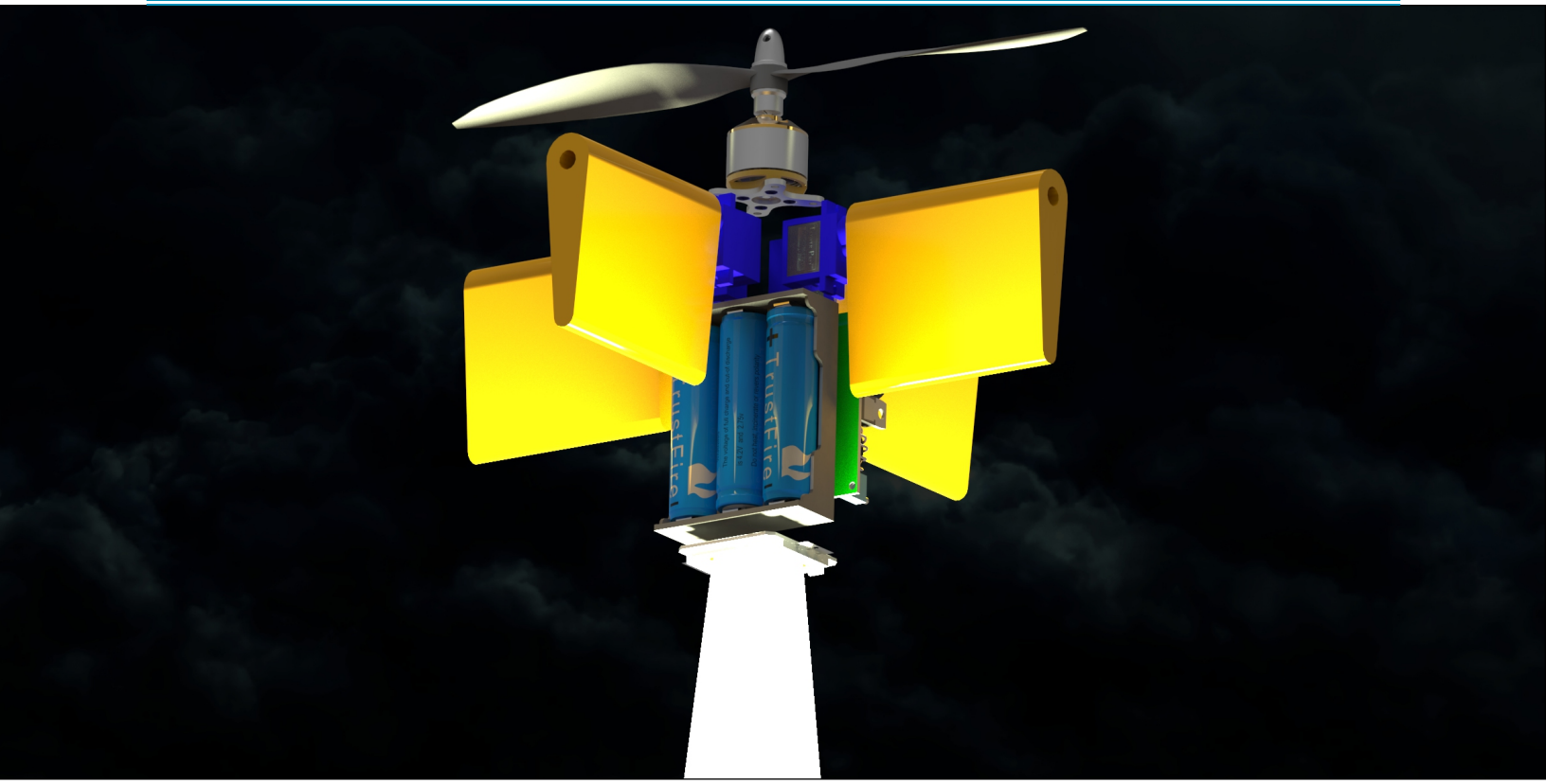
Lumos

A GPS controlled Spotlight Drone

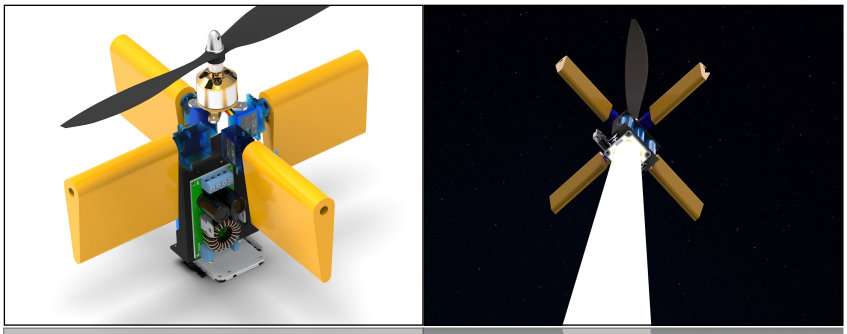
John Loeffler - July 3, 2019



In a World of Darkness

A natural disaster during the day is frightening enough but imagine the same situation at in the darkness of night. The panic of not seeing anything because all electricity is knocked out hearing commotion and not being able to see. And the light you do see is only from the few lucky enough to keep their flashlights close. Panic devolves to chaos which causes more panic and chaos. If only you could just see whats going on around you.

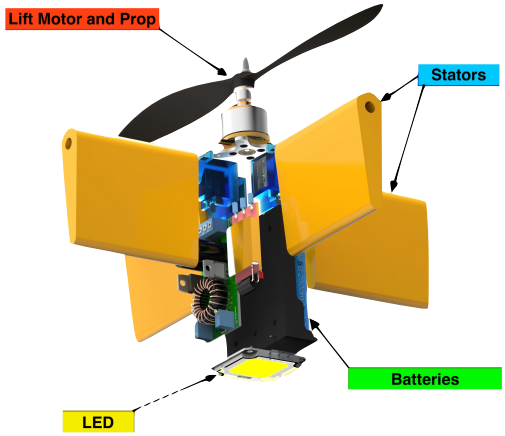
In this you see a small glow above you provided by a **100W** led about **300 feet** above your current location. The glow intensifies and now you can see you family clearly. Some in the distance is injured trapped under debris so you go assist. In a couple hundred feet you see more spotlights in the distance start to glow and now you see the gravity of the disaster. It is frightening in its magnitude. But now that you can see it, fear becomes a call to action and now you can get to work.



The Solution

Once deployed, Lumos will hover above the designated area until its battery reserves are depleted at which point it will return to the base location and where it will be collected and recharged. The process will repeat until the units are no longer needed. To reduce interference with rescue operations it will fly at a distance of **200 to 300 feet** above the area as to be out of audible hearing range and most physical obstacles.

Lumos Consist of 4 Main components to achieve its objective of illumination of a disaster zone. These are the primary lift motor and propeller, the stators, the batteries and the led. All of which will be controlled by the main logic board with onboard GPS.



The Primary Lift Motor

Lumos is equipped with a single brushless motor and propeller which will provide the lift for the aircraft. Using a single propeller will drastically increase the efficiency and lift duration of the drone over traditional quadcopter or multi rotor drones. The drawback to the single rotor design is that a unique mixing flight controller will be needed for stable flight.

Stators

Lumos consists of **3-4 stator** fins which will independently redirect the flow of the primary lift motor. As to not cause excess drag the will be aerodynamically designed. In order to control Yaw, the stators will move in unison to counteract the torque applied by the propeller. In order to control the cyclic a flight-controller will mix the stators to allow the Lumos to change direction and pilot itself to the desired location

Batteries

Lumos will utilize the power of lithium ion batteries to provide enough current for flight. Currently the **18650** Lithium Batteries have one of the highest capacity to weight ratio which will greatly contribute to the flight time of Lumos. 18650 Batteries have been proven the most effective in the quest for long flight times as demoed here in a **160min flight**.

LED

The 50-100W Led will be mounted on the base of Lumos. This will provide the illumination to the disaster area bellow. A simple lens will allow the light to be focused in a narrow beam so that Lumos can provide sufficient light to the area from 200-300 feet away. In order to save weight and space, the flow of air over the led will be utilized to aid in cooling off the lighting module.

Technical Feasibility

Lumos operates on very inexpensive commercially of the shelf products. The total cost per unit can be as little as $60. It is not a particularly intelligent drone an its sole objective is to deploy and hover in open air 200-300ft above a disaster zone immediately after the event. A mockup of Lumos **(See Addendum)** shows that the entire unit will weigh approximately **1 lbs**, with a max thrust of **1.8 lbs**. Significant testing of trust to current for different motors and prop combinations would need to be conducted in order to optimize flight time. Typically the larger the blade diameter the more efficient the system would be which would increase flight time.

Considerations

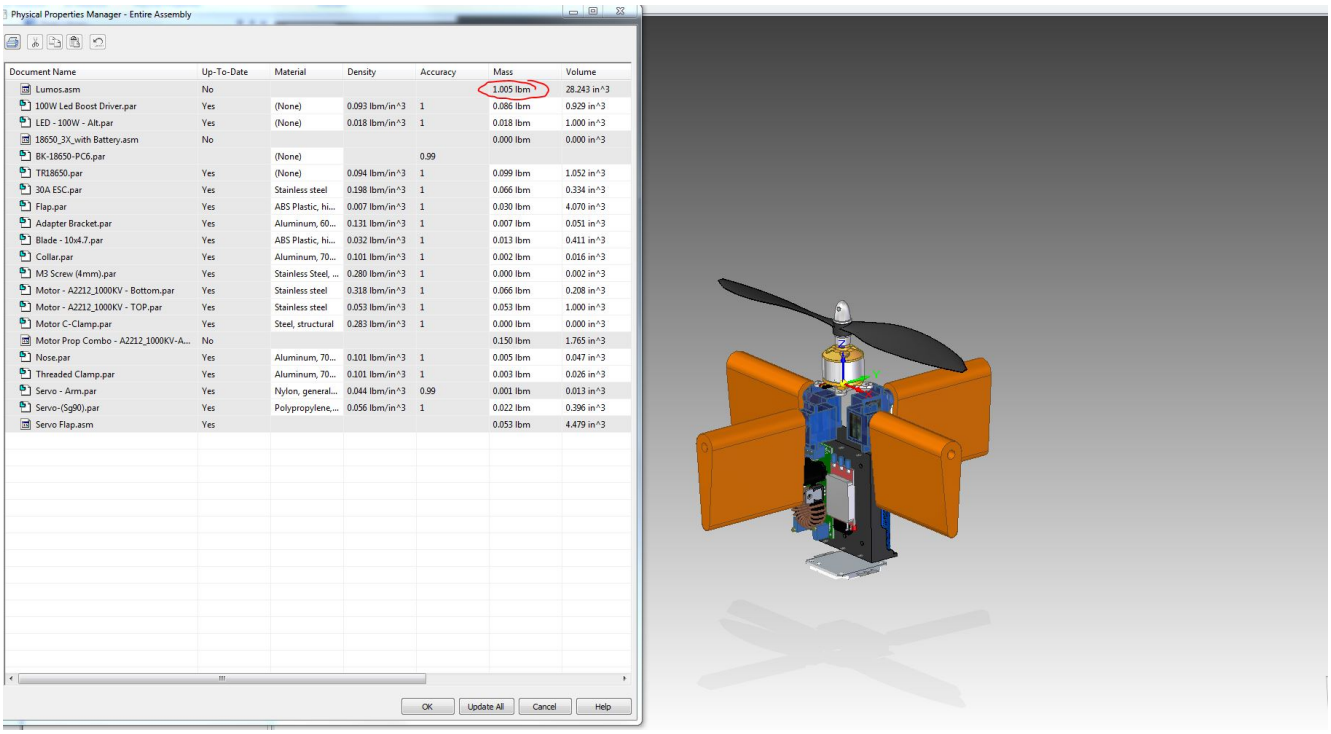
Other things to consider in the development of Lumos would be a spherical cage. A cage would provide protection to the drone should it fall. In edition, a cage would make the collection of depleted drones easier by allowing them to return to a collection basket that could automatically collect charge and redeploy Lumos.

Once Lumos is deployed, it has a unique perspective on a disaster site. With the addition of a simple camera it may allow first responders insight of where to deploy first.

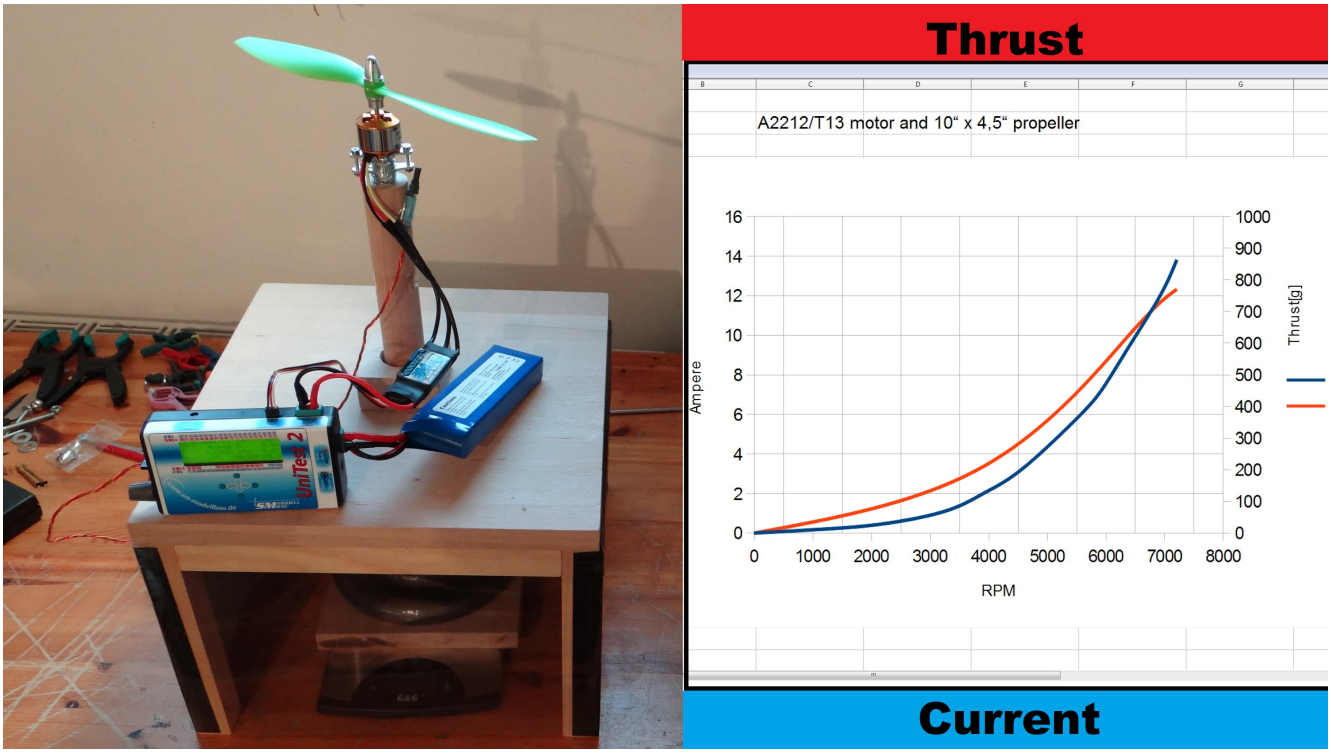
Conclusion

Lumos aims to provide a little bit of calm and comfort to a very fighting and chaotic situation. By providing illumination to an area moments after a disaster, Lumos will aid in preventing panic and making sure rescue and recovery efforts are optimized in their effectiveness.

Addendum



Mockup of Lumos for Weight and CG Calculations



Thrust/current draw Test (Conducted by [Experimentaltechnik]())