

## Electra Meccanica

Electric automotive manufacturer uses Simcenter and NX to move from concept to finished product in 18 months



### Revolutionizing productivity

For nearly 50 years Intermeccanica made custom sports cars. Then owner Henry Reisner met Jerry Kroll, a passionate environmentalist who also happened to love sports cars. The two decided to fuse their passions. They sketched an idea for a three-wheeled, single-commuter electric vehicle. The goal was to marry their love of driving with their mission to save the planet and transform mobility in the process.

The result was a new company called Electra Meccanica, located in Vancouver, British Columbia, Canada, and a new car called the SOLO. Reisner, co-founder and president, and Kroll, co-founder, chairman and chief executive officer (CEO), knew they had to move fast with their concept, so they transformed a napkin sketch into a digital NX™ software design in a matter of days. Then they used Simcenter™ software to optimize and validate the performance of the all-electric SOLO. Finally, using NX CAM and 3D printing, Electra Meccanica built its dream car.

It took just 18 months to go from concept and digitalization to a road-ready vehicle.

Now they're working with Chinese manufacturer Zongshen to produce 75,000 SOLOs in three years.

"There truly is a revolution in productivity because of the Siemens software that we're using," says Kroll.

To top it all off, Electra Meccanica was uplisted to the NASDAQ Capital Market (under the ticker symbols SOLO/ SOLOW) in August 2018. To mark the occasion, Kroll rang the NASDAQ opening bell on August 30.

### Persistence pays off

Kroll met Reisner by walking into the Inter Meccanica office one day: "Jerry was an adamant environmentalist, convinced that electrification of vehicles was the future 15 years ago," says Reisner. "I didn't share that vision and on several occasions ushered Jerry out of my shop so I could get some work done. But his persistence knows no bounds, so he kept coming back and we became friends. When he brought the concept of a single-passenger, three-wheeled commuter electric vehicle to me, I thought it was a brilliant idea."

“The three wheel thing isn’t anything that you say, ‘Oh, it’s got to be three wheels,’” says Kroll. “It’s just the best package for light weighting the vehicle. If you run the analysis on the thing, you’re eliminating 25 percent of the weight, which you don’t need. And you’re in a single-person vehicle. As you’re driving, you turn the wheel and you don’t even know there’s just one wheel back there. It’s sublime.”

Kroll points out that 83 percent of people commute by themselves so a single seater makes an awful lot of sense. He says it also provides the best driving experience.

“I’ve spent the last 25 years in motorsports representing Indy 500 winners and all kinds of different drivers and all kinds of different series, and I’ve been racing cars myself for five years,” says Kroll. “My preference is a single-seater car and there’s a reason for that: It’s the purest form of the driving experience.

“The SOLO offers the single-seater experience for the road for \$15,500 (US). When you drive it, you get it. It’s like before you had a smart phone, you’d say, ‘Why do I need one of those?’ But once you have it you can’t live without it. This is a brilliant product and I predict we’re going sell as many SOLOS as Apple is selling iPhones.”

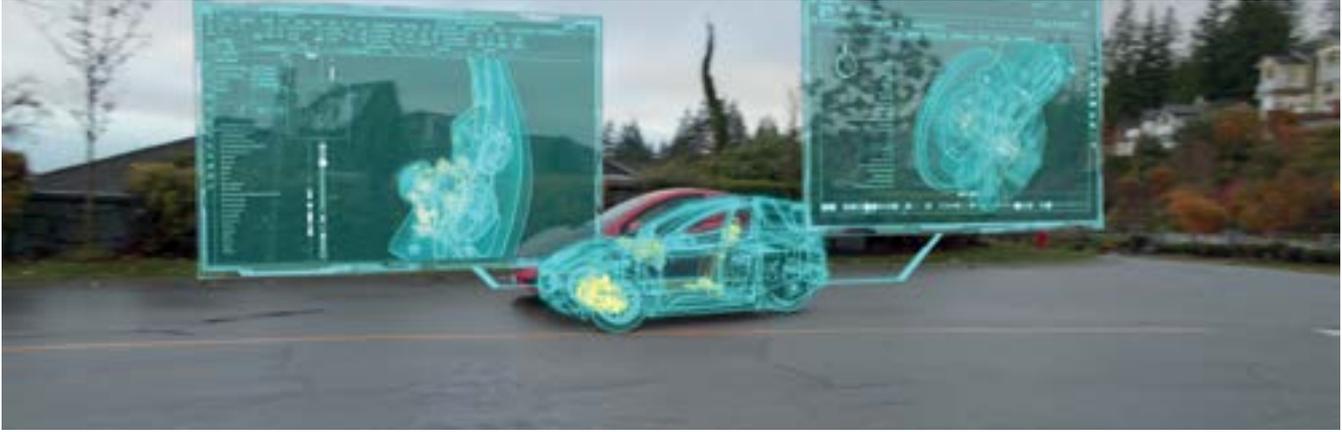
#### **The benefit of using a single interface**

Rich Hoyle, who is the principal engineer at Aligned CAE, was brought on in September 2015 as a direct contractor to Electra Meccanica. He worked on suspension and chassis design and general modeling and simulation for the SOLO vehicle.

“If you look at a vehicle development program, this was extremely rapid,” says Hoyle. “When I became involved in the project in September 2015, basically there had been some rudimentary surfacing done. We had the 2D sketch and the wheelbase to find the defined track, and that was pretty much it.

“One of the advantages of using NX and the fully integrated Simcenter™ 3D software is we’re not jumping between different tools for different activities so we can do our design and simulation work all in a single interface. We weren’t worrying about transferring data from tool A to tool B. That was a big benefit to us.”





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Jerry Kroll  
Chief executive officer  
Electra Meccanica Vehicles Corp.

Hoyle was used to working in the iterative design and computer-aided design (CAD) part of the process, which is largely disconnected from the simulation part of the process.

“With Simcenter 3D, we have a direct parametric link back to the CAD data all in the one GUI, so that means that we can analyze the design, work out how we remove this, reduce some mass here, go back into the design, iterate it with two clicks, and we have updated results,” says Hoyle. “Simcenter 3D is very powerful for rapid design development.”

#### **Design for manufacturing**

The fundamental vehicle design is completed so now Electra Meccanica is focusing on the manufacturing design. The firm is looking at the tooling processes so they can start considering drafts for body panels, and updating the design so they can produce this vehicle in volume.

“Using the NX tools for analyzing the formability draft and those types of issues is very helpful to us,” says Hoyle.

Zongshen is also using NX as the primary tool for the design so they are able to take the design, alter it slightly for high-

volume production and look at all the different molding/forming requirements they have for their mass-volume production.

“We have a constant design loop with our partners in China, who are going to be mass producing the vehicle, and they’re using all the different tools of NX as well as the CAE tools,” says Hoyle. “The fact we’re both on the same page with the tools that we’re using certainly makes the design process a lot easier and the communication a lot smoother.”

#### **Getting to market faster**

“The world is changing and we have two strains of companies that are manufacturing, and what we’re looking at is a totally different way of thinking,” says Hoyle. “The smaller companies have smaller budgets but they have more nimble teams. What they’re looking to do is get tools that enable them to achieve engineering excellence on small budgets with small teams, and tools like NX and Simcenter allow them to do that.”

In the past, simulation has been used for prevalidation of design before going to testing. The tools have evolved so now a manufacturer is able to start looking at preprocessing a design, getting as close as they can to being prepared for the test.

For the composite materials of the chassis, for example, Electra Meccanica used the Simcenter 3D Laminate Composites solution to look at various layups for the skins of the materials and body panels. It is a powerful tool, notes Hoyle, for trying different methodologies for lay-up and also optimizing material usage and distributing layups in different areas of the vehicle, all inside of the Simcenter 3D environment.



“When we looked at the suspension architecture, we used the Simcenter 3D motion tools to evaluate turning radius, roll centers, that type of stuff in the suspension design,” says Hoyle. “Those tools helped us visualize easily and quickly, and make rapid design iterations based on our turning circle requirements, which are obviously extremely tight since we want it to be a great city car so it has to get into tight spots.

“We use NX CAM and the NX 3D printing functionality for prototype development, and generate our parametric toolpaths here, which is another benefit to keeping everything inside of one system. We can have a CAD model that we’ve done in NX that’s parametric and is easily adjustable, and have a fully parametric one linked into our CAM software, which is in NX and can then go straight to our CNC machining center.

“The key benefit is having the design and simulation all inside one environment, and being able to modify a design and automatically update a simulation result

to see the cause and effect. As far as a tangible result, it enables us to iterate faster and get to market quicker, which is really the goal here.”

#### Shutting down the last gas station

“If you look at the numbers, there’s not a lot of competition in electric cars,” says Kroll. “There’s still a bazillion gas cars being built. That’s our competition and we’re trying to encourage as many of those gas car companies as possible to stop doing that and join us in building electric cars.

“The electric car is like the internet and a gas car is like a fax machine. Once you drive it you get the difference. The only difference is that fax paper wasn’t killing the planet and gas is. Less than 10 percent of the cars that are being sold today are electric. We’ve got a long way to go and the faster that we can inspire the big auto manufacturers, in addition to Tesla and GM, to start building all their cars without fossil fuels, the better. That’s really what this company’s mission is: To shut down the last gas station.” ■

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Rich Hoyle  
Principal engineer

