



The extraordinary 'Assist' system pairs the radical Moulton bicycle design with a lightweight, removable power assist system using Bosch power tool batteries. We were among the first to ride it...

An intriguing invitation to come and try a 'revolutionary' new electric bike saw me travelling to hilly Hampstead in London for the unveiling of 'Assist'. Jaded journalists like me take descriptions like 'revolutionary' very much with a pinch of salt, but for once I was not disappointed.

'Assist' is the brainchild of Edward Atkin CBE, an entrepreneur and industrialist, and the engineering and production are handled by ARCC Innovations who have a very well-equipped R&D facility near Cambridge. Edward has for many years been a keen user of Moulton bicycles. But his native Hampstead is distinctly hilly, and he was sure that many more of his friends and colleagues, both locally and further afield, would take to two wheels if the strain of hills could be overcome. The Assist was designed to provide just that assistance, without compromising the Moulton ride.

The ARCC 'Assist' is supplied as a complete bicycle, with the electric system build onto a TSR8 frame supplied by Moulton Bicycles. Initially this will be available directly from ARCC Innovations in Cambridge and London, although ARCC say they also hope in due course to supply it through selected Moulton dealers. The price for the basic model will be £2,999 (including VAT) and it is expected to be available from November 2014.

» ON THE BIKE

Before we move on to the electrics, a brief word about the Moulton bicycle. For those not familiar with the concept, it's one of the very few successful alternatives to the standard, diamond-frame cycle. First produced by Sir Alex Moulton in the '60s, the basic concept is to improve ride comfort and efficiency by using small wheels with high-pressure tyres, supported from a rigid frame by carefully engineered rubber



The people behind Assist: Edward Atkin CBE (right) and Rai Virciglio of ARCC Innovations (left).



suspension units. Most later models use the space-frame design you see here, which separates into two pieces for easy transport. Moultons are now produced by Pashley Cycles.

The Moulton concept has an enthusiastic following across the world, both for its structural and engineering elegance and for its nippy, supple ride. There are owners' clubs in many countries, and lively internet forums if you want to find out more.

The cost of these bikes is perhaps one reason they've not caught on for the mass market: a 'bare' TSR without the ARCC Assist add-ons retails at around £1300. The distinctive look also means riders must be prepared to field questions from the curious!

The bike supplied with the Assist system can come with either flat or drop handlebars; a matter of personal preference really. Both versions share the rest of the specification. V-brakes front and rear do the stopping, and for gears there's a SRAM Automatix two-speed automatic hub gear in the back wheel, combined with a double chainring. With the electric assist to help this gives more than adequate range, and the automatic hub means there's just one shifter (for the front derailleur) to operate.

Note, though, that ARCC can supply Moultons built to almost any specification on request. Numerous Moulton accessories are also available, including luggage racks and fitted panniers. The Assist system does, however, preclude the use of the Moulton front rack.

So to the Assist system itself! There are three main parts to

this. First there's a 250W geared, brushless hub motor in the front wheel, a relatively compact model designed for the smaller wheel size. This connects via waterproof cable connectors, along with a cable from the bottom bracket torque sensor, to the aluminium 'Dock' unit, which clamps securely onto the head tube. Also feeding into this are the cables from the brake lever cut-out sensors. There are contact pads for all of these connections, and for the power wires from the motor, clearly visible until you add the next part.

So far, the system has added around 2 kg to the weight of the unassisted bike. If you're riding on the flat and don't need assistance, just leave the rest behind.

The next main component is the controller box (the 'Assist Pod'), which slots into the dock with a reassuringly positive click. The pictures can't do justice to the feel and finish: it's CNC-machined from solid lumps of aluminium, polished and weather-sealed with O-rings throughout. The switches are also O-ring sealed and have a lovely silky action: I was told they're the same as used on Formula 1 car steering wheels. And I've seen inside it too: the quality of circuit boards, connectors and everything else really is top notch. Convenient USB ports (micro and standard) are provided on the side for phone or GPS charging, and there's an array of spring-loaded contacts to connect it to the bike's electrical systems via the dock.

With another positive click you can slide the battery pack onto the



ABOVE: The Assist's main components are made from solid aluminium. The 'Dock' clamps securely to the bike's head tube. When the 'Pod' is clicked onto it, spring loaded contacts make all of the necessary electrical connections. Finally, a 36V Bosch power tool battery pack clicks securely onto the Pod.

Pod, where it sits with the charge level display conveniently visible. ARCC have opted to use the recently introduced Bosch 36V, 4Ah Li-Ion power tool batteries. At 144 Wh capacity, these packs are relatively small in electric bike terms (Bosch's e-bike packs are 300 or 400 Wh) but there are some convincing arguments in their favour. They are a mass-market product available widely from many suppliers, and can be expected to remain available for many years. They are also relatively cheap as e-bike batteries go: 'street price' is around £120 each as I write. They're robust (rated for a 3 m drop onto concrete!) and have a two year warranty from Bosch. And they charge fast too, in just over an hour. Carrying spares isn't a problem either: weight is just 1.3 kg each and they measure 158 x 97 x 76 mm.

And are there downsides? I did ask about their capacity to deliver high current levels – traditionally bigger packs are better in this regard. But ARCC say they've looked into this and the 4Ah packs can cope comfortably even with peak current draw from the motor.

I do note however that these packs can't quite match the energy density of a purpose made e-bike pack. The power tool pack delivers 111 Wh/kg, while a 400 Wh Bosch e-bike pack weighing 2.42 kg manages 165 Wh/kg, so you get somewhat more capacity per unit of weight with the bigger pack. Then again, it's not a huge difference and with the smaller packs you have the versatility to carry just what you need for any particular trip. ARCC say

one pack will last roughly 30 miles in typical London riding, although of course it will depend on hills, your weight, how much you pedal etc.

Back to the Pod, and I'll quickly describe the controls. The black lever in one corner is the mechanical release: tip it backwards to unlock the battery, then a bit further to completely release it. Tilt it the other way to release the control box from the dock on the bike.

Then there are the two red knobs. One is a straightforward assist level control with 11 settings, min to max. The other is the mode switch: off, A (assist) and A+ ('smart assist') – of which more in a moment. Between the knobs are battery and assist system status LEDs. You can reach down to adjust the knobs as you ride, though switching modes while riding does cut the power for a few seconds.

As the controller 'Pod' weighs around 700 g, in total the Assist system adds around 4 kg to the bike (with one battery fitted). Total weight of an Assist-equipped Moulton will depend on the bike specification chosen but should be around 17 kg.

» THE RIDE

Unfortunately I have no space here to describe the Moulton ride in detail, or to compare it to that of conventionally laid out bikes. Head to the internet for masses of discussion and debate: all I'll say here is that it's a very strong contender when it comes to comfortable but fast on-road riding. The bikes I tried on my visit (drop and flat bar types) each delivered a well-tuned, responsive ride with or without the assist switched on.

There are two modes of assistance. 'A' gives what feels like fairly conventional torque sensor type assist: the motor cuts in immediately as you pedal and its output mirrors your own. So it still feels like a very natural cycling action, but with the buzz from the motor letting you know you're being boosted. It would have been lovely to have a completely silent motor, but it's not a big deal: the sound disappears immediately under any traffic noise.

The 'A+' mode adds some extra cleverness in the form of a tilt sensor, so the bike knows when you're tackling a hill. It'll add power assistance automatically, aiming to keep your exertion level more or less



ABOVE: ARCC modify and strengthen the standard Moulton front dropouts to cope with the torque from the motor.

BELOW: With the rear hub gear changing gear automatically, there's just this single shifter for the front derailleur on the handlebars. Note also the brake cut-out sensors.



constant despite changes of gradient. The difference between the two modes wasn't all that dramatic, at least as far as I could tell from my brief test rides, but perhaps A+ tilted the balance towards more assist on the steepest hills and less on flatter sections where it wasn't needed. Again it felt 'natural' rather than intrusive to the cycling experience: just the peaks of exertion were taken away.

One further function was also very welcome. If before setting off you squeeze both brakes and put some pressure on the pedals, then release and start pedalling, the bike will deliver full power for three seconds in 'traffic light assist mode' to get you up to speed. This is ideal for hill starts.

I rode the two Assist-equipped Moultons around the maze of Hampstead's small, hilly roads, stopping and starting on even quite steep sections, and for a 'torture test' to check that it wouldn't cut out under extended loads I rode the drop-barred

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bike the length of Froggnal and Branch Hill, around 1.2 km with a rise of 57 m (0.75 miles, 187 feet), trying to get the motor to work at full pace and without stopping. Though the average gradient works out at 5% (1 in 20) there were several steeper sections. I'm a heavy rider, too (95 kg) but the system didn't falter, and I rode up at a good pace with little more effort than on the flat.

The Assist system won't pull you along unaided, and in sheer power it can't rival some of the latest high torque hub motor machines. But for someone who is reasonably able, it provides really well judged assistance to take the strain out of hills, while not noticeably affecting the handling of the bike with excess weight. This means that it's still practical and indeed enjoyable to pedal the machine unassisted on flat sections: ride like this and you'll get a good range despite the small battery.

» SUMMARY

ARCC have brought some impressive new thinking and a product of fantastic quality to the electric bike market, with a system which is well targeted to appeal to buyers of the Moulton to which it's fitted: not cheap but with more than a little engineering elegance. And it works very well indeed.

There's also plenty of potential for ARCC to expand their offering. The complete bikes are great, but I'm sure there would be huge interest if they could make the system available in the form of a retro-fitting service for existing Moulton owners. And for other brands of bike...

Perhaps the most significant aspect of the Assist unit, though, is its use of the Bosch 36V 4Ah power tool batteries. These benefit from economies of scale unheard of for electric bike battery packs, and the combination of quick charging, easy and very likely long-term availability, cheap replacement cost and a two-year warranty will make them a tempting option for users when compared to many proprietary battery packs. Yes, the capacity is lower but just buy two or three if that's an issue. It wouldn't surprise me to see other systems following ARCC's lead before long, using similar power tool packs.

All in all, here's a system that can fairly be called unique, revolutionary even, in both mechanical and electrical terms. If you can see yourself commuting on a Moulton with this ingenious, minimalist power assist, do contact ARCC to enquire about a test ride.

Peter Eland

Available from:

ARCC Innovations: see www.arcc.co.uk or e-mail: info@arcc.co.uk

