



Geodetic ground control in Al-Madinah region of the KSA

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Current technology of Global Navigation Satellite Systems (GNSS) is the best choice to establish ground control for photogrammetric mapping. In this project, a network that covers a mountainous area of 145,000 km² western the Kingdom of Saudi Arabia (KSA) has been established using GNSS within the MOMRA Terrestrial Reference Frame (MTRF2000) Epoch 2004.0, where MOMRA stands for the Ministry of Municipal and Rural Affairs. The network that defines MTRF2000 is called Saudi Geodetic Network (SGN) and forty two points of this network were used as reference stations for both high level (HL) and low level (LL) photogrammetric Ground Control Points (GCPs). The scales of the captured aerial photographs were as follows: HL = 1/45,000, and LL = 1/5,500. Thus, the project's network consisted of two categories: primary network and secondary network. Primary network is composed of SGN as reference points and HL GCPs as target points, while secondary network is composed of SGN and HL as reference points and LL GCPs as target points. The total number of new HL & LL GCPs that were constructed and observed according to industry standards is 295 points: 65 HL and 230 LL. While monumentation lasted for 31 business days, GNSS data collection operations lasted for 26 business days. The whole newly-established network was first processed using Ashtech Solutions software package to ensure integrity, then precise ephemeris was acquired and GEONAP software package was used for final processing. After that, least squares adjustment was carried out using GEONET and NGS ADJUST software packages by constraining the GCPs of SGN in the primary network and SGN & Primary stations in the secondary network.

The achieved accuracy was better than 1 ppm in both cases.