The Replication of an Experiment Which Produced Anomalous Excess Energy

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ABSTRACT:

New propulsion methods for interstellar spaceflight will most probably require new on-board energy production methods deriving energy from presently unknown sources.

An experiment conducted by the author in 1981 with a very simple device showed a measured energy output significantly greater than the measured energy input. The origin of the excess energy was and still is unknown. The purposes of this paper are to describe that experiment and to urge that it be replicated. If the anomalous excess energy is seen again, then this experiment might reveal its source and show how it can be enhanced. This may lead to a previously unknown source of energy that could be harnessed to drive the propulsion methods that can take mankind to the stars.

INTRODUCTION:

In recent years, there have been a number of claims, in both scientific journals as well as patents, of devices or processes that produce anomalous energy effects, sometimes including an energy output greater than the known energy input. These include anomalous excess heat produced under special conditions in some solids (Patterson, J., 1997), electrical discharges through water (Graneau, P., 1985), organized electron clusters (Shoulders, K., 1991), and others (King, M., 1992).

In 1981, this author was part of a team that conducted an experiment with a very simple device in which the measured energy output from this device was significantly more than the measured energy input. Estimated experimental errors were relatively small; the anomaly appeared to be real and not readily explainable. This experiment has apparently never been published. Whatever the origin of the excess energy, this experiment should be replicated and the phenomenon explored further and enhanced, if possible.

Specifically, a source of radiant heat energy being used for other tests consisted of a piece of carbon (graphite) heated (in air) to white hot incandescence with dc electricity. The electrical power heating the carbon and radiant heat flux emitted by the carbon were carefully measured, and data were recorded by a computer. The mass of the carbon, before and after heating, was also measured. Even taking into account the relatively slight amount of heat caused by the combustion of the carbon, the output power at equilibrium was approximately 152% as large as the input power.

THE ORIGINAL EXPERIMENT:

Unfortunately, only some pieces of the data from this intriguing experiment still exist. These are:

The experimental apparatus (refer to Figure 1) consisted of the elements listed below.

- A rectangular piece of graphite (purity unknown), which had dimensions (the part that was heated to incandescence) of approximately 8.9 cm long, 1.6 cm wide, and 0.24 cm thick.

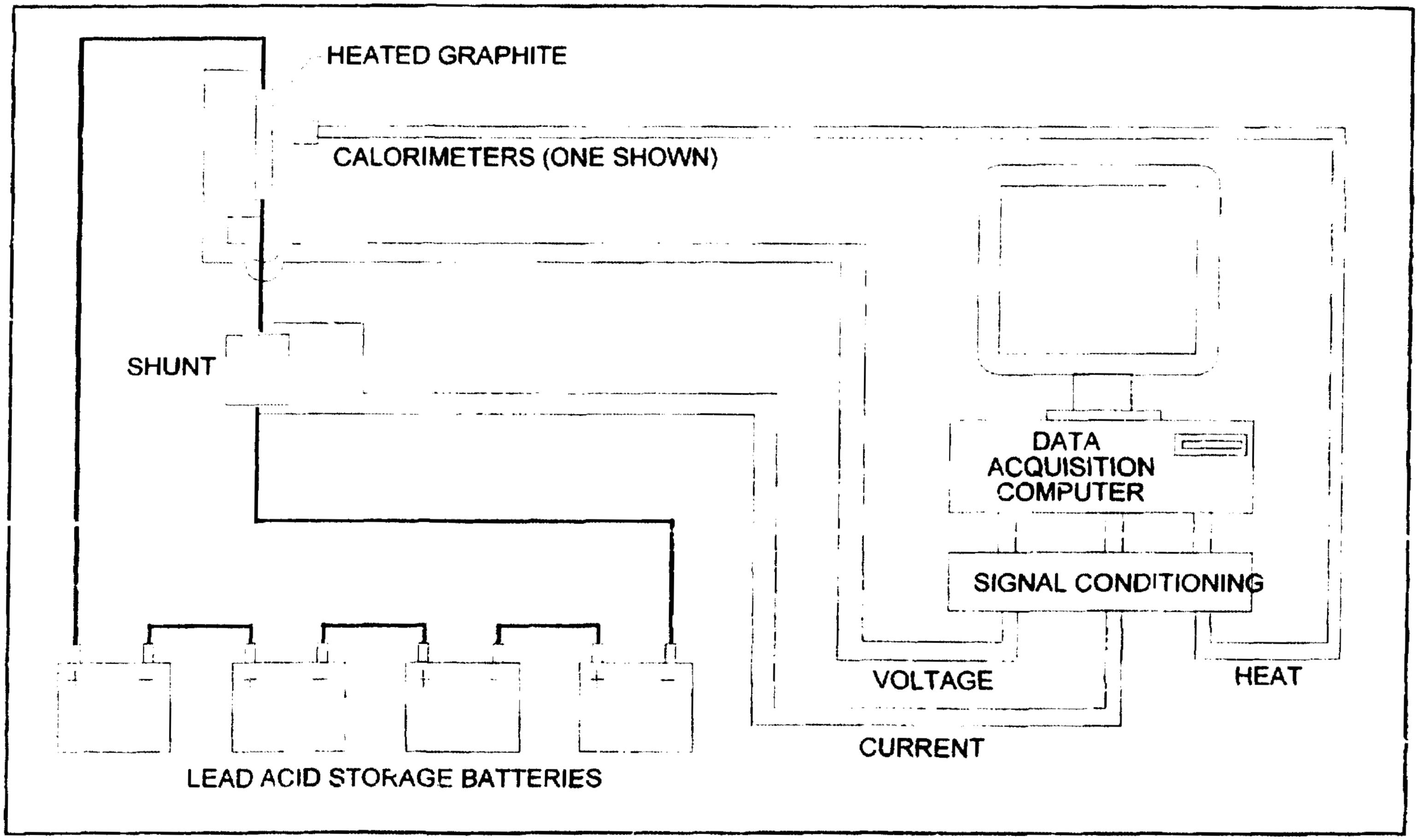

Figure 1. An experiment that produced anomalous excess energy

- The electrical power source, consisting of four truck-type 12-volt lead-acid storage batteries connected in series. Each battery was fully charged to a voltage of approximately 12.8 volts.

- A calibrated voltmeter to measure the voltage across the graphite and a calibrated shunt to measure the electrical current through the graphite.

- A water-cooled, calibrated calorimeter used to measure the heat flux radiated by the incandescent graphite. This instrument was used within its rated range and had a calibration traceable to the National Institute of Standards and Testing (NIST). The calorimeter was positioned approximately 0.4 cm from one of the large faces of the graphite, approximately 2.5 cm from an end of the graphite, and on the longest centerline of the large face. Other details of the calorimeter are no longer available.

- A heavy-duty switch consisting of several car-starting solenoids connected in parallel, used to complete the circuit through the graphite.

- A separate timing circuit that energized the solenoids thereby allowing current flow through the graphite for a predetermined length of time, which was typically 10 seconds.

- Heavy-duty cables that connected the batteries, graphite, current-measuring shunt, and heavy-duty switch in a series circuit.

- A computer and associated equipment to record the data.

- A laboratory balance used to measure the mass of the graphite both before and after a test run to determine the mass loss of the graphite due to combustion.

The data measured for a run (with typical values taken during a steady-state portion of that run in parentheses) were:

- voltage drop across the graphite: (33.61 volts);
- current flowing through the graphite: (502 amperes);
- heat flux radiated from the graphite. (759 watts per cm^2 area times the incandescent area of 32.75 cm^2, which equals a total radiated output of 24.86 kilowatts);
- graphite mass loss due to combustion in air: (0.235 grams); and
- run duration: (10 seconds).

In addition to the radiated heat output, a significant amount of heat was conducted from the graphite through the water-cooled metal clamps that were holding the graphite and providing current contacts. The flow rate and temperature rise of this cooling water allowed the power conducted away in this manner to be calculated. There was also a small convective heating of adjacent air, which was calculated by a method described in a heat transfer textbook (Incropera and DeWitt, 1990).

The energy (actually power) balance for one particular run was as follows:

- radiated output power: 24.86 kilowatts;
- conducted output power: 1.74 kilowatts;
- convected output power: 0.14 kilowatts;
- electrical input power: 16.87 kilowatts; and
- chemical (combustion) input power: 0.76 kilowatts. (This assumes the carbon burned to yield carbon dioxide, which would give the most power.)

The calculated ratio of output power divided by input power was then:

$$\frac{\textit{Output Pwr}}{\textit{Input Pwr}} = \frac{(24.86\,kW + 1.74\,kW + 0.14\,kW)}{(16.87\,kW + 0.76\,kW)} = \frac{26.74\,kW}{17.63\,kW} = 1.52 = 152\%$$

Others at this same laboratory had previously conducted essentially the same experiment except that the incandescent heat source was a 0.635-cm-diameter graphite rod and the calorimeter was placed further away from this rod. On several occasions, the investigators had measured a radiated heat output power that when divided by the electrical input power gave a ratio of more than 200%. (They did not measure conducted nor convected output powers nor the mass loss of graphite due to combustion.)

THE DESIGN OF THE PROPOSED EXPERIMENT:

It is proposed the present experiment be conducted in the same manner as the original. If fundamental parameters were changed, the excess energy (if it is real) may not appear and the reason would not be learned. However, this still allows improvements to be made in areas such as instrumentation. The electrical power source should again be four truck-type 12-volt lead-acid storage batteries connected in series.

The dc electrical power (watts) delivered to the incandescent graphite is the product of the voltage drop (volts) and current flow (amperes) through the graphite. Voltage drop and current flow data are recorded in the data acquisition computer. The radiant energy emitted by the graphite is measured with a calorimeter with output that is an electrical signal, which is also recorded in the computer.

Primary experimental data, recorded in a computer (at selected time intervals, e.g., every 0.1 second) by using the appropriate software and signal conditioning, will consist of:

- voltage drop across the graphite;
- voltage drop across the calibrated shunt (from which current flow through the graphite is calculated); and
- the electrical signal from the calorimeter (which allows the radiant heat flux emitted from the graphite to be calculated).

The ends of the graphite are physically held by copper clamps, which also serve as electrical current connections. It is necessary that these clamps be water-cooled, or they will melt.

Additional experimental data will consist of:

- volume flow rate and temperature increase of the cooling water to the graphite current connection clamps, which allow conducted heat output power to be calculated; and
- mass of the graphite before and after heating and run duration, which allow combustion input power to be calculated.

The output power convected away by air is relatively small, but this can be calculated (Incropera and DeWitt, 1990).

THE DIFFICULTY OF MEASURING RADIANT HEAT ENERGY:

Nearly all the energy output from the graphite will be radiated heat, and it is recognized that its accurate measurement is not as straightforward as the measurement of the other parameters, e.g., voltage, temperature, and mass. For example, one problem can be caused by heat reflecting back to an emitting surface, causing a different emitting surface to emit more heat. To be sure radiated heat will be measured as accurately as possible, it is proposed that part of the planning process for this experiment will include a trip to a laboratory known for the accurate measurement of radiated heat, which could perhaps be a section of NIST. This trip is included in the estimated costs.

SAFETY CONSIDERATIONS:

- Ignitable surfaces must be kept several feet away from the incandescent graphite.
- Hydrogen must be vented properly when the lead-acid storage batteries are recharged.
- The four batteries connected in series will provide approximately 50-volts potential, which requires common sense precautions in its use.

ESTIMATED COSTS:

The estimated costs of equipment and labor for conducting this proposed experiment are given in the table below.

Materials, Equipment, and Hardware	$1,500.00
Instrumentation and software	$2,850.00
Travel	$4,000.00
Labor (600 hours for planning, procurement, fabrication, calibration, and testing)	$30,000.00
TOTAL	**$38,350.00**

The above costs assume that fabrication and assembly of experimental components could be completed and enough test runs conducted to determine if the anomalous energy, measured in the original experiment, is real or not. If the anomalous energy were seen again, the cost of additional testing would be mainly for labor. These costs also assume the testing facility is already available, and they do not include suggested improvements referred to in the next section.

SUGGESTED IMPROVEMENTS:

If the anomalous excess energy is seen again, the following are ways the experiment may be enhanced to explore this phenomenon further.

- The chemical reactions (combustion) of the graphite could be eliminated by enclosing it in an inert gas (e.g., argon) or in a vacuum. This also allows for more continuous operation, providing the power source has enough capacity.
- Rather than using a radiant flux calorimeter, the incandescent graphite could be enclosed <u>inside</u> a calorimeter.
- Different purity grades of graphite could be tested. If the anomalous effect is caused by impurities in the graphite, then the graphite should be intentionally "doped" with various elements (one at a time) to learn which ones are responsible. This could lead to a major enhancement. If anomalous excess energy appears only when the graphite is doped with a specific element (or elements), then this could be evidence for the occurrence of anomalous excess heat produced under special conditions in some solids. Whether the graphite is doped or not, it should be chemically analyzed before and after heating. If anomalous excess energy was emitted by

extremely pure graphite and the graphite had the same purity after heating, then perhaps some other source of energy, such as "zero point energy", is being tapped.

CONCLUSIONS:

In conclusion, the search for an unknown source of energy should begin with anomalies already known. The experiment proposed here is fundamentally very simple and has already been partially replicated; however, it should be replicated again. If the anomalous excess energy is seen again and it can be determined that it is real and is not due to experimental errors, the fundamental simplicity of this experiment may allow the phenomenon to be significantly enhanced. This phenomenon might then be developed into a fuel-less energy source of a sufficient size to drive interstellar space vehicles.

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