# Glider Final Design Package

Design and Presentation by:

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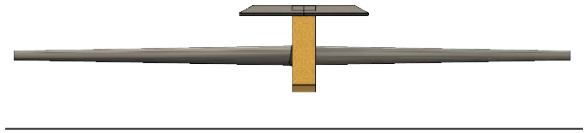
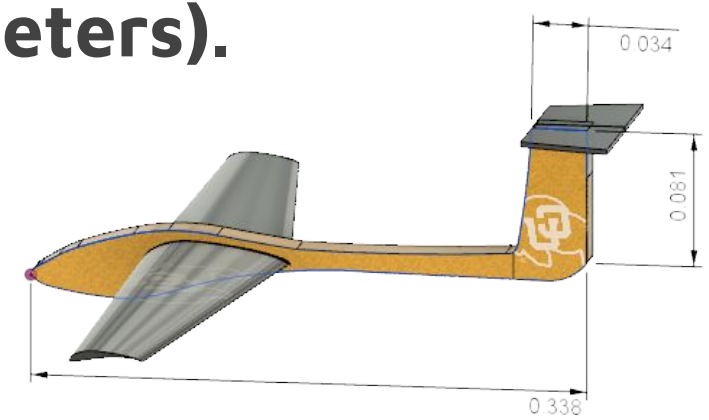
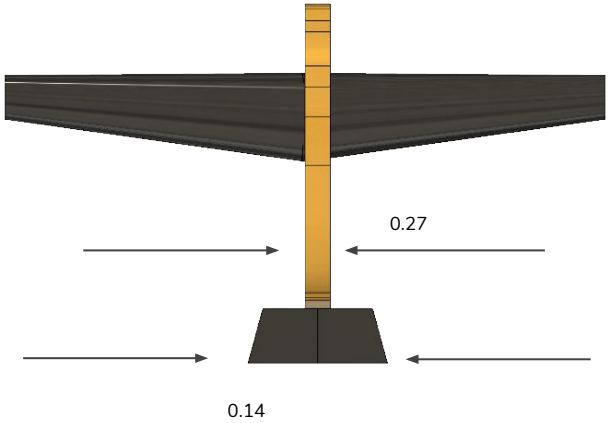
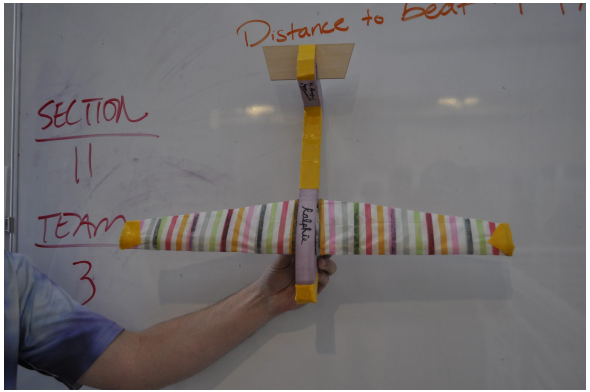
# Finalized Design: (in meters).



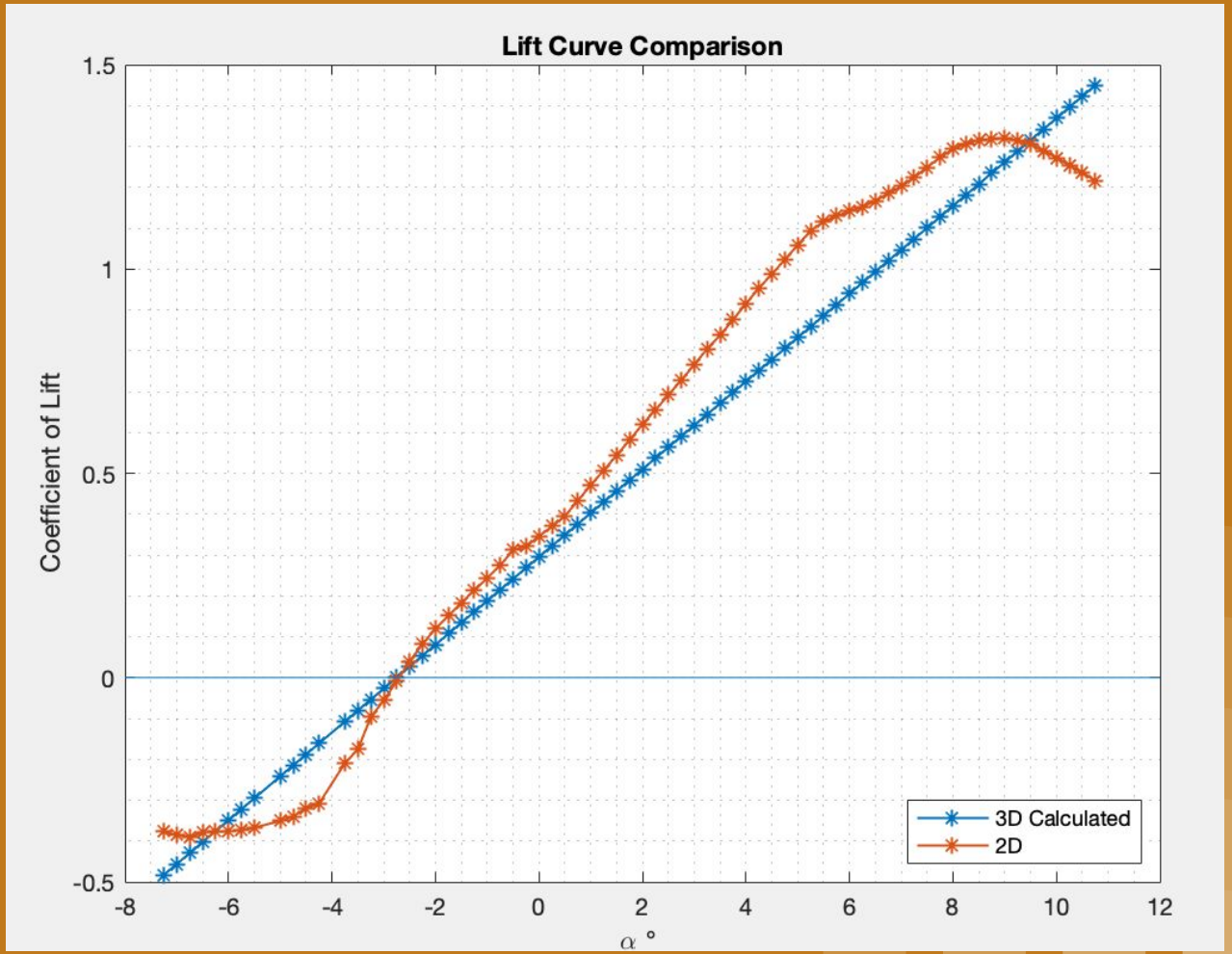



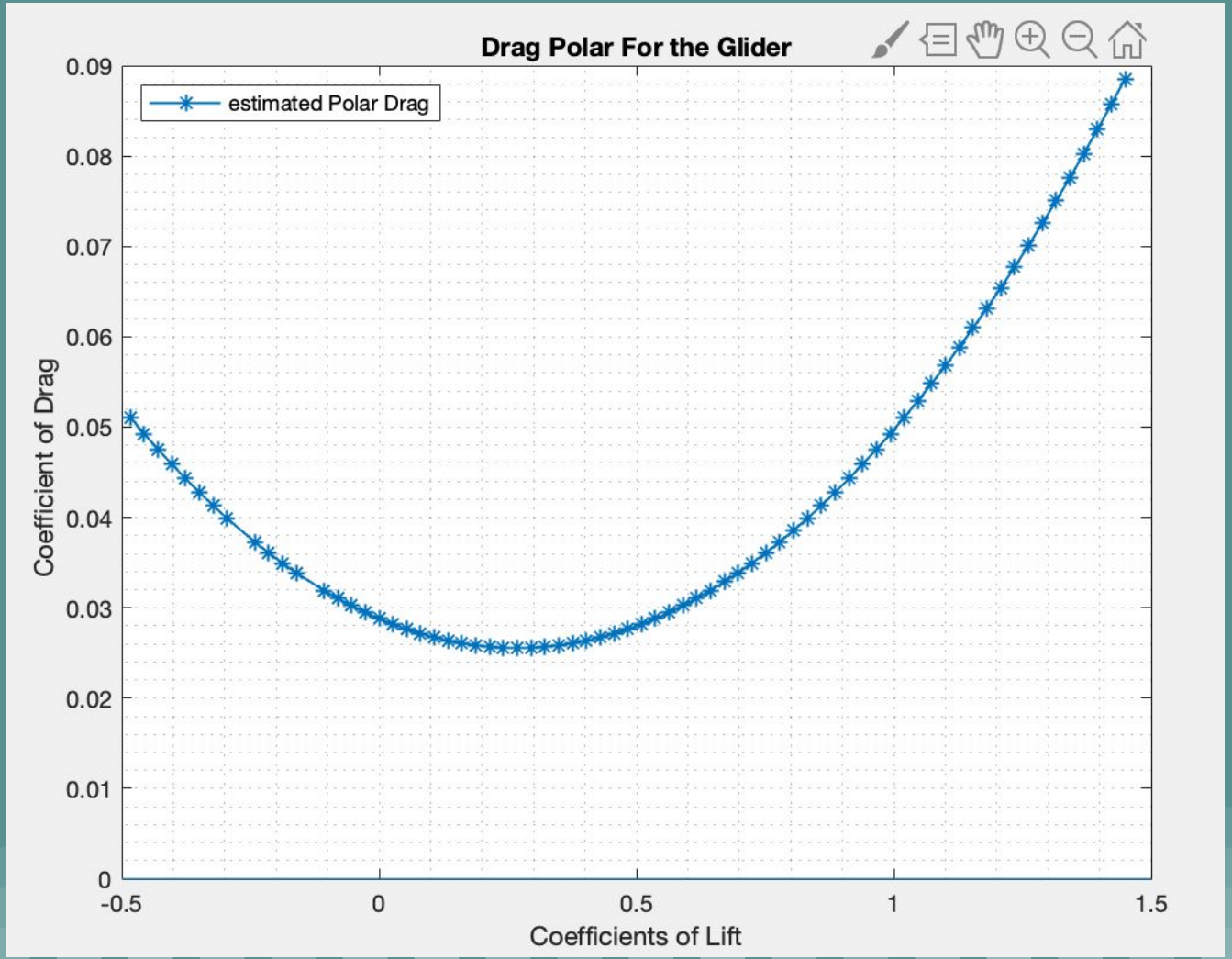



# Lift curve

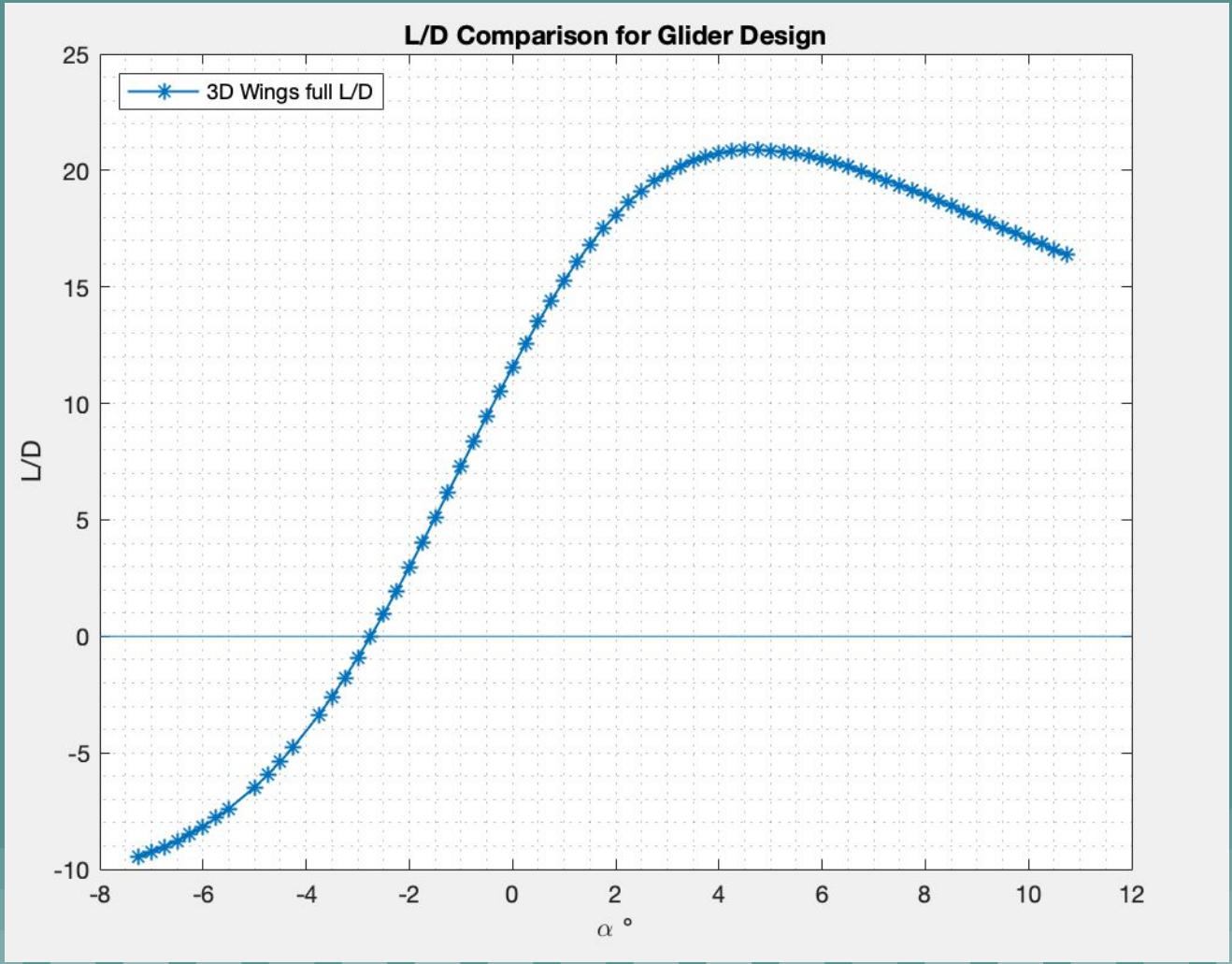
- Airfoil: S1223 (s1223-il)
- Re = 50,000



# Drag Polar


Drag Polar For the Glider
estimated Polar Drag
Coefficient of Drag
Coefficients of Lift
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
-0.5
0
0.5
1
1.5

# L/D Curve


L/D Comparison for Glider Design
3D Wings full L/D
L/D
25
20
15
10
5
0
-5
-10
-8
-6
-4
-2
0
2
4
6
8
10
12
α °

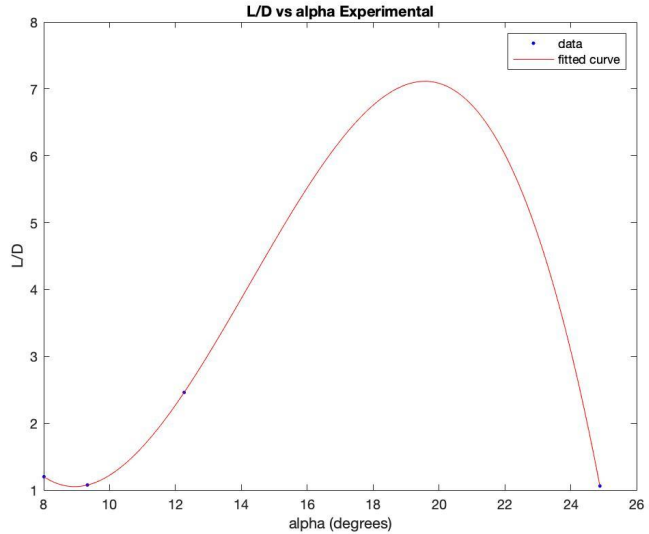
$$\left(\frac{L}{D}\right)_{max} = \left(\frac{C_L}{C_D}\right)_{max} = \frac{R_{max}}{h}$$

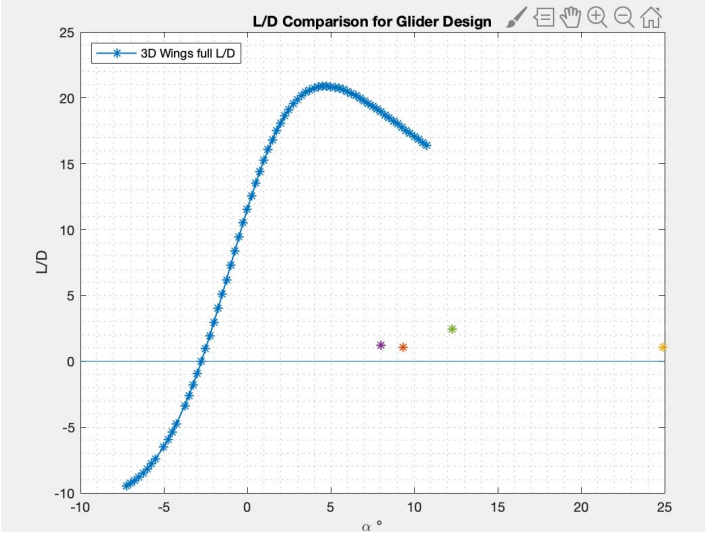
$$V_{trim} = \frac{S_{flight}}{t_{flight}}$$

$$C_L = \frac{W_{measured}}{\frac{1}{2} \cdot \rho \cdot V_{trim}^2 \cdot S_{ref}}$$

$$V_{trim} = \frac{\sqrt{h^2 + R^2}}{t_{flight}}$$

$$C_L = a \cdot (\alpha - \alpha_{L=0})$$

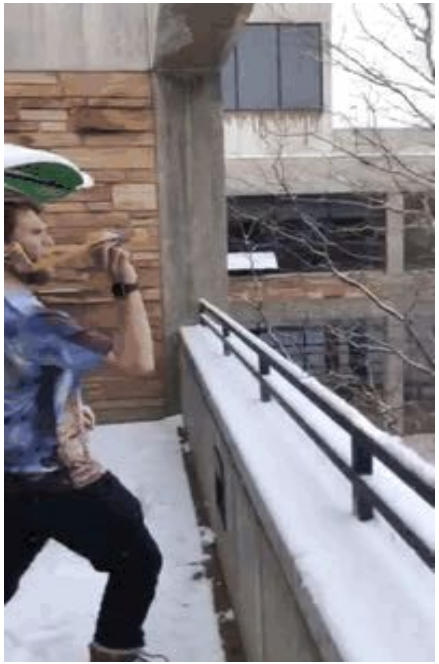


| System Requirements 5 | Threshold | Design | Flight |
|---|---|---|---|
| Max Glide Range (m) | 40 - 80 | 133 | 16.1 |
| Max Glide Range Velocity (m/s) (L/D max) | 3 - 7 | 4.68 | 2.12 |
| Stall Velocity (m/s) | | 4.5 (based on theoretical CL) | |
| Elevator Pitch Control (degrees) | +/- 8 | +/- 15 | +/- 10 |
| Longitudinal Stability (xcg location) | 0.0c - 0.3c | 0.25c | 0.2c |
| Longitudinal Stability (horizontal tail volume) | 0.3 - 0.6 | 0.553 | .585 |
| Lateral Stability (Vert tail volume/spiral) | 0.02 - 0.05 | .038 | 0.363 |
| Maximum Wingspan (m) | 0.9 | 0.6 | 0.555 |
| Total Mass (kg) | 0.040 - 0.080 | 0.053 | 0.063 |
| Unit Cost (dollars) | 20 - 30 | 15 | 28 |

# Glider Performance

Investigating test flights of our plane we can analyze what went wrong with our calculations and furthermore the build



# Valuable Lessons

- How not to compromise total design to fit one design parameter
- More iterations of manufacturing
- Rethink fuselage design
- Wrong calculated trim velocity
- Adding more tape to the tail, have a checklist for each flight
- Theoretical Calculations go out the door once you start manufacturing
- Plan for manufacturing to some degree initially, and work on refining the design through theoretical calculations

# References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