

# Application Note



## GPSG-1000 Validation and Test of WAAS Enabled Navigation Systems



The FAA and the many constituents within our aerospace industry recognize that the legacy air traffic control systems of the past are increasingly more difficult and more expensive to support. In response to this issue, the FAA certified a significant upgrade to our nation's GPS system in 2007, calling the upgrade the Wide Area Augmentation system (WAAS).

WAAS is designed to provide the accuracy, availability and integrity necessary to allow flight personnel to rely on GPS for all phases of flight, from en route through GPS precision approach for all qualified airports within the WAAS coverage area. This newer aviation/navigation technology provides a capability for the development of more standardized precision approaches (LPV), missed approaches and departure guidance for approximately 4,100 ends of runways and hundreds of heliport/helipads in the U.S. airspace<sup>1</sup>.

WAAS will also provide the capability for increased accuracy in positioning reporting, allowing for more uniform and high-quality worldwide air traffic management. WAAS is a critical part of the FAA's NextGen program.

The advantages of utilizing WAAS and LPV approaches are well documented. As a result, operators of private, business and commercial aircraft are rushing to install WAAS and LPV enabled avionics systems in their fixed and rotary wing aircraft which is straining the capacity of MRO and avionics installer organizations to keep pace with demand for these very popular upgraded navigation solutions. In an effort to provide MRO and avionics service center organizations with a tool to expedite the installation of WAAS enabled avionics systems, Aeroflex Test Solutions has added a critical new feature to their GPS simulator the GPS-1000 - the ability to simulate WAAS/LPV Approaches.

### GPSG-1000 Overview

The GPSG-1000 is a single carrier, multi-channel simulator which is portable and ruggedized so that it can be safely and confidently utilized on a flight line or in a hangar environment. The unit is available in 6 or 12 channel configurations, and supports the following GNSS signals:

- GPS Signals: L1, L1C, L2C, L5
- Galileo Signals: E1, E5, E5a, E5b
- SBAS Satellites: WAAS/EGNOS L1, L5

Regardless of configuration, the GPSG-1000 is capable of simulating dynamic motion of an object over a given route. Adding the positional or motional accuracy provided by SBAS satellite/WAAS correction factors, Aeroflex now has a simulator capable of creating high precision dynamic motion scenarios which are necessary for RNAV flight or LPV approaches into any airport in North America (assuming that airport has been approved for LPV by the FAA). Because the GPSG-1000 uses real current time or past history almanacs, these RNAV flight plans or LPV approaches can be simulated in real time or as if they were being flown in the past. Finally, these simulations can be performed by direct connecting to the UIUT or in an "over the air" mode using our antenna coupler system, which can be seen referencing the [data sheet](#) for the GPSG-1000 available on our web site:

### Developing Waypoints and Routes

Using an airport map and LPV approach NavAid information, which details the lat/long position and altitudes of the Initial Fix (IF), Initial Approach Fix (IAF), Final Approach Fix (FAF), Runway Threshold and Missed Approach Fix (MAF), a series of waypoints can be developed which would define the route of an LPV approach into a given airport. One can then add those waypoints into the route file memory of the GPSG-1000. Once an LPV route is stored in the simulator's memory, it will be available for re-play with a few simple keystrokes. The GPSG-1000 has over 3.5 GB of memory allocable to almanac and dynamic route storage so hundreds of routes can be stored to the GPSG's database. Aeroflex will provide a procedure for creating LPV approaches with the GPSG-1000 which will be available on our web site.

### Advantages to Installers

Aeroflex has developed the capability of simulating WAAS LPV approaches in order to expedite and validate the installation of WAAS enabled navigation systems in aircraft. The GPSG-1000 with its WAAS LPV approach simulation capability offers the following advantages to installers of these systems:

- The ability to perform structured, repeatable dynamic motion tests (actual flight) of a WAAS capable/LPV installation
  - Real time, flight plan functionality testing
    - Validation of data from GPS Receiver (latitude, longitude, position accuracy and horizontal position integrity)
    - Verify GPS message triggers to other systems - ADS-B XPDR, FMS, Auto-Pilot
    - Insure WAAS installation functions as intended
  - Prove that aircraft and installation are ready for flight demonstration
  - Troubleshooting - Ability to recreate routes and scenarios where pilots report GPS signal loss or degradation, occurring in the past.
- Reduce in-air flight demonstration time
  - Typical in-flight demonstration items required by FAA can be performed on ground, such as
    - Ground Speed Measurement
    - Proper Sequencing of Waypoints
    - Position Display Scale Changes (2 Mile Marker Approach)
    - Aircraft antenna shielding effects and auto pilot coupling would still be required for flight demonstration
- Provide supporting data for documenting proper processes of WAAS/LPV system upgrades or installs for FAA field approval or STC review - without leaving the hangar.
- Ability to check and validate the sensitivity of an airborne GPS receiver statically or while in motion (this is not possible with a GPS repeater system)
- Save valuable aircraft downtime
  - Elimination of aircraft movement to a GPS signal source

For more information on the GPSG-1000 or Aeroflex Test Solutions' other instruments for avionics installation, repair or maintenance, please contact us at <http://www.aeroflex.com/ats> or call (800) 835-2352.

References:

1. Description of WAAS:

<http://www.duncanaviation.aero/straighttalk/waas/what-is-waas.php>

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