Space Industry; Future Giant Leap Investment

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Abstract

We are living in a very interesting time, while Neil Armstrong took a first step on the Moon 1969, mankind is about to take another first step all over again, this time with renewed interest, better technology, and a better vision for the new space industry, new manufacturing possibilities in microgravity, the possibility of colonizing the Moon and Mars, and taking a vacation in Space. The industrialization of Space is the great economic boom of the 21st century, billionaires such as Elon Musk, Richard Branson, Jeff Bezos, and many other industrialists are making big investments to go up there Space, those billionaires know where to invest not just for a show. Also, worth mentioning that former United States President Ronald Regan 1980s once said that the Space we are opening is the way to private enterprise. The primary objective of this research paper is to discuss the future business's opportunities in the Space; space junk industry, asteroid mining, space travel, space tourism or even taking it further to the Moon or Mars, and guide the millennium businesses where to invest their money for this decade and more decades to come.

Keywords — *Space Junk, Asteroid Mining, Space Travel, Moon Colonization, Mars Colonization, Global Space Internet, Space Tourism, Space Force.*

I. INTRODUCTION

With every innovation comes new industries, new economies, new challenges, and businesses' investors are always looking for what comes next. Similarly, with more human explorations to outer Space, a new problem has emerged; the space debris problem which is numerous, hard to track, and dangerous. On the other hand, asteroids contain precious materials; asteroid mining will take years of work by dedicated engineers, scientists, and billions of dollars to extract the first dollars' worth of useful asteroid material. Astrophysicist Neil deGrasse Tyson predicts that the world's first trillionaire will be an asteroid miner.

Going to Space is more than just a better way to make products. Still, other goals, such as extra-terrestrial colonization, are becoming a popular idea, and space tourism has become a fascination of billionaires and dreamers alike. Manufacturing in Space is considered an extraordinary environment with a completely different set of factors that can enable humans to manufacture things that could not manufacture on Earth that have value.

Lastly, the most significant factor for the financial success of a space-based, space-related business, and space assets, is to protect these assets and that would have never happened without centralized command that was led by the United States of America by dedicating a military branch for Space, called "Space Force."

The research paper highlights the most important business opportunities in the Space for the 21st century from global Internet service, space junk industry, and asteroid mining, from space travel and space tourism to terrestrial colonization, also the important role of protecting the space assets.

II. SPACE JUNK

In the early days of the space race, the number one priority was getting stuff up there and preferably before everyone else. For almost sixty years, humanity has launched rockets and spacecraft into Earth's orbit. Still, now thousands of objects from tiny screws and bolts to dead satellites encircle the Earth, transforming the Space above us into a junkyard. It is a risky environment that technology has created because now the Earth's planet is surrounded by this cloud of space debris. Since Sputnik, there have been about 5,000 successful satellite launches, and more than 1300 are in operation today, and all that has come with a few hundred million pieces of trash as well, usually called space debris or space junk. Space debris comes in all sizes, and according to European Space Agency (ESA), there are over 29,000 objects with the size greater than 10 centimeters flying around in Space, 750,000 objects between 1 to 10 centimeters, and over 166,000,000 objects that have a size between one millimeter and one centimeter. The speed of that debris is at least twenty times the speed of a bullet; therefore, even the smallest debris could cause a disaster in Space and be considered a threat to the safety of the astronauts and the safety of the assets, as shown in Fig. 1, [1].

Fig 1: Space Junk

Two-thirds of space junk is close to Earth at Low Earth Orbit (LEO) altitude between 160 km to 2,000 km, and that is where the International Space Station (ISS) lives. NASA maneuvers the ISS to safety by moving out one satellite or another out of harm's way almost every month. The ISS has already been hit by little debris bits on several occasions, and there are no guarantees that other substantial things might not hit it again in the future.

For the record, when it comes to the worst idea in the history of space pollution, perhaps nothing compares to the summer of 1963 when the United States put a ring around Earth. Before the first satellites, fast long-distance communication meant bouncing radio waves off of the high atmosphere, so the Air Force devised a plan to make the largest radio antenna ever. On May 9th, 1963 the project West Ford satellite released 20 kilograms of copper wire above the Earth, it slowly formed a ring of metal between the north and south poles, too small to see with the naked eye, but dense enough to bounce radio signals off. Those copper needles were very light, and most have probably fallen back to Earth, but due to the extreme cold of Space, many of the project West Ford needles were welded into clumps, and are still orbiting Earth to this day as depicted in Fig. 2, [2].

Fig 2: Space Debris Growing Concerned

There are many ideas that have been proposed for dealing with all that space junk through orbital harpoons, lasers, and space tug boats, but all these remain ideas, none of them have gotten off the ground. Leaving the situation as it is not only considered very dangerous as more objects stick around, but also there is a higher chance that they will collide, putting even more junk into orbit, which is called "Kessler Syndrome" which will cause a chain reaction that results in the uninhabited Earth orbit, it will become a death-trap for future missions.

It is a fact that Space belongs to everyone, however countries are not created equal in terms of our space resources. The United States has a much larger stake in Space than any other country in the world. For example, NASA paid for half of the hundred billion dollars for the ISS. That portion is larger than all the other countries combined. In addition, most satellites' rocket launch providers, as well as launch support facilities are based in the United States. In terms of the satellite business, over 60% of satellites in Space are either serviced by American companies or direct assets of the American government or American based privately owned enterprises, so, all in all, we can say that not a stretch of the imagination to claim that the space debris is an American problem because America has benefited most from the Space. From a capitalistic point of view, Americans own more properties in Space than any other country in the world by a large margin, as described in Fig. 3, [3].

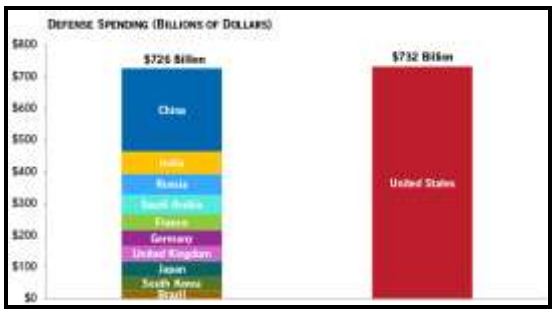

Fig 3: Space Budget

Recently, the efforts to resolve this problem is formalized in three approaches: first, prevention from escalating the situation to a more dangerous level, then capturing what is out there, and finally finding a way to remove it out of the atmosphere or getting rid of it or better yet reuse it. One of the steps was taken to reduce the debris in the earth orbit is most of the satellites now have a "deorbit" instrument that pushes the satellite back to Earth when it is no longer in service. Also, through manufacturing the satellite to be from a certain material and with an appropriate safer design, so at the end of its life, it will create the smallest amount of debris. Another approach to reducing the debris is a robot within a satellite with a tracking camera and robotic arms to extend to capture and bring it down to the Earth and destroyed in the re-entry or the South Pacific Ocean, as represented in Fig. 4. Another approach is suggested using nets to capture space junk. In the meantime, the priority is to make sure new satellites do not add to the problem. Ideally, at the end of their lives, satellites are either parked in graveyard orbits or their course adjusted to re-enter the atmosphere, [4] and [5].

Fig 4: Space Junk Reduction

III. ASTEROID MINING

Originally, asteroids are leftover material from the formation of the solar system. They range from a meter or so to hundreds of kilometers in diameter, and they live primarily in the asteroid belt between Mars and Jupiter, there are also asteroids that cross Earth's orbit. Asteroids are rocky or metallic, and they are classified to types. C-type or carbonaceous asteroids, constituting 3/4 of all known asteroids, have a high abundance of water and valuable heavy elements but not as much as some of the other asteroid types. S-type, or silicaceous asteroids, make up roughly 17% of the asteroids and contain a good amount of iron and nickel. M-type asteroids or metallic, these are the leftover cores of larger asteroids that were destroyed by collisions. All asteroid types can potentially be profitable with the right combination of valuable contents, mission-essential resources, and accessibility, [6].

Metallic asteroids contain gold and platinum. They are more accessible than mining them on Earth. They also have iron, nickel, aluminum, and titanium, but it is not cost-effective to bring back to Earth. Instead, they can go towards building infrastructure in Space, including more asteroid-mining facilities as well. Those metallic asteroids also contain key industrial metals like palladium, rhodium, and iridium; the Planetary Resources company estimates that a single 30-meter asteroid may contain $30 billion in platinum alone and that a 500-meter rock could contain half of the entire world's reserve of platinum-group metals, a kilometer-scale asteroid would be worth trillions of dollars. The most precious thing about metallic asteroids mining is that they contain the rare-earth elements as well that are essential in everything from electronic components, batteries and fuel cells, magnets, chemical catalysts and reagents, and in a huge range of advanced materials. The technological world is heavily dependent on these elements and becoming more so [7].

Many asteroids do cross Earth's orbit in their passage around the Sun, some of these near-Earth asteroids can be accessed with relatively little fuel expenditure from Earth orbit, and these will be the target of the first missions. "Planetary Resources" company is developing its spacecraft with that initial goal, and its main competitor, "Deep Space Industries (DSI)," is working on a range of low-cost prospector craft. Concerning long-distance asteroids, they also contain water that is possible to construct refueling stations for rockets in Space and by splitting the water into hydrogen and oxygen, both of which, when cooled down, can be used in liquid form as a fuel for rockets and the survival of astronauts. Once the enterprise is demonstrated to be profitable, the real gold rush will begin, and tens of billions or even trillions per asteroid speaks very loudly. Likely, the first effort will be purely robotic, but as the industry scales up in the asteroid belt, real-life human operators may be needed, as presented in Fig. 5, [8] and [9].

Fig 5: Robotic Asteroid Mining

Identifying the asteroids that can be targeted for useful mining resources is the goal because near-Earth asteroids are easily accessible and require less energy for launching an automated space vehicle to their surface. These near-Earth orbit asteroids are easier to understand their composition using remote sensing technology. This technology helps to develop radar images of the asteroids, which can be analyzed to understand their usefulness in terms of resources. Such data collected over several years by various space research organizations have made it possible to develop high potential asteroid targets. Apart from the richness in terms of resources, there are other factors, such as the asteroids orbital path. Its size spin rate and composition are also considered for identifying it as a prospective target for mining, as illustrated in Fig. 6, [10] and [11].

IV. SPACE TRAVEL

Recently, NASA turns to private companies to help them reach the Moon, the world's richest man; Jeff Bezos jumped at the opportunity with his company Blue Origin has recently partnered with Lockheed Martin North Grumman, and Draper to build a vehicle which will deliver and return payloads including astronauts to and from the Moon's surface, more recently Blue Origin has showcased their lunar lander, it was called a Blue Moon, they hope that this will be used in 2020 for NASA lunar missions. Jeff Bezos wants Blue Origin to help establish a lunar base and provide NASA with a cargo carrier service support to and from the Moon. Blue Origin's vehicles are expected to carry 3.6 metric tons of goods as he explained it takes 24 times less energy to take off from the Moon than Earth. Jeff Bezos is investing around one billion dollars a year into Blue Origin, anticipating the logistics of Space could prove to be very lucrative. The space billionaires are portrayed in Fig. 7, [12].

Fig 7: Space Billionaires

Blue Origin is not the only company trying to win these contracts; companies like Blue Origin and SpaceX will go head-to-head in building their best vehicle for NASA's needs, [13].

NASA's next chapter of lunar exploration called "Artemis" which is the world's most powerful rocket that exceeds the legendary "Saturn V" of the Apollo era in numerous ways and has the task of not just going to the Moon and create a long-term human presence on and around it, but also to prepare for complex human missions to Mars as shown in Fig. 8, [14].

Fig 8: Saturn V (the 1960s) vs. Artemis (2020s)

There are fundamental differences between "Artemis" and "Apollo," for example, instead of requiring "Orion" to serve as an expendable lunar command module or carry a constrained lunar lander, the Artemis missions will take advantage of a different approach: pre-staging. Everything needed for lunar missions will be positioned in advance by commercial and international partners. This includes rovers, science experiments, and human-rated systems on the surface, but it also includes a dedicated lunar station in orbit around the Moon, called Gateway, where we can pre-stage a robust lunar lander and establish a strong communications relay. Designed with open standards, the Gateway can be expanded as new missions and partnerships develop, allowing multiple human missions on the Moon at the same time, and enabling ongoing science to be conducted even between human missions. And with a growing list of commercial and international opportunities, Gateway is the ideal hub between Earth and all that lies beyond, and with each successful mission, Artemis ushers in the next wave of men and women to explore our Moon and proves that together, humans are ready to go beyond as represented in Fig. 9, [15].

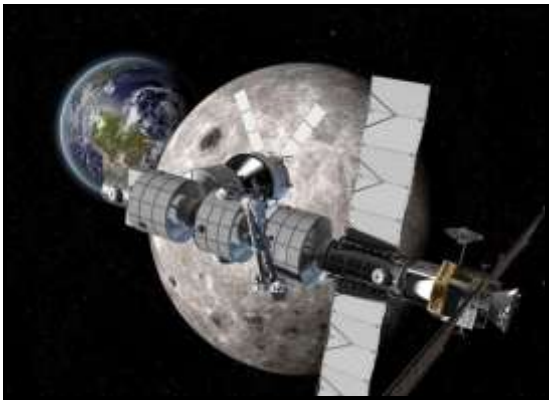

Fig 9: Gateway Lunar Station

Establishing a lunar base that is considered an outpost, a lab, a lunar habitat where scientists, or possibly rich tourists, can live and work for an extended period of time, maybe something similar to the six-month average stay of an astronaut on the ISS. Lunar exploration is going to be ramping up both in the orbit and at the surface, not only international and national agencies and governments but also from the private sector and from commercial entities. This interest is going to be driven by science, by engineering, by technology development, by preparing for future exploration, by understanding the resources that we find locally at the Moon, and how we can use those things to prepare humans for what we do later, [16].

With regard to an extended stay on the Moon, one possible important resource might be newly confirmed "lunar ice", which scientists think it can be used to create rocket fuel by extracting the ice, isolate the oxygen and hydrogen, and manufacture fuel on the Moon, meaning lunar visitors do not have to carry the burden of the extra weight of return fuel. Another resource is the "Regolith", the layer of unconsolidated material covering bedrock, which some space agencies think may be the key to building a moon base, [17].

V. MOON COLONIZATION

Humans' dream has always been about leaving Earth and traveling through the galaxy or building a Moon base as a starting point for more adventures. The reality is, we actually do have the technology, and current estimates from NASA and the private sector that it could be done for $ 20 to 40 Billion, in a decade, the price is comparable to the ISS, but the payoff would be immeasurable. The Moon is a sandbox to develop new technologies and exploit unlimited resources; it would start a new space race and lay the foundation to spread out into the solar system and beyond. It would create a vast array of new technologies to benefit the human race on Earth. The only thing that is considered on the way of accomplishing it is the fact that it is hard to get governments interested in long-term investments in

the future of humanity despite it is only three days' journey, as described in Fig. 10.

Fig 10: Trip to the Moon

The Moon is not a welcoming place for living things, a Moon day lasts 29 Earth days with a difference of maybe 300 degrees Celsius between sunlight and shade, and there is no atmosphere to shield any human from meteorites, big and small or cosmic radiation. Apollo missions discovered tons of information about the Moon sixty years ago, and for the last few decades, satellites like the American Lunar Reconnaissance Orbiter have mapped the Moon. Rovers like the Chinese Yutu have studied the composition of the lunar surface looking for water, ice, and metals. Astronauts will build the first light-weight Moonbase and be completed in a decade and deployed with a natural shelter such as caves or underground lava tube tunnels or craters near the poles where the days are six months long using the available lunar material. Remember, there will be many trips during the first phase going to the Moon and taking off where it is much easier and cheaper to get things off the Moon into orbit.

The Moonbase's significant importance is supplying an orbital depot where scientific missions to Mars and the outer solar system can refuel. Fortunately, lunar soil has all the necessary ingredients to make concrete. Robotic mining rigs can sift the lunar dust for organic molecules and could be used to build huge structures, while advances in 3D printing will make it possible to produce almost everything else the crew needs [18].

The pursuit of clean energy to preserve the environment has become a necessity now. Non-renewable energy sources on the Earth are depleting at an alarming rate, causing scientists to look for viable alternative options. The Moon's energy has been a power source for several decades, wherein its gravitational pull has been harnessed to spin generators. Similarly, tidal power plants have been arranged like hydroelectric dams to trap water during high tide and then during low tide, release it through turbines, [19].

Resources on the Moon are abundant; Platinum, Silicon, Iron, Titanium, Ammonia, Mercury, and even water have been proven to exist on the Moon. One possible energy source that is promising is the mining of Helium-3. This isotope could one day be used in nuclear fusion reactors, something the Chinese lunar exploration program is currently looking into. In addition, in the future Helium-3 can be exported back to Earth. Scientists estimate that the Moon is likely to contain roughly 1 million tons of Helium-3, which translates to a hypothetical 10,000 years' worth of energy. Since there is no atmosphere on the Moon, one thing that could not be afforded is to create a polluted environment. Helium-3 can fuel non-radioactive nuclear fusion reactors to produce safe, clean, and large quantities of energy, and worth to remember that fusion reactors are much more efficient than fission reactors that are currently used in nuclear plants as presented in Fig. 11 [20].

Fig 11: Mining the Moon for renewable energy resources.

Helium-3 allows energy to be generated with a very limited amount of waste as well and when it is burnt with Deuterium, it generates an unbelievable amount of energy and to make it simple for our minds to understand, it is about 100 tons of Helium-3 has the potential to power the entire population of Earth for a year. When all set and done, it will illuminate the life on the Moon and probably on Earth as well. Technology will not stop there, and when enough energy is available, asteroids could be pulled into the Moon's orbit and mined, [21].

Certainly, all these Moon ventures and mining concepts will be very expensive and require billions of dollars of investment. The extraction and refining of Helium-3 also require new technologies and thus more costs to provide a Moon base, as illustrated in Fig. 12, [22].

Fig 12: Moon Base Station Projection

VI. MARS COLONIZATION

Going to the Red planet or Mars is not science fiction anymore, but it is getting some serious thought by Elon Musk. Elon Musk announced his plans to begin colonizing Mars. He proposes that he could have humans on Mars by 2024, not only that, but he intends to use the same technology to get people to travel anywhere around the world in under

one hour. This is all going to be done using a spacecraft codenamed the "Big Falcon Rocket (BFR)." Musk believes that he could send two "BFR" cargo ships to Mars by 2022, with the first two crewed crafts touching down just two years later, as depicted in Fig. 13, [23].

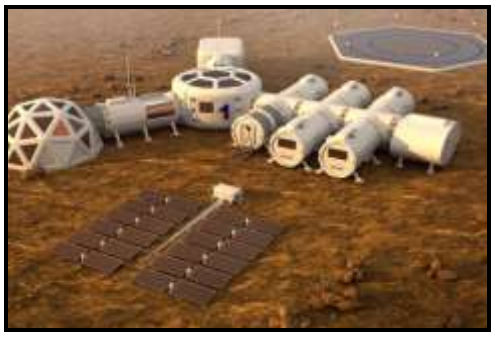

Fig 13: Mars Planet Colony

The same technology could fly people anywhere in the world in less than one hour, potentially revolutionizing global transportation, with passengers paying essentially the same as they do now for a commercial airline ticket. Another use for the "BFR" was to help build an outpost on the Moon. Another brief suggestion was space services. This includes launching many satellites at once or just one large satellite with a surface area ten times that of the Hubble space telescope without a need for a complex unfolding procedure once released, in addition to that old satellites and space debris could be collected at much lower costs, [24] and [25].

The end goal is to have as many as a thousand ships in a holding pattern in orbit around Earth, then every 26 months or so when Earth and Mars are aligned, the ships would unravel their solar panels and leave for Mars. The journey would last three to six months, as shown in Fig. 14, and human cargo and suppliers will be dropped off every trip, [26].

Fig 14: Trip to Mars

VII. GLOBAL SPACE INTERNET

There is a significant demand for low-cost global broadband capabilities. SpaceX opened a new facility in Redmond, Washington, to develop and manufacture these new communication satellites with a plan to have the initial satellite constellation up and running by 2020. In November 2018, SpaceX received approval from the FCC to deploy 7,500 satellites into orbit, which were already approved on top of the 4,400. On May 24th, 2019, SpaceX launched a Falcon 9 rocket filled with sixty satellites into Space, this marked the beginning of their ambitious new project called "Starlink" which aims to provide high-quality broadband internet to the most isolated parts of the planet, while also providing low latency connectivity to already well-connected cities. SpaceX aims to make their broadband as accessible as possible, claiming that anyone will be able to connect to their network if they buy the pizza box-sized antenna, which SpaceX is developing themselves. This launch of sixty satellites was just the first of many, SpaceX has 12,000 satellites planned for launch over the next decade, dramatically increasing the total amount of spacecraft around Earth's orbit. This will cost SpaceX billions of dollars, so they must have a good reason for doing so, [27].

This initial group of satellites is not fully functional. They will be used to test things like the earth communications systems and the krypton thrusters which will be used to autonomously avoid debris and deorbit the spacecraft once it has reached the end of its lifecycle, and will initially be used to raise the Starlink satellites from their release orbits at 275 miles to their final orbital height of 335 miles (ISS is 254 miles high) as represented in Fig. 15. The satellites will contain five 1.5-kilogram silicon carbide components, which indicates that each satellite will contain five individual lasers. These lasers, like our fiber optic cables here on Earth, will use light pulses to transmit information between satellites, [28].

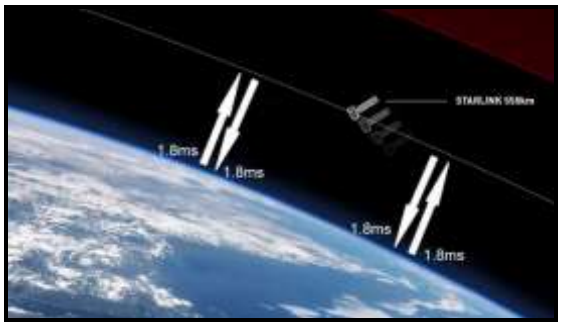

Fig 15: Internet Satellites Space Position

Transmitting with light in Space offers one massive advantage over transmitting with light here on Earth however since light travels 47% slower in glass because of the refractive index which depends on wavelength than in a vacuum that is at a speed of 299,792,458 m/s, this offers Starlink one huge advantage that will likely be its primary money maker, it provides the potential of lower latency information over a long distance. SpaceX needs so many satellites in their constellation to provide worldwide coverage. It becomes even more valuable when we realize this time differential increases with increased transmission distance, every additional kilometer we travel the potential gains in speed increase rapidly as outlined in Fig. 16.

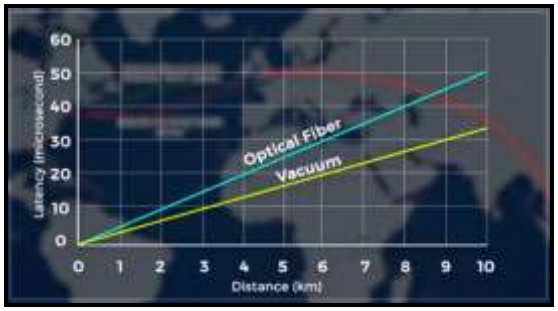

Fig 16: Light Speed in the Space vs. in fiber optics

SpaceX is not just planning on serving this super-fast internet to some customers, they primarily advertise this system as a way to connect every human on this planet to the internet, and they should have plenty of bandwidth left over to serve these people. Elon Musk says that these antennas on the ground will be flat enough to fit onto the roof of a car and other vehicles like ships and airplanes. Each Starlink satellite cost around $300,000 which is already a massive cut in cost for communication satellites, in addition with SpaceX are also saving on launch costs, as they are launching on their own Falcon 9 rocket, something that no other satellite manufacturer has. Starlink is estimated to generate $30 billion to $50 billion in revenue each year on the back of premium stock exchange memberships. The money generated from Starlink will mean that SpaceX will have vastly more funding than NASA, which could go on to fund research and development of new rockets and the technology needed to monetize lunar and Martian colonies. The project also is opening avenues for education for third world countries that do not have adequate connections to the internet.

SpaceX is developing its giant starship rocket, which will have the capacity to launch 400 Starlink satellites at a time, as shown in Fig. 17. It is also the only spacecraft that has ever used a Krypton ion thruster to move around in Space but most importantly keeping a green environment even in Space, and at the end of their life cycles, they can use their built-in propulsion systems to deorbit even if the propulsion system is broken the satellites will burn up within about 1 to 5 years afterward.

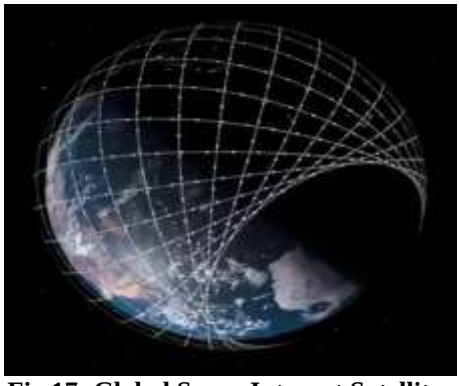

Fig 17: Global Space Internet Satellites

Furthermore, in the future interplanetary communication could be made possible using Starlink, for example, SpaceX city on Mars and Earth would be highly valuable in the future even though it takes to light a bit over three minutes to travel between Earth and Mars and the time it takes for Earth to send a laser to Mars would change based on the time of year and where the planets are in their orbits.

Elon Musk was perhaps one of the first pioneers of this new space industry when he founded SpaceX in 2002. Right now, SpaceX has big plans for the future colonization of Mars; however,

in the meantime, the company is also providing satellite launching, space tourism, and, as mentioned, has recently joined forces with NASA for their Moon missions.

Starlink has some competitors, for example, Amazon trying to launch their satellite internet in the form of project Cooper while another company OneWeb is attempting to do the same but SpaceX appears to be in the driver's seat, [29].

VIII. SPACE TOURISM

Another area for SpaceX to explore is space tourism. SpaceX starts with a Moon flyby that would last six days and has proposed to launch in 2023, Japanese billionaire Yusaku Maezawa partially funded the project and has dubbed the flight an art project. Still, he plans to bring along half a dozen artists with him on the trip, and he hopes that this trip would inspire artists to promote world peace.

Yet another player who wants a piece of the pie his name is Richard Branson, he announced that nearly 800 astronauts who signed up wanting to go up there in the Space and start taking people to Space. The resources and the money they make from that they will be putting things like point-to-point travel into another spaceship called the virgin orbit, which will be putting satellites into orbit, [30].

Richard Branson is not planning to launch from Earth, Virgin orbit funded by a one-billion-dollar investment from sister company Virgin Galactic is planning to launch its first rockets, which will deliver small satellites into orbit by early 2020. But instead of launching from the ground like SpaceX and Blue Origin, virgin orbit plans to do it with a little help. They are going to strap their rocket to the wing of a Boeing 747. The plan is to launch mid-air increasing reliability and reducing cost, as represented in Fig. 18, [31].

Fig 18: Virgin Galactic Mid-air Launch

Other products are needed for space tourism, such as thermal blankets, memory foam. Portable cordless, vacuums freeze trying, NASA has invented or helped to pioneer in some capacity thousands of technologies, [32].

IX. AGE OF SPACE FORCE

Space is the new critical high ground that nations must protect and defend against their adversaries and, in turn, is why the Space is so important to a modern military. Space is important because, with eyes in the sky, we can always monitor any suspicious activities. It is very hard to fight a modern war without the space assets that used for many purposes, such as early warning for ballistic missile launches, communications, precision guidance (GPS), commerce with billions of people daily using it, and the financial system for the stock market as well. So, Space must be protected because if Space is turned into a new battleground, every nation stands to lose, as depicted in Fig. 19, [33].

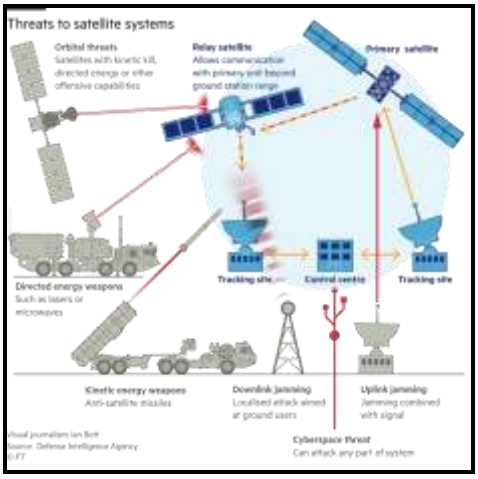

Fig 19: Space Force

"We stand at the birth of a new millennium, ready to unlock the mysteries of space and harness the energies, industries, and technologies of tomorrow"– U.S. President Donald Trump. Currently, American military satellites are divided up between the major branches of the military: Air Force, Army, and the Navy, as well as some of the federal institutions such as the National Reconnaissance Office. On June 18, 2018, President Donald Trump directed the Pentagon to begin planning for a Space Force: a 6th independent military service branch to undertake missions and operations in the rapidly evolving space domain. The U.S. Space Force would be the first new military service in more than 70 years, following the establishment of the U.S. Air Force in 1947. Space Force was signed into law December 20th 2019 as part of the 2020 National Defence Authorization Act. SpaceForce.mil went live shortly thereafter, [34].

By consolidating U.S. space assets into a single branch of the military, the Space Force would make it easier to coordinate the sharing of critical information and respond to any unauthorized attempts that want to sabotage or destroy American military satellites. The Space Force would also be tasked with military surveillance and reconnaissance. Also, it will be responsible for developing new recon technologies and coordinating with the American industry on how to get them into Space best. The Space Force would monitor for any adversaries' activities and be ready to immediately raise the alarm if an attack is suspected, [35] and [36].

X. CONCLUSION

Since mankind landed a man on the Moon, there was that thought the space industry will dominate our lives. Unfortunately only twelve people have ever visited the extra-terrestrial. Today there is a new space race, especially when new industries are already forming around Space. For example, 3D printing human organs have become much simpler because of the zero gravity. The manufacturing of more energy-efficient fiber-optic cables also becomes possible. Space manufacturing could create many more enabling technologies, which could lead to industries that don't even exist.

All the space missions so far relied heavily on the fuel and resources that were carried from Earth by rockets or Space shuttles but if asteroid mining becomes an option, that will definitely change the economies of space travel not only will it serve as a base for refueling our rockets but also it will serve as a backdrop in case of extension of the resources on Earth.

Thanks to Elon Musk and SpaceX for having a vision and expertise to bring down the costs of rocket launches, some hard-core engineering has enabled the Starlink project. Of course, Jeff Bezos could not resist competing with Elon Musk and plans to launch over three thousand satellites over the next ten years to service broadband internet. There are many small players as well in the Space with plans for constellations. Still, it seems that Starlink has the most ambitious yet concrete roadmap and the resources and engineering required to see this through completion; this is a pretty exciting time for the space industry. Space may be dark, but the future is bright.

The research paper has shed light on new space business's opportunities, a fortune, or some might consider it the holy grail of the 21st century, from globally connecting the world as one Internet network to space junk capturing and remanufacturing it, from asteroid mining to space travel and space tourism, building a Moon base as a staging phase to Mars colonization, and finally the significant role of the space force to protect the assets in the Space.

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