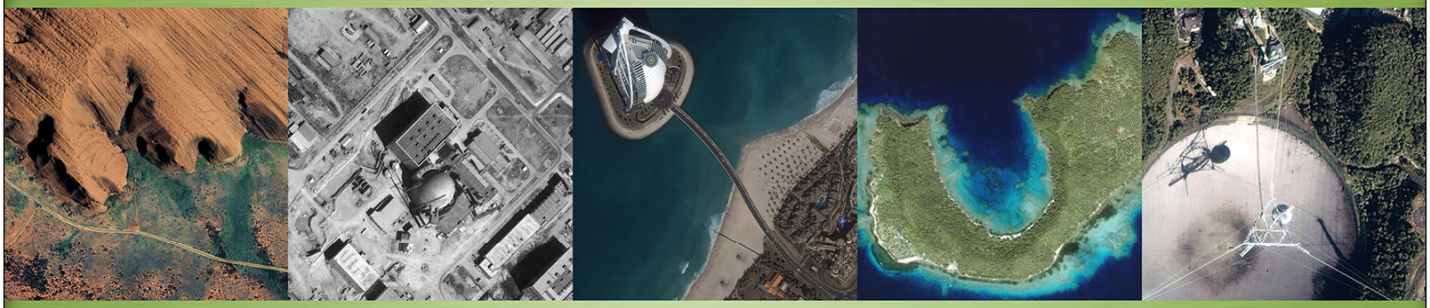
GeoEye Product Guide



Geo™ | GeoProfessional™ | GeoStereo™

GeoEye®

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Introduction

As the most trusted provider of geospatial imagery in the world, GeoEye has set the industry standard. GeoEye's advanced Earth imaging satellites and worldwide network of ground stations offer a unique ability to accurately map, measure and monitor the world for our clients.

GeoEye strives for outstanding customer service. GeoEye has a team of Service Experts who are here to assist you with all of your imagery needs, technical support, tasking and analysis. Because of this, GeoEye gets the right image right the first time. We capture up-to-date images and apply our in-house expertise to make sure you get the quality image data you demand. We provide superior service and support at every level of our organization. It's how we live up to the expectations of our customers and maintain the lowest return rate in the industry.

GeoEye believes geospatial products should be easy to choose and easy to use. Our product line; Geo™, GeoProfessional™, and GeoStereo™ makes selecting the right product for your needs simple and intuitive. Our unrivaled image processing capabilities allow us to deliver geospatial imagery in ways that help our clients extract more information and use these robust image products in almost any geospatial application imaginable.

This guide provides GeoEye's customers with detailed information about our company and each of our imagery products including:

- Product descriptions
- Product specifications
- Ordering
- Licensing
- Frequently asked questions
- Imaging collection platforms
- Market overview and product uses
- Contact information

We suggest that you read the Product Overview section first to determine the product that best suites your needs based on resolution, accuracy and application. If more detailed information is required this can be found in the Products section.

Once you've selected the product you need then proceed to the Ordering and Delivery section for information on how to order our products and when you can expect delivery.

Product Overview

GeoEye's imagery product line consists of three core product offerings: Geo™, GeoProfessional™, and GeoStereo™. Geo™ products are low cost, geometrically corrected images. GeoProfessional™ products are orthorectified (terrain corrected) to specified map accuracy. GeoStereo™ products provide stereo imagery for 3-dimensional viewing and feature extraction. All products are available in pansharpened color in either .50-meter and 1-meter resolution.

In addition to our standard image product offerings, GeoEye is a worldwide leader in advanced image processing and photogrammetry. We offer a broad range of imagery products from a wide variety of satellite and airborne sensors. We provide on-demand custom solutions to match the customer's needs such as; feature extraction, multispectral blended image products, digital elevation models (DEMs), land-use classification maps and many others. Please call a Service Expert to find out more information regarding these additional capabilities.

Geo™

The foundation of the GeoEye imagery product line, the Geo™, is a radiometrically corrected map oriented image suitable for a wide range of uses. In addition to being suitable for visualization and monitoring applications, the Geo™ is shipped with the sensor camera model in rational polynomial coefficient (RPC) format. This camera model maps the respective ground coordinates to image product coordinates. Block adjustment, orthorectification, and other photogrammetric processing can be performed using the RPC camera model. The Geo™ product, coupled with a digital elevation model and control data, permits skilled users to make orthorectified products using standard commercial software. Geo™ imagery products are available as panchromatic, multispectral, and pan-sharpened color imagery.

GeoProfessional™

GeoProfessional™ products are orthorectified (terrain corrected) by GeoEye's staff of experienced production personnel using proprietary processes perfected in our production facilities and optimized to the data collected by GeoEye satellites. The orthorectification process employed by GeoEye enables us to quickly deliver the most accurate and precise terrain corrected products available from a satellite platform. Available in two levels of accuracy, GeoProfessional™ and Precision, these products are suitable for feature extraction, change detection, base mapping and other similar applications. GeoProfessional™ imagery products are available as panchromatic, multispectral, and pan-sharpened color imagery.

GeoStereo™

Providing a strong base for three-dimensional feature recognition, extraction and exploitation, the GeoStereo™ product provides two images with stereo geometry to support a wide range of stereo imagery applications such as DEM creation, building height extraction, and creating various spatial layers. GeoStereo™ products in epipolar or map projections include RPC camera model data. The RPC camera model supports block adjustment, three-dimensional stereo extraction, DEM generation, orthorectification, and other photogrammetric operations. GeoStereo™ imagery products are available as panchromatic, multispectral, and pan-sharpened color imagery.

Product Specifications At-A-Glance

1-Meter	Positional Accuracy			Ortho Corrected	Target Elevation Angle	Mosaics Available	Sample Application
	CE90	RMSE	NMAS				
Geo™[1]	15 meters	8 meters	N/A	No	>60°	No	Visual and interpretative analysis and change detection
GeoProfessional™	10 meters	5 meters	1:12,000	Yes	>66°	Yes	Regional large-area mapping; general GIS applications; base mapping, land use, economic development
Precision[2] [3]	4 meters	2 meters	1:5,000	Yes	>72°	Yes	High positional accuracy for urban applications
	CE90	LE90	NMAS				
GeoStereo™	15 meters	22 meters	1:20,000	No	>60°	No	DEM creation for flood plain analysis
Precision[4]	4 meters	6 meters	1:5,000		>60°		

[1] CE90% exclusive of terrain displacement; Geo™ imagery is not terrain corrected.
[2] Ground control required, DEM from NED or stereo may be used as appropriate to achieve specified accuracy.
[3] Other accuracies are achievable; please contact a Service Expert with your requirements.
[4] Ground control required.

.50-Meter	Positional Accuracy			Ortho Corrected	Target Elevation Angle	Mosaics Available	Sample Application
	CE90	RMSE	NMAS				
Geo™[5]	5 meters	3 meters	N/A	No	>60°	No	Visual and interpretive analysis, change detection, surveillance, habitant monitoring
GeoProfessional™	10 meters	5 meters	1:12,000	Yes	>66°	Yes	Regional large-area mapping; general GIS application, base mapping, land use, economic development, real estate and insurance analysis
Precision[6 7]	4 meters	2 meters	1:5,000	Yes	>72°	Yes	High positional accuracy for urban applications
	CE90	LE90	NMAS				
GeoStereo™	4 meters	6 meters	1:5,000	No	>60°	No	DEM creation for flood plain analysis, engineering grade quality
Precision[8]	2 meters	3 meters	1:2,500		>60°		

[5] CE90% exclusive of terrain displacement; Geo™ imagery is not terrain corrected.
[6] Ground control required, DEM from NED or stereo may be used as appropriate to achieve specified accuracy.
[7] Other accuracies are achievable; please contact a Service Expert with your requirements.
[8] Ground control required.

Products

Product Commonalities

The features listed below are consistent across the Geo™, GeoProfessional™, and GeoStereo™ product lines available from the GeoEye-1 and IKONOS satellites.

Band Combinations:

Color: Color imagery is created using a pan-sharpening process that combines a high-resolution panchromatic image with the multispectral bands to create a .50-meter or 1-meter color product. GeoEye delivers .50-meter or 1-meter color imagery as either one file with three bands in true color (red, green, blue) or false color (near infrared, red, green); or four files of one band each (blue, green, red, near infrared) or one file with four bands.

Multispectral: 2 or 4 meter GSD imagery delivered as one file with three bands in true color (red, green, blue) or false color (near infrared, red, green); or four files of one band each (blue, green, red, near infrared) or one file with four bands.

Panchromatic: .50-meter or 1-meter resolution black and white imagery.

Bundle: Customers receive panchromatic and multispectral imagery. GeoEye-1 and IKONOS collect panchromatic and multispectral imagery simultaneously to ensure radiometric and temporal consistency.

Map Projections: Universal Transverse Mercator (UTM), Geographic (nominal ARC), Albers Conic Equal Area (ACEA), Lambert Conformal Conic (LCC), Transverse Mercator (TM) and State Plane projection (US only). Customers must supply desired parameters for ACEA, LCC, and TM projections.

Datums: Map-projected imagery products are available in a variety of datums such as: WGS84[9] (available worldwide), NAD83 and NAD27[10].

Units: Meters, International Feet, or U.S. Survey feet for conventional projections. Decimal degrees used for geographic projection.

Dynamic range adjustment: When ordering imagery products, specify whether Dynamic range adjustment should be "on" or "off." If "on" is selected, GeoEye will apply dynamic range adjustment to enhance the visual interpretability of the image. If "off" is selected, GeoEye will maintain absolute radiometric accuracy and full dynamic range for scientific applications.

Bits: Choice of 8 bit or 11-bit dynamic range.

Customers interested in small, easy to use images for visual interpretation should select 8-bit images with dynamic range adjustment "on". In an 8-bit image, each pixel is represented by 256 shades of gray per band.

Customers interested in full dynamic range should select 11-bit images with dynamic range adjustment "off". An 11-bit image provides more information to discern subtle differences among objects and extract information from shadows because each pixel is represented by 2,048 shades of gray. When viewing an 11-bit image, use an application that is capable of reading 16-bit file formats and adjusting both image brightness and contrast.

Resampling: Cubic convolution (also called bi-cubic) is the default resampling method for panchromatic, multispectral, and color imagery. Nearest neighbor resampling is available by request but not recommended due to color anomalies that may result.

[9] RPC camera model defined with respect to WGS84 datum
[10] NAD83 and NAD27 available in North America only

Image Format: Choice of GeoTIFF, NITF 2.0, NITF 2.1, or NITF 2.1 with NCD[11].

Stereo imagery is available in NITF or TIFF format for epipolar imagery and NITF or GeoTIFF for map-projected imagery.

TIFF and GeoTIFF images are delivered un-tiled. Image files are delivered according to customer band selections discussed above.

Media: DVD, CD, External Hard Drive, electronic delivery (FTP) or Signiant Service[12].

Deliverables: Media with data (image and support files), License, Return Policy, Packaging list, Packaging.

Minimum Order Size: The minimum order size for new collections is 100 square kilometers. For archive products the minimum order size is 49 square kilometers.

All imagery product orders must be a minimum of five kilometers wide in any direction.

Sun Angle: Solar elevation angle from ground to sun will exceed 15°. Solar azimuth is unrestricted. Collection geometry will avoid reflections of the sun from water bodies into the sensor. Our satellite orbits are sun synchronous; therefore, all imagery is collected at approximately 10:30 AM local solar time, however not necessarily at the same sun azimuth.

Clouds: Newly collected imagery from IKONOS and GeoEye-1 will have less than 15% cloud cover.[13] GeoEye uses an automated process to calculate the percentage of cloud cover in each image collected. Additionally, customers can designate a single coordinate within the image that must be cloud free. The imagery delivered will be cloud-free in a 2 km by 2 km square centered on the customer's designated coordinate.

Project Name: Customer supplied project name included in metadata and printed on media.

Support Files: All GeoEye products are shipped with a text metadata file, license file, shapefiles, TIFF, and JPEG thumbnail with world files. Shapefiles show order area of interest (AOI), delivery component layout, and source image footprints with acquisition geometry.

Metadata: Metadata is provided in an ASCII text file and includes GeoEye contact information, order parameters (area of interest, spectral bands, and coordinate system), source image description (acquisition date, sun angles, and viewing geometry), and product file descriptions (file names, sizes, and coverage).

Components: Images larger than the media capacity are segmented into components and delivered on multiple media (default). Customers may specify a maximum file size or component size smaller than the default value.

Distribution: Customers are eligible to purchase .50-meter resolution panchromatic (black and white) / color (pansharpened) and 2-meter resolution multispectral imagery products except for certain geographic areas that are restricted by United States law.

[11] NITF 2.1 and NCD are currently not available for IKONOS imagery.
[12] Signiant requires system set-up and client software installation prior to delivery.
[13] Cloud cover percentages may vary by ± 5%.

File Sizes: The following table is used to determine the file size for an imagery product order, according to specific color, bit, band and resolution requirements.[14]

	Bits per Pixel	Number of Bands	Resolution	File Size per Square Kilometer	Resolution	File Size per Square Kilometer
Panchromatic	8	1	1-meter	1 megabyte	.50-meter	4 megabytes
	11	1	1-meter	2 megabytes	.50-meter	8 megabytes
Multispectral (true or false color)	8	3	4-meter	.1875 megabyte	2-meter	.75 megabyte
	11	3	4-meter	.375 megabyte	1-meter	1.5 megabytes
Multispectral (4-band)	8	4	4-meter	.25 megabyte	2-meter	1 megabyte
	11	4	4-meter	.5 megabyte	2-meter	2 megabyte
Color (true or false color)	8	3	1-meter	3 megabytes	.50-meter	12 megabytes
	11	3	1-meter	6 megabytes	.50-meter	24 megabytes
Color (4-band)	8	4	1-meter	4 megabytes	.50-meter	16 megabytes
	11	4	1-meter	8 megabytes	.50-meter	32 megabytes
Bundle (true or false color)	8	4	1 meter + 4-meter	1.1875 megabytes	.50-meter + 2-meter	4.75 megabytes
	11	4	1 meter + 4-meter	2.375 megabytes	.50-meter + 2-meter	9.5 megabytes
Bundle (4-band)	8	5	1 meter + 4-meter	1.25 megabytes	.50-meter + 2-meter	5 megabytes
	11	5	1 meter + 4-meter	2.5 megabytes	.50-meter + 2-meter	10 megabytes

[14] Default file sizes for products. The table does not account for potential compression e.g. NITF format

Geo™

The Geo™ product line has .50-meter, 1-meter, 2-meter, and 4-meter imagery products that are ideal for visual and interpretive applications that do not require a precise positional accuracy.

All Geo™ products are map projected, and rectified to a datum and map projection system. To produce a Geo™ product, GeoEye uses a correction process that removes image distortions introduced by the collection geometry and then resamples the imagery to a uniform ground sample distance (GSD) and a specified map projection. Because Geo™ images are not orthorectified, their accuracy is limited by terrain displacement.

Geo™ products are developed from GeoEye-1 and IKONOS images captured at a target elevation angle between 60 and 90 degrees from the Earth's horizon. Because multiple Geo™ images in a single order are not mosaiced, tonal variations may be evident among images.

The Geo™ product provides quick turn around delivery of high-resolution, map-oriented satellite imagery along with the rational polynomial coefficient (RPC) camera model.

The Geo™ product includes the camera geometry obtained at the time of image collection, commonly known as the "RPC camera model". The availability of the RPC camera model, makes the Geo™ product suitable for sophisticated users such as photogrammetrists who want to control the orthorectification process i.e. perform block adjustment and other photogrammetric processing. Using Geo™ imagery, customers can produce their own highly accurate orthorectified products by utilizing commercial off the shelf (COTS) software, digital elevation models (DEMs) and optional ground control. To increase the positional accuracy of the final orthorectified imagery, customers can upgrade the target elevation angle to be between 72 and 90 degrees for an additional fee.

Some examples of Geo™ imagery customers and applications are:

- National Security
  - Situational Awareness
  - Image interpretation
  - Photogrammetric applications
- State and Local Governments
  - Disaster Response including emergency preparedness and response activities
- Oil and Gas
  - Risk Management and Asset Protection
- Insurance
  - Disaster Response and Claims Management
  - Portfolio Management
- Utilities
  - Base Mapping
- Forestry
  - Fuel Modeling
- Agriculture
- Environmental
  - Change Detection and Monitoring
  - Land Management

Geo™ Technical Information

Data Source: GeoEye-1 (.50-meter panchromatic; 2-meter multispectral) and IKONOS (1-meter panchromatic; 4-meter multispectral) satellite imagery.

Processing: Radiometric correction, geometric correction, and rectification to a map projection.

Accuracy: .50-meter products have 5-meter circular error at 90% probability (CE90) and 1-meter products have 15-meter (CE90). Both accuracies are exclusive of terrain displacement. Accuracy is defined as the horizontal distance between true position and the position of an image point projected down to true elevation by RPC or rigorous camera model. Geo™ accuracy is achieved with on-board attitude and ephemeris sensors, and does not require use of ground control points (GCPs).

Image Area: The customer order Area of Interest (AOI) is defined by a geographic rectangle or by a customer-supplied shapefile.

Camera Model: The camera model maps ground coordinates to image coordinates. The camera model is provided in RPC format. RPC camera model data is provided in RPC00B format in NITF files and in text format with GeoTIFF orders. Block adjustment, orthorectification, and other photogrammetric processing can be performed with the RPC camera model.

Target Angles: Sensor target elevation angle from horizon to sensor as seen from the area of interest (AOI). This is typically > 60° but may, with customer consent, be reduced below 60° to facilitate collection. Customers may request collection above 72 degrees for an additional fee. Scan azimuth is typically North-South or East-West, but may be reoriented at GeoEye discretion.

Mosaic: None.

Default Product Parameters:

Listed below are the default product parameters. Please consult with a Service Expert should you require different options.

- Band Combinations – Red, Green, Blue (pansharpened, true color)
- Datum – WGS84
- Projection – Universal Transverse Mercator
- Units – Meters
- Bits – 8 bit
- Dynamic range adjustment – on
- Media – DVD
- Resample method – cubic convolution
- File format – GeoTIFF
- License type – single user
- Rational Polynomial Coefficient – yes

GeoProfessional™

GeoEye designed .50-meter, 1-meter, 2-meter and 4-meter GeoProfessional™ products to be suitable for projects requiring an orthorectified image product with accuracies suitable for most mapping applications. With map accuracy CE90 of 10 meters the GeoProfessional™ products are perfect for projects requiring high-resolution imagery and medium-scale accuracy when ground control may be costly, difficult or impossible to acquire. GeoEye Professional imagery is suitable for use as an image map or as source material for horizontal feature extraction.

GeoProfessional™ high-resolution orthorectified satellite imagery is also available in one accuracy upgrade option, Precision.

GeoEye-1 and IKONOS collect GeoProfessional™ imagery at a target elevation angle between 66 and 90 degrees. GeoEye also mosaics GeoProfessional™ imagery if requested.[15]

Precision Option

With map accuracy CE90 of 4-meters, GeoEye's Precision products support most regional and large-scale urban planning projects. GeoEye-1 and IKONOS typically collect imagery for the .50-meter, 1-meter, 2-meter and 4-meter Precision products at target elevation angles between 72 and 90 degrees. To increase positional accuracy, GeoEye can procure the ground control and uses high-quality elevation models for all Precision products.

Some examples of GeoProfessional™ imagery customers and applications are:

- National Security & Homeland Defense
- State and Local Governments
    - Property record management and taxation services
    - Verification of tax base
    - Public access information
    - Capital planning, design and construction
    - Permitting services
    - Computer-aided dispatch and response activities including crime tracking and investigative activities
- Oil and Gas
    - Seismic layouts – where to locate the source; where to locate detectors
    - Pipeline routing – especially remote international locations
    - Integrating lease lines with other geospatial data
    - Validating map locations – structures, roads, wellheads, etc.
    - Environmental monitoring
    - Establish a baseline before company activity in an area
    - Change detection, especially offshore oil seeps, plumes, etc.
    - Construction encroachment
    - Use of images as a base layer in a GIS
- Real Estate
    - Software Template for Bundling Mapping and Analysis
    - Archiving property data online
- Insurance
    - Portfolio Management
    - Claims Management

[15] Mosaics cannot be performed on orthorectified imagery that uses a very coarse DEM because there will be more than 3 pixels of shear.

  - Underwriting
  - Marketing
  - Flood Mapping
- Transportation
  - Asset Management
  - Pavement Management
- Utilities
  - Right of way monitoring
- Forestry
  - Health
  - Timber inventories
  - Fuel analysis
- Agriculture
  - Mitigating pest infestation
  - Improving crop yields
  - Storm damage assessment
- Environmental
  - Change Detection and Monitoring
  - Land Management

Examples of broader GeoProfessional™ applications include:

- Broad area mapping
- Infrastructure Management
- Planning
- Disaster Response
- Situational Awareness
- Location Services
- Visualization and Simulation
- Internet Mapping

GeoProfessional™ and Precision Technical Information

Data Source: GeoEye-1 (.50-meter panchromatic; 2-meter multispectral) and IKONOS (1-meter panchromatic; 4-meter multispectral) satellite imagery.

Processing: Radiometric correction, geometric correction, orthorectification, and optional mosaic with tonal balance and dynamic range adjustment (DRA).

Accuracy: Product accuracy is controlled by circular error at 90% probability (CE90). GeoProfessional™ accuracy is 10 meters CE90 and Precision is 4 meters CE90. See the table in the Products Specifications At-A-Glance section for additional details.

Ground Control: GeoEye can acquire the Ground Control Points (GCPs) for the Precision product. It may not be possible to produce a higher accuracy Precision product in areas where GCP collection is difficult to access. GeoEye cannot guarantee consistent product accuracy from customer supplied GCPs; therefore, GeoEye does not accept customer supplied GCP for our standard products.

Image Area: The customer order Area of Interest (AOI) is defined by a geographic rectangle or by a customer-supplied shapefile.

Target Angles: Target elevation angles are shown in tables in the Product Specifications At-A-Glance section. Scan azimuth is typically North-South or East-West, but may be reoriented at GeoEye discretion.

Mosaics: Ortho products ordered with dynamic range adjustment on will be mosaiced with tonal balancing. Tonal balance cannot completely compensate for seasonal or other changes in scene content, viewing geometry, or lighting. Mosaic seams will be positioned to reduce visibility. Seams may be visible, particularly when mosaics are viewed at small scale. Geometric shear will be less than 3 pixels linear error (LE90).

Products ordered with dynamic range adjustment "off" will not be mosaiced. Mosaic "off" products from separate source images will be delivered in separate files. This preserves the absolute radiometry of the images and maintains traceability from source imagery to delivered ortho image strips.

DEM: GeoEye uses a variety of DEMs to create orthorectified imagery. If necessary, GeoEye will acquire a DEM generated from GeoEye-1 stereo, IKONOS stereo or other sources to create the GeoProfessional™ and Precision ortho products. GeoEye cannot guarantee consistent product accuracy from customer supplied DEM and so does not accept customer supplied DEM for our standard products.

Default Product Parameters:

Listed below are the default product parameters. Please consult with a Service Expert should you require different options.

- Band Combinations – Red, Green, Blue (pansharpened, true color)
- Accuracy
    - GeoProfessional™: 10 meters CE90
    - Precision: 4 meters CE90
- Datum – WGS84
- Projection – Universal Transverse Mercator
- Units – Meters
- Bits – 8 bit
- Dynamic range adjustment – on
- Media – DVD
- Resample method – cubic convolution
- File format – GeoTIFF
- License type – single user
- Mosaic – on

GeoStereo™

GeoStereo™ imagery is available at .50-meter and 1-meter resolution for the GeoStereo™ and Precision accuracy levels. High-resolution stereo pairs are collected in the same orbital pass, minimizing changes in lighting or scene content. GeoEye provides the stereo imagery pairs with a rational polynomial coefficient (RPC) camera model file. The RPC file provides camera model data suitable for use with commercial-off-the-shelf software packages for block adjustment, photogrammetric extraction of three-dimensional feature coordinates, creation of digital elevation models (DEMs) and subsequent use of DEMs for orthorectification along with other photogrammetric operations.

Stereo pairs comprise two images taken on the same orbital pass. Both images will be above 60° elevation with 30°-45° convergence (0.54 to 0.83 base-to-height ratio). Optionally, for an additional fee, customers may upgrade to have one of the images collected above 72°; this option is especially useful if an orthorectified image will be made from one of the images of the stereo pair.

Some broad examples of GeoStereo™ imagery applications include:

- 3-D Feature extraction
- DEM extraction
- Stereo visualization of geologic formations
- Positioning

Examples of customers include:

- National Security & Homeland Defense
- State and Local Governments
- Oil and Gas
- Real Estate
- Insurance
- Transportation
- Utilities
- Forestry
- Agriculture

GeoStereo™ and Precision Technical Information

Data Source: GeoEye-1 (.50-meter panchromatic; 2-meter multispectral) and IKONOS (1-meter panchromatic; 4-meter multispectral) satellite imagery.

Projections: Choice of epipolar or map projection.

Stereo products require advanced image processing software (e.g. SOCET Set®) for stereo viewing.

Available map projections include Universal Transverse Mercator (UTM), Geographic (nominal ARC), Albers Conic Equal Area (ACEA), Lambert Conformal Conic (LCC), Transverse Mercator (TM) and State Plane projection (US only). Customers must supply desired parameters for ACEA, LCC, and TM projections.

The table below shows which options are available for epipolar and map projections.

Options	Map	Epipolar
Rectangular AOI	√	√
Shape AOI	√	√
TIFF		√
GeoTIFF	√	
NITF	√	√
RPC Camera Model	√	√
Multispectral Products	√	√
Pansharpened Products	√	√
WGS84	√	√

Units: Epipolar stereo is in pixels. Map-projected stereo is in Meters, International Feet, or U.S. Survey feet. Decimal degrees used for geographic projection.

Processing: Stereo images in a map projection are radiometrically corrected, block adjusted, and rectified to the map projection. Epipolar stereo images are radiometrically corrected, block adjusted, and rectified to an epipolar projection.

Accuracy: The table below shows CE90 and LE90 relative to WGS84 for stereo products.

Accuracy of 1-meter GeoStereo™				
	CE90	LE90	NMAS	Target Elevation Angle
GeoStereo™	15 meters	22 meters	1:20,000	>60°
Precision[16]	4 meters	6 meters	1:5,000	>60°
Accuracy of .50-meter GeoStereo™				
	CE90	LE90	NMAS	Target Elevation Angle
GeoStereo™	4 meters	6 meters	1:5,000	>60°
Precision[17]	2 meters	3 meters	1:2,500	>60°

Ground Control: Ground Control Points (GCP) are required for 1-meter and .50-meter Precision stereo products to achieve the above stated accuracies. It may be difficult to produce the GeoStereo™ Precision product in areas where GCP collection is difficult to access. GeoEye cannot guarantee consistent product accuracy from customer supplied GCPs; therefore, GeoEye does not accept customer supplied GCPs for our standard products.

Camera Model: The camera model maps ground coordinates to image coordinates. Stereo products include RPC camera model data. RPC camera model data is provided in RPC00B format in NITF 2.0 and 2.1 files and in text format with TIFF and GeoTIFF orders.

The RPC camera model supports block adjustment, three-dimensional stereo extraction, DEM generation, orthorectification, and other photogrammetric operations.

Target Angles: Sensor target elevation angle > 60° for both legs of the stereo pair. The convergence angle between the two legs will be between 30° and 45° (B/H between 0.54 and 0.83). Scan azimuth is typically North-South or East-West, but may be reoriented at GeoEye discretion. For an additional fee, customers may request that one leg of the stereo pair be imaged above 72° target elevation angle. This would be desirable, for example, if an orthorectified image will be made from one of the images of the stereo pair.

[16] Ground control required. GeoEye procures control necessary to meet upgrade accuracies.
[17] Ground control required. GeoEye procures control necessary to meet upgrade accuracies.

Default Product Parameters:

Listed below are the default product parameters. Please consult with a Service Expert should you require different options.

- Band Combinations – Red, Green, Blue (pansharpened, true color)
- Accuracy
    - .50-meter source (CE90: 4-meters; LE90: 6-meters)
    - 1-meter source (CE90: 15-meters LE90: 22-meters)
- Datum – WGS84
- Projection – Universal Transverse Mercator
- Units – Meters
- Bits – 8 bit
- Dynamic range adjustment – on
- Media – DVD
- Resample method – cubic convolution
- File format – GeoTIFF
- License type – single user
- Rational Polynomial Coefficient – yes

Ordering and Delivery

GeoEye has a team of Service Experts ready to assist you with all of your imagery needs, technical support, tasking and analysis, and order management inquiries. Additionally, our Service Experts are ready to answer specific questions you may have regarding our products and services.

Please contact a Service Expert by phone Monday through Friday,

8:00 a.m. – 8:00 p.m. EST. (-4 GMT)
Phone: 1.800.232.9037 (From within the United States)
+1.703.480.5670 (Worldwide)
Email: info@geoeye.com

Please be prepared to provide details of your project.

Based on the information you provide, our Service Experts will perform a feasibility analysis and provide a proposal with a price quote for your order.

Payment: All payments must be made in US Dollars. GeoEye accepts the following forms of payment[18].

- Credit Card (VISA, MasterCard, and American Express)
- Purchase Order with approved credit from GeoEye
- Wire Transfer
- Check or Money Order

Customers can purchase GeoEye imagery products through our Channel Partners, please visit www.geoeye.com to find a Channel Partner near you.

[18] Sales tax is applicable in Missouri, Virginia, and Colorado.

Customers can purchase imagery from GeoEye for any area of interest (AOI) in the world. Customers can also purchase imagery directly from GeoEye Regional Affiliates (RA) for areas of interest (AOI) within their specific sales territories. For more information on GeoEye Regional Affiliates, please visit www.geoeye.com.

All payments for Products should be made free and clear of any applicable withholding, income or any other taxes or charges whatsoever.

New Collections

New collections are orders for imagery that are not being fulfilled from GeoEye's imagery archive and require scheduling and tasking of the GeoEye-1 or IKONOS satellite. All non-standard collections such as a short-term collection window, rush delivery, etc. require a feasibility assessment and may require a Custom Quotation (CQ). New collections at 1-meter resolution may be fulfilled by either IKONOS or GeoEye-1, at GeoEye's sole discretion.

There is an additional charge for Geo™, GeoProfessional™, and GeoStereo™ orders requested to be collected above 72 degrees.

Archive

GeoEye maintains an extensive archive of IKONOS imagery that has been collected since the launch of IKONOS in September 1999. To determine if archive imagery is available for any area of interest you can access GeoEye's advanced, fully featured online search tool from www.geoeye.com.

Delivery Times

The following tables show the estimated delivery timeframes for GeoEye imagery products.

Geo™ Product						
Collection Terms	**Extended Delivery Terms by square kilometers**		**AOI Min Order Size**	**New Collect?**	**Feasibility Required Prior To Order Acceptance?**	**Custom Quote Required?**
Standard Collect	< 500 km^2	60 Days	100 km^2	Yes	No	No
	500 to 5000 km^2	90 Days		Yes	Yes	No
	5,000-10,000 km^2	120 Days		Yes	Yes	No
	>10,000 km^2	Custom Quote		Yes	Yes	Yes
Archive	5 work days for GeoEye archive 10 work days for Regional Affiliate archive		49 km^2	No	No	No

GeoProfessional™ Products						
Collection Terms	**Extended Delivery Terms by square kilometers**		**AOI Min Order Size**	**New Collect?**	**Feasibility Required Prior To Order Acceptance?**	**Custom Quote Required?**
Standard Collect	< 500 km^2	60 Days	100 km^2	Yes	No	No
	500 to 5,000 km^2	90 Days		Yes	Yes	No
	5,000-10,000 km^2	150 Days		Yes	Yes	No
	> 10,000 km^2	Custom Quote		Yes	Yes	Yes
Precision Collects	< 5,000 km^2	120 Days	100 km^2	Yes	Yes	Yes
	5,000-10,000 km^2	150 Days		Yes	Yes	Yes
	> 10,000 km^2	Custom Quote		Yes	Yes	Yes
Archive[19]	< 500 km^2	60 Days	49 km^2	No	No	No
	500 to 5,000 km^2	90 Days		No	No	No
	5,000-10,000 km^2	150 Days		No	No	No
	> 10,000 km^2	Custom Quote		No	No	Yes

[19] If ground control is not required and in-stock digital elevation models are used this time frame can be accelerated.

GeoStereo™ Products						
Collection Terms	**Extended Delivery Terms by square kilometers**		**AOI Min Order Size**	**New Collect?**	**Feasibility Required Prior To Order Acceptance?**	**Custom Quote Required?**
Standard Collect	< 500 km^2	60 Days	100 km^2	Yes	No	No
	500 to 5,000 km^2	90 Days		Yes	Yes	No
	5,000-10,000 km^2	150 Days		Yes	Yes	No
	> 10,000 km^2	Custom Quote		Yes	Yes	Yes
Precision Collects	< 5,000 km^2	120 Days	100 km^2	Yes	Yes	Yes
	5,000-10,000 km^2	150 Days		Yes	Yes	Yes
	> 10,000 km^2	Custom Quote		Yes	Yes	Yes
Archive[20]	< 500 km^2	60 Days	49 km^2	No	No	No
	500 to 5,000 km^2	90 Days		No	No	No
	5,000-10,000 km^2	150 Days		No	No	No
	> 10,000 km^2	Custom Quote		No	No	Yes

Custom Collection and Delivery

Customers interested in customized project solutions should contact a Service Expert to discuss their specific requirements. Where possible the Service Expert will prepare a Custom Quotation to match your requirements as closely as possible.

Shipping

Standard shipping by ground courier or FTP is billed at a flat fee of $35 per order (or partial shipment) in the US. International shipping fees, FTP or courier, is $50 per order (or partial shipment).[21] A Service Expert will advise you as to when a product will be processed, and how soon it can be delivered.

[20] If ground control is not required this time frame can be accelerated.
[21] Shipping fees are subject to change without notice.

Copies and Redeliveries

Additional copies of imagery products requested after the original data purchase are outlined below.

Copy and Redelivery Minimums[22]			
	Copies	**Geo™ Redelivery**	**GeoProfessional™ or GeoStereo™ Redelivery**
Minimum	$.25 per square kilometer	$1 per square kilometer	$5 per square kilometer
Redelivery available for licensed users only and with permission from original purchaser			

Order Cancellations and Modifications

Cancellations

Days Since the Order Date	Order Conditions	Cancellation Fee
Less than 3	N/A	0%
3-30	N/A	25% of the order invoice price
30+	N/A	50% of the order invoice price
N/A	Late Delivery	0%
N/A	Error by GeoEye	0%

[22] Fees are subject to change without notice.

Modifications

If a customer makes a change to an existing order the following conditions may apply.

Image Collected	Order Conditions	Fee
N/A	Error by GeoEye	0%
No	Order falls under cancellation policy	Ordered less than 3 days: No Fee. Ordered 3-30 days: 25% of order invoice price. Ordered 30+ days: 50% of order invoice price.
Yes	Cancel and reorder as desired	Invoice for percent of collection completed. If over 30 days since order, 50% of order invoice price.

Returns

GeoEye will make every attempt to provide the customer with quality products and services that meet the customer's requirements. If a problem is reported to GeoEye, a GeoEye Technical Support Services (TSS) Representative will discuss the problem with the customer, and review the GeoEye Product Return Policy with the customer. It is the TSS team's responsibility to explain GeoEye's Product Return Policy, not to guarantee refunds or replacements. GeoEye's return policy is outlined as follows:

- GeoEye's warranty is for a period of 30 days from the date of shipment for clients in the USA, Mexico or Canada and 60 days for areas other than the aforementioned countries.
- Replacement and reprocessing of orders accepted as a result of customer error (during the warranty period) may incur a reprocessing fee of at least 20% of the product's invoice price before discounts and/or commissions.
- Returns are to be shipped to GeoEye at the customer's expense unless otherwise approved by TSS management.
- All imagery products to be considered for replacement or credit must be returned to TSS in Dulles, Virginia, USA. TSS management must verify situations where the original product is not received by GeoEye before a credit is issued.
- TSS review criteria for returns acceptance will be based upon published product specifications, catalogue description, production guidelines, Marketing and Sales recommendations, prior approval from senior management and above, and/or unforeseen extenuating circumstances.
- TSS will forward nonconforming products that exhibit quality problems to GeoEye Quality Assurance for further assessment.
- If TSS determines a credit is due to the customer, a credit will be placed for the amount invoiced, including shipping and taxes, on the customer's account. Provided the customer has already paid for the product a refund maybe requested, unless the product is being reworked or replaced.
- When applicable, replacement products will be billed at the original price, plus shipping and taxes.

Appendix A – Frequently Asked Questions

1. How do I get information on GeoEye products?

All public information about GeoEye, our satellites and products, can be found on our website at www.geoeye.com. Please check back periodically, as additional information and updates become available. If you have any questions or concerns that are not addressed on our website, please feel free to contact a GeoEye Service Expert at info@geoeye.com or 800.232.9037 in US/Canada or +1.703.480.5670 (Worldwide).

Customers can purchase GeoEye imagery products through our Channel Partners, please visit www.geoeye.com to find a Channel Partner near you.

2. When will additional products be available from GeoEye?

Products are developed or enhanced according to market needs and requirements. If you have any suggestion for a new product or enhancements to existing products please contact Product Management at products@geoeye.com.

3. When will archive imagery products be available and how can I access them?

Our online archive is updated daily. You can easily search for GeoEye imagery products through www.geoeye.com.

4. How much does GeoEye imagery cost?

For product pricing and availability for all GeoEye products, please call a Service Expert in North America at 1-800-232-9037 or Worldwide at +1 703-480-5670. Contact us by phone Monday - Friday, 8:00AM – 8:00PM EST. Or contact us by email at info@geoeye.com. Or you may call your sales representative or authorized GeoEye Channel Partner.

5. Does GeoEye have sample data available for my area of interest?

Sample imagery products from our satellites are available for download on our website. Generally, we are not able to take requests for specific areas for sample images or products.

6. In what formats are GeoEye imagery products delivered?

The default format for our imagery is GeoTIFF, NITF 2.0, NITF 2.1, or NITF 2.1 with NCD.

Stereo imagery is available in TIFF format for epipolar projected imagery and GeoTIFF for map-projected imagery or NITF for epipolar or map-projected imagery.

7. In what projection and datum are imagery products delivered?

We offer all common projections including Universal Transverse Mercator (default), State Plane (within the US) and Lambert Conformal Conic. Datums include WGS84 (default), NAD27 and NAD83[23]. Please contact a Service Expert at info@geoeye.com if you are interested in other projections and/or datums.

[23] NAD27 and NAD83 available in North America only.

8. What are the minimum order sizes?

The minimum order for new collections is 100 square kilometers.

For archive Geo™, GeoProfessional™, and GeoStereo™ products, the minimum order size is 49 square kilometers.

All orders must be a minimum of five kilometers wide in any direction.

9. How do I place an order for imagery products with GeoEye?

Please contact a GeoEye Service Expert info@geoeye.com or by phone at 800.232.9037 in US/Canada or 703.480.5670 internationally with the following information to initiate the ordering process:

- Contact information
- Intended application (to assist in determining the best suited product)
- Target area and coordinates
- Timeframe for acquisition
- Product type
- Product parameters
- Collection parameters
- Image processing parameters
- Delivery option
- Payment method

Customers can purchase GeoEye imagery products through our Channel Partners, please visit www.geoeye.com to find a Channel Partner near you.

10. How do I order products from GeoEye if I am an International customer?

GeoEye has established a network of international partners for our customers outside of the United States and Canada. Please check our website at www.geoeye.com for the appropriate partner and contact information.

If you cannot locate a GeoEye International Partner for your area, please contact a GeoEye Service Expert at 800.232.9037 in US/Canada or +1.703.480.5670 internationally or info@geoeye.com for assistance.

11. How do I know that the area of interest I ordered can be collected?

Once the product type and parameters are selected by the customer, the order is submitted for collection feasibility. This analysis considers various factors including satellite orbits, climatology, time of year, production capacity and competing orders for your area of interest. Based on this analysis, a proposal will be generated and submitted for your approval.

12. May I choose a tasking priority? If so, what are my options?

GeoEye only offers Routine collection as part of our standard products. Priority and Premium tasking options are only available through a Custom Quotation (CQ) at this time.

13. What is the order cancellation policy?

GeoEye believes in building successful relationships to attain ultimate satisfaction for our customers, especially in the quality of our products and timeliness of deliveries. To ensure this, it is critical that we operate the satellite constellation with these goals in mind

and avoid any unused satellite time. To this end, a cancellation fee is applicable to orders that are cancelled after the order has been started. A detailed cancellation schedule is shown in the table below:

Days Since the Order Date	Order Conditions	Cancellation Fee
Less than 3	N/A	0%
3-30 days	N/A	25% of the order invoice price
30+ days	N/A	50% of the order invoice price
N/A	Late Delivery	0%
N/A	Error by GeoEye	0%

14. What affects the collection time of my imagery product?

The amount of time it will take our satellites to revisit your area of interest is dependent on the following; weather conditions, size of the area, competing orders, and your specified maximum acquisition target angle for collection.

15. What is the approximate product delivery time?

Product delivery time is determined by many factors such as the product type, area of interest size, collection parameters, weather conditions, processing method and type of media. As a result, estimated delivery times are provided once we have the necessary parameters. The table below provides a guide to set expectations.

Geo™ Product						
Collection Terms	**Extended Delivery Terms by square kilometers**		**AOI Min Order Size**	**New Collect?**	**Feasibility Required Prior To Order Acceptance?**	**Custom Quote Required?**
Standard Collect	< 500 km^2	60 Days	100 km^2	Yes	No	No
	500 to 5000 km^2	90 Days		Yes	Yes	No
	5,000-10,000 km^2	120 Days		Yes	Yes	No
	>10,000 km^2	Custom Quote		Yes	Yes	Yes
Archive	5 work days for GeoEye archive 10 work days for Regional Affiliate archive		49 km^2	No	No	No

GeoProfessional™ Products						
Collection Terms	**Extended Delivery Terms by square kilometers**		**AOI Min Order Size**	**New Collect?**	**Feasibility Required Prior To Order Acceptance?**	**Custom Quote Required?**
Standard Collect	< 500 km^2	60 Days	100 km^2	Yes	No	No
	500 to 5,000 km^2	90 Days		Yes	Yes	No
	5,000-10,000 km^2	150 Days		Yes	Yes	No
	> 10,000 km^2	Custom Quote		Yes	Yes	Yes
Precision Collects	< 5,000 km^2	120 Days	100 km^2	Yes	Yes	Yes
	5,000-10,000 km^2	150 Days		Yes	Yes	Yes
	> 10,000 km^2	Custom Quote		Yes	Yes	Yes
Archive[24]	< 500 km^2	60 Days	49 km^2	No	No	No
	500 to 5,000 km^2	90 Days		No	No	No
	5,000-10,000 km^2	150 Days		No	No	No
	> 10,000 km^2	Custom Quote		No	No	Yes

[24] If ground control is not required and in-stock digital elevation models are used this time frame can be accelerated.

GeoStereo™ Products						
Collection Terms	**Extended Delivery Terms by square kilometers**		**AOI Min Order Size**	**New Collect?**	**Feasibility Required Prior To Order Acceptance?**	**Custom Quote Required?**
Standard Collect	< 500 km^2	60 Days	100 km^2	Yes	No	No
	500 to 5,000 km^2	90 Days		Yes	Yes	No
	5,000-10,000 km^2	150 Days		Yes	Yes	No
	> 10,000 km^2	Custom Quote		Yes	Yes	Yes
Precision Collects	< 5,000 km^2	120 Days	100 km^2	Yes	Yes	Yes
	5,000-10,000 km^2	150 Days		Yes	Yes	Yes
	> 10,000 km^2	Custom Quote		Yes	Yes	Yes
Archive[25]	< 500 km^2	60 Days	49 km^2	No	No	No
	500 to 5,000 km^2	90 Days		No	No	No
	5,000-10,000 km^2	150 Days		No	No	No
	> 10,000 km^2	Custom Quote		No	No	Yes

16. What is the policy on clouds in the imagery products?

Newly collected imagery from IKONOS and GeoEye-1 will have less than 15% cloud cover. Additionally, customers can designate a single coordinate within the image that must be cloud free. The imagery delivered will be cloud-free in a 2 km by 2 km square centered on that point.

GeoEye uses an automated process to calculate the percent cloud cover of each image collected. Cloud cover percentages may vary by $\pm$ 5%.

17. What will be delivered with my imagery products?

All GeoEye products are shipped with a text metadata file, license file, shapefiles, and TIFF and JPEG thumbnail with world files. Shapefiles show order AOI, delivery component layout, and source image footprints with acquisition geometry.

The metadata includes GeoEye contact information; order parameters, source image and product file descriptions. Order parameters include area of interest, spectral bands, and coordinate system. Source image description includes acquisition date, sun angles, and viewing geometry. Product file descriptions include geocoding, spectral bands, and coverage area.

18. What type of software do I need to view my imagery products?

GeoEye imagery products are delivered in a variety of formats, which may be viewed in any graphics software that supports these file formats. In order to use the image product for further analysis and utilize the geographic information imbedded in the image product, a GIS or image processing software package may be required.

[25] If ground control is not required this time frame can be accelerated.

Compatible software includes BAE SOCET SET®, ERDAS Imagine®, Intergraph ImageStation®, Research Systems ENVI®, PCI Geomatica®, and many others. Please contact a Technical Support Services representative at Technical.Support@geoeye.com should you require more information.

19. Is technical support available from GeoEye once I receive my order?

For technical support for all GeoEye products, please contact a Technical Support Services representative at Technical.Support@geoeye.com.

Appendix B – Licensing

Upon sale of an image product, GeoEye retains copyright and ownership to all images we collect, produce, and distribute. In effect, customers are not purchasing the image itself; rather, they are purchasing the non-exclusive right to use the image. GeoEye defines how a customer may use the image through a license. The license that is purchased by the customer also determines the amount charged for the right to use the image. For example, a company that purchases a "Single Organization" license that only allows internal use of the data is charged less than a company that purchases a "Multiple Organization" license because they intend to share the data with another company.

Permitted Activities

Under GeoEye licenses, customers may do the following:

- Reformat the Product for customer's use into different formats or media from those in which it is delivered.
- Make an unlimited number of hardcopies and softcopies of the Product for customer's internal use.
- Distribute the Product (with copyright markings) on an isolated, non-commercial basis. For example, as part of a hardcopy research report or publication.
- Modify the imagery Product, through manipulation techniques and/or the addition of other data, and make copies of the resulting bundled image product, for customer's internal use only.
- Distribute works derived from the Product ("Derived Works"). Derived Works that contain the source image data (pixels) or reasonable facsimile of the source image data, inherit the copyright and license restrictions of the source data. Other Derived Works (vector extraction, classification, etc.) have no restrictions on use and distribution. Reduced resolution data sets (RRDS) with ratios of 16:1 or higher shall have no restrictions on use and distribution, but shall contain the copyright markings.
- Make the Product available to its consultants, agents and subcontractors for purposes otherwise consistent with the Permitted Use and subject to the restrictions herein, and without the right to transfer, modify copy or sublicense.
- Post the Product and Derived Works, with copyright markings, in a non-downloadable fashion, on an Internet site with the following credit conspicuously displayed, "Includes material ©GeoEye, all rights reserved".
- All uses of the Product not expressly granted by the GeoEye license are reserved by GeoEye.

Prohibited and Restricted Activities

GeoEye licenses prohibit and restrict the following:

- Copy or reproduce (even if merged with other materials), other than as consistent with the Permitted Use.
- Sell, license, transfer or disclose the Products, or use them in any manner not expressly authorized by the License Agreement.
- Use or distribute the Products in a manner inconsistent with the rights granted to GeoEye by the United States Government, Department of Commerce, National Oceanographic and Atmospheric Administration operations license applicable to imagery products.
- Alter or remove any copyright notice or proprietary legend contained in, or on the Products. Customer agrees that any embodiment of the Products permitted under this Agreement will contain a notice similar to the following: "Includes material © GeoEye, all rights reserved."

License Levels

GeoEye's license structure allows customers to choose from five license levels

License	Price Uplift
Single Organization	0%
Multiple Organization	15%
Tier 1	30%
Tier 2	55%
Tier 3	90%

Single / Multiple Organization License

The Single Organization license allows customers to use the data at one of the following narrowly Defined Customer Groups. The multiple organization license allows the customer to select two of these narrowly defined customer groups.

- One private individual
- One company or corporation, but not subsidiaries
- One civilian federal agency below the U.S. Cabinet level
- One of the four branches of the military, a defense agency, one of the unified commands, one of the non-Department of Defense (DoD) entities identified in the Title 50 USC 401a or the State Department (U.S. A.I.D. shall not be considered to be a component of the State Department)
- One state or provincial agency
- All departments of one county government
- All departments of one city government
- One Non Governmental Organization (NGO) or Non-Profit Organization (NPO)
- All departments within a single educational organization within a single country

Tier License

A "Tier 1" license allows the data to be used by one more Broadly Defined Customer Groups.

A "Tier 2" allows data to be shared by two of the following customer groups.

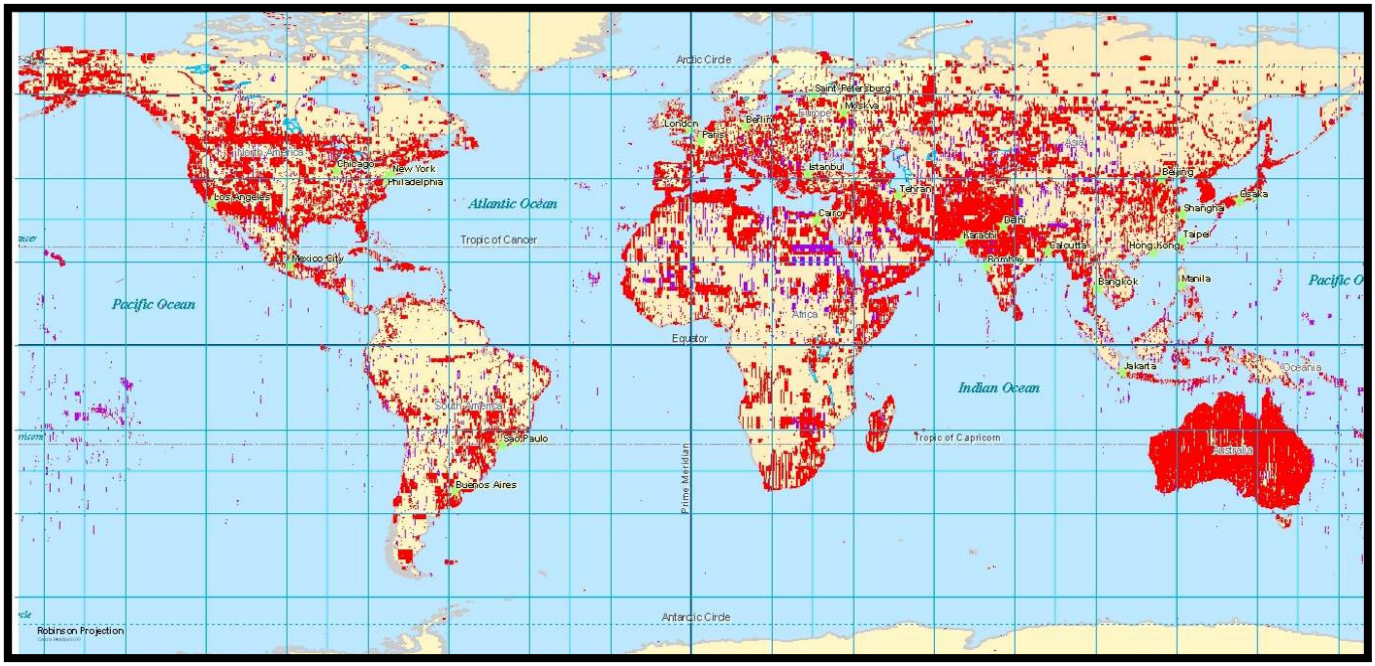
A "Tier 3" license allows data to be used by all customer groups.

- Multiple private companies and/or corporations to include subsidiaries
- All Federal Civilian Government Agencies of a single country
- All DoD/Title 50 Government Agencies of a single country. Includes all Title 50 organizations as defined in 50 USC 401a in the United States.
- One of the four branches of the military, a defense agency, one of the unified commands, one of the non-DoD entities identified in the Title 50 USC 401a or the State Department (U.S. A.I.D. shall not be considered to be a component of the State Department); and "Coalition Forces" including the foreign Department/Ministry of Defense (DoD/MoD) and intelligence organizations, as well as headquarters elements of the UN, NATO, and similar coalitions.
- All state or provincial government agencies of a single state or province
- All local municipal government agencies (county and city) of a single municipality
- Multiple Non Governmental Organizations (NGO) and/or Non-Profit Organizations (NPO)

- All departments within a single educational organization within a single country
- Multiple International Agencies (such as the U.N.) and host nations

Appendix C – Imaging Platform Overview

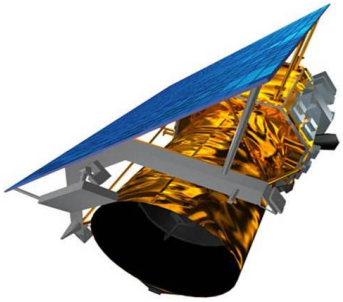
GeoEye manages a constellation of satellites that collect imagery at varying resolutions. Our high-resolution imagery satellites have collected several hundred million square kilometers of imagery to date. The map below shows the high-resolution archive coverage available in early 2008.



Customers can access the GeoEye archive online through www.geoeye.com to see if their area of interest has already been collected.

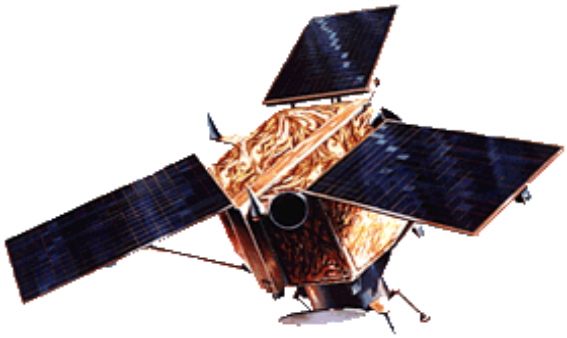
GeoEye-1

Launched in 2008, GeoEye-1 simultaneously captures image detail up to 0.41-meters[26] for panchromatic images and 1.65-meters[27] for multispectral images. GeoEye-1 orbits the Earth every 98 minutes at an altitude of approximately 681 kilometers or 423 miles. The satellite travels a sun-synchronous orbit, passing the equator at about 10:30 AM local time. GeoEye-1 can collect up to 700,000 square kilometers per day, or over 255 million square kilometers per year.



IKONOS

Launched in 1999, IKONOS collects .82-meter panchromatic and 3.28-meter multispectral data at a rate of over 240,000 square kilometers per day or over 87 million square kilometers per year. IKONOS orbits the Earth every 98 minutes at an altitude of approximately 681 kilometers or 423 miles. The satellite travels a sun-synchronous orbit, always crossing the equator at about 10:30 AM local time.



[26] All GeoEye-1 imagery products are delivered to customers at .50-meter resolution as required under GeoEye's NOAA license.
[27] Multispectral imagery captured at 1.65-meters is sampled to 2-meters for product delivery.

Imaging Platforms At-A-Glance

Satellite Feature	Resolution	
	.50-meter GeoEye-1	**1-meter IKONOS**
Spectral range (pan)	450-800 nm	526-929 nm
Blue	450-510 nm	445-516 nm
Green	510-580 nm	505-595 nm
Red	655-690 nm	632-698 nm
Near IR	780-920 nm	757-853 nm
Panchromatic Resolution at nadir	.41 meters	.82 meters
Panchromatic Resolution at 60° elevation	.50-meters	1.0 meter
Multispectral Resolution at nadir	1.64 meters	3.28 meters
Swath width at nadir	15.2 km	11.3 km
Nominal Scene size	231 km^2	121 km^2
Pan point target rate (50 km spacing)	5 points/min	4 points/min
Daily collection km^2	700,000 square kilometers panchromatic, 350,000 square kilometers multispectral	240,000 square kilometers
Dynamic range	11 bits per pixel	11 bits per pixel
Launch date	22-Aug-08	24-Sep-99
Life Cycle	7 years	Over 8.5 years
Revisit Time	3 days at 40° latitude with elevation > 60°	3 days at 40° latitude with elevation > 60°
Orbital Altitude	681 km	681 km
Nodal Crossing	10:30 AM	10:30 AM

Appendix D – Market Overview

GeoEye's commitment to leading the industry in technology and solutions is backed by an expert team of geospatial professionals dedicated to providing the right imagery products for our customer's geospatial and mapping needs. As your "Trusted Imagery Experts", we offer a wide range of product levels intended to match your specific area of interest—anywhere in the world.

GeoEye has an extensive archive imagery encompassing several hundred million square kilometers of readily available imagery. You can access imagery products in our online archive through www.geoeye.com or call a GeoEye Service Expert or a Channel Partner. Our product levels are designed to meet increasing demands for imagery used in applications such as:

- Broad area mapping
- Infrastructure management
- Planning
- Disaster response
- Situational awareness
- Location services
- Internet mapping
- Visualization and simulation modeling

GeoEye imagery products serve the growing national and international demand for highly detailed imagery for a variety of geospatial applications. As the "Trusted Imagery Experts", GeoEye delivers accurate, first-time-right imagery products to meet a diverse set of customers in industries including:

- National Security & Homeland Defense
- State and Local Governments
- Oil and Gas
- Real Estate
- Insurance
- Transportation
- Utilities
- Forestry
- Agriculture
- Internet Mapping

The following sections describe potential customers and uses for GeoEye imagery products.

National Security & Homeland Defense

The U.S. intelligence community has a need for improved information sharing from many sources for a current and accurate understanding of all intelligence situations. Geospatial intelligence plays a crucial role of in the overall national security enterprise. Sharing of information in a multi-intelligence environment with disparate components can be difficult.

With national security at stake, the intelligence community is under constant pressure to turn massive volumes of raw data into actionable information before a threat becomes a crisis. GeoEye can process massive amounts of image data using sophisticated "ingest" and "exploitation" applications. Using GeoEye's earth imaging satellites these applications scale to handle ever-increasing

data volumes, and are highly reliable to avoid delays in processing the data. GeoEye offers the following keys to successful geospatial data implementation across the national security enterprise:

- Predictable and reliable execution of high-volume data-processing and exploitation applications
- Easy scaling for new applications
- Rapidly deployment of new analytical algorithms to facilitate new information extraction
- Using standards facilitates in lowering costs of application development, management and infrastructure

GeoEye imagery products provide visual clarity and representation of natural or man-made objects on the ground and present this information in easy to use map formats for use by virtually everyone. This information provides a common link for almost all other data and offers a way of organizing information to connect and understand relationships between people, things and activities. This "where" component is critical in national security intelligence.

State and Local Government

Providing enhanced services to residents, local governments benefit from the use of geographic information system applications and mapping technology. GIS applications have become integral resources in various local government functions, including planning, public works, financial, public safety and economic development.

Because costs for implementing these systems are high and adequate funding can be a barrier many communities have turn to regional data and system sharing models to maintain a high quality of service to their constituents. GeoEye supports this regional model by providing the ability to collect wide areas of imagery in a timely fashion. Additionally our product licensing schemes facilitate information sharing among regional governments.

GeoEye imagery products provide local governments with a highly accurate base map necessary for the implementation of a geographic information system. These imagery products provide the foundation to address and power a wide range of applications.

Oil & Gas

GeoEye provides solutions to the oil and gas market in the Risk Management and Asset Protection and Green Initiatives segments:

Risk Management and Asset Protection

GeoEye imagery products can help identify risk exposures and methods to protect assets from various threats.

- Facilities: Based on facility inventory identify those facilities which are more susceptible to threats. Of those facilities, identify defensible perimeter and determine resources required to protect the facility.
- Environmental: Determine threats to the environment based on facility and pipeline contents and develop mitigation and remediation schemes.
- Pipelines: Based on what is transported through a given pipeline identify those pipelines which are more susceptible to threats. Of those pipelines, identify areas where the exposed pipeline is the greatest and determine resources required to protect the pipeline.

Green Initiatives

GeoEye imagery products can map and monitor carbon emissions sites and develop schemes to neutralize overall effects on the environment. Using satellite imagery can assist in monitoring and mapping any cap and trade regulatory schemes.

- Facilities: Micro planning (individual facilities) and macro planning (survey of all facilities) to determine present and future carbon output. Use results in overall corporate "green" plan.
- Environmental: Use results from planning in localized environmental assessments to determine and monitor carbon credits required to be made up on a site by site basis.
- Enforcement: Satellite imagery is an effective land use land cover standard to map and track company compliance with cap and trade directives.

Real Estate

Real estate agents require easy-to-use tools that allow them to search for properties that meet their customer's wide range of requirements. This information needs to be presented in a format that their customers can easily understand.

Often times the desired/required data is not available from a single source. It must be gathered from up to a dozen different sources, which is frustrating, time consuming, effort intensive and expensive. Once the data is gathered from multiple disparate sources, real estate companies themselves must agglomerate the data and integrate it/overlay it onto the base maps. Larger brokerages maintain a large research staff to perform these functions.

GeoEye imagery products portray the current landscape in terms that are easily comprehended. GeoEye puts additional geospatial intelligence behind the imagery to facilitate the search process e.g. retail competition, building statistics, owners, demographics, tenants, schools, parks, traffic counts, flood plain, geologic data, etc. Along with simple tools to calculate distances and areas and the ability to bring other GIS functionality and other related applications in. Finally the user is able to draw, annotate and overlay data on recent photography and save the output for future recall, printing, etc.

Insurance

GeoEye imagery products provide solutions to the insurance market in the Planning and Marketing, Underwriting and Renewals, Claims Management, and Portfolio Management segments:

Planning and Marketing

Driving better overall risk management and improving underwriting effectiveness and efficiency by using imagery and other geospatial data to visualize and identify "good customers" and avoid "less desirable customers" (e.g., customers inside a coastal flood zone who are at risk for storm surges, or customers whose properties are in/near hazard areas), allows insurance companies to avoid pursuing "bad" risks. Companies can now obtain new revenue by targeting "good risks" that might previously have been foregone.

Underwriting and Renewals

Reducing costs of initial underwriting of personal residences by using imagery to substitute sending a person (underwriter or photographer) to make a site visit, additionally, underwriters can take better "due diligence" on renewals by using images to assess changes to property risk profile.

Reducing costs and increase efficiency by using imagery and other geospatial data to make initial "go/no go" decisions on whether to make an underwriting visit to a property (especially for commercial and high-value personal properties), saves money by avoiding sending underwriters or photographers on site visits, especially for initial underwriting.

In summary, GeoEye imagery products:

- Improve revenue by using imagery and/or geospatial data to price individual risks more accurately.
- Create time/cost savings by avoiding bad risks.

Claims Management

In the claims management sector GeoEye imagery products provide the following value:

- Using imagery to optimize resource deployment (e.g., sending adjusters) to a catastrophe area (providing better customer service)
- Substitute imagery for adjuster site visits to individual property loss or catastrophic event areas (e.g., in cases of total loss where a property no longer exists)
- Using imagery and geospatial data to create early estimates of potential catastrophic losses
- Manage claims expenses by using images to identify causal factors of a loss and/or using images to conduct a sample audit of claims being made
- Avoidance of paying claims where the cause of the loss is determined not to be covered by the policy (e.g., earthquake, not fire; flood, not wind/storm)
- Ability to mitigate financial market reactions (and their real costs on doing business) by being able to model and communicate potential catastrophic losses prior to, during and/or shortly a catastrophic event

Portfolio Management

In the portfolio management sector GeoEye imagery products provide the following value:

- Using imagery, geospatial data and loss models to better understand, manage and communicate portfolio risks to others (management, reinsurers, rating agencies, regulators) existing risks (portfolio concentrations, hazard areas, etc.)
- Better understanding of risk allows for reduced capital costs (higher agency rating) and reduced surplus requirements
- Better negotiating position for re-insurance contracts (e.g., “excess of loss” contracts)

The marketplace understands that underwriting and portfolio risk management depend on factors beyond the property being underwritten, e.g.: landmarks, hazards, existing geographic portfolio concentrations. GeoEye imagery products along with other geospatial data are critical to understanding these important risk management factors.

Transportation

Many GIS applications have been implemented at transportation agencies over the years. They cover a broad scope of transportation, such as infrastructure planning, design and management, transportation safety analysis, travel demand analysis, traffic monitoring and control, public transit planning and operations, environmental impacts assessment, hazards mitigation, and intelligent transportation systems (ITS).

Each application tends to have its specific data and analysis requirements. For example, representing a street network as centerlines and major intersections may be sufficient for a transportation planning application. A traffic engineering application, however, may require a detailed representation of individual traffic lanes. Turn movements at intersections also could be critical to a traffic engineering study, but not to a region-wide travel demand study.

These different application needs are directly relevant to the GIS data requirements and the subsequent analysis and modeling issues.

GeoEye imagery products provide a highly accurate base map for a transportation agency to visually plan, design and implement their projects. Additionally, GeoEye can derive street centerline vector data to further assist transportation agencies in building the foundation for their GIS.

Utilities

Major investments have been and are made in utility infrastructure; power lines, gas mains, water mains, data lines, telephone lines, and sewer lines. In the past geospatial data has been inadequately recorded and in some cases it is not documented at all.

Reliability of supply, environmental protection and efficiency of operations, require accurate geospatial data. Infrastructure damage can be avoided when reliable information regarding location and description of pipelines is available to the work crews. The repair and replacement of infrastructure can be carried out quickly when accurate geospatial data has been deployed.

Over the years utility companies worldwide have relied on geospatial data for gas distribution/transmission, electric distribution/transmission, telecommunications, cable and water/sewer. These companies need to aggregate geospatial data from variety of sources including satellite imagery, digital photogrammetry, field data and existing maps into a format for use by the GIS database.

Most utilities are now using GIS because of the threat of competition and being able to respond to public, regulatory, and legislative inquiries that are geospatial in nature. Integrated utility mapping provides tools to compete efficiently, identifying where revenue is coming from compared to where facilities are located. GeoEye implements a geospatial data aggregation strategy that includes; data conversion, spatial data processing, GIS database creation, analysis and modeling utility mapping projects.

GeoEye imagery products provide a highly accurate base map for a utility company to visually plan design and implement their projects and workflow management. Additionally, GeoEye can derive street centerline vector data to further assist utility companies in building the foundation for their GIS.

Forestry

Forestry requires the management of natural resources within a forested area. In addition to timber, forests provide such resources as grazing land for animals, wildlife habitat, water resources and recreation areas. Forestry agencies worldwide are responsible for the management of forest harvesting, grazing leases, recreational areas, wildlife habitat, mining activities as well as protecting endangered species. GIS is used to balance the competition for resource conservation and resource use.

GeoEye imagery products provide a highly accurate base map that foresters can use to visually plan, design, balance, and implement various competing projects and resources. Additionally, GeoEye can derive various land use land cover and forest health information that further assist foresters in building their planning efforts.

Agriculture

Satellite imagery provides information on land use land cover of a geographical area because of the ability to collect multispectral data and frequent repetitive coverage. Analysis of spatial distributions is essential prerequisite for proper agriculture planning.

Satellite imagery is a crucial source for many agriculture professionals who need to effectively plan, perform, monitor and analyze operations. With the ability to provide unique information about crop structure and moisture content, satellite imagery is becoming an important source of remote intelligence for agricultural professionals.

GeoEye imagery products provides a highly accurate base map that agribusiness can use to visually plan, design, balance, and implement various pest mitigation, storm damage assessment, and other applications. Additionally, GeoEye can derive various land use land cover and crop health information that further assist agribusiness in improving their yields.

Internet Mapping

Access to geospatial data over the internet has grown rapidly over the last five years. This has spawned an industry of geospatial aggregators targeted at niche markets.

Geospatial aggregators create applications from scratch that display various sources of geospatial data accessible over the internet. These aggregators perform analysis and present the information in an easy-to-digest format targeted at specific end users. Typically these aggregators leverage API's and are viewed in Google Earth, Microsoft Virtual Earth and Yahoo! Maps. These applications allow the end user to publish their data to various destinations, including a local networks or web servers.

GeoEye imagery products provide highly accurate base maps that geospatial aggregators can use to perform analysis on.

Appendix E – Abbreviations, Acronyms and Terms

AOI – Area of Interest.

B/H – Base-to-height ratio of a stereo pair.

Black and white – Single band, black-and-white imagery. Also referred to as panchromatic.

CE90 – Circular Error at 90% confidence. Indicates that the actual location of an object is represented on the image within the stated accuracy for 90% of the points.

Color – Imagery derived by fusing panchromatic and multispectral imagery. Also called pansharpened.

CONUS – Contiguous United States

COTS – Commercial-Off-The-Shelf.

DEM – Digital Elevation Model.

DRA – Dynamic range adjustment. An optional post-processing feature that enhances the visual interpretability of the image.

False color – Viewing multispectral or color imagery in a specific combination of bands (near infrared, red, green). When viewing false color imagery, colors appear "abnormal" (e.g., healthy, green vegetation appears in red on a false color image). False color imagery is commonly used in vegetation analysis.

GCP – Ground Control Point

GSD – Ground Sample Distance. The size of a single pixel as measured on the ground. Also referred to as "resolution".

LE90 – Linear Error at 90 percent confidence. Indicates that the actual elevation of an object is represented within the stated accuracy for at least 90% of elevation posts.

Monoscopic – The collection of a single image, as opposed to a stereo collection.

Mosaic – The process of digitally assembling images to create contiguous large-area coverage.

Multispectral – Imagery collected by IKONOS or GeoEye-1 in four ranges of wavelengths in the electromagnetic spectrum.

Nadir – The point on the ground vertically beneath the sensor.

NED – National Elevation Dataset DEM. NED DEM is available in the United States. Accuracy in Alaska is not as high as in the contiguous United States.

NMAS – United States National Map Accuracy Standards.

Orthorectification – The process of removing image distortions introduced by the collection geometry and variable terrain, and re-sampling the imagery to a specified map projection. Also referred to as ortho-correction or terrain correction.

Panchromatic – black and white single band imagery

Pan-sharpened Color - processed used to colorize imagery by fusing multispectral and panchromatic bands.

RA – GeoEye Regional Affiliates.

RMSE – Root Mean Square Error.

RPC – Rational Polynomial Coefficient camera model. RPCs provide the camera geometry obtained at the time of the image collection. Commercial-Off-The-Shelf (COTS) software can utilize RPC to allow photogrammetric processing.

Stereo – The collection of two or more images of the same Area of Interest (AOI) from different viewing angles.

True color – Viewing multispectral or color imagery in a specific band combination (red, green, blue). When viewing true color imagery, colors appear "normal" (e.g., vegetation is green).

Appendix F – GeoEye Contact Information

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Disclaimer

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GeoEye Product Guide
Prepared by GeoEye
August, 2008
Version 1.0