

NORTHROP GRUMMAN

Drone Disabling Device

Virtual Design Review 1

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Team Introduction



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Northrop Grumman

Leading global security company providing solutions to government and commercial customers.

Involvement:

- Innovative systems
- Undersea technologies
- Outer space technologies
- Cyberspace technologies

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Project Overview

Develop a device that neutralizes drones.

Potential methods:

- Signal based attack
 - Wi-Fi attack
 - Signal jamming
 - Directed EMP
 - Sensor spoof
- Physical attack
 - Weighted Net



Figure 1: DJI Mavic Pro Quadcopter 4k Drone [1]



Project Scope

Objective

- Develop a device to secure specified air space from unmanned flight vehicles.

Key Goals

- Neutralize unmanned flight vehicles within a specified air space
- Ensure the device is portable
- Maintain environmental safety
- Function properly over necessary time period
- Comply with safety and legal regulations



Project Scope

Primary Market

- Military and public safety organizations

Secondary Market

- Defense agencies and private security companies

Assumptions

- Unmanned flight vehicles considered will be drones

Stakeholders

Northrop Grumman

- Tameika Hollis
- Stan Zoubek

COE Advisors

- Dr. Shayne McConomy
- Dr. Chiang Shih
- Dr. Camilo Ordonez



Customer Needs

Drone Specs

- Typical household drones

Effectiveness

- Minimum Requirement: disable
- Bonus: recovery

Range

- 30 feet radius dome



Figure 2: DJI Mavic Pro Quadcopter 4k Drone [1]

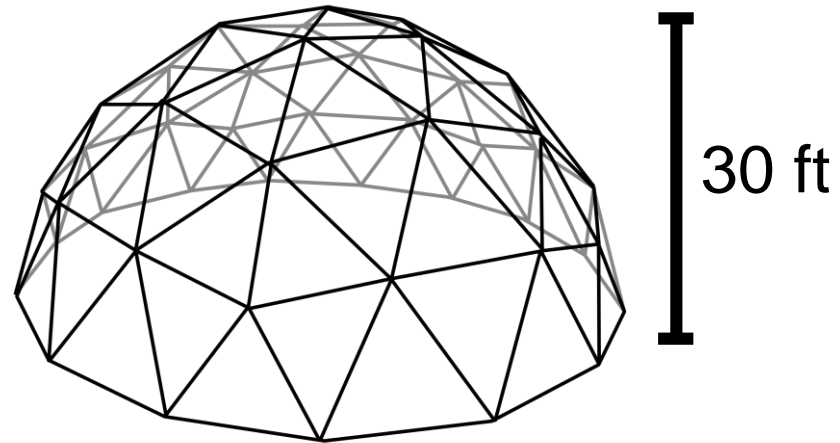


Figure 3: Visual representation of desired dome [2]



Customer Needs

Operation

- Trained human operator

Power

- AC Power
- 15-20 amps

Portability

- Portable
- 4 hour assembly time

Purpose

- Focus on development process



Figure 4: Visual representation of sample user operation [3]

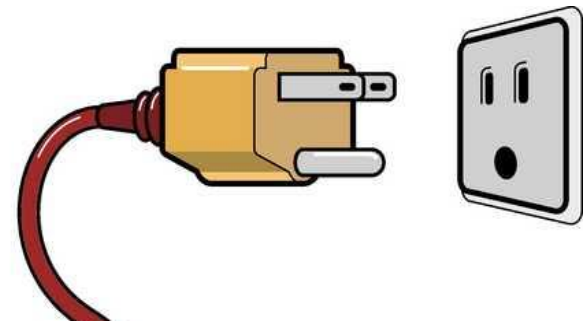
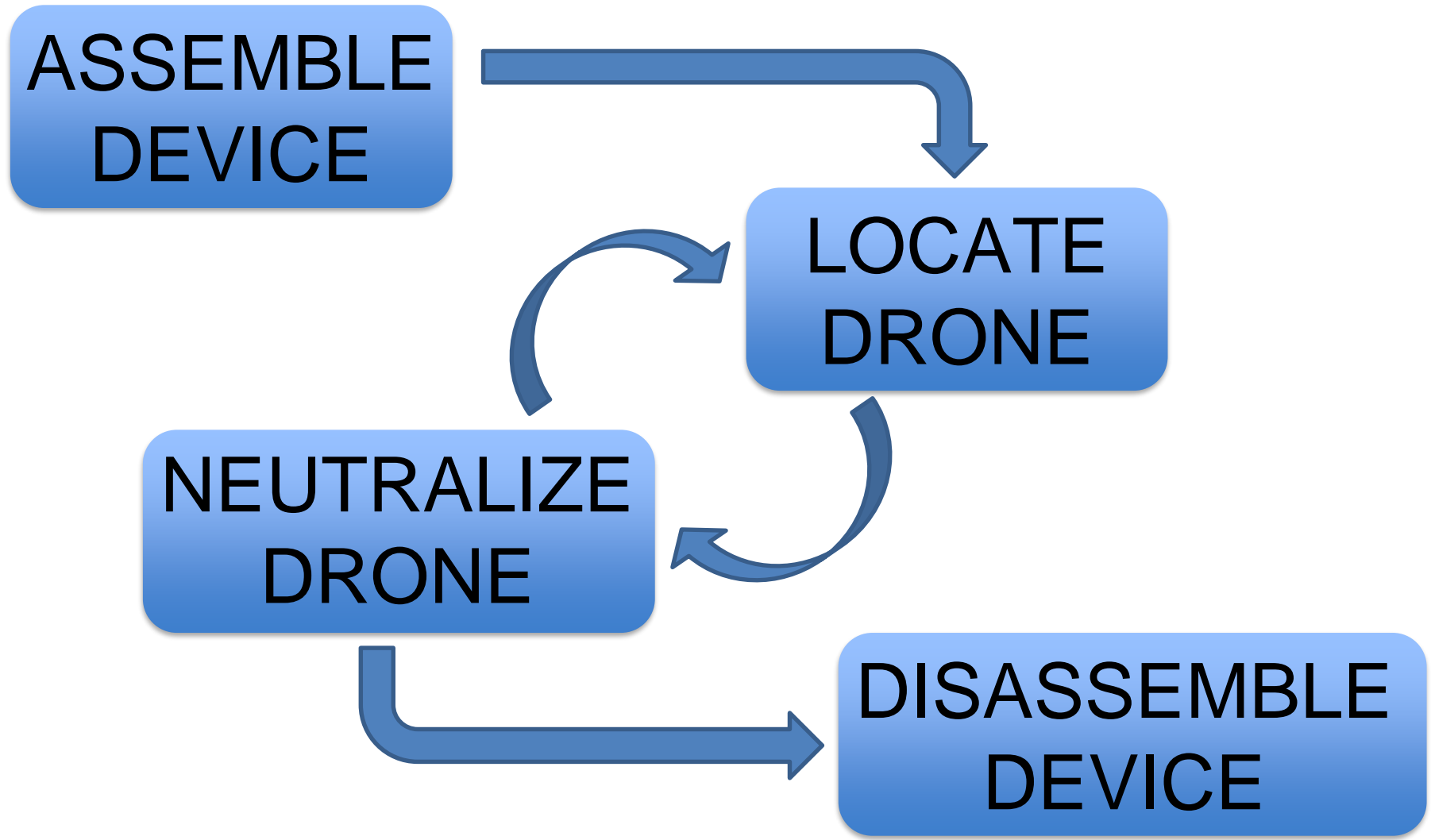


Figure 5: Simple wall plug and outlet [4]



Functional Decomposition



Next Steps

Understand importance of overlapping sub-functions within main functions

Identify range, power, and effectiveness target metrics

Omnidirectional vs. Directional Approach



References

- [1] Argos (Photographer). (2017). *DJI Mavic Pro Quadcopter 4k Drone* [digital image]. Retrieved from <http://www.argos.co.uk/product/6259381>
- [2] Y. (2011, November 01). *Clipart – geodesic-dome* [digital image]. Retrieved October 13, 2017, from <https://openclipart.org/detail/165554/geodesicdome>
- [3] ROCU-7 – Universal Wireless Controller for Unmanned Military Systems (2017). [digital image]. Retrieved October 13, 2017, from <http://www.robo-team.com/products/rocu-7/>
- [4] M. (2014, September 04). *Kerbal Attachment System (KAS) 0.4.7 -- Pipes as fuel lines and even fewer explosions!* [digital image] Retrieved October 13, 2017, from <https://forum.kerbalspaceprogram.com/index.php?/topic/48738-kerbal-attachment-system-kas-047-pipes-as-fuel-lines-and-even-fewer-explosions/&page=6>



Questions?



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Backup “Detailed” Slides

- I. Customer Needs

- II. Functional Decomposition



Customer Needs

Question?

Customer Statement

Interpreted Need

What is the size and type of drone to be neutralized?

Recreational drones that could be carrying IED's or have cameras.

Disable non-military, typical household drones.

How long does this device need to be operable for?

The device should work as long as possible. It can be plugged into a car, building, generator, etc.

AC power with 15-20 amp power consumption (typical outlet)

What is the outcome of the neutralized drone?

Looking to just neutralize the drone given the time constraints, but if possible recover the drone if it is not completely destroyed.

The threshold or minimum requirement would be to disable the drone. Recovering the drone would exceed expectations.



Customer Needs

Question?	Customer Statement	Interpreted Need
Is the device expected to be autonomous?	No, due to time constraints it will most likely not be possible but ideally that's what we would want.	The threshold or minimum requirement is that the device provides user operation.
Is there a specific range that the device must function within?	30ft radius dome around device; may realize this is not possible and constraints may need to be adjusted.	30ft radius dome minimum but operate at longer range if possible.
Does the device need to be portable?	Yes, be able to assemble device within 4 hours.	Portable device with a quick set-up time.
What is the purpose of Northrop Grumman sponsoring this project?	Aid-to-hire and give students an understanding of the learning process. Northrop Grumman is not looking for a proof of concept to scale.	Our team should focus on the development process over delivering the final product.



Functional Decomposition

