ω, *φ* and *κ* – random Greek characters or important variables for aerial archaeologists?

Geert Verhoeven[a,b], Martin Wieser[c], Christian Briese[b,c], Michael Doneus[a,b]

[a] VIAS – Vienna Institute for Archaeological Science, University of Vienna, Franz-Klein-Gasse 1, 1190 Vienna, Austria
(geert.verhoeven, michael.doneus)@univie.ac.at
[b] LBI for Archaeological Prospection and Virtual Archaeology, Franz-Klein-Gasse 1, 1190 Vienna, Austria
christian.briese@archpro.lbg.ac.at
[c] Department of Geodesy and Geoinformation, Vienna University of Technology, Gusshausstrasse 27-29, 1040 Wien, Austria
e0626234@student.tuwien.ac.at

Since manned, airborne aerial reconnaissance for archaeological purposes is often characterised by more-or-less random photographing of archaeological features on the Earth, the exact position and orientation of the camera during image acquisition becomes very important in an effective inventory and interpretation workflow of these aerial photographs. This paper proposes a cost-effective, accurate and precise hard- and software solution to record all essential exterior orientation parameters for the direct georeferencing of aerial archaeological images. Besides a standard GNSS receiver, a low-cost Inertial Measurement Unit (IMU) is applied. The latter consists of three accelerometers and three gyroscopes, a combination that allows the constant monitoring of the camera rotations. After the introduction of this hardware combination, the focus will be shifted towards the newly developed software that allows the continuous logging of all raw sensor data and the estimation of all exterior orientation parameters. Furthermore, the software can embed all exterior orientation information into the image's metadata or in a separate *xmp sidecar file that uses Adobe's eXtensible Metadata Platform (XMP) data model. Storing accurate exterior orientation values can, however, only be executed after a mounting calibration. Due to the fact that the GNSS/IMU combination is mounted in the camera's hot shoe, the position and orientation of its sensors is not exactly the same as for the camera. A camera mounting calibration (also called boresight calibration) mathematically describes the translation and rotation between the camera's coordinate reference system and that of the GNSS/IMU, hereby enabling a reliable coordinate transformation between both systems. In other words: this mounting calibration is essential if one wants to transfer the recorded exterior orientation values to the aerial image.