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THE AEROMAGNETIC SURVEY USING NON-MAGNETIC UNMANNED AERIAL PLATFORM IN KALUGA REGION (RUSSIA)

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The use of light and ultra-light unmanned aerial vehicles (UAV) for magnetic data acquisition can be efficient for resolving multiple geological and engineering tasks including geological mapping, ore deposits' prospecting, and pipelines' monitoring. The accuracy of the aeromagnetic data acquired based on UAV depends mainly on deviation noise of electric devices (engine, servos, etc.) [1]. The goal of this research is to create non-magnetic unmanned aerial platform (NUAP) for high quality aeromagnetic surveys and verify results in laboratory and field experiments. Considering parameters of regional and local magnetic survey, a fixed-wing UAV suits geological tasks better for plain area, and copter type for hills and mountains [2]. Analysis of the experimental magnetic data of the serial light fixed-wing UAV and subsequent magnetic and aerodynamic modeling demonstrates the results of the development of NUAP with internal combustion engine carrying an atomic magnetic sensor mounted on the UAV wings. The results of experimental data demonstrate possibility of using UNAP for aeromagnetic surveys in exploration geophysics.

The recommendations following from aerodynamic and magnetic models have been implemented in the design of NUAP (fig 1) [3]. The NUAP flight duration is at least 5 hours at the altitude of 20-50 m with 20 m/s operation speed. The concept of NUAP equipped with one atomic scalar magnetic sensor characterized by the expected error of the magnetic survey below 2 nT, which completely facilitates magnetic survey of 1: 5,000 – 1: 50,000 scale. The advantage of this concept is:

Figure 1: Non-magnetic unmanned aerial platform

1) No special pre-field works (flights with different azimuth, usually 8 ones, for magnetic deviation studies);
2) No additional fluxgate magnetometer;
3) No special software for post processing and deviation compensation;
4) Autonomy of flight from 5 hours;

Thus, use of NUAP based on the ultra-light UAV can sufficiently improve aerial magnetic survey, especially in the areas below 200 sq.km. The NUAP can be equipped with multispectral or hyper-spectral camera, which opens wide opportunities for resolving geological and engineering tasks. Using the developed concept, the Geoscan group has created a NUAP prototype. The first experimental fieldwork has been made in Kaluga Region (Russia). A comparison of the obtained data with data of the traditional aeromagnetic surveys demonstrates an impressive reproducibility.

References:

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