Reaching The Stars

Interstellar Space Exploration Technology Initiative (iSETI) Report

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Benjamin Thomas Solomon
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Reaching The Stars

The Interstellar Space Exploration Technology Initiative Report

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Front, back, and section divider photographs, courtesy of NASA's Apollo missions.

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Acknowledgment/Dedication

Acknowledgment

My appreciation to the organizers of the National Space Society's International Space Development Conference (http://www.nss.org), and the Journal of Theoretics (http://www.journaloftheoretics.com), for providing the platform to publish my unconventional findings.

To University of Denver, and University of Colorado at Denver, for providing access to their laboratories.

To America, a land where great ideas are nurtured.

Dedication

To our Lord Jesus Christ, the greatest man to walk this Earth.

To the American and Russian astronauts, engineers, and scientist,

That their sacrifices may not be in vain.

To the Challenger & Columbia crew who did not make it back to Earth.

About the Author

Professional Experience

- 20+ years, business re-engineering, strategic planning, finance, operations and information technology.
- Believes in people development, empowerment, team effort, & management by walking around.
- Technology innovator in management, finance, IT, and space propulsion.

Recent Publications

- 2003 Reaching The Stars, The Interstellar Space Exploration Technology Initiative, ISBN 0-9720116-3-3, August 25, 2003
- 2003 "A New Approach to Gravity & Space Propulsion Systems", International Space Development Conference, May 23-26, 2003, San Jose, CA
- 2002 "The Future of the Launch Industry", International Space Development Conference, May 23-27, 2003, Denver, CO.
- 2002 A Rational Approach to Unsystematic Risk, Re-Thinking Modern Finance, ISBN 0-9720116-1-7, April 15 2002.
- 2002 A Rational Approach to Business Design, Strategy and Re-Engineering by Design, ISBN 0-9720116-0-9, April 15 2002.
- 2001 "An Epiphany On Gravity", Journal of Theoretics, Dec 3, 2001, Vol. 3-6.
- 2001 "Wormholes Create Unresolvable Paradoxes", Journal of Theoretics, Aug 6, 2001, Vol. 3-4.
- 2001 "Post-Newtonian Propulsion Technology", International Space Development Conference, May 24-28, 2001, Albuquerque, NM

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Preface

1 Objectives

This report documents the **Interstellar Space Exploration Technology Initiative** required to reach the stars. The US Space Program in its current form will not get us to the stars **and back**; and is not going to provide an approach to a commercially viable space tourism, mining, and construction industries, within our lifetime.

The objective of this report is to convince Academia and the Space Launch industries that another approach is possible. Current efforts are based on Newtonian (rockets) propulsion systems to thrust payloads into orbit and beyond.

2 The Approach

My research is based on Occam's Razor, the simplest theory that fits the facts of a problem is the one that should be selected. This report is divided into 4 sections, The US Industry, Future Concepts, Future Technology, and Technology Management. *The US Industry* presents the need to restructure the US Launch Industry. *Future Concepts* lays out the scientific paradigm shifts Academia needs to embrace. *Future Technology* presents the technologies that will eventually dominate the launch industry. *Technology Management* focuses on how new concepts will drive our understanding and management of space exploration technologies.

3 Expected Benefits

My research has led to the development of a set of interlinking concepts, logical constructs, hypotheses, and experiments that encompass electromagnetism, gravity, the impossibility of time travel, and the missing link in the Special Theory of Relativity.

It is possible to develop Post-Newtonian Propulsion Systems.

Benjamin Thomas Solomon

http://www.QuantumRisk.com

August 2003

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Part 1: The US Space Industry

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1. The Future of the Launch Industry

1.1 Introduction

This chapter presents a business approach to understanding the launch industry [1], and how and why it will change. The author, who developed the Holistic Business Model [2], has used this Model to present a high-level approach to strategy and industry structure analyses.

We will use the airlines industry to infer potential business issues with the Reusable Launch Vehicle (RLV) industry, and it is hoped that the airline industry mistakes are not repeated in the RLV industry.

1.2 Lesson 1: Technology Does Not Guarantee Profits

Today, there are for all practical purposes, two commercial passenger jet manufacturers, Boeing and Airbus Industry. For technological, safety, fuel efficiency, and regulatory reasons, both manufacturers deliver basically the same type of airplane. These multi-million dollar planes are sold to most commercial airlines. As a result, the commercial airlines industry competes with what is essentially the same aircraft from a passenger's

Same Plane

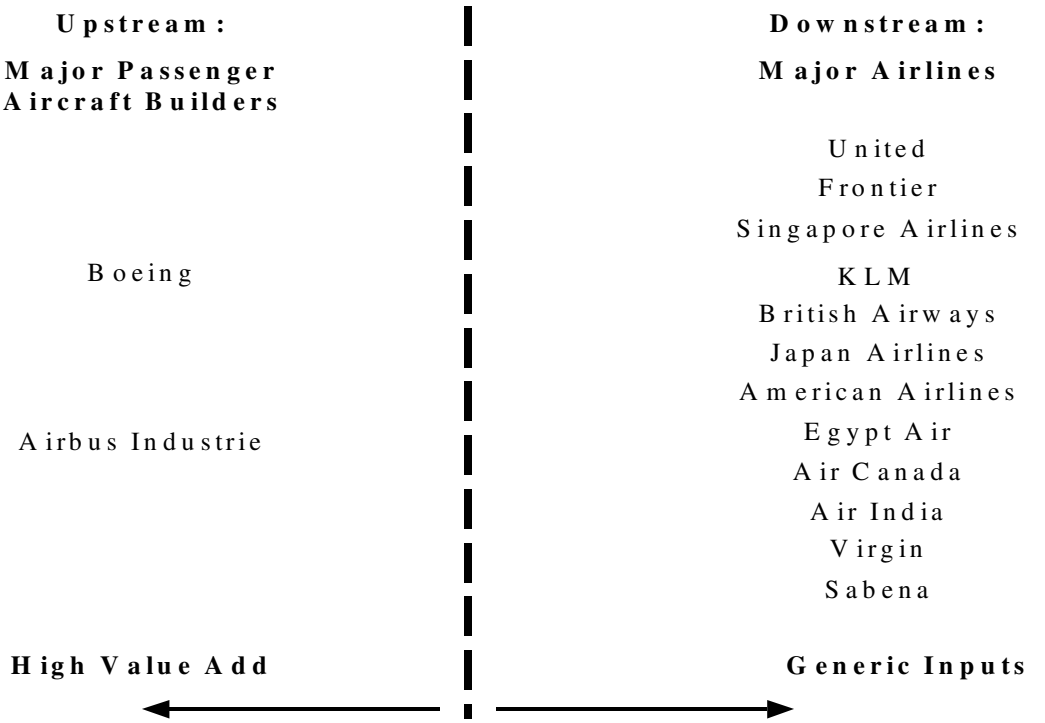

Fig. 1.1: Airline Industry Example

perspective.

Scale Economies

The Holistic Business Models, Fig. 1.2, shows that the airline industry is primarily driven by scale economies. It is in a market that is forcing Consolidation, as consumers primarily seek fare price value. Its market economics is primarily driven by fixed costs. We see that this industry's market sustainability has long-term viability issues. In summary, the airline industry creates it wealth from inputs.

Wealth from Inputs

The commercial jet manufacturers' very high value-add is, in the hands of the airline operators, a very expensive generic value "must have" item. The resulting cost pressures, see Fig. 1.3, forces the airlines industry into extreme rivalry, and price wars. So who is making the profits in the commercial aviation industry? It is the plane manufacturers.

Technology does not Guarantee Profits

The lesson we learn from the airline industry is that strategic positioning, in both the market and industry structure is vital for profits, and that technology does not guarantee profits. The development of the space-related economy is what will ensure a successful launch industry.

Japanese Shuttle

When it develops, the primary competition the US RLV industry will face in the future is from the Japanese shuttle. This is because Japanese industrial policy has always been to

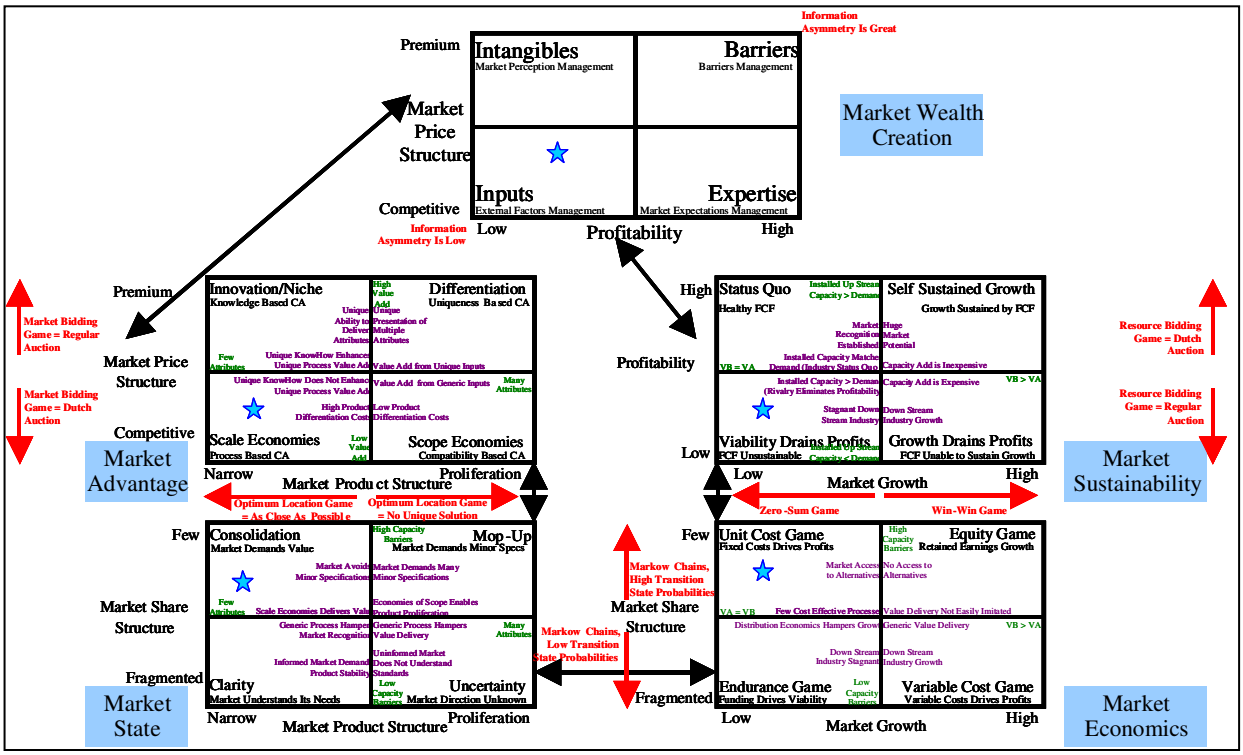

Fig. 1.2: Airline Business Management

enter a market with low cost models and then use the profits to develop more expensive models. The Japanese shuttle is definitely not good news for the US RLV industry. We will look at how this can be addressed.

Russia & Japan, Major Players in Building Non-US Capability

Excluding Europe, Russia, Japan, and China, other potential competitors on the horizon are, Pakistan, India, and Brazil. Brazil will use its satellite industry to backward integrate into the launch industry. The most likely sources of this launch technology are Russia and Japan. There is no visible relationship between Brazil and Russia, but I believe economic pressures will make Russia the more likely candidate in the early stages of Brazil's RLV industry development, and Japan participating in the later stages.

1.3 Lesson 2: NASA' Contribution to the Launch Industry has Eroded

Figure 1.4 shows how the Holistic Business Model has been applied to a government body. The Holistic Business Model shows, in terms of the Launch Business, how NASA has gone from creating wealth from Barriers to Inputs. This is primarily because,

1. Market Advantage: Migration has been from Niche to Scale Economies. As an

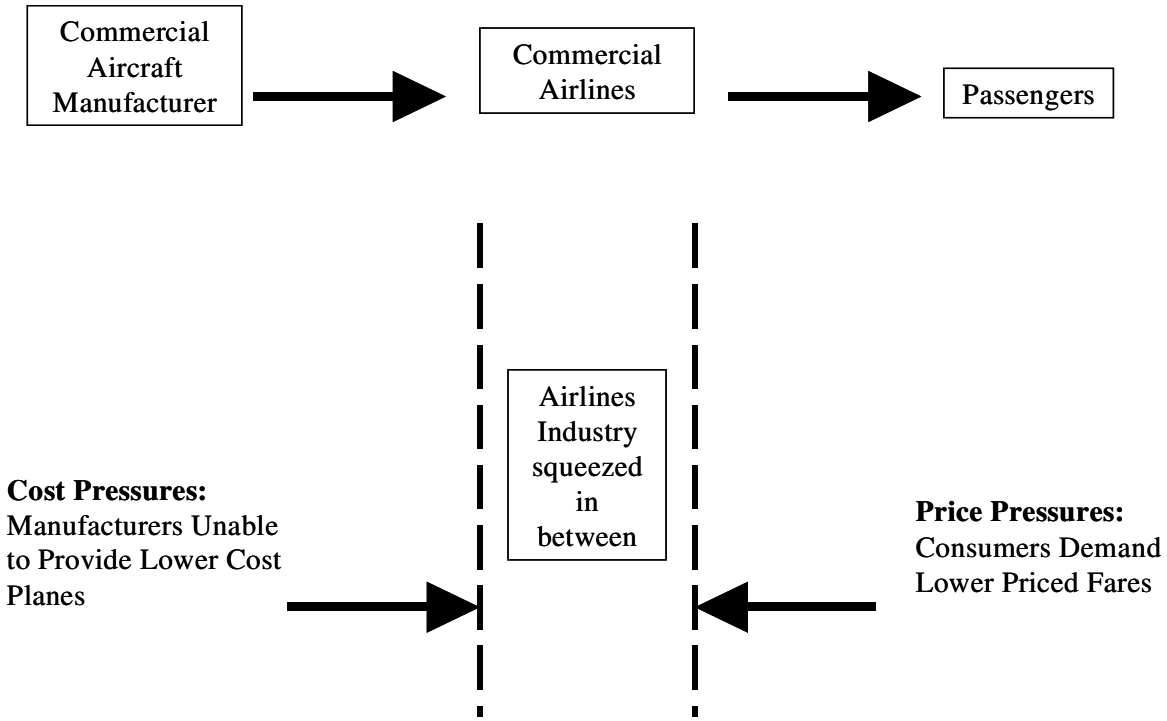

Fig. 1.3: Who is Making the Profits?

organization experiences the technology learning curve, and knowledge is disseminated via academia, NASA industry structure shifts from one that has unique knowledge to one that is able to manage launch technology in a cost effective manner.

2. Market State: Migration has been from Consolidation to Clarity. Again, knowledge is at work, but this time from knowledge at non-NASA organizations.

3. Market Economics: NASA has migrated from establishing an Equity of research, prototyping, and production (sub-contractors) know-how to a Variable Cost Game with the advent of the Shuttle program.

4. Market Sustainability: Similarly NASA has migrated from Self-Sustained Growth – tax payers can afford to fund NASA – to Growth Drains Profits – NASA's budget is approaching the limits of the US tax payers' willingness to fund more programs.

The second lesson is that NASA's unique contribution to the commercial launch industry

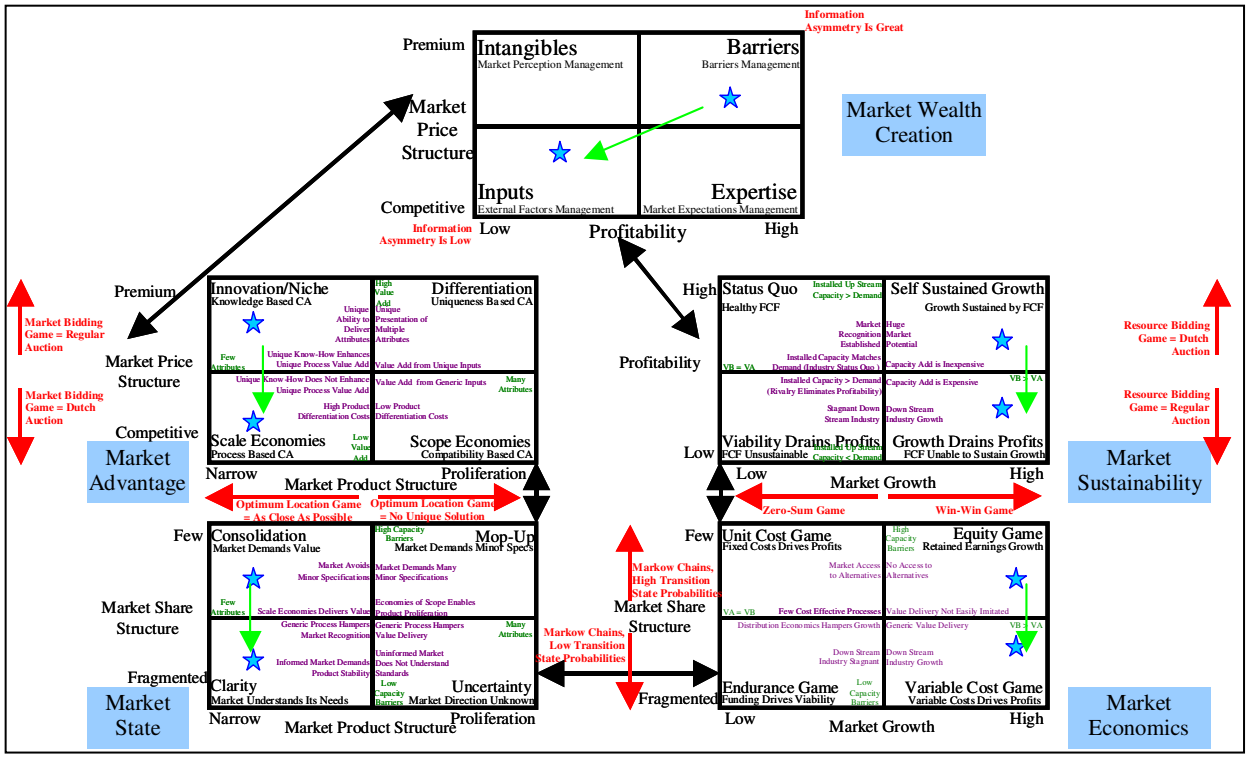

Fig. 1.4: NASA's Industry Structure Outcomes

has eroded significantly. This, in itself is a good and desired result, as do want to see the evolution of the commercial launch industry. However, we do want to see a lower cost commercial launch industry, and therein lies the problem. The hand-off from NASA to the commercial launch industry has not resulted in significant strides in cost reduction; enough to have a viable commercial launch industry.

NASA's Unique Contribution Erosion

1.4 Lesson 3: Avoid the Airline Industry Mistakes

This risk-reward relationship, Fig. 1.5 [3], shows how returns vary with risk. There are three parts to this graph within the context of space technology development;

1. Proven Technologies: This part is the standard risk return relationship. As technology risk in a corporate environment increases, on average, the returns increase. It is the RLV industry role to convert commercially "unproven" technologies into commercially proven technologies.

RLVs to Develop Commercial Technologies

2. Proven Science & Unproven Technologies: This is the little know part of the risk-return relationship. Beyond a certain point, the "knee" of the curve, the investment

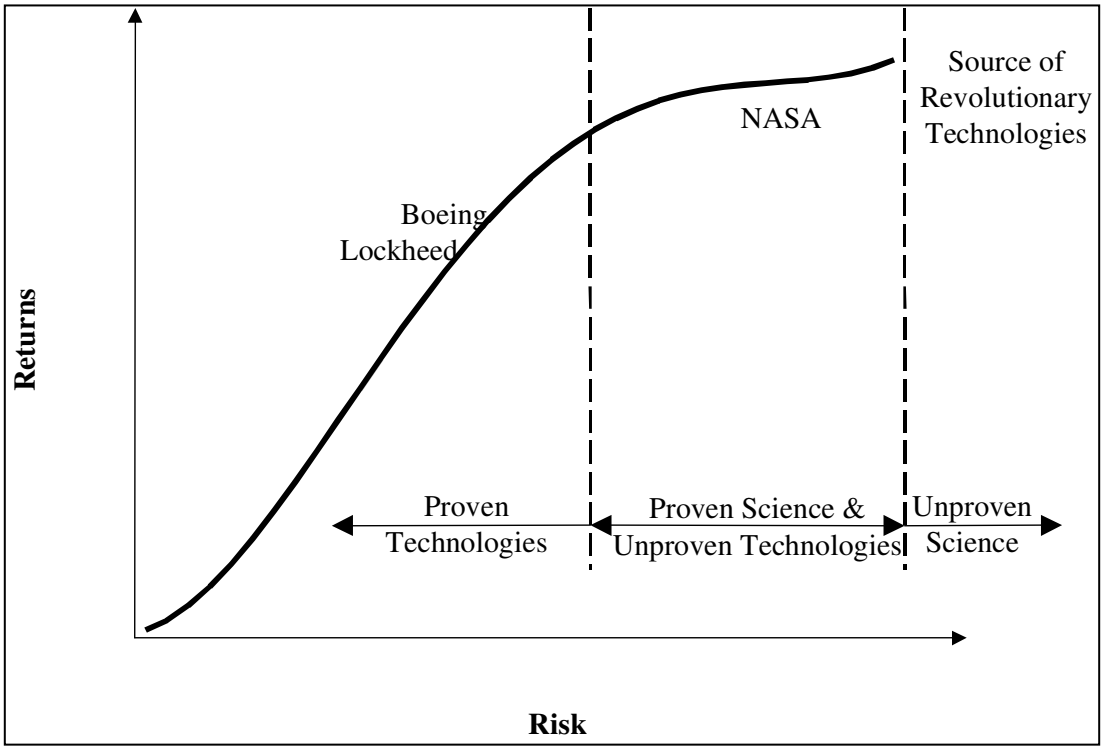

Fig. 1.5: Space Industry Risk Return Structure

returns level off very significantly. That is increased risk is not accompanied by a corresponding increase in returns. This is NASA's role, to convert proven science into unproven technologies. These technologies are "unproven" from a commercial standpoint.

NASA to Convert Science Into Technologies

3. Unproven Science. This last phase is just outside the known risk-return relationship. This is academia's role, to develop and sift through ideas and develop revolutionary science. This is the region that will deliver revolutionary launch technologies.

Academia to Develop Radical Science

It is now clear, that NASA's role is to create commercially unproven but viable technologies, from the wealth of proven science. Bearing in mind the mistakes of the airline industry, NASA should then hand off these commercially unproven technologies, to other corporate entities to commercialize.

Fig. 1.6 shows how the future commercial launch industry should map to the risk-return graph. The key point here is that, unlike the commercial airline industry, the RLV manufacturers should be positioned lower down the risk-return curve, while space exploration & transportation companies should be positioned higher up the curve. There are two reasons for this,

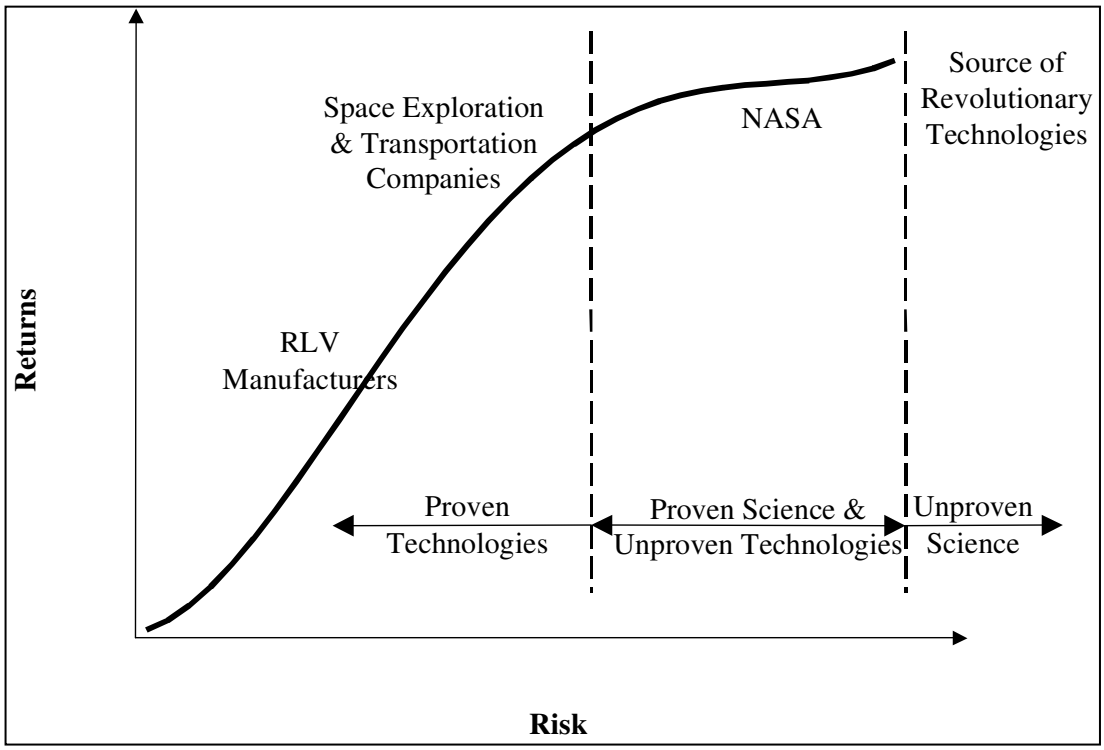

Fig. 1.6: Future Space Industry Risk Return Structure

1. RLV manufacturers will be commercializing NASA technologies that have been proven viable. Therefore their investments are at a lower risk.

2. Space exploration companies have to able to absorb exploration risk, which we do not fully understand.

The Holistic Business Model, Fig. 1.7, shows how the future space transportation industry ought to be structured:

1. Market Advantage is Scale Economies. The more trips the greater the dilution of the fixed costs.

2. Market State is Clarity. This ensures that there will be many exploration companies, with management focused on delivering price value to their customers. This keeps the exploration cost down and ensures thriving space tourism, mining, and construction industries.

3. Market Economics is Variable Cost Game. These company profits are derived from variable costs, and this therefore encourages them to increase the number of space travel mileage.

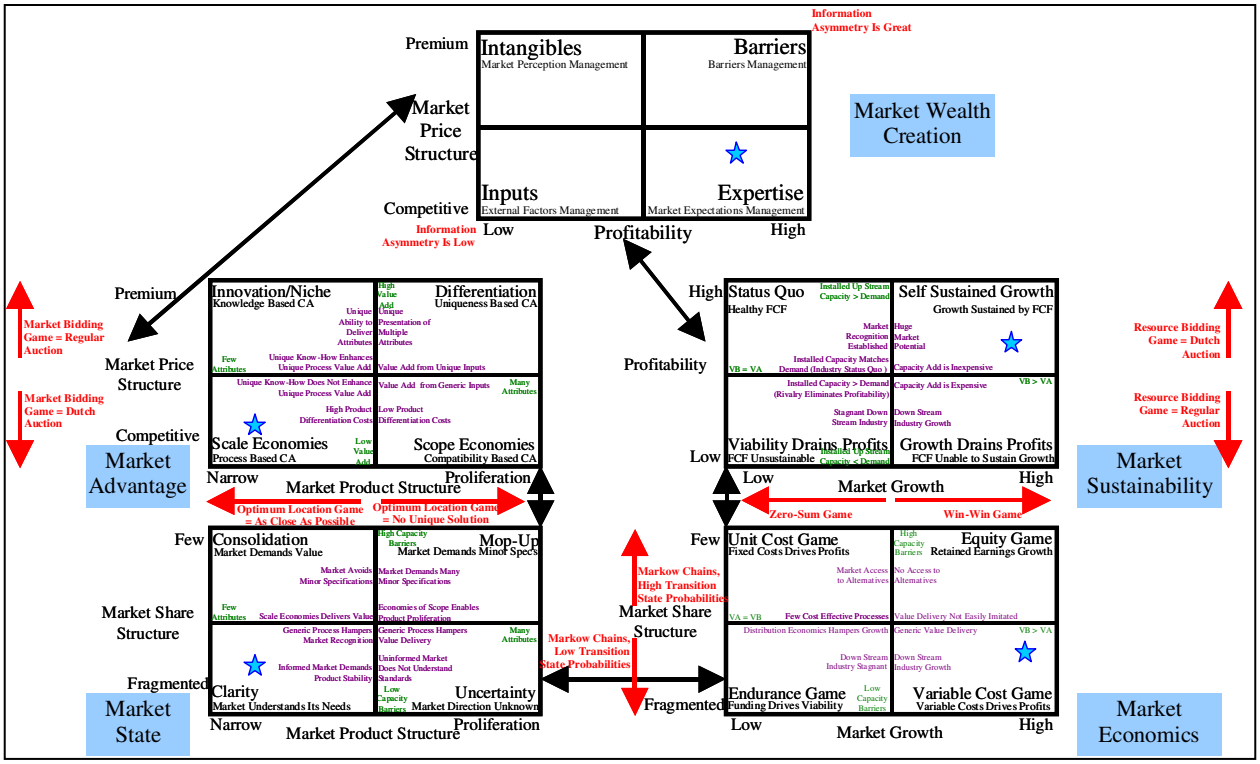

Fig. 1.7: Future Space Transportation Industry

4. Market Sustainability is Self-Sustained Growth. Done right, the upstream industry, RLV manufactures, will be able to provide quantity discounts, so that the capacity add to the space transportation industry is relatively inexpensive.

5. This sums up to a Wealth Creation by Expertise.

With respect to the future RLV industry, two key lessons can be learned, The US needs to:

1. Avoid the mistakes of the airlines industry.

2. Encourage as many RLV companies as possible. This is achieved by spreading out NASA contracts to as many interested domestic companies that meet specific criteria:

Encourage Many RLV Companies

   a. Correctly capitalized. Investors will be more willing to invest in RLV companies if funds and contracts are available for early stage commercialization as opposed to technology development.

   b. NASA is re-positioned as a creator and licenser of technologies rather than an implementer.

NASA a Technology Provider

   c. Having multiple RLV companies ensures competition, lean organizations, and significantly reduced launch costs, as specialized space related sub-industries evolve and deliver highly cost effective solutions.

   d. A launch industry cannot evolve without an economic base, i.e. specialized sub-industries. The two must grow hand-in-hand.

Space Industry Economic Base

Allow the space-based industries to filter and determine what are commercially viable technologies, according to the three basis rules,

1. Sufficiently long commercial life. The technology and financial forecasts need to show that the profit bearing life of the technology is significantly greater than the time required to recoup investments.

2. Cannot be at risk to alternative technologies. In a healthy commercial environment, many types of technologies compete for the customers' budgets. This is good. An alternative technology, however, does become a threat, when it is capable of eliminating an existing technology's profit stream.

3. Cannot be susceptible to "technology snowballing" debugging and development issues. This is the single biggest issue with developing high-technology systems; a problem is solved by adding more technology. This effect continues to repeat, until it is no longer feasible to fund the program.

Avoid Technology Snowballing

1.5 A Peak into the Future

Having observed the International Space Development Conference (ISDC) 2002 Novel Propulsion track, Fig. 1.8, shows a time frame of propulsion systems that are most likely to be commercially successful for manned space programs. This set of outcomes has been derived using the 3 rules for commercial viability and some estimates of possible technology solution delivery time frames.

Looking forward, I believe that the 3 most significant events that are going to affect the US RLV industry are:

External Factors will Drive the US Space Industry

1. Impetus for the launch industry will come from outside the US. For example, China landing a man on the moon. China's schedule of 2010 is assured if China can put a man in orbit by 2007. The US proved 30 years ago, that one does not require "high" technology launch systems to put a man on the moon.

2. Major re-think of gravity physics. I believe the commercial RLV industry will drive this change, as the need to put people in deep space becomes a reality.

3. Changes to NASA. Non-US space launch successes will cause a major re-think

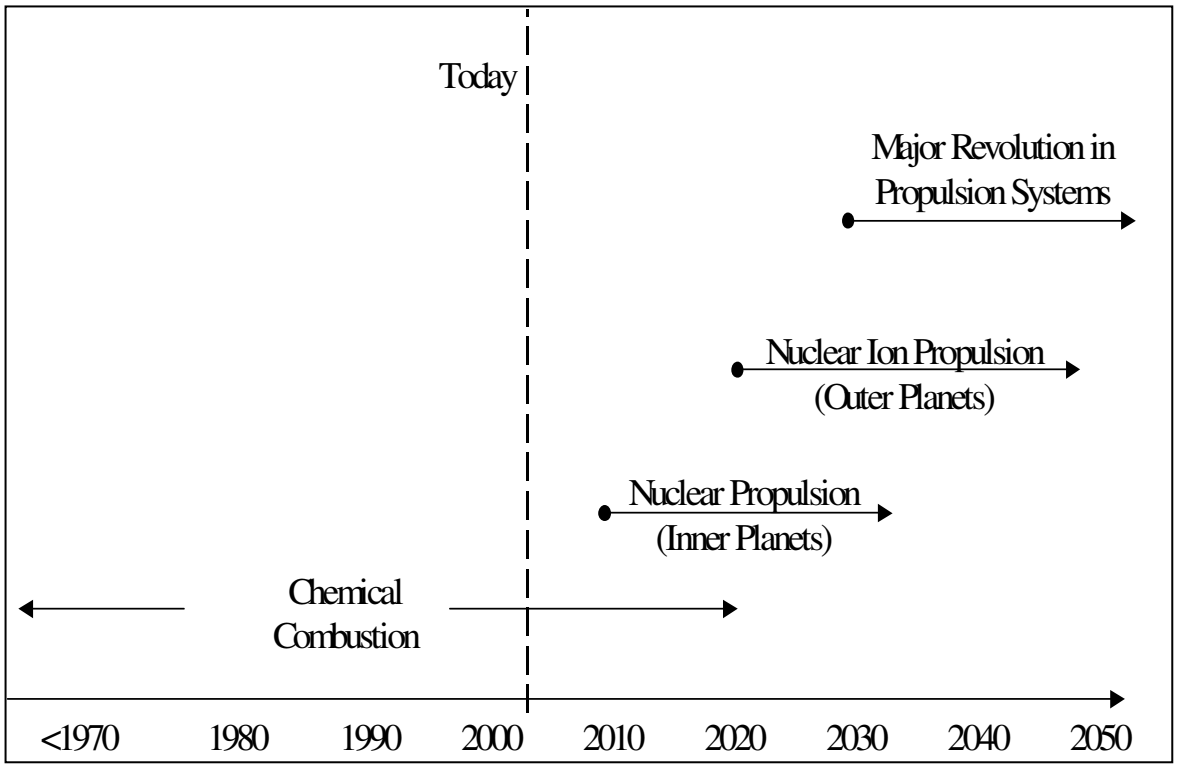

Fig. 1.8: A Peak into the Future

and changes to NASA, as NASA has lost it 30-year lead to even countries like China.

1.6 Conclusion

America is holding back America.

America is Holding Back America

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Part 2: Future Concepts

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2. The Trouble with Time [1]

2.1 Introduction

In the last chapter of Kip Thorne's book "Black Holes & Time Warps, Einstein 's Outrageous Legacy" [2], 'Wormholes and Time Machines', Thorne contemplates the possibility of time machines and suggest that such machines may be theoretically impossible. I would like to put forward an alternative approach suggesting, that just maybe, our models of wormholes are incorrect.

Time Travel is Impossible

2.2 The Basics of the Time Travel Paradox

To understand wormholes [2], one needs to know three things,

1. Matricide paradox. This is about going back in time to change history. A person goes back in time to kill his mother to prevent his birth. The particular characteristic of this problem is that, free will is in play.

2. The Polchinski's billiard ball paradox. This is a version of the matricide paradox without the element of free will.

   "Take a wormhole that has been made into a time machine and place its two mouths at rest near each other. Then, if a billiard ball is launched toward the right mouth from an appropriate initial location, and with an appropriate initial velocity, the ball will enter the right mouth, travel backward in time, and fly out of the left mouth before it entered the right (as seen by you and me outside the wormhole), and it will then hit its younger self, thereby preventing itself from ever entering the right mouth and hitting itself." (Kip S. Thorne)

3. Echeverria-Klinhammer trajectory is that trajectory of the billiard ball, different from Polchinski's paradoxical trajectory, such that when the 'old' billiard ball hits its young self, causes its young self to enter the right mouth of the wormhole and complete the Polchinski's billiard ball scenario in a non-paradoxical manner - that of the old billiard ball exiting the left mouth of the wormhole colliding with its young self and causing its young self to enter the right mouth of the wormhole and . . . etc.

2.3 The Thought Experiment

Using Polchinski's paradox, with the Echeverria-Klinhammer trajectory one is able to conduct a recursive experiment as follows,

1. Time now is 12:00 noon. Set-up the billiard ball and let lie for a given time period, say 10 hours, until 10.00 p.m.

2. Set the two wormhole mouths so that the returning 'old' ball, exits from the left mouth of the wormhole at time 'T'. For starting conditions, let T = 9:55 p.m.

3. Start billiard ball experiment using the Echeverria-Klinhammer trajectory.

4. 'Old' ball exits the left wormhole mouth.

5. As soon as 'old' ball is detected, the wormhole machine is to adjust itself so that T is decremented by time 't'. Say is t=5 minutes. That is, T = T – t = T - 5 minutes.

   (Prior to first collision, T= 9.55 p.m., prior to second collision, T= 9.50 p.m., prior to third collision, T=9.45p.m., prior to fourth collision, T=9.40p.m., etc.)

6. 'Old' ball collides with its 'young' self, causing its 'young' self to enter the right wormhole mouth.

7. Immediately, after collision, collect 'old' ball in a basket by allowing it to roll off the table into a basket (and avoid introducing free will).

Self-Replicating Nested Time Loops

This experiment is a self-replicating nested loop (typical stuff of programmers - I used to be one) which is bounded by 12:00 noon and 10:00 p.m. because the Echeverria-Klinhammer trajectory does not physically exists for collision to occur outside this time period.

I had originally thought that by the end of the experiment there would be 120 billiard balls, and that was the end of this story, but I had another idea.

2.4 The Unresolvable Paradoxes

Let's make the billiard balls very small, almost point size, and make them very dense. Reduce the scale, 'x', of the experiment to almost microscopic level so that the Echeverria-Klinhammer trajectory is preserved. Decrement 't' to almost zero. Then, we see that as 'x' and 't' approach zero, the number of billiard balls collected, approaches infinity. Nothing wrong with this just yet.

Problem is, that since the mass of the mouths of the wormholes are conserved, and assuming that both wormhole mouths have finite mass, at some point in the experiment the left mouth will attain negative mass. If negative mass is not allowed, does the experiment stop?

Breakdown of the Law of Conservation of Mass

Morris, Yurtsever and Thorne introduced the conjecture that there be 'no unresolvable paradoxes' (Thorne). For an idea to have some degree of success in the practical world there cannot be inconsistencies in the logical outcomes of the proposed idea. In the case of the time machine, we see that the logical outcome of the time machine concept is the breakdown in the law of conservation of mass, the first unresolvable paradox, unless negative mass is allowed. If negative mass is allowed then the mass of the collected billiard balls reaches infinity.

If conservation of mass applies to both wormhole mouths together, and their masses are transferable, then the left wormhole mouth will never reach negative mass. But this, however, raises another question. How many balls are there in the basket? And at what time?

You will note that the number of balls in the basket, soon after the experiment is started, 12:00+ p.m. will reach infinity, if the experiment is 'started' at 10:00 p.m. It will be zero if the experiment is not started. That is, cause and effect, though they are bound together, they are reversed in time. Cause occurs after the effect is observed. This is the second unresolvable paradox. At this time, I am not willing to accept the hypothesis that cause can occur after the effect.

The third unresolvable paradox is "What can I do?" That is, if the basket fills up with billiard balls before I set off the experiment, can I choose not to set off the experiment? More programmers' stuff - a nested loop within a nested loop.

Nested Loops within Nested Loops

2.5 Exploring Options

Time travel can only be possible if we can prove, without unresolvable paradoxes, an effect prior to cause, for any case within the boundaries defined by the wormhole mechanics. The example above shows that this is not possible, with our current understanding of spacetime.

"Our current understanding" is the crux of the issue here. Lets explore options in an unbounded manner.

1. One possible explanation is that the wormholes mechanics is not correct. It might be mathematically correct but not the correct model of the universe.

2. If we start with the axiom that there is no past or future, only the present, then wormholes always return us to the present. We observe the past only because the fastest signals, light, takes time to travel across vast distances, but what is happening 'now', in that vast distance, is different from what we are observing 'now'.

3. In order for any theory of time travel to be viable, we must first resolve any paradoxes or at least expose them of not being paradoxes. Only then can we develop any plausible theory of time travel.

A Plausible Theory cannot Entertain Paradoxes

2.6 An Alternative Approach to Time

The generally accepted premise is that the universe is expanding. This expansion is such that all galaxies are moving away from each other. In other words, the universe is expanding with respect to a dimension, which we cannot observe; and the universe, for all practical purposes, exists on the surface of this expanding structure [3]. (See Fig. 2.1)

Fig.2.1 shows the universe at three different times, yesterday, today, and tomorrow. To add to the degree of difficulty of the problem, it also illustrates the universe rotating about its axis. With the universe being on the surface of this structure, one can infer several logical constructs,

1. The surface of this structure has moved out and is at three different "positions" at three different "times" (yesterday, today and tomorrow).

2. Assuming a rotating universe, our location along the radial axis, on the surface has changed.

3. What was "yesterday" no longer exists.

4. What will be "tomorrow" does not yet exist.

5. Only what is "now" exists, and even that is non-stationary.

6. It is important to ask, what is inside, and what is outside, as this may lead to new translocation technologies. I use the term "translocation" rather then "propulsion" because I don't believe these engines of the future will use propellants to relocate our positions in spacetime.

An Expanding Universe does not Allow for Time Travel

This simple model illustrates that it is not possible to time travel, either backwards or forwards, because the universe – the surface of the structure – does not exists in the "past" or the "future".

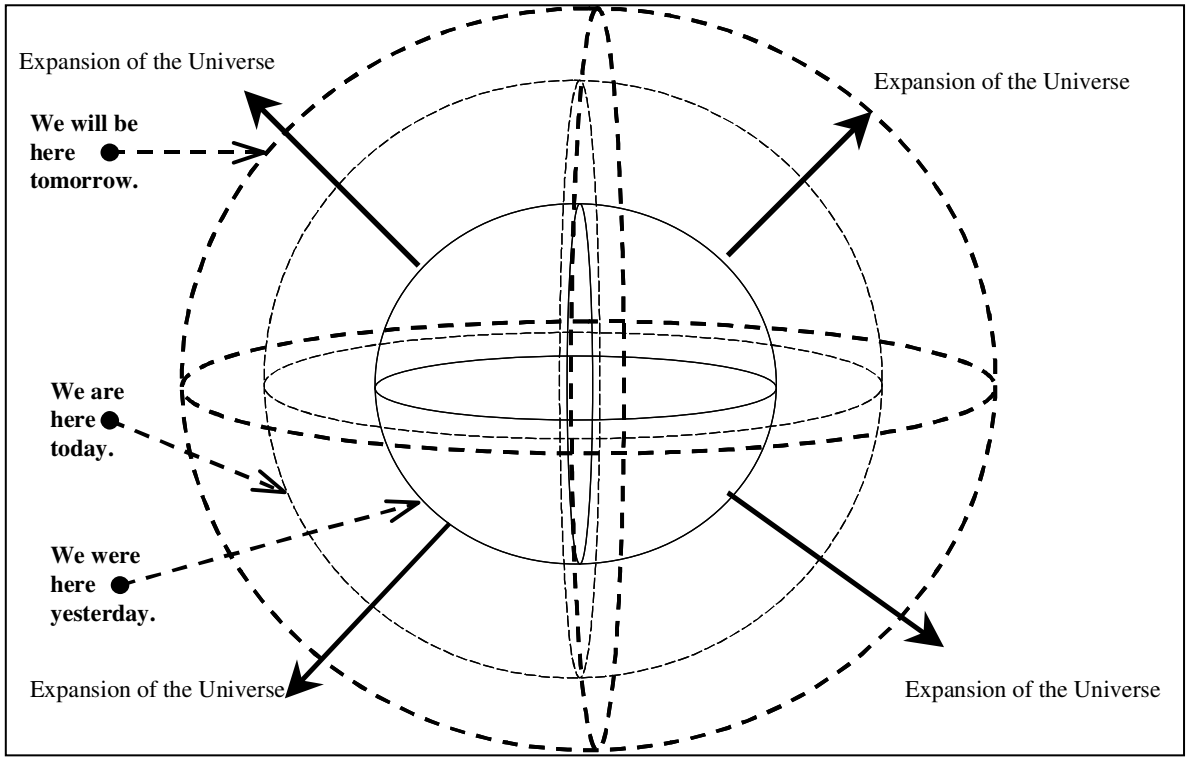

Fig. 2.1: The Expansion of the Universe

We can, however, propose that "time" as we know it, exists as a result of the expansion of the universe. It is possibly a scalar quantity with respect to the expansion of this surface structure, whose effect is equal throughout the universe, given all other factors being equal.

2.7 An Alternative Explanation to Dark Energy

No One Understands Dark Energy

"Dark energy, a mysterious force that no one understands, is causing the universe to fly apart faster and faster . . . Already, they have had to accept the notion of dark matter, which is now thought to far outnumber ordinary matter in the universe, but which has never been detected in any laboratory. Now, the arrival of an unknown force that rules cosmic expansion has added insult to injury" [4].

"Strong but indirect observations had shown that the universe is composed of about 4 percent normal matter -- protons, electrons and neutrons that are collectively called baryons, a figure confirmed this week in a detailed study of the universe's first radiation. This normal, so-called baryonic matter makes stars, planets, flowers, you, and everything else that is visible.

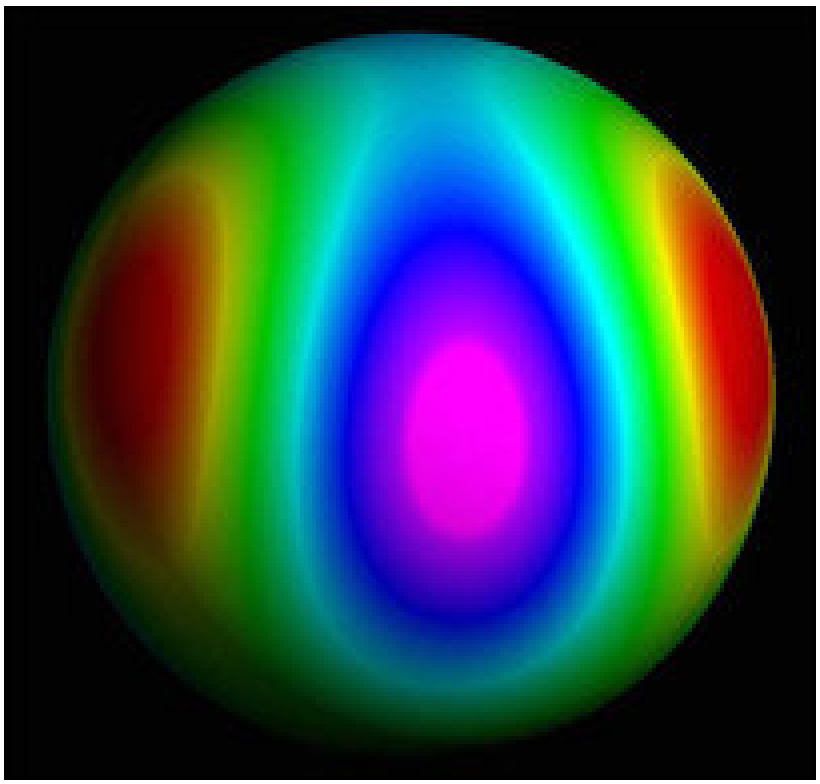

Fig. 2.2: Symmetrical Patterns of the CMB (BBC News Online)

Co-existing with normal matter is an unseen sort called dark matter. Astronomers don't know what it is, but they know it makes up about 23 percent of the universe. It is thought to have played a crucial role in the development of the first galaxies.

The rest of the cosmic mass-energy budget, some 73 percent, involves an even more exotic thing called dark energy, which appears to work across large distances and in the opposite manner to gravity. This anti-gravity force, as it is sometimes referred to, seems responsible for the accelerating pace of the universe's ongoing expansion." [5]

A Rotating Universe Circumvents the Need for Dark Energy

The Expanding Universe as Surface Model provides an alternative explanation to "dark energy" reported in Space.com above. An expanding and rotating Universe, see Fig 2.1, would experience a centripetal force, which would fling all the galaxies apart at an ever-increasing rate. This explanation would circumvent the need to invent a "dark" energy.

To prove that this "anti-gravity" like force is due to the rotation of the universe, one would need to observe differing amounts of this "anti-gravity" effect in different parts of the universe, in a non-random manner.

CMB Suggest a Cosmic Equator

The CMB radiation, Fig. 2.2, is pointing in this direction [6]. To quote, Dr. Tegmark, who cleaned up the CMB maps, "The octopole and quadrupole components are arranged in a straight line across the sky, along a kind of cosmic equator." This is strong evidence that the Universe is rotating, and further reduces the possibility of being able to time travel.

2.8 Conclusion

The Expanding Universe as Surface Model provides a mechanism that does not allow for time travel, and prevents the unresolvable paradoxes associated with time travel. Further, a rotating universe provides a reasonable explanation for dark energy.

Most importantly, it suggests that even though modern theories about spacetime can explain a lot about the Universe, they are probably incorrect, therefore, a case for new theories on spacetime that do not allow for time travel.

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3. Time Dilation Gravity Model [1]

3.1 Introduction

The laws of physics are invariant with respect to frame of reference because the cumulative probability density of a particle cloud is unity for any frame of reference. Time dilation causes gravity and not the other way around. With a stationary particle, I demonstrate how the particle's probability cloud distorts under time dilation. This distortion of the probability cloud causes the centre of mass to shift in the direction of time contraction. This effect in the presence of a continuous, non-linear time dilation well is called gravity. I have shown that the error between gravitational escape velocity and equivalent Lorentz/time dilation velocity is less than ± two parts per million. I have not addressed the relativistic nature of this model in this paper. I hope to spark new theoretical approaches to gravity that is not centred about gravitons, Higgs particle or superstrings to explain my experimental results.

Shifting of Centre of Mass

3.2 The Uncertainty Principle

Quantum mechanics (Bethe [2]) states that for a free particle, (e.g. free electron) "a wave function (wave packet) may be constructed that puts the main probability near a position, x_o, and near momentum p_o". The uncertainty principle, dictates that position and momentum cannot be simultaneously determined accurately, their uncertainties are related by

$$\Delta x \Delta p \geq \tfrac{1}{2}\hbar \qquad (3.1)$$

Since the mass of a free electron is known, the uncertainty principle dictates uncertainty of both position and velocity simultaneously. Let's take this velocity/position concept a little further.

3.3 The Axioms

Axiom 1: Principle of the Particle Probability Cloud. This axiom states that, a particle can be represented by a probability cloud. The probability of detecting a particle at any point in its probability cloud is some value between zero and one. That is, there is a possibility of passing right through a particle without detecting it. However, the cumulative probability of detecting the particle at any point and within any duration, in its probability cloud must be one.

Observed Cumulative Probability is One

Axiom 2: Principle of Probability Density Invariance. This principle states that every mass particle, at rest, is a probability cloud with a probability density, ρ, that is invariant in velocity-space (s_x/t_x, s_y/t_y, s_z/t_z) corresponding to x, y, and z axes in spacetime and allowing for different amounts of time dilation, t_x, t_y, and t_z, along each axis, x, y, and z respectively.

Probability Density is Invariant in Velocity-Space

Axiom 3: Probability Volume. The volume occupied by a particle in velocity-space, is the

volume of its probability function or probability cloud. Therefore, any frame of reference has to observe the cumulative probability of one of detecting the particle in its probability cloud.

Volume Probability Equivalence

Axiom 4: Principle of Mass Density Invariance. This principle states that the mass of a particle is equivalent to its volume occupied by the particle's cumulative probability in velocity-space.

Mass Volume Equivalence

3.4 The Principle of Probability Density Invariance

The probability of detecting the particle in the region of space s_x, along the x-axis, within a time duration d_x, is given by, $P(s_x/d_x)$. Similarly, $P(s_y/d_y)$ and $P(s_z/d_z)$ are the probabilities associated with the y and z-axes respectively.

The cumulative probability of finding this particle is one,

$$\text{Cum } P(s_x/d_x, s_y/d_y, s_z/d_z) = 1 \qquad (3.2)$$

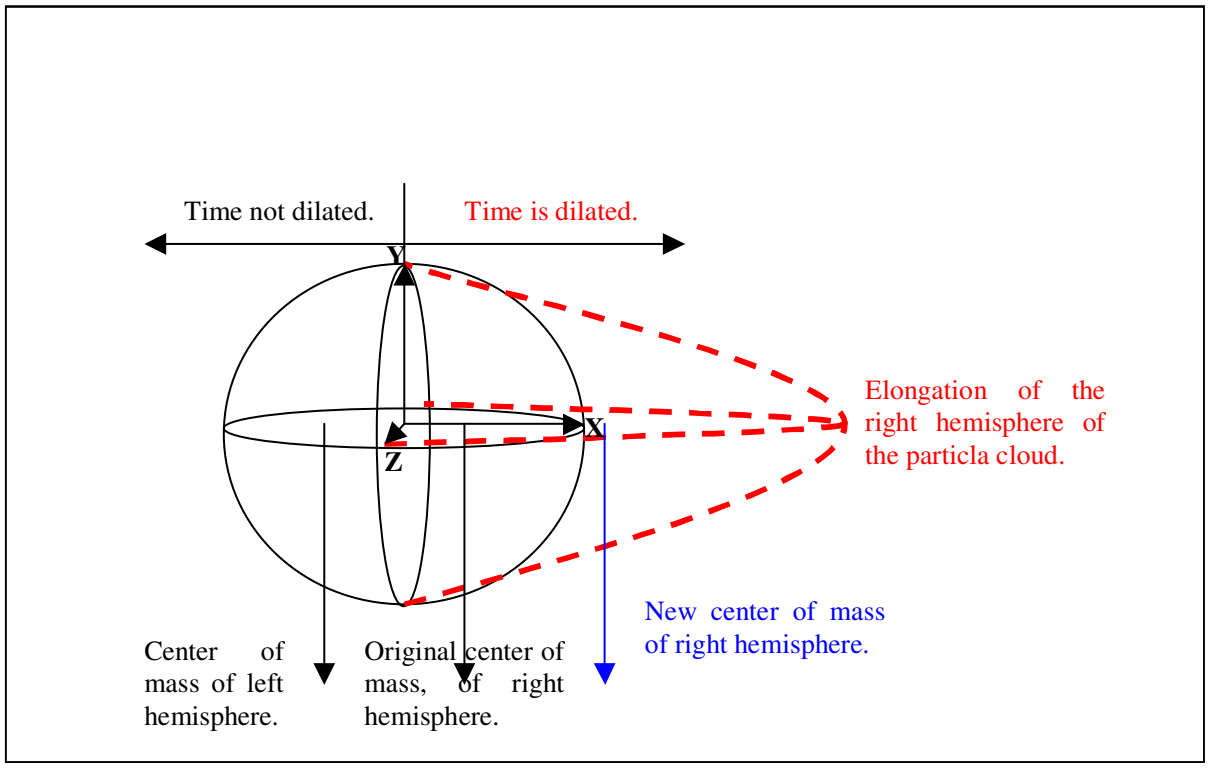

Fig. 3.1: Volume Distortion Under Time Dilation/Contraction

Since the probability distribution is identical along any axis, the cumulative probability is formed by the rotation about y and z-axes, which must be one. Therefore, the volume formed by the probability function is,

$$(4/3)\,\pi\,P(s_x/d_x)^3 = 1 \qquad (3.3)$$

Or,

$$P(s_x/d_x),\ \rho = [1/(4/3)\,\pi]^{-3} = 0.024189, \qquad (3.4)$$

a constant

That is, the probability density in velocity-space is independent of the nature of the particle's probability function and is invariant, when the particle is at rest.

Probability Density is Independent of Probability Function

3.5 The Time Dilation Effect

Since "the laws of nature are the same in all frames moving with constant velocity with respect to one another" (Shapiro [1]), one can substitute an external observer with a stationary observer who is internal to the particle's probability cloud. In effect we have shifted from observing the particle as a probability cloud to observing the probability cloud itself.

Let's say that time is normal on the left half of the particle probability cloud and dilated on its right half. Fig. 3.1 depicts the distortion introduced by time contraction, for a stationary particle, along the x-axis, on the right half of the particle probability cloud. Contracted time allows the right half of the particle probability cloud to spread further out in space than the left half.

That is, even though the probability of detecting the particle on the left half is $P(s_{xo}/d_{xo},\ s_{yo}/d_{yo},\ s_{zo}/d_{zo})\ /\ 2$, the probability of detecting the particle on the right half is now $P(s_{xd}/d_{xd},\ s_{yd}/d_{yd},\ s_{zd}/d_{zd})\ /\ 2$, where the subscript 'o' represents undilated time and 'd' represents contracted time.

Since, time contraction occurs only along the x-axis, for any coordinate in the y-z plane in the left half, there is an equivalent coordinate in the right half, such that, $s_{yd} = s_{yo}$, $s_{zd} = s_{zo}$, $d_{yd} = d_{yo}$, $d_{zd} = d_{zo}$ along the y- and z-axes. Therefore, the probability function for the right side reduces to, $P(s_{xd}/d_{xd},\ s_{yo}/d_{yo},\ s_{zo}/d_{zo})\ /\ 2$.

The cumulative probability of observing the stationary particle must be one. Therefore,

$$0.5\ \text{Cum}\ P(s_{xo}/d_{xo},\ s_{yo}/d_{yo},\ s_{zo}/d_{zo}) +$$

$$0.5\ \text{Cum}\ P(s_{xd}/d_{xd},\ s_{yo}/d_{yo},\ s_{zo}/d_{zo}) = 1 \qquad (3.5)$$

That is, the probability cloud is symmetrical about the x-axis, and given that the left half is a hemisphere, the right half will be an ellipsoid such that,

$$(0.5)\,(4/3)\,\pi\,P(s_{xo}/d_{xo})^3 + (0.5)\,(4/3)\,\pi\,P(s_{xo}/d_{xo})^2\,P(s_{xd}/d_{xd}) = 1.0 \qquad (3.6)$$

substituting for (3.3)

$$P(s_{xd}/d_{xd}) \,/\, P(s_{xo}/d_{xo}) = 1.0 \qquad (3.7)$$

or

$$P(s_{xo}/d_{xo}) = P(s_{xd}/d_{xd}) = [1/(4/3)\,\pi]^{-3} \qquad (3.8)$$

Probability of Detection is Independent of Time Dilation

The probability of detecting a particle within its particle cloud, within a duration, d_{xd} or d_{xo}, is independent of the time contraction distortions, and thus gravitational distortions, it experiences. Therefore,

$$s_{xo}/d_{xo} = s_{xd}/d_{xd} \quad \text{or} \quad s_{xd} = s_{xo}\,(d_{xd}/d_{xo}) \qquad (3.9)$$

Let us call equation (3.9) the Probability Invariance Transformation (PIT) equation for a stationary particle in velocity-space. This PIT equation can also be interpreted as equivalent to the stretching by tidal gravity [Thorne (1)], as time contraction causes the stretching of a particle.

Thus, $s_{xd} > s_{xo}$ when $d_{xd} > d_{xo}$ (3.10)

The probability cloud has extended itself to compensate for the time contraction with respect to its own frame of reference, given an invariant probability density in velocity-space.

The centre of mass of the left hemisphere and right ellipsoid are (3/8) s_{xo} , (3/8) s_{xd} respectively. If, at the very least, both sides have the same mass, the centre of mass of the particle has shifted (3/8)(s_{xd} - s_{xo}) to the right. The new centre of mass, S_{CM}, is,

$$S_{CM} = (3/8)\,s_{xo}\,(d_{xd}/d_{xo} - 1) \qquad (3.11)$$

New Center of Mass

Therefore, the centre of mass of the particle probability cloud has shifted further to the right, in keeping with the direction of time contraction; this shifting is linearly dependent on time dilation/contraction. Note, however, that by the Principle of Mass Density Invariance, the mass of the right side should be greater than the mass of the left side, therefore, equation (3.11) depicts a "best" case or lower bound or minimum shifting of the centre of mass. The gravitational effect can be summarized as follows,

1. Time dilation/contraction distorts the shape of a particle's probability cloud in the direction of increasing time contraction.

2. This distortion of the particle's probability cloud results in the shifting of the centre of mass of the particle in the direction of increasing time contraction.

3. The net effect is that the centre of mass of the particle moves in the direction of increasing time contraction.

4. This effect in spacetime is called a gravitational field.

In a gravitational field, time dilation on the right hand side is replaced with $d_{xo} .t_R$, and on the left hand side with, $d_{xo} .t_L$, where d_{xo} is the duration of the probability cloud in the centre of the particle. t_L and t_R represent the time dilation from a point at an infinite distance from the source of gravity. ($t_L \neq t_R$ for non-linear time dilation) such that,

$$(0.5)\ (4/3)\ \pi\ P(s_{xo}/d_{xo})^2\ P(s_{xL}/(d_{xo}\ .t_L))\ +$$

$$(0.5)\ (4/3)\ \pi\ P(s_{xo}/d_{xo})^2\ P(s_{xR}/(d_{xo}\ .t_R)) = 1.0 \qquad (3.12)$$

substituting (3.3),

$$P(s_{xL}/(d_{xo}\ .t_L)) + P(s_{xR}/(d_{xo}\ .t_R)) = 2\ P(s_{xo}/d_{xo}) \qquad (3.13)$$

That is, the probability gained on one side must be compensated for by the same amount, as a probability loss on the other side of the stationary particle. The new right shifted, centre of mass of the stationary particle in a gravitational field is,

$$S_{CM} = (3/8)\ (s_{xR} - s_{xL}) \qquad (3.14)$$

Using (3.9),

$$S_{CM} = (3/8)\ s_{xo}\ (t_R - t_L) \qquad (3.15)$$

For the short distance of the particle size, the change in time dilation, $t_L - t_R = \Delta t$, and distance moved by the particle, $\Delta s = S_{CM}$, such that,

$$\Delta s = (3/8)\ s_{xo}\ .\ \Delta t \qquad (3.16)$$

Displacement is a Function of Change in Time Dilation

that is, distanced moved by the particle is a function of the change in time dilation at that point. Note that the change in time dilation, Δt, is not the same as the duration taken to move. To put it another way, when time dilation is constant with respect to a particle's frame of reference, the particle is stationary with respect to its own fame of reference. When time dilation is non-linear, the particle is displaced and therefore experiences motion with respect to its own frame of reference.

3.6 Observations

The four axioms stated in section 3.3 of this paper, can be summarized into the First Principle of Equivalence, that velocity and time dilation are equivalent, and governed by Lorentz transformation (McCrea[1]), equation (3.17). What about a gravitational field? Does the Lorentz time-dilation-velocity transformation still hold?

$$t_v = t_o / \sqrt{(1 - v^2 / c^2)} \qquad (3.17)$$

Re-arranging (3.17),

$$v = c \sqrt{(1 - t_o^2 / t_v^2)} \qquad (3.18)$$

Time Dilation is the Only Source of Motion

For a gravitational field, t_o is undilated time at an infinite distance from the source of the gravitational field. t_v is time dilation (contraction) at some point in the gravitational field where a very small body is free falling, from infinity, into this gravitational field. This interpretation of (3.18) allows only time dilation as the source of motion. Assuming that at infinity, $t_o = 1$, (3.18) reduces to,

$$v_f = c \sqrt{(1 - 1/t_v^2)} \qquad (3.19)$$

where v_f is the free fall or equivalent Lorentz/time dilation velocity when time dilation is t_v, assuming that this relationship holds. Lets put some numbers to this equation. Table 1 presents mass, radius, acceleration, time dilation, gravitational escape velocity, v_e, and the equivalent Lorentz/time dilation velocity, v_f, of a small body free falling to the surface of any of the planets in our solar system.

Object	Mass	Radius	Gravity at surface	Gravitational Escape Velocity	Time dilation	Equivalent Lorentz/Time Dilation Velocity	Escape - Equivalent Velocity Error
	M kg	R m	g m/s²	v_e m/s	t_v s	v_f m/s	$v_e - v_f$ m/s
Sun	2.00E+30	6.90E+08	274.98	621,946	1.00000215195969	621,946	0.0000000%
Mercury	3.59E+23	2.44E+06	3.70	4,431	1.00000000010922	4,431	0.0000153%
Venus	4.90E+24	6.07E+06	8.87	10,383	1.00000000059976	10,383	0.0000018%
Earth	5.98E+24	6.38E+06	9.80	11,187	1.00000000069626	11,187	-0.0000080%
Mars	6.58E+23	3.39E+06	3.71	5,087	1.00000000014395	5,087	0.0000245%
Jupiter	1.90E+27	7.14E+07	23.12	59,618	1.00000001977343	59,618	0.0000002%
Saturn	5.68E+26	5.99E+07	8.96	35,566	1.00000000703708	35,566	-0.0000002%
Uranus	8.67E+25	2.57E+07	7.77	21,201	1.00000000250060	21,201	-0.0000005%
Neptune	1.03E+26	2.47E+07	11.00	23,552	1.00000000308580	23,552	-0.0000019%
Pluto	1.20E+22	1.15E+06	0.72	1,178	1.00000000000772	1,178	0.0001586%

Table 3.1: Gravitational Escape Velocity versus Lorentz/Time Dilation Velocity

Table 3.1 shows that the error between gravitational escape velocity, v_e, and equivalent Lorentz/time dilation velocity, v_f, is less than ±2 parts per million. That is, the velocity of a body falling into a gravitational field is governed by the time dilation it experiences at any given point in the gravitational field. Lorentz time-dilation-velocity transformation still holds.

Gravitational Escape Velocity is Lorentz Velocity

This is strong evidence that time dilation is the source of gravity and not the other way around. Therefore, the Second Principle of Equivalence is that acceleration and non-linear time dilation, gravity, are equivalent. That is, the acceleration experienced by a falling body is governed solely by the change in time dilation in the gravitational field.

3.7 Experiments

I am exploring an alternative process on how energy is converted to force. I believe that this is a two-step process. First, electric and magnetic fields create time dilation. Second, time dilation causes acceleration or gravity. These experiments, to create force directly from energy, appear to be consistent with the principles of electromagnetic field theory as put forward by $\mathbf{F}=q_t[\mathbf{E}+(\mathbf{vxB})]$ (Shadowitz [1]).

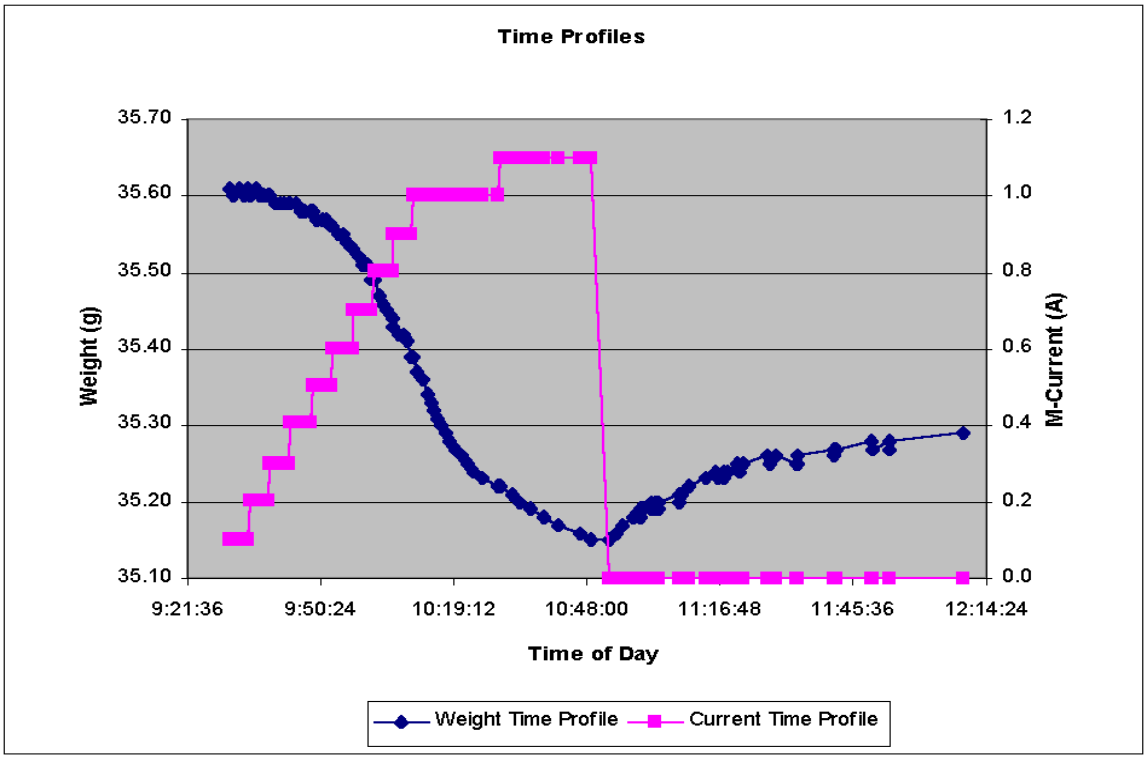

Fig. 3.2: Weight Change Experimental Results (March 2000)

To date, I can demonstrate weight loss of up to 0.9g or +/-3% when both electric and magnetic fields are present. (I have been able to observe 98% weight loss for 3 seconds, but this result is not yet repeatable.) Weight change reverses when the polarity of either the electric or magnetic field is reversed. Weight continues to change even after these experimental electrical circuits are powered off (see Figure 3.2). This experiment was conducted in March 2000. These circuits take more than three hours, after power off, to return to original weight. My research leads me to believe that I am observing the folding of spacetime to change weight. Therefore, this paper hopes to spark new theoretical approaches to gravity that is not centred about gravitons, Higgs particle [James Trefil (1)], or superstrings.

98% (41.5g) Weight Loss has been Observed

3.8 Important Inferences

This paper suggests several important inferences that need to be proved by experimental evidence. They are,

1. Mass, as we understand it, may not be the source of gravity. Given the time dilation approach to gravity, one infers that electromagnetic fields, and not mass is the source of gravity. Therefore, it is the interaction between charged particles in the atomic structure, nuclear structure and mass particles that cause gravity. At present scientific method has not sought to distinguish between mass and particle/ atomic structure for the origin of gravitational fields.

Mass not Source of Gravity

2. New materials. If it is atomic structure, alone, that causes gravity, it may be possible to develop new materials that have gravity shielding or manipulating effects.

3. Space propulsion. This paper also suggests that there is a much closer relationship between electromagnetism and spacetime, than previously thought. Therefore, as suggested by my experimental findings, one should eventually be able to develop radically new propulsion technologies that are propellantless.

4. Wormholes. If truly, electromagnetic fields can be utilized to fold spacetime, then a technology to develop artificial wormholes can be developed.

3.9 Breaking the Relativistic Bind of Lorentz Transformation

Finally, the logical extrapolation of this hypothesis is that, particles that do not exhibit a probability density volume, lets call them zero-point particles, will be impervious to gravitational effects. This is because they do not have a probability density shape/size that can be altered by the non-linearity of time dilation; and are therefore impervious to relativistic effects. Substituting $s_{xo} = 0$, particle size is zero, in equation (3.15) we get,

Zero-Point Particles

$$S_{CM} = (3/8) \cdot 0 \cdot (t_R - t_L) = 0 \quad (3.22)$$

even if $(t_R - t_L) > 0$. That is, this hypothesis does not breakdown at very short distances approaching zero.

Lorentz Transformation Breakout

Yes, this hypothesis suggests an approach that can be used to break out of the relativistic bind of Lorentz transformations.

This raises several questions. Do zero-point particles exist? If they do, how does one detect them? Can they travel faster than light? Do these particles exhibit 'velocity"? Is it possible to use to photons to cancel each other in such a manner as to create a zero-point photon? Is it possible to do create zero-point particles with mass?

3.10 Conclusion

This paper suggests a paradigm shift on gravity, by presenting a model for the gravitational effect that

Implicit Axioms

1. Does not implicitly have an "UP" or a "DOWN" in the model construction.
2. Explains how "action" at a distance is really a field effect.
3. The field effect is only present when the field is non-linear.

Cambridge Cosmology team, ask the question of the current favourite theory, "Why is the cosmological constant 120 orders of magnitude smaller than naively expected from quantum gravity?" [9]. The Time Dilation Gravity model presented in this chapter provides an approach to developing a theory on gravity, starting with the behaviour of a particle, that will enable the development of radically new technologies for space propulsion systems using non-linear time dilation effects, generated by electromagnetic fields, as a means of propulsion.

Most importantly, it suggests that there are three parts to our understanding of gravity,

1. The "Gravitational Effect" which is real.
2. The "Gravitational Field", as we understand it, is not real. The Gravitational Field is a "Virtual Field" that is the effect of a real non-linear time dilation field.

Gravity is a Virtual Field

3. The Virtual Gravitational Field provides an approach to circumventing the relativistic bind of Lorentz transformations.

We may then conclude, that any theory on gravity that does not recognize the gravitational field as a virtual field, is too narrow in scope to be able to deliver future space propulsion technologies.

Narrow Scope

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4. Momentum Exchange Bypass

4.1 Introduction

Probability Density Compensation Causes the Gravitational Effect

The laws of physics are invariant with respect to frame of reference. However, when you distort, one of the parameters of a particle's own frame of reference, time dilation, see Fig. 4.1, the particle's probability density function compensates for this distortion, creating the effect of force.

The previous chapter, The Time Dilation Gravity Model, presented several important insights with regard to the force field effect called gravity,

1. Action at a distance is really a force field effect, called gravity.
2. This force field effect is only present when a force field parameter, time dilation, is non-linear.
3. No implicit "UP" or a "DOWN" in the force field model construction.

In this chapter we will show how momentum exchange can be bypassed using the insights above.

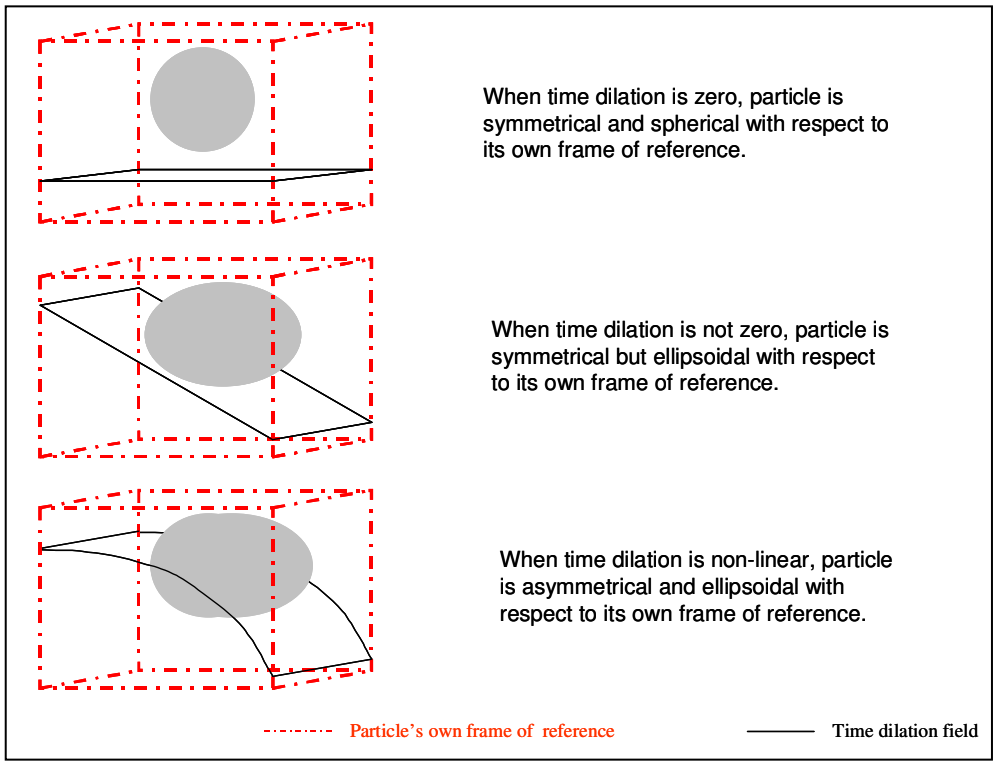

Fig. 4.1: Particle Shape Distortion in the Presence of Time Dilation

4.2 The Mechanics of Momentum Exchange and Conservation

Figure 4.1 shows how a particle's probability distribution behaves under time dilation. Using logical constructs (mathematical constructs are left to the advanced reader to develop), I illustrate momentum exchange mechanics, as I believe it, in the event of two particles colliding.

Momentum Exchange is Due to Probability Cloud Compression

Figure 4.2 illustrates how the particle's probability distribution behaves on collision. Collision compresses the probability distribution, from a symmetrical ellipsoid to, lets say, a sphere. At this point in the collision, a spherical shape implies that there is no time dilation with respect to the particles' own frames of reference.

During collision, see Figure 4.3, as the particle cloud compresses, the time dilation with respect to its own frame of reference, compresses, causing time contraction, so that the compressed particle cloud still exhibits a probability of one.

Momentum is exchanged and conserved as a result of the interplay between the particle's probability cloud and time dilation, as follows,

1. The particle probability cloud always has to be one.

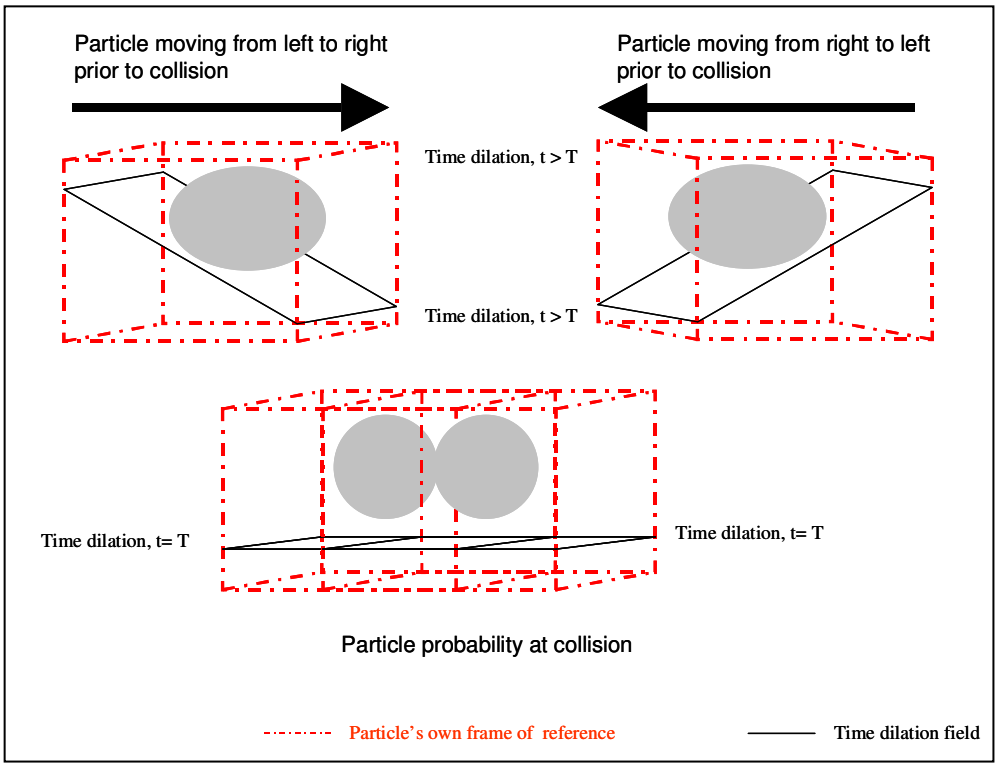

Fig. 4.2: Particle Probability Behavior at Collision

2. The compression of the probability cloud during impact translates directly into non-linear time compression, with respect to its own frame of reference, in order to maintain a particle probability of one.

Compression Translates into non-Linear Time Compression

3. Since the non-linearity of time dilation has not been introduced by factors external to the particle's frame of reference, this non-linearity of time compression transforms back, into a shaped probability distribution and disappears.

4. The new probability distribution of the particle cloud reflects the new shape of the particles, and direction of motion of the particles.

5. In this example, a second particle introduced the shape compression. The probability density function then absorbed the shape compression and transformed this into non-linear time dilation in order to maintain a probability density of one.

6. It is the interplay between particle probability cloud compression and non-linearity of time dilation, with respect to its own frame of reference that causes, the particle to "bounce", or have an elastic effect, during collision.

The Interplay Causes the Bounce

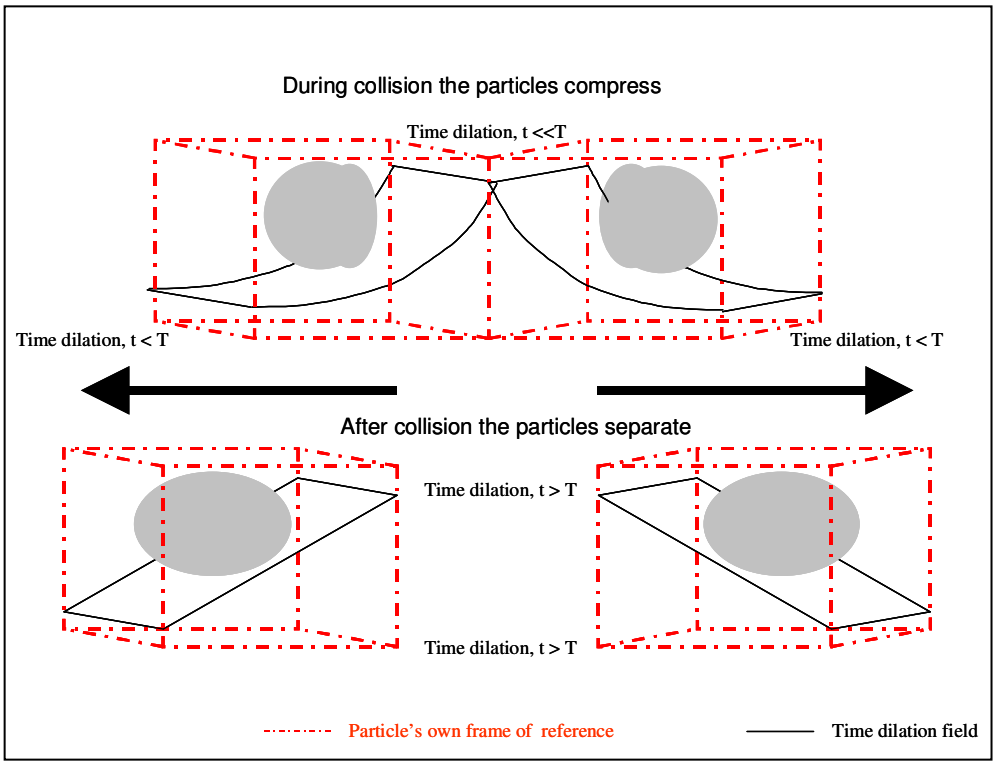

Fig. 4.3: Particle Probability Behavior During and After Collision

4.3 The Concept of Momentum Exchange Bypass

Given that I have been able to demonstrate momentum exchange using non-linearity of time dilation with respect to a particle's own frame of reference, I will now demonstrate how Momentum Exchange Bypass occurs.

Virtual Collision Highlights Key Mechanics

Fig. 4.4 illustrates how a particle behaves when it "collides" with a "virtual" particle. The mechanics is identical to that of a collision with a real particle. However, a collision with a "virtual" particle highlights the key mechanics involved. It shows that if the time dilation can be manipulated with reference to a particle's own frame of reference, one can create the illusion of a collision. In this example, shape/size deformation is introduced by changing the non-linearity of time dilation experienced by the particle.

More importantly, Fig. 4.4 illustrates a "collision" without the momentum exchange of a real external particle. One may say that momentum is conserved with respect to the external environment or enclosure, but my experiments (see chapter 8) suggest that this is not the case.

At this point, all I can say is, the direction of the time dilation, holds the key to the momentum vector. In compressing and bouncing back, the probability cloud is able to use

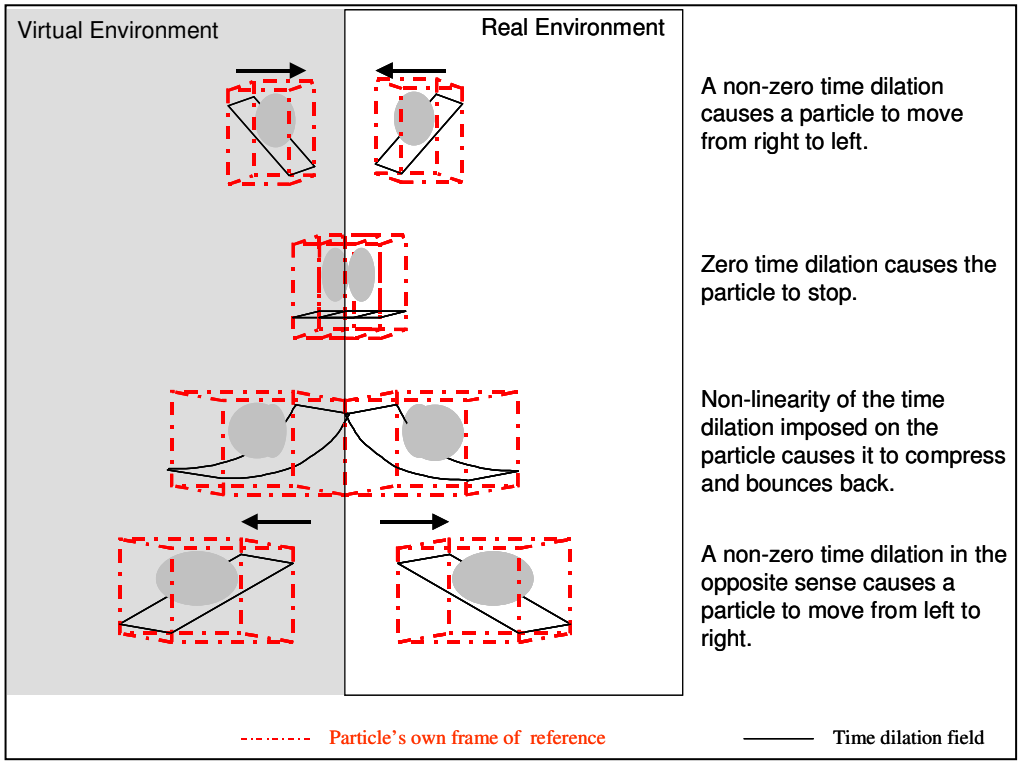

Fig. 4.4: Particle Probability Behavior During a "Virtual" Collision

the direction of time dilation to change the momentum vector. This behaviour of the probability density shape/size in the absence of a real particle is termed Momentum Exchange Bypass.

4.4 Speculation – Black Hole Evaporation & Vacuum Fluctuations

Zero-Point Particles are Impervious to Lorentz Transformation

An important logical extrapolation is an alternative explanation for black hole evaporation. Just as the stars fuse atomic nuclei, can and do black holes fuse particles into zero-point particles? These zero-point particles are impervious to Lorentz Transformations and smooth, non-linear time dilation, and are thus able to escape the black holes' gravitational pull. The super strong magnetic and electric fields around these black holes then create time dilation storms, with nano-time dilation disturbances. These nano-level disturbances are small enough to rupture the zero-point particles into their original set of particles. We see these ruptured zero-point particles as evaporation streams [1] erupting from black holes.

Are vacuum fluctuations, zero-point particles? The logical construct above, suggests that zero-point particles can behave in a manner very similar to that of the mathematically rigorous, vacuum fluctuations.

Another question is: do electric fields behave in a manner similar to the time dilation gravity model? In this case one substitutes a normal probability cloud for an electrically charged probability function.

4.5 Conclusion

The Momentum Exchange Bypass presented in this chapter is based on the Time Dilation Gravity model, and is therefore, consistent with this model.

Momentum Exchange is a Process

If the Time Dilation Gravity hypothesis is correct, then there is a lot more to momentum exchange than straightforward transfer of kinetic energy and momentum vectors. Momentum exchange is a process. This process is able to change vectors, using apparently scalar functions, time dilation and probability density. Given that momentum exchange is a process, using electromagnetism, one is then able to intercede in this process to deliver virtual momentum exchange behaviour, termed, Momentum Exchange Bypass.

Most importantly, Momentum Exchange Bypass suggests that there is more to be done with regard to our understanding of momentum exchange, and if Momentum Exchange Bypass using electromagnetic fields to manipulate time dilation is real, then we are on our way to achieving real propellantless propulsion systems.

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5. Lorentz Contraction Direct Observation Test

5.1 Introduction

This chapter presents a simple experimental set-up to directly observe a particle's shape distortion either by Lorentz contraction at high velocities, or if any, by gravitational fields. The basic premise is that if the shape of a particle is distorted, then on collision, the difference between the centre of mass and the centre of moments causes a particle to deflect on a path different from that expected if both centres were the same. One first needs to prove that gravitational fields do not distort the shape of a particle, and only then test for Lorentz contraction.

Shape Distortion Alters Collision Mechanics

5.2 The Time Dilation Gravitational Effect

In my paper, "An Epiphany on Gravity" [1], I had proposed that the non-linearity of time dilation causes the effect of gravity by causing a non-linear distortion of the particle's shape. If a particle is spherical at an infinite distance from a gravitational field, its shape is distorted to that of an asymmetrical ellipsoid along the axis of the gravitational pull, as it travels through a gravitational field. This shape distortion causes its centre of mass to shift towards the gravitational field. It is this shift in the centre of mass that we observe as

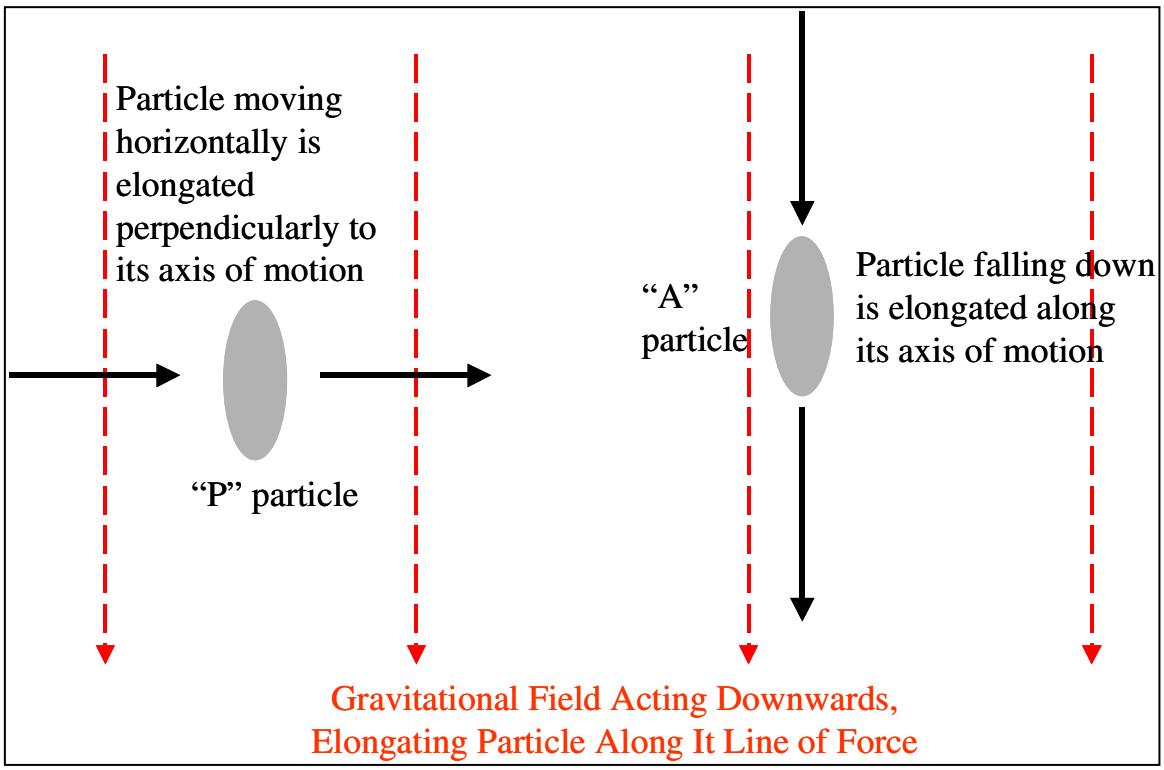

Fig. 5.1: Particle Distortion in a Gravitational Field

the gravitational pull.

If we are to directly observe Lorentz contraction, we have to prove or disprove that gravity does or does not distort the shape of a particle. If the experimental set-up suggested does prove that gravity alters the shape of a particle, then this direct observation of Lorentz contraction should be conducted in zero gravity (Earth's orbit).

5.3 The Resulting Shapes

Particles are Elongated Along Gravitational Lines

Particles travelling along the radial axis of the gravitational source will be elongated along their line of motion - lets call these "A" particles (for "along"). And particles moving perpendicular to the radial axis of the gravitational source will be elongated along an axis perpendicular to their line of motion (which is the radial axis of the gravitational field); lets call these "P" particles (for "perpendicular"). See Fig.5.1.

Lets call particles that are flattened along their direction of motion, "F" particles (for "flattened", for Lorentz contraction experiments.) Lets call perfectly spherical particles, "S" particles.

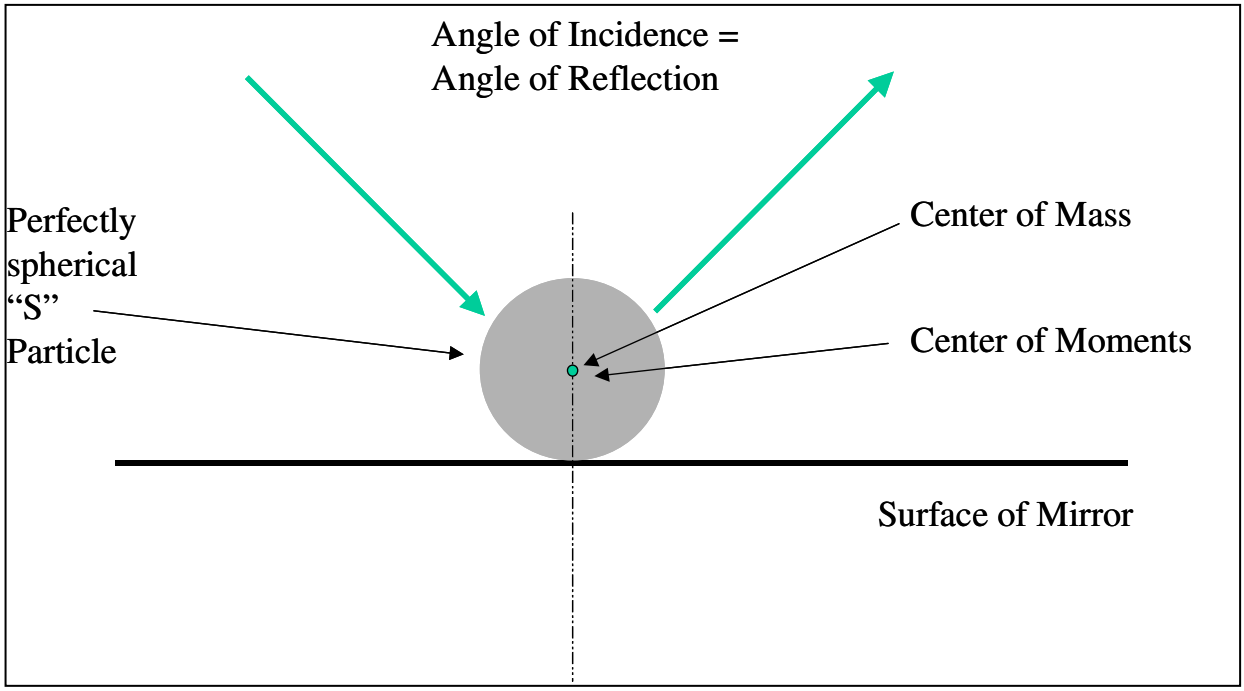

Fig. 5.2: Spherical Particle's Bounce is Symmetrical about the Perpendicular

5.4 The Collision Mechanics

Centre of Moments is Different from Centre of Mass

On collision, the shape of a particle results in a centre of moments that is different from the centre of mass.

If a S particle hits a flat surface at an angle (see Fig. 5.2), assuming perfect elasticity, etc., its centre of moments is the same as its centre of mass, causing the S particle to bounce off at an angle (from the perpendicular of the surface), equal to its angle of incidence, because there isn't any momentary clockwise or anti-clockwise rotational forces at collision.

If an A particle hits a flat surface at an angle (see Fig. 5.3), assuming perfect elasticity, etc., its centre of moments is "ahead" of its centre of mass, causing the A particle to bounce off at a smaller angle (from the perpendicular of the surface), than an S particle, because at collision, there is a momentary anti-clockwise rotational force, along the line of motion.

If an F particle hits this same surface (see Fig. 5.4), assuming perfect elasticity, etc., its centre of moments is "behind" its centre of mass, causing the F particle to bounce off at a larger angle (from the perpendicular of the surface), than an S particle, because, at collision, there is a momentary clockwise rotational force, along the line of motion.

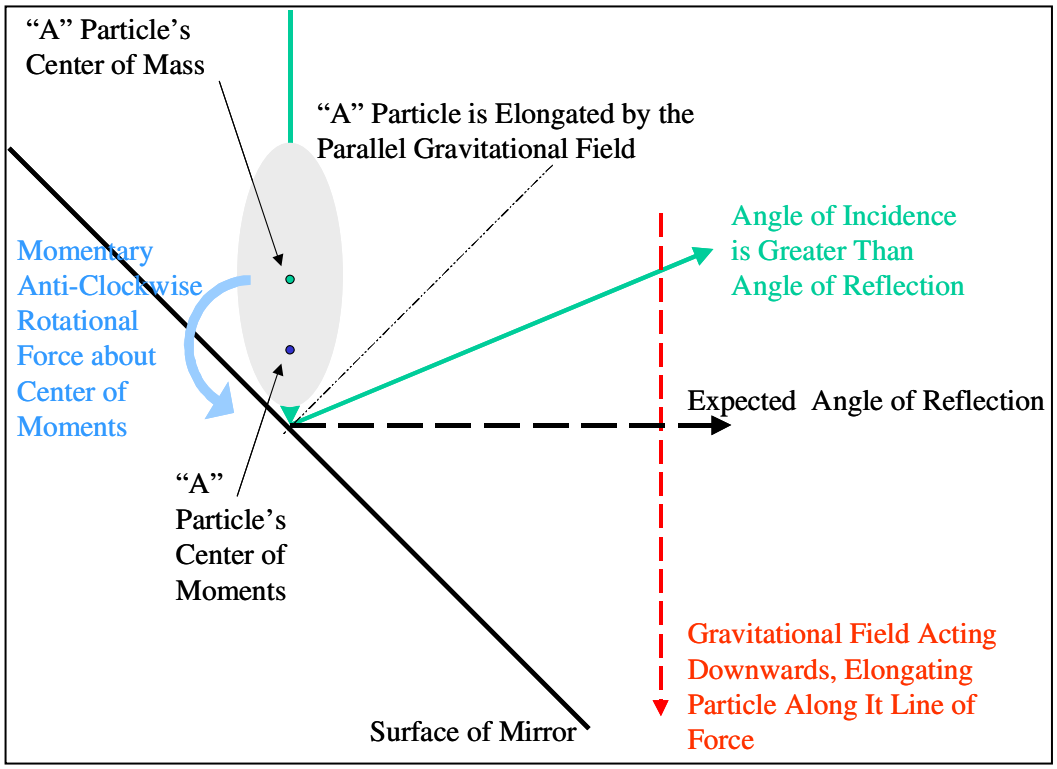

Fig. 5.3: Elongated Particle's Bounce due to Anti-Clockwise Rotational Forces

5.5 The Basic Experimental Set-Up

The experiment consists of a source of photons bouncing off an angled mirror (see Fig. 5.5). A detector measures the amount of photons bounced at different angles from the perpendicular to the mirror. Therefore, first two experiments to test for gravitational shape distortion, can be conducted as follows:

1 Control Experiment:

When this experimental set-up is in the horizontal plane, the photon is a P particle. Its elongation is perpendicular to its line of motion, as its line of motion is perpendicular to the gravitational field. Therefore, it behaves like an S particle, as there is no shape distortion along its line of motion.

The photon scatter should predominantly be along the same angle of incidence, because, at collision, there isn't any significant rotational force along its line of motion.

Control: No Change in Angle

2 Test Experiment:

When this experimental set-up is in the vertical plane, the photon is an A particle. Its elongation is along its line of motion as its line of motion is parallel to the gravitational field.

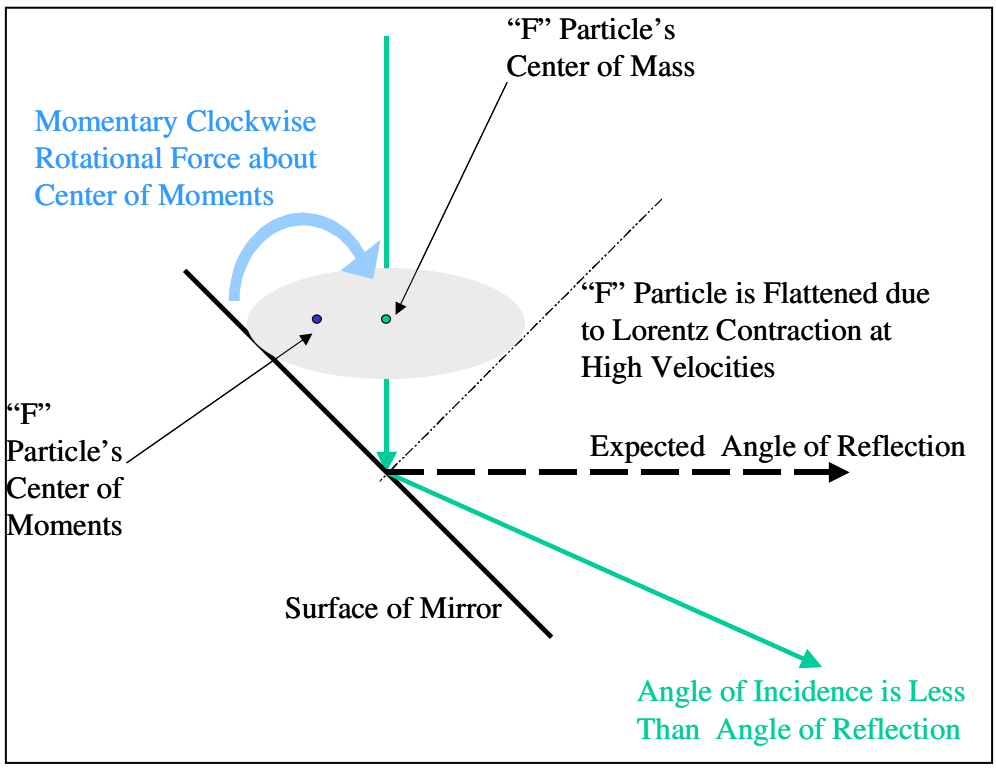

Fig. 5.4: Lorentz Contracted Particle's Bounce due to Clockwise Rotational Force

One should detect much more scatter closer to the perpendicular of the mirror then the control experiment, due to the momentary anti-clockwise rotational force, on collision, if gravity alters the shape of a particle.

More Scatter Closer to Perpendicular

5.6 To Test for Lorentz Contraction

At high velocities approaching the velocity of light, Lorentz transformation suggests that a particle experiences contraction. That is, it is flattened. Using the experimental set-up described in this paper, one should, in theory, be able to conduct the next two experiments that either confirm or deny this contraction effect. If, however, the shape distortion tests described above shows that gravity does alter the shape of a particle, this Lorentz contraction direct observation can only be conducted in zero gravity. The two tests required to confirm Lorentz contraction by direct observation are:

1 Control experiment:

Ideally, in zero gravity, a photon from the Sun to Earth has negligible contraction, as there is negligible relative motion along the radius of the Earth's rotation, so its scatter should be similar to an S particle, as there isn't any significant rotational force at collision.

Control: No Change in Angle

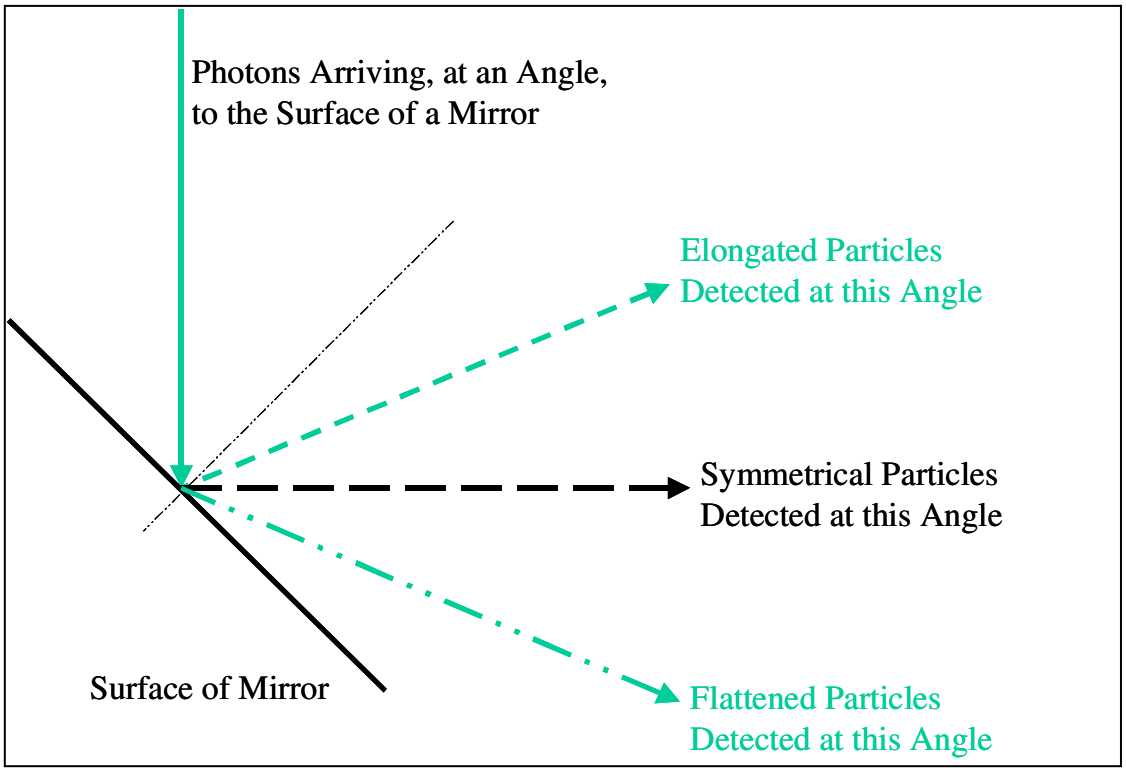

Fig. 5.4: Lorentz Contracted Particle's Bounce due to Clockwise Rotational Force

2 Test Experiment:

In zero gravity, photon from a star to Earth, should be flattened because of the Earth's relative motion to the star. The photon, therefore, behaves like an F particle.

Therefore, there should be more scatter at an angle greater to the perpendicular of the mirror, then the control Sun experiment, due to a momentary clockwise rotational force experienced on collision.

More Scatter Further from the Perpendicular

5.7 Conclusion

This chapter has presented an approach to test by direct observation, Lorentz contraction based on a new approach to how gravity may work. There has not been any direct observation of Lorentz contraction on particles moving at velocities close to the speed of light. It is hoped that this paper will help resolve this lack of direct observation.

Direct Observation of Lorentz Contraction is Conceptually Possible

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6. Relativity Revisited

6.1 Introduction

The correct question to ask is "What is missing from the Special Theory of Relativity?" and not "What is wrong with the Special Theory of Relativity?" Special Theory of Relativity is based on the frame of reference of an external observer. The Time Dilation Gravity Model proposed in "An Epiphany On Gravity" [1], is based on a particle's own frame of reference. Together, they suggest several new conjectures that science has to be aware of in developing theories on spacetime.

Missing Rather then Wrong

6.2 Thought Experiment for New Axioms

When a particle is in motion several constructs exists. First, a particle can observe itself as an internal observer. Second, an external observer that is close to this particle can observe this particle in motion, simultaneously

Third, and most importantly, when this particle collides with the external observer, both their frames of references, at the moment of impact, overlap, merge, and are identical. Note, that just before impact both observers, internal and external, had their own unique

Internal and External Frames of Reference must Merge

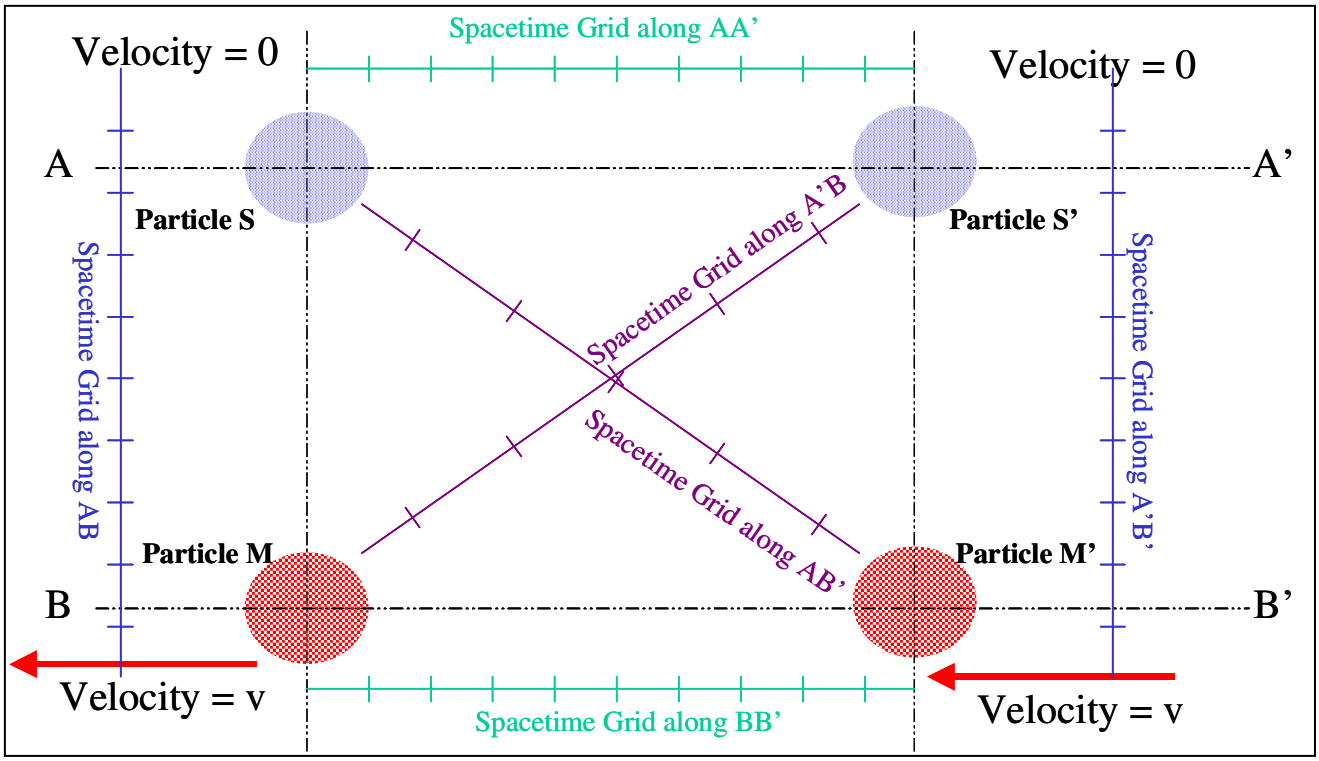

Fig. 6.1: Spacetime Grid, 4-Particle Scenario

frames of references, but at the moment of impact, both frames of references are identical. Therefore, one can conclude, that there exists a continuity of frames of references.

6.3 Continuity of Frame of Reference

This axiom, Continuity of Frames of References, states that an observer's frame of reference is not a discontinuous effect. An external observer's Frame of Reference is continuous and consistent with the observations, events and processes of the internal observer. Both internal and external observers, obey Continuity of Frame of References.

Observations must be Continuous and Consistent

The direct consequence of this axiom is that, the external observer's observations about a particle's behaviour must be consistent with the internal's observer's observation of the particle's behaviour.

The real world validation for Continuity of Frames of References lies in the gravitational red and blue shifts. To an external observer, when both a photon and the observer are at an infinite distance from a gravitational field, the photon has a frequency, f. Both photon and observer can observe this same value of the photon frequency, at collision.

Gravity Provides Real World Validation

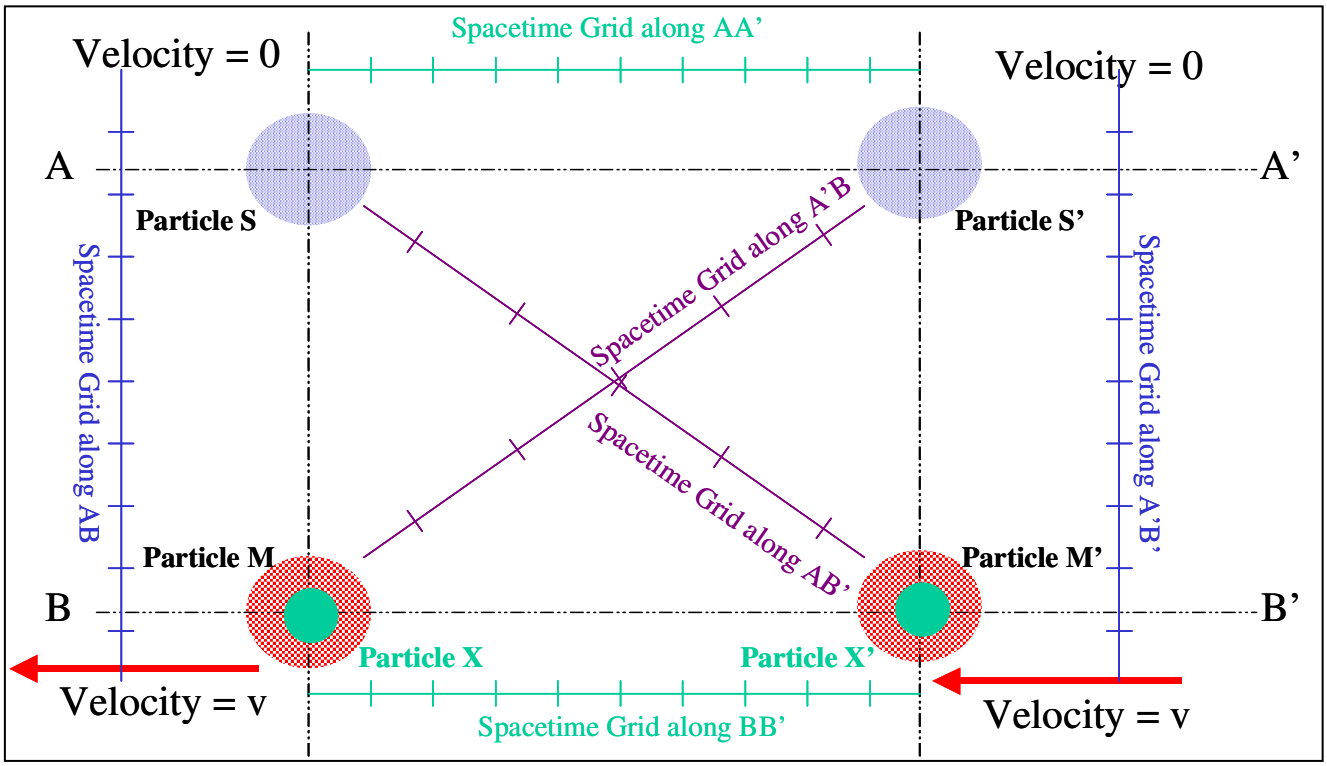

Fig. 6.2: Spacetime Grid, 6-Particle Scenario

When an external observer is on the surface of a planet, observing an incoming photon, both the photon and the external observer are able to observe the blue-shifted photon frequency, at collision. The photon, however, is able to observe its blue shift as it enters the gravitational field.

When an external observer is very far from a gravitational field, and the photon is coming out of this gravitational field, then both the external observer and the photon are able to observe the red-shifted photon frequency, at collision. The photon, however, is able to observe its red shift as it exits the gravitational field.

One can place the external observer anywhere in the gravitational field. The red/blue shift the external observer sees, at impact, will be consistent with the red/blue shift the photon has experienced.

Therefore, Continuity of Frames of References, dictate that the observations, events, and processes an external observer sees, must be consistent with that of the internal observer. This is over and above Einstein's axiom in Special Relativity, that the laws of physics must be the same for any frame of reference. It must be noted that Special Relativity describes how spacetime between any two observers appears, and not how each observer behaves.

Over & Above Special Theory of Relativity

6.4 Length Contraction

The Time Dilation Gravity Model presented in chapter 3 shows that,

$$P(s_{xo}/d_{xo}) = P(s_{xd}/d_{xd}) = [1/(4/3)\,\pi]^{-3} \qquad (3.8)$$

The probability of detecting a particle is invariant to Lorentz transformations. This is because, using equation (3.9), Probability Invariance Transformation,

$$s_{xo}/d_{xo} = s_{xd}/d_{xd} \quad \text{or} \quad s_{xd} / s_{xo} = (d_{xd}/d_{xo}) \qquad (6.1)$$

The probability of detecting a particle is invariant because the particle's change in clock rate is compensated for by its change in unit of measure of its distance. That is if its unit of time dilates, then its unit of distance, U, dilates accordingly. Since,

$$t_v = t_o / \sqrt{(1 - v^2 / c^2)} \qquad (3.17)$$

$$U_v = U_o / \sqrt{(1 - v^2 / c^2)} \qquad (6.2)$$

That is as the number of clock ticks decreases, over a given "quantity" of spacetime, the number of distance markers decreases in step with the clock ticks. Therefore, what we do measure is the Lorentz contraction of distance, when substituting for the elongated observed unit of measure.

Both Unit of Time & Unit of Distance Elongates

Looking at it from a different perspective, at, any point in space, if many pairs of particles are moving relative to each other, the spacetime between them should be the same with respect to a "third" observer, but are different with respect to each other (see Fig. 6.1).

6.5 Spacetime Grid versus Spacetime

4-Particle Example

Lets consider two pairs of particles, the SS' pair and the MM' pair. See Fig. 6.1. The SS' is at rest relative to each other. The MM' pair is at rest relative to each other. The MM' pair is moving at a velocity, v, parallel to the SS' pair. The particles in each pair are an equal distance from each other. The axis AA' and BB' are parallel and are a distance apart equal to the distance between the particles S and S'.

Fig. 6.1 illustrates that instant when the two pairs of particles line up and form a square grid pattern. At this instant the relative velocity between S and S' is zero. The relative velocity between M and M' is zero.

The relative velocity between S and M is zero. The relative velocity between S' and M' is zero. There is, however, a relative velocity between S and M', and M and S'.

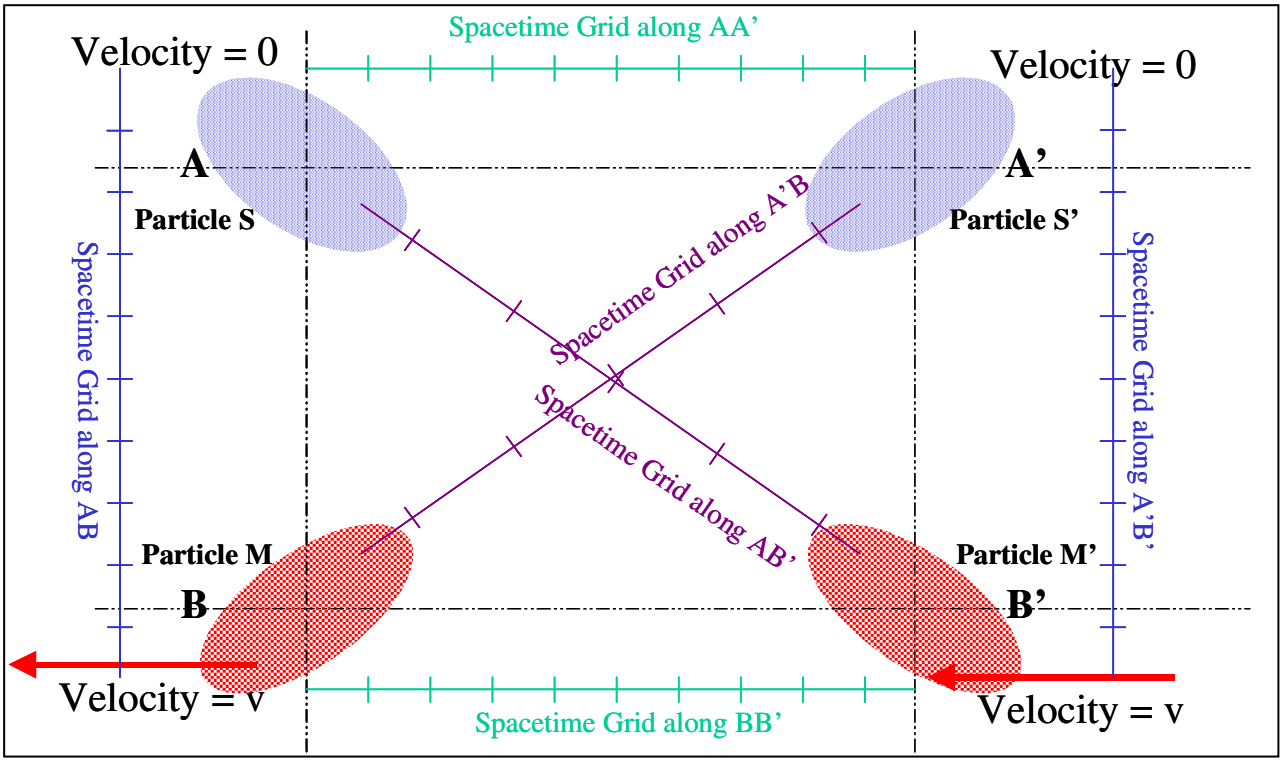

Fig. 6.3: Particle Elongation Affects the Observed Spacetime Grid

Therefore, according to the Special Theory of Relativity, even though the four particles are an equal distance apart, at this instant, the diagonal distances within the square, has shrunk. That is each diagonal is less than the square root of the sum of the square of the sides. This is an apparent paradox.

6-Particle Example

Fig. 6.2 illustrates a 6-particle scenario. The additional pair particles, XX', are at rest with respect to the SS' particle pair. Therefore, we know that, the diagonal distance of the square is as determined by Pythagoras's Theorem. The four particles, S, S', X and X' are an equal distance apart forming the corners of a square. However, at the instant the MM' particle pair overlap the XX' particle pair, the SS' pair observes a different spacetime measurement of the MM' pair from that observed of the XX' pair.

Measurement versus Amount

Fig. 6.2, shows that there less markers/clock ticks, along the diagonals with respect to the MM' pair then there are along the diagonal with respect to the XX' pair, even though, both the MM' pair and the XX' pair of particles overlap. The answer to this paradox lies in the fact that, the "amount" of spacetime is the same but what we measure, the observed spacetime grid, is distorted by our perspective.

The Time Dilation Gravity Model shows that a particle's shape is elongated/dilated by time dilation (see Fig. 6.3.). The elongated space between the distance markers causes the

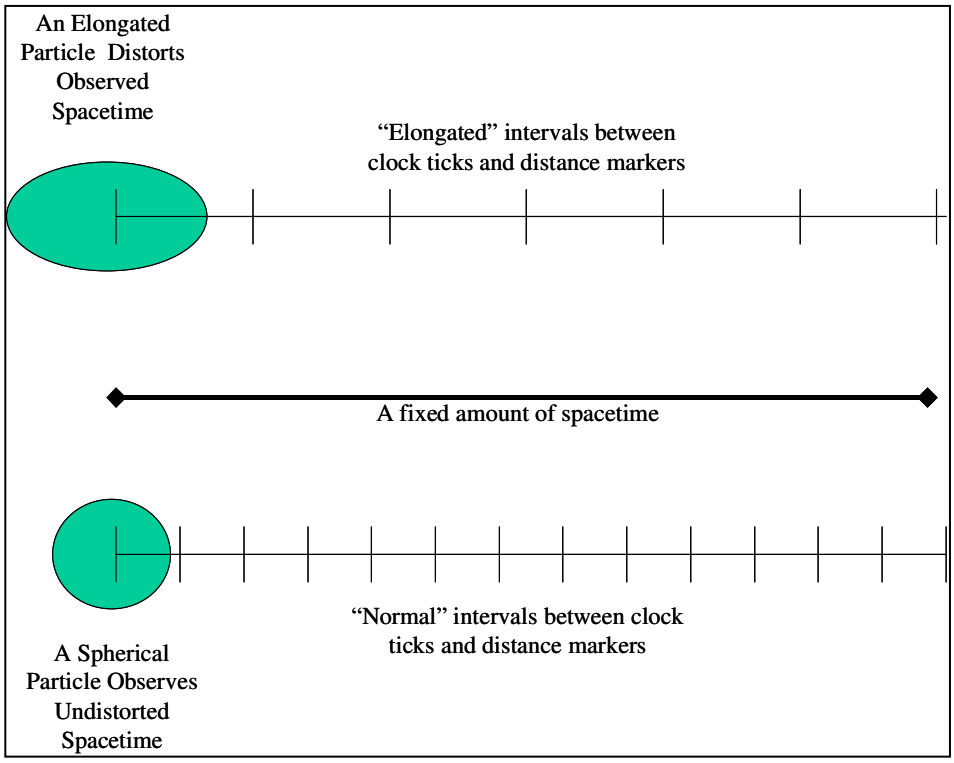

Fig. 6.4: Particle Shape/Size Distorts the Observed Spacetime Grid

particle to "measure" or perceive a shorter space, the effect. Therefore, even though the space is the same, our measurement of it has changed. See Fig. 6.4. Fig 6.4 probably explains while Heisenberg's Uncertainty Principle is valid, the directional shaped probability distribution of a particle keeps changing with the motion of the observer.

Heisenberg's Uncertainty Principle

We can conclude that spacetime is invariant and thus, the laws of physics are invariant but how we measure spacetime is relative to our perspective. Going a step further, Einstein's axiom that the laws of physics must be the same for any frame of reference is true because the cumulative probability of detecting a particle must be one, in any frame of reference. Which brings us back to the Time Dilation Gravity Model. It is the non-linear deformation of the clock ticks, in the spacetime grid, which causes the non-linear deformation of the distance markers in this same spacetime grid that is observed as the gravitational effect.

Spacetime is Invariant, What is Measured is Not

6.6 Conclusion

For now it is sufficient to say that spacetime and its spacetime grid are not the same. This does suggest that altering the observed spacetime grid will not give us time travel as the observed grid exists only in spacetime. The greatest observable quantity between any two clock ticks, and between any two distance markers, in the observed spacetime grid, will be equivalent to the size of the Universe. Therefore, mass particles can approach but cannot attain the speed of light, and consequently, Relativity does not exist for velocities greater than the speed of light.

Spacetime is Not the Spacetime Grid

This, however, does present an opportunity to develop "translocation" technologies. Translocation technologies are technologies that allow us to re-locate our positions in the spacetime grid, by altering the unit of distance measure.

Any logical test of a hypothesis, must be validated by Multi-Scenario Test. These tests must encompass more than the two observer scenario. This chapter has presented different conclusions from the Special Theory of Relativity, as a result of testing with 4– and 6-particle scenarios.

Multi-Scenario Logical Tests of Hypothesis.

Part 3: Future Technology

Reaching The Stars:
The Interstellar Space Exploration Technology Initiative (iSETI) Report

Date: 08/25/2003

Benjamin Thomas Solomon
ISBN 0-9720116-3-3
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7. Summary of Current Research

.7.1 Introduction

This chapter summarizes current experimental research in gravity shielding, and gravity manipulation. It shows that it will probably be quite a few years before current research catches up with my work.

7.2 1992 Gravitational Shielding, Podkletnov & Nieminen

Summary of findings[1]:

Only Real Results, Other Then Mine

1. Shielding properties of single-phase dense bulk superconducting ceramics of YBa2Cu3O7-x against the gravitational force were studied at temperatures below 77 K.

2. A small non-conducting and non-magnetic sample weighing 5.48 g was placed over a levitating superconducting disk and the loss of weight was measured with high precision using an electro-optical balance system.

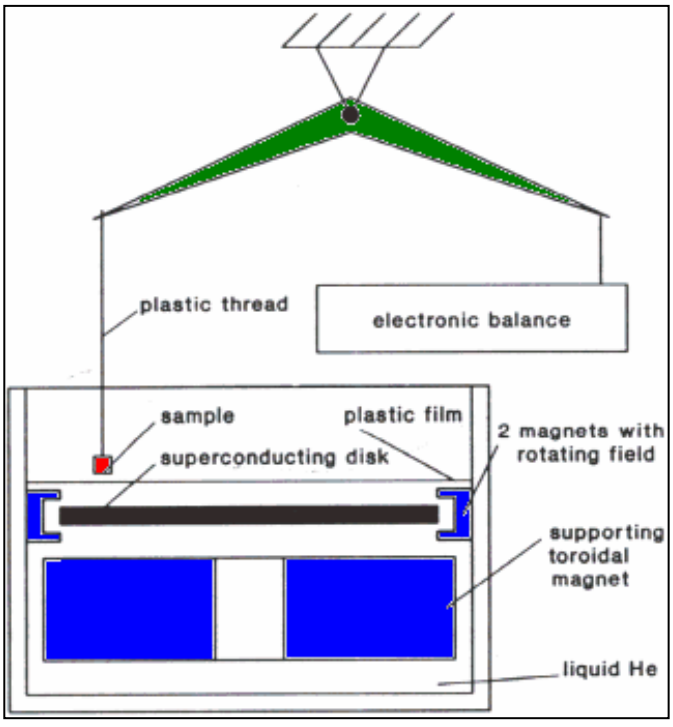

Fig. 7.1: Podkeletov' Experiment
(Source: Quantum Cavorite at http://www.inetarena.com.~noetic/pls/gravity.html)

3. The sample was found to lose from 0.05 to 0.3% of its weight, depending on the rotation speed of the superconducting disk.

4. Partial loss of weight might be the result of a certain state of energy which exists inside the crystal structure of the superconductor at low temperatures.

5. The unusual state of energy might have changed a regular interaction between electromagnetic, nuclear and gravitational forces inside a solid body and is responsible for the gravity shielding effect.

7.3 1995 Hooper's Self-Cancelling Coils, NASA

Summary of findings [2]:

1. Experiments were conducted to test assertions from Patent 3,610,971, by W.J. Hooper that self-cancelling electromagnetic coils can reduce the weight of objects placed underneath.

No Significant Results

2. No weight changes were observed within the detectability of the instrumentation.

3. More careful examination of the patent and other reports from Hooper led to the conclusion that Hooper may have misinterpreted thermal effects as his 'Motional Field' effects.

4. There is a possibility that the claimed effects are below the detection thresholds of the instrumentation used for these tests.

7.4 1997 Static Test, NASA

Summary of findings [3]:

1. Any apparent gravitational contribution of the superconductor can be derived by subtracting the contribution of the magnet and superconductor together from the magnet alone; however, since the relative gravimeter responds (weakly, < 2-5x10^-6 cm s^-2) to the magnetic field, the uniquely superconductive contribution must combine any gravitational effect with the diamagnetic shielding of the magnets by the YBCO superconductor itself (~20-90% shielding of the field depending on hysteresis during cooling and magnetization).

No Significant Results

2. In any case, the maximum contribution to a change in gravity of a static superconductor in a constant magnetic field was measured as less than 2 parts in

10^8 of the normal gravitational acceleration.

3. This measurement extends an approximately 4-5 order of magnitude improvement over that previously obtained with the use of an opto-electronic balance [4-5] instrumented without either thermal or magnetic compensation. Relative to a gravito-magnetic force [9-11; 18] which depends on an AC magnetic drive or source term, dA_g/dt, the static case more strongly constrains interpretations based on either simple material shielding [4-5] or absorption of gravity [8]; regardless of the relative orders of magnitude, a coupling term (quadratic) to Euclidean gravity based on the Bose condensate and radial absorption does not necessarily require either rotation or a magnetic field to induce density fluctuations in the Cooper pairs, particularly in the limit of infinite conductivity.

4. The rotating version of this experiment will be reported in subsequent work. In addition to superconductors, other Bose condensates such as super fluid helium have been investigated for gravitomagnetic field exclusion [19], but the low thermal conductivity of helium limits measurable power transfer from an AC magnetic field by several orders of magnitude below a YBCO superconductor.

7.5 1998 Superconducting Disks, NASA

Summary of findings [4]:

1. We report experiments on RF-illuminated (1-15 MHz) superconducting disks with corresponding gravity readings indicating an apparent increase in observed gravity of approximately 3-5x10^-5 cm/s^2, above and to the side of the superconductor.

No Significant Results

2. The observed gravitational modification range is significantly lower than the 2.1% gravity modification reported by Podkletnov.

7.6 2001 Gravity Shielding, NASA

Summary of findings [5]:

1. The general conclusion is that the results of these tests gave a null result.

No Significant Results

2. Further, it is concluded that the balance is sensitive to mass changes at room temperature and down to approximately –175C . . .

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8. Post-Newtonian Propulsion Technology

8.1 Introduction

This chapter summarizes my experimental results. The first character of a device name designates a design version. For example, device 'A1' is the first device of the first design. Device 'B15' is the fifteenth device of the second design.

The primary difference between the 'A' design and the 'B' design is the orthogonal relationships between the magnetic and electric physical components, while maintaining an orthogonal relationship between the fields.

Device 'C' to 'I' were designed not the work, to test that the concepts I had developed were real. These devices did not work. Design 'J' is a variation of design 'B'.

Device Designed not to Work

8.2 Experimental Procedure

Two types of experiments were conducted.

1. Pendulum Test

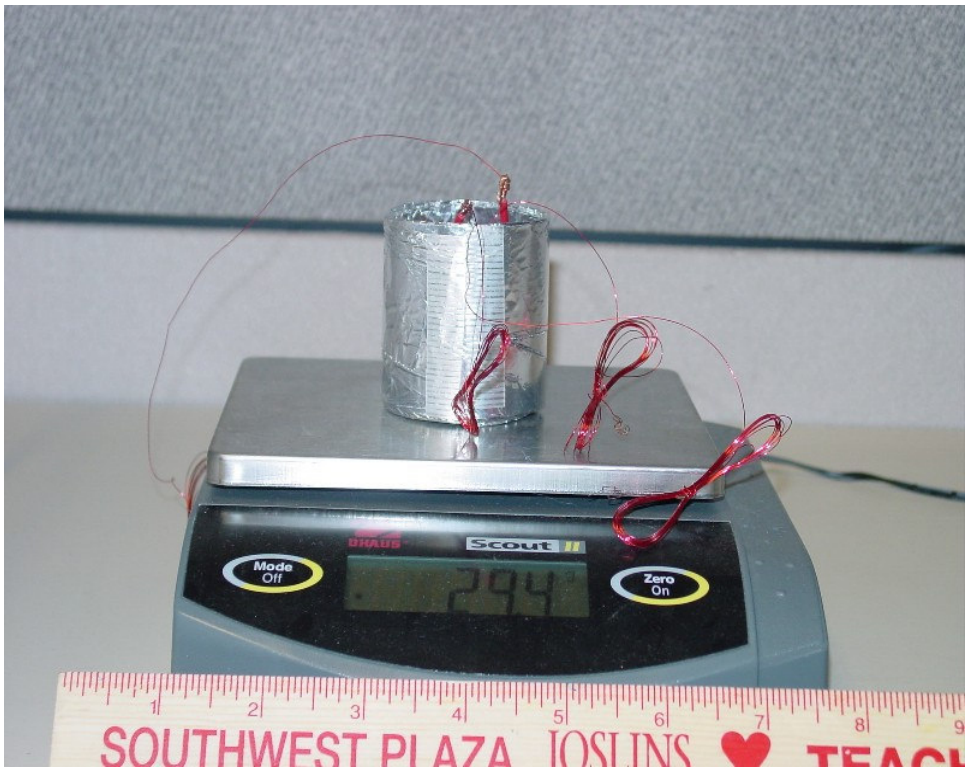

Fig. 8.1: Device Similar to B1

2. Direct Weight Change.

In the pendulum test, both device A1 and B1 were hung from their leads and string respectively. (Device A1, weighed about 1 kg, and device B1 weighed 42.5 g.)

Both devices jerked about 1 mm when powered on. Device A1 was designed to produce motion in a radial manner (see Fig. 8.2), while Device B1 was designed to produce motion in a perpendicular manner (see Fig. 8.3).

Force was Independent of the Earth's Magnetic Field

The results show that the force generated by the devices was independent of the Earth's magnetic field. It also proved that the new concepts held under very different design considerations.

Two types of scales were used, to test for the direct weight change experiments an electronic scale, and a mechanical balance. In all cases with the electronic scale, a paper or wire stand was used to separate the device form the metal surface of the scale (see Fig 8.4).

To eliminate the effects due to lead tension, expansion, and compression, several experiments with different lead arrangements were conducted. Leads were,

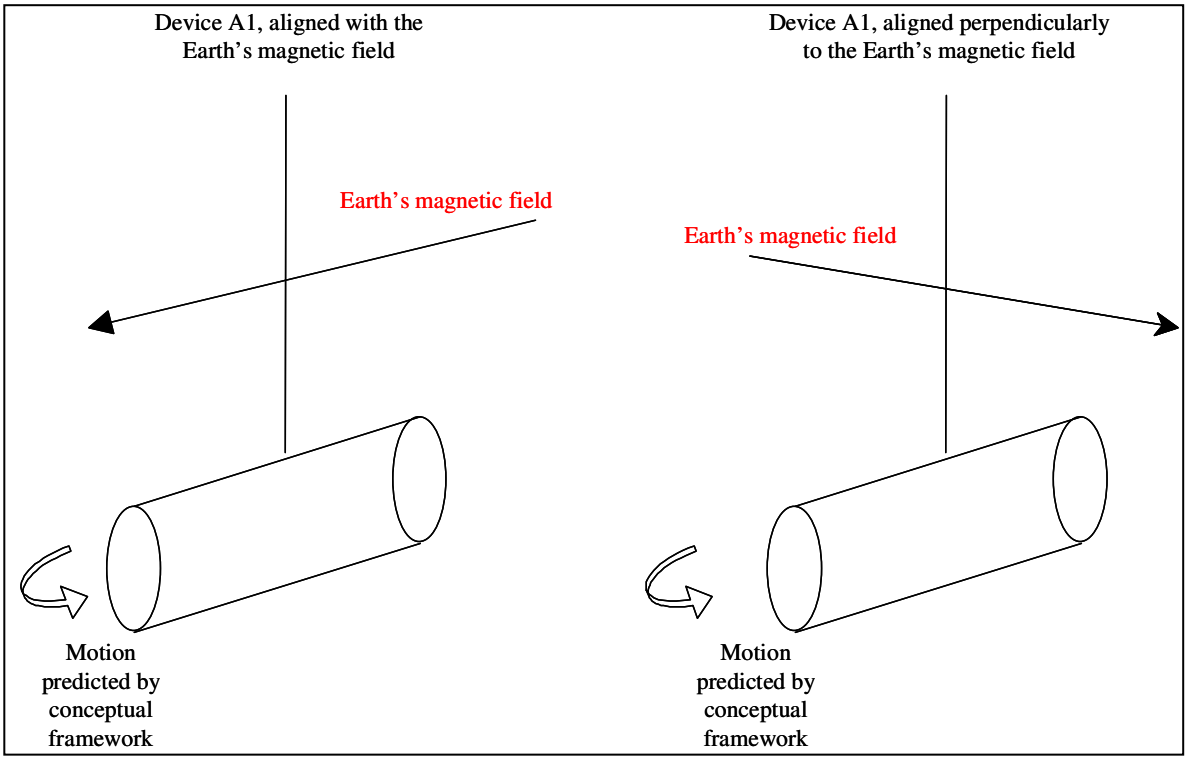

Fig. 8.2: Pendulum Test with Device A1

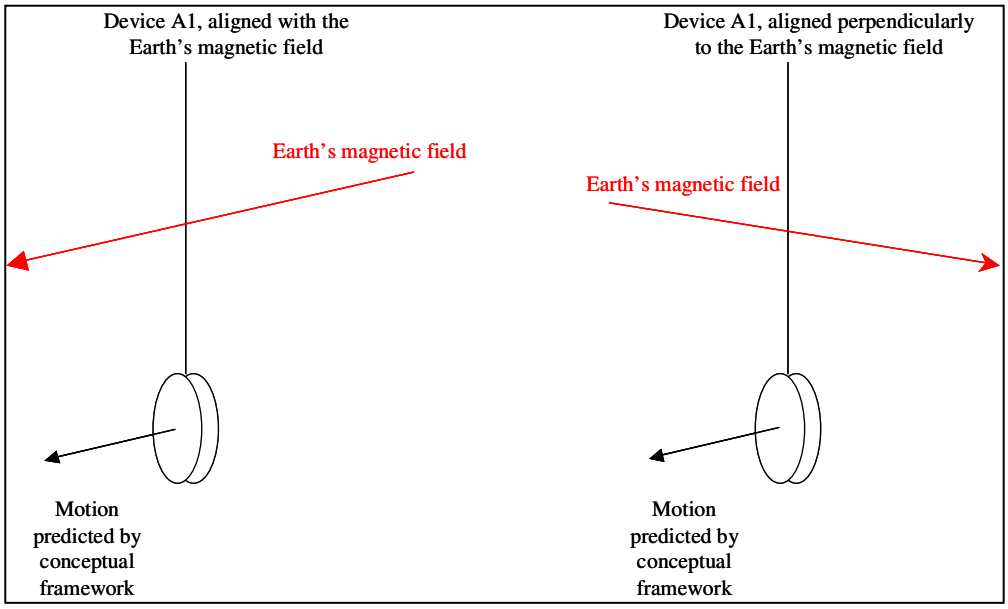

Fig. 8.3: Pendulum Test with Device B1

Fig. 8.4: Device B22 with Leads Laid out at Random

1. Laid out at random and loose on the table (Fig. 8.4).
2. Laid out at random and taped down to the table at two points per lead.
3. Hung from a frame at random.
4. Hung from a frame and coiled (Fig. 8.5. The picture contrast has been adjusted to show the leads clearly in black & white).

Weight Change is not due to Lead Expansion Effects

The weight change results were independent of the position or orientation of the leads. One experiment was conducted in a sealed jar (Fig 8.6) on a mechanical scale. The mechanical balance jerked down (weight loss) when powered up.

8.3 Device B2 Results

Device B2 is similar to that in Fig. 8.7. Fig 8.8 shows weight loss of 1.6 g over 4 hours. This is 10.39% weight loss. Fig 8.9 shows this device's electrical characteristics.

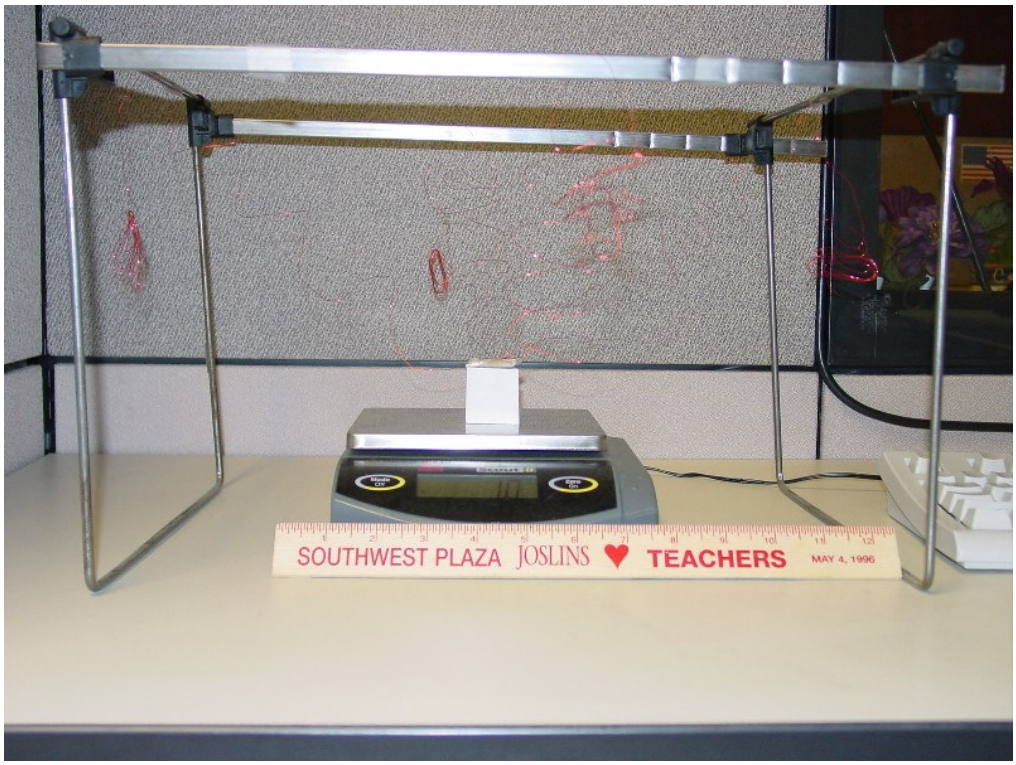

Fig. 8.5: Device B22, Leads Hung from a Frame and Coiled

Fig. 8.6: Experiment Conducted in a Sealed Glass Jar

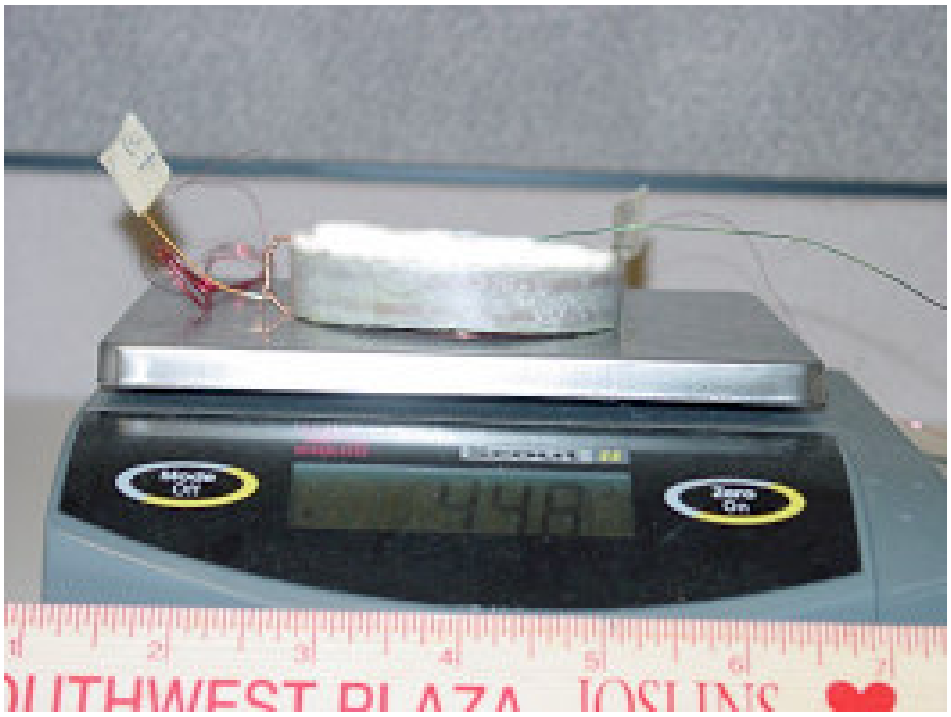

Fig. 8.7: Device B21, Similar to Device B2

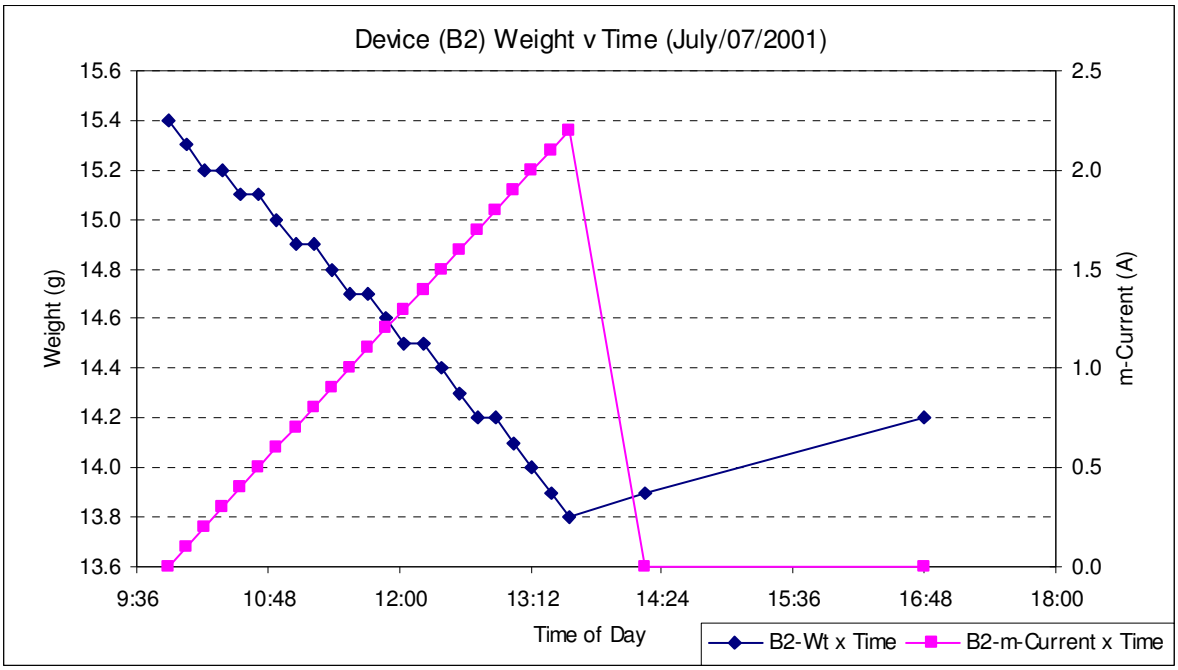

Fig. 8.8: Weight Change, Device B2

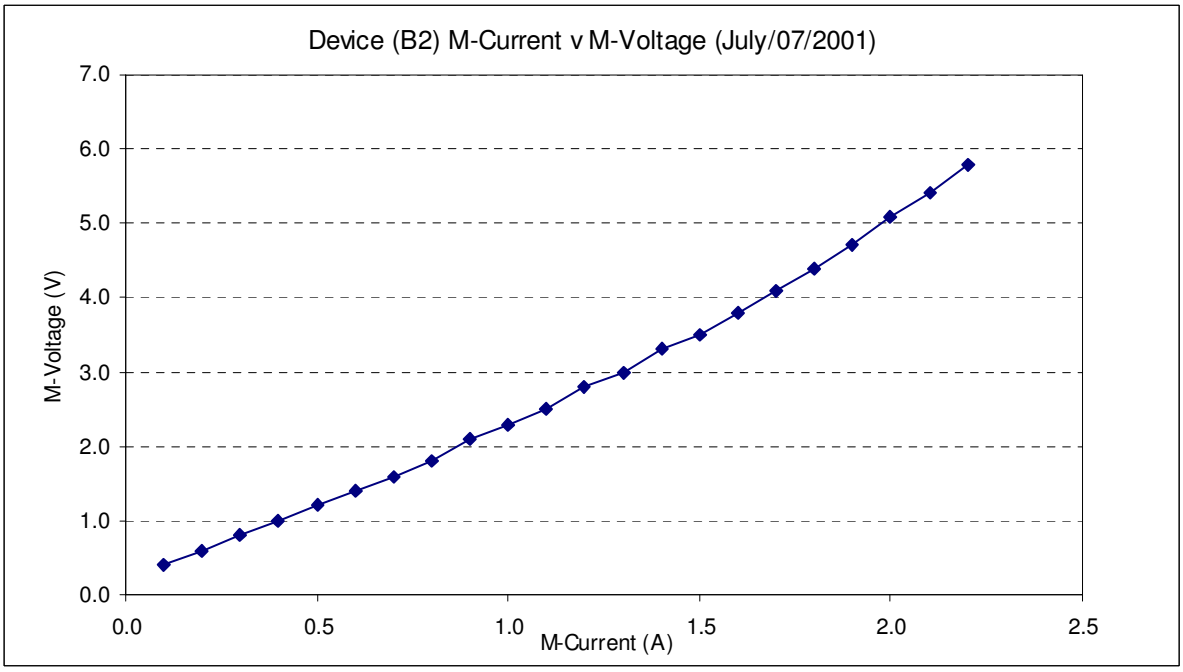

Fig. 8.9: Electrical Characteristics, Device B2

8.4 Device J1 Results

Weight Loss Continues after Power Down

Device J1 is shown in Fig. 8.10. Fig 8.11 shows weight loss of 0.8 g over 3 hours. This is 2.11% weight loss. One notes the full recovery of the weight of the device and continued weight loss after the device was powered down. Fig 8.12 shows this device's electrical characteristics.

8.5 Other Device Results

98% Weight Loss

Two results I have observed with device B1 but have not been able to reproduce are,

Room Temperature Superconductivity

1. 98% weight loss, from 42.5 g to 0.5 g over and for a period of about 3 seconds. This was observed with device B1.
2. Room temperature superconductivity, see Fig. 8.13.

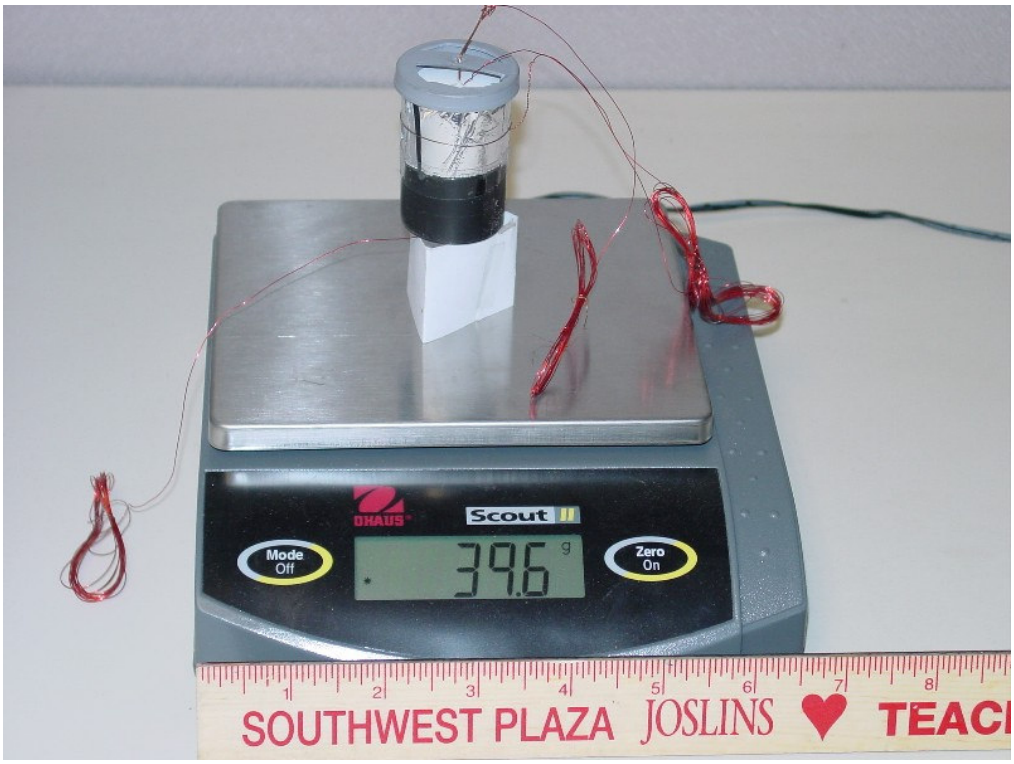

Fig. 8.10: Device J1

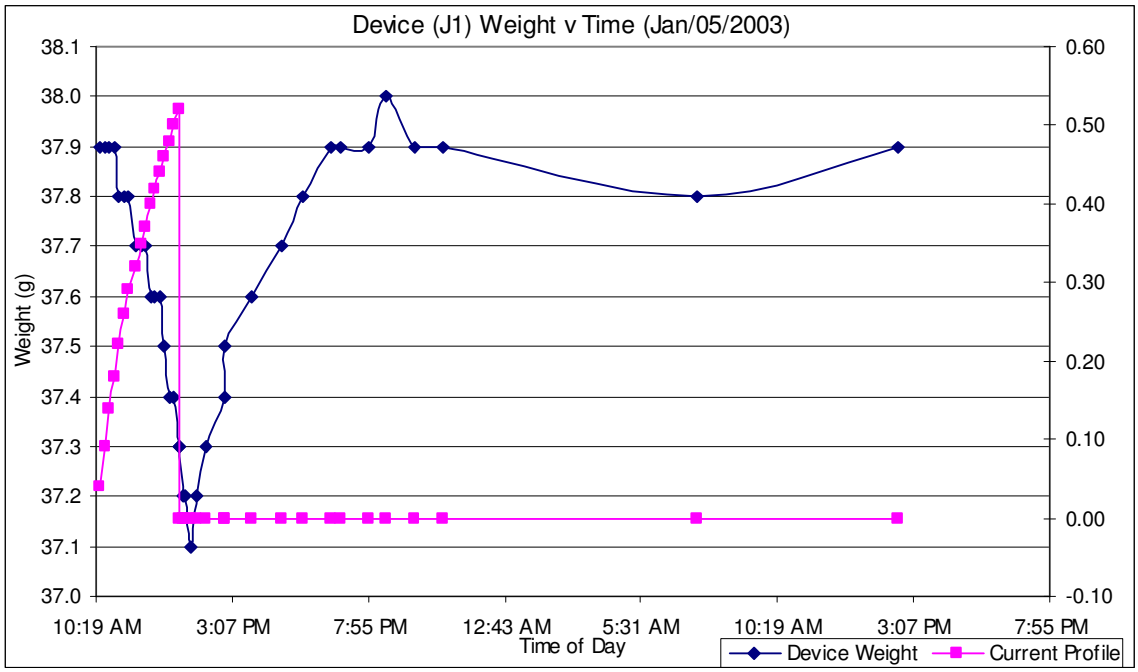

Fig. 8.11: Weight Change, Device J1

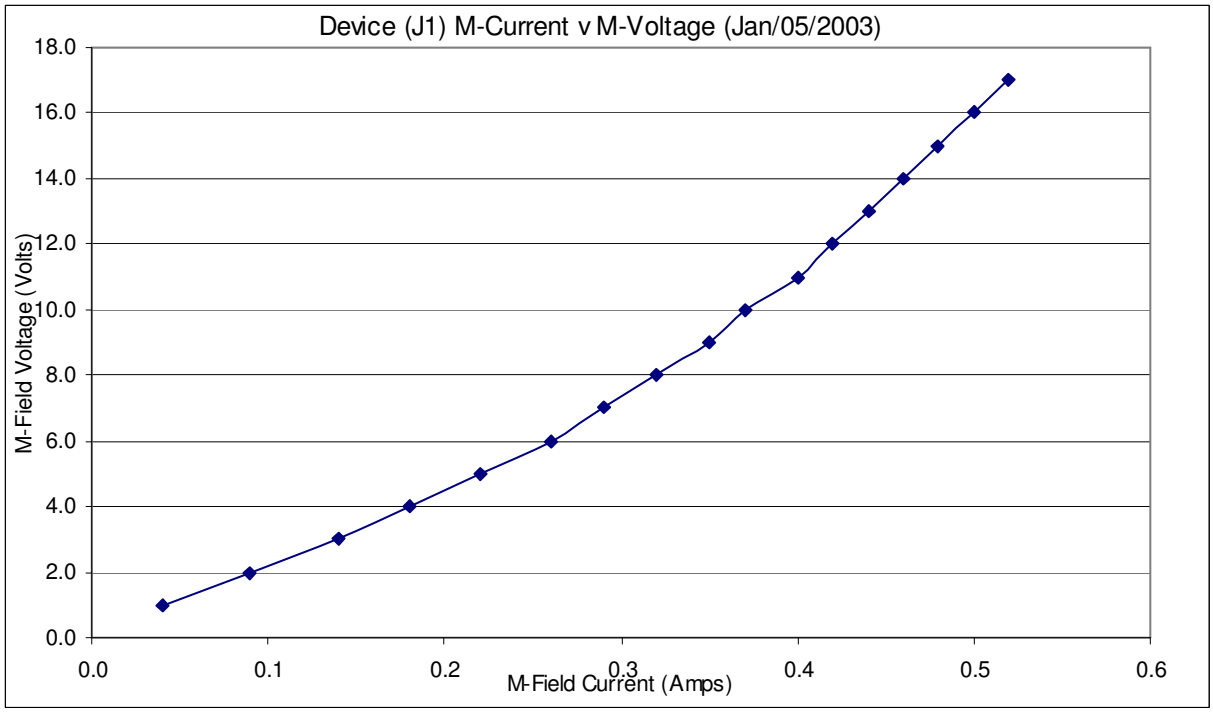

Fig. 8.12: Electrical Characteristics, Device J1

In total I have completed over 400 experiments. Repeatability is assured. The devices, however, do fail. I've finally traced the failure back to the electrical insulation of the leads used. These leads are 30 ga enamel coated leads. Depending on the device design, the insulating properties of the enamel coating begin to deteriorate after 0.35A or 0.5A. When this happens the magnetic component is no longer able to generate the fields required.

100% Weight Loss

It must be note that I achieved 0.00g, or 100% weight loss for a 1.5 g device (Fig. 8.4), but further research and experiments are required (see 8.6 Scale Drift).

8.6 Scale Drift

Scale Drift is not Random

At the end of some experiments, not all, I have observed scale drift with the electronic scales. The direction of this scale drift is not random. It is always in the direction of the force being applied. For example, in some weight loss experiments, the scale shows less weight (-0.1g to -0.2g) when everything is removed; in some weight increase experiments, the scale shows weight increase (0.1g) when everything is removed. The scale should show 0.0g when everything is removed.

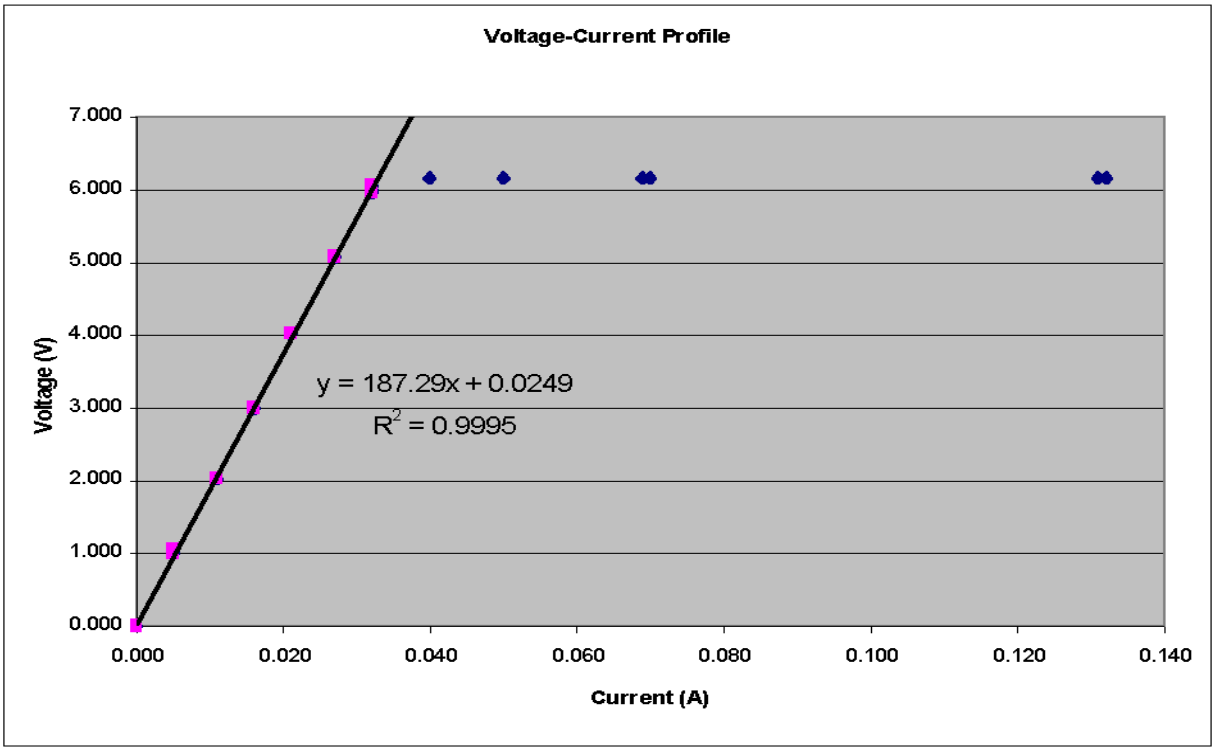

Fig. 8.13: Observed Room Temperature Superconductivity

Since scale drift is always in the direction of the weight change being observed, I hypothesize that the field being generated is big enough to enclose the base plate on which the experiment rests. See Figure 8.14. This field not only changes the weight of the device but also changes the weight of the base plate.

Scale drift that is created by this field effect would explain why devices do not float when they reach 0g weight. That is, part of the 0g weight observed is due to the weight loss of the scale's base plate.

8.7 PNPT v Current Research Comparisons

Table 8.1 summarizes the differences between my work, Post-Newtonian Propulsion Technology (PNPT), and the current research in laboratories around the world.

Repeatability

8.8 Summary of Experimental Results

Comparisons	PNPT	Current Research
Built designs that should work	Yes, they work	No
Built designs that should not work	Yes, they don't work	No
Operates at Room Temperature or Higher	Yes	No
Does Not Use Superconductors	Yes	No
Does Not Use Exotic Materials	Yes	No
Has No Moving Parts	Yes	No
Portable	Yes	No

Table 8.1: PNPT Versus Current Research

My experimental results can be summarized as follows,

1. Experimental repeatability. I have achieved experimental repeatability of my results.
2. Not due to the Earth's magnetic field. The results shows that the force effect is not due to the Earth's magnetic field.
3. No electric field no force. The force effect requires an electric field component. With out this component no force is present.
4. No magnetic field no force. The force effect requires a magnetic field component. With out this component no force is present.
5. Both electric and magnetic fields must be present to observe a force.
6. Not due to the "oxygen" effect. Weight change is observable even in a seal jar.
7. Increased m-current increases net weight change.

Both Electric and Magnetic Fields Must Be Present

Consistent, Repeat-able Relationships

Two Mechanisms

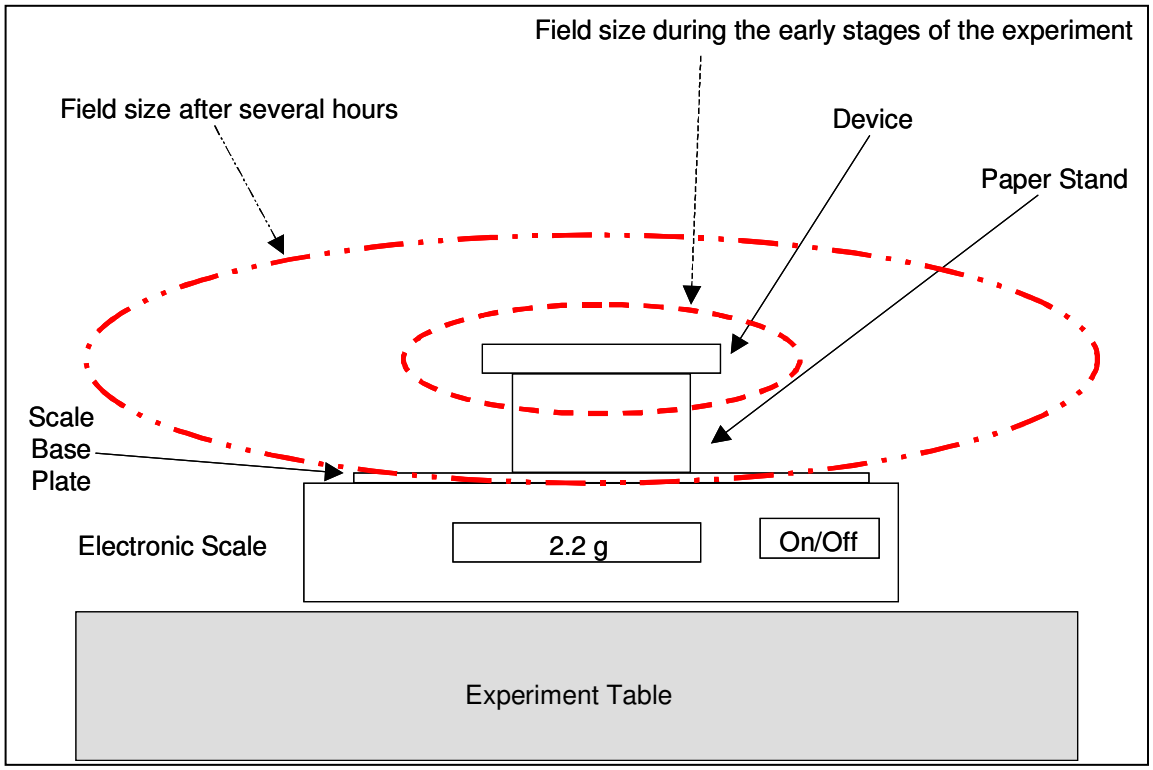

Fig. 8.14: Effect of Field Size on Scale Drift

8. Reverse the electric field and weight change is reversed.

9. Turn it upside down & weight change is reversed. There are consistent, repeatable, relationships within the device technology.

I have observed two different mechanism at work. The first mechanism requires the circuit to superconduct. My second circuit did this. I believe this is the mechanism Podkletnov is observing. I observed 41.5gram weight loss for 3 seconds. I figure that this effect is due to some kind of electromagnetic resonance. The second, mechanism is gradual change. Reversing the electric field component changes the direction of this weight change.

8.9 The Wormhole Experiment

Fig 8.15 illustrates how the device achieves weight loss. Essentially, it flattens the non-linearity of time dilation in the region of the device to neutralize the effect of gravity.

The test that I need to conduct is, if I were to place a second device with reversed effect, as

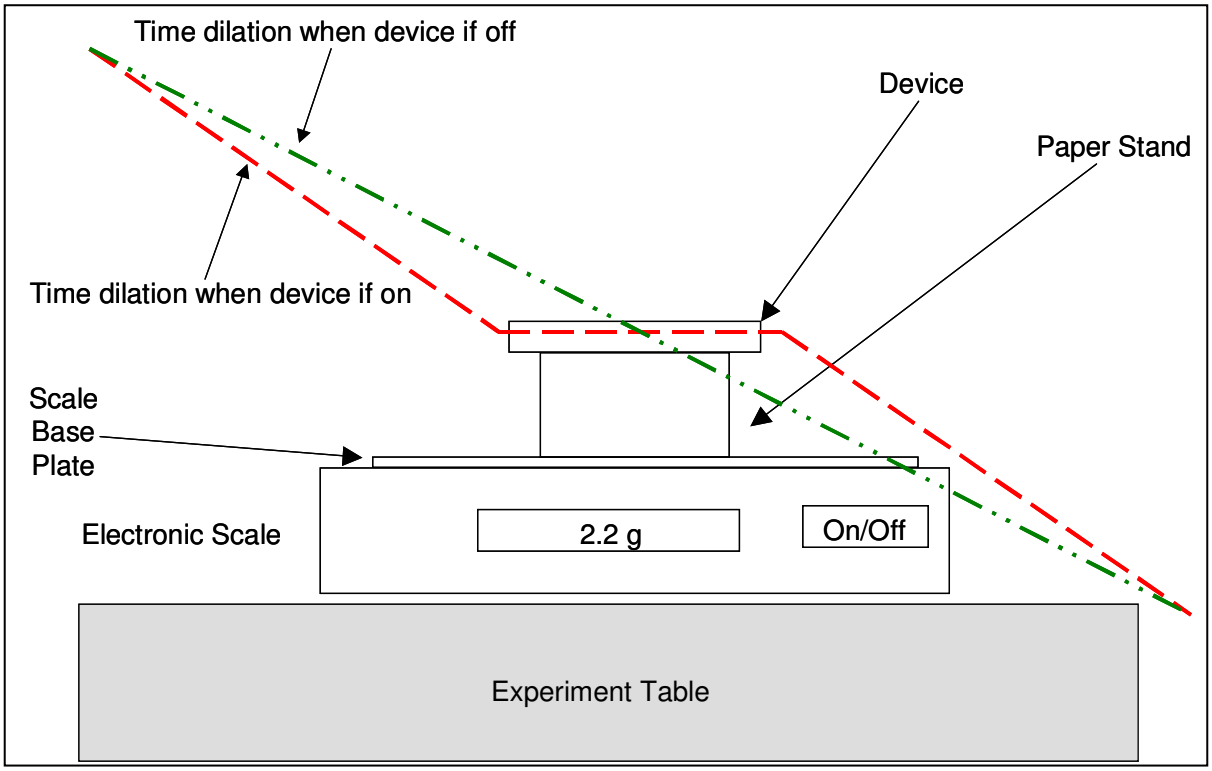

Fig. 8.15: Time Dilation Before and During Experiment

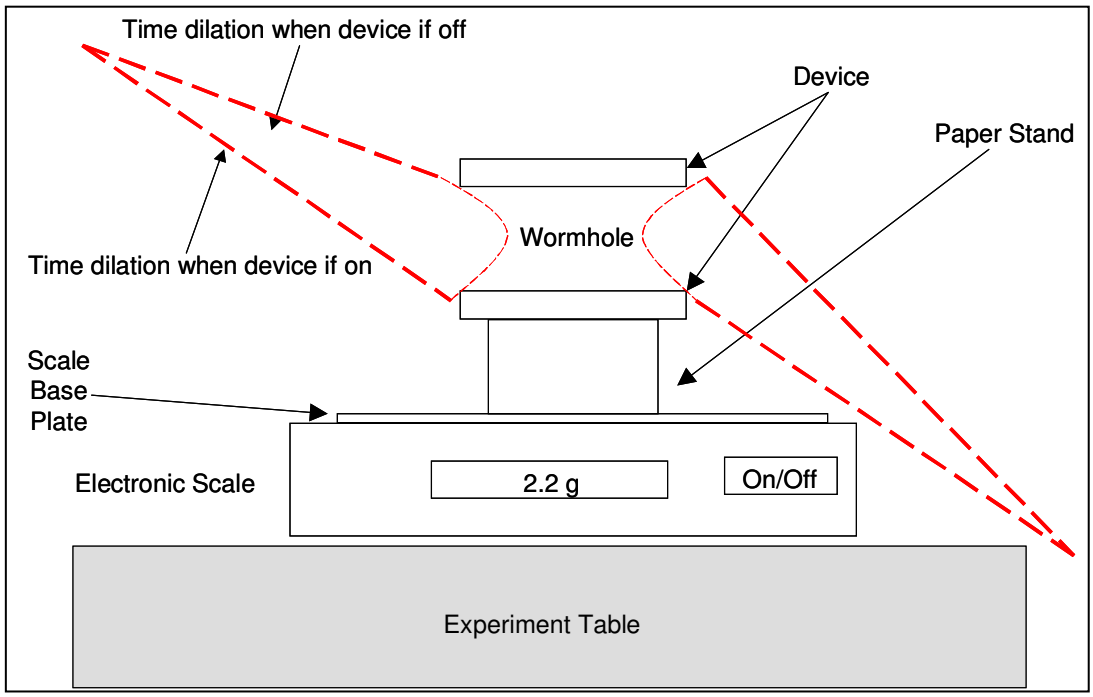

Fig. 8.16: Creating a Tiny Wormhole

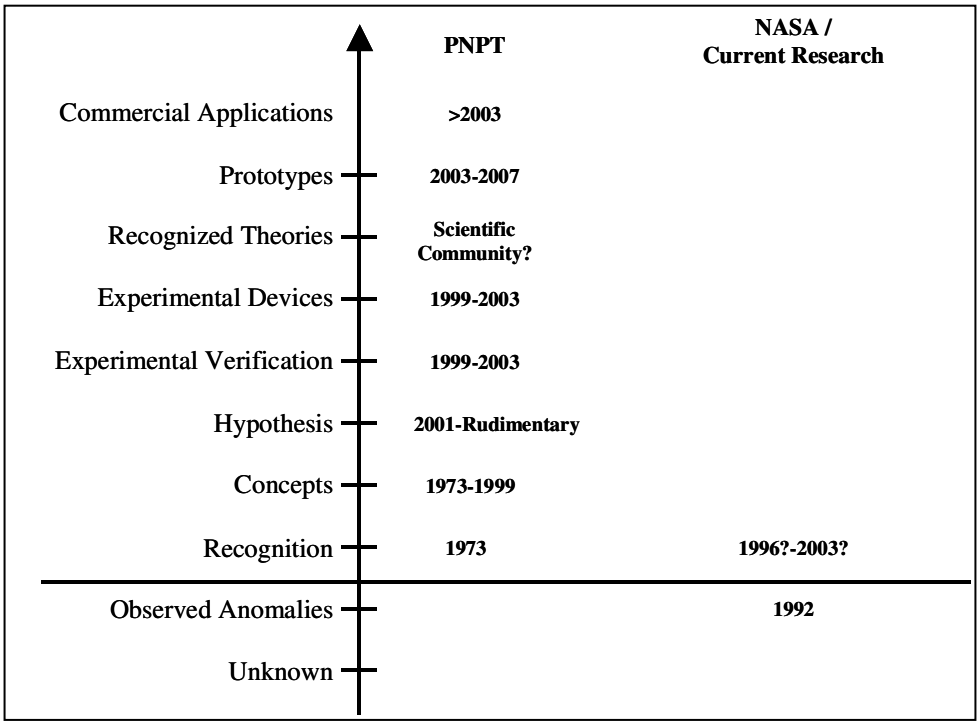

Fig. 8.17: PNPT's Progress Over the Last 30 Years

depicted in Fig 8.16, would I be able to generate a small wormhole?

Semiconductor Chip

8.10 The Future Technology

The Post Newtonian Propulsion Technology has been 30 years in development. Figure 8.17 presents the progress made in comparison with NASA and other research laboratories around the world, and is presented in a manner, I believe, is how new and original technology is developed.

The basic approach to a prototype propulsion system using this technology is to implement it on a semiconductor chip. The reasons are two-fold,

1. We can then achieve mass market easily, as the semiconductor manufacturing process is a mature technology and process. This minimizes inventing more new manufacturing technologies to achieve commercial reality.

2. Given the difficulty in achieving more than 3g of weight loss, with the current knowledge base, this approach is a shortcut to developing excess weight loss and therefore capacity to carry payloads. I estimate that a silicon wafer of 250 die can lift about 0.5kg.

8.11 Press Release

Proof Of Concept Questions Validity of Modern Theories on Gravity

60 to 120 kJ/g

Denver, CO, 07/24/2003 --- Mr. Solomon's Post-Newtonian Propulsion Technology (PNPT) device, an electrical circuit without moving parts, can both, alter its own weight and the weight of a third object. Experiments were conducted in a sealed glass jar.

Mr. Solomon's devices change weight by up to +/- 3 grams over a 3-hour period. The devices weigh between 2 and 300 grams. A weight loss of 41.5 grams has been observed for 3 seconds, but is not yet repeatable. During the experiment, he has noted the current weight, picked up the device, and placed the device back on the scale (Mettler P1200). The weight observed was the current weight, and not some other value. These devices operate at about 2 to 3 Watts. Estimated energy required is between 60 and 120 kJ per gram weight change.

Mr. Solomon is at proof-of-concept. The electromagnetic structure of matter, and not mass, is the source of gravity. This electromagnetic structure creates non-linear time dilation. This non-linearity of time dilation causes the effect of gravity. Modern physics states it the

Force Field Circuits

other way around, that gravity causes time dilation. His success, stemming from this significant paradigm shift on gravitational effects, seriously questions the validity of modern theories on gravity.

His new approach to gravity led to the proposal that momentum exchange is a process and not an event. It is possible to intercede in the momentum exchange process, to create virtual momentum exchange – changing direction without an external force.

He is currently working towards completion of proof of concept, with regard to force field circuits. It is possible to project a force field that is either attractive or repulsive on a third object. Over a period of 3 hours, he has observed 0.1 gram weight loss on 37.6 gram polystyrene brick.

Future Technology

Mr. Solomon is seeking funding to take his technology from proof of concept to prototype engine. The prototype engine will be enclosed within the body of a prototype craft that is capable of moving in any direction without the use of propellants.

Modern theories on gravity will not deliver the space propulsion technologies of the future. Mr. Solomon's Post-Newtonian Propulsion Technology will.

Mr. Solomon is a management consultant and technology pioneer, who has for the last 30 years, been working on a rational and robust approach to reusable launch propulsion systems, that manipulate the effects of gravity. His hypotheses and results are published in the Journal of Theoretics, and the National Space Society's International Space Development Conferences; Publications can accessed via his website, http:// www.QuantumRisk.com/.

8.12 Conclusion

These Post Newtonian Propulsion Technology experiments prove that it is possible to use a field generator that does not have moving parts to create a force, and thus motion.

That is, we have bypassed Newton's 3rd Law of Motion, for every action there is an equal and opposite reaction. I term this behaviour, Momentum Exchange Bypass. Momentum Exchange Bypass allows us to use non-mass fields to create force without an equal and opposite reaction. However, momentum exchange behaviour of this device when it collides with another object is, at this point, unknown.

9. The Lifter Technology

9.1 Introduction

The Lifter Technology is a good candidate for space propulsion technology. Unfortunately, the scientific community has been very quick to write off its potential. This chapter describes the potential for this Lifter Technology.

9.2 History of the Lifter Technology

Fig. 9.1 is a photo [1] of Jean-Louis Naudin's Lifter. This is the most basic form, and Naudin has experimented with many other forms of the technology. His designs, experiments, possible explanations, and other people's efforts are available from his website, http://jnaudin.free.fr/lifters/main.htm.

The original technology was discovered by Thomas Townsend Brown. It is believed that the Biefeld-Brown effect is what propels the Lifter. I don't believe that Biefeld-Brown effect is the correct explanation as the device does not work in vacuum, but do believe that

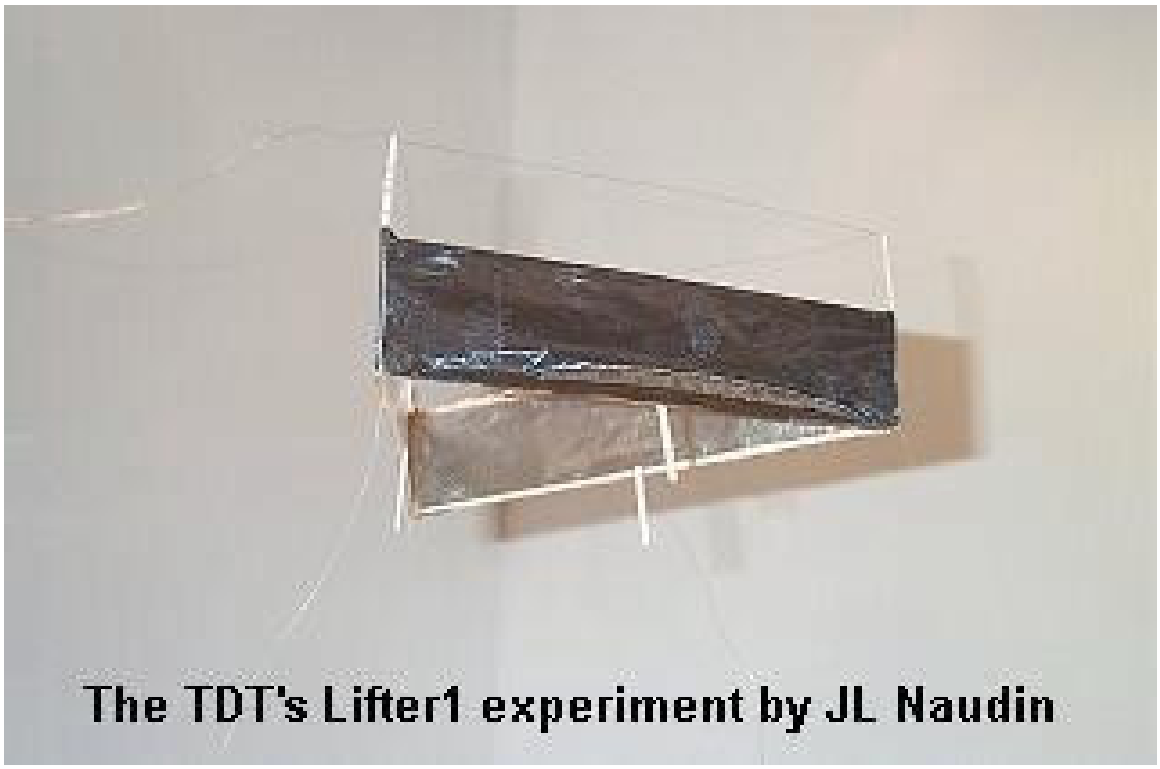

Fig. 9.1: Jean-Louis Naudin's Basic Lifter

the Ion Effect (next section) is the correct explanation. Whatever the mechanism the motion is impressive.

9.3 The Mechanics of the Lifter Technology

Momentum Exchange is not in Effect when Ions are Created

Using the Townsend Brown patent, I present the mechanics of the Lifter Technology (see Fig. 9.2). This material was initially presented at the X-Prixe.org forum [2], on July 31, 2003. A careful examination of this Ion Effect shows that Momentum Exchange is not in effect when the ions are created.

The symbols used are as follows:

1. $m_{(-)}$ = electron mass
2. $m_{(+)}$ = ion mass
3. $v_{(-)}$ = electron velocity

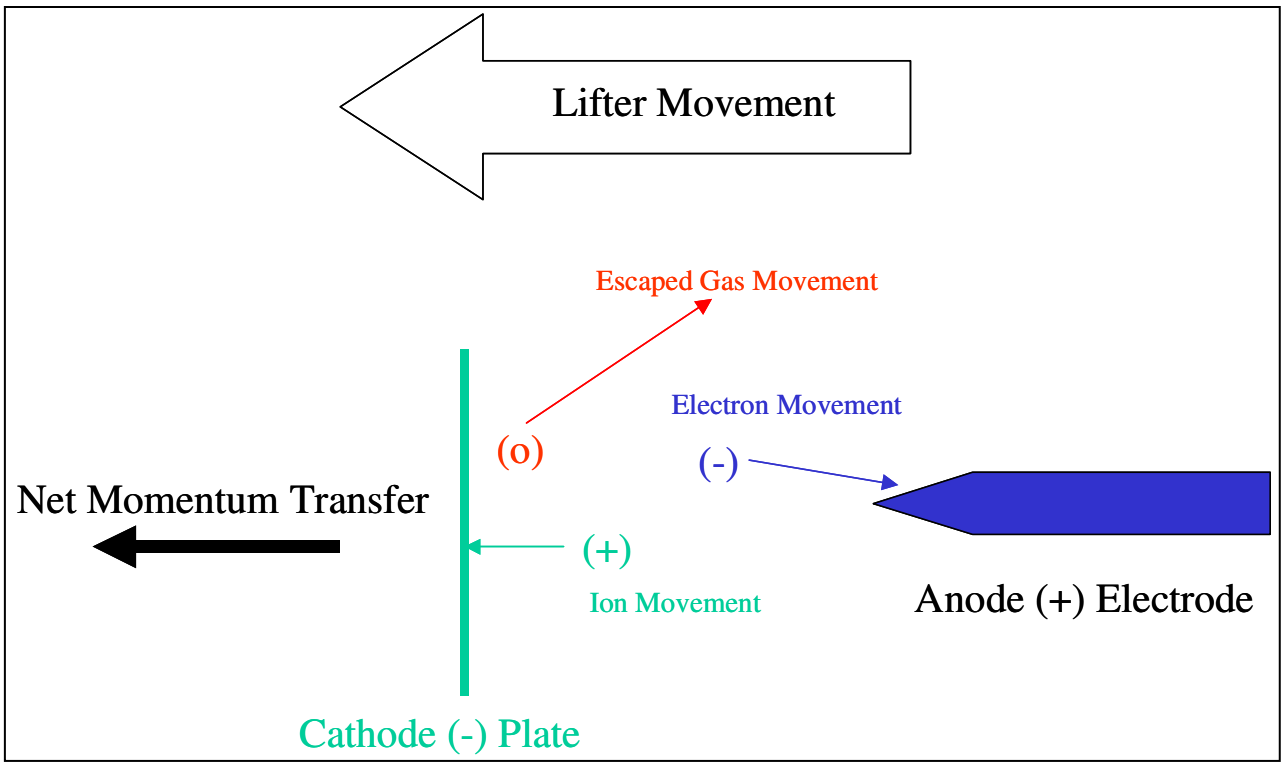

Fig. 9.2: Basic Technology Design of the Lifter

4. $v_{(+)}$ = ion velocity

Energy transferred by the electric field, to both the electron and the ionized atom should be the same, but movements are in opposite directions. See Fig. 9.1. Therefore,

Electron Kinetic Energy, eKE = $0.5\ m_{(-)}.v_{(-)}.v_{(-)}$ (9.1)

Ion Kinetic Energy, iKE = $0.5\ m_{(+)}.v_{(+)}.v_{(+)}$ (9.2)

Since they are both in the same electric field, the electron kinetic energy must equal the ion kinetic energy,

$$eKE = iKE \quad (9.3)$$

Therefore,

$$0.5\ m_{(-)}.v_{(-)}.v_{(-)} = 0.5\ m_{(+)}.v_{(+)}.v_{(+)} \quad (9.4)$$

or

$$v_{(-)} = v_{(+)} . [m_{(+)} / m_{(-)}]^{0.5} \quad (9.5)$$

Electron momentum, Me = $m_{(-)}.v_{(-)}$ (9.6)

Ion momentum, Mi = $m_{(+)}.v_{(+)}$ (9.7)

Rearranging,

$$Me = m_{(-)}.v_{(+)} . [m_{(+)} / m_{(-)}]^{0.5}$$

$$= v_{(+)} .[m_{(+)}.m_{(-)}]^{0.5}$$

$$= m_{(+)}.v_{(+)} .[m_{(-)} / m_{(+)}]^{0.5} \quad (9.8)$$

Since electron mass and ion mass is fixed,

$$Me = m_{(+)}.v_{(+)} .k \quad (9.9)$$

where $k = [m_{(-)} / m_{(+)}]^{0.5}$ (9.10)

and $k < 1$

Therefore, Net Momentum Transferred, Mn is

$$Mn = m_{(+)}.v_{(+)} - m_{(-)}.v_{(-)}$$

$$= \quad m_{(+)}.v_{(+)} \ \{ 1 - k \} \qquad (9.12)$$

That is Ion Momentum > Electron Momentum, as k < 1. Therefore, it works! There is a net greater momentum transferred by the Ion then by the Electron.

The only way to increase the effect is to increase the electric voltage field, increase the number of momentum transfer points or use a heavier gas.

Note, however, there is a limit to how much voltage that can be applied. Stripping more then one electron causes the efficiency of the effect to be reduced, because the effect is caused by the mass differences, and not ionization. For example, if 'x' electrons are stripped from an atom then

Electron energy = $x \cdot 0.5\, m_{(-)} .v_{(-)}.v_{(-)}$ for the same Ion kinetic energy

Net Momentum Transferred in the 'x' electron case, Mx

$$Mx = m_{(+)}.v_{(+)} - x.\, m_{(-)}.v_{(-)}$$

$$= m_{(+)}.v_{(+)} \ \{ 1 - x.k \} \qquad (9.13)$$

However, since the electron mass is very much smaller than the ion mass,

$m_{(-)} << m_{(+)}$ thus, $k \to 0$

Therefore, for all practical purposes,

$$Mx \approx m_{(+)}.v_{(+)} \qquad (9.14)$$

That is, the Lifter Technology has the potential to be a space propulsion system.

Potential Space Propulsion Technology

9.4 Deriving A Space Propulsion Lifter Technology

How can this Lifter Technology be converted into a true space propulsion technology? The answer lies in taking care of subsequent, secondary momentum exchanges.

Fig. 9.2 shows that after the gas ions have neutralized, spent gases, they are released into the atmosphere. For space propulsion, the spent gases have to be re-circulated within the Lifter Propulsion Engine in such a manner as to maximize the forward momentum transfer.

Fig 9.3 illustrates an enclosed Lifter Propulsion Engine. To facilitate smooth flow of spent gases, I have added a separator to separate the forward moving ions from the backward moving spent gases.

To ensure a net forward momentum exchange, the forward ion momentum transfer, Mi, to the front of the Lifter, must be greater then the backward spent gas momentum transfer, Mg, to the back of the Lifter.

That is,

$$Mi > Mg \quad (9.15)$$

$$n_{(+)}.m_{(+)}.v_{(+)} > n_{(o)}.m_{(o)}.v_{(o)} \quad (9.16)$$

where $m_{(o)}$ = mass of spent gas

$v_{(o)}$ = velocity of spent gas

$n_{(+)}$ = number of ions used to transfer forward momentum

$n_{(o)}$ = number of spent gas atoms returned

since, $m_{(+)}$ □ $m_{(o)}$

$$n_{(+)}.v_{(+)} > n_{(o)}.v_{(o)} \quad (9.17)$$

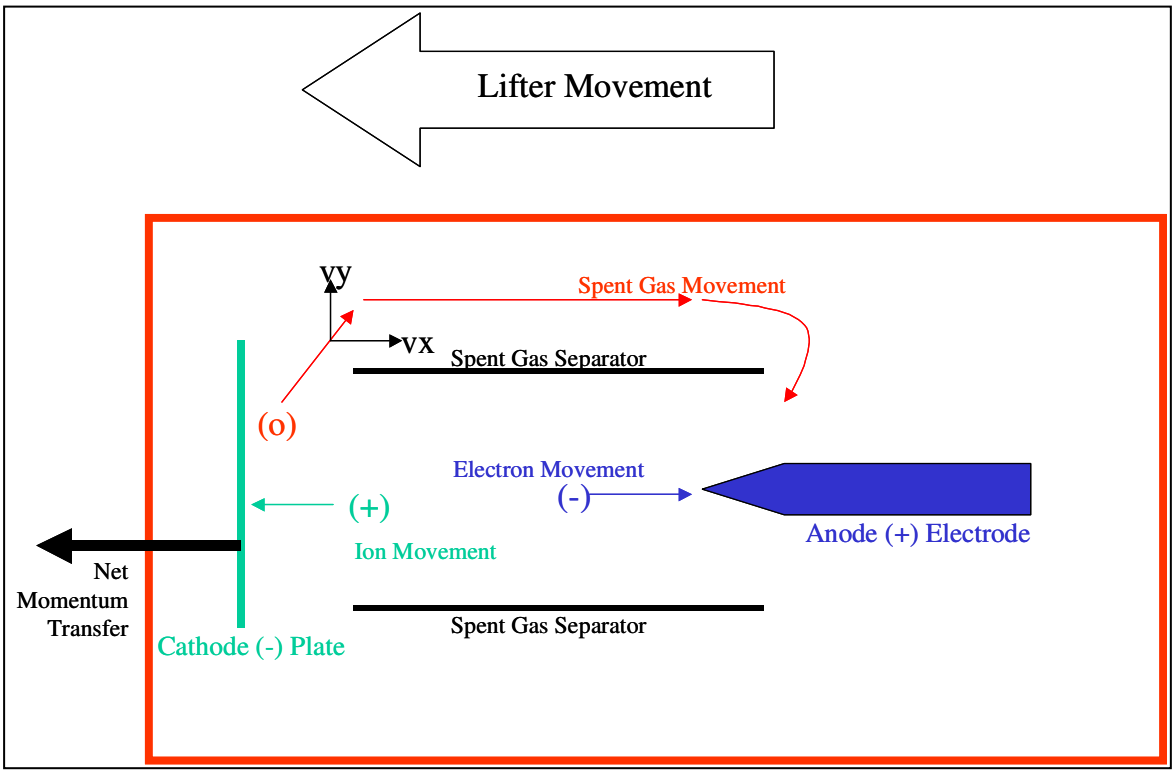

Fig. 9.2: Enclosed Lifter Propulsion Engine

In an open Lifter Engine, the spent gas is not re-circulated, and $n_{(o)}$ is zero. To keep the enclosed Lifter Engine operating, the rate of forward flow of ions has to be equal to the rate of backward flow of the spent gases.

$$n_{(+)} = n_{(o)} \qquad (9.18)$$

Therefore, the net momentum exchange, Mc, for an enclosed Lifter is,

$$Mc = Mi - Mg \qquad (9.19)$$

$$= n_{(+)}.m_{(+)}.v_{(+)} - n_{(o)}.m_{(o)}.v_{(o)}$$

$$Mc \;\square\; n_{(+)}.m_{(o)}.\{v_{(+)} - v_{(o)}\} \qquad (9.20)$$

The Lifter is most effective when the velocity of the returning gases is close to zero. The Space Propulsion Lifter Engine should be optimized to minimize the velocity of returning spent gases, in relation to the moving Lifter. Two modifications are required. First, the cathode has to be "soft", to minimize or eliminate ion bounce. Second, spent gas return has to be effected by Brownian motion.

9.5 Conclusion

Admittedly, the mechanics presented is simplistic, but it does provide an approach to deriving a Space Propulsion Lifter Technology.

9.6 Bibliography

1. http://jnaudin.free.fr/lifters/main.htm/
2. http://www.Xprize.org/

Part 4: Technology Management

Reaching The Stars:
The Interstellar Space Exploration Technology Initiative (iSETI) Report

Date: 08/25/2003

Benjamin Thomas Solomon
ISBN 0-9720116-3-3
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10. Breaking The Rules

10.1 Introduction

NASA is the best in the world. However, at the present time, interstellar travel is outside the scope of NASA's endeavours.

10.2 NASA' Breakthrough Propulsion Approach

In 1996 NASA organized the Breakthrough Propulsion Physics (BPP) Consortium. NASA's approach [1] to breakthrough propulsion physics' concepts can be summarized as follows,

1. Technical Challenge 1 - MASS: Discover new propulsion methods that eliminate or dramatically reduce the need for propellant.
2. Technical Challenge 2 - SPEED: Discover how to circumvent existing limits to dramatically reduce transit times.
3. Technical Challenge 3 - ENERGY: Discover fundamentally new modes of onboard energy generation to power these propulsion devices.

A review of this material from their website, http://www.grc.nasa.gov/WWW/bpp/, shows that NASA's approach is primarily that of a filter. NASA filters current ideas, and funds what it considers to be scientifically feasible.

Current Approaches to Breakthrough Propulsion Physics are not Adventurous

Other NASA website are not quite as adventurous in their reach to achieve radical breakthroughs. These NASA centres are more focused on a 10 to 20-year technology development pipeline. This pipeline is primarily based on Newtonian propulsion systems.

10.3 Breaking the Rules

Current Physics will not Deliver Interstellar Travel

One thing is very clear about space travel. Newtonian propulsion systems will not provide the technology for interstellar travel. Interstellar travel is not feasible with present day conventional wisdom. There is no argument there. It is not even a question of viability.

Newtonian propulsion systems are based on Newton's 3rd Law of Motion (N3L), every action has an equal and opposite reaction. All modes of travel, rockets, airplanes, ships, locomotives, cars, and even walking is based on this 3rd Law of Motion.

Given the relativistic effects of near velocity-of-light travel, and the need to journey in less

than a single human lifetime, the energy required to reach the nearest star, Alpha Centuari, which is 4.2 light years away, would be close to infinite.

This 39-word scenario shows us that there are at least two rules we need to either break or bypass. First, Newton's 3rd Law of Motion. Second, and second, relativistic effects of near velocity-of-light travel. This report has shown that both are conceptually possible.

NASA's approach to breakthrough propulsion physics will not deliver interstellar travel within our lifetimes. This is because NASA has a very great need to be accountable to the American taxpayer, and to its astronauts. This need for accountability prevents NASA from breaking the rules of conventional wisdom, and thereby achieving the technology required for interstellar travel.

10.4 Conclusion

If interstellar travel is to be a reality, we have to break the rules of conventional wisdom but remain within the orbit of rigorous logic.

Breakout of Conventional Wisdom

10.5 Bibliography

1. TD15-PLN-015, John H. Glenn Research Centre Baseline, 21000 Brookpark Rd., Cleveland OH 44135 December 4, 2000. Project Plan for Breakthrough Propulsion Physics (BPP) Space Transportation Research Investment Area

11. Creating New Technology Options

11.1 Introduction

This chapter presents a framework for revolutionary technology management concepts required for interstellar travel. Revolutionary technology is different from advanced technology. It is, in a sense very much more than advanced.

11.2 The New Approach – The Objectives

The new approach to revolutionary technology development requires an examination of the needs to accomplish interstellar travel. There are five objectives,

1. Journey Integrity. To be able to complete a round trip to a deep space destination. This requires the ability deliver payloads, humans, to a destination in deep space, and then return this payload to its launch host, possibly Earth.

2. Propulsion Systems Integrity. To have an effective and reliable propulsion system for the round trip. This requires technology deliver the ability to relocate ones position is space in a self-contained manner.

3. Live Systems Integrity. To be able to support life in a manner that is useful to travellers, launch host, and destination host. Human payloads are delivered in a manner such that their lives are meaningful to both the destination host humans, and the launch host humans.

4. Navigation Integrity. To be able to precisely, consistently and repeatedly map where you are coming from, are at, and going to. Space voyagers need to be able to precisely map their position in deep space where solitary unique reference points are crowded out by a mass of stellar patterns.

5. Communications Integrity. To be able to communicate in real time, with your launch host and your destination host. Real time communications in the middle of deep space know as Nowhere.

Each of these objectives is by themselves “obvious”, but as we examine them in the light of interstellar travel, we will find major differences in this approach when compared to NASA’s.

11.3 The New Approach – Concepts Required

The five integrity objectives are dependent upon the realization of six future technology concepts. These concepts are,

1. **Zero Propellant Replenishment (ZPR)**: One cannot afford to be stranded 10 light years away from the nearest star, let alone, a replenishment station. Therefore, interstellar travel is only feasible if Zero Propellant Replenishment is achieved. In the worst-case scenario, we need to ensure that all propulsion needs are self-contained within the spacecraft.

   Technology Approach: Invent new propulsion methods that eliminate the need for propellants. NASA's "involvement" in space sails, various tethered technologies is in recognition of the ZPR problem.

   Technology Required: Ideally a true propellantless propulsion system is required. The real option right now is the Post-Newtonian Propulsion technology. Nuclear propulsion is not it, though it is a good second option.

2. **Unbounded Energy Onboard (UEO)**: For deep space voyages, one cannot afford not to carry several times the energy required to complete the voyage, in case of unforeseen circumstances. This is not feasible with current rocket propulsion technologies.

   Technology Approach: We need to invent/develop new energy sources/ storage that provide unlimited or nearly unlimited energy requirements.

   Technology Required: This we have. It is nuclear power.

3. **Post-Newtonian Propulsion (PNP)**: Deep space travel requires propulsion systems that bypass Newton's 3rd Law of Motion. By using Momentum Exchange Bypass, I suspect one is not tied into the relativistic effects of near velocity-of-light travel. At this point it is sufficient to say that even near velocity-of-light speeds is not fast enough for interstellar travel.

   Technology Approach: We need to paradigm shift away from the concept of momentum exchange. Future propulsions systems need to utilize Momentum Exchange Bypass. This avoids the ZPR problem altogether.

   Technology Required: Invent propulsion systems that can fold spacetime. Post-Newtonian Propulsion Technology presented in this book is the only option, right now.

4. **Trivial Travel Times (TTT)**: If we are to have human civilizations on other planets across the galaxies, we need to be able to transport humans in a manner that does not disrupt their lives. That is, the time to travel between any two destinations in deep space needs to be trivialized.

   Technology Approach: We need to paradigm shift away from the concept of velocity and duration.

   Technology Required: Post-Newtonian Propulsion Technology (PNPT) is the only option right now. PNPT has the potential to travel at near velocity-of-light speeds because it folds spacetime, by altering time dilation. My thought experiments suggest that, with this technology, voyagers will not experience relativistic effects of near velocity-of-light travel speeds.

   Teleportation is the desired technology to trans-locate us across deep space almost instantaneously. In the worst case, the propulsion technology should be able to move us across very large distances in a very shot period of time.

5. **No Unique Reference (NUR)**: For deep space voyages, one cannot afford to be dependent upon solitary unique reference points that will be lost in the mass of stellar patterns. One needs to be able to use the mass of stellar patterns to determine ones position.

   Technology Approach: Invent new navigation systems that eliminate the need for a central point of reference, and is independent of Earth bound communications and references.

   Technology Required: Stellar Fingerprinting. To be able to look at the mass of stars and recognize where we are. This would be achieved through mapping of billions of stars. A simpler strategy would be to use pulsars, as sources of reference, just as GPS uses satellites on Earth.

6. **Bypass Velocity of Light (BVL)**: Communications with a deep space craft is not feasible at the velocity of light.

   Technology Approach: Deep space voyages require us to invent technologies that bypass the velocity of light. There is no way around this.

Technology Required: Information Teleportation (for the want of a better term). A team of physicists, led by the Malaysian-born Australian scientist, Dr. Ping Koy Lam, at the Australian National University (ANU) announced [1] they had successfully disembodied a laser beam in one location and rebuilt it in a different spot about one meter away in the blink of an eye. Dr. Ping Koy Lam is definitely on tract to realizing this technology if this disembodiment process occurred at greater than the equivalent velocity of light.

On the other hand, if zero-point particles exist, then zero-point photons will be the basis for this technology.

11.4 Conclusion

Table 11.1 shows how the technology objectives are linked to the technology concepts, and how these concepts can be achieved. Note right now only one technology concept, Trivial Travel Times, is unknown. We are closer to interstellar travel than we thought possible.

Objectives	Concepts	State of Technology
Journey Integrity	Post-Newtonian Propulsion	Feasible - Experimental Devices (BTS)
	Zero Propellant Replenishment	Feasible – NASA/Air Force/Navy
	Unbounded Energy Onboard	Available – Nuclear - NASA/Navy
Propulsion Systems Integrity	Post-Newtonian Propulsion	Feasible - Experimental Devices (BTS)
Live Systems Integrity	Trivial Travel Times	Unknown
Navigation Integrity	No Unique Reference	Feasible – NASA/Air Force/Navy
Communications Integrity	Photon Teleportation	Feasible – Australian National University

Table 11.1: Interstellar Technology Objectives and Concepts

11.4 Bibliography

1. CNN, "Australian scientists claim teleporting success", June 17, 2002 Posted: 6:53 PM EDT (2253 GMT)

12. Technology Sensitivity Analysis

12.1 Introduction

This chapter uses technology sensitivity analysis to illustrate how we need to change our priorities to have a successful interstellar space exploration program.

12.2 Current Technology

Current technology is defined as the proven Newtonian technology that has enabled NASA land men on the Moon. Relative to the size of the Universe, this technology provides low speed/short distance propulsion systems.

Figure 12.1, depicts the linkages between current technology objectives and concepts. There are only three linkages vital to success,

Current Technology only has 3 Critical Linkages

1. Journey Integrity and Propulsion Systems Integrity.
2. Journey Integrity and Live Systems Integrity.

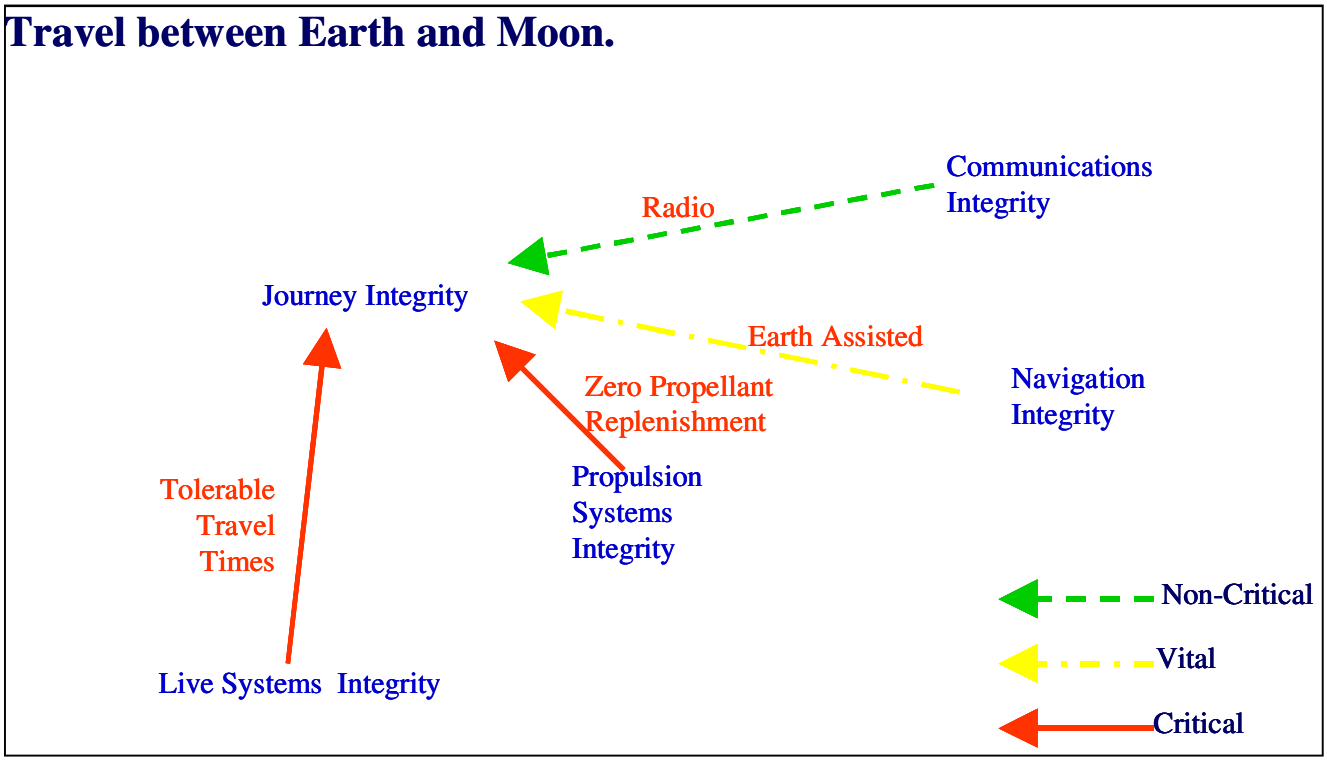


Fig. 12.1: Technology Linkage for Low Speed / Short Distance Space Travel

3. Journey Integrity and Navigation Integrity.

With the Apollo Space Program, the linkage between Communications Integrity and Journey Integrity was non-critical, because humans and computers onboard could survive the trip without communications with Earth. However, if any of the other linkages failed it would jeopardize the mission.

These two week missions, had Tolerable Travel Times, and Live Systems Integrity was primarily designed for two week missions, should there have been a significant extension of this duration, Live Systems Integrity would fail catastrophically.

12.3 Advanced Technology

Figure 12.2, depicts the advanced technology linkages, with Newtonian propulsion systems for travel beyond the Moon, reflecting NASA's current and immediate future programs. There are 5 critical technology linkages, up from 3. This increase in the technology linkages explains why NASA's programs have become significantly more expensive, compared to its Apollo programs.

Advanced Technology has 5 Critical Linkages

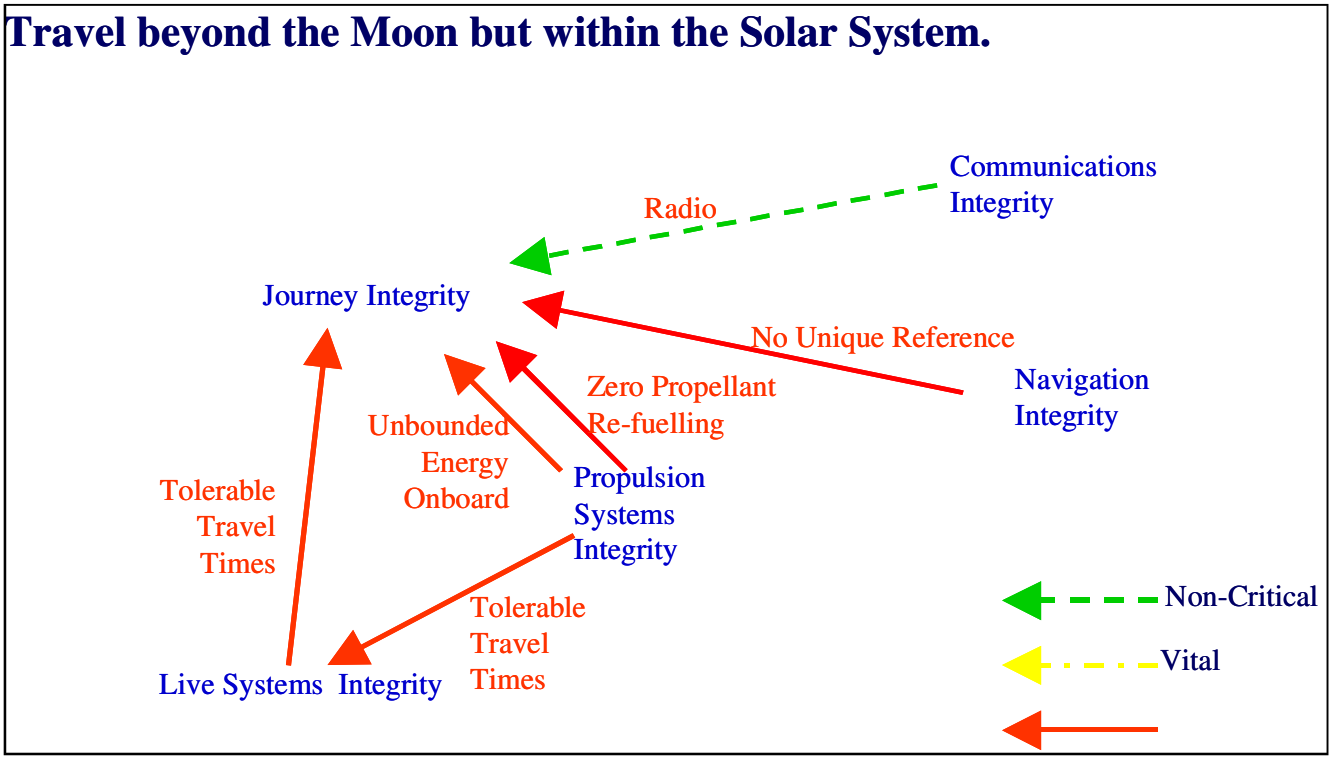


Fig. 12.2: Technology Linkage for Short Duration / Medium Distance Space Travel

Two linkages, Unbounded Energy Onboard and Tolerable Travel Times, have not been solved from a human payload perspective. Further, we see that Propulsion Systems Integrity is a key element towards Live Systems Integrity. This is because Tolerable Travel Times are constrained by propulsion technology, and there is a finite amount of time to catastrophic failure of Live Systems Integrity.

12.4 Future Technology

Figure 12.3, depicts the future technology linkages for travel beyond the Solar System. The most significant change is in Propulsion Systems Integrity and Navigation Integrity. They have merged. That is Navigation Integrity is Propulsion Systems Integrity. Propulsions systems of the future are navigation systems that are able to relocate voyagers to their destinations.

Future Technology only has 2 Critical Linkages

In total, there are at most, three technology linkages, implying that space exploration costs will be significantly reduced. Note the relationship between Live Systems Integrity and Propulsion Systems Integrity is different from that of Current Technology (Fig 12.1) and Advanced Technology (Fig. 12.2), driving costs down even more. In Current and Advanced

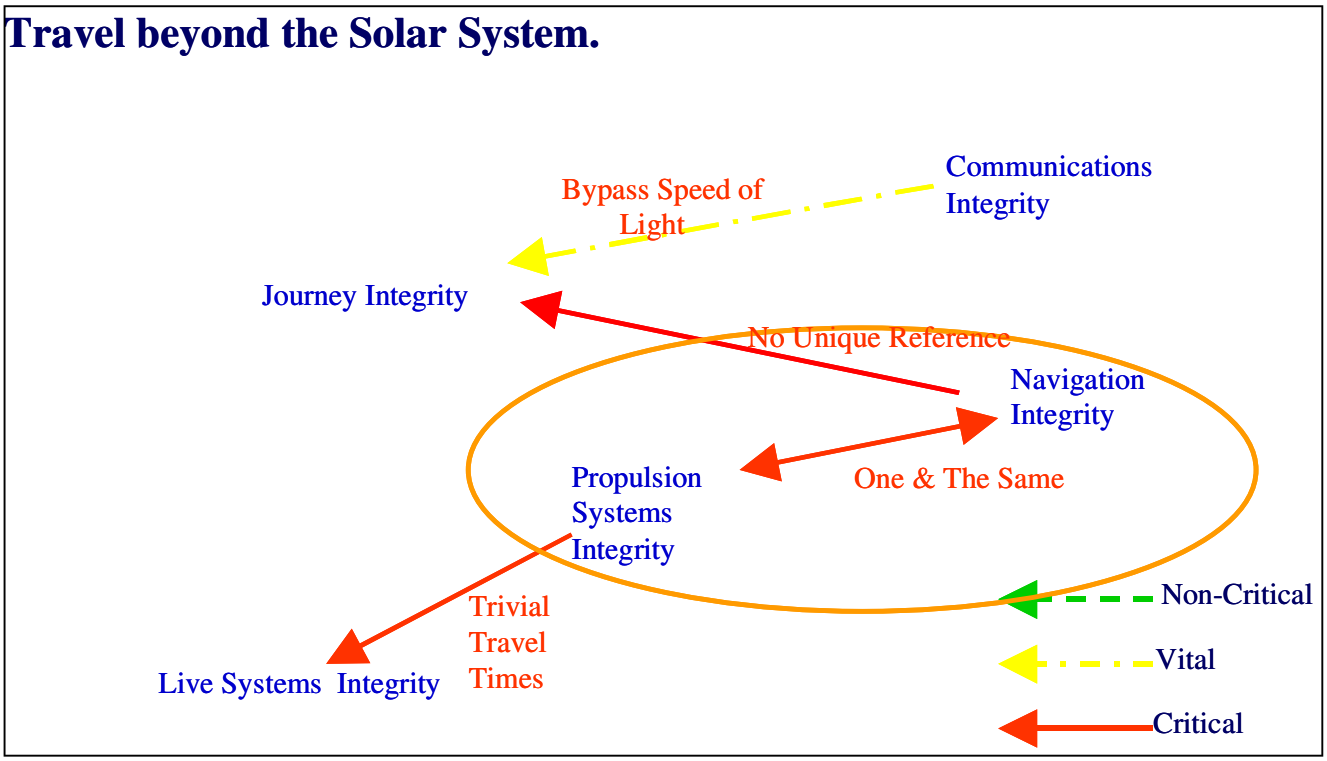


Fig. 12.3: Technology Linkage for Short Duration / Long Distance Space Travel

Technology, Propulsion Systems Integrity requires a long working life of Live Systems Integrity implementation. In Future Technology (Fig. 12.3) Propulsion Systems Integrity provides very short travel times, probably in the region of several hours, and therefore, allows for significantly less expensive implementation of Live Systems Integrity.

12.5 Conclusion

This chapter illustrates the importance of Propulsion Systems in achieving low cost space exploration. Propulsion system is the single most important factor for deep space exploration.

Technology Solving Sequence is Critical

There are two types of problems that can be solved, the Advanced Technology problem, and the Future Technology problem. The sequence in finding solutions can significantly affect costs. Solving the Advance Technology problem addresses Solar System bound travel, but does not solve the Interstellar travel problem. However, solving the Future Technology problem, solves both Solar System travel and Interstellar travel.

Unfortunately, given the available science, NASA's approach has been the opposite, to solve Solar System travel, and then figure out how to go beyond the Solar System. This approach adds to the number of problems (and costs) that needs to be solved in order to be successful.

13. Future Spacecraft Designs

13.1 Introduction

This chapter uses an understanding of PNPT technology to determine the shape of future spacecraft.

13.2 Technology Determines Shape

Technology Determines Shape

Rocket technology determines the shape of the spacecraft. Newtonian propulsion technology dictates that a launch vehicle has to be aerodynamic and cylindrical in shape if it is to thrust itself into orbit. (See Fig. 13.1) This, however, is not the shape of future technology.

Fig. 13.2 depicts an artist's conception of NASA's Ion Propulsion spacecraft. Unfortunately, since it is based on Newtonian propulsion technology, this too, is not the shape of the future.

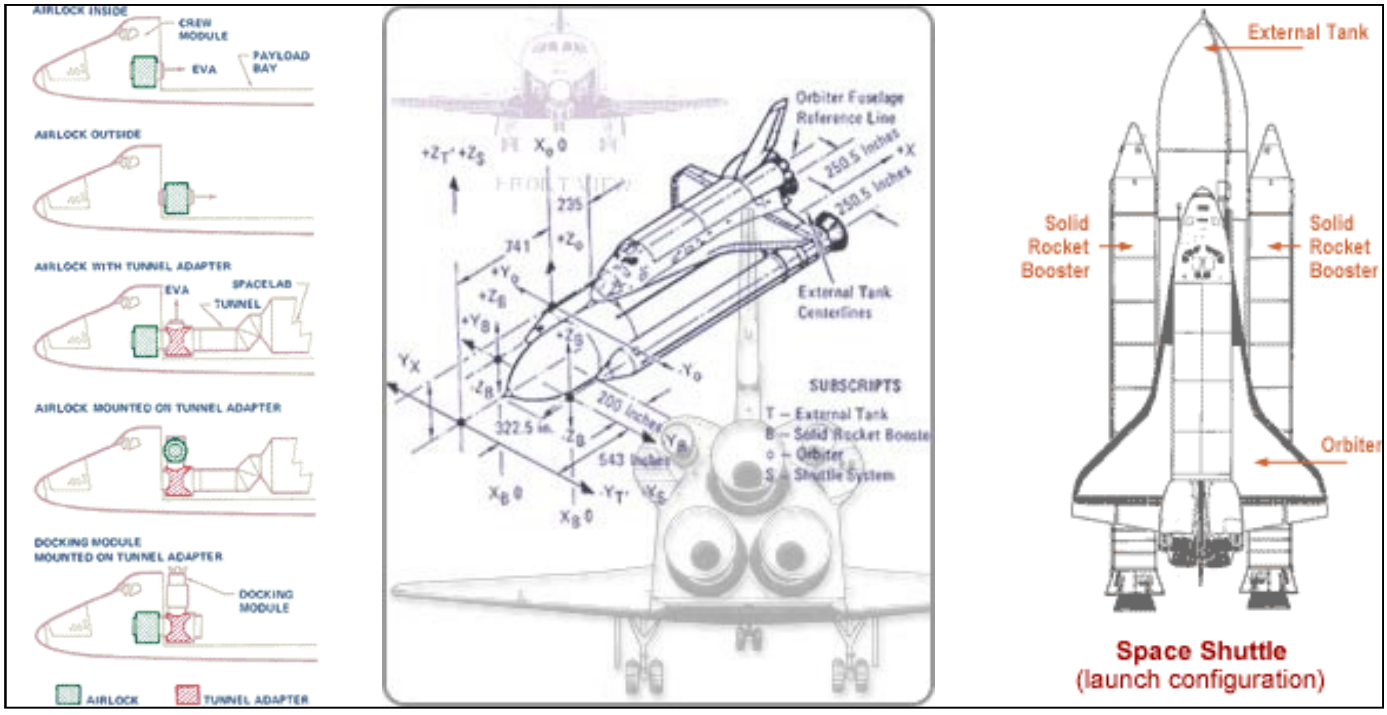


Fig. 13.1: NASA's Space Shuttle [1]

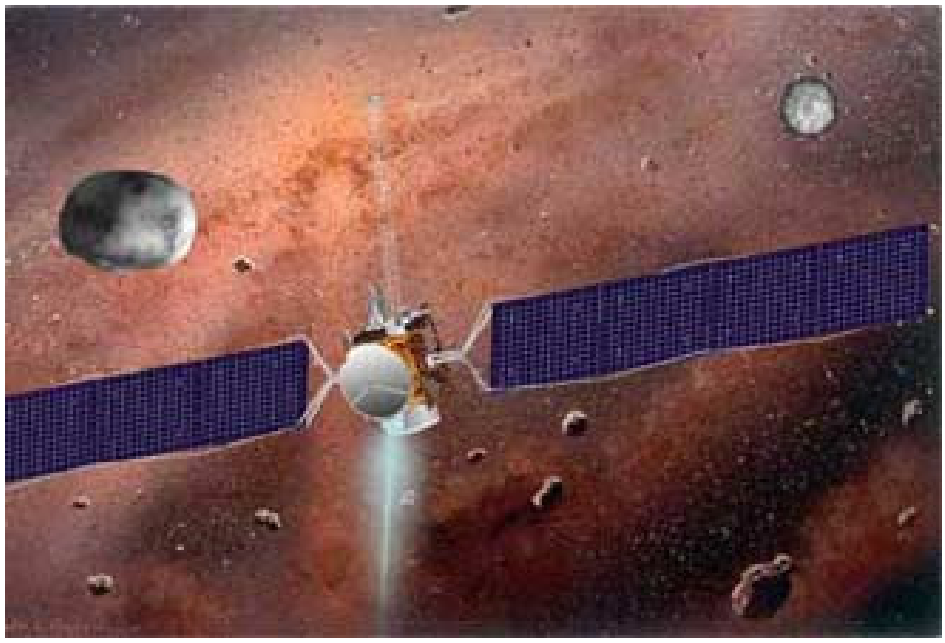
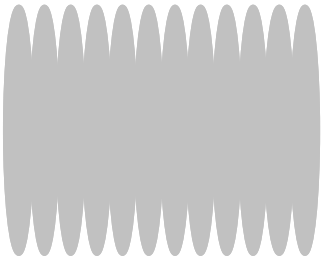
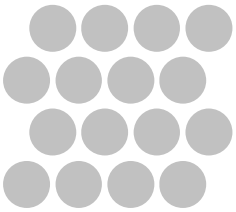


Fig. 13.2: Artist Conception of NASA's Ion Propulsion Spacecrafts [2]

1. Silicon wafers can be laid out in two compact formats.



Tubular format, back to back, suggesting an engine design that is cylindrical.



Flat format, side by side, suggesting an engine design that is part of the spacecraft "floor".

Fig. 13.3: Two PNPT Engine Formats

13.3 Future Shapes

It is envisioned that the future Post Newtonian Propulsion Technology device will be implemented as a silicon chip. Therefore, two engine shapes providing the most compact format (See Fig. 13.3) for implementation are,

1. Cylindrical format. The silicon wafers are placed back to back to form a solid cylinder.

2. Flat format. The silicon wafers are placed side by side to form a flat surface.

Maximize the Field Effect

Another consideration is the need to maximize the field effects produced by the PNPT propulsion system. Since the field emanates from the silicon wafers, logic dictates that these wafers have to be within the spacecraft and as close to the centre of the spacecraft as possible. This is feasible, as the technology does not expel propellants. See Fig. 13.4. This suggest that Star Trek's Enterprise design is not correct, as the propulsion engines are external, too far apart and too far back. See Fig. 13.5.

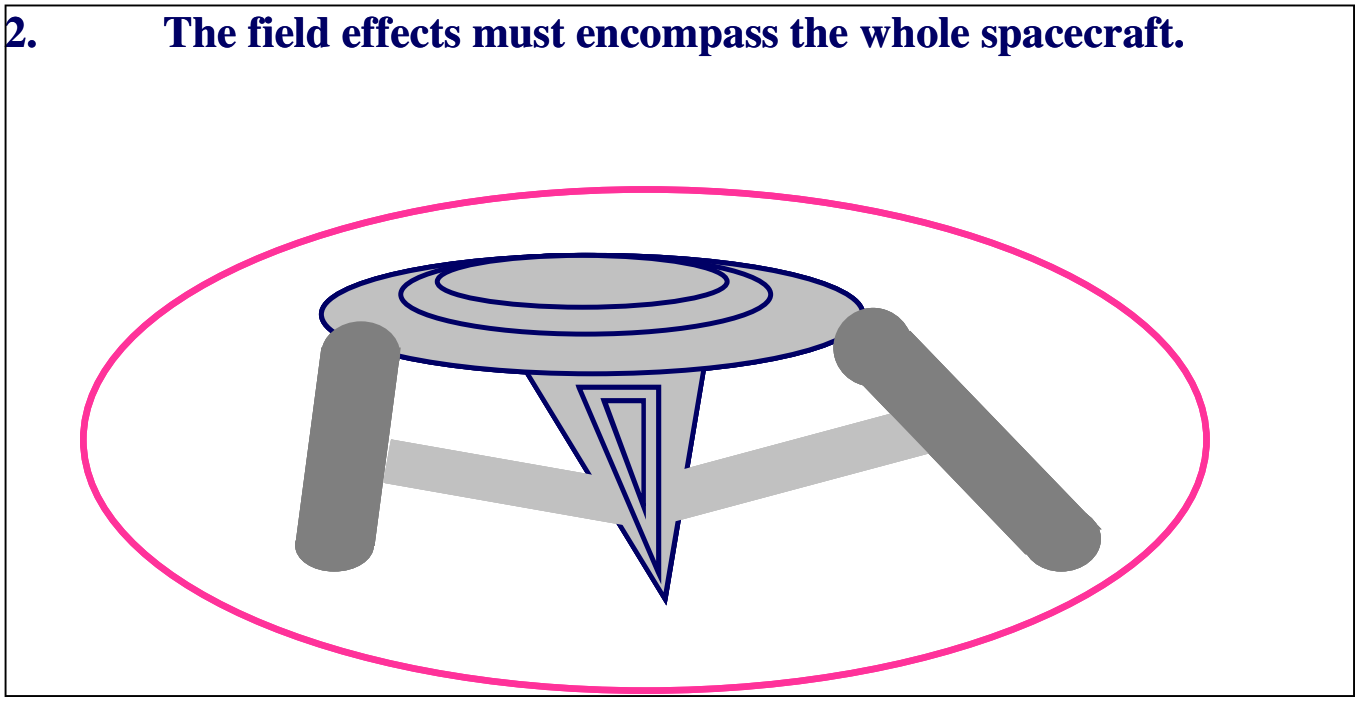


Fig. 13.4: The Field Effect Must Encompass the Entire Spacecraft

Star Trek Enterprise: Not a likely design as the engines are, too far apart & far back for the field effects to encompass the whole spacecraft in an optimal manner.

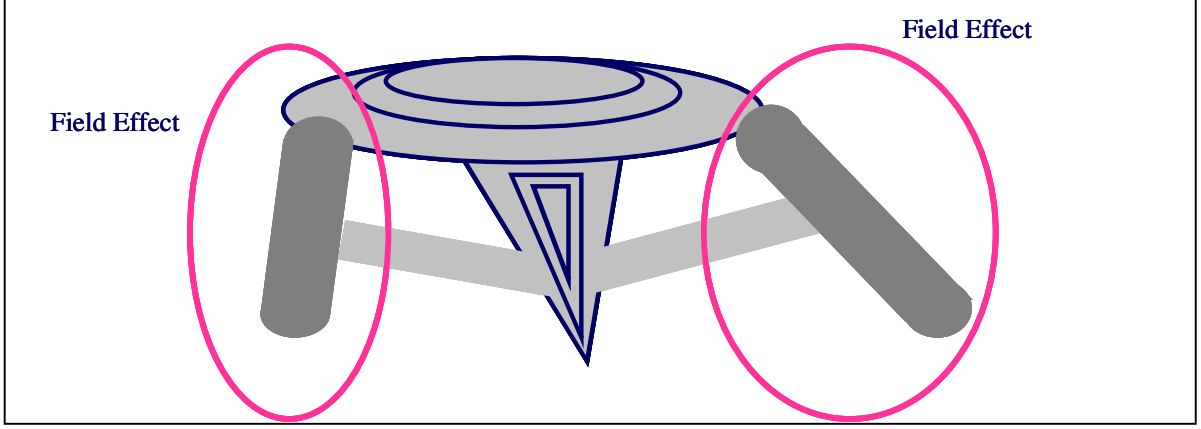


Fig. 13.5: Incorrect Propulsion Systems Location

To maximize the field effects, the propulsion system has to be within and center of the spacecraft.

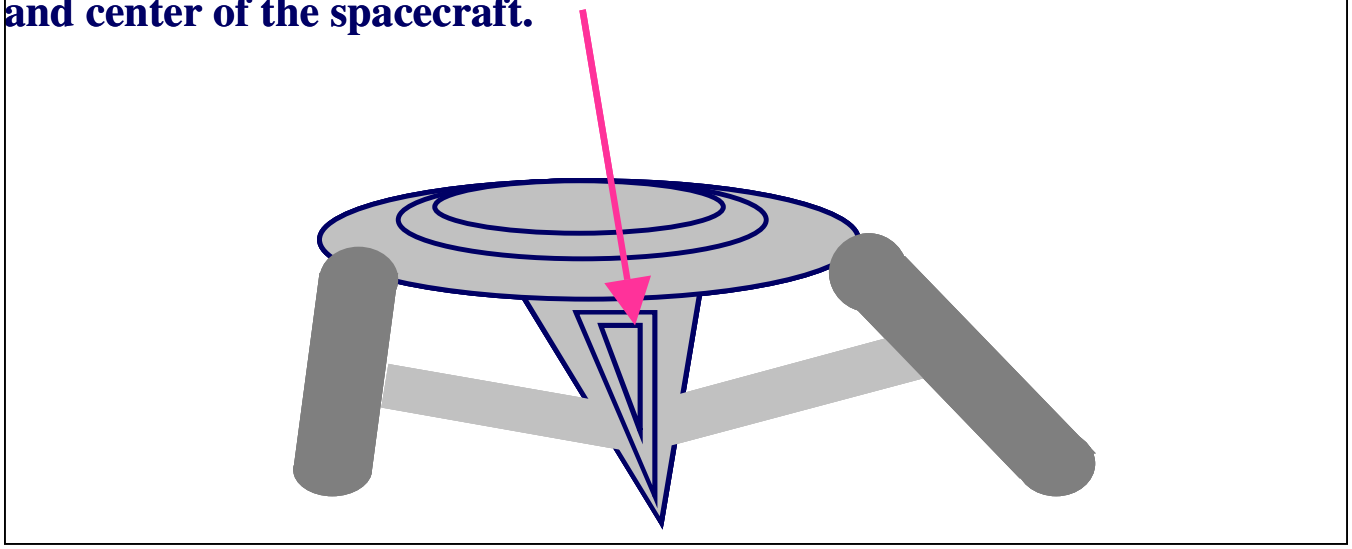


Fig. 13.6: Correct Propulsion Systems Location

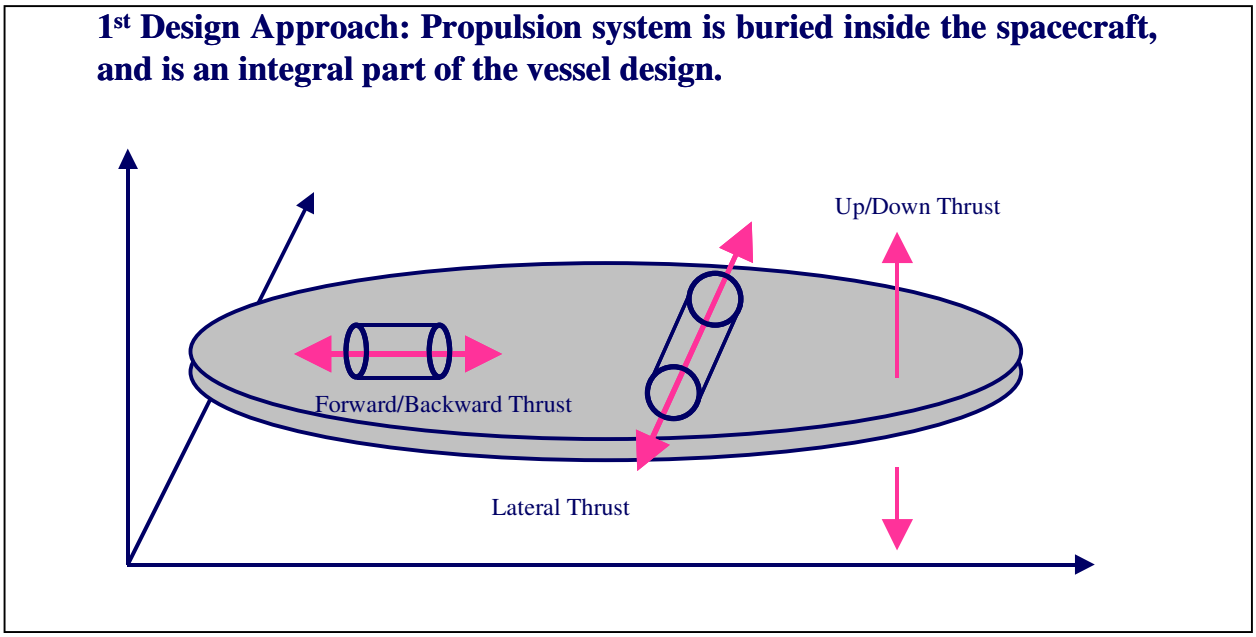


Fig. 13.7: PNPT Propulsion Systems Layout, First Design Approach

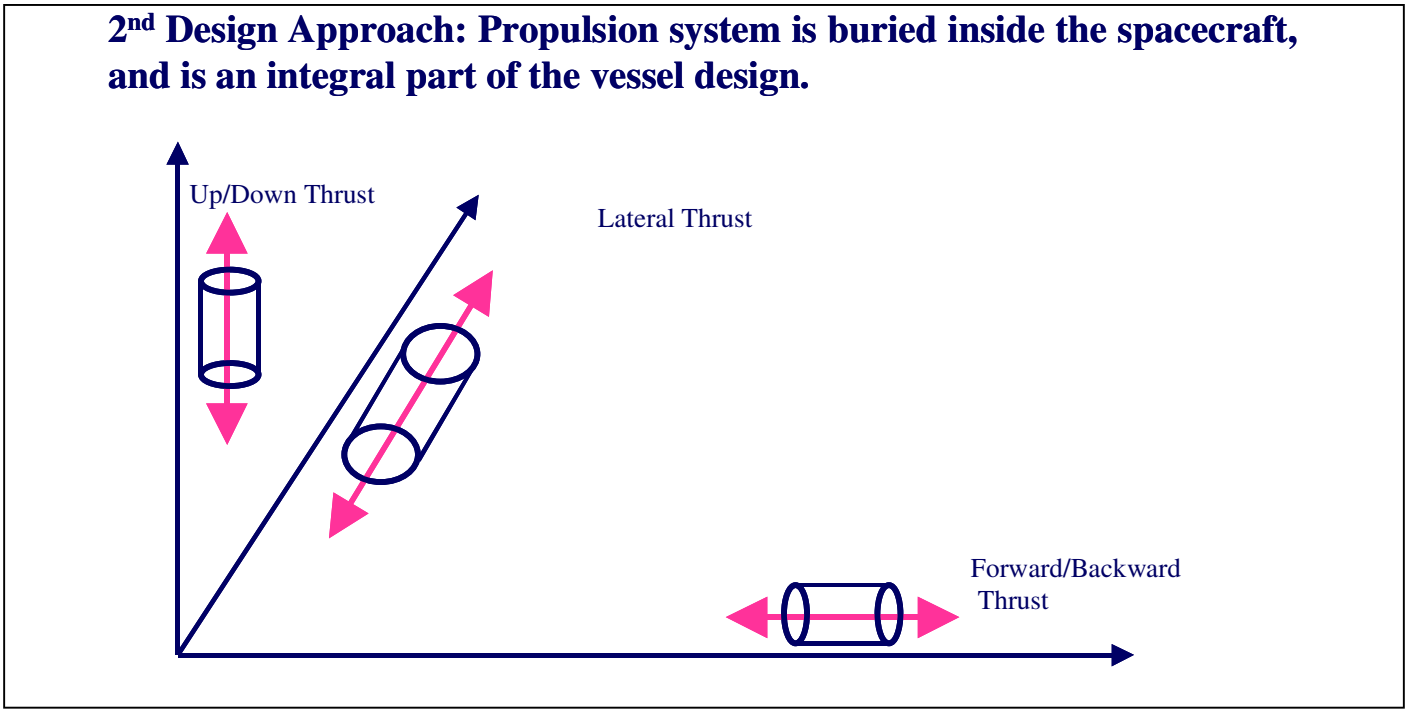


Fig. 13.8: PNPT Propulsion Systems Layout, Second Design Approach

These engine shapes determine the layout of the PNPT engines within a spacecraft. There are two possible compact configurations. See Fig. 13.7 & 13.8. This in turn determines the overall shape of the future technology spacecraft. See Fig. 13.9. The future shape of spacecrafts will be saucer shaped.

Saucer Shaped

13.4 Conclusion

In conclusion the Space Program needs to drive Science, and not Science drive the Space Program.

13.5 Bibliography

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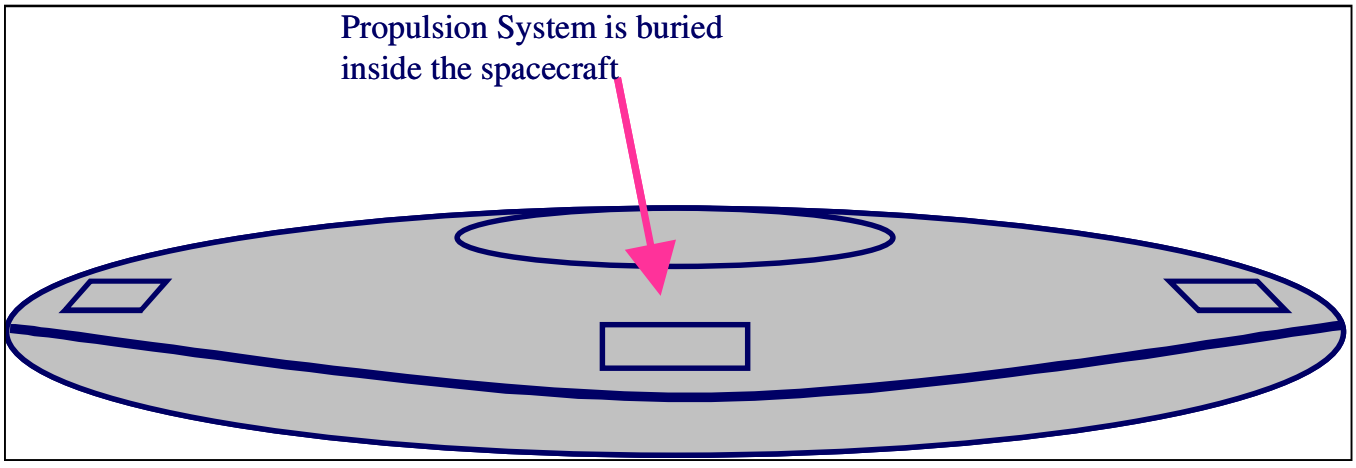

Fig. 13.9: First Design Approach Dictates a Saucer Shaped Spacecraft

Part 5: Conclusion

Reaching The Stars:
The Interstellar Space Exploration Technology Initiative (iSETI) Report

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14. Summary

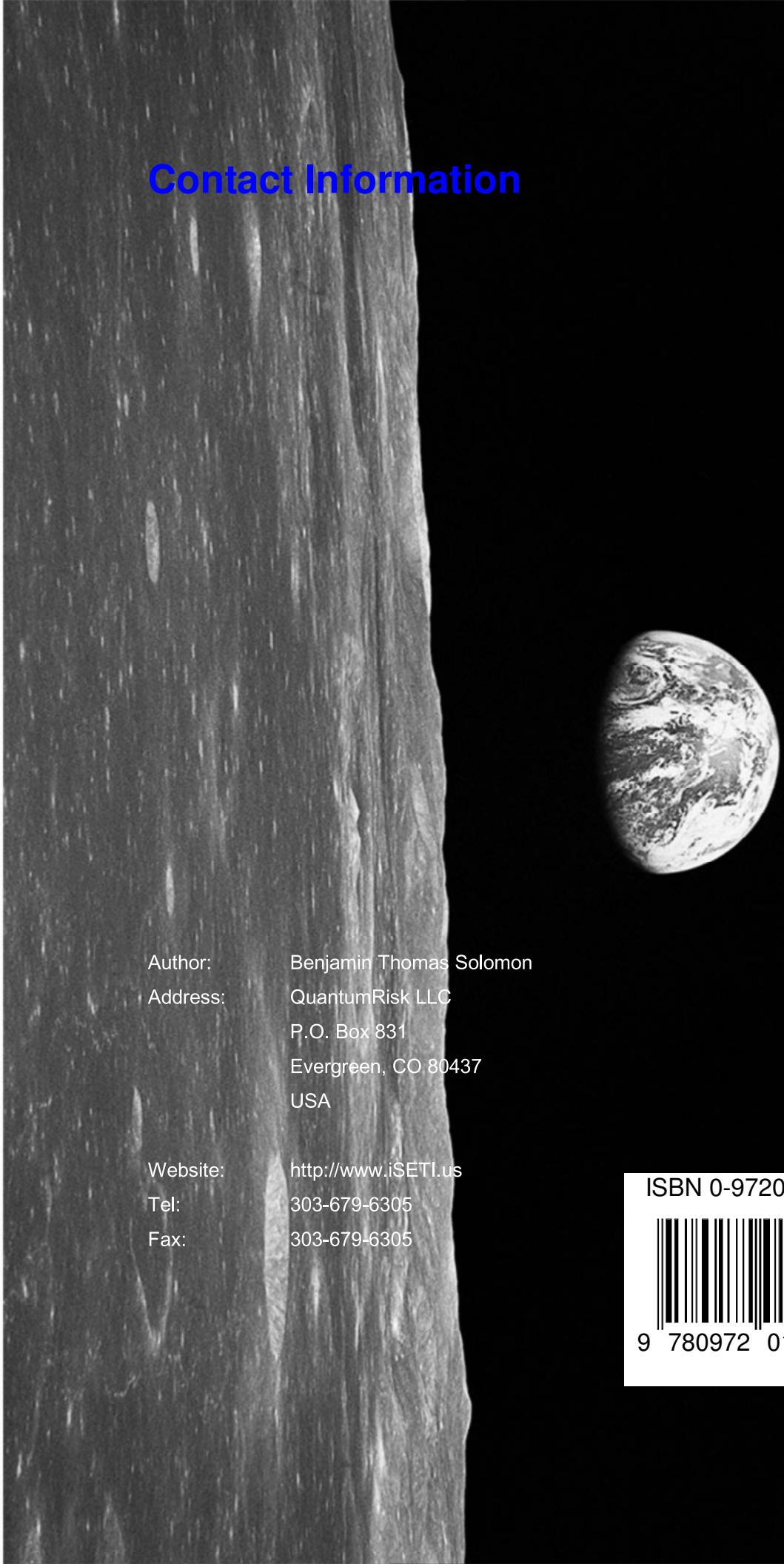
14.1 Summary

This Interstellar Space Exploration Technology Initiative Report has proposed many changes to how we manage technology. These can be summarized as follows

1. The scientific filters we need to embrace are:
    a. Any Special Theory of Relativity derived hypothesis is incorrect if it allows for velocities greater then the speed of light.
    b. Any hypothesis that allows for time travel is incorrect.
    c. Any future hypothesis must pass the Multi-Scenario Tests.
2. The scientific paradigms we need to embrace are:
    a. Any hypothesis that does not recognize gravity as a virtual field is too narrow in scope to deliver the space propulsion technologies of the future.
    b. Momentum Exchange Bypass.
    c. Develop hypotheses that allow for “faster than light” travel.
    d. Spacetime is not the same as the observed spacetime grid.
3. Business & technological paradigms we need to embrace:
    a. Use field effects only, to deliver propulsion systems.
    b. Develop translocation technologies.
    c. Substantial restructuring of the US Launch Industry.
    d. NASA needs to be restructured as it has lost its 30-year lead to even countries like China.

If we are to be a space faring civilization, we need the courage to take the risk, to develop the new theories and technologies that will get us to the stars and back.

Contact Information



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