

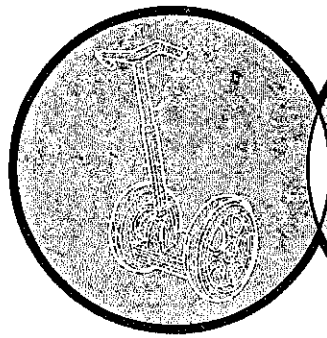
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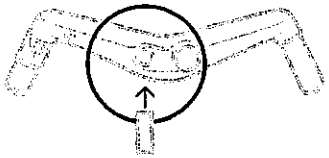
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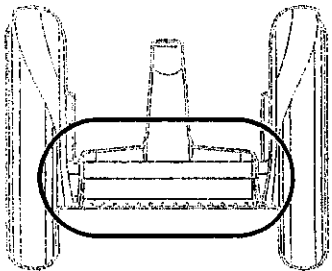
Segway Human Transporter  
 The Inside Story  
 For more facts about Segway HT's design and  
 features go to [www.segway.com](http://www.segway.com)



### Intelligent Key

Segway HT comes with Intelligent Keys that work like electronic keys, storing a unique 64-bit encrypted key code that is required for the machine to start. Each Intelligent Key also stores performance attributes like maximum speed and steering sensitivity.

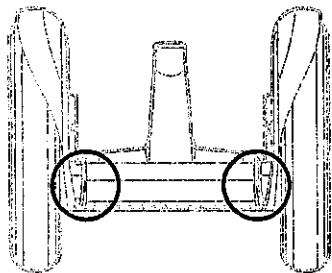
Eventually, fleet managers will be able to custom configure these keys to allow companies to make fleet-wide decisions. In the future, you'll also have the opportunity to purchase self-programmable Intelligent Keys, allowing you to customize a wide range of performance and operating variables.



### Chassis

The die-cast aluminum chassis serves as a user platform and as a protective, space-efficient housing for the motors, batteries, transmissions, and all electronic components.

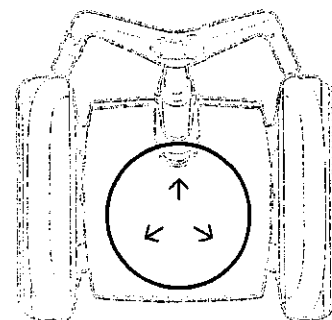
Lightweight aluminum acts as a heat sink for the motors and all moving parts, avoiding the need for cooling fans that would add weight, cost, and complexity.



### Motors

Each wheel is independently driven by dual redundant, high-speed electric motors that produce no emissions and have been tested to power levels of two horsepower. Each motor is wound as two separate electrical circuits capable of independent operation, while acting as one mechanical entity. They were designed and built by Pacific Scientific, a maker of motors and electronic drives for medical, fitness, robotics, semiconductor, and other precision automation applications. This brushless design is maintenance-free and more efficient and durable than a conventional brushed design.

Because Segway HT's motors use reverse torque instead of friction for braking, they convert the energy of your motion into energy that replenishes battery power.



### Inertial Sensor Assembly

This is a critical component of Segway HT's balancing, and we developed it with Silicon Sensing Systems, a leading supplier of guidance systems and navigation electronics for many of the world's most advanced commercial and military air, land, and sea vehicles.

Five gyroscopes and two tilt sensors work together to determine orientation of the machine relative to the direction of gravity. Three-axis measurements compensate for variable terrain and are communicated to the controller boards to keep you balanced and moving safely.

For redundancy purposes, we installed a total of five gyroscopes, each oriented in such a way that any angular motion of the machine will be sensed by at least two gyroscopes. These components have been tested by exposing them to extreme temperature variations, water, and shock.



Segway has three product offerings, optimized for:



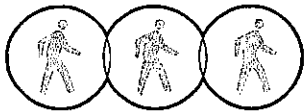
**Series:**  
cargo carrying.



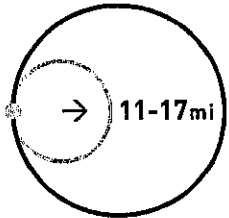
**Series:**  
range and terrain.



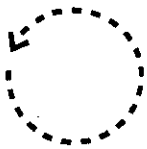
**Series:**  
densest environments.



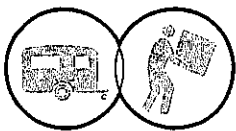
> **Speed**      **C** 12.5 mph (20 kph)      **I** 12.5 mph (20 kph)      **P** 10 mph (16 kph)  
Segway HT must be quick enough to compress time and space without disturbing the pedestrian environment, so we gave it the ability to travel about three times faster than the average walker.



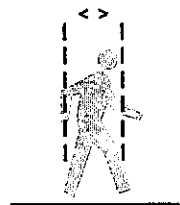
> **Range**  
(on a single charge)      **C** 11-17 miles (17-28 km)      **I** 11-17 miles (17-28 km)      **P** 9-14 miles (14-22 km)  
When most transportation companies talk about range, they reference it under optimal conditions—no wind, flat terrain, and so forth. While a Segway HT i167's optimal range is 17 miles (28 km), we expect you'll be able to travel about 11 miles (17 km) on a single battery charge—accounting for variations in terrain and other factors. This is far more than the distance we expect the average user will travel on a Segway HT in one day.



> **Turning Radius: zero**  
One characteristic of a pedestrian is the ability to turn in place without impacting any nearby person or object, something no vehicle can do. By balancing on a single axle, Segway HT users act no differently than pedestrians. The wheels have the ability to rotate in opposite directions, which enables the machine to turn in place.



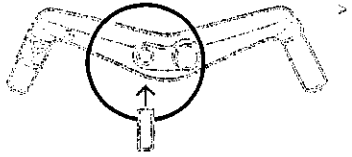
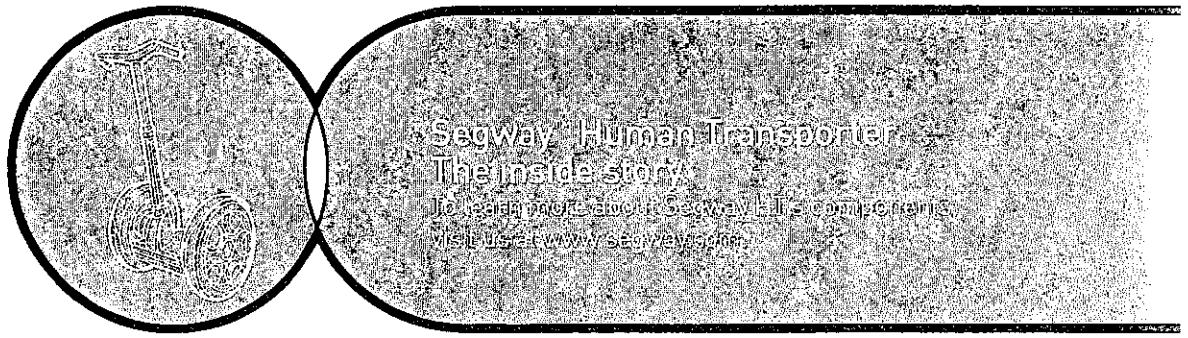
> **Payload**  
**Passenger:**      **C** 250 lbs (113 kg)      **I** 250 lbs (113 kg)      **P** 250 lbs (113 kg)  
**Cargo:**      **C** 75 lbs (34 kg)  
In order for Segway HT to be the optimal local travel solution, it has to have carrying capacity for users, packages, and cargo.



> **Space**  
**Platform Height:**      **C** 8 in (21 cm)      **I** 8 in (21 cm)      **P** 6 in (17 cm)  
**Footprint:**      **C** 19 x 25 in (48 x 64 cm)      **I** 19 x 25 in (48 x 64 cm)      **P** 16 x 21 in (41 x 53 cm)  
We designed Segway HT to take up no more space than the average person. It's no wider than a person's shoulders and raises you only 8 inches off the ground.



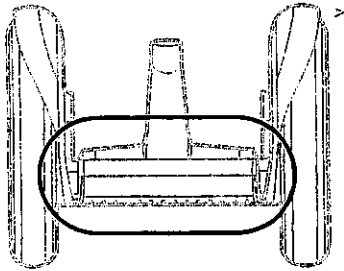
> **Weight**      **C** 95 lbs (43 kg)      **I** 80 lbs (36 kg)      **P** 69 lbs (31 kg)  
Portability was a key design objective. That is why we made Segway HT light enough to handle, small enough to store two in the trunk of a midsize sedan, and collapsible enough to fit in tight storage spaces.



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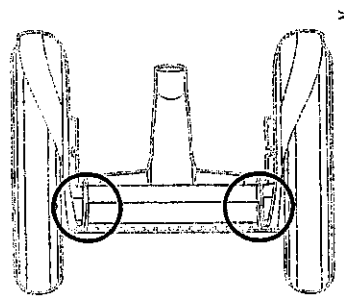
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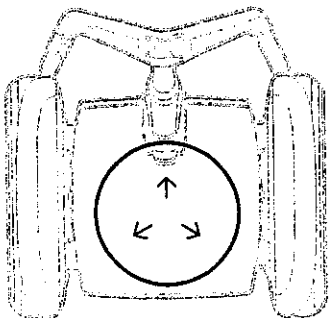
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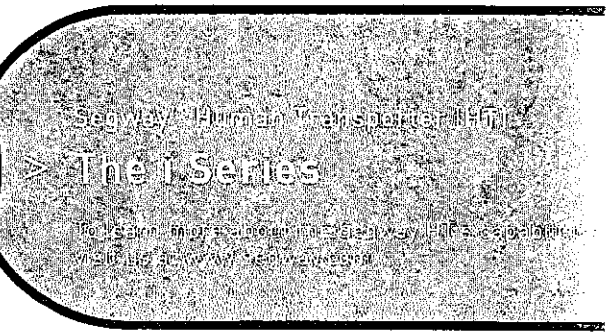
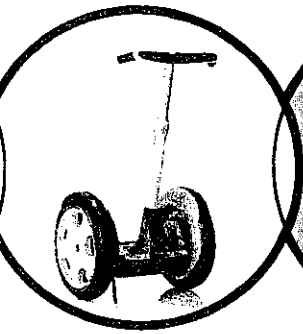


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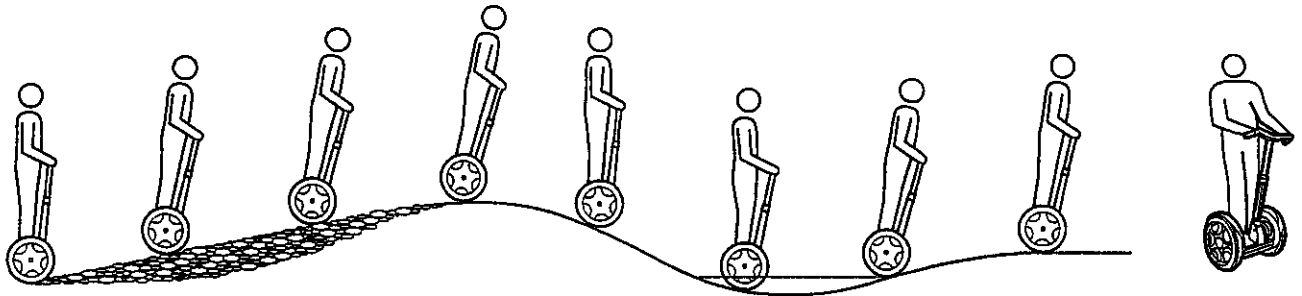
For redundancy purposes, we installed a total of five gyroscopes, each oriented in such a way that any angular motion of the machine will be sensed by at least two gyroscopes. These components have been tested by exposing them to extreme temperature variations, water, and shock.



## i Series: extend your range and enhance your mobility



The Segway HT i Series is optimized for extended range and enhanced mobility on variable terrain. With its inherent speed advantage over walking and its ability to navigate dirt, grass, and hills, the Segway HT i Series is an effective solution for individuals who cover considerable distances throughout their day. For a rider's convenience, the Segway HT i Series may be outfitted with a small front storage compartment for notebooks, clipboards, or other small gear.



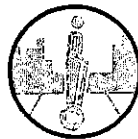
### Operating Modes

Every Segway HT comes with three distinct keys that offer varying performance levels. Riders will select the appropriate key based upon their riding environment and level of experience. Segway provides these key options with the following recommendations for the purpose of allowing new riders to become comfortable with the HT at slower speeds, adapt well in pedestrian environments, and comfortably cover open spaces.



#### Learning Mode

Optimized to allow the new user to get comfortable on the machine by limiting both speed and turning rate. Maximum speed is 6 mph (9.6 kph) with a minimum turning rate.



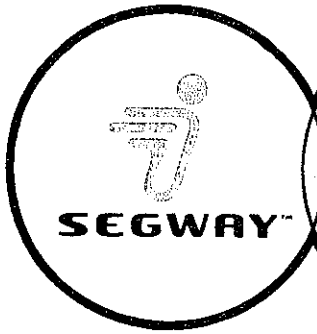
#### Sidewalk Operation Mode

Optimized for use in areas with other pedestrians and unfamiliar terrain. Maximum speed is 8 mph (12.6 kph) with a medium turning rate.

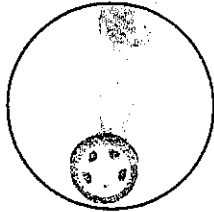


#### Open Environment Mode

Optimized for experienced riders in open areas and smooth terrain. Maximum speed is 12.5 mph (20.1 kph) with the most responsive turning rate.



## The short-distance mobility solution



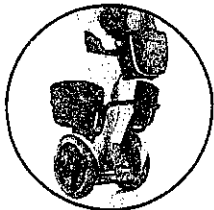
Personal Mobility

Now workers have the ability to restructure their daily routine and complete tasks previously done on foot or with heavy-duty vehicles. They can work and plan their day more strategically and reduce repetition, creating operational efficiencies and profits. Unlike some commercial vehicles, the Segway HT is approachable, convenient, and easy to use and maintain.

The following categories list Segway HT's short-distance mobility solutions.

### Personal Mobility

> Wherever you go during the day, with the Segway HT you go quicker. Imagine this tool on a corporate campus or in a large manufacturing plant.



Cargo

### Cargo

> Allows a person whose primary job is to transport material to arrive faster. Picking up and dropping off critical equipment is made easier.

### Patrol

> Enables people who cover fixed geographic areas to be more efficient. Police and security are already deploying these across the United States.



Patrol

### Response

> Allows service delivery workers and their equipment to maneuver to a destination more efficiently. For example, EMT workers with emergency equipment can move through crowded areas and respond in less time.

### Stop and Go

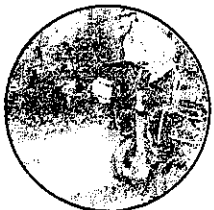
> Allows people whose jobs involve walking a fixed route with multiple stops to be more productive. Postal workers and utility meter readers are currently finding the Segway HT solution useful.



Response

### A new company. A time-tested approach.

Segway LLC is an energetic company driven by an entrepreneurial spirit and built from over a decade of research. Dean Kamen, the founder of Segway, is one of the world's most respected and accomplished innovators. With more than 150 U.S. and foreign patents, Dean has received numerous honors and has bridged innovation with creativity in a way that enhances lives. Companies such as Johnson & Johnson and Baxter have successful licensed products created in this problem-solving environment. The research and development focus at Segway has attracted a collaborative group of individuals with vast experience in the transportation and high-tech industries. Focused on short-distance transportation and making people more productive, the team is poised to provide solutions.



Stop and Go

For more information, log on to [www.segway.com](http://www.segway.com).

# TIME

## REINVENTING THE WHEEL

Compliments of:



**SEGWAY™**

Segway LLC  
286 Commercial Street  
Manchester, New Hampshire, USA 03101-1109  
603-222-6000  
[www.segway.com](http://www.segway.com)

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# REINVENTING THE WHEEL

HERE "IT" IS: THE INSIDE STORY OF THE SECRET INVENTION THAT SO MANY ARE BUZZING ABOUT. COULD THIS THING REALLY CHANGE THE WORLD?

By JOHN HEILEMANN

**"Come to me!"**

On a quiet Sunday morning in Silicon Valley, I am standing atop a machine code-named Ginger—a machine that may be the most eagerly awaited and wildly, if inadvertently, hyped high-tech product since the Apple Macintosh. Fifty feet away, Ginger's diminutive inventor, Dean Kamen, is offering instruction on how to use it, which in this case means waving his hands and barking out orders.





...in the case means waving his hands and barking out orders.

"Just lean forward," Kamen commands, so I do, and instantly I start rolling across the concrete right at him.

"Now, stop," Kamen says. "How? This thing has no brakes. Just think about stopping." Staring into the middle distance, I conjure an image of a red stop sign—and just like that, Ginger and I come to a halt.

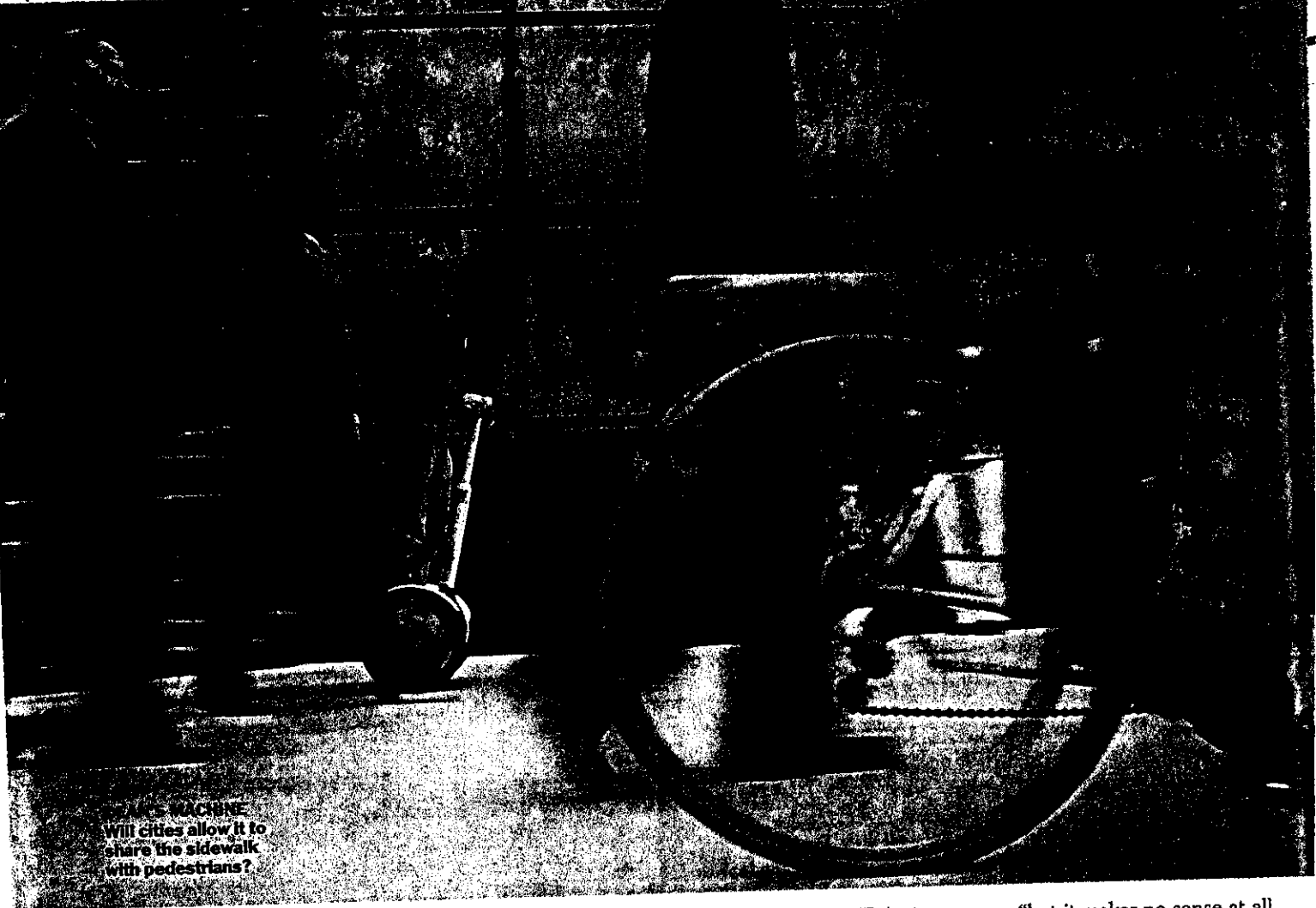
"Now think about backing up." Once again, I follow instructions, and soon I glide in reverse to where I started. With a twist of the wrist, I pirouette in place, and no matter which way I lean or how hard, Ginger refuses to let me fall over. What's going on here is all perfectly explicable—the machine is sensing and reacting to subtle shifts in my balance—but for the moment I am slack-jawed, baffled. It was Arthur C. Clarke who famously observed that "any sufficiently advanced technology is indistinguishable from magic." By that standard, Ginger is advanced indeed.

Since last January it has also been the tech world's most-speculated-about secret. That was when a book proposal about Ginger, a.k.a. "IT," got leaked to the website Inside.com. Kamen had been working on Ginger for more than a decade, and although the author (with whom the inventor is no longer collaborating) never revealed what Ginger was, his précis included over-the-top assessments from some of Silicon Valley's mightiest kingpins. As big a deal as the PC, said Steve Jobs; maybe bigger than the Internet, said John Doerr, the venture capitalist behind Netscape, Amazon.com and now Ginger.

In a heartbeat, hundreds of stories full of fevered theorizing gushed forth in the press. Ginger was a hydrogen-powered hovercraft. Or a magnetic

Photographs for TIME by Gregory Heisler

The  
Kamen  
code  
debating



**WALKING MACHINE**  
 Will cities allow it to share the sidewalk with pedestrians?

antigravity device. Or, closer to the mark, a souped-up scooter. Even the reprobates at *South Park* got into the act, spoofing Ginger in a recent episode—the details of which, sadly, are unprintable in a family magazine.

This week the guessing game comes to an end as Kamen unveils his baby under its official name: Segway. Given the buildup, some are bound to be disappointed. (“It won’t beam you to Mars or turn lead into gold,” shrugs Kamen. “So sue me.”) But there is no denying that the Segway is an engineering marvel. Developed at a cost of more than \$100 million, Kamen’s vehicle is a complex bundle of hardware and software that mimics the human body’s ability to maintain its balance. Not only does it have no brakes, it also has no engine, no throttle, no gearshift and no steering wheel. And it can carry the average rider for a full day, nonstop, on only five cents’ worth of electricity.

The commercial ambitions of Kamen and his team are as advanced as their technical virtuosity. By stealing a slice of the \$300 billion-plus transportation industry, Doerr predicts, the Segway Co. will be the fastest outfit in history to reach \$1 billion in sales. To get there, the firm has erected a 77,000-sq.-ft. factory a few miles from its

**COST:** About \$8,000 for industrial models; consumer versions may cost \$3,000  
**MAXIMUM SPEED:** 5 m.p.h. to 17 m.p.h., depending on settings  
**RANGE:** About 17 miles per battery charge on level ground; decelerating or going downhill generates electricity, extending its range  
**RECHARGE TIME:** One hour of charge for two hours of operation  
**PAYLOAD:** Passenger—250 lbs. Cargo—75 lbs.  
**WEIGHT:** 65 or 80 lbs., depending on the model

Manchester, N.H., headquarters that will be capable of churning out 40,000 Segways a month by the end of next year.

Kamen’s aspirations are even grander than that. He believes the Segway “will be to the car what the car was to the horse and buggy.” He imagines them everywhere: in parks and at Disneyland, on battlefields and factory floors, but especially on downtown sidewalks from Seattle to Shanghai. “Cars are great for going long distances,”

Kamen says, “but it makes no sense at all for people in cities to use a 4,000-lb. piece of metal to haul their 150-lb. asses around town.” In the future he envisions, cars will be banished from urban centers to make room for millions of “empowered pedestrians”—empowered, naturally, by Kamen’s brainchild.

Kamen’s dream of a Segway-saturated world won’t come true overnight. In fact, ordinary folks won’t be able to buy the machines for at least a year, when a consumer model is expected to go on sale for about \$3,000. For now, the first customers to test the Segway will be deep-pocketed institutions such as the U.S. Postal Service and General Electric, the National Parks Service and Amazon.com—institutions capable of shelling out about \$8,000 apiece for industrial-strength models. And Kamen’s dreamworld won’t arrive at all unless he and his team can navigate the array of obstacles that are sure to be thrown up by competitors and ever cautious regulators.

For the past three months, Kamen has allowed *TIME* behind the veil of secrecy as he and his team grappled with the questions that they will confront—about everything from safety and pricing to the challenges of

launching a product with the country at war and the economy in recession. Some of their answers were smooth and assured; others less polished. But one thing was clear. As Kamen sees it, all these issues will quickly fade if the question most people ask about the Segway is "How do I get one?"

## FRED AND GINGER

THE WORLD OF TECHNOLOGY HAS NEVER been short of eccentrics and obsessives, of rich, brilliant oddballs with strange habits and stranger hobbies. But even in this crowd, Dean Kamen stands out. The 50-year-old son of a comic-book artist, he is a college dropout, a self-taught physicist and mechanical engineer with a handful of honorary doctorates, a multimillionaire who wears the same outfit for every occasion: blue jeans, a blue work shirt and a pair of Timberland boots. With the accent of his native Long Island, he speaks slowly, passionately—and endlessly. "If you ask Dean the time," Doerr chides, "he'll first explain the theory of general relativity, then how to build an atomic clock, and then, maybe, he'll tell you what time it is."

A bachelor, Kamen lives near Manchester in a hexagonally shaped, 32,000-sq.-ft. house he designed. Outside, there's a giant wind turbine to generate power and a fully lighted baseball diamond; in the basement, a foundry and a machine shop. Kamen's vehicles include a Hummer, a Porsche and two helicopters—both of which he helped design and one of which he uses to commute to work each day. He also owns an island off the coast of Connecticut. He calls it North Dumpling, and he considers it a sovereign state. It has a flag, a navy, a currency (one bill has the value of pi) and a mutual nonaggression pact with the U.S., signed by Kamen and the first President Bush (as a joke, we think).

But if Kamen's personality is half Willy Wonka, the other half is closer to Thomas Edison. While he was still struggling in college, Kamen invented the first drug-infusion pump, which enabled doctors to deliver steady, reliable doses to patients. In the years that followed, he invented the first portable insulin pump, the first portable dialysis machine and an array of heart stents, one of which now resides inside Vice President Dick Cheney. This string of successes established Kamen's reputation, made him wealthy and turned DEKA Research—the R.-and-D. lab he founded nearly 20 years ago, in which he and 200 engineers work along the banks of the Merrimack River—into a kind of Mecca for medical-device design.

# INSIDE THE SEGWAY

How does Dean Kamen's self-balancing "human transporter" achieve its magic? Using the latest advances in gyros, tilt sensors and high-performance motors. Here's how it works:

**Intelligent key** A digital security code thwarts would-be thieves. Also sets speed limits

**User interface** Tells you the machine is on, what mode it's in and how much battery life is left

**Kill switch**

## UNDER THE HOOD

**"Sisterboards"** A pair of circuit boards sends commands to the motors based on input from sensors. If one fails, the other can function by itself

**Turning control** A single axle gives Segway something no other vehicle has: a turning radius of zero

**Control shaft** Die-cast aluminum, height adjustable

**Motors** Two of them drive each wheel independently. Emission free and fully redundant; if one fails, the other takes over

**Batteries** Two types available; NiCd and NiMH; rechargeable by plugging into any outlet

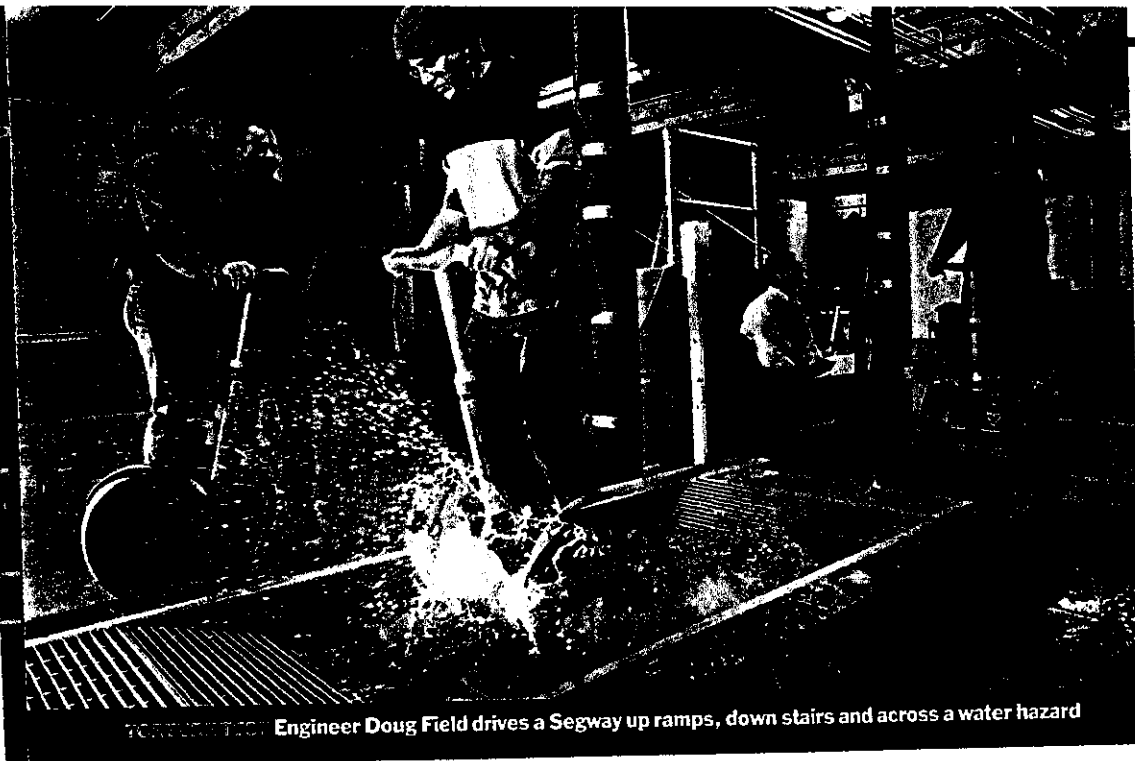
**Balance sensors** Gyroscopes and tilt sensors work together to pick up tiny shifts of body weight and changes in terrain. The five gyros operate by committee, voting among themselves to eliminate errant readings

**Chassis** Houses Segway's electronic innards. Tested to withstand 7 tons of force—the weight of three SUVs

**Rubber diaphragms** Hidden beneath the rider's platform, they engage the machine's self-balancing systems. Step off, and the Segway stops

**Tires** Tubeless and resistant to flats. Treated for enhanced traction on wet surfaces and to leave no marks indoors

Source: Segway  
TIME Graphic  
by Lon Tweeten



PHOTOGRAPH BY: Engineer Doug Field drives a Segway up ramps, down stairs and across a water hazard

The seeds of Ginger were planted at DEKA by what had previously been Kamen's best-known project: the IBOT wheelchair. Developed for and funded by Johnson & Johnson, the IBOT is Kamen's bid to "give the disabled the same kind of mobility the rest of us take for granted"—a six-wheel machine that goes up and down curbs, cruises effortlessly through sand or gravel, and even climbs stairs. More amazing still, the IBOT features something called standing mode, in which it rises up on its wheels and lifts its occupant to eye level while maintaining balance with such stability that it can't be knocked over even by a violent shove. Kamen gets annoyed when the IBOT is called a wheelchair. It is, he says, "the world's most sophisticated robot."

As Kamen and his team were working on the IBOT, it dawned on them that they were onto something bigger. "We realized we could build a device using very similar technology that could impact how *everybody* gets around," he says. The IBOT was also the source of Ginger's mysterious code name. "Watching the IBOT, we used to say, 'Look at that light, graceful robot, dancing up the stairs'—so we started referring to it as Fred Upstairs, after Fred Astaire," Kamen recalls. "After we built Fred, it was only natural to name its smaller partner Ginger."

With Ginger, as with the IBOT, Kamen explains, "the big idea is to put a human being into a system where the machine acts as an extension of your body." On first inspection, balancing on Ginger seems only slightly more feasible than balancing on a barbell. But what Kamen is talking about is the way Ginger does the balancing for you.

Lean forward, go forward; lean back, go back; turn by twisting your wrist. The experience is the same going uphill, downhill or across any kind of terrain—even ice. It is nothing like riding a bike or a motorcycle. Instead, in the words of Vern Loucks, the former chairman of Baxter International and a Segway board member, "it's like skiing without the snow."

Exactly how the Segway achieves this effect isn't easy to explain; Kamen's first stab at it involves a blizzard of equations. Eventually, though, he offers this: "When you walk, you're really in what's called a controlled fall. You off-balance yourself, putting one foot in front of the other and falling onto them over and over again. In the same way, when you use a Segway, there's a gyroscope that acts like your inner ear, a computer that acts like your brain, motors that act like your muscles, wheels that act like your feet. Suddenly, you feel like you have on a pair of magic sneakers, and instead of falling forward, you go sailing across the room."

Pulling off this trick requires an unholy amount of computer power. In every Segway there are 10 microprocessors cranking out three PCs' worth of juice. Also a cluster of aviation-grade gyros, an accelerometer, a bevy of sensors, two batteries and software so sophisticated it puts Microsoft to shame. If Kamen gets irked when the IBOT is called a wheelchair, imagine his pique when—if—the Segway is called a scooter.

## FISH AND BICYCLES

THE POSSIBILITY THAT THE SEGWAY WILL be viewed as simply a high-end toy, a jet ski on wheels, is one of Kamen's greatest

concerns, especially after Sept. 11. He wants his machine taken seriously, as a serious solution to serious problems. That anxiety was one of the reasons he and his team decided to concentrate at first on major corporations, universities and government agencies—large, solid, established institutions—rather than dive straight into the consumer marketplace.

Whether such institutions would embrace Segways, however, was an open question. Before last January's leak, Kamen had demoed his invention only when absolutely necessary, or for luminaries such as Steve Jobs and Amazon CEO Jeff Bezos. After the leak, he became even pickier. He entertained

the Postmaster General, who was keen to put letter carriers on Segways, and the head of the National Parks Service, who wanted to do the same with park rangers and police. (Both are among Segway's first customers.) Kamen also stirred up interest at the Department of Defense, which was intrigued by the notion of giving Segways to special forces, and at Federal Express. But few other potential customers were allowed to pass through DEKA's tightly sealed doors.

A few weeks ago, with the launch approaching, Kamen began to let some others in. The Boston police department sent a clutch of cops to Manchester. The city of Atlanta sent a contingent of city planners. And Thanksgiving week, Kamen took his act to California. In one jam-packed day in Silicon Valley, he revealed the Segway to officials from San Francisco International Airport, the California department of transportation, the city of Palo Alto, Stanford University and Cisco Systems CEO John Chambers. Especially gratifying to Kamen was the reaction of Andy Grove, the chairman of Intel and, unlike so many Silicon Valley boosters, a bone-deep skeptic. Perched tentatively on the machine, the 65-year-old Grove was rolling slowly along when Doerr ambled over and pushed him in the chest. When the Segway kept him from losing his balance, Grove emitted a distinctly un-Grove-like giggle. "The machine is gorgeous," he said later. "I'm no good at balancing; it would take me a hundred years to learn to snowboard. This took me less than five minutes."



CHAMPLAND In Segway's Manchester, N.H., headquarters, prototypes mingle with venture capitalists

## REMEMBER TUCKER?

ONE OF THE HARDEST TRUTHS for any technologist to hear is that success or failure in business is rarely determined by the quality of the technology. Beta-max was better than VHS; the Mac operating system is superior to Windows. Even in the transportation business, there is the cautionary tale of Preston Tucker, who in the 1940s designed a "car of the future" packed with such safety innovations as a padded dashboard, disk brakes and safety glass—a car so far ahead of its time that only 51 were ever produced. In fact, the annals of high-tech history contain remarkably few cases in which the most innovative technology has emerged

triumphant in the marketplace.

This is the sort of thing that keeps Kamen up at night. There are countless others. High on the list are congenitally skittish regulators who will decide if the Segway is safe and if it will be allowed to roll on sidewalks.

Kamen maintains, with characteristicchutzpah, that Segways are "even safer than walking." Only slightly less emphatic, and slightly more plausible, was the verdict of the Consumer Product Safety Commission, which began reviewing the device last May. According to Ron Medford, a senior CPSC official, the Segway has "safety features that are far more substantial than we normally see in a consumer product—features closer to those associated with medical devices." (Medford, it must be said, was so impressed that he is taking a sabbatical at DEKA, though he remains on the government's payroll.) To make the machine even safer, it comes equipped with three computerized keys that set speed and performance limits. The slowest setting, now called training mode, used to be jokingly referred to around DEKA as CEO mode.

The sidewalk issue is dicier. In order to ensure that Segways are permitted to move alongside pedestrians, Kamen's regulatory-affairs mavens will have to keep the machine from being classified either as a motor vehicle or as a scooter. At the federal level, the deal is done—though, for a while, the Occupational Safety and Health Administration wanted to classify the Segway as a "powered industrial truck." Technically, final sidewalk authority rests with state

I asked Grove what he thought of the Segway as a business. "The consumer market is always harder," he said. "But when you think about it, the corporate market is almost unlimited. If the Postal Service and FedEx deploy this for all their carriers, the company will be busy for the next five years just keeping up with that demand."

A patient entrepreneur would revel in that assessment. But Kamen is a man running short on patience. For him, conquering the corporate market is merely a prelude to the battle to come. "The consumer market is where the big money is," says Michael Schmertzler, a Credit Suisse First Boston managing director and, with Doerr, Segway's other major financial backer. "But this is about more than money for Dean. Pardon the cliché, but he really does want to change the world."

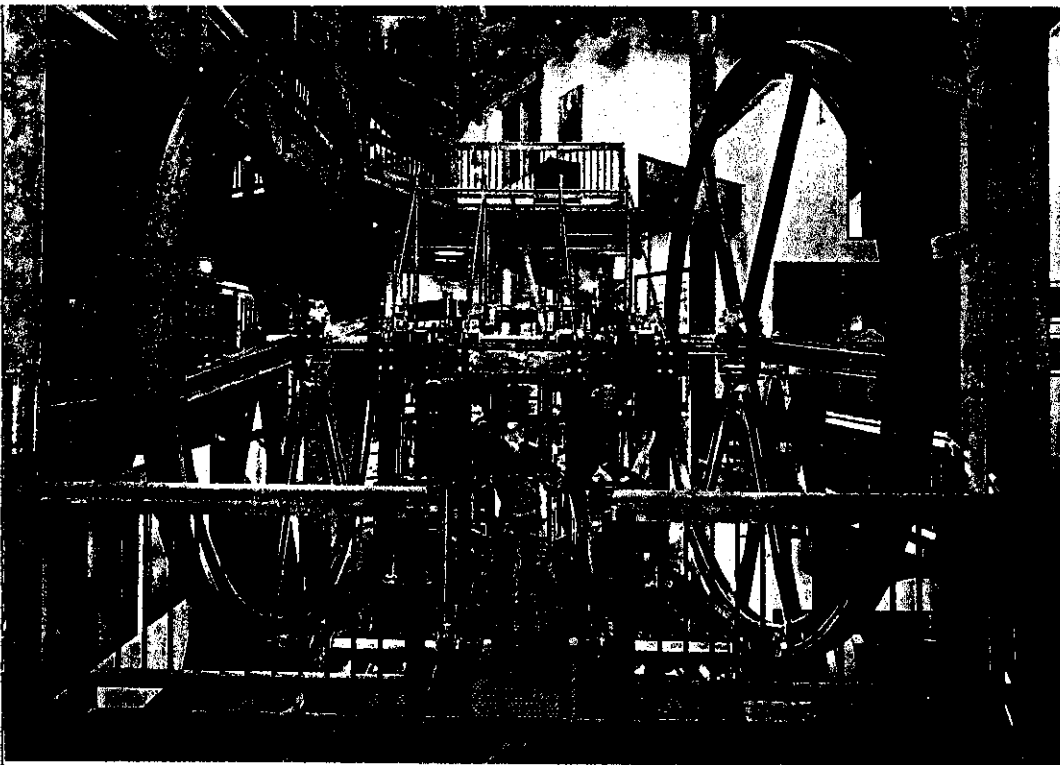
With the Segway, Kamen plans to change the world by changing how cities are organized. To Kamen's way of thinking, the problem is the automobile. "Cities need cars like fish need bicycles," he says. Segways, he believes, are ideal for downtown transportation. Unlike cars, they are cheap, clean, efficient, maneuverable. Unlike bicycles, they are designed specifically to be pedestrian friendly. "A bike is too slow and light to mix with trucks in the street but too large and fast to mix with pedestrians on the sidewalk," he argues. "Our machine is compatible with the sidewalk. If a Segway hits you, it's like being hit by another pedestrian." By traveling at three or four times walking speed, and thus turning what would have been a 30-minute walk into a 10-minute ride, Kamen

contends, Segways will in effect shrink cities to the point where cars "will not only be undesirable, but unnecessary."

Kamen isn't so naive as to underestimate America's long-standing romance with the automobile. ("I love cars too," he says. "Just not when I'm downtown.") And he is well aware that uprooting the vast urban infrastructure that supports cars, from parking garages to bridges and tunnels, won't happen soon. Which is why he has pinned his greatest hopes not on the U.S. but abroad, especially in the developing world. At a meeting with Jobs a year ago, the Apple co-founder proclaimed, in typically hyperbolic fashion, "If enough people see this machine, you won't have to convince them to architect cities around it; it'll just happen."

Kamen agrees. "Most people in the developing world can't afford cars, and if they could, it would be a complete disaster," he says. "If you were building one of the new cities of China, would you do it the way we have? Wouldn't it make more sense to build a mass-transit system around the city and leave the central couple of square miles for pedestrians only?" Pedestrians and people riding Segways, that is.

"There's no question in my mind that we have the right answer," he continues. "I would stake my reputation, my money and my time on the fact that 10 years from now, this will be the way many people in many places get around." Kamen pauses and sighs. "If all we end up with are a few billion-dollar niche markets, that would be a disappointment. It's not like our goal was just to put the golf-cart industry out of business."



**BIG WHEELS** Kamen's living room is built around a two-story antique engine once owned by Henry Ford

tionary vanguard. Will consumers today make the same calculation about the Segway?

If it's seen as sufficiently cool, they might. But here Segway faces a double-edged sword. If not for the media frenzy a year ago, Kamen and his invention would be receiving a good deal less attention. At the same time, that frenzy ginned up expectations so absurdly extravagant that they will be hard to live up to. There is a very real possibility that for those whose only experience of the Segway is on TV or in the press, the reaction to it may boil down to five lethal words: Is that all it is? And that possibility is only enhanced by the fact that to many eyes giving the photos only a cursory

glance, a Segway doesn't look like a revolution. It looks ... well, sorta like a scooter.

But looks can be misleading, as anyone who's ridden a Segway can attest. Just ask Jeff Bezos. On a rainy morning in Seattle recently, Bezos dropped in at a meeting between Kamen, his team and a pair of Amazon execs. The meeting was being held in an Amazon "pick and pack" facility—a warehouse in which employees pick stock from shelves and pack it in boxes for shipment to customers. Kamen had come to sell Amazon some Segways by demonstrating that they would, as Bezos put it, "improve our picking productivity."

Like Grove, Bezos is confident that Segway will make a mint selling to the corporate market; also like Grove, he is less certain about its consumer prospects. "At Amazon, we didn't know at first, and nobody knew, whether people would want to buy books online, and the same is true for whether people will want to ride these," he says. "Walking is a superb mechanism for getting around—I don't see it being replaced anytime soon. And for long hauls, driving is darn good too. The question is whether there's a middle ground, some intermediate zone where these would be better than all the alternatives?"

Just then, Kamen rides up and hands his Segway over to Bezos. As the Amazon boss races madly around the warehouse, hooting and cackling and flapping his arms, someone yells out, "Yo, Jeff, what were you saying about the consumer market?" Whizzing past, Bezos shouts back, "There's definitely at least a consumer market of one!" ■

and local governments. Kamen is betting, however, that the decision will be made not by lawmakers but "de facto, by what becomes standard practice. If we have police and mail carriers riding on the sidewalks for a year, how is anyone in government going to say, 'It's O.K. for us but not O.K. for you?'"

No matter how inherently safe Segways may be, someone, somewhere is going to kill himself on one. "It's inevitable," says Gary Bridge, Segway's marketing chief. "I dread that day." Never mind that people die every day on bicycles, in crosswalks, on skateboards, in cars. The Segway is the newest new thing, and nothing does more to set hearts afire on the contingency-fee bar. "There are some very deep pockets around this thing," remarks Andy Grove. "I fear this could be a litigation lightning rod."

Not to mention a lightning rod for fierce competition. Although Kamen trashes the automobile at every opportunity and is plotting a future in which cars are barred from cities, he insists that the Big Three and their brethren will see the Segway as no threat. "Nobody in America or any developed nation will buy one of these instead of buying a car," he says. "People will buy these in addition to owning a car." But a former top auto executive thinks Kamen is kidding himself—or kidding me. "The car companies track market share by one one-hundredths of a percentage point," he says. "They're incredibly sensitive on that front, and this is going to dent somebody's market share."

Even if the auto barons leave the Segway alone, other players are unlikely to be so forgiving. When Kamen and his lieutenants draw up lists of probable rivals, companies in other branches of the transportation industry—firms that make ATVs, motorcycles, scooters, even snowmobiles—are near the top. But the lists have been long and varied, including a raft of appliance makers, engineering companies and, especially, consumer-electronics giants, such as Sony. Kamen's team is confident it has a long technological lead, as well as patents on most of its key innovations. "Reverse engineering this thing won't be easy," says Schmeitzler. "This is not a pet rock." Yet if the Segway is a runaway hit, you can bet that a flood of knock-offs—much less sophisticated but also much cheaper—will soon wash over the market.

Will the Segway be a runaway hit? A device that reduces the need for walking, one of the healthiest activities known to man, may strike many people as the last thing our culture needs. (Kamen scoffs, "Because I give kids calculators doesn't make them stupider.") And three grand may strike many others as an awful lot to pay for something they've managed so far to live happily without. John Doerr, who helped bankroll Compaq in the infant days of the personal-computer industry, points out that the first PCs cost \$3,000 to \$5,000. The analogy is worth pondering. The brave souls who bought those early PCs were willing to cough up big bucks not simply to own computers that were small and powerful but also to be part of a kind of revolu-