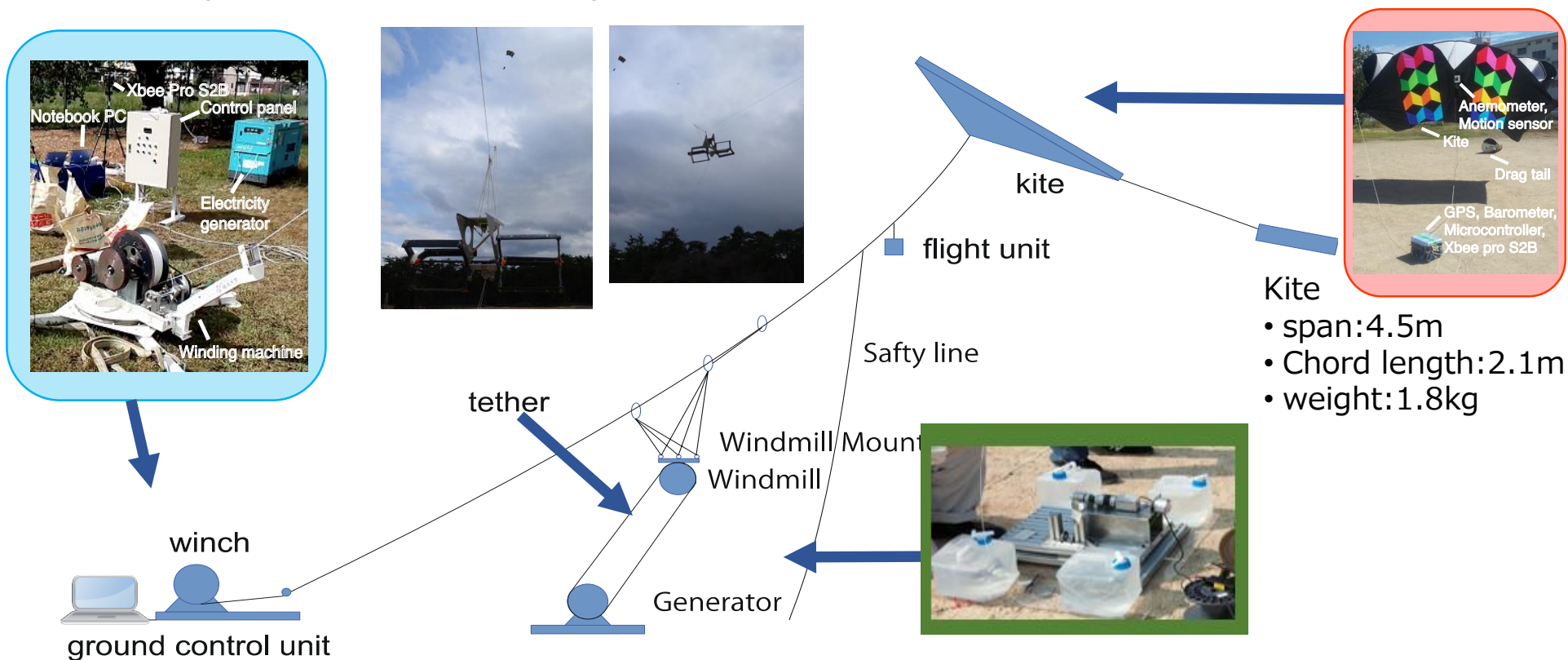


HSWG(High Sky Wind energy Generation) on a Tethered System

Hironori A. FUJII¹, Hiroshi OKUBO², Yasutake TAKAHASHI³, Yusuke MARUYAMA⁴, Tairo KUSAGAYA⁵, Shigeo YOSHIDA⁶, Kazuo ARAKAWA⁶, Hiroki ENDO^{1,6}, Kenji UCHIYAMA⁷, Kazuichi SEKI⁸, and Takeo Watanabe²
¹TMIT; Tokyo Metropolitan University, ²Kanagawa Institute of Technology, ³University of Fukui, ⁴Maeda Corporation, ⁵Tokyo Metropolitan College of Industrial Technology, ⁶Kyusyu University, ⁷Nihon University, ⁸Tokai University

The proposed tethered system employs a straight blade type windmill lifted on high altitude sky by an inflatable kite. Employing tether technology wind energy generated by the windmill in high altitude is transferred to the generator placed on the ground which is heavy in weight



1. Wind tunnel test of Phase 1.5 (6kW system)

The study is now in the phase 1.5 of a wind tunnel model: diameter 0.6m × span 0.6m × 2, which is expected to produce wind energy power 6 kW. The model is to fly with wind velocity about 1.5 times higher on 120m sky high and about double through eight-figured periodic flight. The model is expected to produce thus about 30 times larger wind energy generation with respect to the usual on ground operation of 0.2kW.



2. Transfer efficiency of tethered system

Transfer efficiency of energy through tether system is very important for the present tether system which transfers the mechanical energy of rotation from the windmill on high sky to the generator on the ground. Effect of energy loss at the pully part is not negligible and torque transfer performance is tested. It is seen from the result that the tether tension has much effect on the slipping characteristics at the rotation pully of both the windmill and the generator. The mechanism under investigation is expected to have energy transfer performance of up to 70% and finally 90%.



3. Field test

Phase 1.5 windmill model has been demonstrated in 2017/03/09 for the wind power generation on a field test being floated by a kite. Further field demonstration for windmill of phase 1.5 is now under planning. Results will be presented at the conference accompanied with those in recent study.