

CERTIFICATION OF DIGITAL AIRBORNE MAPPING PRODUCTS (2)

EuroDAC2

Digital airborne imaging has grown in importance over recent years. Large-format digital cameras can fully compete with analogue mapping cameras, and for some applications their performance is better. However, methods of calibration and certification used for analogue cameras are not individually transferable as they are based on laboratory calibration, while for digital cameras the entire data-generation process has to be considered. The author describes a new European initiative, EuroDAC2, aiming at a Europe-wide certification procedure for digital airborne mapping cameras.

The new project on European Digital Airborne Camera (EuroDAC2) Certification is led by the European organisation for Spatial Data Research (EuroSDR), formerly the Organisation Européenne d'Études Photogrammetriques Expérimentales (OEEPE). European National Mapping and Cadastre Agencies (NMCAs) are being co-ordinated to co-operate closely with all relevant digital airborne-mapping camera suppliers and other experts.

Processing Chain

Traditional laboratory calibration of analogue cameras is carried out by camera manufacturers; for example, the Zeiss RMK series at Zeiss Oberkochen, and the Wild/Leica RC series at Wild/Leica Heerbrugg. Hardware and processes are sometimes certified in conformation with national organisations such as Deutscher Kalibrierdienst in Germany. As well as system suppliers, national agencies are themselves responsible for such calibration, as is the case with the US Geological Survey (USGS). One of the most important findings of the recent EuroSDR Camera Calibration Network is that the entire data-processing chain, not just the camera, affects the quality of final results, and this requires identification and implementation of new methods. The design of large-format digital cameras differs greatly from their analogue counterparts. Furthermore, there is a significant increase in medium-format digital cameras, often used in combination with airborne laser scanning. Figure 1 illustrates the variety of digital cameras used in mapping applications. Often the availability of a recent calibration report is obligatory for mapping applications, at least when the mapping has to conform to national standards. An individual camera-specific certification process is unavailable for digital airborne cameras. Current investigations by the USGS have had a strong impact. The requirements for European digital airborne camera certification are being identified, with the stipulation that certification processes have to be accepted throughout Europe.

USGS QA Plan

In 2005 the USGS began an initiative focusing on the quality assurance (QA) of digital imaging sensors and data. In contrast to analogue camera calibration, the focus of certification shifts from individual sensor to the entire product line (type certification). From the USGS viewpoint, individual system certification no longer lies within the remit of system suppliers. To a certain extent individual system-related certification shifts to data providers, that is, the companies flying an individual camera system and/or processing its data to obtain a final product. The USGS has currently type-certified three commercial digital airborne cameras: DSS, DMC and Ultracam-D. Additional manufacturer certifications are currently in progress or are scheduled. USGS certification will become mandatory for future projects in the US. EuroSDR generally approves the USGS QA plan. However, it is yet to be determined whether this approach is also appropriate within the European context. Comparison of typical flight parameters and requirements shows significant differences between the continents. In Europe airborne mapping applications are many and the projects smaller, with more regional-sized projects rather than the state-wide projects in the US. Demands on sensor resolution and accuracy are often more stringent, and therefore different accuracy classes may be required for European users. Europe has already defined its own solutions for other large-impact projects, such as the Galileo satellite navigation system and the Global Monitoring for Environment and Security (GMES) project. This is not to be seen simply as competition with other existing initiatives. In the ideal situation different systems or approaches might support each other. European-based companies were the principal developers of the new technology of digital airborne imaging; many digital airborne systems originated in Europe, such as ADS40, DMC, Ultracam, DIMAC, JAS-150, HRSC, AIC, and DigiCAM. Acceptance of these mainly European systems should be based on their European-wide certification.

Main Steps

The design and implementation of the European certification process may be subdivided into several steps. EuroSDR has identified five main ones:

1. Evaluation of users needs and expectations: action, (mainly) NMCAs and others.
2. Input from camera manufacturers: action, (mainly) system suppliers and others.
3. Definition of EuroDAC2 process: action, (mainly) EuroDAC2 core group.
4. Acceptance of EuroDAC2 process: action, (mainly) NMCAs, system suppliers and others.
5. Implementation of EuroDAC2 process.

The process will be fully completed by the end of 2009. As the major user group, European NMCAs have to define their individual

expectations and demands of the future certification process. A first version of digital camera certification may approximate the former standard national rules and country-specific procedures. However, it is important to define the future certification process on a European-wide basis. This is advantageous not only for system suppliers but also for the data providers and flying companies, and will thus lead to a much wider acceptance. NMCA representatives must carefully examine the USGS QA plan to determine if such an approach might fulfil their individual needs.

Manufacturer Input

To guarantee broad acceptance and support, camera-system suppliers must from an early stage be deeply involved in the certification process. Those system suppliers which have undergone the USGS type-certification process will try to minimise effort and costs involved in the European certification process. This will be facilitated if major parts of the EuroDAC2 process are aligned with the USGS QA plan. Regarding manufacturer interaction, EuroSDR expects to benefit from the well-established contacts arising from the Digital Camera Calibration Network. The above initial steps will lead to a detailed draft of the EuroDAC2 process, including main technical issues. The draft will then be circulated within the group of EuroSDR NMCAs and supporting camera manufacturers. Their input and that of other experts will be used to refine the draft. The modified draft resulting from definition of the process (Step 3) must then be accepted (Step 4) by all NMCAs involved. This could be the most demanding step, since the new EuroDAC2 process will establish an innovative certification process for digital airborne cameras. If such processes are already available nationally, EuroDAC2 will complement existing procedures for all types of cameras.

Concluding Remarks

Anyone involved in the acquisition, processing and use of digital airborne sensor data and products is invited to actively participate in the project outlined here. Your involvement will warrant European-wide certification, avoiding solutions specific to a single country and eventually to become accepted not only by users but also by system suppliers. The EuroDAC2 initiative has established close contact with other worldwide certification projects for the sake of aligning all activities such that a single certification procedure or standard will be internationally accepted.

Acknowledgements

The continuing support of USGS, European NMCA representatives and all other members of the EuroSDR Digital Camera Calibration network is gratefully acknowledged.

Editor's note

Certification of the chain of activities involved in the production of image and map products from digital airborne cameras is a hot issue, treated in two articles this month. The present feature focuses on the European perspective, while the other (see page 13) presents the new Quality Assurance (QA) Plan for Digital Aerial Imagery from the US Geological Survey (USGS) and partners.

Websites

- USGS Digital Aerial Imaging Quality Assurance Approach.
- EuroSDR Digital Camera Calibration network.
- EuroSDR organisation.

<https://www.gim-international.com/content/article/eurodac2>
