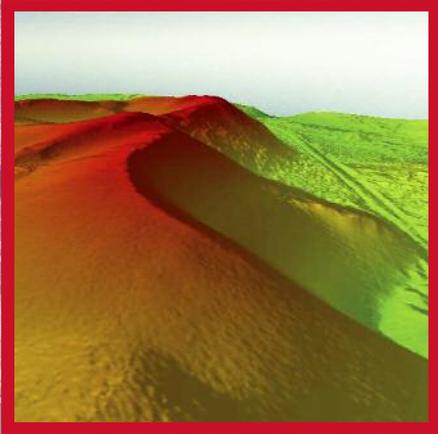


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# Medium Format Photogrammetric Cameras

By Tobias Toelg and  
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**Technology is all about change, and the same goes for the photogrammetry market. Both users and manufacturers are adapting to changes. One of them is Phase One Industrial, a provider of specialized industrial camera systems and software. They are now at the forefront of medium format aerial photography and have adopted the multipurpose tool approach, as explained in the article below.**



The Phase One aerial series of cameras. (L to R) Phase One iXU 150, Phase One iXA-R 50, Phase One iXA 180

## Changes

The digital revolution has affected the photogrammetry market forcing everyone involved in aerial data acquisition to adapt to new equipment and workflows, while simultaneously opening up new opportunities. Changes are coming not only from the introduction of new cameras, but also from the explosive growth of new markets and the technology that is evolving to satisfy the needs of the growing photogrammetry market.

The need for equipment that offers flexibility can lead to new customers and projects. Having options available to meet challenges can make the difference between being able to bid on a project and just watching it go to a competitor.

Many professional engineering companies in the field of photogrammetry, for example, are witnessing a move away from the traditional approach of orthophoto generation and mapping, and moving into new and different fields. In the past, major players concentrated on large projects with a GSD of approximately 25 cm. Today, the requested resolution is much higher and reaches 5 to 8 cm GSD.

Aside from the substantially higher GSD demanded of photogrammetrists, new appli-

cations have evolved, with the expectations that operators have the skills and equipment to tackle new types of projects. These applications include precision farming, coastline surveying, search for narcotics farming, bird counting and a multitude of inspection projects, using fixed-wing, rotary-wing and different UAVs as well.

Not only is there a change to the way aerial data is acquired, there are changes to how that data is stored and transferred from camera to servers for processing and then finally to the end user. The large amount and size of image files require an infrastructure capable of matching the size of the data collection, and with the automation of processes comes an expectation of faster delivery times.

There are even more changes coming in sensor technology. Last year, a 50 MP CMOS-based sensor camera was released, which enables users to capture images under less than favorable light conditions by changing the ISO while maintaining excellent quality. In the coming years, as CMOS sensors grow in resolution, new possibilities will be created for medium format photogrammetrists.

To add to the challenges in the field of photogrammetry, the competition has increased,

and with the added players comes the need for more competitive pricing. Today the price structure for a square kilometer of data collection has plummeted although the market has opened up with new applications. This makes the choice of which equipment to acquire even more critical.

To meet these challenges, users have to recognize that the work that they will be doing during the next 25 years will very likely be different from what they have been doing over the past 25 years. And to adapt these new technologies quickly users have to be more flexible, need a very close relationship with their customers and have their finger on the pulse of the market. They need to understand today's challenges in airborne photogrammetric missions and how to generate custom based solutions for a rapidly changing world.

Making the investment in new technologies is understandably a major challenge fraught with unknowns. Low-end systems may satisfy clients that require the use of inexpensive gear, but users bidding on higher-end project will inevitably be looking at larger investments in high-quality solutions. Many users are turning to medium format photogrammetry to deliver the required high resolution images with top image quality and very reasonable prices.

## A New Approach

From the perspective of a manufacturer of aerial cameras, where R&D and retooling to manufacture new models of cameras can be expensive, an emerging strategy is the "Swiss Army Knife" multipurpose tool approach to creating a quality camera – one that is designed with enough flexibility to handle the new challenges of different types of missions and is also built to serve as a hub in a system of interchangeable components. By making an open system, users can adapt to changes and choose the "best of breed" parts and not be locked in by one company's view of what a system should look like.

Smartphone users have learned the advantages of using apps that enable them to create a personalized experience. Whenever a new app is released that gives them more features than the one they currently use, they are able to switch, while still maintaining their current platform. So too, camera makers can now provide the platform and enable users to integrate hardware and software solutions that meet their needs. In a competitive market, individual companies are all vying for the same share of the pie. The open marketplace encourages innovation, and users of an ecosystem are the beneficiaries of the competition. As new technology is released, users have the ability to update components in their system to meet the needs of their clients.

Over the past twenty years, Phase One has been providing sensor modules for digital aerial cameras. Three years ago, the company emerged onto the scene with new products that act as the central hub of this photogrammetric ecosystem. Phase One is now at the forefront of medium format aerial photography and have adopted the multipurpose tool approach. Because the company is able to

adapt quickly to new technology and incorporate it into new products, thus shortening the development time and production of market-relevant cameras.

Phase One built an ecosystem using a modular approach. For example:

- The Phase One iXU 150 is a 50 MP CMOS-based camera that was designed for general aerial data acquisition projects such as mapping applications as well as surveillance and homeland security use. Its low weight and small size make it ideal for use in UAVs. With multiple communication protocols and full HDMI output, an operator can view video and capture individual images whenever a capture is needed. This allows operators to view important information without generating large amounts of images, which require processing and storage. The camera is so versatile that it can also be used on regular manned missions and because of its CMOS sensor, able to capture from ISO 100-6400 delivering quality images at all ISOs.
- The iXA and iXU cameras were built to be used alone or as building blocks to create a larger system. They can be used effectively in a multiple camera array or combined to create an array of nadir and oblique cameras. The cameras are easily wired together to enable synchronized captures.
- Whether the camera is being used on a manned flight or on a UAV, Phase One designed the cameras with multiple storage options. Images can be stored on an external host computer, such as the iX Controller, with ultra-fast SSD drives via SuperSpeed USB 3.0 or internally via CompactFlash cards.

- Phase One iXA and iXU cameras offer flexibility in optics as well. With a choice of six multipurpose Schneider-Kreuznach lenses ranging from 28 mm up to 240 mm, missions can be flown at any height and coverage and GSD are not an issue. The iXA-R cameras offer a choice of three Rodenstock lenses (40 mm, 50 mm and 70 mm) which are especially suited for mapping. The 50 mm lens, with an opening angle of 56°, is particularly suited for capturing images alongside a LiDAR while doing corridor mapping. Lenses for Phase One aerial cameras are easily swapped out in the field.
- As the hub in what can be a complicated system, all Phase One aerial cameras are built to be compatible with the most popular flight management systems, GPS receivers and stabilized mounts. An owner of a Phase One aerial camera is not locked in to a proprietary system and is able to choose the "best of breed" solutions from independent companies to always maintain a solution that works according to their needs.

Flexibility and adaptability today are requirements not only for the equipment and systems used to capture and process aerial data, they are also qualities that are necessary for companies to survive in this quickly changing market. When disruptive innovations such as UAV-based photography flood the market, companies that are adept at dealing with change and own the necessary equipment that is flexible enough to handle their current workload, as well as new technologies, will be the companies that stand out as the winners.

For more information, have a look at:  
<http://industrial.phaseone.com>



The Phase One iX Controller, a powerful fanless PC, enables operators to connect up to four cameras.