AFFORDABLE E-BIKING

Lightning Strike

2020 ROAD TEST

Words : Alan Cathcart
Photo Credit : Kevin Wing

2019 was Year Zero for electric motorcycles. It was the moment they finally became a genuine alternative to mainstream ICE/internal combustion-engined models in the high-voltage sector, offering comparable performance to 1000-1200cc ICE bikes – so, not low-voltage runarounds. Recent production hiccups notwithstanding, the new Harley-Davidson LiveWire is now reaching customers in the USA, while demand for its Zero SR/F competitor launched a couple of months earlier in both Europe and its American home market is such that Zero CEO Sam Paschel says his company has hired an extra 50 assembly line workers, and introduced a second swing shift in its Northern Californian factory, to try to keep up with demand.

This increase in the availability of – and demand for - performance E-bikes has come despite their elevated price. The 2020-model Zero SR/F with a 3kW charger starts at $18,995 + tax in the USA, rising to $20,995 + tax for the premium-spec version with a 6kW charger, while Harley-Davidson's LiveWire is priced at an even meatier $29,799 + tax, albeit with a hefty 15.5kW charger. Crucially, though Harley's charger only permits Level 1 (household sockets) and Level 3 Fast charging, thus preventing owners plugging in to the same Level 2 charger as a Nissan Leaf or Chevrolet Volt, i.e. at the 79.7% of the 48,472 J1772 public charging stations in the USA that are Level 2. But those steep prices make the launch of a third US-made alternative to saving the planet on two wheels while having fun at a much lower cost, appealing as well as significant.

Lightning Motorcycle Corp. Founder/ CEO Richard Hatfield, 61, has been building E-sportbikes for longer than anyone else [see History sidebar], and he's achieved more with them in the white heat of competition than any of his rivals, too – up to and including scoring victory at Pikes Peak in a direct matchup against ICE sportbikes. For the past six years his Californian company has marketed hand-built LS-218 streetbikes based on the Lightning which currently owns the World Land Speed record for electric motorcycles, of which more than 40 examples have so far been built for delivery to customers around the world at prices from $38,888 + tax on up. So while undoubtedly delivering impressive performance and mega-exclusivity for the money, so far the Lightnings have very much followed the E-biking norm in terms of pricing.

Until now. For Lightning is stepping outside that financial comfort zone, to make electric motorcycles fully

competitive with ICE hardware in price, as well as performance. It's done so by launching the Lightning Strike, a downsized 600 Supersport equivalent to the LS-218 Superbike which, while still delivering attractive styling and appealing performance stats, costs a competitive $12,988 + tax for the Strike Standard base model – and yes, Hatfield did have to pay off Harley to use the Lightning Strike name formerly registered to its defunct Buell brand. "It was more than we wanted to pay," he says, "but not as much as I was fearing!" Living up to the company's strap line of being "Engineered for the track, but designed for the street", the Strike Standard comes with injection moulded plastic bodywork, and is claimed to produce 70 kW/94 bhp at 15,000 rpm at the output shaft and a massive Nm244/180 lb-ft of torque from 1 rpm upwards, while weighing 206kg fitted with a 10kW battery. The pricier ($19,998 + tax) Strike Carbon Edition delivers 90 kW/121 bhp at the same revs thanks to a doubled-up 20kW battery, but still with the same massive hit of torque.

Despite the costlier version's full carbon fibre bodywork handcrafted at Lightning's in-house carbon studio, its larger battery results in the all-up weight rising to 219kg fitted with Lightning's Performance Package, including fully-adjustable Öhlins TTX suspension front and rear instead of the Showas on the Standard, plus Brembo Monoblock

radial brakes rather than lower cost two-piece Brembos on the Standard, and an AIM Strada TFT dash with inbuilt lap timer and GPS-based data logging. Deliveries of the Strike Carbon Edition have already commenced to US customers, with 17 bikes delivered by the time of my recent visit, according to Richard Hatfield, and supplies of the Standard version following shortly, after fine-tuning of the injection moulding process for the plastic bodywork.

Lightning's offer of a choice of three different battery sizes allows riders to choose the range which best suits their needs, and pockets, with the entry level Strike Standard model's 10kW pack giving 70-100 miles range on a combined Highway/City cycle, through the Strike Mid-Range 15kW pack delivering a 105-150 miles range on the same basis, up to the Carbon Edition's 20kW battery's 150-200 miles range (all figures claimed by the manufacturer). With a standard CCS/combined charging system charge port, the Strike has the capability of using Level 1, Level 2 or Level 3 charger outlets depending on the model. Level 1 allows the owner to plug into any 110V US household outlet (or 220/240V overseas) to obtain a full 5-95% charge in 8 hours, typically overnight (the last 5% or so of charging to full always takes longer, to allow rebalancing the cells). Level 2 will fulfil the same 5-95% charge in around 120 minutes at any J1772 public charging station, with a Level 3 DC charger delivering a 5-95% fast charge in just 35 minutes. The Strike Standard comes with a 3.3kW charger with both Level 1 and Level 2 charging capability, with Level 3 fast charging a $1,500 option via the same 6.6kW charger which comes as standard on the Carbon Edition.

The Lightning Strike range's super-competitive pricing gives it the potential to be the two-wheeled equivalent of Tesla's mass-market Model 3 E-auto, and according to Hatfield this comes thanks to the complete restructuring of his company 18 months ago, which included the opening of two new Lightning Motorcycle factories, each 20,000ftÐ in size. The first of these sits between Grumman Aerospace and BAe America in the heart of Silicon Valley in San Jose, California,

just 20 miles from the Apple Campus in Cupertino, and is five times larger than Lightning's previous base in San Carlos, where LS-218 production was initiated. A total of 21 people currently work there, says Hatfield, on both R&D of new applied E-technology as well as construction of new models, both prototype – like a 2WD on/offroader I saw being completed for US Border Patrol, with a motor in each wheel - and production. Coming down the line during my visit was a batch of 35 pre-production versions of the Lightning Spark, the company's next new model due to commence manufacture in August 2020 after it's been validated in everyday use by assigning these 35 initial bikes to customers happy to be a part of Lightning's R&D team. This is a Honda Grom-sized E-runaround available in two versions with Level 1 & 2 charging capability, one selling for $3,995 + tax with a 4.5kW battery offering a range of 40-50 miles in Urban use, the other retailing at $4,995 with a larger 6.5kW pack yielding a 70 mile range. A 20-minute test ride showed the Spark produces effortless and slightly improbable performance for such a mini-wheeled device, while being super-easy to ride, so an ideal beginners bike.

Lightning's second factory opened last year in China, and is run by Richard's Taiwanese wife Jojo Hatfield – partly via an array of a dozen CCTV screens in the company's Californian HQ. Located in the city of Quzhou, 400km south of Shanghai, it's close to the QJ Benelli and KTM-CFMoto plants, as well as Moto Morini's new owner Zhongneng's HQ, and is essentially Lightning's manufacturing base. "We know we must be able to build these bikes at a competitive price and in a kind of volume that will allow Lightning to compete with gasoline bikes on price," explains Richard Hatfield. "We're doing the engineering and product development in California, but manufacturing the majority of the parts in China before shipping them to the USA, where we're assembling bikes destined for North America, and certain of our export markets. We then ship each motorcycle as a CKD [complete knocked-down] kit into our US dealers and our distributors in other countries, where they hand assemble them locally. We're also building complete motorcycles in China for markets where it makes sense to do so geographically – not only China itself, which we see as a key market for Lightning, but also

India, in particular. Together, the two largest motorcycle markets in the world will both predominantly focus on electric motorcycles in coming years, and Lightning will be there to serve them." So essentially what Richard Hatfield is doing is to follow Apple's strategy, and do the technology in Silicon Valley, then manufacture the end result in China. The Strike's debut is thus the opening roll of the dice for a proven industrial strategy, which has never yet been applied to the motorcycle industry – until now.

Both versions of the Strike are powered by Lightning's own liquid-cooled three-phase AC induction motor, paired with the company's own battery packs using pouch-type lithium-ion cells. These are controlled by Lightning's own liquid-cooled inverter complete with an integrated thermal management system, and real time data collection for managing the state of charge and state of health of each individual polymer cell. The Strike Standard's 150V version of the motor is good for a claimed top speed of 135 mph, says Hatfield, while the range-topping Strike Carbon Edition pushes that to 150 mph via a 300V version of the same motor. That's with the full-fairing sportbike bodywork fitted as standard, which delivers a family resemblance to the LS-218 Superbike – despite which, Richard Hatfield insists, this is done for efficiency as much as speed.

"The Strike's bodywork design is intended to blend elements of track-ready performance with comfort for daily rideability, and aerodynamic efficiency to extend range at higher speeds," he says. "It's true that it has a beautifully dynamic sportbike aesthetic, and shares clear design DNA with our LS-218 halo bike in a slightly more compact package. But it doesn't have an extreme riding position that's uncomfortable in everyday use – it has a more spacious and upright rider triangle geometry than the LS-218 [see Comparo image in photo selection – AC], which positions the seat, handlebars and footpegs to make the Strike feel like a natural extension of the rider. But the reason it has sportbike bodywork is that, after sculpting the fairing via extensive wind tunnel testing, our internal comparison analysis indicates that the Strike is by far

SPEC SHEET

LIGHTNING STRIKE CARBON

Engine:	150V (300V) liquid-cooled three-phase AC induction motor with liquid-cooled inverter/con troller
Batteries:	Lightning Strike offers 3 different lithium polymer cell battery sizes: 10kWh, 15kWh and 20kWh, each with integrated thermal man agement system, and real time data collection for managing state of charge of each individual cell
Output:	70 kW/94 bhp at 15,000 rpm at output shaft (90 kW/121 bhp at 15,000 rpm)
Maximum torque:	Constant 250 Nm/184 ft/lb at all motor speeds
Range:	Up to 120 miles at road-legal Highway speeds with 20kWh battery (claimed)
Recharge 5-95%:	Circa.120mins on Level 2 J1772 charger using 3.3kW DC stand ard charger (35mins with 6.6kW optional upgrade charger, standard on Carbon Edition)
Transmission:	Direct single-speed with belt final drive
Chassis:	Integrated battery shell aluminium monocoque frame
Suspension (as tested) :	
Front:	Fully adjustable 43mm Öhlins TTX inverted telescopic fork
Rear :	CNC-machined billet aluminium swingarm with fully-adjustable Öhlins TTX cantilever monoshock
Head angle/trail :	24º with 105mm trail (adjustable)
Wheelbase:	56 in/1420 mm
Weight/distribution:	206 kg/455 lb with all fluids (219 kg/484 lb), split 52/48%
Brakes (as tested):	
Front :	2 x 320 mm Brembo steel discs with four-piston two-pad radially-mounted Brembo Monoblock calipers
Rear :	1 x 245 mm Brembo steel disc with twin-piston Brembo caliper, and supplementary adjustable regenerative braking
Wheels/tyres:	
Front :	120/70ZR17 Pirelli Diablo Supercorsa SC1 on 3.50in Lightning forged aluminium wheel
Rear :	200/50ZR17 Pirelli Diablo Supercorsa SC2 on 6.00in Lightning forged aluminium wheel
Seat height :	32in/813mm
Top speed:	150mph (with track gearing)
Price :	$12,998 + tax for Standard edition ($19,998 for Carbon Edition)
Constructor :	Lightning Motorcycles, San Jose, California, USA www.lightningmotorcycle.com

the most aerodynamically efficient electric motorcycle in the market today. When compared to other non-faired electric motorcycles, the Strike achieves a near 30% reduction in aerodynamic drag at 70 mph, which besides giving added protection to the rider, results in significantly improved mileage per charge."

Only one way to test those claims, and that's to ride the bike in real world conditions. So almost one year on from when I became the first outsider to ride the prototype Lightning Strike along Southern California's racer roads in the hills north of the Los Angeles basin, I headed back to the Golden State to ride its production-ready successor - but this time to the famed Alice's Restaurant south of San Francisco, and the testing tarmac trails running through the Redwood forests off legendary Skyline Boulevard – the very same roads where then-local resident Richard Hatfield honed his prototype Yamaha R1 E-bike a decade and a half ago.

The prototype Strike I rode in 2018 was a proof-of-concept model utilising much of the LS-218's chassis technology, and it just wasn't a comfortable fit, with footrests that were too high relative to a sloping seat, and a stretched-out stance that made working the controls awkward. But in production guise that's all been addressed, mostly thanks to Lightning's Development Engineer, Shawn Higbee, who joined the company in March. Higbee is a top road racer and ex-Formula USA Superbike champion who even has a remote connection with China, after finishing on the rostrum in the definitely insane Macau GP run round the streets of the former Portuguese colony! But, more seriously, Shawn has hands-on electric experience after racing a Zero in the US TTXGP E-bike series. "We couldn't run with the Lightning, which was on a different planet compared to the rest of us," he says. "But I learnt a lot about electric doing that, and the chance to come here and work with Richard and Jojo in producing a realistically priced and super-rideable E-bike has been enjoyable, as well as rewarding. They have such quick response times to new designs or suggested improvements, and that gives you satisfaction working with them and the rest of the team."

Higbee's influence is readily apparent on straddling the production Strike, with its far more rational riding position evidently the fruit of his labours. The 32in/813mm-high seat is now comfortable - welcoming, even -with repositioned footrests that are lower down and further forward than the LS218-derived prototype's were [see Comparo ad]. The aluminium monocoque frame doing double duty as a battery box narrows where the seat meets the 'tank', and this gives a greater sense of control, as well as allowing a 5'10"/1.80m rider to put both feet flat on the ground at a traffic light. It all feels more comfortable, and much more controllable.

Furthermore, the riding position is more upright, with the quite broad clipon handlebars pulled further back and higher, though the fact they I have a 20mm-or-so lead ahead of the fork tubes meant there was space for me to tuck down behind the screen on long, fast stretches of Redwood-lined highway running north from Alice's, after climbing the switchback La Honda Road leading there from Pescadero. You have more of a sense of actually sitting within the bike, rather than being perched atop it like before. But despite first appearances, this is not so much an outright sportbike as a real world ride masquerading as such – call it a switch-hitter of an E-bike! Hatfield has chosen to retain a seven-eighths version of the Lightning brand's trademark bodywork as ridden to world-class success at Pikes Peak and Bonneville, while endowing the result with practical real world rideability, partly conveyed via the quite upright stance that doesn't place undue weight on your arms or shoulders, so isn't tiring.

I can see why Lightning has done this, but focusing on its sporting DNA risks being a flawed strategy, commercially. The sportbike market is falling like a stone globally, and perhaps Hatfield should have come straight out with a Naked roadster that is what it says on the label,

as opposed to being one that looks like a sportbike, but isn't. Zero's astute positioning of the SR/F as a Ducati E-Monster on steroids, and its subsequent sell-out success - at a 50% higher price than the Strike Standard - shows what the market is looking for, and while Hatfield asserts that Lightning is developing just such a Naked Roadster, he says it won't be customer-ready until 2021. "We're working flat out on bringing this to market, in recognising the fact that it will most likely be our volume seller – especially with an even lower target price than for the Supersport," says Richard. Better late than never, I guess...

That's all the more the case because the pre-production bike I rode away from Alice's is such a great dynamic experience – though it must be said that it too was a mix'n'match hybrid version, this time of the two Strike models in the Lightning catalogue. While awaiting the forthcoming injection-moulded plastic bodywork (and, one suspects, a done deal with Showa for suspension supply), 'my' bike had carbon bodywork built in the San Jose factory, as well as the Carbon Edition's Öhlins TTX suspension and Brembo Monoblock radial brakes. Yet it was powered by the Standard's less powerful 150V motor, and carried just that model's smallest 10kW battery pack – though this doesn't affect performance, of course, just range and recharging times, which I didn't have the chance to investigate on this getting-to-know-you ride.

Setting those aside, the Strike's performance even in 150V guise was deeply satisfying. It doesn't have the massive grunt of the LS-218 I rode in customer guise five years ago, which was actually not particularly street-friendly – though the damaged example in for repair at Lightning belonging to Apple's Head of Global Services, who used it to commute to work until he was hit by a taxi while stationary at a stop light en route to his office, disproves that to some extent! But the LS-218 had an aggressive power delivery which, coupled with the massive hit of torque at 1rpm, made it thrilling without being particularly satisfying in real world use.

Hatfield has completely resolved that thanks to the cleverly sanitised way he's mapped the RBW/ride by wire throttle on the Strike, which still had only a single riding mode to choose from when I rode it (there'll be three at least, including a Rain mode, in customer form, which will be retro-fitted to existing customer's bikes). While there's always a thrill to be had by winding the throttle wide open as soon as you get the Lightning moving, in normal riding the initial acceleration isn't as fierce and vivid as on some other E-bikes, only coming on strong one you've got speed up to around 30mph. "We've made the throttle response very progressive because we want the bike to be comfortable to ride on the street," says Richard Hatfield. "So the first 50% of throttle movement accesses less than 30% of the torque - but then when you want to push it harder, as you go up from the other 50% of throttle rotation as measured by a potentiometer inside the handlebar, it progressively delivers more and more torque. The software we use to programme the motor controller allows us to dial in the torque curve in this way, as well as to alter the regen braking."

So in massaging the power and especially torque delivery for everyday use, Hatfield has delivered a degree of progressivity to the throttle response that makes riding the Strike both pleasurable and controllable. But that's without sacrificing the truly addictive thrill you get from cracking the light action throttle wide open when space allows, and surfing

the absolutely intoxicating waves of torque which deliver time-warp acceleration by the standards of anything with lights and a licence plate.

Yet at the other end of the scale, the Strike was super well-behaved creeping along at 25mph through logging towns up in the Redwood forests, whose primary income comes from speeding tickets! There, it was also on best behaviour in delivering the sounds of silence – I didn't have any pedestrians walking off the kerb in front of me this time because they didn't hear me coming, but this has happened to me riding such silent E-bikes in cities, and the EU's forthcoming compulsory added noise stipulation is an intelligent move. But apart from hearing the Brembo brakes screeching when used while cold, you have to wait till you get out of town for the Lightning to make any kind of sound – and then it's a thrilling one, because just like the multiple TT-winning MotoCzysz, the Strike SCREAMS as you wind it wide open, and the straight-cut primary drive gears make their mechanical music. It's an oft-repeated criticism that electric motorcycles are dullsville because they don't make any engine noise. OK - but instead you have the same kind of thrilling sound from the transmission that you get from a supercharged motor. It's both exciting – and addictive:

Shawn Higbee's R&D talents have also transformed the Strike's handling compared to the prototype I rode a year ago, having set the Öhlins suspension up much softer than usual for road use. I found the result super compliant running over rough tarmac up in the hilly forested lanes, with surprisingly good ride quality by sportbike standards – except it's not one of those: I forgot! Exiting a tight turn, I could play the throttle to gradually feed in the ever-present torque so smoothly, as the rear Pirelli hooked up and that linear build of grunt powered me out of the bend. No fuss, no dramas – just a lovely sense of liquid power and effortless performance that never stops being thrilling, as well as congenial.

Compared to a year ago, the Lightning Strike now feels agile, yet balanced - a super-intuitive ride over the switchback roads winding through the Redwood forests. There's honestly no sense of the 206kg/455lb weight the bike carries in terms of the way it turns, or how it flicks from side to side through a series of turns. It's true you have to work the meaty 320mm Brembo radial front brakes quite hard to stop from high speed, but they and the rear brake - whose foot pedal is in the conventional place, not on the handlebar, scooter-style - are up to the task, aided by the now super-effective regen brake settings Hatfield has dialled in to the customer Strike. This was set way too high on the prototype when I rode it, so maintaining turn speed was hard without consciously accelerating into and round a turn, and at low speeds I had to be cautious, else the Strike became unstable with momentum reduced so abruptly. No longer – now I could flow through turns much more easily on part or even zero throttle, although I'd still have preferred to have the regen adjustable, so I can choose the setting according to circumstance. There's also still no ABS fitted to the bike, meaning it can't be sold in Europe, though this is coming, says Hatfield – as it must.

This lack of ABS, the absence of any choice of riding modes, and the Showa suspension package and less high-end Brembo brake package still no-shows, makes it evident that the Lightning Strike is still very much work in progress as a customer product. I look forward to riding a genuine customer-ready Standard Edition model when it's ready – but as a further stage on the journey between the prototype I rode a year ago, and the eventual entry-level production version, this is a promising latest step along the path to Lightning's next-gen E-bike, where performance and accessibility are combined in a single affordable package.