Triot Bosch Electric Trike

By Brian Zupke

I love to ride recumbent bikes and trikes. It's a great way to get exercise and enjoy the outdoors at the same time. One of the few things I love more is riding recumbents with my wife, Cassie. Because of the differences in our physical abilities, the only way we can ride together for any length of time is if she rides a trike with an electric assist. Cassie's trike does not have electric assist, so when we planned a trip to Idaho for the annual Tater TOT rally, we assumed she would go on fewer rides and for shorter distances. Luckily for us, we got a call from Triot's Martin Rasmussen, asking if we'd review two of his fully loaded Bosch electric assist-equipped trikes. Score! We quickly agreed and started making plans for a much different trip.

We didn't have much free time to do more than a quick shake-down ride on the trikes before getting on the road, so the first real test would not be until we arrived in Kellogg, Idaho from Southern California. We hauled the trikes behind our minivan in a utility trailer, so other than having to deal with a trailer, loading the trikes, gear and our luggage was straightforward. We took our time getting to Kellogg and stayed in a hotel in Winnemucca, Nevada, the first night on the road. I didn't like the idea of leaving the two trikes and gear in the trailer overnight, so we hauled everything into our room. We were pleasantly surprised to find the trikes were narrow enough for us to push them through the hotel room door without having to tilt them. Since they were electric assist trikes with two batteries each, they were heavy. It would have been a challenge to turn them sideways and carry them through the door. We have since found out that the Triot was designed to fit through all doors wide enough for a wheelchair.

We continued our trip and arrived at the Fairbridge Inn (which is Tater TOT central) in Kellogg without incident. For the next week, we had a wonderful time riding the beautiful Hiawatha and Coeur d'Alenes trails, enjoying the camaraderie of the other recumbent cyclists, putting the trikes through their paces, and giving them a thorough workout. Thanks to the trikes we flat-out had a blast!

The Triot has an aluminum diamond-truss frame which encloses and protects the drive chain from the elements. A Kevlar belt connects the Bosch mid-drive electric motor to the rear wheel. The belt does not require lubrication and should last a very long time. However, with the addition of Bosch mid-drive motor, there is a short section of chain that connects the bottom bracket on the diamond truss frame with the motor and pedals. This does mean there is some exposed chain, but it won't pick up much in the way of dirt and grime due to its location. When Cassie and I rode through the muddy tunnels of the Hiawatha trail, cleaning the trikes with water from water bottles was pretty much all that we had to do.

The mid-drive, (where the main drive chain connects to the Kevlar belt for the rear wheel), is below and behind the seat. It is fairly low to the ground, so be careful if you ride over large speed bumps or go off-road in rough terrain. Triot has plans to offer a motor that connects to the mid-drive, eliminating the motor and exposed chain from the front of the trike.

Each Triot trike is built to order, and the length of the diamond truss frame is cut based on rider specifications. While adjustments can be made to the seat position, they are limited and do not offer the same flexibility found on trikes with telescoping booms. If multiple riders are riding the same trike, they need to be fairly close in size. This also needs to be taken into account when considering resale.

The frame is anodized aluminum, which looks pretty sharp. It may also be possible to have the frames painted. Triot had a painted frame at last year's Recumbent Cycle-Con event, but the ordering pages on the Triot web site don't have any provision to select the frame color. You'll need to contact Triot if you are interested in a painted frame.

One of the significant features of the Triot is its full suspension. The front has independent A-Arm suspension with up to 4" of travel, which is more travel than any other suspended trike I know of. Each arm has an air shock whose pressure can be set to create a softer or firmer ride. The rear suspension does

not have as much travel, but it has enough to absorb the bumps. It, too, has an adjustable air shock to make a softer or firmer ride.

Both Triots had a Bosch motor and dual batteries, which added a lot of weight to the trike. The Rohloff and Nuvinci hubs also weigh more than a traditional cassette and derailleur. The Triot web site doesn't list the trike's weight, but it is comparable to other high-end trikes with electric assist and dual batteries. When we had to drive to the trailhead for that day's ride, I would load the two trikes into the back of our Honda Odyssey minivan, with one facing forward and one backward. I could load and unload them by myself, but it was a lot easier if Cassie helped stabilize the trikes as I did so. If I were keeping the trikes, I would invest in ramps, such as the ones offered by Easy Load Ramp System – they would make the loading and unloading almost effortless. The weight of the trike was not a matter of concern when I was riding, thanks to the electric assist. But even with the motor turned off, it wasn't too difficult to pedal – it was simply done at slower speeds.

The Triots had 20" wheels in the front and a 26" wheel in the rear. The large tires can be inflated to a high pressure for reduced rolling resistance without compromising ride comfort thanks to the full suspension. However, running them with a lower pressure would make for an even smoother ride.

The two Triots were configured with different drive trains. One had the Rohloff 14-speed hub with electronic shifting. The buttons to shift up or down were within easy reach of my thumb on the right handlebar. Whenever the trike was stopped, the gearing would automatically downshift to 5th gear for easier starts. One thing I noticed when shifting up while accelerating is that it was necessary to ease up on the pedals, as the Rohloff has difficulty shifting under load. This is a characteristic of the Rohloff that I have encountered on other recumbents. It didn't take much practice to pause pedaling while shifting.

The other trike had the NuVinci 360 Continuously Variable Transmission with fully automatic control, where the gear ratio changed to maintain the desired pedal cadence. When you pedal faster, the gear ratio gradually increases and when you pedal slower, the gear ratio decreases. This means you pretty much don't have to worry about gearing at all. You may want to change the pedal cadence at different times while riding, which can be done easily using the controls on the handlebar. The cadence can be set from 30-120 pedal RPMs at 5 RPM increments. The Nuvinci gear ratio can be changed while the drive train is under load, providing a more automated experience – you just need to pedal.

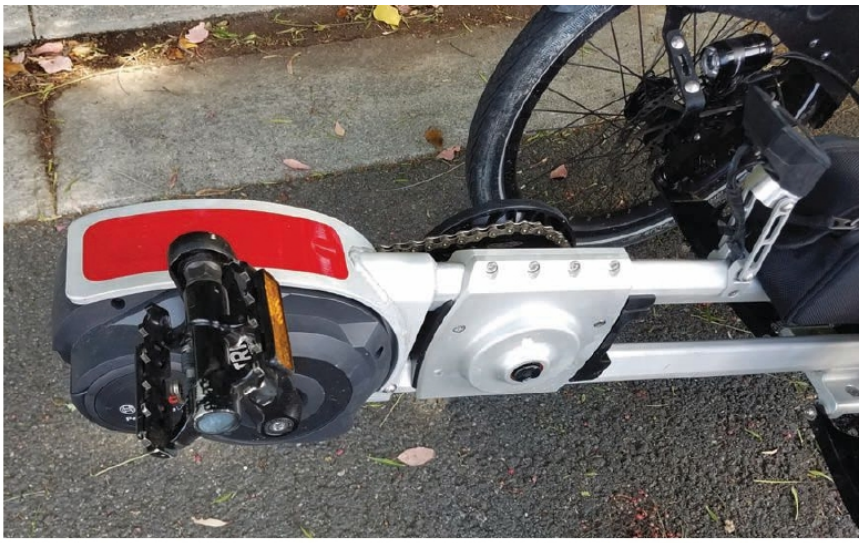
The Bosch mid-drive electric assist motors were very quiet, which made it easier

to engage in conversation and enjoy the sounds of nature, even when they were under maximum power.

The test trikes were equipped with two batteries mounted to the frame behind the seat. Having two batteries doubles the electric assist range. The power is pulled evenly from both batteries and eliminates the need to swap batteries in the middle of a ride. Our longest rides on a full charge were over 50 miles, with maximum pedal assist for the entire route. On such rides, the batteries had over 50% of the charge remaining, so it should be possible to approach or exceed century distance rides using the electric assist. Of course, the lower the assist level and the fewer hills, the greater the actual range. Climbing my local steep hill, I could maintain 8 MPH with max power; without electric assist, my speed would have dropped to below 4 MPH.

The main controls for the Bosch system are mounted on the left handlebar, just below the grip, placing the controls within easy reach. The controls have a total of five different buttons: two control the power level, two cycle through the various display screens, and one to change settings on those screens.

Mr. Zupke found the rear disc brake – hydraulically actuated separately from the fronts – adds measurable braking effectiveness to the rig.



The Bosch electric motor is located at the end of the boom, a two-piece design which contains and protects the chain within.

The Bosch display is mounted on the Diamond Truss frame in front of the storage compartment that is just in front of the seat. This places the display close enough to the rider to allow them to read the values, but it also keeps the display out of the way. The display has multiple screens, many of which are color-coded based on the selected power level:

- Graphical power level (plus time, battery charge level, gear for Rohloff hub).
- Battery levels – shows the % power remaining for both batteries.
- Heart Rate (if using the compatible heart rate monitor).
- Split screen showing Distance, Range, Power, and Heart Rate.
- Split screen showing Average Speed and Maximum Speed.
- Split screen showing Power and Cadence.
- Split screen showing Trip Distance and Ride Time.
- Split screen showing Clock and Range.

The Bosch electric assist has 4 levels of power, each represented by a different color on each screen:

- Grey – off.
- Green – Eco – effective, but gentle support, designed for maximum efficiency for long ranges.
- Turquoise – Tour – measured support for long distances with a clear focus on long ranges.
- Purple – Sport/eMTB – immediate, powerful support for sports riding on natural terrain and even in city traffic.
- Red – Turbo – direct and maximum powerful support up to the highest cadences for sporty riding.

All electronics are powered by the removable batteries which are secured by lock and key. When the batteries need to be recharged, they can be quickly removed from the trike and brought to a power source. The system includes a USB port; so handheld electronics can be charged off the main battery.

The Bosch system doesn't have a throttle, which could be handy when getting started from a standstill. However, the electric assist kicks in quickly, so there's not a significant delay or effort required to get moving – it activated much faster than some of the other electric assist systems I have tested. One benefit of not having a throttle is that the Triot is classified as a bicycle and not an electric vehicle. Some trails, such as the Hiawatha trail, will not allow electric vehicles to enter.

A common concern I hear from people with regards to electric assist is that using it would result in the rider getting less of a workout. I have found the opposite is true, at least for me. Using the electric assist, I'm inclined to ride faster and in doing so, I'll end up working harder than riding a trike without it. You can basically have as rigorous a workout as you wish and no matter how tired you become; you can use the assist to make it home. Knowing this will often mean longer rides will be taken. Of course, sometimes it is fun to ride and just enjoy the scenery and company without a rigorous workout; this was the case for some of the rides along the Coeur d'Alenes trail for Cassie and me. We

certainly would not have enjoyed some of the later rides if we were still recovering from the previous ones.

The handlebars on the Triot are somewhat unique. The bars rotate forward and backward, unlike the steering on most trikes in which the handlebars rotate clockwise and counterclockwise. This geometry increases the useable space between the handlebars as they don't collide with the rider's hip or thigh when turned to the sharpest angles. The indirect steering provides a mechanical advantage, which reduces the effort needed to turn. However, the steering on the Triot was still a bit stiff compared to other indirect steer trikes – it took a little more effort to change direction, especially when making sharp turns. This also meant the trike would go quite a distance in a straight line if I rode with no hands on the handlebars. Additionally, the stiffness made the trike very stable at high speeds – it did not feel twitchy at all.

The ergonomic handlebars have built-in wrist rests, so the rider's hands won't slip off the handlebars, which is a good safety feature. The grips were very comfortable. The controls can be configured to all be on one handlebar for riders who may not have full function of both hands.

The brake levers are built into the handlebars. They are fairly long and provide a lot of leverage, reducing the effort required to apply the brakes. The brake levers have spring-loaded locking pins for parking brakes. To release the parking brake, simply pull the brake lever to ease the tension on the pin and the spring pushes the pin out to the unlocked position. The brake cables are hidden inside the handlebars, so the cables are not in the way and won't catch on anything.

The right-hand brake lever controls both disc brakes on the front wheels, and since the brakes are hydraulic, the pressure on them is applied evenly. This eliminates brake-steer and makes it easy to brake and at the same time signal or hold something in your left hand.

The left brake controls the disc brake on the rear wheel. The effectiveness of the rear brake is lower than the front brakes. Still, the additional stopping force it provides is significant. It is easy to lock up the rear wheel with hard braking, but with a little practice, it's not difficult to keep the amount of braking force below the locking threshold. It is convenient to use the parking brake only on the rear wheel, as it will keep the trike from rolling on a hill but still allow for the trike to be moved quickly by lifting the rear wheel off the ground.

The optional mirror is mounted on the left handlebar. This places the mirror closer to the rider's eyes, which increases the field of vision that can be seen in the mirror. But it also means the angle of the mirror changes when you make turns. Since the mirror is convex, the impact of the steering tilt is reduced.

The Triot seat is a carbon-fiber shell

with an inflatable air cushion that covers the shell. The air cushion reminds one of a swimming pool inflatable raft. The firmness can be easily changed by blowing into an air valve at the top of the cushion. Extra padding under the seat bottom was provided by a Purple™ pad inserted between the shell and the air cushion. This combination provided a very comfortable seat. If the air cushion pressure is low, the Purple™ pad negates the effect of the seat cushion bottoming out if the rider leans forward. The air cushion has channels, and the seat back has several strategically placed holes to provide ventilation as well as for preventing a build-up of perspiration. A general concern I have with the inflatable cushion is the risk of puncture. I have been known to place a screwdriver in my back pocket and forget it's there until I sit down and poke holes in my house furniture. Normally, I don't cycle in regular shorts, nor use the rear pockets in cycling jerseys, but it's not out of the realm of possibility. We didn't have any problems with the cushions on our trip and patch kits were provided just in case. Also, the Purple™ pad would ensure we'd have some comfort in a worse-case scenario.

The seat position can be adjusted forward and backward on the frame. An extension bracket can be used to increase the range of the seat movement. The seatback tilt can be adjusted to four specific positions. While the tilt range is somewhat limited, I found the positions to be very comfortable, (I prefer a more-upright riding position).

An optional neck rest can be attached to the top of the seat shell and adjusted up and down as well as forward/backward. The neck rest had a lot of flex, so on one hand; it helped absorb the bumps that made it through the full suspension, but it also made it easier for my head to oscillate while pedaling. Since the upright seat position reduces the need for a neck rest, I adjusted it back so it was out of the way while riding, but I could still lean my head back on it when stopped.

Above and below: Supple rear suspension and dual a dual battery help supply a comfortable ride for long distances.

Our first ride on the trikes was on the Route of the Hiawatha rail trail, starting in Montana and riding toward Idaho. This trail should be on everyone's bucket list, especially if you are riding a recumbent trike. This very scenic 15-mile trail is hard-packed gravel and dirt and includes 10 train tunnels and seven sky-high trestle bridges. The longest tunnel is 1.66 miles long and curves so that most of the way you cannot see light from either end of the tunnel. Riding the trikes on this trail was perfect. Three wheels meant we could ride at slower speeds, which kept the mud spray in the tunnels to a minimum. There were plenty of flora and fauna and other wildlife (especially those crazy younglings on mud-caked mountain bikes). It was also very green, which coming from southern California was a significant difference. There were plenty of staff and volunteers on the trail who made sure everyone remained safe and provided a wealth of information about the trail.

Informative displays along the way gave a lot of information about the trail, the tunnels, trestle bridges and the construction of the trail as well as its history and use. One fascinating thing was that the temperature inside the long tunnel was somewhere in the upper

40's or low 50's, even though the ambient temperature outside was in the 80's.

There was no artificial lighting in the tunnels, but the dual lighting on the trikes provided excellent coverage. Not only did the lighting illuminate the ground, making it easier to see and avoid puddles of water and mud; it also lit up the sides and ceiling of the tunnel making the experience much more enjoyable. Gazing at the ceiling, it was impossible not to imagine the steam trains going through these tunnels back in the day. Another nice thing about having the dual lighting is it minimized the amount of shadows cast in front of the trike. A single light on the front of a trike will often result in the shadow of the rider's foot to be cast, which can be distracting and somewhat annoying when pedaling. With the dual lights, the shadows were greatly minimized since the shadows cast from one light were drowned out by the other light.

Many trail riders start at the trail head in Montana and ride downhill to the trail end and then take a shuttle bus back to the beginning. Having the electric assist trikes, Cassie and I opted to ride halfway down the trail, which has most of the tunnels and trestle bridges, then turn around and ride uphill back to our starting point. The trike's three wheels plus full suspension, plus the air cushion seats with Purple™ pad meant that riding over the gravel portions of the trail was very comfortable. Also, having three wheels meant we could travel slowly and enjoy the scenery as we rode.

One of the features on the trikes that I really appreciated was that it had fenders on every wheel. On the front wheels, the fenders are secured to the kingpin and the axle, which kept the vibration (and accompanying noise) to a minimum when riding on rough surfaces. Most trikes have fenders that only cover just a portion of the tire, but the Triot's front fenders also have panels on the inside of the wheel, greatly increasing the coverage. This was nice as it helped keep loose objects, including my fingers, out of the spokes of the wheels, as well as reduced the amount of spray that reached me. Cassie's trike only had the rear fender, so while the majority of the mud was kept off the trike and her, they did pick up more mud from the front wheels than I did.

In contrast, it was quite amusing to see 2-wheeled bike riders after they emerged from the uphill side of the long tunnel. Since they had needed to keep up their speed, each of them had a very thick stripe of mud that ran from their seat up their back side, all the way to their helmet. It looked like they had an encounter with a roller paint brush.

The rest of our week in Kellogg was spent riding segments of the Coeur d'Alenes rail trail, which is 73 miles long. Many of the rides started from the hotel, but sometimes we drove to different trailheads. Almost the entire trail is very scenic and since it used to be a rail bed, it is fairly flat, with only slight grades. It is definitely a trail I want to ride again and again.

One of the fun things we encountered while riding the trail was an event hosted by the local towns. Groups of people rode or drove down a road that followed the banks of the river, skipping ahead of an oversized,

heavy-duty beach ball that was making its way downstream. At various turnouts and vista points, they would stop, party, and place bets on how long it would take the ball to get there. Once it showed, they'd collect their winnings, then head down to the next milestone. Next year I'm going to try to place the winning bet.

I ride more than my wife does, so our strengths and endurances are vastly different.

Above: Front suspension showcases more examples of beautiful machine work and design and provides a delightful ride. Left: Seating on the Triot is a unique inflatable bladder design over a padded carbon-fiber shell.

The electric assist was an incredible equalizer that allowed my wife and I to ride together. With the electric assist, we were able to cruise along together at 15-18 MPH, riding side by side, and we were able to hold a conversation without being out of breath.

Also, I sometimes took additional rides. Since I had not put in as much training beforehand as I would have liked, it would have been difficult for me to put in the number of miles I did were it not for the electric assist. When I joined other riders, instead of trying to keep up, I could focus more on the enjoyment of riding with them and taking in the wonderful scenery around me. When the mood struck me, I could push myself harder to sustain higher speeds or ride with a lower power setting to get a better workout.

The electric assist really came in handy on one of our rides on the Coeur d'Alenes trail. My wife and I had intended to do a 35-mile ride, which was at about the end of her endurance level. By mistake, we headed the wrong direction on the trail from our starting point. We had ridden eight miles by the time we realized we were going the wrong way. We backtracked, then continued with the originally planned ride. This meant we ended up riding over 50 miles, but thanks to the electric assist, we enjoyed every bit of it and were not wiped out by the end.

As far as the regular performance tests I put bikes and trikes through when I review them, I did a lot of it on the relatively flat trails we rode in Idaho, but I also did some riding in the hills near my home. The electric assist made climbing much faster and in my downhill test, I hit 51 MPH. At that speed, the trike was very stable. Triot offers a faring – with it I would expect the maximum speed to be 5-10 MPH higher.

Not only is the Triot comfortable for the rider, but it can carry a lot of gear too. The rear rack is secured to the top of the seat post on the frame and can be removed by loosening the quick release. It also has two triangulated supports to allow more weight to be carried on the rack. The rack also holds the rear light.

Triot offers two different storage bags for the trike. A small one is mounted to the diamond truss frame in front of the seat and it is large enough to hold items you need to keep within easy reach, such as phone, keys, wallet, snacks, etc. This compartment is secured to the frame and cannot be removed without tools; therefore, if you are going to park somewhere where security is a concern, you will need to empty it.

A large storage bag mounts on the rear rack and is a combination trunk and panniers all in one. The trunk is secured to the rear rack by four Velcro straps, so it can be quickly removed and be carried either using the built-in handle or the removeable shoulder strap. With the zippered extension opened, the trunk is large enough to carry a gallon of milk. The sides of the trunk can be unzipped and folded down to provide decent-sized panniers. While not as large as dedicated panniers, they are convenient since they fold up when not in use.

The trunk also has a built-in bungee cord and mesh webbing that can be used to carry a jacket, towel, or other wet items. The trunk is insulated to help keep the contents cold, and it has a cup holder in the very back, which provides another place to carry a water bottle. The inside of the trunk has a removable divider (secured by Velcro) to help keep things organized. A couple of adjustable straps on the rear of the trunk are good for securing bulky items. There's a small pocket in the lid of the trunk for lighter items, such as maps or other documents, (heavy items are likely to slide out when the trunk lid is closed).

The Triot's carbon-fiber seat shell has holes drilled that allow you to attach two water bottle cages on the lower portion of the seat back. These place the water bottles at easy-to-access locations – there is no need to lean forward to reach them nor to stop pedaling. The top of the seat pole has a hole for inserting a safety flag.

All in all, the use of the Triot Electric

Above: Final drive is provided via a silent-running belt drive, the five seat back positions can be seen above the suspension shock. Rear hub is a 14-speed Rohloff with electronic shifting. Below: Easy to read computer screen shows all the relevant settings selected via touch buttons on the handlebars.

Bosch trikes made our trip to Idaho very enjoyable. They let us do things we couldn't have done without them. It was also great to have the opportunity to use the trikes in more "real-world" conditions than I normally can, which resulted in a more thorough review. This trip also reaffirmed our desire to have traveling with recumbent trikes become a regular occurrence. While there are many very fine recumbent trikes with electric assist to choose from, the Triot is at the top of our list. RR