Raven Twin Tandems

Rohloff equipped

issue 14.0

www.thorncycles.co.uk

Why ride tandem?

There are many reasons why it makes sense to ride tandem listed below, at least two of them should apply to everybody.

[1] For partners of unequal cycling ability, going cycling together can be a cause of great frustration and concern. The more unequal their abilities... the greater the frustration and concern can be. If it is frustrating to have to constantly wait for your partner to catch up, it is nothing compared to the frustration of constantly being waited for! It can be soul destroying for some, yet merely irritating to others, to know that you are trying your hardest and yet you are still detracting from your partner's enjoyment.
It can also cause great concern, to both parties, to become separated in an unfamiliar environment.
Although the above scenario is very common, it is not always the stereotype of a man waiting for a woman! Most partners of unequal ability would find that riding tandem is the perfect way of enjoying their cycling together. They will now always arrive together, whilst each of them will get the degree of physical work out that they (individually) want! This new tandem partnership should find, as have many thousands before them, that not only does their desire to go cycling together increase but also that the distances they can comfortably cover will also increase.
Frequently, one of them finds that their, often dreamed of adventurous cycling holiday, or cycle event, is starting to look both possible and attractive, to the other... a whole new world beckons.

[2] For those with balance problems or visual impairments, stoking a tandem is the only way to obtain full cardiovascular fitness in the open air.

[3] A tandem fitted with "kiddy cranks", or even better a child back tandem (see Raven Dynamic) enables families to continue cycling together during the early years of parenthood. It also introduces children to the pleasures of cycling in a safe, controlled environment, which remains stimulating enough to be anticipated with excitement.

[4] When two cycling-fit and strong parties ride tandem the result is a shared athletic experience of a quality beyond words... and very fast!

[5] It is only necessary for one of you to be able to ride a bike... that person should be at the front! Indeed, the best stokers are often those who can't cycle on their own!

[6] Riding tandem is fun! It makes you smile... it makes others smile.

Two tandem terms explained.

Pilot... the one on the front (often called captain... but that's not really pc)

Stoker... the one on the back.

Who should be pilot, who should be stoker?

Sometimes body size makes this a really easy decision. The heaviest, or the one with the greatest upper body strength, should go at the front, unless that would mean that the most competent cyclist was not the one controlling the machine. It can sometimes take a fair bit of upper body strength to control a tandem... the heavier the stoker is the more upper body strength the pilot needs! We have sold several replacement tandems for 55kg women to pilot their, considerably heavier, blind husbands... they are all managing fine now, thanks to our extra stiff frames!

The Raven Twins

Mr. and Mrs. Thorn are pleased to announce the arrival of a new set of twins.

Everybody at SJSC wishes them well for the future.

Actually their future is most certainly assured! We know that they will work hard, gain respect, be loved by everybody and go on to become very famous.

This new range of tandems will redefine the future of tandeming.

To ensure that the twins have the best possible start, we have used our unrivalled knowledge and experience to make **the definitive tandem frame**... whichever size you need.

To make certain that we could have exactly what we wanted, rather than have to make do with what was available, we have had our own tube set made. This superb tube set starts life as the finest seamless Japanese Cro-Mo steel blanks, these are then cold drawn and butted into the size and gauge that we require, finally the tubes are heat-treated to ensure the maximum strength, longevity and performance.
These tubes are crafted into frames, by only the very finest of the builders, from probably the world's most respected factory.
The frames have provision for every desirable feature incorporated into them, allowing multiple choice of operation of key functions.
After extensive rust proofing, the frames are applied with one of three colours of super-tough powder coat... the subtle decals are positioned and a super-tough coat of high-gloss powder lacquer applied to protect them.

We have three different frame designs and there are eleven sizes of frame! Each of these frame sizes is available with, or without, S&S couplings. These are the finest frames we have ever had made and represent the most comprehensive range of sizes undertaken by any manufacturer.
There has been so much care, experience and thought invested into these frames, as well as a massive financial investment, that we fully intend and expect them to remain both current and "cutting edge" for at least a decade! We almost certainly have a frame to delight and suit both of you for your entire cycling lives!

The frames themselves are enough to get excited about but we have moved tandem technology onwards; these frames are built specifically to use the ultra-reliable, Rohloff Speedhub! (This is an internal hub gear, which has 14 speeds!) We have used Rohloff hubs, for several years, on touring bikes; we have used them for commuting; we have used them on mountain bikes... they are superb... we would never want to use derailleurs again, on anything more heavy-duty than a super-lightweight Audax solo bike! (There is much more information and detail available in our "living with a Rohloff hub" literature.)
As good as these solo bikes are, we felt that perhaps the biggest advantage of all, for a Rohloff hub, would be in a tandem! We have

persuaded highly experienced customers to ride prototype Raven Twins, on heavily laden touring holidays to some of the most difficult terrain imaginable... the gravel "roads" of Southern Chile and Patagonia! These particular customers did not want to hand the bike back and part-exchanged their Thorn Discovery for it immediately upon return!

The biggest trouble with derailleur gears on tandems has always been the front mech... it is always difficult to set up the front mech so that it changes rings when you want it to... without jamming, dropping or overshooting the chain in the process. There is no possibility of this happening with a Rohloff... there is no front mech!

All 14 gears are operated via one shifter; the gear mechanism runs on multiple bearings and is enclosed in an oil bath in the rear hub. As a bonus, you don't even need to be pedalling to change gear! How many times have you come to a halt on a tandem, only to find that you were in the wrong gear to restart? Do you panic about keeping your balance whilst you stand on the pedals and strain? Do you and your stoker get off and does your stoker hold the rear wheel off the ground, whilst you rotate the cranks? Can you make your gears operate perfectly in the work stand, only to find that they don't work properly when you're under load? Have you ever wanted to change your cassette (and chain) only to find that your system is now obsolete? If you have managed to buy new stuff, have you then found all the spacers mysteriously need changing in your chainset? We have all been there and **we have put up with the inadequacies of derailleurs, because we love riding tandem so much.** The Rohloff changes all that; as a tandem crew, **you can consign derailleurs to the recycling bin of cycling history...** Rohloff makes everything so simple... as long as all the accommodations necessary for its perfect installation have been made. You can be assured that we have spent the time (and the money) to make certain that our Rohloff-specific frames are Rohloff-perfect! (We have had ten different types of cable guide cast from stainless steel; we have had our own Rohloff-specific dropouts cast, again from stainless steel)

Some questions you may have about the Raven Twins answered.

This is a new model and I haven't seen a review yet, how well does the frame handle?

Thanks to our designer, Andy, we have always had the most enviable reputation for frame design... our Thorn Adventure Tandem scored 10 out of 10 for handling in the April 2001 Cycling Plus review, no other tandem has ever achieved this score! Cycling plus liked both the low speed handling and the high speed handling, they said "Overall we can't rate the Adventure's handling too highly". And Cass Gilbert said in November 2001's C+, in his article about riding the Silk Road, "For our ride across Turkestan, we used Thorn's Adventure tandem. Its steel frame is beautifully made with a perfect geometry for long distance riding." He then went on to say "The Adventure's excellent handling surprised us off-road and there were few trails we were not able to venture, albeit slowly" The reason all of our bikes always score so well is that Andy actually rides the bikes themselves, for long periods of time, in different and difficult conditions... if something could be improved, he improves it at the prototype stage... before we manufacture the bikes!

Believe us when we say that not only is Andy a very experienced cyclist and tandem pilot, as far as cycles are concerned, he is only happy with perfection; he imagines that he will own and ride every bike he designs! Having learned how to make a tandem handle perfectly; Andy has certainly not decided to forget all that hard won experience and make a retrograde step; instead he has set about how to perfectly incorporate a Rohloff hub into a perfectly designed frame! Andy is convinced that, because it puts such superior machines within the financial reach of so many cyclists, the Raven series will be regarded as his best ever work. Remember if you don't agree inside 100 days, that this is the best handling tandem you have ridden (or as good as the best, for those who already own a Thorn Discovery or a Vitesse), with the best transmission, we will refund you in full and collect the bike. Don't think that there is a catch in these words... you only have to not want to keep it (without giving a reason at all) and we will refund you.

It is simply that we want you to test your ideal machine... yourselves!

We really don't expect many back!

Why do you have both chains on the same side?

There are three main reasons we continue do this (and because there are only two rings at the back, compared to the four rings we fitted to our derailleur tandems, it makes even more sense now!)

The reasons are; Firstly, it means that we can use conventional solo chainsets, which we have in a huge variety of different lengths. This makes the sourcing of spare parts much easier, should you ever be unfortunate enough to damage a crank whilst on tour. Secondly, having the chains on the same (right hand) side, means that the strain on the rear bottom bracket is considerably reduced... which should quadruple its service life! (The rear BB of a tandem was, historically, always a problem area). Thirdly, having all the chains on one side, means that there is a "clean" and a "dirty" side to the tandem... this is useful when lifting or storing the machine!

Are 14 gears enough... we have 27 on our tandem, can we have low enough gears?

If you study the gearing charts in our literature you will see that actually you don't have 27 gears... at best you have 14, perhaps you only have 12 different gears... you have the same gears several times and you often have to

change chain rings and sprockets, to obtain the next gear. The Rohloff Speed hub has 14 different gears, operated by one shifter... the next gear is always just that... the next gear! The overall range of gears is similar to that found on a current mountainbike... 526%. You have a choice of gearing on your Raven Twin, you choose how low you want your bottom gear to be... top gear is then always 526% higher than this. (All the intermediate ratios are at constant 13.6% intervals). Rohloff insist on a lower limit of 40 x 16 or 42 x 17 on a tandem (42 teeth on the chainring and 17 on the rear sprocket, which is like 22 ring x 32sprocket with a derailleur)... there is no upper limit (Imposed by Rohloff) on your choice of gear range.

What if the Rohloff hub goes wrong... I know lots of little tricks which may keep a derailleur running... but I couldn't possibly take one of those hubs apart?

Rohloff have never had a total failure of the hub... nobody has reported being stuck anywhere with a hub that has lost drive. We searched the internet for problems before we contemplated making the first solo prototypes, you need have no worries about reliability... it is German engineering at its best!
Would you feel that you needed to know how to strip the auto transmission on a German car before you set out on a journey? If you change the oil every 5,000Km and replace the cables and drive chains and turn the sprocket and chain rings around every 20,000Km you will have no worries at all.

I have heard that the hubs need running in... is this correct and how long does it take?

Yes the hubs need to be run in; it seems to take about 1,000Km, on average, for them to become really smooth and much quieter. In dramatic contrast to a derailleur system, the hub gets better as it gets older!

I have heard of a few Rohloff owners who have had trouble with slipping gears... what do you know about this?

Most instances of reports of slipping gears can be traced back to poor installation of Speedhubs into frames not designed for Rohloff... such frames require the use of a chain tensioner... it is this rear-derailleur-like chain tensioner that allows the chain to jump on the sprocket. Our Raven Twin frames are designed specifically for Rohloff, we use a second eccentric BB to tension the chain... this slipping can't happen with our frames!
Very occasionally, when making a gear change, a false neutral is found, this causes a slipping sensation for a few degrees of crank rotation before it engages properly... this is nothing to worry about and causes no problems in normal use. Andy says "When changing gear, whilst I am out of the saddle, I always stop pedalling for a moment... I have never had anything other than a perfect shift when I have done this."
Very, very infrequently, a fairly new hub will start to become difficult when shifting from 3 to 4 or 10 to 11 and may even slip when in these gears... this may be a faulty hub... if the problem will not "go away" after an oil rinse and change, the whole wheel, including inflated tyre, should be returned to Rohloff... they collect and re-deliver. Rohloff's technicians adjust the mechanism with shims and return the wheel inside one week, there are no reported instances of a hub ever having to be returned a second time... their service is second to none! These very occasional problems are merely teething problems, when the hub is new; there are no reports of such problems on high mileage hubs. Rohloff have sold 30,000 hubs and many owners have used them for 160,000Km of demanding cycling... nobody has yet worn one out!

Can you honestly say 32 spokes are enough... you told me I needed 48 on my last tandem?

Rohloff have measured the stresses in the spokes... the forces on each spoke are lower with a Rohloff hub than they are on a 145mm spaced, 48 spoke tandem derailleur hub. The flanges on the Rohloff hub are much further apart than a 145mm spaced derailleur hub, these wider flanges give much more triangulation, the Rohloff hub also builds into a dishless wheel... there is still a small degree of dish in a 145mm spaced derailleur hub. Rohloff say that the Speedhub builds into a stronger more durable wheel than a 48 spoke tandem wheel... we believe them. But it is easy to replace a spoke in a Rohloff; the flanges are so large the sprocket does not need to come off to feed the spokes through the holes.

We are convinced that you do not need more than 32 spokes; however Rohloff have now made some 48 hole Speedhubs exclusively for us and you may choose one of these if you wish...for an extra cost. These 48 hole hubs must be built up into a crow's foot pattern (16 pulling spokes, 16 trailing spokes and 16 radial spokes.)

I use an Arai drag brake on our current tandem; can you fit one to a Rohloff hub?

It is not possible to fit an Arai drum brake to a Rohloff hub.

In that case, can you offer an alternative to the Arai?

We can fit a rear disc brake; we offer Hope callipers with braided stainless steel line and a 205mm rotor, as an upgrade.

How does this compare to an Arai drum brake?

The Arai brake's stopping performance is very poor (but to be fair it would never be fitted as a main brake) whereas the stopping performance of the Hope disc is awesome and the pad wear is minimal!
The Hope disc will not dissipate the same quantity of heat as the Arai, so it must not be used as a drag brake... that is, it must not be used for extended periods of time to simply hold back the speed of the tandem... should you need to hold back your speed for long periods of time you must use all three brakes in rotation, letting each brake have time to cool down. In some situations, with a high "all up weight" on a long steep hill which also needs to be descended very slowly you must walk down the hill or stop to allow the brakes to cool down at regular intervals.

PLEASE NOTE... Repeated decelerations from high speed do not produce anywhere near as much heat as descending the same hill very slowly. With rim brakes, this heat will cause the seam in the inner tube to melt and fail and in the case of disc brakes; this heat will cause the fluid to boil and/or the pads to glaze and/or warp, rendering the brake ineffective.

We will not supply a tandem with a disc without an emergency V brake.

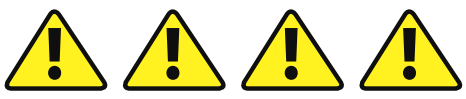
What is it with bicycle discs... disc brakes are fitted to all motorcycles these days, without problems?

Motorcycle disc brakes weigh much, much more than bicycle discs (few people would wish to carry brakes this heavy on a tandem, even if it was a possibility) and on a motorcycle, you can use engine braking down long hills. We are situated at the edge of a very hilly area, 15km away is Crowcombe hill (1km long, altitude loss 195m) we use this hill to test brakes. For example a descent of Crowcombe hill on tandem, with an all-up weight of 200Kg, whilst holding the speed back to 25kph, is literally right on the limit for the 205mm rear disc on its own... they "cook" at 24kph! Whereas a BMW R1100GS motorcycle and rider has an all up weight of 320Kg and a 200mm rear disc, which it doesn't even need to use... it will go down that same hill at under 20kph in first gear on the engine braking alone!

100kph can easily be reached, when descending Crowcombe without braking, on a tandem... the standard V brakes will stop the machine (on the 1 in 4 section) within 100m at this speed. We mention this, not to suggest that you try this for yourselves but to reassure you that (on one of our standard specification tandems, fitted with V brakes) you will be able to stop and walk down safely, should you inadvertently find yourselves on such a hill. We have proven that, even with an all up weight of 200Kg, there is a good margin for safety, descending Crowcombe, at 25kph using and alternating between all 3 brakes, with the supplementary rear disc option.

Can you offer a front disc brake as an option?

We will not fit a disc brake to the front of our tandems and we absolutely insist that nobody attempts to fit one, or modify the forks to fit, one either. Any attempt to fit a disc front brake will immediately void our warranty and discharge us of all liability for any damage, accident, injury or death which may occur as a direct result, or by a consequence of this action.



Wow, strong words! I am intrigued... we believe that a front disc brake would be of huge benefit... why do you say you won't fit one?

When we designed the bike we had to choose either a comfortable fork with provision for V brakes or a fork which would withstand the considerable (and very different) forces created by a disc... we choose the comfortable fork! To make a fork suitable for tandem use with a 205mm disc front brake would have required a through axle hub (to avoid the potential for the disc to rip the axle from the dropouts) we could have lived with through axles but the blades would also have needed to be un-tapered blades 31.8mm in diameter... we know how uncomfortable un-tapered 25.4mm blades are and we did not wish to produce a bike with even more uncomfortable forks!

We want a disc front brake and a front suspension fork, that should give us the braking we want and the comfort we need... can you supply that?

No, although some manufacturers will supply such an option, no manufacturer makes a fork specifically for tandem use, so there is nothing available which has the correct geometry, let alone a warranty for tandem use.

I don't care, I want a suspension fork and a disc brake, I can buy such a machine elsewhere albeit with derailleur gears, will you supply or not?

Please go elsewhere then; we wish to still be in business in the coming years... if we supply something we know to be unsuitable and dangerous it could lead to insurance claims. That might cost us our livelihoods... which would also make our lifetime guarantees worthless for our other customers.

I have modified my derailleur system to give me a huge spread of gears... we need very low gears for going up steep hills and we enjoy pedalling at high speed down the other side...we couldn't accept the range of a typical mountainbike... what do you advise?

You would not lose much by not pedalling down the hills... it is more aerodynamic to "tuck in" than it is to pedal. You need low gears for going up hills... we agree, walking with a tandem is horrible... but you don't need to pedal down steep hills.

But we enjoy pedalling down hills... we love having high gears... but we must have low gears too!

Well there is a solution... we can fit a "Schlumpf Speed drive" in addition to the Rohloff (this is a two speed bottom bracket, which can gear up all the hub's gears by 165%. It will give you an extra four gears when combined with a Rohloff hub). The Schlumpf is made in Switzerland, it is reliable and efficient. If you have the lowest gearing Rohloff will allow on a tandem (42 x 17) you can have a bottom gear, on 26" wheels, of 17.9". With the Schlumpf in speed drive, top gear is then 155.5"! There is no way in the world that you could get this range with derailleurs! We recommend that this option is only fitted for "day ride" or Audax use... servicing or adjusting a Schlumpf bottom bracket requires several very heavy tools and consequently this is best done at home rather than on the road on a long tour.

Ah yes, all your tandems have 26" wheels... I didn't agree with you before about this wheel size, why should I now?

Let's make certain we are very clear about what we are saying. We like 26" road-going-mountain bike tyres, which are at least 1.5" wide... we prefer 26 x 1.75" for most applications! So we are comparing 26 x 1.75" to 700 x 32c. If you use the much, much smaller in diameter 26 x 1.25" tyres you will lose comfort and increase rolling resistance, you would be better off with 700 x 32c! Narrow 700c tyres are better than narrow 26" tyres. Contrary to mistaken but commonly held beliefs, fatter tyres roll more quickly than narrow tyres on anything rougher than perfect tarmac, it is also true that the larger the diameter of a wheel, the faster it rolls. So a "fat" 700 x 44c tyre would actually roll more easily than an identically "fat" 26 x 1.75" tyre!

So why don't you use 700 x 44c?

As diameter increases, weight increases considerably and strength decreases dramatically. (A high quality 26 x 1.75" wheel/tyre combination is far stronger than (the difficult to obtain) 700 x 44c. 26 x 1.75" is also considerably lighter and therefore easier to pedal. The 26 x 1.75" is, in actuality, very,

very comfortable, it rides well and it still feels quick. Most things in life are a compromise; the ideal tyre size, for any given application, is another compromise.)
We think that, carefully weighing the pros and cons, there are overall advantages, for most cyclists, with 26" wheels on a lightweight sports touring solo. We are certain that there are overall advantages to 26" wheels, for all cyclists, on a heavy touring solo. We know beyond all doubt that there are overwhelming advantages to having 26" wheels on a tandem! High quality 26" tyres are available everywhere in the world. The tyres grip the road better; they are far superior on loose surfaces. They are much, much more comfortable. The wheels are stronger and a wheel/tyre combination suitable for a tandem is also lighter.... which means it can be accelerated more quickly. It is, indeed, foolish to have any other size on a new tandem.

Yes, but we are concerned with speed... we want to go fast!

The current mixed Land's End to John O' Groats tandem record (847 miles in 2 days 3 hours 19 minutes and 23 seconds) was set on 26" wheels (and straight bars too, for that matter!) how much faster than that do you want to go?

We would like to see if the Raven Twins are as good as you say, how can we have a test ride?

You can't have a test ride, but you can see how good they are without any financial risk! There are too many permutations of size and specification for us to have a suitable machine available to test. How much could you learn in an hour, or even a day on a poorly fitting machine on roads you don't know? Buy a perfectly fitting machine, with your preferred individual specification and try it on roads you are familiar with. We would like to remind you that we offer you a 100 day money back trial... if you don't wish to keep the machine, for any reason, we will collect the bike and refund you in full.

Are S&S couplings a good idea?

We think that S&S couplings are very beneficial on a tandem! They allow a tandem to fit in a standard airline bike box, they allow a tandem onto trains or the boot on some buses (especially in other, more enlightened, countries!) and they allow a tandem to travel inside most 5 door cars... thus not only reducing damage and the chance of theft but also increasing fuel mileage by a staggering factor... as much as 50% has been quoted by some sources! Given these benefits the chore of daily checking the couplings' tightness is a worthwhile trade-off.

Is an S&S tandem as strong? What is the weight penalty?

How much extra do they cost?

Yes, the couplings are manufactured from the finest materials, to amazing tolerances, in the land of litigation... the USA. Independent tests have shown that the frame is at least as strong with the couplings as without them... a coupled frame only weighs an extra 500g and will only lighten your pockets by £450!

Is it easy to separate and re-join the frames?

Yes, we have chosen to have the Raven Twins built "front-off"... this means that you do not need to disturb the connecting chain. We have meticulously thought through all the cable routing issues and very soon you would be able to take the front off in well under a minute and put it back on in three... even if you have four left hands!

Could I have the couplings retro-fitted to a Raven Twin? Or could I have the frame in a different configuration?

Yes, but because the cable runs for the coupled frames are different to the non-coupled frames, water bottle bosses etc. may be in the way, which would involve extra work. Whilst we couldn't get the same quality paint finish in the UK... we have a good working relationship with an industrial powder coat finisher. The finish is extremely tough and durable but we guarantee that, although the tubes will be totally coated and protected, there will be some surface imperfections. If you had your garden gate re-finished by these people you would be delighted with the result... but not everybody will be pleased with this finish on an expensive bicycle.
We can offer a choice of: - satin black, satin dark green, satin deep blue and satin olive green.
Apart from the self-adhesive stainless steel head tube, we have no way of providing anything other than stick-on vinyl decals, which could soon become "peeling off vinyl decals". The best advice is that, if you want couplings, then find the extra money for a coupled frame at the outset.

Frame Specification

Frame Specification

The frames are painstakingly TIG welded using our own exclusive mega-oversized, seamless, cold drawn, butted, heat treated top quality Japanese Cro-Mo tubes... we call it "Thorn 9/6/9".
There is the option to have S+S couplings on all frame sizes and colours (please see "Are S+S couplings a good idea?")
We have chosen to fit the most comprehensive set of fittings ever seen on a tandem frame, these include:-

[1] V brake bosses on the back of the 19mm seat stays.

[2] ISO disc mount on the base of the LHS seat stay

[3] Reinforcing tubes to spread the forces, generated by disc brakes, between the seat stays and the chain stays. (Because these tubes also reinforce the carrier mounts, we have also fitted a matching tube on the RHS of the frame...this would not be possible with derailleur gears)

[4] Cast stainless steel guides for gear and brake cables/lines...with Adventure and Discovery models these allow for many different permutations of brake setups (please see "rear disc options")

[5] We have fitted the maximum number of bottle bosses possible, this varies with the frame size and whether the frame is S+S coupled or not (please see the end columns in the matrix)

[6] We have made provision for the longest possible pump on the top of the base tube.

[7] Adventure and Discovery models have heavy duty 6mm stainless bosses for the rear carrier

[8] We have specified 5mm bosses under the bridges for the neat, secure and direct fitting of mudguards.

[9] We use our exclusive Cast stainless steel vertical, Rohloff-specific rear dropouts.

[10] All frames have two eccentric bottom bracket shells (with stainless steel threads) The rear one provides for drive chain tension adjustment, whilst the front one allows the connecting chain tension to be adjusted.

[11] The oversized seat tubes make for a very rigid and robust frame...we provide shims to allow the fitting of 28.6mm seat posts.

[12] We use twin bolts on the front seat post clamp (this area has to contend with all the usual forces placed on a seat clamp as well as those extra forces created by the stoker's handlebars).

Fork specification

[1] We use Reynolds tandem fork blades which have a legendary balance of comfort and strength.

[2] Our tried, tested and highly acclaimed "twin plate" crown is used... this allows the comfort of Reynolds forks to be retained whilst making the fork laterally much more rigid than a (heavier) single crown fork.

[3] Twin 5mm bosses are provided under the crown to allow the neat, secure and direct fitting of mudguards

[4] We have 6mm heavy duty bosses for our Lo-loader carriers... these will allow huge loads to be carried, when necessary, without any fear of shearing the fitting screws.

[5] Bosses are provided to mount the mudguard stays in an elevated position. This means that, should an object (a stick or drinks can for example) get jammed between the wheel and the mudguard the gap (between the tyre and the mudguard) will get larger as the wheel's rotation causes the stays to be bent upwards. Without this provision a front mudguard is a potentially dangerous fitment or a cause of rattles if a "break free" fitting is used.

[6] We have specified a small, neat dynamo boss on the front of the LHS blade.

[7] We have mounted the V brake bosses on the backs of the blades... this reduces brake squeal.

Frame & fork **hand-built in Taiwan** exclusively for and to the design of www.thorncycles.co.uk

Colours 3

Finish

Our frames are treated and painted in a modern high tech facility.
The frames and forks are first given a multi-stage anti-rust treatment, followed by an etched primer and then they are powder coated. This environmentally-friendly process produces a tough finish. The decals are applied and then sealed in with a second (this time clear) powder coat finish, the fitting of an exclusive stainless steel thorn headbadge is the final detail.

We offer 3 different colour choices;

[1] Intense Yellow Gloss
[2] Cobalt blue pearl metallic
[3] British racing green pearl metallic

Raven Twin - Order form

Frameset... from £699.99

The THORN **Raven Twin** is available as **frame & fork only**

Frameset: 2 x Thorn Alloy eccentric, FSA Orbit XL II headset (fitted). 2 x Thorn Micro-adjustable alloy seatpin, touch-up paint, eccentric adjusting tool & all stainless screws. Twin Plate Crown fork.
(please choose frame size & colour)
Raven Dynamic frameset £699.99 ☐ **with S&S couplings** £1149.99 ☐
Raven Adventure frameset £699.99 ☐ **with S&S couplings** £1149.99 ☐
Raven Discovery frameset £799.99 ☐ **with S&S couplings** £1249.99 ☐

Complete Tandem... from £1599

Standard Specification.

Individually hand build to your exact specification...
Please choose your desired frame size, frame colour & standard component options below.
Raven Dynamic Tandem £1599 ☐ **with S&S couplings** + £450 ☐
Raven Adventure Tandem £1699 ☐ **with S&S couplings** + £450 ☐
Raven Discovery Tandem £1799 ☐ **with S&S couplings** + £450 ☐

3 piece S&S coupling option (frame in **Satin Black** only):
Adventure from + £900 ☐ **Discovery** from + £1050 ☐
Please contact us to discuss exact options and pricing.

Size & Colour

* = Please √ tick box required

Size
Dynamic (Child back) **#1** S/XXS ☐ **#2** L/XXS ☐
Adventure (Direct lateral) **#3** S/XS ☐ **#4** M/S ☐ **#5** M/M ☐ **#6** L/S ☐
Discovery (Double marathon) **#7** S/M ☐ **#8** M/S+ ☐ **#9** M/M ☐ **#10** L/S ☐ **#11** L/L+ ☐

Colour

Powder coat with matching colour Twin Plate Crown fork...
Yellow gloss (with Black decals) ☐
Traditional British Racing Green gloss (with silver decals) ☐
Cobalt Blue Pearl metallic (with silver decals) ☐

Tandem Build-up options... Each Tandem is individually hand built from the frame up, to your exact specification, on our premises here in Bridgwater.
We offer many upgrades and custom options as standard, and can accommodate most component requests... Talk to us now about your dream specification.

Setup Dimensions - PLEASE COMPLETE

Pilot Dimensions

Height = _____ mm

Standover Height = _____ mm

Weight = _____ mm

Shoe Size = _____ UK

Preferred riding position =
Relaxed ☐ **Sporty** ☐ **Racing** ☐ **Upright** ☐

Stoker Dimensions

Height = _____ mm

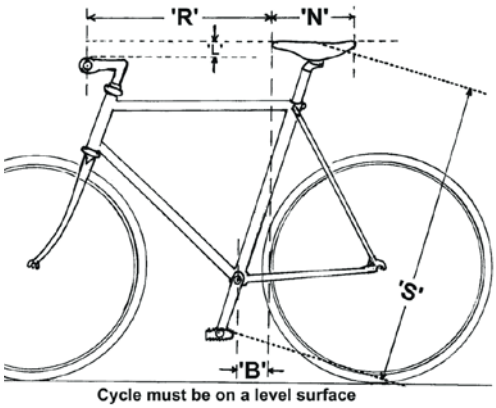
Standover Height = _____ mm

Weight = _____ mm

Shoe Size = _____ UK

Preferred riding position =
Relaxed ☐ **Sporty** ☐ **Racing** ☐ **Upright** ☐

The following dimensions will enable us to set up your New bike exactly like your favourite machine.



Cycle must be on a level surface

N = Overall saddle length & name of Saddle:

S = Distance from top of pedal (crank in-line with seat tube) to top of saddle, measured along the seat tube.

L = Distance from the bottom of a level straight edge placed on the top of the saddle to the top of the handlebar stem.

B = Distance that a plumb line (weight on a bit of thread) falls behind the centre of the bottom bracket when suspended from the tip of the saddle.

R = Distance from tip of saddle to the centre of the handlebars.

Note: The dimensions you send us must be accurate, otherwise this is a meaningless exercise...
Get somebody else to check your measurements.

Pilot Dimensions

N = _____ mm... Name _____

S = _____ mm

L = _____ mm

B = _____ mm

R = _____ mm

Stoker Dimensions

N = _____ mm... Name _____

S = _____ mm

L = _____ mm

B = _____ mm

R = _____ mm

Invoice N°

Title: Mr / Mrs / Miss / Ms / Dr

First name _____

Surname _____

Address _____

_____

_____

Town _____

County _____

Postcode _____

Country _____

Telephone Number

Home _____

Work _____

Mobile _____

Email address

_____ @ _____

Call: **01278 441500**
online: www.**sjscycles**.com

St John Street Cycles
Thorn Cycles Ltd.
91-93 St John Street
Bridgwater
Somerset
TA6 5HX

01278 441500
sales@sjscycles.com
www.sjscycles.com

issue: 16/01/2007

Standard components & options for all models

* = Please √ tick box required

Headset - 1 1/8" threadless FSA Orbit XL II (aerospace bearings... currently **the best** available), black

Wheels - Rohloff Speedhub 500/14 CC OEM - 32 hole rear hub in silver (CC EX OEM - external gear mech hub on Adventure and Discovery) 135mm rear O.L.N, quick release skewer.
Rohloff reversible steel sprocket* **15t** ☐ **16t** ☐ **17t** ☐
Stainless steel spokes, presta valve inner tubes, High quality rim tape.
Panaracer tyres* **Hi Road 1.5"** (40-559) rigid bead 415g ☐
Pasela Tourguard 1.75" (42-559) rigid bead 495g ☐

Rohloff twist grip shifter - with spare hub cable & fitting kit.

Chainset - > Thorn alloy 110PCD chainset - choice of crank length*

Pilot: 140mm ☐ 145mm ☐ 150mm ☐ 155mm ☐
160mm ☐ 165mm ☐ **170mm** ☐ 175mm ☐

Stoker: 140mm ☐ 145mm ☐ 150mm ☐ 155mm ☐
160mm ☐ 165mm ☐ **170mm** ☐ 175mm ☐

> 10 x high quality chainring bolts with tandem sleeves.

Drive chainring - Thorn highest quality alloy single 110PCD reversible chainring in black (lowest gearing: 40x16t or 42x17t)* **40t** ☐ **42t** ☐ **44t** ☐ **46t** ☐ **48t** ☐

Connecting chainrings - 2 x Thorn highest quality **34t** alloy single 110PCD reversible chainring in black.

Connecting chain - SRAM PC48 chain.
Drive chain - SRAM PC48 chain.

Bottom Brackets - 2 x Shimano UN53 sealed bearing bottom bracket.

Stem*

Pilot: Thorn 1 1/8" alloy "front loading" threadless stem (length/angle + alloy spacers to suit)

Stem - Length _____ mm Angle° _____ **(Internal use only)**

Stoker: Thorn 1 1/8" alloy "front loading" threadless stem (length/angle to suit)

Stem - Length _____ mm Angle° _____ **(Internal use only)**

Handlebars*

Pilot: **> Thorn Comfort bars Mk2** - New improved design - Designed in consultation with a senior physiotherapist. Double butted (1.8/3.0/1.8mm) 2014 alloy, 18° sweep. Extra wide 25.4mm centre section gives more room for attaching bar bags, computers & lights etc. (easy adjustment of reach simply by rotating the bars) ☐

> **High quality alloy straight bars** & comfortable handlebar grips ☐

Stoker: > **Thorn Comfort bars Mk2** ☐

> **Thorn alloy Stoker bars** with black cork tape ☐

> **High quality alloy straight bars** & comfortable handlebar grips ☐

Saddle*

Pilot: > **Gents gel** ☐ > **Ladies gel** ☐
> **Gents San Marco Rolls Classic** ☐
> **Womens Velo Crossbow** (Liberator copy) ☐
> **Brooks Competition** - Lightweight saddle, 270g, alloy rails **(NOT Leather)** ☐

Stoker: > **Gents gel** ☐ > **Ladies gel** ☐
> **Gents San Marco Rolls Classic** ☐
> **Womens Velo Crossbow** (Liberator copy) ☐
> **Brooks Competition** - Lightweight saddle, 270g, alloy rails **(NOT Leather)** ☐

> 2 x Thorn alloy micro-adjustable seatpin.

> SKS mudguards - please see "Mudguard Options"* **Silver** ☐ **Black** ☐

> High quality brake + gear inner wires and outer cables & bell... no pedals included.

Raven **Dynamic Specific Components**

32 hole rims **Sun CR18 black** ☐
32 hole Shimano® STX RC MC33 quick release front hub.
Shimano® Deore M510 V brakes and levers

Raven **Adventure Specific Components** & Options

32 hole rims **Sun Rhyno black**
32 hole Shimano® XT M760 quick release front hub* **silver** ☐ **black** ☐
Shimano® Deore M510 V brakes and levers

Raven **Discovery Specific Components** & Options

32 hole rims **Sun Rhyno black**
32 hole Shimano® XT M760 quick release front hub* **silver** ☐ **black** ☐
Shimano® Deore M510 V brakes and levers

Raven **Adventure & Discovery Specific Upgrades**

If you are not choosing a rear disc brake option at the time of placing your order choose this option to future-proof further tandem disc brake developements.
Upgrade to disc compatible Rohloff hub - Rohloff Speedhub 500/14 CC DB OEM - 32 hole rear hub in silver ..... £23 ☐

Tyre Upgrades

Per pair

> Schwalbe Marathon XR **folding** tyre TravelGuard (HS359). THE EXPEDITION TYRE! ... **26 x 2.0** (50-559) 790g ... **(45mm MUDGUARDS ARE TO NARROW) Please select option** [MG55N], [MG65W], [CMG2.0], [CC1] or [MG0] **from "Mudguard Options" below** ..... + £15 ☐

> Schwalbe Hurricane RaceGuard® **folding** tyre (HS352). **26 x 2.0** (50-559) 560g ... **(45mm MUDGUARDS ARE TO NARROW) Please select option** [MG55N], [MG65W], [CMG2.0] or [MG0] **from "Mudguard Options" below** ..... + £15 ☐

> Schwalbe Marathon XR **folding** tyre TravelGuard (HS359). THE EXPEDITION TYRE! ... **26 x 2.25** (57-559) 890g, **Mudguard will not fit with these tyres, please select option** [MG0] ..... + £15 ☐

> Panaracer Pasela Tourguard **folding** tyre with Aramid belt **26 x 1.5** (37-559) 411g ..... + £15 ☐

> Panaracer Pasela Tourguard **folding** tyre with Aramid belt **26 x 1.75** (42-559) 435g ..... + £15 ☐

> Panaracer Pasela Hi Road Compe **folding** tyre **26 x 1.5** (40-559) 375g ..... + £15 ☐

Mudguard Options

Please select an option to suit you requirements.

[MG45] 45mm guards to fit 1.5" tyre ..... + £0 ☐
[MG45N] 45mm guards to fit 1.75" tyre (narrow clearance) ..... + £0 ☐
[MG55W] 55mm guards to fit 1.75" tyre (wide clearance) ..... + £5 ☐
[MG55N] 55mm guards to fit 2.0" tyre (narrow clearance) ..... + £5 ☐
[MG65W] 65mm guards to fit 2.0" tyre (wide clearance) ..... + £3 ☐
[MG0] No Mudguards ..... - £20 ☐

[CMG1.5] 50mm Thorn Carbon mudguards to fit 1.5" tyre ..... + £70 ☐
[CMG1.75] 50mm Thorn Carbon mudguards to fit 1.75" tyre ..... + £70 ☐
[CMG2.0] 68mm Thorn Carbon mudguards to fit 2.0" tyre ..... + £120 ☐

Rim Options/Upgrades

Rim Upgrades **(Raven Dynamic, Adventure & Discovery)**

> Thorn Tungsten Carbide 32 hole rims **black**, includes set of 4 x SwissTop blue carbide cartridge brake pads **(Requires cartridge brake shoe, please select Shimano LX, XT or XTR V brake upgrade)** + £55 ☐

Brake Upgrades

V Brake & V Brake Lever Upgrades

V Brakes (does not include lever upgrade)
> **Shimano Deore LX M580 V-brakes front & rear** ..... + £10 ☐
> **Shimano XTR M970 V-brakes front & rear.... THE BEST RIM BRAKE!** THORN **HIGHLY RECOMMENDED UPGRADE**... Heavy-duty parallel-push linkage design keeps the pads parallel with the rim giving excellent braking power, modulation and longer pad life. Cartridge pad system allows quick replacement requiring no adjustment ..... + £70 ☐

V Brake levers (does not include V brake upgrade)
> Shimano XTR M950 V brake levers ..... + £45 ☐

Rear Disc Brake Options (Raven Adventure & Discovery only)

WARNING! - With a rear disc brake there is a real danger of **LOCKING** the wheel and/or **BURNING OUT** the disc pads.

All disc brake options include a Hope hydraulic rear disc - 205mm rotor with braided line & Rohloff hub with disc fittings (silver).

> **Option 1**
Pilot operated Hope left hand brake lever,
Pilot operated emergency rear V brake (left hand V brake lever),
Pilot operated right hand front V brake lever.
Using standard V brakes & V brake levers ..... + £250 ☐
Please see "V Brakes","V Brake Levers" for upgrades

NOTE: If you require the rear brake controls to be operated by the right hand side controls (Continental style - not standard for the UK) the twist grip will have to be moved to the left hand side of the bars. The gear selection numbers on the twist grip will be displayed upside down. ☐

> **Option 2 RATCHET LEVER NOT TO BE USED AS A DRAG BRAKE**
Pilot operated Hope left hand brake lever,
Pilot operated emergency rachet lever for rear V brake
Pilot operated right hand front V brake lever.
Using standard V brakes & front V brake lever ..... + £280 ☐
Please see "V Brakes" for upgrades

Option 2 Cost saver front brake upgrade - XTR M970 front V brake ..... + £45 ☐
Please also see "V Brakes" for upgrades

> **Option 3**
Pilot operated Hope left hand brake lever,
Stoker operated emergency rear V brake (left hand V brake lever),
Pilot operated right hand front V brake lever.
Using standard V brakes & V brake levers ..... + £250 ☐
Note: Thorn alloy stoker bars cannot be used with this setup.
Please see "V Brakes","V Brake Levers" for upgrades

> **Option 4 RATCHET LEVER NOT TO BE USED AS A DRAG BRAKE**
Pilot operated Hope left hand brake lever,
Stoker operated emergency rachet lever for rear V brake
Pilot operated right hand front V brake lever.
Using standard V brakes & front V brake lever ..... + £280 ☐
Note: Thorn alloy stoker bars cannot be used with this setup.
Please see "V Brakes" for upgrades

Option 4 Cost saver front brake upgrade - XTR M970 front V brake ..... + £45 ☐
Please also see "V Brakes" for upgrades

> **Option 5 FOR EXPERIENCED CREWS ONLY**
Stoker operated Hope left hand brake lever,
Pilot operated left hand rear V brake lever,
Pilot operated right hand front V brake lever.
Using standard V brakes & V brake levers ..... + £250 ☐
Note: If Thorn alloy stoker bars are selected our "Thorn crescent shims and longer screws, to fit onto the larger diameter bars" is required ..... + £15 ☐
Note: This option removes the need for a Staubli 100% dry coupling when fitted to an S&S coupled model.
Please see "V Brakes","V Brake Levers" for upgrades

> **Option 6 FOR DROP BARS**
Please ensure you also select the "Pilot Rohloff drop bar option"
Pilot operated Hope left hand brake lever fitted to drop bars using "Thorn crescent shims and longer screws, to fit onto the larger diameter bars",
Pilot operated left hand drop bar rear V brake lever,
Pilot operated right hand drop bar front V brake lever.
Using "Pilot Rohloff drop bar option" standard V brakes & V brake levers ..... + £265 ☐
Please see "V Brakes","V Brake Levers" for upgrades

> **Option 7 FOR DROP BARS - EXPERIENCED CREWS ONLY**
Please ensure you also select the "Pilot Rohloff drop bar option"
Stoker operated Hope left hand brake lever,
Pilot operated left hand drop bar rear V brake lever,
Pilot operated right hand drop bar front V brake lever.
Using "Pilot Rohloff drop bar option" standard V brakes & V brake levers ..... + £250 ☐
Note: If Thorn alloy stoker bars are selected our "Thorn crescent shims and longer screws, to fit onto the larger diameter bars" is required ..... + £15 ☐
Note: This option removes the need for a Staubli 100% dry coupling when fitted to an S&S coupled model.
Please see "V Brakes","V Brake Levers" for upgrades

> Staubli 100% dry break coupling for front **Pilot operated** rear disc brake, **required on S&S coupled models with brake options 1,2,3,4 and 6** ..... + £275 ☐

Transmission Upgrades

> Rohloff SLT-99 drive chain .....(Highest Quality)..... + £30 ☐
> Rohloff SLT-99 chains throughout .....(Highest Quality)..... + £60 ☐
> Thorn alloy 110pcd chainguard in black (up to 44 teeth) **Pilot** using Stronglight triple chainring bolts ..... + £15 ☐
> Thorn alloy 110pcd chainguard in black (up to 44 teeth) **Stoker** using Stronglight triple chainring bolts ..... + £15 ☐
> Royce Titanium tapered square bottom bracket front and rear, 119mmx73mm, red all weather seals and Royce stainless steel crank bolts (includes fitting)..... + £260 ☐

Wheel Upgrades

Hubs

> **Rohloff hub in Black anodized finish ....** (Improved resistance to winter salt corrosion) .....Thorn Recommended upgrade... **+ £25** ☐

> **Schmidt Son dynamo front hub** - 32 hole in silver, Busch & Muller Lumotec switchable halogen headlamp (without standlight), upgrade bulb for front use only & Highest Quality Thorn alloy headlamp bracket fitted to the fork crown... this will ensure a bar bag will not interfere with the beam (Highly recommended for cycling at night).
Raven Adventure & Discovery ..... + £140 ☐
Raven Dynamic ..... + £150 ☐

> As above but **black Schmidt Son dynamo front hub**... Resists salt corrosion better .....Thorn Recommended upgrade... **Raven Adventure & Discovery + £160** ☐
.....Thorn Recommended upgrade... **Raven Dynamic + £170** ☐
Note - Busch & Muller Oval Plus switchable headlamp will not fit due to the Rohloff cable route.

> **48 hole rear wheel -** Sun Rhyno 48 hole black rim built onto **disc compatible black anodized** Rohloff hub ..... + £68 ☐ ..... If rear disc options 1-7 selected + £45 ☐
> **48 hole front wheel -** Sun Rhyno 48 hole black rim built Phil Wood large flange black anodized hub ..... + £70 ☐

Handlebar Upgrades

Notes on handle bar grip and bar end compatibility with a Rohloff shifter.

All handlebar grips on the Rohloff shifter side should be no shorter than 112mm. This is essential to allow the hand to rest free of the shifter.

1. There is not enough room to fit inboard and outboard bar ends on any handle bar with a Rohloff shifter.
2. There is not enough room to fit bar ends on to the outside of Thorn Comfort bars with a Rohloff shifter.
3. When fitting inboard bar ends to Thorn Comfort bars the bar ends should be passed around the first bend.
4. Straight bars with Ergon grips and Cane Creek Ergo Control bar end grip II is a highly recommended setup, including for a tandem stokers.
5. Ergon's WP-1 anatomic women's handlebar grips are not suitable for use with a Rohloff shifter. The diameter of the grip at the point that it meets the shifter is too small and will cause the hand to rub against the shifter. It is however perfectly suitable for use with SRAM grip shift or for a tandem stoker.
6. Thorn Anatomical Cork grips MUST NOT be shortened (cut down).
7. Thorn Carbon anatomic bar ends are not suitable to be mounted inboard.

Handlebar Upgrades

Pilot Comfort bars:
> Thorn Carbon Comfort Bar - A supremely comfortable, lightweight, yet strong solo comfort bar. Carbon Kevlar wrapped 2014 butted alloy. Rise 60mm, ø25.4mm, width 605mm, 18˚ sweep, 0˚ upsweep, 175mm straight grip section per side, 210g. Extra wide 25.4mm centre section gives more room for attaching bar bags, computers & lights etc. (easy adjustment of reach simply by rotating the bars) ..... + £40 ☐

> Thorn Carbon Anatomic carbon bar ends - perfect shape for a secure comfortable grip ..... + £50 ☐

Handlebar Upgrades - Continued

Pilot Straight bars:

> Thorn Superlight Carbon Straight Bar, 125g, ø25.4mm, width 565mm, 5˚ sweep ..... + £30 ☐

> EASTON EC70 Composite XC Bar, ø25.4mm, width 580mm, 3˚ sweep, 125g ..... + £55 ☐

> Cane Creek Ergo Control bar end grip II ..... + £29.99 ☐

Pilot Grips:

> Thorn Cork grips for Rohloff - Highly recommended ..... + £10 ☐
> Ergon MP-1 anatomic grip Mens ..... + £20 ☐

Stoker adjustable stem:
> Thorn special adjustable alloy stoker stem, ø28.6mm diameter clamp, includes 0˚/30mm Thorn CNC alloy front loading adjustable stem, satin black. + £25 ☐ Please choose a angle/extension option*
17˚/120mm ☐ **17˚/170mm** ☐ **17˚/220mm** ☐ **28˚/170mm** ☐

Stoker Comfort bars:
> Thorn Carbon Comfort Bar - A supremely comfortable, lightweight, yet strong solo comfort bar. Carbon Kevlar wrapped 2014 butted alloy. Rise 60mm, ø25.4mm, width 605mm, 18˚ sweep, 0˚ upsweep, 175mm straight grip section per side, 210g. Extra wide 25.4mm centre section gives more room for attaching bar bags, computers & lights etc. (easy adjustment of reach simply by rotating the bars) ..... + £40 ☐

> Thorn Carbon Anatomic carbon bar ends - perfect shape for a secure comfortable grip ..... + £50 ☐

Stoker Straight bars:

> Thorn Superlight Carbon Straight Bar, 125g, ø25.4mm, width 565mm, 5˚ sweep ..... + £30 ☐

> EASTON EC70 Composite XC Bar, ø25.4mm, width 580mm, 3˚ sweep, 125g ..... + £55 ☐

> Cane Creek Ergo Control bar end grip II ..... + £29.99 ☐

Stoker Grips:

> Thorn Cork grips for Rohloff - Highly recommended ..... + £10 ☐
> Ergon P-1 anatomic grip Womens ..... + £20 ☐

Pilot Rohloff Drop Bar Option

ITM anatomic alloy drop bars: 40cm ☐ 42cm ☐ 44cm ☐ (centre to centre), Dia-Compe 287V (V-brake compatible) aero brake levers, black cork bar tape, Thorn alloy accessory bar:
50mm (recommended size) ☐ 100mm ☐ ..... £60 ☐
Note: Only rear disc brake **option 6 & 7** can be selected with drop bars

Accessories

Carriers for Twin Plate Crown fork

Thorn steel lo loader, black ..... £70 ☐

Rear Carriers

Thorn steel expedition rear carrier, black ..... £70 ☐
Blackburn MTN rear carrier black ☐ or silver ☐ ..... £25 ☐
Blackburn EX1 Expedition rear carrier black ☐ or silver ☐ ..... £30 ☐
Thorn alloy Ultra-lightweight rear carrier, black (Max load: on-road 11kg, off-road 4kg) ..... £60 ☐

Pedals

Pilot:

> SPD type
Shimano (M324) double sided pedals - SPD system one side, standard rat trap style on the other, steel cage (inc cleats) ..... £40 ☐
Shimano (M520) SPD double sided pedals (inc cleats) ..... £16 ☐
Shimano LX (M540) SPD double sided pedals (inc cleats) ..... £40 ☐
Shimano M959 SPD double sided pedals (inc cleats) ..... £75 ☐

> Clip & Strap type
MKS GR9 platform pedals, including toe clips & straps - S ☐ M ☐ L ☐ XL ☐ ..... £30 ☐

Other pedals please specify: _____

Stoker:

> SPD type
Shimano (M324) double sided pedals - SPD system one side, standard rat trap style on the other, steel cage (inc cleats) ..... £40 ☐
Shimano (M520) SPD double sided pedals (inc cleats) ..... £16 ☐
Shimano LX (M540) SPD double sided pedals (inc cleats) ..... £40 ☐
Shimano M959 SPD double sided pedals (inc cleats) ..... £75 ☐

> Clip & Strap type
MKS GR9 platform pedals, including toe clips & straps - S ☐ M ☐ L ☐ XL ☐ ..... £30 ☐

Other pedals please specify: _____

Accessories

Original design Profile cage "made exclusively for Thorn" **THE BEST EVER BOTTLE CAGE!** (Not to be confused with the current offering.) Great for touring, securely holds LARGE drinks bottles ..... Number required _____ x £6 each = £_____ ☐

Composite MTN bottle cage, ultimate security and cleanliness ..... Number required _____ x £5 each = £_____ ☐

Zefal HPX pump SIZE 4, best quality ever, easy to obtain high pressure ..... £20 ☐

Cateye CC-MC100W Micro wireless cycle computer - 10 function, LED back light, very neat + reliable, no messy wires, fitted and set up ..... £35 ☐
Thorn alloy accessory bar, black: 50mm ☐ 100mm ☐ ..... £14.99 ☐

Saddle & Seatpost Upgrades

Pilot Saddle:
Fi'zi:k Nisene CP, Magnesium rails ..... + £35 ☐
Fi'zi:k Rondine (mens), Magnesium rails ..... + £35 ☐
Brooks B17 - black ☐ honey ☐ ..... + £17 ☐
Brooks Swift Titanium rails - black ☐ honey ☐ ..... + £85 ☐
Brooks B17 Titanium - black ☐ brown ☐ honey ☐ ..... + £70 ☐
Other... Please specify _____ £_____ ☐

Stoker Saddle:
Brooks Finesse (womens) Titanium rails - black ☐ honey ☐ or maroon ☐ ..... + £77 ☐
Brooks B17 - black ☐ honey ☐ ..... + £17 ☐
Fi'zi:k Rondine (womens), Magnesium rails ..... + £35 ☐
Other... Please specify _____ £_____ ☐

Stoker Seatpost:
Cane Creek 3G Thudbuster suspension seatpost, 3.9" (9.9cm) of plush travel, 400mm length, 590g, includes neoprene cover ..... + £135 ☐

USE XCR SUMO (with layback) suspension seatpost - 65mm travel, 390mm length, including shim, black, 382g ..... + £75 ☐

Lighting

> Cateye TL-LD1100 LED rear light - The most visible LED rear light we've seen! 10 super bright LED's, highly water resistant, 4 modes... including simultaneous flashing and constant mode! Run time: 50 hours (constant), 100 hours (flashing) ..... £26.99 ☐

Rohloff Spares

Rohloff special chain lubricant 50ml bottle - **We highly recommended this chain lube** ..... £4.99 ☐

Rohloff 2 stage full oil change kit for Speedhub 500/14 - includes cleaning oil, all season oil, syringe, oil filling tube & drain plug ..... £19 ☐

TS20 Torx screwdriver - required for changing hub and shifter cables ..... £4.99 ☐

Rohloff sprocket tool for Speedhub 500/14 ..... £20 ☐

Rohloff sprocket (steel) for Speedhub 500/14 - 15t ☐ 16t ☐ 17t ☐ ..... £20 ☐

Raven Twin Sizing

Model Type of Frame	**Frame Code** number	**Size** Front /Rear	**Virtual Front size C to C** (mm)	**Rear Seat Tube C to C** (mm)	**Virtual Front Top Tube C to C** (mm)	**Base Tube** (mm)	**Stand-over just behind headset** (mm)	**Front Stand-over @ mid-tube** (mm)	**Front Bottom Bracket height*** (mm)	**Rear Bottom Bracket Height*** (mm)	**Rear stand-over @ mid-tube** (mm)	**Bottle Cages non-coupled frames**	**Bottle Cages S+S coupled frames**
Dynamic (Child Back)	**#1**	S/xxs	510	280	**560**	**581**	770	**714**	275	260	**599**	**2**	**2**
	#2	L/xxs	600	280	**600**	**581**	863	**779**	285	260	**613**	**3**	**3**
Adventure (Direct Lateral)	**#3**	S/XS	510	370	**560**	**632**	770	**744**	275	275	**678**	**4**	**3**
	#4	M/S	555	400	**580**	**657**	820	**783**	280	275	**712**	**4**	**3**
	#5	M/M	555	460	**580**	**683**	820	**800**	280	280	**755**	**4**	**4**
	#6	L/S	600	400	**600**	**657**	863	**815**	285	275	**717**	**4**	**3**
Discovery (Double Marathon)	**#7**	S/M	510	460	**580**	**720**	770	**762**	280	280	**746**	**5**	**4**
	#8	M/S+	555	420	**600**	**759**	820	**794**	280	280	**731**	**5**	**4**
	#9	M/M	555	460	**600**	**720**	820	**800**	280	280	**755**	**5**	**4**
	#10	L/S	600	400	**625**	**695**	863	**817**	285	275	**723**	**4**	**4**
	#11	L/L+	600	520	**625**	**784**	863	**850**	285	285	**814**	**5**	**5**

* Bottom bracket height given assumes 26 x 1.75" tyres

Notes on the different frames

As you can see and will have read elsewhere, the Raven Twin is produced in 11 different sizes; each of these sizes is also available with S&S couplings, making 22 frame options, each of which is available in a choice of 3 different colour powder coat finishes.
You will see that the above matrix groups the 11 sizes into 3 types of frame; it may be easier to think of the Raven Twin as being 3 different models... These are the **Raven Dynamic**, the **Raven Adventure** and the **Raven Discovery.**

Sizes #1 and #2 The Raven Dynamic range

These frames are direct lateral child back tandems; that is to say that they are designed for very small stokers. The two sizes are to accommodate either a short or a tall pilot (Mum front and Dad front?)
We have designed these frames to keep the overall length as compact as possible, whilst providing sufficient "growing room" to allow most children to be able to enjoy riding tandem up to an age where they are old enough (and hopefully, sensible enough, having learned roadcraft from an early age) to be allowed to keep up with the rest of the family on their own solo bikes... they will certainly be fit enough! It is difficult to give an age range... we all know 6 feet plus eleven year olds and sub-5 feet adults. Whilst the base tubes are short, compared with the other sizes in the range, they are no shorter than some of yesteryear's double adult racing machines! The compact, stiff frame enables these machines to be ridden solo... making the "school run" a very attractive proposition! Indeed it is reported that such lucky children are considered by their peers to be very "cool". Please remember that these are high quality frames, with very tough paint and the Rohloff hub will ensure a very strong resale or trade-in value... the inevitable capital outlay is more than offset by savings on fuel, servicing and time, compared with driving to school. If it is to be used for leisure only, it is a very small price to pay for your shared experiences, whilst giving a child the best possible opportunity to become a cyclist in their own right.
Stop press: We will offer to exchange the frame if and/or when it is no longer required, for another size Raven Twin (or any solo Raven frame) for half the normal price... one thing is for sure... the hub will still be working!

Sizes #3, #4, #5 and #6 The Raven Adventure range

These frames are built in the very popular **direct lateral** style and are suitable for all types of usage from fast touring (Audax) to fairly heavy touring. The length of the base tube, which dictates how much room a stoker has, varies from size to size in a similar manner to our highly popular Adventure range of tandems... which suits the majority of female stokers. The front top tube is a little longer for each given size than the Adventure, to give room for the pilot to use comfort bars without using an excessively long stem. Although the bias has been shifted to favour comfort bars... **dropped bars could still be fitted, using a short stem and leaving the steerer long, if they are insisted upon!**

Size #3 (S/XS) has the lowest front and rear standover heights that we can make in this style of double adult tandem and would suit much shorter than average male (or slightly shorter than average female) pilots and shorter than average female stokers

Size #4 (M/S) will suit shorter than average male (or average sized female) pilots and slightly shorter than average female stokers.

Size #5 (M/M) is designed to suit the average sized male/female tandem partnership.

Size #6 (L/S) will suit a fairly commonly seen pairing where the pilot is taller than the average male and the stoker is shorter than the average female.

Sizes #7, #8, #9, #10 and #11 The Raven Discovery range

These frames are built in the extra stiff and strong (but still very comfortable) **double marathon** style... like our premium Discovery range; however, unlike a Discovery, the increased cost (over the direct lateral frame) is only £100!

We have taken the opportunity afforded by

having our own tube set made, to have longer butted base tubes... very long on some sizes. This means, for the first time, that we can actually recommend a frame's use for male stokers too. We have also further increased the lengths of the front top tubes... **these sizes are really not suitable for dropped bars but, as you will no doubt have read elsewhere, you will not get the considerable benefit of instant gear changes, when using the Rohloff hub, with drop bars.**

We have also included some more unusual sizes. The double marathon frame (whilst still suitable for very athletic use, by virtue of the frame's ability to allow strenuous "out of the saddle" sprinting and climbing) is particularly suited to heavy loads (heavily built crew, massive luggage weight or both!) and as such it will undoubtedly become the benchmark expedition tandem.

Size #7 (S/M) this size would especially suit a tandem partnership where the pilot was not only short, but possibly shorter than the stoker. It is usual to have the partner with the greatest upper body strength to be on the front, we have also sold many custom built tandems to (or for) sight-impaired stokers... here is one off the shelf as opposed to a "one off"!

Size #8 (M/S+) this frame has an exceptionally long base tube, it is a perfect size for many male/male tandem partnerships. It is also the answer for the average sized male/female tandem pairing where they want to swap ends... we have a fairly elegant solution to the adjustable handlebar stem issues that would be likely to be presented! It will also be ideal where the pilot is an average size male and the stoker is a tall female.

Size #9 (M/M) being shorter in the base tube than size #8, this size will be perfect for the average sized male/female tandem partnership wishing to have the ultimate in frame stiffness. It would also suit an adventurous, slightly taller than average, female/female tandem pairing wishing to carry heavy kit.

Size #10 (L/S) this size will suit a tandem partnership where the pilot is much taller than the average male and the stoker is, perhaps, shorter than the average female. The base tube on this size, whilst being longer than any of the direct lateral Adventure sizes, is the shortest in the Discovery range.

Size #11 (L/L+). You need to both be tall, and almost certainly a male pilot to ride this size... the front top tube and the base tube are both really long... long enough for the average sized male stoker to be comfortable.
When you are both as tall as you need to be to ride this size, frame stiffness contributes so very much. Consequently this size is especially suitable for high performance cycling, as well as being obviously suitable for expedition use.

Further sizing notes.

Please understand that we have seen many many different tandem pairings. In the preceding notes we have tried to draw on our memory banks and sketch briefly some of the many hundreds of customers we have successfully
fitted to their machines. We always try to avoid causing offence but we must often make some very personal observations about sizing... we hope that there is "none taken".
We believe that with this new range of sizes, we will be able to provide over 90% of tandem partnerships with an **elegant looking machine which functions perfectly.** If only the other 10% were all the same size we could accommodate them as perfectly too... we'd have to make size #12! But we think that we will be able to provide perfectly fitting, perfectly functional machines for most of this 10%... they just may not look quite as elegant as we both would have liked.
To the 2% who we will not be able to help, we would like to sincerely say sorry and thank you for contacting us.
Please be realistic about what is "average height" for your gender (ask a friend) and please remember we are talking of averages for the UK... if you are American, for example, you will find we in the UK are, on average, shorter than you.
Also please remember that not only does our national average height increase as the years pass, our actual height decreases in our autumn years... thank goodness our ability to enjoy cycling remains constant!

Always check your standover heights the way we ask for them, as explained elsewhere in this literature... then we should get it right first time... if we don't, please be assured that we consider it is our responsibility to correct matters to your complete satisfaction, this is in addition to your statutory rights and runs parallel with our 100 days trial period.

How much clearance should I have over the top tube?

This will depend upon how tall you are. Very tall people may have more than 100mm clearance; very short people may be almost touching the tubes.

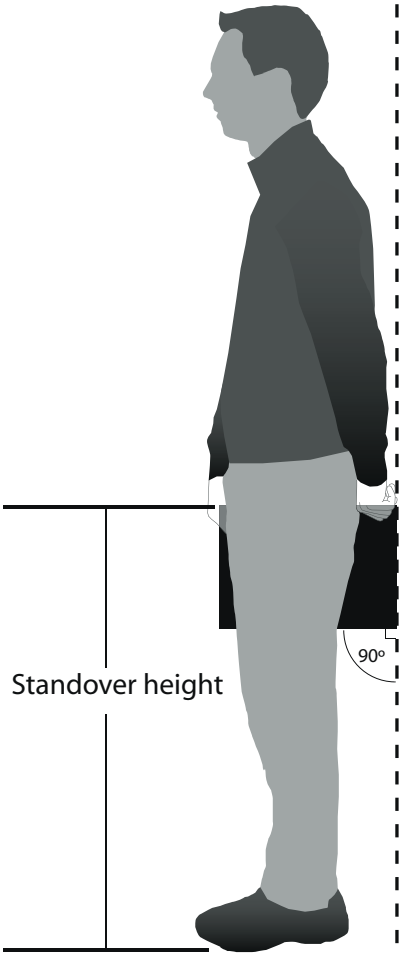
Most pilots would be advised to have 25-50mm clearance at the very front of the machine; this will give much more clearance at the mid-tube position, where they are most likely to stand whilst straddling the machine (except on size #7, which only has a very small slope). Sometimes it is impossible to achieve this clearance at the very front... but we say that you must have at least 1mm of clearance at the mid-tube!

Most stokers should have at least 25mm of clearance at the mid tube (the stokers bars prevent them from standing much further forward than this). As long as they can sit at the right height with a 400mm seat pin it really doesn't matter if they have more clearance than this. Sometimes it is necessary to accept 1mm of clearance if you have really short legs... but this can mean that there is no room to fit a suspension seat post.
We have heard some pilots say that, as they hold the machine upright, their stoker doesn't need any clearance at all... we are most certainly not of that opinion... there are occasions when even the best pilots lose their footing and the stoker saves the day!

Are there any other factors concerning standover height? Aesthetics are not the most important things in life... but all else being equal they should most certainly be considered! For example, a whole stack of spacers under the pilot's stem may be necessary for some people... but if a larger-fronted-frame could have been chosen instead, the machine's appearance would be enhanced considerably. A severely sloping frame always looks (and is) better than a more gently sloping frame with a stack of spacers. A sloping stem always looks (and is) better than a stack of spacers.

How much room does a stoker need?

This is a difficult question. In almost every case the comfortable reach to their bars will be shorter than on their solo bike. This is because, on a solo, when travelling at speed, a cyclist gets a "lift" from the air; at the back of a tandem they are sitting in comparatively still air and consequently more weight is borne by their arms. There is no need for most stokers to adopt a racing crouch to be aerodynamic! However the question was about room, the further behind the pilot the stoker sits... the more they can see to the front... this should be balanced by the fact that conversation can get difficult if they sit too far away! In the past it was true that the shorter a tandem was, the stiffer it was. A tandem can not be too stiff. Our double marathon Discovery tandems frames are very stiff, so a stoker can have more room than they have been used to... if they wish. A short stiff tandem may be slightly better through the twisties but a long stiff tandem should be slightly more stable. If we were to make super-mega-long tandems, then perhaps this could have a significant effect upon aerodynamic efficiency and handling... but ours are just "long" and that's fine!



To measure your standover height...

1. Stand in cycling shoes with your back against a wall, feet together.

2. Place a large coffee table style book (a thin hardback book is best) against the wall between your legs.

3. Raise the book as high as it will go. Without moving the book step forward and note the position of the top of the book.

4. Measure from the floor to the top of book... **that is your standover height!**

Do NOT give us your trouser size... This will result in a cycle at least one size too small!

Tandem tyres.

Andy Blance writes...
In my opinion, there are only a few tyres worth considering for tandem use.

[1] The Panaracer 1.5" Hi-Road is a long-term favourite of ours, we have supplied literally thousands of these tyres for tandem use... they are very light-weight, superbly responsive and we have never had one fail. They are ideal for sporty, performance use such as spring and summer Audax rides. They collect few punctures, despite not having a puncture resistant casing.

[2] A folding version of the above is available, which saves a few ounces per wheel, giving a small but noticeable, gain in performance.

[3] The Panaracer Pasela 1.75" is another favourite tyre, it is heavier than the Hi-Road, which makes it less sporty but it is more comfortable, it has superior wet road grip and a small amount of off road potential. It is very reliable and, thanks to its puncture resistant strip, it almost never punctures. It is capable of higher mileages than the Hi-road. I would still classify the 1.75" Pasela as a performance touring tyre.

[4] The folding version saves a few ounces and feels a bit sportier.

[5] Panaracer has recently introduced a 1.5" version of the Pasela Tourguard. The tyre appears to be every bit as reliable as the 1.75" Pasela, the sporty crew may appreciate the small but noticeable weight reduction and it may make sense for use on better quality roads. The higher pressures that may be safely used with this tyre will help the really sporty crews to achieve a higher cadence (90+ RPM) before the limiting factor... sympathetic resonation, caused by the higher peak pedalling forces compressing the tyres takes effect. The 1.5" Pasela appears to be only marginally less sporty than the 1.5" Hi-Road, it is certainly more puncture resistant and its wet weather grip is superior too.

[6] There is a folding version of the 1.5" Pasela Tourguard available, this saves a useful 80g. This tyre, being lightweight, folding up small and being very durable, would also make a useful emergency spare tyre for all but the most extreme of adventures.

[7] The 2.0" Schwalbe Marathon XR is a folding tyre. It is much heavier than a Pasela and consequently feels much less sporty. It is very comfortable, it grips in all conditions and has some real (dry condition) off road potential. It is perhaps "too much tyre" for good surfaces, but the Marathon XR is really at home on dirt (or gravel) roads. I have never been unfortunate enough to puncture one. The Marathon XR is capable of seriously high mileages and it is currently the ultimate tyre in terms of reliability.

[8] There is a 2.25" version of the Marathon XR, which I would seriously recommend for adventure touring... but it is not possible to fit mudguards with adequate clearances when using this tyre... leaving mudguards behind is generally not a problem for most adventure tourists.
I recommend (for most crews) using 1.75" Paselas with mudguards when in the UK and leaving the 'guards behind and fitting Schwalbe Marathon XR 2.25" tyres for big camping holidays.

Choosing mudguards.

It can be quite tricky and time-consuming to fit a pair of mudguards properly and once properly fitted it is impossible to increase the clearances by very much, therefore we need to know which size tyre size you want the mudguards to fit around. Without this information the mechanic building the bike will assume that the mudguards are to suit the tyres chosen in the specification... this may not be the case.
For example, you may specify the bike with 1.5" Hi Road tyres but you may have every intention of fitting 2.0" Schwalbe tyres for heavier use some time in the future... if we make the guards fit the 1.5" tyres, you won't be able to fit 2.0" tyres. If we supply the machine with (wider) mudguards which are set to fit 2.0" tyres you will be able to fit either tyre but the machine will not look as attractive (or as well set up) when the 1.5" tyres are being used. Also, when choosing mudguards to fit 1.75" tyres you have two options; you can have 45mm wide mudguards, which look very sporty and are very aerodynamic (being only just wider than the tyre) but these 'guards produce quite close clearances between the sides of the tyres and the mudguard stays. Alternatively you can choose less sporty (and less aerodynamic) 55mm mudguards... these require less maintenance to prevent rubbing on the stays and of course they also do a better job of guarding against flying mud.
The same issues are also involved in selecting mudguards for 2.0" tyre... i.e. you could have 55mm or 65mm guards.
The choice is yours, please specify one of the following:

[MG45N] 45mm Mudguards to fit 1.5" tyre.
[MG45N] 45mm Mudguards to fit 1.75" tyre
[MG55W] 55mm Mudguards to fit 1.75" tyre
[MG55N] 55mm Mudguards to fit 2.0" tyre
[MG65W] 65mm Mudguards to fit 2.0" tyre
[MG0] No Mudguards.


THORN
BCD104mm
DEORE LX

THORN
969
DOUBLE BUTTED
HEAT TREATED
CRO-MO
Rohloff
Equipped
Steel

Rohloff

FSA
531

Raven Discovery

Notes on brake options.

None of the Dynamic (child back) sizes (#1, #2, #1 S+S or #2 S+S) have fittings for disc brakes, so the options on these sizes are limited to various upgrades to the V brakes and/or brake levers.
All the other sizes have fittings for an ISO rear disc. Mechanical (cable operated) discs are too bulky to allow the fitting of that most essential accessory... a rear carrier! So we can only supply hydraulic disc brakes. We recommend Hope 205mm hydraulic disc brakes.

What do we need brakes for?

There are three reasons for having brakes on a tandem.
[1] **To allow us to come smoothly to a halt,** or slow us down a little... we don't need anything clever or technical to do this... a single low quality side pull brake, as found on a £40 child's bike, would be sufficient!

[2] **To allow us to come rapidly to a halt in emergencies,** or, in the case of the brave (or foolhardy) to brake very hard at the last second for corners etc... the type and quality of the brakes required obviously depends upon our all-up weight, our velocity and the gradient we are on, these factors are influenced by the grip afforded by the tyres and the road surface. Any brake that can cause a tyre to loose grip, or cause the rear wheel to leave the ground is obviously sufficiently powerful at that velocity. It is very difficult to do a "stoppie" on a tandem... **WARNING... as the fork will almost certainly deform before a "stoppie" can be achieved, this should never be attempted!** With light riders and flat roads, medium quality V brakes will be sufficient. Heavy riders attempting a record time on a long, steep descent, sprinkled liberally with hairpin bends, necessitating repeated decelerations from 70mph to 15mph would need the best brakes on the market... and the skill to know how much braking force they could apply without loosing tyre adhesion or damaging the fork!.

[3] **To allow us to hold back our speed** on long and/or steep descents to that with which we are comfortable. The brakes required to do this vary with the severity of the descent, our all-up weight and (indeed) the speed we are comfortable at! The trouble is that **this kind of braking can (and generally does) generate more heat** than our friends above generate, and they were attempting the downhill record, which involved very dramatic braking!
The reason for this is because, as our speed increases, air resistance plays an increasingly larger part in holding us back... if we dropped down hill in a vacuum, we would generate the same quantity of frictional heat whether we held the machine back to 4mph or let it reach 600mph and did an emergency stop! **It is this heat which causes problems for tandem crews during long descents.** Years ago the heat would have caused the tyre pressure to increase to such an extent that (the poor quality of) **the tyres available at the time, would simply blow off the rim...** with potentially disastrous consequences! **With today's higher quality tyres this is very unlikely to happen,** instead, at slightly higher temperatures, **the seams on the inner tube melt... the consequences are the same!**
The range of requirements varies from crew to crew and situation to situation.
Average weight, experienced crews, who are not particularly nervous and therefore descend at a reasonable speed but who actively avoid the most severe UK descents, should need nothing more than medium quality V brakes... but top quality V brakes will allow a greater margin for safety but what happens if you do find yourself descending an unexpectedly steep/long descent? And what happens when you leave the UK?
Heavy, nervous crews on long descents have been well served, for years, by the Arai drum brake operated by a ratchet lever. The Arai brake weighs 1Kg and many crews developed alternative strategies to avoid using this heavy lump. The Arai is a very poor "stopper" but it has the capacity to dissipate much heat and work when it is very hot. **Unfortunately, we can't fit an Arai to a Rohloff hub... at first the solution seems simple... use a disc brake instead!** But disc brakes can and do overheat, when used to hold back speed on long descents... **the bigger the disc, the**

more heat it will dissipate but the flimsy rotors become more vulnerable to accidental damage. We say that discs must be used with care and always backed up with a V brake. Furthermore, hydraulic brakes can not be operated by a ratchet lever and cable-operated discs do not give sufficient clearance to allow a rear pannier carrier to be used! Add to the mix the indisputable fact that discs are more difficult to maintain on tour, as well as being more prone to accidental damage and you have quite a dilemma.

There can be no single "ideal set up" for every crew but one of the options should be ideal for your requirements.

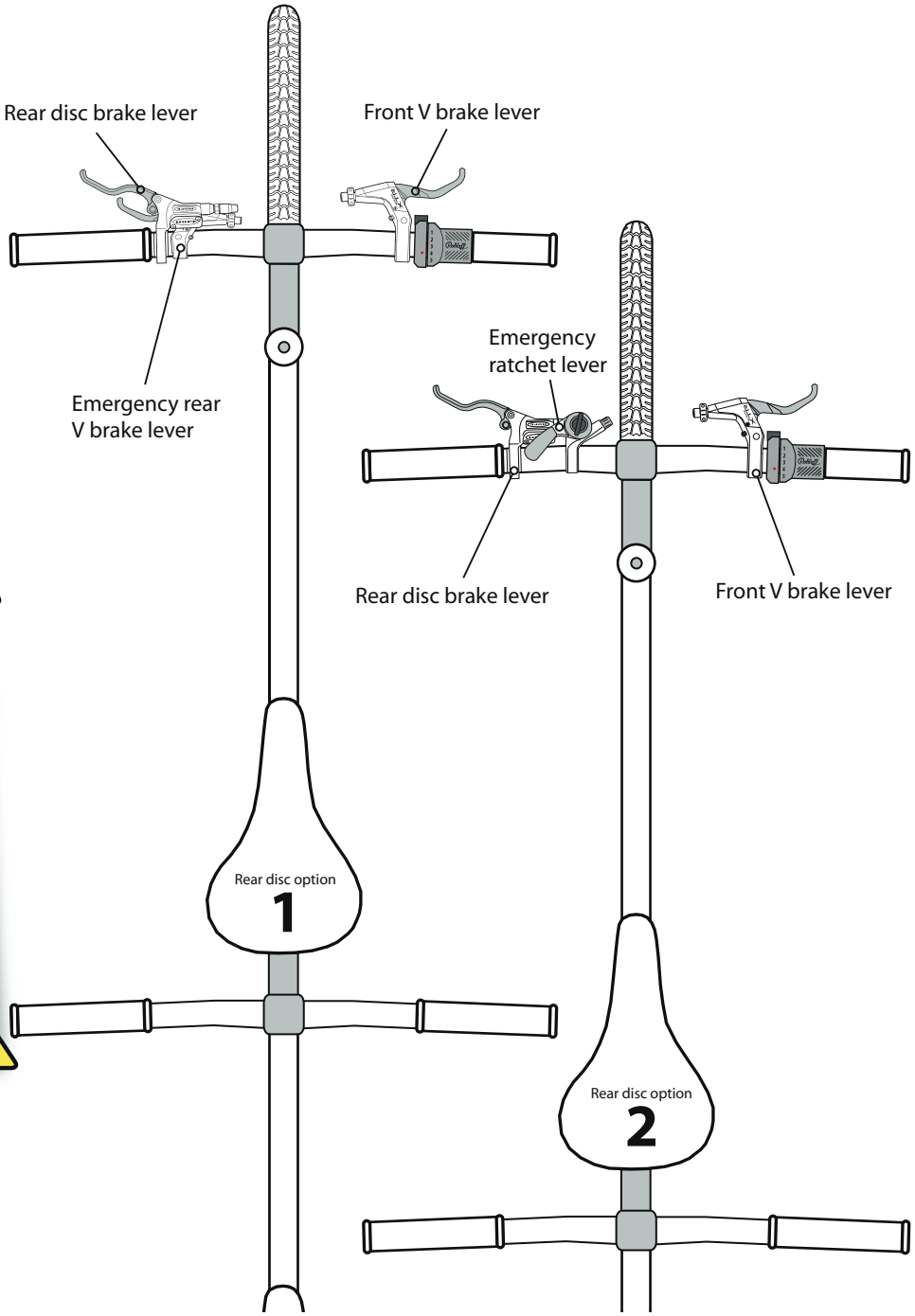
We know that some tandems are supplied with just two disc brakes, we can not stress

We must state quite clearly, right at the beginning, that we are not prepared to sell a tandem with a disc brake, unless it is also equipped with an emergency rear V brake.

strongly enough how irresponsible this is... we know that these brakes will fail given a long enough hill and a slow enough descent, yet these (often cheap quality) brakes are touted as being superior to rim brakes. Whenever we see such machines, we know that the manufacturer has not tested their machine in real world situations... some tandem crews take their machines over the high moors, some take their machines over the high passes!

Brake and brake combination options

Standard equipment.
Medium quality V brakes... steep UK or long continental descents should not be attempted with this set up (unless you are very experienced and/or prepared to stop before the bottom, if necessary, to allow the rims to cool. An upgrade to top quality V brakes is available.
Top quality V brakes are, not only easily capable of stopping a tandem very quickly from any achievable speed, it also have the best "feel" for avoiding locking a wheel.
PLEASE NOTE: Although we have cycle-camped, without incident, in very hilly terrain with only top quality V brakes, it has been because we were constantly aware that this set up would still produce too much heat for the tubes to withstand if the brakes were applied for long periods of time... we have always been prepared to walk, or stop, to allow the rims to cool should the prevailing conditions dictate such action.



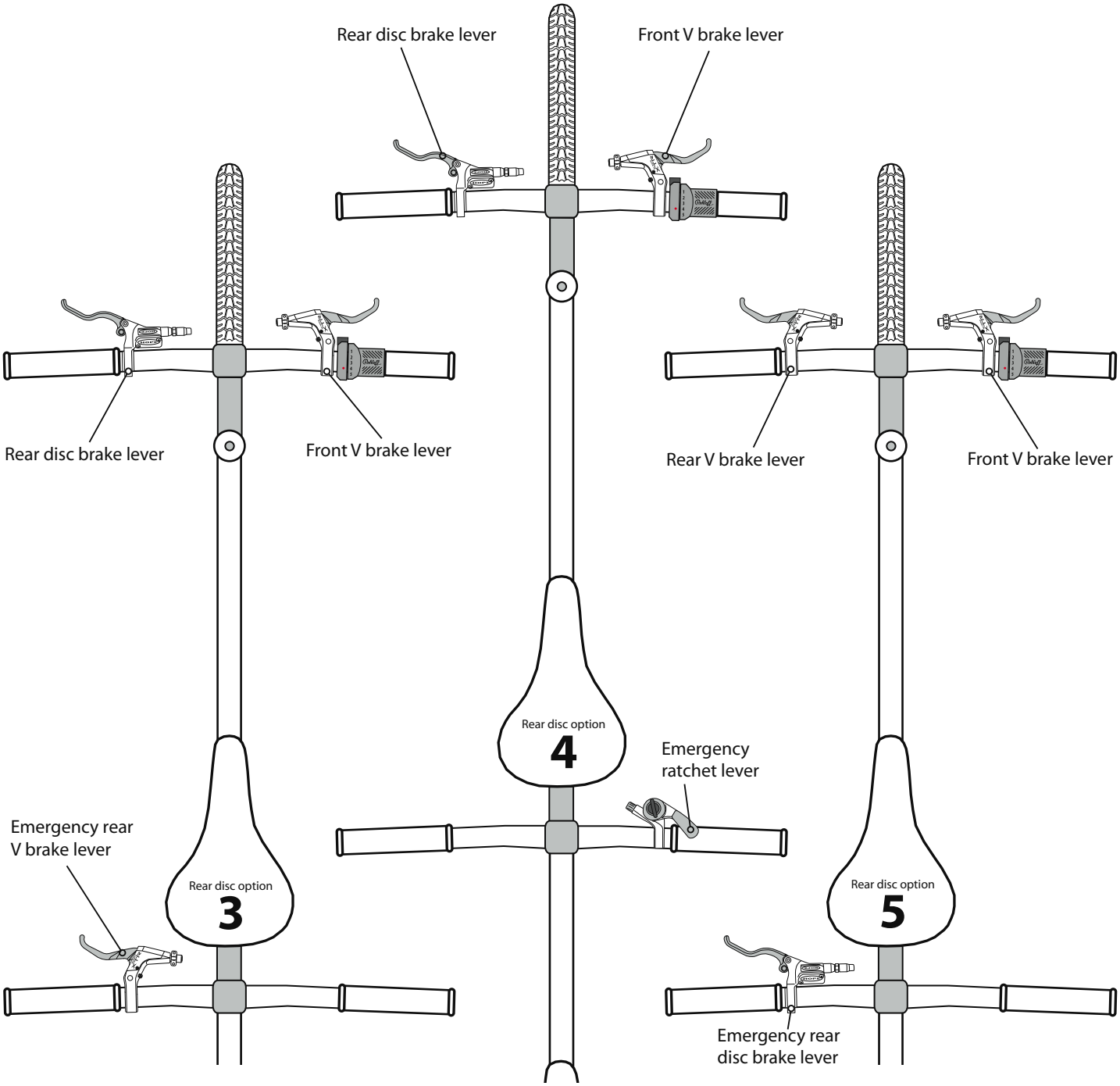
The above options are the only options available on child back sizes: #1, #2, #1 S+S and #2 S+S

Rear disc options

Medium quality V brakes (or upgraded V brakes and/or rims) are augmented by a hydraulic disc rear brake. This may be operated by the pilot, or it can be set up to be operated by the stoker. Please read the pros and cons of each of the 5 possibilities very carefully and decide which option is best for you. **We strongly suggest the removal of the rotor before travelling with the machine by air or by bus.**

With an S+S coupled tandem we must fit a Staubli 100% dry coupling and Goodridge hose when using a front-operated hydraulic disc... this is expensive but absolutely necessary. You may also wish to consider the aesthetics of this approach...

two non matching levers in the conventional brake position and a third lever which may match the front brake lever in an unusual position may offend the sensibilities of many... which is why we anticipate that many people



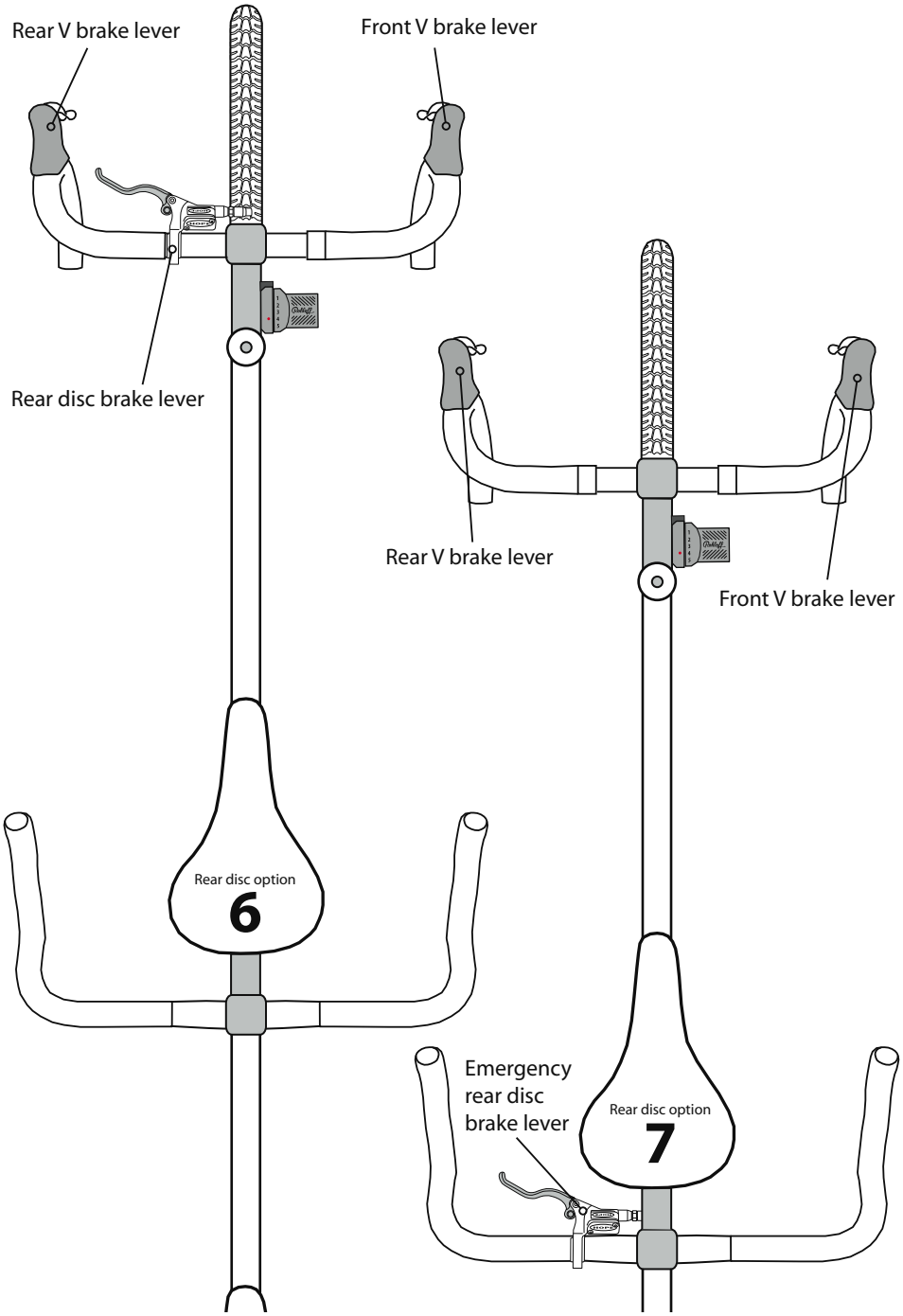
will ask about a front disc option... **but front disc brakes are not an option... see "questions answered" section.**

[1] **Hydraulic rear disc operation by the pilot, pilot-operated rear back-up V brake.** The lever for the disc is in the conventional position, the V brake lever is then fitted in a more difficult to reach (but still reachable) position, which does not matter, as it will

mainly be used to provide "resting time" for the rear disc to cool, or as an emergency brake, in the case of disc failure. In our opinion this is the safest option; it allows all three brake to be used, in rotation, by the pilot. The rear V brake lever can easily be moved to a more reachable position should the rear disc be damaged.

[2] **Hydraulic rear disc operation by the pilot, pilot operated rear V brake via ratchet lever, we accept that the rear V brake could be operated, by an experienced pilot, via a ratchet lever but we must state most strongly that you must not use a V brake as a drag brake because, if this is left on for too long, the tube's seam will melt, resulting in a high risk of loss of control. We must also remind you that, if rotor damage renders the disc unusable, you would have no really effective way of using the rear V as a main brake.**
We do think that this is probably the best option for the experienced crew, who wish to descend at high speed, provided you only use the ratchet-operated V as a (very useful) parking brake (or an emergency brake) and never use it as a drag brake. We suggest you always carry a spare V brake lever and cable, when on tour).

[3] **Hydraulic rear disc operation by the pilot, stoker operated rear V brake, WARNING: please think very carefully about this... do you trust your stoker not to panic and apply the brake before being instructed? If the very mention of the word "instructed" causes your stoker's hackles to rise, we most strongly suggest that you do not choose this option... if the pilot is using the rear disc, even a gentle squeeze on the V brake could lock the rear wheel, causing an accident. Constant operation of this brake will cause the inner tube to fail.** We can see the appeal of this option, it gives the pilot the most powerful brake but there are risks involved (see above) you should carry a spare cable to enable front operation if the disc is damaged on tour.



[4] **Hydraulic rear disc operation by the pilot, stoker operated rear V brake via ratchet shifter, please see warning in [3] previously. Constant operation of this brake will cause the inner tube to fail.** We can also see the appeal of this option... it may be the best option for some crews if the stoker is confident to only apply the brake as and when instructed. This option also gives the pilot the most powerful brake, it allows the rotation of braking to be performed easily and it provides a very useful parking brake but there are still risks involved (see [3]) you should carry a spare V lever and cable to enable front operation if the disc is damaged on tour.

[5] **Hydraulic rear disc operation by the stoker, pilot operated rear V brake. WARNING: please think even more carefully about this please see the warning in [3] if the brake is applied at the wrong moment, serious injury or death could result! The 205mm rotor (necessary to dissipate the heat) is phenomenally powerful... it requires a very light and sensitive touch to avoid locking up the wheel! If the pilot does not realise that the brake is being applied, the merest touch of the rear V brake may be enough to lock the wheel.**
For some highly experienced crews, especially those on long tours, this may be the best possible arrangement, all three brakes may be used in rotation and the (less easily damaged) V brakes are already connected for pilot operation. For other crews it is the surest way to disaster. With S+S coupled tandems, hydraulic disc operation by the stoker does remove the need for the expensive, 100% dry coupling, this should not influence your decision!

[6] Drop bar option; pilot operation of front and rear V brakes via drop bar levers, pilot operation of hydraulic rear disc via front top-of-bar-mounted hydraulic lever (using Thorn crescent shims and longer screws, to fit onto the larger dia. Bars) The much more upright position required to operate the rear disc brake allows the pilot to make most use of the air to provide retardation. If you must have drop bars, this is probably the best alternative.

[7] Drop bar operation of the V brakes by the pilot; operation of the disc brake by the stoker... the only real difference between this and [5] is the fact that the stoker can use Thorn stokers bars (using Thorn crescent shims with longer screws)...**The same warnings apply... injudicious use of the hydraulic brake could cause serious injury or death.** There are also the same pros and cons with this option, as there are with option 5

The selection of Thorn stoker's bars is an option; but only with the following brake options 1, 2, 5, 6 and 7, that is, they are not an option at all on 3 but they could be used on option 4 (if there was room for the Pilot's thigh) to clear a bar-end shifter, which could be used as an emergency ratchet brake.

Which actual models of braking components do you recommend?

The standard, medium quality, V brakes we recommend are Shimano Deore, we think that all things considered there is no point in moving further upmarket, unless you can afford Shimano XTR V brakes... which have a parallelogram action and sealed, adjustable bearing pivots... as mentioned elsewhere XTR V's are superb brakes, being both very

powerful and having great "feel"... in fact, out of all the different brakes we have ever used, only top quality racing side pull brakes have more "feel" and they are not suitable for tandems!

The standard Deore levers are good, XT levers are much nicer to use and can have their leverage altered but XTR V brake levers are superb (and very expensive) they pivot on bearings and have variable adjustment for leverage.

Our experience with hydraulic discs is that a

Hope 205mm hydraulic disc is the best currently available. Please remember that you must have the Staubli 100% dry coupling if you want to be able to separate an S+S coupled frame.

Thorn Tungsten Carbide coated rims.

A high quality V brake system is much easier to maintain and can be much more efficient than a hydraulic disc brake system. The rims are a very important part of such a system. We have sourced top quality rims, with the braking surfaces coated with Tungsten Carbide, which provide a reliable braking surface (wet or dry). This surface is also very hard wearing; Tungsten Carbide is used for the cutting surfaces of machine tools!
The braking surface, on our rims, is applied as a jet at unbelievably high speeds (apparently 5 times the speed of sound!), which causes the Carbide particles to become permanently embedded into and fuse with, the aluminium. Our own tests have shown that this surface also dissipates heat efficiently and the rims run very cool under prolonged braking.

Our Carbide rims also have a considerably thickened extrusion, where the spoke holes are drilled, which allows the holes to be drilled at the perfect angle for very large flange hubs, such as Rohloff.

We are convinced that these rims will prove to be perfect for use on Rohloff touring bikes and tandems...a long service life with great reliability is assured.

Please note: conventional brake blocks disappears at an alarming rate, especially whilst the high spots are being polished off a new rim; we have sourced and tested some special brake blocks, made by Swissstop, which must be used with these rims, especially when they are new! Once this "polishing smooth" process is complete, it is likely that ordinary blocks could be used once again if required.
The rims are also very clean running and do not exhibit the black muck, which gets onto your hands and clothes with conventional alloy rims.

There may be some distressing squealing from the rims when they are new, this soon vanishes with normal brake use but, if you find it particularly annoying, you can dramatically speed the process up with the application of some mud on the brake surfaces and a few runs down a steep hill with the brakes on.

SwissTop Blue Pads
For Thorn Tungsten Carbide rims

Thorn Tungsten Carbide rims.
Width: 24mm
Weight: 686g

Dynamic - Childback

Adventure - Direct Lateral

Discovery - Double Marathon

www.thorncycles.co.uk
Thorn Cycles Ltd. 91-93 St John Street, Bridgwater, Somerset TA6 5HX
01278 441500 sales@sjscycles.com