

Indoor Autonomous Drones for Inventory Management

Presented by:

Kaushik Gala

Chief Business Officer

FlytBase, Inc.

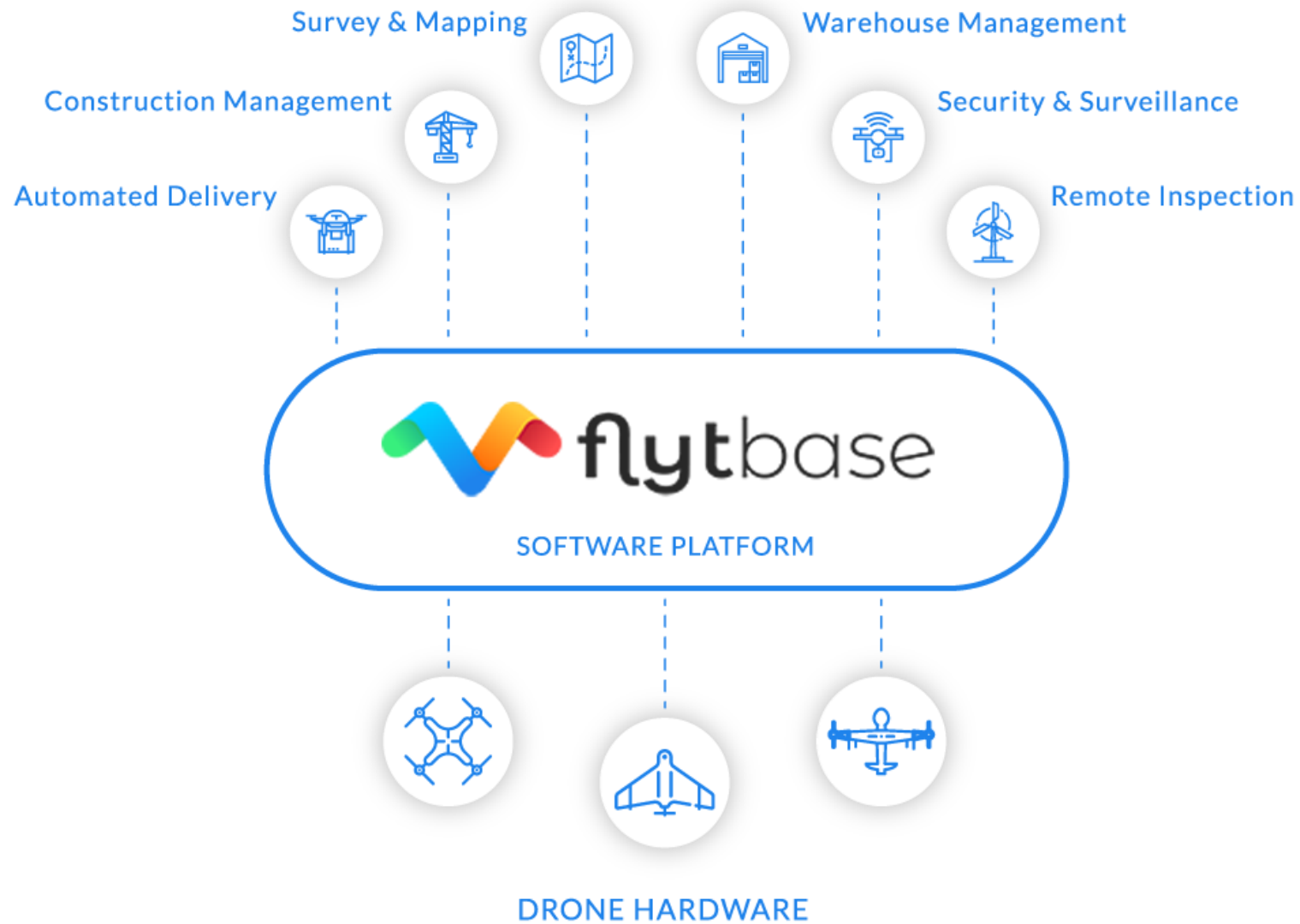


POWERED BY POSSIBILITIES.



powered by  MHI

About FlytBase, Inc.



POWERED BY POSSIBILITIES.

Copyright © FlytBase, Inc.



Indoor Autonomous Drones



Mines



Warehouse



Tanks



Homes

Technical Challenges



**No/Weak
GPS**



**Static/Dynamic
Obstacles**



**Flight
Stability**

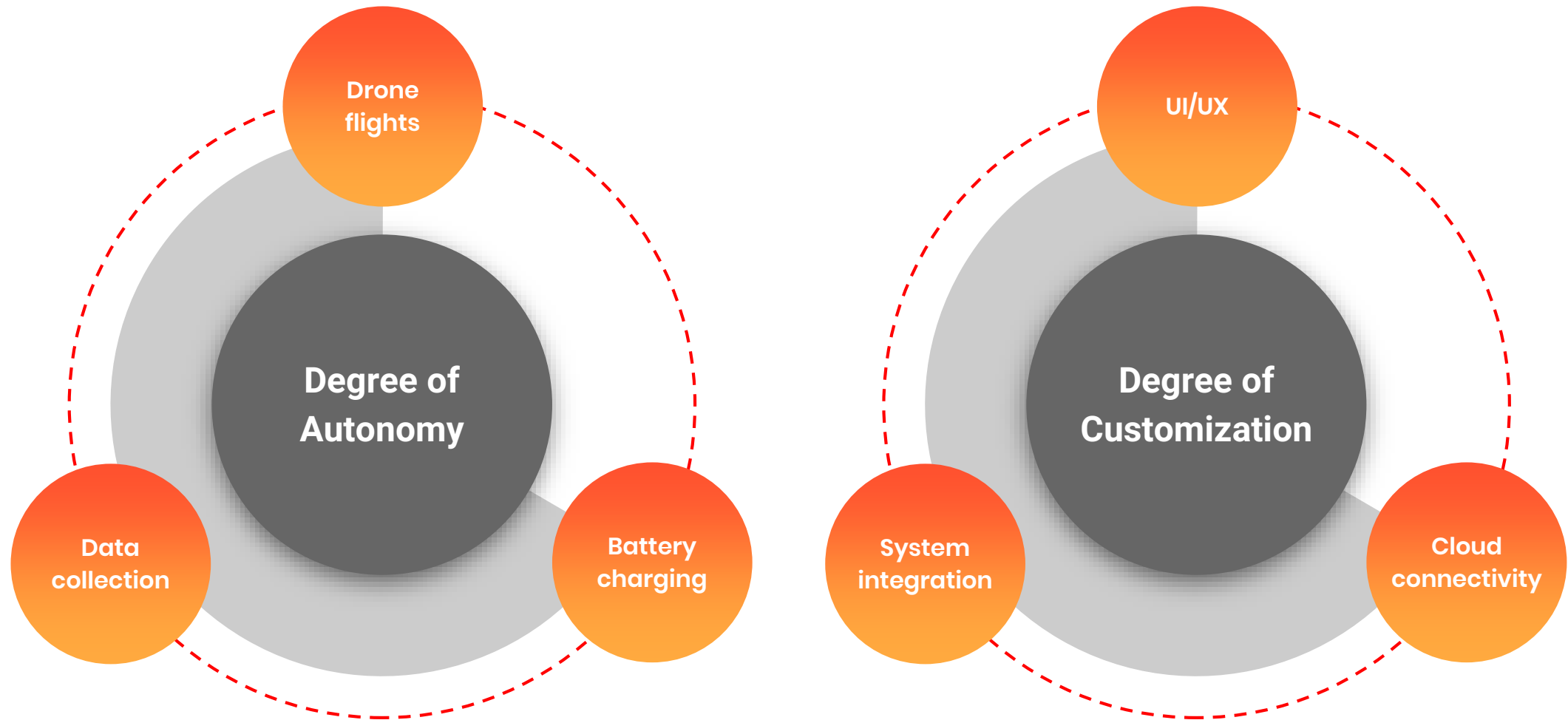


Size & Weight

Solution: ArUco Markers + Simultaneous Localization and Mapping (SLAM)

Types of SLAM: Visual, Inertial, LiDAR, ...

Operational Challenges



Solution: Full Autonomy + Mass Customization

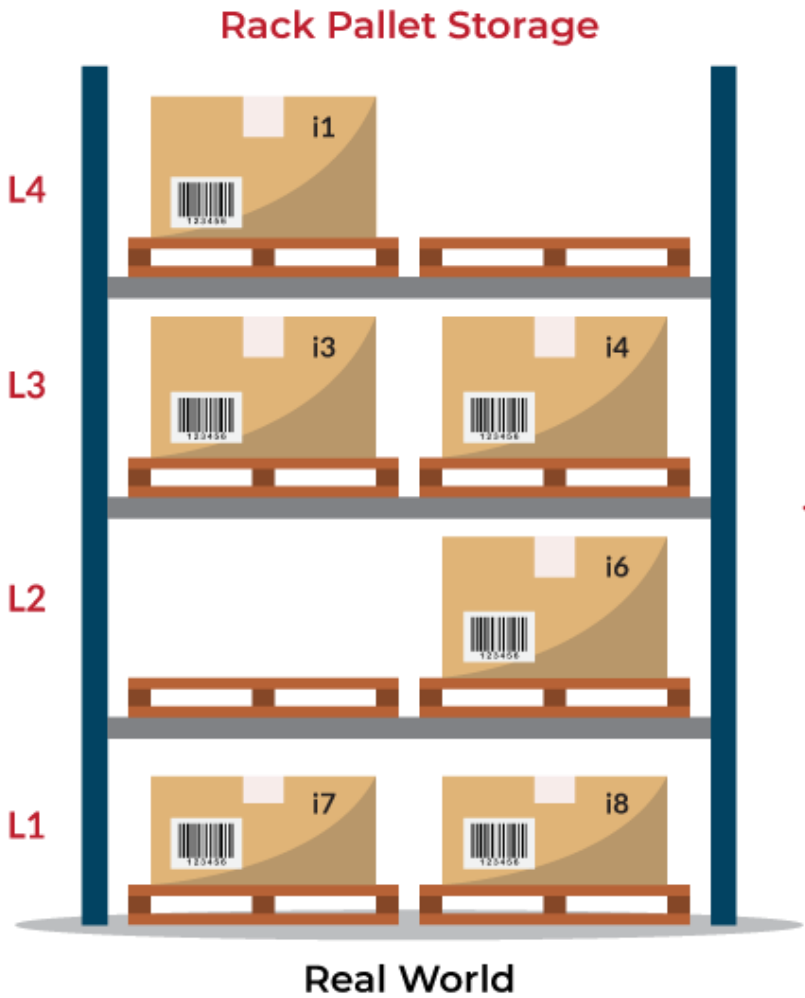
Indoor Autonomous Drones For Warehouse Inventory

POWERED BY POSSIBILITIES.

Copyright © FlytBase, Inc.



Inventory Counting



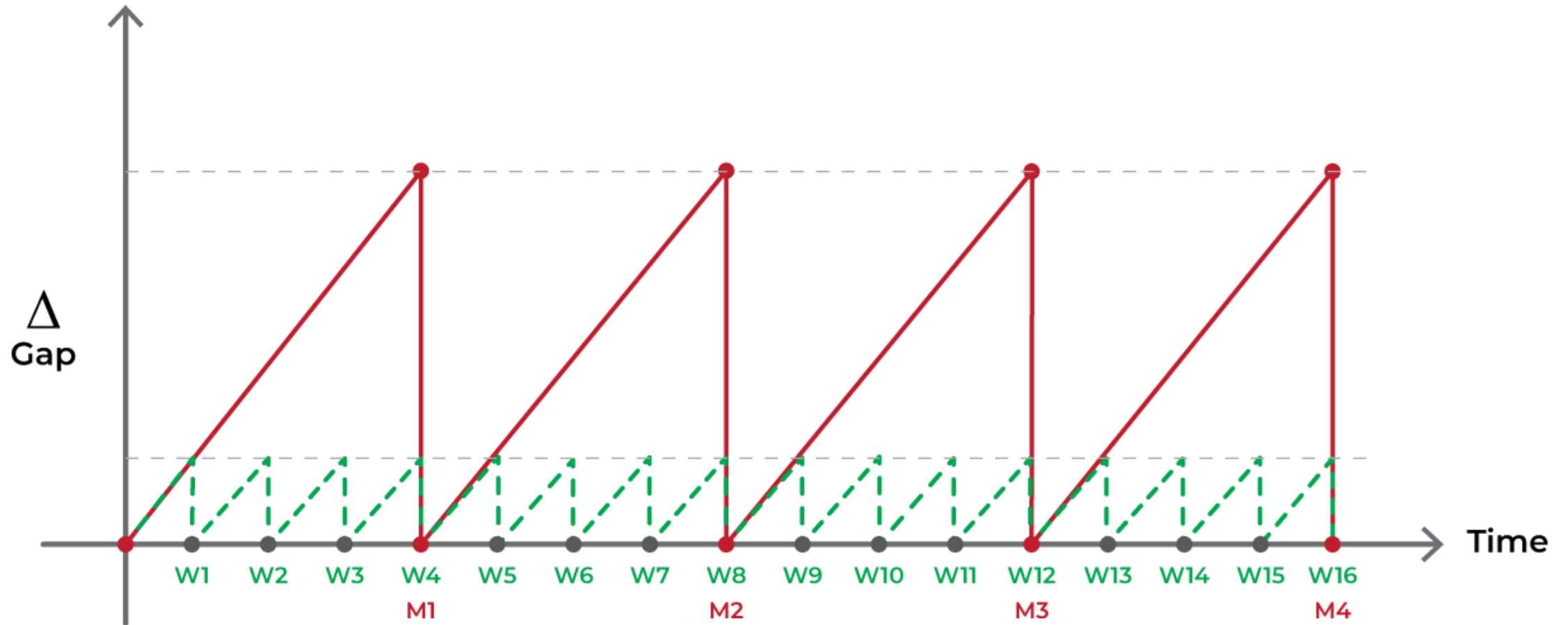
Cycle Counting
($\Delta \downarrow$)

Warehouse Management System

L4	i1	i2
L3	i3	i4
L2	i5	-
L1	-	i8

Digital Twin

Inventory Counting Frequency



Inventory Counting Context



Full Pallets



Case Reserve



Audits / 3PL SLAs



Very Narrow Aisles

Inventory Counting Challenges



Poor
Efficiency



Lack of
Auditability

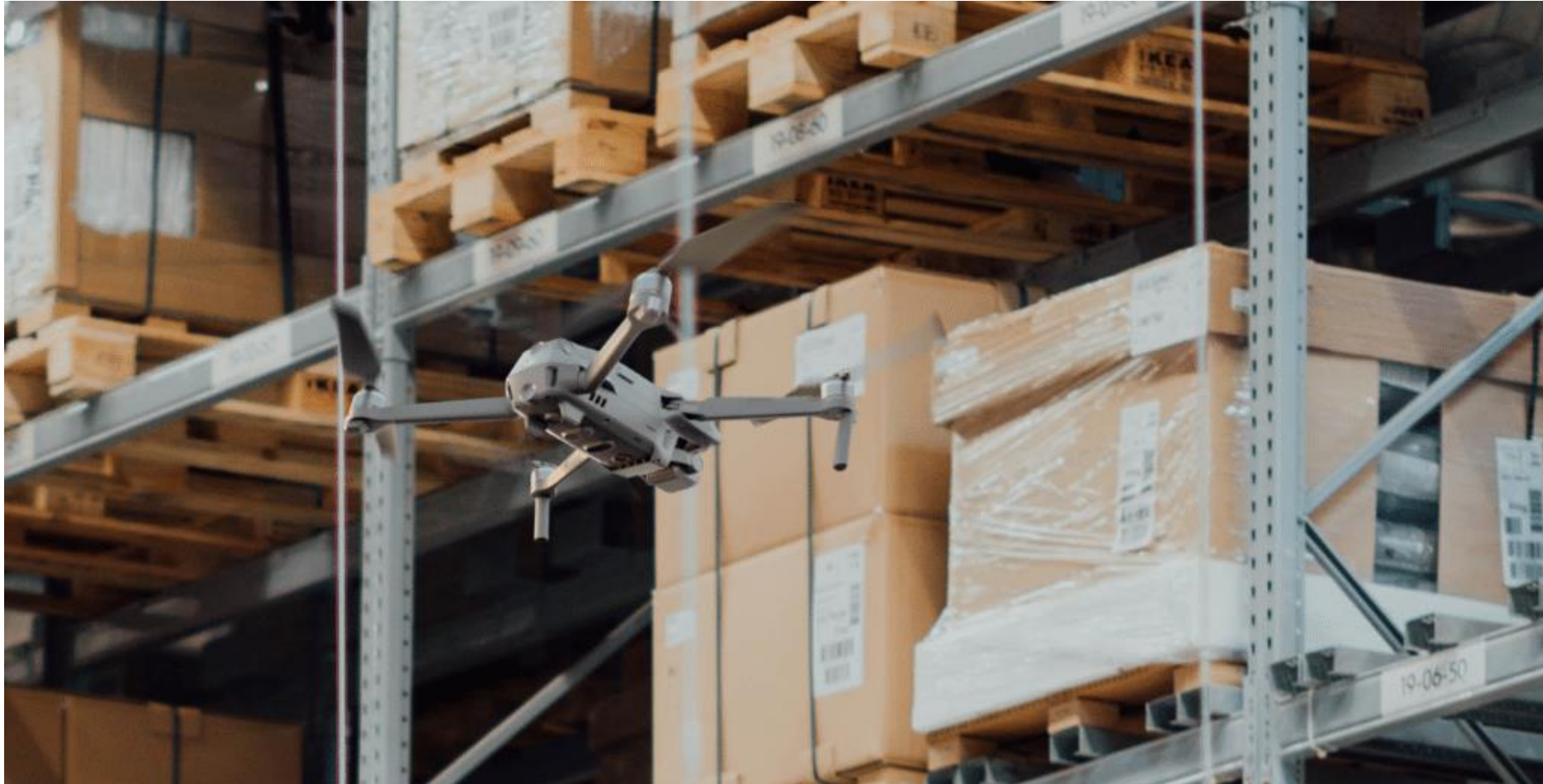


Time
Consuming



Risk of
Worker Injury

Aerial Inventory Scans



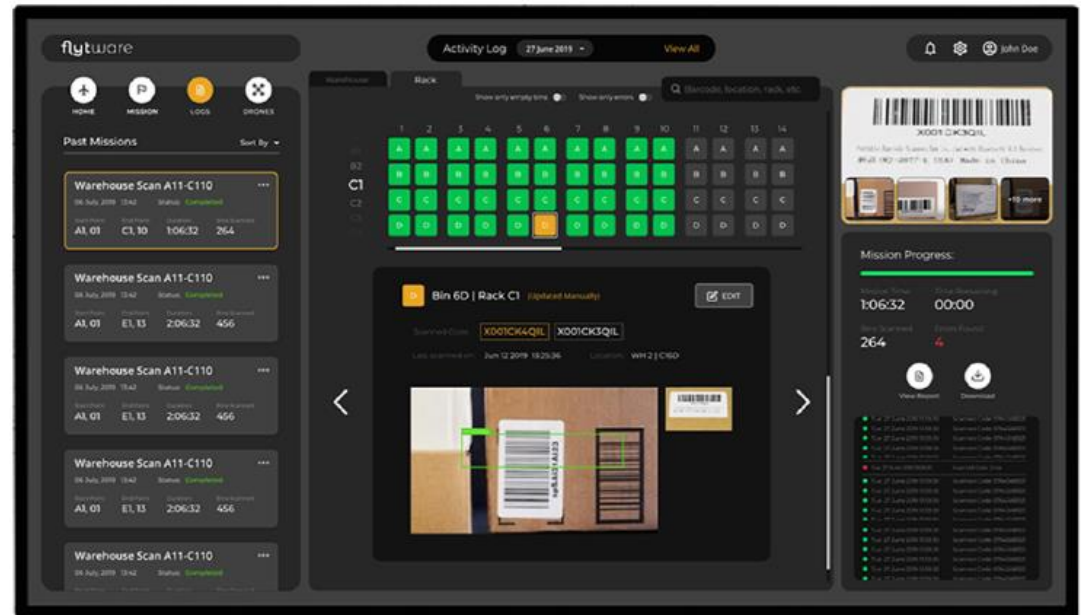
Success Factor: Full Autonomy

- Autonomous navigation - no reliance on skilled human pilots
- Automatic, precise take-off & landing from home location
- Autonomous charging - resume mission after battery charge
- Automatic barcode scans, powered by AI/ML

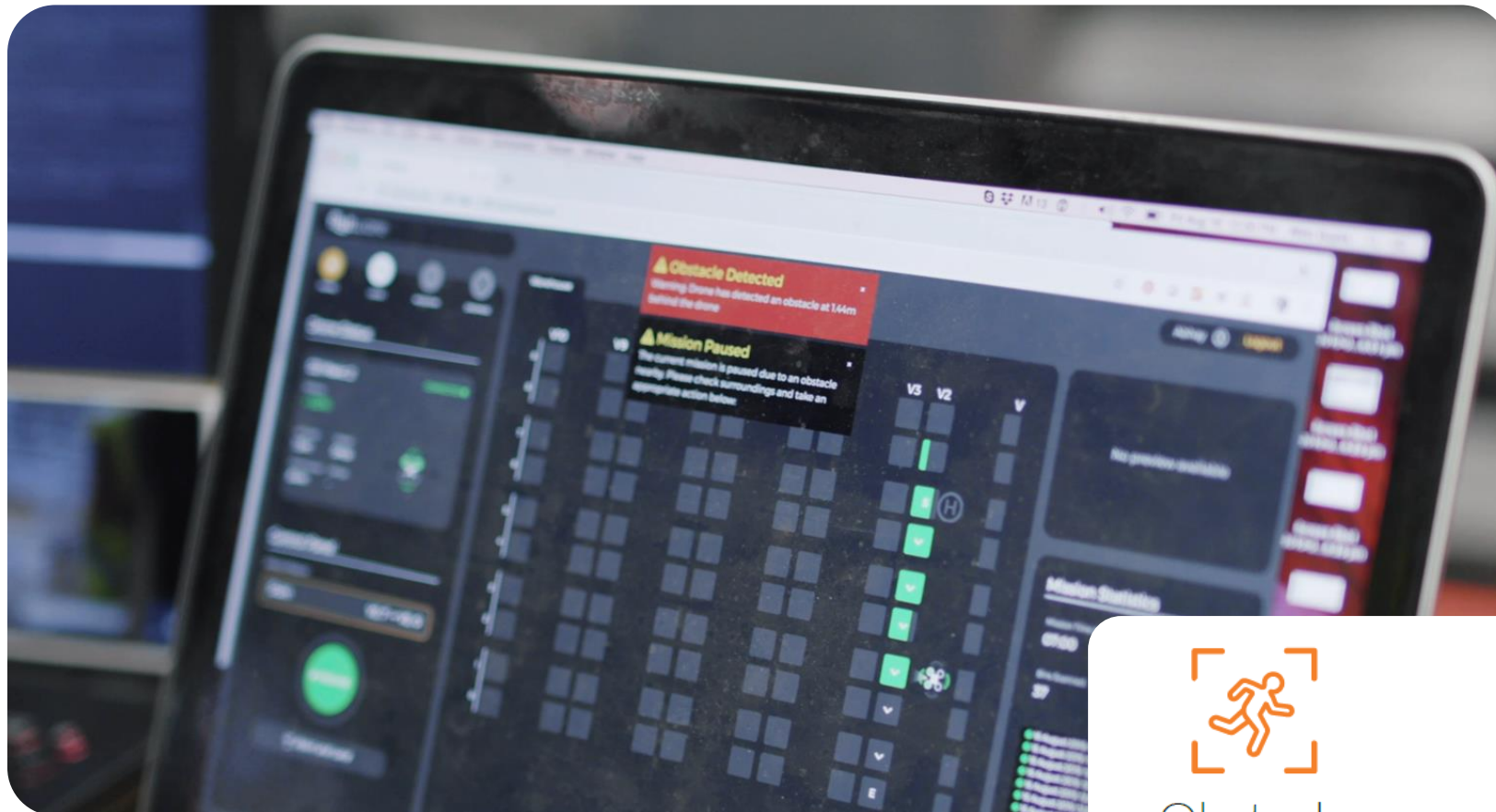


Success Factor: Ease of Use

- Operator-friendly dashboard
- Plan/execute/analyze/repeat inventory missions, on-site or remotely
- Live video feeds, location-wise images, mission archives



Success Factor: Safety



Obstacle
Detection



Sense &
Avoid



SOS
Alert

Success Factor: Inventory Data

- Live video feed
- Location-wise images
- Date-wise image archives
- Location-wise barcodes
- Live drone telemetry
- Mission history
- Drone & battery health
- On-premise/cloud storage

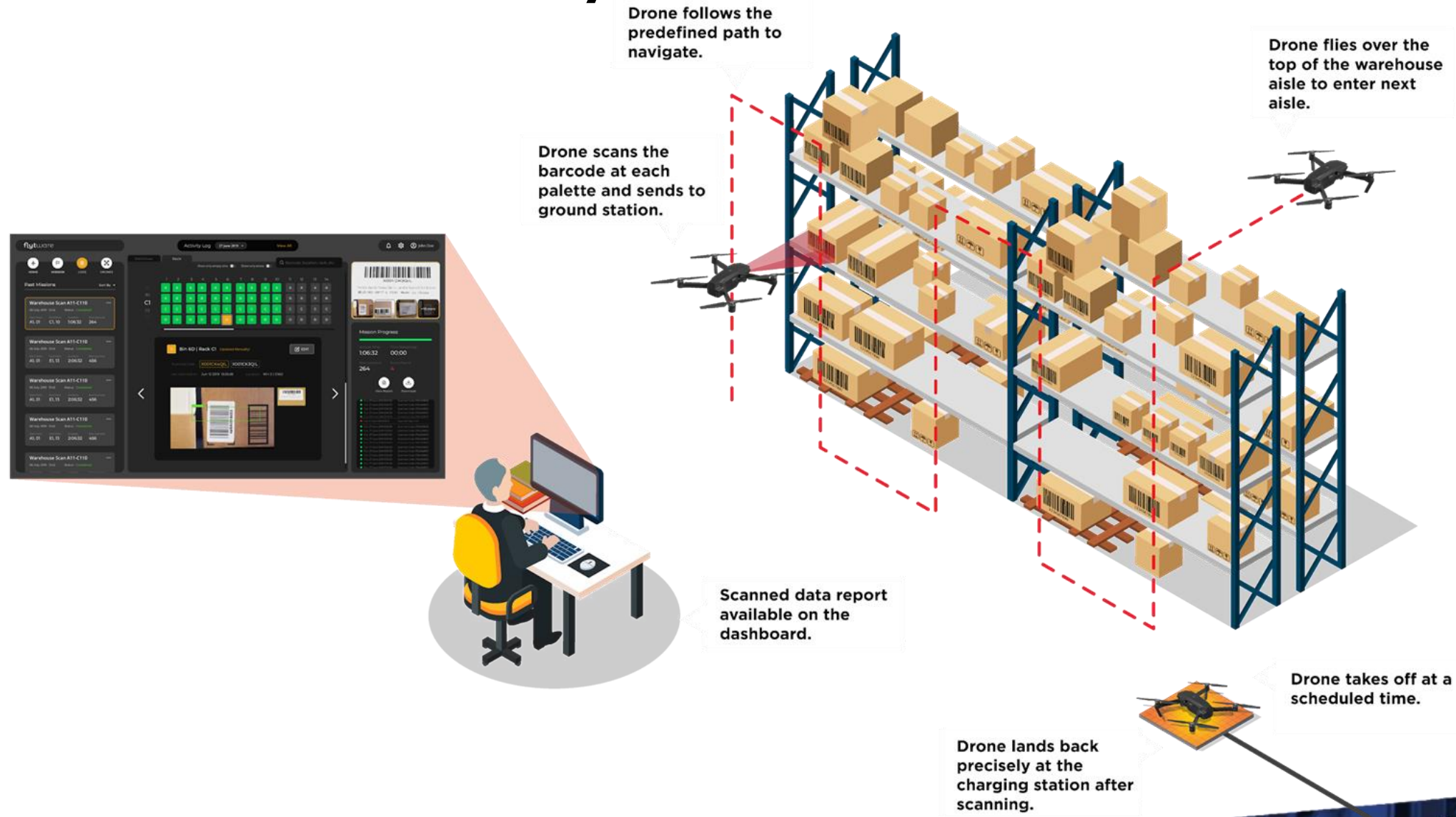


Success Factor: Integration













- Automatic data push into WMS
- Automatic mission triggers from WMS
- API-based system integration
- Remote/centralized mission planning, monitoring & reporting



Workflow for Aerial Inventory Scans



Aerial vs. Manual Counts

Sources of Inventory Inaccuracy		Manual Cycle Count	Drone Cycle Count
1	Hard-to-reach locations inaccessible by a person		
2	Scanning of an incorrect (item or location) barcode by a person		
3	Intentional skipping of an item or location by a person		
4	Theft by a person during stock takes		
5	Errors in manual entry of cycle count data into WMS		
6	Unreadable (damaged, plastic-covered, etc.) or missing barcode		

Estimating the Return on Investment

How many racks have items (full pallets / cases) stored **one-deep** with front-facing bar codes?

On average, how **long** is each aisle?

On average, how often do you **currently** complete a **full** cycle count of all the racks?

On average, how many full time **resources** (across all shifts) are engaged in inventory counts?

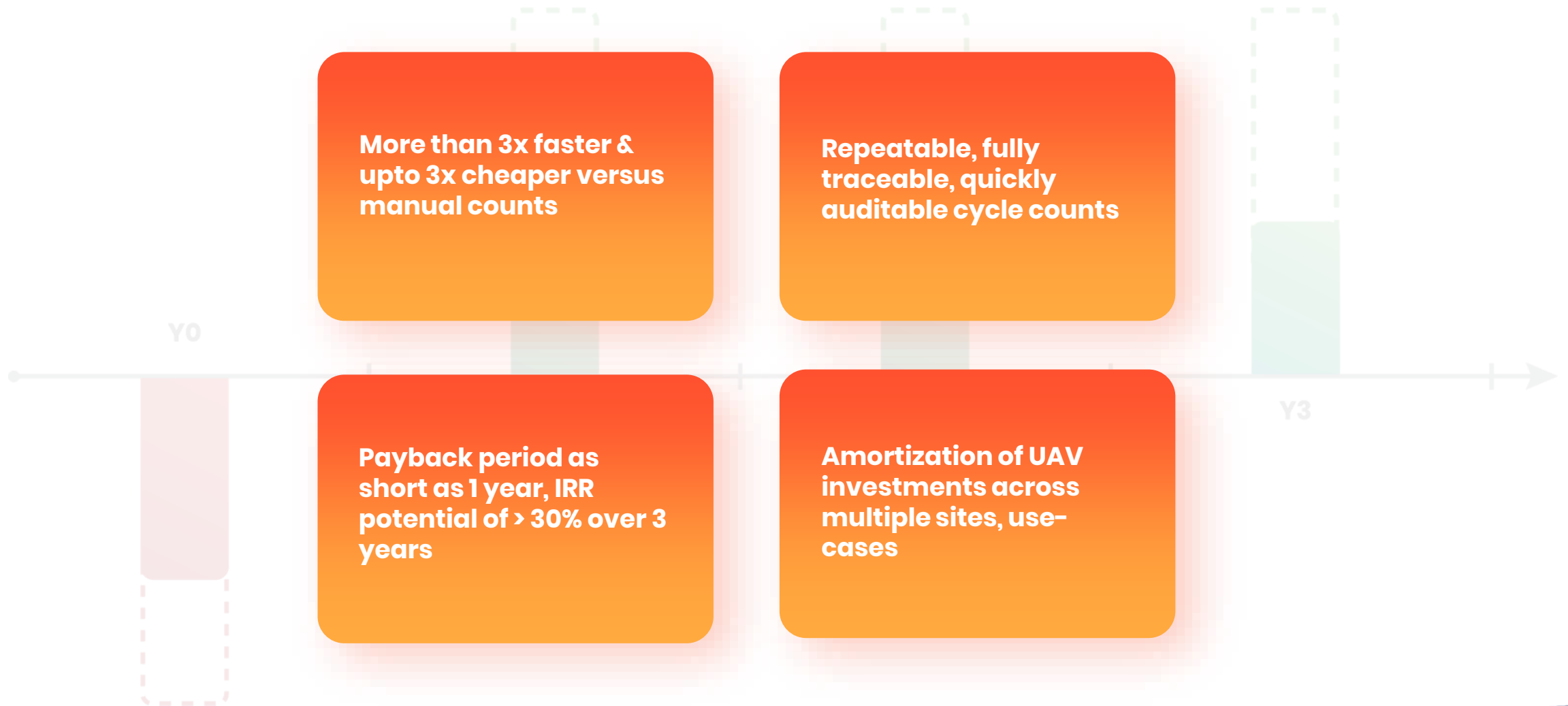
How many racks have items (broken pallets / cartons / cases) stored **multi-deep**?

On average, how **tall** is each rack?

Ideally, how often would you **like to** complete a **full** cycle count of all racks?

On average, how many **hours** each week (including weekends) do you allocate for counts?

Business Value from Drone Cycle Counts



Applicability of Inventory Drones



DCs & Large Warehouses

Save labor, equipment & time by integrating robotic scans of pallets into inventory operations.



Fulfillment & Sorting Facilities

Improve fulfillment metrics by aerial search & detection of critical items, empty & full slots.



Cargo & Freight Forwarding

Adapt to higher supply chain velocity by deploying UAVs for faster, high frequency cycle counts.



Retail Stores & Warehouse Clubs

Minimize stockouts & pilferage by counting bulk storage, every single day, in warehouse stores.

Challenges for Aerial Counts: Broken/Partial Pallets



Challenges for Aerial Counts: Bulk Storage



Aerial & Manual Counts: Complementary, Safe, Scalable

- Humans plan & schedule missions; drones execute them during off-hours
- Drones scan full pallets; humans count partials (usually stored on the ground)
- Drones collect video & images; humans count items remotely
- Drones identify location inaccuracies; humans analyze root-cause
- Drones identify unreadable barcodes; humans read/replace them
- Drones collect top-view of bulk storage; humans move honeycombed items

Drones do the dull, repetitive, dangerous work;

Humans focus on higher-value tasks!

Thank You

For more information:

Email: flytware@flytbase.com

Website: www.flytware.com

Or visit **MODEX Booth #1409**