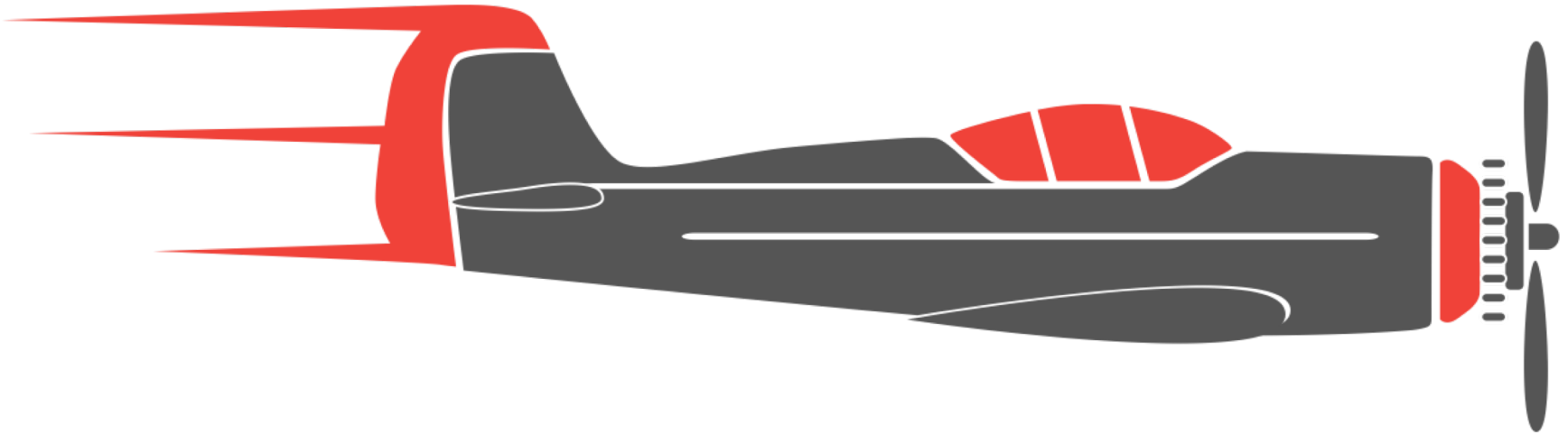


Team 508
SAE Aero Design: Geometric Integration
EML 4552C

Team Members

Jacob Pifer
Project Manager
Manufacturing Engineer

Lauren Chin
Lift & Control Surfaces Engineer
Meeting Coordinator
CAD Engineer

Joseph Figari
Fuselage and Payload Engineer
Financial Coordinator
CAD Engineer

Sponsors

Florida Space Grand Consortium
Financial Sponsor

Seminole RC Club
Equipment Provider

Shayne McConomy, PhD
Faculty Sponsor

Jacob Pifer

Advisors

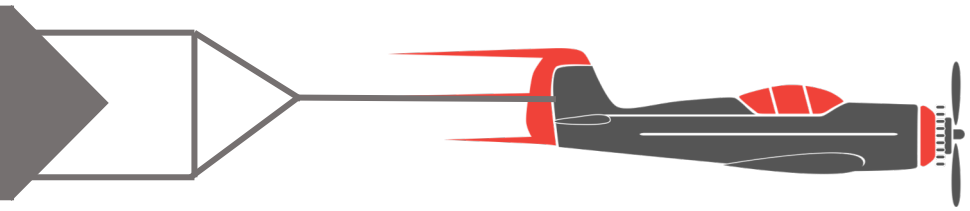
Simone Hruda, PhD
Faculty Advisor

Eric Adams
Fablab Supervisor

Dorr Campbell,PhD
Materials Advisor

Jacob Pifer

Project Objective

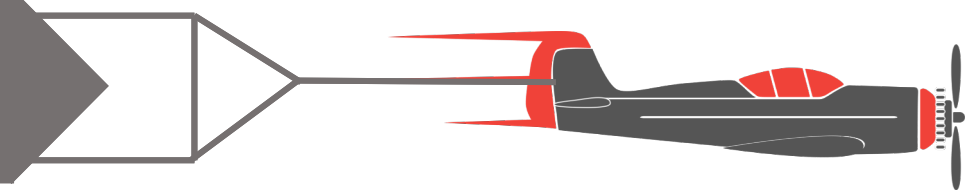


- The objective of this project is to design and manufacture a 3D printed remote control airplane within the rules of the SAE Aero Design Competition

- It will be able to take off, complete the needed flight path, and land while carrying the required cargo

Jacob Pifer

Project Brief Summary

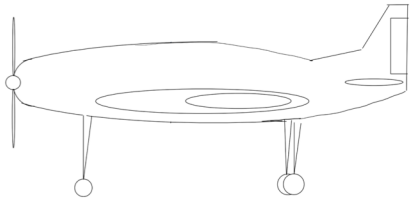


- The plane will not be flown at the competition in March
- Team is still a part of the competition
- Plane will still be built within competition rules
- Test flight will be done in Tallahassee with Seminole RC Club
- If necessary and time permits, design changes will be made and a second flight will take place

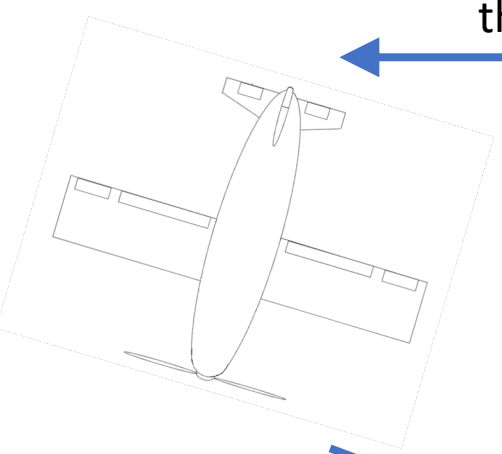
Jacob Pifer

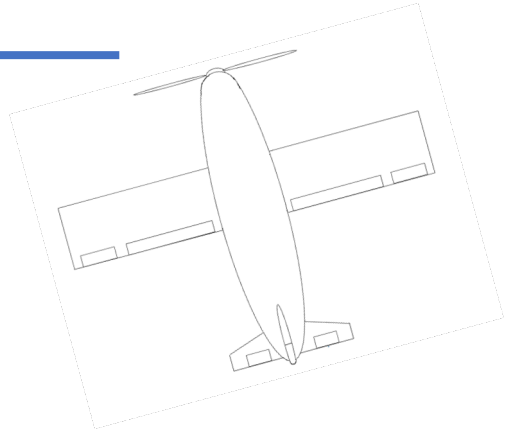
Project Brief Summary

Travel 400 ft past runway then turn back

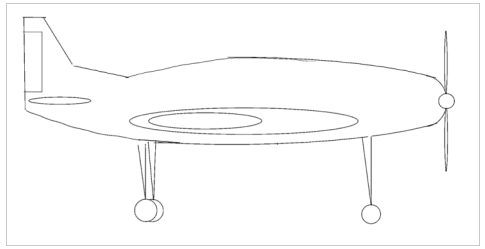


Turn back towards runway





Align with runway then land



Fly 400 ft

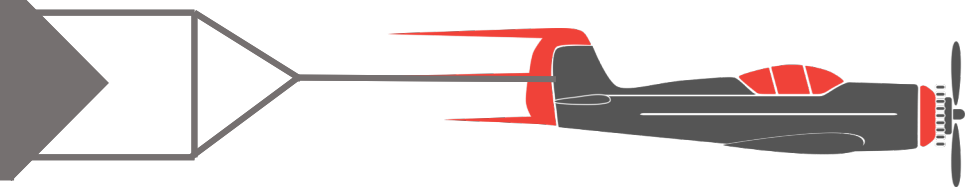
Jacob Pifer

Material Selection

- House of Quality found weight to be most important design factor
- Two possible filaments could be used within budget and competition rules
  - PLA
  - LW-PLA
- Torsion and bending tests done to compare strengths
- Tests found PLA to be stronger but due to weight advantage LW-PLA was chosen

Jacob Pifer

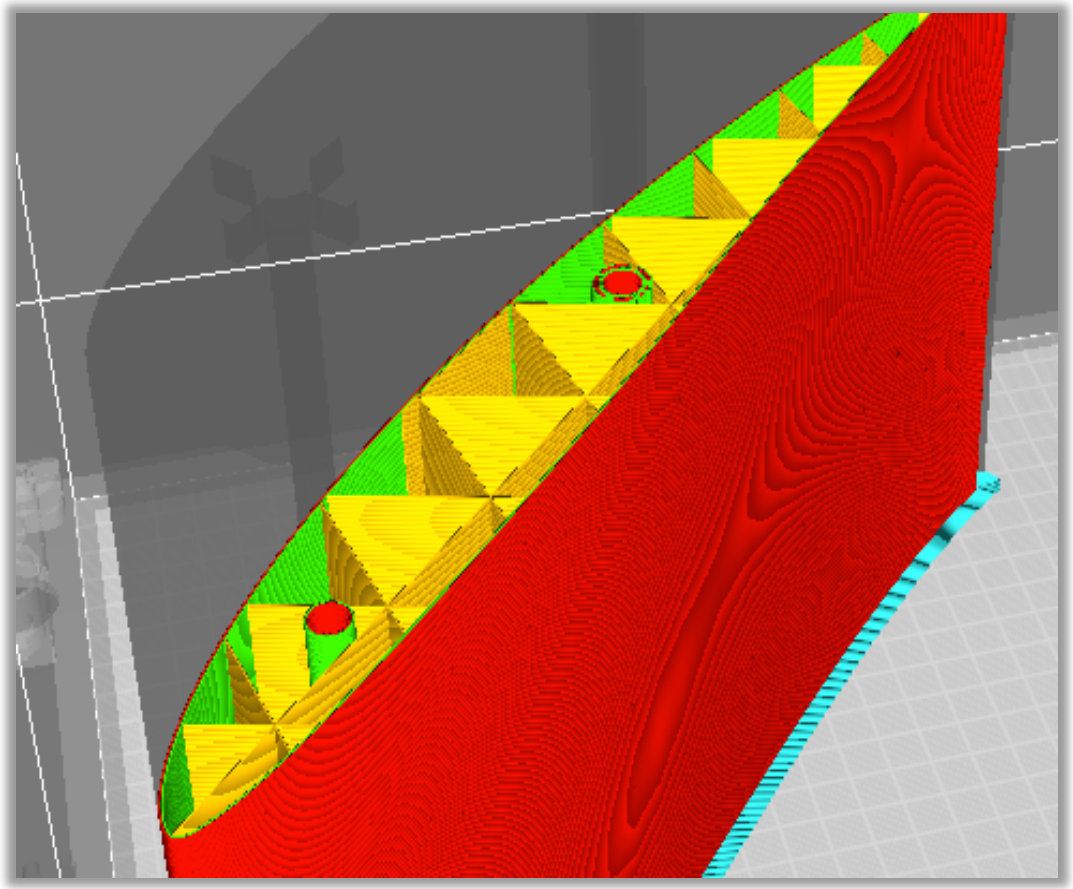
Printers



- Lulzbot TAZ printers are the main printers used
  - Design Lab has two and the Innovation Hub has one
- Any PLA parts will be printed at the Innovation Hub
  - Small parts that DREMEL printers can make
- Cura-lulzbot used to queue prints
  - Helps in estimating print time, material used, and needed printing orientations

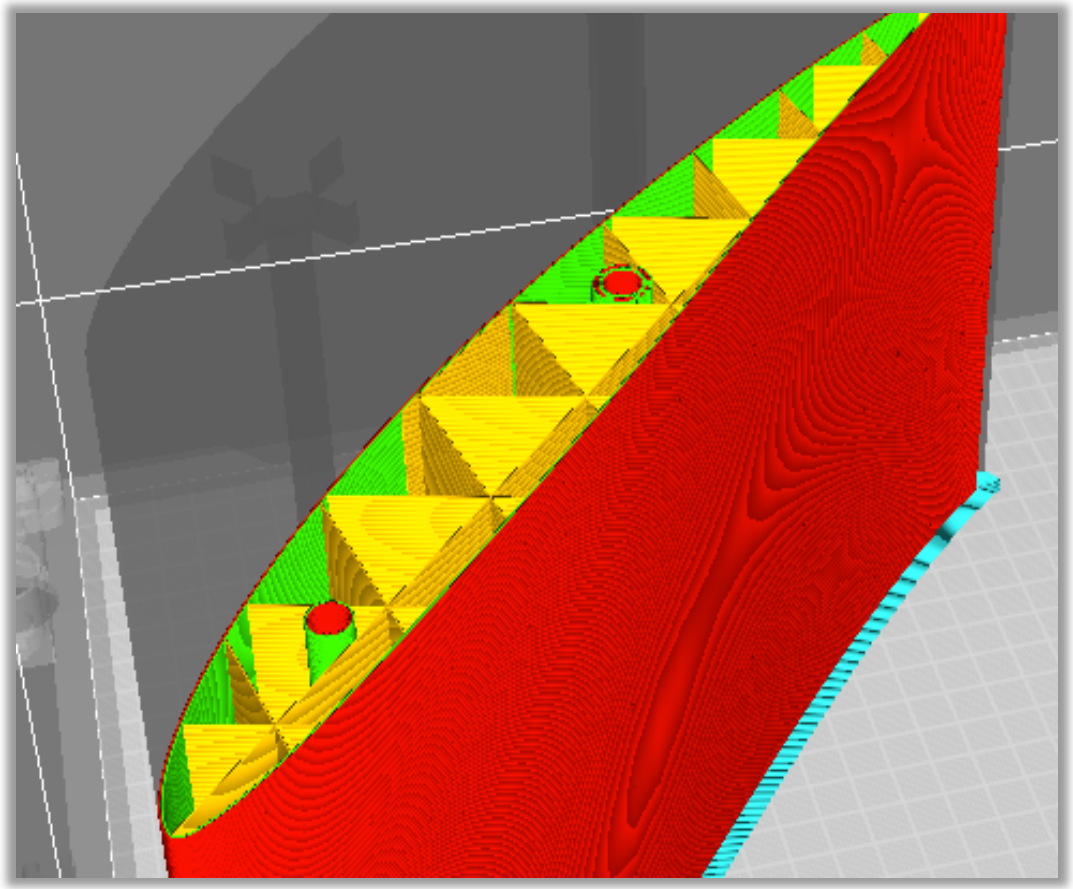
Jacob Pifer

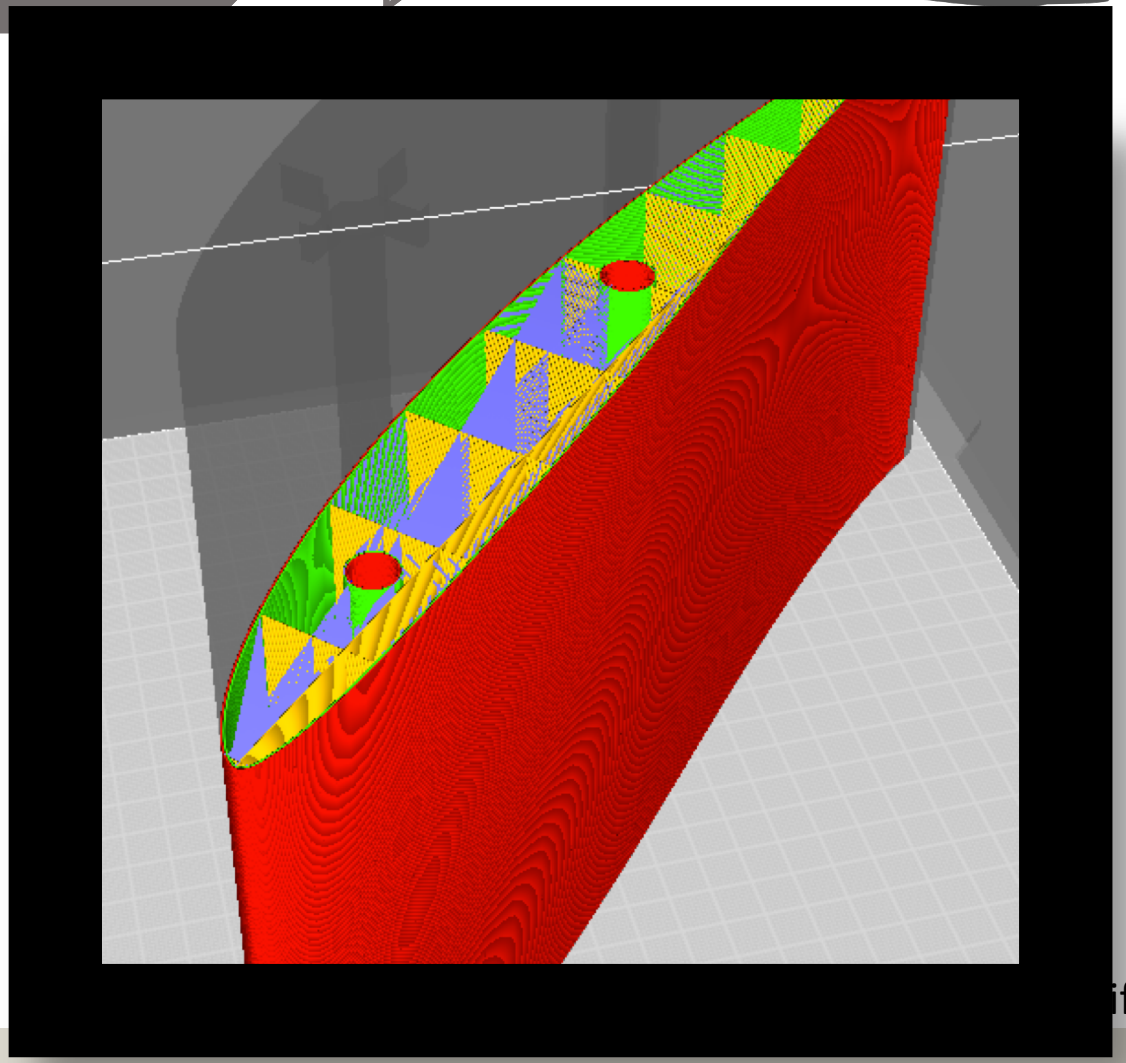
Printing Parts



Jacob Pifer

Printing Parts





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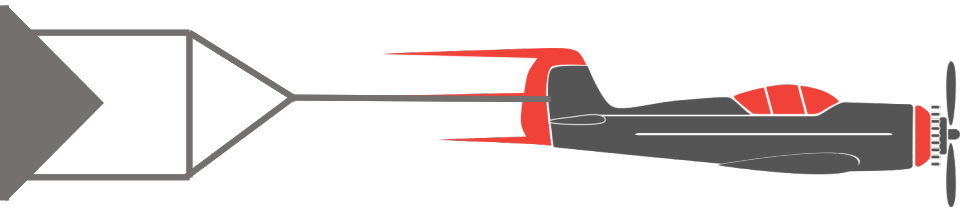
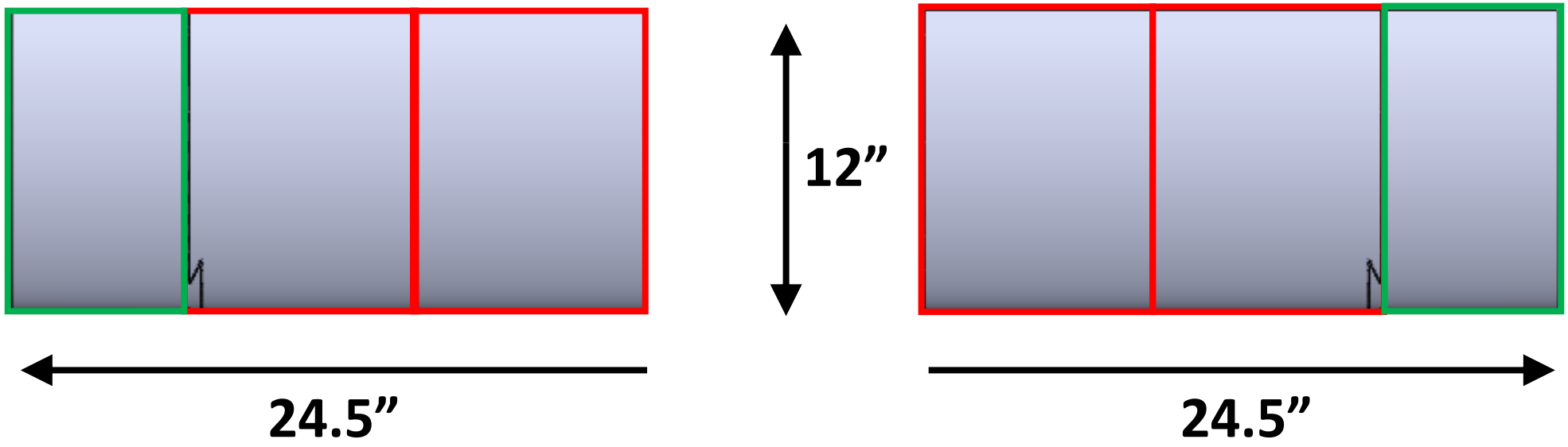
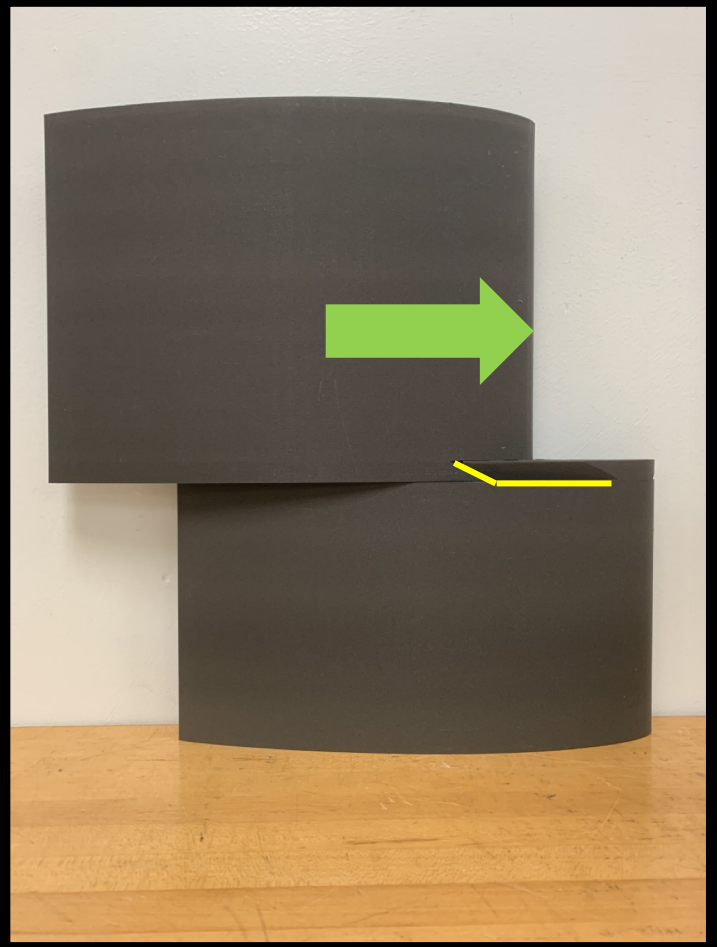
Canard Dimensions

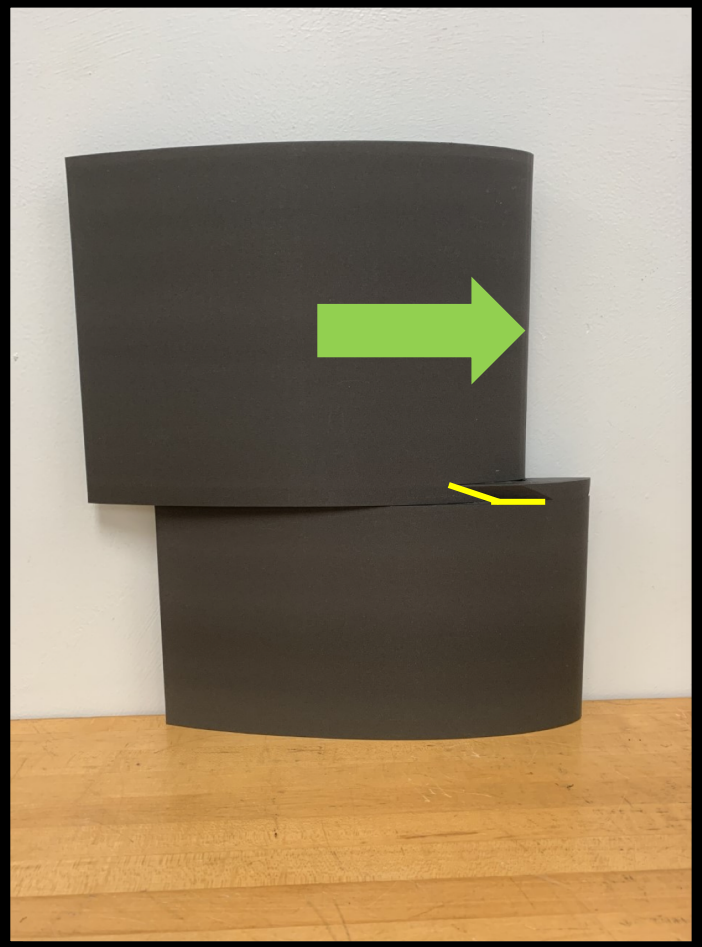


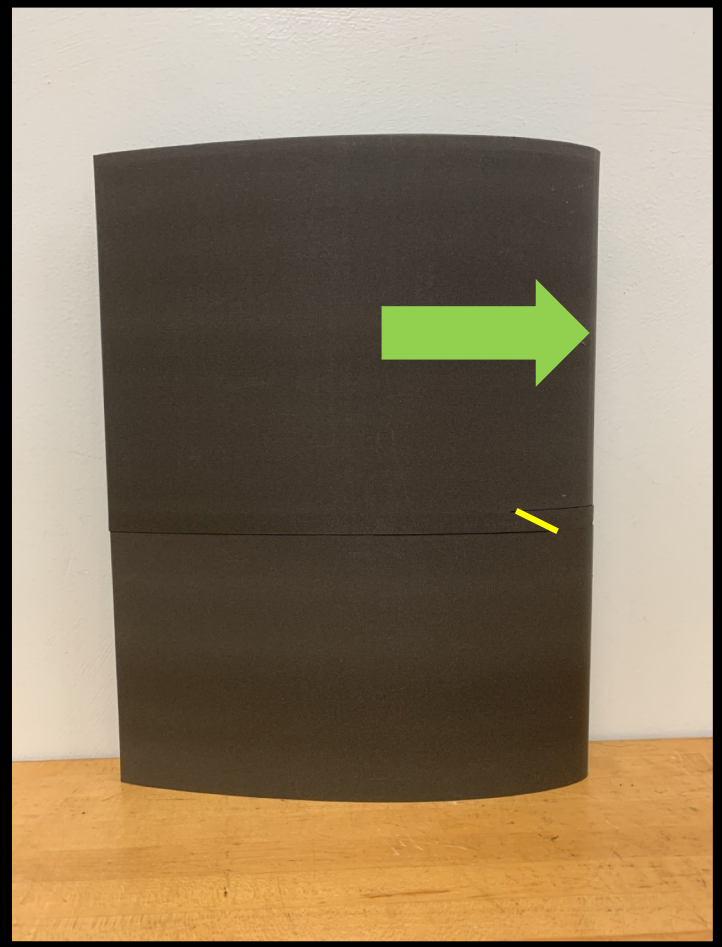


Jacob Pifer

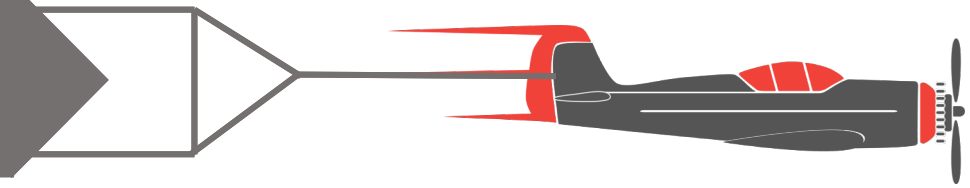
Project Brief Summary



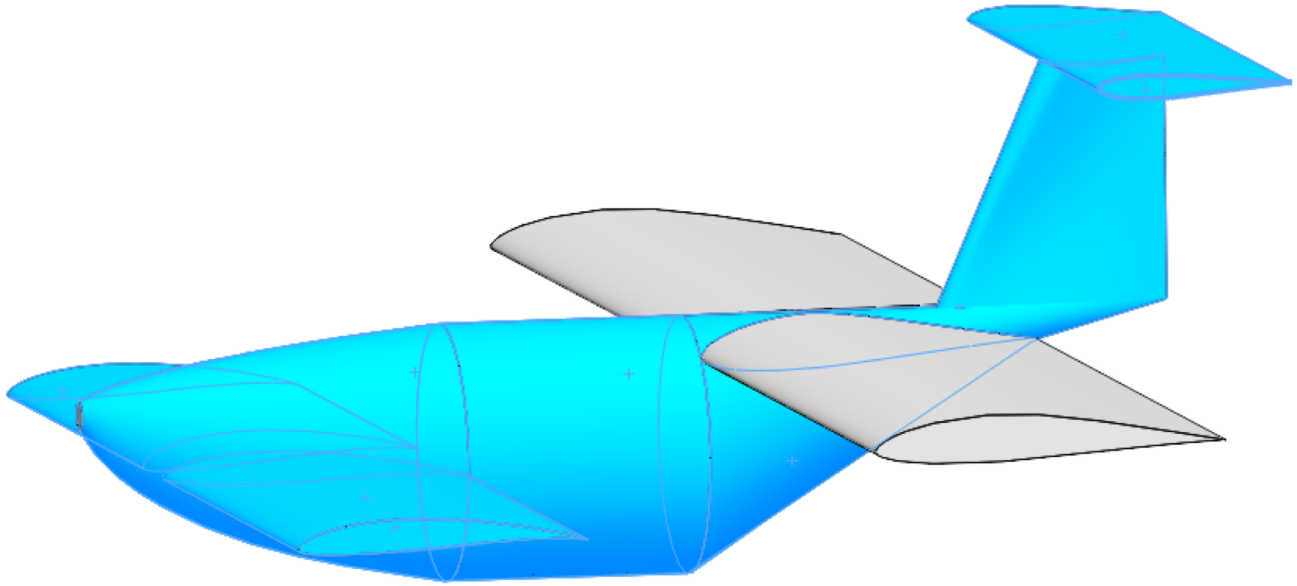




Fuselage Discussion

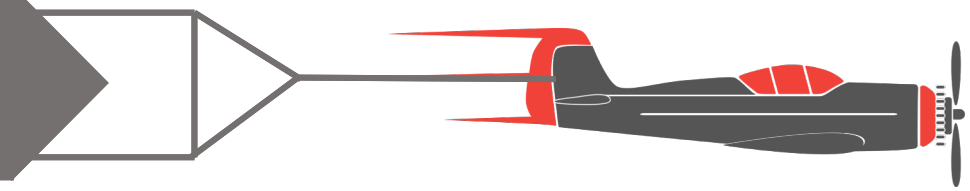


- Body of the fuselage
- Tail of the plane
- Canards of the plane
- Landing Gear



Joseph Figari

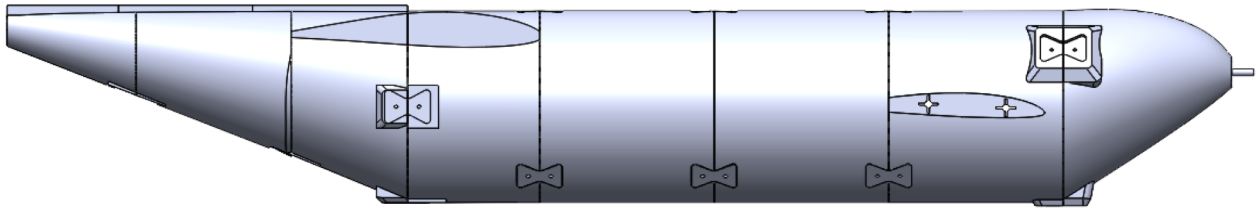
Fuselage Redesigned



- Due to a wrong density value in our original CAD, we had to redesign our plane
- Plane came out 14 pounds heavier than expected
- Weight was cut by reducing the length of fuselage and reducing the size of the tail

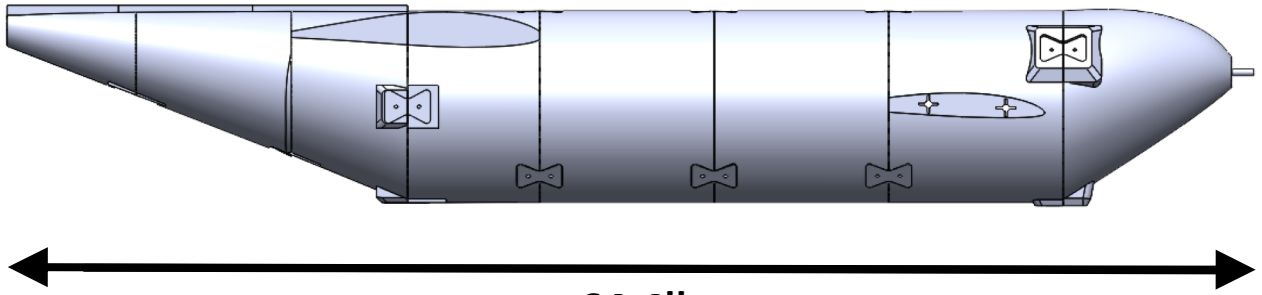
Joseph Figari

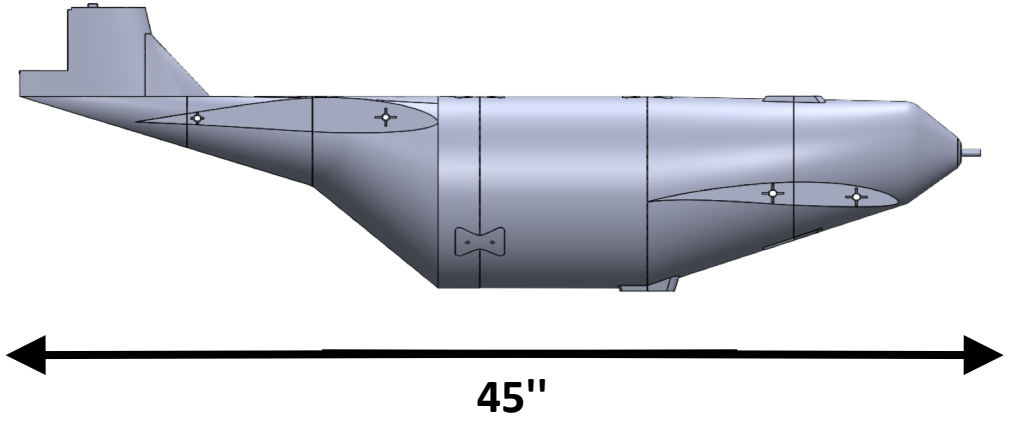
Fuselage Redesigned



Joseph Figari

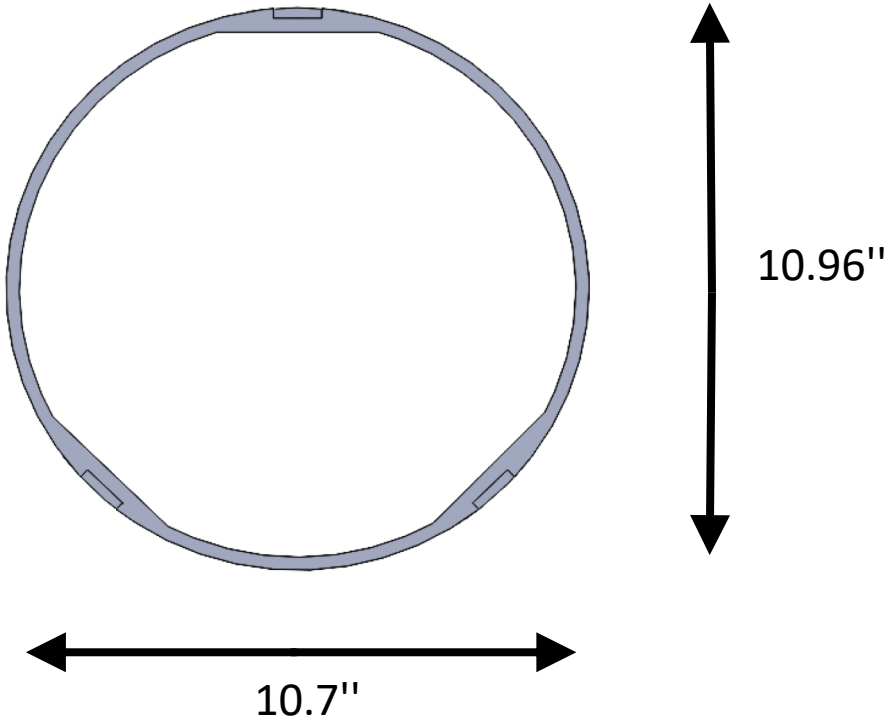
Fuselage Redesigned





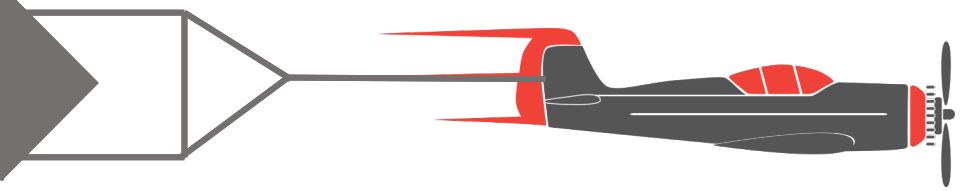
Joseph Figari

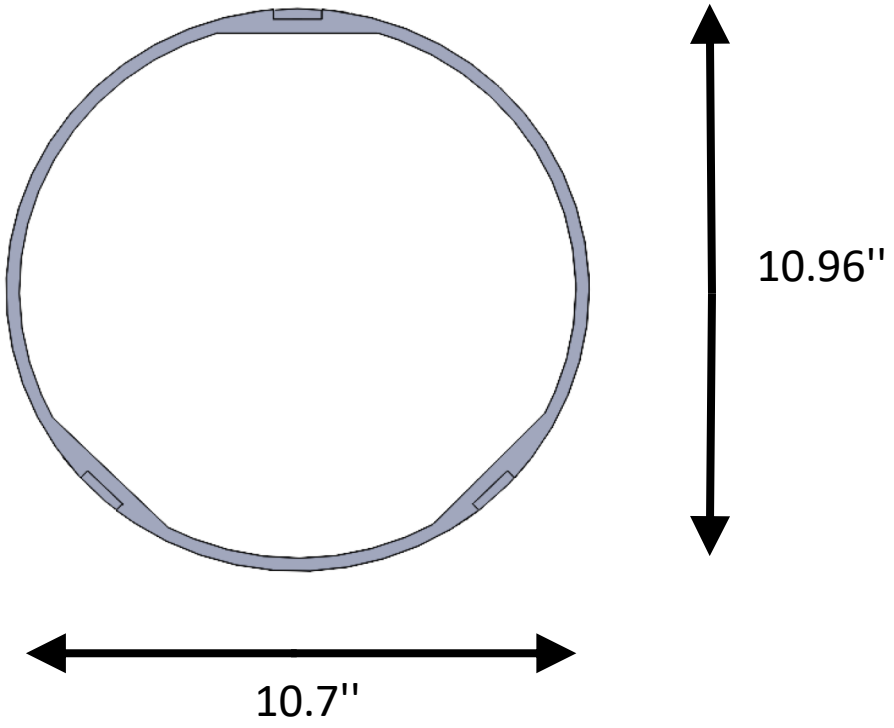
Fuselage Redesigned

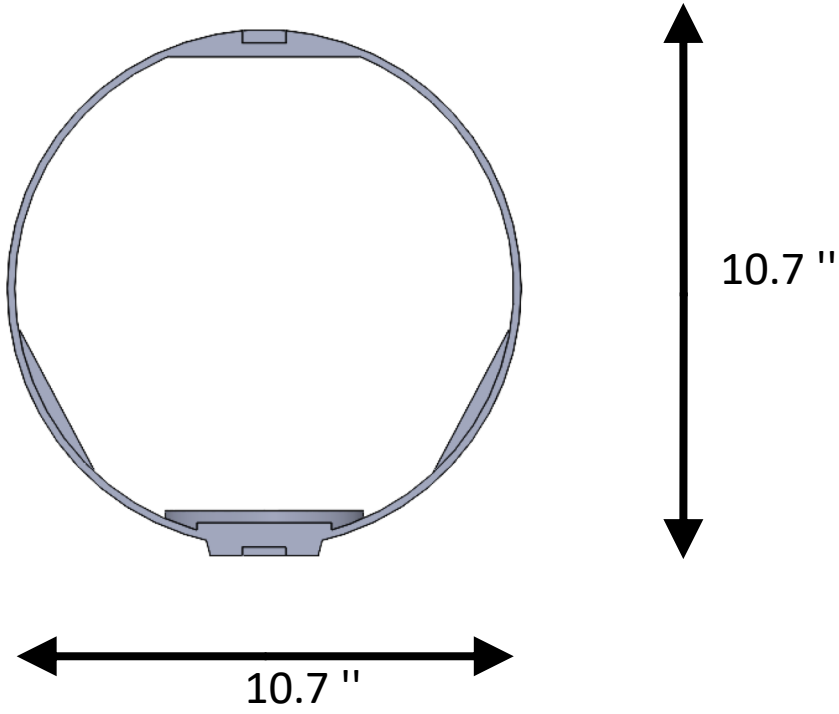


Joseph Figari

Fuselage Redesigned

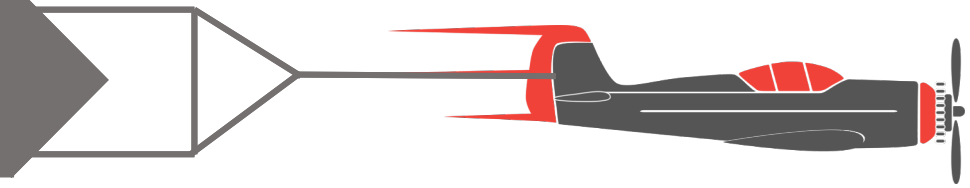






Joseph Figari

Landing Gear



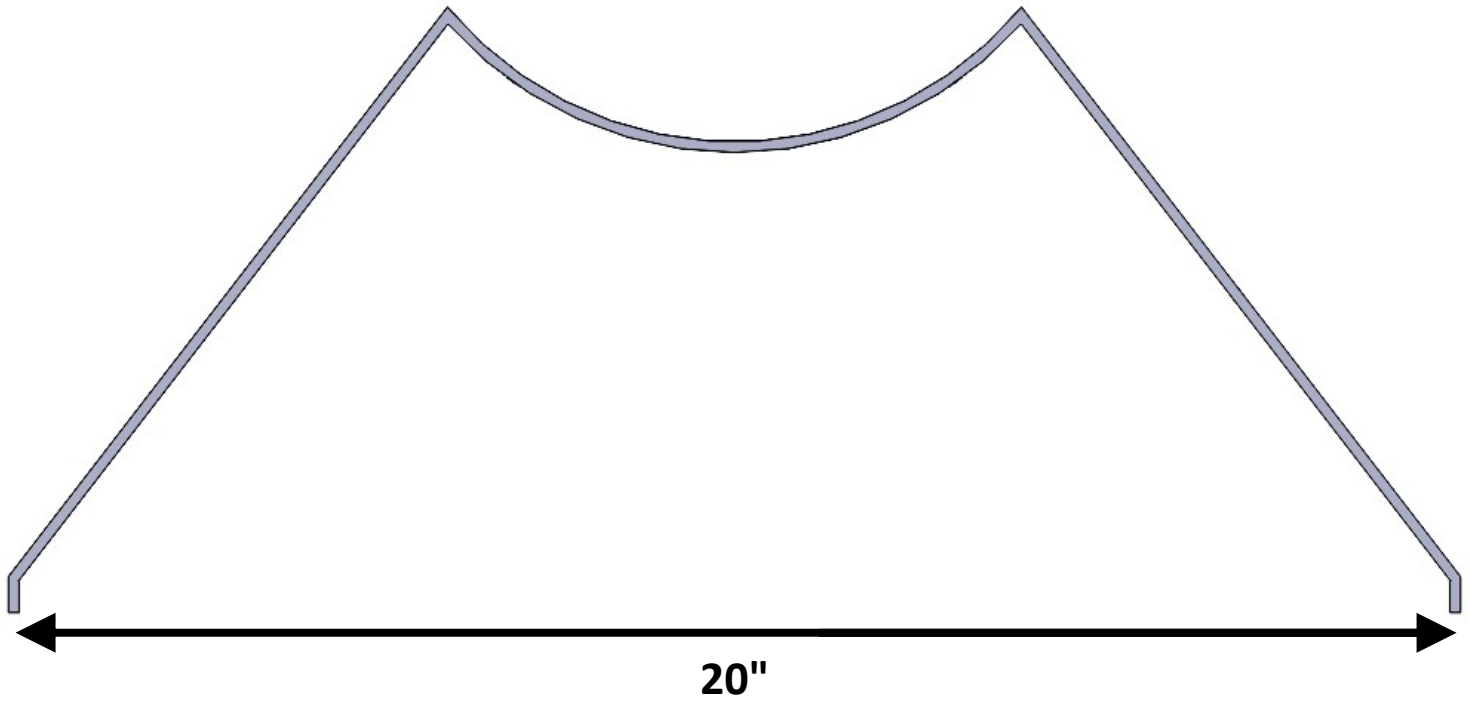
- Seminole RC gave recommendations on designing the landing gear
- Back wheels should be set 20 inches apart
- Propellor should have a 2 – 5 inch ground clearance
- This will help in stabilizing the plane during take-off

Joseph Figari

Landing Gear

Joseph Figari

Landing Gear



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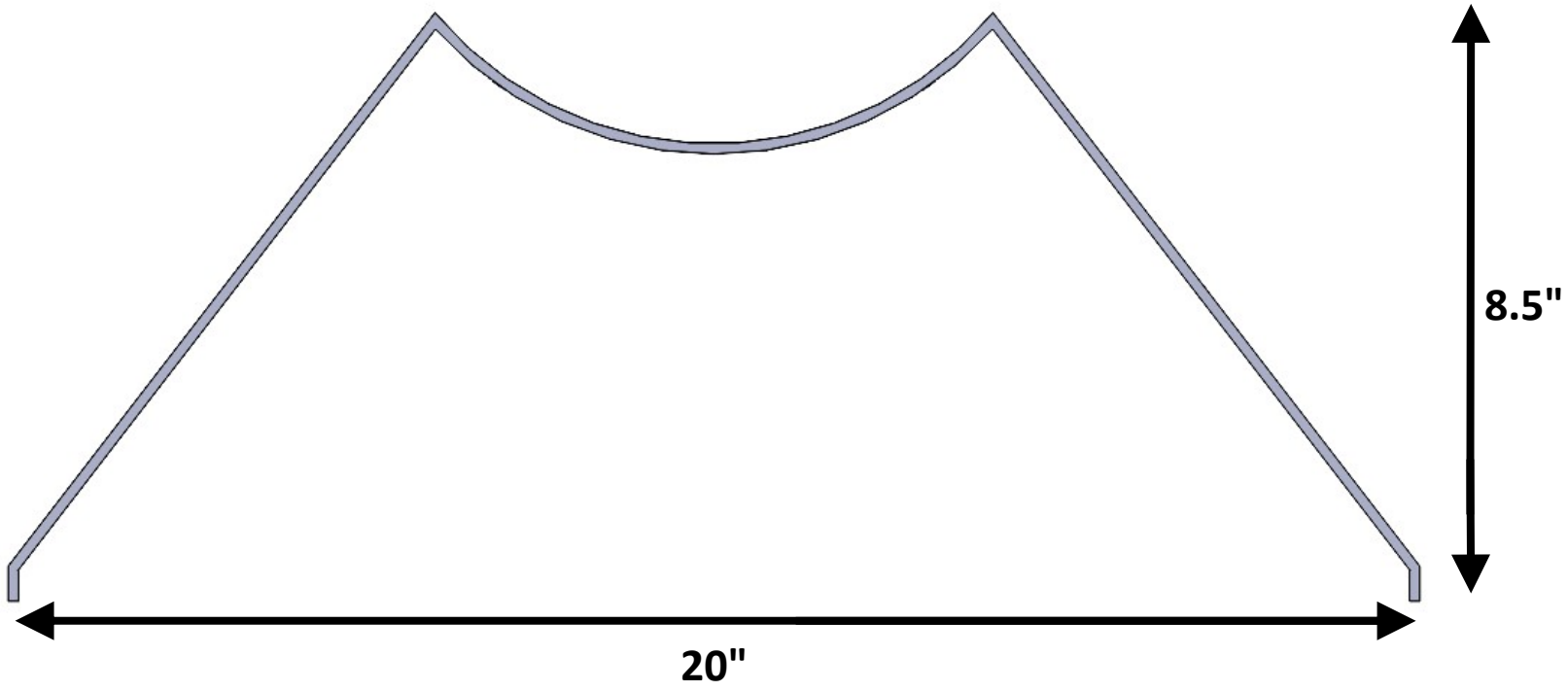
Landing Gear



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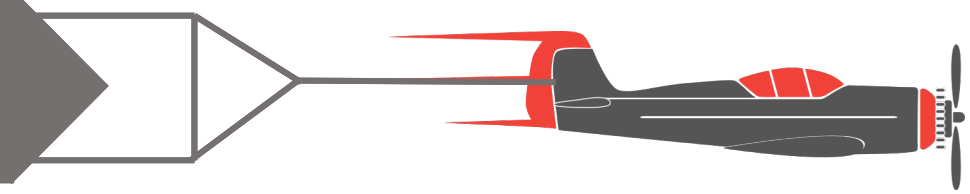
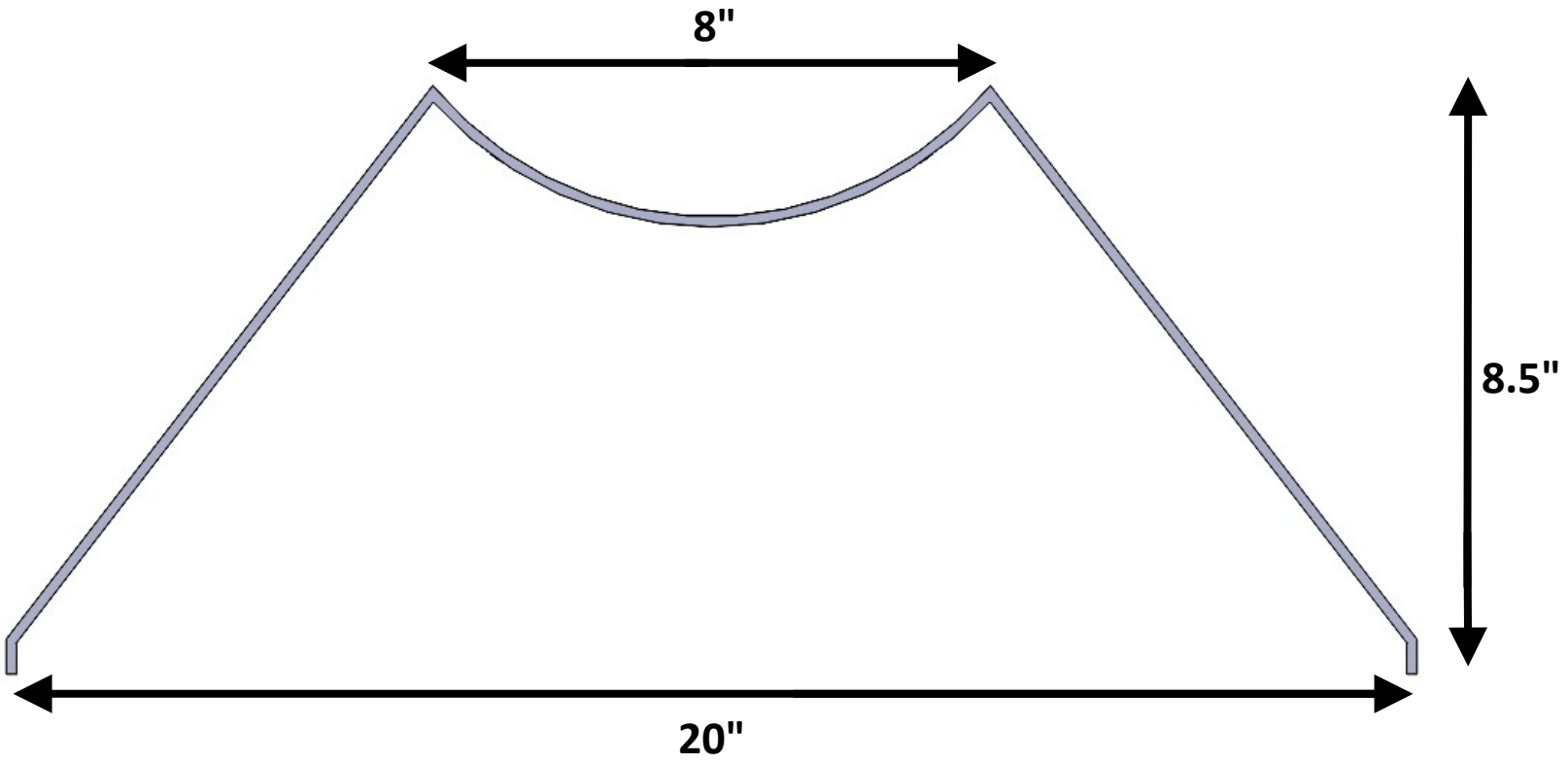
Landing Gear



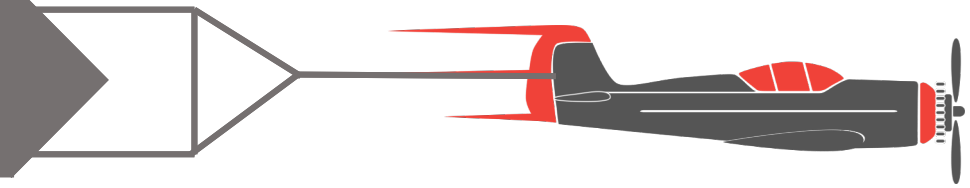


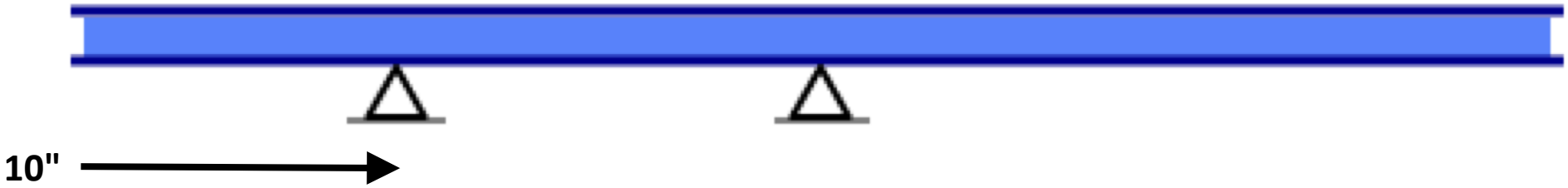
Joseph Figari

Landing Gear

Jacob Pifer

Landing Gear





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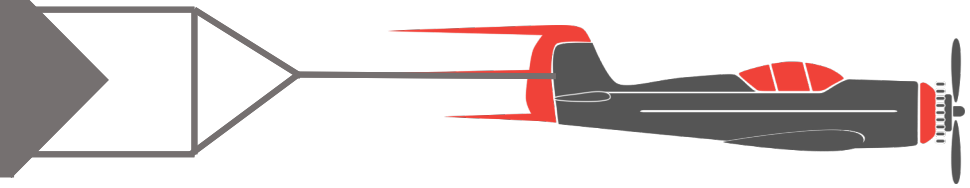
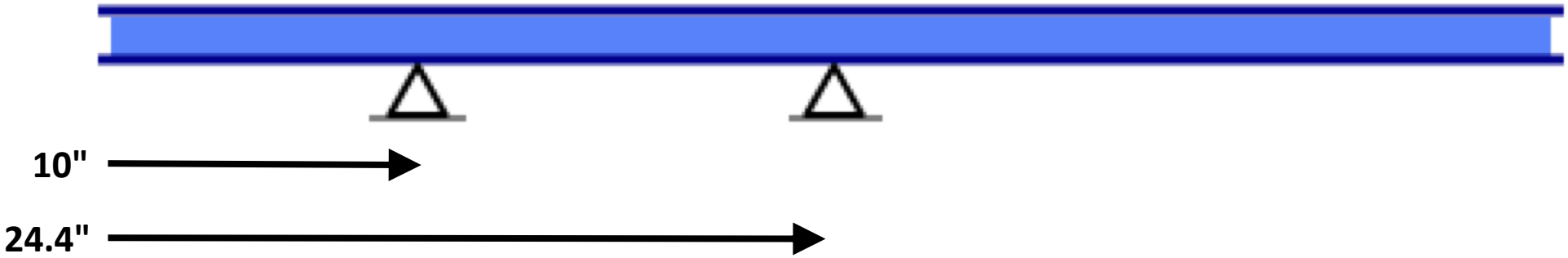
Landing Gear





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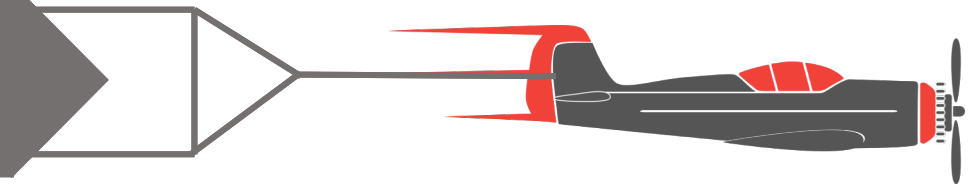
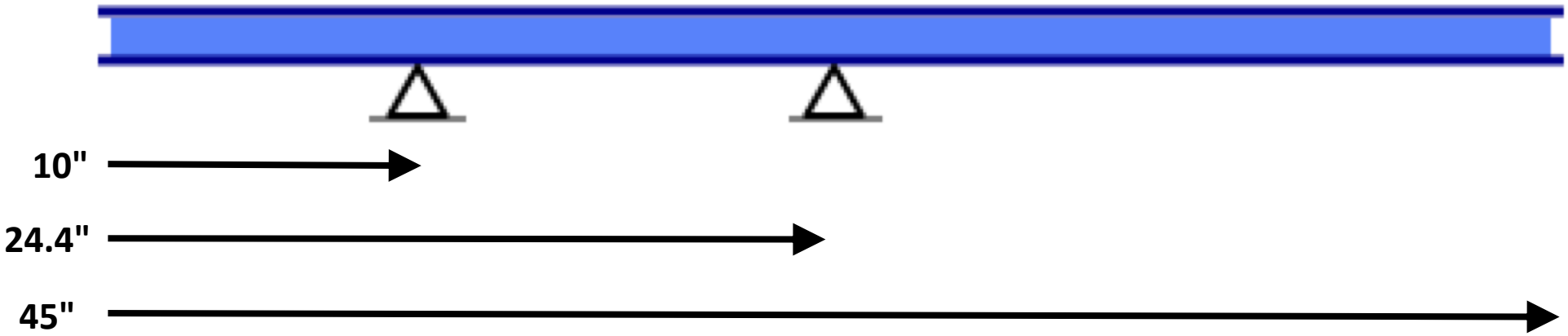
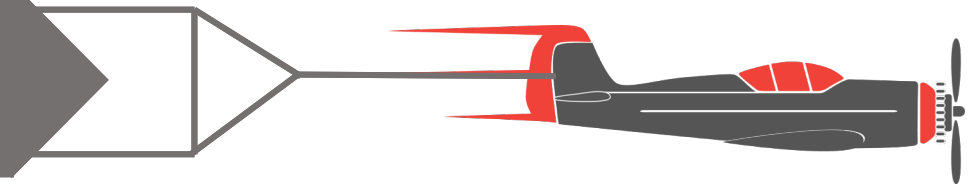
Landing Gear

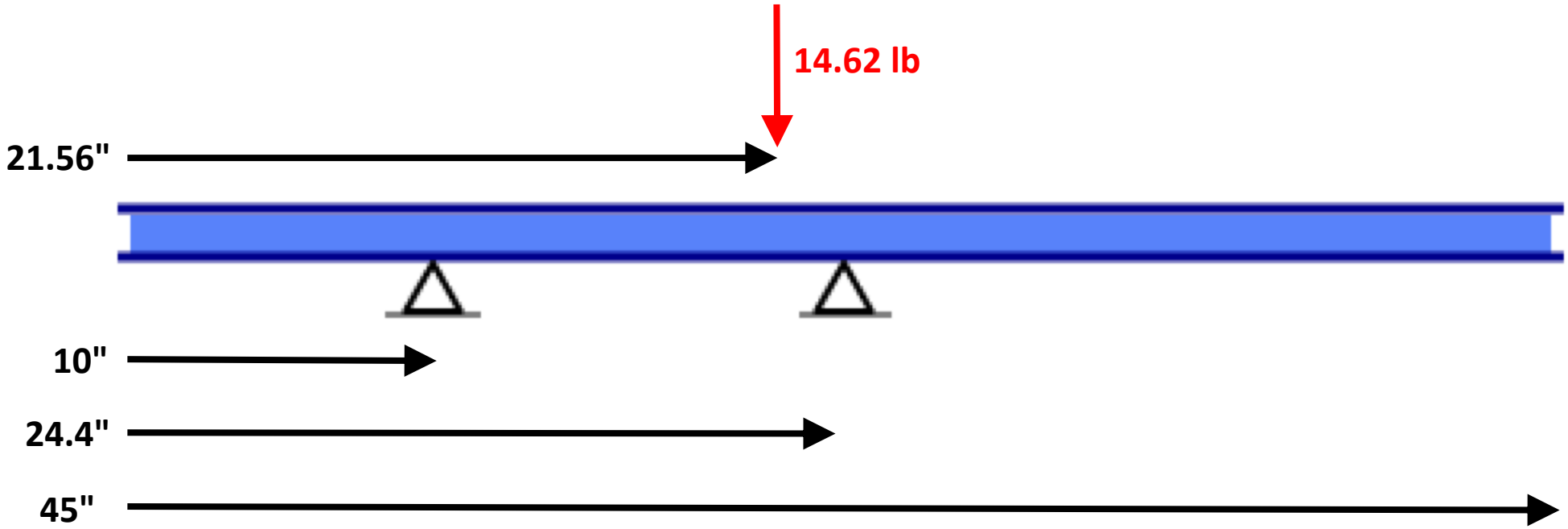




Jacob Pifer

Landing Gear





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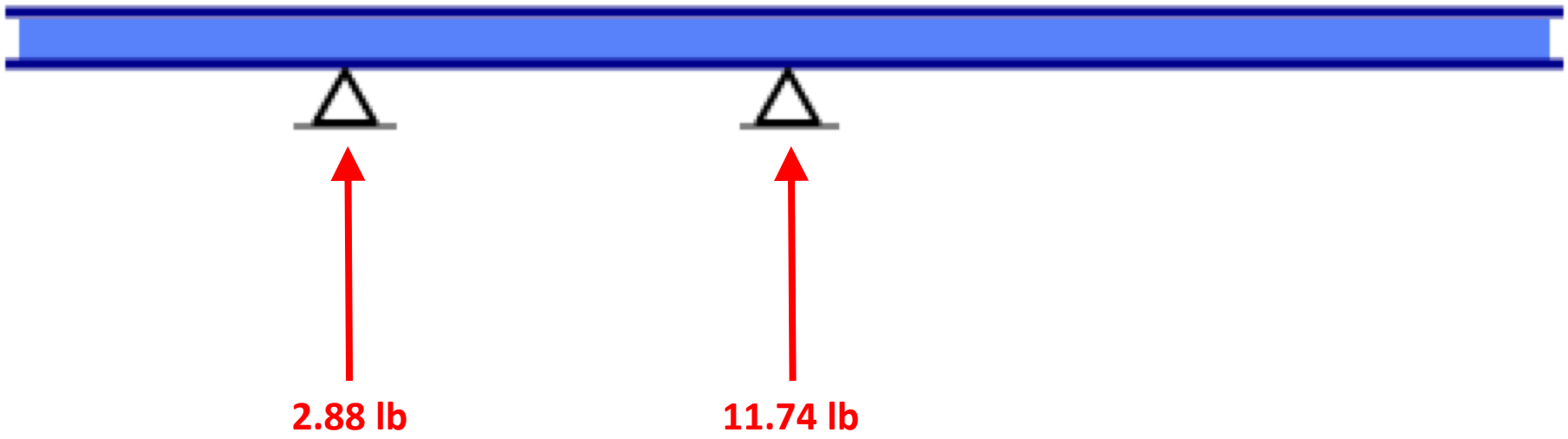
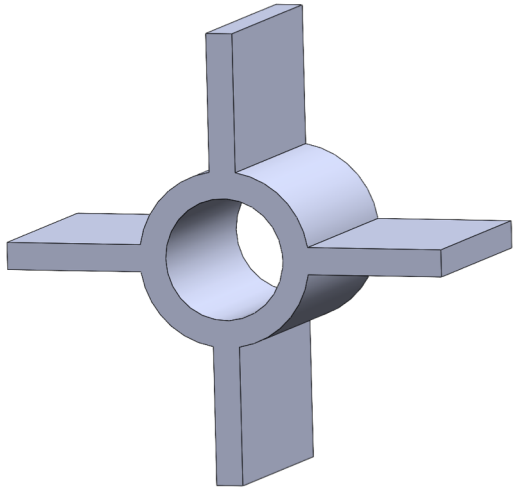
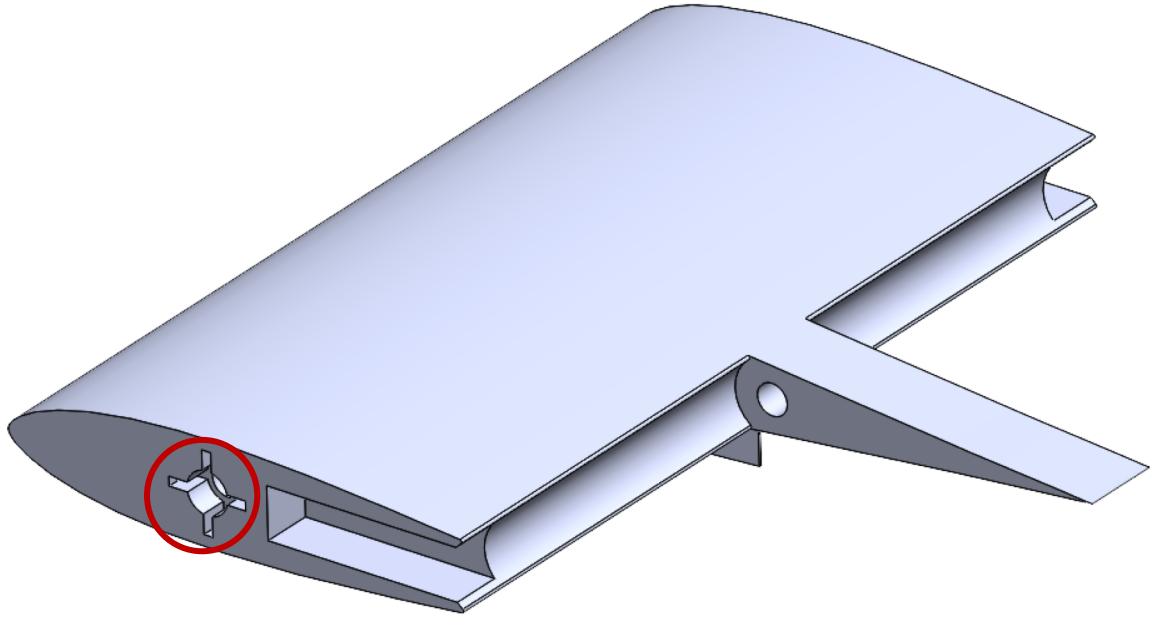
Landing Gear



Jacob Pifer

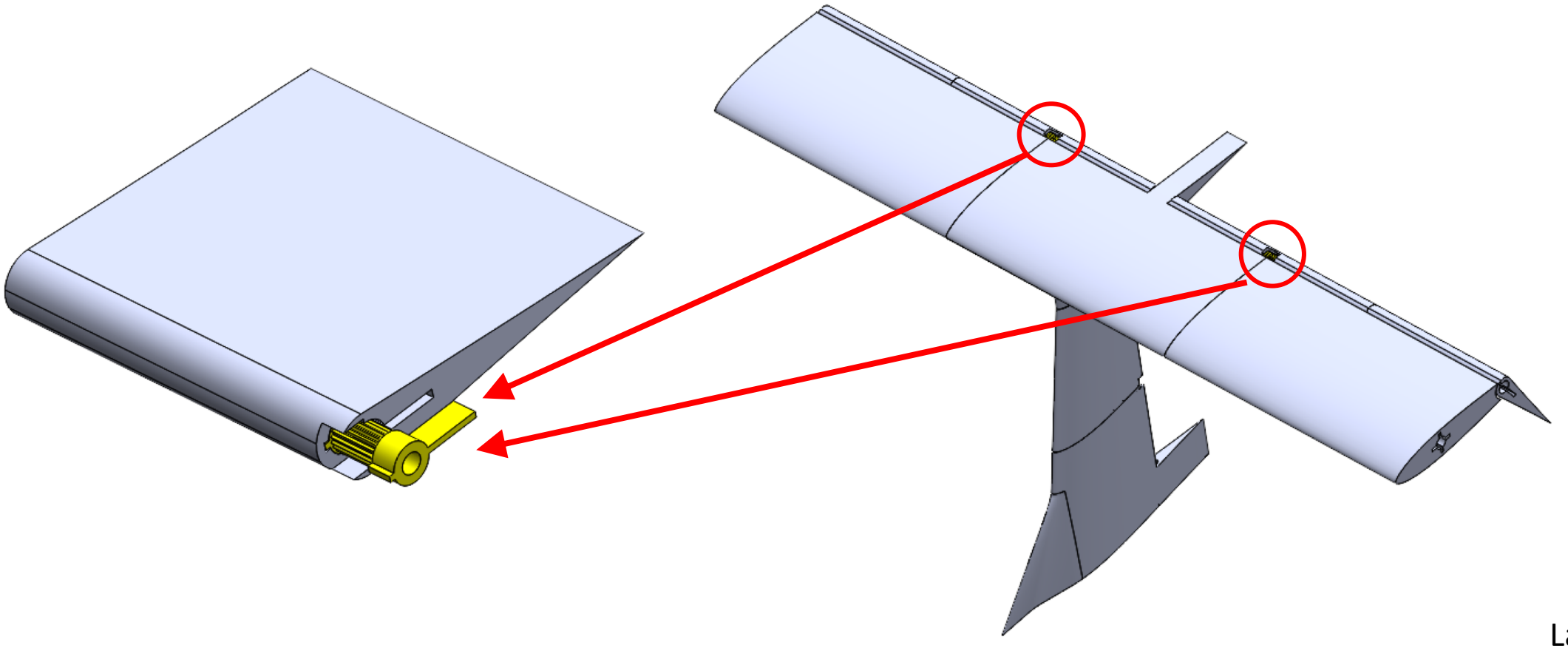
Project Brief Summary





Lauren Chin

Project Brief Summary



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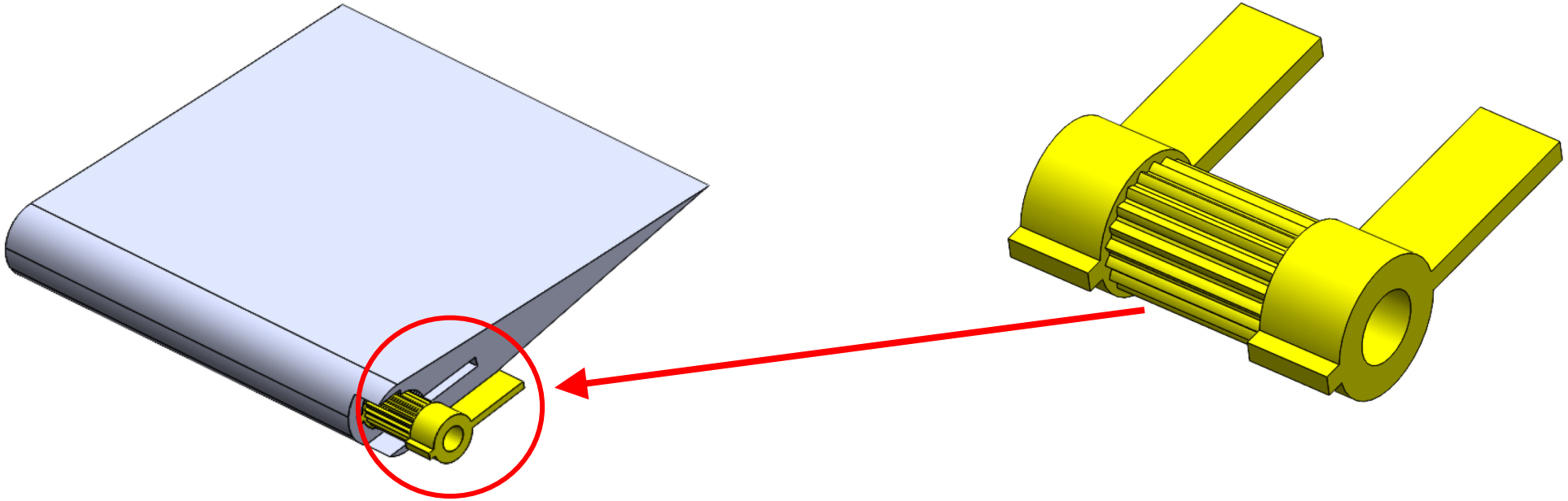
Project Brief Summary



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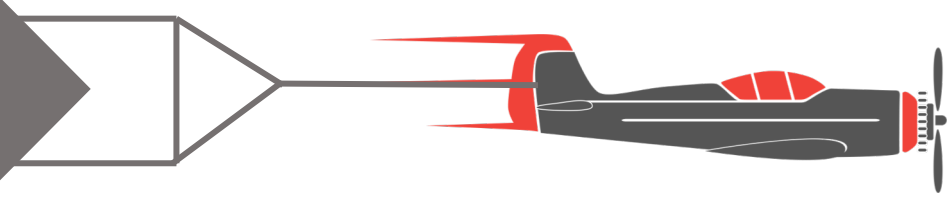
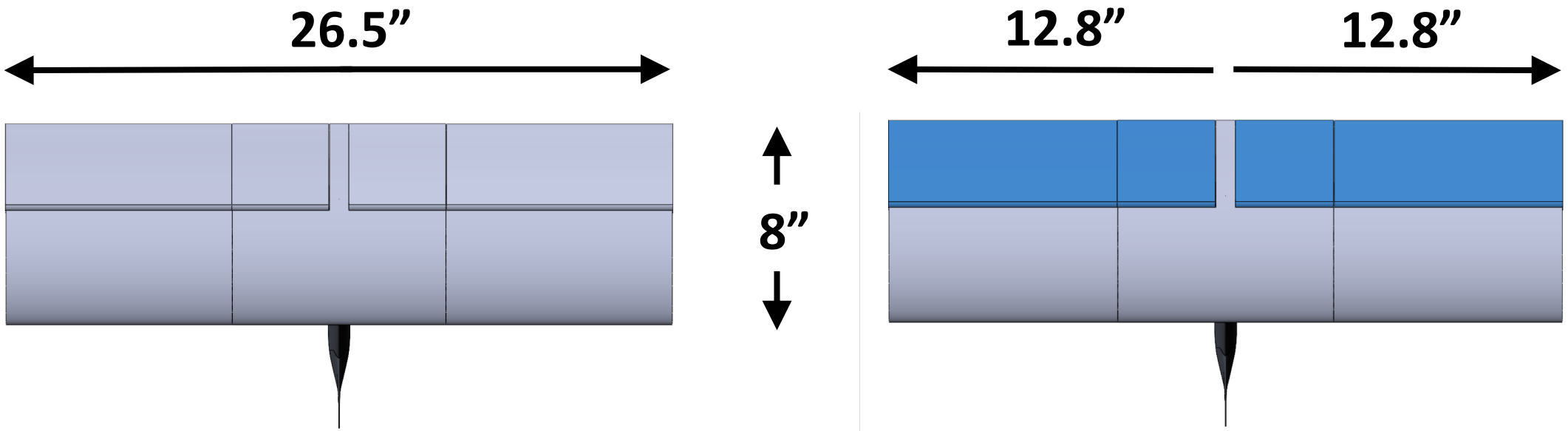
Project Brief Summary





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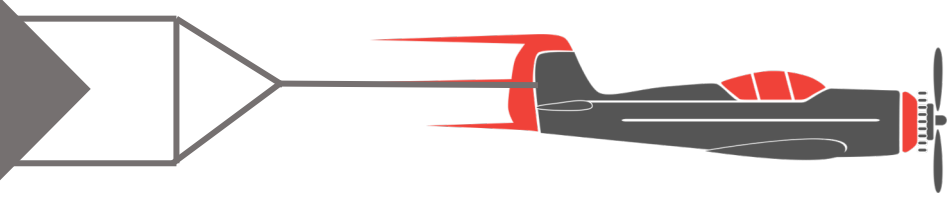
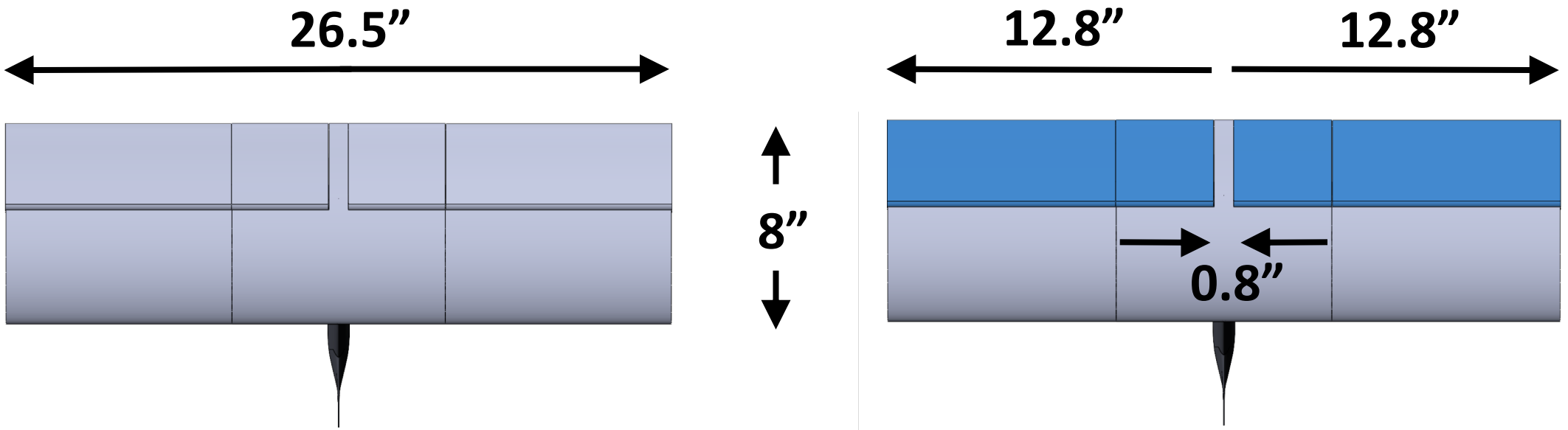
Project Brief Summary





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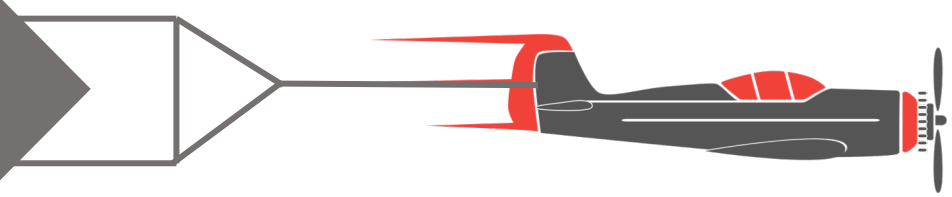
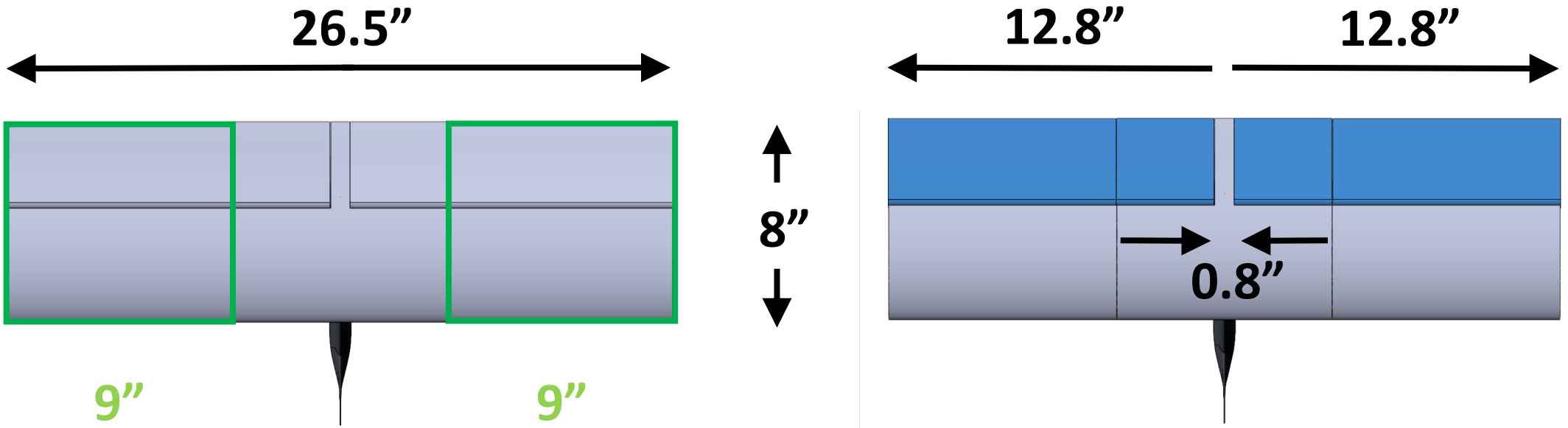
Project Brief Summary





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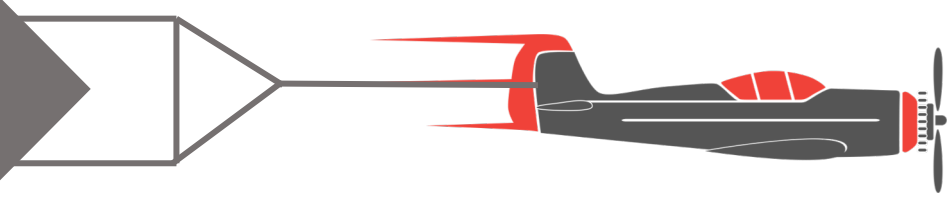
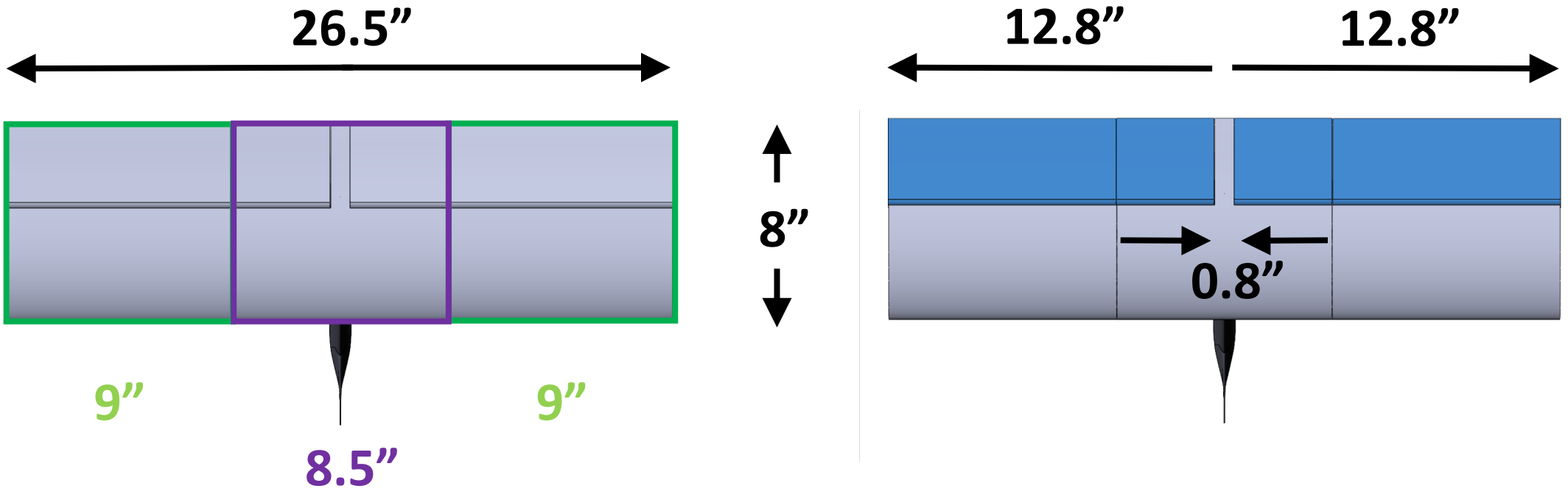
Project Brief Summary





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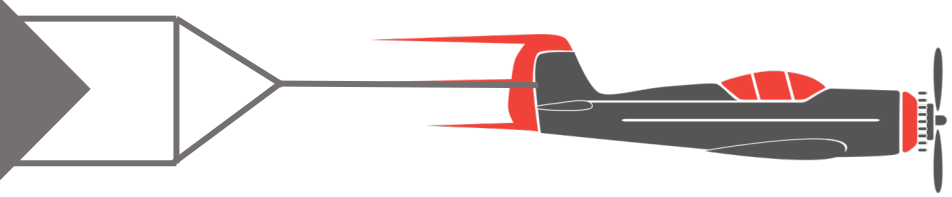
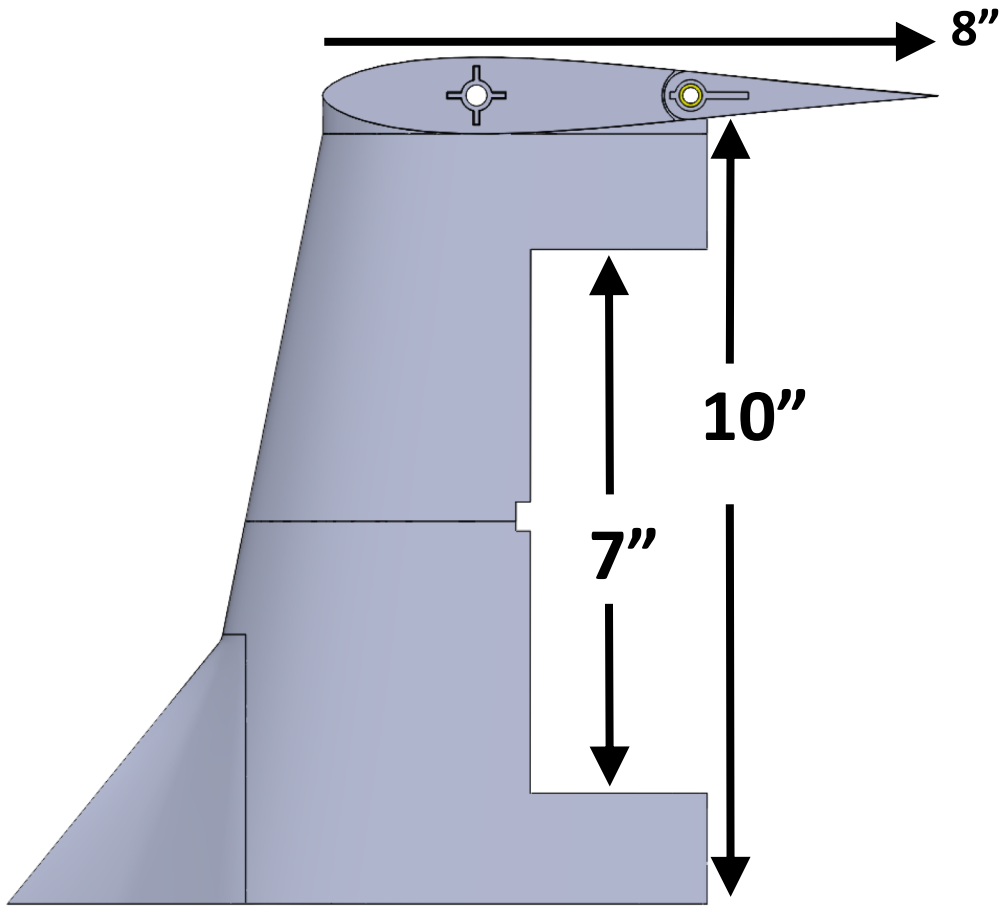
Project Brief Summary





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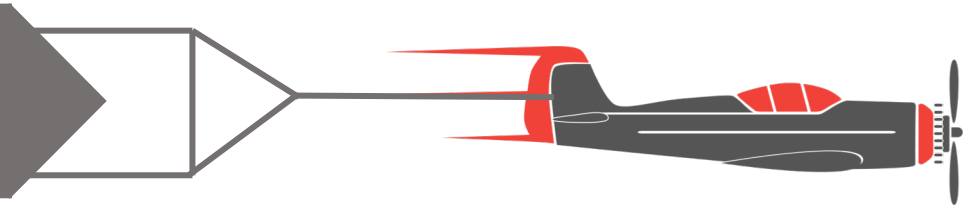
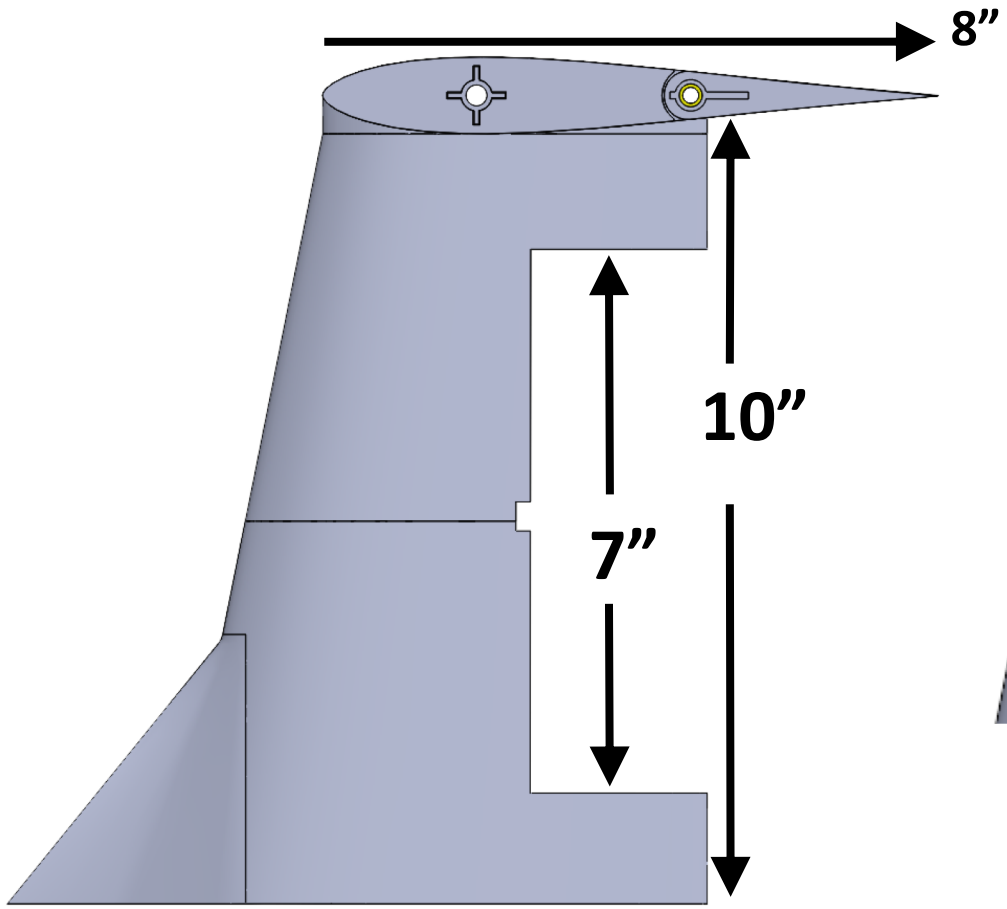
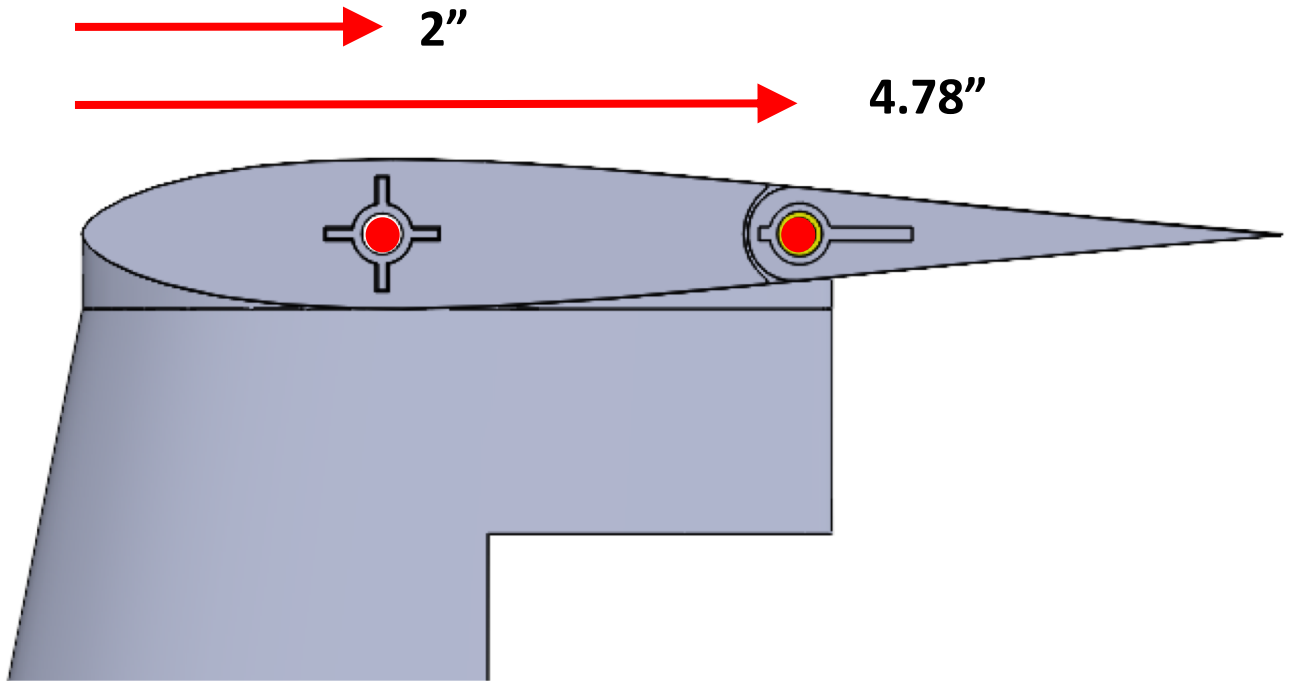
Project Brief Summary







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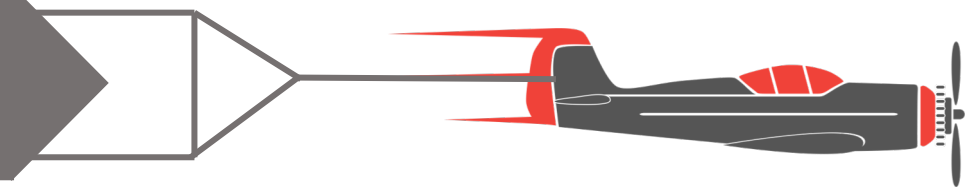
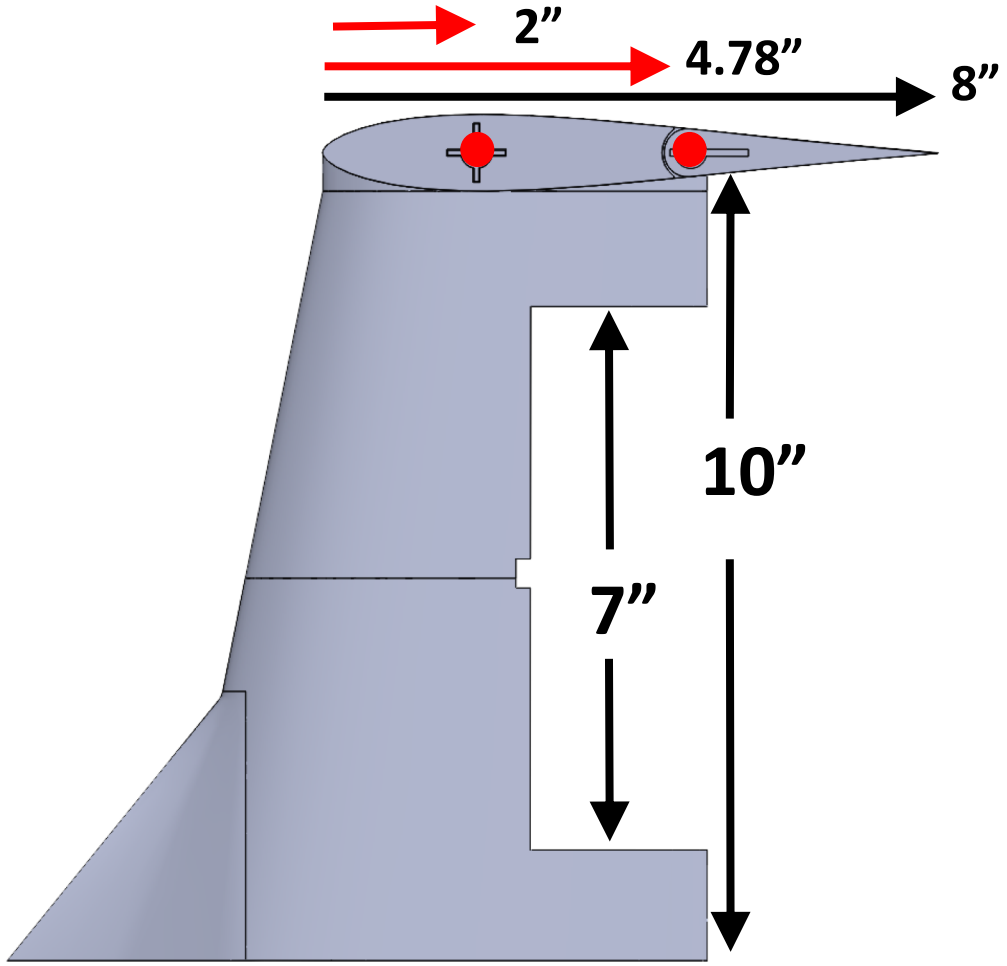
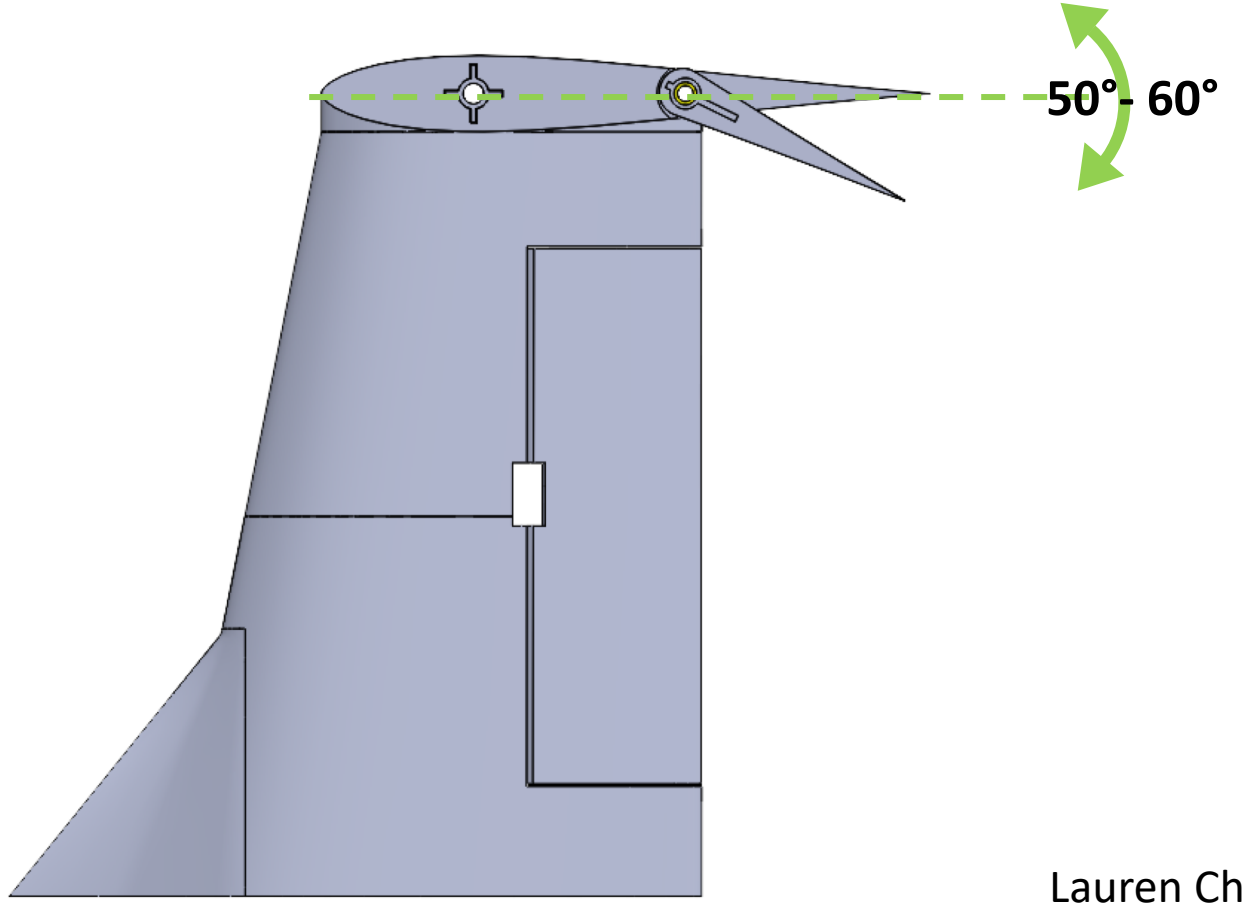
Project Brief Summary







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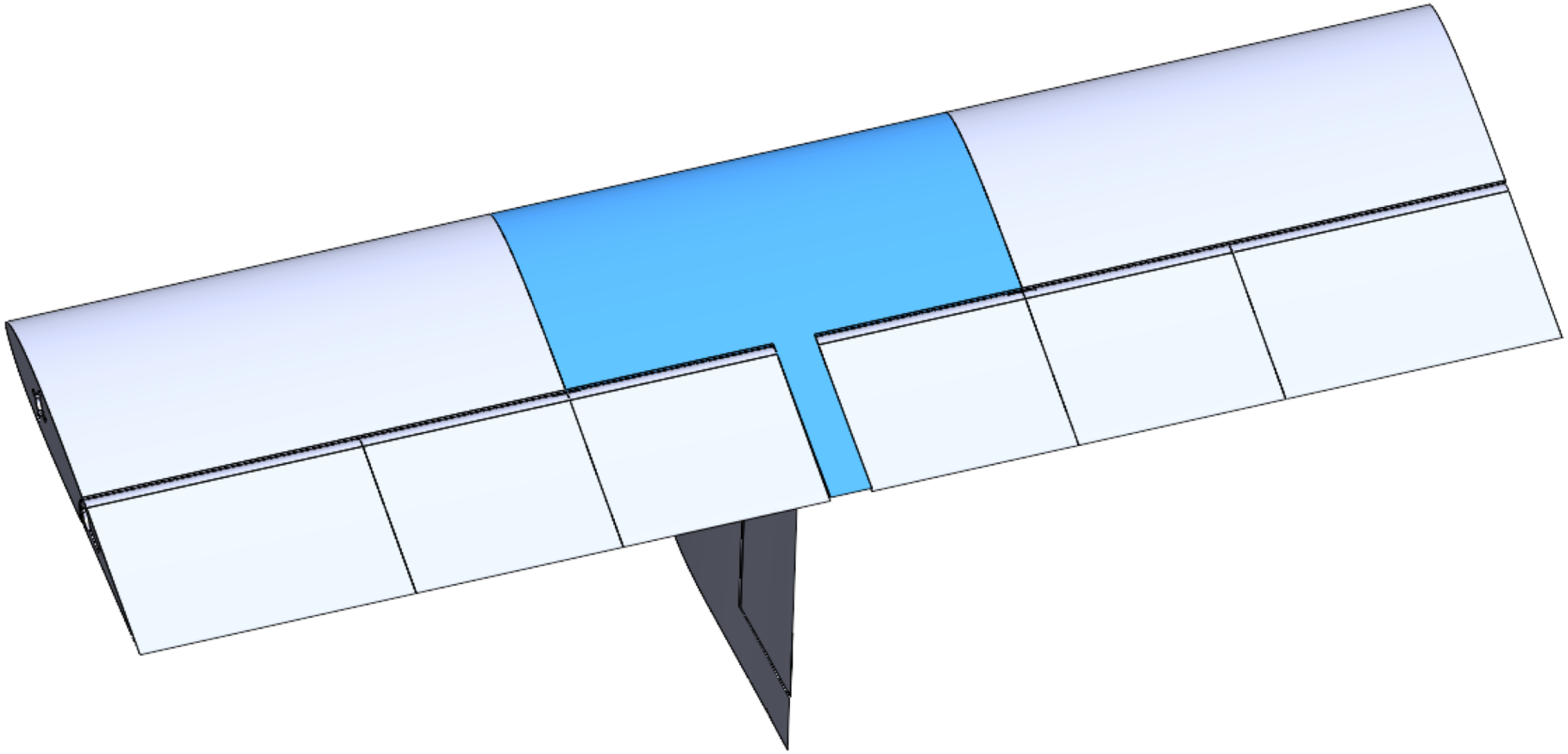
Project Brief Summary



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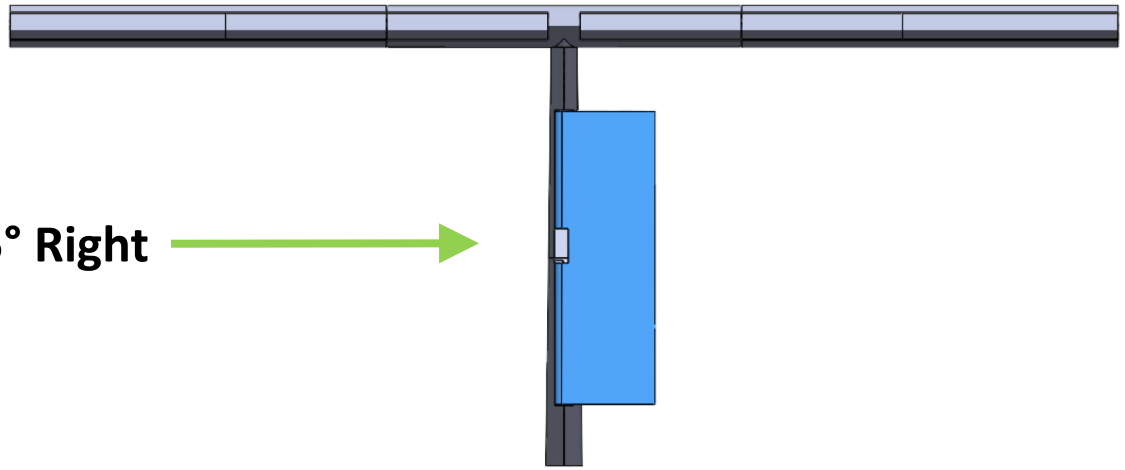
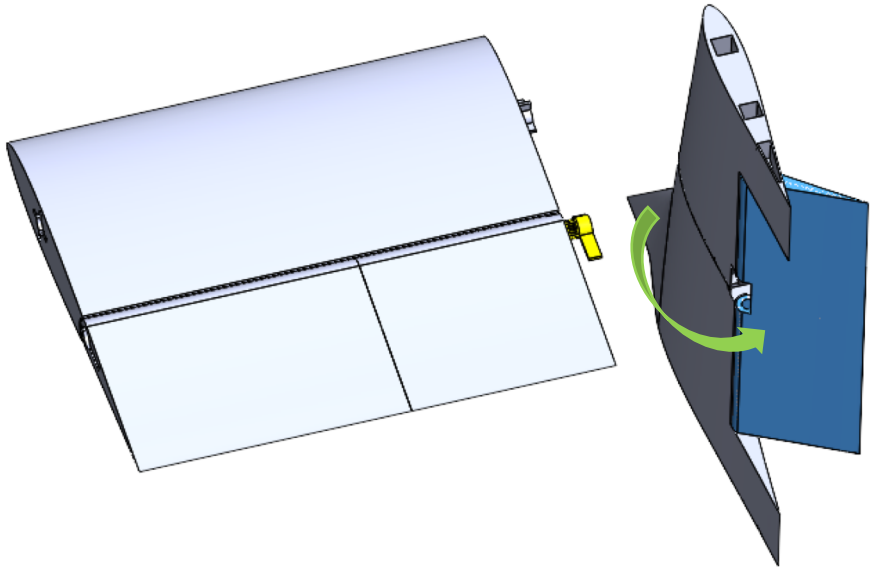
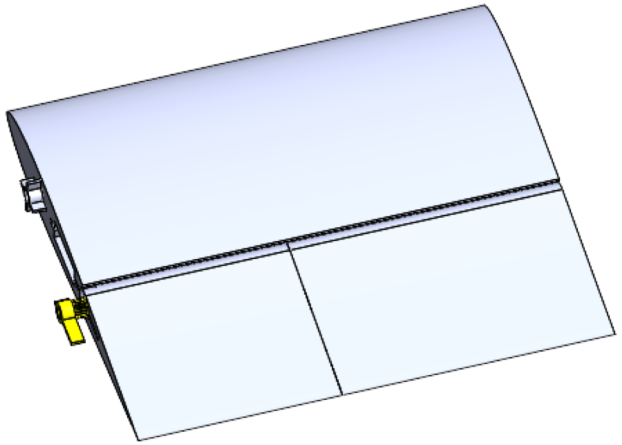
Project Brief Summary







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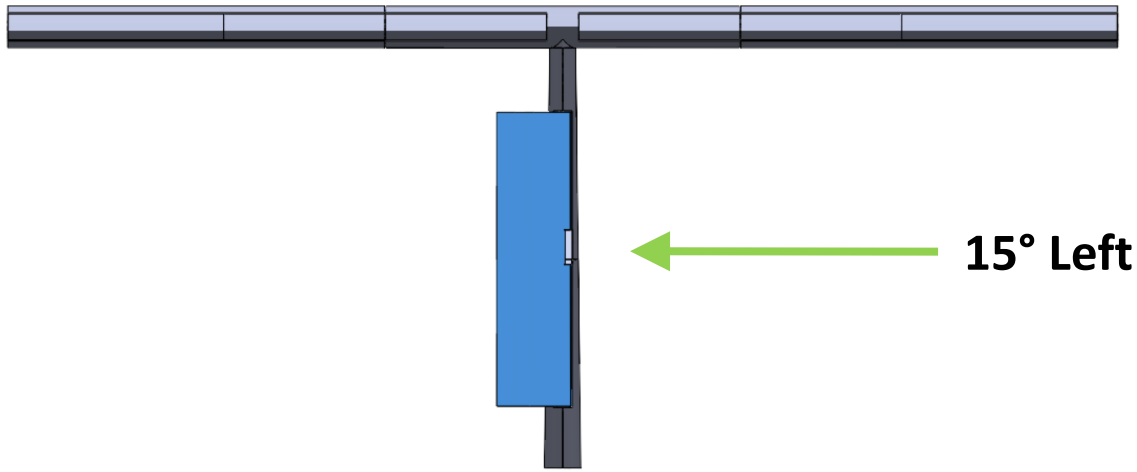
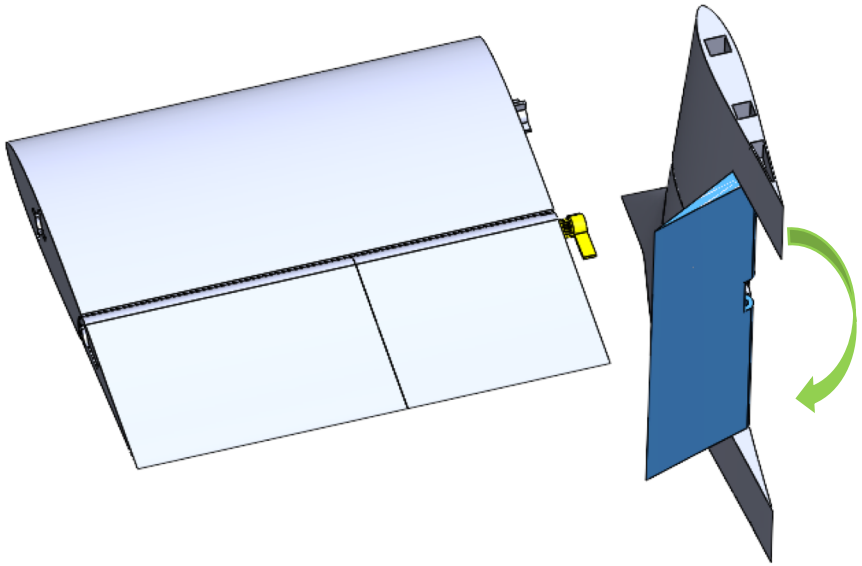
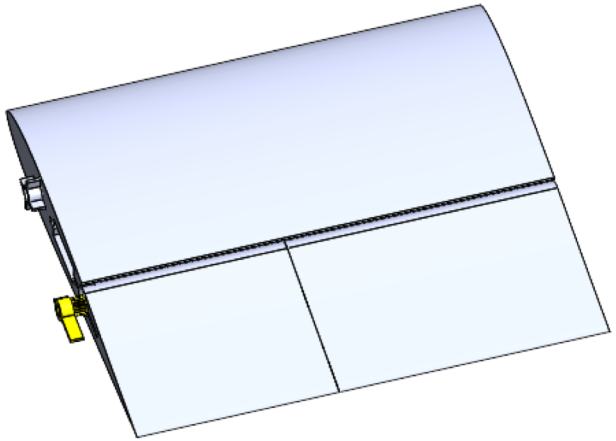
Project Brief Summary



15° Left





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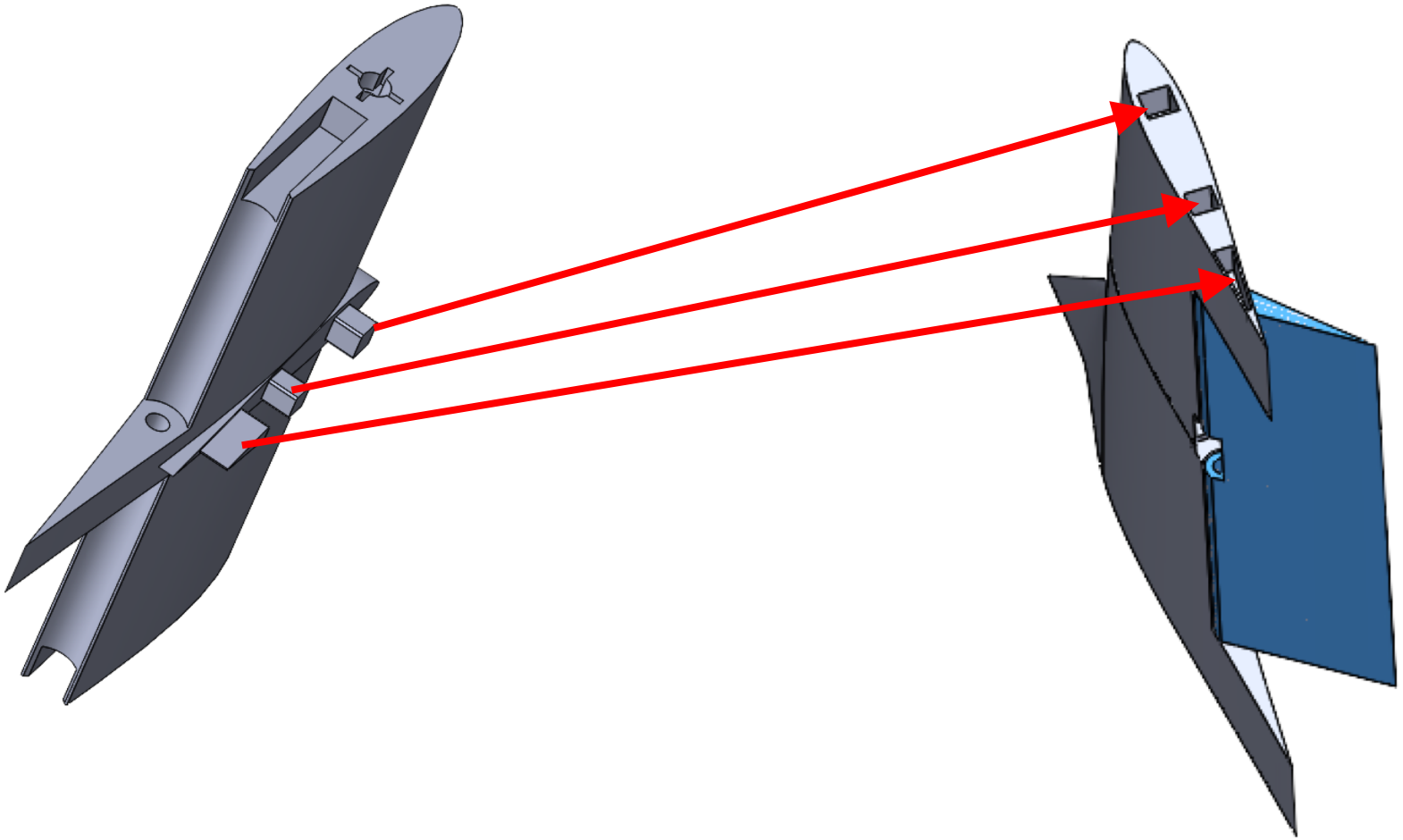
Project Brief Summary



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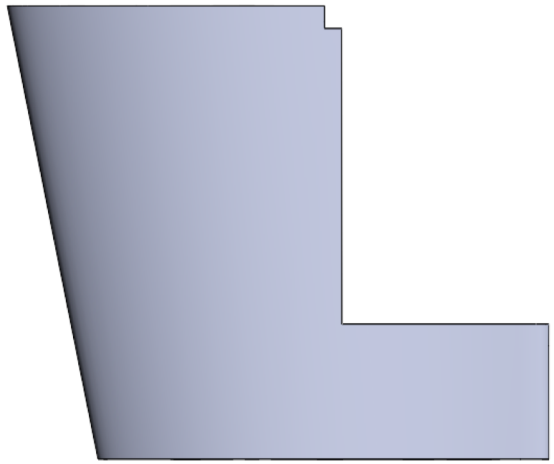
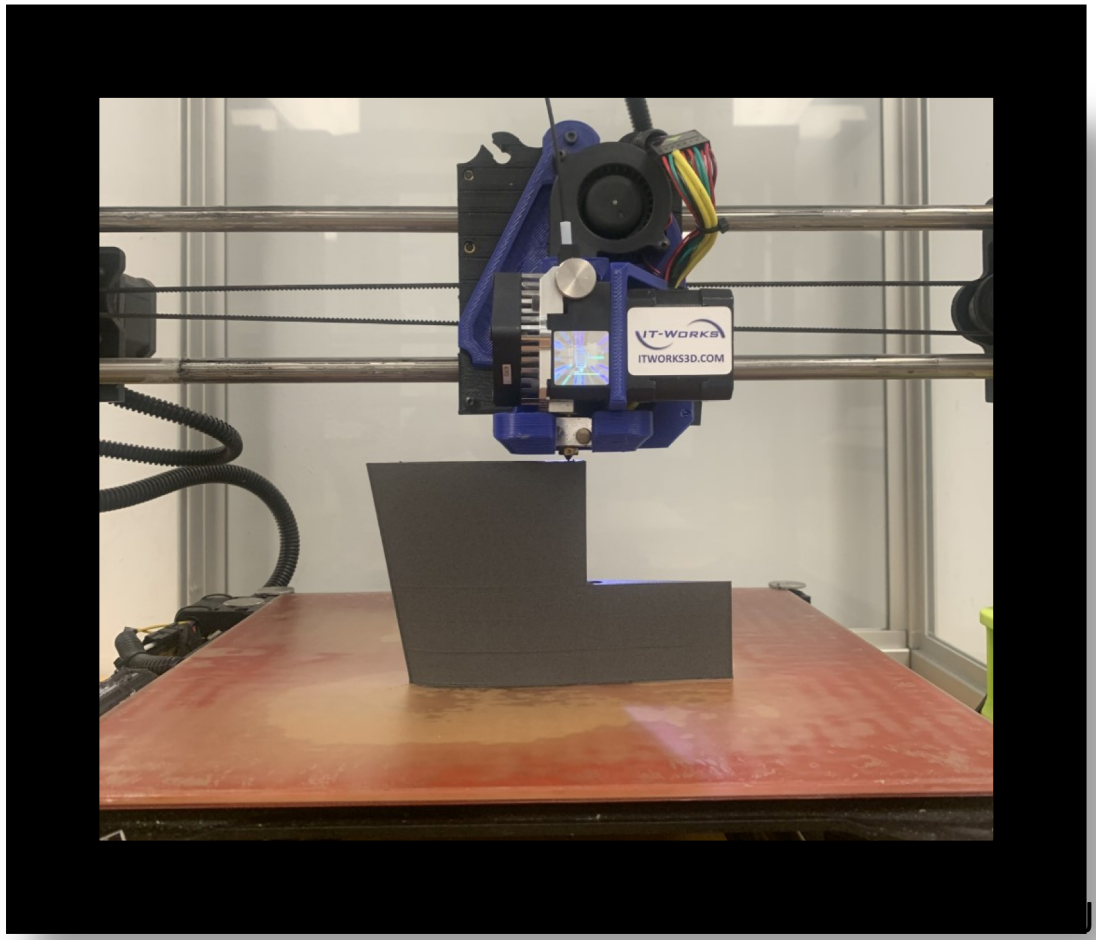
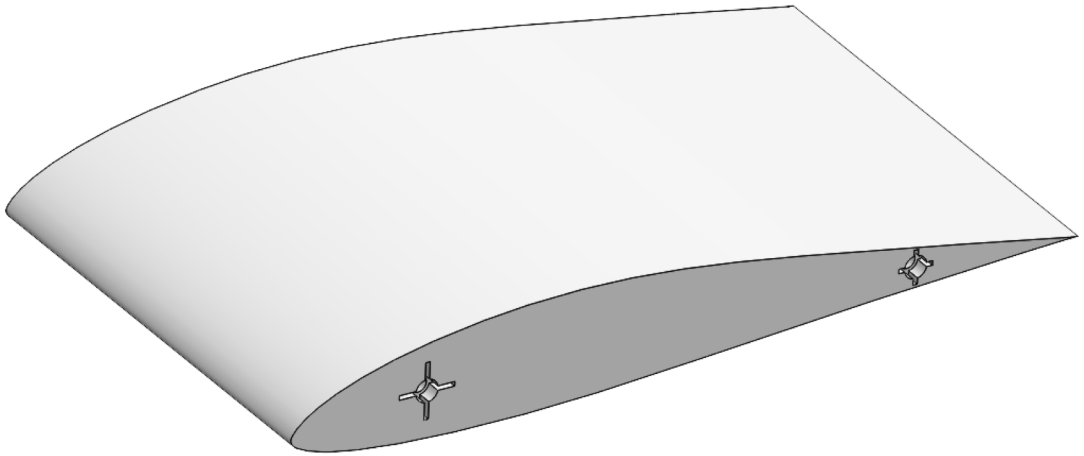
In the Works

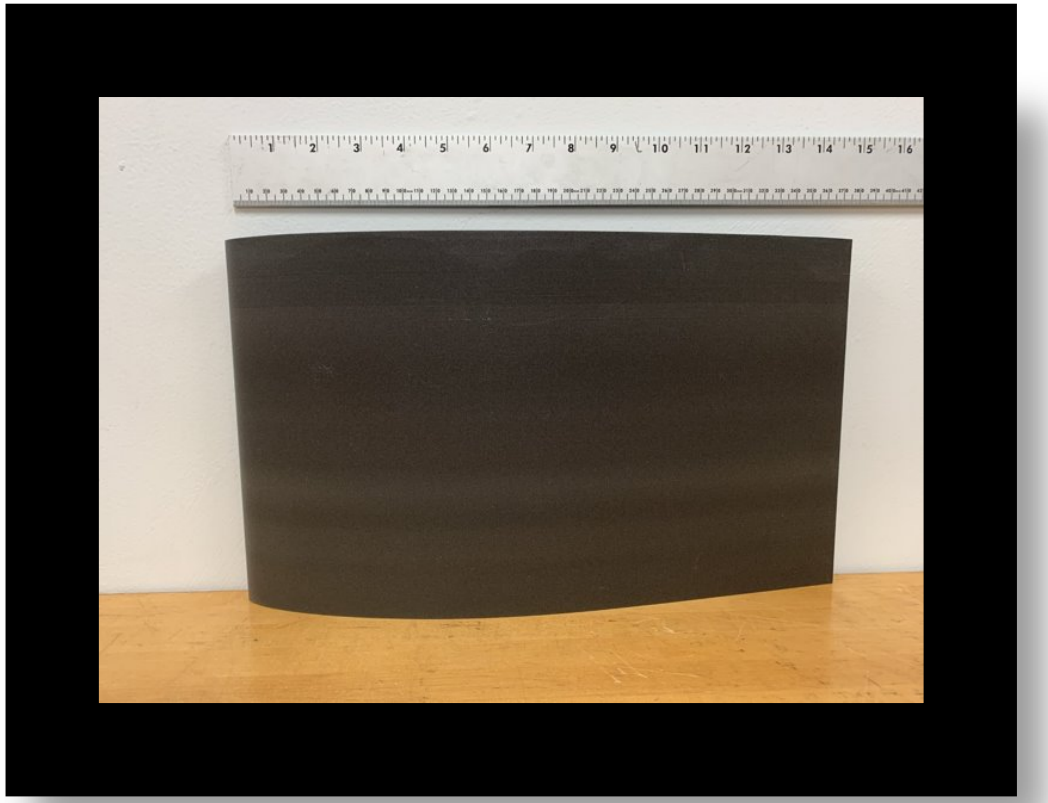




Joseph Figari

In the Works





Joseph Figari

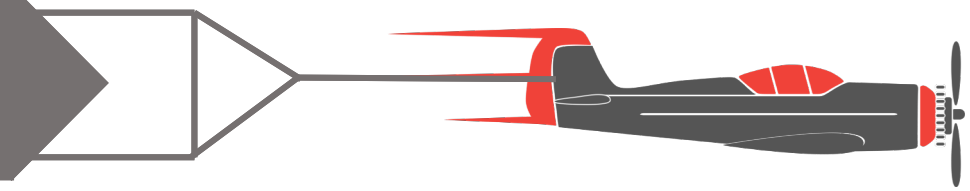
In the Works

- Servos have been ordered
- Spars have been ordered
- Bow ties have been printed

CHANGE TO POINTY BULLETS

Joseph Figari

Future Work



- Design ways to secure the electronics inside the fuselage
- Build the landing gear
- Continue 3D printing the parts
- Set a date and fill out needed paperwork for the test flight with Seminole RC

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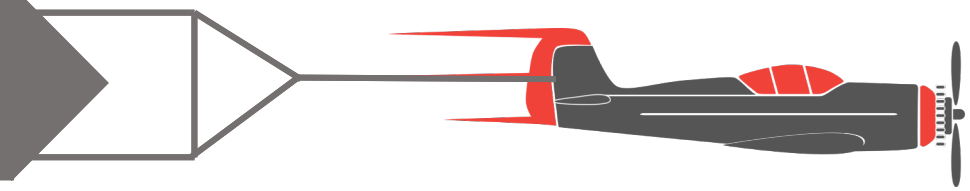
Key Takeaways



- Seminole RC Club will be helping with a test flight
- The plane is still being built within competition rules
- Printing has started and will continue
- All parts must be made with printing in mind

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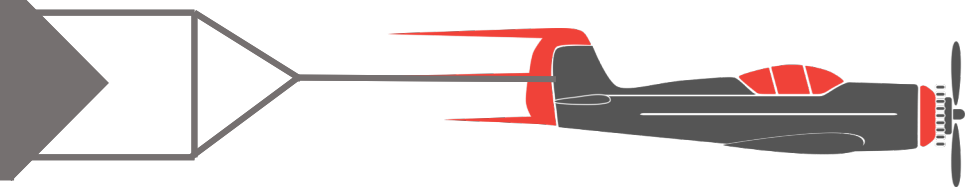
References



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- Aguirre, N., Evans, L.,… Silver, Z. (2020). T513: SAE Aero Design Operations Manual. *Team 513: SAE Aero Design East Competition,* 47-56.

- ADD MANUAL

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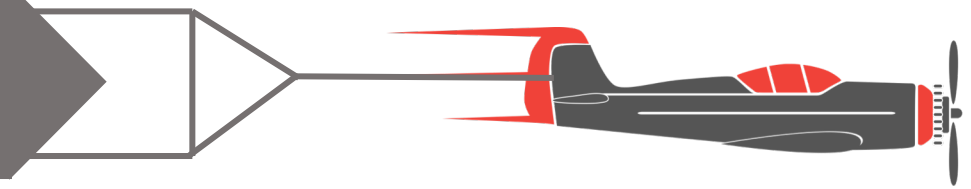
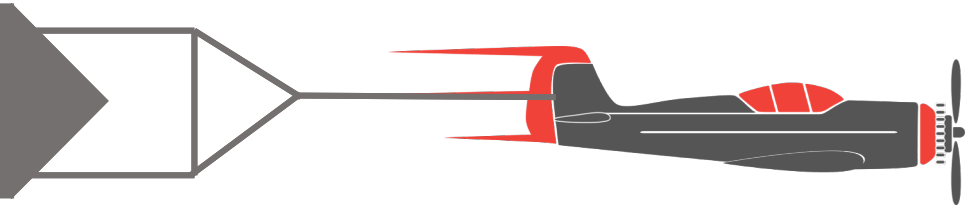
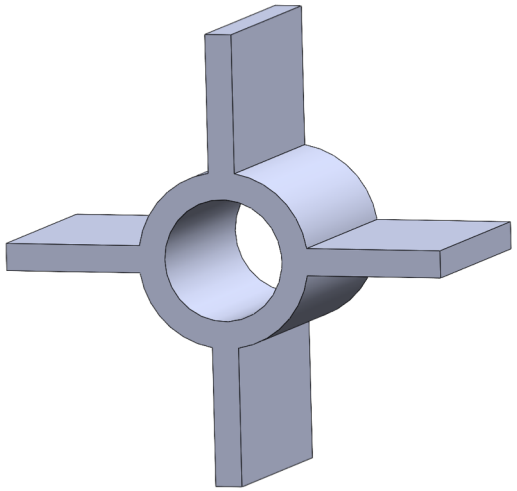
Back-Up Slides

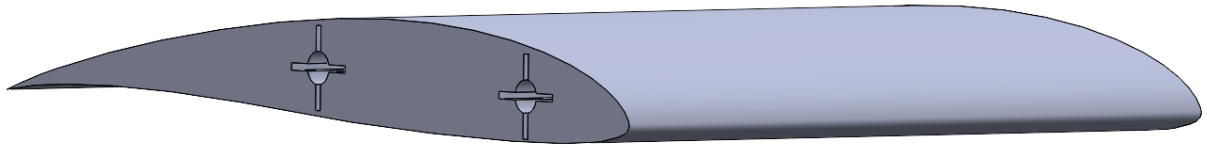


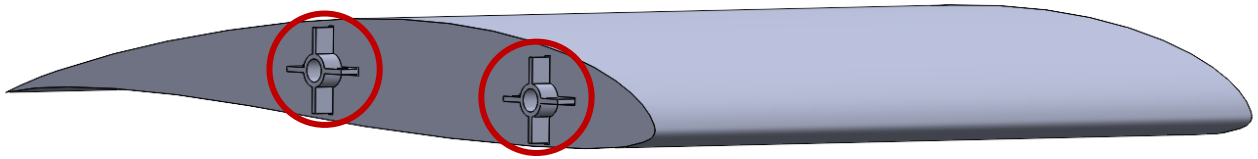
Assembling Methods: Spars



- Plane uses spars to assemble the wings
- Each wing set has two spars
- Small crosses are also used to help lock the wings together
- Ends of the spars are threaded so screws can be used to secure the parts







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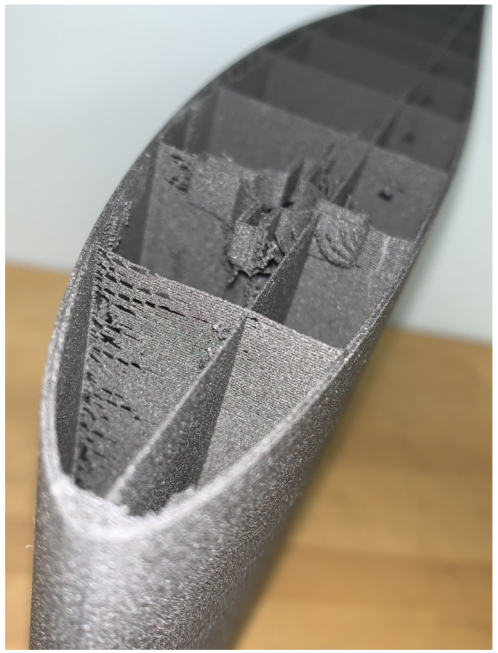
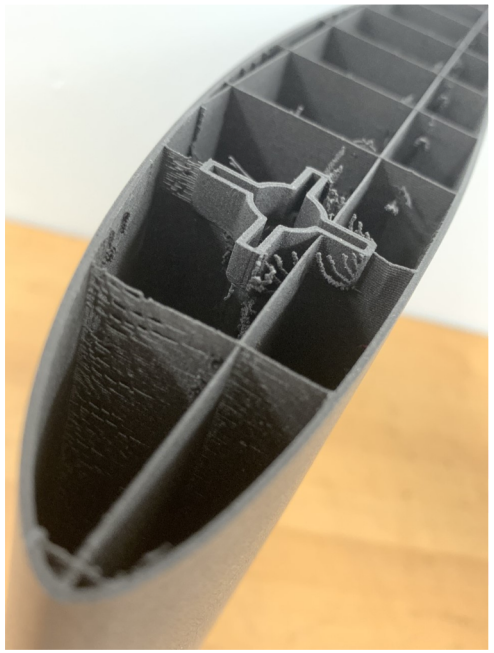
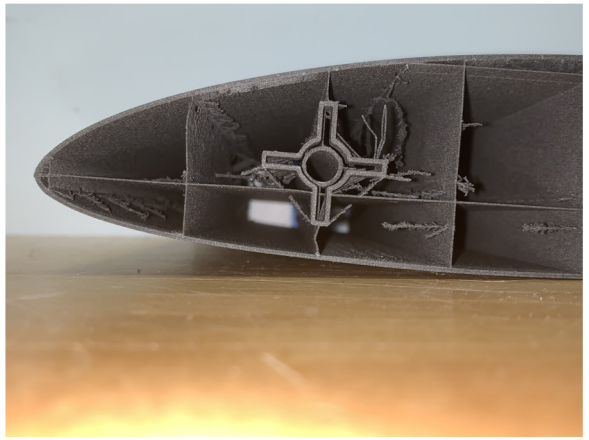
Infill/ Printing Methods



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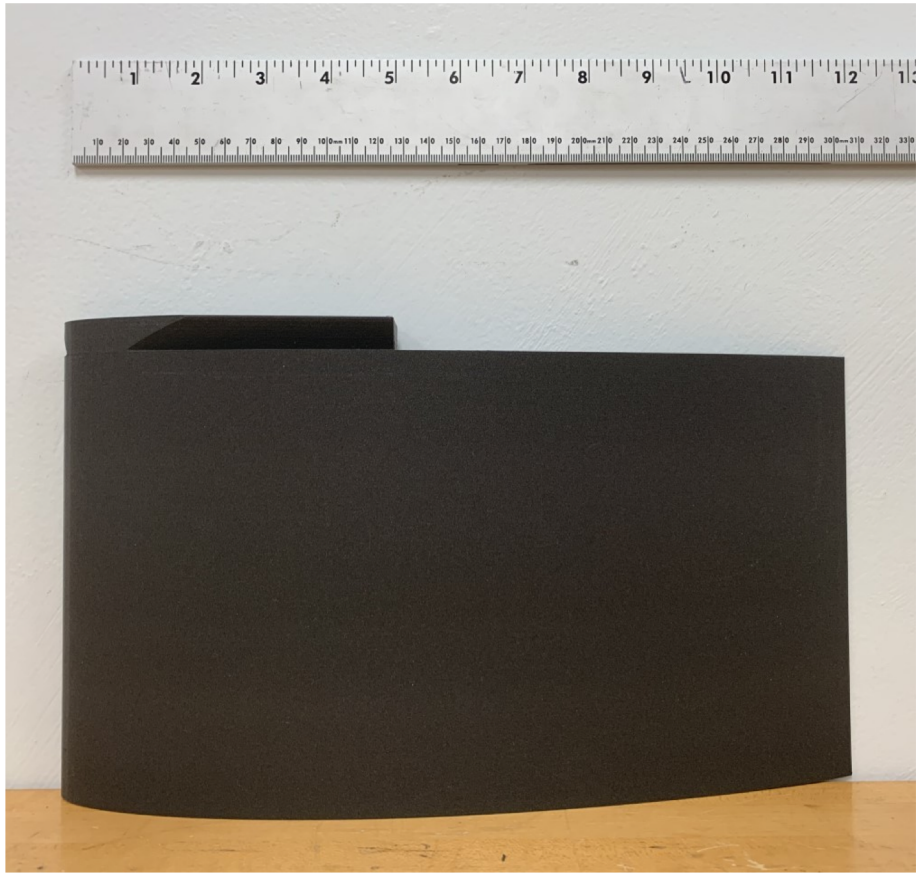
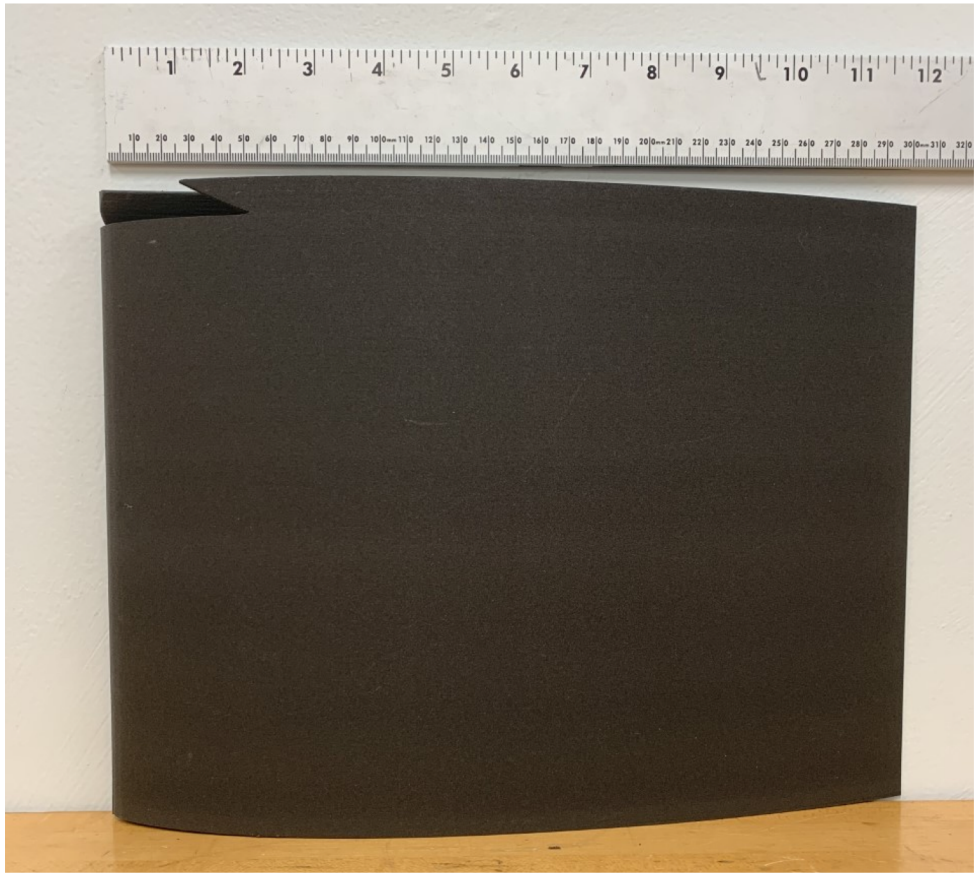
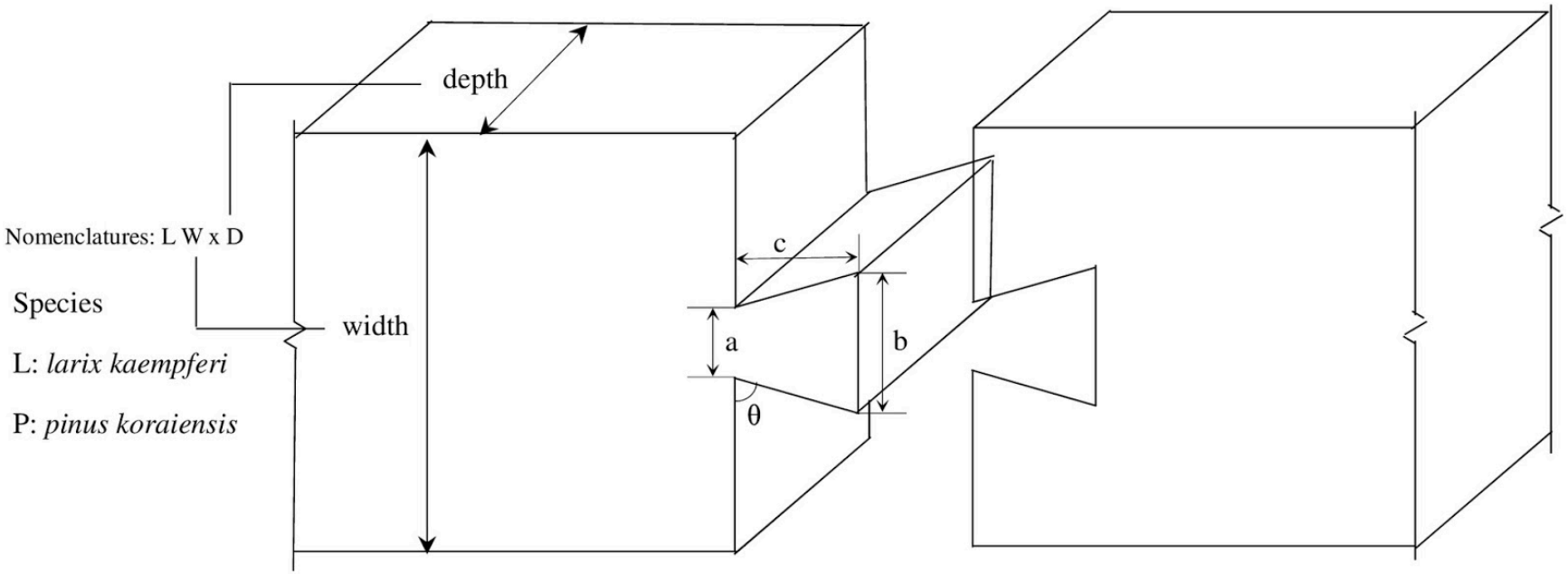




Assembling Methods: Woodworking



- The Dove Tail Connection
  - Consists of a male and female part
  - Prevents movement perpendicular to the connection
  - Prevents rotational movement

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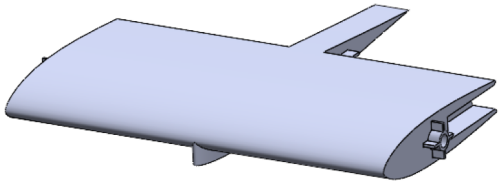
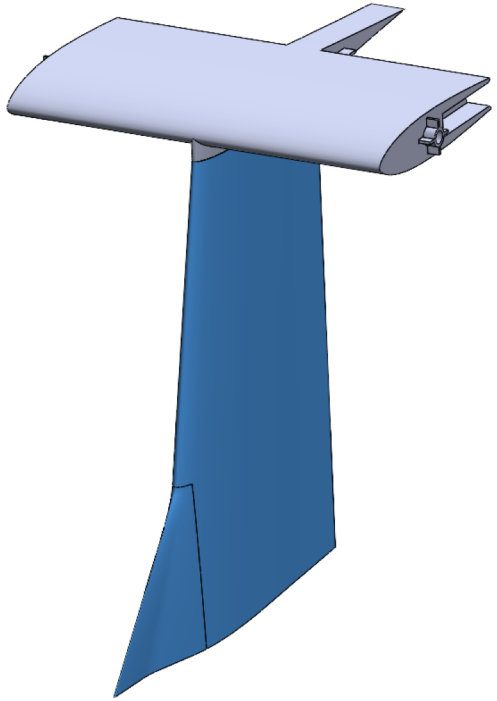
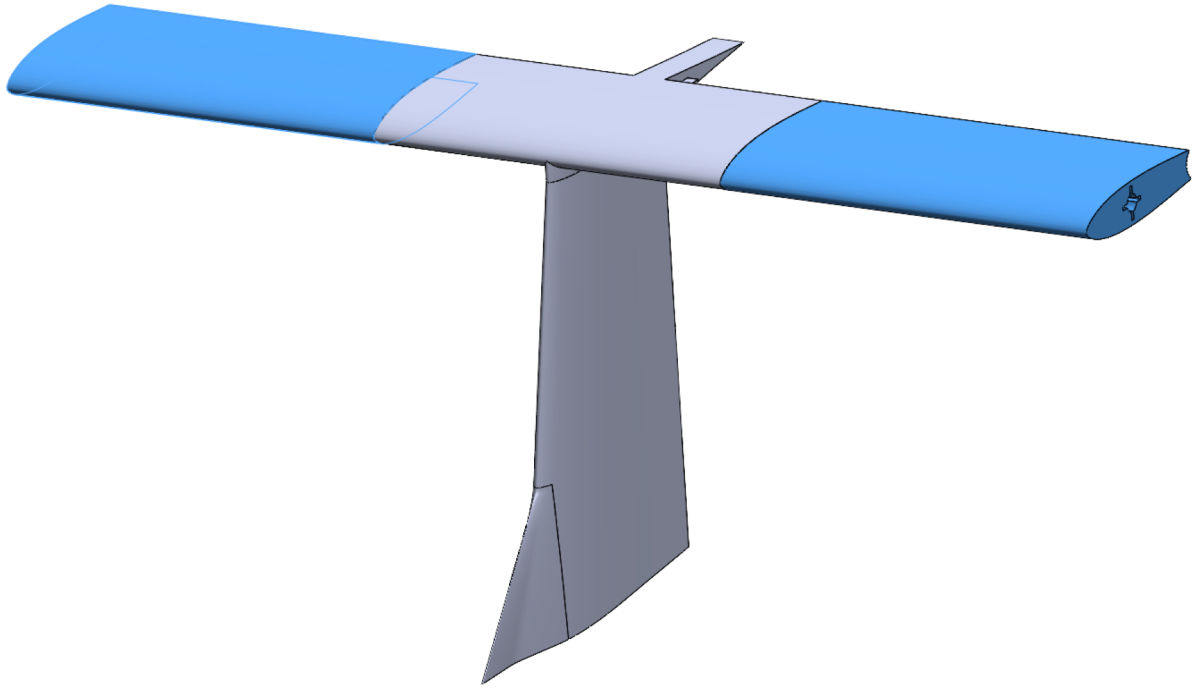
Project Brief Summary







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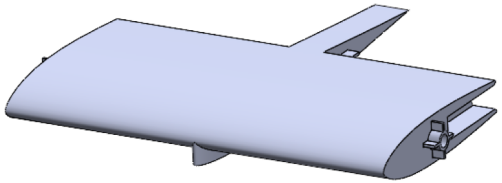

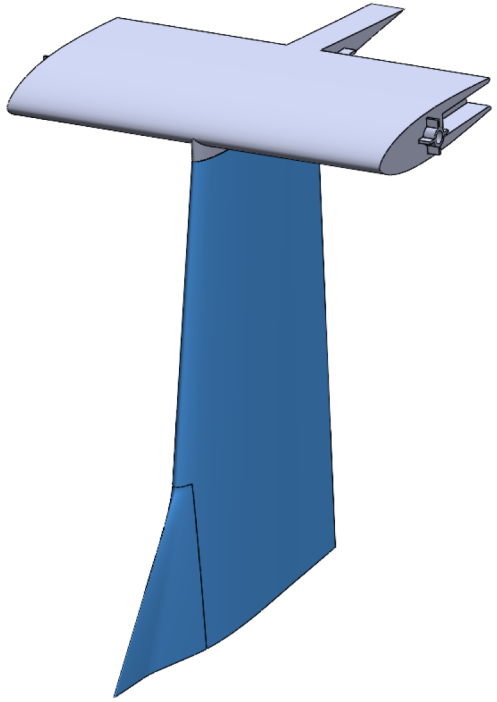

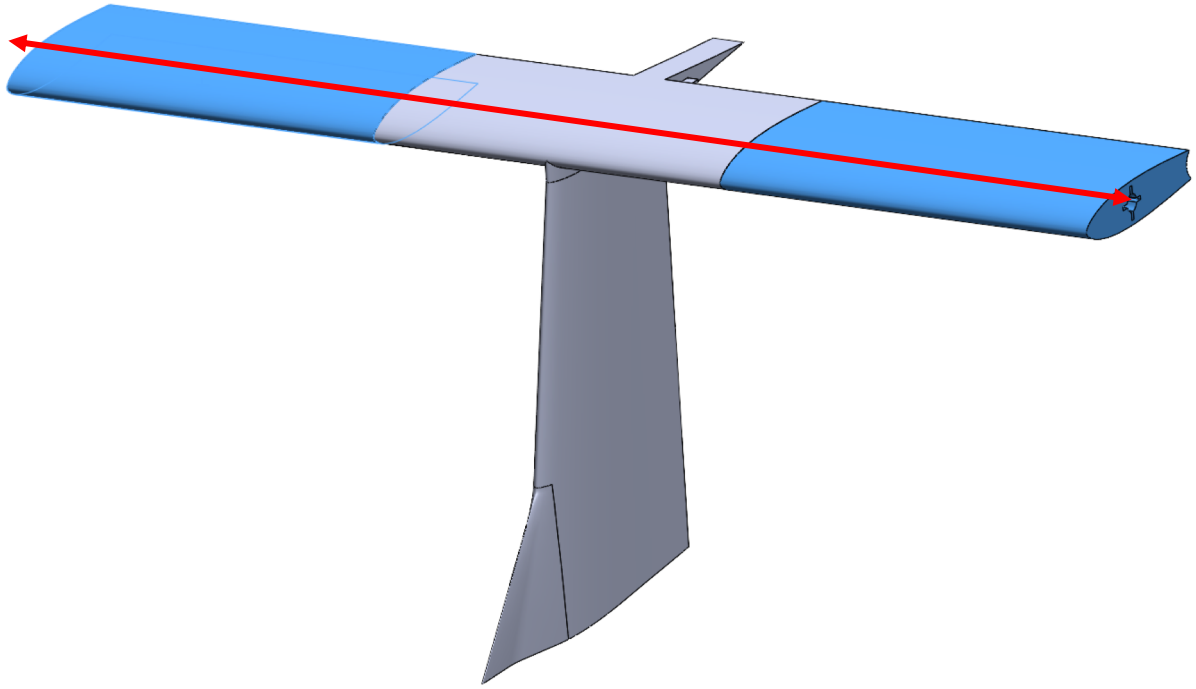

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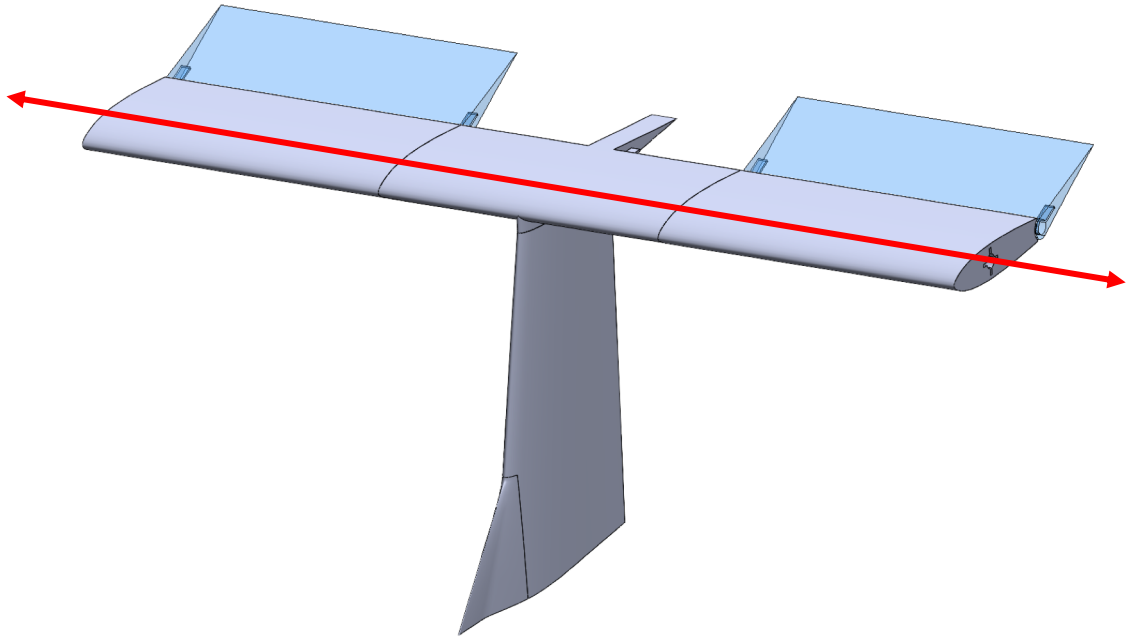

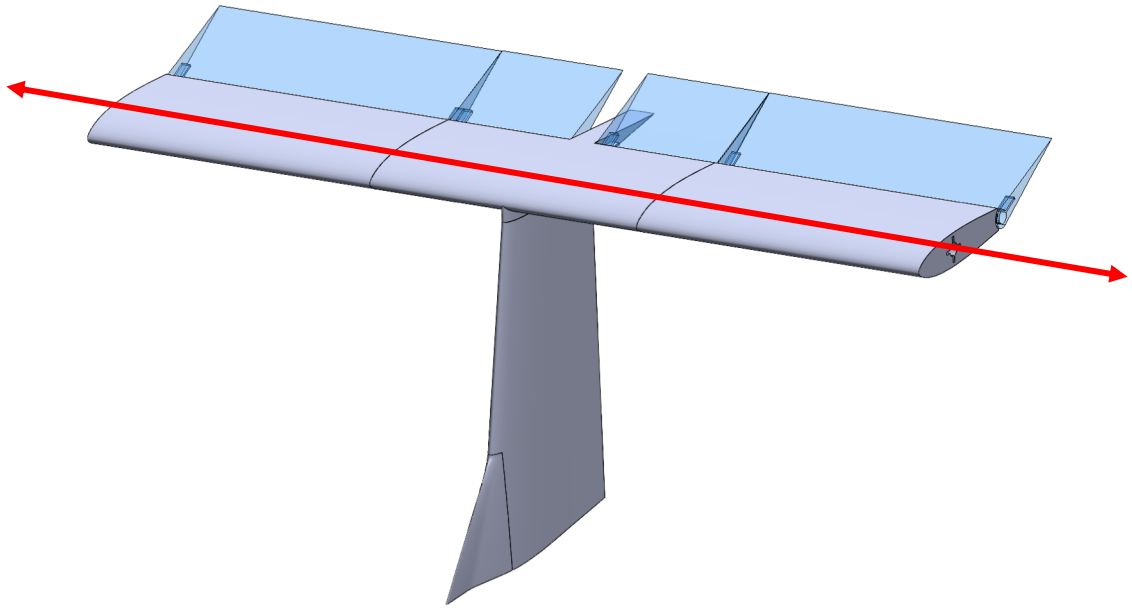

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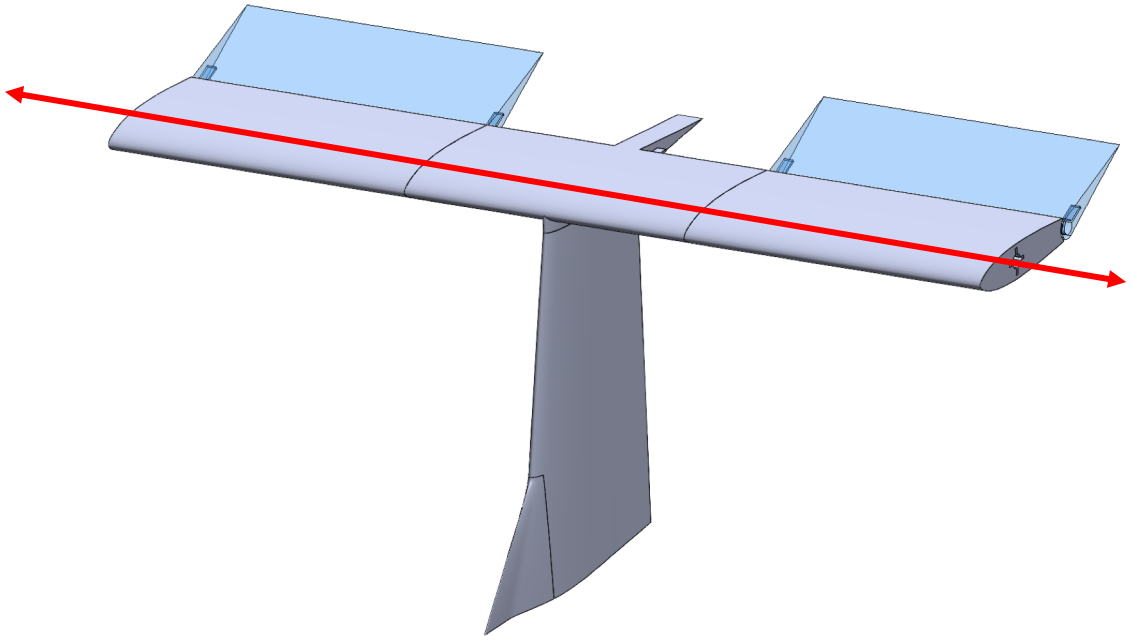
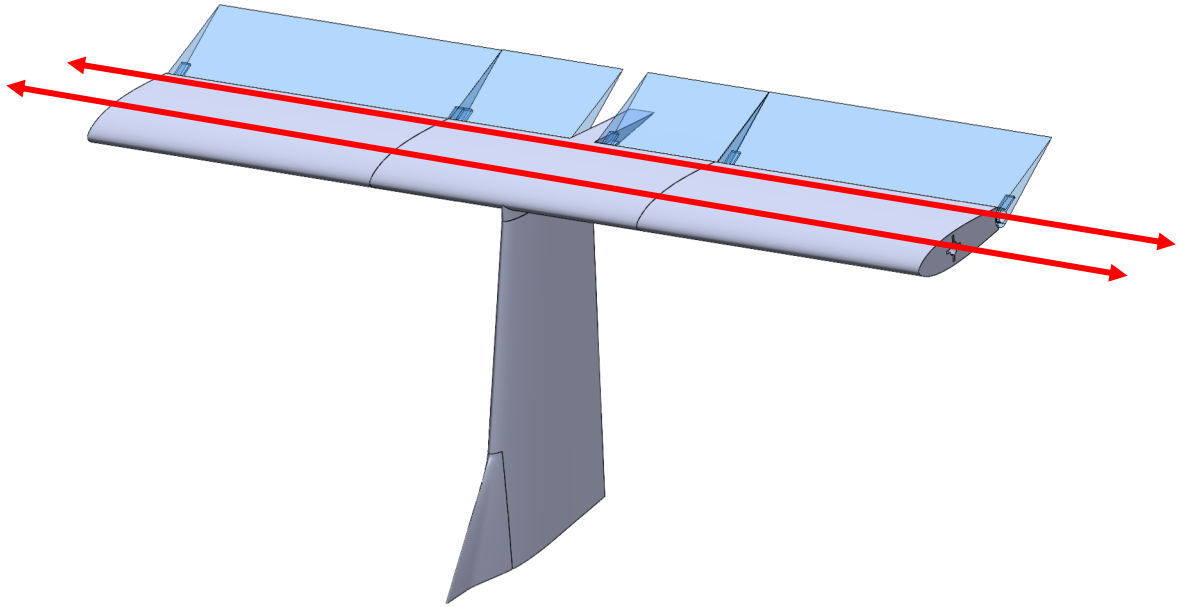
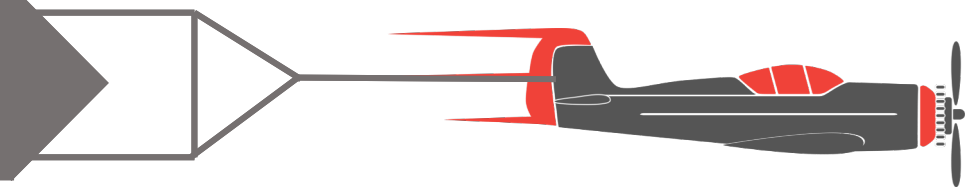


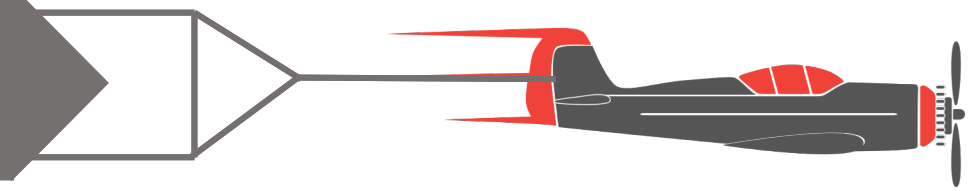


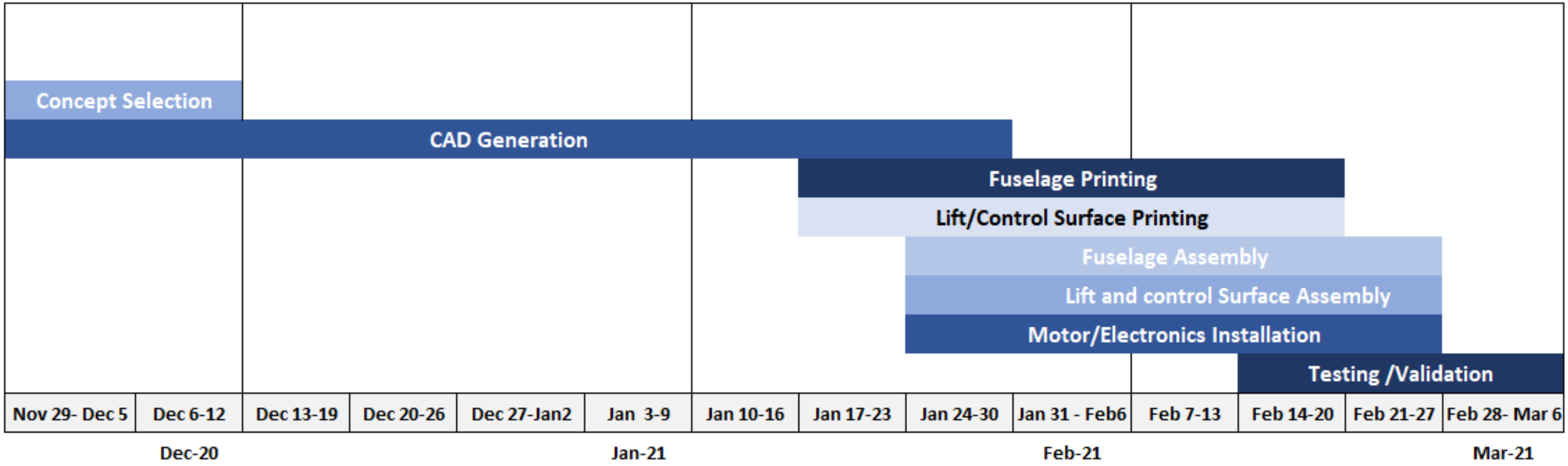
Fall Semester Timeline



Aug 30- Sept 5	Sept 6-12	Sept 13 - 19	Sept 20-26	Sept 27- Oct 3	Oct 4-10	Oct 11- 17	Oct 18-24	Oct 25-31	Nov 1-7	Nov 8-14	Nov 18-21	Nov 22 -28
Preliminary Research												
		Concept Generation										
										Concept Selection		
	Sep-20				Oct-20				Nov-20			

Winter & Spring Semester Timeline





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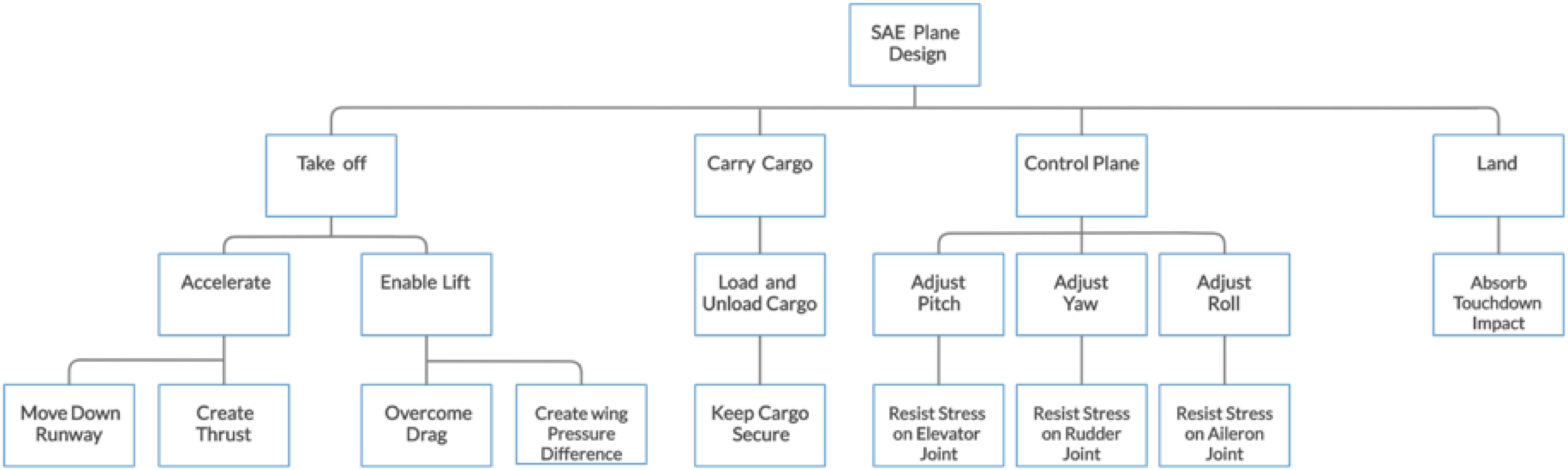
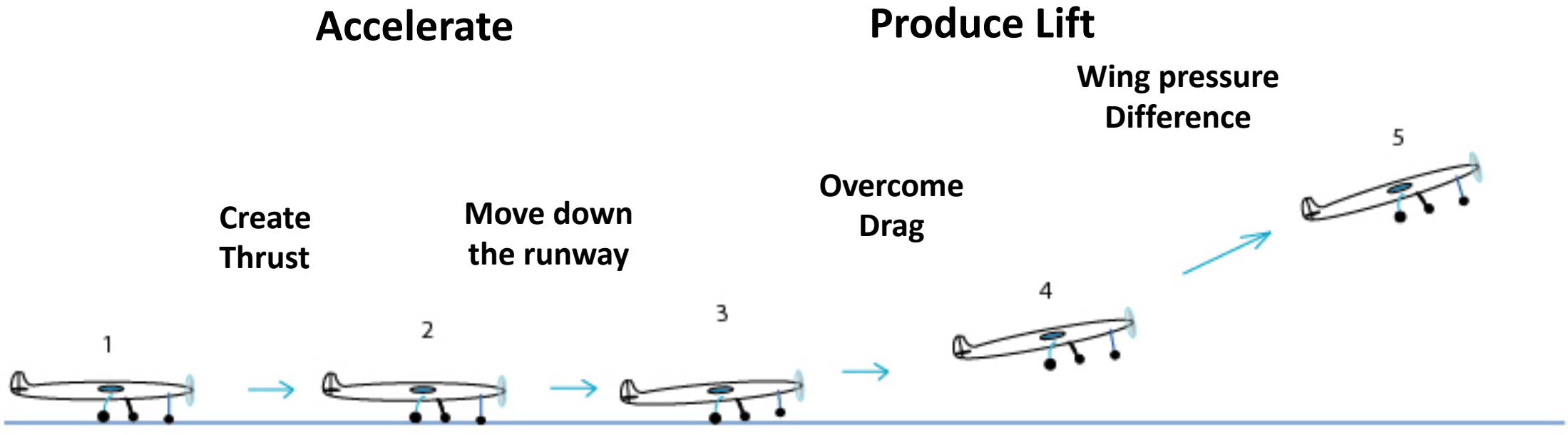
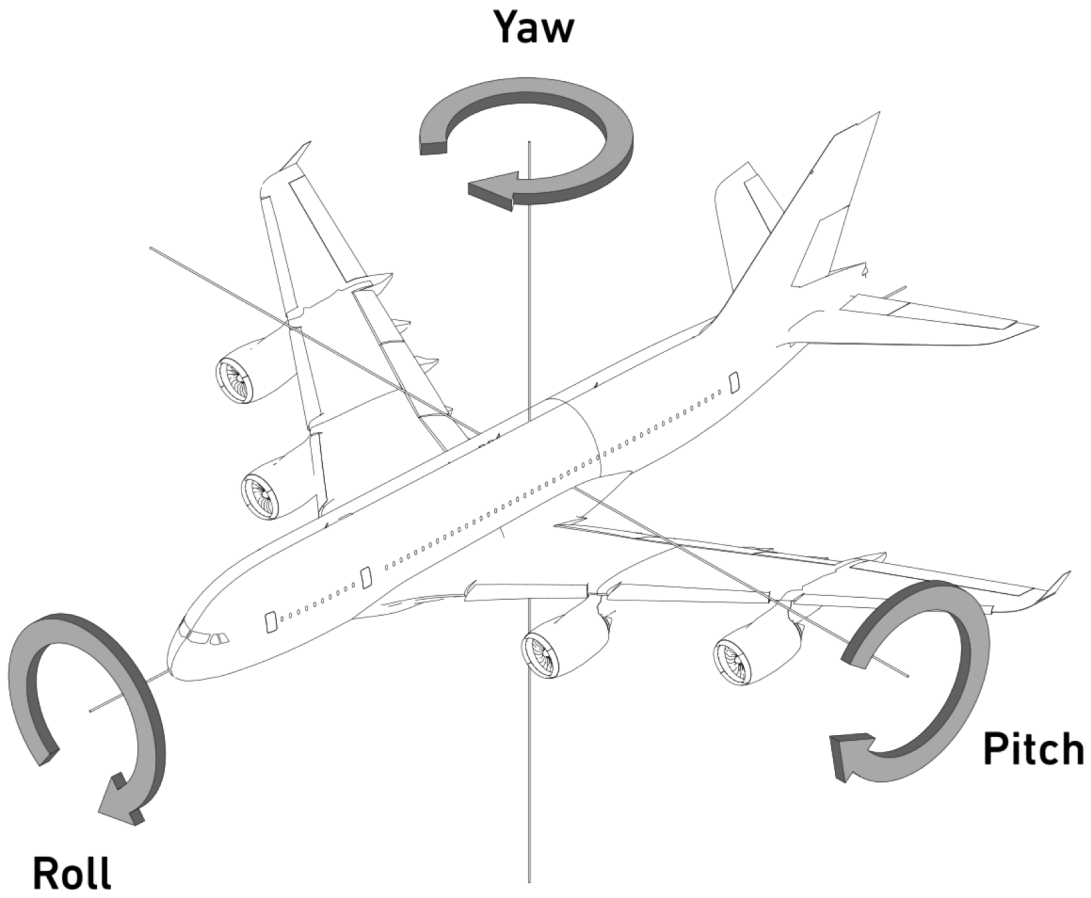
Functional Decomposition



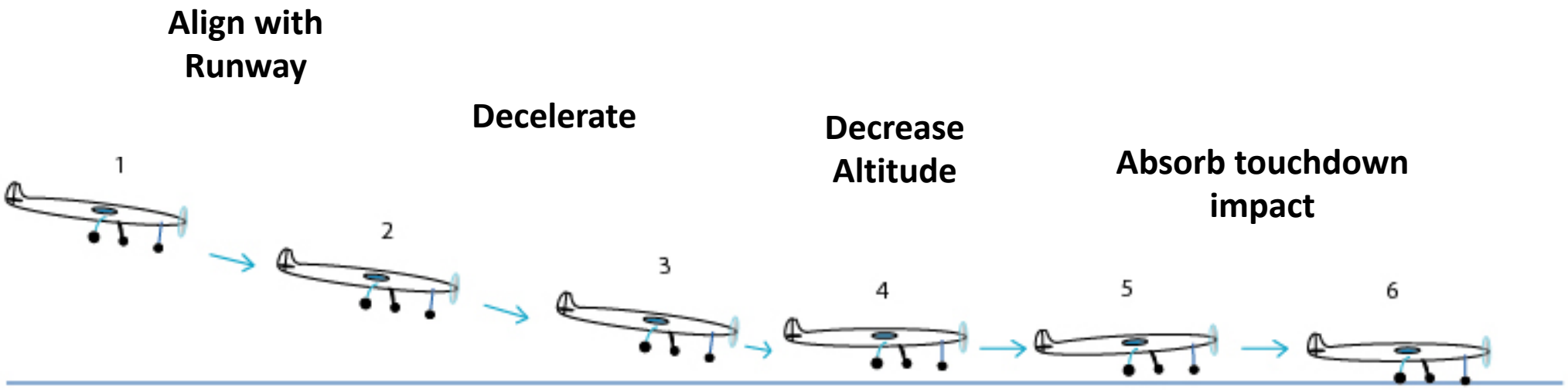
Takeoff

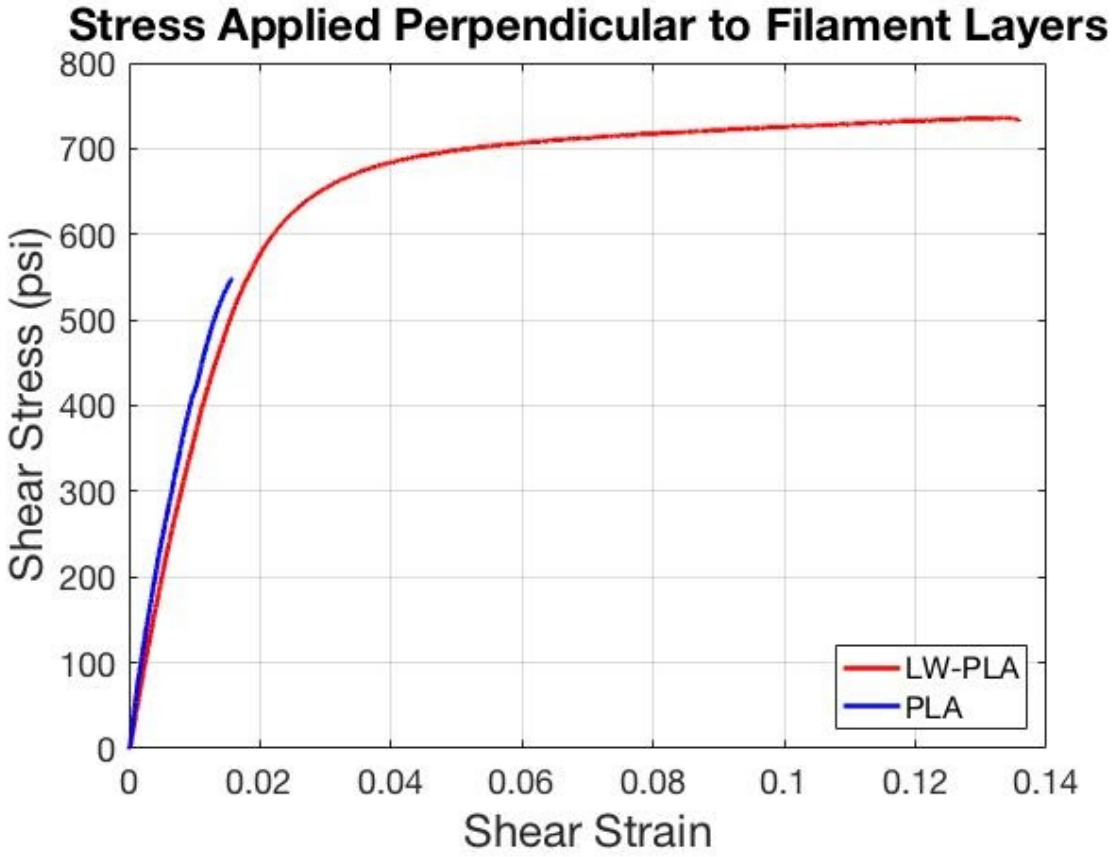

Accelerate
Produce Lift
Wing pressure
Difference
Overcome
Drag
Create
Thrust
Move down
the runway
1
2
3
4
5

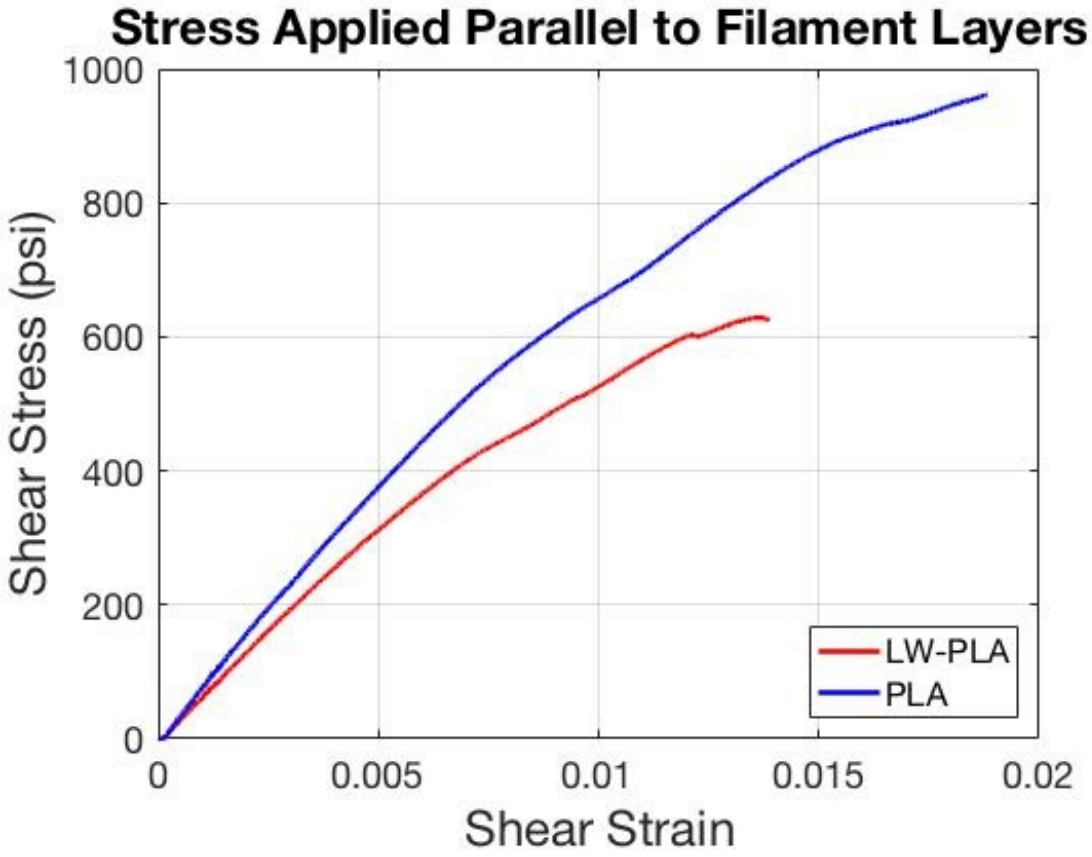
Control Plane



Landing


Align with Runway
Decelerate
Decrease Altitude
Absorb touchdown impact
1
2
3
4
5
6

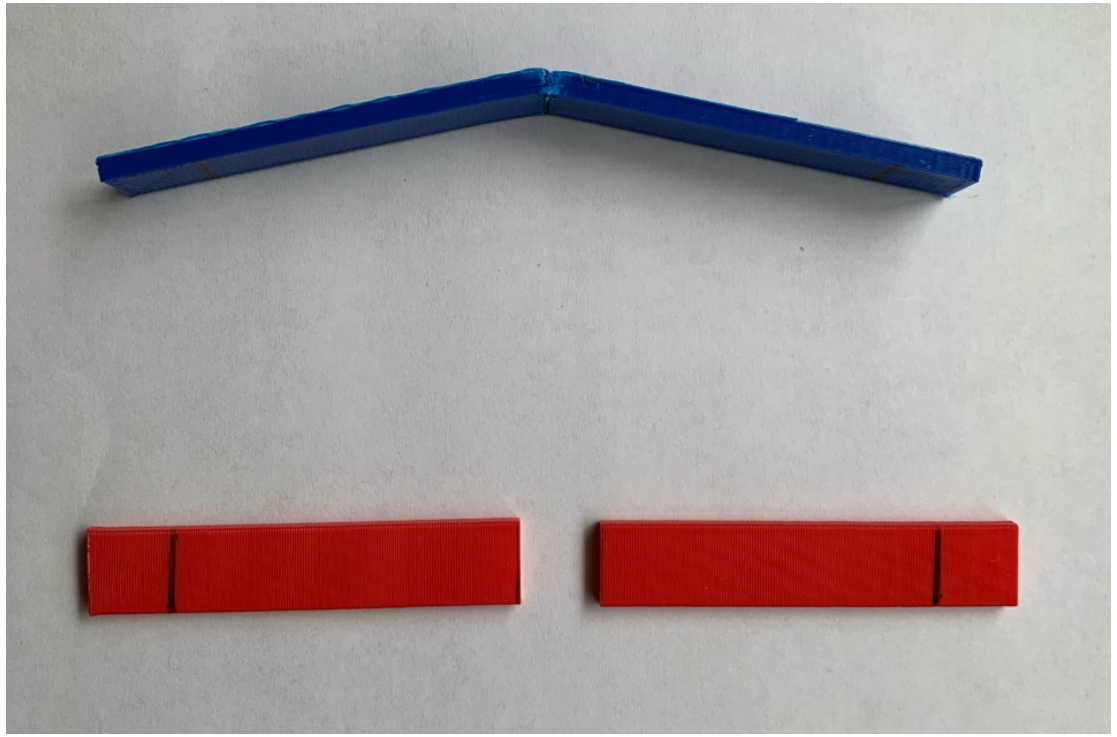




PLA failure stress: 412 psi
LW-PLA failure stress: 552 psi

PLA failure stress: 721 psi
LW-PLA failure stress: 471 psi

PLA



Stress Perpendicular to layering direction: 3,360 psi
Stress Parallel to layering direction: 8,350 psi

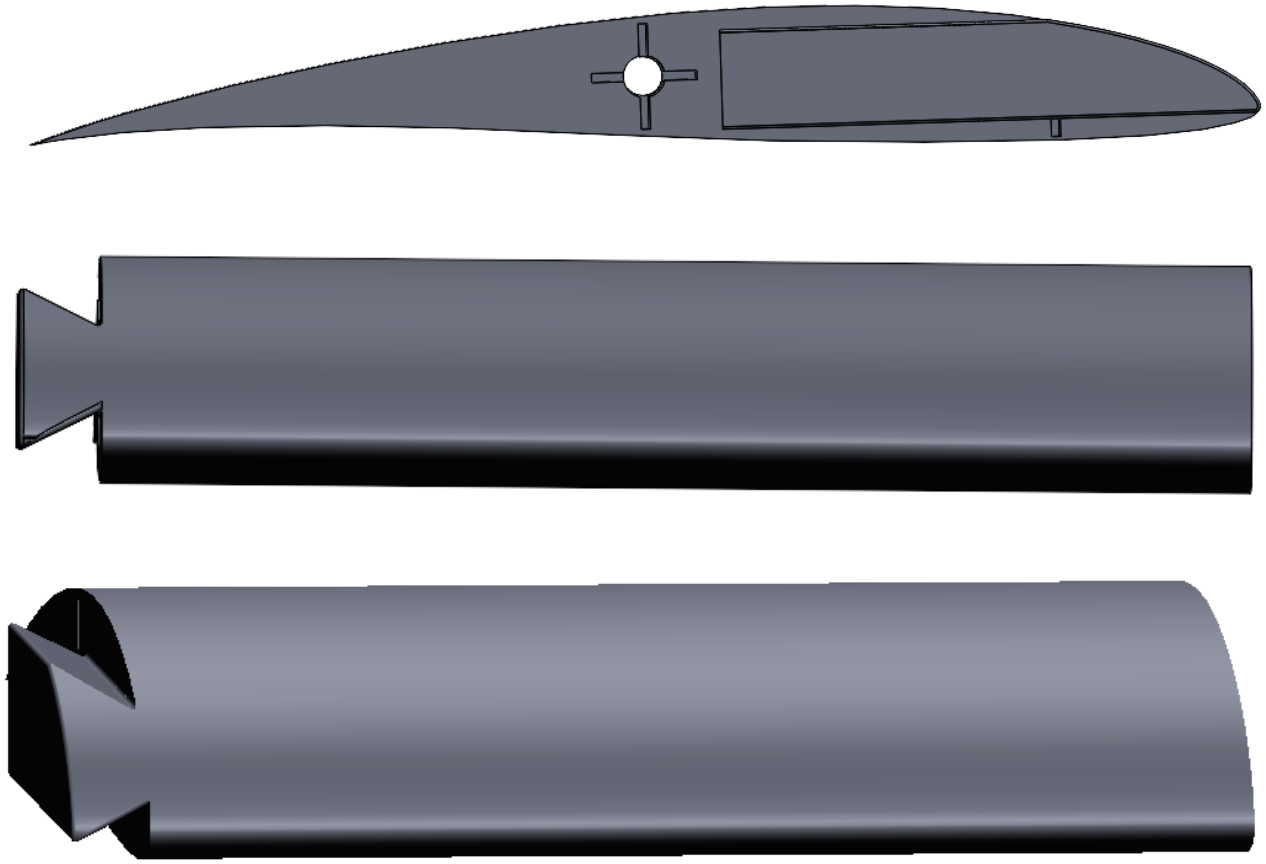
LW-PLA

Stress Perpendicular to layering direction: 3,380 psi
Stress Parallel to layering direction: 6,120 psi

Dove Tail Male Construction

- Dimensions:
  - Minimum thickness: 0.5 inches
  - Maximum thickness: 1 inch
  - Length: 5.25 inches

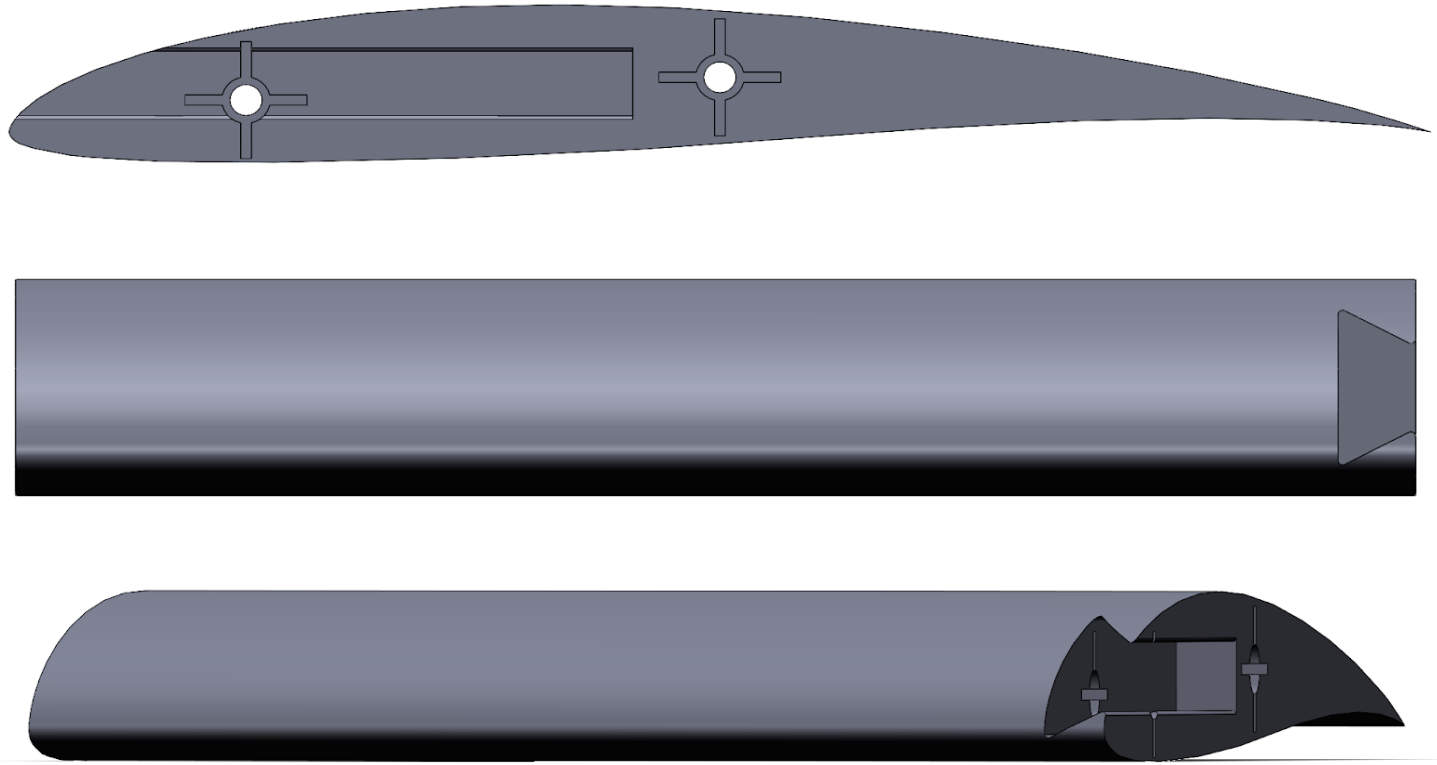
- Characteristics
  - Follows curvature of the airfoil
  - Edges are rounded



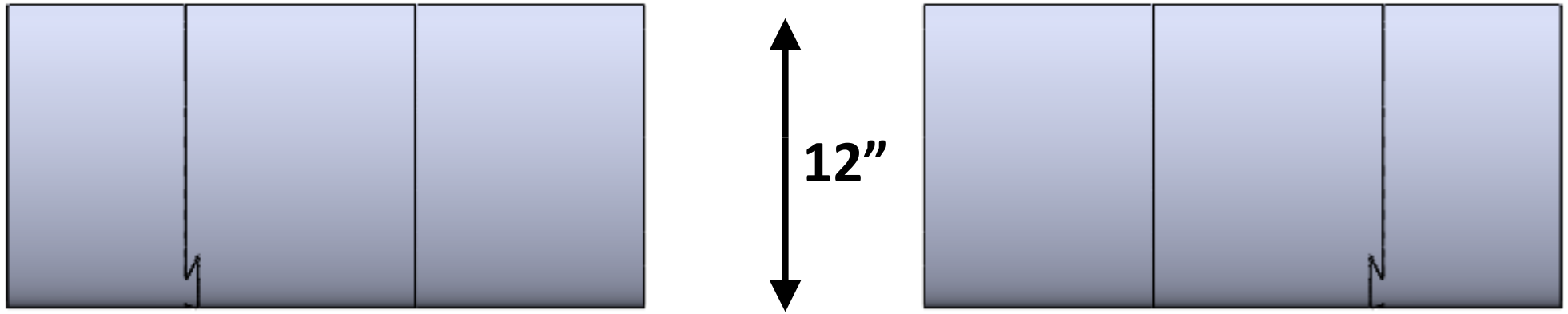
Dove Tail Female Construction

- Dimensions:
  - Minimum opening: 0.5001 inches
  - Maximum thickness: 1.001 inch
  - Length: 5.25 inches

- Characteristics
  - Follows curvature of the airfoil
  - Edges are rounded



Canard Dimensions



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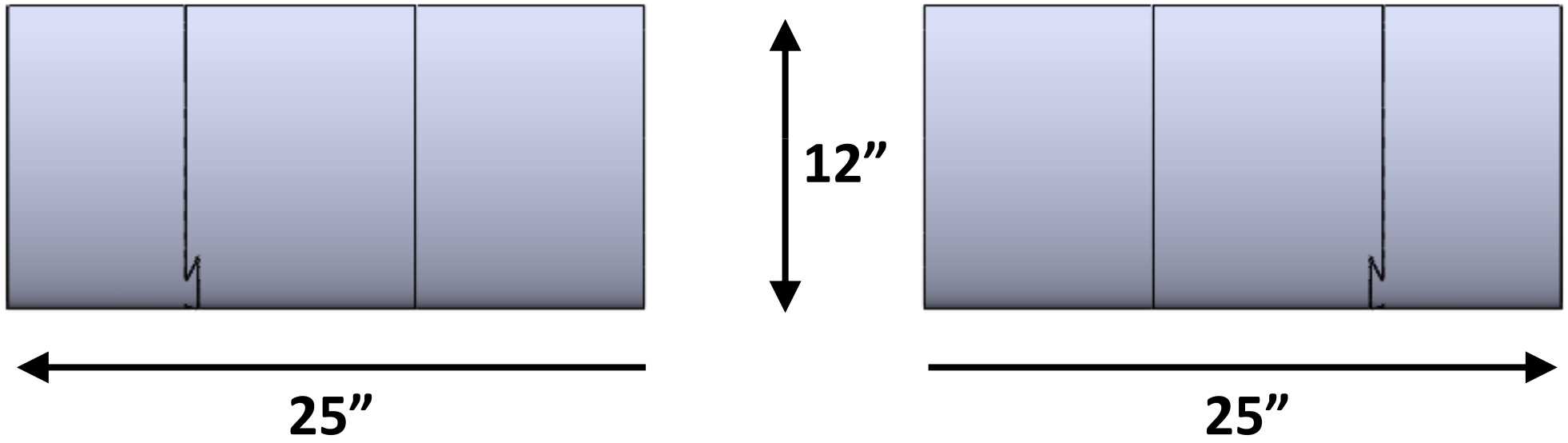
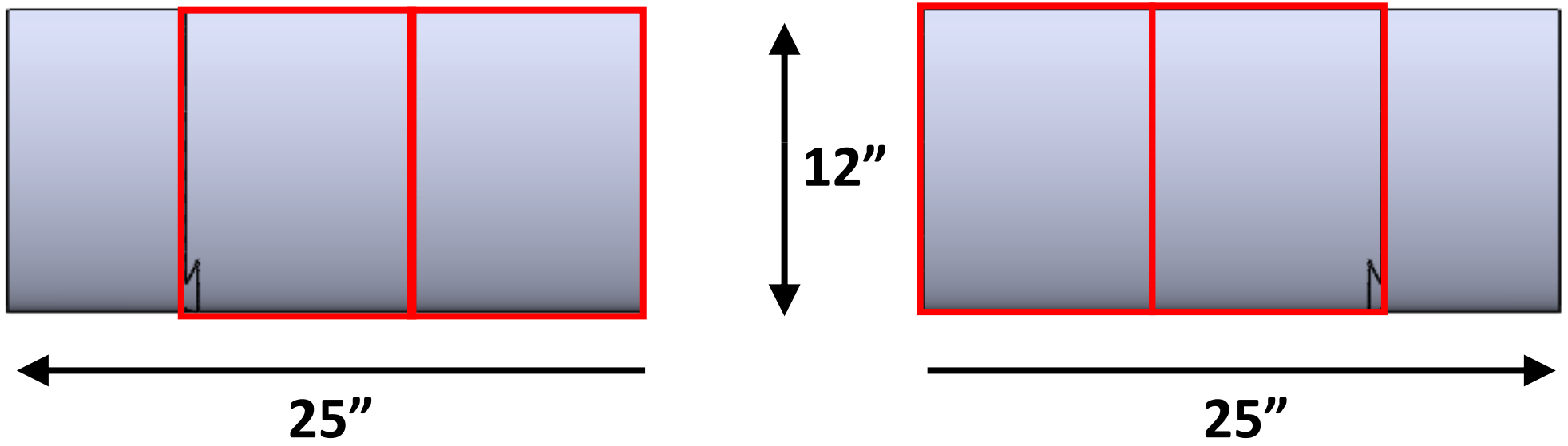
Canard Dimensions



Lauren Chin

Canard Dimensions



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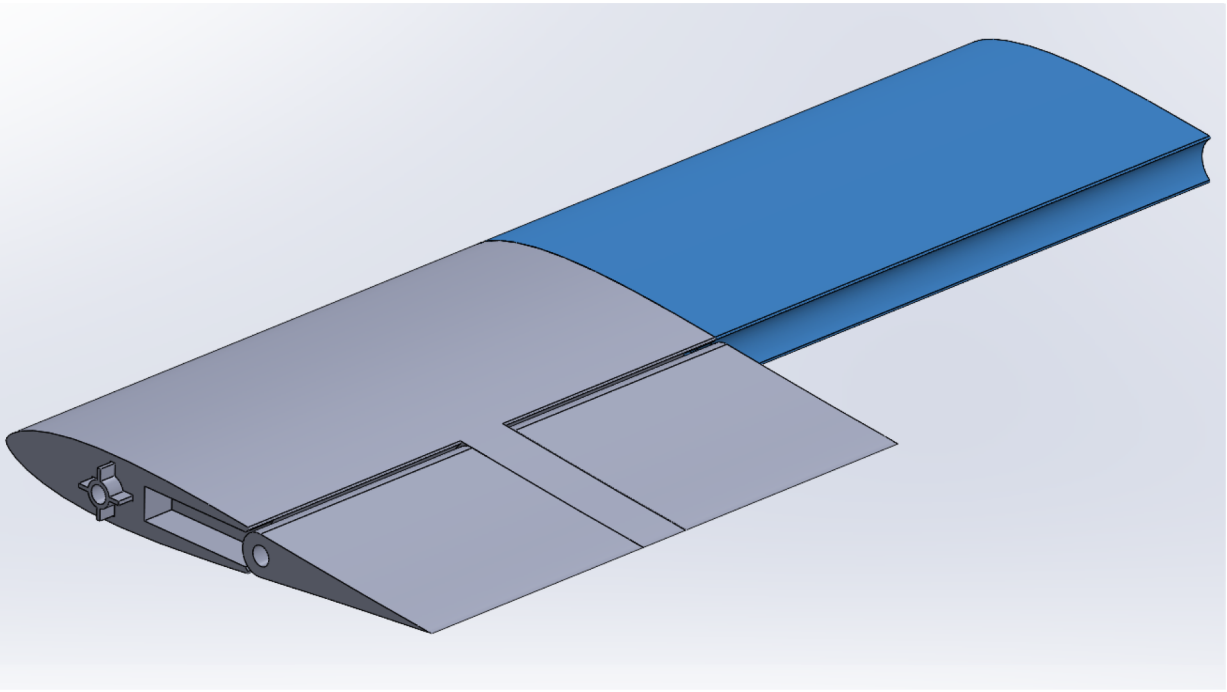
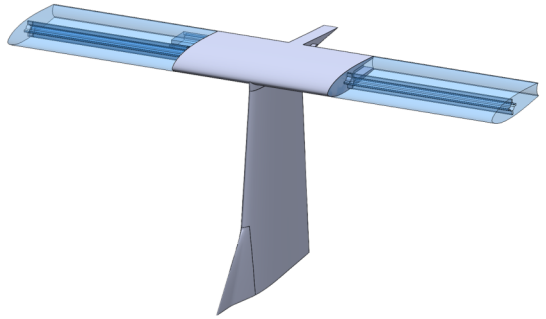
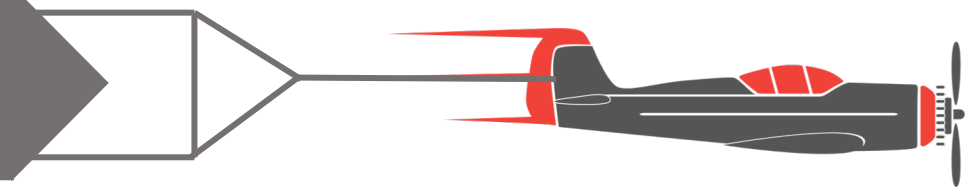


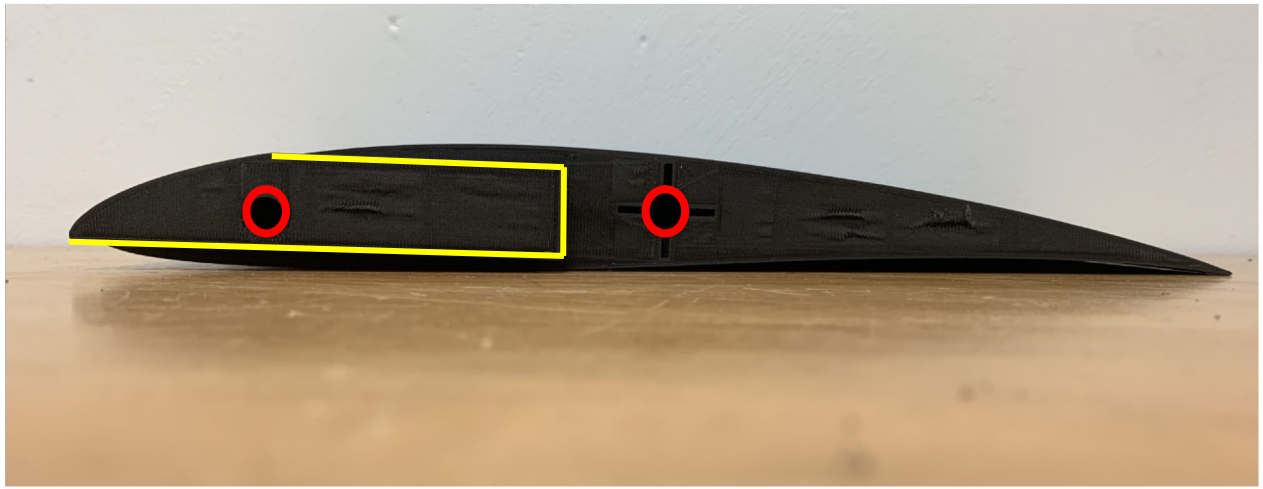


Project Brief Summary

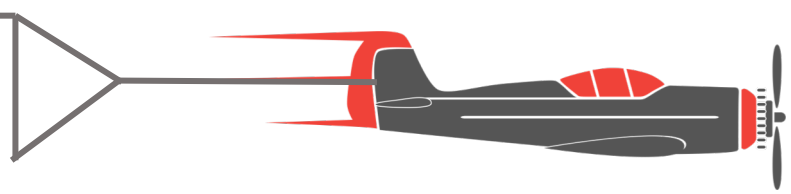


- Dimensions:
  - Minimum thickness: 0.5 inches
  - Maximum thickness: 1 inch
  - Length: 5.25 inches

- Characteristics
  - Follows curvature of the airfoil
  - Edges are rounded

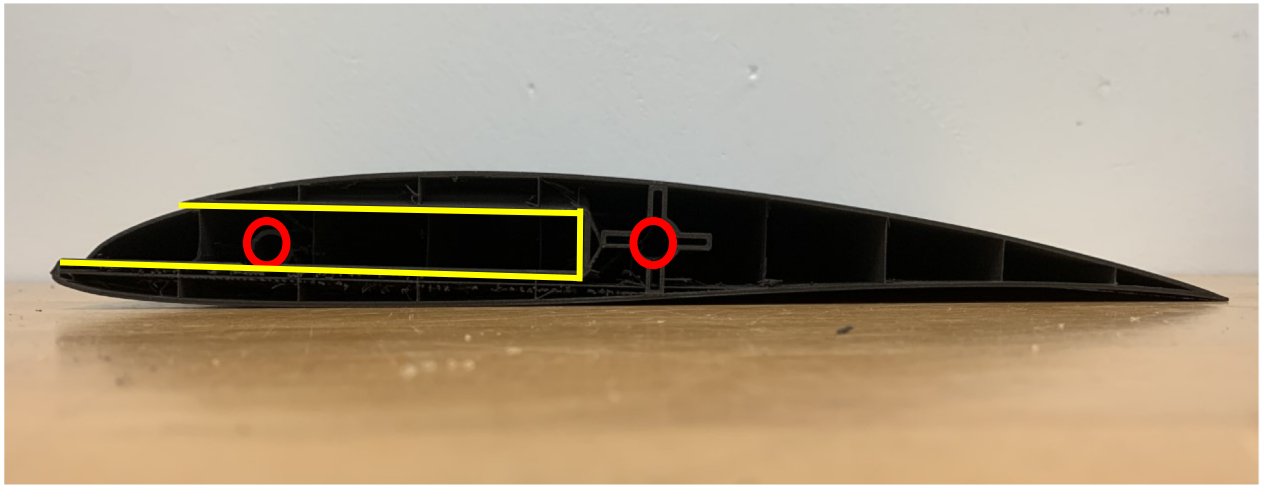


Project Brief Summary



- Dimensions:
  - Minimum opening: 0.5001 inches
  - Maximum thickness: 1.001 inch
  - Length: 5.25 inches

- Characteristics
  - Follows curvature of the airfoil
  - Edges are rounded



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