

We present the design and development of a novel VTOL UAV to tackle two main issues with unmanned aerial systems, namely flight endurance and carrying large payloads.

The vehicle to reach speeds up to 200 km/hr. Furthermore, the propellers are also ducted to increase their efficiency in hover and the fuselage is streamlined to minimize drag forces in forward flight. The vehicle is designed such that it could be scaled easily and could be used in a variety of applications.

The use of gas-powered engine not only allows the vehicle to reach flight times up to 150 minutes but also makes it possible to carry payloads ranging from 5 lbs to 70 lbs (depending on the size of the vehicle). We are in the process to extend these limits by experimenting different configurations and optimizing power to weight ratio.

The vehicle also has a variety of sensors including: Dual IR Cameras, LiDAR, GPS, Altimeter, 3D Camera, etc. The vehicle has a computing unit which is responsible for controlling the vehicle. The control is achieved through thrust vectoring and actively changing the location of center of mass of the vehicle. The vehicle could be controlled manually, semi-autonomous or fully-autonomous depending on the application and situation. The vehicle could also connect to the ground control station or mobile devices to communicate with firefighters.

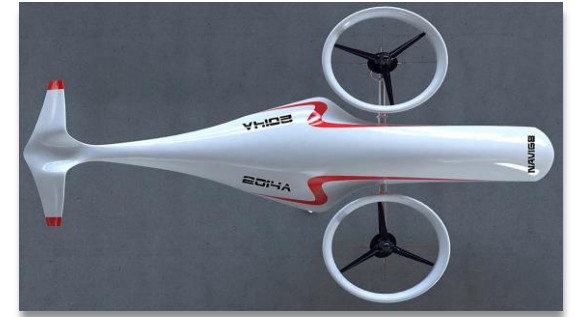
In terms of safety, we propose the following main options: i) a parachute will be added to the system which will be activated in case of engine failure or loss of control, and ii) a small additional battery and electric motor is onboard the vehicle for emergency situations when the gas-powered engine fails. In the second scenario, when the gas-powered engine fails, the electric motor will be engaged automatically and using the emergency battery pack it could power the main rotors for a short period of time (up to 3 minutes) to land the vehicle safely. Another safety feature in the vehicle is the use of ducts for propellers which makes the vehicle safer when operating in public.

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