TC 2-22.7

Geospatial Intelligence Handbook

February 2011

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Headquarters, Department of the Army

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No. 2-22.7

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Geospatial Intelligence Handbook

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Preface

TC 2-22.7 is the Army's manual for geospatial intelligence (GEOINT) doctrine. It describes—

- GEOINT.
- Imagery.
- Imagery intelligence.
- Geospatial information and services.
- The implementation of GEOINT in the Army.
- GEOINT support to planning and operations.

This training circular provides GEOINT guidance for commanders, staffs, trainers, engineers, and military intelligence personnel at all echelons. It forms the foundation for GEOINT doctrine development. It also serves as a reference for personnel who are developing doctrine; tactics, techniques, and procedures; materiel and force structure; and institutional and unit training for intelligence operations.

The term psychological operations (PSYOP) is now referred to as military information support operations (MISO).

TC 2-22.6 uses joint and Army terms. These terms are italicized and the number of each proponent publication follows the definition.

This publication applies to the Active Army, the Army National Guard (ARNG)/Army National Guard of the United States (ARNGUS), and the United States Army Reserve (USAR) unless otherwise stated.

Headquarters, U.S. Army Training and Doctrine Command, is the proponent for this publication. The preparing agency is the U.S. Army Intelligence Center of Excellence (USAICoE), Fort Huachuca, AZ. Send written comments and recommendations on DA Form 2028 (Recommended Changes to Publications and Blank Forms) directly to: Commander, USAICoE, ATTN: ATZS-CDI-D (TC 2-22.7), 550 Cibeque Street, Fort Huachuca, AZ 85613-7017. Send comments and recommendations by e-mail to ATZS-FDC-D@conus.army.mil or submit an electronic DA Form 2028.

Introduction

In 2005, the U.S. Army Intelligence Center of Excellence (USAICoE) began a cradle-to-grave (C2G) effort to identify and address the doctrine, organization, training, materiel, leader development, personnel, and facilities (DOTMLPF) implications of the geospatial intelligence (GEOINT) discipline. C2G members conducted a complete DOTMLPF assessment in order to systematically document emerging and future GEOINT requirements across operations at all levels. C2G members reviewed the current organizational constructs, operational lessons learned, and changes in Army doctrine required in order to implement GEOINT. This study unified directorates and entities affected by GEOINT, such as—

- Doctrine.
- Office of Chief of Military Intelligence.
- Training.
- U.S. Army Training and Doctrine Command Capabilities Manager Geospatial.
- U.S. Army Engineer School (USAES).
- USAICoE.
- GEOINT personnel throughout the intelligence community.

This effort lasted over two years and concluded after C2G members presented their formal findings and solutions to USAICoE's commanding general. The findings identified a capabilities gap due to the lack of co-location and formalized collaboration of imagery analysts and geospatial engineers, which would allow for—

- Comprehensive and detailed analysis.
- Less redundancy of effort.
- The ability to access and fuse data from all sources.

This collaboration was realized in the Army upon the emergence of the GEOINT discipline. C2G members determined there was a need to establish GEOINT cells (brigade combat teams and higher) to address the GEOINT requirement. Additionally, the decision and direction by the Army to move forward with one common digital processing system—the Distributed Common Ground System-Army (DCGS-A)—further solidified the GEOINT cell concept since DCGS-A supports GEOINT data production, and it is the system on which both imagery analysts and geospatial engineers operate.

In February 2006, USAICoE's commanding general approved GEOINT as an intelligence discipline. In June 2006, USAES and USAICoE, via a Memorandum of Agreement, agreed to document and establish GEOINT cells within the Army. This agreement resulted in the redefinition of the roles and responsibilities of engineer and intelligence proponents as related to geospatial engineering and imagery analysis.

GEOINT in its most basic form comprises any one or combination of—

- Imagery.
- Imagery intelligence.
- Geospatial information and services (formerly referred to as mapping, charting, and geodesy).

This composition forms the foundation of Army GEOINT products and allows the Army to build upon that foundation by fusing and layering various intelligence and battle command information with a geospatial component.

The GEOINT cell is the physical co-location of imagery analysts and geospatial engineers working together under the intelligence staff. The GEOINT cell—

- Integrates geospatial information and services data.
- Provides geospatially enabled tactical decision aides and products supporting battle command functional areas, such as plans and operations, intelligence, mission rehearsal, training, modeling, simulations, logistics, and weather effects.
- Produces GEOINT primarily from organic sources but includes data from multiple sources.
- Synchronizes production, product reduction, or mission duplication.
- Provides the geospatial foundation for the common operational picture.
- Ensures that every battle command system has the geospatial foundation necessary to facilitate a common operational picture.

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Chapter 1

Geospatial Intelligence (GEOINT) Overview

The National Defense Act of 2004 authorized a name change of the National Imagery and Mapping Agency (NIMA) to the National Geospatial-Intelligence Agency (NGA). NGA is the proponent for geospatial intelligence (GEOINT) within the Department of Defense (DOD) and manages the National System for Geospatial Intelligence (NSG). GEOINT, as an intelligence discipline, consists of any one or a combination of the following components:

- Imagery.
- Imagery intelligence (IMINT).
- Geospatial information and services (GI&S) (formerly referred to as mapping, charting, and geodesy).

The Army has organic GEOINT capabilities at the following echelons: theater, corps, division, and brigade. Additionally, through the NSG, the Army has access to GEOINT collection and analysis resources available to DOD.

This chapter defines GEOINT, as established in Section 467, Title 10, United States Code (10 USC 467), and discusses—

- GEOINT data layering.
- The organization and capabilities of the NSG.
- How the NSG and NGA support the Army.
- How the Army leverages the capability of the NSG and NGA.
- How GEOINT is integrated into intelligence production categories.

DEFINITIONS

1-1. *Geospatial intelligence* is the exploitation and analysis of imagery and geospatial information to describe, assess, and visually depict physical features and geographically referenced activities on the Earth. Geospatial intelligence consists of imagery, imagery intelligence, and geospatial information (10 USC 467).

Note. TC 2-22.7 further implements that GEOINT consists of any one or any combination of the following components: imagery, IMINT, or GI&S.

1-2. *Imagery* is the likeness or presentation of any natural or manmade feature or related object or activity, and the positional data acquired at the same time the likeness or representation was acquired, including: products produced by space-based national intelligence reconnaissance systems; and likenesses and presentations produced by satellites, aircraft platforms, unmanned aircraft vehicles, or other similar means (except that such term does not include handheld or clandestine photography taken by or on behalf of human intelligence collection organizations) (10 USC 467).

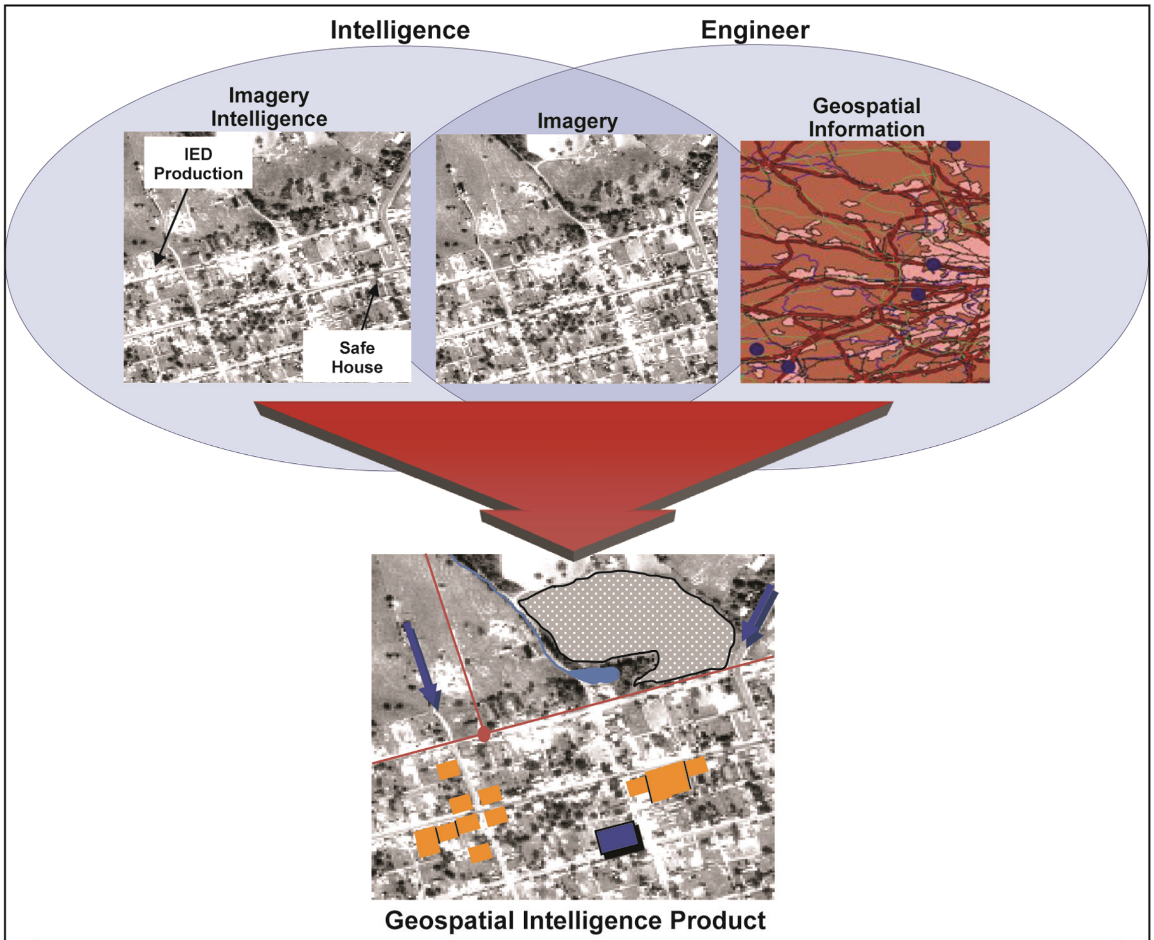
1-3. *Imagery intelligence* is the technical, geographic, and intelligence information derived through the interpretation or analysis of imagery and collateral materials (10 USC 467).

1-4. *Geospatial information and services* refers to information that identifies the geographic location and characteristics of natural or constructed features and boundaries on the Earth, including: statistical data and information derived from, among other things, remote sensing, mapping, and surveying technologies; and mapping, charting, geodetic data, and related products (10 USC 467).

> ***Note.*** Geospatial information is the foundation upon which all other information about the physical environment is referenced to form the common operational picture (COP). (See chapter 4.)

GEOINT DATA LAYERING

1-5. GEOINT consists of layered data combined into a single product. (See figure 1-1.)



IED improvised explosive device

Figure 1-1. GEOINT data layering

1-6. The foundation of a GEOINT product is any one or a combination of the components of GEOINT (IMINT, geospatial information, or imagery). (See figure 1-2.) The foundation provides information about a specific location and describes an operational environment.

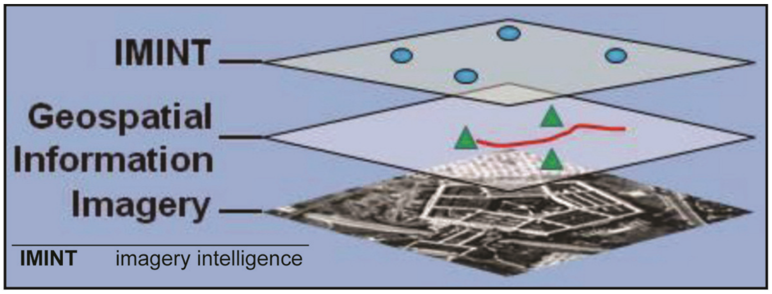


Figure 1-2. GEOINT foundation

1-7. Any geospatially referenced information, commonly referred to as data layers (see figure 1-3), can be added to the GEOINT foundation to enhance visualization of the operational environment. These value-added layers visually depict information provided by other intelligence disciplines and nonintelligence data as supplemental information (figure 1-3). A GEOINT product (see figure 1-4, page 1-4) may consist of the GEOINT foundation layer or layers (IMINT, imagery, or geospatial information) as well as one or more supplemental data layers, depending on what information is needed. GEOINT products have no layer limit.

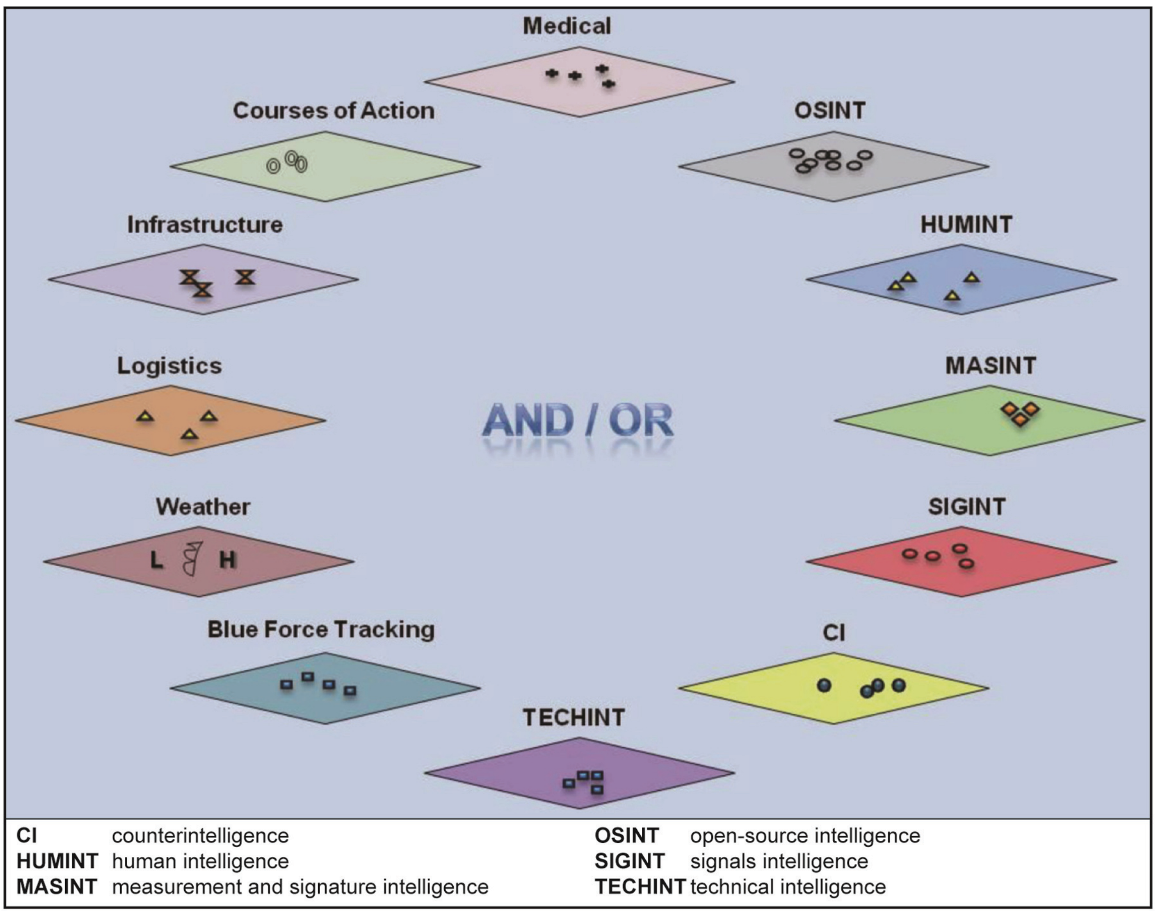


Figure 1-3. Value-added layers

1-8. Intelligence discipline data in supplemental (value-added) data layers provides corroboration, context, and additional details to the battle command staff. Nonintelligence data layers provide more details by addressing subject areas such as battlefield geometry, civil considerations, and weather.

1-9. Figures 1-4, 1-5, and 1-6 illustrate the progressive layering of intelligence information to further enhance a GEOINT product. Figure 1-4, page 1-4, shows the combination of an image and geospatial information. In figure 1-5, IMINT is added. Lastly, figure 1-6, page 1-6, incorporates information related to civil considerations.

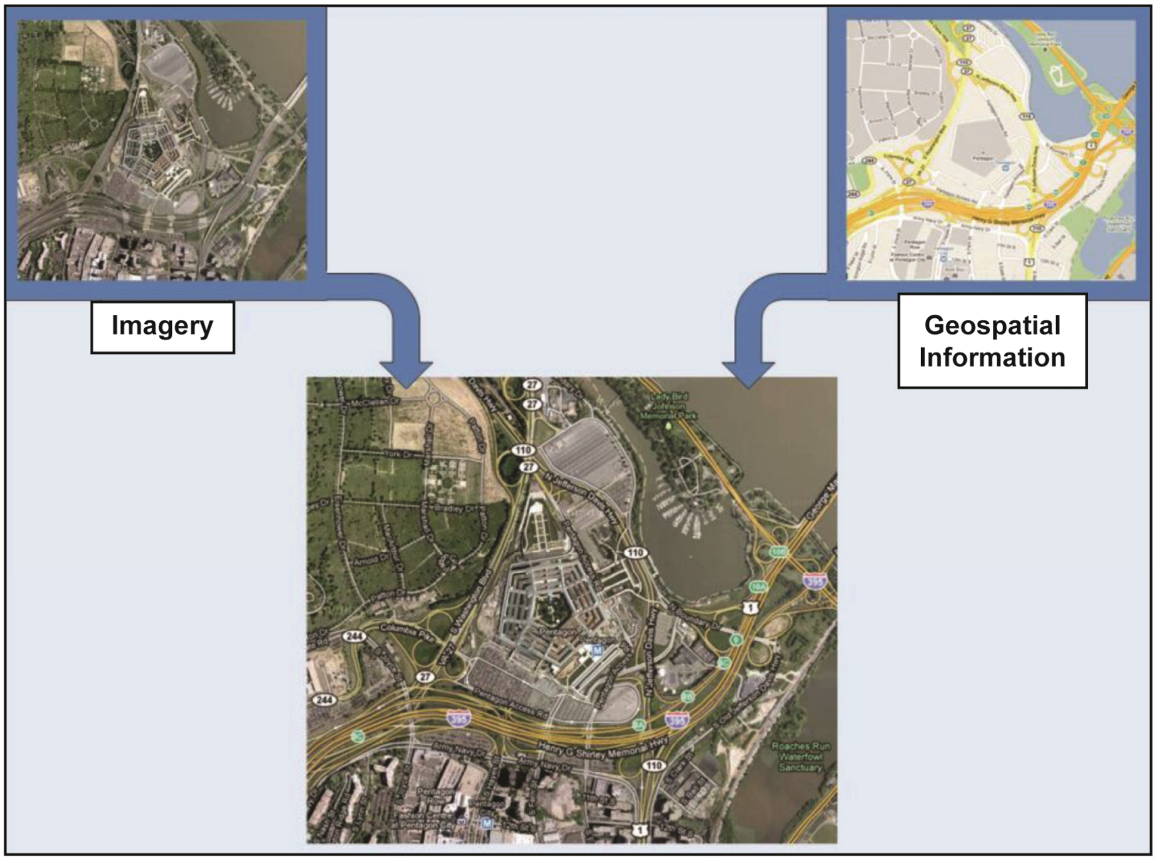


Figure 1-4. GEOINT product—imagery and geospatial information

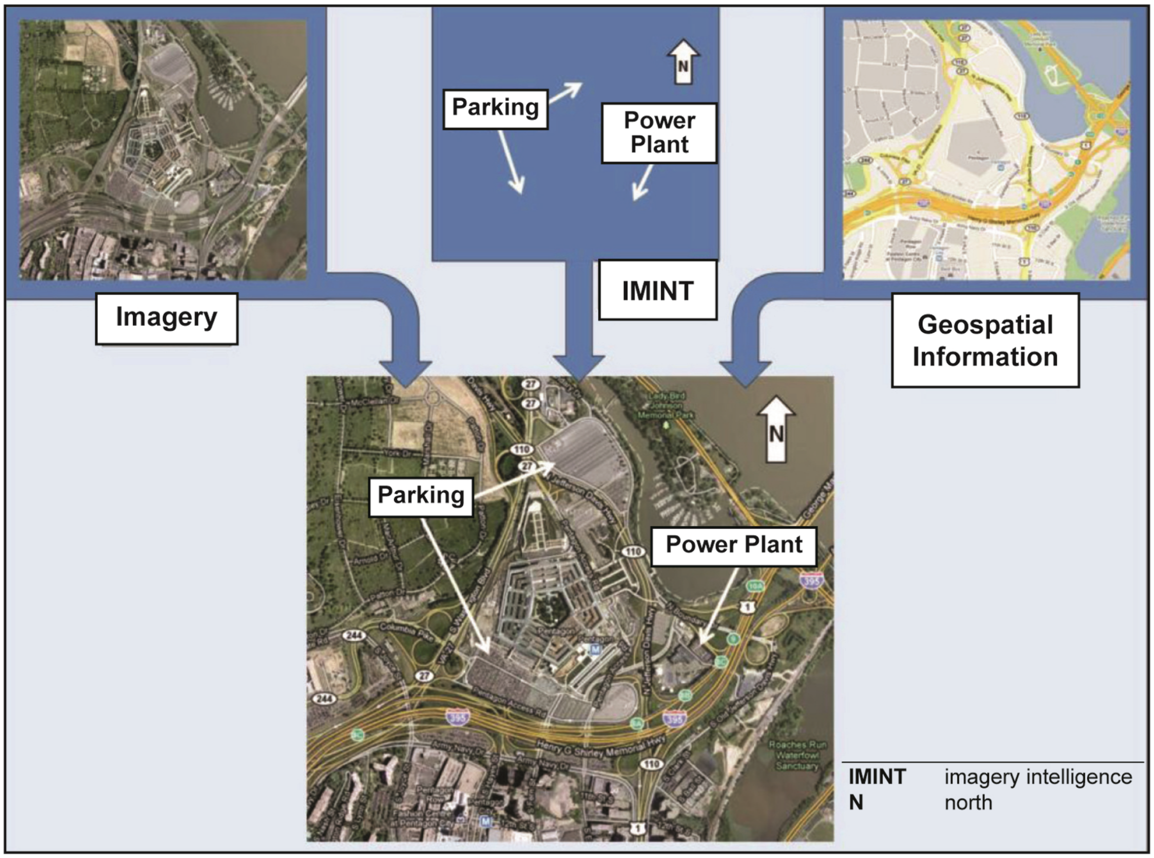


Figure 1-5. GEOINT product—imagery and IMINT and geospatial information

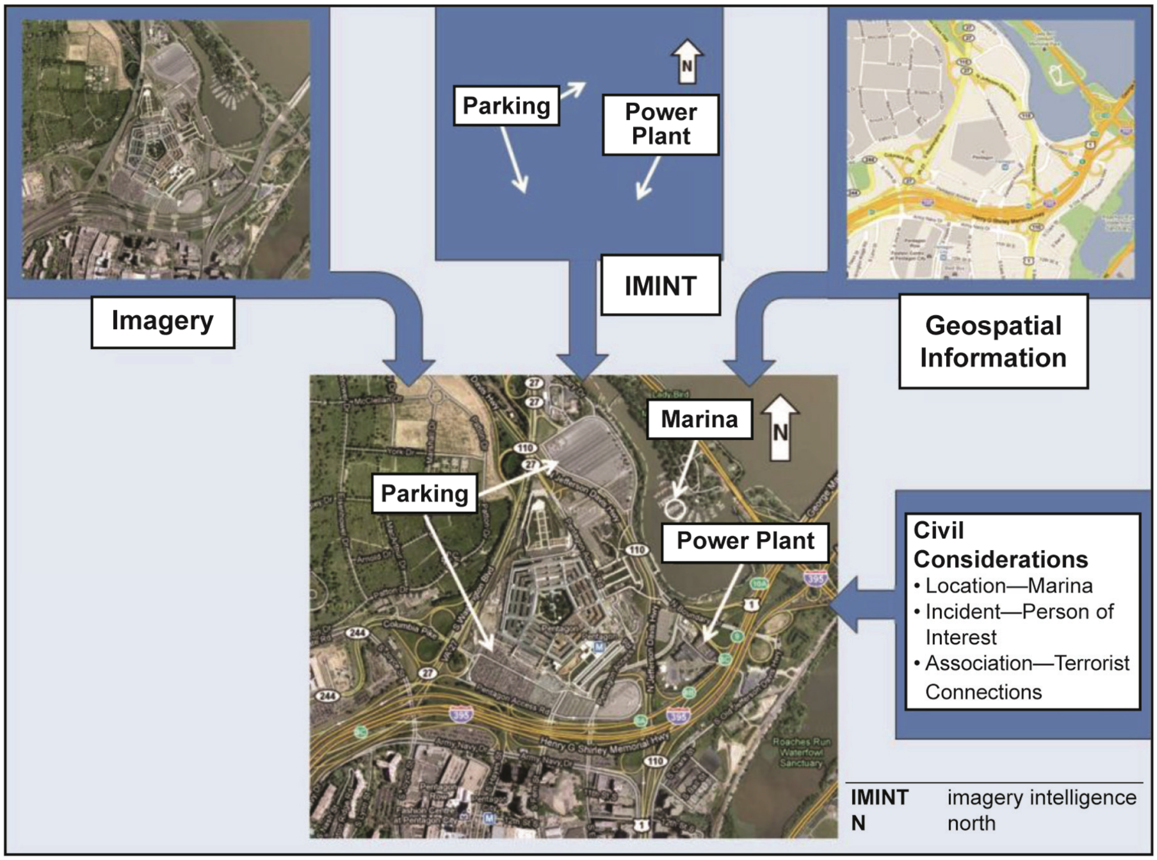


Figure 1-6. GEOINT product—GEOINT and civil considerations

THE NATIONAL SYSTEM FOR GEOSPATIAL INTELLIGENCE

1-10. Many ongoing operations and activities across DOD involve GEOINT. The NSG manages operations through guidance, policy, programs, and organizations with the intent to provide decisionmakers, commanders, intelligence users and producers, and civil authorities a better understanding of GEOINT to effectively execute assigned missions.

1-11. The NSG is the combination of technology, policies, capabilities, doctrine, activities, people, data, and communities necessary to produce GEOINT that can be readily integrated into intelligence analysis, products, and reports disseminated across multiple environments.

1-12. The NSG community comprises—

- **NSG members.** Members are responsible for prioritizing, planning, programming, budgeting, acquiring, collecting, analyzing, producing, sharing, storing, and processing GEOINT. Members include—
  - The intelligence community.
  - Joint staff.
  - Military departments (including the Services).
  - Combatant commands.
- **NSG partners.** Partners influence or indirectly participate in GEOINT prioritization, collection, production, or related programming and budgeting. Partners include—
  - Civil applications committee members.
  - International partners.

- Industry.
- Academia.
- Defense service providers.
- Civil community service providers.

NATIONAL ORGANIZATIONS THAT SUPPORT THE NSG

1-13. The following organizations participate with the Army to support the NSG and may or may not be NSG members or partners:

- NGA.
- Defense Intelligence Agency (DIA).
- National Security Agency (NSA).
- National Reconnaissance Office (NRO).
- Office of Naval Intelligence (ONI).
- Marine Corps Intelligence Activity (MCIA).
- National Air and Space Intelligence Center (NASIC).

National Geospatial-Intelligence Agency

1-14. NGA is the functional manager for GEOINT and a national-level intelligence community member that is responsible for the following major tasks, as outlined in DODD 5105.60:

- Provides timely, relevant, and accurate GEOINT to DOD, intelligence community, and other U.S. Government departments and agencies.
- Manages national imagery tasking, procedures, standards, and acquisitions.
- Conducts other intelligence-related activities essential for U.S. national security.
- Provides GEOINT for safety of navigation information.
- Prepares and distributes maps, charts, books, and geodetic products.
- Designs, develops, operates, and maintains systems related to the processing and dissemination of GEOINT.
- Provides GEOINT support to the Armed Forces.

1-15. NGA's director serves as the functional manager for GEOINT in accordance with applicable laws and guidance from the Director of National Intelligence (DNI) and DOD directives and agreements. As functional manager, the NGA director—

- Serves as principle advisor to DNI for performance of the GEOINT function.
- Exercises functional management and oversight of the NSG, including technical oversight of NSG tactical elements, to ensure—
  - Interoperability between existing and future NSG systems.
  - Connectivity between national and tactical systems.
  - Modernization of tactical systems.
- Manages GEOINT activities.
- Sets standards for GEOINT architecture and products.
- Provides technical guidance for systems using GEOINT.

The National Geospatial-Intelligence Agency's Allied System for GEOINT

1-16. NGA recognizes that GEOINT is greater than NGA and U.S. resources. Although the NSG produces and participates in providing GEOINT to the Nation's decisionmakers and warfighters, the NSG's success also depends on collaborating closely with multinational partners on a day-to-day basis. To reflect this reality, NGA has expanded its operating model to more fully incorporate the valuable input of the Nation's closest multinational partners. Therefore, it is now operating the Allied System for GEOINT (ASG). The

NSG joins Australia, Canada, New Zealand, and the United Kingdom to form an international GEOINT community, with each member building on the contributions of others and underlining the strengths of each nation. ASG is a platform for cooperation on issues that range from—

- Standards to technology.
- Training to fulfilling joint requirements in topographic, aeronautical, and nautical areas and in theaters of operations.

1-17. NGA maintains Web sites and e-mail on the Nonsecure Internet Protocol Router Network (NIPRNET), SECRET Internet Protocol Router Network (SIPRNET), and Joint Worldwide Intelligence Communications System (JWICS). Commanders and staffs can access NGA products directly from these Web sites or communicate directly with NGA analysts via e-mail. (Go to http://www.nga.mil for more information on NGA.)

National Geospatial-Intelligence Agency Support Teams

1-18. The primary mechanism for interaction between combatant commands and NGA is the NGA support team. The team's mission is to—

- Provide timely, accurate, and tailored GEOINT to combatant commands during peacetime, throughout exercises, and during war.
- Act as a conduit for ensuring full fusion of available information between combatant commands and NGA.

1-19. NGA support team coordinates NGA's operational, policy, and training support to its customers. NGA maintains NGA support teams at the joint staff, combatant commands, Services, and DOD agencies. A typical NGA support team comprises a senior representative (a military intelligence [MI] senior officer or a defense intelligence senior leader), staff officers, and imagery and geospatial analysts. A reach component at NGA headquarters focuses NGA production support.

1-20. In addition to using NGA support teams, NGA, upon request, may deploy crisis support teams of two to five imagery and geospatial analysts—either independently as augmentation to an existing NGA support team or as part of a national intelligence support team (NIST).

1-21. A *national intelligence support team* is a nationally sourced team composed of intelligence and communications experts from the Defense Intelligence Agency, Central Intelligence Agency, National Geospatial-Intelligence Agency, National Security Agency, or other intelligence community agencies as required (JP 2-0). A NIST can comprise a combination of these agencies or depending on the mission, may include other intelligence community organizations, as well. A NIST provides the means to integrate national intelligence capabilities into a comprehensive intelligence effort designed to support the joint force. (See JP 2-01.) These government or contract personnel teams employ deployable GEOINT production systems. NIST personnel reach to NGA for data and products; fuse this information with tactical, operational, and strategic sources; and collaborate with users to produce products tailored to their needs.

Defense Intelligence Agency

1-22. DIA is a national-level intelligence agency responsible for providing MI to commanders, defense planners, and defense and national security policymakers. As the proponent for the defense intelligence enterprise, DIA—

- Has oversight of the Defense Intelligence Analysis Program.
- Is a consumer of GEOINT products produced by NGA and other members of the NSG.
- Develops imagery-based products that assist theater, corps, division, and brigade combat team (BCT) intelligence staffs in performing those tasks associated with—
  - Intelligence preparation of the battlefield (IPB).
  - Indications and warning (I&W).
  - Situation development.

- Intelligence, surveillance, and reconnaissance (ISR).
- Targeting.

1-23. DIA maintains Web sites and e-mail on NIPRNET, SIPRNET, and JWICS. Commanders and staffs can access DIA products directly from these Web sites or communicate directly with DIA analysts via e-mail. (Go to http://www.dia.mil for more information on DIA.)

National Security Agency

1-24. NSA is a national-level intelligence agency responsible for protecting U.S. national security systems and producing foreign signals intelligence (SIGINT) information. Its primary mission is to produce SIGINT, provide information assurance products and services, and enable network warfare operations.

1-25. NSA has oversight of all U.S. SIGINT operations and is a consumer of GEOINT products by NGA and other members of the NSG. It does not produce geospatial or imagery-based products for external users.

1-26. NSA maintains Web sites and e-mail on NIPRNET, SIPRNET, and JWICS. (Go to http://www.nsa.gov for more information on NSA.)

National Reconnaissance Office

1-27. NRO is a national-level intelligence agency that builds and operates the Nation's satellites, which support DOD and the Central Intelligence Agency (CIA). NRO is a provider of imagery data for analysis by the NSG. It does not produce geospatial or imagery-based products for external users. (Go to http://www.nro.gov for more information on NRO.)

Office of Naval Intelligence

1-28. ONI produces maritime intelligence to support strategic, operational, and tactical commanders. ONI is a consumer of GEOINT products produced by NGA and other members of the NSG. ONI develops GEOINT related to threats and to friendly air, surface and subsurface, and landing forces. (Go to http://www.oni.navy.mil for more information on the ONI. Also, see Naval Doctrine Publication 2, *Naval Intelligence*.)

Marine Corps Intelligence Activity

1-29. MCIA produces intelligence to support expeditionary warfare. MCIA is a consumer of GEOINT products produced by NGA and other members of the NSG. MCIA develops GEOINT related to threat and terrain-analysis tailored products for Marine Corps tactical units preparing to deploy to a theater of operations. (Go to http://www.quantico.usmc.mil/activities/?Section=MCIA for more MCIA information.)

National Air and Space Intelligence Center

1-30. NASIC is the source of air and space intelligence for DOD and produces intelligence that enables military operations. NASIC provides intelligence assessments and tailored intelligence products directly to operational military units. NASIC produces intelligence related to foreign air and space capabilities, including weapons system performance, vulnerabilities, and employment, which includes—

- Aircraft.
- Ballistic missiles.
- Radars.
- Integrated air defense systems.
- Electronic and electro-optical countermeasures.
- Command and control information systems.

1-31. NASIC is a producer of GEOINT as well as a consumer of GEOINT products produced by NGA and other members of the NSG. (Go to http://www.afisr.af.mil/units/nasic/index.asp for more information on NASIC.)

ARMY ORGANIZATIONS THAT SUPPORT THE NSG

1-32. In addition to national organizations, the following Army organizations described below also support the NSG:

- Army Special Programs Office (ASPO).
- National Ground Intelligence Center (NGIC).
- Army Geospatial Intelligence Office (AGO).
- Army Geospatial Center (AGC).

Army Special Programs Office

1-33. ASPO is an Army acquisition organization (subordinate to the Program Executive Office [PEO] for Intelligence, Electronic Warfare, and Sensors [IEW&S]) responsible for four operational Army programs, one of which is the tactical exploitation of national capabilities program (TENCAP). ASPO, through the TENCAP program manager, enables Army forces to access, exploit, and disseminate national technical means (NTM) data using the TENCAP-developed Tactical Exploitation System family of systems. ASPO collaborates closely with NSG members to ensure the Army's operational forces are empowered by technology, information, and the ability to fuse MI disciplines. Army forces, using the Tactical Exploitation System family of systems, produce SIGINT and GEOINT products. (Go to http://www.aspo.army.mil for more information on ASPO.)

National Ground Intelligence Center

1-34. NGIC is a U.S. Army Intelligence and Security Command (INSCOM) functional command with operational control exercised by the Headquarters, Department of the Army, Deputy Chief of Staff, G-2. NGIC is responsible for the development of finished, all-source intelligence on foreign ground forces under the federated Defense Intelligence Analysis Program. It provides scientific and technical intelligence (S&TI) and general military intelligence (GMI) on foreign ground forces to support senior defense and Army leadership, warfighting commanders, and force and materiel developers. NGIC also provides GEOINT support to combatant commands through the embedded NGA support team, as well as the Army GEOINT Battalion.

1-35. NGIC's mission is to produce and disseminate all-source integrated intelligence on foreign ground forces and related military technologies to ensure U.S. forces have a decisive edge on current and future military operations. Following are NGIC's core competencies:

- Analysis of how foreign ground forces (regular and irregular) organize, equip, train, and operate, including improvised explosive device procurement, production, employment, effects, and networks.
- Analysis of past and present patterns and prediction of future capabilities.
- In-depth analysis of current and projected foreign ground force materiel.
- Analysis of foreign weapon effects and the threat they pose to U.S. materiel.
- Technology forecasts for modernization programs.
- Assessments of integrated warfighting functions.
- Imagery exploitation and analysis.
- Measurement and signature intelligence (MASINT).
- Document and media exploitation (DOMEX).
- Biometric-enabled intelligence (BEI).
- Foreign materiel acquisition and exploitation.

- Chemical and biological warfare assessments, including—
  - Consequence assessments from the release of toxic and chemical and biological warfare agents.
  - Employment of weapons of mass destruction to support threat operational forces.
- Analysis and production of irregular warfare threats with focus on regional and transregional networks.
- Scientific and technical analysis of military-grade and improvised weapon systems.
- Types, characteristics, and performance of improvised explosive devices and associated tactics, techniques, and procedures.

1-36. NGIC comprises the 2d MI Center located in Charlottesville, Virginia. The center includes a subordinate command element, the Army GEOINT Battalion, which is embedded within NGA in Washington, DC. The Army GEOINT Battalion represents Army interests at NGA. The 2d MI Center—

- Advocates for Army requirements for broad-spectrum imagery products and support while contributing to NGIC's overall GMI and S&TI mission.
- Provides GEOINT tactical overwatch of deployed forces.
- Provides crisis support for the Army and DOD agencies.
- Provides GEOINT sustainment training to support the Army.

1-37. NGIC's National-to-Theater Program is the DOD leader in providing innovative advanced geospatial intelligence (AGI) to joint and component warfighters. *Advanced geospatial intelligence* refers to the technical, geospatial, and intelligence information derived through interpretation or analysis using advanced processing of all data collected by imagery or imagery-related collection systems (JP 2-03). This definition of AGI, which is also known as imagery-derived MASINT, includes information technically derived from the processing, exploitation, and nonliteral analysis (including integration of fusion) of spectral, spatial, temporal, radiometric, phase history, and polarimetric data. Through INSCOM, national-to-theater AGI products enable customers to improve targeting and increase situational awareness.

1-38. The National-to-Theater Program performs AGI processing to extract unique information and expand on traditional imagery capabilities by directly leveraging NTM and theater collection assets. The Army National-to-Theater Program comprises numerous GEOINT teams (nodes), each co-located with INSCOM MI brigades, NGIC, and the Army Forces Strategic Command, thus providing GEOINT support to all regional combatant commands.

1-39. Go to http://www.inscom.army.mil/Default.aspx?text=off&size=12pt for more information on NGIC.

Army Geospatial Intelligence Office

1-40. AGO is the designated Service-level element. AGO—

- Provides integrated and coordinated liaison with NGA for executive agents within the Army responsible for the key components of Army GEOINT.
- Develops plans, programs, budgets, and policy related to Army-specific GEOINT activities.
- Assists the Army Geospatial Information Officer in coordinating GEOINT policy within the Army, with the NSG, and with oversight organizations.

1-41. AGO also facilitates GEOINT federation and integration into the NSG by coordinating Army GEOINT tasking, collection, processing, exploitation, and dissemination (TCPED) functions, as well as federated production and capability development. AGO accomplishes its purpose through a team arrangement that unites single-coordinated entities, elements from the Army G-2, INSCOM organizations, and the Army Geospatial Information Office. This coordination affects unified operations, tradecraft, policy, data standard, system acquisition, research and development, and resourcing for integration of GEOINT throughout the Army.

Army Geospatial Center

1-42. With increasing demand for geospatial support at all echelons, the Army created AGC, which replaced the Engineer Research and Development Center's Topographic Engineering Center (TEC). AGC is a direct reporting unit under the U.S. Army Corps of Engineers (USACE). AGC provides timely, accurate, geospatial support to warfighters and expands its mission to support the Army Battle Command System (ABCS) by facilitating the dissemination of relevant geospatial information to every level across the dynamic operational environment. Additionally, the center coordinates, integrates, and synchronizes geospatial information requirements and standards across the Army as well as develops and fields geospatial enterprise-enabled systems and capabilities to the Army and DOD.

1-43. AGC is designated as the Army knowledge center for geospatial expertise. The Army Geospatial Information Officer is also the AGC director. The Army Geospatial Information Officer, as the Army's central manager, is responsible for coordinating, assessing, and synchronizing Army policies and for standardizing requirements for the geospatial information enterprise. (Go to http://www.agc.army.mil for more information on AGC.)

GEOINT SUPPORT TO COMBATANT COMMANDS

1-44. Combatant commands develop area and point target GEOINT requirements to conduct joint operations. Each combatant command has also established a joint intelligence operations center to plan, prepare, integrate, direct, synchronize, and manage continuous, intelligence operations. The center's goal is the integration of intelligence, operations, and plans to increase the speed, power, and combat effectiveness of DOD operations. These organizations facilitate access to all available intelligence sources. They analyze, produce, and disseminate accurate and timely all-source intelligence and GEOINT to conduct military operations.

1-45. At the theater, corps, division, brigade, battalion, and company levels, the commander's primary requirement for GEOINT is the timely production of GEOINT products that aid mission command, command and control, the military decisionmaking process (MDMP), situation development, I&W, and targeting.

1-46. Theater, corps, division, and brigade commanders have organic GEOINT assets that support them. Battalion and company commanders depend mainly on brigade assets to support them. When requirements exceed a commander's organic GEOINT capability, additional support is available through the NSG.

1-47. The NSG is designed to be a mutually supportive enterprise that fosters collaboration between echelons to ensure Army commanders have the GEOINT needed to support operations. When developing intelligence architectures, G-2s/S-2s develop communications protocols and professional relationships with each relevant component of the NSG. When conducting ISR planning, G-2s/S-2s leverage the support each of these components can provide.

1-48. Commanders generally employ organic GEOINT resources against time-sensitive and critical information needs. They rely on nonorganic resources to provide mid- to long-term collection and analysis. Commanders rely on G-2s/S-2s to understand how to use nonorganic GEOINT resources that have or can collect data related to a theater of operations. The NGA can assist G-2s/S-2s in identifying those organizations or agencies that should be included in the command's intelligence architecture. The NGA can also provide advice on integrating NSG members and partners into ISR strategies. This accomplishment leverages the full power of GEOINT for the Army, resulting in more comprehensive and tailored intelligence products across warfighting functions.

INTELLIGENCE PRODUCTS AND GEOINT

1-49. Intelligence products are generally placed in one of seven production categories:

- I&W.
- Current intelligence.
- GMI.

- Target intelligence.
- S&TI.
- Counterintelligence.
- Estimative intelligence.

1-50. The categories of intelligence are distinguishable based on the purpose of the intelligence product. The categories can overlap and some of the same intelligence is useful in more than one category. Depending upon the echelon, intelligence organizations may use specialized procedures to develop each intelligence category. The following information briefly describes each category and its GEOINT connection. (See FM 2-0 for more information on the seven production categories.)

INDICATIONS AND WARNING

1-51. *Indications and warning* are those intelligence activities intended to detect and report time-sensitive intelligence information on foreign developments that could pose a threat to the United States or allied and/or coalition military, political, or economic interests or to U.S. citizens abroad. It includes forewarning of hostile actions or intentions against the United States, its activities, overseas forces, or allied and/or coalition nations (JP 2-0). I&W includes—

- Forewarning of threat actions or intentions.
- The imminence of hostilities.
- Insurgency.
- Nuclear or non-nuclear attack on the United States, U.S. overseas forces, or multinational forces.
- Hostile reactions to U.S. reconnaissance activities.
- Terrorist attacks.
- Other similar events.

1-52. See FM 2-0 for more information on I&W.

CURRENT INTELLIGENCE

1-53. *Current intelligence* is concerned with describing the existing situation (JP 2-0). Current intelligence involves the integration of time-sensitive, all-source intelligence and information into concise, accurate, and objective reporting on the area of operations (AO) and current threat situation. One of the most important forms of current intelligence is the threat situation portion of the COP and as such derives much of its information from GEOINT.

GENERAL MILITARY INTELLIGENCE

1-54. *General military intelligence* is intelligence concerning the (1) military capabilities of foreign countries or organizations or (2) topics affecting potential U.S. or multinational military operations, relating to the following subjects: armed forces capabilities, including order of battle, organization, training, tactics, doctrine, strategy, and other factors bearing on military strength and effectiveness; area and terrain intelligence, including urban areas, coasts and landing beaches, and meteorological, oceanographic, and geological intelligence; transportation in all modes; military materiel production and support industries; military and civilian communications systems; military economics, including foreign military assistance; insurgency and terrorism; military political-sociological intelligence; location, identification, and description of military related installations; government control; escape and evasion; and threats and forecasts (excludes scientific and technical intelligence) (JP 2-0).

1-55. A current and comprehensive intelligence database is critical to plan and prepare rapidly for operations. The G-2/S-2 develops and maintains the unit's GMI database as an essential component of intelligence readiness. The GMI database supports the unit's conduct of operations and reflects the use of GEOINT throughout the data it maintains.

TARGET INTELLIGENCE

1-56. *Target intelligence* is intelligence that portrays and locates the components of a target or target complex and indicates its vulnerability and relative importance (JP 3-60). It entails the analysis of threat units, dispositions, facilities, and systems to identify and nominate specific assets or vulnerabilities for attack, reattack, or exploitation (for intelligence). GEOINT products and information are a critical component for the successful prosecution of this activity.

SCIENTIFIC AND TECHNICAL INTELLIGENCE

1-57. *Scientific and technical intelligence* is the product resulting from the collection, evaluation, analysis, and interpretation of foreign scientific and technical information that covers: a. foreign developments in basic and applied research and in applied engineering techniques; and b. scientific and technical characteristics, capabilities, and limitations of all foreign military systems, weapons, weapon systems, and materiel; the research and development related thereto; and the production methods employed for their manufacture (JP 2-01).

1-58. Details provided through GEOINT products and information enables the S&TI analyst to perform the evaluation, analysis, and interpretation aspects of this capability.

COUNTERINTELLIGENCE

1-59. *Counterintelligence* is information gathered and activities conducted to identify, deceive, exploit, disrupt, or protect against espionage, other intelligence activities, sabotage, or assassinations conducted for or on behalf of foreign powers, organizations, or persons, or their agents, or international terrorist organizations or activities (Executive Order 12333 [EO 12333]).

1-60. Counterintelligence includes all actions taken to detect, identify, track, exploit, and neutralize the multidiscipline intelligence activities of threats. It is the key intelligence community contributor to protect U.S. interests and equities. (See FM 2-0.) GEOINT support to counterintelligence includes the construction of tactical decision aids that help identify threat ISR operations, such as infiltration routes.

ESTIMATIVE INTELLIGENCE

1-61. *Estimative intelligence* identifies, describes, and forecasts threat capabilities and the implications for planning and executing military operations (JP 2-0). The addition of GEOINT products and information to the estimative process helps forecast the unknown based on an analysis of known facts and using techniques, such as pattern analysis, inference, and statistical probability.

Chapter 2
Imagery

Imagery is one of three components of GEOINT, as defined in chapter 1. Imagery is the visual basis of GEOINT, enabling the intelligence staff to "see" the operational environment without actually being there. Characteristics within this chapter include imagery sources, resolution, and types.

IMAGERY SOURCES

2-1. Imagery sources include—

- Satellite systems:
  - NTM.
  - Commercial or civil satellite systems.
  - Overhead persistent infrared (OPIR).
- Aircraft systems:
  - Manned.
  - Unmanned.
- Handheld imagery (derived from other than human intelligence [HUMINT] sources):
  - Ground reconnaissance.
  - Open-source intelligence.

SATELLITE SYSTEMS

2-2. Space-based platforms have been a critical component for imagery collection since their inception in the 1960s. NRO, in collaboration with the Services and other government agencies, designs, builds, and operates the Nation's reconnaissance satellites.

2-3. National reconnaissance platforms and commercial or civil imaging satellites use of domestic imagery operate under legal and policy limitations derived from the U.S. Constitution, EO 12333, goals, direction, duties, and responsibilities with respect to the national intelligence effort and the National Security Act of 1974, as amended, as well as other applicable law and policy directives. Users must be aware of legal and policy concerns associated with domestic imagery, particularly if they pertain to private property. Individuals may be held responsible for any violation of law or inappropriate use of domestic imagery. (See chapter 6, paragraphs 6-28 through 6-30.)

2-4. While commercial or civil imagery is unclassified, caution must be exercised when requesting and obtaining imagery from commercial or civil organizations for operations security reasons. Acquiring commercial or civil imagery is generally not a secure process, and the imagery collected can be placed on a publicly available archive for resale by the vendor.

National Technical Means

2-5. NTM provides timely, relevant, and accurate imagery and GEOINT to support the Nation's military forces, national policymakers, and civil users. National systems are a primary source of imagery used to produce GEOINT. However, imagery collected from national systems is classified; therefore, it requires release authorization, making dissemination more difficult. NTM imagery and products are disseminated via numerous libraries or directly on the SIPRNET. Recently, NGA authorized the release of some NTM data at the unclassified//for official use only (U//FOUO) level.

Commercial or Civil Satellite Systems

2-6. Commercial systems collect panchromatic (visible), spectral, and radar data, and have a broader scope of operations than national systems. Commercial systems and commercial producers from foreign and U.S. vendors increasingly contribute geospatial information and products for NSG requirements.

2-7. Commercially available, submeter resolution imagery and geospatial information are becoming more widely used as the intelligence community seeks more cost-effective ways of providing a full range of imagery-based products to an ever-growing customer base. Commercial imagery provides an important advantage in multinational operations because it is unclassified and can be disseminated without compromising the capabilities and operating characteristics of U.S. national reconnaissance systems.

2-8. Due to their flexibility and resolution capabilities, commercial satellite collectors are increasingly relied upon to augment NTM. For example, commercial aircraft imagery systems are used for planning support to national special security events, such as the Olympics, and national political conventions.

Overhead Persistent Infrared

2-9. OPIR is a defense program of remotely sensed data provided in large spatial samples, including—

- Short-wave infrared (SWIR).
- Medium-wave infrared (MWIR).
- Long-wave infrared (LWIR).
- Near infrared (IR).
- Visible.
- Ultraviolet spectral bands.

AIRCRAFT SYSTEMS

2-10. Aircraft systems are ISR assets residing at the theater and tactical levels. These aircraft systems are tasked and managed through the command's ISR plan. TC 2-01 contains additional information on ISR and ISR synchronization. The full spectrum of GEOINT aircraft ISR sources includes all manned and unmanned platforms that collect still and motion imagery using panchromatic (visible), thermal, multiband, multispectral, hyperspectral, laser-based, or radar-based imaging sensors. Aircraft systems can be either government or commercial systems.

2-11. Commercial aircraft systems provide yet another source of imagery and geospatial information. For example, due to their flexibility and resolution capabilities, commercial aircraft collectors are increasingly relied upon to augment satellite collection.

2-12. Aircraft systems are capable of locating and recognizing major threat forces, moving vehicles, weapons systems, and other targets that contrast with their surroundings. In addition, aircraft systems are capable of locating and confirming the position of friendly forces, presence of noncombatant civilians, and so forth. Current Army aircraft system missions include—

- Reconnaissance.
- Surveillance.
- Security.
- Cooperative engagements.
- Communications relay.

2-13. Currently, aircraft systems bring numerous capabilities to Army units, such as—

- Providing near real-time reconnaissance, surveillance, and target acquisition.
- Providing excellent reconnaissance and attack resolution.
- Being fitted with laser designators to mark targets and some may be armed.
- Supporting target acquisition efforts and lethal attacks on threat reconnaissance and advance forces.

- Assisting in route, area, and zone reconnaissance.
- Locating and helping to determine threat force composition, disposition, and activity.
- Maintaining contact with threat forces from initial contact through battle damage assessment.
- Providing target coordinates with enough accuracy to enable an immediate target handover, as well as first-round fire-for-effect engagements.
- Providing or enhancing spectral sensor coverage of the AO.
- Providing information to other aircraft systems, thus increasing survivability.
- Providing extended three-dimensional (3D) vantage, in both distance and time, at critical decision points in difficult terrain.
- Performing decoy, demonstration, feint, and deception operations.
- Providing digital connectivity, allowing for rapid product dissemination.

Manned Aircraft Imaging Systems

2-14. Manned aircraft systems include but are not limited to the following examples:

- U-2.
- Joint Surveillance Target Attack Radar System (JSTARS).
- Airborne Reconnaissance Low (ARL).
- Airborne Reconnaissance Multisensor System (ARMS).
- Medium Altitude Reconnaissance and Surveillance System (MARSS).
- Constant Hawk.
- Enhanced-Medium Altitude Reconnaissance and Surveillance System (EMARSS).
- Project Liberty.

U-2

2-15. The Lockheed U-2 (see figure 2-1, page 2-6), nicknamed Dragon Lady, is a single-engine, high-altitude aircraft flown by the U.S. Air Force (USAF) and previously flown by the CIA. It provides day and night, high-altitude (70,000 feet), all-weather surveillance. It can use both line-of-sight and beyond line-of-sight data links.

2-16. The U-2 carries a variety of sensors capable of simultaneously collecting SIGINT and IMINT. Although the U-2 is capable of collecting with multidiscipline sensors simultaneously, it is limited to one imagery sensor at a time. IMINT sensors include—

- **Optical bar camera (OBC)—**a 30-inch panoramic format film sensor. It is the only wet-film system still in operation in the USAF. A full roll of film can provide more than 100,000 square nautical miles coverage.
- **Senior Year Electro-Optical Reconnaissance System (SYERS)—**a multispectral visible/IR image that provides deep-look, high-resolution, near real-time imagery. The multispectral capability improves imaging capabilities in night, foggy, or hazy conditions. It provides improved resolution, range, and geo-location accuracy, as well as improved performance in darkness, haze, and inclement weather. When the sensor is out of range from a ground receive location, collected image data can be stored for later retrieval.
- **Advanced Synthetic Aperture Radar System 2A (ASARS-2A)**—a near real-time, high-resolution radar reconnaissance system with all-weather, day-night, long-range mapping capabilities. ASARS-2A detects and accurately locates stationary and moving ground targets. The system can survey more than 100,000 square miles of the Earth's surface in one hour. The sensor can scan the ground on either side of the aircraft and acquire images out to around 160 kilometers. The radar operates in either search or spot modes and relays data in near real-time via a wideband data link, with a line-of-sight range close to 300 nautical miles, to a dedicated ground station.

Joint Surveillance Target Attack Radar System

2-17. JSTARS and the common ground station (CGS) are coupled to provide timely moving target indicator (MTI) data. This data provides important insight on object movements during overseas contingency operations.

2-18. JSTARS is a USAF aircraft battle management and command and control platform that conducts ground surveillance to develop an understanding of the threat situation. These functions support the primary mission of JSTARS—to provide dedicated support of ground and air theater commanders. Although JSTARS is operated and maintained by the USAF, it is considered a national asset for tasking purposes. Its primary mission is the dedicated support of a joint task force's (JTF's) joint force-land component commander or geographic combatant commander under the overall direction of the joint force commander (JFC).

2-19. The JSTARS sensor suite provides detection and tracking of moving targets via MTIs, fixed target indicators, and synthetic aperture radars (SARs). Radar data collected by JSTARS (see figure 2-2, page 2-7) is distributed via an onboard local area network (LAN) to an encrypted, highly jam-resistant surveillance and control data link for real-time transmission to an unlimited number of CGSs.

2-20. As a battle management and command and control asset, JSTARS supports a wide range of roles and missions across the spectrum of conflict. JSTARS can detect moving vehicles, providing the approximate number of vehicles, their location, speed, direction of travel, and the time that the vehicles were detected. Identifying *who* the targets are, *what* equipment they have, whether they are friendly, hostile, or bystanders, is not possible with this system. Other service sensors may reference each other to positively validate JSTARS reports.

2-21. To support air-to-ground operations, JSTARS can provide real-time information needed to increase ground-situation awareness with intelligence support, attack support, and targeting operations, including attack aviation, naval surface fire, field artillery, and friendly maneuver forces. It also provides information for air and land commanders to gain and maintain control of the AO and execute operations against threat forces.

Airborne Reconnaissance Low

2-22. ARL (see figure 2-3, page 2-8) is a multifunction, day or night, all-weather reconnaissance intelligence asset developed and fielded by the Army to support a requirement for a low-profile intelligence aircraft. It consists of a modified DHC-7 fixed-wing aircraft equipped with IMINT and communications intelligence mission payloads. Some variations incorporate an MTI/SAR mission payload. The payloads are controlled and operated via onboard workstations. Intelligence collected on ARL can be analyzed and recorded on the aircraft workstations in real-time or stored onboard for postmission processing. The ARL system includes a variety of communications subsystems to support near real-time dissemination of intelligence and dynamic retasking of the aircraft.

Airborne Reconnaissance Multisensor System

2-23. ARMS is a modified C-12R aircraft (see figure 2-4, page 2-9) equipped with a MX-15 electro-optical camera with enhanced forward looking infrared (FLIR), color spotter, wide zoom capabilities, laser illuminator, laser designator, embedded navigation, and precision geo-location capabilities. ARMS provides mission commanders a simultaneous downlink of video imagery that can be used to identify convoy hazards and targets for quick-reaction forces to engage.

Medium Altitude Reconnaissance and Surveillance System

2-24. MARSS is a modified C-12 aircraft (see figure 2-5, page 2-10) equipped with a MX-15 electro-optical camera with enhanced FLIR, laser illuminator, laser designator, and near real-time full motion video (FMV) downlink. The downlink capability is line-of-sight and beyond line-of-sight. Mission operating altitude is 5000-14000 feet with an endurance of 5.5 hours. The aircrew consists of two pilots and up to two onboard analysts who provide real-time imagery analysis for the warfighter on the ground.

Constant Hawk

2-25. Constant Hawk is a modified Sherpa/Shorts 360 aircraft (see figure 2-6, page 2-11) using the persistent surveillance wide field of view airborne ISR system to conduct counter-improvised explosive device surveillance force protection missions in Iraq. Constant Hawk uses a special video camera system to observe a locality and find useful patterns of behavior. Constant Hawk systems are mounted on piloted aircraft, unmanned light aircraft, and ground structures. Special software compares photos from different times. When changes are noted, they are checked more closely, which has resulted in the early detection of roadside bombs and terrorist ambushes.

Enhanced Medium Altitude Reconnaissance and Surveillance System

2-26. EMARSS is a modified C-12 aircraft (see figure 2-7, page 2-12) equipped with a MX-15 electro-optical camera with enhanced FLIR, laser illuminator, laser designator, and near real-time FMV downlink. EMARSS also provides communications intelligence and real-time electronic threat characteristic information for all communications networks and radars in theaters of operations. Communications intelligence data can be sent to any command level in theaters of operations.

Project Liberty

2-27. The modified C-12W, also known as Project Liberty, is a USAF ISR platform and Air Combat Command asset (see figure 2-8, page 2-13). It was fielded in 2008 and 2009 to meet ground support ISR requirements in the U.S. Central Command area of responsibility for Operations Enduring Freedom and Iraqi Freedom. The modified C-12W platform was created in response to Defense Secretary Robert Gates' initiative to better support Soldiers on the ground with increased ISR in theaters of operations. Project Liberty flew its first combat sortie over Iraq on 10 June 2009.

SYSTEM SUMMARY

Mission—
The U-2 provides high-altitude, all-weather R&S, day or night, to directly support U.S. and multinational ground and air forces. It delivers critical IMINT and SIGINT to decisionmakers throughout the spectrum of confilict, including peacetime I&W, low-intensity conflict, and large-scale hostilities.

Features—
- Single-seat, single-engine, high-altitude/near space R&S aircraft
- Provides SIGINT, IMINT, and electronic MASINT
- Quickly lifts heavy sensor payloads to unmatched altitudes and keeps them there for extended periods of time
- Gathers a variety of imagery, including multispectral EO, IR, and SAR products
- Supports high-resolution, broad-area synoptic coverage provided by the OBC and produces traditional film products
- Carries a SIGINT payload
- Transmits all intelligence products, except wet film, in NRT worldwide via air-to-ground or air-to-satellite data links (MASINT provides indications of recent activity in AOIs and reveals efforts to conceal the placement or true nature of manmade objects.)

Sensor packages—
- EO/IR camera
- OBC
- ASARS-2A
- SIGINT

General Characteristics—
- Wing span—105 feet
- GTOW—40,000 pounds
- Payload—5,000 pounds
- Speed—410+ miles per hour
- Range—6,090+ nautical miles
- Ceiling—Above 70,000 feet
- Crew—One

AOI	area of interest	**IR**	infrared
ASARS-2A	Advanced Synthetic Aperture Radar System 2A	**NRT**	near real-time
		OBC	optical bar camera
EO	electro-optical	**R&S**	reconnaissance and surveillance
GTOW	gross take off weight	**SAR**	synthetic aperture radar
IMINT	imagery intelligence	**SIGINT**	signals intelligence
I&W	indications and warning		

Figure 2-1. U-2 manned aircraft system

SYSTEM SUMMARY

Mission—

The E-8C JSTARS is an airborne battle management, C2, ISR platform. Its primary mission is to provide theater ground and air commanders with ground surveillance to support attack operations and targeting that contributes to the delay, disruption, and destruction of enemy forces.

Features—

- Modified Boeing 707-300 series commercial airframe with radar, communications, operations, and control subsystems is required to perform its operational mission.
- The radar and computer subsystems can gather and display detailed operational environment information on ground forces.
- Information is relayed in NRT to the Army and Marine Corps CGSs and to other ground C3, computers and intelligence, or C41 nodes.
- Antenna can be tilted to either side of the aircraft and can detect targets at more than 250 kilometers (more than 820,000 feet).
- The radar has limited capability to detect helicopters, rotating antennas, and low slow-moving fixed wing aircraft.
- As a battle management and C2 asset, it supports the spectrum of conflict.

General Characteristics—

- Wing span—145 feet 9 inches
- GTOW—336,000 pounds
- Payload—electronic equipment and crew
- Speed—449 to 587 miles per hour
- Range—9 hours
- Ceiling—42,000 feet
- Crew—4 (flight crew), normally 15 USAF and 3 Army (mission crew size varies according to mission)

C2	command and control	**GTOW**	gross take off weight
C3	command, control, and communications	**ISR**	intelligence, surveillance, and reconnaissance
C41	command, control, communications, computers, and intelligence	**JSTARS**	Joint Surveillance Target Attack Radar System
		NRT	near real-time
CGS	common ground station	**USAF**	U.S. Air Force

Figure 2-2. E-8C JSTARS manned aircraft system

SYSTEM SUMMARY

Mission—

ARL is a multifunction, day or night, all-weather reconnaissance intelligence asset developed and fielded by the Army to support an urgent requirement for a low profile intelligence aircraft. ARL is a modified DHC-7 fixed wing aircraft with a core SIGINT and IMINT mission payload controlled and operated via onboard open architecture, multifunction workstations.

Features—

- DHC-7
- Ground processing station
- ACT 101 remote receiver sets
- TACLINK video receiver sets
- FLIR system
- Daylight imaging system
- IR line scanner
- Radio intercept/DF system
- Developed for OOTW
- Arrives ready for immediate employment
- Joint service capable
- Interoperability with ASAS and CTT
- Low political profile collection system
- Small logistic tail
- Multiple sensor system

General Characteristics—

- Wing span—93 feet
- GTOW—47,000 pounds
- Payload—2,500 pounds
- Speed—230 knots
- Range—1500 nautical miles
- Endurance—8 hours
- Ceiling—25,000 feet MSL
- Crew—7 (including 2 pilots)

ARL	Air Reconnaissance Low	**IMINT**	imagery intelligence
ASAS	All-source Analysis System	**IR**	infrared
CTT	commanders tactical terminal	**MSL**	mean sea level
DF	direction finding	**OOTW**	operations other than war
FLIR	forward looking infrared	**SIGINT**	signals intelligence
GTOW	gross take off weight	**TACLINK**	tactical link

Figure 2-3. ARL manned aircraft system

SYSTEM SUMMARY

Mission—	**General Characteristics—**
ARMS is a C-12R, which is a King Air 200-based variant modified with EFIS glass cockpit instrumentation. The C-12 provides on-call, rapid response, modern air transport for high priority supply and movement of key personnel. Specifically, it is used for VIP transport or to deliver repair parts, equipment, and accident investigation teams wherever needed. Its support role also includes such functions as range clearance, medical evacuation, administrative movement of personnel, transportation connections, and courier flights.	• Wing span—54 feet 6 inches • GTOW—12,500 pounds • Speed—333 miles per hour • Range—1,800 nautical miles • Ceiling—32,800 feet • Crew—1-2

ARMS	Air Airborne Reconnaissance Multisensor System	**GTOW**	gross take off weight
EFIS	Electronic Flight Instrument System	**VIP**	very important person

Figure 2-4. ARMS manned aircraft system

SYSTEM SUMMARY

Description—
The MARSS aircraft is based on King Air 300 (C-12 variant) equipped with numerous sensors, including IMINT and COMINT payloads. It also includes several LOS and BLOS communications systems and onboard (manned) processing of IMINT and COMINT.

Features—
- IMINT high-quality imagery is collected through a SAR and GMTI system and a long-range EO sensor.
- High-resolution imagery is saved to an onboard C2 center before being transmitted to ground command centers to generate a precise and comprehensive picture of the operational environment.
- MARSS meets network-centric operations criteria, which translates into the capability to send the data to any command level in the theater of operations.

General characteristics—
- Wing span—54 feet 6 inches
- GTOW—14,000 pounds
- Speed—583 miles per hour
- Range—1,960 nautical miles
- Ceiling—32,800 feet
- Crew—1-2

BLOS	beyond line-of-sight
C2	command and control
COMINT	communications intelligence
EO	electro-optical
GTOW	gross take off weight
GMTI	ground moving target indicator
IMINT	imagery intelligence
LOS	line of sight
MARSS	Medium Altitude Reconnaissance and Surveillance System
SAR	synthetic aperture radar

Figure 2-5. MARSS manned aircraft system

SYSTEM SUMMARY

Mission—	General Characteristics—
Constant Hawk is a surveillance capability that leverages an electro-optical payload to collect intelligence over areas of interest. This capability offers a unique combination of coverage and high spatial resolution required to detect and characterize events of interest along with their relevant tactical context. Typically, a Constant Hawk system maintains surveillance for a period of time while building a history of activity. The Constant Hawk forensic intelligence product is used to ascertain information on the enemy and identify areas that require increased surveillance by other assets.	• Wing span—75 feet • Speed—276 miles per hour • Range—1185 miles • Ceiling—20,000 feet • Crew—1-2

Figure 2-6. Constant Hawk manned aircraft system

SYSTEM SUMMARY

Mission—

The Army ISR aircraft system known as EMARSS provides a persistent capability to detect, locate, classify or identify, and track surface targets in day or night, near all-weather conditions with a high degree of timeliness and accuracy. EMARSS provides additional MARSS systems based on a King Air 350ER aircraft.

General Characteristics—

- Wing span—54 feet 6 inches
- GTOW—14,000 pounds
- Speed—300 knots
- Range—1,960 nautical miles
- Ceiling—35,000 feet
- Crew—1-2

EMARSS	Enhanced Medium Altitude Reconnaissance and Surveillance System
ER	extended range
GTOW	gross take off weight
ISR	intelligence, surveillance, and reconnaissance
MARSS	Medium Altitude Reconnaissance Surveillance System

Figure 2-7. EMARSS manned aircraft system

SYSTEM SUMMARY

Mission—
Project Liberty is a modified C-12W, a medium-altitude manned aircraft. The primary mission is providing ISR support directly to ground forces. The modified C-12W is a Joint Forces Air Component Commander-owned asset to support the joint forces commander.

Features—
Project Liberty is not just an aircraft, but a complete collection, processing, analysis, and dissemination system. It is capable of worldwide operations. The aircraft are military versions of the Hawker Beechcraft Super King Air 350 and Super King 350ER. A fully operational system consists of—

- A modified aircraft with sensors
- A ground exploitation cell
- LOS and SATCOM data links, along with a robust voice communications suite
- EO/IR sensor that includes a laser illuminator and designator in a single sensor package
- Other sensors, as the mission requires

General Characteristics—

- Wing span—57 feet 11 inches
- GTOW—15,000 pounds (300); 16,500 pounds (350ER)
- Speed—312 knots
- Range—1,500 nautical miles (350); approximately 2,400 nautical miles (350ER)
- Ceiling—35,000 feet
- Crew—2 pilots and 2 sensor operators

EO	electro-optical
ER	extended range
GTOW	gross take off weight
IR	infrared
ISR	intelligence, surveillance, and reconnaissance
LOS	line of sight
SATCOM	satellite communications

Figure 2-8. Project Liberty manned aircraft system

Other Manned Aircraft Imaging Systems

2-28. Table 2-1 lists other aircraft imaging systems that have been used or fielded during Operations Enduring Freedom and Iraqi Freedom.

Table 2-1. Other manned aircraft systems

AN/ASD-11 Theater Airborne Reconnaissance System (TARS)
TARS is currently fielded with the USAF aboard the F-16C as a tactical reconnaissance centerline pod system. TARS— • Provides a single forward-looking visible framing sensor, sensor control, second sensor window, data recording, and data link capable of real-time and near real-time transmission of full-resolution imagery. • Makes available postmission download of full-resolution imagery from an onboard solid-state recorder. • Collects IMINT virtually unnoticed (due to the F-16's flight profile) thereby improving the element of surprise. • Has proven itself a critical element in the sensor-to-shooter cycle, having flown in excess of 1,600 tactical missions since 2004.
Advanced Tactical Air Reconnaissance System (ATARS)

ATARS is currently fielded with the USMC aboard the F/A-18D as a tactical reconnaissance nose-mounted system. ATARS—
• Replaces the 20-mm Cannon on the F/A-18D and integrates low- and medium-altitude visible sensors for daylight operations; an IR line scanner for day and night operations; and the SAR modes of the F/A-18D's multimode APG-73 for all-weather reconnaissance.
• Includes a centerline-mounted data link pod for transmitting near real-time from the three digital imaging sensors and SAR imagery to any CIG/SS compatible system, including the JSIPS or Marine TEG based ashore and the JSIPS-Navy aboard ship.
• Digital sensors allow the aircrew to obtain high-resolutioin imagery from five miles standoff, horizon-to-horizon.
• The reconnaissance management system provides control of the sensors, recorders, and data link.
• Manages the flow of data from—
  • The sensors to digital recorders for a total image recording time of 92 minutes.
  • The data link to the ground station or to the cockpit for review by the aircrew.
• Can be preprogrammed to automatically collect imagery of 12 point, area, or strip targets, in addition to 20 targets of opportunity manually selected by the aircrew.

Dual-Band 110 (DB-110)

DB-110 is a DB (visible/IR) airborne imaging sensor designed for surveillance and reconnaissance operations in manned tactical jets, business jets, and UAVs. DB-110—
• Provides high-resolution, broad-area coverage "still" images in the visible and IR spectrums.
• Uses three optical fields of view: long-range, medium-range oblique, and vertical imaging at low altitude.
• Has primary image products in STANAG 7023 and NITF 2.1. Imagery-derived products can be generated from the displayed and annotated imagery in formats, including JPEG, NITF 2.1, and NSIF 1.0 (STANAG 4545).
• Current applications are with the RAF Tornado (designated as the RAPTOR) in the mid-East theater of operations where imagery collected by the RAF is delivered to the United Kingdom, United States, and multinational international security assistance forces. RAPTOR—
  • Applications include standard tactical reconnaissance with particular emphasis on stereo (3-dimensional) imaging to support analysis of possible ground disturbance (buried IED) and mission rehearsal.
  • Standard products support detailed target analysis; activity, force protection, and security reports; route reconnaissance; and battle damage, preoperational, and postoperational assessments.
  • System can data link imagery from the aircraft to a United Kingdom ground station with data transfer into DCGS.

OH-58D/AH-64D
The OH-58D and AH-64D systems can be used to conduct tactical reconnaissance by providing recordable data from IR and daytime video cameras, as well as data recording and relaying to ground forces via voice and digital means. Their stand-off capabilities allow them to remain outside of threat engagement ranges, as required, to minimize exposure to threat air defense.

CIG	common imaging ground	**RAPTOR**	Reconnaissance Airborne Pod Tornado
DCGS	Distributed Common Ground System	**RAF**	Royal Air Force
IED	improvised explosive device	**SAR**	synthetic aperture radar
IMINT	imagery intelligence	**SS**	surface station
IR	infrared	**STANAG**	standardization agreement
JPEG	Joint Photographic Experts Group	**TEG**	tactical exploitation group
NATO	North Atlantic Treaty Organization	**UAV**	unmanned aerial vehicle
NITF	national imagery transmission format	**USAF**	U.S. Air Force
NSIF	NATO secondary imagery format	**USMC**	U.S. Marine Corps

Unmanned Aircraft Systems

2-29. Unmanned aircraft system (UAS) platforms perform some or all of the following functions:

- ISR.
- Enhanced targeting through acquisition, detection, designation, suppression, and destruction of threat targets.
- Support to battle damage assessment and effects assessment.

2-30. UAS missions support the maneuver commander by contributing to effective tactical operations of smaller units. Ground control stations with the following enhance situational awareness and the COP:

- Common data links.
- Remote video terminals and remote operations video enhanced receiver (ROVER).
- One system remote video transceiver (OSRVT).
- Portable ground control stations.
- Army helicopter/Army aircraft command and control system (A2C2S)/UAS teaming.

2-31. UAS operations support commanders and their staffs as they conduct operations. UASs increase the commander's situational awareness through ISR and, in the case of armed UASs, provide commanders direct fire capabilities to prosecute the close fight and influence shaping of the AO.

2-32. Additional system-unique characteristics are—

- Expendability.
- Day and night imagery and operations.
- Low-noise signature.
- Portability (rucksack portable).
- Interchangeable payloads and components.
- Mobile-launch capability.
- Sensors:
  - Electro-optical.
  - IR.
  - SAR.
  - SAR ground moving target indicator (GMTI).

2-33. UASs vary greatly in characteristics and capabilities and fit into three main classes: rucksack-portable, tactical, and theater.

2-34. DOD has an alphanumeric designation for UASs. The letter designation includes the following:

- **C—cargo** designation.
- **R—reconnaissance** designation.
- **M—multirole** designation.
- **Q—UAS** designation.

2-35. UASs include but are not limited to the following platforms in echelon order:

- **RQ-11B Raven**, battalion. (See figure 2-9, page 2-16.)
- **RQ-7B Shadow**, brigade. (See figure 2-10, page 2-17.)
- **MQ-1C Gray Eagle**, division. (See figure 2-11, page 2-18.)
- **MQ-5B Hunter**, corps or higher. (See figure 2-12, 2-19.)
- **Warrior Alpha**, corps or higher. (See figure 2-13, page 2-20.)
- **MQ-9 Reaper**, corps or higher. (See figure 2-14, page 2-21.)
- **RQ-4A Global Hawk**, corps or higher. (See figure 2-15, page 2-22.)

SYSTEM SUMMARY

Descriptions—
- The RQ-11 Raven is a remote-controlled, hand-launched, UAS used by the U.S. military and its multinational partners. The UAS requires a two-person team for launch, recovery, and general operation.
- Raven can be remotely controlled from the ground station or fly a predetermined flight path based on established way-points, without GCS connectivity. A single-button command orders the UAV to immediately return to its launch point for rapid recovery. Standard-mission payloads include charged-coupled device color video and an IR night vision camera.

Characteristics—
- Wing span—4.5 feet
- Air vehicle weight—3.8 pounds (12 pounds with carrying case)
- Range—5-10 kilometers (line of sight)
- Endurance—approximately 90 minutes
- Primary payload—visible or IR

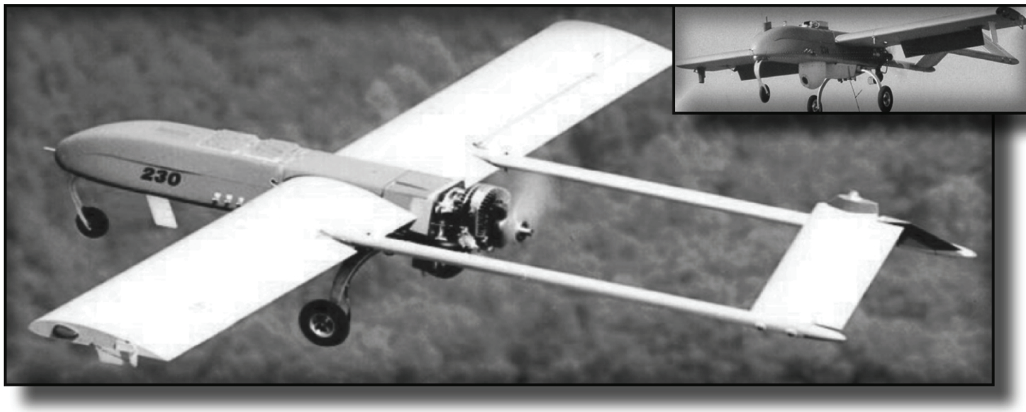
System capabilities—
- Hand-launched
- Auto-land recovery
- Military P(y)-Code GPS
- Auto navigation
- Quick assembly (less than 3 minutes)
- Man-portable/rucksack-portable
- Quiet (electric motor)
- Reusable (100+ flights)
- Digital data link

Configuration and use—
There are five systems per battalion. Each system consists of three air vehicles and one GCS.

Mission—
- The mission of the RQ-11 Raven team is to provide reconnaissance and surveillance and remote-monitoring day and night imagery to support situational awareness, target acquisition, and BDA at the company level.
- The Raven UAS deploys to conduct reconnaissance and surveillance missions and convoy security to protect friendly forces and provide information on threat location, disposition, activity, or support indirect fires.
- Raven can also perform real-time BDA.

BDA	battle damage assessment	**IR**	infrared
GCS	global control station	**UAS**	unmanned aircraft system
GPS	Global Positioning System	**UAV**	unmanned aerial vehicle

Figure 2-9. RQ-11B Raven UAS



SYSTEM SUMMARY

Descriptions—

The RQ-7 can be equipped with a GPS-based navigation system for fully autonomous operations. The primary mission payload is the POP visible/IR. The Shadow's visible/IR payload is capable of producing color video during daylight operations and black and white thermal images at night. This system can spot ambush sites or insurgents planting IEDs. Other payloads under consideration include the SAR/MTI and one with a laser rangefinder and laser designator.

Characteristics—

- Wing span—14 feet
- GTOW—380 pounds
- Range—approximately 125 kilometers
- Airspeed—60 knots (loiter)—105 knots (dash)
- Altitude—greater than 14,000 feet (MSL)
- Endurance—greater than 5 hours at 50-70 kilometers
- Primary payload—visible/IR (up to 60 pounds)

System capabilities—

- Focused operations in the brigade AO
- Interoperable with network operations ISR systems
- Covers the "dead space" by extending the ground reconnaissance capability
- Provides increased situational awareness
- POP 300 with laser pointer capability

Configuration and use—

There is one Shadow platoon per brigade comprising—

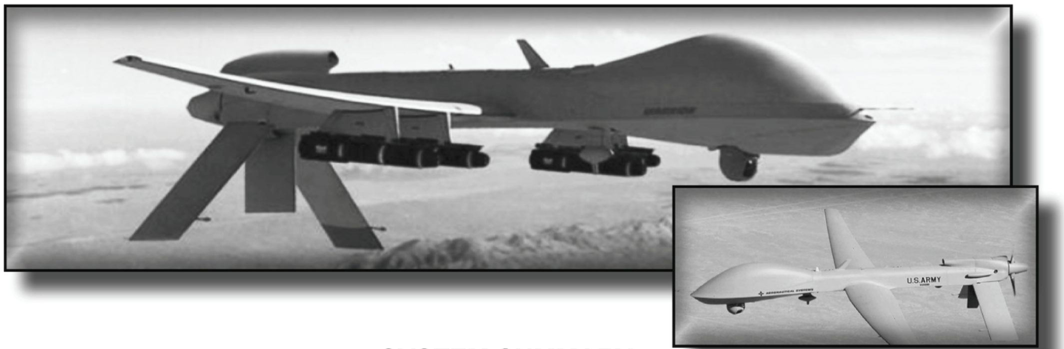
- Two warrant officers and 20 enlisted
- Four air vehicles
- Two one-system GCSs
- Two ground data terminals
- One portable GCS
- One portable ground data terminal

Mission—

The mission of the RQ-7 Shadow aerial reconnaissance platoon is to provide a real-time, responsive day and night imagery surveillance and reconnaissance capability to support situational awareness, target acquisition, and BDA to brigade and below units.

AO	area of operations	**IR**	infrared
BDA	battle damage assessment	**ISR**	intelligence, surveillance, and reconnaissance
GCS	global control station	**MSL**	mean sea level
GPS	Global Positioning System	**MTI**	moving target indicator
GTOW	gross take off weight	**POP**	plug-in optronic payload
IED	improvised explosive device	**SAR**	synthetic aperture radar

Figure 2-10. RQ-7B Shadow UAS



SYSTEM SUMMARY

Descriptions—

- The General Atomics MQ-1C Gray Eagle is an extended range multipurpose UAS. It is an upgrade of the MQ-1 Predator.
- A MALE UAS, the Gray Eagle has an increased wingspan and is powered by a Thielert "Centurion" HFE, which gives it better performance at high altitudes (it is essentially a piston/diesel engine that burns jet fuel). It is capable of operating for 36 hours at altitudes up to 25,000 feet (7,600 meters) with an operating range of 200 nautical miles (400 kilometers).
- The aircraft's nose fairing has been enlarged to house a SAR/GMTI system, and targeting is also provided with a AN/AAS-52 MTS under the nose. The aircraft can carry a payload of 800 pounds and can be armed with AGM-114 Helifire missiles and GBU-44/B Viper Strike guided bombs.

Characteristics—

- Wing span—56 feet
- Length—29 feet
- GTOW—3,000 pounds
- Cruise speed—90 knots
- Maximum speed—130 knots
- Range mission mode—125 kilometers
- Range with relay—300 to 1200 kilometers
- Take-off distance/landing—2400 feet
- Service ceiling—25,000 feet
- Endurance—24-30 hours
- Hardpoints—4 at 108 pounds

System capabilities—

- NRT information/dynamic retasking
- Immediately responsive ISR/RSTA
- Persistent surveillance
- Target acquisition, designation, attack, and BDA
- Reinforce BCT capabilities
- Manned-unmanned teaming
- Two sensor payloads, communications relay, weapons (key performance parameter)
- Tactical common data link, air data relay, and SATCOM
- System target location accuracy of 10 meters
- HFE

Configuration and use—

Basis of issue—one system per combat aviation brigade at division:

- Twelve multirole AV (6 with SATCOM)
- Payloads—visible/IR/LD, SAR/GMTI, TSP, warfighter information-tactical communications payload, and Hellfire munitions
- Five GCSs
- Two portable GCSs
- Five TCDL ground data terminals
- Two TCDL portable ground data terminals
- One ground SATCOM system
- Four automatic take-off and landing systems
- Ground support equipment

BCT	brigade combat team
BDA	battle damage assessment
GCS	ground control system
GMTI	ground moving target indicator
GTOW	gross take off weight
HFE	heavy fuel engine
IR	infrared
ISR	intelligence, surveillance, and reconnaissance
LD	laser designator
MALE	medium altitude long endurance
MTS	multispectral targeting system
NRT	near real-time
RSTA	reconnaissance surveillance and target acquisition
SAR	synthetic aperture radar
SATCOM	satellite communications
SIGINT	signals intelligence
UAS	unmanned aircraft system
TCDL	tactical common data link
TSP	tactical SIGINT payload

Figure 2-11. MQ-1C Gray Eagle UAS

SYSTEM SUMMARY

Descriptions—
RQ-5 Hunter has a demonstrated ability to fly in excess of 600 flight hours in a 30-day period, providing imagery and NRT data. Hunters can operate in relay with two aircraft simultaneously for each mission, allowing for a range of 200 kilometers. An ECW provides longer endurance and slightly higher (up to 16,000 feet [487.68 meters]) altitude tactical mission.

Characteristics—
- Wing span—34.25 feet
- GTOW— 1,950 pounds
- Range with relay—approximately 200 kilometers
- Airspeed—60-80 knots (loiter); 120 knots (dash)
- Altitude—20,000 feet MSL
- Endurance—20+ hours
- Primary payload—MOSP 770 visible/IR
- Launch/Recovery—1,600 feet (unimproved surface)

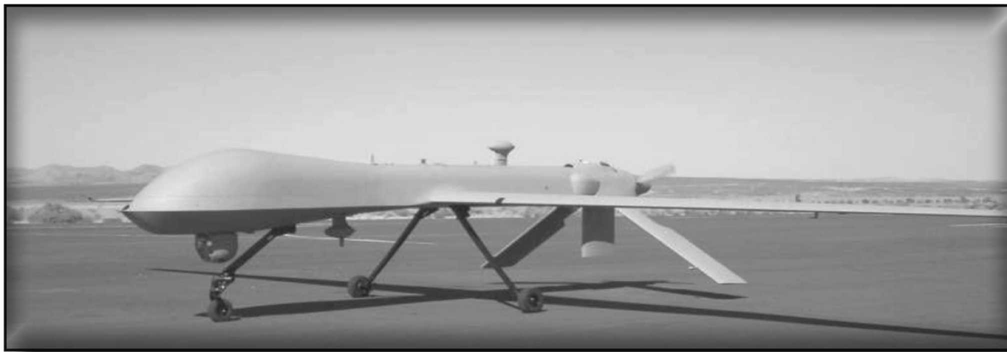
System capabilities—
- Versatile payload platform
- Multiple mission configurations (CRP)
- GBU-44/B Viper Strike laser/GPS guided munitions, for target acquisition, designation, and attack
- Greendart SIGINT payload
- POP 300 with laser pointer capability

Configuration and use—
Corps and above—
- Personnel— 4 officers/2 WO/40 enlisted
- Air vehicles—5
- GCSs—3
- Ground data terminals—2
- Launch/Recovery terminals—1

Mission—
The RQ-5 Hunter provides real-time, responsive day and night ISR capability to support situational awareness, target acquisition, and BDA.

BDA	battle damage assessment	**ISR**	intelligence, surveillance, and reconnaissance
CRP	common relay payload	**MOSP**	multimission optronic stabilized payload
ECW	extended center wing	**MSL**	mean sea level
GCS	ground control station	**NRT**	near real-time
GPS	Global Positioning System	**POP**	plug-in optronic payload
GTOW	gross take off weight	**SIGINT**	signals intelligence
IR	infrared	**WO**	warrant officer

Figure 2-12. MQ-5B Hunter UAS



SYSTEM SUMMARY

Descriptions—
The General Atomics MQ-1C Warrior is an extended range multipurpose UAS. It is an upgrade of the MQ-1 Predator.

Characteristics—
- Wing span—56 feet
- GTOW—3200 pounds
- Range with relay—2000 kilometers BLOS
- Airspeed—135 knots
- Altitude—29,000 feet
- Endurance—36 hours
- Primary payload—SAR/GMTI

System capabilities—
- Versatile payload platform
- Multiple mission configurations (CRP)
- GBU-44/B Viper Strike laser/GPS guided munitions, for target acquisition, designation, and attack
- Greendart SIGINT payload
- POP 300 with laser pointer capability

Configuration and use—
Corps and above—
- Personnel—4 officers/2 WO/40 enlisted
- Air vehicles—2
- GCSs—1

Mission—
The Warrior Alpha provides NRT FMV and persistent reconnaissance, surveillance, and target acquisition for target designation, attack, and BDA. SATCOM enable BLOS collections.

BDA	battle damage assessment	**NRT**	near real-time
BLOS	beyond line-of-sight	**POP**	plug-in optronic payload
CRP	common relay payload	**SATCOM**	satellite communications
FMV	full motion video	**SAR**	synthetic aperture radar
GCS	ground control station	**SIGINT**	signals intelligence
GMTI	ground moving target indicator	**UAS**	unmanned aircraft system
GPS	Global Positioning System	**WO**	warrant officer
GTOW	gross take off weight		

Figure 2-13. Warrior Alpha UAS

SYSTEM SUMMARY

Descriptions—
The USAF MQ-9 Reaper system provides a response to the DOD request for overseas contingency operations initiative. It is designed to go after time-sensitive targets with persistence and precision, and destroy or disable those targets.

Characteristics—
- Wing span—66 feet
- GTOW—10,500 pounds
- Range with relay—3200 nautical miles
- Airspeed—20 knots
- Altitude—50,000 feet MSL
- Primary payload—IR, TV, and SAR
- Launch/Recovery—common ground segment launch and recovery element

System capabilities—
- IR video sensor
- Color/Monochrome daylight TV
- Image-intensifieid TV
- SAR
- Laser-guided munitions

Configuration and use—
- Personnel—2 pilots and sensor operators
- Air vehicles—several
- GCSs—1
- Launch/Recovery terminals—1

Mission—
The MQ-9 Reaper is a medium-to-high altitude, long endurance UAS. The MQ-9's primary mission is as an offensive weapons platform. The MQ-9's alternative mission is to act as an ISR asset, employing sensors to provide real-time data to commanders and intelligence specialist at all levels.

DOD	Department of Defense	**SAR**	synthetic aperture radar
GCS	ground control station	**TV**	television
IR	infrared	**UAS**	unmanned aircraft system
ISR	intelligence, surveillance, and reconnaissance	**USAF**	U.S. Air Force
GTOW	gross take off weight		

Figure 2-14. MQ-9 Reaper UAS

SYSTEM SUMMARY

Descriptions—
RQ-4A Global Hawk is a high-altitude, long-endurance unmanned serial reconnaissance system that provides military field commanders with high-resolution, NRT imagery of large geographic areas.

Characteristics—
Wing span—116 feet
GTOW—26,750 pounds
Range with relay—9500 nautical miles
Airspeed—340 knots
Altitude—60,000 feet MSL
Endurance—42+ hours
Primary payload—visible/IR
Launch/Recovery—common ground segment
Launch and recovery element

System capabilities—
- Visible/IR
- SAR—spotlight, scan, GMTI

Configuration and use—
- Personnel—4 officers/2 WO/40 enlisted
- GCSs—MCE 1
- Launch/Recovery terminals—1

Mission—
The Global Hawk is a high-altitude endurance UAV that provides ISR to support joint forces worldwide. Global Hawk provides NRT coverage using various IMINT sensors, to include SAR, EO and MWIR, and SIGINT sensors worldwide.

EO	electro-optical	**MSL**	mean sea level
GCS	ground control system	**MWIR**	medium-wave infrared
GMTI	ground moving target indicator	**NRT**	near real-time
GTOW	gross take off weight	**SAR**	synthetic aperture radar
IMINT	imagery intelligence	**SIGINT**	signals intelligence
IR	infrared	**UAV**	unmanned aerial vehicle
ISR	intelligence, surveillance, and reconnaissance	**WO**	warrant officer
MCE	mission and control element		

Figure 2-15. Global Hawk UAS

HANDHELD IMAGERY

2-36. Handheld imagery is a source of imagery collection consisting of digital images (photographs or video tape) obtained through individual sources, for example, ground reconnaissance or open-source intelligence medium.

> ***Note.*** For the purpose of this manual, handheld imagery does not include handheld or clandestine photography taken by or on behalf of HUMINT collection organizations.

Ground Reconnaissance

2-37. Digital images of physical areas taken by ground forces can be used to provide additional details of the terrain for general planning, ISR operations, and targeting. These images should be included in a unit's imagery product library.

Open-Source Intelligence

2-38. Digital images taken by news organizations, civil government, and other groups that post or store images on the Internet can provide additional details supporting the development of GEOINT products.

IMAGERY RESOLUTION

2-39. Imagery is collected by aircraft- and satellite-based platforms. Some aircraft and ground-based sensors can be configured to carry a variety of sensor packages. Each sensor has unique technical capabilities that allow it to image geographic areas and resolve physical characteristics of objects and scenes.

2-40. *Resolution* is a measurement of the smallest detail that can be distinguished by a sensor system under specific conditions (JP 1-02). It is expressed in units of meters, submeters, feet, or inches depending on the system and collection in question. The specific resolution of an image is set by unique collection parameters for that image.

> ***Note.*** The intelligence community tracks resolution in feet and inches while the Army converts it to meters for reporting consistency.

2-41. Electro-optical systems collect imagery to satisfy a specified ground sample distance, which refers to the specific measurement between two objects required for a sensor to distinguish two independent objects. Ground sample distance measurements are limited to visible and IR collection systems.

2-42. Radar collections use the term *impulse response* to express similar measurements. While platform positioning is critical to determine ground sample distance, it is irrelevant for radar. Radar impulse response is determined by the energy transmitted and the strength of the returns.

2-43. The intelligence community typically uses the National Imagery Interpretability Rating Scale (NIIRS) to quantify the quality or usefulness of imagery. NIIRS provides a common framework for discussing the information potential of imagery and is a standardized measure of image interpretability. Commercial satellite imagery also uses NIIRS.

2-44. Through a process referred to as *rating* an image, NIIRS is used to assign a numeric value (0-9) that indicates the assessed interpretability of that image. The NIIRS concept provides a means to directly relate the quality of an image to the interpretation tasks for which it may be used.

2-45. Further information concerning NIIRS is available—

- At http://www.fas.org/irp/imint/niirs_c/guide.htm for at—
  - Visible (NIIRS-V).
  - IR (NIIRS-I).

  - Radar (NIIRS-R).
  - Spectral (NIIRS-S).
- At http://www.fas.org/irp/imint/niirs_c/guide.htm for civil (NIIRS-C).
- At http://www.gwg.nga.mil/misb/rppubs.html for video (V-NIIRS).

2-46. Resolution may also be referred to as—

- **Spatial resolution—**is expressed in terms of ground sample distance for electro-optical, and in terms of impulse response (as feet and inches) for radar.
- **Radiometric resolution—**describes how precisely a system can represent or distinguish differences of intensity; it is usually expressed as a number of bits or a number of levels, for example, 8 bits or 256 levels, which is typical of computer image files. The higher the radiometric resolution, the better the subtle differences of intensity or reflectivity, at least in theory. In practice, the effective radiometric resolution is typically limited by noise level, rather than by the number of bits of representation.
- **Temporal resolution—**is the frequency at which images are recorded. Temporal resolution for motion imagery is expressed in frames per second.
- **Spectral resolution—**describes the ability of a sensor to define finite wavelength differences. The finer the spectral resolution, the narrower the range of the wavelength for a particular channel or band.
- **Radiometric resolution—**determines how finely a system can represent or distinguish differences of intensity, and is usually expressed as a number of bits or a number of levels, for example, 8 bits or 256 levels, which is typical of computer image files.

IMAGERY TYPES

2-47. There are two types of imagery:

- **Still imagery** is an individual image of an object or location.
- **Motion imagery** consists of a series of images collected in sequence at varying frames per second.

STILL IMAGERY

2-48. Still imagery uses a variety of media to capture different levels and categories of information about a specific object or location. Still imagery may be collected in one or more of the following media formats:

- Panchromatic (visible).
- IR.
- Radar.
- AGI, including spectral imagery (multispectral, hyperspectral, and ultra-spectral).

Panchromatic Imagery

2-49. A panchromatic or visible image is acquired with a sensor that is sensitive to all or most of the visible spectrum. Panchromatic imagery is black and white, displayed as a grey scale image, and generally has a higher resolution than IR or spectral imagery. Panchromatic imagery has been the mainstay of IMINT for years and continues to be an important source of IMINT data.

2-50. Imagery can be merged with other imagery data sources. One way is to merge panchromatic imagery with multispectral imagery, commonly referred to as pan-sharpening. *Pan-sharpening* is a process that fuses the color information from spectral imagery with the higher resolution of panchromatic imagery. Normally the lower resolution bands (red, green, and blue bands) are fused with the panchromatic imagery, producing a higher resolution (natural or true color) image. This process is also used to create a higher resolution color IR image.

2-51. Controlled image base (CIB) and BuckEye are two examples of panchromatic imagery.

Controlled Image Base

2-52. CIB is a standard NGA digital imagery product produced to support mission planning and command, control, communications, and intelligence systems. Other CIB uses include support to weapons systems, regional overviews, and mapping where maps are nonexistent or outdated. CIB is panchromatic digital imagery (see figure 2-16). It is a seamless, ortho-rectified image dataset from either stereo or mono NTM or other adequate commercial source imagery.

2-53. Currently, CIB production is at one- and five-meter ground sample spacing, but legacy commercial imagery remains available for areas that might not be covered by CIB. CIB is raster product format and national imagery transmission format standard compliant. CIB uses World Geodetic System 1984 (WGS 84) datum and is distributed via classified NGA networks and via the Army supply system from the Defense Logistics Agency on compact disk (CD)/digital video disk (DVD). CIB 5 is available for wider areas of coverage and provides a level of detail approximately equivalent to a 1:50,000 scale map.

Figure 2-16. Controlled image base imagery

BuckEye

2-54. BuckEye was developed to satisfy a requirement for a field-expedient change detection system to spot improvised explosive devices. Initial rotary-wing deployments to Iraq and Afghanistan collected color imagery along transportation routes. BuckEye then evolved to an integrated electro-optical, digital camera/light detection and ranging (LIDAR) system flown on fixed-wing aircraft. BuckEye imagery is true-color, three-band imagery collected at resolutions around 10 centimeters. The individual image frames are ortho-rectified using the LIDAR digital elevation model and mosaiced to form color imagery with absolute accuracies under five meters. It gives Soldiers information through high-resolution color imagery, GEOINT, elevation data, ISR, and detailed maps of urban areas of interest.

Infrared Imagery

2-55. IR imaging is used extensively for military and civilian purposes. Military applications include target acquisition, surveillance, night vision, homing, and tracking.

2-56. Thermal imagery, including IR and OPIR, enables analysts to detect and identify activity based on thermal and emissivity (radiance) signatures. IR imagery, not including the IR bands of spectral imagery, is displayed as a gray scale image in which the different shades of gray represent the differences in temperatures and emissivity of the objects in the image.

2-57. MWIR and LWIR are commonly used IR imagery subdivisions:

- **MWIR** is best for most IR imagery and provides the greatest IR reflective and emissive data with the highest spatial resolution for thermal imagery.

- **LWIR** is the *thermal imaging* region in which sensors can obtain a completely passive picture of the outside world based on thermal emissions only, requiring no external light or thermal source, such as the Sun, Moon, or IR illuminator.

2-58. Some applications for IR imagery include—

- Characterizing foliage.
- Detecting camouflage.
- Assessing crop health.
- Determining the land-water boundary.
- Analyzing coastal hydrography.

Radar Imagery

2-59. Radar imagery enables detection and identification of activity based on reflected radar energy. Due to the active nature of the sensor, radar imagery can illuminate objects day or night and in every weather condition. Processed radar data is depicted in a map-like format on the image. These characteristics enable unprocessed or complex radar data to be used to collect and automatically detect motion within a single radar image and to automatically detect change between two radar images. This ability promotes a radar's primary mission of change detection.

2-60. SAR systems propagate and collect radar energy the same as a real aperture system. However, SAR systems record the returned energy to create a history of frequency shifts, known as a *phase history*, that are reprocessed to create an image with consistent resolution, whether close to the sensor or farther away. The tactical commander now has access to all-weather, day-night, and consistent resolution imagery to compliment visible and IR sensor capabilities.

2-61. MTI is a radar capability that displays objects displaced from their actual location based on the speed and direction of movement. MTI imagery can determine the direction and speed of objects, thereby giving the commander better situational awareness of the AO.

Advanced Geospatial Intelligence

2-62. *Advanced geospatial intelligence*, also known as imagery-derived measurement and signature intelligence, is technical, geospatial, and intelligence information derived through interpretation or analysis using advanced processing of all data collected by imagery or imagery-related collection systems (JP 2-03).

2-63. AGI comprises the techniques used by geospatial engineers, imagery analysts, and imagery scientists to process an image to look beyond the visual information depicted in the image. This process includes all types of information technically derived from the processing, exploitation, and nonliteral analysis (including integration or fusion) of spectral, spatial, temporal, radiometric, phase history, and polarimetric data. These types of data can be collected on stationary and moving targets by visible, IR, radar, and related sensor programs (both active and passive). AGI also includes ancillary data needed for data processing and exploitation and signature information (including development, validation, simulation, data archival, and dissemination).

2-64. *Spectral imagery* is collected by a series of sensors sensitive to specific wavelengths, usually grouped in bands. By adding or subtracting the different bands, color imagery may be generated. Spectral imagery is categorized into three groups that are distinguished mainly by the bandwidths and the number of bands of the various spectral bands:

- **Multispectral imagery** has a set of two to ten spectral bands with bandwidths or filters on the order of ten's of nanometers. One of the simplest examples of multispectral imagery would be a color video camera consisting of three-band.
- **Hyperspectral imagery** sensors, such as the aircraft visible/IR imaging spectrometer (AVIRIS) project, have around 200 or more narrow spectral bands.
- **Ultra-spectral imagery** possesses very fine spectral bandwidths of 1000 or more.

2-65. Spectral imagery collects multiple spectral bands across the electromagnetic spectrum to sense reflective and emissive values of matter within a scene. The higher the resolution of the spectral band, the more capable the sensor is to identify specific objects, such as rock or soil types, camouflage net manufacturers, and vegetation. This capability and the creation of reflectance value (signature) libraries provide additional signatures that allow imagery analysts to identify a wider range of activities, such as distinguishing between real aircraft and decoys, characterizing substances of various types of emissions, and detecting vehicles based on their unique signatures.

MOTION IMAGERY

2-66. A *motion imagery system*, as defined by the Motion Imagery Standards Board, is any imaging system that collects at a rate of one frame per second (one hertz) or faster, over a common field of regard. This explicitly includes but is not limited to electro-optical, IR, multispectral, and hyperspectral systems.

Note 1. Video teleconference, video telemedicine, and video support services applications do not fall within the purview of the Motion Imagery Standards Board and are not subject to its requirements.

Note 2. The Motion Imagery Standards Board makes no formal distinction between the terms motion imagery and FMV. However, motion imagery must contain metadata. Some entities call video with no metadata FMV. Historically, however, FMV has been that subset of motion imagery at television-like frame rates (24-60 hertz).

2-67. Motion imagery frame rates are normally expressed in frames per second and the frequency must be sufficient to show the desired motion. While FMV is the common term for motion imagery, it is normally considered to be FMV when it has a temporal or time resolution of 30 or more frames per second.

2-68. Motion imagery sensors may be visible, IR, or complex waveforms based on radar imaging. Collection of motion imagery, from a sensor mounted on aircraft platforms with long mission endurance, allows imagery analysts to monitor high-interest activities in the operational environment, to include tracking moving, fleeting, and emerging targets. Near real-time FMV also allows observation of rapidly developing events and is a valuable tool for ongoing operations.

2-69. Motion imagery provides commanders a valuable tool for ongoing operations and persistent surveillance. Motion imagery, as with still imagery, is collected in various portions of the electromagnetic spectrum.

SENSOR TYPES

2-70. Imagery sensors collect and display data as either a fixed target indicator or MTI. Each sensor and platform has a unique capability, with distinct advantages and disadvantages. The requirements manager must understand each sensor and platform capability in order to select sensors and platforms that best meet the requirements, thus enabling the analyst to answer intelligence requirements and the user to receive quality intelligence. Appendix C provides a matrix of sensor characteristics.

2-71. There are two types of imagery sensors—passive imagery sensors and active imagery sensors. All forms of image and nonimaging sensing occur through an interaction between some form of electromagnetic energy (natural or manmade) and the object being observed.

PASSIVE IMAGERY SENSORS

2-72. *Passive imagery* is the collection of reflected or emitted electromagnetic energy from objects in the imaged area. The sensor functions only in a receive mode and is therefore “silent.” Passive imagery sensor types include panchromatic (visible), IR, and spectral (multispectral, hyperspectral, and ultra-spectral) imagery. Passive imagery sensors use natural electromagnetic energy sources, such as the Sun, naturally occurring radiation, or objects that generate their own heat (the object is burning energy).

ACTIVE IMAGERY SENSORS

2-73. *Active imagery* includes a growing range of sensing capabilities that broadcast energy and process the returning energy in order to image a targeted area. Radar and LIDAR are the primary examples of this type of imagery.

2-74. Active imagery sensors generate the electromagnetic (manmade) energy needed to "illuminate" the object that is being imaged. Active imagery sensing capabilities include—

- High-resolution radar imagery.
- SAR.
- Interferometric synthetic aperture radar (IFSAR).
- MTI.
- LIDAR laser imaging systems, which serve as a powerful complement to standard spectral imagery.

Chapter 3
Imagery Intelligence

IMINT is one of three components of GEOINT, as defined in chapter 1. This chapter discusses the key role of IMINT:

- Requirements management.
- Echelons of IMINT production.
- Support to commanders.
- Other support.
- Imagery-related products.

ROLE

3-1. IMINT provides concrete, detailed, and precise image-based information on the location and physical characteristics of the threat and the environment. It is a source of information to discern key terrain features, installations, and infrastructure used to build intelligence studies, reports, and target folders.

3-2. IMINT assists commanders in applying and protecting their combat power. It supports the commander's decisionmaking by reducing uncertainty about the hostile situation and the surrounding environment, providing situational understanding of natural and manmade terrain features. IMINT allows the commander to see the AOs in near real-time, as the mission progresses. Additionally, IMINT facilitates the IPB process and development of IPB products.

IMAGERY REQUIREMENTS MANAGEMENT

3-3. Imagery requirements management ensures the effective and efficient employment of collection, processing, exploitation, and reporting resources to meet the commander's need for intelligence. It is the entire process—beginning with the translation of intelligence requirements into data collection, processing, exploitation, and reporting activities. To meet the requirements, the GEOINT cell collaborates with the collection management cell to ensure GEOINT requirements are tasked for collection or requests for imagery are submitted to higher headquarters.

Note. The imagery requirements management process is described in this chapter as it pertains to IMINT. Requirements management is not IMINT-specific; it pertains to all facets of GEOINT.

3-4. Requests for information (RFIs) are handled using organic assets or forwarded to higher or lateral levels that may or may not be an Army unit. This allows for more systems with slightly different capabilities.

3-5. The intelligence staff performs research within the intelligence database to determine whether the needed information is already available. Retrieval or transfer of the information may be restricted by requests that are more urgent. The intelligence staff should not bypass the database to save time in processing an urgent request, since the information may have already been requested. Tasking duplication wastes assets. The needed information may be available at a higher echelon and can be obtained by submitting an RFI.

3-6. If the information is unavailable, the staff—

- Validates the collection requirement.
- Assigns a collection priority. (Prioritization ensures analysts get the most important data first.)
- Checks current collection taskings to ensure organic assets have not already gathered the needed information.
- Assigns the intelligence requirement to organic collection assets, which—
  - Ensure a timely response to the request.
  - Allow for issuance of clear tasking instructions.
  - Lighten the burden on higher echelon assets.

3-7. If existing data or organic assets cannot satisfy a valid intelligence requirement, the intelligence staff generates a collection requirement or request for data support. This can take advantage of the increased capabilities at higher echelons. Requests should be as specific as possible to allow higher echelons to task suitable resources against the requirement. Although unique situations and requirements may necessitate specific assets or platforms (because the product or information requirement only defines the need), particular platforms or sensors are NOT specified by the request.

3-8. Although the joint architecture provides infrastructure for intelligence support, it is not solely hierarchical. Formal command and control relationships exist to facilitate RFI management and optimize complementary intelligence functions. They are configured by echelon but do not obstruct the timely flow of critical intelligence up, down, or laterally. National agencies maintain systems and organizations that respond directly and provide intelligence to any echelon for time-sensitive reporting. The format flow for intelligence up and down echelons is through the National Military Joint Intelligence Center.

3-9. Imagery personnel within the Army G-2 staff's requirement and intelligence support branches—

- Assist in the management of theater-strategic intelligence activities.
- Track RFIs.
- Maintain situational awareness for the theater of operations.
- Exploit near real-time imagery.
- Produce IMINT products to support Army planners, decisionmakers, and the supported JFC's joint operations area.

IMAGERY TASKING

3-10. *Imagery tasking* is the process by which an imaging requirement is validated, prioritized, and submitted for collection.

3-11. Requirements managers first determine whether the imagery requirement can be met by using existing data or products. If new collection is needed, a formatted requirement is generated and submitted to an intelligence collection manager for further processing. Imagery requirements processing falls under one of three tasking options:

- National-level tasking.
- Commercial tasking.
- Aircraft tasking.

NATIONAL-LEVEL TASKING

3-12. Requirements may be submitted for national-level tasking through the Geospatial Information Management System (GIMS) (formerly the Requirements Management System). This system is the only requirements management system used for tasking NTM.

3-13. Validated imagery requirements for NTM are processed through a departmental requirements officer to de-conflict and prioritize requirement requests from other combatant commands, Services, and national agencies. The officer then coordinates with NGA to determine the requirements prioritization and collection method.

3-14. Combatant commands use local collection or requirements managers to consolidate, prioritize, and coordinate imagery requirements before going through a departmental requirements officer or responsible agency for NGA-licensed commercial imagery.

COMMERCIAL TASKING

3-15. GIMS is also the tasking system for commercial systems. GIMS provides an integrated geospatial view of NGA production operations and source holdings with the ability to manage the acquisition and use of national and commercial imagery.

3-16. Commercial tasking requirements are approved through a path similar to national-level tasking. NGA, the functional manager for GEOINT, validates and authorizes new commercial imagery collection.

AIRCRAFT TASKING

3-17. The tasking system used for aircraft assets is called the Planning Tool for Resource, Integration, Synchronization, and Management (PRISM). PRISM is the core mission-planning tool for collection management mission applications. It is a Web-based application that provides users, at the theater level and below, the ability to integrate imagery assets with theater collection requirements. PRISM is also the tasking system for DOD ISR satellites, such as the Operational Responsive Space-1 (ORS-1).

3-18. Aircraft collection requirements are approved by the collection management authority. The collection management authority—

- Establishes, prioritizes, and validates theater collection requirements.
- Establishes sensor tasking guidance.
- Develops theater collection plans.

3-19. Although the collection management authority normally resides at the combatant command, it can be delegated to a subordinate task force as required.

> ***Note.*** While PRISM is a primary requirements management tool, it is not the only means of aircraft tasking. Other avenues may be as simple as word-of-mouth, chat, or standard message traffic.

IMAGERY INTELLIGENCE PRODUCTION

3-20. IMINT production and products are typically separated into four levels:

- National strategic level.
- Theater strategic level.
- Operational level.
- Tactical level.

NATIONAL STRATEGIC LEVEL

3-21. National strategic-level IMINT supports the President, Congress, Secretary of Defense, and senior military commanders. These IMINT products are used to—

- Develop national strategies and policy.
- Monitor international situations.
- Prepare strategic estimates and strategies to prepare military plans.
- Determine major weapons systems and force structure requirements.
- Conduct strategic operations.

THEATER STRATEGIC LEVEL

3-22. Theater strategic-level IMINT supports joint operations by identifying current threat capabilities that could affect national security and U.S. or multinational interests. Theater strategic-level IMINT includes determining *when*, *where*, and in *what* strength a potential threat will stage and conduct theater-level and strategic-unified operations.

OPERATIONAL LEVEL

3-23. Subordinate JFCs and their component commanders are the primary users of operational-level IMINT. Operational-level IMINT focuses on threat military capabilities and intentions and assists JFCs and component commanders in keeping abreast of events within their area of interest. IMINT assists commanders in determining *when*, *where*, and in *what* strength the threat might stage and conduct major operations. During counterinsurgency and counterterrorism operations, operational-level IMINT is increasingly concerned with stability operations and has a greater focus on political, economic, and social factors.

3-24. Operational-level IMINT—

- Addresses operational themes from peacetime military engagement to major combat operations.
- Facilitates the accomplishment of theater strategic objectives.
- Supports the planning and conduct of joint and subordinate operations.
- Focuses on providing commanders the information required to locate threat centers of gravity.
- Provides relevant, timely, and accurate intelligence and assessments.
- Includes monitoring terrorist incidents and natural or manmade disasters and catastrophes.

TACTICAL LEVEL

3-25. Tactical-level IMINT is used by commanders, planners, and operators for conducting full spectrum operations. Relevant, accurate, and timely tactical-level IMINT allows tactical units to achieve positional and informational advantage over their threats. Tactical-level IMINT critically focuses on providing products that support IPB—detecting the presence of threat (and natural) obstacles, determining their types and dimensions, and providing necessary information to plan appropriate bypass, combined arms breaching or clearance operations to negate the impact on the friendly scheme of maneuver.

3-26. Tactical-level IMINT assists in identifying and assessing capabilities and vulnerabilities, as well as describing the physical environment. It seeks to identify *when*, *where*, and in *what* strength the threat might conduct tactical operations. Tactical-level IMINT is used to develop target packages and plan operations.

IMAGERY INTELLIGENCE-RELATED REPORTS AND PRODUCTS

3-27. Regardless of the Nation's effective or sophisticated surveillance systems and organizations, or the analyst's expertise, if the imagery analyst cannot disseminate collected information in a usable form, its value is wasted. Imagery analysis reports and products provide the imagery analyst with a simple, uniform means of relaying intelligence information to the requesting agency. Each imagery analyst is required to prepare the following reports and products.

IMAGERY INTELLIGENCE REPORTS

3-28. Imagery analysts record and disseminate analysis results to the intelligence community via IMINT reports. Reports may be directly requested or used as a data-input vehicle for maintaining intelligence databases, such as the Imagery Exploitation Support System (IESS), the National Exploitation System, or the Modernized Integrated Database. Sample IMINT reports are listed in table 3-1.

Table 3-1. Sample imagery intelligence reports

Imagery interpretation report (IIR)
A Department of Defense (DOD) account of imagery-derived information pertaining to one or more specified targets, resulting from the exploitation of imagery from one or more collection systems and missions. United States Imagery System 2-11.1 (USIS 2-11.1).
IIR message
An electronically transmitted product with one or more DOD IIRs from the originator to specified databases (USIS 95).
Reconnaissance exploitation report

• The proforma used to report the results of a tactical air reconnaissance mission. Whenever possible the report should include the interpretation of sensor imagery.
• A DOD-reporting product that provides abbreviated visual imagery exploitation reporting mainly from tactical imagery collection tasked at the local command level.
• The format is installation- or event-oriented and may contain theater-unique data elements.
• It may be issued in response to five imagery collection mission types:
  • Tactical air reconnaissance (land).
  • Tactical air reconnaissance (maritime).
  • Armed reconnaissance (maritime).
  • DOD theater.
  • National airborne reconnaissance missions (USIS 95).

Inflight report
A report given by the aircrew while still in flight.
Preliminary exploitation phase interpretation report
Contains imagery-derived information from the first exploitation of satellite imagery and is accomplished within two hours of time-over-target.
Initial phase interpretation report
A national target report or a DOD IIR that contains imagery-derived information from first-phase (response to immediate requirements) exploitation of aircraft or satellite imagery (USIS 2-1.1).
Supplementary phase interpretation report
A national target report or a DOD IIR that contains imagery-derived information from second-phase (seven day turn-around on requirement) exploitation of overhead imagery. Formerly called a supplemental phase interpretation report (USIS 95).
Internet relay chat
• Typical first-phase reporting is handled through chat—live interactive text communications on the Internet. • The most commonly used chat application is multiuser Internet Relay Chat (mIRC) and the newest is Jabber. Both provide rapid response functionality, a significant benefit during a crisis. • The major deficiency of chat is its inability to provide a database-accessible breakdown of the message content. • Chat logs can be stored but community-wide access to unique values is limited manual transfer.
Advanced Geospatial Intelligence (AGI) and Measurement and Signature Intelligence Reporting and Dissemination Service (AMRDS)
AMRDS is one of the primary reporting databases used for AGI.

IMAGERY INTELLIGENCE PRODUCTS

3-29. IMINT products are concisely constructed visual packages of intelligence information that show how a requirement has been satisfied. While the base elements of IMINT products may be similar, the specific details are unique, addressing the requirement that drove its creation. Sample IMINT products are listed in table 3-2, page 3-6.

Table 3-2. Sample imagery intelligence products

Imagery derived product (IDP)
Literal (image-like) or graphic representations of an original image or information extracted from the image. • The purpose of IDPs are to— • Create value-added products that highlight specific types of information in the image. • Merge reconnaissance imagery with data from other sources. • Create imagery-based products or data that can be declassified. • IDPs— • Can be created using analog or digital techniques and stored in either a hardcopy or softcopy format. • From reconnaissance satellite imagery are marked and handled at the same classification as the original image unless they are created and used according to Central Imagery Office (CIO) (now the National Geospatial-Intelligence Agency [NGA]) policy guidance and previously approved for particular applications by the CIO (NGA) director. ***Note.*** For the purposes of CIO policy, intelligence reporting and "traditional" maps or charts are not considered IDPs United States Imagery System (USIS 95). • Made from unclassified commercial/civil imagery may be classified for operations security reasons. • Can be stored and catalogued for ready retrieval on Web sites and in product libraries and current databases.
Prints
A representation of a portion of frame of imagery that has been produced from a negative or by a softcopy workstation. Most prints are prepared on a target of interest on the image USIS 95.
Mosaics
An assembly of overlapping aerial photographs that have been matched to form a continuous photographic representation of a portion of the Earth's surface (also called aerial mosaic).
Video clips
Video clips are short clips of video.

IMAGERY INTELLIGENCE IN THE JOINT ENVIRONMENT

3-30. The modern operational environment demands the Army to be a team within—

- A joint team (for example, the Navy and USAF).
- A multinational team (for example, England and Saudi Arabia).
- An interagency team (for example, the CIA, NSA, and the NGA).

3-31. Under current conditions, no Service has the capability to win a war alone. Similarly, only in exceptional circumstances can one Service successfully address the demands of any modern military operation. This team concept involves every aspect of intelligence operations, including IMINT.

3-32. The joint intelligence architecture interconnects collectors, producers, and customers in an information network. It provides a dynamic and flexible structure for global access to information from all intelligence sources, at all echelons. All intelligence made available to the network from any source is stored and communicated as data—as a text file, graphic, imagery, or other formatted information. The data with associated metadata is stored on standards-compliant file servers that interface with the communications network.

3-33. The joint intelligence architecture facilitates support to the JFC and subordinate joint force components via the defense intelligence community and integrates any required support from nondefense agencies and nongovernmental organizations. The architecture is configured to provide baseline data needed to support joint operations and establishes a common means to provide theater and tactical commanders a full range of intelligence, as required for operations. In joint operations—

- The intelligence directorate of a joint staff (J-2) establishes collection requirements to meet operational objectives.
- The operations directorate of a joint staff (J-3) selects, assigns, and employs collection assets to fulfill requirements.
- The intelligence staff has a number of methods to satisfy combat information or intelligence requirements. The staff follows basic principles in a series of sequential actions to answer information needs.

Chapter 4

Geospatial Information

Geospatial information is one of three components of GEOINT, as defined in chapter 1. Geospatial information provides the necessary foundational data to satisfy the commander's and staff's need to see and comprehend the operational environment. This chapter focuses on—

- Geospatial engineering support to operations.
- Integrating geospatial support.
- Geospatial data management.
- Data sources.
- Terrain-related products.

GEOSPATIAL INFORMATION AND SERVICES

4-1. JP 2-03 refers to *geospatial information and services* as the collection, information extraction, storage, dissemination, and exploitation of geodetic, geomagnetic, imagery (both commercial and national source), gravimetric, aeronautical, topographic, hydrographic, littoral, cultural, and toponymic data accurately referenced to a precise location on the Earth's surface. Geospatial services include tools that enable users to access and manipulate data, and also include instruction, training, laboratory support, and guidance for the use of geospatial data.

4-2. Tactically, within the Army, GI&S is the responsibility of geospatial engineers in their mission to—

- Better understand the physical environment.
- Provide a geospatial foundation for situational awareness and the COP.
- Improve understanding of capabilities and limitations for friendly forces as well as the threat, and highlight other conditions of the operational environment.

GEOSPATIAL ENGINEERING

4-3. *Geospatial engineering* refers to those engineering capabilities and activities that contribute to a clear understanding of the physical environment by providing geospatial information and services to commanders and staffs. Examples include terrain analyses, terrain visualization, digitized terrain products, nonstandard tailored map products, precision survey, geospatial data management, baseline survey data, and force beddown analysis (JP 3-34).

4-4. Geospatial engineers also exploit geospatial information and produce spatially accurate products for measurement, mapping, visualization, modeling, and all types of analysis of the terrain. To better understand the physical environment, geospatial engineers perform four major functions—generate, analyze, manage, and disseminate—that are driven by or based on requirements (for more information on geospatial engineer functions and activities, see ATTP 3-34.80):

- **Generate**, acquire, extract, and fuse timely, relevant, and accurate multiresolution geospatial and weather information to provide the appropriate data sets to the ABCS.
- **Analyze** data, aided by computer algorithms and terrain reasoning tools, to enable prediction and provide actionable information for decisionmaking.
- **Manage**, update, and maintain a standard and sharable geospatial foundation to facilitate the COP for the warfighter at all echelons.
- **Disseminate** geospatial data updates to and from ABCS to maintain the COP and distribute geospatial information to the appropriate level to facilitate operations.

Geospatial Information

4-5. *Geospatial information* identifies the geographic location and characteristics of natural or constructed features and boundaries on the Earth, including statistical data and information derived from, among other things, remote sensing, mapping, and surveying technologies; and mapping, charting, geodetic data related products (JP 2-03). Geospatial information is the foundation upon which all other information about the physical environment is referenced to form the COP.

4-6. Geospatial information is categorized as—

- **Geospatial data**, which enables the foundation of the COP, includes—
  - NGA feature or vector data derived primarily from the Geospatial Intelligence Feature Database (GIFD) and the Army's Theater Geospatial Database (TGD).
  - Scanned digital map displays, including compressed arc-second raster chart (ARC) digitized raster graphics, the future enhanced compressed raster graphic, and BuckEye imagery.
  - Elevation data, including digital terrain elevation data, LIDAR, and IFSAR.
  - Ortho-rectified imagery, including CIB, future enhanced compressed raster imagery (ECRI), commercial imagery, and NTM.
- **Terrain data** describes natural and manmade features—how they change over time, with use, and under varying weather conditions. Terrain and weather factors profoundly influence operations by directly affecting the physical environment and capabilities and performance of Soldiers, equipment, and weapons systems.

Terrain Visualization

4-7. Terrain visualization involves portraying and interpreting the terrain and understanding its impact on the situation. This impact affects friendly and threat capabilities. Geospatial engineers at every echelon are considered terrain-visualization experts; as such, they visually present terrain-related relevant information to commanders and staffs to help them conceptualize important aspects of the physical environment in order to support decisionmaking. Advanced technology provides geospatial engineers the capability to use and combine geospatial data to create interactive, dynamic, and customized visual products.

Support to GEOINT

4-8. Geospatial engineering support to GEOINT includes the standards, processes, Soldiers, and equipment to enable understanding of the physical environment. Geospatial engineers maintain an enterprise geospatial database where geospatial data is compiled from multiple sources, including the NGA, AGC, other Services, other federal agencies, and multinational partners. Geospatial data is also compiled by exploiting new collection and production from deployed Soldiers and sensors.

4-9. Geospatial engineering also provides geospatial information that is not intelligence-related:

- Safety of navigation products provided by the National Oceanic and Atmospheric Association (NOAA) to support—
  - The MDMP.
  - Installation maps.
  - GI&S related to master real estate planning and range management.
- Geospatial data for training, modeling, and simulations.

Support to Situational Understanding

4-10. Geospatial information that is timely, accurate, and relevant is a critical enabler throughout the operations process. Geospatial engineers, engineer coordinators, and other staff members—

- Assist in analyzing the meaning of activities.
- Significantly contribute to anticipating, estimating, and warning of possible future events.

- Provide the foundation for developing shared situational awareness.
- Improve understanding of capabilities and limitations for friendly forces as well as the threat, and highlight other conditions of the operational environment.

4-11. Geospatial engineers adjust their analysis as the commander's intent is refined and more information on potential missions is available.

INTEGRATING GEOSPATIAL SUPPORT

4-12. Successful integration of geospatial support focuses on providing the right information to the right person at the right time. Throughout the operations process (plan, prepare, execute, and assess), the four major functions of geospatial engineering (generate, manage, analyze, and disseminate) are performed (see table 5-2, page 5-3) continuously to—

- Describe the physical environment and the military significance of the terrain.
- Facilitate the staff's analysis of the operational environment.
- Support situational understanding.
- Enable decisionmaking.

PLAN

4-13. *Planning* begins with analysis and assessment of the conditions in the operational environment. Most of the geospatial engineering effort is integrated into the MDMP primarily through the IPB process. Geospatial information requirements are generated in the form of RFIs. Geospatial databases are established at the onset of planning and continuously updated and maintained through execution. Geospatial engineers maintain the map backgrounds used in the ABCS to minimize inconsistencies. Analysis of the mission variables enables geospatial engineers to describe the physical environment and to help the staff further its analysis of the operational environment. The resulting geospatial information is systematically disseminated through ABCS and tactical networks to enable staff planning and the development of running estimates. During the last step of the MDMP, geospatial information and terrain products are distributed to the staff to assist them in preparing their annexes and other attachments.

PREPARE

4-14. *Preparation* creates conditions that improve friendly forces' opportunities for success. Geospatial engineering supports preparation by generating terrain visualization products, such as 3D fly-throughs and *perspective* views from projected friendly unit positions, to allow commanders to create realistic scenarios and facilitate mission rehearsal. Geospatial engineers analyze newly acquired geospatial data and manage geospatial databases to support planning refinement by monitoring and integrating geospatial information through ISR collection, RFIs, and reach. New and updated geospatial information and terrain products are disseminated to enable mission planning, planning refinement, and execution.

EXECUTE

4-15. *Execution* is putting the plan into action. During execution, geospatial engineering focuses on maintaining situational awareness, facilitating assessment, enabling decisionmaking, and promoting responsiveness when implementing adjustments. Geospatial engineers respond to new geospatial information requirements generated from the ongoing integrating processes. They maintain geospatial databases and incorporate new or updated geospatial data, which they disseminate to the force. Through analysis, geospatial engineers assist the staff in identifying and assessing variances between current situations and forecasted outcomes. Geospatial engineers also ensure the availability of near real-time geospatial information by maintaining common access databases.

ASSESS

4-16. Commanders, assisted by their staffs and subordinate commanders, continuously monitor and evaluate the current situation and the progress of the operation and compare them with the concept of operations, mission, and the commander's intent. The COP and running estimates are primary tools for assessing the operation. Running estimates provide information from the perspective of each staff section, aiming to refine the COP. The geospatial engineering effort is managed to generate geospatial information needed by the staff to accurately assess the situation.

4-17. To support assessment, geospatial engineers continue to maintain updated geospatial databases and thereby assist in the sharing and flow of geospatial data and information. During assessment, geospatial engineering focuses on helping staffs maintain their running estimates through terrain analysis that highlights the impact of changes in the terrain due to natural and human influences. Geospatial engineers disseminate relevant geospatial information and visualization products to staff sections, functional cells, and working groups to help the staff evaluate the current situation and the progress of the operation.

INTEGRATING PROCESSES

4-18. FM 3-0 describes integrating processes used to synchronize operations throughout the operations process. Geospatial engineering is applied across the warfighting functions (movement and maneuver, intelligence, fires, sustainment, command and control, and protection) through various integrating processes. Although IPB is primarily aligned with the intelligence function, its role within the MDMP provides a link for applying geospatial engineering to each of the warfighting functions.

INTELLIGENCE PREPARATION OF THE BATTLEFIELD

4-19. The integration of geospatial engineering into the four steps of the IPB process requires coordination and synchronization between the geospatial engineer, intelligence staffs, and higher, lower, and adjacent units.

Step One—Define the Operational Environment

4-20. Geospatial engineers identify gaps in the coverage and availability of geospatial data and information for the AO and the area of interest. They analyze the factors of the physical environment in consideration of the warfighting functions.

Step Two—Describe Environmental Effects on Operations

4-21. Geospatial engineering supports this step by describing to the staff the results of the analysis initiated during step 1.

Step Three—Evaluate the Threat

4-22. Geospatial engineers concentrate their analysis and evaluation of the terrain's effects based on geospatial information requirements generated. They incorporate the results of ISR operations, RFIs, and reach into their analysis and disseminate geospatial information to further the staff's analysis. The use of ISR operations, RFIs, and reach continues to augment geospatial engineers' own analysis.

Step Four—Determine Threat Coarses of Action

4-23. Geospatial engineers provide geospatial information and terrain products that assist the staff in defining courses of action (COAs). They describe how the terrain might encourage or discourage a particular COA.

TARGETING

4-24. Targeting is the process of determining what targets to attack to achieve the maneuver commander's desired effects. Geospatial engineering provides high-resolution geospatial data and products with a greater degree of positional accuracy than topographic line maps.

Targeting Process

4-25. The targeting process is based on four functions—decide, detect, deliver, and assess (D3A). To support the targeting process, geospatial engineers by—

- Integrating mobility and suitability products.
- Incorporating terrain effects.
- Performing line of sight analysis.
- Helping to update the high-payoff target list based on changes in the terrain due to natural or manmade influence.
- Managing and providing the standard and sharable geospatial foundation within ABCS.
- Collaborating with imagery analysts to perform change detection.

Targeting Meetings

4-26. Targeting meetings focus and synchronize the unit's combat power and resources toward finding, tracking, attacking, and assessing high-payoff targets. Before the targeting meeting, the engineer coordinator, the geospatial engineering technician, and the G-2/S-2 collaborate to—

- Gather geospatial information on potential high-payoff target nominations and terrain factors on location.
- Provide geospatial information on weapons use.
- Make recommendations for air tasking nominations.
- Provide updates on terrain effects changes.
- Be prepared to provide a restricted target list of geospatial information and products.

INTELLIGENCE, SURVEILLANCE, AND RECONNAISSANCE SYNCHRONIZATION

4-27. ISR operations contribute significantly to the commander's visualization and decisionmaking. ISR synchronization satisfies as many information requirements as possible through staff coordination and RFIs. Geospatial engineering is integrated into ISR synchronization through ISR working groups, GEOINT cells, running estimates, and the ISR synchronization process. Collaborating with geospatial engineers, the engineer coordinator advises the G-2/S-2 and G-3/S-3 on the geospatial engineering and engineer reconnaissance capabilities available and how best to use them. (See FM 3-34.170 for more information.) Terrain analysis and evaluation of the terrain's effects assist the intelligence staff in employing collection assets that allow maximum effectiveness without exposing those assets to unacceptable risks.

GEOSPATIAL ENGINEERING WITHIN OTHER INTEGRATING PROCESSES

4-28. Geospatial engineering can also be integrated into the following processes:

- Composite risk management.
- Knowledge management.

Composite Risk Management

4-29. Composite risk management is an integrating process that occurs during all operations process activities. The process entails identifying, assessing, and controlling hazards (risks) that arise from operational factors and balancing the risks with mission benefits. (see FM 5-19 for more information.) Geospatial engineering—

- Focuses on assisting the staff in visualizing and assessing the hazards associated with the physical environment.
- Can assist planners in determining the effectiveness of cover and concealment provided by natural and manmade features along movement routes and within static positions.
- Can create special-purpose maps and visualization products to assist leaders in communicating their instructions.

Knowledge Management

4-30. Another integrating process is knowledge management. It is the art of gaining and applying information through people, processes, and technology. Geospatial engineers apply knowledge management to transfer their knowledge of the physical environment effectively through terrain analysis. Geospatial engineering—

- Breaks down geospatial stovepipes.
- Provides multiple users with rapid accessibility and retrieval of relevant geospatial information enabled through effective management of geospatial databases and the map foundation of the COP.
- Facilitates a near real-time, collaborative information-sharing environment by exploiting information systems, knowledge networks, and tactical web portals.

GEOSPATIAL DATA MANAGEMENT

4-31. The Army capitalizes on information-sharing capabilities enabled by ABCS to facilitate decisionmaking. To be effective, ABCS relies on access to current, accurate, and common geospatial data residing in shared, distributed geospatial databases to form the foundation of the COP.

DIGITAL GEOSPATIAL DATA

4-32. Metadata consists of data automatically generated by the collection device or entity at the time of collection as well as additional data provided by analysts or users in the future. Metadata allows users to search for products or data as well as obtain services. Metadata allows discovery services in two ways:

- A simple search based on key phrases, dates, names, product and data types, and so forth.
- Users permitted to set up alerts that are triggered when a product or data that meets their predefined query is posted on the network. More common geospatial products are available through web services using a thin-client approach.

THEATER GEOSPATIAL DATABASE

4-33. Gathering geospatial data from numerous sources and making it readily available to multiple entities enables the foundation of the COP. The data used for the COP is maintained and managed through the TGD by the geospatial planning cell (GPC) at the Army Service component command (ASCC) level. NGA data is used to structure the baseline for the TGD, providing a common initial source for GPCs to manage for their assigned theater of operations.

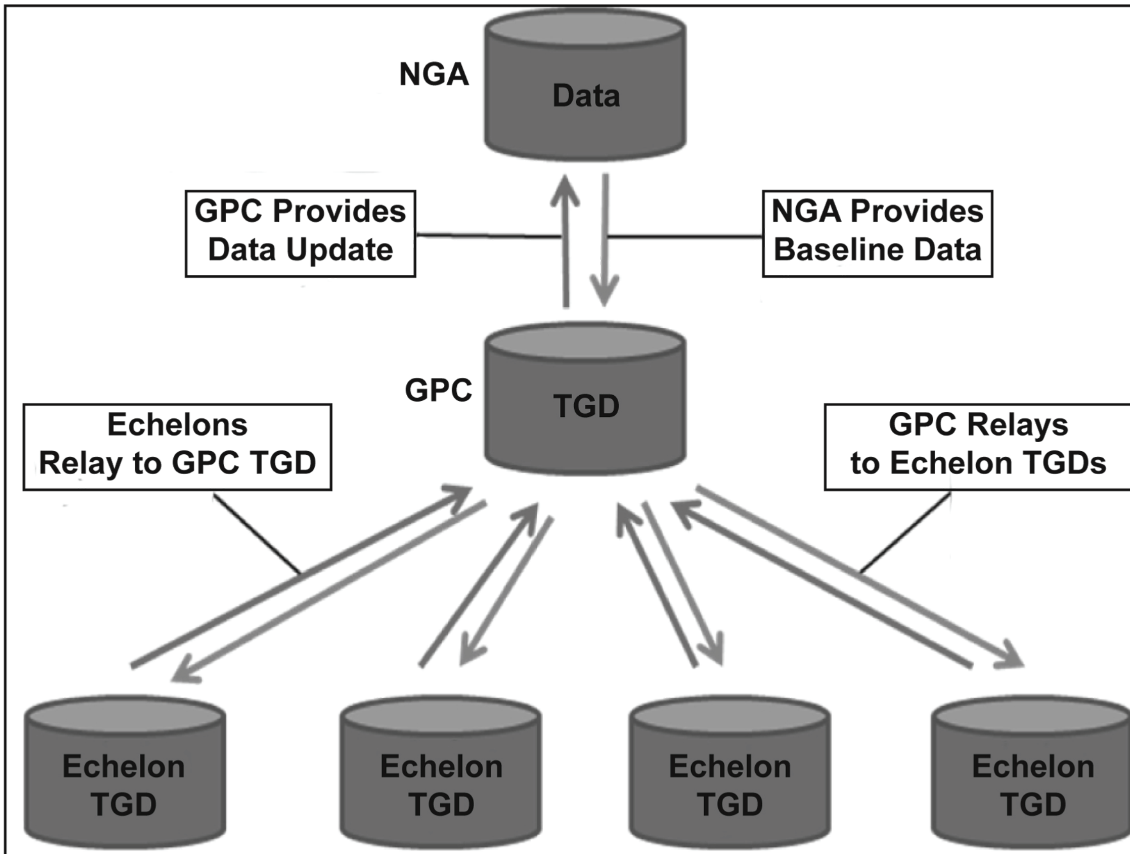
4-34. TGD data is stored and organized at four resolution levels or scales, reflecting those of the NSG's Topographic Feature Data Management. The TGD schema is currently Feature Attribute Coding Catalog-based, it but will transition to the NSG Feature Data Dictionary. The four resolution levels or scales are—

- **Strategic.** Generally equivalent to a 1:1,000,000 scale. Data have features associated with standard NGA maps at this scale (such as NGA Vector Map (VMAP) Level 0).
- **Operational.** Generally equivalent to a 1:250,000 scale. Newly extracted data must adhere to NGA cartographic standards at this map level (such as NGA VMAP Level 1, Feature Foundation Data (FFD), and Planning Interim Terrain Data).

- **Tactical.** Generally equivalent to a 1:50,000 scale, but can range from 1:100,000 to a 1:10,000 scales (such as NGA VMAP Level 2, Vector Product Format [VPF] Interim Terrain Data [VITD], and Interim Terrain Data [ITD]).
- **Urban.** Any special products that are 1:10,000 scales or larger, such as NGA Urban VMAP or the AGC's Urban Tactical Planning Data.

GEOSPATIAL PLANNING CELL

4-35. As the central authority for all geospatial data within a specific theater of operations, GPCs ensure the distribution of geospatial data to each corps within the area of responsibility. Each corps maintains its version of the TGD with inputs from geospatial engineer teams at lower echelons. GPCs collect the enriched data from each corps and evaluate, correct, update, and incorporate it into the ASCC TGD. Lastly, GPCs provide updated data to NGA for inclusion in its national geospatial databases. (See figure 4-1.)



GPC	geospatial planning cell	TGD	Theater Geospatial Database
NGA	National Geospatial-Intelligence Agency		

Figure 4-1. GPC providing updated data to NGA

4-36. Geospatial database development and maintenance is a continuous process and involves shared responsibility by geospatial engineers at each echelon down to the BCT. GPC data-management sections are responsible for the development and maintenance of the TGD. They assist geospatial companies and geospatial engineer teams in acquiring data and constructing their respective databases. Responsibility for original inputs to the TGD rests with each echelon as the data applies to their area of responsibility. Therefore, GPCs coordinate with geospatial engineer teams across echelons to ensure a synchronized geospatial data collection effort that is incorporated into the TGD to provide a common database for all users.

4-37. GPCs must coordinate with each other and develop coproduction agreements to reduce duplication of effort and facilitate the management of geospatial data generation and collection activities within their respective operational areas. Each GPC generally maintains data that is required for its operational area—a TGD does not need to mirror every other TGD. If a GPC enters into a coproduction agreement with another TGD, the validation and acceptance of data belongs with the TGD responsible for that theater of operations.

4-38. NGA may augment GPCs with geospatial analysts, cartographic analysts, and data stewards. This support greatly enhances the management of the TGD and ensures the quality of data generated by GPCs and subordinates meet national mapping accuracy standards for subsequent inclusion and redistribution in NGA's national and regional databases.

DATA SOURCES

4-39. The items covered in this section may reflect the same name as the sensor package that collects them. For example, within an imagery analysis section, the image data collected by the LIDAR sensor is referred to as LIDAR by the analyst. Therefore, the names in this section only refer to the image product available for exploitation by the analyst.

INTERFEROMETRIC SYNTHETIC APERTURE RADAR

4-40. IFSAR is a system or process used to generate elevation data of the Earth's surface by observing a location from two separate positions with a SAR sensor.

LIGHT DETECTION AND RANGING

4-41. LIDAR is used by geospatial engineers to improve situational awareness, terrain visualization, and mission planning. LIDAR is a remote sensing sensor that measures the properties of scattered light from the surface of a given target to determine its range and intensity. This is useful for development of 3D imagery and line of sight determination. (See figure 4-2.) LIDAR is an active sensor-like radar but uses laser light pulses instead of radio waves. The reflections are called *returns* or *postings* and, given the position and altitude of the sensor, distance measurements are then transformed into elevation values. LIDAR sensors can be divided into scanning and nonscanning systems—both capable of 3D imaging.

4-42. LIDAR data can be used to analyze terrain features, such as vertical obstructions and buildings, or gridded to create a high-resolution and high-accuracy surface model. LIDAR data can also be used as a stand-alone product or as an accurate foundation for rectifying and draping high-resolution imagery.

4-43. LIDAR-derived elevation values are used to determine bare Earth surfaces and 3D feature extraction of urban areas and vegetation. Images are typically displayed in "false-color" (colors that differ from the human perception), which represents variations in elevation. LIDAR also supports automated feature extraction of buildings and vegetation.

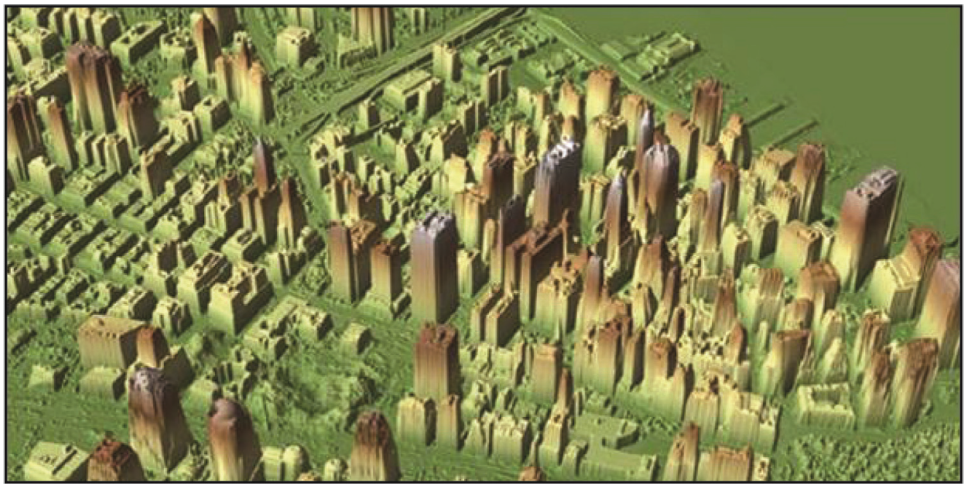


Figure 4-2. LIDAR (with elevation tint)

FEATURE DATA

4-44. Feature data, also referred to as vector data, provides digital representations of natural or manmade objects as points, lines, or polygons (such as wells, roads, and forests). Each feature can include embedded information (attribution), such as bank heights for bodies of water, type of road surface, road width, and bridge load-bearing classification. Fully attributed feature data can be used to perform automated terrain analysis.

DYNAMIC TERRAIN VISUALIZATION

4-45. Dynamic terrain visualization, for example fly-throughs, is created by fusing imagery and elevation data, producing a dynamic, free flying environment to provide terrain visualization. It may also be used as tactical decision aids to support planning and execution of military operations. Dynamic terrain visualization can be displayed as urban environment overlays on high-resolution imagery or maps.

MOTION IMAGERY AS A PRODUCT

4-46. Video imagery systems collect and transmit, edit, store, archive, or disseminate digital video for real-time, near real-time, or for other end-user product distribution. The most common FMV encountered by an imagery analyst is the IMINT product of UAS platforms employed to support daily IMINT collection activities. In contrast, motion imagery—anything less than standard FMV (30 frames per second)—is associated with wide-area surveillance systems, typically collecting at two or six frames per second. Motion imagery is usually exploited in a forensic mode and helps develop pattern of life activities for a target.

4-47. UAS imagery analysis can be used to create IMINT products, or the actual UAS FMV may be disseminated to an end user for analysis or provided in combination with IMINT products. Strategic- and theater-level FMV and motion-imagery collection platform data are disseminated to the NSG architecture via the Community Airborne Library Architecture (CALA), a central repository for unexploited digital aircraft imagery. Aircraft, still, and motion imagery are currently accessible through CALA to the greater GEOINT community.

THREE-DIMENSIONAL MODELING CAPABILITY

4-48. The process of developing a mathematical representation of any 3D object via specialized software is *3D modeling capability*. Models may be created automatically or manually. Manual models are created similarly to fly-throughs or by extracting manmade features for display in a 3D environment. Imagery organizations are capable of creating 3D models or finished products can be ordered through commercial software products. These products are merged, high-resolution, satellite imagery and digital elevation models that provide the user a rich interactive 3D viewing capability.

TERRAIN-RELATED PRODUCTS

4-49. Terrain analysis is described as the study of the terrain's properties and how they change over time with use and under varying weather conditions. Terrain analysis starts with the collection, verification, processing, revision, and construction of source data. It requires the analysis of climatology (current and forecasted weather conditions), soil conditions, and threat or friendly vehicle performance metrics. In short, it transforms raw data into usable information. Terrain analysis is a technical process and requires the expertise of geospatial engineer technicians, terrain data specialists, and geospatial engineers or GEOINT specialists.

4-50. The geospatial engineer technician conducts the major portion of the terrain analysis, combining extensive database information with reconnaissance results. GI&S teams collaborate closely with imagery analysts to enhance terrain analysis and products. Geospatial engineers or GEOINT specialists have access to geospatial information databases, such as those produced by NGA and GPCs, allowing automated support of the terrain analysis process.

4-51. Geospatial engineer and geospatial analysis teams also collaborate closely with the G-2/S-2 to exploit imagery and reconnaissance information and reports, as well as other all-source data collected by the G-2/S-2, to supplement their standard terrain databases and provide direct support to the unit. Computer-generated terrain applications offer two-dimensional (2D) or 3D terrain analysis capabilities. These databases should be supplemented with a physical (leader's) reconnaissance of the terrain in question, when feasible. Automated terrain programs address but are not limited to such factors as—

- Cross-country mobility.
- Lines of communications—such as transportation, communications, and power.
- Vegetation type and distribution.
- Surface drainage and configuration.
- Surface materials.
- Subsurface (bedrock) materials.
- Obstacles.
- Infrastructures.
- Flood zones.

4-52. Terrain analysis must include the effects of weather on the terrain. It must consider the existing situation, as well as forecasted conditions that can occur during mission execution, and express the results of evaluation of the terrain's effects by identifying areas of the AO that favor, disfavor, or do not affect each COA. Drawing conclusions about the terrain and weather assist the staff in evaluating the terrain for areas best suited for friendly and threat—

- Engagement areas directed against aerial and ground targets.
- Battle positions.
- Infiltration routes.
- Exfiltration routes.
- Avenues of approach.
- Specific system or asset locations.
- Observation posts.
- Ambush sites or positions.
- Conclusions about the effects of terrain, which are reached through two substeps:
  - Analyze the military aspects of the terrain.
  - Evaluate the terrain's effect on military operations.

Chapter 5

Army GEOINT Implementation

The proper application of GEOINT provides commanders with timely, relevant, accurate, predictive, and tailored image-based intelligence to support operations. GEOINT, one of the Army's intelligence disciplines, is a critical part of Army tactical, operational, and strategic planning and operations.

THE GEOINT CELL

5-1. GEOINT cells comprise geospatial engineers and imagery analysts. Combining these skill sets into one cell facilitates a collaborative environment for geospatial engineers and imagery analysts to achieve maximum development of GEOINT products. As a collaborative environment, GEOINT cells at each echelon provide direct access to geospatial engineers' and imagery analysts' expertise. GEOINT cells afford a synergistic approach by synchronizing efforts and reducing redundancy, while maximizing the collaboration between geospatial engineers and imagery analysts in a centralized production location.

5-2. Army GEOINT cells provide commanders and staffs a more complete picture of the physical environment and infrastructure of the operational environment.

5-3. GEOINT cells are not exclusive in terms of other military occupational specialties (MOSs) contributing to GEOINT cell missions. Under the G-2/S-2/J-2 staff, multidiscipline intelligence (such as, all-source and signals analysts) collaboration and integration enable the best GEOINT production and visualization. In addition to assigned personnel, GEOINT cells may include other attached personnel, as required.

5-4. The Army national-to-theater regional and national AGI nodes are key GEOINT production partners at the combatant command and national levels. The Army national-to-theater regional nodes have transformed to totally integrate GEOINT capabilities, including IMINT, AGI, OPIR, and GI&S.

5-5. GEOINT cells coordinate between the G-2/S-2/J-2, G-3/S-3/J-3, and engineer coordinator. Coordination for the GEOINT cells should include mission requirements. Echelon levels determine the size and capabilities of their GEOINT cells and the duties and responsibilities of the GEOINT cell personnel.

5-6. At the ASCC level, GEOINT cells include AGI nodes or divisions as part of a larger Army AGI federation. This NGA-funded federation of INSCOM and the United States Army Space and Missile Defense Command/Army Forces Strategic Command production elements provides AGI support to their respective combatant commands as well as federated support to other elements, as required. Production and dissemination are controlled through the AGI and MASINT Reporting and Dissemination Service (AMRDS)—a Web-based portal used for submitting requirements and disseminating finished products. AMRDS provides—

- Standardized and automated GEOINT handling and linkage for producers and consumers, including—
  - GEOINT requirements and RFIs.
  - Report generation.
  - GI&S mapping.
  - Dissemination.
  - Customer feedback.
- Other common tools for searching, viewing, and manipulating reported data to support mission requirements.

5-7. Table 5-1, page 5-2, lists GEOINT cell functions.

Table 5-1. GEOINT cell functions

Geospatial intelligence (GEOINT) cell functions include—
Exploiting motion imagery and full motion video.
Conducting ground moving target indicator analysis and produce supporting intelligence.
Providing and updating the foundation layer for intelligence preparation of the battlefield.
Tagging and preparing GEOINT data for discovery.
Using predictive analysis applicable to the mission.
Managing the geospatial and imagery foundations of the common operational picture (COP).
Visualizing the area of operations.
Providing direct support to create GEOINT products.
Coordinating GEOINT requirements within the area of responsibility.
Identifying gaps in existing GEOINT databases and developing the nominations for the intelligence, surveillance, and reconnaissance synchronization plan that answers the commander's critical information requirements (CCIRs).
Researching external databases as part of intelligence reach to determine if existing products answer CCIRs and priority intelligence requirements (PIRs).
Developing requests for information that answer CCIRs and PIRs.
Collecting geospatial data and imagery that answer CCIRs and PIRs.
Processing the collected data and imagery to extract GEOINT to answer CCIRs and PIRs.
Providing the COP visualization to the commander.
Creating and maintaining a GEOINT database for the COP. This GEOINT database establishes the geospatial data foundation for the GEOINT cell. Examples of these databases include enterprise databases, such as the Theater Geospatial Database and imagery product libraries.
Analyzing GEOINT data and producing products to directly support military operations.
Disseminating GEOINT data, products, and reports to commanders and national agencies.
Coordinating GEOINT requirements with appropriate requirements management personnel.

5-8. Future GEOINT cells may also incorporate or access commercial imagery and topographic capabilities provided by Army space support teams and commercial imagery teams through their commercial imagery data acquisition system.

GEOINT ACTIVITIES

5-9. The intelligence process provides a common model for intelligence professionals to guide their thoughts, discussions, plans, and assessments. (See FM 2-0.) GEOINT operations follow similar steps and activities of the intelligence process. However, GEOINT has several unique considerations used by Army Soldiers and organizations.

5-10. Figure 5-1 depicts GEOINT activities. This sequence is continuous. The commander provides guidance and focus to the activities through commander's critical information requirements (CCIRs). GEOINT activities support the mission by providing the required products that satisfy the CCIRs.

5-11. Table 5-2 is a correlation chart relating the imagery analyst's TCPED process and the geospatial engineer's four primary functions (generate, manage, analyze, and disseminate) with GEOINT activities illustrated in figure 5-1.

Figure 5-1. GEOINT activities

Table 5-2. GEOINT activities correlation chart

Imagery analyst's TCPED	*GEOINT activities*	*Geospatial engineer's functions*
Tasking: • Information gathering • Historical tracking • Requirements generation	**Planning and direction:** • Imagery and GI&S planning • Shaping and prioritizing actions • Developing analysis and production plans	***Note.*** Tasking, in terms of establishing requirements, is not performed as a separate event but, when used, it is an integral part of planning.
Collection: Requirements management	**Collection:** • Requirements drive collection • Sensor tasking • Reach	**Generate:** Sensor data collection reach
Processing: • Data conversion • Information sharing	**Processing and exploitation:** • Data conversion • Exploitation • Reports	**Manage:** Database maintenance
Exploitation: • Information extraction • Information analysis • Information compilation	**Analysis and production:** • Unique and tailored products using multi-intelligence sources • Standard and specialized products	**Analyze:** • Terrain analysis • Terrain visualization
Dissemination: • Product distribution • Web-based posting	**Dissemination:** • Product distribution • Web-based posting	**Dissemination:** • ABCS updates • Maintaining COP

ABCS Army Battle Command System
COP common operational picture
GEOINT geospatial intelligence
GI&S geospatial information and service
TCPED tasking, collection, processing, exploitation, and dissemination

Planning and Direction

5-12. The GEOINT planning activity includes planning for GI&S and imagery support. Direction refers to the process of shaping and prioritizing the actions identified during planning to create a balanced GEOINT collection requirement strategy. The combatant command GEOINT cell coordinates closely with the NSG throughout the planning activity.

5-13. The GEOINT cell performs GI&S and imagery-related planning activities for the commander. The GEOINT cell supports the operations and intelligence processes through the development of functional support plans for GEOINT analysis and production.

Collection

5-14. Information needs drive collection operations. GEOINT requirements necessitate the tasking and collection of imagery, geospatial data, and completed products. Collection operations use satellites, manned and unmanned aircraft, and reach to collect and derive new and existing collections.

Processing and Exploitation

5-15. The imagery and geospatial communities possess exploitation capabilities for aircraft, overhead imagery, and AGI to support operational requirements.

5-16. Raw data is received from collection platforms and processed into human readable formats for exploitation and analysis. Once processed, geospatial data is distributed, archived, and made accessible to users through various libraries and databases. The user can manipulate the data to create tailored products or data sets for specific mission purposes or military applications.

5-17. Imagery exploitation involves the evaluation, manipulation, and analysis of one or more images to extract information related to a list of essential elements of information. Exploitation information and results are normally disseminated via a report. Imagery exploitation is managed through the IESS for DOD organizations and by the National Exploitation System for NGA. Both systems perform numerous functions, including—

- Target management.
- Requirements management.
- Imagery ordering management.
- Exploitation management.

5-18. Urgent information is expedited using the three phases (see table 5-3) of still imagery exploitation:

- Phase 1—time-dominant.
- Phase 2—time-dominant.
- Phase 3—nontime dominant.

Table 5-3. Still imagery exploitation

Phase 1 (time-dominant)	***Phase 2 (time-dominant)***	***Phase 3 (nontime dominant)***
• Phase 1 imagery exploitation is the exploitation of newly acquired imagery within 24 hours from receipt of imagery. • The purpose of phase 1 exploitation is to satisfy priority intelligence requirements of immediate need or to identify changes or activity of immediate significance.	• Phase 2 imagery exploitation is the detailed exploitation of imagery scheduled within the boundary of analytic requirements and timelines of need (typically within one week of imagery receipt). • The purpose of phase 2 exploitation is to provide an organized and comprehensive account of the intelligence derived from validated intelligence requirements tasking.	• Phase 3 imagery exploitation is in depth, long-range analysis that includes all available imagery sources. • During phase 3, detailed, authoritative reports on specified installations, objects, and activities are prepared by agencies participating in the exploitation effort. • Phase 3 exploitation timelines are not bound and typically exceed one week after receipt of imagery.

5-19. Motion imagery is also exploited via phases (see table 5-4):

- Phase 1—rapid or near real-time call outs.
- Phase 2—initial annotated stills and motion imagery clips (supplementary).
- Phase 3—detailed analysis multi-intelligence fusion.

5-20. While these phases are similar to those described in table 5-3, they differ based on the media being analyzed. The key differentiation is the dimension of time. Individual frames collected over time and displayed in continuous sequence result in motion. Analysts perform phase 1 exploitation during this continuous sequential display of the individual frames. For the remaining phases, analysts work from imagery clips selected during phase 1.

Table 5-4. Motion imagery exploitation

Phase 1 (rapid or near real-time call outs)	***Phase 2 (initial annotated stills and motion imagery clips [supplementary])***	***Phase 3 (detailed analysis multi-intelligence fusion)***
Phase 1 motion imagery exploitation or sensor operator personnel (forward or reachback) produce voice reports and chat logs.	Processing, exploitation, and dissemination crews produce: • Initial motion imagery stills. • Initial motion imagery clips. • Shape files based on motion imagery. • Storyboards with annotations and reports.	Processing, exploitation, and dissemination crews; the fusion cell; and interagency partners produce: • Compiled shape files. • Target folders. • Compiled reports and storyboards with annotations.

ANALYSIS AND PRODUCTION

5-21. GEOINT products include traditional geospatial information and imagery-based products as well as more advanced products created by combining GI&S and imagery data into a single, multidimensional product. This activity provides the tactical commander with comprehensive, highly detailed, and precise GEOINT products.

5-22. Once data has been processed, a variety of users can exploit it and produce either general intelligence or mission-specific products. Data can also be combined in a variety of ways to develop tailored products for specific mission requirements. Users or requesters of the intelligence should coordinate with the producers to ensure the products meet mission needs. The main producers include Service exploitation and production centers, NGA, DIA, and the combatant commands. At the combatant command and Service levels, hydrographic and geospatial engineering units or sections—

- Provide the ability to analyze integrated databases for specific applications.
- Add valuable information or update features and attributes within the database.
- Strengthen database content to meet the commander's tailored mission requirements.

5-23. GEOINT products and related services and support are categorized as standard or specialized:

- **Standard GEOINT products** are developed from visible, radar, IR, and multispectral sensor data. These products may be simple—such as imagery read-outs, reports, maps (for example, topographic line maps), and charts—or more complex products containing several layers of data ranging from geographic to intelligence information. Traditional products are usually 2D but may be created as 3D in certain circumstances.
- **Specialized GEOINT products** use standard products as a foundation but provide added capabilities. These products may be developed using data from multiple sources, multiple intelligence disciplines, and advanced sensors. They may also include a fourth dimension (time) that provides motion to create dynamic, interactive products. These products can include realistic mission simulations that help determine the effects of currents, tides, wind, and daylight on a mission or intelligence problem. Customized products also include products such as—
  - Two color multi-view.
  - Change detection.

- Interactive maps to visually depict patterns and trends.
- A visual to provide a common reference and rapid situational awareness for all personnel and organizations involved in the same mission.

5-24. GEOINT products are often developed through a process known as "value added," in which both the producer and user of GEOINT update a database or product with current information. New roads, obstacles, and seismic activity are examples of activities that require updating due to frequent changes. Organizations (such as special forces and terrain teams or cells) may start with NGA products and add tactical data of special interest for use by local commanders and operators. This specialized data is centrally stored and catalogued.

DISSEMINATION

5-25. Dissemination is the timely distribution of GEOINT products in an appropriate form and by any suitable means, whether in hardcopy or digital format. Dissemination is accomplished through the *pull* and *push* principles:

- The *pull* principle provides intelligence organizations at all levels with direct reach capability via electronic access to central databases, intelligence files, or other repositories containing GEOINT data and products.
- The *push* principle allows the producers to transmit GEOINT to requesters along with other relevant information. Typically, the intelligence staff element at each echelon manages the dissemination of GEOINT.

GEOINT-Focused Dissemination Processes

5-26. Current GEOINT-focused processes disseminate GI&S, imagery, or imagery-related products. Single dissemination processes are becoming increasingly common as GEOINT evolves. This publication primarily addresses the more common processes used for separate dissemination of GI&S and imagery derived products.

National Geospatial-Intelligence Agency Portals

5-27. NGA provides GEOINT data or products online via NGA portals that are accessible through the NIPRNET, SIPRNET, and JWICS.

5-28. NGA can also support immediate deployment of personnel and equipment worldwide at any time through remote GEOINT services (RGS):

- **The RGS team** compiles custom GEOINT solutions for military and civilian missions through direct customer interface. NGA sites in Maryland and Missouri serve as reach centers.
- **The RGS technical support team** maintains the robust RGS equipment, including multiple large-format plotters for mass quantity printing. Software includes a full suite of high-end GI&S tools and image manipulation capability.
- **The RGS analytical team** comprises employees with a unique combination of backgrounds and skills, including imagery analysts, cartographers, regional analysts, and geospatial analysts.

5-29. The Services have also developed dissemination capabilities that support standard NGA digital maps and charts (USAF Geospatial Product Library) as well as attributed feature data (Army TGD).

Global Broadcast Service

5-30. Another dissemination system is the Global Broadcast Service (GBS). GBS can disseminate large amounts of data in near real-time to a group of users or each user can pull a large file from the web-accessed retrieval portal (WARP) via GBS. The Joint Warfare Analysis Center (JWAC) also maintains an imagery library, the JWAC Warfighter Imagery Library (JWIL), which is accessible through queries on WARP.

Dissemination Methods

5-31. There are differences in dissemination methods for national, commercial, and aircraft systems. The Image Product Library and the USAF Geospatial Product Library provide standard GEOINT and USAF produced GI&S data that may have been derived from all three sources. Separate systems exist as the primary dissemination method for each collection system.

National Systems

5-32. The National Information Library is the primary online system for storage of information derived from national imagery systems. The command information library is a system that allows higher echelons to make their GEOINT data available to and accessible by lower echelons. Both systems are capable of push and pull dissemination. WARP may be used to research and download NTM imagery. WARP is on JWICS and SIPRNET.

Commercial Systems

5-33. There are several dissemination systems used to distribute information derived from commercial overhead systems. NGA has created a system known as the WARP unclassified national information library for commercial imagery dissemination. The WARP unclassified national information library can be accessed at https://warp.nga.mil. NGA has made commercial imagery available to DOD organizations through Web-enabled distribution systems like the Rapid Dissemination of Online GEOINT Program.

5-34. The WARP unclassified national information library electronically receives NGA-purchased imagery from commercial data providers. Users may access the WARP unclassified national information library to research commercial satellite imagery availability and then download their selections.

Aircraft Systems

5-35. The Distributed Common Ground System (DCGS) is a family of systems connected through designated points of interoperability designed to provide aircraft system-derived, multi-intelligence discipline, ISR task, post, process, and use capabilities at the JTF level and below through a combination of reachback, forward support, and collaboration. DOD and Service architectures are integrated components of this net-centric joint force intelligence processing and dissemination system. Data collected through DCGS are also available on WARP and CALA and can be stored on the National Information Library and command information libraries. CALA stores FMV and MI data streams in one- and six-minute clips for retrieval. (See JP 2-03.)

EVALUATION AND FEEDBACK

5-36. Several GEOINT operations are a combination of individual intelligence products that are powerful capabilities in and unto themselves; they provide a stronger capability when combined. It is imperative that intelligence personnel and consumers at all levels provide honest, timely feedback, throughout the intelligence process, on how well the various intelligence operations perform to meet commanders' requirements.

ARMY ORGANIZATIONS

5-37. The following discussion focuses on GEOINT implementation and interoperability between echelons.

ARMY SERVICE COMPONENT COMMAND

5-38. At the ASCC level, GEOINT cells support the warfighting functions by performing imagery exploitation and GI&S missions. GEOINT cells at the ASCC level—

- Support corps levels by producing GEOINT data to satisfy GEOINT requirements.
- Provide updates to the COP through GPCs, which incorporate these updates into the TGD to ensure consistency of geospatial data from ASCC to corps levels.

- Support the ASCC's planning and decisionmaking processes and operational requirements.
- As the largest GEOINT personnel resource of the Service, support combatant commands or geographic combatant commands via support to planning and operational requirements.
- At a minimum, support the warfighting functions through the development of GEOINT products.

5-39. The ASCC G-2/J-2 and engineer coordinator use geospatial companies to provide support for missions outside the reasonable capacity of a GEOINT cell already dedicated to providing planning and operational support to an ASCC commander and staff. Examples of geospatial company activities include but are not limited to—

- Combatant command or geographic combatant command requirements.
- ASCC operational, forward, or contingency command posts.
- Theater security posture and partnership operations.
- Subordinate units or JTF operations or exercises.

5-40. Corps and subordinate units with TGD updates do not report data to the ASCC GEOINT cell; instead, they provide these updates through GPCs. G-2s/J-2s and engineer coordinators in ASCCs without a GEOINT cell or GPC use geospatial companies for these functions in addition to all warfighting functions.

5-41. Specialized GEOINT capabilities also exist at the ASCC for Army Forces Strategic Command with its global areas of responsibility. These include deployable Army space support teams (ARSSTs), the commercial imagery team and system deployed in the U.S. Central Command area of responsibility, and the ASCC's GEOINT division, a member of the Army's AGI federation. ARSST members also contribute to homeland defense support of civil authorities (DSCA) during times of domestic disasters to provide space-related support.

ARMY CORPS

5-42. Army corps is a command and control headquarters that directs the operations of subordinate units. The corps does not have an organic IMINT collection capability. It receives IMINT collection support from NSG members, theater MI brigades, and battlefield surveillance brigades (BFSBs). As part of its intelligence staff, the corps has a GEOINT cell responsible for developing GEOINT products and collection tasking to support corps operations.

5-43. The corps is a consumer of GEOINT products produced by NGA, as well as other members of the NSG, and develops GEOINT that assists theater, division, and BCT intelligence staffs in performing tasks associated with IPB, I&W, situation development, ISR, and targeting.

5-44. The corps GEOINT cell, organized under its G-2, conducts analysis and develops intelligence based on motion imagery video from BFSB and echelons-above-division imagery collection platforms. It also conducts terrain analysis, developing specialized terrain products and imagery-based products to support corps planning and operations.

5-45. At corps levels, GEOINT cells—

- Leverage theater-level direct down links to satisfy GEOINT production requirements.
- Support the warfighting functions by performing imagery exploitation, GMTI, and GI&S missions.
- Support the division by producing GEOINT data to satisfy GEOINT requirements.
- Maintain awareness of the operational environment and provide updates to the GPC for inclusion in the TGD, thereby ensuring consistency of geospatial data from ASCC to division.
- At a minimum, support the warfighting functions through the development of GEOINT products in accordance with Annex B (Intelligence).

ARMY DIVISION

5-46. Army division is a command and control headquarters that directs the operations of subordinate units. It receives imagery collection support from theater MI brigades and BFSBs. As part of its intelligence staff, the division has a GEOINT cell responsible for developing GEOINT products to support division operations.

5-47. The division is a consumer of GEOINT products produced by NGA as well as other members of the NSG. It develops GEOINT that assists theater, division, and BCT intelligence staffs in performing those tasks associated with IPB, I&W, situation development, ISR, and targeting.

5-48. The division's GEOINT cell, organized under the G-2 staff, conducts analysis and develops intelligence based on motion imagery video from BFSB and echelons-above-division imagery collection platforms. The GEOINT cell conducts terrain analysis and develops specialized terrain and imagery-based products to support division planning and operations.

5-49. At division levels, GEOINT cells—

- Support the warfighting functions by performing imagery exploitation, GMTI, and GI&S missions.
- Support the BCT by producing GEOINT data to satisfy GEOINT requirements.
- Maintain the COP and update the TGD, ensuring consistency of geospatial data from corps to BCT levels.
- Support the warfighting functions through the development of GEOINT products.

THEATER MILITARY INTELLIGENCE BRIGADE

5-50. The theater MI brigade is an intelligence collection, analysis, and production organization that collects combat information and intelligence using a UAS. Through its UAS, the theater MI brigade collects FMV in use by theater, corps, and division staffs to produce GEOINT.

5-51. The theater MI brigade contains the GPC, which provides GI&S for a theater of operations, including management of the TGD. It also has a GEOINT cell within its operations battalion. This element normally deploys as part of an analysis and control element under the operational control of the ASCC.

5-52. The GEOINT cell conducts analysis and develops intelligence based on FMV from theater UASs as well as from national and multi-Service imagery collection platforms. Additionally, the GEOINT cell conducts terrain analysis and develops specialized terrain products to support theater planning and operations.

BATTLEFIELD SURVEILLANCE BRIGADE

5-53. The BFSB is a unique multifunctional support brigade that collects combat information and intelligence using UASs, ground-based SIGINT sensors, HUMINT collection teams, long-range surveillance teams, and ground reconnaissance assets. Through its UASs, the BFSB collects FMV in use by corps and division staffs to produce GEOINT. The BFSB S-2 section has a GI&S cell that provides terrain analysis and management and dissemination of GEOINT to support brigade planning and operations. The BFSB is connected to the NSG through DCGS-Army (DCGS-A).

BRIGADE COMBAT TEAM

5-54. The BCT is a combat organization that collects combat information and intelligence to support its own and supported headquarters operations using UASs, ground-based SIGINT sensors, HUMINT collection teams, and ground reconnaissance assets. Through its UASs, the BCT collects FMV in use by the brigade intelligence staff to produce GEOINT.

5-55. The BCT GEOINT cell conducts terrain analysis and develops imagery-based products from the brigade's organic UAS as well as from echelons-above-brigade imagery collection platforms.

5-56. The geospatial engineer team conducts terrain analysis and develops specialized terrain products to support brigade planning and operations.

5-57. At BCT levels, GEOINT cells focus on directly supporting commanders' GEOINT requirements. This does not exclude GEOINT cells from providing support to other elements within the BCT. GEOINT cells use standard unit table of organization and equipment (TO&E) and modified table of organization and equipment (MTOE) to satisfy mission requirements.

5-58. At BCT levels, the GEOINT cell in its most basic form encompasses the existing GMTI mission, imagery analysis mission, and geospatial support to unified battle commands, including the maintenance of the COP. At a minimum, GEOINT cells support the warfighting functions through the development of GEOINT products.

ARMY SPECIAL OPERATIONS FORCES

5-59. Army special operations forces have GEOINT cells. Civil affairs brigades have geospatial engineers; whereas, special operations aviation regiments have imagery analysts. Each of the above elements has an NGA geospatial analyst; whereas, the ranger and special operations aviation regiments also have NGA imagery analysts.

5-60. Through its UASs, the groups and regiments collect FMV in use by intelligence staffs to produce GEOINT.

5-61. The GEOINT cell conducts topographic analysis and develops imagery-based products from the organic UAS FMV, as well as from JTF and higher imagery collection platforms.

5-62. Geospatial engineers and imagery analysts provide support to unit planning and operations—geospatial engineers through terrain analysis and development of specialized terrain products, and imagery analysts through imagery exploitation and the development of unique imagery derived products.

5-63. GEOINT cells focus on directly supporting commanders' GEOINT requirements. GEOINT cells use standard equipment within the unit TO&E to satisfy mission requirements.

PERSONNEL DUTIES AND RESPONSIBILITIES

5-64. The G-2/S-2 directs all intelligence activities in the headquarters, including GEOINT. Additionally, The G-2/S-2 is the principle staff officer responsible for gathering and analyzing knowledge on threat, terrain, weather, and civil considerations for the commander. The G-2/S-2 leads the staff in the IPB process and assists the G-3/S-3 in developing and executing the ISR plan. The G-2/S-2 also provides intelligence support to lethal and nonlethal targeting operations, ensuring targeting priorities are developed based on intelligence threat assessments and included in the ISR plan. The G-2/S-2 is the principle advisor to the commander regarding the intelligence warfighting function. G-2/S-2 key responsibilities related to GEOINT include—

- Providing guidance on the production of terrain analysis products to support IPB, ISR, and targeting.
- Prioritizing requests for GEOINT support from the staff and subordinate commands.
- Providing quality control over GEOINT products, databases, and data files.
- Ensuring GEOINT support is performed in accordance with established battle rhythm.
- Coordinating digital logistics with the G-6/S-6 for GEOINT support (storage, dissemination, retrieval, and streaming).
- Developing GEOINT collection tasking to support operational requirements.
- Identifying threat electronic warfare (EW) capabilities, which may impede GEOINT, with assistance from the EW officer.
- Coordinate EW support to GEOINT.

5-65. If a division or corps is functioning as a JTF, the G-2 assumes the role of the J-2. The primary function of the G-2 when acting as a JTF J-2 is supporting the combined joint task force (CJTF) and staff by ensuring the availability of reliable intelligence and timely I&W on the threat situation in the joint operational area. Additionally, the JTF J-2 provides support to the CJTF force protection mission. The J-2 is responsible for providing the CJTF, JTF staff, and JTF components and subordinate task forces with the complete air, space, ground, and maritime threat situation by integrating threat assessments developed by the combatant commander's intelligence organization. (See JP 2-03 for information on joint GEOINT operations.)

STAFF COORDINATION

5-66. GEOINT cells require staff coordination to identify and properly task members comprising the cell. Forming an effective GEOINT cell and synchronizing its efforts requires teamwork between the intelligence and engineer staffs. The G-2/S-2 is responsible for the GEOINT cell and collaborates with the engineer coordinator to capture geospatial requirements. The G-2/S-2 and the engineer coordinator must coordinate with their respective technicians and the G-3/S-3 to ensure clearly established priorities for the geospatial effort throughout the operations process.

GEOINT CELL MANNING

5-67. The following MOSs comprise personnel manning the GEOINT cell. Personnel function under the G-2/S-2 in respective teams—the IMINT team and the geospatial engineer team.

Imagery Intelligence Team

5-68. Army IMINT teams provide exploitation and imagery analysis. The team comprises an IMINT technician (military occupational specialty [MOS] 350G) and multiple imagery analysts (MOS 35G).

Imagery Intelligence Technician

5-69. IMINT technicians are warrant officers that administer, manage, maintain, and operate IMINT analytical and exploitation systems across Army operations. IMINT technicians—

- Provide expert technical advice and input in all matters involving IMINT.
- Manage and direct the imagery analysis process.
- Provide input to the aircraft ISR planning process and imagery collection planning.
- Coordinate with other IMINT producers to ensure imagery data and information flow remain fluid.

Imagery Analyst

5-70. Imagery analysts provide input based on imagery interpretation or analysis for the COP and the commander's MDMP process. Imagery analysts—

- Exploit, interpret, analyze, and disseminate imagery from satellite and aircraft systems to provide IMINT support to military, civil affairs, and military information support operations.
- Assist and recommend in the planning and use of imaging sensors.
- Are responsible for detecting, locating, and tracking ground targets, also known as MTIs.

Advanced Geospatial Intelligence Analyst

5-71. AGI analysts—

- Discover, process, retrieve, and conduct analysis of AGI data using national databases and appropriate exploitation tools.
- Create, write, and quality-check graphical and textual reports.
- Publish reports to the AMRDS.
- Train imagery analysts in AGI and IMINT exploitation tactics and techniques.

Geospatial Engineer Team

5-72. Army geospatial engineer teams provide terrain analysis, terrain visualization, digitized terrain products, tailored map products, map production, geospatial data management, and support to the integration of other geospatial information requirements for the force at large. The team comprises a geospatial engineering technician (MOS 125D) and multiple geospatial engineers (MOS 12Y).

Geospatial Engineering Technician

5-73. Geospatial engineering technicians are warrant officers and the Army's terrain analysis and GI&S experts. The technician's primary function is to assist the commander and staff in understanding the physical environment aspect of the operational environment. Geospatial engineering technicians do this through assimilation and integration of large volumes of geospatial information and transforming it into visualization, information, and knowledge of the terrain's effects on friendly and threat operations. As an integral part of the planning staff, the geospatial engineering technician participates in each step of the MDMP to understand the mission and the commander's intent. Geospatial engineering technicians collaborate with imagery analysts to produce GEOINT, and may serve as the officer in charge of the GEOINT cell, as required.

Geospatial Engineer

5-74. Geospatial engineers manage geospatial foundation data, from which all other information about the physical environment is referenced to form the COP. Geospatial engineers use analysis and visualization capabilities to integrate terrain, weather, people, processes, and tools, using multiple information resources and collaborative analysis to build a shared knowledge of the physical environment to support the unit's mission and commander's intent.

Chapter 6

GEOINT Support to Planning and Operations

During planning, geospatial engineers and imagery analysts are responsible for developing a specific set of terrain and imagery-based products within the confines of well-defined guidance and timelines. Terrain-related products produced by GEOINT cells, as part of their continuous analysis of the AO within IPB, have a significant role in targeting and ISR operations.

SUPPORT TO PLANNING

6-1. To effectively assist in planning, imagery analysts and geospatial engineers—

- Must understand—
  - The purpose, environment, and characteristics of the planning process as described in FM 5-0.
  - The IPB process as described in FM 2-01.3.
  - IPB tactics, techniques, and procedures as described in FMI 2-01.301.
  - Intelligence analysis as described in TC 2-33.4.
- Should have a thorough understanding of the products, support, and capabilities provided by commercial satellite collectors available through the NGA commercial imagery office.
- Must understand—
  - Enemy tactics and operational art.
  - The fundamentals of full spectrum operations described in FM 3-0.
  - The art of tactics described in FM 3-90.
- Must be familiar with the operations process (plan, prepare, execute, and assess).
- Must understand how mission command, the commander's visualization of the situation and exercise of command and control, influence planning.

6-2. During planning, geospatial engineers are responsible for developing a specific set of terrain and imagery-based products within the confines of well-defined guidance and timelines. Formal planning begins with the receipt of the mission from higher headquarters or as directed by the commander. However, before formal planning, GEOINT cells have a vast amount of preparation and data processing for mission analysis.

6-3. Before formal planning, the GEOINT cell must develop an understanding of terrain aspects of the operational environment. Equally as important, the GEOINT cell must have constructed or received digital terrain and imagery-based products necessary to support terrain analysis during IPB. Once the orders process begins, time constraints might hinder building these products before the mission analysis briefing or during the rest of the MDMP. The construction of digital overlays is an example of this. Additionally, the amount of time the staff requires to build detailed terrain overlays in order to perform planning is significant; the staff requires even more time to build the overlays necessary for urban operations.

Note. Although the GEOINT cell receives this information from its higher headquarters, it may not be in the format needed to perform planning. Text, graphic, and spreadsheet products may require transformation into digital products that can be used by staff elements in the headquarters.

6-4. *Generate intelligence knowledge* is one of five subtasks of the intelligence task *support to force generation.* (See FM 2-0.) The end state of the generate intelligence knowledge task is the development of four general baseline datasets—threat, terrain, weather, and civil considerations.

6-5. The GEOINT cell is responsible for the terrain dataset and provides support to the all-source or fusion cell for the civil considerations dataset. To accomplish this, the G-2/S-2, based on guidance from the commander, focuses garrison GEOINT operations on specific threat forces worldwide, continually gathering and refining data throughout the Army force generation (ARFORGEN) cycle. Thus, the intelligence staff is as prepared as it can be to begin planning upon receipt of mission.

SUPPORT TO OPERATIONS

6-6. A thorough mission analysis is crucial to planning. Both the process and products of mission analysis help commanders to refine their situational understanding and determine their mission. Accurate situational understanding enables commanders to better visualize the operation.

6-7. There are 17 separate tasks associated with mission analysis; the GEOINT cell is involved in almost all of them. Generally, the intelligence portion of mission analysis is an evaluation of the following mission variables: enemy, terrain, weather, and civil considerations. Additionally, mission analysis includes an analysis of the plan and order of higher headquarters to determine—

- Critical facts and assumptions.
- Specified, implied, and essential tasks.
- Constraints affecting ISR operations.

6-8. The end state includes—

- The development of an initial ISR plan.
- The commander refining the commander's visualization based on a clear understanding of the situation.
- The staff refining staff running estimates based on that same understanding of the situation.

6-9. See appendix B and FM 5-0 for additional information on the conduct of mission analysis.

OFFENSIVE OPERATIONS

6-10. *Offensive operations* are combat operations conducted to defeat and destroy threat forces and seize terrain, resources, and population centers (FM 3-0). Offensive operations at all levels require effective intelligence to help the commander avoid the threat's main strength and to deceive and surprise the threat. During offensive operations, GEOINT must provide the commander with timely updated IPB products and products that support the intelligence running estimate in order for the commander to significantly affect the threat.

6-11. GEOINT supports the S-2's development of IPB products to assist the commander in identifying all aspects within the AO or area of interest that can affect mission accomplishment. The entire staff, led by the echelon intelligence staff, uses the IPB process to identify any aspects of the AO or area of interest that affect threat, friendly, and third party operations.

6-12. Organic imagery collection supports the commander's use of unit ISR assets to analyze the terrain and confirm or deny the threat's strengths, dispositions, and likely intentions. The G-2/S-2, in coordination with the staff, develops an integrated ISR plan using imagery collection to satisfy the commander's maneuver, targeting, and information requirements.

6-13. In offensive operations, the commander's information requirements tasked to GEOINT often include but are not limited to—

- Locations, composition, equipment, strengths, and weaknesses of the defending threat force, including high-payoff targets and threat ISR capabilities.
- Locations of possible threat assembly areas.
- Locations of threat indirect fire weapon systems and units.

- Locations of gaps and assailable flanks.
- Locations of areas for friendly and threat air assaults.
- Locations of threat air defense gun and missile units.
- Locations of threat EW units.
- Effects of terrain, weather, and civil considerations on current and projected operations.
- Numbers, routes, and direction of movement of displaced civilians.
- Withdrawal routes of threat forces.
- Locations of threat command and control and ISR systems.
- Locations of potential integrated threat or civilian assembly areas.
- Locations of friendly force assembly areas.

DEFENSIVE OPERATIONS

6-14. *Defensive operations* are combat operations conducted to defeat an enemy attack, gain time, economize forces, and develop conditions favorable for offensive or stability operations (FM 3-0). The immediate purpose of defensive operations is to defeat a threat attack. Commanders defend in order to—

- Buy time.
- Hold key terrain.
- Hold the threat in one place while attacking in another.
- Destroy threat combat power while reinforcing friendly forces.

6-15. Intelligence should determine the threat's strength, COAs, and location of follow-on forces. Defending commanders can then decide where to arrange their forces in an economy-of-force role to defend and shape the operational environment. Intelligence support affords commanders the time necessary to commit the striking force precisely.

6-16. In defensive operations, the commander's information requirements tasked to GEOINT often include but are not limited to—

- Locations, composition, equipment, strengths, and weaknesses of the advancing threat force.
- Locations of threat command posts, fire direction control centers, early warning sites, and target acquisition sensors.
- Locations of possible threat assembly areas.
- Locations of threat indirect fire weapon systems and units.
- Locations of gaps, assailable flanks, and other threat weaknesses.
- Locations of areas for threat rotary wing and parachute assaults.
- Locations of artillery and air defense gun and missile units.
- Locations of threat EW units.
- Locations of civilian populations.
- Effects of terrain and weather and civil considerations on current and projected operations.
- Likely withdrawal routes for threat forces.
- Numbers, routes, and direction of movement of displaced civilians.
- Locations of potential integrated threat or civilian assembly areas.
- Locations of friendly force assembly areas.
- Weaknesses of defensive structure.
- Threat force disposition.

Stability Operations

6-17. *Stability operations* encompass various military missions, tasks, and activities conducted outside the United States in coordination with other instruments of national power to maintain or reestablish a safe and secure environment, provide essential governmental services, emergency infrastructure reconstruction, and humanitarian relief (JP 3-0).

6-18. Missions where stability operations predominate are often more complex than those where offensive and defensive operations are dominant; therefore, obtaining the intelligence required is often more complicated. In stability operations, commanders often require more detailed intelligence and IPB products to determine how best to conduct operations and influence the local populace to enhance regional stability.

6-19. The identification and analysis of the threat, terrain and weather, and civil considerations are critical in determining the most effective missions, tasks, and locations to conduct stability operations. A lack of knowledge about insurgents, local politics, customs, and culture, as well as how to differentiate between local combatants, often leads to U.S. actions that result in unintended and disadvantageous consequences (such as attacking unsuitable targets or offending or causing mistrust among the local population). This lack of knowledge could potentially threaten mission accomplishment.

6-20. Commander information requirements for GEOINT mirror those of offensive and defensive operations. Additionally they may include—

- Graphic overlays that provide information on the physical construction of buildings, as well as accessibility, potential vulnerabilities, and production capacity of urban areas.
- Analysis of telecommunications infrastructure, underground facilities and caves, industries, and energy capabilities.
- Geodetic, hydrographic, geomagnetic, and gravity surveys; medical facility information; and blue force tracking.
- Graphic overlays and products for use in target folders of high-value targets.
- Imagery analysis to determine change detection.
- Creation of or obtaining *GEOINT base for contingency operations* preassembled packages of selected maps, charts, and other geographic materials of various scales to support mission planning.
- Analysis of public health infrastructure, such as water facilities, waste management, food provisions, and medical treatment facilities.

Humanitarian Assistance

6-21. GEOINT information and visualization are critical components of humanitarian assistance (HA) or disaster relief (DR) operations in which the environment or catastrophic event is the initial focus. A noncombatant evacuation operation is the most common HA or DR operation. The noncombatant evacuation operation assists the Department of State and the host nation in evacuating U.S. citizens, host-nation nationals, and other designated foreign nationals to safety.

6-22. A noncombatant evacuation operation can be conducted in passive or nonpermissive environments, which can increase the size of on-the-ground footprints involved during the operation. GEOINT provides the foundation for initial HA or DR operation decisions, such as—

- Locations for establishing points of entry, extraction sites, and immediate need areas.
- Infrastructure assessments.
- Displaced people camps and activities.
- Current host-nation and nongovernmental organization operations.
- Availability of lines of communications for critical insertion of supplies and services.

6-23. GEOINT support comprises—

- Locating existing and possible future refugee camps.
- Locating water resources and their conditions.
- Identifying possible positions for water treatment assets and distribution points.

6-24. Imagery and terrain studies can determine—

- Soil permeability for effective fields and public sanitation.
- Environmental resource availability for cooking and rebuilding needs.
- Land availability.
- Local agricultural capabilities for food production.

6-25. Additionally, GEOINT supports the identification and conditions of ports, airfields, highways, and railroads for the HA or DR operation. GEOINT is used throughout HA or DR operations to provide—

- Visual assessments of progress, growth, or reduction in refugee or displaced people camps.
- Impacts to the environment and areas of concern.
- Restart of economic activity and monitoring of host-nation (military and government) or nongovernmental organization activities.

6-26. Continuous imagery collection supports both military and Department of State development of policies and procedures affecting the situation and supportive materials for guidance.

Environmental Assistance

6-27. GEOINT can provide environmental assistance, such as damage assessment, environmental monitoring, and maintaining situational awareness. Imagery and geospatial information are critical to the successful mitigation of environmental destruction caused by natural and manmade events. GEOINT answers questions regarding the extent of damage, the potential for further damage, and the progress of repairs. Terrain assessment is key to the accurate assessment of environmental issues, providing essential knowledge and evidence to address environmental assistance requirements.

CIVIL SUPPORT OPERATIONS

6-28. *Civil support* is Department of Defense support to U.S. civil authorities for domestic emergencies, and for designated law enforcement and other activities (JP 3-28). Civil support includes operations that address the consequences of natural or manmade disasters, accidents, terrorist attacks, and incidents within the United States and its territories. Army forces conduct civil support operations when the size and scope of an incident exceed the capabilities or capacities of domestic civilian agencies. Army civil support operations include a range of activities involving support to law enforcement agencies and planned support as part of large-scale events.

6-29. GEOINT products that support civil support operations include but are not limited to—

- Detailed terrain analysis that incorporates weather to assist in determining potential COAs.
- Change detection products that track the extent of damage (including environmental).
- Updated imagery of the AO for use by all agencies involved in supporting operations to monitor and assess the situation.
- Geodetic and hydrographic surveys, medical facility information, and blue force tracking.
- Analysis of public health infrastructure, such as water facilities, waste management, food provisions, and medical treatment facilities.
- Provision of damage and updated maps of the affected local area.

6-30. Support to civil operations may require completion of a Proper Use Memorandum before collection can be authorized. (See appendix E.)

SUPPORT TO ADDITIONAL OPERATIONS

6-31. Special, joint, and multinational operations and operations that support host nations realize the same benefits of GEOINT through visualization, analysis, and a tailorable view of the operational environment.

SUPPORT TO SPECIAL OPERATIONS

6-32. Special operations forces are specifically organized, trained, and equipped to conduct operations independently or in conjunction with the operations of Army conventional, joint, or combined forces. Special operations forces use GEOINT for target analysis, infiltration and extraction, general reconnaissance, humanitarian assistance, military information support operations, or area orientation. The results of the exploitation and the annotated images may be incorporated into an all-source product that focuses on a given threat target, target type, or activity.

6-33. GEOINT products that support special operations forces include but are not limited to—

- Comprehensive, historical, and current imagery in hard and digitized form.
- Detailed facility analysis.
- Development of graphic depictions of the operational environment for the commander and staff.
- Geospatial databases and imagery product libraries that are built and maintained to manage geospatial information.
- Annotated maps, 3D representations of buildings and targets, modeling and simulation products, 3D fly-throughs, imagery, and target graphics that support recognition, identification, location, description, and reporting of objects, activities, and terrain from a variety of geospatial and imagery-based products.
- Secondary Imagery Dissemination System imagery of targets and key terrain.
- Prestrike and poststrike imagery-based products with corresponding reports on the functionality of the target to support combat assessment.
- Highly accurate imagery-based object measurement support.

SUPPORT TO JOINT OPERATIONS

6-34. The objective of joint intelligence operations is to integrate service and national intelligence capabilities into a unified effort that surpasses any single organizational effort and provides the most accurate and timely intelligence to commanders. GEOINT support to joint operations includes the ability to rapidly respond to worldwide threats by providing geo-referenced visual and data products that serve as a foundation and common frame of reference for any joint operation.

6-35. GEOINT support includes but is not limited to—

- Traditional and specialized hardcopy geospatial products and electronic data. An example of specialized products would be those developed using AGI techniques.
- Safety of navigation products and services.
- Populating and maintaining national databases that provide the visualization and analytical framework to support decisionmaking.
- Managing the acquisition of commercial and foreign government geospatial and remote sensing data for DOD users.
- Maintaining crisis-specific GEOINT products and data on NGA Web sites posted on JWICS and SIPRNET to complement direct support activities.

6-36. GEOINT provides a common framework for supporting joint operations to better enable mission accomplishments across the operational themes—from peacetime military engagement to major combat operations. GEOINT support to joint operations is the multidirectional flow and integration of geospatially referenced data from all sources to achieve shared situational awareness of the operational environment, near real-time tracking, and collaboration between forces. The GEOINT cell contains geospatial and imagery competencies required to oversee GEOINT support to the joint force. The GEOINT cell at the combatant command coordinates closely with the JFC GEOINT cell to ensure continuity of operations across all functions, organization levels, and levels of war.

Note. Army GEOINT cells, as referenced outside this chapter, differ in scope and control from those in joint publications and other DOD guidance.

6-37. The GEOINT cell interfaces directly with mission customers to define user requirements. It then interfaces with the NSG to obtain and provide the best quality GEOINT directly to the joint warfighter in fulfillment of the broad range of requirements depicted by various mission functions. The GEOINT cell supports joint operations with the following five activities:

- Define GEOINT requirements.
- Obtain mission-essential GEOINT.
- Evaluate GEOINT content and form.
- Use and share GEOINT.
- Maintain GEOINT data.

Define GEOINT Requirements

6-38. The GEOINT cell collects and prioritizes GEOINT mission requirements, which employ a standardized process that defines the following:

- Mission partners and other trusted data sources.
- Baseline data layers that form the starting point for analysis, visualization, and sharing scenario-dependent layers that typically change frequently or are somewhat specialized.
- Search parameters.
- Forms.
- Geographic area coverage requirements to support Annex B (Intelligence) (see FM 5-0, appendix E).

Obtain Mission-Essential GEOINT

6-39. The GEOINT cell uses technological advances and improved metadata tagging on NSG products, enabling the joint warfighter to efficiently search geospatial databases to—

- Identify geospatial information sources, imagery, and sensors.
- Access unified operations directories, catalogs, or web mapping services and libraries.

Evaluate GEOINT Content and Form

6-40. In this operational flow, the *evaluate GEOINT content and form* activity includes subactivities, as needed to—

- Conflate.
- Manage production.
- Augment and value-add.
- Put into usable form and format.

6-41. The next subactivity is the identification of gaps in coverage, existing sources, and planned-source acquisition. The results are evaluated to determine if data is available, meets requirements, and in the required form. In the event the required GEOINT does not exist or does not fully meet the stated requirements, GEOINT may need to be generated, and the GEOINT cell may monitor and track capabilities of providers and the capacity of distribution channels. The JFC GEOINT cell employs standardized processes enabling the joint warfighter to make decisions about the most effective approach for meeting the requirements within specified timelines. From available NSG assets, the GEOINT cell may—

- Submit collection requests to NGA via combatant commands and DIA in accordance with NSG processes. This ensures requirements are documented in the appropriate GEOINT system.
- Collect geospatial data using organic assets and exploit this data to extract the required geospatial information.
- Request combatant command support in tasking other assets within the NSG.

Use and Share GEOINT

6-42. The ultimate objective of GEOINT in joint operations is enabling the joint warfighter to use GEOINT to more efficiently complete the assigned mission. GEOINT is shared with the NSG, combatant commands, and across the JTF down to the lowest tactical level to achieve shared awareness of the operational environment. GEOINT developed below the JTF level is made available to the JTF and combatant command to augment the TGD and NSG library holdings. Theater-level storage, retrieval, and production capability is required for all components of GEOINT.

Maintain GEOINT Data

6-43. As changes and updates are received, relevant GEOINT must be kept current and continuously validated for accuracy and consistency. Data element changes must be conflated with current data and shared across forces to maintain consistency in the shared awareness of the operational environment. The GEOINT cell, in conjunction with NGA, may—

- Receive updated GEOINT.
- Purge databases and archive deleted holdings as necessary.
- Establish version control and naming conventions.
- Check reliability, availability, metadata, and authentication.
- Monitor and track holdings throughout the command to ensure use of the most current and relevant GEOINT in accordance with mission requirements.

SUPPORT TO MULTINATIONAL OPERATIONS

6-44. *Multinational operations* are operations conducted by forces of two or more nations, usually undertaken within the structure of a coalition or alliance (JP 3-16). Multinational operations have a unique operational environment due to the nature of the mission. The purpose of the operations and participants involved determines the GEOINT products needed. Multinational operations require interoperable GEOINT data (geospatial information and imagery), applications, and data exchange capabilities. Participants should agree to collaborate with a standard datum and ensure all products use that datum. A multinational GEOINT plan must coordinate all products for use by member forces, including disclosure and release issues, accessibility approval and procedures, and the blending of assets into a cohesive production program.

6-45. GEOINT products that support commanders in multinational operations include but are not limited to—

- MTI that provides I&W.
- Planning maps, nautical and aeronautical charts, imagery, and digital data.
- Preassembled packages of selected maps, charts, and other geographic materials of various scales to support the planning and conduct of noncombatant evacuation operations in selected countries or areas.
- Aeronautical products that include aim point graphics, automated air facilities information files, aeronautical charts and graphics, and airfield products.
- Nautical or hydrographic products that include digital nautical charts, digital bathymetric databases, hydrographic charts, and port graphics.
- Geospatial products that include compressed arc-second raster chart digitized (ARC) raster graphics, CIB, digital terrain elevation data, shuttle radar topography mission (SRTM) elevation data, mission specific data sets, tactical terrain data (TTD), and image city maps (ICMs).
- Detailed characteristics of potential detention facilities, recovery sites, and other operationally significant features.
- Precision positioning, collateral damage assessment, targeting, and battle damage assessment products.
- Proper product release authorities.

SUPPORT TO HOST NATIONS

6-46. *Host-nation support* is civil or military assistance rendered by a nation to foreign forces within its territory during peacetime, crisis or emergencies, or war based on agreements mutually concluded between nations (JP 4-0). Host-nation support can include foreign humanitarian assistance, personnel recovery, country rebuilding, and counterdrug operations. Considerations for GEOINT are the releasability of GEOINT products, transparency with the host nation, and the interoperability between the Army and host nation.

6-47. GEOINT products that support the commander in host-nation support include but are not limited to—

- Identification of structures and terrain that can be used for orienting the recovery force and isolated personnel.
- AGI products, such as change detection, environmental damage assessment for the area of interest, or spectral or temporal analysis to locate mass graves.
- Environmental assessment of the area of interest.
- FMV exploitation of activities on the ground, providing situational awareness to the commander.

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Appendix A

GEOINT Attachments to Orders and Plans

Planning is the means by which commanders envision a desired outcome, layout effective ways of achieving it, and communicate to their subordinates their vision, intent, and decisions, focusing on the results they expect to achieve (FM 3-0).

ATTACHMENTS

A-1. Attachments contain details not readily incorporated into the base order or plan or a higher level attachment, for example, appendixes contain information necessary to expand annexes; tabs expand appendixes; enclosures expand tabs. Attachments are portrayed in the manner that best fits the information, for example, text, an image, a sketch, an overlay, or an overprinted map.

A-2. Local commands may require attachments that address GEOINT. If not located in the base order or plan, this information may be located in Annex B (Intelligence) to the base order or plan. If required, the information can be expanded into an appendix. For orders and plans, GEOINT is addressed in Appendix 7 (GEOINT) to Annex B (Intelligence).

A-3. Additionally, GEOINT products can be used as attachments to support base orders or plans or attachments to a base order or plan.

OPERATION ORDERS AND PLANS

A-4. An *operation order* is a directive issued by a commander to subordinate commanders for the purpose of effecting the coordinated execution of an operation (JP 5-0). There are several techniques for issuing an order: verbal, written, or electronically produced using matrices or overlays.

A-5. A *operation plan* refers to any plan for the conduct of military operations prepared in response to actual and potential contingencies (JP 5-0).

A-6. The amount of detail provided in an order or plan depends on several factors, including—

- Experience and competence of subordinate commanders.
- Cohesion and tactical experience of subordinate units.
- Time.
- Complexity of the operation.

A-7. Commanders balance these factors with their guidance and commander's intent, and determine the type of plan to issue. (See FM 5-0 and JP 5-0 for types of orders and plans.)

ORDERS AND PLANNING DEVELOPMENT

A-8. Commanders and staffs use the MDMP to develop an operation plan or operation. The MDMP consists of the following steps:

- Receipt of mission.
- Mission analysis.
- COA development.
- COA analysis (war game).
- COA approval.
- Orders production.

RECEIPT OF MISSION

A-9. As stated in chapter 6, formal planning begins with the receipt of the mission from higher headquarters or as directed by the commander. However, before formal planning, GEOINT cells have a vast amount of preparation and data processing for mission analysis.

MISSION ANALYSIS

A-10. A thorough mission analysis is crucial to planning. The following outlines the 17 separate tasks associated with mission analysis and the GEOINT cell's involvement.

Task 1—Analyze Higher Headquarters Order

A-11. In addition to the requirements stated in FM 5-0, the G-2/S-2—

- Analyzes the higher headquarters order to determine the higher commander's views on the effects of the threat, terrain and weather, and civil considerations.
- Determines which higher command intelligence and reconnaissance assets are supporting operations.

A-12. The GEOINT cell seeks information that includes but is not limited to—

- Digital terrain data to develop the foundation layers for the COP.
- Imagery reports:
  - Imagery interpretation report (IIR) messages.
  - Initial phase interpretation reports.
  - Supplemental programmed interpretation reports.
  - Inflight reports.
  - Reconnaissance exploitation reports.
- Hardcopy image products—target packages on areas, structures, and individuals tasked for reconnaissance, surveillance, or target acquisition.
- Soft copy image products:
  - LIDAR.
  - CIB.
  - BuckEye.
  - Fly-throughs.
  - FMV.
  - Imagery-derived products.
  - Commercial imagery-based products.
- Terrain analysis products showing the military aspects of terrain and its effects on friendly and threat operations for the AO.
- Urban terrain analysis products showing the military aspects of urban terrain and its effects on friendly and threat forces performing urban combat.
- Analysis of civil and cultural considerations, including IPB overlays, information operations, and combat and military information support operations assessments.
- Weather conditions and effects on terrain and imagery collection assets.
- Higher echelon GEOINT organizations and imagery collection assets available to support the operation.

Task 2—Perform Initial Intelligence Preparation of the Battlefield

A-13. During IPB—

- The G-2/S-2 refines higher intelligence products based on the commander's requirements.
- The GEOINT cell reviews its GEOINT holdings and requests additional data if needed.

- The G-2/S-2 leads the staff through the IPB process.
- The other staff officers assist the G-2/S-2 in developing IPB products required for planning, including threat situation and event templates.

A-14. IPB begins during mission analysis, is refined during the rest of the MDMP, and continues during the conduct of operations. It consists of four steps:

- Step 1—Define the operational environment.
- Step 2—Describe environmental effects on operations.
- Step 3—Evaluate the threat.
- Step 4—Determine threat COAs.

A-15. The major results of initial IPB are geospatial products developed from the examination of—

- Physical and human characteristics of the AO.
- Threat situational overlays.
- Threat event templates and matrices.
- High-value target lists.
- Identified intelligence gaps that the commander uses to establish initial information requirements and an initial ISR plan.

A-16. See FM 2-01.3 for a detailed discussion of the IPB process and products.

A-17. During IPB, GEOINT support to the warfighting functions (movement and maneuver, intelligence, fires, sustainment, command and control, and protection) is described in paragraphs A-18 through A-28.

Movement and Maneuver

A-18. GEOINT support to movement and maneuver is closely related. During IPB, the GEOINT cell begins its analysis with the intelligence assessment of the threat's objectives, capabilities, and probable COAs. It then analyzes the terrain using the five military aspects of terrain provided by the terrain-analysis unit—observation and fields of fire, avenues of approach, key terrain, obstacles, and cover and concealment (OAKOC).

A-19. Analysis also includes the mission variables—mission, enemy, terrain and weather, troops and support available, time available, civil considerations (METT-TC), with careful consideration of the effects of the civil population (refugees) regarding unit movement. This analysis is based, not only on characteristics of the ground, but also on the threat and commander's intent.

A-20. During mission planning, geospatial analysts support the engineer and the commander by visualizing the AO by thoroughly portraying the military advantages and disadvantages. The GEOINT cell provides detailed information necessary to understand the terrain regarding maneuver, mobility, and survivability. The geospatial assessment produces recommendations on battle positions and engagement-area sightings as well as initial information necessary to develop an obstacle plan and shape the AO from an engineer perspective: mobility, countermobility, survivability, and sustainment and geospatial engineering.

Intelligence

A-21. Intelligence uses the IPB process to analyze the threat and terrain and weather in a specific geographic area for all types of operations. The IPB process integrates threat doctrine with terrain and weather, as they relate to the mission within a specific operational environment, to determine and evaluate threat capabilities, vulnerabilities, and probable COAs. This analytical process builds an extensive database for each potential area that a unit may be required to operate.

A-22. The IPB process determines the impact of the threat, weather, and terrain on operations. The terrain-analysis portion of the IPB process is critical for determining how the threat will project its forces within the AO and, ultimately, the area of interest. The IPB process supports running estimates and decisionmaking. Applying the IPB process helps the commander selectively apply and maximize combat power at critical points in time and space in the AO:

- **Define the operational environment.** The G-2/S-2—
  - Identifies characteristics that influence friendly and threat operations.
  - Establishes area of interest limits and identifies gaps in current intelligence holdings.
  - To focus the remainder of the IPB process, identifies characteristics that require in-depth evaluation of their effects on friendly and threat operations (such as terrain, weather, logistic infrastructure, and demographics). These characteristics are analyzed in more detail within the command's AO.
- **Describe environmental effects on operations.** The G-2/S-2 identifies limitations and opportunities the environment offers for potential operations of friendly and threat forces. This evaluation focuses on the general capabilities of each force until COAs are developed later in the IPB process. This step includes an examination of terrain and weather, but it may also include discussions of the characteristics of geography and infrastructure and their effects on friendly and threat operations. Products developed in this step might include overlays that depict military aspects and effects of terrain and integrated products, such as modified combined obstacle overlays.
- **Evaluate the threat.** The G-2/S-2 and staff analyze the command's intelligence holdings to determine how the threat normally organizes for combat and how it conducts operations under similar circumstances.
- **Determine the threat's COA.** The G-2/S-2—
  - Integrates results of previous steps into a meaningful conclusion.
  - Determines the threat's likely objectives and available COAs based on preferred actions and the effects of the specific environment in which the threat currently operates.

Fires

A-23. Fire-support assets that support maneuver forces include field artillery systems, mortars, tactical air units, naval gunfire, Army aviation units, and offensive EW. Essential geospatial support provided to fire-support planning includes tactical decision aids.

A-24. Field artillery survey planning and coordination begin at the corps artillery survey planning and coordination element with an interface between the geospatial engineers and the survey planning and coordination element at division artillery and field artillery brigades. Army aviation assets receive terrain support from the following tactical decision aids, which support mission planning and rehearsal: flight-line masking, shaded relief, and vertical obstruction.

Sustainment

A-25. *Sustainment* is the provision of logistics and personnel services required to maintain and prolong operations until successful mission accomplishment (JP 3-0). The art of logistics is integrating strategic, operational, and tactical support while simultaneously moving units, personnel, equipment, and supplies in timely execution of the commander's intent and concept of operations. Logistic elements receive essential geospatial information, such as—

- Line of communications tactical decision aids.
- Potential resupply points.
- Assembly area tactical decision aids.
- Cover and concealment tactical decision aids.

Command and Control

A-26. In the modern operational environment, the magnitude of available information (including geographic information) challenges leaders at all levels. Ultimately, they must assimilate thousands of bits of information to visualize the operational environment, assess the situation, and direct military action to achieve victory. Geospatial analysts are an essential link for commanders to visualize the AO.

A-27. Geospatial analysts provide the commander's staff with timely GI&S for planning, coordinating, and establishing control measures consistent with the commander's intent. The Army integrates its operations with other Services, national agencies, and multinational and coalition forces. This necessitates a COP with a foundation based on geographic information. The management and exploitation of the terrain database is a geospatial engineer function.

Protection

A-28. A key element of protection is air defense artillery. Air-defense-artillery assets protect maneuver forces from threat air attacks. These assets receive support from tactical decision aids, such as—

- Flight-line masking.
- Air avenues of approach.
- Elevation tint.
- Flight-line target locator.
- Obstructed-signal loss.
- Surface-wind direction.
- Visibility.

Task 3—Determine Specified, Implied, and Essential Tasks

A-29. The G-2/S-2—

- Analyzes the higher headquarters order to identify assigned specified ISR tasks.
- Develops any implied tasks that must be performed to accomplish the stated specified tasks.
- Provides a list of specified and implied tasks to the G-3/S-3.
- Assists in determining essential tasks for inclusion in the command's mission statement.

A-30. The GEOINT cell reviews the order for specified and implied tasks related to GEOINT, informs the G-2/S-2, and provides a recommendation to the G-2/S-2 if there are any essential GEOINT tasks.

Task 4—Review Available Assets

A-31. The G-2/S-2—

- Reviews the status of the command's ISR assets.
- Identifies additions or deletions made by the higher headquarters order.
- Indentifies other ISR support available for the operation.
- From this review, determines if the command has the necessary assets to accomplish all collection tasks.
- Identifies shortages and recommends additional resources.

A-32. The GEOINT cell—

- Assists the G-2/S-2 in determining if the command has sufficient imagery collection support.
- Recommends what higher headquarters support is needed.
- Reviews its geospatial data holdings to identify additional required data.
- Coordinates with higher echelons to obtain or request collection of the data.

Task 5—Determine Constraints

A-33. A typical constraint for ISR operations is establishing a limit of advance for air or ground reconnaissance. The G-3/S-3 performs this task with assistance from the G-2/S-2. The GEOINT cell has no role in this task. (See FM 5-0 for more information on this task.)

Task 6—Identify Critical Facts and Assumptions

A-34. The G-2/S-2 and staff are responsible for gathering two categories of information concerning assigned tasks—facts and assumptions. The GEOINT cell assesses facts and assumptions relative to terrain that are relevant to the operation. (See FM 5-0 for more information on this task.)

Task 7—Perform Risk Assessment

A-35. The G-3/S-3 performs this task with assistance from the staff. Although the GEOINT cell has no direct role in this task, the cell can be tasked to provide products that aid in coordinating the implementation of safety measures designed to mitigate risk. (See FM 5-0 for more information on this task.)

Task 8—Determine Initial CCIRs and Essential Elements of Friendly Information

A-36. Task 8 is the first step in developing a collection plan:

- The staff does not develop priority intelligence requirements until COA analysis.
- The commander—
  - Does not approve priority intelligence requirements until COA approval.
  - In the mission analysis briefing, states what is *known*; *thought to be known*; and *unknown*.
- The G-2/S-2—
  - Recommends to the intelligence team what information to collect and analyze to support continued planning and COA development.
  - Recommended information requirements help the commander filter information available by defining what is important to mission accomplishment.
  - Recommended information requirements help the staff and subordinate commands focus their efforts.

A-37. The GEOINT cell—

- Reviews intelligence holdings relative to terrain and imagery.
- Determines additional products needed to accomplish its mission.
- Confirms if the data is available from external agencies.
- Submits requests for collection support to the ISR section for validation and inclusion in the command's ISR plan.

Task 9—Determine the Initial ISR Plan

A-38. The G-3/S-3 is the staff proponent of the ISR plan—an integrated staff product executed by the unit at the commander's direction:

- The G-3/S-3, assisted by the G-2/S-2, uses the ISR plan to task and direct available ISR assets to answer CCIRs and other intelligence requirements.
- The G-2/S-2 must have its input and products ready for publication as part of the warning order issued by the G-3/S-3 at the conclusion of mission analysis.
- GEOINT collection priorities are established at this time.

Task 10—Update the Operational Timeline

A-39. The commander and staff—

- Compare the threat operational timeline developed during IPB and illustrated by the event template and matrix with the timeline established by the higher headquarters order.
- Determine windows of opportunity to exploit threat vulnerability.
- Determine times the command may be at risk from threat activity.

A-40. The GEOINT cell has no direct role in this task.

Task 11—Write the Restated Mission

A-41. For task 11—

- The chief of staff drafts a recommended mission statement based on the staff's mission analysis and presents it for approval to the commander at the conclusion of the mission analysis briefing.
- The G-2/S-2 provided input for the restated mission during task 3 and normally has no further input at this time.
- The GEOINT cell has no direct role.

Task 12—Deliver a Mission Analysis Briefing

A-42. The mission analysis briefing is a decision briefing resulting in an approved restated mission, commander's intent, and commander's planning guidance. During this briefing—

- The staff, if time permits, briefs the commander on its mission analysis results.
- The G-2/S-2—
  - Briefs initial IPB products developed for threat, terrain and weather, and civil considerations.
  - May also brief the initial ISR plan if the command is in a position to collect combat information and intelligence.
  - As do the rest of the staff, presents relevant information the commander needs in order to develop situational understanding and formulate planning guidance.
- The geospatial engineering technician either prepares the G-2/S-2 to deliver the terrain portion of the briefing or delivers the briefing personally.

Task 13—Approve the Restated Mission

A-43. Immediately after the mission analysis briefing, the commander approves a restated mission. Once approved, the restated mission becomes the command's mission. The GEOINT cell has no direct role in this task.

Task 14—Develop the Initial Commander's Intent

A-44. For task 14—

- The G-2/S-2—
  - Is generally concerned with the commander's intent as it applies to the warfighting functions.
  - As the staff proponent, is mostly concerned with the intelligence warfighting function and the commander's intent for ISR.
  - Makes recommendations relating to ISR, informally, before the mission analysis briefing or at the conclusion of the intelligence portion of the briefing.
- The commander considers the G-2's/S-2's recommendations before formulating the commander's guidance and intent.
- The GEOINT cell makes recommendations to the G-2/S-2 for GEOINT priority of effort and support.

Task 15—Issue the Commander's Planning Guidance

A-45. The commander issues the planning guidance after the mission analysis briefing and before the start of COA development. The GEOINT cell has no direct role in this task.

Task 16—Issue a Warning Order

A-46. Immediately after the commander gives planning guidance—

- The G-3/S-3 issues a warning order.
- The G-2/S-2 input into the warning order, at a minimum, includes—
  - The threat situation paragraph.
  - Intelligence collection priority.
  - Intelligence support priority.
  - Intelligence tasks to subordinate units.
  - Information requirements.
- GEOINT-related collection tasks that have been developed may be included in the ISR plan.

Task 17—Review Facts and Assumptions

A-47. During the rest of the MDMP, the commander and staff periodically review facts and assumptions. New facts may alter requirements; therefore, further mission analysis may be required. Assumptions may become facts or invalid. Whenever the facts or assumptions change—

- The commander and staff—
  - Assess the effect of these changes on the plan.
  - Make the necessary adjustments, including changing the CCIR, if necessary.
- The GEOINT cell reviews facts and assumptions relative to terrain analysis.

COURSE OF ACTION DEVELOPMENT

A-48. The purpose of COA development is to update staff running estimates and prepare COA options for the commander's consideration:

- The staff develops friendly COAs based on facts and assumptions identified during IPB and mission analysis. By incorporating IPB results into COA development, each friendly COA takes advantage of opportunities the environment and threat situation offer.
- The G-2/S-2—
  - Collaborates closely with the G-3/S-3 and staff to analyze relative combat power and develop friendly COAs that can defeat threat operations. Friendly COAs are developed from the threat situation template and threat event template or matrix produced by the G-2/S-2 during mission analysis.
  - At the conclusion of COA development, has drafted information requirements for each friendly COA and an ISR overlay and synchronization matrix in preparation for COA analysis.
- The GEOINT cell has no direct role in this step.

COURSE OF ACTION ANALYSIS (WAR-GAMING)

A-49. COA analysis is a disciplined process that includes rules and steps followed sequentially. It relies heavily on an understanding of the environment, doctrine, tactical judgment, and operational experience. Each participating staff member must be prepared with full knowledge of the warfighting function represented. In the war game, the G-2/S-2 role-plays the threat commander and the command's intelligence officer:

- As the **threat commander**, the G-2/S-2 uses the threat situation template as a starting point and the event template or matrix as a guide, to—
  - Develop critical threat decision points relative to friendly COAs.
  - Project threat reactions to friendly actions.
  - Project threat losses.

- As the **command's intelligence officer**, the G-2/S-2—
  - identifies new information requirements.
  - Assists the staff in developing priority intelligence requirements.
  - Refines situation and event templates.
  - Develops the ISR overlay and synchronization matrix.
  - Assists in developing high-payoff targets and the decision support template.

A-50. At the conclusion of the war game, pending the commander's COA approval, every intelligence product that must be published with the warning order should be complete. This includes input into the base order and Annex B (Intelligence) with all appendices and tabs, including the IRS synchronization matrix, collection matrix, and ISR overlay.

A-51. Although the GEOINT cell has no direct role in this step, it monitors the war game to determine and begin production of additional geospatial requirements for possible COAs.

COURSE OF ACTION APPROVAL

A-52. At the conclusion of the war game, the COA decision briefing is held. During the briefing—

- The staff identifies its preferred COA and makes a recommendation to the commander.
- The G-2/S-2—
  - Briefs changes to the current threat situation and environmental factors that have changed since the commander was last briefed.
  - Ensures intelligence products used during the war game are updated, if necessary.
- The GEOINT cell has no direct role in this step.

ORDERS PRODUCTION

A-53. Orders provide updated information and data to subordinate commanders for planning and execution of their operations. During orders production—

- The staff, directed by the G-3/S-3, prepares the order by turning the selected COA into a clear, concise concept of operations and supporting information.
- Before issuing the order, the G-2/S-2 performs an orders crosswalk with the staff as directed by the G-3/S-3.
- The geospatial engineer prepares the Annex B (Intelligence) for the order.
- The G-2/S-2 reviews information relative to GEOINT to ensure its accuracy.

A-54. The primary purpose of the orders crosswalk from an intelligence perspective is to ensure that—

- The base order includes the most current intelligence assessment.
- The intelligence annex is complete and includes the most current intelligence products.

A-55. Other staff annexes are based on the data in the intelligence annex.

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Appendix B
The GEOINT Architecture

The Army's GEOINT integrated architecture demonstrates the seamless availability of national, theater, and tactical GEOINT to Soldiers, planners, and decisionmakers at every echelon. Additionally, deployed forces at every echelon using push, pull, and global query capabilities, across robust commercial and military satellite communications, enable reach capabilities to leverage national, joint, and strategic information databases to support and sustain the intelligence mission area.

THE DISTRIBUTED COMMON GROUND SYSTEM-ARMY

B-1. The current and future venue to deliver reach capabilities is the DCGS-A. DCGS-A—

- Uses a variety of point-to point, broadcast, and web-based networks.
- Is the critical intelligence system for the objective force at all echelons.
- Receives raw and preprocessed sensor data from all intelligence disciplines at any echelon.
- Processes the sensor data into a finished intelligence product.
- Receives single-source and multidiscipline products from national, regional, and theater intelligence organizations and agencies.
- Allows the analyst to create a new multidiscipline product.

B-2. DCGS-A, as the Army portion of the DOD DCGS family of systems, has a specified two-way (full duplex) external connectivity to—

- DCGS of the USAF, Navy, and Marine Corps.
- NTM receive segment.
- Commercial satellite intermediary or receive segment.
- NTM multi-intelligence sensors or platforms.
- Space-based commercial sensors or platforms.
- Intelligence community partners (CIA, DIA, NGA, NSA) and theater command and control information systems (joint intelligence operations center/joint analysis center).
- JTF and subordinate commands.
- Baseline aircraft ISR sensors or platforms.
- Nonbaseline aircraft ISR platforms.
- Nonbaseline ground ISR platforms or sensors.
- Baseline aircraft ISR sensors or platforms receive segment.
- Multinational aircraft ISR sensors or platforms.
- Multinational ISR tasking, processing, exploitation, and dissemination elements.
- CJTF or JTF.
- JTF and below.

THE GLOBAL INFORMATION GRID

B-3. The *Global Information Grid* is a globally interconnected, end-to-end set of information capabilities, associated processes, and personnel for collecting, processing, storing, disseminating, and managing information on demand to Soldiers, policymakers, and support personnel (JP 6-0).

B-4. The Global Information Grid (GIG) identifies the vast net-centric environment—a framework for full human and technical connectivity and interoperability—that allows all DOD users and mission partners to share the information they need, when they need it, and in a form they can understand and act on with confidence. Additionally, the net-centric environment protects access to information, via individual network adjudication processes, against those who should not have it.

Appendix C

Sensor/Platform Characteristic Matrix

Passive imagery sensors (see table C-1) use natural electromagnetic energy sources, such as the Sun, naturally occurring radiation, or heat-generating objects. Active imagery sensors (see table C-2) generate the electromagnetic (manmade) energy needed to *illuminate* the object that is being imaged. There is a range of active imagery sensing capabilities that serve as a powerful complement to standard spectral imagery.

Table C-1. Passive imagery sensor/platform characteristic matrix

Sensors	*Advantages*	*Disadvantages*
Panchromatic (PAN) (visible) ***Best tool for—*** • Daytime. • Clear weather. • Detailed analysis. • Single-frame acquisition.	• Affords a familiar view of a scene. • Offers system resolution unachievable in other optical systems or in thermal images. • Is preferred for detailed analysis and mensuration. • Offers stereoscopic viewing. • Is impossible to jam a passive sensor.	• Is restricted by terrain and vegetation. • Is limited to daytime use only. • Has limited area coverage. • Has degraded imagery in other than clear weather. • Is subject to denial and deception (camouflage).
Full motion video (FMV) ***Best tool for—*** • Daytime (red, green, blue [RGB]) or nighttime (infrared) (depends if RGB or infrared FMV). • Clear weather. • Detailed temporal, analysis. • Persistent surveillance. • Forensic analysis.	• RGB FMV offers color over black and white PAN still imagery. • Infrared FMV offers nighttime, persistent imaging. • Includes temporal information. • Allows real-time tracking. • Future systems offer high-definition imaging. • Is impossible to jam a passive sensor.	• Has limited field-of-view (FOV). • Is restricted by terrain and vegetation. • RGB FMV limited to daytime only. • Has degraded imagery in other than clear weather. • Aerial platforms affected by weather.
Wide-area persistent surveillance (WAPS) ***Best tool for—*** • Daytime. • Clear weather. • Wide-area event detection. • Forensic analysis.	• Offers near real-time persistent surveillance. • Allows for large FOV event detection providing the "big picture" for intelligence preparation of the battlefield (IPB). • Enables event tracking from start to finish.	• Has limited WAPS analysts and no formal training. • Has limited available tools for automated exploitation. • Has large datasets, making dissemination and storage difficult.
Thermal infrared ***Best tool for—*** • Nighttime. • Clear weather. • Detection of human activity.	• Is impossible to jam a passive sensor. • Includes camouflage penetration. • Has nighttime imaging capability.	• Is ineffective during thermal crossover periods. • Is not easily interpretable; requires skilled analysis. • Cannot penetrate clouds.

Table C-2. Active imagery sensor/platform characteristic matrix

Sensors	***Advantages***	***Disadvantages***
Radar ***Best tool for—*** • Detecting objects at night and in bad weather. • Including synthetic aperture radar (SAR) still frame imagery.	• Is all weather; penetrates fog, haze, clouds, and smoke. • Is for day or night use. • Has active sensor; does not rely on visible light or thermal emissions. • Is the best sensor for change detection; good standoff capability. • Provides large area coverage.	• Is not easily interpretable; does not produce a literal representation of imaged area. • Requires skilled analysis. • Is difficult to obtain positive identification or classification of equipment. • Has terrain masking.
Moving target indicator (MTI) ***Best tool for—*** • Locating, tracking, classifying, and identifying moving targets of interest. • Target profiling based on speed. • All weather. • Daytime or nighttime.	• Is based on radar technology, providing all weather, nighttime and wide-area surveillance capabilities. • See radar advantages.	• Requires automatic processing for tracking and analysis. • See radar disadvantages.
Interferometric SAR (IFSAR) ***Best tool for*** digital elevation extraction for wide areas to meet nighttime collection requirements.	• Acquires accurate, terrain elevation in real-time. • Includes active, all weather acquisition. • Maps large areas.	• Terrain posting and range accuracy. • Not as fine as light detection and ranging (LIDAR) imagery.
Foliage penetrating (FOPEN) radar ***Best tool for—*** • Penetration of common obscuration techniques, nets and foliage. • Separates target from natural background clutter. • Includes ultra high frequency/ very high frequency (VHF/ UHF).	• Is for day or night imaging. • Has all weather availability. • Is an active sensor. • Has good stand-off collection ranges greater than 40 kilometers. • Provides persistent wide-area surveillance.	• Is not easily interpretable. • Requires advanced analysis training. • Cannot detect dismounts.

Table C-2. Active imagery sensor/platform characteristic matrix (continued)

Sensors	*Advantages*	*Disadvantages*
Multispectral imagery (MSI) ***Best tool for—*** • Acquiring spectral signatures used in geospatial product generations and advance geospatial intelligence (AGI). • Frequent use when standard mapping, charting, and geodesy products are not available. ***Note.*** Can be used for bathemetry.	• Is easily interpretable. • Provides naturally colored images of a desired site. • Provides context to otherwise black and white panchromatic (PAN) imagery. • Provides wide-area coverage. • Provides detailed analysis, including spectral signature and material category information.	• Has lower resolution than PAN imagery. • Is limited to daytime use only. • Has degraded imagery in other than clear weather.
Hyperspectral imagery ***Best tool for—*** • Differentiating material types. • Detecting and identifying plumes. • Search and rescue. • Producing cues for high-resolution spot collection sensors. ***Note.*** Used for ecology, mining, denial, and deception (camouflage).	• Is easily discernable. • Is preferred for AGI applications as compared to MSI. • Provides detailed analysis, including spectral signature and material category information. • Provides spectral capability from both aircraft and space platforms.	• Usually has poorer resolution than PAN imagery or MSI. • Has degraded imagery in other than clear wether. • Has large "cubes" of data that inhibit rapid or wide-area coverage. • Has bands that are more sensitive to noise than MSI or PAN imagery bands.
LIDAR ***Best tool for—*** • Providing high-resolution three-dimensional (3D) imaging capability for either 3D visualization or digital elevation mapping. • Using 3D overlay on PAN, red, green, blue (RGB), and visible imagery. ***Note.*** Can be used for bathemetry in shallow waters.	• Has good resolution both in ground sampling and range accuracy. • Provides 3D target imaging regardless of material properties. • Collects in the visible spectrum, near infrared and shortwave infrared. • Is for daytime and nighttime use. • Can be used to locate both manmade and natural targets (dismounts).	• Has limited area acquisition. • Has standoff limitations. • Is not all-weather imaging. • Is heavily absorbed by water.

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Appendix D

GEOINT Training

Geospatial engineers and imagery analysts hold positions in GEOINT cells at the ASCC, corps, division, and BCT levels. An organization's mission focus determines the specific MOS set required to support the commander's intent in the most efficient and effective manner.

GEOSPATIAL ENGINEER TRAINING

D-1. Listed in this section are geospatial engineer training courses.

12Y INITIAL ENTRY TRAINING COURSES

D-2. Geospatial engineer initial entry training courses for enlisted personnel are listed in table D-1.

Table D-1. Geospatial engineer 12Y initial entry training courses

• Introduction to Computers • Advanced Map Reading • Grid Reference Systems • Marginalia • Datum • Coordinates • Projections • Terrain Features Identification • Determine Distance, Elevation, and Location • Introduction to GI&S • Digital Geospatial Data • Data Quality and Accuracy • Ordering and Accessing Geospatial Information	• GPS/PLGR/DAGR • Remotely Sensed Imagery • Analysis of the AO • Troops in Contact Exercise • Tactical-Level Analysis (BCT), Production, and Presentation • Data Import and Export • Mosaic • Subset • Rectify • Classification • Elevation Data Analysis • Change Detection • GI&S Introduction to Factor Overlays	• ArcGIS, Synthesis of Terrain Information • Tactical Decision Aids • Urban Analysis • Battlefield Visualization • IPB • Weather Effects • The MDMP • Staff Functions • Briefing Techniques • Operational-Level Analysis (Division), Production, and Presentation • Battle Update Brief Exercise

ArcGIS	Arc Geographic Information System	**GPS**	Global Positioning System
AO	area of operations	**IPB**	intelligence preparation of the battlefield
BCT	brigade combat team	**MDMP**	military decisionmaking process
DAGR	Defense Advanced GPS Receiver	**PLGR**	Precision Lightweight GPS Receiver
GI&S	geospatial information and services		

125D WARRANT OFFICER BASIC COURSES

D-3. Geospatial engineering technician warrant officer basic courses are listed in table D-2.

Table D-2. Geospatial engineering technician 125D WOBCs

• WOBC Overview and Staff Introduction • Staff Duties and Responsibilities • Staff Plans and Orders • Staff Operations and Sections MDMP/IPB/SWO • Writing and Briefing • Support Form and OER 12Y NCOERs • GEOINT Staff Officer Course • Remote Sensing • Exploitation of RSI • ERDAS Imagine and LPS	• System Administration • Introduction to DG 2.0 • GI&S Users • GI&S Software Configuration • GI&S Introduction to ArcGIS • Geospatial Data Management • GI&S Data Production and Editing • QA/QC of GI&S Data • Spatial Analysis (Tactical Decision Aids) • ESRI ArcInfo Workstations, PLTS, and Data Reviewer (GPC only)	• Geospatial Enterprise • Manage Enterprise Geodatabase and Service and System Administration on Server • Terrain Visualization Skyline Suite • Integrated GI&S Operations Project Management • Strategic, Operational, and Tactical Analysis of the Area of Operations • Military History • Battle Analysis Staff Ride

12Y	geospatial engineer	**MDMP**	military decisionmaking process
ArcGIS	Arc Geographic Information System	**NCOER**	noncommissioned officer evaluation report
ArcInfo	Arc Information	**OER**	officer evaluation report
ERDAS	Earth Resources Data Analysis System	**PLTS**	Production Line Tool Set
ESRI	Economic and Social Research Institute	**QA/QC**	quality assurance/quality control
GI&S	geospatial information and services	**RSI**	rationalization, standardization, and interoperability
GPC	geospatial planning cell		
IPB	intelligence preparation of the battlefield	**WOBC**	warrant officer basic course
LPS	Leica Photogrammetry Suite		

125D WARRANT OFFICER ADVANCED COURSES

D-4. Geospatial engineering technician warrant officer advanced courses are listed in table D-3.

Table D-3. Geospatial engineering technician 125D WABCs

• WOAC Overview and Staff Introduction • GSOC • DG 2.0, Geospatial Server and Workstation System Administration	• GPC and TGD, Manage Enterprise Geodatabase and Services, and System Administration • GPC and TGD, Data Production, and Editing	• QA/QC of GI&S Data • PLTS and Data Reviewer • OIL Project, Geospatial OIL Presentation and Paper • Military History • Battle Analysis Staff Ride

GEOINT	geospatial intelligence	**PLTS**	Production Line Tool Set
GI&S	geospatial information and services	**QA/QC**	quality assurance/quality control
GPC	geospatial planning cell	**TGD**	Theater Geospatial Database
GSOC	GEOINT Staff Officer course	**WOAC**	warrant officer advanced course
OIL	observation, insight, lessons learned		

125D Warrant Officer Senior Courses

D-5. Geospatial engineering technician warrant officer senior courses are listed in table D-4.

Table D-4. Geospatial engineering technician 125D WOSCs

• In processing WOSC Overview • ArcGIS Server • ArcGIS Server Administration • ArcGIS Server Enterprise Geodatabase Configuration and Tuning • ESRI Federal Users Conference (Evaluate Emerging Geospatial Technology)	• Geospatial Data Management in an Enterprise Geodatabase • Managing Geospatial Data Editing Workflows in an Enterprise Geodatabase • Enterprise GI&S System Architecture Design Strategies for GI&S Managers • Enterprise GI&S 125D WOSC Capstone Exercise
125D geospatial engineering technician **ArcGIS** Arc Geographic Information System **ESRI** Economic and Social Research Institute	**GI&S** geospatial information and services **WOSC** warrant officer senior course

IMAGERY INTELLIGENCE TRAINING

D-6. Listed in this section are IMINT training courses.

35G Initial Entry Training Courses

D-7. Imagery analyst initial entry training courses for enlisted Soldiers are listed in table D-5.

Table D-5. Imagery analyst 35G initial entry training courses

• Imagery Analysis Organizations and Equipment • Document Security • Map Reading • Photogrammetry	• Imagery Analysis Procedures • Imagery Analysis Reports • Lines of Communications Analysis • Identification of Military Equipment (Friendly and Threat)	• Ground Equipment Threat Characteristics Analysis • Radar Imagery Analysis • Infrared Imagery Analysis • Digital Imagery Exploitation

35H Initial Entry Training Courses

D-8. CGS operator enlisted personnel receive initial entry training in the fundamentals of CGS operations, operator- or unit-level maintenance, and basic imagery interpretation techniques.

350G Warrant Officer Course

D-9. The IMINT technician warrant officer course ensures the IMINT technician is tactically and technically proficient in managing IMINT collection, analysis, production, and dissemination; IMINT; and ISR synchronization.

GEOSPATIAL AND IMAGERY TRAINING

D-10. Listed in this section are geospatial and imagery training courses.

Advanced Geospatial Analyst Course

D-11. The Advanced Geospatial Analyst course enhances the understanding of GEOINT capabilities by providing a fundamental grasp of MASINT/AGI, denial and deception, and imagery manipulation tool (including software) functionality. The training focuses on when to employ these capabilities, use of exploitation tools, and situational awareness.

ADVANCED REMOTELY SENSED IMAGERY COURSE

D-12. The Advanced Remotely Sensed Imagery course is an advanced level course designed to provide students a solid understanding of advanced spectral imagery processing techniques. The objectives of this course include—

- Understanding the advanced functionality of the Earth Resource Data Analysis System (ERDAS) Imagine software.
- Understanding basic hyperspectral data and applications.
- Understanding radar theory, applications, and analysis.
- Becoming proficient with the use of advanced remotely sensed imagery, processing techniques, and analysis.
- Having introductory hyperspectral training with the Environment for Visualizing Images (ENVI) software.

BASIC OFFICER LEADER COURSE

D-13. The Basic Officer Leader course instructs officer basic skills and knowledge as well as tactical all-source intelligence officer and MI platoon leader skills and knowledge. Subjects include—

- The threat.
- Unit training management.
- EW.
- HUMINT.
- SIGINT.
- IMINT.
- Operations security support.
- Counterintelligence.
- Tactical all-source intelligence production.

COMMUNITY GEOINT ANALYSIS COURSE

D-14. The Community GEOINT Analysis course (CGAC) is an intermediate GEOINT training course that augments entry-level training and bridges the gap from identification to analysis. CGAC is open to selected mid-career noncommissioned officers, warrant officers, and DOD civilians in the geospatial analysis and imagery tradecraft. CGACs objectives include—

- Providing intermediate GEOINT analysis training within a geospatial context.
- Enhancing the geospatial analysis tradecraft at the journeyman level.
- Focusing on analysis training using multiple sensors and sources in a training environment with operational exploitation scenarios.

DISTRIBUTED COMMON GROUND SYSTEM-ARMY

D-15. DCGS-A enables—

- Situational awareness.
- Identification and location of the threat.
- Estimates of the threat's intentions toward the Soldier at all echelons.
- Exploitation and fusion of data from Army, joint, national, and multinational sensors and sources to provide actionable intelligence to the Soldier.

D-16. DCGS-A is the Army component of the DOD DCGS family of systems and the ISR component of battle command. The course teaches individual operator skills to successfully operate the DCGS-A Basic Analyst Laptop (BAL).

FOUNDRY PROGRAM

D-17. The Foundry Program provides funded, focused, predeployment training to MI Soldiers (Regular Army and Reserve Component units) or any Soldier serving as an S-2 or S-2 staff at any echelon (18 series MOSs, geospatial engineers, and military information support operations). The Foundry Program's three tenets are—

- Unit partnership.
- Functional partnership.
- Quick-reaction capabilities.

D-18. The Foundry Program trains, through mobile training teams (MTTs), live environments or operational training opportunities, home-station training, warfighting-function related certification, embedded training support, or one-time special training events.

D-19. The Army GEOINT Battalion at NGIC, Washington Navy Yard, Washington, District of Columbia (DC), is the Foundry Intelligence Training Functional Lead for GEOINT.

GLOBAL BROADCAST SERVICE MOBILE TRAINING TEAM

D-20. GBS MTT provides Soldiers basic skills to employ GBS, with emphasis on setup, maintenance, cryptology, operations, and GEOINT dissemination.

GEOINT MOBILE TRAINING TEAM–LEADERSHIP

D-21. GEOINT MTT-Leadership training provides a GEOINT orientation and capabilities brief to the commanders, G-2/S-2, the analysis and control element chief, assistant S-2, S-2 noncommissioned officer in charge, collection manager, and geospatial and imagery analysts. Additional emphasis is placed on the following GEOINT applications: WARP, SOCET GXP®, PSS-SOF, FalconView, the Image Product Library, AGI, and NGA/AGC geospatial support.

GEOINT PRODUCTION COURSE

D-22. The GEOINT Production course is designed for imagery analysts to develop, sustain, refresh, and enhance MOS skills on current imagery exploitation operational needs. The course places specific emphasis on the following areas:

- Imagery systems.
- Retrieval databases.
- Research applications.
- Exploitation tools.

D-23. Course training takes place at the Army GEOINT Battalion, NGIC, Washington Navy Yard, Washington, DC.

GEOSPATIAL INFORMATION AND SERVICES FOR THE WARRIOR

D-24. The GI&S for the Warrior objectives include—

- Tailoring the training to the unit.
- Training on defining basic geodetic terms, including accuracy, datum, and coordinate types.
- Training on listing geospatial products that can be created or viewed in FalconView, applicable to mission accomplishment.
- Creating a geospatial product with a dataset and FalconView software.
- Identifying applications for FalconView software within the student's unit mission. (This course is basically FalconView on the road, a customizable [with time] course.)

Geospatial Information and Services Joint Staff Officer Course

D-25. The GI&S Joint Staff Officer course provides an overview of key concepts, systems, procedures, and organizations involved in producing GI&S. The course emphasizes knowledge and skills the commanders, staffs, and planners need to leverage NGA's capabilities to support military plans and operations. Course training objectives include—

- Identifying aspects of geospatial fundamentals that affect operations.
- Recognizing GEOINT doctrine and knowing resources available within the NSG to provide GI&S support to military plans and operations.
- Comprehending processes and requirements involved in obtaining NGA GI&S products and services.
- Appreciating how GI&S and additional programs, such as FalconView, Geographic Translator (GEOTRANS), and Defense Logistics Agency (DLA) Map Catalog enable mission planning and terrain visualization.

Global Broadcast Service User Course

D-26. The GBS User course is designed to allow Soldiers to deploy the Transportable Ground Receive Suite (TGRS) to any worldwide conflict. Soldiers receive hands-on training as well as participate in a capstone for students to use all aspects of training received. Course training objectives include—

- Soldiers employing GBS to enable commanders to achieve information superiority.
- Soldiers receiving critical information products, such as imagery, weather, and air-tasking orders composed of large data files.

D-27. Course training takes place at the Army GEOINT Battalion, NGIC, Washington Navy Yard, Washington, DC.

Imagery Exploitation Support System Basic Imagery Analyst Course

D-28. The IESS Basic Imagery Analyst course is for the imagery exploiter who uses IESS to assist in tasking imagery exploitation. Topics include—

- A system overview.
- Software navigation.
- Basic and advanced target and image queries.
- IIR and non-IIR product creation and submission for review and validation.

D-29. Other topics include using the Web-based softcopy client, the Graphical Exploitation Manager (GEM), to enhance everyday workflow processes, such as discovering and retrieving imagery from a site's library and IIR generation. Course training objectives include—

- Performing basic and advanced target and image research queries against the IESS database.
- Using IESS and GEM clients to access and retrieve current and historic imagery residing on the site's image library.
- Exercising all capabilities of the GEM.
- Composing IIR and Non-IIR products in IESS to submit for review and validation.
- Using the image list function, in conjunction with other query tools, to build and save a list of current and past imagery and generate softcopy tasking.

Imagery Analyst Transition Course

D-30. The Imagery Analyst Transition course trains the 35H CGS operator, who is transitioning to 35G imagery analyst, in the fundamentals required for effective integration into the 35G MOS.

IMAGERY INTELLIGENCE OFFICER'S COURSE

D-31. The IMINT Officer's course trains MI officers to manage GEOINT (geospatial information and IMINT) collection, exploitation, processing, production, and dissemination functions; systems; and organizations. Army intelligence officers receive a skill identifier of 1D at the completion of the course.

IMAGERY ORIENTATION COURSE

D-32. The Imagery Orientation course is designed to give intelligence professionals an overview of imagery tools and capabilities. This course covers fundamental tools needed to succeed as an imagery analyst. It is NOT intended to train non-35Gs to be imagery analysts, rather, to give them an overview of what imagery analysts need to efficiently complete timely and accurate intelligence products.

D-33. Skills taught during the Imagery Orientation course assist the 35H CGS operator in transitioning to a 35G imagery analyst. It also provides a knowledge base for leaders without imagery analytical capabilities exposure, so they can readily function in brigade- or battalion-level intelligence or operations positions. Officers and enlisted personnel working within the GEOINT community benefit from learning the diverse aspects of IMINT collection, capabilities, and analytical techniques. Course training takes place at the Army GEOINT Battalion, NGIC, Washington Navy Yard, Washington, DC.

JOINT INTELLIGENCE COMBAT TRAINING CENTER

D-34. The Joint Intelligence Combat Training Center provides tailored battle simulation exercise-based training to resident courses and visiting intelligence staffs and organizations. The center reinforces individual MI skills or tasks in a shared collective training environment and hones MI combat-related commander's staff skills. GEOINT training comprises LIDAR, GMTI, SOCET GXP®, and ArcGIS.

MILITARY INTELLIGENCE CAPTAIN'S CAREER COURSE

D-35. The MI Captain's Career course trains MI officers in MI common core, intelligence support to brigade or battalion operations; intelligence support to division, corps, and joint operations; and intelligence support to counterinsurgency operations. Course graduates are adaptive and competent leaders prepared to manage, teach, and lead intelligence Soldiers of the future.

REMOTELY SENSED IMAGERY COURSE

D-36. The Remotely Sensed Imagery course provides education based on commercial, multispectral imagery with ERDAS Imagine. The objectives of this course are analyzing commercial, multispectral imagery with ERDAS Imagine software in the following areas:

- Digital image processing.
- Landcover classification with multispectral imagery terrain visualization.
- Analysis tools:
  - Imagery annotation and product generation.
  - Hyperspectral imagery concepts.
  - Multispectral image interpretation.
  - Imagery importing and preparation.
  - Imagery concepts and sources overview.

TACTICAL FULL MOTION VIDEO PRODUCTION COURSE

D-37. The Tactical FMV Production course is designed to give intelligence professionals operating within a BCT a basic awareness and understanding of ISR concepts, tactical FMV roles, and how to conduct or analyze FMV missions in a counterinsurgency environment. Upon successful completion of this course, each student is familiar with the following factors as they pertain to tactical FMV missions:

- Threat tactics.
- TTP.
- Blue force operations.
- AO cultural features, behaviors, and infrastructure.

D-38. Course training takes place at the Army GEOINT Battalion, NGIC, Washington Navy Yard, Washington, DC.

TACTICAL EXPLOITATION SYSTEM COURSE

D-39. The Tactical Exploitation System is an operational and theater intelligence and EW asset. The Combined Arms Training Strategy (CATS) is designed to meet the needs of echelons below corps. CATS applies to the Tactical Exploitation System because of its ability to provide timely intelligence support to Army tactical operations. The Tactical Exploitation System integrates hands-on situationally based training events highlighting operator or leader task and skills analysis.

THE SCHOOL OF GEOSPATIAL INTELLIGENCE

D-40. The National Geospatial-Intelligence College (NGC) provides mission essential training, education, and professional development services to enable the U.S. global GEOINT mission. Major areas of training concentration include—

- Entry-level and intermediate training in terrain analysis and surveying for Armed Services personnel.
- GEOINT, analysis, systems, sensors, and related courses.
- Communications, intelligence, professional studies, supervisory and management skills, and leadership and executive development.
- GEOINT-specific acquisition courses.

D-41. NGC serves a broad base of students, including all NGA personnel, members of organizations within the NSG, other intelligence community personnel, and multinational partners supporting NGA's international agreements. The college is accredited by the Council on Occupational Education.

Appendix E

Support Documents

Support documents covered in this appendix are the Proper Use Memorandum and electronic target folders.

PROPER USE MEMORANDUM

E-1. Organizations may require new collection or archived imagery of domestic areas to perform certain missions. Domestic imagery is any imagery collected by satellite (national, commercial, or DOD, including OPIR) and aircraft platforms that cover the land areas of the 50 states; Washington, DC; and the territories and possessions of the United States, out to a 12-nautical mile seaward limit of these land areas. A Proper Use Memorandum that defines the requirements for domestic imagery outlines its intended use and acknowledges that awareness of legal and policy restrictions regarding domestic imagery must be submitted to NGA—for NTM and new commercial domestic imagery collection—or to the combatant command or military Service—for aircraft platform collection.

SUBJECT: Proper Use Statement Memorandum for Exercise XXX

Paragraph 1
State purpose of request, intended use of imagery, location of exercise (military property; federal [Bureau of Land Management land, national forest], state, or U.S. territory or possession; or private property), and timeframes for collections.

Paragraph 2
Identify targets. Provide target name, geo-coordinates (latitude and longitude), and basic encyclopedia (BE) number.

Paragraph 3
List all organizations receiving imagery and derived products. Include desired format and where imagery will be stored (automated information system). State special production requirements and security restrictions for softcopy imagery dissemination.

Paragraph 4
Include the following statement:

I certify that the intended use of the requested information, materials, and imagery derived from classified overhead systems is not in violation of applicable laws, including the statutory authority of this agency. The request for imagery is not for the purpose of targeting any specified U.S. person, nor is it inconsistent with the constitutional and other legal rights of U.S. persons.

Paragraph 5
Certification: “I am authorized as a certifying official on behalf of (requesting command), and I understand I am responsible for the accuracy of the information contained herein and for the proper safeguarding of products received in response.”

Name, rank/grade, position title, and office.

Note. NGA does not require a Proper Use Memorandum for commercial domestic imagery unless the requester is asking for a new collect to be paid with NGA funding. Commercial domestic imagery in the NGA archive does not require a Proper Use Memorandum.

E-2. The Domestic Imagery Release document is required when the Government obtains imagery of private property. This may be an individual's or city's property. The owner or chief executive of a municipality must sign the release. (See the following example.)

Private Property Release Statement

I, name of landowner, hereby give my consent for the U.S. Government to take overhead photographs and collect remote sensing data of my list specific targets, and surrounding area located at enter street, route, city, state, and to use such information for U.S. Government purposes. I understand that the photography and data collection will take place between enter collection dates.

Signature of land owner

E-3. The Army Departmental Requirements Office has Wiki pages on SIPRNET and JWICS listing Army Proper Use Memorandums for each state.

Note. The Army Departmental Requirements Office produces and maintains Proper Use Memorandums for almost all major units. Subordinate units can use these Proper Use Memorandums as long as they are in compliance with them.

E-4. Units and staff organizations performing intelligence activities may not infringe on or violate the rights of U.S. persons. Collecting information on specific targets inside the United States raises policy and legal concerns that require careful consideration, analysis, and coordination with legal counsel. Collection must be in accordance with EO 12333, the National Security Act of 1947, as amended, and DOD 5240.1-R.

E-5. Acceptable reasons for domestic collection include—

- Natural disasters.
- Counterintelligence.
- Force protection.
- Security-related vulnerability assessments.
- Environmental studies.
- Exercise.
- Training.
- Testing.
- Navigational purposes.

E-6. When using—

- **National satellites**, NGA is responsible for the legal review and approval of requests for the collection and dissemination of domestic imagery.
- **Airborne platforms**, an approved Proper Use Memorandum must be on file with the appropriate combatant command or military Service before they can be tasked to collect domestic imagery.
- **Commercial imagery**, intelligence components can obtain domestic commercial imagery without higher level approval for valid mission purposes, such as training or testing on federally owned and operated ranges, calibration-associated systems development activities, and domestic disaster relief operations.
- **UASs** for navigational or target training activities, UASs may collect imagery during formal and training missions as long as the collected imagery is not for the purpose of obtaining information about specific U.S. persons or private property.

ELECTRONIC TARGET FOLDER

E-7. The electronic target folder items in table E-1 are provided as an example. Actual target folder items may or may not be included as the specific needs of the target are defined.

Table E-1. Sample electronic target folder items

Heading:		
• Classification • Target identification • Target name	• Category code • O suffix • Geo coordinates	• Country code • Last update
Target summary:		
• Significance • Critical elements	• Expectation • Collateral damage assessment	• Modernized Integrated Database data
Supporting materials:		
• GEOINT data	• Other	
Weaponeering support:		
• Critical element description	• JDPI graphics (mensurated points)	• Weaponeering solutions
Combat assessment:		
• Weapon system video • Battle damage assessment	• Munitions effects assessment	• Reattack recommendation
Associated/Co-located targets:		
• Units • Equipment	• Facility	• Other
Objectives and guidance		
Folder notes and related information		
GEOINT geospatial intelligence	**JDPI** joint desired point of contact	

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Glossary

SECTION I – ACRONYMS AND ABBREVIATIONS

2D	two-dimensional
3D	three-dimensional
10 USC 467	Section 467, Title 10, United States Code
ABCS	Army Battle Command System
AGC	Army Geospatial Center
AGO	Army Geospatial Intelligence Office
AGI	advanced geospatial intelligence
AMRDS	AGI and MASINT Reporting and Dissemination Service
AO	area of operations
AR	Army regulation
ARL	Airborne Reconnaissance Low
ArcGIS	Arc Geographic Information System
ARMS	Airborne Reconnaissance Multisensor System
ASCC	Army Service component command
ATTP	Army tactics, techniques, and procedures
BCT	brigade combat team
BFSB	battlefield surveillance brigade
CALA	Community Airborne Library Architecture
CCIR	commander's critical information requirement
CGS	common ground station
CIA	Central Intelligence Agency
CIB	controlled image base
CJTF	combined joint task force
COA	course of action
COP	common operational picture
DCGS	Distributed Common Ground System
DCGS-A	Distributed Common Ground System-Army
DIA	Defense Intelligence Agency
DOD	Department of Defense
DODD	Department of Defense directive
EMARSS	Enhanced-Medium Altitude Reconnaissance and Surveillance System
EO 12333	Executive Order 12333
ERDAS	Earth Resource Data Analysis System
EW	electronic warfare

FLIR	forward looking infrared
FM	field manual
FMI	field manual interim
FMV	full motion video
G-2	assistant chief of staff, intelligence
G-3	assistant chief of staff, operations
G-6	assistant chief of staff, signal
GBS	Global Broadcast Service
GEOINT	geospatial intelligence
GI&S	geospatial information and services
GMI	general military intelligence
GMTI	ground moving target indicator
GPC	geospatial planning cell
HUMINT	human intelligence
I&W	indications and warning
IESS	Imagery Exploitation Support System
IFSAR	interferometric synthetic aperture radar
IIR	imagery interpretation report
IMINT	imagery intelligence
INSCOM	United States Army Intelligence and Security Command
IPB	intelligence preparation of the battlefield
IR	infrared
ISR	intelligence, surveillance, and reconnaissance
J-2	intelligence directorate of a joint staff
J-3	operations directorate of a joint staff
JFC	joint force commander
JP	joint publication
JSTARS	Joint Surveillance Target Attack Radar System
JTF	joint task force
JWICS	Joint Worldwide Intelligence Communications System
LIDAR	light detection and ranging
LWIR	long-wave infrared
MARSS	Medium Altitude Reconnaissance and Surveillance System
MASINT	measurement and signature intelligence
MCIA	Marine Corps Intelligence Activity
MDMP	military decisionmaking process
MI	military intelligence
MOS	military occupational specialty
MTI	moving target indicator
MWIR	medium-wave infrared

NASIC	National Air and Space Intelligence Center
NGA	National Geospatial-Intelligence Agency
NGIC	National Ground Intelligence Center
NIPRNET	Nonsecure Internet Protocol Router Network
NRO	National Reconnaissance Office
NSA	National Security Agency
NSG	National System for Geospatial Intelligence
NTM	national technical means
ONI	Office of Naval Intelligence
OPIR	overhead persistent infrared
PSS-SOF	Precision Strike Suite for Special Operations Forces
RFI	request for information
S-2	intelligence staff officer
S-3	operations staff officer
S-6	signal staff officer
SAR	synthetic aperture radar
SIGINT	signals intelligence
SIPRNET	SECRET Internet Protocol Router Network
SOCET GXP	Softcopy Exploitation Toolkit Geospatial Exploitation Product
S&TI	scientific and technical intelligence
TC	training circular
TCPED	tasking, collection, processing, exploitation, and dissemination
TGD	Theater Geospatial Database
UAS	unmanned aircraft system
USAF	United States Air Force
WARP	web-accessed retrieval portal

SECTION II – TERMS

geospatial information and services

Information that identifies the geographic location and characteristics of natural or constructed features and boundaries on the Earth, including: statistical data and information derived from, among other things, remote sensing, mapping, and surveying technologies; and mapping, charting, geodetic data, and related products. (10 USC 467)

geospatial intelligence

The exploitation and analysis of imagery and geospatial information to describe, assess, and visually depict physical features and geographically referenced activities on the Earth. Geospatial intelligence consists of imagery, imagery intelligence, and geospatial information. (10 USC 467)

imagery

The likeness or presentation of any natural or manmade feature or related object or activity, and the positional data acquired at the same time the likeness or representation was acquired, including: products produced by space-based national intelligence reconnaissance systems; and likenesses and presentations produced by satellites, aircraft platforms, unmanned aircraft vehicles, or other similar means (except that such term does not include handheld or clandestine photography taken by or on behalf of human intelligence collection organizations). (10 USC 467)

imagery intelligence

The technical, geographic, and intelligence information derived through the interpretation or analysis of imagery and collateral materials. (10 USC 467)

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