Windnauts -Human Powered Aircraft Team

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Introduction -Team

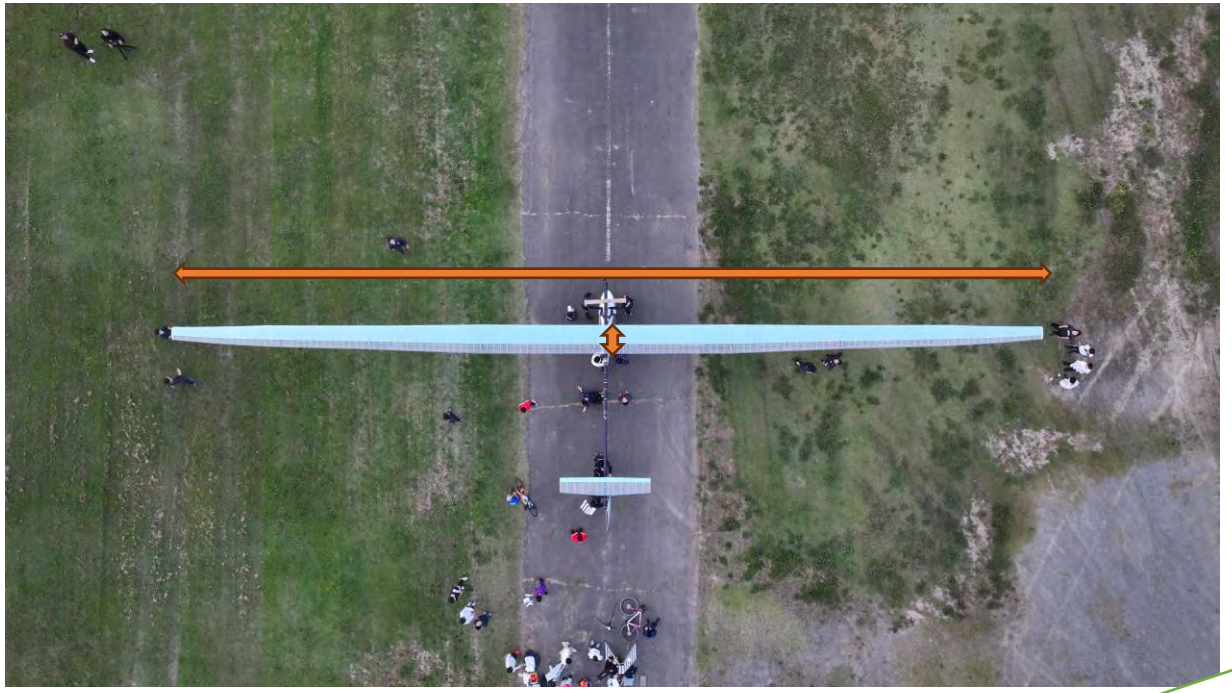
■ Windnauts

- ✓ A student club that designs and builds human powered aircraft.
- ✓ 49 members
- ✓ Founded in 1993
- ✓ Holder of the student flight distance record

■ Japan International Birdman Rally

- ✓ A competition for human powered aircraft.
- ✓ The team that flies the longest distance wins the competition.
- ✓ Our team has won first place eight times.
- ✓ Our goal is to achieve even longer flight records.

Introduction -Design



Pilot

B777-200ER

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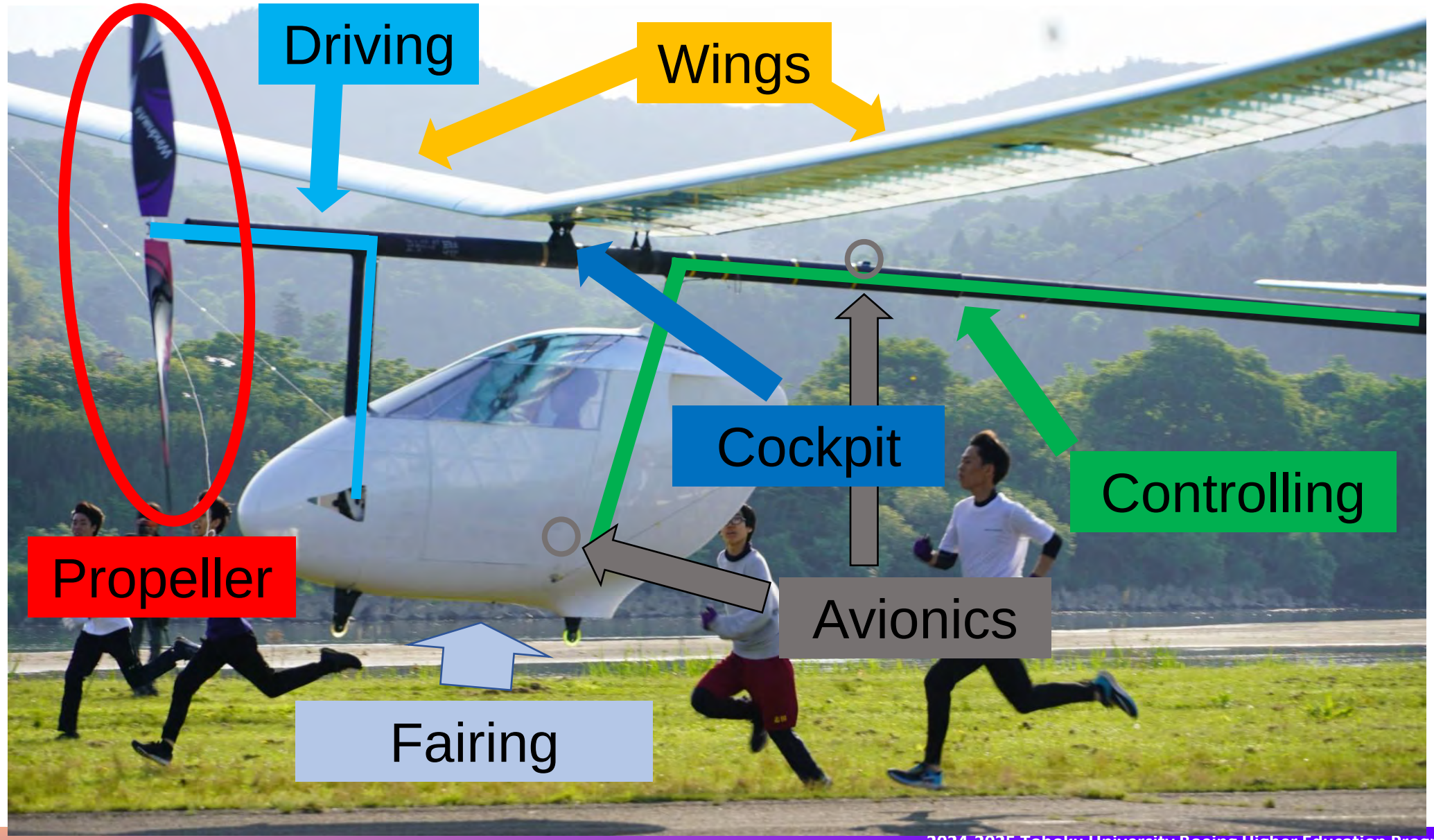
Our pilot's power is only 0.001% of that of B777-200ER

- Key characteristics
  - The pilot's power is extremely limited,
    Large aspect ratio wings
    - Very low flight speed
    - Very low power required for cruising

	Our Aircraft	B777-200ER
Aspect ratio	35.81	8.68
Flight Speed[km/h]	26	875
Horsepower [H.P.]	0.2	13,000

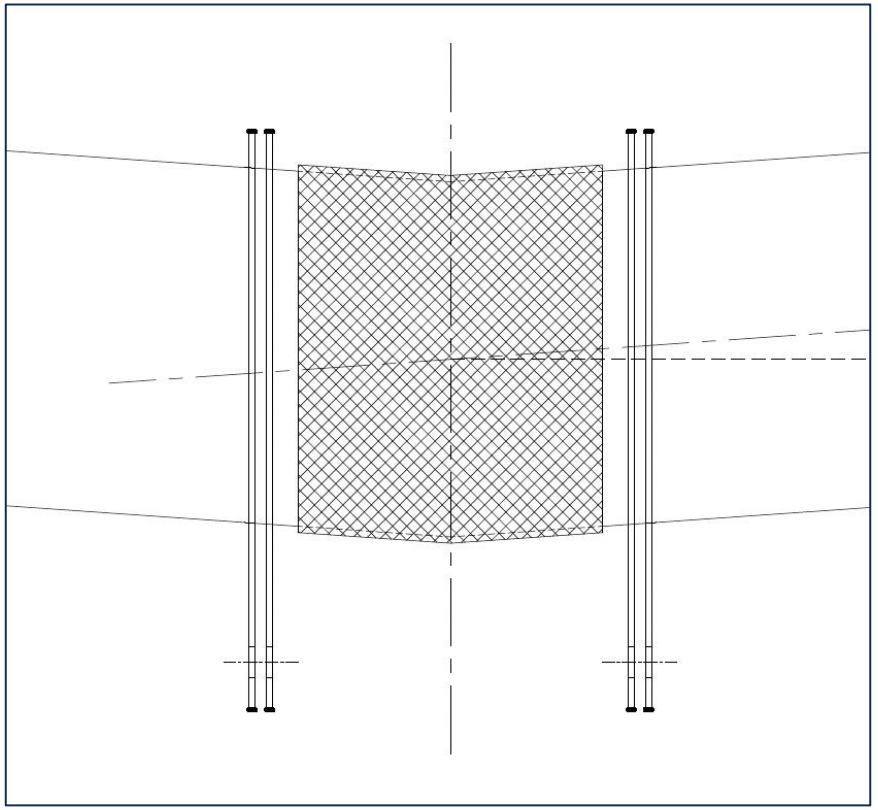
Introduction -Making



Annual schedule

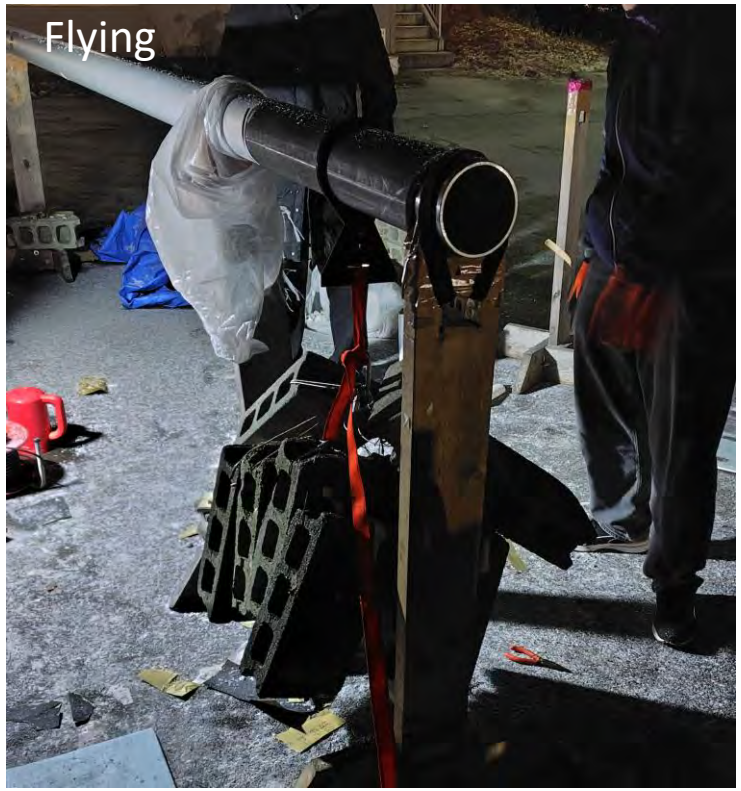
Oct～Next Feb	Dec～Next Mar	Apr～Jul	End of July
Make	Test	Flight test	Flight

Main technical progress



- We improved the joint between the body and the center wing for the main wing.
- By sandwiching the body-side plate with two wing-side plates, we can reduce the weight by 0.05 kg, corresponding to the 0.1% of the cruise power.
- This part becomes more redundant towards the separation between the body and the wing than previous.

Main technical progress



- We performed three kinds of tests for the landing load, flying load, and yawing torque in the turnaround situation.
- All of the tests above have been passed, and so are in the flight test.
- This part became more polished and more redundant to catastrophic damage.

Results

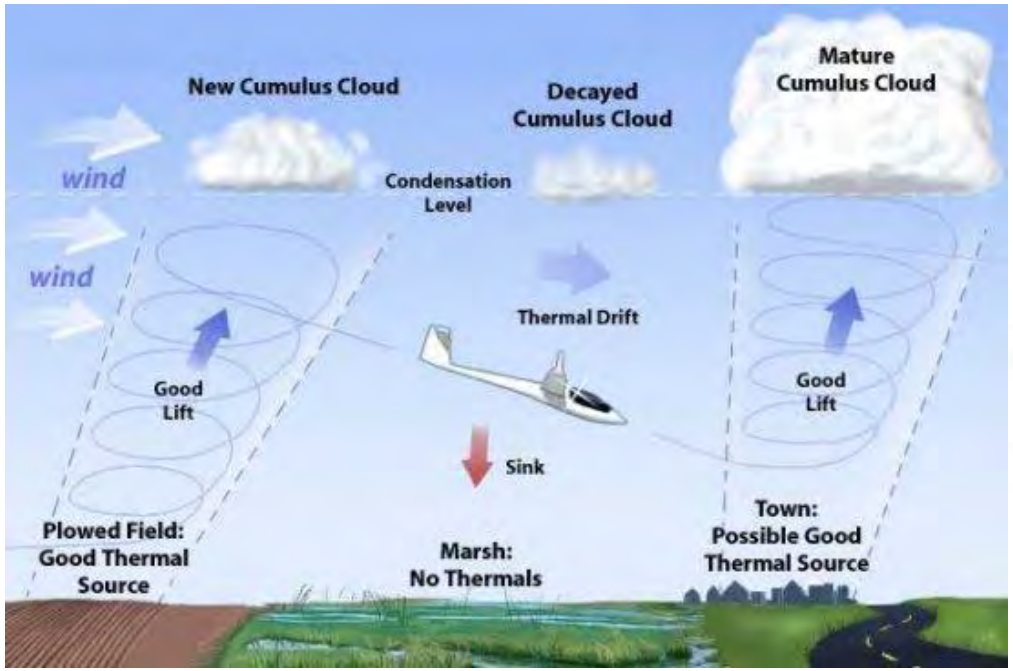
First half

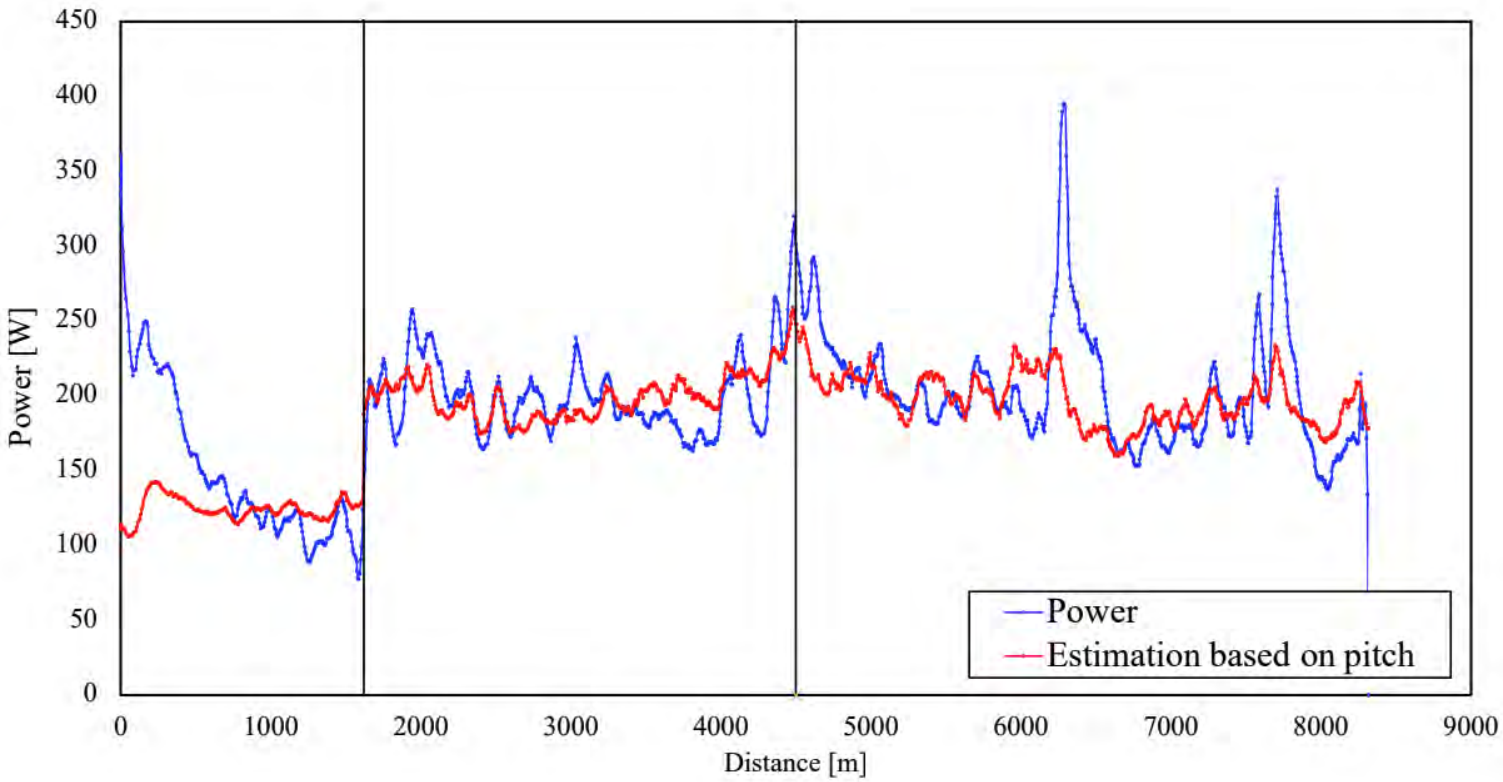
- Good take off
- Under half of the cruise power
  - Due to the strong thermal and the pitch-up flight to save his strength
- Flighting on the route discussed in advance

Second half

- Suffered from the sink wind
- The moment over 300 [W]
  - Against the shear wind from thermal to sink.
  - This power should be considered as the “afterburner.”

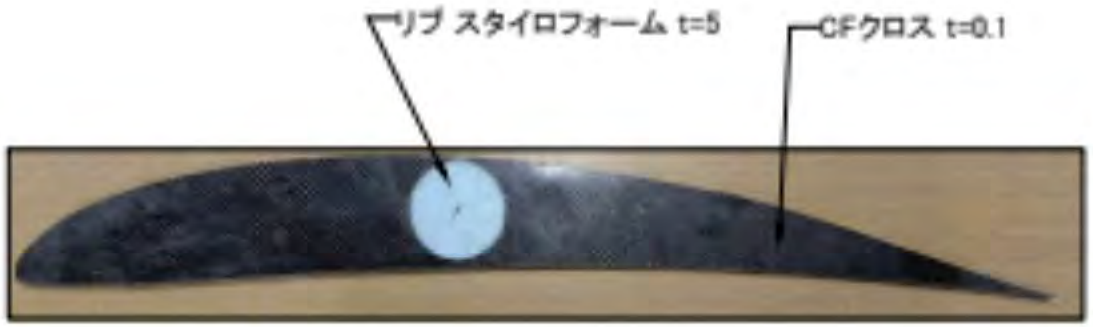
Results





- Because of thermal and sink wind, disrupting the pilot's sense of pitch, power output, and speed necessary for stable flight.

Future plan



主翼と尾翼のエンドリブは、昨年と同様に、CFクロス-スタイロフォームサンドイッチ構造とした。サンドイッチ構造の剥離の対策として、真空圧着を採用した。

- The conceptual design is modified to reduce the minimum power to fly.
- The knowledge of the strong wind shear is accumulated, which other teams cannot obtain.
- The airfoil designed by Bayesian optimization is employed.
- Other old team members and I will fully support so that the Windnauts come back.

Conclusion

Significant flight data was obtained.

- Unique data that other teams do not have

Introduction of new technology into our aircraft.

Acknowledgement

Prepreg for CFRP pipes, CFRP pipes for propeller, Styrofoams for fairing, etc…

This project received significant support through the Boeing Higher Education Program.

We sincerely thank you and express our deepest gratitude.