


Chapter 44

Unmanned Aerial Vehicle Applications for Military GIS Task Solutions

Azad Agalar Bayramov

Armed Forces War College of the Azerbaijan Republic, Azerbaijan

Elshan Giyas Hashimov

 <https://orcid.org/0000-0001-8783-1277>

Armed Forces War College of the Azerbaijan Republic, Azerbaijan

Yashar Ali Nasibov

Geography Institute of Azerbaijan National Academy of Sciences, Azerbaijan

ABSTRACT

In the chapter, the authors present the results of unmanned aerial vehicle (UAV) applications for military geoinformation system (GIS) task solutions. The results of the visual modelling of the revealing process of invisible military objects from one of point of observation on the mountainous terrain of the Azerbaijan Republic by using UAV are presented. The observation conditions between two points of the selected mountain terrain during battle operation have been investigated using GIS technology. The quantitative method of the invisible area assessment and military objects in mountainous terrain are developed and offered by using UAVs. The numerical estimation method of a task support success of UAV reconnaissance flight in mountainous battle conditions has been offered and considered. Using UAVs for the purpose of orthophotomap making of the terrain and combat control the detailed 3D-model has been constructed.

INTRODUCTION

The development and application of small aviation automated systems is one of the most importance problem in the aviation and aerospace industries, in particular in military area. There are many examples of applications of the small modern aviation automated systems. In this chapter, the development and

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military application of small aviation automated systems (Unmanned Aerial Vehicles -UAV) is considered. The results of visual modelling of the revealing process of invisible military objects from one of point of observation on the mountainous terrain of the Azerbaijan Republic by using UAV are presented. The observation conditions between two points of the selected mountain terrain during battle operation have been investigated using GIS technology. The traditional methods (e.g. ground mapping, space remote sensing) do not allow to carry out precision and efficient (operations) measurements. The quantitative method of the invisible areas and military objects assessment in mountainous terrain has been developed and offered by using UAVs. The numerical estimation method of a task support success of UAV reconnaissance flight in mountainous battle condition has been offered and considered. There have been made the comparison of obtained results by using various methods; it has demonstrated that by using small aviation automated systems helps efficiently to solve various civil and military tasks on the terrain. The future scope of presented investigations is improving and development of small aviation automated systems possibilities for more efficiently solve both civil and military tasks.

BACKGROUND

The observation condition is one of the tactic properties impacted on the application of weapons and battle technics, on the organization of war operations (Zaritski & Charkevich, 2007). This property is determined by the invisible level of terrain, visible distance and it is dependent on the relief condition. The right organized visual monitoring provide correct data. These data give to commandant the possibilities to make detailed assesment of battle area and to adopt reasonable decision making. The more flank of hill, slope of ravine, valleys, heights, trees and bushes, various buildings the more disadvantageous observation condition on the terrain. During monitoring should to choose such observation point that mountain passes, patches, slopes of ravine and valleys are observed.

The topographic map is one of the main source giving information about terrain topographic elements: coordinates and mutual locations, sizes and other qualitative and quantitative peculiarities. Moreover, not reflected itself in the map changed elements have tactical importance, too. These elements impact much on the tactical battle properties. The main information sources about such objects are aerophotographs made during battle. Further, these aerophotographs can be applied in navigation systems of the high precise weapons, for instance, various kind of correlation-extreme navigation systems, to destroy invisible enemy targets. The large natural and artificial obstacles (forests, high hills, mountains, etc.) aggravate this problem, and create a necessity to applied UAVs (Butin, 2013; Varvarina, 2012). The UAVs are widely applied in reconnaissance searches for observation tasks (Petrov, 2013).

The modern GIS have been widely applied in Armed Forces for preparation and control of battle operations, for information providing of tactic activities, for improvement of topographic maps, for determination of location on the ground of the land forces etc. (Sokolov & Tixonov, 2008; . Olaf Conrad, 2010). In the real situations during battle operations the Geography information about situation on the terrain can be often changed. So, in this cause, the application of usual maps isn't effective. Only the modern automated control system can provide fast changing an information documenting. The modern GIS electron maps, video data editing systems, the especial GIS software in modern computer-driven control system (Windows 8, 10, 13, etc.) have been developed (ArcGIS, 2008; Karmanov, 2012). They provide a creation of vector, raster and matrix maps, and efficiently data about terrain updating.

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