

LOGIHACK-A-THON: VIRTUAL TWIN OF OPERATION

CASE STUDY: ZIPLINE



**"REVOLUTIONIZING SUPPLY CHAINS: THE LIFE-SAVING
POTENTIAL OF DRONE SERVICES"**

-BY CHETAN PANCHAL

INTRODUCTION

- **Zipline** is the world's largest autonomous delivery system, specializing in on-demand **drone** delivery and instant logistics.
- In 2019, Zipline expanded in Ghana and became world's largest drone based medical delivery service reaching over 25 million people.



Faster delivery

Zipline deliveries are 7x the speed of traditional automobile deliveries.



Ultimate convenience

Deliveries arrive in the exact right place with down-to-the-second ETAs.



More customers

Zipline's extended range multiplies your service area by up to 150x.



Lower cost

Scale your operations at low, predictable prices with autonomous delivery.



Easy integration

Get set up in just days with our simple software integration and infrastructure.



Fewer emissions

Our fully electric aircraft fly with 97% fewer emissions than traditional delivery.

- Zipline announced a funding of \$250 million financing its healthcare logistics network with a target of reaching 700 million people by 2024.
- It achieved nationwide coverage in Rwanda and Ghana in 2019 and had expanded into Nigeria in 2021.
- In 2023, Zipline introduced P2, a new delivery system that combines a hybrid fixed-wing drone with a small tethered droid that can drop out of the belly of the drone to make precision deliveries.

History & Success

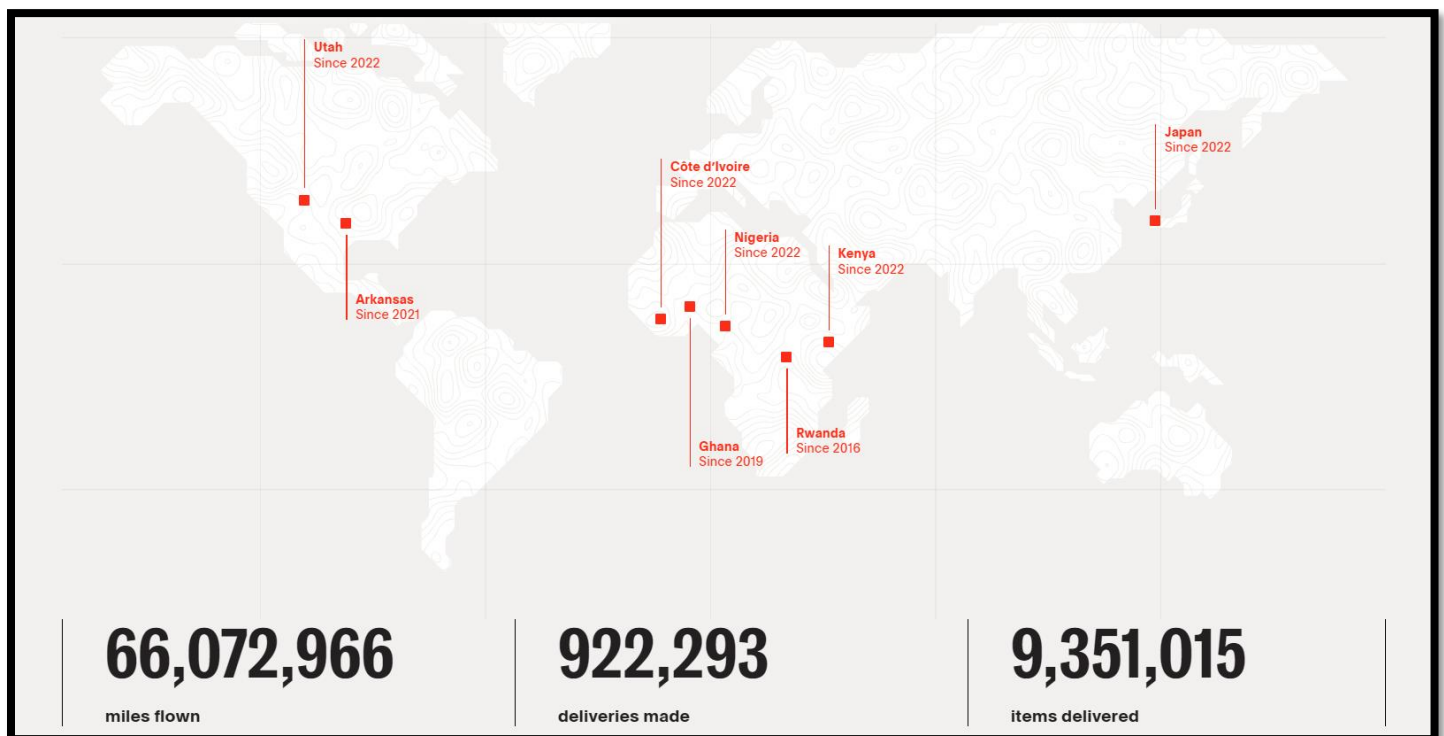
- The last mile delivery problem hampers the access of medicinal supplies especially in developing countries due to insufficient infrastructure. The Zipline founders observed this problem in Rwanda because the medical supplies were stuck in central warehouse and could not get to local clinics on time.
- Truck delivery was inefficient during the rainy season for several months during the emergency situation in the rural areas.
- Zipline originally started delivering blood and medical products in Rwanda in 2016 and has since expanded to food, retail, agriculture products, and animal health products.
- Zipline worked with the Rwanda government and convinced drone technology to solve the problem.



- A simple low cost delivery system as it uses simple parachute and keeping the infrastructure, operational costs low.
- Zipline is on a mission to build the world's first logistics system that serves all people equally. With operations in seven countries across three continents, and more than 45 million commercial autonomous miles flown to date, Zipline is transforming access to healthcare, consumer products, and food.

STARTEGIES

- Zipline participated in the Integration Pilot Program hosted by Federal Aviation Administration that allowed the authorities to assess the feasibility of drone approvals. In February 2021, it signed a deal with Kaduna State in Nigeria which focused on distribution of COVID 19 vaccines without significant state investment in cold chain storage. It helped Kaduna to bypass need to purchase ultra low temperature freezers and enabled on demand deliveries.
- During COVID 19, the company majorly focused on the vaccine, PPE, Blood supply and distribution within less time and precise locations.



- Zipline focused on operations and engineered every element and successfully reduced the cost .
- They partnered with the government and health systems who pay for service through a tired subscription model.
- The team redesigned the system by incorporating lessons learned from the customers and internal operations feedback.
- They focused on innovative infrastructure set up such as mobile distribution center that fits into a truck and can be easily set up anywhere

CONTRIBUTION SECTORS

Explore the different industries and customers ZIPLINE serve.



HEALTHCARE



RESTAURENT



CONVENIENCE & GROCERY



Public Health Services

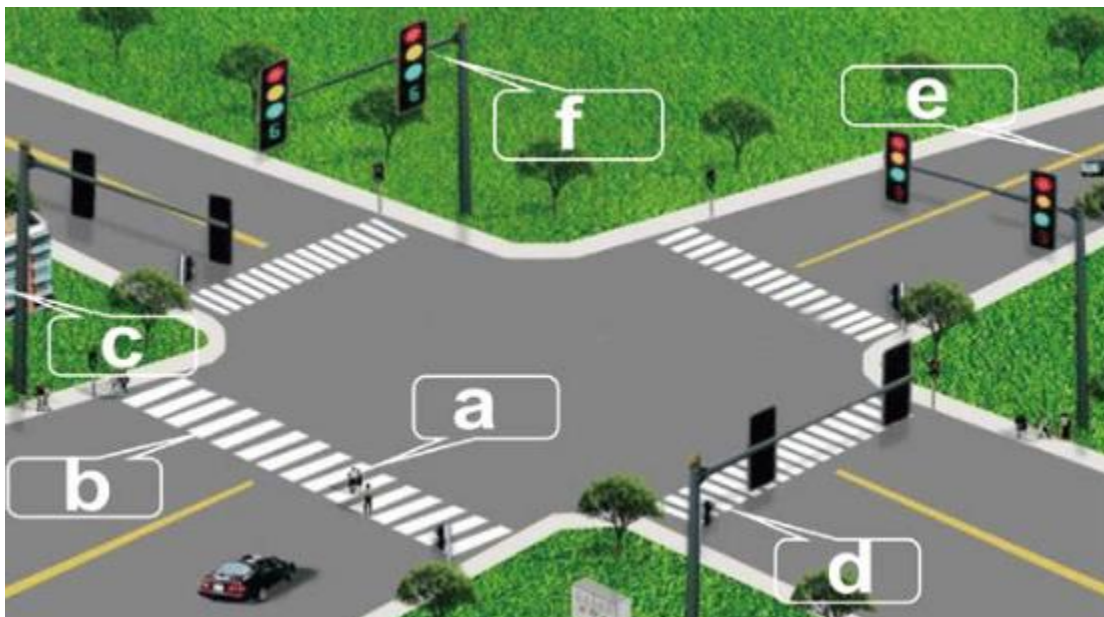


Husbandry products

Challenges and Solution

1. Optimum Path for long distance delivery:

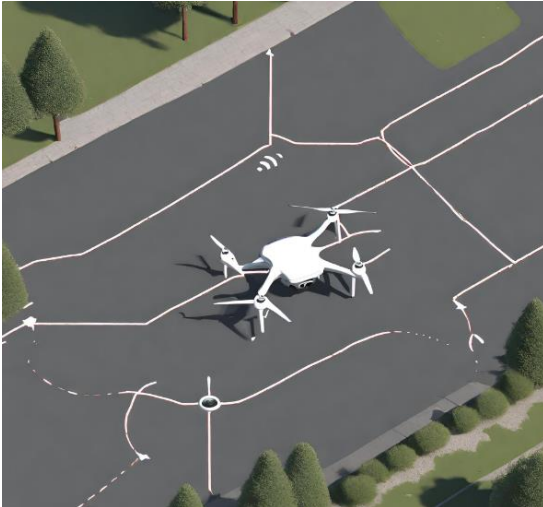
Drone delivery faces a significant challenge with long-distance travel, primarily due to limitations in battery life, which restricts the range drones can cover in a single flight. To overcome this obstacle and ensure end-to-end delivery, it's necessary to establish a network of strategically positioned stations where drones can refuel or recharge before continuing their journey. This approach enables seamless coordination between multiple drones, allowing them to collaborate effectively to complete deliveries over longer distances.



Solution: **DELMIA Quintiq** supports Planning & Scheduling of Manufacturing and the Supply Chain, Logistics and the Workforce with key capabilities, such as predictive and prescriptive data analytics and forecasting. Using **DELMIA Quintiq** capabilities a smooth end to end supply chain can be build for drone delivery.

2. Navigation and Collision Avoidance:

Ensuring accurate navigation and effective collision avoidance is crucial for safe and reliable drone operations, especially in urban environments with complex airspace structures.



Solution: DELMIA provides tools for simulating complex environments and testing navigation algorithms. Companies can use **DELMIA** to create virtual environments that replicate real-world scenarios, allowing them to validate collision avoidance systems and optimize drone routes for safe navigation.

3. Communication and Connectivity:



Maintaining reliable communication and connectivity with drones, especially in remote or congested areas with limited network coverage, is critical for real-time

monitoring and control. Developing robust communication protocols, leveraging satellite communication networks, and implementing mesh networking solutions can enhance connectivity and data transmission capabilities.

Solution: NETVIBES offers real-time monitoring and analytics capabilities to optimize communication and connectivity for drone operations. Companies can use **NETVIBES** to monitor network performance, analyze data transmission efficiency, and ensure reliable communication with drones in remote or congested areas.

4. **Weather Resilience:**

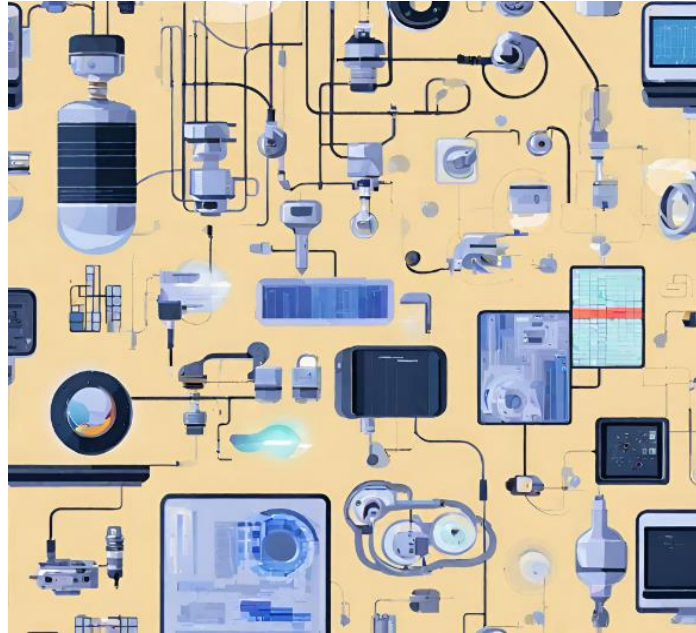
Adverse weather conditions such as high winds, rain, fog, and extreme temperatures can disrupt drone operations and compromise flight safety.



Solution: 3DEXPERIENCE Platform provides simulation tools to analyze the impact of weather conditions on drone performance. Companies can simulate different weather scenarios using **3DEXPERIENCE Platform**, allowing them to evaluate the resilience of drones and optimize designs to withstand adverse weather conditions effectively. **SIMULIA** simulation software accelerates the process of evaluating the performance, reliability and safety of materials and products before committing to physical prototypes. Explore the engineering disciplines that we support.

5. Sensor Integration and Data Processing:

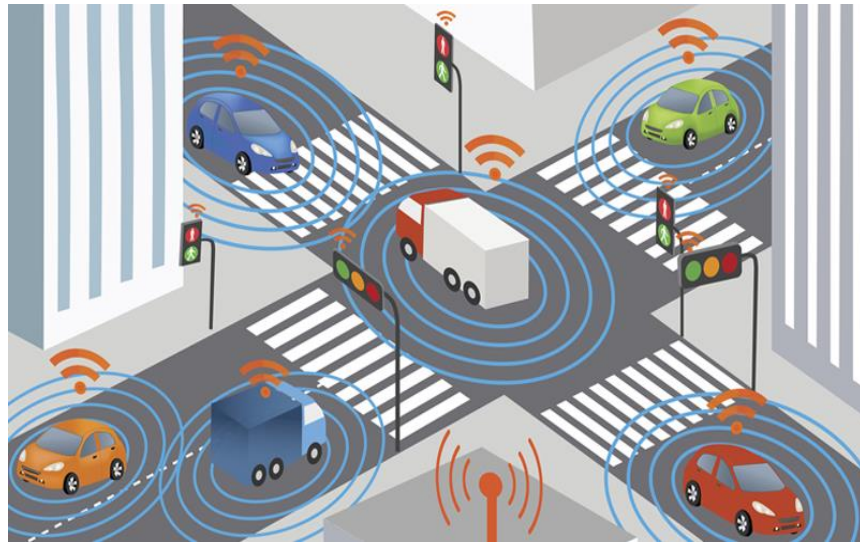
Integrating various sensors such as cameras, LiDAR, GPS, and inertial measurement units (IMUs) into drones and processing the vast amounts of sensor data in real-time pose significant technological challenges.



Solution: **SIMULIA** and **DELMIA Quintiq** can be used to integrate sensors into drone designs and optimize data processing workflows. **SIMULIA** and **DELMIA Quintiq** enables companies to simulate sensor performance and integration also provides advanced analytics capabilities to process sensor data in real-time and extract actionable insights for decision-making using a virtual twin model.

6. Autonomous Operations:

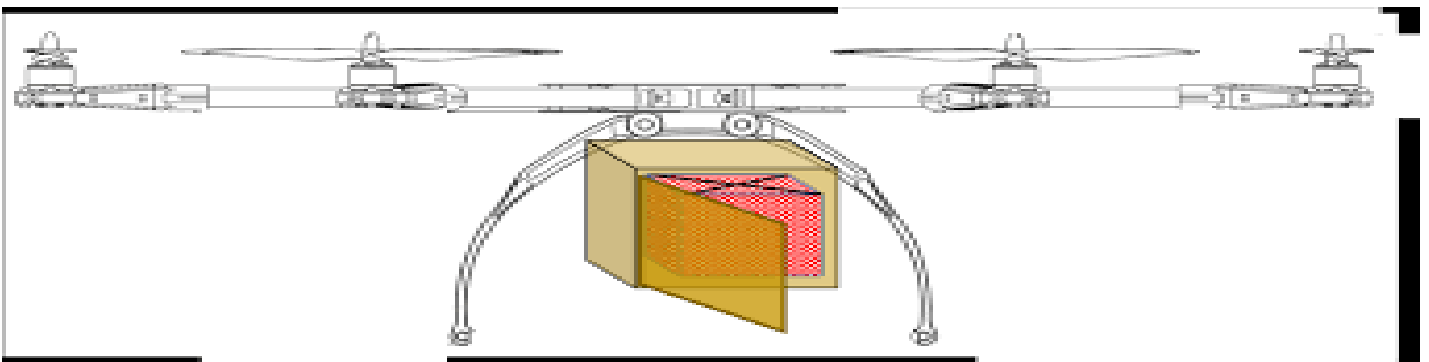
Increasing the autonomy of drones to perform tasks such as takeoff, landing, route planning, and obstacle avoidance without human intervention is a significant technological challenge.



Solution: Through virtual twin capabilities of **3DEXPERIENCE Platform** models behaviors under different circumstances can be verified and simulated for autonomous operations. Using **SIMULIA Automation & Optimization** , companies can validate their various models for optimum use.

7. Payload Capacity:

Drones have limited payload capacities, restricting the types and quantities of goods they can transport. Enhancing payload capacity without compromising flight performance requires advancements in lightweight materials, aerodynamics, and propulsion systems.



Solution: Using the **3DEXPERIENCE Platform** an optimum design for a wide range of payload capacity drones can be decided. Simulation and virtual twinning capabilities of 3DEXPERIENCE Platform will allow a company to select a drone for a specific use case.