



# KiteStackDrone (KSD)

Since the height a kite can reach is limited by the weight of the rope, many kites have to be stacked so that each kite can carry its own rope (cable). As the system should also work when the winds close to the ground are weak and ultimately power is to be generated, the kites are also drones that can fly autonomously and generate electricity when positioned well in the wind. As soon as a drone has positioned itself well in the wind, the lift is taken over by the wings, the KSD becomes the kite, the propellers turn in the opposite direction and the motors produce electricity. The higher the kites climb, the better they can take advantage of the stronger and more constant high winds.

## Details:

### Engines:

The motors are induction motors (three-phase machines without commutator and brush) which can be operated both as a motor and as a generator. In the visualizations the rotors are designed as propellers. This means that the propeller ends travel in the stator like a magnetic levitation train. In a first version, commercially available motors would be used, which would then of course require a mounting bracket.



### Rope (cable):

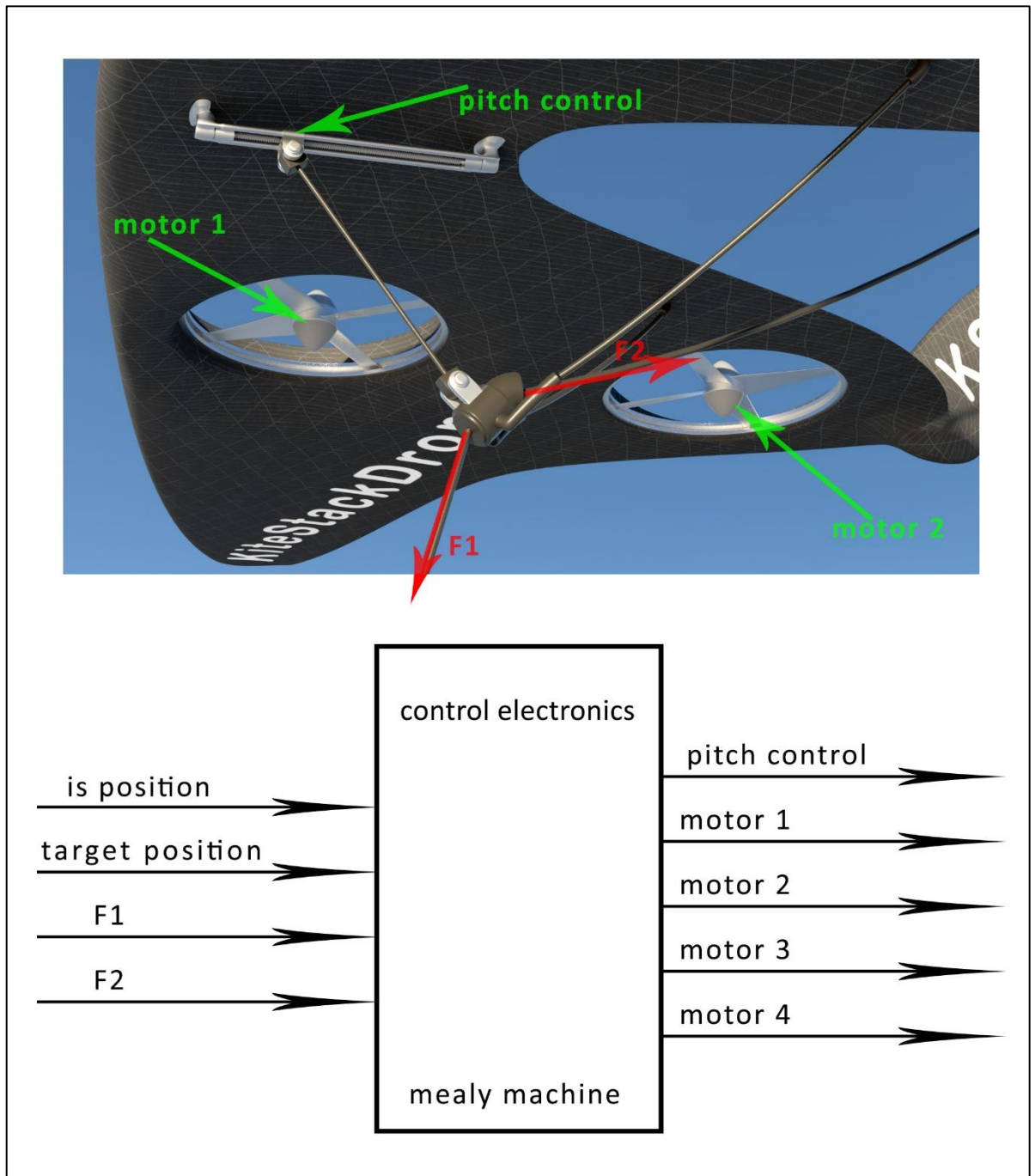
The neutral conductor and the high-voltage cable for connecting the individual KSD and the ground station run in the rope. It remains to be clarified whether a bus will also be installed for data transmission or whether communication will be implemented via radio. Makani has developed optimized cables for their "Makani kites".

### Ground station:

On the ground there is a large battery with connection to the grid, the fixation and the device for winding the cables.

## Steering system:

For the flight in "drone mode" a large part of the control and stabilization electronics can be taken from commercial drones. In "kite mode" the aircraft stabilizes itself. In order to optimize energy production and lift, the angle of attack can be changed mechanically. With a "Mealy machine" the control electronics can be realized in a simple way.



### Energy management:

Energy management can be taken from electric vehicles such as Tesla or BMW-i3.

### Phaseability:

The proof-of-concept can be carried out in several steps. First, a commercial drone can be combined and tested with a commercial kite. Then the power generation and later the stackability can be proven. If everything works well, the ascent to the **jet streams** can be tackled.