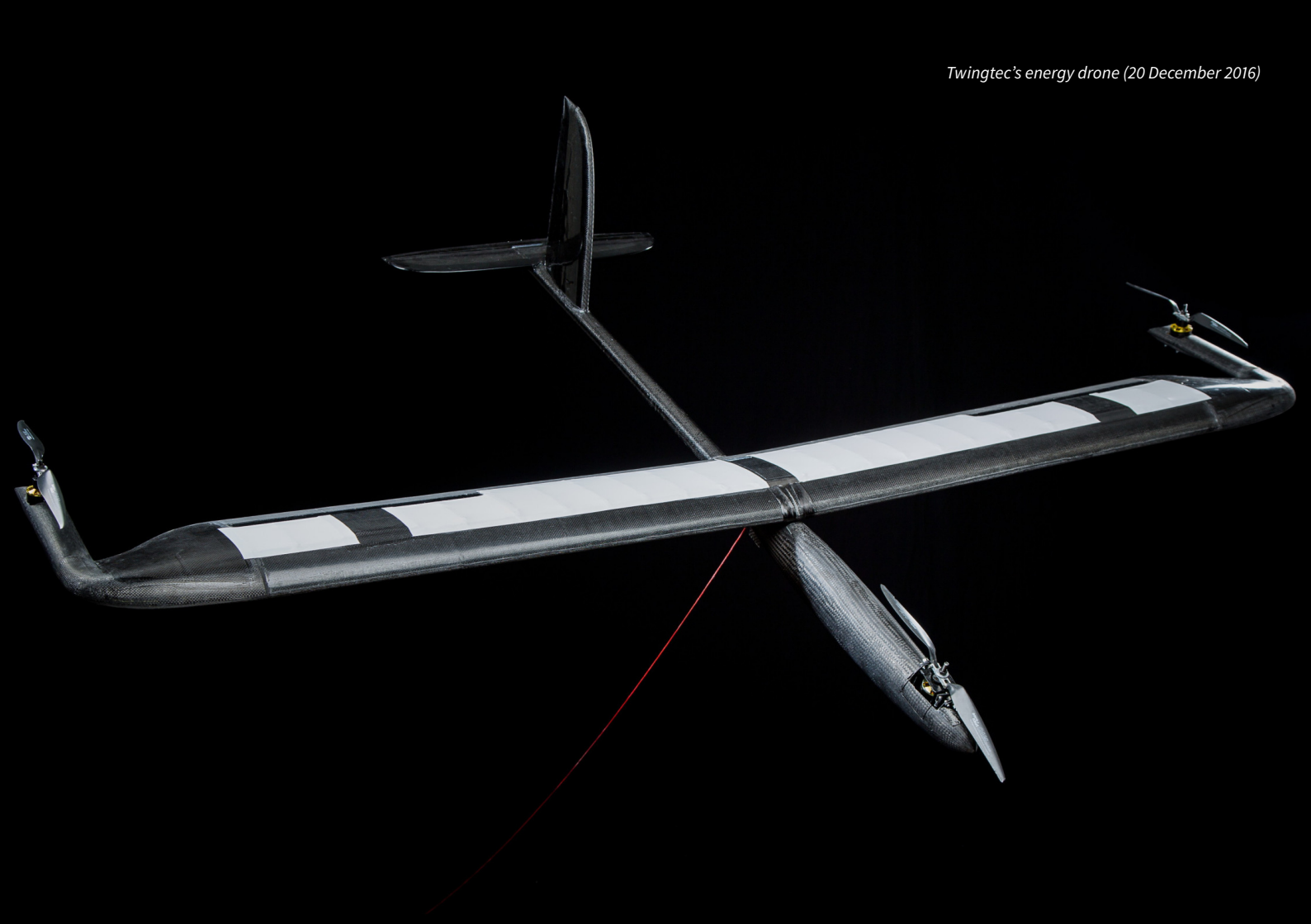

Twingtec's energy drone (20 December 2016)

Airborne wind energy research team at the University of Freiburg (3 February 2016)

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The Effect of Realistic Wind Profiles on Multiple-Kite System Optimal Control

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Multiple-kite airborne wind energy systems (MAWES) have raised interest recently, as systems that are expected to be more efficient than other airborne wind energy (AWE) systems. This is because Loyd's limit for the power produced by an airborne wind energy (AWE) system is inversely proportional to the the square of the system drag coefficient [3], and single-kite systems may have significant tether drag. MAWES, in contrast, aim to limit tether drag by balancing the forces on multiple kites to prevent the tether from flying cross-wind.

Existing studies of MAWES [2,4,5] typically consider the wind-field to follow a logarithmic wind profile. However, logarithmic wind profiles are known to be approximate, and are not generally considered valid at altitudes above 500 m [1].

It is not known to what extent this logarithmic wind profile assumption influences the results of MAWES optimal control studies. The purpose of this work is to study the effect of realistic wind profiles on optimal MAWES pumping-cycle kite trajectories. A periodic optimal control problem (OCP) is solved for a MAWES, using wind profiles based on realistic wind data measurements in Göteborg, Sweden. This study focuses on the effects to the optimal flight path and the optimal flight altitude as a result of these realistic wind profiles.

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