独立行政法人　国立高等専門学校機構
福井工業高等専門学校

Shooter-A

Kensuke HIROSHIMA,　Yasuhiro HINOKI

Concept

Simple and Light

Figure

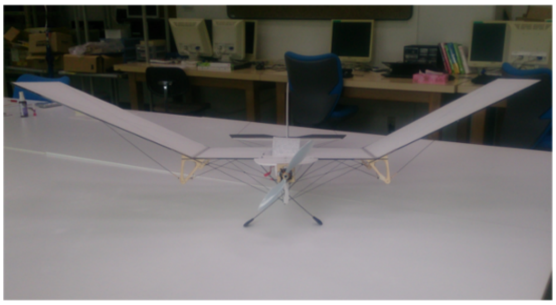


fig. 1. Front

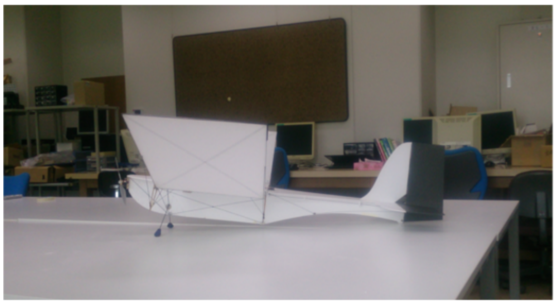


fig 2. Side

Specifications

Length	1,050 mm
Height	360 mm
Span	1,280 mm
Weight	245 g
Wing area	38.4 dm^2

Speed	5.0 m/sec
Turning Radius	5.0 m
Payload	150g over

Motor	COBRA 2203/46　17.5g
Motor controller	HiModel 10A ESC　9.5g
Elevator servo	New Power XLD-4.5　4.7g　Speed 0.10 sec/60deg　Torque 0.65 kg·cm
Rudder servo	New Power XLD-4.5　4.7g　Speed 0.10 sec/60deg　Torque 0.65 kg·cm
Buttery	Hyperion G3 2S 240mAh 25C　16.8g

Folding wing system

Conpact and Easy carrying

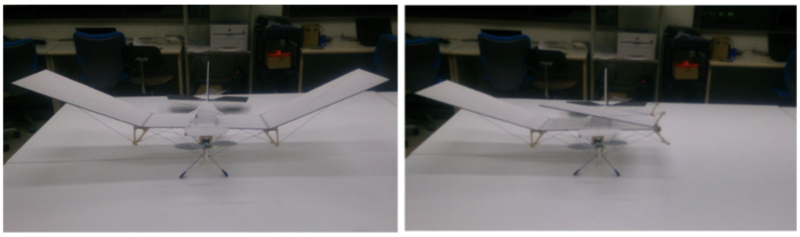


fig. 3. Folding wing system (Left: Usually, Right: Folding)

How to build

Design

We assume that begginers pilot robotic plane in the general gymnasium of 20x40x8[m]. We aim to ensure 5[m/sec] speed and 5[m] turning radius so that they can pilot it safely.

Furthermore we adopt rudder plane since the weight becomes lighter and motion performance is not imporatant in our case.

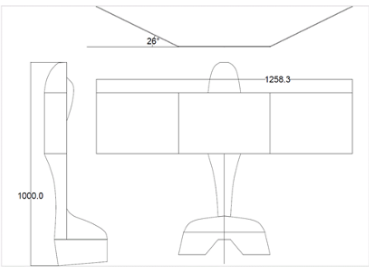


fig. 4. Drawing

We adopt rectangular wing. Because the structure is simple, in addition production time is shorter.

In order to steady roll action and to turn easily, both right wing and left wing are angled about 26[deg] dihedral angle from horizontal center wing.

We adopt expanded polypropylene (EPP) for wing. This results from light weight, easy repair and absorbing shock.

Build

As shown in the figure 5, the wing is reinforced by carbon since the strength is not enough to fly. We glue carbon to not only the side of the wing but the inside of the wing diagonally. This results torsional stiffness of the wing is higher.

The main wing and the nose material are EPP, and others are depron. Carbons of thickness 1[mm] which used for reinforcement are formed like truss as shown in the figure 6.

Except carbon is cut using a raser cutter.

Finally, we glue side wing to main wing, and mount a servo, microcontroller and others to this.

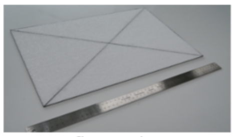


fig. 5. Wing

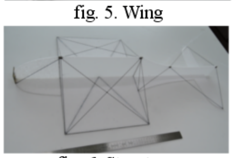


fig. 6. Structure

fig. 7. Mount

Computer system

PID Controller

We adopt PID Controller with Ardupilot Mega, unmanned aircraft microcomputer based on Arduino Mega 2560, and Adafruit 10DOF, 10 axis sensor including gyro, acceleration, magnetic, and atmospheric pressure.

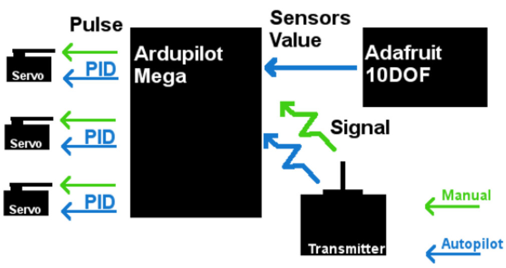


fig. 8. Computer system flow

fig. 9. Ardupilot Mega

fig. 10. Adafruit 10DOF

Drop system

Slide carbon using single servo to drop relief supplies

fig. 11. Drop system

Safety

fig. 12. EPP

Strong and Soft

The body is almost composed of carbon and expanded polypropylene (EPP).

The later is strong for a shock, so the body's damage would be little if it crashed.

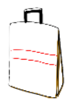
In addition, this is very soft as shown in the figure12. If this collided with people, they wouldn't have a serious damage.

NilA 2 Automatic control category

Endo Katsuhiro, (auto landing sys)
Okutani Ryosuke, (dropping unit)
Sekiguchi Hiromu, (control unit)
Toyoda Akihiro, (main wing)
Matsuda Masayoshi (body and tail wing)
Keio University

Concept and Design

1. Easy to FLY 
... very slow flight and high stability

2. Easy to CARRY 
...dismantles easily in small 5 components.

3. Easy to REMODEL 
...using a standard mount allows us partial remodeling especially around tail wings

Drafting
hand writing

Materials
EPS, styrene paper reinforced by tapes and carbon fiber rod

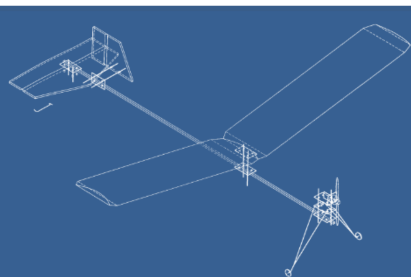
Fabrication
body: cutter and scissors
dropping unit : laser cutter
main wing : Hot wire cutter

Main wing

1. High strength, low weight
... Made of EPS supported by styrene paper tape

2. Prominent resiliency
... dihedral effect of the wing

3. High stability
... huge wing area, original effective airfoil

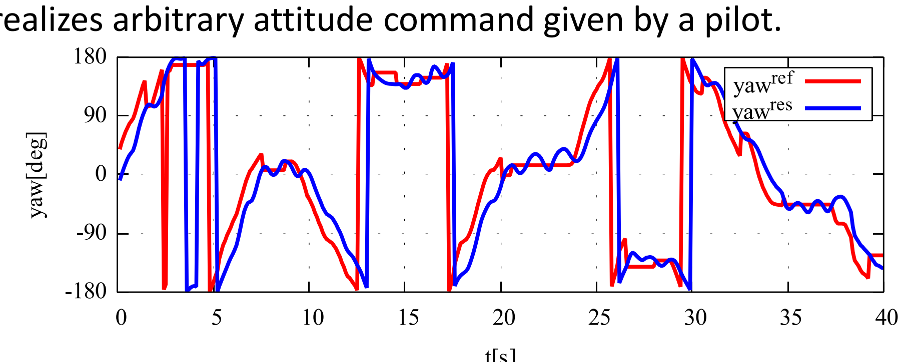


assemble

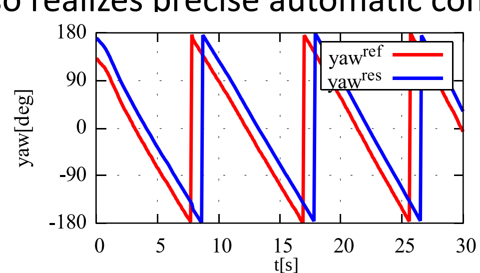
Control Unit

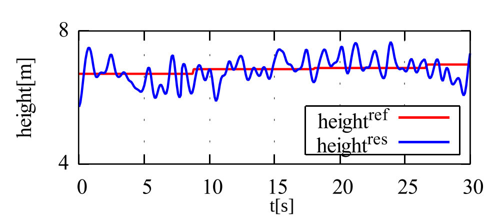
Everyone can maneuver Nila easily

...It realizes arbitrary attitude command given by a pilot.



...It also realizes precise automatic control





auto landing system

...The system estimates 3D position of the plane using IR LED on the plane and IR stereo camera on the ground

For safety

・EPS wings absorb shock.
・All parts are planed off the corners.

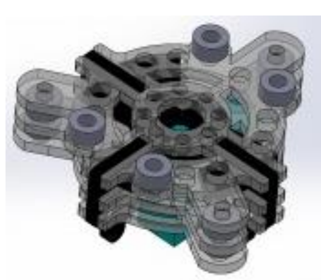
Dropping Unit

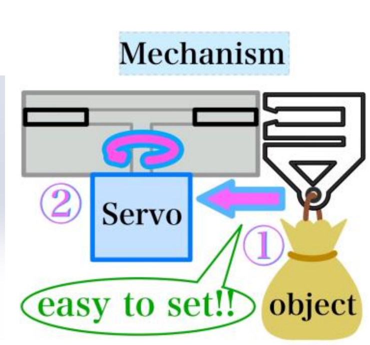
1. Weight saving 
...Made many lightening holes

2. Size saving 
...Adopt the simplest mechanism

3. Reliable operation 
...Made sturdy and precisely

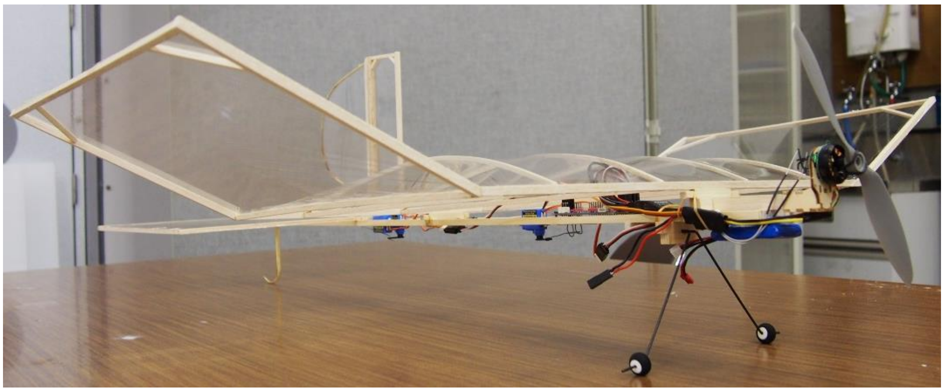
4. Easy to set
...





Tokyo Metropolitan University
-Aerospace System Operation Engineering Office-

GOSAM



CONCEPT

- With combination of balsa and Japanese cypress (hinoki), we realize not only strength but also lightweight easily.

DESIGN METHOD

- GOSAM can fly slowly by using 'slow fly' propeller. (propeller: 8×3.8SF)
- GOSAM has space between wing and the backbone by arch-shaped wing to load her brain, Arduino.
- Outer arch-shaped wing, GOSAM has a wing with dihedral angle and can get roll stability.
- 3ch control: throttle, rudder, elevator.

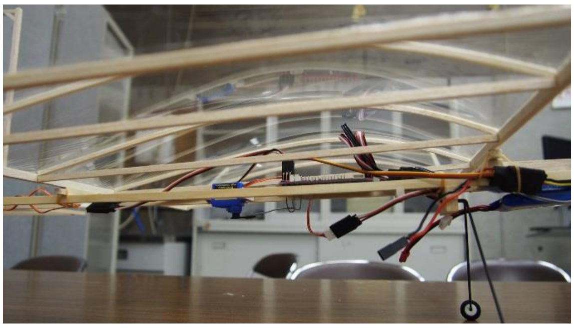


Fig. Under the wing

FABRICATION METHOD

- Wrapping the wing with domestic cellophane, so we can get it anywhere easily and inexpensively.
- The balsa is very lightweight material, but is weak at a shock.
  We attached the support material to adherence part, and only glued the balsa, not nailing.

FAILSAFE

- By setting throttle upper limit, if you mistake throttle operation, GOSAM won't fly out of control.
- If the receiver can't get normal radio because of noise or interference, it automatically gets throttle off and prevents out of control.

Tab. Aircraft Specifications

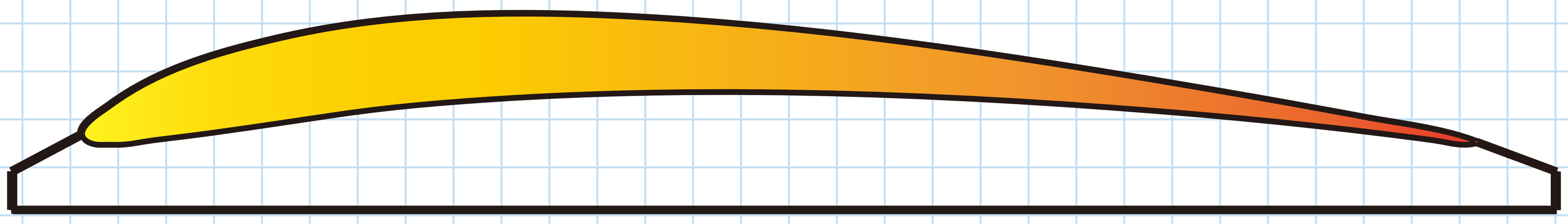
Width	770 mm	Weight	245.5 g
Length	900 mm	Wing Area	26.24 dm^2
Height	268 mm	Wing Load	9.36 g/dm^2

Noob2

Taiga.F

Tomoki.H

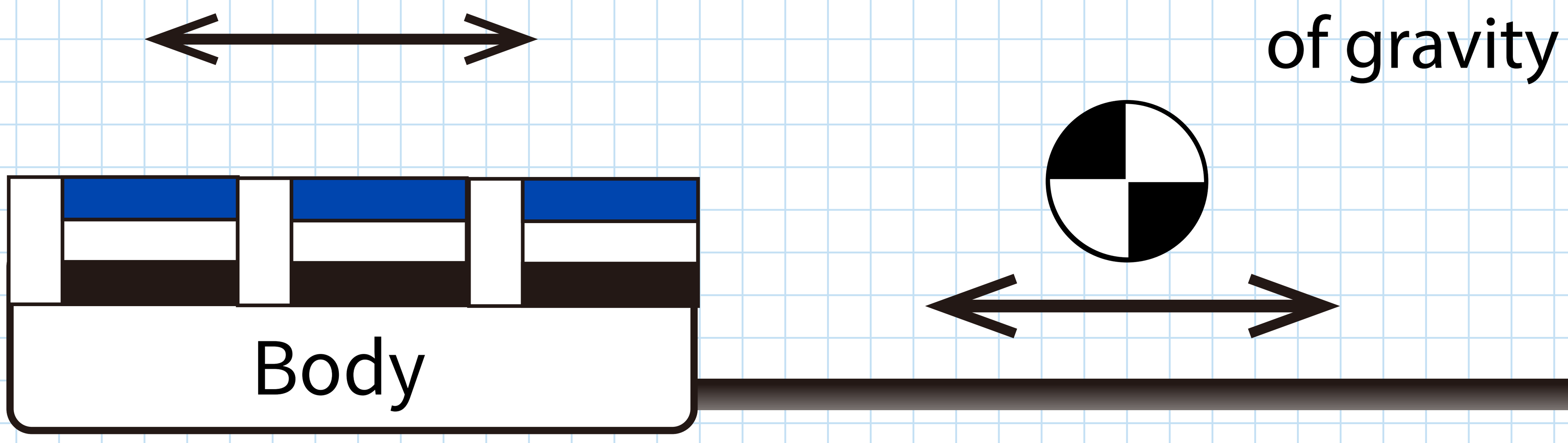
Airfoil

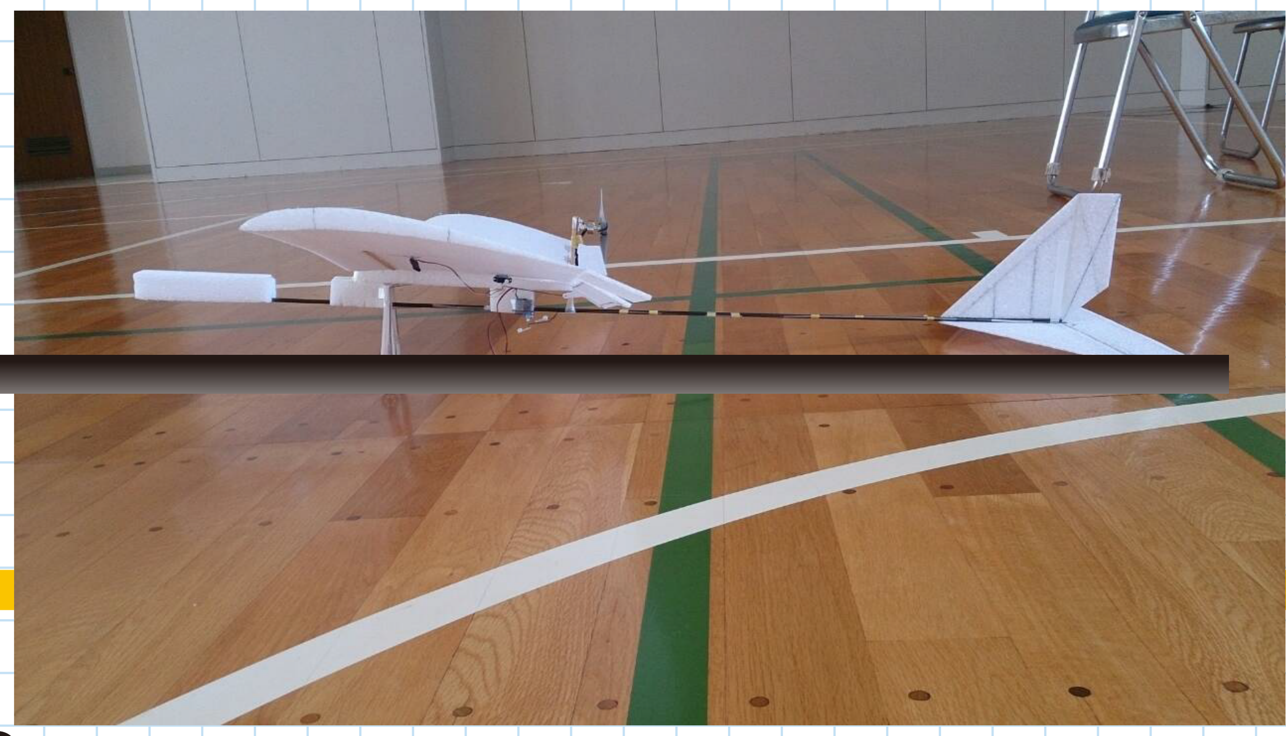


The airfoil is based off of the Benedek B6356b that is commonly used for hand launch gliders. By making the wings thin, we managed to reduce weight and air resistance.

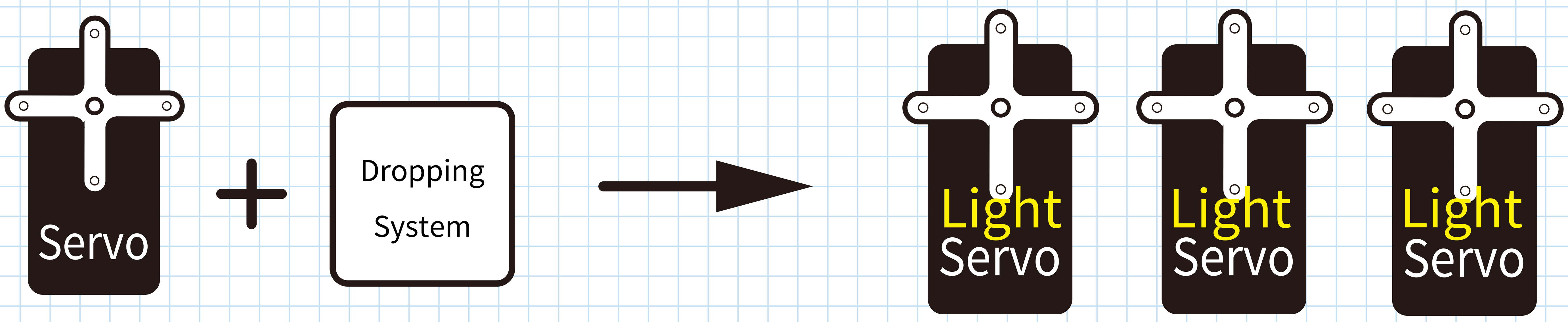
Pyroad

Also, by extending the nose we made the center of gravity adjustable using the pay load.

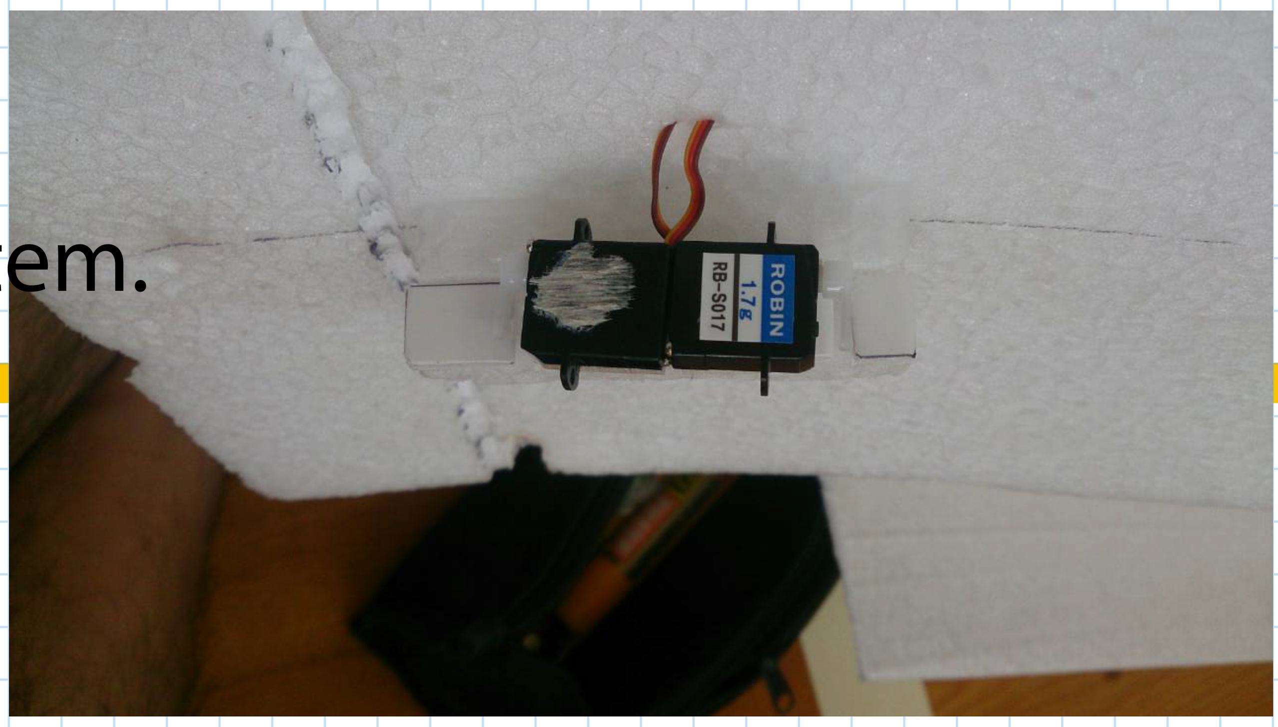




Dropping System



For the dropping system, we used one servo for each drop object, and improved the accuracy of the movement and reduce the weight of the system.



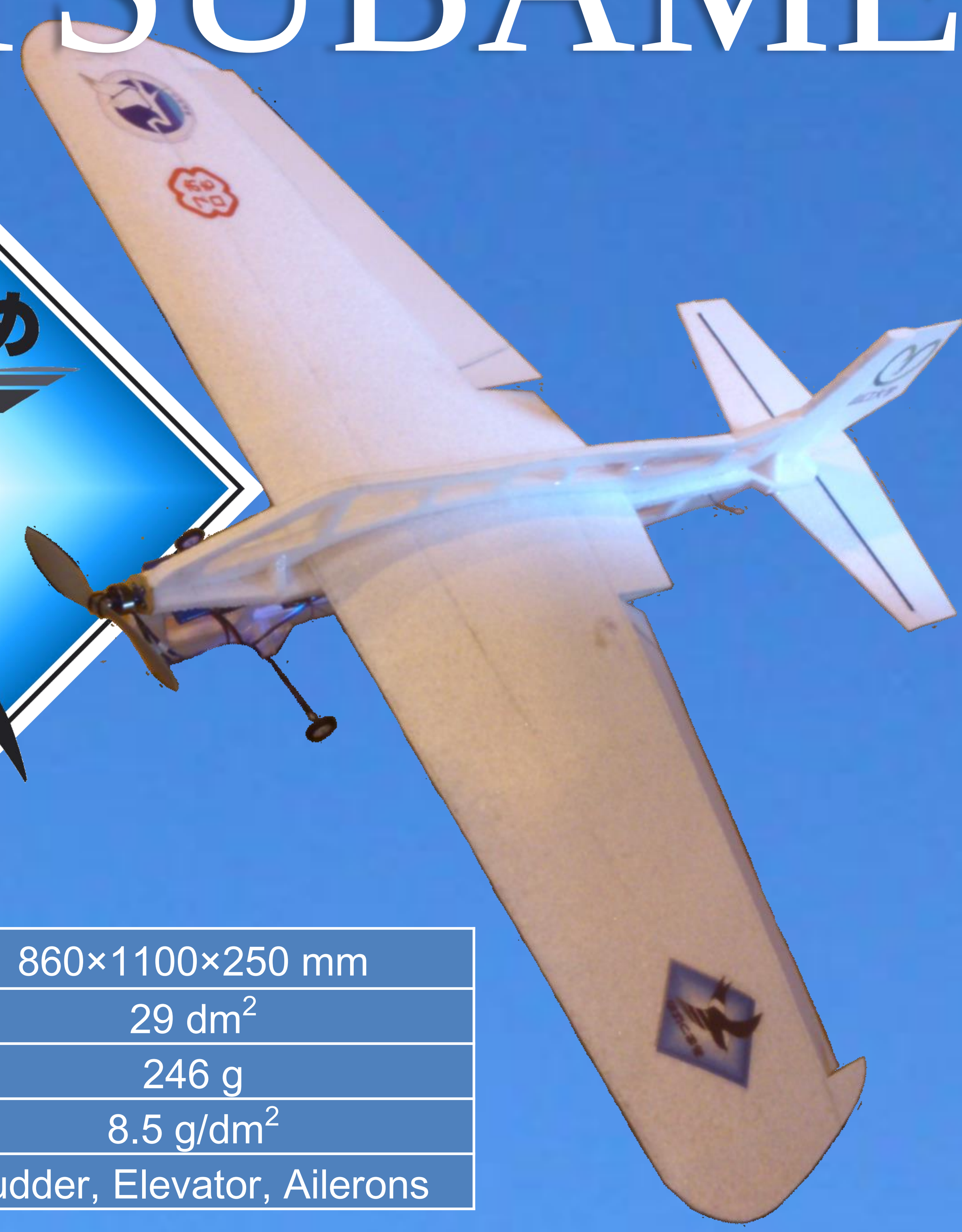
Specification

Length	mm	Wing area	dm²
Span	mm	Empty Weight	g

NIT, Toyota College

AMATSUBAME

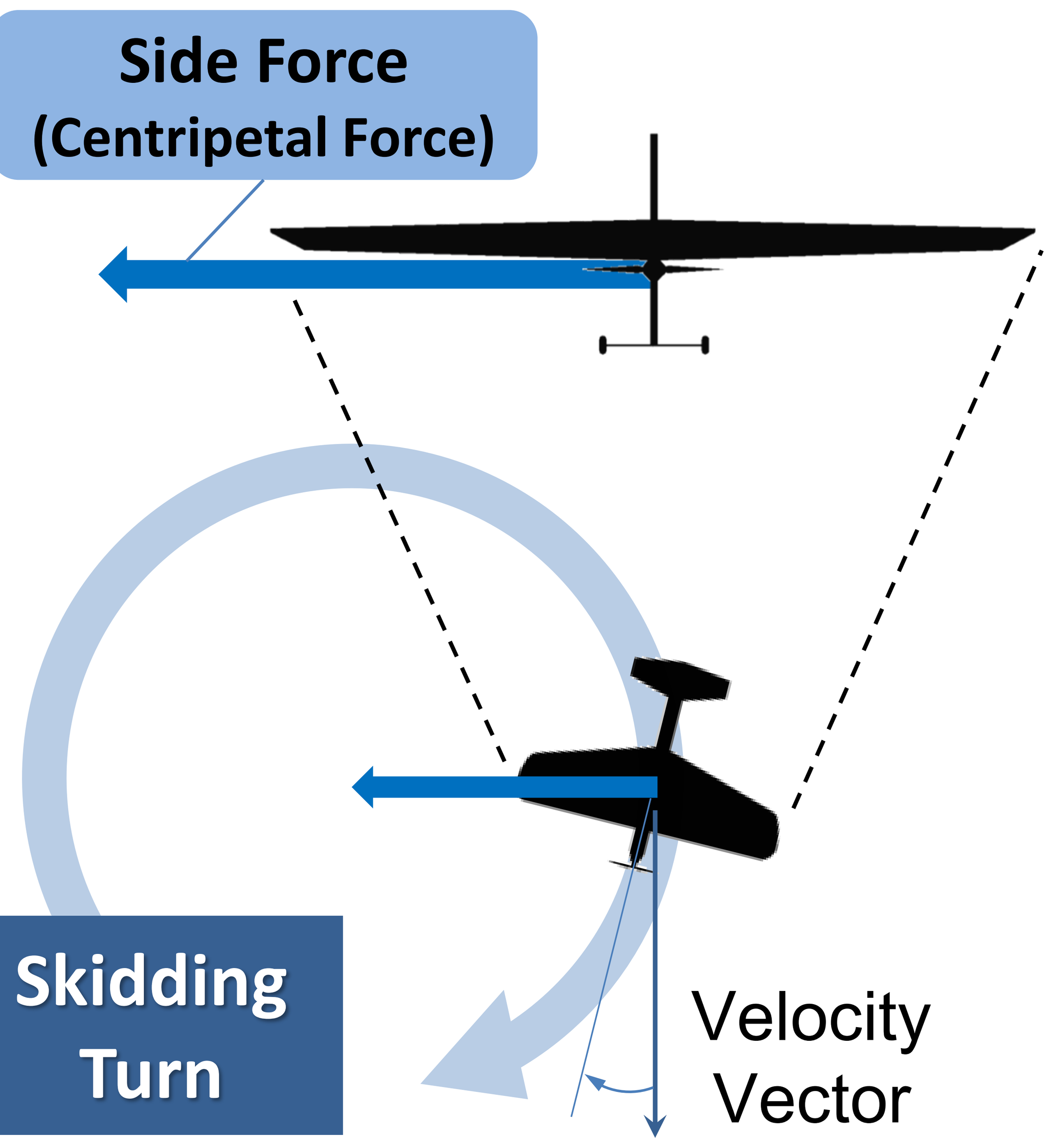
あまつばめ



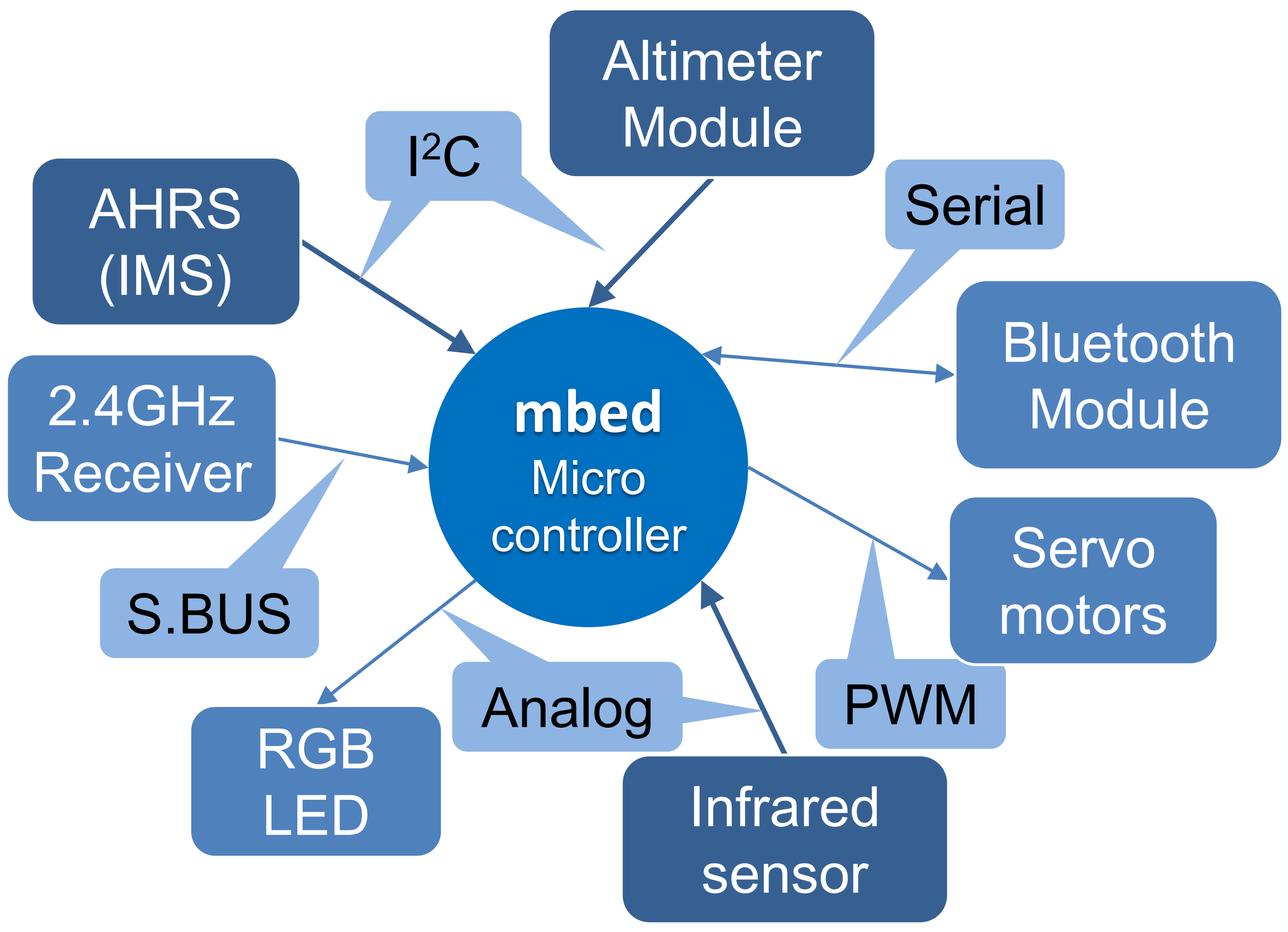
Length × Width × Height	860×1100×250 mm
Wing Area	29 dm^2
Empty Weight	246 g
Wing Loading	8.5 g/dm^2
Control Surfaces	Rudder, Elevator, Ailerons

FLAT TURN

TURNING WITHOUT BANKING



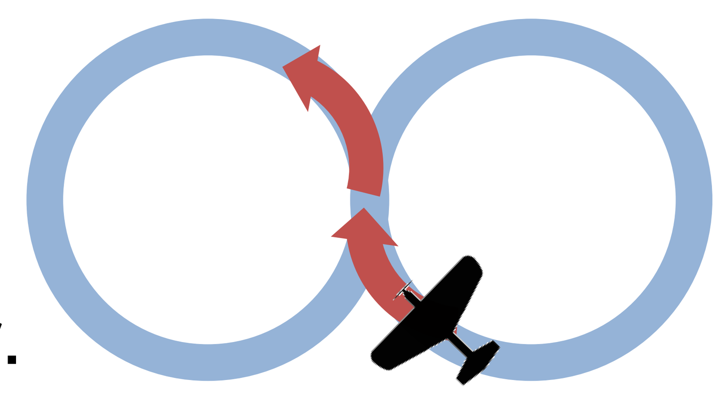
AVIONICS



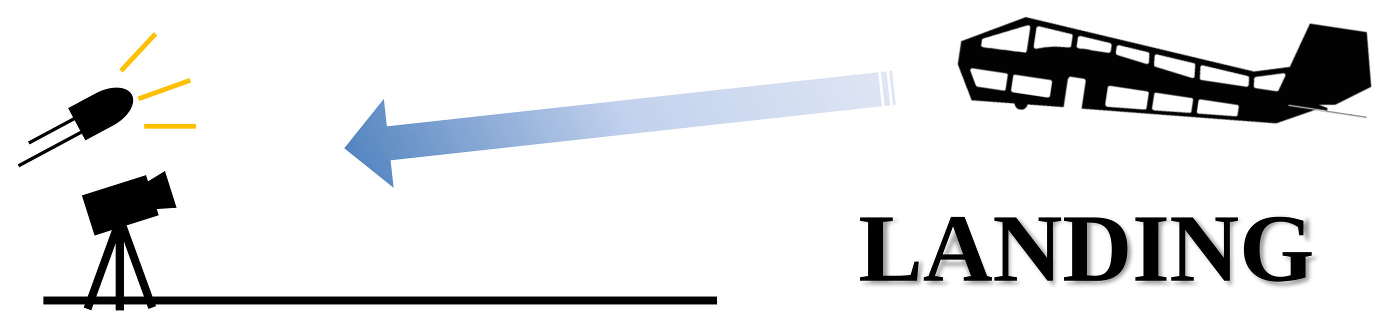
AUTOPILOT

8 AROUND PYLONS

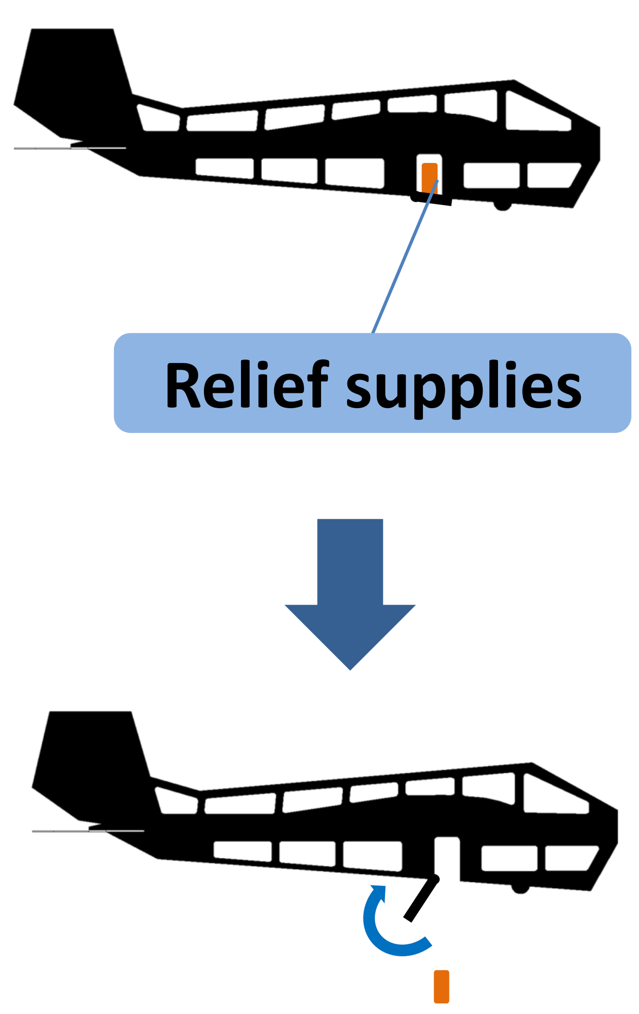
The airplane can quickly change heading by rudder.



Optical Landing Control + **IR Homing**



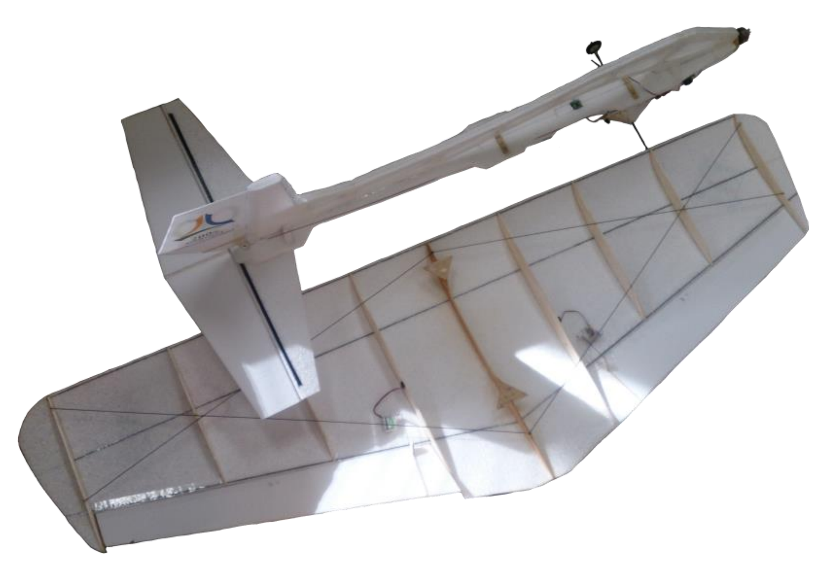
DROPPING



TRANSPORT

QUICK DISASSEMBLY

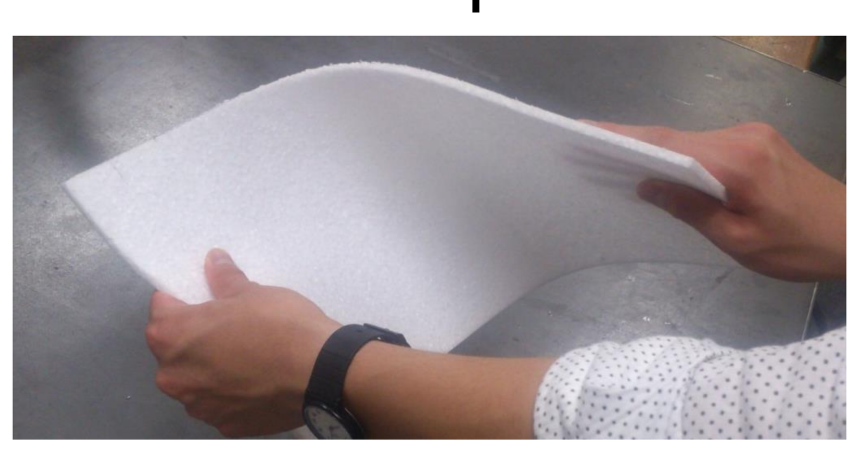
The fuselage and wing can be easily disassembled for transport.



SAFETY

EPP (Expanded Polypropylene)

The body frame and wing are made of soft plastic foam material that will absorb the impact.

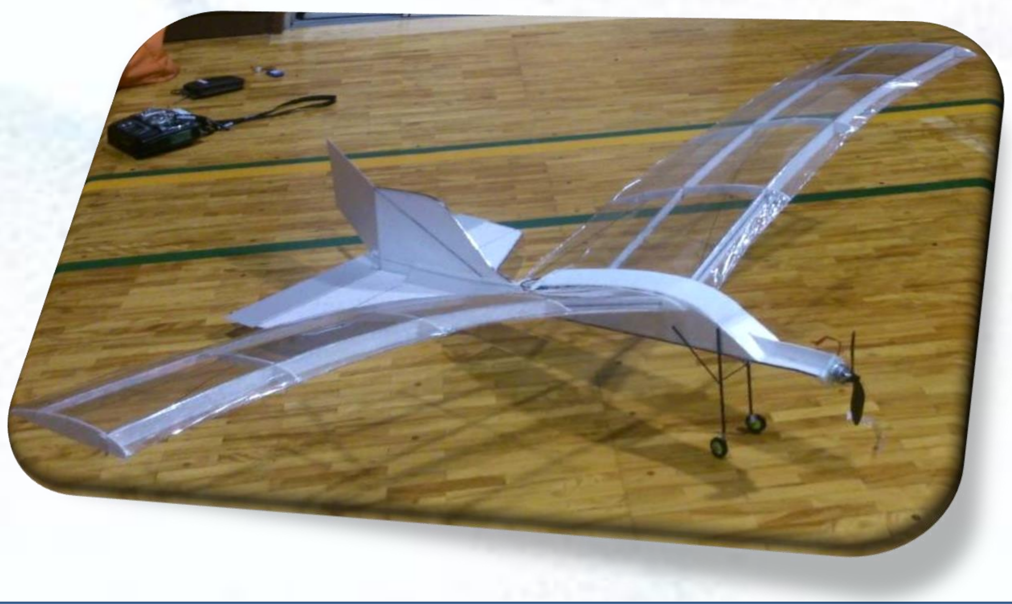


YAMAGUCHI UNIVERSITY

DEN-NO HIKO 2015 (Autopilot)
Sugano Yusuke, Shibata Mitomu, Tajima Yuichi

T-SPARROW2015

Tottori university



Concept ①High Gliding Capacity ②High Strength ③Excellent Serviceability

How to design

Estimate weight and velocity

↓

Determine wing area

↓

Determine parameter of a tail wing

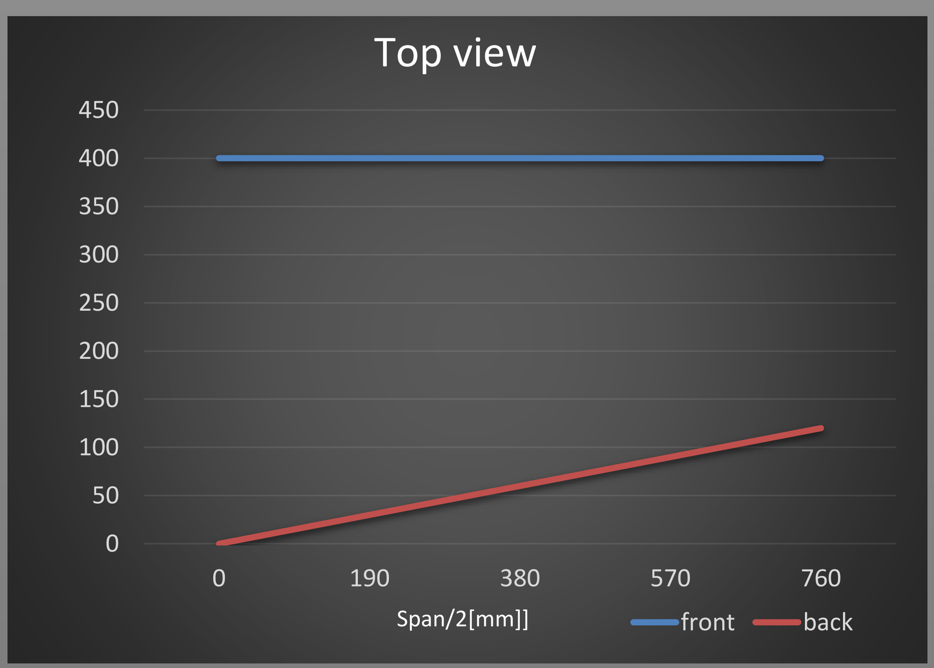
How to make

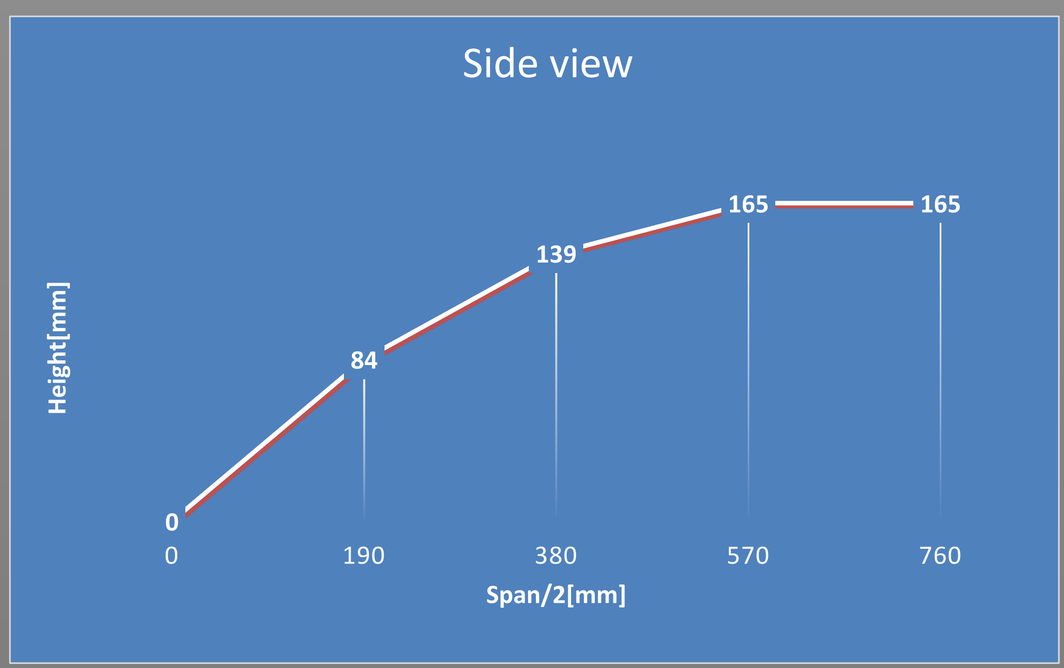
We use parts stuck EPP with Carbon sheet for strength and light.

Arced main wing

Dihedral of the main wing has multistage. It being approximately represented as Arced main wing.

The following table shows specification about main wing of multistage dihedral.





Equivalent dihedral: 7[deg]

Spec

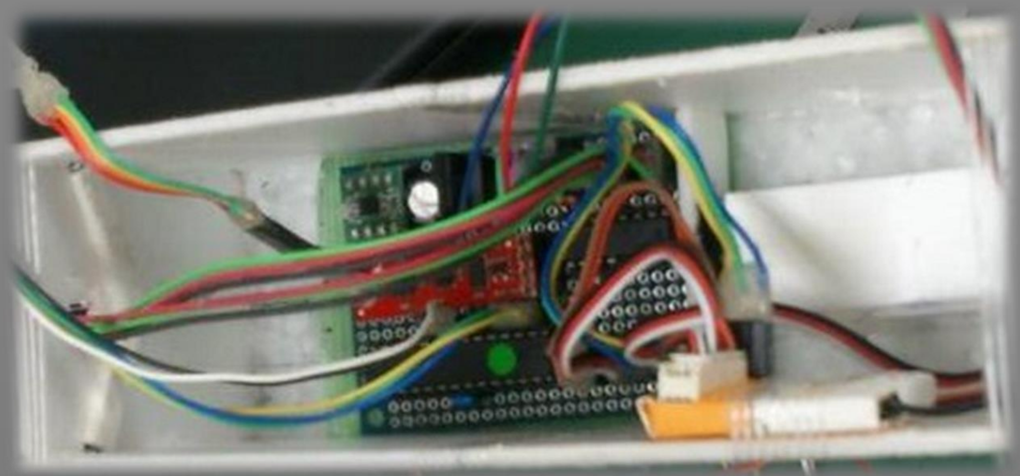
Weight:246[g]

Length:1180[mm]

Span:1500[mm]

Safety

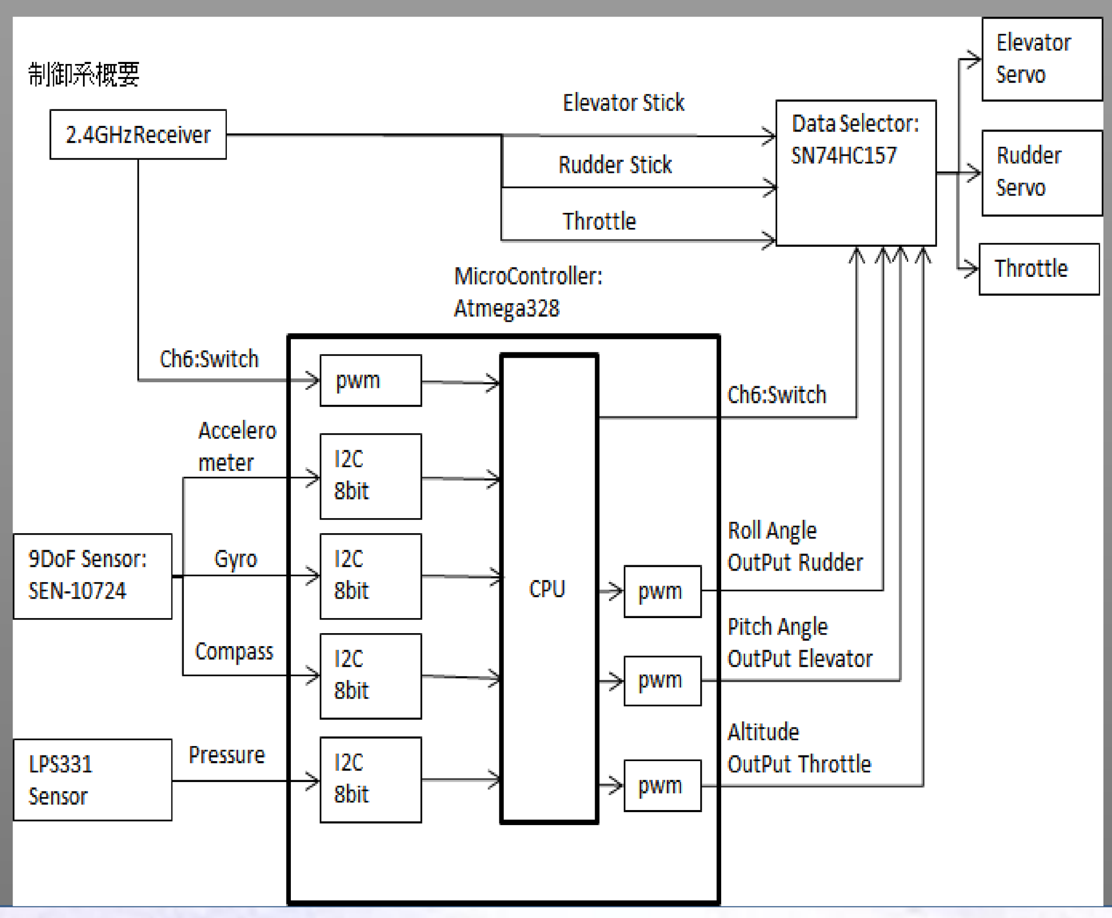
The load are built in the body so as not to scatter them.



Automatic control system

The attitude angle and the altitude of aircraft are estimated with four sensors: Compass, Accelerometer, Gyro and barometric altitude.

Ch6	OutPut	Mode
Low	Elevator Rudder Throttle	Manual Control
High	Elevator_U Rudder_U Motor_U	Automatic Control



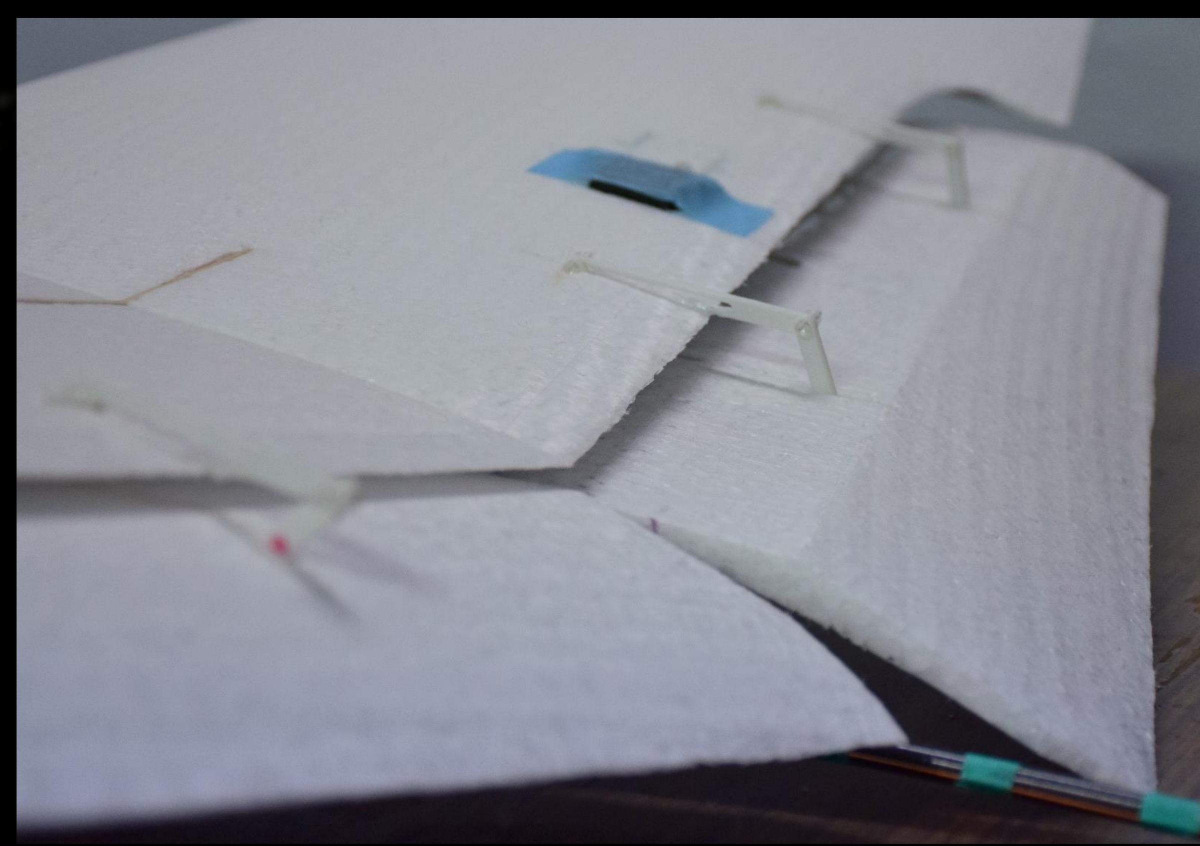
FireStar

Concept

"Firestar" has both strength and lightness. We can fly it easily by both manual operation and automatic control.

Flap

By using fowler flap, we get our plane have more capability to load and fly more slowly. When we make flap, we succeed in keeping durability by using original cutting method.



Design method

We use 3D-CAD to design aircraft accurately. We achieve making aircraft in short term by making wing and body separately. By using genetic algorithm, we make original wing.

Product method

Body is made of carbon. Wing is made by cutting mass of styrene foam. Motor mount and some parts are made by using 3D printer.

Safety

We decrease the impact of collision by weight saving, and also we lower the possibility of injury by doing away with sharp parts.

Auto-pilot system

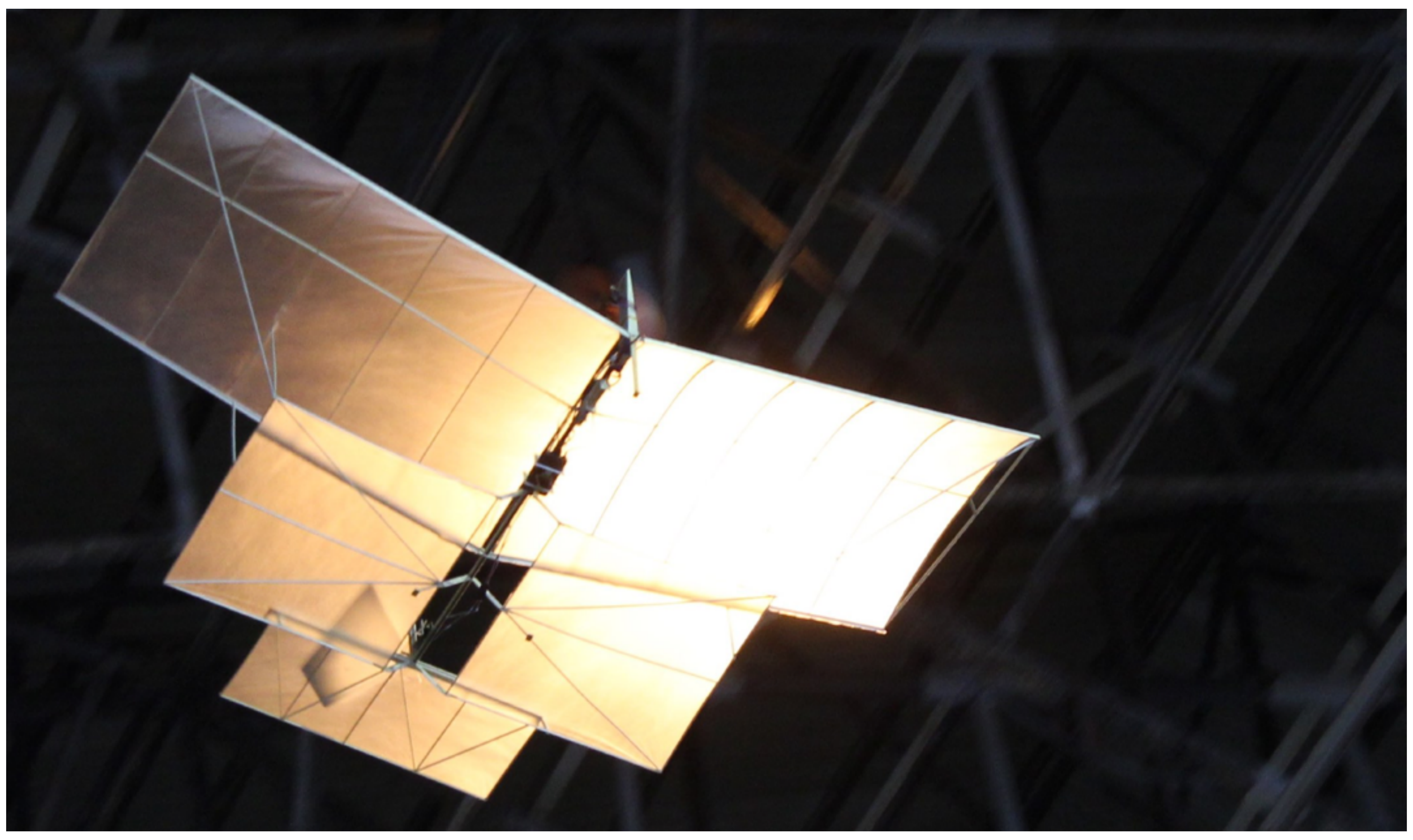
Original automatic control board "SkipperS" became smaller and lighter than last year. It equips gyro, acceleration, compass, atmosphere censor. We used mbed and reduced term of developing.

specification

Length	930 mm
Width	1180 mm
Height	175 mm
Weight	143.4 g
Wing Area	28.45 dm^2
Wing Load	5.63 g/dm^2

Pegasus *"How big can an idea be?"*

Team crew
Fukaya Temma, Yoshioka Yuma, Sugawara Takuto, Kurosawa Michito, Saito Shogo
Advisor
Konda Yoshinori, Masamitsu Wakoh



20 gr +LIGHTER AIRFRAME

Although Weight is not everything,
we removed 20 grams anyway.
Lightness brings best performance.

20 % +STIFFER STRUCTURE

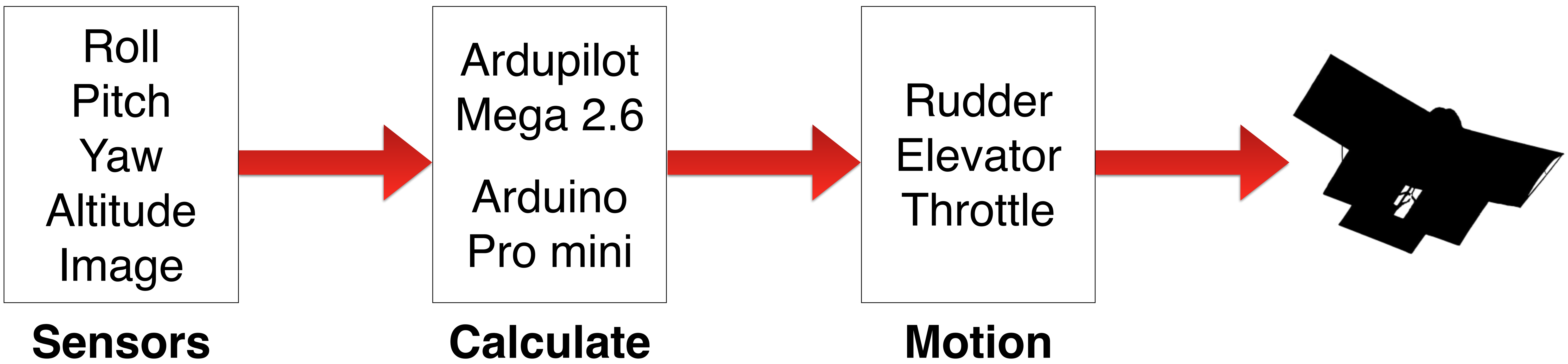
Pliable structure brings distortion.
Rigid structure may hurt a person,
So we improved assembling method.

25 % +QUICKER MOVEMENT

Quick movement brings safety.
However, restive horse may lose control,
So we improved controllability.

25 % +IMPROVED AUTOPILOT

Software and hardware made for each other.
Necessary minimum number of sensors simplify Autopilot.
Two microcomputers share work of Autopilot and Autoland.



Kanazawa Institute of Technology
DreamLab UAV Project

EAGLE12

Team members :
Tomoki Kawanaka ,Takuya Kataoka
Hiromu Takatsuka , Takayuki Nagawara
Fumiya Taga

Concept

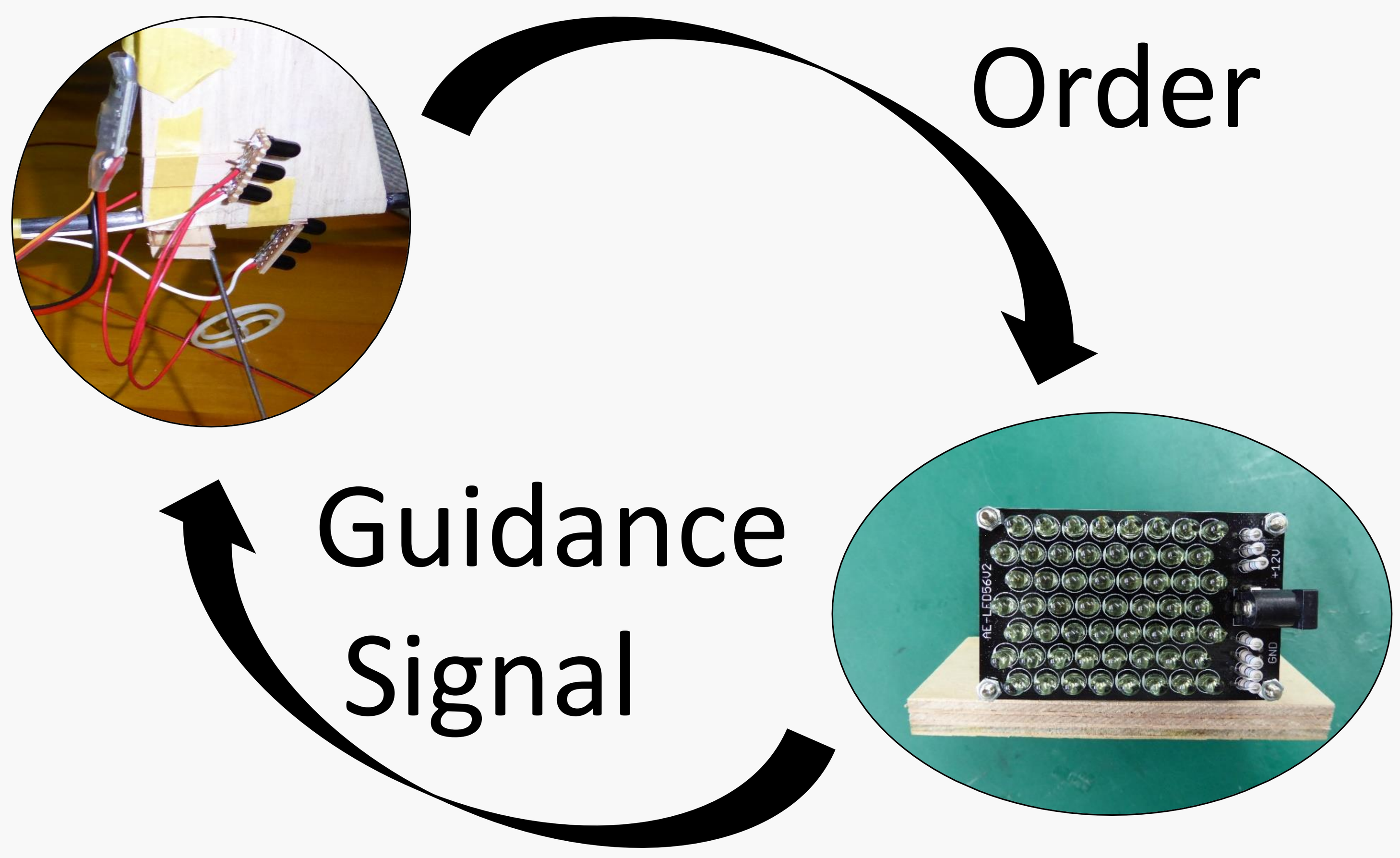
Stabilize flight and Achieve All missions

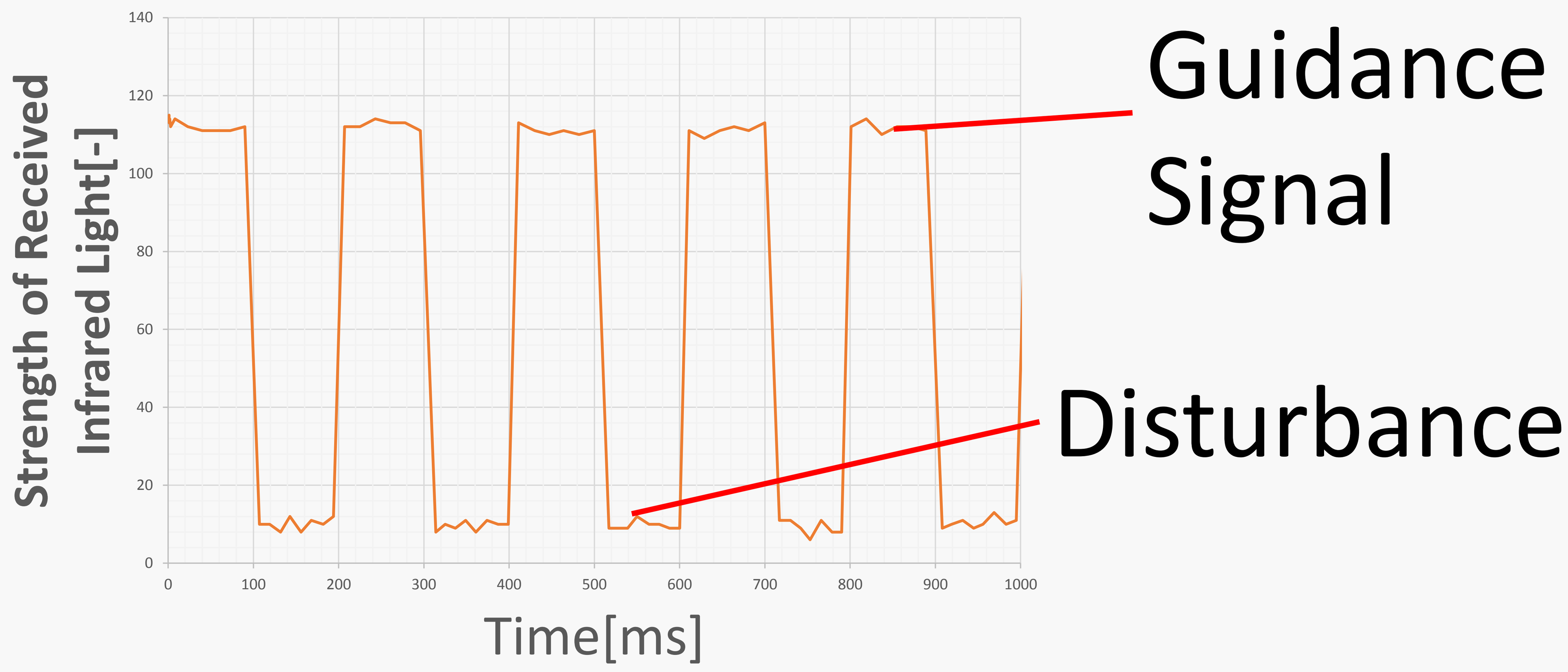
Flight Control Unit

- Enough processing speed to carry out all missions
- Adding optional equipment for auto landing

  Communicate Auto Landing System , Receive signals

  →To Separate Guidance Signal from Disturbance.





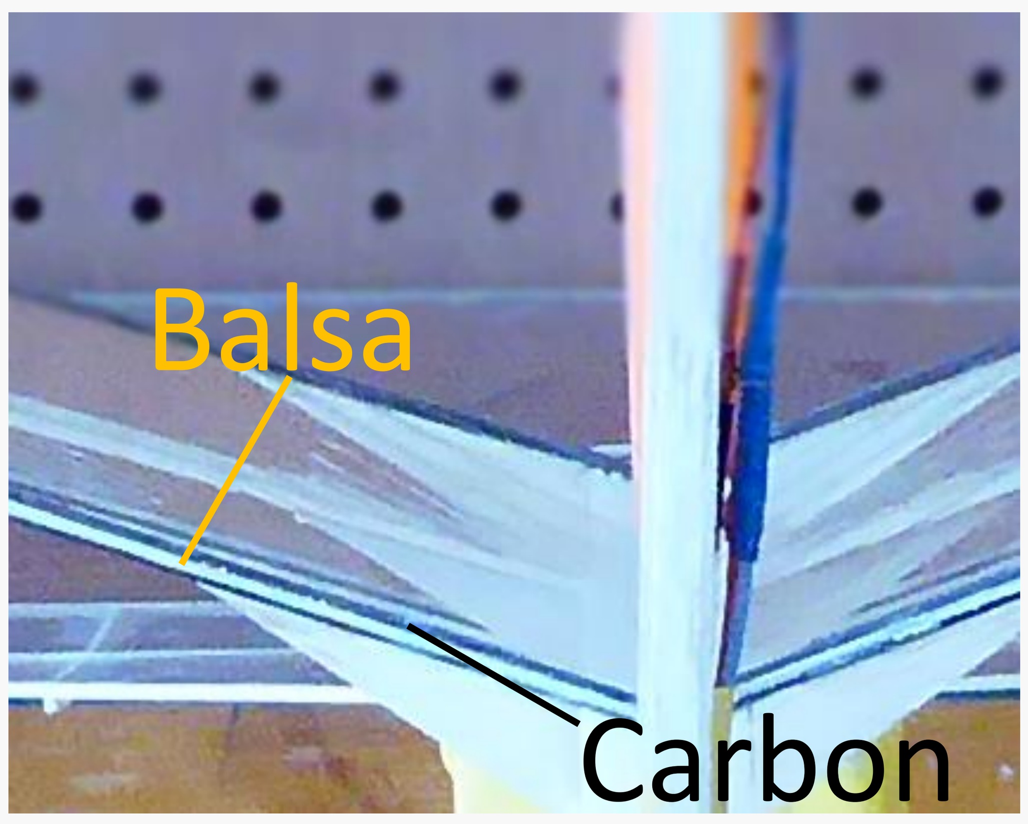
Design

Carry [Heavy FCU & Payload] ➡ HEAVY

- Increasing wing area

  Increasing Wingspan

  × Spar distortion decrease stability



- **CFRP Spar**

  To Prevent Wing distortion

- **Optimum Airfoil**
  - Optimum Glide time
  - To Achieve Enough Stability for Pilot