FIND YOURS.

Integrating Drones in Logistics and Inventory Management

Presented by:
Wilstair, LLC
Presented by:

Will Stavanja
Founder
Wilstair, LLC
Drones in Logistics

Indoor – Inventory Management

Outdoor – Delivery
The Role of Drones

Rapid Fulfillment Needs
Drones Inside Warehouses and DCs

Why?

Another tool for:

1. Cycle Counts
2. Stocktaking or Stock Count
3. Visual Inspections
Drones Inside Warehouses and DCs

Other Options?

• Forklift attachments
• RFID
• 360 cameras
• AGVs
• Automatic shelf scanners
Drones Inside Warehouses and DCs

Benefits?

1. Improve labor efficiency
2. Fewer workers compensation payouts
3. Decrease misplaced or missing inventory
Drones Inside Warehouses and DCs

Safety?

Drones are safe as long as end users and designers don’t neglect the following:

1. Secured and protected battery compartment
2. Established in-flight battery/energy management
3. Established safe charging station(s)
4. Flights do not occur over people inside the facility
5. Perform scheduled maintenance on aircraft
Drones Inside Warehouses and DCs

How do they work?

There are four common methods applicable to indoor flight autonomy:

1. Manual (no autonomy)
2. Flight Assistance
3. High Automation
4. Complete Automation
Drones Inside Warehouses and DCs

How do they work?

Manual (no autonomy)

• Pros:
  – Quick and easy setup
  – Tailor any type of payload/scanner
  – Smaller size aircraft is an option
  – Low cost

• Cons:
  – Demands advanced pilot skills
  – No obstacle avoidance sensors
  – Requires one or two operators (pilot & visual observer)
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How do they work?

Flight Assistance

• Pros:
  – Sense and avoid sensors
  – In-flight pilot assist data

• Cons:
  – Added weight from sensors
  – Unpredictable environment flight behavior
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How do they work?

High Automation

- **Pros:**
  - Single operator
  - Increased sense and avoid in-flight controls
  - Indoor Path planning

- **Cons:**
  - Facility path planning sensors, tags, etc.
  - Requires a skilled operator
  - Setup/Installation cost
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How do they work?

Complete Automation

- **Pros:**
  - Dynamic path navigation
  - Increased level of position accuracy
  - No in-flight operator
  - Long term financial benefits

- **Con:**
  - Decreased flight time
  - Larger aircraft platform
  - Initial integration cost

Photo Credit: Exyn Technologies
Drones Inside Warehouses and DCs

What is the appropriate level of autonomy for your facility?

Depends on:

• Layout of the facility
  – Shelve width, height, and arrangement depth
  – General obstacles (fixtures, cables, signs, etc…)
  – Light conditions
• Wind drafts
• Existing tools (i.e. scanners, etc…)
• Existing process and procedures
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Inventory Data Collection Methods?

Bluetooth

Image Recognition
Drones Inside Warehouses and DCs

Inventory Data Collection Methods?

• Bluetooth (common scanners)
  – Provides flexibility to using common scanners
  – Low integration cost
  – Raw data collection

• Image recognition
  – Real time WMS data feed (requires data feed interface)
  – Rapid isle scans
    ▪ Requires post-processing
  – Logos or special feature recognition are an option
Delivery Drones

Hype Vs. Reality
Delivery Drones

Realistic Expectations?

• Residential deliveries ✗
• Deliveries in various weather conditions ✗
• Long range deliveries with fixed-wing aircraft ✓
• Flights in same space as manned-aircraft ✓
• Hybrid energy sources ✓
• 24/7 flight operations ✗
Delivery Drones

Technical Perspective?

Technical Evolution

- Regulations
- Security
- Reliability
- Airspace
- Endurance

Dark Clouds Above UAV Technology

FIND YOUR WOW
Delivery Drones

Are delivery drones relevant today?

YES!*  

*Disclaimer – Not for all use cases
Delivery Drones

Why?

Use Case

The Van Vs. The Drone
Delivery Drones

Why?

Objective:

- Single package delivery (≤ 10 lbs.)
- Distance of 3.7 miles (point A to B)

The Van Wins!

($0.37 lower operating cost)
Delivery Drones

Why?

Objective:

- Delivery of three packages (≤ 10 lbs.)
- Distance of 3.7 miles ea. (from deployment facility)

The Drones Wins!
($3.52 lower operating cost)
Delivery Drones

Today’s Real Benefits?

Burritos?  Pizza?  Rural Locations

Emergency Medical Supplies
Delivery Drones

Who Really Benefits?

Medical & Pharmaceutical

End User (Recipient)

E-Commerce
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The Technical Reality?

Risks
- Weather
- Temperature
- Wind
- Communications
- UTM
- Regulations

Solutions
- Secured Payloads
- Remote Tracking
- Flight Plans
- C2
- Redundancies
  - Motors
  - Power
Delivery Drones

Technical Considerations?

- Redundancy
- Energy
- Thrust
- Comms
- PNT
- Payload
- Sensors

Secure Payload

Ground Stations

Charging Stations
Key Takeaways

1. Drones are tools and **NOT** the solution
2. Invest in the right technology
3. Don’t sit back and “wait”
4. Technology keeps improving
5. Think: safety, security, & reliability
For more information

Speaker name: William.Stavanja@wilstair.com
Website: www.wilstair.com

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