

Drone (Hexacopter) vs Car, Efficiency of Delivery Breast Milk Problem (Case Study in Jakarta)

1st Med Irzal

Department of Computer Science
 Faculty of Mathematics and Natural Science,
 Universitas Negeri Jakarta
 Jl. Rawamangun Muka, Jakarta 13220
 Indonesia
 medirzal@unj.ac.id

2nd Ari Hendarno

Department of Computer Science
 Faculty of Mathematics and Natural Science,
 Universitas Negeri Jakarta
 Jl. Rawamangun Muka, Jakarta 13220
 Indonesia

3rd Debby Agustine

Department of Mathematics, Faculty of Mathematics and Natural Science,
 Universitas Negeri Jakarta
 Jl. Rawamangun Muka, Jakarta 13220,
 Indonesia

Abstract—Increasing the efficiency of time and cost of delivering goods is urgent now. The need for fast delivery times is crucial for certain items such as breast milk. It is common for mothers who have children who still need breast milk to work to help the family economy in big cities like Jakarta (Indonesia). Even if a mother has to work, the milk needs for her child must be fulfilled. Often a mother has to send milk to her home from work because she is out of stock at home. Problems with delivery times arise because breast milk does not last long at room temperature. Breast milk can be stored for 3–4 hours at room temperature (16 °C – 19 °C), 72 hours in a refrigerator (4 °C), 5–8 days in a refrigerator under very clean conditions, and up to 12 months in a freezer (–17 °C) [7]. At room temperature, the breast milk must arrive at home immediately for consumption. Deliveries with refrigerated cars might be possible but what is the efficiency comparison if it is delivered with a drone (hexacopter)?

Keywords: drone (hexacopter), car, efficiency of delivery, breast milk problem

I. INTRODUCTION

UAV (unmanned aerial vehicle) or commonly called drones began to have an important role in human life [1]. Drone has many definitions, from various definitions of drones that can be concluded drone is a device or set of tools that are assembled into an object that is able to survive flying continuously in which there are no humans as pilots and under control to carry out the desired activities [6] The use of drones in various fields has been widely implemented, such as used in checking visually or securing areas that are not easy to reach and in the future the drones will be increasingly used [2]. Based on the various uses of the drone, development that is still urgent to do is one of them in sending something that must be immediately to the destination. Drones can play an important role in the delivery of items such as drugs, blood, vaccines, breast milk, and other items [3].

Hexacopter which is a variant of a drone has the advantage that it does not require a large area for take-off and landing because it is able to take-off and landing vertically [4]. However, hexacopter batteries have a limited capacity so their range and flight time are also limited [5]. Previous research conducted in 2017 shows max weighted time compared to flying mileage as the following graph [3]:

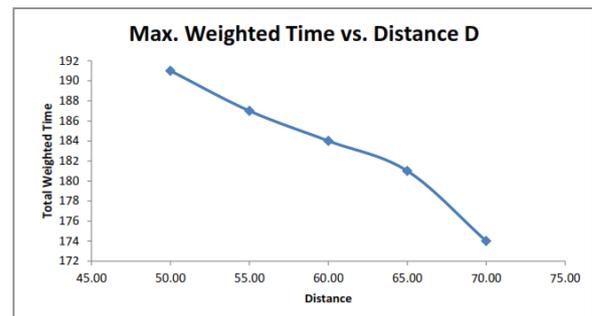


Figure 1. Max weighted time versus distance

From the graph above it can be seen that weight affects the distance from the hexacopter. The hexacopter heavier the load, the lower the distance. Hexacopter can be used in breast milk shipments. Breast milk requires special treatment because it can be damaged. Breast milk (breast milk) can not be consumed anymore and can only last for about 3 hours at a temperature of 250C - 290C [7]. Breast milk is very important for babies and is a major source of nutrition for growth and development. Problems arise when working mothers have to send milk from their workplace to where their babies are. Delivery by road in DKI Jakarta is a problem during normal business hours (Monday-Friday, 08.00-17.00 WIB). DKI Jakarta is the city with the highest level of traffic jams in the world. Other solutions are needed to overcome this. Time is one of the important keys of breast milk delivery. These things underlie why sending breast milk requires hexacopter compared to shipping over land which requires relatively longer time. Based on the explanation of the problem, the focus of this research is the comparison between sending breast milk using hexacopter and sending using car.

II. METHOD

The method used is experiment. Experiments carried out after hexacopter assembly. Hexacopter that has been assembled, added with a breast milk carrying bag and its contents with a load of 1.2 kg. Time is recorded for a certain distance so that the average speed is obtained.

III. RESULTS AND DISCUSSION

Hexacopter specifications used are:

- a. Naza M V2 (Flight Controller)
- b. Emax 930Kv (Brushless Motor)
- c. F550 (Frame)
- d. 30A Skywalker (ESC)
- e. Landing Gear
- f. 1045 (Blade Size)



Figure 2. Hexacopter

The flight test results have been uploaded to Youtube at the following link:

- 1) <https://www.youtube.com/watch?v=fJAhb4RqqAA>
Flight test and RTL (Return to Launch)
- 2) <https://www.youtube.com/watch?v=EPY2QMMi9w>
Flight test (Take Off and Landing with GPS ATTI mode)
- 3) <https://www.youtube.com/watch?v=8ToPXIzXI5w>
Flight Test even further (GPS ATTI mode)
- 4) <https://www.youtube.com/watch?v=LL8JcyxvJPM>
Flight test with breast milk (Take Off and Landing).
Total weight carried 1,2 Kg.
- 5) <https://www.youtube.com/watch?v=ga9itvi9Peg>
Flight test with breast milk (Take Off and Landing).
Total weight carried 1,2 Kg.
- 6) <https://www.youtube.com/watch?v=U6rmOqAt3DE>
Flight test with breast milk. Total weight carried 1,2 Kg.

Head Head of the DKI Jakarta Transportation Agency, Syafrin Liputo said that the car's speed is 28 km / hour [8]. The fastest speed of the hexacopter breast milk carrier tested was 26.6 km / hour. It can be seen that the speed of the hexacopter carrying breast milk is slower than the average speed of cars in DKI Jakarta. Experiments were carried out again by trying to get a better time, but the breast milk carrier hexacopter fell and needed repair.

IV. CONCLUSION

In this experiment the speed of sending breast milk with hexacopter was not faster than using a car in Jakarta. The experiment stopped because the hexacopter used fell during the trial to get greater speed. The risk of a hexacopter falling becomes greater when the speed is greater.

ACKNOWLEDGMENTS

Researchers realized that during the process of this research found many difficulties. These difficulties will not be resolved by researchers without the help and encouragement of various parties.

REFERENCES

- [1] Koh, Lian Pin and Wioh, Serge., (2012) Dawn of Drone Ecology: Low-Cost Autonomous Aerial Vehicles for Conservation, Tropical Conservation Science, Vol 5 (2): 121-132.
- [2] Tabares, Diego Alonso, et.al., (2017) Drone Pad Station and Managing Set of Such a Drone PAD Station, US Patent App.15/233,403.
- [3] Scott, Judy E. Scott and Carlton H., (2017) Drone Delivery Models for Health Care. Proceeding of The 50th Hawaii International Conference on System Science, Page 3297-3304.
- [4] Lara, David, et.al., (2006) Real Time Embedded Control System for VOTL Aircraft: Application to Stabilize a Quad-Rotor Helicopter, International Conference on Control Application, Munich, Proceeding of the 2006 IEEE.
- [5] Fuji, Katsuya., et. al., (2013) Endless Flyer: A Continues Flying Drone with Automatic Battery Replacement. 2013 IEEE 10th International Conference on Ubiquitous Intelligence & Computing.
- [6] Clarke, Roger.,(2014) Understanding The Drone Epidemic, Computer Law and Security Review, Elsevier, Australia.
- [7] Kim, Min Hyung, et.al 2019 Macronutrient Analysis of Human Milk according to Storage and Processing in Korean Mother.
- [8] <https://otomotifnet.gridoto.com/read/231828416/kecepatan-rata-rata-kendaraan-di-jakarta-naik-9-perluasan-ganjil-genap-efektif>,
Online: 23 October 2018, 09.57