Steam Infrared Survey at Cornell University

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Agenda

- Overview of Cornell District Steam System
- History of Infrared Inspections
- EagleHawk Intro & Experience
- Camera Specs
- Approvals Required at Cornell
- Sample Infrared Report
- Comparison of Helicopter vs Drone with Infrared Video
- Questions

Cornell District Steam System

- Cornell Ithaca Campus
  - 21,000 Students + 11,000 Staff & Faculty
  - 2 Square Miles
  - 15.83M GSF

- Steam System
  - Peak Load of ~380 K#/hr
  - 40 psi Summer and 80 psi Winter
  - 9 Miles of Main & 3 Miles of Laterals w/ ~ 175 vaults
  - Some areas date to 1922.
  - Mix of small concrete tunnels, clay tile tunnels, direct buried w/ foamglas, some hot water.
  - Condensate is mix of FRP and CS in tunnels

History of Infrared Steam Distribution Inspections at Cornell

- Started in early 1990's with Steve Seeber - Mid Atlantic Services on 3 year intervals
- Camera in a helicopter at ~1000 foot elevation with Cornell & Technician
- Coordinating the helicopter around helicopter availability, weather, leaf cover, and Campus events was always a challenge.
- Administration approvals became very difficult. Worried about student concerns of active Campus shooter due to presence of a helicopter hovering over Campus.
- 2017 Mid -Atlantic changed hands and EagleHawk stopped by.
- Verified infrared camera specifications
- Reviewed what approvals Cornell needed.
- Rest is history.

About EagleHawk

DRONE POWERED DATA FOR BETTER DECISIONS

Mission: Leverage drone technology to provide better data more efficiently and effectively.

- Real Estate
- Construction and Development
- Property Management
- Insurance
- Engineering and Consulting
- Energy & Utilities

GENIUSNY

EagleHawk One Inc. Founders:

Patrick Walsh – CEO & Thermal Imaging Specialist

Patrick spent 8+ years at Lockheed Martin working with ***thermal (IR) sensors*** for pilotage, targeting, and threat detection systems. He also holds a Master's Degree in Mechanical Engineering from RIT and an MBA from Rollins College. Patrick is also a Certified Level 1 Thermographer.

Will Schulmeister – COO & GIS Specialist

Will holds a Master's Degree in ***Geographic Data Science*** from SUNY Buffalo, is a private investigator in NY, and spent 8 years with a national property inspection services company.

FAA Certified & Insured Pilots

Experience

Drone Service Experience:

Inspections

- Commercial Roof Inspections – 700+ Buildings (>11M sqft)
- Residential Roof Inspections – 500+ Buildings
- Solar Panel Inspections – 8000+ Panels
- Steam Tunnel Inspection – >10 Mile
- Pipe Lines – 3 Miles

GIS

- Geographical Data Collected - >30,000 acres

University at Buffalo, The State University of New York

SUNY State University Construction Fund

GENESEO THE STATE UNIVERSITY OF NEW YORK

Buffalo State The State University of New York

New Paltz State University of New York

SUNY Cortland

Stony Brook University

The College at Brockport State University of New York

Troy University

Cornell University

Wagner College

Professional and Experienced

Camera Specs

LENS MODELS

Lens Models		6.8 mm	7.5 mm	9 mm	13 mm	19 mm
17µ 640×512	FoV iFoV	/	f/1.4 90° x 69° 2.267 mr	f/1.4 69° x 56° 1.889 mr	f/1.25 45° x 37° 1.308 mr	f/1.25 32° x 26° 0.895 mr
17µ 336×256	FoV iFoV	f/1.4 49.1° x 37.4° 2.519 mr	/	f/1.25 35° x 27° 1.889 mr	f/1.25 25° x 19° 1.308 mr	f/1.25 17° x 13° 0.895 mr
Min Focus Distance		2.3 cm	2.5 cm	3.2 cm	7.6 cm	15.3 cm
Hyperfocal Distance		1.2 m	1.2 m	2.1 m	4.4 m	9.5 m
Hyperfocal Depth of Field		0.6 m	0.6 m	1.1 m	2.2 m	4.8 m

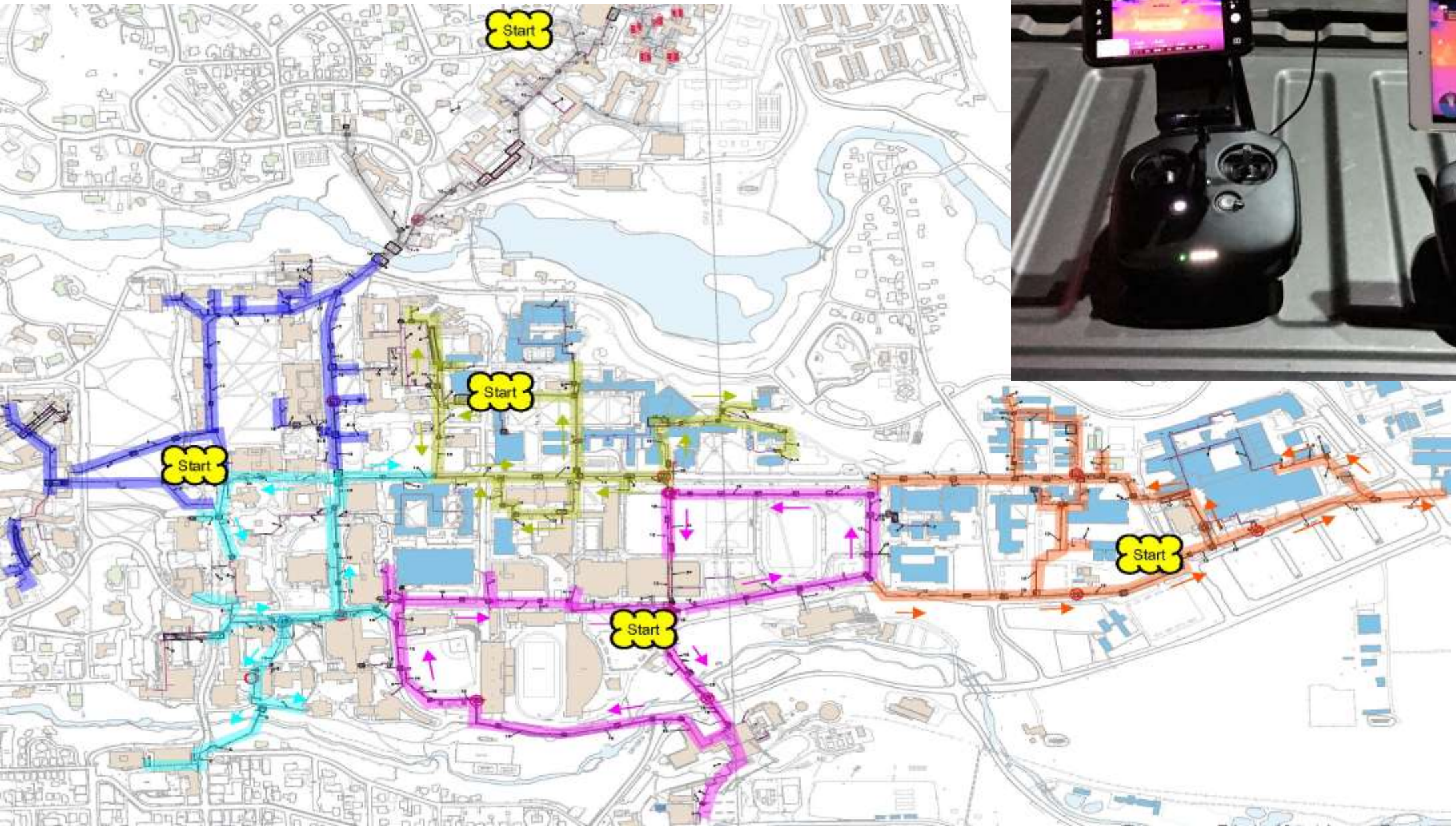
CAMERA

Thermal Imager	Uncooled VOx Microbolometer
FPA/Digital Video Display Formats	• 640 × 512 • 336 × 256
Analog Video Display Formats	720 × 480 (NTSC); 720 × 576 (PAL)
Pixel Pitch	17 µm
Spectral Band	7.5 - 13.5 µm
Full Frame Rates	• 640 × 512: 30 Hz (NTSC) 25 Hz (PAL) • 336 × 256: 30 Hz (NTSC) 25 Hz (PAL)
Exportable Frame Rates	7.5 Hz NTSC; 8.3 Hz PAL
Sensitivity (NEdT)	<50 mK at f/1.0
Scene Range (High Gain)	• 640 × 512: -13° to 275°F (-25° to 135°C) • 336 × 256: -13° to 212°F (-25° to 100°C)
Scene Range (Low Gain)	-40° to 1022°F (-40° to 550°C)
Spot Meter	Temperatures measured in central 4×4
File Storage	Micro SD Card
Photo Format	JPEG, TIFF
Video Format	MP4

Approvals Required at Cornell

- Insurance Certificate
- 14 CFR 107.41 Wide Area Airspace Authorization
- Cornell Risk Management
- Cornell VP of Facilities and Campus Services
- Notify the Campus Police

Flight Plan



Comparisons

Helicopter

- Allows high data collection infrared film due to hard storage
- Downsides are maneuverability, disruptions, coordination, and verifying steam line location

Helicopter Video Link Here

Drone

- Flight time limited due to battery life. Continuous battery charging
- Quiet, GPS guided for video
- Higher quality still photos. Much closer inspection distances. Instant review of entire system.
- Capture high-res visible and thermal for more effective analysis
- Generate picture-in-picture video thermal / visual.

Drone Video Link Here

Contact Info

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Questions?