Introduction to Unmanned Aerial Systems (UAS) for Public Safety

IMPORTANT TERMS AND DEFINITIONS

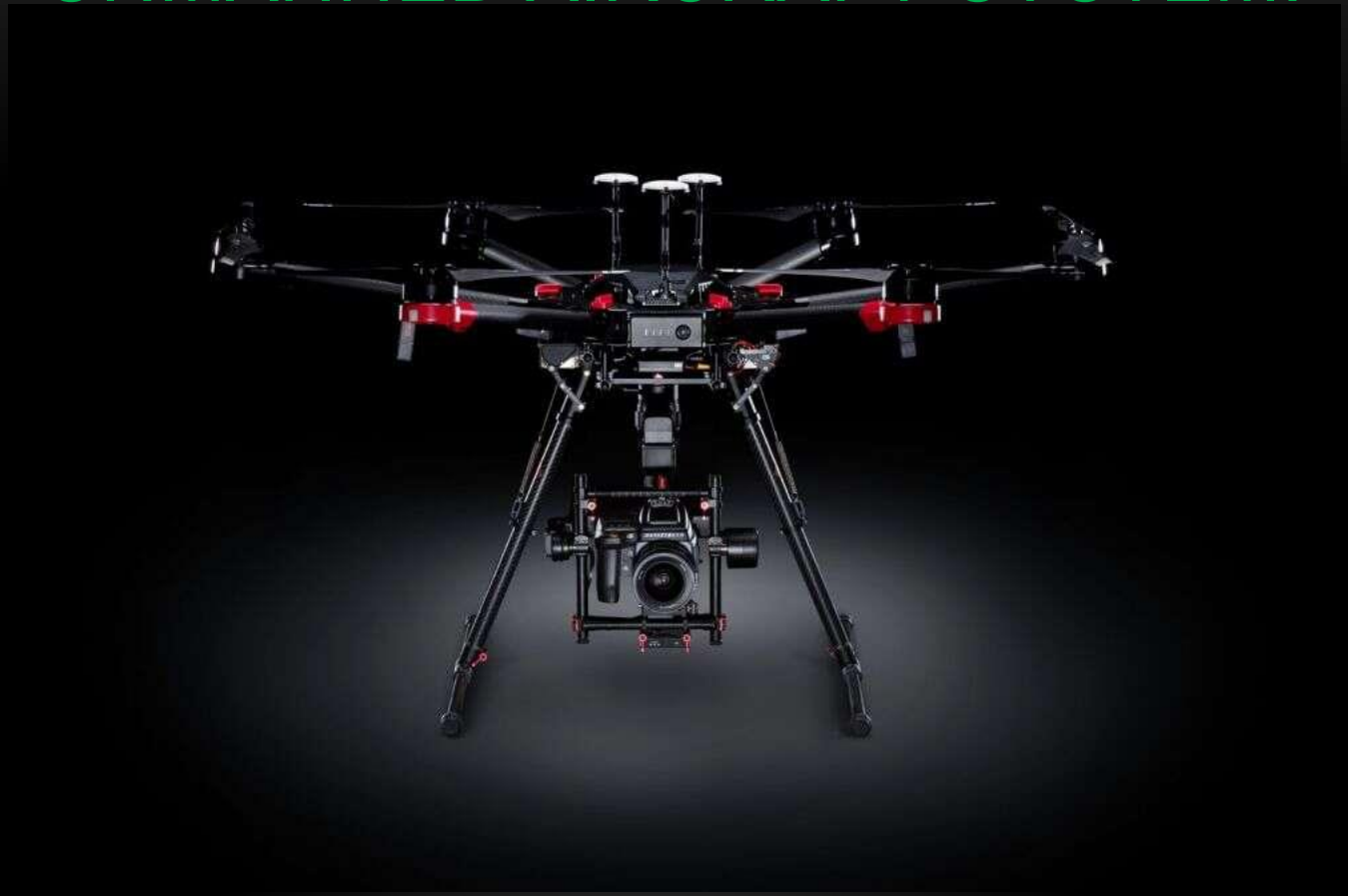
- **UAS:** Unmanned Aircraft System
- **UAV:** Unmanned Aerial Vehicle
- **RPV:** Remotely Piloted Vehicle

COURSE OBJECTIVE

- To define a UAS & technology limitations
- Explain Part 107
- Community Engagement
- How the unit was created, testing, etc..

THIS IS NOT A SMALL UNMANNED AIRCRAFT SYSTEM!

THIS IS A UNMANNED AIRCRAFT SYSTEM!



WHAT ARE "UNMANNED AIRCRAFT SYSTEMS" ?

- Remotely controlled airplanes, helicopters, and airships
- Less than 55 lbs gross weight (Part 107)
- Less than 100 mph (87 kts.) top speed (Part 107)
- Capable of downlinking data
  - Still pictures
  - Video
  - FLIR
  - Environmental sampling

IMPORTANT TERMS AND DEFINITIONS

- **First Person View (FPV):** Flying UAS solely based upon video downlink image from aircraft.
- **Visual Flight Rules (VFR):** Operating an aircraft in visual conditions pursuant to airspace ceiling and visibility requirements. 3 sm visibility and 500’ below clouds for UAS.
- **14 CFR, Part 107:** New section of federal aviation regulations addressing small UAS (UAS). (Aug 16)

UAS TECHNOLOGY

- **Four ways to legally Fly UAS**
  - Hobby use: No COA required (AC 91-57)
  - Government use: COA required or exercise Part 107
  - Commercial use: 333 exemption* or exercise Part 107
  - Special airworthiness certificate

*Sec 333 of the FAA Modernization and Reform Act of 2012

UAS TECHNOLOGY

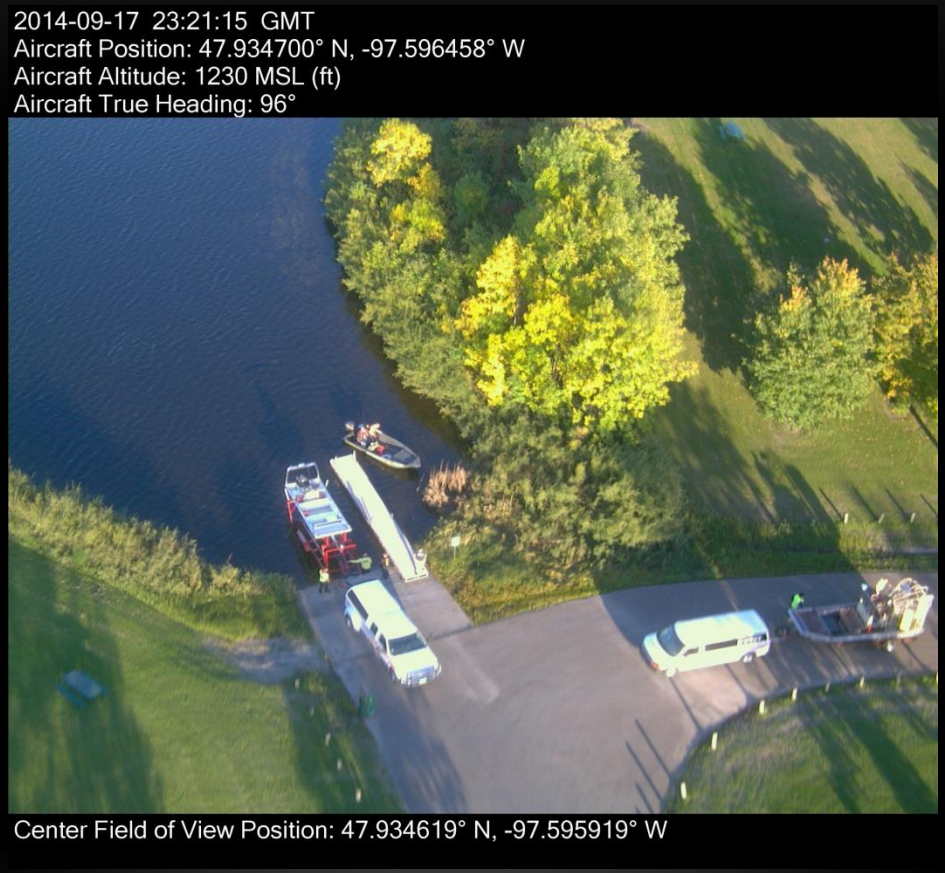
- **Power plants:**
  - Most common: Brushless electric motors
  - Some internal combustion engines also in use (Scan Eagle, Lepitron, Honeywell MAV)

- **Batteries:**
  - Most common: Lithium Ion
  - Key is high storage capacity combined with low weight and bulk
  - Lithium Ion batteries subject to thermal runaway (B-787)
  - Do not leave unattended while charging
  - Do not charge when hot

UAS TECHNOLOGY

- **Sensor Systems:**
  - Electro-optical camera (EO)
  - Low Light (LUX)
  - Infrared (IR)
  - Multispectral (MS)
  - Hyperspectral (HS)
  - LIDAR (**Light D**etection **A**nd **R**anging)
  - Gas chromatography
  - Radiation Sensor

FULL SPECTRUM CAMERA VIEW



2014-09-17 23:20:49 GMT
Aircraft Position: 47.934753° N, -97.597099° W
Aircraft Altitude: 1230 MSL (ft)
Aircraft True Heading: 94°

Center Field of View Position: 47.934655° N, -97.595573° W

UAS LIMITATIONS

- **Technical Limitations:**
  - Vary widely but commonly:
    - Winds less than 25 MPH
    - Flight duration:12-90 minutes
    - Max level flight speed: 35 MPH (average)

- **FAA Limitations**
  - Generally below 400’ Feet
  - No flight over people not involved in operation of the UAS
  - Public aircraft with COA or Part 107 Operations
  - Daytime Ops only unless night ops permitted by COA or Part 107 Waiver

SYNOPSIS OF PART 107: OPERATIONS

- Class G operations do not require ATC notification
- Class B, C, D, and E operations permitted with ATC approval
- No operations from a moving aircraft
- Operations from moving vehicle only in sparsely populated area
- External loads OK but no HAZMAT
- Pre-flight inspection required
- Operators may control one aircraft only

SYNOPSIS OF PART 107-PILOTS

- Establishes “Remote Pilot Certificate”
  - PREREQUISITE: Age 16
  - Be vetted by Transportation Security Administration (TSA)
  - Pass an aeronautical knowledge test at an FAA approved testing center, OR
  - Be a Part 61 certificated pilot (other than student), AND
    - Complete an online training course (www.faasafety.gov), AND
    - Have a current biannually flight review (BFR)
- Part 61 pilots must complete online refresher course biannually.
- Remote Pilots (only) must retake knowledge exam biannually.

SYNOPSIS OF PART 107: AIRCRAFT

- No airworthiness certificate required
- Maintenance records must be maintained
- Aircraft must be registered

PART 107 OPERATIONS

- **14 CFR Part 107**
  - Final rule published 21 Jun 16
  - Regulation published late August 2016
    - Daytime Ops in any airspace except “A” below 400’ AGL
    - Certificated pilot online course completion
    - Non-certificated pilot knowledge exam (valid for 2 years)
    - Exemptions available (night ops, over 400’ AGL)
- **Advantages:**
  - Nationwide operations
  - Standardization of pilot certification requirements
- **Disadvantages**
  - Pilots must complete online course and, if not manned pilot, exam
  - Additional FAA oversight
  - Need to secure waivers for night, airspace, etc.…

COMMUNITY ENGAGEMENT

- **Actively engage the public and the media**
  - Invite media to observe scenario based training
  - Solicit public comments
  - Grant interviews to the media
  - Be honest and straightforward

HOW MPD'S UNIT IS BEING CREATED

- Draft a UAS Unit Policy Manual
  - Minimum pilot and visual observer requirements
  - Duty hour limitations
  - Operational limitations (wind, visibility, ceiling)
  - Initial and recurrent training requirements
  - Maintenance tracking
  - Safety
  - Pilot and visual observer duties
  - Data retention and security (if not addressed by separate policy)

HOW MPD'S UNIT IS BEING CREATED

- Keep good records
  - Make written record of all flights
  - Maintain excellent training records
  - Maintain excellent maintenance records
  - Comply with FAA COA online reporting requirements
- Be respectful of 4th Amendment and privacy
  - Establish an image retention policy
  - Retain only essential images
  - Safeguard images as evidence
- Train regularly and realistically