



ELEVATING NUCLEAR RESPONSE: **NORTH CAROLINA DRONE RADIATION MONITORING PROGRAM**

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North Carolina Radiation Protection



Drone Sampling Program

THE PROBLEM

➤ **Typical Nuclear Response:**

- **Monitoring teams travel area of highest radiation rate and contamination**
- **Collect air samples to determine isotopic mix and concentration of radioiodine**
- **Retrieve other environmental samples to determine extent of contamination**
- **Data used to determine protective action recommendations (PARS)**

THE PROBLEM

➤ **Consequences and Limitations:**

- **Teams receiving excessive radiation dose**
- **Vehicles and other expensive equipment becoming contaminated**
- **Travel is limited to navigable roads**
- **Potential high turnover rates-increased manpower needs**

THE PLAN

- **Identify alternative technology, partners and roles**
- **Identify required training and testing**
- **Provide funding**
- **Develop FAA/FEMA compliant procedures**
- **Train staff and partners to develop and improve skills**

POTENTIAL CHALLENGES

➤ **Contracts, Budget, Purchasing and Support**

➤ **Training**

- **Identifying and receiving adequate pilot training**
- **Individual passing the test for FAA remote pilot certification**

➤ **Procedures, Compliance and Approvals**

- **FAA / NC DOT / FEMA**
- **Flight and responder agency acceptance**

EXPECTATIONS

- **Establish new normal for response to nuclear events**
- **Reduce radiation exposures**
- **Reduce resource needs during a response**
- **Foster a positive collaboration between the Branch and other responding agencies within the State**
- **Using this tool for other departmental needs**

TECHNICAL: Drones

➤ **DJI Phantom 4 Pro**

- **Training**
- **Other State/Section needs**

➤ **FlyCam: Acecore-NEO Octocopter**

- **Pros: autonomous flight; heavy lift; decent flight times**
- **Cons: sensitive controls; overseas maintenance**



TECHNICAL: Drones

➤ DJI Matrice 600 Pro

- Easy to translate from trainer
- Autonomous flight, heavy lift, superior flight times, local dealer/repair, intuitive controls



TECHNICAL: RADIATION INSTRUMENTATION

➤ **Technical Associates/Overhoff**

➤ **Gamma/Beta**

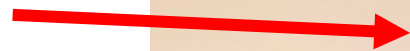
- **Probes at six inches and three feet (apprx)**
- **Actuators for open and closed readings**

➤ **Air Sampler**

- **Capable of taking a cartridge and filter sample**
- **Radio controlled with totalizer; 10ft³ in apprx 7.5 minutes**

Technical-Radiation Instruments

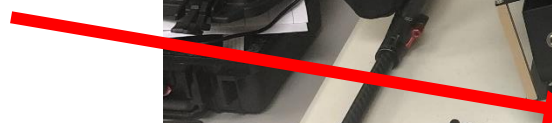
~1 meter GM



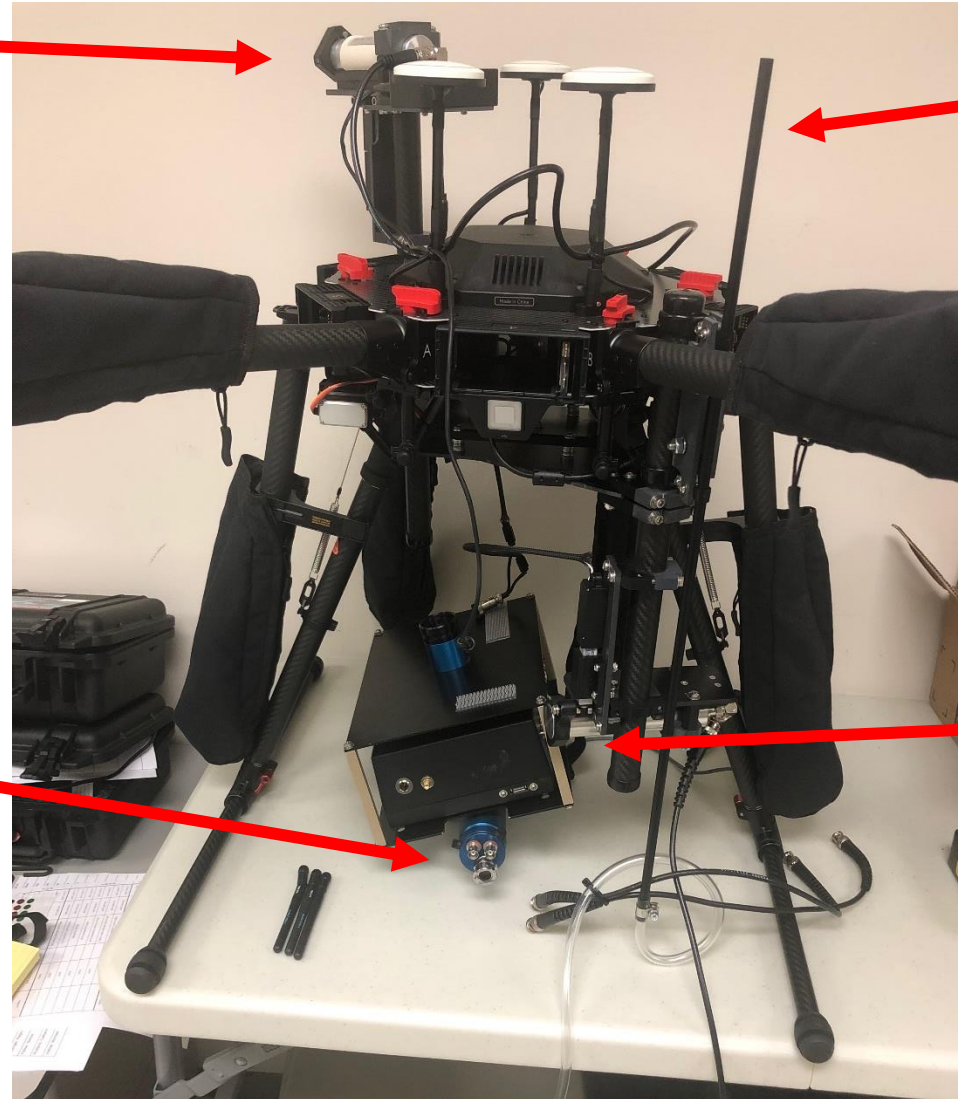
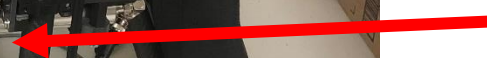
Pitot tube



Air Sampler



6 inch GM

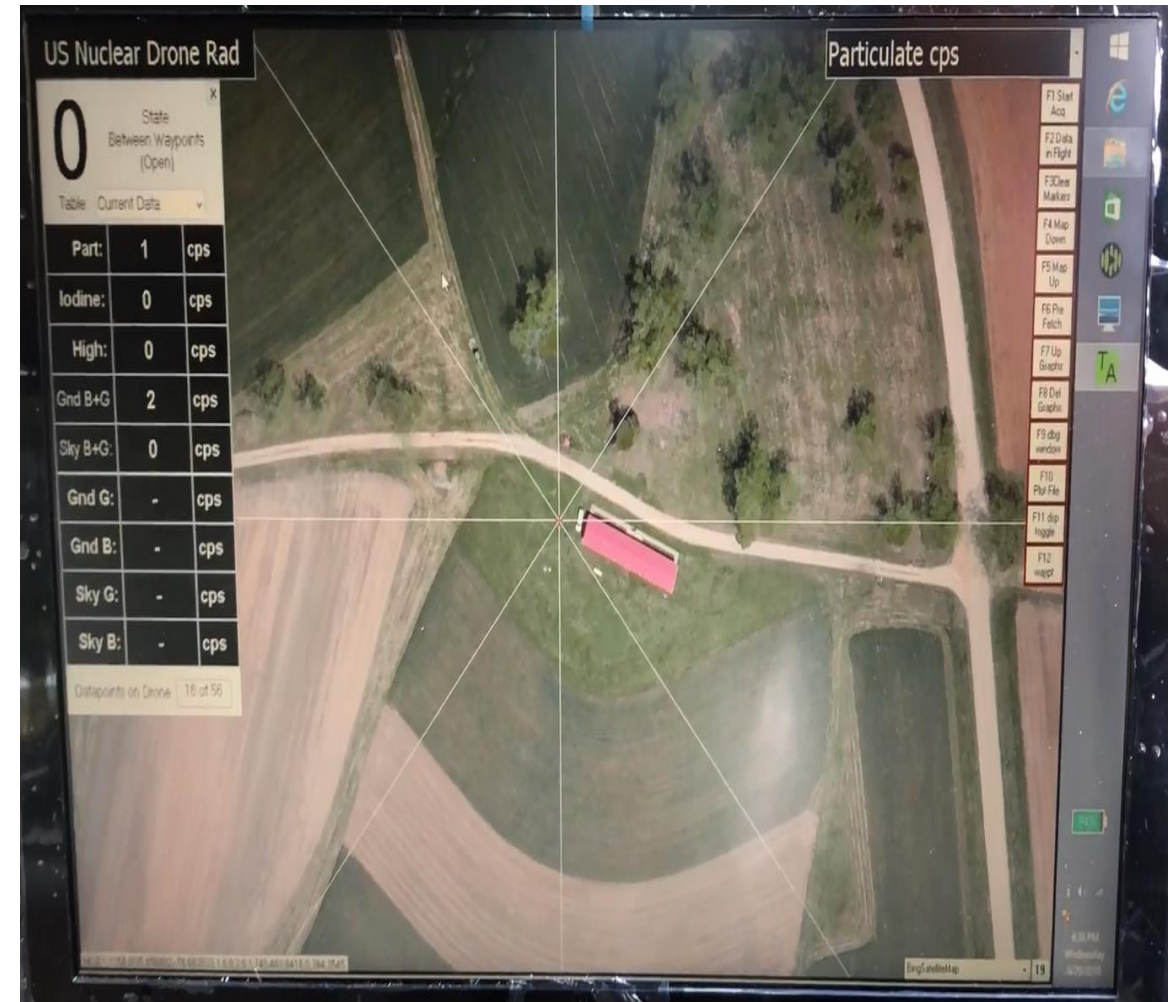


TECHNICAL: SOFTWARE

➤ Drone Rad-US Nuclear Corp

➤ Telemetric

- Instantaneous data capture
- Automatic, per-second data



TECHNICAL: LESSONS LEARNED

- **Complexity of the program**
- **Training**
- **Battery life of drone**
 - **Smaller drone with gamma/beta detector to find plume centerline**
- **Air-sampler flow rate**
 - **Different specs**

MOVING FORWARD

- **FAA waivers for deviating from Part 107 compliance**
- **Loss of line-of-sight**
- **Weather and operations**
- **Battery life and mission times**
- **Drill demonstration with FEMA**

QUESTIONS?

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