

ABSTRACT

Commercial, government and private use of Unmanned Aerial Systems (UAS) are rapidly expanding in the United States. Although commercial use of UAS is still limited to a case by case basis, the Federal Aviation Administration began allowing companies to petition for use of UAS for commercial purposes. As of October 30th 2015, 2020 exemptions have been granted to companies in various industries. Those companies approved to use UAS for surveying see a need for the technology, but must also weigh the capabilities and limitations of UAS to acquire and process survey data against those of more traditional methods. This study sought to answer the question of whether or not using UAS for topographic mapping and volumetric surveying can lower the cost and time to complete the same task using land surveying and manned aircraft systems while still achieving acceptable accurate results. This study compares the use of UAS within the surveying and mapping industry with traditional and accepted methods and provides a comparison of their use. Specifically, this thesis reports on tests comparing UAS data acquisition and processing for volumetric calculation and topographic mapping. Time, accuracy, and cost were compared between UAS and traditional survey methods. The results of this study showed that using UAS for topographic mapping and calculating volumes is more time and cost efficient than land surveying, with no loss in accuracy, but only when performed over bare earth terrain. The results also showed UAS to be more time and cost effective than using terrestrial Light Detection and Ranging (LiDAR), but with less accurate results. The author is currently employed as the Flight Operations Manager for a large surveying and mapping firm, and the position involves the day-to-day remote acquisition of survey data through the use of aerial LiDAR and aerial photography, as well as the establishment of a UAS department within the

company. In addition, flight of all kinds, both manned and unmanned, has been a passion of the author since becoming an aviator in the United States Army in 2004.