

A good example of how digital photography allows the user to “see into the shadows.” With film, the shadowed areas would have been less usable.

THE SKY IS NO LONGER THE LIMIT

UltraCam User Group Meeting

We used to say, “The sky’s the limit.” But boundaries continue to be pushed. Following the International LiDAR Mapping Forum held in January in Denver, I drove to Boulder to attend the Microsoft UltraCam User Conference. Held in Microsoft’s beautiful Bing building downtown, the event was attended by more than 30 UltraCam sensor users. I was honored to be in the same room with the guys who fly the planes and process the deliverables.

What amazing progress in less than a decade! We were in attendance at the ASPRS annual show in Anchorage in 2003 when the first UltraCam camera was introduced by Vexcel. The introduction created a buzz because the first camera was priced at roughly half of the competing Zeiss and Leica cameras. With its latest offering, the UltraCam Eagle, the company has come a long way as far as what the camera and software will do. And digital photography brings with it something film can’t: dynamic

range. That is, with film, dark areas are dark, period. With digital images, you can “see into the shadows,” making a greater amount of information available.

Alexander Wiechert, Microsoft Business Manager for the Vexcel Imaging subsidiary that develops and distributes the UltraCam products, and Michael Gruber, Chief Scientist gave the opening presentations. Wiechert provided a short history of the evolution of the camera since 2003. By 2006, the company had sold 47 cameras, by 2008, 101, and as

continued on page 46

BY MARC CHEVES, PS



Alexander Wiechert (L), Microsoft Business Manager for the Vexcel Imaging subsidiary that develops and distributes the UltraCam products, and Michael Gruber, Chief Scientist.

Cheves, continued from page 48

of January of this year, 213. If you count upgrades to existing cameras, the total is 258. Wiechert said the company estimates it has a fifty percent market share of digital photogrammetric aerial cameras on a world-wide basis. The first U.S. customer for the UltraCam Eagle, introduced at ASPRS last May, is Keystone Aerial Surveys Inc. In all, 14 UltraCam Eagles have been sold world-wide.

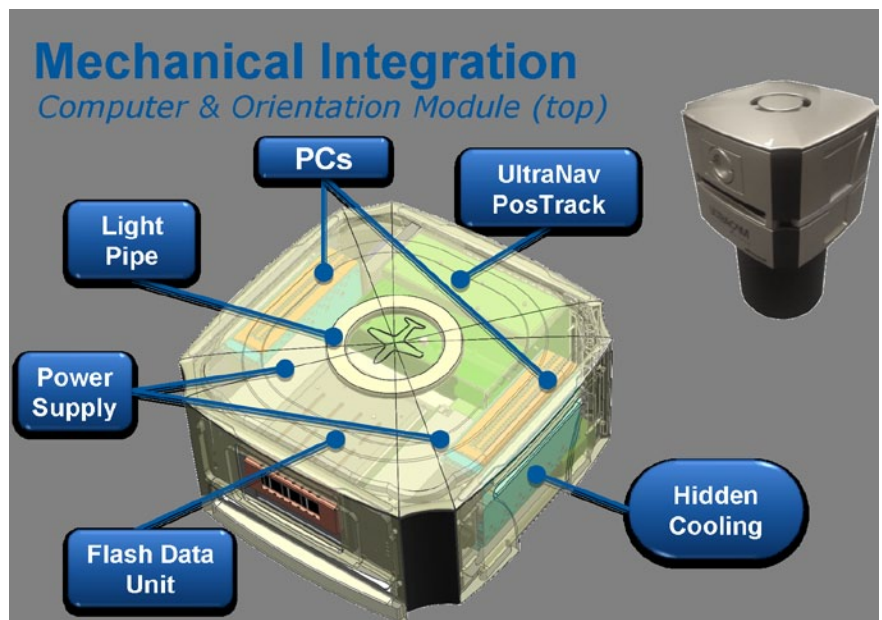
With each succeeding model, the resolution of the cameras increased. The first had a PAN image footprint width of 9,000 pixels, but the UltraCam Eagle has a PAN image footprint of more than 20,000 pixels across the flight strip. When the aerial digital cameras first came out, people were concerned with adequate data storage and ample speed to transfer the digital information to the storage device. As always, technology improved, and those concerns are no more.

The UltraCam Group has established a business model that helps to supply Microsoft's Bing Maps with up-to-date imagery. In response to an inquiry from

me about industry rumors surrounding camera pricing, Jerry Skaw, UltraCam Sales and Marketing Manager, said, "UltraCam customers that are selected to support the Bing Maps Global Ortho imagery program are "loaned" not-commercially-available versions of

the UltraCam, the UltraCamG. They are paid for their services. The only tie to the commercial UltraCam business is that being an experienced UltraCam user (and owner) is a requirement."

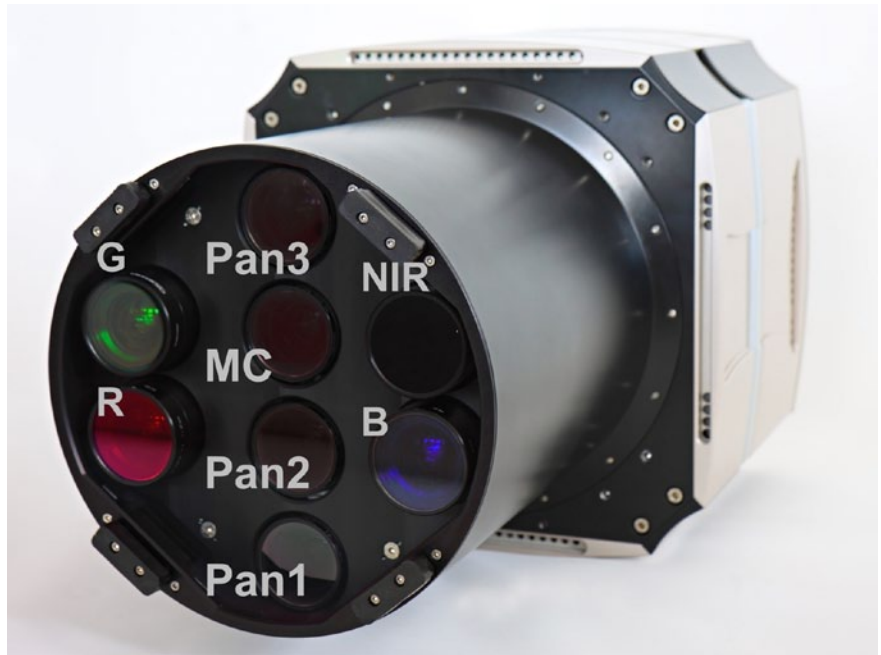
The UltraCam Eagle sports all kinds of improvements including the UltraNav FMS/GPS/INS, or direct georeferencing and flight management system. Vexcel Imaging partnered with Applanix on the development of the OEM product, and everything is now integrated. Joe Hutton from Applanix explained that the new IMU will require less ground control points, and that future GNSS signals will allow $\pm 2\text{cm}$ robust positions in the air. Just like surveying equipment, cables can be a weak link, and in an effort to improve overall system reliability, most of the cables connecting system components have been eliminated with the new integrated design. Although testing is still taking place, the company states that at an 800 meter flying height,



a 5cm GSD can be achieved. Because of flying height restrictions in parts of the world, the standard 80mm lenses can be replaced with 210mm lenses. The two different lens systems allow customers the versatility to fly low-altitude and high-altitude projects.

Gruber discussed how the camera design has improved over time. Early models, in addition to the plethora of cables, had 14 computer boards: the Eagle has two. This helps reliability. Starting with the UltraCamLp model, UltraCam systems have shifted towards solid state storage. Gruber explained how the camera's nine CCDs work, and claimed that the UltraCam approach is superior. In addition to PAN data, four of the sensors gather red, green and blue, and infrared. With its 20K by 13K CCD sensors, each image is 260 Megapixels.

Something else that impressed me at the UltraCam event was the soon-to-be-released UltraMap 3.0 software. Microsoft has found a way to



generate point clouds from the digital image, and the attendees saw impressive applications. In talking with some of the attendees, I learned that this capability will not replace traditional aerial LiDAR because it doesn't deliver the same kind of product, but, at densities of up to 300 points per square meter versus a handful per m² with traditional LiDAR, I'm sure it'll have applications. To achieve the density, the software uses a "multi-ray" photogrammetric approach to match pixels from 12 "looks" at the ground. Wiechert claimed that this capability could replace traditional aerial LiDAR, but admitted that the traditional approach is better for such things as power lines and seeing thru forest canopy. Wiechert said, "Some traditional

LiDAR applications will remain the domain

of LiDAR while others may be served more efficiently by our photogrammetric approach." Skaw added, "This is an industry changer. Some LiDAR-served applications will go to the photogrammetry bucket, but not all. Some will stay in the LiDAR bucket."

Also new in UltraMap 3.0 will be digital surface models, created directly from the dense point clouds produced from the image. Wiechert claims the results are highly accurate, edges are sharp, and even complex scenes such as roof structures or tree canopies are highly detailed.

Digital aerial photogrammetry has come a long way. And with companies like Microsoft and its Vexcel Imaging subsidiary, the sky's not the limit anymore. ■

Marc Cheves is the editor of *The American Surveyor*.



The UltraCam Eagle, with solid-state memory module and controller.