

**The concept of mobile wind generators.** Miloš Bukumira, High Graphic school, address: Otona Zupancica 19, 11070 New Belgrade, Serbia-Europe, e-mail *bukumira@gmail.com* .

**Introduction:** Our project was initially designed to be used on boats (which is patented in the Patent Office of Serbia). However, as we found the problems in the power supply of the vehicle used for the exploration of Mars, we decided to present you our solution.

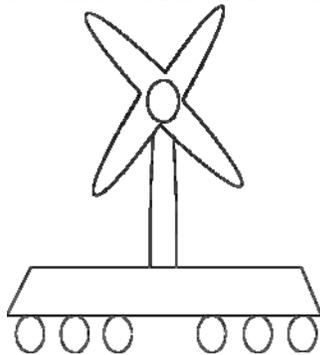
The essence of this method of power supply is in using a number of physical methods and rules in the field of fluid mechanics to obtain the most economical exploitation of low-speed and low wind power in generating electric power, without losing stability and mobility of vehicles.

**Major actual issues:**

- The possibility of exploiting low-speed and low power wind depends directly on the size of the propeller wind turbines.
- The size and weight of wind turbines disable movements of vehicles and their stability.
- The composition of the atmosphere on Mars is resulting in smaller wind power.

**Draft of current options:**

1. Vehicle with horizontal-axis wind turbine

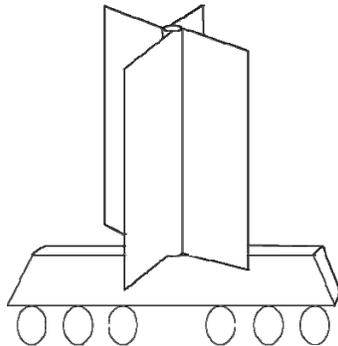


- + surface activity
- weight
- stability
- mobility
- adaptability

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- the usability

2. . Vehicle with vertical-axis wind turbine



- + surface activity
- weight
- + stability
- mobility
- adaptability

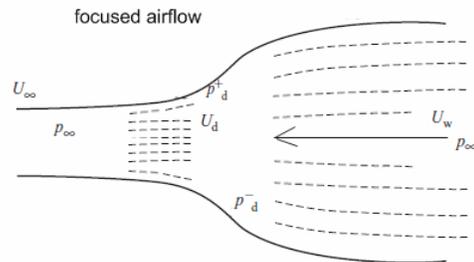
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- the usability

**Conclusion:** Today's wind generators, because of their size and shape, have serious deficiencies in the implementation on mobile platforms.

**Brief draft of our solution:**

- low center of gravity for vehicle stability control - generator and battery are placed in the lower part of the vehicle;
- this enables vertical-axis wind turbine (which has many other advantages);
- smaller diameter blades mounted on the pillar of adjustable size - which allows reduced weight and improved mobility;
- small wind effect is solved with special light-weight sails that direct the wind-flow to the blades:



The air that passes through the axis undergoes an overall change in velocity,  $U_\infty - U_w$  and a rate of change of momentum equal to the overall change of velocity times the mass flow rate:

$$\text{Rate of change of momentum} = (U_\infty - U_w)\rho A_d U_d$$

The force causing this change of momentum comes entirely from the pressure difference across the blades because the stream-tube is otherwise completely surrounded by air at atmospheric pressure, which gives zero net force. Therefore,

$$(p_d^+ - p_d^-)A_d = (U_\infty + U_w) \rho A_d U_\infty (1 - a)$$

To obtain the pressure difference ( $p_d^+ - p_d^-$ ) Bernoulli's equation is applied separately to the upstream and downstream sections of the stream-tube; separate equations are necessary because the total energy is different upstream and downstream.

Bernoulli's equation states that, under steady conditions, the total energy in the flow, comprising kinetic energy, static pressure energy and gravitational potential energy, remains constant provided no work is done on or by the fluid. Thus, for a unit volume of air,

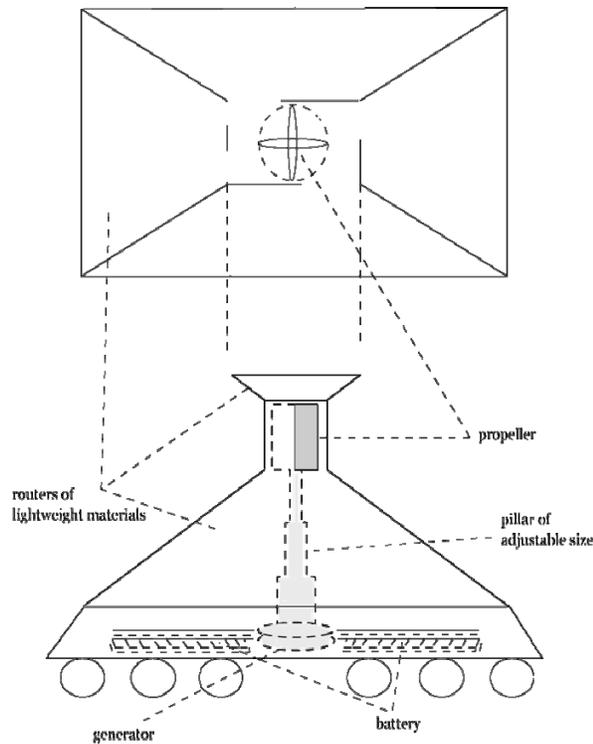
$$\frac{1}{2}\rho U^2 + \rho + pgh = \text{con.}$$

**The basic draft and concept sketches:**

Because this concept is based on the project for other purposes, here we present only its basic sketches and explanations.

At the center of this device is a generator which supplies the battery with the energy. The axis of the

generator is attached to the pillar (which is in vertical position and with adjustable size). At the end of the pillar is the propeller which rotates using wind power. Wind power increase is achieved using routers of lightweight materials.

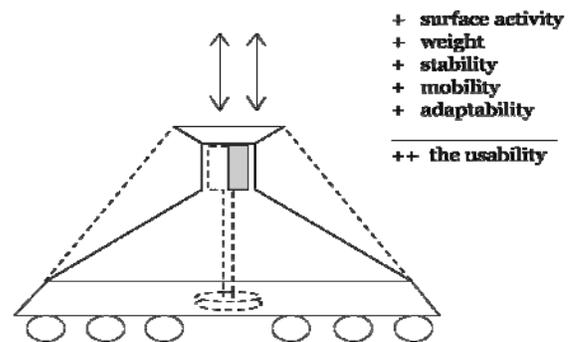


**Final conclusions:**

This concept is based on experimental research and calculations. Accessible solutions solve the main problems in mobility wind turbine:

- surface to which the wind acts is increased by an innovative method;
- weight is reduced by using lightweight materials and smaller size propeller;
- stability is increased by lowering the center of gravity on the vehicle and with the possibility of adjusting the height of the vehicle;
- mobility has been increased with the possibility of adjusting the height of the vehicle and custom design;
- adaptation is enabled by complete solution.

Because of all this, we can say that this solution is very useful for many purposes.



**References:**

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