

## **Project on Zipline-Logistic Drone**

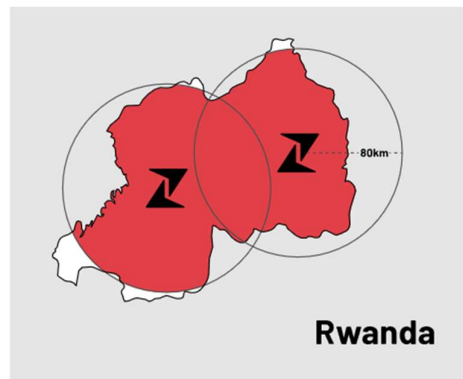
### **Introduction to drones**

Autonomous drones are those machines which are controlled by themselves (automated) and not by humans. In recent years we all have noticed a huge growth in drones and its applications like development in military, healthcare, civil, logistic, research and etc. The reason for increase interest in drones is due to the portability, cost effectiveness, access to remote areas, reliability and etc. of the drones. The purpose of using drones is to unlock their full potential by giving full control of itself which solves the problem of finding skilled drone pilots.

### **Zipline and its important role**

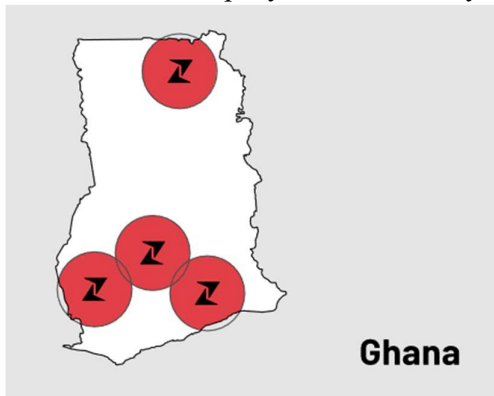
In recent years, the company called zipline had a tremendous growth in health care sector by delivering medical requirements in remote places. Zipline's mission is to produce each human on earth with instant access to very important medical provides.

They natively operate in Rwanda and some places of Ghana (South African countries). Rwanda is a small country (the country of thousand hills) of few natural resources and lacks proper roadways to remote areas which makes impossible for medical supplies to reach on time. the initiative of using drones for medical purposes was started by Rwanda government. Presently Zipline covers almost 85% of the Rwanda. Now they have around 6 active drone distribution (2 in Rwanda and 6 in Ghana).



Dozens of hospitals and health facilities currently think that Zipline is very important service to enhance patient care. Our drones currently cowl the country, giving doctors instant access to crucial medical product, like blood and vaccines, that were antecedently out of reach. Now they are providing more than 12,500,000 people to instant access to urgent medicines. Zipline calls its drones as Zips.

This company was founded by Keller Rinaudo. Zipline have many private investors



some of them including yahoo founder Jerry Yang, Microsoft co-founder Paul Allen, The UPS Foundation and some leading investors including Sequoia, A16Z, GV, Temasek, TPG, Baillie Gifford, and Katalyst Ventures. It also raised \$190 million in recent venture capital fundraising to expand its services in Rwanda, Ghana and soon in U.S.

Zipline encourages local workers and teaches them how to operate most complex

software's and hardware. So, most of the operators in Rwanda and Ghana are locals which in turn increase employment in the country. Due to companies use of automated drones decrease need of skilled drone pilots.

It has headquarters is in Half Moon Bay, California U.S.A. It is where they design, prototype and test flight. Zipline's drones are assembled in the south San Francisco, California. They perform extensive flight testing in Davis, California. They have built the fastest, most reliable delivery drone, and largest autonomous logistics network in the world.

### **How zipline works?**

Hospitals have various ways of placing an order like WhatsApp, messages, dedicated zipline application and etc. This data is processed and gives centralized view of orders. the orders are processed according to their priority which is most helpful in emergency cases (all this process takes place with no delay).

The blood or medicines are brought from their blood bank. Operators pack the blood packs into the boxes and passes to next stage. By then the hospitals get conformation of the confirmed order. The next stage brings the parts and assemble and make the drone ready.



They launch the drone with the help of catapult which gives momentum to it and can achieve high speeds in no time. Zipline drones fly in harsh climate and high-altitude mountains. They have pre-fixed flight path which kicks in if it is unable to connect to zipline servers.

Hospital get notification regarding the delivery of package before 1 minute of its arrival. the drone later arrives to the distributing place. This whole process of delivery takes place below 40 minutes from time of delivery.



### **Ziplines hardware**

As we know most of the drones have similar types of parts like flight control board, power supply, different sensor units, rotors, body frame, chasy and etc. (additional parts needed for special type of drones).

Zipline drone's body shell and its parts are designed for break on contact for minimizing potential damage to the things on the ground. Its frame is made out of Styrofoam which can easily break, but the chasy is made up of carbon fiber. Carbon fiber provides strong support for the parts and light weight compared to aluminum and other metals.

Zipline in drone sector is huge which means that they have combined many parts of the drone such as flight control board, battery, gps, some sensors like altitude, speed, climate and etc. into one single piece. This enabled them to decrease the launch time from 10 to 1 minute. This was possible due to always on gps connection with battery.

The flight data is stored to their servers when battery is placed into its charging dock. Every hour drone uploads 1 GB of drone data. Drone is equipped with LTE based sim for long distance connection. This drone doesn't have any kind of transmitter and receiver. It only has network sim card. This way they don't need any kind of powerful Tx and Rx (by not using them saves a lot of money).



The drone is launched by a catapult which has powerful electric motors. It gains around 100km/hr top speed in just 0.3 seconds. It can do delivery in just 30 minutes in 85 km range. The packaging of delivery package is made of paper and can easily be thrown away. The drone is programmed to drop the package in selected location. After the delivery the Zip is returned to its headquarters. In case of emergency from the airspace control division, zip's control tower takes down the Zip by releasing the parachute of the zip.

Zipline has modular design, this design is efficient, reliable, cost-efficient and etc. operators do pre-flight checks with its drone and mobile integrated software. They check whether the parts like motors, wings are working or not from their drones mobile app.

Zipline drones landing is quite interesting. There is a small hook given in the tail of aircraft

which grabs the rope between two actuated poles at the time of landing which again gives it short and safe landing capability. For safety purpose- Two of everything is given in plane like 2-motors and 2-actuators. If all fails for that a parachute is provided for avoiding the crash of drone. The total weight of the drone is 6.4 kg and the wings weight is 2 kg. The heaviest part of this drone is the battery which is 1/2 of the total weight and have power- 1.25kwh.

### **Zipline's software**

Most of the software used in zipline project is designed and patented by them. They decreased the use of workers for controlling most of the things. Due to use of artificial intelligence in zip's software makes it most automated drone in the world.

The drone has fixed delivery routes and drop points (this was made if the drone is unable to contact the zipline control division).

The drone depends on the hardware design software called NX™ from Siemens PLM software. Zipline found that NX™ software package from Siemens PLM software was the ideal solution for their drone designing needs. With NX, Zipline's engineers could load the entire aircraft into the CAD model and check the fit of individual parts against the rest of the plane.



NX eliminated those concerns and allowed Zipline to have multiple engineers work on the same parts in real time and see how they all fit and functioned together when they were finished. The amount of medical supplies Zipline's drones have to carry at least 1.5 kg, testing for weight is critical. The ability to rapidly perform thickness analysis or stress analysis to cut weight allows Zipline to save on extreme repetition and testing time to hit their targets.

NX is also a valuable tool for operating with the circuit boards Zipline uses for their drones. Instead of a wiring harness, small unmanned aerial vehicles (UAVs) like those Zipline uses require complex circuit boards that have to not only replace wiring harnesses, but also perform all required avionics functions. With the confluence of electrical and mechanical engineering in the designing and building of drones, subtle nuances such as plane balance and weight distribution from front to back have to be perfect.

NX brings these disciplines together to allow Zipline's engineers to seamlessly navigate an iterative design process and know when someone makes a change to any drone part without any delays. Digitalization is a key component to Zipline's drone design process.

Zipline uses NX software package for the reason that they consider it a "force magnifier." Features such as NX Journal allow them to get a total illustration of the aircraft so when they're manufacturing. for a use case like Rwandese Republic, the company will be understanding of the economic science over the working time period of the aircraft, a vital consideration.

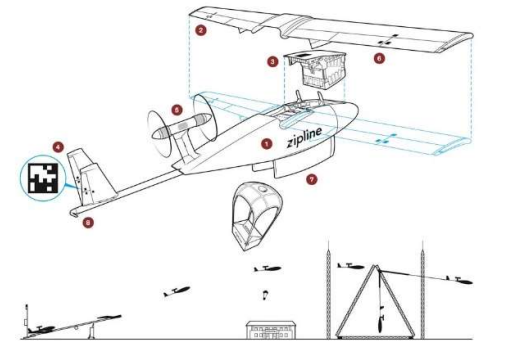
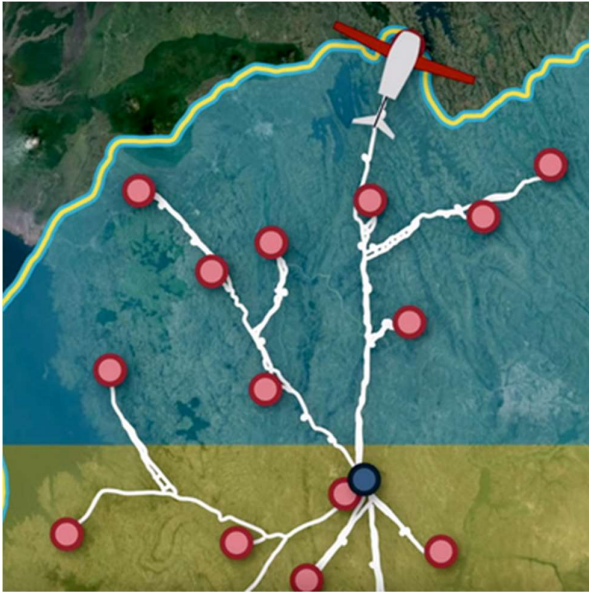


Each kilo of weight savings will rise the range of the self-directed electric drones by 5 %. Using the software Journal enables Zipline to create a custom, Materials that gives a detailed mass build-up, which helps the firm optimize the aircraft. Breakdown features like check wall thickness make it fast and effective to enhance parts.

The ultimate vision is to be able to deliver any essential medical product to one of Rwanda's 11 million citizens in 15 to 35 minutes. That could alter health care because it'd mean self-directed drones might be used to deliver life-saving medical product anywhere in the world wherever ground travel is difficult or not possible.



Extras



## **References**

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