Essay

Why so Long?

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Abstract

Fifty years ago, I led a group of spirited High School students to consider a range of topics involving advanced technology including the working principles that propel UFOs (should they exist), alternate sources of power generation, and so on. The physical sciences have progressed considerably since then, yet most professional scientists lack the understanding to answer the questions we pondered. I know from attending their lectures that some of the world's brightest and best thinkers have all of the tools needed to understand these things, and may have put many of the pieces in place already – to solve those foundational problems. But to my disappointment, there are no flying cars that require no fossil fuels to operate quite yet. So in this paper I will share some basic insights on progress toward solving the problems we considered 50 years ago, using mainly material available in textbooks from that timeframe.

Keywords: Propulsion, power generation, advanced technology, UFO technology, spacecraft.

1. Introduction

I was an avid Science student in High School and I especially loved Physics. It was my wonderful vehicle to explore fully the inner workings of the cosmos, and I pursued it avidly. I had some early success ending the year at or near the top of class, but there were many bright students who outclassed me at that time and knew more than I did. So when they made me president of the Science club, I exploited the opportunity to explore some difficult Physics questions and other perplexing things I was hearing about at the time. I also enjoyed reading Science Fiction. A friend in the club loaned me a copy of *Analog*[1] magazine wondering what I would think about an article involving UFOs and their possible means of propulsion. I read Arthur Eddington's book "Space, Time, and Gravitation[2]" in that same timeframe, so my thoughts immediately went to questions about how one might modify the force of gravity and so on. But it didn't stop there. I had also been reading about magneto-hydrodynamics, plasma torches, and ion drives, as well.

As you might imagine, when they asked me for ideas about what we might ponder, these lines of inquiry were suggested to the Science club. We called ourselves S.O.L.V.E. After a long period of brainstorming we formulated a game plan and delved deeper into the questions above and

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more. We calculated de Broglie wavelengths for objects of various masses and different velocities, and the equivalent frequency. We found the gravitational radii (which is the Schwarzschild radius for a black hole) for both large and small masses, and their half-wave frequencies as well. Then we did experiments involving electrically-induced plasmas and magneto-hydrodynamics, with mixed results. Then by the time our glass plasma chamber cracked, the school year was at an end and we could do no more.

S.O.L.V.E.

Glenn Storrs, Dave Harnett, Mark Hansen, Jon Dickau (Pres.), Don Bender, John Morse—Founder.

Fig. 1. S.O.L.V.E. photo from Arlington High School '74 Yearbook, "Anchors"
(David Baker was an avid participant but is absent from photo, & perhaps others)

Years later, I sit here after attending lectures by some of the world's top scientists, having the opportunity to meet many of them and ask our brightest minds a few probing questions most folks don't get to ask. At this point I still have quite a few difficult questions that can only be answered by these people, so I feel privileged many of my questions were answered by speaking or communicating directly with the originator of a theory or discoverer of an important result. Lingering questions remain, but my time here is limited. What we pondered in High School remains mysterious, even to our best scientists, and I have better answers now. So I set aside concern for the moment to give you my ideas, with care to omit what is dangerous, while making general information available for everybody at once. I have a fairly large collection of graduate-level Physics and Math texts in my personal library, at this point, but most were published in the 70s, 80s, and 90s, so I am well equipped.

Therefore, I can easily write this paper including only information that was available during that era, inserting modern insights as needed but alerting the reader. In this way volatile or sensitive information can be filtered out automatically, without needing to use further discretion. While I do not wish to put matches into the hands of children, it is time for the world to rise above the current state of affairs, which requires me to share some insights I offer in this paper with others, so a young person's dreams can become a reality sooner.

2. Offsetting the Earth's Pull

The primary challenge to space travel is the pull of Earth's gravity. Any attempt to get off the planet's surface requires an offsetting force or a way to modify the effects of gravity, so that modification serves to lessen or cancel its pull. Objects fall with a constant acceleration towards the center of the Earth until they hit its surface. So rising off of that surface requires a rocket to have more thrust than enough to impart that acceleration to the rocket upon take-off. We are in a gravity well and we need to get up and out of that well to reach space. It is no easy task. If we had a better way to accomplish this we would not need rockets to get there, or we might make our rockets fly easier and carry us farther out into space. So what are our options? We need to work with what we have, and that means more than people think.

When I obtained my own copy of the Handbook of Chemistry and Physics, back in High School , I noticed a curious reference which hearkens back to the experiments of Benjamin Franklin. There is a static electric differential between the Earth and the ionosphere, which averages 128 V/m at sea-level over water, but varies from 67 to 317 V/m over land[3], depending on a variety of factors. The reason that old Ben did experiments in a lightning storm was to show that his Leyden jar charged up faster, and perhaps to inject a bit of showmanship. It is not essential that energy extraction takes place during a storm, but I have seen only a handful of articles describing that charge differential being put to use.

Of course if you are supplying rather than extracting energy, a correctly designed craft might exploit that feature of the Earth's electric field. The biggest challenge is to assure your craft does not tip over, or arc over, once a sufficient field strength is achieved. One might need powerful gyroscopes and specially engineered materials to get the job done. But it appears to be doable with modern technology, and might have been accomplished by well-funded clever people 50 years ago. Nicola Tesla worked on this idea years before that, with some reported success. But I am sure Tesla knew more about electric fields around the Earth than most scientists today, including the curious result of Benjamin Franklin and its significance.

I am guessing the latter part of that statement is most important to highlight. Learning facts about the planet or the laws of Physics is of little value, unless you understand the significance they have and consider how a particular fact or datum gives you insights into the broader implications. Physics does not happen in a vacuum because there are no isolated systems and everything is connected to its background. So any vital statistic tells you something about the nature of the Earth or the larger cosmos. If our goal is to reach for the cosmos; we must be mindful of the background conditions we operate in. For example, as any craft ascends it must cross through different layers of the atmosphere[4], and for each layer prevailing conditions change. But if we needed rockets only once we reach the edge of space, it would be a game-changer in terms of facilitating human space exploration.

One of the ideas we tossed about back in High School was the notion that specific frequencies are associated with moving objects of a particular mass, according to their de Broglie wavelength, and whether it is possible to calculate frequencies of electro-magnetic energy that would move a craft away from the Earth – lifting it – given other known factors or statistics, but we did not get very far. Nor could we have known about the Unruh effect[5], which was only discovered a few years after we graduated. But we were on the right track calculating gravitational radii and their associated frequencies. The gravitational radius of a Schwarzschild black hole is its event horizon and how the apparent temperature of the event horizon changes with an observer's relative acceleration, and this defines the Unruh effect. So the important facts were on the table around 50 years ago. I am not saying we had nothing to learn to crack the problem, but we did work out how to set up the problem and later obtain a robust solution.

I am confident that someone somewhere has figured this out before now, but it is not common knowledge it is even possible. In my opinion; there is no need to violate any of the known laws of Physics to construct electric-powered craft that do not need conventional thrust to get off of the ground. The problems lie more in the area of materials and a power supply well-suited to the task. There are challenges in Materials Science to make the material lightweight enough but strong enough and deliver both DC and AC power where it is needed, while insulating elsewhere, and new power generation schemes with enough punch to get a spacecraft off the ground, and still be lightweight as well.

The materials used now for commercial aircraft and even spacecraft are not well-suited for building craft that could rise to the edge of space using electrostatic or electro-magnetic propulsion systems. We need materials that are both ultra-light and ultra-strong, while having the electrical characteristics that allow it to be highly-conductive and capable of carrying high current in some areas but insulate and forbid the passage of electricity or EM flux elsewhere on the craft. This is no small feat! Of course it has to be seamless or well sealed, in order to withstand the rigors of space, as well. So there are many tough problems to solve before a full-blown electric spacecraft could be built.

I probably won't see one in my lifetime, but I am confident it can be built and will happen some day – hopefully sooner rather than later. That could usher in a new era of space exploration for humanity by making it cheaper and easier to get there. Of course; other factors like radiation and the constant danger of being hit by micro-meteoroids make it hard to assure the safety of a human being or animal, and any shielding required adds to the payload making it more difficult to get off the ground. So it may be a while before we can talk about using electric technology for everyday people to visit the edge of space on their way to visiting friends on the other side of the globe. However the day is getting closer. Clearly; the engineering and materials design challenges are enormous possibly requiring designer superconductors, portable fusion generators, and other technology we don't have yet and may be years away. But we could develop many of the necessary components in the next decade, with a little effort.

Finally; one other approach we considered back in High School was to use magneto-hydrodynamics in reverse of how it is used in power generation to increase the thrust of a conventional rocket or the exit velocity of the heated or ionized gases. Of course; it would be possible to use the MHD device either to increase velocity or to charge the ship's batteries, by changing only the polarity of the coils. One wants to coast sometimes and pour on the acceleration at others, so this is a useful feature, but a well-designed MHD aided rocket could go farther or get us somewhere with less fuel. And with batteries fully-charged, or solar panels to draw on, one can easily use the same device as a kind of ion drive – so long as the right propellant gas is used which is lightweight and easily ionized. This could greatly extend our reach into deep space by providing a fairly small thrust for a very long time. To be fair, however, batteries tend to be heavy and take up a large amount of space, and solar power dims as we go farther from the Sun. But it is still useful to develop this idea further.

Attaching an MHD device to a rocket adds to the complications and uncertainties of rocketry, plus it has engineering challenges of its own. If it needs to accept the volume and stand the temperature of a rocket's exhaust, it must be very sturdy and well-engineered, but it can't interfere with the operation of the rocket in any way. This means MHD devices could only be used in this manner for the final stage or top leg of a rocket's ascent, and not for any of the earlier stages where an extra boost might be nice. So it might not help so much getting into orbit, or to the moon, but it could cut our flight times to Mars by a fair amount. That means this technology deserves to be examined as a way to extend our reach in outer space.

3. Closing Remarks

To be honest, I figure that lots of young people must have explored similar questions by now, and I thought that professional scientists would have figured out more of the answers before now. The other young people who were in the room with me back in High School are as old as I am, assuming they have survived. But to the best of my knowledge I am the only one for whom those questions became a burning passion over time, who took some of the questions that arise from studying such thing to the top experts. I have met a lot of bright young people as well as some of the world's best elder scholars, but I trust the elders more. The fact it takes so long to become proficient in any one discipline in the subject of Physics means few get a chance to explore even one branch well before they need to focus on their area of specialization in order to make a living. And the lack of a more encompassing or comprehensive view of Physics is what holds us back.

Students here in America seldom have the option to elect a complementary subject for a second advanced degree, but instead must be content to specialize more and more, to pay the bills. In Europe the tradition of habilitation is still strong, though not as pervasive in academia as it once was. The cost of higher education is a difficult burden for most students to bear, and that makes it hard to focus on their studies without concern for everyday needs. To be fair I am glad I took a shortcut by presenting my work at conferences. Even the least skilled or qualified presenters get to attend the lectures of top experts, ask them questions, plus compare notes with their peers – those still working toward expert status. I often wish I stayed in school longer, studied harder, and learned more when I was there. Even today; too many questions that I and many others pondered 50 years ago remain unanswered. We need to know those answers already.

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