

GPS: A Compatibility that Keeps on Zeroing into Precision

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Throughout history man has always been trying to perfect a system that is reliable in informing where people are and how they can get to their destination and back home again. Today that system has already been developed and its perfection continues to be significantly achieved. Global Positioning System is the most precise system of navigation universally available to plot, position, and monitor any location.

The Global positioning system, now commonly known GPS was first launched in 1978. Before GPS people in earlier centuries used longitudes and latitude lines to verify their locations. They also used magnetic compasses, chronometers, and sextons, however still knowing time and location through these systems was not accurate enough. In the early twentieth century several radio-based navigation systems were developed and used widely during World War II (Aerospace Corporation, par 7). Global Positioning System begun in the mid twentieth century through research interest in radio astronomy.

Radio-based astronomy navigation played a major role in the space age and GPS, “Astronomers learned in the late 1950’s and early 1960’s that by widening the distance between the elements of their radio telescopes they could observe radio sources much more precisely” (Knight, 105). When Sputnik was launched into space by Russia on October 4th, 1957, researchers determined the orbit of the Russian satellite by noting that the Sputnik’s radio signal amplified as it approached and decreased as it left (Radio Shack, par 5). Scientist therefore recognized that the best way to give precise coverage of the entire world was to place a high-frequency radio transmitter in space.

A transmitter high above the Earth would broadcast a high-frequency radio wave with a special coded signal that could cover a large area and still reach Earth far below at a useful power level (Aerospace Corporation, par 8). GPS does exactly that. It brings together centuries of breakthroughs in navigation by providing accurately located lighthouses in space that are synchronized to show commonly needed exact locations and times. First launched in 1978 and originally known as Navstar GPS, the launch of the twenty-fourth GPS satellite in 1994 completed its primary series. According to The

Aerospace Corporation, the next generation, Block IIF is to be launched in the late 2005 (2).

The parts of a GPS consist of the space segment, the control segment, and the receiver segment. The space segment consists of twenty-four satellites in six circular orbits. Each satellite takes twelve hours to orbit the Earth one time and is in orbit at an altitude of eleven thousand nautical miles, equivalent of 12, 660 miles above Earth (Radio Shack, par 1). Each one of the satellites is equipped with four atomic clocks which are so accurate that they keep the time to within three nanoseconds which is three billionths of a second. The satellites continually broadcast precise needed positions and time data to the controls and receivers on Earth.

The control segment consists of five worldwide unmanned base-stations that monitor the satellites. The main control segment is located in Schriever Air Force Base in Colorado Springs, Colorado (Dana, par 4). The other four are located on Ascension Island in Atlantic Ocean, Diego Garcia in Indian Ocean, and Kwajalein and Hawaii both in the Pacific Ocean. These five stations track the satellites exact position on space; they also have transmitters that have atomic clocks just like the satellites (Radio Shack, par 2). The information the stations collect from the satellites are also shared by the receiver segments.

The receiver segment which is also known as the user segment consists of processors, antennas, and hand held receivers. The antenna receivers allow land, sea, or airborne operators to receive the GPS satellites broadcast and compute their precise position, velocity, and time (U.S Coast Guard, par 1). Hand held receiver models can be purchased from your local electronic store. More than one hundred different receiver

models are already being used by consumers (Aerospace Corporation, par 5). These hand held receivers are commonly used outdoors, including in private cars. Currently the future of GPS is significantly advancing; newer models of mobile phones have GPS receiver signals built in.

How then does a GPS work? A GPS receiver knows the location of the satellite because that information is included in the satellite transmitter built in (Smithsonian, par 4). The receiver calculates how far away it is from the satellite and therefore it knows it's in half the distance from it, which is the radius in the surface of an imaginary line between the satellite and the receiver and another satellite. The receiver knows its exact distance from two satellites because it is located somewhere on the imaginary line where the two satellites interact. If the receiver takes measurements from more satellites it then knows very precise locations.

GPS is used vitally in emergencies. Medical service units use GPS to locate ambulances and helicopters nearest to the injured. Police departments and fire rescuers use GPS for the quickest response to life and death situations (Aerospace Corporation, par 2). Police and investigators even use GPS to track down criminals. They can furtively stick a GPS location tracker under a suspect's car and use it as evidence to keep off criminals from the society. They catch these criminals through a law of "no expectation of privacy while in public" (Childress).

Whether through mapping, constructing, or surveying, GPS are extensively used in building artistically modern engineering marvels. During building of the tunnel under the English Channel, French and British crews started digging from opposite ends: one from Dover, England, and one from Calais, France. They relied on GPS receivers outside

the tunnel to check their locations along as they worked making sure they met exactly in the middle. GPS allows mine workers to navigate mining locations and equipments safely, even when visibility is obscured (Aerospace Corporation, par 5). GPS signals are also being used to measure atmospheric parameters (Dana, par 3).

As an economical and cultural advancement contributor, GPS has always been recognized by the government. The United State's budget plan for 2006 includes the Air Force spending that incorporates advances in navigation. "By far the Pentagon's largest contribution on this area is growing to \$ 9.9 billion next year" (Wall and Fulghum). Earlier in 1996, the White House reported under the Office of Science and Technology Policy on National Security Council that a campaign was in effect in making GPS available to both the military and civilians (Coast Guard par 1). In 1998 President Clinton helped update the use of GPS to civilian availability rather than selective availability that was previously for military (Radio Shack, par 1).

Global Positioning System is the most precise system of navigation that is efficient and universally convenient. Convenience through GPS is therefore the future that cannot be achieved through any system that is less compatible to human needs; GPS is just the opposite of other past navigational systems and with an advancement that keeps on zeroing into precision, it holds a brighter and user friendly future.

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