Tohoku UAV Tech

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Introduction of the club

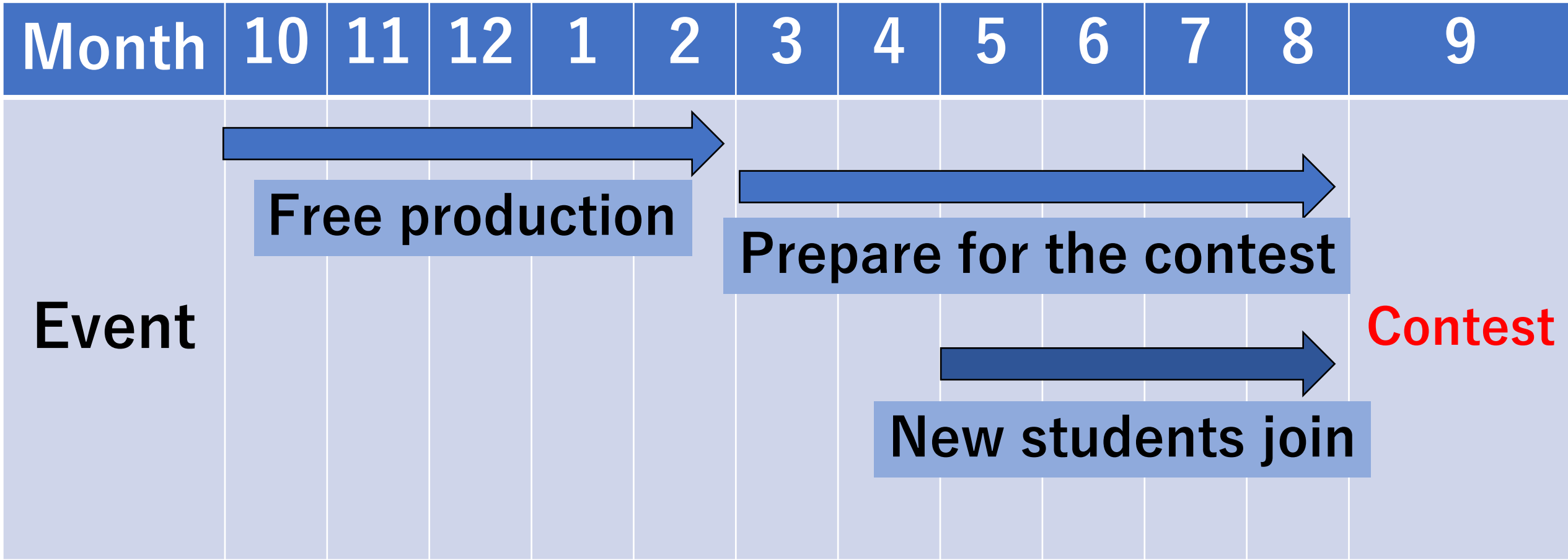
Purpose of our activity

- To make aircrafts for the Japan Student Flying Robot Contest

Members: 12

- (M2)×2
- (B4)×2
- (B3)×1
- (B1)×7

Yearly schedule：How the club works



Japan Student Flying Robot Contest

Overview

- Contest held in summer
- Contestants compete in teams
- Team members make radio-controlled aircrafts and compete their skills

General section

- Teams compete the amounts of points that can be earned by missions such as gliding and dropping supplies.

Unique design section

- Evaluate the originality and the usefulness of the team's original mission

Event outline

(1) General : 30 teams, (2)Unique design : 9teams

Our club competed 2 teams in the general section and 1 team in the unique design section.

Aircraft in the Contest (General)

■ Flying-Tan

- Long wingspan
- Low wing loading
- Rear wheels are linked to rudder

Flying-Tan

■ Takustsu-Type1

- Use own thick airfoils
- Composed of a small number of parts

Takustsu-Type1

Flying-Tan

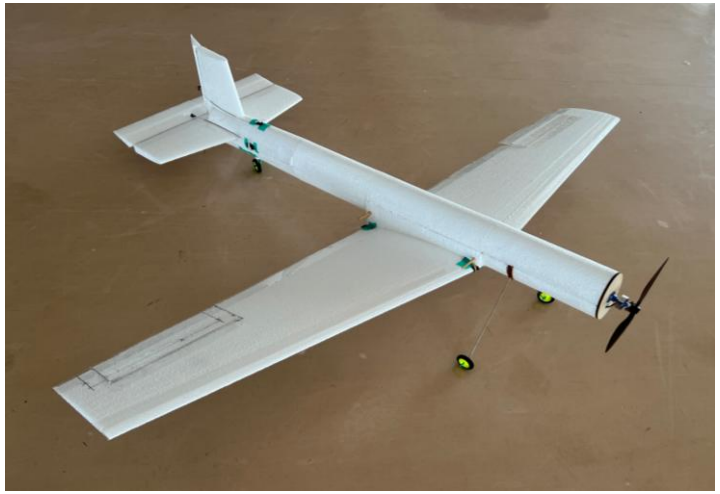
■Goal & Approach

Goal : An aircraft that can fly stably and glide longer

- ●For stability
  - ✓Make dihedral
  - ✓Large tail area
- ●For gliding performance
  - ✓Make a lighter aircraft
  - ✓Use a larger wing

■Prototype

- ●Issue
  - ✓Fast descent speed
  - ✓Skidding when turning
  - ✓Poor maneuverability when driving on the ground



Prototype

Flying-Tan

■Tournament aircraft

Overall Length：870mm

Overall Width ：1200mm

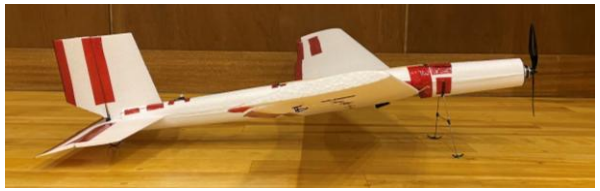
Overall Height：350mm

Weight：157g

Wing Load：6.74g/dm²

Flying-Tan(top)

Flying-Tan(front)



Flying-Tan(side)

■Result & Reflection

This aircraft hit the ceiling during the flight and the aircraft broken

→Stretch a film on the nose to increase strength

Takuetsu-Type1

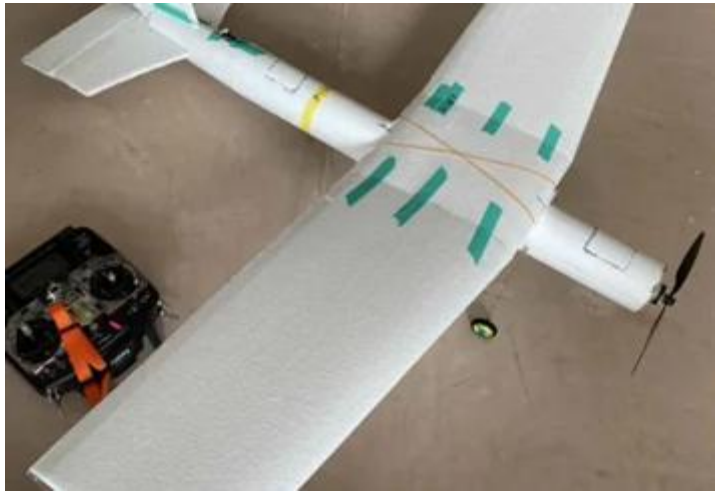
■Goal & Approach

Goal : A tough aircraft that can endure damages and make easily

- ●To avoid impact
  - ✓Set the main wings high
  - ✓Lager tail area
- ●To make easier
  - ✓Make the aircraft without ailerons

■Prototype

- ●Issue
  - ✓Exceed the weight limit of 200g
  - ✓Rudder moves differently from left to right



Prototype

Takuetsu-Type1

■Tournament aircraft

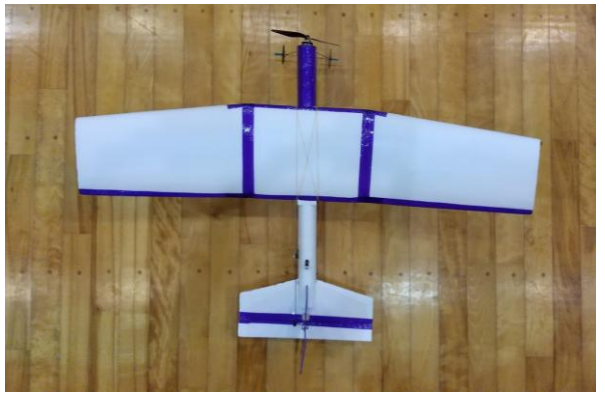
Overall length : 810mm

Wingspan : 1073mm

Height : 225mm

weight : 180g

Wing loading : 7.69g/dm²



Takuetsu-Type1(top)

Takuetsu-Type1(front)

Takuetsu-Type1(side)

■Result

This aircraft collided with a pole

■Reflection

・Main wing was able to make it a little thinner and lighter

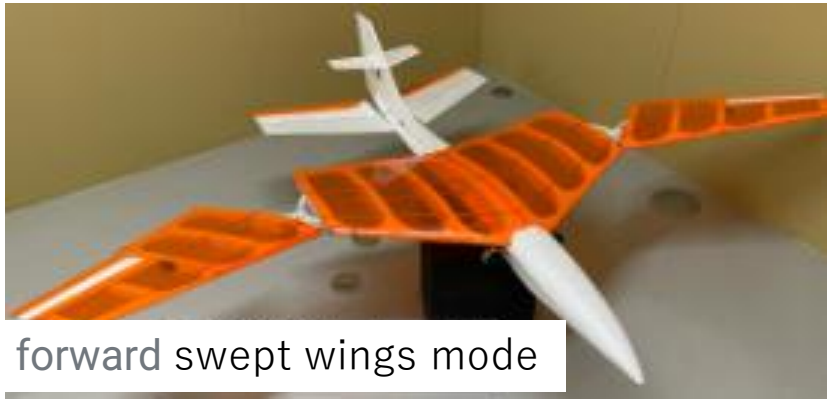
・When the knot of the thread is pulled by the application of force several times, it could not be fixed

Aircraft in the Contest (Unique design)

■ Syushigo

・Two modes
(sweptback wings & forward swept wings)
・Slave units are carried in the front and rear of the aircraft


sweptback wings mode


forward swept wings mode

Syushigo

■Goal & Approach

Goal : Increase payload by allowing slave aircraft to be placed in front of and behind the fuselage rather than at the center of gravity.

- **●To ensure stability**
  - **✓ Use Variable Geometry Wing**

■Prototype

- **●Issue**
  - **✓ Spiral instability**
    - **→Change the angle of upper rebound from 1 degree to 10 degrees**
  - **✓ Pitch instability**
    - **→Attach a small wing to the vertical tail**

Prototype

Syushigo

■Tournament aircraft

●Master aircraft

Overall length : 1250mm

Wingspan : 1560mm

Height : 240mm

weight : 460.3g

Wing loading : 10.1g/dm²

Master aircraft
(Left : top view, upper right : front view, lower right : side view)

●Slave aircraft

Overall length : 380mm

Wingspan : 200mm

Height : 90mm

weight : 36g

Wing loading : 11.5g/dm²

Slave aircraft
(Left : top view, right : side view)

Syushigo

Syushigo

■Result

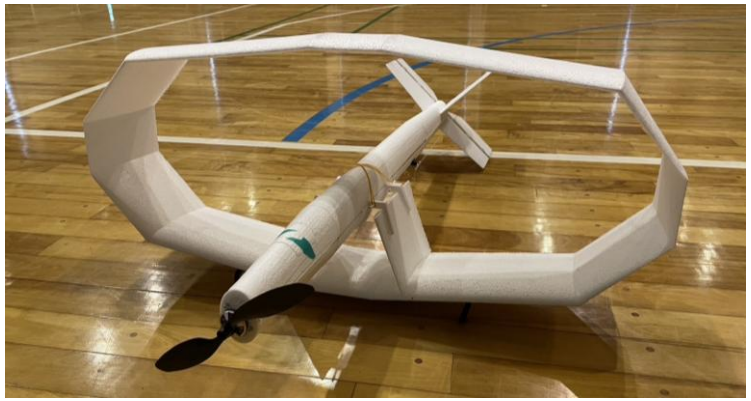
Win 2 prize

・Best Craft Prize (Hanyuda Ironworks Prize)

・Autodesk Prize

Aircraft production throughout the year

●Circular wing and X-tail
- **✓Overall Length：1000mm**
- **✓Overall Width ：1200mm**



●demonstration model－α
- **✓Overall Length：750mm**
- **✓Overall Width ：1000mm**

●U100
- **✓Overall Length：400mm**
- **✓Weight：85g**
- **✓Wing Load:14.4g/dm²**

Circular wing and X-tail

■Purpose＆ Approach

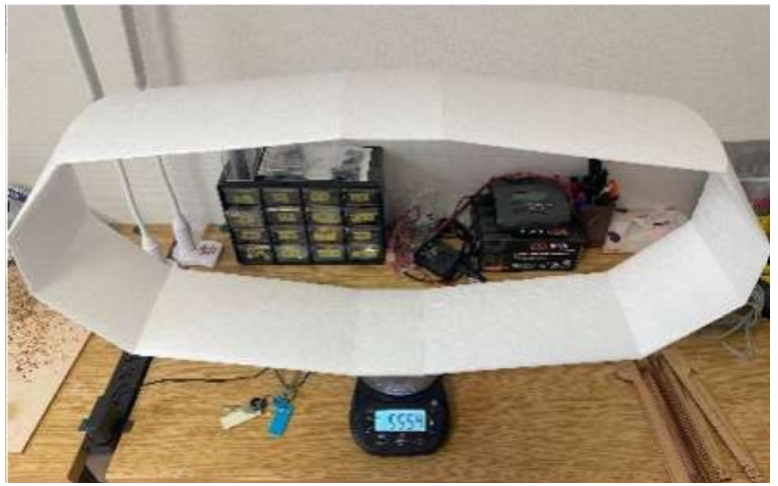
●Purpose

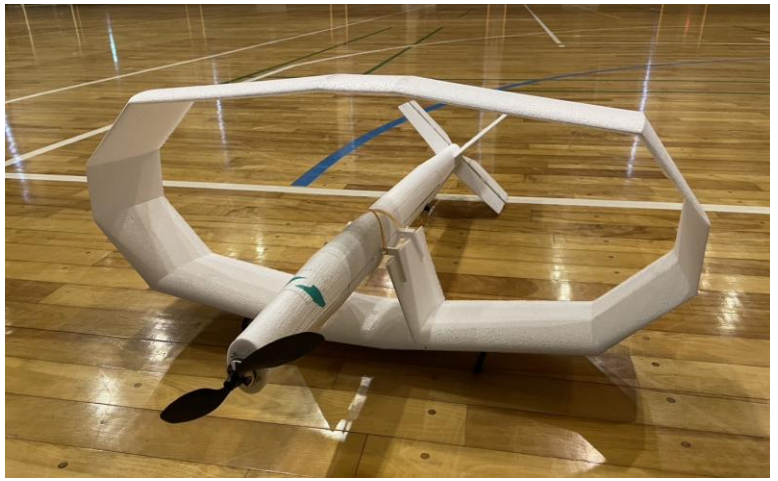
✓To create a never-before-seen aircraft with a circular main wing and an X tail reminiscent of a submarine, which has not yet been realized

●Approach

✓Create main wings in 10 or more parts

✓Use ruddervator system





■Aircraft Overview

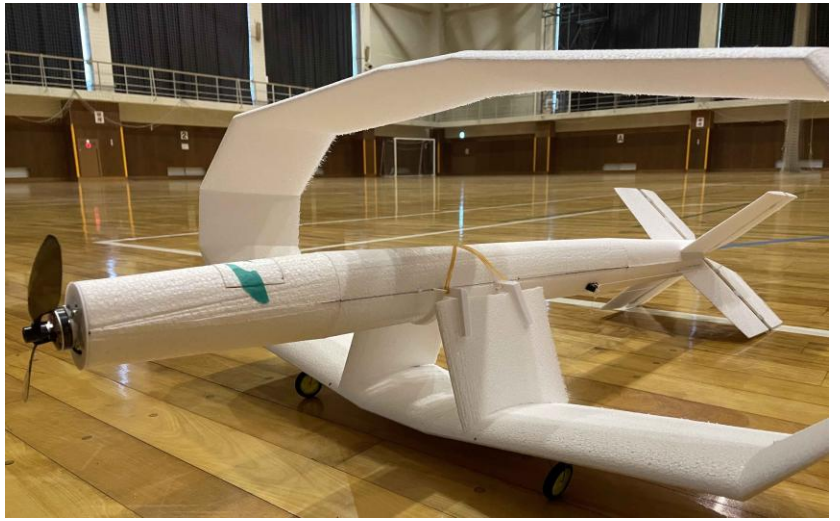
✓Overall Length：1000mm

✓Overall Width ：1200mm

✓Overall Height：50mm

✓Weight：200g

Circular wing and X-tail



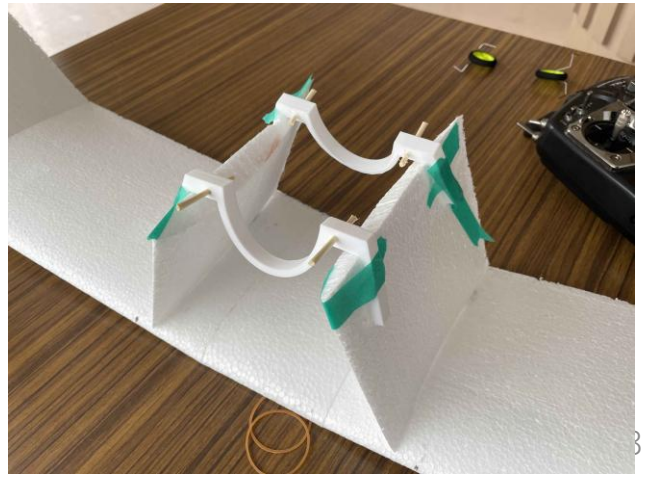
■Issue ＆ Solutions

●To ensure aircraft stability

- ✓Lowering the center of gravity by making the fuselage position lower than the center of the main wings

●Detachable main wing and fuselage attachment method

- ✓Put supports on the wings so that the fuselage rests on top of them



■Performance

●Difficult to tilt back in roll direction

- ✓Larger turning radius

demonstration model - α

■Purpose

Reverse engineering other teams' aircraft seen in previous competitions for future production

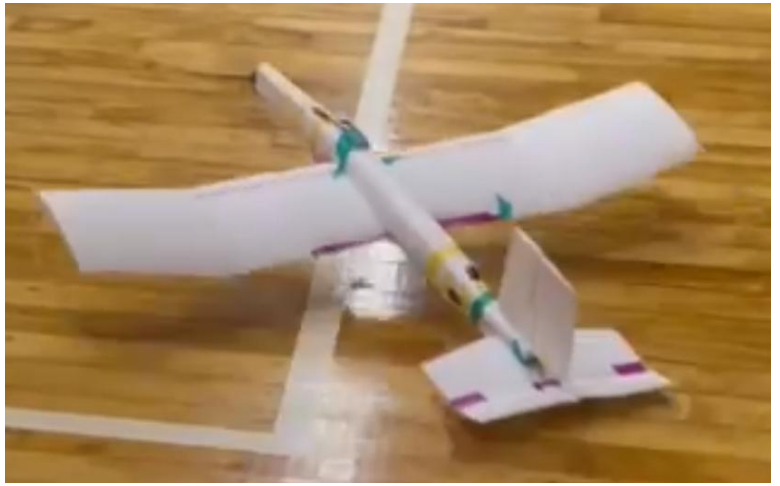
■Concept

- ●Low torque
- ●Thin Wings
- ●Reversible ESC

demonstration model - α

■First Prototype

- ✓ Overall Length：750mm
- ✓ Overall Width ：1000mm



First Prototype

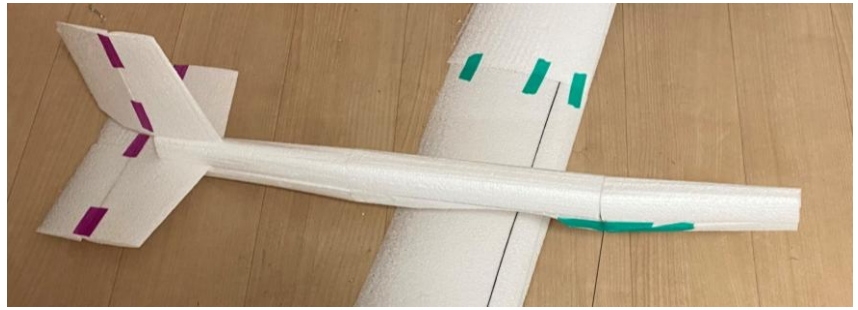
■Issues & Future outlooks

●Issues

- ✓ The nose of the plane vibrates due to the rotation of the motor
- ✓ Very poor serviceability

●Future outlooks

- ✓ Shorten the length of the body
- ✓ Add flaps



U100

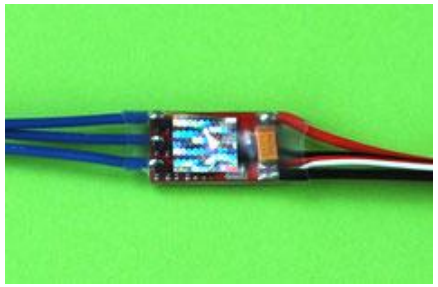
■Purpose

Create an aircraft weighing less than 100g so that it can be flown outdoors without registration.

■Approach

- **Build a smaller aircraft**
- **Use electronic devices that are as light as possible**

Receiver(1.0g)



ESC(4.4g)

Motor(5.4g)

U100

■Aircraft Overview

Overall Length：400mm

Weight：85g

Wing Load：14.4g/dm²

U100

■Performance

Flies slowly with the fuselage pointing quite high up

→Because the motors were forced to fly at higher power with a much higher wing loading.

■Future Outlook

Reduce wing loading by enlarging the main wings

Conclusion

- These are the kind of activities we are doing in the club
- We would like to work hard so that we can deepen our skills through our daily activities
- We will do our best to win a prize in this year's contest too

Acknowledgement

Thanks to your support, we were able to engage in these exciting activities.
We are truly grateful for your support.

Thank you for listening