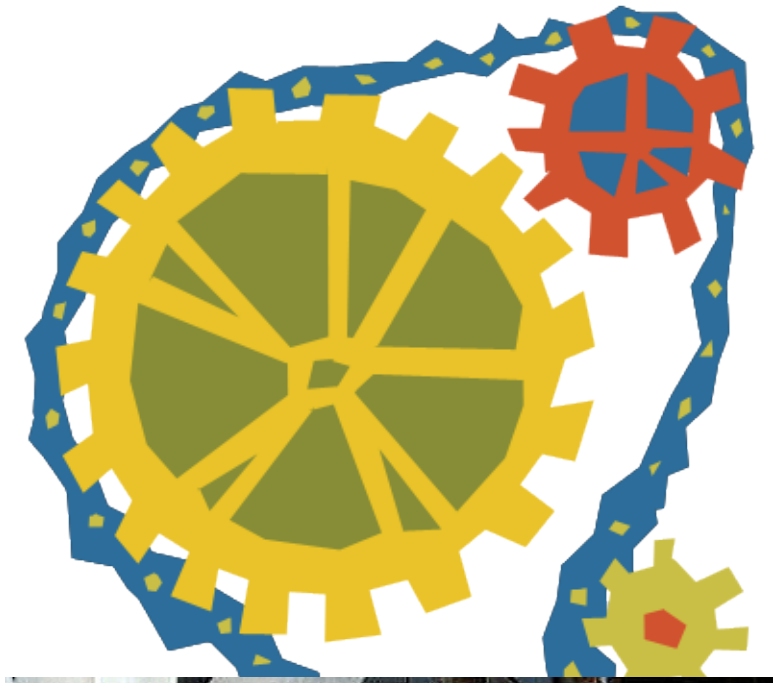
Freewheels and Adapters

You must have a freewheel—or several. Each pilot must be able to hold his feet still while the vehicle keeps rolling. If the pedals keep flailing, the pilot will soon need new feet. Mostly, we use bicycle freewheels, which are part of the bicycle rear wheel. The BMX one speed freewheels come in different number of teeth.

To install that freewheel on a shaft, you will need some sort of adapter. You can weld something up using the threaded part of a bicycle rear wheel. Or see if J&B Importers still have them—many bicycle shops carry the J&B parts line. Adapters for three-quarter-inch (3/4") shaft are currently hard to find, but try Staton, Inc. also. Worst case, have a machine shop make them. Blueprints are available free from Yours Truly – *Elliot.naess@att.net*.

In the picture, counting from the left to right you can see:

- Paddle-wheel spokes made of 1" aluminum angle bolted to a home made flange on a Weld-A-Sprocket hub,
- BMX bicycle freewheel on an Adapter - this is the one with chain on it,
- The pillow block bearing that it all lives in,
- A small gray shaft collar, helping the shaft stay in place, and the tip of the three-quarter-inch (3/4") shaft.



The big Omega shaped lump with the bolt thru the front of it, is a pillow block bearing. The other bolt is on the other "leg" of the Omega.

Floatation

Archimedes, founder of Eureka, was right—anything can float if it displaces more water than its own weight. Do you think a battle ship is light?! Yet, it floats. All you need to do is trap enough air and hold it under water. This air can be inside each of the millions of little bubbles in a slab of plastic foam, or it can be in one large glob inside a boat hull.

Design

The fundamental concept is that one cubic foot of water weighs about 60 pounds. So to make a 600 pound vehicle float, you need MORE THAN ten cubic feet of pontoons. Yes, MORE THAN. You need plenty of margin—I think boaters call it freeboard—or you WILL tip over. The moment the outer edge of a pontoon goes under water, you are going swimming. A 600 pound vessel—300 pound vehicle and two 150 pound pilots—must have something like 15 cubic feet of floatation to be safe and reliable.

You also need the floatation to be widely spaced on the vehicle. Remember the first time you tried a kayak? Yep, the very first thing they teach in every kayaking class on Earth, is how to escape from an up-side-down kayak. Putting all the floatation under you will not work in Kinetics. You must have floatation outboard of the weight to avoid tipping over.

As for pontoon materials, that is all about balancing weight against reliability.

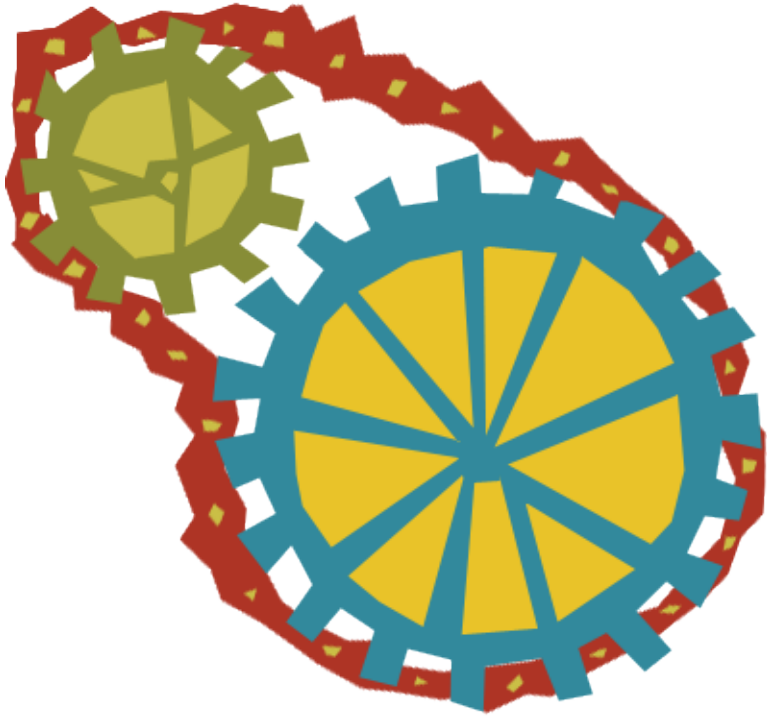
Foam Pontoons

There are two kinds of foam. And many varieties thereof, but I'm thinking of solid foam and liquid foam.

- Solid foam like polystyrene (Styrofoam) is cheap. Buy it from insulation dealers. A common product is Dura-Float, in 8 foot x 2 foot x 9 inch size.
- Liquid foam, like Tap Plastic's X-30, is expensive. To use the liquid foam, you mix parts A and B, quickly, and pour into... something. A chemical reaction generates gas bubbles and the stuff expands 30-fold before it solidifies.

Foam needs to be encased in something so it doesn't break up—several coats of paint at the very least.

Plenty of floatation—right under the middle.



Hard Pontoons

Once you encase foam in something strong like fiberglass, you have a hard pontoon. A foam filled pontoon. But even foam weighs a little bit, so a hard shell pontoon full of nothing but air is a good thing. These range from drain pipes with caps on the ends to commercially manufactured pontoon-boat units.

Keep your eyes open for kayaks, canoes, barrels, boats, water tanks, bath tubs—whatever! You will move much easier thru water if your "ship" is long and slim like a canoe rather than wide and squat like a barge. Putting wheels on a boat can work well.

Rolling Floatation

It also works well to combine wheels and pontoons. "Drum Roll", one of the most successful Kinetic Contraptions on the Planet, both rolls and floats on three 55-gallon steel drums.

Inflatable Pontoons

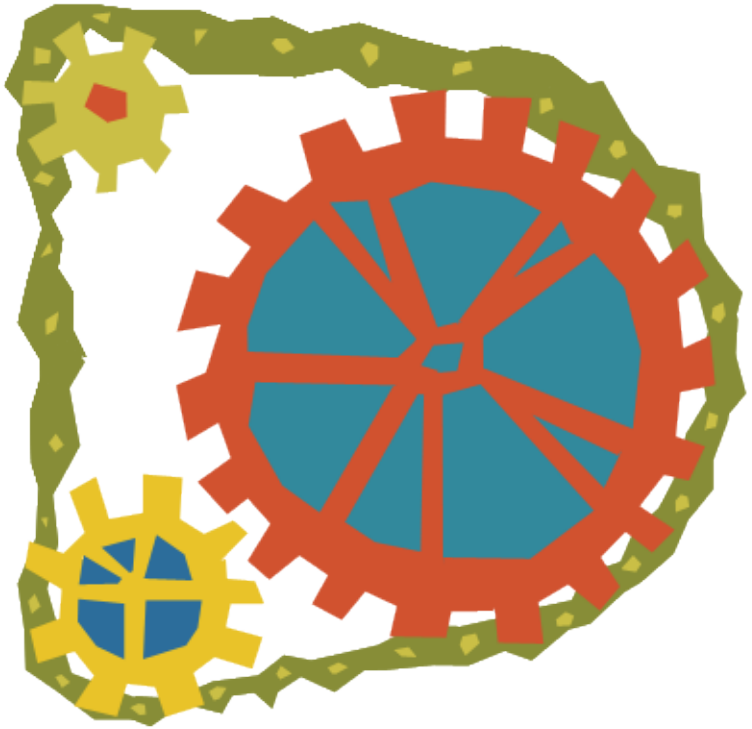
Many racers use inflatable pontoons, like rubber rafts and inner tubes. With a strong budget, you may want professionally manufactured pontoons—the top-of-the-line brand is probably Wing. Other racers avoid inflatables since they can pull that Titanic Trick rather easily. But they sure are light and can be stowed away. Inflatables can also be "dumped" (deflated) in motion for water exit—a great tactic that we will talk more about later.

Water Propulsion

Off the top of my head, I can think of four ways to move forward in water: sail, oars, propellers and paddle wheels. (Yes, sails are allowed.) It is perfectly OK to simply sit on your contraption and row or paddle with oars. In fact, this may be the way to go for a beginner with minimal mechanical experience. When you are ready for another design challenge, then you add a propeller or paddle wheel.

Often, the road wheels can serve as paddle wheels simply by adding paddles to them. Oh, the depth of this thinking! This is perfect for plywood wheels. But you need to plan this from the beginning—or be real lucky—for paddle wheels are, in spite of their visual simplicity, very dependent on correct design. The trick is that only a small

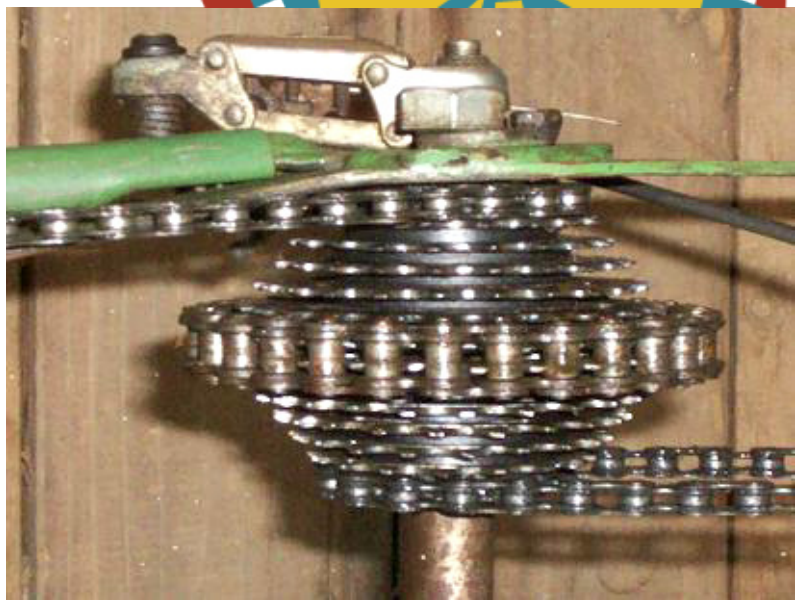
Drum Roll travels sideways in the water, minimizing the water resistance of the wheels/pontoons, and eliminating the angle drive for the propeller. Dig that prop wash!



part of the wheel can be in the water. This works just like a wheel rolling on land—if a two foot tall wheel encounters a solid object that is one foot tall, forward motion will stop. Almost the same in water—if the water is up to the axle, you will mostly churn butter. Propellers work surprisingly well. When I discovered this sport, I figured that a propeller needs an Evinrude in front of it to work at all. Not so. But the Evinrude prop won't work very well for our purpose. Most racers report best success with long, skinny propeller blades, including model airplane props. The hard part is coming up with the drive mechanism, which may require a 90 degree turn in the shaft. Such a bevel drive is often scavenged from a power tool like an angle grinder.

Gears

Life is not perfect. None of us get thru it without some heartbreak, illness, accidents, rained-out garden parties etc. Love seems to trip a lot of us up. In Kinetic Sculpture Racing, the tough part is often Gears. Most people use bicycle parts, and sure, derailleurs can do the job. I think Lance Armstrong uses them. But derailleurs also malfunction a lot, since they are not meant for the abuse we dish out. Just listen to the word—"de-rail"! Oh boy, do they ever. A key point is to keep the sprockets perfectly aligned. Bicycle wheel-hubs with built-in gears reduce the derailing problems, but they are rather fragile. The old Sturmey-Archer-style three speed hubs are too weak for any use. There are brand new multi-speed hubs as close as your nearest bicycle store, and they are stronger than the old three speeds. But you may never find these in thrift shops.



Bizarre gear and chain and sprocket arrangements are... not so bizarre in Kinetics.

Gear boxes from power machinery can be adapted to our purpose. Look at lawn mowers, motor cycles, appliances, factory machinery and anything else you can find. But most such solutions will require multiple units in series to get enough spread between the highest and the lowest ratios.

Some racers move chains manually from sprocket to sprocket. No, not while rolling! It's slow, and not elegant, but it works, and there is no limit on how big a change you can make.

The Ideal Transmission remains the holy grail of Kinetic Engineerians. Let me know when you find it.

Steering

At the modest speeds we run, almost any kind of "hinge" in the vehicle will serve to steer it. But make the mechanism sturdy. And test it thoroughly in an empty parking lot so you know how it will behave when you try to make a sharp turn at high speed. After crashing savagely once, determine a lower maximum speed (see also "brakes").

To aim higher, you can study the steering geometry of vehicles with the same number of wheels.

On a cycle, look at how the front fork slopes forward. This prevents the "shopping cart wheel wobble." On a car or lawn tractor, note how the king pins are angled the same way. Then look at how the steering arms on the spindles are angled so they form two lines that meet in the middle of the rear axle. Very important. Google "Ackerman Principle."

You can have the steering at the rear, but it tends to be less stable at speed. Many Contraptions have the steering pivot in the middle, like some large construction, farming and mining machinery. This works fine, and allows you to have four wheel drive with straight axles - no complicated u-joints. And four wheel drive is good.

Brakes

You must have good brakes! Not in the sense that the thing can stop on a dime like a modern automobile, but so that you can reliably keep it under control on any down-hill under any conditions you will encounter including drenchings from rain and water crossings. A stout lever that rubs directly on the tire like a stage coach works well. Cute little go-cart brakes do not. Think "leverage."

Suspension

You don't need much in the way of suspension. And with a two-wheeler and a three-wheeler, you don't need any. But with a four-wheeler you should have something that keeps all four wheels on the ground over uneven terrain. A pivot in the middle of an axle, like on a lawn tractor, works fine. If you steer by a "hinge" in the middle of the vehicle, remember to include a way for it to twist, or the whole thing may break apart from being forced to run on three wheels.

The Henry Ford goes aquatic

Basically just a lever that rubs on the tire, stage coach style, works well.

Safety

Having mentioned brakes, I suppose we should devote a paragraph to the rest of the safety aspect of humans with dependents hurdling into lakes and rivers atop back-yard-built contraptions on wheels.

It's truly not as dangerous as it sounds. The real danger is in the philosophy, just as Thoreau was considered a very dangerous man. And of course every body wears a life jacket. Maybe even helmets.

And the organizers always have a couple of boats patrolling for sinking contraptions. Still, keep in mind the immortal words of veteran Kinetic Racer Allen Brown, after a particularly nasty struggle with a leaking pontoon: "Sinking would be so... unseemly." Just use common sense, all right?

You will suffer countless cuts, nicks and bruises, mostly from repairing your machine along the way. And you will wind up with muscles so sore you can barely walk for two weeks. That soreness is an exquisite feeling, I can assure you—to be savored more than any trophy.

Be sure to check the rules for the race(s) you're entering for the actual safety requirements.

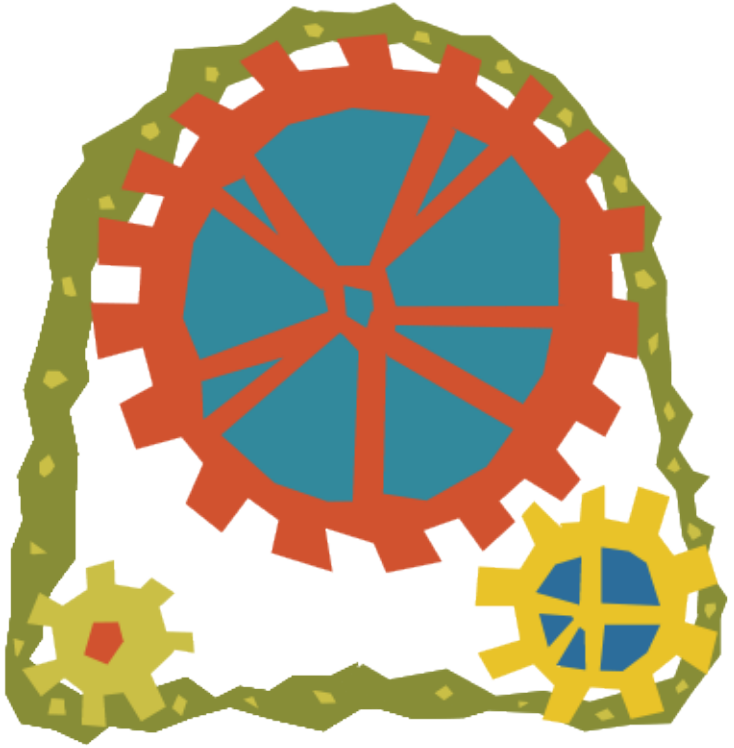
Safety Third! Drum Roll narrowly escapes a shark attack.

Art

Oh, my. Do not call 911—this is art. Oh, wait—that's Pageantry. Or bribing the Judges.

Art is the decorations you strap onto your Machine after it has been proven to actually go—and maybe even float. Your Art can be any-darn-thing-you-want—so long as it is G-rated. The Art should be light weight. And it should be colorful—in every sense of the word. The art materials are even more up-in-the-air than the mechanical bits. Most folks are much better at decorations than at mechanical gadgets, so there's just going to toss a few stray thoughts out here, and I know you will manage very nicely. Then come help me with my art. I could use some.

----> See next page!



Art (continued)

- Papier-mache over chicken wire. You thought you'd never need those skills after grade school, did you? Yards and yards of chicken wire. Gallon jugs of yellow glue. Paper towels by the case. Cover with waterproof paint. Yee-hah!
- Clothes dryer vent hose—cheap, light and flexible—makes great octopus tentacles.
- Cheap cloth from the 99 cent store is the lightest body material for your giant safari bus.
- Electrical conduit will support all that stuff without suddenly snapping off like plastic sprinkler pipe has been known to do. Clamp, bolt and tie the stuff so you don't have to weld it.
- Hose clamps are great for fastening all kinds of things together.
- Paint. Glitter. Feathers! It's a Giant PigaSaurus!
- And if your Giant PigaSaurus farts when you push a button, so much the better—at least for all the eight year old boys watching. And for the Judges.

Jack Ass, a Grand Champion, was a one season art work of chicken wire & papier-mache, on top of a proven chassis that gets redecorated every year.

Consolidated Art, Incorporated

There is a second way to do art. This is to incorporate the shape of the desired object in the chassis of the Machine.

That means you cannot pull the PigaSaurus off after this year's race and slap a river boat on the chassis next year. Instead, you get to become an icon of the sport.

The best example may be the USS Yellow Submarine. The sub is retired now, but for many years it was the most recognizable Kinetic Kontraption around. It was a septic tank. With three guys inside. A brand new, straight from the factory septic tank, mind you. It was fiberglass, shaped like a stubby sausage, and had assorted lumps that became perfect port holes and conning tower. They installed axles and wheels, and enough bicycle chains and derailleurs and pedals and stuff to choke a sea-horse, and a propeller out the back, and two big torpedoes that were actually pontoons for stability. "We all live in a...."!

Art and chassis consolidated—the USS Yellow Submarine cannot very well be anything else. Which may be a good thing.

Tactics

We'll be here all day, and not get any kontraption konstructioning done, if we don't wrap this up soon.

One word about racing tactics—about the maneuver called the Water Exit Pontoon Dump.

The Water Exit Pontoon Dump is performed by many teams at the edge of the water, just as the front of the vehicle bumps into the shore. The purpose is to disable the floatation effect of the pontoons so the wheels sink deeper and get traction of the bottom. Many teams without front wheel drive could not ever get out of the water without this trick.

Those with inflatable pontoons just pull the cork, and as the air whooshes out, the craft sinks and the wheels reach the bottom and they pedal out of the water—the wettest they have been on the whole water crossing. If they miss the approach after they pull the cork, they get even wetter, because then they are... are... yes, sunk.

Those with non-inflatable pontoons sometimes rig a mechanism that allows them to lift the pontoons for the same effect—without the possibility of terminal sinking.

And some have movable wheels, which serve the same purpose. That's when you start seeing some serious engineering and fabrication goodies!

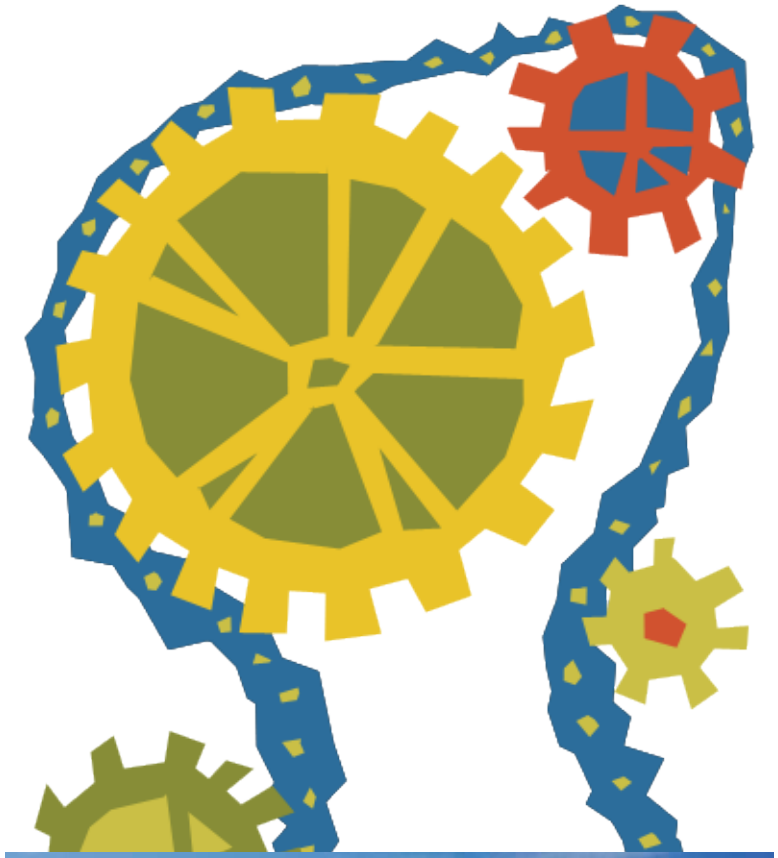
Sponsorship

All right, how do we pay for all this?

Well, the best financed teams are usually those that are paid for out of a business advertising budget.

If that does not apply to you, you could go out and find a sponsor. When talking to a potential sponsor, it is vital that you put your best foot forward in every respect. You are a salesman now; you live on "a smile and a shoe shine." What you are really doing, is applying for a job as your sponsors salesman. You must present yourself and your cause to the business owner the same way he wants you to represent him and his product in the marketplace.

Folks who own or manage businesses are often the "show me the money" types—a bit cynical. That's not a criticism—it's how they stay in business. So they don't necessarily



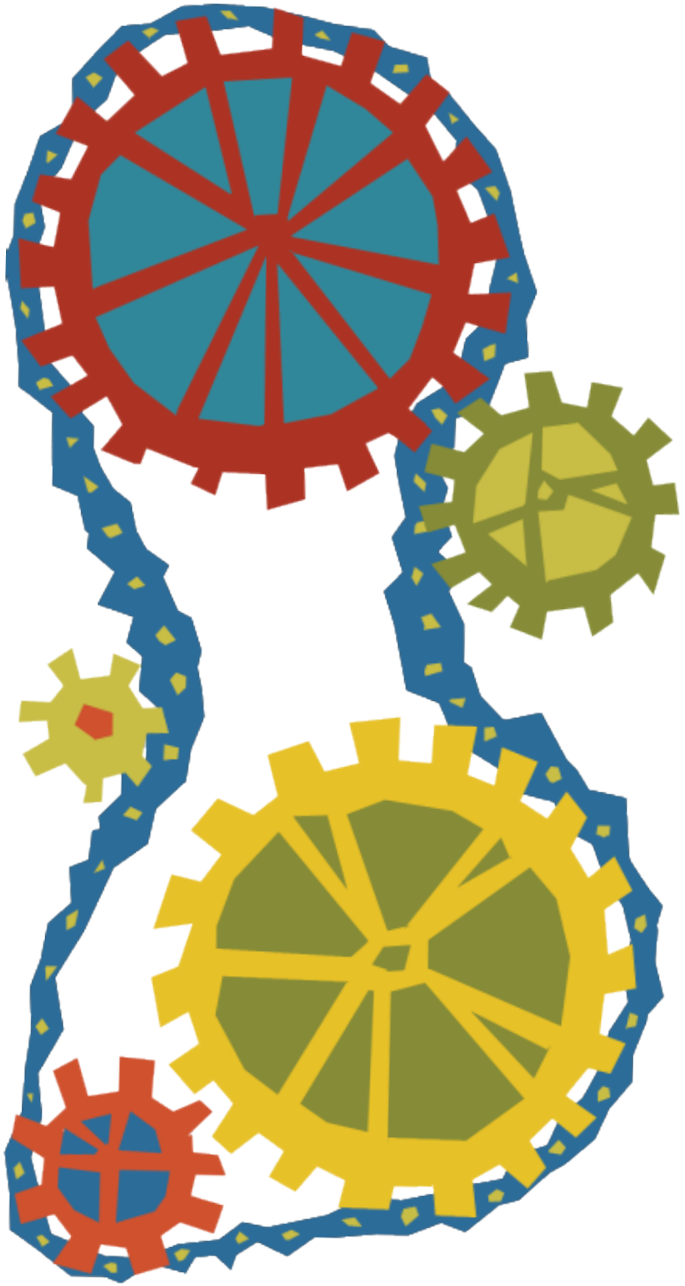
A coffee pot pouring coffee into a coffee cup? You bet, it's the Kinetic Koffee Company, a local coffee company advertising its product!

want you to kiss them. But they sure want you to kiss their potential customers, so you must project that chipper spirit. If that's not your style, recruit another team member for this task.

One approach is to start out talking about the race and him, rather than yourself. That is, recruit/invite/challenge him to build a Kinetic Sculpture and enter the race as the Acme Enterprises team—as if you work for the race organizer. Once in a while, you'll catch one. In that case you may not get any sponsorship for yourself, but the race will get another well-funded entry, and you will benefit tremendously from the overall success of the event.

If he says that he doesn't have time, then you switch to sponsorship for your entry—and he may be so glad to get off the hook for an entry of his own that he writes you a check on the spot! Or not. The point is, that the way to find sponsorship is to go out and talk to people. With a smile.

By the way, a tabletop model of your proposed Racing Sculpture is a great tool for recruiting a sponsor. Clip the sponsor's logo from an ad or off his web site, and paste in on the model. As big as will fit.



Next To Last Thing

Next To Last—like number 44 out of 45 entries—is a treasured finishing position in Kinetics.

The things you put your feet on to move the vehicle forward, are ***pedals***. Verb; to *pedal*.

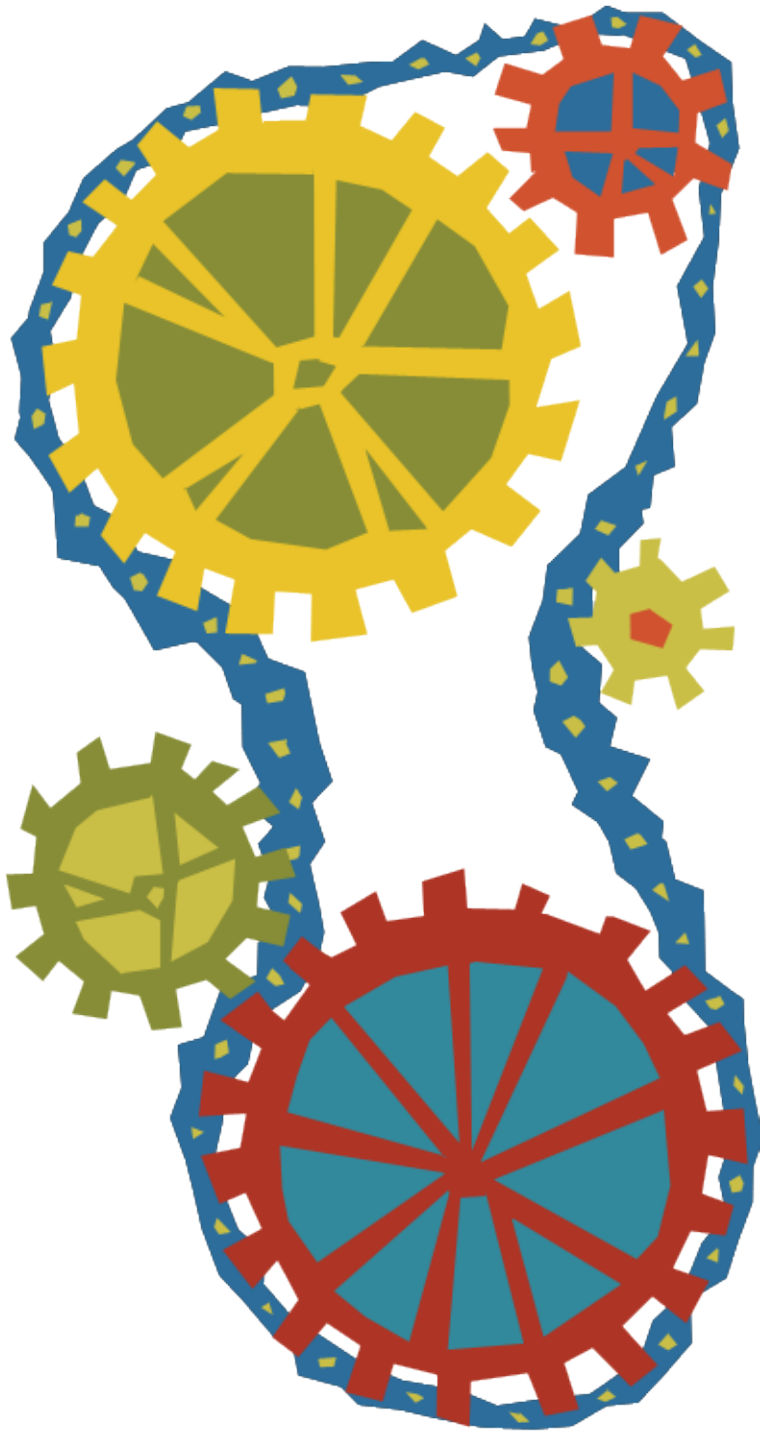
The things you hold in your hands to move the boat on water, are ***paddles***. Verb; to *paddle*.

To ***peddle*** something, means to sell the silly thing to somebody—probably for more money than it is worth. A *peddler* is a salesman. There is no such noun as a "*peddle*". Now you know more about English than many working journalists.

And the Last Thing

These "few paragraphs" must be rabbits, and we still have only scratched the surface. But I'm-a tellin-ya, once you start tinkering with this stuff, you will soon learn more than you thought possible, and you'll invent stuff that nobody else thought possible, and pretty soon you're a Kinetinut, or Kinetinaut, or some such.

For now, we'll slap this thing on the web and add, correct and otherwise noodle around with it when we feel so inspired. Your input is welcome—even encouraged! We don't offend easily. E-mail: ***elliot.naess@att.net***.



Go build something