

# DMC – Digital Mapping Camera from Intergraph

## Use for CwRS



Images Courtesy of Stereocarto, Spain; PhotoScience, USA; AAM Hatch PTY Ltd., Australia

MARS PAC annual conference, Madrid 12th – 14th November 2007



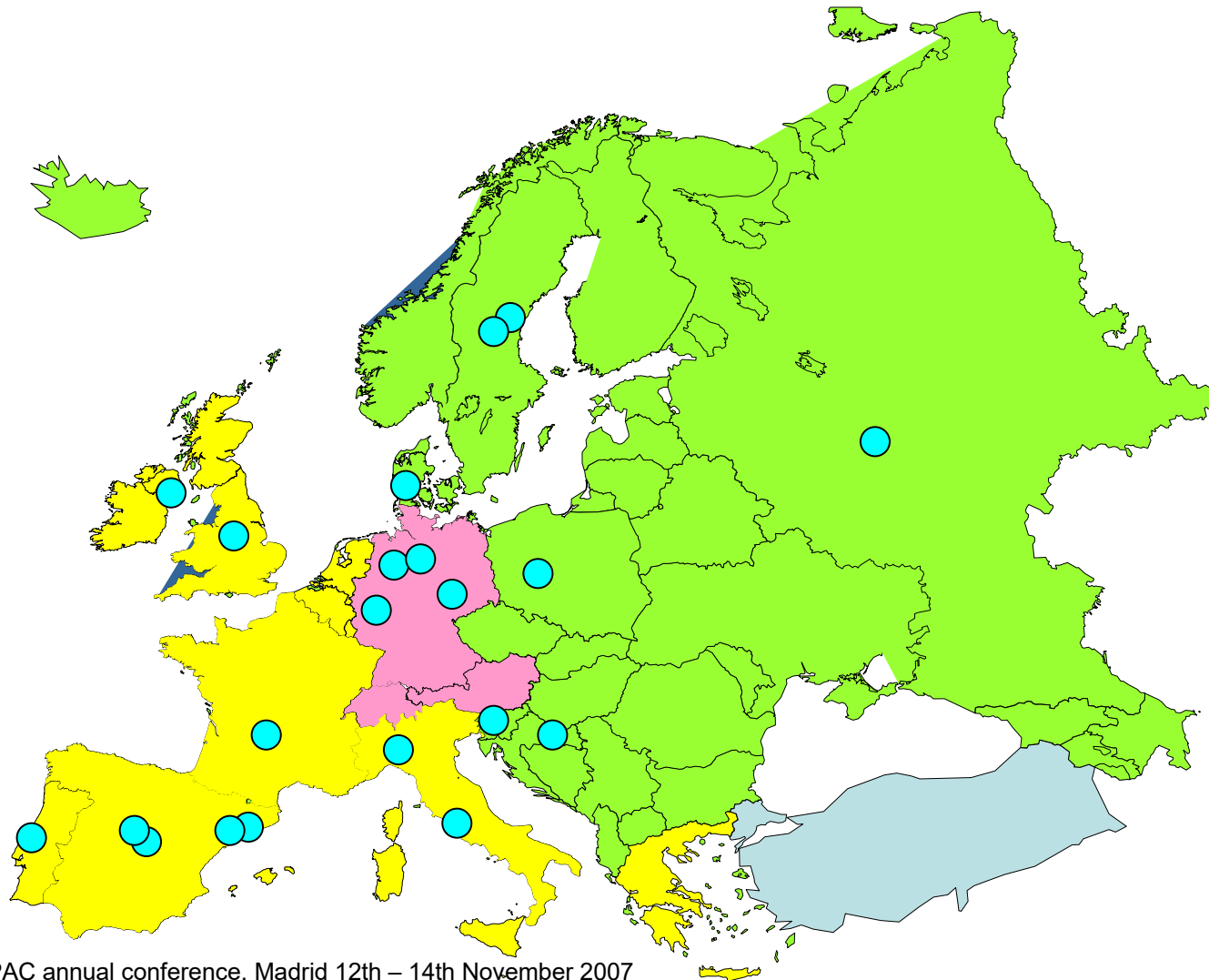
# Overview

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- DMC Camera System technical details
- Digital Camera Photo Flight Workflow
- Use of DMC Image Data for LPIS and CwRS
- Digital Aerial Cameras as alternative to VHR Satellites

# DMC Installations in Europe



DMC sold / in use:

- Germany
- Spain
- Portugal
- France
- Italy
- UK
- Sweden
- Denmark
- Slovenia
- Croatia
- Poland
- Russia
- North Ireland

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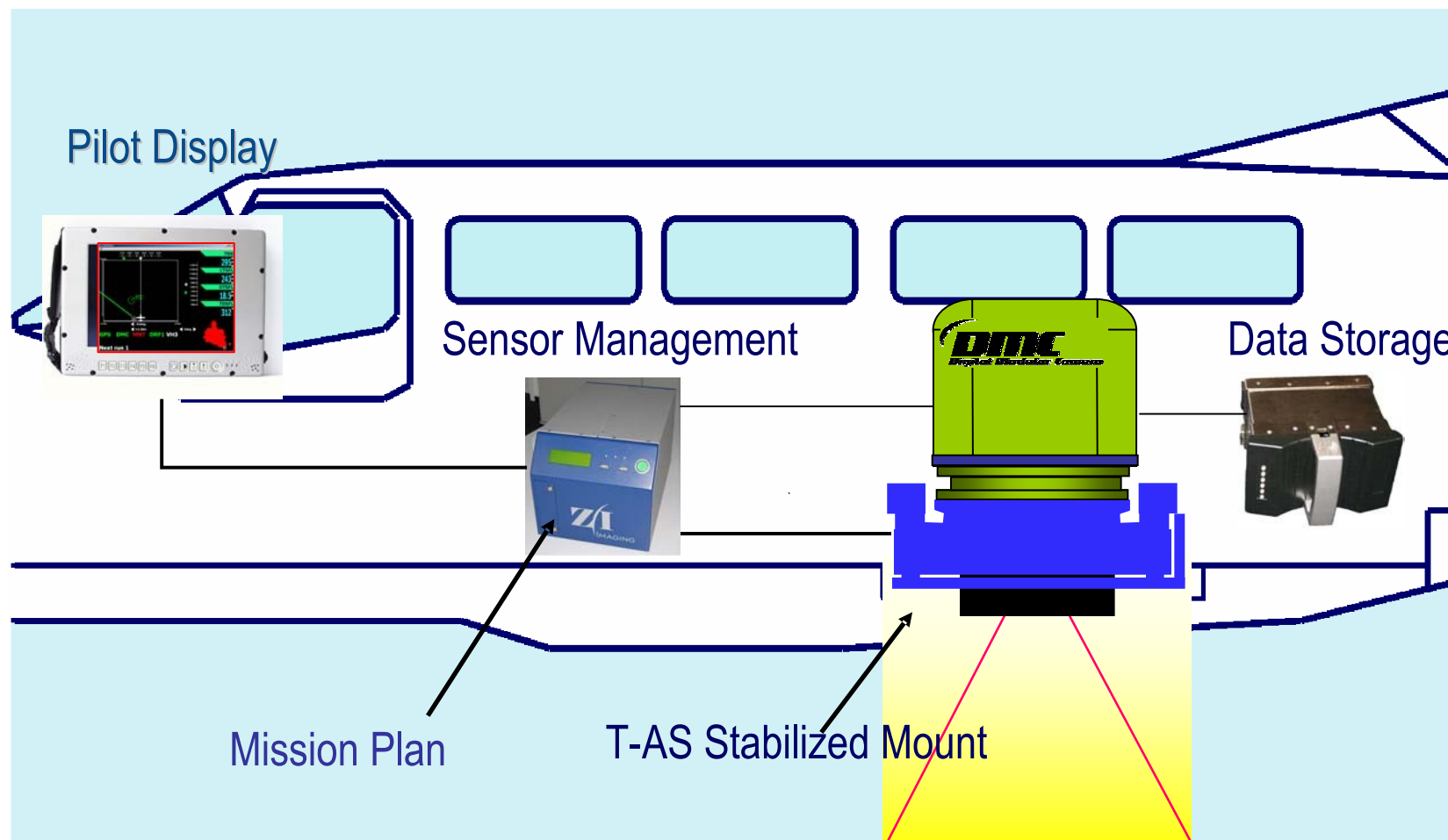
# DMC System Aircraft Installation



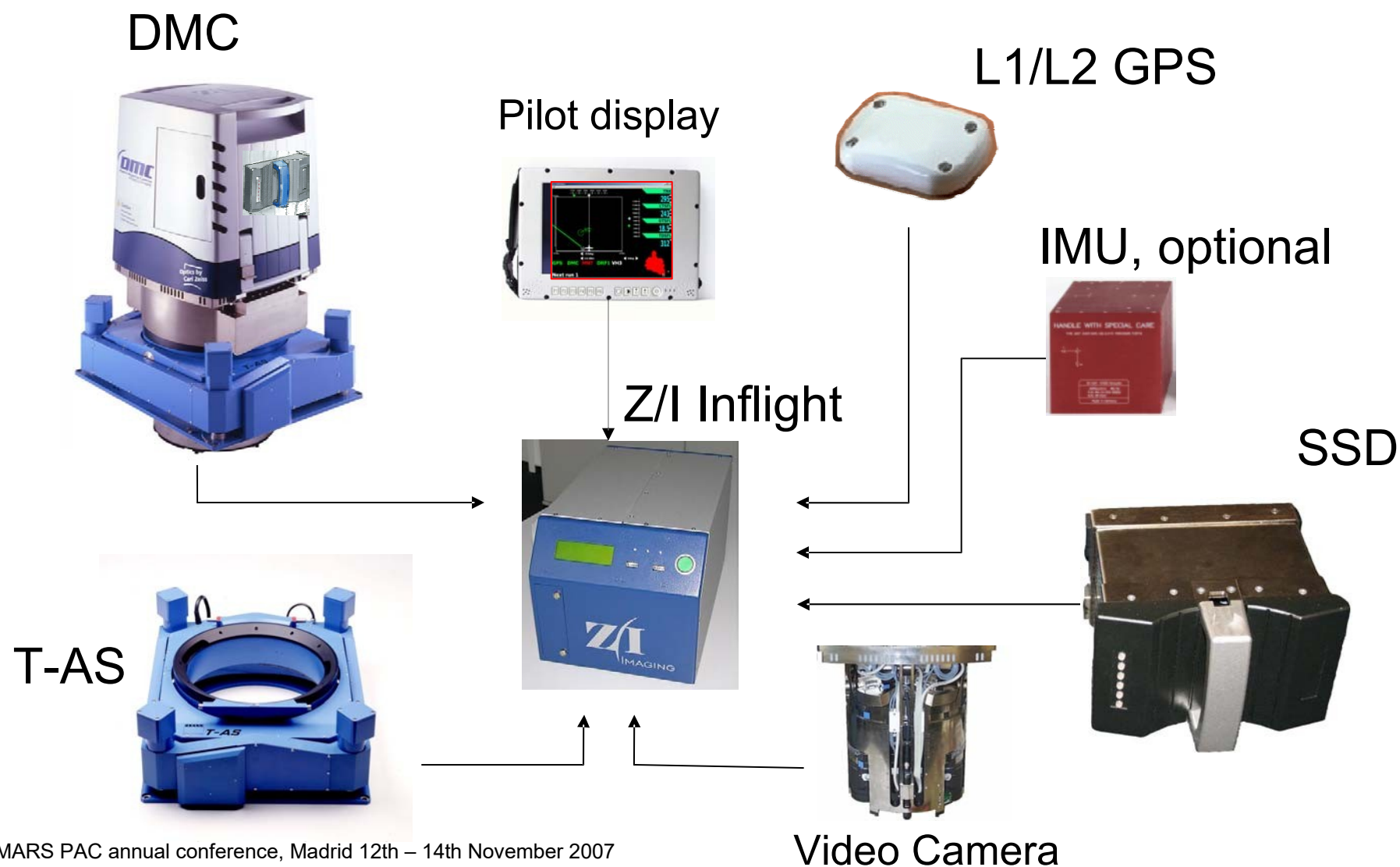
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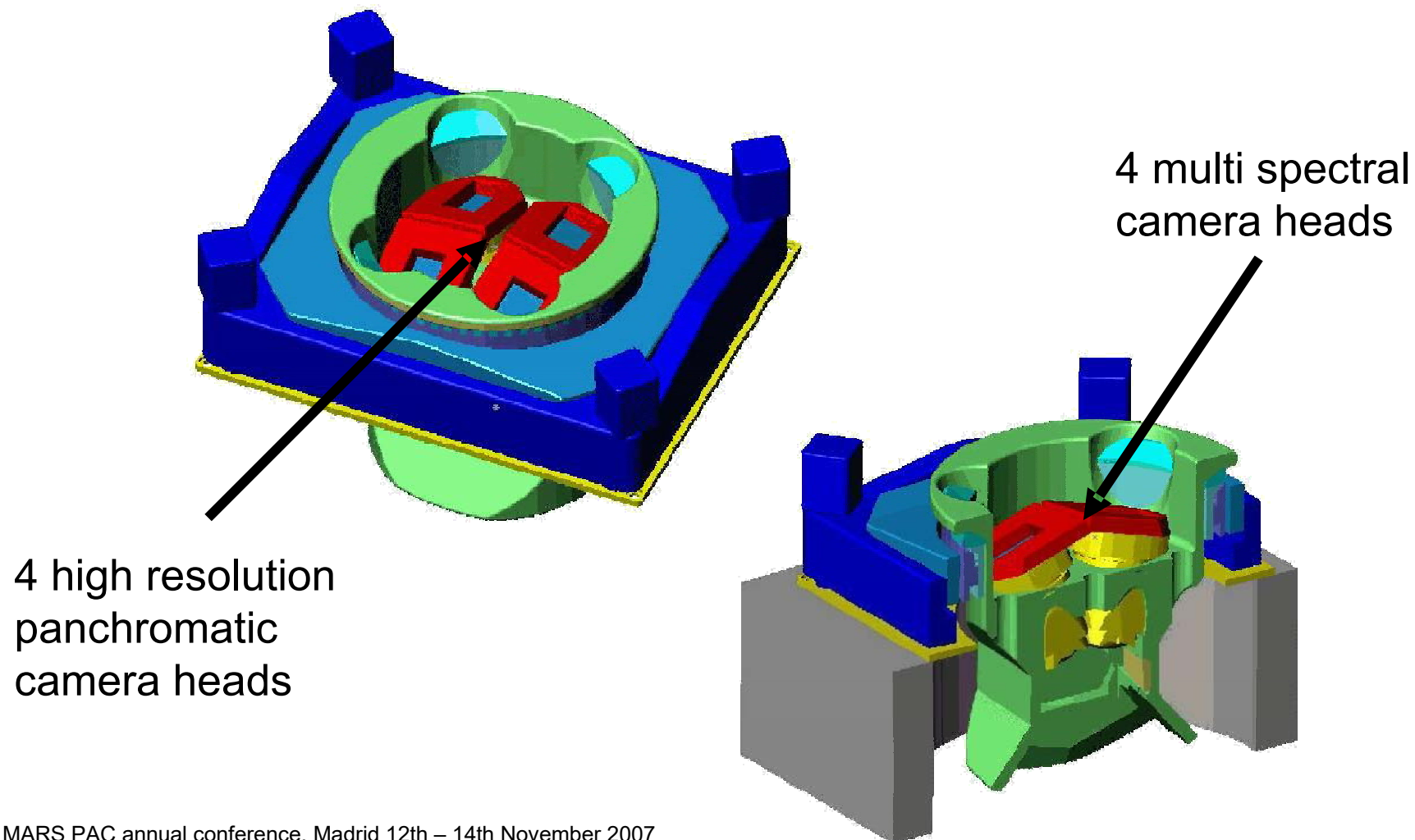
# Aircraft System Installation



# Airborne System Configuration

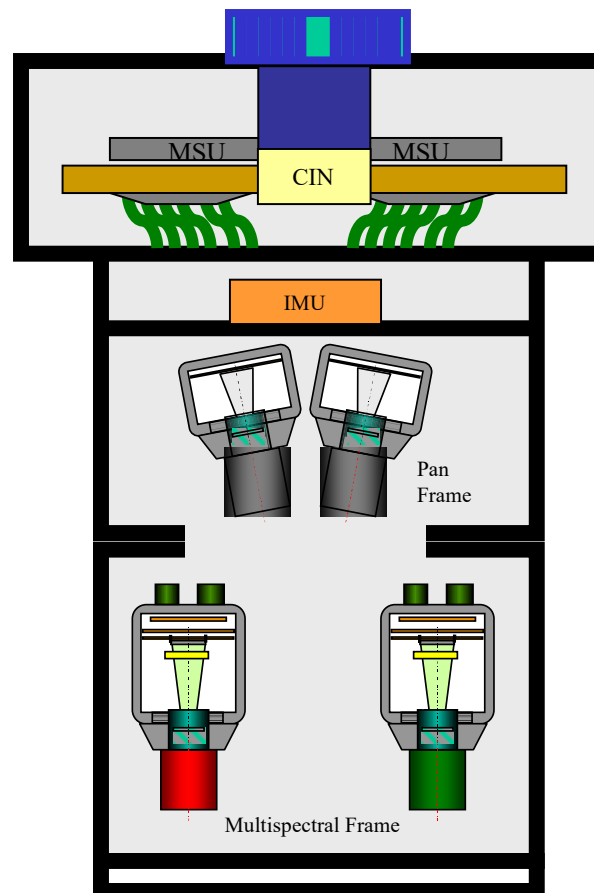


# The DMC Design Concept



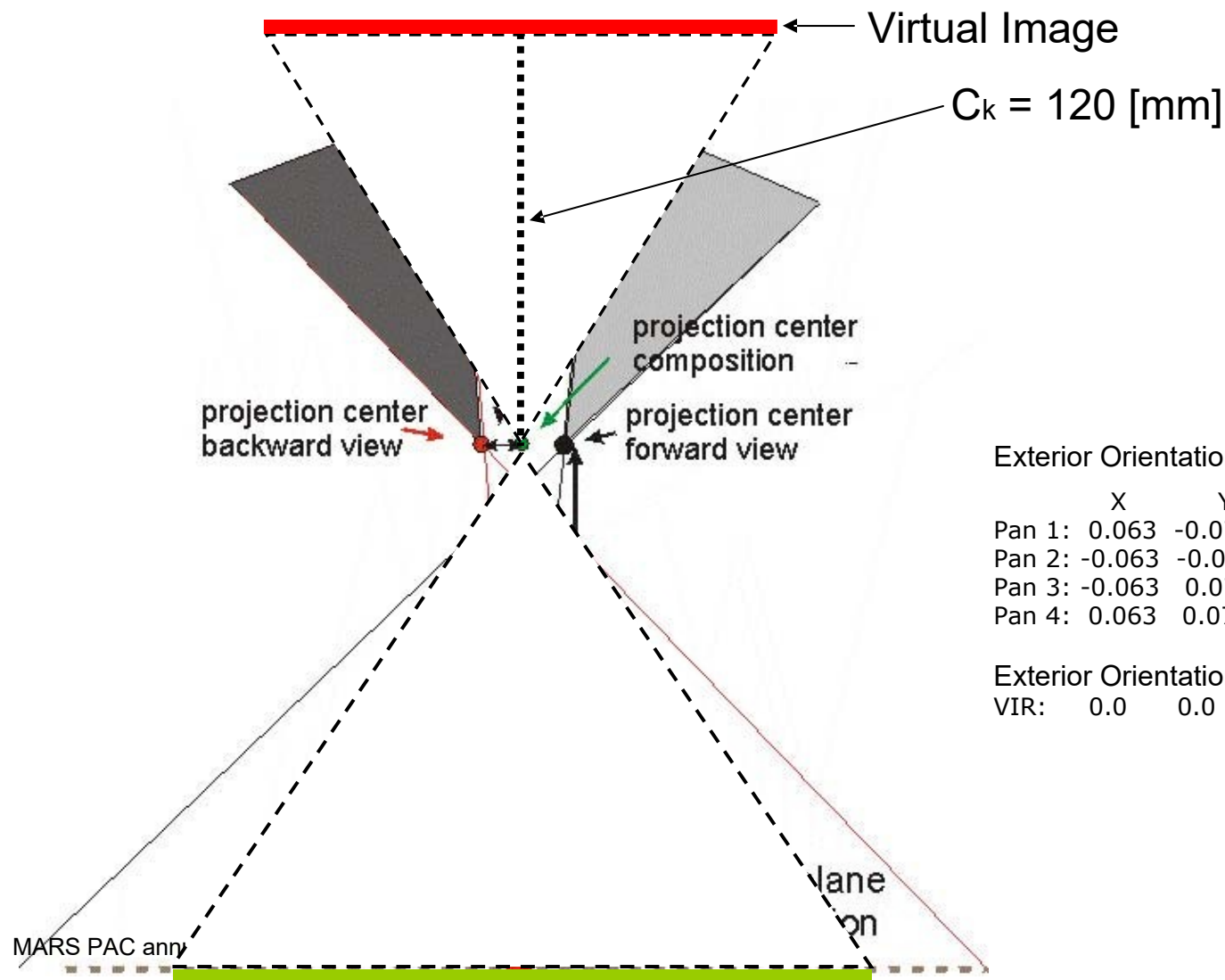
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# Camera Base Unit CBU





# Principle of virtual image composition



## Exterior Orientation parameters of Pan Heads

	X	Y	Z	omega	phi	kappa
Pan 1:	0.063	-0.0786	Z	17	10	90
Pan 2:	-0.063	-0.0786	Z	17	-10	90
Pan 3:	-0.063	0.0786	Z	-17	-10	-90
Pan 4:	0.063	0.0786	Z	-17	10	-90

## Exterior Orientation parameters of VIR image

VIR:	0.0	0.0	Z	0.0	0.0	0.0
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# Solid State Disk (SSD)



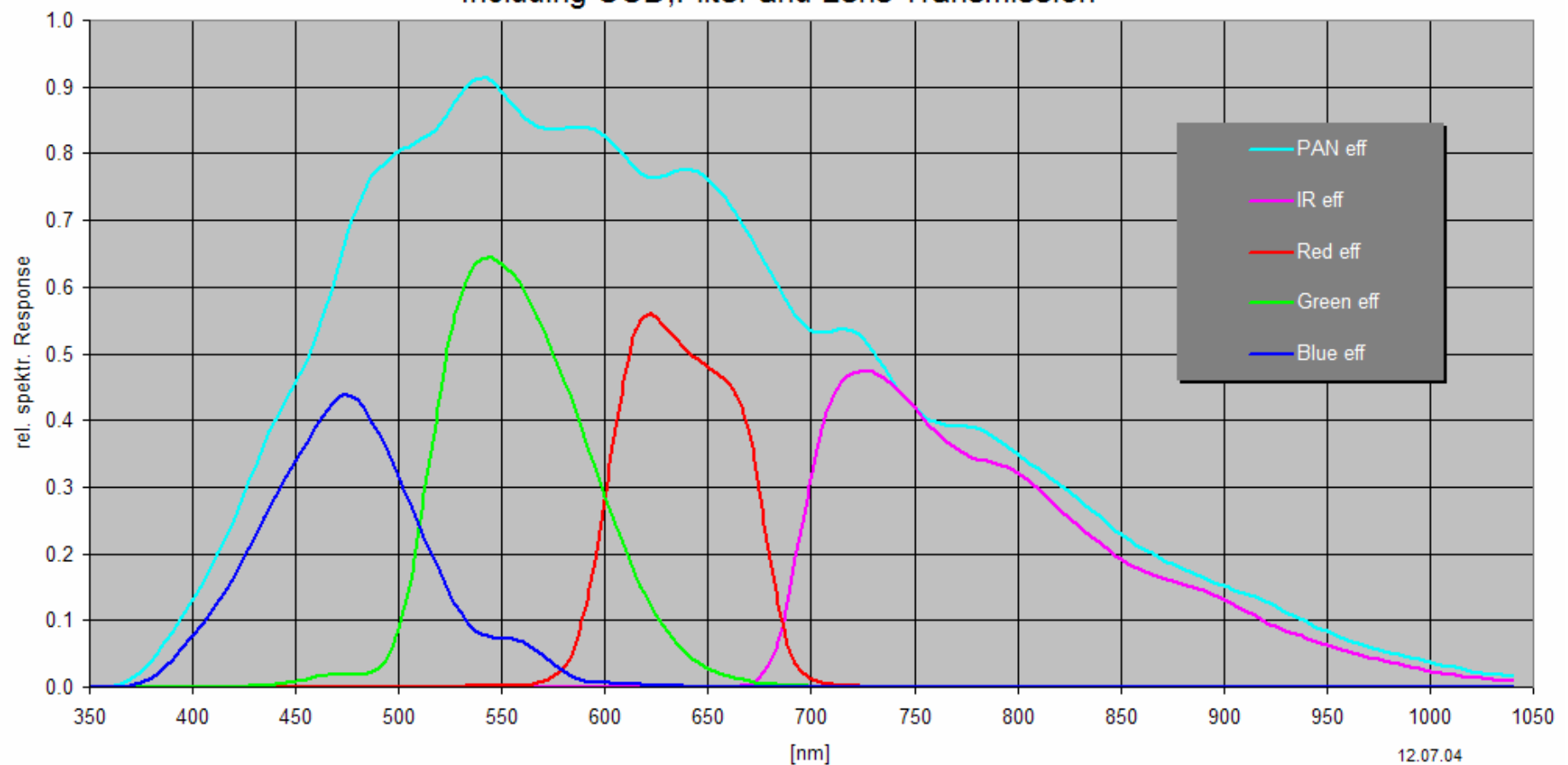
## ③ Replaces Disk Drives

- Smaller System Footprint
- Drastically Reduces Weight (Eliminates 87kg of FDS!)
- Reduced Power Consumption
- Allows DMC to fit into Small, Single Engine Aircraft (e.g. Cessna 206) without power modifications
- High Reliability
- Plugs directly into side of DMC
- Can be exchanged in flight
- First version with 1000 images capacity
- future enhancement planned
- Extra SSD cartridges may be purchased



# DMC Spectral Sensitivity

## DMC - Spectral Calibration Including CCD, Filter and Lens Transmission



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# USGS Certification



United States Department of the Interior  
U.S. GEOLOGICAL SURVEY  
National Center for Earth Resources Observation and Science  
Sioux Falls, South Dakota 57198

12/15/06

**Subject: Successful Completion of the USGS Manufacturer Certification Process for the Intergraph Digital Mapping Camera (DMC)**

The United States Geological Survey (USGS) certifies that the Digital Mapping Camera (DMC) system manufactured by the Intergraph Corporation (Zeiss/Intergraph), in Aalen, Germany meets the claims of the manufacturer and is capable of providing quality, consistent image data to support civil government mapping and ortho-photography product development.

The USGS provides this certificate to Intergraph Corporation for successful completion of the USGS Manufacturer Certification process which included presenting and providing all appropriate information to address the certification requirements as define in the USGS Quality Assurance of Digital Aerial Imagery plan and the USGS Manufacturer Certification Checklist.

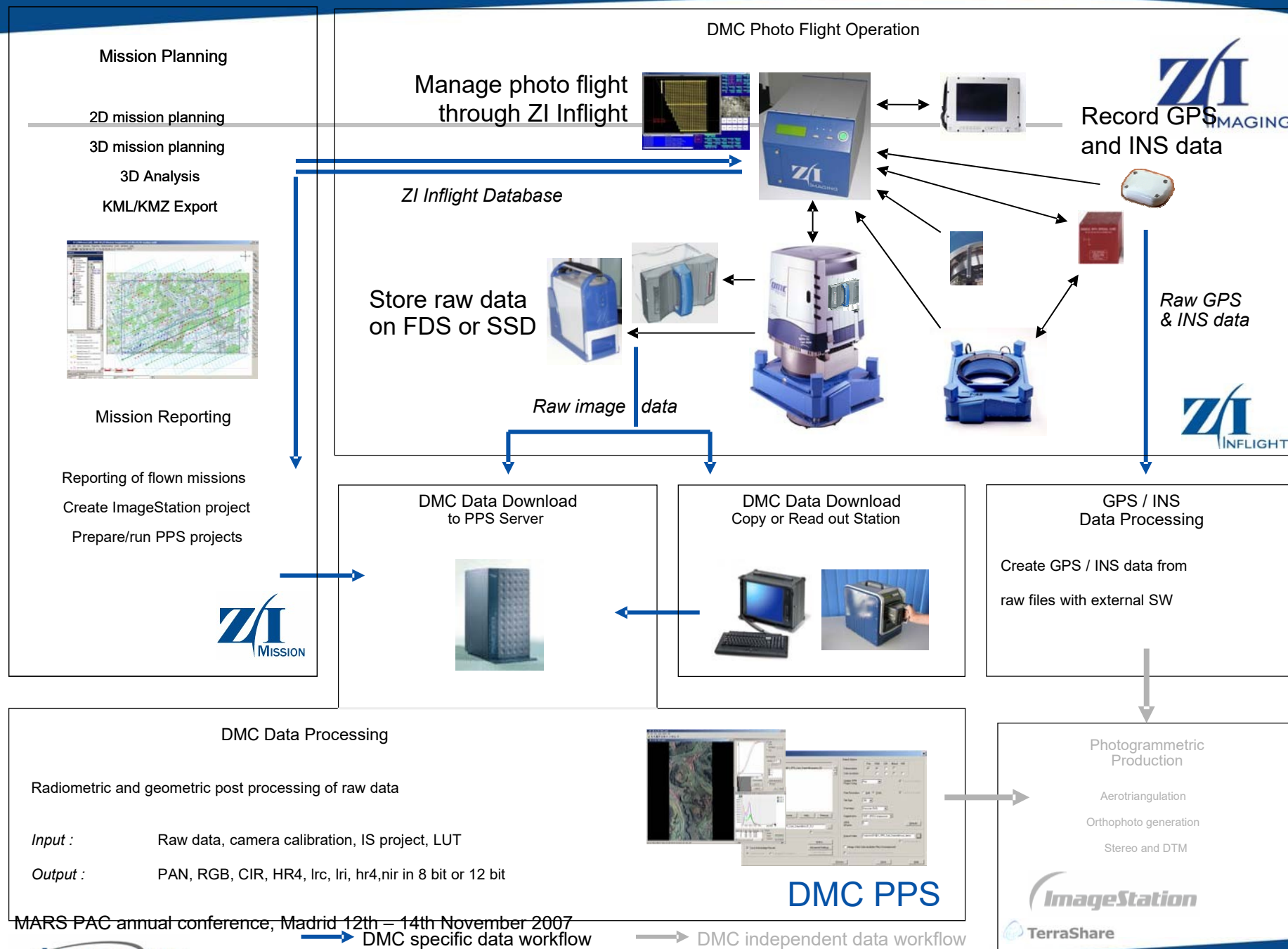
This certification is valid for all Intergraph DMC systems that match the system type evaluated by the USGS during the 2006 site inspection. Any design changes that change the effective output of the system will require additional evaluation and re-certification if necessary.

To discuss manufacturer certification, please contact the manufacturer, or the USGS certification team via the following web mail link - <http://calval.cr.usgs.gov/>.

A handwritten signature in black ink, appearing to read 'Gregory L. Stensaas'.

Gregory L. Stensaas  
USGS Manufacturer Certification Team Lead  
Remote Sensing Technologies Project Manager  
Geography Discipline





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DMC specific data workflow

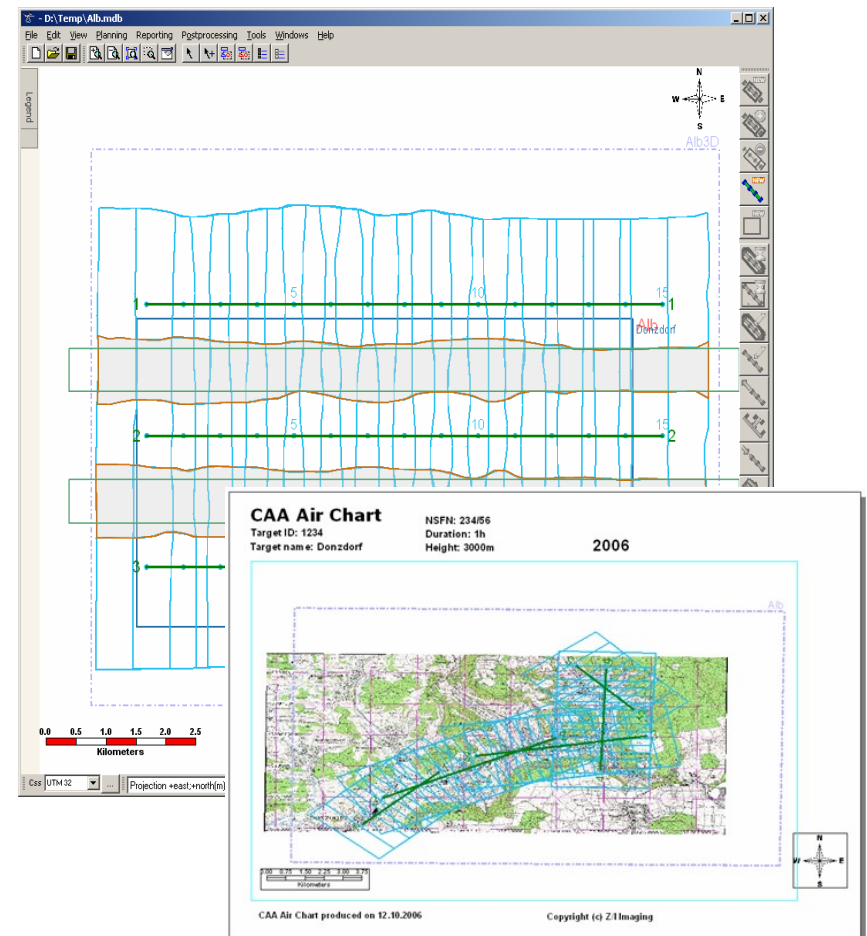


DMC independent data workflow

# Z/I Mission

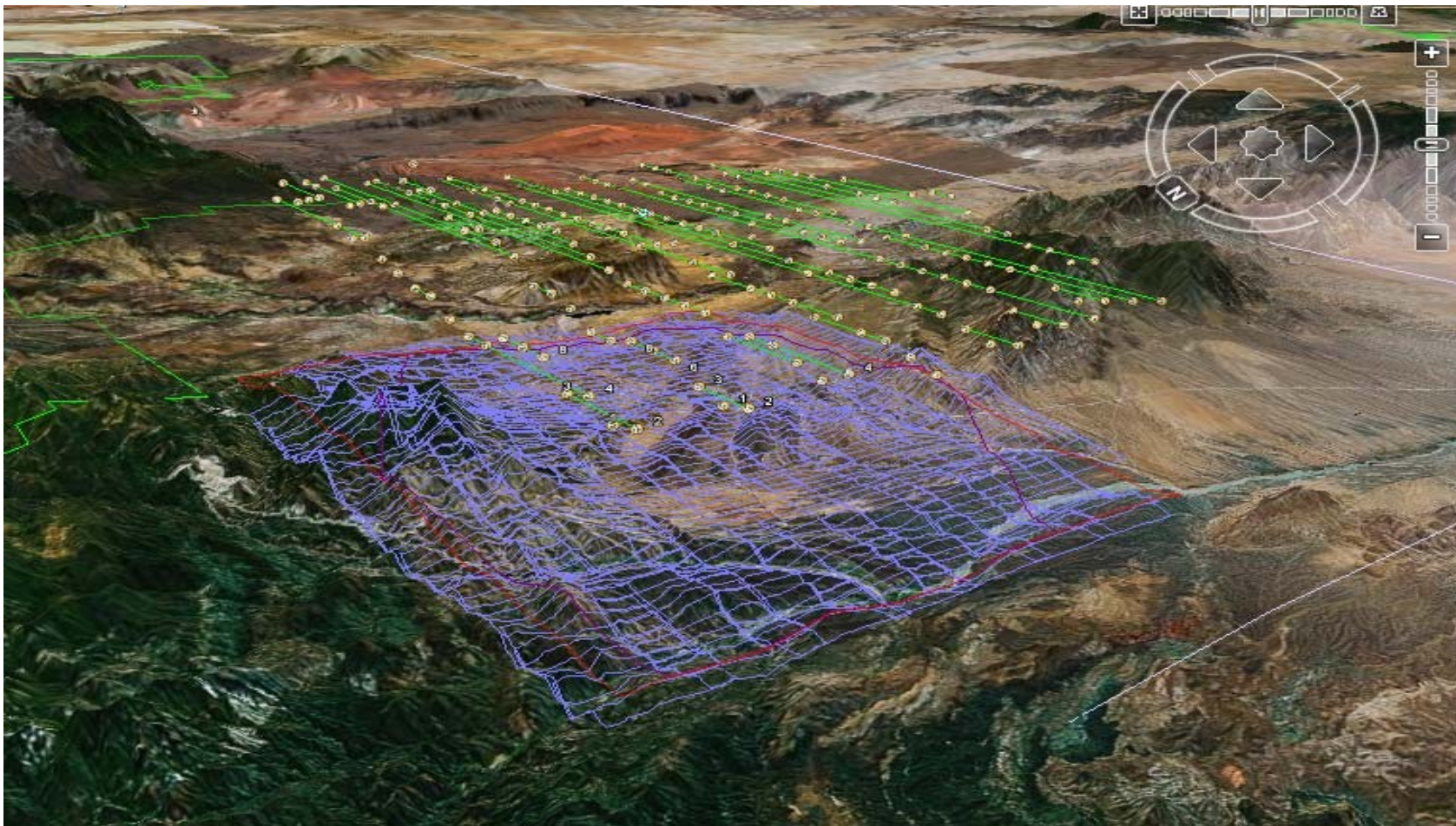


- ③ 3D planning tool (with DTM's to be imported)
- ③ 3D quality control tool to check overlap and break flight lines
- ③ Z/I Mission Airborne Mission Planning and Reporting
- ③ no need for MicroStation
- ③ Common database for planning, photo flight and image data post processing





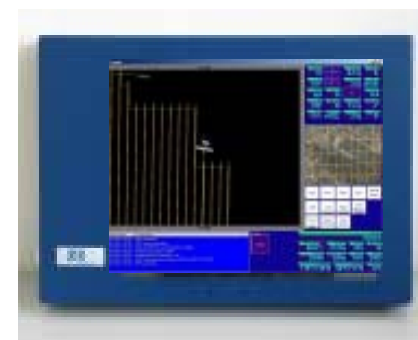
# Z/I Mission planning software



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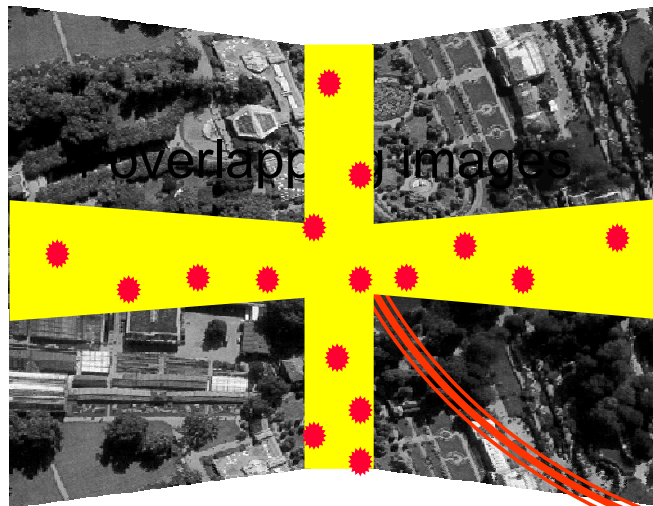
# Z/I Inflight

- Eliminates the need for a separate laptop computer
- Smaller form factor
- High Reliability
- Touch Screen Controls for operator and pilot
- Flash Disk (4GB upgradeable to 64GB)
- Contains two computers
  - ③ RTC running LINUX
  - ③ Computer running Windows XP
- High Speed Data Hub (1Gb) on-board
- Interface to RMK-TOP under development





# DMC Image Post Processing

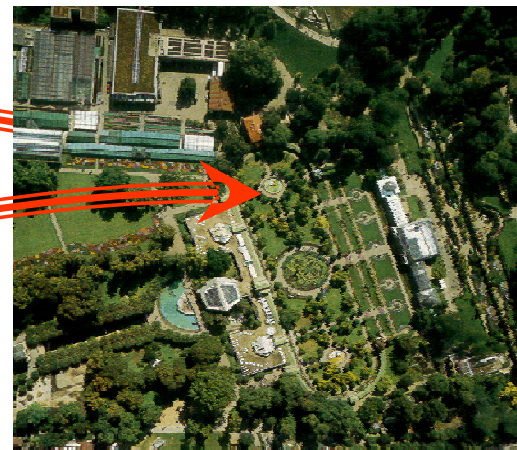


 tie point area

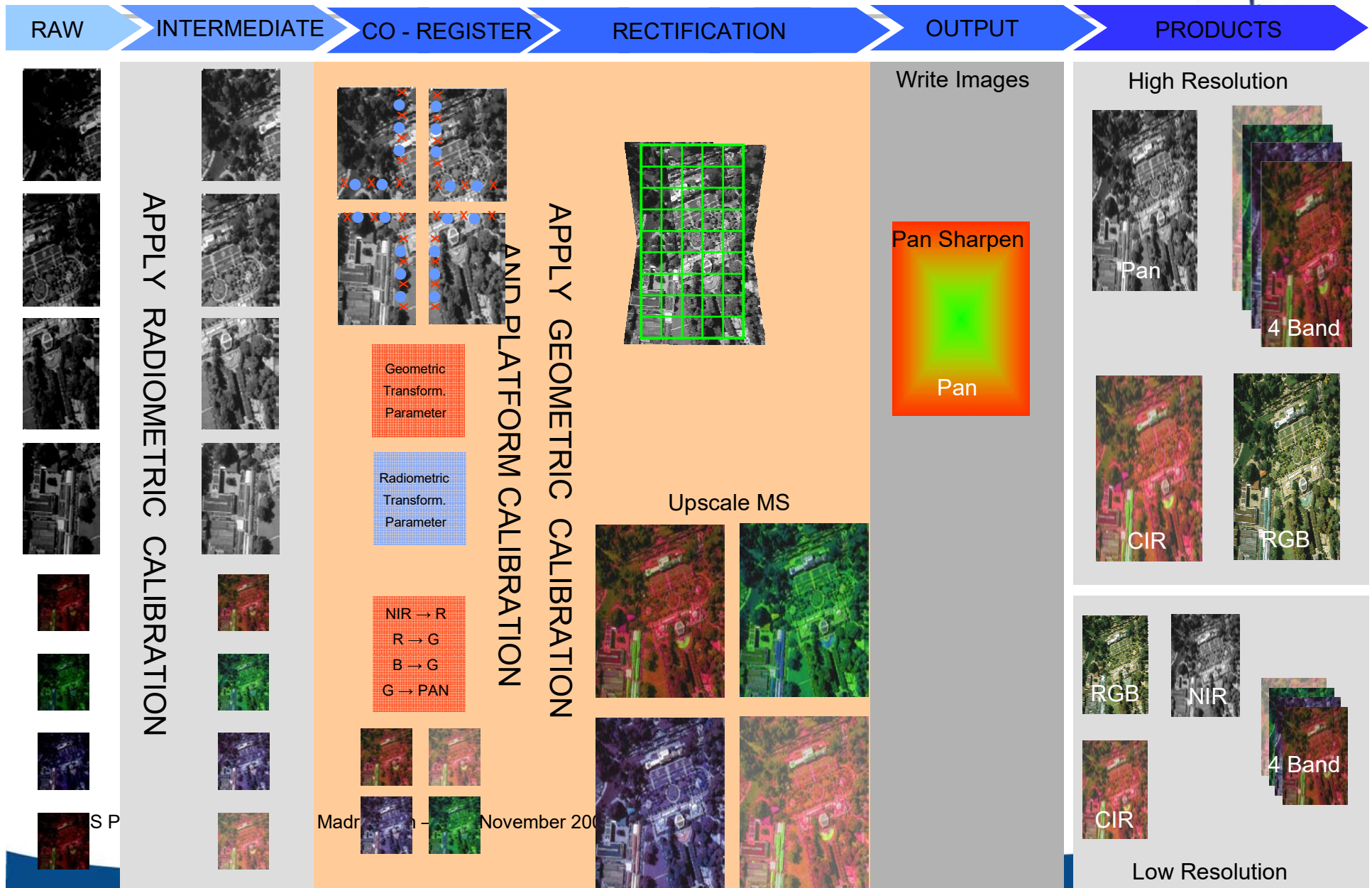


## Image Mosaicking

- $\frac{3}{4}$  DMC calibrated camera heads
- $\frac{3}{4}$  Geometric and radiometric correction
- $\frac{3}{4}$  Check calibration with tie points
- $\frac{3}{4}$  Mosaicking
- $\frac{3}{4}$  Fusion with color composite



# DMC Image Post Processing

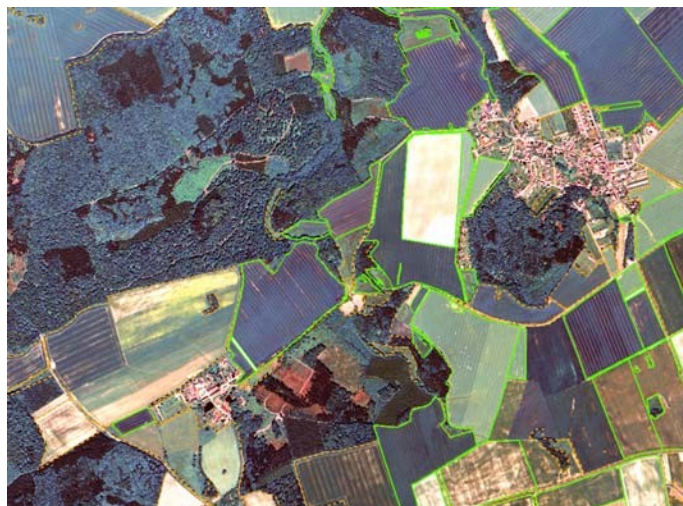




# Project for InVeKoS , Germany

Data acquisition with DMC Digital Mapping Camera by

Data processed by

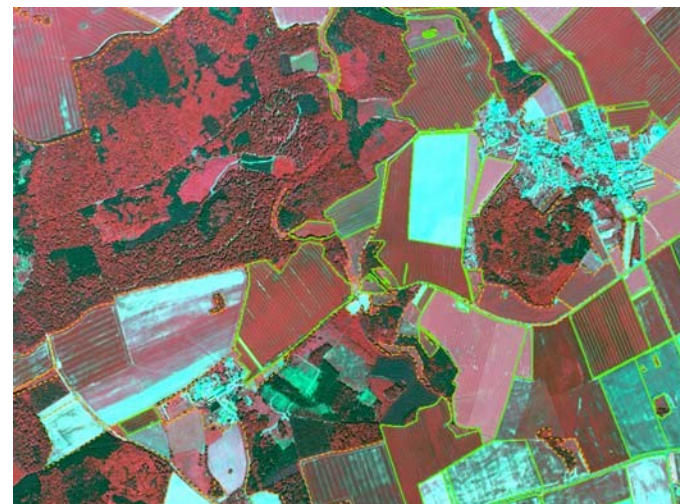


True Color Ortho Photo



Project summary:

- 1045.5 km<sup>2</sup>
- 72 cm GSD
- 60% / 30% Stereo Overlap
- 1m RGB and CIR Digital Ortho Photos



Color IR Ortho Photo

# Control de ayudas de la PAC

Data acquisition in July 2007  
with DMC Digital Mapping Camera by



Project summary:

- 227000 ha
- 50 cm GSD
- 70% / 30% Stereo Overlap
- RGB and CIR Digital Ortho Photos



True Color  
Ortho Photos



Color IR

Several areas in Andalucía for

- Servicio de Control e Inspección de Campo
- Dirección General del F.A.G.A.
- Consejería de Agricultura y Pesca
- Junta de Andalucía





- Largest Area DMC Project in North America
- Collection by Jet Aircraft
- 1.0 meter pixel, 17,100 frames
- 121,360 square miles in NM
- Additional 26,000 square miles in AZ & UT





## Image 1: Better definition



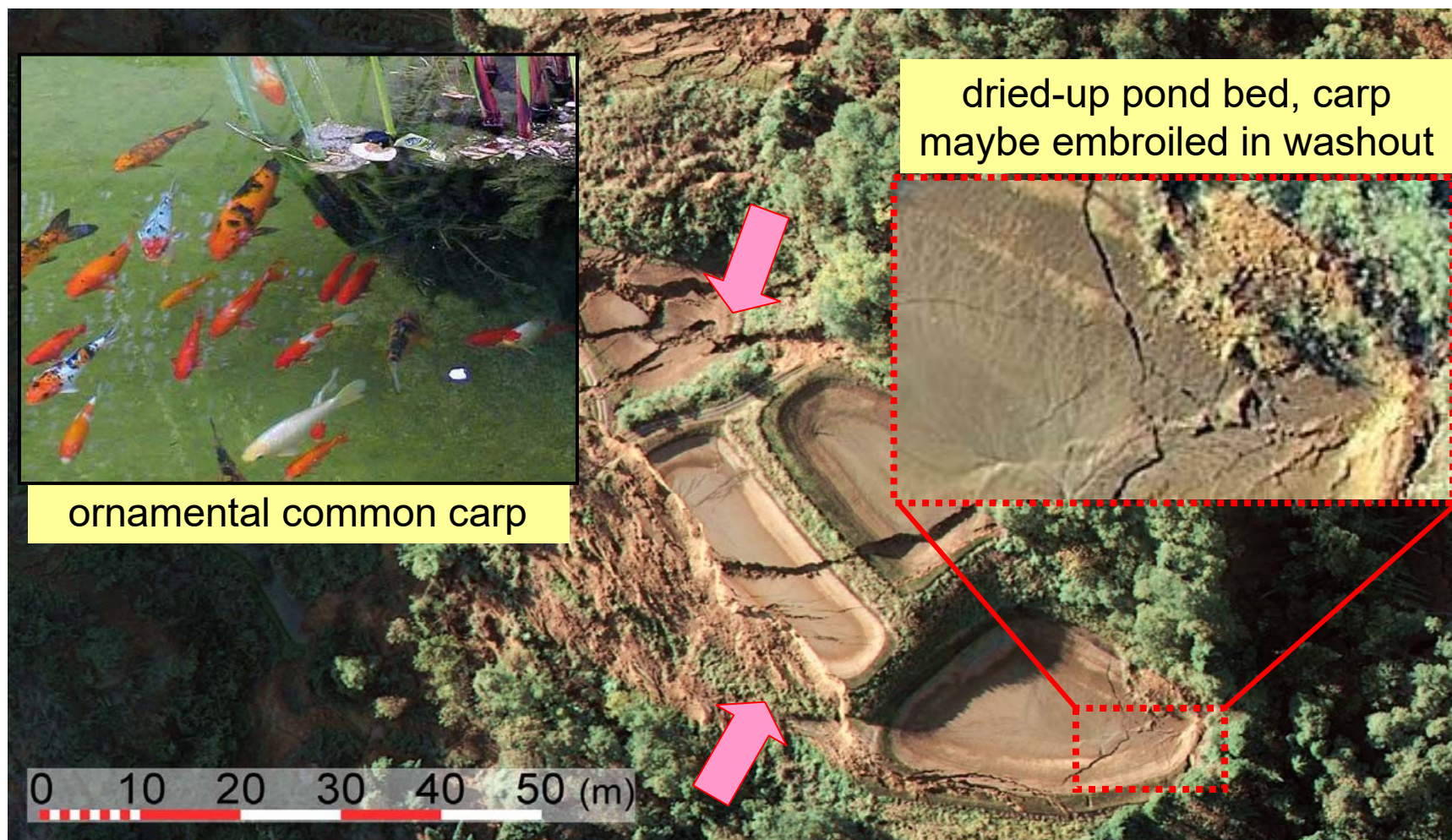
**GSD=12.0cm:** Yamakoshi village (now part of Nagaoka city), at Oct. 24

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Image courtesy of Asia Air Survey Co



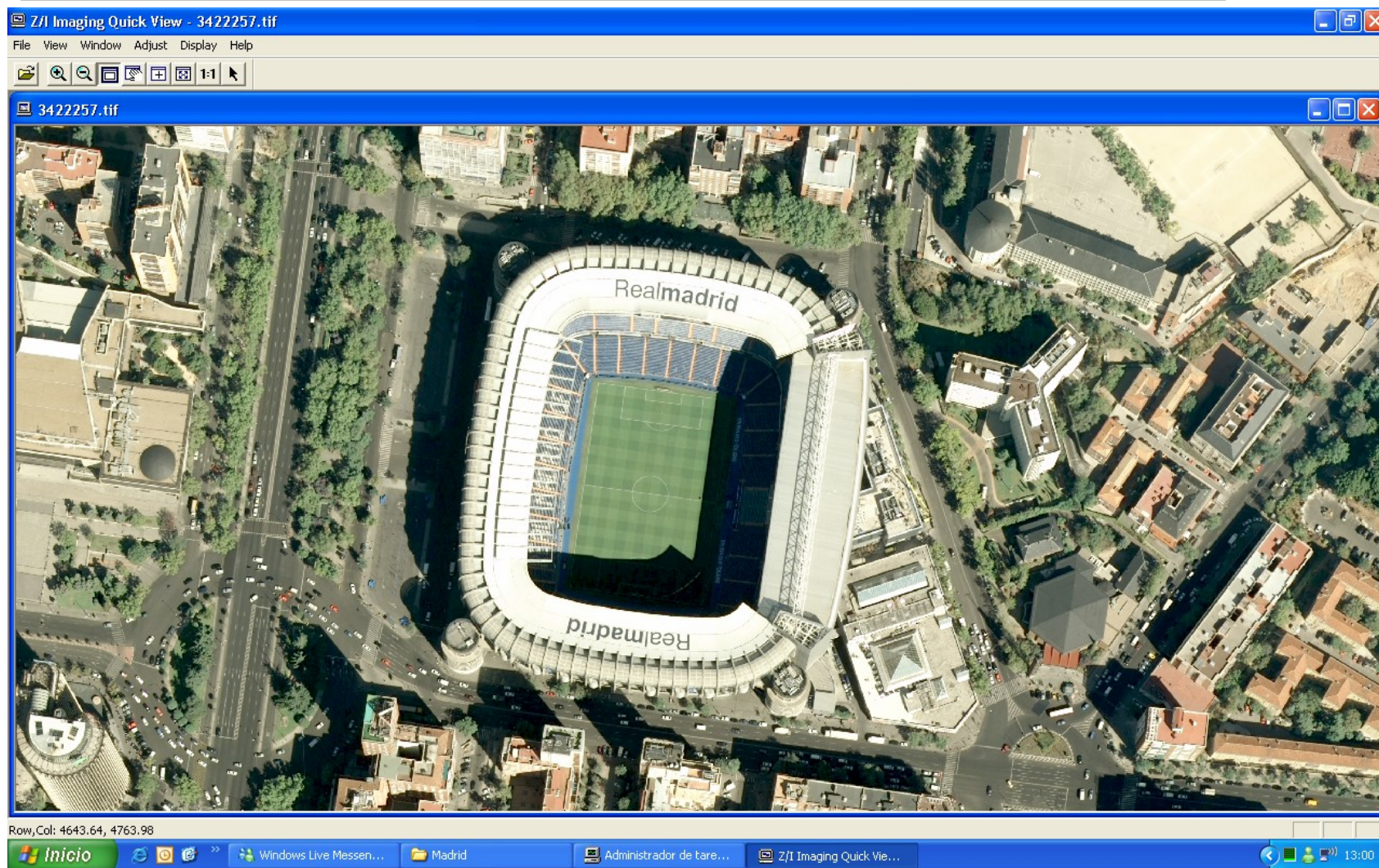
## Ruins of breeding pond



**GSD=12.0cm:** Yamakoshi village (now part of Nagaoka city), at Oct. 24



# Estadio Bernabeu Madrid



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Image courtesy by





# Palacio Real Madrid

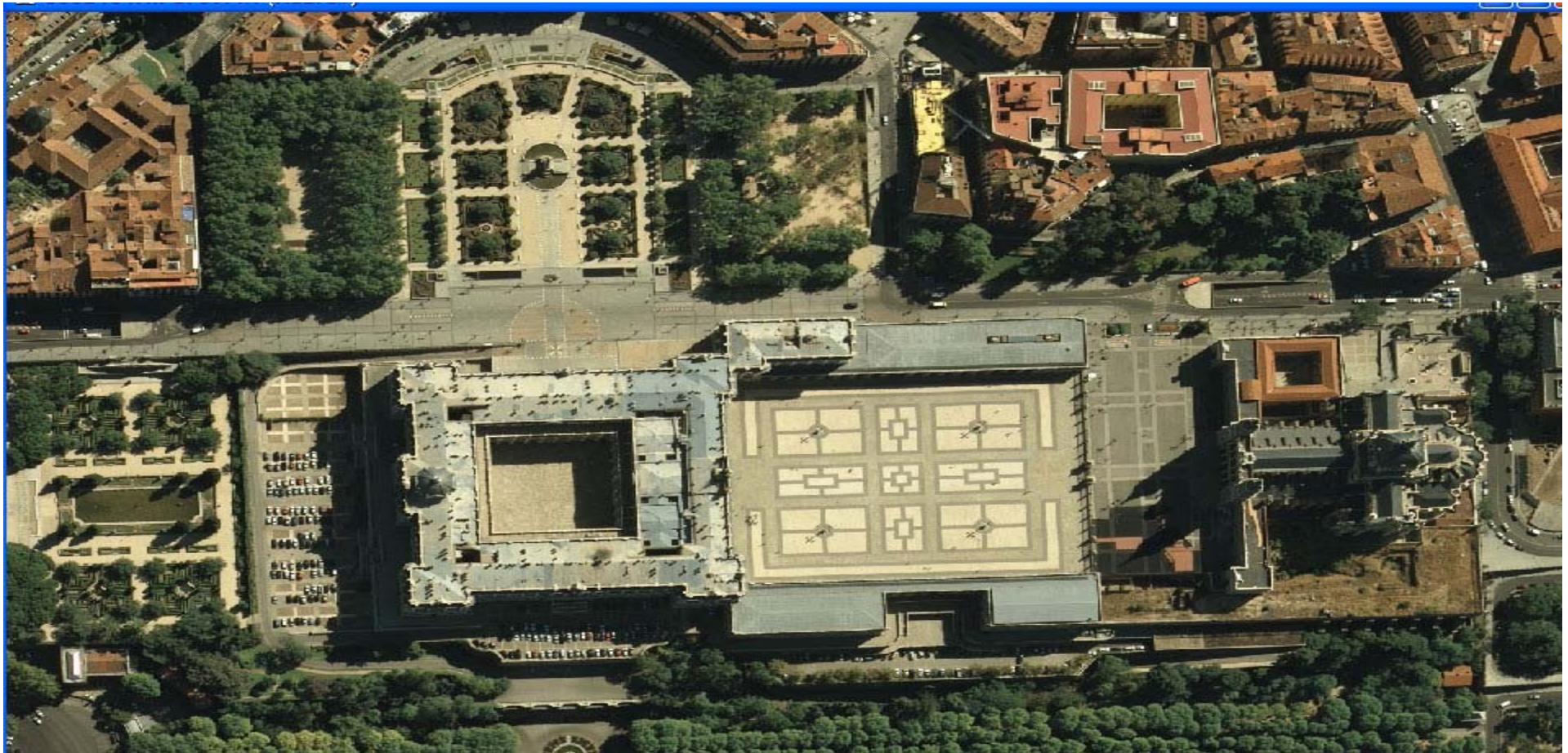


Image courtesy by



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## DMC advantages among VHR satellite images

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- ③ Very high detail level ( small objects recognizable )
- ③ Real natural color for RGB
- ③ Central perspective of the images
- ③ High contrast in shadow areas
- ③ Very sharp images
- ③ Good ability for CIR images to discriminate different crops and parcels

Thank you !



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Klaus Neumann

Z/I - Earth Imaging Solution Center

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