Aids-to-Navigation 101 - Quick Review (2011)

OFF STATION INFORMATION

Off Station means the buoy (floating aid) is not at the Lat/Long indicated on the PatoN Record. We are checking private aids and the care in which they were placed is not known. With buoys there is also the issue of the watch circle where tide or current may take the aid some distance off its assigned position. Because of this some inexactness in location is allowed.

Note: beacons (fixed aids) won't be 'off station' unless they are no longer attached to the structure or the structure itself has been moved. They may be incorrectly located on the chart/GPS datum, but the lat/long on the PAtoN worksheet should match the lat/long on your GPS.

The Key question here is:

- if the aid **IS** doing as intended
  - an error in position of up to 250 yards (or 7 seconds) is allowable

- if the aid **IS NOT** doing as intended
  - an error in position of up to 100 yards (or 3 seconds) is allowable

The Math:

One (1) nautical mile is one (1) minute or 2025 yards
There are sixty (60) seconds in one (1) minute
One (1) second equals approximately 34 yards (or 100 feet)
One (1) meter equals 3.2808399 feet

GPS Accuracy:

15 meters (approx. 50 feet): Typical GPS position accuracy
3-5 meters (approx. 16 feet): Typical differential GPS (DGPS) position accuracy
< 3 meters (approx. 10 feet): Typical GPS with WAAS enabled position accuracy

Note:

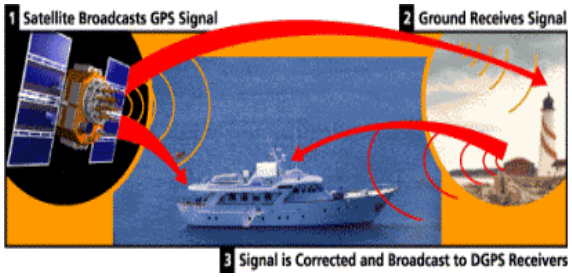
WAAS signal reception is ideal for open land and marine applications. However, the position of the satellites over the equator makes it difficult to receive the signals when trees, mountains or buildings obstruct the view of the horizon. ***Given this, you may see decreased accuracy in marinas or near shore.***

DGPS INFORMATION

What Is DGPS?

To make GPS even more accurate, the U.S. Coast Guard created a radio beacon system based upon differential GPS techniques.

This system is a series of more than 60 ground-based stations that transmit a correction or differential signal on marine radio beacon frequencies. This signal can make a GPS receiver more accurate by applying additional 'corrections' to the existing GPS signal.



What affects the signal?

There are hosts of natural and man-made interferences to the GPS signal. Basically, anything that will not allow the receiver to have a clear view of the sky will block the signal. This includes buildings, trees, mountains and the body of your car. This is why the receiver needs to be outside for optimum reception. The signal can be effected by water vapor in the upper atmosphere and even by the earth's own sounds.

How it works

The GPS receiver will receive the signal and calculate your position with the standard method. At the same time, the ground station receives the same signal at a known spot. The difference between what is received and the actual known spot is calculated and broadcast as the DGPS signal. The properly equipped GPS receiver will make the necessary calculations to correct itself. All this takes place in seconds.

Where is this available?

Currently the DGPS signal is available on the Coasts of the U.S., Canada and Australia and around the Great Lakes. These reference stations do broadcast to a large area that extends far inland. To find out if it is available in your are click on one of these links: US Coverage, Canadian Coverage, Australian Coverage

WASS INFORMATION

The origins of WAAS

The Federal Aviation Administration (FAA) and the Department of Transportation (DOT) are developing the WAAS program for use in precision flight approaches. Currently, GPS alone does not meet the FAA's navigation requirements for accuracy, integrity, and availability. WAAS corrects for GPS signal errors caused by ionospheric disturbances, timing, and satellite orbit errors, and it provides vital integrity information regarding the health of each GPS satellite.

How it Works

WAAS consists of approximately 25 ground reference stations positioned across the United States that monitor GPS satellite data. Two master stations, located on either coast, collect data from the reference stations and create a GPS correction message. This correction accounts for GPS satellite orbit and clock drift plus signal delays caused by the atmosphere and ionosphere. The corrected differential message is then broadcast through one of two geostationary satellites, or satellites with a fixed position over the equator. The information is compatible with the basic GPS signal structure, which means any WAAS-enabled GPS receiver can read the signal.

Who benefits from WAAS?

Currently, WAAS satellite coverage is only available in North America. There are no ground reference stations in South America, so even though GPS users there can receive WAAS, the signal has not been corrected and thus would not improve the accuracy of their unit. For some users in the U.S., the position of the satellites over the equator makes it difficult to receive the signals when trees or mountains obstruct the view of the horizon. WAAS signal reception is ideal for open land and marine applications. WAAS provides extended coverage both inland and offshore compared to the land-based DGPS (differential GPS) system. Another benefit of WAAS is that it does not require additional receiving equipment, while DGPS does. Other governments are developing similar satellite-based differential systems. In Asia, it's the Japanese Multi-Functional Satellite Augmentation System (MSAS), while Europe has the Euro Geostationary Navigation Overlay Service (EGNOS). Eventually, GPS users around the world will have access to precise position data using these and other compatible systems.