MOB DRONES AS SOLUTIONS TO SOME OF THE MOBILITY CHALLENGES IN SOUTHERN AFRICA

ZA ZURBA

Department of Logistics, Faculty of Economic and Management Sciences, Stellenbosch University, Private BagX1, Matieland 7602 Stellenbosch, South Africa, Supervisor: Dr JA van Rensburg; Email: 25881914@sun.ac.za

ABSTRACT

Mobility challenges are a significant barrier to delivering healthcare services in South Africa (Walls et al., 2016). Medicine is often not accessible to remote towns, including the farming communities in rural areas of South Africa. While vehicles can reach these locations, they are not the optimal solution, as travel times are long. In humanitarian and medical logistics, these delays can put lives at risk. There is a growing trend towards autonomous transportation solutions. Unmanned aerial vehicles (UAV) may seem far-fetched, but they are not. This paper compares the difference in travel time from a standard road vehicle to a drone. The calculations will be based on UAV technology already existing in South Africa, specifically from Milkor Air. The travel time data for vehicles was taken from Google Maps, while UAV data was sourced from the Milkor Air website. The time was calculated using the basic time calculation formula, where time equals distance divided by speed and expressed in hours and minutes. The results show that significant time savings are achieved when using UAV over traditional vehicles. This has major implications for humanitarian logistics, where delivering medicine or transporting people in and out of remote areas. For example, a doctor could reach a patient faster, dispense medication, or even use a drone to transport the patient to a hospital, all without needing a pilot's license.

1. INTRODUCTION

Aeroplanes have been capable of flying themselves for many years. However, for safety, peace of mind, and potential emergencies, there is always a qualified pilot in the cockpit of commercial aircrafts. Drones or unmanned aerial vehicles (UAV) is an aircraft that does not need a human pilot in the aircraft to fly the aircraft. The automation capabilities of UAVs have many benefits, making them increasingly valuable.

South Africa has the 10th largest road network in the world yet still has many mobility challenges. Building more roads or adding lanes is not a sustainable solution. In many areas, the quality of the roads drastically deteriorates in areas that have not been regularly maintained (Department of Transport, 2009). Furthermore, South Africa's increasingly unpredictable weather patterns (Nhamo et al., 2025) and lack of implementation of long-term plans contribute to an unreliable and inefficient transport system (Walters, 2013).

Healthcare in South Africa remains a concern and often relies on aid from foreign countries. It is counterproductive for the essential medical supplies to be available but have no means to get it delivered to areas in need. It is important for the necessary aid to get to the destinations where it is needed to improve the country's health outcomes.

This paper will explore the current uses of drones in South Africa and examine the potential to improve mobility. A comparison will made between the time travelled using a Milkor UAV and a road vehicle, simulating how UAVs could offer faster, more reliable trips. The overall aim is to highlight the benefits of UAV technology and understand the current trends and encourage South Africans to confidently adopt the innovation.

Two routes were selected for this study, from the Cape Winelands Airport to Williston and from the Cape Winelands Airport and Matroosberg. The Cape Winelands Airport is currently a focal point due to investment and development, for both local and international interest. The investors see the airport's potential for a drone hub in the future. Including this airport as an origin or destination shows the growing feasibility of UAV in regular transport operations.

Conversely, the selection of Matroosberg and Williston is more exploratory. Matroosberg is in a mountainous area at a high altitude, which is relatively inaccessible. The terrain increases fuel consumption and has potential safety risks for the standard car. It is a popular hiking area, making it prone to emergency response. Since it lacks nearby medical facilities it is ideal for drone-based service. Williston, on the other hand, is a remote town with only one hospital. Clear mobility challenges stem from the town's isolation, making it a good candidate to show the potential of UAV to reach previously neglected areas.

2. OVERVIEW OF EXISTING UNMANNED AIRCRAFT SYSTEMS IN SOUTH AFRICA

While drones and UAV have been used in military settings for a number of years, the commercial use is only just starting to gain traction. For example, in conservation, there was a study conducted at Lake Nyamithi, Ndumo Game Reserve in KwaZulu-Natal. This study aimed to use UAV to take aerial photographs of the lake to determine the number of Nile crocodiles and where they were located. This study resulted in a 26% increase in counting the number of crocodiles compared to the traditional ground inspections (Ezat et al., 2018).

In addition, UAV are being used in agriculture. It comes down to precision farming, where the drones would be able to accurately identify the crops that need special attention. The drones have been proven to be more effective than traditional methods of manually going through the crops and have seen that the drones can pick up a disease 10 days before it is recognised to the human eye (Mkhonto and Zuva, 2024). This has led to the use of drones making farming activities more efficient and sustainable.

Mears explains that drones are no longer just children's toys but an asset to nations. South Africa is in a unique position where the growing trend is the use of drones (Mears, 2024). Additionally, the Western Cape Government (WCG) has created the idea of a drone testing sandbox/corridor zone. This will create an environment where drones can be tested, researched and aim to meet regulations. The environment the WCG is creating will encourage emerging drone supplier to test their drones in a safe and affordable manner. This initiative will spearhead the normalising of drone use in South Africa across all facets and sectors (Wenger, 2024).

Further, the WCG has predicted that the use of the drone "sandbox" will promote economic diversification and job creation. In addition, the project is projected to benefit urban air mobility. And the goal is to make South Africa the leader in the drone industry. This incentive has already gained a lot of traction as private investment has been heading the

drone initiatives for a while, and it will grow exponentially now that the government is involved. And the opportunities are now endless.

One of the largest constraints is existing aviation legislation. Namely, the aircraft needs to be tracked and be able to track other aircrafts to be safely accommodated in the airspace. In addition, it must have ground and aircraft avoidance systems and all types of weather competence.

Beyond legislative barriers, there are practical and technological challenges. A major issue to consider is the weight of the aircraft batteries. The heavy batteries cause the aircraft to be heavier and the heavier the aircraft the more fuel it uses and the less distance it will be able to cover. However, as technologies evolve to make the batteries lighter the aircrafts will become more efficient and be able to travel further.

Lastly, public perception on drones present a significant hurdle. Currently drones are viewed with suspicion, regarded dangerous and unpredictable, particularly because they are unmanned and can fly over populated areas. Overcoming these fears requires technical assurance and public education. Ironically, aircrafts that are used daily are not controlled by on board pilots but rather ground-based staff.

3. RESEARCH QUESTION, OBJECTIVES AND METHODOLOGY

What is the difference in travel time between using road transport compared to unmanned aircrafts?

Objectives:

1. Calculated the time needed to complete a journey using a vehicle.
2. Calculate the time needed to complete the same journey using an unmanned aerial vehicle.

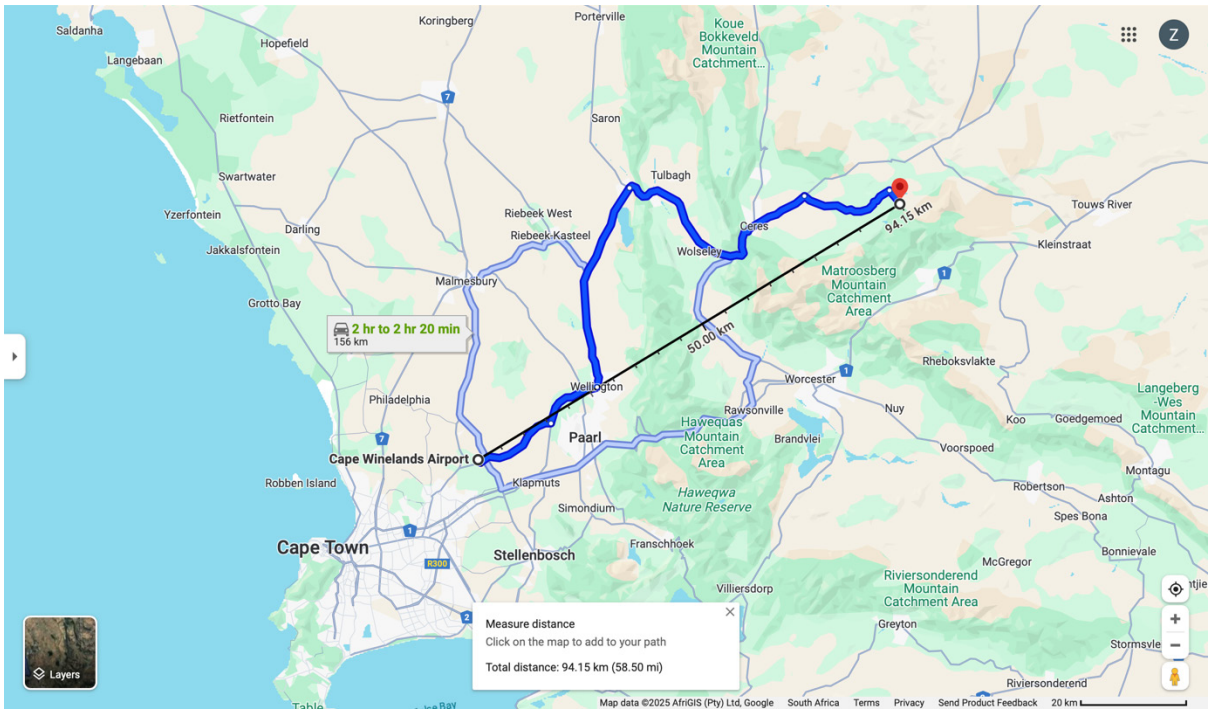

Figure 1: Comparing the route of Cape Winelands Airport to Matroosberg of a standard vehicle and a UAV

The methodology relies on readily available resources, as illustrated in Figure 1 and Figure 2. Route and distance data was obtained using Google Maps, which also gave estimated travel times for a standard vehicle. Information on the drone specifications was sourced from Milkor Aviation as the UAV proposed for this study. The travel distance is calculated by using the straight-line distance from the origin to the destination, see Figure 1 and Figure 2. A simple speed calculation was used to estimate how long the drone would take to complete the trip. Finally, a comparison was made between the UAV and the standard car with distance and speed.

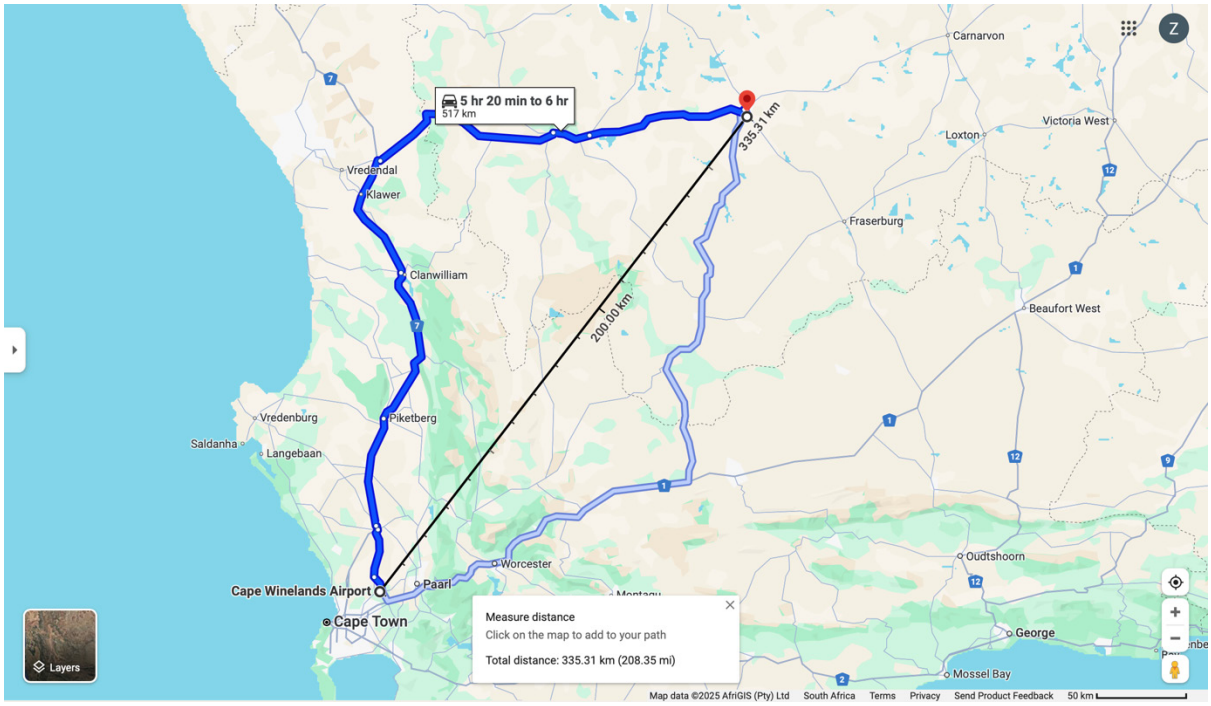

Figure 2: Comparing the route of Cape Winelands Airport to Williston of a standard vehicle and a UAV

4. ANALYSIS AND CALCULATIONS

The Milkor 380 UAVs were selected for the calculations because they are already in use in the military and a few tests away from commercial use (Milkor, 2025; Liebenberg, 2025). Milkor Aviation is known for its innovative technology, advanced gadgets, and features that will be useful in real-world conditions. The UAVs support both manual and autonomous modes of flight. Key specifications include a cruising speed of 110-150 km/h and a maximum speed of 250 km/h. The battery has a maximum life of 30 hours, making it ideal for long-distance travel. The maximum payload is 220 kg, and highly versatile in the way that the loads can be carried. Where 80kg can be carried at each outer wing point and 150 kg at each inner wing point. Alternatively, the full 220 kg can be accommodated from the underbelly (Liebenberg, 2025). According to UNICEF, a cold box that contains 5000 doses of vaccines typically weighs 17-25 kg. Whereas palletised medical consignments can range from 100-500 kg. This means that small and medium-sized pallets can be moved, but large ones will need to be divided into smaller units. If drones can deliver critical medical supplies more efficiently than conventional methods, then their adoption should be strongly considered.

A comparison between a standard vehicle and a UAV is presented in Table 1 and Table 2, corresponding to the specific routes. The tables show the distance, average speed, and

the total time for both modes of transport. Additionally, the drone's maximum speed was added to show the potential travel time for critical emergency situations.

Table 1: Showing Cape Winelands Airport to Matroosberg

	Distance (km)	Speed (km/h)	Time (h:m)
Car (road design speed)	145	60-120	2h
Drone	94.25	130	43 min
Drone (maximum speed)	94.25	250	23 min

Table 2: Showing Cape Winelands Airport to Williston

	Distance (km)	Speed (km/h)	Time (h:m)
Car (road design speed)	517	60-120	5h30min
Drone	335.26	130	2h35min
Drone (maximum speed)	335.26	250	1h20min

Cars are restricted to the road network and limited to conditions such as congestion and road quality. Based on the findings, the travel time for vehicles is relatively high and a driver needs to always be present. In addition, the data shows the indirect and lengthy route cars must take to get from the origin to the destination. Whereas unmanned aircraft traveling between the same origin and destination experience significantly reduced travel times. This is because drones are not restricted by the road infrastructure and can travel at higher speeds along more direct paths. As a result, drones are a more efficient mode of transport in humanitarian emergencies.

5. CONCLUSION

The increasing global trend towards UAVs suggests an inevitable role in helping the humanitarian sector. The paper highlighted the time saving of using UAV as compared to traditional methods like the standard vehicle. An average of a 78% decrease in travel time shows the enormous travel time benefits with using UAV. Drones in the healthcare industry can help improve South Africa's mobility challenges. Some of the implications are saving lives by having rapid transport services of essential medical supplies. Further research on the regulatory framework and determining the cost-effectiveness justifies further research. These findings highlight the use of UAVs as an effective solution for South African mobility challenges.

6. REFERENCES

Department of Transport 2009. Draft TRH 20 Unsealed Roads: Design, Construction and Maintenance. *In:* Transport (ed.).

Ezat, MA, Fritsch, CJ. & Downs, CT. 2018. Use of an unmanned aerial vehicle (drone) to survey Nile crocodile populations: A case study at Lake Nyamithi, Ndumo game reserve, South Africa. *Biological Conservation,* 223:76-81. Doi: https://doi.org/10.1016/j.biocon.2018.04.032

Liebenberg, A. 2025. Milkor busy with Milkor 380 production and deliveries as UAV project enters a new phase. *Defence Web* [Online].

Mears. 2024. *The future awaits advanced aerial mobility* [Online]. IOL News.

Milkor. 2025. *Milkor: Air, Land, Sea, Cyber* [Online].

Mkhonto, M & Zuva, T. 2024. A Model for the Adoption and Use of Drones Technologies in the Agricultural Sector, South Africa. *2024 4th International Multidisciplinary Information Technology and Engineering Conference (IMITEC)*, 1-5. Doi: https://doi.org/10.1109/IMITEC60221.2024.10851179

Nhamo, G, Chapungu, L & Mutanda, GW. 2025. Trends and impacts of climate-induced extreme weather events in South Africa (1920-2023). *Environmental Development,* 55:101183. Doi: https://doi.org/10.1016/j.envdev.2025.101183

Walls, HL, Vearey, J, Modisenyane, M, Chetty-Makkan, CM, Charalambous, S, Smith, RD & Hanefeld, J. 2016. Understanding healthcare and population mobility in southern Africa: The case of South Africa. *South African Medical Journal,* 106:14-15. Doi: https://doi.org/10.7196/SAMJ.2016.v106i1.10210

Walters, J. 2013. Overview of public transport policy developments in South Africa. *Research in Transportation Economics,* 39:34-45. Doi: https://doi.org/10.1016/j.retrec.2012.05.021

Wenger. 2024. Annual Performance Plan 2024/25. *In:* Tourism, E.D.A. (ed.).