

Bearing Straight

May 4, 1998, 12:00am EDT

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I has always been considered an art, knowing how to navigate. Something that sets you apart from the rest of the mob. A skill that took brains and training and some fluency with delicate instruments and tools. If you were a gentleman at the time of the American Revolution, and you could do a competent survey -- like Washington and Jefferson -- that was a point in your favor. In the British Navy of Admiral Nelson, Captain Bligh and Lt. Aubrey, only officers and gentlemen knew how to navigate, and any ordinary sailor who was found to be cultivating those skills could be hanged. This happened to one man who had the temerity to advise Admiral Sir Cloudisley Shovell, in 1707, that he had miscalculated and was about to put his fleet aground. The Admiral had the man strung up for mutiny, which preserved the iron hierarchy, but not his wooden ships. They broke up on the rocky coast of the Scilly Isles at the cost of 2,000 lives. The Admiral made it to shore, where a local woman murdered him for his ring.????? This tale opens one of the finest little books published on navigation in the last 50 years, Dava Sobel's

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accurate instruments. Fewer shipwrecks. But the improvements were always incremental, and perfection remained elusive until the advent of something called GPS (Global Positioning System). It is the latest navigational system and, perhaps, the last that humans will ever need.???? Like the Internet, GPS is a creation of the Defense Department, with vast civilian potential. The military's need for a precise, worldwide navigational system is plain enough, and in the late '70s, the Defense Department began launching a network of 24 satellites.

Each orbits every 12 hours at an altitude of approximately 12,000 miles and transmits its exact location and the precise time -- determined by an atomic clock onboard the satellite. A receiver that picks up three (four is better) of these signals can then determine a precise location on the surface of the earth through the technique known as "triangulation."

That is the exceedingly simple explanation for how GPS works. It is, in fact, sophisticated technology that uses ingenious methods to solve problems most laymen couldn't understand if you drew them a picture. The only thing such people really want to know about GPS is, simply, "Does it work?" The answer is, "Splendidly."

The first conclusive proof of this came during the Gulf War in 1991.

American military units operating in the desert, where there are no landmarks and the ground can be as trackless as the sea, still deployed on precise (if imaginary) staging lines, moved to distant

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guard against that possibility because they knew the desert, and they knew it was impossible to navigate there.

The reports from the Gulf made GPS technology sound just about irresistible, especially to people who spend time on boats or in the outdoors. Some companies were making units for the civilian market, but they were expensive. The technology began to improve rapidly while the price went down. The unit that would have gone for \$3,000 during the Gulf War can now be bought for less than a tenth of that. And it will do more things.

It is impossible to keep up with the flood of new GPS- based products. A RAND study predicted that the industry would be worth close to \$9 billion by the year 2000. Much of that growth is in high-end, specialized technology for use in surveying, mineral exploration and other commercial applications. There are GPS units designed for marine use, civil aviation and for use in automobiles. I put that application of GPS technology to the test in Washington, D.C., and the adjacent Virginia suburbs, driving a Hertz Ford Taurus equipped with a GPS-based navigational system called NeverLost. I entered the name of the suburb where I was going to meet someone, then scrolled down the list of streets until I found the right one and entered the street address. The computer gave me instructions on how to get out of the airport, how to negotiate the expressways and which exit to take. Finally, it took me right to the front door of the house I was looking for. You pay extra for this feature, of course, but in places like Los Angeles, Boston or Washington you'll make it up in meetings not missed and stress avoided.

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The price is \$1,995. Call 800-823-2547 to find out the nearest location that offers the service. General Motors also offers a GPS-based road assistance service called OnStar in some models.)

But the best way to enter the world of GPS, if you are not some kind of specialist, is through the hand-held units, which can be found in many catalogues and large retail outlets and generally cost less than \$500. The best reason for owning one of these devices is simply that GPS is marvelous technology and is changing one of the fundamentals of life -- navigation -- the same way the fax and e-mail changed communications.

Playing around with one of those little hand-held units is, you inevitably discover, a lot of fun. In a world of superficial and even pointless gizmos, this one has a genuine *raison d'être*. With a GPS you are never lost in theory, anyway.

Anyone who is lost, of course, wants to be found. Or to find himself.

This is a lot easier if you are carrying a GPS unit, which Scott O'Grady was when his F-16 was shot down over Bosnia-Herzegovina in 1995. O'Grady was able to pinpoint his location and radio the information to his rescuers. In the days before GPS he could have used visual signals, like smoke, which would have been visible to his enemies. Or he could have stayed on the radio long enough for search planes to locate him by direction-finding. But this would also have made him vulnerable. With GPS he was

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Stories like that one inevitably lead some people to believe in technological salvation, which turned out to be an embarrassing assumption for one hiker in the White Mountains of New Hampshire. His GPS worked just fine, and so, in fact, did his cell phone. But without a map he was unable to recognize terrain, even when people were telling him where to turn. He and his partner missed a trail and eventually had to be rescued.

This story is famous in GPS circles precisely because it illustrates an important point. Navigation is still an art, even in the age of GPS.

If you already know how to use a map and a compass in the woods, then with a GPS in your inventory, you will be unstoppable. But a GPS is not a compass. You can find north with a GPS, but you will have to walk around some to do it. Also, while a GPS might show you the way home, it cannot point out the obstacles along the way like a map can. When you ask a GPS, "Where am I?" it responds with a set of numbers, which is your position in latitude and longitude, or in some kind of grid coordinates (most often, Universal Transverse Mercator or UTM). Those numbers do not mean much without a map. Digital map displays are coming into use with GPS, and that is probably a big part of the future. But, for now, paper maps and magnetic compasses are still essential tools.

This said, there is a lot they can't do that a GPS can. A GPS can, for one thing, backtrack. Say you want to go wandering around in the woods, doing a little photography. Well, you record the

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some do it by time, and some will enter a new point whenever the traveler makes a sharp change in course.

These features should determine which unit you choose when it comes time to buy.

If you come across something you would like to revisit, mark the location in your GPS and name it as a "waypoint." When you come back to this area, you simply ask the machine how to get to the spot. It will give you course and distance and, if you desire, all sorts of other information such as ETA, cross track error and velocity made good.

The capability for fixing a location so that you can return to it, or guide someone else to it, is one of GPS's most valuable features, and there are times when it can save lives. Or, at least, direct rescue squads to the scene of a disaster, which a fisherman who just happened to be carrying a GPS did when that ValuJet airliner went down in the Everglades.

Technology is morally neutral, of course, and GPS has found fans among all sorts of people. Drug smugglers are known to use GPS units.

Make a drop, record the location, then tell the mule, who has his own GPS, where to make the pickup. And then there was the fishing guide who caught his client recording the location of one of his best bonefish flats. The guide snatched the GPS out of his client's hands and threw it overboard. The client was out one GPS unit, but he got a free day of fishing.

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Richard Bliss was locked up in a Russian jail for 11 days -- the first six incommunicado -- for using a GPS to fix locations while he was mapping a cell phone system, which is what he had been hired to do. The Russians took a look at the gizmo and charged him with espionage. He got off.

It is doubtful that even the KGB -- if it still existed -- could stand up to the GPS revolution. It didn't do very well against the fax and the PC, after all, and GPS comes from the same technological gene pool. It is a universalizing technology, and its prophets see a day coming when GPS may unify the world's maps, something that once seemed impossible.

Just as we all have our own unique phone numbers, with area code, our street address could be reduced to a series of numbers which anybody with a map and a GPS would be able to make sense of. True GPS aficionados already print these numbers on their business cards.

But this is the future. For now, the GPS is -- for most of us -- a gizmo. A really fine gizmo, but still a gizmo. It can be useful and it can be fun. And if you want to see how much fun it can return the page. ?

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