Team SAR
Some Assembly Required
Explorer Post 1010

Flight Readiness Review Briefing

Introductions and Flight Mission Roles

Nathan	Airboss
Visesh	Team Captain / Mission Planner Specialist
Muhammed	Primary Pilot in Command
David	Strategic Technician / Safety Specialist

System Overview - Flight Method Strategy and Tasks

1. Fly autonomous objectives
2. Manually search for scoring items
3. Autonomously fly to scoring items
    a. Record coordinates
    b. Drop balloons
    c. Land
4. Autonomous takeoff and landing

System Overview - Expected Performance

- 3 packages (balloons) on-target
- All 16 waypoints captured
- At least 6 of 8 SAR targets located and classified
- Mission completed within 25-28 minutes flight time
- Autonomous takeoff and landing

System Overview - Risk Evaluation

Decision	Risk	Reward
Autonomous search	GPS malfunctions, unable to pause/resume mission to write down coordinates	Consistent/reliable searching for scoring objects
Manual search	Loss of orientation, inconsistent altitude, drift while recording coordinates	Able to recover from GPS issues, potentially faster speed

System Overview - Mission Planner Usage

- Monitor aircraft telemetry data
- Program autonomous missions
- Control Balloon Mechanism Servo
- Safety dashboard (arm/disarm, GPS status, flight mode)
- Simulate Missions
- Use flight log to Diagnose Problems

System Overview - Monitor Usage

Team decisions made based on:

- Latitude/Longitude
- Altitude
- Battery Voltage
- GPS Lock
- GPS Satellite Count
- Flight Mode

System Safety - Operational Strategies

ALL flights conducted:

- With supervising adult
- In visual line of sight
- BELOW 400 feet and within FAA regulations

NO flights conducted:

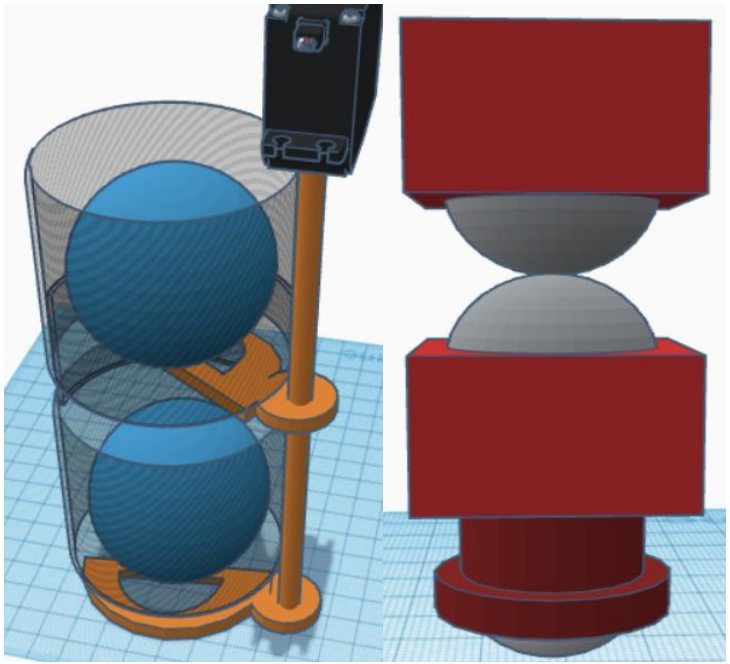
- Without performing pre-flight inspection
- In bad weather or bad visibility
- Over people or buildings

System Safety - Maintenance and Checklists

- We use checklists to enforce safety
  - Pre-flight
  - Post-flight
- We regularly inspect all aircraft parts
- Repairs are made with consent from all team members

System Safety - Design Strategies

- 3D-modeled balloon enclosure
- Double balloon drop system
- Balloons held in by rotating plates
- “Camera Shutter” feature activates servo to release balloon
- Using magnets for a camera gimbal

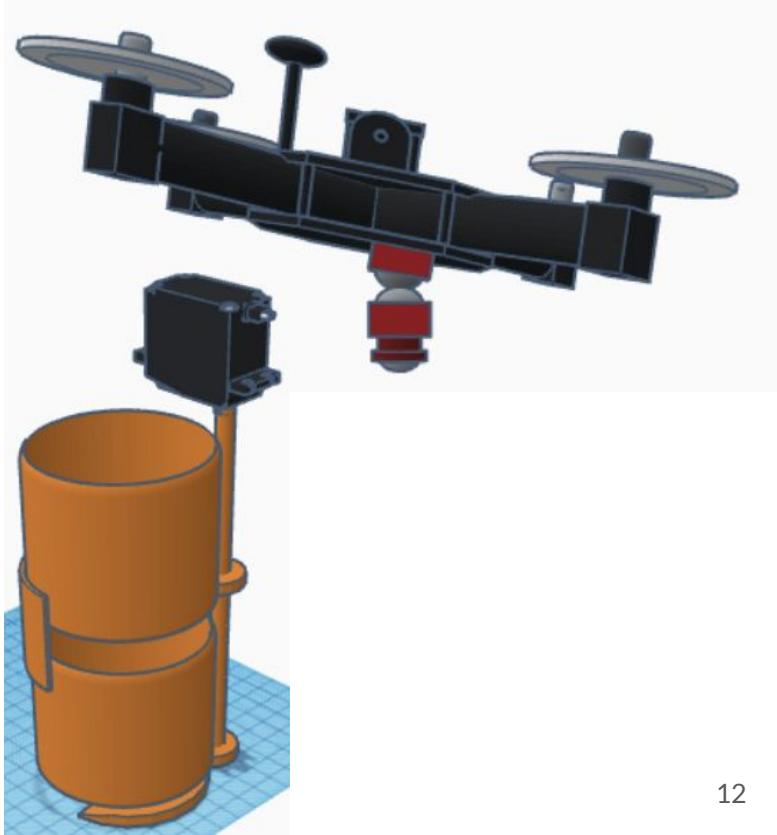


Developmental Test - Ground and Mission Performance

- Testing aircraft modifications
- Flight tests in open field at Redgate Park (former golf course)
- Simulated competition flight experience:
  - Finding scoring items (autonomous map method followed by manual search)
  - Dropping balloons on target
  - Completing autonomous objectives
- Identified errors that occur due to wind

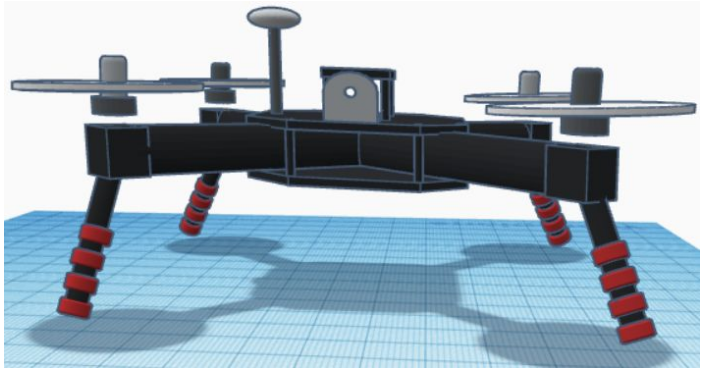
Developmental Test-System Enhancement (New dropper/gimbal)

- Developed iterations for better performance
- Added another balloon casing for more balloon drops per flight
- Efficient with only 1 servo
- Magnets help realign camera



Modifications to Improve Mission Effectiveness

- Different landing gear for stable landings
- New Frame arms and Motor mounts to reduce motor vibrations
- Multiple balloon drop designs



Evidence of Mission Accomplishments

- >20 successful flights
- Accurately identified target objects
- Balloons landed <10 ft from targets
- Safety protocols that effectively prevent unsafe deviations from planned missions (autonomous mode)
- Problems solved through effective team communication

Pre-Mission Briefing - Personnel Resourcing & Communications

Nathan	Airboss
Visesh	Team Captain / Mission Planner Specialist
Muhammed	Primary Pilot in Command
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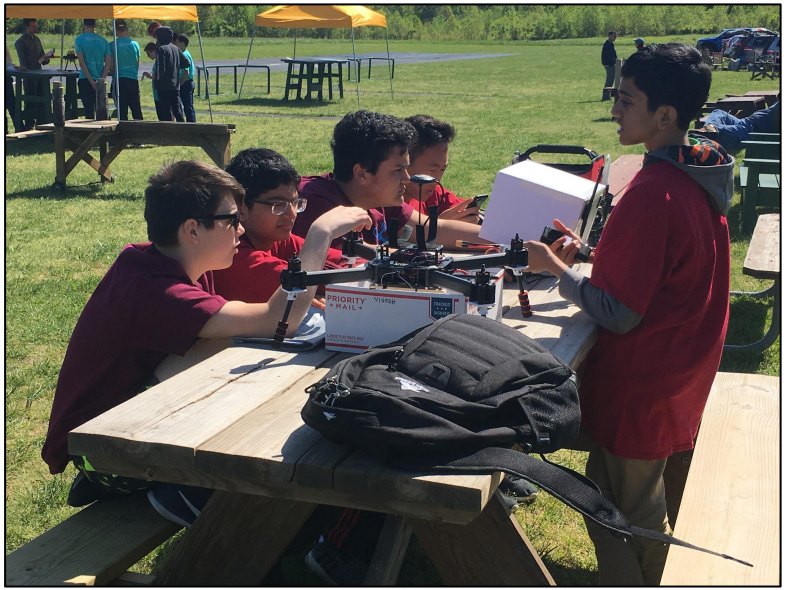

Pre-Mission Briefing - Team Comms

Maintaining Communication with Team Roles:

- All non-essential activities are forbidden (sterile cockpit)
- Share essential information
- Each role has specific call outs
- Maintain records of each flight

Pre-Mission Briefing - Go/No-Go Criteria and Fall Back Plans

Before Flight

- Weather
- Airspace Activity
- Presence of people on field
- Condition of Quad

During Flight

- Aircraft stability / functionality
- Wind Speed
- Battery Condition
- Airspace Activity

When one or more conditions is seen as a hazard we may:

- Return to Land Immediately
- Reschedule flight or travel to other fields
- Make necessary plans to repair and inspect Quad thoroughly

Progress during COVID-19

- Working virtually and In-person
  - Social distancing
  - Masks
- Flying our own drones and Quadzilla
- Community outreach
- Personal projects

Future Steps for Improvement

- More practice, practice, practice!
  - Manual and autonomous flight
  - Mission Planner
  - Plans & Procedures
- Maximize balloon drop accuracy
- Implement new designs
- Increase understanding of the Mission Planner tools and features

Thank you for your time!

Questions?