Tohoku University

Windnauts

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What is Windnauts?

- We make the human powered aircraft (HPA) for participating in the Birdman rally at Biwa lake.
- We compete distance from taking off to landing on the water surface.
- In 2018, 50 members belonged to our team.

Official name	**Human-powered flight club**
Team name	**Windnauts**
Starts	**1993**
Number of people in each grade (1/2/3)	**21/14/15**

Activity Location of Windnauts

Test Flight (Tohoku Univ.)

Workshop

We make the HPA and test flight it at Tohoku Univ. Kawauchi Camps.

Sendai Station

Tohoku Univ.
Kawauchi Camps

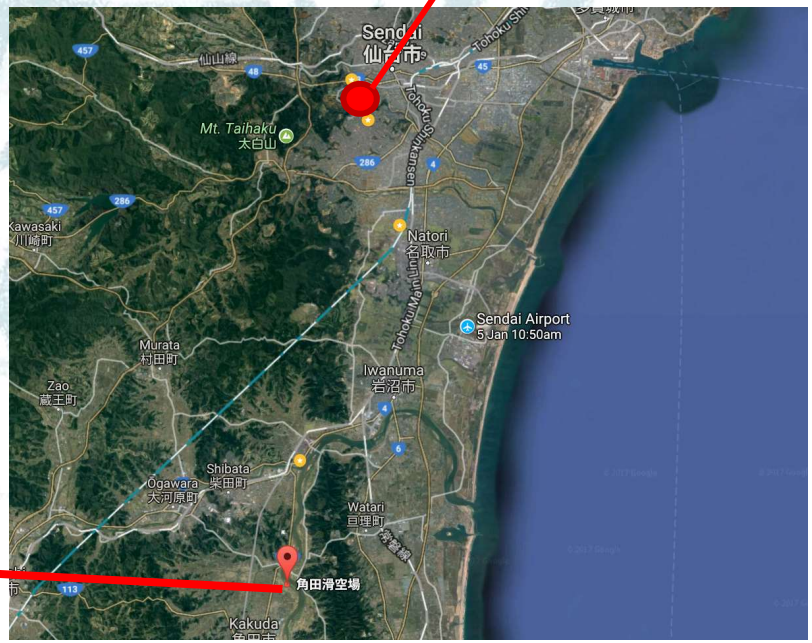
Tohoku Univ.
Katahira Camps

Activity Location of Windnauts

- The distance of runway in Camps is short.
- So we also take test flight at Kakuda Gliding Field on every weekend.(in May ~ July)

Kakuda Gliding Field

Tohoku Univ.



The Process to Competition

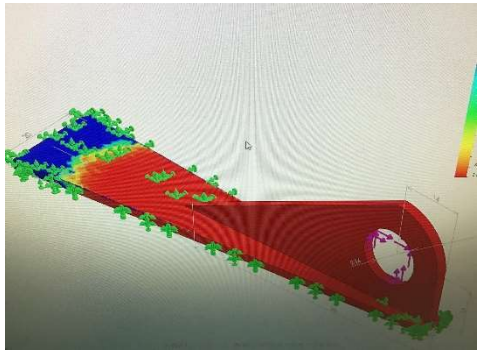
Test Flight

Competition

Making

Load Test

Design



Design concept

Our Design concept is

“ Escape from Strong Wind quickly”

In competition , we must fly in tough climate

- High temperature. (more than 33℃)
- Very strong wind. (3~4 m/s)

So we designed

High Speed and Easily control aircraft

機体諸元

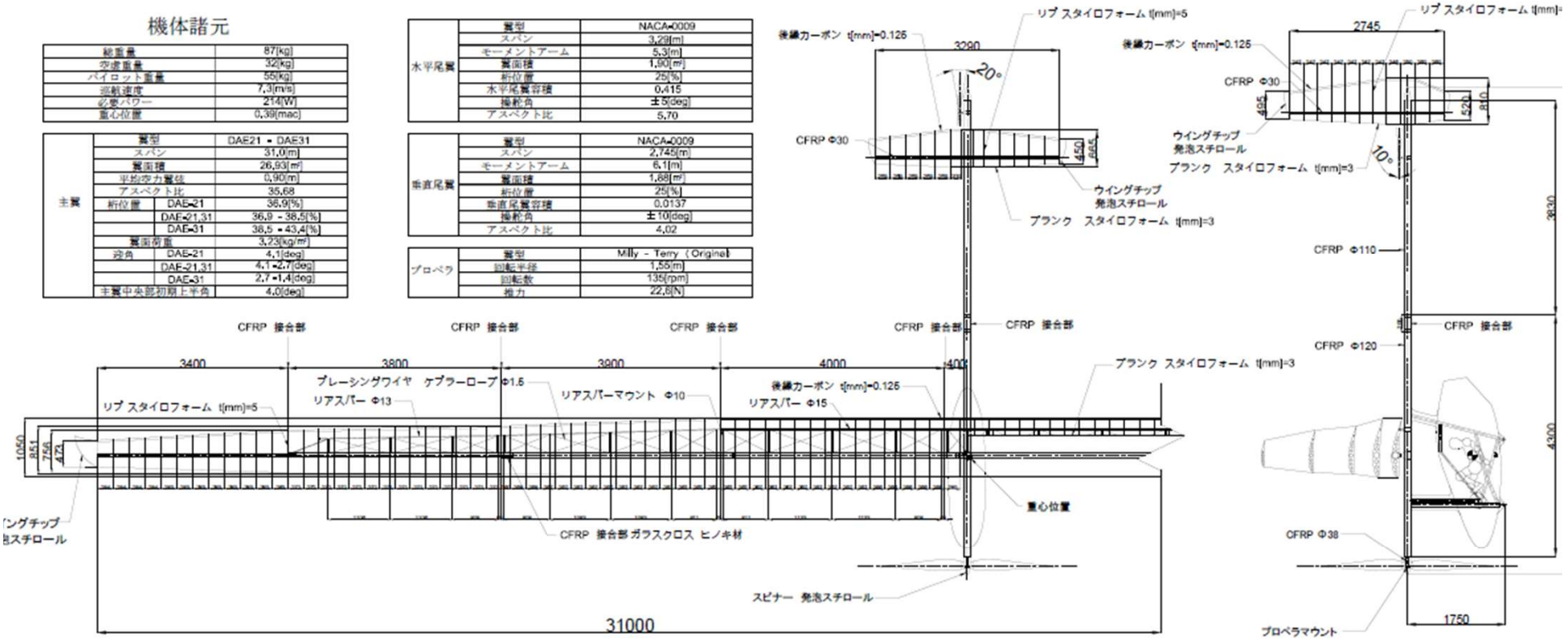
総重量	87[kg]
空虚重量	32[kg]
パイロット重量	55[kg]
巡航速度	7.3[m/s]
必要パワー	214[W]
重心位置	0.39[mac]

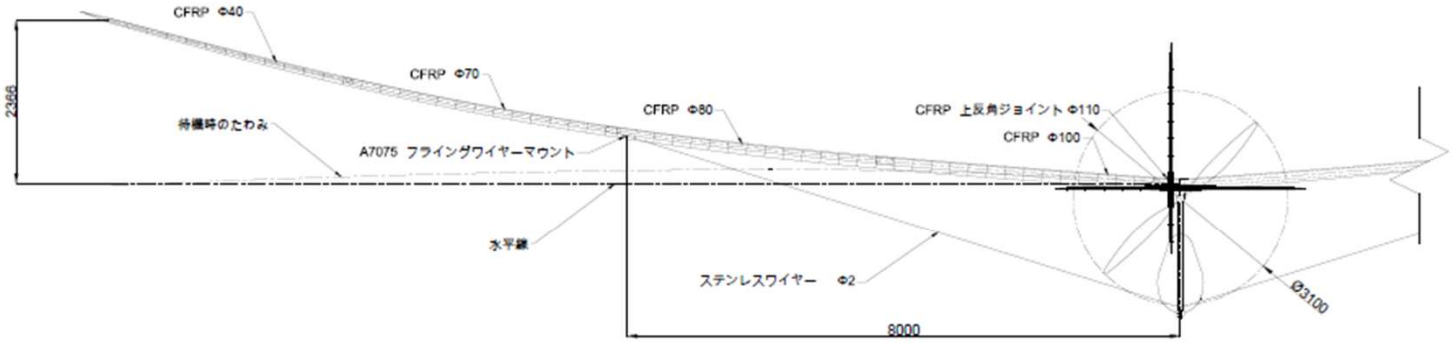
主翼	翼型	DAE21 - DAE31
	スパン	31.0[m]
	翼面積	26.93[㎡]
	平均空力翼弦	0.90[m]
	アスペクト比	35.68
	桁位置 DAE-21	36.9[%]
	DAE-21,31	36.9 - 38.5[%]
	DAE-31	38.5 - 43.4[%]
	翼面荷重	3.23[kg/㎡]
	迎角 DAE-21	4.1[deg]
	DAE-21,31	4.1~2.7[deg]
	DAE-31	2.7~1.4[deg]
	主翼中央部初期上半角	4.0[deg]

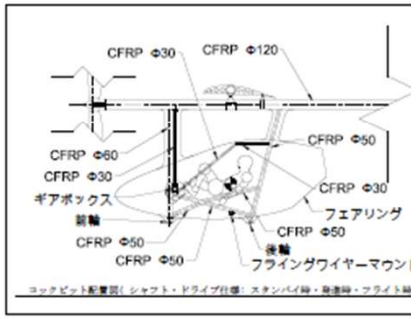
水平尾翼	翼型	NACA-0009
	スパン	3.28[m]
	モーメントアーム	5.3[m]
	翼面積	1.90[㎡]
	桁位置	25[%]
	水平尾翼容積	0.415
	操舵角	±5[deg]
	アスペクト比	5.70

垂直尾翼	翼型	NACA-0009
	スパン	2.745[m]
	モーメントアーム	6.1[m]
	翼面積	1.68[㎡]
	桁位置	25[%]
	垂直尾翼容積	0.0137
	操舵角	±10[deg]
	アスペクト比	4.02

プロペラ	翼型	Milly - Terry（Original）
	回転半径	1.55[m]
	回転数	135[rpm]
	推力	22.8[N]







東北大学Windnauts 2018
第41回鳥人間コンテスト選手権大会
プロペラ機ディスタンス部門出場機体

遥かなる空へ夢を紡げ

紬 Tsumugi

チーム名	東北大学Windnauts	機体名	紬
パイロット	越野陽也	尺度	1:2
設計	藤井哲也	投影法	三角

Making

We have 7 teams, and each team makes components in charge.

Wing Team

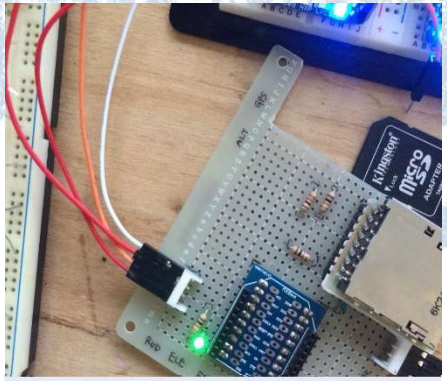
Fairing Team

Cockpit Team

Propeller Team

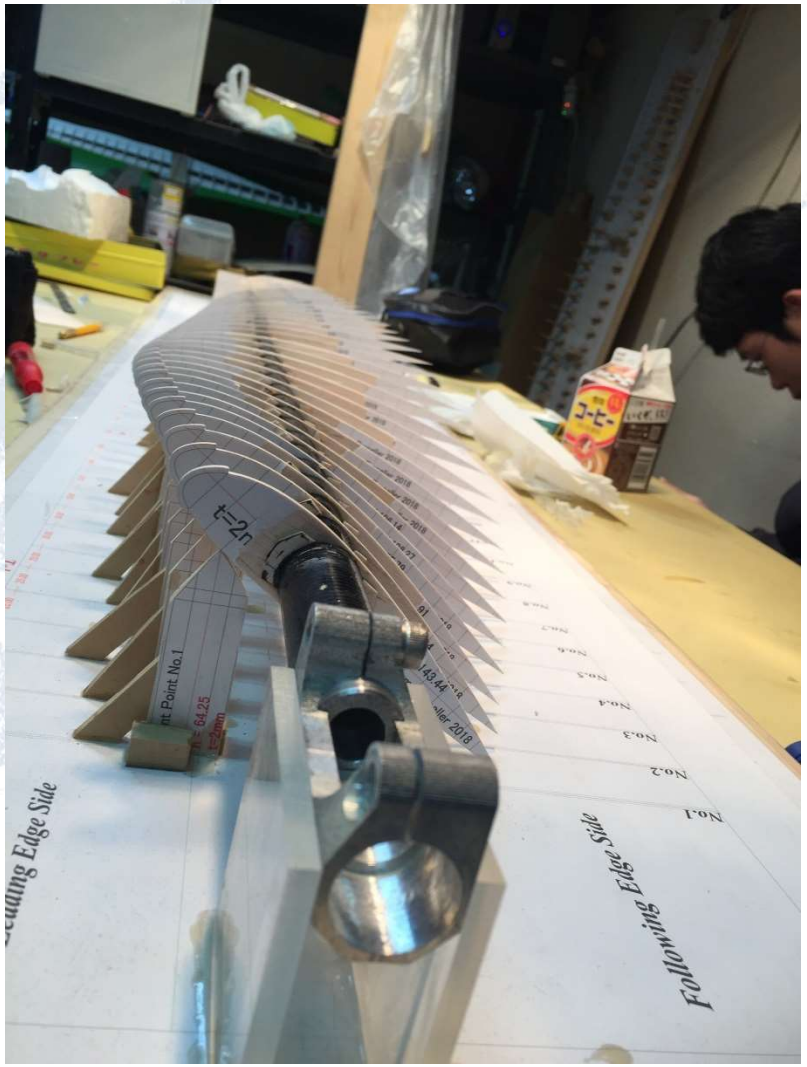
Steering Team

Drive Team



Avionics Team

Making Scenery



Making Scenery

Load Test

To check strength of wing beam

Take a load $1\frac{1}{2}$ times as much weight as steady flight.

Test Flight

The purpose of Test Flight is…

- Training of the pilot and the members.
- Check-up of assembly correctness.
- Training of airplane handling.

Test Flight at Kawauchi camps

The main purpose is checking safety of the aircraft and flight short distance.

	Date	purpose
1st	June.5	Assembly and Running test
2nd	June.7	Assembly and Running test
3rd	June.9	Center of gravity measurement
4th	June.15	Elevator test
5th	June.17	Elevator test
6th	June.19	Elevator and ladder test
7th	July.1	Elevator and ladder test
8th	July.8	Elevator and ladder test
9th	July.17	Take off practice

Test Flight at Kawauchi camps

Test Flight at Kakuda

- The main purpose is training of airplane handling.
- Flight relatively long distance and high speed

	Date	Purpose
1st	June.23	▸Assembly and Running test ▸Center of gravity measurement ▸Elevator and ladder test
2nd	July.16	▸Final Confirmation of Aircraft ▸Steady Flight

Test Flight at Kakuda

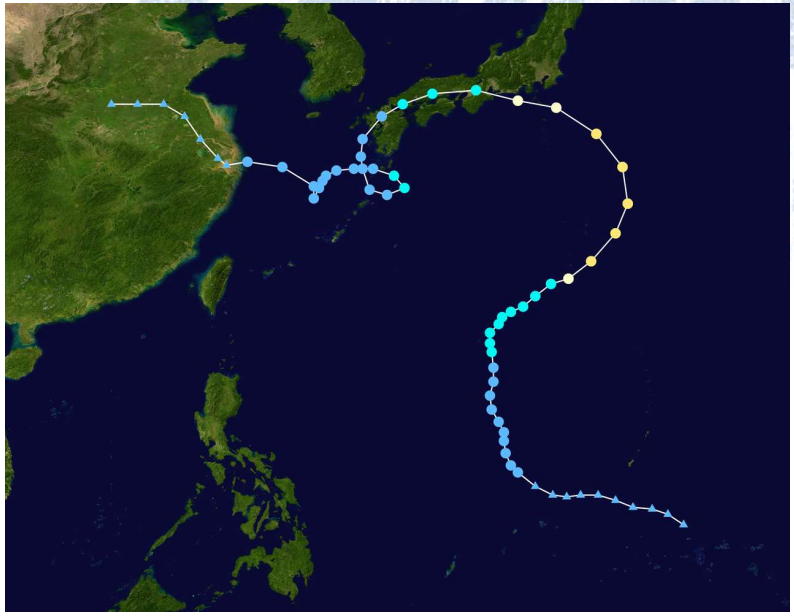
Taking off
(The Birdman Rally 2018)

Broke the wing

landing on the water

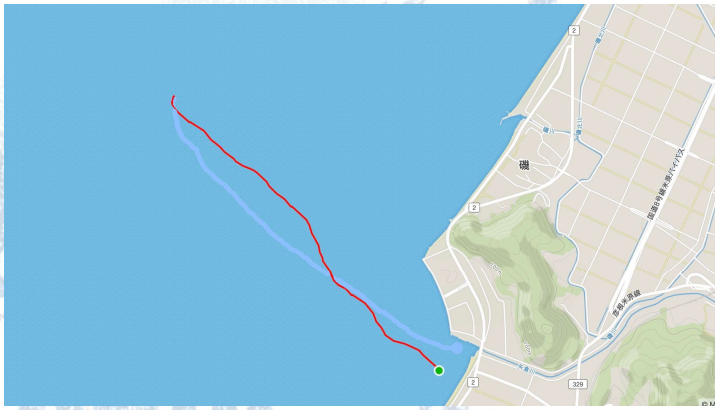
Typhoon coming

- The strong typhoon No.12(Jongdari) landed on Japan and hit the competition
- Very strong wind was blowing at the venue
- After 4teams flighted, the organizer announced discontinuance of the competition



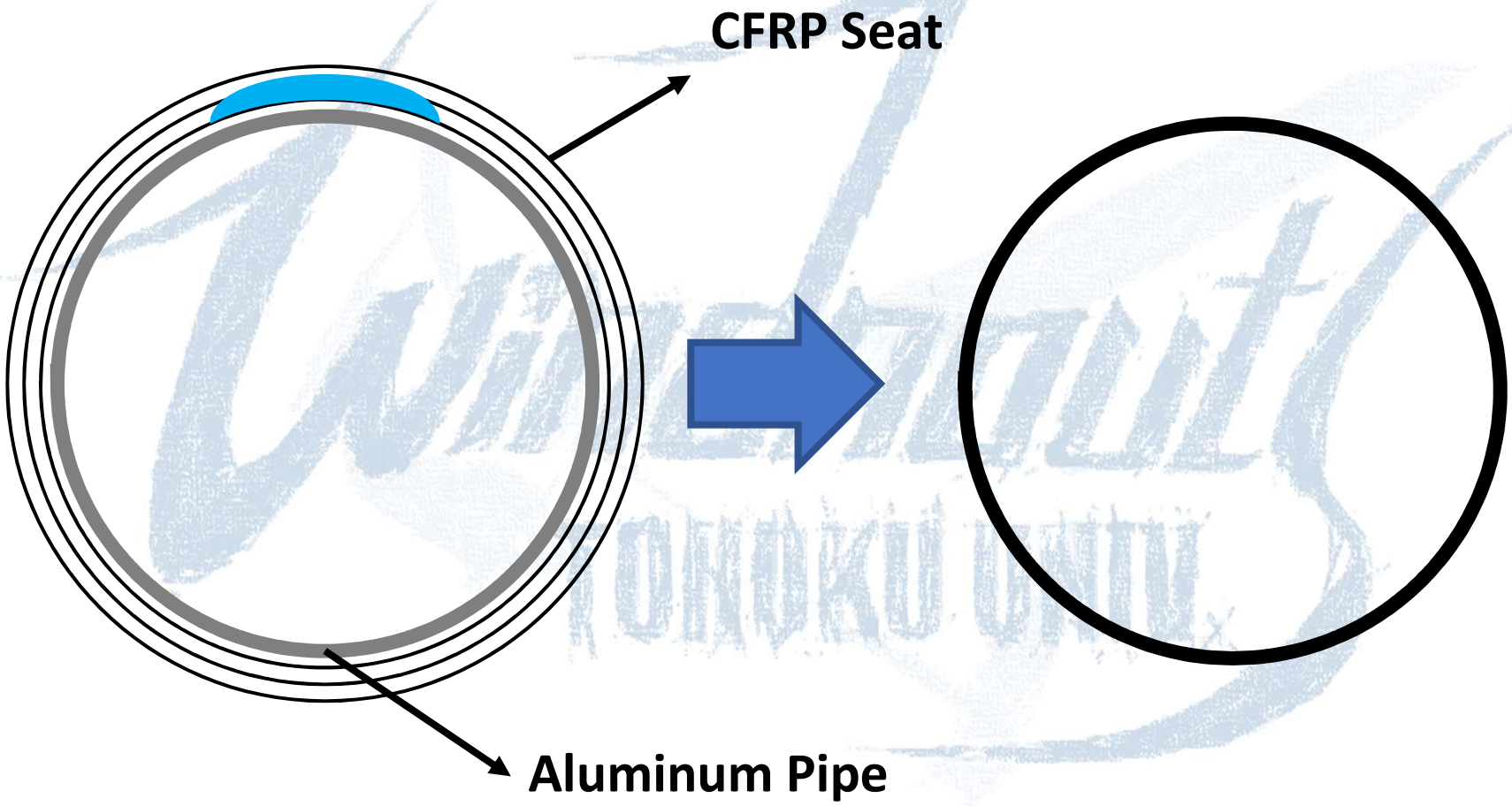
Result of The Competition

- Date：July. 28, 2018
- Rank: failure (1st in flighted teams)
- Flight distance: 2,347.58 [m]



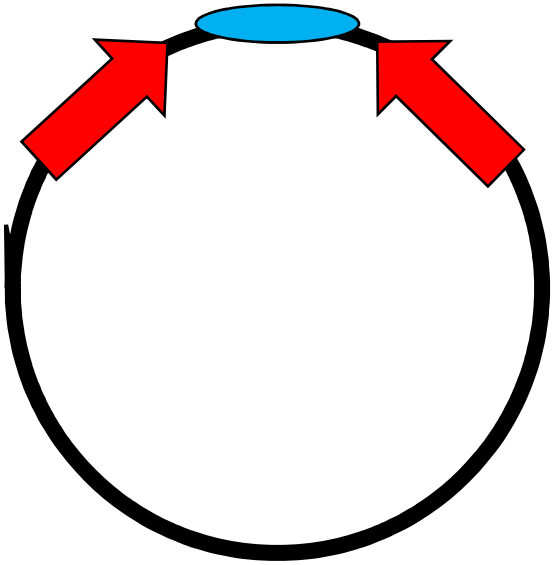
Rank(preliminary)	Team	Record[m]
1	Windnauts(Tohoku univ.)	2348
2	The University of Electro-Communications	470
3	Nihon univ.	146
4	Osaka Institute of Technology	112

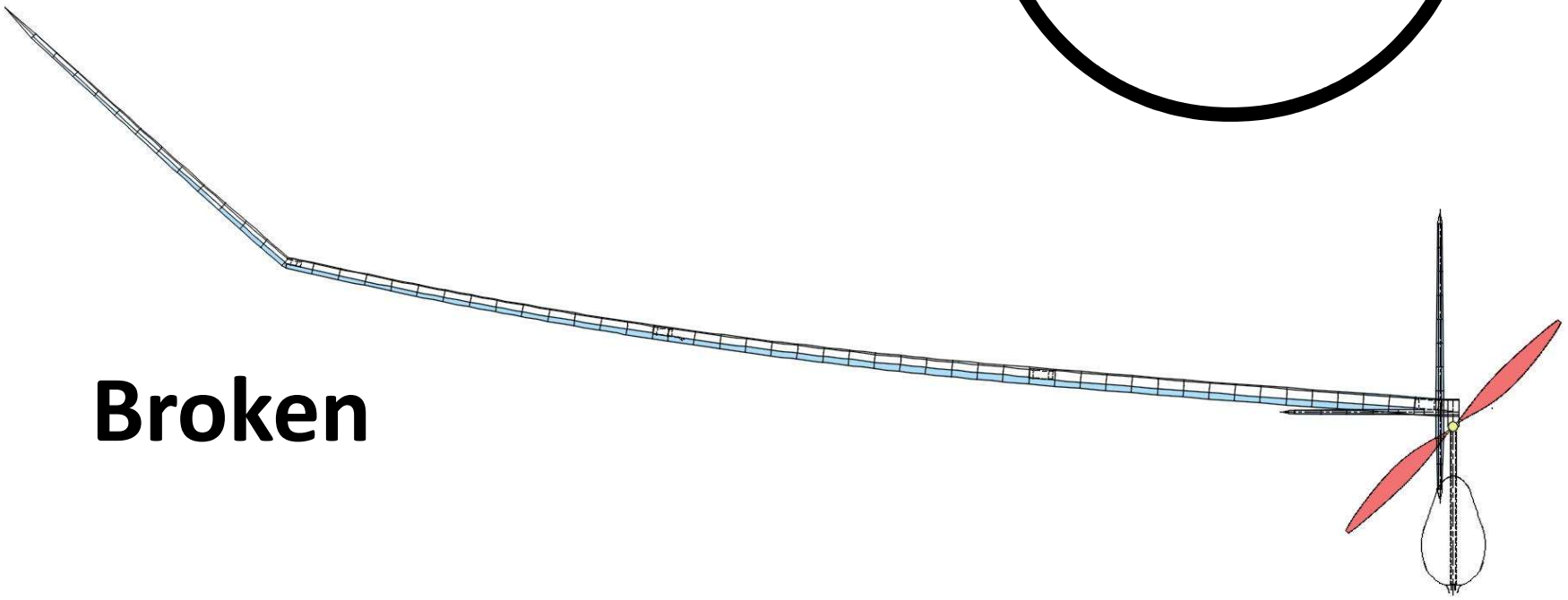
Wingpipe broken



Wingpipe broken

Stress Concentration





Broken

Summary

- Our aircraft broke the wing because of badly condition.
- We investigated the cause of the accident and found a defect in the aircraft.
- Next year, we improve aircraft and we will certainly win the competition.

Additional Slides

Specifications

Specification	
Gross weight	87[kg]
Empty weight	32[kg]
Design cruising speed	7.3[m/s]
Need Power	214[W]

Propeller	
Airfoil	Milly-Terry(original)
Rudius	1.55[m]
Rotational speed	135[rpm]
Thrust power	22.6[N]

Main wing		
Airfoil	DAE21-DAE31	
Span of wing	31.0[m]	
Wing area	26.93[m^2]	
Aspect ratio	35.68	
Angle of attack	DAE21	4.1[deg]
	DAE-21,31	4.1-2.7[deg]
	DAE-31	2.7-1.4[deg]
Dihedral angle	4.0[deg]	