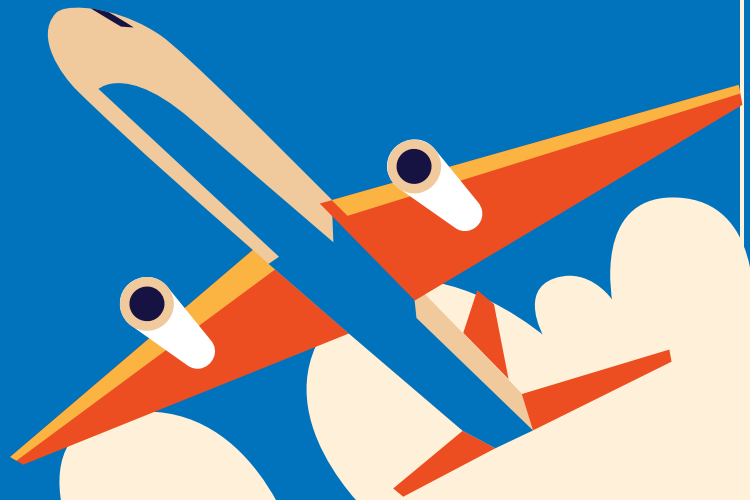
Making and Flying a Glider

SILP 2026

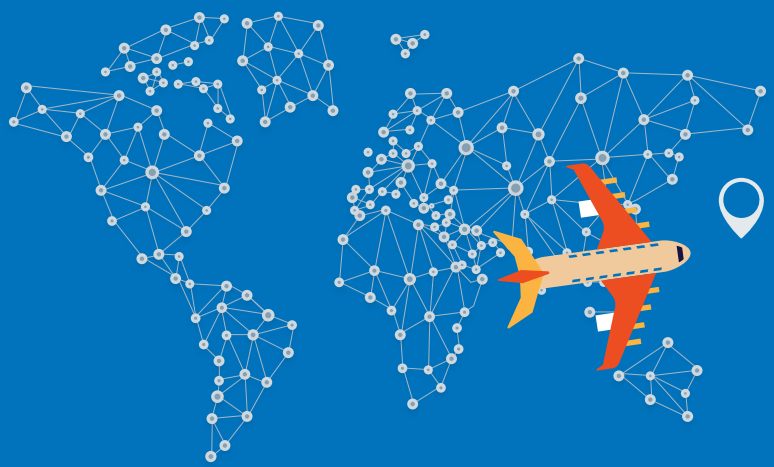
PROF. SUSUMU HARA

LAB MEMBERS: ADRIAN (YUPENG) LI, SOFIA PACHECO

Nagoya University X New York University



FLIGHT PLAN:



- 01 Mission and Objectives
- 02 Aircraft Design
- 03 Electronics & Control
- 04 Manufacturing Process
- 05 Final Design
- 06 GIFU University competition!

MISSION



Aerodynamics

Optimize lift-to-drag ratio for efficient gliding.



Structural Design

Reduce overall weight while maintaining structural strength and durability.



Flight Stability

Achieve smooth, controlled flight using the elevator, rudder, and balanced aircraft geometry.

Aircraft design

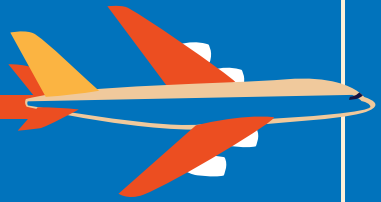
Designing Road Map

Objectives

- ❏ Glide as far and as stable as possible.
- ❏ Maximize lift-to-drag ratio

Constraints

- ❏ Center of gravity at 30% from the main wing leading edge
- ❏ Mass budget



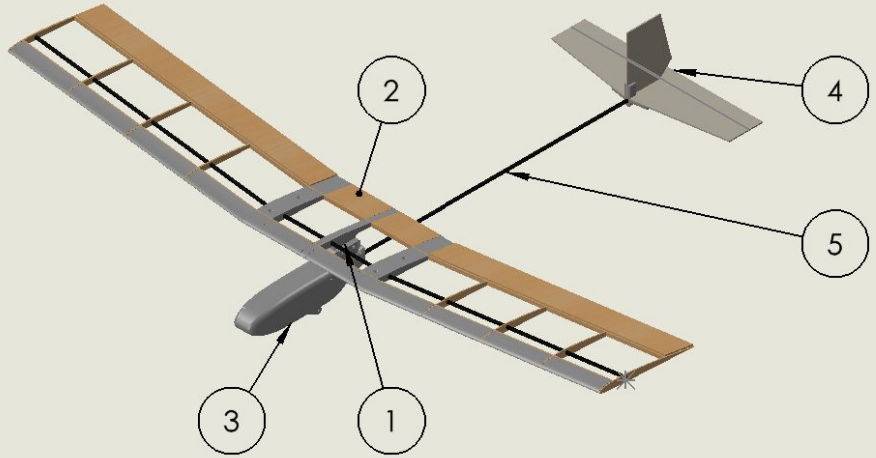
Design Decisions

- ❏ Wing w/Dihedral
- ❏ Tail wing dimensions
- ❏ Select AG03 Airfoil
- ❏ Maximize aspect ratio
- ❏ Optimize reynolds number

Final Configurations

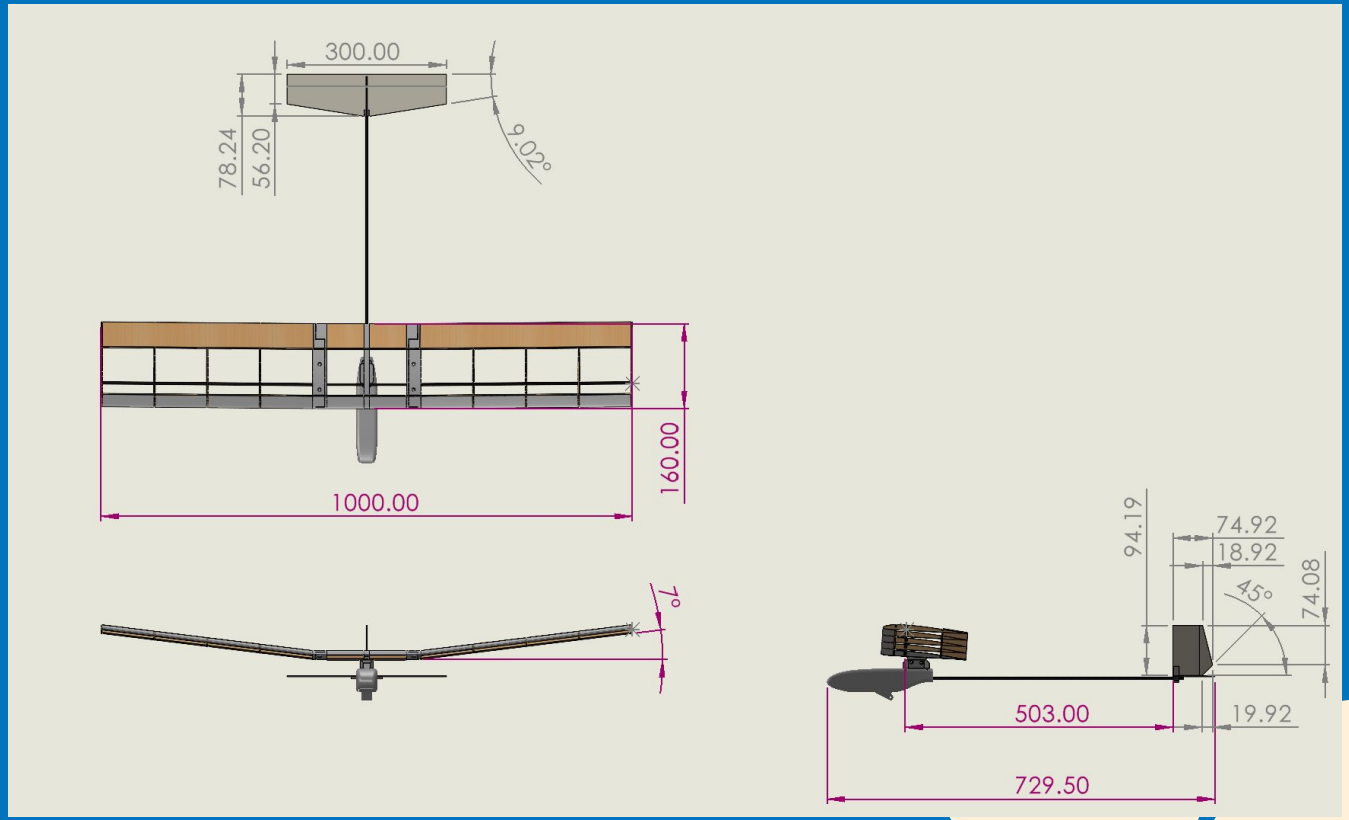
- ❏ Wing geometry
- ❏ Center of gravity location
- ❏ Material selection
- ❏ Ready for CAD

Final Assembly



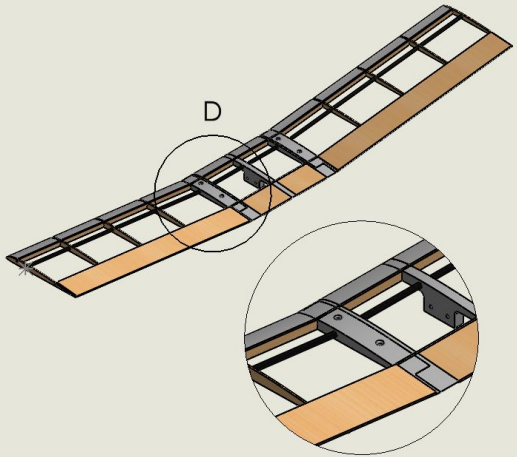
ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	Angler4	PLA: Adjusts Wing Angle of Attack	1
2	Mainwing	PLA, Carbon Fiber, Balse/Birch Wood	1
3	Nose	PLA: Contains Eletronics	1
4	Tail_Wings	Styrofoam: Controls Flight	1
5	TailRod	Carbon Fiber: Provides Rigidity	1

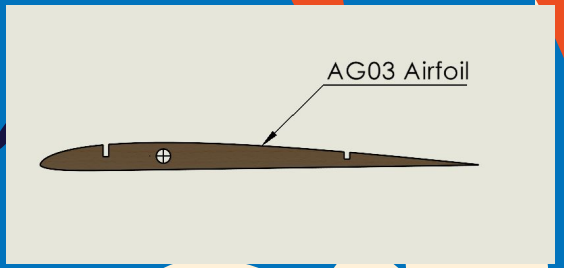
Key Dimension



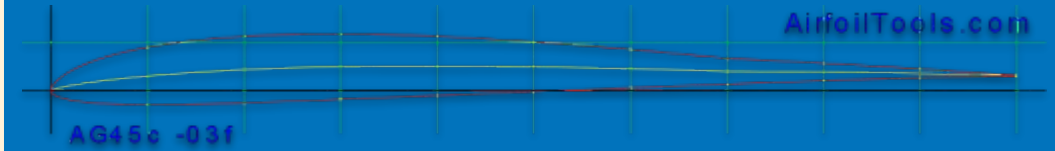
I. Main Wing

Parameter	Value
Wing Span	1 m
Mean Chord	16 cm
Wing Area	0.160 m²
Aspect Ratio	6.25
Airfoil	AG03
Dihedral Angle	7°

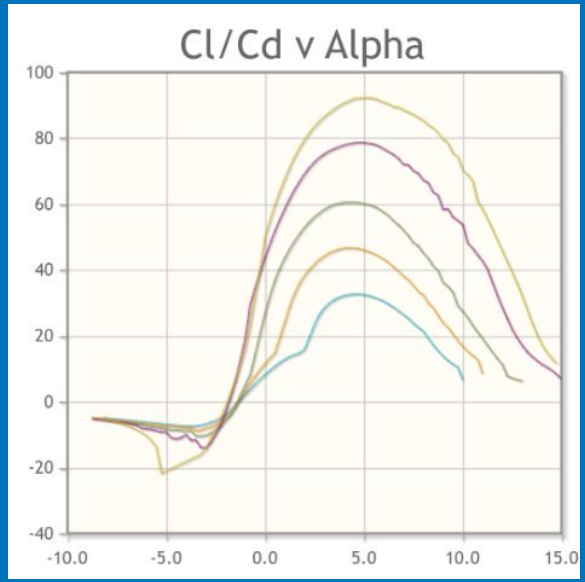




II. AG03 Airfoil



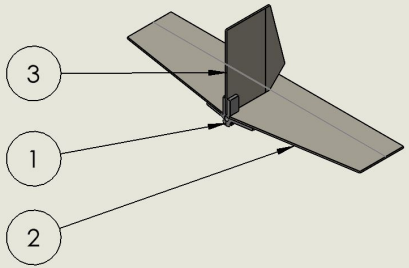




- Optimized for low Reynolds numbers
- High lift-to-drag ratio
- Suitable for slow gliding flight

I. Geometry

Horizontal Tail Area	204.8 cm²
Vertical Tail Area	64.0 cm²



ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	Tail Attachment	PLA Connects w/Nose	1
2	Horizontal Tailwing	Styrofoam: Elevator	1
3	Vertical Tail Wing	Styrofoam: Rudder	1

Horizontal Tail

- Controls pitch stability
- Elevator moves the nose up/down
- Sized using tail volume ratio

Vertical Tail

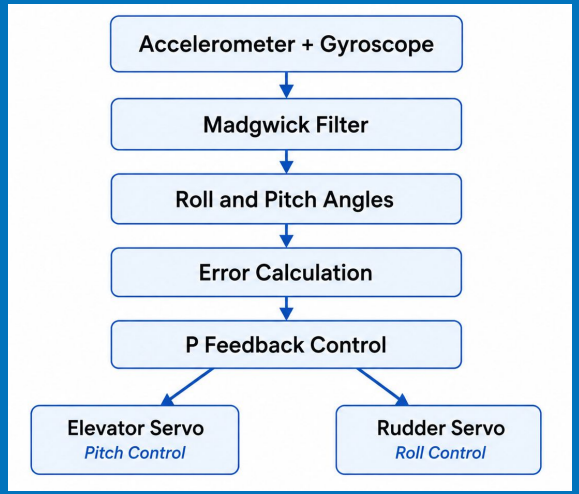
- Controls yaw stability
- Rudder helps steer left/right
- Prevents side-to-side instability

Electronics

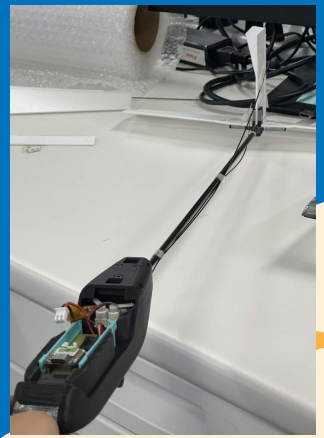
Objective: Stabilize the glider by correcting unwanted pitch and roll motion.

System components

- XIAO nRF52840 Sense
- LSM6DS3 six-axis IMU
- D1 servo: elevator
- D2 servo: rudder
- Control-loop frequency: 100 Hz







Control Calibration/ Feedback

Procedure: Hold glider in desired launch attitude

Set reference roll and pitch

Error = Current − Reference/Target

Command: Neutral + Pitch Gain × Pitch

The elevator controls pitch, while the rudder corrects roll through the wing's dihedral effect.

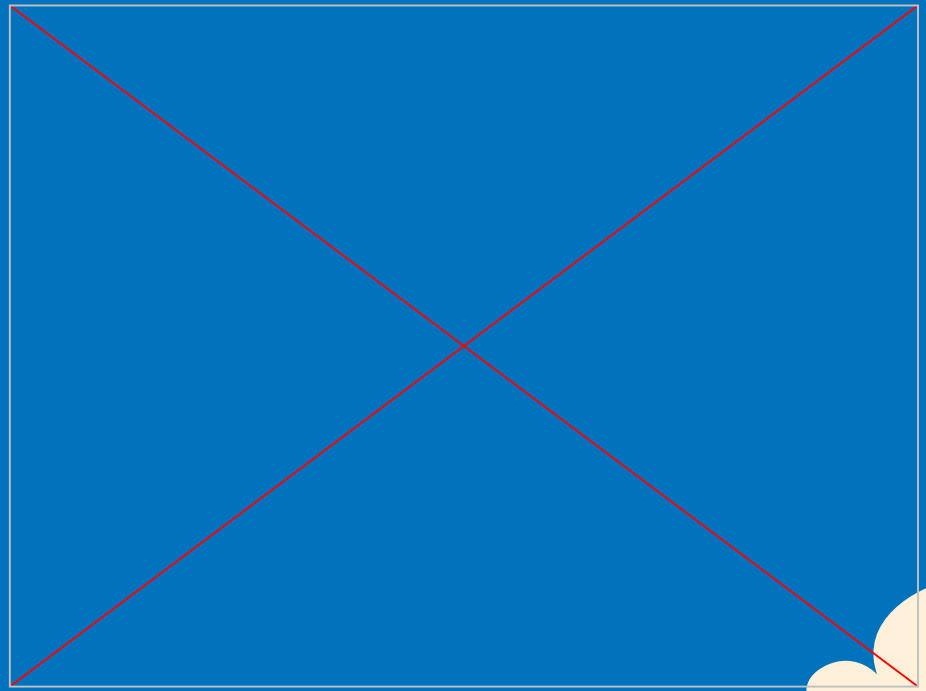


Calibrated Servo Motor Angle Limits

Surface	Min	Neutral	Max
Elevator	60°	100°	135°
Rudder	60°	93°	140°

Software limits prevent mechanical interference and excessive servo travel.

Control Demo



Manufacturing



Laser Cutting

- ❏ Main Wing Airfoil and Ribs
- ❏ Tail Wing



Physical Assembly

- ❏ Fasteners
- ❏ Glue
- ❏ Heat Shrink Film





3D Printing

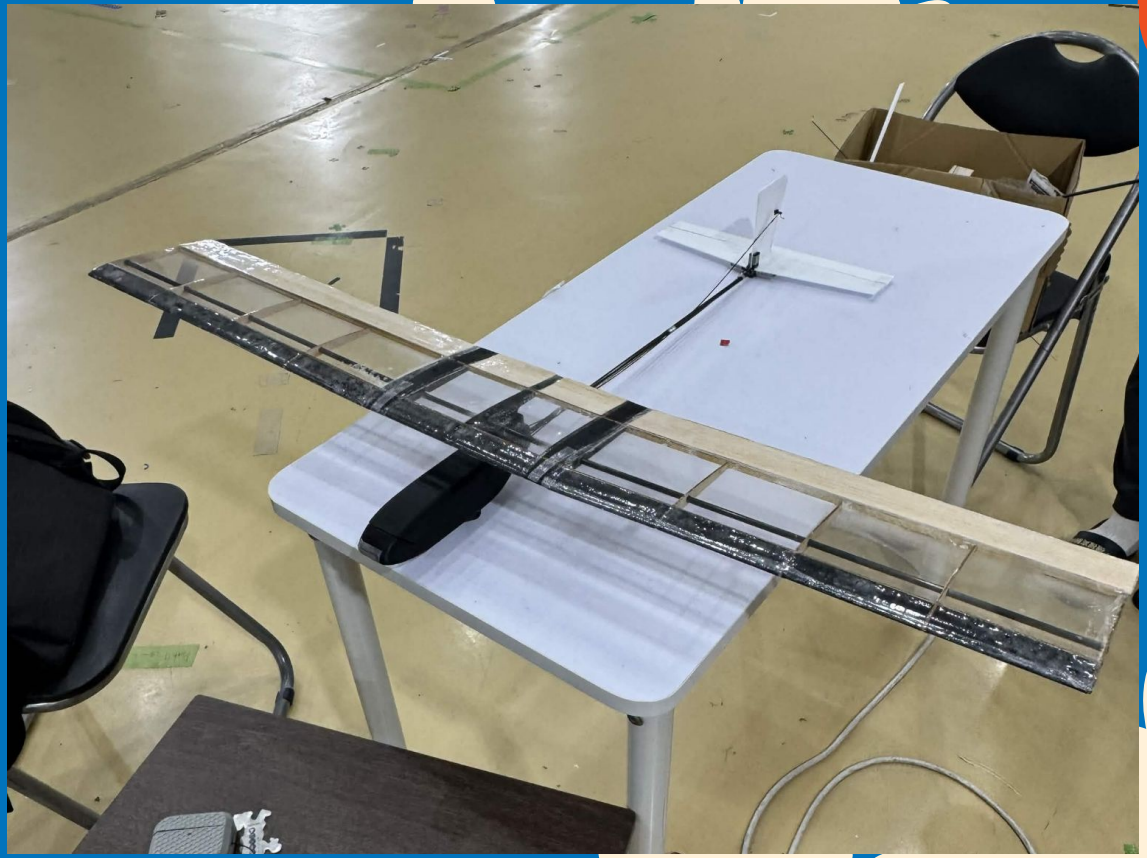
- ❏ Nose
- ❏ Main Wing Dihedral Airfoil
- ❏ Connecting Pieces

Controls/Calibration

- ❏ Electronics Wiring
- ❏ Servo Lever Arm Calibration
- ❏ Center of Mass adjustment

Physical Assembly

Final Weight: 340g



GIFU COMPETITION



Results/Improvement

Overall Success! Some improvements include:

- Lowering Weight down to 250g
- Adding D controls to reduce oscillations
- Improves Structural Integrity

Arigato Gozaimasu!

Special thanks to Professor Hara for this opportunity and for the lab students and TA's on helping us achieve our end goal.

We learned a lot!

