Using the RQ-11 Raven-A and the T-Hawk for Oversight Inspections of Surface Coal Mines in West Virginia

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Project Overview

• Background
• Timeline
• Data collected
• What we do with the data?
• How successful was it?
• Future Study
Why are we doing this?

• Helicopter over-flights
• Satellite Imaging
• The U.S. Geological Survey coordination
2011
The RQ-11 Raven

Specifications:
- Weight: 4.2 lbs
- Length: 3 ft 7 in.
- Wingspan: 4 ft 3 in.
- Cruising speed: 60 mph
- Range: 6.2 miles
- Flight time: 60-80 minutes
- Interchangeable payloads
- Cost: $35,000
The Raven Methodology

- Site selection
- Must be a mine site
- Multiple on the ground features
- Underground mine fire

- The Bridge Fork West Surface Mine
- Fayette Co., WV
- Issued Jane 21, 2004
- 463.8 acre Contour strip mine
- Site mostly reclaimed
What did we get?

Optical and Thermal Video Images
The Raven Conclusions

- Image quality is sufficient.
- Multiple views
- Different cameras
- Inspector safety
- Historical record
- Time Savings
- Paperwork
- Personnel
- Visual line of Sight
- Data Duplication
- Aircraft Maneuverability
- No Scale
The RQ-16A T-Hawk

- Micro Air Vehicle (MAV) with ducted fan
- Vertical Take Off and Landing
- Weight: 20 lbs
- Capable of up to 81 mph speed
- Flight time: 40 minutes
- One person operation
- Fuel: Aviation fuel
- Cost $500,000
T-Hawk Methodology

- **The Plan**
  - 15 randomly selected Mine sites with Raven and T-Hawk side by side (2 teams)
    - 3 days
    - Thermal and Optical data

- **The Reality**
  - 8 sites flown
  - Only 1 flown with Raven
  - 3 ½ days
  - Thermal camera not effective due to weather conditions
Results
Permit overview-Quick look
Drainage Control Inspection
Large Features
Adjustable Camera
• Helps identify potential problem areas
Pond 1A-
Spillway bottom
- 45’ measured
- 42.96’ certified
- 43’ calculated

Top
- 65’ measured
- 66.10’ certified
- 69’ calculated

Pond 1B-
Spillway bottom
- 42’ measured
- 44.6’ certified
- 43’ calculated

Top
- 65’ measured
- 67.5’ certified
- 65’ calculated
3D Models

Height measurement
Length: 102, 129 Feet
Results

- 6500 acres flown
- 4 miles of drainage structures
- Average time per permit 50 minutes
- 90% of each permit inspected
- Improved Imagery Quality
- Time saving
- Increased safety
Results cont.

- Scale
- Maneuverability
- Inspector safety
- Historical record
- Time Savings
- Paperwork is still an issue
- Visual line of Site still applies
- Cost/Benefit Ration is in the works
- Further study is needed
- No trained pilots in OSM to date
Questions?
Thank You For Your Attention!

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