Roadmaps and Roadblocks for AMRs in Logistics

Aaron Prather, Senior Technical Advisor, FedEx
“I Didn’t Know!”

What everyone says after visiting FedEx operations.
FedEx’s Structure

**Express**
- 1-2 Day Product
- 6M packages a day
- 681 aircraft
- 13 Hubs

**Ground**
- Deferred Product
- 8.5M packages a day
- 39 Hubs

**Freight**
- Less Than Truck Load
- 110K shipments a day
- 25K Trucks

**Logistics**
- Warehousing
- Customs Brokerage
- Cross Border
- Special Handling
Cargo Airports

- **Top 10 in US**
  - Memphis (4.3M metric tons)
  - Anchorage (2.7M metric tons)
  - Louisville (2.6M metric tons)
  - Los Angeles (2.2M metric tons)
  - Miami (2.1M metric tons)
  - Chicago (1.7M metric tons)
  - JFK (1.4M metric tons)
  - Indianapolis (1.0M metric tons)
  - Cincinnati (944K metric tons)
  - Dallas (809K metric tons)

- **Top 10 in World**
  - Hong Kong (5M metric tons)
  - Memphis
  - Shanghai (3.8M metric tons)
  - Incheon (2.9M metric tons)
  - Anchorage
  - Dubai (2.7M metric tons)
  - Louisville
  - Tokyo (2.3M metric tons)
  - Tapei (2.3M metric tons)
  - Paris (2.2M metric tons)
Logistics Clusters (2012)

- Positive Feedback Loop
- A bit Recession-proof
- Jobs can’t be offshored
- Memphis was already a Logistics Cluster before FedEx (1973)
- “Add Value” by generating other industrial activities
  - Memphis – growing Medical Device Industry
  - Indy – growing Pharmaceutical Industry
So Let’s Talk Memphis

- Memphis is America’s Distribution Center
- 87,600 jobs related to Transportation in Memphis
- Per the Bureau of Labor Statistics, Memphis has the highest concentration of “Freight, Stock, and Material Movers” in the country for a large city (64 per 1000 jobs).
- 3PLs locate their operations to be close to the Airport, creating competition for the same talent pool
FedEx & AMRs
FedEx has a history of using AMRs and other robots in various operations across the enterprise. This will only continue as the technology continues to improve.
FedEx’s AMR Process

• Match the Right Robot to the Right Task
• Good ROI
• Test, Prove, Rollout, Repeat
• Duplicate as much as possible across the Corporation
• Co-OpCo Robotics Council
Looking Forward

- Business Models
- Outdoor Use
- Multi-AMR Systems
Business Models

- Product Match to Use Case
- RaaS vs. Purchase Models
- Where is the ROI?
- Avoid Perpetual Pilot Purgatory
Moving Outside The Warehouse

• Logistics Involves Various Levels Of Outdoor Use
• Making AMRs Able To Handle Various Indoor/Outdoor Conditions Will Be Critical Moving Forward
• There Will Be Costs Associated With This
Defining “Outside”

• There Are Various Degrees Of Outside
• Canopy Operations
• Cold vs. Hot
• Dry vs. Humid
• Short Travel Runs vs. Long Travel Runs
Typical LTL Facility
Multiple AMR Management

• How Will End Users Manage Multiple AMR Environment?
• Will My MIR Robot Talk To My Vecna Tugger? How About My Locus Robot Talking To My Otto?
• Deployment of RTLS (Real-Time Location Systems)
• A Recent Audit Of Ground Support Equipment At The Memphis Hub Found 32 Different Manufacturers Of Equipment On The Property.
• FedEx uses an RTLS system to track all its GSE inside the “Four Walls of FedEx.”
Memphis Hub – 1.5 miles across
Recap

• Logistic Clusters
• Logistics Is More Than Warehousing
• Building AMRs For Multiple Environments
• Developing Protocols For Multiple AMR Operations