

MAPPING & GIS

Digital Aerial Imagery at the Cost of Film

The Vexcel UltraCam Large Format Digital Aerial Camera

Features

- No film, no photo lab, no scanning—the UltraCam is an investment that pays for itself
- No noise from film grain
- No cost for color nor for color-IR
- Better radiometry for more flying days, more success in automated processes, and better stereo imagery
- The miracle of no-cost, high forward overlaps optimizes the number of photos per project for accuracy, automation, and robustness
- UltraCam “Plug-and-play” compatibility maintains traditional workflow yet delivers increased productivity
- Shortened delivery times to customers
- The only digital solution to single-handedly replace your film camera for all mapping



The UltraCam large format digital aerial camera system

Overview

VEXCEL'S REVOLUTIONARY ULTRACAM digital camera system delivers large format aerial imagery that is radiometrically and geometrically superior to images captured by conventional film cameras at a comparable price.

The technological approach used in developing the UltraCam is clever, yet surprisingly simple. The camera supports a high degree of parallelism in data collection, transfer and processing, and therefore reduces cost and sensitivity to environmental effects. Yet it enforces a single coordinate system, a single perspective center, and produces a highly accurate digital image.

The UltraCam features a better than 12-bit per pixel dynamic range, compared to film cameras at less than 8-bits per pixel, and without any grain-noise. The result is unrivaled radiometry with better matching accuracy, allowing for more flying days in marginal weather as well as better interpretability, better stereo, and more success in automated procedures.

The UltraCam digital process makes it completely compatible with existing photogrammetric procedures, while increasing productivity. More importantly, the images from the UltraCam-D feed into existing photogrammetric work flows and vastly improve automation, using no-cost redundancy.



Overview (cont'd)

In-flight quality control with quick-view images and with online exposure control improves aerial operations. Full digital image archiving avoids the hassle of film rolls and costly film storage, while facilitating access to imagery. Camera maintenance is supported via the Internet, with the camera simply being a set of computers on the Internet.

In addition to the benefits derived from the UltraCam's technical innovations are its unique economic advantages—UltraCam users will never again need to buy rolls of aerial film, nor pay for photo processing or film scanning. Add to this, true RGB-color and false color IR at no extra cost, and the UltraCam is clearly an investment that pays for itself.

Options

- Data Management and Archive System
- Mobile Storage Unit (MSU)

UltraCam Configuration

Sensor Unit (SU)

- Distributed parallel sensing achieved with a set of 8 optical cones to assemble a large format digital image in color
- 13 area array CCDs collect pixels
- Each CCD array feeds signals into its own compact and proprietary electronics setup and data path
- The “Master Cone” provides single image coordinate system

Storage and Computing Unit (SCU)

- Each CCD array accompanied by separate “private” processing and storage components, with capacity for dual redundant storage
- 15 units are assembled into removable cabinet, providing distributed parallel storage and computing

Rich Data Flow Options

- On-board system with SU and SCU is all that is needed for image acquisition, preprocessing and delivery
- Images are collected and pre-process is started during flight for creation of deliverable output images
- SCU is a multi-processor computer with 15 CPUs
- On the ground, pre-processing can optionally be completed onboard the idle plane, in a mission office, or in the home office
- Transfer data from the SCU using Mobile Storage unit (MSU)—a set of external disks in a small portable “briefcase” ready for shipment



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Technical Specifications

Image Product Specification

Image format	Analogous to an aerial film image at a format of 23 cm x 15 cm
Image data formats	JPEG; TIFF with options for 8 and 16 bits, scan-line, stripped or tiled
Image format (Level 2)	Full resolution panchromatic, separate color channels at color resolution
Image format (Level 3)	Full resolution (fused) R, G, B, Near-IR channels, planar or pixel-interleaved

Digital Camera Sensor Unit (SU)

Panchromatic image size	11500 * 7500 pixels
Panchromatic physical pixel (detector) size	9 μ m
Physical format of the focal plane	103.5 mm * 67.5 mm
Panchromatic lens focal distance	100 mm
Lens aperture	f= 1/5.6
Field-of-view, cross-track (along-track)	55° (37°)

Color (multi-spectral capability)	4 channels -- RGB & NIR
Color image size (Level 2)	3680 * 2400 pixels
Color physical pixel (detector) size	9 μ m
Color lens focal distance	28 mm
Color lens aperture	f = 1/4.0
Color field of view, cross-track (along-track)	61° (42°)

Shutter speed options	1/500 to 1/60 second
Forward-motion compensation (FMC)	TDI-controlled
Maximum FMC-capability	50 pixels
Smallest pixels on the ground at flying height of 300 m (1000 feet)	3 cm (1.1 inch)
Frame rate per second (minimum inter-image interval)	> 1 frame per second
Analog-to-digital conversion at	14 bits
Radiometric resolution in each color channel	better than 12 bit
Physical dimensions of the camera unit	45cm x 45cm x 60 cm
Weight	~45 kg
Power consumption at full performance	150 W

Storage and Computing Unit (SCU)

In-flight storage capacity	1.5 TB (including mirrored data)
Capacity to collect in-flight uncompressed frames	2692
Storage and computing configuration	Parallel arrangement with multiple CPUs and disks
Data redundancy	Dual disk sets on-board containing mirror images
Data transfer into office environment	Removable, dual use as office post-processor
Physical dimensions	40cm x 55cm x 65 cm
Weight	~ 65 kg
Power consumption at full performance	700 W

Operational Specification

Max. image collection period: 70% forward overlap, 20 cm GSD (film scale 1:10,000)	~5 hours
Data download from aircraft (for 2692 images)	< 55 minutes (using Mobile Storage Unit)
Data transfer to office	By Mobile Storage Unit (MSU), external disk, or physical transfer of SCU
Post-processing system	Using the SCU or in office network environment
Mounting of the camera	Using adapter ring for current film camera mount, or manual mount
Flight planning support	Compatible with IGI's CCNS, TrackAir and similar systems
Exposure triggering	Manually, automatically, or from external flight management system
Exterior orientation support	Compatible with IGI's Aero-Control, Applanix POS and similar systems
Photogrammetric Production	Compatible with major photogrammetry software suppliers
Image geometric accuracy	< \pm 2 μ m

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Overview

The UltraCam CX/DX upgrade kit provides UltraCamD (UCD) owners with the same rapid-change, high-capacity storage system enjoyed by UltraCamX customers. Converting the UltraCamD Storage Computing Unit* (SCU) to the state-of-the-art CX/DX storage system eliminates the need for the Mobile Storage Unit (MSU), delivers a simpler and more efficient cabling method between the Sensor unit (SU) and the CX/DX (two Infiniband cables in lieu of 14 firewire cables), and provides operators with unlimited image collection capacity during a flight.

The Complete Upgrade Kit Includes:

- CX Computer Unit
- DX Data Storage Units (2)
- DKX Docking Station for downloading images from a DX unit to a mobile computer or server system
- PCI-X cards (4)
- All necessary cables

* The UCD SCU must be returned to Vexcel Imaging as a condition of the program

