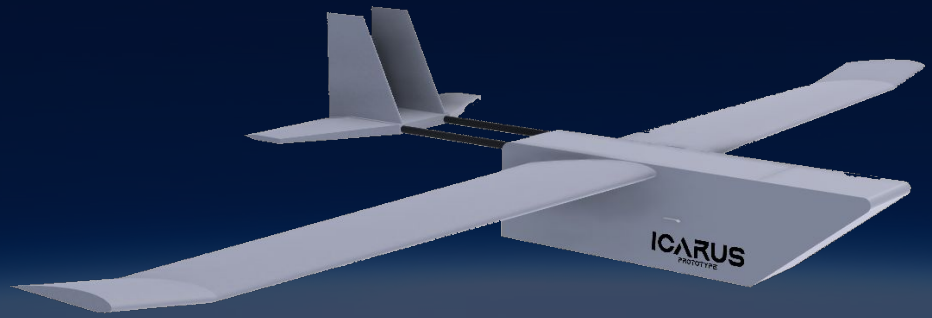
Icarus Cargo Glider



By: Ayden 9-3

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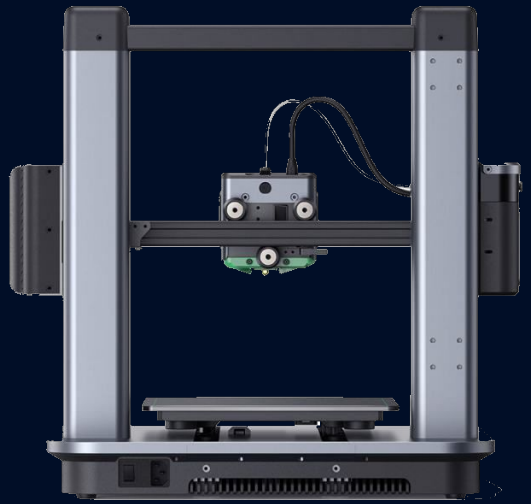
Background Information

Some background information about Icarus.



Background Info:

Some background information for Icarus:
- Science Fair Project
- 3D Printed Parts, mainly the cargo bay
- Modeled In Fusion 360
- Clark Y Airfoil for high lift
- Carbon Fiber Supports
- Foam Wings
- Simplistic Design for ease of use
- Meant to carry 1kg in a 15 x 15 x 25cm bay
- 1.9 M wingspan for long distance flight
- 3-4 Kg total weight with package
- Optimized for a low stall speed and beginner-friendly flight characteristics
- Servo-actuated door using a MG90S servo

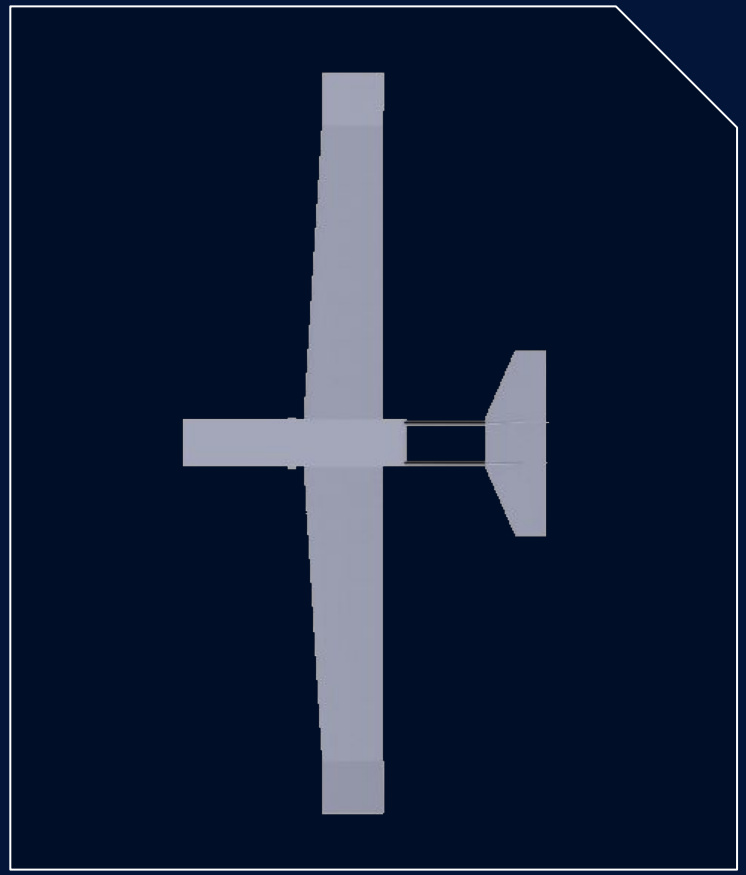
02

Project Idea & Graphics

The main idea that inspired this project

Hypothesis

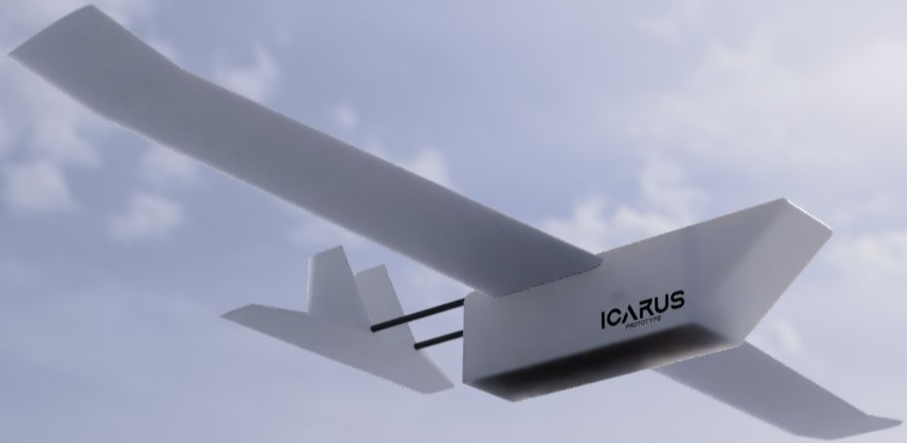
If I use a glider then it will lower noise pollution and cost to transport packages because it doesn't have motors for propulsion.



Project Idea:

The ideas behind Icarus:
- A Lightweight Cargo Glider
- Capable of Carrying Cargo In a City
- Scalable Design
- Easy and Cheap To Manufacture
- Can replace some drones for lighter packages
- Should be able to be used in remote areas

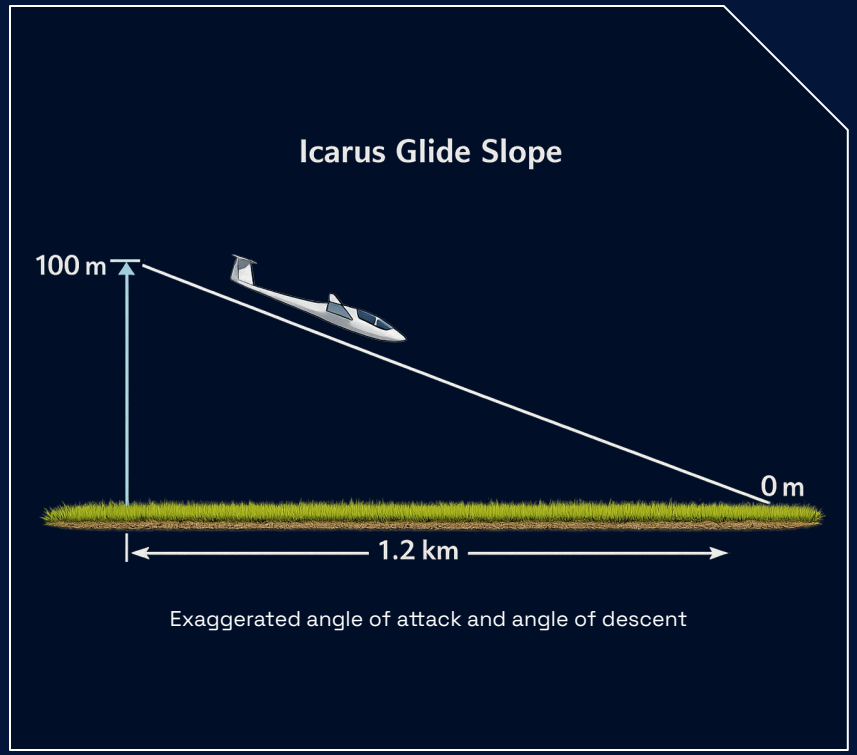
A Render Of Icarus:



03

Summary Of Findings

The summary of what I found during this project.

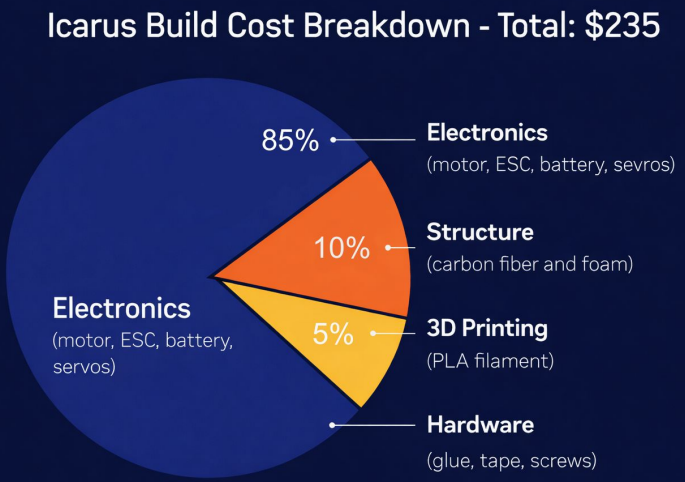


Exaggerated angle of attack and angle of descent

Summary of Findings

- 12:1 Glide slope, meaning for every 100 meters in altitude it can glide 1.2 km at about 40 km/h without wind.
- Longer glide slope with headwind (Wind coming from the front)
- Can do this on a 4.8° below horizontal
- Best glide speed is roughly 43 km/h
- Takes 1.5 min to glide 1 km making it good at delivering packages quickly

Summary Of Findings Continued:



Design:

- The design makes it really feasible because of the following points.
- Proven Materials, 3D Printed Body, Carbon Fiber Tubes, Foam wings.
- Low Stall Speed, stalls at about 30 km/h due to the nose shape pushing air down and keeping nose up.

Cost:

- Autonomous flight making cost lower by not having a human pilot controlling it.
- $235 build cost, with free labour, most of it is electronics
- Cost Per Flight Hour is around $8.5 which is on a average 15 min flight
- Annual Maintenance (50 Flights/year) is about $40

04

Conclusion

The summary of what I found during this project.

Conclusion

- Icarus proved a 3D Printed Glider can deliver 1 Kg payload, unpowered.
- 12:1 glide ratio confirmed the Clark Y airfoil and twin-boom design worked as expected
- The carbon fiber rods did successfully support the weight and high force loads.
- The low operating cost makes it far cheaper than drones
- The wingtips pointed upwards did help out with passive stability
- Hybrid Manufacturing can work if done properly, just like Icarus proved.
- Hypothesis was answered and, yes, cargo gliders can indeed be viable for lighter packages.