ARE WE THERE YET?

» How far? How fast? How high? **HIGH-TECH PEDOMETERS** and other **ELECTRONIC GADGETS** seek to provide consumers with accurate speed and distance information.

BY CLYDE SOLES

THEY ARE AGE-OLD QUESTIONS FOR HIKERS and runners: *How far have I gone? How fast am I moving?* Aside from trivia, the answers can be useful for navigation, time planning and training. On a bike, an inexpensive computer reliably provides this information. But foot-powered outdoors people have long had to rely either on guesstimates or trail markers, where accuracy is dubious. But all that is changing as new electronic devices now track speed and distance more accurately.

LIKE CLOCKWORK

The cheapest pedometers have been on the market for decades, though they've been gussied up a bit in recent years with digital readouts. Most sub-$30 retail pedometers are mechanical devices that have a suspended lever arm inside. When worn on a belt, the lever arm moves with the motion of the hip during each step, acting much like the pendulum of a clock. Like the clock's pendulum, it also assumes equality and regularity in steps. The less expensive models can make a clicking sound as the end of the lever hits a contact to make the count. A good example of this genre is the Brunton Analog ($28) which has a large glow-in-the-dark dial.

Better mechanical pedometers can be quite accurate as long as the person is making normal and consistent length strides on flat ground. These are calibrated at the factory and have higher-quality components (coiled spring, dampened or magnetic switch). The less expensive versions require calibration by the user and are less likely to be accurate.

Where the higher-end mechanical pedometers differ from one another is mostly in the bonus features. Many devices, such as the Freestyle Pacer ($20), state they count calories based on steps. Some models ask users to input height, weight, gender and age to allow the device to be more accurate. Other pedometer options include a pulse meter, and some have a panic alarm that shrieks at high decibels when activated.

ACCELERATE YOUR BOD

The key thing that affects the accuracy of a mechanical pedometer is a consistent stride. Any semblance of consistent stride pretty much goes out the door when hiking or running on hilly or uneven terrain. When the trail dictates foot placement, even the best of these devices can leave users wondering about the distance.

Enter a new generation of high-tech pedometers, which use accelerometers to achieve greater accuracy. These utilize a strain gauge that flexes with acceleration and deceleration. Unlike the mechanical devices, these piezoelectric pedometers can detect the degree of motion and adjust accordingly for a more accurate measurement, particularly on uneven terrain. Some have more than one strain gauge, so they will work in different orientations or when carried in a pocket.

Unfortunately, you often can't find instructions for pedometers, and their packaging rarely contains technical details, so the easiest way to tell if a model is mechanical or electronic is to look at the battery. Most likely, a small button battery (LR44) means mechanical, and a quarter-size battery (CR2032) indicates an accelerometer. The other way is to look at the price: Most of those with accelerometers are in the $30 to $50 range.

As with the mechanical pedometers, ones with accelerometers are often sold with extra features. The Highgear Fitware

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($30) does a fine job of measuring distance, and for an extra $5, consumers can get an FM radio built-in. Add $15 and they get a pulse meter.

While more accurate than mechanical pedometers and generally a better option for hiking, the accelerometer versions do eat batteries. They are always collecting data (don't forget to tell your customers to switch them off when not in use), and the extra features also consume power.

FAST ON THE MOVE

Placement for accuracy is everything. Even the fanciest of the hip-mounted pedometers, when used for running, have a tendency to undercount steps considerably. The solution preferred by many runners is a wireless accelerometer attached to a shoe with a wristwatch receiver, commonly called a Speed Distance Meter (SDM).

All the rage with roadrunners who suffer from gadgetitis, SDMs are usually bundled with a heart-rate monitor. The fanciest of these can upload information onto a computer for analyzing a workout.

To get the most accurate results, the SDM needs to be calibrated for the user's stride. This is usually done by running or walking around a 400-meter track and then entering a manual correction. When properly set, these devices can provide remarkably accurate readings with some major caveats.

Since the accelerometer is on the shoe, it is more sensitive to variations in stride than a pedometer on the hip. Thus, the SDM can be set for walking or running, but not both. All of the companies warn that trails with significant hills will yield inaccurate results since pace varies so much; an error of 10 percent or more is possible. Even if just used for running on relatively flat terrain, the SDM can lose accuracy as the runner gets fatigued and shortens his or her stride.

Despite these limitations, SDMs offer something no pedometer can—real time speed estimation in either miles per hour or minutes per mile. The latter is particularly useful as it allows runners to get a tangible feel for a given pace. Since heart rate varies at a given pace (level of conditioning, temperature and hydration all affect heart rate), combining the two is more valuable than either alone for competitive runners.

Among the first and still one of the best-known SDMs on the market is the Nike Triax Elite ($370), which launched at the 2003 Boston Marathon. This package includes an ergonomic running watch, chest transmitter, foot pod and a wireless computer link. The included software runs on PCs and Macs and is designed for maximum simplicity to encourage its use.

Considered an industry leader in heart-rate monitors, Polar offers two SDM models for runners that receive information from a foot pod. The stylish RS200sd ($220) is geared mostly toward hardcore racers; it even counts down the time remaining until the next race. However, its computer interface is not as advanced as other models. The more sophisticated S625X ($350) has all the running features (speed, distance, heart rate) and adds an altimeter. Cyclists can also add a speed sensor ($40), cadence sensor ($40), and power sensor ($350). And those with inquiring minds can purchase the infrared USB interface ($40) and software ($60) to really analyze the data with elevation gain and loss.

Suunto also has some powerful offerings. When introduced last year, the t6 ($400) was arguably the most sophisticated training device on the market. The heart-rate monitor and altimeter interfaces with computer software (included, PC only) and can be combined with a foot pod ($100) or bike sensor ($70). The recently upgraded software allows detailed analysis, and users can connect via the Internet for additional advice. Next season, the new t4 ($200) will provide the important data during the workout, including that sent by the optional foot pod. However, to upload that data to a computer will require the optional PC pod ($100).

Silva USA entered the SDM market this season with three unique models in the Tech4O line—all models allow the display to be worn on the wrist or around the neck (like a stopwatch). The R1H Running Speedometer ($200) uses an accelerometer that is either integrated into the heart-rate strap or worn at the waist when heart rate isn't needed. The B1 Inline Skate Speedometer ($120) comes with a replacement wheel (three sizes available) that has an accelerometer inside; ideal for speed and fitness skaters. The most unusual SDM on the market is the S1 Ski Speedometer ($260), which uses a wireless radar sensor to measure speed and distance over snow. It's great for Nordic track skiing, but is not quite as ideal for alpine skiers (sensor must be outside of clothing). Both the B1 and S1 can be combined with a heart-rate transmitter ($80).

Probably the coolest SDM entering the market is the Sport Kit ($30) created by Nike and Apple. The Sport Kit consists of an

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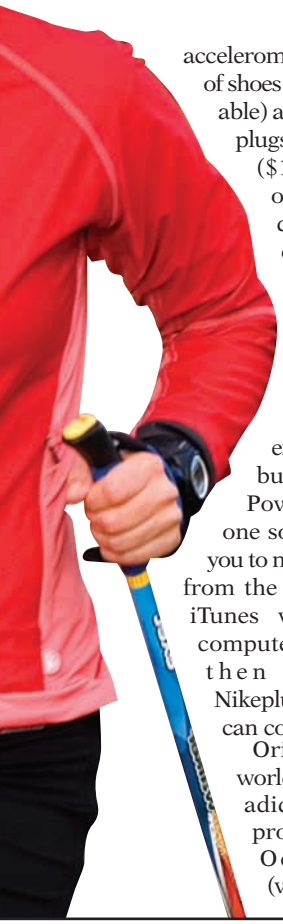

accelerometer that fits inside a pair of shoes (12 models currently available) and a wireless receiver that plugs into an Apple iPod Nano ($150 to $250). Nike also offers a line of shirts designed to carry the iPod on the sleeve, or it can be worn with one of several holster options. While you're rocking and running, the combo can relay speed and distance. And, when you need an extra boost, the touch of a button starts playing your Power Song of choice—that one song that really motivates you to move. It also stores the data from the run and uploads it into iTunes when hooked to your computer. This information can then be shared on the Nikeplus.com website and users can compete in virtual races.

Originally scheduled for worldwide release in April, the adidas-Polar collaborative project is now set for an October 2006 launch (www.adidas-polar.com). The $680 system consists of the adiStar Fusion cushioned road running shoe, which has a pocket in the midsole that holds the Polar S3 Footpod sensor. (If you don't have the sensor, a plug fills it.) At ispo in January, we saw the adiStar Fusion tops—three men's styles and three women's styles. They have sensors bonded to the fabric that transmit heart data via the clip-on Polar WearLink. That means no more straps to annoy, chafe, feel foolish in or generally muck around with. All of the data is received by the new Polar RS800, which is similar to the RS200sd, but adds an altimeter and some graphical features. Actually, any Polar WearLink will fit the system to at least give a user strap-free, heart-rate monitoring and allow someone to step gradually into what is a rather pricey endeavor. The entire system is geared toward high-end road-runners—or at least those with gadgetitis. More shoes are, of course, planned that fit the pods, we were told. Meanwhile, the S3 Footpod can be clipped onto the lace of other shoes, although we are told it won't be as accurate, and the clothing and transmitter will work with other Polar watches.

GPS ODOMETER

We know what you're thinking, "Why use a pedometer when you can just use a GPS receiver?" Aside from a much higher cost, it makes sense at first blush because these devices can locate your position anywhere on the planet to within a few feet. But it turns out that GPS is not very accurate when it comes to measuring distance on winding trails—typically, they come up short. For example, on a trail that is accurately measured as 13.6 miles long, the GPS may only show the distance covered as 12 miles.

The problem with handheld and wrist-mount GPS receivers is that they typically don't update their position often enough at the default setting (usually 30 seconds to one minute). Any twists and turns made between the intervals are interpreted as a straight line. If users can find the deeply buried menu, they can change the update interval to one second. However, this eats up memory quickly.

Even if the user opts for the most frequent update interval, the smallest GPS receivers are also the ones with the least sensitive antennas, particularly the early versions. Thus, hikers and trail runners will often lose a signal as they move under tree cover or through steep valleys.

Another consideration with wearable GPS receivers is how much power they hog. All of the current wrist-mount versions use built-in rechargeable batteries that are only good for about 10 hours when the GPS is operating. This will be adequate for day excursions, but makes them impractical for extended trips or ultra-endurance events. Still, there may come a day not too far in the future, when the strengths will outweigh the weaknesses.

The recently introduced Garmin Forerunner 205 ($268) and 305 ($377) are major improvements over the company's previous models (101, 201 and 301). These new models (the same, except the 305 is also a heart-rate monitor) have a far more sensitive antenna and faster processor. Besides better performance, the sleeker form makes these less dorky to wear and more practical in cool weather. To get the most from these devices, outdoor enthusiasts need to pay $95 per year for a subscription to Motionbased.com and serious athletes need to pony up $120 per year for a subscription to TrainingPeaks.com. These web services combine advanced mapping and a range of other features with the data from the Forerunners to let users really geek out.

When it came out two years ago, the Suunto X9 had the best design but was weak on performance (slow and poor), not to mention a hurtful price tag of $700. Fortunately, the new X9i solves most of those issues, though it's still spendy at $500. Compared to the Garmin offerings, this is more of a navigational tool since it includes a compass and altimeter. (The Forerunners

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cannot indicate direction, and no GPS is as accurate as an altimeter for estimating elevation.) The X9i is now compatible with National Geographic Topo! State Series mapping software (for PC and Mac), which greatly enhances the value and usefulness. However, there is no heart-rate option, so the X9i is not really a training tool.

Competing with the Garmin 305 is the new Timex Trail Runner (5C391) and Data Recorder 2 package ($420). This system consists of a wireless GPS receiver worn on a belt, a chest transmitter for heart rate, a wrist-mount data display, and a wireless storage unit for data. Since each of the components has its own replaceable battery, the Trail Runner has a much greater power supply duration than the Garmin or Suunto units. The system can be purchased without the data recorder, but that defeats much of its usefulness since the data cannot be analyzed after the run. The drawbacks are limited storage (only 10 waypoints) and the lack of mapping software compatibility. But the other features make it a strong contender for serious trail runners who want to know speed, distance and heart data.

Going high-tech minimalist is the Navman Sport-Tool ($100 to $130). This GPS receiver tells the user speed and distance, plus some other trivia such as a count of ski runs. But unlike all other GPS receivers, the Navman does not tell your location or help with navigation. Nor can it connect with a computer to store all the data. So it isn't geeky enough for the gadget geeks, but it is possibly still too complex and expensive for the non-geeks.

On the horizon: Although we've seen this at European shows, a GPS-based system from the Finnish company FRWD, which is not sold outside Europe yet, consists of a receiver on an armband that accumulates data in the field (GPS position, barometric altimeter and heart rate from a chest strap). This information can be viewed at home after uploading via Bluetooth to a PC with Windows. Of course, the company (www.frwd.fi) is looking to cross the pond with its FRWD system ($380, or $545 with heart rate).

More is, of course, coming nearly daily since the segment has hardly been tapped. For example, an online tracking and logging system called Bones In Motion (www.bonesinmotion.com; monthly subscriptions, $10) works with the new generation of Assisted GPS cell phones. The phone must be worn on an armband or in a bike jersey pocket for best position accuracy. The software collects the data and then sends it to a website for analysis at home.

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