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AeroWash

Elevator Pitch

Introducing AeroWash: the innovative cleaning drone designed for high-rise buildings. In a global window cleaning market worth \$100 billion, AeroWash offers a safer, more efficient alternative. It keeps workers safely on the ground, reducing risks and cutting costs. Discover the future of skyscraper cleaning with AeroWash—where innovation meets practicality.

Problem Statement

Cleaning skyscrapers and tall buildings is a challenging, expensive, and risky task. Aero-Wash aims to solve this problem by developing a drone prototype with a high-pressure water jet and air blower for safe and effective cleaning. However, there are challenges to overcome, including safety, payload capacity, efficiency, environmental considerations, regulatory compliance, and cost-effectiveness.

The goal is to design a drone system that simplifies and improves the process of cleaning building facades.

Constraints

- Drone Stability: Proper weight distribution, with standing Water & Air Pressure
- Weather Conditions: The drone's performance and functionality should be able to withstand various weather conditions
- License from GACA: Obtaining the necessary licenses and permits from regulatory authorities

Target Specifications

Specification	
Payload	6kg
Thrust to Weight	2:1
Flying Time	10min
Height	30m
Battery	Fast Charging/Swapping

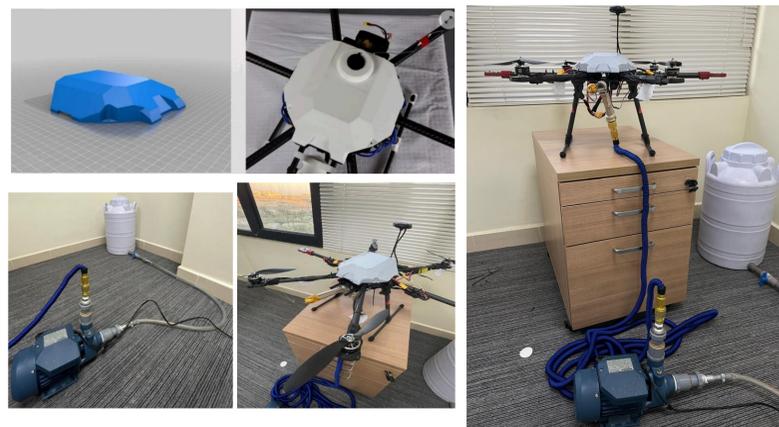
Project Impact

- Enhanced Safety: The drone reduces risks by eliminating the need for scaffolding and manual labor in cleaning high-rise buildings, enhancing worker safety.
- Increased Efficiency: With autonomous operations, the drone cleans buildings more quickly and accurately, significantly reducing cleaning times and disruptions.
- Cost Savings: Replacing traditional methods with our drone cuts costs related to labor, equipment, and maintenance, providing substantial savings for building owners.
- Environmental Benefits: The drone promotes sustainability by using less water and eco-friendly cleaning solutions, while also reducing carbon emissions compared to conventional cleaning methods.

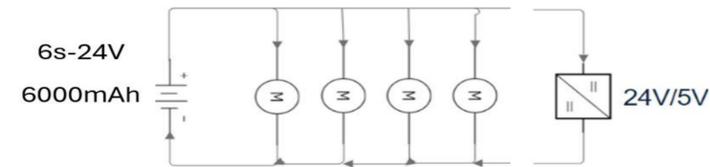
House of Quality



Prototype



Drone Power Distribution

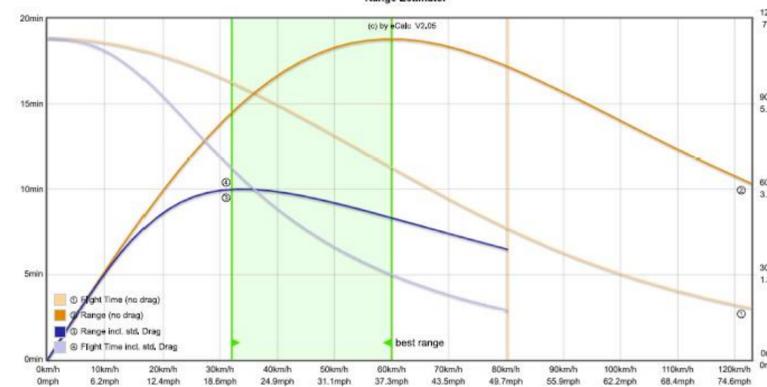


To power up the drone, we need to connect the battery in parallel with all other electrical components of the drone, making sure to have a stable 24V on all components. Meanwhile, all components run on 24V, the Pixhawk flight controller runs on 5V, so we need a step-down 24V DC/5V DC Buck converter.

Testing / Validation

Specification	Achieved or Not Achieved	Prototype Achievement
Payload	6kg	3.6kg
Thrust to Weight	2:1	4:1
Flying Time	10min	19 min
Height	30m	30m
Battery	Fast Charging/Swapping	Swappable

Validation by Simulation Software (eCalc)



- The height is limited by the hose length which is 15m, So to solve this limitation we came up with the idea of dividing the building into different zones in which the water tank is either on the roof of the building or on the ground depending on the floor that we are cleaning.

Thrust Calculation:

$$1) \text{Thrust Produced} = \frac{(4 \text{ (Num of Motors)} \times 2800 \text{ (Thrust of 1 Motor)})}{2 \text{ (Thrust to Weight Ratio)}} = 5.6\text{kg}$$

$$2) \text{Payload} = 5600 - 2000 \text{ (Weight of Drone)} = 3.6\text{kg}$$

Conclusion

- The AeroWash project has significantly improved building cleaning by using advanced technology for high buildings. This drone system enhances safety, efficiency, and cost-effectiveness over traditional methods. By lowering risks for workers and reducing environmental impacts, AeroWash demonstrates how innovation can provide practical, sustainable solutions for urban infrastructure. It represents our dedication to elevating industry standards and delivering effective solutions for modern cities.

Future Improvement

Our product will be developed in the future in many ways.

- Automating the process: The drone will be able to navigate itself and avoid obstacles during its flight, which will speed up the process and make it easier for the organization.
- Longer flight duration: By providing a larger battery capacity that is on the ground and supplies the drone to make it fly for a longer period.