York County Emergency Management Agency
(YCEMA)

UAS Workshop

New England Highway Operations Group

April 11, 2019

Today's Presentation

sUAS – Unmanned Aerial Systems

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DISCLAIMER

- ✓ Nothing contained in this presentation is to be interpreted as an endorsement of any product or service
- ✓ This slideshow will not be shared
- ✓ Feel free to raise your hand for questions; we'll do our best to answer them for the benefit of the whole audience or plan to meet one on one

Background & Introduction

In winter 2016 Art Cleaves, Director of York County EMA tapped the resources of a volunteer IMAT Team to create the sUAS Initiative.

After purchasing the first aircraft and navigating the fledgling FAA regulations we learned "day by day".

The purpose of this presentation is to describe the opportunities and considerations for commercial use of Unmanned Aerial Systems in the National Airspace System (NAS) which is controlled by the Federal Aviation Administration (FAA)

YCEMA Objectives

1. Support Town, County, State, and Federal Agencies as possible.
2. Conduct safe and successful sUAS operations with qualified (FAA Part 107) pilots and Visual Observers (VO).
3. Operate sUAS IAW Local/State Laws & FAA Regulations.
4. Develop Center of Excellence as working model for training and sUAS operations in Maine.

"Potential" Real World Missions

- Structure & other Fires
- Vehicle accidents
- Search & Rescue
- Live Shooter/Stand off / Evac Drill
- HAZMAT Spill
- Damage Assessment –FEMA support
- Dam Inspection/Flooding
- * Indoor fires (Industrial) *

Potential Support to:

- York County Sheriff Office
- Maine IF&W
- Local Fire Departments
- Maine State Police
- Local Law Enforcement
- MEMA/FEMA
- Maine Dept of Transportation
- Department of Environmental Protection
- Public Sector Quasi-Municipal Agencies
- Private Sector Partners – Note: “crossing the line”

Overview UAS Section

- Regulatory issues
  - FAA Part 107 (airspace, pilot quals, reporting, limitations, etc)
  - COA - Certificate of Authority (Waiver)
  - State Laws & Local Ordinances
- Leadership & Structure
  - Volunteer team –multiple skill sets, varied schedules
  - Policies & Procedures
  - Accountability (Need responsible custody of data)
  - Support from EMA Director
- Equipment (Show & Tell)
  - UAS airframes: *DJI S1000, DJI Inspire I, DJI Mavic Pro*
  - Capabilities: Recorded Video, Still photos, Thermal, Video Streaming

Equipment

S1000 Octocopter

DJI Inspire 2

DJI Mavic Pro

FPV Goggles

Live Stream to Command Vehicle

YCEMA Command Vehicle

YCEMA COA

- FAA - Certificate of Authorization
  - Public Use Aircraft defined; refer to **49-USC-40125**
  - Initial issued 22 April 2016 ; Renewed –Jun 2018
  - COA may be cancelled at any time by FAA Administrator.
  - Restricts use of sUAS to **<55lbs** only in **Class G** airspace at or below **400' AGL.**
  - Addendum issued 5 Jun 2017 to permit sUAS night operations.

Mission Flying

- Overall Incident briefing
- Approval to fly (Jurisdiction and Incident Commander)
- Risk Assessment Checklist
- With "COA" - Public Use Aircraft defined; refer to **49-USC-40125**
  - National Defense, Intelligence
  - Firefighting
  - SAR
  - Biological, Geological Resource Management
- Part 107
  - Training
  - Law enforcement activities
  - Damage Assessment

YCEMA OPS Plan

- UAS Operations & Deployment
  - Authorization from EMA Director
  - Pilot in Command (PIC) + 1 or 2 Visual Observers (VO's)
  - PIC must maintain VLOS (Visual Line Of Sight)
  - Public Civil Liberties & Rights to Privacy Training
  - Archive video & preserve chain of custody
  - Pre-flight checklist
    - Varies per airframe
    - Define mission
    - Conduct Risk Analysis

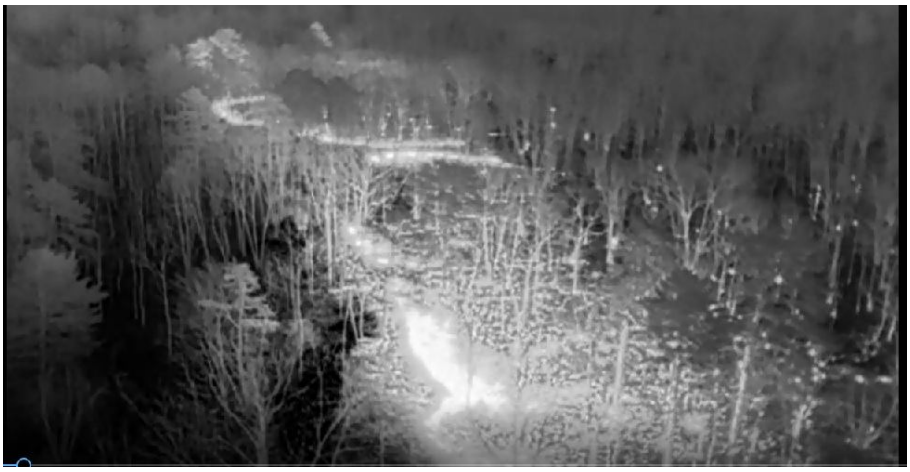
Sanford Mill Fire - June 2017

Video

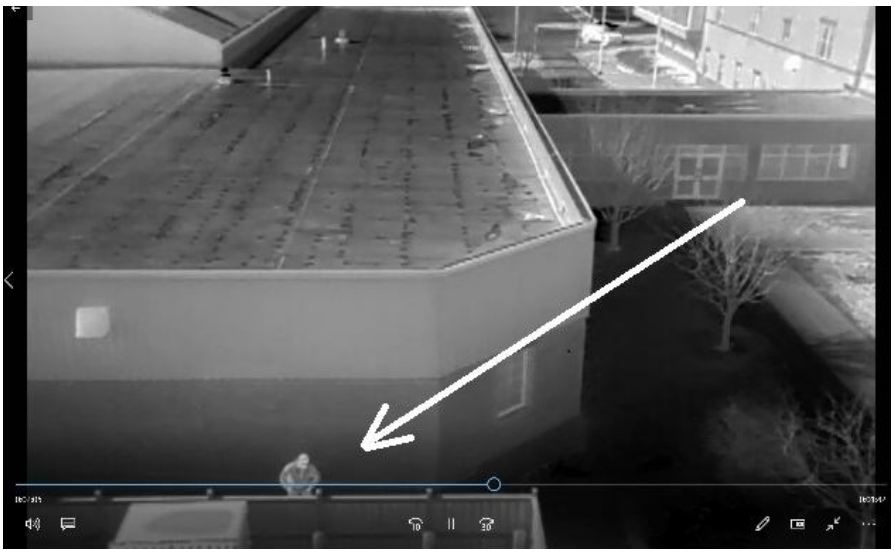
Sanford, Maine

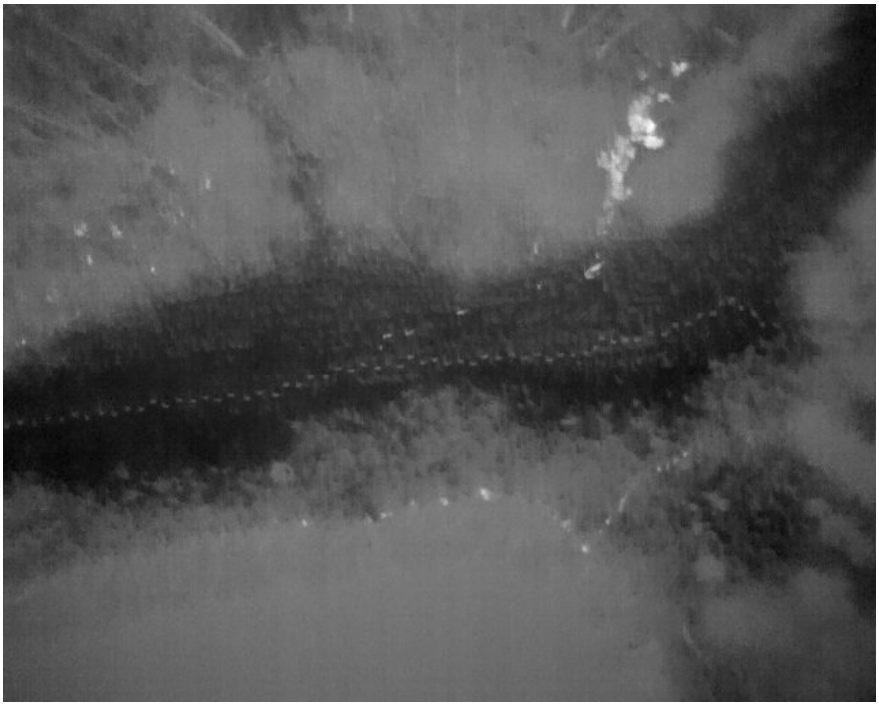
Video

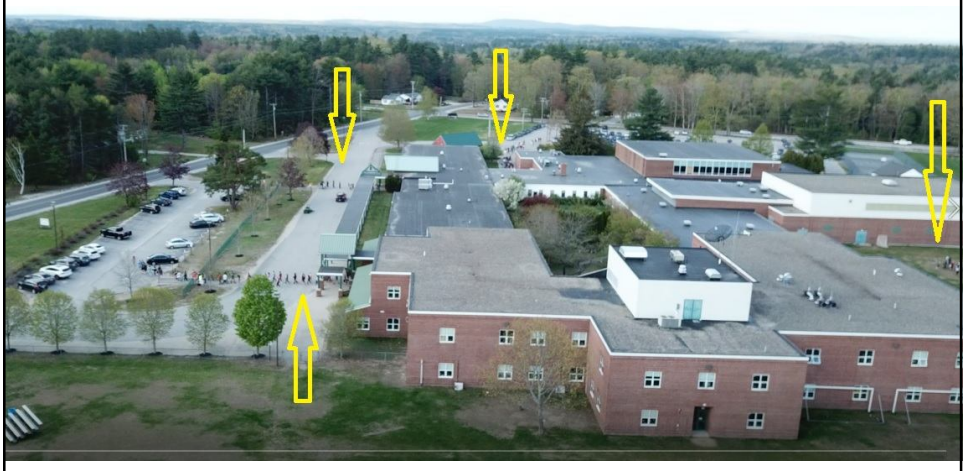
Kennebunk Woods Fire - Thermal



Video







Click for Video

WHAT COULD POSSIBLY GO WRONG ??

(Click photo for balloon video)

Black Box Data

- Higher end (professional) drones have data logging capabilities.
- Provides similar function to commercial aircraft "black boxes"
- Drone logs hundreds of data points by the second such as:
  - Pilot input from remote controller
  - UAS response to the pilot commands
  - UAS flight attributes such as: Lat/Long position; speed, altitude, etc.
  - This data is important for investigating flight anomalies such as "fly away" scenarios or proving whether or not the UAS was in a certain location at a specific time.

Black Box Data

Software used to access the data from a DJI UAS:
DJI Assistant 2

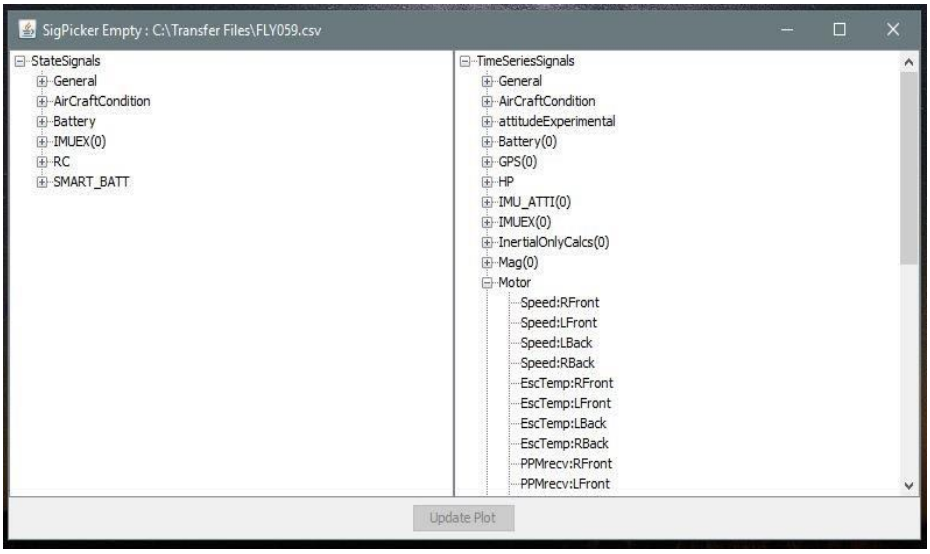
Methods for analyzing the "Black Box" data:

1. **Internet based analysis**; www.Airdata.com
   Free (Basic data analysis) and paid
   versions (More in-depth analysis)

2. **User based software programs**;
www.DATFILE.net for CsvView, DatCon (Both Freeware).
   User can control extent and complexity
   of data analysis (Learning curve required).

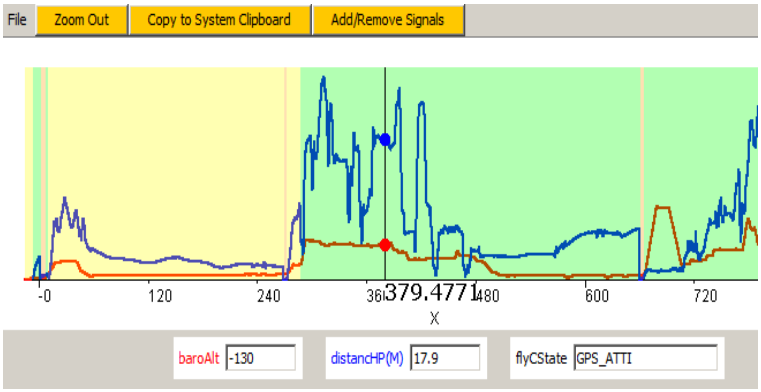
Black Box Data

Some of the data points available from the CsvView program.



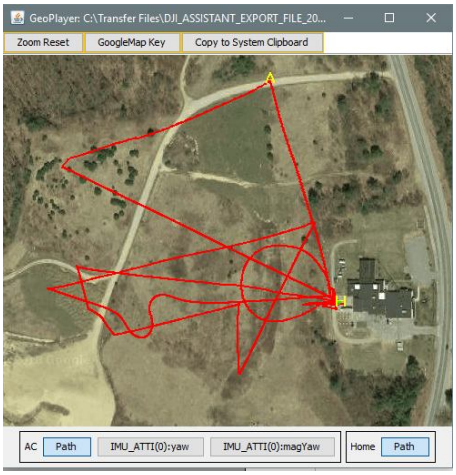
Black Box Data

Typical graph from CsvView software program.



Black Box Data

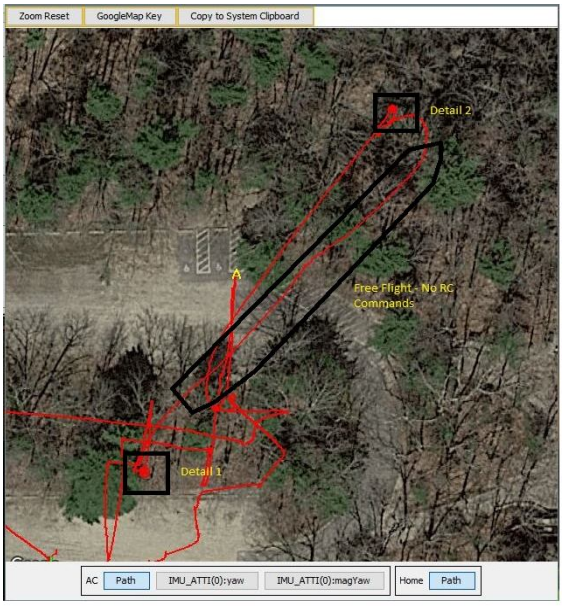
UAS flight path overlaid on a Google Earth background in CsvView program.



Black Box Data

Example of how "Black Box" data analysis helped to explain and rectify a past YCEMA UAS flight anomaly.

Black Box Data



Black Box Data

Black Box Data

	Flight time	Altitude	Home Dist	Type	Notification
A	00m 00s	0.0 ft	0 ft	Mode	Mode changed to P-GPS
B	00m 00s	0.0 ft	0 ft	Tip	Log filename: FLY059.DAT
	00m 01s	0.0 ft	0 ft		100% Battery
C	00m 02s	0.0 ft	1 ft	Mode	Mode changed to Assisted Takeoff
D	00m 05s	0.0 ft	1 ft	Mode	Mode changed to P-GPS
	01m 38s	170.9 ft	396 ft		90% Battery
	02m 59s	170.6 ft	413 ft		86% Battery at maximum distance
	04m 10s	171.6 ft	401 ft		80% Battery
	06m 05s	170.6 ft	112 ft		70% Battery
	08m 14s	124.7 ft	64 ft		60% Battery
E	09m 51s	124.3 ft	60 ft	Mode	Mode changed to Atti
F	09m 51s	124.3 ft	60 ft	Warning	Yaw Error (repeated 49 times)
G	09m 56s	124.3 ft	76 ft	Warning	Yaw Error (repeated 48 times)
H	10m 01s	128.9 ft	146 ft	Warning	Yaw Error (repeated 26 times)
I	10m 04s	132.2 ft	216 ft	Mode	Mode changed to P-GPS
	10m 19s	133.2 ft	243 ft		50% Battery

Perils of third party apps and devices:

•Personal iPhone or Android
•SAR apps ie. Litchi, DroneSAR, etc.
•No support from DJI if UAS lost
•Possible confiscation of personal device
•Inconsistent operator settings, difficult to create standardization
•Potential for memory crash, software, firmware conflict.

Continuing Operations

- Aircraft
  - Pre-flight Checklist
  - Airframe Condition (motors, props, cameras, etc)
  - Maintenance & Repair
  - Maintain integrity of digital media
  - Returning to service for next flight
- Pilot
  - FAA Part 107 Qualifications & license renewals
  - Training for Basic Flight and control
  - Logbook entries (dronelogbook.com)
  - IMSAFE (Acronym for pilot readiness)

Area of Rapid Change & Choices of Equipment

- Drone Manufacturers
  - DJI, Yuneec, Holy Stone, GoPro, etc
- Regulation –FAA *trying* to get out in front
- Technology – Every day a new capability
- Reliance on 3rd party apps & implications
- For Example: DroneSense, Airmap, Dronelogbook, Litchi

- → Click for video - → DroneSense

Looking forward to Proposed Changes

- Flight over "people" – creates three categories
  - < .55 lbs
  - > .55 lbs (Mfr injury rating; no exposed props)
  - > 55 lbs (threshold of injury determinant)
- Night Flying
- Pilot renewals (Change in testing requirements)
- Open comment period ending 4/15/19

Thank You

The End