

A Powerful One-Two-Three Punch for American Manufacturing

Paul Elio wants to keep the American Dream alive. The 52-year-old mechanical engineer started his own car company, **Elio Motors**, in 2009, after 13 years as head of an engineering consultancy, ESG Engineering, and a four-year stint as a design engineer at Johnson Controls. If things go according to plan, the first Elio automobile—an 84 mpg three-wheeler with a base price under \$7000—will roll off the assembly line at GM’s former Hummer H3 plant in Shreveport, Louisiana, next year, carrying with it Paul Elio’s commitment to creating American jobs and his faith in American automotive ingenuity.

“From day one, I wanted to build a 100 percent American car,” Elio told *D2P* in a phone interview. “I can show, with data, that we can build a low price, high quality vehicle in this country with about 90 percent North American content. We have to make things in this country and we have to export from this country. I think it’s critically important to our long term survival as a nation.”

Reshoring is real, but it’s only one part of a robust expansion currently taking place in U.S. manufacturing.

Elio estimates that manufacturing the car—known as the Elio—in the United States will create more than 1500 jobs at its Shreveport facility and approximately 1500 jobs throughout the supply base, most of which is located within easy reach of Elio’s design center in Livonia, Michigan. Another 18,000 jobs are projected to be created as an indirect result of the manufacturing. The company is currently building its E-Series test vehicles at its Pilot Operations Center in Livonia, where its engineering team and supplier partners will put the cars through a battery of safety, aerodynamics, and durability tests before the final design is approved.

The Elio is a compact three-wheeled vehicle that uses a combination of strong, lightweight materials and aerodynamic design, including front-to-back, two-person seating—to achieve fuel efficiency targeted at 84 mpg on the highway and 49 mpg in the city.

Safety is a high priority of the design, which calls for three airbags, a reinforced roll-cage frame, an anti-lock braking

Paul Elio, CEO of Elio Motors, stands beside the Elio, a high-mpg, low cost three wheeled car that will be manufactured in the USA using approximately 90 percent North American content. Image courtesy of Elio Motors.



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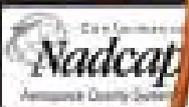
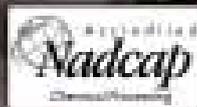
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Technicians install the right-front fender of the Elio E-Series vehicle at the Elio Motors Pilot Operations Center in Livonia, Michigan. Elio Motors plans to build 23 E-Series vehicles for crash and validation testing, prior to moving to commercial production of the vehicle in its assembly facility in Shreveport, Louisiana. Image courtesy of Elio Motors.

system, and crush zones 50 percent larger than those on similar vehicles. One of the keys to achieving its low price point, targeted at \$6800, is the use of existing technology that has been re-engineered throughout the vehicle.

“Most of those parts exist and are already in production somewhere on another vehicle, and we’re just putting them together in a unique way,” said Elio. “So it’s innovative, but not high risk.”

The Genius in the Supply Base

The vehicle has been designed through a series of what Elio calls “supplier summits” that recognize the expertise of Elio’s supplier partners and seek to tap their expertise. All of the suppliers get together to work on the Elio as a group for three days, break apart, and then come back together to do it again. In Elio’s eyes, there’s no better way to design a car.

“There’s been heavy supplier involvement from the very beginning, and then through the process, and that’s part of why we can hit this price point—by involving them before you draw the lines, rather than after you’ve kicked off tooling,” Elio said. “They can use their knowledge base to improve the product.”

According to Elio, the supplier summits were a revelation to some engineers, whose ideas for design improvements aren’t often heeded in the traditional OEM-Tier One relationship. “There’s a guy who had been an engineer for 30 years, and last year, at one of our summits, he’s like, ‘I’ve never had this much fun coming to work,’” Elio said, “because we were willing to listen, and he’s a smart guy, and he had lots of great ideas. I think the real genius of the car industry is in the supply base, and in engaging them and listening to them.”

Who are the suppliers for Elio Motors? It’s an impressive list of mostly North American/U.S. companies that Paul Elio doesn’t keep secret. One, **Admiral Tool**, is an assembly manufacturer in Livonia, Michigan, that specializes in steering column assemblies and steering-related components. One of the reasons Elio Motors chose Admiral Tool, ac-



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According to the company, is Admiral Tool's reputation for reliable systems for controlling vehicles. "Additionally, Admiral is a U.S. company that supports our mission," Elio states on its website.

Another, **Peterson Spring**, is a Southfield, Michigan-based designer and manufacturer of engineered metal products, including springs, coiled retaining rings, wire forms, hose clamps, and assemblies for the automotive, industrial, and motor sports markets. The company will be supplying Elio with parts that include engine valve train components, springs, shock absorbers, and wire forms. Other suppliers to Elio Motors include D.E.S. Group, Eastern Catalytic, MVO USA, and Genesee Group, among others.

Paul Elio was asked what he sees as the most important benefits that Elio Motors, as an OEM, will achieve by working with American suppliers. He said that in addition to creating American jobs, Elio Motors will be getting a top quality project.

"When you look at the names here, there are no second stringers; these are all top-shelf suppliers," Elio told *D2P*. "And by focusing on sourcing in North America, we create a lot of jobs directly in our own factory, but we also create an enormous amount of jobs across the country in the supply base."

For thousands of manufacturing workers and daily commuters to jobs ranging from restaurant to retail, the Elio will be a vehicle for keeping their dreams—the American Dream—within reach. When Paul Elio started Elio Motors in 2009, the economy had tanked, creating

additional challenges for people who were already struggling to make a living.

"People were losing their jobs, which meant credit was in trouble, and folks started losing their cars," said Elio Motors Vice President Jerome Vassallo during an interview at Mohegan Sun in Uncasville, Connecticut, where a prototype of the Elio was on display at a Barrett-Jackson auto auction in June. "Once you lose the car, you're [in trouble]. So you've got very qualified Americans out there that have to take two part-time jobs so that they don't lose the house. Even though they may be qualified for that job across town, they no longer have transportation to get there. That's when Paul stepped in and said, 'I know I can fix this.' That's how it started. The idea was to get Americans back to work."

Readying for Production

Elio Motors plans to build 23 E-Series vehicles for crash and validation testing, before beginning commercial production of the vehicle next year in Louisiana. In the meantime, Paul Elio expresses gratitude for the passionate commitment that his staff and suppliers have shown for the success of this unique project. "Everybody on this project has done way more than we paid them to do, without exception, and I think it's because everybody believes in what we're trying to accomplish, and that we can pull it off," said Elio.

Some economic analysts believe that innovation, widely seen as an engine of U.S. economic growth, is dependent to a great extent on the strength of American manufacturing.

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If American manufacturing falters or weakens, innovation will suffer. Paul Elio is doing what he can to make sure both—domestic manufacturing and innovation—continue to thrive.

“Knowing that we can have the impact that we’re going to have is really what gets me up in the morning,” said Elio. “We can reduce total U.S. gas consumption by nearly a half percent after five years of sales—that’s a meaningful number. Whether your big concern is global warming due to greenhouse gases, or our trade deficit due to foreign oil, the answer is the same—use less oil, and we do that better than anybody. We create thousands and thousands of American jobs, and what doesn’t leap off the page for you, initially, is that if you’re struggling in this country, your biggest issue is mobility. And now, people who are struggling can get to their job. And so this project is really important. It moves the needle on a lot of very important things in our country, and I think that’s the coolest part—getting to be a part of something that has that kind of impact.”

Three Pillars of Support

It wasn’t that long ago that manufacturing jobs were leaving the U.S. for lower cost countries at an alarming rate. In the years 2000-2007, the United States lost a net total of about 220,000 manufacturing jobs per year to offshoring, according to the Reshoring Initiative, a non-profit organization that works to help bring manufacturing jobs back to the United States.

But today, more manufacturing work is coming to the U.S. than leaving the country, according to the Reshoring Initiative. Fueling the turnaround is a potent three-part

combination of reshoring (the return of previously offshored manufacturing work by U.S. companies), foreign direct investment (FDI) in the U.S. manufacturing sector, and domestic investments by U.S. companies, such as Elio Motors—that are either starting up new operations or expanding existing U.S. operations.

Last year, the combination of reshoring and foreign direct investment brought 67,000 new manufacturing jobs to the U.S., the Reshoring Initiative reported in its 2015 Reshoring Report. That combination has also added more than 249,000 jobs from offshore since the low of February 2010, when 11.45 million people were employed in U.S. manufacturing jobs. Today, about 12.32 million Americans are employed in the manufacturing sector, and more manufacturing work is coming to the U.S. than leaving the country, according to the Reshoring Initiative.

“We publish this data annually to show companies that sourcing domestically is an increasing trend in the United States,” said Harry Moser, founder and president of the Reshoring Initiative, in a statement. “With 3 to 4 million manufacturing jobs still offshore, as measured by our \$500 billion per year trade deficit, we see potential for even more growth.”

In June, the U.S. Department of Commerce released a report confirming that foreign direct investment in the United States remains strong, with total FDI growing at an average of 6 percent per year. The report, titled “Foreign Direct Investment in the United States: Update to 2013 Report,” stated that the U.S. is the “largest recipient of global FDI, with an inward FDI stock of \$2.9 trillion on a historical-cost basis in 2014.” As an industry, manufacturing claimed the highest percentage of that FDI stock, taking



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in 36 percent, for a total of \$1.05 trillion on a historical-cost basis.

“This report reaffirms that America is the world’s best investment destination,” said U.S. Secretary of Commerce Penny Pritzker, in a statement accompanying the report.

A Voice for Hiring US Veterans

As a kid growing up in Bridgeport, Connecticut, during the 1950s and ‘60s, John Ratzenberger heard the hard sounds of machine tools punching, bending, drilling, and cutting metal, often late into the night. Bridgeport, a port city on Long Island Sound with access to a vital freight rail network, had long before established itself as an industrial powerhouse of the Northeast. Connecticut’s largest city was home to a mix of product manufacturers—companies like Bridgeport Machine Tool, Remington Arms, and Singer Sewing Machine—and the smaller machine shops and stamping houses that churned out parts for their equipment.

“I was surrounded by people who knew how to make things,” Ratzenberger said in an interview with *D2P*. “If you couldn’t fix or make something, your father or your uncles, or somebody else in the neighborhood, knew how to do it. Everybody seemed very self-reliant, and that was my introduction to manufacturing.”

Some of Ratzenberger’s relatives worked at the Bridgeport Machine Tool Company, and he remembers how proud they were when they talked about tolerances of one twenty thousandth of an inch (0.020 inch), “like the fate of Western civilization depended on it,” he said. “As I travel around the country, visiting different factories, I still

see the same machines in operation that were operating 80 years ago—still operating like they were brand new.”

Ratzenberger is perhaps best known for his portrayal of Cliff Clavin, the know-it-all mail carrier on the critically acclaimed sitcom, *Cheers*. But as he produced and hosted the Travel Channel’s documentary series, John Ratzenberger’s *Made in America*, from 2004 to 2008, he became widely known as a staunch advocate of American manufacturing. These days, he serves as the official ambassador for **Elite Aviation Products**, an Irvine, California-based engineering and manufacturing company that provides precision machining services—including 5- and 6-axis CNC machining and Swiss turning—to the aerospace industry. The company employs 54 people, 15 of whom are engineers working in manufacturing, design, or quality.

In his role as company ambassador, Ratzenberger works with politicians on both sides of the aisle to support companies in their efforts to increase the available pool of skilled workers by employing American veterans. He and Elite Aviation Products President and CEO Dustin Tillman recently testified before the U.S. House of Representatives’ Small Business Committee to share with legislators some of the prime challenges facing small manufacturing companies, including reshoring—bringing manufacturing jobs back to America—and implementing strategies for addressing the skilled labor shortage.

“Right now, there are almost a million jobs available in manufacturing, with nobody to fill them,” he said. “One of the reasons I enjoy working with Elite Aviation is that they started a program of hiring veterans, which is a great, smart thing for everyone to do.” When veterans get to the



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workplace, he said, they've already been trained in life skills that translate well to most jobs. "They're disciplined, they show up on time, and they get the job done." And they might even be suited for a specific job that they've already been trained for, he said.

Ratzenberger said that he believes it's critical for U.S. manufacturers to keep manufacturing onshore. One of many reasons for doing so, he said, is to insulate themselves from any unforeseen challenges that may impede international freight shipments. The payoff for companies is that they can count on receiving their parts much faster than they could expect to get them from overseas. "It is so very important. That's how we won World War II, with our abilities to make things fast. And if you're not making things in this country, well, then you're not going to be making things fast."

A New Golden Age of Aviation

When Dustin Tillman and co-founder Zeeshawn "Zee" Zia founded Elite Aviation Products in 2013, they were determined to instill in the company a mindset to embrace new technologies and optimize the efficiencies they provided. They had previously worked for large companies in the aerospace and defense industry, and had seen many suppliers that still possessed much of the same technology they had been using for the last two, three, or four decades.

"We elected to start a company from a blank sheet of paper so that we could really put in measures and building blocks that would allow for extraordinary and unlimited growth over a very long period of time," said Tillman in an

interview. "Specifically, that was to ensure that technology was part of our DNA."

Tillman and Zia also focused on putting in place systems—such as their ERP system and how their machine technologies communicated with each other—that were mature and very scalable to accommodate the high levels of growth that they envisioned. Another essential building block was their focus on human capital, including the question of how to change the mindset of those entering the workforce to be really excited about and embrace machining technologies. Tillman said it's important to counter the misperception that manufacturing is less than exciting, especially among millennials, since the average age in the industry for a machine technologist and operator is over 50 years old.

"We built a very robust human capital management system that would allow for scalability," said Tillman. "That's building up bench strength, making sure we're marketing to the right schools and institutions, not just for the folks who have 15 to 20 years of experience, but for the next generation. So we partnered with four separate technical schools nearby and have created internship programs and have hired many of those folks."

Elite's outreach extends to the veteran community, and Tillman is proud to say that U.S. veterans make up 10 percent of the company's labor force. Efforts to attract workers will be a perpetual necessity, he said, because Elite intends to scale up as the market grows.

"We're entering what's being referred to as the second Golden Age of Aviation," Tillman said, "and we don't see

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any limit to the growth that’s in front of us. So, you’ve got several trillion dollar industries that need to be supported adequately over the next 50 years, and we certainly want to be there at the top of the list, growing as the market grows.”

Tillman believes that Elite’s adoption of precision machining technologies, including 5-axis CNC machining and 6-axis Swiss turn milling, and advanced manufacturing automation, robotics, and multiple pallet changing systems, is the company’s ticket to thrive in this new Golden Age. He said that one of the company’s key differentiators is not just its ability to embrace new technology, but its penchant for optimizing that technology so as to produce high-quality parts at a measurably faster rate. Product manufacturers are taking notice at a time when many are turning to domestic suppliers, rather than overseas, for parts manufacturing.

Total Cost of Ownership Analysis Leads to Reshoring

Elite is proud of having been able to win work back from low cost countries by helping to show its customers how, with a total-cost-of-ownership mindset, working with suppliers overseas can be exorbitantly more costly than sourcing domestically. Often, Tillman said, invisible costs related to maintaining quality, processing, and shipping can go undetected, ultimately affecting the bottom line. “Helping our customers to recognize this has been extremely beneficial to both them and us,” he said.

The company won a large contract with an airframe manufacturer that had been procuring parts from China

to fabricate seat monuments. The rejection rate for the parts had topped 50 percent per delivery, leaving Elite’s customer in a predicament because to have the parts reworked at the manufacturer in China would be extremely cost prohibitive and involve further delays. In an effort to manage the supplier, Elite’s customer had its quality team visit and surveil the supplier on multiple occasions, costing the customer tens of thousands of dollars in unnecessary airfare, hotels, and other expenses.

“When our customer tallied these totals up and amortized this cost back through the piece price for the goods, they were appalled by the results,” Tillman said. “This made their decision a no brainer. We hope more companies take the time to go through this exercise.”

Proponents of reshoring say that it’s important for companies to have their manufacturing operations, or sources, in relatively close proximity to their R&D and design centers in order to nurture and support innovation in product development. Tillman said that Elite has had great successes in working with customers located close to its operation.

“Working with innovative companies, we’re really able to take that product from concept, in a prototype environment, all the way to production,” Tillman told *D2P* in an interview. “Whereas in the past, a lot of prototype work would be supported and then they would move that work. We see a lot of tribal intelligence created during that collaborative process, so that as you do mature into a production environment with some of these products, the learning curve allows for unlimited innovation, in my opinion.” ■