The Roots of Space Privatization in the New Space Race

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THE ROOTS OF SPACE PRIVATIZATION IN THE NEW SPACE RACE

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Introduction

People like Elon Musk and Jeffery Bezos are investing heavily in private space exploration, hoping to establish bases on the Moon and Mars in the near future.[1] These private investments lay at the basis of the new space race, which has turned into a competition between the billionaires of the world to conquer space. Bezos' Blue Origin has just launched its sixth successful space tourism mission.[2] SpaceX, the space company of Musk, has been sending fully crewed missions to the International Space Station ever since its first crewed flight in May 2020.[3] Their next astronaut launch, the Crew-5 mission, is planned to launch later September 2022.[4] This new generation of space entrepreneurs, the 'new rocket men' as professor Tim Jackson calls them, are determined to colonize the 'final frontier.'[5] America's space industry pioneers are being given a helping hand by NASA, which has financially supported these commercial space companies in recent years and concluded contracts with them. For the upcoming lunar mission, Artemis, NASA is working together with SpaceX to develop a human moon lander.[6] Former President Donald Trump even went as far as saying he paved the way for the private investors: "I made it possible for them to do this. I actually said to my people: Let the private sector do it. These guys want to come in with billions of dollars. Let's lease them facilities because you need certain facilities to send up rockets, and we have those

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[1] Davenport, Christian, "The Inside Story of How Billionaires Are Racing to Take You to Outer Space," *Washington Post*, August 19, 2016. https://www.washingtonpost.com/business/economy/the-billionaire-space-barons-and-the-next-giant-leap/2016/08/19/795a4012-6307-11e6-8b27-bb8ba39497a2_story.html.

[2] Wall, Mike. "Blue Origin Launches 6 People on Company's 6th space tourism mission," *Space.com*, August 4, 2022. https://www.space.com/blue-origin-ns-22-space-tourist-flight-success.

[3] Gohd, Chelsea. "SpaceX's Astronaut Mission for NASA: Live Updates," *Space.com*, August 5, 2022. https://www.space.com/nasa-spacex-crew-launches-live-updates.

[4] Bartels, Meghan. "SpaceX's Next Astronaut Launch for NASA Slips to Late September," *Space.com*, July 21, 2022. https://www.space.com/spacex-crew-5-mission-delayed-sept-29.

[5] Jackson, Tim. "Billionaire Space Race: The Ultimate Symbol of Capitalism's Flawed Obsession with Growth," *The Conversation*, July 20, 2021. https://theconversation.com/billionaire-space-race-the-ultimate-symbol-of-capitalisms-flawed-obsession-with-growth-164511.

[6] Brown, Katherine. "NASA Picks SpaceX to Land Next Americans on Moon," NASA, April 16, 2021, http://www.nasa.gov/press-release/as-artemis-moves-forward-nasa-picks-spacex-to-land-next-americans-on-moon.

facilities. We have the greatest."[7] This thesis will discuss why private companies in the US, with the support of American public agencies and institutions, have been investing huge amounts of money in a new 21st-century space race by taking into account and exploring the deep historical roots of such a phenomenon and what it implies for American politics and identity. The idea is that the privatization of space is part and parcel of the long historical trajectory of American capitalism, and it is intertwined with the consolidation (and current decadence) of American core values, such as the American Dream.

In the relatively recent history of space exploration, the space race of the 20th century has been a key factor in expanding humankind's horizons. From the mid-1950s to the late 1970s, the two Cold War enemies, the Soviet Union and the United States of America, challenged themselves to conquer the outer space. When the US sent Neil Armstrong and his crew to the Moon in 1969, the war was considered to have been won by the Americans. Their lunar program Apollo had been able to both broaden the imagine and the concept of the frontier and expand our understanding of the universe, by discovering new planets while also bringing distant worlds closer to us: the space program, in other words, simultaneously helped our world to grow and expand and to discover its place in the broader universe.

There has been a myriad of academic research pertaining to the role of the space race within the Cold War context: this thesis will mostly focus on one aspect of such a narrative, that is the recent developments in space exploration driven by private interest, and will argue that such a driving force has characterized the impulse to explore the outer space since the beginning of the space race. In doing so, this thesis draws on scholars' ideas such as John Lewis Gaddis' ones, who in *The United States and the Cold War Origins* refutes the idea that only economic motives were at the root of the Cold War confrontation and argues that it was a matter

[7] More, Mark. "Trump Says He Paved the Way for Billionaires' Space Race," *New York Post*, July 11, 2021, https://nypost.com/2021/07/11/donald-trump-says-he-paved-the-way-for-billionaires-space-race/.

of a combination of factors – such as domestic policies and American perceptions of the USSR – that led to conflict between the two nations.[8] William D. Kay too wrote a book called *Defining NASA: The Historical Debate over the Agency's Mission* in which he examines the agency's history as well as the funding controversies that it has had to deal with ever since it was established in 1957, focusing on the convergence of interests between the public agency and private companies.[9] Funding and finances are two major topics that will be discussed throughout this thesis, as these are important to understand the origins and evolution of space privatization. Space privatization is the term given to the involvement of private companies in spaceflight.[10] At first, they primarily provided launch services for unmanned missions, but in more recent years, they have expanded their capabilities to include crewed space programs as well. Recently, space tourism has become a third component of space privatization.[11] Commercial, or private, spaceflight, has "with lower costs and faster production times […] displaced some functions of government space agencies," writes Maanas Sharma in an article on the privatized frontier.[12] Even though private spaceflight seems to be a rather recent phenomenon, it actually has a long history, argues historian Alexander MacDonald.[13]

Space privatization also taps into a debate revolving around the very nature of US governmental structure and foreign entanglements. In fact, as an abundance of academic articles that have been authored over the last few years demonstrates, the American conduct of the space race allows to better grasp not only the relationship between public and private interests,

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[8] Gaddis, John Lewis. *The United States and the Origins of the Cold War, 1941-1947*. New York: Columbia University Press, 2000. https://hdl-handle-net.ezproxy.leidenuniv.nl/2027/heb00094.
[9] Kay, William D. *Defining NASA: The Historical Debate Over the Agency's Mission*. Albany: SUNY Press, 2005. https://search-ebscohost-com.ezproxy.leidenuniv.nl/login.aspx?direct=true&db=e000xww&AN=144996&site=ehost-live.
[10] Sharma, Maanas. "The Privatized Frontier: The Ethical Implications and Role of Private Companies in Space Exploration," *The Space Review*. Accessed August 19, 2022, https://www.thespacereview.com/article/4238/1.
[11] Dunk, von der, Frans G. "Space tourism, private spaceflight and the law: Key aspects." *Space Policy* 27, no. 3 (2011): 146-152.
[12] Sharma, Maanas. "The Privatized Frontier: The Ethical Implications and Role of Private Companies in Space Exploration," *The Space Review*. Accessed August 19, 2022, https://www.thespacereview.com/article/4238/1.
[13] MacDonald, Alexander. *The Long Space Age: The Economic Origins of Space Exploration from Colonial America to the Cold War*, 2018.

but also how such a relationship came to typify American values and the American Dream. According to Saadia M. Pekkanen, visible trends are present in the new space race, including commercialization and militarization. She argues that private actors, such as Boeing and Lockheed Martin, have been a part of American space history "from the onset of the space age." The difference with the space race now compared to the one during the Cold War, she argues, "is that rather than just supporting governments, newspace is striking out with its own initiatives."[14] This trend creates "critical challenges for designing governance," Pekkanen writes, because the private companies are seeking profits from both space programs as well as settlements on other planets, like Mars. Another trend she talks about is militarization, for which "a far more nuanced lens on the balance between governments and businesses is […] necessary." 95 percent of the space technologies are used for both commercial and military purposes, which is important for these firms whose goal it is to make profit and remain viable.[15] A second challenge that comes with militarization is the changing world order in which a great power competition is present. "Intensifying geopolitical rivalries on Earth today, with all states attempting to shift the balances of space power in their favor, require deep understanding of state intentions and interests," says Pekkanen.[16] This dual purpose of space technologies shows that the new space race is at its core quintessentially American. At the root of this new space race are private-public cooperation (commercialization) and the military-industrial complex (militarization); the space race during the Cold War featured other characteristics, which will be discussed in the first chapter. President Dwight Eisenhower already warned for the rise of the military-industrial complex back in 1961, as he was worried it did not fit within the history and national identity of the US. "Defense contractors and a 'scientific-technological elite' could

[14] Pekkanen, Saadia M. "Governing the New Space Race." *AJIL Unbound* 113 (2019): 92–97. doi:10.1017/aju.2019.16.
[15] Pekkanen, Saadia M. "Governing the New Space Race." *AJIL Unbound* 113 (2019): 92–97. doi:10.1017/aju.2019.16.
[16] Pekkanen, Saadia M. "Governing the New Space Race." *AJIL Unbound* 113 (2019): 92–97. doi:10.1017/aju.2019.16.

hijack public policy, while defense spending could throw off the proper 'balance between the public and private economy' and make government contracts 'virtually a substitute for intellectual curiosity' in academia," writes Katherine Epstein about Eisenhower's concerns.[17] However, despite his warnings, the military-industrial complex has found its way into American identity and history, with its roots lying in the early Cold War.[18] The commercialization, on the other hand, will contribute to capitalism in the United States. "The growth of private space companies in recent years has been closely intertwined with capitalism," writes Sharma. He is concerned that due to recent acts that have been passed by Congress to reduce the regulations on private space companies, "capitalism in space will recreate the same conditions in outer space that plague Earth today, especially with the increasing push to create a "space-for-space" economy, such as space tourism and new technologies to mine the Moon and asteroids."[19]

While it is possible to find literature on the origins and consequences of the US's Cold War space race in the 1960s, it is still difficult to find literature on the motivations for the US to embark on a new space race. Rather than examining how the two competing space developments relate to each other, research to date has tended to focus on the two periods of history separately and distinct from each other. While some research has been carried out on the space race as we know it today, little attention has been paid to its origins. Recent developments in space tourism and the privatization of space by companies like Blue Origin and SpaceX are proof that a new space race is in full swing. These new developments call for different perspectives in order to better comprehend what is currently taking place and what may lie ahead of us in the future. The aim of this thesis is to examine why the United States is

[17] Epstein, Katherine C. *Torpedo: Inventing the Military-Industrial Complex in the United States and Great Britain*. Cambridge, Massachusetts: Harvard University Press, 2014.
[18] Epstein, Katherine C. *Torpedo: Inventing the Military-Industrial Complex in the United States and Great Britain*. Cambridge, Massachusetts: Harvard University Press, 2014.
[19] Sharma, Maanas. "The Privatized Frontier: The Ethical Implications and Role of Private Companies in Space Exploration," *The Space Review*. Accessed August 19, 2022, https://www.thespacereview.com/article/4238/1.

embarking on a new space race which is also the central research question. This new space race is different from its predecessor because it has a much more international character. It is being run between private companies from all over the world supported by their governments, with the goal of being the first to open the space frontier to civilians. “The [private spaceflight] industry is part of the global initiative to commercialize space with an increasingly important role for the private sector, especially for sub-orbital and orbital activities,” writes Joseph A. Giacalone.[20] Especially the commercial character of this space race is what makes it new.

In order to provide the most substantiated and correct answer possible to this central question, research for this paper has been primarily conducted on the correlation between the Cold War space race and the space race today. This thesis traces the most interesting element of continuities in an underlying privatization of both the enterprises. In other words, this project intends to determine the extent to which the privatization of today’s space race has its roots in the Cold War and whether the drives of the US to embark on a new space race are related to the ones that the country had in the second half of the 20th century. Arguments will be made in order to highlight a move from national security to profits, which is driven by private interests rooted in the Cold War. Private businesses had a significant role in the NASA programs of the 1960s and 1970s, and they have continued to play a crucial role in the process of new projects ever since. This developed a sort of interdependence between the private and public sectors involved in space research and development that lasted till our contemporary days. Space privatization and space tourism are therefore the core elements of the new contemporary space race.

Before outlining the structure of this thesis, it is useful to first define a number of key terms that will recur frequently in this research. Probably the most important one is the term ‘space race.’ This refers to the technological and intellectual competition that took place in the

[20] Giacalone, Joseph A. "The evolving private spaceflight industry: Space tourism and cargo transport." *ASBBS Proceedings* 20, no. 1 (2013): 643.

second half of the 20th century – during the Cold War – between the United States and the Soviet Union to acquire superior space capabilities, such as sending a human into space. The term is used by a large number of scholars who wrote about the "action-reaction dynamic" that occurred during the Cold War between the US and the USSR in the area of space developments, which had the ultimate goal of gaining those superior space capabilities (such as landing someone on the Moon).[21] Another commonly used term is 'space privatization.' As mentioned earlier, it refers to the participation of private businesses in spaceflight.[22] Throughout this thesis, the term is being used to refer to private companies privatizing space by taking over the role of the government in providing space travel, but it is also being used to talk about the involvement of private companies in government funded space missions. The former is a 21st-century development, while the latter occurred in the 20th century. Next, there are a few basic American principles worth outlining in order to gain a better understanding of the arguments being made about why the United States is embarking on a new space race. The first one is the notion of the 'Frontier.' American historian Frederick Jackson Turner, who was known for his "Frontier Thesis," argued that the North American western frontier in the 19th century and its expansion contributed undeniably to the democracy of the United States. It is a term that has a long history, but in recent times has become as relevant as ever with the exploration of space. Another term historians have been using when talking about the space frontier, is the 'final frontier.'[23] Throughout this thesis, I will use 'space frontier' instead of 'final frontier.' As new worlds are being explored, new frontiers will appear. Therefore, I believe that the space frontier is not the final frontier. The term 'space frontier' is used to refer to the imaginary boundary that serves as a portal to the undiscovered expanse of space. Companies, such as SpaceX, have made

[21] Day, Dwayne A. "Racing To Where/What/When/Why?" *The Space Review*. Accessed August 19, 2022, https://www.thespacereview.com/article/3893/1.
[22] Sharma, Maanas. "The Privatized Frontier: The Ethical Implications and Role of Private Companies in Space Exploration," *The Space Review*. Accessed August 19, 2022, https://www.thespacereview.com/article/4238/1.
[23] Genta, Giancarlo, and Michael Rycroft. *Space, the Final Frontier?* Cambridge: Cambridge University Press, 2003.

investments to profit on this phenomenon during the last few decades. The notion of the frontier goes hand-in-hand with other American values and ideas, such as Manifest Destiny and the American Dream. Manifest Destiny also dates back to the 19th century when it was believed that the United States' expansion and colonization of the American continents was both necessary and inevitable.[24] The American Dream, on the other hand, is the national ethos that highly values freedom and implies that everyone, regardless of their background or social status, should be able to achieve their own goals in life and thus experience upward mobility in American society.

The methodological approach of this study is based on historical research: I used and analyzed both primary and secondary sources. The primary sources include data that was collected from NASA archives, presidential databases, and commission reports. From the NASA archives I have consulted primary data from the *NASA Historical Data Book* on the top 100 contractors of the agency between 1969 and 1978. The amount of money that was awarded to each private business during those years, can be found in this data book. It has given me insights on space privatization and the agency's spendings during the Apollo era; the prime time of the Cold War space race.[25] For the recent budgets that were requested for NASA by the presidents in charge, I have examined the budgets of the US government. These documents also provide more information on the budgets envisioned to be spent on specific space projects.[26] Presidential databases were useful to analyze the presidential speeches that have been influential during the space race, such as President Kennedy's "New Frontier" speech in 1960, as they had an impact on policy making and the funding of space developments.[27] Furthermore,

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[24] Mountjoy, Shane. *Manifest Destiny: Westward Expansion*. New York: Infobase Publishing, 2009.
[25] Data from the *NASA Historical Data Book: Volume IV NASA Resources 1969-1978*. https://history.nasa.gov/SP-4012/vol4/ch5.htm.
[26] Budget of the U.S. Government, https://www.govinfo.gov/app/collection/budget.
[27] President John F. Kennedy, "The New Frontier," acceptance speech of Senator John F. Kennedy, Democratic National Convention, 15 July 1960, JFKSEN-0910-015. John F. Kennedy Presidential Library and Museum. https://www.jfklibrary.org/asset-viewer/archives/JFKSEN/0910/JFKSEN-0910-015.

I have looked into advisory reports written by US space commissions and used the Federal Register for documents on space related rules and laws.[28] As for the secondary sources, I consulted a number of books and essays on space tourism, space privatization, the Cold War, and the space race. The authors critically analyzed the dynamics of the Cold War and the space race. They discussed the roots of NASA and explain that they lie in the International Geophysical Year (IGY) of 1957.[29] It is being argued that the fear of a growing missile gap led to the extra investment in national security.[30] This national security threat lies at the basis of the space race. Scholars have also argued that the space race was a "action-reaction dynamic" between the US and the USSR.[31] Most authors agree that the end of the space race was the successful landing of Apollo 11 on the surface of the Moon in 1969.[32] What they are missing, is what happened after that first crewed moon landing in terms of public-private partnerships. Despite the fact that there were no major space developments, the government still awarded money to private companies. This was because the preparations for the Space Shuttle, for example, were also in progress at that time. I contribute to the existing literature by analyzing the rationale for US investment in the new space race and space privatization. I will use the works that already exist to circle back to the Cold War, where the roots of the current privatization of space lie.

The thesis is composed of three distinct chapters. The first section gives a brief overview of the Cold War and the origins of the space race and covers the period from right after World War II up until the late 1950s. It discusses the Cold War ideologies, the uprising of scientific

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[28] Federal Register, https://www.federalregister.gov/.
[29] Newell, Homer E. "Response To Sputnik: The Creation of NASA." In *Beyond the Atmosphere: Early Years of Space Science*, 87-99. Mineola: Dover Publications, 2010.
[30] Campbell Craig, and Fredrik Logevall. *America's Cold War: The Politics of Insecurity*. Cambridge: Harvard University Press, 2009. https://search-ebscohost-com.ezproxy.leidenuniv.nl/login.aspx?direct=true&db=e000xww&AN=327559&site=ehost-live.
[31] Wohlstetter, Albert. "Is There a Strategic Arms Race?" *Foreign Policy*, no. 15 (1974): 3–20. https://doi.org/10.2307/1147927.
[32] Samuels, Richard J. *Encyclopedia of United States National Security*. Thousand Oaks: SAGE Publishing, 2005.

developments and nuclear weapons, the roots of the space race, and the establishment of NASA. Chapter two begins by laying out the first space victories of the USSR and looks at how private companies gained merit and credibility in the space race. It focuses on the developments of the early 1960s, when NASA started working on their first lunar program, Apollo, until the 1990s when the Space Shuttle was fully operational. The third chapter is concerned with space privatization as we know it today. It provides a summary of the pioneers of space privatization, talks about joint ventures between the public and private sectors, and cites the importance of fundamental American values as what drives the new space race. Last but not least, I will conclude this thesis through the findings and research conducted throughout, aims to answer the key question, “Why is the US embarking on a new space race?”

Chapter One: The Cold War and the Origins of the Space Race

Historians disagree on the exact moment the Cold War began. Some scholars argue that the roots of the Cold War can be found in the decades that followed the Second World War. American historian Gar Alperovitz, for example, contends that the 1945 nuclear bombs on Hiroshima and Nagasaki signaled the beginning of the Cold War. He believes that the United States was the main contributor to global tensions. Alperovitz says that "the atomic bomb was a primary catalyst in creating the Cold War, and that, apart from the nuclear arms race itself, the most important specific role of nuclear weapons was to revolutionize American policy toward Germany."[33] Others argue that it started in 1946, when American diplomat in Moscow George Kennan sent an 8,000-word telegram – known as the 'Long Telegram' – to Washington DC in which he described his views on the USSR and how the US would have to deal with Soviet communism in the future. "Further concessions to Moscow would be futile, Kennan argued; the Stalinist regime would always remain hostile because it depended upon the existence of foreign threats to maintain its domestic authority," writes John L. Gaddis.[34] This document influenced the American policy greatly; it "spurred intellectual policy debate that formed the basis of American policy towards the Soviet Union for the next 25 years, including the Truman Doctrine and the Marshall Plan"[35] It has also been argued that the Berlin crisis, which started in June 1948, was the actual start of the Cold War:

> By the end of 1947, the three western powers had finally reached the conclusion that no settlement with Russia was possible and that they therefore would have to move ahead in western Germany on their own. In early 1948 it became clear

[33] Alperovitz, Gar, and Kai Bird. "A Theory of Cold War Dynamics: U. S. Policy, Germany, and the Bomb." *The History Teacher* 29, no. 3 (1996): 281–300. https://doi.org/10.2307/494546.
[34] Gaddis, John Lewis. *The United States and the Origins of the Cold War, 1941-1947.* New York: Columbia University Press, 2000. https://hdl-handle-net.ezproxy.leidenuniv.nl/2027/heb00094.
[35] Truman Library Institute. "This Day in History: George Kennan Sends 'Long Telegram,'" February 22, 2022. https://www.trumanlibraryinstitute.org/kennan/.

> that they intended to establish a west German state. The Soviets, however, were deeply opposed to what the western powers were doing.[36]

Soviet forces blocked rail, road, and water access to Allied-controlled regions of the city. In turn, the US and the UK reacted to these blockades by airlifting food and fuel to Berlin from their air bases in Western Germany.[37]

Other authors, such as Craig Campbell and Frederik Logevall, argue that the implementation of the NSC-68 signified the start of the Cold War under the Truman administration. On April 7, 1950, this National Security Council Paper (NSC-68) was published by the US Department of State's Policy Planning Staff. It was one of the most influential documents written by the government until it was declassified in 1975. In essence, the document stated that the US could defend its territory and overseas interests in the event of an armed conflict with the USSR.[38] According to Campbell and Logevall, the NSC-68 provided a clear explanation of what American foreign policy had to entail, "the United States must wage the Cold War on every front. It must fight communism by every means, not only political and economic […] but also military. It must project its own armed forces to the far corners of the world, in order to meet the Kremlin's pressure with countervailing American power."[39] Douglas Stuart, however, argues that the ratification of the National Security Act of 1947 undoubtedly began the Cold War. He writes that "none of the well-known events of the immediate postwar era […] was as significant as the 1947 National Security Act in determining both the direction

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[36] Trachtenberg, Marc. *A Constructed Peace: The Making of the European Settlement, 1945-1963*. Vol. 79. Princeton University Press, 2020.
[37] "Milestones: 1945–1952 - Office of the Historian." Accessed March 31, 2022. https://history.state.gov/milestones/1945-1952/berlin-airlift.
[38] "Milestones: 1945–1952 - Office of the Historian," accessed August 17, 2022, https://history.state.gov/milestones/1945-1952/NSC68.
[39] Craig, Campbell, and Logevall, Fredrik. "To The Ends Of The Earth" In *America's Cold War: The Politics of Insecurity*, 102-138. Cambridge: Harvard University Press, 2022. https://doi-org.ezproxy.leidenuniv.nl/10.4159/9780674053670-004.

of American foreign policy and the future of American society."[40] In doing so, he refutes, for example, the argument of John L. Gaddis, who says that the 'Long Telegram' from 1946 was the start of the Cold War.

It is without a doubt that these events had a role in stirring the global tensions and creating a Cold War, yet there are also scholars who argue that the roots of this conflict lay in the first half of the twentieth century, grounding their argument on the leading role played by ideological confrontation. According to Harvard historian Odd Arne Westad, the foundations of the Cold War had already been laid with the Great October Socialist Revolution of 1917. To Westad, "The Cold War had its roots, of course, in the early parts of the twentieth century and as an ideological divide, its shadow had long fallen on much of European and global history."[41] This perspective emphasizes the ideological frictions between the United States and the Soviet Union as the quintessential characteristics of the Cold War. American liberalism and capitalism on one side and Soviet Communism on the other provided two antithetic and irreconcilable universalistic models and visions. Both countries were directly opposed to each other and were confident that they could overthrow the other's ideology and impose their own in other parts of the world. Seen in this way, thus, the Cold War was not primarily a socio-economical conflict over markets and territories, but above a massive global struggle over ideological ideas.[42]

Insisting on the role of ideology, historian David Engerman explains that Communism and US liberalism were substantially antithetic and destined to clash. According to Engerman, Lockean liberalism inspired the Founding Fathers during the creation of the Declaration of Independence:

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[40] Stuart, Douglas T. *Creating the National Security State: A History of the Law That Transformed America*. Princeton: Princeton University Press, 2008. https://search-ebscohost-com.ezproxy.leidenuniv.nl/login.aspx?direct=true&db=e000xww&AN=286704&site=ehost-live.

[41] Westad, Odd Arne. *The Cold War: A World History*. First edition. New York: Basic Books, 2017.

[42] Engerman, David. "Ideology and the Origins of the Cold War, 1917–1962." Chapter. In *The Cambridge History of the Cold War*, edited by Melvyn P. Leffler and Odd Arne Westad, 1:20–43. The Cambridge History of the Cold War. Cambridge: Cambridge University Press, 2010. doi:10.1017/CHOL9780521837194.003.

> As the etymology suggests, Lockean liberalism was, at its core, a theory of liberty, one that viewed liberty as defined for the individual, based in law, and rooted in property. The Declaration of Independence paraphrased Locke in proclaiming human beings "endowed by their Creator" with rights to "life, liberty and [where Locke had emphasized property] the pursuit of happiness." Liberty could be protected only by a system of laws in a polity guaranteeing popular sovereignty. A government, furthermore, should provide only formal freedoms (protecting the rights of property and participation), not substantive ones (equality of condition).[43]

Liberalism is therefore deeply ingrained in the American foundations, and it is inextricably bound to the development of American capitalism. According to the precepts of American liberalism, indeed, "the spread of liberty could be measured by the spread of market economies allowing the free exchange of goods."[44] A free exchange of goods is vital as it can facilitate a smooth and more seamless trade relation. Moreover, international trade would also help the US in spreading their ideology and, as a result, the spreading of 'liberty.' The American government felt responsible for protecting the right to freedom to own property and participate in society, for it would benefit the Manifest Destiny of the United States.

Engerman also explains that American liberalism evolved way beyond Lockean Liberalism. American elites truly believed in their country's Manifest Destiny, the notion that American liberty was destined to grow and, moreover, that their ideology would eventually apply to all nations. On the other side of the world, the Soviet Union also held the idea that history would be on their side and that, eventually, their ideology would prevail. The USSR policy makers were firm believers of Karl Marx and his theory on capitalism. He believed capitalism relied on exploitation; Soviet policymaking – both foreign and domestic – was largely built upon the Marxist ideology. According to Engerman there were three main

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[43] Engerman, David. "Ideology and the Origins of the Cold War, 1917–1962." Chapter. In *The Cambridge History of the Cold War*, edited by Melvyn P. Leffler and Odd Arne Westad, 1:20–43. The Cambridge History of the Cold War. Cambridge: Cambridge University Press, 2010. doi:10.1017/CHOL9780521837194.003.

[44] Engerman, David. "Ideology and the Origins of the Cold War, 1917–1962." Chapter. In *The Cambridge History of the Cold War*, edited by Melvyn P. Leffler and Odd Arne Westad, 1:20–43. The Cambridge History of the Cold War. Cambridge: Cambridge University Press, 2010. doi:10.1017/CHOL9780521837194.003.

differences between American liberalism and Soviet communism. The Soviet ideology had a much more deterministic attitude and believed that revolutions were better than gradual change. Moreover, the Soviet ideology rejected the idea of capitalist organizations as leaders of the governing class. Engerman points out that despite the many differences between their ideologies, they were both universalistic and displayed traits of messianism. For this reason, permanent coexistence of American liberalism and Soviet communism was impossible.[45]

According to this interpretation emphasizing the ideological gap between the US and USSR, the Second World War alliance was just an ephemeral convergence of interests. After the defeat of the Nazis in 1945, both nations came back to their original antagonism and tried to spread their ideologies worldwide. "The clashing perceptions of a common goal wrecked the Grand Alliance at the moment of victory, creating an ironic situation in which simultaneous searches for peace led to the Cold War," as historian Marc Trachtenberg writes.[46] Ideology, however, was only one of the many dimensions of the Cold War. Apart from the ideological factors that ignited the Cold War, the US and the USSR developed other confrontational fissures that perpetuated tensions. First, the Cold War emerged as a geopolitical conflict; a conflict in which two global superpowers, the US and USSR in this scenario, push their political objectives onto the world by means of strategic military alliances, power of influence, and confrontation. The conflict mostly revolved around the core of Eurasia, and the future of Germany in particular, as the Soviets were concerned that if Germany became too independent, the risk of another war would increase. After WWII, Europe was divided between east and west, allowing the Soviet Union and the western powers to rule freely on their side of the continent. Germany, however, was an exception. "The Soviets would not stand idly by if their former allies allowed

[45] Engerman, David. "Ideology and the Origins of the Cold War, 1917–1962." Chapter. In *The Cambridge History of the Cold War*, edited by Melvyn P. Leffler and Odd Arne Westad, 1:20–43. The Cambridge History of the Cold War. Cambridge: Cambridge University Press, 2010. doi:10.1017/CHOL9780521837194.003.
[46] Trachtenberg, Marc. *A Constructed Peace: The Making of the European Settlement, 1945-1963*. Vol. 79. Princeton University Press, 2020.

West Germany to become too strong or too independent … [A]s the Soviets saw it, a powerful Germany meant a greatly increased risk of war."[47] The USSR feared that a strong West Germany would intervene in the case of uprisings in Eastern Europe; hence, Germany's important geopolitical position on the map also made the Cold War a geopolitical conflict.[48] Moreover, as Federico Romero writes, "Without instability and fragmentation of the West, Communism began to lose its strategic, intellectual and emotional claim on the future and saw its grip on the present sharply circumscribed."[49] In other words, the Cold War was a disagreement of each superpower's individual interpretation of what the world at peace was; the conflict of defining what was optimal safety and security. As historian John Lewis Gaddis wrote in his book *The United States and the Origins of the Cold War*, the US was convinced that "the whole system of relations between nations would have to be reformed" in order to seek global security.[50]

The emphasis on geostrategic objectives contributed to transforming the Cold War into an open, direct military conflict, embodied by the emergence of two distinct and formal military alliances across the blocs. In April 1949, the North Atlantic Treaty Organization (NATO) was founded. During the first couple of decades after its establishment, NATO's "major purpose of existence", according to historian Lawrence Kaplan, had been the Cold War and the Soviet Union.[51] In May 1955, the Soviet Union established its own treaty organization, referred to as the Warsaw Pact. The Warsaw Pact was intended to function "as a coordinating centre to ensure

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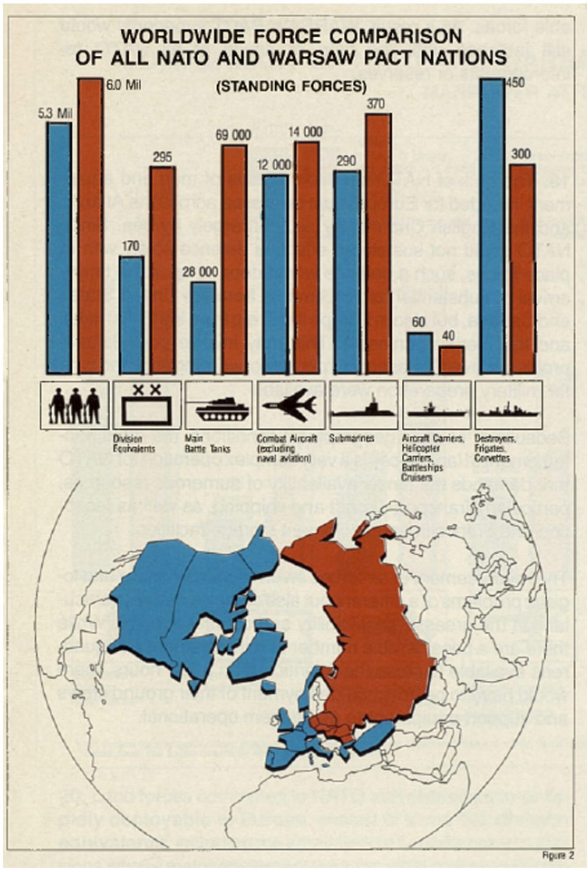
[47] Trachtenberg, Marc. *A Constructed Peace: The Making of the European Settlement, 1945-1963*. Vol. 79. Princeton University Press, 2020.
[48] Trachtenberg, Marc. *A Constructed Peace: The Making of the European Settlement, 1945-1963*. Vol. 79. Princeton University Press, 2020.
[49] Romero, Federico. "Cold War Historiography at the Crossroads." *Cold War History* 14, no. 4 (October 2, 2014): 685–703. https://doi.org/10.1080/14682745.2014.950249.
[50] Gaddis, John Lewis. *The United States and the Origins of the Cold War, 1941-1947.* New York: Columbia University Press, 2000.
[51] Kaplan, Lawrence S. *NATO Divided, NATO United: The Evolution of an Alliance*. Greenwood Publishing Group, 2004.

that [the communist parties] would fight the capitalist enemy together rather than separately."[52] The organization, "generally considered a Soviet instrument, 'used to continue the total subordination of the smaller East European governments to the Kremlin's actual aims and policy in the post Stalin-era,'" caused concern among Western nations in terms of the Pact's military might.[53] As discussed earlier in this chapter, the Western bloc – known as NATO – and the Eastern bloc – known as the Warsaw Pact – were ideologically opposed to each other. After a while, both sides began a military race that characterized the Cold War. The following infographic, published by NATO, is interesting for it visualizes both the geographical as well the military conflict of the Cold War.[54]



Infographic of NATO and Warsaw Pact Worldwide Force. "What Was the Warsaw Pact?" NATO.

[52] Crump, Laurien. *The Warsaw Pact Reconsidered: International Relations in Eastern Europe, 1955-1969*. London: Routledge, 2015.
[53] Crump, Laurien. *The Warsaw Pact Reconsidered: International Relations in Eastern Europe, 1955-1969*. London: Routledge, 2015.
[54] NATO. "What Was the Warsaw Pact?" NATO. Accessed March 3, 2022. http://www.nato.int/cps/en/natohq/declassified_138294.htm.

The infographic shows that NATO did have reason to be concerned. The Eastern bloc had a remarkably larger number of standing troops than the Western bloc. Moreover, Germany was no longer a neutral territory. The German Democratic Republic (GDR) became a member of the Warsaw Pact and consequently had easy access to military supplies.

Geopolitics and military confrontation reverberated to many other aspects of politics and society too. The Cold War, indeed, was not confined to security elites, but it affected people's everyday life too, at multiple levels. Its popular and cultural connotations have induced many authors to stress such totalizing characteristics. "The principle of total war – that wars were no longer fought just by armies in the field, but by the entire nation – erased distinctions between the front line and the home front and made the mobilization of the of the masses an indispensable feature of modern conflict," writes historian Kenneth Osgood in his book *Total Cold War*.[55] Osgood adds that, "The desperation created by total war in Europe and the fear that it would spread to much of the rest of the globe was in the minds of all those who experienced it, regardless of where they experienced it."[56]

> The importance of ideological and symbolic factors in this conflict, then, in turn, made the Cold War even more all-embracing. Virtually every aspect of the American way of life – from political organizations and philosophical ideals, to cultural products and scientific achievements/to economic practices and social relationships—was exposed to scrutiny in this total contest for the hearts and minds of the world's peoples.[57]

Osgood implies that the Cold War was not a war fought only in the fields, but the war was also making its way into societies all over the world. Through propaganda, both sides tried to influence the perceptions of other nations. According to Osgood, "total war made distinctions

[55] Osgood, Kenneth. *Total Cold War: Eisenhower's Secret Propaganda Battle at Home and Abroad*. Lawrence: University Press of Kansas, 2006.
[56] Westad, Odd Arne. *The Cold War: A World History*. First edition. New York: Basic Books, 2017.
[57] Osgood, Kenneth. *Total Cold War: Eisenhower's Secret Propaganda Battle at Home and Abroad*. Lawrence: University Press of Kansas, 2006.

between propaganda intended for "domestic" and "international" audiences meaningless". The kind of "psychological warfare" that was taking place in the United States through propaganda, even became an issue in Dwight D. Eisenhower's political campaign when he was running for president in 1952. "Eisenhower and many of his advisors viewed the challenge of peaceful coexistence as representing a "new type of Cold War," a war of persuasion that would be won or lost on the plain of public opinion […] Psychological factors seemed more important than ever to winning this total contest for hearts and minds."[58]

Hence, the Cold War was a multifaceted and multidimensional conflict that affected ideology, geopolitics, security, culture, and society. What historians are now discovering is that among the many battlefields in which the Cold War reverberated, the environment had a particular importance. A couple historians have done research on this; one of them is Jacob Darwin Hamblin. In his book *Arming Mother Nature*, Hamblin provides evidence of how governments supported environmental science research to discover innovative ways to control natural phenomena that have the potential to kill millions of people.[59] This rising interest in environmentalism – both as a movement and as a scientific focus – is also the topic of John R. McNeill and Corinna R. Unger's book *Environmental Histories of the Cold War*. They point out that the history of the Cold War also includes both the emergence of environmentalism and the acceleration of environmental change.[60] Audra J. Wolfe also underlines in her book on science and the Cold War the importance of the environment during the Cold War: "From the late 1940s through the late 1960s, the US foreign policy establishment saw a particular way of thinking about scientific freedom as essential to winning the global Cold War – and not just

[58] Osgood, Kenneth. *Total Cold War: Eisenhower's Secret Propaganda Battle at Home and Abroad*. Lawrence: University Press of Kansas, 2006.
[59] Hamblin, Jacob Darwin. *Arming Mother Nature: The Birth of Catastrophic Environmentalism*. Oxford: Oxford University Press, 2013.
[60] McNeill, J. R., and Corinna R. Unger, eds. *Environmental Histories of the Cold War*. Publications of the German Historical Institute. Cambridge: Cambridge University Press, 2010. doi:10.1017/CBO9780511730382.

because science created weaponry."[61] The significant importance of the environment was of course a direct consequence of the fact that natural science and physics had gained prominence in both modern political rhetoric and policymaking. Scientific research was seen as a key to gaining comparative advantages in a world stuck to a zero-sum game. The effects of such a switch were many. The Cold War underwent a qualitative switch from being a mere ideological confrontation to an outright technological war. These technologies, including atomic power and nuclear weapons, were at the basis of the space race. "Nuclear weapons have so dominated strategic thought that it is easy to forget how scientists tried to exploit the pathways and forces of nature in other ways," writes historian Jacob D. Hamblin.[62] World War II gave technology and science new meaning and power. The Cold War did not only cause upheaval in societies globally, but it also affected the environment in many ways. In the *Environmental Histories of the Cold War* by historian John Robert McNeill and historian Corinna Unger, a couple of these have been laid out. Kristine C. Harper and Ronald E. Doel wrote a chapter on environmental diplomacy during the Cold War for this book, pointing out that environmental sciences, oceanography, and meteorology were critical to winning the war. In the post-World War II era, science and technology seemed to offer a solution to the turbulent geopolitical atmosphere. Soon, the idea emerged that weather control could be an essential weapon in the Cold War. Already in the late 1940s, the US military started to explore the possibilities of weather control and considered it as a tool of American foreign policy.[63]

In addition to weather control, one of the most characterizing weapons of the Cold War, which contributed to intertwining the Cold War confrontation with the Earth's ecosystems –

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[61] Wolfe, Audra J. *Freedom's Laboratory: The Cold War Struggle for the Soul of Science*. Baltimore: Johns Hopkins University Press, 2018.
[62] Hamblin, Jacob Darwin. *Arming Mother Nature: The Birth of Catastrophic Environmentalism*. Oxford: Oxford University Press, 2013.
[63] Harper, Kristine C., and Ronald E. Doel. "Environmental Diplomacy in the Cold War: Weather Control, the United States, and India, 1966–1967." Chapter. In *Environmental Histories of the Cold War*, edited by J. R. McNeill and Corinna R. Unger, 115–38. Publications of the German Historical Institute. Cambridge: Cambridge University Press, 2010. doi:10.1017/CBO9780511730382.005.

and endanger them – were nuclear weapons. Nuclear tests were conducted without much concern about the ecological consequences. Many tests were done in Remote Oceania by the United States, France, and the United Kingdom. The islands in the area were isolated and therefore considered to be the best places to test their weapons. Mark D. Merlin and Ricardo M. Gonzalez wrote a chapter on the "direct and indirect atmospheric, geological, and ecological effects of nuclear testing in Remote Oceania."[64] The US executed 110 atomic tests between 1946 and 1962 in this region. These harmed the ozone layer and caused a potential creation of nuclear winter conditions:

> One study of the consequences of atomic testing concluded, "Fallout and other residual radioactivity from atmospheric nuclear testing conducted by all nations have caused or will cause through infinity an estimated 3 million cancer fatalities."[65]

Conducting weapons tests in isolated areas provided no ecological safeguard; they still remained to be irreversibly damaging on the global environment and society. In the region itself, living organisms in the marine and terrestrial environments suffered from both short- and long-term effects. A great number of fish died, and the blast of a nuclear bomb test turned water to steam in only a couple of seconds. Moreover, it also affected the geology of the islands, "Surface and underwater detonations created craters and, in some cases, vaporized islets partially or entirely." Merlin and Gonzalez concluded that "the willingness of the nuclear rivals to test weapons of such magnitude attests to both the intensity of the Cold War and the

[64] Merlin, Mark D., and Ricardo M. Gonzalez. "Environmental Impacts of Nuclear Testing in Remote Oceania, 1946–1996." Chapter. In *Environmental Histories of the Cold War*, edited by J. R. McNeill and Corinna R. Unger, 167–202. Publications of the German Historical Institute. Cambridge: Cambridge University Press, 2010. doi:10.1017/CBO9780511730382.007.

[65] Merlin, Mark D., and Ricardo M. Gonzalez. "Environmental Impacts of Nuclear Testing in Remote Oceania, 1946–1996." Chapter. In *Environmental Histories of the Cold War*, edited by J. R. McNeill and Corinna R. Unger, 167–202. Publications of the German Historical Institute. Cambridge: Cambridge University Press, 2010. doi:10.1017/CBO9780511730382.007.

superpowers' lack of environmental sensitivity."[66] McNeill and Unger themselves argue that science played the most central role in the Cold War:

> The Cold War world was, in many respects, a scientific world – one in which political, social, and cultural problems were viewed through the lens of science and in which science was believed to offer solutions to the challenges both of everyday life and of international politics, including the Cold War itself.[67]

As it has been discussed, the impact of science and technological developments on the environment had been huge. Atomic energy, for example, caused environmental challenges. Jacob Darwin Hamblin names a few in his book *The Wretched Atom*. One example is the relationship between carbon emissions and global climate change. However, the concerns of ecological and environmental activists were often seen as "irrational and emotional when they questioned atomic energy".[68] The World Health Organization (WHO) stated early on that "its domain – that of public health – would necessitate its involvement in atomic energy issues." The issues included "air, soil and water pollution, the problem of wastes from the public health point of view and, as a consequence, the problems related to the location of nuclear facilities."[69] Leaders saw solutions in the scientific evolution but turned a blind eye to the negative side-effects it would cause in the future. After all, they had a war to win. And just as important, there was also something else to win: the space race.

Similarly to the nuclear arms race, the space race came to typify and represent one of the most quintessential characteristics of the Cold War. The two superpowers invested in the

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[66] Merlin, Mark D., and Ricardo M. Gonzalez. "Environmental Impacts of Nuclear Testing in Remote Oceania, 1946–1996." Chapter. In *Environmental Histories of the Cold War*, edited by J. R. McNeill and Corinna R. Unger, 167–202. Publications of the German Historical Institute. Cambridge: Cambridge University Press, 2010. doi:10.1017/CBO9780511730382.007.

[67] McNeill, J. R., and Corinna R. Unger, eds. *Environmental Histories of the Cold War*. Publications of the German Historical Institute. Cambridge: Cambridge University Press, 2010. doi:10.1017/CBO9780511730382.

[68] Hamblin, Darwin Jacob. *The Wretched Atom: America's Global Gamble with Peaceful Nuclear Technology*. New York: Oxford University Press, 2021.

[69] Hamblin, Darwin Jacob. *The Wretched Atom: America's Global Gamble with Peaceful Nuclear Technology*. New York: Oxford University Press, 2021.

Cold War through fiscal and reputational means, transforming the field into a highly politicized battleground where science came to be at the service of political power. But scientific progress and developments made the space race possible. In 1957 and 1958 the International Geophysical Year (IGY) took place, a year in which scientists from 67 countries conducted scientific research, hoping to play a greater role in helping to solve international problems.[70] The IGY marked a new departure in terms of exploration, both on Earth – such as Antarctica – and in space. This contributed, according to Christy Collis and Klaus Dodds to "a conceptual shift in the ways in which the Earth and beyond was imagined, understood and managed."[71] To better understand why the IGY was crucial to the further course of the space race, it is important to look at how the legal status of the Antarctic came about. The Antarctic continent did not belong to any nation; however, it was – and this caused friction – a valuable region for IGY scientists to conduct research. Scientific stations from different nations were established on Antarctica and it was important that "contending sovereignties did not interfere with the programme of research." Therefore, in 1959, the Antarctic Treaty was signed by the IGY Antarctic participants; it declared "the Antarctic a zone of peace and a 'continent for science.'"[72] But when a *The New York Times* headline on October 5, 1957, read 'Soviet Fires Earth Satellite Into Space', new questions arose: what is the legal status of space? And who owns space?[73] Since the area and conception of outer space possessed no legal status, no other nation protested a possible violation by the Soviet Union of their sovereign territory. In 1960, President Dwight Eisenhower proposed to the United Nations that the principles of the

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[70] Sullivan, Walter. "The International Geophysical Year Document No. 521." *International Conciliation* 32 (1959 1957): [iii]-338.
[71] Collis, Christy, and Klaus Dodds. "Assault on the Unknown: The Historical and Political Geographies of the International Geophysical Year (1957–8)." *Journal of Historical Geography* 34, no. 4 (2008): 555–73. https://doi.org/10.1016/j.jhg.2008.05.016.
[72] Collis, Christy, and Klaus Dodds. "Assault on the Unknown: The Historical and Political Geographies of the International Geophysical Year (1957–8)." *Journal of Historical Geography* 34, no. 4 (2008): 555–73. https://doi.org/10.1016/j.jhg.2008.05.016.
[73] Jorden, William J. "Soviet Fires Earth Satellite Into Space: It Is Circling the Globe at 18,000 M.P.H.; Sphere Tracked in 4 Crossings Over U.S." *The New York Times*. October 5, 1957. https://archive-nytimes-com.ezproxy.leidenuniv.nl/www.nytimes.com/partners/aol/special/sputnik/sput-01.html.

Antarctic Treaty would be applied to "outer space and other celestial bodies". The UN Assembly announced that the UN Charter and international law would apply in outer space and on celestial bodies, but nevertheless, "wrangling over the legal status of outer space continued as the US and USSR disagreed over disarmament issues, including the location of missiles on US foreign bases proximate to the Soviet Union."[74]

The US as well as the USSR were determined to test the military-scientific potential of their equipment during the International Geophysical Year. With the launch of Sputnik I on October 4, 1957, the Soviet Union had won the first phase of the space race. The launch did not come as a complete surprise to their opponents. The Soviet Union had made it clear at the beginning of the IGY that it wanted "to 'race' the United States into the atmosphere with the little sphere."[75] As a response to the USSR's Sputnik, Eisenhower established in 1958 the National Aeronautics and Space Administration (NASA), "a federal agency dedicated solely to technological progress in a field deemed vital to national interests."[76] Until the creation of NASA, much of the American space program was part of the US military branch. The start of the space race changed that:

> Had it not been for the shock generated by Sputnik, the American space program would probably have evolved into one largely devoted to military objectives-with space science as an adjunct. […] With the [space] program in NASA, the scientific community was in a stronger position to impress its brand on American space science and to work openly with foreign colleagues when that seemed appropriate.[77]

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[74] Collis, Christy, and Klaus Dodds. "Assault on the Unknown: The Historical and Political Geographies of the International Geophysical Year (1957–8)." *Journal of Historical Geography* 34, no. 4 (2008): 555–73. https://doi.org/10.1016/j.jhg.2008.05.016.

[75] Jorden, William J. "Soviet Fires Earth Satellite Into Space: It Is Circling the Globe at 18,000 M.P.H.; Sphere Tracked in 4 Crossings Over U.S." *The New York Times*. October 5, 1957. https://archive-nytimes-com.ezproxy.leidenuniv.nl/www.nytimes.com/partners/aol/special/sputnik/sput-01.html.

[76] McDougall, Walter A. "Sputnik, the space race, and the Cold War." *Bulletin of the Atomic Scientists* 41, no. 5 (May 1985): 20-25. https://books.google.nl/books?id=7gUAAAAAMBAJ&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false.

[77] Newell, Homer E. "Response To Sputnik: The Creation of NASA." In *Beyond the Atmosphere: Early Years of Space Science*, 87-99. Mineola: Dover Publications, 2010.

American leaders wanted to obtain leadership and dominance in space, while also "projecting an image of peaceful purpose and cooperativeness in the world." Immediately after its establishment, NASA got involved in international space science activities. As Homer E. Newell, a professor of mathematics who held a senior position at NASA, writes in his book *Beyond the Atmosphere*, "the appearance of an international component in NASA's space science program was inevitable," since NASA's roots lied in the International Geophysical Year.[78]

[78] Newell, Homer E. "Response To Sputnik: The Creation of NASA." In *Beyond the Atmosphere: Early Years of Space Science*, 87-99. Mineola: Dover Publications, 2010.

Chapter Two: Space Privatization and America's Cold War

Throughout the first decades of the Cold War, outer space became part and parcel of the multifaceted Cold War battlefield. Such a new dimension took the confrontation away from the surface of the earth and gave it new dimensions in a completely different and uncharted environment. Outer space became a frontier on which the ambitions of both the US and the USSR were tested. It became a terrain of both technological and military confrontation, where scientific capabilities and investments in modern technologies became the ciphers of the two superpowers' might. One of the main characteristics of the Cold War space race, however, as this chapter will show, was that over the years it moved progressively away from discourses of national security and started being centered more and more around profit. Such a process was driven by huge and powerful private interests that proliferated due to the rising influence of the military-industrial complex in the Cold War. From the late 1960s onwards, private companies started to gain more importance in NASA programs, such as the satellite and lunar programs. They started working as contractors for NASA's ambitious programs initiated by President Kennedy in 1961. To get a better understanding of the roots of space privatization as we know it today, this chapter will explore and analyze the shift from national security to profit by discussing the period between the early 1960s and the late 1980s.

From National Security to Private Profits

When the Soviet cosmonaut Yuri Gagarin became the first human in space in 1961, the United States had apparently lost another battle in the Cold War space race. By the time Gagarin was launched in the *Vostek 1*, the USSR had been taking the lead in the space race for a couple of years already. In October 1957, the Soviets launched the *Sputnik*, the first ever artificial satellite from Earth. The *Sputnik* enterprise was popular and influential and caught the attention

of the public: it showed that the USSR had gained a competitive advantage in ballistic science, a crucial part of the nuclear arms race too. The Soviet Union's remarkable progress led journalists, politicians, and military leaders to declare a so-called 'missile gap,' a term used to describe the status whereby the Soviet Union had taken the lead in the production of nuclear weapons. This gap could lead to the USSR gaining military superiority over the US in the future. The missile gap was used in Kennedy's presidential campaign, whereas Eisenhower repeatedly denied that there even was a gap. JFK claimed, "that the United States was falling dangerously behind the Soviet Union in the one category that still truly mattered – nuclear deterrence – even though he possessed clear evidence that the United States held the lead," write Craig Campbell and Frederik Logevall. During the presidential campaign in the late 1950s, the missile gap gained importance among the US public; in doing so, it contributed to the victory for the Democrats.[79] However, during the first weeks of JFK's presidency, members of his administration told him that there was no missile gap – this was confirmed by his secretary of defense – but, "Kennedy refused to declare the missile gap closed […] Instead, the Kennedy administration pressed on with its promised defense build-up that was deemed necessary to rectify the potentially destabilizing inferiority posed by the missile gap," writes historian Christopher A. Preble.[80] JFK asked for extra funding for a couple of missile programs, to cover up the gap. He said that it would be "an investment in peace that we can afford – and cannot avoid."[81]

The rapid developments of the USSR had also happened right when tensions in the United States were at an all-time high over the growing Soviet and communism threat. "In this

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[79] Campbell, Craig, and Fredrik Logevall. *America's Cold War: The Politics of Insecurity*. Cambridge: Harvard University Press, 2009. https://search-ebscohost-com.ezproxy.leidenuniv.nl/login.aspx?direct=true&db=e000xww&AN=327559&site=ehost-live.

[80] Preble, Christopher A. ""Who Ever Believed in the 'Missile Gap'?": John F. Kennedy and the Politics of National Security," *Presidential Studies Quarterly* 33, no. 4 (December 2003): 801-26. https://doi-org.ezproxy.leidenuniv.nl/10.1046/j.0360-4918.2003.00085.x.

[81] "An Investment for Peace," speech by JFK excerpted from Congressional Record, February 29, 1960. JFKSEN-0906-035. John F. Kennedy Presidential Library and Museum. https://www.jfklibrary.org/asset-viewer/archives/JFKSEN/0906/JFKSEN-0906-035.

climate, many Americans became concerned that if the USSR could launch a satellite into space, it could also launch a nuclear missile capable of reaching the United States," writes Deborah D. Stine in a 2009 Congressional Research Service report for Congress on *Sputnik*.[82] Only a month after the Soviets put the *Sputnik* in orbit, they sent Laika – a stray dog from Moscow – into orbit as well. After Gagarin successfully returned to the surface of the Earth, President John F. Kennedy – who had won his campaign in part due to the fear of a missile gap too – suggested a collaboration between his country and the USSR in terms of space developments. Kennedy decided, after he had learned that the missile gap was not as big as he initially thought it was, to implement the Arms Control and Disarmament Agency (ACDA) in 1961. The ACDA was meant to strengthen the national security of the USA and to ensure the full integration of arms control into the development and implementation of the American national security policy.[83] It was one of the first steps towards global nuclear disarmament. In a telegram sent to the Soviet leader Nikita Khrushchev in 1961, Kennedy wrote: "We congratulate you and the Soviet scientists and engineers who made this feat possible. It is my sincere desire that in the continuing quest for knowledge of outer space our nations can work together to obtain the greatest benefit to mankind."[84] JFK realized that in order for the US to regain its global status, he had to take more aggressive political actions. He made a promising statement in a speech to Congress, "this nation should commit itself to achieving the goal, before this decade is out, of landing a man on the moon and returning him safely to the earth."[85] In his speech, he asked Congress for the funds that were needed to pursue long-term space programs, such as the lunar program, Apollo. Until then, the space race had been a matter of

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[82] Stine, Deborah D., *U.S. Civilian Space Policy Priorities: Reflections 50 Years After Sputnik* (Congressional Research Service, February 2, 2009) https://sgp.fas.org/crs/space/RL34263.pdf.
[83] "Agencies - Arms Control and Disarmament Agency," Federal Register, accessed August 17, 2022, https://www.federalregister.gov/agencies/arms-control-and-disarmament-agency.
[84] President John F. Kennedy in a telegram to Soviet leader Nikita Khrushchev, April 12, 1961. https://nsarchive.gwu.edu/document/20832-02.
[85] John F. Kennedy, "Address to Joint Session of Congress," May 25, 1961, JFK Library, transcript and video recording, https://www.jfklibrary.org/learn/about-jfk/historic-speeches/address-to-joint-session-of-congress-may-25-1961.

national security, but the speech presented by Kennedy categorized the space race into a higher level of prestige, profit, and privatization. In 1960, Kennedy's acceptance speech as the Democratic candidate for the presidential elections was called 'The New Frontier.' This speech was already a prelude to his great conviction in expanding the American frontier and showing the world the resilience and endurance of the United States:

> But I tell you the New Frontier is here, whether we seek it or not. Beyond that frontier are the uncharted areas of science and space, unsolved problems of peace and war, unconquered pockets of ignorance and prejudice, unanswered questions of poverty and surplus. […] But I believe the times demand invention, innovation, imagination, decision. I am asking each of you to be new pioneers on that New Frontier.[86]

He continues his speech by saying that the country is at a turning point in history, standing on this new frontier, during which they have to prove whether or not they can compete against the Communist system. JFK calls this "the question of the New Frontier". "All mankind waits upon our decision," he ends his speech, "A whole world looks to see what we will do. We cannot fail their trust, we cannot fail to try."[87]

When Kennedy addressed Congress in 1961, he asked for funds to support space programs – specifically the lunar program. He expressed his confidence in the American citizens and their "willingness to pay the price for these programs, to understand and accept a long struggle […] to meet the tax levels and close the tax loopholes I have requested."[88] Congress approved the supplemental funding Kennedy requested, and NASA immediately

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[86] John F. Kennedy, "The New Frontier," acceptance speech of Senator John F. Kennedy, Democratic National Convention, 15 July 1960, JFKSEN-0910-015. John F. Kennedy Presidential Library and Museum. https://www.jfklibrary.org/asset-viewer/archives/JFKSEN/0910/JFKSEN-0910-015.

[87] John F. Kennedy, "The New Frontier," acceptance speech of Senator John F. Kennedy, Democratic National Convention, 15 July 1960, JFKSEN-0910-015. John F. Kennedy Presidential Library and Museum. https://www.jfklibrary.org/asset-viewer/archives/JFKSEN/0910/JFKSEN-0910-015.

[88] John F. Kennedy, "Address to Joint Session of Congress," May 25, 1961, JFK Library, transcript and video recording, https://www.jfklibrary.org/learn/about-jfk/historic-speeches/address-to-joint-session-of-congress-may-25-1961.

began negotiating the Apollo program's key contracts.[89] The funding for the lunar program began in 1961 and continued all throughout that decade. Anyone with criticism on the amount of money that was being spent on this mission was told that the investment was necessary for 'national survival.' Lyndon B. Johnson, during his time as vice president under President Kennedy, once told a group of reluctant congressmen, "would you rather have us be a second-rate nation or should we spend a little money?"[90]

Initially, NASA was established in 1958 as a research and development (R&D) company. It goes without saying that NASA's role was huge in the preparation and execution of the Apollo mission. However, when it began to participate in space operations and services – stunting the growth of the private sector of space – people started questioning the purpose of the agency. To get a better understanding of what the agency actually did during the 60s – both in terms of achievements and funding – historian Arnold Levine says that "one must be considering it as an institution coordinated to achieve certain goals that were neither fixed nor always precisely determined."[91] The Space Act of 1958 gave NASA the freedom to establish its own contracting practices and rely on the private sector to develop its programs (rather than in-house staff). "Between 1962 and 1968, more than 90 percent of NASA's annual expenditures were for payments to outside contractors for a wide range of products and services," according to research presented in the *NASA Historical Data Book*.[92] NASA had a couple of reasons to defend the contracts for nonpersonal services:

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[89] Levine, Arnold S., *Managing NASA in the Apollo Area*. Washington DC: National Aeronautics and Space Administration, 1982. https://history.nasa.gov/SP-4102.pdf.
[90] Kay, William D. *Defining NASA: The Historical Debate Over the Agency's Mission*. Albany: SUNY Press, 2005. https://search-ebscohost-com.ezproxy.leidenuniv.nl/login.aspx?direct=true&db=e000xww&AN=144996&site=ehost-live.
[91] Levine, Arnold S. *Managing NASA in the Apollo Area*. Washington dc: National Aeronautics and Space Administration, 1982. https://history.nasa.gov/SP-4102.pdf.
[92] *NASA Historical Data Book*. Createspace Independent Publishing Platform, 1993. https://history.nasa.gov/SP-4012/vol4/contents.htm.

1. [T]he rapid buildup of the Gemini and Apollo programs precluded reliance on civil servants alone,
2. [I]t was NASA policy not to develop in-house capabilities that were already available in the private sector,
3. NASA employees were needed for technical direction rather than for hardware fabrication or routine chores,
4. NASA had developed safeguards for policing its contractors,
5. [I]t was better to let the up-and-down swings in manpower take place in the contractor, rather than the civil service, work force,
6. [A]nd … the practice of using support service contractors had been fully disclosed to Congress and the Bureau of the Budget.[93]

In 1961, 423.3 million dollars was spent on business firms; this budget was more than doubled in 1962 with over a 1.03 million dollars spent. In 1965, four years before the first crewed landing on the Moon, NASA had awarded 4.14 million dollars to contractors – the biggest spending on outside contractors made by the agency in the 1960s (see Appendix A).[94] Among the contractors for the Apollo program were companies such as Boeing, IBM, and North American Aviation. NASA told these companies exactly what they wanted them to deliver; there was no autonomy given to the contractors.[95] "Total payments to outside contractors for goods and services during the decade 1969-78 amounted to $32,133.3 million, or 86.4 percent

[93] Levine, Arnold S., *Managing NASA in the Apollo Area*. Washington dc: National Aeronautics and Space Administration, 1982. https://history.nasa.gov/SP-4102.pdf.
[94] National Aeronautics and Space Administration, *Annual Procurement Report Fiscal Year 2003*, https://www.nasa.gov/sites/default/files/atoms/files/annual2003.pdf.
[95] Kluger, Jeffrey, "NASA Is Working With Private Companies to Go Back to the Moon. That's Riskier Than It Seems." *Time* Magazine. Accessed August 3, 2022. https://time.com/5639998/nasa-moon-commercial/.

of NASA's total expenditures in that decade," states one of NASA's Historical Data books (see Appendix B through L).[96]

North American Rockwell Corporation – later named Rockwell International Corporation – was one of the companies that had been awarded the largest amount of money by NASA; they built the Apollo command and service modules.[97] William B. Bergen, former President of North American Rockwell's Space Division, noted in 1969 that the Space Division had been working on the Apollo mission for eight years under a NASA contract worth 3.4 billion dollars (over 27 billion dollars today in 2022), with a peak employment of 34,000 people. "Half of the contract money has gone to 9.000 suppliers and subcontractors across the country," is written in a 1969 press release.[98] Another company that was awarded money by the agency, and therefore worked on the lunar program, was aerospace company Boeing. They helped build all of the major components of the Apollo spacecraft, and the majority of the Saturn V rocket used during the lunar missions. In 1969, they were awarded 228,679 thousand dollars by NASA, ranking third in the top 100 contractors (which was their highest position from 1968 until 1978). Boeing remained in the top ten of that list for almost ten years, making the firm one of the prime contractors of the Apollo program.[99]

The Relevance of the US Military-Industrial Complex

On January 31, 1958, only a couple of months after the USSR launched *Sputnik*, the US sent *Explorer* into space – their own satellite. The successful launch came after a failed attempt to send the *Vanguard* satellite into space in December 1957. While the launch was – strictly

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[96] Data from the *NASA Historical Data Book: Volume IV NASA Resources 1969-1978*, p. 153. https://history.nasa.gov/SP-4012/vol4/ch5.htm.
[97] Data from the *NASA Historical Data Book: Volume IV NASA Resources 1969-1978*, Table 5-15 until 5-24. https://history.nasa.gov/SP-4012/vol4/ch5.htm.
[98] North American Rockwell Press Kit, p. 13-16. https://cdn2.hubspot.net/hubfs/413105/Apollo%20Press%20Kits/North%20American%20Rockwell.pdf.
[99] Data from the *NASA Historical Data Book: Volume IV NASA Resources 1969-1978*, Table 5-15 until 5-24. https://history.nasa.gov/SP-4012/vol4/ch5.htm.

speaking – part of the experimental stage of the project, and therefore a test flight, the press billed it as a satellite launch that followed as an immediate response to the USSR's *Sputnik*. Only two seconds into the flight, the *Vanguard* exploded, "The failure of what was supposed to be a test flight struck America to its core. Immediately Vanguard was dubbed 'Kaputnik' and 'Flopnik' by an unforgiving press," writes Andrew J. LePage.[100] When the United States managed to send *Explorer* into space, it meant that from that moment onwards they were able to observe the Earth from outer space, which had military and commercial purposes. "*Sputnik* and *Explorer* […] inaugurated a global space race, accelerated the arms race, and encouraged other nations to compete for the commercial and military spoils of earth observation," writes historian Jocelyn Wills.[101] These scientific advancements had been made possible by a strict cooperation between public institutions and private investors. Such relationships have grown so powerful and out of control to provoke President Eisenhower's famous reaction. During President Eisenhower's farewell speech, he warned the American people of the growing influence of the so-called 'military-industrial complex' (MIC). He was concerned that a rapidly growing military-industrial complex would preclude the possibilities of democratic politics and competitive capitalism. Large industrial business firms were eager to work together with the American Department of Defense – the Pentagon. However, in the years to follow, people started to question the MIC's purpose:

> [T]he military establishment and the corporations created a giant sector in the American economy devoted to the production of deadly weapons, in which public dollars were funneled to favored contractors without much competition. The MIC

[100] LePage, Andrew J. "Vanguard: America's Answer To Sputnik." S*paceViews- A publication of the Boston Chapter of the National Space Society*, December 11 (1997).
[101] Wills, Jocelyn. "Innovation in a Cold [War] Climate: Engineering Peace with the American Military–Industrial Complex." *Enterprise and Society* 12, no. 1 (2011): 120–74. doi:10.1093/es/khq147.

> socialized risk, privatized profit, and gave corporations undue influence over U.S. domestic and foreign policy.[102]

The MIC, producers of powerful weapons, did not particularly contribute to creating peace. When Congress approved President Kennedy's request for additional funds to establish a lunar program in 1961, American citizens would eventually be the ones paying for the approved funding through taxes. As mentioned earlier in this chapter, people who expressed criticism were told it was in the interest of 'national security' to be investing in space developments. NASA started to negotiate with private companies right after the budget was approved. The agency was established in response to the launch of the Soviet Union's *Sputnik* satellite, which made the request for additional NASA funding appear to be just another Cold War investment. Furthermore, it made people wonder if their money – the money that NASA allocated to private companies – was not just being used to strengthen the military-industrial complex any more. William Kay encapsulates the concerns of that time well in his book *Defining NASA*, "Given what is at stake, can the taxpayers really be assured that these very large sums they have entrusted to their government have always been spent in the most productive fashion?"[103]

The origins of federal contracting, or the "American bias in favor of private enterprises" as Arnold Levine puts it, can be traced back to the 18th-century *Report on Manufactures* by Alexander Hamilton.[104] Hamilton stated in this report that he strongly believed in investing in the manufacturing industry, claiming that the American economy could grow far beyond

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[102] Bernstein, Michael A, and Mark R. Wilson. "New Perspectives on the History of the Military–Industrial Complex." *Enterprise & Society* 12, no. 1 (2011): 1–9. https://doi.org/10.1017/S146722270000971X.
[103] Kay, William D. *Defining NASA: The Historical Debate Over the Agency's Mission*. Albany: SUNY Press, 2005. https://search-ebscohost-com.ezproxy.leidenuniv.nl/login.aspx?direct=true&db=e000xww&AN=144996&site=ehost-live.
[104] Levine, Arnold S., *Managing NASA in the Apollo Area*. Washington dc: National Aeronautics and Space Administration, 1982. https://history.nasa.gov/SP-4102.pdf.

agriculture.[105] Ever since NASA was established, the majority of the goods and services they use are provided under contracts with the private sector. Except for a few outliers, the agency did not manufacture its own flight hardware. NASA engineers instead "planned [out] the program, drafted the guidelines, and established the parameters within which the product is to be developed," writes Levine. "Viewed in this light, the rationale for an in-house staff has largely been to enable NASA to perform those functions that no government agency has the right to contract out."[106]

When Lyndon B. Johnson became president, he showed significantly little interest in NASA and space programs; this was remarkable, because he had put quite some time and effort in defending and defining the agency while being in the Senate and later as vice president. He was now agreeing to big cuts to the NASA budget, and in some cases even initiating them. "[B]y late 1964, Johnson's rhetoric around space exploration has mellowed considerably," says Kay. Along with the president, there were other voices of influence in the White House sharing their skepticism of the agency, the space race, and the requested budgets of former NASA administrator James Webb. Besides White House officials and President Johnson, the American citizens also started to show less support for the space program:

> Virtually all public opinion polls taken during the mid- to late 1960s showed significant differences – sometimes on the order of two to one – between the percentage of respondents who favored reducing government spending on space and those who supported in- creasing it.44 In short, it appears as though, except for NASA and a relatively small group of space enthusiasts, most people – public officials as well as ordinary citizens – wanted to see a smaller space program.[107]

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[105] "Alexander Hamilton's Final Version of the Report on the Subject of Manufactures, [5 December 1791]," *Founders Online,* National Archives, https://founders.archives.gov/documents/Hamilton/01-10-02-0001-0007. [Original source: *The Papers of Alexander Hamilton*, vol. 10, *December 1791–January 1792*, ed. Harold C. Syrett. New York: Columbia University Press, 1966, pp. 230–340.]

[106] Levine, Arnold S., *Managing NASA in the Apollo Area*. Washington dc: National Aeronautics and Space Administration, 1982. https://history.nasa.gov/SP-4102.pdf.

[107] Kay, William D. *Defining NASA: The Historical Debate Over the Agency's Mission*. Albany: SUNY Press, 2005. https://search-ebscohost-com.ezproxy.leidenuniv.nl/login.aspx?direct=true&db=e000xww&AN=144996&site=ehost-live.

In 1967, Johnson approved cuts to the NASA budget, however, the US citizens suspected that there was a correlation between the costs of the Vietnam War and the cuts in the space program funding. However, simultaneously, the public also started to question whether it was worth it to spend large amounts of money on the space program, "[T]he general public were beginning to see spaceflight as less important than issues like Vietnam, race, or the condition of American cities."[108] Despite the fact that policy priorities appeared to have shifted, making the space program less important, Johnson's proposal and approval of a lower NASA budget can be used to refute the claim that NASA's cooperation with contractors was a component of the American military-industrial complex, as the money he was taking from the agency's budget was being used to fund the Vietnam War.

The Rise and Fall of the Apollo and the Shuttle Programs

One of the costliest American projects to date was the Apollo Program; the estimated price tag hovers between 21.8 billion dollars and 25 billion dollars (USD 1960 value).[109] Its goal was to bring people to the Moon and return them home safely. There are a couple of reasons why there was interest in such a big and expensive space project. Many scientists were keen to be leaders in space innovation and exploration; harnessing the unknown facets of the Moon and the means to achieve a moon landing. Secondly, the program was, together with projects like *Vanguard* and *Explorer*, part of the Cold War space race and a direct response to the space advancements of the USSR. Lastly, developments in space technology had two purposes, "it could serve peaceful ends, demonstrating a country's scientific competence but could also contribute to military goals," write Monika Gisler and Didier Sornette.[110] The

[108] Kay, William D. *Defining NASA: The Historical Debate Over the Agency's Mission*. Albany: SUNY Press, 2005.
[109] Gisler, Monika, and Didier Sornette. "Exuberant Innovations: The Apollo Program." *Soc* 46, 55–68 (2009). https://doi.org/10.1007/s12115-008-9163-8.
[110] Gisler, Monika, and Didier Sornette. "Exuberant Innovations: The Apollo Program." *Soc* 46, 55–68 (2009). https://doi.org/10.1007/s12115-008-9163-8.

program itself was set up during the Eisenhower administration in early 1960, "The goal was to develop the basic technology for manned spaceflight and investigate human's ability to survive and perform in space."[111] Between 1961 and 1967, the Apollo program employed 400,000 people and garnered loyalty from 20,000 different industrial companies as well as hundreds of universities.[112] Around 10,000 students were involved in this lunar mission.[113] There were 14 missions in total, with Apollo 11 being the most well-known, bringing the first two feet of mankind to step foot on the dusty, desolate surface of the Moon.

The Apollo program was a textbook example of American Exceptionalism. As historian Roger D. Launius puts it, "The successful Apollo program [as] an exemplar of the exceptionalist trope in American history […] has become the primary interpretation of the space race. It revolves around an initial shock to the system as a challenge from a powerful Soviet Union seemed to overcome American capability and then a whirlwind of activity to recapture the initiative in the realm of space."[114] So what happens after you land a man on the Moon? How do you keep that sense of American Exceptionalism alive? Those were questions Richard Nixon, sworn in as president of the United States only six months prior the Apollo 11 mission, faced. However, the space program was not a priority for Nixon, and his administration felt no need to define what the US would do after the last men set foot on the Moon in December 1972. The race was won; the urge to rule outer space was over. There was no desire to establish and execute another ambitious space program post-Apollo. "[N]ixon decided that the nation neither wanted nor could afford such an undertaking," writes John M. Logsdon, founder of the Space

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[111] Gisler, Monika, and Didier Sornette. "Exuberant Innovations: The Apollo Program." *Soc* 46, 55–68 (2009). https://doi.org/10.1007/s12115-008-9163-8.
[112] Gisler, Monika, and Didier Sornette. "Exuberant Innovations: The Apollo Program." *Soc* 46, 55–68 (2009). https://doi.org/10.1007/s12115-008-9163-8.
[113] Nicolas Turcat. "The Link between Aerospace Industry and NASA during the Apollo Years," *Acta Astronautica* 62, no. 1 (January 2008): 66–70, https://doi.org/10.1016/j.actaastro.2006.12.046.
[114] Geppert, Alexander C. T., ed. *Limiting Outer Space: Astroculture after Apollo*. London: Palgrave Macmillan UK, 2018.

Policy Institute at the George Washington University.[115] NASA proposed the idea of developing a space station in 1969, but the agency was running short on funds for research on a space station and thus was having a hard time outlining to potential contractors what exactly they had to study. George Mueller, Associate Administrator for Manned Space Flight at NASA, argued in 1968 that the agency's priority after Apollo had to be "the development of an economical launch vehicle for shuttling between Earth and the installations, such as the orbiting space station, which will soon be operating in space."[116] This 'vehicle' was the Space Shuttle, which would become vital to NASA's future plans. In January 1972, Nixon announced plans for the Space Shuttle; it would be cheaper to launch and could be reused, making it a profitable investment. "The belief was that, by reducing the cost of space launch, the shuttle would open up space to a wide variety of activities," says Logsdon in *After Apollo?*[117]

The Space Shuttle era began in the late 70s, but the preparations had already started mid-Apollo era. For this new project, NASA relied on external contractors. During Phase A in 1968, General Dynamics, Lockheed, McDonnell Douglas, and North American Rockwell won the Integral Launch and Reentry Vehicle (ILRV) study contract – a study during which these companies were asked to research what a reusable space vehicle would look like and what was needed for it to be viable. In June 1970, Phase B took off. NASA awarded McDonnell Douglas and North American Rockwell to conduct a design study and gave Lockheed and Grumman/Boeing contracts to further research other ideas that resulted from Phase A (in case Phase B would turn out to be too expensive). "In the meantime, NASA pursued its own internal studies, in part, to improve the competence of its engineers and to give them better insight into

[115] Logsdon, John M. *After Apollo?: Richard Nixon and the American Space Program.* New York: Palgrave Macmillan, 2015.
[116] Logsdon, John M. *After Apollo?: Richard Nixon and the American Space Program.* New York: Palgrave Macmillan, 2015.
[117] Logsdon, John M. *After Apollo?: Richard Nixon and the American Space Program.* New York: Palgrave Macmillan, 2015.

the contractors' work," writes Professor Ray A. Williamson.[118] A year later, the agency awarded the development contract to Rocketdyne; they were now in the lead to develop the Space Shuttle Main Engine (SSME). The final contractor decision, the one that would decide which company would design and develop the Shuttle orbiter, was made in July 1972; North American Rockwell was the one eventually ending up with the contract. After years of engineering, designing, and developing, NASA launched the first Space Shuttle *Columbia* on April 12, 1981. The Space Shuttle was now fully operational, which meant that there was little need for any of the systems to undergo further development, says Williamson, "By the mid- to late 1980s, NASA hoped, reduced costs for operating the Shuttle system would allow the agency to fund other projects, such as a future space station."[119] However, the operational costs were higher than expected and several voices urged passing policies that would hand over the operational control of the Shuttle to the private sector, as they claimed that the private industry would reduce operating costs faster and more successfully than NASA. Though tempted by the idea, Reagan administration officials came to the conclusion that "the Shuttle is an important instrument of national policy and is needed primarily for government civilian and military payloads." By the late 1990s, NASA believed it could delegate day-to-day Shuttle operations to private contractors.[120]

When NASA submitted a budget request to the White House in September 1970, it realized that the Nixon administration and Congress would not support the development of both the Space Shuttle and a space station. Therefore, they made the decision to prioritize the development of the Space Shuttle. By the early 1990s, NASA started to revive the idea of launching a space station and believed the Space Shuttle could be used for constructing and operating the International Space Station (ISS). By that time the Berlin Wall had fallen, and the

[118] Williamson, Ray A. "Developing the Space Shuttle." *Exploring the Unknown*, n.d., 32. 161-92.
[119] Williamson, Ray A. "Developing the Space Shuttle." *Exploring the Unknown*, n.d., 32. 161-92.
[120] Williamson, Ray A. "Developing the Space Shuttle." *Exploring the Unknown*, n.d., 32. 161-92.

Cold War was over. In 1993 followed an agreement between Russia and the United States, making them partners in the development and construction of the ISS. They agreed on using both *Mir* – Russia's first modular space station in orbit – and the Space Shuttle to facilitate the construction of the International Space Station. This collaboration in the construction of the space station gave way to a new space era, and with it the beginning of the new space race in which privatization, capitalism, and profit have gained even more importance. The Space Shuttle program, however, ended in 2003. In 1986, *Challenger* exploded in the initial moments after it was launched in 2003, and similarly, the *Columbia* failing to land as it returned to Earth, resulting in a devastatingly scarring loss of life. Both disasters combined had cost the lives of 14 astronauts; thus, the Space Shuttle era came to a sad end. It also meant the end of the Cold War space race era and marked the beginning of the modern space race as we know it today.

Chapter Three: Modern Space Exploration and Privatization

The science and technology in the space industry have vastly improved over the last 70 years. Due to the Cold War, the search for new discoveries and developments were being sped up after World War II. Whereas the finish line of the space race in the 20th century was being the leader of spaceflight, which meant being the first one to take people to the Moon, the goal of the current century's race focuses on space tourism and the privatization of spaceflight. The previous chapters discussed the origins of the 20th century space race, situating it in the context and dynamics of the Cold War, and the privatization of space in the United States. To be able to come to a clear answer to the research question, "Why is the United States embarking on a new space race?" there is one other element that is crucial to look more into: the takeover of space privatization and its contemporary developments. This chapter will look at NASA's role in supporting commercial space flight, the private space investors who are currently influencing the industry, and how this new space era reinforces core American values.

The Pioneers

In recent years, a couple of American companies have been the frontrunners in taking private spaceflight and space tourism – literally – to another level. As a result of both financial and political constraints imposed by the government on NASA, space programs were directed towards private investors rather than governmental bodies. "In 2004 a report commissioned by President George Bush called for a drastic overhaul of NASA and a bigger role for private firms in space exploration. The space entrepreneurs took on a major role wanting to shape the future of human space flight," wrote professor Sveinn Guðmundsson.[121] There are three key players that are worth discussing, as they have been giving shape and meaning to the privatization of

[121] Gudmundsson, Sveinn Vidar. "Blue Origin: Riding the Wave of Disruption in the Space Industry." *SSRN Electronic Journal*, 2018. https://doi.org/10.2139/ssrn.3179135.

space in the 21st century. One of the first private investors in commercial space flight is Jeffrey Bezos, founder and CEO of Amazon and Blue Origin. The American aerospace manufacturer and sub-orbital spaceflight services company was founded by Bezos in 2000 and "aims to develop low cost and reliable technologies to enable human access to space." SpaceX, another key player in the space industry, is more focused on serving the International Space Station (ISS) and landing on Mars, Blue Origin's focus is more on facilitating space tourism.[122] The company's first major historical milestone occurred in 2015 when its New Shepard rocket booster made a vertical landing on Earth after returning from space and flew and landed four more times afterwards. In the summer of 2021, three years later than originally planned, Blue Origin launched its first private astronaut mission. Ever since that moment, they have successfully launched four more missions, one in 2021 and three in the first half of 2022.

The second company worth mentioning is Virgin Galactic, founded in 2004 by Richard Branson. From the start, the American spaceflight company's aim was to facilitate space tourism. Branson's Virgin Galactic engaged from early onwards in manned suborbital space flight, unlike its competitors Blue Origin and SpaceX. The company "consequently faced far higher technical and regulatory barriers imposed for such flights."[123] Apart from the setbacks Virgin Galactic has dealt with, the leading space company has been setting a precedence for the future of space tourism:

> The other space pioneers have built mass through unmanned commercial flights yet have both stated their ambitions to offer manned flights. For this reason, these companies may be in a stronger position to overcome the hurdles of manned flight in the future, while Virgin Galactic paved the way at a high cost.[124]

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[122] Gudmundsson, Sveinn Vidar. "Blue Origin: Riding the Wave of Disruption in the Space Industry." *SSRN Electronic Journal*, 2018. https://doi.org/10.2139/ssrn.3179135.
[123] Gudmundsson, Sveinn Vidar. "Blue Origin: Riding the Wave of Disruption in the Space Industry." *SSRN Electronic Journal*, 2018. https://doi.org/10.2139/ssrn.3179135.
[124] Gudmundsson, Sveinn Vidar. "Blue Origin: Riding the Wave of Disruption in the Space Industry." *SSRN Electronic Journal*, 2018. https://doi.org/10.2139/ssrn.3179135.

Yet, in a failed Virgin Galactic test flight in 2014, one pilot tragically lost their life, and the other was left with injuries, tarnishing the forward movement and slowing progress for Branson. The crash came seven years after another catastrophic explosion during a ground test. Despite all of the failures and obstacles they have encountered over the years, the company has also reached some milestones and has gained popularity among people who dream of going to space; hundreds of customers have already paid a deposit for one of Virgin Galactic's space flights in the future. The first crewed test flight took place in July 2010. The spacecraft spent more than 6 hours in the air. There have been multiple successful test flights, but nevertheless, the plan to take tourists to space for the first time keeps getting postponed.[125] In July 2021, Virgin Galactic became the first spaceflight company to take its founder to space. Together with three other employees and two pilots, Branson experienced four minutes of weightlessness above the surface of the Earth. Going to space is hard – there are many factors to take into consideration. For that reason, "we only sent our finest, fittest, brightest, bravest to make the journeys," as Jeffrey Kluger, writer for *TIME*, stated on the day of the mission. With Branson going to space – be it very briefly – all of that changed:

> Branson and others – including Elon Musk (founder of SpaceX) and Jeff Bezos (founder of Blue Origin) – have long promised that their private companies would lead to the democratization of space, making the experience of leaving the Earth something available to more than just the elite. All three companies were founded in the early years of the century, and all three men have thus been making that promise for going on two decades. Today, the promise was kept.[126]

What sets Branson and Virgin Galactic apart with this flight, is the fact he became the first one to send non-trained people to space. In doing so, he has opened the doors to the space frontier for future space tourists.

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[125] Howell, Elizabeth. "Virgin Galactic: Richard Branson's Space Tourism Company." Space.com, July 8, 2021. https://www.space.com/18993-virgin-galactic.html.
[126] Kluger, Jeffrey. "Why Richard Branson's Spaceflight Is a Very Big Deal." *TIME*. Accessed July 17, 2022. https://time.com/6079480/richard-branson-space-achievement/.

Last but not least: Elon Musk, one of the most well-known and prominent private investors in commercial spaceflight. Musk is the CEO of the electric car brand Tesla and the founder of American aerospace manufacturer SpaceX. His goal is to create a spacefaring civilization. To him, "it's about believing in the future and thinking that the future will be better than the past. And I can't think of anything more exciting than going out there and being among the stars."[127] SpaceX made history in September 2008 with the Falcon 1, a small-lift launch vehicle. It was the first liquid fuel rocket made exclusively for private use to enter Earth orbit. Only four years later, in May 2012, Musk's SpaceX launched the Dragon capsule – the first private cargo mission to dock at the International Space Station.[128] For the first time in the history of spaceflight, a privately owned spacecraft visited the ISS. When Dragon launched in 2012, it was the first vehicle with a reusable orbital rocket stage to have ever been to space. "Dragon's landmark mission proved that uncrewed cargo vessels sent to the ISS could be recovered and reused and also boosted the company's efforts to make its spacecraft suitable for crewed missions," wrote Erik Seedhouse in his book on SpaceX and its goal to make commercial spaceflight reality.[129] "The docking of Dragon represented a historic moment when a commercial enterprise managed to achieve that which had previously only been accomplished by governments." Ever since the successful launch – and the successful landing back on Earth – of the Dragon capsule, SpaceX has kept on growing. Almost exactly eight years after Dragon was sent to the ISS for the first time, the capsule returned to the ISS again on May 30, 2020. This time, however, Dragon had NASA astronauts on board. In doing so, human spaceflight had returned back to the United States after nine years. Later in 2020, NASA approved SpaceX's Falcon 9 and Dragon human spaceflight system for crewed missions to and from the

[127] SpaceX. "SpaceX." Accessed July 16, 2022. http://www.spacex.com.
[128] Anderson, Chad. "Rethinking Public–Private Space Travel." *Space Policy* 29, no. 4 (2013): 266–71. https://doi.org/10.1016/j.spacepol.2013.08.002.
[129] Seedhouse, Erik. *SpaceX: Making Commercial Spaceflight a Reality*. Springer Science & Business Media, 2013.

ISS. It became "the first commercial system in history to achieve such designation."[130] SpaceX's next big goal is to bring human civilization and manned missions to Mars by the end of this decade.

Private and Public Partnerships

The monumental achievements of these three space pioneers in the US have demonstrated that the space industry has undergone disruption and is no longer exclusively the domain of governmental organizations, such as NASA, writes Guðmundsson:

> Private companies are moving the sector vigorously forward at a much faster phase than would ever be the case if left to governments alone. The companies have set themselves tough goals for the future yet edge themselves forward through a competition for customers rather than striving for geopolitical dominance as was often the case for national space programs in the past.[131]

Whereas NASA told private contractors in the 20th century exactly what to do, the companies today shape the industry themselves and develop as well as design their own ideas. This creative freedom and rise of private undertakings in the space industry roots set as far back to the early 2000s. After the Space Shuttle *Challenger* and *Columbia* disasters, which occurred in 1986 and 2003 respectively, US President George Bush realized that it was time for some changes in American space policy. In January 2004, Bush shared his "Vision for US Space Exploration" in which he suggested encouraging international and commercial participation; he called for pursuing "commercial opportunities for providing transportation and other services supporting the International Space Station and exploration missions beyond low Earth orbit."[132] Bush set

[130] SpaceX. "SpaceX." Accessed July 16, 2022. http://www.spacex.com.
[131] Gudmundsson, Sveinn Vidar. "Blue Origin: Riding the Wave of Disruption in the Space Industry." *SSRN Electronic Journal*, 2018. https://doi.org/10.2139/ssrn.3179135.
[132] Bush, George W. "A Renewed Spirit of Discovery: The President's Vision for U.S. Space Exploration." January 2004. https://history.nasa.gov/renewedspiritofdiscovery.pdf.

up the Commission on Moon, Mars, and Beyond which delivered its report to the White House in June 2004. The report called for a transformation of NASA, "building a robust international space industry, a discovery-based science agenda, and educational initiatives to support youth and teachers inspired by the vision."[133] Most importantly, the Commission suggested that "NASA['s] relationship to the private sector […] must be decisively transformed to implement the new, multi-decadal space exploration vision." The purpose of this was to give the private space industry the opportunity to provide their services to NASA. "NASA's role must be limited to only those areas where there is irrefutable demonstration that only government can perform the proposed activity," according to the Commission.[134] NASA was forced to reinvent itself; they developed programs that would encourage private companies to solve some of NASA's urgent issues while at the same time sharing the financial risk. With a lower entry barrier for startup space companies at that time, namely for companies like SpaceX and Blue Origin, this partnership allowed NASA to test more effective alternatives to carrying out missions.[135] In the last few years, these partnerships have taken more shape. As mentioned earlier, SpaceX sent NASA astronauts to space, leading to an approval of the agency to use SpaceX's spaceflight system for future missions to and from the International Space Station. On top of that, NASA is currently working on the preparations for the lunar mission Artemis (Artemis I, the uncrewed mission, is supposed to launch late August 2022). For this special mission, the agency is working closely with SpaceX; Musk's company was picked to build the first crewed lunar lander. However, NASA also wants an additional manned lunar lander that will be developed by a second private company. "NASA originally intended to select multiple

[133] Aldridge, E. C. Pete, Jr. et al. "Report of the President's Commission on Implementation of United States Space Exploration Policy: A Journey to Inspire, Innovate, and Discover". Washington, 2004. https://govinfo.library.unt.edu/moontomars/docs/M2MReportScreenFinal.pdf.
[134] Aldridge, E. C. Pete, Jr. et al. "Report of the President's Commission on Implementation of United States Space Exploration Policy: A Journey to Inspire, Innovate, and Discover". Washington, 2004. https://govinfo.library.unt.edu/moontomars/docs/M2MReportScreenFinal.pdf.
[135] Sehovic, Irhad. "The Private Space Industry and Its Effect on Public Support for NASA Funding," n.d., 55.

private crewed landers for Artemis […] [b]ut Congress didn't allocate enough funding to support the development of multiple vehicles, so NASA went solely with SpaceX in April 2021," was written in an article published in March 2022.[136] The budget for NASA has been a thorny issue ever since Americans have shown less interest in space exploration; as discussed in the previous chapter as well, gaining public support for the funding of NASA has always been a struggle. Because private enterprises have emerged, Americans believe that NASA funding is no longer necessary as these businesses can take the agency's place. The collaboration between private and public organizations should, however, not be a matter of one or the other. Like they already have been doing now, their partnerships can strengthen and grow over the years to come.[137]

When looking through the yearly Budget of the United States Government since 2015, two years before the start of the lunar Artemis program, NASA's budget has become increasingly needy, asking for more and more funding each year. They also stress the importance of partnerships with private companies. In the budget report of fiscal year 2015, when Barack Obama was president, 17.5 billion dollars was requested. One of the priorities for that year was to increase partnering with the commercial space industry in order to be able to cost-effectively send astronauts to space from American soil.[138] For fiscal year 2019, President Donald Trump requested 19.6 billion dollars for NASA. With this budget, he wanted to support "an innovative and sustainable program of exploration with commercial and international partners to enable the return of humans to the Moon for long-term exploration and utilization, followed by human missions to Mars and other destinations."[139] Trump's request mentions that

[136] Wall, Mike. "NASA Wants Another Moon Lander for Artemis Astronauts, Not Just SpaceX's Starship." Space.com, March 23, 2022. https://www.space.com/nasa-more-artemis-moon-landers-for-astronauts.
[137] Sehovic, Irhad. "The Private Space Industry and Its Effect on Public Support for NASA Funding," n.d., 55.
[138] Obama, Barack H. Budget of the U.S. Government FY 2015, March 4, 2014. https://www.govinfo.gov/app/collection/budget.
[139] Trump, Donald J. Budget of the U.S. Government FY 2019, February 12, 2018. https://www.govinfo.gov/app/collection/budget.

NASA "pioneers the space frontier" and that the Budget supports a "sustainable space exploration program to be proud of – one that reflects American ingenuity, ambition, and leadership."[140] It is worth noting that he proposes to end the financial support of the ISS and instead wants to rely on commercial partners. In order to support these commercial partners, he had foreseen a budget of 150 million dollars. On top of that, another 54.2 million dollars was reserved for other public-private partnerships.[141] For fiscal year 2020, the Trump administration requested a budget of 21 billion dollars for NASA, of which 363 million would be used for the commercial development of a large lunar lander.[142] The following year, 25.2 billion dollars was requested; roughly 4.1 billion dollars was reserved for the lunar Artemis mission. This budget wanted to prioritize the stimulation of public-private partnerships as well by using some of the money for giving out research grants and new prizes and challenges, hoping it would lead to new technologies that would make future missions to Mars more affordable.[143] In the most recent Budget of the United States Government, 26 billion dollars – almost 10 billion more than only 8 years earlier – was requested for NASA. To enhance the "US human spaceflight leadership", 7.5 billion dollars is foreseen to be invested in the Artemis lunar exploration. The Biden administration wants to continue supporting the operation of the ISS – unlike his predecessor. However, 224 million dollars would be used to support the development of a commercial space station that eventually could be used by NASA, other government agencies, international partners and the private sector after the ISS retires.[144]

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[140] Trump, Donald J. Budget of the U.S. Government FY 2019, February 12, 2018. https://www.govinfo.gov/app/collection/budget.
[141] Trump, Donald J. Budget of the U.S. Government FY 2019, February 12, 2018. https://www.govinfo.gov/app/collection/budget.
[142] Trump, Donald J. Budget of the U.S. Government FY 2020, March 11, 2019. https://www.govinfo.gov/app/collection/budget.
[143] Trump, Donald J. Budget of the U.S. Government FY 2021, February 10, 2020. https://www.govinfo.gov/app/collection/budget.
[144] Biden, Joseph R. Budget of the U.S. Government FY 2023, March 28, 2022. https://www.govinfo.gov/app/collection/budget.

It is remarkable how all of these budgets rely on a sense of willingness of the American people to pay extra taxes in order to support the leading position of the US on the space frontier. The goal of budgeting is to make space exploration and space flight more affordable by investing in public-private partnerships. However, in order to reach that goal, the government has been increasing the NASA budget requests almost every single year. The money that has been enacted since 2015, has surpassed the foreseen budget year after year, with the exception of FY 2021.[145]

Space Privatization: The American Dream

"Rather than a short lived event to win a space race, this modern space age will be designed as a sustained effort in human space colonization," write Kevin Hertzler and Rebecca McCauley Rench in their article on the global extinction of humanity and the space race.[146] Chapter two touched upon space privatization as part of the American military-industrial complex (MIC); Hertzler and McCauley Rench believe that pursuing colonization outside of our planet will not only have the potential to save humanity, but will also provide an economic boost by establishing a space-industrial complex. In 2020, right before the end of his term, one of Donald Trump's last achievements as president of the United States was creating the US Space Force. Today, launch vehicles from United Launch Alliance and SpaceX are being used by the Space Force in the National Security Space Launch (NSSL) program – a program that contracts with private companies to launch satellites for national security. Even in the years before the establishment of the Space Force, the American Air Force already awarded money to private enterprises such as SpaceX. In 2018, Musk signed a contract with the Air Force for 28 million dollars to evaluate its low earth orbit (LEO) constellation of Starlink satellites. With

[145] Biden, Joseph R. Budget of the U.S. Government FY 2022, May 28, 2021. https://www.govinfo.gov/app/collection/budget.
[146] Hertzler, Kevin, and Rebecca McCauley Rench. "Global Extinction or a Space-Industrial Complex," *STEPS* 3 (2016): 42-47. https://www.potomacinstitute.org/steps/images/PDF/Articles/HertzlerSTEPS_2016Issue3.pdf.

private enterprises now being employed to sustain current national security and future colonization, space privatization contributes to the formation of the space industrial complex.[147]

Profoundly embedded in both the 20th-century space race and the contemporary space race are the core ideals of the United States. Spaceflight allows for the US to advance their core values such as the American Dream, Manifest Destiny and opening up the frontier. Howard A. Schwartz, professor at Oakland University, writes that NASA – when it was established in 1958 – had to maintain "the narcissism of a strikingly, and perhaps increasingly narcissistic American culture." He added that, "Through NASA Americans were telling themselves that, despite the drubbing the US army took in Vietnam, despite the fact that American industry could not compete even within the American market, despite the fact that many American cities had become modern instantiations of Hobbes' "state of nature", despite all this – still America was perfect."[148] This narcissism that professor Schwartz talks about can be linked to both the American Dream and the notion of Manifest Destiny that are deeply rooted in the two space races. The American Dream is a set of ideals that dictates that every American should have an equal opportunity to achieve success through hard work; Manifest Destiny is the idea that the United States is meant to expand its territory and spread democracy and capitalism. The latter dates back to the 19th century, when the US used this term to justify its westward expansion, which resulted in the forced removal of many Native Americans. In light of this, the objectives for America's space successes in the second half of the 20th century become much clearer. Through hard work, NASA was able to take people to the Moon. The agency "was serving a symbolic function within the overall American culture," writes Schwartz.[149] This symbolic

[147] Venable, John. "U.S. Space Force." The Heritage Foundation, October 20, 2021. Accessed August 8, 2022. https://www.heritage.org/military-strength/assessment-us-military-power/us-space-force.
[148] Schwartz, Howard S. "The Symbol of the Space Shuttle and the Degeneration of the American Dream," *Journal of Organizational Change Management* (1988): 5-20. https://www.emerald.com/insight/content/doi/10.1108/eb025596/full/html.
[149] Schwartz, Howard S. "The Symbol of the Space Shuttle and the Degeneration of the American Dream," *Journal of Organizational Change Management* (1988): 5-20. https://www.emerald.com/insight/content/doi/10.1108/eb025596/full/html.

function was to expose what the real American Dream entails. When Neil Armstrong became the first person to set foot on the moon, he contributed to the idea that the American Dream exists and that anyone can pursue it. Armstrong was awarded the Presidential Medal of Freedom in 1969.[150] This medal is the "Nation's highest civilian honor" and is only given to people who "have made exemplary contributions to the prosperity, values, or security of the United States, world peace, or other significant societal, public or private endeavors."[151] Armstrong's receipt of this medal demonstrated to the public that anyone who strives to achieve the American Dream will be rewarded in the end with freedom. Following Apollo, a few space enthusiasts began to propagate the idea that it was the US's manifest destiny to discover new worlds and colonize space. One of them was Gerard K. O'Neill. In his book *The High Frontier*, published in 1977, he describes what colonies in space could look like according to him. O'Neill also aims to convey the message that colonies in outer space are the solution to the shortcomings of industrialization on our planet. Indeed, he is convinced that the rise of industry would mean the downfall of man on earth. In 1901, Woodrow Wilson delivered a speech in which he said, "The great pressure of people moving always to new frontiers, in search of new lands, the full freedom of a virgin world has ruled our course and formed our policies like a Fate."[152] This notion of expanding territories, led to the westward movement of the American frontier in the 19th century. Two decades later, the widely shared idea of expansion has led to the upward movement of the frontier, which now reaches pristine and unconstrained areas of space. Professor Rachel Armstrong writes that, "these bold pioneers are largely treating 21st-century Space as a continuation of the 20th century. In other words, as an extension of the American

[150] Laura Newton, "Neil A. Armstrong," NASA, April 22, 2021, http://www.nasa.gov/centers/armstrong/about/biographies/pilots/neil-armstrong.html.
[151] The White House, "President Biden Announces Recipients of the Presidential Medal of Freedom," The White House, July 1, 2022, https://www.whitehouse.gov/briefing-room/statements-releases/2022/07/01/president-biden-announces-recipients-of-the-presidential-medal-of-freedom/.
[152] Wilson, Woodrow. "The Ideals of America," The Atlantic, December 1, 1902, https://www.theatlantic.com/magazine/archive/1902/12/the-ideals-of-america/376192/.

frontier and a vast terrain for prospectors and colonists."[153] As such, American values are also at the root of the modern space race and the modern space age. The three companies – Blue Origin, SpaceX, and Virgin Galactic – and its founders discussed earlier, are helping to open up the space frontier, not only by expanding it but also by making it accessible to a new type of consumer. These ideas have come to play an important role in the privatization of space. Moreover, the investors have been using the American values to promote commercial space flight and space tourism amongst other Americans. Elon Musk, for example, makes it clear, time and again, that he wants nothing more than to colonize and privatize Mars saying it could save humanity, leaning on the notion of Manifest Destiny. "He believes we need to develop a self-sustaining, independent Martian civilization, because otherwise we are limited as a species to a single planet, and subject to a single-point failure known generically as Doomsday," wrote *The Washington Post* after Musk announced his Mars colonization plan in 2016.[154] His ideals could lead, however, to turning Mars into "the ultimate gated community," writes Irish historian Aidan Beatty. According to Beatty, the ambitions of Musk, Bezos, and Branson are a continuation of previous initiatives to monopolize private ownership over newly discovered lands. This resulted in the violent forced removal of Native Americans from their land back in the 1800s:

> For elites, colonialism was seen as a safety valve. Not only could [English] owners claim new private property in […] North America, but England could send settlers abroad, to alleviate the "mobbish threat" to private property in England. The safety valve of colonialism strengthened private property even further. […] America was seen as a dumping ground for the people who might form dangerous mobs at home.[155]

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[153] Armstrong, Rachel. "Space Is an Ecology for Living In." *Architectural Design* 84, no. 6 (2014): 128–33. https://doi.org/10.1002/ad.1844.

[154] Achenbach, Joel. "Elon Musk unveils Mars colonization plan, but don't pack your bags just yet." *The Washington Post*. September 28, 2016. https://www.washingtonpost.com/news/speaking-of-science/wp/2016/09/28/elon-musk-unveils-mars-colonization-plan-but-dont-pack-your-bags-just-yet/.

[155] Beatty, Aidan. "For Elon Musk, space may be the final frontier of private property." *The Washington Post*. April 20, 2022. https://www.washingtonpost.com/outlook/2022/04/20/elon-musk-space-may-be-final-frontier-private-property/.

Today's space privatization could have the same effects on society. Tickets and travel costs to go to space are already immensely costly (Richard Branson's Virgin Galactic tickets, for example, will cost 450,000 dollars) that only the wealthy and upper class will be able to leave the surface of our planet. Space privatization – whether in the 20th century or the 21st – always leads back to one and the same thing: capitalism. "In his depictions of space exploration, the final frontier reveals itself not as a place where we can imagine a better world but as a frontier that is already assumed to be internal to capitalism's web of life," says Beatty about Musk. "It is just another space to be privatized in capitalism's never-ending self-perpetuation."[156]

NewSpace

So, why do the wealthiest among us want to go to space? Do they have the same motivations as the settlers of the 18th and 19th centuries and is history, in other words, repeating itself? "This era, driven by private corporations […] has been labeled by industry insiders as 'NewSpace' – in contrast to 'Old Space', a Cold War-era mode of space relations when (allegedly) slow-moving, sluggish states dominated outer space. NewSpace marks the arrival of capitalism in space," write scholars Victor L. Shammas and Tomas B. Holen.[157] They claim that the colonization of space, and thus the upwards movement of the frontier, will not benefit humankind. As mentioned earlier, it will only benefit the wealthy – the 'captialistkind' – and leave the others behind. They do so by deploying "humanist tropes to engender enthusiasm for their activities."[158] The 2010s will most likely go down in history as the 'NewSpace Age,' as this is the decade when capitalism became the main driving force behind space exploration. It

[156] Beatty, Aidan. "For Elon Musk, space may be the final frontier of private property." *The Washington Post*. April 20, 2022. https://www.washingtonpost.com/outlook/2022/04/20/elon-musk-space-may-be-final-frontier-private-property/.
[157] Holen, Tomas B., and Victor L. Shammas. "One Giant Leap for Capitalistkind: Private Enterprise in Outer Space," *Palgrave Communications* 5, no. 1 (January 29, 2019): 1–9, https://doi.org/10.1057/s41599-019-0218-9.
[158] Holen, Tomas B., and Victor L. Shammas. "One Giant Leap for Capitalistkind: Private Enterprise in Outer Space," *Palgrave Communications* 5, no. 1 (January 29, 2019): 1–9, https://doi.org/10.1057/s41599-019-0218-9.

was also the decade in which private companies started to invest in making their technology and vehicles reusable, leading to lowering the price of going to space; this is called the 'SpaceX Effect'. Musk wants to prove that innovation can make reusable launch rockets more affordable. In doing so, SpaceX forces its competitors to seriously consider embracing reusability as well.[159] NASA is helping to make space an incubator for flourishing capitalism, "In early 2018, NASA was set to request $150 million in its 2019 budget to 'enable the development and maturation of commercial entities and capabilities which will ensure that commercial successors to the ISS […] are operational when they are needed.'" Furthermore, the US government has been supporting Musk's SpaceX as part of a public-private financing arrangement for improbable start-ups; this calls into question the individual liberty and business of the 'capitalistkind'. Shammas and Holen argue that space libertarianism merely claims to be libertarian in name:

> Behind every NewSpace venture looms a thick web of government spending programs, regulatory agencies, public infrastructure, and universities bolstered by research grants from the state. SpaceX would not exist were it not for state-sponsored contracts of satellite launches […] SpaceX, too, is increasingly imbricated with an attempt on the part of a particular state, the United States, to colonize and appropriate resources derived from a particular area, that of outer space; it, too, depends on the infrastructure, contracts, and regulatory environment that thus far only a state seems able to provide.[160]

Without the government's financial and legal assistance, private enterprises would be unable to function and experiment as they do today. This all comes back to American narcissism; firms like SpaceX, Virgin Galactic, and Blue Origin have become the face of the new successful space age in the United States, and as such, the US must support them where necessary. Helping them pursue their goals will boost the country's image and reputation around the world.

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[159] Reddy, Vidya Sagar. "The SpaceX Effect," *New Space* 6, no.2 (January 3, 2018): 125-134, http://doi.org/10.1089/space.2017.0032.

[160] Holen, Tomas B., and Victor L. Shammas. "One Giant Leap for Capitalistkind: Private Enterprise in Outer Space," *Palgrave Communications* 5, no. 1 (January 29, 2019): 1–9, https://doi.org/10.1057/s41599-019-0218-9.

Furthermore, it promotes the notion of the American Dream: if you work hard enough, you may achieve success and, eventually, freedom.

There will always be proponents and opponents to anything new and innovative in the past – think of the Wright brothers, for example, who showed that flying was possible. Many people assumed that it would only be available to the wealthy. To their dismay, it has become one of the most popular forms of transportation that is – to some extent – affordable, especially when compared to the early years. Supporters of space privatization argue that critics should embrace the chance to discover what has worked well in the past and apply those lessons widely to space privatization, instead of dumping on billionaires. "Smarter policy combined with American ingenuity is a recipe for success, both here on Earth and out in space," write Senior Research Fellows William Rinehart and Adam Thierer.[161]

More so than ever, the economics of the space industry has become a trade-off between government and private enterprises; one cannot make progress in space without the other. After all, the new space race does not differ a lot from the one in the 1960s and 1970s. Protecting national security remains important, as does upholding the core American values on which the country thrives. One important difference is that the 'final frontier' now has opened up to the public and is no longer restricted to trained astronauts. Ultimately, discovery is inevitable. Whether or not this is a worthwhile venture for the benefit of all humankind is yet to be seen. Without a doubt, the machine of space exploration is in full motion, and on autopilot. There is no way to stop what has already happened or what will, there is only time that will tell.

[161] Thierer, Adam, and William Rinehart. "Why Capitalists in Space Are Good for Americans' Future," Regulatory Transparency Project, August 5, 2021, https://regproject.org/blog/why-capitalists-in-space-are-good-for-americans-future/.

Conclusion

The purpose of this thesis was to examine why the United States is embarking on a new space race. Based on historical research conducted from both primary and secondary sources on the Cold War, the space race, and space privatization, it can be concluded that staying true to the American core values and guaranteeing the sustainability of capitalism are important factors in the governmental decision to invest in a new and modern space race. The American capitalistic spirit – one of the core American values – has been a main driving force in convincing US citizens of the importance of investing in space exploration. Along with this, which redirects immediately to discourses of American exceptionalism and the revamping of the American Dream, this new space race has been characterized by the large involvement of private space companies and a deeply rooted public-private partnership that is well-established, influential, and financially well supported.

This study has shown that the roots of the new space race privatization lay in the Cold War. The funding of private companies by NASA began in the 1960s as a response to the first achievements in space by the USSR. The US made it their goal to be the first nation to bring humans to the Moon and return them home safely; this competition that the US declared was the space race. In order to achieve that goal, NASA was established in 1958 – a government funded organization. They awarded money to private companies to help them develop the technology that was needed to fly someone to the Moon. The second major finding is the significant relevance and influence of the American core values, such as expanding the frontier, Manifest Destiny, and achieving the American Dream. The research that was conducted has further proves that every action can be traced back to the capitalistic nature of turning a profit. In current times, however, the US government intends to invest in public-private partnerships to make space exploration cost-effective. Instead of imposing strict design and research

guidelines, the companies now have much more creative freedom than they did during the Cold War.

The findings of this thesis complement previous research. It fills the knowledge gap in regards to the the roots of the modern space race and provides an explanation as to why the United States is investing in a new space race. In addition, it highlights NASA's decision-making and funding, and the money the agency awarded to private companies over the years. This study analyzed data from the budget given to the agency in the 1960s and later in the 2010s, as well as money given to private companies that helped NASA further develop their space programs. In doing so, this thesis has been one of the first attempts to thoroughly examine the motives behind the US interest in this modern space race and the benefits to the country. Supporting private companies shows, first and foremost, how sophisticated and successful American companies are and helps them grow. Their successes reflect positively on the United States and contribute to enhancing their reputation as leaders of the space race and the space frontier. Second, Washington DC justifies the financial investment in space by emphasizing the importance and relevance of expanding the frontier, America's manifest destiny, and the American Dream. The successful companies, like Blue Origin, SpaceX, and Virgin Galactic, are exemplary of these core American values; their leaders strongly believed in them and therefore wanted to put a lot of effort into making their dream – and their American Dream – come true. As such, the companies also symbolize the American Dream, for example. They can persuade people opposed to more funding for space flight to join in their efforts – despite their opposition – by demonstrating how these fundamental American principles assure success. It strengthens the conviction of people who already highly respect those American core values. Lastly, any success that these businesses achieve will result in profits. This profit, in turn, will benefit the American economy by attracting more companies and international investors to the United States, bringing in further economies of scale.

Given the growing interest of private investors in the new space race, favored by the government, former President Trump's choice to safeguard space through the establishment of the US Space Force seems understandable. Furthermore, it is consistent with the US's traditional exceptionalism: preserving economic and capitalist interests has always been a primary driving force, even during the Cold War, when national security was prioritized over private interests. All of this is happening again right now.

The research that was conducted is limited due to the lack of information on the effects of the new space race and the expansion of the space frontier on American society and democracy. Nor does it make a comparison with space race programs or space developments of other countries that are taking part in this space race. Additionally, it is difficult to ascertain current developments in companies like SpaceX, as the modern space industry is rapidly moving forward. Further research work could be done on any of these. Another plausible topic for research could involve the motives behind the idea of New Space in relation to the Space Shuttle program and the subsequent tragedies that occurred during that era of space travel. Finally, another avenue of research can argue the ideologies and politicization of the modern space race, but with a 21st-century lens, analyzing the current and future developments of the space industry.

Because of the quickly expanding number of space developments, it is difficult to predict exactly which direction the space industry will take and who will dominate in the future: governments or private companies, or maybe even both. As long as there is public interest in space exploration, space races will keep on occurring. These races lead companies to challenge each other to do better, create new technologies and come up with new – and hopefully more sustainable – ideas. This 21st-century modern space race is primarily pursued by private companies whose aim is to be the first to open up the space frontier and make space accessible to all. The next space race might occur on planets like Mars that have not yet been extensively

explored. Assuming that if humans migrate to other planets, they will leave behind their values and interests from Earth, like the American Dream, seems wishful thinking. I do not think history will start over again once humanity leaves the surface of the Earth and colonizes other places in space; I think history will repeat itself. Most likely, the American Dream will outlive any upcoming space race. Driven by Manifest Destiny and the sense of American exceptionalism, the United States will always seek to be a pioneer – no matter where the next frontier lies.

Appendices

Appendix A

Annual Procurement Report, Fiscal Year 2003

DISTRIBUTION OF DIRECT NASA PROCUREMENTS

FISCAL YEARS 1961 - 1970

TYPE	FY 1961	FY 1962	FY 1963	FY 1964	FY 1965	FY 1966	FY 1967	FY 1968	FY 1969	FY 1970
				Net Value of Awards (Millions)						
Total	$755.5	$1,550.6	$3,230.5	$4,593.9	$5,187.4	$5,031.6	$4,650.9	$4,132.7	$3,652.0	$3,405.6
Business Firms	423.3	1,030.1	2,261.7	3,521.1	4,141.4	4,087.7	3,864.1	3,446.7	3,022.3	2,759.2
Educational	24.5	50.2	86.9	112.9	139.5	150.0	132.9	131.5	131.3	134.3
Nonprofit			15.3	29.1	25.3	27.7	39.6	33.6	32.3	33.0
JPL	86.0	148.5	230.2	226.2	247.2	230.3	222.2	207.2	156.3	179.8
Government	221.7	321.8	628.5	692.6	622.8	512.5	366.9	287.0	279.0	265.8
Outside U.S.	*	*	7.9	12.0	11.2	23.4	25.2	26.7	30.8	33.5
				Percent of Total						
Total	100	100	100	100	100	100	100	100	100	100
Business Firms	56	66	70	77	79	81	83	83	83	81
Educational	3	3	3	2	3	3	3	3	4	4
Nonprofit			* *	1	1	1	1	1	1	1
JPL	12	10	7	5	5	5	5	5	4	5
Government	29	21	20	15	12	10	8	7	7	8
Outside U.S.	*	*	* *	* *	* *	* *	* *	1	1	1

*Included in Government. * * Less than 0.5 percent.

Appendix B

Ranking of NASA's Top Ten Contractors, *NASA Historical Data Book: Volume IV*

Table 5-14. Ranking of NASA's Top Ten Contractors

Contractor	FY 1969	FY 1970	FY 1971	FY 1972	FY 1973	FY 1974	FY 1975	FY 1976	FY 1977	FY 1978
North American Rockwell Corp. a	1	1	2	3	1	1	1	1	1	1
Grumman Aerospace Corp.	2	2	6	-	-	-	-	-	-	-
Boeing Co.	3	4	5	5	7	7	9	8	10	-
McDonnell Douglas Corp.	4	3	1	1	2	3	3	2	2	3
General Electric Co.	5	6	3	4	4	6	6	6	6	8
Bendix Corp.	6	7	4	6	6	4	5	5	4	4
Int'l. Business Machines Corp.	7	5	9	7	8	8	7	-	8	6
Aerojet-General Corp.	8	9	-	-	-	-	-	-	-	-
Martin Marietta Corp.	9	8	7	2	3	2	2	3	3	2
RCA Corp.	10	-	8	9	10	-	10	10	-	-
TRW, Inc.	-	10	10	-	-	-	-	-	-	-
General Dynamics Corp.	-	-	-	8	5	5	4	4	5	-
Fairchild Industries, Inc.	-	-	-	10	9	-	-	-	-	-
United Aircraft Corp.	-	-	-	-	-	9	-	-	-	-
Philco-Ford Corp.	-	-	-	-	-	10	-	-	-	-
Lockheed Electronics Co., Inc.	-	-	-	-	-	-	8	7	7	5
Hughes Aircraft Co.	-	-	-	-	-	-	-	9	-	7
Thiokol Corp.	-	-	-	-	-	-	-	-	9	9
Computer Sciences Corp.	-	-	-	-	-	-	-	-	-	10

a Became Rockwell International Corp. in 1973.

Appendix C

Top One Hundred Contractors: FY 1969 (top 26), *NASA Historical Data Book: Volume IV*

Table 5-15. Top One Hundred Contractors:[a] FY 1969(in thousands of dollars)

Contractor and Place of Contract Performance	Rank in FY 1968	Net Value of Awards		Contractor and Place of Contract Performance	Rank in FY 1968	Net Value of Awards	
		Amount	Percentage			Amount	Percentage
1. North American Rockwell Corp.* Downey, Calif.	1	680,862	22.53	14. Trans World Airlines, Inc. * Kennedy Space Center, Fla.	19	35,363	1.17
2. Grumman Aerospace Corp. * Bethpage, N.Y.	2	369,168	12.21	15. Sperry Rand Corp. * Huntsville, Ala.	17	34,057	1.13
3. Boeing Co. * Kennedy Space Center, Fla.	3	228,679	7.57	16. General Dynamics Corp. * San Diego, Calif.	11	34,003	1.13
4. McDonnell Douglas Corp. * Santa Monica, Calif.	4	207,496	6.87	17. General Motors Corp. * Milwaukee, Wisc.	13	30,856	1.02
5. General Electric Co. * King of Prussia, Pa.	5	150,049	4.97	18. Federal Electric Corp. * Kennedy Space Center, Fla.	20	27,014	0.89
6. Bendix Corp. * Owings Mills, Md.	7	127,635	4.22	19. United Aircraft Corp.* Windsor Locks, Conn.	22	26,214	0.87
7. Int'l. Business Machines Corp. * Huntsville, Ala.	6	112,526	3.72	20. Service Technology Corp. * Houston, Texas	--	26,180	0.87
8. Aerojet-General Corp. * Sacramento, Calif.	8	64,857	2.15	21. Philco-Ford Corp. * Houston, Texas	16	22,388	0.74
9. Martin Marietta Corp. * Denver, Colo.	18	56,037	1.85	22. Catalytic-Dow (JV) Kennedy Space Center, Fla.	21	19,428	0.64
10. RCA Corp. * Camden, N.J.	9	51,643	1.71	23. LTV Aerospace Corp. * Dallas, Texas	14	18,265	0.60
11. TRW, Inc. * Houston, Texas	12	49,974	1.65	24. Brown/Northrop (JV) Houston, Texas	28	12,679	0.42
12. Chrysler Corp. * New Orleans, La.	10	42,454	1.40	25. Northrop Corp. * Huntsville, Ala.	26	12,360	0.41
13. Lockheed Aircraft Corp. * Houston, Texas	15	39,763	1.32	26. ILC Industries, Inc. Dover, Del.	36	12,187	0.40

Appendix D

Top One Hundred Contractors: FY 1970 (top 26), *NASA Historical Data Book: Volume IV*

Table 5-16. Top One Hundred Contractors:[a] FY 1970 (in thousands of dollars)

Contractor and Place of Contract Performance	Rank in FY 1969	Net Value of Awards		Contractor and Place of Contract Performance	Rank in FY 1969	Net Value of Awards	
		Amount	Percentage			Amount	Percentage
1. North American Rockwell Corp. * Downey, Calif.	1	531,536	19.26	14. General Dynamics Corp. * San Diego, Calif.	16	37,968	1.38
2. Grumman Aerospace Corp. * Bethpage, N.Y.	2	284,411	10.31	15. Trans World Airlines, Inc. * Kennedy Space Center, Fla.	14	35,988	1.30
3. McDonnell Douglas Corp. * Santa Monica, Calif.	4	236,294	8.56	16. Service Technology Corp. * Houston, Texas	20	27,485	1.00
4. Boeing Co. * Kennedy Space Center, Fla.	3	158,575	5.75	17. United Aircraft Corp. * Windsor Locks, Conn.	19	27,113	0.98
5. Int'l. Business Machines Corp. * Huntsville, Ala.	7	133,429	4.84	18. Federal Electric Corp. * Kennedy Space Center, Fla.	18	26,295	0.95
6. General Electric Co. * King of Prussia, Pa.	5	131,679	4.77	19. Philco-Ford Corp. * Houston, Texas	21	23,988	0.87
7. Bendix Corp. * Owings Mills, Md.	6	109,765	3.98	20. General Motors Corp. * Milwaukee, Wisc.	17	20,434	0.74
8. Martin Marietta Corp. * Denver, Colo.	9	108,012	3.92	21. LTV Aerospace Corp. * Dallas, Texas	23	17,853	0.65
9. Aerojet-General Corp. * Sacramento, Calif.	8	71,598	2.60	22. Chrysler Corp. * New Orleans, La.	12	16,709	0.61
10. TRW, Inc. * Houston, Texas	11	58,264	2.11	23. Brown/Northrop (JV) Houston, Texas	24	16,635	0.60
11. RCA Corp. * Camden, N.J.	10	54,547	1.98	24. ILC Industries, Inc. Dover, Del.	26	13,016	0.47
12. Sperry Rand Corp. * Huntsville, Ala.	15	48,118	1.74	25. Singer-General Precision, Inc. * Houston, Texas	29	12,337	0.45
13. Lockheed Aircraft Corp. * Houston, Texas	13	41,040	1.49	26. Honeywell, Inc. * St. Petersburg, Fla.	35	11,494	0.42

Appendix E

Top One Hundred Contractors: FY 1971 (top 26), *NASA Historical Data Book: Volume IV*

Table 5-17. Top One Hundred Contractors:[a] FY 1971 (in thousands of dollars)

Contractor and Place of Contract Performance	Rank in FY 1970	Net Value of Awards		Contractor and Place of Contract Performance	Rank in FY 1970	Net Value of Awards	
		Amount	Percentage			Amount	Percentage
1. McDonnell Douglas Corp. * St. Louis, Mo.	3	302,873	13.29	14. United Aircraft Corp. * Windsor Locks, Conn.	17	28,426	1.25
2. North American Rockwell Corp. * Downey, Calif.	1	172,463	7.57	15. Lockheed Electronics Co. * Houston, Texas	b	26,546	1.16
3. General Electric Co. * King of Prussia, Pa.	6	161,352	7.08	16. Lockheed Aircraft Corp. * Sunnyvale, Calif.	13	24,797	1.09
4. Bendix Corp. * Columbia, Md.	7	121,383	5.33	17. Philco-Ford Corp. * Houston, Texas	19	23,054	1.01
5. Boeing Co. * Kennedy Space Center, Fla.	4	114,407	5.02	18. Service Technology Corp. * Houston, Texas	16	22,396	0.98
6. Grumman Aerospace Corp. * Bethpage, N.Y.	2	113,670	4.99	19. Trans World Airlines, Inc. Kennedy Space Center, Fla.	15	22,252	0.98
7. Martin Marietta Corp. * Denver, Colo.	8	107,602	4.72	20. Federal Electric Corp. * Kennedy Space Center, Fla.	18	21,826	0.96
8. RCA Corp. * Camden, N.J.	11	93,906	4.12	21. Hughes Aircraft Co. * El Segundo, Calif.	32	20,857	0.91
9. Int'l. Business Machines Corp. * Huntsville, Ala.	5	72,360	3.17	22. General Motors Corp. * Milwaukee, Wisc.	20	19,573	0.86
10. TRW, Inc. * Redondo Beach, Calif.	10	62,329	2.73	23. Computer Sciences Corp. * Silver Spring, Md.	28	17,449	0.76
11. Aerojet-General Corp. * Sacramento, Calif.	9	54,647	2.40	24. Fairchild Industries, Inc. * Germantown, Md.	79c	16,392	0.72
12. General Dynamics Corp. * San Diego, Calif.	14	50,784	2.23	25. LTV Aerospace Corp. * Dallas, Texas	21	15,438	0.68
13. Sperry Rand Corp. * Huntsville, Ala.	12	31,727	1.39	26. Chrysler Corp. * New Orleans, La.	22	15,304	0.67

Appendix F

Top One Hundred Contractors: FY 1972 (top 26), *NASA Historical Data Book: Volume IV*

Table 5-18. Top One Hundred Contractors:[a] FY 1972 (in thousands of dollars)

Contractor and Place of Contract Performance	Rank in FY 1971	Net Value of Awards		Contractor and Place of Contract Performance	Rank in FY 1971	Net Value of Awards	
		Amount	Percentage			Amount	Percentage
1. McDonnell Douglas Corp. * St. Louis, Mo.	1	343,131	16.01	14. Grumman Aerospace Corp. * Kennedy Space Center, Fla.	6	28,478	1.33
2. Martin Marietta Corp. * Denver, Colo.	7	208,361	9.72	15. Aerojet-General Corp. * Sacramento, Calif.	11	25,718	1.20
3. North American Rockwell Corp. * Downey, Calif.	2	175,146	8.17	16. Lockheed Electronics Co. * Houston, Texas	15	24,375	1.14
4. General Electric Co. * King of Prussia, Pa.	3	114,944	5.36	17. Chrysler Corp. * New Orleans, La.	26	24,301	1.13
5. Boeing Co. * Kennedy Space Center, Fla.	5	94,186	4.40	18. Federal Electric Corp. * Kennedy Space Center, Fla.	20	23,465	1.10
6. Bendix Corp. * Columbia, Md.	4	87,956	4.10	19. Computer Sciences Corp. * Silver Spring, Md.	23	23,298	1.09
7. Int'l. Business Machines Corp. * Huntsville, Ala.	9	72,019	3.36	20. Hughes Aircraft Co. * El Segundo, Calif.	21	22,029	1.03
8. General Dynamics Corp. * San Diego, Calif.	12	66,627	3.11	21. LTV Aerospace Corp. * Dallas, Texas	25	21,925	1.02
9. RCA Corp., Inc. * Camden, N.J.	8	47,210	2.67	22. Lockheed Missiles and Space Co., Inc. * Sunnyvale, Calif.	b	16,399	0.77
10. Fairchild Industries, Inc. * Germantown, Md.	24	42,025	1.96	23. Brown and Root/Northrop (JV) * Houston, Texas	34	16,295	0.76
11. Philco-Ford Corp. * Houston, Texas	17	36,219	1.69	24. United Aircraft Corp. * Windsor Locks, Conn.	14	15,869	0.74
12. Sperry Rand Corp. * Huntsville, Ala.	13	33,535	1.57	25. Service Technology Corp. * Houston, Texas	18	15,473	0.72
13. TRW, Inc. * Redondo Beach, Calif.	10	33,299	1.55	26. Brown Engineering Co., Inc. * Huntsville, Ala.	32	11,808	0.55

Appendix G

Top One Hundred Contractors: FY 1973 (top 26), *NASA Historical Data Book: Volume IV*

Table 5-19. Top One Hundred Contractors:[a] FY 1973 (in thousands of dollars)

Contractor and Place of Contract Performance	Rank in FY 1972	Net Value of Awards		Contractor and Place of Contract Performance	Rank in FY 1972	Net Value of Awards	
		Amount	Percentage			Amount	Percentage
1. Rockwell International Corp. * Downey, Calif.	3	317,756	15.40	14. Chrysler Corp. * New Orleans, La.	17	27,693	1.34
2. McDonnell Douglas Corp. * St. Louis, Mo.	1	272,364	13.20	15. Sperry Rand Corp. * Huntsville, Ala.	12	26,558	1.29
3. Martin Marietta Corp. * Denver, Colo.	2	191,987	9.30	16. Computer Sciences Corp. * Silver Spring, Md.	19	25,103	1.22
4. General Electric Co. * King of Prussia, Pa.	4	86,856	4.21	17. United Aircraft Corp. * East Hartford, Conn.	24	24,986	1.21
5. General Dynamics Corp. * San Diego, Calif.	8	80,422	3.90	18. Federal Electric Corp. * Kennedy Space Center, Fla.	18	24,833	1.20
6. Bendix Corp. * Columbia, Md.	6	79,054	3.83	19. Hughes Aircraft Co. * El Segundo, Calif.	20	20,941	1.01
7. Boeing Co. * Kennedy Space Center, Fla.	5	75,535	3.66	20. LTV Aerospace Corp. * Dallas, Texas	21	19,878	0.96
8. Int'l. Business Machines Corp. * Huntsville, Ala.	7	61,307	2.97	21. Northrop Services, Inc. * Houston, Texas	46	16,522	0.80
9. Fairchild Industries, Inc. * Germantown, Md.	10	43,724	2.12	22. Lockheed Missiles and Space Co., Inc. * Sunnyvale, Calif.	22	14,717	0.71
10. RCA Corp. * Princeton, N.J.	9	38,227	1.85	23. Kentron Hawaii, Ltd. * Houston, Texas	--	12,956	0.63
11. Philco--Ford Corp. * Houston, Texas	11	37,521	1.82	24. Honeywell, Inc. * St. Petersburg, Fla.	27	12,419	0.60
12. Lockheed Electronics Co. * Houston, Texas	16	29,339	1.42	25. Grumman Aerospace Corp. Bethpage, N.Y.	14	11,998	0.58
13. TRW, Inc. * Redondo Beach, Calif.	13	28,223	1.37	26. Litton Systems, Inc. * Los Angeles, Calif.	42	11,235	0.54

Appendix H

Top One Hundred Contractors: FY 1974 (top 26), *NASA Historical Data Book: Volume IV*

Table 5-20. Top One Hundred Contractors:[a] FY 1974 (in thousands of dollars)

Contractor and Place of Contract Performance	Rank in FY 1973	Net Value of Awards		Contractor and Place of Contract Performance	Rank in FY 1973	Net Value of Awards	
		Amount	Percentage			Amount	Percentage
1. Rockwell International Corp. * Downey, Calif.	1 b	486,478	22.96	14. Sperry Rand Corp. * Huntsville, Ala.	15	21,667	1.02
2. Martin Marietta Corp. * Denver, Colo.	3	201,800	9.53	15. Federal Electric Corp. * Kennedy Space Center, Fla.	18	20,932	0.99
3. McDonnell Douglas Corp. * Huntington Beach, Calif.	2	155,955	7.36	16. TRW, Inc. * Redondo Beach, Calif.	13	20,750	0.98
4. Bendix Corp. * Columbia, Md.	6	79,801	3.77	17. Hughes Aircraft Co. * El Segundo, Calif.	19	17,996	0.85
5. General Dynamics Corp. * San Diego, Calif.	5	79,539	3.75	18. LTV Aerospace Corp. * Dallas, Texas	20	17,229	0.81
6. General Electric Co. * King of Prussia, Pa.	4	64,996	3.07	19. Thiokol Corp. * Huntsville, Ala.	46	17,012	0.80
7. Boeing Co. * Kennedy Space Center, Fla.	7	60,047	2.83	20. American Airlines, Inc. * New York, N.Y.	--	16,850	0.80
8. Int'l. Business Machines Corp. * Houston, Texas	8	47,491	2.24	21. Northrop Services, Inc. * Houston, Texas	21	16,271	0.77
9. United Aircraft Corp. * East Hartford, Conn.	17	39,671	1.87	22. Chrysler Corp. * New Orleans, La.	14	16,053	0.76
10. Philco-Ford Corp. * Houston, Texas	11	36,010	1.70	23. Morrison-Knudsen Co., Inc. Kennedy Space Center, Fla.	42	15,551	0.73
11. Lockheed Electronics Co., Inc. * Houston, Texas	12	35,377	1.67	24. Fairchild Industries, Inc. * Germantown, Md.	9	12,976	0.61
12. RCA Corp. * Princeton, N.J.	10	34,736	1.64	25. Honeywell, Inc. * St. Petersburg, Fla.	24	12,644	0.60
13. Computer Sciences Corp. * Silver Spring, Md.	16	27,395	1.29	26. Teledyne Industries, Inc. * Los Angeles, Calif.	28	12,341	0.58

Appendix I

Top One Hundred Contractors: FY 1975 (top 26), *NASA Historical Data Book: Volume IV*

Table 5-21. Top One Hundred Contractors:[a] FY 1975(in thousands of dollars)

Contractor and Place of Contract Performance	Rank in FY 1974	Net value of Awards		Contractor and Place of Contract Performance	Rank in FY 1974	Net Value of Awards	
		Amount	Percentage			Amount	Percentage
1. Rockwell International Corp. * Downey, Calif.	1	681,619	30.23	14. Thiokol Corp. * Brigham City, Utah	19	28,958	1.28
2. Martin Marietta Corp. * Denver, Colo.	2	130,255	5.78	15. Computer Sciences Corp. * Silver Spring, Md.	13	27,142	1.20
3. McDonnell Douglas Corp. * Huntington Beach, Calif.	3	125,450	5.56	16. Hughes Aircraft Co. * El Segundo, Calif.	17	26,263	1.16
4. General Dynamics Corp. * San Diego, Calif.	5	85,281	3.78	17. Sperry Rand Corp. * Huntsville, Ala.	14	22,333	0.99
5. Bendix Corp. * Columbia, Md.	4	75,702	3.36	18. LTV Aerospace Corp. * Dallas, Texas	18	18,451	0.82
6. General Electric Co. * King of Prussia, Pa.	6	69,738	3.09	19. Northrop Services, Inc. * Houston, Texas	21	16,961	0.75
7. Int'l Business Machines Corp. * Houston, Texas	8	54,246	2.41	20. Textron, Inc. * Fort Worth, Texas	30	15,231	0.68
8. Lockheed Electronics Co., Inc. * Houston, Texas	11	46,219	2.05	21. Grumman Aerospace Corp. * Bethpage, N.Y.	28	14,136	0.63
9. Boeing Co. * Kennedy Space Center, Fla.	7	43,686	1.94	22. Planning Research Corp. * Kennedy Space Center, Fla.	56	13,792	0.61
10. RCA Corp. * Princeton, N.J.	12	39,683	1.76	23. Control Data Corp. * Minneapolis, Minn.	39	12,525	0.56
11. United Technologies Corp. * Stratford, Conn.	9 b	36,230	1.61	24. Teledyne Industries, Inc. * Los Angeles, Calif.	26	11,864	0.53
12. TRW, Inc. * Redondo Beach, Calif.	16	34,425	1.53	25. Chrysler Corp. * New Orleans, La.	22	11,393	0.51
13. Aeronutronics Ford Corp. * Houston, Texas	10 c	28,965	1.28	26. American Sciences and Engrg., Inc. Cambridge, Mass. (S)	43	10,929	0.48

Appendix J

Top One Hundred Contractors: FY 1976 (top 26), *NASA Historical Data Book: Volume IV*

Table 5-22. Top One Hundred Contractors:[a] FY 1976(in thousands of dollars)

Contractor and Place of Contract Performance	Rank in FY 1975	Net Value of Awards		Contractor and Place of Contract Performance	Rank in FY 1975	Net Value of Awards	
		Amount	Percentage			Amount	Percentage
1. Rockwell International Corp. * Downey, Calif.	1	906,270	35.73	14. Sperry Rand Corp. * Huntsville, Ala.	17	31,482	1.24
2. McDonnell Douglas Corp. * Huntington Beach, Calif.	3	124,766	4.92	15. Computer Sciences Corp. * Silver Spring, Md.	15	29,081	1.15
3. Martin Marietta Corp. * New Orleans, La.	2	109,616	4.32	16. Planning Research Corp. * Kennedy Space Center, Fla.	22	22,267	0.88
4. General Dynamics Corp. * San Diego, Calif.	4	76,268	3.01	17. Aeronutronics Ford Corp. * Houston, Texas	13	20,415	0.81
5. Bendix Corp. * Columbia, Md.	5	75,125	2.96	18. Blount Brothers Corp. * Kennedy Space Center, Fla.	--	19,674	0.78
6. General Electric Co. * Cincinnati, Ohio	6	60,576	2.39	19. United Technologies Corp. * West Palm Beach, Fla.	11	17,488	0.69
7. Lockheed Electronics Co., Inc. * Houston, Texas	8	55,691	2.20	20. Northrop Services, Inc. * Houston, Texas	19	16,492	0.65
8. Boeing Co. * Kennedy Space Center, Fla.	9	55,104	2.17	21. Vought Corp. * Dallas, Texas	18 b	15,638	0.62
9. Hughes Aircraft Co. * El Segundo, Calif.	16	47,461	1.87	22. American Sciences and Engrg., Inc. Cambridge, Mass. (S)	26	15,079	0.60
10. RCA Corp. * Princeton, N.J.	10	46,984	1.85	23. Singer Co. * Binghamton, N.Y.	29	14,663	0.58
11. Thiokol Corp. * Brigham City, Utah	14	46,974	1.85	24. Federal Electric Corp. Kennedy Space Center, Fla.	28	14,051	0.55
12. TRW, Inc. * Redondo Beach, Calif.	12	45,201	1.78	25. Grumman Aerospace Corp. * Bethpage, N.Y.	21	13,370	0.53
13. Int'l Business Machines Corp. * Houston, Texas	7	42,532	1.68	26. Global Associates Bay St. Louis, Miss.	31	11,995	0.47

Appendix K

Top One Hundred Contractors: FY 1977 (top 26), *NASA Historical Data Book: Volume IV*

Table 5-23. Top One Hundred Contractors:[a] FY 1977 (in thousands of dollars)

Contractor and Place of Contract Performance	Rank in FY 1976	Net Value of Awards		Contractor and Place of Contract Performance	Rank in FY 1976	Net Value of Awards	
		Amount	Percentage			Amount	Percentage
1. Rockwell International Corp. * Downey, Calif	1	1,011,448	35.64	14. United Technologies Corp. * East Hartford, Conn.	19	33,866	1.19
2. McDonnell Douglas Corp. * Huntington Beach, Calif.	2	138,480	4.88	15. TRW, Inc. * Redondo Beach, Calif.	12	28,891	1.02
3. Martin Marietta Corp. * New Orleans, La.	3	119,437	4.21	16. Ford Aerospace and Communications Corp. * Houston, Tex.	17 b	27,694	0.98
4. Bendix Corp. * Columbia, Md.	5	90,642	3.19	17. Planning Research Corp. * Kennedy Space Center, Fla.	16	26,120	0.92
5. General Dynamics Corp. * San Diego, Calif.	4	78,708	2.77	18. Vought Corp. * Dallas, Tex.	21	22,005	0.78
6. General Electric Co. * King of Prussia, Pa.	6	68,613	2.42	19. Singer Co. * Binghamton, NY.	23	20,559	0.72
7. Lockheed Electronics Co., Inc. * Houston, Tex.	7	67,986	2.40	20. Sperry Rand Corp. * Houston, Tex.	14	19,491	0.69
8. Int'l Business Machines Corp. * Houston, Tex.	13	66,116	2.33	21. Global Associates Bay St. Louis, Miss.	26	19,069	0.67
9. Thiokol Corp. * Brigham City, Utah	11	62,440	2.20	22. Northrop Services, Inc. * Houston, Tex.	20	18,749	0.66
10. Boeing Co. * Seattle, Wash.	8	53,020	1.87	23. Lockheed Aircraft Corp. * Burbank, Calif.	27	18,474	0.65
11. RCA Corp. * Princeton, NJ	10	42,383	1.49	24. Boeing Services International, Inc. * Kennedy Space Center, Fla.	46	16,053	0.57
12. Computer Sciences Corp. * Greenbelt, Md.	15	40,494	1.43	25. Teledyne Industries, Inc. * Los Angles, Calif.	30	14,449	0.51
13. Hughes Aircraft Co. * El Segundo, Calif.	9	38,658	1.36	26. Federal Electric Corp. Kennedy Space Center, Fla.	24	13,978	0.49

Appendix L

Top One Hundred Contractors: FY 1978 (top 26), *NASA Historical Data Book: Volume IV*

Table 5-24. Top One Hundred Contractors:[a] FY 1978(in thousands of dollars)

Contractor and Place of Contract Performance	Rank in FY 1977	Net Value of Awards		Contractor and Place of Contract Performance	Rank in FY 1977	Net Value of Awards	
		Amount	Percentage			Amount	Percentage
1. Rockwell International Corp. * Downey, Calif	1	890,257	30.14	14. Boeing Services International, Inc. * Kennedy Space Center, Fla.	24	42,990	1.45
2. Martin Marietta Corp. * New Orleans, La.	3	144,651	4.90	15. Boeing Co. * Seattle, Wash.	10	42,728	1.45
3. McDonnell Douglas Corp. * Huntington Beach, Calif.	2	139,682	4.73	16. Vought Corp. * Dallas, Tex.	18	32,883	1.11
4. Bendix Corp. * Columbia, Md.	4	94,950	3.21	17. Ford Aerospace and Communications Corp. * Houston, Tex.	16	29,632	1.00
5. Lockheed Electronics Co., Inc. * Houston, Tex.	7	75,095	2.54	18. Planning Research Corp. * Kennedy Space Center, Fla.	17	28,550	0.97
6. Int'l Business Machines Corp. * Houston, Tex.	8	73,000	2.47	19. Sperry Rand Corp. * Houston, Tex.	20	26,197	0.89
7. Hughes Aircraft Co. * El Segundo, Calif.	13	72,956	2.47	20. Frank Briscoe Co., Inc. Kennedy Space Center, Fla.	--	23,757	0.80
8. General Electric Co. * King of Prussia, Pa.	6	68,473	2.32	21. Air Products and Chemicals, Inc. * Allentown, Pa.	38	22,871	0.77
9. Thiokol Corp. * Brigham City, Utah	9	67,757	2.29	22. Lockheed Missiles and Space Co., Inc. * Sunnyvale, Calif.	33	21,001	0.71
10. Computer Sciences Corp. * Greenbelt, Md.	12	66,326	2.24	23. Singer Co. * Binghamton, NY.	19	20,436	0.69
11. General Dynamics Corp. * San Diego, Calif.	5	64,380	2.18	24. TRW, Inc. * Redondo Beach, Calif.	15	20,021	0.68
12. RCA Corp. * Princeton, NJ	11	52,500	1.78	25. United Space Boosters, Inc. Kennedy Space Center, Fla.	57	17,703	0.60
13. United Technologies Corp. * East Hartford, Conn.	14	50,813	1.72	26. Ball Corp. * Boulder, Colo.	36 b	17,611	0.60

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