FIND YOURS.
The Future of Drone delivery and how everyone can benefit from it
Presented by:
North Carolina Department of Transportation
Commercial Drone Delivery

2017 - First year we started to see progress in commercial drone deliveries.

2018 - Real progress on the drone delivery, which came in the form of the creation of the UAS Integration Pilot Program (UAS IPP).

• Test various types of flights that are otherwise prohibited by the FAA’s Part 107 rules - flying BVLOS, or over people.
• Pilot programs selected will be testing drone delivery - Airbus, Matternet, Flytrex, Project Wing, and Zipline

2019 - Going to be the year we see more and more deliveries being approved for complex operations.
Beyond Visual Line of Site

• For routine Drone Deliveries to become a reality, drones will have to be flown BVLOS, almost definitely without a direct Visual Observer.

• In total FAA has granted 29 BVLOS waivers, 17 were given out in 2018.

• Drone delivery companies who received BVLOS
  • Zipline International (2 BVLOS)
  • Matternet (1 BVLOS)
  • Project Wing (2 BVLOS)
  • Flirtey (1 BVLOS)
Parachute standards for Drones

• Specification defines the design, fabrication, and test requirements of installable, deployable parachute recovery systems (PRS) that are designed to be integrated into drone to lessen the impact energy of the system.

• Standard requires an autonomous triggering system to detect failures and deploy the parachute without relying on the pilot as well as a flight termination system to stop the motors from spinning.

• To meet the standard, parachute systems will need to pass a 45 deployments for multi-rotors through which they need to prove the effectiveness of the system in the drones full flight envelope and in various failure scenarios.
UAS Integration Pilot Program

• Established by **PRESIDENTIAL MEMORANDUM**

• **TEST** and **EVALUATE** various models of state, local and tribal government involvement in the development of regulations

• **ENCOURAGE** UAS operators to develop and test new innovative UAS CONOPS

• **INFORM** development of federal guidelines and regulatory decisions on UAS operations nationwide
FAA UAS Integration Pilot Program
North Carolina Aviation Timeline

1903
1940
2015
2018
2020
NC Offers Robust Proving Ground

• Wide range of topography
• Time-consuming routes due to geography (esp. coast and mountains)
• All types of airspace (Class B, C, D, E, Military)
• Urban/rural mix, high-tech innovation centers, agriculture, major biotech/medical clusters
North Carolina Participation Goals

• **IMPROVE** the lives and economic well-being of North Carolinians through innovative UAS operational concepts throughout the state, with primary focus on **medical package delivery and infrastructure inspection**

• **UNDERSTAND** the role of state and local government in localized UAS airspace management and new regulations

• **INFORM** development of federal guidelines and regulatory decisions on UAS operations nationwide

• **ENABLE** gateway to routine UAS operations for the public good
NC UAS Integration Pilot Program

NCDOT’s pilot project will test drone flights that go beyond the operator’s line-of-sight. The pilot includes:

- **Medical package delivery** across an urban medical network and rural package delivery originating from or near an urban center.

- **Local package delivery** originating from a moderately sized town’s shopping center to a nearby athletic park.

- **Infrastructure Inspection** of State assets including roads, bridges, dams and waterways.
NC leading in UAS technology
Program Benefits

NC Benefits
• Continues our leadership in UAS innovation
• Promotes UAS industry and job growth
• Offers hands-on STEM educational outreach

Consumer Benefits
• On-demand service and faster results
• Reduced time to treatment, potential to save lives
• Potential for lower patient costs

Industry Benefits
• Opens new markets for on-demand delivery
• Informs and assists product development
• Accelerates the adoption of regulations
Community Impact

- **Improved Health Care Outcomes** – Greater access to health care services and resources, faster service, lower costs
- **Tangible Economic Outcomes** – New industry and related economic impact
- **Innovation Outcomes** – Linking aviation, technology, health care
- **Rapid intra-metro and rural access** – Critical medical supplies and laboratory tests exchanged on-demand in minutes
Planned NC Operations

Urban Example

Rural Example
• Urban medical package delivery focus
• Operational in Switzerland delivering lab samples since October 2017
• 4000+ autonomous flights
• 1,300 urban BLVOS delivery flights
• All-weather drone with 12-mile range
• Secure landing station that changes batteries and delivery items
First Flight: Medical Package Delivery

First Flight: Aug 29, 2018
Task:
Fly a lab sample from a medical surgical center to main campus
Test:
• Package delivery
• Air space management tool
• Flight over people
• Detect & Avoid
Routine Flights: March 12, 2019
• First routine revenue package delivery flight via drone took place at WakeMed Campus in Raleigh, NC.
• Official partnership between UPS and Matternet for Part 135 operations.
• Waiver for Operations over People
BVLOS UAS Route Planning
• Suburban food package delivery focus
• BVLOS operations in Iceland, Panama and Costa Rica
• Operating automated aerial deliveries, from delivery stations located in central commercial areas and distribution centers
• Orders made using an online ordering portal
• Using a single station all residents living within a 3-mile radius from the station could be potentially served.
ZIPLINE

• Rural medical package delivery focus
• Operational in Rwanda since Oct 2016
• Only company with autonomous deliveries at national scale
• 150,000 miles flown (circling the globe 5.5x)
• 5,000+ operational BLVOS flights
• 10,000 units of blood delivered
• 50-mile operational radius
• All-weather capable fixed-wing drones
NC Continued Path Forward

Urban Air Mobility (UAM)

• Routine Medical Package Delivery
• Routine Food/Parcel Package Delivery
• Infrastructure Inspection
• Autonomous Ambulatory Services
• Single Pilot Cargo Aircraft
• Unmanned Cargo Aircraft
• Unmanned Traffic Management
Flirtey received approval from the FAA to conduct drone delivery flights beyond visual line of sight (BVLOS) in city of Reno.

Based on historical data, just one Flirtey delivery drone carrying an AED has the potential to save at least one life every two weeks in Reno. Deployed nationwide, AED drone delivery service has the potential to save more than 100,000 lives per year and more than 1 million American lives over each decade to come.
Project Wing has made the first BVLOS over-urban area drone delivery flights in Virginia, as part of the government’s UAS IPP. A drone operated by the company flew from a simulated store in Blacksburg more than a mile away, hovered over a lawn and lowered an ice cream and Popsicle to a waiting customer.
• Urban first and last mile use case is the most tangible and spectacular in the logistics industry.

• Largest barriers are privacy and safety concerns which multiply in the densely populated urban environment.

• Regulatory framework conditions and infrastructure challenges especially integration into existing urban infrastructures
Weight Limit for Drone Delivery

- **Amazon Prime Air**: 5 lbs (2.3 kg)
- **Flirtey**: 5.5 lbs (2.5 kg)
- **DHL Parcelcopter**: 2.6 lbs (1.2 kg)
- **Posti**: 6.6 lbs (3 kg)
- **Alibaba**: 2.2 lbs (1 kg)
- **Horsefly**: 10 lbs (4.5 kg)
- **CJ Sky Door**: 6.6 lbs (3 kg)
- **UPS-Matternet**: 4.4 lbs (2 kg)
AIRMAP UTM Dashboard

- AIRMAP tool developed to track drones for NC IPP
- Drone operators ID the drone and location through an app
- Have both FAA SWIM manned aircraft and unmanned aircraft data
Remote ID Application

• On December 17th, 2018 Kittyhawk, Wing and AirMap demonstrated an implementation of an open source, network-based, remote identification solution called InterUSS.

• This is a key building block for future UTM, BVLOS, and even Urban Air Mobility (UAM).

• Wanted to allow the public to see who is operating in their vicinity and what they were doing, and at the same time also protect the privacy of customers they were delivering to.
Urban Air Mobility

• What – UAM is an aviation term for on-demand and automated passenger or cargo-carrying air transportation services, typically flown without a pilot.

• Why – UAM will bring new ways for people to travel around cities and urban areas, while reducing congestion.

• Who - NASA remains committed to supporting accessible air transport systems for passengers and cargo by working with the UAM community to identify and address the key challenges ahead.
NC Department of Transportation

• Transportation Infrastructure Inspection
• Operations under Part 107 and COA
• Beyond Visual Line of Site, Night Operations and Operations Over People
• Routine inspection, natural disaster response, critical construction phase inspection
• Airports, bridges, construction projects, landslides, rail corridors, traffic monitoring
• Internal NCDOT operators/flight teams
Environmental Applications

• Successful utilization of a drone to spray an herbicide to treat Australis phragmites at Bodie Island Lighthouse

• North State Engineering supported effort

• First time approved by National Park Service

• Agricultural Permit
For more information

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