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EM-GI Propulsion Systems

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ABSTRACT: This article intends to show that there are several electromagnetic and gravitoinertial methods to produce propulsion, which are: electric levitation, magnetic repulsion with mass rotation and ionic vortexes, gravitational neutralization with mass rotation and others related with these. We will work on the understanding and development of mathematical equations to quantify these systems. In the end, we will have a first approach to a new set of mathematical concepts to experiment with suitable technology for self-propelled fuel-free machines.

KEYWORDS: electric levitation, magnetic repulsion, ionic vortex, magnetic vortex, gravitational neutralization, mass rotation, gyroscopic effect.

Contents

1 Introduction

Since the first decades of the 20th century several researchers have presented electrical and magnetic methods that can be used in aircraft and spacecraft propulsion. Alongside these research paths, several technical reports contained in the books, written by people contacted by other humanities who visited our planet, can be used to understand how the propulsion systems of their spaceships work.

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Between the several identified technologies we can list the following:

1. Electric levitation;
2. Magnetic propulsion through the rotation of volumetrically charged masses;
3. Magnetic propulsion through the rotation of magnetic and metallic vapor vortexes;
4. Gravitoinertial propulsion with mass rotation.

The present article intends to provide the understanding and to develop some mathematical methods that allow to quantify these technologies, devoid of the pretense of inventing what has already been invented, but only establishing the first mathematical approximations.

2 Electric Propulsion

The purely electric propulsion systems, as we will see, do not alone have the vertical propulsion capacity required by atmospheric ships, however they present effective advantages in canceling the gravitational attraction and allow great horizontal acceleration. Outside the atmosphere, where there is no air resistance or gravitational attraction, they are quite effective systems. High-voltage electrical propulsion systems are often used in conjunction with other systems, such as magneto-hydrodynamics, to multiply their efficiency.

2.1 Electric Levitation

Electric levitation has been known since the 18th century, when Benjamin Wilson demonstrated its physical realization by floating an object charged with static electricity and subjected to a high electric field. In the experiment, if the external electric field applied in a plate at the top has positive polarity, and negative in a plate at the bottom, the object must be negatively charged (with a surface density of electric charge) so that it is attracted upwards and repelled from below. If the external electric field has reverse polarity, the object must be positively charged.

The electrostatic field stored in the atmosphere has a vertical potential of 80 to 300 volts every meter, depending on the altitude, the incidence of solar radiation and the humidity of the air. The positive pole of this electric field is in the upper layers of the atmosphere and the negative pole is in the planet's soil, thus, by controlling the amount of electric charges distributed on the external metallic surface of a device, it is possible to position it vertically in the atmosphere.

Vertical navigation within the atmosphere is done as a result of the following forces:

1. Repulsion between the device and the planet
   Negatively charged device is attracted by the upper layers of the atmosphere and repelled by the Earth's crust;
2. Attraction between the device and the planet
   Positively charged device is repelled by the upper layers of the atmosphere and attracted to the Earth's crust.

For a device to float, just consider that the gravitational field force $F = m g = q_G G$, which is the weight of the device, must be canceled out by the force of electrical attraction/repulsion $F = q_E E$. Thus:

$$F = q_G G = q_E E \quad \Rightarrow \quad q_E = \frac{q_G G}{E} \quad .$$

With:

F = Gravitational force or weight [N];
q_G = Gravitational charge (mass) of equipment [kg];
G = Gravitational field [N kg^{-1}] = g = Gravity acceleration [m s^{-2}];
q_E = Electric charge [C];

E = Electric field of atmosphere [N C^{-1}] [V m^{-1}].

Considering that the device has insulated metallic layers that can make a capacitor, the electric potential necessary to neutralize the weight of the device will be:

$$q_E = C V_E \quad \Rightarrow \quad V_E = \frac{q_E}{C} = \frac{q_G G}{E C} \quad .$$

With:

V_E = Electric potential between the layers [V];
C = Capacitance between the layers [C V^{-1}] [F].

If the two metallic layers that make up the capacitor are part of the spherical hull of a ship, there is a need to place another insulated internal metallic layer, so the crew members will not be influenced by the high electric field created by the distribution of electrical charges in the two outer metallic layers. The value of the two-layer spherical capacitor can be calculated by:

$$C = 4\pi\varepsilon_0 \frac{r_e r_i}{r_e - r_i} \quad .$$

With:

C = Capacitance between the layers [C V^{-1}] [F];
ε_0 = Electrical permittivity of air = 8.8541878*10^{-12} C V^{-1} m^{-1} [F m^{-1}];
r_e = External radius of capacitor [m];
r_i = Internal radius of capacitor [m].

Example:

Device composed of two overlapping concentric metallic spherical layers. The outer sphere has an internal diameter of 1 m and is separated from the inner sphere of 90 cm in external diameter by electrical insulators of 50 mm in length. The total mass of the set is 100 kg and an absolute vacuum is made between the spherical layers. We will calculate the electrical voltage applied between the two spherical layers to make the set float in the Earth's atmosphere.

The necessary negative electrical charge distributed on the surface of the outer layer with an atmospheric electric field of 80 V/m is:

$$q_E = \frac{q_G G}{E} = \frac{100 * 9.80665}{80} = 12.25 C \quad .$$

With:

q_E = Electric charge [C];
q_G = 100 kg;
G = 9.80665 N kg^{-1};
E = 80 V m^{-1}.

The capacitance of the set of concentric spheres is given by:

$$C = 4\pi\varepsilon_0 \frac{r_e r_i}{r_e - r_i} = 4\pi * 8.8541878 * 10^{-12} \frac{0.5 * 0.45}{0.5 - 0.45} = 5.01 * 10^{-10} F \quad .$$

With:

C = Capacitance [F];
ε_0 = 8.8541878*10^{-12} C V^{-1} m^{-1} [F m^{-1}];
r_e = 0.5 m;

r_i = 0.45 m.

The electrical potential applied to the spherical capacitor to accumulate the calculated electrical charge is:

$$V_E = \frac{q_E}{C} = \frac{12.25}{5.01*10^{-10}} = 2.45*10^{10}\,V \quad .$$

With:

V_E = Electric potential [V];
q_E = 12.25 C;
C = $5.01*10^{-10}$ F.

We see that the electric potential to be reached are very high and allow only the use of absolute vacuum as an electrical insulator. However, currently some inorganic crystals are known to have very high relative electrical permittivity, such as barium titanate ($BaTiO_3$) with ε_r between 1,000 and 4,500 and lead zirconate titanate ($Pb[Zr_xTi_{1-x}]O_3$) with ε_r between 300 and 20,000. Such materials, if used as a dielectric, increase capacitance and drastically reduce the voltage needed to accumulate the amount of electrical charges necessary to neutralize the weight of the device. In the example above, using a material with ε_r = 10,000, we have:

$$C = 4\pi\varepsilon_r\varepsilon_0 \frac{r_e r_i}{r_e - r_i} = 4\pi*10^4*8.8541878*10^{-12}\frac{0.5*0.45}{0.5-0.45} = 5.01*10^{-6}\,F \quad ;$$

$$V_E = \frac{q_E}{C} = \frac{12.25}{5.01*10^{-6}} = 2.45*10^{6}\,V \quad .$$

2.2 The Biefeld-Brown Effect

In 1923, Thomas Townsend Brown, accompanied by his tutor Dr. Paul Alfred Biefeld, experimented with capacitors subjected to high voltages and began his investigations to build the necessary theoretical bridge between two separate phenomena: electricity and gravitation.

Brown presented his first discoveries in an article published in Science & Invention: [1]

> The first actual demonstration of the relation was made in 1924. Observations were made of the individual and combined motions of two heavy lead balls which were suspended by wires 45 cm. apart. The balls were given opposite electrical charges and the charges were maintained. Sensitive optical methods were employed in measuring the movements, and as near as could be observed the balls appeared to behave according to the following law: "Any system of two bodies possesses a mutual and unidirectional force (typically in the line of the bodies) which is directly proportional to the product of the masses, directly proportional to the potential difference and inversely proportional to the square of the distance between them."

The peculiar result is that the Earth's gravitational field had no apparent connection to the experiment. Gravitational factors came in by considering the mass of the electrified bodies. The force discovered was obviously the physical effect resulting from an electric-gravitational interaction. It represented the first evidence of the basic relationship. The force was called "gravitator action" and the apparatus or mass system used was called "gravitator".

Brown also tested the "gravitator action" in the form of impulse using a gravitator fully immersed in oil and suspended to act as a pendulum. When the high voltage DC electrical voltage (75 to 300 kV) is applied, the gravitator moves in an arc until its propulsive force balances the force of Earth's gravity resolved at that point, so it stops but does not remain there. The pendulum gradually returns to the vertical or initial position while the potential is maintained. The pendulum moves only to one side of the vertical. Less than five seconds is required for the pendulum to reach the maximum range of motion, but 30 to 80 seconds are required for it to return to zero.

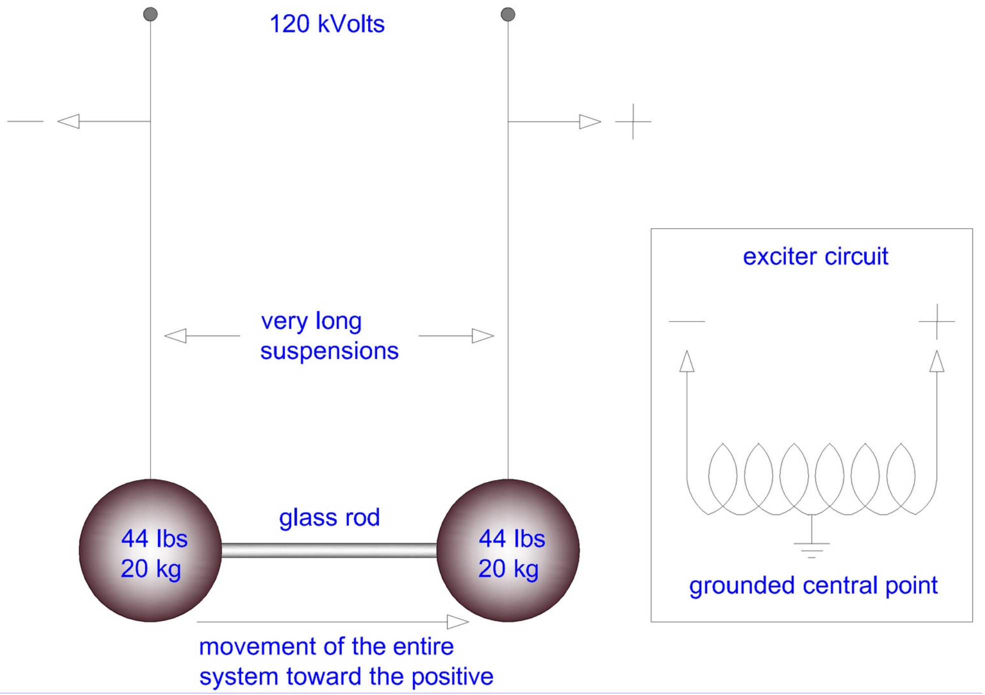

Figure 1: Brown simple gravitator.

The total time or duration of the pulse varies with cosmic conditions such as the position and relative distance of the moon, sun and so on. It is not affected in any way by fluctuations in the applied voltage and regulates the same for all mass or material under test. The duration of the impulse is governed only by the condition of the gravitational field. It is a value that is not affected by changes in the experimental setup, applied voltage or type of gravitator used. Any number of different types of gravitators operating simultaneously at very different voltages would reveal exactly the same pulse duration at any given moment. Over an extended period of time, all gravitators would show equal variations in the duration of the impulse.

After the gravitator is completely discharged and its impulse is exhausted, the electrical potential must be removed for at least five minutes so that it can recharge and regain its normal gravitational condition. The effect is very similar to the discharge and charging of a battery, except that the electricity is reversed. When the pulse duration is long, the time required for the full recharge is also long. Discharge and recharge times are always proportional. Technically speaking, the exo-gravity and endo-gravity variations are proportional to the gravitic capacity.

In the gravitator's experiments immersed in oil, where the metal tank was polarized, it was proven that the gravitator moves in the opposite direction from that required by the laws of electrostatic attraction and repulsion. The polarity inversion of the tank and gravitator does not change the direction, extension or duration of the gravitational impulse.

In 1928, Townsend Brown registered a British patent number 300,311 describing “A Method of & an Apparatus or Machine for Producing Force or Motion” using capacitors of multiple flat plates superimposed with solid dielectric which, when polarized with high voltage, produce a displacement force towards the positive pole. The produced force can be used in any direction, depending only on the position of the capacitor. If it is placed vertically with the top plate of the capacitor positively charged, it will lose weight; with the top plate negatively charged, it will increase the weight.

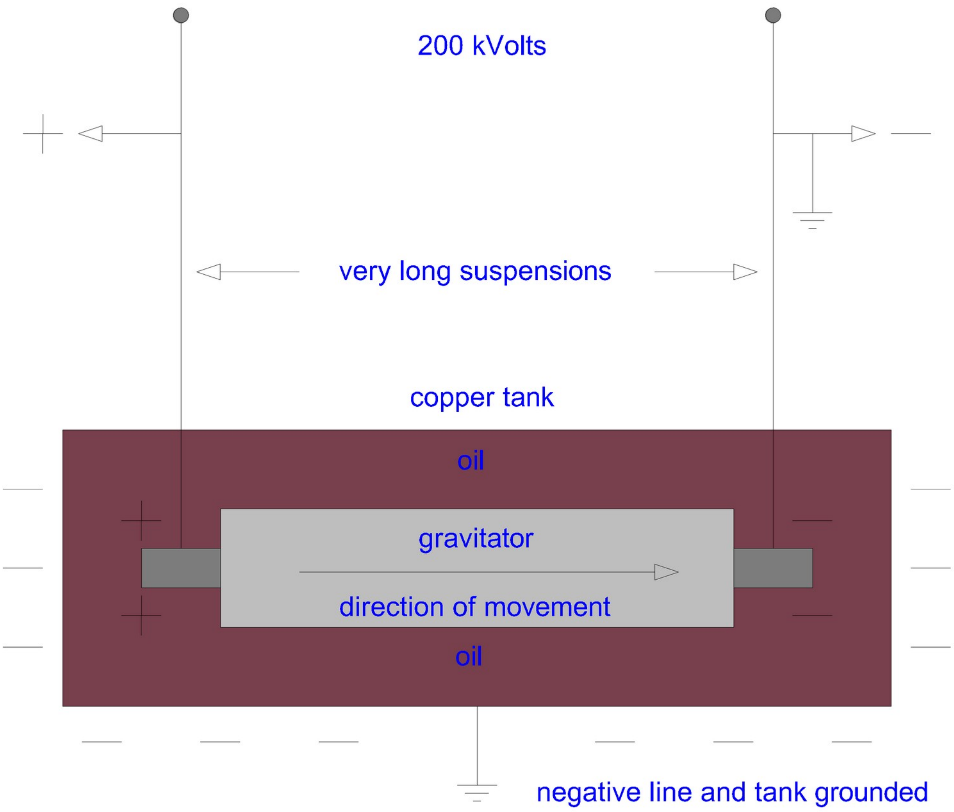

Figure 2: Electrogravitic pendulum with negative polarity.

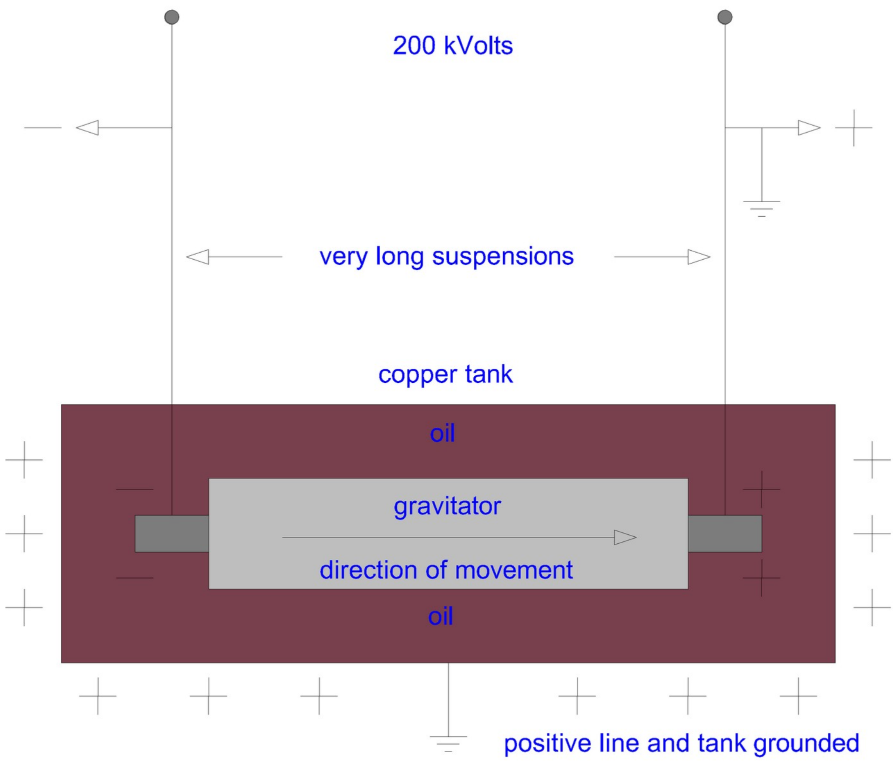

Figure 3: Electrogravitic pendulum with positive polarity.

After numerous tests, it was found that the intensity of the effect is determined by five factors:

1. The separation distance of the condenser plates. The closer the plates were to each other, the greater the effect.
2. The ability of the material between the plates to store electrical energy in the form of elastic stress. The measure of this ability is called the dielectric coefficient of the material. The higher this coefficient, the greater the effect.
3. The size of the areas of the condenser plates. The larger the areas, the greater the effect.
4. The voltage difference between the capacitor plates. The higher the voltage, the greater the effect.
5. The mass of the material between the plates. The greater the mass (atomic mass), the greater the effect.

In 1957, Brown registered an American patent number 3,018,394 describing an “Electrokinetic Transducer” that describes the reverse effect, that is, when a dielectric medium between high voltage electrodes is set in motion by an external mechanical force, there is a change in the voltage of the electrodes that corresponds to the variation of the applied force.

In 1965, Brown registered an American patent number 3,187,206 describing an “Electrokinetic Apparatus” using a metallic arc and sphere separated by a rod of insulating material that, when polarized with high voltage, produced a buoyant force in the direction of one electrode, provided that it had a configuration that causes the convergence of the power lines towards the other electrode. Therefore, the force follows the direction of the region of high density of electrical charges towards the region of low density of electrical charges, usually in the direction of the axis of the electrodes. The thrust produced by such a device will be present if the electrostatic field gradient between the two electrodes is non-linear. This gradient non-linearity can result from a difference in the configuration of the electrodes, the electrical potential and/or polarity of adjacent bodies, the shape of the dielectric part, a gradient in the density, electrical conductivity, electrical permittivity and magnetic permeability of the dielectric part or a combination of these factors.

After realizing the propulsive effects, Brown designed and built sheet metal discoid devices 24″ (60 cm) in diameter that reached speeds of 5 m/s (18 km/h) in his laboratory, described as an “Electrokinetic Apparatus” in the American patent number 2,949,550 registered in 1960. These discs were a variation of the simple two-plate capacitor, loaded with 50 kV DC. Tied to a mast, they rotated in a circular course 6 m in diameter. The continuous input power to keep them flying has been reported to be only 50 Watts.

Another set of experimental discs 90 cm in diameter, also tied to a central mast, rotated on a 15 m diameter course. These disks were also polarized with 50 kV and their speeds were so impressive that their results were classified and all public information about their experiments

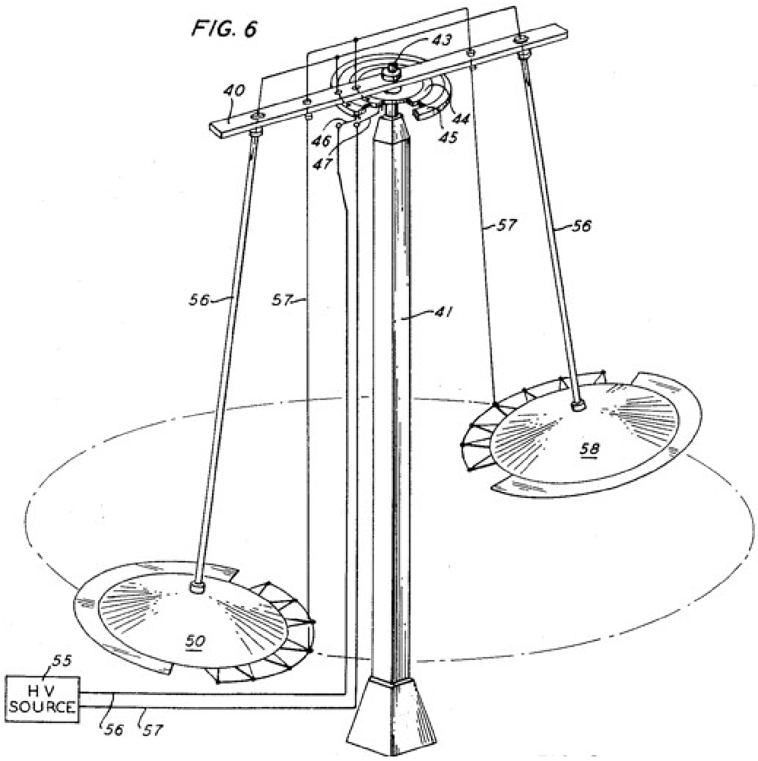

Figure 4: Electrokinetic apparatus of Brown.

ceased. There was a slight "hummm" emanating from the disks as they flew. In the dark, they glowed with a strange lavender light. They spun in free flight, the energy was supplied to them through wires that departed from the central mast.

2.2.1 How the Biefeld-Brown Effect Works

It is possible, by subjecting a mass to an electric field, to change the position of the center of its molecules. In this situation, with the center displaced from the inertial center, the mass moves towards its new neutral center, seeking balance.

Since all matter consists of atoms and each atom has an electropositive nucleus (protons) surrounded by electronegative particles (electrons), a typical atom is always in an electrically neutral field. However, if the atom is placed inside an electric field of a capacitor, its atomic field becomes distorted, the nucleus is pulled towards the negative plate and the electronic field is pulled in the opposite direction, to the positive plate. Then, the normally symmetrical field of the atom becomes asymmetrical when placed in an electric field and acquires the properties of a dipole, with the opposite polarity to that of the inductive electric field. It is for this reason that Townsend Brown preferred to call what is known as the "Biefeld-Brown Effect" by the name "stress on dielectric material". [2]

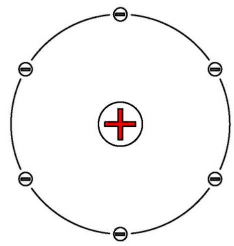

Figure 5: Neutral atom.

This is the reason why, in the gravitic pendulum experiment, where the capacitor is placed inside a polarized metallic tank, the capacitor moves in the reverse direction of the electrostatic attraction/repulsion laws. Which leads us to understand that the attraction of the electric field of the atomic dipole is greater than the electrostatic attraction of the capacitor. This explains why in the atmosphere the capacitor is always pushed towards the positive pole of the capacitor: because the atmosphere is always positive in relation to the earth and attracts the negative side of the atomic dipole towards its axis.

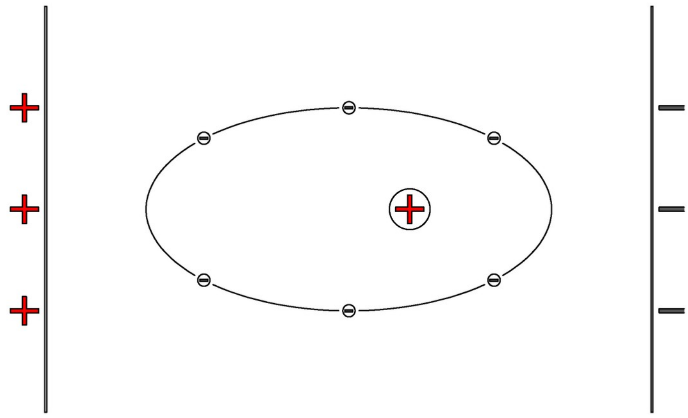

Figure 6: Polarized atom.

Another way to understand this phenomenon is considering that an electric charge inside an electric field suffers a force of attraction to the potential of opposite polarity and a repulsion force from the potential of similar polarity. If a gravitator device contains an electric field and is immersed in a volumetrically charged space (which is the case with the atmosphere), it will tend to move in the opposite direction to the movement of the electrostatic charges. That is, the electric charges that are inside the electric field will move towards the opposite potential and the device will move in the opposite direction to the electric charges, considering that both can move.

This same understanding can be applied to the gravitic pendulum, since the electrostatic charges inside the tank are of a single polarity:

1. Positively charged tank
   Positive charges inside the tank always move in the same direction as the gravitator's electric field vector. Consequently, the gravitator will move in the opposite direction to the charges and in the opposite direction to the electric field vector.
2. Negatively charged tank
   Negative charges inside the tank always move in the opposite direction to the gravitator's electric field vector. Consequently, the gravitator will move in the opposite direction to the charges and in the same direction as the electric field.

We can deduce that there is an ionic wind flowing in the opposite direction to the gravitator's movement, that is, because the gravitator is not fixed on a support, it is moved in the opposite direction to the ionic wind. This explains why in the tank there is only an impulse and the pendulum return to its initial position: the quantity of electrostatic particles inside the tank is limited and the impulse looses force when all the charged particles have moved to the opposite pole.

2.2.2 Biefeld-Brown Propulsion System

As we have seen, it is possible to obtain thrust force through the Biefeld-Brown effect, however it is necessary that the surfaces and stresses involved are large, knowing that in the atmosphere the thrust force always occurs in the opposite direction of the electric field vector of the device, that is, the direction of the force vector is from the negative pole to the positive pole.

For a craft to move horizontally within the atmosphere, it is sufficient to create high-voltage electric fields between three spheres positioned in a horizontal plane at 120° from each other. If each sphere can have its electric potential varied from positive to negative, there will be complete horizontal mobility. To confirm this possibility, we can identify three spherical condensers on the disk seen by George Adamski [3], whose photograph is reproduced beside. This arrangement allows to create a non-linear gradient of electrostatic field between the condensers, always polarizing two of them with the same potential and the third with opposite potential, as described in Brown's patent.

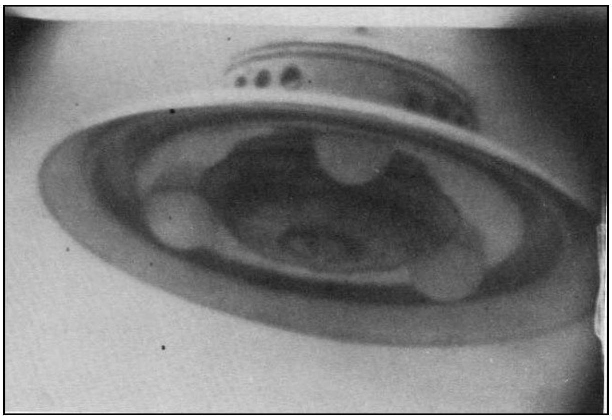

Figure 7: Flying saucer seen by Adamski.

3 Magnetic Propulsion Through Mass Rotation

Magnetic levitation is based on the principle of magnetic repulsion between the vertical component of the planet's magnetic field and a magnetic field generated inside of an equipment. If the magnetic field has the same direction as the vertical component of the planet's magnetic field, there will be a repulsion force between these two fields that will partially or totally cancel the gravitational force on the device, so it will weigh less; if the magnetic field generated inside the system has a contrary direction to the vertical component of the planet's magnetic field, there will be attraction between these two fields and the device will weigh more. For levitation to occur, the force of this repulsion must equal the force of the planet's gravitational attraction.

The intense magnetic field required can be generated in a number of ways, however, it basically consists of intense electric current circulation or rotation of good conducting materials that contain high density of free electrons or high density of electric charges or ions. The text below, extracted from the book “The White Sands Incident”, exemplifies one of these systems. [4]

> All bodies of matter which are in motion have magnetic fields about them for the reason just given: that all matter contains electrons and all electrons in motion produce magnetic fields. The magnetic field of your earth is very weak in proportion to its gravitational field and it may be difficult for you to understand how acceleration against a strong field can be produced by opposition to a weak one. Just remember what happens when you bring together the 'like' or opposing poles of two 'permanent' magnets, how the lines of force are pushed outward almost perpendicular to their normal position. So the field of the craft fans outward until it intersects sufficient lines of earth's field to produce the required repulsion.

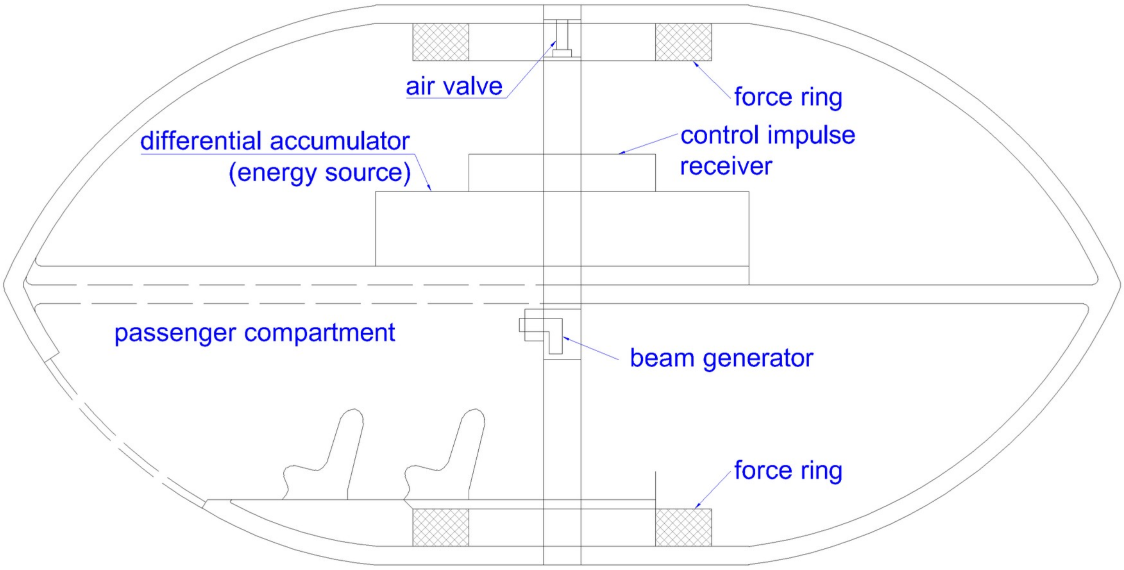

Figure 8: Internal configuration of the ship showing the force rings.

The control mechanism allows these electrons to flow through the two force rings which you see at the top and bottom of the craft. You are familiar enough with electrodynamics to know that a moving electron creates a magnetic field. The tremendous surge of electrons through the force rings produces a very strong magnetic field. Since the direction and amplitude of flow can be controlled through either ring, and in several paths through a 'single' ring, we can produce a field which is in opposition or in conjunction with any magnetic field through which we wish to travel. This also gives us control of the attitude of the craft with respect to the given field.

It is possible to simulate a circular electric current by high-speed rotation of material masses that contain a large amount of free electrons (such as superconducting materials) or a large amount of positive ions by heating metals at high temperatures (a condition in which they lose electrons in large quantities and become bright). The result will be the creation of a magnetic field in the geometric center of the rotating material, as we see in the text below, extracted from the book “The Janos People”. [5]

… In this annular space above him, he could see a succession of bright silvery cylinders which traveled round in a circular path, at first slowly, but with rapidly increasing speed.

Each cylinder was attached to a radial arm, which came from the direction of the unseen center of the ship. Soon he realized that there was just one long beam, pivoted centrally somewhere out of his sight, with a cylinder at either end. Each cylinder was shaped, if one can imagine such a thing, like a double-ended bullet; the middle part was cylindrical, but each end tapered off into a streamlined paraboloidal 'nose'.

Anouxia now turned to John, and, seeing him looking at the bright cylinders on their rotor beam – they were now turning much faster – said: "If we turn fast enough, there is no gravity to hold us down to the Earth". He went on to explain that he had been telling the people to get ready to raise the ship off the ground, because someone was coming, and they had to move to avoid discovery. …

A humming sound, quiet at first, coming from below the main deck, increased steadily in pitch and volume, until it reached a fairly noisy maximum; but the giant rotor continued to increase its speed until the separate repetitions of the passing cylinders could no longer be distinguished, and the whole visible part of the rotor became a uniform, gleaming silvery disc.

John says the engines made a lot of noise, and he could feel the deck vibrating under his feet.

At this point, he had a curious experience: he became weightless, and lost his balance, falling helplessly sideways, but not falling to the deck. …

…

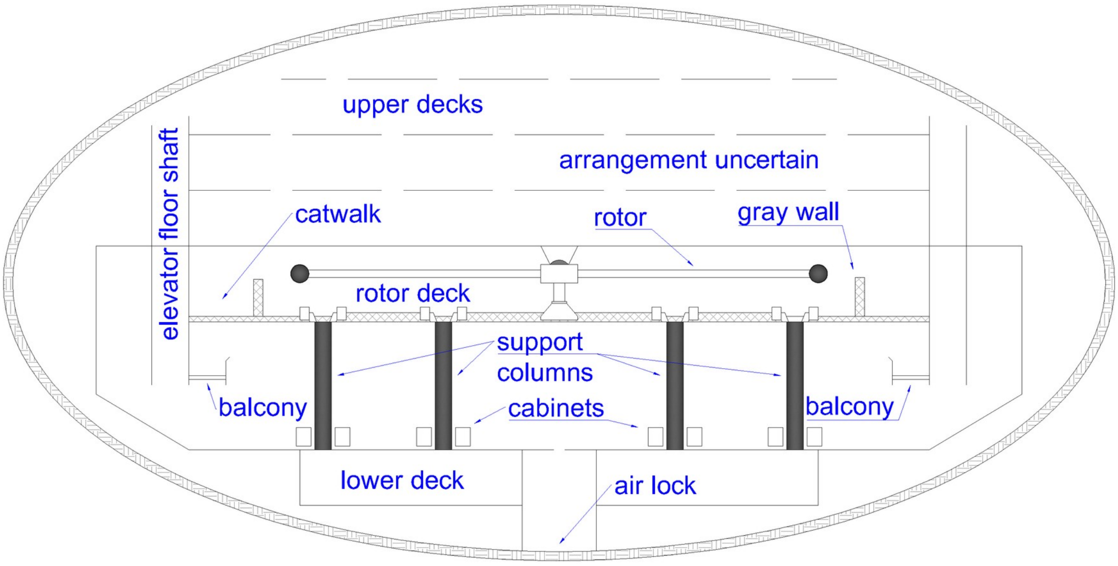

Figure 9: Section of the ship's engine room.

Anouxia told John about the big circular room: "This is where we make power". He said something about electromagnetism; he said they used "very, very high voltage". John understood him to say that the humming sound he heard coming from below was a starting device; once the rotor was spinning fast enough, it "took over".

…

The giant rotor was now still; and he was able to examine it closely. In fact, Anouxia told him, no one was allowed to be on this deck while the rotor was turning: it was too dangerous.

The beam which carried the bright cylinders on its outer ends was well above John's head; its lower face was nearly eight feet clear above the deck on which he stood. The beam was sixteen inches wide; its edges were rounded, and the upper surface sloped gently up towards the middle from each side. This sectional shape would give some stiffness without impairing the transverse streamlining, so important when the rotor is turning at really high speeds; it would, I think, also give a slight aerodynamic lift to the rotating rotor beam, which was about 36 feet (11 m) in overall length.

At each end, the beam was inserted laterally into the center of the cylinder; each cylinder was about five feet (1,5 m) long, and about 18 inches (0,46 m) in diameter in the middle straight-sided portion. This cylindrical portion was about 27 inches (70 cm) long; beyond that, the shape smoothly tapered off like a blunt-nosed bullet, with well-rounded ends, not pointed.

The maze (labyrinth) of pipework made it difficult to approach the center of the rotor deck; but John could see plainly the central pivot about which the rotor beam turned: it consisted of a vertical shaft, about 18 to 20 inches (50 cm) in thickness, extending from floor to ceiling, being secured top and bottom in a massive bearing. A comparably massive collar, mounted on the shaft near its upper bearing, provided secure anchorage for the beam. My calculations suggest that this collar occupies the geometrical center of the ship.

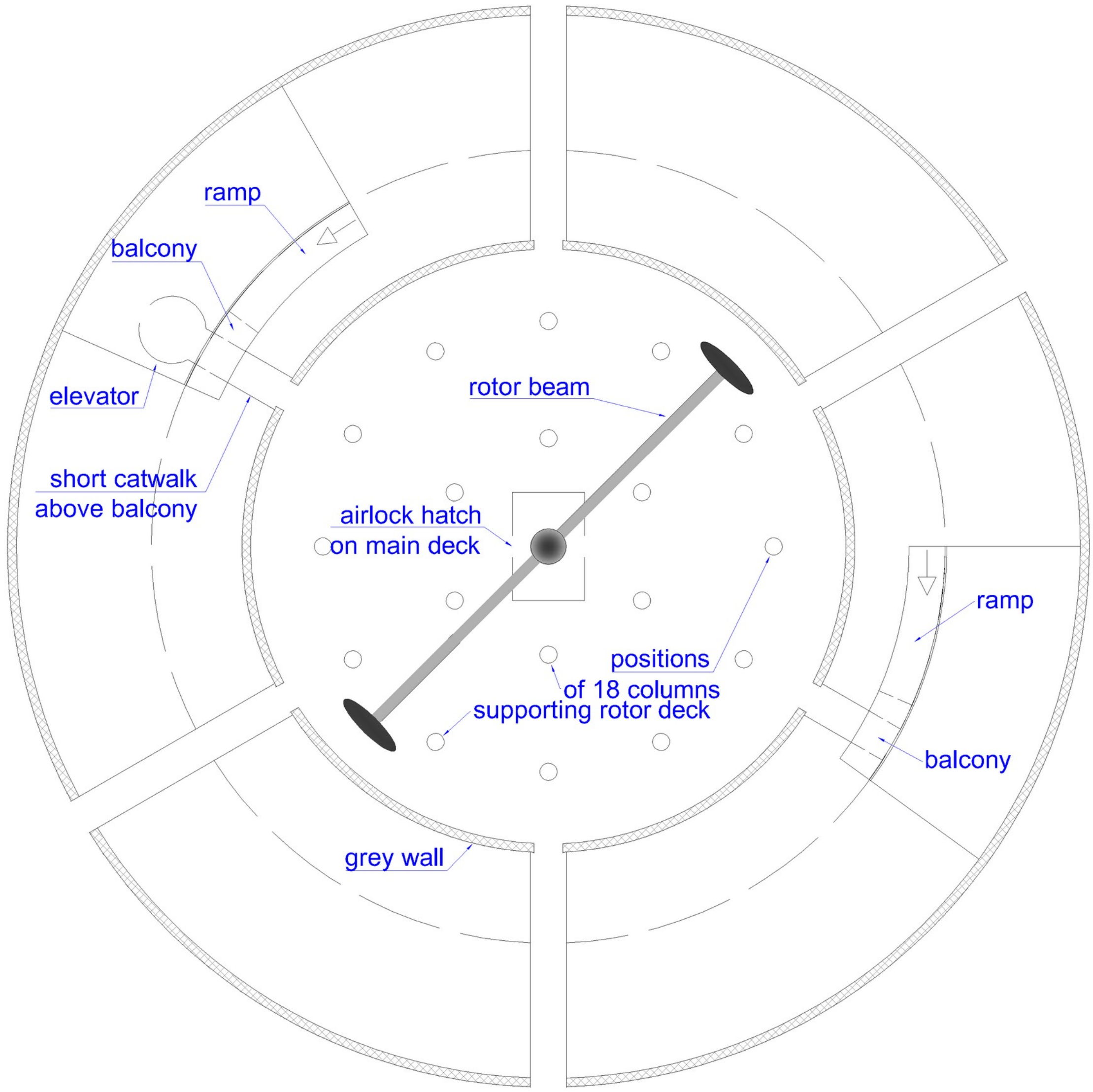

Figure 10: Top view of the ship's rotor deck.

The ultimate ceiling of the engine room was about ten feet (3 m) above the rotor deck; so the overall height of the engine room was about thirty feet (9 m). The thick grey wall, through which they passed, was about six feet (1,8 m) high; it did not extend all the way to the ceiling. Anouxia told John that the grey wall was not merely a wall, but was part of the electrical mechanism.

It is also possible to simulate an electric current by high-speed rotation of rings made of materials that contain large amounts of free electrons or superconducting material. The result will be the creation of a magnetic field in the geometric center of the rotating ring, as we see in the text below, extracted from the book "Flying Saucers Have Landed". [3]

As the ship started moving, I noticed two rings under the flange and a third around the center disk, this inner ring and the outer one appeared to be revolving clockwise, while the ring between these two moved in a counter clockwise motion.

The text below, extracted from the book “UFO Contact from Planet Korendor”, confirms a similar system as exposed in the text above: [6]

"With the propulsion techniques we use, namely gravitic and magnetic, propulsion is provided from fields generated by equipment inside the craft."

"Concerning magnetic propulsion: As you know, the planet Earth is surrounded by magnetic flux. It flows from south to north, since in reality the geographic South Pole is Magnetic North, as opposed to something called the North Magnetic Pole located in Hudson Bay."

"When entering this field, automatic detectors determine the flux intensity and the direction of flow in relation to the ship. There are also many more factors which are involved for this type of discussion."

"On Korendian ships, there are two sets of magnetic poles. One is vertical through the center of the ship. The other set of poles is on one of two rotating rings on the bottom of the ship."

"The vertical set of poles repels the Earth’s field with sufficient force to cancel the effects of gravity, much as centrifugal force, so as to suspend it in the air. For descending we simply weaken it. To ascend, we strengthen it."

"The poles on one of the rotating rings are used to travel in directions other than directly perpendicular to the field. These are automatically aligned by computer so that the Ring North faces Terran magnetic South, and vice versa. The poles are generated independently, and are variable independently or simultaneously, either in terms of strengthening or of weakening both together, or strengthening one and weakening the other."

"The second of the two rotating rings contains a revolving field, generated by a heavy current whipping around in coils in this ring. This field can be reversed instantly by simply changing the polarity of the current."

The above descriptions indicate the possibility of producing propulsion devices based on the rotation of masses that have been electrically charged, usually with the objective of generating intense magnetic fields. We will try to develop mathematical methods to quantify these various possibilities.

3.1 Rotation of Superficially Charged Masses

To create a magnetic field, it is possible to distribute a large amount of electric charges on the surface of a metal plate with a high-voltage generator and to spin this plate in high rotation; the effect will be the same as an electric current. The metal plate can be one of the faces of a circular flat plate capacitor. The equations involved in the calculations are:

$$E=\frac{V_E}{l} \quad \Rightarrow \quad D=\varepsilon E=\varepsilon\frac{V_E}{l}=\frac{q_E}{S} \;,\; C=\varepsilon\frac{S}{l} \quad \Rightarrow \quad q_E=C V_E=\varepsilon\frac{V_E}{l}S \;.$$

With:

E = Electric field [V m^{-1}];
V_E = Electric potential between the plates [V];
D = Surface density of electric charge [C m^{-2}];
ε = Electric permittivity of dielectric [C V^{-1} m^{-1}] [F m^{-1}];
q_E = Electric charge distributed on plate [C];
l = Distance between the plates [m];
S = Surface of the plates [m^2];
C = Capacitance [C V^{-1}] [F].

Knowing the value of the electric charge, we can calculate the equivalent electric current when the circular plate is rotating on an axis that passes through its center. The total surface of a metallic disk can be analyzed as the sum of infinitesimal turns (rings of length $2\pi r$) in which the radius of these varies from R_i, the smallest radius, to R_e, the largest radius (of the perimeter) of the disk. The electric charge of each disk ring is dq_E and the time of a rotation is dt, the current per disk ring is dI_E:

$$dq_E = D(2\pi r)\,dr = \varepsilon\frac{V_E}{l}2\pi r\,dr \quad , \quad dt = \frac{2\pi}{\omega} \quad \Rightarrow \quad dI_E = \frac{dq_E}{dt} = D\,\omega\,r\,dr = \varepsilon\frac{V}{l}\omega\,r\,dr \quad .$$

The sum of the current rings gives us the total current of the disk:

$$I_E = \int_{R_i}^{R_e} dI_E = D\,\omega\int_{R_i}^{R_e} r\,dr = D\frac{\omega}{2}\left(R_e^2 - R_i^2\right) = \varepsilon\frac{V_E}{l}\frac{\omega}{2}\left(R_e^2 - R_i^2\right) \quad .$$

With:

I_E = Electric current [A];
R_i = Internal radius of disc [m];
R_e = External radius of disc [m];
ω = Angular speed of disc [rad s^{-1}].

Knowing the value of the equivalent electric current, we can calculate the intensity of the magnetic field generated inside the rotating disk and the repulsion force between the generated magnetic field and the vertical component of the planet's surface density of magnetic charge. This vertical component varies according to latitude, longitude and altitude, being able to assume values of 1 nT (10^{-9} T) in equator to 60 μT ($6*10^{-5}$) in the poles.

Again, the total surface of a metallic disk can be analyzed as the sum of infinitesimal turns of current (rings of length 2πr) in which the radius of these varies from zero, the smallest radius, to R, the largest radius (of the perimeter) of the disk. If the axis of rotation of the disk is on the Z axis of the coordinate system, each loop of electric current produces a magnetic field at a distance z above the center of the loop: [7]

$$dH = dI_E\frac{r^2}{2\left(r^2+z^2\right)^{3/2}} = D\,\omega\,r\frac{r^2}{2\left(r^2+z^2\right)^{3/2}}dr = \frac{\varepsilon\,\omega\,V_E}{2l}\frac{r^3}{\left(r^2+z^2\right)^{3/2}}dr \quad .$$

With:

dH = Infinitesimal magnetic field [A m^{-1}];
dI_E = Infinitesimal electric current (ring of current) [A];
r = Radius of current ring [m];
z = Distance above the ring center [m].

The total magnetic field of the disk is given by the integral:

$$\vec{H} = \int_0^R dH = \frac{\varepsilon\,\omega\,V}{2l}\int_0^R\frac{r^3}{\left(r^2+z^2\right)^{3/2}}dr\,\hat{z} = \frac{\varepsilon\,\omega\,V}{2l}\left[\frac{\left(R^2+2z^2\right)}{\sqrt{R^2+z^2}} - 2z\right]\hat{z} \quad .$$

If the magnetic field is calculated in the center of the disk, the distance z will be zero, and the above equations are:

$$dH = dI_E\frac{1}{2r} = \frac{\varepsilon\omega V_E}{2l}dr \quad \Rightarrow \quad \vec{H} = \frac{\varepsilon\,\omega\,V_E R}{2l}\hat{z} \quad \Rightarrow \quad \vec{B} = \mu_0\vec{H} = \frac{\mu_0\varepsilon\,\omega\,V_E R}{2l}\hat{z} \quad .$$

The gravitational force must be overcome by the force of magnetic repulsion between the magnetic field generated inside the rings and the vertical component of the planet's surface density of magnetic charge. We can calculate this repulsion force between magnetic fields by knowing the repulsion/attraction force between a magnetic charge and a magnetic field, considering that one of them provides a surface charge distribution:

$$F = q_M H = B S H \quad .$$

With:

F = Repulsion/attraction force [N];
q_M = Magnetic charge [Wb];
H = Generated magnetic field [A m^{-1}];
B = Vertical component of the planet's surface density of magnetic charge [Wb m^{-2}];
S = Area submitted to the generated magnetic field [m^2].

Example:

Two metal discs 10 m in diameter are separated from each other by a distance of 1 m. One rotates clockwise and the other counterclockwise at 12,000 RPM. The disk axis has a diameter of 10 cm and an electric generator applies a voltage of 300 kV between the two plates.

The capacitance between the plates is calculated by:

$$C = \varepsilon \frac{S}{l} = 8.854 * 10^{-12} \frac{78.54}{1} = 6.954 * 10^{-10} F \quad .$$

With:

C = Capacitance [F];
ε = Dielectric permittivity = ε_0 = 8.854*10^{-12} F m^{-1};
S = Surface of the plates = πR^2 = $\pi * 5^2$ = 78.54 m^2;
l = Distance between the plates = 1 m.

The amount of electrical charges distributed on the surface of each disk is:

$$q_E = \varepsilon \frac{S}{l} V_E = C V_E = 6.954 * 10^{-10} * 3 * 10^5 = 2.086 * 10^{-4} C \quad .$$

With:

q_E = Electric charge [C];
C = Capacitance = 6.954*10^{-10} F;
V_E = Electric potential between the plates = 3*10^5 V.

The angular speed of the disks is:

$$\omega = v_{RPM} \frac{2\pi}{60} = 1.2 * 10^4 \frac{2\pi}{60} = 1.257 * 10^3 \, rad \, s^{-1} \quad .$$

The equivalent electric current of each disk is:

$$I_E = \varepsilon \frac{V_E}{l} \frac{\omega}{2} \left(R_e^2 - R_i^2 \right) = 8.854 * 10^{-12} \frac{3 * 10^5}{1} * \frac{1.257 * 10^3}{2} \left(5^2 - 0.05^2 \right) = 4.17 * 10^{-2} A \quad .$$

With:

I_E = Electric current [A];
ε = ε_0 = 8.854*10^{-12} F m^{-1};
ω = 1.257*10^3 rad s^{-1};
l = 1 m;
V_E = 3*10^5 V;

R_i = 0.05 m;
R_e = 5 m.

The equivalent electric current is twice that calculated by a disc because they are two discs that rotate in opposite directions.

As we can see, the equivalent current has no significant value, at least in these simulated conditions, so we will not continue with the magnetic repulsion calculations. It is possible, using electrical insulating materials and multiple metallic layers, to multiply the value of the equivalent electric current, however, it will still be below what is necessary to develop the buoyant forces for the propulsion systems of atmospheric ships.

3.2 Rotation of Volumetrically Charged Masses

We can also make a metal lose electrons by increasing its temperature through the thermoelectric effect. As long as the metal withstands the necessary high temperature, it can be taken to lose an excessive amount of electrons and remain with a very high amount of positive charge.

On the other hand, scientists are looking to make metals and their alloys superconducting and also certain ceramics by subjecting them to very low temperatures. This drop in temperature causes the substance to absorb electrons from the environment to complete the missing electrons in its last (conduction) layer, which would also occur by subjecting these same substances to an environment where there is excess electrons, such as the high speed movement of negative electrical charges (electrons), as occurs in vortexes.

The absorption of electrons by the material cooled at low temperatures increases its electron density and, in the case of copper which has a density of $n_e = 8.4538*10^{28}$ electron/m^3 (1 electron in the last layer for each atom), it will have this same additional electronic density (completing the missing electron in the last layer), therefore, when rotating a ring of this refrigerated material in high rotation, it will be the equivalent of a high intensity circular electric current. And all these charges will be moving together at a speed much higher than the drag speed provided by the electric current produced by an electric field applied to an electric conductor material. The advantage is that, with no collisions between the free electrical charges and the atoms of the material, there is no energy loss by heating.

In the present theme, we will calculate the intensity of the magnetic fields generated inside rotating rings and the repulsion force between them and the vertical component of the planet's surface density of magnetic charge. This vertical component varies according to latitude, longitude and altitude, being able to assume values of 1 nT in equator and 60 μT in the poles.

The magnetic field produced in the center of a circular wire loop, when an electric current circulates through it, is calculated by:

$$H=\int_0^{2\pi r}\frac{I_E}{4\pi r^2}dl=\int_0^{2\pi}\frac{I_E}{4\pi r^2}r\,d\theta=\frac{I_E}{4\pi r}[\theta]_0^{2\pi}=\frac{I_E}{2r} \quad\Rightarrow\quad B=\mu H=\mu\frac{I_E}{2r}\ .$$

With:

H = Magnetic field [A m^{-1}];
B = Surface density of magnetic charge [Wb m^{-2}] [T];
I_E = Electric current of the circular wire loop [A];
l = Circular wire loop length [m];
r = Circular wire loop radius [m].

The gravitational force must be overcome by the force of magnetic repulsion between the magnetic field generated inside the rings and the vertical component of the planet's surface density of magnetic charge. We can calculate this repulsion force between magnetic fields by knowing the repulsion/attraction force between a magnetic charge and a magnetic field, considering that one of them provides a surface charge distribution:

$$F = q_M H = B S H \quad .$$

With:

F = Repulsion/attraction force [N];
q_M = Magnetic charge [Wb];
H = Generated magnetic field [A m^{-1}];
B = Vertical component of the planet's surface density of magnetic charge [Wb m^{-2}];
S = Area submitted to the generated magnetic field [m^2].

The magnetic repulsion force above is able to cancel the gravitational force of the following amount of mass:

$$F = q_G G = B S H \quad \Rightarrow \quad q_G = \frac{F}{G} = \frac{B S H}{G} \quad .$$

With:

q_G = Gravitational charge (mass) [kg];
F = Force [N];
G = Gravitational field [N kg^{-1}] = g = gravity acceleration = 9.80665 m s^{-2}.

Example 1:

Refrigerated copper ring with 10 m average diameter and section 20×20 cm spinning on its geometric center with 36,000 RPM (revolutions per minute).

In this condition, the electrons in the ring will rotate at an average speed of:

$$v = \frac{l}{t} = l f = 2 \pi r f = 2 \pi * 5 * 600 = 1.885 * 10^4 m s^{-1} \quad .$$

With:

v = Velocity [m s^{-1}];
l = 2πr = 2 * 3.14159 * 5 = 31.4159 m;
f = 36,000/60 = 600 Hz.

The electric current is equivalent to the number of charges per second that pass in the ring section:

$$I_E = n_e e S l f = 8.4538 * 10^{28} * 1.602 * 10^{-19} * 4 * 10^{-2} * 2 \pi * 5 * 600 = 1.021 * 10^{13} A$$

With:

I_E = Electric current [A];
n_e = 8.4538*10^{28} electron m^{-3};
e = 1.602*10^{-19} C;
S = 2*10^{-1} * 2*10^{-1} = 4*10^{-2} m^2;
l = 2πr = 2 * 3.14159 * 5 = 31.4159 m;
f = 36,000/60 = 600 Hz.

Applying the magnetic field formula, without introducing magnetic material inside the ring, we have:

$$H=\frac{I_E}{2r}=\frac{1.021*10^{13}}{2*5}=1.021*10^{12}\,A\,m^{-1}\quad .$$

With:

H = Magnetic field [A m^{-1}];
I_E = $1.021*10^{13}$ A;
r = 5 m.

$$B=\mu_0 H=1.256637*10^{-6}*1.021*10^{12}=1.28*10^{6}\,T$$

With:

B = Surface density of magnetic charge [Wb m^{-2}] [T];
μ_0 = $1.256637*10^{-6}$ Wb A^{-1} m^{-1};
H = $1.021*10^{12}$ A m^{-1}.

With these information we can calculate the repulsion force between the magnetic fields and the amount of gravitational charge (mass) that can be levitated.

$$F=q_M H=B\,S\,H=10^{-9}*7.854*10^{1}*1.021*10^{12}=8.019*10^{4}\,N\quad .$$

With:

F = Attraction/repulsion force [N];
B = 10^{-9} T;
S = $\pi r^2 = \pi(5)^2 = 7.854*10^1$ m^2;
H = $1.021*10^{12}$ A m^{-1}.

$$q_G=\frac{F}{G}=\frac{8.019*10^{4}}{9.80665}=8.174*10^{3}\,kg\quad .$$

With:

q_G = Gravitational charge (mass) [kg];
F = $8.019*10^4$ N;
G = 9.80665 m s^{-2}.

Effects of nullification of the gravitational force were observed by Dr. Eugene Podkletnov, who led a research with the rotation of a superconducting ceramic ring (yttrium-barium-copper oxide) rotating at 5,000 RPM. In his experiment, all the equipment was kept cooled with liquid nitrogen inside a chamber called the cryostat. The superconducting ring was 145 mm in diameter and 6 mm thick and floated without friction over three solenoids while was turned by other solenoids.

The team found that even the atmospheric pressure measured vertically on the device reduced slightly and the effect was detectable directly on the device on each floor of the laboratory. In his last experiments, samples of different compositions and weights (10 to 50 g) were placed at distances of 25 mm to 1.5 m from the superconducting disc and the weight loss reached almost 2%. These experiences were reported in two scientific articles: E. Podkletnov and R. Nieminen, Physica C 203 (1992) 441 and E. Podkletnov and A.D. Levit, Tampere University of Technology report, January 1995 (Finland).

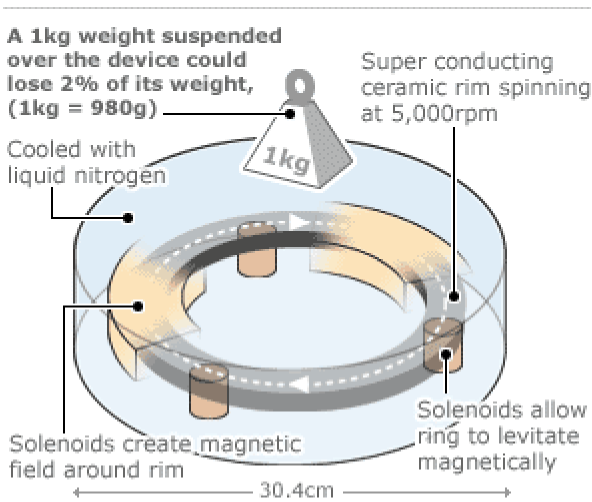

Figure 11: Podkletnov experiment assembly.

The example below comes close to the experiment carried out by E. Podkletnov. We must note that the calculated magnetic repulsion force is for an object that occupies the entire area of the rotating ring and not just a small part. Likewise, the distance between the object and the magnetic field also influences this force.

Example 2:

Superconducting ring of mercury (Hg maintained at transition temperature 4.15 K) with 145 mm outside diameter and section of 6×25 mm rotating with 5,000 RPM (revolutions per minute) on its geometric center with rotation.

In this condition, the electrons in the superconductor will rotate at an average speed of:

$$v=\frac{l}{t}=l\,f=3.770*10^{-1}*83.333=31.42\,m\,s^{-1} \quad .$$

With:

v = Average speed [m s^{-1}];
l = Ring average perimeter = 2πr = 2π (145 – 25)/2 *10^{-3} = 3.770*10^{-1} m;
f = 5,000/60 = 83.333 Hz.

The equivalent electric current is:

$$I_E=n_e e\,S\,l\,f=10^{13}*1.5*10^{-4}*3.770*10^{-1}*83.333=4.712*10^{10}\,A$$

With:

I_E = Electric current [A];
n_e*e (for superconductors) ≈ 10^{13} C m^{-3};
S = 6*10^{-3} * 2.5*10^{-2} = 1.5*10^{-4} m^2.

It is a high electric current for a small ring, because the density of electric charges in a superconductor, represented by electrons, is approximately 1,000 times greater than copper:

For copper: $n_e e=8.4538*10^{28}*1.602*10^{-19}=1.354*10^{10}\,C\,m^{-3}$.
For superconductors: $n_e e\approx 10^{13}\,C\,m^{-3}$.

Applying the magnetic field formula, without introducing magnetic material inside the ring, we have:

$$H=\frac{I_E}{2r}=\frac{4.712*10^{10}}{2*6*10^{-2}}=3.927*10^{11}\,A\,m^{-1} \quad .$$

With:

H = Magnetic field [A m^{-1}];
I_E = 4.712*10^{10} A;
r = Ring average radius = (145 – 25)/2 *10^{-3} = 6*10^{-2} m.

$$B=\mu_0 H=1.256637*10^{-6}*3.927*10^{11}=4.935*10^{5}\,T \quad .$$

With:

B = Surface density of magnetic charge [Wb m^{-2}] [T];
μ_0 = 1.256637*10^{-6} Wb A^{-1} m^{-1};
H = 3.927*10^{12} A m^{-1}.

With these information we can calculate the repulsion force between the magnetic fields and the amount of gravitational charge (mass) that can be levitated.

$$F = q_M H = B S H = 10^{-9} * 1.651 * 10^{-2} * 3.927 * 10^{11} = 6.483\, N \quad .$$

With:

F = Attraction/repulsion force [N];
$B = 10^{-9}$ T;
$S = \pi r^2 = \pi(1.45*10^{-1}/2)^2 = 1.651*10^{-2}$ m^2;
$H = 3.927*10^{11}$ A m^{-1}.

$$q_G = \frac{F}{G} = \frac{6.483}{9.80665} = 0.661\, kg = 661\, g \quad .$$

With:

q_G = Gravitational charge (mass) [kg];
F = 6.483 N;
G = 9.80665 m s^{-2}.

The total gravitational charge (mass) of the mercury disc is calculated according to its density and volume:

$$q_G = \rho_{Hg} V = 13.55 * 5{,}65 * 10^1 = 766\, g \quad .$$

With:

q_G = Gravitational charge (mass) of mercury disk [g];
ρ_{Hg} = Volumetric density of mercury = 13.55 g cm^{-3};
V = Disc volume = $\pi((145/2)^2 - (95/2)^2)*6*10^{-3} = 5.65*10^1$ cm^3.

The above result shows that the repulsion force between the magnetic field generated by the device and the vertical component of the terrestrial magnetic field reduces the weight of the mercury disk by more than 85%, but there is no information to confirm this reduction. The calculated mass value would correspond to a decrease in weight of the device itself, and not for other objects placed under the influence of the magnetic field. Anyway, this experiment proves the possibility of canceling the gravitational force through the creation of intense magnetic fields produced through the rotation of cooled metals and superconducting materials.

As we can see, it is possible to create magnetic fields of increasing intensities the greater the amount of electric charges are rotated. In order to create usable magnetic fields for propulsion systems it will be necessary to rotate much larger amounts of charges, as we can see in the text below extracted from the book "UFO… Contact from the Pleiades". [8]

> "This machine is operated through reversible electromagnetism. See those columns going to that rotor that looks like transparent plastic?"
>
> "Yes."
>
> "Well, those are reactors. When the mercury in that rotor gets going full speed we can reverse the magnetic and electrical energy. That way we can control matter and also overcome the forces of gravity."

The text above suggests that a possible device for this can be implemented by forcing the rotation of liquid metal at high speeds inside a rotor or a tube with toroidal shape. This can be done through the use of high frequency three-phase electromagnetic fields, which heats the metal until it melts by inductive heating and, at the same time, puts the liquid metal to rotate inside the toroid as a linear induction motor. If the system uses metallic mercury, there is no need to heat it. The calculations for this device is the same as we already have done.

4 Magnetic Propulsion Through Vortexes

We saw in the previous chapter that magnetic levitation is based on the principle of magnetic repulsion between the vertical component of the planet's surface density of magnetic charge and a magnetic field generated inside and in the center of a rotating device. The force of this repulsion must overcome the gravitational pull of the planet. What distinguishes this chapter from the previous one is that the magnetic field is generated at the center of a vortex of electrical charges immersed in an electrical insulating medium, which is nothing more than electric current.

This movement of electrical charges, when carried out in a circular path (cycloid), allows the generation of high electrical currents because the charges can be accelerated to extremely high speeds. In fact, there is a big difference between the circulation of electric charges within an electrically conductive material and the circulation of electric charges within an electrolyte or insulating substance, such as dielectric gases and oils. The first ones produce low intensity electric fields, due to the good conductivity of the material, and the second ones produce high intensity electric fields, due to the high resistivity of the material.

In both methods, the magnetic field produced in the center of the vortex is proportional to the speed of the electric charges, however, in the second method, the high intensity of the electric field provides dissociation and ionization of the atmospheric air, with the consequent formation of a luminous colored halo ranging from silvery blue to orange yellow, depending on the intensity of the electric field and atmospheric air density. This dissociation of air reduces hull friction when the spacecraft is at high speeds and, when properly directed, reduces atmospheric pressure on the upper side of the spacecraft, when it is just floating, and also in the direction the spacecraft is moving. In fact, this air dissociation and ionization system can be used as a propulsion system, as we saw in the article Power from Air Ionization [9].

There are several techniques to create vortexes of electric charges, among them: rotation of magnetic fields, circulation of atmospheric air, circulation of metallic vapors and circulation of (electrically charged) particles. In the present theme, we will calculate the intensity of magnetic fields generated inside those rotating electric charge vortexes and the repulsion force between the generated magnetic field and the vertical component of the planet's magnetic field. This vertical component varies according to latitude, longitude and altitude, ranging from 1 nT in equator to 60 μT at the poles.

The mathematical model for the electric current, magnetic field, force and gravitational charge that can be lifted is the same as we have already used.

4.1 Magnetic Field Rotation

In the article Power from Electrostatic Charges [10] it was described the creation of electric charge vortexes with the rotation of magnetic fields. The calculations of the electric currents (electric charges in circulation) produced with these vortexes were demonstrated in the chapter Electric Charge Gathering by Magnetic Vortex, considering that:

$$I_E = \frac{q_E}{t} = \frac{N n_e e S_i 2 d_i}{t} \quad .$$

With:

I_E = Electric current [A];
q_E = Electric charge quantity [C];
N = Quantity of magnets on disc;
n_e = Electron density of atmosphere [electron m^{-3}];

e = Electron charge = 1,602*10^{-19} C;
S_i = Magnet surface area [m^2];
d_i = Magnetic field penetration distance [m];
$t=t_1+t_2$ = Ions travel time [s].

This electric current corresponds to the amount of electrical charges that reaches the collecting belt every second. As these charges tend to follow the tangential speed of the disc, we can assume that we will have the equivalent of a circular electric current around the disc's perimeter and that this electric current will create a magnetic field in its center that will deflect even more charges from the environment.

In fact, the rotation of the magnets creates conditions to the production of a much more intense and comprehensive magnetic field than the sum of the magnetic fields of the magnets. As the charges are being deflected towards the periphery of the device and positioning themselves orbitally, the central magnetic field will be increased and will also contribute to the deflection of more charges. The system will find a balance point that depends on the intensity of the magnetic field and the dimensions of the magnets, the rotation speed of the magnets and the density of electrical charges in the environment.

Example:

The electric current of this example is already calculated in the chapter Calculation Example of the article Power from Electrostatic Charges [10]. There is no need to calculate it again, so we will use its final value. The description is as follows:

1 m diameter support disc with 12 neodymium (NdFeB) magnets fixed onto its perimeter with axial magnetic polarization. The magnets are 10 cm in diameter and 20 mm high, have a remaining magnetic induction Br = 13,800 G (1.38 T) (1 Gauss = 10^{-4} Tesla), intrinsic coercive magnetic field iHc = 13 kOe (1.0 MA/m) (1 kOe = 79.67 kA/m) and 48 MGOe (382 kJ/m^3) Bhmax energetic product (1 MGOe = 7,957 kJ/m^3). They are equally spaced from each other and their centers are 44 cm far from the center of the disc, this is, they are fixed at 1 cm from the edge of the disc. The center of the disc is fixed to the shaft of a motor that has speed control. The motor is mounted vertically and the disc attached to its shaft is horizontal. The electron collection system is a 1 mm thick, 20 cm wide and 1.40 m diameter aluminum foil strap and is fixed so that its center coincides with the motor shaft, and the disc rotates at half its height.

The final electric current calculated at 1,800 RPM is:

$$I_E=\frac{q_E}{t}=\frac{N n_e e S d}{t}=\frac{12*4*10^{25}*1.602*10^{-19}*7.854*10^{-3}*0.1}{2.19*10^{-7}}=2.76*10^{11}\,A\quad .$$

With:

I_E = Electric current [A];
N = 12;
n_e = 4*10^{25} electron m^{-3};
e = 1.602*10^{-19} C;
S_i = πr^2 = $\pi(5*10^{-2})^2$ = 7.854*10^{-3} m^2;
d_i = 5 cm = 5*10^{-2} m $\Rightarrow$ d = 0.1 m;
$t=t_1+t_2$ = 2.19*10^{-7} s.

Applying the magnetic field formula, without introducing magnetic material inside the ring, we have:

$$H=\frac{I_E}{2r}=\frac{2.76*10^{11}}{2*0.7}=1.97*10^{11}\,A\,m^{-1} \quad .$$

With:

H = Magnetic field [$A\ m^{-1}$];
$I_E = 2.76*10^{11}$ A;
r = 0.7 m.

$$B=\mu_0 H=1.256637*10^{-6}*1.97*10^{11}=2.48*10^{5}\,T \quad .$$

With:

B = Surface density of magnetic charge [$Wb\ m^{-2}$] [T];
$\mu_0 = 1.256637*10^{-6}$ $Wb\ A^{-1}\ m^{-1}$;
$H = 1.97*10^{11}$ $A\ m^{-1}$.

With these information we can calculate the repulsion force between the magnetic fields and the amount of gravitational charge (mass) that can be levitated.

$$F=q_M H=B S H=10^{-9}*1.539*1.97*10^{11}=3.03*10^{2}\,N \quad .$$

With:

F = Attraction/repulsion force [N];
$B = 10^{-9}$ T;
$S = \pi r^2 = \pi(0.7)^2 = 1.539$ m^2;
$H = 1.97*10^{11}$ $A\ m^{-1}$.

$$q_G=\frac{F}{G}=\frac{3.03*10^{2}}{9.80665}=30.9\,kg \quad .$$

With:

q_G = Gravitational charge (mass) [kg];
$F = 3.03*10^{2}$ N;
G = 9.80665 $m\ s^{-2}$.

4.2 Metallic Vapor Vortex

It is possible to greatly increase the magnetic field produced inside a particle vortex using metallic vapor in a closed circuit, so that there is no material loss. A very suitable metal is metallic mercury (Hg), which at room temperature remains in a liquid state. If the mercury is heated to sublimation, its vapors can be used to advantageously replace atmospheric air in equipment that produces a vortex of electrical charges.

There are some references to the Vimanas ships that, in the land of the Vedas, would use mercury vortexes, as shown in the text of an old Indian book Samarangana Sutradhara translated in the book Mercury: UFO Messenger of the Gods. [11]

> Inside the circular air frame, place the mercury-engine with its electric/ultrasonic mercury boiler at the bottom center. By means of the power latent in the mercury which sets the driving whirlwind in motion, a man sitting inside may travel a great distance in the sky in a most marvelous manner. Four strong mercury containers must be built into the interior structure. When those have been heated by controlled fire from iron containers, the vimana develops thunder-power through the mercury. At once it becomes like a pearl in the sky.

In the case of working with metallic vapor vortexes, there is the possibility of working with charge densities thousands of times greater than with atmospheric air because, with the hermetically closed circuit, we can circulate the ionic cloud by injecting the metallic vapors under pressure and controlling its temperature.

The calculations of such a system are completely similar to the air vortexes already seen in the article Power from Electrostatic Charges [10] and complemented in the section above, with the difference only in the density of electric charges, so we will not repeat them. However, those who are interested in designing systems with metallic vapor vortexes should initially perform tests for the production of ions with metallic vapors to have an initial estimate of the potential of this system.

5 Mechanical Propulsion Through Magnetic Vortexes

The magnetic vortexes produced with the rotation of magnetized materials project electrostatic charges of the atmosphere in the radial direction. If the rotation of the device is sufficient, the speed of the electrical charges projected to the periphery will be sufficient to ionize the air molecules around the equipment.

In this situation, there will be an atmospheric pressure gradient between the ionization region and the non-ionized region of the atmosphere that moves the air in a turbulent way. If the direction of electrical charges is controlled, mechanically or by electromagnetic fields along the perimeter of the equipment, it will be possible to propel it in the direction in which there is air ionization. The charges can be deflected to the top, bottom or side sections so that the device moves in any direction.

In the chapter Atmospheric Air Ionization of the article Power from Air Ionization [9] we saw that the greatest energy of 1st ionization of the gases that make up 99.03% of the volume of atmospheric air (N_2 + O_2) corresponds to nitrogen molecule N_2, which is 14.53 eV ($2.5*10^{-18}$ J). If the kinetic energy of the electric charges projected by the magnetic vortex is equal to or greater than this value, then there will be ionization of the air up to the proportion of almost 100%, that is, vacuum, depending on the amount of charges projected. The kinetic energy and the amount of charges displaced to the periphery vary with the rotation speed of the magnets, so there is complete control over the equipment propulsion.

In the section Mathematical Model for Magnetic Vortex of the article Power from Electrostatic Charges [10], a mathematical development was carried out to calculate the velocity reached by electrostatic charges in the air (electrons) after accelerating within the magnetic field of the rotating magnets. The calculations were based on the Lorentz's force and the final equations are shown below:

$$F = q_E v B = q_E (\omega r_m) B \quad , \quad \omega = 2\pi f = 2\pi \frac{v_{RPM}}{60} \quad ;$$

$$a = \frac{F}{m} = \frac{q_E B \omega r_m}{m} \quad ; \quad d_1 = \frac{l_m}{2} = \frac{a t_1^2}{2} \quad ; \quad t_1 = \sqrt{\frac{l_m}{a}} = \sqrt{\frac{m l_m}{q_E B \omega r_m}} \quad ;$$

$$v_0 = a t_1 = a \sqrt{\frac{l_m}{a}} = \sqrt{a l_m} = \sqrt{\frac{q_E B \omega r_m l_m}{m}} \quad .$$

With:

F = Force over ions [N];
ω = Angular speed of device [rad s^{-1}];
v_{RPM} = Rotation speed of device [RPM];
f = Rotation frequency of device [cycles s^{-1}];
a = Acceleration of ions [m s^{-2}];
v_0 = Maximum speed of ions [m s^{-1}];

B = Surface density magnetic charge of the magnets [Wb m^{-2}] [T];
q_E = Ions electric charge [C];
m = Gravitational charge (mass) of ion [kg];
r_m = Distance from axis of device to center of magnets [m];
l_m = Length of the magnets (diameter) [m];
d_1 = Average acceleration distance (half the length of magnets) [m];
t_1 = Acceleration time [s].

With the final speed of the charges it is possible to estimate their kinetic energy, which is the average inertial energy acquired by the charges when they are accelerated.

$$\bar{U}_I = K = \frac{1}{2} m v_0^2 \quad .$$

With:
$\bar{U}_I$ = Average inertial energy [J];
K = Kinetic energy [J];
m = Gravitational charge (mass) of electric charge [kg];
v_0 = Maximum speed of ions [m s^{-1}].

The amount of charges accelerated by the device in the time unit, which determines the resulting pressure difference, can be estimated as a function of the number of magnets in rotation and the volume of air that their magnetic field reaches:

$$N_e = N \frac{n_e S d}{t_1} \quad .$$

With:
N_e = Quantity of electric charges displaced by second [electron s^{-1}];
N = Quantity of magnets of device;
n_e = Ion density of atmosphere = 4*10^{25} electron m^{-3};
S = Area of magnets [m^2];
d = Magnetic penetration distance [m];
t_1 = Acceleration time [s].

When the device is in rotation, there will always be new charges being accelerated in the acceleration time, so this is the total amount of charges that reach the final speed in the unit of time.

Atmospheric pressure at sea level is 1.033 kg/cm^2 (1.0133*10^5 N/m^2) and varies with altitude. Lowering the pressure by ionizing the air will create a pressure gradient that will determine a thrust force and accelerate the equipment. Knowing the surface area subjected to low pressure, it is possible to calculate its acceleration:

$$F = (P_a - P_i) S = \Delta P * S = q_G a \quad \Rightarrow \quad a = \frac{F}{q_G} = \frac{\Delta P * S}{q_G} \quad .$$

With:
a = Acceleration [m s^{-2}];
F = Thrust force [N];
P_a = Atmospheric pressure = 1,013*10^5 N m^{-2};
P_i = Pressure resulting from air ionization [N m^{-2}];
ΔP = Pressure difference [N m^{-2}];
S = Area submitted to pressure gradient [m^2];
q_G = Gravitational charge (mass) of equipment [kg].

In the vertical movement, it is necessary to discount the weight of the equipment:

$$P = q_G G = q_G g \quad \Rightarrow \quad a = \frac{F - P}{q_G} = \frac{\Delta P * S}{q_G} - g \quad .$$

With:

a = Acceleration [m s^{-2}];
P = Equipment weight [N];
G = Terrestrial gravitational field [N kg^{-1}] = g = gravity acceleration= 9,80665 m s^{-2}.

Example:

Circular structure with 10 m in diameter and 12 neodymium magnets (NdFeB) fixed on its perimeter with axial magnetic polarization. The magnets are 50 cm in diameter and 20 mm high, have remaining magnetic induction Br = 1.38 T, intrinsic coercive magnetic field iHc = 1.0 MA/m and BHmax energy product of 382 kJ/m^3. They are equally spaced from each other and their centers are 9.65 m away from the center of the disk, that is, they are fixed 10 cm from the edge of the disk. The center of the structure is fixed to a motor shaft with speed control. The motor is mounted in a vertical position and the structure attached to its axis is horizontal. All is mounted on a 12 m diameter discoid craft with a total mass of 1,500 kg. We will calculate the kinetic energy and amount of electrical charges displaced for 3,600 RPM rotation.

$$F = e \omega r_m B = 1.602 * 10^{-19} * 120 \pi * 9.65 * 1.38 = 8.04 * 10^{-16} N \quad .$$

With:

F = Force on charge [N];
B = 1.38 T;
e = 1.602*10^{-19} C;
$\omega = 2\pi f = 2\pi\, v_{RPM}/60 = 120\pi$ rad s^{-1};
r_m = 9.65 m.

$$a = \frac{F}{m_e} = \frac{8.04 * 10^{-16}}{9.109 * 10^{-31}} = 8.83 * 10^{14} m s^{-2} \quad .$$

With:

a = Acceleration of charge [m s^{-2}];
F = 8.04*10^{-16} N;
m_e = 9.109*10^{-31} kg.

$$t_1 = \sqrt{\frac{l_m}{a}} = \sqrt{\frac{0.5}{8.83 * 10^{14}}} = 2.38 * 10^{-8} s \quad .$$

With:

t_1 = Acceleration time [s];
l_m = 0.5 m;
a = 8.83*10^{14} m s^{-2}.

The final speed of charges after acceleration is:

$$v_o = \sqrt{\frac{e \omega B r_m l_m}{m_e}} = \sqrt{\frac{1.602 * 10^{-19} * 120 \pi * 1.38 * 9.65 * 0.5}{9.109 * 10^{-31}}} = 2.10 * 10^{7} m s^{-1} \quad .$$

The kinetic energy of the charges after acceleration is:

$$\bar{U}_I = K = \frac{1}{2} m_e v_0^2 = \frac{1}{2} 9.109 * 10^{-31} \left(2.10 * 10^7\right)^2 = 2.01 * 10^{-16} J = 1.25 * 10^3 eV \quad .$$

With:

$\bar{U}_I$ = Average inertial energy [J];
K = Kinetic energy [J];
m_e = Gravitational charge of electron = $9.109*10^{-31}$ kg;
v_0 = $2.10*10^7$ m s^{-1}.

The quantity of electric charges displaced by second is:

$$N_e = N \frac{n_e S d}{t_1} = 12 \frac{4 * 10^{25} * 0.196 * 0.5}{2.38 * 10^{-8}} = 1.98 * 10^{33} elétron\, s^{-1}$$

With:

N_e = Quantity of electric charges displaced by second [electron s^{-1}];
N = 12;
n_e = $4*10^{25}$ electrons m^{-3};
S = $\pi r^2 = \pi(0.25)^2 = 0.196$ m^2;
d = 0.5 m;
t_1 = $2.38*10^{-8}$ s.

This example shows that at 3,600 RPM rotation the electrons acquire a kinetic energy greater than 80 times the value of the maximum energy of the 1st ionization of N_2. This means that each electron is able to ionize these quantity of air molecules that surround the equipment.

At a pressure of 1 atm, the density of gas molecules in the atmosphere is approximately $2.447*10^{25}$ molecules/m^3, as seen in the article Power from Air Ionization [9]. The calculated values for the number of accelerated electrons per second are $8*10^7$ times greater than this density with 3,600 RPM. This means that the volume of ionized air around the equipment can reach a complete vacuum and still have a pressure gradient for the use of electric generators, if the equipment is mounted on a discoid craft.

By varying the device rotation, we can vary the amount of electrical charges projected to the periphery and, through deflectors, orientate and accelerate the equipment by controlling the atmospheric pressure gradient. In this example, for ΔP = ½ atm ($5.065*10^4$ N/m^2), the calculation of the thrust force and vertical acceleration discounting the weight of the equipment is done by:

$$F = \Delta P * S = 5.065 * 10^4 * 4.52 * 10^2 = 2.29 * 10^7 N \quad .$$

$$a = \frac{\Delta P * S}{q_G} - g = \frac{5.065 * 10^4 * 4.52 * 10^2}{1{,}500} - 9.80665 = 1.53 * 10^4 m s^{-2} \quad .$$

With:

F = Thrust force [N];
a = Equipment acceleration [m s^{-2}];
ΔP = Pressure difference = $5.065*10^4$ N m^{-2};
S = Area submitted to pressure difference = $\pi r^2 = \pi(12)^2 = 4.52*10^2$ m^2;
q_G = Gravitational charge (mass) of equipment = 1,500 kg;
G = g = Terrestrial gravitational field = 9.80665 m s^{-2}.

This acceleration is 1,500 times greater than terrestrial gravitational acceleration!

6 Gravitoinertial Propulsion

The mathematical development of the phenomenon that allows the neutralization of the planetary gravitational field through linear and angular velocity was carried out in the article Inertial Field [12], studying the balance of forces that maintains the orbit of satellites.

It was also deduced that the gyroscopic effect, which occurs in objects in high rotation, allows the neutralization of the gravitational field without the need for linear motion until reaching the escape velocity of the planet. In fact, an escape rotation is achieved.

This is a purely mechanical propulsion process that can also cause electromagnetic effects, either through friction with air or centrifugal forces.

6.1 Separation of Electrical Charges Through Mass Rotation

There is a phenomenon that occurs with materials that are good conductors of electricity when subjected to high rotations: they present an axial magnetic field, in the direction of the angular speed vector. This magnetic field is created by the separation of electrical charges of the material, that is, the electrons in the conduction layer are pulled out of their orbits and projected to the periphery when the ionization potential of the atoms is reached.

The cause of this separation of charges is a centrifugal force that, seen in another way, is equivalent to a radial gravitational force produced by the difference in gravitational potential between the center of the body, whose speed is almost zero, and its periphery, which moves with high speed. The centrifugal acceleration that the atoms of a rotating body undergo is given by:

$$F = q_G \frac{v^2}{r} = q_G \omega^2 r = q_G \frac{V_G}{r} = q_G G \quad \Rightarrow \quad a = \frac{v^2}{r} = \frac{V_G}{r} = G \quad .$$

With:

- F = Centrifugal force [N];
- a = Centrifugal acceleration [m s^{-2}];
- q_G = Gravitational charge (mass) [kg];
- v = Tangential velocity [m s^{-1}];
- r = Cylinder/disc radius [m];
- V_G = Gravitational potential [m^2 s^{-2}];
- G = Gravitational field [N kg^{-1}] [m s^{-2}].

The above equation shows that centrifugal acceleration is a measure of the radial gravitational field. If the gravitational energy reached at the cylinder/disk periphery is greater than the 1^{st} ionization energy of the material's atoms, there will be ionization and the electrons pulled out of their orbits will be projected to the periphery, changing the electronic density in the radial direction. The center of the cylinder/disc becomes positive in relation to the periphery and the material is no longer neutral. The excess of negative charges (electrons) on the perimeter behaves like an electric current because the cylinder/disk is spinning at high speed.

The gravitational energy associated with the movement of a gravitational charge allows us to calculate the speed threshold of the 1^{st} ionization potential of the rotating cylinder/disk atoms. Isolating the angular speed and converting it to RPM, we have:

$$U = q_G V_G = q_G v^2 = q_G \omega^2 r^2 \quad \Rightarrow \quad \omega = \frac{1}{r}\sqrt{\frac{U}{q_G}} \quad \Rightarrow \quad v_{RPM} = \frac{60}{2\pi}\frac{1}{r}\sqrt{\frac{U}{q_G}} \quad .$$

By consulting a table of ionization potentials of some metals, we can calculate at which speeds we can reach the ionization potential (work function W).

For aluminum, we have $W=4.20\,eV=6.728*10^{-19}\,J$. Considering a disk with a radius of 10 meters, replacing in the speed equation:

$$v_{RPM}=\frac{60}{2\pi}\frac{1}{r}\sqrt{\frac{U}{q_G}}=\frac{60}{20\pi}\sqrt{\frac{6.728*10^{-19}}{9.109*10^{-31}}}=8.21*10^5\,RPM \quad .$$

With:

v_{RPM} = Rotation speed [RPM];
r = Cylinder/disc radius = 10 m;
U = W = Work function = $6.728*10^{-19}$ J;
q_G = Gravitational charge (mass) of electron = $9.109*10^{-31}$ kg.

For magnesium, we have $W=3.66\,eV=5.863*10^{-19}\,J$. Considering a disk with a radius of 10 meters, replacing in the speed equation:

$$v_{RPM}=\frac{60}{2\pi}\frac{1}{r}\sqrt{\frac{W}{q_G}}=\frac{60}{20\pi}\sqrt{\frac{5.863*10^{-19}}{9.109*10^{-31}}}=7.66*10^5\,RPM \quad .$$

With:

v_{RPM} = Rotation speed [RPM];
r = Cylinder/disc radius = 10 m;
U = W = Work function = $5.863*10^{-19}$ J;
q_G = Gravitational charge (mass) of electron = $9.109*10^{-31}$ kg.

As the speeds involved are quite high, it can be considered that they cause sufficient friction of the metallic surface with atmospheric air to produce static electricity with dry air and ionization with moist air. In addition, the magnetic field induced by the electric current in the periphery of the disc causes a separation of ions and electrostatic charges that exist in the local space, reinforcing the electric current and the magnetic field. Therefore, the effect of separating electrical charges in the atmosphere is greater than it would be if the disk were in a vacuum.

6.2 Gravitational Potential Neutralization

The theoretical development that allows to neutralize the gravitational field force in function of the speed of an object was made in the chapter Gravitational Neutralization of the article Inertial Field [12], by analogy to the balance of forces that keeps a satellite in orbit on the planet. In this chapter we will use the equations already developed to be included as a practical procedure, as we will see in the calculated examples.

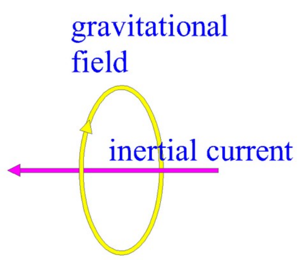

Figure 12: Gravitational induction.

The balance of the satellite orbit occurs when the gravitational force is equivalent to the force of the satellite's centripetal acceleration, due to its uniform circular motion – UCM. A gravitational potential induction process occurs by the presence of an inertial current, which corresponds to the square of the velocity of the satellite. The equations show that the gravitational potential is equal to the square of the velocity, in this condition:

$$F=\frac{U}{r}=q_G G=q_G\frac{V_G}{r}=q_G\frac{v^2}{r}=q_G\omega^2 r \quad\Rightarrow\quad G=\frac{v^2}{r} \quad\Rightarrow\quad V_G=G\,r=v^2=I_I \quad .$$

With:

F = Gravitational force [N];
U = Gravitational energy [J];

q_G = Gravitational charge (mass) of object [kg];
G = Gravitational field [N kg^{-1}] [m s^{-2}];
V_G = Gravitational potential [m^2 s^{-2}];
v = Tangential speed of object around planet [m s^{-1}];
ω = Angular speed of object [rad s^{-1}];
r = Distance from object to center of planet (radius of planet + orbit high) [m];
I_I = Inertial current [m^2 s^{-2}].

There is, however, the inertial current relative to the rotation of bodies over their center of mass, in which the linear velocity is replaced by the angular velocity, that is, $v=\omega r$. A body with radial symmetry, rotating with constant angular velocity, has an inertial current given by:

$$I_I = v^2 = \omega^2 r^2 \quad \Rightarrow \quad I_I = \omega^2 \int_{r1}^{r2} r\,dr = \omega^2 \left[\frac{r^2}{2} \right]_{r1}^{r2} = \frac{\omega^2}{2} \left(r_2^2 - r_1^2 \right) \ .$$

With:
I_I = Inertial current [m^2 s^{-2}];
v = Tangential speed of rotation [m s^{-1}];
ω = Angular speed of object [rad s^{-1}];
r_1 = Internal radius of object [m];
r_2 = External radius of object [m];
r = Radius of object [m].

In the equation on the left, the distance from the object to the center of rotation is the distance r, so its entire mass is at speed v. In the equation on the right, the object (which can be a disk) has its mass distributed over the distance r_1 to r_2 around the center of rotation.

Knowing that an inertial current induces a gravitational potential, we can calculate the gravitational field of this gravitational potential in relation to the planet's center of mass – CM to know how much the planetary gravitational field on the rotating object decreases:

$$G = \frac{V_G}{R} = \frac{I_I}{R} = \frac{(\omega r)^2}{R} \quad \Rightarrow \quad G = \frac{V_G}{R} = \frac{\omega^2}{2} \frac{\left(r_2^2 - r_1^2 \right)}{R} \ .$$

With:
G = Induced gravitational field [N kg^{-1}] = acceleration [m s^{-2}];
I_I = Inertial current [m^2 s^{-2}];
V_G = Induced gravitational potential [m^2 s^{-2}];
ω = Angular speed of object [rad s^{-1}];
r = Radius of object [m];
R = Radius of planet [m].

And the weight reduction of the rotating object in relation to the planet's center of mass – CM, which corresponds to the value of the gravitational force that will be reduced from the planetary gravitational force:

$$F = q_G G = q_G \frac{(\omega r)^2}{R} \quad \Rightarrow \quad F = q_G \frac{\omega^2}{2} \frac{\left(r_2^2 - r_1^2 \right)}{R} \ .$$

With:
F = Induced gravity force = discounted object weight [N];
q_G = Gravitational charge (mass) of object [kg].

When the inertial current of the rotating object induces a gravitational potential equivalent to the object's planetary gravitational potential, it will be possible to neutralize the planet's gravitational force without the need to linearly accelerate the body until reaching the escape velocity to place the equipment at orbital height. If we rotate masses at high speeds with the angular speed vector parallel to the planetary gravitational field, it will be possible to neutralize the gravitational potential being on the planet's surface and gradually rise as the rotation increases.

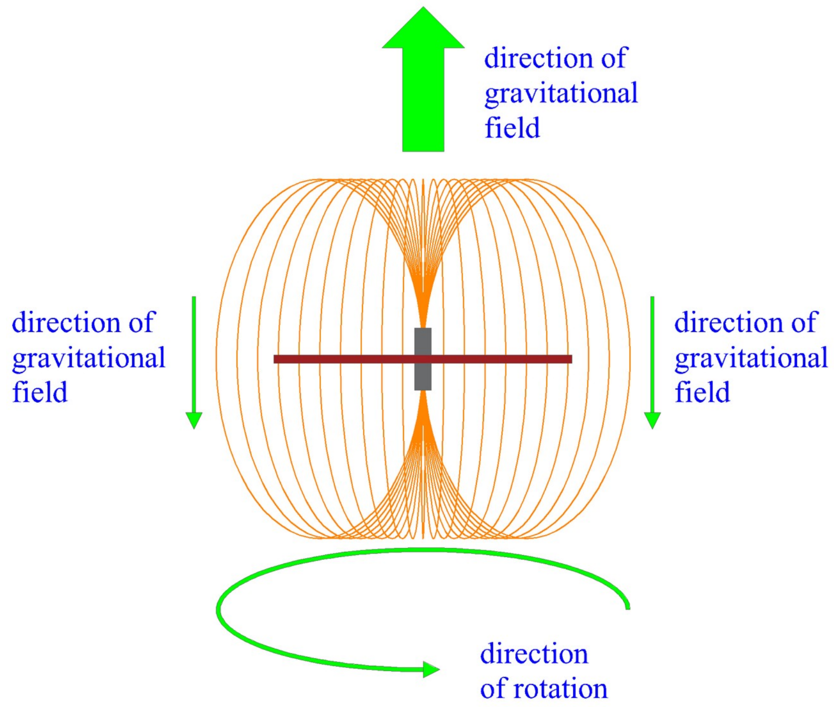

Figure 13: Direction of the induced gravitational field.

On the planet's equatorial surface, it will be necessary to neutralize the following gravitational potential:

$$V_G = k_g \frac{Q_G}{R} = 6.6739 * 10^{-11} \frac{5.976 * 10^{24}}{6.378 * 10^{6}} = 6.253 * 10^{7} m^2 s^{-2} \quad .$$

With:

V_G = Gravitational potential [N m kg^{-1}] [m^2 s^{-2}];
k_g = Universal gravitational constant = 6.6739*10^{-11} N m^2 kg^{-2} [m^3 kg^{-1} s^{-2}];
Q_G = Gravitational charge (mass) of the Earth = 5.976*10^{24} kg;
R = Equatorial radius of Earth = 6.378*10^6 m.

This gravitational neutralization can be visualized in the same way that a loop of electric current produces a magnetic field at its center. A coil of enameled wire, flat or cylindrical, with an electric current produces a magnetic field in its center proportional to its number of turns. Likewise, a disk, cylinder or ring of matter rotating produces in its axis a gravitational field proportional to the summation of the infinitesimal circumferences that make up the object.

In this case, the right hand rule also applies to identify the direction of the induced gravitational field, which is the angular speed vector actually established. In this way, rotation in the opposite direction induces a gravitational field in the opposite direction, allowing the acceleration of the body to occur in any direction in which the angular speed vector points.

The consequence of this exposure is that it is possible to create a center of gravitational attraction if we have two concentric disks rotating in the opposite direction. In the case of a discoid spacecraft, this procedure allows the central cabin to remain stationary, while the artificially produced gravitational center keeps everything in its interior attracted and eliminates any inertia due to the curves that the craft may take.

The equation for calculating the rotation that neutralizes the gravitational force is:

$$I_I = v^2 = \omega^2 r^2 = \frac{\omega^2}{2}\left(r_2^2 - r_1^2\right) = V_G \quad \Rightarrow \quad \omega = \sqrt{\frac{2V_G}{r_2^2 - r_1^2}} \quad .$$

Example 1:

Calculate the induced gravitational potential and gravitational field and the amount of weight decreased from a cylindrical flywheel of mass q_G = 30 kg and 0.5 m radius that is spinning at 60,000 RPM with its vertical axis on the Earth's surface.

The induced gravitational potential is calculated by:

$$\omega = \frac{2\pi}{60} v_{RPM} = \frac{2\pi}{60} 60{,}000 = 6.283 * 10^3\, rad\, s^{-1} \quad \Rightarrow$$

$$V_G = I_I = \frac{\omega^2}{2}\left(r_2^2 - r_1^2\right) = \frac{\left(6.283 * 10^3\right)^2}{2}\left(0.5^2 - 0^2\right) = 4.935 * 10^6\, m^2\, s^{-2} \quad .$$

With:

V_G = Induced gravitational potential [$m^2\ s^{-2}$];
I_I = Inertial current [$m^2\ s^{-2}$];
$\omega = 6.283*10^3$ rad s^{-1};
r_1 = 0 m;
r_2 = 0.5 m.

The gravitational field induced in relation to the center of the planet is calculated by:

$$G_i = \frac{V_G}{R} = \frac{4.935 * 10^6}{6.378 * 10^6} = 7.736 * 10^{-1}\, m\, s^{-2} \quad .$$

With:

G_i = Induced gravitational field [N kg^{-1}] = acceleration [m s^{-2}];
$V_G = 4.935*10^6\ m^2\ s^{-2}$;
$R = 6.378*10^6$ m.

Considering that the induced gravitational field decreases the planetary gravitational field, the weight reduction will be::

$$F = q_G G_i = 30 * 7.736 * 10^{-1} = 23.2\, N \quad .$$

With:

F = Induced gravity force = discounted object weight [N];
q_G = 30 kg;
$G_i = 7.736*10^{-1}$ m s^{-2}.

The original weight of the wheel is $P = q_G G = 30 * 9.80665 = 2.942 * 10^2\, N$. The percentage of weight reduction is calculated by:

$$P_{\%}=\frac{F}{P}100=\frac{G_i}{G}100=\frac{7.736*10^{-1}}{9.80665}100=7.8\% \quad .$$

We can see that, although the mass of the flywheel remains constant, the gravitational field induced by its rotation partially shields the planetary gravitational field and decreases its weight.

Example 2:

Calculate the speed of rotation that neutralizes the weight of a metal disk with radius r = 2 m rotating on its center of mass.

$$\omega=\sqrt{\frac{2V_G}{r_2^2-r_1^2}}=\sqrt{\frac{2*6.253*10^7}{2^2-0^2}}=5.59*10^3\,rad\,s^{-1} \quad .$$

With:

ω = Angular speed of object [rad s^{-1}];
r_1 = 0 m;
r_2 = 2 m;
V_G = $6.253*10^7$ m^2 s^{-2}.

$$v_{RPM}=\frac{60}{2\pi}\omega=\frac{60}{2\pi}5.59*10^3=5.34*10^4\,RPM \quad .$$

With 53,400 revolutions per minute it is possible to neutralize the gravitational potential on the planet's surface and make this device float without a linear escape velocity. In this case, we have an angular speed (rotation) of escape.

To neutralize 50% of the weight, or to produce 50% of the planetary gravitational field on site, the required rotation will be:

$$\omega=\sqrt{\frac{2*0.5*V_G}{r_2^2-r_1^2}}=\sqrt{\frac{2*0.5*6.253*10^7}{2^2-0^2}}=3.95*10^3\,rad\,s^{-1} \quad ;$$

$$v_{RPM}=\frac{60}{2\pi}\omega=\frac{60}{2\pi}3.95*10^3=3.78*10^4\,RPM \quad .$$

The equation used above considers that the entire mass of the device is in this rotation. The weight of the additional mass that does not rotate (as is the case with the stationary cabin) must be compensated with an increase in rotation. Such force can be calculated by:

$$F=q_{G2}G=q_{G2}k_g\frac{Q_G}{R^2}=q_{G1}\frac{I_I}{R} \quad \Rightarrow \quad q_{G2}k_g\frac{Q_G}{R}=q_{G2}V_G=q_{G1}I_I=q_{G1}V_{G1} \quad .$$

With:

F = Gravitational attraction force [N];
q_{G1} = Rotating gravitational charge [kg];
q_{G2} = Total Gravitational charge [kg];
G = Gravitational field [N kg^{-1}] [m s^{-2}];
k_g = Universal gravitational constant = $6.6739*10^{-11}$ N m^2 kg^{-2} [m^3 kg^{-1} s^{-2}];
Q_G = Gravitational charge (mass) of the Earth = $5.976*10^{24}$ kg;
R = Equatorial radius of Earth = $6.378*10^6$ m;
I_I = Inertial current of rotating object [m^2 s^{-2}].

The last equation give us the planetary gravitational energy and the inertial energy of the rotating device, which must be equivalent for the device to fluctuate. The radius R of this equation is the distance from the device to the center of mass of the planet, which can be just the radius of the planet if the device is on the planet's surface, or also include the height of the device.

To calculate the additional gravitational potential we match the inertial energy of the amount of gravitational charge in rotation with the gravitational energy of the total gravitational charge of the device:

$$U=q_{G1}V_{G1}=q_{G1}I_I=q_{G1}\frac{\omega^2}{2}\left(r_2^2-r_1^2\right)=q_{G2}V_G \quad \Rightarrow \quad \omega=\sqrt{\frac{2V_G}{r_2^2-r_1^2}\frac{q_{G2}}{q_{G1}}}=\sqrt{\frac{2k_g}{\left(r_2^2-r_1^2\right)R}\frac{Q_G q_{G2}}{q_{G1}}} \quad .$$

With:

U = Energy [J];
q_{G1} = Rotating gravitational charge [kg];
q_{G2} = Total Gravitational charge [kg];
V_{G1} = Gravitational potential of the rotating object [m^2 s^{-2}];
V_G = Gravitational potential of the planet [m^2 s^{-2}];
I_I = Inertial current of the rotating object [m^2 s^{-2}];
ω = Angular speed of the object [rad s^{-1}];
r_1 = Internal radius of object [m];
r_2 = External radius of object [m].

Example 3:

A flying saucer contains two metal discs with 5 m radius and 250 kg each that rotate in opposite directions by two engines mounted in the cabin, which remain static. One of the discs has contra-rotating rotors to create an artificial gravity inside the ship, leaving only the other disc to neutralize terrestrial gravity. The total mass of the device is 2,500 kg. Calculate the speeds to cancel 30% and 100% of the total weight.

In the case of eliminating 30% of the weight we have:

$$\omega=\frac{1}{r}\sqrt{\frac{2k_g Q_G q_{G2}}{R q_{G1}}}=\frac{1}{5}\sqrt{\frac{2*6.674*10^{-11}*5.976*10^{24}*0.3*2{,}500}{6.378*10^6*250}}=3.874*10^3\,rad\,s^{-1} \quad .$$

$$v_{RPM}=\frac{60}{2\pi}\omega=\frac{60}{2\pi}3.874*10^3=3.70*10^4\,RPM \quad .$$

In the case of eliminating 100% of the weight we have:

$$\omega=\frac{1}{r}\sqrt{\frac{2k_g Q_G q_{G2}}{R q_{G1}}}=\frac{1}{5}\sqrt{\frac{2*6.674*10^{-11}*5.976*10^{24}*2{,}500}{6.378*10^6*250}}=7.073*10^3\,rad\,s^{-1} \quad .$$

$$v_{RPM}=\frac{60}{2\pi}\omega=\frac{60}{2\pi}7.073*10^3=6.75*10^4\,RPM \quad .$$

6.3 Artificial Gravity

The consequence of the above is that it is possible to create a center of gravitational attraction if we have two concentric disks rotating in opposite directions. In the case of a discoid spacecraft, this procedure allows the central cabin to remain stationary, while the artificially produced gravitational center keeps everything in its interior attracted and eliminates any inertia due to the curves that the spacecraft may take.

The gravitational potential associated with this gravitational center is calculated from the same equations already seen:

$$I_I = v^2 = \omega^2 r^2 = \frac{\omega^2}{2}\left(r_2^2 - r_1^2\right) = V_G \quad \Rightarrow \quad U = q_G V_G = q_G I_I = q_G \frac{\omega^2}{2}\left(r_2^2 - r_1^2\right) \quad .$$

On the other hand, considering what was exposed in the article Gravitational Charge [13], the energy associated with a gravitational field may be expressed by:

$$u = \frac{1}{2}\gamma_0 G^2 \quad \Rightarrow \quad U = \frac{1}{2}\gamma_0 G^2 V \quad .$$

With:

u = Volumetric density of energy [J m^{-3}];
U = Energy [J];
γ_0 = Gravitational permeability of vacuum = 1.19230*10^9 [kg^2 N^{-1} m^{-2}];
G = Gravitational field [N kg^{-1}] = acceleration [m s^{-2}];
V = Volume of the gravitational field [m^3].

Matching the two energies, we can estimate the value of the artificial gravitational field produced by the rotation of a quantity of gravitational charge (mass):

$$U = q_G(\omega r)^2 = q_G \frac{\omega^2}{2}\left(r_2^2 - r_1^2\right) = \frac{1}{2}\gamma_0 G^2 V \quad \Rightarrow \quad G = \sqrt{\frac{2U}{\gamma_0 V}} = \sqrt{\frac{2q_G}{\gamma_0 V}(\omega r)^2} = \sqrt{\frac{q_G}{\gamma_0 V}\omega^2\left(r_2^2 - r_1^2\right)} \quad .$$

In experimental setups, it is possible that two platforms have different amounts of gravitational energy. In this case, the gravitational center will be formed by the same amount of gravitational field in opposite directions, the excess of field will result in the displacement of the set in the direction of the largest field. This central field also provides a gravitational shield, since it is more intense than the external gravitational fields.

It is common to have assemblies with three rings, discs or platforms, two with opposite rotation to create the gravitational shield and the third to define the direction of propulsion.

Example:

A flying saucer is built with two 12 m diameter platforms with a mass of 1,000 kg, 10 cm apart, which rotate with opposite rotations of 24,000 RPM, that is, the relative rotation is 48,000 RPM.

The inertial energy of the set is given by:

$$U = q_G \frac{\omega^2}{2}\left(r_2^2 - r_1^2\right) = 1{,}000\,\frac{\left(2.513 * 10^3\right)^2}{2}\left(12^2 - 0\right) = 4.547 * 10^{11}\,J \quad .$$

With:

U = Energy [J];
q_G = 1,000 kg;
ω = 2π/60 v_{RPM} = 2π/60*24,000 = 2.513*10^3 rad s^{-1};
r_1 = 0 m;
r_2 = 12 m.

We will estimate that the volume occupied by the gravitational field is that of the cylinder defined by the distance between the platforms and their diameters.

$$G=\sqrt{\frac{2U}{\gamma_0 V}}=\sqrt{\frac{2*4.547*10^{11}}{1.19230*10^9*1.131*10^1}}=8.21\,N\,kg^{-1}=8.21\,m\,s^{-2}\quad .$$

With:

G = Gravitational field [N kg^{-1}] = acceleration [m s^{-2}];
U = $4.547*10^{11}$ J;
γ_0 = $1.19230*10^9$ [kg^2 N^{-1} m^{-2}];
V = $\pi r^2*h = \pi(6)^2*0.1 = 1.131*10^1$ m^3.

This gravitational field value, very close to the terrestrial gravitational field, occurs within the volume occupied by the field, so if these disks rotate below the cabin, everything inside the ship will be drawn downwards, giving the real impression of a planetary gravity. On the other hand, if these platforms are three meters apart, everything in this volume will be under the action of gravitational shielding.

$$G=\sqrt{\frac{2U}{\gamma_0 V}}=\sqrt{\frac{2*4.547*10^{11}}{1.19230*10^9*3.393*10^2}}=1.50\,N\,kg^{-1}=1.50\,m\,s^{-2}\quad .$$

With:

G = Gravitational field [N kg^{-1}] = acceleration [m s^{-2}];
U = $4.547*10^{11}$ J;
γ_0 = $1.19230*10^9$ [kg^2 N^{-1} m^{-2}];
V = $\pi r^2*h = \pi(6)^2*3 = 3.393*10^2$ m^3.

7 Conclusion

The electric levitation based on the interaction between the electrostatic field of the atmosphere and an electric field generated inside a craft is very dangerous because the electric potentials are very high, even using electrolytes of high permittivity. Special protection to the crew is necessary to avoid body ionization.

The Biefeld-Brown effect is yet an unexplained system because simple calculations considering the conservation law of linear momentum shows that its propulsion force is not consequence of an ionic wind, but it works. It was included here for completeness, but its formulation is not possible with actual physics.

The magnetic propulsion based on the repulsion/attraction between the terrestrial magnetic field and an intense magnetic field created inside the craft is a promising propulsion system. There are various methods to get this: rotation of volumetrically charged rings or discs and superconductors and ionic vortexes, that we know were the propulsion system of vimanas. All these methods are viable actually, with the available technology.

The mechanical propulsion system obtained through air ionization by projecting electric charges to the periphery of a discoid craft with magnetic vortex is simple to realize with rotating magnets. The calculated example showed that it is an equivalent method to that exposed in the article Power from Air Ionization [9], but with huge results and the only spent energy is to turn a motor.

The gravitational potential neutralization obtained rotating masses at high speed is a simple method to levitate, called gyroscopic effect, derived from the understanding of the satellite orbit balance. This is a very simple mechanical system for levitation with rotations around 70.000 RPM for a 2,500 kg device. It is interesting for using in self-propelled satellites.

In a spacecraft it is possible to use several of these methods and experimentation will indicate which of them is better. So, this is only a first approach to a vast field to be explored.

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