



VDR 1

Team 518: Light-Weight UAV

October 20, 2020

Team Introductions



Ethan Hale
*Manufacturing and
Systems Engineer*



Jackson Dixon
*Supply Chain
Engineer*



Maxwell Sirianni
*Flight
Dynamics Engineer*



John Storms
Test Engineer





Joseph Ledo-Massey
*Design Engineer and
Project Manager*

Sponsor and Advisor

**NORTHROP
GRUMMAN**

Jennifer Tecson


 Manager of Engineering

 FSU Electrical Engineering Graduate



Lance Cooley, Ph.D.

 Professor of Mechanical Engineering

 Research interests in superconducting materials

Max Sirianni

Objective

The objective of this project is to develop a lightweight UAV to directly increase the flight time while maintaining surveillance capabilities.

Max Sirianni



Project Background

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Background

Project Scope

Customer Needs

Functional Decomposition



Background

✈ UAV- Unmanned Aerial Vehicle
➤ Piloted by remote control or onboard computer

✈ Two styles



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Background

 UAV use often coincides with surveillance

 Surveillance is used to gather information and data that is valuable to the user



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Adaptation of the project Team 518 performed during 2019-2020 school year

Primary focus was on light-weighting the battery, the tail, and wing components with lighter materials

Based design on Believer 1960mm



Senior Design Team 2020-2021

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Markets



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Assumptions

The UAV...

...is a category 1 drone, as defined by the DoD.

...is remotely controlled.

...will be operated in rural areas with rural climates.

...will be easily operated and user-friendly.

...will follow all state and federal laws.

...will be flown in clear airspace.



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Key Goals

Provide surveillance recordings using the UAV.



Keep the UAV lightweight compared to market ready UAV's.



Increase the flight time of the UAV.



Develop the UAV with multiple light-weighting techniques.



Make the UAV easy to transport and operate.



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Customer Needs

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Customer Needs

The drone will be designed and constructed with selected lightweight materials

The UAV will be of the fixed wing style

The UAV will have a payload

The drone implements previously purchased components to be cost effective

Use available materials and stay within budget and design capabilities

The drone will take off and land either unassisted or assisted

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Customer Needs: Take Away

 Requirements coincide with the project objective

 Cost is a major factor for this project

 There are a lot of design requirements that are up to the team to decide on

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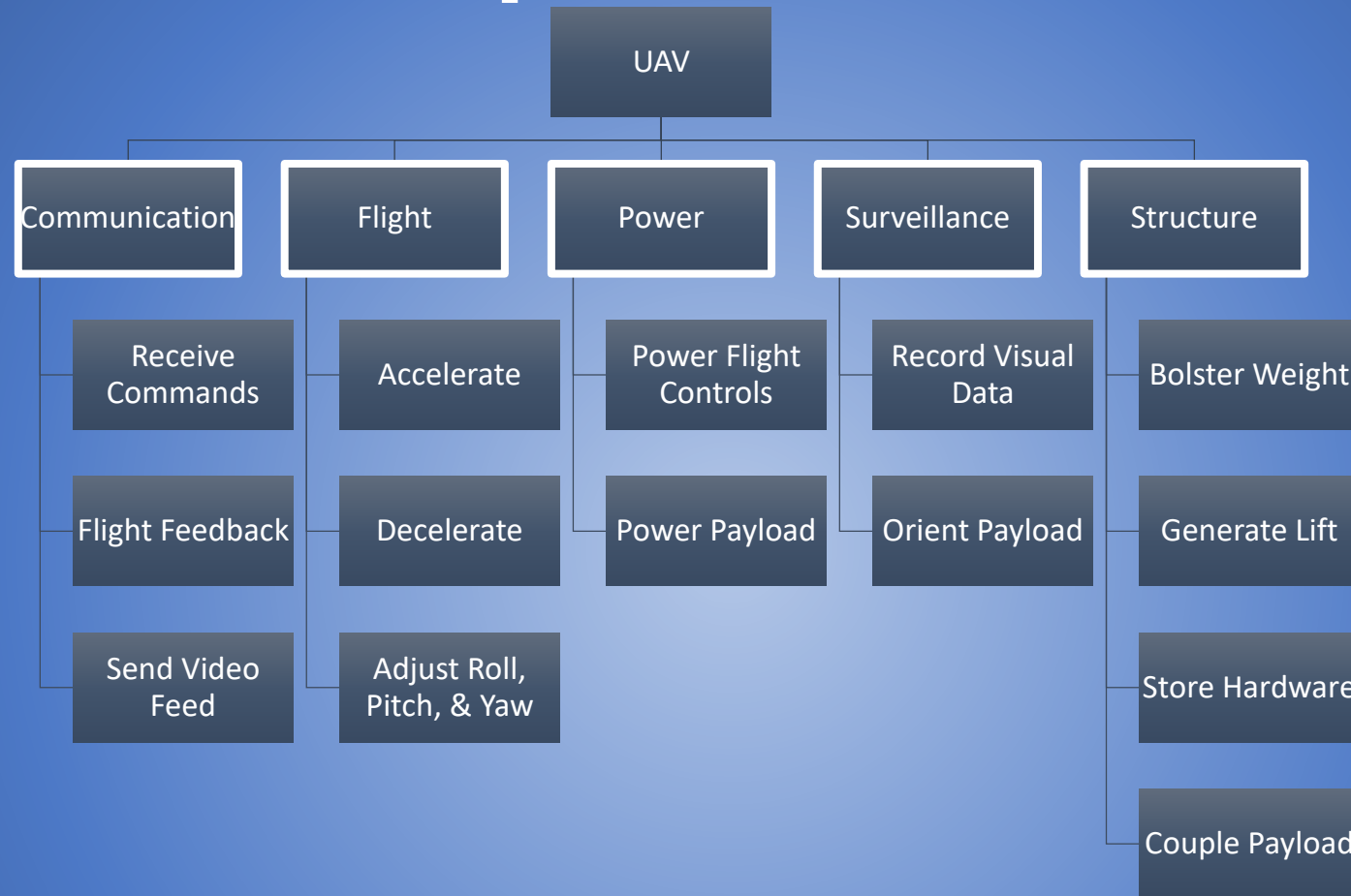
Project Scope

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Functional Decomposition



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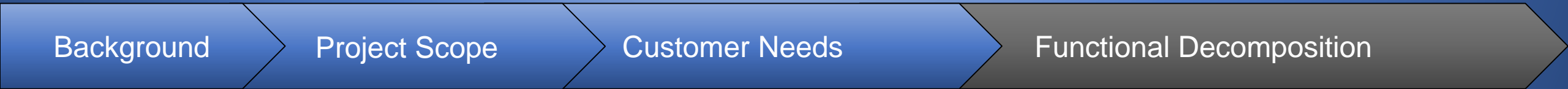
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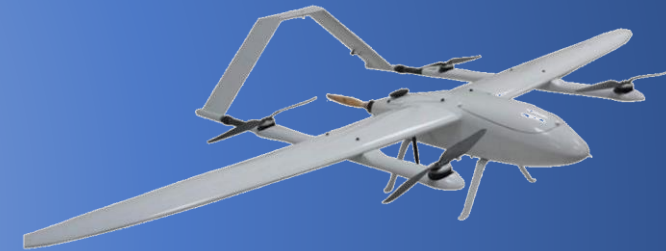
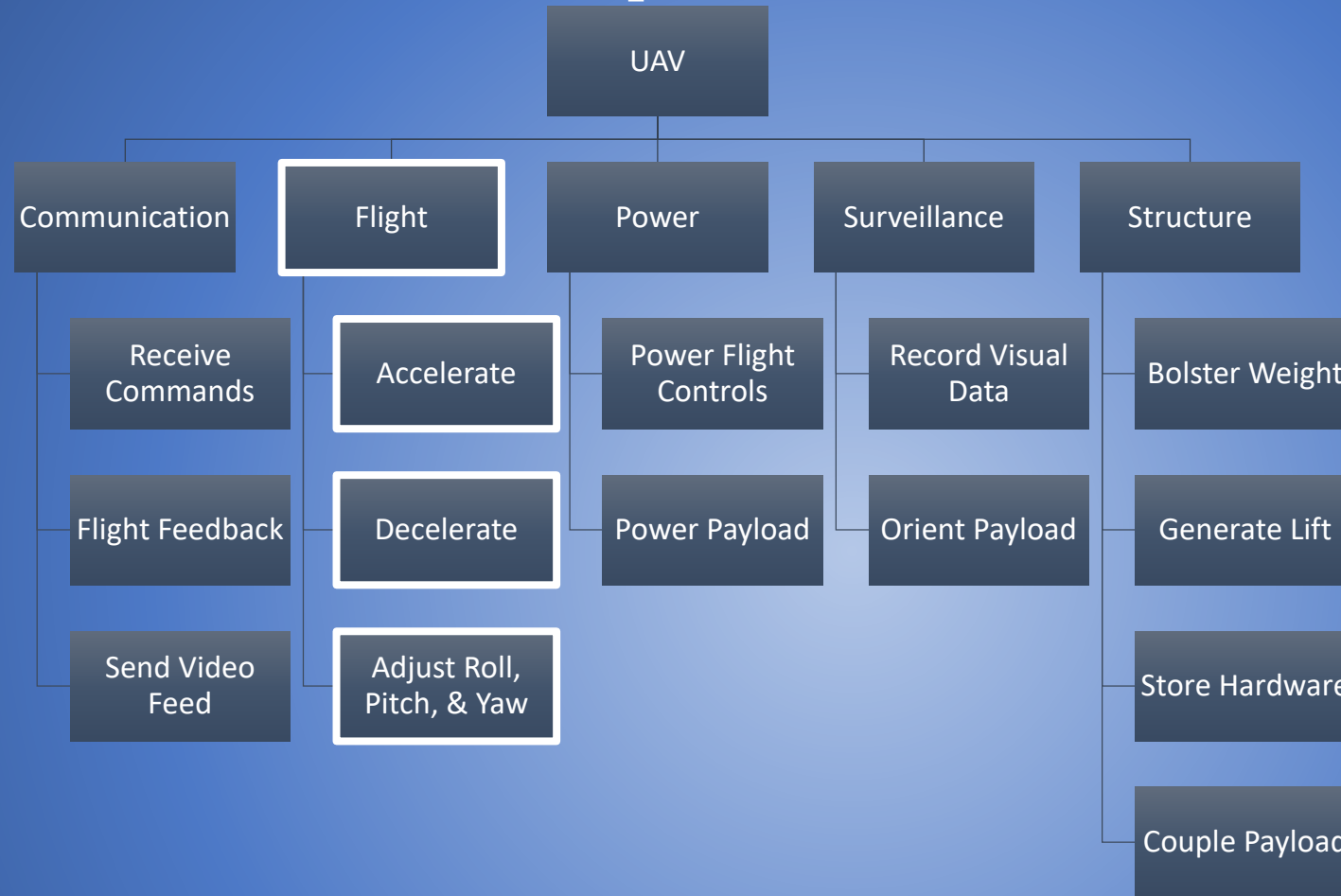
Functional Decomposition



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Functional Decomposition



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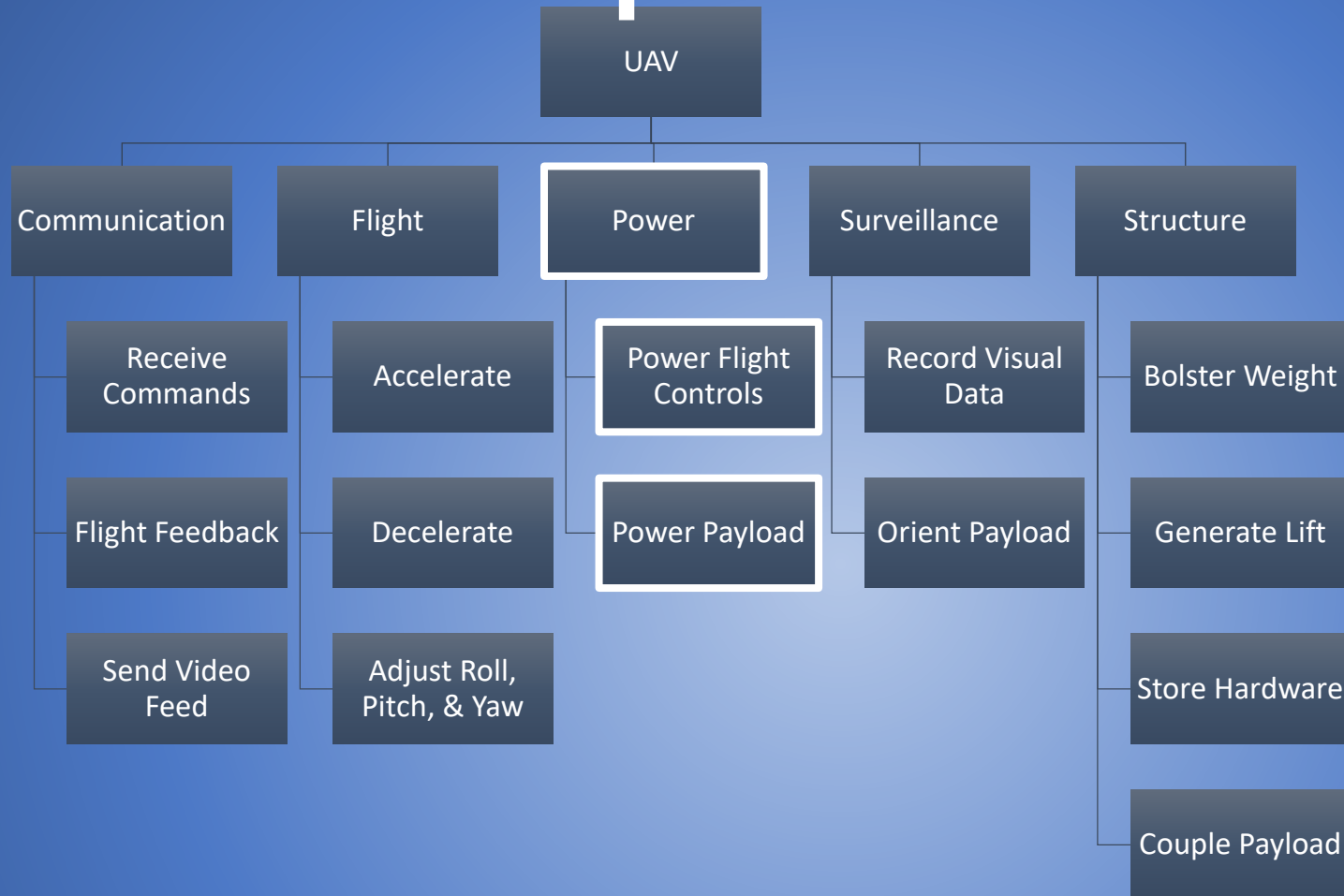
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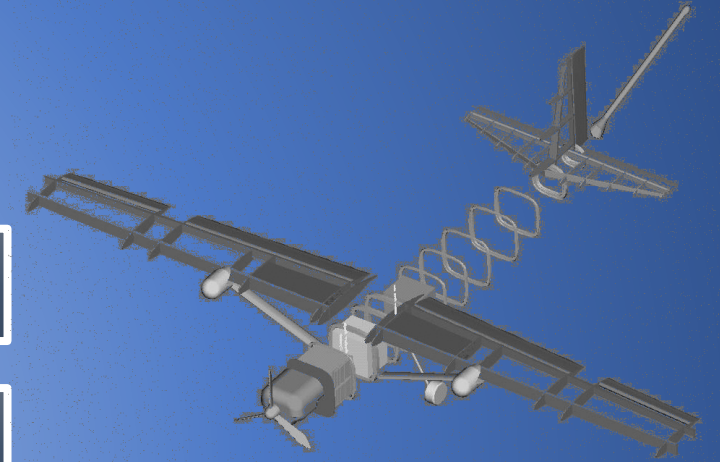
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Functional Decomposition

	Communication	Flight	Power	Surveillance	Structure
Communication	X	X	X	X	X
Flight	X	X	X		X
Power	X	X	X	X	X
Surveillance	X		X	X	X
Structure	X	X	X	X	X

Priorities:

1. Structure
2. Power
3. Flight
4. Communication
5. Surveillance

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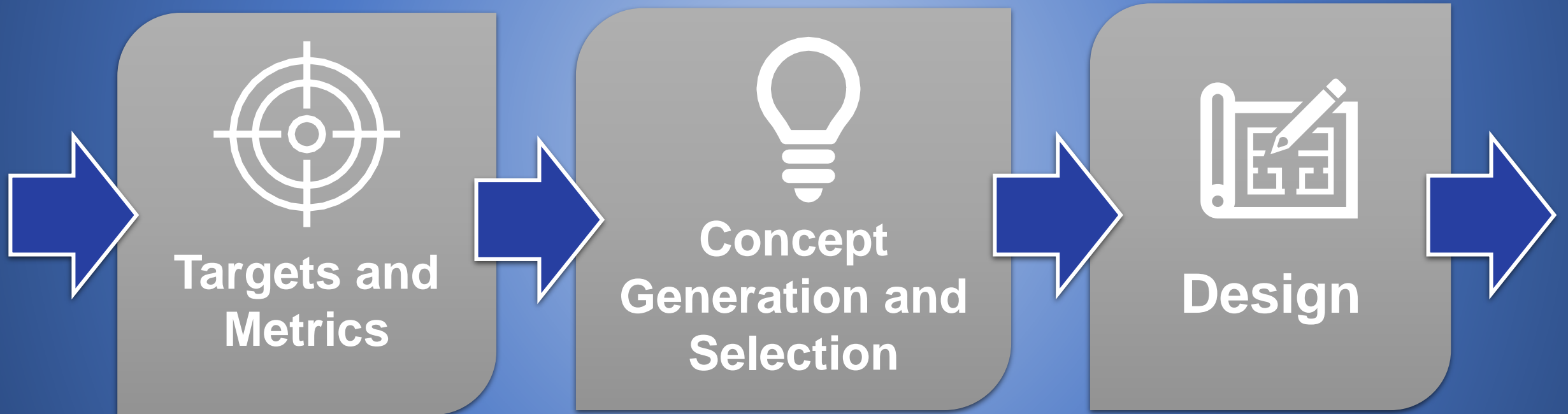
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Future Work



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Conclusions

- **Purpose: Develop a lightweight UAV to directly increase the flight time**
- **Motivation: Aerial surveillance**
- **Market: Farmers, Military, Hobbyists, Infrastructure, Education**

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References

Classification of the Unmanned Aerial Systems. (n.d.). Retrieved September 25, 2020, from <https://www.e-education.psu.edu/geog892/node/5>

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Questions?



Backup Slides



Questions	Customer Statements	Interpreted Need
What materials should be used?	The team last year found an innovative composite to use as a lightweight material.	Use available materials and stay within budget and design capabilities.
Is there a pre-existing drone to work from or will the drone design be original?	Utilize the previous SD project to interpret a direction for this year's project.	The drone will be designed and constructed with selected lightweight materials.
How much of the work should be continued from last year?	With the budget issues we have, figure out what can be used from last year's work.	The drone implements previously purchased components to be cost effective.
Are there take-off and landing requirements?	There is no take-off or landing requirements.	The drone will take off and land either unassisted or assisted.
Quadcopter or fixed wing drone?	Look at the work of last year. A quad rotor is harder to control.	The UAV will be of the fixed wing style.
What kind of payload is expected to be a part of the UAV?	Payload can be for surveillance or data collection purposes.	The UAV will have a payload.
Can the components be outsourced, or will the components need to be self-created?	Decide a payload size/range. Unnecessary to create sensors.	The drone will use outsourced components.
What is the size requirement for the UAV?	Look at existing design from last year.	The drone is smaller than double the reference drone.
What is the weight restriction of the UAV?	Look at the work of last year but lightweighting can come in forms of efficiency.	The drone will be a category 1 UAV.

	Communication	Flight	Power	Surveillance	Structure
Receive Commands	X	X	X	X	
Flight Feedback	X	X	X		
Send Video Feed	X			X	
Accelerate	X	X	X		X
Decelerate	X	X	X		X
Adjust Roll, Pitch, & Yaw	X	X	X		X
Power Flight Controls	X	X	X		X
Power Payload	X		X	X	X
Record Visual Data	X		X	X	
Orient Payload	X		X	X	X
Bolster Weight		X			X
Generate Lift		X			X
Store Hardware					X
Couple Payload		X		X	X