S03E03: Redefining the electric bike: A conversation with Damon Motors

Derek Dorresteyn (00:00):

This is a really magic moment. Their mind is freed up to pay attention to their surroundings, when they want to break, how they want to apply that throttle because they're not a slave to managing the internal combustion engine.

Kyle Fox (00:28):

This is a Smarter World podcast focusing on breakthrough technologies that make our connected world better, safer, and more secure. I'm host Kyle Fox. Each episode we introduce bright minds and their approach to a more sustainable world. We discuss the opportunities and challenges they face and how technology can change the world for the better. Today it's all about smart, safe, and electric motorcycling. I'm excited to be joined by Derek Dorresteyn, Chief Technology Officer at Damon Motors. Damon is a global technology leader that aims to set a new standard for motorcycle safety and sustainability worldwide. Anchored by its proprietary electric power trade, Damon has captured the attention of the motorcycling world by delivering top speeds of 200 miles per hour with innovative designs while implementing new features that keep the driver safe and sound. Most recently Damon showcased its critically acclaimed HyperFighter motorcycle in the NXP booth at the Consumer Electronics Show 2024. Derek played an integral role in its technical development and I'm very excited to have him on the show. Welcome, Derek.

Derek Dorresteyn (01:32):

Kyle, so great to be here. Can't wait to dig in and talk more about Damon.

Kyle Fox (01:37):

Absolutely. So before we start, I have to admit I'm incredibly impressed by what I've learned about what you and your team have achieved with Damon Motors so far. So to give our listeners a little bit of context and background about that, in 2017, Damon brought the first motorcycle collision warning system to life. So something that we were beginning to see inside of the cars was brought for the first time into the motorcycle community. Only two years later, Damon introduced the world's first smart motorcycle and in 2020, launched the first proof of concept with the founders' edition being sold out within four days. So it was very popular. This is an amazing amount of progress over a very short period of time. So Derek, give our listeners a little bit more insight, unpack Damon's mission for a more safe and sustainable motorcycling world. What is that all about?

Derek Dorresteyn (02:26):

It started with the founders Jay Giraud and Dom Kwong having this idea to put an ADAS system on a motorcycle to create a safer motorcycle. And that mission led to hiring a small team and developing the safety system with some innovative approaches, using some off the shelf radars, but developing the ECUs internally that then process the radar data algorithms to alert riders to oncoming threats. And it was quite successful early. Testing was really promising. We brought a bunch of outside experts in and that led to really the beginning of Damon. Once it was discovered that there was a real appetite for this, Damon's vision really expanded, it went beyond just safety and turned into a whole motorcycle company and that's really where I came in, in late 2019.

Kyle Fox (03:521):

So that must have been a bit of a change of direction. It sounds so obvious to be able to take ADAS from an automobile and apply it to a motorcycle, but it's still astounding to think about having that type of technology. You listed out things like radar, et cetera. So tell me a little bit more about that technology. What makes a 360 degree safety bubble around a motorcycle work?

Derek Dorresteyn (03:40):

So we've got both forward and rear facing radars and cameras, so front and rear cameras, and we've experimented with several different techniques. So both using raw radar data to alert a rider to a threat, but also integrating vision system data and sensor fusion to create a more complete picture of what's going on. We think in the long run, this integrated approach is going to offer the most versatility in different conditions as well as adding other functionality like being able to read signs and traffic signals and the like.

Kyle Fox (04:18):

That makes sense and I believe y'all call it co-pilot, is that correct?

Derek Dorresteyn (04:21):

That's right. We call it co-pilot and it's probably not surprising to understand that the application of the motorcycle is significantly different than the car. Motorcycles as a virtue of their dynamic ride characteristics end up leaning when you turn. And so-

Kyle Fox (04:39):

I never thought about that.

Derek Dorresteyn (04:40):

... the entire data framework now also leans and part of the sensor data is now truncated by the road and you also end up pointing a different direction than you're going on this sort of arc as you lean. It's a very different problem than the car problem. We've had to develop some algorithms that deal with both that aspect of motorcycling and there's a significant more pitch that happens in a motorcycle. Motorcycles, as another aspect of their dynamics, transfer weight on braking. So the suspension very much collapses on braking, the motorcycle kneels down in the front. This again affects what the sensors are seeing and how you need to respond to that data.

Kyle Fox (05:28):

Let's unpack that because that was staring me in the face. I never really realized it. You lean when you're coming around, just turning or even just changing lanes and we were just talking a few days ago about camera stabilization, but a car typically if your car leans you've got a different type of problem. You probably are in the process of wrecking the car, but this is a regular thing that's going to happen. So yeah, you would have to have some pretty significant looks at the data, even the camera data because the camera data is going to be tilted.

Derek Dorresteyn (05:55):

So we end up truncating which part of the image that we use. In addition to the cameras and radars, we have a six axis IMU on the vehicle. So we have a very good picture of what the vehicle is doing in 3D space when this is happening, so that we can adjust the sensor data that responding to.

Kyle Fox (06:15):

That makes sense. As long as you know where it's at, you can actually start interpreting your 3D world as long as you've got data. Which now makes sense why you have radars both in front and back as well as visual cameras at the same time. That's a pretty rich data set.

Derek Dorresteyn (06:27):

That's correct. On the rear-facing sensors, of course we have lane change assistance is a functionality that's very useful for a motorcycle. Motorcycles end up having relatively poor visibility because a rider's got a helmet on and a helmet impacts their peripheral vision. It also impacts their ability to be looking at mirrors and so frequently riders have to turn their head and look behind them when they change lanes to make sure nobody's there. So having some sensor awareness of a car in your blind spot or a car approaching at a high speed that will potentially intersect your path is really important data for the rider to have. And so that's part of the rear sensor information that we provide to the rider.

(07:15):

There's another potential threat and that's a rear collision. So motorcyclists are notoriously not perceived of as threats by car drivers. So car drivers, they very much think of other cars and trucks and bigger things as threats. Motorcycles don't seem like a threat to life and limb and so they're not frequently seen. They're not acted on in the same way. And so because of that, motorcycle riders have to have a lot more situational awareness, even understanding when a car is approaching at high speed behind them and that might create an unsafe situation for a rear collision. So we give riders even a warning there where they might want to zip forward or get out of the way of a car that's closing on them too fast.

Kyle Fox (08:02):

I'm trying to think of my own experience with that, but you're right, if you're driving you may actually see the motorcyclist if I'm driving my car but it doesn't have that level of danger versus the 18-wheeler that may be on the left-hand side. I can see it but not see it at the same time if that makes any sense.

Derek Dorresteyn (08:18):

But clearly the biggest benefit is front collision and when you interrogate the safety data that's out there, there's been studies done both in the US and in the European Union because motorcycles have a much higher incident of injury than automobiles do. We don't have airbags, we don't have all the same safety features. You're really exposed out there on a motorcycle. A lot of the accidents tend to happen as front collisions in four-way intersections. There's various different mechanisms of that. There's people turning from side streets in front of the motorcyclists. There's people that are turning in front in a left-hand turn in front of a motorcyclist. And then there's scenarios where people have an emergency brake at an intersection and the motorcyclist may have already seen a car slowing in front of them and they may be turning their head and looking behind them so that they can pass that vehicle, they can change lanes to the left and pass that vehicle and that car slams on the brake.

(09:17):

So now you're not looking forward. The car in front of you has dramatically slowed. And so that is also a common accident where a motorcyclist will run into the back of a stopped car not due to inattention, but because they've got this other plan where they're going to pass it. The co-pilot safety system alerts the rider to these various threats with some strategically placed LED lights. But most importantly, and this is some IP protected feature with haptics in the handlebars. So you can get this vibration in the handlebar that alerts you to a front collision even when you're looking the other way. And at that point we're not currently intervening into the drive train. We're not doing automatic braking or cutting torque to the motor though those are features that we're experimenting with. But at that point the rider is

giving literally additional seconds to respond to this threat, so they can start applying the brakes even before they've turned their head around to see what it is that they're applying the brakes for. And that could make all the difference.

Kyle Fox (10:18):

Just with my own personal experience, I used to do long distance cycling. But that was something we always worried about because if you had a big train of bikers in front of you, you'd turn to your left to make sure that you can move out of the train, but if the guy or the girl in front of you hits their brakes, you're going to run right into them. And so it takes a lot of coordination. So if you're running 60 miles an hour, that window to do something about it is much tighter.

(10:41):

And you actually led into one of my big questions. You've got an amazing amount of data that you are centering this bike in, your 3D space and these warnings and alerts and that sort of thing is how do you get feedback to the rider? And I love the idea of haptic feedback because I was trying to think in my mind, what is the rider probably always doing? One of the things they're probably always doing is having at least one hand or hopefully both hands on the handlebars. Is there anything else like with the helmet? Is there anything where you might in the future projecting stuff on the helmet or is that even useful or is that distracting?

Derek Dorresteyn (11:11):

One founder in particular, Dom had some experience with heads up displays and it was his opinion that would be more of a distraction than a benefit. And there is some data out there. I can't cite the specific study that basically points to an input like a haptic feedback. A sensory input into your skin can be acted upon faster than a visual input because with a visual input you have to interpret a bunch of things going on in a really complex field and with a haptic input, it's really this one thing. And if you've already understood what that vibration is and you know what it is, there's not a lot of processing.

(11:50):

It means something in front of you is happening that you need to respond to. And so we think that potentially, and we have not done this experimentation or characterization, but we think that potentially the haptic feedback is a faster way to get this information to the rider. And in the end, this is all about giving seconds back to the rider to reduce the rate of accidents. And there was some comments in one of these crash data studies that said another second or two of response time by the riders could have prevented a large proportion of all the accidents that they collected data on. So we're chasing that exact thing.

Kyle Fox (12:30):

And it makes intuitive sense. We talk about that all the way in the four wheel vehicles where you're trying to gain back time to do something and focus the awareness, keep the driver looking forward the whole time and intuitively with the heads-up display, I agree with it. I have a heads-up display in my car, but I just use it to see how fast I'm going. But we've seen concepts that were like, yeah, we're going to put all these arrows on the screen. I'm like, if I put my mother in front of that car, you're going to increase the likelihood of an accident because she won't know what's going on. So haptic feedback is a little friendly poke to say, hey, you need to pay attention to this. That makes a lot of sense. The safety angle on this is huge, being able to save lives, that's really what it boils down to.

(13:09):

And I heard loud and clear from you is that also trying to change some of the perception of the safety of these bikes, which if they're driven correctly, and especially with co-pilot they actually are very safe. When you start talking about sustainability, we do a lot of stuff around where my house is and really we don't need that tons of metal to be able to drive myself to work every day. There's going to be more efficient ways of doing that. And one of the other pillars that you guys have is around the EV side of this, and I remember reading that I think you're one of the first, if not the first to hit 200 miles per hour with an EV drivetrain. There is no performance issue here. If people thought going to EV on a bike would somehow reduce your top speed, you definitely have that, correct?

Derek Dorresteyn (13:51):

That's right. And Damon clearly has a vision to electrify motorcycling on a global scale and we can talk more about what that vision entails. The first products are frankly very specialized products and they're meant to showcase that EV isin no way a compromise and that buying a bike like this is good and actually better than the comparable bike that you can buy from famous European and Japanese manufacturers.

Kyle Fox (14:19):

From your perspective, how is EV better than just the traditional high-pitched gasoline powered engine?

Derek Dorresteyn (14:23):

I've been in the CV motorcycle world now for 15 years.

Kyle Fox (14:26):

Oh, wow.

Derek Dorresteyn (14:27):

Yeah, so I founded another company called Alta Motors back in California, and the premise there was that we could make an electric motocross bike. It was an off-road race bike that was better than the gas bike that would perform better on the track. And a lot of that thinking has carried over into this first product for Damon, and it's really how do you make a motorcycle that is more intuitive for the rider? It's more connected, it's more part of the rider bike system. It integrates those things together. And you do that by removing something that we've become accustomed to, which is adjusting the way we interact with the vehicle to manage it. And so the internal combustion engine requires an incredible amount of management on behalf of the rider or the driver even in a car.

(15:18):

And we don't think about it, we just do it. And so you have to manage starting it. You have to manage shifting gears, keeping the vehicle in the right RPM range to deliver the right amount of torque, easing off the line to manage the way that torque is delivered. Because the torque curve on internal combustion engines is not linear. It's very non-linear, in fact. There's a lot of work that goes into creating flatter torque curves in motorcycles to make them more easy to ride, more accessible. Electric really solves all of that, so it gets rid of the sequential transmission, so there's no longer a need to shift gears to operate a clutch. And so this opens the doors to other customers that maybe have been put off by that or haven't even learned how to operate a transmission. You think about younger people now we have digital shift gearboxes, DSG, we have all this technology that has made this thing that is still common on motorcycles, the sequential transmission, completely obsolete and people don't know how to use them.

(16:24):

And so there's this huge barrier to entry into motorcycling that is managing all of that, managing the internal combustion engine, non-linear torque, a clutch to be able to shift. And it takes a little time to be good at that. With Damon's, HyperSport and Damon's products, we don't have any of that. So peak torque can be delivered at zero RPM. Of course, we have a suite of rider aids that sort of make that torque delivered in a safe way, but we can deliver peak torque from zero RPM. The torque is very linear and there's no shifting or clutching when this is a really magic moment. Their mind is freed up to pay attention to their surroundings, when they want to break, how they want to apply that throttle because they're not a slave to managing the internal combustion engine. Which in the motorcycle community, people are

really proud of how good they are hitting their shift points and doing all of that. But that's old thinking.

Kyle Fox (17:24):

It's old thinking. You just described why I've never ridden a motorcycle because like I said, I used to ride bikes with 18 gears, and what you just described is what a bicyclist going up a hill has to manage the gearing to do it, but it's a hundred times more simple on a bike than it is a motorcycle. But when I would think in my mind of extending that into something, I'm managing energy curves all the way through this and it's consuming all my time and I got to make sure I'm watching out for somebody who really doesn't even see me as a threat on the road. I was like, whoa, whoa, that's too much. But I loved how you said that, it's the magic moment. I'm sure you've seen that a lot of times, bring somebody into an EV bike that has to be a magic moment where they're like, oh, wait, it just works.

Derek Dorresteyn (18:03):

And then there's some additional performance advantages. If you look at that torque curve of internal combustion engine and the way that the gearboxes are set up, if you're trying to accelerate at your maximum rate, imagine on the internal combustion engine, you apply the throttle, you're building torque, you're not at maximum torque instantly. You're building torque, you're getting to peak torque, and then you shift and at the point that you shift, the gear ratio goes up by about 20%, and so now the RPMs go down by 20% and you're now at a lower point of torque. And then you're building up that torque into that high spot again before you then shift again. And what this means is there's a lumpy delivery of torque through all of that speed. If you're doing a big linear acceleration all the way up to top speed, it's lumpy.

(18:58):

It's not a smooth line on the Damon HyperSport, that's a smooth line. It's completely smooth. And so that does a couple things. One thing that it does is you accelerate faster because you spend more time at peak torque, accelerating the bike faster. So the bike accelerates faster than the internal combustion engine bike, but it also has benefits to chassis dynamics because you're not varying this torque. And so the suspension and the physics of the bike, because the acceleration rate is changing, they're not suddenly changing. So the bike remains in contact with the surface better or it has better traction, then the rider has more control because they're not managing any of that motion. So they have a much better sense of what's happening with the machine. In fact, they can feel the tire better.

Kyle Fox (19:46):

That. Exactly what was going through my head is they're going to feel more anchored, right?

Derek Dorresteyn (19:49):

That's right.

Kyle Fox (19:50):

And if they can accelerate faster back to the beginning of the podcast where you're talking about you may need to accelerate away from a danger coming up behind you or whatever happens, that actually makes it safer.

Derek Dorresteyn (20:01):

We end up doing quite a bit of testing on closed circuit racetracks. And we do this because we've got a very high performance motorcycle and we need to confirm its operating parameters at these higher speeds and more extreme conditions. And you can't do that on public roads. So we do this on a closed course racetrack with some quite skilled riders, but we also test back to back with a competitor benchmarking product. So we've got a product from a European company that's an internal combustion engine product, and we've had a chance to put some people on those bikes back to back. And even if it's their first time riding an electric bike, and it's notorious, especially when you're trying to ride these sort of high speed, high performance things, it's notorious that it takes a while to figure out a new bike and maybe the ergonomics are slightly different and the brake lever is three degrees different than you prefer it.

(20:57):

And there's always a lot of little things that riders need to get comfortable with before they're willing to really push the envelope of speed and hard braking and hard acceleration on a track like this. And we've had this experience many times now where we let somebody out on the benchmark bike to get a feel for the track, and they eventually get up to speed and they get comfortable on the benchmark bike and we put them on the electric and they're instantly running the same pace. Literally, in a lap they're running the same pace and the bike is that intuitive and this is different. This is a special moment. And then eventually they end up running a faster pace. And it's because of all this complexity has been minimized and it's a much simpler experience, and you have that time to think about your braking points, your acceleration points, all of that stuff. You're given back that extra focus and it's a really great thing.

Kyle Fox (21:49):

And you've removed the learning curve, especially for an experienced rider, but let alone somebody that's new to it. It's fascinating how all that comes together. And on the other side of EV, it's the sustainability side of it. And there's been this question of is EV lower lifetime

emissions than a gasoline engine? What does that do on the sustainability side from your perspective?

Derek Dorresteyn (22:07):

Absolutely, a hundred percent, life cycle of these products from mine to recycling again is a huge positive win. The numbers are constantly in flux of what that win is. I know that the fossil fuel industry was promoting this idea that EV batteries, if you looked at the total life cycle, including the EV battery, that it was not a win, but that's pretty much propaganda. I think it didn't consider the fact that we've got four or five companies now that have shown the ability to recover over 90% of the active materials in EV batteries through a recycling process.

Kyle Fox (22:49):

90% recovery?

Derek Dorresteyn (22:50):

90% recovery.

Kyle Fox (22:51):

Wow.

Derek Dorresteyn (22:52):

So this is the lithium, this is cobalt. These are all these expensive elements that are really driving a lot of the price in these EV batteries. And they think that over time this material stream for recycling will account for somewhere around 20% of the global material usage for EVs.

Kyle Fox (23:12):

That's a fantastic number.

Derek Dorresteyn (23:13):

It's incredible, and it's really a facet of where the industry is right now. We're still growing. We're still building the infrastructure to make this seamlessly fit into our lives. We've had to add our level two charging stations at home to support our EVs. Of course, the government is incentivizing the construction of tremendous amount of charging infrastructure in the US and in Europe. And it's wonderful because this really makes it easy. And Damon is really doing some interesting things in that part of it too. We have a 7.2 kilowatt AC charger on the vehicle that's built into our drive train, but we also have DC fast charging incorporated. So the DC fast

charging is another set of controls and another connector that is compatible with the standard J1772 charge connector. It's called J1772 CCS. So it has these big DC fast charging contacts on it in addition. And so with that setup, we can recharge our 20 kilowatt battery from 20 to 80% in about 35 minutes.

Kyle Fox (24:25):

That's very fast. And what kind of range does that battery give the bike?

Derek Dorresteyn (24:28):

We talk about the range in terms of a mixed drive cycle. So it's a combination of city and highway miles, arguably moderate speeds. And in that drive cycle, it's about 200 miles.

Kyle Fox (24:41):

200 miles?

Derek Dorresteyn (24:43):

That's right. And 200 miles is frankly further than the ICE bikes go. So they have small fuel tanks, so they don't actually go that far.

Kyle Fox (24:51):

You have a higher energy density, right?

Derek Dorresteyn (24:52):

Yeah. The 200 miles, that was another consumer concern, that is range. And we see this all the time across cars and motorcycles and even bicycles. People think about the longest possible trip they might do instead of what they do 95% of the time, which is actually shorter trips.

Kyle Fox (25:09):

If you include motorcycles in the global automotive industry, which is reasonable to say it is. There's a variety of challenges that we face, and I think you hit on a couple of them. There is one, just the charging. 10 years ago you'd be lucky to find too many chargers hanging around your regular route, but the industry definitely has been expanding to be able to make it easier and more affordable and more convenient is probably the better term for consumers to be able to charge their vehicles. That's a big challenge. The second one from a sustainability occurs to me that living here in Austin, if you want to go downtown, yes, its range is one of the first thing that comes to mind, but also just where are we going to park?

(25:44):

And if you're in a big car, you can go to a parking garage, but then you might take an hour just to get out of the thing if it's really busy. The obvious benefit of having what is considered a small vehicle like a bike is huge. And being able to have that kind of range with that kind of charge time, I would imagine that really helps not only with sustainability, but also just the lifestyle that people are talking a lot about, to make it easier to get in and out of the cities without huge parking lots and lots of traffic jams. This seems like this would be a big part of it as an overall challenge that motorcycles and the use of them would address. Right?

Derek Dorresteyn (26:15):

Absolutely, a hundred percent. And clearly when you look at it on a global basis, this is critical. The most common form of personal motorized transportation globally is a motorcycle. I bet you didn't know that.

Kyle Fox (26:30):

I didn't know that. Actually, I did not know that.

Derek Dorresteyn (26:32):

And so for most of the world, and this is predominantly in places like India, Thailand, Indonesia, the motorcycle is king, and you'll go to an intersection in a big city and there might be 70 motorcycles at the intersection. It's quite incredible to see. And you just can't fit more cars, right?

Kyle Fox (26:55):

Literally, there's no room for it. You just can’t do it.

Derek Dorresteyn (26:58):

There's no room. So the fact that a single motorcycle takes up the space of maybe a quarter of a car or less, you can just pack more bikes, you can park them in more places. And when you look at the pattern of human population growth and changes in demographics, we are becoming much more urban over the last 50 years. And it's accelerating the rate of transition from people living in suburban and rural environments to living in urban environments. And this is accelerating globally. So this is in large cities in Africa and Asia, this is everywhere. The same phenomenon is going on, and these cities are not growing in a way that can sustain everybody having a car. It just won't work. So motorcycles are really the dominant form of transportation there now and likely will continue to be. And the trick really is let's electrify

those motorcycles. Let's make them safer and let's continue to do the thing that's actually working.

Kyle Fox (27:59):

You just uncovered a hidden bias perhaps, or just a blind spot on my part. It is funny that the dichotomy here is that you've got American cities trying to make it easier to move around in. And that's already happening because there's a greater proportion of people using motorbikes in other countries. So we have the reverse problem. And now that provides a heck of a lot of context to your founders' statement. I want to go global with this because you're describing an existing market that can benefit from all the stuff we've talked about on safety and sustainability. It's a feedback loop. You inject these types of solutions into those markets, more people use it. There's going to be a greater impact on safety, lives saved, as well as sustainability of the planet itself. That's a powerful message.

Derek Dorresteyn (28:41):

Absolutely. And back to the North American application of these things, it's interesting. California has the highest density per capital of motorcycle usage of any state, largely due to a lot of the industry is focused there in California. With this long history, some interesting loopholes in the legal system have emerged, and one of them is this phenomenon called lane splitting. So in California, you're allowed to ride between cars, and there is some California Highway Patrol guidelines on what they think safe lane splitting is. And it's basically viewed as long as you're not going 15 miles an hour over what the other cars are going, you can travel between two cars. And this isn't done typically when cars are moving at highway speeds, this is done when the cars are stopped. You can imagine when the cars are stopped, this is a huge opportunity to now not be stuck in traffic, right?

Kyle Fox (29:42):

Oh, I see it immediately. Yeah, you're cutting your commute in half because everybody else in those cars are sitting on their butts waiting for things to move, and you're zipping right along.

Derek Dorresteyn (29:49):

That's right. And so a lot of people commute in dense urban areas on motorbikes just for this reason. In addition, to not to pay a high monthly rate for parking spots or other things because it's a lot easier to find street parking or less expensive parking for a motorbike. Damon is also, and this is future work, but Damon is working on integrating features into the co-pilot system that supports lane splitting.

Kyle Fox (30:15):

And let's be honest, one of the best ways to get EV use to increase and the sustainability increase is to make it worth the consumer's while. I mean, that's a huge benefit to be able to say, I'm going to cut your commute time significantly and we have the range for it, and you're going to have a much easier time parking and we're going to be able to do it safer. So what's your cooperation with NXP?

Derek Dorresteyn (30:37):

So we've specified NXP microcontrollers in all of our internally developed ECUs on the vehicle. And so we've done something pretty different than the typical automotive and ECU developments. If you look at a typical automotive OEM, they lean heavily on tier ones and tier twos and even tier threes to supply developed ECUs. Frequently, these ECUs are very long-lived. They're around for 10 plus years, they get integrated into the system. There's a lot of effort to get these things integrated and communicating and working within a complex system that might have a hundred ECUs, in some automobiles even more. And that whole ecosystem, to my mind, is completely dysfunctional. It frequently and almost always doesn't allow updates to firmware on the CCUs. You're locked in. And so we threw that out. Once again, old thinking. So we threw that whole thing out. We looked at our drive train, we looked at co-pilots, we looked at a whole family of ECUs on the motorcycle, and we said, first of all, we're going to own them because the value and the features of this vehicle are delivered via software to the rider.

(31:52):

So we're going to own these things because the most valuable part of it is the software and the ability to keep building on that software and keep enhancing the vehicle over time. We've built the infrastructure to do over-the-air updates, and certainly these are enhanced with the security and some of the features in the NXP products. But we built the infrastructure for our over-the-air updates of all of our ECUs. And since we've honed in on one particular family of NXP products, we're able to reuse a bunch of the software. So the lift of developing all these things simultaneously is less because we're reusing some of the internally developed firmware and then leaning heavily on NXP's amazing software libraries, which are a tremendous help in our development. And now we've got this ecosystem of our own ECUs that are doing all of our critical functions. They've got some of the highest performing silicon that exists with really great software support, and this is a cutting edge product. We're not leaning on 10-year-old tech from tired old school companies.

Kyle Fox (32:57):

And it ties way back to when you were talking about adding in lane splitting and you said it, we're thinking about adding that. And I'm telling you, my old school brain way of thinking of

this was like, oh, this must be five years in the future when they roll out a new bike that has this. But that's not what you're talking about. You're talking about upgrading.

Derek Dorresteyn (33:13):

We like to talk internally. We're going to build these products that get better over time. We're going to build bikes that the user's going to get a notice that, hey, we updated your software overnight. Here are some of the new features. Have fun.

Kyle Fox (33:26):

Incredible, and have fun. Let's talk about a specific bike, about Damon's HyperFighter. Personally, love the name. So that was recently showcased at CES's NXP booth. You were the technical visionary behind HyperFighter. And I'd like for you to tell our listeners a little about your baby here. It's an amazing looking bike. Tell us more about that.

Derek Dorresteyn (33:45):

The HyperSport, the first Damon product has got a very revolutionary drive train underneath the skin and that drive train, we call hyperdrive. It's a very integrated drive train. All these ECUs are very integrated in it. It's one big case that holds the battery. It holds all of the power electronics, the BMS, all of this power train stuff is all in one big case. And this case is also most of the chassis of the motorcycle. So we've simplified the way a motorcycle is made, we've made it really robust. This case is water tight, AP 67/69, so you could submerge it underwater. So that's the core of Damon's large motorcycle technology. And so HyperFighter is looking at a different segment of motorcycling than HyperSport. And so this segment is less concerned with low bars and being tucked in and going high speed, say on a racetrack.

(34:45):

And it's more of a practical motorcycle. It's a more upright stance on the motorcycle. It's something that you can and you will go out onto twisty country roads and have a really great time because this motorcycle is still delivering this blistering performance, this acceleration, these very high speeds, but it's got a more comfortable stance that allows you to transition into urban riding and feel more confident. So in the end, this is about delivering a no compromise better product into the market that displaces the existing market leaders and creates a whole new industry. So this isn't us just saying, hey, we made an electric bike. You should buy it because it's clean and it's sustainable. No, we're like, we made a better motorcycle that happens to be electric.

Kyle Fox (35:33):

I love that. It's not just about the EV. Would you ever see some of this, ADAS is too strong of a word into a bicycle. As a former cyclist, we worry about a lot of this stuff, but still, do you think it would ever transition?

Derek Dorresteyn (35:47):

I think it could. And I think there's a development curve that can see that happening. Currently, we're starting to look at the application of these systems in very low cost motorcycles. So we've announced a partnership with Latin America's largest motorcycle manufacturer and distributor, a company called Auteco. They're located in Columbia. They have plants and distribution all through Latin America, and they're interested to put copilot on some of the motorcycles that they already make. We'll also sell some Damon motorcycles with that partnership with Auteco, but they want to put copilot on low cost motorcycles that they make in those markets. And so we've been exploring ways to simplify the cost and really create the accessibility of this technology.

Kyle Fox (36:35):

At the end of every episode, we ask our guests the same question. How do you envision a greener world 50 years from now? What does that world look like?

Derek Dorresteyn (36:44):

So I'd say 50 years from now, we've obsoleted all of the carbon burning energy production globally, that we're all sustainable, solar, hydro, wind, wave, whatever it is. But we've gotten rid of burning fossil fuels and that our transportation networks have also transformed into cleaner versions of themselves, and that we're all taking part in really stewarding this planet into a sustainable mode, be it the way we use/consume materials, the way that we build things, all of that, or done in a more sustainable way.

Kyle Fox (37:23):

I loved what you said there, better stewards of this planet. It doesn't define an end goal. It defines a way of life. It defines an attitude.

Derek Dorresteyn (37:30):

It's a process. It's something that we have to keep doing for generations.

Kyle Fox (37:34):

And your work with them, you're definitely one of the good guys helping us into that future, for sure. It has been an absolute pleasure talking with you. My wife is going to be very mad at me because I think I want to go get one of your bikes. That just sounds so much fun. So Derek, again, thank you for being here today.

Derek Dorresteyn (37:50):

Thank you so much.

Kyle Fox (37:51):

And for our listeners, thanks for joining in and we will see you on the next cast.