

Product

R E P O R T

“Last year it finally hit me” says Diana Lord,

ELECTRIC SCOOTERS

a 50-year old with a disabling condition.



“If I didn’t do something..., I might never visit an art gallery again.” That’s when she bought an electric scooter.

Introduction

Almost any day of the week you can find Diana Lord zipping along the paths and sidewalks of suburban Washington, DC, riding her electric scooter. It gets her around the house, but it also gets her out of the house. She goes to church, the grocery store, the community center, and the museums and art galleries in Washington, DC, via subway, on her scooter. For users, like Diana, a scooter isn't just transportation, it's independence. Diana's in her early 50s, and has a disabling condition called neuromyopathy. This condition weakens both her nervous and muscle systems and prevents her from taking even a few steps. "Last year it finally hit me," says Diana. "If I didn't do something, I might never visit an art gallery again." That's when she started shopping for a scooter. Diana began by reading scooter advertisements and writing away for more information. Next she test-drove a scooter. "I was like a teenage boy with his first motorcycle," Diana says. She settled on an indoor/outdoor scooter for \$2,445 and has been a satisfied user for more than a year. Diana still drives a car, sporting a scooter carrier. In reality, however, it's the scooter that gives her the legs she

needs to go where she wants to go.

Diana's decision to buy a scooter is like those of more and more adults. Last year, approximately 30-40,000 consumers purchased new scooters. Many scooter owners, according to an AARP questionnaire sent to 500 member users, appear to be older. The average age was 69 years but there are also 40 year-olds and 90 year-olds driving scooters. Half the scooter owners questioned in the AARP tabulation purchased their vehicles within the last two years and paid an average of \$2,400. Over 60 percent drive their scooter every day, and 58 percent use it both indoors and out. Almost all users (93 percent) expressed satisfaction with their vehicles.

Buyers can find plenty of new and used vehicles to choose from. There are at least twenty different manufacturers of scooters, many with different models. With all these choices, how do you make a decision?

Product Report - This booklet provides information to help you decide if an electric scooter might meet your needs. Up to now, very little comparative information was widely available. This product report seeks to fill an information gap with brand-

name information, user comments, and suggestions. We can't guarantee you'll be problem free, but we'll help you make a more informed choice. We wrote this guide for the first-time buyer. However, if this is your second or third purchase, there will be information you, too, can use.

What's an Electric Scooter?

An electric scooter is a battery-powered, three or four-wheeled vehicle designed for individuals who have difficulty walking. There are scooters for indoor use, scooters for outdoor use, and indoor-outdoor scooters for use in both places.

While models vary, each scooter normally comes equipped with:

◆ **A Metal (or in some instances, plastic) Chassis with Three or Four Inflatable tires**

-The tires could be soft or hard, filled with air or foam.

◆ **An Adjustable Seat with Armrests** – The seat adjusts to fit the rider and swivels to provide access to tables and desks while seated on the scooter.

◆ **A Tiller with Controls** - (see figure 1) The tiller is a combination steering wheel, gas pedal, and control panel. It adjusts up and down and tilts forward for easy entry. It's bicycle-like handles steer left and right and, frequently, what appears to be hand brakes is actually the throttle. Some manufacturers call the throttle a *wigwag*.

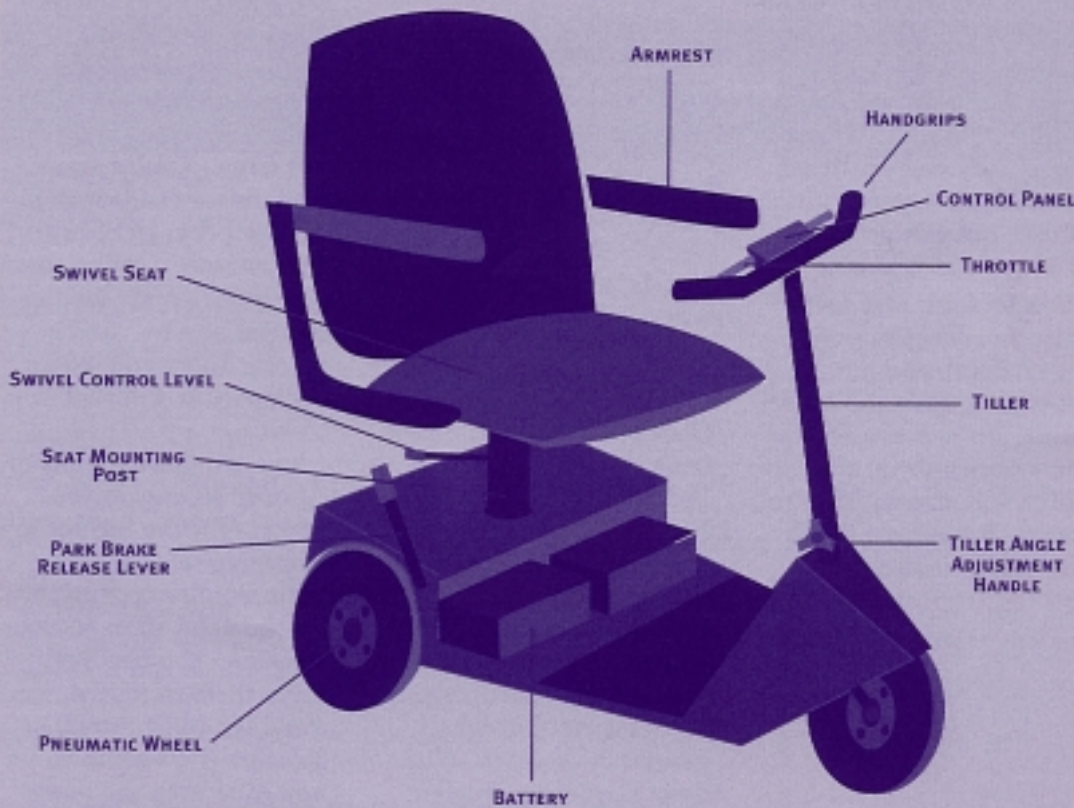
Mounted on top of the tiller is a console with an ignition switch (requiring a key), a speed control (high, low, or medium), a switch for forward and

reverse, and a battery gauge displaying available power. On most scooters you won't find driver-operated brakes on the tiller or the chassis. Instead, scooters use an automatic system called regenerative braking. The brakes automatically take hold when you release the throttle. Combined with the regenerative braking is a mechanical system, a parking brake, which holds the vehicle in place after it stops.

◆ **An Electric Motor with Rechargeable Batteries** - Two

rechargeable, lead batteries power the scooter's electric motor. Some scooters (depending upon make and model) speed along at up to eight miles an hour and some (depending upon make and model) travel up to 35 miles on a single battery charge. Your scooter's maximum speed and range will vary not only upon make and model but also upon travel conditions. Hilly roads or bad weather, for example, slow you down and call for more battery power. With proper maintenance and care, a scooter can last

Figure 1: Scooter with Various Parts



for years (one AARP member reports he's still driving a 1978 scooter). The most expensive repair will likely be a new set of gel cell batteries costing \$180 every 12 to 24 months.

Most consumers (an estimated 75 percent) pay for their scooters out of their own pockets. However, if it's used indoors (at least in part), is medically necessary, and prescribed by a physician, Medicare may reimburse you for part of the cost. It will take some paperwork, however. Some private health insurance plans also cover scooters.

Why a Scooter? -

A scooter's not your only choice in motorized mobility aids, but it has some distinct advantages. Chief among these is cost. New scooters range from \$1,800 to \$5,000. Electric wheel chairs, on the other hand, are usually custom fitted and start at around \$4,000, but can go as high as \$15,000 to \$25,000. Scooters are also more versatile. They're used both indoors and out, depending upon the model. While you can use an electric wheelchair on sidewalks and streets, they're generally not considered an outdoor vehicle.

Types of Scooters

To select the right vehicle for you, you must decide which scooter meets your driving needs. There are three types of scooters:

Indoor, Outdoor, and Indoor-Outdoor

Indoor scooters are smaller, three-wheeled vehicles. Manufacturers designed them to work best indoors or on paved, level ground. It's a smaller and lighter scooter (generally less than 130 pounds) and its tires won't mark your floors. This is a front-wheel drive vehicle where the front-wheel pulls the scooter forward. Because it's a smaller, lighter vehicle, indoor scooters turn the tight corners in your home (doorways, for example) without running into walls. They also travel shorter distances on an electric charge at slower speeds, and cost less. You will pay between \$2,000 and \$3,500 for a new, indoor scooter.

Outdoor scooters, by contrast, weigh as much as 100 pounds more than their indoor cousins. They are rear-wheel drive vehicles, where the rear wheels push you forward. Almost all-outdoor scooters have four wheels and sit higher off the ground (higher ground clearance). With their larger size, higher

ground clearance, and a more powerful motor, out-door scooters climb hills, go up curbs, and travel over open ground. They're faster, travel farther on a battery charge, and go in all kinds of weather. If you want to travel longer distances outdoors, this is your scooter. Outdoor scooters also cost more (\$2,500 to \$5,000).

However, manufacturers didn't design them for indoor driving. Outdoor scooters can't make sharp turns through narrow doorways. As a result, you'll bump into walls driving indoors. Also, an out-door scooter's tires may mark up your floors.

Indoor-outdoor vehicles are a mixture of the best features of both indoor and outdoor scooters. Most are three-wheeled vehicles with rear-wheel drive and soft tires. A fully assembled indoor-outdoor unit weighs between 80 and 150 pounds. Unlike outdoor vehicles, an indoor-outdoor scooter can be readily disassembled for transport in your car's trunk.

You can drive an indoor-outdoor scooter in your home. They're harder to maneuver indoors than their smaller cousins, but much easier than outdoor scooters. You can also drive them outdoors, although indoor-outdoor scooters can't climb curbs and hills with the power

and stability of the heavier outdoor vehicles. In fact, it may be wise to avoid uneven ground or steep hills (see safety measures on page 8). Still, they meet most of the needs for indoor-outdoor use. The remainder of this guide focuses exclusively on indoor-outdoor vehicles because that's what most consumers buy. Table 1 describes 15 different indoor-outdoor scooters, each manufactured or distributed by a particular company. This table lists retail prices, maximum speed, driving range, over-all weight, and the weight of the heaviest part of each scooter. Table 2 (page 5) summarizes the results of

a scooter evaluation conducted for AARP by the Institute for Technology Development (ITD). ITD combined the results of 50 different trials, performance measures, and preferences under six headings. Based on the results of these measurements, ITD compared each scooter to all the others and ranked it as average, above, or below average in each category (Handling Ability, Safety Measures, Performance Trials, Features and Adjustments, Riding Comfort and Assembly/Disassembly). If the scooter scored in the average range, you will see a circle (●). Above average

is pictured with an upward facing pyramid (▲) and a below average ranking receives a downward facing pyramid (▼).

If the scooter scored below average on safety measures, for example, does that mean it's unsafe? No, if driven according to the manufacturer's instructions, it should be safe. Some scooters simply perform better or are preferred by some people.

There is no overall rating. Users must decide for themselves which scooter best meets their needs.

The remainder of this report discusses each of these categories in more detail.

Table 1

		Indoor-Outdoor Scooters			Top	Range in
Manufacturer	Model	Mfg. Retail Price	Weight in pounds	Weight Heaviest Part	Speed ¹	Miles ²
Amigo Mobility [®]	Deluxe	\$2995	158	85	4.5	25.5
Booster Electric	Town & Country Sport	2995	151	46	4	15.5
Bruno	Regal Ten™ #75	2495	154	41	5	11.5
Electric Mobility™	Rascal™ #230	2795	130	30	5.5	14.7
Fortress Scientific	#2000	3255	132	55	5	24.3
Genus Medical	Flyer	2950	165	34	5.5	18.5
Invacare [®]	Tri Rolls	2860	153	47	5.5	19.8
Leisure Lift	Pace Saver III Premium	2350	143	40	5.2	17.2
Mobility Mfg.	Bobcat	2395	143	38	5.5	19.7
Ortho-Kinetics	#4635	3295	147	48	4.9	22.1
Pillar Technology	Blazer 2	1795	134	60	5.2	13.4
Pride Health Care	Sundancer	2495	140	38	4.5	23.4
Ranger	Safari	2295	124	43	5	15.5
Shoprider	Sunrunner™	1995	82	26	5	19.8
Suntec	MIDI	2395	144	37	4	10.3

¹As reported by the manufacturer.

²As measured by ITD.

Handling Ability

Can I drive a scooter in crowded places?

Can I get into my bath room on a scooter?

Can I back the vehicle down narrow hallways?

Can I park at a restaurant table and be comfortable eating dinner, seated on a scooter?

All of these are questions about handling or how easily can you maneuver a scooter in tight spaces. To try to gauge each scooter's handling ability, ITD conducted six separate trials with testers. These were:

- Negotiating an obstacle course.
- Turning around in a small room
- Turning (90°) through a typical doorway
- Stopping at a precise point

- Driving forward and backing down a narrow path, at various speeds
- Pulling up to a table.

Researchers clocked completion times, recorded any errors (bumping into a wall for example), and asked testers to rate each scooter's ease of carrying out the task. ITD combined the various measurements to provide the rating under **Handling** for each scooter.

In reading through the findings or the ratings, don't consider that assessment to necessarily be the final word. First, although ITD conducted the trials with the rigor of scientific experiments, they base their findings on a small sample of users and scooters. Second, there are personal trade-offs to consider with each rating. Readers must always keep their own needs and wishes in mind; otherwise, you won't find the scooter that's right for you.

We don't have enough space to discuss each measurement. Therefore, we'll limit ourselves to the most important items.

Obstacle Course – In some ways, driving a scooter is more difficult than driving a car. For example, there aren't any marked scooter lanes in a shopping mall. Even if there were, mall walkers can appear out of nowhere, forcing you to go around them or brake. In its obstacle course, ITD sought to gauge each scooter's ability to go around roadblocks. Researchers placed plastic pylons (the kind of cones used with road construction) on a seven foot by 38 foot path. Testers drove from one end to the other, scooting around each pylon. Without stopping, they turned around and retraced their steps. Researchers noted any errors and recorded completion times.

Table 2

	Handling Ability	Safety Measures	Performance Trials	Features and Adjustments	Riding Comfort	Assembly/Disassembly
Amigo Mobility	●	▼	▲	▼	●	▲
Booster Electric	●	▼	▼	▼	●	●
Bruno	▼	▲	▼	●	●	▼
Electric Mobility	▲	●	●	▲	●	▼
Fortress Scientific	●	▼	▲	▼	●	●
Genus Medical	▲	▼	●	▲	●	▼
Invacare	●	▲	▲	●	●	●
Leisure Lift	●	●	●	●	▲	▲
Mobility Manufacturing	▲	▲	▲	▲	●	●
Ortho-Kinetics	▲	▼	▲	▼	●	●
Pillar Technology	▲	▲	●	●	●	▲
Pride Health Care	▲	●	▲	▲	▲	▲
Ranger	▲	●	●	●	●	▼
Shoprider	▲	▼	▲	●	▲	▼
Suntec	●	▼	▼	▼	▼	▲

Key: ▼ Below Average ● Average ▲ Above Average

The most important finding from this trial is that no matter which scooter you buy, you must exercise great care in crowded places. In two out of three trials, testers either struck a pylon or went out of bounds at least once per try. Testers driving the *Pillar Blazer*, *Electric Mobility Rascal*, *Pride Sundancer*, and *Booster Town and Country Sport* did better, making fewer than one error per try. Drivers with the *Amigo Deluxe*, *Leisure Lift Pace Saver III*, *Suntec MIDI*, and *Ortho Kinetics' 4635* scooters averaged one and one half or more errors per try.

Turning - Next, let's look at turning ability. ITD conducted two trials to measure this ability. In the first trial, (see figure 2, page 7), testers drove each scooter into a five foot by five foot room (about the size of a small bathroom or an elevator). The driver then backed-up, turned the vehicle around, and drove out, trying not to hit anything (researchers recorded bumping into walls or door ways as an error). In the second test, drivers passed through a narrow hallway and made a right-hand (90') turn through a 36 inch doorway (a standard width for many

Scooter Evaluation

AARP contracted with the ProMatura Group of the Institute for Technology Development (ITD) to evaluate 15 indoor-outdoor scooters and review user feedback. ITD completed the following tasks:

- ◆ user trials with 25 older, first-time user, female testers driving each scooter through an obstacle course, turnarounds, turns, straightaways, ramps, a grassy area, and other test runs.
- ◆ Eight separate performance measures including climbing ramps, curbs, measuring stopping distances, and hill climbs.
- ◆ A review of federal scooter injury files.
- ◆ An analysis of 500 user letters and the tabulation of a user questionnaire.

ITD researchers measures, timed, and evaluated the results of the user and performance trials. They queried testers about their experiences and preferences and recorded and analyzed all this information.

AARP was the sole sponsor of this study. Every manufacturer/distributor was invited to participate by donating a sample indoor-outdoor product for evaluation.

doors¹). Again, testers tried to complete the task as quickly as possible without hitting anything. According to testers, the *Electric Mobility*, *Pride*, and *Pillar* scooters are easier to turn around and make 90' turns. They also completed the turns in the best time and made fewer errors with these vehicles. On the other side, testers rated the *Invacare Tri Rolls* as the most difficult scooter to turn around. Drivers also made more errors with it and took longer to complete the exercise.

Similarly, testers rated the *Bruno Regal Ten* as the most difficult scooter with which to make the right hand turns. They also too longer and made more errors with the *Bruno*. The turning trials contributed to the above-average ratings for the *Electric Mobility*, and *Pillar* scooters and the average or below-average ratings for the *Invacare* and *Bruno* scooters under **Handling Ability**. Do the down arrows here indicate inferior products? Not necessarily. We're back to the question of trade-offs.

Note: From the time we began the research, there have been a number of product and industry changes. *Electric Mobility* introduced a new *Rascal 230* in 1995. The new model includes a number of product changes from the vehicle tested in this study. *Fortress Scientific* was purchased by *Optiway Technology Inc.* and has made a number of changes in the *Fortress 2000*. *Genus Medical* was purchased by *Invacare*, manufacturer of the *Tri- Rolls*, and *Mobility Manufacturing* went out of business.

We chose to list these products even though they may no longer be manufactured, because dealers and distributors may still stock the scooters.

¹ Note: Many residential interior doors are only 30 inches wide

Take a look at the ratings under **Safety Measures**. Here, both the Bruno Invacare rate a ▲. Both scooters are larger, heavier, and generally have a wider turning radius (less able to make sharp turns). That

makes them difficult to maneuver in tight places, but it also makes them more stable and less likely to tip. The personal trade off is: If you need maneuverability, look at the **Handling Ability** rating

and, if you need to climb hills and travel over open ground, look at the ratings under **Safety Measures**.

Types of Scooters

Can I cross a steep hill with a scooter?

Can I stop when I need to with this vehicle?

Can I climb a curb?

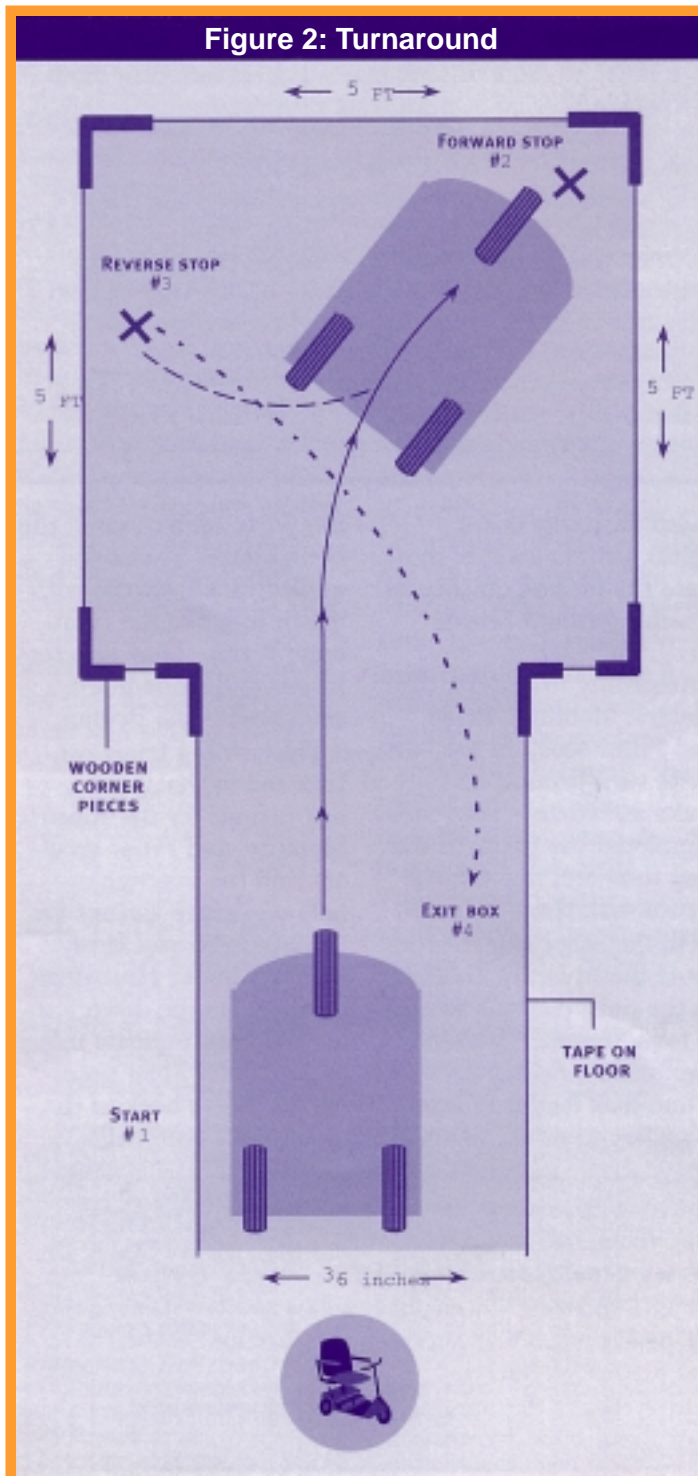
These are questions about scooter safety and stability. To investigate these issues, ITD conducted six performance tests. Researchers:

- ◆ Calibrated the angle at which a scooter begins to tip sideways
- ◆ Evaluated sideways tip ability with the seat at various levels
- ◆ Traveled full speed across a 13° grassy hill
- ◆ Drove across potholes,
- ◆ Measured stopping distances
- ◆ Climbed 2.5, 3, and 3.5 inch curbs (most curbs are from three to six inches high)

In addition, ITD reviewed the scooter accident reports filed with the federal Food and Drug Administration.

Sideways Tipability -

According to the FDA's files, one in six reported accidents involves a scooter tipping over on its side. To be sure, the overall number of reported accidents is small². Nonetheless, based on both the FDA reports and ITD's findings, sideways



² Only 230 reports were filed between 1988 and 1993.

tipping should be a concern for indoor-outdoor scooter buyers.

To compare the risks of tipping, ITD began by measuring the angles at which each vehicle begins to tip sideways (when one of the rear wheels lifts off the ground). To determine this angle, researchers slowly jacked up one side of the scooter as it sat on a plywood platform. When one of the rear tires raised up, researchers measured the angle of the incline. On average, scooters begin to tip when one side of the vehicle is about seven inches higher than the other. This is approximately 16°.

The tip ability angles ranged from 14° (one side is approximately six inches higher than the other) for the Ranger *Safari* to 19° (one side is approximately eight inches higher than the other) for the Booster *Electric*.

Next, ITD conducted three performance tests. First, researchers drove each scooter up and then across the same 13° hill. Second, they drove across a series of five potholes that ranged from 1.5 to 3.5 inches deep. Third, researchers drove the scooters at full speed, in tight circles, on level ground, to learn how seat adjustments influence tip ability. For the circle test, they adjusted the seat to the lowest and farthest forward position and then the highest and farthest back position. In all three trials, researchers noted if

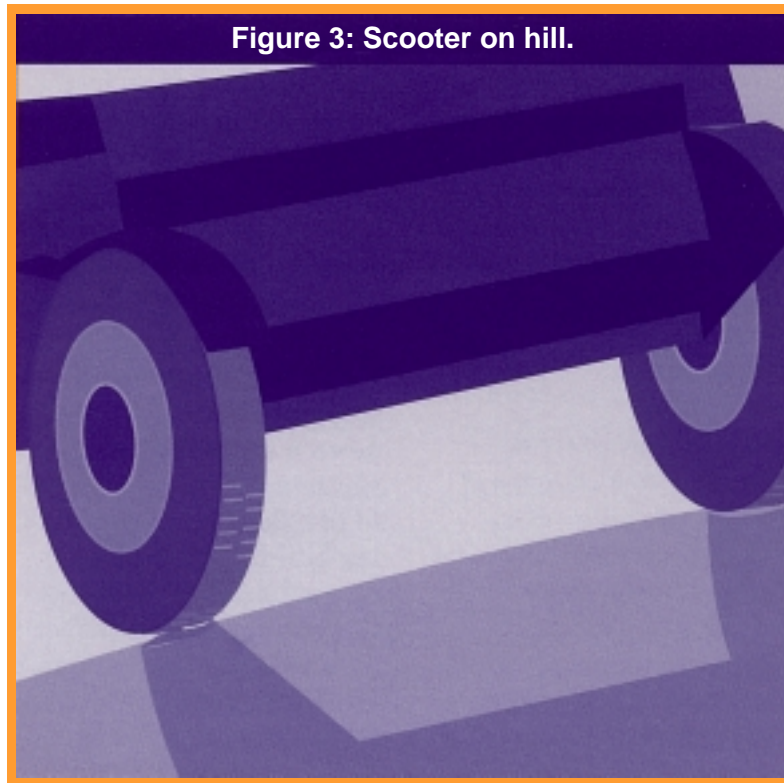


Figure 3: Scooter on hill.

the scooter tipped.

Of the 15 scooters, only three successfully completed each performance test with the rear wheels planted firmly on the ground. The three scooters were Leisure Lift, Bruno, and Pillar. Interestingly, ITD found that these three scooters only had average or slightly better tipability angles (16° or 17°). Further, the scooter with the 19° tipability angle tipped. Why's that? Stability or keeping the wheels on the ground, is certainly related to the angle at which a scooter begins to tip. However, no single factor appears to determine stability. Crossing a small pothole shouldn't cause most scooters to tip. However, crossing that pothole at full speed may be a jarring experience (see **Riding**

Comfort, for more information). If jostled too far to one side, the d-river's weight alone might topple the vehicle. Indoor-outdoor scooters only weigh about 150 pounds. ITD's 160 pound driver, for example, weighed more than all but one of the 15 scooters he test drove over the potholes. What do the tipping trials mean for the scooter buyer? First and foremost, if you plan to drive regularly on open ground, across hills, and potholes, you need an outdoor scooter. Outdoor scooters are larger, heavier, and more powerful. To be sure, there are significant differences among the 15 scooters tested by ITD. Generally speaking, however, driving indoor-outdoor scooters on rough ground puts you at risk. If you must cross a hill on an

indoor-outdoor scooter, try to avoid steep grades. If you can't avoid a steep hill, drive slowly, crossing it in small steps. Some scooters come equipped with anti-tipping devices on each side. These should prevent side tipovers in many instances, but they're not a permanent fix.

Stopping on a Dime –

According to a number of retirement center managers, scooter accidents are accelerating in these facilities. In part, this is because more people are driving scooters, but are there other reasons? A medical journal suggests that scooter accidents relate to inadequate driver training and drivers with slowed reaction times. However, the authors reached these conclusions without looking at the scooters. ITD's evaluation tried to take a snap shot-look at both the older driver and scooter performance in braking. In the first trial, researchers asked testers to try to stop each scooter at a certain point on a track. ITD asked testers to stop while going forward and in reverse, at medium and then at high speeds.

The averages for all scooters with these trials

were as listed in Table 3. The differences among individual scooters in these trials weren't significant and aren't included here. In the second test, ITD tried to determine the distance needed to stop a scooter traveling fool-speed on an incline. Here, a researcher drove each scooter full-speed, up and down a 5°, 30 foot long ramp (a 5° incline is equal to the slant on ramps making buildings wheelchair accessible).³ Midway up the ramp, researchers set-up an electric eye to sound an alarm when the scooter crossed its beam. Just as the alarm sounded, the driver released the throttle, or the scooter equivalent of *slamming on the brakes* (as mentioned earlier, scooters rely on regenerative brakes). After each vehicle came to a halt, researchers measured the distance from where the alarm sounded to the front of the scooter. Going up the ramp, the regenerative brakes brought the scooters to an immediate standstill. They stopped within inches of the electric eye, (each scooter actually rolled backwards a little). Going down the ramp, however, was a different story. Not one scooter

came close to *stopping on the proverbial dime*. The best performers, the Bruno, Shoprider, Ranger, and Pride scooters, stopped four feet from the alarm and the Fortress 2000 took more than nine feet to come to a halt. Scooter manufacturers indicate the long stopping distance is a *design compromise*. Stopping too quickly might throw the driver forward so the rate of deceleration is slowed for a gradual stop.⁴ None the less, long stopping distances can be dangerous if you're not prepared. You should never drive full-speed down a hill, particularly in a congested area. However, for comparison purposes alone, let's put the scooter on a 5° sidewalk in San Francisco, instead of an indoor ramp. If the driver delayed *slamming on the brakes* until reaching the street corner, he or she would be in the road before the scooter came to a standstill. What do these trials mean to the scooter buyer? First, in the main, the ITD testers were close, but couldn't stop on a line. You probably won't either. Driving experience will surely improve your abilities, but you must always give yourself an extra margin in stopping every scooter. Second, remember that regenerative brakes appear to work fine going uphill. However, in driving down hill at whatever speed, learn the scooter's limits.

Table 1

Trial	Percentage Stopped On Line	Percentage Stopped Within Ten Inches
Driving forward, medium speed	54	47
Driving forward, high speed	36	53
Driving reverse, medium speed	28	49
Driving reverse, high speed	18	42

³ The user trials are included under the **Handling Ability** column in Table 1. The performance evaluation is included under the **Safety Measure** column.

⁴ It's interesting to note that both the Pride and Fortress scooters had the highest percentage of smooth stops on level ground. Nonetheless, on the 30 foot ramp, the Pride stopped about four feet from the electric eye and the Fortress over nine feet.

Test drive a scooter, braking as you go downhill.

Manufacturers, Amigo, for example, with some models, do produce scooters with manual brakes and it could have been interesting to compare regenerative and manually controlled brakes with users. ITD reports that the testers kept looking for the brakes as they stopped.

Performance Trials

How many miles can I travel on a scooter?

Can I climb a ramp with a scooter?

How sharply can I turn the scooter?

These are all questions about scooter performance or the limits of effective vehicle operations. To try to gauge scooter performance, ITD conducted six separate measurements. These were:

- ◆ Measuring distance traveled on a fully charged battery
- ◆ Clocking maximum driving time on a charge
- ◆ Climbing two steep ramps (nine° and 18°).
- ◆ Measuring turning radius
- ◆ Climbing a 35 yard-long, 8° hill

Researchers clocked completion times, measured distances, and turning radiuses, and observed ramp climbs.

Time and Distance With a Charge - Before you set off on an all-day trip through Disney World, you'll want to know if your scooter will make it. To measure time and distance, ITD's researchers began by charging each scooter's batteries for the recommended 12 hours. They then loaded the vehicle with the equivalent of a 160-pound driver and placed it on a treadmill-like device.

Researchers set the scooter's speed control and throttle for the fastest rate and ran each vehicle in place until it drained its batteries. ITD recorded the distance traveled and clocked the running time. The average distance traveled by all scooters was 18 miles. They ranged however, from ten to 26 miles. The average driving time was a little over four hours, but individual vehicles ranged from two to six hours. Be aware that, in some instances, ITD's findings are higher or lower than manufacturers' claims. The differences might be attributed to nothing more than different measurement techniques⁵. The driver's weight, weather conditions, driving speed, and the terrain can all influence the power drain on a battery. Some scooters also use more power because they're designed to carry heavier passengers. As a result, they don't travel as far or as long. We report ITD's findings for each scooter in

Table 1. Match your needs with the range and power demands of these scooters.

Climbing Ramps -

Office buildings, schools, churches, and many other public facilities now have ramps for wheelchair and scooter accessibility. By federal law, none of these ramps should exceed 5°. The question is, can every scooter climb them? Every manufacturer claims their products will, at a minimum, climb a 5° ramp and ITD's tests confirmed this. Most manufacturers maintain their products do better than 5°, climbing 12° or 15° ramps and hills. To test these claims a 160 pound ITD researcher tried to climb both a 9° and an 18° ramp with each scooter. ITD found every scooter, including the Amigo, which only claims to be able to climb 5°, made it up a 15 foot ramp set at 9°. With the 18° ramp, which is more than three times as steep as most access ramps, every scooter except the Amigo and Genus made it up. Is it safe to climb an 18° ramp or hill with these scooters? No. First, there's a major safety consideration. Climbing the 18° ramp, eleven scooters tipped backwards, lifting the front wheels off the ground. Of those scooters climbing the 18° ramp, only the Leisure Lift and Booster vehicles kept their front wheels on the ground. Most scooters

⁵ For example, the Department of veterans Affairs (VA) certified the Leisure Lift scooter's range at 22 miles or five more miles more than the ITD test noted. At least in part, the difference is connected to the fact that the scooter's throttle was set at a slower speed in the VA test.

come equipped with anti-tipping devices on the back and this second set of wheels prevented tipping over. Even so, when the front wheel's suspended in the air, the scooter's balance is precarious. A shift in the driver's weight could cause a sideways tip. It's important to remember that no manufacturer recommended climbing 18° ramps. Second, in climbing inclines this steep, you may trip the scooter's circuit breaker. To prevent damage, each scooter has a fuse-like device that cuts power when the motor reaches a certain temperature climbing steep grades heats up the motor. Resetting the circuit breaker restores the power, providing the engine cools down. Again, based on your driving conditions, you must decide which scooter is best for you. Be sure, however, to buy a scooter with anti-tipping wheels.

Features and Adjustments

Can I readily get in and out of a scooter?

How easy is it to operate the controls?

How easy is it to adjust the scooter to fit me?

These are questions about scooter features and adjustments. Features include: ignitions, tillers, speed controls, throttles, seat locks, battery gauges, and brake

locks. Adjustments include: tiller, seat, and armrests. To review each scooter's features and adjustments, ITD asked:

- ◆ Testers to express their preferences for features in one-on-one scooter comparisons
- ◆ Testers and research assistants to rate the ease of entering and exiting, adjusting the seat and armrests adjusting the tiller, and setting the speed control.

Throttles - Once you've turned the ignition on, your scooter starts rolling when you squeeze the manual throttle (see figure 1). The harder you squeeze, the faster the scooter goes, within the limits set at the console (speed control). Even though the throttle may feel comfortable to operate, remember you must squeeze it as long as you're driving. Therefore the throttle's size, shape, texture, and ease of use are all important to driver comfort.

Testers preferred accessible, large-handled throttles with a rubber or plastic covering. In one-on-one comparisons, they preferred the Fortress Scientific throttle (67 percent). Its curved, L-shaped, design made this throttle easier to reach and the handles were rubber-coated with a springy comfortable material. Following close by were the Pride (preferred 66 percent), Bruno (preferred 64 percent), and Electric Mobility

(preferred 64 percent). Each of these throttles was large and coated with soft rubber or plastic.

Tiller - Many scooters' tillers adjust up and down, forward and backward to fit the driver. However, with a very large person, the tiller may not adjust to fit their torso. Be sure to test this before buying a scooter. Once adjusted, most users don't alter their tillers. Along with adjustability, tillers swing forward and out of the way of entering and exiting drivers. Most of our testers, however, didn't bother to swing the tillers forward after the first few test drives. In their opinion, this was an unnecessary bother. Testers preferred the Pride tiller (86 percent) in paired comparisons. Electric Mobility was a close second (83 percent). Testers found the latter tiller easier to adjust; however, both tillers are lightweight, and easy to raise and lower.

Ignitions - Overall, testers prefer ignitions that are large and easy to use. The top choices were the ignitions on the Pride (preferred 74 percent of the time) and the Shoprider (preferred 70 percent). The Pride key is a two-inch long, plug-in device, similar to the audio visual plugs (banana plug) found on electronic equipment. It is large, easy to insert and remove, and audibly clicks upon insertion.

The Shoprider key was similar to the size of a car key. Testers rated it highly because the key provided a good grip and was easy to handle. Testers gave the lowest rating to the Mobility Manufacturing key (preferred only 24 percent of the time). This key was about the size of a thick, stubby pencil. It's a half inch cylindrical magnet encased in a rubber cover. The key isn't difficult to use. Rather, testers didn't know what to do with it once they turned on the ignition (the key doesn't remain in the ignition). The lower rating was for an inconvenience factor.

Riding Comfort

How comfortable is the ride on rough ground?

Does the scooter start and stop smoothly and evenly?

How comfortable are the throttle and tiller to use

How loud is the motor?

These are questions about scooter comfort or the sense of ease or enjoyment with the ride and key features. To try to measure this factor, ITD asked:

- ◆ Testers to rate comfort riding on rough ground
- ◆ Testers to gauge the ease of using scooter throttles and tillers
- ◆ Research assistants to rate smoothness of scooter starts and

- ◆ Research assistants to measure noise level in decibels

Driving on Rough Ground

- If you've ever driven a car on washboard gravel roads, you know the value of shock absorbers and springs. Most indoor-outdoor scooters, however, don't come with a suspension system to level out the bumps in the road. It's the springs and padding in the seat that cushion the driver. To rate scooter comfort on a bumpy course, testers drove each scooter for 90 seconds on a flat, mowed, grassy, but uneven surface. There weren't any potholes but the crusty surface visibly jostled testers. Bouncing about on the grass didn't alarm testers 78; percent said the ride was stable, but only 47 percent rated it as comfortable.

The Pride and Pillar scooters were the most comfortable on the grassy surface, according to testers, and the Fortress the least. The comfort extremes seemed to be focused on the seat. The rigid back on the Fortress⁵ seat pinched testers as they bounced back and forth, and the padding was thin. The Pride and Pillar seats were well padded, and seemed to wrap around and almost encase the driver. The seat in effect, became a suspension system. The message to buyers is: 1. Test drive the scooter on different surfaces before

buying, and,
2. Make sure the seat is comfortable for you.

Smooth Starts and Stops -

Jerky starts and stops also jostle drivers. To evaluate any patterns of shaky starts and stops with scooters, ITD's researchers watched testers as they accelerated and braked. With each motion, they tried to answer two questions: Was it smooth and even? Were there any jerky body movements?

Overall, while driving the scooters forward, 89 percent of starts and 65 percent of the stops were rated as smooth and even. Going backwards, 91 percent of the starts and 76 percent of the stops were rated smooth and even. Setting the speed control at medium, the starts and stops were smoother than with the fast setting. The vehicles with the smoothest stops and starts, according to the researchers, were the Pride, Shoprider, and Leisure Lift scooters. On the other side, researchers noted that the Suntec scooter had many uneven starts and stops. Testers complained of being jostled back and forth both starting and stopping with this vehicle.

Make sure you ask the same two questions with any scooter you're interested in. Are the starts and stops smooth and even? And, am I jerked back and forth with this scooter?

⁶ The new manufacturer of the Fortress says the seat has since been improved.

Assembly Disassembly

Is it easy to take a scooter apart for transport?

Can I lift each of the disassembled pieces?

How difficult is it to put it back together?

If the battery dies, can I push the scooter?

All these questions relate to transporting the scooter. To investigate the ease of assembly, disassembly, and transport, ITD conducted six trials. Without using any tools, testers:

- ◆ Removed and replaced the scooter seat
- ◆ Adjusted the tiller (for transport)
- ◆ Disconnected and attached battery connectors
- ◆ Lifted the heaviest piece of the disassembled vehicle
- ◆ Released the brake lock
- ◆ Pushed the scooter.

Testers and researchers rated each trial for ease of completion. We combined their ratings here. Researchers recorded the number of testers successfully lifting the heaviest disassembled pieces. Finally, researchers recorded the number of testers who released the brake lock and pushed the scooters.

Taking it Apart and Putting it Together - each of the indoor-out-door scooters disassembles

into three to six pieces. These pieces could include the seat, tiller, batteries and connections, chassis, and body shroud (a cover over the motor and chassis). The ability to break down the scooter into smaller pieces permits users to transport it in their car without buying special carriers.

ITD asked testers to assemble and disassemble the scooters and to lift the heaviest disassembled piece. Researchers demonstrated each step, and asked testers to copy the procedure. In general, the testers completed most of these tasks. They didn't find them to be difficult, but it wasn't easy either.

First they removed the scooters' seats, one of the bulkier components. On average, half the testers dismantled the seats. Testers found the Suntec and Amigo seats easiest to remove (17 of the 25 dismantled the Suntec seat and 16, the Amigo). The most difficult to disassemble was the Shoprider (only one of 25 testers dismantled this seat).

By comparison, readjusting the tiller for transport⁷ was effortless. Testers successfully flattened the tillers against the chassis in 98 percent of their attempts. Almost three fourths of the testers rated the task as easy. To successfully transport the disassembled pieces in your car, you must also be able to lift them into the

trunk (about three feet off the ground) and the scooter pieces must fit in the trunk. The weight of the heaviest scooter pieces ranged from 24 pounds for the Shoprider to 85 pounds for the Amigo (See Table 1 for details). However, weight alone isn't the only criteria for easy lifting. Only eight testers lifted the 24 pound piece of the disassembled Shoprider. Yet, 12 testers lifted the heaviest piece, 38 pounds, on the Pride. What's the difference? The size of the heaviest piece. The Shop rider's seat was the heaviest item on this scooter and its bulky size made it difficult for the testers to get their hands around to lift. By contrast, the heaviest piece on the Pride was the rear wheel assemblage. It was compact and provided a handle for easier lifting. (Note: There are commercial lifts to help you place the scooter in the trunk.)

What do these trials mean for buyers? At least one scooter advertiser claims the disassembled pieces are so lightweight "no lifter (someone or something to hoist the pieces) is needed." Yet, the ITD testers failed to lift the heaviest scooter pieces in three out of four attempts. A second advertising claim is that the scooter "disassembles or reassembles in seconds." ITD didn't time the disassembly trials, but testers succeeded in dismantling scooter seats in only half their attempts.

⁷The Electric Mobility tiller didn't readjust for transport. Instead, the tiller separated from the chasis. Testers found this procedure difficult

Clearly there's a contradiction between what the advertisers' claim and what the testers accomplished.

Was there something unique about ITD's testers? They were older, average age 74, but ranged from 59 to 84.

However, over half said their health was good to excellent, and by all the physical measurements, they fit well within the normal range for this age group.

Scooter buyers need to go beyond the advertising hype and check to see for themselves if they can assemble or disassemble the vehicle they want to buy. They should also see how long it takes and, after disassembling it, try to lift the pieces into the trunk of their car. Even if you can't lift the heaviest pieces, a particular scooter may be the right one for you. However, know what you're buying, not what the advertising is trumpeting.

Final Thoughts

Accessories - For this test, we asked each manufacturer to provide us with a sample of their baseline product. As a result, every scooter was gray in color and the least expensive seat was attached. Every manufacturer also sells a whole range of accessories to increase comfort or distance. There are devices to convert a three-wheeled scooter into a four-wheeled vehicle. Scooters

are available in many different colors. Baskets and special carriers for canes and walkers are sold. Different seats are available in cloth and vinyl. It's your choice in adding on to the scooter.

Shopping for a Scooter - Scooters are sold through the mail, in the home, and through dealers. We suggest you begin by calling one of the manufacturers listed here. Above all, shop around and test drive any scooter on different terrain's before you buy. You should also find out if the salesperson services what he/she sells? Ask if they're factory trained? Find out what happens in an emergency and what kind of reputation does the seller have? And, finally, what happens when you travel with a scooter?

Conclusion

The choice is yours. Scooters provide the legs that many older persons need to go where they want to go. There are also differences among the various products and you may need to make some trade-offs. We suggest you look through the test results mentioned in this booklet. Give yourself plenty of time to make a decision. Remember too, the scooters we've listed in this guide are only a small sample of what's available.

Scooter Manufactures Listed in this booklet

Amigo Mobility International
6693 Dixie Hgwy
Bridgeport, MI 48722
(800) 821-2710

Booster Electric Vehicles
202 Woodward Hill RD
Edwardsville, PA 18074
(800) 845-9642

Bruno Independent Living Aids
PO Box 84
Oconomowoc, WI 53066
(800) 882-8183

Electric Mobility Corporation
1 Mobility Plaza
Sewell, NJ 08080
(800) 662-4548

Fortress
Optiway Technology INC
500 Norfinch Dr
Ontario, Canada McNIY4
(800) 514-7061

Genus Medical Inc.
441 -A Applewood Crescent
Concord, Ontario
Canada L4K 4B4
(800)567-9153

Invacare Corporation
PO Box 4028
Elyria, OH 44036
(800) 333-6900

Leisure Lift Inc.
1800 Merriam Lane
Kansas City, KS 66106
(800) 255-0285

Ortho-Kinetics
PO Box 1647
Waukesha, WI 53187
(800) 558-7786

Pillar Technology Inc.
417 Main ST
Neodesha, KS 65020
(316) 325-2629

Pride Health Care Inc.
71 South Main Street
Pittston, PA 18640
(800) 457-5348

Ranger All Season
Corporation
PO Box 132
George, IA 51237
(800) 225-3811

Shoprider
13880 Mayfield Place
Richmond, British Columbia
Canada V6V 2E4
(604) 273-5173

Suntec Systems
5001 Joerns Drive
Stevens Point, WI 54481
(800) 643-4515



American Association of Retired Persons
601 E Street, NW 1 Washington, DC 20049

Other Product reports in this series are:

Canes D14916
Life Insurance for Older Adults D14139
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Personal Emergency Response Systems D12905
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Walkers D14390
Wheelchairs D14049

They can be ordered by writing on a postcard to AARP Fulfillment,
601 E Street, NW Washington, DC 20049

Be sure to include the stock number.
Allow six to eight week for delivery.

Product Report: Electric Scooters was produced by the American Association of Retired Persons
as an educational service to members and other older persons.