Remote Pilot Certification for Safe Legal Operation of an Intelligent Radiation Awareness Drone (iRAD)

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Introduction and Motivation

- Proper licensure required to fly drones for any purpose other than recreational
- Remote Pilot Certificate needed custom iRAD testing and for research with other drones
- Exam preparation enhances knowledge of flight procedures for safe operation

Technical Approach

- *Requirements:* ≥ 16 years old, English fluency,, adequate physical/mental condition to fly safely, pass initial aeronautical exam
- *Responsibilities:* familiarity with airspace, adherence to FAA Part 107, drone registration
- *Continuing education:* online @24 mo)
- *Test topics:* Regulations, Airport Operations, Radio communications, Airspace and Charts, Weather Theory and Services, Decision Making, Physiological Factors, Maintenance and Inspection

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Results

- UM has two new licensed pilots

Conclusion

- 15-20 hours of study through an affordable online course enables one to obtain a Remote Pilot Certificate
- A Remote Pilot Certificate is necessary for drone flight beyond recreational purposes, including research

Next Steps

- Register drones
- Obtain airspace authorization for missions as needed
- **Fly!** Inspired Flight IF1200, UAV System International Aurelia 4, DJI Mavic Pro, UM iRAD-Lite

Personnel Safety Considerations for Initial Testing of a Small Homemade Drone

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Introduction and Motivation

- Performing tests during drone design process to ensure drone is structurally stable and performs assigned tasks successfully
- Ensuring the safety of anyone in the vicinity of the drone during the various phases of design testing
- Engaging in preliminary testing of individual components prior to assembly to ensure efficiency and safety

Technical Approach

- Components should be appropriately strong and flexible, with motors and moving parts functioning properly
- Strong connections, heat generation, and vibrations require attention
- Propellers added and observed for their correct rotational direction
- More advanced flight tests then conducted in a controlled environment

Conclusion

- Attention to safety during drone design and pre-flight testing sets good attitude for missions using final drone design while increasing drone longevity

Results

- If motors all uniformly rotate in same direction, drone cannot create lift
- Improper balancing of motors and payload can result in erratic behavior & possible injury during testing
- Only necessary personnel should enter controlled environment as needed
- Protective glasses needed, breaking parts and unpredictable flight are significant factors in this testing stage
- Parts at the highest risk for breakage and loss in an accident: propellers, bolts, batteries

A purpose-built 930 m² netted scientific facility, M-AIR, was used to successively test at progressively higher lifts and longer motions at greater speeds.

Next Steps

- Create pre-flight checklist
- Outline goals for flight testing
- Verify durability of high-risk parts

Mission Relevance

- More efficient radiation monitoring
- Modular and reproducible design helps educational outreach
- Individuals with new skills in CAD modeling, additive manufacturing, finite element analysis, design

Expected Impact

- iRAD methodology widely deployed widely to collect radiation background data and mapping
- Build-your-own drone and sensor packages for high schools and colleges

MTV Impact

- Research experience
- Workshop participation and presentation
- Student funding
- Supplies

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