Re: Faster Than 'c' Communication.

Source: http://sci.tech−archive.net/Archive/sci.physics.relativity/2005−01/3210.html

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From: Paul B. Andersen (*paul.b.andersen_at_deletethishia.no*)
Date: 01/16/05

Date: Sun, 16 Jan 2005 21:49:26 +0100

Henri Wilson wrote:
> On Thu, 13 Jan 2005 15:43:33 +0100, "Paul B. Andersen"
> <paul.b.andersen@deletethishia.no> wrote:
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>
>>Henri Wilson wrote:
>>
>>>On Wed, 12 Jan 2005 10:13:28 +0100, "Paul B. Andersen"
>>><paul.b.andersen@deletethishia.no> wrote:
>>
>>I find the idea of going downwind faster than
>>the wind much more counter intuitive.
>>But it IS possible to make such a vehicle.
>
>
> No it isn't.
> When the vehicle reaches exactly wind speed, no further energy can be
> transferred to it. The windmill will be still. So it can never pass through
> that barrier.

No. You are wrong. Think again.

>>Let's stay on land and make a cart.
>>A weel on the ground is driving the propeller,
>>which drives the cart downwind faster than the wind.
>>Your first reaction is probably that this is
>>a perpetum mobile. (Mine was!)
>>And it would be − if there were no wind.
>>But if there is a wind, it is perfectly possible.
>>
>>Let's analyze what's happenning in the ground frame.
>>The propeller is blowing the air in the opposite direction
>>of the the wind. So even if the cart is going faster than
>>the wind, it will slow the wind air flow. That means that kinetic
>>energy is taken out of the wind, and is transferred to the cart.
>>No perpetum mobile.
>>And there is in principle no limit to how fast it can go.
>>(But the energy lost to drag will of course give a practical

>>limit.)
>
>
> I know what you are saying.
>
> It is wrong.
>
> If the vehicle is moving faster than the wind and the gearing is not reversed
> then the windmill pumps the wind FORWARD (not backward into the wind) faster
> than it is already moving. The windmill accelerates the wind and the vehicle
> decelerates back to windspeed.
>
> If the gearing IS reversed so the vehicle's movement blows air backwards, then
> you might achieve something.

I think you should think again, because you are wrong.

It is interesting to note that a "downwind vehicle"
and an "upwind vehicle" are of exactly the same basic
design. And they are in principle symmetrical.
That is, your upwind vehicle will go upwind even if you
turn it with its backside to the wind. (If we assume
that the propeller has a symmetric profile and works
equally well in both directions.)
I think the difference between the "upwind vehicle"
and "downwind vehicle" is only the pitch of the propeller
(and maybe the gearing ratio, which is related).

I will try to elaborate on this.

Let's start with a propeller with an infinite pitch,
that is, the propeller blades are fore and aft.
When the vehicle is stationary, nothing happens.
There is no lift and no drag (ideally) on the propeller
blades.
Now we give the blades a small angle from fore−and aft.
(That is, the pitch is very high, but not infinite).
Now there will be a torque on the propeller from the wind.
The propeller will have a high torque, and low drag.
The force on the wheel will be higher than the drag,
and the vehicle will move upwind.

Now let the pitch be zero, that is, the propeller blades
are transverse.
When the vehicle is stationary, there will be a high
drag on the propeller, and no torque.
The vehicle will move downwind, and the propeller
will turn. But it will never go faster than the wind.
Now we let the propeller have a small pitch.
When the vehicle is stationary, the propeller blades will
be stalled, the drag is high and the torque trying to move

the vehicle upwind will be too small to overcome the drag.
The vehicle will move downwind. Now the propeller will turn,
and drive the air backwards, that is in the opposite direction
of the wind. The vehicle will move faster downwind.
There will of course be a torque on the propeller which
will make an upwind torque (braking torque) on the wheel,
but due to the small pitch this will not be big enough
to overcome the downwind pull from the propeller.
The vehicle may now move downwind faster than wind.

There will obviously be a pitch between these extremes
which will make the vehicle not move at all.

I think it would be desirable to be able to adjust
the pitch to the speed and the strength of the wind.
I am pretty sure this can be done on Bauer's cart,
notice the small wheels in front of the propeller:
http://www.dcss.org/bauer_cart.jpg

Paul