



# Emerging UAS Technologies for Utility Infrastructure

**Overlay Aerials: Monitor. Analyze. Optimize.**

September, 2026

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PA PUC SAFETY SEMINAR 2026

# Going Beyond Visual Inspection

Emerging UAS Technologies for Utility Infrastructure to Enhance  
Safety, Visibility, and Operational Decision-Making

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# Why This Conversation Matters



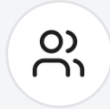
## Legacy Infrastructure

Large, distributed systems create inspection and monitoring demands that benefit from repeatable, risk-based coverage.



## Increasing Inspection Demands

Mileage, asset counts, and inspection frequency requirements continue to climb faster than headcount.



## Workforce Challenges

Experienced field personnel are retiring, and the labor market for climbers, linemen, and inspectors remains tight.



## Safety Expectations

Operators are expected to reduce exposure to confined spaces, energized equipment, and elevated work at the same time demands rise.



## Reliability Expectations

Regulators, ratepayers, and boards all expect fewer outages and faster, better-informed response.



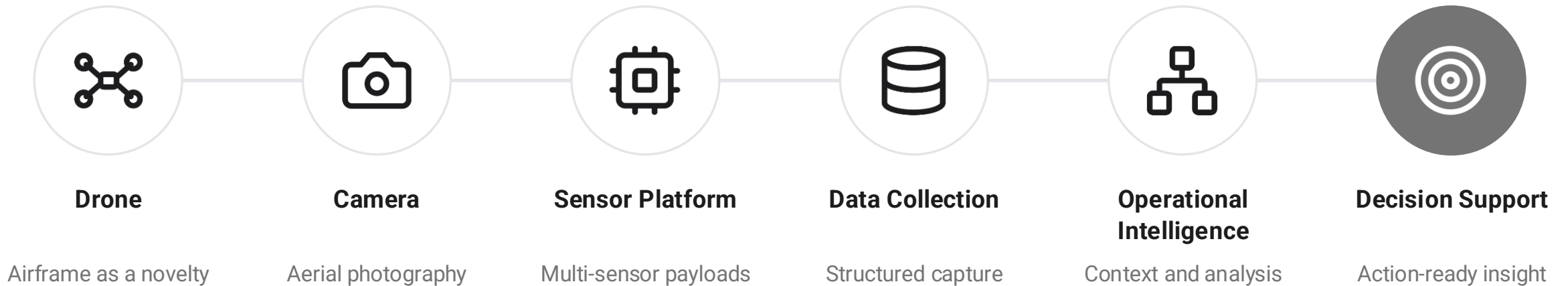
## Regulatory Oversight

Regulatory expectations increasingly reward defensible workflows, qualified review, and complete records—not technology alone.

*The underlying need isn't more inspections. It's better operational intelligence.*

# The Evolution of UAS

*Each stage builds on the last — none of them get left behind.*



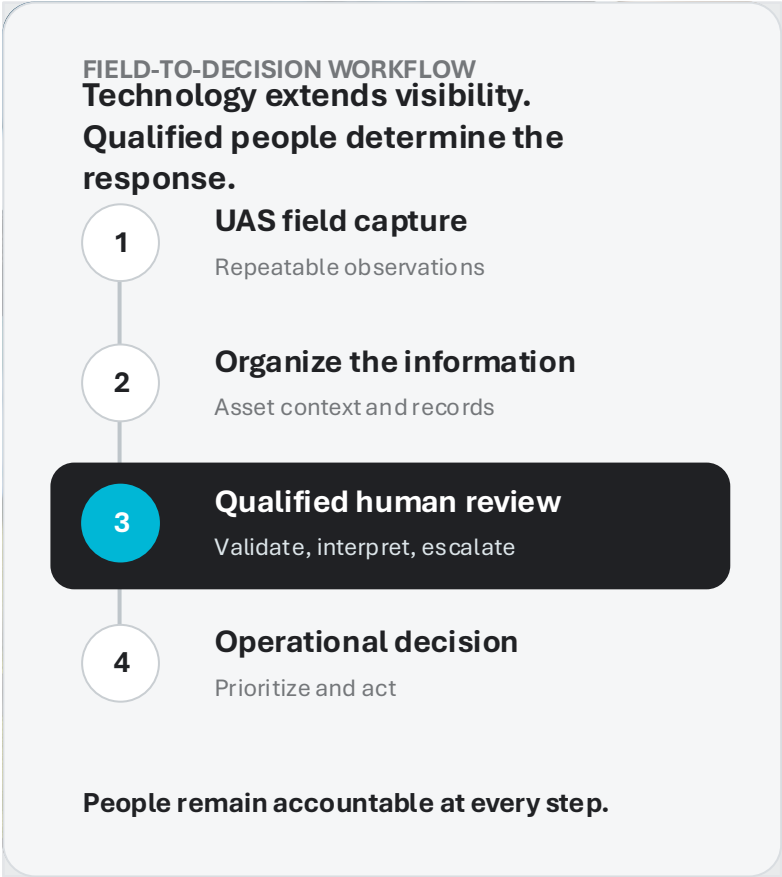
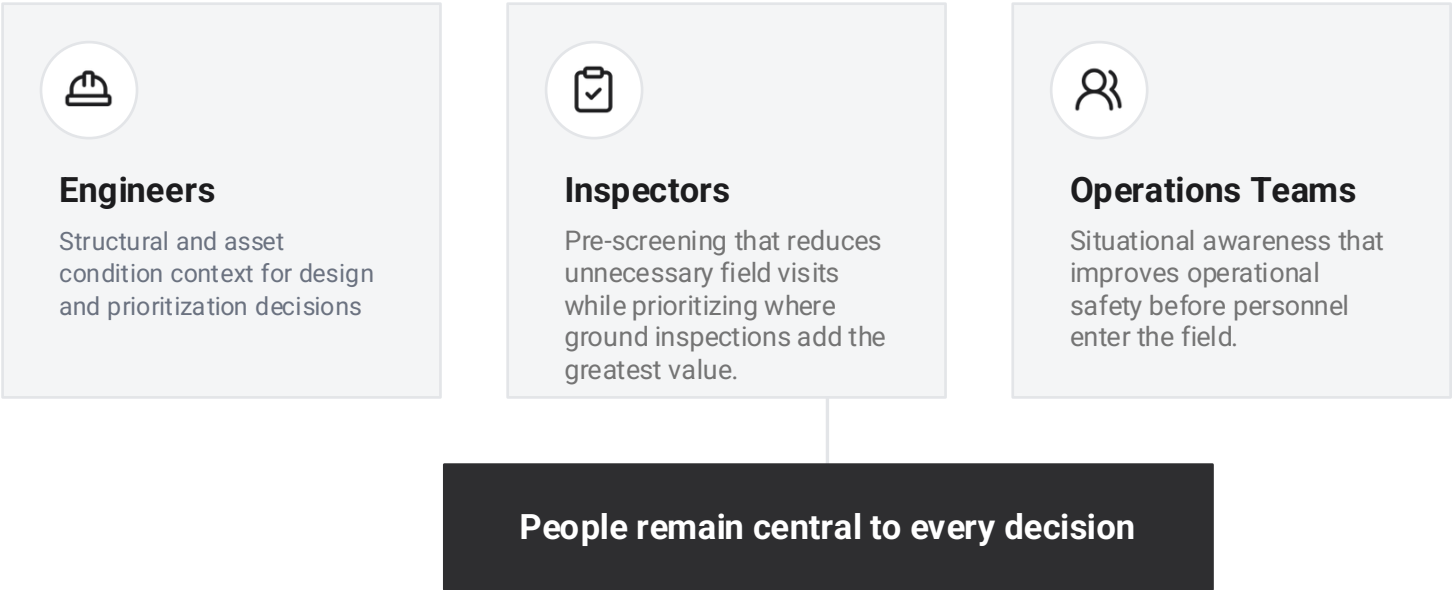
Modern UAS programs are broader than aerial photography — the aircraft is simply the delivery mechanism for a much larger data and analysis capability.

The conversation has moved beyond the aircraft itself. Today's value comes from solving operational challenges—not showcasing the technology.

# Where UAS Fits Within Utility Operations

UAS complements existing inspection programs. It does not replace the people who run them.

AERIAL DATA CAPTURE



WHERE IT'S ALREADY WORKING

# Practical Utility Applications



**Pipeline ROW Monitoring**



**Electric Transmission**



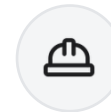
**Distribution**



**Substations**



**Vegetation Management**



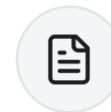
**Construction Oversight**



**Emergency Response**



**Storm Recovery**



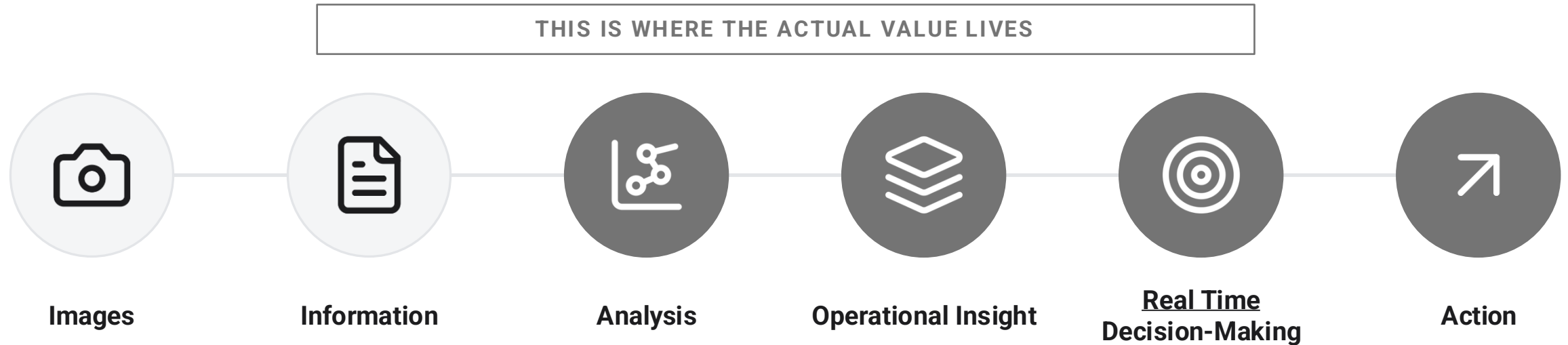
**Asset Documentation**

*The common thread across every use case: value comes from the operational problem solved, not the technology used to solve it.*



**Repeatable coverage creates a defensible record—not just a collection of images.**

# Beyond Visual Inspection



Collecting imagery was never the goal. The goal is delivering operational insight quickly enough to support confident, timely decisions and faster response.

# Sensor Technologies



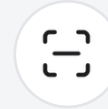
## RGB

High-resolution visual imagery for general condition assessment and documentation



## Thermal

Heat signature detection for electrical equipment, insulation, and early-stage failure indicators



## LiDAR

Precise 3D mapping for clearance analysis, vegetation encroachment, and terrain modeling



## Gas Detection

Optical gas imaging and other gas-sensing methods for leak detection and emissions-monitoring workflows



## Multispectral

Vegetation health and stress analysis beyond what the visible spectrum can show

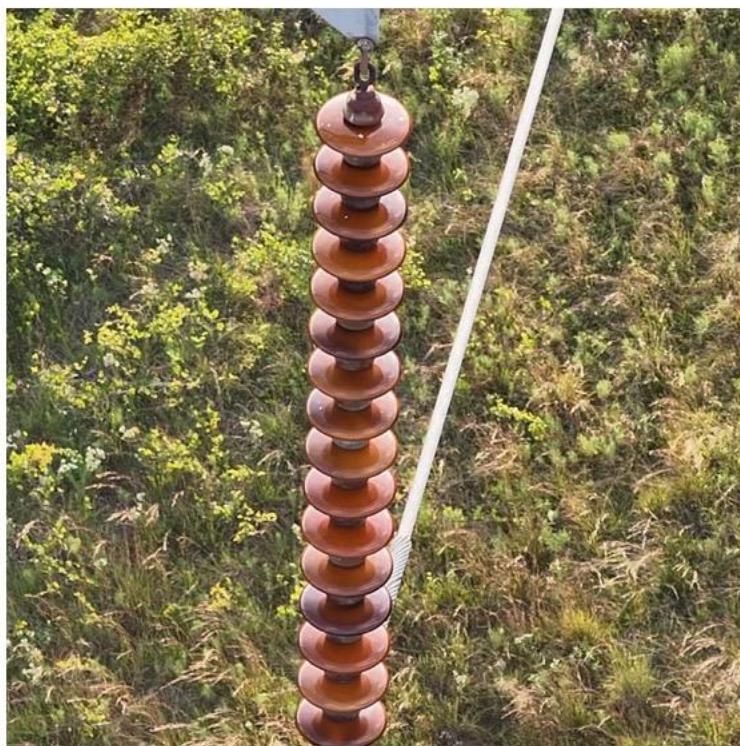


## Other Advanced Sensing

Acoustic, magnetic, and emerging payloads suited to specific operational questions

*The sensor is chosen by the operational question being asked – not the other way around.*

# Sensor Capabilities



## RGB

Electrical component detail



## Thermal

Flare stack



## OGI

Optical gas imaging

Complementary sensor views support asset documentation and closer review.

# Common Misconceptions

## MISCONCEPTION

✗ *UAS replaces inspectors.*

✗ *AI replaces engineering judgment.*

✗ *Every inspection requires LiDAR.*

✗ *BVLOS is required to generate value.*

✗ *Drones are only useful for imagery.*

## OPERATIONAL REALITY

✓ **UAS extends inspector reach and prioritizes where ground time is spent.**

✓ **AI flags and prioritizes; engineers still make the call.**

✓ **It's not about the sensor but about the question you're answering.**

✓ **VLOS creates value today; approved BVLOS extends coverage when the waiver, CONOPS, aircraft, airspace, and risk controls align.**

✓ **Modern programs deliver imagery, thermal, 3D, and gas-detection data within qualified, auditable workflows.**

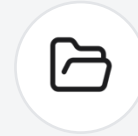
# What Makes a Successful UAS Program



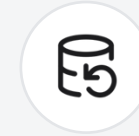
**Training**



**Standard Operating  
Procedures**



**Documentation**



**Data Management**



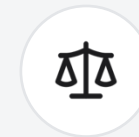
**Repeatability**



**Risk Management**



**Safety Culture**



**Governance,  
Qualification &  
Compliance**

Programs scale when qualified people, repeatable procedures, risk controls, and defensible records align.



**Aircraft capability enables the mission. Program discipline makes it operational.**

WHERE THIS GOES NEXT

# Looking Ahead



## AI-Assisted Analytics

Faster anomaly detection and change comparison across flight history



## Remote Operations

Pilots and analysts supporting multiple sites without on-site travel



## Drone Docking Systems

Fixed-site automated launch and recovery for recurring monitoring



## Digital Twins

Aerial data feeding persistent, queryable 3D asset models



## Predictive Maintenance

Trend-based flagging before a condition becomes a failure



## Regulation-Ready Workflows

Qualified review, traceable decisions, and records designed for auditability

# Key Takeaways

1

UAS has matured from a camera platform into a repeatable source of operational intelligence.

2

The best sensor is the one matched to a clearly defined operational question and response workflow.

3

Remote sensing can strengthen inspection and emissions-monitoring programs; it does not remove operator accountability.

4

The durable model is people, process, technology, and governance working together at the right scale.

# Questions

Discussion & Follow-Up

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# Thank You.

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