Bikes, Cars and Other Things

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Sustainable Living in the Suburbs

By Nev Sweeney
& Bill Tarplee

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1.0 Introduction

1.1 Environmental Impact

The environmental impact of transport in Australia primarily stems from its role as a major source of greenhouse gas emissions, contributing about 22% of the nation's total, largely from road vehicles. This contributes to air pollution, which has significant health consequences, including hospitalizations for cardiovascular and respiratory issues. Impacts are also associated with energy consumption from non-renewable fossil fuels.

Greenhouse gas emissions

- Transport is Australia's third-largest source of greenhouse gas emissions (behind electricity generation and stationary energy consumed at fixed locations like homes, businesses etc.).
- Road vehicles are the largest contributors, making up over 80% of the transport sector's emissions.
- Passenger cars and light commercial vehicles are responsible for over 60% of transport emissions or 10% of Australia's *total* greenhouse gas emissions.
- Domestic aviation accounted for 8.5% of the sector's emissions in 2022.

Air pollution and health impacts

- Vehicle emissions include carbon dioxide, nitrogen oxides and fine particles, which contribute to air pollution.
- Pollution from vehicles is linked to serious health problems, such as hospitalizations for cardiovascular and respiratory issues.

Energy consumption

- The transport sector consumes a large amount of energy, primarily from non-renewable fossil fuels.
- The consumption of petroleum products is a significant factor in the sector's environmental footprint.

So, what can we do about it?

First, remembering that according to Edwards Demming “What we don’t measure, we don’t control” is to conduct a Household Transport Sustainability Audit, which is covered by the next section of this eBook.

Other ways to help you reduce the environmental impact of your transport that are covered in this eBook include –

- Bikes – Section two covers how to use, repair and maintain them
- Cargo transport – Section two talks about how to turn your bike into a cart bike, and section four talks about making a hand cart and how to repurpose a pram to carry home the shopping.
- Cars – Section three talks about our experience of doing without a car for six months and how we worked out how to drive in a more fuel-efficient manner.

1.2 Conducting a Household Transport Sustainability Audit

So, we know that there is a problem, but what do we do about it? It seems reasonable to use our purchasing power and behaviour to reduce our environmental impact as much as we can but that presumes we know where to start. The premise of this part of the eBook and the associated **sustainable Transport audit form** (which is available as Appendix 1) is that it gives us a way to review how sustainable our practices are at the moment and help us work through what we need to do to improve.

You may want to work through the Sustainable Lifestyle Assessment Matrix first to understand the bigger picture of sustainable living or if you just want to focus on transport alone and give the transport audit a go. It can be as simple or formal as you like, filling the form out as you go or just running through things in your head and working out where you go from there. I recommend the more formal method so you have a record of where you are starting from which you can come back to later, re-do and get a feeling of how far you have come.

I also suggest that you share this with your family, or the people you are living with, so improvement can be on a united front.

Instructions

Go through all of the questions one section at a time and mark the number most appropriate for your answer from “always” = 3 down to “never” = 0 by circling, crossing out or whatever. Some questions may appear to support a more yes/no answer so to reflect this it would be best to mark 3 for yes and 0 for no. If the question is not applicable to your situation, strike it out and when counting up the maximum possible number to work out score do not add 3 for that question.

To calculate your score add up all of the potential answers and multiply by 3 to give the maximum possible score, and then add up all of the scores from your answers. Divide your answer score number by the maximum possible score and multiply by 100, this will give you your sustainable transport score as a percentage. The number itself does not mean much, but provides a base number upon which you can improve over time.

Review the results with your family, focussing on some of the lower scores and this will help you focus on areas which you wish to improve. This may be as simple as buying E10 petrol more often or making sure you walk rather than drive for short journeys; or you may wish to write up a plan so that you can track your progress over time. Either way you may want to run the sustainable transport audit again every year or two to check over all progress.

Public transport

Most of us in the urban/suburban landscape can get where we need to go with public transport. Seeing as public transport is already in place and running, using it does not add greatly to the environmental degradation due to transport. It also reduces our cost because we no longer need to –

- Buy a car

- Pay to register a car
- Pay to maintain a car
- Pay to use motorways
- Pay to park a car
- Pay to fuel a car

And it means one less car on the road. If enough of us take this option then the roads will be less cluttered and the air will be less polluted. There are some things, like picking up bulky materials which would be easier with a car (or more specifically a ute) and in this case it is easy to rent one for a specific job. For this purpose alone it is worth maintaining your driver's licence.

Bikes

"When man invented the bicycle he reached the peak of his attainments. Here was a machine of precision and balance for the convenience of man. And (unlike subsequent inventions for man's convenience) the more he used it, the fitter his body became. Here, for once, was a product of man's brain that was entirely beneficial to those who used it, and of no harm or irritation to others. Progress should have stopped when man invented the bicycle" So says Elizabeth west in her book about living the simple life called "Hovel in the Hills".

That covers things pretty well really! Bikes are comparatively cheap to by (the usual ones anyway) and for a few hundred dollars more you can get an electrically boosted bike to help with those pesky hills. While I love bikes and biking, you do need to think about where you are and if you can get safe bike access to where you want to go. I rode to work a few times many years ago and then walked rather than biked because it was safer. If you live in a more enlightened and bike friendly city than Sydney, it is worth a go!

Cars

Cars have a whole lot of regulations and costs associated with them and they would be about the least environmentally friendly of all the transport options. At each step of the car ownership journey buying, driving and maintaining there are things you can do to reduce the impact of your car ownership. If you can't get away from owning a car because of your personal circumstances (and it is worth asking the question, not having car ownership the default transport answer) check out the things you can do and start reducing your impact today!

A few years ago I had a company car, which went when I was retrenched. For some months Linda and I did without a car and our experiences can be read about later in this eBook.

Walking

This would be my favourite low impact transport method. It is healthy, requires a minimum of equipment and almost anyone can do it. It is, however, quite slow and not well regarded in this fast-paced western civilisation which we live in. That aside from the point of view of savings, environmental benefits and positive health effects walking has got to be the transport mode of choice, at least for short distances.

Air Travel

While it is only a comparatively small contributor to our greenhouse gas production at 6% of the total, they pump them out at high altitude, which can enhance their effects. Certainly when calculating your ecological footprint, air travel seems to have an effect more than its share. It suffices to say that if you can get there another way, don't fly!

2.0 Bikes

2.1 The sustainable Pushbike – Part 1 – By Bill Tarplee

These articles were first published in 1982 as "Survival Push Bike" in the magazine Australasian Survivor and was written as part of a three-part series by the then editor, Mr Bill Tarplee. Bill is a wizard with things mechanical, and his advice and insights are still relevant today for those who wish to live more sustainably by using their bike. Of all the things I am, artist is not one of them so I have tried to reproduce Bill's original drawings as best as I could.

Recently, at the age of 39, I took up serious push bike riding again. (Serious in the sense that I ride to and from work each day). This is a round trip of 30 odd kilometres per day. To most people this is considered a vast distance, and I must admit that before I commenced the pastime, I thought the same way.

Bicycling has many advantages, but the one that is frequently overlooked is the time that it gives you to think (apart from the pedalling there isn't much else to do). One thought that occurred to me is that the bike is such an ideal survival (and sustainable living) machine. It has many advantages – it is cheap; it costs nothing to run; it is simple in construction; it has a minimum of parts to go wrong; it is silent in operation; it will operate in most conditions; it requires only the power of the rider; it does not need the use of public roads; it can carry a surprising amount of material; it can be used to cover vast distances; it is one of the few modes of transport that improves the fitness of the user.

There are obvious disadvantages – use is dependent on fitness; weather conditions affect use; hills make travel a bit more difficult. Notwithstanding the negatives, the bike is an ideal mode of transport and one you should seriously consider.

When considering bikes, we have to realise that basically there are two types of bikes –

old fashioned bikes and modern bikes. (This may come as a surprise to my younger readers.)

Old bikes were divided into two classes – free wheel and fixed wheel bikes. Free wheel bikes were those with a ratchet arrangement in the hub, whereby you could stop pedalling and keep your feet motionless as in the modern machine. Fixed wheel bikes came without the ratchet (or coasting) hub and were such that the pedals rotated as long as the bike moved. There were advantages in both systems and I really couldn't which form I preferred, having had both.

You can still find both types in the second hand shops and trading/swap gatherings. They came with two forms of rim shape, and both forms were fitted with a much wider and lower pressure tyre than is currently fitted to modern bikes.

Generally these older bikes are far less desirable than a modern bike and command a much lower price on the second hand market. Unfortunately there are at least two big disadvantages to owning such a bike. The first is that it is becoming increasingly difficult to obtain the wide tyres necessary to fit the older rims. The tyres were 1 3/8 inches to 1 ½ inches wide whereas the modern tyres a 1 ¼ inches or less. Also, the older bikes will have travelled many miles – maybe 50,000 or more and in all probability are suffering from serious metal fatigue. I have had one bike break up under me from metal fatigue, and it is an experience I would not like to repeat. A fresh coat of paint and cleaned up parts will not remove metal fatigue. For this reason alone I would think very seriously about buying an older bike. Such bike may also be seriously affected by internal rust in the frame. While you can see the exterior rust or pitting, if it is on the inside it will not be apparent until he bike breaks up – maybe at speed. All things considered, I feel that the older bikes are fast becoming a risky proposition, despite the price advantage.

This now brings us to the modern version. In general it will be a bike with multiple gears – 3 speed hub gears or 10 speed derailleur gears, also they will have the thinner wheel previously mentioned. It is this type I will consider simply because such bikes are more commonly available and spares easier to obtain.

The older bikes had some advantages with the low pressure “thorn proof” tyres and comfortable touring saddles. The modern version is easier to pedal as the high pressure tyres produce less road friction and the 10 speed gears are a labour saving device on hills or when riding into the wind. While it will take a little while to become accustomed to using ten speeds to full advantage, they are far superior to older bikes with a single (compromise) gear.

To get full advantage from a cycle it is necessary to maintain the machine at its mechanical best. This is not a difficult job but one that takes a bit of periodic care. A little thought will soon show that if the bike is not functioning properly, YOU will have to do more work to achieve the same results.

In a mechanical sense, bikes can be considered as two systems – the bearings and the drive mechanism. It is interesting to note that modern ball races (best known as “ball bearings”) owe their widespread popularity to cycles, since it was necessary to produce a cheap and efficient bearing for the early cycles to function efficiently.

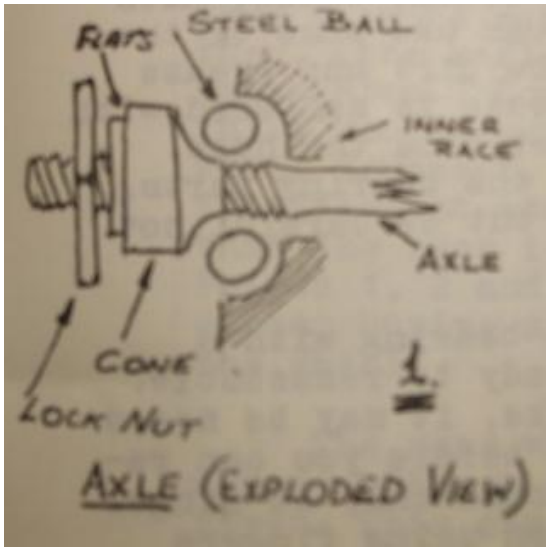
Cycle maintenance is easy and usually quick once you know what you are doing. Assuming that the bike is a survival tool it is important that you know how to fix it. You

may not be able to rely on others to perform the basic repairs in our increasingly uncertain future.

I shall cover some basic points. If you know absolutely nothing about mechanics, then I suggest you follow the basic rule of maintenance – never wait for something to go wrong: always work upon a machine before it breaks down. That way you will recall how well (or otherwise) it performed before it broke, and you will have a ready reference once you have completed the job. Also, never work on more than one part at a time, if possible. If you pull the whole thing apart, you may have difficulty determining why it still doesn't go when you reassemble it all. (I learned that the hard way with cars and it is a rule I can't impress too strongly).

A cycle contains at least five sets of ball bearings. It is to your advantage to be able to clean, oil and adjust them all as necessary.

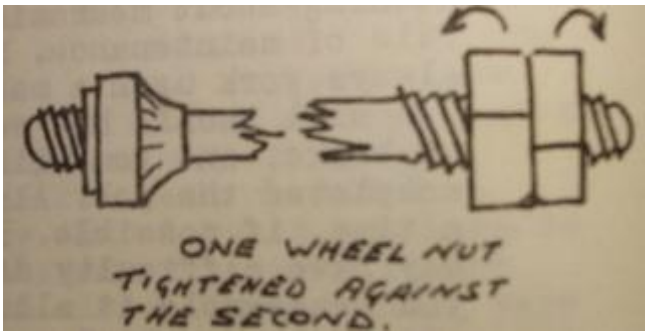
In the exploded view of a typical axle I have shown the basic construction found in most bikes. The steel balls are held in position in the inner race by a cone. This locked in position by a locknut. The forks fit outside the locknuts and are secured by another nut. It is all very simple and there are few problems involved in the cleaning or adjusting processes.



However, before I get down to specifics, I would suggest that you obtain a quality tool kit. Most of the cycle tool kits are just unadulterated rubbish, and I wouldn't let one near my bike. You cannot improve on a quality ring spanner when it comes to tightening or loosening nuts. Don't use sloppy fitting open ended or adjustable spanners. They will invariably mush up the corners of the nut and make it next to impossible to remove next time. Far better to go to the hardware store and buy a 14mm. Ring spanner or whatever size is needed, and not ruin any of the nuts. You'll only need a couple of spanners to fit all the nuts encountered on a bike.

With all that said, adjusting the front wheel. Assuming that you have a new bike that has not been worked on before, file or otherwise mark one end of the axle and record which side of the wheel is thus marked. (Axles have a particular side or way of facing). I shall explain a little more in a minute).

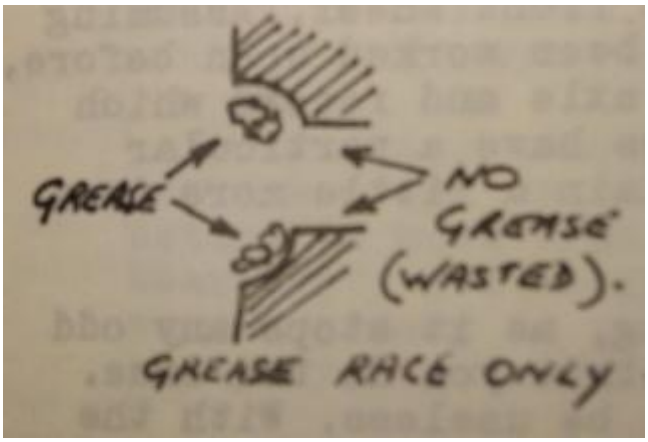
I like to work on an old sugar bag, as it stops any odd pieces from rolling away. I'd suggest that you do the same. One lost steel ball and your bike will be useless. With the wheel out and lying on its side on the bag, you will need twp spanners - one to fit the locknut, and one to go under the locknut on the two flats milled on the sides of the cone. This will needs be a thin sectioned spanner, and special cycle spanners are sold for this purpose. Remove the locknut and then the cone (the cone should only be finger tight). If the cone is tight upon the axle, roll the wheel over and try the cone on the other side. You will that on many bikes only one cone is easily removable. This is one reason for marking the end of the axle. If you can't remove either cone, screw the outside nut back upon the axle for 12mm and then screw on the other wheel nut. Using two spanners, tighten one nut against the other, you can then use the locked nuts as a base to screw against when you fit the spanner back on the cone.



With the cone removed, the axle will fall back through the hub and the steel balls will fall out onto the bag, be certain that they all fall out. A magnet is useful for picking the balls out of the race. Put the axle, cones, balls, nuts etc. Into a tin and cover with kerosene. You can use some of the kero and an old paint brush to clean all the grease and dirt off the hub, rim and spokes. Once the grease is softened with the kero, hose the mess off with a hard jet from the hose. Leave the wheel to dry while you clean up the bearing parts, these can be cleaned in a similar manner but be careful not to lose any pieces.

Once the parts are dry, wipe out the bearing with a piece of soft clean rag. You are then ready to reassemble. If you are working on an old or abused bike, it may be necessary to clean out the threads on the axle before you can reassemble. Remember how I said the cone should be only finger tight? It should be possible to screw it on using fingers only. If you can't tease out a bit of steel wool and pull a few strands through the hole in one of the hexagonal nuts, holding the axle with a vise, visegrips or pliers (in the middle where there is no thread) run the nut along the threads. Once washed down again with kero, you should find that the nuts can easily run on with finger pressure only.

To reassemble you will need a tin of thin car grease. Apply grease all round the inside of the inner race and replace the steel balls (same number each side). The grease will hold them in position and you should be able to turn the wheel over without any balls falling out. Work over the bag just in case. Be careful to keep everything as clean as possible, as a speck of dirt could start scratching the ball race and causing unnecessary wear.



Before fitting the axle, check for the following, as I said before, one cone is usually wound up tight and can't be easily removed (frequently it is run up to the end of the thread), the other side is the adjustable cone. The action of the wheel rotating should be trying to unwind the cone. It has to go to the side of the bike where this will happen. If the wheel turns clockwise, and you have a clockwise thread on the axle, the adjustable cone would go to the left. Make sure of this before you fit the axle. That done, replace the parts as you removed them.

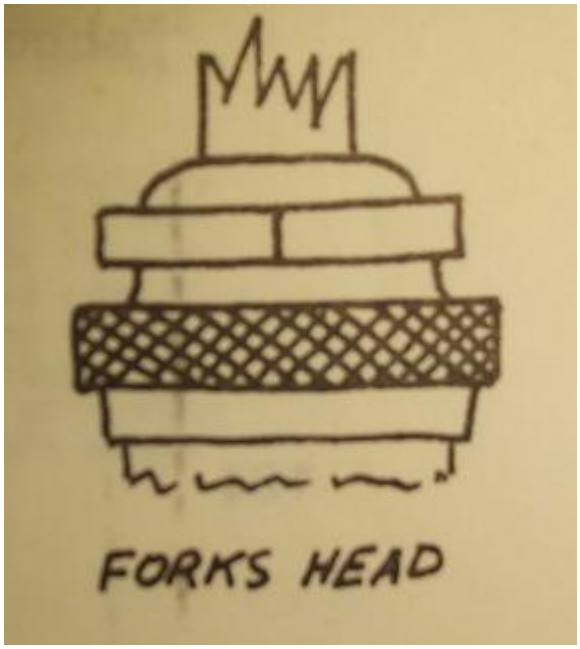
To adjust the bearing, you finger tighten the cone just to the point where there is no rocking or wobbling in the bearing. The axle should turn freely with no resistance or binding, but at the same time, no wobble. It is a fine adjustment but easy to do. It is better to be marginally on the loose side than too tight. Fit the locknut and check that in doing so you haven't increased the cone tightness on the steel balls.

If you upturn the bike, a properly adjusted cone should have no sideways movement at the tyre, but the wheel should rotate freely. The weight of the valve stem should be sufficient to turn the wheel slowly until the stem bottoms. If you have a spoke reflector this weight should cause the wheel to turn (the reflector is a bit heavier so should outweigh the valve stem). Sometimes you will find that no matter how carefully you adjust the cone, you cannot remove all the lateral wheel movement. This is an indication that either there are insufficient steel balls on one side; that the balls are worn; that the race is worn or the balls are the wrong size. Points 1, 2 and 4 are easily fixed. Point 3 could necessitate either buying a new wheel or buying a new hub and re-spoking the wheel.

The rear wheel is cleaned and adjusted in a similar manner although obviously the chain will have to be removed first. This can be done by loosening the wheel nuts and moving the wheel forward, the slack in the chain will enable you to lift it off the sprockets.

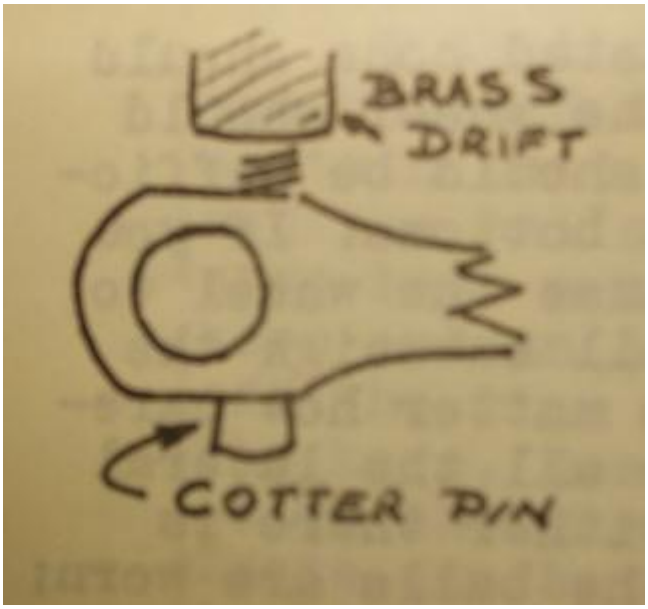
In cleaning the rear wheel, check the condition of the sprocket teeth. They should be clean and free from wear. Teeth shape will vary slightly, depending on the gear mechanism used. Derailleur gears are a flat top bevelled edge tooth; hub gears have a more pointed tooth. In either case there should be no wear on the back or sides of the tooth. Worn teeth will cause a new chain to wear rapidly, so you aren't saving money by not replacing the sprocket.

When cleaning and adjusting the crank bearings and forks head, the procedure is similar, though the mechanical arrangement varies slightly. The forks are locked with a large lock nut, and a minute of close inspection will show you how it works. The nut beneath is frequently knurled and has to be gripped with slip jaw pliers (which is a nasty way to hold a nut!). The steel balls are smaller than in the wheel bearings, so you will have to be more careful not to lose any.



With the crank bearing you will have to remove the pedal cranks first. Usually this isn't difficult but there are a few points to observe. Firstly, there are two types of cranks – those using cotter pins and keyless cranks. If you have the latter type, you will need a special puller that you can obtain from almost any bike shop for a few dollars. While you might get the crank off without the puller, it is false economy as you will invariably damage the bike in the process. Far better to buy the right tool now, before inflation bites any deeper. The puller will come with specific instructions on its use, so I won't go into details here.

With cotter pins, first loosen the nut off a couple of turns only, then with a soft faced hammer or with a piece of soft metal across the nut, nit the nut a smart blow with the hammer. If you don't use a soft face on the nut you will invariably damage it and make future work far more difficult. Also, the crank must be fully supported so that the blow doesn't damage the bearings.



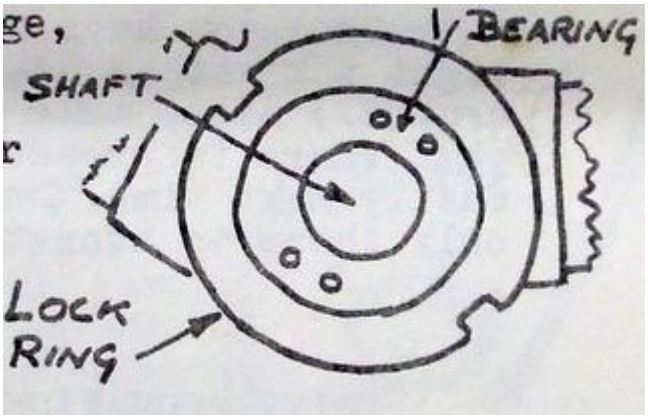
If you are working on an old bike you may find that some clown has already done the wrong thing and butchered the cotter pin. This means you will have to replace it before you can reassemble the cranks. If you have trouble in removing the damaged pins I have found that a 150mm x 12mm bit of brass makes a good drift. You will need a heavy hammer and the crank supported on a substantial block to absorb the shock.

If a couple of smart blows do not dislodge the pin you will have to use heat, Make up a heat shield from a piece of jam tin so that it can fit over the spindle, between the crank and the frame, this will stop any flame reaching the frame. Play a blowlamp or propane

torch on the crank by the cotter pin for thirty seconds or so. Try not to heat the axle and don't use more heat than you need or you will soften the steel. (Never continue if the grease starts to smoke – it's getting far too hot). A few seconds with the torch and the pin should almost fall out. I have done a couple of repairs this way, and no problems. However it is a last resort, and not the sort of thing you should do unless you have no other choice.

2.2 The Sustainable Pushbike – Part 2 – By Bill Tarplee

With the cranks off you can now get access to the bearing. You will find that only one side is removable. Also, the bearing differs slightly in that it doesn't use cones, instead an adjustable ball race is locked in position with a locking ring (it is almost the cone system in reverse). The locking ring has slots milled in the edge for tightening and removal. There is a special half moon spanner made for just this nut. Either buy the correct spanner or make up a tool as shown. Lazy people don't bother with the correct tools and use drifts; this in turn damages the slots. Do the right thing and get the proper tool now, while such tools are readily available at reasonable prices. Making your own spanner isn't a bad idea as it will give you practice and saves a bit of money as well. Either way, having the correct tools will stand you in good stead and could give you a ready source of income in the coming bad times. No matter how bad things get, many people will still be ready to pay good money for a job well done and you could be setting yourself up for a future business when earning money won't be so easy.



The greasing and adjustment process is similar to that already discussed. The one thing to watch is the refitting of the cranks. The left hand pedal spindle is threaded anticlockwise. This means that the normal pedalling action will tend to tighten the spindles. This it is important that the appropriate crank be fitted to each side. It is often a good idea to mark the cranks before removing them, but you will often find that the manufacturer has stamped L an R on the inner face of the spindle. If this is the case you won't need to mark them.

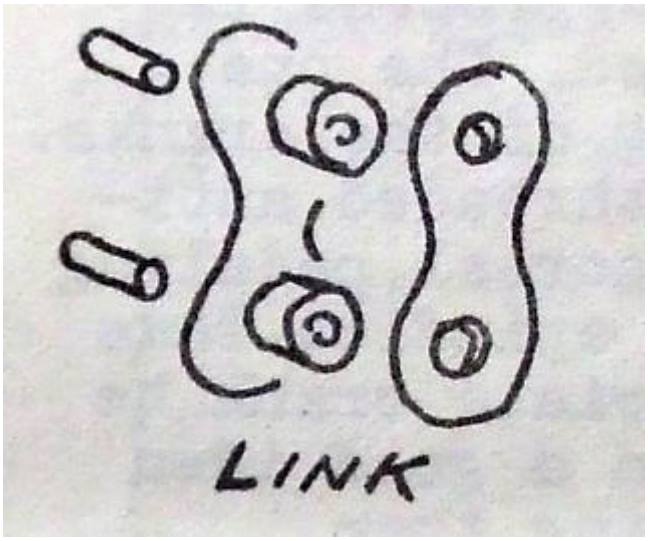
I mentioned in Part 1 about replacing the cotter pins. These are a cylindrical pin with a taper milled along one side. Often they are made slightly oversize to allow for wear. It should not be necessary to drive them home, as they should be a snug fit only. Firstly try them in the crank hole while it is off the bike. If the pin fits the hole you won't have to do any work on the circumference. (If it won't go right through, try it from the other side). If it won't go either way you will have to relieve the outside of the pin slightly. I do this with a fine file, removing metal equally over the cylindrical surface only, until I get the pin to project some four threads out the other side. Once this is done you can then fit the crank to the shaft. (smear a bit of grease over the shaft and around the pin). Try pushing the pin in, while slightly rocking the crank. Bear in mind that it is designed to fit from one side only, so it will go further through on one side than the other. Quite

often it will be necessary to file a bit off the flat, but before you do so be sure that you have located the right side. Some lairs just use the back of an axe to persuade the pin to fit, but they will pay for that in the next life – do it properly! Also, if you have to file, keep the face at the same angle as it must bear across the entire surface.

Once you have a neat fit, give the pin a light tap with a hammer and do up the nut (using a washer of course). Also, make sure that the pin is still greased and that there is grease on the threads. Then it will come out easily next time. Don't over tighten the nut either, as it is only there to stop the pin falling out again.

Drive Mechanics

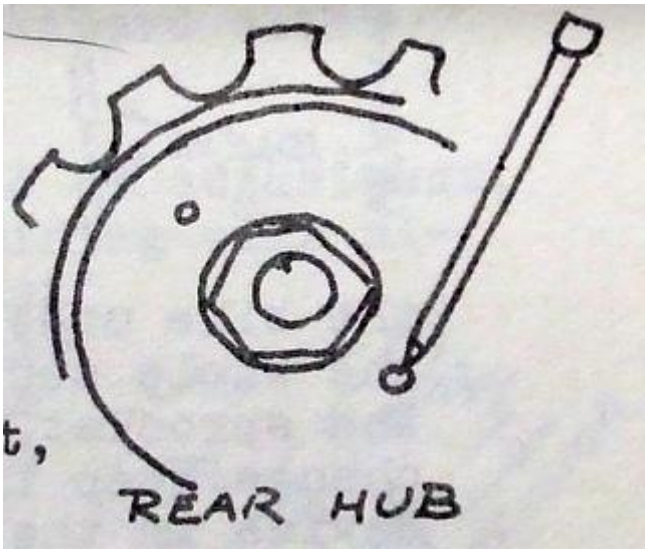
The part that receives a lot of abuse under most adverse conditions is the chain. Chains may vary slightly to the degree that sometimes a different type is fitted to the external (derailleur) gears. These chains have more sideways movement built in, so that the chain can ride freely over the sprockets when changing gears. The important question is whether the chain will move in a lengthwise direction under tension – i.e. "stretch". This gives greater distance between the rollers and causes increased wear upon the backs of the sprocket teeth. If there is much wear you can't do much but throw the chain away. Such wear is easier prevented by simply cleaning the chain frequently , and applying a light oil to the links. As an example, I clean and oil my chain every weekend – about every 150 km. It only takes a few minutes, and prevention has always been better than cure.



I simply get a small tin of kero and an old paint brush and paint all the oily or greasy surfaces with kero, as previously described (including all the derailleur gears). Once the oil is runny with kero, I hose it off with the garden hose and leave the bike in the sun for ten minutes or so. As soon as the chain, sprocket, gears etc. are dry I apply a light coating of thin oil. The bottles of Singer sewing machine oil are ideal for this purpose. As an alternative, some people like to spray on WD 40, RP 7 or a silicone spray lubricant. I will agree that the silicone sprays do not collect dirt as readily, but they still pick it up, so you will have to clean the chain almost as frequently. The oil is a lot cheaper and will be easier to obtain in hard times so I recommend you get into the habit of using it now, and stock away a supply while it is still only 50 cents *(1980s prices)* a bottle.

I have elected to include the freewheeling device under the "Drive Mechanics" section simply because it is located inside the rear wheel sprockets. Basically, the freewheeling mechanism is a set of (usually) two pawls inside the rear wheel cluster. It gives very little trouble and lasts for a very long time. However it does need maintenance from time to time. It can only be worked on with the rear wheel removed. If you stud the gear cluster you will notice that there is an inner ring screwed into the gear periphery. There are two holes in the inner ring, and I guess there is a special spanner to suit, though I haven't found one as yet. The ring is hardened so I use a 2 inch wire nail as the punch (nails are very soft steel). With the nail in one hole then laid over to an angle of 45 degrees, one blow from a hammer is usually sufficient to loosen the ring. The

important thing is to determine which way the thread ruins before you start. Normally it is a right hand thread (clockwise tightening) so you point the nail anticlockwise. If in doubt, get a fine nail, pin, probe or wire and run it in the thread. You can readily determine which way it tightens and loosens. I have found that an old dental pick is most useful for this purpose.

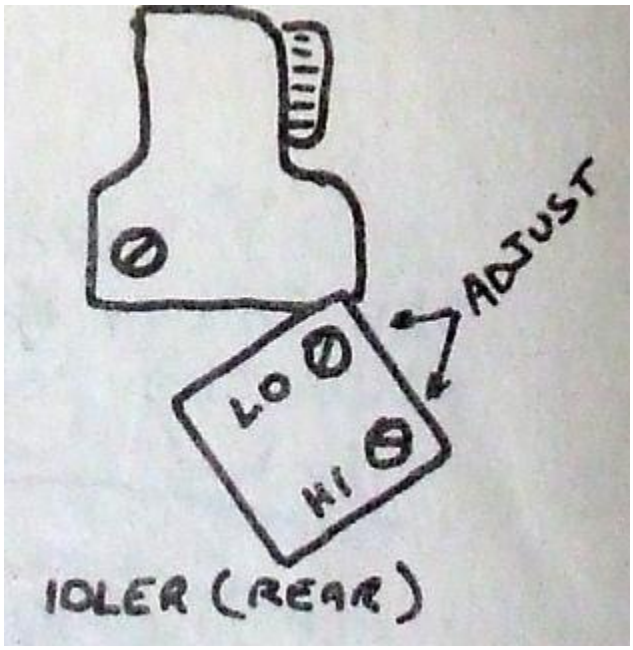


Once you have removed the retaining ring, you will find that there are two sets of ball bearings inside the gear cluster. The balls are small and numerous and it is important that you don't lose any. Use a magnet to collect them or work over a bag. Clean up all the parts, taking care to note how the parts are fitted before you remove them. (I know a bloke that bought an old school slate for just this purpose; he draws a "mud map" as he goes and if necessary will also number the parts with a felt pen just to be sure.) Then clean up with kero and grease before reassembly. It is best to do the freewheel mechanism at the same time as the rear wheel bearings, as you can clean everything properly at the same time.

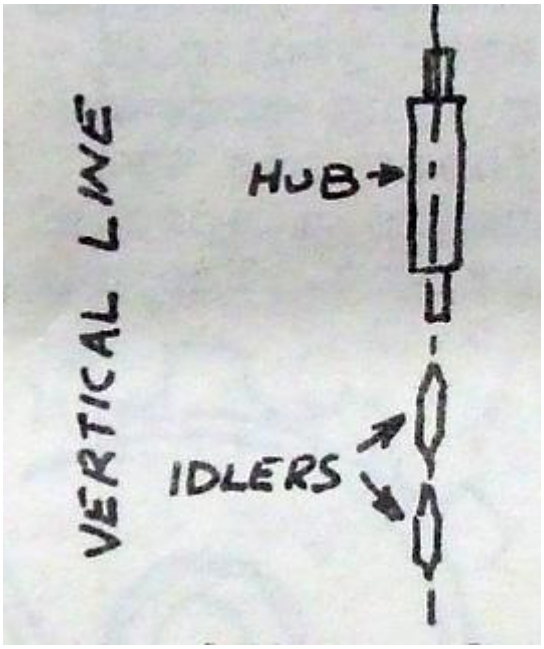
To be frank, I haven't had any experience with internal hub gears. I have seen a few diagrams over the years and I would simply follow the steps I have already laid out, putting the pieces in order as I removed them, but also taking the time to study how it worked as I went. There are no prizes for having any pieces left over! Clean everything

carefully and reassemble with light grease. Read the next section in conjunction with this, as the two are closely related.

Derailleur gears are simple in action and easy to adjust (which is contrary to some opinion). Simply, the system divides into two parts – the front drive sprockets and the rear driven sprockets, with a chain tension device to take up the tension on the chain.



Moving the rear hub selector lever causes the trailing idler arm to move laterally. It must move from the inner gear to the outer, without any extra movement to either side. The limits of this movement set by tow small screws on the idler arm. I'd suggest you don't tamper with the gears unless the chain is jumping off either sprocket. If the chain shows a tendency to jump off while pedalling, then take the following measures – Raise the rear of the bike so the wheel is clear of the ground. Select the highest gear by the lever, then while standing at the rear of the bike, sight the idler wheels to make sure that they are in a vertical line with the chain sprocket. If this is not the case, slowly turn the screw marked "H" until the idler pulleys and the sprocket line up vertically. Then crank the pedal while changing gears to the lowest gear. If the line-up is not perfect, adjust the "L" screw until it is. (Usually there is very little screw adjustment required – maybe ½ to 2 turns maximum.) Usually that is all that is required.



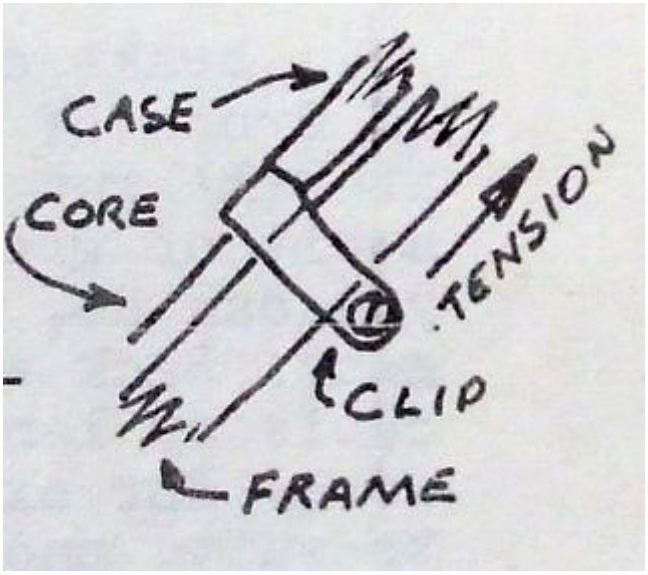
Test the bike under load to be sure that the adjustment is correct. The whole secret lies in getting the idler to line up with the sprocket, since it is the idler that causes the gears to change. Keep in mind also that while there is a free wheel device in the hub, you should not pedal backwards. Even with perfectly adjusted gears such action will occasionally cause the chain to jump off. I suspect that this is simply because of the lateral movement built in to the chain.

The front sprocket change is adjusted in a similar way, only there is more latitude for the selector movement, since it is required to cover a much shorter lateral difference. Usually you will find that it does not lake full movement of the lever to shift the chain. Thus is high drive gear is selected at the top of the lever travel, low gear will be at about half the lever travel, not at the bottom of the lever arc. You could adjust the whole system so that Low was at the very bottom of the lever arc, though this is not usually done. Then you would find that high would be at about half level travel.
With both sections of the derailleur system, check to see there is not excessive wear. Some idler wheels are a type of plastic, and wear fairly quickly. The front chain guide also wears on the sides and may require replacing. Further, you should remember that jumping gears may be a sign of excessive chain wear, not poor adjustment. Thus if it

jumps gears and the idler wheels are in a vertical line, suspect the chain or sprockets, or both.

One other point – jumping gears can be a sign of misuse. No bike gears are designed for changing under load. You should always change gears before load is incurred. This if you are about to climb a steep pitch, or start off from the lights or whatever, go down to the gear you will need while you are still rolling. This way the chain is aligned and squarely seated before the load is introduced. It is much kinder to the machinery and prevents excessive wear. If it is necessary to change gears on a hill, just reduce the load on the pedals while the chain is shifting. You can do this quickly with practice, and you won't lose much momentum.

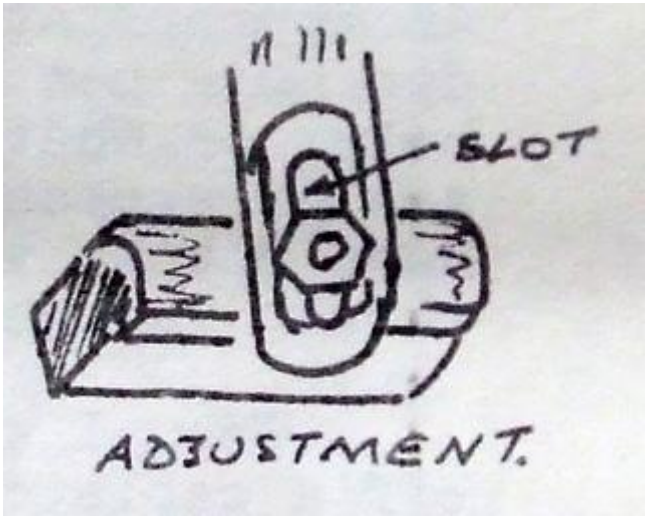
One last point about gears is the selector cable. In both internal and external gears the cable should not have any slack. This is particularly true of the internal gears. The cable must be in slight tension, even in first gear (I once had to fix a three speed hub gear that only had two operable gears. I was all set to rip the whole thing apart, but I had a flash of inspiration and studied the linkage operation while slowly cranking by hand. I found that the selector movement was travelling half way just to take up the slack in the cable. One minute's work and I was a "wizard" with bikes.")



The cables rarely have any inbuilt method of adjustment. Usually you have to shift the rear cable retaining clip along the frame. Moving the clip toward the front of the bike tensions the cable and moving the clip to the rear slackens the cable. Normally such movement would be sufficient . Should it happen that the cable has become unduly stretched, I shall discuss shortening cables later on. At the same time i would point out that such treatment is rarely required and I'd look to all other caused before chopping up the cable.

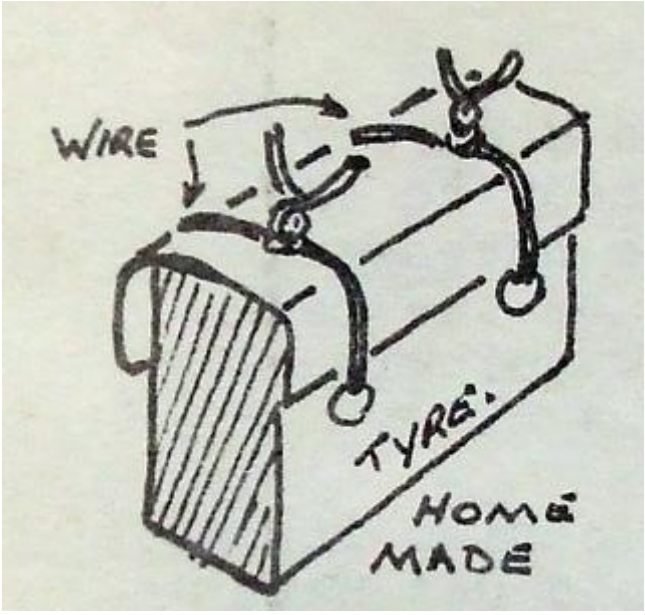
Brakes

There is very little that I can write about brakes that is not obvious. The brake shoes are replaceable and should be thrown away once the wear is approaching the metal backing plate. When replacing the shoes, or even adjusting them, make sure that you are getting maximum surface contact on the rim. Bike brakes are never totally effective and it is important that you obtain maximum rim contact. Most brakes have and slot adjustment so that the shoes can be raised or lowered to match the rim. Also the brakes are badly affected by moisture which tends to lubricate the rim. I have been riding in fog and found that the small amount of moisture is sufficient to reduce braking effectiveness to near nil for the first twenty feet of action. If the shoes don't have full rim contact, this distance will be greatly increased.



Should circumstances arise that you could not obtain brake shoes, I would look to cutting a pair from an old car tyre. I feel confident that they would work satisfactorily.

The regular shoes are glued onto the backing plates. I would prise the old shoes out with an old screw driver and either glue or wire the new shoes in their place.

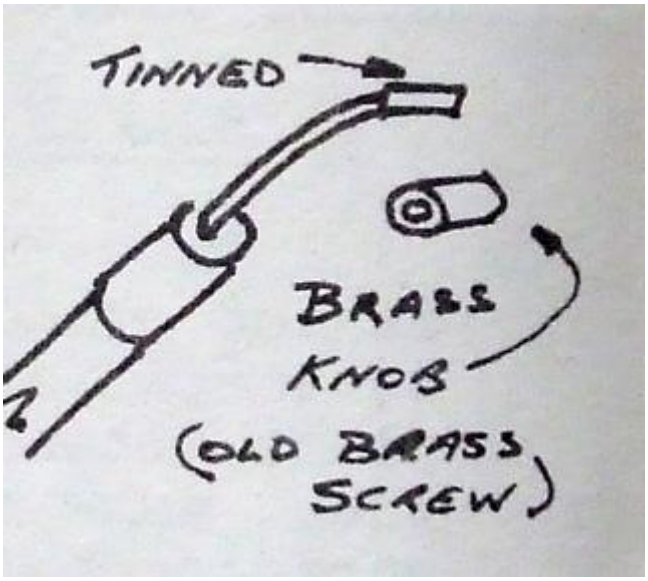


If it becomes necessary to make your own brake shoes – keep one tip in mind. You will need a very sharp knife to cut a tyre. On its own this will probably not be sufficient; you should mix up a bit of soap and water to make a lubricant. Thoroughly wet the knife and rubber and you will be able to cut it without any trouble at all. I should also point out that you should not try to cut the tread of steel belted radial tyre, as it would have a number of layers of hardened steel wire impregnated into the rubber. Look for a conventional cross ply or textile radial, and it will save both your knife and your temper. *(These types of tyre have become rare as hens teeth, try used conveyor belting)*

Lastly, when adjusting brakes, don't make the adjustment too fine. The current "side pull" brakes don't centre very well. Thus you will find that even when the brakes are fully slackened on shoe frequently skims the rim. While this contact is not excessive, it is a constant drag on the bike and it becomes very wearing after a few miles. It is better to have a bit more free travel and no possible interference on the rim.

Brake cables require very little maintenance. A couple of drops of light oil down the throat of the casing so that it will run down the core and keep it lubricated, and a bit of

grease on any exposed core is pretty well all that you can do. If a cable breaks in hard times, don't throw it away. Back when I wore short pants you could still buy brake cable by the length – 3 feet of casing and 3 feet six inches of core, for example. Buy two special brass knobs to suit, and home you went. Just "tin" the ends of the core with solder, slip on a brass knob and sweat solder the joint. Do the same at the other end and you were set. Since cables mostly break at the knob, you would only be losing 15 to 25 mm of cable if you were to cut and appropriate length from the casing and solder on a new knob made from a brass screw or bold or what-have-you. Most modern cables are of excessive length anyway, so you usually have plenty to play with. Those not "in-the-know" would have thrown the whole thing away.



When I was a kid, one bloke I knew who broke the end off a cable cut about 200mm off the end of the casing and then tied the core around the top bar near the handle bars. To stop he just pulled up the casing and the brakes worked. Very primitive, but who knows when.....

Lastly – in a pinch you could make brake and gear cables utilising other materials. The plastic coated coiled wire used for kitchen curtains would make a casing and fishing trace would make a core, Alternatively you could just shorten gear cables, as these are always much longer than brakes.

2.3 The Sustainable Pushbike – Part 3 – By Bill Tarplee

This is the final part to our series on survival push bikes, so we will get off to a good start by looking at that one source of inflation that is dear to all cyclists' hearts.

Tyres

Tyres are one of those things that just go around. At present they are cheap, readily available and don't last very long. Most cyclists I know replace their tyres about once a year. This is not because they are worn out, but because they suffer from biodegradable breakdown – which is a nice way of saying that they are just not made to last any more. I recently noticed on my cycle that the rubber (actually neoprene, a coal or oil derivative) seems to have shrunk. It has cracked into blocks and in places can be peeled away from the canvas backing.

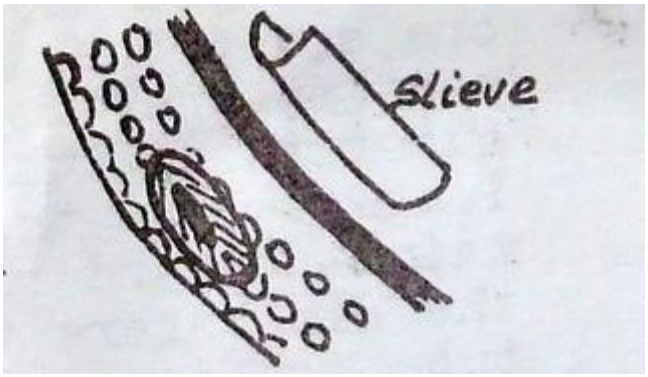
This presents a problem, to the point that stocking away a supply of tyres against a future emergency would not necessarily help a great deal. In all probability you could find that your emergency reserve had deteriorated after just a couple of years. However, tyres are cheap, so you wouldn't be losing much if they were useless when you got them out of storage.

My suggestion would be to buy several and dust them well with talcum powder both inside and out. (Use a cheap baby powder sold by supermarkets). Put each into a large plastic bag and press out as much air as possible and seal the top with a strip of packaging tape. Then put the bags away under the house in as dark and cool a spot as you can find. Then cross your fingers and hope!

If, on some future occasion you are forced to use perished tyres, there are alternative available to you –

Assuming that the tyre has only a few bald spots where the "rubber" has worn away you can take another worn tyre and cut off a section about twice as long as the worn

spot. Using a sharp knife, well lubricated with soapy water, cut away most of the side walls and just keep the tread section. This piece – called a slieve - is placed inside the worn tyre so that it is under the worn spot. When the tyre is inflated again the slieve will be pushed up to support the worn area.



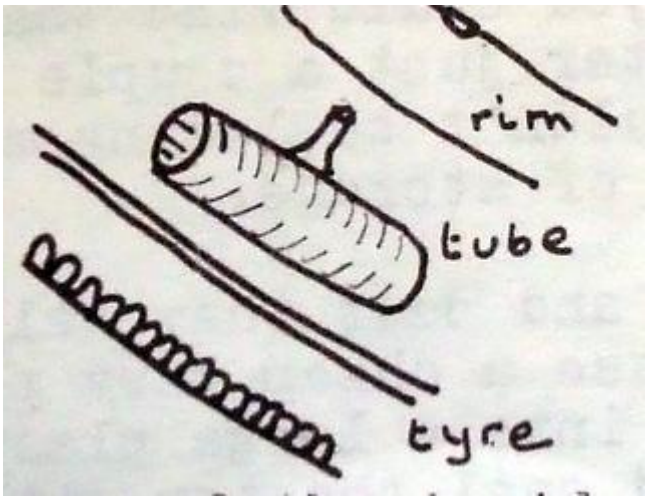
This works fairly well and was a tried and proven method in the “good old days”. If times are desperate and the whole tyre is just about “gone” then you would only have a couple of choices. Firstly you could slieve the entire wheel. you would need another tyre and have to remove the sidewalls, in addition you would have to cut out a short section so that the slieve would fit inside the tyre without forming a fold. Alternatively , you could seek out some thick car or truck tube and cut a ribbon form the outer middle of the tube, this would then form a slieve.

Either way you would find in necessary to glue the slieve in place with some rubber cement/contact adhesive. This is because the inflated pressure of the tube would cause the tyre to split around its circumference. This would be rather deflating, to say the least! If the slieve was well glued it might help prevent your being let down.

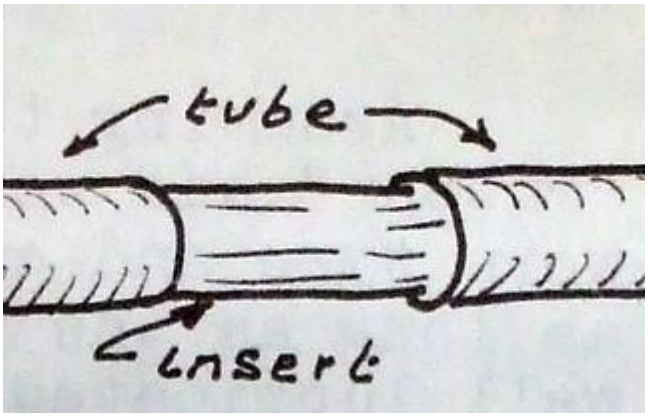
The last alternative would be to seek out a tyre with reasonable tread but sidewall damage. In that case I would cut around the side where the sidewall merges into the tread. If you then sanded the tread smooth on the worn case, you could then glue the “retread” over the worn case. With the bead removed the outer case should expand sufficiently when the tyre was inflated. While these are “last ditch” remedies, in desperate times.....

Tubes

Unlike tyres, tubes do not seem to perish nearly as quickly. A prudent person would stock away several along with a couple of tins of vulcanising patches and a patch clamp. (store the tubes in the same manner as tyres – plenty of talcum powder and a cool place). When selecting tubes always choose the ones with car valves, that way you will always have the option of pirating replacement valves from cars.

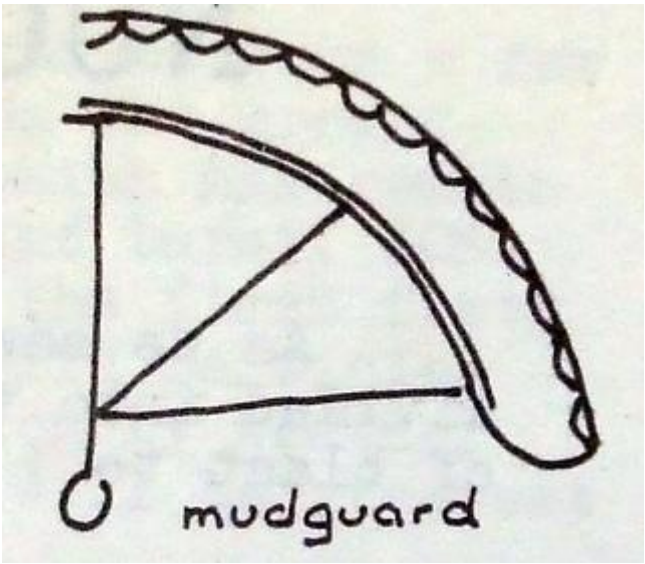


Assuming the worst, you can make a pushbike "tubeless". If the tube is unpatchable, clip it about 100mm either side of the valve stem and assemble in the normal way. It is necessary to use a sound tyre and then run some glue around the tube where it contacts the rim and case. Also a bead of glue must be run around the inside of the rim, to seal the tyre. The whole trick lies in being able to get sufficient air into the tyre to push the case out to the rim. While this is not difficult if you use compressed air at a service station, it would not be possible if you only had a bike pump. For this reason I would look to the following alternative.



Rather than make a tyre tubeless I would suggest you try and join two tubes to make a sound one. In other words, cut out the section that is perished or punctured and substitute with another that was about 100mm longer. Poke the ends of the replacement into the ends of the main tube and run some glue around the joints. Fit the tyre onto the rim before the glue has dried, and inflate immediately. The tube would expand to the required length and the air pressure would seal the joints. Again, this is a case of desperate times .....

I have heard of tyres being stuffed with cloth, grass, rope etc I'd try other methods first. Unless you get a firm tyre the bike will slide about too much. In fact, I think it would be uncontrollable at all but the lowest speeds. You just must have reasonable pressure for it to work properly. So if it came to a point where you tried slieving and gluing and even patching with glue and still couldn't stop small leaks I'd look to the very last resort. This would be to use a thick liquid – maybe gearbox oil – and pump that in instead of air. It would have to be as practical as stuffing leaves and grass into the case.



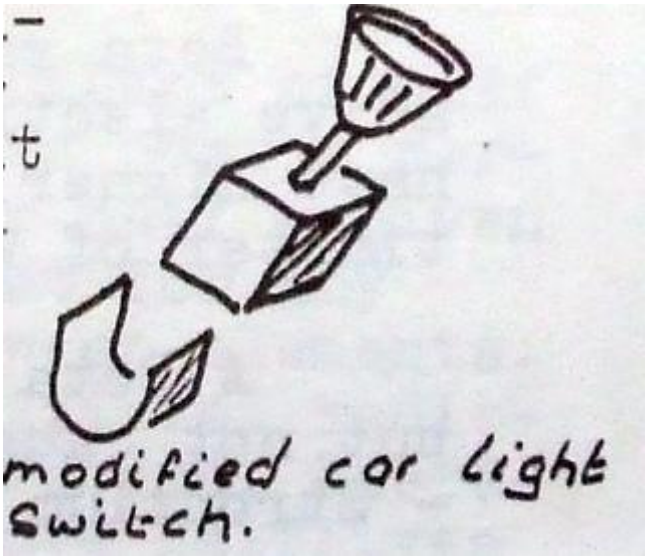
Lastly, when tyres are completely worn out they can still be used to make mudguards. Clip off a piece the necessary length, and support it with several stays bent up from fencing wire. Such mudguards work quite well and don't rattle like the metal ones. Besides, they will flex if you pick up a stick between the spokes.

Lights

Lights can be considered under two headings – generated current and stored current. Generated current comes from a small generator that is rotated through contact with a tyre. I have found generators to be dependable and almost everlasting. The only problems I have ever had is when a generator works loose and goes thought the spokes, or when it gets smashed in a prang. Reasonable maintenance will prevent the former, and luck the latter.

While generators rarely give problems, they can cause bulbs to burn out. Usually this only happens on a downhill run, when the bikes speed generates excessive current. If the generator is mounted on the front forks, the shorter wire to the front light usually means that the front light will blow first. The rear will then follow because of the overload. If you mount the generator at the rear the sequence will be reversed, either way you can suddenly be in the dark, as it were.

Unless you are prepared to buy the more expensive compensating generators, which monitor the current through zenner diodes, you only have one course of action available to you. Mount the generator to the rear, fir the normal 6 volt headlight bulb, but instead of fixing a 6 volt tail light bulb, replace it with a low amperage 12 volt bulb from a car instrument panel. This will then help to prevent bulbs from burning out.



Instead of turning a generator you could wire a motorcycle battery into the circuit. This would give a bit more weight, but less resistance when pedalling. The battery could be recharged on a wind generator (or solar panel). It would not be necessary to fit a rear light if you were running off a battery. In fact it would extend the life of the battery if you didn't use a rear light.

The only point that you would have to watch when using a battery would be that you didn't lay the bike down on its side as this would cause the battery acid to spill out. The way around this would be to hang the battery below the cross bar in a bag.

2.4 The Sustainable Pushbike – Revisited – By Bill Tarplee

In the early '80s an old friend of mine, Bill Tarplee wrote a series of articles on pushbikes under the title of "The Survival Pushbike" which are reproduced here under the title of "The Sustainable Pushbike", parts one, two and three above. By 1988 he considered that

there had been sufficient changes to warrant a revisiting of the subject and he wrote parts one and two of "The Survival Pushbike – Revisited" now reproduced here (of course!) as "The Sustainable Pushbike – Revisited". Bill is a wizard with all things mechanical and his advice and insights are still relevant today for those of us who wish to live more sustainably by using bikes.

The prices of all equipment mentioned are as at 1988 (sorry).

Back in the early days (*of the magazine*) we had a series on survival bikes. A few things have changed since then, and the subject is worth looking at again.

The old "treadly" is one of the mechanical marvels of all time. With a minimum of fuss or effort it will take you as far as you want to go……. And back again. It costs little to buy, less to run, and can be repaired very cheaply.

For less than $50 you could buy all the spares you would normally need to last a lifetime. For an additional $50 you could buy all the tools you would need to fix a normal bike.

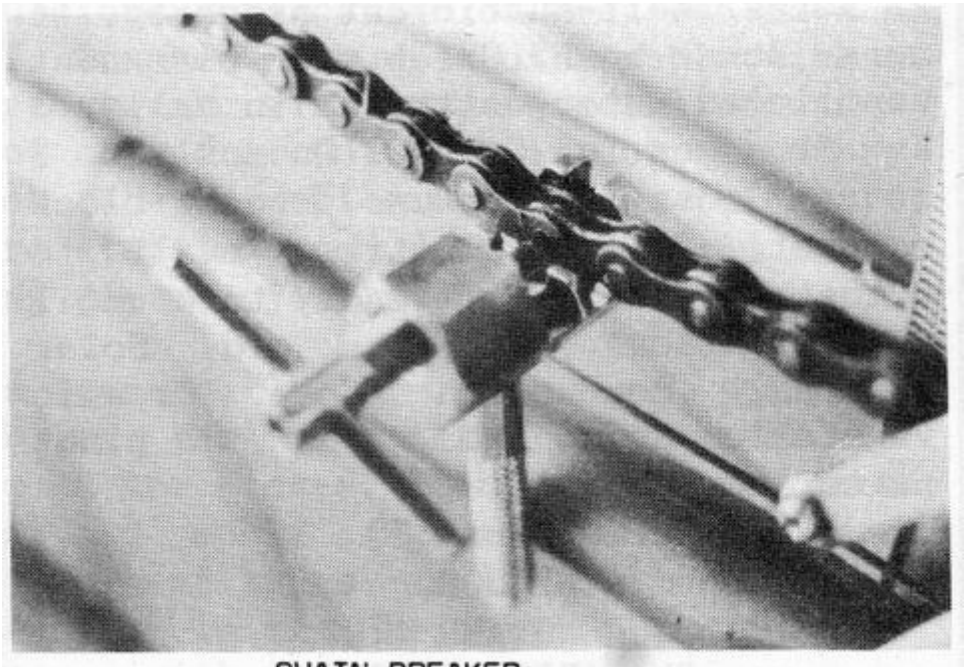
THEY ALSO GIVE OLD BIKES AWAY

You don't need a lot of tools for bikes. There are a number of specialised tools involved, but they don't cost much. Chain breakers cost about $5. Spoke spanners cost about $3. Hub removers cost about $7.50 each, and you'd need two, maybe three. A few basic spanners, several screw drivers, a hammer, a bronze drift, and you'd be in business. Learning to use most of the equipment isn't difficult. It is mostly a matter of reading several books, using common sense and going at it quietly. Most damage done to bikes is by kids lacking proper tools, who don't know what they are doing.

Fixing bikes under survival conditions need not be difficult. There will be plenty of parts that can be cannibalised for quite a while to come. Much of the parts are interchangeable, so you can swap parts around without too much problem.

The Chain

To take a chain off you need a chain breaker. Line up the punch on the connecting pin, turn the tommy bar and out pops the pin. Installation is a reversal of this procedure.



CHAIN BREAKER

Ideally you should clean a chain every couple of hundred kliks. I do this by breaking the chain, then soaking it in kero for 5 minutes. Swab off the grit with a toothbrush, then

hose the chain clean with a strong jet of water. Allow the chain to dry then spray with WD 40, RP7 or similar spray.

Silicone sprays are good in that the silicone dries out and does not attract dust like oil does. The chain stays cleaner for longer. You can buy special chain oils that don't attract dirt, but they will cost more than the bike.

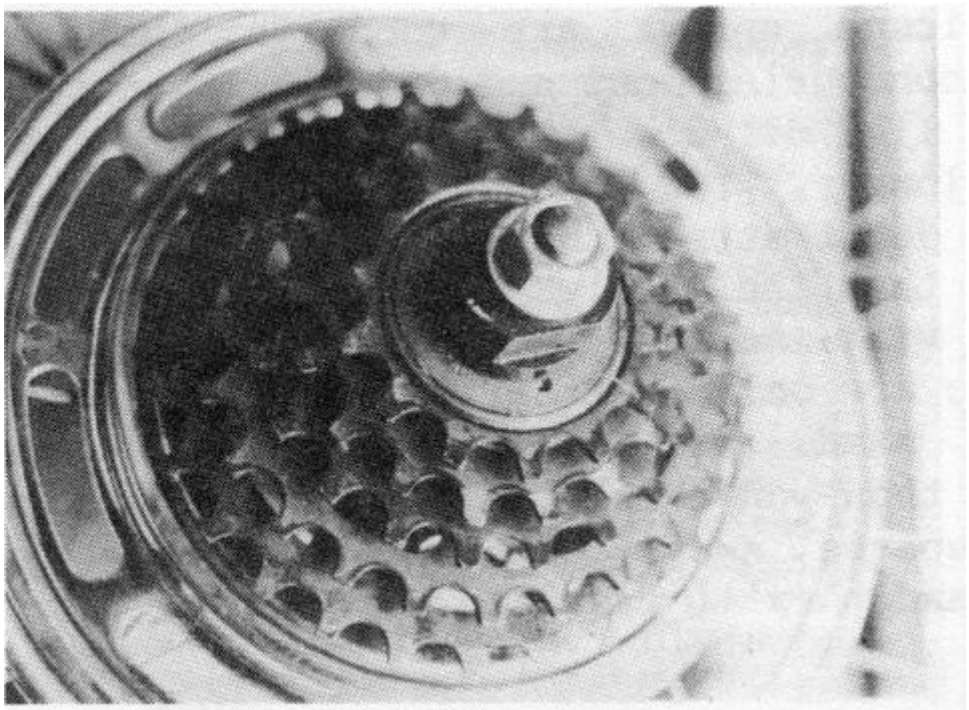
Bearings

You will need a few bags of steel balls. There are only four sizes you would normally need, and they are cheap. Buy more bags than you think you'll need and put the spares away. Cover them with engine oil and they will last forever.

You may find that you have to remove the rear cluster before you can remove the balls from the rear wheel ballrace. There are two main sorts, the Shimano and the Sun Tour. Both are cheap and you really need both if you are going to handle most bikes.

The Cluster Gear

To remove the cluster first place the puller into the cluster splines. Then put the nut onto the axle and run it down until it is just about tight on the puller. You can then use a spanner to turn the puller anticlockwise. The nut stops the puller from coming off the splines. As soon as the puller rotates a bit, slacken off the nut a fraction and repeat again.



CLUSTER PULLER

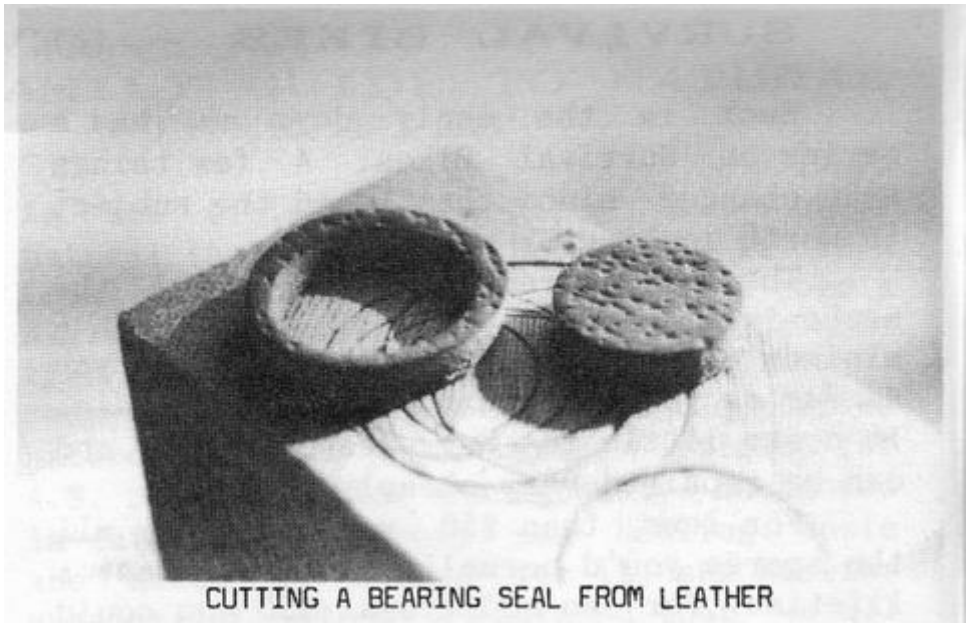
You can either use a spanner to grip the flats of the puller, or you can hold it in a bench vice. I prefer the vice because it gives a better grip, and you get a better control on the wheel.

When you go to replace cluster gears make sure the threads on the cluster and hub are clean and free from grit. Smear some light car grease on the threads. Then run the cluster on by hand. It need only be run up finger tight. Pedalling with tighten it sufficiently. Overtightening will present difficulties when you come to remove it next time.

Many bike parts are interchangeable. You may find in necessary to cannibalise and combine parts to make up various assemblies.

Hub Bearings

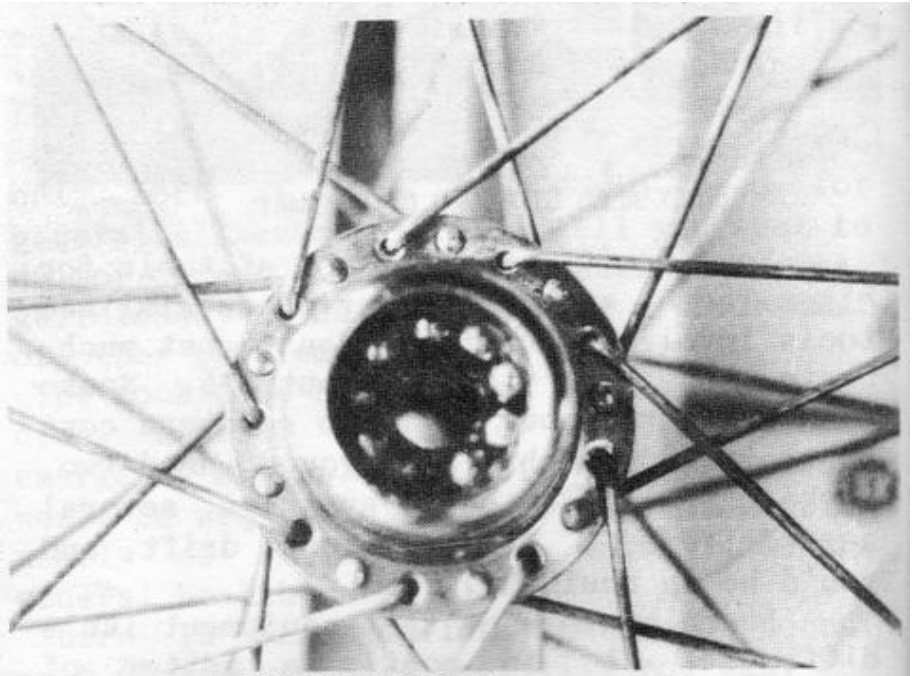
For example, there are several variations in cone sizes for front and rear hubs. One wheel I was assembling had small cones in a large cone hub. Once the cones were fitted much of the bearing would still have been exposed to dust. Several minutes work with several wad punches and a piece of leather and I had a dust proof bearing protector. Simple, easy and very effective.



CUTTING A BEARING SEAL FROM LEATHER

Bearing should be thoroughly cleaned before assembly. I usually pick the balls out with a magnet, then drop them in a tin of kero. Wipe out the grease with a paper towel or piece of rag, then wash thoroughly with kero. Spray off with a fine jet of high pressure water, then allow to dry for several minutes.

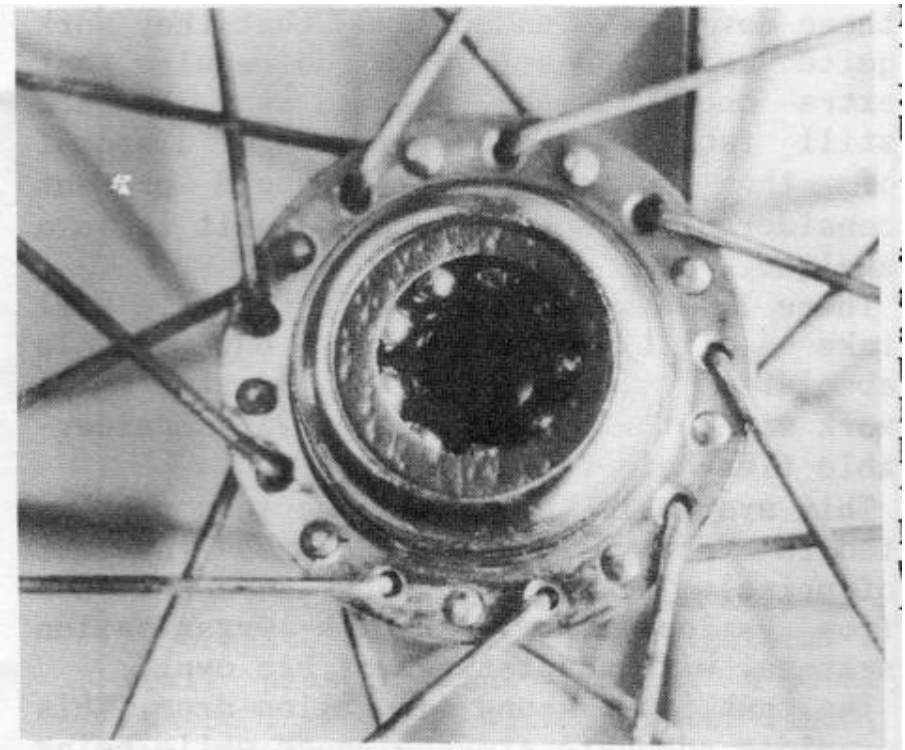
When replacing the balls, put a goodly dollop of light car grease in each race, and spread it evenly around the race. The grease will then hold each steel ball in place and prevent them falling out. For this type of work you want a light grease. If you only have heavy or old grease (new, of course, not second hand) then mix in some engine oil. This will thin the grease. (grease is only engine oil, soap and sometimes additives).



EXPOSED BEARING

Adjusting ball races is easier done than described. The cones or cups should be tightened to a point where there is no sideways movement in the bearing. Then you stop! It possible to go quite a way past this point. You can do a bearing up until you can't turn it. This only ruins the bearing. Never tighten a bearing more than required to remove sideways movement.

Hold the cone or cup with a spanner while tightening the lock nut. Keep testing while you tighten the lock nut. Sometimes the bearing turns with the nut, varying the adjustment.



LEATHER SEAL FITTED TO BEARING

Pins (Including the Cotter Pin)

When drifting out pins such as cotter pins, always support the crank on a block. The blow is then absorbed by the block, not the bearing.

Use a bronze or brass drift on cotter pins. Turn the nut back about half a turn, then use the drift to drive both the nut and pin. Once it shifts slightly release the nut half a turn and drive again. When driving a drift always use the biggest hammer you can comfortably use. Large hammers, when used gently, have a much better shocking power. Small hammers just bounce around and round pins over.

A judicious application of heat can save a lot of trouble. A couple of minutes with a propane torch will expand metal around a pin, or expand a nut. It is not necessary to cook the bejeebies out of the thing. If you are starting to see smoke and smell burning grease you have heated it too long.

As a general rule, whenever you are assembling parts, put a fine smear of grease on the pieces. This holds true for spokes and spike nipples, to nuts and bolts, to seat tubes in the down tube, to handle bars in the head stock. It doesn't hold true with tyres and tubes – you use talcum powder instead. When sliding on handgrips you rub some soap on the bars. Whatever the application, it will help you take the pieces apart later.

2.5 Making a Cart Bike

Transporting things like hay, chook pellets, bought in groceries and stuff can take a bit of effort without a car. The handcart is one option but slow, so I wanted to make one of our bikes into a tricycle for more transporting power, plus my lovely partner in sustainability is a bit unsure on a normal bike and a trike would be more stable. One way of doing this is to hybridise a bike and a shopping cart, so that is what I did, and this is how it went.

Before getting into the meaty bits I do want to point out that if you want to do this get hold of a shopping cart LEGALLY! We bought ours from a shopping cart reconditioner (and for those doubting Thomases among you, we still have the receipt) I do not want to spawn a trade in rebirthed Woolies or Coles shopping trolleys!

The things you will need to make the cart bike are –

A bike – We used a girls mountain bike, the girls bike being easier to get on and off, plus the cart bike is for Linda to ride.

A shopping cart – 'nuff said!

2 x spare sets of bicycle forks, about the same size as the one on the bike.

6 x 25mm U-bolts – to hold the forks to the cart

1 x 30mm U-bold to secure the goose-neck to the cart.

First things first, I attacked the shopping cart with that most wonderful and versatile of tools, my angle grinder, with a metal cutting disk. My intention was to cut through the welds holding the wheel assembly onto the basket but on closer inspection I found that would have weakened the basket structure by removing some stiffening rods. In the end I cut through the 1cm thick chromed steel rod that formed a brace between the wheels and the basket. It was a work of minutes with the shopping cart upside down.

I then got hold of Linda's bike and unbolted the front wheel, which would then become one of the wheels on the side of the cart. The two sets of forks proved remarkably difficult to find. If you were not in a hurry you could frequent garage sales, rubbish tips, your neighbours nature strips on garbage nights or your local trash and treasure markets and while I did various amounts of all of these, the required forks were not forthcoming. You really want uncomplicated forks without shock absorbers or the like, but it seems that was all bike shops had and even if they were second hand they still wanted to charge me two or three times more than I wanted to pay. In the end though I did find the Bike Barn who had two forks and only charged me one and a half times what I wanted to pay. They were good guys though and worth talking to about bikes.

To join the forks to the cart body the recommended practice is to use U-bolts, so called because they are U shaped bolts with a steel strap across the end. The bolt goes around the forks in two places and in through the side wires of the cart and then the plate gets screwed down over the wires. There are thicker wires going horizontally around the cart and one going diagonally from the back to part way along each side. It is this diagonal one which I bolted the forks to, where it crossed two of the other horizontal thicker wires. That way the forks were being attached to doubly strong point which would hopefully put up with the strain and not get pulled out.

To accomplish getting the forks on I had to prop the cart up on a plastic box so that the wheels were only just touching the ground, that way I could move things about until the angle was right then tighten up the bolts. The next trick is to get the whole cart assembly attached to the front of the bike, so i brought the front of the bike (minus front wheel of course) up to the back of the cart and slid the part where the front wheel axle would normally go over the main rear structure wire running along the bottom of the cart at the back.

Once that was done I tried to get the top of the cart close enough to the handlebars and gooseneck but it didn't want to go. I had to remove the front brake calliper assembly from the front of the fork and the cable up to the hand grip, so mow there is only the spring loaded hand grip left. Also the cart push handle was pretty much in the

way but fortunately it was only held on with some plastic fittings and a bit of persuasion from my rubber hammer and it was safely removed. So now the forks could be secured to the rear of the cart with a U-bolt on each fork. There is also supposed to be a bigger U-bolt that goes around the gooseneck of the bike and gets secured to the top of the cart at the back, but i didn't have one so tried without it – if you are going to try this, put it on.....trust me!

With everything more or less set up it was time for a test ride, bearing in mind that the back brake was the only on that was working. It straight ahead level flight it wasn't too bad, but it didn't want to turn. When I did get the cussed thing to turn it had a bad habit of the cart turning and the bike going straight ahead. This resulted in the pivot point at the handle bars heading down and the cart bike trying (successfully I might add) to buck me off! Turning the little bugger is not much fun at all, plus the U-Bolts have a most disconcerting habit of allowing the wheel and fork assembly on the side of the cart to move around, letting the wheels point at odd angles. All in all a less than successful first ride. So...I need to –

- Review the design and see if I can work out the bugs with the turning process,
- Firm up the attachment of the side forks, probably with a bit of judicious welding, and
- Get hold of the missing U-bolt and fit it.

If after all this I can't fix it, I'll put Linda's bike back together and turn the cart into a bike trailer, so watch this space.....

Update - September 2010

Two things have changed with the cart bike - My neighbour has offered to MIG weld the forks to the cart so I will be taking him up on his kind offer. The other thing is that I have moved the forks back toward the rear of the cart so that the forks are now attached right at the rear of the cart and this has improved stability to an amazing

degree! It is easier to steer and shows much less of a tendency to tip over sideways when you make a turn. Not perfect but considerably improved.

3.0 Cars

3.1 Save Fuel, Save Money

I have been facilitating a **study circle** with a few friends based around the various aspects of sustainability. One of those aspects is, of course, transport and we talked about among other things the issues with car use (greenhouse gas production, fossil fuel use and consumption of other resources). Discussions around car use generally seem to find their way back to how much fuel we consume and what we can do about it.

Our circumstances (unfortunately) do not allow us to dispense with the car entirely so it was a case of understanding what we could do to reduce the amount of fuel we used in a meaningful way. This would not only reduce environmental damage but save money as well and as a result of the meeting we all agreed to do some work towards reducing our fuel consumption and then report back. This is what I did and how it worked.

Measuring the Base Line

Strange as it seems, to be able to work out how much you have improved this means knowing where you are starting from, so my first act was to fill up the car and note the mileage (kilometerage?) on my odometer. I then drove the car for a couple of weeks without making any changes to the car or my driving behaviours so I could work out where I was now.

We drive a Suzuki Alto and the manual says I should get 5.3 litres/ 100 kilometres, but these official figures tend to be pretty optimistic, and I needed to know what I was really getting. I filled the car up (first click on the nozzle only, fill to the same point every time for consistency) and took note of the mileage on the odometer. It was then just a case of doing what I always do and driving around as normal.

After the tank was getting down towards empty I filled the car up and noting the number of litres consumed and I checked the odometer again, writing down the reading.

To calculate your fuel consumption in L/100km just take the original reading on the odometer away from the second reading to give you the number of kilometres travelled, then multiply this number by 100, divide the resulting figure by the number of litres of fuel consumed. (or use an **on-line calculator**). This will give you your fuel consumption in L/100km. Mine turned out to be 6.4 litres/100km.

The longer you let the test go on the more accurate the reading will be, but I wanted to know what affect I could have quickly (I'm impatient OK?) so this would do me.

Making the Changes

There are a whole stack of changes you can make to your car and your behaviour to reduce fuel consumption, as far as making changes to the car you could –

- remove any unnecessary materials/weight from the car
- remove roof racks, external steps and brush guards when they are not required, to

improve the cars aerodynamics, and

• Ensure the tyres are pumped up to the required pressure (not overpressured)

In terms of behaviour, changes might include -

• driving steadily, at or below the speed limit (operating speed)

• using the cruise control where possible

• accelerating smoothly to operating speed

• avoiding idling and turning the engine off where idling time is likely to exceed one minute.

• going slower up hills and faster down hills (within the speed limit)

When I checked the car over, I found the tyres were down a bit so I pumped them up. We get the car serviced regularly, rarely carry a lot of extra weight and don't have roof racks or other protrusions to screw up the car's aerodynamics. In terms of behaviour I am, as much as is possible with a car with an engine capacity of 996cc) a rev head! I needed to slow down, drive more smoothly and concentrate on driving to minimise acceleration and braking. (yes, I am that idiot who hares up behind you then jams on the anchors, stupid, I know).

Well, I made the changes to my behaviour. It wasn't easy, there is always the tendency to slip back into old habits and after all, I have been driving for almost 40 years. Having a wife who supports the changes and is not shy in pointing out when I am doing the wrong thing helps. Sort of. You know how they say your fuel consumption goes up if you drive stressed?

Anyway, I know you are dying to know how it worked and it reduced my fuel consumption to 5.5 L/100km, a reduction of almost 15%. This was achieved at no extra cost to me (how do you cost in grey hairs?) and is a significant saving on fuel and cost. Just working out your fuel consumption on a regular can help you focus on your driving and how it affects your mileage, so start today!

3.2 Life without a Car (What We Have Learned)

For the last ten years or so I have had a company car and for at least the last five it has been our only car, thus when I was retrenched a few months ago we were left without a car at all. Rather than jump back into the world of motoring again, with all its associated costs, we decided to save our pennies and buy a car again only when I needed it for work. In the mean time I have returned to my roots; my father never having owned a car since before I was born and I was in my mid-teens when my brother first bought a car. So, you can see that for a long time in my formative years I was well acquainted with the sustainable forms of transport like public transport and shank's pony.

However, the world and my circumstances have changed a bit since those days so I thought that by describing how things have worked for us it might give you something to think about if you decide to head down this route.....willingly or not.

Location, Location, Location

No, not the TV show! You may consider it luck, while I rather think it is good management on my part, but a whole stack of places we need to get to on a regular basis are within easy walking distance, such places as –

- Shops
- Our bank
- Family doctor
- Dentist
- Church
- Schools, although with both kids having grown up and moved out this one is no longer so important for us.

And there are buses to a number of comparatively major centres and several train stations that leave from outside our local shops. So if you do decide (or are forced) to ditch the car, have a think about those places you absolutely must get to, and see what alternative ways there are of getting there.

Walking

A much underrated means of locomotion. Slow but sure, it keeps you fit and requires the burning of no fossil fuels, just the food you would be consuming anyway. Admittedly you can carry as much as you can when driving a car, but it is surprising how much you can carry so having a backpack can be a good thing if you intend to pick up stuff and walk it home. This is Australia so if you are doing serious walking make sure you have a good wide brimmed hat, not a stupid baseball cap that doesn't protect your ears or the back of your neck, sunscreen and a good pair of sunglasses. In Asia I have seen ladies walking on a sunny day with an umbrella up to keep the sun off them and my lovely partner in the sustainable life uses this technique today, the Cancer Council sun umbrellas are particularly protective. Remember that clouds are no barrier to ultraviolet radiation so cover up even on cool cloudy days.

Also make sure you take a supply of water with you, as walking on even a dull day can dehydrate you before you know it, especially if you are not acclimatised to doing it.

Let's face it, after being a desk jockey for over fifteen years and my main exercise consisting of cutting the lawn on the weekend, I needed to get used to walking everywhere again myself. Being a shiny bum isn't all it's cracked up to be.

Shopping Carts, shopping jeeps, Grocery prams and the like.

One way of increasing the amount of gear you can haul while walking without spending outrageous lumps of cash is to invest in a two or four wheeled shopping cart or make yourself a grocery pram (see another article in this section). Shopping carts, once the preserve of old ladies.....and still are to a certain extent....are increasing in popularity again. It wasn't so long ago that the only place you would find one was second hand at the salvation army or Vinnies, but they have been rebadged as "enviro trolleys" or "Eco carts" or whatever to cater to the green market. This is a good thing because they have become available again, but be aware that some are pretty rubbishy and most do not have the quality of the ones of years gone past so inspect closely before you buy. An even cheaper option is to get a second hand baby stroller and turn it into a grocery pram, so consult our other article if you want to go that way.

Bike it!

This is a bit more expensive, but there are still some bargains to be had especially if you get an old second hand bike and fix it up. This has a spin off in teaching you how to maintain and repair your own bike, a handy skill at any time. You occasionally come across bike maintenance courses at TAFE or the local community college and these are well worthwhile, otherwise get yourself a good book on bike repair and maintenance. A minimal number of tools and a small stock of spares will enable you to keep your two wheeled mate tootling along and give you years of trouble-free pedalling.

As always, make sure you know and follow the road rules and have and use a good quality brain bucket, skid lid or stack hat. I am speaking from experience here, having wound up on my neck in the gutter after a close encounter with a car, so don't tell me you look like a dork, just wear the bloody thing.

If you have a bit more money or are techo you could buy or build a powered bike, usually pushed along by a small electric or petrol motor. In Australia if the motor on your bike does not produce in excess of 200 watts it is still regarded as a push bike rather than a motor bike and no license is required. I was lucky and there was a comparatively inexpensive one going a few Decembers ago, guess what I got for Christmas that year. It is electric and I keep it charged by the 12volt system through a square wave inverter, but before I plugged it in I rang the manufacturer to ensure that the square wave inverter would not do anything terminal to the charger, they said it

would be OK and it was. If you are in the same situation don't take my word for it, check yourself!

Another advantage of an assisted bike (electric or petrol) is that extra assist up hills makes it easier on the unprepared body. While walking is great and gets you where you want to go it will not adequately prepare you for the rigours of biking, particularly uphill! So start out slow and work up to it.

To further increase your carrying capacity you can buy or build a bike trailer. While I intended to build one I was able to get hold of a commercial model at a reasonable price so I wound up buying one. I must admit that I don't have a huge amount of experience with it yet but it will be getting a work out soon. Our local hardware is about an hour's walk away and I will need the bike trailer to bring home some of the bulkier and heavier stuff for my projects.

Next rung up the totem pole is the adult tricycle, which come in pedal power and pedal electric. I bought a pedal powered one for my lovely partner in the sustainable life, the electric ones being just too expensive. It has a reasonably sized basket and we have both used it to haul gear and ourselves, making trips that would have been difficult and time consuming on foot much easier. I must admit that even though it only has three

hub gears it is a huge amount of fun to ride, but it is hers rather than mine so she gets to use it before I do.

Public Transport

I must admit, I didn't know just how far, or where I could get to on public transport until I needed to. It had been many years but thank heaven it was still there waiting for me. OK it does have its disadvantages; it's not door to door, it takes longer and after dark there can be some security issues but it saves you cash on owning a car, you can't run a speed or red light camera, it's more sustainable and strangely enough connects you more with your community. Each of us living in our own little car-centric worlds tends to keep us apart from our neighbour; public transport gets us out and communicating with fellow commuters even if it is just to bitch on how poor the service is. Truthfully though public transport does give opportunities to meet people than being stuck by ourselves in our cars and that can be quite fulfilling.

It does take more time to use public transport and that's why it is important to plan, and to get hold of the timetables for the buses, trains or ferries you will be using, particularly if you will be using more than one service so you can be sure the connections will line up. Studying the timetables (mostly accessible and printable off the net) is no guarantee you won't be stuck in a bus shelter or on a train station

somewhere, waiting for the next one, but it gives you a better chance of a smooth trip.

Planning

While we have found being without a car is not as bad as it might be, we can't just jump up and drive off somewhere whenever we feel like it. Our trips out require more planning and when public transport is involved, more time – so it is important to get the most out of each trip even if you are just walking down the shops to pick something up.

Make a list – this is important to help you maximise each trip, particularly if you are going somewhere a bit difficult to get to. We have reached an age where it is quite possible to forget why you entered a room, when you knew absolutely before you walked in let alone miss something on a shopping trip. Anyone can have a lapse of memory so write down all things you want to do/pick up on your expedition and you will be sure that there will be no need for loud swearing about forgotten items when you get home.

Keep a stock – all of those consumables like eggs, sugar, flour as well as nails, screws or even cleaners like soap or bleach or that necessity of all necessities; toilet paper – we take them for granted but it can be intensely annoying when we run out. It may be some time before it is convenient to get out to pick them up, so when you do buy them buy a bit more than you would normally and store the excess away in a cupboard, to be dragged out when there is a panic that you may have run out.

Do a milk Run – When you are out and about, see if you can plan for your activities and things you need to get to be in the same rough geographical area. That way you will be able to accomplish the most on each trip that you make, hopefully reducing the overall number of trips needed saving you time and money.

Getting hold of a Car

Relatives - OK, so you are without a car, it is cheating but you may be able to con your relatives into providing a taxi service. I wouldn't count on it all the time but in

emergencies or for special occasions a nearby relative can be very handy. Our daughter and son in law live about 20 minutes down the freeway from us and this is both good and bad (good for us – bad for them) so we will occasionally ask for their help and they are pretty good at providing it.

Hire – There are occasions such as wanting to get some place difficult to access by other means or where you need to pick up something heavy or bulky and it is difficult to do it any other way, hiring a vehicle may be the answer. You are only paying for the vehicle for that particular activity or trip so that in the long run it will work out much cheaper than having to buy, maintain and fuel a vehicle of your own.

Conclusion

So, if you were wondering, there is life after car! Whether it will be a full time or temporary arrangement, whether it was by choice or forced upon you, the car free life is still a full one. It is more sustainable, cheaper, and very satisfying when everyone starts complaining about the price of fuel. So make your plans and go for it!

4.0 Other Things

4.1 The Grocery Pram (Bringing Home the Shopping)

While we are attempting to be more sustainable and self reliant in the suburbs, as much as we wish it were not so, we cannot produce everything we want on our 600m2 of land, so we do still have to go shopping. We live about 10 minutes walk away from our local shopping centre and it would be evil to drive, as much petrol is consumed in small hops, so for the most part we walk, even if we have a load of stuff to being back. The stuff we get can be quite heavy on occasions and there is somewhat of a temptation to take the car down "just this once...", so my lovely partner in suburban sustainability came up with an idea – The grocery pram.

Before we go any further, yes it is possible to borrow a shopping cart form some shopping centres, but the large number of lazy people who borrow a cart then just leave it out in the street drive me crazy. It is just something we refuse to do.

We obtained an old pram from the Salvation Army, for manoeuvrability sake the pram had four wheel steering and four wheel parking brakes for security. There was some rust but by and large it was in pretty good condition and while you may not have

wanted to cart your child around in it, it was more than adequate for our purposes. On the base chassis she then set about retrofitting it for its new duty as her grocery-mobile by grafting on the following features –

1.The front basket – this holds the blue insulated cold bag used to transport frozen and refrigerated items without having them defrost or warm up to much.
2.The central orange basket or plastic box – this is where the majority of the materials being picked up goes – 10 kg bag of potatoes or rice, a load of flour or whatever is required. The small area behind the main container is ideal for holding biscuits or other items you don't want crushed.

3. Two underslung wire cages – ideal for glass bottles or a load of toilet paper. These two wire cages increase the storage area remarkably, although you must be careful going up a steep incline as items in the back on can slide out.
4.The light basket attached to the handle – good for smaller items you don't want crushed, or to keep the handbag in (if you are game!).

The grocery pram works remarkably well, we also have a “shopping jeep” which is good for lighter items but if it is too heavily laden drags your arm down and has the most disconcerting habit of rolling over and taking your wrist with it when you least expect is, especially on uneven ground. For heavier loads the grocery pram is certainly a much better choice.

The grocery pram does fetch us some weird looks when we go shopping with it and I suspect that some people may think we are homeless, but most people seem to like it and we have been given some very positive comments, but we are still the only people we have seen who have one!

My wife even took the cat (inside a cat carrier) down to the vet in the grocery pram. One bloke who saw the cat in the pram thought this was hilarious and got a good laugh out of it, it made his day.

Mind you, when heavily loaded the shopping pram may need the bigger engine!

4.2 Constructing our Hand Cart

About twenty years ago I was tooling around on the internet and found the idea of a handcart, I had some time off from work and decided that would be one of the projects I would work on. I figured I could use it to pick up stuff, move things around the yard and just generally have fun with it.

There were fairly detailed plans available and I downloaded some of them, but they all seemed to have vanished, or at least the free stuff has.

My original idea was that the chassis almost looked like a pallet and maybe I could modify one to do the job, but on closer inspection that proved not to be the case. I did, however, use four hardwood pallet stringers recovered from pallets I had gotten from work to frame the chassis. Most of the other timber involved was DAR pine either from my stock or bought in expressly for the purpose.

Please bear in mind that I made this a long time ago and my memory isn't the best these days. Fortunately I do have lots of photos, and some plans available (See appendix 2 of this eBook)

The Chassis

The chassis started off as the four pallet stringers, two each bolted together through a 10cm cube of timber at each end to form each side of the chassis. The two sides were then connected by screwing timber onto the top and bottom of each end of the stringer assembly to form a square.

In terms of the wheels, they are (obviously) bike wheels with the axle in place. I drilled holes out through the centre of each stringer, towards the bottom and then fitted in some 10mm (OD) aluminium tubing, which the axle went through. To fit the wheel, it was necessary to remove the outside stringer, install the axle and wheel assembly, then re-bolt the outside stringer back into place.

On front of the chassis there is also a stand fitted (again I used DAR pine) so that the cart can remain upright while parked. It is place on the front end of the chassis due to the weight of the push bar on that end causing the cart to drop forward when not in use. The stand is made with a pine plate on the front and back, secured with six screws, and a piece of pine in the centre, which is bolted to the rear plate and pivots, allowing it to act as the stand.

The Box

The box is roughly a metre long, half a metre wide and a third of a metre high. It fits on top of the chassis and contains the load. It is fully removable from the chassis and there are four pieces of timber screwed onto the bottom of the box that are turned around to secure the box to the chassis.

The box is formed by three pieces of DAR pine secured to the bottom of the box, with the fourth side being able to be slid in and out between a couple of rails on each side and removed to expedite loading.

The push bar allows the cart to be wheeled around by the driver and is attached to the sides of the box at the front of the cart. The sides of the push bar assembly are made from 42mm 18mm DAR pine, with a hole drilled in the end to allow the 25mm pine dowel push bar to be inserted.

The Fate of the Hand Cart

While it was fun to make, and did get some use in the back yard, it did take up quite a bit of space in the shed. After a few years I passed it on to a mate who has a larger, but still suburban, property than I have. In turn, he passed it on to a local scout group who, to the best of my knowledge, still have it.

Photos

Chassis

Box & Push Bar

Chassis with Box

Push Bar Fitted

5.0 Resources

5.1 Bicycle Books

Bike Repair Manual – Chris Sidwells – Dorling Kindersley (UK) 2004 ISBN 1 4053 0252 4 – I love this book! It is not so big but gives good coverage to all aspects of bike maintenance. It starts off with sections on getting to know your bike and caring for your bike then gets down to the nitty gritty of maintaining your transmission, steering and wheels, adjusting rim and hub brake and, tuning your suspension. Lots of "step by step" instructions and colour photos means anyone can follow the processes they describe.

The Urban Biking Handbook – Charles Haine – Quarry Books (US) 2011 ISBN 978 1 59253 695 5 – This book is a one-stop-shop about riding bikes in and around cities. It covers choosing your bike, the issues that crop up specific to riding in the city, customising your bike, what tools and clothing you need and building up to a car free lifestyle. The technical side of how bikes work and how to adjust them is covered but so to bicycle education and how it fits into the community. Lots of colour photos and how to info.

Green Guides: Cycling – David North – Flame Tree Publishing (UK) 2011 ISBN 978 0 85775 096 9 – While not being as information dense as the first two books, this is not bad for beginners and covers the benefits of cycling and choosing a bicycle; Equipment, clothing and safe cycling; bicycle maintenance and troubleshooting. Some colour photos.

Bicycling, A Reintroduction – Karen Ruth – Creative Publishing International (US) 2011 ISBN 978 1 58923 605 2 – This book is about reintroducing the driving public to the bike as a serious mode of transport. The book discusses the new options available for bikes and riding, the health benefits and how to get a bike. It also covers riding skills; clothes and accessories; the parts of a bike and how to fix your new bike. While not information dense on "how to" there is lots on "why you should". Lots of colour photos.

The Australian Bicycle Book – Ian Christie – Cassell Australia (AUS) 1979 ISBN 0 7269 1400 2 – This book has all the usual bits, choosing a bike, tools and their uses, now to fix each of the various bike bits and bicycle safety. Not huge amounts of detail but some line drawings and black and white photos. Good for beginners (as I was when I bought it!)

The Fantastic Bicycles Book – Steven Lindblom – Houghton Miflin company (US) 1979 ISBN 0 395 28482 3 – This is a pretty wild book about turning standard (recycled) bikes into something different; projects include, a ski bike, a racer, an exercise bike, a tandem bike, a three wheeler and a sidecar rig. There is also lots of good "how to" stuff on modifying bikes. There are only colour photos on the back cover but the book is filled with really good line drawings.

Cycle Repair – Rob van der Plas – Springfield Books Ltd (UK) 1994 ISBN 1 85688 027 3 – A really good book! Lots of detail and colour photos, the book goes through all parts of the bike and how they work. There is then a detailed discussion on how to service and maintain each part of the bike in all their different combinations. There is even a section on bike accessories and how to install them.

Fix your Bicycle – Eric Jorgenson & Joe G. Bergman – Clymer Publications (US) 1972 ISBN 978 0 89287 035 6 – A bit dated but good information on tools and how to use them and a good section on lubrication and maintenance. The rest of the book is taken up looking at the various bike systems. All black and white photos or line drawings, but lots of 'em!

The Bicycle Book – Twelve contributors from Cycling Plus – Future Publishing (UK) 2006 ISBN 978 1 84188 263 5 – As the title suggests this is a good general book on cycling. The book covers buying a bike in some detail and what is right for you; essential accessories like helmet, locks, lights etc.; Maintenance, storage and security for your bike; cycling safety and getting the most out of your bike. Lots of colour photos.

Anybody's Bike Book – Tom Cuthbertson – Ten Speed Press (US) 1979 ISBN 0 89815 003 5 – Nothing fancy or high tech here, just good solid information for basic bike maintenance. The items covered are tools, brakes, handlebars, stem, headset, forks, wheels, frame, seat and power train (extra detail on power train, wheels and brakes). No photos but quite good (and sometimes humorous) line drawings.

Better Bikes – Tom Cuthbertson – Ten speed Press (US) 1980 ISBN 0 89815 024 8 - The tag line for this book is "A manual for an alternative mode of transportation" and that just about covers it. The book is in two parts, the first covering how to get the best out of your current ten speed or standard bicycle, like making it more efficient, modifying the bike for shopping and riding a bike in rough weather. The second part covers alternative bicycles like recumbent bikes, portable bikes and high speed bikes. As above, no photos but good line drawings.

Ultimate Bicycle Book – Richard Ballantine & Richard Grant – DK Publishing Inc. (UK) 1992 ISBN 0 7894 2252 2 – This book goes into great detail about different types of bike, how they were developed, how they are made and what you can do with them. The bike is broken down into 7 sections, the first called the essential bike that discusses bikes in general terms followed by a section each on mountain, racing, touring, everyday and future bikes. The last section is on bicycle maintenance. Lots of colour pics.

The Complete Book of Bicycling – Eugene A. Sloane – Simon & Schuster (US) 1988 ISBN 0 671 65802 6 – This is a big thick book (500+ Pages) which covers how to buy and ride a bike, the history of bikes, bike touring and commuting. The remainder of the book (a bit over half) covers the anatomy of the bike and how to maintain all the bits. All black and white pics with a few line drawings thrown in.

The Raliegh Book of Cycling – Reginald C. Shaw (Ed.) – Sphere Books (UK) 1978 ISBN 0 7221 7749 6 – This is a standard size paperback with no photos and a few line drawings that covers all sorts of stuff. Chapters include buying and riding a bike, cycling for

health and fitness, cycle gears and gearing, the history of cycling and a chapter each on various cycling sports.

The Penguin bicycle Handbook – Rob van der Plas – Penguin Books Ltd (UK) 1983 ISBN 0 14046 488 3 – Covers all the usual bits and pieces including choosing and buying a bike, a breakdown of the bike's components, bike history, using a bike to keep fit as well as a section on maintenance and repairs, including painting a bike. The book has lots of good line drawings as well as a centre section of black and white photos.

Richard's Bicycle Book – Richard Ballantine – Pan Books Ltd (UK) 1977 ISBN 0 330 24203 2 – The book is broken into two halve, the first half covering the types of bike available, how to ride, touring, racing etc. The second half breaks the bike down into its components and then discusses maintenance and repair including putting together a maintenance program. There are some line drawings but no photos.

It's Easy to Fix Your Bike – John W. McFarlane – W. Foulsham and Co Ltd (US) 1972 ISBN 0 572 00890 2 – This book is quite specific and names names in terms of brands when discussing maintenance and repair processes. Brands mentioned include Bendix, Komet Super, Centric, Shimano, Mattatuck and Sturmey-Archer. All the usual bits and pieces are covered. Lots of good black and white photos.

Bicycle Care and Repair – Ben Burnstyn – Coles Publishing Company (CAN) 1979 ISBN 0668 02706 1 – Lots of good information with chapters on care and maintenance, braking systems, derailleurs , crank assemblies and sprocket clusters, frame and fork aligning, building and truing wheels and short cuts on common repairs. A mix of line drawings and black and white photos.

5.2 Books about Fuel Efficiency and Fuel Alternatives

Making Your Own Motor Fuel – Fred Stetson – Garden Way Publishing (US) 1980 ISBN 0 88266 163 9 – This is a book about how to make alcohol fuel for your car using various size stills including a 200 litre drum monster that might get you shot here in Aus, I'm

not sure of the legal ramifications but if memory serves a 5 litre is the biggest you can have. Also covered is how to make your car run on alcohol and how to ferment the stuff in the first place. Lots of detail, line drawings and black and white photos.

Methanol and Other Ways Around the Gas Pump – John Ware Lincoln – Garden Way Publishing (US) 1976 ISBN 088266 051 9 – This is not so much a "how to" as "what's out there" and discusses methanol, producer gas, fuel cells, and hydrogen, with a focus on methanol. Some line drawings and black and white photos.

Pumped – 101 Ways to Beat Petrol Prices – Roz Hopkins – Hardie Grant Books (AUS) 2008 ISBN 978 1 74066 713 5 – A little local book with some obvious and less obvious ways to minimise your fuel costs. Chapters include filling up for less, preparing and maintaining your car for greatest fuel efficiency, driving tips, choosing the right car alternatives like car pooling, public transport and bike riding. There is also a 101 tips section. A couple of graphs, no illustrations.

Cutting your Car Use – Randall Ghent with Anna Semlyen – New Society Publishers (US) 2006 ISBN 0 86571 558 0 – Another little book to help you reduce your reliance on your car including why you should, what alternatives are out there, changing your travel habits, living without a car. There is a large "resources" section but most only pertain to North America.

From the Fryer to the Fuel Tank – Joshua Tickell – Tickell Energy Consulting (US) 2000 ISBN 1 74018 149 2 – A very technical book that helps you turn vegetable oil into biodiesel including how to press your own veggie oil, plant and processes for making biodiesel and how to run your car on straight vegetable oil. There is also a chapter on trouble shooting and success stories. Lots of line drawings and black and white photos. Also published in Aus by Fast Books.

A Few Books with Sections on Fuel Efficiency Etc.

547 Ways to be Fuel Smart – Roger Albright – Storey Books (US) 2000 ISBN 1 58017 369 1 – This book is about being fuel smart in the larger sense but chapter 10 (pp83 to 90) covers reducing your car's fuel consumption. Basic stuff.

Time to Eat the Dog – Robert and Brenda Vale – Thames and Hudson Ltd (UK) 2009 ISBN 978 0 500 28790 3 – Chapter 2 (pp72 to 126) covers transport with a well researched and scholarly discussion of the options including bikes, walking, cars, railways, planes etc. And what you need to do to make the correct decision about how you get to where you want to go.

CSIRO Home Energy Saving Handbook – John Wright, Peter Osman, Peta Ashworth – Pan Macmillan Aust (AUS) 2009 ISBN 978 1405 039611 – Chapter 8 (PP163 to 187) explores minimising greenhouse gas emissions from various transport alternatives. Colourful graphs and full colour photos but not particularly information dense, covers the usual stuff.

Greeniology – Tanya Ha – Allen & Unwin P/L (AUS) 2003 ISBN 1 86508 929 X – The Green Garage (pp 131 -142) – Tanya Ha's stuff is usually pretty good and this book is no exception. Her chapter called the Green Garage covers some easy and not-so-easy things to implement to improve the carbon footprint of your car usage. Simple and easy to read.

Appendix 1 – Household Sustainable Transport Audit Form

Date:					
Reducing transport requirements					
No	Item	Always	Sometimes	Rarely	Never
1.1	Live within walking distance to shops	3	2	1	0
1.2	Telecommute where possible	3	2	1	0
1.3	Mail/internet order rather than drive to shops	3	2	1	0
1.4	Get home delivery rather than drive to shops	3	2	1	0
1.5	Have at least one “car free” day per week	3	2	1	0

Public transport					
No	Item	Always	Sometimes	Rarely	Never
2.1	We use public transport to get to the shops where possible	3	2	1	0
2.2	We use public transport to get work where possible	3	2	1	0
2.3	We use public transport when we go to see friends &family where possible	3	2	1	0
2.4	We use public transport to get on other outings where possible	3	2	1	0
2.5	We trip plan and use public transport as part of our plan where possible	3	2	1	0

Walking					
No	Item	Always	Sometimes	rarely	Never
3.1	We walk to the shops where possible	3	2	1	0
3.2	We walk to work where possible	3	2	1	0
3.3	We walk to see friends &family where possible	3	2	1	0
3.4	We walk on other outings where possible	3	2	1	0

Bike					
No	Item	Always	Sometimes	Rarely	Never
4.1	We ride bikes to the shops where possible	3	2	1	0
4.2	We ride bikes to work where possible	3	2	1	0
4.3	We ride bikes to see friends &family where possible	3	2	1	0
4.4	We ride bikes on other outings where possible	3	2	1	0

Car - Purchase					
No	Item	Always	Sometimes	Rarely	Never
5.1	We keep our car for a number of years rather than buying a new one each year	3	2	1	0
5.2	We buy second hand rather than new cars	3	2	1	0
5.3	We buy only fuel efficient cars ie have a fuel consumption of <5 litres/ 100km for highway driving and <6.5 litres/ 100km for city driving	3	2	1	0

5.4	We rent or borrow a ute when we need one rather than owning a larger car	3	2	1	0
5.5	We buy vehicles which can use low emission fuels such as LPG	3	2	1	0

Car - Maintenance					
		Always	Sometimes	Rarely	Never
5.6	Our car is regularly maintained in accordance with the manufacturers instructions	3	2	1	0
5.7	We ensure that the tyre air pressure is maintained to manufacturers specifications	3	2	1	0
5.8	We ensure that the lowest viscosity oil is used in the engine.	3	2	1	0
5.9	We regularly check and replace clogged air filters	3	2	1	0
5.10	We regularly check and replace worn spark plugs	3	2	1	0
5.11	We maintain the cooling system by checking the engine temperature regularly	3	2	1	0
5.12	We unsure the fuel filler cap is in good condition and seals well to prevent leakage	3	2	1	0
5.13	We have the vehicles air condition system checked yearly	3	2	1	0
5.14	We have the fuel filter checked and replaced at least every 2 years or 40,000km	3	2	1	0
5.15	We wash the car on the lawn using eco friendly cleaners	3	2	1	0

Car - Use					
5.16	We record our mileage and fuel so we can track our fuel consumption over time	3	2	1	0
5.17	Where possible, we use our car to transport more than one person at a time	3	2	1	0
5.18	We plan our trips so that we can use the car for a milk run rather than using a separate trip for each activity.	3	2	1	0
5.19	We car pool where possible	3	2	1	0
5.20	We remove any unnecessary materials/weight from the car	3	2	1	0
5.21	We remove roof racks, external steps and brush guards when they are not required, to improve the cars aerodynamics	3	2	1	0

Car - Fuel					
5.22	We use environmentally friendly fuel (petrol containing ethanol; biodiesel etc.)	3	2	1	0
5.23	When filling up we only run until the fuel nozzle shuts off	3	2	1	0

Car - Driving					
No		Always	Sometimes	Rarely	Never
5.24	We drive steadily, at or below the speed limit (operating speed)	3	2	1	0
5.25	We use the cruise control where possible	3	2	1	0
5.26	We accelerate quickly and smoothly to operating speed	3	2	1	0
5.27	We avoid idling and turn the engine off where idling time is likely to exceed one minute.	3	2	1	0
5.28	We go slower up hills and faster down hills (within the speed limit)	3	2	1	0
5.29	We use the air conditioner rather than opening the windows when travelling at or above 80 kph	3	2	1	0
5.30	We keep the top up when driving a convertible	3	2	1	0
5.31	We park close to the carpark exit to minimise stop-and-go driving	3	2	1	0

Air Travel					
No		Always	Sometimes	rarely	Never
6.1	We use air travel only when no other options are available	3	2	1	0
6.2	We holiday locally	3	2	1	0
6.3	We fly less often and stay longer	3	2	1	0
6.4	We teleconference rather than fly to conferences or meetings where possible	3	2	1	0

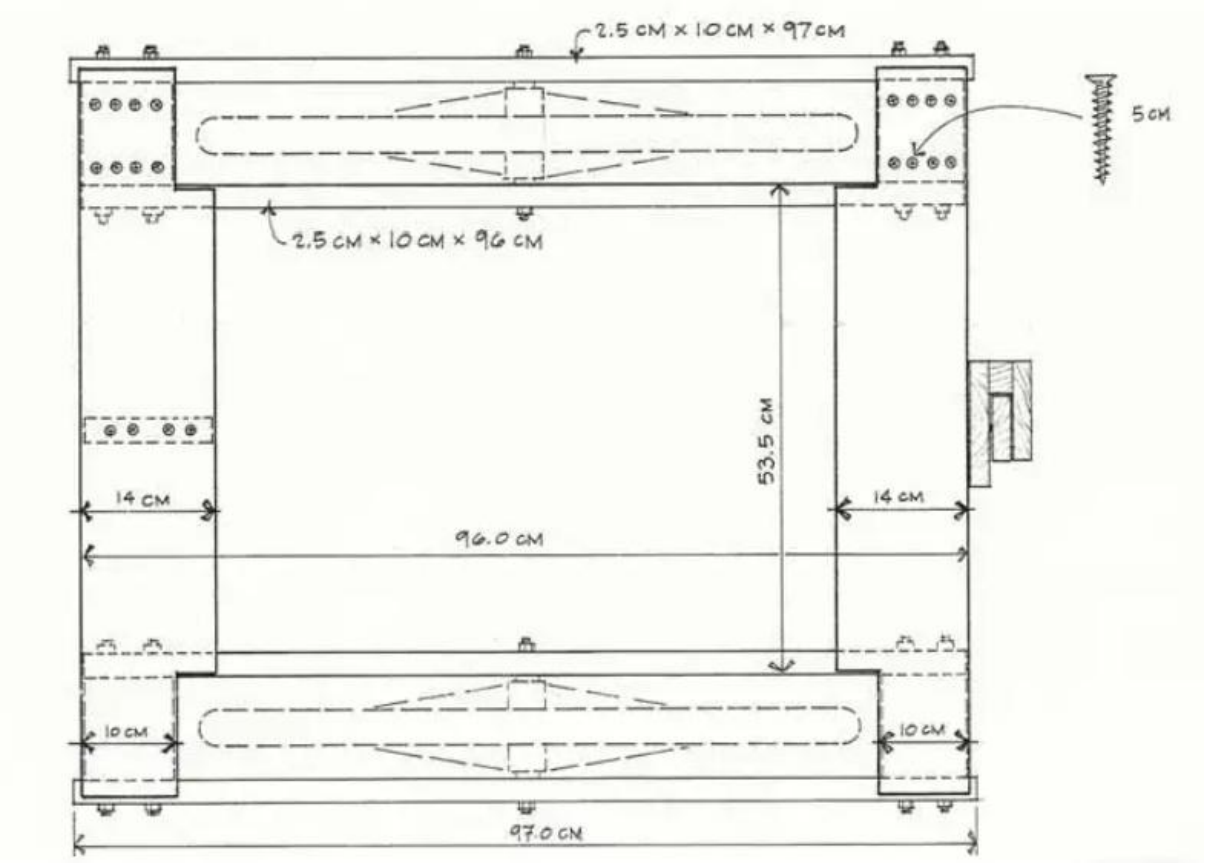
Total possible points (P) =

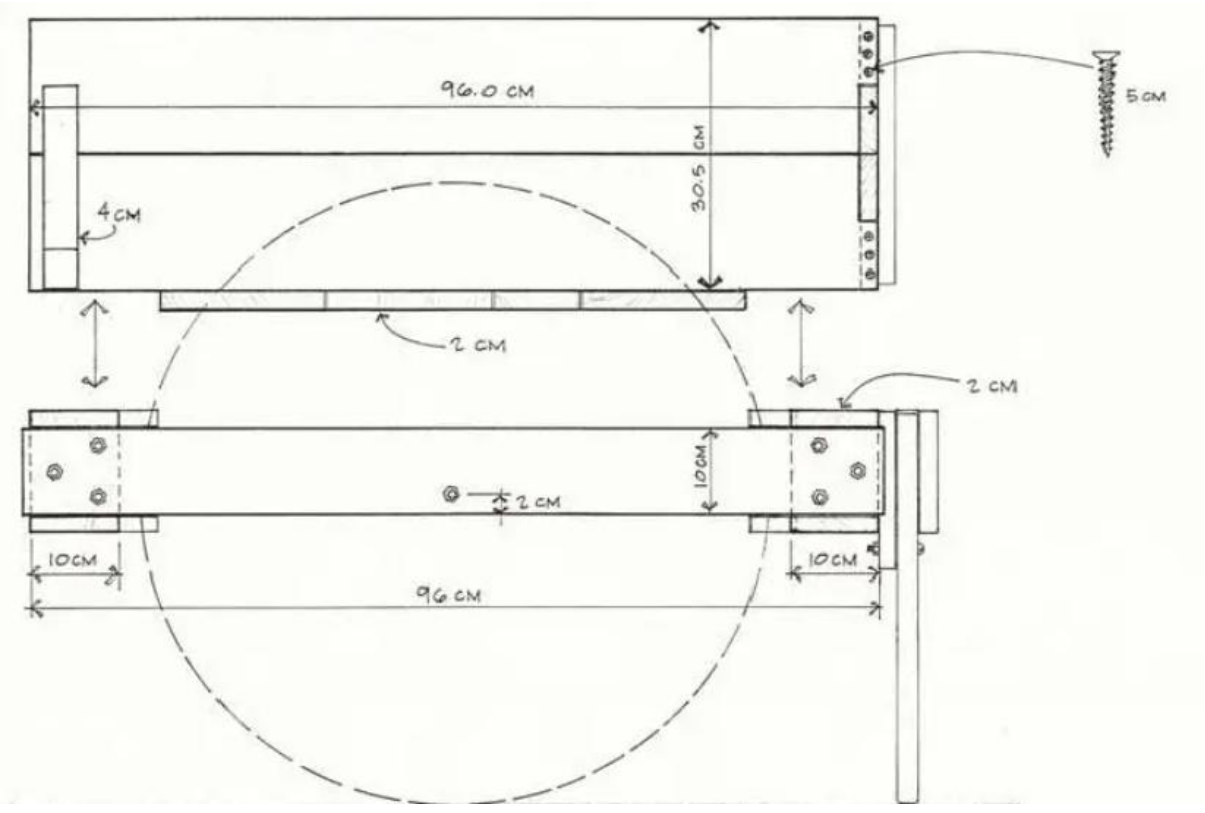
Total points achieved (A) =

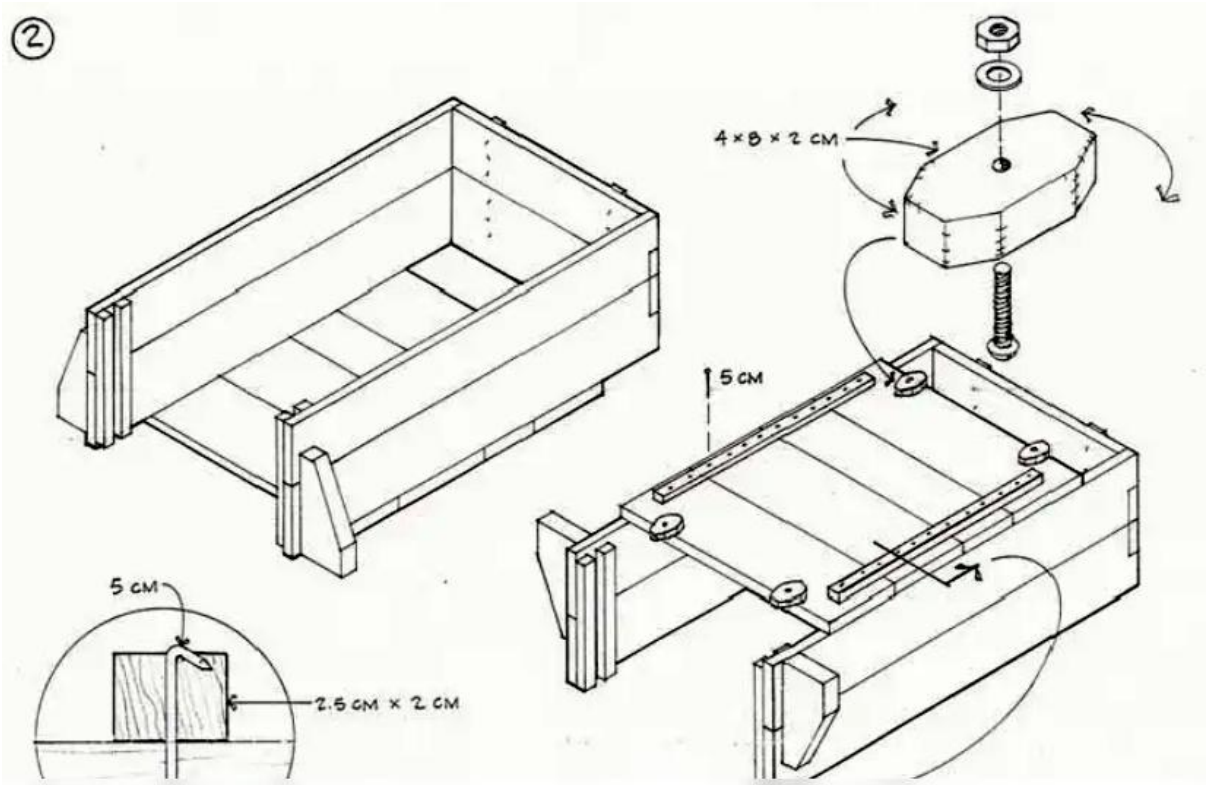
Score % = A / P x 100

Date audit was completed:

Appendix 2 – Handcart Plans






②
4×8×2 CM
5 CM
5 CM
2.5 CM × 2 CM