Ikonos, launched on September 24th 1999, is the first commercial high-resolution satellite, collecting 1-metre panchromatic and 4-metre multi-spectral imagery. Although de-classified military high-resolution panchromatic data has been available from Russian sources for some years, Ikonos is a wholly commercial venture, providing data to an expanding remote sensing market.

**Acquisition Modes and Reference Systems**

Ikonos has a repetitive, circular, sun-synchronous, near-polar orbit, guaranteeing full coverage of the earth. The sensor can be inclined to acquire imagery up to 700 km either side of the track (maximum incidence angle 26°), thus giving the satellite the capacity to revisit, albeit with different sensor angles and resolution, any area on the earth on average every 1.5 days (data resolution up to 2 metres). An average 2.9 day revisit can be achieved for 1 metre resolution data in an area that covers up to 300 kms either side of the track (angle +/- 10°).

Ikonos does not continuously acquire data, as other satellites (e.g. Landsat) do. Instead the satellite’s time is tasked by the satellite operator, Spacelimage. For this reason if an image is not already in the archive (or does not have the customer’s required characteristics), it must be planned in advance. Therefore it may take up to 60 days before an order for non-archived data can be fulfilled, cloud cover permitting.

**Coverage**

Ikonos is equipped with an on-board recorder, and so can acquire data over almost any area of the Earth’s surface. This recorder can hold 64 Gbit of data (approximately 26 Full images of both Pan and MS data), and the downlink of data is made at the stations of Fairbanks and Tromso, in optimal position thanks to their high latitude.

In addition, a network of Ground Receiving Stations owned by Spacelimage's affiliates is being constructed to enable direct downlinking of data in many areas.

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**Technical Summary**

<table>
<thead>
<tr>
<th>Satellite</th>
<th>Launch Date</th>
<th>End Mission</th>
<th>Altitude</th>
<th>Inclination</th>
<th>Sensors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ikonos—1</td>
<td>Lost on launch</td>
<td></td>
<td></td>
<td></td>
<td>PAN, MS</td>
</tr>
<tr>
<td>Ikonos—2</td>
<td>24—sep—99</td>
<td>operational</td>
<td>681 Km</td>
<td>98.1°</td>
<td>PAN, MS</td>
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</table>

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Band</th>
<th>Spectral range (µm)</th>
<th>Pixel Size (m)</th>
<th>Quantization</th>
<th>Swath width</th>
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</thead>
<tbody>
<tr>
<td>PAN</td>
<td>1</td>
<td>.45 — .90</td>
<td>1</td>
<td>11 bit</td>
<td>11 Km</td>
</tr>
<tr>
<td>MS</td>
<td>1 (blue)</td>
<td>.45 — .53</td>
<td>4</td>
<td>11 bit</td>
<td>11 Km</td>
</tr>
<tr>
<td></td>
<td>2 (green)</td>
<td>.52 — .61</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3 (red)</td>
<td>.64 — .72</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4 (VNIR)</td>
<td>.77 — .88</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Currently fully operative stations are: Dubai (SpacelMaging Middle East), Japan (SpacelMaging Japan) and Korea (SpacelMaging Asia). The Athens (Greece) Receiving Station (SpacelMaging Europe) has been recently shut off, but its archive of acquired data over Europe, North Africa and Middle East is still available.

Another station in Ankara, Turkey (SpacelMaging Eurasia), will be soon available. Eurimage has a contract with SpacelMaging Europe to sell Ikonos images to its customers and to all the Italian market, and new agreements will improve the accessibility to Ikonos data for Eurimage customers.

Ikonos Products

Processing Level

Geo Products

Geo is a geometrically corrected product, rectified to a specified ellipsoid and map projection. The rectification removes image distortions introduced by the collection geometry and re-samples the imagery to a uniform ground sample distance (GSD) and a specified map projection. CARTERRA Geo may be ordered in a variety of projections and formats. This product has a ±50 meters (CE 90%) Horizontal Accuracy.

Orthorectified Products

The Orthorectified product provides data rectified to a specified ellipsoid and a user-specified Map Projection. These products may be corrected for terrain errors through use of a Digital Terrain Model (DTM) generated by Ikonos or provided by the customer. The final products are re-sampled to a uniform GSD. Orthorectified products are available at five metric accuracy levels. Ground Control Points (GCPs) may be required for certain products depending on specific collection geometry and accuracy requirements.

• Reference: useful for Large Area Mapping, particularly international coverage, and GIS applications requiring low positional accuracy. This product will be of interest to Media, Real Estate, Insurance and other commercial markets. The deliverable has a ±25.4 meter Horizontal Accuracy (CE 90%) and meets 1:50,000 Map Accuracy Standards.

• Map: useful for State and Regional Governments and Utilities applications such as infrastructure planning, environmental impact assessment, etc. This product has a ±12 meter horizontal accuracy (CE 90%), and meets 1:24,000 Map Accuracy Standards.

• Pro: suitable for City and Local Governments, Agriculture, Telecommunications and Utilities customers with applications such as Environmental Impact Assessment, Transportation and Infrastructure Planning, Utilities Planning and Economic Development Site Evaluations. This product has Horizontal Accuracy of ±10 meters (CE 90%) and meets 1:12,000 Map Accuracy Standards.

• Precision: ideal for Urban Mapping, Cadastral Mapping, and GIS Applications requiring high positional accuracy. This product is produced with the use of Ground Control Points (GCPs), has a ±4 meter horizontal accuracy (CE 90%) and meets 1:4,800 Map Accuracy Standards.

• Precision Plus: the Highest Accuracy orthorectified product, produced using
Ground Control Points (GCPs), has a ±2 meter Horizontal Accuracy (CE 90%) and meets 1:2,400 Map Accuracy Standards.

**Product Type**
- 1-meter Panchromatic (Pan)
- 4-meter Multispectral (MS):
  - 4 bands in 4 separate files, or 3 band combination in one file
    (RGB=321 or 432)
- 1-meter Pan-Sharpened (PSM):
  - 4 bands in 4 separate files, or 3 band combination in one file
    (RGB=321 or 432)

Pan-Sharpening combines the spatial content of the 1-meter panchromatic data with the spectral content of the 4-meter multi-spectral data. The final product gives a "colour" image at 1-meter resolution, but the MS radiance values are changed and therefore the product is no longer suitable for automatic classification.

**Dynamic range**
Products can be 11 bits/pixel (two 8-bit words) or 8 bits/pixel, with or without Dynamic Range Adjustment (DRA). The DRA stretches the raw data values to fit the whole range of the radiometric resolution; by default DRA is applied to Pan but not to MS and PSM products.

**Available Formats**
- GeoTIFF (available only with UTM projection)
- NITF 2.0 (available only to Government Organizations in 8 or 11-bit Pan or 8-bit MS)
- TIFF 6.0
- BIL
- BIP

**Ellipsoid/Projection**
Datum (Ellipsoid) is WGS 84 for all products.
Available projections are:
- UTM
- Transverse Mercator
- Albers Conical Equal Area
- Lambert Conformal Conic

**Data Examples**

MS 432 (upper left): 4-metre resolution.
PAN (lower left) and Pan-sharpened (right): 1-metre resolution.

Pan-sharpened (321) views of Egyptian pyramid, and Eiffel Tower at 1-metre resolution.