# NGA Introduces Global Area Reference System

By Lawrence Nault

GA has developed a global reference system for battle-space deconfliction in response to a tasking by the Secretary of Defense. The Global Area Reference System (GARS) is the first to provide a worldwide standard for Department of Defense mission planning and operations. The Coordinate Systems Analysis Team (CSAT) within NGA's Source Operations and Management Directorate developed GARS, and NGA's Office of Military Support managed the interservice coordination of the system.

Even city tourist maps use some form of area referencing with numbers across the top and bottom and letters along the sides. In the armed forces, grid reference systems have historically been developed and used for battle-space deconfliction. Proven reference grids are in use in Afghanistan, Iraq and South Korea.

The predecessor to GARS was the Common Geographic Reference System (CGRS). Around the world numerous CGRSes were being used in the field, all with their own scheme and not compatible with each other. The most noteworthy one was developed for Operation Iraqi Freedom by commanders and support personnel in Iraq. It was hailed as a key enabler of the digital battle space and common operational picture. While serving as a standard for area reference systems, the CGRS set the stage for the development of the worldwide system now called GARS.

### Why a Global System?

GARS is an administrative measure used to rapidly and clearly define geographical locations for battle-space coordination, deconfliction and synchronization as well as for large-area search-and-rescue efforts. Unlike the geographical grid systems used for the different operational areas, GARS is global in scope, providing a common language between the services / combatant commands and simplifying communications.

Before the adoption of GARS, the combatant commands all had separate area reference systems. But with the global war on terrorism, areas of conflict that overlap seemed more likely to occur. Even with the latest change to the Unified Command Plan, which moved Syria and Lebanon from the U.S. European Command geographical area of responsibility (AOR) to the U.S. Central Command AOR, the borders dividing these two commands and the U.S. Pacific Command continued to pose a challenge. A conflict could have erupted crossing combatant commanders' geographical areas of responsibility (AOR), with the potential for confusion by having multiple common geographic reference systems.

GARS is highly useful in facilitating rapid attacks on time-sensitive targets and for expediting deconfliction of friendly force locations. It is important to note that GARS is primarily designed for battlespace management and not to be used for navigation or targeting.

A global reference system is also needed on the home front. Just as GARS is used to manage the battle-space environment and deconfliction, it can also be used to coordinate and manage search and rescue efforts involving the Federal Emergency Management Agency, U.S. Coast Guard and local governments. And since GARS

## Global Area Reference System (GARS)



The diagram shows the construct of the Global Area Reference System (GARS) grid. It also helps to explain the relationship of the GARS grid to various NGA products of different scales.

was developed on a worldwide scale, disaster relief efforts can be managed anywhere in the world without having to rely on different local systems of varying compatibility.

### **How GARS Works**

GARS divides the world into 30-minute by 30-minute cells, about 900 square nautical miles at the equator, diminishing in size at higher and lower latitudes. Each cell is subdivided into four 15-minute by 15-minute quadrants. Furthermore, each quadrant is subdivided into nine 5-minute by 5-minute areas, about 25 square nautical miles at the equator.

The system has many uses to the warfighter. Because it describes any 5minute by 5-minute area with only seven characters, rather than transmitting a series of lengthy latitudes and longitudes, users can define an area by a brief yet succinct number/letter character string. This enables the location to be transmitted through already-cluttered secure data transmission channels without occupying much bandwidth.

"GARS is expected to be used to rapidly identify locations of friendly surface forces, ground force maneuver boundaries, areas of intended attack to include kill boxes and terrain or airspace orientation," said Air Force Lt. Col. Brett Plentl of U.S. Strategic Command Enterprise Architecture.

#### **Development and Implementation**

At a conference hosted by the multi-service Air Land Sea Application Center, over 70 warfighters, doctrinaires, trainers, cartographers, systems managers, software engineers and requirements personnel met to establish the base line for GARS. Attendees represented the services / combatant commands, joint commands and combat support agencies.

From March through August 2005, NGA hosted three joint working groups to solicit base-line requirements for GARS. A global video teleconference was set up with attendees from Germany, South Korea, the United Kingdom and the United States. CSAT developed many area grid schemes and described to the working group the pros and cons of each. In the fall of 2005, the NGAGARS proposal was staffed through the Services / combatant commands via the Joint Staff. It was unanimously supported and subsequently approved in December of that year. In January 2006, the Director of NGA sent a letter to the Secretary of Defense stating that NGA had completed its task of leading the defense community in the development of GARS punctuated by the need for continued community engagement toward full implementation.

Joint Service Publications and Doctrine are being updated as well as Search and Rescue Supplement documentation to include GARS. Several publications that deal with multi-service tactics, techniques and procedures (MTTP) are also affected, including Time-Sensitive Targeting, Joint Fires and Theater Air Ground Systems (TAGS) as well as NGA Technical Manual TM8358.1. The first MTTP that will include GARS will be TAGS. The implementation of GARS may also affect hardcopy NGA Topographic Line Maps. Technical exchanges among the services and NGA are being organized to determine the necessity of GARS on hardcopy and associated margin information.

### **The Way Ahead**

GARS is not a replacement for any existing reference system such as the World Geographic Reference System (WGRS or GEOREF), or the Military Grid Reference System (MGRS) based upon the Universal Transverse Mercator and Universal Polar Stereographic grids. It complements joint fire support and/or airspace control systems and measures. It is not optimized for defining natural terrain features but may be combined with ground-feature references for easier use.

With these important caveats, GARS is the new area reference system for the globe, approved by the Director of NGA. The countless benefits of standardizing a global area reference system are limited only by our imagination. GARS will facilitate significant multi-service coordination at every level in the global war against terrorism and in any future conflicts.

GARS data files are available for immediate use, along with information about how to use GARS, shape files for geographic information systems and FalconView<sup>™</sup> software, and a calculator for determining GARS locations from user-defined geographic coordinates. GARS is also being included in the latest edition of GEOTRANS, the DoD standard software for coordinate conversions and datum transformations for mapping purposes. For more information contact the GEOINT Sciences Office at (314) 263-4171 or the Office of Military Support at (703) 264-7292.

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