GLOBAL POSITIONING SATELLITE SYSTEM (GPS)

Global Positioning Satellite Systems (GPS) are navigation tools which allow users to determine their location anywhere in the world at any time of the day. GPS systems use a network of 24 satellites to establish the position of individual users. Originally developed by the military, GPS is now widely utilized by commercial users and private citizens. GPS was originally designed to aid in navigation across large spaces or through unfamiliar territory. As a tool for law enforcement, GPS can assist agencies by increasing officer safety and efficiency.

WHAT IS GPS?

The United States Coast Guard defines GPS as “a satellite-based radio-navigation system.” In lay person terms, GPS operates when a network of satellites “read” the signal sent by a user’s unit (which emits a radio signal). A GPS unit receives data transmitted from satellites—at least three satellite data inputs are necessary for accurate measurements. The unit then interprets the data providing information on longitude, latitude, and altitude. GPS satellites also transmit time to the hundredth of a second as coordinated with the atomic clock.

With these parameters of data and constant reception of GPS signals, the GPS unit can also provide information on velocity, bearing, direction, and track of movement.

GPS receivers can be integrated with other systems, such as a transponder or transmitter. The transmitter takes information from the GPS receiver and transmits it to a defined station, such as a police dispatcher. The dispatcher must have the system to both receive the transmission in “real time” along with the GPS data. To be truly useful, this information must be integrated with a Geographic Information System (GIS) which has a map of the community and translates the longitude and latitude into addresses.

GPS units allow users to process this information regardless of weather conditions and location anywhere in the world—land sea or air. As a general rule, however, GPS receivers will only work outside where the signal from three satellites can be clearly received. Thus, transmissions from police cars inside a structure—such as a parking garage—will be obstructed. Similarly, use in a building will generally be limited.

GPS was originally developed by the military to aid in navigation. Naval vessels, aircraft, and land vehicles could all determine their exact location to a high degree of accuracy in a matter of seconds without human error. A civilian GPS system now allows commercial and private users to enjoy the ability to accurately navigate anywhere in the world. Currently, corporations are developing GPS as a way to enhance customer service, to track inventory, and enhance security.

As one example, a consumer subscribing to Cadillac’s OnStar service can receive assistance 24-hours a day. Using a cellular phone and GPS technology, when the subscriber contacts the service center, an OnStar representative can locate the user’s position with a high degree of accuracy. This allows OnStar to ensure that subscribers receive any needed roadside assistance or specific directions from the
user’s current location to their final destination. By using GPS technology, OnStar can provide its services, even if the user does not know their exact location.

**LAW ENFORCEMENT APPLICATIONS**

GPS technology can offer numerous benefits to law enforcement agencies of all types. For some agencies, the navigational capabilities offered by GPS might enhance efficiency and safety. These navigational applications can be used to support a variety of policing and criminal justice functions. Other agencies might be interested in using GPS positioning technologies to carry out special operations or to provide enhanced personnel safety. GPS is still an emerging tool which may offer a multitude of unforeseen applications for law enforcement and the justice system. We can expect to see this technology decline in cost and/or improve in quality in the years to come.

As a navigational tool, GPS can be a powerful asset for law enforcement users. The Riverside (California) Police and Ventura County (California) Sheriff use GPS to enhance the efficiency of their aviation units. Using computerized maps of their jurisdictions in conjunction with GPS, aviation personnel can determine their exact location, their speed, and their estimated time of arrival when responding to calls. A GPS unit provides a computer with constant updates of the helicopter’s location. The computer is able to plot the location on a map of the agency’s jurisdiction. This map is displayed for the flight crew; this enables flight personnel to always know their true location.

Aviation personnel observing activities on the ground might not know the exact location of the events which they are witnessing. Using a computerized map integrated with a GPS unit, these observers could accurately direct personnel on the ground to a specific location. Aviation personnel do not have to fumble with paper maps or provide vague locations in reference to major streets or landmarks (“Subject is three streets west of Main”). This technology can improve the performance of aviation personnel and enhance communication between members of different units.

In addition to aiding aviation units, GPS could easily be applied to assist personnel operating in ground vehicles. The advantages of GPS for ground-based personnel are most profound for employees working in large jurisdictions. State and county officers who are rookies or were recently assigned to a particular jurisdiction will never be lost if their vehicle is equipped with a GPS unit (although there is still no substitute for a solid knowledge of one’s jurisdiction). Officers engaged in a pursuit which has taken them outside of their jurisdiction can always determine their precise location. Officers responding to a mutual aid call can plan their route and estimate their time of arrival.

There are a variety of other GPS applications which go beyond supporting patrol and aviation functions. Personnel who routinely travel in unfamiliar or semi-familiar territory may find GPS helpful in improving their efficiency. For example, state-level investigators may frequently be called to assist in major crime investigations in an area encompassing hundreds or thousands of square miles. GPS systems could help guide these employees to the exact location where their assistance is needed. Correctional personnel might frequently be called to transport prisoners and detainees between locations. Having access to a GPS system provides an extra level of security. Employees will always know their location if they need to call for assistance. Transport officers will no longer have to worry about not knowing their location should they need to summons back-up or roadside assistance.

Beyond these navigational applications, GPS may be used to enhance officer safety or assist in special operations. Datalink Systems (operating in Canada and the British Virgin Islands) manufactures the SENTRY system. The SENTRY system is about the size of a
pager and is worn on an officer’s belt. If an officer needs emergency assistance, a panic button on the SENTRY unit can summon assistance. When the panic mode is activated, an alert message is transmitted to the officer’s vehicle. A second unit in the vehicle relays the alert message to a police dispatcher, along with the GPS location of the vehicle. An officer can summon help, even if dispatch does not know the officer’s location and/or the officer is not able to verbally transmit a distress call.

GPS UNIT MOUNTED ON A POLICE CAR

In addition to being a tool for law enforcement “bait” operations, GPS can also provide enhanced security in the private sector. By outfitting expensive (and relatively mobile) equipment with GPS units, stolen items can be quickly located and recovered. Corporations owning these vulnerable “mobile investments” (semi-trailers, heavy machinery, construction equipment, automatic teller machines, etc.) could enjoy an element of security knowing that their inventory is safer. Law enforcement agencies might also profit by being able to clear major theft cases. In addition to tracking stolen cars, investigators could use GPS to create bait operations for a variety of vulnerable merchandise. An area having problems with the theft of heavy machinery could set up an operation to attempt to catch the guilty parties. This would allow investigators to target a wide variety of theft operations.

The positioning capabilities offered by GPS may also contribute to the success of specialized law enforcement operations. Working with local law enforcement agencies, ATX Technologies has operated a number of successful “bait car” auto theft sting operations. A bait vehicle was equipped with a GPS unit which relayed information about the vehicle’s location to a remote unit. This allowed investigators to easily track the vehicle and make an arrest once it had been stolen. The company claims that one such program operated in Minneapolis (MN) led to a 60% reduction in auto theft after only one month.

GPS may make it easier for investigators to track a vehicle’s movement over longer periods of time and across larger distances. A team of investigators might not simply want to track a vehicle to apprehend the thief. Using GPS, a vehicle could be tracked for several hours until it is taken to a “chop shop” in another city. This would enable investigators to attempt to prosecute a ring of car thieves, rather than just targeting isolated offenders.

GPS UNIT MOUNTED ON A POLICE CAR

The future prospects of GPS technology are virtually limitless. Officers operating in unfamiliar territory will always know their location. Investigators can track stolen merchandise anywhere in the world (imagine if a credit card sized transmitter could be slipped into a stack of $100 given as ransom money). The OnStar system automatically sends out a distress signal when an air bag deploys in a subscriber’s vehicle. Similar technology might some day alert police dispatchers of an officer’s exact location in the event that the officer discharges their firearm. The greatest advantage of GPS technologies are their ability to help police officers do their jobs more efficiently and with a greater degree of safety.
SOME WORDS OF CAUTION ABOUT GPS

In exploring the variety of GPS options available to law enforcement agencies, it is important to consider the degree of precision offered by each system. Many larger electronic stories sell a basic, handheld GPS locator unit for a few hundred dollars. These units will simply give the user a readout of their location with a varying degree of accuracy (most civilian units are accurate to less than one hundred meters). More precise units, and systems which pinpoint location on maps, will be more expensive in that they require “differential correction equipment”. Such units, however, can identify a location within one meter.

Interestingly, the reason for the lack of precision in commercial GPS is not a matter of technology, but one of policy. The U.S. Department of Defense (DoD) which operates the GPS system, intentionally distorts the signals for all receivers except those of the military. Current plans are for DoD to stop the distortion around the year 2002. At that time, all GPS receivers will be able to pinpoint positions on the earth within one centimeter.

Agencies integrating GPS and computerized maps need to be sure that the accuracy of the maps matches the precision of their GPS units. Although the quality of both GPS and computerized maps is improving, care must be exercised to ensure that the maps will reflect the actual position of the GPS unit. Maps must also be regularly updated to reflect significant changes within a community.

The recent accidental bombing of the (Chinese Embassy in Belgrade, Yugoslavia is a testimonial to the vital need to keep maps updated.) When mapping and positional systems are properly integrated, GPS can be a powerful asset to support law enforcement agencies in a broad (and expanding) variety of operations.

RESOURCES

Agencies interested in GPS technology may find out more from the following resources. This list is not exhaustive and should not be viewed as constituting an endorsement of any specific products or producers.

ATX Technologies
http://www.track.com/

Datalink Systems, Inc.
Vancouver, B.C
604/926-3680 (Voice)
604-903-0730 (FAX)
e-mail: info@rfdata.net

Introduction to GPS Applications
http://ares.redsword.com/gps/apps/introduction/toGPS.htm

Riverside (CA) Police Aviation Unit
http://www.pe.net/~rpd/av-ltr.html

United States Coast Guard Navigation Center GPS Homepage
http://www.navcen.uscg.mil/GPS/

To Contact Us:
Toll Free: 888.877.0585
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Web: www.wsurcpi.org

GPS SCREEN—HIGHLAND PARK, TEXAS POLICE CAR

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