

## Review Topcon GMS-2 Picture GIS

*Geo-information provides an adequate description of the general lay-out of an area. It cannot, however, capture the truth like a photo or video camera can. On the other hand, manually referencing your photographs is a painstaking process. The Topcon GMS-2 offers a potential solution as it is a GPS receiver / controller with built-in camera, digital compass and GPS receiver.*



Topcon GMS-2 mobile mapping GPS.

By Huibert-Jan Lekkerkerk

The GMS-2 can be used as a stand-alone receiver using the onboard GPS patch antenna or with an external (geodetic) antenna connected to it. When used stand-alone it can either employ SBAS (WAAS / Egnos) or, in the USA, coast guard beacon corrections. It can also log raw GPS data which can then be post-processed in the office. In addition, the receiver can be used as controller with other GPS systems from Topcon. It can replace controllers such as the FC-100 and FC-200 in this manner.

### Controller

The reviewed system consisted of a single receiver/controller without an additional antenna or receiver. The purpose of the review was to test the GIS capabilities of the receiver/camera combination. The receiver was operated using SBAS corrections only.

The receiver feels very robust and has a replaceable battery. However, no separate charger was supplied for the battery and the receiver was charged using a power cord directly connected to the receiver. Furthermore, with the unit off, the battery is still drained when the GPS board is switched permanently on, requiring regular recharging. One needs to get accustomed to the method of shielding the port covers on the GMS-2. Rubber covers are used that, at first, don't seem to fit. After some practice, however, they open and close without a problem. Something I still dislike on this type of controller is the lack of a (numeric) keypad. All data entry has to be done using the onscreen keyboard which covers almost a third of the screen and has tiny keys. Personally, I prefer to have at least a numeric keyboard with cursor keys.

### Camera

As mentioned, the GMS-2 has both a camera and a digital compass. The camera is mounted in front of the receiver in such a way that, with the receiver in a natural position, the lens points forward. The lens itself is very small and recessed, protecting it from shocks. The downside of a small lens is that every particle of dust on the lens will show up in the photograph.

The camera itself is 1.3 megapixel, which is quite low resolution compared to modern digital cameras and camera phones. The maximum resolution equals 1280 x 1024, barely enough for full-screen viewing on a modern display. The default resolution selected by the camera when storing the photograph in survey mode is 160 x 120; this has to be reset for each photograph taken with TopPad.

There are few controls on the camera and no flash, making it easy to operate. This makes it hard to operate, though, in disadvantageous circumstances such as darkness or with fast moving objects. During testing I found that



Part of an image taken with the internal camera (1.3 MP) and a similar image using a semi-professional 6 MP camera. Both images have been edited and scaled in a similar manner and are directly comparable.

under cloudy conditions, only slow-moving or stationary objects could be captured.

### Compass

The built-in digital compass provides heading as well as pitch and roll, making it possible to keep the camera exactly level when taking a photograph. The compass is a so-called fluxgate compass, indicating magnetic north instead of true north. For a general indication of direction this is no problem, but do not expect miracles from it.

Furthermore, a magnetic compass is influenced by magnetic and steel objects in its vicinity that, depending on the type of disturbing object and the distance from it, can cause deviations as large as tens of degrees.

### TopPad Software

The GMS-2 as reviewed came with TopPad survey software installed. This is an extension of ESRI ArcPad software. As seems the case with all

#### Number of channels

#### Battery

#### Interface

#### Display

#### Camera

#### Dimensions (receiver / controller)

#### Weight (receiver / controller)

50 (50 GPS, Glonass & SBAS satellites at L1)

Replaceable internal battery

Bluetooth, USB, SD card, external antenna

3.5" (240 x 320 QVGA touchscreen)

1.3 megapixel fixed focus lens

W: 90 x L: 197 x D: 46 mm

0.7 kg

GMS-2 particulars as specified by Topcon

ESRI software, loading it takes some time: roughly a minute on this receiver. Moreover, a total of four toolbars are used which, together with the status bar, take up almost a third of the screen. That said, the software performs exactly as expected and behaves like other ESRI products. Surveys can be set up using the feature and attribute dialogs that are familiar to ArcGIS/ArcPAD users.

### Coupling Photograph to a Position

A downside to the current version of the software is that only shapes created on the receiver itself can store photo information. The method for storing the photo information is less than optimal. The photos are stored in a certain folder on the receiver with the shape file connected to the surveyed feature. After copying the shape file to the office computer, the attribute link will still reference the original folder on the GMS-2, requiring either a folder at the same location on the office computer or adjustment of all the references in the shape file.

Furthermore, since the format used to store the photographs is bitmap instead of jpg, no position information is stored within the actual photograph. Other solutions store the position in

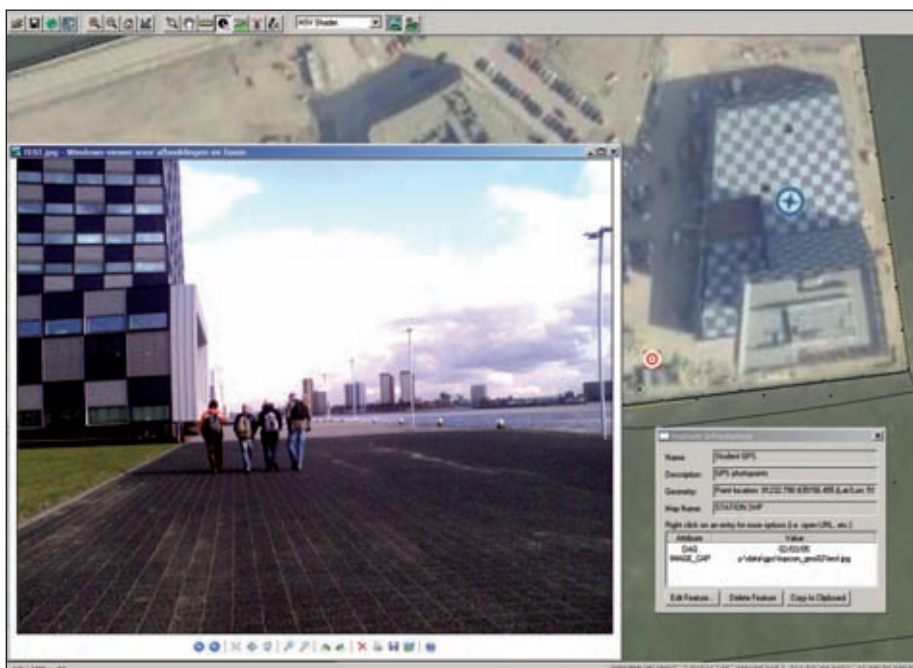
the so-called EXIF part of a jpg image, keeping position and image together. When storing a full resolution photograph (1280 x 1024), TopPad seems to lose the connection to the GPS receiver. The probable reason is that storing the image to the flash disk takes too much time. Resetting the receiver solves the problem, which does not occur at lower resolution.

Finally, there seems to be no integration between the camera/receiver on the one side and the compass on the other. For example, the compass heading is not used to indicate the direction into which the photo was taken. This addition would be very useful when analyzing the imagery in the office.

### Conclusion

As a receiver and/or controller there is nothing amiss with the GMS-2 apart from some minor nuisances that are not specific to this product.

The integration of a camera, digital compass and GPS receiver is promising, and the GMS-2 could be a valuable piece of equipment when some of the issues mentioned in this review are ironed out. In particular, the quality of the camera and the integration of the images with position and heading need more attention.



Shape file with geo-referenced image in Global Mapper software.

We naturally asked Topcon Europe Positioning B.V. to respond to our remarks. They answered as follows:

“Our TopPad Mobile GIS software has been updated in the meantime. This new release will come to the market in June 2007. At the International ESRI User Conference in June 2007 in San Diego, California, Topcon - as a Business Partner of ESRI - will introduce the new GMS-2 extension that runs on the ArcPad platform and gives every ArcPad customer access to the GMS-2. With this update, our customers are assured of a smooth workflow.”

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