Trends in digital aerial imaging – Part B

*European Activities in Camera Cal/Val and Certification*

Michael Cramer
michael.cramer@ifp.uni-stuttgart.de

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*May 7 – 11, 2007*
The EuroSDR mission

- to be the **European research** platform for **National Mapping and Cadastre Agencies**, **Academic Institutes**, **Private Industry** and **User’s Groups** ...
- ... on issues related to the **implementation of technology** developments in view of **optimizing the provision of reference information** in a geo-information infrastructure context

- **Develop and improve methods, systems and standards** for the acquisition, processing, production, maintenance and dissemination of geospatial reference information
- **Promote applications** of all such data
- **Encourage interaction** between research organisations and the public and private sector
EuroSDR members and structure

Structure

- 2 participants from each country
  - 1 from academia
  - 1 from NMCA
- additional industry participation
- secretariat in Dublin
- 5 scientific research commissions

The 17 EuroSDR member states
### EuroSDR research commissions

<table>
<thead>
<tr>
<th>Commission</th>
<th>Leader</th>
<th>Institution</th>
<th>Country</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Sensors, primary data acquisition and georeferencing</td>
<td>Michael Cramer</td>
<td>Universität Stuttgart</td>
<td>D</td>
</tr>
<tr>
<td>2. Image analysis and information extraction</td>
<td>Juha Hyppä</td>
<td>Finnish Geodetic Institute</td>
<td>SF</td>
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<tr>
<td>3. Production systems and processes</td>
<td>Eberhard Gülch</td>
<td>Univ. of Appl. Sciences Stuttgart</td>
<td>D</td>
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<tr>
<td>4. Geospatial reference databases</td>
<td>Keith Murray</td>
<td>Ordnance Survey</td>
<td>UK</td>
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<tr>
<td>5. Integration and delivery of data and services</td>
<td>Mike Jackson</td>
<td>University of Nottingham</td>
<td>UK</td>
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European Activities in Camera Cal/Val and Certification

The EuroSDR digital camera calibration network
The EuroSDR Activities in Camera Calibration and Validation

**Digital Camera Calibration Network**

*Fall 2003 – spring 2007 (scientific project, focus on technical aspects)*

- **theoretical PHASE 1 (finished end of 2004)**
  	collection of publicly available material to compile an extensive report documenting currently used calibration practice and methods

- **empirical PHASE 2 (finished spring 2007)**
  
analysis of empirical test flights for (in optimal case) recommendation of best practices for camera calibration / validation

**European Digital Airborne Camera Certification – EuroDAC²**

*Fall 2006 – ongoing*

- *initialization and implementation of European wide certification process*
  
  EuroSDR core competence group in close cooperation with National Mapping and Cadastre Agencies (NMCA), system suppliers and others
## EuroSDR Network on Digital Camera Calibration and Validation

<table>
<thead>
<tr>
<th>#</th>
<th>Group</th>
<th>Institutions / Systems</th>
<th>#</th>
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<tbody>
<tr>
<td>1</td>
<td>Camera manufacturers</td>
<td>ADS, DiMAC, DMC, DSS, Ultracam, Starimager, 3-DAS-1, DigiCAM</td>
<td>12</td>
</tr>
<tr>
<td>2</td>
<td>AT software developers</td>
<td>BLUH, ORIMA, inpho, dgap</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>Other companies</td>
<td>Vito, ISTAR, Geosys, OMC</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>Science</td>
<td>ETH, OSU, Glasgow, Stuttgart (2x), IdeG, Rostock, DLR (2x), Berlin, Nottingham, Aas, Pavia</td>
<td>28</td>
</tr>
<tr>
<td>5</td>
<td>NMCAs</td>
<td>ICC, OrdSurv, IGN, FGI, Lantmäteriet, Swisstopo, BEV, ICV, itacyl, USGS</td>
<td>13</td>
</tr>
</tbody>
</table>

\[ \sum \text{representatives} = 62 \]
DMC block (low-flying height)

$h_g 950m$, $GSD 0.10m$
European Activities in Camera Cal/Val and Certification

EuroDAC² - a concept for future certification of digital airborne cameras in Europe
EuroSDR decided to **initiate and coordinate** a project on the Certification of Digital Airborne Cameras in an international European context (**EuroDAC²**)

Europe has to identify its **needs** for digital airborne camera certification and based on that a certification process has to be defined **not only in single countries but European wide**

it might be problematic if other quality assurance concepts (like USGS approach) are **adopted as a quasi-standard** from European countries almost automatically, although such approach might be partially non optimal for European environments

European certification process must be available quite **soon**, must be **acceptable** and **operational**, must have a **broad support**, otherwise only national individual solutions
Why European camera certification?

EuroSDR in general agrees and underlines the high relevance and impact of the USGS quality assurance plan but

- **different requirements** in flight project parameters and accuracy
  - projects are of smaller extension, more regional sized, more stringent requirements in resolution and accuracy
  - different accuracy classes are required for European users
  - Type certification vs. individual sensor (serial number) certification

- new technology of digital airborne imaging mainly **originated in Europe**, i.e.
  - ADS40 (CH), DMC (D), UC-D/X (A), DiMAC (L), JAS-150 (D), HRSC (D), AIC-Rolleimetric (D), DigiCAM (D), IGN-Camera (F)
  - accepted use of those systems throughout Europe should be based on their European wide certification

- Europe has already defined its own solutions for other projects of larger impact (i.e. Galileo GNSS). Not only as competition but also **to support / complement each other**. Same might be possible for different certification approaches.
<table>
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<tr>
<th>#</th>
<th>Process steps</th>
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| 1  | Evaluation of users needs / expectations<br>

*Action: (mainly) NMCAs and others* |
| 2  | Input from camera manufacturers<br>

*Action: (mainly) system suppliers and others* |
| 3  | Definition of EuroDAC² process<br>

*Action: (mainly) EuroDAC² core group* |
| 4  | Acceptance of EuroDAC² process<br>

*Action: (mainly) NMCAs, system suppliers and others* |
| 5  | Implementation (in Europe) of EuroDAC² process |
**EuroDAC² current status**

- **Position paper** (available as draft version) for first information on certification process (motivation and future steps)
- **Acquisition of core competence team** members, not yet completed, representatives from
  - national mapping and cadastre agencies
  - companies
  - standardisation organisations
  - science
- **financial aspects** to be discussed
- next step: EuroSDR Science and Steering committee meeting in Rotterdam / The Netherlands, end of May 2007
Some remarks on new German standards in digital airborne imaging
Some activities in defining standards on national base (DIN organization in Germany)

standard series **DIN 18740 – Photogrammetric Products** (Part 1 – 4)

- Requirements for aerial survey flight and analogue photograph (11-2001)
- Requirements for the scanned aerial photograph (02-2005)
- Requirements for the orthophoto (10-2003)
- Requirements for digital aerial cameras and digital aerial photographs (Draft, 02-2006)
  - digital aerial camera
  - aerial survey flight
  - digital aerial photograph
German standard DIN 18740 – 4

- Focus digital aerial cameras includes
  - general requirements on camera and its components
  - camera calibration (geometry and radiometry)
  - sensors for positioning and attitude determination

... the quality related to the image product has to be documented in a **manufacturer certificate** ... the camera system and its subsystems have to be **geometrically and radiometrically calibrated** ... calibration of camera has to be documented by **manufacturer calibration certificate** ... the validity of geometrical calibration at the time of flight has to be proven by **validation test** (less than **one** year ago) or **new calibration** (less than **two** years ago) ... the accuracy from validation test has to be within the quality specs given in the manufacturers certificate (max. difference allowed <25%)