Flying Manta

Concepts

Main concept of “Flying Manta” is to carry and drop much heavier payloads than other aircrafts in the same weight class.
“Flying Manta” was characterized with four features to fulfill the concept.

- Lightness
- Large lifting force
- Dropping payloads
- High stability

Large lifting force

A main feature of “Flying Manta” is blending its fuselage and main wings together. In other words, the shape of its fuselage is same as main wings. Therefore, it enables to expand its wing area, and “Flying Manta” enables to have large lifting force.

Lightness

By cutting out unnecessary body of the back of fuselage and main wings for thinning and lightening, the weight of fuselage and main wings could be suppressed greatly. Thus, “Flying Manta” allows carrying 300 grams payloads that equals to carrying 15 chicken-ramen packs.

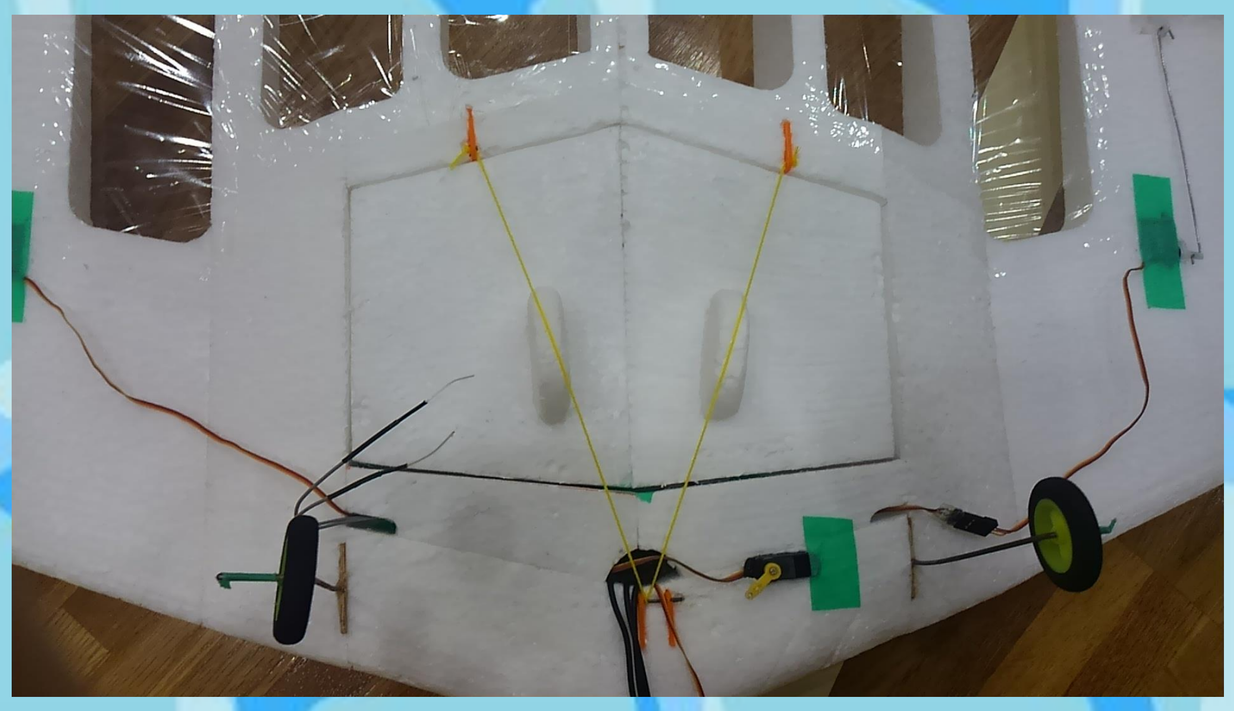
specification	
Length	1000 mm
Span	1100 mm
Empty weight	195 g
Wing area	34.1 dm^2
Wing load	5.72 g/dm^2

Dropping payloads

“Flying Manta” can drop payloads. A drop equipment is designed with 3D-CAD and consists of servomotor and 3D-printed components. In addition, payloads is contained inside the body before dropping it, and air resistance could be suppressed.

High stability

“Flying Manta” has the payload space under its Center of Gravity (CoG). Therefore, CoG don’t widely changes its position after dropping the payload. As a result, “Flying Manta” can maintain its stability.



Croissant

Concept

"*Croissant* flies like a bird"

How birds fly?

Each part of bird's wing has different functions. The inner part of the wings produces lift by working as a fixed wing, and the outer part produce thrust like a propeller (Figure1).

Bird's wings change the form through the up-down motion. When moving up, the wing is folded and the angle of attack is up, so it keeps up the thrust and produces lift (Table1).

Figure1. Wing's function

Table1. Change of attack of angle and wing form

	Attack of angle	Wing form
Down		
Up		

Specification

Width: 1005mm
Length: 388mm
Height: 147mm
Weight: 31g
Wing area: 15.6dm²

How to produce

The tail unit is made of sheets of EPP. All of the ABS resin parts are produced by 3D printers.

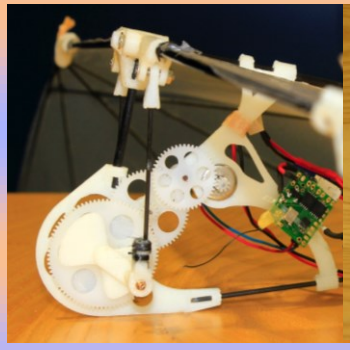
Safety

For human…

Croissant doesn't hurt human because all of the front parts are roundish.

For croissant…

Croissant is tough when it collides with something because the body frame protects spar gears and both of the wings and the tail units are flexible.



How to design

1. Wing: Light and flexible wing

The frame consists of 2mm carbon pipe and less than 1mm carbon rod in order to reduce the load of gears. The film of the wings is made of polyethylene film.

2.Gear frame: Strong frame to produce high torque

Brass pipes are used for bearings. Gear frames are made of ABS resin and carbon pipes connect these gear frames to reinforce them.

In order to move the wings by tiny motor, the gear ratio is set as 1/180. The frequency of the wing's motion is 3~4 cycles per second, and this number is almost the same as that of crow.

3. Electronic component: Light and easy to use

Motor: We use coreless motor, which don't require ESC. Its diameter is 8.5mm.

Battery: 130 mAh 1Cell lithium polymer battery

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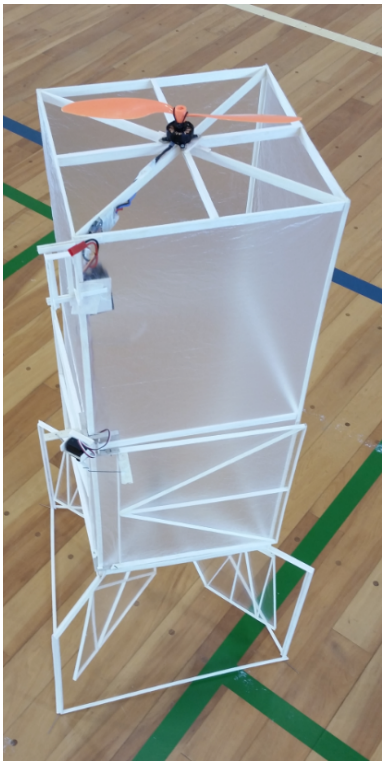
YDK-RR



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Concept

- Compact
- Like Drone
- High Energy Efficiency

Design

YDK-RR is quadrilateral flying robot.
It can take off and touch down vertically.
It has variable wings expanding under the main wing.
The stability of the horizontal flight is improved.
YDK looks like Kanto, a traditional event in Akita.

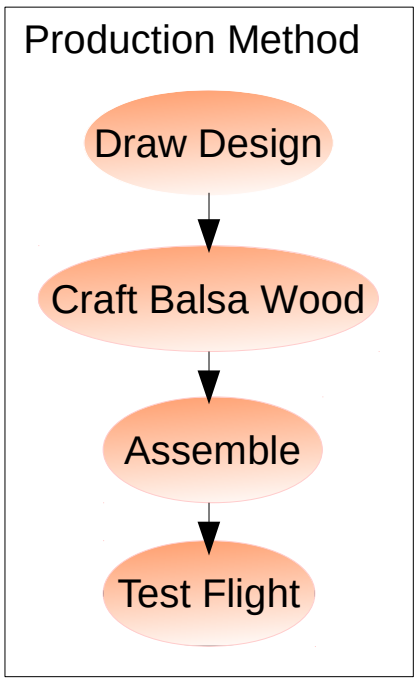
Safety

Since YDK is made of soft balsa, it's too soft to injure someone.

Story

The first YDK was squidish and not efficient enough.
We put the propeller on the top of body, then efficiency was improved.

Production Method



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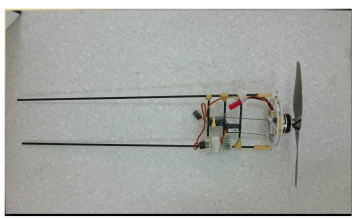
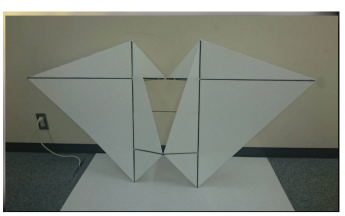
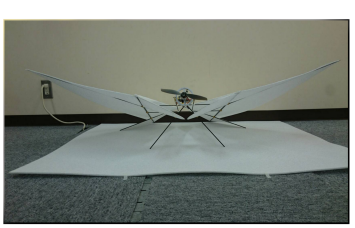
Improvement of the maintainability by modularization



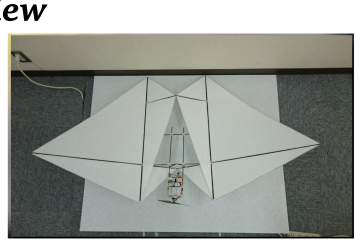


The maintainability was improved by dividing the airframe into two part; a power unit and a wing part. Moreover, its position of the centre of gravity can be change by changing the mounting position of power unit. Luggages can be placed on the midsection.



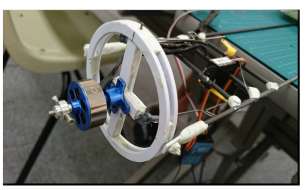
front *view*

side view



top view

Thrust vectoring system



The flying robot is controlled by moving gimbal. Moreover, this system enabled us to put some servomotor into one place.

Wings made from EPP

EPP is light, tough and it is easy to glue. So, the wing is wide and tough.

specification

Length: 800mm wing area: 78dm^2
span: 1920mm Empty Weight:196.0g