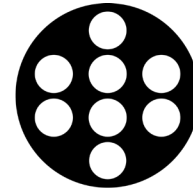


**VEXCEL**  
IMAGING

---

UltraCam 4<sup>th</sup> Generation

---



**VEXCEL**  
IMAGING

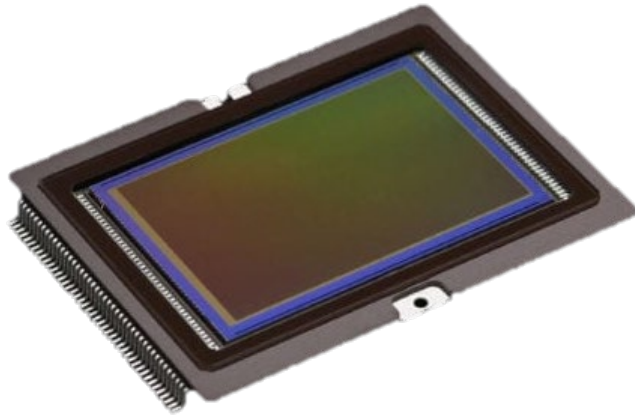
---

Common Features

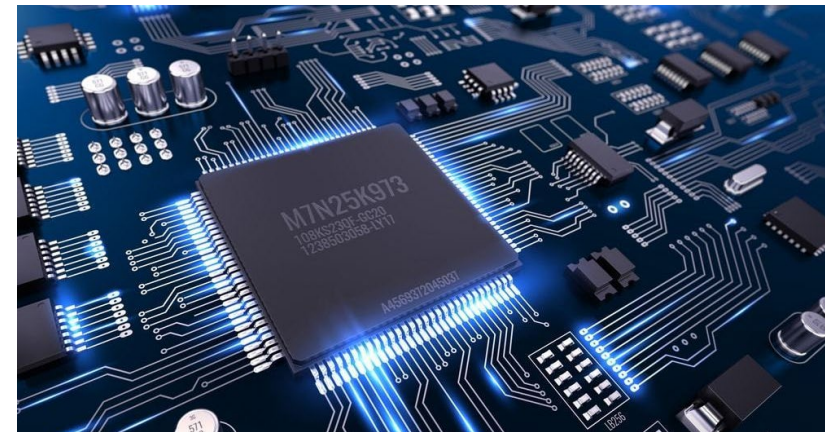
---



# Common Features UltraCam 4<sup>th</sup> Generation



Fully CMOS based cameras



New electronics and  
therefore, increased  
throughput and maintained  
dynamic



# Common Features UltraCam 4<sup>th</sup> Generation



New lenses to fully resolve the higher resolution of the CMOS sensors and therefore, crisp and sharp images



Higher image dynamic and therefore, fly at sun angles of up to 35-40° or in overcast weather conditions.



# Increased image resolution with high dynamic range

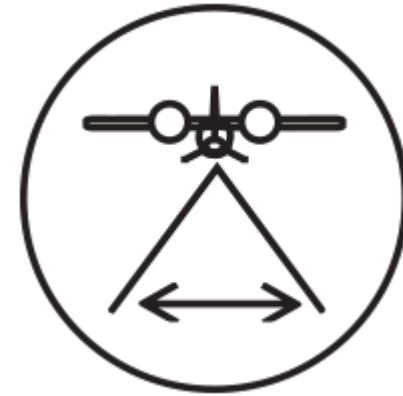




# Common Features UltraCam 4<sup>th</sup> Generation



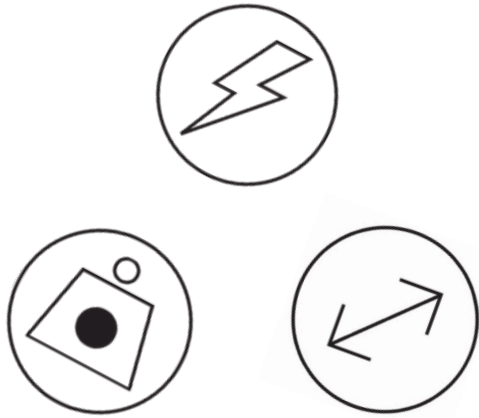
Faster frame rate of 0.7 seconds  
and therefore, faster flight speed  
and/or higher forward overlap



Increased footprint and therefore,  
higher flight collection efficiency



# Common Features UltraCam 4<sup>th</sup> Generation



Less power, less weight, new cylinder and therefore, more fuel and longer flights

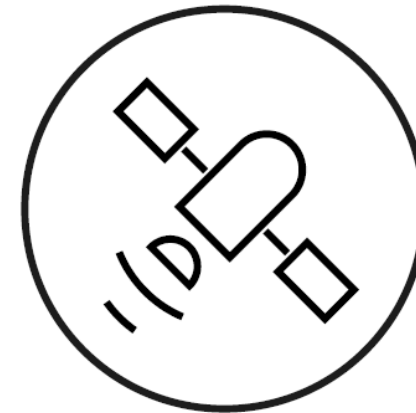
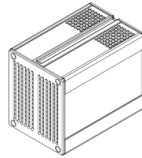


New housing concept and therefore, easier installation, no lifters required, easier access to IMU and storage



# Common Features UltraCam 4<sup>th</sup> Generation

Type: <u>Solid state disk pack</u> <u>(in-flight exchangeable)</u>	○	○	Redundancy: <u>Yes, optional</u>
Storage capacity: <u>32 TB (4x 8 TB NVMe SSD)</u> <u>16 TB (4x 4 TB NVMe SSD)</u> <u>8 TB (4x 2 TB NVMe SSD)</u>	○	○	Size of one raw image: <u>1,830 MB (1,300</u> <u>MB without optional</u> <u>redundancy)</u>
Weight of data unit: <u>1 kg</u>	○	○	Number of raw images <sup>1</sup> (without optional redundancy): <u>8 TB: up to 3,460 (5,180)</u> <u>16 TB: up to 7,100 (10,600)</u> <u>32 TB: up to 14,400 (21,600)</u>

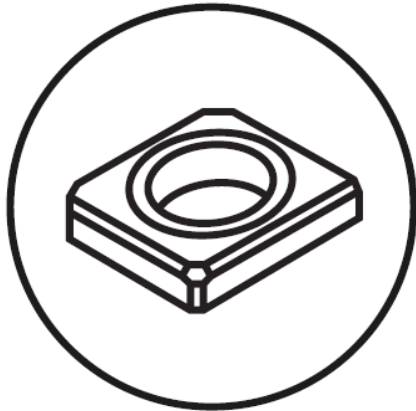


Larger hot swappable SSD storage system and therefore, uninterrupted flying days

GPS/INS/FMS – integrated UltraNav & third-party systems and thereof, maximum flexibility and usage of installed base



# Common Features UltraCam 4<sup>th</sup> Generation



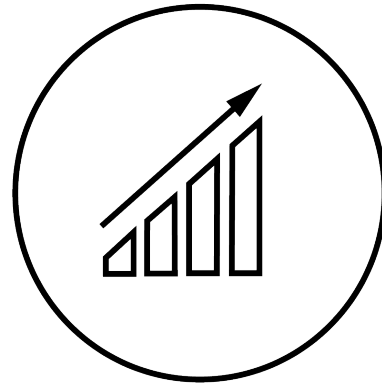
MOUNTING – UltraMount  
GSM 3000 & 4000 & others  
(on request) and thereof,  
maximum flexibility and usage  
of installed base



DATA PROCESSING – UltraMap  
processing suite including data  
import/export in standard  
formats and thereof,  
consistent data processing  
across UC generations



# Common Features UltraCam 4<sup>th</sup> Generation



Adaptive motion compensation and  
therefore, exceptional efficient  
multidirectional blur compensation



# Image Motion Characteristics

## Goal

- Motion blur free images @ long exposure times

## Reality

- Translational and rotatory image motion during exposure

## Problem

- Blur is uniform if motion is translational and if image scale is constant across the image
- Blur is nonuniform if motion is rotatory or if image scale is different across the image

## Traditional BCM or FMC solutions don't address this

- Shorter exposure times (BCM) are not a real solution as this lowers image dynamic and increases noise
- Mechanical FMC solutions work only along some axis, not in between and don't address different image scales across an image (e.g. oblique images)
- FMC by TDI solutions work only along one axis and don't address different image scales across an image (e.g. oblique images)



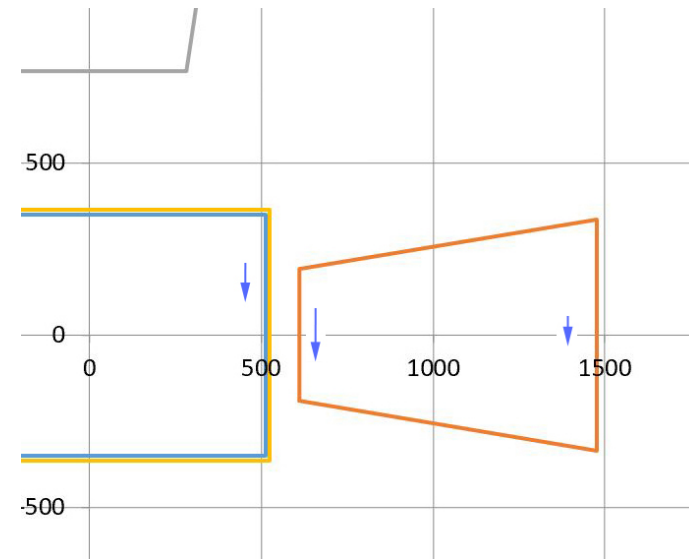
# AMC Principles

- Software based solution
- Usage of GPS and INS data
  - Translational motion is known
  - Rotatory motion is known
- Knowledge of exposure information
- Knowledge of local image scale (local = per pixel)
- Deconvolution algorithms used to calculate the image correction
- Benefits
  - Corrects uniform and nonuniform blur at any angle
  - Considers image scale variations (e.g. oblique images)
  - Eliminates critical mechanical parts of a camera



# One axis motion blur example

- Parameters
  - AGL: 1065 m
  - Speed: 100 m/sec (195 kts)
  - Exposure time: 1 ms
- Forward motion blur
  - FMB Nadir: 2,00 pixel
  - FMB Obl near: 2,76 pixel
  - FMB Obl far: 1,58 pixel





AMC



GSD: 5cm:  
Above Ground Speed: 126 knots  
Flight direction: to the right based on the picture  
Exposure time: 1/500  
Max Forward motion blur in pixel: 3.06  
Motion Compensation: not aktiv  
Zoom: 400 Percent





# AMC



GSD: 5cm:  
Above Ground Speed: 126 knots  
Flight direction: to the right based on the picture  
Exposure time: 1/500  
Max Forward motion blur in pixel: 3.06  
Motion Compensation: FMC by AMC  
Zoom: 400 Percent





AMC



GSD: 5cm:  
Above Ground Speed: 126 knots  
Flight direction: to the right based on the picture  
Exposure time: 1/500  
Max Forward motion blur in pixel: 3.06  
Motion Compensation: full AMC  
Zoom: 400 Percent





AMC



GSD: 5cm:  
Above Ground Speed: 126 knots  
Flight direction: to the right based on the picture  
Exposure time: 1/500  
Max Forward motion blur in pixel: 3.06  
Motion Compensation: not aktiv  
Zoom: 400 Percent





Examples:

UltraCam Osprey 4.1  
GSD: 3,5 cm  
London



Capture 19103  
Left Oblique



AMC OFF



AMC ON



AMC OFF



AMC ON



AMC OFF



AMC ON



# ULTRACAM

## OSPREY

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The UltraCam Osprey 4.1  
enables new perspectives  
on 3D Aerial Mapping

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## More than a standard camera.

The UltraCam Osprey 4.1 meets diverse application needs ranging from 3D mapping to traditional mapping applications from the same flight mission.



## Aerial camera collecting nadir & oblique imagery.

The UltraCam Osprey 4.1 collects photogrammetry-grade nadir imagery plus oblique images simultaneously, enabling unprecedented flight collection efficiency at industry-leading image and data quality.



# Specifications

## Mapping grade Nadir

### High-resolution PAN

- 20,544 x 14,016 pixels
- 3.76  $\mu\text{m}$  CMOS
- 80 mm focal length

### RGB & NIR lens system

- 12,840 x 8,760 pixels
- 3.76  $\mu\text{m}$  CMOS
- 50 mm focal length
- 1:1.6 Pansharpen ratio

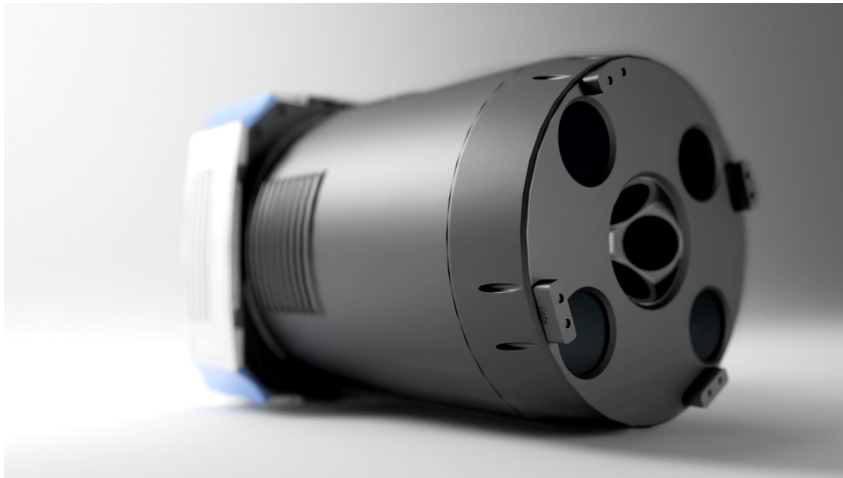
## RGB Oblique

### Color lens system

- 14,144 x 10,560 pixels
- 3.76  $\mu\text{m}$  CMOS
- 120 mm focal length
- Forward/backward:  
Landscape oriented
- Left/right: Portrait  
oriented



# Sensor system



1 frame per 0.7 seconds (2.5cm GSD @ 85% frontlap @ 126 knots)

>83 db at base ISO

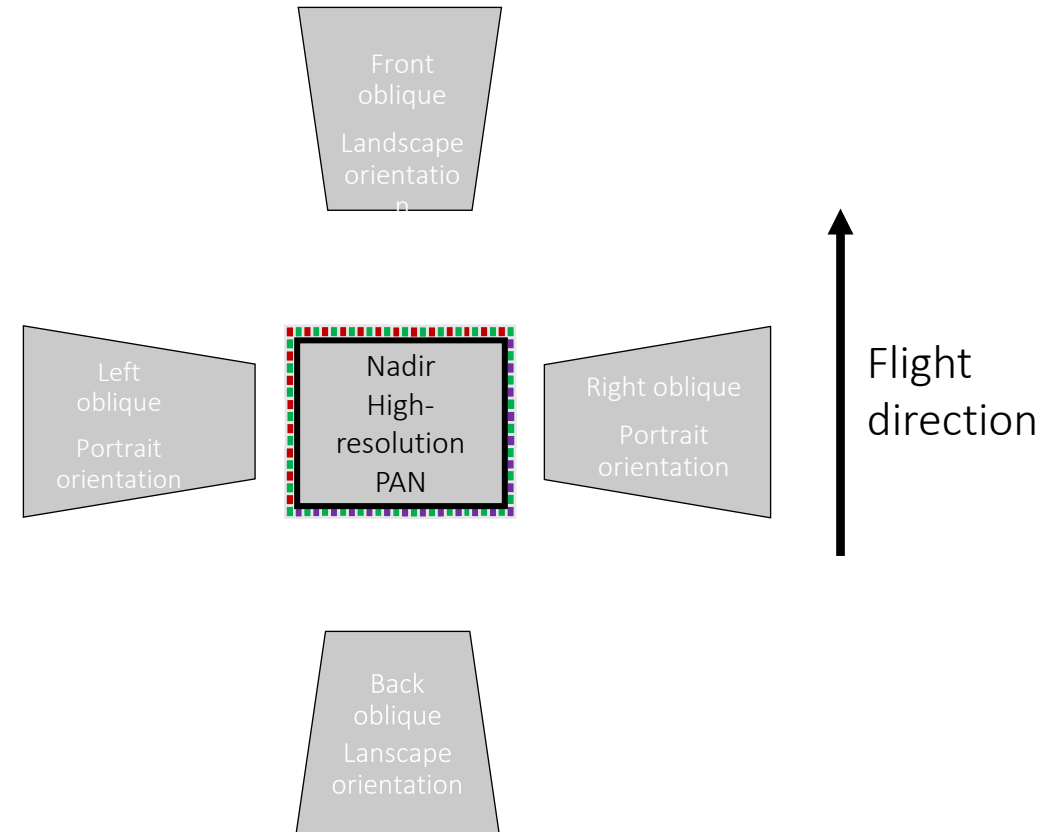
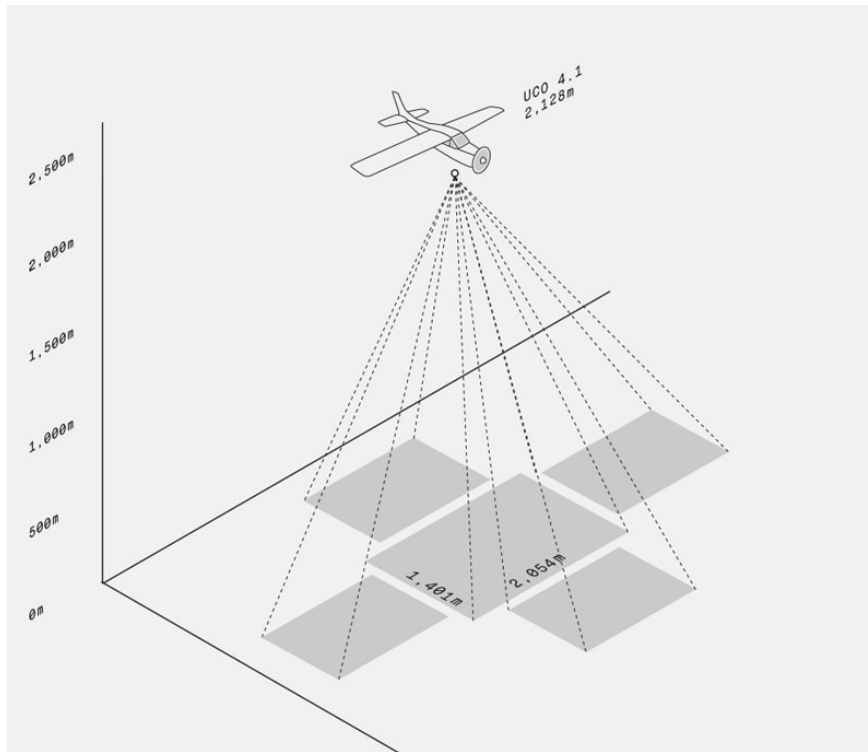
14 bits analog-to-digital-conversion

Prontor magnetic-0 HS shutter (longlife central leaf)

Adaptive Motion Compensation



# Layout top-down view



The UltraCam Osprey 4.1 uses the full swath width of the nadir cone (20,544 pixel) in conjunction with the perfectly configured oblique image overlap.



# High performance at a small form factor



Power  
consumption

Max. 350 W



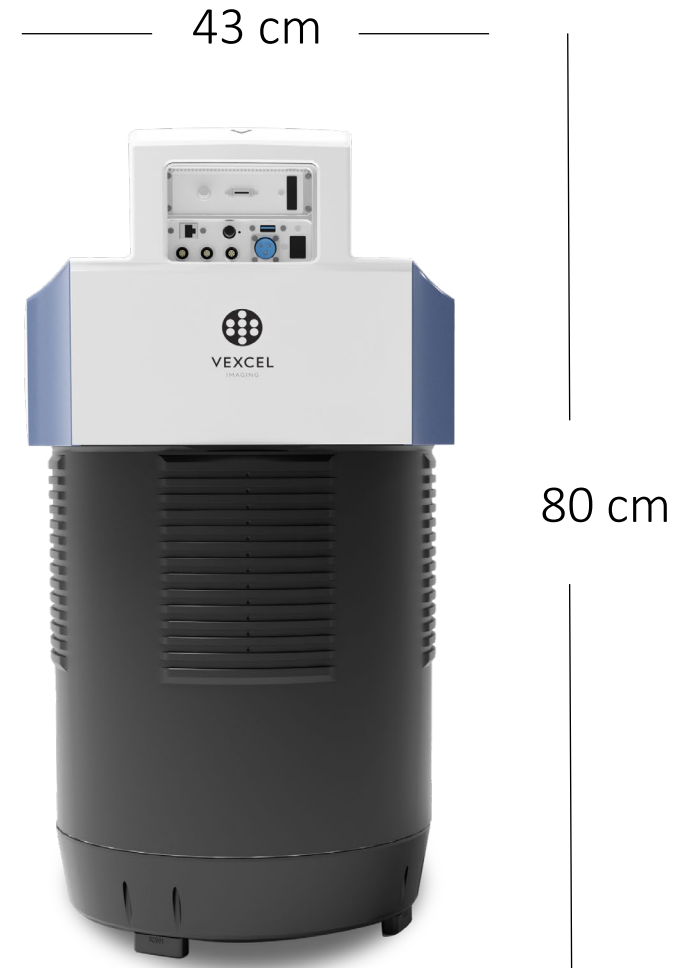
Camera  
weight

<58 kg



Cylinder display

395 mm











# Automated generation for high-precision 3D city models





# ULTRACAM

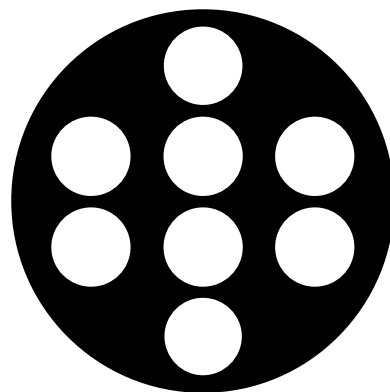
CONDOR 4.1

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The gold standard for  
wide-area mapping

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**VEXCEL**

IMAGING