



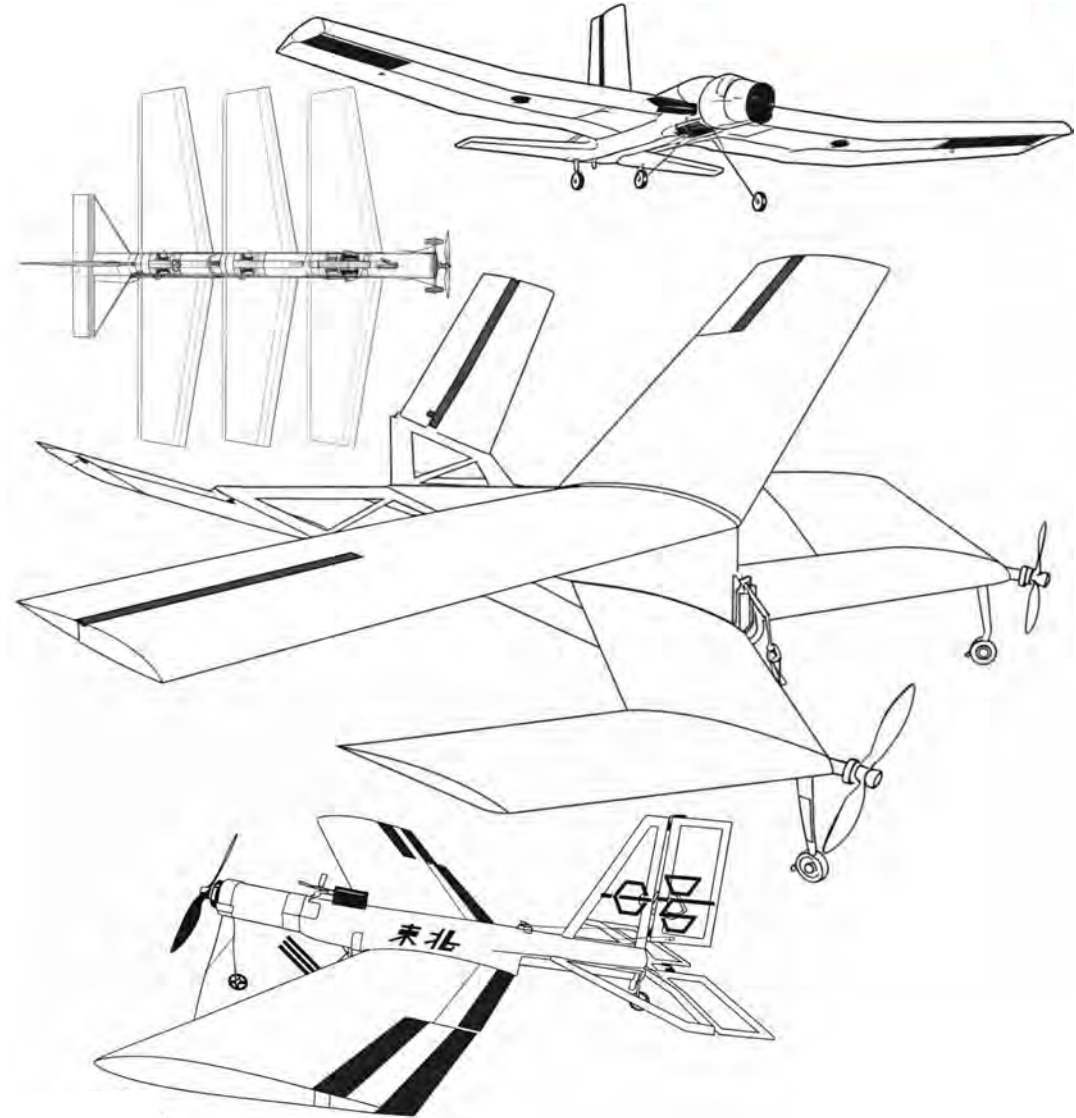
2025 Annual Activity Report

Tohoku UAV Tech

Ryo Kimura, Haruto Koshiba

Outline

- Activity Details
- About Contest
- 2025 Club Goals
- Activities In This Year
- Conclusion
- Next Year's Goals
- Acknowledgment



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Activity Introduction



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■ Tohoku UAV Tech

✓ Purpose of Our Activity

- To make aircraft and win prize in the **Japan Student Flying Robot Contest**
- To develop new **method** for making and controlling aircraft
- To improve **aeronautical engineering** skills

✓ Members: 12

- Sophomore ×7
- Freshman ×5



Activity Details



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■ Tohoku UAV Tech

✓ Yearly Schedule

| Month | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 |
|-------|--------------------------------------|---|----------------|---|---|---|-----------------------------|----|-------------------------------------|---|---|---|
| Event | <p>Make aircraft for the contest</p> | | | | | | <p>Make aircraft freely</p> | | | | | |
| | <p>New Student Join</p> | | <p>Contest</p> | | | | | | <p>Prepare for the next contest</p> | | | |

For Developing New Method

- Without regulations
- **Project-based** approach

About Contest

■ Japan Student Flying Robot Contest

✓ Overview

- Students come from all around Japan
- Compete in teams
- Team members make **radio-controlled aircraft**

✓ Separated to some sections

- General : **Performance** and **Maneuverability**
- Unique : **Originality**
- Multi copter : **Performance** and **Maneuverability**
- Auto operation : **Autopilot system**



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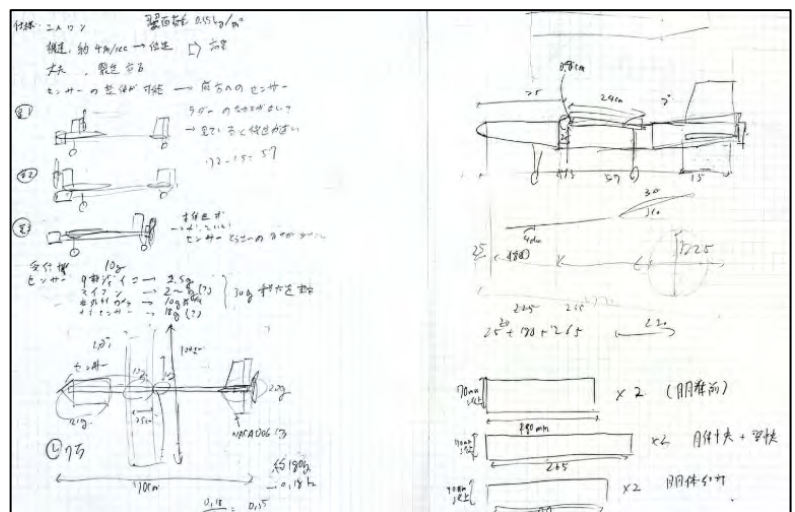
How we develop our machine



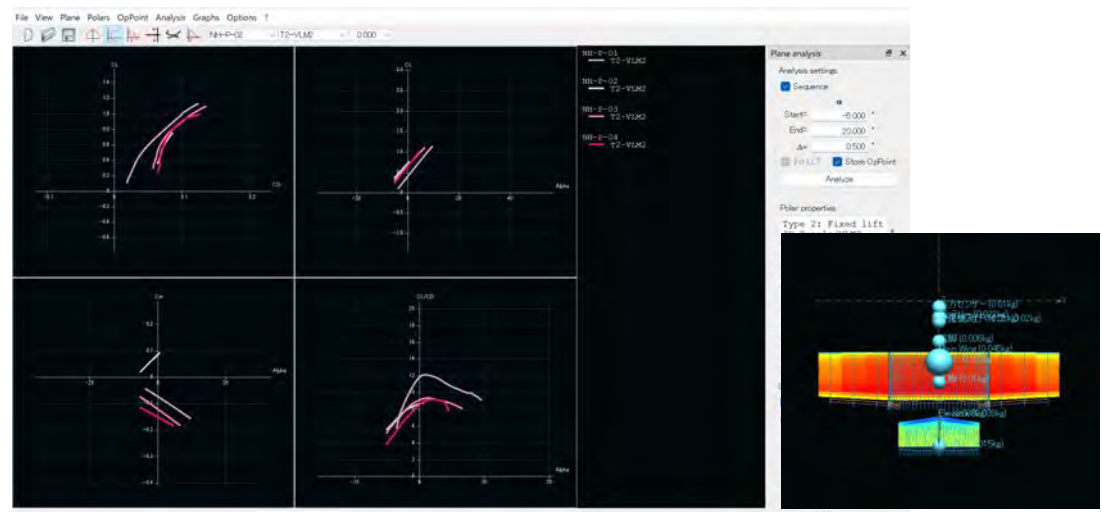
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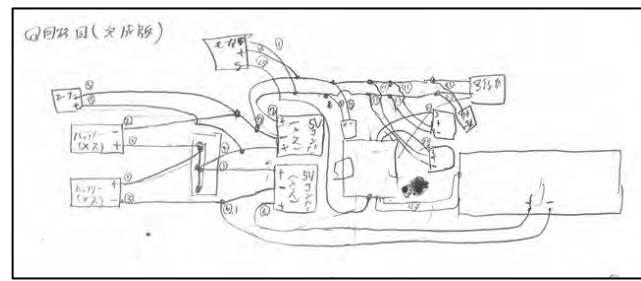
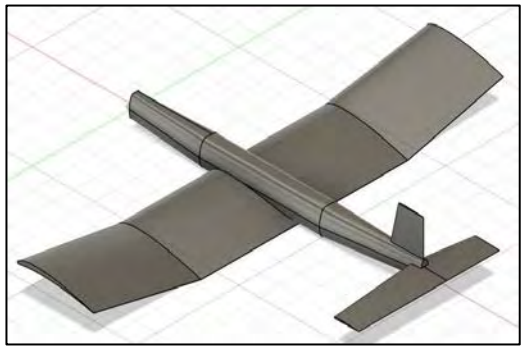
■ Design



Concept Sketch



Analysis



Electrical Systems and Overall Airframe Design

How we develop our machine

■ Manufacturing

✓ Based on Design



We repeat this cycle



2025 Club Goals



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- Design unique aircraft
- Win more than 2 Prizes in the contest
- Make many kinds of aircraft continuously

Takuetu-1.1



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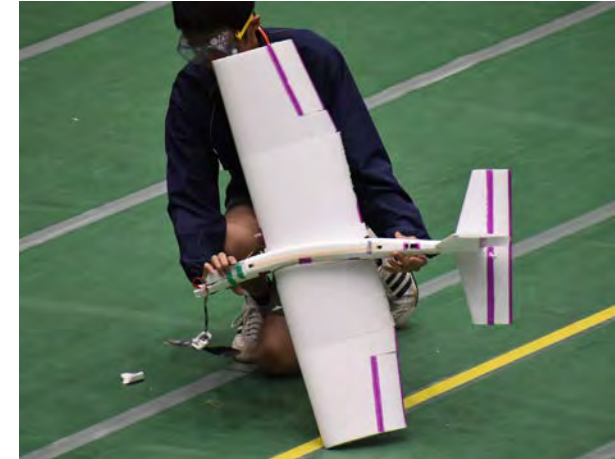
■ Concept

- ✓ High gliding performance and **Maneuverability**

■ Characteristic

| Length | Span | Height | Weight | Wing area | Wing loading |
|--------|-------|--------|-------------|-------------------|----------------------|
| 780mm | 995mm | 355mm | 178g | 24dm ² | 6.49g/m ² |

- ✓ **Large wing** with custom designed air foil
- ✓ **Slender body** to decrease air resistance
- ✓ Counter-rotating propellers



■ Result

- ✓ Clash caused by equipment failure
- ✓ The machine needed more toughness

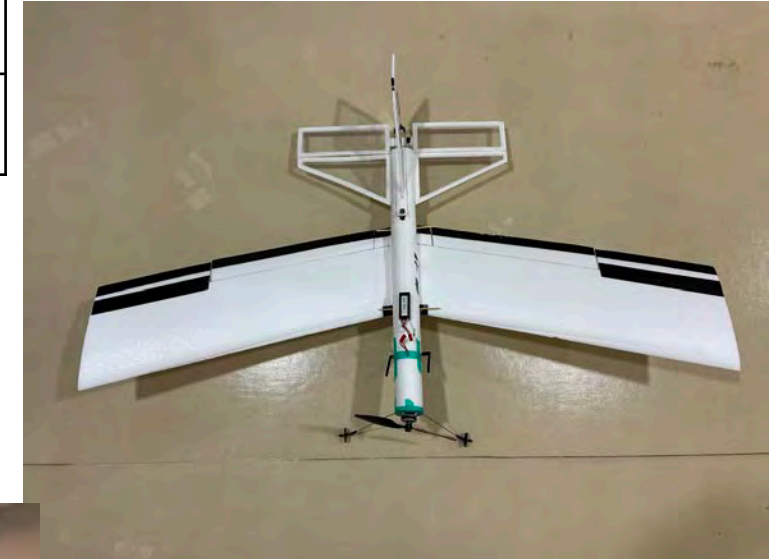
■ Concept

- ✓ High maneuverability in **slow speed** and Mechanism suitable for the mission

■ Characteristic

| Length | Span | Height | Weight | Wing area | Wing loading |
|--------|--------|--------|--------|-------------------|----------------------------|
| 670mm | 1200mm | 330mm | 193g | 22dm ² | 8.77g/m² |

- ✓ Gain lift by using **flaps**
- ✓ **Forward swept wing** and large **lightening holes** in tailplane
- ✓ One mechanism capable of both collection and release



■ Result

- ✓ Achieved high stability
- ✓ 5th place in the final tournament



εi3 (Butterfly effect)



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■ Concept

- ✓ Win the contest with a **unique machine**

■ Characteristic

| Length | Span | Height | Weight | Wing area | Wing loading |
|--------|--------|--------|--------|-------------------|----------------------------|
| 820mm | 1100mm | 220mm | 195g | 36dm ² | 5.42g/m² |

- ✓ Yaw control by **varying the thrust** of the two motors
- ✓ **Another wing** in front of the main wing
- ✓ M-shaped wing and V-tail
- ✓ **High gliding performance**

■ Result

- ✓ Received **Best craft prize (SUBARU prize)**



Flapping-tan



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■ Concept

- ✓ Machine with **flapping wings** and **Combine** motor and wing system

■ Characteristic

| Length | Span | Height | Weight | Wing area | Wing loading |
|--------|-------|--------|--------|-------------------|----------------------|
| 800mm | 650mm | 150mm | 142g | 18dm ² | 7.89g/m ² |

- ✓ **Multiple wings**
- ✓ 3 different modes (Flapping, Motor-driven, Hybrid)
- ✓ Unitized body

■ Result

- ✓ Machine that is easy to control
- ✓ Received **Boeing Prize**



Conclusion

- We managed to design many unique aircraft.
- We were able to receive 2 prizes in the contest.
 - ✓ SUBARU prize, Boeing Prize
- We made 9 aircraft this year.



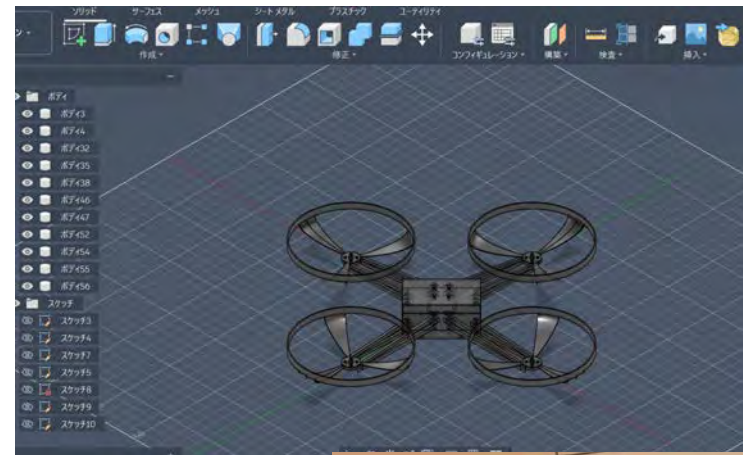
Next Year's Visions



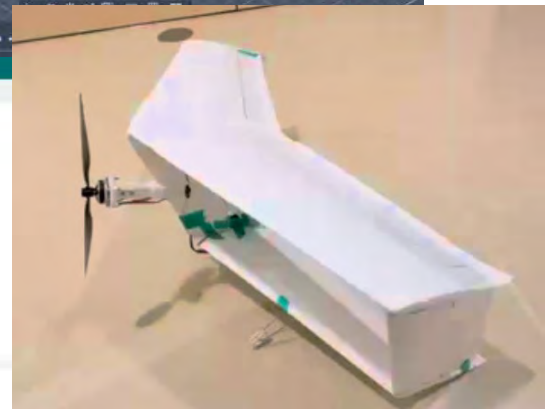
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- Aim for higher prizes
- Make more than 6 kinds of aircraft in a year
- Develop Multi Copters
 - ✓ Establish drone manufacturing techniques
- Create Automatic Operation System
 - ✓ Use 9-axis gyro sensor and camera
 - ✓ Challenge the automatic landing



```
File Edit Sketch Tools Help
Seed XIAO RP2040
flapping_kakino
247
248   if(angle[j]>1800){
249     angle[j] = 3600 - angle[j];
250     dir[j] *= -1;
251   }else if(angle[j]<1200){
252     angle[j] = 2400 - angle[j];
253     dir[j] *= -1;
254   }
255   }
256   //servo: wrt
257   for(j=0;j<7;j++){
258     pwm.writeMicroseconds(j*2,angle[j]+trim_1[j]);
259     pwm.writeMicroseconds(j*2+1,angle[j]+trim_0[j]);
260   }
261   delay(25);
262 }
263 }else if(mode == 1){
264   Serial.println("mode : MOTOR");
265   throttle = (val[2]-t_min)*(t_max-t_min)/2000+1000;
266   vr = (val[9]-vr_min)/(vr_max-vr_min)*100;
267   delta_ang = 300 / (4+(2000-throttle)/125);
268   delta_del = 10000 / ((16+(2000-throttle)/31.25)*vr);
269   esc_f.writeMicroseconds(throttle);
270   //servo: fixed
```



Acknowledgment



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We were able to improve skills through rewarding activities.
We really appreciate supporting us.



Thank you for listening