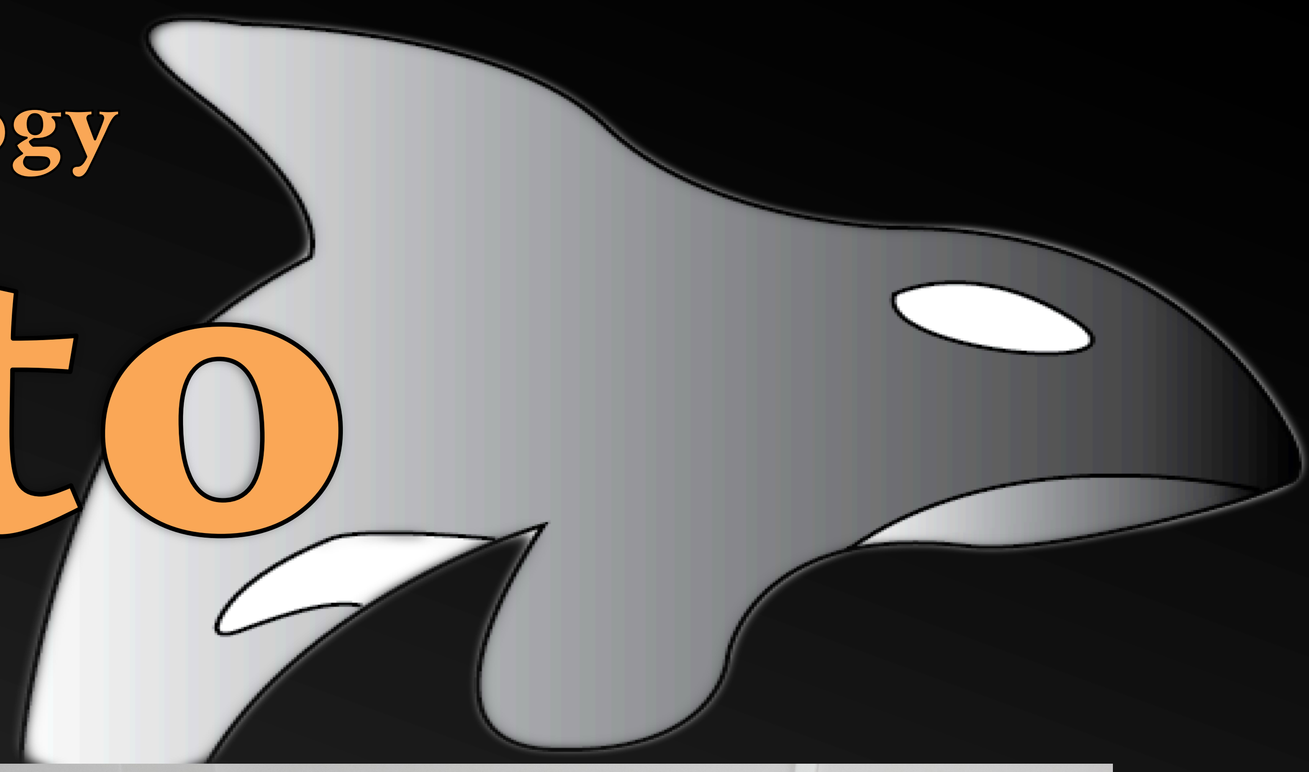
Tokyo University of Agriculture and Technology

OrcaAlato



Concept

- Lift Force and Buoyant Force Combination
- Wide Range Speed Flight
- High Glide Performance

Integrated Wing

- Two Function of OrcaAlato's Body
  1. Main Wing
  2. Envelope

  → Integrated Wing
- Benefits of Integrated Wing

  Using Lift Force

  and

  Buoyant Force

Specification

Width	: 1030 mm
Length	: 1100 mm
Height	: 480 mm
Wing Area	: 19.975 dm^2
Wing Loading	: 9.51 g/dm^2
Empty Weight	: 190 g
Volume of Envelope	: 0.038 m^3

Design and Production

- Design

  Focus on Aerodynamics
- Materials

  Vapor Deposition Film

  Styrene Foam

  → Soft and Light

Flight Performance

- Wide Range Speed Flight
  - Large Helium-Gas Envelope

    → Flying Slowly Like an Airship
  - Changing Attack of Angle

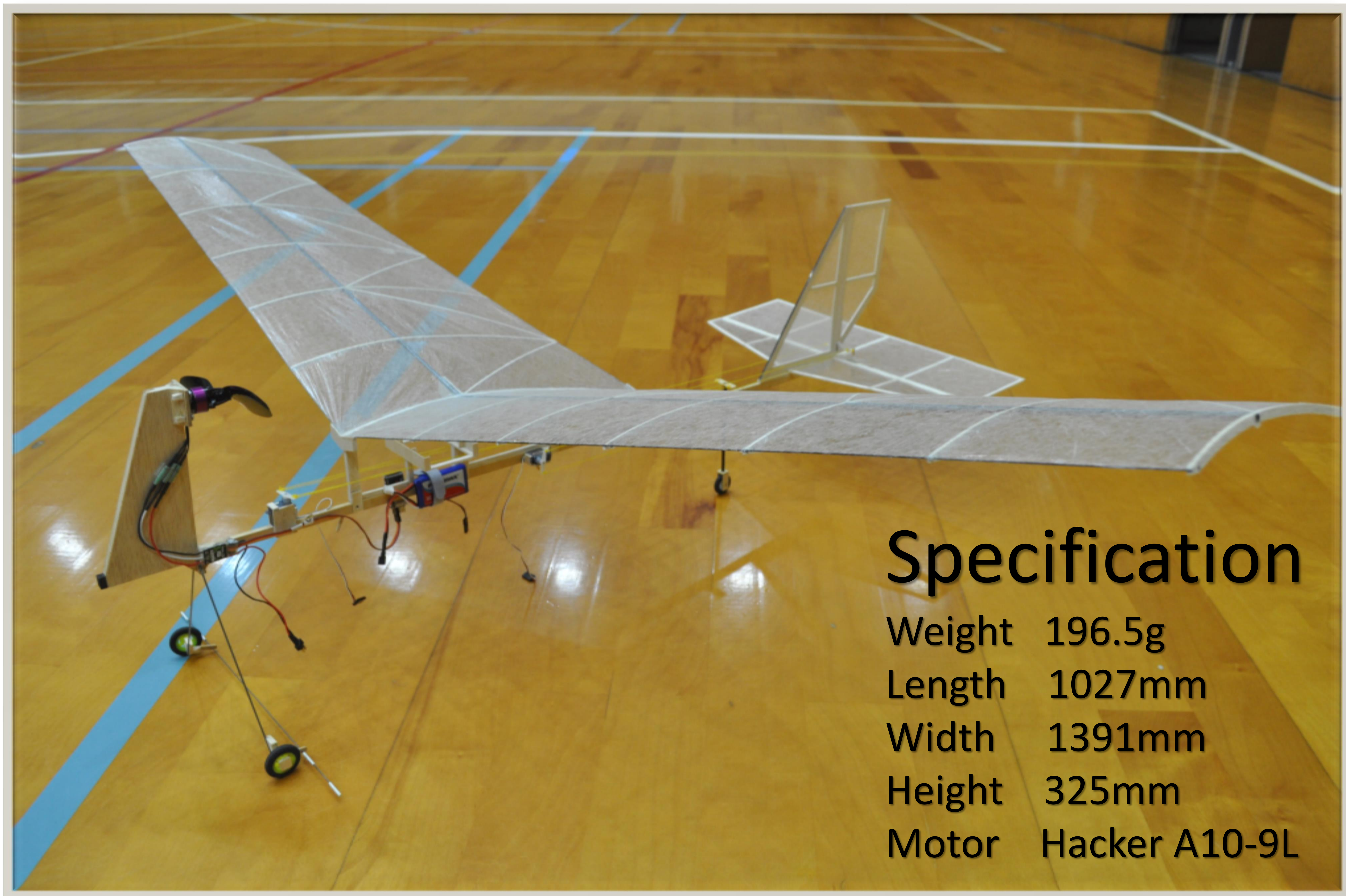
    → Flying Fast Like an Airplane
- High Glide Performance

  Discovering Low Drag Shape

  by Aerodynamic Analysis

高知工科大学
KOCHI UNIVERSITY OF TECHNOLOGY

Aeshnidae-2



Specification

Weight	196.5g
Length	1027mm
Width	1391mm
Height	325mm
Motor	Hacker A10-9L

Concept

Use Tosa-washi to main wing, horizontal stabilizer and vertical tail.
Tosa-washi is the paper produced in Kochi.

Hybrid-Skin

Skin is made of very thin film. The film tears easily.
So we paste very thin Tosa-washi on it.
Skin is reinforced by fiber of the paper.
Tosa-washi is very light.
So weight increase only 0.7g.

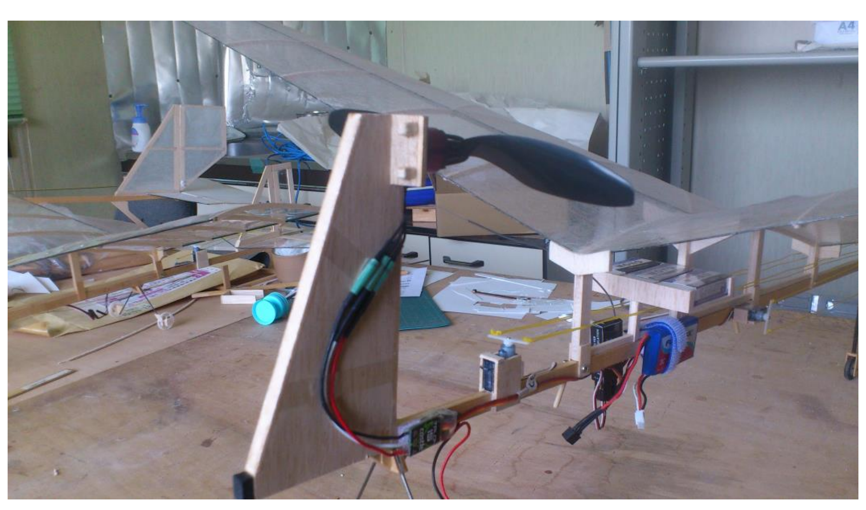
This is the thinnest paper in the world.

How to make

Our plane is handcrafted.

Safety

Pusher propeller



Flug Hetzer

Kanagawa Institute of Technology Aviation Research club

Concept

Even immature driver with an emphasis on stability to be able to respond. The torso long, tried to achieve take a lot of wing area.

Characteristic

Both weight and strength by the carbon fuselage, ensure angle of attack that was angled the motor to the fuselage, dropping device was lighter by lightening.

Design method

Designed using CAD, and output to the machine and paper.

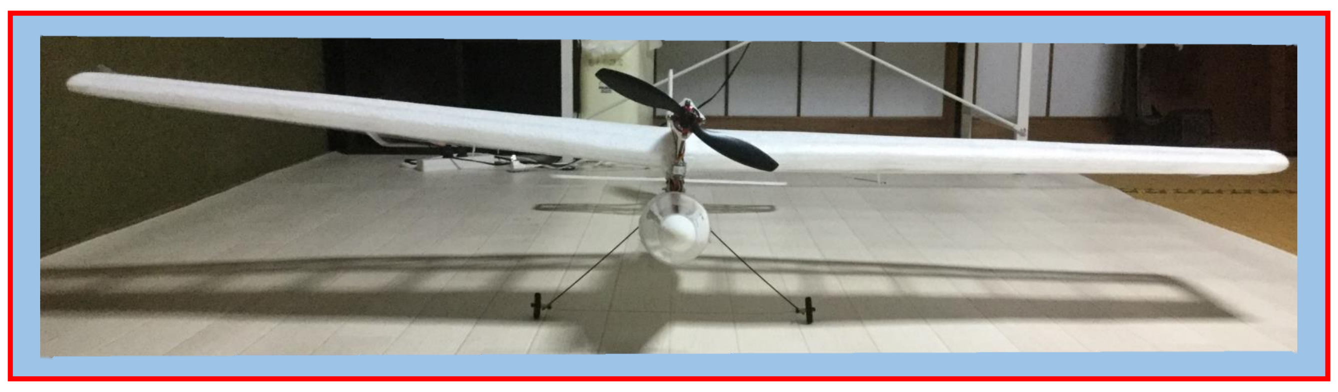
Method of fabrication

Fuselage as an axis of carbon, fitted with a servo or Ringeji hand, attachment was manufactured by 3D printers.

Wing was tension produced a plastic bag on the basis of the framework of balsa.

Safety

Also in order to prevent a serious accident such as a collision with an emphasis on stability. It should reduce the damage by eliminating as much as possible sharp edges even when the collision.



Aosagi

Kanazawa Technical college
Shota Okamizu (Leader)
Nanbo Shinichiro (Member)
Kohei ito (Adviser)

Concept

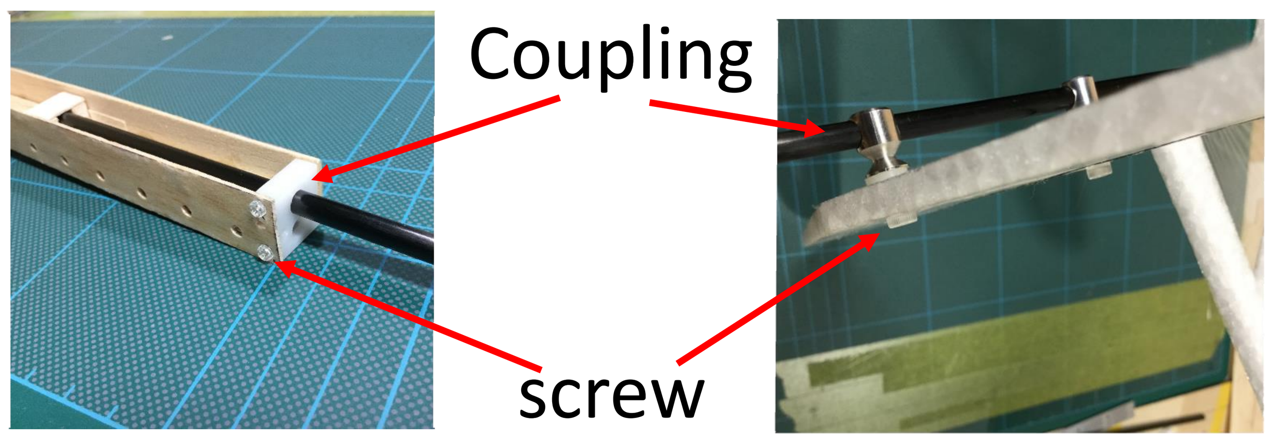
- Impact resistance
- Maintainability
- Drop Device mechanism

Design

Impact resistance

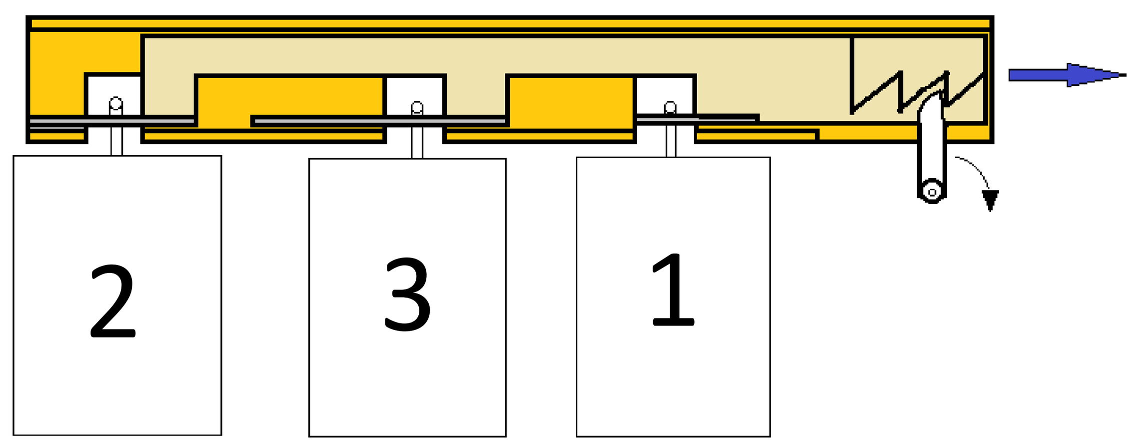
The tip of the wing of the aircraft is covered with EPP, to prevent the aircraft from being destroyed at the time of the crash.

Maintainability



Are connected by means of a screw and the stopper and the coupling, Removal of parts has become easier.
Parts replacement possible.

Drop Device mechanism

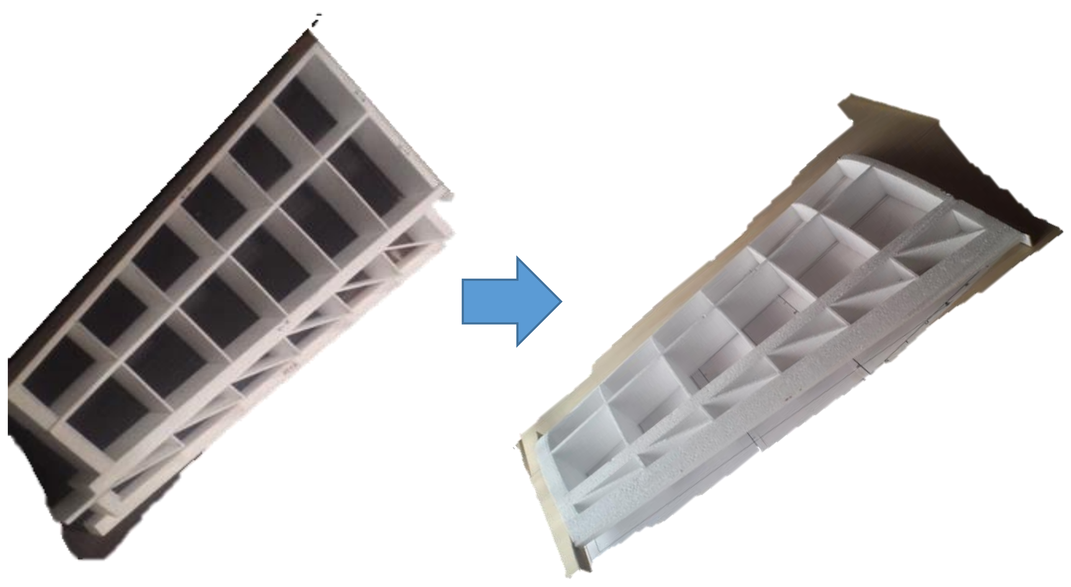


I created the following method in order to reduce movement of the center of gravity.

1.First, in order to prevent stalling, a weight is dropped from the rear, and the C.O.G. moves forward.
2. Then, the front weight is dropped. At this time, the center of gravity will return to normal.
3. Finally, drop the weight in the centre.

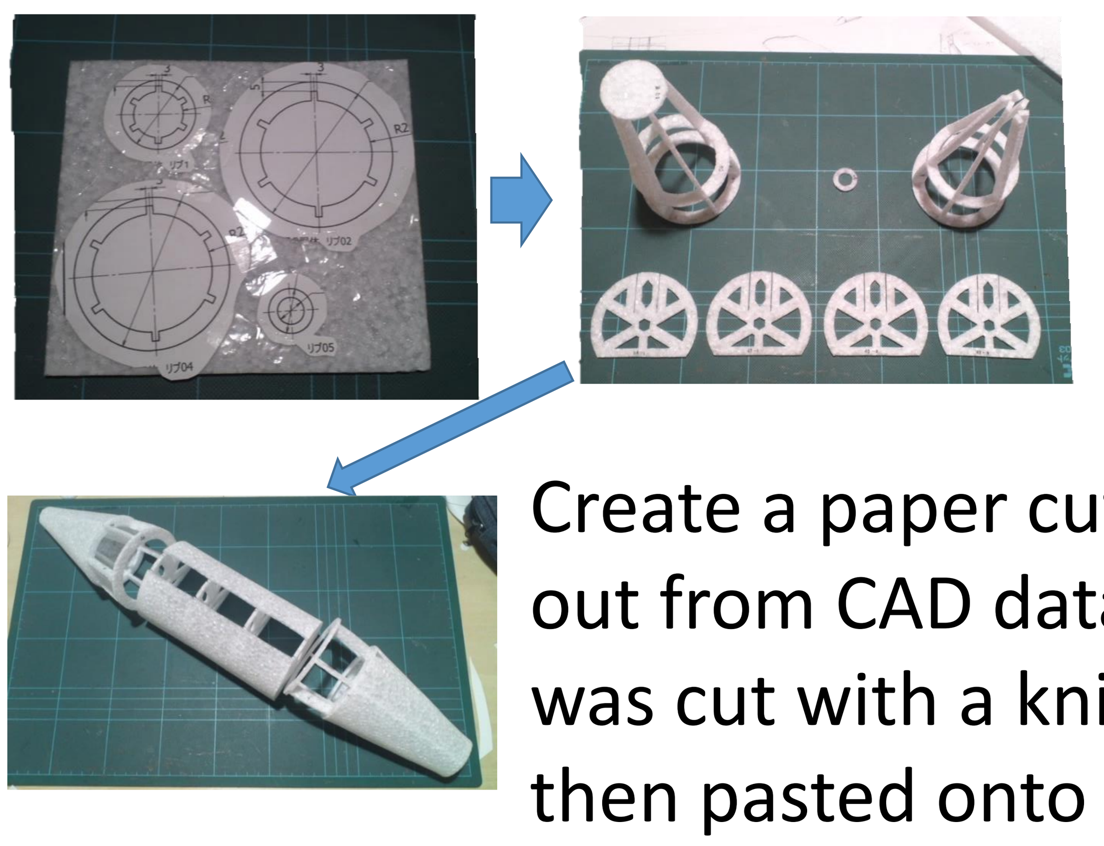
Method of manufacture

Hot wire cutter



First, the EPP frame of the wing planform was manufactured, then the frame was cut along the mold of the airfoil with a hot wire cutter.

Hand processing



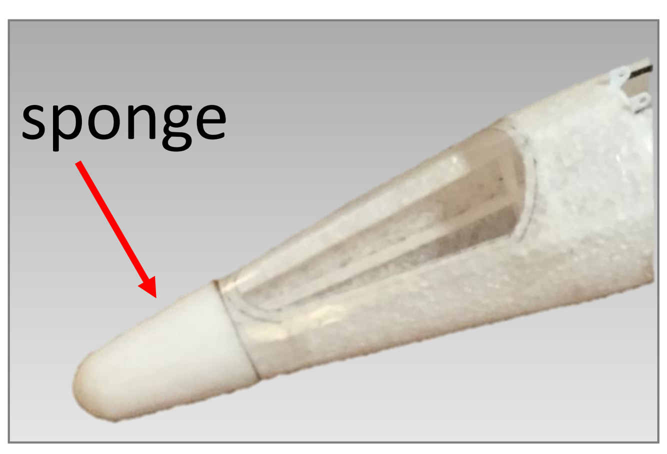
Create a paper cut-out from CAD data, It was cut with a knife then pasted onto the material.

machining process

Stopper parts was manufactured by milling machine and lathe.

Safety

Tip section



The tip is made from household sponge with low rebound potential.

Overall

Since the EPP is soft, the danger of hurting people is low.

YAL Ⅶ Yokohama National University

CONCEPT

・ **First Flying Robot**

We were sticking to the basic of aircraft.

・To gain lift

・To be careful to safety at the time of the crash

・To make strong and light

DESIGN

・ **Large Wing Area**

The chord length is long to make the wing area large. By large wing area, the aircraft can gain a high-lift and fly at low speed.

・ **KRARK-Y**

KRARK-Y has good aerodynamics and this airfoil is easy to make.

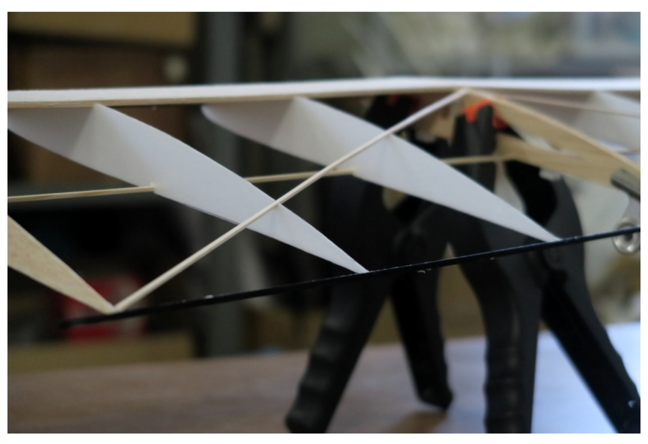
FABRICATION

・**Use of Balsa wood plates**

Balsa wood plates are used for the wings to be light.

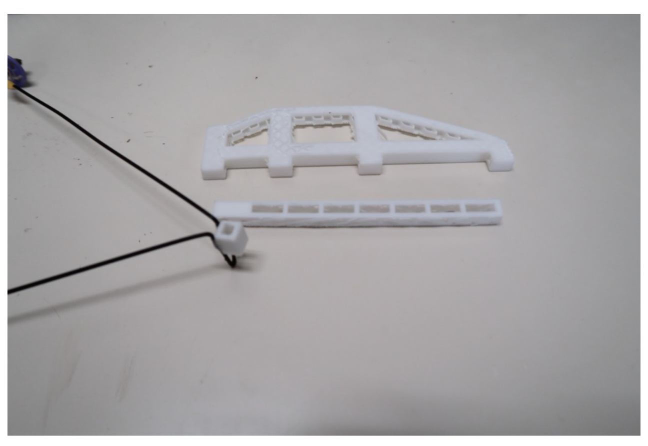
・**Strengthen by carbon**

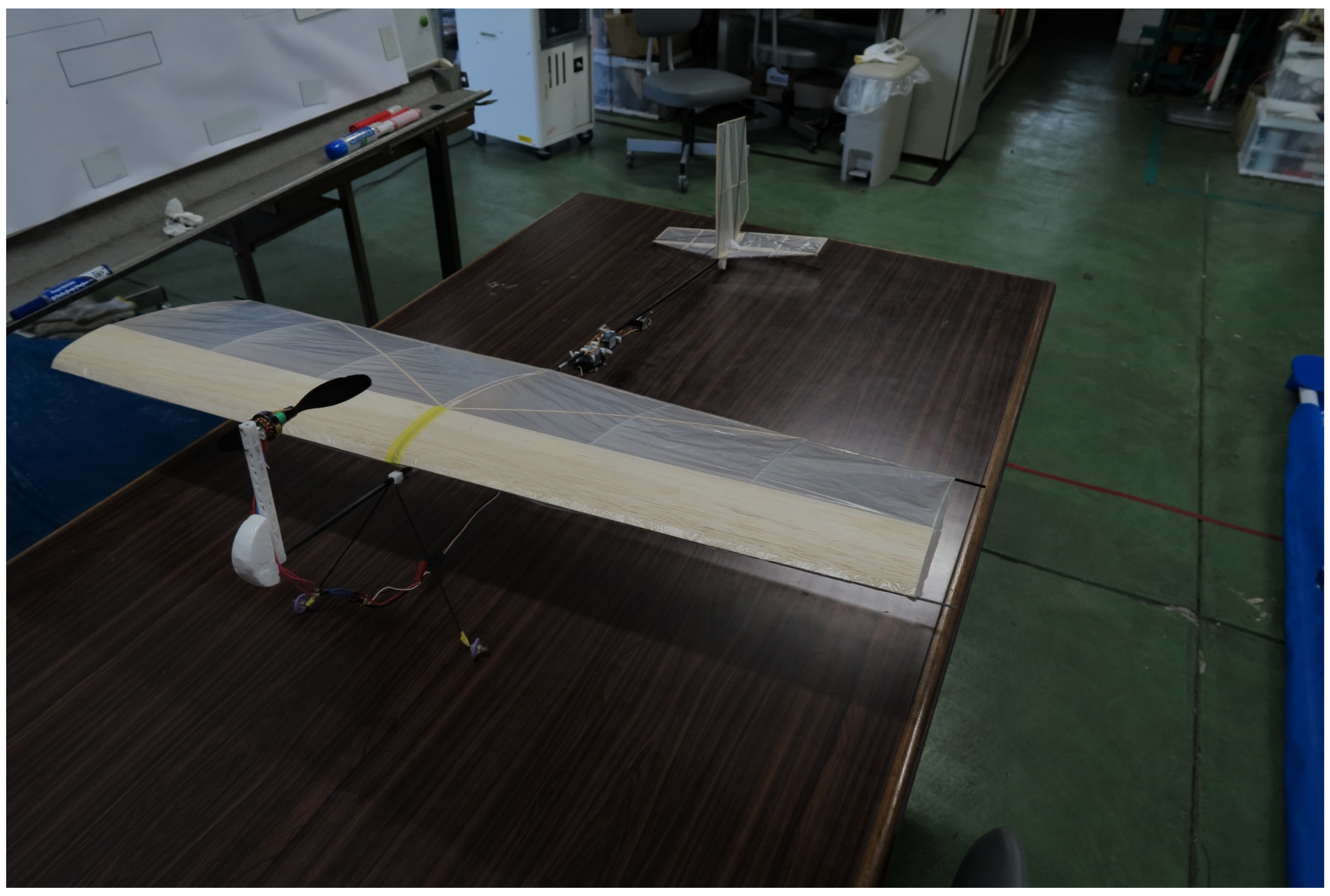
It has been reinforced with carbon in order to strengthen the structure.



・**Joints by 3D printer**

All joints are made by 3D printer. Simple but steady joints are made.





SAFETY

・**Rear-mounted Propeller**

Rear-mounted Propeller is safer than Front-mounted Propeller, because Rear- mounted propeller is able to avoid direct propeller crash.

MEMBER

・**Supervisor** : Prof. Seiya UENO, Takehiro HIGUCHI

・**Member** : Yoshinori ASADA, Yuta KIMURA, Shohei KOYAMA, Takumi HOSHI, Ryota SUZUKI, Chiharu NIWA, Ryuki OTANI, Manami KITAHARA, Naoki KUWAHARA, Kenta SUGAUCHI, Fuminao NAGASAKI, Takuma MIYAZAKI

Tokyo Metropolitan College of Industrial Technology

Snoopy

Design

Calculate volume of envelope to obtain enough buoyancy for missions and determine coordinates of ellipsoid. Use the Pythagorean theorem to calculate how to form the ellipsoid with 3 gores.

Manufacture

Use heat seal ruler to weld films of evaporated aluminum.

Safety

Even if it hits someone, they won't be injured because envelope is keeping shape with internal pressure.

Characteristic

- Control altitude of Snoopy with vector thrust.
- Easy to change fins and propeller covers because they are attached with hook-and-loop fastener.
- We can carry Snoopy easy when gas is removed from Snoopy, it will be small.
- Able to change direction of rotation because it is mounted an amplifier. Therefore, able to go back and useful for collecting materials.

Members

- Mari TANAKA
- Kenta SAITO

HAYABUSA

YAMAGUCHI UNIVERSITY

DEN-NO HIKO 2016 (Manual Flight)
Tajima Yuichi,
Fukuda Yuta, Awaya Kazuki,
Ichida Tuyoshi, Inagaki Takato

Length × Width × Height	1070×1185×290 mm
Wing Area	30 dm^2
Empty Weight	196 g
Wing Loading	6.5 g/dm^2
Control Surfaces	Rudder, Elevator, Ailerons

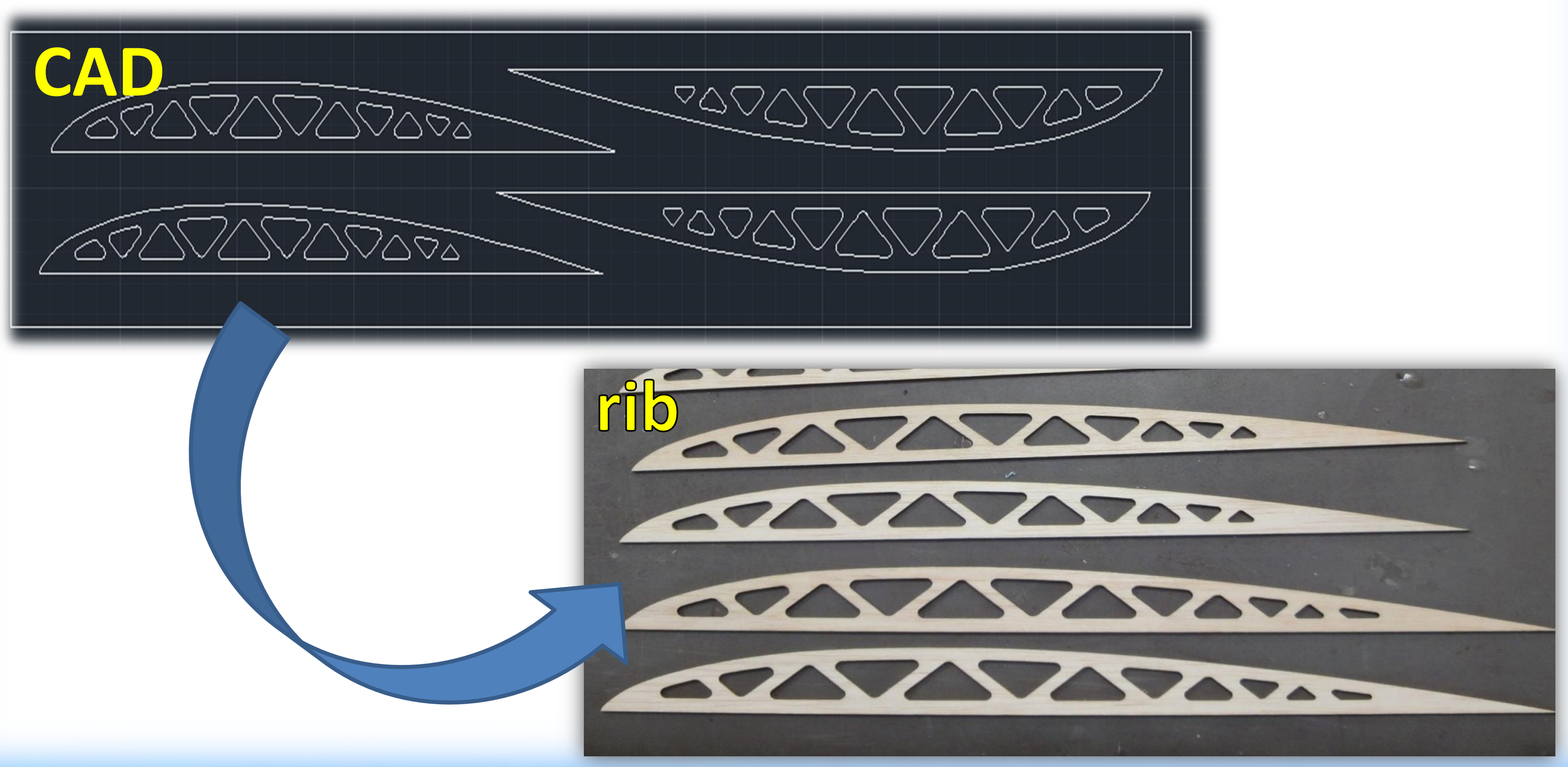
WING REINFORCEMENT

Strength up

Strong structure to twist by embedding the three of the carbon rod to the wing

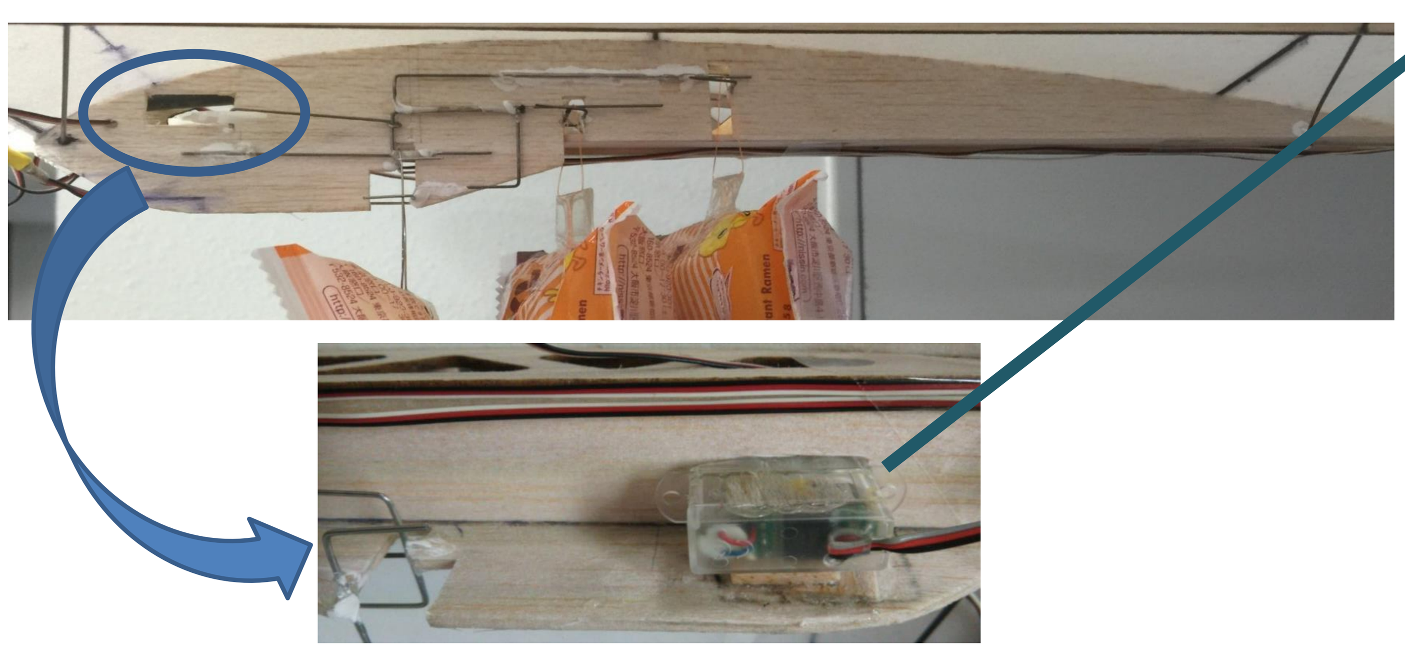
LASER PROCESSING

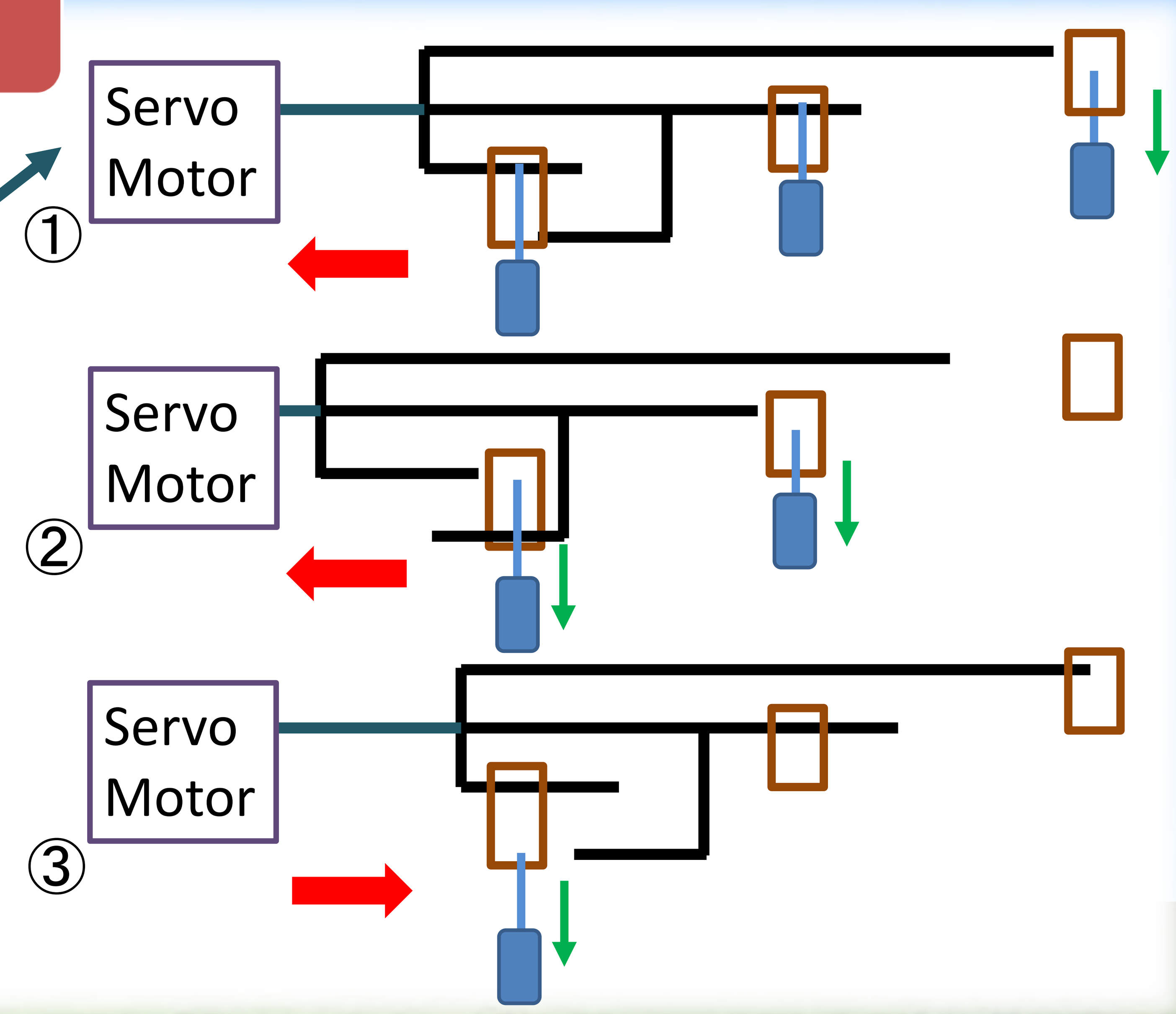
Lightweight & Exactness & Efficiency up



DROPPING

Mechanism to drop three of relief supplies in one of the motor





SAFETY DESIGN

Divide the shaft back and forth

The nose is designed to break when the aircraft crashes. This will absorb the shock, preventing any injuries.

SkyRay Ⅲ

Specifications

Height : 240mm
Length : 975mm
Wing span : 1040mm
Chord length : 250mm
(canard & main wing)
Wing area : 26 dm^2
Canard area : 10.8dm^2
Mass : 200 g
Angle of attack : 4°

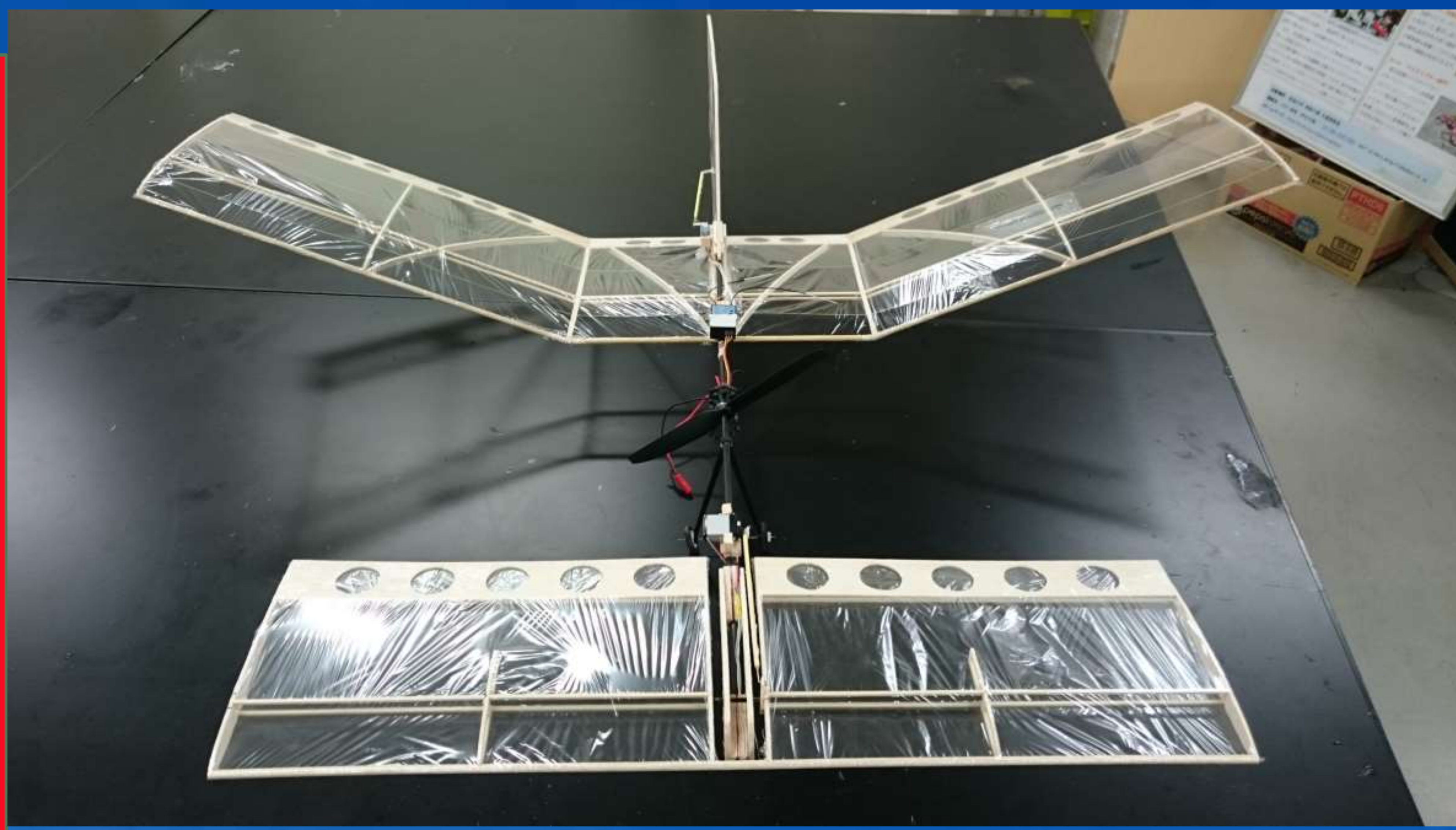


Fig.1 SkyRay Ⅲ

Wind-Tunnel Test

Table.1:Experimental condition

Reynolds number	99206.34921
Wind speed	6[m/s]
Temperature	24.2[℃]
Atmospheric pressure	1004.95[hPa]
Angl of attack	−4～24[°]

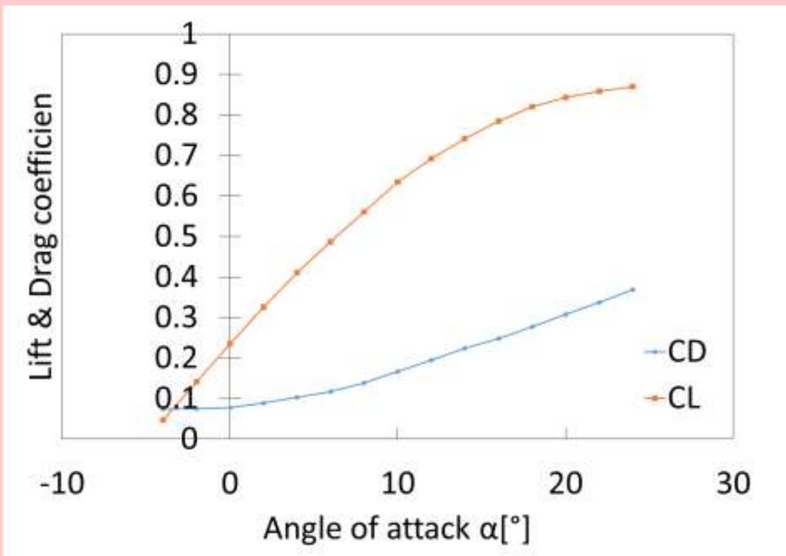


Fig.2.1:Wing – Tunnel Test

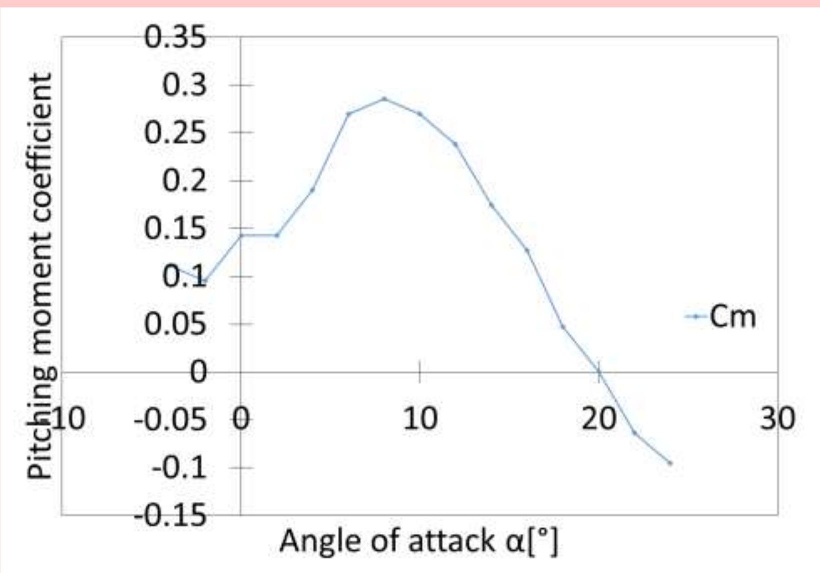


Fig.2.2:Wing – Tunnel Test

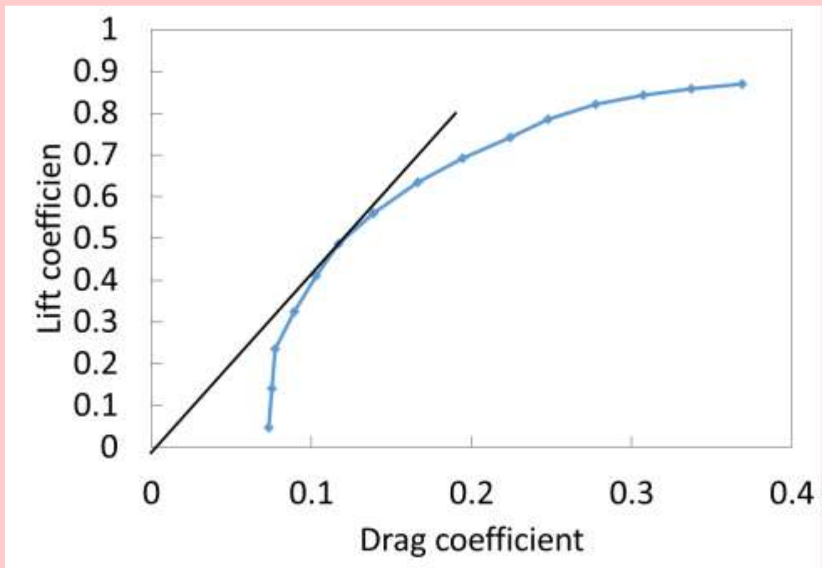


Fig.2.3:Wing – Tunnel Test

SkyReyIII doesn't stall even when its angle of attack is 24 degrees. Before the aircraft stalls, the pitching moment is nose-up. After the aircraft stalls, the pitching moment changes to nose-down due to canard. By above result , the characteristic of canard is confirmed. And It is clear that an optimum angle for descent is 13.5 degrees according to tendency of lift-drag ratio. When the altitude is 20m, the plane is able to glide over a range of 83m. In other word , the palne is able to glide for 15 second when the speed of the aircraft is 5.6 m/s.

Safety

1. The propeller sets at middle position of the fuselage of the plane. If this plane crashes into people, people never get hurt.
2.The canard wing has excellent stall characteristics. Therefore, it prevents plane from stalling.

Canard wing

Fig.3:Canard wing

This canard wing behaves as all flying tail. Advantages of this type of wing is as below.
1, The high mobility is realized. Therefore , this plane can loop the loop in flight mission .
2, The wing is easy to make for unnecessity of attaching of the elevator

Drop mechanism

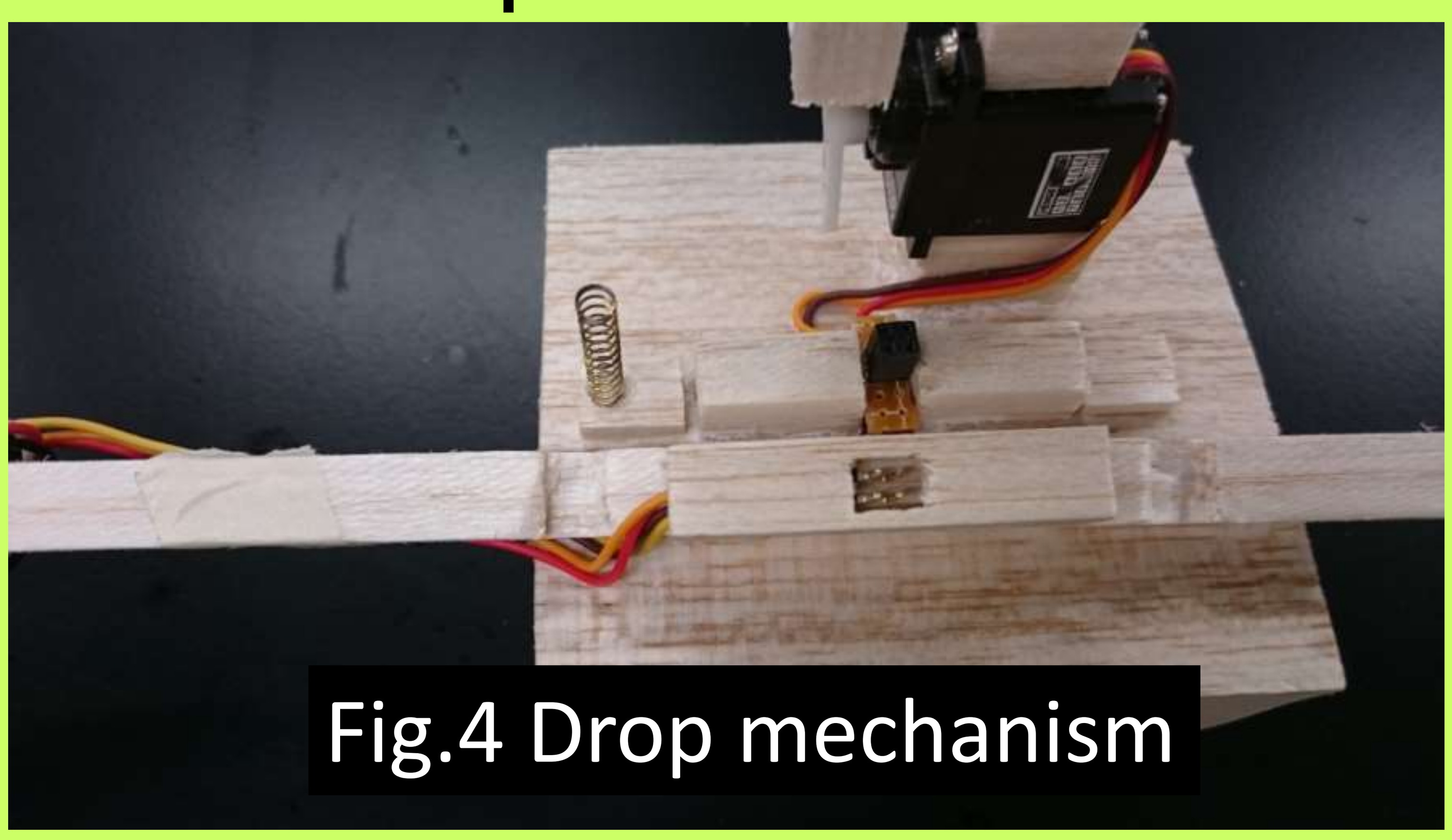


Fig.4 Drop mechanism

The concept is "Don't leave anything". This device can drop also servomotor as a part of attachment, not only relief supplies. This concept has two advantages after drop-mission.
1, Reduction of the drag force of air.
2, Reduction of the weight of airplane.
The above advantages are useful in time trial and mission.

Tokai University Student Aircraft Project

SBF2016-J

Specs

Weight 168g

Length 1060mm

Hight 305mm

Width 1072mm

-Main wing-

Wing area $0.29m^2$

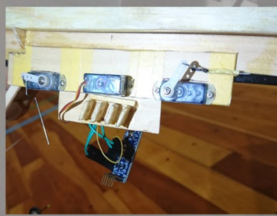
Wing load $5.61g/dm^2$

-Horizontal tail-

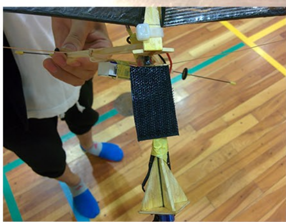
Wing area $0.068m^2$

Tail volume 0.55

Design



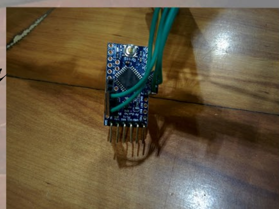
It was lighter by a simple structure.



We used Velcro to the mounting of components for ease of maintenance.

Dropping system

The goods will be dropped by servomotor and Arduino.



Transport

This airplane is possible to separate the main wing and body to carry easily.

Safty

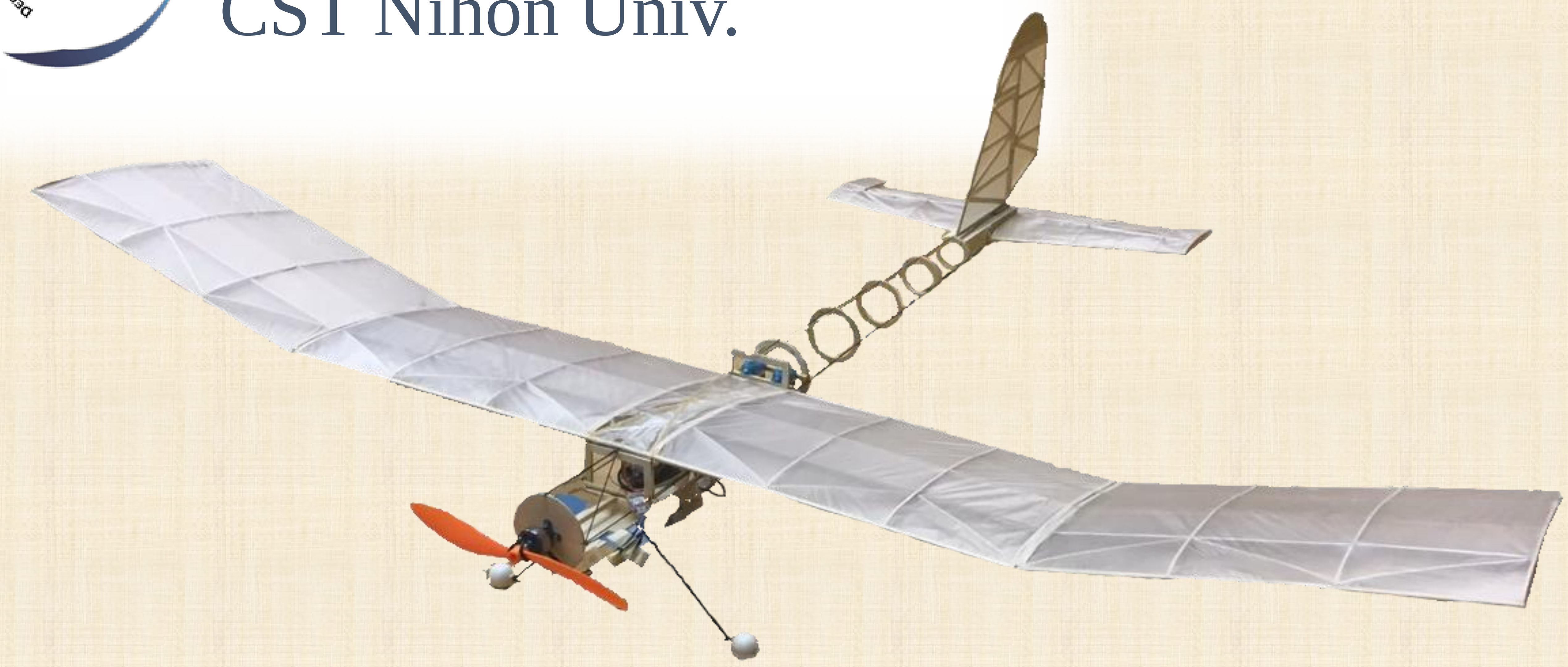
Main wing will come off when the strong impact applied to the airplane.

Libellen-16

Dept. of Aerospace Eng

CST Nihon Univ.

Member
K.YAMAGUCHI , M.YANASE
R.MATSUO , K.YOSHIMURA
T.WAGAI

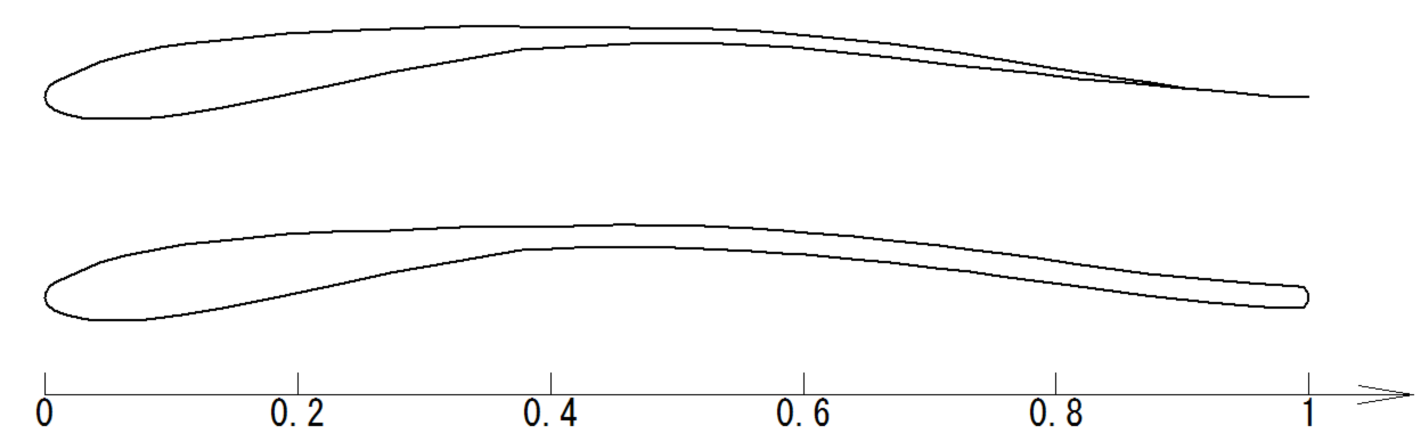


Specification

Weight : 150[g]
Length : 894[mm]
Span : 1200[mm]
Higher : 270[mm]
Wing area : 24.0[dm^2]
Wing load : 6.25[g/dm^2]
AR : 6

Concept

We made airplane with high lift in low speed, utilized Owl-like airfoil.



↑Original Owl-like airfoil
↓ Improved Owl-like airfoil

How to design

First, we conducted wind tunnel test. Second, we made a rough estimate of airplane's specification and drew the plan.

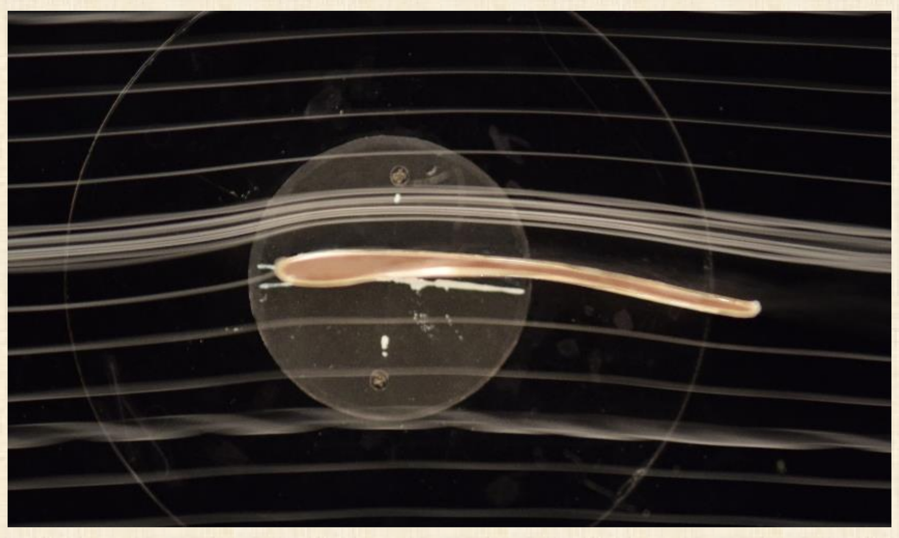


Fig.1 State of a wind tunnel test(α = 5[deg])

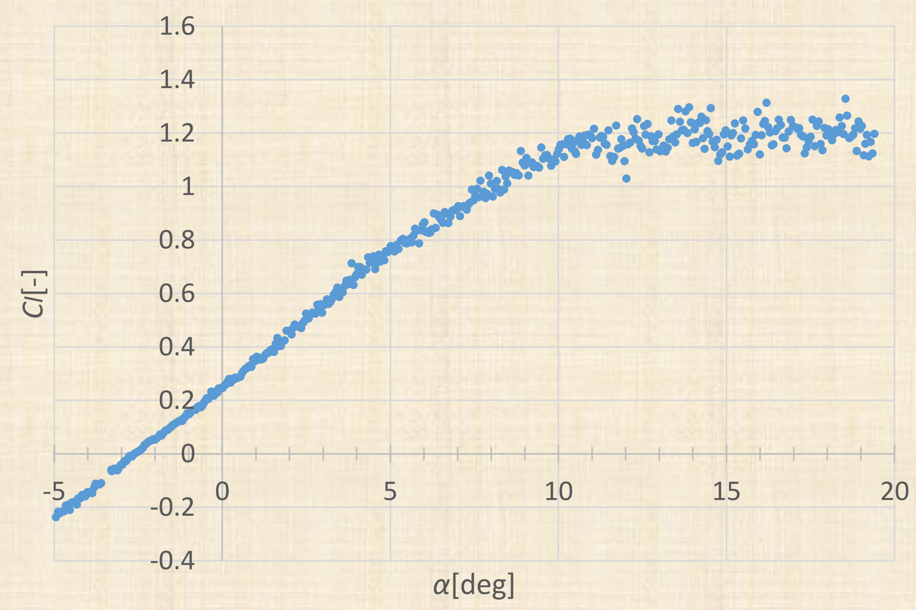


Fig.2 Cl-α (Re = 45,000)

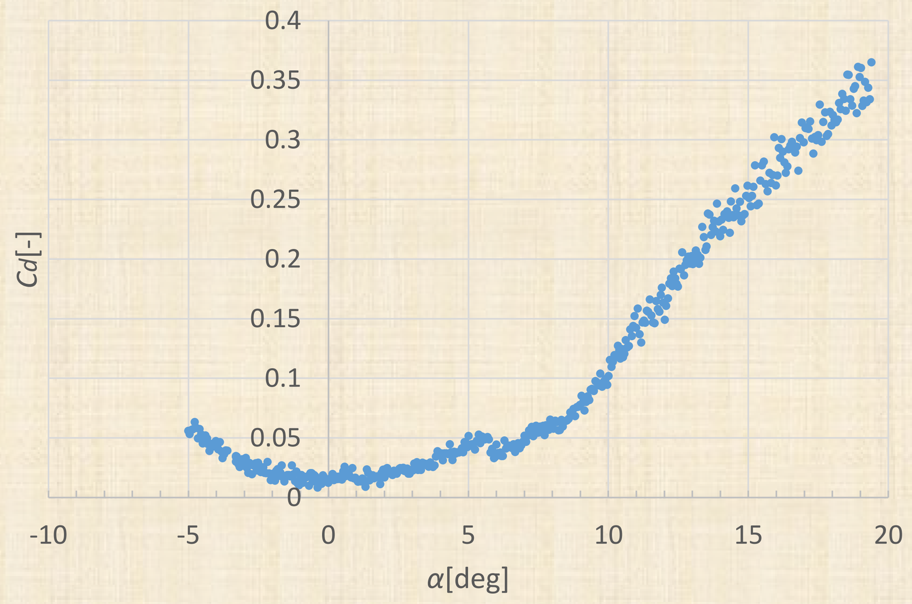


Fig.3 Cd-α(Re = 45,000)

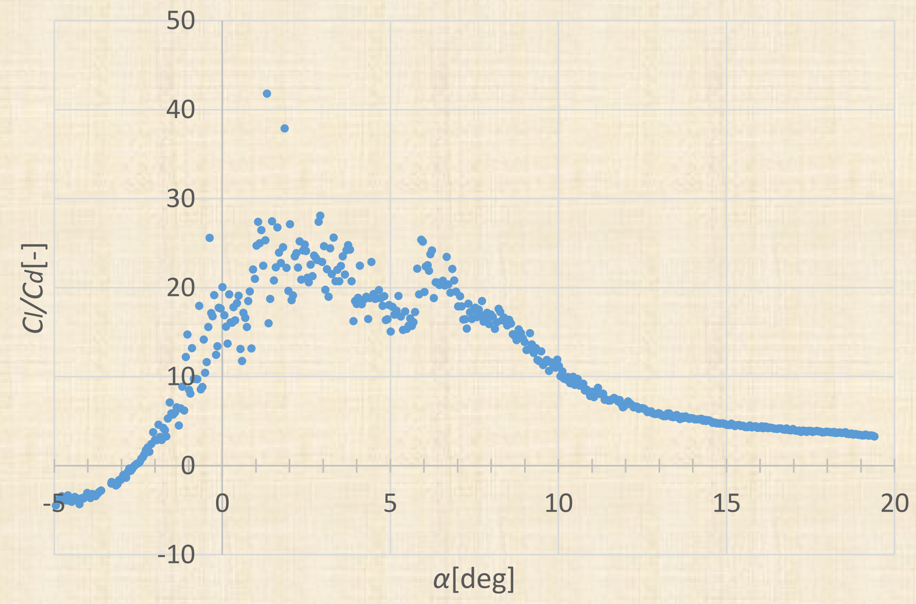
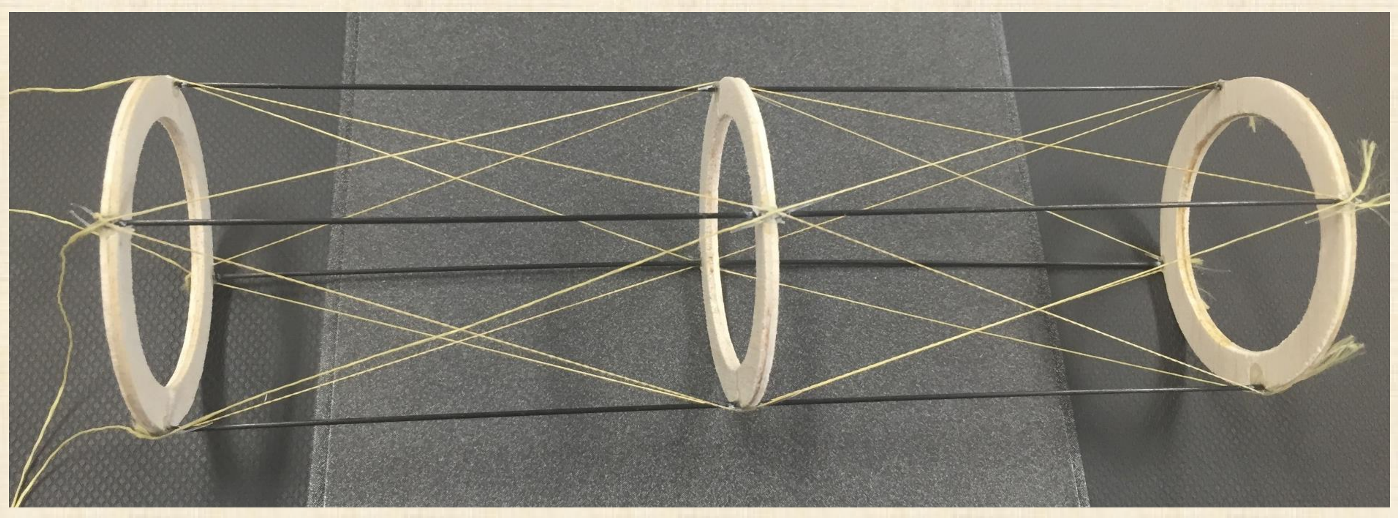
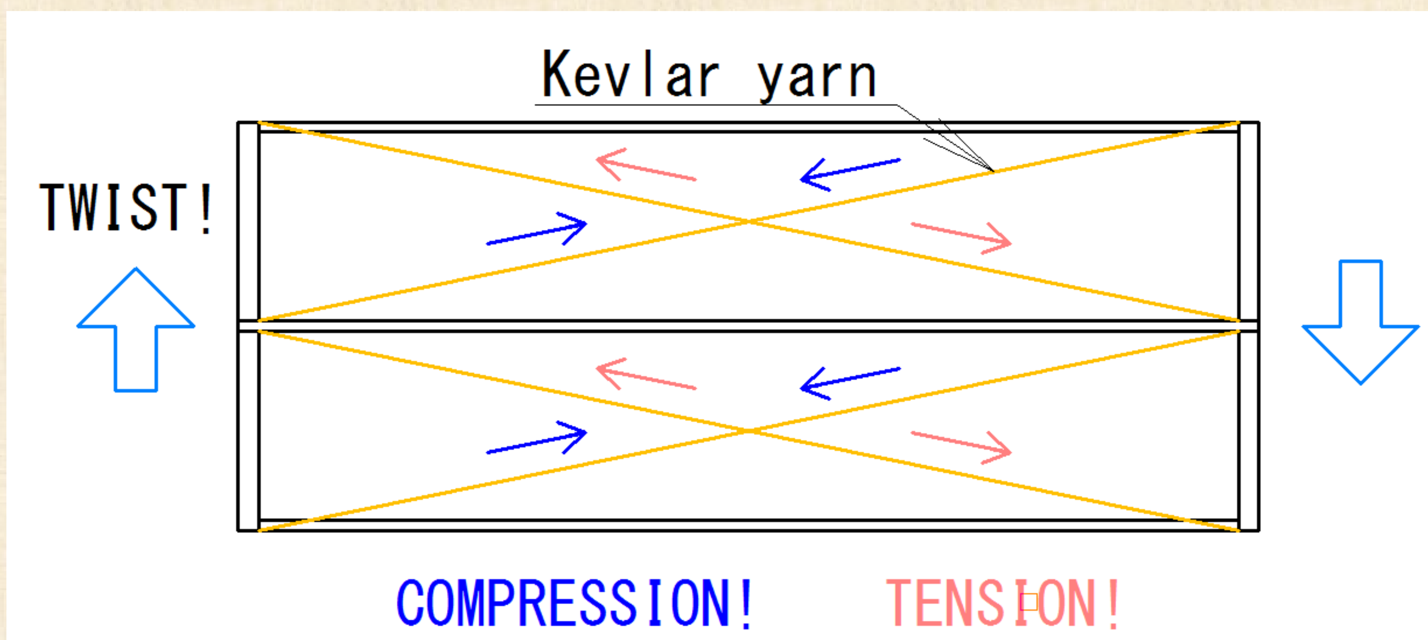


Fig.4 Cl/Cd-α (Re = 45,000)





How to make

Main body and main wing are made by balsa , carbon and kevlar yarn. Kevlar yarn play an important role in our airplane to prevent from twisting the fuselage.

Safety

Our airplane is made by balsa . It is easy to separate before breaking anything.

Video→

National Institute of Technology, Akita College

Rising Eagle

Member

Ryo Okabe
Yusuke Miura
Kouki Oguma
Yoshiho Nakata
Ryo Saito

Advisor

Yoshinori Konda
Hajime Tsuchida

Specification

Length: 950mm
Width: 1985mm
Height: 400mm
Motor: Dualsky XM2223-10
Battery: Hyperion LiPo 550mAh

Concept

High-speed Stability
More Mobility
Gliding Like Eagle

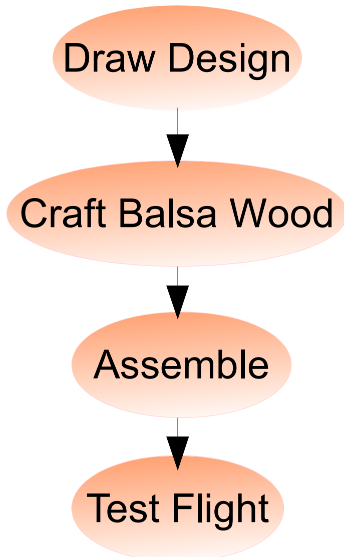
Design

We evolved Rising Eagle(RE), our winning flying robot.
First, we modified wing.
Longer wingspan and shorter chord length enable RE to do high-speed flight and more smooth glide.
Furthermore, RE is different from previous RE in many points. (ex. landing gear, rudder, flying wire, etc.)
It's slight, but big change.
That makes RE stronger.

Safety

RE is made of soft balsa wood, so hitting someone by chance, it will break into pieces without injuring them.
Pusher propeller will also work to avoid touching rotating propeller.

Production Method



Still We Rise.

Nagoya University

DEGUCHI Hideki
SAITO Satoshi
KUNO Takuma

NAVIX-h

- Canard
  - Enable to generate a lift in the main wing and tail both

- Passing a wing tip vortex on the blade surface
  - Enable to be increased lift

- Increase the stability
- Prevent the wing tip vortex is hit in the body