

# The DMC Solution

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Security, Government & Infrastructure





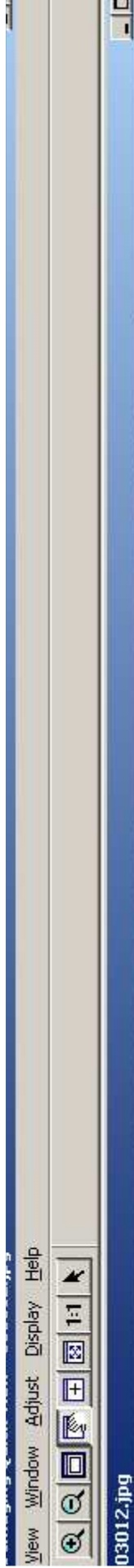
# DMC today



- No.18 delivered
- No.26 under contract

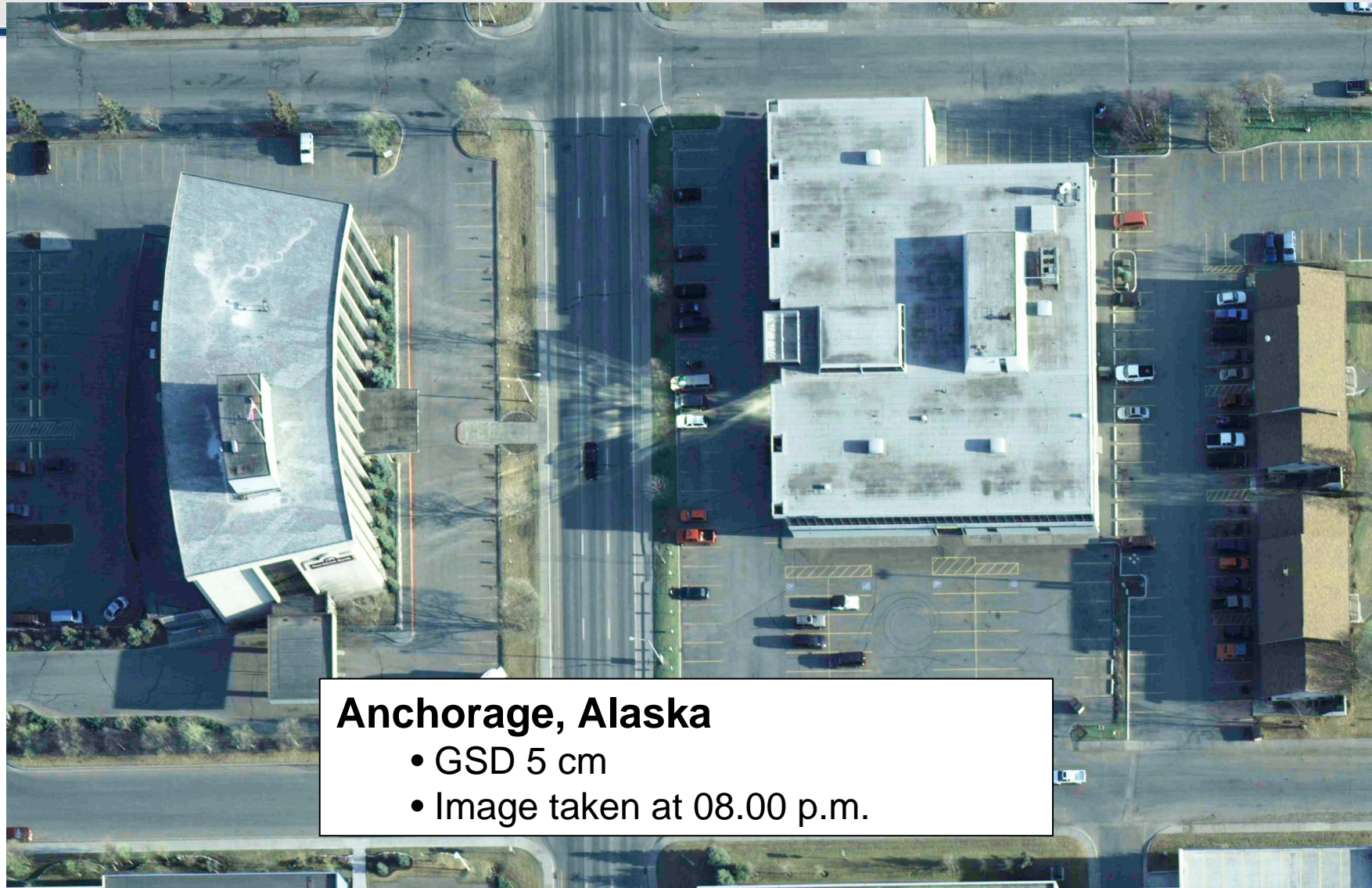








# Experience: High Quality

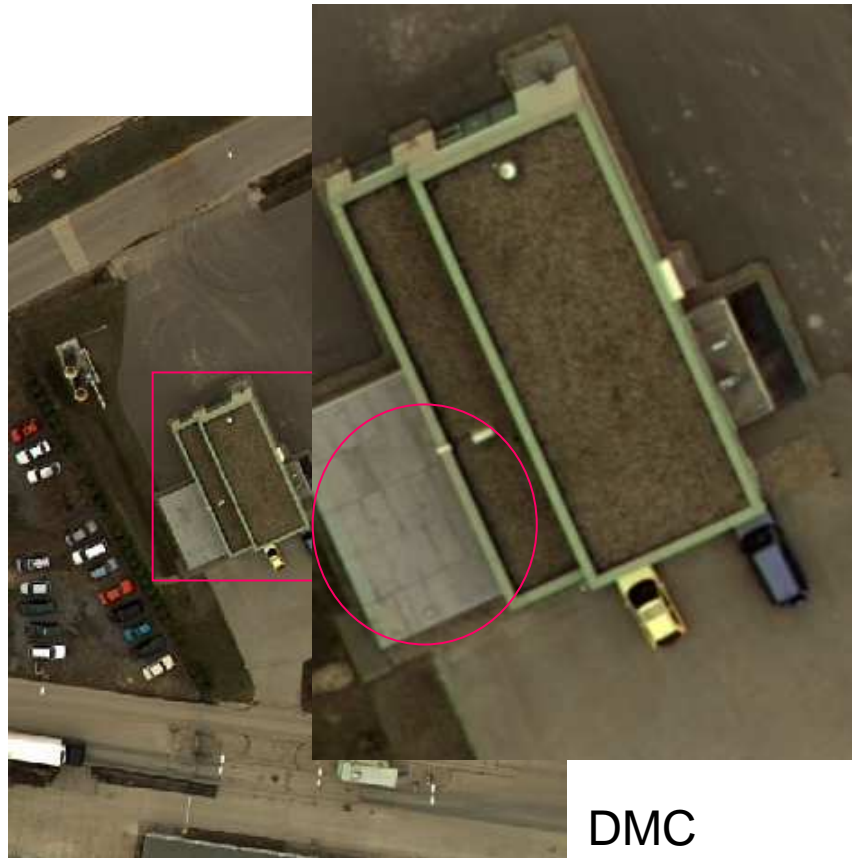


## **Anchorage, Alaska**

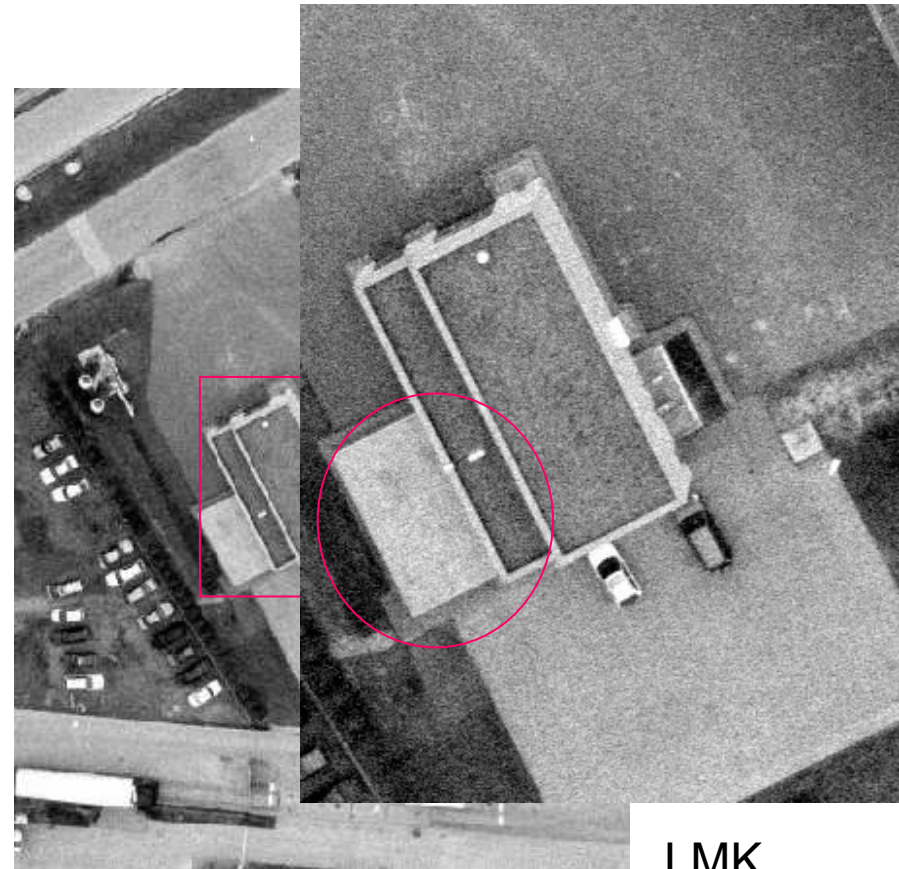
- GSD 5 cm
- Image taken at 08.00 p.m.



# Experience: Digital over analog



DMC



LMK





# Wide range of applications



ISPRS Hannover Workshop 2005



Image courtesy by

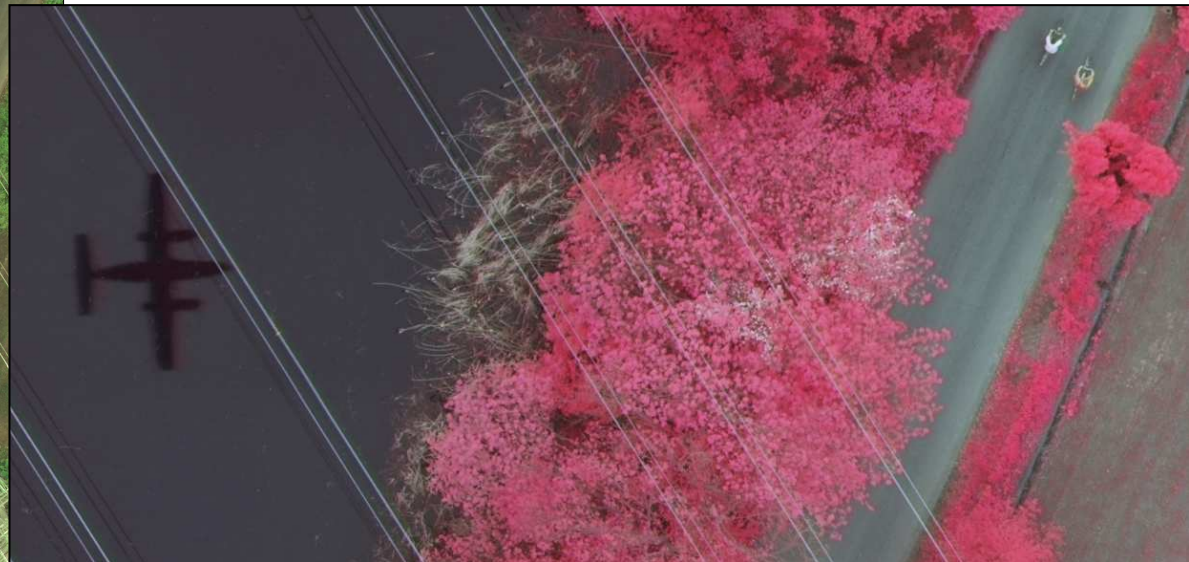
 KOKUSAI KOGYO CO., LTD.



# Experience: Multi Purpose



PAN / RGB / NIR / combinations

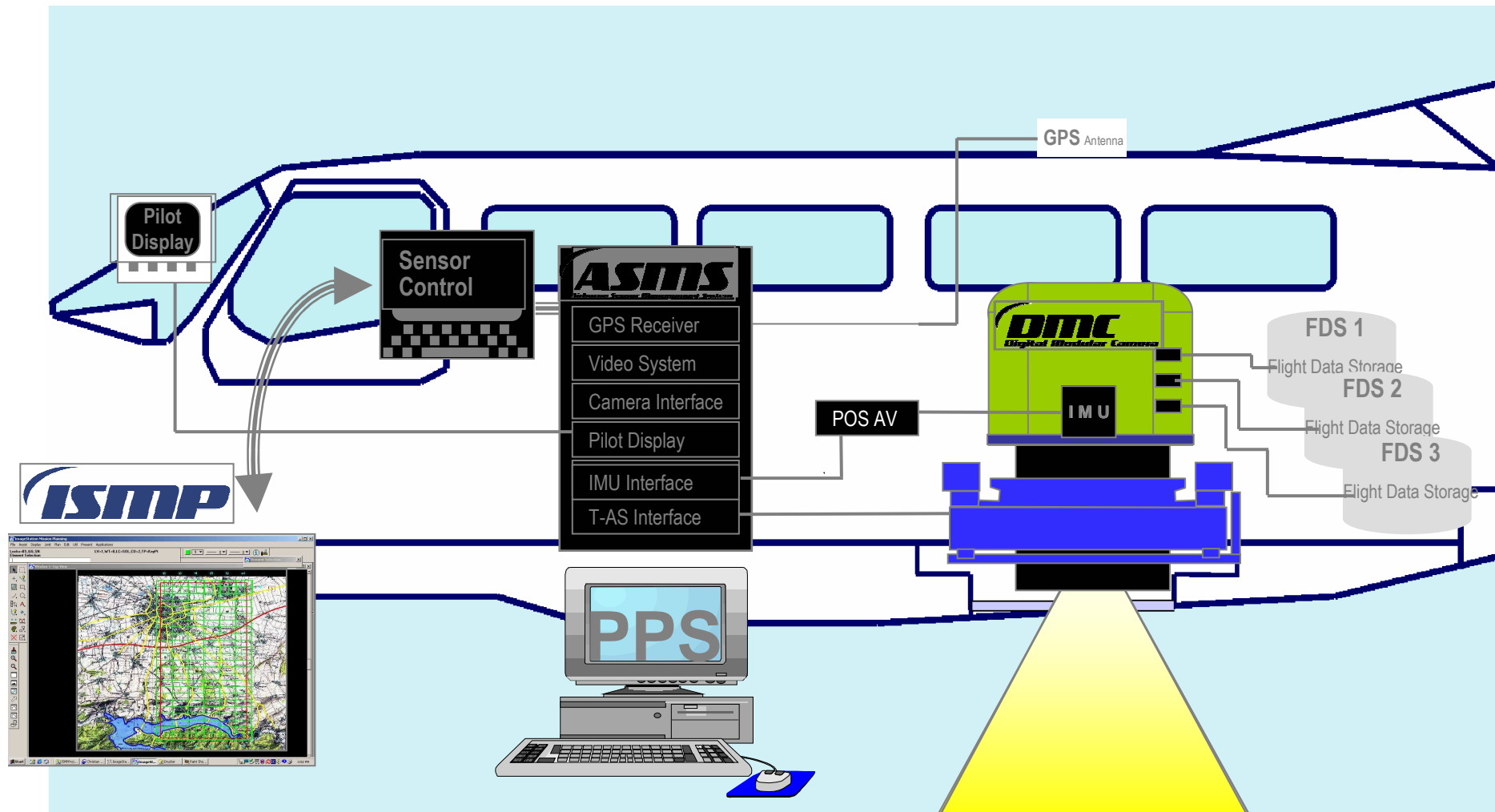


ISPRS Hannover Workshop 2005





# DMC Solution

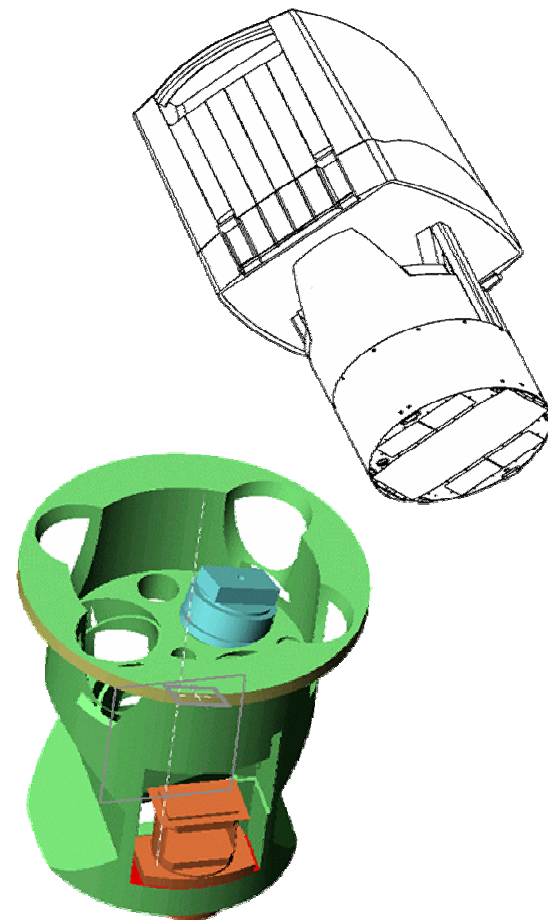




# DMC Camera Cone



- with 4 (7k x 4k) panchromatic
- and 4 (3k x 2k) multi spectral camera heads





# DMC Technical Overview



- Large format CCD digital aerial frame camera
- Metric camera for photogrammetry
- High spatial resolution
- 12-bit radiometric resolution
- Pan and 4-Band multispectral imagery
- Forward-motion compensation
- Onboard data storage
- Airborne system management
- Post-processing ground station
- Image management & distribution





# DMC Technical Data



● <b>Field of view</b>	<b>69.3° x 42°</b>
● <b>Panchromatic</b>	<b>13,824 x 7,680 pixel</b>
4 optics	f = 1:4.0 / 120mm
<b>Multi spectral</b>	<b>2,048 x 3,072 pixel</b>
4 channels	RGB & NIR
4 optics	f = 1:4.0 / 25mm
● Shutter, aperture	variable
● Flight data storage	<b>840 GB = &gt; 2,200 images</b>
● Frame rate	2 sec / image
● Radiometric resolution	12 bit
● Weight (camera only)	< 80 kg





# Airborne Sensor Management



DMC



GPS

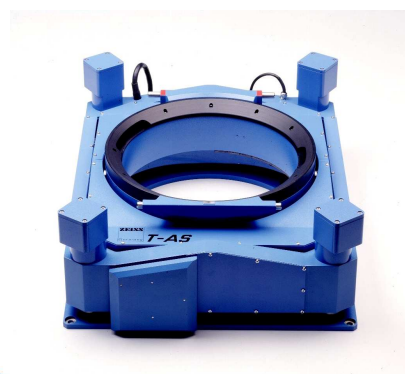


IMU



RTC

Video Camera



T-AS





# Airborne Sensor Management System (ASMS)



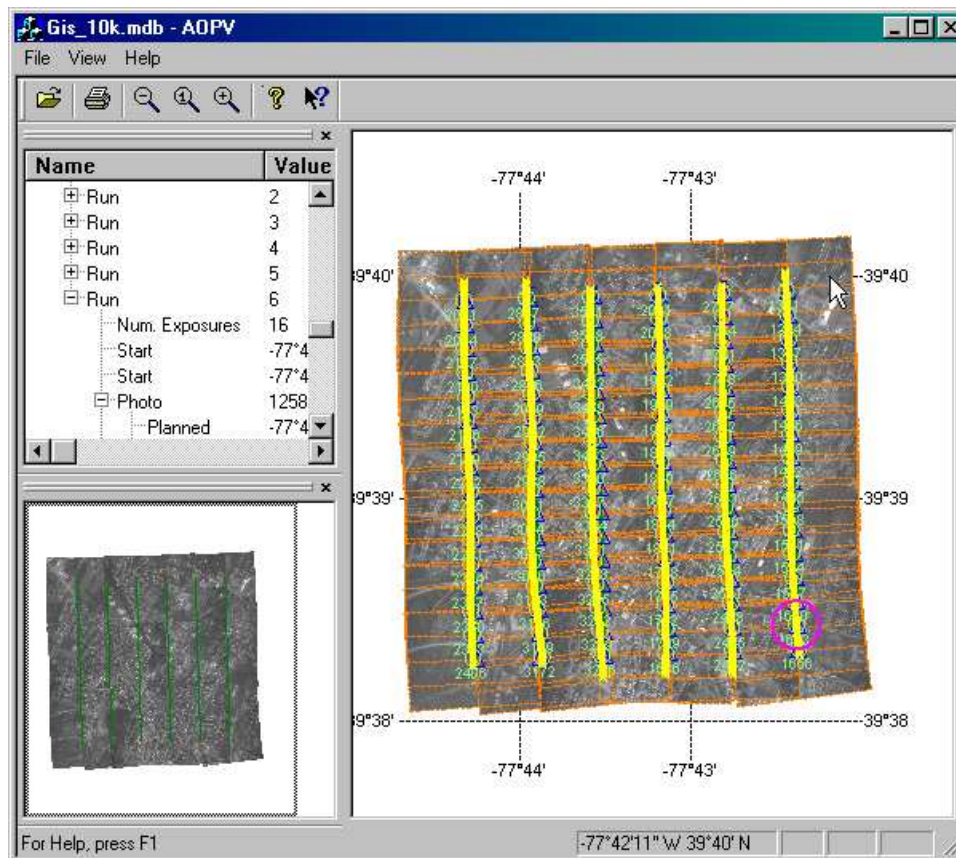
- Integrated Management of Multiple Sensors
- Single Operator Interface
- Camera Operation (DMC or RMK TOP)
- GPS Flight Management
- Optional Applanix IMU
- Video Viewfinder





# AOPV

## Airborne Onboard Project Viewer



- real time video information
- real time project status
- real time project overview  
including flight lines and image centers
- mosaic of mission area





# Flight Data Storage FDS

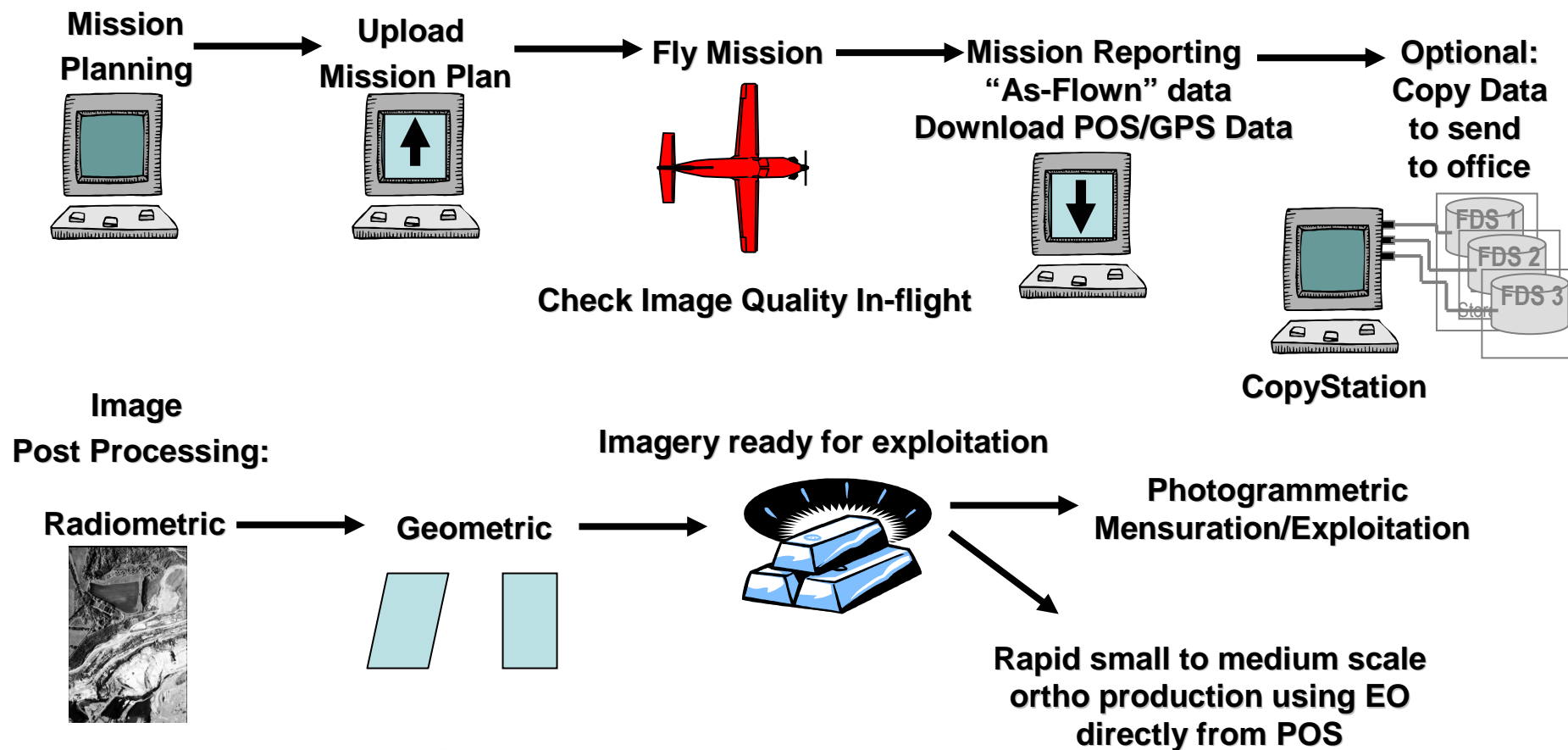


- **Extremely reliable and robust**
- **Pressurized, hardened enclosures**
  - **Passed DO 160 Standard**
  - **Designed for use at up to 8000m non-pressurized**
- **Small, light weight**
- **Standard interface technology**
- **Flexible aircraft installation**  
plug and play, no tools required,  
no cables to be disconnected
- **Storage capacity 288 GB each**  
3 units required, equivalent to 2240 images  
(PAN+RGB+CIR )





# DMC Workflow





# DMC Post Processing Software



- Consideration of LUT to easily improve/modify image appearance
- Improved color stability of RGB and NIR images
- Now Possible to batch process Dodging-Utility after images have been written to disk
- Generation of LUT with DIA-Tool (DMC Image Analysis) for tonal adjustments, color balancing and contrast / brightness correction
- Improved handling for 8-Bit image output
- JPEG2000 output
- Automatic correction of possible gaps or slivers due to high TDI values





# DMC Image Analysis (DIA)



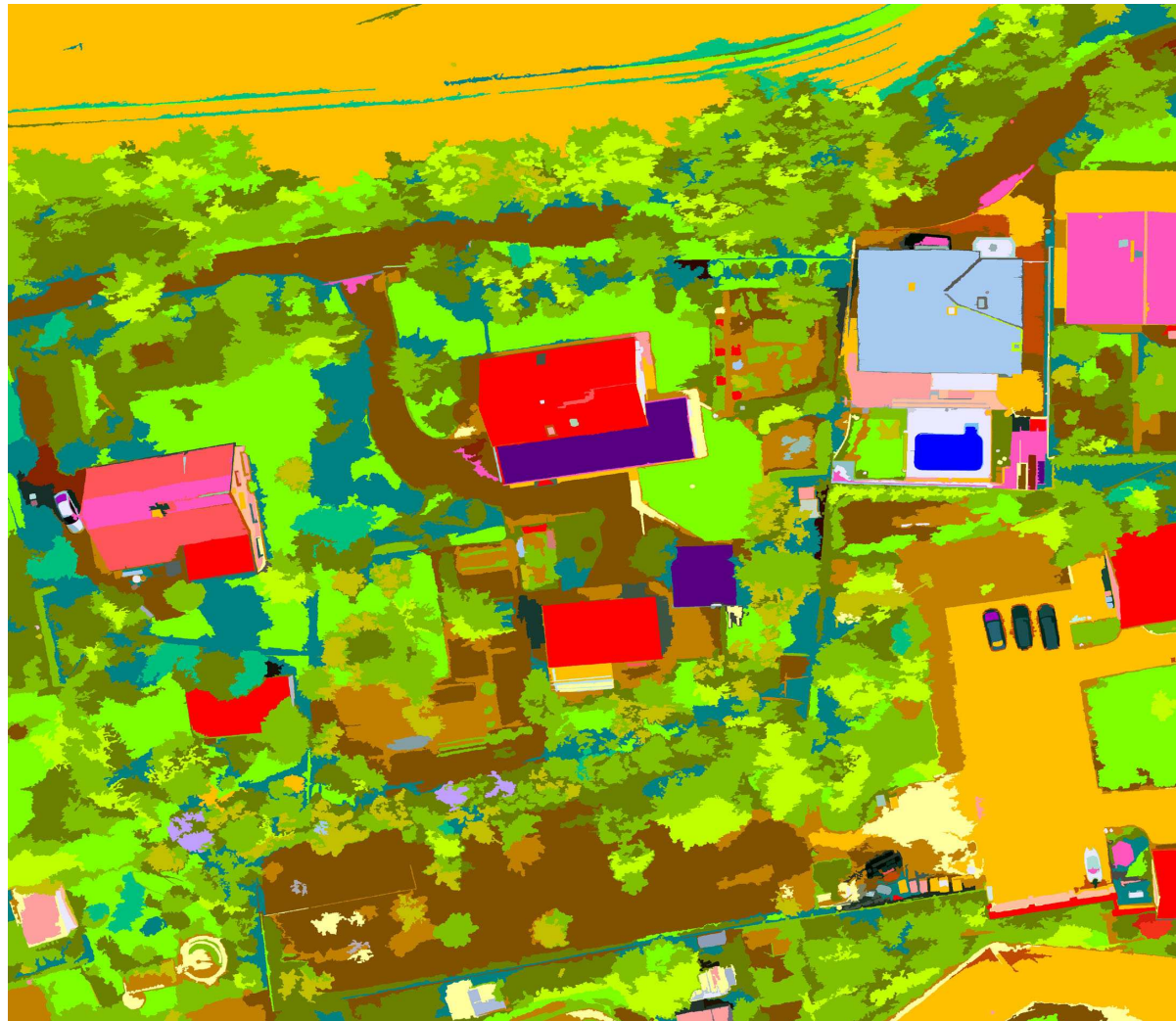
- Histogram display and write function
- Generation of LUT for tonal adjustments, color balancing and contrast
- Brightness correction
- Online preview of tonal adjustments
  - New image balancing software





# Experience: New Applications

INTERGRAPH



Class Hierarchy	
<input type="checkbox"/>	Keine Vegetation
<input type="checkbox"/>	Hof versiegelt
<input type="checkbox"/>	Hof gepflastert III
<input type="checkbox"/>	Hof gepflastert II
<input type="checkbox"/>	Hof gepflastert
<input type="checkbox"/>	Hof gepflastert dunkel
<input type="checkbox"/>	Dach
<input type="checkbox"/>	Dach braun
<input type="checkbox"/>	Dach grau
<input type="checkbox"/>	Dach hell
<input type="checkbox"/>	Dach Schiefer
<input type="checkbox"/>	Dach dunkel
<input type="checkbox"/>	Ziegeldach
<input type="checkbox"/>	Boden
<input type="checkbox"/>	Boden dunkel
<input type="checkbox"/>	Boden hell
<input type="checkbox"/>	Boden mittel
<input type="checkbox"/>	Sand
<input type="checkbox"/>	Hauswand, Beton
<input type="checkbox"/>	<b>Autos</b>
<input type="checkbox"/>	Dachfenster, Schornstein
<input type="checkbox"/>	Vegetation
<input type="checkbox"/>	Baum
<input type="checkbox"/>	Nadelholz
<input type="checkbox"/>	Laubholz
<input type="checkbox"/>	Laubbäume hell
<input type="checkbox"/>	Obstbäume
<input type="checkbox"/>	Flieder
<input type="checkbox"/>	Vegetation niedrig
<input type="checkbox"/>	Wiese
<input type="checkbox"/>	Acker
<input type="checkbox"/>	Wiese dünn
<input type="checkbox"/>	Wasser



# Experience: New Applications



**Developing a True Ortho Technique Using a Digital Mapping Camera**  
The Costs Have Decreased Significantly

The quest for the True Orthophoto has achieved almost mythical status among the providers and consumers of aerial mapping products. Long considered technologically impractical, the ability to generate orthoimagery devoid of the distortions inherent in airborne image acquisition has gradually become more common thanks to digital processing techniques. But despite these digital advantages, acquisition of true ortho-

**Ortho Project**

accurate data sets available, the ImageStation OrthoPro software performed the pixel-by-pixel analysis and processing necessary for generation of true orthos. No

saturation and rapid refresh rate, provide the flexibility to fly the system at both low and high altitudes for collection

Figure 1. Standard configuration of the DMC system.

3001  
the spatial data company

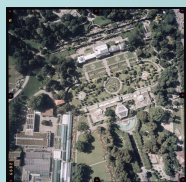
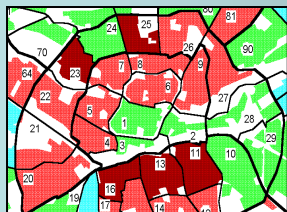
Name	Value
Project	
Identifier	
Planning Date	1/1/
Company Name	300
Client Name	NGA
Project Name	Jack
Project Number	020
Full Area Name	
Aircraft Type	

- Photo scale 1:22608
- Flying height 2600 m
- GSD 26 cm
- Overlap 80/97
- Flight lines 11
- Images 140



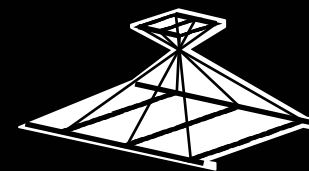


# DMC – Market Positioning



line sensor < 40%

line w/o FMC



DMC = 100 %

Matrix with FMC

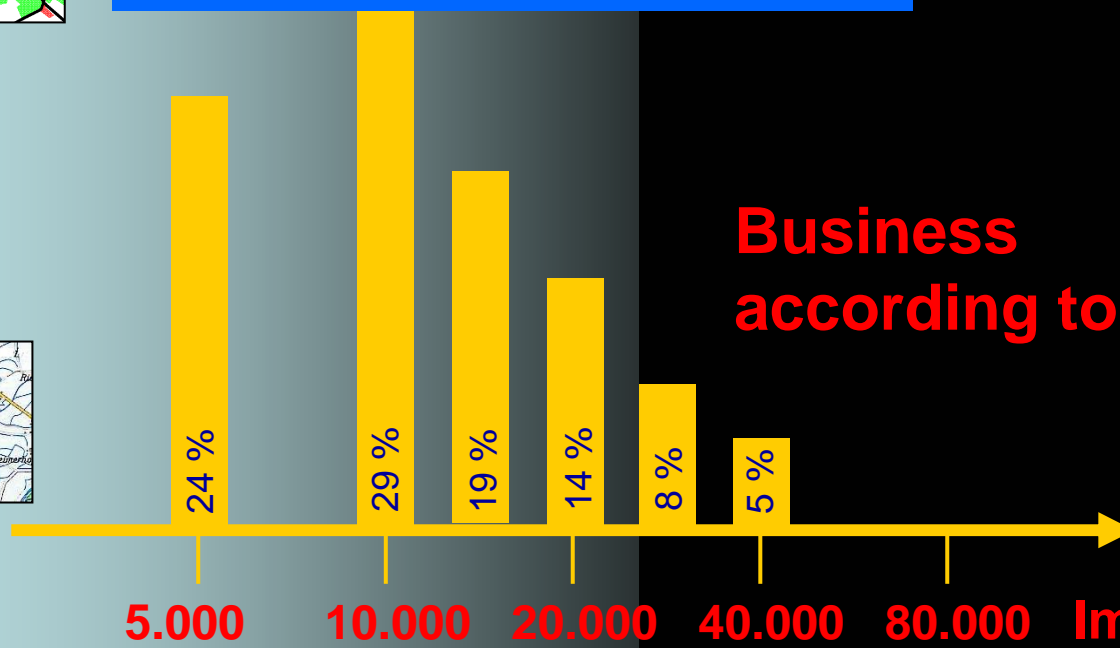


RMK = 100 %

23 cm Film with FMC



Business  
according to scale





# DMC Benefits





# Fast Results



● ISMP – Mission Planning	7:00 – 7:30 h	<i>30 min</i>
● Photo Flight	7:30 – 9:00 h	<i>1 h 30 min</i>
● ISMP – Mission Reporting	9:00 – 9:10 h	<i>10 min</i>
● PPS	9:10 – 14:40 h	<i>5 h 30 min</i>
● Aerotriangulation	14:40 – 16:10 h	<i>1 h 30 min</i>
● Automatic DTM Generation	16: 10 – 17:40 h	<i>1h 30 min</i>
● Orthophoto Generation	17:40 – 21:40 h	<i>4 h 00 min</i>

● *Total project time : 14 h 40 min*





# DMC among Line Sensors



- a very stable and precise image geometry
- does not require a GPS/INS system ( optional )
- “central perspective” image data
- wide range of applications
- image data can be processed with any standard softcopy system on the market

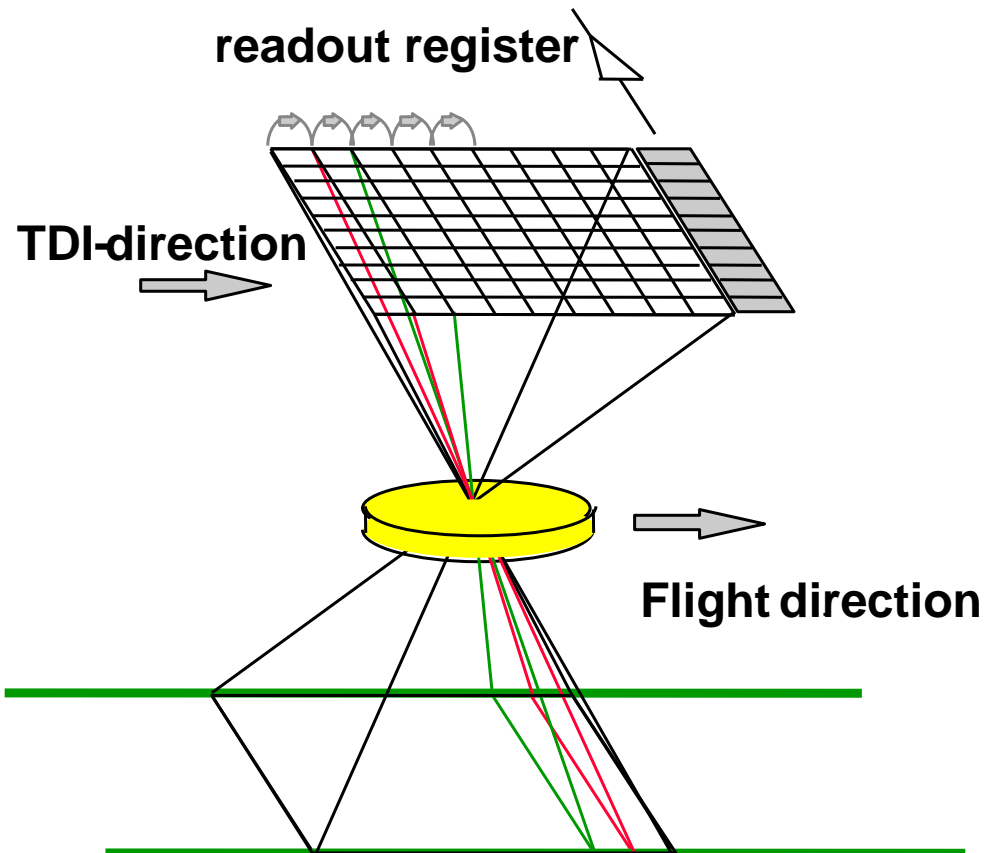




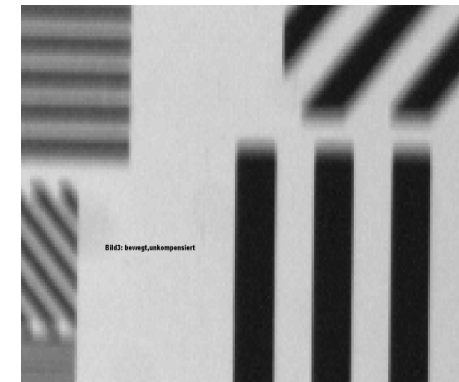
# DMC among Line Sensors



has Forward Motion Compensation FMC implemented through TDI ( Time Delayed Integration )



moving target,  
uncompensated



moving target,  
compensated





# DMC among Line Sensors



in combination with a 12 Bit radiometry it produces outstanding results even in unfavorable weather conditions

- Higher Sensitivity -> **Extended flying days**
- Improved image quality -> **more shadow details**





# DMC among other Frame Sensors



- uses high grade industry components for safe and reliable aircraft installation ( high grade connectors, environment tests against DO160, a minimum of cable connections, crash load tests against DO160 )
- single vendor supplier. The complete camera system including all components and peripherals provided through a single source, Intergraph - Z/I Imaging
- product quality and operational stability supports operational cost savings for the user

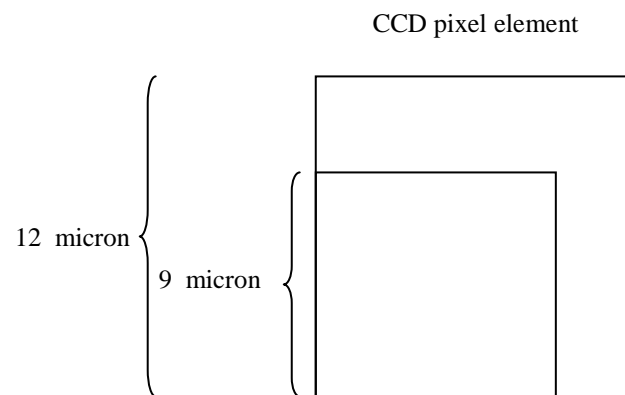




# Excellent Image Quality



**Large pixel size in combination with a 12 Bit radiometry produces outstanding results even in unfavorable weather conditions**



**A 12 micron CCD has 77% more light sensitive area comparing to a 9 micron CCD element**

larger CCD elements have a **higher sensitivity**

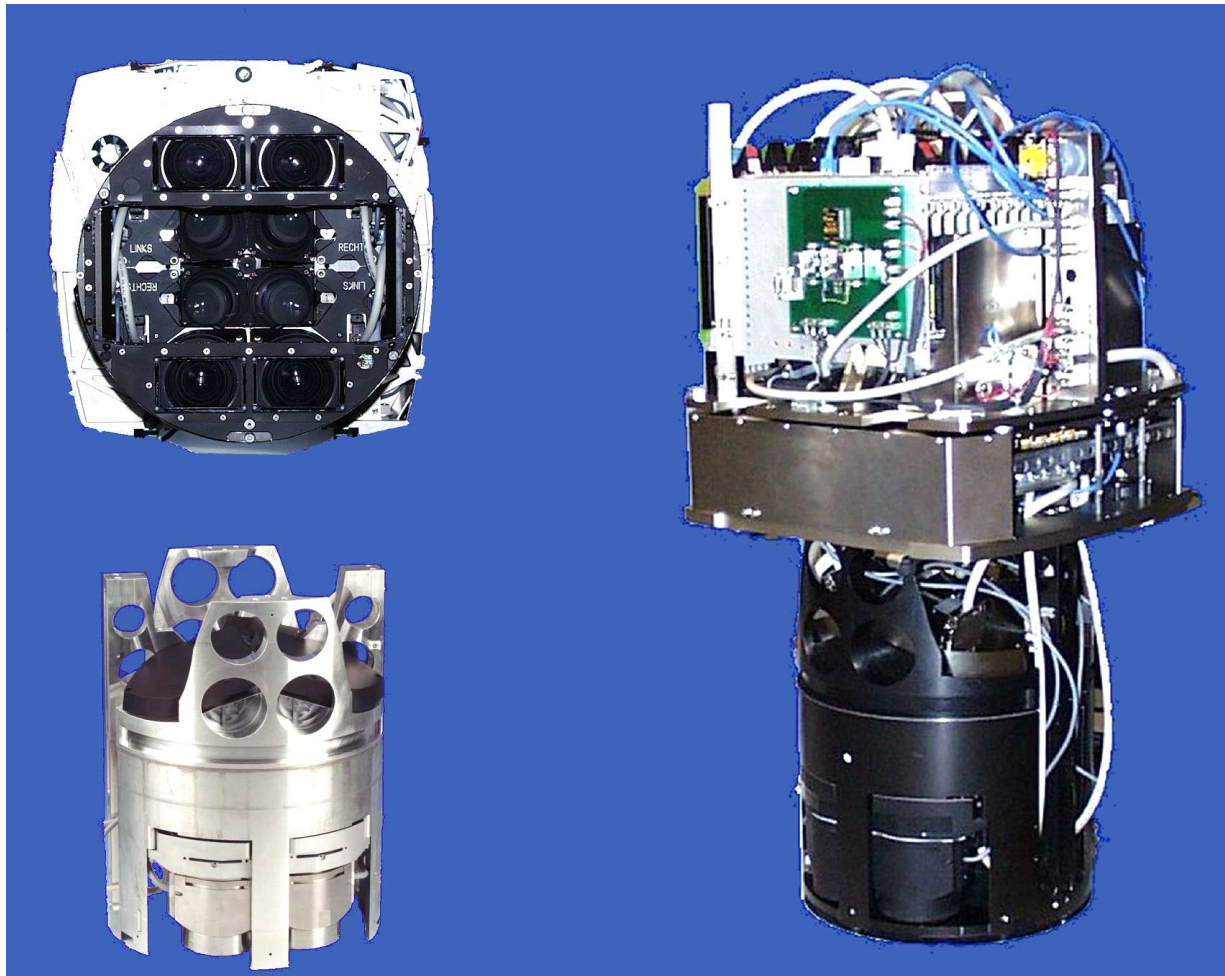
-> better **image quality**

-> more **shadow details**





# Reliable and robust design





# Investment into Quality



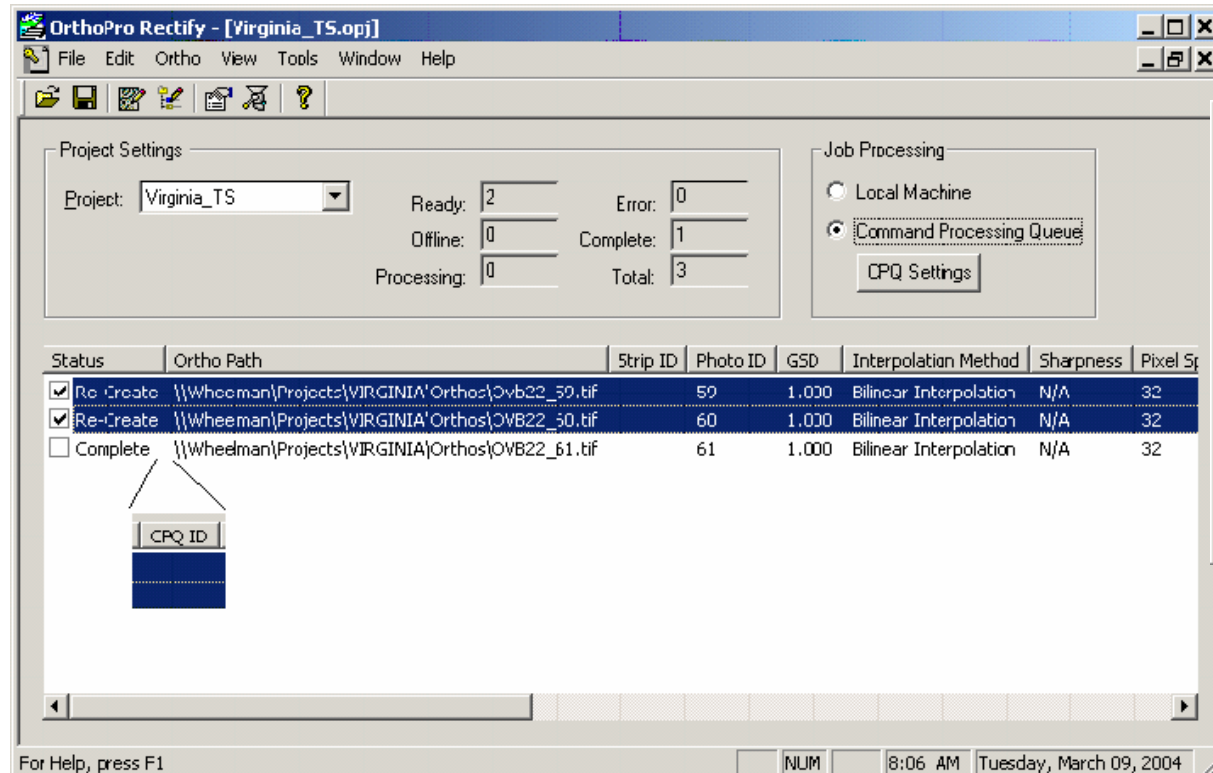
## *Experiences from decades: Carl Zeiss & Intergraph*

- Aerial Survey Cameras** are used in very rough conditions
- extremely high and low temperatures
  - high and low humidity in rapid alteration
  - shock and vibration loads





# Distributed Processing = *fast throughput*



**OrthoPro Rectify - [Virginia\_TS.opj]**

File Edit Ortho View Tools Window Help

**Project Settings**

Project: Virginia\_TS

Ready: 2 Error: 0

Offline: 0 Complete: 1

Processing: 0 Total: 3

**Job Processing**

☐ Local Machine

☒ Command Processing Queue

CPQ Settings

Status	Ortho Path	Strip ID	Photo ID	GSD	Interpolation Method	Sharpness	Pixel Size
<input checked="" type="checkbox"/> Re-create	\\Wheelman\Projects\ VIRGINIA\Orthos\OVB22_50.tif	59		1.000	Bilinear Interpolation	N/A	32
<input checked="" type="checkbox"/> Re-create	\\Wheelman\Projects\ VIRGINIA\Orthos\OVB22_50.tif	60		1.000	Bilinear Interpolation	N/A	32
<input type="checkbox"/> Complete	\\Wheelman\Projects\ VIRGINIA\Orthos\OVB22_61.tif	61		1.000	Bilinear Interpolation	N/A	32

CPQ ID

For Help, press F1

NUM 8:06 AM Tuesday, March 09, 2004

**CPQ Settings**

Processing Server

Type: First Available

Name:

OK

Cancel

Job Priority

Execution: Normal

Job: 10 - Lowest





# DMC among other Frame Sensors



7640 pixel



13824 pixel

- plus 20% ground coverage
- 20% less flying time
- thus reduced image acquisition costs

➤ World largest format commercial digital frame camera

➤ savings of flying cost

Flight direction





# DMC Benefits - Summary



- Extended Flying Window of Opportunity  
**Up to 20% increase in flying day / season length**, due to DMC's higher radiometric sensitivity  
eg, an extra 1.5 hrs per day / 6 weeks per year
- Return on Investment  
**Up to 15% reduction in operational costs & materials** compared to film-based systems
- Faster Delivery  
**Quicker image data turnaround = reduced map revision cycles**
- Maximum Productivity / Minimum Downtime  
**High reliability, local service engineers & spares facilities**
- Competitive Advantage  
***DMC lets you to bring new & better products to market faster & cheaper than others***



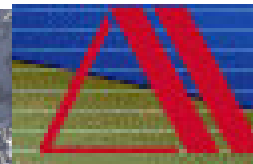


# DMC is accepted worldwide



**KOKUSAI KOGYO CO., LTD.**

second camera purchased



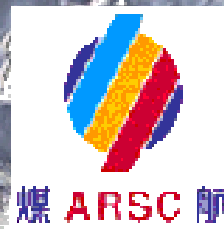
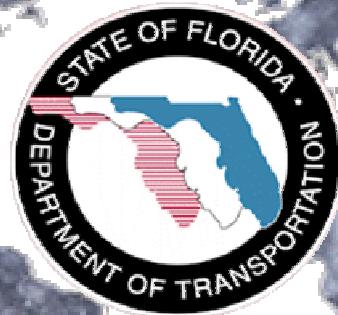
**Aero Asahi Corporation**



Tianjin Golden Universe  
Information Technology  
Co. Ltd (2)



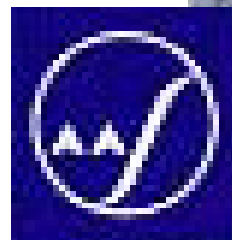
imagination at work



**AERO-METRIC**



4+ camera purchased



**Asia Air Survey**

