

New technology can pinpoint anything; surveyors, navigators see uses

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office — is their surveying first must start from a special point of reference, one of which sits on Mt. Washington Hill, just off West Mountain Road near Calkins Road.

Establishing such a precise reference point, called a monument, costs the U.S. government about \$10,000 for each point, said Collins, who worked for the National Geodetic Survey, which places the monuments. The Mountaintop Hill monument is a concrete block topped with a brass plate.

With Navstar, "You can establish the same type of points to better accuracy for between \$800 and \$1,000," said Collins. By using at least two GPS receivers, one at a monument and the other at an unknown point, the unknown point's location can be measured to an accuracy of 1 millimeter — the width of three grains of rice.

Locher surveyor Frank Russell said his company recently did some preliminary highway surveys for Route 90 from Bush-rells Basin to the south end of Deerview Mall. The project took about 160 man-hours, which GPS could have cut in half. "At \$40 an hour, that adds up pretty quickly."

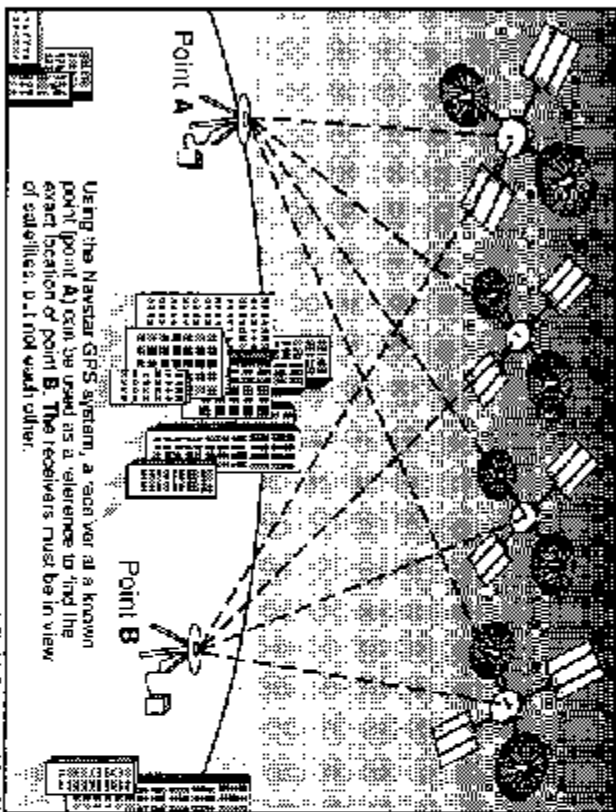
Beside highway work, the GPS receivers will be used for aerial mapping and any large-scale surveying project where visual obstructions and construction activity make surveying difficult, he said.

"We WANT to be the first in Monroe County to offer the service and use it as a marketing tool for our own benefit," Russell said. "The company plans to first lease and then buy GPS receivers for which Collins, company, Ashbach Inc., charges about \$30,000 each.

The breadbox-sized units used to be as big as small refrigerators, Collins said. Less sophisticated receivers already have shrunk to brick size. Ashbach is one of about 20 U.S. companies making GPS receivers for surveying and navigational uses.

GPS surveying equipment alone over the next two years will be a \$20 million annual industry, according to industry sources. These experts won't try to project sales for cheaper but less accurate GPS receivers being developed for boats, cars and other uses.

FOR SUBVEYING, though, it's pre-



A Navstar receiver and transmitter.

son, not savings, that's the big attraction. Collins points to the New Jersey Turnpike as an example of surveying gone wrong.

"That long stretch of highway goes for miles straight as an arrow. Then the lanes suddenly swerve. Though there's nothing to swerve around. They gave one firm a piece, and another firm a piece. When they came together they didn't quite meet. So they had to put these little transition pieces in there. GPS surveying could have solved that problem economically."

GPS receivers already have proved valuable for many uses:

- Mount Everest at last was proved to be the world's highest point, topping rival peak K-2 by 800 feet.
- The San Andreas Fault is being monitored for minute shifts that could foreshadow an earthquake.
- Collins did GPS surveying for an extension of the Stanford University linear accelerator, cutting surveying time from months to weeks. Such accelerators usually consist of many particles, which shoot

down long tunnels.

"As these particles fly down there, there can't be a bend or a dog leg."

PERHAPS THE biggest commercial use for Navstar GPS will come from its military use, navigation.

"It's the greatest thing to navigation since the compass," said Greg Hoot, a project manager at Magiswor Advanced Products and Systems Co. in Torrington, Conn.

Ironically, a navigation disaster spurred then-President Reagan to authorize Navstar GPS for civilian use. In 1983, Soviet fighter jets shot down a Korean Air Lines flight that strayed into Russian air space. Flight USF dismantled drawings in current navigation systems, which can be skewed by human or mechanical error, or which rely on surface-based radio signals limited by distance, weather and terrain.

Airlines using GPS coordinates could better avoid each other around congested airports, land more accurately and measure wind shear. Also, they could fly closer together, allowing more planes to be packed into jet-traffic airways, which

save time and fuel.

About 80 percent of the world's airports do not have landing aids, and could be served cheaply by a GPS landing system, aviation industry experts said. Airlines will be ready to use GPS navigation as soon as the constellation is complete. **HOWEVER, MILITARY** control has dominated aviation edge almost, using GPS for two seasons. First, the Block II satellites will send out two signals, a precise one for military use that will be coded, and an un-coded but less accurate signal for civilian use.

While the military signal will be accurate to within a few feet, the civilian signal can be off by more than a football field. (For surveying purposes, however, the accuracy still will be to the millimeter because multiple, stationary receivers are used.)

Also, in times of national emergency, the civilian system could be switched off — a deterrent prospect for an airline pilot counting on GPS to land in a thick fog. Soviet military pilots being skillfully blinded by a GPS blackout isn't likely, however. The Soviet's own GPS system, Glonass, is already in place.

JUST AS Glonass is GPS's military competitor, other satellite systems will compete with GPS for civilian use. GeoStar Corp. of Washington, D.C., already offers both landing and two-way communication for the transportation industry, and government agencies through its own satellite system.

"What our system does that GPS doesn't do is allow headquarters to know where (a truck) is," said Michael Breslin of Geostar. A Geostar-equipped vehicle can be tracked by a central office, which can communicate with the driver. Through Geostar isn't as accurate as GPS, it's free and isn't global in scope. GPS doesn't offer communication and is two years in the future.

"Our feeling is the potential for GPS lies more in the government arena," said Breslin.

MANY in private industry would disagree.

The Big Three auto makers already have tested GPS equipment, and some auto officials envision GPS tracking being offered as an option within five years.

To be worth the cost, officials said a GPS system would use a car computer and video screen that also would have other functions, such as talking messages and storing travel information.

The video screen would not simply give latitude and longitude readings, but also would show a car's position on a map.

GPS for a car "would have to cost considerably less than \$1,000. We don't think consumers would pay more than that," said GM spokesman Mark Corbett. But, he added, "It's just a question of miniaturizing the technology."

TOYOTA MOTORS Corp. already offers a navigation system on cars sold in Japan, although ground-based transmitters, not satellites, feed car computers information. However, the Japanese apparently have a lead in placing standardized map data in car computers.

"I would say we're probably behind on this," said Robert Aronin, product engineering manager for Chrysler Corp.'s Acquirer division. "We used a standard way of developing map data."

Domestic GPS receiver makers also have knowledge from other Japanese sources, including researchers at Japanese universities and manufacturers such as Sony Corp., which makes freestar equipment and GPS receivers.

Competition could drive GPS car systems down to \$100 to \$200 a unit, each of which might contain a map with locations and prices of hotels and restaurants and emergency services, said Collins. He foresees driving across country using GPS to figure how far away a hotel is and how long it will take to get there, then simply making reservations from your calculator phone.

"We've seen wonderful things happen in the last couple of years," he said. "That scenario really isn't far fetched."

N.Y. LOTTERY

Yesterday's winning number was 351. The Win Four number was 7227. The Keno numbers were 9, 19, 21, 31, 32, 37, 39, 42, 43, 44, 54, 57, 65, 68, 69, 75, 77, 78, 79. The Lotto numbers were 2, 14, 18, 19, 43, 46. The supplemental number was 40.