Build "The Flying Lizard"

Part One: Origins and Conditions

As part of the alternative energy community in Northern Nevada, I had on many occasions chance to observe the construction and operation of many small scale wind systems in this part of the state, and sadly many times, would pass by a site of a previously installed wind system and find it in pieces on the ground.

I decided to use my knowledge of reliability engineering and vibration analysis to see if I could prototype a more reliable and durable small wind system that could survive the conditions of northern Nevada.

I spent some time observing the small wind systems response during the gusty and turbulent conditions that occur during the passage of cold fronts off of the northern Pacific. It is during these times it appears, from asking the owners of these wrecked systems , that most damage to small wind systems occur.

Part Two: The flaws in conventional small wind systems (SWS)

From eyewitness evidence of SWSs actions during the passage of these weather systems, it became immediately obvious what made these SWSs fall down, in a word, harmonic oscillations whose origins come from many sources.

In the design of the Flying Lizard, all of these conditions have been eliminated or reduced.

Here are the changes that make the Flying Lizard different and more durable than a conventional SWS.

1. No top mounted generator. The weight of a generator at the top of a tower makes that weight a "node" which creates standing waves in the tower structure during turbulent wind conditions. The lightweight sail head of the Flying Lizard becomes the point of maximum

oscillation at the top of the tower, where they are dissipated by the induced drag of the sail assembly before they can do any damage to the tower.

Because the wind energy is transfered down the tower by a turning shaft or rope , it enables the placement of a generator a greater capacity than would be feasible with a top mounted unit.

2. Down wind orientation. Because the Flying Lizards' sails are downwind from the rotation point on the tower, the drag force from the sails will make the sail head assembly point more stable into the wind. In a conventional SWS with an upwind, tail stabilized sail assembly, the combination of gyroscopic and yaw forces between the sails and the blades generates destructive oscillating movements.

3. Steep pitch, low speed, high torque. The unique shape of the blades of the Flying Lizard and the relatively slow speed from the steep pitch of the sails provide a slow speed, high torque power transfer to the bottom of the tower, where it is more convenient to overdrive for the operation of a high speed generator.

The shape of the sails also provide some automatic self feathering of the sails in high wind conditions.

I recommend the use of a twisting rope as a power transfer system, as it provides anharmonic decoupling and some storage of mechanical energy to the bottom mounted generator or other device at the base of the tower. You can use a rotating shaft, but you will need to put some type of harmonic decoupler between the sail head and whatever you are driving. If you don't have the slightest idea what a harmonic decoupler is, use a rope. Be aware of the rotation direction of your mill. I designed this one to turn so that the rope will tighten as the sails turn, do the same with yours.

4. Some notes on sails and towers. A properly designed windmill should always have an odd number of sails. There is a reason for this, but it is too complicated to explain here. Also, the lengths of those sails should never approach an even multiple of the tower height. In other words, an 4 foot radius sail arc should never be mounted on top of a 8,16,24, 32, or 40 foot tower, always aim for the

tower length to be a multiple that is a prime number greater than 2. This windmill was mounted on a 14 foot 4x4 post and was held in place on the side of a 16x8 storage barn, that is the scene as it is running in the video. It turns in an elegant fashion.

When orienting your windmill, get a "wind rose " from NOAA to see from what direction the wind in your area will blow most of the time. For our area, my experience has been its mostly WNW or about 280 degrees. Orient your windmill on a 4x4 post so that the sail head hub is far away from the post for the majority of the time that the wind is blowing.

One of the most amazing things about the sails is that they are made of old political campaign signs, they are remarkably durable, strong and weather resistant for being pieces of plastic. If you can find something else to make them out of, try it, but these things worked for me, and they were free! Try other ways of mounting them.

As far as the use you can put this windmill to, generating electricity is just one aspect. Try pumping water or compressing air for a start. Because the power output is at the bottom of the tower, other applications can be very convenient.

OK thats' it. The pictures should be self explanatory. Have fun and be safe.

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Some facts:
 power output 20 mph wind: 400 watts with a Delco 60 amp auto alternator. With 8 foot diameter sails, the available power in a 20 mph wind could go as high as 3000 watts.

Cost: $25 with enough scounging
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Maintenance note:

Use graphite only to lubricate the contact space between the tube

guide and the spring, just as if it were a speedometer cable. A hydrocarbon based lubricant will cause the spring to break.

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Please read first before continuing:

Disclaimer: this document is for informational purposes only. The author assumes no responsibility for injury, damage or loss resulting from the construction or operation of this device. Check local building codes and ordinances to ensure compliance for any structure you might build. Do not build this structure in a location on your property where its failure might result in it falling on some other partys land or causing injury.

Know what you are doing, and always act in a safe manner, taking proper precautions during the construction and operation of this device. A minimal knowledge of the safe operation of hand and power tools is necessary for the proper construction and operation of this energy transferring device.

The home builder assumes all responsibility for damage, loss, or injury resulting from the construction and operation of "The Flying Lizard".

Please read all instructions and commentaries before attempting to build your version of the Flying Lizard. This information can be freely copied and distributed and should be considered in the public domain. I do not intend to seek any type of patent protection or copyright for these concepts and encourage others to freely experiment with these ideas, subject to safety concerns only. Always be careful.

The home builder/ reader acts solely as his own agent in all regards in designing , building and operating any device on the information presented here.

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