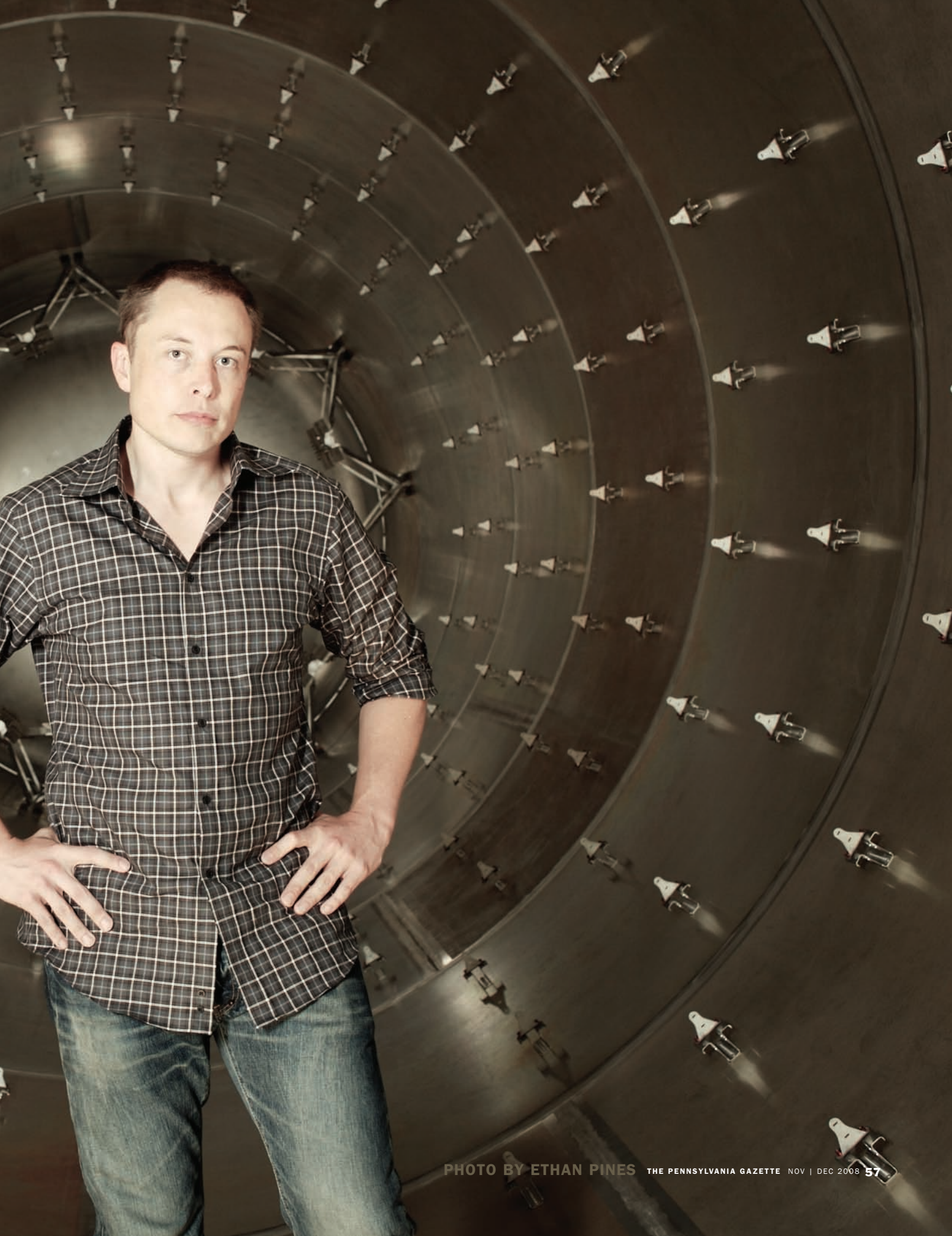
The Next, Next Thing

BY ROBERT STRAUSS

If serial entrepreneur Elon Musk has his way, sending a payload—and eventually, people—into space will be handled commercially, more like UPS than "the Right Stuff." (At least if you leave out the part about settling Mars.) Oh, and the rest of us here on earth will be able to tap affordable solar power and drive fast, efficient, cool-looking electric cars.



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The way Adeo Ressi C'94 tells it, "all this space stuff" started with a somewhat whispered-out-loud daydreaming session coming back to New York City after some time on the beach on Long Island.

"The wife and the girlfriend were sleeping when I blurted out, 'Hey, let's do space,'" Ressi recalls. "Elon and I immediately thought it was the stupidest idea we could think of. But then, somehow, it seemed just right. It really fits what he is—looking for the challenge that is just beyond what everyone else is thinking."

Shortly before that driving trip Ressi and his one-time Penn housemate, Elon Musk W'95, took, Musk's second Internet startup company—originally called X.com but by then merged with another company and known as PayPal—had been sold to eBay for $1.5 billion. This was after his first, Zip2.com, had sold for $305 million in 1999 ["From Zip to X," Nov|Dec 1999]. Fabulously wealthy and barely into his 30s, Musk was actively in search of that fabled "next, next thing."

"I had always been interested in space, from the time I was a kid looking at the stars in South Africa," says Musk. "It wasn't that much of a stretch, at least to me, that I would try something to get us there, cheaply and with a sense of environmental soundness."

Not even your average thinking-out-of-the-box Silicon Valley entrepreneur would necessarily connect going to Mars or the moon with an environmental imperative, but that is how Musk's mind operates, say his friends and business associates. It is not that he is exceptionally moral or righteous, but when he is gripped by an idea—*obsession* might be a better word—he makes it important and won't back away from accomplishing it. In a December 2007 article naming him its "Entrepreneur of the Year," *Inc.* magazine noted that Musk, in contrast to many entrepreneurs who build their companies on incremental improvements, "has distinguished himself by attempting things that most people who care about avoiding personal bankruptcy would not even consider."

Space Exploration Technologies—the result of that seminal discussion with Ressi—certainly fills that bill. SpaceX, as the company is generally known, is in the business of developing launch vehicles—at a fraction of NASA's costs, he hopes—to more easily send payloads, and eventually people, to the moon and beyond. Musk, who has invested a reported $100 million in the company since founding it in 2002, is both chief executive officer and chief technology officer. In late September, after a series of failed efforts that would have tested the resolve of many an entrepreneur (though apparently not Musk's), the company successfully launched one of its rockets into orbit around the Earth—the first privately developed rocket to manage this feat.

Musk is also involved in two other initiatives with major environmental implications—as chairman of Tesla Motors, a company that has designed and will aggressively market an electric sports-car capable of traveling more than 200 miles on a single charge while going from 0 to 60 mph in under four seconds, and as a major investor in SolarCity, which has started bringing cheaper solar energy to homeowners and other individual customers in California.

It all started, Musk says, when he was just a kid who dreamed the American dream—albeit from Pretoria, South Africa, where he grew up middle-class, the son of an engineer and a dietician. Musk was a tinkerer as a kid, and even developed and sold a computer game, "Blast Star," when he was 12. His biggest dreams, though, were about space and about coming to America.

"I have to admit I might have been a bit too fascinated about America, but it really did seem everything was possible there and, at the time, not so possible in South Africa," where the system of apartheid was still in place, says Musk. "And I did have this thing about space. I still believe this: If we continue upon the Apollo program and get to Mars and beyond, that will seem far more important in historical context than anything else we do today. The day multiplanetary species come about, things like the Soviet Union will be forgotten or merely remembered by arcane historical scholars. Things like the invasion of Iraq won't even be a footnote."

After graduating from high school, Musk left South Africa—in part to avoid army service there—and came about as close as he could to the U.S., enrolling at Queen's College in Kingston, Ontario (his mother was born in Canada). He completed the journey by applying to Penn as a transfer student, arriving on campus in his sophomore year to study economics and physics.

And also to have a bit of fun and make a little cash on the side with his buddy Ressi.

"We were both transfer students and they stuck us in these giant dorms and we just wanted to get out," recalls Ressi, who transferred to Penn from Carnegie Mellon University. So they found each other and rented a house off-campus. "But then we weren't connected to the fraternity scene, and we weren't new students either. We had to meet people, so we decided to have parties, but since we also didn't have money, we decided to make it a business."

They hired bouncers and even cleaning crews, charged enough to always have a little left over to spend, and realized they had gotten the entrepreneurial bug.

"They do that sort of thing all the time now, but back when we did it, everyone thought it was clever and business-like," says Ressi, himself the veteran of several startups—most recently as the founding member of TheFunded.com, a website where entrepreneurs can bite the hands that feed them (or decline to) by rating and otherwise commenting on venture-capital firms. "I think Elon was careful to do everything right then, and has not wavered from that same sort of attention to detail now."

After Penn, Musk went to Stanford in 1995, intending to earn a graduate degree in high-energy physics. Within a month, in the midst of the Silicon Valley startup frenzy, he decided his time would be better spent working on a software idea—one designed to help news organizations provide content online. So he dropped out and started what became Zip2, which was bought four years later by Compaq's Alta Vista division.

At the same time, Musk was developing the software for his next venture, which he called X.com. With more and more people becoming comfortable on the Internet, Musk saw that they would want to pay their bills from their home computers, and companies would certainly welcome a good clearinghouse type of program.

The programmer in Musk is never alone, though. He is always being joined by the business guy. Musk was looking for synergies for his new system and found it in

On its fourth try, in September SpaceX's Falcon 1 rocket successfully launched from the company's test site in the South Pacific and reached Earth orbit after about nine-and-a-half minutes in flight.

Confinity, a company primarily designed to beam money between Palm Pilots. Part of Confinity, though, was a product somewhat like Musk's at X.com, and it was called PayPal. Confinity and X.com merged in 2000, and in 2002 the combined company, by then known as PayPal, Inc., was bought by eBay for $1.5 billion. Musk owned nearly 12 percent of the PayPal shares at the sale, so while he did not have, say, Bill Gates' kind of money, he had clearly jumped from the ranks of the merely very wealthy into the I-can-do-whatever-I-always-wanted-to-do category.

And what Musk had always wanted to do was go interplanetary. In fact, several months before the sale of PayPal he had already started SpaceX. "I didn't and still do not have an expertise in rockets, but I am determined to acquire it," Musk says. "It is not like I ever worked for Boeing or Lockheed. But I do have an understanding of how things work in physics and engineering, and the people at SpaceX are arguably the best in the world at what they do."

Originally, Musk thought his mission was going to be to settle Mars—or at least figure out how to grow things on the planet, since conditions there share at least some similarities with Earth.

"If you go from the context of what is the best place to establish a self-sustaining human presence, Mars is substantially superior [to the moon] because the resources on Mars are vastly greater," Musk says. "On the moon, you are missing a bunch of elements. Mars has the minerals, and a tremendous amount of water in permafrost. If you could raise the temperature on Mars about 30 or 40 degrees Celsius, it would be under water. The basic point is, there is enough water in permafrost. On the moon, water is almost completely absent. Also gravity on Mars is closer to that on Earth."

That business guy in Musk, though, always tempers the visionary. The people he found who were most interested in the Mars idea were a bit too dreamy, and he wanted something that could produce results. Eventually, that desire led to modifying the mission into SpaceX's current goal of manufacturing space-launch vehicles with lower costs and higher reliability.

"If you wanted to separate SpaceX into what I think makes sense as far as human exploration of space, it is that SpaceX is a commercial company, with the objective of producing a reliable, low-cost, launch vehicle that will be used to put a satellite into orbit," Musk says. "If we do it right, NASA will use it for human exploration of space, and that is the ultimate goal."

Like anyone entering a new field, Musk looked into the fraternities, so to speak, of space exploration, the groups and individuals involved in thinking about the moon, Mars, and beyond.

"Elon is a true visionary," says Louis Friedman, the executive director of the Planetary Society, which promotes all ideas about space travel and of which Musk is currently a trustee (as is Ressi). "When he wanted to change his career from the Internet to space exploration, he wanted to know not just what was fantastic, but where he could make a difference.

"He first came to talk to me about Mars, but in the end, he is building a rocket," Friedman adds. "One could say he scaled back his ambition, but he has not scaled it back at all. He still wants to go to Mars, but unlike many, he has decided to make a business out of it.

"To the extent that he can spark an interest in other people, he is doing it. He has that old NASA we-can-do-it attitude. Whether he succeeds or fails on any given launch is irrelevant. It is the valiant attempt that makes Elon."

Ressi was with his old roommate on many of Musk's initial trips to build the company and drum up business. "We went everywhere: France, small private contractors in Russia, the Pasadena Jet Propulsion Lab, the people who have the X Prize," says Ressi.

(Both Ressi and Musk are also trustees of the X Prize Foundation, which awards $10 million-plus prizes for being the first to achieve goals it determines—most famously in 2004 to the builders of SpaceShipOne, which managed to meet the challenge of carrying three people to 100 kilometers, or roughly 62 miles, above the Earth, two times within two weeks.)

"It ran the gamut from the seemingly crazy ideas to the large nationalistic space programs," Ressi adds. "We were still pretty skeptical, but what was more clear was that no one was doing anything interesting in space—and certainly not efficiently."

For that initial round of discussions, Musk held firm to his idea of getting to Mars. He named the venture "Life to Mars" and started holding seminars, some even including filmmaker James Cameron, of *Terminator* and *Titanic* fame.

"People would come up with crazy ideas, like sending mice to Mars or not actually bringing any crops because they might pollute the Mars atmosphere," recalls Ressi. Then it all dissipated. The Russians they had talked to jacked up the price of launch vehicles and few other people seemed serious about it as a business.

"Elon just got fed up and started SpaceX instead," says Ressi. "He is not a guy you want to alienate by sounding too silly. He wants results. He was that way when we had the parties at Penn, and he is that way with his businesses now. Money has definitely not changed him."

Ah, yes, money. Musk and Ressi say they did not have a dime at Penn before they started doing their parties. Now Musk could be worth $300 million or so. He admits that his first taste of wealth with his initial Silicon Valley-boom companies was addictive. He got himself a $1 million McLaren F1 sports car, the fastest production car available, and a couple of small aircraft, which he pilots himself. He bought a house in the posh LA neighborhood of Bel Air. He adds, though, that when his kids were born—Musk and his wife Justine, a writer, have five young sons, including triplets—he knew he had to buy into a better future world for them.

"It really went all the way back to when I decided to do something with the Internet," says Musk. "I really believed the Internet was going to change humanity—give humanity a new nervous system. It was going to give that nervous system access to any piece of information in the world, and I wanted to be a part of that."

SpaceX has three different versions of its Falcon rocket, designed for different-sized payloads, in various stages of trials. The company made several attempts to launch its Falcon 1 model—a 90-feet-long, two-stage, liquid-fueled rocket designed to carry satellites—before succeeding on its fourth try on September 28. Carrying a dummy payload weighing 364 pounds, the rocket lifted off from the company's test site on the Kwajalein Atoll in the South Pacific at 4:15 p.m. (PDT) and reached orbit about nine-and-a-half minutes after launch.

"There are three things you look for: You have to look forward in the morning to doing your work. You do want to have a significant financial reward. And you want to have a possible effect on the world. If you can find all three, you have something you can tell your children."

Previous launches had died on the pad or in early flight. The third one lost two NASA satellites with it, along with the ashes of 208 people, including *Star Trek* actor James "Scotty" Doohan and astronaut Gordon Cooper, who wanted part of their final legacy in space.

But even after that failed third launch, Musk kept up his vaunted optimism. He sent an email to SpaceX employees to prove it. "The most important message I'd like to send right now is that SpaceX will not skip a beat in execution going forward ... There should be absolutely zero question that SpaceX will prevail in reaching orbit and demonstrating reliable space transport. For my part, I will never give up and I mean never. Thanks for your hard work."

To the extent that Musk had doubters, it is less about technology—after all, there have been thousands of space flights since the first Sputniks of the 1950s—but about whether it will be a money-making proposition.

SpaceX's Vice President of Marketing, Diane W. Murphy, says Musk's enthusiasm is not unwarranted, that SpaceX is already making money and that some malfunctions in test flight were to be expected. The successful fourth flight, despite not having any commercial payloads, is another positive step. She says clients can pay SpaceX as much as $9.1 million, depending on weight, and that SpaceX has a waiting list for future flights.

The company has a contract with NASA to deliver its products through 2015, the next time NASA plans a moon expedition. If it all works out, SpaceX could make a billion dollars from that contract. Murphy says that the money from NASA comes from SpaceX reaching 22 different milestones, of which the company has made 12.

"The ultimate goal of the NASA program is to have commercial companies deliver cargo to the International Space Station and we are on target to do that," she says. "NASA is looking to us, and possible competitor commercial companies, to be smaller and reliable, sort of like the Toyota to a sports car. It is how space flight will be in the future and Elon inspires us to be that future."

"Elon is really shrewd," says Gwynne Shotwell, SpaceX's vice president of business development. "I have been in the aerospace business for 20 years, and I have never seen someone who started from nowhere become so versed in the subject. He interviews everyone and asks the right questions.

"I know it sounds clichéd to say good things about the top guy, but Elon is like that," she adds. "He doesn't know everything, but he is technically savvy and loves doing business. I guess that is what it is, a person who is driven doesn't look back and say, 'I already did this,' but looks forward and says, 'I've got to do that.'"

The way Musk sees it, his three businesses are really all about changing society in marvelous ways. SpaceX will expand man's horizons infinitely, and the Tesla electric car and SolarCity's popularization of solar energy will help solve the energy crisis here on Earth, thus enabling the world to expand technologically—in an environmentally sound manner.

"I think you have to enjoy what you are doing. Otherwise, it is hard to do it," says Musk. "There are three things you look for: You have to look forward in the morning to doing your work. You do want to

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For an admitted fan of fast, stylish cars it is hard to imagine something more fun—and more possibly world-affecting—than Musk's involvement with the Tesla, the first all-electric roadster (www.teslamotors.com). Musk has invested upwards of $70 million in the startup (not by him this time; Tesla was founded by Silicon Valley electrical engineer Martin Eberhard) and has since taken over the company's chairmanship. Named after Nikola Tesla, the early-20th-century Slavic inventor and electrical theorist, the car runs about 220 miles on a charge, is sleek and fast, and costs about $100,000. It's the kind of thing George Clooney and Arnold Schwarzenegger have put deposits on. Musk himself is the proud owner of the seminal test model, Tesla No. 1.

"Tesla is important because it shows people that you can be sporty and good for the environment—that you don't have to give up something that is fun to be conscious of the Earth," says Musk. "I certainly intend to make money on it, too."

The company started delivery of its pre-ordered roadsters in July, producing about four cars per week initially, which will increase to about 100 per month by December, according to a post on its website by Tesla president and CEO Ze'ev Drori. By the end of 2009, Musk hopes to be selling as many as 10,000 Teslas, some at $50,000, and to eventually have a model that will sell for $30,000. The firm has already opened two showrooms, on Santa Monica Boulevard in Los Angeles and in Menlo Park, California, next door to Stanford.

"Our product is good for the country, good for the world, and good for the environment," says Drori, a long-time Silicon Valley technology executive whom Musk installed a year ago after a long-running dispute with Eberhard, who left the company in January 2008. Drori acknowledges that even though Musk spends most of his time these days with SpaceX, he still has a lot of hands-on suggestions at Tesla.

"Look, Elon is a very creative guy, very intelligent," says Drori. "He knows about cars. He definitely knows about technology. And he clearly knows about business, so why would I not take his advice? He is the face of this company. After all, he put a lot of money in it, so why can't he be the face?" Musk's celebrity could be a key to the company's success, Drori adds. "He is well-known, which certainly puts Tesla ahead of other electric cars, as far as marketing them."

Musk is a little less directly active in his most recent investment, a reported $10 million commitment to SolarCity, an innovative solar-panel leasing business run by his cousins Lyndon and Peter Rive.

"We went to Elon and he knew immediately how to modify our idea," says Lyndon Rive. "The barrier to getting individuals to use solar power was the up-front cost of installing the panels." SolarCity now arranges financing for leases on the equipment for the homeowners or businesses, so the panels are rented rather than owned by the customer. Customers usually use less energy, so those savings help offset the monthly rental on the panels, resulting in overall reductions on energy bills.

"We're in the vanguard here in California, and we will soon be in Arizona and Oregon," says Rive. "But what has made us go is our association with Elon. He is one of the few people in the world to have extreme talent in technicality—that engineering and technical background—and, at the same time, in business. It is rare you have an individual like that. Then you add his passion to make the world a better place."

That passion for whatever he sets his mind to can sometimes look more like obsession, to colleagues and rivals alike. "Yes, there is something about Elon that he has to work 18 hours a day, it seems," Rive says. "You tell him to slow down and he speeds up. You would think he wouldn't need the money or the aggravation any more, but that is the way he is."

Musk acknowledges this view—but to him it looks more like freedom. "I came to the United States because this was the one place where all of this was possible—to make your fortune, but to also realize dreams," he says. "On the other hand, you can't just dream, you have to work hard at it.

"If I have to be accused of something, I am happy to have it be that."◆

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