



Federal Aviation
Administration



wide area augmentation system **WAAS**

<http://gps.faa.gov>

WIDE AREA AUGMENTATION SYSTEM

WAAS is an extremely accurate navigation system developed for civil aviation. Before WAAS, the U.S. National Airspace System (NAS) did not have the potential to provide horizontal and vertical navigation for approach operations for all users at all locations. With WAAS, this capability is a reality. WAAS provides service for all classes of aircraft in all phases of flight - including en route navigation, airport departures, and airport arrivals. This includes vertically-guided landing approaches in instrument meteorological conditions at all qualified locations throughout the NAS.

WAAS uses a network of precisely-located ground reference stations that monitor Global Positioning System (GPS) satellite signals. These stations are located throughout the continental United States, Hawaii, Puerto Rico and Alaska; with additional stations being installed in Alaska, Canada and Mexico. These stations collect and process GPS information and send this information to WAAS master stations. The WAAS master stations develop a WAAS correction message that is sent to user receivers via navigation transponders on geostationary (GEO) satellites.

The WAAS message improves the accuracy, availability, and integrity (safety) of GPS-derived position information. Using WAAS, GPS signal accuracy is improved from 20 meters to approximately 1.5 - 2 meters in both the horizontal and vertical dimensions. Availability is increased through the addition of the WAAS satellites providing additional course correction. WAAS also eliminates the requirement to conduct receiver autonomous integrity monitoring (RAIM) predictions. In terms of safety, WAAS provides pilot alerting within 6 to 8 seconds (depending on the airborne equipment) anytime the input signal for positioning becomes unusable.

WAAS reached initial operational capability for aviation use in the NAS on July 10, 2003, providing navigation throughout the entire NAS and vertically-guided approach service known as localizer performance with vertical guidance (LPV) to the 48 contiguous states. Initially, LPV capability enabled pilots using WAAS to descend with stabilized vertical guidance to decision altitudes as low as 250 feet above the runway and visibility minimums as low as 1/2 mile at qualified runways. In March 2006, the FAA announced the extension of this initial capability to decision altitudes as low as 200 feet above the runway. Since our first service delivery in 2003, our focus has shifted to expand LPV performance to all areas of the continental United States, most of Alaska, and most of Canada and Mexico. This expansion will be complete in 2008.

The implementation of WAAS into the NAS will result in safety and capacity improvements. WAAS-enabled procedures can open more usable airspace to pilots and provide more direct routing. WAAS will also eventually reduce operations costs for the FAA by enabling the removal of a portion of existing ground-based navigation infrastructure.

WAAS is an enabler of Required Navigation Performance (RNP); a critical component of the movement toward performance-based navigation in the NAS. RNP is a concept of area navigation (RNAV) operations in which the aircraft navigation system provides containment, monitoring, and alerting for flight within a given airspace. WAAS navigation services meet or exceed the most stringent RNP performance values. As air traffic management becomes more global, the WAAS concept is being applied to civil aviation infrastructure worldwide, enabling global safety improvements. WAAS is the first of several space-based augmentation systems being developed throughout the world and is compatible with all other international satellite-based augmentation systems. Moreover, with more stringent RNP standards, inefficiencies in airspace utilization could be reduced, thus increasing traffic flows and reducing delays.

Although the WAAS was designed for aviation users, it supports a wide variety of non-aviation uses including agriculture, surveying, recreation, and surface transportation, just to name a few. The WAAS signal has been available for non safety-of-life applications since August 24, 2000, and numerous manufacturers have developed WAAS-enabled GPS receivers for the consumer market. Today, there are millions of non-aviation WAAS-enabled GPS receivers in use.

The next phase of WAAS is referred to as the Global Navigation Satellite System Landing System (GLS) segment. The GLS phase of WAAS is scheduled to coincide with the operational capability of GPS modernization and is scheduled to be completed in 2013. GLS will utilize, and depend upon, improvements that the Department of Defense (DoD) will make as part of its GPS modernization program. GPS modernization will enable WAAS to provide the GLS capability during periods of severe solar storm activity and provide additional security against interference to the GPS.

WAAS is the first of many augmentation systems being developed throughout the world. In the future, WAAS will be compatible with international satellite-based augmentation systems, enabling WAAS-type augmentations worldwide.