



The GPS Computer-Based Tutorial

By Major Guy R. Mallow and Edward A. Forman

The Global Positioning System (GPS) revolutionizes navigation and positioning capabilities and soon will be integrated into everything the military does. The engineer community must learn how this technology works, so they can take advantage of it.

"The map, compass, and survey equipment in use will not provide the location and navigation information to the degree of accuracy and responsiveness required to support the combat user of fielded or emerging tactical systems." (taken from a DoD required operational capability document, revised in 1991) The 1994 funding appropriations bill passed by Congress states, "Funds may not be obligated after September 30, 2000, to modify or procure any DoD aircraft, ship, armored vehicle, or indirect-fire weapon system that is not equipped with a Global Positioning System receiver."

Why the GPS?

The GPS could be referred to as just another device that answers the age-old question "Where am I?" However, a user can expect seven times better accuracy with a GPS receiver than with a map and compass. Because of its accuracy, the GPS has replaced all previous positioning systems.

Many current and future devices used by engineer soldiers will incorporate GPS technology. An example is the more than 70,000 precise lightweight GPS receivers (PLGRs) fielded to the Army.

GPS technology also will be included in future minefield recording equipment such as the Digital Reconnaissance System and the Digital Map Reporting System. (See "Building a Minefield Database System," *Engineer*, December 1996, page 14.)

The Tutorial

The Army Global Positioning System Tutorial is a training tool developed to provide a nontechnical, operational perspective of the NAVSTAR (navigational, strategic, tactical, and relay) GPS. It is primarily intended for officers and NCOs responsible for planning and executing operations at theater level and below. However, any military personnel wanting to maximize the benefits of GPS for their mission, unit, and troops can use the training.

The tutorial consists of 13 modules designed to be viewed in sequence (see sidebar, page 37). The program incorporates lessons learned as GPS evolved from a developmental program to the operational fielding currently underway in all U.S. military services.

The Army GPS Tutorial shows how the GPS's diverse capabilities can be used to support any mission when you plan and conduct combat operations or operations other than war (OOTW). It delivers convenient GPS training that will increase your unit's mission effectiveness in targeting and navigating precision and accuracy.

The Army GPS Tutorial Modules

Module 1 - GPS Overview. Explains what GPS is, how it works, and what it can do for your unit. It details military applications (such as precise positioning and navigation, communication time synchronization, confident rendezvous, and common language in joint and combined operations) and GPS accuracies.

Module 2 - GPS Policies. Describes DoD and Joint Chiefs of Staff policies and guidance for military operations planners. For example, all services must employ militarily accurate GPS equipment to support their operations.

Module 3 - GPS Security. Describes how military receivers obtain the best accuracies and reduce exposure to electronic warfare (spoofing), cryptologic key loading requirements, and setting up an account for the cryptologic keys. The GPS keys are different than SINCGARS (Single-Channel, Ground-to-Air Radio System) keys.

Module 4 - Maps and GPS. Describes the complementary relationship between GPS and maps. It contains eye-opening lessons learned and important tips (such as never use a map for precise positioning or targeting; use the GPS). GPS coordinates are seven times more accurate than map coordinates. Failure to comprehend the new relationship of maps and the GPS can lead to confusion in the field, a lack of confidence in the GPS, and forfeiture of the precision provided by the GPS.

Module 5 - GPS Equipment. Describes current receivers and selected receivers being developed.

Module 6 - Survivability. Discusses threats to the GPS and countermeasures.

Module 7 - Interoperability. Characterizes the GPS contributions to battlefield interoperability and provides guidance on relationships between the GPS, maps, fire-control systems, command and control systems, and navigation sensors.

Module 8 - GPS Applications. Explains the diverse capabilities of GPS receivers and how military operations planners and field users can capitalize on those capabilities during combat operations and OOTW. The module reflects on GPS applications used by U.S. and allied operational forces since the late 1980s, as derived from operational evaluations, Operation Desert Storm, and other military operations. The module describes premission and postmission applications, as well as applications for situational awareness, battlefield preparation, targeting and fire support, close air support, air drop, communications, and navigation. For example, the GPS can function as a compass inside a metal vehicle.

Module 9 - Battlefield Implementation - Operations Planning and Execution. Presents a checklist with suggested actions for commanders and their staffs to carry out on the air/land/sea battlefield. Actions draw on operational experience with the GPS and are oriented toward theater and component staffs with responsibility to plan, execute, and control an operation. Actions can improve target accuracy and reduce the potential for fratricide.

Module 10 - The Future. Presents future applications of the GPS within the U.S. military services.

Module 11 - GPS Training. Lists DoD training support for the GPS. It includes PLGR training, GPS survey receivers, cryptologic key ordering procedures, points of contact, and training aids. The module shows the classroom setup for PLGR training.

Module 12 - Feedback. Provides a form to submit comments and recommendations.

Module 13 - Glossary and Terms. Contains more than 130 GPS-related terms and definitions.

Note: A HELP key describes additional features in the tutorial.

Obtaining the Tutorial

The National Imagery and Mapping Agency (NIMA) (formerly the Defense Mapping Agency), Saint Louis, Missouri, produces and distributes the Army GPS Tutorial. It is free to military units and can be ordered from NIMA through normal supply channels. Call the NIMA Order Fulfillment Department, DSN 287-2495 or (800) 826-0342, for assistance. When ordering, use your DoD activity address code (DODAAC) and request national stock number (NSN) 7644-01-416-4051. If you do not have a DODAAC, contact the NIMA Army Customer Support Team at DSN 570-3001 or (703) 264-3001.

The tutorial is on eight 3.5-inch discs. Minimum computer system requirements for using the program are—

- DOS Windows 3.x
- 486 PC
- 256 color VGA monitor
- 8 MB RAM

NIMA also has three GPS receiver emulators available. They are computer-based interactive replicas of the PLGR, the Trimble 4000SSE, and the Ashtech MD-XII. These emulators are still in the Beta versions but can provide valuable training. Order them using the same procedure as for the tutorial. The national stock numbers for these emulators are—

- PLGR Emulator 7644-01-416-4034
- Trimble 4000SSE 7644-01-416-4040
- Ashtech MD-XII 7644-01-416-4036

Other Resources

Additional information about the GPS is available on the Internet at the following sites:

- University of Texas at Austin - <http://www.utexas.edu/depts/grp/gcraft/notes/gps/gps.html>
- U.S. Coast Guard - <http://www.navcen.uscg.mil/gps/gps.htm>
- NAVSTAR GPS Internet Connections - <http://gauss.ggc.unb.ca/GPS.INTERNET.SERVICES.HTML>
- National Geodetic Survey - http://www.ngs.noaa.gov/geodetic_links.html



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