NATIONAL SYSTEM FOR GEOSPATIAL INTELLIGENCE

GEOSPATIAL INTELLIGENCE (GEOINT) BASIC DOCTRINE

Publication 1.0
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MESSAGE FROM THE GEOINT FUNCTIONAL MANAGER

I am pleased to present *Publication 1.0: GEOINT Basic Doctrine, 2018*, to the NSG Community. This publication serves as an introduction to GEOINT, establishes common references and terminology, and directly supports our NSG Strategic Priority "Professionalization – Inspire the Next Generation Talent."

Publication 1.0 is unique because it was created by the NSG Community and carefully crafted to avoid terms and language specific to any Agency or Service. The NSG Working Group (which included representatives from Services and Agencies that train GEOINT professionals) guided and approved all content prior to formal NSG coordination.

One contribution of Publication 1.0 is the establishment of a common, NSG-coordinated GEOINT glossary. This is a basic but very important step to achieve standardized training and certification, shared curricula, and a workforce that can provide GEOINT support in any environment. These goals are also supported by Chapter Four, which contains the first GEOINT Tradecraft Chart to map military occupations to civilian tradecraft roles.

Other key features of Publication 1.0 include:

- Reference charts for platforms and phenomenology
- User-friendly descriptions of GEOINT concepts and functions
- Introduction and definition of the term "GEOINT Enterprise"
- Definitions of GEOINT, NSG, ASG, CAC
- Charts that show members of the NSG, ASG, CAC, and GEOINT Enterprise

Finally, I am proud we were able to complete an unclassified, publically releasable document to help ensure the widest distribution and use across the NSG, ASG, and beyond.

Onward,

R T Cardillo

Robert Cardillo
GEOINT Functional Manager

TABLE OF CONTENTS

INTRODUCTION

PURPOSE.

Geospatial Intelligence (GEOINT) Basic Doctrine, Publication 1.0, (hereinafter referred to as *Pub 1.0*) provides decision makers and intelligence producers a basis for understanding GEOINT to help plan and execute their assigned missions. This document also serves as a common frame of reference for the GEOINT Enterprise Community. As the highest level of doctrine for GEOINT, NSG Pub 1.0 is written at an unclassified level and in a manner that can be readily understood by consumers (non-producers) and new producers of GEOINT. Pub 1.0 also complements the doctrine, tactics, techniques, and procedures and guidance outlined in Joint Publication 2-03, *Geospatial Intelligence Support to Joint Operations*.

GEOINT doctrine is prepared under the auspices of the GEOINT Functional Manager (GFM). Executive Order (E.O.) 12333 "United States Intelligence Activities" (as amended in 2008), Section 1.3 (b) (12) (A) (iii), designates the Director of the National Geospatial-Intelligence Agency (NGA) as the GFM for the U.S. Intelligence Community (IC). The title of GFM encompasses the roles and responsibilities of the Department of Defense (DoD) GEOINT Manager, as defined in DoD Directive 5105.60 "National Geospatial-Intelligence Agency," and the IC Functional Manager for GEOINT, in accordance with applicable law and Director of National Intelligence (DNI) and DoD directives, guidance, and agreements. The GFM leads the National System for Geospatial Intelligence (NSG), as described in Chapter Five.

SCOPE.

This document supersedes *Geospatial Intelligence (GEOINT) Basic Doctrine Publication 1-0*, dated September 2006. As NSG community doctrine, it documents fundamental principles to guide the operation of the NSG and how it produces, maintains, and employs GEOINT. Pub 1.0 includes the legal definition of GEOINT, an overview of data used for GEOINT products, a basic understanding of GEOINT products, an understanding of the GEOINT professional work roles, and a description of the governance framework for the function of GEOINT. GEOINT is rapidly evolving to incorporate capabilities such as data analytics, artificial intelligence, machine learning, deep learning, and computer vision. However, these topics are beyond the scope of this introductory document.

APPLICABILITY.

Pub. 1.0 applies to the NSG, as defined in Chapter Five. It also applies to NSG Partners and the GEOINT Enterprise (also defined in Chapter Five), to the extent defined by their distinct roles. As doctrine, this publication is authoritative but not directive. It does not include policy or strategy but does serve as a foundational guide for the production, maintenance, and sustainment of GEOINT across the NSG Community.

OVERVIEW.

Chapter One presents the legal definition of GEOINT, including a description of its three complementary elements: Imagery, Imagery Intelligence, and Geospatial Information. Since the term GEOINT is used broadly to include the supporting aspects of GEOINT, the chapter also addresses areas that are critical to the function of GEOINT but not included in its definition.

Chapter Two addresses GEOINT data used to create each of the three elements of GEOINT and provides information on how that data is collected. The chapter includes a section that clearly delineates different types of collection platforms, sensors, and GEOINT phenomenologies, and lists the advantages and disadvantages of each type for various circumstances and purposes. Chapter Two also describes additional types of data used for imagery intelligence and geospatial information.

Chapter Three is focused on Products. This chapter describes how GEOINT products are developed using any combination of three types of layers—Geospatial, Mission, and Intelligence—and then explains how elevation, time, motion, and activity may be added to create a more dynamic, realistic, and comprehensive GEOINT product. For the purposes of this document, products are separated into three broad categories: Mission/Event Preparation, Assessment, and Detection. The chapter describes what each of those areas encompasses and provides multiple examples of products in each category to illustrate how they may be used to support specific mission requirements.

Chapter Four discusses GEOINT professionals and defines tradecraft areas. The chapter includes a chart with specific civilian work roles and corresponding military designations for GEOINT professionals.

Chapter Five describes the GEOINT Community, from the entire GEOINT Enterprise to its key elements such as the NSG—which includes U.S. Government GEOINT entities and activities—and the Allied System for Geospatial Intelligence (ASG). The chapter references authorities that designate the Director of NGA as the GEOINT Functional Manager and DoD GEOINT Manager, and outline GFM authorities and responsibilities. Chapter Five also describes GEOINT Community forums and the important role they play in helping the GFM to shape and guide the function of GEOINT.

CHAPTER ONE – WHAT IS GEOINT?

Geospatial Intelligence, also known as GEOINT, is defined by law in Title 10 of the U.S. Code, Section 467 (2005) as:

> **GEOINT:** "The term 'geospatial intelligence' means 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."

Section 467 also provides definitions of the three elements of GEOINT:

- **Imagery.** A likeness or presentation of any natural or man-made 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 or presentations produced by satellites, airborne platforms, unmanned aerial vehicles, or other similar means.

  Imagery includes handheld photography, but, within the context of GEOINT, "does not include handheld or clandestine photography taken by or on behalf of human intelligence collection organizations."

- **Imagery Intelligence.** The technical, geographic, and intelligence information derived through the interpretation or analysis of imagery and collateral materials.

- **Geospatial Information.** Information that identifies the geographic location and characteristics of natural or constructed features and boundaries on the earth and includes: statistical data; information derived from, among other things, remote sensing, mapping, and surveying technologies; and mapping, charting, geodetic data, and related products.

Title 10 U.S. Code, Section 442: MISSIONS

This section of the U.S. Code codifies NGA's national mission and addresses systems and tasking of GEOINT. Although the language does not define GEOINT, it provides additional context about the definition and is shown below to ensure awareness. Title 10, Section 442(a)(2) states:

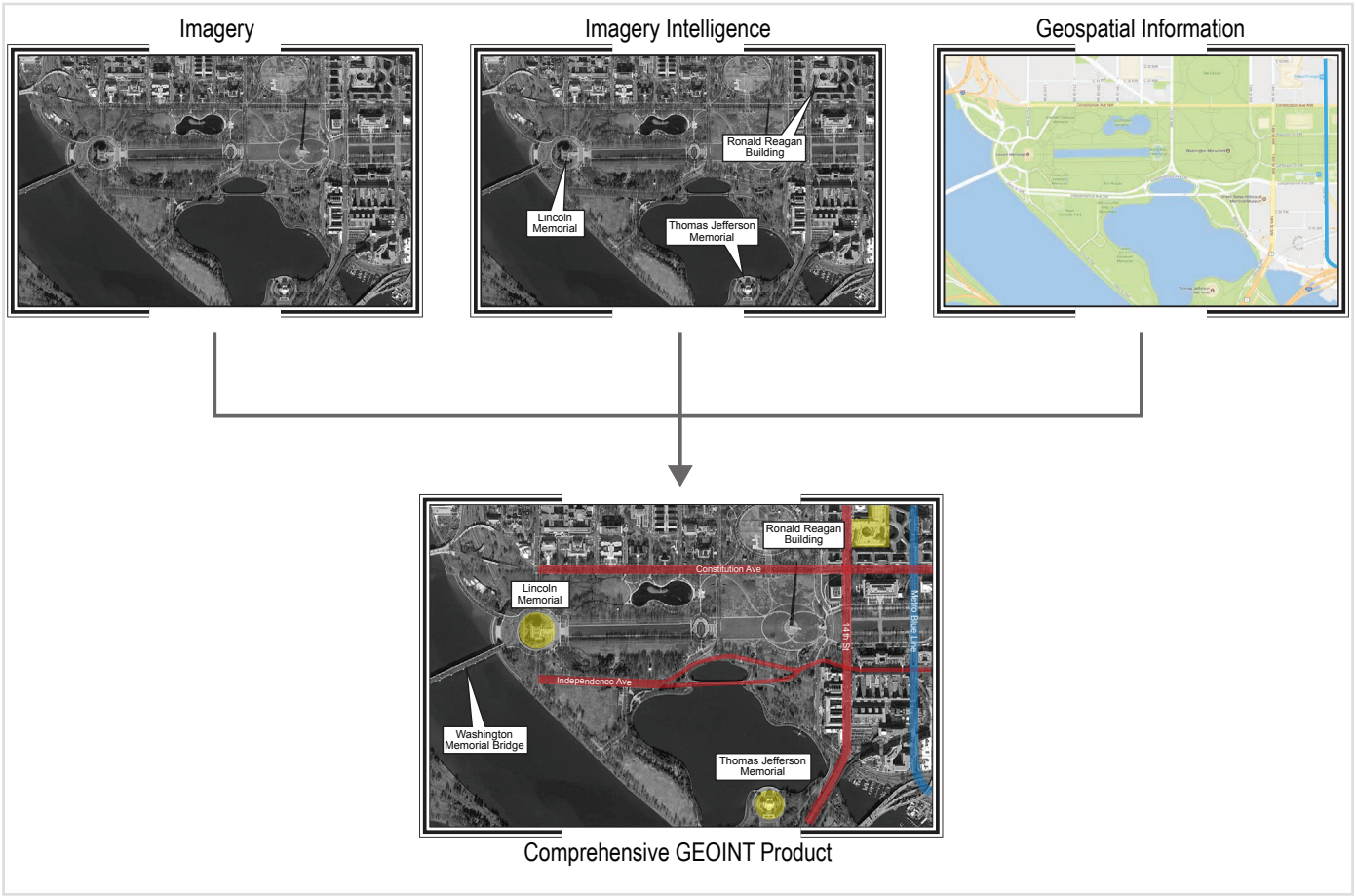
"As directed by the Director of National Intelligence, the National Geospatial-Intelligence Agency shall develop a system to facilitate the analysis, dissemination, and incorporation of likenesses, videos, and presentations produced by ground-based platforms, including handheld or clandestine photography taken by or on behalf of human intelligence collection organizations or available as open-source information, into the National System for Geospatial Intelligence."

"The authority provided by this paragraph does not include authority for the National Geospatial-Intelligence Agency to manage tasking of handheld or clandestine photography taken by or on behalf of human intelligence collection organizations."

Any one or a combination of the three elements, and/or the data used to create them, may be considered GEOINT. GEOINT data is described in Chapter Two.

The graphic below shows an example of each of the three GEOINT elements and the effects of combining all of them into a single product.

- The first frame in the graphic shows **Imagery**, which looks similar to a photograph.
- The second frame shows the same image with notational **Imagery Intelligence**, which refers to the analysis of the image or the information used to develop the analysis. For example, if analysis of the image indicated that the buildings shown are part of a factory used to make a particular type of weapon, that information would be considered imagery intelligence and noted on the image, as illustrated by the white callout boxes.
- The third frame depicts a map with **Geospatial Information,** which provides details— such as roads, transporation networks, location and shape of buildings, and elevation data.



NGA, Analytic Production & Design Center (ATC) Imagery Copyright 2017, DigitalGlobe

The large frame at the bottom is a comprehensive **GEOINT** product that combines all three components in a more informative and useful form to satisfy specific requirements/Essential Elements of Information (EEI)/Requests for Information (RFI) better than any of the individual components can when used separately.

Chapters Two and Three provide other examples of imagery, imagery intelligence, and geospatial information and related products.

Although the legal definition of GEOINT refers only to the **exploitation and analysis** of imagery and geospatial information—which includes processing and analyzing GEOINT data and the resulting products—there are many key areas that enable and are integral to the GEOINT function but are not part of the legal definition. These include training, architecture, data collection, technology, research and development, storage, and dissemination of GEOINT.

GEOINT DEFINITION: UPDATES AND AMPLIFICATION

Changes to the definition of GEOINT are not valid unless they are issued in U.S. Public Law, and amplifications of the definition are not valid unless they are issued or approved by the DNI or the Director of NGA.

Several documents provide amplifications to the 2005 Title 10 legal definition of GEOINT, in accordance with the guidelines stated above, but do not amend the definition provided in U.S. Code:

- The DNI issued a memo on 5 July 2005 that addressed details of what GEOINT collection activities and exploitation and analysis encompass as well as some specifics on what they do not include.
- The DNI issued a memo on 17 October 2005 that provided a detailed description of what "imagery" encompasses, including the capabilities formerly known as imagery-derived Measurement and Signatures Intelligence (MASINT) and Advanced Geospatial Intelligence (AGI).

Language from the unclassified documents, as well as the corresponding language in DoD Directive 5105.60, is provided in Appendix B.

CHAPTER TWO – DATA

This chapter describes the major categories and sources of data for all three elements of GEOINT: Imagery, Imagery Intelligence, and Geospatial Information.

1. IMAGERY

This type of GEOINT Data is collected by a system of sensors and platforms. Sensors collect the data, and platforms are the vehicles or objects to which sensors are attached. The sensor or platform used depends on the type of data to be collected, the conditions in which it is collected, and the purpose for which it will be used. The range of platforms and sensors are described below.

PLATFORMS: This section addresses satellite, aircraft, ground-based, and sea-based platforms. Aircraft, drones, aerostats, balloons, and dirigibles are referred to as *airborne* platforms. Airborne, ground-based, and sea-based platforms may be manned or unmanned/unattended.

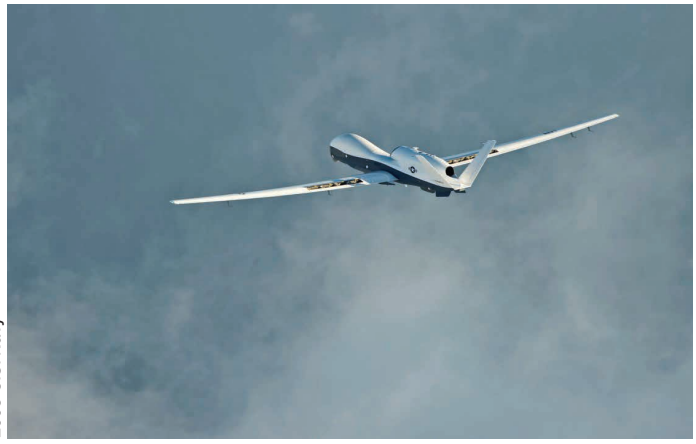
Satellites – Imagery data is collected from space by two satellite sources: Government-owned satellites and private industry-owned satellites, known as *commercial systems.* U.S. Government satellites are used for both unclassified and classified purposes. Satellites orbit at a far higher altitude than airborne platforms, enabling them to collect above any airspace, including sovereign airspace of any nation, hostile territory, and areas to which airborne platforms are denied access.

NGA

Government and Commercial

Government Systems – Sensors attached to government systems are a significant source of GEOINT data used for intelligence and national security purposes. These systems are employed when the government needs discretion in when or where it collects the data. They are used for more sensitive data collection and circumstances. Note that E.O. 12333 restricts U.S. Government systems from imaging U.S. persons.

Commercial Systems – The sensors attached to these vehicles produce unclassified data. The U.S. Government uses unclassified commercial data whenever possible, and increasingly is using commercial systems as a primary source of data. In addition, products derived from commercial system data can be more easily shared with government and military organizations outside the intelligence community, non-governmental organizations (such as non-profit relief organizations), private industry partners, foreign allies, and other foreign nations.



2008 U.S. Navy

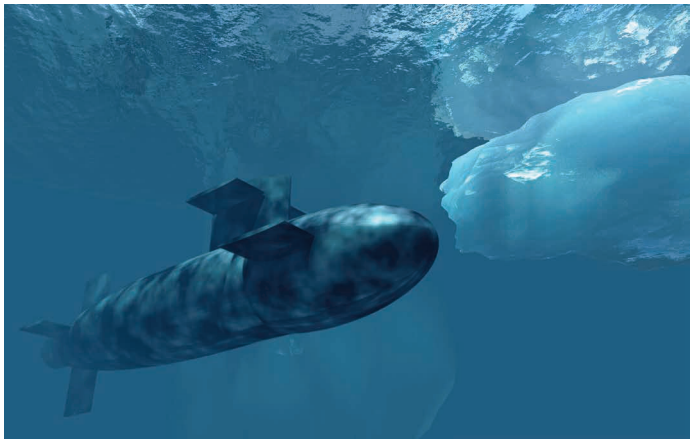
Airborne

Airborne platforms consist of manned, unmanned, fixed wing, and rotatory aircraft, as well as balloons and dirigibles. The sensors and cameras mounted on airborne platforms can provide continuous (known as *persistent*) coverage of a location or target. U.S. Government airborne platforms can often be employed more rapidly than satellites in part because military regional combatant commanders have authority over the platforms, and can re-task the platform in near real time, as required. The effectiveness of airborne GEOINT collection can be limited, however, by denied or contested airspace and adverse weather or atmospherics.

Department of Defense

Ground-based

Ground-based platforms are stationary or moving objects on or beneath the ground that have a camera or sensor attached. These platforms may be manned or unattended. The platforms can be as simple as a pole in the ground, a building, a vehicle, or a human taking photographs (known as *hand-held photography*).



Thinkstock

Sea-based/Maritime

Sea-based platforms include ships, underwater survey vessels, submarines, or buoys. They carry cameras or sensors that may be above or below the surface of the water. The platforms may be manned and unmanned.

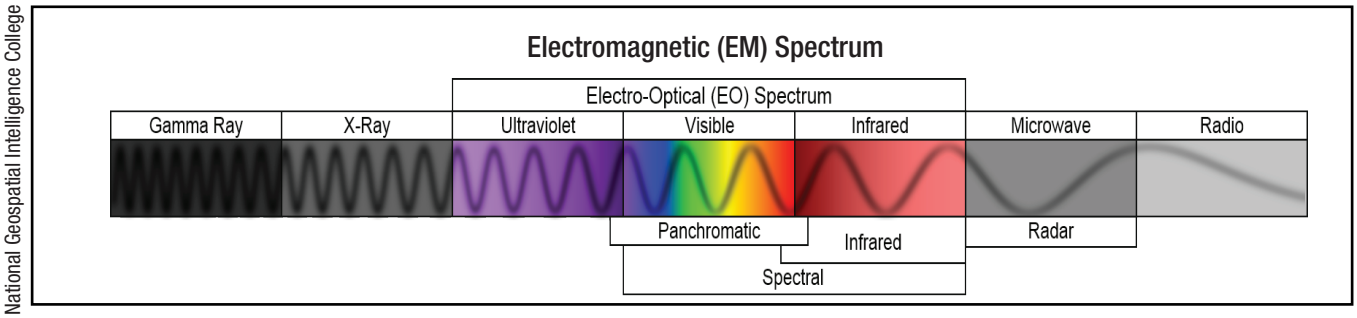
PLATFORM CHART

This chart provides examples of common satellite, airborne, sea-based, and ground platforms, and discusses the basic advantages and disadvantages of using each.

PLATFORM TYPE	EXAMPLES	ADVANTAGES	DISADVANTAGES
Satellite – (Government)	LANDSAT GOES-R	• Global coverage/access • No cost to most users for data • Data is in Government control	• Limited collection opportunities • Limited persistent coverage of target/area • Competition for tasking priority
Satellite – (Commercial)	GeoEye-1, Worldview 1/2/3/4 Radarsat 2	• Global coverage/access • Unclassified - easily releasable • Avoids competition with higher priority IC requirements	• Competition w/ other consumers • Slower availability of products • Tasking/acquisition information generally not secure
Airborne – High Altitude (manned)	U-2/Dragonlady	• Moderate duration/persistence • Rapidly re-tasked under Theater Commander control • Wider sensor area of coverage • Can carry variety of sensors	• Less persistence than possible with UAV • Limited collection into hostile/denied airspace
Airborne – High Altitude (unmanned aerial vehicle, or *UAV*)	RQ-4/ Global Hawk MQ-4/Triton	• Very long duration; persistent surveillance • Rapidly re-tasked under Theater Commander tasking control • Moderate sensor area of coverage	• Limited collection into hostile/denied airspace
Airborne – Medium Altitude (manned)	P-3/AIP	• Moderate duration/persistence • Moderate sensor field of view/range from platform track • Rapidly re-tasked under Theater Commander tasking control • Can carry a variety of sensors	• Less persistence than possible with UAV • Very limited collection into hostile/denied airspace
Airborne – Medium Altitude Long Endurance (MALE), UAV/RPV**	MQ-1/Predator MQ-9/Reaper RQ-7/Shadow MQ-5/Hunter MQ-1C/Gray Eagle	• Long duration; persistent surveillance • Rapidly re-tasked under Theater Commander tasking control	• Narrow field of sensor view • Very limited sensor range from platform • No collection (or high risk) in hostile/denied airspace, A2AD* environment.
Ground	Buildings, Poles, Vehicles, People, Unattended Ground Sensor (UGS)	• High resolution/detail possible • Long duration availability • Less expensive than most other types of platforms • 24-7, open source coverage	• Difficult placement/access in A2AD* environment • Very limited sensor range • Authentication
Sea	Ships, Buoys, Submarines	• Underwater imagery, topography • High-resolution bathymetry	• Limited to good sea conditions • Narrow sensor swaths

Graphic Credit: GEOINT Enterprise Office

*Anti-Access/Area Denial
**Unmanned Aerial Vehicle or Remotely Piloted Vehicle



Portions of the Electromagnetic Spectrum used for Phenomenologies

SENSORS: The two primary categories of sensors are electro-optical (EO) and radio detecting and ranging (radar), and both have several types or variants, known as phenomenologies. Each phenomenology achieves different results with the data. Descriptions of sensor characteristics and phenomenologies are listed below. At the end of this chapter, we discuss how sensors are used to capture and characterize motion.

ELECTRO-OPTICAL (EO)

EO derives data from the ultraviolet through the infrared portions of the electromagnetic (EM) spectrum. Each part of the EM spectrum provides a different representation of the object imaged, depending on the sensor phenomenology used. EO sensors are passive (with the exception of light detecting and ranging, or lidar, described below), which means they use natural EM energy sources such as the sun, naturally occurring radiation, or emitted heat. They generate data by capturing the reflected or emitted electromagnetic energy from an object. These sensors, which operate only in a passive or "receive" mode,* do not emit energy. This factor diminishes the adversary's ability to detect whether they are being imaged. The effectiveness of electro-optical sensors can be degraded or denied by adverse weather, light conditions, and atmospherics.

*Except Lidar

EO PHENOMENOLOGIES

PANCHROMATIC IMAGING (PAN)

PAN uses the visible part of the EM spectrum, along with a portion of IR spectrum, and produces an image similar to a black and white aerial photograph. The images can provide a very detailed and accurate likeness of an area or object, and can show shadows and other distinguishing features that help identify characteristics of an object or environment.

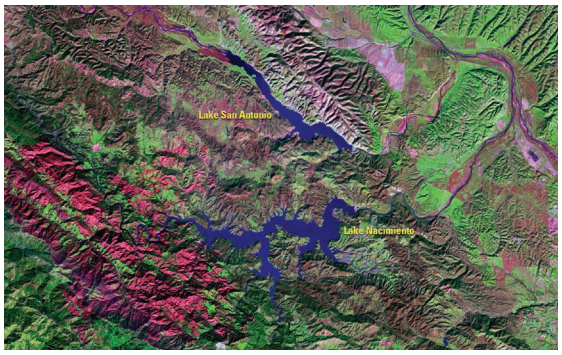
INFRARED (IR)

USGS

IR uses the infrared part of the EM spectrum to detect heat and radiance/reflection, and displays that information in a gray-scale image.

Thermal Infrared (TIR) – TIR is similar to IR, but it uses different wavelengths of the infrared spectrum to indicate the temperature of objects or radiated/reflected heat. The shape and size of the object or environment emitting energy (heat) is shown as a different shade than the rest of the image. Cooler objects appear darker, warmer objects appear lighter, and hot objects appear bright white.

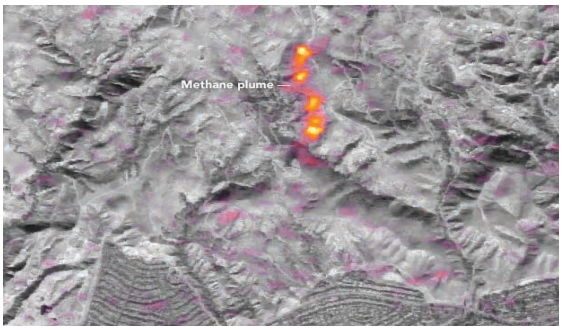
MULTISPECTRAL IMAGING (MSI)



USGS

MSI provides a color image by using tens of additional bands of the visible and infrared portions of the spectrum. It also provides more detail to images, showing characteristics that are not otherwise visible. The bands can be combined in various ways to highlight different manmade or natural features.

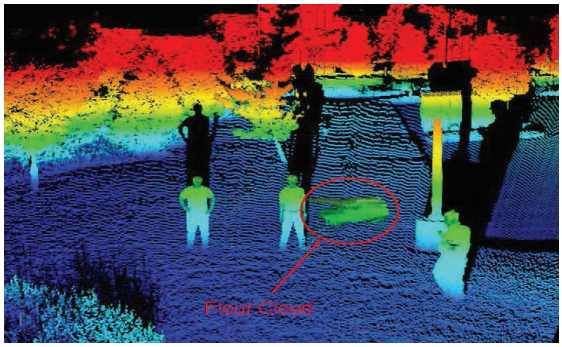
HYPERSPECTRAL IMAGING (HSI)



NASA

HSI is similar to MSI but uses hundreds, rather than tens, of bands of the visible and infrared portions of the EM spectrum. These extra bands can provide greater fidelity and characteristics of an object than MSI. For example, HSI allows users to detect materials by their unique spectral signature.

LIGHT DETECTION AND RANGING (LIDAR)



NGA Office of Corporate Communications

Lidar uses laser pulses in the visible and infrared portions of the EM spectrum. The sensor emits a pulse of laser light toward an object, which reflects back some of the energy to the sensor. The time it takes for the energy to return provides information that helps identify many characteristics of an object and the environment, including distances and heights. For example, shorter roundtrips indicate higher elevations and longer roundtrips indicate lower elevations. The process can be used to develop three-dimensional models of an object, such as a building.

OVERHEAD PERSISTENT INFRARED (OPIR)

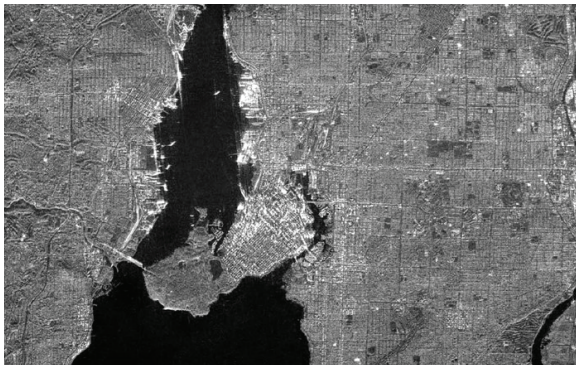
OPIR combines several EO sensor phenomenologies described above to create a unique collection capability that detects energy radiation from tactical and strategic targets and allows continuous (known as persistent) coverage of a mission area. OPIR can detect energy radiance in the visible and near infrared, short-wave infrared and mid-wave infrared parts of the spectrum to characterize energy as an event or process it as a scene.

RADAR

Radars are active sensors that emit manmade electromagnetic energy to illuminate the environment or object they are imaging, and then use the characteristics of the response to create an image. These sensors use reflected radar energy to illuminate objects in day or night and in almost any weather conditions. A radar image is non-literal, which means it does not appear as a photo that shows an exact likeness of an object or environment. It is similar to an X-ray of an area or object, with the ability to detect characteristics that a literal picture would not show. An important feature is that it can be used for poor light and weather conditions in which EO technologies are less effective.

RADAR PHENOMENOLOGIES

SYNTHETIC APERTURE RADAR (SAR)

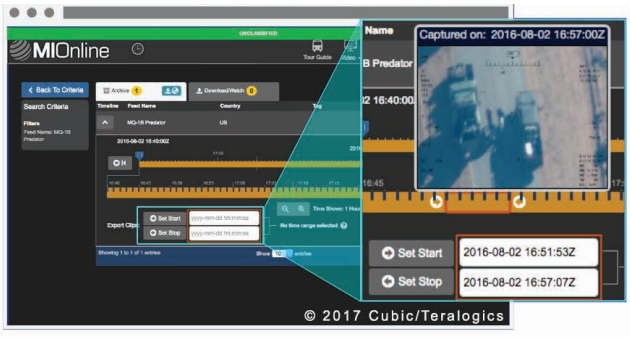


SAR illuminates objects with pulses of microwave energy. It applies signal processing to a series of many pulses to produce imagery.

Interferometric SAR (IFSAR) – IFSAR uses a SAR sensor to observe a location from two separate positions. This method generates elevation data of the Earth's surface.

MOTION GEOINT

Both EO and radar sensors can create or capture motion by collecting multiple frames over a short period of time. This activity is known as Motion GEOINT. The most common types of Motion GEOINT include the following:



Search

Full Motion Video (FMV) – FMV uses many frames per second to create a near-real-time video capability, which may be displayed as visible or IR and may be recorded by digital or analog means. This near-real time capability allows observation of rapidly developing events and is a valuable tool for ongoing operations. It also provides continuous observation of an object, such as a person or vehicle, to analyze its patterns over long periods.

Moving Target Indicator (MTI) – This predominantly radar capability shows only those objects that are in motion and provides information on the speed and direction that objects are moving. Some EO sensors can detect motion in a small area but generally are not considered an MTI capability.

Wide Area Motion Imagery (WAMI) – A set of motion imagery sensors with a wide field of view (FOV) diameter of up to 8 km, which provides continuous surveillance of a broad area.

FMV, MTI, and WAMI are primary sources of collection that allow persistent coverage of a target or area. All three enable forensic backtracking of kinetic events, network analysis, pattern of life (PoL) studies and security monitoring. Motion imagery is also a key enabler of Activity Based Intelligence, as discussed in Chapter Three.

SENSOR & PHENOMENOLOGY CHART

SENSOR/PHENOMENOLOGY	ACRONYM/ SHORT FORM	CHARACTERISTICS	USED FOR (EXAMPLES)
ELECTRO-OPTICAL SENSOR	**EO**	**Typically a passive sensor, uses natural energy sources, ultraviolet through infrared portions of EM spectrum**	**For detailed, literal, photo-like picture of a scene and the objects within it.**
PANCHROMATIC	PAN	Uses the visible section of the spectrum to create black and white (grayscale) images.	Provides a literal picture of a scene, area, and/ or objects. Used in daytime, good weather conditions.
INFRARED	IR	Uses the infrared portion of the spectrum to detect heat/ radiance.	Detects presence of living entities and active vehicles and equipment in day or night. May be limited by bad weather/light conditions, smoke.
• Thermal Infrared	TIR	Uses infrared portions of the spectrum to indicate temperature level of heat/radiance.	Determines operational status of equipment, factories, and nuclear facilities. Penetrate smoke, track activities at airfields, ports, etc.
MULTISPECTRAL IMAGING	MSI	Uses tens of visible ***and*** infrared bands to provide a color image with more detail.	Sees beneath the water; detects camouflage, vegetation density and cover type, mineral, soils, and material analysis; illuminates shadowed material.
HYPERSPECTRAL IMAGING	HSI	Uses hundreds of visible ***and*** infrared bands to provide a greater detail and additional characteristics.	Same as multispectral but with greater levels of detail.
LIGHT DETECTION & RANGING	Lidar	Uses laser pulses in the visible and infrared sections of spectrum.	See objects beneath vegetation canopy, battlefield visualization
OVERHEAD PERSISTENT INFRARED	OPIR	Uses visible and near infrared bands. Characterizes energy as an event, processes as a scene.	Provides persistent coverage. Detects missile launches, wildfires, hostilities, volcanos, and identifies weapons.
RADAR SENSOR	**Radar**	**Active sensor, emits manmade energy sources, uses microwave and radio wave portions of EM Spectrum.**	**Unlike EO, can be used in most weather, day or night.**
SYNTHETIC APERTURE RADAR	SAR	Illuminates objects with microwave energy pulses. Applies signal processing to a series of pulses to produce a single image.	Penetrates foliage, material, and ground (with limitations), detects barriers and overhead power lines. Used in most weather, light conditions. Creates a black & white (grayscale) image.
• Interferometric SAR	IFSAR	Uses SAR sensor to observe from two separate positions to generate elevation data of the Earth's surface.	Identifies elevation data.

Adapted from graphic in U.S. Army Doctrine ATP 2-22-7 "Geospatial Intelligence," March 2015 – Appendix C

2. IMAGERY INTELLIGENCE

Imagery intelligence data is produced during analysis of the imagery and geospatial data. The data may be derived from analytic expertise, classified data, unclassified information, analysis techniques, or any combination of those sources. For example, an analyst may determine that two objects on an image are foreign aircraft from a specific country based on expert knowledge of foreign aircraft. The analyst may then use unclassified publications to determine the exact nomenclature of the aircraft and review classified intelligence reporting to assess whether this is the first appearance of such aircraft in this location and if the arrival of the aircraft is related to military or political activity in the area. The analyst might also employ analysis techniques to determine other information about the aircraft, location, or arrival details.

3. GEOSPATIAL INFORMATION

Geospatial Information is derived from data collected through many different sources including: platforms and sensors used for imagery data; subsurface sensors, such as sonar (sound navigation and ranging) attached to water-based platforms including ships, submarines, and buoys; ground sensors, such as seismic, attached to land-based platforms such as vehicles, stationary poles, or humans; and open source information, such as population.

Geospatial Information can be separated into seven major categories, as described below.

Aeronautical: Safety of Navigation information such as vertical obstructions, no-fly zones, flight routes, approach procedures, airfield infrastructure and layout, and aeronautical charts.

Maritime: Safety of Navigation information such as shipping routes, underwater obstructions, sailing restrictions, port infrastructure and layout, approach procedures, and nautical charts.

Topographic: Safety of Navigation information such as trafficability and obstacles to movement, and other ground/surface feature-related information including infrastructure (roads, power grids), man-made features, population data, vegetation, and hydrography. Topography may also include connectivity of network elements within a geospatial database that allow for ground-based routing, navigation, and hydrology flow.

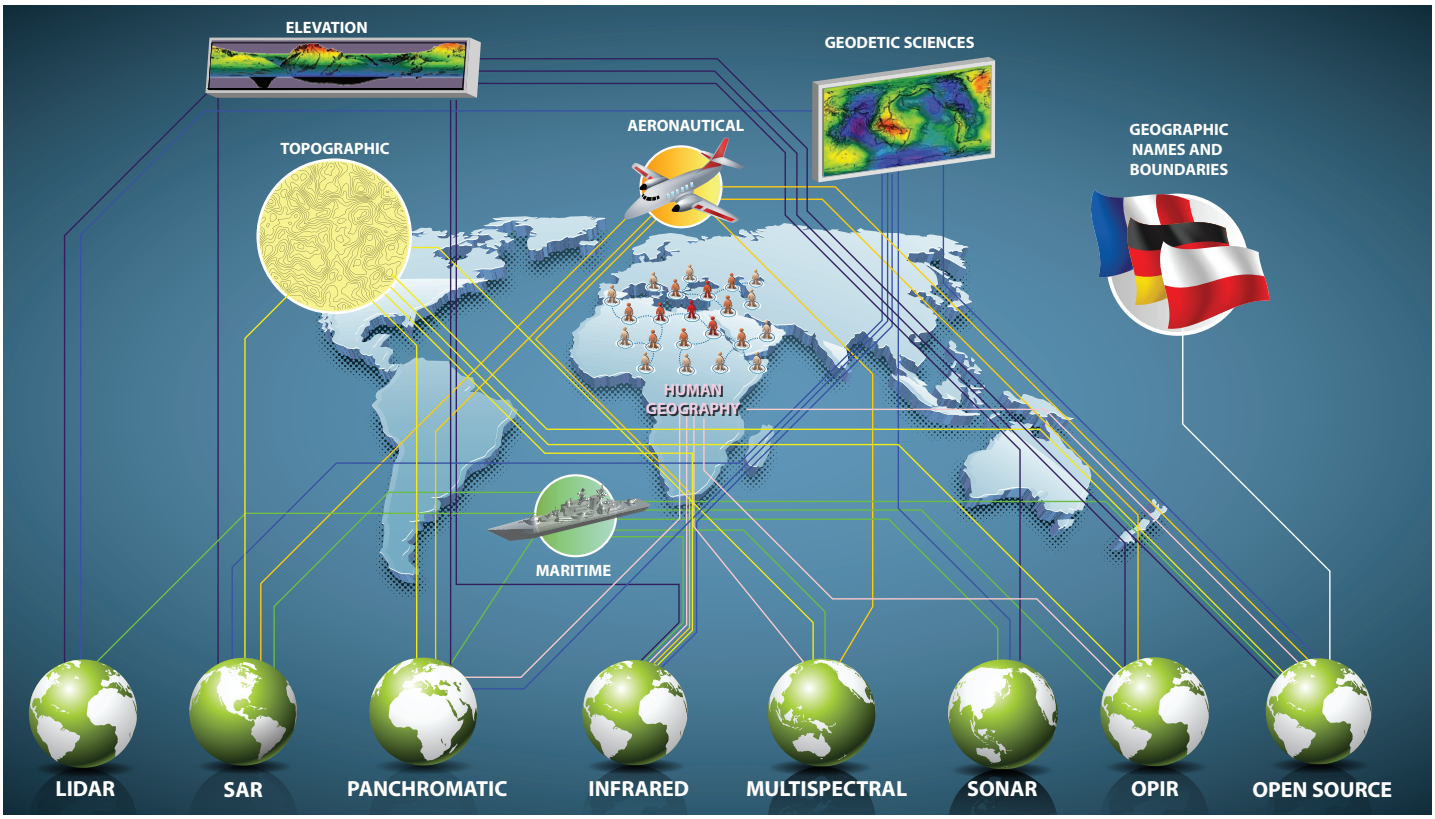
Elevation: Information about the height of objects on or in relation to the Earth. Elevation data includes heights of objects above the surface of the Earth (spaceborne and airborne), on the surface of the Earth (buildings and physical relief), and below the surface (bathymetry and underground facilities).

Human Geography: A social science discipline based on analyzing the interconnections between people and places, including patterns of human activities, in the context of their environment. It also seeks to explain how actions taken in one place/population can impact another place/population. Human Geography includes sub-disciplines such as: population geography, political geography, cultural geography, and religious/ethnic geography. It may include both classified and unclassified information.

Geographic Names and Boundaries: Names and boundaries of cities, towns, provinces, regions, states, and countries. Identification of major landmarks, facilities, and buildings.

Geodetic: Magnetic and gravimetric data (which have an impact on geo-positional systems), navigation tools, surveying, and systems of map grids and coordinate systems.

NOTE: The combination of these seven categories and a category called “Controlled Imagery,” may be referred to as “Foundation GEOINT.”



National Geospatial Intelligence College

Sources from which Geospatial Info usually is requested

DATA SOURCE	AERONAUTICAL	MARITIME	TOPOGRAPHIC	HUMAN GEOGRAPHY	GEOGRAPHIC NAMES & BOUNDARIES	ELEVATION	GEODETIC SCIENCES
PANCHROMATIC	X	X	X	X	X	X	X
MULTISPECTRAL	X	X	X	X	X		
INFRARED	X	X	X	X		X	X
SAR	X	X	X			X	X
LIDAR	X	X	X			X	X
SONAR		X				X	X
OPIR	X	X	X	X		X	
OPEN SOURCE	X	X	X	X	X	X	X

(Adapted from a graphic by the National Geospatial Intelligence College)

CHAPTER THREE – PRODUCTS

GEOINT products enable the visualization and geo-location of intelligence gathered from intelligence disciplines, known as INTs, as well as information from non-intelligence sources. Products range from simple to advanced, depending on the type and amount of information used, level of analytic complexity, and use of different processing techniques. Sometimes, a simple product, such as a map or image with annotations, may be all that a user needs. In some cases, a more sophisticated product is required in order to provide the type of information or level of detail needed to accomplish a mission or answer a question. In the first section, we will describe GEOINT products, from the most basic form through the most advanced. The second section "Product Examples & Applications" will show a variety of products and provide examples of how they are used for different missions and purposes.

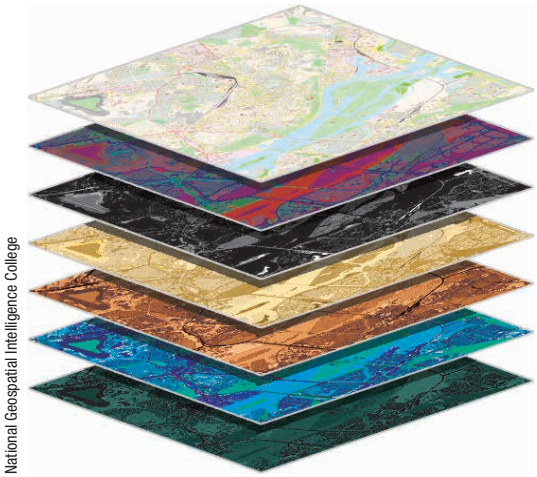
BASE PRODUCTS

The foundation (first layer) of a GEOINT product may consist of any one or combination of the GEOINT components described in the Section "What is GEOINT?" This foundation usually* is a map or image of a specific location and shows visible terrain, objects, and other features in that location. GEOINT images and maps are unique because they can display highly accurate geo-coordinates of the location, as well as additional information on objects or features depicted.

*As noted earlier, data is used to create a product. But in some cases, the processed data itself is the product. For example, certain forms of data are used to create a product called a Digital Point Positioning Database, which is used to derive digital information that is fed directly into weapons systems to ensure accuracy. However, to simplify the explanation of GEOINT products, this section focuses on describing how products are created using maps and images as a foundation.

LAYERING

Different types of information can be layered onto the foundation to provide more detail and context. However, the information must be geospatially referenced, meaning that it is shown in the precise location, within the exact associated grid coordinates, that it appears on the image or map. There is a wide variety of information that can be added to customize the image for its intended purpose, as described below.


National Geospatial Intelligence College

GEOSPATIAL LAYERS: Comprise geospatial information including boundaries, infrastructure (such as sewer lines, power grids), elevation data, geodetic data, human geography data (population, cultural, political/religious geography), safety of navigation data, and identification of key facilities and natural or manmade features.

MISSION LAYERS: Provide general information relevant to the purpose and area for which the product is being used. The information may include weather conditions and climate, logistics data, locations of friendly forces, routes and alternatives, characteristics of the local terrain, population and government information, and other data obtained through commonly used, unclassified sources.

INTELLIGENCE LAYERS: Customize products for a specific mission or purpose and consist of information derived from various intelligence sources, or a combination of those sources. Examples include locations of friendly and enemy forces, presence of chemical or biological hazards, weapons facilities, routes and alternatives, and potential targets. GEOINT serves as a base for the depiction of data from other intelligence disciplines (INTs), each of which is described below. (These are user-friendly descriptions approved by the agencies responsible for each INT. They are not the official definitions in law.)

- Human Intelligence (HUMINT) – Intelligence obtained through clandestine or overt HUMINT activities, or operations and activities utilizing human sources or other human assets.

- Imagery Intelligence (IMINT) – The technical, geographic, and intelligence information derived through the interpretation or analysis of imagery and collateral materials.

- Signals Intelligence (SIGINT) – A form of technical intelligence derived from the exploitation of foreign electronic emissions. SIGINT can be in the form of the actual information content of a signal or in the form of its temporal and spectral characteristics, called signal operating parameters. SIGINT includes both the raw data and the analysis product of that data. This category of intelligence includes all Communications Intelligence, Electronic Intelligence, and Foreign Instrumentation Signals Intelligence.

- Measurement and Signature Intelligence (MASINT) – Scientific and technical intelligence information obtained by quantitative and qualitative analysis of data. MASINT, which is derived from specific technical sensors, identifies distinctive features associated with the source, emitter, or sender. It can measure physical characteristics of targets and events of interest to determine composition, location, and/or performance.

- Open Source Intelligence (OSINT) – Intelligence produced from publicly available information that is collected, exploited, and disseminated in a timely manner to an appropriate audience for the purpose of addressing a specific intelligence requirement.

Conflation or adding one or more of these layers to a GEOINT product is considered *Multi-INT*, which means that input from at least one additional INT was used to provide as much context as possible to a GEOINT product depicting a specific object, area, or activity. Multi-INT GEOINT should not be confused with all-source intelligence, in which data and products from all INTs are used to provide a comprehensive strategic assessment. Even the most comprehensive Multi-INT GEOINT product may only be one part of an all-source analysis subject, such as a matter spanning multiple regions, networks, or governments or an issue that involves strategic relationships and intentions.

ADVANCED ANALYTICS: ELEVATION, INTERACTION, AND ACTIVITY

Analysts may introduce any of the following elements to create a more dynamic, realistic, and advanced GEOINT product.

Elevation: The majority of GEOINT products use one or more of the layers described above. However, a more sophisticated product can be developed by adding elevation to create a three-dimensional (3D) model or simulation that provides a more realistic representation of an environment or object.

Time: The element of time can be used to create temporal products. These products can simulate factors such as speed, tides, wind direction, and changing daylight to help the analyst determine how each factor will affect a mission or event.

Motion: Location, elevation and time can be combined to create a virtual, interactive scene that allows users to familiarize or train in a simulated environment before operating in a real situation. Such simulations also allow analysts to experience different perspectives from which to analyze objects and scenarios.

Activity: Most GEOINT analysis and products focus on providing as much information as possible about a specific object or area. However, activity-based analysis examines human, vehicular, and other activity related to that object or area, which can lead to different areas and show correlations between areas, people, and objects. This method allows for a more complex level of analysis. Three processes that contribute to activity-based analysis are listed below.

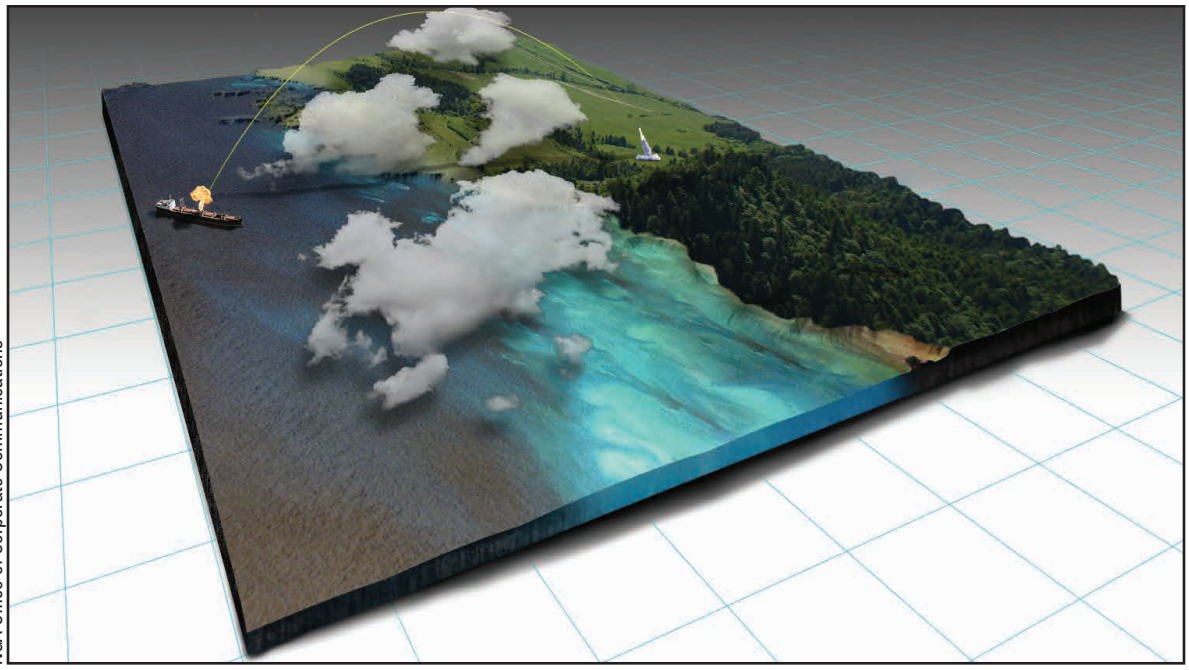
- **Object-Based Production (OBP):** OBP is the standardized IC process in which observations from sensors are captured, structured, stored, and shared. The process also brings together information from all available sources of intelligence—and from systems of different security levels—related to an object. Thus, the most comprehensive and up-to-date information is available to everyone at the same time, and analysts from any location or organization can rapidly access the data. Examples of objects include natural features, people, vehicles, buildings, and events.

- **Structured Observation Management (SOM):** SOM is the method in which GEOINT observations from satellites and sensors and other sources are captured, structured, stored, and shared in a standardized format compatible with the OBP format. This ensures that GEOINT information can be integrated into the IC's OBP process.

- **Activity-Based Intelligence (ABI):** ABI is a methodology that incorporates the OBP information into a process that can detect when the object changes or activities related to an object occur, and then provide an electronic "alert" to analysts interested in that object. By examining this new information about the object, analysts can discover relationships with other objects or locations and detect patterns of activity and behavior.

PRODUCT EXAMPLES AND APPLICATIONS

A wide variety of products can be created to satisfy specific mission requirements by using different types of data, data processing, or analysis. Most products provide a common, accurately geo-located visualization of a scene or environment to enable planning and collaboration among different organizations. In this section, we will provide examples of products grouped in categories that are related to the overall missions and purposes for which the products are used: Mission/Event Preparation, Assessments, and Detection.



NGA Office of Corporate Communications

3D Simulation that incorporates elevation, time, and motion.

Mission/Event Preparation – Used to prepare for a mission, operation, or major event. These products focus on familiarization with the area, including identification of key landmarks and existing or potential hazards. They usually are map or imagery products that facilitate safety of navigation by identifying elements such as buildings, routes, water depth, terrain features, obstacles, and threats. The products assist with activities such as route planning and security preparations.

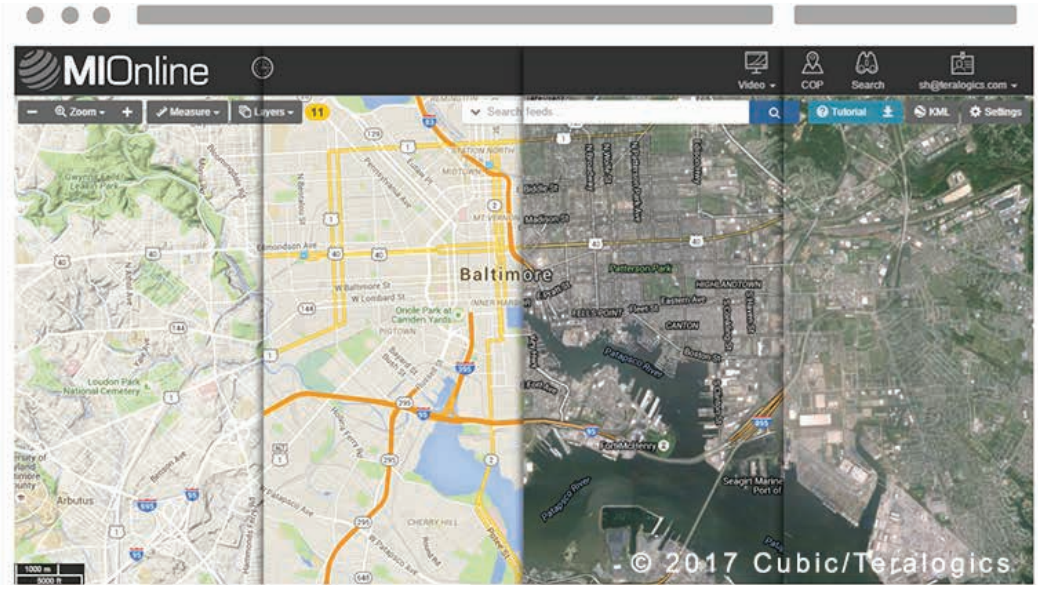
Assessment – Provide analysis for what is shown in an image or on a map, and provide information on the "who, what, when, where, how, and why," usually in the context of the purpose or mission for which it has been developed. Such products may be a simple image of a facility and parking lot, with notations that indicate the type of facility, information on how many cars are parked there now compared with the usual volume, and an assessment of how many people may be in the facility and what types of activities they may be conducting. A more complex product may show a hazardous material leak, with notations on potential effects over time using variable factors such as wind speed and tides.

Detection – Designed to find natural and manmade materials that are not visible or easily identifiable to the human eye. A variety of EO or radar sensor phenomenologies and specialized data processing techniques are used to develop detection products. These products may be used for many purposes, such as to "see" beneath foliage and camouflage or identify heat and other emissions.

PRODUCT EXAMPLES AND APPLICATIONS

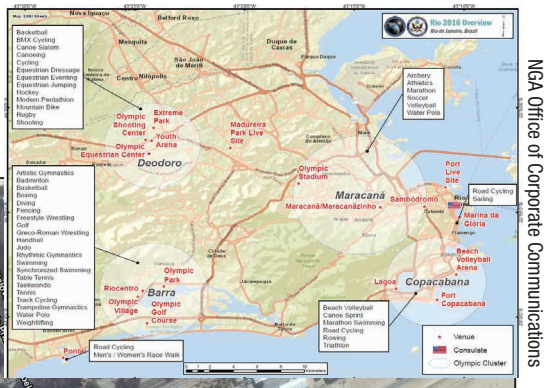
Below are examples of products for each of the categories described above.

MISSION/EVENT PREPARATION



Map Overlays

Products such as map overlays and digital nautical charts are used to analyze locations for potential security threats and emergency operations, well in advance of a major event or VIP visit. Examples include the beach volleyball venue for the 2016 Olympics in Rio, Brazil, and the stadium area for the Super Bowl in Jacksonville, Florida.



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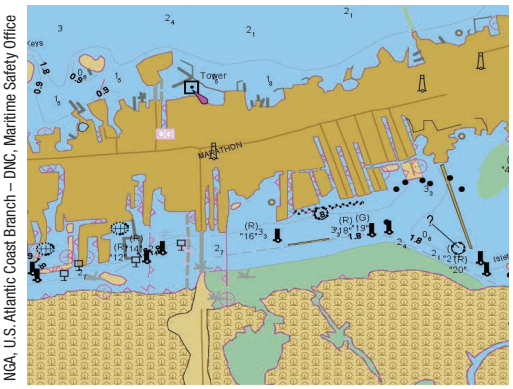
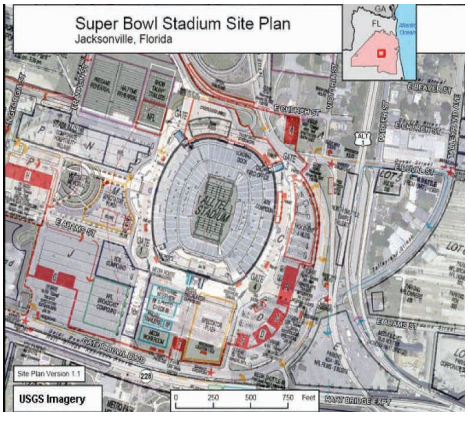
2016 DigitalGlobe, NextView License



NGA, U.S. Atlantic Coast Branch – DNC, Maritime Safety Office

Digital Nautical Chart



USGS image

Annotated Image
National Security Special Event (NSSE)

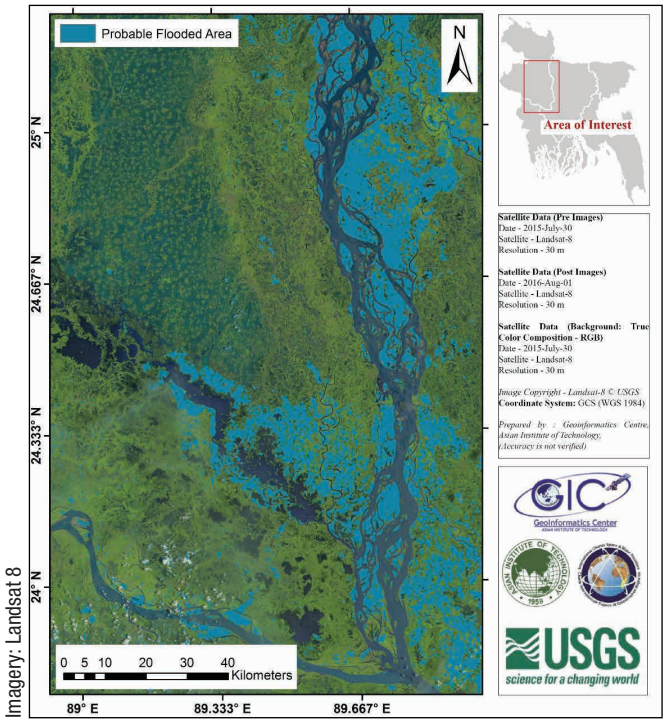
ASSESSMENTS

This example is from the 2015 earthquake in Nepal. On the left is an image from before the earthquake and on the right is an image after the earthquake. Analysts compared the two images to identify damaged structures, accessible roadways, and internally displaced persons. The results of that analysis were sent to the U.S. State Department, which provided the information to first responders and NGOs assisting in the recovery effort.

This image shows two separate camps for persons displaced after the earthquake. Analysts estimate the number of displaced persons in this area by counting the number and size of the tents. This information allows the State Department to determine the appropriate amount of food, water, clothing, and other supplies or support the affected people may need.

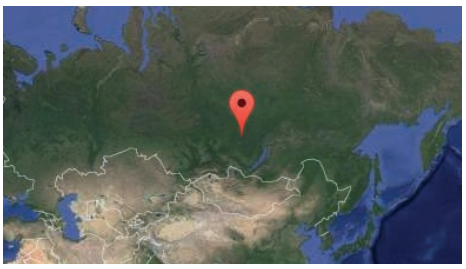
Flood inundation along the Brahmaputra River in Bangladesh

Over 3.2 Million people were affected by flooding in Bangladesh with 250,000 houses fully or partially damaged and 25,000 people displaced.

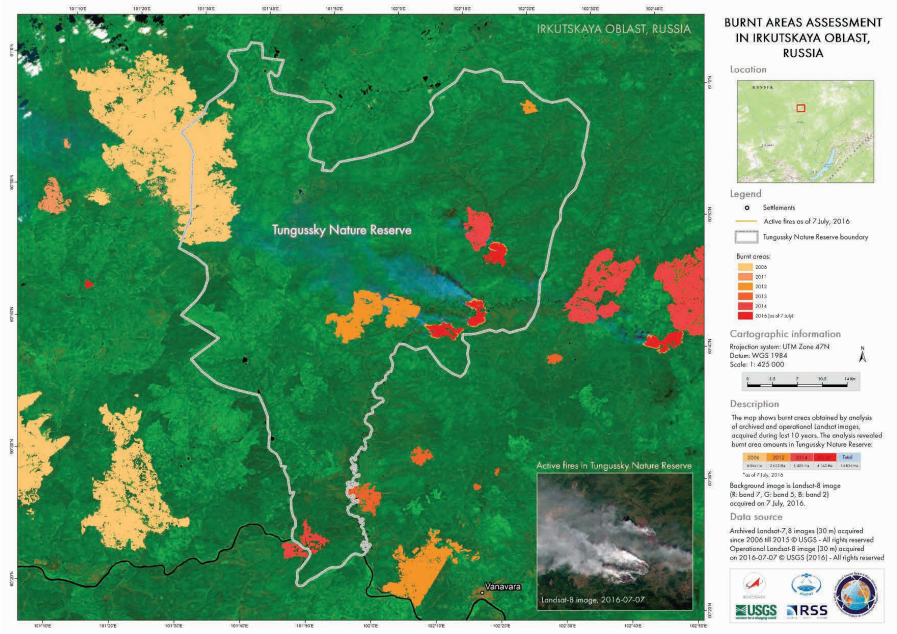


A total of 38 people have drowned since flooding began on July 25, 2016.

Burnt areas assessment in Irkutskaya Oblast, Russia

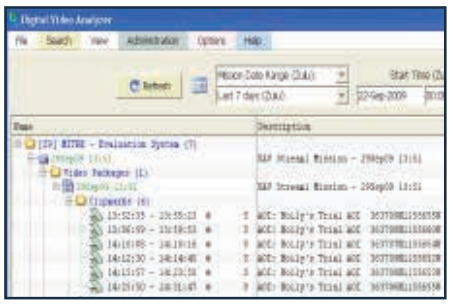


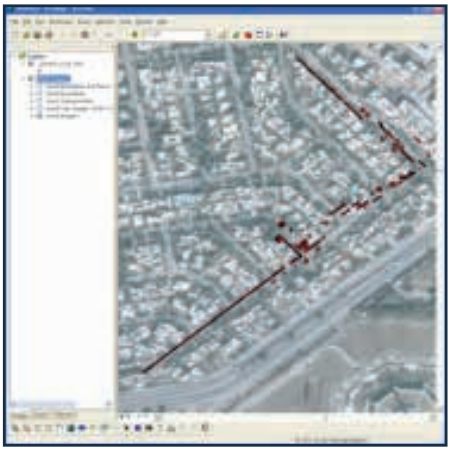
The Siberian Wildfires were triggered by lightning in late June and burned around 3,000 hectares.

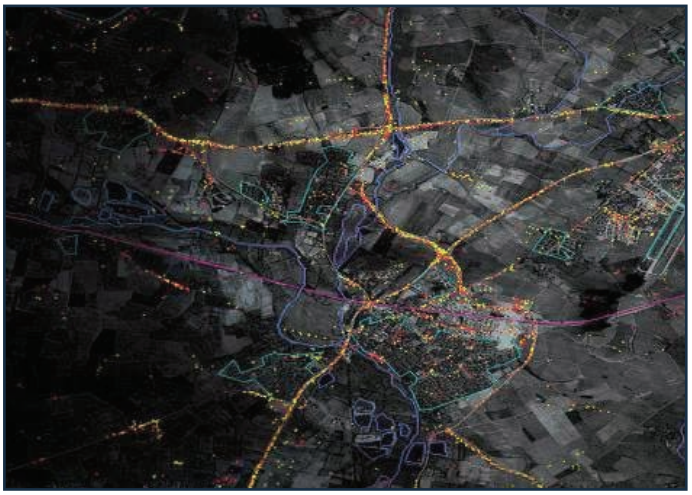


The fires were located in remote areas and did not pose a threat to inhabited areas at the time.

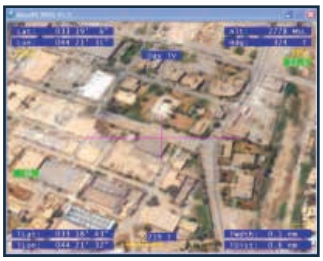
DETECTION

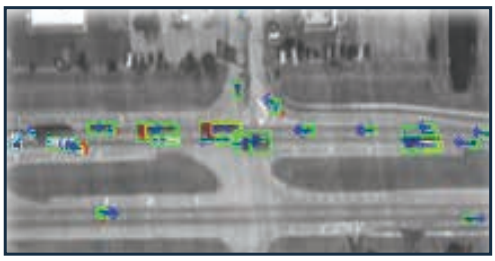






JSTARS image (DoD)





This Activity Based Intelligence (ABI) product illustrates how information extracted from large-scale data (also called *big data*) can be used to detect activity, patterns, networks, and anomalies. The NSG increasingly is using automation, which serves as a framework for advancing GEOINT to its future state.

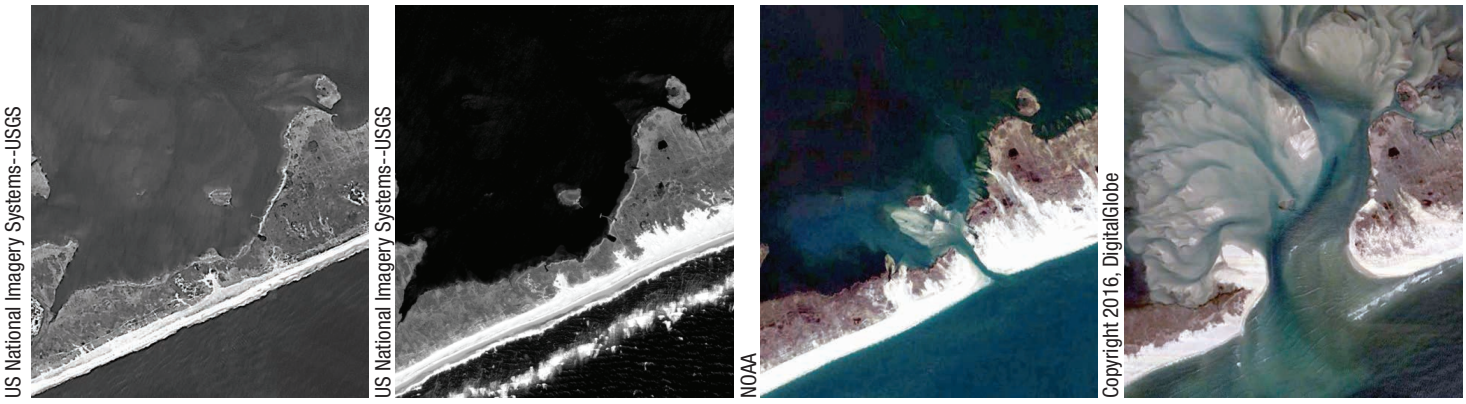
FEB. 15, 2014

DEC. 6, 2014

APRIL 1, 2016

Spratly Islands, South China Sea

Construction of man-made island reefs with pumped sand is documented by DigitalGlobe's satellites over a period of 25 months. Change detection using EO sensor.



Fire Island National Seashore, New York
Five Global Fiducial Program (GFP) time series images showing changes that occurred at Fire Island National Seashore, New York during the 17+ year period from March 1999 to May 2016. The GFP uses imagery from multiple sources to document dynamic Earth processes and change.

PRODUCT STORAGE, DISSEMINATION, AND ACCESS

GEOINT data and products are accessed by or delivered to producers and users via storage and dissemination systems. The system used may depend on the classification level of the data or products, type of sensor platform used to obtain the data, level and type of organization that produced the products, or whether hardcopy or electronic versions are needed. There are numerous national, military, and commercial GEOINT libraries for GEOINT data and products. However, the Director of NGA, as the GFM, established the NSG Consolidated Library (NCL) for long-term, large-volume storage of GEOINT data.

Traditionally, products were "pushed" to users via a variety of dissemination systems. However, with the advancement of technology, users may readily access many repositories themselves and can select and independently "pull" the specific data or products they need from storage systems.

CHAPTER FOUR – TRADECRAFT

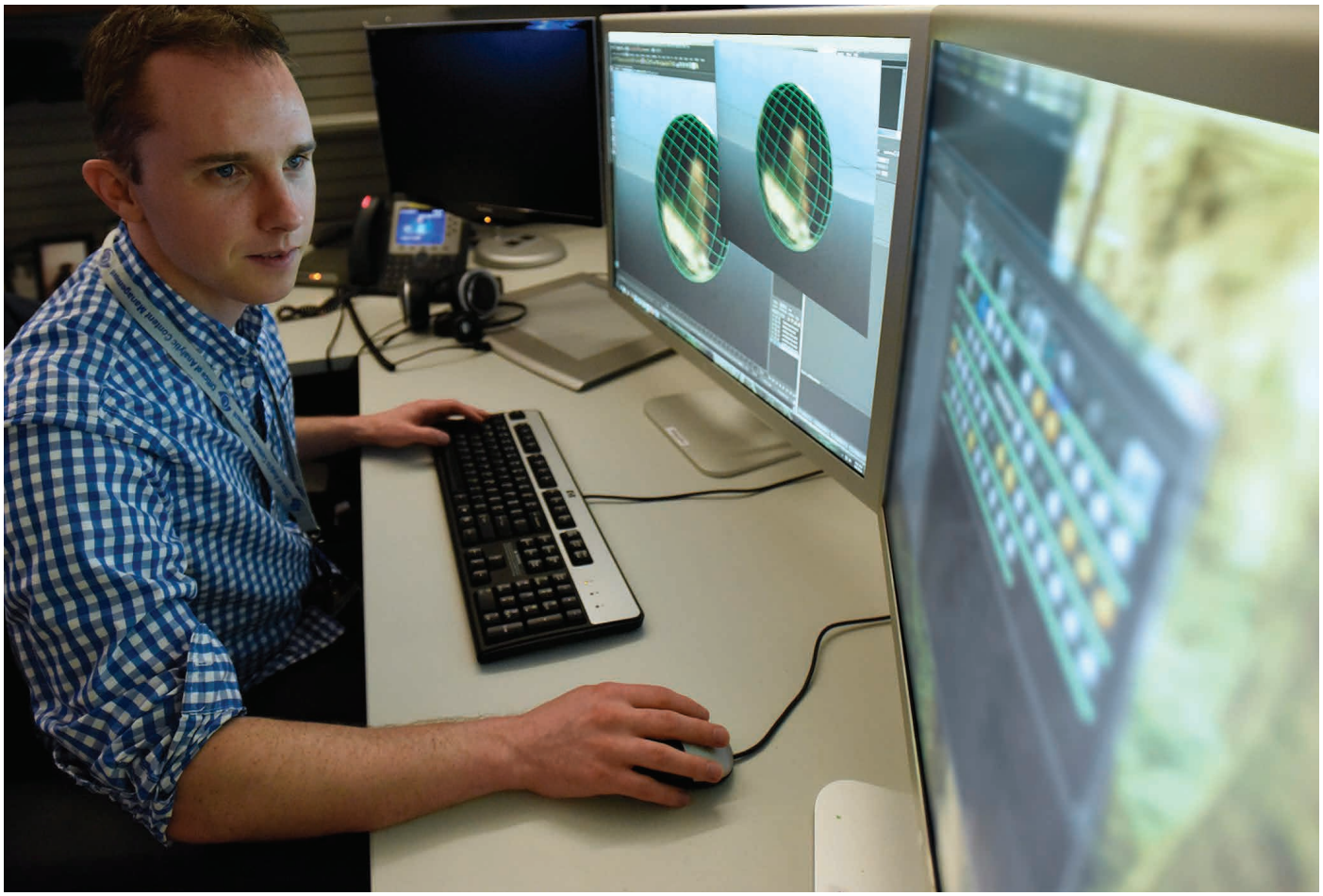


Photo by Erica Knight, NGA Office of Corporate Communications

GEOINT is a specialized field of practice, with a U.S. Government professional certification program that is mandatory for most Agencies and Services. The GEOINT discipline encompasses all activities involved in the planning, collection, processing, analysis, exploitation, and dissemination of spatial information in order to gain intelligence about the national security or operational environment, visually depict this knowledge, and fuse the acquired knowledge with other information through analysis and visualization processes.

The GEOINT discipline is much more than systems, processes, and products; it includes highly skilled, educated professionals and the many specialized tradecraft areas in which they work. GEOINT Tradecraft is the application of skills, technology, techniques, leadership, continuing education, mentoring, special experiences, and knowledge of GEOINT in one or more occupational specialties, which are described below.

GEOINT PROFESSIONAL TRADECRAFT AREAS

NGA Photos

- **Aeronautical Analysis –** The analysis and exploitation of worldwide aeronautical data and other sources in support of safety of navigation and national security goals, concerns, requirements, and strategies.
- **Applied Sciences –** The analysis of the Earth's gravity and magnetic fields, geophysical structure, material properties, and dynamics for geospatial intelligence and DoD applications. Professionals in the applied sciences provide in-depth technical expertise on Geodetic and geophysical issues and satellite issues.
- **Cartography –** The art and science of making maps and charts.
- **GEOINT Collection –** The collaboration with customers and source providers to develop comprehensive GEOINT, multi-source strategies to address intelligence problems. Professionals in this field create tasking and dissemination requirements, adjudicate requirements, analyze and investigate collection performance, assess collection opportunities, assess and report on the end-to-end GEOINT system performance data, advise customers, and satisfy essential elements of information (EEI) requirements.
- **Geospatial Analysis –** The science of extracting meaning from geospatial data and using geographic information systems to uncover and investigate relationships and patterns in all forms of geospatial data to address intelligence or military issues.
- **Geospatial Data Management –** The management of the development, approval, and population of geospatial data within a feature database to ensure that it can be used to satisfy customer requirements. This requires knowledge of the wide range of products and a solid understanding of the capabilities of various systems used to support the extraction, analysis, and finishing of in-house, co-production, commodity, and contract data.

- **Human Geography –** The science of understanding, representing, and forecasting activities of individuals, groups, organizations, and social networks with a geo-temporal context. Human Geography professionals gather, assess, and evaluate source materials and ensure its quality and suitability to build foundational data and apply knowledge and expertise in physical, socio-cultural, and political aspects of countries, regions, and urban areas to support national security goals, concerns, and strategies. This data is analyzed to characterize events, discover relationships and trends, infer conclusions, and predict behaviors.

- **Imagery Analysis –** The science of converting information, extracted from imagery, into intelligence about activities, issues, objects, installations, and/or areas of interest.

- **Imagery Science –** The generation, collection, duplication, analysis, modification, and visualization of images. It includes the use of advanced techniques to identify objects that cannot be detected by the human eye. Imagery science is used to develop algorithms, evaluate tools, and create customized methodologies and products to address a variety of geospatial intelligence problems. Imagery scientists typically specialize in precision mensuration, radar, spectral, infrared, and other specialized collection systems.

- **Maritime Analysis –** The acquisition, analysis, compilation, and dissemination of maritime safety of navigation information to populate and update nautical databases to support the Digital Nautical Chart, hardcopy charts, digital publications, and Electronic Chart Display and Information Systems. Marine Analysts generate datasets, promulgate worldwide navigational warnings, and respond to queries from foreign hydrographic offices and the users of our products and services.

Each GEOINT tradecraft area has specific duties within it. Civilian and military GEOINT professionals often perform similar functions but have different job titles. The chart below shows the GEOINT civilian job titles/categories and the corresponding military designations for each tradecraft area.

Evolving Work Role - Data Scientist. This work role will soon become a primary GEOINT tradecraft role. A community-coordinated definition will be provided in the next Publication 1.0 update.

GEOINT TRADECRAFT WORK ROLE/DESIGNATION CHART

TRADECRAFT AREA	GOVERNMENT CIVILIAN DESIGNATION	MILITARY DESIGNATION
Aeronautical Analysis	GEOINT Analyst (Aeronautical Intelligence)	Geospatial Engineer (Army–12Y) Geospatial Engineering Technician (Army–125D) Air Traffic Control Terps Specialist (Air Force–1C1X1) Geographic Intelligence Specialist (Marine Corps–0261)
Applied Sciences	GEOINT Analyst (Geodetic Earth Science) GEOINT Analyst (Geodetic Survey) GEOINT Analyst (Geodetic Orbit Sciences) GEOINT Analyst (Bathymetry) GEOINT Analyst (Oceanography) GEOINT Analyst (Meteorology) GEOINT Analyst (Hydrography) GEOINT Analyst (Precise Time/Astrometry)	Technical Applications Specialist (Air Force–9S100) Technical Engineer (Army–12T) Geospatial Engineering Technician (Army–125D) Diver (Army–12D) Aerographer's Mate (Navy Officer–1800) Geospatial Engineer (Army–12Y)
Cartography	GEOINT Analyst (Cartography) GEOINT Analyst (Photogrammetric Cartography)	Geospatial Engineer (Army–12Y) Geospatial Engineering Technician (Army–125D) Geographic Intelligence Specialist (Marine Corps–0261)
GEOINT Collection	GEOINT Analyst (Foundation Strategies) GEOINT Analyst (Open Source Research) GEOINT Analyst (Persistent Operations) GEOINT Analyst (Source Strategies) GEOINT Analyst (Throughput Strategies) GEOINT Analyst (Requirements & Integration)	Operations Intelligence Officer (Air Force–14N) Operations Intelligence Technician (Air Force–1N0) GEOINT Imagery Technician (Army–350G) GEOINT Imagery Analyst (Army–35G) GEOINT Officer (Army–35D–1D) Technical Engineer (Army–12T) Engineer Officer (Army–12A–W2) Imagery Analysis Specialist (Marine Corps–0241)
Geospatial Analysis	GEOINT Analyst (Geospatial Analysis) GEOINT Analyst (Analytical Methodologies) GEOINT Analyst (Infrared Source Analysis)	Targeteer (Air Force–1N1X1B) Technical Applications Specialist (Air Force–9S100) Geographic Intelligence Specialist (Marine Corps–0261) Geospatial Engineer (Army–12Y) Geospatial Engineering Technician (Army–125D) Engineer Officer (Army–12A-W2)
Geospatial Data Management	GEOINT Analyst (Data Stewardship) GEOINT Analyst (Database Management)	Geospatial Engineer (Army–12Y) Geospatial Engineering Technician (Army–125D) GEOINT Imagery Technician (Army–350G) GEOINT Imagery Analyst (Army–35G) GEOINT Officer (Army–35D–1D) Engineer Officer (Army–12A–W2) Geographic Intelligence Specialist (Marine Corps–0261)

Human Geography	GEOINT Analyst (Political Geography) GEOINT Analyst (Regional Geography) GEOINT Analyst (Regional Source) GEOINT Analyst (Scientific Linguistics)	GEOINT Imagery Technician (Army–350G) GEOINT Imagery Analyst (Army–35G) GEOINT Officer (Army–35D-1D) Engineer Officer (Army–12A-W2) Geospatial Engineering Technician (Army–125D) Geographic Intelligence Specialist (Marine Corps–0261) Master Analyst (Marine Corps–0205) Intelligence Specialist (Marine Corps–0231) Geospatial Engineer (Army–12Y)
Imagery Analysis	GEOINT Analyst (Imagery Intelligence)	Imagery Analysis Specialist (USMC–0241) GEOINT Analyst (Air Force–1N1X1A) GEOINT Imagery Technician (Army–350G) GEOINT Imagery Analyst (Army–35G) GEOINT Officer (Army–35D-1D) Navy Imagery Interpreter (IS–3910) Engineer Officer (Army–12A-W2) Geospatial Engineer (Army–12Y) Geospatial Engineering Technician (Army–125D)
Imagery Science	GEOINT Analyst (Lidar Image Science) GEOINT Analyst (Photogrammetric Image Science) GEOINT Analyst (Radar Image Science) GEOINT Analyst (Spectral Image Science) GEOINT Analyst (Thermal Infrared Image Science) GEOINT Analyst (OPIR Image Science)	GEOINT Imagery Technician (Army–350G) GEOINT Imagery Analyst (Army–35G) GEOINT Officer (Army–35D-1D) Technical Applications Specialist (Air Force–9S100) Geospatial Engineer (Army–12Y) Geospatial Engineer Technicians (Army–125D) Engineer Officer (Army–12A-W2) Geospatial Engineer (Army–12Y)
Maritime Analysis	GEOINT Analyst (Maritime)	Naval Imagery Interpreter (IS–3910) Imagery Analysis Specialist (Marine Corps–0241) Geographic Intelligence Specialist (Marine Corps–0261)

CHAPTER FIVE – GEOINT COMMUNITY & GOVERNANCE

This chapter has two sections. The GEOINT Community section addresses the National System for Geospatial Intelligence (NSG), an organization comprised of IC and DoD elements, and identifies the NSG's Principal Partners. It also defines and describes the GEOINT Enterprise, which encompasses a wide range of U.S and foreign entities that contribute to and influence the function of GEOINT. The Governance section describes the role of the GEOINT Functional Manager, the functional management governance structure, and related NSG organizations and forums. It also includes information on the governance structure of our Commonwealth partners, who have a significant impact on U.S. Government GEOINT activities.

GEOINT COMMUNITY

THE NATIONAL SYSTEM FOR GEOSPATIAL INTELLIGENCE (NSG)

The term "NSG" is used to describe the U.S. Government community, capabilities, assets, and other aspects of GEOINT that support U.S. national security decision making and U.S. military operations. The full definition of the NSG, shown in the box below, is established in both national Intelligence Community and DoD GEOINT doctrine. The NSG Community consists of Members and Partners.

NSG Members

NSG Members are IC and DoD organizations that fall under GEOINT Functional Management authorities, as outlined in EO 12333, DoD Directive 5105.60, and Intelligence Community Directive 113. NSG Members include the IC, the Joint Staff, the Military Departments (including the Services), and Combatant Commands (CCMDs).

National System for Geospatial Intelligence (NSG): The NSG is the combination of technology, policies, capabilities, doctrine, activities, people, data, and organizations necessary to produce GEOINT in an integrated multi-intelligence, multi-security domain environment. Its mission is to create an integrated, collaborative community of common practice promoting the GEOINT discipline across a diverse group of producers and consumers. It consists of members and partners that produce and employ GEOINT across the full range of national, military, and civil domains.

NSG MEMBERS

THE INTELLIGENCE COMMUNITY

Intelligence Agencies
- Central Intelligence Agency
- Defense Intelligence Agency
- National Geospatial-Intelligence Agency
- National Reconnaissance Office
- National Security Agency

Intelligence Components:
- Air Force Intelligence
- Army Intelligence
- Coast Guard Intelligence
- Marine Corps Intelligence
- Naval Intelligence
- Federal Bureau of Investigation (Office of Intelligence)
- Dept. of Energy (Office of Intelligence)
- Dept. of Homeland Security (Directorate of Intelligence & Analysis)
- Dept. of State (Bureau of Intelligence and Research)
- Dept. of Treasury (Office of Intelligence Support)
- Drug Enforcement Administration (Office of National Security Intelligence)

THE JOINT STAFF

MILITARY DEPARTMENTS
- Dept. of the Army (US Army)
- Dept. of the Air Force (US Air Force)
- Dept. of the Navy (US Navy and US Marine Corps)

COMBATANT COMMANDS
- US Africa Command (AFRICOM)
- US Central Command (CENTCOM)
- US Cyber Command (CYBERCOM)
- US European Command (EUCOM)
- US Northern Command (NORTHCOM)
- US Pacific Command (PACOM)
- US Southern Command (SOUTHCOM)
- US Special Operations Command (SOCOM)
- US Strategic Command (STRATCOM)
- US Transportation Command (TRANSCOM)

NSG PRINCIPAL PARTNERS

NSG Principal Partners include U.S. federal and civil agencies, allied Commonwealth countries, and certain members of U.S. industry, academia, and non-profit organizations. These Partners are organizations with which NSG Members work on a consistent basis. However, NSG Members continuously develop other U.S. and foreign partnerships, often just for the duration of specific missions and situations.

PRINCIPAL PARTNERS

U.S. FEDERAL AND CIVIL AGENCIES

NSG Member-organizations are closely linked with a number of federal agencies—such as the Defense Logistics Agency and Defense Information Services Agency—and work with most U.S. civil agencies via the Civil Applications Committee (CAC). The CAC is an interagency committee that facilitates the appropriate civil uses of remote sensing technologies and data collected by military and intelligence overhead capabilities, including commercial capabilities. This Committee is chaired by the USGS Director or his/her delegate on behalf of the Secretary of Interior, and the Vice Chair is a senior executive from a non-DOI member organization. The CAC is comprised of Principal Members (Federal civil organizations), Associate Members (IC and DoD organizations) and Ex-Officio Members. Principal members include the Departments of Interior, Agriculture, Commerce, Health and Human Services, and Transportation, as well as the U.S. Army Corps of Engineers, U.S. Coast Guard, Environmental Protection Agency, Federal Emergency Management Agency, National Science Foundation, National Aeronautics and Space Agency, and Tennessee Valley Authority.

The Civil Applications Committee (CAC): The CAC is an interagency committee that facilitates the appropriate civil uses of remote sensing technologies and data collected by military and intelligence overhead capabilities, including commercial capabilities.

U.S. FEDERAL & CIVIL AGENCY MEMBERS

CIVIL APPLICATIONS COMMITTEE (CAC)

- Department of Agriculture
- Department of Commerce
- Department of Health and Human Services
- Department of Interior*
- Department of Transportation
- Environmental Protection Agency
- Federal Emergency Management Agency
- National Science Foundation
- National Aeronautics and Space Administration
- Tennessee Valley Authority
- U.S. Army Corps of Engineers
- U.S. Coast Guard

OTHER U.S. FEDERAL AGENCIES

- Defense Information Services Agency
- Defense Logistics Agency
- Other

*The Department of Interior's U.S Geological Survey (USGS) serves in key roles as Chair of the Civil Applications Committee and voting member of the National Geospatial Intelligence Committee (GEOCOM).

ALLIED COMMONWEALTH COUNTRIES

NSG Principal Partners in the Commonwealth countries are represented by an organization body known as the Allied System for Geospatial Intelligence (ASG). The ASG manages the relationship of the geospatial intelligence organizations of the Commonwealth Allied partners (Australia, Canada, New Zealand, United Kingdom) and the United States. Each nation is represented by its lead GEOINT organization(s) and is an equal partner in the coalition. The United States provides the permanent Chair of the ASG Senior Management Council (ASMC) and the ASG Coordination Executive (ACE), which serve functions similar to that of the NSMC and GEOCOM (described in the Governance Section) respectively.

The Allied System for Geospatial Intelligence (ASG): The ASG manages the relationship of the geospatial intelligence organizations of the Commonwealth Allied partners—Australia, Canada, New Zealand, United Kingdom—and the United States.

ASG MEMBERS

- Australia
- Canada
- New Zealand
- United Kingdom
- United States

THE GEOINT ENTERPRISE

The term "GEOINT Enterprise" is used to describe the full breadth of U.S. and foreign government, commercial, and academic entities that produce, use, or contribute to one or more of the three elements of GEOINT (imagery, imagery intelligence, and geospatial data), and thereby influence the entire function. Given the widespread use and practice of GEOINT, it is essential to maintain awareness of activities and advancements occurring throughout the entire GEOINT Enterprise.

GEOINT Enterprise: The combination of technology, data, people, policies, capabilities, doctrine, activities, and organizations necessary to produce GEOINT in any government, academic, or commercial environment in the U.S. and partner countries.

THE GEOINT ENTERPRISE COMMUNITY

NSG MEMBERS
- Intelligence Community
- Joint Staff
- Military Departments
- Combatant Commands

ASG
- Australia
- Canada
- New Zealand
- United Kingdom
- United States

INTERNATIONAL GEOINT ENVIRONMENT
- Foreign Governments
- Foreign Industry
- Foreign Academic Institutions

OTHER U.S. PARTNERS
- U.S. Industry
- U.S. Academic Institutions
- U.S. State, Local, Tribal Organizations
- U.S. Law Enforcement

FEDERAL & CIVIL ORGANIZATIONS

Civil Applications Committee (CAC)
- Dept. of Agriculture
- Dept. of Commerce
- Dept. of Health & Human Services
- Dept. of Interior
- Dept. of Transportation
- Environmental Protection Agency
- Federal Emergency Management Agency
- National Science Foundation
- National Aeronautics and Space Administration
- Tennessee Valley Authority
- U.S. Army Corps of Engineers
- U.S. Coast Guard

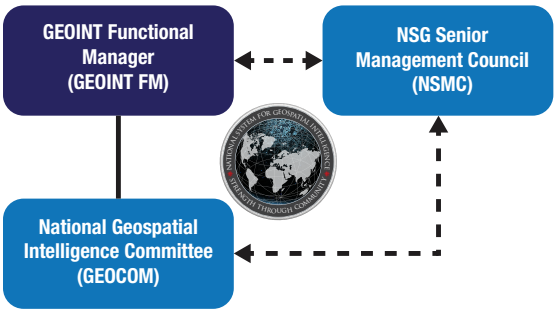
Other U.S. Federal Agencies
- Defense Information Services Agency
- Defense Logistics Agency
- Other

The term Global GEOINT Enterprise is sometimes used to emphasize the international aspects of the GEOINT Enterprise, but there is no difference between the terms or the communities associated with them.

NSG GOVERNANCE

The NSG is led by the GEOINT Functional Manager (GFM) in concert with a DNI-mandated "Committee of Record" and a GFM-appointed advisory council composed of members of the U.S. Government GEOINT Community. Each governing body has an important role to play in the management and future planning of the GEOINT function, and ensures that the GFM receives input from a wide range of users and producers of GEOINT. This section outlines the roles and responsibilities of the GFM and each governing body. Of note, the ASG has a parallel construct to the NSG framework.

Geospatial Intelligence Governing Framework



The three elements of the NSG governing structure are interdependent and serve collectively to advance the GEOINT function. The GFM may directly task the GEOCOM.

GEOINT Functional Manager (GFM): Executive Order 12333, "United States Intelligence Activities," as amended in 2008, legally designates the Director of NGA (D/NGA) as the GEOINT Functional Manager (GFM) for the Intelligence Community. Department of Defense Directive (DoDD) 5105.60, "National Geospatial-Intelligence Agency," 2009, designates the D/NGA as the DoD GEOINT Manager. The title GFM refers to both roles, thereby encompassing the Intelligence Community and DoD. The GFM is the authoritative GEOINT advisor to the Director of National Intelligence (DNI) and the Secretary of Defense.

The Functional Manager's role is defined by both obligations and authorities. Intelligence Community Directive (ICD) 113 "Functional Managers," 2009, states that a functional manager's primary obligation is to "oversee and guide the function in a manner that is distinct from organizational affiliations." Functional managers have other obligations as well, such as "maintaining knowledge of the totality of activities and resources pertaining to the function," and they "are accountable for continuously improving the performance of the function and for enhancing cross-function integration." ICD 113 and DoDD 5105.60 provide details on the full range of GFM authorities and responsibilities, such as issuing GEOINT standards for the DoD and IC. Please reference those documents for additional details.

NSG Senior Management Council (NSMC): Chaired by the GFM, the National System for Geospatial Intelligence (NSG) Senior Management Council, or NSMC, is the senior, three-star equivalent functional management advisory council of the NSG. Members discuss strategic, community-wide GEOINT issues and jointly address areas of common concern. The GFM brings a variety of issues before the NSMC for review, deliberation, endorsement, and/or decision. Commonwealth "Five Eyes (FVEY)" counterparts and issues are included at the discretion of the GFM. (FVEY is a term often used in classification of documents to indicate that the information can be shared with the five members of the Allied System for Geospatial Intelligence, or ASG.)

Geospatial Intelligence Committee (GEOCOM): The GEOCOM is a DNI-chartered forum for GEOINT. This Committee also provides a venue for community members to discuss, coordinate, and vote on substantive issues of common concern, and to develop recommendations on high-priority issues for the GFM or DNI. The GEOCOM is comprised of civilian Senior Executive Service (SES)/DISL and military Flag Officer (GOFO)-level members from key government GEOINT stakeholders, including the IC, DoD, and federal civil agencies, which are represented by the Civil Applications Committee (CAC)—a permanent NSG Partner. The GEOCOM administers subcommittees and working groups composed of subject matter experts from GEOCOM-member organizations. Each subcommittee is responsible for a specific GEOINT discipline such as collection, information systems and architecture, analysis and production, and training and professional development.

ABBREVIATIONS AND ACRONYMS

3D	Three Dimensional
ABI	Activity-Based Intelligence
ACE	ASG Coordination Executive
ASG	Allied System for Geospatial Intelligence
ASMC	ASG Senior Management Council
CAC	Civil Applications Committee
CCMD	Combatant Command
DCGS	Distributed Common Ground System
DISL	Defense Intelligence Senior Leader
DNI	Director of National Intelligence
DoD	Department of Defense
EEI	Essential Elements of Information
EM	Electromagnetic
EO	Electro-Optical
E.O.	Executive Order
FMV	Full Motion Video
FVEY	Five Eyes
GEOCOM	Geospatial Intelligence Committee
GEOINT	Geospatial Intelligence
GFM	GEOINT Functional Manager
GI&S	Geospatial Information and Services
GOFO	General Officer/Flag Officer
HSI	Hyperspectral Imaging
HUMINT	Human Intelligence
IC	Intelligence Community
ICD	Intelligence Community Directive
IFSAR	Interferometric Synthetic Aperture Radar
IMINT	Imagery Intelligence
INT	Intelligence Discipline
IR	Infrared
LIDAR	Light Detecting and Ranging (Also can be written as the word “lidar”)
MALE	Medium Altitude Long Endurance
MASINT	Measurement and Signatures Intelligence
MSI	Multispectral Imaging
MTI	Moving Target Indicator
NGA	National Geospatial-Intelligence Agency
NCL	NSG Consolidated Library
NSG	National System for Geospatial Intelligence
NSMC	NSG Senior Management Council
OBP	Object-Based Production
ODNI	Office of the Director of National Intelligence
OPIR	Overhead Persistent Infrared
OSINT	Open Source Intelligence
PAN	Panchromatic
PoL	Patterns of Life
RADAR	Radio Detecting and Ranging (Also may be written as the word “radar”)
SAR	Synthetic Aperture Radar
SES	Senior Executive Service
SIGINT	Signals Intelligence
SOM	Structured Observation Management
SONAR	Sound Navigation and Ranging (Also may be written as the word “sonar”)

TERPS	Terminal Instrument Procedures
TIR	Thermal Infrared
UAV	Unmanned Aerial Vehicle
UGS	Unattended Ground Sensor
USD(I)	Undersecretary of Defense for Intelligence
WAMI	Wide Area Motion Imagery

GLOSSARY

Activity-Based Intelligence (ABI): ABI refers to a methodology and automated technical process that contributes to intelligence analysis and products. It is defined as "An IC analytic method applied to structured data from all sources, to discover objects, relationships, or behaviors by resolving significant activity." Most GEOINT products focus on a specific object or area and seek to analyze everything about it. ABI enables more complex analysis by linking human, vehicular, and other activity related to the object or area, which can lead to different areas or objects and show patterns.

Aeronautical Analysis: A tradecraft involving the analysis and exploitation of worldwide aeronautical data and other sources in support of safety of navigation and national security goals, concerns, requirements, and strategies.

Aeronautical Data: Aerial Safety of Navigation data such as vertical obstructions, no-fly zones, flight routes, approach procedures, airfield infrastructure and layout, and aeronautical charts.

Applied Sciences: A tradecraft involving the analysis of the Earth's gravity and magnetic fields, geophysical structure, material properties, and dynamics for geospatial intelligence and DoD applications. Professionals in the applied sciences provide in-depth technical expertise on Geodetic and geophysical issues and satellite issues.

Assessment Products: Provide analysis of what is shown in an image or on a map, and provide information on the "who, what, when, where, how, and why," usually in the context of the purpose or mission for which it has been developed.

Base Layer: The first layer of a GEOINT product, also called the Foundation Layer, which consists of any combination of the three components of GEOINT: imagery, imagery intelligence, and geographic information. The base/foundation usually* is a map or image of a specific location and shows visible terrain, objects, and other features in that location. GEOINT images and maps contain highly accurate geo-coordinates of the location shown, as well as of any object or feature depicted in the map or image. *In some cases, the processed data itself is the product.

Cartography: The art and science of expressing graphically, by maps and charts, the known physical features of the Earth, or of another celestial body.

Detection Products: Designed to find natural and manmade materials that are not visible or easily identifiable to the human eye. A variety of EO or radar sensor phenomenologies and specialized data processing techniques are used to develop detection products. These products may be used for many purposes, such as to "see" beneath foliage and camouflage or to identify heat and other emissions.

Electro-Optical (EO): EO derives data from the ultraviolet through the infrared portions of the electromagnetic (EM) spectrum. Each part of the EM spectrum provides a different type of data or magnifies the results of the data, depending on the phenomenology used. Electro-optical sensors include panchromatic (visible), infrared, spectral (multispectral and hyperspectral), and light detection and ranging (lidar).

Elevation Data: Information about the height of objects on or in relation to the Earth. Elevation data includes heights of objects above the surface of the Earth, (spaceborne and airborne), on the surface of the Earth (buildings and physical relief), and below the surface (bathymetry and underground facilities).

Foundation Layer: See definition of Base Layer.

Full Motion Video (FMV): FMV, typically an EO capability, uses many still frames per second, creating a near-real-time video capability, which may be displayed as visible or infrared and may be recorded by digital or analog means. This near-real time capability allows observation of rapidly developing events and is a valuable tool for ongoing operations. It is also useful for continuous observation of an object to analyze its patterns over a long period of time.

Geodetic Data: Terrestrial, airborne, and satellite data used to scientifically measure the size, shape, and parameters of the earth, model the gravity field of the earth, and compute three-dimensional positions and coordinates of points above, on, and below the surface of the earth. This data has an impact on geo-positional systems (GPS), navigation tools, and systems of map grids and coordinate systems.

Geographic Names and Boundaries: Names and boundaries of cities, towns, provinces, regions, states, and countries. Identification of major landmarks, facilities, and buildings.

GEOINT: See the definition for Geospatial Intelligence.

GEOINT Collections: A GEOINT tradecraft involving collaboration with customers and source providers to develop comprehensive multi-INT, multi-source strategies to address intelligence problems. Professionals in this field create tasking and dissemination requirements, adjudicate requirements, analyze and investigate collection performance, assess and report on the end-to-end GEOINT system performance data, and advise customers in support of the National System for Geospatial-Intelligence (NSG).

GEOINT Enterprise. The combination of technology, data, people, policies, capabilities, doctrine, activities, and organizations necessary to produce GEOINT in any government, academic, or commercial environment in the U.S. and partner countries.

GEOINT Functional Manager (GFM): The authoritative advisor to the Director of National Intelligence (DNI) and Secretary of Defense, though the Undersecretary of Defense for Intelligence (USD(I)), on GEOINT issues and resources. Executive Order 12333, "United States Intelligence Activities," as amended in 2008, legally designates the Director of NGA (D/NGA) as the GFM for the Intelligence Community. Department of Defense Directive (DoDD) 5105.60, "National Geospatial-Intelligence Agency," 2009, designates the D/NGA as the DoD GEOINT Manager. The title GFM refers to both roles, thereby encompassing the Intelligence Community and DoD.

Geospatial Analysis: The science of extracting meaning from geospatial data and using geographic information systems to uncover and investigate relationships and patterns in all forms of geospatial data to answer intelligence or military issues. A scientific discipline that brings physical and human geography together in a digital environment in order to solve problems with regard to spatial analysis, physiography, socio-cultural aspects, and temporal relationships.

Geospatial Data Management: A tradecraft involving management of the development, approval, and population of geospatial data within NGA's feature/geospatial information database to ensure that it can be used to satisfy customer requirements. Requires knowledge of the wide range of products and a solid understanding of the capabilities of various systems used to support the extraction, analysis, and finishing of in-house, co-production, commodity, and contract data.

Geospatial Information: "Information that identifies the geographic location and characteristics of natural or constructed features and boundaries on the earth and includes: statistical data; information derived from, among other things, remote sensing, mapping, and surveying technologies; and mapping, charting, geodetic data, and related products." (This legal definition is in Title 10 of the U.S. Code, Section 467.)

Geospatial Information and Services (GI&S): The collection, information extraction, storage, dissemination, and exploitation of geodetic, geomagnetic, imagery, gravimetric, aeronautical, topographic, hydrographic, littoral, cultural, and toponymic data accurately referenced to a precise location on the Earth's surface.

Geospatial Intelligence (GEOINT): "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." (Statutory definition codified in Title 10 of the U.S. Code, Section 467 (5)). Imagery, imagery intelligence, and geospatial information are defined separately in the glossary. Any one or combination of these three elements may be considered GEOINT.

GEOCOM: See the definition for "National Geospatial Intelligence Committee."

Geospatial Layer: A product layer composed of geospatial information including boundaries, infrastructure (such as sewer lines, power grids), elevation data, human geography data (population, cultural, political/religious geography), and identification of key facilities and natural or manmade features.

Global GEOINT Enterprise: A term sometimes used to emphasize the international aspects of the GEOINT Enterprise, but there is no difference between the terms or communities associated with them.

Human Geography (component of geospatial information): A social science discipline based on analyzing interconnections between people and places, including patterns of human activities, in the context of their environment. It also seeks to explain how actions taken in one place/population can impact another place/population. Human Geography includes sub-disciplines such as: population geography, political geography, cultural geography, and religious/ethnic geography. It may include both classified and unclassified information.

Human Geography (tradecraft): The art and science of understanding, representing, and forecasting activities of individuals, groups, organizations, and social networks with a geo-temporal context. Human Geography professionals gather, assess, and evaluate source materials and ensure its quality and suitability to build foundational data and apply knowledge and expertise in physical, socio-cultural, and political aspects of countries, regions, and urban areas to support national security goals, concerns, and strategies. This data is analyzed to characterize events, discover relationships and trends, infer conclusions, and predict behaviors.

Human Intelligence (HUMINT): Intelligence obtained through clandestine or overt HUMINT activities, or operations and activities utilizing human sources or other human assets.

Hyperspectral Imaging (HSI): An electro-optical phenomenology similar to MSI but uses hundreds, rather than tens, of bands of the visible and infrared portions of the EM spectrum. These extra bands can provide greater fidelity and characteristics than MSI. For example, HSI allows users to detect materials by their unique spectral signature.

Interferometric Synthetic Aperture Radar (IFSAR): A radar phenomenology that uses a SAR sensor to observe a location from two separate positions. This method generates elevation data of the Earth's surface.

Imagery: A likeness or presentation of any natural or man-made 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 or presentations produced by satellites, airborne platforms, unmanned aerial vehicles, or other similar means. (This legal definition is in Title 10 of the U.S. Code, Section 467.)

Imagery Analysis: The science of converting information, extracted from imagery, into intelligence about activities, issues, objects, installations, and /or areas of interest.

Imagery Intelligence (IMINT): The technical, geographic, and intelligence information derived through the interpretation or analysis of imagery and collateral materials. (This legal definition is in Title 10 of the U.S. Code, Section 467.)

Imagery Science: Tradecrafts involving the generation, collection, duplication, analysis, modification, and visualization of images. It includes the use of advanced techniques to identify objects that cannot be detected by the human eye. Imagery science is used to develop algorithms, evaluate tools, and create customized methodologies and products to address a variety of geospatial intelligence problems. Imagery scientists typically specialize in precision mensuration, radar, spectral, infrared, and other specialized collection systems.

Infrared (IR): IR is an electro-optical phenomenology that uses the infrared part of the spectrum to detect heat and radiance/reflection, and displays that information in a gray-scale image.

Intelligence Layer: A GEOINT product layer customized for a specific mission or purpose that consists of information derived from various intelligence sources, or a combination of those sources. Examples include locations of friendly and enemy forces,

presence of chemical or biological hazards, weapons facilities, routes and alternatives, and potential targets. GEOINT serves as a base for the depiction of data from other intelligence disciplines (INTs), including Human Intelligence (HUMINT), Signals Intelligence (SIGINT), Measures and Signatures Intelligence (MASINT) and Open Source Intelligence (OSINT).

Light Detection and Ranging (Lidar): An electro-optical phenomenology that uses laser pulses in the visible and infrared portions of the EM spectrum. The sensor emits a pulse of laser light toward an object, which reflects back some of the energy to the sensor. The time it takes for the energy to return provides elevation values—shorter roundtrips indicate higher elevations and longer roundtrips indicate lower elevations. This process helps measure distances to, heights of, and other characteristics of an object. The process can be used to develop three-dimensional models of an object, such as a building.

Maritime Analysis: A GEOINT tradecraft involving acquisition, analysis, compilation, and dissemination of maritime safety information to populate and update nautical databases to support the Digital Nautical Chart, hardcopy charts, digital publications, and Electronic Chart Display and Information Systems. Marine Analysts generate mission specific datasets, promulgate worldwide navigational warnings, and respond to queries from foreign hydrographic offices and the users of our products and services.

Maritime Data: Maritime Safety of Navigation data such as shipping routes, underwater obstructions, sailing restrictions, port infrastructure and layout, approach procedures, bathymetry, soundings, and nautical charts.

Measurement and Signature Intelligence (MASINT): Scientific and technical intelligence information obtained by quantitative and qualitative analysis of the physical and technical attributes of data. MASINT, which is derived from specific technical sensors, identifies distinctive features associated with the source, emitter, or sender. It can measure physical characteristics of targets and events of interest to determine composition, location, and/or performance.

Mission/Event Preparation Products: Used to prepare for a mission, operation, or major event. These products focus on familiarization with the area, including identification of key landmarks and existing or potential hazards. They usually are map or imagery products that facilitate safety of navigation by identifying elements such as buildings, routes, water depth, terrain features, obstacles, and threats. The products assist with activities such as route planning and security preparations.

Mission Layer: A GEOINT product layer that provides general information relevant to the purpose and area for which the product is being used. The information may include weather conditions, logistics data, characteristics of the local terrain, population, and government, and other data obtained through commonly used, unclassified sources.

Motion GEOINT: Both EO and radar sensors can create or capture motion by collecting two or more frames per second. This activity is known as Motion GEOINT. The most common types are Full Motion Video (FMV), Moving Target Indicator (MTI), and Wide Area Motion Imagery (WAMI).

Moving Target Indicator (MTI): This EO and radar capability shows only those objects that are in motion, and provides information on the speed and direction that objects are moving.

Multispectral Imaging (MSI): MSI is an electro-optical phenomenology that provides a color image by using tens of additional bands of the visible and infrared portions of the spectrum. It also provides more detail to images, showing characteristics that are not otherwise visible.

National Geospatial Intelligence Committee (GEOCOM): The GEOCOM is a Director of National Intelligence-chartered forum to discuss, coordinate, and vote on substantive issues in order to provide recommendations to the GEOINT Functional Manager. It is comprised of Senior Executive Service and General Officer/Flag Officer-level members from key government GEOINT stakeholders, including the IC, military Services, Combatant Commands, the U.S. Geological Survey and civil agencies, which are represented by the Civil Applications Committee (CAC). The GEOCOM manages subcommittees and working groups composed of subject matter experts from GEOCOM-member organizations. Each subcommittee focuses on a different substantive area such as collection, information systems and architecture, analysis and production, and training and professional development.

National System for Geospatial Intelligence (NSG): The combination of technology, policies, capabilities, doctrine, activities, people, data, and organization necessary to produce GEOINT in an integrated, multi-intelligence, multi-security domain environment. It includes members and partners that produce and employ GEOINT across the full range of national, military, and civil domains.

NSG Senior Management Council (NSMC): Chaired by the GFM, the NSMC is the senior, three-star equivalent functional management advisory council of the NSG. Members discuss strategic, community-wide GEOINT issues and jointly address areas of common concern. The GFM brings a variety of issues before the NSMC for review, deliberation, and/or decision. Five Eyes (FVEY) counterparts and issues are included at the discretion of the GFM.

Object: Representations of physical objects of interest, such as a person, unit, facility, or type of equipment.

Object-Based Production (OBP): The process of formatting and organizing intelligence related to objects. This structured approach enables automated identification of the object, or identical objects, and access to all sources of known information about that object. It also facilitates Activity Based Intelligence analysis.

Observation: Information or image gleaned from data captured by a sensor.

Open Source Intelligence (OSINT): Intelligence produced from publicly available information that is collected, exploited, and disseminated in a timely manner to an appropriate audience for the purpose of addressing a specific intelligence requirement.

Overhead Persistent Infrared (OPIR): OPIR sensors operate in the visible and near infrared, short-wave infrared, and mid-wave infrared portions of the spectrum to characterize this energy as an event or process it as a scene. OPIR sensors provide persistent (i.e. continuous) coverage of mission areas and energy radiation detection from both tactical and strategic targets including missiles launches and events, wildfires, enemy hostilities, weather, volcanos, and weapons characterization.

Panchromatic (PAN): PAN uses the visible part of the EM spectrum, along with a portion of IR spectrum, and produces an image similar to a black and white aerial photograph. The images can provide a very detailed and accurate likeness of an area or object, and can show shadows and other effects that help identify characteristics of an object or environment.

Phenomenology: The study of natural occurring and measurable activity (e.g., effluent emission as a result of a chemical reaction). As used in this document, it refers to sensor technology, literal and non-literal, which allows discovery, observation, and characterization of natural and measurable occurrences (spatial, spectral, radiometric and temporal). Various phenomenologies discussed in Publication 1.0 include electro-optical imagery, multispectral imagery, hyperspectral imagery, light detection and ranging, and radar.

Platform: The vehicle to which one or many sensors are attached. Platforms include satellites, aircraft (known as “airborne” platforms, and include unmanned aerial vehicles, balloons, and dirigibles), ground-based (for example, vehicles, stationary objects such as poles, and humans who carry sensors), and water-based platforms (such as ships, submarines, sonars and buoys).

Radar: Active sensors that emit manmade electromagnetic energy to illuminate the environment or object they are imaging, and then use the characteristics of the response to create an image. These sensors use reflected radar energy to illuminate objects in day or night and in almost any weather conditions. A radar image is non-literal, which means it does not appear as a photo that shows an exact likeness of an object or environment. It is similar to an X-ray of an area or object, with the ability to detect characteristics that a literal picture would not show. An important feature is that it can be used for poor light and weather conditions in which EO technologies are ineffective.

Sensor: A technical device designed to detect and respond to at least one stimulus and that may record and/or transmit a resultant impulse for interpretation or measurement. Two primary categories of sensors are electro-optical (EO) and radar, both of which have several types or variants, known as phenomenologies. Sensors may be active or passive, as described below.

- Active Sensor: Sensors that generate the electromagnetic energy needed to illuminate the object that is being imaged. They broadcast energy and process returning portions of it in order to image a targeted area. Active imagery sensing capabilities include real-aperture radar, synthetic aperture radar, interferometric synthetic aperture radar, moving target indicator, and light detection and ranging systems.

- Passive Sensor: Sensors that use natural electromagnetic energy sources such as the sun, naturally occurring radiation, or objects that generate heat. They generate data by capturing the reflected or emitted electromagnetic energy from an object. Passive sensors, which operate in "receive" mode and do not emit energy, diminish the adversary's ability to detect the fact that they are being imaged. Electro-optical sensors (except lidar) are passive.

Signals Intelligence (SIGINT): A form of technical intelligence derived from the exploitation of foreign electronic emissions. SIGINT can be in the form of the actual information content of a signal or in the form of its temporal and spectral characteristics, called signal operating parameters. SIGINT includes both the raw data and the analysis product of that data. This category of intelligence includes all Communications Intelligence, Electronic Intelligence, and Foreign Instrumentation Signals Intelligence.

Structured Observation Management (SOM): An organized method to capture, store, standardize, and provide data and information from GEOINT sources (sensors). This approach decreases the time required for analysts to search for data, enabling them to focus on conducting analysis and developing products.

Synthetic Aperture Radar (SAR): A radar phenomenology that illuminates an object with pulses of microwave energy. It applies signal processing to a series of many pulses to produce imagery.

Terminal Instrument Procedures (TERPS): Process of data extraction and analysis to produce Department of Defense Instrument Approach Procedures. Analysis includes imagery derived features, host nation, and vertical obstruction data.

Thermal Infrared (TIR): TIR is a type of Infrared phenomenology, but uses different wavelengths of the infrared spectrum to indicate the temperature level of the heat or radiance/reflection. The shape and size of the object or environment emitting heat is shown as a different shade than the rest of the image. Cooler objects are darker, warmer objects are lighter, and hot objects are bright white.

Topographic Data: Ground/surface-related information including infrastructure (roads, power grids), man-made features, population data, vegetation, and hydrography.

Wide Area Motion Imagery (WAMI): A set of motion imagery sensors with a wide field of view (FOV) diameter of up to 8 km, which provides persistent surveillance of a broad area of coverage. WAMI data enables forensic backtracking of kinetic events, network analysis, pattern of life (PoL) studies, and security monitoring.

Appendix A: REFERENCES

GEOINT FUNCTIONAL MANAGEMENT AUTHORITIES

a. Executive Order 12333, "United States Intelligence Activities," as revised, 30 July 2008

b. United States Code, Title 50, "War and National Defense," 2014

c. United States Code, Title 10, "Armed Forces of the United States," 2010

d. Intelligence Community Directive 113, "Functional Managers," 19 May 2009

e. Department of Defense Directive 5105.60, "National Geospatial-Intelligence Agency (NGA)," 29 July 2009

Appendix B: GEOINT DEFINTION

(Including Amplifications)

Exact language from:

- *NSG GEOINT Basic Doctrine (2018)*
- *Title 10, U.S. Code, Section 467 (2005 & 2010)*
- *DoD Directive 5105.60 (2009)*
- *Director of National Intelligence Memo (2005)*

NSG GEOSPATIAL INTELLIGENCE (GEOINT) BASIC DOCTRINE: PUB 1.0,

(Updated in 2018)

This GEOINT Definition contains the same language as the Title 10, Section 467 Definition (shown in next entry) but provides slight changes in organization to improve clarity and readability.

GEOINT DEFINITION

"The term 'geospatial intelligence' means 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."

- **Imagery.** "A likeness or presentation of any natural or man-made 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 or presentations produced by satellites, airborne platforms, unmanned aerial vehicles, or other similar means." Imagery includes handheld photography, but "does not include handheld or clandestine photography taken by or on behalf of human intelligence collection organizations."
- **Imagery Intelligence.** "The technical, geographic, and intelligence information derived through the interpretation or analysis of imagery and collateral materials."
- **Geospatial Information.** "Information that identifies the geographic location and characteristics of natural or constructed features and boundaries on the earth, including: statistical data; information derived from, among other things, remote sensing, mapping, and surveying technologies; and mapping, charting, geodetic data, and related products."

TITLE 10, US CODE: ARMED FORCES

(2005)

Subtitle A – General Military Law
PART I – Organization and General Military Powers
CHAPTER 22 – National Geospatial-Intelligence Agency
SUBCHAPTER I – Missions and Authority
§ 467. "Definitions"

§ 467. Definitions

Release date: 2005-07-12

In this chapter:
(1) The term "function" means any duty, obligation, responsibility, privilege, activity, or program.
(2)
(A) The term "imagery" means, except as provided in subparagraph (B), a likeness or presentation of any natural or man-made feature or related object or activity and the positional data acquired at the same time the likeness or representation was acquired, including—
I. products produced by space-based national intelligence reconnaissance systems; and
II. likenesses or presentations produced by satellites, airborne platforms, unmanned aerial vehicles, or other similar means.
(B) Such term does not include handheld or clandestine photography taken by or on behalf of human intelligence collection organizations.
(3) The term "imagery intelligence" means the technical, geographic, and intelligence information derived through the interpretation or analysis of imagery and collateral materials.
(4) The term "geospatial information" means information that identifies the geographic location and characteristics of natural or constructed features and boundaries on the earth and includes—
(A) statistical data and information derived from, among other things, remote sensing, mapping, and surveying technologies; and
(B) mapping, charting, geodetic data, and related products.
(5) The term "geospatial intelligence" means 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.

*NOTE: Title 10, Section 442, was updated in 2010 to include language on the NGA Mission. The new paragraphs address systems and tasking, and do not impact the definition of GEOINT in Section 467. However, the language is shown below because it provides context to the handheld photography language in the definition.

Section 442(a) of title 10, United States Code, is amended—

by redesignating paragraph (2) as paragraph (3); (2) by inserting after paragraph (1) the following new paragraph (2): "(2) (A) As directed by the Director of National Intelligence, the National Geospatial-Intelligence Agency shall develop a system to facilitate the analysis, dissemination, and incorporation of likenesses, videos, and presentations produced by ground-based platforms, including handheld or clandestine photography taken by or on behalf of human intelligence collection organizations or available as open-source information, into the National System for Geospatial Intelligence.
"(B) The authority provided by this paragraph does not include authority for the National Geospatial-Intelligence Agency to manage tasking of handheld or clandestine photography taken by or on behalf of human intelligence collection organizations"; and (3) in paragraph (3), as so redesignated, by striking "paragraph (1)" and inserting "paragraphs (1) and (2)".

DODD 5105.60

"NATIONAL GEOSPATIAL- INTELLIGENCE AGENCY"
(July 29, 2009)

GLOSSARY, DEFINITIONS

GEOINT. 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 (section 467 of Reference (a)). **[Pub 1.0 Note: the following portion of this definition was derived from a classified July 2005 ONDI/C memo]** GEOINT collection encompasses all aspects of: literal, infrared (IR) and synthetic aperture radar (SAR) imagery; overhead persistent infrared capabilities; and geospatial information and services. The terms imagery intelligence and advanced geospatial intelligence are encompassed within this definition of GEOINT. GEOINT includes the exploitation and analysis of electro-optical, IR, and radar imagery; and of geospatial, spectral, laser, IR, radiometric, SAR phase history, polarimetric, spatial, and temporal data. It employs all ancillary data, signature information, and fused data products, as necessary. Integrated GEOINT products may also include data and information from collateral sources.

Geospatial information. Defined in sections 455(c) and 467 of Reference (a) [Title 10, U.S. Code].

Imagery. Defined in section 467 of Reference (a) [Title 10, U.S. Code].

Imagery intelligence. Defined in section 467 of Reference (a)

DNI MEMO

"Statutory Definition of Geospatial Intelligence and its Amplification"
(17 October 2005)

2. The following amplifies the statutory definition [of GEOINT] and represents the full manifestation of NGA's missions per section 442(a) Title 10. The relevance of this amplification derives from the "terms of art" unique to the GEOINT discipline.

GEOINT encompasses all aspects of imagery (including capabilities formerly referred to as Advanced Geospatial Intelligence and imagery-derived MASINT) and geospatial information and Services (GI&S; formerly referred to as mapping, charting, and geodesy). It includes, but is not limited to, data ranging from the ultraviolet through the microwave portions of the electromagnetic spectrum, as well as information derived from the analysis of literal imagery; geospatial data, and information technically derived from the processing, exploitation, literal, and non-literal analysis of spectral, spatial, temporal, radiometric, phase history, polarimetric data, fused products (that is, products created out of two or more data sources), and the ancillary data needed for data processing and exploitation, and signature information (to include development, validation ,simulation, data archival, and dissemination). These types of data can be collected on stationary and moving targets by electro-optical (to include IR, MWIR, SWIR TIR, Spectral, MSI, HSI, HD), SAR (to include MTI), related sensor programs (both active and passive), and non-technical means (to included geospatial information acquired by personnel in the field).

3. The statutory definition, as amplified, provides the basis for a clear distinction between GEOINT and MASINT. The relevant Intelligence Community Directives should reflect this definition and amplification.

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