

# LAI DBACK

RECUMBENT CYCLIST NEWS



Kent Peterson and his mixte-based homebuilt SWB 'bent "William Burroughs"

**Recumbent Homebuilder  
Special Edition**

# LAIDBACK

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## What I Did On My Summer Vacation

Since we're over the hump for the 1998 season, I guess I can say that it has been a tough year for the RCN crew. Our circulation growth is up nearly 35% over a year ago, but advertisers are canceling ads, and manufacturers have *not* been very attentive with our buyers' guide, press release, photo and test bike needs. I guess we can blame the overwhelming demand for recumbents this year. What this means for the RCN skeleton crew is a lot more work and longer hours.

In our rush to make up for being slightly behind schedule, RCN#46 turned into a bit of a disaster with a few mistakes (cover & title page photo info). A trike manufacturer had me on the firing line for my trike commentary and we were trashed by a UK reader on the internet. Somehow, they can't understand why I feel safer and more stable on a two wheeler here in suburban King County.

It was plain to see that I needed a vacation. Everyone around me knew it, too. Since my life's passion (bikes), career, hobby and sport of choice all converge on cycling, sometimes I just need to disappear for awhile. With the '98 schedule (terminal buyers' guides), this had not been possible. So, every July, we shut down the office for ten days, pack up the kids, dog, and bikes and head for the hills. We go to a quiet north Cascades mountain town and camp by a lake. My brother-in-law brings his dog and his fishing boat. My other brother-in-law and sister-in-law bring their kids, kids' friends, kids dog, and 4 x 4 with travel trailer, and our family communes with nature in a most American sort of way.

I make it a point of not telling anyone where I'm going. I don't check my email or voice mail. Our secret spot is on a Washington state tour loop—popular with cyclists, and a great mountain biking area. There are lots of scenic country roads and mountains to climb—a real cyclist's heaven. Last year I took my Rans Rocket; this year I took my wedgie Gary Fisher Alfresco Nexus 7 (\$300 on closeout) with sprung Lepper leather saddle (beater bike) as I'm doing some research on internal hub gearing. The city bike gave me one other vital benefit—the kind of anonymity that I was desperately in need of.

Besides daily bike rides and family camping fun, my other big thrill is to read. I love bike touring narratives. This year, I chose Stan Purdum's new book, Roll Around Heaven All Day. I also had Rob van der Plas' The Bicycle Touring Manual and Bicycling the Pacific Coast, by Tom Kirkendall and Vicky Spring. With family, dog, mobile cycling library, Fisher Nexus wedgie and the clean mountain air—I'm set. I can be a cycling enthusiast with the biz, phones, and email hundreds of miles away.

I finally talked the family into the yearly bicycling trek into town. It's a six mile round trip, though mostly up hill on the return. It was also 95° by 10 a.m. (heading towards 100°). Our plan was to stop at the espresso stand in town for an iced latte. The kids had their eyes on a candy store on main street. So we're standing on the main corner in this town in the quiet north Cascades when my nephew, Brian, says, "Hey Bob—a recumbent" and points across the street. Just then, everyone else sees the bike and points in unison. Marilyn yells, "Nice bike!" and gives a thumbs up. The rider rolls his steed across Main street. It's a Black Gold set up for touring (ooh, ahh). We exchange pleasantries. The rider says "Bob?" and comments about the unattended whiskers on my face (my attempt to be incognito). "I didn't know it was you until I heard your voice." He says.

So, it turns out that I know this guy. It's Jim Giles from Quilcene, WA on the last leg of his Maine to Washington tour—over 4,000 miles in 8 weeks. Jim had the look of a seasoned cycle tourist and was clearly having a good time. He had just come down a mountain pass, and would be climbing the last big pass on his tour. He'd be home in three days. He was excited that his cyclist friends would be coming out to meet him for the last day of riding. Interestingly enough, I had just received a post card from Jim the week before. This was really cool.

Jim's bike is very trick—a '97 Easy Racer Gold Rush Replica Black Gold with a 559mm 26" rear wheel, 406mm 20" front wheel, Magura hydraulic brakes, Zzipper fairing, rack and panniers. The extreme gearing, Magura conversion and trick extended cage front derailleur were immediately recognizable as the work of Zach Kaplan Cycles (and Conrad Oho). Jim said he's ridden 4,000 miles without a flat tire. Just as a precaution, he had just replaced the 406mm Comet the day before due to a slit in the tread. He said the bike performed flawlessly. In true Easy Racer style, the bike looked brand new—even in the final leg of Jim's transcontinental ride. Seems like a GRR set up in this format would make the ultimate touring recumbent. Let's hope Gardner Martin pays attention.

We talked for about twenty minutes. My family had all but disappeared to a museum up the hill. I needed to roll out, but needless to say, this experience made my day and made what I do seem real, offering a pleasant, yet unexpected, boost in my revitalization process. Jim and I said goodbye and he set off to climb a mountain pass, and I rode the three miles back to camp with my family.

Some other interesting experiences on my summer vacation included camping next to a group traveling in a 5th wheel trailer towed by a full size Peterbilt semi-tractor (downright bizarre, though highly entertaining) and a really neat conversation with a guy who lives in a bus with full solar power (the solar thing really set my mind a-buzz). Comparing Jim touring on his GRR "RV" to the crew in the semi and the 5th wheel trailer gave me a good chuckle.

Viva Recumbency, Bob Bryant



The cost of bringing a product to market far surpasses what one person could kluge one together themselves for. Our quest for product perfection and “newer is better” is not always the right path for everyone, though corporate America may have you believe otherwise.

It is okay to place different standards for commercially built bikes over what is acceptable for homebuilders. New uses for a recycled frame, U-bolts, hose-clamps and JB weld is exciting in the world of recycled ‘bent building, though put any of these items on a \$2,000 bike and you will have customers turn their noses up in disgust. What is the difference? About \$1800!

It costs a lot of money to build a bike for commercial consumption. There are middle-men all along the way with their hands out, and bicycles have comparatively smaller profit margins.

We’re all for a healthy ‘bent and bike industry. Manufacturers need to make a profit and so do the dealers. Dealers deserve a healthy margin, as a bike shop is not generally the key to fortunes. Some manufacturers barely make a living. I know one who admits to living on \$7K a year and another who lives in an RV.

The manufacturers deal with powdercoat painters, multiple component sources and trying to bring all of the cast members of the three ring circus into the big top all at once. As we have seen especially this year, that doesn’t always happen and results in long delays. Other manufacturers will hire more people to build, take extended trips to Taiwan to build overseas—which again slows the whole process down.

The cost of building anything comes with a train load of overhead. The actual cost of building a product may be as low as 1/3 of the final retail price—or less. If you want access to a ‘perfect’ commercially built product, you should be prepared to pay a retail price.

If you are *not* willing to pay the price—the easiest way to cut the cost of anything is to get off your duff, look for an angle, a deal, or do some work yourself.

### ■ THE BIKE YOU BUILD!

I have ridden every nice recumbent made, from suspended compacts to imported trikes. There is a constant flow of bikes through RCN. It’s fun, but it also has made me realize that the perfect ‘bent has not



*Remember Tony’ Licuanan’s CAT (RCN#35)? Tony took the amidship suspension seat out and made it into a low racer—RCN.*

been built yet. Besides making my living solely from publishing RCN, I am a ‘bent hobbyist. When I do find the ‘perfect’ ‘bent, I hope that it will be done with my own two hands.

### ■ YOU CAN BE A ‘BENT CHEAPSKATE

There are several ways to cut the cost of a ‘bent. We will split the list into homebuilders and retail sources. Here are just a few:

#### ■ HOMEBUILDERS

Be careful here. Plans and kits are a neat idea, but do a careful cost comparison, as once you add a factory seat, fork, handlebars, components and a paint job, you may be already out of sight—cost wise.

Here are some creative ideas for building a ‘bent that can help you get on the road cheaply.

✓ **Recycle Frames:** Build your own by recycling old road, BMX and mountain bikes. This is by far the least expensive way to get into recumbent bicycles.

✓ **Building Plans:** The great ones like Easy Racers and EconBent are no longer produced. They required old bike frames and parts. Want ads for plans are free to subscribers.

✓ **Building Plans II:** The new breed of building plans, like those offered by BenTech even offer optional frame tubing kits.

✓ **Half-Building:** Be your own ‘bent contractor. Source the parts, frame tubes, miter and jig

stuff yourself and when it’s ready to weld up, find a local guy to do it. Local welders will charge less than bike builders. Finding a buddy who welds is the best and may set you back a few lattes or a take-out Chinese food dinner.

✓ **Local Guru:** In every group there is a local guy who helps folks build bikes. Heck, Joe Kochanowski gave the Joetator away and he’s given away other bikes and frames as well.

#### ■ RETAIL DEALS

✓ **Manufacturers:** Ask the manufacturer about factory 2nds, repaired frames, or used bikes.

✓ **Manufacturers II:** Buy a frameset and strip down your old road bike or MTB for parts. (though keep in mind that some mfr.’s penalize frameset buyers with inflated prices to discourage frameset build-ups).

✓ **Last year’s demos:** Last year’s ‘bents are often considered passe and can be a bit soft on the market, thus good deals.

✓ **Yesterday’s Latest Greatest:** Supreme bargains can be had in 700c and 26/20 and 24/20 V-Rexi, square tube Rockets, first generation BikeE’s, Metro’s (I found a ‘97 21-spd. demo for \$650!) and anything with Suntour components (which most retrogrouches prefer).

✓ **Bikes that had mediocre RCN reviews:** These bikes can be soft on the market or sold in low quantities, and be good bargains. Small builders like to sell framesets and often discount them

(while others penalize frameset buyers).

✓ **Stale/Soft Product:** If you've seen a particular demo around the shop for awhile, talk to the owner about a deal.

Bikes that are built in large quantities or that are not perceived as the best can often be found at half their new cost—slightly used.

✓ **Used 'Bents in unlikely places:** Hypercycles, ReBikes, Turner, S & B, often low end or regionally built 'bents can be had for a few hundred bucks if you are in the right place at the right time. Our S & B Beach Cruiser was recently in the paper for \$375. Thousands of Hypercycles were built and show up at swap meets and garage sales. We even heard of a mint Avatar 2000 purchased for \$200 out of somebody's basement.

✓ **RCN classifieds** are a great place to find parts and used bikes. However, it is not always the cheapest place. RCN readers are educated to the values of a used bike. If that bike is in demand, the price will be higher, though I've still heard of a few local Tour Easys selling for \$500!

✓ **Local Media:** Traders, Recycler's, Freebie newspapers, local bike club newsletters (two of the Tour Easys came from club newsletters) are all great sources.

✓ **Clubs:** Some great bikes and deals are found within local bike clubs and recumbent rider groups. You'll never know about these unless you make yourself known.

✓ **2nd Hand:** You may get lucky and find a 'bent at a 2nd hand store, swap meet, or 2nd hand bike store, but this is rare.

✓ **'Bent-A-Holic:** Everybody knows one. Somebody who goes through bikes like other people do underwear. The deals can be great—and the bikes exceptional as these guys are usually the pickiest of customers.

✓ **Internet:** Check out the HPV For Sale list [www.ihpva.org](http://www.ihpva.org) or [www.bikeroute.com](http://www.bikeroute.com) for online recumbent classifieds. Even America Online has a used 'bent section.

## ■ LOW-TECH IS CHEAP

Once you have a good frameset, you must choose between expensive high-tech stuff or cast-offs or parts taken from recycled bikes or wedge donors. Here are some simple rules:

**1. New technology is expensive** and is not as diverse in how it interacts with other components. Mixing and matching is becoming more and more difficult these days, especially if you require 24 or 27 indexed gears.

**2. New technology is disposable.** For the most part, it has taken the high quality (last forever?) out of bike components and built them with planned obsolescence as the goal. This is why the old Campy, Suntour and even Huret parts are highly sought after by retrogrouches.

**3. Indexed Shifting** is the single biggest money sucking technology on your bike. It requires the following:

**A. A perfectly aligned frame.**

**B. Expensive drivetrain parts** that are supposed to work perfectly in unison.

**C. Expensive ramped chainrings** on your new current model crankset.

**D. Expensive shifters** that match your

derailleur, cassette, etc.

**E. Expensive "indexable" chain.**

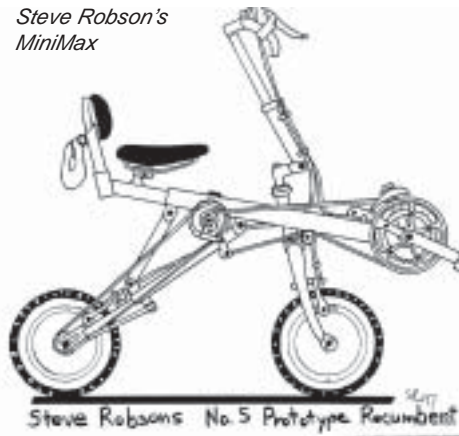
**F. Proper indexed cables and housing.**

**G. Constant and frequent adjustments.**

**H. Better 'bent hygiene** (clean your bike more often).

If you take indexed shifting out of the picture, you can use any brand of parts. Mix and match components to your heart's content: freewheel, crankset, derailleur, shifters, wheel spacing and your frame doesn't have to be perfectly true. You will have some extra time on your

Steve Robson's  
MiniMax



hands not worrying about perfect 'click' shifting, as well as a less stressful hobby and sport. Friction works with most every brand of part—though requires retro shifters.

**Indexed:** "Click-click....Ka chunk!"

**Friction:** "....."  
(silence)

With indexed, riders all around you will hear you shift and know that you are shifting. RCN's master recycler guru Kent Peterson uses friction exclusively. He was telling me last week that he needed a new rear wheel. Kent said he had a budget of \$160 (only the best for Rose Red). He went into a bike shop. The clerk asked him how many gears, spacing and then indexed or friction? Kent said, 130-135mm, 6 or 7 speed and friction. The guy came back with a perfect, and gorgeous new 26" wheel...for \$40. Why? The wheel is outdated with narrow spacing and for a FREEWHEEL, thus the great buy.

In the past two years we have had difficulty with modern indexed shifting on recumbent bicycles being ridden in extreme weather. The tough rainy season miles really take their toll on bikes. The road grit, grime and total soaking can equal more than a year's worth of use in a dry climate.

For rainy city commuters, the biggest problem with the indexed shifting is retaining an acceptable adjustment. Some local mechanics joke about how long a drivetrain will retain its perfect "new" shifting. The biggest culprit seems to be with the mating of the Grip Shift shifters and a Shimano derailleur. This, and the new 11-tooth cogs on modern cassettes, along with the weak spring on modern Shimano derailleurs makes for a system that doesn't like grime. On several test bikes with this drivetrain

combo, we lost our high gear (11-T), reducing our drive-train to an 18 speed, and one that doesn't indexed very well. So far, we have yet to find a solution to this dilemma, short of going back to friction shifting, and that is just what we have done with the '97 test Rocket. Many of our hard-core local riders now ride with friction shifting on their bad weather bikes.

I really do feel like I've been sold a bill of goods with modern bicycle drivetrains. They are seemingly designed for weekend warriors who use their bikes as toys. I am shocked and appalled that I have never read about this in any other bike mags. We are currently experimenting with internal hub gears and hope to have an article about them in the near future.

Friction systems do not revolve around high tech disposable plastic shifters with a dial to tell you what gear you're in, but a learned skill to judge the spacing between gears, shift and then trim to make it perfect. The fewer cogs on your freewheel, the easier this is. You can spend time perfecting your skill rather than driving to the bike shop where the mechanic gives you an annoyed look about your most recent high-tech whine.

Today's indexed parts are heavier than ever, and little progress has been made over the light downtube, MTB thumbshifters and bar-end (bar-con) shifters of cycling's past.

**4. The quest for more gears is a big waste of time.** We want range, not number of gears. 5-speeds was enough, six was cool, seven was fine, 8 gives me a headache, 9 will inspire a new cult of retrogrouch 'bent riders and 10 gears on the rear hub will lead to the demise of derailleur gears. The next thing we may see is bike shops charging \$67 per hour for 'scheduled maintenance' like your local car dealership.

**5. The Latest, Greatest, Newest most High Tech does not mean that it is the best:** KISS—Keep it Simple Stupid. The beauty of bicycles is in their simplicity. It's about how a basic human powered two wheeled vehicle can take us great distances with granola and apple juice (or lattes & round powerbars—donuts...) as fuel. Learn to work on your bike yourself and rid it of any component you can't fix yourself. Don't let the technoweenies dissuade you on this one. There are thousands, upon thousands of road bike, mountain bike, and city bike 'donors' just sitting in garages awaiting the lustful eye of the 'bent homebuilder/recycler. Five and six speed FREEWHEELS are still used on low end bikes today, made by Shimano, Sachs, Pyramid and others, and they are cheap, too.

**6. You Can't Buy Bicycle Performance!** Sure, the record breaking design, with race heritage, speed records, swoopy looks and a multi-thousand dollar price tag is very cool, but deep down inside we all know that training has a much greater effect on bicycling performance.

We don't need lighter, skinnier, faster, more expensive, we need more free time to ride (or rearrange your priorities), petition the powers that be to take cycling as a serious mode of transport, giving us safe places to ride without the plow-you-off-the-road, harried, toxic infernal combustion powered commuters living in

road-rage hell in their pollution spewing metal crypts. Many of these unfortunate souls see the cyclist as the enemy, and that you are making them slower, late and stressing them out even more.

#### ■ TECHNOWERNIE DISCLAIMER

If you must have the latest stuff, the best deal is the Shimano Nexave Megarange 11-34 ultra-wide range cassette. It's relatively medium level, fairly inexpensive and will work with other Shimano stuff, or you can use the Nexave derailleur and shifters. With this choice, you will need to go indexed—and deal with 8-speeds, so I don't know if the trade-off is worth it.

Just keep in mind that even the fancy stuff wears out and needs service and adjustment. One local recumbent commuter I know takes his maintenance-free cartridge bearings out of his Phil Wood hubs to squirt some grease in every so often. Aren't these supposed to be maintenance free? A good retro-rant on this subject can be found in John Forester's book, *Effective Cycling*. Mr. Forester mixes his own lube and converts his headset, BB and hubs to lube inject (Zach Kaplan offers this service).

If you like wiz-bang, there are lots of companies out there willing to cater just to the high-tech bicycle consumer. Bicycle components are on the planned obsolescence fast track to be outdated yearly like computer stuff. If high-tech is your thing, more power to you! I will offer RCN readers carte blanche to make your bike as fancy as you can with all of the most high-tech parts in the world.

#### ■ RETRO TENDENCIES & STUFF

My bikes have indexed shifting because that is the way they came from the factory. While writing this issue, I had the chance to put some miles on my old Rans Rocket which now sports friction thumbshifters (Kent replaced the Grip Shifts). It brought back many wonderful memories of simpler days of cycling. I would not hesitate to switch to friction and plan to build a retro'bent soon.

Those who know me are aware of my retro tendencies, though with



*Jerry Jacobsen build this "Jari-Rig" using a road bike rear triangle, steel main tube and 16" front wheel—RCN archives 1991*

this issue I've kind of come out of the closet. Don't feel guilty if you like nice stuff, or even indexed shifting—just become educated about bicycle components, learn how they work, and even better, how to fix them yourself. Develop your own personal criteria and standards for what you will allow on your bike.

Just remember, bicycles were meant to be simple and used as efficient transportation for work or play. Carefully consider what you plan to do with your bike and where you are going to ride it. Don't let the lack of bucks keep you off a 'bent. Improvise, recycle, don't be afraid to go retro. And if you have a super high tech expensive bike, build up a grungy bad weather beater/shopper to park next to it. Hey, if you don't want to ride it, a friend might. □

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# GET PRIMAL

*by Dan Kavanagh, kavanagh@freenet.tlh.fl.us*

Get primal, do not obsess about the details. If this is your first bike project, the largest obstacle is actually completing it. Try to remember that you are building a bike, not a Faberge egg. Use old Huffys and the like as they are easy to cut, bend and weld because the steel is soft and thick. Ignore naysayers and kindly givers of advice, for they are jealous of your initiative or likely never to have lifted a wrench themselves.

Let fly with all your wild ideas at once.

If 28" wheels, 7 of them all in a line with knobby tires and 328 gears with a butterfly steering wheel that you had been saving for a VW sand rail is your idea for the perfect 'bent, do not let anyone talk you into a conservative SWB design. Kill the lawn furniture in your quest for a seat, use that piece of water pipe for a top tube and attach it with 19 hose-clamps. Stick the frame together with a stick, MIG, TIG, brazing rod, silver solder, epoxy, sheet metal screws, pop rivets, JB Weld (Kent Peterson's

miracle epoxy of choice) and if all else fails use chewing gum. Believe me it *WILL* be rideable.....it just may take some practice runs.

If others call it ugly, ask politely to see theirs and return to your rust and can of Rust-Oleum. After all, the next one will be even better. □

*Dan Kavanagh is the chief mechanic and designer of the Daisy Mayhem tandem at Fools Crow Cycles in Tallahassee, Florida.*



**H**omebuilding covers a wide and diverse spectrum of people who build recumbents. The most famous homebuilders are Gardner Martin (Easy Racers), Randy Schlitter (Rans) and Grant Bower (Vision). These folks built so many bikes that they turned it into their business. With the exception of the new Trek recumbent, almost every other one started out being built by one guy in one garage.

Don't let any lofty recumbent manufacturers talk to you in a condescending manner. Nearly every manufacturer currently building a recumbent in the USA today was, at one time, a homebuilder—possibly right where you are today. They need to be reminded of this from time to time, as they ask you to part with thousands of hard earned dollars.

## ■ HOMEBUILDER QUEST

After riding many, many commercially built recumbents, I can say that the one I most want to ride is one that I build with my own two hands—the crowning achievement for the recumbent hobbyist.

These days, the homebuild crowd is actually split in two sections: “homebuilders” and “recyclers.”

BENTECH leads the way with the homebuild-plans/tube-kit sales. They advertise a simple philosophy and the plans provide exactly what is stated in the information provided. “The keystone of BENTECH's design philosophy is that the design be simple, functional and easy for anyone to build. To accomplish this, BENTECH has come up with plans for comprehensive welding jigs for seat and frame.”

My concern with the “simple philosophies” is that they look too hard to build for many people, especially those of us who do not have access to fabrication tools. As somebody who has dreamed of building for ten years and never done so, here are the questions I ask myself:

▲ **WHY** not use a rear triangle from an existing bike? Wouldn't this solve a lot of problems and simplify things?

▲ **WHY** not use a BMX frame? This gets a triangulation and since BMX is so hot, parts are readily available everywhere. I would think that this would be the absolute simplest way to build a recumbent—possibly a weekend project? I don't want to build a huge frame jig and I don't want to buy a welder.

Kent Peterson has become the local homebuilder guru and is the vision of a recum-

bent homebuilder master recycler working in his carport, or under the big tree in his yard.

## ■ POPULAR HOMEBUILDER TYPES

✓ **LWBASS**—This is Easy Racer homebuilder territory. These have made the Easy Racer into the world's most recognizable design. The plans are currently not available, though thousands have been sold. We run free want ads for subscribers looking for them. People Movers has plans for a similar bike. Steve Robson offers LWB plans in his plan book.

✓ **LWB USS**—Bentech offers plans and tube kits for a Vision/Linear-like design.

✓ **SWB**—Bentech offers the most complete SWB building plans ever done. They are concise, well-written, and will allow builders to create a SWB from scratch, start to finish. This is not a recycle project.

✓ **SWB-Wedgie Conversion**—This design requires the use of a road bike rear triangle mated to a monotube front end, and usually a 16" front wheel. This is an easy to build design, however, it often places too much weight on the front end. So, if you try this, plan on stretching the wheelbase out to at least 38". No plans are available.

✓ **SWB-BMX Conversion**—This is a natural as BMX bikes have a similar layout to 20/20 SWB recumbents. Many homebuilt SWB bikes are built each year in many, many different configurations.

We have seen booms welded on, clamped on—even with wood fasteners in the front of the triangle. This is a fun and quick homebuilder project, and most ride very nicely. In riding “Cheap & Ugly” (tested in this issue), I realized that a BMX ‘bent is very similar to a Counterpoint Presto with the 38-39" wheelbase, and the lower bottom bracket possible with this design makes it even more user-friendly than some similar commercially built bikes. Cheap & Ugly's drivetrain was quieter than our Vivo test bike. The BMX conversion can be done more easily than any other homebuilt project, and can easily be done in a weekend utilizing tips and tricks found in this issue.

✓ **SWB-Mixte Conversion**—This is *the* homebuilder design for the '90's. Kent Peterson, Lee Brown and Alan Amenta have had great luck with the mixte. They make great SWB and FWD recumbents. The weight distribution of the mixte is superior to the standard rear-triangle SWB, or BMX conversions which always are too quick handling...unless you flip them upside down. The mixte SWB is a homebrew V-Rex that anyone can build.

A mixte is a ladies step through frame,

usually with twin top tubes that run from the head tube straight back to the rear dropouts. These were sold by Peugeot, Motobecane and others throughout the '70's and '80's. This makes for a perfect mounting platform for a recumbent seat. Kent U-bolts, hose clamps and JB welds the SWB boom onto the mixte frame (see Kent's article in this issue).

✓ **FWD**—The Tom Traylor plans have been the best resource for front wheel drive plans for years.

✓ **FWD-Mixte Conversion**—This is the slickest way to build a front wheel drive. Kent Peterson's first mixte project was a FWD.

✓ **TRIKE**—Greenspeed and Crystal (Trice) sell blueprints/plans. Greenspeed sells mitered tube sets and all the parts you'll need. Steve Robson sells simpler trike plans and there are a few on the internet.

## ■ HOMEBUILDER PLANS

There are just a few plan sets still available today. BenTech sells monobeam SWB and LWB plans and now parts and frame tube kits. Tom Traylor sells his FWD plans. Both are excellent and will fuel the novice ‘bent builder fires. There is plenty of homebuilder action on the internet. Here's some to get you started:

◆ **IHVPA:** [www.ihvpa.org](http://www.ihvpa.org) (great links and learn how to get on the hpv mailing list).

◆ **Mark Matarella's recumbent site:** [www.recumbent.com](http://www.recumbent.com)

◆ **Steve Schmeck's Wood Recumbent:** [www.up.net/~manytrac/recumbent/htm](http://www.up.net/~manytrac/recumbent/htm)

◆ **Steve Robson site:** [www.xclelco.on.ca/~stevbike/](http://www.xclelco.on.ca/~stevbike/)

◆ **Beng's Bike Page** [www.web.singnet.com.sg/~ahbeng/bent.htm](http://www.web.singnet.com.sg/~ahbeng/bent.htm)

◆ **Bentech site:** <http://members.aol.com/domerie/bentech/htm>

More Easy Racer plan-sets have been sold than any other—making it quite possibly the most popular recumbent design in the world today. The Easy Racer was born of an old wedgie tandem. The tandem had a lady's style rear frame section with a low (mixte-style) top tube. Designer Gardner Martin realized that if he hack-sawed off the front riders seat post and installed a “Stingray” style laid back handlebar, he could sit on the rear section of the frame and pedal at the front riders pedals. The rear seat post was then removed and some old partially inflated innertubes were wrapped on the seat area. This was the first Easy Racer. We all know where this little experiment led.

## ■ FABRICATION

Okay, I'll admit it. I don't weld or braze. And I am not about to give you advice on it, though I will cover some of the ways in which homebuilders get their bikes built.

✓ **Learn to Weld**—Take a night course at a community college or have a welding friend give you some tips. Some welders come with videos and step-by-step info on how to do it.

✓ **Hire a welder**—Your best bet may be to find a local welder. You know, one of those guys who has a sign out in front of their house that says "Welding & Fabrication." They fix boat trailers, minibikes and anything that needs hot molten metal. They won't expect as much pay as a bike builder.

✓ **Bike Builder**—Some bike builders will be willing to weld or braze for you. Be sure you're jugged up as we've been quoted, "\$50 per hour" to build a recumbent—and that's no bargain.

✓ **Braze/Mapp Gas**—These portable welders have been used to flow brass onto recycled bike frames. They are affordable and, I am told, fairly easy to use.

✓ **Kent Peterson's Weldless** (U-bolt, Hose-Clamp and JB Weld)—Kent and I flunked out of brazing class. Ming Dinh's BMX wood/clamp-on boom is a neat idea for the non-welding/brazing builder (see photos on page 27).

✓ **Square Tubing**—It worked great for the first Rans Rockets and Tailwinds. They are far stiffer than their round tube counterparts. Square tubing makes mitering easier, though is heavier.

✓ **Muffler Moly**—You can hire your local muffler shop to bend you a piece of muffler pipe as the mainframe of your homebuilt. This was the basis of the EconBent from CycloPedia (no longer in business).

## ■ WHEEL CONFIGURATION

This is primarily dependent on what you are starting out with and your own preference as to wheel sizes. Most recumbent riders do have a preference. I prefer dual 20's, however, a 26/20 combo makes a lot of sense though 700/20 seems to be the fastest. Consider where you ride, your body weight and how many flat tires you have with your current bike in your decision making process. BMX technology is tough and inexpensive. Most bike shops have a supply of 20" parts (fat 406mm wheels).

Recyclers may be swayed by what's in the parts heap or what fits their BMX or mixte frame. Head tube angles can be adjusted by larger or smaller wheels and shorter or longer forks. Some may scoff at the mere thought of this, but hey, it's been done in the mainstream 'bent world for years. Lightning, Rans and Vision have all offered the same bikes with varying front and, in some cases, rear wheel sizes.

## ■ COMPONENTS

Retro-Recycle is the name of the game. Do the world a favor and dismantle a wedgie (I'm smiling...), look for upwrongs and BMX bikes at garage sales. If you want first class stuff, prepare to pay dearly. Our best advice for new stuff is to buy outdated parts. To make your life simple, forget about 8/9-speeds, cassettes and

especially indexed shifting.

Stick with tried and true MTB or road components from Shimano, Sachs or the ultimate retro Suntour. For those with style, the ultimate is retro Campy.

A word of warning—*DO NOT* mix new and used drivetrain parts (chain, cluster/cassette, chainrings) or you will have problems. This is the recycler's cardinal rule.

✓ **Shifters**—Twist grip style shifters were designed to get you back into the bike shop for indexed adjustments. None of these work with old fashioned friction shifting, so don't even consider them. The best shifters are as follows:

✓ **MTB Thumbshifters**—These are fantastic, have a friction option and are tough.

✓ **Bar-Cons** (bar ends)—The finest recumbent shifter ever made, available from Campy, Suntour and Shimano. All are great. The newer models have an indexed option.

✓ **Downtube** (clamp on)—Suntour and Campy downtube shifters with clamp-on mounts can be placed on frames, or ASS bar/stems and are the lightest shifters made. They last forever, too.

✓ **Derailleurs**—These miracles of modern man are the next closest thing to prying your chain from gear to gear with a stick—and we love them. Most recumbents require a long cage MTB or touring derailleur—the longer the cage the better (if you don't have a chain idler). Alivio, STX, LX, and XT all work great. Suntour's XCT, XCD, XC LTD and XC Pro are all fine and work especially well without indexing. Kent even uses some low end Shimano TY derailleurs from Target and they work fine.

Some derailleurs like the Huret Jubilee, DuoPar and Campy Rallye (long cage) are highly sought after. The Suntour MounTech is one of the best front derailleurs ever made for wide range 'bent gearing.

Suntour had these great drivetrains in the '70's. We didn't appreciate them then, but in these days of planned obsolescence—they bring happy thoughts. The VGT long cage shifted wonderfully. The Powershifter had small click detents and was a mock indexing. These were found even on pre-indexed MTB thumbshifters. The Powershifters are some of the coolest bike parts ever made. They generally shift and feel better than Campy or Shimano thumbshifters.

The fact of the matter is that in 'friction mode,' many of these older parts shift better than the new stuff. Try to find a wedgie 'donor' or a good source for used parts. Paying upwards of \$100 for a new set of derailleurs is unreasonable for a low-brow project like this.

Modern Shimano rear derailleurs have wimpy springs. You can upgrade them, though it's a hassle. If you do buy new, STX, Nexave and LX are your best bet for the rear and a 105 for the front (full size road triple). Don't get stuck with Microdrive stuff unless you've figured the smaller size chainrings into your drivetrain and gear range calculations.

The top of the line is for racers. Many of them get it free, and/or get new stuff every year. The Nexave has the same reverse pull rear derailleurs as the Gold Rush's XTR—which you

don't really need.

✓ **Internal hubs**—The Nexus are very slick and cool—and a mystery mechanism. They shift great, though have lots of very noticeable drag and they are a real hassle to remove when you have a flat—possibly the worst system for removal. Sturmey Archer 3, 5 and 7 speed hubs are probably your best bet. Sachs are also very nice as well and some have drum brakes. All are expensive, though there are millions of 3-speeds out there for recyclers. If you add one to a recumbent, Gardner Martin's trick is to leave the rear derailleur on as a chain idler, which allows you to spring the chain and use a front derailleur too.

The Sachs 3x7 has an internal 3-speed with a 7-speed cassette. It makes for a 21-speed drivetrain without the use of a front derailleur (or 63-speeds with). The 3x7's #2 gear is a 1:1 lockup, supposedly friction free. Gear #1 is a 27% reduction, and gear #3 is a 36% overdrive. This system works fantastic and is near bullet-proof. However, it is heavier, more complex and there is some friction loss (a few percent) in the over and underdrives. Whether you'll notice this is another story.

✓ **Freewheels** (not cassettes)—Steer clear of the cassette thing unless you have to. First, you don't need 8 or 9 gears. There are plenty of 5/6/7 speed freewheels available and they still come on cheap new bikes. The fewer the cogs, the easier they are to friction shift, trim and finesse.

✓ **Chains**—We're still fans of Sachs chain—recall and all. The new chains with quick link is phenomenal. We've heard KMC is improved and haven't had any KMC woes as of late.

Friction systems do not require the world's best chain. I suggest keeping it clean and fresh, and use your personal preference.

✓ **Chain Idlers**: You can buy these from your local 'bent builder, use machined skateboard wheels, cannibalize a lower derailleur cage, adapt an MTB downhill idler or whatever you like. Kent Peterson uses the same hardware store "T" brackets that he uses for brake bridges to make idler mounts. Keep in mind that drive-side idlers create friction, noise and vibration and need to be carefully thought out.

✓ **Brakes**—Cantilevers are strong, available and have been nearly outdated by the new-fangled V-brakes. A good side-pull or centerpull can be made stronger by adding Mathausser, Aztec or Kool Stop pads. Centerpulls are retro and cool. BMX calipers like the Big Dog, Bull Dog and FSE (we like them in that order) are one-bolt and very strong. The Odyssey PitBull is a one-bolt mount roller cam BMX brake that sells for around 20 bucks new and less used. Kent Peterson uses steel "T" brackets and off-the-shelf clamps to make lower brake bridges.

Drum brakes are underrated. Bike Friday used them on my Family Tandem 20" front wheel and they work awesome (not a bad source for these...). Local riders Joe Kochanowski and Nick Hein use Arai tandem drag brakes with good success, though these require a tandem rear hub/wheel as they thread on.

The bike industry consumerism machine would have you believe that you need hydrau-

lics, disks or super power V-brakes, when side-pulls were adequate for 30 years previous. So, the question remains, how fast do you really need to stop?

Be wary of the expensive and high tech lined brake and shift cables. We've had reports of great performance when they are new, but that they wear out quickly.

✓ **Wheels**—New wheels can be had for around \$50 each complete, or up to \$150+. A new 3x7 rear wheel may even be more than that. New wheels are a good idea. An old wheel with rusty spokes may be unsafe. Recyclers must be willing to take that risk. A good indication that a recycled wheel is no good is the first time a spoke breaks. A broken spoke can quickly turn into a wheel failure that has the ability to toast your derailleur and bend your rear derailleur hanger. A decent set of new wheels will be money well spent.

✓ **The Best Stuff**—You can still be a recycler or retrogrouch and like nice componentry. Being a retrogrouch or using friction shifting will give you access to a treasure-trove of 30-years of high quality bike components that are better than most of what is being made today and will work on your bike.

You may still want to have an XT derailleur and Phil Wood hubs; that is cool, too.

## ■ SEATS

This is another one of those crucial areas where you can spend \$3, \$30 or \$300. From the homebuilders that I have met, none of them are as picky as I am about their seats.

✓ **Wood Built**—Wood can be very light. **Charles Brown** has done some neat work with wood seats (and bikes). Charles cuts wood sides with a contoured lumbar, and then uses a 3rd piece of wood for the back/base. **Bill Volk** has a wood Euro seat on his homebuilt. The simplest wood seat method is two pieces of plywood (back and base) cut to fit your bike, connected by a piano or door hinge, layered with foam, contoured and covered with lycra or naugahyde.

✓ **Recycle Back/Base**—**Joe Kochanowski** uses sheet metal and sheet aluminum covered with foam and old shag carpet (olive green). **Kent Peterson** likes backpack frames, and a home-made base covered with foam and a recycled Rans seat cover, held on by an old innertube with an auto seat pad from Target on top. **Lee Brown** also likes backpack frames from garage sales and flea markets and looks for seat bases from rowing machines.

**J. Gaerlan** sells a ReBike-like seat base shaped like an old John Deere tractor seat. These have been used on BikeE's as comfy upgrades as well. This type of seat base (or a rowing machine base) could be used in conjunction with a mesh back, foam covered plywood back or an old backpack frame.

✓ **Tubular**—CroMo steel, aluminum or even conduit can be used to form a sling seat frame. Just be careful with galvanized conduit (nasty fumes). The best deal we know of is Dan Kavanagh at Fools Crow who would build you

a sling/mesh seat like that on the Daisy May-hem tandem for around \$150.

✓ **Commercial**—If you buy a seat outside of the 'bent industry, you'll save a lot of money. Consider looking at seats designed for the following: marine use (boats), go-karts (see Pop. Mech. for catalog sellers) and even cheap seats designed for school cafeterias. We've even heard of a rider using a K-Mart bass boat seat on his BikeE. Be creative on this one.

Keep in mind that any upholstery shop can cut or ad foam, sew a seat cover, or customize a seat. Most can build seat mesh sections to suit, though this kind of work can be pricey.

✓ **'Bent Factory Built**—Most homebuilders will scoff at the thought of \$300 for a factory seat. However, if you do need dialed, proven comfort, the Rans seat seems to be the easiest to mount on different bikes. The aluminum channel comes in different widths to fit on top

### ■ WHERE TO GO FOR PARTS:

- ▲ **Bike Shop**
- ▲ **Recycled Bike shop**
- ▲ **Garage sales**
- ▲ **Thrift stores** (Kent's tip is to frequent these in upscale neighborhoods).
- ▲ **Swap Meets**
- ▲ **'Bent pals**
- ▲ **Friends and relatives** about old bikes in the garage.
- ▲ **Recumbent Parts sellers**
- ▲ **Bike Nashbar/Performance** offer the best prices.
- ▲ **Internet sites and lists**
- ▲ **Dumpster-Dive:** Bike shops and bike builders throw out a lot of stuff. Make friends with your local 'bent builder and offer to help clean up or haul away unwanted stuff.
- ▲ **TIP:** Don't just watch the classifieds, get out and look around. People who want to get rid of cheap stuff don't always advertise it, as ads can be costly.

of the main tubes. There are versatile mounts for Ryan and Easy Racer bikes as well. Easy Racers has used/trade-in Cobras as well as the new Cool Back seat. S & B's fiberglass bucket is as cheap as they come. The BikeE, Vision and Haluzak seats are more difficult to mount on homebuilts, though not impossible. Used and trade-in seats are often available from manufacturers when they come out with a new seat design.

## ■ PERFORMANCE

The other day, I was reminded by Joe "Road Warrior" Kochanowski of yet another reason to build a bike—performance. Virtually no manufacturers build out and out performance bikes to HPV racer standards—low, fully faired streamliner chassis. Once I asked a midwest HPV racer what he thought of the production hot rods. He chuckled and said, "What hot rods?"

Sure, there are the F-40 and Gold Rush, though there are plenty of reasons homebuilders

may want to pass on these off-the-shelf speed bikes. The primary reason is price; a faired version of each can set you back \$3,500-\$6,000 or more bucks. Others don't like the high centers of gravity of either model, and of the speed guys in the NW, nobody rides with the upright seat and high bottom bracket of the Lightning design, though I know they can be very fast.

## ■ FAIRINGS

Zipper fairings are available to fit nearly any recumbent—though they can be pricey (SWB are much more than LWB). Earth Cycles has been working on their own bubbles as well. Coroplast is the king of the homebuilder fairing material. Anybody can craft a tailbox of coroplast (plastic cardboard). Kent Peterson wrote a great article on how to build a tailbox in RCN#44. Kent's newest theory is to build tailboxes on top of rear racks for MORE support, haul more stuff and quick-release removal. Zzip Designs' plastic bolts and wing nuts would be ideal for this.

Homebuilt front fairings are more difficult. Kent built a coroplast fairing for his BikeE (see RCN#40: the Fast Pig). He bent underground sprinkler tube to shape the coroplast, along with a lexan safety shield for a windshield and his usual host of hardware store mounts. Many have used flat, or sections of glued lexan. RCN's Tony Licuanan actually used a doghouse igloo as a nose cone. The midwest hpv guys blow their own fairing bubbles.

People Movers sells the Ed Gin coroplast full body fairing building Seminar on videotape. This, along with Kent's article in RCN, a few sheets of coroplast and some zip-ties, can make you an expert. This is a pleasing experience, and a simple project that nearly anyone can be proud of.

In the advanced fairing course, Kent Peterson has built a body stocking using fabric store lycra, hand stitched with custom PVC and velcro mounts. Look for a story on this in an upcoming RCN.

## ■ COSTS

It's pretty easy for things to get out of control. Do a careful cost analysis to find out if you can even afford to build. Similar homebuilts can be priced hundreds of dollars apart. An example can be found in comparing Alan Amenta's 'ExWrecks Uranus 10' to Kent Peterson's 'William Burroughs' and 'Jack Kerouac.' Alan used many new parts and spent nearly \$700. In contrast, Kent spent \$50 on 'William Burroughs' and \$100 on 'Jack Kerouac.'

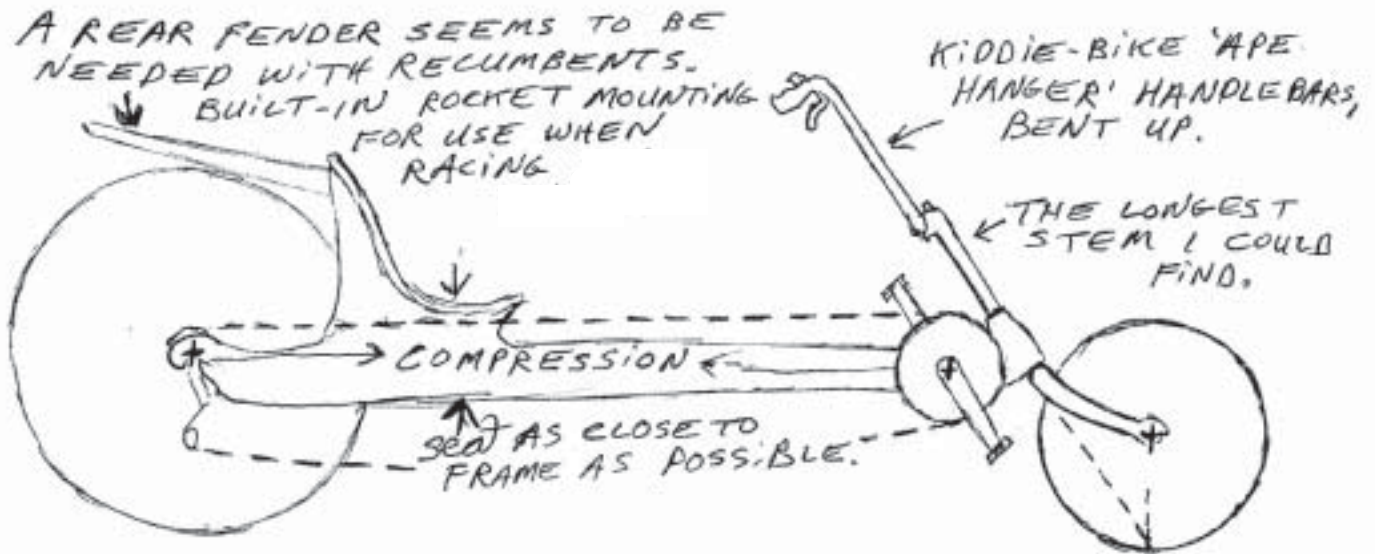
If you plan to use a factory seat, handlebars, and a bunch of new parts from Nashbar, you can easily spend over \$1,000. At this point, ask yourself if it wouldn't be a better choice to buy a new entry level factory built bike.

## ■ SOURCES

For up to date recumbent sources, be sure to check out our 2003 Season Preview issue (RCN 74).



by Charles Brown



Since 1980 I have built 30 different recumbent bicycles, over half of them made of wood. Robert J. has invited me to describe wooden construction for the homebuilder.

Wood is stronger for its weight than even the finest steels, but frames made from it tend to be more flexible. The low Young's modulus must be kept in mind to design a successful frame.

### ■ BEST WOOD

The ideal wood will require a straight grain, no knots, and a low density. The lighter wood is less stiff, but you can make the frame members large with the same weight of material, and it is this larger size that gives low density woods a better stiffness to weight ratio.

You can't just slap wood together any which way. The strength and stiffness along the grain is around 10x what is across it, so the grain has to be pointed right. Wood swells and shrinks across the grain, too, so if you want your glued joints to hold together, think about which way the grain goes before making the joint.

### ■ BEST GLUE

The best glue to use is epoxy. The slow setting varieties give you more time to put it together and line it up right. They are stronger and waterproof—many are used in boat

building. Joints must be clean, dry, and slightly roughened before gluing, and mix that epoxy well. Even so, I often run a couple of long thin screws into critical joints just to make sure.

### ■ ATTACHING STEEL PARTS

When attaching steel parts to a wooden frame, always remember to spread the load! Sometimes this just means backing up the head of a bolt with a fender washer. Dropouts are trickier.

### WOOD 'BENT BUILDING TIPS

- ✓ Dreaming of HPV's every time you pass a lumberyard!
- ✓ Live in mortal fear of termites!
- ✓ Carry a hammer and nails in your repair kit!
- ✓ Watch the Flinstones movie for construction tips!
- ✓ Ask your frame painter if he/she can do spar varnish!

I now taper the back ends of my wood chainstays to a point, then cover them with fiberglass and extend this out in a flange, 3/8" or 1/2" thick, so I have fiberglass dropouts. Another way would be to slot the back ends of the chainstays, then insert and firmly attach 1/8" steel, letting it protrude out the back to form the dropouts.

### ■ BEST WOODY DESIGN

In my own experience, wood works better for a LWB or Compact (CLWB) bike. There is a major compressive force between the bottom (boom) bracket and the rear axle, and I usually design the frame as a single member going straight between the two or bending down slightly to best resist this force.

My best frame of solid wood weighs 8 pounds, very similar to an Easy Racer or Rans frame in my XL frame size. This frame is a little wiggly, though, slightly affecting the bike's steering and hill climbing. It is better to enlarge the frame member somewhat and hollow out the inside. The wall thickness can be trimmed to about 1/8" of the outer diameter—making for a lighter, stiffer, stronger frame. In this way, I've gotten a frame for my big self down to 6 pounds. I recently built a test model of a truss structure which suggests this may be the way to achieve an even more efficient frame.

In concluding this overview, I'd like to mention that wood is perhaps the nicest material to build with and to use—imagine a steel or aluminum Stradivarius violin! For more information, pester the author, along with an SASE and description of just what it is you are trying to do. □

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by William Volk

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In January, if you had told me that in a few months I'd be riding a homebuilt recumbent of my own design, I would have laughed. Homebuilding was for the sort of person who had a machine shop in this garage and years of welding experience, not for a weekend mechanic and sometimes fairing builder like me. Besides, I was set on buying something new and exotic, like a Greenspeed, Trice or even a European Low Racer. At least that's what I had in mind for 1998.

It wasn't that I needed a new recumbent. I was already riding my second custom built USS SWB frame, wonderfully crafted for me by S&B. I had been using a tall Rans seat for years, and had the bike "dialed in" with a huge tailbox, Zipper front fairing, and nice lighting system. I had ridden the previous frame over 11,000 miles and was finishing a great 8500 mile year.

The bike was comfortable, the bike was fast, and I could haul a week's worth of produce in the trunk. However, I had the racing bug... and I had it bad. During the previous summer I had had the use of a Ross Festina Low Racer. This was a fast machine, and riding the S&B was like driving a Miata Sports Car after having had the loan of a Porsche Turbo for a few months.

#### THE CANDLESTICK HOLDER

We received an iron candlestick holder for Christmas last year. Sure enough on the flight back home, the airline managed to break it. I figured why not visit Home Depot and see what they had in the way of brazing torches.

Now the sum total experience I had in brazing metal was the construction of a stainless steel water bottle holder in 1977. I was tired of the aluminum ones breaking and wanted something light that would last. In college I had a part time job in an electronics lab, and had access to lathes, milling machines, and oxy-Acetylene torches. With some help from the resident expert I managed to do a pretty fair job of silver brazing some stainless sheet and tubing into a neat water bottle cage that outlasted the now rusted out road bike it was attached to.

#### ISN'T BRAZING FUN?

I still had NO INTENTION of building a frame. But I purchased a nice Air-MAPP torch at Home Depot along with the required safety gear and brazing supplies. Spending \$75 on tools to fix the \$25 candlestick holder is something my wife has become familiar with.

They say you never forget how to ride a bike, and I suppose you don't forget how to braze. I had to braze a nut onto a tube. In a few

seconds the deed was done. The Air-MAPP stuff works great, if you are patient enough to let the work get heated sufficiently.

So now what was I going to do with all of the equipment I had? Near where I work is a metal supply house that sells scrap at amazing prices. I figured, what's the harm in buying some 1/2" stainless tubing, the sort of thing I could use to build a rear rack or a fairing frame?

Now the fun begins. Every weekend I would spend a few hours cutting, mitering, and brazing whatever I had scrounged from Industrial. I picked up some cheap steel tubing and practiced making miters. I'd even braze a joint and then see if I could break it.

This was getting serious. I ordered the CroMo assortment from the Aircraft Spruce Catalog. This is a box of various tubes (round and square) and plate that sells for \$25. I would braze some sort of joint and then take a chisel and hacksaw to it to see if the brass had migrated throughout the joint (An excellent reference is [The Brazing Book](#). See [www.handyharmancanada.com/TheBrazingBook/bbook.htm](http://www.handyharmancanada.com/TheBrazingBook/bbook.htm)).

#### MR. BILL DESIGNS HIS DREAM BIKE

So by now I had decided to go for it—to enter that exalted level of bike fanatic, the realm of those who build what they ride. Since I had a Mountain Bike that had maybe 50 miles on it, I figured I'd build a dual 26" wheel SWB bike. I snagged a new alloy 26" road fork for \$25 and started the drawing work via "Delta CAD" (a Windows shareware drawing program, see [www.dcad.com](http://www.dcad.com) for details).

Quickly it became apparent that the absence of dual 26" wheel recumbents on our nation's roads was not some sort of conspiracy. It's nearly impossible to design one without lots-o-idlers, something I was trying to avoid. The first thing I did was to exchange the fork for a new sealed bottom bracket. One thing I have learned from designing software is never let some cool demo fool you. In the case of the bike, the neat-o alloy fork was an incentive to make a bad design decision, at least in my opinion.

So now it's time for "Bill's Design Philosophy," some of which applies to more than bikes. Most of this is based on 20 years in the video game business, some of this is based on my experience working on bikes, the rest is pure B.S.—but hey, it's MY B.S. so enjoy.

**1. Simple is good. Really simple is really good.**



2. **A solution that's hard to implement may sound impressive**, but the bike doesn't care how hard you worked on it.
3. **Paranoia in design is good. Overbuild it.** If weight is an issue... it's easier to lose some (unless you're Zach Kaplan).
4. **Design for manufacture.** Know the limits of your ability and your equipment and don't try to exceed them too much.
5. **Amateurs copy, professionals steal with both hands.**
6. **If no one does that, there may be a reason why.**
7. **Constraints are good. Constraints are your friend.**
8. **There's no UNDO key with metal.**
9. **Spent more time in design than in production.**
10. **The full-scale drawing is not an option.**
11. **Don't count on miracles, rely on them!**

The bike I most wanted to build was the Challenge Hurricane. This is a dual 20" wheeled low racer. I've wanted a dual 20" recumbent since I first saw a ATP Vision R20 (the bike that predates the R40). That's where I started. Of course my bike, Heavy Metal (HM), looks nothing like it. The Challenge Hurricane's seat is about 12" off the ground. HM's is over 20" off the ground. It's not my fault, folks! The design constraints did it.

In a way, the design constraints did the design for me. I knew what the seat-to-crank distance on my S&B was. I knew I wanted a "low racer" type profile, high cranks, and ASS. However, I didn't want any idlers on the power side of the chain and I wanted a stiff frame.

I'm not a bad mechanic, but the test brazes with the round steel tubing convinced me that I'd have a tough time aligning a round tubing frame. Besides, square tubing is stiffer (given the same dimensions) than round tubes of the same wall thickness (but it's heavier).

I spent months revising the drawings. I love design. It's fun to visualize what the bike is going to look like and imagine riding it. I posted my drawings on the IHPVA web site ([www.ihpva.org](http://www.ihpva.org)) and received so much valuable feedback. I also feel that the HPV CD-ROM (People Movers) is a great resource; there are some very interesting 'bents "over there."

## THE BUILDING BEGINS

This is where I started getting serious. I ordered 6 feet of 2" x 2" square 4130 0.065 wall tubing from Dillsburg Aircraft Supply (no one else had it in stock). Overkill? At over 2 pounds per foot—you bet. I really wanted a stiff frame, and nothing succeeds like excess. I also purchased the bottom bracket shell and head tube from Gaerlan ([www.gaerlan.com](http://www.gaerlan.com)); they sell thick wall versions that don't heat-distort. Gaerlan also supplied the various braze-ons. Finally I managed to obtain chainstays from a "wish to remain unnamed" bike company.

And you know what, after 6 weekends of cutting and brazing I had a bike, just in time for the San Diego Streamliner Event on April 18th. The bike worked great. I managed a better time on this bike sans fairing than I had on the S&B with front and rear fairings. I still had tons of braze-ons to add, stuff like a front derailleur post and rear canti-brake studs, and a bike to be painted but I was racing on my own bike.

## THE BIG SURPRISE

The San Diego Bike Club runs an open time trial series in the winter and spring. If you can pedal it, you can race it. It's a good place to get yer butt kicked by some fast roadies. It's a 20km TT on a 3 lap course. Lots of wind, small climbs. In February I braved rain and hail and managed to place 37th out of a field of 44 with a time of 40:05 (on the S&B). In March the conditions were better and I managed a 39:42

on the same bike.

On the day of the race I had yet to install any bike computer. I figured I would just put it in the highest gear I could turn over and try to finish the 20km "just on the dry side of puking." So I had it in a 96" gear and just stayed there. The bike felt great. BUT having no cyclo-computer I had NO IDEA if I was a slug, or if I had gone faster than February. To make matters worse I couldn't stay for the results, I had to get home to deal with some family stuff.

Later that week I found out that I had managed to do 34:10 unfaired. I was quite surprised. Heck I was in a state of shock! That 34:10 was a 14% improvement and I didn't have fairings. This was good. This made all the work worth it. Later I would find that my theory that "stiffer is better" was right for me. HM gets me up the hills about 20% faster than the S&B. I love this bike and I loved building it. There's nothing in bicycling that can match the experience of building your own 'bent. □

## HEAVY METAL SPECS

|  |                 |
|--|-----------------|
| Wheelbase.....                           | 41"             |
| Bottom Bracket Height.....               | 28.75"          |
| Seat Height.....                         | 24.5"           |
| Headtube Angle.....                      | 80°             |
| (that is why it can be ridden hands off) |                 |
| Seatback.....                            | 40°             |
| Weight.....                              | about 30 pounds |

by Tony Licuanan

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**H**ave you ever looked at a bike and wondered, "Hmmm... I think I can turn that into a recumbent..."? This is what my little folder is all about. "With a little cutting here, brazing there," I'm there!

It all started while walking around the Flea Market. I spotted a little folder bike that's out of commission, but the frame, handlebars, and the front wheel looked good. I've always wanted to convert a regular bike into a recumbent anyway. The project looked too easy not to tackle. Plus the bike being a folder adds a twist and some excitement to it all. So I handed the gentleman the \$20 bucks that he wanted for the bike and the transformation began.

### ▲ GUIDELINES

1. The project must be simple.
2. The cost should be reasonable.
3. The bike must perform well as a commuter.
4. The bike must remain a folder.

### ▲ FRAME SURGERY

Like Ed Gin says, "This is not rocket science!" This project is truly easy to do. The procedure is a simple one that mostly anyone should be able to follow. This is what I did to transform the frame:

1. I cut the seat tube down to make room for the recumbent seat.
2. Then, brazed on:
  - A) Boom/BB to the head tube, (adjustable).
  - B) Add two seat mounts, (fore and aft).
  - C) Add a brake bridge to the fork, (original bike had coaster brakes).

### ▲ ASSEMBLY

I put the bike together as normal. I used flex riser (chain tubes) as idlers, installed a Nexus 7-speed internal hub with built-in brakes and attached a quick release Vision seat. For tires, I went with dual 406 Primo Comet 20" x 1 3/8" tires.

### ▲ BUCKS

Thanks to Vision's help, the cost was kept to a minimum. I told them about RCN's Homebrew issue and they gave me the parts for the project at cost. (For a detailed breakdown see the cost analysis box.)

### ▲ THE RESULT

I ended up with a bike that's truly fun to ride, commuter worthy, and a fun educational project that left me with knowledge. For around \$320 bucks and less than 20 hours of work, I have a bike that rides like a new fac-



Tony's dual 20" folder with Nexus 7 hub and Vision seat—RCN



It takes about a minute to break it down this far, and I had never done it before

tory built. It has a quiet drivetrain, it's good on trail and/or city streets and heck, it even did Kent Peterson's hilly Issaquah ride just fine. I can say I'm satisfied. Now, all I need is a can of spray paint. ☐

Tony Licuanan is an esteemed member of both the RCN Crew and the NW Low Down and Laid Back Recumbent Riders. He has way too many bikes, and has way too much fun. He runs a dental lab by night.

### FOLDER HOMEBREW COST ANALYSIS

|  |          |
|--|----------|
| 1. Complete Nexus 7 wheel w/ brake, shifter, and hardware..... | \$X      |
| 2. Brake levers, grips, chains and a front tire.....           | \$X      |
| 3. Vision seat, (slightly irregular).....                      | \$X      |
| <b>TOTAL:</b> .....  | \$285.00 |
| *Don't know itemized breakdown. This is what they charged me.  |          |
| 4. Flex riser (chain) tubes (2x).....                          | \$6.00   |
| 5. Zip ties.....   | \$6.00   |
| 6. Folder bike.....  | \$20.00  |
| <b>GRAND TOTAL:</b> .....                                      | \$317.00 |



## SS20—The Folding, Dual Suspension, Compact LWB Recumbent

by Steve Smith

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Kathryn Smith on the SS20 with 26" rear wheel on Vail Pass trail in Colorado—Smith

I prefer long wheelbase bikes, but they are a bit of a bother to haul around, especially in cars and airplanes. So I set about building a folder for my most recent homebuilding project. The bike was built in my one-car (actually six-bike) garage with a Jet mill/drill, old Atlas bench lathe, and a portable Oxy-Acetylene outfit.

The SS20 is a truly suitcase-able folding recumbent that does not sacrifice performance or comfort. It is the fastest of my current fleet of six recumbents. And while not the very best off road, it handles well on dirt and gravel surfaces with a silky smooth ride. Recently during bike-to-work week, I was the only one who actually pedaled up a steep rutted dirt shortcut to the plant. Every mountain bike rider I saw carried or walked his bike up.

There are a couple of nice features on the SS20 that homebuilders can get away with, since we do not have the liability risk that goes along with selling products to the public. One feature is the hinged fork crown that allows micro dialing of the trail (caster) as well as full folding back of the front fork for suitcaseing.

Another feature is the sliding rear brake boss mounts that accommodate use of any wheel size from 26" down to 20". This makes

a win-win situation: I have a 26" rear wheel with a 100 psi tire for everyday riding, and a 20" rear wheel with 100 psi ACS tire for suitcase traveling. It takes about 10 minutes to adjust the brakes for the rear wheel size.

The bike folds down using quick releases and a 5mm hex wrench in about 15 minutes. On a recent vacation trip to Florida<sup>1</sup>, the bike and all my personal effects went into two boxes, each 27" by 20" by 9" in size, and a daypack. The frame fits in one box and the seat and wheels in the other. Since I spent all my spare change on bike parts, I have not yet purchased actual suitcases. I use cardboard boxes lined with corrugated polyethylene and use my clothing compressed in zipper bags as stuffing/protection for the bike.

### ▲ GOOD FEATURES OF THE SS20:

**Wheelbase:** 59.5 inches

**Seat adjustment:** 5 inches

(29 Inch inseam +/- 2.5 inches)

**Rear Shock:** Noleen coil/oil

**Front shock:** Action Tech coil/oil

**Seat material:** Polypropylene and GoreTex

**Paint:** Mystic Purple powdercoat

### ▲ NOT AS GOOD FEATURES OF THE SS20:

**Weight:** Too heavy for a market competitive folder (light weight, though, is overrated).

**Seat height:** 26" with 26" rear wheel.

**Number of braze joints:** 63.

### ▲ HOMEBUILDER TIPS

**1. Read:** Rob Talbot's book *Designing and Building Your Own Frameset*, Manet Guild, ISBN 0-9602418-1-7.

**2. Read:** *Bicycle Metallurgy for the Cyclist*, by Douglas Hayduk, Johnson Publishing, ISBN0-9618977-0-8.

**3. Read:** *Bicycles and Tricycles* by Archibald Sharp, first published in 1896, republished by David Gordon Wilson, MIT Press, ISBN 0-262-69066-7.

**4. Read:** *Bicycling Science* by Witt and Wilson, MIT Press, ISBN 0-262-23068-2.

**5. Read:** *The Oxy-Acetylene Handbook*, Union Carbide, Linde Division, ISBN 0-914096-109.

**6. Pay attention to the trail measurement of your design** (trail is the distance from the theoretical point where the head tube centerline contacts the ground to the point where the tire contacts the ground directly below the axle). 1 to 1 1/2 inches of trail are in the ballpark. The use of stock forks with non-stock head angles will result in poor handling (most likely over-steer). Try to make trail adjustable if possible—I once made front dropouts with several axle slots. One quarter inch of trail change can make the difference between a good handling bike and a sweet handling bike. LWB, SWB, steep or low head angle, the best handling bike will be the one with dialed in trail.

**7. I use 1/16th-inch diameter Silver braze filler** (50% Silver) for all joints, which are all lugless. It is expensive at about US\$30 for one bike's worth, but wonderful to work with and melts at about 1400°F. This means that the bike tubing does not have to be heated to cherry red - better for avoiding hydrogen embrittlement that is prone in chrome moly tubing. When using Silver braze filler, make sure your joints fit tightly with no more than .015 inch air gap.

**8. Polypropylene trampoline cloth is great seat material.** It is super strong, durable, wicks, and breathes, but a bit hard to work with. I lace my Polypropylene seats tight as a drum for maximum pedaling efficiency. Buy it from your local trampoline dealer.

**9. Use roller skate wheels for idler pulleys.** They are totally quiet and energy efficient. I chuck them in my drill press and use a rat tail file to auger in a chain groove.

**10. High quality hole saws**, such as Lenox and Starrett, work just fine for mitering tubes.



*SS20 with 20" rear wheel—Smith*



*SS20 shown folded in open box, note yard stick—Smith*

Clamp the tubes in a vise in a drill press.

**11. Don't worry about not making the perfect bike the first time.**

The SS20 completely changed steering, seat, and rear swing arm before it was rideable.

**12. The more you pay for components, the more delicate they often are.**

**▲ GOOD SOURCES OF SUPPLY**

1. Gaerlan Custom Cycles.
2. Aircraft Spruce and Specialty (wide range of 4130 tubing in small quantities, lots of fastener gadgets).
3. Recumbent dealers advertising in RCN.

**▲ PERSONAL RANTS**

While I can only speak for my own designs, I have some safety concerns about USS. I have two USS bikes and four ASS bikes. USS is super comfortable while touring, but in an emergency situation there is little to brace yourself with. Picture this scenario: a cat runs in front of you and you brake hard. Your feet naturally go to the ground to protect a fall. Once a shoe makes contact with the road, it digs in, and momentum causes your body to pivot forward. Since your hands are at the center of your forward rotation, they are useless to control your body movement and you do a face plant on the frame of the bike. I've done this twice. It hurts.

**▲ 'BENT OFF-ROAD RANT**

There has been some good discussion in recent RCN issues regarding off-road riding. One side says big air and single track are a great new re-

cumbent sport, and another side says stick to asphalt for safety reasons. I see the middle ground. Single track jumping on a recumbent, if even possible, seems like asking for a broken back, but so does riding with road raged 4,000 pound automobiles bearing down on you. Dirt and gravel roads and paths are absolutely within the realm of suspended recumbents and these byways are missing cars and the odor of asphalt and exhaust fumes. See where you and your bike can reasonably go and have some fun.

Take the handling/climbing/racing advantage claims towards any generic recumbent type with a grain of salt. I was amazed a while ago when a co-worker invited me to test ride his expensive drop-handlebar wedgie touring bike and I almost dumped it within 20 feet. After 15 years of recumbent-only riding, I had literally lost my ability to ride a bike that once was second nature. It felt horribly wobbly, and truly over-weighted on the front wheel. If this bike design were new, rather than 100 years old, we would call it unrideable. The human body is incredibly adaptable. Pick the recumbent design that appeals to you, learn to ride it well and go for it. □

1 Our friends at United Airlines attempted to charge the extra fee for bicycles, even though the boxes are well within luggage size and weight limits - they relented as the ticket line behind me grew longer and the contents were re-declared as metal tubing rather than a bicycle.



*SS20 in boxes at airline counter—Smith*



by Mark Colliton



Mark Colliton's 20/16 FB1 with Rans seat and Sturmev 5-spd. hub—MC

**A** Long, Long Time Ago, In a Galaxy Far, Far Away.... (oops, wrong story)... Long before the V-Rex, Mark Colliton was on a warp-speed evolution of recumbent knowledge. Mark started tinkering with BMX frames back in 1990 as he built several rideable SWB BMX conversions before graduating to a Rans Stratus, then onto a Lightning P-38, then used his knowledge gained as the co-designer of the original Rans V-Rex. This article was originally printed back 1991.

After pricing a few SWB recumbents, I knew that if I was ever going to own one, I would have to build it myself (famous last words). Although I had no background in frame building, I decided to go ahead and give it a try anyway. Fortunately, I've had some good luck and what I think are some good successes. I've named the bikes "FlatBlacks" for their easy primer black finish. One nice thing about designing and building your own bikes is that you can call them whatever you like.

There are four bikes in the FlatBlack series. FB-1 was built and later made the trip to the HPV Speed Championships where it turned more than a few heads. When I was checking into the hotel before the races I had the good fortune to meet Easy Racers' Gardner Martin. He gave the bike a nod of approval after a quick inspection. Needless to say, I came home with recumbent-building fever. As with most homebuilders, the FB-1 was disassembled for parts when the new FB-

2 frame was complete.

Both the FB-1 and FB-2 were built using a standard BMX 20" frame with a boom tube and bottom bracket added to the front of the head tube. I took a rough guess at what the boom length should be—knowing that I needed 6" of seat adjustment. Using your X-seam measurement is a good place to start when laying out your BMX boom length. For my 6'1" body, an 18" boom seemed just about perfect. The FB-1 had no heel interference with the 16" front wheel, though the inverted FB-2 does.

The difference between FB-1 and FB-2 is the frame geometry. With FB-2, I inverted the BMX frame and turned the fork upside down in the frame angle. This gave the bike a more relaxed head angle. I did not have any problems with the taller FB-1, but a shorter rider found the seat height a bit awkward when starting and stopping.

One other change that was made to the FB-2 was to make it easier to build. Instead of cutting the seat tube and bottom bracket out of an old wedgie frame, I used a 1.5" muffler tube and a sleeved bottom bracket. This required just one weld and gives you the ability to adjust both seat and bottom bracket for a perfect fit. On the FB-1, I found that the seat tube from the old frame set wasn't strong enough on its own and needed additional bracing. Even so, three welds is not a lot of welding.

Both bikes use a custom built 20" rear with a Sturmev Archer 5-speed internal hub with a

16" front wheel. This was necessary because the dropout spacing was not wide enough for a freewheel. My friends at the bike shop said it could be spread to accommodate conventional gearing, but I didn't want to take the chance of screwing up the frame.

For steering I used the original stem and handlebars that came with the BMX frameset. I simply turned the stem backwards, cut out the cross-brace tube and pushed the bars down under the seat. I later added bar-end extensions which greatly improved steering control and you can move the bars a bit further back and truly under the seat. You may need an odd size (rare) stem, though I did find one at my local shop.

The one thing that I would recommend spending your money on is a commercially built recumbent seat. I used an old Rans "bucket" fiberglass shell that was the stock seat on the Nimbus and Stratus of the time. The aluminum channel mounts to the top tube making seat mounting a breeze. Modern Rans seats are a bit pricey, though there are still Rans buckets and other inexpensive seats to be found.

I used a Rans chain idler as well. It was easy to modify. I've used it in many different configurations and it is versatile. The exact positioning is a bit tricky. It must carry the return chain over the front fork and still not interfere with the drive-chain. I positioned it by hand after the chain was installed, marked the stop and bolted it to the frame later. You become very proficient at chain removal throughout this little exercise. Chain tubes or a BB-mounted mid-drive are also possibilities.

All in all, I spent about \$350 on the FB-1. Most of that went for the seat, wheels, tires and front fork. The frame boom was TIG welded in a welding class that I had taken. The FB-2 frame cost \$30, plus \$20 for the MIG welding at a local muffler shop.

FB-3 started life as a 24" wheeled Mon-goose mountain bike frame that I retrieved from the trash ('bent dumpster dived). As a recumbent, the wheel set up was a 24" rear and 20" front. The boom was, again, welded on the frame at the local muffler shop. I finished it out as an 18 speed with MTB style gearing. FB-4 started out as a Hutch dual 20" wheeled SuperBike and has the perfect geometry for this type of conversion. If you have a chance to get your hands on one of these, grab it. BMX conversions are easy, fun and offer a great SWB education. □

by Ming Dinh

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Ever since I started researching recumbents on the internet, I have been fascinated by how many people have built their own, the innovative materials used, and the ingenuity of the builders. The bikes created match the building requirements and skills of the builders. I have seen bikes made of wood, bikes made without welding, and bikes where just about every part of the frame was machined by the builder.

My first recumbent was a mail order BikeE, the only recumbent I could find at the time which looked like it could fit my 5' tall, 105 pound, 26" inseam, 36" x-seam self. I was right. None of the other bikes I have tried since have fit (Vision, Rans, Quetzal...) Riding the BikeE around for a year taught me that I preferred a more closed pedaling position than BikeE offered, and that I wanted a smaller, more compact bike as well. The Vision and Rans SWB that I tried didn't fit, but allowed me to see that I would probably like a SWB bike, but I wasn't sure. What if I made a mistake and didn't like it? Budget considerations also wouldn't allow me to do the serial/multiple recumbent ownership thing—I just can't afford it. I also couldn't envisage making my own until I came across Kent Peterson's no-weld homebuilt SWB at [www.halcyon.com/peterson/bentkent.html](http://www.halcyon.com/peterson/bentkent.html). After seeing that a bike could be knocked together using the skills that I had (saw, file, drill), I decided to give the project a go.

I started gathering supplies: a friend of my brother's donated a Kuwahara BMX frame, I found a junked bike in the trash to cut up, I had an old backpack frame, some wood, and assorted bike parts from past bikes. I did have to buy some parts, like wheels and forks and tires and chains. I think that I managed to keep my costs to below \$300 Can (about \$200 US).

After doing research on the internet and picking the brains of several people on the HPV list (thanks, guys), I had a design drawn up for a high BB, ASS bike. What made this BMX conversion so simple was the frame itself, which has a gusset between the top and down tubes, with holes cut out of it for lightness (which is a joke, as the frame weighs around 7 pounds. All I had to do was to bolt a boom to this gusset and I had myself a SWB frame.

I took a tip from Mark Colliton's RCN BMX conversions Flat Black article (reprinted this issue) and flipped the frame upside down. This laid back the head angle to a relaxed 70



Ming Dinh and the BMX "Shopper"—Ming Dinh

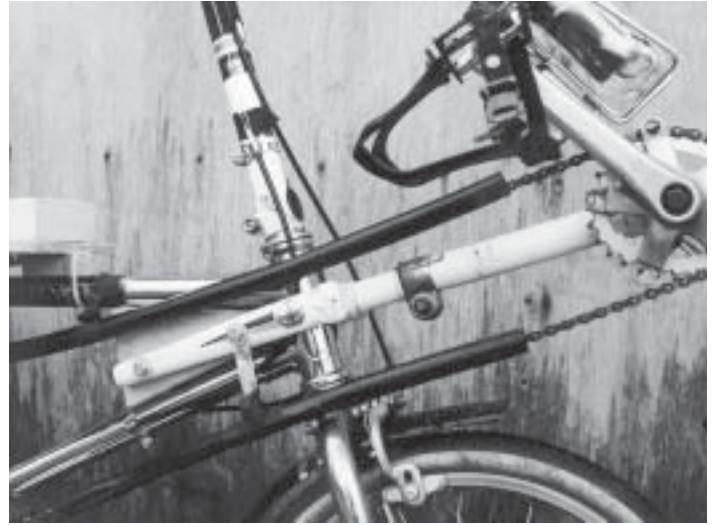
degrees and lowered the seat height somewhat. I used a 16" wheel in front, fitted with a 16" x 1-3/8" Primo. The fork offset was around 25mm, giving me a trail of 65mm. The handling of this combination is very stable and predictable and I'm very happy with how it rides.

The boom of the bike is made from a road fork that has had the tips cut off (they make great bottle openers) and the blades drilled to accept two 4" x 3/16" bolts. I cut a couple of wooden boards to fit exactly in the space between the head and down tubes on either side of the gusset and screwed them together through some holes in the gusset. That held them in place. Next, I drilled a hole for the forward-most bolt. I squeezed the fork blades until they were parallel and bolted them to the frame. I could then swing the boom up and eyeball where I wanted to position the BB for heel clearance. I decided on a 24" BB height. I then marked off where to position the second hole on my wood block/gusset and finished drilling and bolting the boom on. The nice thing about this setup is that it allows me to play around with BB height. For instance, I think I may want to experiment with a higher BB height. Flipping the cut-off fork around will give me a 25" BB height, due to the orientation of the fork offset. If I want an even higher BB height, I will just cut off some more wood blocks and drill new holes for the new boom position. The BB was made from cutting up the junked bike frame. I believe that this is where being short came in handy for me. I have read other people's accounts of how they made their boom from a BB attached to a length

of seat tube and had it bend. Because I'm short, I was able to keep the boom length short (around 12") and boom flex (or bending) hasn't been a problem for me. That may also be due to knee problems forcing me to remain very low powered in my pedaling. The seat tube portion slips nicely over the fork steerer tube (boom) to allow seat to pedal adjustment. I used a seat clamp to hold it on. It twisted when I put pressure on the pedal, so I cut a shim from a plastic soda bottle that solved the problem.

The seat was made from an old backpack frame and plywood. The seat bottom was made from a triangular piece of plywood that I have trimmed repeatedly until there is as little wood left as possible to still give me a comfortable seat. This allowed me to get a good shape to be able to easily put a foot down flat at a stop. The mesh fabric that I used for the seat back was window screening. This is temporary as it really isn't strong enough for the purpose, even when doubled. I added a wooden seat horn to the plywood to prevent sliding forward during pedaling. Cushioning and ersatz suspension is provided by a Thermarest Sportseat and a couple of layers of 5mm closed-cell foam. I have this cushion positioned in such a way that it supports my lower back too, so when I am riding over rough spots, I just lean forward and let the bike rock and roll under me while I sit totally suspended on a cushion of air. I suspect this also works well due to my small size.





*Ming Dinh's BMX "shopper." Note the bolt-on boom utilizing a road fork, frame tube and a clamp bolted to a wood wedge in the frame—Ming Dinh*

*Note the idler-less drivetrain using chain tubes—Ming Dinh*

The stem riser was made from the remainder of the seat tube and a seatpost to provide the shim for an ordinary stem and MTB straight bars. The chain line is very straightforward with 2 poly garden irrigation tubes serving as chain guard and guide (the bottom tube).

The project took a couple of weeks to complete and was a nice winter project that I was able to put together entirely in my living room.

This bike serves its purpose very well as my commuting and everything else bike. It handles well and is stable at all the speeds I ride at, both loaded and unloaded. I use it every day and have also taken it touring. It packs well for travel in the bottom of a bus, and is easy to maneuver inside houses and elevators. The bike currently weighs in at 35.5 pounds, I will eventually trim a few pounds off that with a lighter frame. The BB is at 24" and the seat at 22", weight distribution is 45% front, 55% rear. It has rack and fenders and part-time doggie assist.

I use Power Grips pedal straps on the bike. They work great, and are a less theft appealing alternative to clipless pedals and allow me to walk better when off the bike than my bike shoes do—important for my knee comfort. I have recently bought a Bicycle-R-Evolution two wheeled trailer to use with it and it is the perfect transportation combination for me: a bike that's more comfortable than a car (cars are stuffy) and has a trunk!! What more can I ask for? Well, a fairing that's in the works, better knees, which is an ongoing project... and oh yeah, a folding recumbent, which is a story for another time. □

by Alan Amenta

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After 30 years of riding a wedgie, the pain in my neck was forcing me off my bike. When I was on the verge of cancelling a long-anticipated century ride, a friend suggested, "Why not try a recumbent?" I rented a Rans Rocket for two weeks, did the century, and became an instant 'bent-head. NO PAIN!

I could afford to buy a bike, but which one? I decided to play around with some old bikes just to see what riding configuration I would like and then, I thought, I'll buy a bike of similar design.

My wife had a Peugeot mixte frame from the early '70s (which seem to be highly sought after by bent homebuilders). If you squint real hard and turn it upside down, it looked like a V-Rex. Well, at least a starting point. First, I cut down the seat tube and cut the seat stays at the brake bridge. I then attached the bottom bracket and chain stays from a junk frame to the head tube with a muffler clamp plus two bolts through the rear drop out, one above the mixte seat tubes and one below. Voila!—an adjustable bottom bracket! A standard bike seat is mounted with a broken skateboard deck as a backrest which is padded with a half of a boating life preserver. The adjustable riser is the handle from a pull golf cart. An added bonus of this project is that I've cleaned out my garage. I tried installing the front fork backwards and forwards—like the Street Glider. Hands-off stability was better backwards, so it stayed that way.

During the next couple of months, I upgraded everything. By now I was so happy with this bike, I was stripping parts off of my beloved road bike: the rear wheel, derailleurs, and crank. I bought a skinny front wheel. The seat base is a Kmart mattress bike saddle (a seat from a recumbent stationary exerciser would probably work better). The seat back and struts are hardware store aluminum tubing joined with electrical conduit connectors. The mesh came from a company that rebuilds pool furniture. The new riser is 1" aluminum, which accepts a standard stem with BMX hi-rise handlebars. I put a few hundred miles on this bike and decided it was time to "weld it up."

#### ■ IF IT LOOKS STRAIGHT—IT IS STRAIGHT ENOUGH

A local frame builder ok'ed the strength of my design and sold me some tubing and a bot-



The almost final Bangletech Ex-Wrecks Uranus 10—Alan Amenta

tom bracket shell. I had never brazed anything, but on one of my trips to the hardware store, I spotted a Bernz-O-Matic oxy-propane brazing

torch. I bought it, followed the directions on the box and made a right angle joint with some scrap tubing—a piece of cake! Brazing is easier than soldering because the flux doesn't run. Just carefully paint the flux exactly where you want the brass. It won't run out of the joint and all over the piece. I used no jigs, figuring "if it looks straight, it is straight." If you'd rather skip the brazing, the frame builder would have charged me \$40 to braze the mitered parts.

#### Ex-Wrecks Uranus10 Specs

|  |   |
|--|---|
| WHEELBASE.....                             | 36.5"   |
| REAR WHEEL.....                            | 26" X 1.5"  |
| FRONT WHEEL.....                           | 20" X 1-3/8"  |
| FORK: .....                                | BMX elastomer<br>2" travel, fork reversed to provide 3.5" trail |
| SEAT HEIGHT.....                           | 24"   |
| Rans sliding mount with adjustable recline |   |
| BB HEIGHT.....                             | 28"   |
| WEIGHT.....                                | 32 pounds   |
| WEIGHT DIST.....                           | 52.5% (R)/43.5% (F)   |
| GEAR INCHES.....                           | 22-118  |
| COST.....                                  | \$676   |

Parts were new unless otherwise listed: Used rear wheel \$50; cassette \$30; front wheel \$90; chain \$24; derailleurs \$135; used brake levers \$2; Twist shifters \$22; crank \$30; fork \$20; seat \$200; frame parts \$34; Misc. \$39. I recently picked up another mixte frame for \$7.50 at a junk shop.

#### ■ FINAL FORM—Yeah Right!

The photo shows the current, though probably not the final Bangletech Ex-Wrecks Uranus 10. A few years ago suspended forks were offered on BMX bikes but they didn't work very well. I located one of these for twenty bucks. I bought a Rans seat and opted to eliminate the adjustable stays and support the seat with the rack. I extended the fork steer tube 2" above the head tube by cutting it in half, inserting a piece of tubing and brazing. A 1-1/8" OD piece of CroMo slips over the steer tube, receives the 1" aluminum riser, and is clamped with a BMX seat post clamp. An alu-

minum MTB stem slips into the riser and supports the aluminum handlebars.

I'm pretty pleased with the performance of the bike. The high bottom bracket and reversed fork results in no heel interference. The bike can be pedaled at a crawl of about 2 mph, ridden "no hands" above 8 mph coasting, and a figure-8 can be ridden inside a 21' square.

#### ■ BUILD TIME

How many hours did I spend? Countless—this was the most fun I've had in years. So, get out in the garage and start cutting up old bike frames! You've nothing to lose but your trash.

■ COMPONENTS: Shimano BioPace (state-of-the-art) 26/36/50, Shimano 11-30 cassette,

Sachs chain, skateboard wheel idlers (premium bearings), Campy derailleurs (road triple), Grip Shift shifters, Side pull road brakes with Kool Stop Pads.

#### ■ SOURCES OF SUPPLY

- ✓ People Movers was very friendly and supplied a used V-Rex front wheel and fork.
- ✓ Local bike shops supplied used: suspension fork, crankset, rear wheel.
- ✓ Bike flea markets supplied: stem, bars, shifters, brake levers, rack, pedals.
- ✓ The Campy derailleurs were new from Nashbar, and the saddle bags are a \$10 dandy from Kmart.
- ✓ The seat mesh came from my local lawn chair/

patio store. Bob Bryant says Prairie HPV sells seat mesh. □

*Alan Amenta has lived in southeast PA all of his 55 years. His primary career has been as a programmer and IT consultant and he currently is licensing his patented Y2k solution to end user corporations and software developers (www.TOCS.com). Secondarily he designed-built-sold three passive solar homes and owned a kite store. The favorite family gathering place is their log cabin on a mountain top in WV. He first rode a two wheeler at age three, took his first 50 mile ride at age 12, and did his first century at age 54. Member of Bicycle Club of Philadelphia.*



*NW Rider Lee Brown's mixte-based SWB—Lee Brown*





Paul Carter and his LWB homebuilt—RCN archive

## The Easy Ryan-Tator Racer

by Paul Carter

A few years back, a friend of mine showed me a picture of a Ryan recumbent. I fell in love with it and decided to build my own. I started with a Schwinn Varsity and ended up using the head tube and making the rest out of 1" box .049 steel. To say the least, it was very heavy, but also sturdy in the Varsity tradition. It rode nicely. My next three versions all suffered from steering geometry problems.

I had to learn about head tube angle, rake and trail the hard way. I had to learn how to align the major components of the bike to make it track straight. Fortunately for me, there are a lot of builders around here who shared their time and expertise. USS or linkage steered recumbents can use a more upright head tube angle of 69 or 70 degrees. For direct ASS, lay your head angle farther back to 59 or 60.

My latest homebuilt LWB has proven to be a very fast machine, taking second at an Oregon Human Power Muster and first at DaVinci days in LWB. It is a mono-tube LWB with dual 27" wheels (700c's, 26's, or even 20's would work fine) with a tiller steering. I am working on a design to change to a mid-head tube and remote steering via connecting

rod because there are very few people who can handle the tiller—though it is a cheap way to get your bike on the road.

The mainframe can be round or square tubing to suit your needs. The diameter depends on your body weight and how much flex you want in the frame. I usually make my main tubes 48" long, though every one will vary. My head tube and rear triangle came from old ten speeds. I actually cut off the rear triangle of a 'donor' upright and welded the chain stays to the mainframe monobeam of the new bike. It was necessary to vertically ovalize the mainframe to fit the chain stays. The mainframe is a 1.5" .049 MufflerMoly (muffler tubing). The LWB frames are easier to build than a SWB because they do not require a hole in the mainframe for the SWB head tube. The frame cost me about \$10 and 10 hours of labor. Since building this bike, I have made a jig that is totally adjustable for just about any bicycle.

My first seats were plywood and foam. They were comfortable and durable, though be sure to cover them or the foam will soak water. I later made a sling/mesh seat from 1/2" .049 conduit. I bent the frame with a conduit bender and welded it, though this is not recommended

## A MIXTE SWB

by "downtown" Lee Brown

This is my 7th homebuilt recumbent. The day Kent Peterson came on the Low Down and Laid Back Recumbent Ride I was intrigued. His frame was a unisex "mixte" made over into a SWB ASS. It looked too easy to build and so cool that I made up my mind to have one.

I was in luck as a friend of mine had a CroMo mixte frame that he gave me. I was off to a great start. With a little hack sawing here and there—a boom out in front—some idlers and brake mounts and presto—it starts to look like a SWB.

The rear wheel is a 24" with a Sachs 3x7 hub and a V-brake for stopping power. The rear fender is a 26" transformed with a heat gun. The idlers are old shoe skate wheels. The seat back is from a backpack frame. This is one of the secrets to the design and they are easily found at garage sales. The seat supports are recycled crutch parts. The seat base is a plastic tractor style off of a rowing machine exerciser.

I first made the steering riser rise straight up, but had to slant it back (a la Flip It) to bring it closer to my body and farther away from my knees. The front wheel is a 16" x 1-3/8" with a Primo tire. The internal shift is down with a Sachs twist shifter. The rear derailleur is also shifted with a Sachs twist shift. The front derailleur is a Shimano LX and is shifted with a Rapid Fire lever. It all works together well. The crank is a 34/48 110mm MTB style crank with a sealed BB. The bike is painted with metallic green Hammerite spray paint which seems to hold up well.

**NOTE:** Lee Brown is an active Northwest homebuilder who has organized local 'bent displays at the State Fairgrounds and the local mall. Lee is a long time member of the NW Low Down and Laid Back Recumbent Riders. Lee rides regularly with the group, though on the longer rides he uses his power assist recumbent that he built himself using a Ryobi 4-stroke trimmer motor. □

due to the fumes that the galvanized conduit puts out. The seat base is 9" long, then a nice easy bend, with a 15-18" seat back height. The webbing and nylon straps came from the local fabric store.

This is a very simple, easy to build LWB recumbent project—a recumbent bike that can be built in a weekend. □

## Honey, I Shrunk the Bike

Or...As Michael Moore would say, "Downsize This...."

by Mark Ariens

*ariens@execpc.com*

In the fall of 1996 I got my nose pressed to the window of Wheel & Sprocket checking out their 'bent display when I spotted a '96 Stratus with red to black fade paint job. I wiped the drool off the glass and went in for a closer look. I met Harry Wozniak and he explained to me that this is one of two Stratus' built with a 24" rear wheel. I took it out for a spin and found it much to my liking. The next day, I returned to the shop with my wife Pam "Car Back" Ariens. One ride with Pam and you'll understand the nickname. She hollers "CAR BACK" so loud that even the drivers of the cars check their rearview mirrors. If she likes the Stratus as much as I do, it will be ours. Pam really likes the low, feet on the ground, position and we now own the Stratus.

During one of our many trips to Wheel & Sprocket, Harry, knowing that we are avid tandemists, waves a Rans Screamer under our noses, recites his secret mantra and abra cadabra the Screamer is in my garage. A neat trick that I'll bet other dealers would like to learn. This is the most enjoyable tandem we've ever owned.

Early Spring riding finds Car Back enjoying her outings on the Stratus, for the most part. However, she does struggle a bit with climbs. We've come to believe that the wide style bars and longish wheelbase are a bit oversize for her, but suit me just fine (she really needed a 33", but this is a 37", which is really too large).

So, I'm back at Wheel to see Harry and check out a small frame V-Rex24 ('97 24/20). I'm impressed with the V-Rex and do a deal with Harry. Back at the house, I have Car Back try the 'Rex thinking this might be the solution to her low speed stability problem. She takes to the V-Rex quickly and hills are a snap, but there is one big problem! Her landing gear is about 4" too short and I have to launch and catch her while she tests the bike. The bottom line is that at 5'1", Pam is too short (vertically challenged or inseam impaired). "What dear?" she says. "Oh, petite!" That's it, she's too petite for the V-Rex. Funny how I think that a bike that fits me perfect will work for her.

It's now late summer '97. Pam and I are at Wheel once again searching for the correct size 'bent for her. I suggest a Rocket, but Harry points out that it's not much lower than a V-Rex. Harry then has a brainstorm. "What if we take the V-Rex24 and put a 20" wheel in the rear and a 16" wheel in the front? That should effectively drop the rear a few inches and the front even more, which should lower



Pam "Car Back" Ariens and (left) V-Rex 24/20 and (right) V-Rex 20/16

the bottom bracket in relation to the seat. That would give Pam a riding position more to her liking," says Harry.

Harry thinks for a moment and runs into the back room. He returns a moment later with a 20" rear wheel and a 16" front wheel and CroMo fork. "Go for it, let's see what happens," he adds. I say, "Harry, look where the rear brake posts are in relation to that 20" rim. What if we try a U-brake or one of those old roller-cam MTB brakes. They use similar cantilever-type posts, but the studs are mounted closer to the wheel." Harry says, "I think it may work."

The changeover goes fast and Pam tries out the V-Rex 20/16 set up with just a front brake (don't try this at home). Starts and stops are no problem and both feet down while stationary is good. Car Back is zipping up and down the block making U-turns with ease. She says she likes the set up and is very comfortable on the bike.

Back at the shop, Harry proudly produces a shiny new (old) SunTour Power Cam (roller cam) brake. He found them in a crusty Dunkin Donuts box that still contained three rather nasty donuts (round power bars as 'Bent Bob calls them). Slipping the brake on shows us that they will work, but a bushing will be needed to compensate for the difference between the cam brake hole diameter and the brake stud. The search takes us to a local hobby shop where we found some 5/16 I.D. thin-wall brass tube—and

it works like a charm.

In this part of the universe, Harry Wozniak is the local recumbent wizard who has ridden more makes and models of commercial and homebuilt 'bents than I know to exist. To me, his assessment of this modified V-Rex will be the truest test of its practicality. After putting it through its paces, Harry proclaims that it handles much like a Rocket and should serve its purpose as a recumbent for smaller riders. "Hey Harry, if it rides like a Rocket, does that mean we just performed Rocket Science?" A moment of brilliance in Hales Corner, Wisconsin. And no, NASA won't be interested in our accomplishment, though Rans may.

So that's it! A very simple and unique way to cut down a V-Rex24 without sawing, welding, bending or messing with the excellent frame in any way. Pam and I would like to thank the following people for raising our interest in recumbent riding and reducing our savings account. Bob Bryant, for this great publication, with its excellent reviews and enthusiasts' idea exchange and much, much more. Chris Kegel, owner of (5) Wheel & Sprocket stores in the Milwaukee area. Chris is a 'bent rider himself and promoter of the recumbent movement. Harry Wozniak, for his expert advice and encouragement.

PS: Hey Bob, Harry ate those three donuts!

□



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# The Notebook of an Unreasonable Man

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By Kent  
Peterson

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[www.halcyon.com/peterson/  
bentkent.html](http://www.halcyon.com/peterson/bentkent.html)

## Dumpster Diving and the Beat Bikes

Kent's Mission: A 'bent beat from the back alleys, garages and dumpsters where new bikes don't come powdercoated and old bikes live on with the help of duct tape, hose clamps and determination.

Thomas Edison once said, "To invent you need a good imagination and a pile of junk." As anyone who's ever been to my house will attest, I've got that pile of junk part covered. In fact, that pile of junk keeps threatening to cover every square inch of living and storage space, but pressures from my long suffering wife, my neighbors, and various zoning laws work valiantly to keep things under control. And I do my part as well by periodically swooping into the pile, tinkering and combining pieces, and eventually emerging with something that looks suspiciously like a recumbent bicycle.

### ■ JUNK DISCLAIMER

In this article, I'll describe what I believe is the fastest and easiest way to build a recumbent bicycle from various pieces of junk. A bike like this may not be especially pretty, but it will ride well and be quite comfortable. I should make it clear that while I've ridden homebrew bikes for over a thousand trouble free miles, neither I nor Recumbent Cyclist News can make any guarantees as to your safety if you choose to build your own bike based on the information in this article. Riding any bicycle involves some risk and riding a bike you built yourself may involve added risk. Use your head and be careful out there.

Still with me? Good. Let's talk about junk. Junk is not useless, worn out stuff. Junk is stuff that may no longer work for its original purpose; maybe it has a broken piece or is out of fashion or is the wrong size. Junk is thrown out by people too busy, too cramped for space, or too unskilled to deal with it. If junk is lucky, it gets rescued by someone like me and it gets a second chance at usefulness.

### ■ DUMPSTER DIVING

One of my favorite sources of bike junk is the dumpster behind a bike shop not far from my house. This is a good shop, although it's small and always tight on space. Most of the shop's customers are either BMX riding kids with rich parents or mountain bike riding weekend warrior yuppies. This shop has no ready market for used parts and no space to store them even if they did. It does have a handy dumpster right out back, and at least once a week I get

up early and do my bit to lessen the burden on the King County landfill.

I never know what I'll find in the dumpster, but it's usually a safe bet that at the very least I'll score some inner tubes. Most tubes can be patched pretty easily, but even the ones too far gone to ever hold air can be made into various cargo straps and bungee cords. Other common finds are tires with many miles still left on them.

But some days the dumpster holds major treasure. At various times I've found an entire bike frame whose front end had lost an argument with a tree but whose back half was completely functional, a nice mountain bike stem with one tiny spot of rust, a single pannier in mint condition, various dinged wheels, an assortment of cables, widowed brake levers and orphaned friction shifters. I haul all these pieces home to the bike lab where they get to know the other discards and I begin drawing plans in my head.

### ■ HOMEBREW SWB

My favorite design is a short wheelbase recumbent that at a quick glance looks a lot like a Lightning P-38 or a Rans V-Rex. I built the first of these bikes as an experiment to see if I could build a cheap, roadworthy recumbent using junk parts and simple tools. When this bike was a success, I decided to build another one using slightly better components. Mainly I wanted to prove to myself that the first bike wasn't a fluke.

Since my first bike was very old and junky, I named it after the old junky godfather of the *beat* generation, William Burroughs. Old Bill wrote through his junk addiction and pioneered a writing style he called "cut-ups," which involves combining found pieces of text in new and novel ways. I like to think part of his spirit lives on in the bike that bears his name. My second bike, which also captures a similar spirit, I put together with a bit more care and polish. I made this one a bit more reliable and a bit more suited to go "on the road." I named it Jack Kerouac.

To build a basic beat bike, you should really start with three bikes. First you need to get a mixte frame touring bike. A mixte bike is a kind of "ladies" bike. Instead of having a single horizontal top tube running from the head tube to the seat tube, a mixte frame has twin

tubes running from the top of the head tube diagonally back to the rear dropouts. This makes a mixte frame strong and light while giving it a very low stand-over height. I've never found a mixte bike in the dumpster, but they do show up in thrift stores and yard sales. Since the mixte frame forms the heart of the bicycle, try to find one made from high quality chrome-moly or Reynolds 531 tubes. I've gotten some wonderful old bikes for as little as three dollars and on more than one occasion I've had people give me old bikes! Once you get a reputation as a recycler, the bike parts will find you.

In addition to the mixte bike, you'll need one old BMX bike and a mountain bike. These donor bikes don't have to be in very good shape or even be complete bicycles. As you look over the rest of this article, you'll see what's needed. You will also need a few other items that may require trips to your local thrift and hardware stores. A few final bits may need to come from your local bike shop, but I always view buying a new part as an absolute last resort. Part of the appeal of building the recycled cycle is seeing how low I can keep the overall cost. William Burroughs wound up costing me about fifty bucks, while Jack Kerouac's cost was closer to one hundred. Compared to even the lowest priced factory built recumbents, these bikes are bargains.

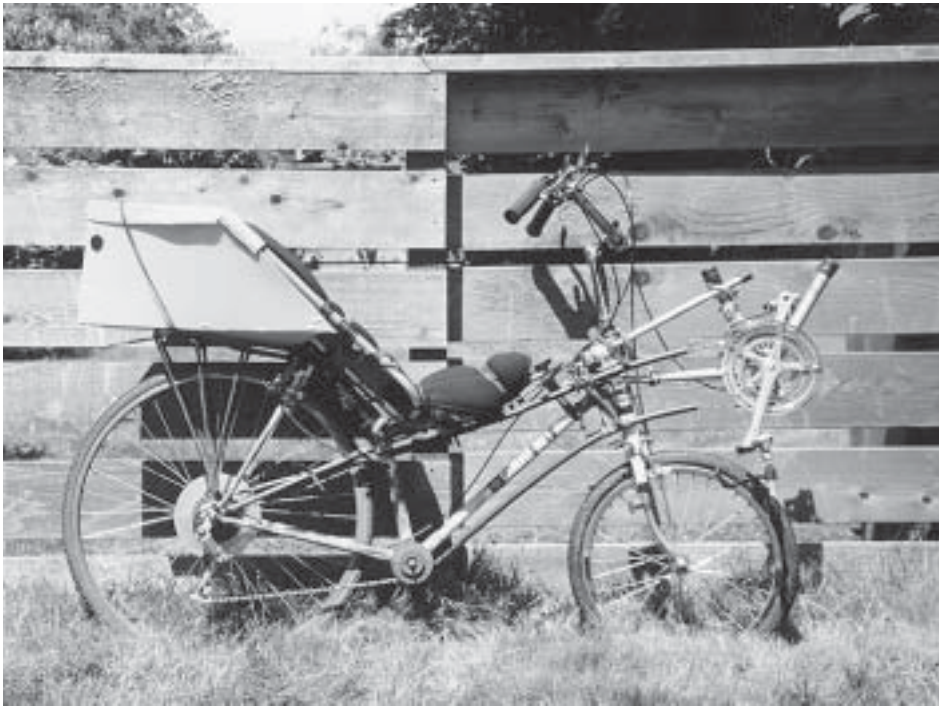
*"My pal Joe Kochanowski took one look at William Burroughs and declared it to be "even less than homemade!" Coming from Joe, I took this as high praise."*

### ■ JACK & WILLIAM

I built my pair of beat bikes using simple hand tools—nothing more complex than a hacksaw, some wrenches and a drill. My pal Joe Kochanowski took one look at William Burroughs and declared it to be "even less than homemade!" Coming from Joe, I took this as high praise.

Here's the basic breakdown of what pieces go into a beat bike:

✓ The mixte bike provides the basic frame,



*Kent Peterson's original mixte SWB, "William Burroughs."*

fork, rear derailleurs, rear wheel and brakes.

✓ The BMX bike is the source of the front wheel and handle bars.

✓ The rear triangle of the mountain bike becomes the front boom. The mountain bike also provides the crankset, front derailleurs, brake levers and shifters.

✓ The seat is a thrift store special made from an old backpack frame and the wide saddle from an exercise bike. A small pillow and an inexpensive car seat cover make things comfy.

✓ Various nuts, bolts, hose clamps, steel mending plates, plastic pipes and epoxy come from the local hardware store.

✓ A tall stem or a stem extension is the part of the puzzle that will probably have to come from your local bike shop. While you are there you may want to pick up some extra shift and brake cables as well as some chain.

#### ■ BENT BUILD

Assembling the bike is basically a matter of taking the above mentioned pieces and assembling them in such a manner that the final product looks like a recumbent bike and is strong enough not to fall apart. I tried writing down step by step instructions, but they wound up being too long and besides each beat bike is its own unique beast. Your particular components and dreams will shape your bike, so instead of instructions, I'll give some hints and guidelines.

First, make very sure the seat is secure. You may need to cut or bend part of the mixte frame behind the backrest to position the seat at a comfortable angle, but make sure the backrest is well braced. I used the upper stays, a rear carrying rack and in one case a set of old aluminum aerobars to brace the seat back. A strong seat back will let you punch a lot of power to your bike's pedals.

The other part of the bike that has to be

rock solid is the front boom. You make the boom by hack-sawing the rear triangle off the mountain bike and cold bending the seat stays down until they join the seat tube an inch or two above the front derailleurs. A pair of U-bolts hold the stays in place. The boom itself is quite strong because it is triangulated but the boom is only as strong as the point where it joins the rest of the frame.

#### ■ I SUCK AT BRAZING

When I made William Burroughs, I didn't have a brazing torch so I secured the boom with a massive array of clamps, U-bolts, steel mending plates and JB Weld epoxy. By the time I made Jack Kerouac, I'd gotten a torch, but a few hot, frustrating hours of brazing attempts convinced me that I truly suck at brazing and I went back to my bolts, mending plates and JB Weld.

Mending plates are incredibly useful devices. These are steel pieces in either rectangular or "T" shapes with quarter inch holes drilled in them every couple of inches. You can use mending plates and bolts to make some strong clamps and the "T" shaped ones make a great brake bridge for the front wheel.

#### ■ JB WELD

JB Weld is one of mankind's best weapons in our never ending war against entropy. JB Weld comes in a couple of tubes that you mix together and it contains some chemicals that can't be good for you together with powdered metal, a bit of acid and some darn strong polymers. Once you mix the contents of the two tubes together, it gets warm and sticky and you've only got a few minutes to slap it where you want it before it permanently bonds to whatever you're working with. The JB Weld package contains wonderful quotes from guys in Texas who use it to

repair cracked engine blocks and busted radiators. I figure JB Weld together with all the steel plates and bolts can handle my little bicycle projects. So far, it's held up fine.

The best way to route the chain is with chain tubes and a single idler. You can use black plastic sprinkler pipe for the chain tubes, but I've found that riser pipe is better. Riser pipe is available at larger hardware stores and garden centers. It's a bit stiffer than sprinkler tubing. Two foot lengths cost about 89 cents. I used about three feet on the drive side of the chain and two feet on the return side. The chain tubes keep the chain clear of the front fork, and I've found the best way to secure them is to use big rubber straps cut from old inner tubes. The idler wheel is attached to the bottom bracket of the mixte frame. I made a pretty decent idler out of a couple of bearing assemblies and some big washers, but a lot of homebuilders make idlers from old skateboard wheels.

The most important thing to remember is that you are building a junk bike. Do not get carried away trying to make it fancy or perfect. It's easy to get the drive train working if you stick with a five or six speed freewheel and friction shifting. If you value your time and mental health, you won't even think about trying to set up an eight or nine speed indexed freehub. Save that stuff for the multi-thousand dollar bikes.

#### ■ WHY?

This brings me to the whole purpose of this article. Why build a junk recumbent? You may want to build one because it's a cheap way to experiment with these fascinating bikes, but why in the world did I build not one but two of these bikes? I write for this magazine, but I have a real job as well and I can actually get my hands on almost any recumbent on the planet if I put my mind to it.

The answer is simple: these bikes are fun. It's fun to mess around with junk and solve problems and wind up with something you can ride down the street. I've ridden William Burroughs in a snowstorm when I didn't feel safe on any other bike and found that this creaky, rusty, junky-looking bike is the most stable two wheeler I've ever ridden. I've blown past three thousand dollar titanium Litespeeds on a hundred dollar bike I made from garbage, and let me tell you that feels good. On the rare occasions when I get passed by someone who is younger, fitter and more determined, I console myself with the thought that my entire bike cost less than his left pedal.

A junk bike you build yourself is yours in a way no factory bike can ever be. You are the designer, builder and chief mechanic, and when you are done you'll have a bike that you can ride to the store or around the world. Sure, you might break down, but with a crescent wrench, some duct tape, and just the right piece of garbage, it won't be long before you're back on the road. □



# Recumbent Design: Rat's Long, Cheap & Easy

by James Bauer

Do you drool over the high priced, high-zoot recumbent bikes that are advertised in this rag? These bikes cost a lot of money and seem to offer little in the way of actual benefit over what a home-builder may be able to hack together his/herself. My thoughts left me wondering if this big buck, high zoot craze where recumbent manufacturers have lots of new \$2000-\$5000 recumbents is healthy for the industry (or our sanity). The low-end bikes are often a slap in the face of the serious recumbent enthusiasts. They are either too high off the ground, have poor 'entry level' (low speed) handling or they have components that you've never heard of or that don't work. \$700 entry-level recumbents offer nothing for me—the recumbent 'performance' cheapskate, so I started Rat's Long, Cheap & Easy Recumbent Bicycles.

## THE 'RAT' LONG, CHEAP & EASY RECUMBENT BICYCLES

An Interview With Industry Blacksheep Martin "Rat" Ratner  
Interviewed by James Bauer (JB)

**JB:** When did you first get involved in recumbent bicycles?

**RAT:** I did an endo on my mountain bike and was laid up for a few days. That was 1996. I had seen a copy of that overpriced recumbent rag and 'borrowed' a few copies from 'somebody.' I kept riding my mountain bike for awhile, but started getting 'numbness' in my nether regions. My girlfriend started to complain...so I decided to try a recumbent.

**JB:** What kind of recumbent bicycle did you buy?

**RAT:** I rode everything out there. I would take bikes on extended test rides and put them through their paces (beat the crap out of them). The guy at the local recumbent shop thought I was a jerk and banned me from the shop. I liked the low Harley-like recumbents the best, but they were too expensive. The compact and SWB bikes made me look like a real geek, and as a recumbent newbie, I was concerned about my image.

Then I got this wild idea that I could actually do it myself. I borrowed more magazines, wrote for brochures and asked stupid questions on the Internet (library's computer). I stayed up for two days straight eating nothing but cold pizza and warm beer and going through two pads of draft paper coming up with my unique design. It is a long chopper bar recumbent based on parts from new or recycled BMX bikes and mountain bikes/frames mated to a square section mild steel main tube. This stuff is big, heavy and easy to work with. I can make nearly perfect miter cuts with my junk or borrowed tools. I got some handlebars from a bike shop that sells lowrider bikes. They are like from a Stingray or something. The shiny chrome is cool, but they're heavy.

I don't have a welder, but this guy down the street does. For \$20 and a six pack, he does the welding for me. It takes him a few hours. Square steel is easy to bolt things to. Giant U-bolts work miracles. My bike looks like a Schwinn Varsity collided with a lowrider BMX bike morphed into a Gold Rush. With my 'hot rod' wheels, it blows the doors off of a Gold Rush.... downhill. It weighs about 50 pounds. I'll be adding a fairing soon. My el cheapo fairing design utilizes hardware store aluminum strips, glued, screwed and duct-taped into position. I've used some coroplast sections to do a cheap stealth looking fairing and tail box. Did I tell you how fast this thing was down hills?

**JB:** Did your mountain bike pals give you a hard time?

**RAT:** All of my riding pals told me that I was turning into a total geek. That is when I traded my green hair for a pocket protector, protractor and let my beard grow (kidding). I've been working on a new offroad recumbent design that should 'blow chunks' in their faces. My girlfriend is very excited about my new interest in recumbents (Big Grin!). My 'nether numbness' is gone and my heavy Long, Cheap & Easy is getting me into great shape and gives me great endurance. If you know what I mean.

**JB:** When did you decide to start your own company?

**RAT:** Back at the recumbent store, I realized within minutes that the recumbent was for me. What I also realized is that I could never afford what is considered a 'good' recumbent. And the bikes aren't getting much cheaper. My mountain bike cost \$259 at a warehouse store (it has full suspension). I can't even buy a factory-built recumbent seat for that price. While at the local bike recycler (junk yard) all of the sudden it came to me: Recumbents are no longer about guys designing high-tech bikes in their garages late at night. They have become about the quest for big bucks in our materialistic capitalist pig society. Everyone is looking to get rich with stock options. I don't even think some of these guys are even designing products that we really want. The push for the latest, greatest is driven by the builders who sell to bike shops at the tradeshow. Successful builders whip the shop owners into a buying frenzy with their 'newer is better' sales patter.

I look at some of these new designs and shake my head. It was at that time that I decided to quit complaining... and start my own company. I knew I'd be an underdog. The recumbent status quo isn't interested in a guy like me. They're too busy acting like snobs and working on the next, latest, greatest, lighter, better performing recumbent to brainwash you into thinking you'll be faster and that last year's bike isn't good enough. I was mad as hell. And this is America! I've decided to stand up for the 'average guy' who thinks 700 bucks is too much for a recumbent!

**JB:** Tell us more.

**RAT:** Besides the dealers and manufacturers (many with dollar signs in their eyes)...I'd show up at recumbent rides and the yuppie snobs would give me a lot of crap. Some bragging about their \$5000 Titanium head-rush or some damn thing. I mean, these guys are spending thousands on their bikes, and then they don't ride them much. Most of them drive some big road hog SUV getting 8 miles to the gallon, and they are working 80 hours a week to pay for them.

Somebody told me that the ti bike (cost 40% more than aluminum) is 5% faster than the aluminum (costs 35% more than steel), which is 5% faster than the steel (A Long, Cheap & Easy costs 15% of the cost of this bike). This may be true for the yuppies that buy these bikes, but not for me. I work part time at this Mexican restaurant in town and at Rat Bicycles during the day (a few hours). I ride everywhere (lost my driver's license...a long story...it wasn't my fault). My legs are strong. It takes me about 5 minutes to leave the ti-guy in the dust. Rat Long, Cheap & Easy (bike model) can be built for around 300 bucks. More if you don't want a plywood, piano hinge and naugahyde covered seat; less if you scrounge more. We may offer mounting directions for a few commercial seats, but we'll have to choose a cheap one or it will double the cost of the bike. (Thanks to my pal Joe for the advanced math lesson above.)

**JB:** Did you have a plan for your company?

**RAT:** Nope. Not really. In the beginning I was just looking for a way to finance my hobby and recumbent building projects. Hey, I guess that sounds like every other recumbent manufacturer. The difference is that I'd like to think that I have a social conscience. It isn't about bucks to me. My mission is simple and is good advice for the average recumbent customer looking to part with a grand or two. You can build one yourself real cheap, most of the industry hype is smoke and mirrors and the rest can be overcome with riding more and drinking fewer lattes. If you want light weight, go on a diet. I like bikes that are big and strong. I've never broken a Long, Cheap & Easy frame. This is amazing given that I beat the Schlitz out of it and ride it offroad.

**JB:** How did you come up with your company name?

**RAT:** My nickname has been 'Rat' since the '60's. My hero is 'Rat Fink.' Long, Cheap & Easy was a natural. I take life easy. I like a lot of stuff

'Easy' if you know what I mean. I like the long recumbents with the chopper bars. I don't like the direction of the bike bizness and the high cost of bikes, esp-ecially recumbents. So Rat's Long, Cheap & Easy is my anti-establishment, non-commercial, roots showing through.

**JB:** What about a company slogan?

**RAT:** We're a pretty exclusive group you know. Not everyone can join. You have to pass a test that I have spent years working on (build a Long, Cheap & Easy). Our unofficial corporate slogan is "*Cheap Bikes Kick ASS.*"

**JB:** What do you actually sell?

**RAT:** Well, we actually just provide proven insight and knowledge into cheapskate recumbent technology and performance in our building manual. Our manual is chock full of ideas on how to get almost as good performance for a fraction of the bucks.

**JB:** What models are covered in the manual?

**RAT:** Our flagship model is the one with the wedgie bike rear end mated with the 2" steel tubing and plywood seat. Like I said, it can be built for under 300 bucks in 5, 6, 7, 14, and 21 speed models. Our manual recommends not using an 8/24 or 9/27 speed drivetrain as you'll always be fussing with them. If you do, forget about the indexed shifting. Actually, we recommend that you don't use indexed shifting at all. Our bikes have no cable stops. We run continuous housing zip-tied to the frame for the brakes and shifters. Some of our builders mount the shifters under the seat to keep the cable runs shorter. You know those chrome Stingray bars are rather high and you might need some extra-long tandem cables. No need to worry, our manual tells you where to find those, too.

We have a performance model. It has a higher bottom bracket. It is our lightest bike at just a tad under 40 pounds and is painted with gold spray paint. We like to give prospective owners a little quiz (outlined in the manual) to make sure they fit the criteria and personality profile to ride one. We think skinny tires suck and don't recommend them unless you are a racer type who rides on perfect pavement that have no thorns, nails or other road hazards on them, EVER. We've found a limited market for this model, though offering it proves a point to some riders (who live in a dream world).

**JB:** What about upgrades?

**RAT:** We're working on a full suspension design....and it won't set you back two grand neither. Did you know that those 20-inch shock forks were made for kids' BMX bikes? You'd be surprised at what you can get for a couple of hundred bucks. I buy a fully suspended mountain bike from a toy store or wholesale club, and a BMX bike with a front shock fork. I figure that full suspension might add a few hundred bucks, but you'll get a bunch of good components, a drivetrain, and enough parts to get going on your second Long, Cheap & Easy.

You can actually hack the back end of a Long, Cheap & Easy off and weld on your Bikes R Us suspended rear end. That way you don't have to buy a new multi-thousand dollar bike. We don't outdate Long, Cheap & Easy models. We are all for recycling and reusing. Our product updates are all do-it-yourself retrofitable. There are a lot of unriden bikes sitting around in garages out there. We suggest that you put the word out that you are looking for them.

**JB:** Are your construction methods environmentally friendly?

**RAT:** Well, we kind of leave that up to the builder. We kinda figure that our recycling is about as good as we can get. We don't use cheap foreign labor, toxic chemicals or anything like that, and everyone speaks English. We don't use fancy paint or powdercoat neither. Since you might be modifying your bike at some point in the future, our manual gives careful instructions on the best methods of using spray paint—the colors to use and avoid....that sort of thing.

**JB:** Aren't the Long, Cheap & Easy recumbents kinda heavy?

**RAT:** You know, recumbents in general are heavy. Any mid-20 pound recumbent is either too flexible or not tough enough to meet our rigorous standards. The long bikes are all in the mid-30 pound range once you carry some spares and tools...and a fairing. Aerodynamics is far more important

than saving a few grams—or even pounds!

We have a unique way of looking at the weight. If you have a 25 pound recumbent, chances are that it is worth 2 or 3 grand. You will need to carry a pretty damn big lock to keep it safe...that is if you really USE your bike. We've found that a long recumbent with a fairing, even one of our hack-job strip aluminum and coroplast jobs is still faster in most situations than a 25-pound factory built. We blow their doors off downhill. Uphill is where the 25-pounder might have the edge, though you need to ask yourself if .5, 1 or even 2 MPH uphill is worth a grand or two. If you ride a factory long bike, they already weigh in the low-mid 30-pound range. Add a heavy lock for parking security and they are up to the weight of our bikes. Our manual also suggests other theft deterrents, though theft of these bikes has not been too big of a problem.

**JB:** What are your thoughts on bottom bracket height?

**RAT:** Well, with the easy and cheap 'Long, Cheap & Easy,' the bottom bracket can be placed at or below the seat height. For those who prefer a really low bottom bracket, the manual shows how to weld on a wedgie's lower frame section/bottom bracket or some more square steel with a BB attached to accomplish this. A lower bottom bracket seems to work best with this design. We find it a personal preference sort of thing.

There really is little benefit to these euro-sheik dudes with their feet way up in the air.

We have had the benefit of many decades of motorcycle ergonomic R & D. We stare at a big Harley, and rotate the riding position backward a bit. It's not brain surgery. If you identify more with the Euro dudes, that's cool, too. We've got a design on the drawing board that starts with a BMX bike, and we weld a high triangulated boom onto the frame. It will be lighter, but the best benefit is that the plans for all of our models are in the same manual so that owners dissatisfied with the feet in the skyward position (looking at the moon) can bring them back down to planet earth and ride like the guys in Easy Rider. I mean, it's really about comfort, man. Odd and extreme riding positions can be a pain.

**JB:** What about cycling outfits?

**RAT:** We recommend that you throw away all of your Lycra leotard sissy-looking outfits that make you look like a jerk. Have you ever seen guys riding Harley's wearing Lycra? It makes you look like a clown. I wear whatever I've got on. Usually some baggy hiking shorts and one of our Long, Cheap & Easy corporate T-shirts. I wear real shoes and ride with platform pedals. To get more of your hard earned cash, the dealers and rags recommend clipless pedals. My theories on this are simple. Borrow from somebody who has done extensive R & D. Shark tooth BMX pedals grab my high-top Converse Allstars just fine. Sometimes I wear hiking boots when I'm riding offroad to protect my ankles. One of the added benefits of the lower bottom bracket is that you don't need to hook your feet onto the pedals. They also work well if you are being chased by a dog. Don't get me wrong, I like dogs, but I take a 'him or me' attitude when I'm on the road.

If you are still wearing Lycra, 100 dollar shoes, pedals and sunglasses, we suggest you get over that addiction first. Sometimes we recommend riders go back to riding a drop bar upright bike until they can break these bad habits.

**JB:** What do you think about the direction of the bicycle industry?

**RAT:** All of my theories are based on simple and affordable strategies (all of which are outlined in the Long, Cheap & Easy Building Manual). As we examine the term 'SIMPLE,' I refer back to the often overlooked (by geek engineers who want to sell you expensive bikes and money motivated component makers who have a burning desire to outdate parts EVERY freakin' year). Think K. I. S. S. When in doubt, KEEP IT SIMPLE, STUPID! Extreme theories and complexities add cost.

When we analyze modern components (in the Long, Cheap & Easy Manual), we see that systems are not getting easier to use, they are getting more difficult. I read in some rag that weather changes can alter a 9/27-speed drivetrain. Since our weather changes by the hour, that might stress me out too much. I don't use 9/27 speeds or even indexed shifting. My bike is 7 speed with two chainrings up front (with no front shifter or derailleur) for a manual shift. If you don't like greasy hands, make a little chain-tube-guard and pull it or kick it to change gears. Like I said,



K. I. S. S.

**JB:** How do the Long, Cheap & Easy ride?

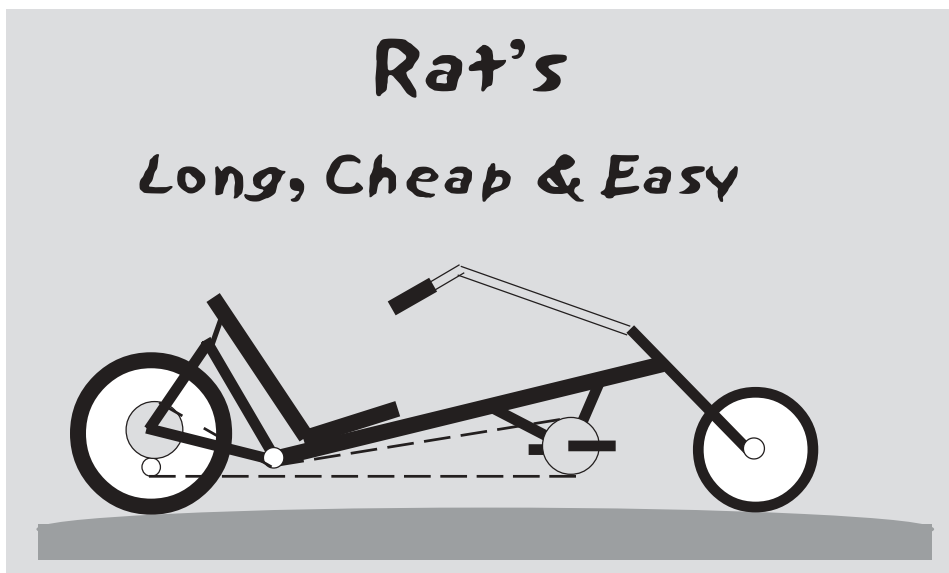
**RAT:** Well, they ride like any of the classic, expensive factory built long recumbents with AFC (above frame controls). Long, Cheap & Easy's kick ASS in the downhill. They are like a roller coaster with a ton of bricks tied to the frame. They handle well, though depending on how creative you get with the front end, skinny or fat tires, 20" or 26" wheel, they will vary a bit in ride 'feel.' You can expect even the worst Long, Cheap & Easy to be more confidence inspiring than a tall skinny tire short bike, or a tail-heavy wheelie popping compact. Recumbent climbing is overrated. Most are fairly slow unless you are an athlete. I have low gears, and spin up the largest hills. All of the Long, Cheap & Easy's are faster than the wedgies we cut up to make them. If you need better performance than we have to offer, RIDE MORE.

**JB:** It's really about the money, huh?

**RAT:** Well, yeah. Kinda. 'Cool' has become trademarked. Have you noticed that once-rebellious rock and roll is now used in TV commercials? Harley's were once for outlaws, now it costs 20 grand for the privilege while looking like a yuppie, consumeristic sucker. And you'll be doing it with a bunch of posers. I'm for a REAL world cycling experience. Something that I make with my own two hands, for cheap. I'm proud of that. And without the industry smoke and mirrors. We've got a bunch of borderline hucksters trying to convince you that their costly technologically advanced bikes are superior. Yet, they'll try to sell you the next latest greatest a year from now—mark my words. And don't ask what your trade-in is worth. These bikes are so costly new, they depreciate 50% the first year (often more if traded in). Most of these basic recumbent designs have been around for 30 years. Some can be traced back nearly 100 years. So what is really new? Maybe the Long, Cheap & Easy approach to recumbent cycling.

If everyone followed my lead, we could start a revolution. Rampant materialism sucks. The endless pursuit of multi-thousand dollar bikes never ends and leaves you feeling empty, taken advantage of and depressed as well as broke. Many riders are on a quest for the next bike even before their current one is broken in. I'm just saying take a look at your life and realign what's important. If you like recumbent bikin', GO RIDE!

Bicycles are the cheapest and simplest (and greatest) form of transportation known to mankind. Recumbent bikes will bring more riders into the cycling fold. The industry needed a non-commercial venue for those of us who don't have one, two or even three grand for a new bike (and question the sanity of those spending 5 or 6 grand—actually, they are the same folks buying 35 grand SUV's). Give the posers a bad time. Show them that they need to RIDE to keep up. You can't really BUY performance with a bicycle. Ride with all of your heart and soul. Ride to the store. Ride for a burrito. Ride to the.....recumbent ride. We can



agree that ridin' ' bikes is clean, cool fun. Whether you build a Long, Cheap & Easy or ride a factory bike, we can agree to that. ☐

**Editor's Note:** The 'Rat' Long Cheap & Easy article is a spoof. "Rat" exists only in the mind of the author and maybe a little bit in every homebuilder and bicycle retro-grouch. If you are interested in similar technology, we suggest that you check out the LaBent from Denny LaDue. Mr. LaDue's bikes may have been the motivation for this article, but the views of the author are his/hers alone and may not represent the views of RCN, Bob & Marilyn Bryant, our advertisers, sponsors, writers, LaBent or Denny LaDue.



# *The Recumbent Bicycle*

by Dan Henry

The desire for more and more speed has perhaps fathered more vehicular designs than any other single consideration. And so it has been with this recumbent bicycle. I was seeking greater speed and I found it. But even more exciting, I found undreamed of ease and comfort.

The recumbent bicycle, as such, is not a new idea. Over several generations a number of them have been shown and tried on bike tracks around the world and outstanding performances have been recorded.

Previous versions were either ridden on one's belly in a swimming position, with the pedals at the rear, or on one's back in a reclining position quite like that assumed on a deck chair. On this second type, feet were extended horizontally forward with pedals convenient to this position. Less successful designs utilized some combination of crank and rod instead of a conventional chain drive. In all cases, the prime object was to reduce aerodynamic drag by reducing the square unit of body area passing through the air. Aerodynamic drag is by far the most formidable barrier to attaining greater speeds.

All recumbent designs insofar as I can determine, failed to prevail and never achieved mass production or distribution. Usually just a single unit was hand built.

Much of the failure appears to have derived from the inability of the cyclist to sustain himself for extended periods on the bike because of physical distress. One or a number of physiological factors placed them in disfavor. Additionally, it is my belief that they also failed for a variety of mechanical and economic factors.

The recumbent shown here was conceived after a careful study of photographs and drawings of a goodly number of previous designs. My goal was to build a speedy bicycle that would be comfortable and a pleasure to ride.

This bicycle is *fast* and has the *drive* and float of a tandem. A real speedster and fun machine. Fun for the person on the bike and a fascinating and amusing occasion for most spectators. Unlike any other bike that I have ridden, I find an *aura*, an invisible envelope of contagious excitement seems to follow it down every road upon which I ride. Faces light up with childish delight as I pass and this adds immeasurably to the pleasure of the day's outing. The phenomena is quite unlike simple ridicule to which cyclists have become accustomed.

## **Technical Details**

Except for the frame, which is silver brazed of ultra light CroMo aircraft tubing, it is built from conventional bicycle parts, or other equipment likely to be found around the house or in a neighborhood hardware store. Many parts have, however, been modified by heating, bending, cutting, etc. Not a single part was machined especially for this bicycle.

The most novel feature of all is the remote steering arrangement. A false steering head supports the handlebar and steering is accomplished by a chain drive from this false head to the true steering head at the front.

## **Seat of Furniture Webbing**

The seat is constructed of old handlebars and furniture webbing very much like the webbing of a folding chair. Sitting comfort is comparable to that of a webbed chair. The seat in its present version, shown here, is the fourth type that was tried. The three that were discarded were equal to or better than the ordinary standards of bicycle comfort but fell short of the degree of comfort that I had hoped to attain.

## **Spring Suspension**

Both wheels are spring suspended for the elimination of road shock. This suspension is similar to the one employed on a more conventional bicycle previously described in *American Bicycling* 1967.

The wheelbase is longer than a tandem and about twice that of a conventional bicycle. This extreme of wheelbase gives exceptional comfort. The rider being suspended well within this long wheelbase, results in his receiving but a fraction of the amplitude of shock received by the wheel.

Hub brakes are employed because of the spring wheels. The conventional rim brakes are not feasible with this arrangement.

Normal riding position is relaxed and natural imposing no discomfort. In several of the photographs it is apparent that the riding position assumed greatly reduced the aerodynamic drag factor. On the recumbent, substantially the biggest reduction in drag is derived by both the arms and the legs entering the air stream endwise rather than full or partially broadside, as is the case on a conventional bicycle. The torso is about equally situated in



either case.

### **Increase In Pedal Thrust**

One's thrust upon the pedal is considerably greater than can be achieved on a regular bicycle. It is quite like sitting upon the floor with your back against the wall—in this braced position a force much greater than one's weight can be imposed upon the pedals. On the conventional bike, your weight approximates the maximum thrust.

### **Very High Gears**

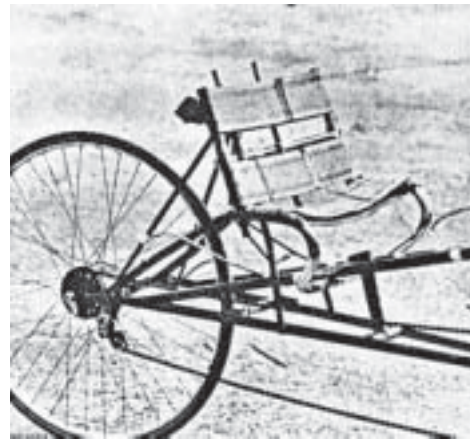
Because the recumbent rolls at a higher speed with comparable effort, exceptionally high gear ratios are employed. It has a five speed set of conventional derailleur gears utilizing a chain wheel with 60 teeth. Several gear ratio choices with over 100 are available. The gear shifting lever is at the center of the handlebar. Eight ounce rims, silk tires aluminum parts wherever possible, and egg shell thin tubing are many of the refinements that make the bike a very lively and responsive machine. The gross weight is within a few pounds of the conventional racing bike.

"So long for now I'll wait for you at the coffee shop."

This article was originally published in American Cycling Magazine 1968 Article by Dan Henry. Photos by Victor Hirschfield. Scanned by Mark Colliton from photocopies of the original magazine article



*Dan Henry and wedgie rider chat. Note dual suspension and remote above-seat steering—photo circa 1968*



*Dan's recumbent seat consisted of an inverted drop bar, homebuilt seat back with mesh from a lawn chair*