

## Background and Objective

- Next generation of small unmanned flying vehicles (about 30 cm wingspans)
- Civilian and military operations
- Tiny disturbances to airflow can cause dramatic instabilities in flight
- Dr. Geoffrey Spedding's current research studies the aerodynamic effects on small wings of about 30 cm at Reynold's numbers of  $5 * 10^{-4}$
- Objective is to investigate the effects of porosity on small wings with goal of improved gliding flight



Birds' porous wings are the inspiration behind the project

## Experimental Setup

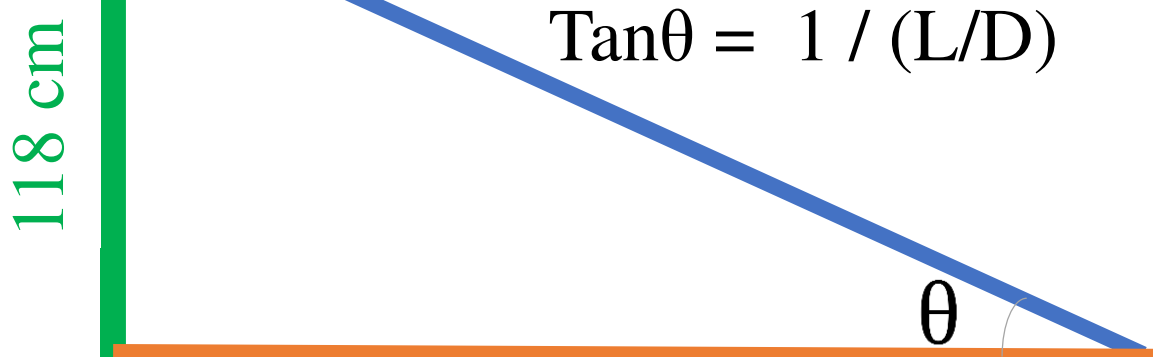


Wingspan: 55 cm

$$D = W \sin \theta$$

$$L = W \cos \theta$$

$$\tan \theta = 1 / (L/D)$$



Distance (cm)



AeroVironment Wasp

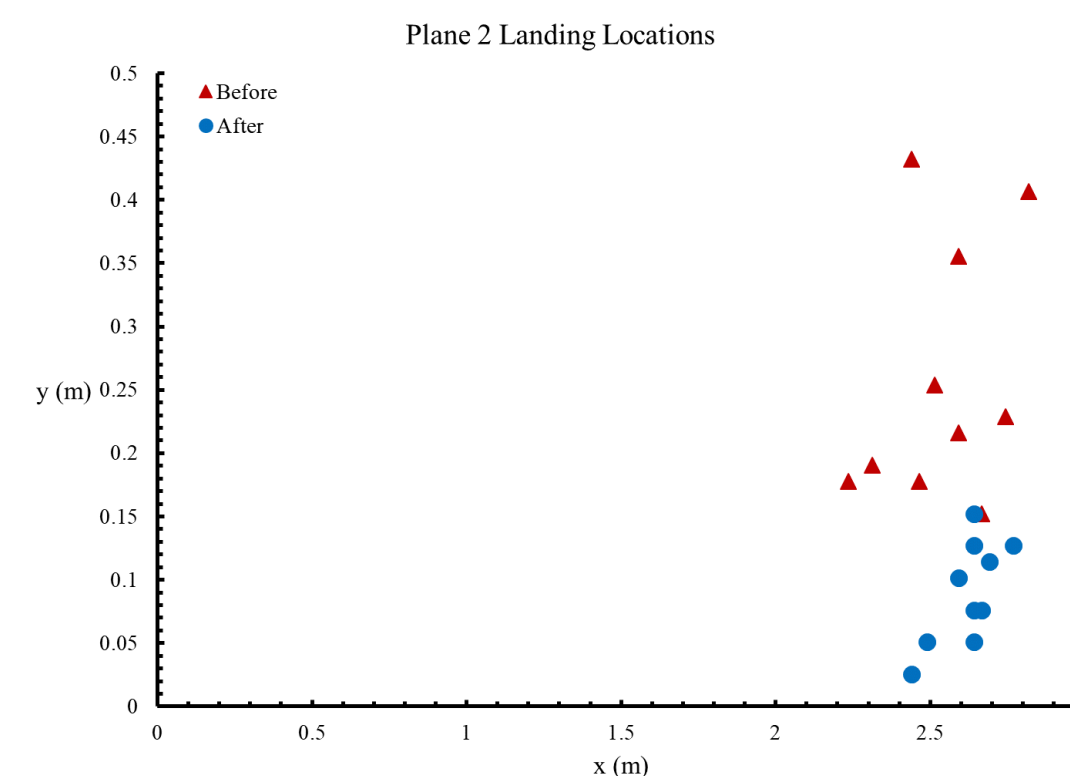
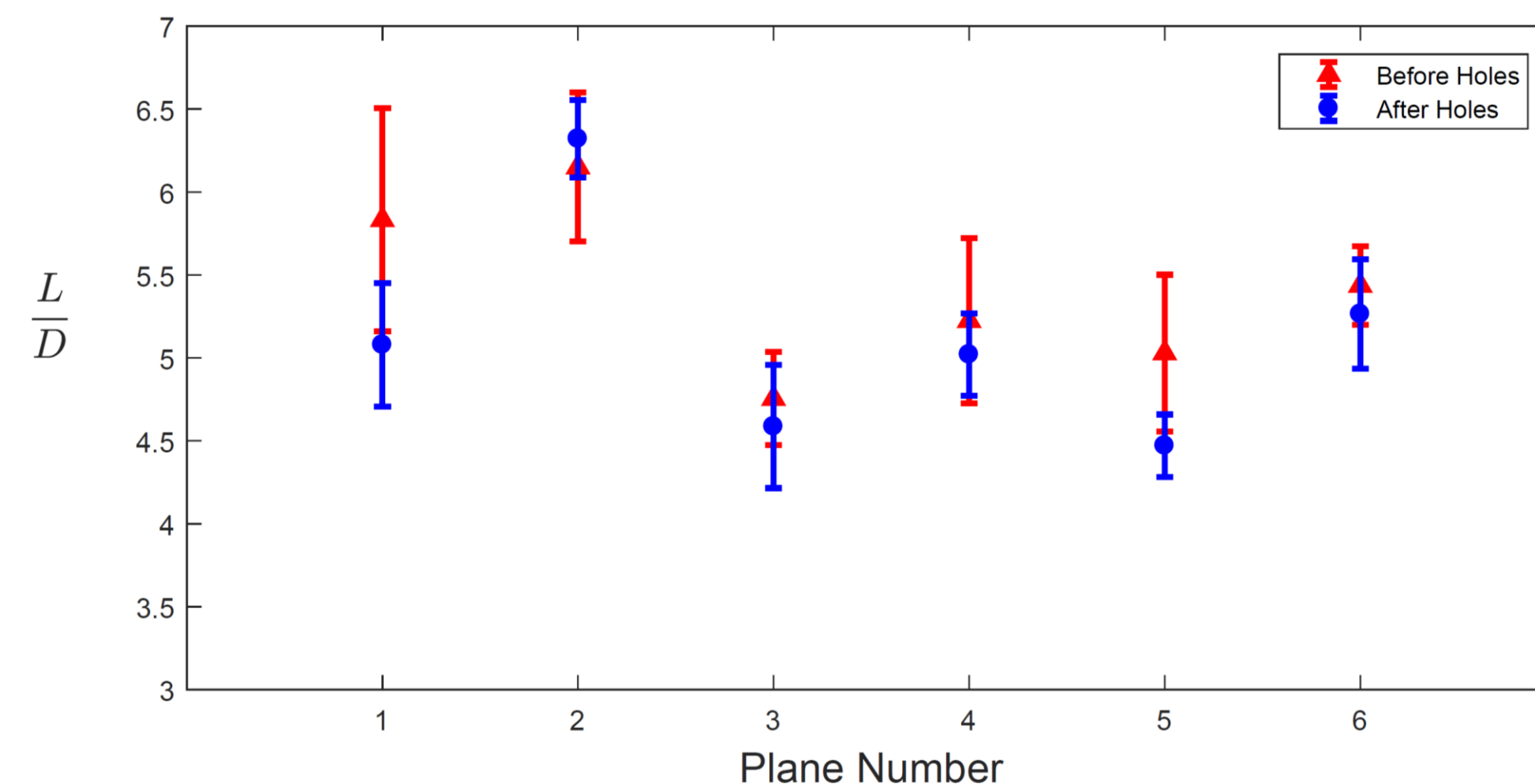
## Skills Learned

- MATLAB
  - Plotted Distance, L, D, and L/D
  - Assisted PhD student Michael Kruger perform calculations to determine numerical models based on input values
- Statistics
  - Calculated standard deviation and propagation of error for all collected data (gliding flight distance)
- Hands-on construction
  - Designed and constructed a launcher to consistently launch glider in a straight path
- Electrical Circuit
  - Assisted PhD student Joe Tank to amplify the signal from a pressure transducer by 100x
- Force Balance Calibration
  - Assisted PhD student Yohanna Hanna to calibrate force balance for Dryden Wind Tunnel experiments

## Relation to my Stem Coursework

- Real-World usage of equations and concepts learned in physics and calculus classes
- Use of extensive mathematical and programming knowledge

## Results



Plane Number	Hole Size (mm)	Number of Holes
1	1	34
2	1.5	34
3	2	34
4	1.5	16
5	1.5	34
6	1.5	70

## Conclusions

- No statistically significant result was achieved
- More tests are needed with more precise equipment to determine whether porosity has an effect on gliding flight

## Acknowledgements

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