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Prospects and pitfalls of using drones in logistics

Drones and their use in logistics have long been a topic of study for many leading companies and scientists. However, like any new technology, the use of drones is associated with both significant benefits for the company and society, and negative consequences and disadvantages

The global drone logistics and transportation market was worth $7.5 billion in 2020, 8 billion in 2022. According to Emergen Research, that figure will reach $32bn by 2028 [1]. Fortune Business Insights predicts that the commercial drone market is going to grow to 47 billion in 2029 [2]. Initially used for military purposes only, drones are being increasingly used by the logistics all around the world. Drones are likely to stay in the logistics industry and are actively becoming a bigger and bigger part of it. Those who are forward-thinking in this industry would be wise to improve their understanding of how to implement drone use more productively.

In the history of the commercial use of drones in logistics, Amazon can rightfully be considered a leader. Most purchases made on Amazon are light and could be delivered by drone. The current model of the drone that Amazon is testing is capable of flying at 50 miles per hour with a 5-pound (2.3-kilogram) payload; About 86% of orders Amazon ships weigh less than that amount, according to company filings [3].

The small drones currently used in the logistics sector are not capable of carrying the increased volumes of goods that would help reduce delivery costs. However, California-based startup Nautilus is working on large-scale fuel-powered drones to solve this problem [4].

Even without drones, Amazon is already capable of offering same-day delivery through conventional means to 15% of the US population, and will increase this reach to 50% of the population within a few years, according to [5].

Companies utilize UAVs technology in many different ways. Five of the most common current drone uses in logistics are [6]:

1. Forward and reverse delivery of packages.
2. Inspecting infrastructure.
3. Security surveillance.
4. Collection of videos and images.
5. Scanning of pallets inside distribution centers.

Benefits of drones' implementation in logistics and supply chain:

1. Projected financial savings. The main reason companies use drones is the amount of money they can save. Forbes reports that in one example, delivery by drone was about 90 percent cheaper than delivery by car service [7].

According to Business Insider, Amazon's Prime Air delivery drones could be expected to ship out packages directly to the customer from the warehouse in 30

minutes or less for as low as $1.00. The chart below shows the substantial difference between Amazon Drones and FedEx and UPS costs (with a much longer delivery time) (Fig. 1).

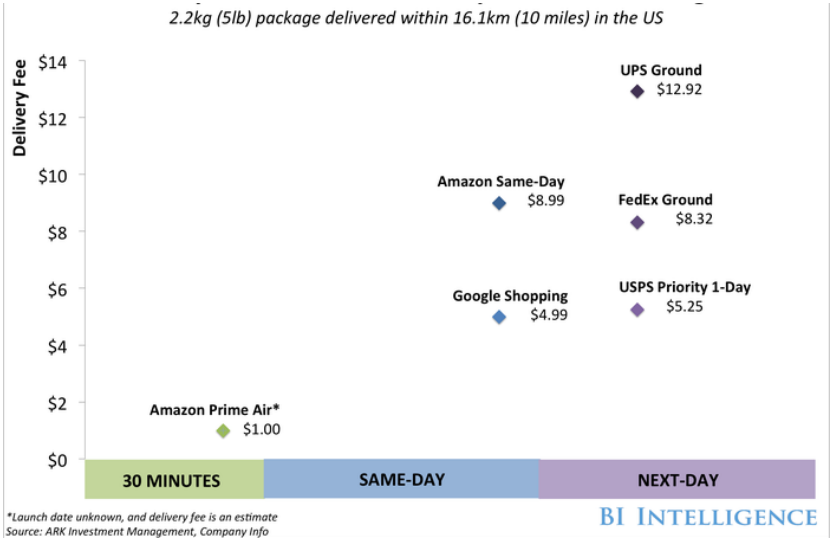

Figure 1 - Delivery fee that consumers pay for a small package [3]

2. Speed and efficiency. When it comes to speed, drones have the same advantage as air transport. And for the same reason - the ability to move in a straight line in the air. Of course, the average speed of an aircraft is much higher than the speed of a drone used in commerce. However, when it comes to working indoors (like a warehouse), in a small area (like an enterprise), or delivering in a city (where traffic is usually hampered by congestion), drones are fast enough to get the job done. Moreover, they are usually able to do the job faster than a vehicle or a person.

3. A greener solution. One of the enduring advantages of drones is their environmental friendliness. One report predicts that a growing demand from e-commerce will result in 36 percent more delivery vehicles in inner cities by 2030 [8]. The study found that delivery vehicles emitted 26 to 28 times more CO2 than drones, a rather staggering number when you consider the number of deliveries that are done every day [9]. Moreover, environmental friendliness manifests itself precisely where environmental problems are the most painful - in places of high population density or large concentrations of people. Namely, when working at an enterprise or in an urban environment. The absence of harmful emissions, non-participation in traffic congestion, low accident rate minimize the harmful impact of drones on the environment and society.

4. Accessibility. Again, similar to air transport, one of the advantages of drones is the ability to use them in hard-to-reach places. Such places can be storage bins in a warehouse that are difficult for a forklift or worker to access. As for the

urban environment, the drone can deliver goods to the roof of a building, even to a certain floor, places with no roads, etc.

5. Reduced labor costs. Speaking of reducing labor costs, we should remember the technical term for a drone, namely an automatic vehicle. Accordingly, it does not require constant human attention and is controlled most of the time through special software. Business Insider predicts that drones could replace $127 billion dollar worth of human labor across various industries [10].

Disadvantages of drone's implementation in logistics and supply chain:

1. Initial investment costs. Unfortunately, like any innovation, the use of drones requires an initial investment. Investments should cover the whole complex - the purchase of drones themselves, software for them, licensing, as well as staff training.

2. Weatherproofing and handling the elements. The drone belongs to a high-precision mechanism that needs fine tuning and protection from external influences (whether it be weather conditions or a hacking attempt). Therefore, when using in open areas, it is necessary to take care of the safety of both the drone itself and the cargo that it delivers.

3. Regulation and security concerns. Logistics firms spend millions on insurance and ensure operators are certified to cover costs in the event of an accident. Clear rules should be developed in case of accidents with drones. For example, who will bear the cost of replacing the product if the drone breaks down or crashes? Or who and in what amount compensates for the damage to the owner on territory of which the drone, its parts or the cargo that the drone was transporting fell? [11].

4. Tech vulnerability. Drones, currently limited to small packages and short distances, are still quite fragile and require highly skilled technicians and operators, increasing the cost of production and use. Because they are controlled by a computer, they are also vulnerable to hackers who want to steal or destroy the materials entrusted to them [11].

Conclusion

So, no one in the world has any doubts that the use of drones in logistics and supply chains is a promising area. There is evidence of this from the major players in the global market who are investing huge amounts of money in this technology. However, the disadvantages of using drones should also be assessed sensibly and impartially. We can only hope that the elimination of these shortcomings will be done quickly enough, which will allow us to talk about the imminent breakthrough of drones in logistics, along with their low cost and environmental friendliness.

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