



A review on the aeromagnetic surveys using unmanned aerial vehicle (UAV)

Hashem Shahsavani^{1*}

1- Assistant Professor; University of Kurdistan, Sanandaj, Kurdistan, Iran

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Corresponding author: h.shahsavani@uok.ac.ir

Keywords

Unmanned aerial vehicle (UAV)

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Summary

As the technology for unmanned aerial vehicle (UAV) has evolved, miniature sensors have also been developed. By equipping the unmanned aerial vehicles (UAVs) with such sensors, they can be used in various scientific researches. Thanks to the advantages of UAVs like zero risk of fatality, cost-effectiveness, low maintenance and operation costs, high precision positioning system and high versatility, they are used as powerful tools for aeromagnetic surveys. The UAVs can fill the gap between the land data, which are obtained on the surface with high resolution and low coverage, and the data, which are

obtained by aircrafts or helicopters with low resolution and high coverage.

Introduction

The history of UAV or unmanned aerial system (UAS) or drone is backed to 1924 in which the first airplane has been flown successfully while it has been fully controlled by the ground station. At that time, the motivation toward applying an UAV was to reduce the peril of fatalities in risky military missions. By date, the UAVs are of interest to a wide variety of applications. The geology, ecology, agriculture, forestry are some examples of Unmanned Aerial Vehicle applications. Magnetometry is one of geophysical method that investigates the variation of the Earth's magnetic field. Magnetometry is a robust tool in oil and mineral exploration. One of the privileges of magnetometry, compared to the other geophysical methods, is that it is possible to perform it in form of airborne. Hence, aeromagnetic method has high coverage and is very cost-effective. In this study, the advantages and the importance of UAV in the field of geophysics are investigated. In this study, the methods of installation of magnetometers on UAVs to mitigate the noise effect of the UAV on the sensor are examined. Then, different UAV platforms are investigated. Finally, the challenges and the prospects of the UAV application on the aeromagnetic field are discussed.

Methodology and Approaches

The aerial magnetometry is performed by helicopters or aircrafts, which are traditional tools for aeromagnetic surveys. As the advanced technology for UAVs has evolved, miniature sensors have also been developed. By equipping the UAVs with such sensors, they are ready to be applied in various scientific researches. Considering the advantages of UAVs, for instance low cost, zero risk of fatality, low repeating operation costs, high precision positioning system and high versatility, they have become powerful tools for aeromagnetic surveys. The UAVs can fill the gap between high resolution and low coverage land data and low resolution and high coverage airborne data obtained by aircrafts or helicopters. At the time of writing this paper, no scientific report of aeromagnetic surveys using UAVs has been found in Iran. Hence, the author wishes that this investigation serves as a reference for future studies and applications in the field of aeromagnetic surveys using UAVs in Iran.

Results and Conclusions

In this study, 43 papers in the context of aeromagnetic surveys using UAVs have been considered in which two, nine and six papers have been published in 2008, 2016 and 2019 respectively. These results show that although aeromagnetic surveys using UAVs are in their infancy period, they are developing rapidly. Moreover, the geography of the application of the research on the field of aeromagnetic surveys using UAVs has been investigated. The results show that this technology has been performed in 10 countries. Canada is the pioneer of applying this state of the art technology as 14 publications out of the total 43 papers are related to this country. China, Russia, and Japan have lower number of publications with 7, 6, and 5 publications, respectively.

