

Technical outline of piloted 2kW kite generator

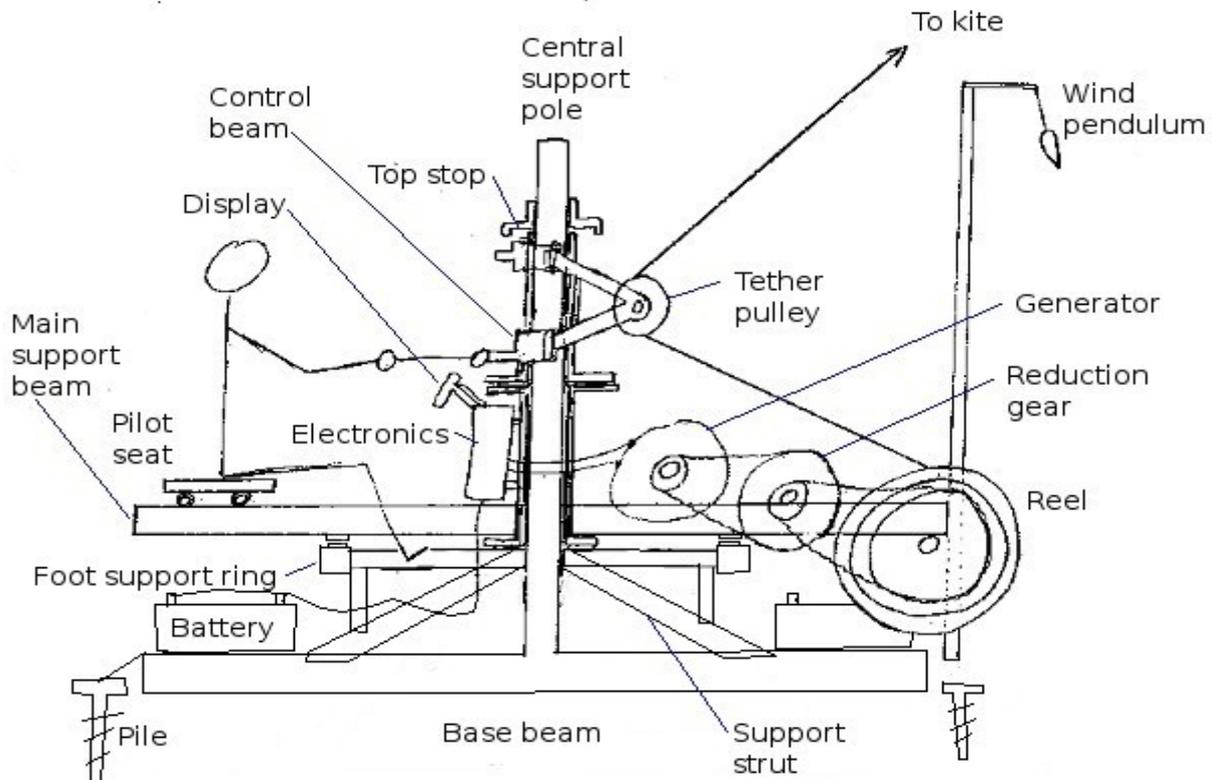
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The pilot controls the kite by pulling on the control beam to which are attached a pair of pulleys for the tethers. The control beam rotates on the central support pole so the pilot only has to supply enough force to steer the kite. The pilot sits on a seat at one end of the main support beam and the 2 tethers are wound onto 2 reels at the other end. Using the foot support ring the pilot rotates the main support beam so that he has his back to the wind. The wind pendulum helps him judge the wind direction and speed. The reels are connected to a generator via chains or belts that increase the rotation rate. The cross-sectional schematic below illustrates the main features.



The pilot makes the kite fly figure of 8 motions in the sky and the tension in the tethers rotates the reels. These rotate a system of gears or chains or belts that make the generator rotate faster than the reels. When the tethers are nearly fully extended the pilot depowers the kite and rewinds them. The rewind stage needs to be as fast and efficient as possible, but exactly how this is done will require development.

There are 2 base beams perpendicular to each other and they are firmly anchored to the ground so that they do not slide or lift as the wind pulls the kite. The anchoring could be done with piles. The base beams will be attached to the piles with adjustable tethers because it will be difficult to place the strong piles required with high precision.

Early prototypes will rewind the kite tethers by flying them out of the power window and the generator will be used as a motor to perform a slow rewind. Eventually the plan is to use a side-slip technique where one tether is released and the other is used to rewind the kite sideways. A well designed kite will offer very little resistance to side-slip and the rewind stroke will take less than a tenth of the time of the power stroke. This may require the development of a specialist kite.

To start with we hope to be able to use parasailing kites that have exceeded their safe lifespan. However, the supply of these will be limited and a specialist design will have to be developed. The use of tensairity techniques is proposed because very stiff but light structures can be made. It also allows an aerodynamic shape with a high glide ratio to be formed and

this enables more power to be generated for a given kite size.

The power drawn from the generator will need to be controlled to suit the wind speed, the size of kite and the strength of the pilot. Drawing too much current from the generator will damage the kite, the tethers, or the generator itself. This means there needs to be a circuit to control how much current is drawn from the generator.

Simply connecting the generator to a battery via a rectifier could produce a functional system but it would be difficult to keep the kite flying in anything but optimum wind conditions. It is therefore important to develop the electronics early in the program.

The pilot will have control over these electrics. For instance, to launch the kite it will be pulled out to a suitable position and then the rewind motor can be used to pull it into the air. There would also be a switch to start a rewind if a problem occurred. Since both hands will have to be on the control bar at all times it is proposed that foot switches may be needed.

Since the kite will be one of the less durable elements in the whole machine it is probably sensible to have a range of kites for different wind conditions. The power in the wind is proportional to its speed cubed so there is an enormous variation and a single kite could not cope with all common conditions.

A rather unexpected advantage of this machine is that it can be used to generate electricity even when the wind is too slow, or too fast, for available kites. It will be possible to use humans or animals to pull on the tethers!