Evidence of Very Strong Low Frequency Magnetic Fields

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Abstract— We have shown *why* the propulsion of Unconventional Flying Objects of unknown origin can result from very intense low-frequency magnetic fields and an adequately pulsed ionization of the ambient medium. We also found *how* these fields could be produced, if the surface of these objects were superconducting. Now, we present *evidence of the existence of these fields.* It results from traces left on the ground by induced currents, rotating compass needles, direct magnetometer recordings and very remarkable magneto-optical effects. They provide even proof of the required pulsed ionization.

1. INTRODUCTION

Since spheres or similar objects could produce very intense low frequency magnetic fields if their surface were superconducting [1] and since this would account for Pulsed EM Propulsion of Unconventional Flying Objects [2], it is necessary to verify if observational evidence of this type of magnetic fields is really available.

2. INDUCED CURRENTS AND SPINNING COMPASS NEEDLES

On May 11, 1969, a Canadian farmer was awakened by his dog and discovered then a hemispherical object with a rim, hovering or standing slightly above the ground at about 150 m from his farm [3]. Its diameter was close to 10 m, but its luminosity was so intense that the witness had to protect his eyes. The following morning, he found there *a large ring, where the soil was depressed and dehydrated* (Figure 1). Its external diameter was 9.6 m and its width 90 cm. There were also three round 20 cm wide and 8 cm deep imprints, forming an equilateral triangle. They were attributed to the landing gear and the weight of the object, while the large ring could result from currents induced in humid soil by an oscillating magnetic field.

A vertical oscillating magnetic dipole of moment M and frequency ω produces an induced electric field $E = \omega(M/r^2)\sin\theta\sin\omega t$, whith circular horizontal field lines [1, 2]. The resulting current density $J = \sigma E$, where σ is the conductivity of the ground, increased by ionization. The soil will thus be heated. For an object that is situated at a hight h above the ground, the average dissipated power $P = \sigma E^2 = \sigma\omega^2 M^2 x^2/2(h^2 + x^2)^3$, when x is the distance from the symmetry axis. The maximum would be reached for $x = h/\sqrt{2}$ and after some time, the temperature could reach there 100°C and even more, when excess water was evaporated. Since *Pulsed EM Propulsion* (PEMP) predicts downwards oriented forces that are maximal for the same circle, the associated depression of the ground can also be explained. Even *circles of molten ice* have been observed, and ice has a higher conductivity than liquid water.

Capt. Ruppelt of the USAF investigated a related incident that happened on August 19, 1952 in Florida [4]. Since a scoutmaster thought that a plane had crashed, he searched for it and got under a large, silently hovering disk. He mentioned that the air was “oppressively moist”. Capt.

Figure 1: Physical trace, due to currents.

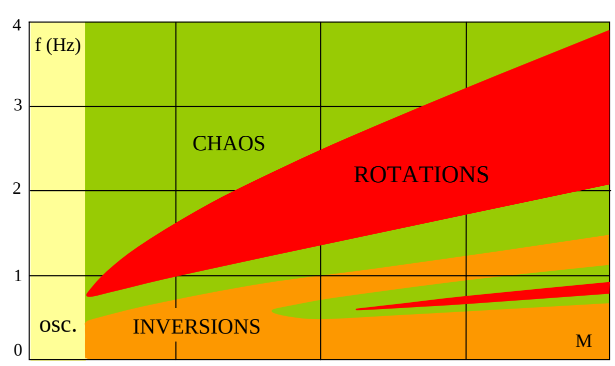


Figure 2: Possible behavior of compass needles.

Ruppelt sent lumps of earth and vegetation to a laboratory, where it was discovered that *the roots were charred,* while the grass blades were intact. The investigator suggested that this might be due to induction heating, but he didn't follow up. The electrical engineer Thomas [5] proposed an explanation that is similar to the present one, but Ruppelt didn't mention a ring and we can directly relate these observations to the propulsion system.

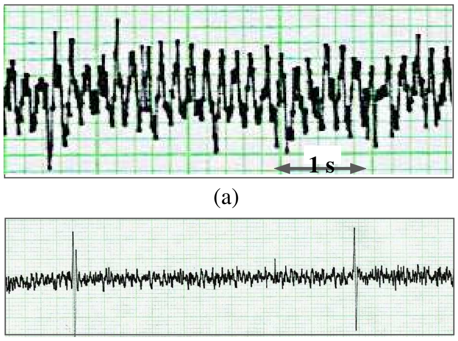
Another set of remarkable observations were made by pilots, who saw that *the needle of the magnetic compass was steadily rotating* when an Unconventional Flying Object accompanied their plane. This behavior was not obvious for us, since the PEMP model would only yield a magnetic field that oscillates *along a given direction* at the scale of the compass. Thus, we studied this phenomenon in detail [6]. Subjecting a compass for map reading to a magnetic field of modifiable magnitude M and modifiable frequency f, oscillating along a direction that is different from the N-S direction, we found various results (Figure 2). For low values of M, the neeedle oscillates only around the N-S direction with a resonance effect (yellow part). For very low frequencies, the needle simply follows the inversions of the magnetic field (orange part). It is possible, however, to set the needle in *steady rotation* (red parts), although the needle is subjected to viscous friction. At somewhat lower or higher frequencies, the needle turns towards the left or the right in an unpredicatble way (green parts).

This system allows thus for "order or chaos". The equation of motion is *nonlinear*, indeed, but it can be solved by numerical integration. This proves that the needle is exactly rotating at the frequency of the applied field with small superposed vibrations. Haines and Weinstein [7] provided 64 pilot reports, involving EM effets of various types. They included rotations of compass needles (cases 11, 13, 23, 34, 38, 39, 45 and even 18, because of complementary data). Gyroscopic, electric magnezyn and radio compasses were also perturbed, but reactions of a magnetic compass needle are the most useful for our purpose. The needle was said to be spinning fast, wildly or crasily, but in some cases, it was slowly rotating (even at 4 to 5 turns/min). Estimated distances of the unconventional flying objects were of the order of 50 to 200 m, but all compasses on *a ship of the Argentinian Navy* were deviated when a large, round "airship" silently stayed at a distance of about 2000 m. This event was carefully studied to exclude any conventional cause [8]. Since the compasses had to be perturbed by a stronger magnetic field than 5.8×10^{-5} T and since a magnetic dipole field varies like $1/r^3$, its strength at a distance of 20 m (possibly corresponding to the surface of the object) exceeds 58 T, although the object was not accelerating.

A complementary observation [9] was made already on July 27, 1904, when *a British steamer* was approaching Delawere (USA). Shortly after sundown, a strange gray cloud was spotted at the horizon. It was round and nearly in tangential contact with the sea, with glowing spots that became more vivid when it silently came nearer. Suddenly, it enveloped the whole ship (90 m), where the (ionized) air glowed then "like phosphorous". It contained electric charges, since head and beard hairs of the crew members "stood straight on end". There was also an oscillating magnetic field, since Captain Urquhart saw that "*the needle of the compass revolved with the speed of an electric fan.*" Moreover, the sailors were unable to move iron chains lying on the steel deck. The ship was immobilized and after about 10 minutes, the witnesses felt it difficult to move their arms and legs. They also noticed a great silence, as if the air "would not carry sound". Very strong static or ELF magnetic fields are not really harmful [10], but can act on fluids in the inner ear. The luminous cloud left only after about half an hour. The chains could then be easily moved and the compass needle was again "steadily pointing towards the north".

3. MAGNETOMETER RECORDINGS

Ray Stanford founded in 1973 and directed a team (Project Starlight International) that was dedicated to *optical and electronic detection* of Unconventional Flying Objects. With the help of donors, they acquired various instruments, including radar, magnetometer, gravimeter and cameras. In 1974, they filmed at their base station in Texas a light that pulsated at 4 Hz and another one that pulsated at 30 Hz with nearly rectangular pulses. In 1978, Stanford got a tip from a scientist at White Sands that UFOs were often "plaguing" government facilities out there. On July 19, 1978 the team went there with its mobile laboratory and had the chance to make already at *Plains in Texas* and then at the north edge of the *White Sands Proving Ground, New Mexico,* magnetometer and simultaneous gravimeter (i.e., vertical accelerometer) recordings. The horizontal magnetic field was also recorded on July 27, 1978 at *Prescott National Forest in Arizona.* UFOs were seen and filmed in all three cases. We are grateful to Ray Stanford for providing extracts of these important recordings (Figures 3 and 4).



(a)

(b)

Figure 3: Extracts of magnetometer.

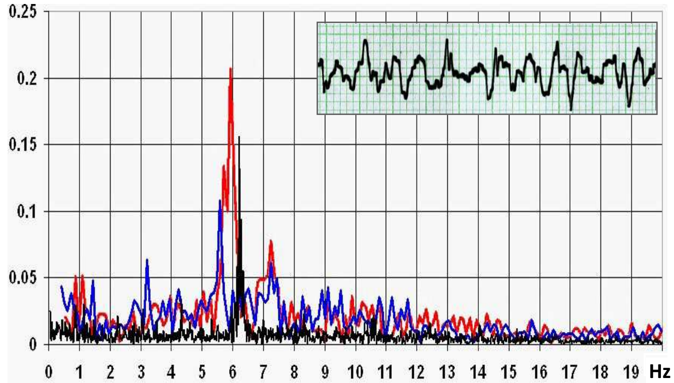


Figure 4: Spectrum of the magnetometer signal.

The oscillation of the magnetic field can be nearly harmonic (Figure 3(a)), but it usually is more irregular (insert of Figure 4). Since the witnesses saw a very great object and smaller ones, darting around, there could be some interference, but the *Fourrier spectrum* of three extracts of the recordings of July 27 (Figure 4) indicates the presence of many frequency components around 6 Hz. This is possible for the special oscillator [1] and yields steeper variations of the magnetic field. The induced electric field is then increased and also the efficiency of the propulsion system [2].

When the smaller, very red objects *suddently reversed their motions, there appeared "spikes" in the analog recording* (Figure 3(b) for two reversals of the same object, observed west of Plains, Texas). The witnesses heard loud rumbles and felt soft-tissue-shaking vibrations that were associated with these reversals and could result from plasma dynamic effects. Their delay with respect to the visually observed 180° or sometimes 90° turns indicated that this happened at about 1.6 km from the witnesses. Unfortunately, the instrument had not been calibrated to determine the magnitude of the recorded horizontal magnetic field component and to calculate the strength of the source. However, after the disappearance of all these objects it was immediately verified that the signal had been far above any background noise.

4. FARADAY EFFECT AND MAGNETO-REFRACTION OF EM WAVES

Anomalous Aerial Objects can also modify the propagation of EM waves, because of very intense magnetic fields and ionization of atmospheric air. Let's review and generalize the theory, by considering a *linearly polarized EM wave* of frequency ϖ that is propagating along a given z-axis. At $z = 0$, its electric field $\mathbf{E}$ is oriented along the x-axis, but this wave can be decomposed into two circularly polarized waves that propagate at different velocities. The x and y components of the corresponding electric fields $\mathbf{E}^{\pm}$ are $E_x = E^{+}\cos\phi^{+} + E^{-}\cos\phi^{-}$ and $E_y = E^{+}\sin\phi^{+} - E^{-}\sin\phi^{-}$, where the phase factors $\phi^{\pm} = k^{\pm}z - \varpi t$ and $E^{\pm} = E_o$. Thus, $E_x = E_o\cos\phi\cos\theta$ and $E_y = E_o\cos\phi\sin\theta$, where $\phi = kz - \varpi t$ with $k = (k^{+} + k^{-})/2$, while $\theta = \varphi z$ with $\varphi = (k^{+} - k^{-})/2$. This defines the velocity $v = \varpi/k$ of the linearly polarized light wave, while the plane of polarization is rotating at the rate $d\theta/dz = \varphi$. This requires that the circularly polarized waves are propagating at different velocities: $v^{\pm} = \varpi/k^{\pm} = c/n^{\pm}$, which happens when there is a magnetic field $\mathbf{B}$ along the z-axis. Indeed, the dielectric constant $\varepsilon^{\pm} = 1 + \ \mathbf{P}^{\pm}/\varepsilon_o\mathbf{E}^{\pm} = (n^{\pm})^2$, where the polarization densities $\mathbf{P}^{\pm}$ are respectively due to the $\mathbf{E}^{\pm}$ fields. $\mathbf{P}^{\pm} = Nq\mathbf{u}^{\pm}$ for a density N of particles of charge q and mass m, but the displacements $\mathbf{u}^{\pm}$ result from the equations of motion. Taking into account the magnetic field, we get $\ddot{u}_x = (q/m)\,E_x + \omega_c\dot{u}_y$ and $\ddot{u}_y = (q/m)\,E_y + \omega_c\dot{u}_x$, where $\omega_c = \mathrm{qB/m}$. It follows that $u_x = A^{+}\cos\phi^{+} + A^{-}\cos\phi^{-}$ and $u_y = A^{+}\sin\phi^{+} - A^{-}\sin\phi^{-}$. For low frequency magnetic fields and pulsed ionization, the values of B and N are practically constant during the lifetime of these particles. Thus,

$$A^{\pm} = \frac{\pm(q/m)E^{\pm}}{\varpi(\omega_c \mp \varpi)} \quad \text{and} \quad \varepsilon^{\pm} = 1 - \frac{\omega_o^2}{\varpi(\varpi \mp \omega_c)} \quad \text{where} \quad \omega_o^2 = \frac{Nq^2}{\varepsilon_o m}$$

Usually, we can assume that $\varpi \gg \omega_o$ and ω_c, so that

$$n^{\pm} = 1 - \frac{\omega_o^2}{2\varpi^2}\left[1 \pm \left(\frac{\omega_c}{\varpi}\right) + \left(\frac{\omega_c}{\varpi}\right)^2\right] \quad \text{and} \quad \varphi = \frac{-\omega_o^2\omega_c}{2c} = \frac{e^2NB}{2c\varepsilon_o m^2} \tag{1}$$

The rate φ of the Faraday rotation along the z-axis is *proportional to the local value of B and the local density N of free electrons.* There are no second order effects and the action on ions is negligible. However, the velocity of the wave is $v = c/n$, where

$$n^2 = \varepsilon = \frac{(\varepsilon^+ + \varepsilon^-)}{2} = 1 - \frac{\omega_o^2}{(\varpi^2 - \omega_c^2)} \to 1 - \frac{\omega_o^2}{\varpi^2}\left(1 + \frac{\omega_c^2}{\varpi^2}\right). \tag{2}$$

The index of refraction n *decreases* for high ionization densities and even more for extremely intense magnetic fields. This effect is proportional to B^2 and could account for the fact that *optically visible UFOs* are *not always detectable by radar*. Microwave beams could simply be deflected by progressive refraction, without requiring any other cloaking system.

The result (2) can also account for the *perturbation of the autopilot system of airplanes, guided by VOR* (very-high frequency omnidirectional radio contact). Dr. Haines reported that this happened on March 12, 1977 for a DC-10 of United Airlines during a non stop flight from San Francisco to Boston (case 41 of Reference [7]). When the aircraft was just south of Syracuse NY and flying by radio navigation through VOR contact with Albany, *the airplane suddenly and unexpectedly began to turn left, making a 15° bank.* The captain, first officer and flight engineer saw then "an extremely white light source" at their left side and at about their own altitude (37,000 feet). This perfectly round light had an estimated diameter of about 30 m and kept a distance of about 1000 m. Its angular size was thus larger than three times the apparent diameter of the moon. Three cockpit compasses, using sensors in different parts of the plane, gave different readings, but the essential point is that the VOR system combines two signals emitted by a given ground station. One of them is omnidirectional, while the other corresponds to a narrow rotating beam, where the phase of the EM wave changes from 0 to 360° in proportion to the azimuth. When this beam is deflected by an intermediate magnetic field and the presence of free electrons, the calculated azimuth is not the correct one.

There are also cases where very strange optical effects [11] were photographed below and above UFOs. Local luminosities result from ionization and extremely intense magnetic fields can prohibit transmission of background light when n^2 defined by (2), becomes negative.

The *Faraday Effect* was observed on May 5, 1953 by the chemist *Wells Allen Webb* near Yuma, Arizona, between 9:45 and 10:00 AM local time. He saw an elongated white object on an otherwise blue sky at about 90° with respect to the Sun. Scattered sky light was thus vertically polarized, while his Polaroid sunglasses blocked horizontally polarized light. Putting them on and off, no difference appeared when the object was steadily advancing sideways, but after about 5 minutes, it became a white circle. It had changed its direction of motion and was moving away, since it slowly vanished like that. However, when the witness was looking along its axis, there appeared *several dark rings* around the central light, every time he used the sunglasses [12]. These rings were nearly equidistant and their ensemble had the size of the full moon. This fits the theory of the Faraday Effect, since the plane of polarization of the scattered light could be rotated by 90° for the external circle and by additional 180° turns closer to the object, where the magnetic field and ionization were more intense. When the line of sight was orthogonal to the axis of the magnetic dipole, the plane of polarization was rotated at first towards one side and then towards the other. The total effect was zero, by symmetry.

Ray Stanford documentated this phenomenon in a very impressive way. On December 4, 1980, while flying fom Mexico City to San Antonio, Texas, he spotted anomalous objects in the sky, grabed his Super 8 Canon camera and filmed for about 25 s at 70 mm focal length. This happened after sunset, but the Sun was still illuminating the sky in the direction he was filming. Vertical sunrays were scattered in the west at about 90°, yielding horizontally polarized light that passed near the objects. The beam-splitter of the camera acted like an analyser, by reflecting mainly horizontally polarized light toward the film. Viewing the resulting pictures one by one, Ray Stanford discovered *in one frame an extraordinary set of at least 12 white concentric rings* (Figure 5).

They were centered on one of the small objects dashing in various directions. By chance, this picture was taken exactly at the instant where one these objects encountered a long unidentified structure (dark edge in Figure 5). To reverse its motion, the smaller object produced a very intense magnetic field and a short ionization pulse, the pictures being taken at 54 frames per second. The white rings resulted from horizontally polarized light and many 180° rotations near the object. Its symmetry axis was oblique with respect to the plane of the film, yielding ellipses instead of circles. It is possible to account for the progressive change of the distances between successive rings by considering the velocity $\mathbf{V}$ of free electrons in very strong magnetic fields and auto-ionization,

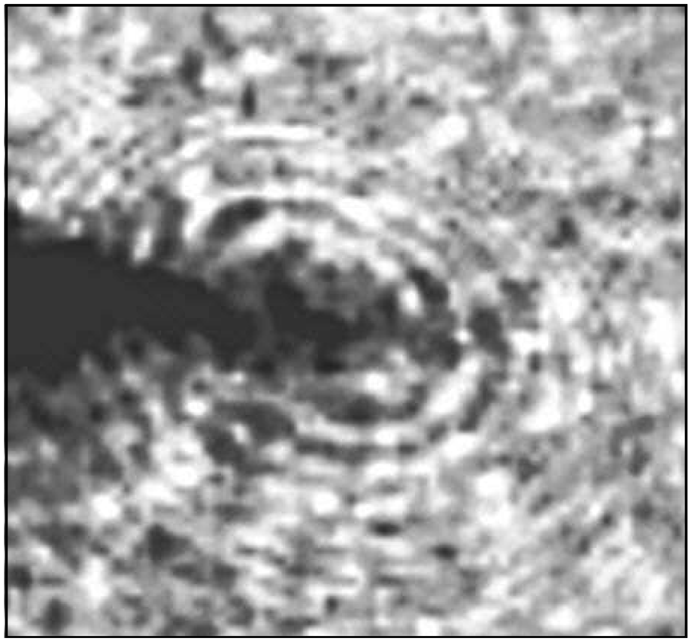


Figure 5: Ray Stanford's set of Faraday rings.

proportional to the average kinetic energy of free electrons. Ray Stanford discovered also some other Faraday rings on other occasions.

5. CONCLUSION

The general conclusion is that *the phenomenon of Unidentified Flying Objects merits scientific interest* and that its study raises questions that could foster progress in various fields. This includes the search of new types of superconductors, which could eventually be graded metamaterials.

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