I believe that I can fly!

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Abstract

This paper presents data on the dependence of thrust on voltage for the “lifter” devices popularized by J.L. Naudin.[1] Whereas previous explanations cited the Biefeld-Brown Effect (otherwise known as anti-gravity) or displacement current, this data suggests that the thrust is due to nothing more than an ionic wind.

1 Introduction

The “lifter” devices were first introduced in June 2001[2] by Transdimensional Technologies (TT) as so-called Anti-gravity devices. Popularized by J.L. Naudin, “research”[1] has gone into the search for the theory behind the apparent propulsion produced in the apparatus which will be described below. Naudin and TT attempted to explain the propulsion via a lesser known effect called Biefeld-Brown Effect[3], which hinges on the unification of electroweak force and gravity on the macroscopic scale.

The Biefeld-Brown Effect was first postulated by Dr. Biefeld of Dennison University in 1923 and “demonstrated” by T. Townsend Brown in 1923-1926. It rests on the claim that electromagnetism can interact and impact the apparent effects of gravity macroscopically. Brown postulated that a large charge placed on a condenser (capacitor) will interact and reduce gravity in some orientations. He demonstrated the effect by the apparent reduction and increase in weight when a charged parallel plate capacitor is placed with the positive side upwards and downwards respectively. In his measurements, he showed that:

1. The closer the plates of the capacitor, the stronger the force.
2. The higher the dielectric constant of the dielectric in the capacitor, the stronger the force.

3. The larger the area of the plates, the stronger the effect.

4. The greater the voltage difference between the plates, the stronger the effect.

5. The heavier the dielectric, the stronger the effect.

On the basis of that last item, Brown postulated the interaction of gravity with electric fields.[3]

Even though in currently accepted literature, there are no direct observable evidence that in the macroscopic scale, gravity interacts with electromagnetism, Naudin and TT produced “experiments” to demonstrate this “anti-gravity.” Yet none of its experiments have successfully removed all factors that hints at other effects, the most significant being the ionic wind effect. Though Naudin and TT mentioned vacuum experiments that would invalidate the ionic wind experiment, no result has come out of the apparatus which was already completed[2].

The ionic effect, however, has been greatly exploited in recent inventions. One of such is the Ionic Breeze Air Purifier[4] made by Sharper Image, which employs the “Zenion effect”[5]. A quick look at the patent 4,789,801 at the United States Patent and Trademark Office confirms that the Zenion effect and its predecessors (interestingly, includes one filed by T. Townsend Brown in 1960, Patent No. 2,949,550, and another in 1962, Patent No. 3,018,394) demonstrated that “the electrokinetic transducers . . . when immersed in ionizable dielectric fluid media . . . converts electrical energy directly into fluid flow” (Zenion Patent No. 4,789,801).

The data and observations collected during this experiment refutes Naudin and TT’s claim that there exist some macroscopic electric-gravity interactions in the operation of the “lifter” devices. Furthermore, the analysis of the data from this experiment (as there is none from Brown’s own experiment) can explain all of the observed effects Brown made in his experiment in 1923-1926.
2 Apparatus Design and Performance

The apparatus was build with help from the Physics Department Machine Shop. It consists of three 12 cm G-10 rods that are quarter inch diameter positioned vertically in an equilateral triangle that is 20 cm to a side. It is secured with two triangular frames made of cold roll steel (CRS) rods that are 1/8 inch diameter. The rods attach to CRS “washers” that are half inch in diameter, and quarter inch in inner diameter, which is 3/8 inch high. The G-10 rods fit through the washer and are attached with a screw. The two triangular frames are separated by 6 cm from top to bottom. And Aluminum foil (18 cm by 13 cm) was wrapped around it and secured with masking tape. See attached facsimiles of drawings for details.

A copper 36 gauge wire is wrapped 3 cm above the top of the aluminum foils, and is also connected to a variable power supply of 30kV maximum and 3milliamps maximum. The ground of the power supply is connected to the aluminum foil, and grounded to all other metal objects in the vicinity inside the Faraday Cage.

To measure lift, the apparatus is placed above an electronic balance of 2 percent error that reads to 0.1 grams. The apparatus is placed such that the aluminum foils are down and the copper wires are up. Measurements are taken of the difference in readings on the electronic balance when the power is off and when the power is on at a certain voltage.

To measure the effect of the ionic wind, the apparatus is lifted above the balance by 2 cm with plastic stacks. With the high power supply on, data are recorded of the change in readings on the balance due to the ionic wind produced by the apparatus.
Diagram:

- Side View
- Zinc 1/4" d
- 6 cm
- To be wrapped with Al foil
- 30 cm

Notes:
- Wrapping Al foil of 15 x 15 cm on side.
- St tape is smooth.
3 Hypothesis

The data is consistent with the hypothesis that the lifter is a reaction drive. Toilet paper and other light masses around the lifter were observably blown away from the lifter, and air was moving on the order of 1 ms. An even blue corona was observed around the thin wire of the functional lifter, and the functionality appeared critically dependent on the geometry of the wire and foil in its effect on the corona, though we made no systematic tests to that effect.

To a first approximation, it seems reasonable to model the lifter as laminarly moving an ionized cylinder of air downwards. In this model, Newton’s second law tells us...

\[ F = \frac{dp}{dt} = \frac{dm}{dt} v \]  
\[ = \rho \frac{dV}{dt} v \]  
\[ = \rho A \frac{dx}{dt} v \]  
\[ = \rho Av^2 \]  
\[ = \frac{1 \text{ mol}}{22.4 \text{ L}} \frac{0.03 \text{ kg}}{1 \text{ mol}} \frac{1000 \text{ L}}{1 \text{ m}^3} (0.1 \text{ m})^2 (1 \text{ m/s})^2 \]  
\[ = 1.3 \times 10^{-2} \text{ N} \]  
\[ \sim 1.4 \text{ g} \]  

...using reasonable values for the density of air \( \rho \), the cylinder’s cross-sectional area \( A \), and the velocity \( v \). If we further model the movement of air as an acceleration of particles of mass \( m \) and charge \( q \) across a potential difference of \( V \)...

\[ \frac{1}{2} v^2 dm = V dq \]  
\[ v = \sqrt{\frac{2Vdq}{dm}} \]  
\[ = \sqrt{\frac{(2)(30000 \text{ V})(1.6 \times 10^{-19} \text{ C})}{0.03 \text{ kg}}} \]  
\[ = 4.4 \times 10^5 \text{ m/s} \]
This is several orders of magnitude higher than our velocity above, but since this is based on a conservation of energy argument, there are many opportunities to lose energy down to a reasonable \(1 \text{ m/s}\). Also, it seems reasonable only a ten-thousandth of the air is charged, so that the overall velocity of the air would be on the order of \(1 \text{ m/s}\). The basic relationship should hold nonetheless, so...

\[
F = \rho A v^2 \quad (13)
\]

\[
= \frac{2\rho A}{dm} \frac{1}{2}mv^2 \quad (14)
\]

\[
= \frac{2\rho A}{dm} V dq \quad (15)
\]

So we have \(F \propto V\). Also...

\[
F = \rho A v^2 \quad (16)
\]

\[
= (\rho A)^{2/3}(\rho A)^{1/3} \quad (17)
\]

\[
= (Fv)^{2/3}(\rho A)^{1/3} \quad (18)
\]

\[
= P^{2/3}(\rho A)^{1/3} \quad (19)
\]

\[
F \propto P^{2/3} \quad (20)
\]

We will see that \(F \propto V\) and \(F \propto P^{2/3}\) in the analysis of the numerical data.

## 4 Data

During the operation of the lifter, the voltage and current were recorded from the galvanometers on the HV power supply, and the weight was recorded from the digital display on the electronic balance. To correct for the drift of the balance, the voltage was periodically reset to zero, and the new zero point for the balance was recorded. Then, an adjusted weight was calculated for each data point based on the average of the two closest zero points.
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<thead>
<tr>
<th>Voltage / kV</th>
<th>Weight / g</th>
<th>Current / mA</th>
<th>Net Weight / g</th>
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<td>0.00</td>
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<td>-0.1</td>
</tr>
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<tr>
<td>± 0.5</td>
<td>± 0.1</td>
<td>± 0.05</td>
<td>± 0.2</td>
</tr>
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</table>

5  Analysis

Plotting the net weight versus voltage reveals a linear relationship once the voltage exceeds a certain threshold. Fitting a line to the points above this threshold by a least squares regression, we find...

\[
\frac{\text{NetWeight}}{\text{grammes}} = 2.17488 - 0.210968 \frac{V}{\text{kiloVolts}}
\]
This is consistent with the ionic wind hypothesis; the first 10 kV of energy ionize the air around the thin wire, and the remaining energy propels the air downwards.

Plotting the logarithm of net weight versus the logarithm of power reveals that net weight $\propto$ power$^{0.6}$, approximately a square-root relationship.

Fitting a curve to this yields...

$$\text{Net Weight} \text{ grammes} = -0.21 + 1.0 \left(\frac{\text{Power}}{\text{Watts}}\right)^{0.59} - 0.14 \frac{\text{Power}}{\text{Watts}}$$

Plotting on a linear scale, we have...
This relationship provides further support for the ionic wind hypothesis. As modelled before, the thrust generated \((\frac{dp}{dt})\) should vary with power to the two-thirds power, just as measured.

6 Discussion

First to be noted is the apparent incongruency between the theoretical calculated power-force ratio (at \(F = CP^2\)) to the actual experimental value of 0.59 power. But this incongruency can be resolved once it is realized that the ionic wind carries momentum. By the nature of the experimental apparatus, the downward flowing ionic wind would impact the balance and produce a partial cancellation of the lift. By measuring the ionic wind flow, we were able to confirm that there is a fluid flow. The lift effect is due to some sort of fluid being propelled downward by the apparatus.

Most of the effects noted by Brown can be explained by classical electrodynamics. Assuming that the ionic wind effect is true, with closer plates, there will be a stronger electric field associated with the high voltage wire, thus ionizing more air and give more air flow. With higher dielectric constant, more surface charge accumulate at the wire, and more easily ionizes the fluid. With larger area, there’s increased capacitance, and again, more surface charge associated with the capacitor. Same with a larger voltage, with larger voltage, the electric field near the wire would be greater, and more air will be ionized. However, we weren’t able to explain the last effect as noted by Brown.
In the experiments, we tried inserting pieces of paper and polystyrene between the wire and the aluminum foil. If a dielectric of considerable area is inserted, there will be no lift. With the ionic wind, this can be easily explained by that fact that any upward momentum gained by the wire pushing air away from it will be exactly canceled by a downward momentum gained by the piece of dielectric blocking the air flow. And in net, there is no force. What differs this experiment from the Brown experiment, however, is the geometry of the capacitors. Brown experimented with parallel plate capacitors, and any effect he observed is probably due to ionic wind produced by the edge effects of capacitors. This experiment uses planar capacitors, which made it impossible to simply “insert” a piece of dielectric between the two metals. However, it is speculated that Brown observed the mass effects because denser materials usually have associated higher dielectric constant, thus reducing the case to the second observation.

References


Daniel Peng was born in New Brunswick, New Jersey, on April 21, 1985. He received a high school degree from the Science and Engineering Learning center at Manalapan High School in Englishtown, New Jersey, in 2001. Since 2001, he has been pursuing a B.S.E. degree in electrical engineering at Princeton University in Princeton, New Jersey.

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