We started with gunpowder sticks whizzing around the air scaring off enemies in china and now we have a 418 000kg giant hunk of metal whizzing around the earth at Mach 23! How crazy is that? Satellites are one of the pinnacles of human achievement. The technological marvels that constantly fall towards earth but miss every time. Enriching our lives by providing new ways to communicate, predict weather phenomena like magic and even spy on each other. They do all these things, but there's so much more that they're capable of and I'm not going to wait around for someone or some organization to make better use of them… I'm going to do it myself. Let me tell you how.

I've always been passionate about space. I spent the better half of this year developing a solid rocket booster that won my school first place at the Lebone STEM derby in South Africa. It was a big moment for me and a huge surprise considering that it only flew vertically about 15m and blew up most of the time! But it started a fire in me that I couldn't put out even if I tried. You can find my work here: https://www.youtube.com/channel/UCw7tr0H7ckkqUdhyxBfIvNQ/videos

or on the included flash drive

I've also created and registered a company in Botswana. The African International Agency for Aerospace Research and Development (or AIAARD for short). Its part of my long-term plan for Africa to have a significant and eventually dominating presence in space. We're going to send men and women to the moon and then to mars, then Pluto, then a couple of trips to Alpha Centauri, establish the first mining colony in space and develop the first intergalactic internet (Galanet v1.0 (we've actually started working on it)). And while we're currently only a team of 3 with my mom as our secretary and our headquarters in my study I'm hellbent on realizing this dream.

Okay Tanaka, that's great and all but what about that masterplan you have for satellites? I'm glad you asked. Now there's currently about 8 major uses of satellites. These include but are not limited to: Astronomy, Atmospheric studies, communications, Navigation, Reconnaissance, Remote sensing, Search and rescue, space exploration (my favorite) and weather monitoring. These areas are pretty well saturated. One of the potential applications AIAARD is interested in is using satellites as refueling stations to help get space ships further into… well… space. The space shuttle used about 780000kg of solid and liquid rocket propellant to carry a 22700kg payload to orbit. It ran out of fuel as it reached orbit so obviously the next logical phase would be to have it refuel in orbit if you want to go any further with a massive payload of say 50 people going to another planet in any reasonable amount of time. Preforming this maneuver and deploying a propellant depot would be tricky but it has been done before on a small scale. A facility much larger than the international space station would have to be built and in the case of using methane as fuel, a process like the Sabatier reaction would need to be perfected in space. Achieving the desired temperature of around 300 degrees Celsius shouldn't be too difficult as orbital temperatures are known to reach upwards of 120 degrees Celsius. Reflectors can be used to increase the intensity up to the desired 300. The size of said facility shouldn't be an issue either, we could make it

as tall and as wide as the Burj Khalifa and have it safely orbit earth. The moon is way bigger than the Burj Khalifa and its never come crashing down on earth. Getting the refueling satellite and raw materials into space can be done much like the ISS. Piece by piece with several rocket launches over time. As well as being essentially a gas station, these outposts can serve as launch points outright for future mission into the unknown.

Another untouched application that AIAARD aims to pioneer is the use of giant laser death rays! Satellites have a unique vantage point being so high up above the earth. You only need 3 satellites in strategic orbits at a time to effectively 'see' all of earth at once. Mount a powerful solar powered laser on each of them and you have the world's fastest and most accurate defense system. Now, most of the energy dissipated in a laser is wasted as heat and the intensity of the beam drastically reduces with an increase in distance to the target, because of this, for the laser to be even a little bit effective it would probably need to produce a beam on the order of gigawatts which would in turn produce heat energy equivalent to that of 500 tons of TNT exploding per second. Obviously, this would destroy the satellite. So, it seems that this idea is fundamentally flawed buy hey, the Wright brothers would have never guessed that less than 70 years after they invented manned flight would man be on the moon so with the advent of new technology its possible that this could one day see the light of day. An alternative to firing lasers would be to launch missiles from satellites. This is a more realistic approach to weaponized satellites and while it is still very expensive, it can prove to be invaluable to a countries defense and isn't impossible to implement even now. Again, missiles and be carried to launch sites in space on existing rockets (and in the near future AIAARD rockets) and be kept dormant until they are required.

Global warming is the bane of mother earths existence. Caused or at the very least accelerated by industrial revolutions worldwide. While many laws are in place globally to combat these changes, it is difficult to crack down on individual factories or industries that ignore these laws and continue to pump millions of excess greenhouse gasses into the atmosphere. This is were satellites can play a crucial role. As stated before, satellites can effectively 'see' all of earth and therefore can be used to monitor the levels of pollutant gasses in the atmosphere and their specific sources. The technology to do this isn't quite there yet which is why this particular application needs a lot of attention. If sensors powerful enough can be built, then this technology can spill over into monitoring other substances like moisture in soil to determine the best place to plant crops in arid regions in Africa or the location of oil and mineral deposits underground which can save surveyors a lot of time.

The nuclear reactor in the sky puts out more than 10 trillion times the power consumed by earth every year. If a satellite that consists of an array of solar panels where to be placed in orbit and beam the energy back to earth it could drastically reduce our reliance on fossil fuels and provide a streamlined, centralized, universal power grid for all of earth. By orbiting the earth in a geostationary orbit, the satellite would always face the same part of earth much like one side of the moon always faces earth and provide a

constant uninterrupted stream of power because there are no atmospheric effects in space like clouds to block out sunlight. Unfortunately, the startup costs for this are astronomically high, projected at $1 trillion in the 1960s but the projected cost today is about a hundredth of that proposed in the 60s and is going to continue to fall. A potential issue of this is that to be effective enough to justify the cost, we would need to put what amounts to giant solar farms in orbit that could be an eyesore.

Now this one is a bit in the realm of science fiction but I'm going to include it anyway. By applying the fundamental law of electromagnetic induction, that is, a conductor moving through a magnetic field induces a current in the conductor and vice versa. If there was a giant hollow halo (made up of coils of wire) in space attached to earth with building sized permanent magnets (acting as satellites due to orbiting earth) orbiting earth in the halo, then their movement (by conversion of their gravitational potential energy) through the coils would produce colossal amounts of electrical energy that could be used on earth. Back of the envelope math puts the production cost at $500 trillion but that's a small price to pay for essentially free energy that would give Tesla a run for his money!

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