# WAAS and GPS Accuracy



## Introduction

Global Positioning System (GPS) accuracy is affected by several factors. These include:

- Satellite Geometry: Positioning of satellites in the sky Multipath:
- Satellite signals bouncing off surfaces before reaching receiver
- Propagation Delay: Atmosphere slowing transmission of data from satellites
- Internal Clock Errors: Slight timing errors in the receiver
- Selective Availability: Government-based intentional error

While inaccuracies in locating a position might not always be eliminated, there are ways to receive better accuracy with recreational GPS.

## Differential GPS

Differential GPS (DGPS) reduces navigational errors by providing correction data while comparing real positions with that given by the GPS system. The U.S. Coast Guard Navigation Center operates the Coast Guard Maritime and Nationwide Differential GPS Services, which consist of two control centers and many remote broadcast sites. The Service broadcasts correction data to radio beacons capable of receiving these frequencies.

A DGPS system is composed of a DGPS beacon and GPS receiver at a known fixed location along with a DGPS beacon and GPS receiver in the field. The fixed beacon transmitter communicates corrections to the GPS in the field. The theoretical goal of DGPS is to provide accuracies of less than 10 meters, while in practice the standard accuracy is 3–5 meters. The downside to DGPS is the need for additional hardware. Each system requires multiple receivers and beacons. Because of this need for additional equipment, DGPS is less attractive for many recreational users.

## Wide Area Augmentation System

Wide Area Augmentation System (WAAS) is a project funded by the Federal Aviation Administration (FAA) designed to improve the overall accuracy and integrity of the GPS signal for flying in instrument meteorological conditions. Though designed for aircraft, it makes recreational GPS more accurate than ever before. Unlike DGPS, no additional hardware or software is required to gain increased accuracy using a WAAS-enabled GPS receiver.

## An Overview of How WAAS Works

WAAS consists of approximately 25 ground reference stations positioned across the United States, two master stations located on both coasts and two geostationary satellites near the equator. The ground reference stations receive the same satellite signals as GPS receivers and forward a correction message to the master stations. Correction messages reduce error by correcting for satellite orbit and clock drift and signal delays from the satellites. The corrected message is then broadcast through one of two geostationary satellites (located over the equator) to WAAS-enabled receivers on a standard GPS signal. Currently WAAS is only available in North America. A person outside North America can use a WAAS-enabled GPS, but the data have not been corrected.

## Effect of WAAS on Accuracy

The goal of the FAA is to provide reliable signals with an accuracy of seven meters both horizontally and vertically 95% of the time a WAAS signal is being received. Current testing by manufacturers of handheld GPS receivers have shown that actual accuracies are typically around 2–3 meters.

How WAAS relates to typical GPS accuracy can be seen in the following:

| | |
|---|---|
| Original GPS System | 100 meters |
| After Selective Availability was Lifted | 15 meters |
| Differential Correction (DGPS) | 3-5 meters |
| WAAS | 2-3 meters |

## Coverage Concerns with WAAS

As stated before, the geostationary satellites are positioned near the equator. This creates a low profile for GPS users in much of the United States, especially in northern latitudes. Obstructions such as trees and deeply sloping terrain tend to reduce signal reception, which can result in less reliable position data.

## GPS Receivers with WAAS

As long as a GPS receiver is WAAS-enabled, no additional hardware or software is required. Click below to check out the WAAS-enabled GPS receivers and accessories carried by Ben Meadows Company.

Waas Enabled GPS Units

***Order any of the products above online or call 1-800-241-6401 to place a phone order.***