Unmanned Aerial System (UAS) Remote Sensing Missions "Onion Box"

URSA UNDERGRADUATE RESEARCH & SCHOLARLY ACTIVITY

UAF UNIVERSITY OF ALASKA FAIRBANKS

I. INTRODUCTION

- Challenges with remote missions in Alaska
  - Long distances
  - Weather: extreme and variable
  - Drone flight time ~ 20 min

II. OBJECTIVES

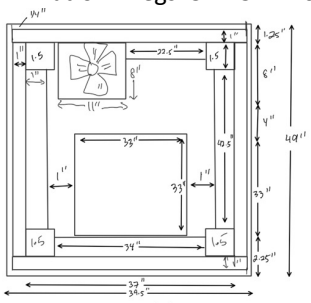
Design and construct and "Onion Box" with the following major capabilities:

- Drone recharging
- Lid opening and closing mechanism
- Drone-shelter-operator communication

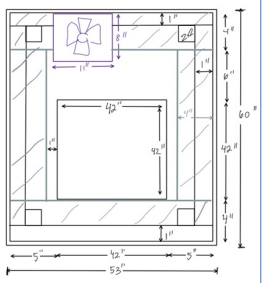
III A. "ONION BOX" – STRUCTURAL SYSTEM

"Onion Box": L x W x H = 60" x 53" x 42"

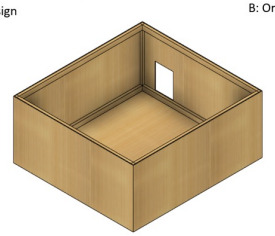
- L x W = 60" x 53"
  - Plywood thickness: 1/4 in
  - Insulation: XPS 4"for R = 20 (R = 5/in)
- Lid = 60" x 53"
- Height = 42"
  - Landing gear + arm width = 6.7"
  - Platform Legs: 5" X 5" X 10"



A: Prototype design

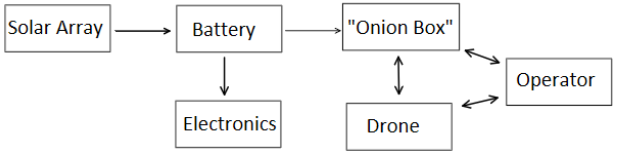


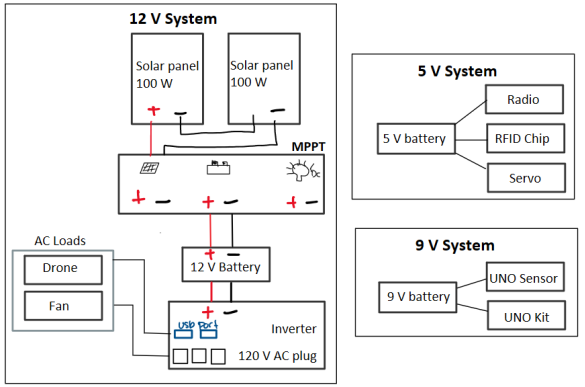
B: Original design



III A. ELECTRICAL SYSTEM

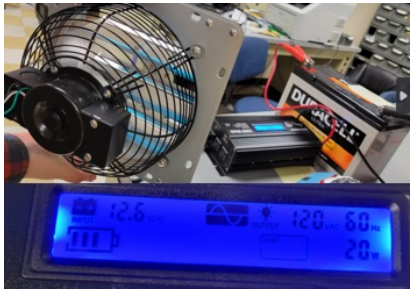
The left shows the power and communication flow diagram for the "Onion Box." The right shows the 12 V, 9 V, and 5 V electrical systems serving different loads.





IV. PROGRESS AND REMAINING WORK

The body and insulation is almost complete and the fan runs on the battery. The inverter shows the input DC voltage and output AC voltage as well as the consumed power by the fan. The sensor module was tested and confirmed to turn a mini fan on at a specified temperature.



Remaining work:

- Complete wiring the 12 V system
- Code Arduino for servo opening/closing mechanism
- Code and test for radio communication system

V. FUTURE WORK/IMPROVEMENT

Consider installing the following:

- Energy management system (EMS) for energy allocation
- Heating system
- Debris/snow/ice removal system
- Battery replacement/recharging system for smaller batteries

Improvements:

- Overall box design (e.g., insulation type/implementation)
- Electrical system efficiency

VI. ACKNOWLEDGEMENTS

The senior design team acknowledges and appreciates the efforts and support of the CEM department, professors in change of the Senior Design class: Professor Richard Wies and Michael Hatfield, and URSA for funding this project.