TEAM 513: SAE AERO DESIGN COMPETITION

10-Oct-19

Team Introductions

Nestor Aguirre
Aeronautics/ 3D Printing Engineer

Zachary Silver
CAD Engineer

Martina Kvitkovicova
Electronics Test Engineer

David Litter
3D Printing Engineer

Hebert Lopez
Electrical Design Engineer

Leah Evans
Aeronautics Engineer/ Financial Advisor

Sponsors

Florida Space Grant Consortium	Seminole RC Club	3D Solutech	Dr. Shih
Providing Funding	Providing Equipment	Providing various Filaments	Providing Technical Knowledge

Zac Silver

Objective

- The objective of this project is to design and manufacture a 3D printed remote controlled (RC) airplane capable of carrying the designated cargo in order to compete in the regular class of the SAE Aero Design East competition.

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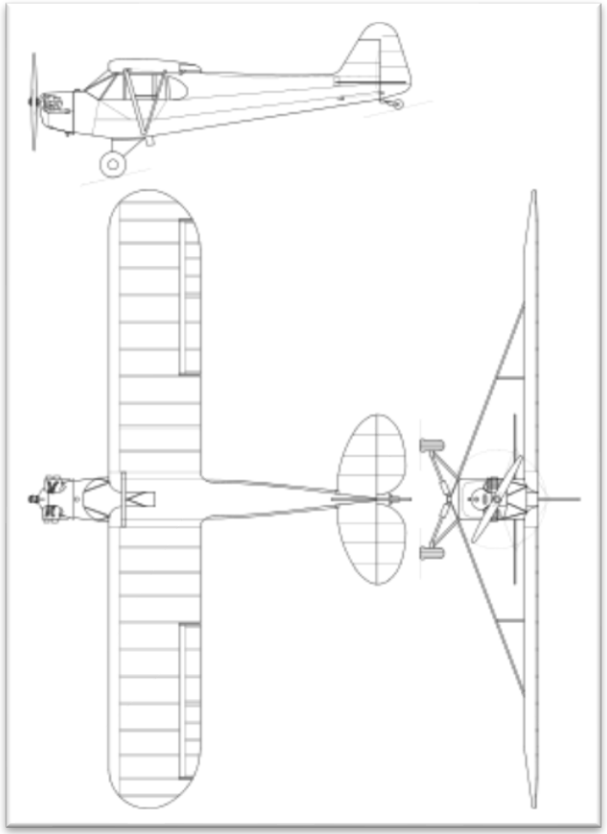
Project Summary

- Follow regulations from SAE Aero Design Competition
- Design and manufacture an airplane from 3D printed processes
- Test and validate the capabilities of a 3D printed airplane
- Compete in the Eastern SAE Aero Design Competition in March 2020
- Innovate novel solutions



Zac Silver

Key Goals

The airplane is over **85%** 3D printed by weight.

The airplane can **take off** within the designated runway length and **land** within the designated landing area.

The airplane can operate effectively while carrying the designated payload.

The airplane has an easily accessible cargo area that minimizes loading and unloading time.

The airplane is easily **controllable** while in flight.

The airplane can withstand environmental conditions.

The airplane is re-creatable and affordable.

The airplane can easily be assembled, repaired, and transportable by parts.

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Assumptions

Environmental conditions will be comparable to test conditions in Tallahassee.

The airplane will be constructed of modular pieces.

The airplane does not have to be 100% 3D printed.

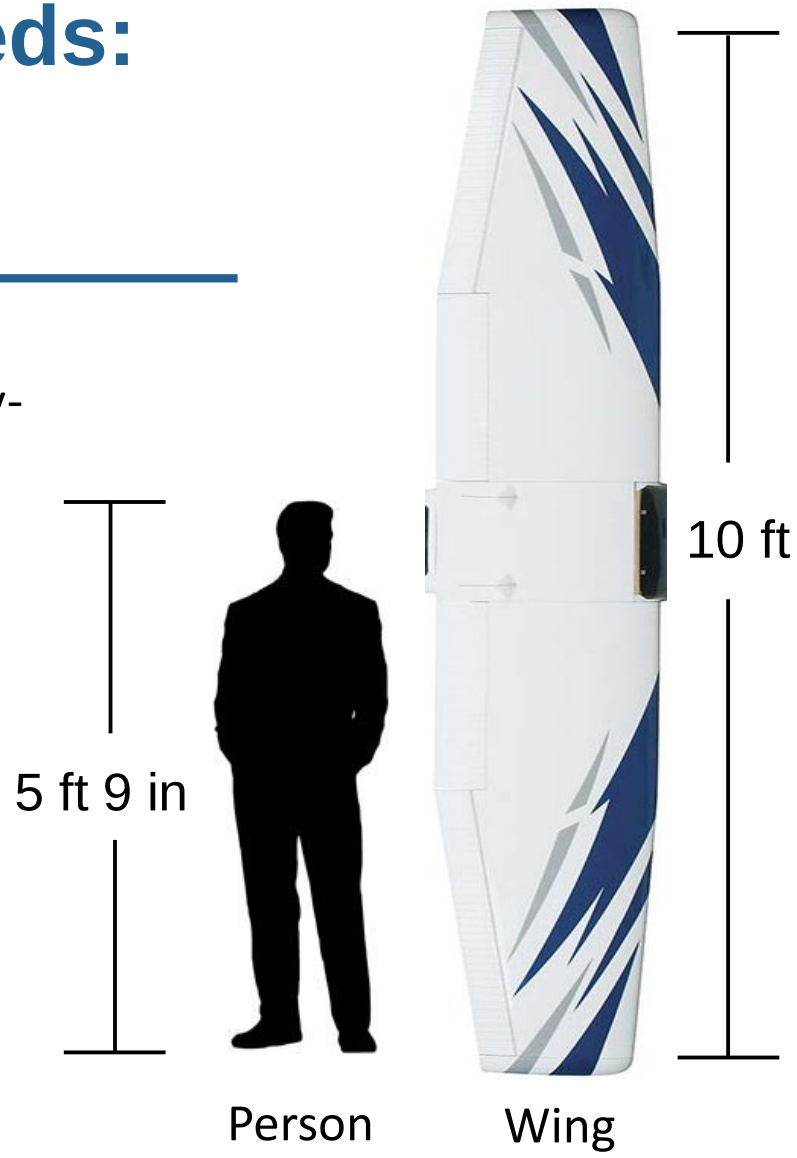
The airplane will not need to perform aerobatic maneuvers.

Zac Silver

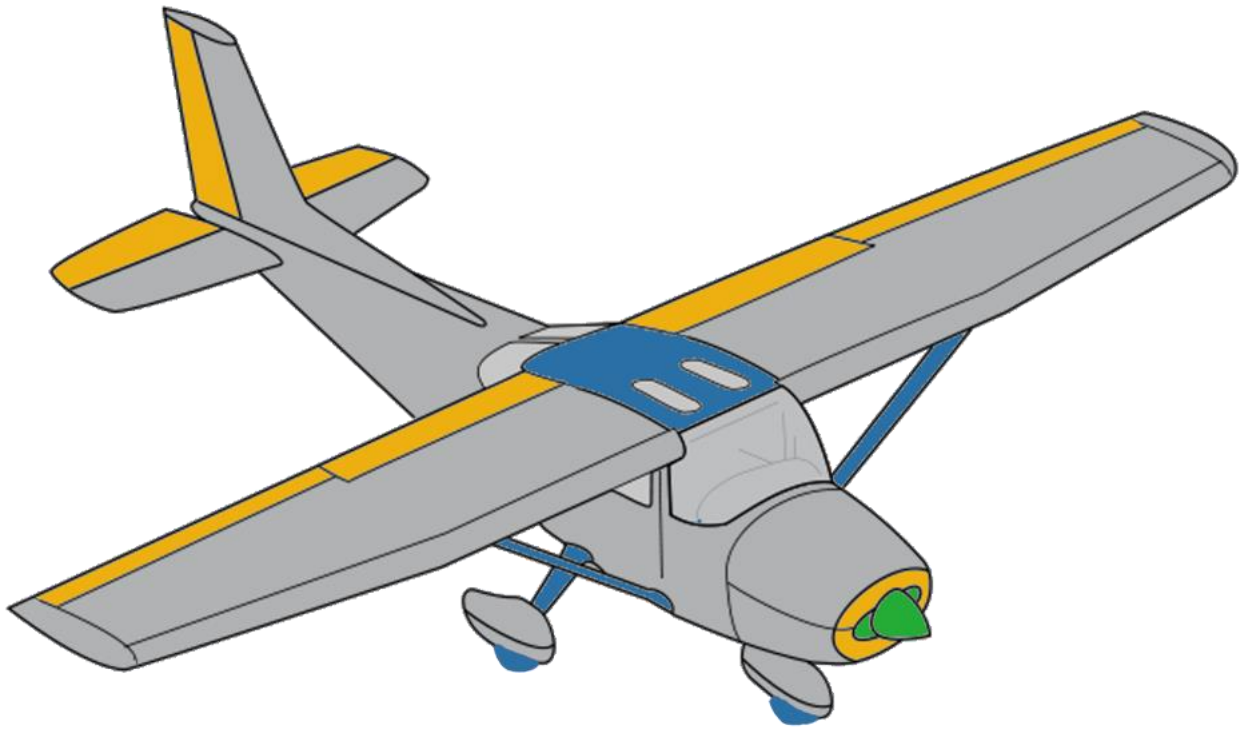
Customer Needs: General Requirements

- The airplane and payload weight cannot exceed fifty-five (55) pounds.
- The airplane can fly without the payload.

Dimension constraints ⟶

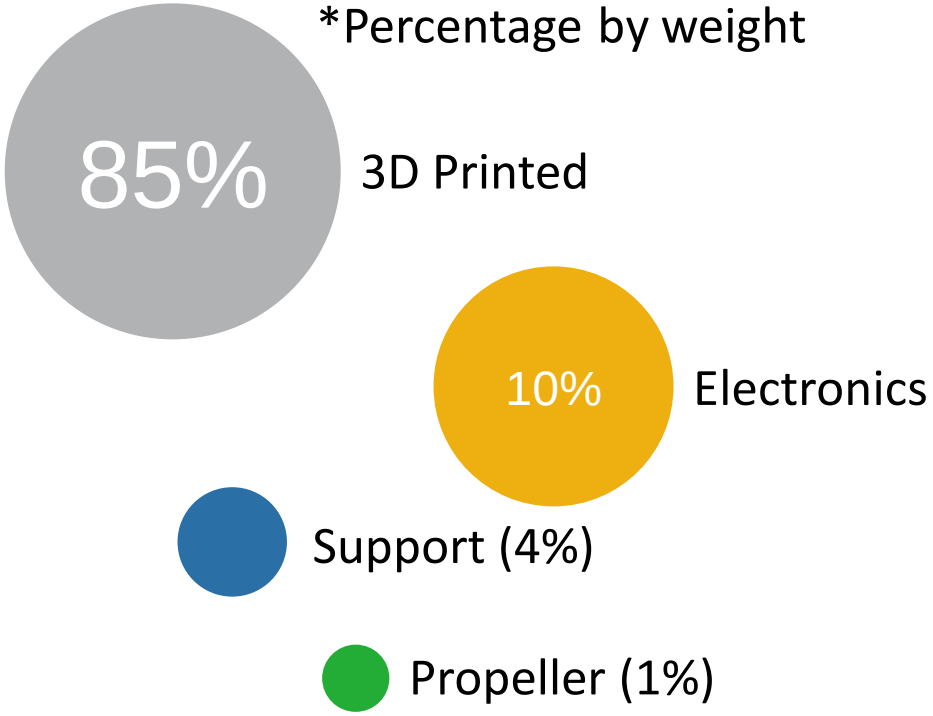


Martina Kvitkovicova



Customer Needs: Material Requirements

*Percentage by weight



- No metal propellers
- No fiber reinforced plastics
- No rubber bands as support

Martina Kvitkovicova

Customer Needs: Electronics Requirements

22.2 V Lithium polymer battery

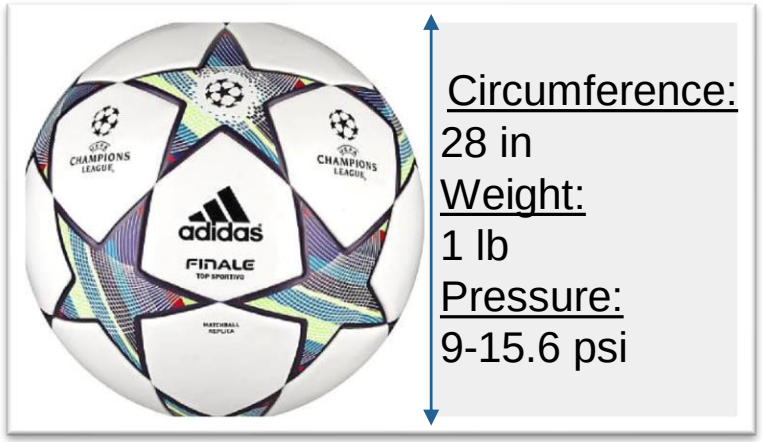
2.4 GHz Radio control system

Power toggle switch

One electric motor

Martina Kvitkovicova

Customer Needs: Payload Requirements

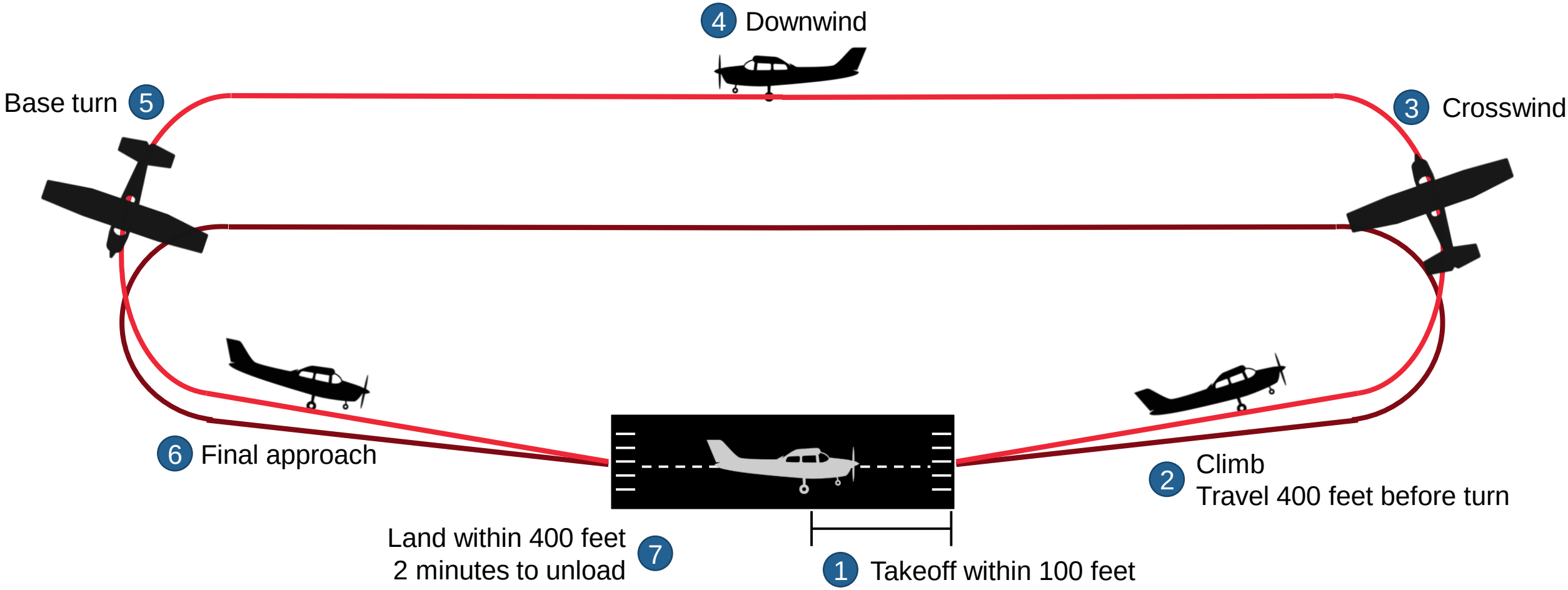


Spherical cargo

Weighted plates

Metal fasteners

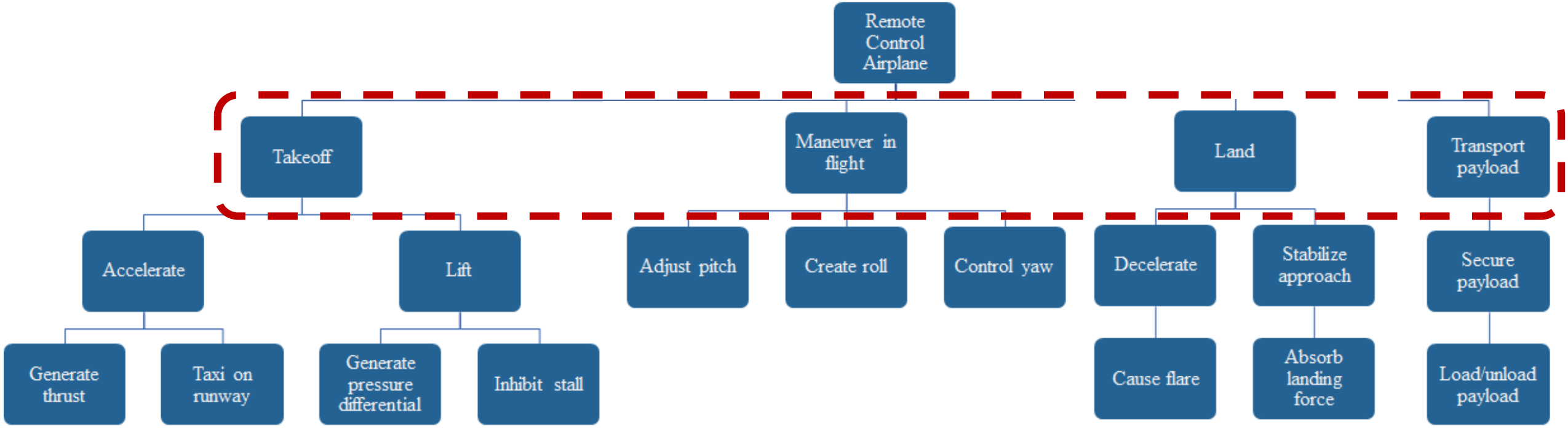
Martina Kvitkovicova



Customer Needs: Mission Requirements

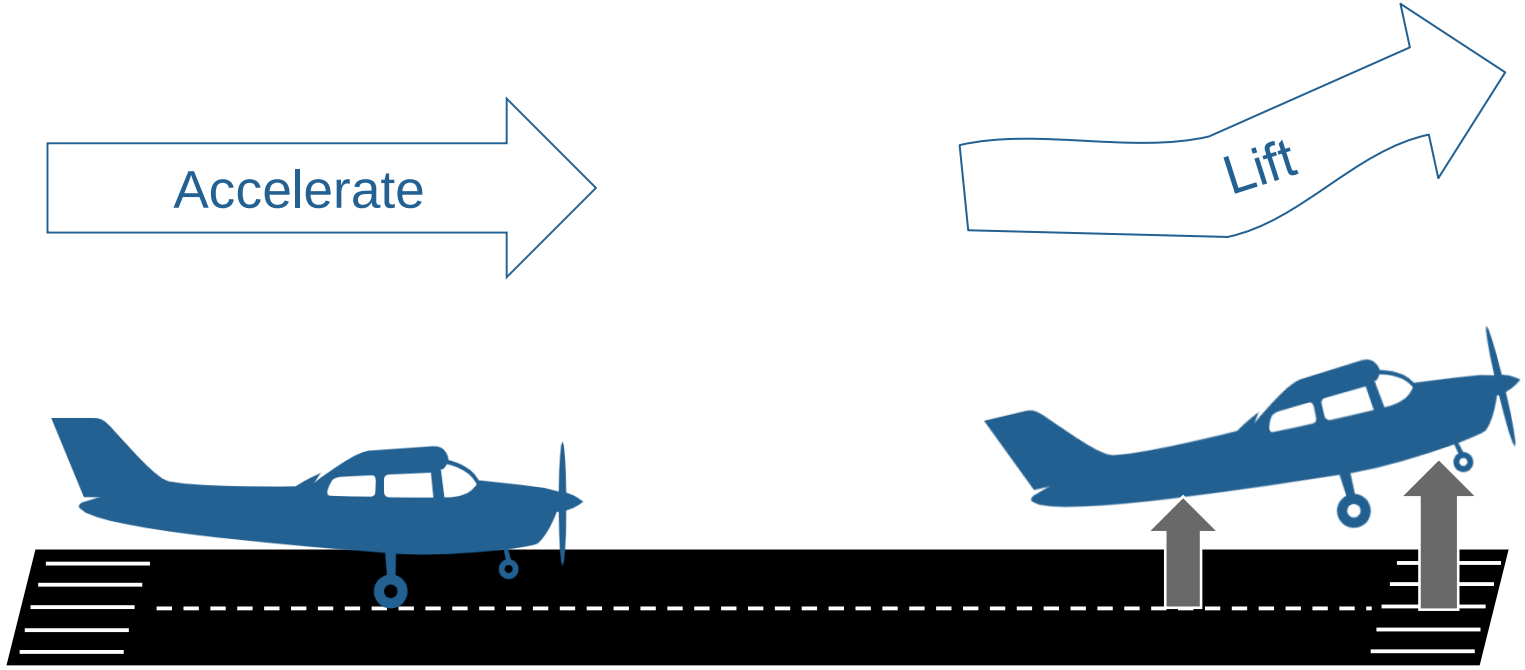
Martina Kvitkovicova

Functional Decomposition



David Litter

Functional Decomposition:
Takeoff

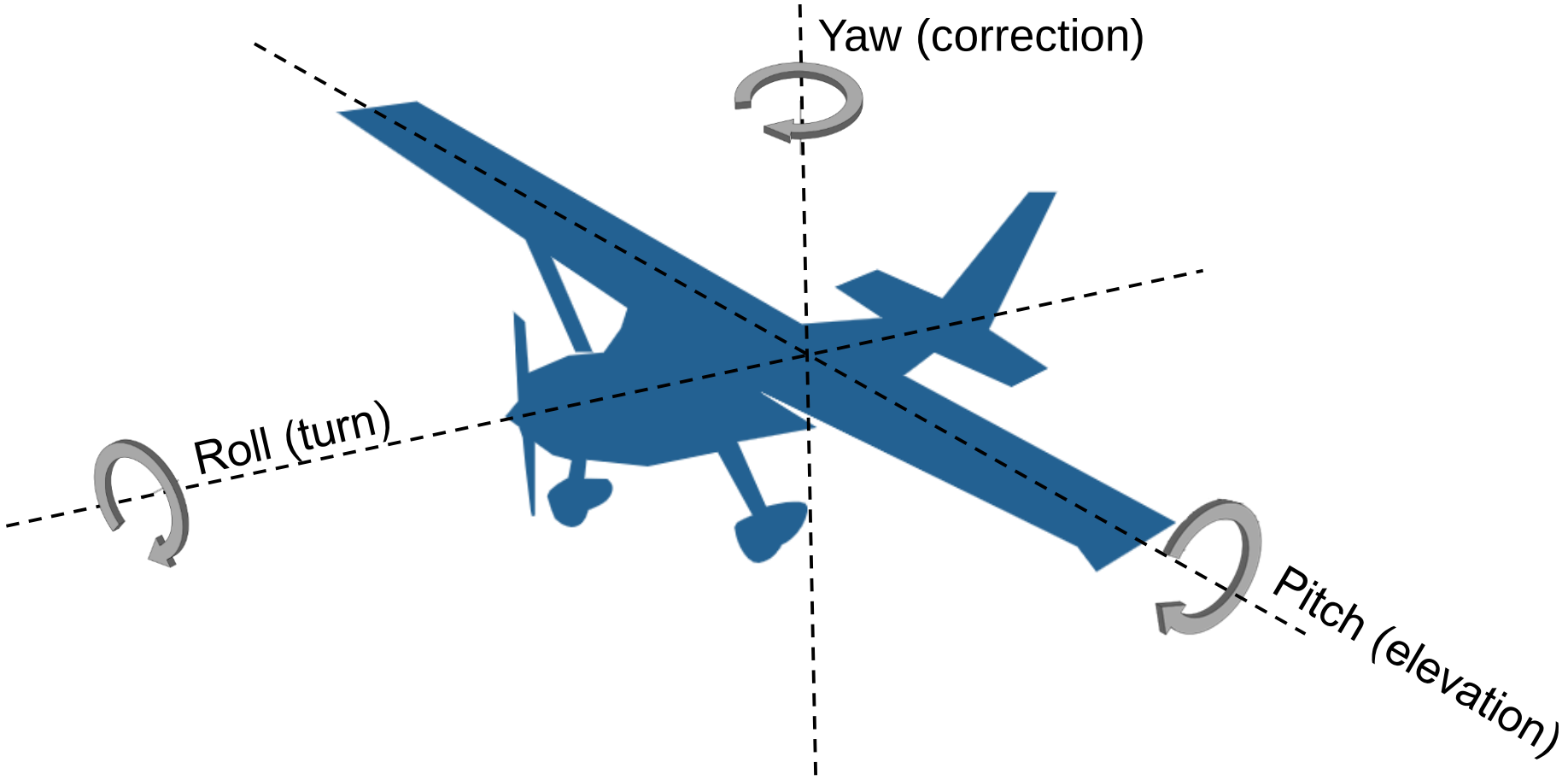


Generate Thrust
Taxi on Runway

Generate Pressure Differential
Inhibit Stall

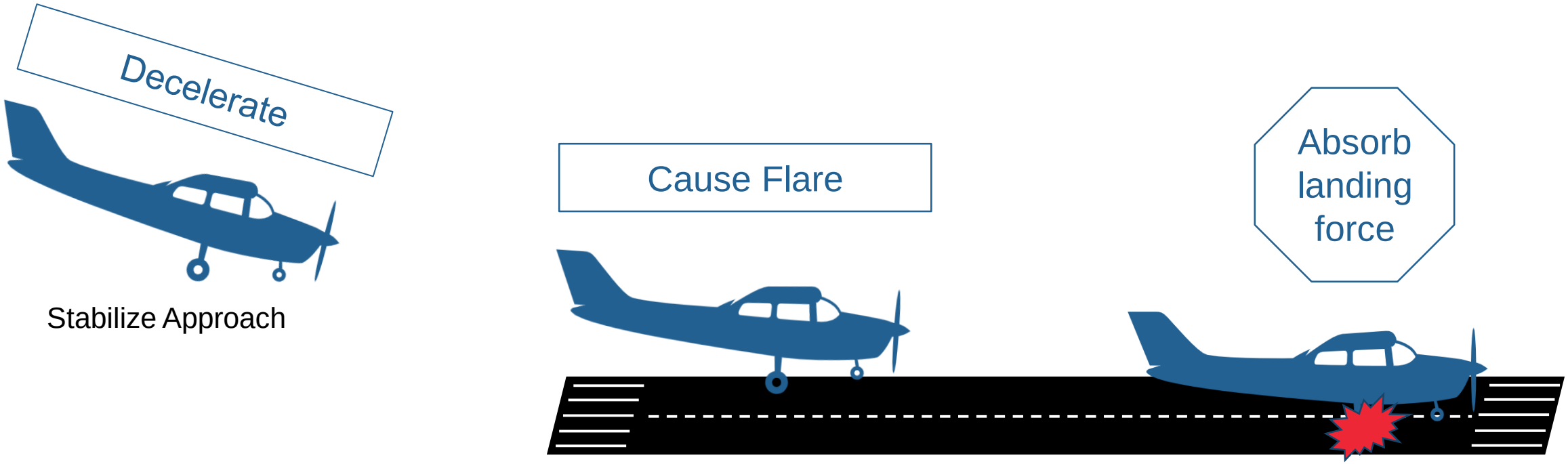
David Litter

Functional Decomposition:
Maneuver in Flight



David Litter

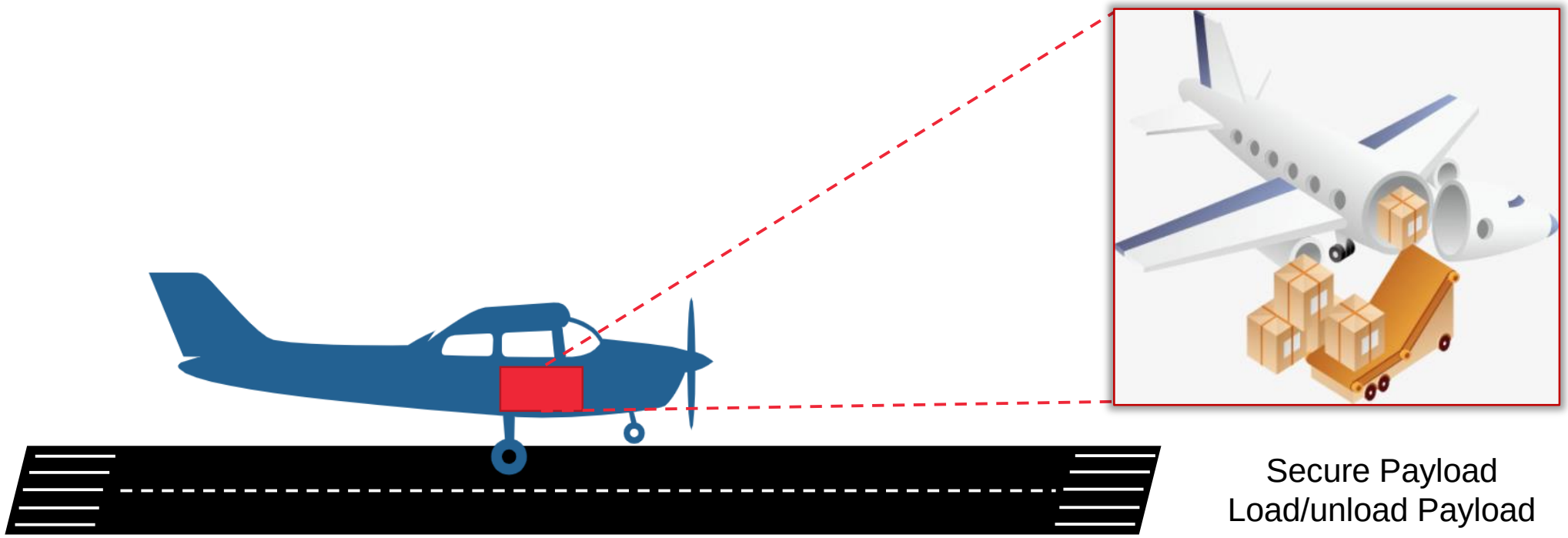
Functional Decomposition:
Land



Stabilize Approach

David Litter

Functional Decomposition:
Transport Payload



Secure Payload
Load/unload Payload

David Litter

Completed Work

- Read rule and regulations
- Began testing lightweight PLA
- Secured filament sponsor
- Assigned research/design areas
- Began research, gathering equations
- Determined rough weight of electronics and airplane

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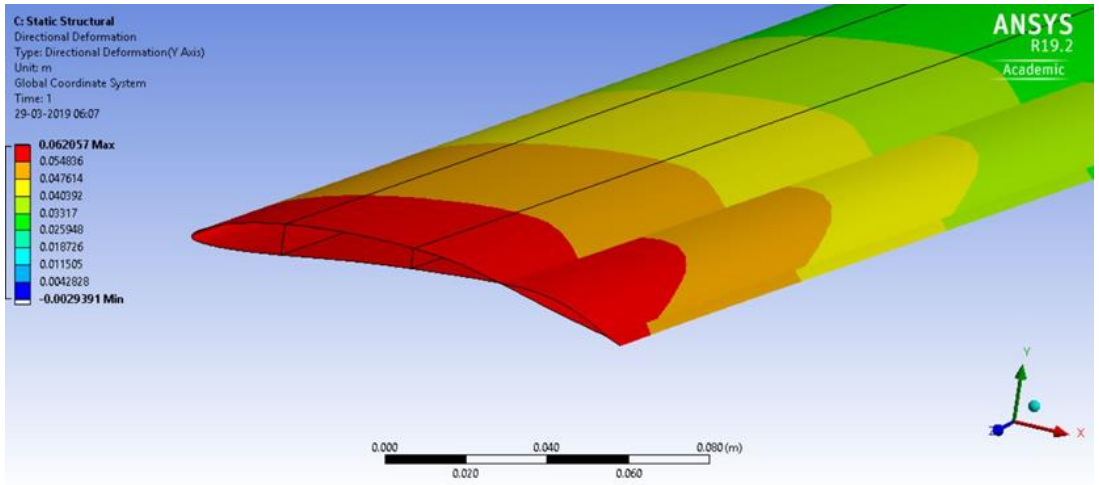
Future Work



- Test/Compare the appropriate filaments
- Determine the exact weight of airplane
- Determine airfoil shape
- Size wings to aircraft
- Calculate approximate take off distance
- Learn simulation software

Zac Silver

Five Most Important Points

1. The goal is to design and manufacture a 3D printed airplane capable of carrying assorted payload.

2. The team is utilizing all available resources to begin engineering the airplane.

3. There are many constraints in the SAE rulebook but none on the 'design'.

4. The material selection process of major components is underway.

5. The preliminary calculations needed to begin designing are underway.

Zac Silver

Thank you

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References

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