

Geospatial Intelligence

The New Intelligence Discipline



Airman uses mobile radio satellite phone

U.S. Air Force (Edward E. Snyder)

SPECIAL FEATURE

By RICHARD E. BARROWMAN

United States Joint Forces Command (USJFCOM) uses geospatial intelligence (GEOINT) daily in a variety of applications and methods, including modeling and simulations to support concept development and experimentation such as the Urban Resolve and the Multi-National Experiments. It also has a role in training support for mission rehearsal exercises for deploying forces and geographic combatant commander-driven scenarios based on current or emerging situations. Additionally, GEOINT is used to support the Joint Warfare Analysis Center with various nodal analysis models, the Joint Personnel Recovery Agency with evacuation charts, and both the Joint Warfighting Center and Standing Joint Force Headquarters with joint task force training and preparation. This list is by no means the limit to which GEOINT affects what is done within USJFCOM and how it impacts the job of joint transformation. It is but a sample of what GEOINT is capable of when applied correctly, and therein lies the rub.

The term *geospatial intelligence* made its formal debut along with the National Geospatial Intelligence Agency (NGA), formerly known as the National Imagery and Mapping

Agency, on November 24, 2003. The term also became one of the most important expressions from a perspective of visualizing and understanding today's battlespace. Yet geospatial intelligence remains widely misunderstood in the joint lexicon. So what exactly is geospatial intelligence, why does anyone need to know, and how does it affect what warfighters do and how they do it?

This article will clarify what geospatial intelligence is. It will introduce related terms and address current and emerging doctrine. It will discuss how GEOINT is currently used and applied to the joint task force as well as standing commands, whether functional or service-specific. It will identify the present geospatial intelligence picture and discuss how it could look in the future. Finally, it will look at a few scenarios within the USJFCOM and how GEOINT is being applied to develop new concepts, integrate them within the current structure, and help train the warfighter engaged in today's operations.

Defining Geospatial Intelligence

Arriving at a definition of geospatial intelligence and understanding it are two separate matters. That is not because it is difficult

E-8C Joint Surveillance Target Attack Radar System (JSTARS) aircraft communicates with Army ground units



Headquarters Air Force News (Lance Cheung)

to comprehend or even use, but because it is already pervasive in so much of what we do that we fail to recognize the obvious. Operational warfighters are providing GEOINT at a rate too quick to gather, analyze, configure, disseminate, store, and maintain; planners are using it for planning every branch and sequel;

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Italian army warrant officer sets up satellite dish, Exercise Combined Endeavor

52nd Communications Squadron (Karen Z. Slicott)

through the interpretation or analysis of imagery and collateral materials

- *geospatial information*: data that identifies the geographic location and characteristics of natural or constructed features and boundaries on the earth, including the statistical data derived.

In short, GEOINT includes but is not limited to data ranging from the ultraviolet through the microwave portions of the electromagnetic spectrum. It embraces information derived from the analysis of imagery and geospatial data. And it also includes information technically derived from processing and exploiting spatial and temporal data, which provides the location and time information to conduct three-dimensional (spatial, specifically elevation) and four-dimensional (temporal) analysis.

The term and idea of *GEOINT* were created due to advances in technology and the creative use of these advances. Many

well as the layers that can be toggled on and off, are GEOINT. These layers of data, such as Blue Force Tracker, significant activities, or other aspects of the battlespace the commander directs, may be geospatially enabled and provide more than a static one-time view. Additionally, the terrain relief details provided when conducting a fly-through in Falcon View are also GEOINT. In many circumstances, the PowerPoint slides used in briefings contain data points derived from GEOINT. Anyone who has participated in an exercise, experiment, or modeling and simulation event has used it. Geospatial intelligence tells the computer where roads are, how tall buildings are, what slope the land is, and other features warfighters take for granted.

Geospatial intelligence finds its foundation in National Geospatial-Intelligence Agency Publication 1, *GEOINT Basic Doctrine*. Pub 1 discusses the Title 10, U.S. Code definition of *geospatial intelligence*, the functional management role NGA plays, the various systems included, and the National System

of Geospatial Intelligence (NSG), which is one of the main bodies that provide policies and activities necessary to integrate GEOINT into the combatant commands (COCOMs), Services, and agencies. It is a high-level guidebook providing the overview. Joint Publication (JP) 2-03, *Geospatial Intelligence Support to Joint Operations*, on the other hand, provides fundamental principles and guidance for GEOINT in joint operations.

It is focused more specifically

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on the Armed Forces and how they integrate with multinational and interagency operations. JP 2-03 is more detailed than Pub 1 and includes tactics, techniques, and procedures (TTPs) for the application of GEOINT. It is formatted around the discipline, data, process, and products associated with GEOINT. While each Service, as well as the various commands and agencies, possess additional doctrine, standard operating procedures, and instructions, Pub1 and JP 2-03 remain the foundation.

GEOINT and U.S Joint Forces Command

The Director of the National Geospatial Intelligence Agency as the GEOINT functional



Airman adjusts communications modem on lightweight, multiband satellite terminal, Exercise Bushwacker

355th Communications Squadron (Alesia Goosic)

and commanders are asking for it on a daily, hourly, and even minute-by-minute basis.

Geospatial intelligence is defined as the exploitation and analysis of imagery and geospatial information to describe, assess, and visually depict physical features and geographically referenced activities on the Earth. It consists of three elements:

- *imagery*: a likeness or presentation of any natural or man-made feature or related object or activity and the positional data acquired

- *imagery intelligence*: the technical, geographic, and intelligence information derived

will remember the days of layers of acetate hung on the mosaic paper maps taped to the wall. Innovation and initiative, coupled with technology, have turned that into a digital display using geospatial intelligence as the source of the visualization. GEOINT was created to describe and encompass elements that were disparate. Combining these elements is the source of GEOINT's power.

The most common locations for geospatial intelligence are the Common Operational Picture and Common Relevant Operational Picture. The map or image on the big screen in the front of the Joint Operations Center, as

manager, and the Commander of U.S. Joint Forces Command as the Joint Force integrator, have acted to extend the National System of Geospatial Intelligence to the lowest tactical level and to bring GEOINT from that level back to the NSG for updating products and data bases and use by all GEOINT customers. This partnership between NGA and USJFCOM is titled Joint GEOINT Activity (JGA), and it emphasizes collaboration vertically throughout all echelons from strategic to tactical as well as horizontally with all members of the NSG. The NSG is the combination of technologies, policies, capabilities, doctrine, activities, people, data, and communities needed to produce GEOINT. It consists of COCOMs, Services, agencies, and other partner organizations. The Director of the National Geospatial Intelligence Agency serves as the functional manager. JGA informs the NSG and receives guidance and direction based on input from the members. The current objectives of JGA are:

- bringing the Services and commands together to seek common, joint capability for the provision of GEOINT to the last tactical mile
- defining specific requirements and operations capabilities for this support
- developing an architecture and concept of operations that connect the NSG with currently unavailable or incompatible service systems and processes
- defining joint doctrine and tactics, techniques, and procedures for the management and application of GEOINT at the strategic, operational, and tactical levels of war
- acting as advocate for resources to implement these concepts.

To accomplish these objectives, JGA organized into five lines of operation (LOs) across USJFCOM staff codes to ensure inclusiveness and leverage the command's expertise residing in the staff. These LOs and their respective staff codes of responsibility include Requirements (J-8); Procedures (J-7); Plans, Programs, and Policy (JTC-1); Architecture (J-6); and Standards (J-8). The command lead for this effort is the Strategic Initiatives Office delegated to J-29. In addition to JGA forming these LOs, Joint Pub 2-03 directs the formation of a Geospatial Cell within the commands to properly manage

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geospatial activities. J-28 is the GEOINT functional manager for USJFCOM.

Concept of Operations

The bottom line purpose of GEOINT is to support the decisionmaker, which is challenging due to the lack of understanding at various levels, to include the command level, on where, when, and how to apply guidance and intent with regard to GEOINT. This disconnect usually exists between the users and producers, and removing it begins with understanding the basic steps required to transform raw data, which is usually derived from NGA, into the understanding required by decisionmakers.

Data is obtained to answer the "so what" of the commander's guidance and intent and commander's critical information requirements. This raw data is aggregated into *information* through management (organization and discipline) by gathering it into systems, analysis, processing, and exploitation. This information is provided to senior-level staff members who place it within the context of their experience, and it becomes *knowledge*. Once fused into knowledge, the sum of this knowledge, over time and within a spatial context, gives the commander the *understanding* required to make effective decisions.

To enable this process of transformation, a concept of operation (CONOP) must be applied to GEOINT within the command. It may vary slightly based on factors such as how people are organized to support the sharing of what they know, and how decisionmaking is supported (battle rhythm and linkage of the products and decision in the various boards, centers, and cells throughout the organization). It will also vary from the operational level to the tactical level, as the tactical level is less formal and may involve only two or three individuals. *The Joint Warfighter Integrated GEOINT CONOP* is the JGA document that addresses these issues. A

Army satellite equipment used in Exercise Joint Forcible Entry



1st Combat Camera Squadron (Steven Smith)

Joint Task Force GEOINT Cell normally performs many of these operations.

The first step of CONOP is to define the requirements, which usually happens in the military decisionmaking process as part of a Joint Planning Group or another operations planning team. The GEOINT subject matter expert should be included in the planning process not just as an afterthought for the intelligence planner, but as an actual member of the team from the GEOINT Cell, Terrain Team, or other asset organic to the command. Just as the varied staff officers develop, coordinate, and formulate plans during the process, the GEOINT expert can provide planning aids as well as decisionmaking aids for briefings. The expert needs to completely understand the commander's guidance and intent rather than be told to produce certain products. The other place where GEOINT requirements are defined is on the Joint Operations Center floor. If no expert is there, chances are the battle captain/major cannot provide the best visualization of the battlespace or environment. Finally, GEOINT capabilities must reside in the intelligence section of the staff, allowing them to use the command's systems and integrate with the other intelligence disciplines to define specific requirements and help shape overall situational awareness. The JTF GEOINT Cell will provide processes for defining data. Required content, resolution, accuracy, and currency in the form of metadata search criteria document requirements to support decisionmaking about alternative courses of action to meet the requirement.

Now that it is known what is needed, how is it obtained? The easy answer often appears to be to task collection assets rather

than searching a number of disparate databases the customer may or may not be aware of. This may be the most time-consuming course of action. Rather than starting out fresh, it is possible the image or data is already out there. Discovering where and with whom is the real challenge. This is addressed later but is a critical second step. It is the GEOINT Cell that enables the joint warfighter to make a decision on the most cost-effective approach for meeting the requirement within specified timelines.

Once the data is found, can it be used? Did it come in the right format? There are many visualization and analysis tools today. Unfortunately, some are proprietary and only work with specific data types. If the user has found what he is looking for but cannot use it, the data must be converted to the right format. The GEOINT Cell helps with the determination, and additional assets such as the Terrain Detachments or Intelligence Sections can usually convert the data, but it takes time and, depending on the software, may reduce data functionality. For example, some transformations require the data to be converted from “smart” to “dumb” to be displayed, defeating the purpose of using digital versus hardcopy products.

The fourth step is to actually use and share the data. The ultimate objective is to enable the joint warfighter to use superior GEOINT to plan, decide, act, and monitor. This includes shared awareness of the operational environment with regard to numerical, spatial, and temporal aspects. It is also ensuring that data is available to not just the collector or processor, but also to subordinate, superior, and peer organizations so they can gain the same level of awareness. One has only to consider the *common* in Common Operational Picture. If only one command has it, it is not very common.

Finally, the data should be kept current and relevant. As changes and updates are received, GEOINT must be continuously validated for accuracy and consistency. A map printed yesterday, but with outdated data, is of little value. Providing a true picture includes currency, allowing decisionmakers to consider the risks based on the age of the data.

These five steps may seem obvious, but the real test is in the process used to ensure they are followed. Some aspects of these steps are beyond a commander’s control. The key is to understand where the shortfalls are and take steps to bring things back in line to provide the best support to the command. Annex M,

“Geospatial Information and Services, to Operations Plans or Orders,” is where this concept can be codified for separate operations or as an interim until formal documentation can take place. Annex M often becomes a list of standard products instead of an operational document providing guidance to the commanders or staff.

The Current Picture

The application of geospatial intelligence is as varied as the people using it. Each command has applied different resources and processes and, therefore, has experienced varying levels of success and frustration. For JGA to gather a big picture of the current state of GEOINT within the community, it was necessary to survey the varied commands and discuss with each how GEOINT has been applied and where they have experienced triumphs and defeats. It is easy to form opinions of the current state of GEOINT from personal experiences; however, that leads to anecdotal discovery and not empirical data. A broad understanding and application of GEOINT must come from the community, not from a few war stories. To gain this level of understanding, USJFCOM and NGA surveyed U.S. Northern, U.S. Pacific, U.S. Special Operations, and U.S. European Commands. The results were generally predictable; however, there were a few surprises, some confirmations, and various practices that may be shared amongst the partnering members of the NSG.

Personnel with GEOINT experience were targeted for the site survey and were from the operational and tactical levels, as the goal was to interview personnel who collect, produce, analyze, visualize, manage, maintain, or disseminate GEOINT. The survey engaged a mix of supervisor and worker levels within cross-functional areas across the COCOMs and components (not only intelligence) to gain a broader foundation. While the formal survey has concluded, continued input from the field force is still collected as azimuth checks and to evaluate the implementation of the best practices. The preliminary findings center on a number of factors, including doctrine, training, personnel, organization, data issues, and multi-level security and release policies.

Doctrine. Limited joint GEOINT doctrine exists, and most of the commands rely on various TTPs and standard operating procedures (SOPs) to fill this void. The

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users find ways to get the job done, creating procedures that are not incorporated into doctrine. The SOPs that supplement doctrine are frequently outdated. Additionally, information sharing is not adequately addressed in procedures, and there are shortfalls in GEOINT standards that cause implementation inconsistencies (for example, metadata tagging) and compliance and enforcement issues.

Training. Limited mission-related GEOINT training is available to the COCOMs/JTF that obliges the commands to rely on specific theater experience that may not apply across all situations. There is also a general lack of knowledge of available capabilities and various GEOINT repository databases and how to access them. This forces a heavy reliance on NGA support teams for on-site and reachback support that, while welcomed, dissuade training of internal experts.

Personnel and Organization. There is a perception of insufficient GEOINT organization within the commands and billets at both the junior and senior levels. Additionally, where billets were identified, they were not supported, and gaps existed in filling military Joint Table of Distribution geospatial information and Services officer positions.

Data Issues. GEOINT from military sources (vice NGA) often provide the coverage and timeliness required by operations, but the holdings are on separate architectures and domains, and no single system or tool exists to discover and obtain data. In addition to the single site data storage issue, inconsistent use of metadata standards makes it difficult to determine validity and relevance, which, when coupled with the inconsistent use of metadata fields, requires extra data manipulation. Finally, there is no integrated requirements/production management system to clearly articulate what is needed.

Multi-Level Security and Releasability Policies. Much unclassified data resides in secure but not necessarily in unclassified systems. Too often, data is overclassified. Classification policies are not understood, resulting in inconsistent application as well as execution procedures not established to properly implement existing policy. This complicates multi-national coalition, nongovernmental organization, and host nation information sharing.

The Way Ahead

The findings make it clear that technology is not the long pole in the tent. In fact, it is ironic that the U.S. Armed Forces list some data management items as issues when North Atlantic Treaty Organization partners, according to a recent article in *E!Sharp*, are worried about the United States pulling so far ahead they will be unable to operate. Since the conclusion is that technology is not the primary factor for challenges, the application of what is known and done becomes the focal point. It goes back to the fact that while GEOINT is pervasive in all security and defense activities, we do not have our arms around it; therefore, it lacks structure and purpose. The number of collection platforms and sensors has exploded in recent years. More and more data is available, at a higher intensity, around the clock, and in a wide array of formats. JGA's intent is to understand existing capabilities to collect, fuse, and share GEOINT (both up and down echelon) at the theater/JTF level. JGA is doing that by:

- seeking joint capability for provision of GEOINT to tactical level and back
- defining joint requirements
- developing and integrating standards
- developing joint architecture and CONOPs
- experimenting, demonstrating, and integrating joint solutions.

USJFCOM is helping shape emerging doctrine, specifically in Joint Publication 2-03, to use a GEOINT Cell to manage the process within a headquarters. While present doctrine does not dictate who should be in the Cell, it provides some guidance on personnel and functions. The fact that using a cell in lieu of other methods is indicated alludes to the importance of performing these functions. A cell is a group of personnel with specific skills who are listed together on the manning document to accomplish key functions. This GEOINT Cell acts in lieu of a working group, which is an action officer-level body that meets to provide recommendations to boards. The boards are bodies of personnel empowered to make decisions in regard to key staff functions. So by its nature, the GEOINT Cell is a permanent organization staffed by specific skill sets to perform a broad array of functions within the geospatial intelligence arena. As mentioned earlier, the JGA membership essentially functions as the USJFCOM GEOINT Cell. How does this apply to the COCOM

survey? Following are potential actions for each area identified earlier.

Doctrine. Users rely on limited GEOINT experience or the advice of experts rather than doctrine/SOPs. There should be smaller, quicker, and regular revisions of doctrine, standardizing the framework of CONOPs, and sharing the TTPs and SOPs within com-

tend to restrict information sharing more than policy requires. GEOINT data should be mirrored on Unclassified but Sensitive Internet Protocol Router, Secret Internet Protocol Router, and the Joint Worldwide Intelligence Communications systems, as appropriate, after evaluating security and classification policies/procedures. Additionally, training on policy

since technology is not the primary factor for challenges, the application of what is known and done becomes the focal point

mands to pursue common or compatible joint procedures. Also, a single definitive source and process for identifying requirements and discovering and obtaining all forms of GEOINT data should be established.

Training. Theater and tactical users require greater knowledge of the multiple GEOINT tools and processes and rely too heavily on deployed NGA resources. Training on the mission applications and limitations of GEOINT data should be increased along with the various tools while developing mission-related joint training to build internal expertise.

Personnel and Organization. There is a shortage of billets within the organization and lack of emphasis on filling identified GEOINT billets. Training opportunities at military and government agency levels should be increased while manning authorizations are reviewed and updated to reflect current GEOINT requirements.

Data Issues. Researching and obtaining GEOINT is a time-intensive process because the knowledge of data sources (how to use and obtain the data) is limited, and both who will be able to satisfy data requirements and the timeframe are uncertain. People, processes, and tools must be enabled to discover and obtain data from all sources through increased awareness of current architecture and future revisions. Additionally, the need exists to extend the influence of data standards beyond national organizations and into lower echelons of users.

Multi-Level Security and Releasability Policies. Users must check multiple domains and Web sites, utilizing different tools and processes, to discover and obtain GEOINT; therefore, GEOINT needed to support missions does not reach tactical users. Also, release decisions are inconsistently interpreted, and procedures

should be increased and broadened to address ambiguity in releasability policy and establish process for quickly sanitizing sensitive data.

United States Joint Forces Command's geospatial intelligence is used throughout the J-codes: in J-9 for concept development and experimentation, J-7 for training, and the Joint Warfare Analysis Center for nodal analysis. The command's modeling and simulation is built around geospatial intelligence and uses it in a number of ways, including draping imagery over three-dimensional models, creating fly-/drive-throughs, and even doing temporal studies based on traffic at various times of the day. The training arena uses geospatial intelligence to develop scenarios for other combatant commands and joint task forces. There are numerous additional examples of how geospatial intelligence may be applied to provide realism, save money and time, and provide value to the Warfighter. United States Joint Forces Command is continuing to look to the future to ensure that transformation efforts are leveraging geospatial intelligence and that these are being integrated into existing and future systems. Geospatial intelligence is a true combat multiplier when applied correctly. It is as valuable as any other intelligence discipline and provides a level of understanding previously unobtainable. It incorporates new concepts, developing technology, and emerging practices and integrates many facets of today's missions. Key takeaways are commanders' use of geospatial intelligence capabilities within their organizations and providing guidance and intent in the same manner as other disciplines. At the same time, staff officers manage geospatial intelligence and support its Cell. Finally, everyone understands the basic concepts of geospatial intelligence and how these capabilities may be applied. **JFQ**