DORIS: Prototype Demo #2

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Prototype #1.2: Drone Flight System

Question: How will the drone parts and electronics practically fit together? How big will it be?

Methods: MDF cutting, FDM 3D printing with TPU

Answer: The drone will be approximately 44 inches across in current configuration, and approximately 15 lbs in total weight. The layout can be seen in the figure on the next slide.

Moving forward:

- Carbon fiber frame plates can begin to be modeled with openings for integrated electronics

- More standardized bolts need to be purchased for arm brackets

- Arms can be analyzed for stability to determine if they need to be shorter

- Motor mounts will be further refined for manufacturability and needed parameters



Prototype #1.2: Close-up Images







Prototype #2.2: Cruise missile



Question: Can we achieve a functioning, controllable missile based on cruise missile design documents from AeroJTP?

Methods: FDM 3D printing w/ Lightweight PLA, wiring diagram of missile

Answer: No. The current state of the airframe design needs refinement. Further testing is needed.

Future work:

- Further calibration of LWPLA is needed, reprint major parts
- Perform more small-scale flight tests before attempting free flight
- Design/redesign and print missile attachment to drone



Prototype Testing

Testing Results

- All four motors receive power
- Fast throttle response present, and enough power is supplied for flight
- Possible reason for failure is the motors had uneven power distribution.
- Wiring on top plate was cut due to exploding blade, indicating the need for top armor.



Prototype Testing

Testing Results

- Cruise missile power and propulsion tested before flight
- During flight, crashed did not fly at all
- Possible reason for crash is the missile was not thrown fast enough for the weight and wing size

Test Stand

- HX711 Load Cell
- 55mm Linear sliding rail
- Oscilloscope will be mounted for power analyzing
- Useful for varying motor and propeller combinations



Thrust Analyzer (Dynamometer)

Collected Data (0-60%)

16x8 Propeller	
Percent Thrust (%)	Average Thrust (g)
0	0
15	338.635
30	2714.2425
45	5646.908
60	6779.416667

Propeller Thrust vs Throttle Percent (su 6000 5000 4000 ----- 16X8 Propeller Thrust Throttle Percent (%)

Team Responsibilities

- Dylan:
 - Design and manufacturing of motor mounts
- Andre:
 - Motor mount/motor assembly
- Connor:
 - CAD modeling of frame plates
 - Manufacturing of MDF frame plates
- Jeremy:
 - Design and manufacturing of new motor mounts
 - Mounting hardware selection
- Michael:
 - Manufacturing, assembly, and troubleshooting of cruise missile electronics/fuselage
- All:
 - Final assembly

Thank you!

Questions?