The New Space Race: Public versus Private Sector

Jan Janovský

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L.S.

doc. Ing. Anežka Lengálová, Ph.D.
děkanka

PhDr. Katarína Nemčoková, Ph.D.
ředitelka ústavu

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ABSTRAKT

Předmětem této bakalářské práce jsou překonávání hranic Amerického národa jako součást jeho národní identity, překonávání hranic vesmíru a možný nový Vesmírný závod. Práce se dále zaměřuje na ranné počátky Vesmírného závodu vyvolaného Studenou válkou v padesátých letech a jeho výsledky, následnou stagnaci NASA vedoucí ke kooperaci s dalšími národy za účelem přežití a možným návratem na základě spolupráce se společnostmi soukromého sektoru za dosažením nové hranice, kterou představuje Mars.

Klíčová slova: hranice, NASA, Měsíc, Mars, vesmír, veřejný sektor, soukromý sektor, průzkum vesmíru

ABSTRACT

The subject of this bachelor thesis is the Frontier of the American nation as a part of its National identity, Space Frontier and possible new Space Race. The thesis further focuses on the early beginning of the Space Race started by the Cold War in the 1950s and its results, the following stagnation of NASA, resulting in cooperation with other nations in order to survive and its possible return due to cooperation with private sector companies, reaching the next Frontier represented by Mars.

Keywords: frontier, NASA, Moon, Mars, space, the public sector, the private sector, space exploration

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I hereby declare that the print version of my Bachelor's/Master's thesis and the electronic version of my thesis deposited in the IS/STAG system are identical.

CONTENTS

INTRODUCTION

Individuals, just as the whole society, move forward through their values, ideals, and visions, they explore, conquer and exploit, believing they have a purpose. If any setback occurs, people either adapt or fight back, fight for what they believe in, because just like curiosity, the need for sustaining the survival is deeply embedded in the human nature. Just as the Frontier times during the colonization of West are depicted throughout various stories, movies, books and legends, the space exploration of last six decades gained its own lore and stories as well as depiction in science fiction and fantasy, created by authors and storytellers inspired by the Space Race, a rivalry between United States and Soviet Union and its results. For Americans, the rightful place in the space exploration became one of their Frontiers, proving their superiority in the world by putting a man on the Moon and taking the leading position as the most capable nation. But when another setback occurred, the agency's work began to stagnate and resulted in joining forces with its former rival and other nations. With the stagnation of its programs, will the United States be able to continue its purpose in space exploration? But with another Frontier in a sight and recent administrations, United States takes back the independence with help and mutual support of private sector and tries to keep the space exploration superiority on the American soil. Will NASA reach the next Frontier represented by either return to the Moon or settling Mars on its own or will it be any of the private sector companies?

1 THE FRONTIER AS A CONSTRUCT OF AMERICAN SOCIETY

The Frontier can be depicted more importantly as a substantial westward-moving zone, adjacent to the settled sections of the continent, and peopled by a variety of individuals applying their individual skills to the development gained momentum, a number of Frontier "types" such as Cold War and Moon landing emerged, each playing a distinguishing role in the progression of society. Even though they vary with time and place, every single one of them is identifiable as a shaping element of the whole society.[1]

America has developed and prospered economically in the context of a well-developed lore and mythology of the Western Frontier that is unique to the United States and embedded within its culture. To this well-developed lore belong, for example, the remaining Indian reservations or Western-based stories, legends, and films. According to this lore, the western Frontier consisted of newly discovered open land that required only hard work and resourcefulness to conquer. It was an exciting place to be, a land of unparalleled economic opportunity and freedom for the few who had the strength and determination.[2]

For the three centuries during which whites occupied the continent, generation after generation had looked to the Frontier as a region of limitless resources and opportunity. Easterners comforted themselves with the belief that in times of economic stress a safe shelter in the West awaited them or their fellow citizens.[3] The frontier experience did not remake every establishment, or create new characteristics in people. It was likely to strengthen certain behavioral patterns and weaken others. The Frontier simply provided a pleasant setting for a continuation of a trend initiated generations earlier.[4]

The ideology of Frontier in American history became a part of the American mythology. Frontier basically became a symbol, a myth, a belief, a vision which makes people go forward and expand, exploit and spread. It can be seen as a form of the uniting element and justification for a course of actions. The Frontier is an artificially created construct serving a certain purpose.

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[1]Ray Allan Billington and Martin Ridge, *Westward Expansion: A History of the American Frontier* (Albequerque: University of New Mexico Press, 2001), 3.
[2]Ray A. Williamson, *Outer Space as Frontier: Lessons for Today* (Long Beach: Western Folklore, 1987), 259.
[3]Ray Allan Billington and Martin Ridge, *Westward Expansion: A History of the American Frontier* (Albequerque: University of New Mexico Press, 2001), 385.
[4]Ray Allan Billington and Martin Ridge, *Westward Expansion: A History of the American Frontier* (Albequerque: University of New Mexico Press, 2001), 383.

1.1 National identity

Among the basic components of the standard Western model of the nation, as they evolved throughout the course of history, belong historic territory, legal-political equality of members, legal-political community, common civic culture, and ideology. These elements have remained vital even under the influence of the West in the Modern World, although in somewhat enhanced forms, in most of the non-Western conceptions of national identity. During the same period of time, a fairly differentiated model of nation has initiated outside the West, especially in Eastern Europe and Asia. Historically, this model of nation challenged the superiority of the Western model of the nation and added substantial new elements, more adjusted to the very different conditions and courses of non-Western societies.[5]

Identification of the differences between nations does not essentially create competition. Differentiation urges mutual comparing, the identifying of the certain ways in which does one of the groups differ from the other. Comparison thus produces further evaluation: Are the ways of one of the groups worse or better of those of the other group? Egotism of one of the groups leads to justification: Ways of the first group are better than those of the second group. Since the other group is engaged in a comparable process, conflicting justifications lead to competition. The groups need to prove the superiority of their ways to the ways of the other group. Competition leads to an antagonism and only to expanding of what could have begun only as a recognizing of subtle differences into more extreme and essential ones. Stereotypes are created, the rival is demonized or even turned into an enemy. Whereas the need for enemies justifies the ubiquity of the conflicts between and within societies of human community, it does not clarify the forms and conditions of the conflict. Competition and conflict can only arise between groups which are in the same universe or arena.[6]

On the other hand, when taking an example from modern history, when the Cold War ended, the dissolution of the Soviet Union as the biggest enemy of that period of time got rid of the major and obvious threat to the American security and allowed to decrease the importance of the national identity in the United States in comparison to other national

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[5]Anthony D. Smith, *National Identity* (Reno: University of Nevada Press, 1991), 11.

[6]Samuel P. Huntington, *Who are We?: The Challenges to America's National Identity* (New York: Simon & Schuster, 2004), 26.

identities. Historical experiences show that the lack of an "external other" tends to weaken the unity and create divisions in a certain society. It cannot be surely said if the irregular terrorist attacks and conflicts with "rogue states" such as Iraq will produce the needed national coherence which twentieth-century wars and rivalries did.[7]

Americans as a nation have a strong emphasis on different values which make up their National identity, more than communities of other countries in the World do, especially in Europe. Whereas for example, the Eastern European countries emphasize on their ethnic values alongside vernacular and "family-based" elements, the Western countries emphasize the values of religious, civic and territorial elements and ideology, as the Frontier element is deeply embedded in their history and creating their culture. When referring to John Winthrop's A City upon a Hill, there is a metaphorical reference to religious mission of Puritan voyagers to the New World, seeing the America as the chosen one in the eyes of God, watching over the whole world from the hill as well as being looked up to and watched by the rest of the world.[8]

National identity could be undermined, softened by occurring circumstances such as losing an "enemy" of some form, with whom the nation compares its achievements and rivals with, thus it has to be strengthened and supported via common aim of society. The stagnation in the space programs development after the end of Cold War could be taken as an example, as the United States did not have to prove its superiority in space anymore. American society and its National identity are based on myths and artificially created constructs, on beliefs and on having a certain purpose, an aim, a goal – a Frontier. One of those beliefs was, for example, President Kennedy's speech to Congress aiming to put a man on the Moon, believing that they were capable of such an achievement and referring to their superiority as a leading nation.[9]

1.2 The Space Frontier

Anthropologists, historians and social scientists for a long time have been affected by a philosophy of knowledge that posits the invention of meaning. That is, the concepts by which humanity lives originate in communities' needs: social practices and their meaning

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[7]Samuel P. Huntington, *Who are We?: The Challenges to America's National Identity* (New York: Simon & Schuster, 2004), 17-18.
[8] Lawrence W. Kennedy, *Planning the City Upon a Hill: Boston Since 1630* (Boston: The University of Massachusetts Press, 1992), 11.
[9] TheApollo11Channel, „*John F. Kennedy „Landing a man on the Moon" Address to Congress – May 25, 1961*," Youtube Video, 3:46, July 1, 2010, https://www.youtube.com/watch?v=TUXuV7XbZvU.

deliberate creations to serve those needs, and thus may be created and recreated intentionally over a longer period of time. Concepts and meanings may be conveyed via narratives, myths, symbols, images, icons, rituals, and traditions, as well as direct discourse. Some meanings last, some are adjusted to the needs and adapted, and some fail.[10]

In the first half of the nineteenth century, American astronomical observatories were key mediums for the personal exploration of space, the planets and the stars, which were perceived as monuments of civic development. Value of those monuments was very often rather symbolic than scientific and signified substantial expenditures for the communities as well as for the individuals who participated upon them.[11] The motivations and impulses which were influencing the interests of these "light-houses of the sky" were personal ones: fundamental interest in the heavens and scientific inquisitiveness, or the desire to signal their status via using those monuments and legacies.[12]

A spaceflight cannot be seen as anything else than an invention. Nothing about the spaceflight is natural, except perhaps the human need and urge to explore. It is an activity first envisioned and then engineered and accomplished at grand effort and expense. Spaceflight is the cultural creation of humanity's will, imagination, and intelligence. To create the overall message and to foster the support and involvement of people it needs a narrative which explains its purpose and value for the society. Using a well-liked expression which occurred in current social and cultural researches, spaceflight is seen as an image, a "big idea" stated in consequential narratives, images, symbols, and actions that symbolize shared beliefs and values. Among the many images that saturate American culture with a sense of identity and shared experience are "the West," "the Melting Pot," "the American Dream," "the Cold War," and even "Democracy." A more abstract image is "American Exceptionalism," the belief that the United States is unique in history and has an extraordinary destiny to broaden freedom, develop technology, and ensure progress for humanity.[13]

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[10]Valerie Neal, *Spaceflight on the Shuttle Era and Beyond: Redefining Humanity's Purpose in Space* (New Haven: Yale University Press, 2017), 2.
[11]Alexander MacDonald, *The Long Space Age: The Economic Origins of Space Exploration from Colonial America to the Cold War* (New Haven: Yale University Press, 2017), 4.
[12]Alexander MacDonald, *The Long Space Age: The Economic Origins of Space Exploration from Colonial America to the Cold War* (New Haven: Yale University Press, 2017), 4.
[13]Valerie Neal, *Spaceflight on the Shuttle Era and Beyond: Redefining Humanity's Purpose in Space* (New Haven: Yale University Press, 2017), 8.

Nonetheless, the similarity between conquering and settling the West during the Frontier period and settling outer space is seriously inconsistent. The images of the Frontier that space enthusiasts resort bear little relationship with the actual experience of life on the Frontier. Clothing their ambitions in the mythic garments of a romanticized Frontier is a way of ignoring or pushing aside the possible negative aspects of the exploitation of space. For example, although in space there are no Indians and no plasmoid buffaloes to exploit, the only nations that can afford to make use of the potential material wealth in space are those that can now afford the enormous expenditures to reach them. It is likely that in exploiting space, the humanity is going to continue the same imbalances of resources and material wealth like it does experience on Earth. The countries without the same rate of distribution of resources or economic growth as United States, Russia or Europe such as the third world countries will most probably never be capable of participation in the space exploration.[14] Space Frontier is seen as another kind of conquering a land, finding new resources, and an expansion of humanity. It is especially a domain of the nation, which gives its people a vision of a common goal which can be achieved by rivalry or need to survive. Human curiosity, learning, and nature of exploring and developing new things have pushed the humanity to the level where it is now.[15]

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[14]Ray A. Williamson, *Outer Space as Frontier: Lessons for Today* (Long Beach: Western Folklore, 1987), 260.

[15] Edward O. Wilson, *On Human Nature* (Cambridge, MA: Harvard Univesity Press, 2004), 4.

2 THE ORIGINAL SPACE RACE DURING THE COLD WAR

In 1957, the Soviet Union's launch of Sputnik, following the successful launch of a first Soviet ballistic missile, surprised the United States and the rest of the world. The Soviet Union declared their system of social organization and mainly of their government as a system of the future. In the United States, President Dwight D. Eisenhower attempted to downplay the significance of Soviets' military motives with the aim of calming down the public, but people started to ask if the Soviets are able to launch a satellite into space, what other things could they be capable of? The space could be used as a strategic high ground for launching ballistic or nuclear missiles and the threat of another World War could become imminent.[16] Since the end of the World War II, Soviets made their missiles a biggest military asset. Space programs and space technology rapidly became a symbol of power and national prestige.[17] The imminent impact of the Sputnik Crisis in the United States was an immediate call for an absolute mobilization, for "blood, sweat, and tears," in a pursuit of technological and scientific superiority. This call expanded to the American nation's industrial base, to its commodity culture, to its methods of governance and identifying priorities as well as to its educational system.[18]

The formation of National Aeronautics and Space Administration (NASA) in July 1958 participated in and reflected the universal growth of technocracy in the American society. NASA was established with the purpose of protecting the American prestige in the eyes of the whole world as a civilian agency. Its space programs were meant to contribute to creating a bigger picture to show the bold, big and expensive government that worked properly. In 1958, former chief of NASA James E. Webb called the agency a pattern which is needed by the American nation where its progress is acquired via resilient problem solvers, a provisional system of various professionals united together by coordinating executives in an organic flux.[19] Despite the fact that many members of the American scientific community protested, NASA was widely popularized as a kind of an archetype

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[16] Von Hardesty and Gene Eisman, *Epic Rivalry: The Inside Story of the Soviet and American Space Race* (Washington, DC: National Geographic Books,2007), 99.
[17] Henry W. Lambright, "*Exploring Space: NASA at 50 and Beyond*," Public Administration Review 70, no. 1 (January–February 2010): 152.
[18] Barton Beebe, "*Law's Empire and the Final Frontier: Legalizing the Future in the Early Corpus Juris Spatialis*," The Yale Law Journal 108, no. 7 (May 1999): 1745.
[19] Barton Beebe, "*Law's Empire and the Final Frontier: Legalizing the Future in the Early Corpus Juris Spatialis*," The Yale Law Journal 108, no. 7 (May 1999): 1746-1747.

of a state-sponsored "technology of command" proved by the material, intellectual and spiritual advantages which it produced.[20]

As a response to the Soviet Union's triumphant launch of Sputnik satellite, followed by their successful launch of Vostok space capsule on 12 April 1961, carrying the first cosmonaut Yuri Gagarin as the first man into the Earth Orbit,[21] the United States dedicated its resources, talents and will to put a man on the Moon and safely back as the President John. F. Kennedy stated in his Address to Congress on 25 May 1961. It was a time for "A new enterprise, time for the American nation to take a leading role in space achievements which may be crucial to the future on the planet Earth."[22]

And when Neil Armstrong stepped on the surface of the Moon on 20 July 1969 as the first man in history, planted the American flag and stated "It's one small step for man, one giant leap for mankind,"[23] he did not only refer to the American nation but to the whole humanity. Throughout a history, planting a flag was always seen as conquering of a land, but according to the Outer Space Treaty, the Moon was not subject to the national appropriation by claim of sovereignty. The American nation was in this case taken as a nation representing the whole humanity.[24]

Not only did the United States refer to this event as a triumph for all mankind, but press all over the World, from Asia, Europe, and Africa did so as well. The achievement of the Moon landing was not highlighted only as "a success of America" but as "a success for every living man." It was referred to as "We watched this adventure and we were proud of ourselves and what the human mind achieved", and "The Moon landing is every man's mission." But the achievement brought to people more than that. It gave them a hint of a higher purpose, a vision of a common goal, cooperation and peace through some of the press statements such as "July 21, 1969, represents a grand hope for all men of goodwill, who see in this fantastic leap toward the heavens a step toward the gods.", "A man on the Moon is more than a purely scientific achievement. It is the extension of man's mind and

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[20] Barton Beebe, "*Law's Empire and the Final Frontier: Legalizing the Future in the Early Corpus Juris Spatialis*," The Yale Law Journal 108, no. 7 (May 1999): 1747.
[21] "Yuri Gagarin: First Man in Space," Space.com, accessed March 25, 2018, https://www.space.com/16159-first-man-in-space.htm l.
[22] TheApollo11Channel, „*John F. Kennedy „Landing a man on the Moon" Address to Congress – May 25, 1961*," Youtube Video, 3:46, July 1, 2010, https://www.youtube.com/watch?v=TUXuV7XbZvU.
[23] 20th Century Time Machine, "*Apollo 11 Moon Landing NASA Original Footage. One Small Step for Man, One Giant Leap for Mankind,*" Youtube Video, 7:09, March15, 2016, https://www.youtube.com/watch?v=HlECwTxbiRg.
[24] "Where No Flag Has Gone Before: Political and Technical Aspects of Placing a Flag on the Moon," Space.com, accessed March 3 2018, https://www.jsc.nasa.gov/history/flag/flag.htm.

human spirit to a higher plane" or "this is not a simple space trip. It is even more than adding the Moon to the Earth. It is a harbinger of human victory."[25]

The ideology of the Frontier was repeatedly accentuated by scientists from NASA, by the press office of White House and the astronauts from space programs themselves. NASA's former general counsel, John Johnson called it a "great new human adventure." Former vice president, proposing the devotion for yet another NASA spaceflight center, referred to space as the last and greatest Frontier and when ensuring his point in such a statement, he added that Americans go into space as pioneers went to the West, for one purpose only. In his statement, the goal meant by the "one purpose" was a metonymy for the opportunity, a historical magnitude. NASA's aspiration was to reach insisting historical magnitude through a form captured by a historical past which is universally understood by the whole American society.

Flight director in NASA, Gene Kranz afterward described his feeling of the moment when the Eagle lunar module from Apollo 11 mission was seconds from landing on the Moon surface in a way that summarizes this mythic mission – it was like watching Christopher Columbus wading a shore of the New World. In a very real mythical way, this version of the Frontier offered exactly what president John F. Kennedy hoped for. It offered a hidden motive for supporting and justifying the support of Apollo missions and corresponding space programs. And, as long as astronauts and government executives followed the "pioneering" ideals of that nineteenth-century version of the Frontier mythology the rhetoric practically worked as a myth, too.[26]

NASA stated that the devotion of the Soviet Union to a development of its own space programs necessitated the same level of devotion from the United States. Thus United States had to reach at least the same standard of efforts as were those of the Soviet Union. The Soviets had to be kept from going ahead as the unchallenged leader in space as James Webb, a NASA administrator in 1966 pointed out. Even after the successful Moon landing of Apollo 11 in 1969, Wernher von Braun, a German rocket designer for NASA warned that the United States had to sustain their efforts, because if the Americans start stagnating in the development and dedication to its goals and achievements represented by new space

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[25] Foy D. Kohler and Dodd L. Harvey, "*The International Significance of the Lunar Landing*," Journal of Interamerican Studies and World Affairs 12, no. 1 (January 1970): 3-40.
[26] Matthew Wilhelm Kappel. *Exploring the Next Frontier: Vietnam, NASA, Star Trek and Utopia in 1960s and 1970s Myth and History* (New York: Routledge, 2016), 127.

programs, they may be bracing themselves for yet another surprising move of the Soviet Union in oncoming years.[27]

After the successful Moon landing of Apollo 11 in 1969, NASA sent to the surface of Moon 6 more manned missions until 1972. Apollo 12 was sent to the Moon on 14 November 1969, to sample the areas and collect surface data. The first setback occurred with the mission of Apollo 13, which was the only one of the missions forced to circle the Moon and head back to Earth due to the unexpected explosion aboard. The remaining Apollo 14, Apollo 15, Apollo 16 and Apollo 17 missions were sent to the Moon with two main purposes – to search the Moon and its regions (survey the materials and resources), to study the zero gravity, do experiments and understand the space for future space exploration.[28] The Soviet Union developed its own series of missions too. Unmanned Luna spacecrafts were launched to the Moon to research the surface and bring back samples. The first successful launch of Luna 2 was on 12 September 1959 and the program ended with Luna 24 in August 1976, fulfilling its missions, bringing back Moon rock samples, information for future projects and developing reliable robotic technology for unmanned missions. Despite these achievements, Soviets were not able to develop fully manned spacecraft for reaching the Moon.[29]

During the 1970s, the United States and the Soviet Union also built their own space stations in low Earth Orbit, for a better understanding of the conditions in space which could be used for future space exploration as well as taking military and strategic advantages. The United States launched their Skylab space station in 1973, using their remaining rockets initially meant for Apollo missions to return to the Moon. Skylab hosted 3 manned missions, providing NASA with information about zero gravity, use of technology and growing plants in space. The station burned in the atmosphere in 1974 and fell into the Pacific Ocean. Soviet space station Salyut was constructed in Orbit in 1971 and went through many modifications and versions, as a stepping stone to Soviet space station Mir.[30] With growing involvement of both nations in space, the United States and the Soviet Union agreed on participation in reaching a common goal. The cooperation

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[27] Mark E. Byrnes, *Politics and Space: Image Making by NASA* (Westport: Praeger, 1994), 13.
[28]"The Apollo Missions," NASA, accessed March 6, 2018, https://www.nasa.gov/mission_pages/apollo/missions/index.html.
[29] "Luna 2," National Aeronautics and Space Administration, accessed March 6, 2018, https://nssdc.gsfc.nasa.gov/nmc/spacecraftDisplay.do?id=1959-014A.
[30] "Apollo-Soyuz Spawned 1st Handshake in Space by US-Soviet Crews 40 Years Ago," Space.com, accessed March 6, 2018, https://www.space.com/29979-apollo-soyuz-test-project-40th-anniversary.html.

between the superpowers aimed at lowering the tension, preventing possible conflicts and developing new technologies based on the results.[31] The Apollo-Soyuz mission was the very first action of involvement from both sides for the future of space exploration. On 17 July 1975, American astronauts and Soviet cosmonauts met in Orbit, connecting their spacecrafts, enabling future space rescues and laying the foundation for future international cooperation.[32]

The first module of Mir was not launched until 20 February 1986 and the station was used by the Soviet Union until 1990 when it fell into the atmosphere. The Salyut/Mir space station enabled to observe long-duration effect of zero-gravity and isolation on humans and their health and psychology. The Soviets were able to sustain their space station program longer than the United States because of their focus, which was not aimed at manned Moon missions. While the US aimed for the Moon with its Apollo programs, Soviet Union devoted its resources and engineering to construct a place for permanent occupation of the Earth Orbit.[33]

Entire space exploration development of the 1960s and early 1970s resulted in the Soviet Union realizing that it alone cannot reach any significant goals or create an advantage over the United States and that the United States cannot do the same thing by exploring the space without external help. Despite that, the USSR could possibly continue to see the space only from the point of view which primarily focused on the military and strategic connection. Yet it could barely believe that the United States would not immediately make use of such a situation. With the Moon landing and with the wide range of capabilities which the United States developed in connection with the Moon landing project, the Soviet Union could not any longer hope for any superiority in space. The Soviet Union increasingly came to realize that space over a long period of time cannot be seen as a province of solely one nation and that the Soviets as other nations in the world stand to gain more from a cooperative effort than from efforts put in space exploration by themselves alone.[34]

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[31] "Apollo-Soyuz Mission 25 Years Later," ABC News, accessed March 6, 2018, https://abcnews.go.com/Technology/story?id=120107&page=1.
[32] "The Apollo Missions," NASA, accessed March 6, 2018, https://www.nasa.gov/mission_pages/apollo/missions/index.html.
[33] "Mir Space Station: Testing Long-Term Stays in Space," Space.com, accessed March 6, 2018, https://www.space.com/19650-mir-space-station.html.
[34] Foy D. Kohler and Dodd L. Harvey, "*The International Significance of the Lunar Landing*," Journal of Interamerican Studies and World Affairs 12, no. 1 (January 1970): 16.

3 RISE OF THE PUBLIC SECTOR

In the second half of the 1970s, James C. Fletcher, a former NASA administrator aimed at keeping the human space exploration program and probably NASA itself too, alive through a space shuttle project. With prior access to the Moon by the United States and starting the cooperation with the Soviet Union, the space shuttle had to be justified mostly on cost-benefit terms. On the 5 January 1972, President Richard Nixon approved a development of the space shuttle project as the main focus of NASA. Since then the shuttle project stabilized the expenditures towards NASA and set the tone for the rest of the 1970s and early 1980s with the shuttle as its main driving force. The purpose of the space shuttle project was to develop a less expensive spacecraft for future missions regarding flights back to the Moon, construction of new space stations and launching military and communications satellites into Orbit.[35] The construction of the first space shuttle Columbia started in June 1974 and was referred to as the Space Transportation System (STS). After six years under construction, the Columbia's first flight took place on 12 April 1981[36], proving a reusability of a spacecraft and followed by four other space shuttles in total – Challenger (1983), Discovery (1984), Atlantis (1985) and Endeavour (1992).[37]

For more than a decade since the construction of the first space shuttles, the United States believed that their development would make space easily accessible, inexpensive and also safe. However, Challenger accident in 1986 presented space shuttle flights as something far from being safe, depicting the space shuttle as neither cheap nor effective as a universal space transportation system.[38] Due to this accident, the oncoming launches of remaining shuttles were postponed and with a limited budget and doubtful restart date, the Department of Defense stood up to lay its first proposition to the space shuttle flights. As a result of the final decision and a new policy announced in 1986, no commercial payloads (communication satellites) were allowed to fly on the shuttle anymore.[39]

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[35] Henry W. Lambright, "*Exploring Space: NASA at 50 and Beyond*," Public Administration Review 70 no. 1 (January–February 2010): 154.
[36] "Columbia: First Shuttle in Space," Space.com, accessed March 6, 2018, https://www.space.com/18008-space-shuttle-columbia.html.
[37] "The 3 Most Flown Space Shuttles of NASA's Fleet," Space.com, accessed March 6, 2018, https://www.space.com/12173-nasa-space-shuttles-miles-flown.html.
[38] Bruce Murray, "*"Born Anew" versus "Born Again"*," International Security 11, no. 4 (Spring 1987): 182.
[39] Albert D. Wheelon, "*A "Born Again" Space Program*," International Security 11, no. 4 (Spring 1987): 147.

By 1987, the American planetary program, which was decades ago a source of national pride, was almost dead. NASA dedicated most of its available resources to manned space programs. First of those were the Apollo missions and lunar landing followed by the space shuttle which proved to be not as cheap and effective as initially intended, with costs per one flight rising up to $1.6 billion compared to planned $20 million. With the rising costs of those programs, the slice of budget left for further space exploration, planetary and science programs such as purely US space station (Skylab or proposed Freedom), gradually decreased. The United States was not able to sustain their space programs and become a leading superpower in space exploration again after setback regarding the Challenger accident. The only solution was to partner with other nations to form international relationships leading to new cooperation in space.[40]

In 1989, NASA was spending billions from its budget on a development of a proposed space station Freedom, which eventually did not come to a realization. President George H. W. Bush attempted to extract NASA from its period of stagnation and depression by setting a new goal that would move the human spaceflight program from low Earth Orbit back to its originally manned exploration missions. In July 1989, which marked the 20th anniversary of the first lunar landing of Apollo 11, George H. W. Bush announced the new Space Exploration Initiative, according to which, NASA would put a man back on the surface of Moon and later on the surface of Mars, too. Bush gave no further specifications, however, and the Democratic majority in Congress rejected the program as empty rhetoric, promising that it would never fund the Space Exploration Initiative campaign. The public and the media were lethargic as well. In 1990, NASA's situation only worsened, when the first pictures sent back from the Hubble Space Telescope were blurry. The agency was overwhelmed by its existing projects and unable to commence a new one on its own. The Space Exploration Initiative proposed by George H. W. Bush vanished completely when Bill Clinton was elected to be the next president in January 1993.[41] The Initiative never got off the ground, literally and figuratively and was not proposed again ever since.

In 1993, NASA's development of the proposed space station Freedom transferred into more ambitious project, which was not possible to achieve without international

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[40] Albert D. Wheelon, "*A "Born Again" Space Program*," International Security 11, no. 4 (Spring 1987): 145.
[41] Henry W. Lambright, "*Exploring Space: NASA at 50 and Beyond*," Public Administration Review 70. no. 1 (January–February 2010): 155.

cooperation and its financial and material resources. After the end of the Cold War and the dissolution of the Soviet Union in 1991, decrease of the tension in political relationships between the United States and Russia and their involvement and experiences in space development, the former rivals were two main candidates for the international space project. United States (NASA), Russia (Roscosmos), Canada (Canadian Space Agency), Japan (Japan Aerospace Exploration Agency) and Europe (European Space Agency)[42] laid the foundation for a construction of the International Space Station which began in 1998 and has been continuously occupied since 2000. The purpose of the ISS is purely scientific (effect of long-term zero gravity on human beings, vital information essential to future lunar and planetary manned spaceflights, technologies, drugs, growing plants) [43] The time assigned to the independent researches is based on the contributions of particular agencies. US shuttles and Russian Soyuz provided the construction and resupplying, the European, Canadian and Japanese agencies provided the support via mission control centers. [44]

The Columbia accident on the 1 of January 2003 caused that the American nation started to realize that the space shuttle was getting old, had many intrinsic flaws and that it would never be capable of making spaceflights truly routine. The Columbia Accident Investigation Board, officially housed by NASA but operating independently, presented a report which not only faulted NASA but mainly pointed out an urge to change its major policy. The agency itself directly stated that it had to move forward from the space shuttle and space station eras and that the human lives should be given at risk for greater purposes than just for purposes of sending humans around the planet in low Earth Orbit again and again. NASA's purpose was space exploration and since the Apollo missions, there have not been any manned programs in this way.[45]

One year later, in 2004, President George W. Bush announced a plan regarding the retirement of the space shuttles due to their riskiness and high launch costs. NASA was led to consider the cooperation with space entrepreneurs and their private companies, following a success of SpaceShipOne and President Bush's announcement of a

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[42] "Space History Photo: Freedom Space Station Concept," Space.com, accessed March 6, 2018, https://www.space.com/19359-freedom-space-station-concept.html.
[43] Henry W. Lambright, "*Exploring Space: NASA at 50 and Beyond*," Public Administration Review 70. no. 1 (January–February 2010): 157.
[44] "International Space Station: Facts, History and Tracking," Space.com, accessed March 7, 2018, https://www.space.com/16748-international-space-station.html.
[45] Henry W. Lambright, "*Exploring Space: NASA at 50 and Beyond*," Public Administration Review 70. no. 1 (January–February 2010): 155-156.

Constellation program regarding sending people back to Moon by 2020 and then to Mars, developing a successor to the space shuttle – project Orion, planned to be capable of reaching the Moon and then Mars.

Bush did not directly address it as a politically motivated move, just as President Kennedy's "landing a man on the Moon" was. At that time it was not because of Russians, but because of Chinese, who managed to send an astronaut to the Orbit in 2003 and were aiming for the Moon on their own. Although the motives were not based on the rivalry between nations like during the original Space Race of the 1960s, the successful mission of other nation could diminish the world's status of American aerospace technology. Bush explicitly stated that he denied the existence of a new space race between nations and envisioned it as a journey. This goal has been promising from aspects of new technological breakthroughs, advances in electronics, communications, and scientific satellites as well as inspiring next generations of young people to get them involved in scientific studies. [46]

In January 2009, President Barrack Obama took the office after George W. Bush and in May 2009, Obama Administration ordered a complete independent review of the agency's progress regarding the human-spaceflight plans. This came to be known as the Augustine Commission. The results of the Commission included in the final report published in October 2009, described the Constellation as being behind schedule and way over the budget. The five-year-old program was canceled by President Obama in 2010 and NASA was instructed to put the astronauts on a near-Earth asteroid by 2025 and then on the surface of Mars by 2035, using the Orion spacecraft once its development is finished. The retirement of the space shuttles fully ended in 2011, after the completion of the ISS which required the shuttles. Since 2011, US space activities regarding the access to the ISS became fully dependent on Russians and their Soyuz program, leading to the stagnation of NASA.[47]

During Obama's presidency, two American private companies SpaceX and Orbital ATK began to fly unmanned resupply missions to the International Space Station for NASA. In Addition, SpaceX should start transporting the NASA astronauts to and from the

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[46] Michael Belfiore, *How a Visionary Band of Business Leaders, Engineers, and Pilots is Boldly Privatizing Space* (New York: Harper Collins, 2008), 116-117.
[47] "President Obama's Space Legacy: Mars, Private Spaceflight and More," Space.com, accessed March 19, 2018, https://www.space.com/35394-president-obama-spaceflight-exploration-legacy.html.

orbiting laboratory in 2018 and 2019, based on a multibillion-dollar contract with the agency.[48]

NASA has been dependent on the Russian delivery systems since the last flight of the space shuttle in 2011 and its following retirement. Obama administration prioritized the development of private vehicles for manned missions, which was based on the announcement of NASA's Commercial Orbital Transportation Services starting the public-private cooperation in January 2006 (after the success of SpaceShipOne and X-Prize contest). For many, the cooperation established between the public and private sector is the biggest legacy of the Obama administration.[49]

On 11 December 2017, current US President Donald Trump signed the directive, according to which NASA will refocus its space programs on the deep space exploration and discovery. The goals he set are putting men back on the Moon and eventually on Mars in the future. By returning Americans to the Moon and going to Mars by 2030s, Trump aims to ensure that the United States will lead the future space exploration.[50]

The current Trump Administration is willing to end the supporting of the International Space Station by 2025, leading to grounding the astronauts on Earth until the agency fully develops the Orion and deep space exploration programs. The ISS has been a long-term project for more than last two decades, operated in partnership with Russian Roscosmos, the astronauts from Europe, Japan and Canada and has cost NASA more than $87 billion investment from the US government.[51]

Since the completion of the ISS requiring a full focus of NASA, the agency became mired in the low Earth Orbit instead of fulfilling its original purpose – the deep space exploration. NASA started stagnating after the inconvenient accidents of Challenger and Columbia shuttles, losing lives and resources. The partnership between the nations helped to stabilize the agency's status and long-term goals regarding the international cooperation and ISS, but also produced dependence on the other nations in order to survive. As a result, the only solution may be the use of US private space companies, building upon the

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[48] "President Obama's Space Legacy: Mars, Private Spaceflight and More," Space.com, accessed March 19, 2018, https://www.space.com/35394-president-obama-spaceflight-exploration-legacy.html.
[49] "President Obama's Space Legacy: Mars, Private Spaceflight and More," Space.com, accessed March 19, 2018, https://www.space.com/35394-president-obama-spaceflight-exploration-legacy.html.
[50] "President Trump Directs NASA to Return to the Moon, Then Aim for Mars," Space.com, accessed March 7, 2018, https://www.space.com/39050-trump-directs-nasa-humans-to-moon.html.
[51] "Trump administration wants to end NASA funding for the International Space Station by 2025," The Verge, accessed March 19, 2018, https://www.theverge.com/2018/1/24/16930154/nasa-international-space-station-president-trump-budget-request-2025.

previous American space achievements. NASA's course of existence was determined by how well or miserably the administrators and leaders have dealt with changing situations. The administrators had to be very effective in working with their presidents. The agency did well if the relationships were positive and leaders supportive. When they were not, the agency suffered and stagnated. The successful wellbeing of NASA depended in large part on relationships between NASA, Congress and the US president. Presidential support can make possible for the administrator to get public funding and congressional support.[52]

Implementation of the initiatives and new space exploration projects can take many years as well. When these stretch over a longer period of time and the leadership positions are changing when being handed from one administrator to a new successor (sometimes smoothly, sometimes not), the programs need to be adapted too. The programs NASA sustains are crucial to the agency's survival, but over a longer period of time they can get too expensive and stand in the way of newer, more demanded goals, including those which are central to the agency's purpose.[53]

[52] Henry W. Lambright, "*Exploring Space: NASA at 50 and Beyond*," Public Administration Review 70. no. 1 (January–February 2010): 156.
[53] Henry W. Lambright, "*Exploring Space: NASA at 50 and Beyond*," Public Administration Review 70. no. 1 (January–February 2010): 152.

4 RISE OF THE PRIVATE SECTOR IN THE UNITED STATES

NASA strolled throughout the 1970s, making use of the last rockets (originally purposed for flying back to the Moon) by building a Skylab, the very first purely U.S. space station, and using the remaining Apollo spaceships to send three manned missions there. The space shuttle project initially conceived to serve as the main mean of transport and service vehicle for maintenance of possible space stations did not happen until the 1980s, late and overly expensive for the agency. In the end, without proper spaceships providing the regular boosts it needed to stay in the orbit, the Skylab crashed to the surface of the Earth in 1974, years before the shuttle was completed, creating a ship without a port, before it could even be launched.

In the 1980s and after the first shuttle accident the interest of public regarding space travel started to fade based on the idea that people no more live in a space age. Nothing was happening, no new Frontiers were discovered or explored, Astronauts were flying in the shuttles around the Earth in low orbit, maintaining the International Space Station since 1998, launching military and communication satellites and performing missions oriented on the scientific field and those did not inspire the people as much as visiting and exploring new worlds did. And since the government and NASA could not carry on the legacy of the original Space Race, the general public assumed that nobody else could. As a result of that, since 2004 and the space shuttle retirement, United States has been dependent on the Russian Soyuz.[54]

This left a gap in the development of NASA and its programs. Since the completion of the International Space Station in 2011, a number of private space companies led by visionary entrepreneurs emerged. Some of those companies were founded mainly for making space profitable through space tourism and flights around the Moon, others were founded for technological and scientific purposes and only a few of those aims for the much more substantial milestone. Despite all the differences, all of them want to participate in the space market, lowering the prices of their services to commercial satellite companies or governmental agencies.[55]

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[54] Michael Belfiore, *How a Visionary Band of Business Leaders, Engineers, and Pilots is Boldly Privatizing Space* (New York: Harper Collins, 2008), 7.
[55] Michael Belfiore, *How a Visionary Band of Business Leaders, Engineers, and Pilots is Boldly Privatizing Space* (New York: Harper Collins, 2008), 164.

4.1 The satellites, the X-PRIZE and Space Age legacy

The US government's role in space exploration is to sustain the services which could not be supported by the private companies. Sending exploration spacecrafts to various asteroids and distant planets in our Solar system to gain knowledge is generally understood as important due to its scientific value people tend to believe. Ever since the Moon landing, the understanding of the universe became a part of the human society, knowing that these obtained pieces of information may become valuable at some later time. But this kind of space exploration is not very appealing to the private companies due to its lacking return on investment.[56]

To sustain such profitability, private space companies have to specialize on the gap in the market created by the NASA's stagnation, offering their private services to the government as well as other commercial companies. The new millennium brought new technologies such as internet and communication and broadcasting technologies developed by specialized companies. The technologies started to become more and more important in connecting the whole world as well as sustaining it. Satellites became crucial instruments for mapping the Earth, weather, living conditions, pollution and global issues occurring on the whole planet. To fully sustain the space exploration and devote suitable resources to it, the Earth has to be taken care of first.[57]

One of the first private satellite companies was DigitalGlobe founded in 1992. The first major contractor of DigitalGlobe was the US government, regarding defense and communication satellites. With the rise in technologies and communications during last two decades, the company gained more customers – companies oriented on communication, infrastructure, online mapping, energy and mining industries and many more. With rising demand for using services of DigitalGlobe, there was a higher demand for companies which were able to send satellites into Orbit. The satellite launching industry made use of new technologies for commercial and beneficial purposes. And since NASA with its space shuttles was the only one able to send the satellites into space at that

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[56] "The Pros And Cons of Privatizing Space Exploration," Forbes, accessed March 15, 2018, https://www.forbes.com/sites/quora/2017/04/04/the-pros-and-cons-of-privatizing-space-exploration/#3831ce3a3319.

[57] Wendover Productions, "Space: The Next Trillion Dollar Industry," Youtube Video, 27:11, March 27, 2018, https://www.youtube.com/watch?v=hiRBQxHrxNw.

time, making the launches expensive with no other options, private entrepreneurs saw an opportunity at creating a new market of space launch companies.[58]

The first step in privatizing the space and encouraging people to develop and fly their own spaceships, was fulfilled by the X-PRIZE in 2004 - a competition of aerospace engineers held by aerospace entrepreneurs and visionaries Peter Diamandis and Gregg Maryniak, starting the spacecraft market and making it possible to compensate for the shutdown of NASA's space shuttle program. The aim was to develop a fully reusable craft which could substitute the shuttles. The X-PRIZE's requirements consisted of building a manned spacecraft without any government funding and making spaceflights a routine, launching 3 people in a spaceship into low Earth orbit and back to Earth and developing the craft for multiple launches as a reusable vehicle. The winning prize of the whole competition was $10 million.[59]

On 21 June 2004, during the X-Prize event, the first non-governmental crewed spacecraft SpaceShipOne was launched above the Earth's surface to reach the border of space. The SpaceShipOne was manufactured by Scaled Composites, an aerospace company owned by Burt Rutan. The development of the spacecraft was funded by Microsoft co-founder Paul Allen and aimed at lowering the costs of technology which would be able to make space accessible on regular basis. Although this craft made only two more successful flights to the Orbit, it was the first privately built craft to carry on the legacy of the space age. The SpaceShipOne was the only manned spacecraft which left the Earth atmosphere in 2004 after the Columbia Accident[60] and was followed by a development of SpaceShipTwo one year later, backed by British entrepreneur Richard Branson and his private spaceflight company Virgin Galactic.[61]

As a first of many oncoming private companies, Transformational Space Corporation (t/Space) responded to NASA's Broad agency announcement (BAA) declared in spring 2004. The purpose of the BAA was to hold a government based competition offering a prize of $3 million for private entrepreneurs' companies able to develop studies, crucial

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[58] Wendover Productions, "Space: The Next Trillion Dollar Industry," Youtube Video, 27:11, March 27, 2018, https://www.youtube.com/watch?v=hiRBQxHrxNw.
[59] Michael Belfiore, *How a Visionary Band of Business Leaders, Engineers, and Pilots is Boldly Privatizing Space* (New York: Harper Collins, 2008), 23-24.
[60] Michael Belfiore, *How a Visionary Band of Business Leaders, Engineers, and Pilots is Boldly Privatizing Space* (New York: Harper Collins, 2008), 96.
[61] "SpaceShipOne: The First Private Spacecraft – The Most Amazing Flying Machines Ever," Space.com, accessed March 19, 2018, https://www.space.com/16769-spaceshipone-first-private-spacecraft.html.

technical blueprints and papers regarding the agency's future spaceship designs and technologies. The result of the announcement brought a major redesign of the inside of a shuttle cockpit and fuselage regarding the seats and usable space for the crew. The t/Space won $3 million in the first competition in 2004 and was funded again with $6 million in 2005.[62]

After the X-PRIZE, the perception of spaceflight changed, when the Congress came up with a legislation allowing passengers to fly private spacecrafts at their own risk. The Commercial Space Launch Amendments Act was signed by President George W. Bush on 23 December 2004, enabling the private companies to work free of any regulations from the Federal Aviation Administration. The only restricting condition was the aspect of safety of people involved, thus if anybody got hurt, or the accident was at hand, the government would take its part and stop the development and private launches. Since the end of 2004, the private space companies were allowed to develop and launch their own spacecrafts, fully contributing to the exploration of space on their own or with possible governmental support.[63]

Carrying on with the successes of the X-PRIZE and NASA's BAA, the agency released another project, named Commercial Orbital Transportational Services (COTS) in 2006. Elon Musk, a developer of PayPal internet payment service and a visionary willing to put a civilization on Mars with his Space Exploration Technologies (SpaceX) founded in 2002, was one of more than 20 applicants. In the end, SpaceX was one of two companies who won the COTS, alongside the Kistler Aerospace founded in 1993 by a Swiss immigrant Walter Kistler.[64]

There are many private space companies on the market which emerged in the last two decades. These companies are differed by their purpose, their aim and their devotion to specific aspects of making space accessible and profitable. The most discussed and commonly known purpose of private space companies is sending people to space as a form of tourist attraction. Companies oriented on the space tourism are just a fragment of the whole number of examples. There are companies focusing on communication and mapping

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[62] Michael Belfiore, *How a Visionary Band of Business Leaders, Engineers, and Pilots is Boldly Privatizing Space* (New York: Harper Collins, 2008), 118.
[63] Michael Belfiore, *How a Visionary Band of Business Leaders, Engineers, and Pilots is Boldly Privatizing Space* (New York: Harper Collins, 2008), 112.
[64] Michael Belfiore, *How a Visionary Band of Business Leaders, Engineers, and Pilots is Boldly Privatizing Space* (New York: Harper Collins, 2008), 129-130.

satellites (DigitalGlobe, SES Global, Inmarsat), aerospace and defense companies (Lockheed Martin, Northrop Grumann) and companies focusing on scientific research, new software, and technologies. The private companies offering their services and vehicles also have to compete with companies which already have long-term contracts with NASA, including ULA - United Launch Alliance (between Boeing and Lockheed Martin) and Orbital Science. Boeing, Lockheed Martin and Orbital science have been used by the agency for development of current and future spacecrafts and technologies for the public sector.[65]

Among the leading companies of the private space and aerospace market, according to a research conducted by space scientist Monica Grady[66], belong Jeff Bezos' Blue Origin, aiming at making space accessible for tourists as a vacation, Richard Branson's Virgin Galactic, offering space tourism and suborbital flights for people willing to pay for it, and Elon Musk's SpaceX aiming for colonization of Mars as the next Frontier of humanity. All those companies approach the development of their spacecrafts and services for the space market differently, with different propulsion and launch systems and technologies, but their goal represented by reusability and sustainable access to space is common for all of them.[67]

4.2 Blue Origin

One of the leading private space companies is Blue Origin founded in 2000 by Jeff Bezos, a founder of Amazon.com. Since 2000, Blue Origin focuses on sub-orbital commercial spaceflights and aims to launch people to space and develop fully sustainable flight system for space tourism. The reusability and elimination of the high costs of spaceflights belong among main visions of the company. Blue Origin developed its vertical launch vehicle named New Shepard (after the first American astronaut in space, Alan Shepard) and it is designed to reach the 100km altitude – a border known as the area where the "space" begins. The following descend is designed to be vertical as well, taking no

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[65] "Here are 20 companies that are best exposed to the growing space economy," Business Insider, accessed April 28, 2018, http://www.businessinsider.com/space-companies-morgan-stanley-best-exposed-to-the-growing-space-economy-2017-10.
[66] "Private companies are launching a new space race – here's what to expect," Phys.org, accessed March15, 2018, https://phys.org/news/2017-10-private-companies-space.html.
[67] "The Pros And Cons of Privatizing Space Exploration," Forbes, accessed March 15, 2018, https://www.forbes.com/sites/quora/2017/04/04/the-pros-and-cons-of-privatizing-space-exploration/#3831ce3a3319.

more than 10 minutes in total.[68] The company already offers tickets for people willing to be among the first space tourists after the planned completion of the program in 2018 and its regular flight schedule. The vehicle was tested in 2012 for the first time, then further developed and its first successful launch to space took place on 29 April 2015, reaching roughly 94km altitude. This test flight was followed by more test launches in 2016 and currently the last one on 16 December 2017 (all of the tests were performed with a use of unmanned capsules).

The most recent project of Blue Origin is a spacecraft called New Glenn, which is scheduled to take off in 2020, using the basic structure and technologies of New Shepard and powered by Origin's latest rocket engine which has been in development for the last 7 years. The new rocket engine is planned to perform more than 100 launches, using only refueling for a propulsion system, thus reducing the costs of the flights. With its development, Blue Origin's rocket engine is being considered as an option for Vulcan capsule, which is currently in development by United Launch Alliance (ULA), an alliance between Boeing and Lockheed Martin as a main public contractor for NASA. Blue Origin was compared to Bezos' Amazon – it builds upon capabilities and reliable services, gets its customer base and continues to build upon that. Beside public contracts, Blue Origin publicly offers its services for civil, military and private clients regarding communication, defense, broadcasting, and mapping satellites.[69]

4.3 Virgin Galactic

Virgin Galactic was founded in 2004 by the British technology and retail entrepreneur Richard Branson, the founder of Virgin Records and Virgin Atlantic Airlines. The goal of Virgin Galactic is to become the first private spaceline on Earth, offering an unparalleled customer experience.[70] Unlike Blue Origin and SpaceX, Virgin Galactic approached the reusability of its vehicles by a different way. Instead of vertical launches and landings, Virgin uses "mothership" vehicles to carry the spacecrafts to an altitude of 18km (about twice as high as a regular airplane), at which the crafts get released and use their own

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[68] "Private companies are launching a new space race – here's what to expect," Phys.org, accessed March15, 2018, https://phys.org/news/2017-10-private-companies-space.html.
[69] "Blue Origin's new rocket engine will be able to launch "100 full missions," CEO says," CNBC, accessed March 15, 2018, https://www.cnbc.com/2018/04/18/blue-origin-ceo-bob-smith-be-4-will-be-able-to-launch-100-missions.html.
[70] "Infinity and beyond: Will Virgin Galactic ever make it into space?," The Telegraph, accessed March 15, 2018, https://www.telegraph.co.uk/travel/news/will-virgin-galactic-ever-make-it-to-space-Richard-Branson/.

rocket engines to get to the 100km border of space.[71] In 2005, after the initial success of the SpaceShipOne, Branson and Rutan created a joint venture between Virgin Galactic and Scaled Composites to develop and produce SpaceShipTwo, a spacecraft meant to take first tourists into space. In 2008 Virgin Galactic revealed its WhiteKnightTwo, the mothership developed to carry the SpaceShipTwo.

In October 2014, during one of its manned test flights, SpaceShipTwo split into pieces and exploded, drawing the attention of National Transportation Safety Board. As a result, it took 2 years for the Virgin Galactic to regain an approval from the Federal Aviation Administration of United States to launch the SpaceShipTwo again.[72] After the setback and further development and installation of crucial safety elements, the spacecraft made its first successful test flight to space in January 2018, making Branson so confident that he claimed he will be able to send first space tourists to space later this year. The company already sold flight tickets to more than 700 passengers (the ship allows 6 passengers per one flight), with one ticket going for $250 000 with the expected decline in price up to no more than $20 000 due to the full reusability of the craft, charging mainly for refueling the propulsion system.[73]

4.4 SpaceX and its vision

Space Exploration Technologies (SpaceX) was founded in 2002 by Elon Musk. The aim of the company is to revolutionize the space technology in order to enable humans to become multi-planetary species. Since its first successful launch on 8 December 2010, the company sends rockets into Orbit on average once a month, based on contracts with the US government and NASA for resupplying the International Space Station and private commercial satellites for companies and other nations. SpaceX is the only private company which can compete with prior American aerospace companies (which have long-term

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[71] "Private companies are launching a new space race – here's what to expect," Phys.org, accessed March15, 2018, https://phys.org/news/2017-10-private-companies-space.html.
[72] "Virgin Galactic will send tourists into space within months: Richard Branson's VSS Unity spaceplane completes another successful glide test 3 years after the firm's deadly crash," Dailymail, accessed March 16, 2018, http://www.dailymail.co.uk/sciencetech/article-5261965/Virgin-Galactic-set-send-tourists-space-YEAR.html.
[73] "Virgin Galactic Aims to Fly Space Tourists in 2018, CEO Says," Space.com, acehttps://www.space.com/36654-virgin-galactic-fly-space-tourists-2018.html.

contracts with NASA) like Boeing, Lockheed Martin or Orbital Science in terms of technologies, reusability of spacecrafts and design.

Beside cheaper operating costs due to the reusability, SpaceX offers independence of Russian and other foreign suppliers which its competitors have to count on. The construction of its rockets and space modules is provided exclusively by its own plant in the United States.[74] What Musk came up with is the reduction of the supply chain used for the construction of the spacecrafts. The parts and technologies required for the assembly of the spacecrafts are highly specialized. Due to their very limited use, these parts are expensive to produce and the manufacturer has to charge high prices in order to make a profit, pay its own production plant and obtain the materials. With each step of the supply chain leading to the final construction of the main components, the costs gradually rise. SpaceX manufactures 85% of its components and parts in the production plant in California from scratch and thus avoids the necessity of external or foreign suppliers.[75]

The non-reusability of any spacecraft has been an issue since the 1960s and the Apollo missions. The crafts and satellites breaking up into specific modules and thus leaving dangerous space junk behind created a field which is risky to cross because of high-speed-floating fragments. The reusability of spacecrafts can be compared to a regular use of airplanes. Throwing away a spacecraft after one launch can be seen as throwing away a Boeing 737 after a single flight across Atlantic. To fully compensate for those costs and to make a profit, a company would need to charge every single passenger for partial cost of the whole airplane. The plane ticket would cost more than $400 000 per seat and no one would be willing to pay the price at such rate.[76]

During the Apollo missions, the cost for sending one single astronaut to the surface of the Moon was between $100 billion and $200 billion in current-year costs, sending up 12 astronauts in total. SpaceX's goal is to achieve reduction of the costs per person to about $200 000 with the use of fully reusable crafts, charging only for the refilling of the propulsion system and thus using economies of scale.[77] The current price of ULA's launch

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[74] Ashlee Vance, *Elon Musk: How a Billionaire CEO of SpaceX and Tesla Is Shaping Our Future* (London: Virgin Books, 2015), 215.
[75] Wendover Productions, "Elon Musk's Basic Economics," Youtube Video, 10:21, October 24, 2017, https://www.youtube.com/watch?v=h97fXhDN5qE.
[76] Michael Belfiore, *How a Visionary Band of Business Leaders, Engineers, and Pilots is Boldly Privatizing Space* (New York: Harper Collins, 2008), 169.
[77] SpaceX, "Making Humans a Multiplanetary Species,"Youtube Video, 1:04:46, September 27, 2016, https://www.youtube.com/watch?v=H7Uyfqi_TE8&t=605s.

based on a contract with the US military regarding communication and defense satellites is $400 million per launch. In comparison to ULA's price, the SpaceX's price for the launch of a satellite or resupply mission to the ISS is only $80 million, thus drastically lowering the prices in comparison to the competition.[78]

The vision of the company is important for its success. The vision of Elon Musk can be compared at a rather smaller scale to the vision of Steve Jobs. Steve Jobs wanted to change the world with Apple computers – he wanted to change the way how people work, how they think, learn, educate themselves and their children. People buy his products not because of what he did, but why he did it. Steve Jobs could sell his vision through a story, a myth people believed in.[79]

Musk sells his vision of colonization of Mars and survival of humanity through a story similar to the Frontier times and colonization of West by pioneers. Musk is on a journey to find new resources, a new place where to live and how to get there. His vision also includes changing and sustaining the world until the reaching of the next Frontier will be possible. He aims at a transition away from the reliance on fossil fuels towards sustainable energy sources with Tesla. He aims at bringing affordable solar products to power people's households with SolarCity and aims at making humanity a multi-planetary species to sustain its long-term survival with SpaceX. The vision is what distinguishes Musk from his competitors just as Steve Jobs distinguished from his. Musk's competitors aim at making space affordable and accessible for space tourism with profit as the main motivator. With his vision, Musk can be seen as a pioneer in space colonization.[80]

The issue of comparatively affordable flights and satellite launches to space in the last two decades was not purely technological, but rather organizational. The governmental aerospace and spacecraft companies had a monopoly on the launch market from the first space flights in the 1960s to 2004 and the Commercial Space Launch Amendments Act. Without any competing companies, there were no incentives to bill anything else than the highest prices for launching the commercial satellites.[81] Rockets and spacecrafts do not

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[78] Wendover Productions, "Elon Musk's Basic Economics," Youtube Video, 10:21, October 24, 2017, https://www.youtube.com/watch?v=h97fXhDN5qE.
[79] Forbes, "Steve Jobs and the Power of Vision," accessed March 25, 2018, https://www.forbes.com/sites/carminegallo/2011/01/18/steve-jobs-and-the-power-of-vision/#73a552a4172b.
[80] Teslarati, "Elon Musk's vision for the world's transition to sustainable energy," accessed March 25, 2018, https://www.teslarati.com/elon-musk-vision-worlds-transition-to-sustainable-energy/.
[81] Michael Belfiore, *How a Visionary Band of Business Leaders, Engineers, and Pilots is Boldly Privatizing Space* (New York: Harper Collins, 2008), 170.

belong among consumer products and governments buy those regardless of the costs, to fulfill their year quotas of launched satellites. The purpose of SpaceX is to temporarily reduce the costs and to make a profit for financing the colonization of Mars. SpaceX has proven itself as capable of solving one of the most urgent problems of space industry regarding the vehicles and rockets, proven by the successful test launch and landing of his latest reused Falcon 9 rocket on 30 March 2017.[82] Musk aims at reducing the costs of flights at a drastic rate by developing a fully functional system of reusable crafts.[83] He is willing to lower the price of single launch to $40 million, which is ten times cheaper than what the ULA charges for their military satellite launches.[84]

4.5 The involvement of the private sector

Nowadays there are two ways of how NASA should be run, according to the US government, the agency itself and the presidential administrations. The first is to continue making its own spacecrafts through its already established contractors in ULA (Boeing, Lockheed Martin), where the agency controls the development and at the end, it owns the complete vehicle. For NASA, this way is more expensive than funding and buying services from private companies like SpaceX, where the agency does not own the vehicle at the end. According to many recent studies, the funding of private companies showed as more cost-effective for NASA.

When comparing the agency's latest project Orion with SpaceX's Dragon capsule, the costs of the development and flights are significantly more appealing to NASA to fund the private companies. The cost of finishing the Orion is $19.47 billion, whereas the costs for Dragon are $2.2 billion. This drastic difference in the construction costs suggests that SpaceX's approach to the reduction of the costs is already very efficient and that the company has an obvious lead before its competitors. In addition to that, the development of NASA's Orion ship is mutually beneficial for the agency's own development as well as for

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[82] Wendover Productions, "Elon Musk's Basic Economics," Youtube Video, 10:21, October 24, 2017, https://www.youtube.com/watch?v=h97fXhDN5qE.
[83] Michael Belfiore, *How a Visionary Band of Business Leaders, Engineers, and Pilots is Boldly Privatizing Space* (New York: Harper Collins, 2008), 117.
[84] Wendover Productions, "Elon Musk's Basic Economics," Youtube Video, 10:21, October 24, 2017, https://www.youtube.com/watch?v=h97fXhDN5qE.

the private companies. As a part of the contract, NASA provides SpaceX with valuable data from Orion tests, which can be used to skip certain steps of their own development.[85]

During one of the hearings of Congress in 2017, NASA was criticized for delay of their Space Launch System, the rocket meant to carry the Orion module. Both projects are being built by the government contractors and have cost NASA between $3 billion and $4 billion each year, with a low probability of the first flight until 2020.[86] For NASA, SpaceX's specialization in a development of a reusable spacecrafts significantly reduced the costs. Based on the current costs of SpaceX's launches, the company should be able to send a single astronaut to the International Space Station for $20 million, in comparison to Russian Soyuz rocket, charging NASA $70 million for one astronaut, and also heavily reliant on the political relations between the United States and Russia.[87]

Nowadays, NASA and space programs it focuses on are dependent on the will, understanding and support of the president, whether the president is republican or democrat and what strategy for the agency is chosen by him. NASA funds the development of the private companies (SpaceX, ULA), but they are paid for their achieved milestones only after showing the results of their work. The goals for the companies are set by the agency itself, but the companies are free to interpret the goals by themselves and come up with innovative and new solutions on their own, enabling a rivalry between the companies, stimulating them for giving the best outcomes.[88]

So as the result, the United States rather started supporting the cooperation with the US private sector companies, trying to get rid of the dependence on Russia and aims at creating its own fleet of spacecrafts. Since 2004, when the US private companies were allowed to participate in the space launch industry, the companies proved as capable of solving the issue of reusability of spacecrafts and partially compensated for the shutdown of NASA's shuttle program in 2011. The government saw a potential of private developers based on their progress which in many cases started from scratch. In addition to that, the

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[85] "NASA is saving bug bucks by partnering with commercial companies like SpaceX," The Verge, accessed March 19, 2018, https://www.theverge.com/2017/11/10/16623752/nasa-commercial-cargo-crew-spacex-orbital-atk-boeing-orion.

[86] "NASA is saving bug bucks by partnering with commercial companies like SpaceX," The Verge, accessed March 19, 2018, https://www.theverge.com/2017/11/10/16623752/nasa-commercial-cargo-crew-spacex-orbital-atk-boeing-orion.

[87]"Elon Musk's misson to Mars," The Guardian, accessed March 19, 2018, https://www.theguardian.com/technology/2013/jul/17/elon-musk-mission-mars-spacex.

[88] "NASA Could Reach Mars Faster with Public-Private Partnerships, Companies Tell Congress," Space.com, accessed March 19, 2018, https://www.space.com/37491-nasa-to-mars-faster-with-private-partnerships.html.

investors and entrepreneurs willing to fund private sector saw not only the results of the companies alone but also the involvement of the government and NASA itself. Since 2009, the number of private space investment firms increased from 15 to more than 120 in 2017, funding the start-ups with venture capital. In 2017, private venture capitalists and investors backed commercial space companies with $3.9 billion, according to the Space Angels report.[89]

With a rise of new technologies in the last two decades and with its connected communication and mapping satellites, the demand for rocket launches increasingly grew. After the accidents of space shuttles and their retirement in 2011 after the completion of the ISS, the private space companies were the only ones capable of sustaining the US space launch industry. Companies like SpaceX, United Launch Alliance and Blue Origin fulfilled the need for satellite launches and created new market alongside companies offering space tourism, such as Virgin Galactic. Some of those, mainly SpaceX managed to build upon its achievements and gain contracts from NASA regarding the resupply missions to the International Space Station and the development of new space exploration vehicles. In comparison to its competitors, SpaceX managed to gain the first successful launch of his spacecraft and proved that the full reusability is possible. The company became a cheaper solution for NASA's programs and development, cutting the prices of rocket launches. In a way, SpaceX became a symbol of spaceflights and Mars colonization based on Elon Musk's vision, a story he could sell to fulfill the company's purpose. Every space-oriented company is contributing to the space exploration, preserving the world or developing new helpful technologies. Although all the private companies in the space industry can be seen as space pioneers, none of them has overcome the achievements and vision of Elon Musk's SpaceX.

[89] "Space companies received 3.9 billion in space investment during "the year of commercial launch": Report," CNBC, accessed March 19, 2018, https://www.cnbc.com/2018/01/18/space-companies-got-3-point-9-billion-in-venture-capital-last-year-report.html.

5 SEEKING THE NEXT FRONTIER

With new technologies, growing population and global issues on Earth, there are many questions arising. The Earth will not exist forever and the conditions may get only worse in the future. Survival of humanity might depend on reaching the next Frontier – but why even consider taking another step as humanity? Why now and why at all? Is it going to be the already reached and explored Moon or the Red Planet? What is the significance of the private sector companies in the overall development of the space industry?

5.1 The resources depletion

When taking the world resources and its overall sustainability into consideration, a study by World Wildlife Fund, released in July 2002 showed the lowering capacity of resources on Earth. The downfall in planet's ecosystem from 1970 to 2002 shows for example loss of forest coverage by 12 %, the biodiversity regarding the Oceans by a whole third and the freshwater ecosystems in the region of 55 %. The downfall includes the Earth's fauna as well as its flora. One of the factors that the study is based on is the consumption of grain, fish, wood and freshwater and the emissions of carbon dioxide produced by vehicles. America was placed in the first place in this report, having doubled the consumption and emissions level of the United Kingdom or the whole Western Europe.

Among the Earth's most urgent global issues belong marine crisis, pollution, deforestation and endangering the wildlife.[90] According to the Living Planet report, another study by WWF released in 2008, the humans were overusing the planet's resources by more than 30% each year and faster than the Earth is able to replenish them. Both studies (2002 and 2008) also concluded that humanity will need two planets to sustain its needs by 2050 as the population and consumption are growing faster than the rate at which technology is able to come up with more efficient ways of obtaining new resources. With having only one planet, its capacity to support the life of many species from human beings to endangered species and plants will drastically decline more and more in oncoming years. In the 1960s most of the World's population lived in its original habitat and was using mainly its own ecological resources. Compared to the last 2 decades, more than three-quarters of the World's population live in countries which belong among those which

[90] "Earth "will expire by 2050"," The Guardian, accessed March 19, 2018, https://www.theguardian.com/uk/2002/jul/07/research.waste.

consume more than they are able to replenish.[91] The latest report in January 2018 shows a gradual global warming of the planet's atmosphere from year to year, from warming of the Oceans to melting glaciers, deforestation and higher consumption due to rapidly growing population and thinning of the ozone layer, followed by depletion of the resources.[92]

The reports regarding the declining conditions on Earth were based on the information provided to the researchers and scientists by the private companies like DigitalGlobe and Intelsat. The mapping of the Earth brings vital information about weather, flood, fires, disasters, deforestation and other global issues, which could be used for better understanding of our world and sustaining it for survival until the proper solutions are found.[93]

The Earth and our whole Solar system will once eventually cease to exist, either due to the extinction of the Sun in distant future or due to global accidents. The spreading of humanity and colonization enabling the survival can be seen as a Frontier for the whole humanity. Based on the need for another place to colonize, the question now might be, whether the next Frontier will be represented by the Moon or the Red Planet and which of those will be the best candidate?

5.2 Moon or Mars?

The Moon was the last proper Frontier of United States during the 1960s and 1970s, proving their superiority in space exploration as the most capable nation. The Moon landing ended the initial Space Race and nowadays when taking the Moon into the consideration as the next Frontier, there are several reasons for seeing the Earth's natural satellite only a stepping stone for the journey to Mars.

One of the reasons may be the question of resources and atmosphere. The Pioneers went to the West and settled it because of the discovery of new resources used for the further development and survival. Pioneers moved to the West because of its sustainability and creating a new world out of it. The place considered as the next Frontier should be possible to transform into the self-sustaining system. Although the Moon contains elements which cannot be found on the Earth, for example, helium-3, contained in the lunar winds,

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[91] "World is facing a natural resources crisis worse than financial crunch," The Guardian, accessed March 19, 2018, https://www.theguardian.com/environment/2008/oct/29/climatechange-endangeredhabitats.
[92] "Global Climate Report – January 2018," National Centers for Environmental Information, accessed March 18, 2018, https://www.ncdc.noaa.gov/sotc/global/201801.
[93] Wendover Productions, "Space: The Next Trillion Dollar Industry," Youtube Video, 27:11, March 27, 2018, https://www.youtube.com/watch?v=hiRBQxHrxNw.

which could be possibly used in not yet built nuclear fusion reactors and further mining under the surface could reveal more rare earth elements, it does not have ground containing the elements enabling growing of plants, suitable atmosphere or oxygen.[94]

Without sustainable elements produced by possible Moon colonies themselves, the resources should be delivered from Earth, leading only to their further depletion. The problem of lowering resources on Earth would get only worse, pumping the needed ones to the Moon as supplies. In comparison with the Moon, the Red Planet has its own atmosphere, containing mostly CO2, nitrogen, and argon. These are elements which can be compressed and heated, resulting in the creation of an atmosphere which can make the growing of plants on Mars possible.[95]

According to Elon Musk, when questioning the Moon being the objective of starting a second human civilization, the Moon does not belong among such places. In a way, it is similar to the Arctic. In a much-simplified comparison, where Europe is seen as the Earth, then the Arctic is the Moon and North America is Mars. The pioneers during the Frontier times colonized North America because of its productivity and new opportunities and possibilities and making use of newly discovered resources in the West. Europe is seen as the Earth in terms of a starting point. The Arctic is seen as the Moon because of its very limited productivity. The colonization of the Moon would still require regular transportation of resources from the Earth.

The Moon is widely unproductive and poor in the aspect of resources. There is no atmosphere and very low gravity with a day length of 28 hours, few of many aspects which would make it problematic to start a new human civilization there.[96] When again comparing the Moon with Mars, the Red Planet is much warmer than the Moon, there are areas of frozen water and many resources in the ground alone, including for example iron, copper, nickel and many minerals and the life there would become sustainable once the atmosphere will be heated. The day length on Mars is 24 hours and 40 minutes and the size of the planet is closer to the size of Earth more than the size of the Moon is.[97]

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[94] "Moon mining economic feasibility," Space.com, accessed April 28, 2018, https://www.space.com/28189-Moon-mining-economic-feasibility.html.
[95] SpaceX, "Making Humans a Multiplanetary Species,"Youtube Video, 1:04:46, September 27, 2016, https://www.youtube.com/watch?v=H7Uyfqi_TE8&t=605s.
[96] Michael Belfiore, *How a Visionary Band of Business Leaders, Engineers, and Pilots is Boldly Privatizing Space* (New York: Harper Collins, 2008), 170.
[97] SpaceX, "Making Humans a Multiplanetary Species,"Youtube Video, 1:04:46, September 27, 2016, https://www.youtube.com/watch?v=H7Uyfqi_TE8&t=605s.

Next reason for not depicting the Moon as the suitable place for colonization may be the point of view regarding the Frontier. The Moon was already conquered during the Space Race commenced by the Cold War in the 1950s and 1960s. Putting a man on the Moon was the ultimate answer of the United States to the Soviet Union's Sputnik.[98] Moon cannot be depicted again as the Frontier due to lack of its resources, sustainability and lack of purpose as it was already conquered almost five decades ago unlike Mars, which can offer new possibilities and opportunities for humanity.

5.3 Reaching the next Frontier

As a result of consistent changes of American Presidents, their attitudes and administrations, NASA leadership and the political environment, the American space programs have been declining ever since the start of 1960s after the lunar landing, struggling with the development of the space shuttle, which became extremely expensive and proved as not as safe as intended after the Columbia and Challenger accidents.[99] With the space shuttle's following retirement and dependence on the Russian launch systems sustaining the access to the International Space Station, America's public sector involvement in deep space exploration became stagnating. With current Trump administration planning the end of support of the ISS, NASA should get back to deep space exploration after 2025.[100]

Since the retirement of the space shuttles, the launches of communication, broadcasting, defense and mapping satellites emerging due to the rise of new technologies were sustained by private companies. Few of these companies (SpaceX, ULA) proved themselves very capable and responsible and thus arranged direct contracts with NASA regarding the development of agency's future spacecrafts and resupply missions to the ISS. With the stagnation of NASA, the private companies were able to get ahead of the agency in terms of the development.[101]

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[98] "Yuri Gagarin: First Man in Space," Space.com, accessed March 25, 2018, https://www.space.com/16159-first-man-in-space.html.

[99] Henry W. Lambright, "*Exploring Space: NASA at 50 and Beyond*," Public Administration Review 70. no. 1 (January–February 2010): 155-156.

[100] "Trump administration wants to end NASA funding for the International Space Station by 2025," The Verge, accessed March 19, 2018, https://www.theverge.com/2018/1/24/16930154/nasa-international-space-station-president-trump-budget-request-2025.

[101] "The New Space Race: 3 Companies on a Mission to Mars," Zacks, accessed April 28, 2018, https://www.zacks.com/stock/news/285704/the-new-space-race-3-companies-on-a-mission-to-mars.

One part of the Trump administration also involves Mars mission – colonization of Mars as the next Frontier of humanity by 2030s.[102] In March 2018, Russian president Vladimir Putin has also announced plans of Russia in the exploration of Mars with manned missions. Russian space agency Roscosmos began works on early stages of the mission in cooperation with European space agency. This move from Russia could be taken as an answer to the Mars mission announcement of President Trump.[103] In recent years, the colonization of Mars became a domain of Elon Musk's SpaceX as well.

A new Space Race could be commenced not between the public and private sector but rather between particular private companies or between nations again. After the initial success of the US private space companies, US government saw a potential in cooperation with the private sector. Due to its stagnation, NASA was years behind in the development and sustaining the spaceflights but by cooperation with the private sector companies, the agency could again strengthen the position of the United States in the space exploration.

One of the possible versions of the new Space Race may be the competition between the United States and Russia or any other nation capable of reaching the Mars first. Such as the United States and the Soviet Union competed with each other since the 1960s, claiming their "firsts" in space exploration and reaching the Moon, a similar situation may be possible even today. Although the nations cooperate in terms of the International Space Station, both of them still develop their own space programs on their own, avoiding the cooperation in reaching the Red Planet.[104]

Another possible version of the new Space Race may be the competition purely between the US private companies. Although many private entrepreneurs do not see any potential return on the investment in terms of going to Mars by themselves, they could become part of the space market which would be created by a success of the public sector. If the United States or any other nation managed to reach the Red Planet, the private sector would get involved in the process. The demand for communication, imagery, technologi-

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[102] "Journey to Mars Overview," NASA, accessed April 28, 2018, https://www.nasa.gov/content/journey-to-mars-overview.
[103] "Russia to launch missions to Mars next year as part of bid to colonise the Red Planet," Dailymail, accessed April 28, 2018, http://www.dailymail.co.uk/news/article-5504055/Russia-launch-missions-Mars-2019-says-Putin.html.
[104] "Unmanned missions to Mars," Russian Space Web, accessed April 28, 2018, http://www.russianspaceweb.com/spacecraft_planetary_mars.html.

cal, scientific and space launch companies would grow and these companies would compete with each other in delivering the best solutions for the best prices.[105]

There is also a chance of a private company reaching the Mars first. Musk's SpaceX, with its reusable spacecrafts and his vision of pioneering the Mars, seems as the most capable of doing so. He differs from his competitors in terms of the motivation. He aims at making humans a multi-planetary species, making a profit only to fulfill his goal.[106]

[105] "Private companies drive "new space race" at NASA center," Phys.org, accessed April 28, 2018, https://phys.org/news/2017-08-private-companies-space-nasa-center.html.
[106] "Elon Musk wants to colonize Mars with SpaceX – here's what he said it will be like as one of the first residents," Business Insider, accessed April 28, 2018, http://www.businessinsider.com/elon-musk-colonization-of-mars-sxsw-2018-3.

CONCLUSION

The Americans as a nation with its Frontier ideology serving as a vision of exploration and proving their dominance managed to put a man on the Moon, probably one of the greatest achievements in the human history. They presented themselves as the leading nation of the rest of the world, by making only a small step for a single man, but a giant leap for the whole mankind. As NASA began its stagnation due to expensive and as proved at the end, dangerous programs (space shuttles involving risking human lives), American participation in space exploration became only a part of a bigger cooperation of once great rivals, the United States and the Soviet Union. The breakthroughs and space exploration achievements which were brought by the rivalry between the United States and the Soviet Union during the Cold war, inspired and gave an opportunity to the next generation of American visionaries, enthusiasts, engineers, designers and entrepreneurs willing to carry on the legacy of the Space Race.

With worsening conditions on the Earth, finding a new source of resources and new land to colonize in a distant future becomes more and more important. The survival on this planet is threatened by quickly rising population and global issues, observed via companies aiming at sustaining the Earth for as long as possible. One day the life on the Earth will become even harder to sustain, thus the reaching of the next Frontier and colonizing another planet becomes even more imminent, with Mars being the best solution possible.

Whether the Mars will be reached by US public sector, US private sector, their cooperation or by any of the other nations, the potential success is going to influence all of them. Every nation in the world capable of going to Mars would eventually contribute to the colonization of the planet, claiming its own achievements and rights to the land and its resources. The first manned flight there would be the most expensive, with others gradually building upon the first successful mission, just as the current private companies based their development upon the knowledge and development made during the Original Space Race. If a private entrepreneur would be able to reach the Mars on his own, it could be taken as a provocation, thus stimulating other nations. The potential success of the US public sector in reaching the next Frontier would probably start the new Space Race between nations and surely strengthen the American national identity.

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LIST OF ABBREVIATIONS

BAA Broad agency announcement

COTS Commercial Orbital Transportational Services

NASA National Aeronautics and Space Administration

SpaceX Space Exploration Technologies

ULA United Launch Alliance