

Your behavior appears to be a little unusual. Please verify that you are not a bot.

☐ I'm not a robot

reCAPTCHA
[Privacy](#) - [Terms](#)



[Geospatial Solutions](#)

Search the Site...



- [Home](#)
- [News](#)
- [Opinions](#)
 - [GSS Monthly](#)
 - [GeoIntelligence Insider](#)
- [Technology](#)
 - [BIM](#)
 - [GIS Software](#)
 - [GNSS/GPS](#)
 - [Imagery](#)
 - [Lidar](#)
 - [Mobile Devices](#)
 - [Mapping](#)
 - [UAS/UAV](#)
- [Featured Stories](#)
- [Videos](#)
- [GPS World](#)
- [More](#)
 - [Events](#)
 - [Products/Services](#)
 - [Videos](#)
 - [Webinars](#)
 - [White Papers](#)
 - [Buyers Guide](#)

Navigate to ...



[Oblique Imagery: The New Kids on the Block](#)

July 2, 2013 - By [Art Kalinski](#) [10 Comments](#)

Last month [I covered current vendors](#) of ortho imagery with some pros and cons regarding the different sources. There wasn't room to also include oblique imagery, so I'm covering that topic this month.

I've been a very strong proponent of oblique imagery for many years based on my experience as the GIS manager for the Atlanta Regional Commission, where I found that there was no single geospatial tool that had such a positive and dramatic impact on our first responders as oblique imagery. (See [my 2008 article](#) that describes why.) I felt so strongly that it could make our troops more effective and help save lives that I joined Biotometry for a few years to help promote it. This site uses cookies to offer you a better experience, analyze site traffic, and serve targeted advertisements. By continuing to use this website, you consent to the use of cookies in accordance with our [privacy policy](#).

had patent protection dealing with much of the technology. However, the patent protection is ending and many new players are entering the field.

 [A Graflex camera circa World War I.](#)

A Graflex camera circa World War I.

Early History

Few people realize that the first serious aerial surveillance collections were oblique images taken with old Graflex cameras held out of a biplane cockpit. The images were good but users soon learned that it was a nightmare to try to assemble the oblique perspective images into a large mosaic. So analysts switched to ortho imagery that could be stitched together nicely, and we've been pretty much stuck in that straight down world. Fortunately, sophisticated algorithms and digital image processing have changed all of that.

The underlying reason that oblique imagery works so well for visualization compared to ortho imagery is a function of our mind-eye vision referred to as anamorphic illusion. Our eyes can look at 2D images and perceive them as 3D objects if the right visual cues are present. There are some interesting examples of [anamorphic illusions on the web](#).

So let's look at the current sources of oblique imagery.

Pictometry International, Corp.

[Pictometry](#) has been the dominant force in oblique imagery capture for more than a decade, thanks partially to patents and surrounding technology the company has developed. Not only does Pictometry have the tools and technology to capture, serve and exploit the oblique imagery, it also amassed a huge library of images covering almost 90 percent of U.S. populated areas. Pictometry has desktop viewing software that permits users to view and measure almost any aspect related to the oblique image — x,y location, length, width, and very accurate heights, while also displaying overlaid GIS data including elevation data and contour lines. Pictometry does this by re-projecting the GIS vector data to match the trapezoidal footprint of a perspective oblique image. Pictometry also serves its extensive library of images, over two petabytes, through an online service called POL (Pictometry On Line). Users can view imagery and do the same measurements as with the desktop software.

 [Pictometry's desktop viewing software.](#)

Pictometry's desktop viewing software.

My experience showed that the positional accuracy ranged in the 3- to 15-foot range. To meet USGS National Map standards, Pictometry developed AccuPlus, which includes ground surveys and image correction of the ortho view to meet USGS's 30-cm product specification.

For users who want to view and use the oblique imagery inside the ortho footprint ArcGIS environment, the Pictometry engineers developed a transform tool that effectively stretches the back of the trapezoidal oblique footprint to a rectangular image that can be used just like an ortho image but with an oblique view. The only downside is that without perspective the image looks a little funny. Note this example and the fact that the garage is the same width in front as in back. This is what happens when the perspective is removed. This transform tool is now part of ESRI's ImageServer so users can import an oblique image and the transformation is automatic. Pictometry also supplies oblique imagery for Microsoft Bing, called the Birdseye View. The imagery supplied for Bing has slightly less resolution and cannot be measured, as with Pictometry software.

 [The Pictometry transform tool.](#)

The Pictometry transform tool.

Woolpert, Inc.

[Woolpert](#) has been in the oblique imagery capture business almost as long as Pictometry, but it uses a completely different technology, the push broom method. Most oblique capture systems take five oblique single frame photos — north, south, east, west, and straight down. Those oblique images show natural perspective so the image footprint is a trapezoid. Woolpert uses a three-camera system — one ortho and a forward and aft oblique image scanner. The continuous 45-degree scanning has a big benefit in that the system produces an oblique image with a true ortho footprint right out of the box, so the resultant oblique images can be viewed by GIS software as if it was an ortho image. This site uses cookies to offer you a better experience, analyze site usage, and serve targeted advertisements. By continuing to use this website, you consent to the use of cookies in accordance with our [privacy policy](#). Close

ortho image. The down side of push broom capture is that the geometry of tall buildings is distorted so that some of the buildings seem to lean toward each other.

The Sanborn Map Company, Inc.

[Sanborn](#) is a large and well-established aerial imagery firm now getting into the oblique business. Although I haven't had any broad experience with its imagery and navigation tools, the online demo has a very slick interface and very nice quality imagery. [Try it yourself](#). As an oblique newcomer, Sanborn's coverage is limited, and I can't judge its accuracy, but it has a strong reputation of producing quality work and products so it is a company to watch. Some of the company's imagery is credited as part of Google Maps, but both are secretive as to the extent or parameters.

Fugro EarthData, Inc.

I've had no personal experience with [Fugro](#) data and software, but I did see a trade show demo of its software, PanoramiX. The software and imagery looked good, but as a newcomer its image library is limited and the accuracy of its imagery is unknown.

GEOSPAN, Corp.

On its website, [GEOSPAN](#) lists oblique imagery capture in addition to Street level imagery, orthophotography, 3D models, street centerline creation, and GIS feature extraction. There is no information available as to coverage or accuracy.

ControlCam

[ControlCam](#) is the newest entry into the oblique market. It is a Florida-based aerial imagery company that pioneered and perfected a process of identifying cable TV leaks through the use of aerial surveillance. The company owns and manages its own fleet of aircraft capturing both orthogonal and oblique imagery. ControlCam will soon launch a software platform, including a mobile app, that will permit clients to have quick and seamless access to the imagery with measurement tools. The sample image shown here is 2-inch GSD, very nice for a newcomer to the oblique business.

 [A ControlCam image.](#)

A ControlCam image.

Microsoft Bing and Google

If you have any doubt about the popularity and value of oblique imagery, just look at Bing Maps and Google Maps, the two elephants battling for eyes-on-site time. Both have incorporated oblique imagery in their viewers. Both bring up the oblique views as you zoom in from a high-level ortho image, then transition to street-level imagery. The key difference is that Bing uses Pictometry oblique images, which show a natural perspective, and Google uses oblique imagery from different sources. Bing shifts from one optimal oblique to another while Google stitches together multiple oblique images. This multiple-image stitch is good at ground level, but causes funny building lean similar to a push-broom capture (see the sample images). Both are very good for their intended purpose, but neither permits measurement, nor do they include accurate metadata.

By their own admission and licensing agreements, neither Bing nor Google claim to be authoritative GIS data sources. So be cautious how you use their imagery. Note the problem I cited [in my article last month](#) about a police SWAT team raid using Google. Another issue for federal users is FARS and licensing restrictions, so make sure your legal staff reads the fine print.

 [A Google oblique image.](#)

A Google oblique image.

 [A Bing oblique image.](#)

A Bing oblique image.

Other Systems

This site uses cookies to offer you a better experience, analyze site traffic, and serve targeted advertisements. By continuing to use this website, you consent to the use of cookies in accordance with our [privacy policy](#). Close

If you'd like to do a deep dive into oblique cameras and capture systems including overseas operations, I recommend reading "[Systematic Oblique Aerial Photography Using Multiple Digital Cameras](#)" by Professor Emeritus Gordon Petrie of the University of Glasgow. In his presentation he quotes the ISPRS 2008 Congress that "There is a strong movement towards combining traditional nadir images with oblique images acquired at high angles to build 3D models of cities with the texture of building walls taken from the oblique photos. For non-specialists in the emergency services (military, police, fire and ambulance), the combination of oblique and nadir images improves their interpretation while special software allows simple measurements on the oblique photos."

The Future

I have no doubt that within a few years the zoom-in from space to orthos, obliques, accurate 3D models, ground-level imagery, and interiors of buildings will be smooth and seamless. Ultimately, accurate, detailed and up-to-date 3D models draped with actual imagery, not textures, will be optimal. This will be especially important if 3D or holographic display technology reach acceptable quality levels. 3D model creation keeps improving, and I believe that the merging of ortho imagery, oblique imagery, LiDAR, and ground-level photos with more powerful computers and software will make accurate 3D models practical and ubiquitous.

For some closing amusement, somewhat related to our current discussion, take a look at what [360 Cities](#) is doing with very high resolution fixed panoramic cameras. Note the 80 gigapixel photo of London and this zoom-in to a London Eye giant Ferris wheel pod. Although coverage is limited to one viewer location, I could see this being one of several resources to drape 3D modes.

Contact me at akalinski@gpsworld.com.

 [A zoom-in on the London Eye with 360 Cities.](#)

A zoom-in on the London Eye with 360 Cities.

This article is tagged with [Bing](#), [Google](#), [oblique aerial photography](#), [oblique images](#), [Pictometry](#) and posted in [GeoIntelligence Insider](#), [Lidar](#), [Opinions](#)

 Art Kalinski

About the Author: [Art Kalinski](#)

A career Naval Officer, Art Kalinski established the Navy's first geographic information system (GIS) in the mid-1980s. Completing a post-graduate degree in GIS at the University of North Carolina, he was the Atlanta Regional Commission GIS Manager from 1993 to 2007. He pioneered the use of oblique imagery for public safety and participated in numerous disaster-response actions including GIS/imagery support of the National Guard during Hurricane Katrina; the Urban Area Security Initiative; a NIMS-based field exercise in Atlanta; and a fully manned hardware-equipped joint disaster response exercise in New York City. Kalinski retired early from ARC to join Pictometry International to direct military projects using oblique imagery, which led to him joining SPGlobal Inc. He has written articles for numerous geospatial publications, and authors a monthly column for the GeoIntelligence Insider e-newsletter aimed at federal GIS users.



Subscribe to Geospatial Solutions

If you enjoyed this article, subscribe to Geospatial Solutions to receive more articles just like it.

10 Comments on "Oblique Imagery: The New Kids on the Block"

[Trackback](#) | [Comments RSS Feed](#)

Inbound Links

1. [MAPPING URBAN AGRICULTURE IN ROME « Agricoltura Urbana](#) | December 4, 2014

This site uses cookies to offer you a better experience, analyze site traffic, and serve targeted advertisements. By continuing to use this website, you consent to the use of cookies in accordance with our [privacy policy](#). Close

1. *Cliff Mugnier, Louisiana State University* says:
[July 3, 2013 at 12:15 pm](#)

Vertical aerial photography is not “ortho.” Orthorectification was invented by the USGS in the late 1960s. Oblique aerial photography was heavily utilized with the Tri-Metrogon system during WWII. Let’s keep our history straight.

[Reply](#)

- o *Art Kalinski* says:
[December 13, 2013 at 3:51 pm](#)

Hi Cliff,

I understand the concern over the term “Ortho” which is a fairly recent contraction of the term orthorectified imagery. My terminology came from my two uncles who by coincidence were both photographers during WWII. Uncle John Dudas was a Navy combat photographer who shot Pacific war footage, some of which can still be seen on TV today. My Uncle Ted Rappe was an Army photographer and aerial photo interpreter primarily for the European theater. In teaching me photography, darkroom procedures, drafting and photographic silk screen printing they both used the terms “orthographic projection,” “ortho,” oblique drawings” and “obliques” as used in drafting and photography from the original Greek definition “orthos” = “straight.” They both used the terms ortho and oblique in discussing aerial photography. Perhaps it was their military drafting background that shaped their terminology.

[Reply](#)

2. *Mike McPeak* says:
[December 17, 2014 at 12:16 pm](#)

Hi Cliff,

I have heard rumors that Google has recently succeeded or is about to succeed in break some of Pictometry’s patents protections. Any idea what this means for offering of oblique imagery going forward? I would imagine Google had something in the works prior to moving against pictometry’s patents.

[Reply](#)

3. *executivesearch.ru* says:
[October 2, 2018 at 5:45 pm](#)

I blog often and I truly appreciate your information. The article has really peaked my interest. I will take a note of your blog and keep checking for new details about once per week.

I opted in for your Feed too.

This site uses cookies to offer you a better experience, analyze site traffic, and serve targeted advertisements. By continuing to use this website, you consent to the use of cookies in accordance with our [privacy policy](#). Close

4. [PV Photovoltaic Solar Panels gloucester](#) says:
[October 22, 2018 at 1:29 am](#)

What's up mates, how is all, and what you desire to say regarding this paragraph, in my view its genuinely remarkable for me.

[Reply](#)

5. [Felix](#) says:
[November 12, 2018 at 1:20 pm](#)

Hello,
I tried to contact with the companies from the article but most of them not answer.
Any updates about oblique imagery viewer? I'm looking for software solution (Desktop/web/server).

Thanks,
Felix

[Reply](#)

6. [Roman](#) says:
[December 18, 2018 at 10:33 pm](#)

Hi! Someone in my Facebook grokup shared this website with us so I came too look it over.
I'm definitely loving the information. I'm book-marking and will be tweeting this to my followers!
Great blog and fantastic design.

[Reply](#)

7. [Emilie Girven](#) says:
[August 1, 2019 at 10:47 pm](#)

This is the perfect weeb site forr evveryone who hopes to find out about this topic.

You realize so much its almost hard too argue with you (not that I personally would want to...HaHa).
You definitely put a brand new spin onn a topic that has been discussed for decades.
Wonderful stuff, just wonderful!

[Reply](#)

8. [Adelia Schuetze](#) says:

This site uses cookies to offer you a better experience, analyze site traffic, and serve targeted advertisements. By continuing to use this website, you consent to the use of cookies in accordance with our [privacy policy](#). Close

Hi, i think that i saw you visited my blog so i cae to “return the favor”.I’m trying to fijnd things to enhance my site!I suppose its ok to use some of your ideas!!

[Reply](#)

Post a Comment

	Name (required)
	Email (required; will not be published)
	Website

Submit Comment

Today's News

[more news...](#)

- [Applanix introduces GNSS-inertial platform for mobile mapping](#) [Applanix has announced the Trimble AP+ Land GNSS-inertial OEM platform for accurate and robust position and orientation for mobile-mapping applications. Read more»](#) Mar 10, 2022 | 0 Comments
- [AEC firms use aerial mapping to share infrastructure funding](#) [Aerial mapping provides a competitive advantage for AEC companies to win their fair share of the \\$17 billion infrastructure bill. Read more»](#) Mar 10, 2022 | 0 Comments
- [CHC Navigation: The rise of digital-twin models](#) [Digital twins enable the integrated operation and maintenance of any geospatial asset to meet the increased demand for sustainable infrastructure and more. Read more»](#) Mar 10, 2022 | 0 Comments
- [ComNav Technology: Surveying in urban conditions](#) [In April 2021, the government of Burkina Faso used ComNav GNSS T300Plus to provide ground control points survey for the construction of a hospital. Read more»](#) Mar 10, 2022 | 0 Comments
- [MetaGeo launches 3D mapping platform](#) [MetaGeo has launched a GIS platform to enable organizations of all sizes to host, analyze, find and share 3D map datasets among internet-capable devices. Read more»](#) Mar 10, 2022 | 0 Comments

This site uses cookies to offer you a better experience, analyze site traffic, and serve targeted advertisements. By continuing to use this website, you consent to the use of cookies in accordance with our [privacy policy](#). Close

 [Click Here!](#)

- [About Us](#)
- [Contact Us](#)
- [Subscriber Services](#)
- [Advertise](#)

This site uses cookies to offer you a better experience, analyze site traffic, and serve targeted advertisements. By continuing to use this website, you consent to the use of cookies in accordance with our [privacy policy](#). Close



- © 2022 North Coast Media LLC, All Rights Reserved.