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THE SPACE ERA

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GRATITUDE

In first place I want to thank my parents who gave me all the love I needed since I was born, especially my dad for lending me the gift of studying at this school, where I learn a lot of things on a daily basis. They also, in most part, made me the person I'm to this day. Being responsible, respectful and grateful for the things I have are values that come directly from them. I want to thank my sister for being a person I can always count on when I need help or even when I think I don't need it, she has listened through all my ups and downs in life and gave me useful advice. I don't want to ignore thanking my friends for always making me feel loved, made me laugh when I'm feeling down and all those who have tried to put me down too, because without them I wouldn't have learned about my own mistakes in the past, and how I can become a better person by not repeating those mistakes again. They also helped me to become strong in many ways. I'll always be thankful to amazing people such as Elon Musk, Jeff Bezos, Robert H. Goddard, because they are people I really look up too, what they have done for and to the world, starting from the bottom, just having innovating thoughts and now being some of the most known people all across the Earth, didn't make me the person I was yesterday, but they give me hope for the person I want to become in the future. They are the living proof that if you are truly persistent with your dreams you can achieve anything in life.

SUMMARY

This monograph contains an historical-scientific investigation about the past, present and future for space exploration, this term is formally denominated as Space Era. You'll find the author's thoughts and facts implanted on this monograph. You'll be learning about the first liquid rocket engineer, and his success. Soon after you'll be reading on how space exploration developed in the middle of The Cold War, when the rivalry of USA and USSR was all that mattered, in this same context, President John F. Kennedy had the privilege of making one of the greatest announcements in history, promising his people to get the man on the moon in less than a decade. On his speech he stated the reasons on why we should care about space exploration, and even though Cold War is over and we already reached the moon, you can still hear his words as something that should be listened to till this day. Then, you'll become more conscious about NASA's actual budget (very low compared to others) and what they have done for humanity with it. Now, on another topic, it is no secret that private companies are now part of the Space Era, companies such as Virgin Galactic, SpaceX or Blue Origin are trying to bring back the excitement for space exploration, and we'll be discussing that on this monograph. Finally, we have a complete schedule plan for the future of NASA and SpaceX, followed by the answers of a poll, concerning the knowledge about space so we can determine the interest for it in the present.

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INTRODUCTION

Space is something humanity has always put their eyes on. Since the beginning of time, we stood up looking at the stars, with no knowledge of them, wondering where we come from, or even more exciting, are we going there in the future? Space is something amazing, although as all things in life make some people crazy about it and some don't. The author of this monograph is one of those who stands up proud of the excitement for space, he will try to convince you, with facts, knowledge and passion about space, so you can transmit that to others.

Author's monograph may not teach anything we already know about facts of space; in just a few moments you will understand that it is not easy nor cheap to make a discovery or investigation of space. But it can truly manifest new feelings and hope for the future of humanity up there, in Space. Who knows, maybe this monograph is going to inspire future engineers, astronauts and cosmologists to make the decision of their life, to study a career of the future, a career that leads up to new discoveries and developments in space technology, here on Ecuador and worldwide for those who are not going to stay here. Along with the poll made by the author, which is going to give you a point of view from mostly teenagers, to what they think and know about space in the present, helping us as readers, realize how poor is the knowledge of space on the present and how can it improve in the future.

Academically the author hopes this monograph opens the eyes not just of the people who read it, but also the people that learned something thanks to it, and consequently teach something they got out from this monograph.

This thoughts and words were implanted here by a kid on a computer, there is no such truth as that, but everyone can learn something new, even from people that are younger than them, so I invite you to read not just to learn, but to feel passionate about space too.

CHAPTER I

THE BEGINNING OF SPACE EXPLORATION AND THE SPACE RACE

1.1. Robert H. Goddard and First Successful Launch

“It is difficult to say what is impossible, for the dream of yesterday is the hope of today and the reality of tomorrow.” -Dr. Robert H. Goddard, National Aeronautics and Space Administration (NASA). An idea comes from a dream, and if you make this idea of a reality, all of your dreams will come true. Robert H. Goddard was one of those kind of people, who put an idea in their minds through their dreams, and make it happen in the real world. He didn't care about the technology available at his time, he fulfilled his dream, it was to successfully launch a liquid fueled rocket into the atmosphere. He is considered by many as the father of modern rocket propulsion, that is why NASA commemorates him and even named a Space Center after him. To understand the magnitude of his experiments at the time, they made little impression to the government, just as the experiment of the Wright brothers, when they first made a plane fly. With the success of land vehicles at the time, no one cared about rockets or space exploration. His public story started when he was doing experiments with powder in the Worcester Polytechnic Institute physics building and made a mess. School officials did not expel him, because they were really interested in his work. In 1914, he

received two patents, the first one for a rocket using liquid fuel, (the ones used till this day) and the other patent was for a two or three stage rocket using solid fuel (He had the vision for a two or three stage rockets, these are the ones that have the ability to separate in different stages when reaching orbit, to reach even further in space, even though multiple stage rockets are only used with liquid fuel, not with solid fuel, just as powder). With some financial help by Smithsonian Institution and the Daniel Guggenheim Foundation, he had successfully constructed and tested the first liquid fueled rocket by 1926. All of his investigation helped in future rocket development and NASA's mission. Without him, history would've been very different, that is why he is so remarkable in the space era, he was one of the first who really felt passion for space exploration and did something about it.

1.2. Cold War: The Space Race

Cold War was definitely one of the most exciting periods for the space era, in which two political movements tried to point out they were better than the other one in spaceflight capabilities. After the World War II, communism and capitalism were in the middle of a war without weapons, and here is where space exploration comes in play. The Space Race began on the August the 2nd, 1955. Four days after United States announced the launch of several artificial satellites, Soviet Union said that they were going to launch satellites in the near future too. To have the first satellite in orbit was the first stage of the race, and Soviet Union won, with their artificial satellite Sputnik 1.

This was a simple satellite that only carried radio transmitters, and they gathered some data about the atmosphere thanks to its instruments. United States followed them early next

year, just 5 months later. Their satellite Explorer 1 had some instruments capable of radiation measurements, made by Dr. James Van Allen. Second stage in the Space Race during Cold War was to get the first man on space. Once again Soviet Union won, Yuri Gagarin was the first successful man on space, he was a hero all around the world, it didn't matter where you were from, that is one of the reasons the author is so interested in space exploration, because it can make barriers in our world disappear, showing everyone that despite all differences we have two things in common: that we are all human and that we all share this Earth with no exceptions. Yuri returned home safely and he didn't just stay on space for some minutes, he even did a complete orbit around the earth on the spaceship Vostok 1. It is essential to know that this wasn't Soviet Union's first try, they failed with Soyuz 1 spaceship, which carried Colonel Vladimir Komarov, which died on the spacecraft during its return to the Earth. Alan Shepard was the first American on space, just one month after Yuri. Alan was also one of the astronauts that visited The Moon on the mission Apollo 11 with Neil Armstrong. One of his most remarkable quotes is: "It's been a long way, but we're here" -Alan Shepard, BrainyQuote.com, it represents in just 10 words, all the efforts and sacrifices NASA made till this point. Reaching The Moon was supposed to be the final stage on the Space Race, and even though Space Race didn't end just after reaching The Moon, it got less attention, but at least we can be sure it ended on 1991, with the dissolution of the Soviet Union.

1.3. We Choose to Go To The Moon

Landing safely on the Moon and then coming back was the last objective in the Space Race, as books of history tells us, United States got there first. NASA achieved this through

their space program named Apollo. The dream of American people for reaching the Moon and supporting space exploration started on the 12th of September, 1962, when President John F. Kennedy delivered the speech named “We choose to go to the Moon” –President John F. Kennedy, National Aeronautics and Space Administration (NASA), its principal objective was to have more people supporting the Apollo program. The speech is full of a sense of urgency and destiny to explore space far more than ever before. In his speech the president said such things as:

“But this city of Houston, this State of Texas, this country of the United States was not built by those who waited and rested and wished to look behind them. This country was conquered by those who moved forward--and so will space.” –President John F. Kennedy, National Aeronautics and Space Administration (NASA), The speech was pronounced in Houston, Texas, that its why he said this in the context, just as mentioned before, to win the space race against Soviet Union, because he believed United States was better; “The exploration of space will go ahead, whether we join in it or not, and it is one of the great adventures of all time, and no nation which expects to be the leader of other nations can expect to stay behind in the race for space.” –President John F. Kennedy, National Aeronautics and Space Administration (NASA), in this quote he wanted to point out that if United States wanted to become a world leader, more than they already were at that time and hope that other countries lived up to their full potential, they had to beat Soviet Union in the Cold War; “We choose to go to the moon. We choose to go to the moon in this decade and do the other things, not because they are easy, but because they are hard, because that goal will serve to organize and measure the best of our energies and skills, because that

challenge is one that we are willing to accept, one we are unwilling to postpone, and one which we intend to win, and the others, too.” –President John F. Kennedy, National Aeronautics and Space Administration (NASA), those words can give anyone goose-bumps, because this words not just reflect the hope for reaching space or the moon, it can be applied on life itself, to reach for the hard objectives, those are the ones that if we fail, give us a lesson that will remember all life, and if we succeed, it would not change just your life, but the life of people around you and even the world, not the easy ones that mean almost nothing. That hot day of September, he said all of this only to overcome Soviet Union in their efforts in the Space Race, which had already won two stages of the Space Race.

CHAPTER II

THE SPACE ERA IN THE PRESENT AND THE INFLUENCE OF PRIVATE COMPANIES

2.1. NASA's Budget

We already know that it is money that moves the world, this is a fact. Without money nothing mentioned before could have happened. In this first part of the second chapter the author wants to eliminate any controversy surrounding the topic of the budget that is available on NASA's hands annually. According to polls, 1 in 4 Americans think that NASA's budget should be reduced, but why do they think this? Because most Americans don't even know how much of their Federal Budget goes into it. For example, according to An American Budget in behalf of 2019 Federal Budget: "The Budget requests a total of \$19.6 billion for NASA, a \$500 million (2.6-percent) increase from the 2018. Budget (\$61 million below NASA's 2017 funding level)" -Whitehouse.gov, (2018). \$10.5 billion of those will only be used "to lead an innovative and sustainable campaign of exploration and lead the return of humans to the Moon for long -term exploration and utilization followed by human missions to Mars and

other destinations.” -Whitehouse.gov, (2018). After reading this, some people may think “Well they use almost \$20 billion annually! that could be used in our own planet’s problems just as world hunger”, now the author respond, The Department of Defense of the United States, who is in charge of the military forces “needed to deter war and to protect the security of the United States” -Whitehouse.gov will receive \$686 billion! Now that the author showed you the official numbers for 2019, can you even compare the two?

From now on, till the end of the chapter, arguments will be based on Mark Rober, an ex-NASA, employee and American engineer’s YouTube video “Is NASA a waste of money?” The author is going to give 5 actual reasons to think that NASA and its current little budget can give the world many things in return for just \$18 billion annually, (\$9 per year, per person) (this is an estimated):

1. Improve Life on Earth: “Why should we spend money on NASA when we already have so many problems here on Earth”- Mark Rober, (2018), “Why should we waste time trying to figure out agriculture when we have so much work to do hunting and gathering?”- Mark Rober, (2018), or “Why should we spend so much time messing around in boats when we have so many issues here on land”. - Mark Rober, (2018). These things are something our ancestors could have asked, and the answer for those three questions is the same. Reaching for new heights often create new solutions and opportunities for people back on the ground. SMAP for example is a super complex Earth orbiting satellite. It is using a Radiometer that can see through clouds to measure soil moisture levels on Earth, how this has improved life on Earth? By measuring the moisture

levels on soil, it can allow humans to predict droughts, monitor floods and even predict crop yields for a given year! Also this information is not kept by NASA or United States Government, this information goes to everyone all around the globe so it can be properly utilized. SMAP had a cost of around \$900 million dollars and “Africa is the continent with the most extreme poverty today. I did the math and for \$900 million and you could feed all of Africa for less than a day” -Mark Rober, (2018). Instead of doing that, keeping in mind that it is not a real solution for world hunger, NASA is investing in research and technology, which empowers that continent to better help themselves.

2. Extinction Protection: It may sound like something that just happens in movies, but it is true. For example, if a large asteroid impacted Earth, all of humanity’s present and past would convert to ashes. The chances of this happening are small, but the consequences of something just as an asteroid impact are just so large that it makes sense to not take it as a joke. NASA has already put an asteroid early warning detection system (again, it serves Earth, not just United States) and in October of 2022 they will crash a spacecraft into an asteroid to see if they can deflect its course, the mission’s name is DART.

3. Offshoot Technology: “We don’t know what we don’t know”- Tony Schwartz (2011), so for NASA to justify its funding for things that are not in plans of being invented but could help the daily lives of millions of humans is pointless, for example, who would have thought that with sending satellites in the middle of The Cold War could now be giving us precise GPS to guide us home, or TV signal beamed down to us from space. So the

problem is that by predicting the amazing things that space will make us discover in the future would be like expecting Christopher Columbus, when he was asking for ships, to predict things such as movie theatres or Internet.

4. Economy: Research of space gives a considered amount of that annual budget to the salaries of tens of thousands of people who work at NASA's facilities, and they are truly one of the most skilled workers on the planet. And some people may ask, "Well... why don't private companies pay these workers and not the Federal Budget?" Because private companies have interests, and they focus their resources on bringing their inversion back, for example, space tourism or launching satellites for other organizations (Blue Origin and SpaceX). These companies are not going to waste their money on getting information that will be available for everyone like the SMAP satellite does, another example mentioned earlier is the DART mission.

5. Exploration & Imagination: This is the less concrete reason, but the most important on this list for the author.



This is the result of a 10-day exposure image from the Hubble Deep Space Telescope, with the exception of 3 single stars that appear in that image, every dot, speck, smudge and spiral you see is a galaxy with hundreds of billions of stars in it, just as our own Milky Way has. What is more surprising is that the field of view in that image is the size of Roosevelt's eye on a dime held at arm's length. That is all of the information the author has to give in this final statement. Just think about what the author just pointed out, imagine all the secrets that are waiting to be solved by us, and as far as we know, we are alone in this vast universe. We explore space not necessarily because there's some financial incentive or some payoff waiting for us, but because we as humans have questions that we're eager to answer.

The first person who is going to set foot on Mars is alive right now, he/she could even be in high school right now! and that feeling of having expectations for the future is why this reason is called “Imagination”. It truly inspires to reach higher and make everyone a better person.

2.3. Elon Musk and Jeff Bezos

Despite its efforts NASA can't do enough in terms of space exploration because of their available budget. Some individual people think space is important in some way too. For example, we can mention Jeff Bezos, who is the actual richest man in the world according to Forbes. He, apart from being the owner of Amazon, 18 years ago, he quietly founded a spaceflight company named Blue Origin in an old Boeing plant south of Seattle. With his visionary mind, he expected and stills expect to revolutionize space travel. He called it “Launch, land, repeat”. He says that the propellant used on rockets is just 1% of the total cost of each mission and that if we start reusing rockets, we could lower the costs to access space by a factor of 100! Blue Origin, as it creator has the same mentality of Amazon, where you have access to buying whatever you need or like, Blue Origin doesn't care about your interests in space, they just want you to be able to get there. Jeff Bezos was only 5 years old in 1969, the year where Neil Armstrong and Buzz Aldrin first landed on the Moon, and it is an achievement he inspires his work to this day. The problem for him is that apart from that achievement, less than 600 people have been on outer space, progress hasn't been that much.

Another man worth mentioning, is Elon Musk, who is a South African-American entrepreneur, whose future in space exploration we'll be discussing on the next chapter. Elon Musk was born in Pretoria, South Africa in 1971. He developed a love for reading at a young age and by 12 years old he used self-taught programming skills to develop code for a video game he called Blaster, which he then sold for \$500. Musk attended Queens University in Canada for two years before moving on to Penn. While at Penn, Musk ran an unofficial nightclub out of a rented 10-bedroom frat house. In 1995 Musk entered the PhD program at Stanford and then dropped out after two days to focus on entrepreneurial ventures based on this internet thing everyone is suddenly talking about. He created Zip 2 along with his brother. Four years later he received \$22 million for his share when they sold Zip 2 to Compaq Computer. Musk used some of this money to cofound X.com, a user-friendly online financial service you might know better today as PayPal, and when eBay purchased PayPal in 2002, Musk's shares netted him \$165 million. Committed to fighting global climate change, Musk founded Solar City and Tesla. The Solar City plant, to be constructed in Buffalo, will be the biggest solar plant in the United States three times over, and he plans to build even bigger plants in the future. Tesla has grown into the leading electric car manufacturer and the fourth most valuable automotive company in the world. Musk conceptualized the Mars Oasis, a plan to commercialize space travel and colonize Mars in order to avoid the inevitable extinction of human kind on Earth. And let's be honest, even if you survive, nobody wants to be the only human left on a planet with crocodiles, cockroaches, and Twinkies. Musk founded SpaceX with \$100 million of his own cash. In February 2018, SpaceX successfully test launched the most powerful operational rocket in the world, the Falcon Heavy. And as part of the launch,

they sent a Tesla Roadster into space. When he's not launching sports cars into space, Musk is working on the Hyperloop, a high-speed transit system that shoots pods holding riders through a reduced pressure tube. It is expected to get people from Los Angeles to San Francisco in less than an hour, which is less time than it takes to drive from one side of L.A. to the other. While tweeting in traffic in 2016, Musk mused, I'm going to build a tele-boring machine and just start digging. And thus, the Boring Company was born. He states that he hopes to die on Mars, just not on impact.

CHAPTER III

FUTURE OF THE SPACE ERA

3.1. Future Plans for NASA

First, let's make clear what is the main difference between NASA and SpaceX in terms of what they would like to achieve in space exploration in the near and far future, NASA's objective is basically to understand our world, our solar system and our universe. To use technology to move humans beyond Earth. SpaceX is a contractor to NASA, and it has lots of industry partners just as SpaceX, one of their purpose is to launch cargo up to the International Space Station in recent years. Starting next year, they'll launch crew up to the International Space Station. SpaceX has stated that they want to see humans on Mars. NASA wants to see humans on Mars too, so their goals are really aligned, NASA has a partnership with SpaceX to help them land one of their dragon capsules on Mars. It's exciting because they've done a lot of work on the entry, descent and landing job.

Does NASA have a future solution to the growing space junk problem? They are working right now, figuring out a way to eliminate space junk. Over the last 60 years NASA and other space agencies have left a lot of stuff up there on orbit, some of it has broken up so there are actually even old stages of rockets and parts of spacecrafts there. There was an occasion a couple years ago where two spacecraft ran into each other and it created a whole lot more pieces of debris so there's just a lot of stuff up there now that is slowly deorbiting but

NASA do have to worry about it a couple times year. They must move the International Space Station slightly to avoid space junk or other satellites. Space is big so this isn't anything to panic over but NASA and other space agencies around the world are looking at how do they vacuum that stuff up. At some point NASA will have to deorbit the space station. Right now, it's funded until the years between 2024 and 2028.

3.2. Future Plans for SpaceX

The main goal for SpaceX on the Falcon Heavy launch was to just collect mountain of data from everything that they could to make sure that future Falcon Heavy launches are successful as well, even more successful possibly, this is some of the most incredible space footage that we've seen in a very long time, maybe ever. The thing that didn't go quite according to plan was the injection that burned for the Mars orbit, it was actually stronger than they meant for it to be and it actually is going to go way beyond Mars orbit into the asteroid belt almost of the orbit of Ceres. The main thing is they got their payload into orbit and that is hugely important because that gives contractors the confidence to work with them, to put their own satellites into orbit. According to Elon Musk, next launch will be three to six months after their first one. And it is going to be a very heavy communication satellite called the Arabsat 6A and then they're going to follow that up with a satellite for the air force that's creatively named Space Test Program (The STP-2), that last one will also carry the LightSail 2 from the Planetary Society. One thing that is interesting is that they decided not to rate the Falcon heavy for human flights. They're not going to be doing any crewed flights on the Falcon Heavy which means that it's specifically going to be launching heavy payloads into

geostationary and high Earth orbit positions. that's kind of niche for them to do, but it is important not only because it opens up new opportunities for SpaceX to do stuff that they can't do now or previously but it also opens up opportunities for contractors that have satellites that they want to put up there to be able to launch it for less than 300 million dollars.

SpaceX is putting up their own fleet of Internet satellites to give high-speed Internet to the entire world called Starlink, they already started this year, and they are planning to put up in Space more than 12,000 of this satellites. SpaceX is still moving forward with crewed missions on the dragon capsule for the Falcon 9, Elon said he wants to launch the first test flights of the Dragon 2 capsule possibly with humans on board by the end of 2018. The United States has not had a manned space program ever since 2011 when they retired the space shuttle program. The dragon 2 capsule was originally supposed to land vertically kind of like the Falcon 9 does but that's been scrapped, it was just too much work for the engines on the capsule. On the bright side those are going to work for emergency situations for when in launch something goes wrong. It can carry seven people, and it's fully autonomous although you can do things from inside the cabin too. SpaceX's new space suits are much less heavy, and they allow more mobility, and we'll be actually seeing some astronauts in those suits in the dragon crew capsule going up into space hopefully by the end of this year as mentioned earlier.

The second stage of the BFR, a new rocket that SpaceX is developing, can go into low-earth orbit all by itself, it doesn't even need the booster part of the rocketry that is

powered by 31 next generation Raptor engines as opposed to the 27 Merlin engines that are on the Falcon Heavy. With full booster power the BFR will be able to launch 150 metric tons into low-earth orbit compared to 122 with the Saturn V which would make it by far the biggest most powerful rocket ever built, but what's even better is it'll have an even lower cost per kilogram for the cargo than Falcon Heavy does because the entire ship is reusable.

Elon Musk is expecting orbital tests on the BFR sometime in the next three to four years which would put it around it 2021, 2022. Elon put the dates for flying out to Mars with the BFR at around 2022 for cargo missions and in 2024 for crewed missions, he said these dates were aspirational. Keep in mind that the Falcon Heavy was delayed five years and that was basically just three Falcon 9 strapped to each other it turns out there were a lot more problems that they didn't foresee. Elon wants to not just get to Mars but to colonize it and maybe even terraform it, which of course would take centuries to do.

3.3. Space Knowledge and Opinions

One of the objectives of this monograph is to see the amount of interest and knowledge that exists for the space era and space exploration. The author has conducted a survey where 80 different people between the ages of 13 and 18 have answered the following. 85% considers that space exploration in the 21st Century is important, while the remaining 15% says that it is not. A type of response that we find in some cases says like this: "before exploring other planets or looking for life and water we should resolve the conflicts that we already have here on

earth. Diseases, extreme poverty and inequality first”. Another similar example of response is something like this: “No, because the human being cannot deal even with our own planet. First let's help the Earth itself and then do space exploration”. Meanwhile other answers say the opposite as: “It is very important to know the reason of what surrounds us, especially the space, that is unknown. To explore the majority would help ourselves answer several of the questions that humans they have been made since they know their existence such as: why we are here? where do we come from? and endless examples”. It is really interesting to find ourselves with totally opposite answers but that each one truly supports their arguments. The following question has some definite answers; question is: What reason you think is the most valid to justify the investment in space? Although there are five different alternatives, 37.5% that are 30 of the 80 people, decided to choose the option of finding protection for the human species against a extinction possibility, which means that they are more concerned about the future rather than about the current problems that we are going through. Two almost equal percentages occurred in the following answers: “It's in us as a species to be curious and explore what we do not know (taking as an example the discovery of agriculture and electricity or a new continent” and “Improve current life on earth using satellites that provide information regarding the climate and its changes” with 26.25% and 26.3% respectively. With only 1 person answering “The salaries of people who work in the space agencies of different countries” it was the least chosen since it favors a minority of people and the author gets that. The following questions tests what the surveyed know about some things respecting to the space era and space exploration. For example, in the question “What year do you think was the first landing to the Moon?”, half of the answers are correct with 1969, while the other half of the answers are divided between 1964,

1965 and 1971. B Another question says the following: “Which planet reaches higher temperatures according to your knowledge?” the logical answer would be to say Mercury because it is closer to the Sun. The thing is that it is not the correct answer. Venus is the hottest planet with only 13.8% in correct answers while Mercury got 48.8%. Even 5% of surveyed came to think that Earth was the hottest planet among the options: Mercury, Venus, Earth, Mars and Jupiter. The average temperature of the planet Mars is about -50 degrees Celsius So the only reason why to ensure that the planet is hot is by its color. Something similar would happen with Jupiter because it is generally known that it is a planet made of gases therefore, for some it is logical to think it is hot. Venus is the hotter because its atmosphere is able to keep most of the heat it receives from the Sun, while Mercury rotates on its own axis very slowly, with one side of the planet with an average of 250 degrees Celsius and the other side of the planet in about -250 degrees Celsius. The author was surprised by the following answers regarding the question: “Did you know that the man does not go to the moon since 1972?”. The 67% of the 80 respondents responded “No”, that is a little more than a third of the total! It means that they didn’t know that it has been 46 years since we last visited the moon. This next question has a very recent fact related to it and yet most people answered the opposite in the question. The human being has landed a rocket? The answers that we found are very diverse 27.5% said yes we could land one in 1972, being strange because at that technology could permit that. the 16.2% said that not yet, that it is planned to land a rocket in 2021. The next answer is the most answered because it sounds the most technical, and it was the one that received the 33.8% and says the following “The no entry speed makes it impossible to get a rocket to land” but the correct answer is “Yes, we can land rockets since December 2015”. The following question makes the surveyed travel a bit with their

imagination, with the question “How many stars you believe exist for every grain of sand on Earth?” The correct answer is 10 stars for each grain of sand on Earth which is surprising. If we imagine each of the grains of sand on our Ecuadorian beaches, on the beaches of our neighbor countries, the sand that lies under every ocean and in the countries of other continents, it gives a lot to think about and 65% of the surveyed correctly answered. The last question says: “According to your knowledge until which year the International Space Station will continue in operation?”, the majority of people, 76%, said it was still going to be expanding and operating with no expiration date, While only 13.8% answered 2024, that is the correct answer for the moment, according to what NASA has informed us, only one person answered in 2019, that can make us think that a historical event that is so close to the present should be known by people as a general culture. It is worrisome to see today's teenagers are so unconcerned about a topic that we have given so much importance in this monograph and that certainly in the near and distant future will have as much weight as it has the development of technology in our daily lives, as the private and public space agencies will not rest from working until we discover the secrets of the universe or until our very species allows them to discover.

CONCLUSIONS

At the end of this monograph work, it is concluded that:

- The space Era started slowly, with just one man and a dream, it was to build the first liquid fueled rocket. Robert H. Goddard was the pioneer of the space era, before he died, he successfully launched the first “modern” rocket. NASA didn’t exist at the time, so he was all alone in this world of new discoveries. Many monuments, buildings and even a spacecraft are named after him. Cold War is what truly started passion for space, many people remember this time as scary because of the imminent war between USSR and USA, and space took a big importance here, ending when USA got to the moon. The dream of American people for reaching the Moon and supporting space exploration started on the 12th of September 1962. That day, President John. F. Kennedy gave an amazing speech, worth of being a whole topic on this monograph.
- NASA’s budget is something still discussed till this day, some people want it decreased and other to rise in importance, we found that space exploration has many valid reasons to give it the importance it deserves. This monograph wouldn’t be complete if it wasn’t for a timeline, showing us some of the most important achievements that were done between 1960 and the present day. Now, space exploration is not based on a race like it was on the Cold War, now private companies such as SpaceX and Blue Origin are trying to make going to space cheaper, and hopefully in a bright future, colonize other planets and enjoy space in our daily lives.

- What happened in the past, stays in the past, but what matters is what the future is holding for us. NASA and SpaceX have solutions and space programs for the future, some of those are to colonize mars, to clean the space junk, leave the ISS, launch and land new rockets, put new telescopes in space, and develop new technology in general to serve us humans. What we discovered is surprising, the level of space knowledge demonstrated in a poll by the average teenager is very little, that is why we should be teaching more things about space and how it works, we are used to knowing things about the earth but not what it is surrounded by.

RECOMMENDATIONS

At the end of this work it is recommended that:

- Take space more seriously, because maybe it is not that important for humanity now, but it is a fact that space exploration is going to develop exponentially in the coming years.
- Try investigating more about space after reading this monograph, YouTube is one of the best media platforms to find information, but be careful, not everything on the Internet is true, so if you watch videos, consider watching from reliable sources such as “SpaceX”, “El Robot de Platón” or “C de Ciencia”, those and many others can help you understand space in a creative way.
- If you are one of those who prefer books, and like to discover new things, try buying books that are related to space, the author is confident that you will learn a lot of things and maybe change the way you see life in a better way, sometimes people should realize how little we are to see how big we could become.

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