



# Drone Payload for Safely Carrying and Deploying Multiple Smaller Rotary Drones



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## Background Information

### Small Rotary Drone

- Agile, inexpensive, and increasingly powerful, but limited in range.
- Ground transportation can increase their range but may be insufficient to reach remote locations, severely limiting their capabilities.

### Drone Swarms

- As drone research has advanced, more focus has been put on drones working cooperatively as a “swarm” system.
- Allow for drones to complete tasks together that no single drone could, but are still limited in range.

### Drone Launching System

- Research has focused on extending the range of smaller drones, but most research involves fixed wing drones and carriers or aquatic drones.
- Little work has been done towards the aerial launching of multiple rotary drones.

## Purpose

- Develop a payload system to allow multiple rotary drones to be released from a larger carrier drone.
- Increase the operational range of these smaller drones, increasing their usability.

## System Design

### Payload System

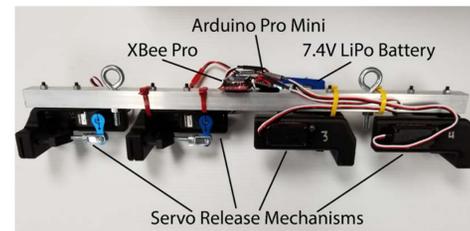


Figure 1: Payload System



Figure 2: Payload Configured for Launch

- Utilizes four individual servo pin pulling mechanisms for launching the payload drones.
- Launches drones in any order.
- Can be configured to work well with other drone systems as payload.
- Tested slung underneath a rotary carrier ship, but can be configured to work with any type of carrier aircraft.

### System Architecture

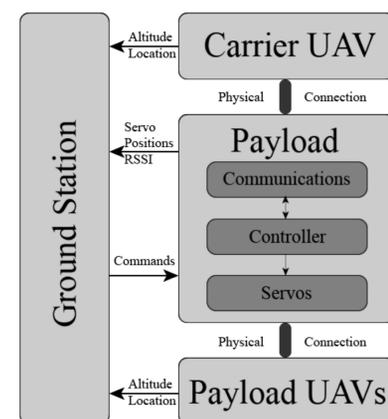


Figure 3: System Architecture

The system consists of a ground station, carrier UAV, payload, and payload UAVs. All of these parts communicate separately to the ground station through radios. Radio commands sent to the payload are processed by the onboard controller, which then actuates the given servo mechanism.

As the drones are released, the downward acceleration triggers their arming sequence. This allows them to start up their motors and right themselves. After which, they hold a steady hover.

## Field Testing Results



Figure 4: System in Flight



Figure 5: Deployed Payload

- Drones launched in varying numbers and sequences
- Proven to reliably launch four drones and be configured to launch according to differing demands.

## Future Work

- Optimize the payload based on field results.
- Integrate with other small drone systems
- Test with other carrier vehicles
- Increase drone payload size for larger swarm.

## Acknowledgements

- Sebastian Elbaum, Research Mentor
- Jacob Hogberg, Lab Engineer
- Adam Plowcha, Graduate Assistant
- UNL McNair Scholars Program



MCNAIR SCHOLARS PROGRAM