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Cold War Merchants and the Commercialization of Space

A Dissertation Submitted

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Abstract

During the Cold War, several merchants commodified space exploration and human spaceflight. Beginning with defense contractors who supported the development of missiles for national security and artificial satellites for the International Geophysical Year (IGY), industry and government collaborated to form consortiums which promoted U.S. dominance in space. The initiatives resulted in research and development of innovative technology which the U.S. government used to propel hegemony, leading to commercial industries taking an active role in space. The impact of *Sputnik* created a new competitive environment in which Western economic methods facilitated the commercialization of space, capitalizing on market-based production of goods and services that built the U.S. space economy. Throughout the Cold War, government maintained principal control over space programs and the development of technology used to launch rockets, probes, and humans into low earth orbit (LEO) and eventually to the moon. However, over time this trend shifted to include more collaborative strategies between government and private industry which eventually led to the commercial infrastructure in the twenty-first century. Although there were many policy-related considerations, including the Commercial Space Launch Act of 1984, the primary driving force for the commercialization of space developed in the Cold War through media and communication merchants, popular culture and consumer markets, the economic side of government, the domestic and international competition with NASA, and entrepreneurs seeking a framework for solutions to modern problems that could be solved by a commercial presence in LEO. The framework presented in this dissertation focuses on the contributions of private industry in the commercialization of space outside the parameters of defense, technocracy, and revenue. This framework provided utility that was a function of the Cold War and space commerce rather than a product of it.

Acknowledgements

The process of researching and writing this dissertation happened over the course of several years, beginning well before starting the program at Liberty University. However, the culmination of this project would not have been possible with the constant faith in God and the support of family. Proverbs 3:5-6 tells us to "Trust in the Lord with all your heart and lean not on your own understanding; in all your ways submit to him, and he will make your paths straight." This verse aptly applies to this project, but also in every aspect of life. Life intersected this process in so many forms, including the challenge of working multiple jobs, making time for family, and a pandemic, the latter of which was a blessing in disguise since it provided time at home to spend on research and coursework. In all things, God provides.

My family supported me immensely as I spent countless hours researching and writing. They were there as I continued to pursue more and more education. To my son Michael, I am so blessed. He makes me think all the time. His patience and critical questions always made me spend time pondering what the purpose of my project was. It is not easy to pursue one's own advanced degree while helping your mother complete hers. To my husband David, I am grateful for the enduring support of taking care of everything so I could focus on my studies. This was not easy because I always seemed to be in school pursuing one degree after another. He pushed me when I was tired and needed a break. To my parents, I am very appreciative and indebted for the constant love and support they gave me my entire life no matter what challenges I faced or path I chose.

I am humbled to work with such patient and knowledgeable people at Liberty University. The constant strength, motivation, and encouragement made this process and project possible.

There are many excellent professors and courses at Liberty University, each of which left an impression upon me. I admit I was somewhat cautious about applying to the PhD program because I did not feel religiously versed enough. However, from the very first course, the unobtrusive and welcoming warmth I sensed changed my entire mindset and reignited my passion for learning. I knew at that moment this was the right place for me. Any fears I had about my capabilities, or lack of, dissipated. In that moment I understood that, as Colossian 3:23 states, "whatever you do, work at it with all your heart, as working for the Lord, not for human masters." For that understanding I am truly grateful.

Lastly, this project came to fruition with the help of many professors, including my advisor Dr. Chad Shelley, who constantly met with me and was willing to listen as I talked through my ideas. Dr. Shelley consistently made time to meet with me, even on Saturday mornings. I bombarded him with questions nearly every weekend as I worked on the research and organization. He gave me great ideas to help me crystallize my thoughts. Dr. Mary Mac Ogden gave me excellent advice in the courses she instructed. Her detailed critiques gave me insight into my project. Dr. Luci Vaden also provided detailed feedback that help me express my thoughts more clearly. Other professors over the past four years also made a difference in my journey as well, including Dr. Alan Harrelson, Dr. Allen York, and others. Finally, the entire Liberty University team whose constant concern for student well-being and accomplishment is a testament to the school and the outcomes of its students. It is my wish to convey the same dedication to others as I recall Micah 6:8: "He has shown you O mortal what is good. And what does the Lord require of you? To act justly and love mercy and walk humbly with your God."

Contents

Abbreviations

APP	American Presidency Project
AWST	Aviation Week and Space Technology
CBS	Columbia Broadcasting System
CP	Communist Party
DoD	Department of Defense
ELV	Expendable Launch Vehicle
GE	General Electric
GEO	Geosynchronous Orbit
HCSST	House Committee on Science, Space, and Technology
HLV	Heavy Lift (Launch) Vehicle
ICBM	Intercontinental Ballistic Missile
IGY	International Geosynchronous Year
ISS	International Space Station
LEO	Low Earth Orbit
NARA	National Archives and Records Administration
NBC	National Broadcasting Corporation
NHRC	NASA Historical Reference Collection
NS	New Shepard
RAND	Research and Development
RCA	Radio Corporation of America
RRL	Ronald Reagan Presidential Library
R and D	Research and Development
SEI	Space Exploration Initiative
SpaceX	Space Exploration Technologies
SIG	Senior Interagency Group (Space)
TRW	Thompson Ramo Woodbridge, Inc.
ULA	United Launch Alliance
USIA	United States Information Agency
VTVL	Vertical Takeoff Vertical Landing
Y2K	Year Two Thousand

Chapter 1

Introduction

On February 6, 2018, Florida's Space Coast thundered in the wake of Space Exploration Technologies' (SpaceX) launch of its massive Falcon Heavy rocket with "Starman," the life-sized human mannequin astronaut aboard a cherry-red Tesla Roadster. "The waiting in the sky" symbolism from musician David Bowie's famous space song "Oddity" played to a silent space audience.[1] Meanwhile on the ground, SpaceX founder Elon Musk held his breath as he, along with thousands of space enthusiasts, observed the historical launch of the most powerful rocket of its time.[2] While the implication of the launch proved this rocket could carry a significant payload into deep space, it also capitalized on an earlier significant SpaceX event in 2015 of using propulsion landing, a reinvented rocket capability that made it fully reusable. The innovation reduced cost and enabled multiple launches and landings which made space access and commercialization viable.[3] These two technological feats marked a watershed period in space access, the former absent since the Apollo Era. However, the greater story revolved around the power of Musk's entrepreneurial drive of private companies taking the reins of responsibility

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[1] Christian Davenport, "SpaceX Successfully Launches the World's Most Powerful Rocket, the Falcon Heavy, as it Sends a Tesla on a Path Near Mars," *The Washington Post,* February 6, 2018. https://www.washingtonpost.com. See also, *Starman* lyrics by David Bowie found on azlyrics.com, https://www.azlyrics.com/lyrics/davidbowie/starman.html. The SpaceX dummy was named Starman after British Rock musician's famous "Starman" song from *The Rise and Fall of Ziggy Stardust and the Spiders from Mars* album released on June 16, 1972 by RCA Victor, James Perone, *The Words and Music of David Bowie*, (Santa Barbara, Greenwood Publishing, 2007), 162. Additionally, the song Space Oddity accompanied the Starman as well as a copy of the book *Hitchhiker's Guide to the Galaxy* by Douglas Adams, (New York, NY: Crown Publishing, 2004). See also, Robin Seemangal, "SpaceX Successfully Launches the Falcon Heavy," *Wired,* Science, February 6, 2018. https://Wired.com/story/spacex.

[2] Ibid.

[3] Mike Wall, "Wow! SpaceX Lands Orbital Rocket Successfully in Historic First," December 21, 2015, Space.com, https://www.space.com/31420-spacex-rocket-landing-success.html. Since this was a first ever rocket landing during an orbital launch, SpaceX's groundbreaking technology reimagined and built on earlier Cold War Era space technology. The big difference is that a propulsive landing rather than firing rocket engines to reduce speed approach theorized in the 1960s. Under this approach, rockets were design to land in the ocean and were typically unrecoverable so were of little value in terms recyclability.

for human spaceflight capabilities. Not since the Saturn V rockets developed in 1967 for the Apollo missions had any event demonstrated the reality for deep space exploration or the possibility of humans in space beyond the International Space Station (ISS) or moon. This was especially meaningful considering it relied on innovation developed by a non-governmental entity.

When asked by Columbia Broadcasting System (CBS) News correspondent William Harwood about the purpose of the Tesla Roadster, Musk laughed and stated, "there is no purpose, obviously. It is just for fun."[4] Nevertheless, this spectacle energized renewed interest in space exploration while launching the SpaceX brand to higher realms, which is characteristic of Musk and the risks that pioneers like him take to expand private industry into space. The success augmented human presence in outer space, also a goal from another commercial space industry entrepreneur, Jeff Bezos and Blue Origin. It simultaneously connected the global public to future space experiences using what seemed a trivial stunt representing a monumental commercial exhibition. In doing so, Musk forged a new relationship between humans and the development of a commodified, commercial, space access and economy, untethered to Cold War objectives.

Forging new space activities was not a SpaceX exclusive. The Blue Origin also reached the high frontier as recently as July 20, 2021, crossing the Karman Line with four civilian passengers, which is the accepted boundary between the Earth's atmosphere and outer space, first accomplished during the Cold War space race by Soviet cosmonaut Yuri Gagarin in 1961.[5]

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[4] William Hardwood. "Elon Musk 'Giddy' ahead of SpaceX's Historic Falcon Heavy Launch," *CBSnews.com*, February 6, 2018, https://www.cbsnews.com/news/elon-musk-giddy-ahead-of-spacexs-historic-falcon-heavy-launch/.

[5] Jeff Foust. "Blue Origin Launches Bezos on First Crewed New Shepard Flight," *SpaceNews.com*, July 20, 2021, https://spacenews.com/blue-origin-launches-bezos-on-first-crewed-new-shepard -flight/. See also, Eric Betz, "The Karman Line: Where Space Begins," November 27, 2023, *Astronomy.com, https://www.astronomy.com/space-exploration/the-karman-line-where-does-space-begin/.* See also, NASA, "April 1961-First Human Entered Space," last updated November 3, 2023, accessed November 30, 2023, https://www.nasa.gov/image-article/april-1961-first-

The consequence of this launch was its commercial impact on culture and space business. The New Shepard (NS)16 carried a civilian crew on a commercial rocket launched to coincide with the fifty-second anniversary of the Apollo 11 moon landing in 1969. It utilized symbolic naming conventions referencing astronaut Alan Shepard who was the first American to fly in space. Blue Origin demonstrated the power of exhibition in advancing commercial interest in space.[6] This launch produced additional spectacle in that its passengers included one of the most recognizable names in the technology industry in Bezos, founder of Amazon. Additionally, Wally Funk, one of the first trained female astronauts in the Mercury13 program during the Cold War space race also flew. The power of icons of the past connected nostalgia to the future of space commerce industries using a marketing strategy built on Cold War imagery, symbols, popular culture, and commodification of space.

Musk and Bezos's spectacles and engineering accomplishments, along with other private company launches like Virgin Galactic, Orbital Sciences Corporation, and Bigelow Aerospace, ushered in a new era of space interest through dramatic display. Commodification of space helped expand commerce, the U.S economy, and influenced public perception of the domain of

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human-entered-space/#:~:text=Yuri%20Gagarin%20from%20the%20Soviet,not%20land%20inside%20of%20capsule. See also, Asif Siddiqi, "Competing Technologies, National(ist) Narratives, and Universal Claims: Toward a Global History of Space Exploration," *Technology and Culture*, Volume 51, Number 2, April 2010, pp. 425-443, 4. The discussion presented concerns the opposing views of the history of space exploration and significant techno logical and exhibition events. Russians view the launch of cosmonaut Yuri Gagarin as the most influential space event during the Cold War space race. Both the Apollo Moon landing and the launch into orbit of Gagarin were important technological events and provided both countries with a sense of nationalism. Siddiqi argues that national identity was essential to the complex nature of the techno logical fests and that by historically examining old historiography about the space race, it is possible to understand the new nature of space exploration in the broadening spectrum of space participants globally. He intended to demonstrate a revised understanding of the influence of technology to space.

[6] Isaac S. Battaglia. "Alan B. Shepard, Jr.," last modified date November 21, 2023, accessed December 1, 2023, NASA, https://www.nasa.gov/former-astronaut-alan-shepard.

space.[7] While innovation of space transportation provided by companies like SpaceX were historic, the technology used to succeed was founded in earlier rocket systems like the Boeing, North American Aviation, and International Business Machines (IBM) built Saturn V, an enormously powerful rocket also capable of launching payloads into space. The difference is in the types of payloads and capacities for multiple, reusable launch technologies, and more importantly, the business model used to garner new interests and influence for human space access.[8]

The launch of the Falcon Heavy applied reusable heavy-lift rockets that served as a gateway for future commercial activity in space. This included ferrying private industry astronauts to ISS and beyond, contracting with other private space firms to manufacture resources necessary for use in a space environment, building long-range transportation and communication systems for interplanetary exploration and settlement, and developing a network of subsidiary businesses that promoted the advancement of humans in space.

Musk's electric vehicle (EV) Tesla, a popular consumer product and cultural icon, mounted on board the rocket was essential to the mission because it signified opportunity and accomplishment using a fantastic spectacle to generate interest in Mars exploration and settlement.[9] EVs and other transportable or manufactured energy sources are critical to

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[7] Brian Kennedy and Alec Tyson, "Americans' View of Space: US Role, NASA's Priorities and Private Companies," July 20, 2023, ewresearch.org/science/2023/07/20/americans-views-of-space-u-s-role-nasa-priorities-and-impact-of-private-companies/. The article demonstrates attitudes and view on various aspect of US space activities. The study concluded that Americans from multiple demographics have some interest in space either as participant, supporter of private or government activities, and future space access among civilians. The study also concluded that political party affiliation scored nearly the same positive viewpoints when it came to interest in space endeavors. Most Americans view humans in space a norm in the coming decades.

[8] Matthew Weinzierl and Mehak Sarang, "The Commercial Space Age is Here," *Harvard Business Review,* February 12, 2021, https://hbr.org/2021/02/the-commercial-space-age-is-here

[9] Joe Papalardo, "Elon Musk's Tesla Isn't Going to Mars. It's going Somewhere More Important: Why the Roadster's Destination Matters for the Future of Exploring the Red Planet," *Popular Mechanics,* February 6, 2018, https://www.popularmechanics.com/space/moon-mars/a16571489/elon-musk-space-tesla-mars/.

establishing a human presence on the Red Planet and beyond, according to Musk.[10] Moreover, this launch, combined with a growing desire to expand the United States' and the global economy through spaced-based commerce, as well as engineer a framework for common human-space interactions, made this launch immensely important. While the possibilities for commercialization of space are limitless and trending, modern space commerce developed in earnest well before the post-shuttle era, during the Cold War. Many entrepreneurs like Musk and Bezos oriented their space business models toward efficiency and technical rationality, which empowered them to capitalize on engineering of the past, but also on consumer cultural nostalgia, the golden age of space, and the spirit of free enterprise. The result enabled them to seek solutions to planetary problems while expanding commercialization to support their goals of human interplanetary travel.

Existing scholarship identifies the commercialization of space as a phenomenon of policy actions in the 1980s or as a product of twenty-first century innovation. While this is justifiable, this dissertation presents the argument that the driving force for commercialization and commencement of a space economy began during the Cold War with divergent merchants commodifying space in public venues. Marketing actions based on Western economic principals and cultural identity created an environment which transitioned government-led endeavors to private industry responsibility for U.S. dominance in space. This strategy provided a useful tool

[10] Stephen Clark, Photos: Elon Musk's Tesla Roadster Prepped for One-way Trip to Deep Space, *Spaceflight Now*, December 28, 2017, https://spaceflightnow.com/2017/12/28/photos-elon-musks-tesla-roadster-prepped-for-one-way-trip-to-deep-space/, the Tesla was bound for heliocentric orbit and will be in deep space for billions of years.

to forecast the methods for promoting future space commercial and human presence in low earth orbit

Tracing the development of the commercialization of space raises a question that this dissertation intends to answer: What was the driving force behind the commercialization of space, and who benefited? Correlating probes include what was the extent to which Cold War merchants galvanized the perceptions of significance of space exploration and contributed to the modern space economy and the commercialization of space in the post-Apollo and shuttle eras? How has the relationship between humans and the space economy created opportunities impacting future space activity? How did the Cold War influence perceptions of space and contribute to commercialization? To answer these, it is necessary to understand how assorted merchants were involved in this on-going process.

The purpose of this dissertation research is to examine commercialization through the lens variety of merchants and affiliated industries that commodified space during the Cold War, including government agencies, popular consumer markets, and the relationship between these entities and society to demonstrate how the modern space economy was formed. It investigates costs, risk factors, and changing space policy, economic incentives, commerce, and social interactions with the space-related activities. This trend started in the post-World War II geopolitical era.

Examining space history from an industry, economic, and cultural perspective challenges traditional understanding of the origins and driving force behind the commercialization of space. Additionally, this perspective offers an alternative definition of commercialization based on the commodification of space, demonstrating an economic good with substantial fungibility in space

markets, leading to a framework for a commercial space economy that will positively impact society.

Terminology used in this dissertation includes commercialization of space, which in modern terms means a transition from government-dominated launch and access to private industry activities, including rocket design, cargo missions, scientific data collection, and human spaceflight. However, this definition also includes power and perception based on the demand to develop a robust space economy by exploiting popular culture, consumerism, manufacturing, scientific knowledge, innovation, and the continuously developing space commodities.[11] Commercialization involves economic stimulus in multiple sectors of society and the transactions that generate interest in space for specific purposes. For example, the manufacture of space products may also be used in a consumer society, advertising, companies that exploit space for diverse purposes, the provisioning of goods and services of commercial value by using equipment manufactured either on earth or in space for use in low earth orbit (LEO) or outer space.

The term power refers to various capacities and abilities to direct or influence attitudes, perception, and behaviors of others over the course of one or more events or period. Perception refers to the collective beliefs of a general population or society that is shaped by culture, economics, political, or other influences. It assists in the creation of diverse opportunities for access, operation, and participation in a space-based economy through technical display and

[11] Bureau of Economic Analysis, "Exploring the Space Economy," accessed June 12, 2023, https://www.bea.gov/system/files/2023-space-economy_infographic-falcon9-what-is-the-us-space-economy-l.pngBureau of Economic Analysis.

popular understanding.[12] The space economy refers to the "full range of activities and uses of resources that provide valuable benefits to humans in the course of understanding, managing, and utilizing space."[13] It comprises contributions by both government and private industry. Spectacles are the events that demonstrate technical supremacy, scientific achievement, or economic impact through a dramatic visual display, including symbolism, advertising, social media, and propaganda. A commodity is any raw material or resource used to build, access, shape, and stimulate a space economy in the space exchange. The exchange is an infrastructure built to support space endeavors including launches in (LEO), extracting resources from celestial bodies, or materials used in space.[14] Finally, merchants are the entities that generated strategies for commercialization and manufactured the necessary components of a commercial framework.

Primary sources utilized in this study include government documents and memos, statistical data provided by government agencies including the Bureau of Economic Analysis, Bureau of Labor Statistics, Department of Transportation and Commercial Space, Federal Aviation Administration, and Office of Space Commerce, historical newspapers, industry publications, advertising, news reels, classic and modern film. Additionally, research from presidential libraries, the Library of Congress, NASA Archives and History, and consumer and industry archives are also a key part of this dissertation.

There are currently three significant historiographies surrounding the commercialization of space. First, the term commercialization of space refers primarily to the engineering aspect of

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[12] Michael L. Smith, "Selling the Moon: The U.S. Manned Space Program and Triumph of Commodity Scientism", in *The Culture of Consumption: Critical Essays in American History*, *1880-1980*, ed. Richard Wightman Fox and T.J. Jackson Lears, (New York: Pantheon Books, 1983), 184.

[13] The Organization for Economic Development Cooperation and Development, 2012, 20. See also, Federal Aviation Administration, 2010, George, 2019, Whitehouse 2010.

[14] Space Commodities Exchange, (2018), http://www.spacecommoditiesexchange.com/, accessed March 13, 2023.

space access and Cold War demands. Second, the commercialization of space is founded in political policy with the most recognized point of origin as the passage of the Commercial Space Launch Act of 1984. This law intended to promote private sector production of expendable launch vehicles (ELVs), as well as regulate licensing.[15] Finally, the commercialization of space proliferated at the turn of the twenty-first century with new aerospace industries forming.

While these historiographies are independently significant for space exploration, defense, and the engineering aspect of privatization of space access, the commercialization of space is seldom analyzed as a phenomenon of commodification in various market sectors. For example, the concept of commercialization is a modern term associated with a period toward the end of the Cold War and the turn of twenty-first century as a product rather than a function of the early Cold War. Commercialization arose in the early Cold War separate from Department of Defense (DoD) missile production in a multi-dimensional manner. Although many private sector firms manufactured of a variety of rockets, other technology companies became increasingly involved with the space-related research and design, contributing to space program, manned spaceflight, and subsidiary components for space vehicles and equipment. Examples include the communication, computer, and photography industries. Exploring innovation in these industries and how they became involved in space is essential to understand the depth of commercialization and the formation of the space economy.

Historians have focused on the portrayal the Soviets as an evil villain through psychological warfare, propaganda, and culture.[16] They communicated ideas about the Cold War

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[15] Congress.gov, H.R. 3842-98th Congress (1983-1984), The Commercial Space Launch Act, 1984" October 30, 1984, ongress.gov/bill/98th-congress/house-bill/3942/text.

[16] Arthur Schlesinger, Jr., "Some Lessons on the Cold War," *Diplomatic History* Volume 16, no. 1 (Winter 1992), 2.

and even the space race that presented the United States as the alternative society in the wake of evil communism. For example, "Through the United States Information Agency (USIA) and the Central Intelligence Agency (CIA), the U.S. waged a war of words to influence friends, woo neutrals, and alienate enemies."[17] However, the concentration rarely concerns the commercialization of space and how these ideas filtered exclusively into the space economy. While these foci include various private defense contractors, it is from the national security, defense, and technocracy standpoints rather than from a commercial perspective. By studying the industries involved, what they produced and the influences they created, it is possible to understand the meaning of commercialization in this period and the factors shaping it's its development.

Examining which companies produced tangible and abstract products for the American public provides a view of space commercialization from a Cold War culture perspective. Additionally, examining space through the impact of the economy on space business and on scientific gains contributed significantly to commercialization. Thus, the driving force behind the commercialization of space consisted of diverse merchants whose power and influence contributed to perceptions about space and its economy. This eventually bifurcated the space industry between public and private launch and access. Toward the end of the Cold War the space economy slowly transitioned from a dominant federal government program to a collaborative and trending toward private business leadership of launch and access. These businesses capitalized on

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[17] Kenneth Osgood, *Total Cold War: Eisenhower's Secret Battle Propaganda at Home and Abroad*, (Lawrence: University of Kansas Press, 2006), 8-9, and Chapter 10 which discusses the psychological strategies and propaganda challenges presented by the launch of *Sputnik*. Eisenhower intended to defend America's reputation and mass transmit all aspects of American life to contrast that of the Communist Soviet regime. See also Walter Hixson, *Parting the Curtain: Propaganda dam Culture, and the Cold War, 1945-1961*, (New York: St. Martin Griffin, 1998), xi, discusses the inclusion of various forms of culture that represents a group or society and employing it as a psychological warfare tactic. One prime example was the establishment of overseas libraries that housed pro-American ideals as a form of propaganda.

the power of symbolism, consumerism, popular culture, and changing perceptions of the purpose for space exploration. These merchants emerged in the post-WWII era. Collectively, these areas are the framework for the commercialization of space.

During the early Cold War between 1957 and 1969, the space age consisted of perceived threats from the Soviet Union.[18] This perception extended from the years immediately following World War Two where the United States achieved technical supremacy over the globe with the development and deployment of the Atomic bomb. Three years after the United States tested its new hydrogen bomb, the Soviets developed their own nuclear program and by the time *Sputnik* launched, had detonated a hydrogen bomb in 1955. This event significantly impacted political and military threat assessments. In 1952, the Central Intelligence Agency issued a study on how to meet the Soviet threat of a surprise attack. The results of this iterated the demands for a U.S. satellite to detect and possibly deter attack and led to increased competition between the

[18] Roger Launius, *NASA's Origin and the Dawn of the Space Age*: *Monographs in Aerospace History Series* # 10 (National Aeronautics and Space Administration, 1998), 10. Revisionist historian Roger Launius argues that space programs of the U.S. and the Soviet Union formed a symbiotic relationship that propelled further competition for technical supremacy. He suggests that this competition drove perceived threats. Research provided by historian Asif Siddiqi echo's this sentiment in a published account of events in the Soviet Union leading up to Sputnik's launch. See Asif A. Siddiqi, "Korolev, Sputnik, and the International Geophysical Year" *(http://www.hq.nasa.gov/office/pao/History/sputnik/siddiqi.html).* Similarly, R. Cargill Hall used declassified U.S. documents to trace the Eisenhower administration policy decisions that reined in the U.S. satellite program in the years immediately prior to Sputnik. See R. Cargill Hall, "Origins of U.S. Space Policy: Eisenhower, Open Skies, and Freedom of Space," in John M. Logsdon, gen. ed., with Linda J. Lear, Jannelle Warren-Findley, Ray A. Williamson, and Dwayne A. Day, *Exploring the Unknown: Selected Documents in the History of the U.S. Civil Space Program, Volume I: Organizing for Exploration* (Washington, DC: NASA SP-4407, 1995), pp. 213□29. Together, these articles paint a coherent picture of events in the United States and the Soviet Union leading up to the start of the space age.

scientists and engineers in the U.S. and the Soviet. Wernher von Braun and Sergei Korolev were the leading rocket scientists on either side.[19]

Orthodox Cold War historians blamed the rise in these tensions to the antagonistic behavior of the Soviets in the form of advancing technological capabilities. In the minds of early Cold War participants, those living in the age, the evidence was clear. The Soviets were not considered a "friendly state."[20] Any state that intuitively promotes the use and advancement of technology to intimidate either opponents or surrounding regions are necessarily evil. The production of satellite and ballistics, combined with failure to honor post-war agreements after 1945 prompted the United States to pursue reciprocal actions for the good of the globe.[21]

Previous studies demonstrated that the space race originated with the need for defense programs like nuclear arms race and missile development.[22] Moreover, competition emerged in

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[19] Central Intelligence Agency, Special Estimate. Soviet Capabilities for a Surprise Attack on the Continental United States on or July Before 1952, CIA.gov, https://www.cia.gov/readingroom/docs/DOC_0000269249.pdf.

[20] Thomas Baily, *America Faces Russia*," (New York: Cornell University Press, 1950), 8. Stanford professor Baily evaluates how the United States diplomatically relates to other countries, focusing on historical connections to Russia.

[21] Ibid, 355. Baily makes the case that the American people were so "alarmed" by the Soviet actions that there was popular support to take initiatives to stop the threat. Also, see Truman's speech to Congress on March 12, 1947, in which he stated that it was the responsibility of the U.S. to help those resisting attempted subjugation by armed minorities around the world, referring to the Soviet military threat. See National Archives, Truman Doctrine, https://www.archives.gov/milestone-documents/truman-doctrine#:~:text=President%20Truman%20declared%2C%20%22It%20must%20be%20the,a%20long%20and%20enduring%20bipartisan%20Cold%20War.

[22] Sean Kalic, *U.S. Presidents and the Militarization of Space, 1946-1967*. (College Station: Texas University Press, 2012), 7. Kalic explains that the years immediately following World War Two are not typically referred to as the beginning of space race; however, he argues that this is the intellectual beginning of the space program with missile and satellite research and development as well as the origin of U.S foreign policy to promote space in peaceful terms. He further claims that Eisenhower did not invent the space age or space race, he merely expanded upon Tuman's policies by appeasing the military with funding for research and developing a national space policy based upon Cold War Parameters and the militarization of space, 27. See also, Asif A. Siddiqi, *Sputnik and the Soviet Space Challenge,* (Gainesville: University of Florida Press, 2000), 201-212. Technology historian Saddiqi argues The Soviet space program consisted of a mixture of scientific exploration and a military defense posture; the latter most prominent. Although the Central Committee and the USSR Council of Ministries developed created the Scientific and Technical Council for Space Research, the funding came from the Ministry of Defense and used this to promote intercontinental ballistic missiles (ICBM). Khrushchev then created a new military branch knowns the Strategic Missile Forces. The relevancy is the response by Washington, D.C., and its own shift from aviation to ICBMS.

tandem with the nuclear arms race in the 1950s and 1960s which proliferated in a variety of technological firsts. This led to the need to formulate a popular and positive public perception of the space program that also promoted Cold War ideology. This perspective also resonated with early Cold War historians who argued that the Cold War was a product of Soviet aggression, therefore the United States responded through the space program from that viewpoint.[23] This interpretation transformed into a competitive environment between the United States and the Soviet Union and demanded technical and engineering expertise to support Cold War challenges. As the U.S. government contracted with the DoD, support from multiple private entities enabled technical and psychological commercialization.

During the 1950s both the United States and the Soviet Union sought a space spectacle through technology, building satellites for the International Geosynchronous Year (IGY) which coincidentally provided an environment for missile research and development."[24] Beginning with

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[23] Arthur Schlesinger, Jr., "Origins of the Cold War." *Foreign Affairs* 46, no. 1 (1967): 22–52. The article suggests that the United States responded to Soviet aggression as the guardian of democracy, free men, and expansionism dated back several decades. p 24; Schlesinger also credits the informative historian of the Cold War origins, Herbert Feis in his book series titled *Churchill, Roosevelt, and Stalin: The War they Waged and the Peace they Sought* which concurs with the assessment that the Soviets were the aggressors. Similarly, George Kennan spent time in Russia as a private citizen and as a diplomat had formed negative opinions regarding his experiences and interactions Czarists and later with Communists, claiming they were difficult, lacked manners, and were aggressive expansionists, in Thomas Baily's *America Faces Russia: Russian -American Relations from Early Times to Our Day*, (Cornell, University Press, 1950), 167-345. Baily also describes the relationship of the Russian diplomats in the waning months of WWII as souring as the Soviets grew less cooperative about diplomatic issues and post-war organizations. He claims that Soviet Ambassador Vyacheslav Molotov demanded colonial possession, ignored the needs small states, and reneged on its Poland promise, insisting Poland's new government under Kremlin rule be represented, p.340. Americans had little doubt of the expansionist intent of the future. Further, Kennan's' Long telegram of February, 1946 set the stage for the Truman Doctrine which established the policy of Containment of Communism. In it, George Kennan reports that there is no hope of reconciliation "or co-existing peace" with the Soviets. He states that "they continue to be antagonistic against capitalism."

[24] Walter McDougall. *The Heavens and the Earth: A political History of the Space Age.* (Baltimore: Johns Hopkins University Press), 41-42. The discussion in this section of Chapter 2 reveals the lengths that both the U.S and Soviets when to obtain German rocket technology and how Stalin intended to build his military stronger through missile development to have the upper hand which ultimately led to *Sputnik.* For the Soviets this was state-sponsored, for the U.S., the limited spending in this area reflected a reliance on private industry and consumer goods. Additionally, in the post-World War Two years, Stalin's new Five -Year Plan called for accelerated spending on research and development on military, defense, and rocket development. This was what space and policy historian Walter McDougall called "the greatest crash military program in the history of the Stalinist regime.

the Truman Presidency, followed by Eisenhower's Doctrine which included developments of space technology, and then President Kennedy challenge the U.S. to "land a man on the moon before the decade is out," space competition required extensive involvement from private companies to assist in achieving Cold War goals. *Sputnik I, Sputnik II*, Yuri Gagarin, and Laika the dog were propaganda spectacles, but the U.S. had the Mercury, Gemini, and Apollo astronaut heroes, *Explorer I, Freedom 7,* NASA, and *Apollo 11*. Each utilized private industry to build space access, infrastructure, and operation. For example, American Telephone and Telegraph (AT&T), Hughes Space and Telecommunications, Radio Corporation of America (RCA), Boeing, Northrop Grumman, ILC Dover, a division of Playtex, Pillsbury, Fairchild Semiconductors, to each contributed to the manned space program.

For the first category, Werner von Braun's *The Mars Project* outlines technical aspects of the possibility of a mission to Mars. Published in 1953, von Braun covers the conditions and challenges inherent to such a monumental undertaking by exploring the orbital mechanics involved, the construction of rocket engines, and spacecraft design. Additionally, there are considerations for human and physical cargo specifications, as well as the design and manufacture of communication equipment which was essential for the success of such a mission. The technical descriptions of rocket engine types were critical to applied engineering during the early space program due to the options being investigated. These included chemical propulsion engines like liquid oxygen, thermonuclear, and ion nuclear.[25] While this is not a book about

[25] Werner von Braun, *The Mars Project*, (Champagne, Ill.: Illini Books, University of Illinois, 1953), xvi. Von Braun wrote the fictional story based on his real life ideas for space travel. There are engineering, political, and cultural overtones ion the book, which first appeared in mass print through Colliers Magazine and other media. The ideas in the story became part of the basis for developing a space station, deploying heavier rockets, and potential transfers of spacecraft in orbit. See also Michael Neufeld, "Mars Project: Wernher von Braun as a Science Fiction Writer," *Air and Space*, January 22, 2021, https://airandspace.si.edu/stories/editorial/mars-project-wernher-von-braun-science-fiction-writer, accessed January 14, 2023.

commercialization of space, it is written from an engineering standpoint and one that was very popular during the era.

After *Sputnik* launched in 1957, the United States embarked on an intentional space program extending beyond the production of rockets and missiles. The calculus of which built military and national defense, as well as perceptions of technological strength, superiority, and economic culture. *This New Ocean: The History of Project Mercury* provides an in-depth examination of the microcosm of NASA and the technical, engineering, and scientific history of the early manned space program.[26] Commercially, this history includes details of early collaboration with defense contractors and subsidiaries that not only manufacture physical components, but adopted and emulated American industrial capacity and power.

Likewise, *On the Shoulders of Titans: The History of Project Gemini* represented the manifold in the manned spaceflight program as the intermediate phase of landing a man on the moon. Performance-oriented machinery demonstrated the technical ability of the United States and propelled NASA beyond the Russian State Space Program. Experimentation with extravehicular mobility (EVA) proved spectacular throughout the Gemini Program. Additionally, multiple experiments in photography, television signaling, communications, space operations,

[26] Loyd S. Swinson, James M. Grimwood, and Charles C. Alexander, *This New Ocean: A History of Project Mercury*, (Washington, D.C.: National Aeronautics and Space Administration,1998), 133-140, 267. This book examines the Mercury program from research, technical, and operation aspects. It provides an overview of the organizational structure, the growth of personnel, and technical requirements for manned spaceflight including the contractors used to build machines for space.

tethering, docking, and rendezvous provided needed research for the upcoming Apollo program utilizing components manufactured by multiple private industry contractors.[27]

London Wainwright also describes the powerful effect of the marvel of engineering by watching and writing about the February1962 launch of the Atlas rocket carrying Mercury astronaut John Glenn. *Freedom 7* orbited the globe putting the United States on the space map with is massive rocket manufactured by the McDonnell Aircraft Corporation.[28] The awe expressed in the article is twofold; the innovation achieved with rocket design and engineering capability, and the cultural effect of the moment which lifted American ingenuity into space with hearty public support. Wainwright commented that during an interview with Glenn, the theme song from *Around the World in 80 Days* played subtly in the background. This seemed quite appropriate as the Hans Zimmer and Christian Lundberg score generated a dramatic reverberation to the tremendous event, not unlike Musk's recording of *Space Oddity* during the 2018 Falcon Heavy launch.

In another significant publication, *Apollo: Race to the Moon* by Charles Murray and Catherine Bly Cox, chronicled the U.S. Space Program from a technical perspective within NASA.[29] The focus intended to share the details of the era, but explains the connections between

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[27] Barton C. Hacker and James M. Grimwood, *On the Shoulders of Titans: A History of Project Gemini*, (Washington, D.C.: National Aeronautics and Space Administration, 1977), v-vii, 51-55, 383. This very detailed book covers the Gemini Program from beginning to transition into Apollo. The book includes a detailed discussion on the challenges faced in this program including costs and budget, defense contracting, contributions by North American Aviation, McDonnell Douglas, Rocket Power, Incorporated, General Electric, and others. Some of the considerations related to hydraulics, electricity, structural framework for rockets and boosters, fuel cell production, etc.

[28] London Wainwright, "The View from Here: The Good Old Days of Space," *Life Magazine* (October 2, 1964), 39.

[29] Charles Murray and Catherine Bly Cox, *Apollo: Race to the Moon*, (New York: Simon and Schuster, 1989).

the government program and the engineers and designers of the hardware used during this Apollo program.

Jeffrey T. Richelson's *America's Secret Eyes in Space: The U.S. Keyhole Spy Satellite Program* connects satellite reconnaissance to commercial industries used in building the American space satellite program. Satellite development began during World War II and accelerated in the mid-1950s, parallel to the early Cold War. Richelson also explains the impact of competition between various U.S. government agencies in producing a viable intelligence gathering device that eventually produced commercial uses of the technology, such as long distance radio and television communication, advances in photography, technological innovations in infrared imaging, communication satellites generating two connections which would serve on manned spaceflights, and on global positioning satellites (GPS) used in civilian and military transportation.[30]

The second category of scholarship concerns policy actions that eventually led to the commercialization of space. In this category, historians chronicled various aspect of the space race as a matter of foreign policy. The effects of the American satellite program and President Dwight D. Eisenhower's decision to focus on its development in the wake of *Sputnik* are explained in detail by Robert A. Divine in *The Sputnik Challenge: Eisenhower's Response to the Soviet Satellite,* who argued that the development of satellites was part of Eisenhower's response. Furthermore, that those who feared a missile gap and lag in defense were not fully aware of the

[30] Jefferey t. Richelson. *America's Secret Eyes in Space: The U.S. Keyhole Spy Satellite Program, (*New York: Harper Row, 1990), 1-29, 31-40, 65-75, 185,229-250. The book provides a provocative assessment of the nature and evolution of the American spy satellite program from an intelligence point of view. The engineering framework for reconnaissance satellites tilted the push to develop commercial satellites partially under the guise of improved communications systems, but in large part for intelligence gathering in the spirit of "open skies." Additionally, the peripheral technology and commercialization of subsidiary products significantly boosted the space economy through imaging, enhanced communications in real-time, and improving transportation.

highly secretive activities the administration pursued, but could not be made public, giving the impression of a lack of leadership.[31]

Satellite development continued throughout the Cold War in the guise of missile defense, particularly as an early warning system under the code name SAMOS, a satellite and missile defense observation system.[32] This was the beginning of a fledgling satellite program dedicated to increased military intelligence gathering. Even as Richelson discussed various technological designers and uses for satellite vehicles in terms of their defense components, the book covers contractors which were used to manufacture spacefaring equipment.

Arthur L. Levine describes the commercialization of space as technical appendages of government defense policy as early as the 1950s with advancing communication technologies. This included international data transmissions, television, and satellite communications.[33] These technological achievements developed in a space-age environment which expanded with Congressional support from the Landsat program and establishment of the Communication Satellite Corporation (COMSAT) in the early 1960s.[34]

Another book, *Before the Decade is Out: Personal Reflections on the Apollo Program,* details the technical aspect of Apollo program through the eyes of the participants who engineered America's most daring technological feat. While this publication canvases the management aspect of R&D and problem-solving requirements early in the program, it also chronicles the on-going issues and interactions between NASA and engineering contractors as well as the mission objectives. Commenting on Tom Paine's tenure as the NASA Deputy

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[31] Robert A. Divine. *The Sputnik Challenge: Eisenhower's Response to the Soviet Satellite*.

[32] Richelson, 45.

[33] Arthur L. Levine, "Commercialization of Space: Policy and Administration Issues," *Public Administration Review,* Sep-Oct, 1985, Vol 45, No. 5, 562.

[34] Levine, 2.

Administrator, James Webb explains the functions of key people recruited by Paine from significant private sector industries such as International Business Machines (IBM), Westinghouse, and General Electric (GE). This is significant in that the program was a government initiative driven by technological competition in the Cold War but incorporated private industry.[35]

Revisionist historians of the Cold War evolved thinking about origins throughout the 1960s and 1970s. Many were influenced by events taking place as the result of the on-going competition and proxy wars with the Soviets which resulted in the United States becoming increasingly imperial. Part of the empire included dominance of technology and space resulting in policies that supported U.S. presence in the high frontier. [36]

Accordingly, John M. Logsdon argued that space commercialization interest revolved around the production of increased military strategy to dominate the "new high ground" of space.[37] He discussed in the article "Space Commercialization: How Soon the Payoffs?" that space hegemony developing into a new market for commerce in transportation, telecommunications, remote sensing, and in-orbit services such as delivering payloads.[38] He concluded that space activity depended on increased involvement from the private sectors as well as public support for any space ventures. In 1984 when the article was published, many of the

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[35] Glen E. Swanson, Ed., NASA-SP 4223, *Before this Decade is Out: Personal Reflections on the Apollo Program,* (Washington, D.C.: National Aeronautics and Space Administration, 1999) ,45.

[36] William Appleman Williams advocated that the U.S. was significantly responsible for the high tensions in the Cold War. He suggested that the U.S. was more interested in advancing its own interest around the globe that containing communism. See *Tragedy of American Diplomacy, 1972, Chapter Five,* "The War for American Frontier," 162-180, https://archive.org/details/tragedyofamerica00willrich/page/n6/mode/1up?q=162. See also Logsdon and Launius.

[37] John M. Logsdon, "Space Commercialization: How Soon the Payoffs?" *Futures*, vol. 16 (February 1984), 1

[38] Logsdon, 5.

determinants had yet come to fruition. At this time, commercialization was still an aspect of government research and development (R and D) and national defense.

The third category reveals that early space race literature specifically dedicated to the commercialization of space is sparse. The 1970s and 1980s saw more scholarship focusing on this area of study in several categories, most notably in regulatory policy history. This included President Ronald Reagan's ideas about American exceptionalism, competition in space, and the development of space transportation which led to the passage of the Commercial Space Launch Act of 1984. This act specified that the United States government partner with private industry to produce communications, transportation, and other technologies that supported and strengthened a U.S. presence and supremacy in outer space activities. Further, these activities protected U.S. security and economic interests utilizing a space environment.[39]

An essential history to consider is Walter A. McDougall's *The Heavens and the Earth: A Political History of the Space Age,* which details the progression of technology and provides the context of the space race from *Sputnik* through *Apollo 11*. The book was McDougall's seminal work on this subject. The overall argument supposes that the Soviet's made it to space first by simply "employing the world's first 'technocracy."[40]

It is this technical area in which the United States strove to maintain supremacy, but it was not sufficient to simply perform on the global stage in the same manner as the Soviets. The U.S. would also employ its own version of technocracy to make a giant leap over them for the benefit of all mankind. This became the ultimate spectacle of the early Cold War and the first

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[39] Commercial Space Launch Act, 1984. Public Law 98-575. U.S. Statutes at Large 98 STS 3055 (October 30, 1984): H.R. 3942 codified 49USC 2601. https://uscode.house.gov/statutes/pl/98/575.pdf.

[40] Walter A. McDougall. *The Heavens and the Earth: A Political History of the Space Age*. (Baltimore: The Johns Hopkins University Press, 1985), back flap.

space race. McDougall points out that the strategy deployed to accomplish this feat was a function of the economy.[41] This meant that while the U.S. had vast resources, they primarily from private industry. The capitalist model made technical competency and supremacy possible.

Where the U.S. experienced a potential or perceived scarcity in technology, the opportunity cost of ignoring how to use private industry to maintain and surpass the Soviets in the space age was greater than funneling money toward overly expensive conventional defense projects. This was the mission under President Eisenhower's administration. This can be seen through the military industrial complex and high value deterrents such as missile potential, satellite programs, and launch capabilities.

Additionally, McDougall's research focuses heavily on policy and planning, which contributed to energizing the American public about space exploration, consumerism, and technological industrialization. Citing economist and national security advisor for President's John F. Kennedy and Lyndon B. Johnson, McDougall explains that Walt Rostow argued that the economic growth of the country through the development of space infrastructure, investments in technology, and competition in innovation were the key to a successful space program.[42]

Space policy scholarship continued to emerged coinciding with political considerations and newly developing space policy. For example, James M. Haggarty's "The Outlook for Commercialization," both of which focus on the future role of private industry in space.[43] These studies concentrated on the technical superiority and engineering accomplishments also rooted in

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[41] Ibid, 177.

[42] Walter A. McDougall., *The Heavens and the Earth: A Political History of the Space Age*, (Baltimore: Johns Hopkins University Press, 1985), 210-215.

[43] John M. Logsdon, "Space Commercialization: How Soon the Payoffs?" *Futures,* vol. 16 (February 1984), p. 72. See also, James M. Haggarty, "Outlook for Commercialization," Aerospace, vol. 22 (Winter 1984), pp. 2-7.

the Cold War, but from an American Exceptionalism perspective. This is evident from the policies and actions taken during the Kennedy through Reagan Administrations. Space policy historian John Logsdon contributed significant material to this growing field. His books *Kennedy and the Race to the Moon, The Decision to go to the Moon, After Apollo, and Reagan and the Space Frontier* recount the development of space policy throughout the Cold War and the key people involved in the decision making processes, what drove them, and their impact on the aerospace industry.

Specifically, Logsdon's examination of the Reagan era explains how interagency cooperation formed the Senior Interagency Group for Space, (SIG Space). Logsdon contends that President Reagan's optimism for the United States motivated him to pursue space as a final frontier for the purpose of demonstrating American Exceptionalism. From this policy point of view, Logsdon explores the administrations delve into commercialization to prove the technical superiority of the United States. Reagan's enthusiasm for space prompted White House discussions on the proper method to create sustainable commercialization. The developing policies became the genesis for the International Space Station, funding the shuttle program, and incorporating private industry to exhibit American Exceptionalism.[44]

Logsdon also argued that one of President Reagan's core convictions was that free enterprise benefitted society and that government should not interfere with the private industry in way other than to "provide a supportive and regulatory environment from which to operate in."[45] Logsdon further argued that to promote American innovation and exceptionalism, it was also necessary to lead a cooperative of international agencies to construct an International Space

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[44] John M. Logsdon, *Ronald Reagan and the Space Frontier* (Washington, D.C.: Palgrave MacMillan, 2019), 45-46, 109-113, 180.

[45] Ibid, 171.

Station while expanding private sector investment in the products that emerged. Space policy played a significant role in transforming from a defense posture to partnering with commercial space companies from the 1980s to present.

Space transition shifted to creating regulatory and licensing laws that intentionally included the commercialization of space by enticing commerce from the private sector. These included the Commercial Space Launch Act of the 1984, the Commercial Space Launch Act of 1988, the Land Remote Sensing Act of 1992 which concerned licensing private industries, and the Commercial Space Act of 1998 which spurred the growth of the satellite communications industry without ties to the military. Logsdon argued that this was a turning point in the commercialization of space, and an enduring legacy of the Reagan Administration that "laid the foundation of an increasingly dynamic business sector."[46] Interest in space and a move toward commercialization by building a vigorous space economy in part to thwart communism, exhibited U.S. strength, enabling cooperation with international governments in space.

Roger Launius and historian Patricia Limerick argued against that point stating that exceptionalism is a myth and that commercialization for this reason only serves to exploit.[47] Additional opposing viewpoints are found in historian Linda Billings' essay "Overview: Ideology, Advocacy, and Space Flight - Evolution of a Cultural Narrative" which describes the ideas of a rugged frontier and American free enterprise manifest destiny a myth and that being a capitalist democracy does not equate with productive advocacy for human access in space or American leadership in the commercialization of space.[48]

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[46] Ibid, 173.

[47] Ibid, 391.

[48] Linda Billings, 'Overview: Ideology, Advocacy, and Spaceflight-Evolution of a Cultural Narrative," NASA, https://history.nasa.gov/sp4801-chapter25.pdf.

Reexamination of the development of space policy scholarship focused on space policy that integrated activity for counterspace endeavors within the scope of security, defense, and global space leadership. A good example of early policy historiography is Rip Buckley's *The Sputniks Crisis and the Early United States Space Policy,* published in 1991, and offers insight to how Americans perceived space activity in the war years. Science fiction was alive and well and may were open to the idea of space access. Film in this period centered on space exploration and fantastic transportation. Buckley wrote that around this time rocket scientist Werner von Braun's article on the development of liquid rockets contained proposals for other space applications for "unmanned satellites."[49] This early view resulted in the urgency to advance missile and satellite research. Defense industry companies contracted with the federal government to develop powerful long-range rockets. These contractors worked with and in addition to military research programs in the Army, Navy, and Air Force.

Buckley's account demonstrated how space policy formed in response to *Sputnik* during the Truman and Eisenhower presidencies. Concentration on gathering intelligence and providing a reliable method of communication helped drive development of commercial satellites.[50] One of the most controversial arguments made concerns the speed with which the American Space Program developed. He attributes this to Truman's lack of urgency in supporting R&D for U.S. rocketry.[51] University of Virginia's Miller Center author Maddie Davis argued this ideological and security point in the article, *The Space Race: The Soviets and Americans Race to the Stars*.[52]

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[49] Rip Buckley. *The Sputnik Crisis and the United States Space Policy,* (London: Macmillan Academic and Professionals, LTD, 1991), 45-47.

[50] Rip Buckley. *The Sputniks Crisis and Early United States Space Policy*, (London: MacMillan, 1991).60-104, 145-156.

[51] Rip Buckley, *The Sputnik Crisis and Early United States Space Policy*, (London: Macmillan, 1991), 85.

[52] Maddie Davis. "The Space Race: Soviets and Americans Race to the Stars," 2023, accessed June14, 2023, https://millercenter.org/the-presidency/educational-resources/space-race.

Focusing on historical narratives, events, and political procedures in the aftermath of Sputnik, Buckley contends that space historians failed to examine policy missteps of the Truman administration and willingly attributed the lag in space development to President Eisenhower.[53] While the Navy's Vanguard rocket program supporting the IGY were publicized as purely scientific in nature, Buckley claims that the real intent was to boost American prestige. The result was that Truman owned responsibility for losing the early space race. While this historiographic presentation does not directly discuss space commercialization in the spirit of this dissertation, it sets the stage for future space policy based on objectives of each new administration, which is a common perspective in the development of the commercialization of space. There are significant references to private industry participation included in the discussion, such as Douglas Aircraft, The Martin company, and Proctor and Gamble.

Following in this revised pattern of historiographic reasoning, modern space historians such as Roger Launius, categorizes this long-developing process into stages based on technical, display, and impact domains in an article "Historical Dimensions of Space Exploration: Reflections and Possibilities."[54] He further documents this process in his book *Historical Analogues for the Stimulation of Space Commerce*. Launius also published numerous essays and historical material while serving as NASA's Chief Historian, which include research on popular appeal of human spaceflight, "Kennedy's Space Policy Reconsidered: A post-Cold War Perspective," "It's Finally Time for Space Tourism," and *Critical Issue in the History of Space Flight* to name a few. Launius's contributions to space history and their relevance to twenty-first

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[53] Buckley, 187-200.

[54] Roger D. Launius. "The Historical Dimensions of Space Exploration: Reflections and Possibilities," *Space Policy* 16 (2000) 23-38.

century commercialization are also essential for tracing the development of the commercialization of space.[55]

Launius also served as Associate Director for Collections and Curatorial Affairs for the Smithsonian National Air and Space Museum in Washington, D.C. His approach to space scholarship and commercialization consistently reflects skepticism for commonly accepted histories. He argued that it was the technological component that sequestered more private industry initiatives, contributing to the commercialization of space.[56] The policy of securing European Western allies also evolved in ballistic missile programs by using private industry such as General Electric Corporation and Convair to research and develop ICBMS and later assist in satellite studies.[57] Additionally, he is a proponent of the social implications of commercialization which have become more popular since the turn of the twenty-first century.[58]

By the late 1990s, interest in space increased with administrative policies becoming more complex and as a critical component government framework. Private sector participation in the development of space vehicles and operations steadily grew as the monetary risks slowly declined while profitability potential improved. There are other varying factors for amplified commercial space activity after the year 2000 (Y2K), but it is this era that scholarship on the

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[55] Roger D. Launius*, Historical Analogues of for the Stimulation of Space Commerce: Monographs is Aerospace History, no. 54,* NASA SP:2014-4554, 9Washington, D.C.: NASA, 2014), 14-30. Outlines the benefits of commercialization of space. While this publication more readily applies to the twenty-first century category, it is quite relevant to on-going space policy development as it accelerated in the early 1980s. See also, Roger Launius, "NASA's Quest for Human Space Flight "which explains the methodologies used to sell the space program to the public. See also, Robert Dallek's "Johnson, Project Apollo, and the Politics of Space Program Planning," p 68-91, and Roger D. Launius and Howard E. McCurdy, eds., *Spaceflight and the Myth of Presidential Leadership*, (Urbana: University of Illinois Press, 1997.

[56] Roger Launius, *Historical Analogues for the Stimulation of Space Commerce,* NASA, https://www.nasa.gov/wp-content/uploads/2015/04/historical-analogs-ebook_tagged.pdf

[57] Rip Buckley, *The Sputnik Crisis and Early United States Space Policy* (London: MacMillan Press, 1991),70-78.

[58] Roger D. Launius, "Historical Dimensions of Space Exploration: Reflections and Possibilities," *Space Policy* 16 (2000) 23-38.

commercialization of space and the development of a space economy proliferated. There are currently numerous publications on aspects of commerce and commercial opportunity, the majority focused on transportation services, potential manufacturing, and public services stemming from the space domain. Modern scholarship often focuses on future opportunity but lacks explanation for the driving force behind innovation and building the framework for a space exchange other to explore the rise of the individual companies.

Scholarship in this area also includes space policy expert Roger Handberg, who chronicled a more specific commercialization of space based on a generational approach that consist of pre-World War II, Cold War, and new millennium with each era focused on visionaries imagining the fantastic, the reality of technological supremacy, and the possibility of future space-related enterprises.[59] Further, Handberg lays out a vision for the future of the space industry beyond the Challenger years. He argue that the link between the dominant military control and the modern private industry provided more critical public activity to foster commerce in microgravity environments[60] He argues some level of government support is required as commercialization transition to private industry, and that NASA will need to reimage its purpose and mission in the twenty-first century to demonstrates its capacity to build scientific projects that are useful to space exploration and commercial endeavors. He comments that in the past, NASA held a monopoly over the launch and access to space. But in the future, the private sector will have more realistic scope of innovation and will be faster producers of necessary vehicles and parts to expand the economic landscape into space.[61]

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[59] Roger Handberg. *The Future of the Space Industry: Private Enterprise and Public Policy*, (Westport, Connecticut: Quorum Books, 1995), 5.

[60] Roger Handberg. *The Future of the Space Industry: Private Enterprise and Public Policy*. (Westport, Conn: Quorum Books, 1995), p.9, 25, 95-153.

[61]Handberg, 16.

More recent scholarship focuses on commercialization as a parallel to Détente. As the Cold War came to an end, there was more of an approach toward cooperation in space activities, which led to more government-private partnerships. Consumerism continued to play a significant role in the promotion of space through spectacle and commercialization which increasingly informed public opinion and participation in space-related activities. For example, historian Michael L. Smith's essay on *Selling the Moon: The U.S Manned Space Program and the Triumph of Commodity Scientism* demonstrates how the development of the space program explored the possibility of limitless consumption and the impact this had on society. Part of this impact included the expansion of government and a turning point in manufacturing to produce a new product, space. Space became a commodity, but so did the consumption surrounding the technological feats that contributed to achieving ideological, political, and economic goals of global leadership. The modern consumer participated by powering the race from cultural standpoint.[62]

Capitalism, the economy, and the commercialization of space is discussed at length by economic historian Andrew MacDonald in *The Long Space Age: Economic Origins of the Space Exploration from Colonial America to the Cold War.* He argues that understanding the competitive nature of the space race also requires analysis and understanding in a framework of signaling, a concept that is much broader than the prestige theory of early and middle Cold War historians.[63] Signaling is an attempt to conceptualize space exploration detached from the political terms and focus on domestic and international response to Sputnik. This includes

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[62] Michael L. Smith. "Selling the Moon: The U.S. Manned Space Program and the Triumph of Commodity Scientism" in Richard Wightman Fox and T.J. Jackson Lears, editors in *The Culture of Consumption* (New York: Pantheon, 1983), pp.175-185, 193-199, 204-205.

[63] Andrew MacDonald. *The Long Space Age: The Economic Origins of Space Exploration from Colonial American to the Cold War,* (New Haven: yale University Press, 2017), 160-163.

perceptions about the Apollo Program, manned spaceflight, the economic benefits of exploration, and analysis of those that chose to invest space exploration because of the value of scientific knowledge. MacDonald illustrates how private industry contributed to a taxonomy of signaling via transmission of knowledge, the use of technological research, and application beyond the space program, including the consumer market, to form the space economy.

Likewise, technological spectacle resulted from perceptions created by advertising agencies, government, and cultural phenomenon beginning with Sputnik. As consumers became emersed in the Space Age, the consensus posture of society in the United States thrust spectacles as method of accomplishment. These spectacles in turn shaped interrelations between various space entices, merchants, and consumers. This was more profound than the actual technological accomplishment, according to Guy DeBord in *Society of the Spectacle.* He argues that society is "not the collection of images but a social relationship between people mediated by the images."[64]

One such demonstration involved automakers who entered the golden age of America developing galactic, space-age designs for the modern consumer. American dreamers such as Charles Balogh and Ben Kroll connected the image of the future of America and sold the idea of prosperity through exceptionalism with out-of-this-world car styles, launching advertising as a key force in commercializing the American brand.[65] This was a necessary step in casting a cultural response to the rising red storm and unequivocal Soviet technical superiority and showmanship. American need to launch, and while government debated the course of action, developed its own rockets from the German engineers captured after WWII, and created policies,

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[64] Guy Debord. *The Society of the Spectacle*, (Detroit: Black and Red, 1983), 4.

[65] *Evening Star.* (Washington, D.C.), October 4, 1957.https://www.loc.gov/item/sn83045462/1957-10-4/ed-1/. See also, Margaret Myers. "Photos: Auto Sketches from Detroit You Were Never Meant to See*." PBS News Hour.* April 24, 2015. https://www.pbs.org/newshour/arts/golden-age-american-car. Accessed May 13, 2023.

employed its most powerful resource of capitalism, rescued American image, and captured space.

Research has also been conducted on the interpretation of space movies and their connection to society. However, this dissertation examines the entertainment industry as part of a larger consumer space economy and as a driving force behind the commercialization of space. For example, David Bell and Martin Parker, editors in *Space Travel and Culture* chronicle iconic moments in the twentieth century and the images produced by the Space Age, as well as their artistic influence on society and culture. The collection of essays argue that these iconic moments have not generated as much influence and writing as the political histories. The historians in this collection also make various counter arguments to the Cold War theories of the origins of the space race , but also for the cultural impact of popular culture on modern space endeavors. For example, Peter Dickens "The Cosmos as Capitalism's Outside," Daniel Sage "Giant Leaps and Forgotten Steps," Martin Parker's "Capitalists in Space," and Holly Henry and Amanda Taylor's "re-thinking Apollo: Envisioning Environmentalism in Space."[66]

Other examples of popular culture contributions to the commercialization of space include William Blake Terrell wrote about *Star Trek* and television and the myth it played in creating a fictional hero intertwined with reality in Captain Kirk. [67]Also, Robert V. Kozinets essay concerning the *Star Trek* cultural consumption and what it means for society.[68]

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[66] David Bell and Martin Parker, ed., *Space Culture and Travel: From Apollo to Space Tourism*, (Malden, MA: Wiley-Blackwell Publishing, 2009, Chapters 5, 6, 7, 10.

[67] William Blake Terrell. "*Star Trek* as Myth and Television as Mythmaker. *Journal of Popular Culture*, 10 (Spring 1977), 711-719. Also, Rick Wortland. "Captain Kirk: Cold Warrior." *Journal of Popular Film and Television*. 16 (Fall 1998), 109-110.

[68] Robert V. Kozinets. "Utopian Enterprise: Articulating the Meaning of Star Treks Culture of Consumption." Journal of Consumer Research 28, no. 1 (June 2001): 67-68.

In the 1990s, television shows like the X-Files promoted the idea of Alien existence harkening back to an event in 1947 in Roswell New Mexico. Aliens in popular culture also shaped cultural attitudes about space exploration, space tourism, and space consumption. Aliens were not confined to stereotypical enemies, although many Hollywood films portray this theme. From Alien, to E.T. to Luke Skywalker, alien phenomenon generated space commercialization in media, social media, film, comics, books, and other merchandise driven to engage the public on reexamining the past in terms of declassified documents that shed light on the context for decisions made in the early cold war and space race that influenced commercial activity. One example is Kenneth Osgood's *Total Cold War: Eisenhower's Secret Battle at Home and Abroad*, support a military footprint and psychological warfare origin because of Sputnik and the demand for powerful propaganda.[69] Still other scholarship explores the role of space communications in promoting a Cold War agenda.

With the revised scholarship available, it is still at times commonly accepted by prominent historians and enthusiasts of the Cold War that competitive space exploration commenced with Sputnik and the quest to dominate this new territory. Historian Douglas Brinkley's *American Moonshot: John F. Kennedy and the Great Space Race* discusses the impact of Sputnik on the public and on American politics in 1957, commenting that American prestige had been damaged with the launch.[70] Further, physicist Neil DeGrasse Tyson argued that Sputnik "spooked" the United States in a space race.[71] Additionally, historian Susan Cadbury argued the

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[69] Kenneth Osgood*, Total Cold War: Eisenhower's Secret Battle at Home and Abroad,* (Lawrence: University of Kansas Press, 2006), 323.

[70] Douglas Brinkley. *American Moonshot: John F. Kennedy and the Great Space Race*, (New York: Harper Perennial, 2019), 135-138.

[71] Neil DeGrasse Tyson. *Space Chronicles: Facing the Ultimate Frontier* (New York: W.W. Norton, 2012), 5.

conquest for supremacy in space was borne out of the "unparalleled rivalry" between the United States and the Soviet Union that began immediately following World War II.[72]

It is from this standpoint that commercialization became relevant and grew out of the technocracy of the space race.[73] While this is basically true, this idea resonated from the ideological perspective of the era rather than from the pure concept of exploring for other purposes that are potentially more meaningful to humans than military or technical contests.

Several actors known here as merchants of space contributed the evolution of commercialization. The goals of merchants included the desire to implement better forms of communication and remote sensing satellites, to influence popular space culture, to design government policies related to national budget and foreign space competition, and as an effort to solve problems on earth using celestial resources, resulting in the expansion of a space economy. This includes learning the extent to which merchants successfully achieved their goals and crafted American perceptions about space.

The propaganda value of this period was critical to shaping perceptions and delivering spectacles that guided public thinking about the Soviet threat in space. Walter L. Hixson argues in his book, *Parting the Curtain: Propaganda, Culture, and the Cold War, 1945-1951,* published in 1997, that Eisenhower grasped the psychological war fare game and played in it well.[74] Hixson provides the detached view of early Cold War era from the perspective of the post-cold war lens. He argues that American psychological warfare and the cultural exports to Eastern

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[72] Susan Cadbury, *The Epic Battle Between America and the Soviet Union for the Dominion of Space,* (Great Britain: Perennial Books, 2005), xi, 300.

[73] Arthur L. Levine. "The Commercialization of Space, Policy, and Administration Issues," *Public Administration Review* 45, no. 5 (1985), 2. See also, Roger D. Launius. "The Historical Dimensions of Space Exploration: Reflections and Possibilities," *Space Policy* 16 (2000) 23-38.

[74] Walter L. Hixson. *Parting the Curtain: Propaganda, Culture, and the Cold War, 1945-196, (*New York: St. Martin's Griffin Press, 1997, 167.

Europe were essential in winning the Cold War. Part of this was the seen through the Marshall Plan, which subsidized the rebuilding of Europe in the aftermath of World War Two (WWII) and rebranded provincial economies to that of successful, capitalistic, American trademark. Along with many items transported to Europe in the post-war such as soft drinks, cars, fast food, fashion, were idea about the significance of maintaining Western democratic principles. Hixon argues that these items filtered through the Iron Curtain and played a significant commercial role in breaking down Soviet influence in that hemisphere. This demonstration of capitalism would also be used as ammunition in the Space Race.

In the late 1960s through the 1980s the United States shifted from a purely defense stance to technological supremacy posture. This shift focused on launch capabilities rather than just satellite development. Missile manufactures contracted with NASA to produce (ELV) for the purpose of deploying satellites into LEO, Medium Earth Orbit (MEO), and Geostationary Orbits (GEO) and to achieve the biggest spectacle of landing a man on the moon before the Russians.[75]

This also reflected a more moderate approach about the causes of the Cold War that challenged the traditionalist perspective. Revisionist historians argued that the Cold War reflected more of a U.S. responsibility for the ideological competition due to its capitalist economic interests around the globe. This revisionist approach presented a new perspective that technology production was possible because of capitalism.[76]

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[75] Federal Aviation Administration. "Origins of the Commercial Space Industry," accessed May 5, 2023, https://www.faa.gov/space.

[76] Thomas G. Patterson. "The Origins of the Cold War," *OAH Magazine of History,* Vol. 2, No. 1 (Summer, 1986), 18. Published by Oxford University Press, p 2-3Thomas Patterson and William Appleman Williams also argued that the real intent of the Truman Containment Policy was to promote self-interests and sway countries to accept Western ideals to support its economic goals. Examples of this include the Marshall Plan and the formation of the North Atlantic Treaty Organization (NATO), each of which established the American brand in Europe. See also, William Appleman Williams, *Tragedy of American Diplomacy* which argued that capitalism was the blame for U.S. expansionism during the Cold War, which led to self-serving economic interests by establishing new markets for its goods. Williams further argued that it was not the atomic the atomic bomb that led the U.S to take a hardline

with commercial ventures both on earth and in space. The effects on the public are highlighted by Jodi Dean in *Aliens in America: Conspiracy Cultures from Outer Space to Cyberspace.* Dean attributes the variety of popular cultural depictions of aliens intertwined with societal beliefs manifested by these genres that reflect pervasive attitudes toward capitalism.[77] The participation in these venues themselves are acts of consumer culture and merchants of space that sell this commodity also contribute to the trend of the long commercialization.

Government policy continued to shift with each presidential administration, agencies, and NASA, administration. Ronald Reagan was one of the most pro-space presidents, possibly except for Donald Trump, which in 2016 create a new branch of the military called the Space Force. During the Reagan administration, years, there were optimistic efforts to bolster support for private industry directly led to on-going commercial space polies in future administrations, including both George H.W. Bush and George W. Bush, Barak Obama, and Donald J. Trump.

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approach to the U.S.S.R, but economic gains through an "open door" policy and global corporate leadership. This view is counter argued by post-revisionist historians that consider a multitude of factors leading to the Cold War. This would also be argued in the case for space commercialization. See also the Foreign Assistance Act of 1958 which states in the opening lines "To promote world peace and the general welfare, national interest, and foreign policy of the United States through economic, financial, and other measures necessary to the maintenance of conditions abroad in which free institutions may survive and consistent with the maintenance of the strength and stability of the United States," https://www.marshallfoundation.org/wp-content/uploads/2014/06/Foreign_Assistance_Act_of_1948.pdf, the Economic Cooperation Act, 1948 which states in section 102(a). "The policies to be effectuated are the encouragement of the nations of Europe, "through a joint organization to exert sustained common effort ... which will speedily achieve that economic cooperation in Europe which is essential for lasting peace and prosperity"; the sustaining and strengthening of the "principles of individual liberty, free institutions and genuine independence in Europe through assistance to those countries of Europe which participate in a joint recovery program based upon self-help and mutual cooperation"; provided, that the continuity of United States assistance should be "dependent upon continuity of cooperation among countries participating in the program."25 All this is to be achieved through the rendering of assistance to the participating countries to the extent necessary to enable them to become independent of extraordinary outside assistance.". and the Economic Recovery Act, 1948 which is also known as the Marshall Plan which proposed that the United States provide economic assistance to restore the economic infrastructure of postwar Europe, https:// history.state.gov/milestones/1945-1952/marshall-plan.

[77] Jodi Dean. *Aliens in America: Conspiracy Cultures from Outerspace to Cyberspace*. (Ithaca: Cornell University Press, 1998).45-100.

Detailed primary sources from presidential archives and from NASA reveal the extent to which commercialization became an important priority for administrative agendas.

For example, Lori Garver, former Deputy NASA Administrator argues that during the Obama administration, there was a substantial shift from funding NASA to partnering with private industry more than had previously occurred. In her book, *Escaping Gravity: My Quest to Transform NASA and Launch a New Space Age,* she argues that in light of fiscal concerns in other areas, and of the lack of progress within NASA in building a new transportation system to replace STS, it was necessary to recruit as many investors for space launch projects as necessary to remove the tax-payer funded burden for expensive government space activities that were overdue and overbudget.[78] These, she claims were best performed by innovative, fresh minds that produced faster and cheaper capabilities. Garver also argues that the commercialization of space included the concept that private industry development and exploration is part of the American fabric and democracy. She added that producing more value added innovations enabled a flourishing space economy and "broke a cycle of self-interests and taxpayer funded programs. The result was more efficiency and meaningful progress."[79]

Another example includes the demonstrations by Space Exploration Technologies (SpaceX), Virgin Galactic, and Blue Origin, modern entrepreneurial space merchants who rely on vision and technological determination to accomplish goals in using private launch and access to break through the bureaucratic atmosphere and become leaders in the commercialization of Space. Christian Davenport highlights the evolution of these companies in his book *The Space*

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[78] Lori Garver, *Escaping Gravity: My Quest to Transform NASA and Launch a New Space Age,* (New York: Diversion Books, 2022).

[79] Lori Garver. *Escaping Gravity: My Quest to Transform NASA and Launch a New Space Age*. (New York: Diversion Books, 2019) Front matter and epilogue, 242.

Barons: Elon Musk, Jeff Bezos, and the Quest to Colonize the Cosmos.[80] One of the goals, Davenport writes, is to reengage American interest in space exploration through commercialization. Tracing the driving force behind commercialization in this book reinforces the commitment to marvel in that these wealthy entrepreneurs invested billions in creating a monumental lift resurrecting the significance of space exploration and accomplishment through commercialization. Their mammoth rockets like the Falcon 9 and Falcon heavy have become new icons in space adventures, replacing the Apollo, Titan, and other classic missiles of the early space race. The aging launch vehicles (LVs) catapulted dreams and engineering research to one day go beyond the moon to Mars.

NASA also possesses a vested interest in shaping commercial space policy. This research reveals they transitioned from the dominant space entity to one that operates in conjunction with private industry for access, project sharing, transportation, low earth orbit (LEO) and deep space exploration. NASA's partnering with private and commercial ventures is vital to obtaining continued funding and relevance, as well as maintaining government control over the space industrial complex and economy. Moreover, as the primary stakeholder in space ventures, NASA contributes to the space economy with various satellite endeavors and regains opportunities for deep space exploration projects.

NASA History Office and Archives contain a vast amount of collected research and data, with online libraries and physical research rooms. Some the material is also housed in the National Archives and presidential libraries. One example is the webpage with journal, e-book, and policy documents about the rise of commercial space with NASA, citing that NASA

[80] Christian Davenport. *The Space Barons: Elon Musk, Jeff Bezos, and the Quest to Colonize the Cosmos*. (New York: Public Affairs, 2018), 48.

Administrator Mike Griffin in the George W. Bush Administration set the goals to design and build a new space transportation system, known as Commercial Orbital Transportation Services (COTS) to stimulate the space market.[81] Additionally, NASA's news archives include past and current update on their role in the space economy. This is a useful resource with an extensive archive. One example that supports the idea of NASA as a merchant outline how this commercial partnering impacts future economic development and work in microgravity environments that potentially iterate new opportunities for space business operations and investors. This will enhance accessibility to space and fund deep space missions to study the cosmos, utilize resources to benefit humanity, and help solve problems on earth.[82]

Between 2009-2018, news of Mars and the possibility of manned mission to the planet filtered through social media in the twenty-first century. While Mars intrigue has existed since before the space race began, this modern media accelerated interest and gave minute by minute details of commercial space endeavors. The silvery moon of 1957 that took Americans to the first celestial object transformed that same spirit into an even greater destination like Mars. Elon Musk said it best with "you want to wake up in the morning and think the future is going to be great…and that is what a spacefaring civilization is all about…I can't think of anything more exciting going out there and being among the stars."[83] This entrepreneurial passion represents the epitome of commercialization. It entices excitement and innovation and captures the public's imagination. Consumer buy-in is one form of shaping cultural attitudes about what comes next.

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[81] "Space Commercialization." NASA. Last modified December 16, 2020. Accessed October 9, 2022. https://www.nasa.gov/centers/hq/library/find/bibliographies/space_commercialization.

[82] "NASA's Commercial Partners Move the Needle for Space Station Destinations", March 27, 2023. https://www.nasa.gov/leo-economy/Commercial_Partners_Move_Needle.

[83] Elon Musk. SpaceX. Mars & Beyond. Spacex.com/human-spaceflight/mars/.

SpaceX's retro-design travel posters capitalized on the push for private access and participation through the consumer markets, helping to shape societal perceptions about the proximity of visiting the red planet. Advertisements displaying "Jetson-Like tourists on Mars" personified space travel and infiltrated American psyches in a way that made fantasy seem a much closer reality.[84]

Likewise, space historians Rod Pyle and Robert C. Jacobson argue that the idea of investing space, both highlighting economic gains from business and exploration opportunities w helps the planet by using the space environment to collect resources, conduct experiments and generating a new economy based in LEO. The impact of a new space industry and economy also have a multiplier effect for new start-ups, expanding industries, opportunities for academic research, and for post-cold war historians' perspective, opportunities for internationalization and democratization of space. *Space 2.0: How Private Spaceflight, a Resurgent NASA, and International Partners Are Creating a New Space Age* and *Space is Open for Business,* respectively. [85]

This reflects some of the stated goals of entrepreneurs like Space Exploration Technologies (SpaceX), Blue Origin, and Virgin Galactic, older companies like Northrup Grumman and Boeing, as well as fledgling companies such as Bryce Technology to name a few.

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[84] Ibid 246.

[85] Rod Pyle. Space 2.0: *How Private Spaceflight, a Resurgent NASA, and International Partners are Creating A New Space Age* (Dallas, TX: BenBalla Books, 2019), Chapter 3,7, 8, 10. See also Robert C. Jacobson, Space is Open for Business, (Los Angeles, CA: Robert C. Jacobsom.com, 2020), 2-5, 148-170, 197-233.Argues further the commercialization of space includes more than an economic landscape extended to LEO, but also an evolution of humanity through technical innovation translated to mankind through industry, infrastructure, and economic democratization. This concurs with SpaceX Founder, Elon Musk's mission statement. See SpaceX Website, Human Spaceflight, Making Life Multiplanetary. https://www.spacex.com/humanspaceflight/. See also Roger P. Launius, *Critical Issues in Human Spaceflight*, NASA publication, 2006, Chapters IV and VI. See also, Lori Garver, *Escaping Gravity: My Question to Transform NASA and Lunch a New Space Age*, (New York: Diversion Books, 2022).

Research findings thus far in the industry point out perspectives and benefits of commercial endeavors in space that include longevity and posterity of humanity, capitalizing on energy resources, and conducting experiments to support advances in medical, environmental, and communication technologies.

Chapter One introduces the topic and identifies modern historiographies and existing scholarship about the commercialization of space. The primary consideration in this chapter is to introduce the question concerning what drove the commercialization of space and how it impacted society. Chapter Two argues that one of the driving forces of the commercialization of space during the Cold War was the result of manufacture and sale of various forms of communication, including newspapers, magazines, science fiction and technical publications, propaganda and other print medium, as wells as the development of satellite and telecommunications.

Chapter Two also examines commercialization from the perspective of communication merchants who include publishers of propaganda, psychological warfare, the effect and impact of perception management as part of the commercial space economy, and symbolism. It expands the definition of commercialization of space by exploring the industries that promoted space like advertising agencies, newspaper editors, and technical spectacles. It seeks answer the question how various methods of communication supported the early space program, shaped public perceptions about America's purpose in space exploration, and how these efforts contributed to a space-based economy. This includes DoD contractors and the manufacture of satellites, agencies supporting propaganda, spectacles, and symbolism. It explains how these products drove the commercialization of space and impacted society.

Chapter Three argues that popular culture and consumerism were driving forces in the commercialization of space. Space merchants including film and television studios, producers, and manufacturers of consumer products reflected popular consensus during the Cold War and built a space economy that incorporated imaginative technology, space societies, and the impact of social interaction in space environments. These space markets capitalized on fears of communism, often portraying themes of good versus evil, alien invasion, and eventually the benefits of cooperation. The popular consumer space market invigorated real life innovators that helped transition the visionary aspect of the productions to modern private industrial interaction and influence in the commercial space business.

While space-age products ranging from food, toys, cars, home goods, or architecture did not directly create a transition from a government sponsored space program to a private industry based control, it indirectly helped this transition through the popular cultural effect of the early propaganda and adverting. The question in this chapter concerns how consumerism contributed to public acceptance of space exploration and uncovers venues that propagate the possibility of humans in space, such as through entertainment and establishing space commerce. Movies, television, and fascination with alien subculture contributed to the commercialization of space and impacted society through its increasing eagerness to participate and emulate space characters and lives.

Chapter Four argues that collaboration between the government and private industry began to develop a prosperous space-based economy. It explores the impact of the economy and perception of spectacle which assisted transition from sole government access and control of space activities to partnering with private industry. It asks what role new industries had in building a framework for a commercial and space-based economy, as well as, what incentives

were used to support this, and how non-industry owning employment in local communities contributed to and benefited from space industry efforts.

Chapter Five argues that domestic and foreign competition associated with NASA as a merchant of space cultivated a rapidly expanded space economy within the public and private sphere and with foreign space agencies. It answers the question impact did this competition have on NASA's decisions to transfer many of its launch capabilities to private industry to focus on more scientific endeavors related to exploration scientific vehicle production. It shares the impact of human space flight research and development on society, including products made for the space program that have become either commercial consumer merchandise, or other life enhancing or supporting products. The chapter examines commercialization from this point of view as a significant contributor to building, promoting, and supporting a commercial, space-based economy beginning with the International Space Station and new space transportation vehicles. It also sheds light on the burgeoning democratization of space.

Finally, Chapter Six argues that entrepreneurs represent the final driving force for the commercialization of space by building on the innovation, drive, and unlimited resources offered during the Cold War and by utilizing Western economic methods which enhanced the U.S. presence in LEO as provided global benefit. Entrepreneurs became the drivers of launch, access, and human exploration of deep space by removing government barriers to practical operations and development of cost-effective means of human space activities. It examines the role of entrepreneurs as merchant and the contributions in building, operating, and maintaining space launch vehicles. It demonstrates how the pioneering spirit and quest to expand the human presence in space promoted value-added products and services for humans through a multiplicity of commercially based applications, and industries. This includes manufacturing, transportation,

communication, mining of resources, tourism, and technology to benefit the earth. These areas help answer the primary question of what drove the commercialization of space and how it impacted society. It also sets the stage for further deep space exploration, eventual colonization, and a democratization of access, contribution, and benefit of a space-based economy.

Chapter Seven concludes the dissertation by reiterating the driving forces behind the commercialization of space as a function of the Cold War and Western economic principals as an additional perspective separate from the result of late and post-Cold War policy actions.

Chapter 2

By the Light of the Silvery Moon

When Lillian Lorraine first crooned "By the Light of the Sil'vry Moon" in 1909, audiences fell under the spell of the honeymooning couple whose dreams were cast by a lunar glow.[1] Likely, the Tin Pan Alley moon series songwriters Gus Edwards and Edward Madden had no idea of the metaphorical uses their song might lead to in the decades to come. For example, Edwin Marcus demonstrated concern regarding the possibility of the United States falling behind in the arms race because of *Sputnik* in his 1957 *New York Times* cartoon editorial, signifying fear in both the United States and Great Britain.[2] The cartoon depicts Uncle Sam and John Bull reading a newspaper with the slogan "defense speed up" by the light of the silvery *Sputnik* moon. Additionally, artist John Collins captures this symbolism in his cartoon by the same name with John Foster Dulles contemplating a response.[3] This symbolism reflected the mixed reaction to the spectacle of *Sputnik*.

Symbolism became an important feature in the Cold War competition for the Eisenhower Administration in the wake of the *Sputnik* launch. Through symbols, the U.S. government communicated power and influenced public perceptions of strength and supremacy. This strategy

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[1] Philip Furia and Laurie J. Patterson, *The Poets of Tin Pan Alley: A history of America's Great Lyricists*, Second Edition, (New York: Oxford University Press, 1990), 72-74. The Tin Pan Alley Moon series written as part of the *Ziegfeld Follies* in the early 1900s. Some of these songs introduced a more relaxed and sexualized culture like that of Parisian music and stage, but also romanticized love and attraction. Songs of the period mainly concerned. Culture, American landscapes, and families. *By the Light of the Silvery Moon* along with sone like *The Moon has Eyes on You* (1905), *Laughing Moon* (1908), *There's No Moon Like a Honeymoon* (1908), and *I'll Sit Right on the Moon and Keep My Eyes on You (1912)* are some of the songs that convey these themes. See also Samuel E. Backer, "The Best Songs Came from the Gutters: Tin Pan Alley and the Birth of Manhattan Mass Culture," *The Journal of the Gilded Age and Progressive Era*, 22, no. 4 (2023): 384-405.

[2] Marcus, Edwin, Artist. *By the Light of the Silvery Moon.* United States Great Britain, ca 1957. Photograph. https://lov.gov/item/2016683503/. Accessed June 15, 2023.

[3] McCord Stewart Museum. *By the Light of the Silvery Moon.* Canada. Object number M965.199.7349, https://collections.musee-mccord-stewart.ca/en/objects/32193/a-la-lueur-de-la-lune-argentee.

began in the post-WWII era during the Truman Administration and incorporated deliberate actions that helped shape public attitudes in American society toward outer space activities. For example, when speaking at the 100th anniversary of the U.S. National Science Foundation in 1948, President Truman indicated that he had formed a Scientific Research Advisory Board whose mission to fund and conduct scientific research was outlined as necessary for the welfare of the nation.[4] Scientific research was critical to national strength and government would undertake that initiative. He indicated several areas of research through agencies like the Atomic Energy Commission, national military laboratories, and the Federal Security Agency. He added that "The National Advisory Committee for Aeronautics has expanded its many aeronautical developments."[5] From this last point, a concerted effort developed to fund and research space medicine.

Several areas of space-related research emerged in the 1940s, including guidance systems, target acquisition, vehicle propulsion, and atmospheric sciences.[6] These actions were reported in various public trade and culture magazines like *Colliers*, *The New Yorker*, *Aviation Week and Space Technology,* and military publications by RAND or ABMA.[7] Space-oriented lexicon entered the public's language in the 1930s and 1940s via science fiction magazines and publications like *Magazine of Fantasy and Science Fiction*, *Science Fiction Quarterly, Other Worlds, Universe Science Fiction, and Science Stories*. While the American public had a vast

[4] Harry S. Truman, "Speech Delivered to the Centennial Anniversary of the American Association for the Advancement of Scientific, 1948," https://www.nsf.gov/about/history/nsf50/truman1948_address.jsp

[5] Ibid.

[6] Rip Buckley, *The Sputnik Crisis and the Early United States Space Policy*, (London: MacMillan, 1991), 45-48.

[7] "William Kroger, "Lockheed Consolidated Merger Would Create a New Aircraft Giant," September 16, 1946, *Aviation Week and Space Technology,* 7-9, https://archive.aviationweek.com/issue/19460916#!&pid=6, See also same issue with NACA rocket test at Langley Filed and Ames Research Center. Both companies testing space gear in pressurized suits and modifications of the old V-2 rockets.

interest in space fiction, their connection to the reality of humans in space developed through their rising awareness of satellite and missile technology after WWII.

The effort to solicit private enterprise to help establish and manage the American brand image both at home and abroad contributed to the commercialization of space using various communication mediums. To understand how the relationship between the government of the United States and agencies it contracted formed to manufacture a favorable public perception of U.S. power, it is necessary to question that the goals of the early Cold War governments of Presidents Truman, Eisenhower, and Kennedy.

What methods did the U.S. government employ to communicate power and influence public perception its role in the space age? How did firms producing propaganda, advertisers selling America, and communications technology engineers commodify space? Agencies that communicated power and perception of the U.S. technological strength became Cold War merchants selling outer space dominance; to what extent did their efforts drive the commercialization of space?

This chapter argues that U.S. communication merchants commodified space and mass transmitted Western economic power and influence in shaping public perceptions of technological superiority while selling space and initiating a long transition of government-led access to private industry operations in Low Earth Orbit (LEO).

Historians of media, presidential history, diplomatic history, and social history view power, influence, and symbolism in divergent ways. For example, James Chapman who studies British popular culture focused broadly on the cultural impact of propaganda and film in the Second World War and early Cold War period. Lary May argued that a significant connection existed between the national government and Hollywood along with some its most glamorous

stars. The films produced communicated power for both conservative and liberals alike by "reshaping utopian view and defining a consumer ethos."[8]

May also argued that in the Post-war America, Hollywood film makers adhered to a consensus assertiveness that filtered into the consumer culture with future growth in the industry on the horizon.[9] Big name stars like John Wayne and Ronald Reagan portrayed traditional American values. While this represents a sector in popular commercialization during the Cold War, these actions also applied to space-age culture through good versus evil casting well-known actors like Hayden Rorke, Leslie Neilson, James Drury, and Harry Dean Stanton.

Power, superiority, and consensus forms of psychological warfare in the Eisenhower Era existed in journalism in newspapers and magazines. They impacted upon political events and society and "became an integral component of statecraft."[10] These forms of media influenced the American public and coalesced power of mass communication via some form of commercial forum. Assorted disciplines of history related to the Cold War and space race are functions of commercialization of space. Their contributions relied in many ways on the capitalization of fear and technological aplomb which created power and influence through print communication media.

One of the biggest drivers of power is fear. Both the United States and the Soviet Union concentrated on alarm to advance their respective interests during the Cold War and in the age of Sputnik. French philosopher and economist, Bertrand de Jouvenel, defined power in terms of

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[8] Larry May, *The Big Tomorrow*, (Chicago: University of Chicago Press, 2000), 202-203. May is a cultural historian.

[9] Ibid, 211.

[10] Kenneth Osgood, *Total Cold War: Eisenhower's Secret Propaganda battle at home and Abroad*," (Lawrence: University of Kansas Press, 2006), 15-16.

fear that societies inculcate in their daily lives.[11] For example, the threat of nuclear war, of aggression, the unknown consequences of new technological events. Psychologist Vanessa LoBue argued that fears are of result of conditioning or experience.[12] In the early Cold War, government communicated power through various commercial means connected to the space age. Each of the methods targeted the citizenry to peddle negative attitudes towards communism and positive ideas about the strength and desirability of democracy and the United States.

In 1946, the Clifford-Elsey Report documented ideas about American-Soviet relations in the post-World War II years, highlighting significant caution regarding the global and military intentions of the Soviets. The report suggested that the U.S. needed to filter out communist penetration into the country, study cultural and intellectual aspects of Soviet society, and participate in scientific and technical exchanges to help foster motive relations.[13] It further concluded that it was necessary to keep the U.S. public well-informed of the Soviet record of evasion, militarism, aggression, misrepresentation of its intents and perceptions of the United States.[14] This early evidence of the value of public perception contributed to developing political

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[11] Bertrand de Jouvenel, *On Power: The Natural History and its Growth*, (Carmel, IN: Liberty Fund from Viking Penguin,1976), 89, 95.

[12] Vanessa LoBue, "How We Learn to be Afraid, *Psychology Today,* October 12, 2020, https://www.psychologytoday.com/us/blog/the-baby-scientist/202010/how-we-learn-be-afraid, Accessed January 2, 2024. See also, Patrick Anselme, "Reward Uncertainty and the Aversion-Attraction Dilemma," Chapter One in *Advances in Motivation Science, ed.* Andrew J. Elliot, volume 9, 2022. Discusses dilemmas associated with fear of uncertainty in which humans must solve to be able to provide for its safety and anticipate future acts. See also, Ellen Schrecker, "McCarthyism: Political Repression and the Fear of Communism," *Social Research,* Vol 71, no. 4, FEAR: Its Political Uses and Abuses, (Winter 2004), argued that the Federal government was the main actor in perpetuating anti-communist fears and designated communism a perceived threat to the US way of life, p1043; further that the language of NSC-68 resented this threat as an attempt to destroy civilization, 1048. This same language evolved in the 1950s and 1960s space race where commercial efforts to propagandize this sentiment through messages in magazines, newspapers, comic book characters, film, art, billboards, stamps, etc.

[13] Clark M. Clifford, Special Counsel to the President, "Letter to President Truman," September 24, 1946, https://www.trumanlibrary.gov/library/research-files/report-american-relations-soviet-union-clark-clifford-clifford-elsey-report?documentid=NA&pagenumber=1, accessed November 15, 2023.

[14] Ibid.

decisions and activities that culminated in space activity as early as the late 1940s via satellite research and development using confiscated rocket technology from the Nazis.

In 1945, just after President Truman authorized the use of the atomic bomb to end the war with Japan, Nazi rocket scientist Werner von Braun surrendered to U.S. forces at Peenemunde. He subsequently transferred to the United States to work on Trumans missile development programs run by the Army Ballistic Missile Agency (ABMA). One of von Braun research ideas included building rockets powerful enough to insert mirrors in space to reflect weather on various cities around the globe.[15]

He further expressed his position that to explore space effectively it was necessary to build and launch an orbiting space station. This appealed to Truman since part of his doctrine included containing the Soviets by any means possible. As von Braun implied, scientific and nuclear weapons could be the cargo on a space station.[16]

In the late 1940s, as ballistic missile research accelerated, several private sector companies participated in warfare studies with special intertest in meteorological science and defense applications. Multiple aerospace industry companies worked closely with military research focusing on design and manufacture of increasingly long-range missiles such as Intercontinental and Medium range Ballistic Missiles (ICBM and MRBM). Applications of these missiles to innovation in artificial satellite production convinced Consolidated Vultee (Convair) to promote and build the Navy's Vanguard Rocket.[17] Additionally, Douglas Aircraft's research

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[15] Fred Nadis, "Nukes on the Moon When the Atomic Age Met the Space Age," *Astronomy Magazine,* March 1, 2022, stronomy.com/observing/nukes-on-the-moon-when-the-atomic-age-met-the-space-age/.

[16] Nadis, 1. See also The Truman Doctrine, Harry S. Truman Address to a Joint Session of Congress, March 12, 1947. https://avalon.law.yale.edu/20th_century/trudoc.asp.

[17] Rip Buckley, *The Sputnik Crisis and Early United States Space Policy*, (London: MacMillan, 1991), 45.

division known as RAND, became a separate entity called the RAND Corporation. Increased interest in the space domain led to feasibility studies for advanced rocketry with payload.

In October of 1945, Air Force Captain W.B. Cogswell, who was involved with the Navy's Bureau of Aeronautics formed the Committee on the Feasibility of Space Rocketry and for the first time commits to the development of an American artificial satellite.[18] Furthermore, J.E. Lipp of the Douglas Aircraft Company, Project RAND division, estimated that the technology was sufficient for the development of satellites and concluded that it would either be the United States or the Soviets in his report on satellite studies in February 1947. His study reflected on various components and uses for satellites for which companies like Aerojet and Douglas Aircraft would manufacture.[19] The report also conveys the cost estimates for such a project, and he analyzed the opportunity cost of failing to act on certain specified areas including long-range rocket development.[20] This last part he considered imperative. This information was transmitted to the White House and attached to the report were considerations for scientific research, military application, and psychological and political factors congruent with these emergent technologies.

By 1947, the symbolic honeymoon between the United States and the Soviet Union was over, and when *Sputnik* launched a decade later in 1957, a new silvery moon cast a shadow on the U.S. technological monopoly, increasing tensions between the two nations for dominance of the globe. The figurative silvery moon helped the Soviet Union stage one of the biggest

[18] Robert L. Perry, "Origins of the USAF Space Program, 1945-1956", Volume V (Space Systems Division Supplement) HISTORY OF DCAS 1961, 10, NASA Spaceflight Forum, https://forum.nasaspaceflight.com.

[19] J.E. Lipp, "Reference Papers Related to a Satellite Study, RA-15032," Douglas Aircraft Company, February 1, 1947, 41. In his report Lipp concludes that the technology has been established and that new vehicles are being produced and will be produced to propel a satellite into orbit around the earth.

[20] Lipp, 45.

propaganda feats during the Early Cold War.[21] In determining the reaction to *Sputnik*, the Eisenhower Administration acknowledged the credibility of the Soviet propaganda machine, thus confirming the powerful technological achievement reached. In a preliminary report conducted by the White House on reaction to *Sputnik*, President Eisenhower credits the Soviet scientists and engineers, while also gauging public reaction both at home and abroad. However, being perspicacious, he waited for the right moment to make a move.[22] The U.S. would reserve judgment on the extent to which the nation was significantly impacted by this event.

Although historian Kenneth Osgood argued that *Sputnik* successfully shook the confidence of the American government as well as the global public with its technological leap over the United States, who until this point enjoyed an unsurpassed monopoly, the report clearly comments that the perception of anxiety and intense emotional interest rested abroad, a view purported by the Soviet media, *Pravda*.[23] The propaganda machine used media as a vehicle to leverage doubt about the true military and technological capabilities of Western government systems. This ultimately affected the approach that President Eisenhower took to win over only international audiences, as well as influence domestic perceptions. Eisenhower's Press Secretary James Haggerty and his assistant Murray Snyder capitalized on the presidents long standing positive relationship with the press to convey the image that America was indeed the global technological leader despite the recent Soviet achievement. One of Eisenhower's key strengths

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[21] White House. "Reaction to the Soviet Satellite-A Preliminary Evaluation. October 16, 1957, Dwight D. Eisenbhower Presidential Library, https://www.eisenhowerlibrary.gov/sites/default/files/research/online-documents/sputnik/reaction.pdf.

[22] Reaction to the Soviet Satellite- A Preliminary Report. [White House Office of the Staff Research Group, Box 35, Special Projects: Sputnik, Missiles and Related Matters; NAID #12082706], Dwight D. Eisenhower Presidential Library, https://www.eisenhowerlibrary.gov/sites/default/files/research/online-documents/sputnik/reaction.pdf.

[23] Kenneth Osgood. *Total Cold War: Eisenhower's Secret Propaganda Battle at Home and Abroad,* (Lawrence: University of Kansas Press, 2006), 323.

was how he viewed the press. Stephen Ambrose wrote that communication was a single most important factor of leadership.[24] Public relations was President Eisenhower's trusted compass. He was confident that the news media would serve his interests.

Between 1955 and 1960, newspapers gained approximately five billion dollars from sales and advertising.[25] This figured accounts for over 300 American newspaper publications including local and national circulations. Newspapers in the twentieth century represented the largest news source for most Americans, even in the age of the radio and television. After the launch of *Sputnik, Explorer 1, Friendship 7, Surveyor 1*, and finally the moon landing in 1969, newspapers published more that 1000 articles detailing the events as American technological achievements related to space or armament.[26] What this meant was that the American public gained an opportunity to understand the events in a constant fashion, which helped fashion their perception about space and technology.

This widely used media format contributed to the commercialization of space through its influence on readership and sales. Newspapers communicated ideas about national identity, consequently shaping public attitudes about its role in the Cold War, and more specifically in the space race. The *Sputnik* launch galvanized newspaper editors in search of sensational stories geared for sales. Andrew Falk wrote that "the shapers of public opinion had a role to play in giving the Cold War character."[27] However, initially, in the wake of *Sputnik*, news articles had

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[24] Stephen Ambrose, *Eisenhower the President,* (New York: Simon & Schuster, 1984), 53.

[25] Newspaper Fact Sheet, Pew Research Center, November 10, 2023, www.pewreserchcenter.org/journalism/fact-sheet/newspapers.

[26] *New York Times*, various articles in Timesmachine archives, October 1957, https://www.newyorktimes.com/1957/10/11/archives/reply-to-the-sputnik.html?searchResultPosition=7. See also, Arlene Balkansky, "Newspaper Coverage for 'One Giant Leap For Mankind,'" August 20, 2019, *Library of Congress,* blogs.loc.gov/headlinesandheros/2019/08/newspaper-coverage-one-giant-leap-for-mankind/.

[27] Andrew Falk, "Reading Between the Lines: Negotiating Identity on American Television," *Diplomatic History*, "vol 28, no. 2, (April 2004), 2. Andrew Falk is a media historian. The article's focus concerns the rise of

yet to catch up with the persuasive intentions communicating perceptions about U.S. space and technological hegemony. American were still reading space science fiction, but not participating it its reality.

Several news articles generated after the *Sputnik* launch in 1957 characterized the event from multiple views hinging on their respective agendas. For example, if the American public were shaken, outraged, or in a state of disbelief, their demeanor did not initially reveal these emotions. As early as October 5, 1957 many newspapers either did not report or only mentioned in passing on the historical launch except for key outlets such as the *New York Times* and the *Washington Evening Star*. The general sense of these publications revealed more of a fascination with the event rather than fear, initially. For example, *The St. Croix Avis* reported in a small, front page section that the Russians launched an earth satellite and about two meters in diameter using intercontinental ballistic missile (ICBM) technology.

Other news concerned religious activities, wage hearings, and legislative accolades.[28] Likewise, the Alaskan paper *The Frontiersman* merely reported on October 10th that "a satellite seen by local residents flashed like a diamond."[29] It was not until October 18th that famed author and *Atlanta Constitution* columnist Celestine Sibley wrote a carefree article about Americans not having to follow the Russians in space to get an out of this world experience. While she referred to the time spent in traffic on a lackadaisical meander through the southern countryside to

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television in the 1960s but comments on news media and the collaboration between government and media and it influence on popular culture.

[28] *The St. Croix avis*. "The Russians launch and earth satellite months ahead of the U.S." (Christiansted, Vi), October 5, 1957, Library of Congress, https://www.loc.gov/item/sn84037526/1957-10-05/ed-1/.

[29] Alaska Frontiersman, October 10, 1957, (Wasilla, AK), October 10, 1957. https://www.loc.gov/item/sn84006942/1957-10-10/ed01/.

photograph and write for the newspaper, she subtly hinted at the infringing tech-political event.[30] By October 25th, the *Chapel Hill Weekly* published a comical commentary about *Sputnik's* effect on the American public, noting it was like an "old friend."[31]

Finally, Oliver Gale, in a memorandum to the Secretary of Defense Neil McElroy on April 14, 1958, indicated that the public opinion survey conducted immediately after the *Sputnik I* launch concluded that while the majority of the American public new about the launch, less than half gave it much thought or summarily dismissed it altogether.[32] The memorandum provides a cogent assessment of the public perception which focused heavily on peripheral issues, such as poor education in the areas of science and math, too much inter-service rivalry, and low wages for scientists and engineers, leading to what Congress called the missile gap. To Congress, the latter was the number one concern and what facilitated the Soviet launch. While the survey intended to garner the extent to which the method that Eisenhower Administration needed to respond to *Sputnik,* it highlighted key initiatives that the president would focus on in the weeks to come. These would also become spectacles associated with the early space race.

Meanwhile, in the immediate days following the launch, newspapers across the country ran front page stories about civil rights and justice events, Teamsters activities, or news about the economy. Even President Eisenhower made little fanfare, albeit intentionally, about the Russian moon other than to present a steadfast soldier's calm that indicated he was more confident in American technological prowess than in the Soviet satellite.[33] However, behind the closed doors

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[30] Celestine Sibley. "A Lovely Way to Work." *The Atlanta Constitution (1946-1984),* Oct 18, 1957: 25, https://www.proquest.com/historical-newspapers/lovely-way-work/docview/1534749320/se-2.

[31] "Then and Now," *Chapel Hill Weekly Observer* (Chapel Hill, N.C.) October 25, 1957, 2.

[32] Public Opinion Survey, April 14, 1958. DDE's Records as President, Official Files, Box 625, OF 146-F-2 Earth-Circling Satellites (2); NAID #12060495]. Accessed August 5, 2023.

[33] Robert A. Divine. *The Sputnik Challenge: Eisenhower's Response to the Soviet Satellite*. (New York: Oxford University Press, 1993), vii.

in the halls of Congress a different narrative was unfolding in another agenda. Trepidation was manufactured.

A political divide created in part by *Sputnik* evolved into two new agendas, each of which replied on newspaper reporting to influence, satisfy its audiences, and initiate some form of action. In some cases, the influence was reverse in that the American reading public influenced writing and the government action. The first was the calculated attack on the presidency and the Republican Party, the other to persuade through the efforts of the Whitehouse Communications Office to present a posture of conformity and unity as it portrayed the Soviet communists as aggressors. Using jingoistic headlines and opinion pieces (op-ed) helped sensationalize the stories for the American public and forced reactions by the intended audience.

"Senators Attack Missile Fund" was printed in the *New York Times* immediately following the *Sputnik* launch. Several Senators, including Lyndon B. Johnson, openly challenged President Eisenhower's response to their machinated defense crisis.[34] On November 4, 1957 the *Washington Evening Star* included a commentary on U.S. defense readiness in the wake of *Sputnik*. Texas Senator Lyndon B. Johnson teamed up with Democrats from other states to head a subcommittee to investigate whether Eisenhower effectively performed this duty. Johnson states, "we have fallen behind…we need to direct the attention of the American people to the frame of mind that we can explore drastic changes in our [space and defense] policies.[35] In another example from the *Farmville Herald* which discusses the political impact of *Sputnik* as more Democrats win gubernatorial elections demonstrating a lack of confidence in the Republican led Whitehouse on scientific and missile defense issues. This further prompted President Eisenhower

[34] "Senators Attack Missile Fund," *New York Times* (New York), October 6, 1957, Newspaperarchives.com

[35] "Bold Defensive Thinking Held Vital by Johnson," *Evening Star,* (Washington, D.C.) Nov 4, 1957, loc.gov, https://loc.gov/item/sn83045462/1957-11-4/ed-1/.

to appoint Dr. James Killian, head of Massachusetts Institute of Technology (MIT) as the special assistant to the president on scientific and technology.[36]

Walter Lippman, an influential journalist from the widely read *New York Herald Tribune,* recognized the monumental impact of the *Sputnik* event and penned an op-ed concerning the consequences of political and technological complacency. Lippman harangued the American public for its deceptive ideals that its prosperity protects it, and that McCarthyism destroyed any scientific and technological purpose. He pointed to *Sputnik* as a failure of America to launch the first satellite which inevitably would lead to a deterioration of American culture and way of life.[37] The symbolism of contentment and apathy fell upon some of the American public but was also a condemnation by many in the political community as well. Craig Allen argued that Eisenhower was forced to implement a national strategy of fear management to communicate to the citizenry after *Sputnik* that the U.S. was indeed a technological leader in the world.[38] Politization, propaganda, and commodified media helped drive the commercialization of space in the early Cold War as opportunities for the golden age of science fiction and the reality of *Sputnik* intersected. Jettisoned were the complacency and policies of the late 1940s as President Truman and then Eisenhower relied on mass communication and public perception to guide their course in the rising race to space.

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[36] "Democrats Win Major Elections: Sputnik Still Up," *Farmville Herald* (Farmville, VA), Nov 12, 1957, loc.gov, https://loc.gov/item/sn98068396/1957-11-12/ed-1/., 1, 5. The articles is a national news summary with no identified author. The articles highlight various events of the day in relation to Sputnik and goes on to express concern over Russian aggression.

[37] Walter Lippman, "A Society Cannot Stand Still," *New York Herald Tribune* (New York), October 10, 1957, https://www.pulitzer.org/article/sputnik-should-wake-us-our-failings.

[38] Craig Allen, *Eisenhower and the Mass Media: Peace, Prosperity, and Prime-Time TV*, (Chapel Hill: University of North Carolina Press, 1993, 151-153. Allen writes modern military and twentieth century history.

Other media formats influenced the American public and government action by including space-age designs and colorful images that shaped Americans' perceptions about the value of space exploration and technology. This reflected another form of commercialization. Non-fiction science magazines were more widely read in the 1950s and 1960s than today; however, publications such as *Popular Science* enthralled readers with articles and images of space design, rockets, and humans in space.

In the 1950s, space age design included various forms of architecture, sculpture, cars, furniture, playground equipment, motel signage, and a plethora of gadgets that symbolize a technologically influenced society. While most American's were not technically savvy, their growing connection to technology emerged parallel to the space race. Having space age consumer items represented the human capacity to commodify space and take part in an imagined future. But the future was also a growing reality. Advertisers and science writers impacted the commercialization of space socializing technology. In the May 1955 issue of *Poplar Science*, a family is shown flying over a residence in a spacecraft while below, a car is parked in front launching pad with a similar vehicle, indicating a social commonality. The image suggests that the Coleopter was a family mobile and predicted to be the airplane of the future.[39] The design featured provides visualization of research by Heinrich Hertel, a former German aircraft engineer, who promoted its touring uses claiming that "occupants may sit comfortable in upright and swivel seats," and for short-range transportation is the logical craft for "private and economical flyers."[40]

[39] Aiden P. Armagnac, "Why You May Fly in a Barrel" *Popular Science*, May 1955, 98-99.
[40] Ibid, 100.

The Coleopter was also heavily researched by NASA's Center for Aerospace Information (CASI) in 1968.[41] The X-14A Vertical Takeoff and Landing (VTOL) craft, based on the Hiller VXT-8 design by Hiller Aircraft, was originally designed in the 1950s. The research, as well w the design, was initiated by the Army and Navy's interest in viable helicopter exigence. NASA's research attempted to solve other flight problems during the space race including thrust, system control, acceleration, and yaw gyro, instruments and hardware required on spacecraft. The connection between the *Popular Science* advertisement and the later U.S. demonstrates the level of interest in space activity and the recognition of influence the space on society.

Other common science publications included *Modern Electronics*, *Weird Tales and Amazing Stories, Galaxy Science Fiction, Space Stories,* and *Mar Mission* each communicated ideas about the space-age and provided a way for the average American to keep abreast of new trends and events. They articulated ideas about the space era and promoted thought, causes, and products. This genre of print commodified space during a period of increasing interest in technological pursuits during the Cold War. Sales from magazines like these increased revenues for their publishers.[42] Throughout the late 1950s and 1960s, print culture became a merchant of space by capitalizing on what the government was already promoting, the technological supremacy of the United States. Prior to this era, active interest in scientific and space-related publications exited in small niches; after *Sputnik,* advertisers and publishers developed a new market based on excitement of the age.

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[41] Seth B. Anderson and Laurel G. Schroers, "A Review of Facilities and Test Techniques Used in Low Speed Flight," Ames Research Center, Moffett Field: 1968, NASA, https://ntrs.nasa.gov/api/citations/19680018186/downloads/19680018186.pdf.

[42] David Abrahamson, "Reflecting and Shaping American Culture: Magazines Since WWII," In book, *A History of the Book in America*, ed. David Hall, Vol 5, Chapter 7, ed. David Paul Nord, Joan Shelley Rubin, and Michael Schudson (Chapel Hill: University of North Carolina Press, 2014), 1-25. Discusses phenomenon related to the decline of some magazine titles and the rise of others. A primary reason is the post war culture of individuality and special interests related to the space age.

Collier's Magazine frequently published articles about space exploration and rocket technology. An eight article series penned by Werner von Braun, the leading rocket scientist in the 1950s and 1960s, and other well-known and respected scientists of the day, the articles were intended to engage the American public and build interest in space exploration. The first edition in the series boldly state that "Man Will Conquer Space Soon." The editorial page includes a lengthy discussion and argument for U.S. space program, claiming that the Soviets had already established the possibility of an artificial satellite and space station. The editors, explained that the U.S. was still too far behind and that the Secretary of Defense under President Truman, James Forrestal, declared there was an "earth satellite vehicle program." However, Werner von Braun and other scientists questioned the existence of such a program.[43] Since rocket research and space exploration development were funded by the federal government, Werner von Braun aptly sought interaction with American readers to generate even more interests and funding.

Magazines such as *Collier's* and *Popular Science* represented a form of space commercialization which drove interest in science and technology associated with the space race. Magazines, like newspapers, also offered a popular venue for advertising, driving the space economy and commercialization of space. Other popular magazines subsequently increased in publications as well, including *Popular Electronics*, *Popular Photography*, *The New Scientist, The Atomic Bulleting, and A Boys Life.*

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[43] Editors, "What Are We Waiting For?", *Collier's,* March 22, 1950, 23. https://dreamsofspace.blogspot.com/2012/03/colliers-march-22-1952-man-will-conquer.html. The entire edition is posted on the blog with colorful images and various articles about the reality and possibility of space travel and work. Contributors to the content include Wily lay, Fred Whipple Chairman of the Department of Astronomy at Harvard University in 1952, Joseph Kaplan, Professor of Physics and University of Southern California (UCLA), and Heinze Haber U.S. Air Force Department of Space Medicine. See also, New Mexico Museum of Space History for biographies on each of the men listed and for space history.

Not all magazine editors wrote favorable reports about the government's efforts in space exploration and travel. Robert Hotz who was the editor of *Aviation Week* (and later *Aviation Week and Space Technology*) captured some of the angst felt by those who opposed President Eisenhower's response to *Sputnik* in his editorial of October 14, 1958. Hotz bantered Eisenhower for allowing the U.S to fall behind scientifically by what he referred to as "a nation that couldn't even play in the same scientistic ballpark as the United States."[44] *Sputnik* symbolized for the United States a wake-up call.

While Eisenhower's opposition geared up with investigations, he privately met with Secretary of Defense Charles Wilson to speed up defense activity and rocket launch capability using the Redstone rockets built by ABMA and Werner von Braun. Wilson excitedly reported to the president in the months just prior to the *Sputnik* launch that the Jupiter-C missile had fired successfully. Both on August 26th and 29th, he reported the "propulsion system, aeroballistics behavior and range demonstration" were successful with "excellent telemetry "and good photographic coverage, only partially limited by cloud coverage."[45]

Despite challenging the Administration, *Aviation Week and Space Technology* consistently published articles supporting the space industry. It highlighted the feats and accomplishments for the manned space program along with the individual achievements of the astronauts. Between 1960 and 1970, nearly every issue contained a front page photograph of some aspect of the space race. For example, in the May 9, 1960 issue, there are advertisements

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[44] Robert Hotz," Sputnik in the Sky," *Aviation Week and Space Technology*, October 14, 1957, 21, https://archive.aviationweek.com/issue/19571014.

[45] Charles Wilson, Secretary of Defense, "Report to the President on Jupiter Test Firing, August 29, 1957, [DDE's Papers as President, Administration Series, Box 41, Wilson Charles 1957 (1)], Dwight D. Eisenhower Presidential Library, https://www.eisenhowerlibrary.gov/sites/default/files/research/online-documents/declassified/fy-2011/1957-08-29.pdf.

from multiple technology companies involved in the space program like Thiokol Chemical advertising valves for space vehicles, AiResearch for steering control mechanisms for spacecraft, Haloid Xerox for business machines, IBM for its supercomputers with ability to support mass amount of data for the space program, and Standard Steel Corporation advertising cryogenic equipment for missiles and rockets.

The print magazine culture of the early space represented a commodification of space. This led to increased interests in technology applications, increased revenues, and contributed to a steadily emerging space economy. It also reflected government's use of image-making to support and sell its ambitions for space exploration and technological superiority against the Soviet Union.[46] Image-making, advertising, and increased sales of popular technology, science, and science fiction magazines seemingly succeeded in its goal to raise support for the U.S. space program. According to NASA director Keith T. Glennan, the NASA budget for 1961 increased by a staggering 50 million dollars.[47]

Print advertising during the space-age ignited an entirely new industry based on fascination with Cold War themes and social interaction with the elements of *Sputnik*, Mercury, and NASA. As magazine interest peaked, advertisers rushed to purchase ad inventory. Prior to the 1950s, much of the ad space related to household or consumer items and were either black and white or with little design or image. Post-sputnik and the rise of the space age, advertisers spent millions on creating stand-out visual print.[48]

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[46] Michael L. Smith, "Selling the Moon: The U.S. Manned Space Program and the Triumph of Commodity Scientism," in *The Culture of Consumption: Critical Essays in American History, 1880-1980*, ed Richard Wightman Fox and T.J. Jackson Lears, (New York: Pantheon Books, 1983), 178.

[47] Contributor, "NASA Budget Boosted by Senate Group," *Aviation Week and Space Technology*, May 9, 1960, 27. https://archive.aviationweek.com/issue/19600509#!&pid=36.

[48] Robert J. Cohen and Douglas Galbi, "U.S. Annual Advertising Spending Since 1919," Cohen Structured Advertising Dataset, 2008, https://www.purplemotes.net/2008/09/14/us-advertising-expenditure-data/, retrieved

Ads reinforced government efforts at generating public perceptions of the U.S. in the Cold War and in the leader in the space race. For example, colorful graphics detailed fantastic technical possibilities, gadgets, and potential opportunities for human participation in space. In fact, advertising developed into its own cultural phenomenon and "as a mass civic objective…that was as much ideological as technical."[49]

One aspect this campaign, however, remains overlooked when considering the segments of the participating populations and how they were influenced. Much of the print culture of the era directed its attention to the dominant white population and neglected to an extent minority groups. While this had no effect on the objective in the Cold War, the space race, or the commercialization of space, it initiated a periphery movement in civil rights so closely connected to the tenets of Cold War messaging. For example, African Americans struggling domestically and consistently blocked from participating in key roles in the space program saw opportunities to advance their causes for equality stemming from U.S. global efforts in promoting that very theme.[50] There were significant contributions to the space program by African Americans during this period, however, most were excluded from obtaining the necessary education or consideration for priority occupations until the late Cold War.[51]

March 1, 2024. See also, Louis D. Johnson and Samuel H. Williamson, "The Annual Real and Nominal GDP for the United States, 1790-Present," Economic History Services, 2005.

[49] Megan Prelinger, *Another Science Fiction: Advertising in the Space Age, 1957-1962,* (New York: Blast Books, 2010), 15.

[50] Vaughn Raspberry, *Race and the Totalitarian Century: Geopolitics in Black Literary Imagination*, (Cambridge: Oxford University Press, 2016), Chapter One specifically highlights challenges and ironies that many in the Truman Administration considered as they promoted the Cold War. The administration struggled to come to terms with African Americans fighting for America when America upheld systematic social discrimination. This led to the passage of the Executive Order 9981, which desegregated the military. Raspberries research also suggests that this move was in part motivated by attempts to polish U.S. image abroad in the Cold War. See also, John David Skrentny,. "The Effect of the Cold War on African-American Civil Rights: America and the World Audience, 1945-1968." *Theory and Society* 27, no. 2 (1998): 237–85.

[51] Shawn D. Lewis, "Professional Woman: Her Fields Have Widened," *Ebony Magazine*, August 1972, 32, Johnson Publishing CompanySee https://www.nasa.gov/history/honoring-african-americans-in-

Another development that arose from advertising print culture in magazines included enthusiasm for working in the space industry. Ads enticed readers to help build a future space economy and infrastructure where people accepted jobs supporting NASA whose recruitments increased dramatically in the 1960s from approximately 10,000 employees to near 34,000 by 1965, along with its annual budget.[52] NASA employment over the same period reflected an increase of nearly 400% growth from 8,000 to 237,000 employees at its peak in 1968.[53] One trend is clear; while magazine and print culture increased and included advertising, spending on NASA increased as well. No longer was science fiction and fantasy connected only to scientists and engineers, but to the American public as well who were eager to join the race. Advertisements engaged readers in a new industry and the U.S. government began recruiting. Figure 10 shows the annual budget increase that enabled growth in the organization. Recruitment consisted primarily of scientists, engineers and technical personal. However, technical support staff, trade and labor employment, and clerical and administration occupations also increased during this period.[54]

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space/#:~:text=These%20astronauts%20have%20made%20history,and%20commanding%20space%20shuttle%20missions.

[52] NASA, NASA Annual Budget, CISAerospace.org.

[53] Jan Van Nimmen and Leonard C. Bruno, NASA Historical Data Book, Volume I, SP-4012v1, (Washington, D.C., National Aeronautics and Space Administration, 1976), 51. The series provides statistical record of the history of NASA in th first decade of its existence.

[54] Jan Van Nimmen and Leonard C. Bruno, NASA Historical Data Book, Volume I, SP-4012v1, (Washington, D.C., National Aeronautics and Space Administration, 1976), 54-55. It is also significant to note that during the Cold War, the more prestigious jobs associated with rocket engineering, science, and aircraft piloting and development were considered traditionally male occupations. This trend slowly shifted throughout the Cold War as women were accepted into the astronaut program in 1978. See https://www.nasa.gov/image-article/nasas-first-class-of-female-astronauts/ and https://www.planetary.org/space-images/nasas-first-class-of-women. Likewise, there is new scholarship coming available in November 2024 by Loren Grush who argues that the first women were hired rusting from pressure in the feminist movement of the 1970s and had to overcome significant challenges including political, cultural, and practical roadblocks. There were not the first women ever teste for the space program; there were the first 12 Mercury women astronauts, but their testing was suspended when Congress deemed that experienced military pilots were needed. This is a direct contradiction to the publicly and propagandized egalitarian Soviets. See Cold War astronaut Valentina Tereshkova, https://www.nasa.gov/history/valentina-tereshkova-and-sally-ride-women-space-pioneers/. Two significant books that capture the roles of women in the space program during the Cold War include Nathalie Holt, *The Rise of the Rocket Girls: The Women Who Propelled US From*

Marquardt Aircraft Company ran colorful ads depicting space in the background with engineers in the foreground working on "state of the art" systems for air and space. The ad "invited those interested in a dynamic and exciting career in space operations to investigate employment opportunities."[55] American Bosch ARMA Corporation also ran numerous ads depicting work in outer space. The ads enticed readers and art weaved a story line by showing various activities taking place in the images created. While the ads seemed fantastic, they connected audiences with the possibility of taking part in the future. Print culture would precede and parallel other forms of communication supporting the commercialization of space.

As the press continued to generate revenue with commentaries, articles, and editorials about the space program and related content, advertising also represented a rising form of media that contributed to the commercialization of space. Two factors subsidized the U.S. role in the space during Eisenhower's and later in President Kennedy's administration. The first was print advertising and the second was digital via television and radio. Television played a crucial role by providing the citizenry a face-to-face conversation, albeit one way, with the president and other well-known leaders in the field. Also, as a new technological medium, shared images of actual events and advertisements geared toward support for America in the Cold War and space race.

As early as 1953, President Eisenhower characterized the Soviets as malevolent and without any moral grounding. In his State of the Union Message to Congress he defined the purpose of his foreign policy, which was to support democratic institutions around the globe,

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Missiles to the Moon to Mars, (New York: Black Bay Books, 2016), and Margot Lee Shetterly, *Hidden Figures: The American Dream and the Untold Story of the Black Women Who Helped Win the Space Race,* (New York: William Morrow and Company, 2016).

[55] Frank Tinsley, artist, Marquardt Aircraft Company ad, *Missiles and Rockets,* May 23, 1960, in Prelinger, 19.

create economic environments conducive to creating broader markets, and defy communist aggression. He further characterized the "turmoil around the globe" due to the calculated pressures of communism that threaten world peace."[56] President Eisenhower had usually enjoyed a favorable relationship with the press. The speech demonstrated is ease with public speaking. In future annual addresses, Eisenhower continued to bolster attitudes toward the Soviets with his rhetorical abilities.

In 1954, Eisenhower established the mission of the United States Information Agency, an organization created during World War Two that worked in conjunction with the office of War Information. He reorganized the agency so that its directors report to him through the National Security Council (NSC). While creating this civilian agency to dispel negative perceptions if the United States, it was intended, as Secretary of States Allen Dulles would later inform Director Arthur Larson, was to provide accurate and unbiased facts.[57] However, Eisenhower's mandate clearly indicated that its purpose was to "submit evidence to the peoples of the nations of the world by means of communication techniques….that the U.S. policies are in harmony with their aspirations for freedom and peace."[58] This reflected one of the methods the U.S. government employed to communicate power and influence public perceptions of the United States during the Cold War. This method continued in force throughout the space program as well. While not

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[56] Dwight D. Eisenhower, Annual Message to Congress on the State of the Union, February 2, 1953, Dwight D. Eisenhower presidential Library, https://www.eisenhowerlibrary.gov/sites/default/files/file/1953_state_of_the_union.pdf.

[57] Arthur Larson Papers, Box 2, Voice of American, Dwight D. Eisenhower Presidential Library, https://www.eisenhowerlibrary.gov/sites/default/files/finding-aids/pdf/larson-arthur-papers.pdf.

[58] Mission of the United States Information Agency, 1954,[DDE's Records as President, Official File, Box 748, OF 247 United States Information Agency 1954 (2); NAID #12648972], Dwight D. Eisenhower Presidential Library, https://www.eisenhowerlibrary.gov/research/online-documents/people-people-program, See also Newsletter on the People to People Program, Vol 1, no 2 October 1956, Dwight D. Eisenbhower Presidential Library, https://www.eisenhowerlibrary.gov/sites/default/files/research/online-documents/people-to-people/binderrr.pdf.

directly a contribution to the space economy, it represented the network of connections and the use of communication mediums selling the brand of America.

Propaganda from the USIA indirectly supported the space race. In April 1957, Arthur Larson, Eisenhower's handpicked director of USIA, Larson met with the Postmaster General , Arthur E. Summerfield to discuss a new Citizens Advisory Committee for stamp art.[59] Summerfield was also an Eisenhower appointee and included the USIA in collaboration with the stamp committee through his presidency. The purpose of the meeting was to establish a visual method to promote American culture, symbols of liberty, and achievement. The outcome included the mandate "The Stamp Advisory Committee shall advise the Post Office Department on any matters pertaining to the subject matter, design, production and issuance of postage stamps."[60] This new relationship between the USIA and the Postal Service served the purpose of propagandizing the accomplishments possible by a democratic system of government and demonstrated the technical superiority of the U.S. by creating space-related stamps. This was a significant contribution to the space economy and the commercialization of space because it demonstrated for potentially improved public relations.[61]

The Project Mercury Stamp sold for .4¢ cents each in 1962. They were launched upon the safe return John Glenn's *Friendship 7* orbit and were generated under a secret project using a new color printing cast to sell 289,240,000 stamps.[62] Sales successfully communicated the

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[59] NA RG 306 64-A-0536, Director's Office Subject files, 1957–8, box 3, file: Stamp Committee: General Correspondence, esp. Minutes, April 30, 1957, https://www.archives.gov/research/foreign-policy/related-records/rg-306.

[60] "Postal Files and the Smithsonian Postal Museum, Smithsonian Institute, https://www.sil.si.edu/DigitalCollections/npm/uspodm_keyword_search_action.cfm?keyword=Minutes.

[61] Mystic Stamp Company, "A Day in History: The Citizens Stamp Advisory Committee," Last update 2024, https://info.mysticstamp.com/the-citizens-stamp-advisory-committee/.

[62] Mystic Stamp Company, "Project Mercury Stamp," issued February 20,1962 in Cape Canaveral, Florida Post Office, https://www.mysticstamp.com/1193-1962-4c-project-mercury/.

technical feat and spectacle of the United States though a commercial venue. The stamp deployment represented a powerful tool in influencing public perceptions about Americans in space. Since the onset of Project Mercury, the CSAC has issued many space stamps to commemorate American achievement including, the Echo satellite stamp, the Gemini Space Twins stamp, the Apollo 8 stamp, Apollo 11 Moon Landing stamp, the Apollo 15 stamp, the Copernicus Stamp, Kylan, Apollo-Soyuz, Project Jupiter and Mariner stamps, the Shuttle stamp, Sally Ride stamp, and many more themes.[63]

Highway billboards and street signage also contributed to American perceptions and fascination with the space age. Space-themed slogans enticed consumers to use products and support an American image. For example, in the 1960s one might find a roadside sign for Astro or Sonic Tires, Satellite Gasoline, or "Fuel for the Future."[64] Billboards and signs highlight the consumer nature of American society, a possibility that Presidents like Eisenhower, Kennedy, Nixon, and others communicated globally in the freedom loving pro-Western democracy.

Radio also provided a valuable medium to express the positive benefits of democratic institutions. On February 25, 1957, President Eisenhower spoke to a global audience over the airwaves of *Voice of America* (VOA*),* a part of the United States Information Agency (USIA). This broadcast highlighted American progress and as "a principal sources of order in the world."[65] While the VOA did not generate monetary revenue, it communicated "America" and

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[63] Space-themed stamps of the United States, https://alphabetilately.org/Space.html, for more detailed history of USPS stamp collections see the Smithsonian Institute Postal history Museum, https://postalmuseum.si.edu/exhibition/stamps-take-flight-us-air-and-space-stamp-gallery/space-stamps%E2%80%93missions-mercury-gemini.

[64] Space Age Museum, "Space Age Roadside Americana," https://www.spaceagemuseum.com/space-age-roadside-americana, accessed Jun10, 2023. The museum exhibits a variety of road signage from the 1050s and1960s during the space age heyday.

[65] Dwight D. Eisenhower, World Broadcast in Observance of Fifteenth Anniversary of Voice of America. Online by Gerhard Peters and John T. Woolley, The American Presidency Project https://www.presidency.ucsb.edu/node/234107wight, access March 10, 2023.

realized capital based on propaganda and image. Additionally, members of the organizations board, in Eisenhower's second term, including Arthur Larson, built a cadre of well-known men from public industries. These men served as a contingency in the event of a national emergency much like the designated survivor in political circles. Companies included the Ford Motor Company, Metro Goldwyn Meyer (MGM), and United Fruit.

President Eisenhower relied on Larson's skill at using radio and television to generate favorable perceptions of the United States in the1950s.[66] The VOA began transmitting books and film in multiple languages that highlighted the oppressive nature of life under Soviet rule while "stressing the nature of rebellion in democratic societies."[67] This demonstrated the attempt to thwart Soviet propaganda aimed at racism in the United States and the international image of a hypocritical U.S. society. While Eisenhower endeavored to project a positive impression of America instead of one resembling "a race of materialists," he concluded the necessary of investing in a cultural program that supported the encroaching civil rights movement and its connection to Cold War Policies.[68]

VOA served as a significant weapon against Soviet propaganda and its influence increased dramatically along with its budget as it played "a prominent role in the ideological struggle against the Soviet Union."[69] Against the backdrop of Soviet racism propaganda, VOA strategy accentuated the stark contrast between living in an economically and political free Western society opposed to a weak Soviet system where citizen owned no voice.

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[66] Nicholas Cull, "In the Shadow of Sputnik," In book *The Cold War and the United States Information Agency: American Propaganda and Public Diplomacy, 1945-1989*, (Lawrence: University of Kansas Press, 2008), 5.

[67] Ibid,7

[68] Penny von Eschen, *Satchmo Blows up the World* (Cambridge: Harvard University Press, 2004), 5-7.

[69] Walter Hixson, *Parting the Curtain*, 32, 39-45. See also Alex Inkels, "Soviet Reaction to the Voice of America, 1947-1951," May 1952, Reports and Related Studies, 1958-1953, Box 40, RG 306, USIA.

President Eisenhower also used the VOA to generate a fantastic spectacle in December 1958. The president demonstrated technical supremacy of the United States by broadcasting his voice from space using an Air Force Atlas rocket. More significantly, this feat projected awareness of the social impact of the space race. Commodifying radio to broadcast propaganda contributed to the commercialization of space by employing technology in space. This would become even more evident as satellite communications evolved in the aftermath.

The considerations for adopting a staunch U.S. satellite program included advice from the President's National Science Advisory Committee in two key areas: the intelligence applications and a study of international law regarding "Freedom of Space, " also known as opens skies considering recent military technological development of both the United States and the Soviet Union.[70] Analysis of this concept reveals that not only did a space race emerge in the 1950s, but that the arms race and military preparedness were distinctly connected. The value of producing satellites that track weapons deployment in a non-military or threatening manner, appealed to Eisenhower, especially given that fear from potential atomic bomb dropping from space by the Soviets was negligible. Instead, engaging in high value reconnaissance to collect intelligence became the prioritized strategy from the administration.

President Eisenhower's public reaction to *Sputnik* exhibited calm strength and faith in U.S. technological supremacy, which he supported through missile defense programs and satellite studies. Much to the chagrin of his opponents, like Lyndon B. Johnson, Eisenhower's seeming lack of worry proved a favorable coyness that some in Congress did not fully

[70] National Security Council Planning Board, NSC 5520, "Draft Statement of Policy on U.S. Scientific Satellite Program General Considerations," Dwight D. Eisenhower Presidential Library and Museum, 20 May 1955. See also Office of the Historian, NCS 5520, 20 May 1955, https://history.state.gov/historicaldocuments/frus1955-57v11/d340.

appreciate. Unlike the traditional Cold War historians' assessment that the U.S. need a strong and swift response to symbolize U.S. military strength was unnecessary for Eisenhower; instead, he preferred to invest his resources in satellite research in the show of missile development.

President Eisenhower assured reporters that the U.S. military was "impressive." He further ensured U.S. technical supremacy and offered examples of missile production ins existence, including Jupiter, THOR, Atlas, and Titan, all of which demonstrated successes. To the point that rocket launches had already proved failures, Eisenhower replied that these were studies to be conducted inflight and any perceived failure was only a method to study and locate areas that required more research to understand the fullest capabilities.[71] To the perceived failure of the Vanguard rocket in December, 1958, which became known publicly as "Flopik" and "Dudnik" and "Stayputnik," Eisenhower's reflection in the press conference rang true, despite being ostracized by the media.[72] Further, the Vanguard launches effectively laid the groundwork for near future launch of the Army's Jupiter-C rocket and the U.S.'s own silvery moon, *Explorer I,* which eclipsed *Sputnik* by reaching low earth orbit (LEO) at approximately 1600 miles high, creating a symbolic spectacle of its own.

The natural communication of media represents a component of commercialization of space in the form of reporting and sales. The period between the 1940s and 1950s was already considered a golden age of science fiction with a plethora of media outlets carrying either news

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[71] President Dwight D. Eisenhower. Transcript of the Press Conferences on the Launch of the Soviet Satellite. [DDE's Papers as President, Press Conference Series, Box 6, Press Conference Oct. 9, 1957; NAID #12024539], Dwight D. Eisenbhower Presidential Library, https://www.eisenhowerlibrary.gov/sites/default/files/file/nasa_Binder3.pdf.

[72] Kenneth Osgood. *Total War: Eisenhower's Secret Propaganda Battle at Home and Abroad* (Lawrence: University of Kansas Press, 2006), p.342-343. See also,

or literature on science fiction, including space-related subject matter.[73] In 1956, Sam Moskowitz, an industry consultant for trade magazines and companies like DuPont, Campbell's Soup, and Consumer Research. Regarded as the leading expert and authority of the science fiction field, he was asked to conduct a historical analysis of readership at the World Science Fiction Convention in New York City in August 1956. In this capacity conducted market surveys and reported his findings to Science Fiction industry publishers.[74]

The relevance of the data collected is that science fiction reader represented a large portion of public interest in space age topics, which converted to spending. This media accounted for a growth in sales in the same era as satellite research and development, Sputnik, and other fledgling space vehicles. For example, readership interest for engineering and technical magazines rose in conjunction with science fiction literature. According to the study, approximately 32% of the readership in this field was under 21 years old, while over 21 represented nearly 25% of the readers in this popular genre. [75]

As a segment of the commercial space industry, this study reflected influence of the era. The post-war period with advances in technology further stimulated interest in space. Combined with President Eisenhower's efforts to secure funding for education in engineering and science fields, the contribution of media to space commercialization is evident. Furthermore, as method of influencing public perceptions about space, government consulting with media outlets contributed to the commercialization.

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[73] Marshall B. Tymn, "Science Fiction: A Brief History and Review of Criticism," *American Studies International,* April 1985, Vol XXIII, no.1, 6.

[74] Sam Moskowitz, "Science Fiction Market Survey, 1956," 3, https://www.fanac.org/fanzines/1950s_One_Shots/1950s02.pdf.

[75] Moskowitz, 15

President Eisenhower enjoyed an amiable relationship with mass media. As an early means of influencing public opinion and propagating favorable information, this first press conference after the *Sputnik* launch played a critical role in laying the foundation for manufacturing propaganda, instituting psychological warfare orbiting the space competition and Cold War environment, as well as partnering with private industry to engineer better rockets, useful tools and capacities for satellite usage, and symbolism and prestige to the American public and global populations.

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[76] National Security Council Planning Board, NSC 5520. "Draft Statement of Policy on U.S. Scientific Satellite Program General Considerations," Dwight D. Eisenhower Presidential Library and Museum, 20 May 1955. See also Office of the Historian, NCS 5520, 20 May 1955, https://history.state.gov/historicaldocuments/frus1955-57v11/d340.

competition and Cold War environment, as well as partnering with private industry to engineer better rockets, useful tools and capacities for satellite usage, and symbolism and prestige to the American public and global populations.

One might wonder how Eisenhower's public reaction permeated the attitude of the American society. The administration's apparent lack of a sense of urgency indicated a laissez-faire response, leaving American's unsure where the county stood on the issue of technological supremacy. With the Cold War arms race intensifying in the 1950s, military and political leaders urged Eisenhower for a more aggressive stance, insisting that the purely scientific International Geosynchronous Year (IGY) motivation for rocket research was not enough. The Soviet propaganda machine had all but obliterated the perception of American superiority. The psychological edge the communists leveraged demanded catalytic action in the Department of Defense (DoD), the State Department, the National Science Foundation (NSF), the Central Intelligence Agency (CIA) , and the Whitehouse to ensure prestige. The adoption of a new method focused on recapturing the perceived loss of American supremacy required a strategy that penetrated the consumer market. The U.S. used psychological warfare tactics that including fear to capitalize on *Sputnik* and market American exceptionalism in space, while simultaneously contributing to the commercialization of space and the space economy.

One of the first methods employed because of the fear of the missile gap came from the news media. Newspapers across the nation began printing editorials that influenced space age perceptions concerning the impact the silvery moon made. Within a few weeks of the launch American news outlets retreated from the wonderous awe of *Sputnik* and transmitted accounts of alarm. For example, *The People's Voice* out of Helena, Montana's editorial page claims that out of the multiplicity of reasons for a Soviet first launch, McCarthyism bears the burden of

responsibility.[77] Under this policy, Senator Joseph McCarthy, R-Wisconsin, led a veritable witch hunt for communist infiltrators in the early Cold War.

This confrontational atmosphere initially drove many scientists and engineers away from government research projects out of fear, not from communism, but of McCarthy. Critically acclaimed physicist Edward Condon declared that brilliant minds were excluded from projects ranging from atomic energy to the missile programs due to Senate hearings by the House and Un-American Activities (HUAC). "Condon specifically cited Dr. J. Robert Oppenheimer as a top man in missile research was excluded because of national security hearings back in 1954."[78]

With a lagging field of scientific researchers, the U.S. government gave the impression of falling behind scientifically and militarily. The cracks in the pillar of American power indicated a need for urgent action. One method was to turn the tide of public perception, which in part became a task for media outlets. By November 4, 1957, the *Daily Oklahoman* plastered fear over the front page with multiple articles highlighting a second "Soviet Satellite Launch Whirling Around the Globe with a Dog as a Passenger," and that "Military Aspects [of *Sputnik]* Alarm Military Officers," "The U.S. Can Soon See the Satellite," and "Monster Satellite Spinning Through Space 1000 Miles up!"[79] These articles indicate a mixture of attitudes ranging from a lack of military preparedness to sensationalism. Government leaders seemed complacent while the military demanded support in the wake of possibility of an even greater spectacle, one of rockets with armaments. The Navy's Vanguard scientists were not surprised. The momentum was

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[77] McCarthyism Yields a Bitter Harvest," *The People's Voice,* (Helen, MT), November 1, 1957. Loc.gov., https:// www.loc.gov/item/sn86075189/1957-11-01/ed-1.

[78] Ibid.

[79] *Daily Oklahoma*, "Soviet Satellite Launch Whirling Around the Globe with a Dog as a Passenger," November 4, 1957, loc.gov., https:// www.loc.gov/item/sn86075189/1957-11-04/ed-1.

starting to shift toward apprehension. Was this is product of Eisenhower's calculating response or the lamentations of his advisors and opponents?

In November of 1957, science writer Alton L. Blakeslee reported in the Bridgeport Sunday Post that "All the World Watches for the *Sputniks* Deaths" and dwarfs the October reporting on the topic. The article circuitously explained how the Russian satellite will meet its end as a flaming meteor perishing under the doom of aerodynamic drag, known as air drag, which is the force exerted against the velocity of a moving object, in this case forcing the satellite to the earth.[80] While the article on the surface outlines the process for which the silvery moon will decay as expected and on the usefulness of its launch to the U.S government and scientific community, its hyperbole and descriptive language symbolized that the spectacular launch was not what it was hyped up to be. The propaganda was good, but the actual longevity of the craft and the superiority of the engineering behind were in its infancy.

Demonstrating the extent to which the tiny moon stirred emotions in Congress came in the publication of *Beckley Herald Post* in Beckley, West Virginia reporting on the fierce debate rising in Congress over the Soviet spectacle. These debates became knowns as the *Sputnik* Session. Two Democratic Senators challenged the coolness of the Eisenhower Whitehouse in favor of staunch defense spending whipped support in favor of reducing the perceived missile gap. Lyndon Johnson, who would later become the head of the space council as Vice President to John F. Kennedy, suggested $10 Billion or more was needed to fight the technology war; and Styles Bridges claimed that instead of focusing on "deep pile and automobile tail fins," ironically symbols of American prosperity, there existed an urgent need to invest in defense for the security

[80] Alton L. Blakeslee. " All the World Watches for Sputniks Deaths," *Bridgeport Sunday Post (*November 17, 1957), p.35, https://newspaperarchive.com/bridgeport-post-nov-17-1957-p-35/. See also, Air Drag, NASA, https://www.grc.nasa.gov/www/k-12/rocket/drageq.html.

of the U.S.[81] The article, situated on page four, endcaps a cartoon suggesting that the effect of *Sputnik* may be to galvanize the economy with spending, suggesting the slowly stagnating economy can be rescued by the spectacle.

With newspapers beginning to trend toward the fears bellowed by Congress, the American perception about where the country stood played a key role in propagating support for defense, education, and rebuilding exceptionalism. One of the first strategies initiated by the White House came in the press conference from President Eisenhower on October 9, 1957. Transcripts from his press secretary James Haggarty reveal that while the president acknowledged the Soviet accomplishment, there was insistence that the United States was never in a race for space and that American scientists had already been working publicly on the development of satellite technology for scientific purposes and openly shared with the global community.[82] While on the surface, this was an necessary approach to the *Sputnik* situation, it reflected the circumstance in which the U.S. government found itself. The U.S. had been beaten at its own game and were forced to resolve it by downplaying the significance to public audiences, both at home and abroad.

The analysis of the *Sputnik* situation suggests the Russian satellite was merely a propaganda stunt that consisted of essentially smoke and mirrors with not scientific value, unlike the U.S satellite research program designed for scientistic contributions to the global

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[81] Ray Tucker. *The Bleckley-Post Herald* (Bleckley, West Virginia) December 30, 1957. https://newspaperarchive.com/beckley-post-herald-dec-30-1957-p 4/?utm_source=email_program&utm_medium=email&utm_campaign=new_matches/.

[82] Transcript of Press Conference Regarding the Soviet Launch, October 9, 1957. [DDE's Papers as President, Press Conference Series, Box 6, Press Conference Oct. 9, 1957; NAID #12024539], Dwight D. Eisenhower Presidential Library, https://www.eisenhowerlibrary.gov/sites/default/files/file/nasa_Binder1.pdf.

community.[83] Privately, the Whitehouse concerned itself with engaging a multiplicity of responses, including propaganda, funding missile and satellite research, and recruiting the American public and consumer market to support American efforts at demonstrating superiority over the U.S.S.R. technically, economically, militarily, and ideologically.

The fact that the U.S. was involved in a technological race with the Soviet Union was clear as early as 1945 when General H.H. Arnold, Commander of the Army Air Forces assessed the immediate post-World War Two military weapons research and development. In a letter to the Secretary of War, Robert Patterson, General Arnold assured that a robust weapons research and development agency would build ICBMs within a few short years and would include "spaceships capable of operating outside the earth's atmosphere."[84] His analysis suggested that as projectile improvements from U.S. enemies increased, it also necessitated that a reciprocal weapon was required to be launched from any direction, including space.

Then in 1955, a few months before the detonated their first hydrogen bomb. In a briefing report from James S. Lay, Jr of the National Security Council (NSC) on October 11, 1957 regarding the implications of the Soviet Earth Satellite for U.S. Security, recommendations to adopt a U.S. scientific satellite program were outlined for presidential approval. NSC 5520 was based on Eisenhower's press conference of October 9, 1957, and included an annex report from Nelson A. Rockefeller, Special Assistant to the president concerning the military, psychological,

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[83] Kenneth Osgood. *The Total Cold War: Eisenhower's Secret Propaganda Battle at Home and Abroad.* (Lawrence: University of Kansas Press, 2006), p 324-325.

[84] General H.H. Arnold, *U.S. Air Army Air Forces, Third Report of the Commanding General of the Army Air Forces to the Secretary of War Robert Patterson*, November 12, 1945., p.65-69. See also, R. Cargill Hall, Origins of U.S. Space Policy: Eisenhower, Open Skies, and Freedom of Space, Chapter Two, NASA, https://history.nasa.gov/SP-4407/vol1/chapter2-1.pdf.

and scientific value of a U.S. satellite program.[85] Rockefeller's directive, utilized broadly, concerned developing psychological warfare tactics and implementing methods to counter Soviet foreign policy. Additionally, he was tasked to advise the president in all areas concerning actions of the Operations Coordinating Board that handled covert operations and psychological warfare.[86] It is in this capacity that he robustly recommended that the U.S. view the newly forming satellite research and development program for its long-term strategic value and tactical possibilities.

Rockefeller interpreted the program as a high value asset providing military intelligence reports, and explained the cost of ignoring the possibility of Russian advances in this area would have profound effects on world perceptions of both the U.S. and the U.S.S.R. He further claimed that symbolically, American prestige was at stake and that the satellite program was not a race they could afford lose.[87] While the fledgling satellite program was a project many in the military sections perhaps did not consider as significant at the expense of missile development and aerial warfare doctrine, Rockefeller noted that by participating the IGY, the U.S. could continue to research and develop its military missile programs under the auspices of the satellite program.

Secretary Lay's NSC 5520 report was transmitted to the president for approval and to a limited number of cabinet members and agency directors, including the Secretary of Defense,

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[85] National Security Planning Board. NSC 5520. "Annex B-Views of Nelson A. Rockefeller, Special Assistant to the President, on the subject, dated May 17, 1955." Dwight S. Eisenhower Presidential Library and Museum, May 20, 1955.

[86] Cary Reich. *The Life of Nelson A. Rockefeller: Worlds to Conquer, 1908-1958*, (New York: Doubleday, 1996) p. 558.

[87] National Security Planning Board. NSC 5520. "Annex B-Views of Nelson A. Rockefeller, Special Assistant to the President, on the subject, dated May 17, 1955," paragraph 2. Dwight S. Eisenhower Presidential Library and Museum, May 20, 1955.

Bureau of the Budget, the Joints Chiefs of Staff, and Central Intelligence Agency.[88] The purpose of NSC 5520 was to ascertain the progress of the Soviet program established under the Astronomic Council of the USSR Academy of Sciences and to develop a course of future action in the form of a specific satellite policy. The recipients of the document were under the strictest secrecy and carried military overtones as well as hinting at possible psychological benefits from U.S. actions. President Eisenhower revealed some of the components regarding the U.S. stated purpose in his press conference on October 9, 1957, including the responsibilities of the U.S. government to develop small, non-military satellites by the Naval Research Laboratory's Project Vanguard for the express intent of adhering to scientific knowledge that would be obtained from its deployment in the International Geophysical Year (IGY).[89]

What the satellite research and development provided was significant and relevant scientific data on the composition of the ionosphere and the drag for future launch of missiles into space for the purpose of the projected intelligence gathering. Lastly, according to NSC 5520, a program to develop small scientific satellites could be an extension of current existing missile programs with the Department of Defense and for minimal funding, a key element of consideration.[90] By building small satellites for launch to the altitude needed, studies could be conducted on instrumentation, rocketry, telemetry and tracking stations abilities and preparedness.

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[88] National Security Council Planning Board, NSC 5520. "Draft Statement of Policy on U.S. Scientific Satellite Program General Considerations," Dwight D. Eisenhower Presidential Library and Museum, 20 May 1955. See also Office of the Historian, NCS 5520, 20 May 1955, https://history.state.gov/historicaldocuments/frus1955-57v11/d340.

[89] President Dwight D. Eisenhower. Transcript of press conference regarding launching of Soviet satellite.[DDE's Papers as President, Press Conference Series, Box 6, Press Conference Oct. 9, 1957; NAID #12024539], https://www.eisenhowerlibrary.gov/research/online-documents/early-history-and-development-national-aeronautics-and-space.

[90] Ibid, para,10, p.5.

For President Eisenhower, this goal was attainable. The moment for study and production of satellites accelerated with assistance from private industry, another symbolic posture in proving that Western economic principals were more capable of sustaining peace, security, and a stable economy. For example, *Echo I* developed by Dr. John Robinson Pierce and Rudolf Kompfner at American Telephone and Telegraph (AT&T) resulted from their research on two-way communication systems from orbit.[91] This project began prior to the *Sputnik* but proceeded in earnest once the Soviets launched their little silvery moon. By 1960, AT&T continued the reseae3ch to develop *Telstar I*, designed in conjunction with NASA. Bell Laboratories to experimented with communications from space.[92] While this was not the first communications satellite, the Signal Communications Orbiting Relay Equipment (SCORE) launched in December 1958 using the Atlas rocket developed by in part by General Dynamics, *Telstar* was one of the first contractual developments between government and private industry.

Bell Laboratories had staked a claim in the satellite business as early as 1955 when Dr. Pierce published his work on the utilization capabilities of communications satellites.[93] By studying the relationship between the amount of power, bandwidth, antenna gain, and orbital mechanics, he was able to advocate for the transmission of data, voice, and images via space, especially after the arrival of *Sputnik*. It is significant to note that AT&T's interest in developing new modes of communications used earlier research and satellite performance data innovatively leading to future participation in the fledgling communications and space industry. Their investment into the *Telstar Project* included paying for the development and launch of the

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[91] John Robinson Pierce, "Communication Satellites," *Scientific American,* 205, October 1961, 101.

[92] NASA. Telstar I. *Special Publication* NASA-SP-32/Vol. 1, accession number 64N10868. https://ntrs.nasa.gov/citations/19640000959.

[93] A.G. Dickieson, "Telstar I Experiments," NASA Technical Report Server, Volume I, February 6, 1963, 740, NASA, https://ntrs.nasa.gov/api/citations/19640000959/downloads/19640000959.pdf.

satellite as well as some of the tracking service. This signaled an early and on-going partnership between the private sector and the public sector in the space marketplace.

The *Telstar Project* became a NASA proprietary project even though it was developed collaboratively with AT&T.[94] In 1962, NASA, as a government entity, maintained the monopoly on launch capabilities the same as AT&T represented the primary communications conglomerate. Through this relationship, both partners continued to develop advanced communication satellites and commit extensive sums of cash to research and development while optimistically forecasting commercialization on the technology. This would eventually lead to the expansion of the market to other firms to avoid monopolization of the industry.[95] The event signified a driving force in the commercialization of space and the continued development of the space infrastructure and economy because it opened new business opportunities for firms in the telecommunications industry. While these firms could not stand alone in terms of any significant space dominance, they could individually contribute to an ever growing market.

Furthermore, AT&T's involvement in satellites provided the possibility of intelligence gathering, something Eisenhower was specifically interested in, but also the development of more sophisticated rockets such as the Delta-THOR configuration of rockets used in the launch of NASA's *Echo* and *Telstar* satellites.[96] This meant that several stages of booster produce high efficiency of thrust enabling the rockets with their satellite payloads to achieve apogees of 3500 miles attitude or greater. What this meant was that direct link communications were possible across greater distances. From the Cold War and space race perspective, this meant visibility of

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[94] Daniel R. Glover, "NASA Experimental Communications Satellites, 1958-1995," Chapter 6 in *Beyond the Ionosphere*, NASA Publication SP-4217, https://www.history.nasa.gov/SP4217/Ch6/html.

[95] Delbert D. Smith, *Communication via Satellite: A Vision in Retrospect*, (Boston: A.W. Sijthoff, 1976), 71.

[96] A.G. Dickieson, 743.

opponents and their capabilities, as well as future economic opportunity in the United States through the sale of communication and transmission devices for public use. This would eventually extend to satellite programming in television, cellular phones, and radio produced by AT&T and a variety of other service providers like Verizon, Direct TV, Spectrum, Dish Network, SiriusXM Broadcasting Corporation, and more.

President Eisenhower, a keen observer of communication opportunity, sought the advanced development of satellite programs noting the utilization for intelligence gathering without the deployment of aircraft or servicemen. Since satellite technology existed prior to *Sputnik,* embarking on a new trajectory for reconnaissance purposes posed no real barriers. In October 1957, the same time frame as the Russian baby moon launch as *Sputnik* was sometimes called, the trade journal *Aviation Week* published an article highlighting the collaboration of various industrial communities in the development of such a product.[97] This suggests that opportunities to spy and carry out overt missions using outer space did not begin with Sputnik, but even before the IGY since experimentation and testing required a significant amount of time. What is not commonly reflected on is the interaction with the industries.

The RAND Corporation and Lockheed Martin had consistently been involved in the production of space vehicles and components necessary to exert enough force to break gravity and launch a significant object into orbit. However, the research and development on advanced image production involved other carriers as well, including Eastman-Kodak.[98] Recommendations for Thor an Atlas boosted rockets carrying payloads of over 500 square feet of film that provided panoramic views of millions of miles over earth targets. While this visually enhanced military

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[97] "USAF Pushes Pied Piper Space Vehicle," *Aviation Week*, October 14, 1957, p 26.

[98] Jeffrey T. Richelson, *America's Secret Eyes in Space, The U.S. Keyhole Spy Satellite Program*, (New York: Harper Row Publishing, 1990), 21-30.

defense protocols, it also became the precursor remote sensing satellite technology and terrain mapping for weather, agriculture, energy resources. The development of the reconnaissance satellite project was assigned to the Central Intelligence Agency (CIA) and commenced as Project CORONA and employed photographic surveillance.[99]

Polaroid Chairmen Edwin Land consulted with James Killian, head of the Scientific Advisory Board, and President of MIT and concluded that the use of military satellites for the purpose of spying needed a cover story of sorts. Thus, Project DISCOVER simultaneously evolved to provide the necessary purpose and funding for the spy project.

Satellite communications technology expanded significantly during the Eisenhower and Kennedy administrations. Early satellites developed to support reconnaissance programs quickly manifested into opportunities for expanded communications and commercial applications. In 1962 when *Telstar* launched, NASAs budget stood at just over $514 million for space applications.[100] This meant the development of satellite and communications technology, navigations systems, computing components, vehicular equipment, and more.

In February of 1962, James Webb, NASA's Administrator, contacted Mr. F. R. Kappel at AT&T seeking assistance for the technological development of satellites, but also for operational and logistical expertise in effective coordination between multiple entities in project management.[101] Coordinating world-wide communications contributed significantly to the mission set forth by U.S. government in developing intelligence gathering devices. By the time President Kennedy entered the Whitehouse, several projects of this nature were underway. In. his

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[99] Ibid, 30.

[100] Thomas G. Roberts, "History of the NASA Budget," September 2022, https://aerospace.csis.org/data/page/2/, accessed August 5, 2023.

[101] James E. Webb, "Letter to Mr. F.R. Kappel, American Telephone and Telegraph," February 21, 1962, https://about.att.com/ecms/dam/corpcomm/ec/1962Feb%2021-WebbletterKappel_re_Bell_Helping_NASA.pdf.

letter, Webb dangled a golden nugget for AT&T to motivate their willingness to support the national goal, first by making it understood that their assistance would be a great public service, and second by mentioning future business opportunities existed.[102]

In 1962 President Kennedy set the stage for building a commercial infrastructure by getting the Communications Satellite Act of 1962 passed. This act provided parallel opportunity for NASA to develop satellites congruently to the DoD using divergent orbits. *Project Relay* offered the civilian agency to directly oversee and manage new communication methods including transmitting television signals globally from space. Consider the significance of this capability in the heat of the Cold War. Not only did news travel faster across the globe, but the technology enabled satellites to transmit desired messaging as well. The group COMSAT formed from this act. Communication Satellite Corporation paved the way for a new global network geared toward the public sector. NASA contacted with Radio Corporation of America (RCA) to develop and manufacture the components for *Project Relay*, outbidding AT&T and Hughes Space Division.[103] The project was managed by Goddard Spaceflight Center.

Communicating national importance in the technological race to space provided contracts between NASA and AT&T, but the business relationship provided AT&T with a "reasonable profit," in addition to going on to privatize satellite communication technology. Webb ended his letter stating that he was "sure that Bell Systems understood the historic and important nature of the manned spaceflight program and hope that the origination would find it possible to assist NASA in the venture. This was capitalism and policymaking which defined American society.

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[102] Ibid.
[103] Delbert Smith, 100.

Chapter 3

Aliens in America

In 1962, Post Cereals launched a commercial for a space-aged breakfast food destined for American kitchens and potential young explorers. *Count Off*, a space-themed Cereal, intended to boost kids' interest in technology by marketing American culture, value, and identity through the consumer marketplace. The slogan was "You can count on it to help keep in shape for the space age!"[1] As the astronauts splashed down from space, the commercial flashed images of the rigorous training required for astronauts to keep in shape for such strenuous and dangerous accomplishments. The cereal pieces consisted of numbers and two box tops would get a space map "packed with facts" about space, rockets, satellites, and the moon. Commodification of culture utilizing space-age products functioned as a parallel thrust for U.S. efforts to conquer space, and commercialization became a primary stimulus that evolved into the twenty-first century space economy.

In economic theory, popular culture pertains to market-based efforts to gain revenue based on motivating factors in the public.[2] It is part of evolutionary economic theory which suggests that mass media, entertainment, and popular participation informs consumption and how manufacturers produce goods and services. For the space industry, the rapid growth of societal interaction manifested through the promotion of humans in space in film, television, and consumer gadgets significantly enhanced the U.S. presence beyond LEO.

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[1] *Classic Airlines and Vintage Pop Culture*. "Post Count off Commercial," August 28, 2014. (Original commercial aired in 1962). YouTube video, 3:14, https://www.youtube.com/watch?v=GxUAlMI8zSM.

[2] Don Cusic, "The Popular Culture Economy," *The Journal of Popular Culture*, Oxford, Vol. 35 Is 33 (Winter, 2001), 2, https://go.openathens.net/redirector/liberty.edu?url=https://www.proquest.com/scholarly-journals/popular-culture-economy/docview/195367582/se-2?accountid=12085.

There are several factors that modulated human presence and interaction with space. How did the consumer marketplace drive the commercialization of space? Why did Cold War merchants manufacture influence in culture? What is the extent to which merchants of space built a U.S. space economy and transitioned responsibility for space access and operation from government to private industry?

The historiography of popular space culture includes a wide breadth of scholarship ranging from film analysis, psychological interpretation of messaging, political propaganda and policy, the history of NASA, the economic impact of advertising, and more.[3] For example, the television show *The Outer Limits*, which first aired on September 16, 1963, the same year that Soviet astronaut Valentina Tereshkova became the first woman in space. The television series highlighted the anxieties and fears of the Cold War, the nuclear arms race, the space race, and the possibility of Soviet technological preeminence.[4] The modern film *Interstellar* portrays impact of good versus evil, truths and falsehoods, and hope and salvation, each of which are popular themes in evolutionary culture pertaining to political polices between the Cold War and modern era.[5] However, the value of studying space popular culture and consumption from industry perspective and understanding the role Cold War space merchants played in stimulating a positive framework for human presence in space is slightly under researched.

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[3] See Tom Wolfe, *The Right Stuff,* (New York: Farrar, Straus, and Giroux Publishing, 1979). Provides a biographical history of the Mercury Project , the formation of NASA, and the promotion of astronauts and national heroes. See also, Dario llinares, "Idealized Heroes in 'Retrotopia': History, Identity, and the Post Modern Apollo 13," in *Space Travel and Popular Culture from Apollo to Space Tourism,* ed. David Bell and Martin Parker, (Malden, MA: Wiley/Blackwell Publications, 2009), 164-176. See also Jodie Dean, *Aliens in America: Conspiracy Cultures from Outerspace to Cyberspace*, (Ithaca: Cornell University Pres, 1998).

[4] Joanne Morreale, *The Outer Limits*, (Detroit: Wayne State University Press, 2022), 6.

[5] Matthew Steven Bracey, "Hope, Love, and Transcendence: An analysis of Interstellar," April 1, 2109, https://www.helwyssocietyforum.com/hope-love-and-transcendence-an-analysis-of-interstellar/.

This chapter argues that while proponents of non-capitalist economics and those that claim national defense commodification of space culture merely reflected the pursuit of profits, popular culture and consumption added existential value beyond monetary benefit. Defining communities and identity directly related to how Americans viewed themselves in the space race and as creators of technology. Technology consumption elevated societal morale and confidence in the U.S. ability to thwart alien intrusion. By promoting the possibilities of humans living and working in space, demonstrations of future technologies supported ideas of the benefits of space exploration. The entertainment and consumer industries created commerce that functioned as new commodities and normalized humans in space. This action subsidized the transition of government dominated access to private industry prominence for the benefits produced from LEO and deep space exploration.

Advertising of technology existed before *Sputnik* in science fiction circles and in the very specific niche of the aerospace and defense communities; however, the arrival of the space age ignited popular interest in the activities of the U.S. and the Soviet Union. One the most significant competitive forces in the Cold War, the economy, permeated society through the consumer market and channeled American supremacy in space. For example, in 1959 before Post *Count Off,* Ideal Toys' *Countdown Electronic Missile Base* produced commercials in 1959 which highlighted the power of Atlas Rockets. Space-themed television commercials touted opportunities to mimic the real space force using public consensus enthusiasm for U.S. dominance and reliance on consumer support.

In the 1950s and 1960s, Cold War tensions escalated as both the U.S. and the Soviet Union competed for global supremacy through a series of technological spectacles. These demonstrations of firsts propelled each side to LEO and eventually the moon. Though costly, the

United States promoted efforts though the defense industry while the corporate world initiated a space culture market that drew support from the public and helped form an American identity in space. People fascinated with the space industry participated in its rise by their desire to be a part in it. Film, television, and consumer products reflected this aspiration. Producers and manufacturers obliged by portraying the supremacy of the U.S. in the early Cold War and of the evils of communism as forms of aliens. The threat of aliens in America categorically boosted space popular culture and consumerism.

The release *of Star Wars* on May 25, 1977, awed audiences watching as colorful beams of energy whizzed through the corridors of the Rebel Alliances' ship *Tantive IV*, while outside in space, Imperial Star Destroyers surrounded a rebel craft. Meanwhile, the antagonist, Darth Vader, towered over the slumped bodies of the rebel soldiers and commanded his Storm Troopers to find Princess Leia, alive. *Star Wars Episode IV: A New Hope* transported audiences to a distant galaxy using high-tech movie effects depicting a human and alien interactive culture, making it one of the highest grossing films of its time.

Earning a total domestic lifetime amount of approximately $775.8 million as of February 27, 2023, S*tar Wars,* created and developed by George Lucas and Twentieth Century Fox Studios, influenced the public by incorporating technology, media, and marketing to commercialize space through popular culture and entertainment.[6] He revolutionized the film industry using visual a medium of spectacular special effects like high-energy motion, physical replicas of Muppets, robots, and models to achieve realism in the film. Additionally, he included mixed themes of chivalry, fantasy, and political history themes while employing merchandizing

[6]Star Wars IV: A New Hope. Box Office Mojo, IMDb. Retrieved February 27, 2023. https://www.boxofficemojo.com/chart/top_lifetime_gross/?area=XWW

techniques to market toys, books, and comic series, as well as providing a mechanism for future similar productions.[7] This strategy enabled the film to gross billions of dollars in revenue from the franchise through continued releases and years of cultural dominance. One huge sector of this commercial empire rests also in the modern video game industry with Star Wars gaming produced by LucasArts which raked in nearly 1.6 billion dollars as of 2007.[8] This cultural phenomenon represents the ongoing commercialization of space as part of the cadre of merchants advancing the modern U.S. space economy.

Special effects were a dominant factor in early science fiction films pertaining to space.[9] The spectacle provided through film enticed movie consumers and has remained a key trend in the industry.[10] *Star Wars* captured viewers fascination with space while engaging them as part of the action. This was important in the post-apollo era, permitting ordinary citizens to participate to access space in a way they were unable to before. This represented a pivotal moment in the transition from government to private industry access as the genre contributed to the next generation of the Cold War space economy.

The impact of the image of *Star Wars Episode IV* Death Star and of Luke Skywalker as the savior of galactic peace drew audiences of the post-apollo era into the popular culture of

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[7] Star Wars Visual Effects Through the Years: A Star Wars Breakdown of Special Effects. Platt College of Digit Media, and Design., n.d. accessed March 14, 2023. https://platt.edu/blog/a-breakdown-of-the-visual-effects-used-in-the-star-wars-franchise/. See also George Lucas, "Our Story," n.d., accessed October 20, 2012 and January, 14, 2023, https://www.lucasfilm.com/who-we-are/our-story/. Lucas, "Our Story."

[8] Andy Greenberg. "Star Wars' Galactic Dollars," *Forbes.com* (May 24, 2007), *Forbes.com* forbes.com/2007/05/24/star-wars-revenues-tech-cx_ag_0524money.html?sh=411924203978, March 14, 2023. See also, George Lucas, "Our Story," n.d., accessed October 20, 2012 and January, 14, 2023, https://www.lucasfilm.com/who-we-are/our-story/. Lucas, "Our Story."

[9] Mark Jancovich and Derek Johnston. "Genre, Special Effects, and Authorship in the Critical Reception of Science Fiction Film and Television during the 1950s," in *It Came from the 1950s: Popular Culture and Popular Anxieties*, Darryl Jones, Elizabeth McCarthy, and Bernice M. Murphy, ed. (New York: Palgrave Macmillan, 2011), 92-93.

[10] Lisa. Bode, "'It's a Fake!': Early and Late Incredulous Viewers, Trick Effects, and CGI." *Film History* 30, no. 4 (2018): 2.

space arena by getting them involved with an ongoing storyline, character development, and offshoot series, which in the early days of the Cold War space genre of the 1950s characterized television series.[11] For example, *A New Hope* became a prequel, fourth installment in a series of now nine films and supported by two additional spin-off films about the characters. Additionally, several animated films, comics, and series contributed to the *Star Wars* universe. The continuing saga explored individual characters' lives and mindsets in a generational method against the background of much larger real-life issues that often reflected modern, Earthly problems.[12] Whether it was baby boomers, Generation X (Gen X), millennials, or Generation Z (Gen Z), each generation interacted with exotic aliens, the Force, and diversity of cultures as well as subtle mystical, political, or spiritual themes reminiscent of some portion of earth's history.[13]

The commercialization of space through consumption occurred well before *Star Wars* entered the marketplace. In the early Cold War, the U.S. manned space program relied on presentation of advanced technology through visually dramatic advertising to create the perception of supremacy. Consumer spending on film that reflected unparalleled military, technological, and cultural supremacy. Spectacular events of the early space race are not only the feats but the iconic images that demonstrated supremacy.[14] Selling the moon required a unified front to manufacture a positive image of Western society to combat the Soviet firsts, and to impede alien forces in America.

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[11]Ibid.

[12]Alex Ledbetter, (January 24, 2017), "A Brief History of Star Wars Titles," *Screen Rant. https://web.archive.org/web/20190206205905/https://screenrant.com/star-wars-original-title-last-jedi/*

[13] Mathieu J. Guitton. "The Underwater Quest of Prince Lee-Char: Renewing the Hero Archetype in Star Wars*," The Journal of Religion and Popular Culture,* 31:1,Spring 2019, 2-3.

[14] Michael L. Smith, "Selling the Moon: The U.S. Manned Space Program and the Triumph of Commodity Scientism," in Richard Wightman Fox and T.J. Jackson Lear's, ed., *The Culture of Consumption: Critical Essays in American History, 1880-1980,* 177-180.

The U.S. government replied on cultural infiltration to challenge Communism.[15] One of the venues of this challenge included the early space race and perceptions of U.S. technological and economic leadership by defining it as part of Western culture. This focus concerned cultural influences and applied psychological warfare; the principals used connected the government with Hollywood films in the early Cold War. Merchants of space produced subsidiary markets in print and media sin-offs like games which propelled commercialization of space into the twenty-first using spectacles in culture to booster the space economy and provide continued leadership in space.

Space-themed games appeared in the 1960s in several forms including board games, travel games, and cards. For example, the Hasbro Company developed a space-themed pinball game. Examples include Captain Video in 1959, Orbit the card game produced by Play-more USA in 1960, and manufacture by Blastoff! Made by Waddington's, in 1969 are a few of the games. The space race generated interest in the space consumption market that previously did not exist. Prior to the 1960s, many companies, just like common public awareness of space-age gadgets, most publishers and producers of consumer items viewed science fiction as a minute cadre and therefore did not target the market. However, by the time *Sputnik l*aunched, this position evolved as did the economy based on the new space interest reflected in film and television.

Movies dating back to the beginning of the space race often included themes related to the Cold War and the possibility of either invasion by aliens, a subtle reference to Soviet aggression, or unification of Earth against other terrestrial forces, or of human manifest destiny

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[15] Walter L. Hixson, *Parting the Curtain: Propaganda, Culture, and the Cold War, 1945-1961* (New York: St. Martin's Griffin), ix-x.

to conquer space. For example, movies such as *Destination Moon* (1950), *The Day the Earth Stood Still,* and *When Worlds Collide (1951), Invaders From Mars, It Came From Outer Space, and Invasion of the Body Snatchers, War of the Worlds* (1953), *Spaceflight IC-1(1965),* all tapped into the alien-contact market.[16] The outer space ethos allowed Hollywood producers to capitalize on cultural influences through film creating an explosive subculture in outer-space entertainment. Additionally, Hollywood movies served as glamorous and alluring advertisements for the possibility of a Western or American standard of living.

Space movies of the 1950s and 60s promoted the real life attempt to oppose Communism during the Cold War through prosperity, which flooded the big screen, popularizing capitalist ideology. For example, *World Without End* (1956) depicts a team consisting of military, scientist, and an engineer returning to Earth after an exploration trip to Mars. Their craft somehow accelerates, knocks them unconscious, and transports them through a time warp, causing them to land on Earth 500 years in the future.

The symbolism used throughout the movie relates to bomb shelters and the effects of radiation from nuclear fallout through its characterization of a society hidden underground to avoid grossly deformed and monstrous beasts. Furthermore, the monsters above ground enslave the normal humans that exist outside the safety of the underground caves. The leaders of the underground society have long decided that fighting will not protect them or solve their problems and so they disarm the newly arrived astronauts. Meanwhile, the astronauts attempt to provide a strategy to help the underground people, as well as the enslaved people, fight off the monsters that are synonymous with Communists. The astronauts represent liberating Americans. They

[16] Simon Cherpetil, Sebastian Quiblier, and Mark Preston, *Cinemacom,* n.d. "The 42 Best Sci-Fi Movies 1950-1965," accessed December 15, 2013 and January 2023, https://www.cinemacom.com/50s-sci-fi-BEST.html.

succeed in putting down the monsters, enabling life to exist above ground free from fear, while the astronauts set out to rebuild the society, providing education to children, agricultural technology to the citizens, and military training to the defenders of new civilization. Space-themed movies not only reflected culture but created culture.[17]

As the Cold War heightened, movies depicting American preeminence continued as well, enticing moviegoers to participate in the massive advertising efforts of government sponsored and Hollywood produced films. Eventually, as fears of Communism slowed, movies depicted space without the message of Cold War competition. However, the powerful influence of entertainment on the public helped support ongoing real life policies regarding human outer-space endeavors by subconsciously participating in the overall process. For example, *Apollo 13* (1995) recaptured the essence of public participation in a post-Moon era of the Apollo program through the recollection of the harrowing event that still signaled an exhibition for US technological leadership and the possibility of failure. Accordingly, although the release of *Star Wars* occurred after the Apollo program ended, Space Transportation System (STS) was just gearing up. The space shuttle *Enterprise* launched in September of 1976 with the orbiter *Columbia* following close behind. These two vehicles, along with *Challenger* became the icons of the U.S. Space Programs, symbolizing technological strength, leadership, and space hegemony.[18]

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[17]Boedeker, Hal. "Moon Landing Influenced Toys, Jewelry - Later Films; Countdown to Apollo 11." *Orlando Sentinel*, 2019 Jun 22, 2019/06/22/, https://go.openathens.net/redirector/liberty.edu?url=https://www.proquest.com/newspapers/moon-landing-influenced-toys-jewelry-later-films/docview/2244544838/se-2, access May 23, 2024.

[18] Mike Wall, quoting Space historian Roger D. Launius, "How the Space Shuttle Was Born," *Space.com* (June 28, 2011), https://www.space.com/12085-nasa-space-shuttle-history-born.html. Accessed August 2012.

Shortly thereafter, the country slowly began to move towards an environment of international cooperation in space in conjunction with the newly forming spirit of *Détente,* rather than strictly divisive Cold War boundaries. This attitude found expression in many movies and television programming, thus transforming perspectives towards universal context of active inclusion in the space community rather than witnessing it. Americans began interacting with aliens in various forms. Whether human or extraterrestrial, the familiarity of characters such as Obi Wan Kenobi, Anakin and Luke Skywalker, Mr. Spock, Kruge, Whorf, E.T., Paul, the Tenctonese, or Alex Krycheck descended on the American public and became part of the alien cultural consumption.

The most recognizable example, *Star Trek,* the 1966-69 television (T.V.) series by Gene Roddenberry, depicted a unilateral effort to explore space for all humankind. The television series immersed itself in political and social themes, many in response to the overall cultural changes taking place across the country. For example, the plot of the show sets the timeline in 23rd century. The star ship *Enterprise* belongs to the Earthly United Federation of Planets, suggests duality of meaning: one, the metaphorical meaning of consensus among the good capitalist Western world (United States) against an evil Communist empire (Soviet Union), and two, the more literal connotation of a united Earth-led alliance serving all life forms, including the more maniacal Klingon Empire. Either way, the series incorporated themes of racism, feminism, politics, the necessity of technology, and peace.[19] Arguably, these themes express a more potent ideology, that of a utopian existence, modulated by Federation standards, aka

[19]William Blake Tyrell, "*Star Trek* as Myth and Television as Mythmaker." *Journal of Popular Culture*, 10 (Spring 1977), 711-719. Also, see Rick Wortland . "Captain Kirk: Cold Warrior." *Journal of Popular Film and Television*, 16 (Fall 1988), 109-117.

Earthly or regional control. The significance of this series in popular culture reflects the message that even though the futuristic civilization demonstrates acceptance of others, it also projects the image of strength and exceptionalism on the part of the Federation.

Other television series depicted space exploration, commercialization, alien invasion, and colonization. For example, Lost in Space 1965 and reboot in 2018, Space 1999 in 1975, V in 2009, the X-Files in 1993, and *Expanse* which premiered in 2015. Television provided an alternate orbit to view space and take part in the imagery and spectacle from the comfort of the American living room. While the fantastic feats of the Apollo Era launches and the moon Landing saw a decline in interest once the goal was reached, capitalizing on the tool of television became NASA's best friend. Whether it's the Fred Haise Show or the peril of *Challenger*, NASA reconnected with the networks to provide nonstop coverage. Furthermore, depicting the control room on television provided a real-life glimpse into the operations of space previously unavailable to the public, which provided opportunities for quips in popular culture references. For example, Jodi Dean writes that trough television the agency of space is no longer with astronauts but with the spectacle accomplished by geeky nerds operating space. She states that one astronaut stated that the engineer was a "steely-eye missile man."[20]

The expansion of the space industry in the commercial market took these popular topics and developed them into multiple literary forms and eventually movies applying technology to the scientific innovation portrayed in their respective stories. Examples include *Star Trek: The Next Generation*, *Deep Space Nine*, *Voyager, Enterprise*, and several motion pictures. These themes and characters, like that of its successor *Star Wars,* which continued its saga with *The*

[20] Jodi Dean. *Aliens in America: Conspiracy Cultures from Outer space to Cyberspace*. (Ithaca: Cornell University Press, 1998), 160-162.

Empire Strikes Back, *Return of the Jedi*, *Phantom Menace*, *Attack of the Clones*, and *Revenge of the Sith*, and the animated version of the *Clone Wars,* became glorified in popular culture. This trend continued in the twenty-first century with films such as *Star Trek Beyond*, *Star Trek into Darkness*, *Star Wars Rogue One*, *The Force Awakens*, *The Last Jedi*, *The Rise of Skywalker* and a host of other spin-of films about individual characters of the franchise. The commercial industry supported the entourage of "Trekkies" and Jedi through costume development, makeup and accessories, and toys, most notably from *Star Trek,* the Starship Enterprise, which coincidentally was the name of one of the space shuttles, the communicator, and from *Star Wars,* the light saber. According to NPR's Karen Bates, the Star Trek Franchise in 2009 was worth approximately $500 billion, including merchandise, movies, and spin-off series.[21] This market created a fantasy culture engulfed in a contact zone communicating a desire to become one of the characters or live in the make believe world of the stories.

Throughout the 1980s and 90s *Star Wars* and *Star Trek* infiltrated American culture, often incorporating futuristic lingo into the mainstream language. For example, people submersed in the sub-culture of the Galactic Republic commonly employ Jedi Master Yoda's linguistic characteristic of flipping word order, or rearrangement of normal speech construction using object-subject-verb order. This syntactical organization possibly serves two purposes: one to provide a literary tag associated with a powerful character, and two, offer a poetic device in the form of metaphorical rest. This feature naturally enhances the overall philosophy of the character and in turn the movie, followed by the culture.[22] The magnitude of this linguistic emersion

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[21]Karen Bates. "How Much Money Has Star Trek Franchise Made?"*NPR.org*.15 May 2009

[22] Debra San. "Hiatus of Subject and Verb in Poetic Language." *Style* 39, no. 2 (Summer 2005): 137-152. *Sociological Collection,* EBSCO*host*, accessed April 4, 2023. Additional research retrieved from Pullman, Geoffrey (2005) "Language Log: Yoda's Syntax the Tribune Analyzes: Supply More Detail I Will." Itre.Cis.upenn.edu: retrieved April 4, 2023.

essentially blends popular culture with fantasy. This culture translates into revenue for the commercial industry by enticing potential consumers, but more importantly, connects humans with the very real possibility of normal life in the realm of a space neighborhood. This remains key to the overall mission of a national presence in space, and one that media contributes to significantly.

Another example of fantasy slang includes Captain Kirk's famous quip "beam me up Scotty", Captain Picard's "make it so number one", Spock's "live long and prosper", and lastly, Klingon, Romulan, and Borg languages of which do not appear as entirely constructed forms but more phraseological in nature. The introduction of alien languages in American film and culture, both Earth bound and extraterrestrial, suggest a conglomerate nature of humankind. Through the multitude of communication structures and dialects on Earth, people commonly understand the significance of these movies as humans taking part in a much larger space culture in a more distinctive way. Commercialization of these franchises unanimously thrust the American space mission forward through the impetus of a film forum.

Media remains a powerful vehicle for transferring knowledge. *Star Trek* and *Star Wars* provide examples of how mass media consumption influences popular thinking through symbols, text, and language. These social impacts translate into profit and transform perspective regarding human capabilities and understanding of their role in the modern space community. Through just these two productions, people identify with some portion of the films whether characters, messages, circumstance, or actions, which according to Robert Kozinets, proliferates desires to consume the culture. Fans interact with the imagined worlds and take part in the science that drives their existence.[23]

[23]Robert V. Kozinets, "Utopian Enterprise: Articulating the Meanings of Star Trek's Culture of

Symbolism tenders a powerful tool in the determination to maintain supremacy in space and cultural consumption with regards to the space program debuted in the 1950s as corporate advertisers conveyed images of "national purpose by equating technological preeminence with military, ideological, and cultural supremacy" according to Michael L. Smith.[24] Making sure that the United States won the newly forming space race really meant securing the nation against the concurrent arms race and the possibility of nuclear proliferation. However, by capitalizing on the cultural component for broad-base support of the nation, mass media provided the method to recruit the public. Public consumption of the spectacle ignited more commercialism in the form of buying into to the totality of the consensus posture while embracing its most famous characters in film, television, radio, and alien and space sub-culture. Guy Debord argues that it is this culture that becomes a commodity and a driving force behind the development of an economy, in this case the U.S. space economy.[25]

For example, as Smith also explains, when "Walter Cronkite exclaimed 'by golly we've done it!' in 1969 as Apollo 11 landed on the moon," he spoke for America, for winning the race to the moon, and for the spectacular minute-by-minute display of the media that functioned as the cavalry for American cultural domination and presence in outer-space.[26] The media plays an integral role in the commercialization of space through advertising not only products and film, but through support of popular culture through news media.

Consumption." *Journal Of Consumer Research* 28, no. 1 (June 2001): 67-88. Business Source Complete, EBSCOhost, accessed April 4, 2023.

[24]Michael L. Smith, " Selling the Moon: The U.S. Manned Space Program and the Triumph of Commodity Scientism," in Richard Wightman and T.J. Jackson Lears, ed, *The Culture of Consumption: Critical Essays in American History, 1880-1980*. (New York: Pantheon Books, 1983). 185.

[25] Guy Debord, *The Society of the Spectacle,* (Detroit: Black and Red Publications, 1983), 193.

[26]Michael L. Smith, " Selling the Moon: The U.S. Manned Space Program and the Triumph of Commodity Scientism," in Richard Wightman and T.J. Jackson Lears, ed, *The Culture of Consumption: Critical Essays in American History, 1880-1980*. (New York: Pantheon Books, 1983). 177

Mass coverage of historic events through news outlets or other communication venues, often ends up in film and provides another method to express superiority or technological display. However, without media support, many of the features presented in Hollywood films might never occur. The necessity of media backing as one vital source of support significantly propels the industry: in this case, space. A clear example of media support occurred with the private and independent launches of SpaceX and Orbital Sciences Corporation, further driving home the point of expanded commercial involvement in the space exploration business. Another key media event occurred when Felix Baumgartner performed the first ever space jump sponsored by Red Bull, the maker energy drinks, on October 14, 2012. This feat initially appeared in the 2009 movie *Star Trek,* when the characters James T. Kirk and Hikaru Sulu made the leap from their craft onto a space drill connected to Earth. Red Bull sponsorship demonstrates another venue in which the commercial sector continues to claim a stake in the space industry.

Star Trek and *Star Wars,* however, are not the only space movies to receive media coverage or to impact popular culture regarding potential existence of space born beings or even human interactive participation in space. Movies such as *2001: A Space Odyssey* (1968), *Close Encounters of the Third Kin*d (1977), and *E.T. The Extraterrestrial* (1982), reflect a less geocentric perspective and the possibility of nonthreatening alien life existence. In *Odyssey*, director Stanley Kubrick and writer Arthur Clarke reflect on the popular space themes of technology and existence and origin of human and extraterrestrial life. They focused on the interaction of technology with the process of its evolution along with that of mankind in search of something bigger. In popular culture, *Odyssey* became one of the most commercially

successful ventures with regards to film earning over $56 billion domestic lifetime gross and nearly $69 billion worldwide.[27]

Steven Spielberg introduced society to the possibility that alien life forms exist and seek out people of Earth in addition to humans exploring the cosmos. In *Close Encounters of the Third Kind*, Spielberg develops the theme of universal communication through the character Roy. Spielberg acknowledges that communication or language exists in multiple forms as demonstrated throughout the film. He applies symbolism, texture, speech, visual art, and music to make his point. Charlene Engel, author of an essay that describes how communication exists in many forms through her example of *Close Encounters*, further concludes that communication might well be a mechanism for future transparent boundaries between nations. The film, she elucidates, takes place on American soil but the message clearly conveys a "supra-national" context.[28] The *New York Times* printed a review of the 1977 movie when its rerelease hit theaters in 2009, calling it an epic science fiction movie. Other responses to the film included comments from readers claiming that it was the first movie that included the audience. The movie incorporated everyday people into the sphere of alien contact, helping it succeed as a commercial sensation.[29] Ray Bradbury writes that *Close Encounters* puts humans in touch with another part of the universe but connects them.[30] Commercializing this space- related theme earned over $337 billion worldwide.

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[27] 2001:A Space Odyssey. http://boxofficemojo.com/movies/?id=2001.htm and http://www.boxoffice.com/statistics/movies/2001-a-sapce-odyssey-1968

[28] Charlene Engel. "Language and the Music of the Spheres: Steven Spielberg's Close Encounters of the Third Kind." *Literary Film Quarterly*; 1996. Vol 24, Issue 4, p.376.

[29] http://www.nytimes.com/movies/movie/10031/Close-Encounters-of-the-Third-Kind/overview. Additionally see reader response *pfirth7 opinion about the film for pop culture.*

[30] Ray Bradbury. Close Encounters of the Third Kind. http://www.filmforum.org/movies/more/close_encounters_of_the_third_2010.

In 1982, with *E. T. The Extraterrestrial,* Spielberg encountered aliens again and escorted humanity beyond the boundary of Cold War division and towards the more popular spirit of cooperation through the eyes of a little boy and lost alien child. E.T. possibly signifies the infant stage in which humans exist in conjunction with the universe. However, it is through this infancy that people of Earth can communicate and cooperate. The larger meaning implies the ability for nations of Earth to communicate, a clear deviation from Cold War philosophy that prescribed demarcation. In the movie, although more dire forces are out to capture and exploit E.T., his human savior rescues him and helps him return home. This movie cleverly depicts the possibility of working together as well as the authority to participate in a higher purpose, interaction with other countries, or more evidently, alien culture and space. The move presents metaphors on multiple levels, including peace, demonstrated by the rainbow tail of E.T's spaceship departure, and E.T.'s pointing of his finger symbolizing a higher being for Elliot, the Earth boy E.T. relates to, or the idea that E.T. is just a part of Elliot coming to life. Interpretation, often speculated on by the media, enables consumer involvement, thus interest in the idea of humans taking part in space via the enchantment in movies, according to movie critic Roger Ebert.[31]

While the themes of the previous movies reflect modern popular cultural thinking with regards to space, they also suggest commercialization of space via semiotics, another avenue of consumerism. Semiotics and semantics essentially represent key components of advertising and propaganda in mass media, an element required to gain support for a cause, such as the national purpose, in the context of space for example. Subtle clues in language and literature propagate subliminal messaging, but also promote the realization, in the case of space movies, of an

[31] Roger Ebert. E.T. the Extra-Terrestrial. http://roberebert.com/reviews/movies/2002. 22 March 2002.

existence of a product, an idea, or of life beyond Earth. For example, in E. T. The Extraterrestrial, the candy "Reese's Pieces" demonstrate how strategic product placement infiltrates society through subliminal advertising and results in mass consumption. Other commercial messages introduced in popular culture through the medium of film are global communication devices used in LEO. From *E.T.,* the line "E.T phone home" suggests a more innovative technological capability.

In *2001: A Space Odyssey*, the initial scenes portray conversations in a spaceport, much like a modern day airport sky lounge. The location becomes clear as the camera reveal's *Howard Johnson's.* According to journalist George Hahn, a *Hilton Hotel* also exists in the space station portrayed in the film.[32] This revelation suggests space tourism, an active market in the industry today with businesses such as Virgin Galactic planning to operate suborbital flights in 2013. SpaceX and Bigelow Aerospace also, in conjunction with their production of HLV's and parts for use by NASA, expect to branch out into the space tourism industry soon.[33] Additionally, in *Odyssey*, the space station resort contains an image of a bell phone that according to George Hahn, reflects modern Skype, Face Time, and a host of video conferencing platforms like Zoom, Webex, and Teams.[34] The suggestion of modern-day business existing in space reflects the notion that as humankind explores the realm of space and uses commercial means to get there, commerce will follow in a variety of forms.

The idea that the elements of popular culture, technology implementation, and advertising promote mass consumption through the media is not new. During the onset of the

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[32] George Hahn "Early Skype and Ho-Jo's Earthlight Room in 2001: A Space Odyssey'" (November 8, 2011). Retrieved 2013-10-04.

[33] Amanda Stevens, "SpaceX vs Blue Origin vs. Virgin Galactic: What's the Difference?" Techtarget.com, December 21, 2021

[34] Ibid.

Cold War, President Eisenhower realized the significance of media use, information, and propaganda to influence the public. Applying psychological techniques through advertising converted the masses to support ongoing political or economic decisions, and later to promote the American technological presence in outer space. Eisenhower, to build a positive image for the United States abroad, created the United States Information Agency, which expanded the notion that capitalism was the superior economic model to Communism. Western trends appeared in movies over the decades, initially depicting American exceptionalism. As Victoria de Grazia indicates, movie making offered the opportunity to promote "American cultural imperialism."[35] This idea demonstrates a connection between policy, culture, and industry. As commercial enterprises expand to the suborbital marketplace, advertising these ventures will also likely appear in movies, or consumer products advertised in them will prompt support for them. For example, in 2018, NASA looking for additional funding floated the possibility of selling add space on rockets and a way further share in the commercialization of space and increase their budget. the possibility of selling ad space on NASA rockets. Then NASA Administrator Jim Bridenstine suggested that a committee form to investigate the potential benefits of this move. According to the Hill.com, the Science and Technology Policy Institute considered this move revenue rendering for NASA.[36] The effect of this resembles corporate branding of professional sports venues like Mercedes Benz Stadium and Truist Park in Atlanta, Georgia, Minute Made Park in Houston, Texas, or Gillette Stadium in Foxboro, Massachusetts. Corporate brand recognition makes NASA a commodity for the public and connects commercialism with the

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[35] Victoria de Grazia, *Irresistible Empire: America's Advance Through Twentieth Century Europe* (Cambridge: Belknap Press of Harvard University, 2005). 306-307.

[36] Avery Anapol, "NASA Looking into Selling Naming Rights to Corporate Brands: Report," *The Hill.com* September 10, 2018, hehill.com/homenews/administration/405875-nasa-looking-into-selling-naming-rights-for-rockets-to-brands/, accessed June 10, 2023.

NASA brand and with capitalism, thus the space economy. Thrusting brands to space simulate further economic activity in space.

Thus, the consumer-commercial connection in movies, which in turn provided mass advertising in the form of product marketing to support films, produces another form of consumption. Licensing of products associated with films introduces the psychological element of desire into the marketplace, much like that of the products distributed and market during the space race. The entertainment industry influences consumer culture by submersing the public into the subculture of the films produces, i.e., space. Additionally, movies entice consumers into products markets through advertising and peripheral marketing, and lastly helps form social attitudes about political and economic events. The promotion of film in common public forums, such as websites, social media, and billboards, exists in movies that connect the fantasy world with the real world, creating the consumer interaction. For example, the commercial aspect through digitally broadcast advertising is seen in many futuristic movies such as *I, Robot* (2004), *Blade Runner* (1982), *Total Recall* and *Star Trek Into Darkness* (2013) to name a few.

Advertising and propaganda were one of the most prominent avenues to mass consumption regarding the space race in the 1950s and 60s. The perception of strength constituted the basis of geopolitical relationships. Cheryl L. Marlin writes that the media intentionally or unintentionally provokes outcomes based on policy or cultural attitudes towards the subject; and influences the direction of the perspective at the same time through its coverage of events. Her example, the "era of international competition between the United States and the Soviet Union" in the late 1950's, media outlets consistently reported on the successes of Soviet techno-ability while simultaneously recounting the U.S.'s failures in the same area."[37]

[37]Cheryl L. Marlin "Space Race Propaganda: U.S. Coverage Of the Soviet Sputniks in 1957." *Journalism*

While the Soviets hid their rocket programs, the United States, in a diplomatic effort, chose to publicly offer their scientific achievement for all to witness, including the failures. This strategy, exploited by the Russians, gave the perception of the United States as being backward.[38] For example, the failure of Vanguard Test Vehicle number three, (TV-3) made a launch attempt on December 6, 1957. Newspapers across the country reported on the spectacular explosion on the launchpad in full view of the world. Images of the failed launch were captioned as "Flopnik" and "Poopnik,' terms coined by Democratic National Chairman Paul Butler in a speech on December 13, 1957, to symbolize the epic disaster and embarrassment of U.S. technical prowess.[39] Much to the chagrin of his Republican counterparts who immortalized American scientists and engineers for their stoic perseverance in developing a viable rocket program, Butler created a media frenzy that depicted the U.S. as technically inept.[40] This carried profound meaning in terms of the geopolitical affairs. From a consumer and cultural standpoint, people were buying into the fact that the Reds were technically more sophisticated and for all the touted resources stemming from a capitalist society, the space program for the U.S. was critically recognized as a "no-go."

Furthermore, the Chinese and Russians exploited the United States as recently as 2013 in the same manner through their media propaganda, which included letters written to the American public through news outlets, and by taking the responsibility for ferrying U.S. astronauts to

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Quarterly 64, no. 2 (Autumn87 1987): 544-559. *America: History & Life*, EBSCO*host*, accessed February 12, 2023.

[38] Ibid, 544

[39] National Air and Space Museum. "Flopnik: The Vanguard TV-3 Disaster," December 27, 2017. https://airandspace.si.edu/events/flopnik-vanguard-tv-3-disaster. Accessed March 27, 2023.

[40] A.P. "Butler's Talk on Missiles Denounced," Evening Star. (Washington, D.C.), December 14, 1957. https://www.loc.gov/item/sn83045462/1957-12-14/ed-1/. Accessed March 28, 2023.

space.[41] This period represented another static time, much like the inertia of the mid-1970s, in the U.S. manned space program as lack of funding and decommissioning of the aging shuttle fleet, the symbolic icon of NASA and the U.S. Yet, it also gleaned opportunities for private commercial space firms to capitalize on the space launch access markets as seen by SpaceX's 2012 Dragon Commercial Orbital Transportations (COTS) C2+ delivered its first cargo to the International Space Station (ISS). The Dragon gained space cultural notoriety from its naming convention stemming from Puff the Magic Dragon, symbolizing an impossible goal.[42]

Commercialization is impacted by these events and of changing space polices. This is seen in movies depicting both strength and vulnerability. For example, a scenario based on real life problems through the characterization of the U.S. manned Mars Ares missions depicted in the film *The Martian*. While the movie grossed $228, 433, 663.00 domestically to date, the gains in public association with space were far greater.[43] As the main character, Mark Watney becomes stranded on Mars, the audience gets to participate in his rescue through cinematography and realism. Additionally, the possibility of humans visiting Mars as routine is tangible due to public imaging by SpaceX and the overall purpose to make life multi-planetary.[44] Moreover, the film demonstrates that the U.S. is at once at the apex of space travel while at the same time ineffectual in their attempts to salvage their reputation and bring Watney home. NASA ultimately defers to the Chinese who have been watching the progress all along. This is part of the reason the movie

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[41]Harold Maas. "Is China Pulling Ahead in the Space Race?" *TheWeek.com,* January 8, 2015, https://theweek.com/articles/463370/china-pulling-ahead-space-race. Accessed March 27, 2023.

[42]Filippo Zamprogna."Discovering the Dragon: The Capsule that Made SpaceX Big," *Space Voyaging.com,* January 26, 2023. https://www.spacevoyaging.com/dragon-the-capsule-that-made-spacex-big/#:~:text=Elon%20revealed%20that%20he%20named,he%20founded%20SpaceX%20in%202002.Accessed March 27, 2023.

[43]The Numbers. *The Martian (2015). The-numbers.com/movie/Martian-The#tab=summary,* accessed June5, 2023.

[44]SpaceX. Human Space Flight. SpaceX.com. Updated 2023, https://www.spacex.com/human-spaceflight/. Accessed June 5, 2023.

sells, and that the public are raptured by the tale. It portrays that the U.S has global competition, and while the Chinese may not be as advanced as the U.S., they are catching up by using Apollo era technology.[45] Their advantage is that they do not have to reinvent the wheel, or the rocket. For Watney, the ingenuity and sheer determination to survive on intellect is also symbolic of the American dream and industriousness.

The national attitude reflects one or the other through its overall support of U.S initiatives. Two prime examples of trends in movie making in the 2010's transitions the United States from a cooperative entity towards a vulnerable existence, due to a previous defensive posture: *Olympus has Fallen* (2012) and *World War Z* (2013). While these two movies do not explicitly use or relate to space, they refer significantly to the propaganda in film towards a changed perception of the United States not only domestically, but globally.

The movie *Gravity (2013)* provides an example of how the manipulation of popular culture occurs while aiming for a particular line of thinking with regards to an identified context. While this movie, on the surface (or in orbit) portrays human technological display by its presentation of working at the International Space Station (ISS) as an everyday activity, it also characterizes the vulnerability of humankind through a seemingly inescapable event horizon. The movie itself contains multiple areas of scientific inaccuracies; however, it does offer an opportunity to present the perception of strength through space endeavors.

In 1957, increased expenditure in the arena of space relied on mass consumption of consumer goods that identified leadership, freedom, and greatness with American

[45]Harold Maas. "Is China Pulling Ahead in the Space Race?" *TheWeek.com,* January 8, 2015, https://theweek.com/articles/463370/china-pulling-ahead-space-race, accessed March 27, 2023. See also, The Martian.

exceptionalism, or the production of wealth. The United States achieved this goal through military spending initially, for national security purpose, followed by scientific and engineering objectives to transmit this ideology. Media involvement through entertainment, including film, literature, and related merchandise, served to promote space endeavors in popular culture. Another viable way to capture support for costs and requirements involved in perpetuating the space race also occurred through propaganda, i.e., news coverage.[46] For example, in 1957, Martin writes, "can-do article often repudiated or contradicted hysterical headlines" offering the acknowledgement that the U.S was indeed supreme but need work in certain areas to keep up with the Soviets, i.e., HLV's.[47]

Today there are several trade publications that promote space exploration and commerce. *Spaceflight.com*, a publication of the British Interplanetary Society, issues a monthly magazine that consistently provides editorials on the benefits of continuing space research and development, reports on ongoing aerospace accomplishments, and support businesses in the industry. Editor David Baker raises awareness for space science and the factors that influence it. He regularly focuses on a British position in space, world news analysis pertaining to space, U.S space politics, and ISS operations. *Astronomy* magazine reports on space anomalies, scientific data, the solar system, reader letters. *Discove*r magazine, although not a solely space oriented trade publication, often reports on space related science and history. *Space Trade* magazine reports and analyzes news from the space industry. Others such as Smithsonian Air and Space, IEEE Explore, and Space.com contribute to the ongoing development of the space program.

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[46]Cheryl L. Marlin "Space Race Propaganda: U.S. Coverage Of the Soviet Sputniks in 1957." *Journalism Quarterly* 64, no. 2 (Autumn87 1987): 544-559. *America: History & Life,* EBSCO*host,* accessed February 12, 2023.

[47] Ibid, 548.

Throughout the history of space exploration, media reflected modern thinking in many forms including but not limited to political ideology, social influences, racism, sexism, and economics. Movies catapulted the United States to the moon through its overall support in space-related movies echoing the themes of their respective generations. Language, symbols, and visual effects supported popular cultural ideas and concerns while news outlets reported successes and failures. Propaganda and advertising enticed commercial markets for film, for offshoots such as books, toys, other film productions, and scores of musical creations easily recognizable as its own genre or culture. Movies themselves participated in the commercialization of space through products displayed in them or the suggestion of commerce in space. Media in the form of film, journals, televised news, or internet technology offer opinion, editorial, and analysis on commercial, political, social, and technological ventures associated with space. Media remains an all-important asset to the expanding commercialization of space and the role the United States plays in it.

The human desire to explore the unknown, to understand what exists beyond a localized community, whether it is the continents, oceans, low earth orbit (LEO), the Moon, or deep space, remains an innate characteristic in people. In the past, many supporters of space innovation, exploration, and commerce, including politicians, scientists, engineers, business leaders, and entertainment producers joined together to share ideas and attempt to implement support for these goals. During the early years of the space race, Cold War consumerism evolved in conjunction with outer-space aims and helped facilitate rapid scientific research, mass consumption, advertising, and promotion of goods connecting the idea of freedom to products gleaming of innovation in the space industry, consumer market, and commercial endeavors. The means to communicate these endeavors proliferated through media forums, such as in movies,

literature, and popular culture intersection. These forums captured the evolutionary economic theory that audience, public, and society interaction fuel industry which then drives the pursuit of innovation and the possibilities of real-life scenarios like those imagined in popular culture.

Cold War merchants commodified space for several reasons. Since economic theory suggests that commodification replicates a market for profit, this is a tenable reason to capitalize opportunity. The cost of ignoring that opportunity implicates lack of ability and skill. In this Cold War this meant forgoing technical superiority and space dominance. Whether that assumption may accurately describe reality, the perception of reality, the identity formulated by it was significant. The imperative to transmit mass culture functioned as a driver of the commercialization of space in two ways. First, the literal commodification of ideas and products stimulated the space economy. Second, the ideas generated concerning the future and the innovation possibilities stemmed from it facilitated the egress of the government dominance at the end of the Cold War to private industry rise.

Cold War merchants like Hollywood movie producers, artists, writers, television series creators, and toymakers expanded the consumer space market and identified American values through consumption. The benefits included company bottom lines, but more importantly significantly impacted public awareness and participation in space which continued to evolve throughout the Cold War with each new generation. With each new merchandise produced, more innovative items arrived. The production of mas entertainment created subcultures which manufactured a domine effect or chain markets producing even more goods. Many of the goods stimulated economic growth in other markets leading the expansion of the space economy.

Cold War merchants manufactured influence by the same manner as consumers inspired industries. The fictional worlds led to the induction of more interest in average citizens getting

involved in space and for entrepreneurs to develop inventive new research igniting opportunity for new private industries to enter LEO and commercialize space.

Chapter 4

Little Green Men.

On April 12, 1981, Launchpad A, Complex 39 at Cape Canaveral, Florida roared to life amid the anticipation of the first Space Shuttle launch, space transportations system (STS-1) *Columbia*.[1] Powerful clouds of steam engulfed the shuttle as the massive RS-25 engines designed and manufactured by Rocketdyne, a division of North American Aviation, thrust *Columbia* to orbit. Aboard were veteran astronaut and 1972 moonwalker, John Young and Navy test pilot Robert (Bob) Crippen. This iconic launch represented a new technological era in space transportation and launch with the use of the first reusable space plane.

Built by Rockwell International, the space shuttle became a significant symbol in the preservation of the U.S. Space Program in the post-Apollo era. Pilot Bob Crippen commented once in orbit that, "this shuttle performed as advertised…I think we got something that's really going to mean something to the country and the world."[2] Flight director Neil Hutchinson proclaimed that the shuttle was a "super vehicle, a super piece of machinery."[3] For NASA, this launch reclaimed some of its former glory as excitement rippled across the country from the desert of Edwards Air Force Base (AFB), California, to the streets of Titusville, Florida, and in the Oval Office. President Reagan commented that the launch was "a truly spectacular event."[4] Its landing a few days later at Edwards sparked even more enthusiasm and much needed optimism in the wake of the malaise of the previous decade.

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[1] John Noble Wilford, "Shuttle Rockets Into Orbit on First Flight; Some Tiles Fall Off, but NASA Sees No Danger," *New York Times*, April 12, 1981, https://archive.nytimes.com/www.nytimes.com/library/national/science/041381sci-nasa-columbia-6.htmll, accessed January 3, 2024.

[2] Robert Crippen quoted in Harry S. Rosenthal's "Columbia Orbits 'Like a Champ.'" *The Bakersfield Californian,* (April 13, 1981), 1. https://newspaperarchive.com/panama-city-news-herald-apr-12-1981-p-2/

[3] Ibid.

[4] Ibid, 4.

Given the challenge of the federal deficit at the start of the 1980s, it is worth questioning how the nation could afford expenditures of the magnitude of the shuttle program and use it to its advantage. There is also merit in probing other economic factors that STS-1 extricated from the quagmire of the recession. As a merchant of space, to what extent did the national economy impact the actions of the federal government and private industry in asserting power that contributed to the commercialization of space in the late Cold War? The fledgling stages of the shuttle program also gave impetus to goals of economic recovery, the expansion of the space economy though the private sector, and in the perception of the benefits of continued space exploration. This chapter will explain this argument.

One year after its maiden launch, space shuttle *Columbia* returned from its fourth mission in space on July 4, 1982. An exuberant President Reagan welcomed the crew home and reiterated his goals for the space program, declaring that the U.S. Space program was a vital part of the nation's economy.[5] In his remarks, President Reagan shared his vision for the space shuttle program, comparing its impact to the completion of the Transcontinental Railroad, ushering in a new era that would spur subsidiary innovation and economic progress. He went on to announce the approval of a national space policy, the "National Space Policy, National Security Directive, NSDD 42." In it, the space shuttle was designated a "major factor in the future evolution of the United States space programs."[6] Its role was to create a collaborative and cooperative environment between national security and civil aviation. The directive encouraged the efficient

[5] Ronald Reagan, "Remarks at Edwards Air Force Base on the Completion of the Fourth Space Shuttle Mission," July 4, 1982, Ronald Reagan Presidential Library, https://www.reaganlibrary.gov/archives/speech/remarks-edwards-air-force-base-california-completion-fourth-mission-space-shuttle.

[6] National Space Policy, National Security Decision Directive 42, July 4, 1982, NASA, https://www.nasa.gov/history/national-security-decision-directive-number.

utilization of national resources to promote this endeavor. The shuttle program symbolized visible power for the United States in the Cold War. Moreover, the shuttle stood as a technological national identity, which resonated throughout the citizenry as more and more, people incorporated the by-products of commercial space technology into their everyday lives.

Space shuttle *Columbia* galvanized public interest and became a driving force in the commercialization of space as opportunities materialized from NSDD 42 and the power of the spectacle, which influenced positive public perception. President Reagan's patriotism exuded confidence and optimism. When invited to share the platform with the president, astronauts Captain T.K. Mattingly and Colonel Hank Hartsfield concurred the importance of the shuttle and the benefits to the United States, saying that "American technology is the greatest in the world, with the best people in the world" with limitless and drive ingenuity.[7]

Former NASA historian Roger Launius argued that President Reagan motived the American public in favor of NASA and space exploration projects in his remarks.[8] However, President Reagan also simultaneously coalesced power for his presidency and the United States by expanding private sector endeavors, which filtered to the expansion of economy through space. The shuttle program supported decisions that were in the planning stages in mid-1981, just as Columbia was about to make its first launch.

President Reagan's actions stemming from NSDD 42 penetrated the economy in diverse ways, like leveraging the benefits of the shuttle program against the federal budget which called

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[7] Ronald Reagan, "Remarks at Edwards Air Force Base on the Completion of the Fourth Space Shuttle Mission," July 4, 1982, Ronald Reagan Presidential Library, https://www.Reaganlibrary.gov/archives/speech/remarks-edwards-air-force-base-california-completion-fourth-mission-space-shuttle.

[8] Roger D. Launius, *"The Historical Dimensions of Space Exploration: Reflections and Possibilities," Space Policy 16, (2000), 23-38, 33.*

for reallocation of funding to support partnerships with private industry.[9] One example included transferring weather and observation satellite operation to the private sector. Ed Harper of the OMB informed Craig Fuller, the Deputy Assistant to the President that there was a need to consider the economic options of this proposed transfer and resolve any potential issues. Given the budget constraints and the Presidents firm position on limiting federal spending, discussion revolved around whether the private sector was even willing to assume the investment risks associated with the production of new satellites beyond what was already budgeted.[10]

Participants in the meeting included the Departments of Commerce, Agriculture, Defense, Interior, State, CIA, and NASA, each of who's interest were impacted by any final decision. In the report, Harper acknowledged the need for fiscal restraint and proposed options such as reducing expenditures on certain types of satellite projects that could best be operated by private aerospace companies using their communication satellites[11] This would ease the 1983-1986 budgets which translated into economic power for the president and a check in the box of his campaign agenda, which promised delivering a balanced budget.

On February 3, 1981, President Reagan in another example of asserting executive control in the economy setting the stage for spending on the space program and commercialization, rescinded the Budget and Impoundment Act of 1974.[12] This action eliminated obstacles to spending by forcing a variety of subsidiary spending allocations into one, omnibus bill that Congress could pass. This rendered Reagan more power to fulfill his national goals of balancing

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[9] Cabinet Matter: Private Sector Transfer of LANDSAT Activities July 23, 1981. Collection Edwin Meese, III, Box Number 9, Folder Private Sector Transfer of LANDSAT, (CM# 106) (1 of 3). Ronald Reagan Presidential Library, https://www.reaganlibrary.gov/archives/white-house-inventory/meese-edwin-iii-files-1981-1985

[10] Ibid, 5.

[11] Ibid.

[12] Ronald Reagan, Message to the Congress Reporting a Budget Rescission Online by Gerhard Peters and John T. Woolley, *The American Presidency Project* https://www.presidency.ucsb.edu/node/24669.

the budget, stimulating the economy, and focus on space initiatives, which he viewed as a necessary part of his agenda. This action allowed him to continue this trend throughout his presidency.

According to the Government Accounting Office (GAO), President Reagan proposed a total of 593 rescissions in the budget with 215 approved by Congress.[13] The greatest number proposed and approved by Congress occurred in 1985, the same year that he directed NASA to build the International Space Station and the same year that the shuttle Atlantis, built by Rockwell International, made its debut into the cannon of space transportation, lifting off on its first voyage on October 3, 1985.[14]

By 1984, President Reagan continued to demonstrate his rhetorical influence as he weaved discussions of space into daily administration matters. This power represented another facet in the commercialization of space, which energized President Reagan's already fervent interest in space-related topics and activities. Chairman of the Joints Chiefs of Staff, General (Gen.) Colin Powell, commented that Reagan's fascination with space at times flustered some White House staff. He stated that when the president brought up space-related endeavors, Gen. Powell muttered " here comes the little green men again."[15] It was evident that not everyone in the administration understood the enchantment nor the correlating rationale to space prospects.

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[13] Susan A. Poling, "Testimony Before the Subcommittee on Federal Financial Management, Government Information, Federal Services," and "International Security, Committee on Homeland Security and Governmental Affairs, U.S. Senate," and "Impoundment Control Act Use and Impact of Rescission Procedures," United States Government Accountability Office, December 16, 2009, 2-17.

[14] National Aeronautics and Space Administration, "First Flight of Space Shuttle Atlantis, October 3, 1985. Last updated October 4, 2017, NASA, https://www.nasa.gov/image-article/this-week-nasa-history-first-flight-of-space-shuttle-atlantis-oct-3-1985/

[15] Lou Cannon, *President Reagan: The Role of a Lifetime* (New York: Public Affairs, 2000), 42.

One persistent area was his belief in developing space as the next frontier and connected it to the American dream.[16] This reference was reminiscent of Frederick Jackson Turner's frontier thesis which identified the West as part of the rugged American spirit and part of its tradition, identity, and destiny, a concept familiar to Reagan.[17] This theme also built upon the earlier challenges faced in 1960 as John F. Kennedy accepted the Democratic nomination for president, claiming that America was the edge of a "new frontier" that among other things, lies uncharted areas of science, space, mastery of the skies, and the far side of space.[18] While American exceptionalism reverberated throughout the address, the more important inference was the economy and how to recovery from stagnation while developing new opportunities by expanding commerce in the space frontier. This powerful message resonated with many who saw newly developing technology as a useful tool to preserve the environment, provide groundbreaking research in a variety of research including healthcare, weather, and defense.

While the private sector production of ELV's was a significant focus of scholarly debates on the point of origin for the commercialization of space, President Reagan was most interested in the benefits obtained, arguing that space-related commerce would provide tremendous economic opportunity.[19] This included gains in knowledge that allowed for people live and work

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[16] Ronald Reagan, State of the Union Address "Tides of Freedom," Washington, D.C., January 25, 1984.

[17] Frederick Jackson Turner, "The Significance of the American Frontier, 1893," *American Historical Association,* accessed January 18, 2024, https://www.historians.org/about-aha-and-membership/aha-history-and-archives/historical-archives/the-significance-of-the-frontier-in-american-history-(1893).

[18] John F. Kennedy, "Acceptance for Democratic Nomination for President, July 15, 1960. https://www.jfklibrary.org/learn/about-jfk/historic-speeches/acceptance-of-democratic-nomination-for-president

[19] See Roger D. Launius, *Critical Issues in the History of Spaceflight,* Chapter 6, (Washing, D.C., National Aeronautics and Space Administration, 2006), 171-175., See also, W.D. Kay, "NASA and Space History," *Technology and Culture* 40 (1999:120-127; and John M. Logsdon, "Space Commercialization: How Soon the Payoffs?" FUTURES February 1984. Logsdon discusses a variety of issues in space policy, including transportation services and the demand for ELV's in rockets like Titan, Delta, Thor, and Centaur. These rockets serve multiple purposes and privatization potentially supports this initiative, according to Logsdon. However, during the Reagan Era, the cost factor created limits on the number of ELV's produced by NASA or by NASA and Private sector cooperation.

in space to develop new economic activity that could be applied on earth.[20] A major necessity for this to happened depended on licensing and production of ELVs. This infusion stimulated job growth. It was estimated that private companies created new jobs, sold new products, which motivated interests in technical education, much like the early years of the space race, leading to even more jobs.

One such area for potential job growth came from the design and production of the Conestoga Rocket by Space Services Incorporated in 1982.[21] The company was a wholly owned private sector launch service founded by entrepreneur David Hannah, Jr. Stephen Harrington of the Texas Monthly write in November 1982 that Hannah's vision of future space enterprises drove him to design and launch a rocket that he intended to use in the development of space transportation industry that supported expansionist views.[22] This line of thinking caught the attention of the President Reagan whose on-going motivations included supporting entrepreneurial drive, especially when it coincided with Administration economic and space policy goals.

Accomplishing these goals required a substantial amount of money to acquire economic power and maintain a national identity through continued achievements in space activity. President Reagan proposed industry and economic incentives that became a driving force for future commerce and commercialization. It was also linked to building the space economy through capitalization on existing national space goals and the intention to exploit them further. For example, the augmentation of privatizing communication technology in the form of remote

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[20] Ronald Reagan, State of the Union Address "Tides of Freedom," Washington, D.C., January 25, 1984.

[21] "Origins of the Commercial Space Industry," Federal Aviation Administration, accessed January 12, 2023, https://www.faa.gov/sites/faa.gov/files/about/history/milestones/Commercial_Space_Industry.pdf.

[22] Stephen Harrigan. " Mr. Hannah's Rocket," *Texas Monthly,* November 1982, exasmonthly.com/news-politics/mr-hannahs-rocket/.

sensing.[23] Likewise, formulating a space policy structure that enhanced America's position in the changing political direction of the Cold War and its relationship to the Soviet Union. George M. Low, head of the NASA transition team for President Reagan reported that NASA would inspire and innovate in the next decade, ensuring superiority over the Soviet Union and its space program. The report outlined the benefits of the vibrant space policy that included maintaining global leadership and national prestige, developing advancements in technology that increased economic opportunity, and spurring new commerce in scientific accomplishments.[24]

Furthermore, the U.S. government expanded its power by developing policies that supported Administration initiatives in tandem with commercialized space transportation. For example, among its stated goals of national security and U.S. space leadership, was to exploit space for economic and national resources. Included in this statement was principal D, "encouraging domestic commercial exploration of space capabilities, technologies, and systems for economic benefit."[25] What is interesting in this directive is that commercialization and private sector cooperation was intertwined with the aggregate goals of national security and under the guise of dynamic domestic control.

Much like the previous space generation, many of the parts for space launch systems (SLS) were built by private industry defense contractors. However, in the wake of the zeal from STS-1, the Reagan Administration questioned the shuttle's future role and the costs involved.[26] President Reagan was an avid space enthusiast, but he also committed his administration to

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[23] Edwin Meese, III: Files, Folder: Private Sector Transfer of LANDSAT (CM# 106) (1 of 3), Box 9

[24] George M. Low to Richard Fairbanks, Director of the Transition Resources and Development Group, "Report of the Transition Team (NASA), December 1980," https://www.nasa.gov/history/report-of-the-transition-team-december-1980/.

[25] Ibid.

[26] John M. Logsdon, *Ronald Reagan, and the Space Frontier*, (Washington, D.C.: Palgrave Macmillan, 2019), 25-26.

balance the federal budget, which meant streamlining non-defense priorities.[27] NASA fell under this category. Office of Management and Budget (OMB) director for the Reagan Whitehouse, David Stockton, was also an enthusiast of the space shuttle program. While significant cuts were considered for NASA planetary exploration programs, Stockton informed the public that the shuttle was vital to the nation.[28]

The economic environment in the early 1980s consisted of increased federal deficit stemming from domestic government programs in the 1960s and 1970s, the Vietnam War, the oil crisis, and inflationary policies of the 1970s[29] President Reagan sought avenues to limit federal spending. In his inaugural, he argued that the "economic affliction of great proportions" threatens freedom and liberty, as well as causes "social and political upheaval." He claimed that "government was not the solution to the problem, government is the problem."[30] He laid the groundwork for what became the Economic Recovery Tax Act, he declared that there were new entrepreneurs with the "faith the create innovative industries, jobs, and opportunities."[31] The Commercial Space Launch Act of 1984 echoed this sentiment.

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[27] Ronald Reagan: "Address Before a Joint Session of Congress on the Program for Economic Recovery," February 18, 1981; See also, Ronald Reagan, "Inaugural Address, 1981, U.S. Capitol, Washington, D.C. January 20, 1981, Reagan Library and Museum, https://www.reaganlibrary.gov/archives/speech/inaugural-address-1981

[28] Logsdon, 25-25.

[29] "The History of the Debt," TreasuryDirect.gov. reasurydirect.gov/government/historical-debt-outstanding/. See also, "Historical Debt Outstanding," fiscals years 1971-1980, https://fiscaldata.treasury.gov/datasets/historical-debt-outstanding/historical-debt-outstanding. Debt rose from just over $389billion in in 1971 to almost $908 billion by 1980. The 1970s were a period of two recessions and constant stagflation, which harmed the economy and weakened the power of the federal government. See also, "Federal Budget, Receipts, and Outlays, Coolidge to Biden, American Presidency Project, n.d., https://www.presidency.ucsb.edu/statistics/data/federal-budget-receipts-and-outlays.

[30] Ronald Reagan, "Inaugural Address, 1981, U.S. Capitol, Washington, D.C. January 20, 1981, Reagan Library and Museum, https://www.reaganlibrary.gov/archives/speech/inaugural-address-1981

[31] Ibid.

The fiscal budget in 1981 when President Reagan took office was approximately $594 billion.[32] This amount steadily increased between 1968 and 1981with deficits at its highest during President Nixon's Administration in 1975. While gross domestic product rose, expenditures remained nearly the same in the thirteen year period. However, the federal deficit continually increased.[33] The country was spending more and taking in less. President Reagan, as a fiscal conservative, determined to cut the budget, reduce spending, lower taxes, and modify where spending occurred. Considering what economic factors contributed to the commercialization of space and how the space shuttle program helped solve fiscal issues, it is necessary to examine President Reagan's goals and initiatives.

In February of 1981, in his State of the Union Address to a joint session of Congress, President Reagan solemnly declared the national economy was in a dire state, "the worst since the Great Depression." He went on to describe how much more it cost for the average citizen to afford the everyday essentials like housing, while wages had generally not increased. Ever the actor, Reagan applied his story-telling voice to connect with the American people as he outlined federal spending and the expansion of the government since the Second World War.[34] In his address he laid the groundwork for an economic recovery plan that would eventually translate in spending on national security and defense, as well as methods for strategically modifying the federal budget. This included the investments in America through the shuttle program and its partnerships with private industry.

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[32] Malcolm Baldridge, Guy W. Fiske, and Robert G. Dederick, "Federal Expenditures, State by State, Fiscal Year 1981," United States Census Bureau, February 1983, https://www.census.gov/library/publications/1983/govs/fes-81.html.

[33] See also, "Federal Budget, Receipts, and Outlays, Coolidge to Biden, *American Presidency Project*, n.d., https://www.presidency.ucsb.edu/statistics/data/federal-budget-receipts-and-outlays

[34] Ronald Reagan, "Speech to the Joint Session of Congress, February 5, 1981, eaganlibrary.gov/archives/speech/address-nation-economy-february-1981.

Of the several options he proposed, stimulating the economy through tax reduction and investment stood out. He proclaimed that

> "A president's greatest responsibility is to protect all our people from enemies, foreign and domestic. Here at home the worst enemy we face is economic—the creeping erosion of the American way of life and the American dream that has resulted in today's tragedy of economic stagnation and unemployment."[35]

By naming the economy an enemy, he effectively demonstrated that he would fight it just as he would foreign powers. He affirmed his belief in the investment of the people, the country, and in private industry, suggesting that the American ingenuity is driven by its entrepreneurial spirit. What came from this speech was the Economic Recovery Tax Act. This law provided incentives for small business development, research and development of new technologies, credits for scientific and intellectual property and research, a reduction in corporate taxes which also lessened regulations on experimentation, and development of innovation.[36]

What this act essentially did was provide a means for taxpayers to increase their wages via tax reduction that in turn, Reagan intended as stimulus for spending in the economy including in new business ventures, risk taking opportunities, and building new factories that provided new jobs in industry and technology. Through this law, President Ragan opened the door for opportunity, expanded the power of the federal government through perception, and set the stage for rewarding industry. This resulted in the movement of little green men and advancement into space-related objectives. This action was another strategic move that fulfilled his 1980 campaign promises. The Economic Recovery Tax Act (ERTA) expanded the power of government by initiating legislative action to repair the economy while promoting innovation.

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[35] Ibid.

[36] Congress.gov. "H.R. 4242-97th Congress (1981-1982): Economic Recovery Tax Act, 1981, August 13, 1981, https://www.congress.gov/bill/97th-congress/house-bill/4242/text.

Perception that the economy improved under Reagan empowered his administration, rendering future opportunities to exploit not only technology, American exceptionalism, and leadership, but in the expansion of each into the space frontier. This data demonstrates public perception of the leadership of the president in using the federal government to curtail economic problems. While the actual effect of ERTA was not immediate, the perception of its intent was well received. Once the law took effect, Congressional oversight and effort to speed recovery, also passed the Tax Equity and Fiscal Responsibility Act (TEFRA) chaired by Robert Dole from the Senate Finance Committee. This act rescinded some of the previous tax cuts in ERTA, while continuing spending cuts and tax reform.[37] According to Dr. Arthur Laffer at the annual American Legislative Exchange Council (ALEC) held on the 40th anniversary of ERTA, the Reagan Tax cuts represented a catalyst for the American economy because it boosted recovery while stimulating long-term growth that continues today. One way it did this was through enhanced competition and innovation in business, technology, and tax cuts that support income.[38]

Speaking in a televised campaign address on October 24, 1980, Ronald Reagan touted his economic plan while making stark comparison to President Carter's failed economic policies. Titled "A Vital Economy: Jobs, Growth, and Progress for Americans," the speech outlined the causes for economic decline in the country and set the stage for recovery in the 1980s. Reagan's rhetoric once again weaved metaphor and imagery that connected with the citizenry claiming that "America does not need a president who sees unemployment and inflation as a temporary

[37] White House Report on the Program for Economic Recovery, February 18, 1981. https://www.reaganlibrary.gov/archives/speech/white-house-report-program-economic-recovery-0.

[38] Jonathan Williams and Lee Chalk, "40th Anniversary of Reagan's Economic Recovery Tax Act, August 20, 2021, https://alec.org/article/40th-anniversary-of-reagans-economic-recovery-tax-act/.

inconvenience, but one with a vision for the future." [39] He promised to limit government spending to a "reasonable and prudent level," to "revitalize American industry" and to revisit and remove any burdensome regulations that stifle economic opportunity and growth.[40] The significance of this checklist was the Economic Recovery Tax Act did exactly that. By 1984, the economic policy also promoted the removal of cumbersome and bureaucratic regulations for space activity, space launch services, and private sector participation and production of critical machines, tools, and systems. This enhanced private sector activity supported a space economy via research and development of computer software companies and technological innovation industries.[41]

The extent to which the national economy and the actions of the federal government in the 1980s contributed to the commercialization of space is evident in the passage of The Commercial Space Launch Act of 1984, which was another pivotal moment in the commercialization of space timeline. But what drove commercialization of space and the passage of the Commercial Space Launch Act was the result of two priorities: gaining power and control of the economy and demonstrating through exhibition increased production of space-oriented technologies that set the United States apart from the Soviet Space Program, and in the tensions derived from the ongoing Cold War. This is evident from the summary of the Act, Public Law 98-575 in which regulated the licensing and payload launch of vehicles into space while defining

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[39] Ronald Reagan. Speech, "A Vital Economy: Jobs, Growth, and Progress," televised campaign speech, October 24, 1980. eaganlibrary.gov/archives/speech/televised-campaign-address-vital-economy-jobs-growth-and-progress-americans.

[40] Ibid.

[41] Joint Committee on Taxation, "General Explanation of the Economic Recovery Tax of 1981 (H.R.4242, 97th Congress; Public Law 97-34), December 20, 1981, 128-162. https://www.jct.gov/CMSPages/GetFile.aspx?guid=d44df064-f7c8-444a-9c57-68d03522feed.

necessary steps for commercial activity in space under federal guidelines.[42] It states the purpose of the act was "to promote economic growth and entrepreneurial activity through utilization of the space environment for peaceful purposes."[43]

In commercializing space launch systems, the United States maximized opportunity to increase it space domain presence while simultaneously investing in technological innovation and stimulating economy. The act outlines that U.S activity in outer space was for peaceful purposes, and investment in technology and research applications provided economic stimulus for the country in the form of new and innovative business.[44] Several new business ventures grew out of this federal posture, including Space Launch of America, inc., which specialized in the production of launch vehicles; Orbital Science Corporation, which specialized in launch and a variety of Low Earth Orbit (LEO) satellite communication design manufacture, and production services, including LANDSAT; and American Rocket Corporation which built hybrid rocket motors.

By 1989, these first space launch companies benefited directly from the passage of the Commercial Space Launch Act of 1984 and set the stage for further private industry participation in space commerce. Additionally, though this act represented a monumental shift government space policy, it symbolically reflected the Reagan Administrations vision of America by meeting its goals through the expansion entrepreneurial innovation and activity, as well as what the United States stood for economically, politically, and technologically. Moreover, the introduction of the private sector through providing launch capability and payload services, President

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[42] "The Commercial Space Launch Act,1984," Public Law 98-575. U.S Statute 98 (1984): 3055, codified at U.S. Code 49 (1984) 2601.

[43] Commercial Space Launch Act, 1984.

[44] Commercial Space Launch Act, 1984.

Reagan's policy on the commercialization of space provided control over the economy, the industries, and domestic and global perceptions of power outlined in his campaign, first inaugural, and second inaugural address related to the economy of the United States.

While previous scholarship has focused on the production of ELV's and as a main contributor to the commercialization of space, the act itself was a driving force. Additionally, the act provided a mechanism for the manufacture of subsidiary space products, as well as provisions to partner and privatize government-owned telecommunication satellites. For example, propulsion industries, spacecraft component manufacturers land rovers and probe design developers, and satellite communications distributers. The latter boosted by the earlier , 1981-82 Cabinet Council on Commerce and Trade discussions and policies set forth by the Reagan Administration.

The Cabinet on Council, Commerce, and Trade concluded that benefits of commercializing remote sensing telecommunications satellites included bosting U.S. power by identifying environmental concerns across the global, giving the United States opportunity to act. Information collected by LANDSAT was determined to be essential because the United States applied this data to determine consumer economy forecasts in areas such as how drought conditions affected cattle grazing, the movement of goods through oceanic shipping lanes, and determining the location of a possible renewable resources.[45]

Baldridge argued that land remote sensing from space creates opportunity to conduct geological surveys from space, reducing the costs to U.S. consumers, which at the time cost taxpayers over $10 billion dollars a year out of the federal budget.[46] It was further estimate that

[45] Malcom Baldridge. "Transmittal of Issue Papers Land Remote Sensing and Weather Satellites," March 12, 1982, Edwin Meese, III: Files, Folder: Private Sector Transfer of LANDSAT (CM# 106) (1 of 3), Box 9

[46] Ibid.

in the short term until private sector production of satellite and lift vehicle capabilities caught up to the government, there would be an elevated cost added to the federal budget. However, it was anticipated that the opportunity cost over time would prove economically efficient and reduce spending.

By 1984, Hughes Aircraft designed and built LANDSAT 4 and 5, and in conjunction with NASA, delivered them to sun synchronous orbit (SSO), approximately 600 miles altitude, or 521 nautical miles. Additionally, these land sensing satellites contained equipment for mapping the earth which included the thermal mapper (TM), multispectral Scanner (MSS), and the enhanced thermal mapper (ETM), each built by Santa Barbara Research Center, (SBRC) a division of Hughes Aircraft.[47]

The significance of this satellite transfer besides reducing strains on federal budget, a Reagan Administration goal, was that it also coincided with the president's belief in space technology as a natural next goal for the United States. It became an and an economic powerhouse for the country in terms of encouraging entrepreneurship and innovation, expansion of the space economy which benefited the U.S. economy and provided opportunities for employment which also helped strengthen and build the economy. For example, during the early Cold War, Hughes aircraft had become the largest employer in Southern California with its aircraft and space component manufacturing.[48] Furthermore, as the space economy grew during

[47] "Landsat 4 and Landsat Story Map," U.S. Geological Survey (USGS), Department of the Interior, accessed December 1, 2023, https://www.usgs.gov/landsat-missions/landsat-4#:~:text=Landsat%204%20was%20built%20and,keeping%20of%20the%20Landsat%20program. See also, Landsat 5.

[48] Hughes Industrial History, "The Southern California Aerospace Industry," last updated 2024, accessed December 1, 2023, https://www.hugheshistoric.com/southern-california-aerospace-industry/.

the Cold War, the period of the 1980s saw approximately 60-70% of all aerospace industry workers employed in the Los Angeles area, stimulating the regional economy.[49]

Hughes Aircraft went on to develop future satellites and other electronic equipment in its Space and Communication Division, eventually developing consumer satellite access in the 1990s in Direct TV. Consumer products continued to filter into the civilian economy with the development Global Positioning Satellite (GPS) Technology developed by space industries like Aerospace Corporation and Magellan who in the 1980s produced the first handheld GPS.[50]

Considering the government decision to commercialize other types of satellites in addition land sensing, weather satellite sales became a prominent are of discussion. On March 1, 1982, discussions on the analysis of issues for commercialization of civilian weather satellite concluded that although there were significant concerns related to national security and military preparedness, the overall risk was minimal. This was attributed to the benefit procured from sales of certain types that the administration gave approval for.[51] This meant that while certain risks were annotated, they mainly concerned their capability as a backup system to military systems, which determined to be negligible.

In his March 12, 1982 memo to the Cabinet Council on Commerce and Trade, Malcolm Baldridge argued that the commercialization of weather satellites to multiple companies generated significant revenue for the government which translated into less spending on these vehicles and effectively supporting President Reagan's national goal to reduce the federal budget. Furthermore, commercialization reduces unnecessary time spent on studies by the OMB and

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[49] Ibid.

[50] GEOTAB, "The History of GPS and Commercial Satellite Tracking, June 23, 2020, https://www.geotab.com/blog/gps-satellites/.

[51] Malcolm Baldridge, "Discussion and Analysis of the Issue and Options on Commercialization of the Civil Weather Satellites," Files: Edwin Meese, III, Box 9, 1.

National Security Council (NSC), as well as eases unnecessary regulatory issues for the private sector to enter the market.[52] These points all supported competition in the marketplace, avoided monopolies, and encouraged innovation. Just one year later the president again referred to a new frontier that included high technology and support of private industry to "carry us to the twenty-first century."[53] The national economy impacted the actions taken by the Reagan Administration in that efforts to reduce federal spending while maintaining America's technological leadership, it was possible to invest in the private sector to stimulate growth. Additionally, this investment spurred the growth of new technology and space businesses that supported the shuttle program, which was in turn required to lift the government and commercial satellites to LEO.

By 1983, the president accelerated his space initiatives. Those that saw Reagan's ideas about space and the economy as pure fantasy, such as Gen. Colin Power and Senator Edward (Ted) Kennedy, realized that this was a national goal, like it or not. One of the first moves of the year was in the announcement that NASA would build an International Space Station (ISS). This bold initiative promised to benefit humanity in several ways. First, the station proposal included opportunity for collaboration with the international community. In his 1984 State of the Union Address Reagan iterated that "technology transforms lives."[54] He went on to say that space would create multiple job opportunities through innovation and the plan to develop the ISS

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[52] Ibid, 5-6.

[53] Ronald Reagan, "State of the Union," January 25, 1983,*The Miller Center* accessed December 1, 2023, https://millercenter.org/the-presidency/presidential-speeches/january-25-1983-state-union-address

[54] Ronald Reagan, State of the Union Address, February 6, 1985. https://www.reaganlibrary.gov/archives/speech/address-joint-session-congress-state-union-february-1985. The president explains the progress made by his administration actions on the economy, and the continued progress planned. He reminded the country of the ongoing importance of building the space economy as vital to securing jobs, entrepreneurial innovation that stimulated economic growth, provided benefits human society, and anticipation of humans living and working in space in the New Era and into the twenty-first century. One example offered was the semi-conductor manufacturing industry and the involvement of companies like AT&T in building these. Here he argues that record funding for research and development of commercial space is needed to continue meeting this national goal.

economic and scientific gain.[55] By this time, the realization of Reagan's space initiative came to fruition. Using space to stimulate the economy and garner influence and power that impacted society was not a fantasy or worries about little green men. It was a reoccurring theme throughout his presidency and evidenced in multiple speeches and meetings between various government agencies including the Senior Interagency Group for Space, (SIG Space).

For Reagan, the ISS meant showing strength in the face of Cold War adversaries. It also meant displaying technological supremacy. Reagan did not lavish the thought of war and thoughts of nuclear war were constant.[56] By exploiting outer space and taking the lead role in establishing a joint-international venture for peaceful and economic intent, he solidified his national goals, boosted the economy, and promoted and strengthened the commercial opportunities in the space environment, including space commerce and the development of space transportation.

As promising as opportunities in space seemed, especially for the economy in the form of private sector investment, new job opportunities, manufacturing, and zero-gravity research, there were a few skeptics. Fears of rising costs, concerns over its necessity, and worries of the message that the construction and operation of the ISS exuded. For example, Reagan appointed NASA Administrator James Beggs, and others in the Space Community questioned the effect of the ISS on the economy from the spending point alone. Others wondered how research and funding for

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[55] Ronald Reagan, "Address Before a Joint Session of Congress, January 1984, Ronald Reagan Presidential Library, https://www.reaganlibrary.gov/archives/speech/address-joint-session-congress-state-union-january-1984

[56] Peter Beinart, "Think Again: Ronald Reagan, The Gipper Wasn't the Warhound his Conservatives Followers Would Have You Think," *Foreign Policy.com,* June 7, 2010. Accessed November 27, 2023. oreignpolicy.com/2010/06/07/think-again-ronald-reagan/.

the ISS might interfere with their other projects and the NASA overall budget considering one of the president's primary goals was to cut spending. No agency was immune to cuts.[57]

However, analysis of communication between Beggs and James Baker, the White House Chief of Staff to the President demonstrated substantial support for the ISS Project. It was simply a matter of timing, rather than whether to move forward at all. This is significant because as Beggs explains to Baker, "Mac Baldridge and I are convinced that the commercial and scientific needs and potential warrant this undertaking," which supports the president's drive for the commercialization of space as an economic and scientific benefit.[58] Further analysis demonstrates clearly that national policy goals drove commercialization; however, it is important to glean that on-going economic concerns leftover from the Carter Administration weighed heavily on decision to incorporate private sector activity in the space domain. Beggs argued "there is substantial momentum for private sector investment and potential benefits from commercialization."[59] Furthermore, this adhered to President Reagan's July 1982 vision of the shuttle program and space as an economic frontier.

Also in August of 1983, Central Intelligence Agency (CIA) documents revealed that discussion on the implementation of a feasibility study for the ISS was presented to the CCCT offering a variety of options and argumentation for moving forward. Craig Fuller, Assistant to the President on Cabinet Affairs, presented a report from the SIG Space groups along with recommendations, stating that "Department of Commerce and the President approve the

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[57] Richard J. Smith and Richard E. Benedick*, Negotiating Environment and Science: An Insider's View of International Agreements from Driftnets to the Space Station*, Chapter 6, (New York: Taylor Francis Group, 2015), 117-118. See also David Sanger, "Weinberger Letter on Allies Role in Space Station Stirs Furor," *New York Times*, April 10, 1987.

[58] James M. Beggs, Letter to Honorable James A. Baker, III, Chief of Staff and Assistant to the President," August 24, 1983. https://www.cia.gov/readingroom/docs/CIA-RDP85M00364R001803470011-0.pdf

[59] Ibid,2.

enhanced shuttle program and the ISS."[60] Among the considerations were three substantial benefits. One, that investment in the shuttle and ISS uphold U.S. leadership in space and provide a "wide spectrum of commercial potential." Two, that the ISS boosted U.S. global prestige. Third, that "space is an area of commercial and technological competition."[61]

Establishing a geosynchronous (GEO) space station is the most relevant since manufacture of the space station gave the U.S. the global edge and opened bourgeoning space markets. These markets benefited U.S. private industry for future commercial ventures. This in turn help build, promote, and stimulate the space economy through spin-off markets, which are subsidiary commerce and commercial exploitation of space by private industry, specifically commercial manufacturing of pharmaceuticals in space. This was expected at the turn of the century.

John Yardley, President of McDonnell Douglas, attended a meeting in Washington concerning ISS. He hastily sent a letter to Jim Beggs promoting commercial opportunities in space for pharmaceutical reach and development from its Electrophorese Division (EOS). He explained in his sales pitch that the "development of EOS process cannot be competed economically on earth; however, the zero-gravity environment offers opportunities to manufacture pharmaceuticals in space at a fraction of the cost and could made available to the public."[62] He went on to explain that experimentation on the shuttles provide the space environment effective, this method was costly. He then requested the opportunity to be one of the

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[60] Craig Fuller, Assistant to the President on Cabinet Affairs, "Memorandum for Members of the Council of Commerce and Trade, Subject Space Station, November 22, 1983, ia.gov/readingroom/docs/CIA-RDP85M00363R001002300012-7.pdf.

[61] Ibid, 4-6.

[62] John Yardley, President of McDonell Douglas, Letter to James M. Beggs, NASA, August 23, 1983. ia.gov/readingroom/docs/CIA-RDP85M00158R000800010005-0.pdf. This letter also contained an extensive report and explanation of cell processes and how they function in zero-gravity, offering a commitment to invest in the ISS.

first commercial investors in ISS for use of research and experimentation on EOS, which for his company would be a significant cost-effective investment. His letter was immediately forwarded to William Clarke, Assistant to the President on National Security Affairs, pointing out that it was first formal industrial commitment to use the ISS commercially.[63]

By the 2000s, this manifested into a diverse space exchange with launch, communication, manufacturing, mining, and tourism to name a few. Private sector companies gaining a foothold in the space market in the 1980s and 1990s included several defense contractors like McDonell Douglas Astronautics Corporation, Lockheed Martin, and Raytheon, private venture companies Maxar Space (Space Systems Loral) building on-board electronic equipment, sensors, and batteries for ISS,[64] and SpaceDev, a division of the Sierra Nevada Corporation, building components for microsatellites as well as launch vehicles for private sauce launch systems.

President Reagans other monumental space project was the Strategic Defense Initiative, dubbed "*Star Wars*." This program was a product of Reagan's fear of nuclear war as well as his continued interest in investments in the space environment which he believed augmented the prestige of the U.S. However, he did not receive support for this project in the way the space shuttle program and the ISS did. Senator James McClure acknowledged thus in his 1986 letter to the president stating, "Reagan's approach to the SDI program was weak."[65] Further analysis of this document shows that support for this program declined due lack of funding support and a belief that in Reagan's quest for anti-war programs, his vision was potentially blinded by

[63] James M. Beggs, NASA Administrator, Letter to William Clarke, White House, August 26, 1983, https://www.cia.gov/readingroom/docs/CIA-RDP85M00158R000800010005-0.pdf, 1.

[64] Space Systems Loral, "International Space Station," https://archive.ph/20120912094155/http://www.ssloral.com/html/satexp/iss.html

[65] James McClure, U.S. Senator, Letter to President Reagan, September 29, 1986, Subject, SDI, https://www.cia.gov/readingroom/docs/CIA-RDP88G01116R000700840016-6.pdf.

tendencies of Soviet appeasement. The main point gleaned from this communication is perhaps that SDI was not an economic issue at all, but while it was a space initiative, pertained only to national security and Reagan's sense of fascination with space. It was increasingly difficult to correlate economic advantage to this program. However, it did demonstrate Reagan's continued commitment to his national goals and the American public outlined in each of his State of the Union addresses. The driving force behind the commercialization of space remained the strength of the of the economy and space programs.

Ronald Reagan and his immediate successors envisioned space as the natural next frontier and space economy. There was a significant drive to provide incentives for commercial investment. Investments from the private sector were intended to ease the federal budget while strengthening the economy through innovation and jobs. During Reagan's two terms in office, the promotion of space exploration through economic and scientific innovation became another merchant of space and a driving force behind the commercialization of space.

President Reagan vision for the country to remain strong global leader on earth and in space led him to develop pioneering strategies for rebuilding the U.S. economy while expanding economic, political, and technical power using the frontier of space. His incentives including the continued funding for the space shuttle program saw five vehicles constructed and launched into space, each participating in a variety of missions. He realized that investments in space would thrive over time, developing as a place where people could live and work. This commercialization vision eventually spurred grow in the space economy present in the early Twenty-first century as he predicted.

By 2010, the passage of the Commercial Space Jobs and Investment Act sponsored by Senator Bill Nelson of Florida reflected an amendment to the 1986 Internal Revenue Code

provided tax incentives to "encourage investment in commercial spaceflight facilities and equipment, research, and job training, and for other purposes."[66] The act was intended to create commercial zones that would entice space businesses and provide job opportunities to communities impacted by the retirement of the shuttle program, according to space journalists Amy Klamper.[67]

Further investment in commercialization of space demonstrates industries contributing to the space exchange include communications, remote sensing satellite, transportation, manufacturing both on earth and in LEO and MEO, as well as what is known as satellite industries, those organizations that that stem from these categories above. Examples include wholesale and retail trade, computer electronics and semiconductors, pharmaceuticals, space tool components, mining, and tourism.[68]**.**

President Reagan ushered in a new era of Cold War diplomacy, economic incentives intended to bolster the national economy, promote innovation and entrepreneurial endeavors, and launch the U.S. space program further into space by partnering with private industry for vital functions of government. This included advancing U.S. interests globally through a policy of American exceptionalism that supported research and development of new applications for space technology. Using the economy to forge the high frontier, President Reagan delivered on his national policy goals outlined during his campaign. Using symbols of the Cold War and of commercialization, artifacts such as the space shuttle program, Strategic Defense Initiative, and

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[66] Congress.gov, Commercial Space Jobs and Investment Act, of 2010, Senate 3785, 111th Congress (2009-2010), September 15, 2010, https://www.congress.gov/bill/111th-congress/senate-bill/3785/text?s=1&r=6.

[67] Amy Klamper, "Tax Incentives proposed for Commercial Space," *Space.com*, August 17, 2010, pacenews.com/tax-incentives-proposed-commercial-space/.

[68] Tina Highfill, Annabel Jouard, and Connor Franks, "Updated and Revised Estimates of the U.S. Space Economy, 2012–2019," Bureau of Economic Analysis https://www.bea.gov/system/files/2022-01/Space-Economy-2012-2019.pdf.

the International Space Station demonstrated American hegemony in space. His policies also created a new public perception of strength, confidence, and optimism, as well as a favorable attitude toward space exploration. The power of these Cold War symbols and the power of public perception helped drive the commercialization of space.

During the 1980s, a full transfer from government controlled access to space to that of solely private industry was in its infancy. However, during this period, commercialization incorporated more than this physical transfer, it combined Cold War ideology from an economic and political standpoint. This revolutionized the space industry with the expansion of government interest in space, the development of a specific space policy as part of the national defense and security and created opportunities to develop new technologies which served the benefit of the public. It increased manufacturing of products for space and as well as for consumers. It promoted economic growth and jobs in the aerospace industry and peripheral businesses. It excited the American public and became a powerful symbol of U.S. leadership.

Chapter 5

The Grand Tour

On September 16, 2021, the first ever all-civilian mission to orbit the earth launched with Space X's Falcon 9 heavy lift rocket carrying the *Dragon Crew Capsule*. Arcing across a dark, Florida horizon, the craft hurled to LEO leaving the space coast in its wake. Its competitively chosen team trained for six months for the historical mission. Christened Inspiration4, the mission began as a competition to raise awareness for St. Jude's Children's Hospital cancer research initiated by Jared Isaacson, founder of Shift4, in partnership with SpaceX.[1] While this event was sponsored by a private entity and the commercial space industry, its connection to NASA represented the driving force of U.S. entrepreneurship, ingenuity, competition, and the steady transition to public-private partnerships.

The mission symbolized human achievement and exemplified NASA's commitment to continuously strive for relationships that created sustainable, value-added eCommerce and LEO markets. Furthermore, the commercial space partnership with NASA reflected the Cold War trend of commodifying space by transforming a social and intellectual product into a tangible commercial utility. Isaacson commented after the flight, "we are just getting started."[2] NASA's role in the venture included providing a communications base and "on-site Kennedy Space Center facilities support."[3] Additionally, NASA transferred scientific and program knowledge to

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[1]Robert Lea, "Incredible SpaceX Launch Photos Shows Inspiration4 Crew Blast into Space," *Newsweek,* September 16, 2021, https://www.newsweek.com/spacex-launch-photos-inspiration4-crew-first-all-civilian-space-jared-isaacman-hayley-proctor-162970, accessed January 30, 2024.

[2] Christian Davenport, Jared Isaacson, Who Led the First All-Private Astronaut Mission to Orbit, Has Commissioned 3 More Flights from SpaceX," *Washington Post,* February 14, 2022, https://www.washingtonpost.com/technology/2022/02/14/jared-isaacman-polaris-spacex-starship-inspiration4/, accessed December 10, 2023.

[3] "NASA Enables Commercial Crew and Private Astronaut Mission," September 15, 2021, https://www.nasa.gov/humans-in-space/nasa-enables-commercial-crew-private-astronaut-missions/.

SpaceX, as well as other private companies that facilitated on-going growth in the space transportation industry.

More broadly, NASA's increased Commercial Crew Development Program sponsored a variety of interests in the commercial space industry which included affiliating with companies like Axiom Space, Blue Origin, Orbital Reef, Star Lab, and others for human spaceflight to future destinations. Projects launched in connection to space included biological, physical, technological, and other scientific explorations.[4] The collaborative trend for NASA resulted from competition during the early Cold War aerospace industry for vehicle design, launch capabilities, mission support, and eventually led to cargo transfers to LEO. Domestic competition necessitated private industry expertise and organization management from outside NASA. These Cold War partnerships drove the commercialization of space.

Internal and external competition also commodified the space industry through NASA while simultaneously building an American space exchange. Throughout the Cold War as ideological shifts occurred, technological spectacles generated commercialization through marketing and sales of the NASA brand. Eventually, commodifying the brand through collaborative activities created opportunities for transferring the government space monopoly and its products into saleable goods and services utilizing private industry.

How did domestic competition in connection to NASA drive the commercialization of space? What methods did NASA employ as merchant of space to market its space brand, its national and global leadership, and its industry dominance throughout the Cold War and post-shuttle environment. Additionally, how did NASA's relevance in the space domain change over

[4] Ibid, NASA.

time and impact society through commercial partnerships? How did competition in various markets lead NASA to form commercial partnerships?

In 2009, space historian Roger Launius argued that competition in space drove foreign policy, as well as stimulated economic growth.[5] In 2010, space historian Asif Siddiqi further argued that principal motives for space exploration initiated from a wide range of objectives, most notably, security, defense, and national identity.[6] Then, in 2021, space policy historian John Logsdon argued that China had become the U.S.'s largest competitor in space.[7]

While these primarily policy-based assumptions from prominent historians in the field are historically tenable, they do not account for other forms of competition that drove the demand for space leadership, commercialization, and how it was achieved. The argument presented in this chapter contends that competition also evolved from domestic activities including interagency efforts to gain an important role in the space program, scarcity of funding, a desire for industry contracts, attempts by rival media organizations to access space coverage, challenges between the first astronauts for spaceflights, demands for education, and securing public participation in space activity after the 1969 moon landing. Each form of competition consolidated the power and influence of NASA by commodifying aspects of space. Additionally, as foreign competition emerged from global space agencies in the post-Apollo era and challenged NASA's monopoly in space, collaboration with private industry transformed these commodities into a commercialized function of the space economy and exchange.

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[5] Roger Launius, "United States Competition and Cooperation in Space: Historical Reflections," *Astro Politics, The International Journal of Space Politics and Policy*, Vol 7 Issue 2, 2009, 89.

[6] Asif Siddiqi, "Competing Technologies, National(ist) Narratives, and Universal Claims Toward a Global History of Space Exploration," *Technology and Culture, Volume 51, Number 2, April 2010*, 431.

[7] James Pethokoukis, Interview with John Logsdon, "Looking Back on the Space Race: My Long Read Q&A with John Logsdon," American Enterprise Institute, November 17, 2021, https://www.aei.org/economics/looking-back-on-the-space-race-my-long-read-qa-with-john-logsdon/.

While competition in the early twenty-first century seemed new for NASA as the dominant space agency, the concept originated in its initial framework. Founded in 1958, the National Aeronautics and Space Administration (NASA) was established for the purpose of advancing "research into the problems of flight and other purposes."[8] Additionally, Title II, Section 201 of the NASA Act specified that the administrative agency establish a coordinating council to, among other things, "resolve differences between the various agencies with respect to aeronautical and spaceflight activities." [9] By creating the council, NASA inculcated the idea that agencies would compete for projects and funding. Competition enabled NASA to persuade the public of the benefits of the U.S. space program through innovation. This echoed the technological and political competition in the Cold War with the Soviet Union. The act also enumerated other responsibilities to the agency, including design and development of missiles, satellites, and other components necessary to maintain defense and security for the United States. Its purpose was to advance scientific exploration in direct competition with the Soviet Union.

NASA was initially created as a civilian and public agency, yet it maintained close ties to the military, especially in the areas of booster technologies, space vehicle production, and ground facilities operations. However, despite this close cooperation with the Department of Defense (DoD), the latter became one of NASA's first domestic competitors. Other competitors, including private contractors and commercial space companies, eventually entered the space arena and challenged NASA as the premier technological, scientific, and explorative body.

Notwithstanding this challenge to NASA, competition is the bedrock of the United States. The economic system of capitalism is based on competition in the marketplace and supports free

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[8] National Aeronautics and Space Administration Act, 1958, *Public Law #85-568, 72 Stat., 426, NASA, https://www.nasa.gov/history/national-aeronautics-and-space-act-of-1958-unamended/*

[9] Ibid, NASA Act Title II, Section 201.

enterprise and entrepreneurship to build national wealth. According to the Federal Trade commission, competition relates to price, selection of goods, and service. This concept fundamentally applies to the space domain since there is a demand for exchange which creates some utility for a specific merchant. For NASA as a merchant, competition produced new utilities that employed commercialization as a function of the industry. Exchange is also motivated by perceptions of value in a post-transactional period.[10] It implies that the space economy, industries, and agencies that support space exploration in all its capacities are driven by competition to manufacture new and better products and methods to achieve space goals. President Ronald Reagan stated this clearly throughout his presidency, insisting that space markets and entrepreneurial endeavors propelled the economy.[11]

Competitiveness in any market, including political, scientific, or social domains, derives from the perception of scarcity.[12] When demand for a commodity appears greater than the availability of a product in any form, competition to fill the perceived vacuum arises. This premise also applied to technical competition in which rival firms or industry's attempted to capture market shares in space race. An example of this concept existed in the missile gap theory promoted in the late 1950s.

The demand for more enthusiastic missile development to keep the competitive edge against the Soviets during the Cold War created calls for additional research and development of

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[10] James E. "Nelson, Four Models of Competition and Their Implications for Marketing Strategy, *Perspectives* Vol. 19, No. 1, January-March, 1994, 4. The term post-transactional refers to how a consumer perceives the value after making a purchase or taking part in some form of exchange.

[11] Ronald Reagan, multiple speeches. See also James E. Nelson, Four Models for Competition.

[12] Alan J. Meese, "Price, Theory, Competition, and the Rule of Reason," n.d., William And Mary Law, https://law.wm.edu/faculty/documents/meese_price_comp_reason.pdf, 5-7. See also, Francois. Perroux "The Domination effect and Modern Economic Theory," *Social Research* 17, no. 2 (1950): 188–206. http://www.jstor.org/stable/40969221, 192-193. It suggests that power and influence are the motivating factors for competition in a market.

larger, more efficient missiles for defensive purposes. This debate drove rival services to directly lobby government for funding to produce the missiles, as well as for their own relevancy.[13] For example, as the question arose regarding which boosters supplied the most powerful thrust as well as political value, companies that contracted with the Army, Navy, and Air Force argued vehemently for their products. In 1955, only three years prior to *Sputnik*, Donald Quarles headed up a team to consider launch possibilities for the IGY. The DoD Advisory Group on Special Capabilities, also known as the Stewart Committee, awarded the Glen L. Martin Company the primary contract to build the Vanguard satellite launch project for the Navy.[14] Using a Viking first stage rocket, the launcher also incorporated a Rocket Motors, Inc rocket with liquid fuel to support the mission.

Just a few short years later, ABMA competed for funding with its Chrysler-built Jupiter-C rockets.[15] White House Science Advisor James Killian reported his recommendations to the President in December 1957. Based on conclusions from the engineering and science panel he organized, ABMA's Redstone's were considerably favored for the U.S. satellite launch that to be used to regain a competitive edge in the newly developing space race with the Soviet Union.[16]

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[13] John L. Sloop, NASA History Series, "Part II, 1958-1959, Chapter 11" in *Liquid Hydrogen as a Propulsion Fuel*, NASA SP-4404, (Washington, D.C., NASA Technical Office, 1978), https://www.hq.nasa.gov/pao/History/SP-4404/ch11-6.htm. Each military branch wanted to be the main supplier of the demand for rockets and boosters. Each lobbied for funding by trying to make their products more appealing and necessary.

[14] "The Martin L. Company, *"The Vanguard Satellite Launch Vehicle: An Engineering Summary,* Report 11022, Contract no. Nonr-1817, April 1960, 4, accessed December 12, 2023, https://archive.org/stream/TheVanguardSatelliteLaunchingVehicle/The%20Vanguard%20Satellite%20Launching%20Vehicle_djvu.txt.

[15] George Kistiakowsky, "Memorandum to James R. Killian from Dr. George Kistiakowsky, Dr. Emmanuel Piore, and Dr. Herbert York on the U.S. IGY Satellite Program Prognosis, and Recommendations," December 19,1957, White House Office of the Special Assistant for Science and Technology, Box 12, IGY (International Geophysical Year); NAID #16649022].

[16] James R Killian, "Memorandum to the President from James R. Killian: Missile Programs," December 28, 1957, White House Office of the Special Assistant for Science and Technology, Box 12, IGY (International Geophysical Year); NAID #16649022].

Advocating for the superiority of these rockets, Wernher von Braun petitioned Neil McLeroy, the new Secretary of Defense to employ the Redstone, North American Aviation built engine with a variant propellant.[17] The Jupiter rocket launched America's first satellite into orbit, the *Explorer I* in January 1958. During the same year, the Air Force urged funding and usage for its Thor rockets manufactured by Douglas Aircraft Company.

By December of 1958, Keith Glennan, NASA's first Administrator, made a public announcement of Project Mercury. This launched immense interest from private industry to participate in what seemed the opportunity of a lifetime.[18] This interest energized the space program while garnering continued public perception of American technological strength and the power of industry, innovation, and free enterprise. The publicized program glamorized the American astronaut and utilized American private industry to bolster the program dramatically.

The competition for defense contracts for fuel production and other components during the space race contributed to the increasing commercialization with reliance on the private sector to support U.S. efforts in space. For example, Allis-Chalmers Energy and Pratt & Whitney competed to develop fuel cells for Gemini and Apollo spacecraft. President Kennedy called this the New Frontier as he asked, "be pioneers toward that New Frontier…of uncharted space and science….of a race for the mastery of the sky, the rain, the ocean, the far side of space, and the inside of men's minds."[19]

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[17] Brian C. Odem "The Story of *Explorer 1*," January 19, 2018, NASA, https://www.nasa.gov/history/story-of-explorer-1/.

[18] Loyd S. Swenson, Jr., James M. Grimwod, and Charles C. Alexander, *This New Ocean: A History of Project Mercury,* (Washington, D.C., NASA, 1966), 12.

[19] John F. Kennedy, Address Accepting the Democratic Nomination for President at the Memorial Coliseum, in Los Angeles, California, July 15, 1960, https://www.presidency.ucsb.edu/documents/address-accepting-the-democratic-nomination-for-president-the-memorial-coliseum-los, See also NASA contract history for Project Mercury with Western Electric Company for construction and engineering of Mercury Tracking Network.

One way Kennedy proposed to accomplish this by "incorporating private sector contracting for the purpose of achieving space goals.[20] President Kennedy relied on the content of the *Wiesner Report* published in January 1961 which argued for accelerated efforts in outer space to challenge Soviet accomplishments. This required that NASA distance itself from military-related missions. It stated that an applicable thrust toward space technology generated by the private sector was needed to boost the manned space flight program and publicly appear as the civilian-oriented organization.[21] Commodification of satellite communications technology begun during the Eisenhower Administration would "make important contributions to the national economy."[22] Global Cold War competition energized industry competition for civilian technology and NASA as a merchant supplied the demand through its rocket development and launch capacity.

To support the Mercury, Gemini, and Apollo missions, several scientistic and engineering companies competed and won contracts to facilitate the programs designed by NASA to achieve national space goals. In the process, a steady commercialization of space formed from the partnerships developed with private enterprises to build the American space program, specifically manned spaceflight. Many of the companies transformed their original production lines to match advancing technologies and national aerospace goals. Corporate mergers for example, led to combining resources to support demand in the industry. The Glen L. Marin

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[20] Sandra J. Piseno, "Space Race! How consumers Powered the American Space Industry," *History is Now Magazine,* March 2016. See also, Sandra J. Piseno, "Ideology, Technology, and Culture: How the Cold War Influenced Consumerism and Marketed American Exceptionalism in Space," (Master Thesis), Clayton State University, 2013, 10. The thesis section discusses policy and identity as it pertains to American Consumer culture associated with the manned space program.

[21] The Wiesner Committee, "Report to the President Elect of the Ad Hoc Committee on space," January 10, 1961, https://www.hq.nasa.gov/office/pao/history/report61.

[22] Ibid.

Company merged with American Marietta to form Martin Marietta in the 1960s and focused their efforts on the Gemini Program.[23]

Martin Marietta won contracts to manufacture the external fuel tanks for the Titan II-Gemini missions and later participated in the development and production of subassemblies and fixtures for rockets and fuel tanks for the shuttle mission. Constructed at the NASA Michoud Assembly Plant in New Orléans, Louisiana, the company shared the site with other space production lines like the ground support systems (GSS) built by Denver Aerospace in the mid 1970s, and procurement, integration, and testing by the U.S. Air Force and Martin Marietta Engineers eventually supporting the orbiter *Enterprise*.[24] Competition leading to mergers and subsequent partnerships with NASA provided commercial utility for the U.S. space program, further driving the steady fabrication of the space economy.[25]

The utility of each company drove further commerce and established the space domain through sales of various components required to sustain American power and leadership in LEO. For example, thousands of contractors and subcontractors contributed to the national effort for the Mercury spacecraft including, Northrup Grumman, Bell Aerospace Corporation, AiResearch Manufacturing Division of the Garret Corporation which provided environmental controls systems. The Perkins-Elmer Corporation providing a periscope and the Wheaton Engineering Corporation providing time delay relays and programmers. Cincinnati Testing and Research

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[23] John R Breihan and Gilbert F. Pascal, "Glen L. Martin and Middle River Community," Glen L. Martin Maryland Museum of Aviation, n.d., https://www.mdairmuseum.org/martin-and-community.

[24]"External Tanks Loaded for Vandenburg," *Martin Marietta New*s Number 23, 1984, 5, https://marsretirees.org/wp-content/uploads/historical-documents/Martin%20Marietta%20News%201984-23.pdf.

[25] SpaceNews Editor. "Michoud Set for Major Changes as NASA Transitions to Orion," *Space News.com* July 25, 2007, spacenews.com/michoud-set-major-changes-nasa-transitions-orion/. Retrieved August 13, 2023. Articles discusses the history of the NASA Michoud Assembly Plant , including several private contractors that used the facility to build rockets and engine such as Chrysler, martin Marietta, Lockheed Martin, and Aerojet. It is currently the location of the New Artemis Missions and its massive rockets. See also, *This New Ocean*, p.12.

Laboratory of the Studebaker-Packard Corporation provided the heat shield, and Motorola, Texas Instruments, Collins Radio Corporation, Cooper Electric, Melpar Incorporated, and Avion Division of G.E. contributed to communications.[26]

By the time the Gemini Project launched, several other key contracts were issued to support the manned spaceflight program. Lockheed Missile and Space produced the Agena, which was for space docking practice, General Dynamics built Atlas boosters, and North American Aviation manufactured paraglider landing system.[27] NASA, as a merchant, negotiated contracts and controlled the space access and operation as the engineers from various companies supported the missions.

The last of the Cold War presidents each contributed a commercial vision for NASA, including Nixon who referred to space as a Global Frontier. His vision called for greater privatization of space travel, and Ronald Reagan considered space the Final Frontier, created an enhanced space economy through various forms of competition within NASA. Finally, President George H.W. Bush commissioned a panel in his July 20, 1989 speech commemorating the Apollo moon landing to study the options for a Space Station Exploration Initiative (SEI), calling this *Space Station Freedom*.[28] Hailing space, "the Great Expanse," he committed the United States to embark on an Apollo-style endeavor use the vast resources of the U.S. economy, which he noted was "the most powerful in the world." He went on to claim that the national goal was nothing less that being the "preeminent spacefaring nation.[29]" The significance of this last

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[26] James M. Grimwood, NASA Special Publication-4001, *Project Mercury: A Chronology,* (Washington, D.C.: NASA, 1963), Appendix 9.

[27] Barton C. Hacker and James Grimwood, *On the Shoulders of Titans: A History of Project Gemini*, Scientific and Technical Office, (Washington, D.C.: NASA, 1977), xvii.

[28] George H.W. Bush, Remarks on the 20th Anniversary of the Apollo 11 Moon Landing, *Public Papers of the President of the United States,* https://bush41library.tamu.edu/archives/public-papers/712, accessed January 5, 2023.

[29] Ibid.

comment imbues the economic, innovative, and powerful character of American values. President Bush explained that the NASA's *Pioneer 10* reflected this sentiment as it sailed across the universe seeking distant frontiers, just as America sought its destiny among the stars.

While President Bush's SEI speech contained a plethora of metaphor, the bottom line appealed to NASA's administrator Richard Truly assigned to work with Vice President Dan Quayle's Space Council. In the July 20, 1989 Whitehouse Press briefing, Truly reflected on the commitment called for by former President Kennedy and stated that President Bush (41) called on a similar commitment, prioritizing the pledge to construct and launch *Space State Freedom* in the 1990s.[30] Truly initiated a 90-day study to determine the feasibility of such a program called for by the president and to estimate estimated the costs. Aaron Cohen, the Director of Johnson Spaceflight Center in Houston reported that NASA was working closely with the parameters set forth by President Bush, as well as various internal agencies including the Jet Propulsion Laboratory (JPL) and the newly established Space Council for alternative approaches to accomplishing space goals.[31]

Competition between the interdepartmental participants in the program; however, likely led to its failure to materialize with one exception, the International Space Station. The report signed off by the Administrator Truly indicated that the costs alone were enormous. The estimated utility for human exploration of space was negligible compared to the massive

[30] Admiral Richard H. Truly, "Whitehouse Press Briefing, Office of the Press Secretary," July 20, 1989, https://aerospace.org/sites/default/files/policy_archives/NASA%20Administrator%20press%20briefing%20Jul89.pdf.

[31] NASA. Report on the 90-Day Study of Human Exploration of the Moon and Mars, N91-2705, *NASA News,* November 20, 1989, 157, https://ntrs.nasa.gov/api/citations/19910017741/downloads/19910017741_Update.pdf.

financial burden anticipated which was in the billions of dollars.[32] Additionally, factoring into the equation the required peripheral moving parts contributed to the rapidly expanding budget projections as each supplier added to the costs. These included producers of critical technology such as bioregenerative life support systems, radiation protection, nuclear thermal and electric rocket propulsion, and efficient engines. Budget concerns accelerated NASA's need to parcel out projects to private industry, which contributed to the steady transition of control of space access begun in the Reagan years.

Companies supporting the various interworking parts of SEI included Hamilton Standard, an aerospace manufacturer, providing environmental controls for spacesuits and spacecraft.[33] Oxygen, carbon dioxide, and waste management systems were crucial to survival in space. Other components for the Apollo, STS, ISS, and COTS required specific industry knowledge, like DuPont for example which produced radiation protection for space suits and vehicle protections. For the SEI and future space exploration missions to have valuable and sustainable impact, NASA as a merchant of space sold the perception of scarcity to produce viable utilities. These utilities commodified space and supported the transition from solely government controlled space activities to private industry leadership with technology transfer and partnering with the primary spacefaring organization, NASA. Later, this technology transfer supported SpaceX for humanitarian missions through competition like Jared Isaacson's Inspiration4 for St. Jude Children's Hospital.

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[32] Steve Dick, "Space Exploration Initiative Summary, NASA Report on the 90-Day Study of Human Exploration of the Moon and Mars, N91-2705," *NASA News,* November 20, 1989, 157, NASA, https://ntrs.nasa.gov/api/citations/19910017741/downloads/19910017741_Update.pdf.

[33] News Release, "Flight Suits for Apollo Program," Hamilton Standard Division of United Aircraft Corportion, n.d., https://cdn2.hubspot.net/hubfs/413105/Apollo%20Press%20Kits/Hamilton%20Standard.pdf.

Competitiveness serves consumers and drives innovation which leads to better products.[34] This concept fundamentally applies to the space domain in that there is a demand for exchange which creates utility for a specified merchant. For NASA, and in the space domain, competition produced new utilities that employed commercialization as a function of the industry. It implied that the space economy, industries, and agencies that support space exploration in all its capacities are driven by competition to manufacture new and better products and methods to achieve space goals.

Considering simple economic theory of supply and demand, the higher the cost, the less consumers purchase. The higher the cost, the more suppliers want to produce.[35] NASA as a merchant operates at high costs, therefore, they have potentially less opportunity to fund programs and missions without substantial Congressional or public support. Thus, the opportunity cost of remaining a government operated organization was great. Competition in the marketplace relieved some of the budgetary strains and contributed to the commercial space infrastructure. President Reagan stated this throughout his presidency, insisting that space markets and entrepreneurial endeavors propelled the economy.[36]

Competition in during the Cold War increased over the nuclear arms capabilities and their delivery systems. Each side needed to demonstrate technological superiority and often employed symbolic feats or spectacle to prove this. Parallel to this, each country used its ideological power and influence to convince domestic and global communities of its respective superiority.

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[34] Federal Trade Commission, "Competition Counts," n.d., https://www.ftc.gov/advice-guidance/competition-guidance/competition-counts.

[35] Irena Asmundson, "Supply and Demand: Why Markets Tick," *International Monetary Fund*, n.d., https://www.imf.org/en/Publications/fandd/issues/Series/Back-to-Basics/Supply-and-Demand. Accessed March 4, 2024.

[36] Ronald Reagan, multiple speeches. See also James E. Nelson, Models for Competition.

Competition for the United States in space came from its desire to meet and surpass the Soviet challenge, and to emphasize Western economic principals to develop innovative technological and engineering products that achieved its national space policy goals.

These competitive spheres over time contributed to NASA's ability to remain relevant in the space industry as initially the sole provider of scientific and technological knowledge, efficient launch capabilities, and space transportation, and later as a leading partner in space commerce and industry in the twenty-first century. Its history of outer space activities had already resulted in national and international economic competitiveness.[37] New competition established renewed interests and more markets developed.

One of the first major competitions during the Cold War regarding the new space administration arrived as it absorbed activities formerly conducted by military branches. For example, interservice rivalries during the Cold War resulted from the high level demand of complex weaponry, such as missile systems, which led to reliance on private contractors.[38] Dependence on industry facilitated further rivalry, especially between the Army's research and development departments and the Navy and Air Force over construction of Jupiter-C and Thor missiles, as well as the Nike Project. This prompted each agency to focus on advertising their respective accomplishments. For example, in 1959 the Air Force relied on Boeing to support its missile programs. The company published a series of articles in *Aviation Week* magazine that countered negative news about its programs.[39] The Army also centered their attacks on the Air

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[37] Robert A Divine, *The Sputnik Challenge* (New York: Oxford University Press, 1993), 103-104.

[38] Samuel P. Huntington, "Interservice Competition and the Political Roles of the Armed Services," *American Political Science Review, Review* 55, no. 1 (1961): 40–52, 48. Huntington discusses the rivalries for missile development and how this competition influenced public opinion about each service branch as well as political motivations for various programs connected to defense and space.

[39] *Aviation Week*, 6 April 1953, p. 15, accessed February 25, 2024.

Force by persuading Western Electric to published advertising on the Nike Program. This vituperation continued as companies like Chrysler and Douglas publicly supported success of the Jupiter space launch.[40] The intent for each was to rally public support for funding its programs and participation in the space programs.

Senate hearings conducted by the Armed Services Committee focused heavily on spending requirements and benefits related to the competitive projects. For example, in early January 1959, Werner von Braun testified in response to inquiries that "the most important objective was to dominate space." The instant reply from the hearing board was to challenge von Braun to which he then countered "interagency rivalry between the Air Force, Navy, and Army was pointless; the end objective is not a bigger missile but dominance in the field."[41] Where the focus had been the response to *Sputnik* and the question of a missile gap between the United Sates and the Soviet Union, the conversation turned toward funding projects specifically for space separate from security and defense. Competition led directly to decision to transfer sole authority for this development to a civilian community through NASA with the DoD as the supporting agency.

In October 1959, NASA administrator T. Keith Glennan wrote to the president about to direction of the organization, stating that "in coordination with the Secretary of Defense, recommend that the president clarify responsibilities, improve coordination, and enhance

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[40] 8 Hearings, *Inquiry into Satellite and Missile Programs, Senate Armed Services Committee*, 85th Cong., 1st Sess., 615, https://congressional.proquest.com/congressional/docview/t29.d30.hrg-1957-sas-0015?accountid=12085.

[41] Hearings, *Inquiry into Satellite and Missile Programs, Senate Armed Services Committee*, 85th Cong., 1st Sess., 595-597,https://congressional.proquest.com/congressional/docview/t29.d30.hrg-1957-sas-0015?accountid=12085.

national space goals."[42] Furthermore, the Glennan and the Secretary of Defense determined that NASA carry the sole civilian effort in space activities and the development of a super booster for space access and exploration activities.[43] The DoD, with clear lines of responsibility would world continue to focus strong military space projects.

In an earlier letter to the president, Glennan iterated the necessity of increased spending on space programs and the exploitation of space for the purpose of "our own vigorous program" rather than "compete shot for shot for shot with the USSR."[44] Glennan emphasized that working in direct competition with the Army Ballistic Missile Agency (ABMA) was inefficient; allocating money to the Saturn Project and then appropriating funds for scientistic research and booster development for space defeated the purpose of space dominance. He suggested collaboration rather than competition. He respectfully requested that all funds for the management of space programs, scientific, research, and booster technology transferred from ABMA to NASA along with the funding.[45] Once NASA's mission was adopted and clearly outline, competition for astronauts ensued. This process was highly publicized and commercial.

The first spectacle was the Mercury Astronaut Program. The idea of a national space-faring organization did not commence with *Sputnik*. More accurately, NASA's origins are rooted in the U.S.'s aeronautical delay behind Europeans in the early twentieth century. The United

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[42] T. Keith Glennan, "Memorandum for the President from the Administrator of NASA and the Secretary of Defense for Responsibility and Organization of Certain Space Activities," October 21, 1959, [DDE's Records as President, Official File, Box 770, OF 342 NASA] (7), https://www.eisenhowerlibrary.gov/sites/default/files/file/nasa_Binder19.pdf.

[43] Glennan, 1

[44] T. Keith Glennan, NASA Administrator, "Letter to the President Regarding Budget Matters," October 20, 1959, DDE's Papers as President, Administration Series, Box 15, Dr. Keith Glennan-NASA; NAID #12042605]https://www.eisenhowerlibrary.gov/sites/default/files/file/nasa_Binder10.pdf.

[45] T. Keith Glennan, NASA Administrator, "Letter to the President Regarding Budget Matters," October 20, 1959, DDE's Papers as President, Administration Series, Box 15, Dr. Keith Glennan-NASA; NAID #12042605]https://www.eisenhowerlibrary.gov/sites/default/files/file/nasa_Binder10.pdf.

States government upon finding itself increasingly involved in world affairs created an independent government agency in 1915 to study aeronautical techniques, research, and design. The National Advisory Committee for Aeronautics (NACA) partnered with the federal government, the military and private industry to achieve its mission.[46] Working with companies such as Douglas Aircraft, De Havilland Aircraft Company, Packard, who designed aircraft and automobile engines and was known for the Liberty engine, and Hall-Scott Motor Company who built water cooled engines for aircraft in WWII, NACA quickly advanced studies and applied technology in the field of aeronautics. This included aircraft design, speed, utilization, and eventually missile research and spacecraft launch and re-entry expertise. NACA later transformed into NASA as a civilian controlled entity in 1958.[47] NACA was unknown outside of the aerospace community. Once NASA was formed, strategic efforts were made to promote it and publicly symbolize American technical ingenuity and strength through it.

One way to accomplish this was in the astronaut program. The first astronauts were part of the Mercury Project, named for the Roman mythological figure who served as a messenger between Gods. The Mercury Seven, as they became known, were highly publicized and fashioned into American heroes.[48] This was NASA's first spectacle; it seduced the American public who wanted to know everything about these brave men. Glamorized by *Time* and *Life* magazines, their image and NASA's shaped public opinion about American national identity, intellectual prowess, and competitive edge. Public favor became a powerful tool in advancing the United States in the space race.

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[46] Elizabeth Suckow, "Before there was NASA, there was NACA," April 23, 2009, NASA, https://www.nasa.gov/history/naca/overview.html, accessed January 2, 2024.

[47] Ibid.

[48] Lloyd S. Swenson Jr. ,James M. Grimwood , and Charles C. Alexander, *This New Ocean: A History of Project Mercury,* NASA Special Publications SP-4201, *NASA History Series*, 1989., 57.

The Mercury astronauts were presented to the public in their silvery suits fabricated by B.F. Goodrich. This purposeful design and image reflected the trend of shiny new space-age products proliferating in the early Cold War. B.F. Goodrich and other companies that participated in the research, design and manufacture of products for the astronauts. NASA seized a publicity opportunity to display the pressure through its news releases, demonstrating ventilation, dexterity, mobility, and physiological data reporting ability.[49]

Promoted by Walter T. Bonney, the NASA Public Relations Officer, requested resources to build up the image for the American public, who were highly excited about the prospect of manned space flight during the Cold War.[50] While, according to NASA, this was not the original intent, it quickly became clear that turning American astronauts into superheroes would sell the manned space program. The commodification of the Mercury astronauts helped drive the commercialization of space by making these first men public American heroes.

Mr. Bonney, along with NASA Administrator Dr. Keith Glennan, introduced the Mercury astronauts in a highly publicized press conference on Thursday April 9, 1959 in Washington, D.C.[51] The significance of this press conference was the opportunity to publicly demonstrate the strength and character of the men selected, but also as a propaganda display for the Soviets to see what the U.S. manned spaceflight had produced so far. It also provided an occasion to project technical and physical competence to the public. These attributes shaped perceptions of the U.S. space program. The press conference demonstrated how intense competition led to success.

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[49] NASA News Release, "Pressure Suits for Project Mercury Astronauts," *National Aeronautics and Space Administration*, Houston, Texas, NASA, https://www.nasa.gov/wp-content/uploads/static/history/40thmerc7/pressuresuits.pdf.

[50] NASA, "Project Mercury Astronaut Selection Overview," November 30, 2006, https://www.nasa.gov/history/project-mercury-overview-astronaut-selection/, accessed January 8, 2024.

[51] Walter T. Bonney, "Mercury Astronaut Team Press Release, NASA, Washington, D.C., April 9, 1959, NASA, https://www.nasa.gov/wp-content/uploads/static/history/40thmerc7/presscon.pdf.

Success would led to commodifying other aspects of the Mercury, Gemini, and Apollo program which contributing the commercialization of space.

President Kennedy recognized and glamorized the Mercury astronauts as he presented the Collier Award in the Rose Garden of the White in October 1962. The president stated, "it is one of the nation's highest honors."[52] The first seven men in the manned space flight program at NASA were further sensationalized by newspapers and magazines across the country, turning them into national heroes. The *New York Times*, *Chicago Tribune*, *The Evening Independent*, and many more ran front page stories heralding the astronauts.[53]

Competition to publish images of the astronauts and every aspect of their lives was fierce. However, *Life Magazine* played the central role in documenting the astronauts aside from Bill Taub, with photographer Ralph Mores symbolically becoming the "eighth Mercury astronaut."[54] By commodifying the astronaut, NASA commercialized space by capitalizing on competition, building an image of a national hero, and using photography as the powerful and influential art of persuasion to shape public attitudes in the Cold War. The image in figure 4 demonstrates the nationalistic attributes with the patriotic American spaceman looking upward with his guidon. Furthermore, the astronauts capitalized on the publishing rights to their images. In November

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[52] Jannelle Warren-Finley, "The Collier as Commemoration: The Project Mercury Astronauts and the Collier Trophy," In book *From Engineering to Big Science*, ed. Pamela E. Mack, NASA History Series, (Washington, D.C., NASA, 1998), Chapter 7. See also, Papers of John F. Kennedy. Presidential Papers. President's Office Files. Speech Files. Remarks on presenting Collier Trophy to first U.S. astronauts, 10 October 1963, https://www.jfklibrary.org/asset-viewer/archives/jfkpof-047-021#?image_identifier=JFKPOF-047-021-p0002. President Kennedy gave his remarks and spoke about accomplishing the task of sending a man to the moon and possibly beyond. He closed by remarking that this awrad highlighted the significance of the space program and the impact is has on America. These Americans are heroes.

[53] *New York Times*, October 11, 1963, clipping, *NASA Historical Reference Collection*, NASA History Office, NASA Headquarters, Washington, DC. See also, *Evening Independent,* October 11, 1963. https://newspaperarchive.com/evening-independent-oct-11-1963-p-12/.

[54] Ben Cosgrove, "The Right Stuff: When American Met the Mercury Astronauts," *Life Magazine Archives,* https://www.life.com/history/mercury-seven-photos-of-nasa-astronauts-in-training/.

1960, the law offices of De Orsey and Thompson negotiated the contract between the men and *Life Magazine* for $20,000 each as a first payment, for which all participants benefited from.[55]

The Mercury, Gemini, and Apollo astronauts competed for spaceflight missions with each new spectacle. The Gemini missions were supposed to be the bridge between Mercury and Apollo to test various systems for manned space flight. Several astronauts trained for the missions including Gus Grissom, Roger Chafee, Jim Lovell, Walter Shirra, and more.[56] While each wanted to take part in the crewed missions, the decision ultimately rested with flight directors and project coordinators.

Regardless of the competitive nature of the astronauts, each successive crewed mission obtained another technology improvement, which made tasks easier. Many of the innovations are in use today in commercial capacities. For example, memory foam designed by aeronautical engineer Charles Yost with Systems Dynamic Group, a subsidiary of North American Aviation. Yost contracted with NASA to develop cushions for aircraft after conducting research in conjunction with Stencil Aero Engineering Corporation in 1969.[57] The intended uses were to support the human body in vehicular events and to provide support for launch and reentry of spacecraft as well.[58] This technology is sold today in various applications including bedding, shoes, sports equipment, car seats, and safety gear. Collaboration with NASA facilitated the

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[55] Mercury Astronauts *LIFE* Magazine Payment Letter *The Mercury Seven receive their first Life Magazine payment, https://www.rrauction.com/auctions/lot-detail/33622510493371-mercury-astronauts-life-magazine-paymentletter#:~:text=A%20tax%20lawyer%20from%20Washington,the%20heroes%20of%20Project%20Mercury.*

[56] Gilruth, R. R., and G. M. Low, Gemini mid-program conference including experimental results, NASA, SP-121, 1966. (Papers Presented at the Manned *Spaceflight* Center, Houston, Feb. 23-25, 1966), https://nssdc.gsfc.nasa.gov/nmc/spacecraft/display.action?id=1965-024A.

[57] NASA Spinoffs, "40-Year Old Foam Springs Back with New Benefits," 2005, NASA, https://spinoff.nasa.gov/Spinoff2005/ch_6.html.

[58] Charles Yost and Ronald Oates, "Human Survival in Aircraft Emergencies," *NASA Contractors Report,*(Ashville, N.C.: Stencil Aero Engineering Company, 1969), 28, NASA, https://ntrs.nasa.gov/api/citations/19690005431/downloads/19690005431.pdf.

research through its Ames Research Center. NASA uses the technology today to transition returning astronauts to a gravity environment using the foam pads to cushion walking.

Other innovations produced included Black and Decker Tools inventing battery-operated hand tools, electric wrench, and electric drill. The technology filtered its way into commercial markets as the "dust buster" handheld vacuum cleaner. Additionally, other products were developed including fireproof clothing designed and manufactured by Owings-Corning, Du Pont, and Celanese Corporation. Other technology included digital cameras, scratch resistant glasses, and cold weather gear.[59] As missions increased and competitive forces emerged in the manned spaceflight program, NASA capitalized on demands required to fulfill objectives. The contributions by private industry continuously demonstrated the benefits of non-government manufacturing which commercialized space.

During the post-Apollo era, NASA saw a decline in funding and public interest. Once the moon was conquered, society turned to other issues challenging the nation. Richard Nixon had become president, the Vietnam War had escalated, and an energy crisis was on the horizon.[60] Arthur F. Burns, the Chairman of the Board of Governors of the Federal Reserve System stated that the manipulation of the oil prices by the Organization of Oil Exporting Countries (OPEC) created inflation and decreased purchasing power for the American consumer.[61] This economic environment drew attention from NASA which received reduced federal funding in the 1970s. Figure 5 depicts the sharp decrease in spending. Its most significant funding occurred during the early Apollo era between 1965-1968, with levels dropping by the time New Armstrong, Michael

[59] NASA Spinoffs, "Polymer Fabric Protects Firefighter, Military, and Civilians," NASA, https://spinoff.nasa.gov/Spinoff2008/ps_3html.

[60] "Energy Crisis of the 1970s,"https://americanhistory.si.edu/powering/past/history3.htm

[61] Arthur F. Burns, "Speech to Joint Economic Committee, November 27, 1974," 10, https://fraser.stlouisfed.org/files/docs/historical/burns/Burns_19741127.pdf?utm_source=direct_download.

Collins, and Buzz Aldrin set foot on the moon on July 20, 1969. This trend continued through the 1970s and did not improve until the mid-1980s. The increase in 1986 derived from the promotion by President Reagan to utilize the shuttle orbiters as the primary means of space access. While funding levels were moderately increased between 1986 and 2022, they never reached their peak Apollo budgets.

NASA now competed with the economy and on-going efforts wind down U.S.-Soviet Cold War tensions. The mood of the country was changing. President Nixon's space policy shifted because of the political upheavals, economic downturn, and social unrest. In March of 1970 Nixon stated, "the principal goal of the space program was to walk on the moon and has been met…now other critical problems on Earth are more pressing."[62] This meant that the United States would seek new goals for space exploration, which were to explore, gain scientific knowledge, and make practical use of applications space technology developed. He presented the recommendations from the Space Task Group (STG) led by Spiro Agnew and announced the development of a reusable space transportation vehicle, the shuttle.[63]

Between 1970 and 1981, the NASA budget authority decreased from $ 20 billion dollars to slightly over $13 billion, which was down from the peak of over $50 billion. Included in the 1970 expenditures was human space flight for the remainder of the Apollo Program, at just under $12 billion and the touted space technology and application which was approximately $1.5 billion dollars.[64] Funding new space missions was increasingly difficult. A new approach was needed to garner public support for the Space Program. NASA needed a new spectacle as well.

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[62] Richard Nixon, "Statement About the Future of the United States Space Program," Online by Gerhard Peters and John T. Woolley, The American Presidency Project https://www.presidency.ucsb.edu/node/240967.

[63] Ibid.

[64] Thomas G. Roberts, "NASA Budget History," September 1, 2022, https://aerospace.csis.org/data/history-nasa-budget-csis/. Accessed November 1, 2023.

Along with the new shuttle program, an atmosphere of collaboration and cooperation emerged. The Apollo-Soyuz Test Project and Skylab was intended to be a cooperative effort between space-faring nations, specifically the United States and the Soviet Union. President Nixon signed the Agreement Between the United States of America and the Union of Soviet Socialist Republics Concerning Cooperation in the Exploration of the Use of Outer Space for the Peaceful Purposes. May 24, 1972, which enumerated objectives and responsibilities in collaboration for scientific and cultural purposes.[65] The effect of this agreement was cost sharing as well as developing renewed interest in space after the biggest feat of all had been met.

Bu the 1980s, aside from President Reagan's public advocacy for the space shuttle program and building a space economy, he also iterated the necessity of competition to advance innovation in space. Another way to gain public support through innovative competition came in the form of the teacher in space program. As he to gain public support while he actively promoted the U.S. space program, he introduced a new competition emerged that set a path for civilians in space and the potential for commercialization. On August 27, 1984, the president announced the NASA Teacher in Space Project (TISP) which he hoped to solicit an ordinary American to help boost the new space shuttle and give NASA prominence once again.[66] The program aligned with the administration's goals of monthly shuttle launches, the advancement of a space economy, and advocacy of the importance of NASA in commencing in a new era.

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[65] Agreement Between the United States of America and the Union of Soviet Socialist Republics Concerning Cooperation in the Exploration of the Use of Outer Space for the Peaceful Purposes. May 24, 1972, https://www.archives.gov/files/presidential-libraries/events/centennials/nixon/images/exhibit/agreement-of-cooperation.pdf.

[66] NASA, "Teacher in Space Project," Document 6a, August 27, 1984, Ronald Reagan Presidentail Library and Museum, https://reaganlibrary.gov/public/documents/challenger-doc-06a—nasa-teacher-in-space-project.pdf.

TISP presented an opportunity for NASA to open its doors to more collaboration with the private sector and stimulate the Reagan education policy promoting science, technology, engineering and math (STEM). For example, the mission background promoted teaching a live lesson in space, conducting experiments, and leading discussions intended to generate input to "create and abundance of new space-related materials for the classroom."[67] Since the idea included student participation, student-designed experiments were planned for STS-51L, space shuttle *Challenger* carrying Christa McAuliffe, a social studies teacher from Concord, New Hampshire.

Another educational opportunity publicized for the mission included the Spartan-Halley payload constructed at the Laboratory for Atmospheric and Space Physics for the purpose of observing Halley's Comet. Additionally, NASA's Tracking and Data Relay Satellites (TDRS-B) built by TRW Space Systems and owned by Space Communications Company were scheduled to deploy to geosynchronous orbit, according to NASA's mission press release.[68]

While TISP generated high interest in a civilian participation in the space program, it also came to fruition as a powerful competitive initiative. Out of 21,000 applications, Christa McAuliffe landed the spot along with backup mission specialist and teacher Barbara Morgan. The idea for a teacher in space blossomed out of the need for more positive publicity for NASA.

Parallel to President Reagan's enthusiastic support for a space economy, TISP solicited excitement meant to inspire school children to take an interest in math, engineering, and engineering education. Jim Beggs, Reagan's NASA Administrator in 1982, tasked its Advisory

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[67]Ibid, 2.

[68] NASA, Document Set 6b, Space Shuttle Mission 51-L Press Kit, January 1986, Release number 86-5, 3, Ronald Reagan Presidential Library and Museum, https://www.reaganlibrary.gov/public/documents/challenger-doc-06b---nasa-space-shuttle-mission.pdf.

Council to study a proposal for a private citizen to take an active part in the space program and train to fly on a shuttle mission.[69] This action potentially carried several positive outcomes. First, the publicity alone drew attention to the benefits of the manned space program and the shuttle mission congruent to President Reagan's national goals. Second, the political capital collected from the publicity was stunning. Compared to other professions, a teacher provided connections to children in ways the White House or Department of Education could not.[70] Third, taking a private citizen paved the way for future commercial endeavors in space in anticipated tourism, business, and industry employees' participation.

Another education and commercial competition emerged in the late twentieth and early twenty-first century. The impact of STEM challenges boosted public awareness for science, engineering, and math programs, promoted interest in NASA and in space careers, and commodified another aspect of NASA. The Jet Propulsion Laboratory (JPL) actively promotes STEM competitions and encourages collaboration. JPL sponsors a space ambassador program which is a community outreach program geared toward teaching students of all ages about space exploration and STEM activities.[71] Additionally, NASA sponsors competition for design and scientific investigation in multiple disciplines by partnering with private industry, driving the commercialization of space. Examples include Lego Education, Noggin, Girl Scouts of America, and Aerospace Corporation Robotics competition. In addition, the International Space Station

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[69] John Nuagle, "Letter from John Naugle to Dan Fink, with attached 'Report of the Informal Task Force for the Study of Issues in Selecting Private Citizens for Space Shuttle Flight'", June 16, 1983, Folder 4261, NHRC.

[70] Ronald Reagan: "Remarks at a Ceremony Honoring the 1983-1984 Winners in the Secondary School Recognition Program," August 27, 1984, Ronald Reagan Library and Museum, https://www.reaganlibrary.gov/archives/speech/remarks-ceremony-honoring-1983-1984-winners-secondary-school-recognition-program.

[71] "Solar System Ambassador: Sharing Science for 25 Years,"n.d., https://www.nasa.gov/centers-and-facilities/jpl/nasa-solar-system-ambassadors-sharing-the-science-for-25-years/#:~:text=Volunteers%20with%20the%20program%2C%20which,25th%20anniversary%20in%20fall%202022.

and the National Oceanographic Institute partner with NASA for competitive STEM challenges. Each of the programs commodify space application via education.

Education and interest in space enhances the U.S. position as a leader in space exploration and commercialization. As foreign competition from prominent global space agencies competes for the space domain, actively supporting education is required. Ariane Space, European Space Agency (ESA), Japan Aerospace Exploration Agency (JAXA), ROSCOSMOS the Russian Space Agency (RSA), and the China National Space Administration (CNSA) required NASA to actively seek private industry partnerships in the 1990s as a strategic method for funding and innovative design and manufacture of new technologies include space launch vehicles.

Even though budgets trended downward in the 1970s, by the end of the 1980s into the 1990s, NASA continued to expand is reliance on contractors which continued to bloat the organization.[72] Cost overruns persisted with projects and missions, including ISS and the space shuttle. The budget difficulties became more evident as national priorities changed along with national interest. In 1990, NASA was spending upwards of $10 billion on space research and development while critical expenditures were falling behind. For example, air transportation and air transportation management were at an all-time low of under $1 billion compared to $2 billion at the lowest point in its budget history in 1975.[73] To combat these financial and competitive issues, NASA explored commercial partnerships.

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[72] Roger Handberg, *The Future of the Space Industry: Private Enterprise and Public Policy*, (Westport: Quorum Books, 1995),95-99. A discussion on the problems that plagued NASA in the 1990s with decreased funding but expanding expenses.

[73] Thomas G. Roberts, "NASA Budget History," September 1, 2022, https://aerospace.csis.org/data/history-nasa-budget-csis/.

Orbital Sciences Corporation became the first privately owned company developed for space access and to launch a rocket in April 1990. The company contracted with NASA in the early1990s for satellite remote sensing projects for commercial applications.[74] Since the turn of the twenty-first century, NASA has partnered with rapidly emerging private industry firms like Blue Origin, SpaceX, and United Launch Alliance to build and launch vehicles to LEO and assist in cargo transfers and ferrying astronauts to ISS. More recently, Blue Origin won contracts to develop and launch for the Artemis Program which will send NASA astronauts back to the moon in 2025.

Since 2012, NASA gained in popularity in the public sphere, enabling its significance to modern space economy. It assists in technology transfers and have leveraged its possibilities for scientific exploration against partnership with private space industry. In a recent Pew Research poll, Americans sounded their support for NASA and viewed its role as necessary for new priorities including climate change and environmental concerns.

NASA's relevance remains significant. Changing goals and priorities have continued to boost support for the agency. The extent to which competition contributed to public perceptions is equally significant given changing political tides since *Sputnik*. NASA as a merchant of space and a function of a Cold War relied on competition to gain public support for its funding and social impact. Competition drove the commercialization of space by commodifying publicity, making astronauts national heroes in print which led to increased sales of magazines and other products, and by capitalizing on educational connections by partner with ordinary citizens. This

[74] Orbital Science Corporation, "About Orbital Science," n.d. https://www.northropgrumman.com/.

connected the American public to science and to the ideological origins of the Cold War space program.

As the Cold War ebbed, global competition increased the necessity of commercial partnerships which eventually led to the transfer of government control launch and access to partnerships with private industry. Innovative enterprises like the relationships between NASA, SpaceX, and Inspritation4 connected people to the value each organization created and of space exploration as part of the modern space economy.

NASA brilliantly incorporated the power of influence, competition, marketing, and shared cultural endeavors for human interests through its joint venture with Shift4 and SpaceX including the fascination with space. As a business venture, Shift4 launched a competitive campaign that embraced challenges, nostalgia, and marketed human community.

In the post-Cold War environment, NASA continued to promote competitive access to space through various programs including the nextStep-2 which solicited concept studies, basic and applied research for human spaceflight, and for robotic research and design.[75] Areas of consideration included commercial development of LEO, commercial communications, landing platforms, and navigation. Guiding principles for this program fiscal responsibility to ensure technological capabilities within a realistic budget framework, economic development, global collaboration with spacefaring partners, expanded capability, and continuity of human spaceflight.[76] Restrictions on competitive funding exist in many areas pertaining to direct or indirect association with China or Chinese affiliations. Associations of this nature contradict

[75] NASA, "Next Step for Technology for Space Exploration Partners," National Aeronautics and Space Administration Headquarters, April 19, 2016, NASA, https://www.nasa.gov/wp-content/uploads/2018/02/nextstep-2-omnibus-baa-amendment-23-19dec2023.pdf?emrc=440020.

[76] Ibid, 6.

modern business logic in that funding competitive agencies reduce intellectual property cache and technology base in addition to interference in political capital, laws, and policies.

Several companies participated in the program and received contracts to collaborate with NASA, including Lockheed Martin, a long time contractor, Impulse Space, and Firefly Aerospace, which produced delivery systems for small payloads to orbit. Other stable participants included Blue Origin, United Launch Alliance, and Astrobotic for medium hosting services. Finally, larger companies develop and manufacture launch capabilities, payload or, components, including SpaceX and Astrobotic for Mars, Redwire Space, Dynetics, and Northrup Grumman for large scale delivery systems for Mars exploration missions.[77] Contract awards ranged from $9 million to $34 million dollars and provided collaborative work on the Artemis program between 2023-2026. Contract awards signified a permanent commercial partnership between public and private industries. The projects continue to evolve into extensive and expanded longevity as prospects for Mars exploration and potential colonization appear on the horizon.

[77] Monica Witt and Jena Rowe, "NASA Selects Five U.S. Companies to Mature Artemis Lander Concepts, September 14, 2021, https://www.nasa.gov/news-release/nasa-selects-five-u-s-companies-to-mature-artemis-lander-concepts/ , access April 14, 2023. See also, Aria Alamalhodaei, "Nasa Orders Studies from Private Companies for Mars Mission Roles," May 1, 2024, NASA, echcrunch.com/2024/05/01/nasa-orders-studies-from-private-space-companies-on-mars-mission-support-roles/#:~:text=The%20companies%20selected%20are%3A%20Lockheed,-imaging%20services%3B%20and%20Spa, accessed May 1, 2024.

Chapter 6

Steely-eyed Missile Men (Women)

"You want to wake up in the morning and think the future is going to be great-and that's what being a spacefaring civilization is all about. It's about believing in the future and thinking that the future will be better than the past. And I can't think anything more exciting that going out there and being among the stars." – Elon Musk[1]

When Elon Musk appeared before the House Committee on Space, Science, and Technology in October 2011, SpaceX was becoming a familiar entity in the aerospace community. The Falcon1 heavy lift vehicle (HLV) had already proved successful and the heavier Falcon 9 received support through a partnership with NASA to develop a reusable vehicle technology.[2] The purpose of his statement was twofold: to report on the progress of the partnership between SpaceX and NASA through the Commercial Orbital Transportation Services (COTS), and to impress upon the committee of the iterative possibilities reaching the goal of cost-effective, reliable, and safe access to LEO provided.[3] While at the time of this statement SpaceX was in its infancy in securing valuable government contracts to enhance the United States' space access and human presence, the inspiration for this endeavor lie in what Musk called "safeguarding and transporting true American heroes to space and back."[4]

COTS was a major component of NASA's survival in terms of ongoing oversight into the budget commitments and sustainability of space exploration and transportations services. NASA's budget history already showed signs of reduction after a boost in spending in the 1990s

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[1] Elon Musk, SpaceX.com, n.d., https://www.spacex.com/mission/

[2] Leonard David, "SpaceX Tackles Reusable Heavy Launch Technology," *Space.com,* September 8, 2005, https://www.space.com/1533-spacex-tackle-fully-reusable-heavy-lift-launch-vehicle.html.

[3] Elon Musk, "Statement of Elon Musk, CEO and CTO of Space Exploration Technologies Corporation (SpaceX), before the House Committee on Science, Space, and Technology, U.S. House of Representatives," October 26, 2011, https://science.house.gov/_cache/files/2/6/26810a9d-c6d7-4a7f-8be8-d0355d6c3903/D46250838E9413B5FC11568BA13590F7.102611-musk.pdf.

[4] Ibid, 2.

and early 2000s. However, inflated expenditures, slow production, and forced reliance Russian Soyuz enabled SpaceX to leverage a position in the space market.[5] This represented a monumental watershed for private space companies and in the commercialization of space. Musk relied on the power and influence of past space heroes, Cold War space culture, and the space race era vision of astronauts to persuade the committee on the long-term benefits of this private public relationship. He succinctly advocated for the necessity and importance of innovation in the space domain. Capturing the nostalgia for the earlier U.S. prominence in the dominion of space, SpaceX followed the trend of contributing to private investment and innovation to the program. This view had its detractors arguing a melancholier reasoning for the origin of space access and driving force for commercialization.[6]

It is worth asking what the motives were for space entrepreneurs. What was the extent to which Cold War commodification enabled entrepreneurs' ability to capture commercial space markets in the post-Apollo and shuttle era? Likewise, it is significant to understand how entrepreneurs connected with the public to garner support for space endeavors and what the impact became for the economy and society. Despite arguments suggesting that space accomplishments were purely the result of corporate greed, entrepreneurial merchants expanded commercialization in LEO based on the economic foundations of an American capitalist system to solve critical problems and provide sustainable solutions, promote human presence, and

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[5] NASA, *Falcon 9 Launch Vehicle NAFCOM Cost Estimates*, August 2011, https://www.nasa.gov/wp-content/uploads/2015/01/586023main_8-3-11_NAFCOM.pdf.

[6] Norman Mailer, "A Fire on the Moon," *Life Magazine*, August 29, 1969, *Life Magazine Archives.com*, accessed January 15, 2024. This was a three-part series commentary of the moon shot in 1969. These articles were written as an opposing and scornful commentary on the origins of the space program. See also, Martin Parker, "Capitalism in Space," essay in *Space travel and Culture: From Apollo to Space Tourism*, (Malden, MA: Wiley-Blackwell, 2009), 85-86. The essay offers discourse on opportunity for the US government and NASA to use space for revenue generating for policy purposes, including defense spending. Parker argues that capitalism is the root cause of the space race although I argue that capitalism was necessary to accomplish technological supremacy; it is what made the US footprint in space possible.

benefit humankind. They relied on the power of Cold War era nostalgia, spectacle, and technological strategies to continue U.S. space dominance.

Advances in technology from SpaceX include designing, building, and testing new technologies to support COTS. It included a significantly modified government business strategy that lowed costs, but also provided cost-effective new launch methods. “The American hydrocarbon engine for orbital booster” was the first new attempt in over 40 years of this type in space program.[7] This led to further opportunity to incorporate critical development of space systems to support ISS, crew and cargo transport to LEO and back, and future space exploration technologies and business.

The incentives for private industry to embark on such a risk-filled venture, both in terms of human commitment and in financial well-being of companies involved were in some ways like those of Cold War reliance on U.S. industrial capacity. Early merchants of space contributed to the economy, seized the opportunity to build brand America in space, and capitalized on the growth of business in the technology sector which improved companies’ bottom lines. Modern space industry entrepreneurs have identified long term long-term goals and capabilities impacting space enterprises by building on the Cold War merchants’ ability to commodify space and drive the commercialization in the twenty-first century. As a merchant of space, entrepreneurs represent the culmination of various contributions to the space industry. Their aggregate role exhibits the epitome of U.S. leadership in space. They are the example of how Cold War commodification of space sparked interest in developing new possibilities in the high frontier.

[7] Musk, Statement to HCSST, 3.

While fascination with space remained impressive in the last decades of the twentieth century, the new millennium saw a much more participatory process emerging parallel to the technology revolution. A recent Pew Research Poll conducted indicated that 69% of Americans believe it is essential for the United States to be the leader in space exploration.[8] Likely, the rise in competitive international space endeavors and the cooperative effect of ISS reignited interest in space activities. The same poll reported that most Americans feel NASA has a critical role in space access, but private companies have a major contributing factor in the awareness of space activities, with at least 47% those polled indicating their recent involvement in space-related activities. 55% of adults surveyed also indicated that space tourism and space travel will become routine with the next 50 years.[9] This means that as NASA continued to focus on scientific explorations, private companies became leaders in a fledgling commercial tourism industry. Several well-known companies advertised this, including SpaceX, Blue Origin, Virgin Galactic, Axiom Space, Bigelow Aerospace, and Space Adventures.

Incentivizing commercial space companies required determination, drive, fortitude, and a desire to achieve problem-solving goals. Having name recognition and significant financial resources were a necessity, but not a focus, according to several major space actors.[10] Jeff Bezos, Robert Bigelow, Richard Branson, and Michael T. Suffredini were entrepreneurs who envisioned going to space when they were children in the first space race. They were also visionary in their thinking, possessed critical problem-solving skills, and used them to generate new businesses

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[8] Brian Kennedy and Alec Tyson, "Americans' Views of Space: U.S. Role, NASA Priorities, and Impact of Private Companies," *Pew Research Center*, July 20, 2023. https://www.pewresearch.org/science/2023/07/20/americans-views-of-space-u-s-role-nasa-priorities-and-impact-of-private-companies/

[9] Ibid.

[10] Center for Innovation and Education, "What is a Space Entrepreneur?," *Space Foundation.com,* n.d., https://cie.spacefoundation.org/what-is-a-space-entrepreneur/, accessed December 27, 2023.

including contracting with NASA in divergent ways. They are the steely-eye missile men of the millennial space age. They all grew up in the afterglow of first space race where images, propaganda, advertising, books, and excitement for space travel motivated them. They are the problem solvers of the new generation of space exploration.

While many other companies exist, these well-known space business developers specify that enthusiasm and opportunity for people to access the limitless resources of space, benefit earth, expand humanity in space, and provide low cost services and business to LEO and beyond.[11] Like the captains of industry of the American Gilded Age, these entrepreneurs saw a need, commenced solving problems, and created viable solutions that revolutionized industries resulting in the expansion of the economy in space.

Unlike the adage of the robber baron, modern titans possess primarily favorable stance among the public. They contributed to and influenced the growing space economy. This promoted recognizable social connections which helped form perceptions of humans in space evidenced by 72 % public approval for private industry.[12] Robert Bigelow, for example, stated that he knew he would work in the space industry when he was 12 years old in 1956.[13] Growing

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[11]Elon Musk, SpaceX Mission Statement, "To Make Life Multiplanetary, updated April 6, 2024. See also, Christian Davenport, "*Space Barons: Elon Musk, Jeff Bezos and the Quest to Colonize the Cosmos*, (New York: Public Affairs, 2018), 19-25. The first chapter in the book chronicles Bezos' interest in space and how he was able to fund it after Amazon. For information on Robert Bigelow, see Bigelow Aerospace/who we are. Provides a biography of the hotel magnate and how he converted some of his business profits into developing habitats for NASA, solving a problem for astronauts on ISS and potentially in other space missions. See also, Michael T. Suffredini, CEO of Axiom Space at https://www.axiomspace.com/team/michael-suffredini. Axion provides human spaceflight services and space infrastructure. He was a NASA engineer responsible for ISS management for 30 years prior to starting his own company.

[12] Brian Kennedy and Alec Tyson, "Americans' Views of Space: U.S. Role, NASA Priorities and Impact of Private Companies," July 20, 2023, *Pew Research Center, https://www.pewresearch.org/science/2023/07/20/, accessed July 20, 2023.* The report canvases various surveys related to space tourism, American perceptions and favorability of human-space interaction, working in space, and expectations for ordinary non-scientific population in space.

[13]Adam Higginbotham, "Robert Bigelow Plans A Business Empire in Space," May 13, 2013, *Bloomberg Businessweek,* access July 17, 2023. The article discusses Robert Bigelow, real estate moguls plan to build space habitats for the commercial space industry.

up at the peak of the Cold War, his realized that space was the industry of the future. By 1999, he founded Bigelow Aerospace after 30 years of successful real estate ventures including Budget Suites hotels. The travel industry enabled him to concentrate on developing inflatable space habitats for ISS. Between 1999 and 2017, the company invested millions developing and manufacturing the commercial structures. As the chief financier, buyer, and producer of the habitat technology, he created Bigelow Expandable Activity Module (BEAM) and several prototype spacecraft including Genesis I and II.[14] He advocated for sustainable commercial space infrastructure and economic exchange. The goal for these crafts and the B330 centered on using ISS as a gateway to deep space living. The Mars Habitat supported that mission and NASA looked to capitalize on the technology as its first customer.

Habitats are expected to become a valuable commodity as NASA seeks another moon landing and potential space base as a steppingstone to deep space and Mars. Space tourism is a rising industry with reservations sold by companies like Virgin Galactic, Blue Origin, Axiom Space, and Max Space. In his report to the U.S. Senate Committee on Commerce, Science, and Competitiveness, Bigelow petitioned for the reopening of the American space frontier by removing regulatory barriers hindering economic expansion. He stated that he "personally funded the development of space habitat systems and architecture with over $350 million dollars as of April 2017."[15] What is interesting is that the BEAM and B330 habitats and stations are also

[14] Bigelow Aerospace, "NASA Extends Expandable Habitat's Time on the International Space Station," last updated 2018, https://bigelowaerospace.com/pages/beam/. Provides summary points on various products designed and manufacture by Bigelow Aerospace in the public relations and news links. See also Dave Mosher, "A New Company Plans to Launch Huge, Inflatable Spacecraft Into Orbit-and Sell Reservations to Countries and Tourists,: February 21, 2018, *Business Insider.com*, https://www.businessinsider.com/private-space-station-hotels-robert-bigelow-2018-2, accessed July 17, 2023.

[15]Robert Bigelow, "Statement to the United States Senate Committee on Commerce, Science, and Transportation, Sub-committee on Space Science, and Competitiveness," April 26, 2017, https://www.commerce.senate.gov/services/files/304459F5-7206-47EC-9BC8-94E0D275C9A5, 1-7.

products of collaboration with NASA and SpaceX, expanding the commercial connectivity of the Bigelow venture.

Bigelow Aerospace represented the entrepreneurial competitiveness, drive, and critical problem-solving characteristics akin to others in the space businesses coming of age in the glow of the first space race and Apollo and shuttle accomplishments. Iterating the demand for safe, affordable, and robust technology that supported human spaceflight and deep space exploration projects, his economic vision became a driving for commercialization in the LEO economy. Mr. Bigelow affirmed that as a company goal in the committee.

His intention was to revolutionize the commercial space industry with the anticipation of reduced regulatory burden.[16] This meant that Congress needed to actively endorse commercial prospects in any updated commercialization bills to give credibility to entrepreneurial ventures which would potentially lead to subsidiary business investments. Chain economic function in LEO, which supports existential business much like a domino effect, are critical phases need for future deep space travel. They provide diversified assets like tourism, scientific research, life-support systems food generation, water reclamation, energy production, traffic and waste management systems.

Other entrepreneurs of the late twentieth and early twenty-first century dreamed of space too, and contributed to problem-solving for human access and development of new markets.[17] They put all their energy into building successful businesses that they later converted into a

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[16] Ibid, 4.

[17] Notably, Jeff Bezos and Amazon, Richard Branson and Virgin Group which is a conglomerate consisting of Virgin Rail, Virgin Records, and Virgin Air before founding Virgin Galactic, John Chisolm and Sierra Nevada Corporation, and Jim Benson with SpaceDev and American Rocket Corporation, later acquired by Sierra Nevada. SpaceDev also owned various space technology subsidiaries. See Christian Davenport, *Space Barons: Elon Musk, Jeff Bezos and the Quest to Colonize the Cosmos, (*New York, Public Affairs, 2019), Chapters 3 and 3. See also, "Changing Hands," *Aviation Week and Space Technology, vol 169, no. 16,* October 27, 2008, 16 and " As a Private Sector,"38-41.

utility for the space program. Their ability to analyze problems significantly enhanced the modern space exchange. They are reminiscent of the fictional steely-eyed missile men, Rich Purnell, in the 2015 movie, *The Martian*, as well as the exemplar NASA problem solver, John Aaron.

In the film, a computer broadcasted to NASA's Hermes Mission Control Room that the Ares III mission team found a solution to the problem of rescuing astronaut Mark Watney who was stranded on Mars. "Houston, be advised: Rich Parnell is a steely-eyed missile man."[18] The nickname originated with real-life NASA engineer John Aaron operating the electronics console during the *Apollo 12* flight on November 14, 1969.[19] During the initial launch of the Saturn V rocket, lightning struck the rocket creating a systems malfunction. All electrical systems had gone haywire. Searching for a solution while trying to determine if the mission needed to be aborted, Aaron's cool confidence allowed him to quickly analyze the problem and reach a solution, saving the mission. From that moment, he earned the nickname "steely-eyed missile man" for sharp-witted reasoning, an honor bestowed to those few that react in a similar manner when faced with technical or critical situations.[20]

The new steely-eyed missile men and women are the entrepreneurial merchants of space, quick thinking problem-solvers emerging as the newest business innovators operating in the high frontier. In the past, any number of engineering issues often resulted in hours of brainstorming, or redesigns of parts, tools, equipment, and vehicles. This often required collaboration with

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[18] *The Martian,* Scott Free Productions, Kinberg Genre, and TSG Entertainment, Film, 20th Century Fox, September 11, 2015. https://www.space.com/1533-spacex-tackle-fully-reusable-heavy-lift-launch-vehicle.html

[19] Andrew L. Warren, "John Aaron: Oklahoma's Legendary Steely-Eyed Missile Man," Oklahoma Historical Society, Winter 2014; Oklahoma City, Oklahoma. (https://gateway.okhistory.org/ark:/67531/metadc2017362/m1/5/: accessed October 14, 2023.

[20] Ibid.

contractors. Today, the commercialization of space has provided opportunities for companies to provide relatively fast solutions through coding, for example.[21]

The World Wide Web empowered many with access to images and information significantly easier than in the past. While technology supported STEM, it also commodified space in its use of visual modeling and graphics that more average people accessed and understood. This is evident in the proliferation of apps, games, and simulators available to anyone with a computer or cell phone. For example, Apple launched the Spaceflight Simulator video game several platforms including Nintendo Switch, Microsoft Windows, and Mac Operating Systems.[22] These are significant drivers of commercialization of space built on familiarity of past spectacles, icons, and technology. Digital technology provided real-life application to experiences and problems of space which became beneficial in simulators and research for deep space access. Bigelow Aerospace advocacy for deregulation of economic barriers in LEO correlates to this concept entirely.

Private space entrepreneurs play a dominant role in commercial space activities conducting commerce, innovating on existing technology, and providing applications of products and services previously unavailable to the public. Examples include space hospitality and commodity oriented businesses.[23] A larger significance is the method in which the transition

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[21] West Midland Family Center.org, "Generational Differences," chart.http://www.wmfc.org/uploads/generationaldifferenceschart.pdf, See also, Caleb Henry, "Space Industry Pressed to Hire Enough Software Engineers," *Space.com*, October 19, 2019*,* https://spacenews.com/space-industry-pressed-to-hire-enough-software-engineers/, The *SpaceReport.org* provides statistics on the future of space industry jobs open to millennials with growth and opportunity currently unlimited.

[22] Apple, *Space Simulator,* computer application for rocket science, 2022, https://apps.apple.com/us/app/spaceflight-simulator/id1308057272.

[23] Space Foundation Editorial Team, "What is a Space Entrepreneur?" n.d., https://cie.spacefoundation.org/what-is-a-space-entrepreneur/#:~:text=Space%20entrepreneurs%20represent%20your%20average,in%20the%20commercial%20space%20community.

from a government dominated space infrastructure to a private commercial space industry occurred.

Modern space entrepreneurs capitalized on the influence of the Cold War space race fascination, the spectacle of feats, and the problem-solving fortitude that drove their energies in other, typically successful businesses.[24] Many modern steely-eyed missile men and women included the baby boomers of the first space age as well as some Generation Xers. These space actors grew up after Apollo during the shuttle era. Their current employee base consists of some millennials, but primarily of Generation Z populations whose digital skills far surpass the technological proficiencies of their predecessors.[25] This group grew up in the computer and digital age, which is built into their psyche. It is a part of who they are. Their ability to navigate and deploy solutions through software reflected their sheer determination to succeed. For example, when asked what he thought of SpaceX was a serious company, NASA's Liam Sarsfield commented that "Musk was a problem solver and his highly talented, hand-picked team was driven. SpaceX was serious and noted that NASA should support the company."[26]

The Pew Research reflects the increase in technology usage among the different generations since the turn of the twenty-first century. This is critical when considering the skills

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[24] Christian Davenport, *Space Barons: Elon Musk, Jeff Bezos and the Quest to Colonize the Cosmos*, (New York: Public Affairs, 2018), 21. Bezos is quoted saying that NASA was a national treasure and he had been fascinated with space since he was five years old watching the moon landing in July 1969. He would later become mesmerized with Gerard O'Neill and the book the High Frontier while at Princeton studying electrical engineering and computer science.

[25]Emily A. Vogels, "Millennials Stand Out for t=Their Technology Use, But Older Generations Also Embrace Digital Life," *Pew Research,* September 9, 2019, https://www.pewresearch.org/short-read/2019/09/09/us-generations-technology-use/, accessed February 6, 2024.

[26] Christian Davenport, *The Space Barons: Elon Musk, Jeff Bezos, and the Quest to Conquer the Cosmos,*(New York: Public Affairs, 2018), 45-47. Liam Sarsfield was a high ranking NASA official over the chief engineering department and answerable to Sean O'Keefe, the NASA Administrator between 2001-2005. His interest in fledgling companies promoted him to investigate SpaceX. His "right-hand man" Sarsfield was highly supportive of a transition to commercial space.

necessary to solve highly complex technical issues in the development of space applications. This includes navigating, docking, transitioning orbital and reference trajectories, deep space communications, and probe control. Additionally, companies like SpaceX and Blue Origin developed more reliable Vertical Take-off Vertical Landing (VTVL) technology as part of its utilization of reusable launch vehicles operated by many of the more tech savvy and exceptionally adaptable Millennials and Gen Xers.[27]

The number of software engineers, a significant role in the space industry, and science occupations has steadily increased since the early Cold War space program. The post-2012 SpaceX launch of the Falcon 9 rocket era shows that there are nearly 6000 occupations in this field compared to just under 2000 in 1960 at the start of the space age. Additionally, this data indicates that with each generation, society became more Science, Technology, Engineering, and Math (STEM) oriented. Several reasons account for this trend, including the Servicemen's Readjustment Act of 1944, also known as the G.I. Bill, the Eisenhower National Defense Education Act of 1958 supporting more enrollments in engineering and math in the wake of *Sputnik,* and increased grants from organizations such as the National Science Foundation during the space race.[28] These acts stimulated educational growth for many men and women who helped launch the U.S. to the Moon.[29] One of the benefits of these pieces of legislation includes the

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[27] Dave Doody, *The Basics of Spaceflight,* (NASA: 2024),Chapter 1 and Chapter 13, https://science.nasa.gov/learn/basics-of-space-flight/.

[28] Litrecenter. "How U.S. Curriculums Changed in the 1950s and 1960s," https://www.literacentre.com/blog/us-curriculum-change-in-the-1950s, accessed March 12, 2024.

[29] In the 1950s-1970s, Science, technology, engineering, and math disciplines were dominated by men. By 1978, women were finally allowed to apply and become astronauts. Two significant female astronauts accomplished as much as their male counterparts; Sally Ride and Judith Resnik. See "Dr. Sally K. Ride: First American Woman in Space," *Smithsonian Institute*, https://www.si.edu/spotlight/sally-ride. See also NASA Oral History Archives for women in leadership roles in the aerospace industry including Ellen Ocha who became the first Hispanic female astronaut and later the Administrator if Johnson Spaceflight Center in Houston, Texas, Gwendolyn Wheatle and Kanama Bivens who work at Langley's NASA Research Center for STEM education and associate director of the center, respectively, NASA, https://www.nasa.gov/women-at-nasa/.

expansion of individuals pursuing space-related occupations in the 1950s and 1960s which significantly contributed to the development of technology applications assisting in U.S. dominance in space. Those born during the baby boom generation also benefited from the opportunity. By the 1980s, women entered the field. To date, women make up a significantly higher percentage of STEM fields in the space sector than the previous two generations with education and occupation in computer software and hardware engineering, research, launch, tourism, communications, and exploration significantly contributing to the transition of government to private commercialization of space[30]

Early Cold War Era education legislation provided a launchpad from which to build the space economy by their contribution to the commercial space industry in STEM subjects. The National Defense Education Act of 1958 provided students loans for higher learning, financial support for science and math equipment in schools, funding for foreign language studies, and aptitude testing for determining potential candidates for fellowships.[31] The Bureau of Labor Statistics indicated that occupations within STEM disciplines heralded computer scientists, chemists, physicists, aerospace engineers, biologists, and medical-related professions.[32] Furthermore, during the Cold War space race the U.S. government significantly encouraged students to pursue these fields for national security purposes.[33] Government commodified education, NASA energized awareness of space age possibilities, and the consumer culture drove

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[30] EVANA, "Women in the New Space Sector-A Recruitment Insight," 2024, https://www.evona.com/blog/women-in-the-new-space-sector/, accessed March 15, 2024.

[31] Pamela Ebert Flattau, et al, "The National Defense Education Act of 1958 Selected Outcomes*", The National Defense Policy Institute*, 10-30, B-3, https://www.ida.org/-/media/feature/publications/t/th/the-national-defense-education-act-of-1958-selected-outcomes/d-3306.ashx.

[32] Bureau of Labor Statistics, "Periodic table of STEM Jobs," https://www.bls.gov/k12/students/careers/stem-table.htm.

[33] Pete Mandler, "STEM Subjects and the 'Market' in Education Since the 1960s," September 3, 2020, https://www.historyandpolicy.org/opinion-articles/articles/stem-subjects-and-the-market-in-education-since-the-1960s.

interest. With NASA commodifying space and the spaceman, many of the students of this period were mesmerized and driven to participate in that glamorized industry.

Not everyone in the Cold War space community raced to be a part of the industry. Gwynne Shotwell, the Chief Operating Officer at SpaceX, began her career as a mechanical engineering student. Her fascination with cars, however, led her to an engineering job first at the Chrysler Corporation which played a major role as a merchant of space in the development missile, rockets, and spacecraft. She eventually landed a position with a small satellite company called Microcosm, which launched her aerospace career. She stated that by developing sales and engineering skills she quickly realized that there was a major difference in the way government and commercial space industries functioned.[34] This led her to take a keen interest in the space sector to procure launch access for commercial satellites and eventually placed her with SpaceX.

In a statement to Congress Shotwell advocated for greater commercial participation in the space launch industry by selling SpaceX products, engineering, and technical team capabilities.[35] In 2015, the United States still relied on its old competitive Cold War adversary for space launch access. The Space Transportation System (STS), better known as the Shuttle, no longer provided the means for space access. This was mission critical for the United States in terms of defense,

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[34] Gwynne Shotwell, "Interview with Mark Holmes," *Satellite Today*, April 21, 2014, https://www.satellitetoday.com/content-collection/it-all-started-with-a-suit-the-story-behind-shotwells-rise-to-SpaceX, accessed May 14, 2024. Gwynne Shotwell is an industry leader in the Aerospace and commercial space industry working with to build the space economy and promote commercial space business in LEO. She works with other notable space actors including Elon Musk, Lori Garver, John Logsdon, and Roger Launius. See also, Rebecca Wright, "Interview with Gwynne Shotwell," NASA Johnson Spaceflight Center Oral history Project for Commercial Crew and Cargo Program, January 15, 2013, https://historycollection.jsc.nasa.gov/JSCHistoryPortal/history/oral_histories/C3PO/ShotwellGE/ShotwellGE_1-15-13.htm.

[35] Gwynne Shotwell, "Statement of Gwynne Shotwell, President and CEO Space Exploration Technologies Corporation (SpaceX) Before the Committee on Armed Services, Subcommittee on Strategic Forces, U.S. House of Representatives," March 17, 2015, https://docs.house.gov/meetings/AS/AS29/20150317/103135/HHRG-114-AS29-Wstate-ShotwellG-20150317.pdf. Critical evaluation of the US governments strategic position with regards to space launch and access in terms of defense.

security, and dominance in LEO. SpaceX produced launch vehicles to fill that role, saving taxpayer money while offering reliable transport for cargo and eventually human spaceflight.

In terms of commercialization and building a space economy, SpaceX was in a unique position to offer a cost-effective mechanism to ensure access without relying on Evolved Expendable Launch Vehicles (EELV) which continue to project escalation in yearly budgets.[36] Shotwell pointed out that the U.S. government committed to "two independent launch systems" and argued that contracting with commercial providers significantly enhanced national security needs.[37]

Advocating for commercial space partners produced a more robust space economy while maximizing the U.S. government's national security needs. Additionally, promoting sound technological policy supports critical space infrastructure that outpaces competitors like China or Russia. Shotwell rightly argued that investment in the commercial sector through partnerships drove further investment and innovation while it provided unprecedented cost reductions for launch and spacecraft development. This was a positive driver for future commercialization of space because new talent recruited were especially tech-savvy and well-versed in space operations resulting from Cold War era efforts in space and a consumer culture stemming from a fascination with human spaceflight.

The U.S. government as a public entity benefitted from entrepreneurial connection to the tax-paying public. By 2015, Elon Musk's well-known persona created brand recognition through naming conventions, problem-solving enterprises separate from SpaceX, and a 2012 maiden

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[36] Department of Defense, "Selected Acquisition Report: Evolved Expendable Launch Vehicle (EELV) as of Fiscal Year 2015 President's Budget," RCS:DD-A&T)Q&A) 823-176, April 16, 2014. https://www.gao.gov/assets/gao-15-623.pdf.

[37] Shotwell, Statement to the Committee on Armed Services, 1.

cargo launch to ISS using the *Dragon* spacecraft and Falcon rockets. Musk's 2018 spectacle calibrated the entrepreneurial drive with popular icons like Tesla Motors perched atop a Falcon Heavy headed for orbit. Ordinary people understood Musk and the possibility of a human working and living in LEO environment.

The idea of a normalized human presence in space boosted Jeff Bezos' entrepreneurial drive. He grew up in the Cold War -space race era and spent his energies emulating his heroes. He founded Blue Origin in September 2000 with the intent of developing reusable "launch vehicles and in-space systems" that supported the dream of ordinary people having access to space.[38] His goal was like Elon Musk's in that he envisioned millions of people living and working in space as part of a full-fledged space economy. Like Musk, Bezos was an avid reader and tinkerer growing up. This skill led him to study computer science and engineering at Princeton University where he met Neil Gerard.[39] His interest in space led to the development of Blue Origin which since its inception in the cadre of private space companies has secured contracts with NASA for launch support in LEO and recently for the new Artemis Project which will orbit the Moon in 2025 and land a team in 2026.

In July 2021, Bezos penned a letter to NASA administrator Bill Nelson in which he stated his motivation for commercial space access. Blue Origin's commitment to sustainable applications that allow multiple future moon landings. Bezos iterated that NASA's continued support in space access was necessary to inspire a new generation of interest in the aerospace field. He advised that Blue Origin answered the call for developing technology that provided the

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[38] Jeff Bezos, Blue Origin Mission Statement, https://www.blueorigin.com/about-blue, accessed April 5, 2023.

[39] Academy of Achievement ,"The King of Cyberspace, n.d., "https://achievement.org/achiever/jeffrey-p-bezos/

US with uninterrupted dominance using the Lunar Landing System incorporating subsidiary commercial space companies as well.[40] This is another example of the power of innovation, but it also explains Blue Origins motives for space exploration and commercialization, which according to Bezos stemmed from Cold War era excitement and competition.

Jeff Bezos, like other space entrepreneurs, see innovation as necessary for human continuance. Elon Musk, Robert Bigelow, Ken Grossman, and others collectively envision humans working and living in space as an extension of earthbound enterprises. For Bezos, this means that as the space domain populations increase, so does the opportunity to study and solve critical problems related to energy resources, climate and environmental protection, and medical breakthroughs.[41] This represents a distinct market expansion in which the proliferation of new technologies will likely emerge similarly to the way new products materialized during the Cold War space race.

Space markets that evolved from Cold War era innovation and consumerism continue to function as a fractal where one industry, impacts, creates, and promotes another. This was evident as over time technologies improved which in turn affected policy shifts both economic, political, and foreign diplomacy.[42] Blue Origin and SpaceX, for example, produce new launch methods while expanding into other orbits of business like satellite communications, heavy

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[40] Jeff Bezos, "Open Letter to NASA Administrator Bill Nelson," July 26, 2021, Blue Origin Blog, https://cie.spacefoundation.org/what-is-a-space-entrepreneur/. See also Chapter 2 on the necessity of competition in the commercial space market.

[41] Jeff Bezos, "Interview with Alan Murray and Nicholas Gordon, *Fortune Magazine*, March 1, 2024, https://fortune.com/2024/03/01/jeff-bezos-blue-origin-space-travel-earth/, accessed March 1, 2024.

[42] Dick S. J., Launius R. D., *Societal Impact of Spaceflight. Vol. 4801* (US National Aeronautics and Space Administration, 2007). https://www.nasa.gov/wp-content/uploads/2023/03/sp-4801.pdf. Space historian Roger Launius' publication reveals how the space economy produces extended commercial and economic impact which leads to environmental considerations including culture, society, and national security. See also, Jackson D. J. "A Compilation of Technology Spinoffs from the US Space Shuttle Program" in *The 1993 NASA/ASEE Summer Faculty Fellowship Program* (1993).

human transport, and privately owned space stations deemed necessary to produce new economic growth, and as Robert Bigelow stated, serve as a critical steppingstone for future deep space activity.

Their innovation employs an economic model known as new growth economics which intuitively relies on supporting new ideas, ventures, risk and reward, and entrepreneurial experimentation.[43] The driving force for commercialization under this model came from Cold War competition to out-produce technology over the Soviet Union. Considering historiography on space commercialization, the driving force for a space economy through the transfer from public to private industry for access and operation, was Cold War merchants that facilitated commercialization rather than modern space corporations inventing it. Cold War merchants made entrepreneurial economic methods possible.

Bigelow Aerospace designed, manufactured, and serviced space habitats as well as research for human interaction in space and future colonization. The company, along with others like Axiom Space who provide tourism services along with Virgin Galactic, represent the growing space industry and infrastructure. The transition from solely government controlled access to space to partnerships with private companies continues to commercialize space.

Sierra Nevada Corporation represents another modern aerospace industry engaged in the space economy. The company provides a variety of application and mission support through its software development division, satellite communications, and cyber security packages. Sierra

[43] Louisa Corrado, Maureen Cropper, and Akhil Rao, "Space Exploration and Economic Growth: New Issues and Horizons," *Space Exploration: Economics, Technologies, and Policies,* 120(43), 5, October 23, 2023.

Space, a subsidiary of Sierra Nevada contracted with NASA to build its *Dreamchaser* Aircraft to help supply ISS and eventually other seep space missions.[44]

Sierra, along with a rapidly developing field of space access and operation providers, bridged the gap between government dominated technology production and access to space and increased commercial industry presence. Lunar Outpost, Ispace, Astrotech, Relativity Space, Eclipse Orbital, and Masten Space Systems are a few of the companies providing rocket components, navigation systems, life support systems, landing gear, critical mapping functions for orbits and surfaces, prolusion systems and more. These companies represent critical functions in the operation and logistics of human space economy and environment. They will be equally critical as deep space exploration commences in earnest in the decades to come.

Space access viewed through the lens of Cold War merchants and upcoming private space firms transform the old linear method of monopsony to a market encompassing the competition which enhances productivity, innovation, and economic expansion for the United States as well as in the global community. The Artemis Accords reflect attitude and represent conditions and consequences of early Cold War motives and tactics for space exploration.

The driving force behind the commercialization of space arose out early Cold War ideological strategies. The components of commercialization from a point of view of Cold War merchants that contributed to building today's space economy. In the past, studies about the space have consisted of the political and ideological aspects of the greater struggle between the

[44] NASA, "Sierra Space's Dream Chaser New Space Station Resupply Spacecraft," December 15, 2023, https://www.nasa.gov/missions/station/commercial-resupply/sierra-spaces-dream-chaser-new-station-resupply-spacecraft-for-nasa/#:~:text=NASA%20and%20Sierra%20Space%20are,of%20NASA's%20commercial%20resupply%20services.

United States and the Soviet Union in their competitive technological contest embedded in the nuclear arms race.

It was through these technological accomplishments that different merchants commodified space as a function of the Cold War. The product was a long transition from government controlled launch and access to private industry in LEO. The result established the U.S. space economy, the opportunity for ordinary citizens to participate in it, and the awareness of the benefits obtained from supporting continued exploration of space. Additionally, the United States remained the principal leader in space access and operations even as the environment is steadily incorporating multinational participation in the twenty-first century.

The term commercialization regarding space access is a modern construct which arrived toward the end of the twentieth century referring specifically to partnership with private enterprise. The quintessential idea that commercialism means something is for sale or operated for financial gain is an accepted truth. However, the evolution of the economy to include space produces other maxims as well, including new commodities and benefits to the United States, to humanity, and to earth. The process leading to the alliance between government and private industry included other forms of commercialization which this research demonstrates.

When *Sputnik* launched 67 years ago, Cold War merchants mobilized their forces with the intent of shaping perceptions about the strength of the United States, the superiority over the Soviet Union, and as the leader of the free world. More significantly, firms representing the United States government collaborated to present spectacles of power and influence in society which generated more opportunity to commodify and communicate ideology.

While historians have produced endless scholarship concerning technology, the space race, the militarism of the cold war, the individual projects associated with the climatic moon

landing in 1969, and the popular culture stemming from the space race, the contribution to this community of scholarship encapsulates the various components of commercialization. In this lens, the framework of commercialization is actually a long process originating in the merchants of the Cold War who capitalized on space age products. Their goals varied, but typically included the promotion of spectacle, technological, economic, and political superiority, and culminated in a new generation of thinkers pursuing commerce in space, commercialization of access and existence in space.

The new perspective on the term commercialization, the transition from government controlled space launch and access to private industry partnerships, stemmed from the long process of commodification. This dissertation argues that despite modern assumptions which pinpoint commercialization to the passage of the Commercial Space Launch Act of 1984 and of post-Cold War policies, communicating American ideology, the commodification of the consumer space market, and both domestic and international competition created the environment conducive to privatization of some elements of space. It asserts commercialization in a much broader understanding of the Cold War mechanisms contributing to the modern space economy. Communication of power, the forces that shaped public perceptions of space like propaganda and popular culture, the fractal like evolution of space technology application into the consumer space marketplace, much of what seemed imagined in space fiction and film, and finally the enthusiastic fascination with NASA and the nostalgia of the space race led modern entrepreneurs to build a commercial space future that continues to expand today.

Without innovation, imagination, and Cold War domestic and global competition, transitioning to the highly involved production of space launch, access, and transportation systems by contractors and then enterprising entrepreneurial capturing a significant share of

market was improbable. The United States' primary nemesis, the Soviet Union could not sustain a government backed space program toward the end of the twentieth century as the Cold War deescalated and came to an end. It's space sector finally showed signs of recovery after the new millennium when the overall economy began to improve.[45] However, it was the ability for the United States to reply on the private sector, even in the early Cold War government controlled space program, that created the environment for the commercialization of space.

Today, there are numerous industries capturing market shares in space. LEO and deep space resources entice both government and private industry to explore and exploit the space environment, creating current and future jobs in newly forming commerce. For example, the space economy gross output by industry includes forestry, agriculture, and oceanic fields. Skilled workers in these occupations study the earth from space via remote sensing provided continuously developing satellite technology.[46]

Other industries expanding in space include mining, utilities, manufacturing, computer development, construction, trade, motion picture, finance and insurance, professional scientific and technical consulting, defense, medical, and telecommunications. As of June 27, 2023, these industries combined produced 171, 676 billion dollars, an increase of nearly 36,000 billion dollars. These figures do not include chained output, value added, employment, or chained value added statistics. The chained output refers to subsidiary business that stem from an existing industry or occupation and in multiple economic stages or years.[47] This data is expected to increase with the four largest industries impacting economic space market growth in

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[45] Anders Asland "Russia's Collapse." *Foreign Affairs* 78, no. 5 (1999): 64–77. https://doi.org/10.2307/20049451. See also, https://www.russianspaceweb.com/centers_industry_2000s.html

[46] Tina Highfill and Connie O'Connell, "Space Economy Gross Output by Industry," *Bureau of Economic Analysis*, June 1, 2012-2023, https://www.bea.gov/data/special-topics/space-economy.

[47] Ibid.

manufacturing and information leading, followed by wholesale trade and other smaller commerce.[48]

Manufacturing continues to produce hardware components for the execution of space missions including scientific and technological exploration. For example, orbiters, satellites, launch capacity, ground equipment tracking and network systems, tool, weapons, vehicle parts including electronics. This segment of the space economy also captures future apparatus necessary in conducting excavation, exploitation, and production of resources, any goods, services, and new commodities integrated into this economy.

Wholesale and retail trade will inevitably contribute to the expansion of this market in conjunction with information systems growth. This will include enhanced communication products filtering to earth, LEO, and deep space aerography.[49] This will require viable marketing methods as seen during the early Cold War with spectacle, coverage in information outlets, and advertising, as well as commodification of new space products. Modern examples include naming conventions of space entities soliciting funding via namesake advertising like the popular naming sports arenas like Mercedes Benz, Gillette, and MetLife Stadiums. SpaceX naming conventions reflect Elon Musk's characteristic wittiness with names like Dragon which represents Puff the Magic Dragon, a fantasy name referencing the challenge of completing something impossible. Musk stated that his critics insulted him. So, he named his vehicle after it

[48] U.S. Bureau of Economic Analysis, Chart, "Space Economy Growth by Industry, 2012-2021," updated June 2023, https://www.bea.gov/data/special-topics/space-economy.

[49] Lt. Fredrick J. Nelson, "A History of Aerology in the Navy," April 1934, U.S. Naval Institute, U.S. Navy meteorological the term meaning the geography of the upper atmosphere. This term is difficult to define for specific locations in space; however, the term geography cannot apply since it is refers the study of "earth." https://www.usni.org/magazines/proceedings/1934/april/history-aerology-navy. See also, https://www.navy.com/careers-benefits/careers/science-engineering/aerographers-mate.

in classic Elon humor. Likewise, the Falcon series rockets are named after the fictional *Star Wars* Millennium Falcon representing speed and popular culture.[50]

In 2018, the possibility of buying advertising space on NASA vehicles prompted a study of the use of the organization's logo. NASA administrator Jim Bridenstine investigated boosting the brand image by selling naming rights, which met with overall negative feedback. Part of the potential policy included using astronauts in commercials and on consumer items much in the same way as in the Cold War Mercury, Gemini, and Apollo days. The purpose was to offset some of the growing costs associated with space exploration and manufacture of viable transportation, booster, and spaceflight vehicles as well as space station operation components and probe construction.[51] However, this idea has not been fulfilled as of 2024 and NASA maintains strict regulations regarding advertising on its vehicles or the use of its brand in advertising other products.[52] Given the nature of capital markets in the United States and the potential for exploitation, the extension of advertisers launching products in space or from a space environment setting seems a natural progression of the economy.

There are currently sky-based advertising mediums such as blimps, and aircraft banners. But these forms are limited in number and are mobile, meaning they are not permanent fixtures interfering with the upper atmosphere.[53] Likely, advertising of the future will be fixed on entities

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[50] Clara Moskowitz, SpaceX's No. 1 Rule for Naming Private Spaceship Parts: Be Cool," *Space.com,* May 28, 2012. https://www.space.com/15879-spacex-dragon-spaceship-cool-, access May 14, 2023.

[51] Christian Davenport, "Why NASA's Next Rocket May Say 'Budweiser' on the Side," *Denver Post,* September 10, 2018, https://www.denverpost.com/2018/09/10/nasa-rockets-advertising/, accessed May 14, 2023.

[52] NASA, "Advertising Guidelines," https://www.nasa.gov/nasa-brand-center/advertising.guidelines/#:~:text=NASA%20does%20not%20permit%20use,at%20NASA%20Headquarters%20in%20Washington.

[53] Robert C. Cochetti, "Are We Ready for Space-based Advertising?," December 3, 2022, *The Hill.com,* hehill.com/opinion/technology/3760766-are-we-ready-for-space-based-advertising/, accessed May 14, 2023.

like private space stations or spaceships which will potentially generate more revenue for those funding the ads.

Today, there exists a specific niche of communication that drives commercialization of space through promotion.[54] It uses the power of public influence in its methods and continues to shape public opinion regarding the space economy, space exploration, the role of private industry and of NASA. This will be necessary to continue funding deep space projects by supporting means of supply, human requirements, equipment and much more. Like Cold War and modern methods, the future will continue to focus on visual content, name recognition, celebrity endorsement, and spectacle to gain attention and generate revenue.

There are hundreds of private space companies today with a distinct variety of goals and products. These include waste management serving the needs of the ISS. D-Orbit provides logistical services for ISS including waste management. Ad Astra develops rocket propulsion, concentrating on plasma methods. Varda Space Industries, Deep Space Industries, and Bradford Industries focus on the development of energy and energy resources in space. Deep Space and AstroForge develop space mining and asteroid mining methods.

Capitalizing on Cold War ideology, commodification of space-age products, consumer advertising and perceptions, competition, budget, and entrepreneurial innovation were the driving factors leading to the modern commercialization of space. The consequences of commodifying space demonstrate a new realm of benefits beyond political dominance. As more people in society connected with space industry through perceptions from propaganda,

[54] Communication Strategy Group, "Understanding Space Industry Marketing: What the Future Holds," July 6, 2023, https://wearecsg.com/blog/space-industry-marketing/.

technology, popular culture displayed in media, the more interactive society became with products manufactured.

Consider the internet, cell phones and the development of computer commerce. These fundamental industries emerged from Cold War merchants forming new industries and merchants that impacted global trade. E-commerce and technology development produced spinoffs including artificial limbs research, development, and manufacture; other medical devices including the infrared ear thermometer and computer tomography (CAT) developed from deep space exploration and imaging. Cordless appliances, freeze-dried foods, scratchproof lens, and anti-icing devices sold via the internet in markets developed via the cell phone or web conferencing increased the U.S., global, and space economy by as much as 10 trillion dollars by 2023.[55] This figure represents commercial factor of e-commerce; there are subsidiary exponential advancements and growth through associated industries in public, private, wholesale, and retail markets. Jeff Bezos' Amazon demonstrates the effectiveness of e-commerce.

Other significant key trends and activities contributing to the commercialization of space and the expansion of the LEO economy include information sharing which utilizes satellite-based frameworks discussed in Chapter Two. SpaceX's Starlink, Orbcom, Hughes, Echostar and

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[55] Aldo Spadoni, "How Technology from the Space Race Changed the World," Northrop Grumman, April 9, 2020, https://now.northropgrumman.com/how-technology-from-the-space-race-changed-the-world, accessed June 9, 2022. See also, James Manyika and Charles Roxburgh, "The Great Transformer: The Impact of the Internet on the Economic Growth and Prosperity, McKinsey Global Institute, October 2011, https://www.mckinsey.com/~/media/mckinsey/industries/technology%20media%20and%20telecommunications/high%20tech/our%20insights/the%20great%20transformer/mgi_impact_of_internet_on_economic_growth.pdf. There exists a prominent connection between the development of technology produced for the space race and the evolution of the computer industry. Many inventions utilized for space exploration and human spaceflight evolved into consumer products then sold via e-commerce. This industry grew exponentially, increasing jobs, further innovation in markets, revenue for both private industry and government. Industries utilizing internet platforms include real estate, communications, financial services, education, manufacturing, healthcare, construction, agriculture, and more. See also, Eika Torpey, "Employment Growth and Wages in E-Commerce," *Bureau of Labor Statistics*, December 2018, https://www.bls.gov/careeroutlook/2018/article/e-commerce-growth.htm.

others to produce healthcare communications, consumer entertainment, and geospatial mapping and remote sensing products that enable benefits such as remote consultation, weather event forecasting, agricultural conditions, and climate change.[56] Entrepreneurial innovation and enhancement of Cold War technology help solve problems in public health, which began in the 1950s and 1960s when presidents Eisenhower and Kennedy promoted the use of space for peaceful purpose to better mankind.

[56] Scott Atkins, The Commercialization of Outer Space: How an International Securities Framework can be the Launching Pad for a Global Space Economy," *International Corporate Rescue,* Volume 19, No 22, May 2022, www.chasecambria.com. Includes several articles covering the scale of commercial activity stemming from space-based economies which provided beneficial outcomes for human populations on earth.

Chapter 7

Conclusion

Since the genesis of the space race, commodification of the fundamental elements supporting U.S. technical power infused distinct perceptions about the significance of space exploration and manned spaceflight. For the United States, a steady course of political consensus, reliance on Western economic principles, and capitalization of industrial resources thrust the country into orbit and deep space, surpassing its Soviet counterpart. The assets consisted of divergent businesses and aims that manifested into a thriving space economy. The space marketplace eventually transitioned the scope of domestic responsibility for LEO access by the arrival of the twenty-first century. Commercialization occurred because of the consumer space market, popular ideological and space culture, and assorted competition.

Cold War merchants of space, which included the media and communication industries, producers of consumer space merchandise, entertainment and popular culture, the financial side of government, NASA, and entrepreneurs, each contributed to the unremitting transition from government dominance of space access to reliance on private entrepreneurs leading the way. More importantly though, Cold War merchants cultivated a thriving space-based economy by systematically commodifying industrial resources and culture through consumerism, competition, and collaboration.. Every aspect of engagement in the commercialization process transpired through Cold War venues and became the driving forces for commercialization of space.

Culture reflected one of the most prominent factors stimulating interest and support for space commercialization. Since culture indicates the values expressed by certain groups of

people or of specific communities and societies, it economically impacts each. The values articulated between 1945-1991 were primarily stimulated by consensus feelings of American superiority and triumph over the Soviet Union yet varied and shifted over the period. The attitude required to defend Western principals and democratic institutions was not staged as nationalistic in the sense of superior populations, but more of the necessity of arrogance to counter the equally propagandized exhibition from the Soviet Union.

The cultural ethos of the United States during the Cold War combined a desire to stay abreast of technological developments and maintain its monopoly on power. Cultural icons, spectacles, and advertising enabled values present after the end of World War Two to flourish through leisure spending, political complacency, a superior moral attitude which dominated mainstream media, politics, and society. In the United States, individuals were free to pursue business, invention, and innovation. Entrepreneurs continued to express attentiveness toward solutions for perceived and literal issues. Their prospects for a consumer-oriented society also relied on advertising and propaganda to set the course for future spending and the development of space consumption.

Cultural ambivalence exacerbated by threats of technological dominance by the Soviet Union guided many of the early decisions with regards to the Cold War, followed by the space race, and commercialization. Advertising and propaganda employed much of the psychological stamina needed to produce an environment conducive for a thriving space consumption. The apparatus installed marketing and distribution that helped merchants navigate the demands for human space flight and supply necessary popular support.

In play were efforts to respond to the global threat perceived by the launch of *Sputnik,* but also to measure awareness of containing U.S technological dominance. The use of psychological

methods to manipulate of perceptions, the creation of a public identity and connectivity with space activities through consumption, competition, and a pioneering spirit generated a robust approach. This became one of the greatest assets in terms of diplomacy and policy. Mass culture and dissemination of favorable propaganda galvanized perceptions of significance and garnered American public support. These actions were also an Eisenhower skillset which he actively deployed. This required communication with the public and by utilizing commerce and industry as a function of the Cold War and space race.

As Christopher P. Wilson argued, mass communications and particularly magazines enticed readers to the golden age of science fiction, but also lured the average citizen to the non-fiction science trade publications.[1] These forms of literacy consumption fostered a space-faring environment allowing the average American citizen to connect and become a part of objective to surpass the Soviet Union economically, politically, technologically, and culturally.

The commercial culture in the United States consistently invented and reinvented the American brand in the forementioned categories. Technology and economic production defined a social force that was as potent as military power. Consumption was and is a hallmark of the capitalist democratic society, and existed in the form of space marketing, consumer spending, and conscientious absorption of good over evil in communism. The aperture revealed potential to shape public perceptions about technology, consumer uses, and the deployment of the space

[1] Christopher P. Wilson. "The Rhetoric of Consumption: Mass-Market Magazines and the Demise of the Gentle Reader," *Chapter in The Culture of Consumption: Critical essays in American History, 1880-1980,* (New York: Pantheon Books, 1983, 37. Although the primary discussion focuses on the early twentieth century, the thesis presented relates to the advertising, sales, revenues, communications, and technological innovation associated with popular print magazines that harnessed consumer feelings about politics, contemporary affairs, and American culture and life.

economy through the public venue by capitalizing on manufacturing tangible products to convey the symbolically moral attitude.

Americanizing symbols throughout the globe became a cultural quest. One of the biggest early examples was the Marshall Plan which brought brand America to post-war Europe bringing with it a positive viewpoint of the West. Concerning space, this trend continued as the U.S. publicly pursued participation in the IGY for peaceful and human purposes. This project openly promoted the meteorological study of the upper atmosphere, a scientific world's fair in which many countries engaged in. American military power produced a plethora of missiles which utilized big name industrial businesses such as Lockheed, Boeing and Grumman. The reliance on industrial merchants became a driving force for the commercialization of space.

Admittedly, both the U.S. and the Soviets developed satellite research for other purposes. However, culturally speaking, the openness of the U.S. directly contradicted the secrecy of the CP. The Marshall Plan brought American culture, opportunity, and consumerism to Europe and exhibited the possibility for the newly forming Eastern European countries regulated by Moscow. This trend filtered through to the space economy and infrastructure and embedded American economic space identity as a cultural weapon in the Cold War.

The exhibition of American culture, both economic and technical was one of the most successful spectacles, and it demonstrated the value of attaining it by those who did not possess the opportunity to experience it like those behind the Iron Curtain. With each symbolic space achievement, the intricate inclusion of mass communication, commerce, and consumption, the West economically and culturally won the hearts and minds of people both domestically and internationally. Building the space economy through the venues highlighted the necessity and capability of private industry in setting this space stage in creating their value in the process.

Considering the extent to which the early Cold War merchants rather than executive or congressional policies of the mid-1980s, or even the proliferation of commercial industries in the twenty-first century, it is abundantly clear that activities promoted during this time built the space economy. This foundational framework positioned the U.S. government to lead the Soviet Union technologically, economically, and culturally both domestically and abroad. As early as the immediate end of World War Two, rocket and missile production heightened as the technology rapidly developed. It was also evident that the United States and the Soviet Union would revert to opposing political entities, leading to the arms race. U.S. industrial resources were far greater than that of the Soviets, which was displayed throughout the war. Capitalizing on these resources and the technological capacity, merchants of space, those that participated in the selling of the American brand, became the driving force for commercializing space.

Merchants of space displayed technological feats that enticed modern consumers. The powers of persuasion from the standpoint of the federal government and their solicitation of favorable ratings within society, both domestically and abroad, filtered into society, shaping perceptions about U.S. strength and leadership. President Truman initiated satellite and rocket research, but President Eisenhower capitalized on the power of speech, psychological warfare, and the language of politics using the United States Information Agency.

Communication became a driving force for commercialization and technological preeminence. This occurred in several formats, including print culture, media, propaganda, and the physical hardware electronic media and satellites. Venues such as newspapers, magazines, books, posters, stamps, and other literature and advertising commodified space connecting the American public to the possibilities of humans in space. Newspaper sales rose from editorials and stories about the competition with the Soviet Union in space and on U.S. government policy.

Efforts to use forms of communication successfully built the dominant US presence in space through programs like the United States Information Agency, the Voice of America, cultural exchanges, but also astronaut exchange programs which led to sharing to technology extent but highlighted American confidence through openness. It also drew attention to the dark shroud of secrecy from the Soviets and painted an image of malevolence.

By the time President Kennedy became president, the tension between the United States and the Soviet Union amplified with the competitive spectacles in the race to space in the 1960s as Yuri Gagarin became the first human in space in 1961. This dramatic display pushed the U.S. harder to reach Kennedy's goal of landing a man on the moon. The technology accumulated in this Mercury, Gemini, and Apollo programs created significant social impact that transformed the idea of a scientific conquering of terrain to one of human involvement as part of the social consciousness. It stimulated manufacturing, advertising, and symbolic display of prowess that Americans became very attuned to.

Even though the early twentieth century was known as the golden age of science fiction, this genre was confined to a very small niche of people, i.e., scientists, physicists, engineers, and a few quizzical students of science literature. However, though print culture and electronic communications, advertising helped redefine this market and turn it into a space commodity that connected the average citizen to the feats, making them a part of the history. There was a social and economic benefit to this phenomenon. The country became smarter. The average citizen became more technologically savvy over time. Space consumption rose and boosted the national economy as investments in space in the 1960s and 1970s ignited new businesses. Finally, reliance on private industry grew in the form of increased utilization of contractors, the commercialization of communications, and contracts to build new a space transportation system.

Though the Cold War, American fascination with space grew parallel to the space race. Popular space culture offered a new form of commodification which enhanced the possibility of a human presence in space beyond the moon landing. Even after this spectacular feat accomplished the previously unthinkable goal, and as the relationship with the Soviet Union began to ease, the alien subculture market continued to grow. Themes shifted from protagonist against antagonist and incorporated to some extent collaboration and peaceful coexistence. Selling space became more convoluted for NASA but interest in exploration continued to rise among society. Space movies and technology, another form of space commodification, generated revenue and continued the connection between fantasy and reality. This market became another driving force for space commercialization.

In television, shows like *I Dream of Jeannie*, produced by Screen Gems and incorporated music that people still identify today, cast a theme of astronauts and American program. Additionally, programs like *My Favorite Martian, Twilight Zone, and The Outer Limits,* each contributed to the theme of space, humans in space, fantastic innovation, and the possibility of a normalized human presence in space. This is most relevant considering the continuing trend of newly forming companies developing the technology imagined during the golden age of science fiction, making it a reality. Today, communications have well surpassed the *Star Trek* communicator or "Computer." These technologies have also been commodified and incorporated into the space program, but into the very heart of society.

The technology present in the cherry red Tesla communicates the value of innovation and economic capacity and potential of the United States. Elon Musk's seemingly superficial stunt really embedded ingenuity and personal drive, characteristics of value. However, this spectacle associated with a billionaire, one who made his fortunes through opportunity in the United States

to developed new technology that enhanced society, but also provided value. While linking more efficiency in launch capabilities and efficacy in the environment, Musk captured a new market while coalescing peripheral markets that possessed value to the human community, the electric car as part of space operations, the Starman representing humans in space, and the most effective rocket since the Saturn V to propel society in space through commercial means. The messaging clearly conveys normality. Musk's efforts to solve climate problems through responsible vehicle production while using space and the most recognized EV represent another driving force for the commercialization of space.

Technology alone did not elevate the U.S. commercial presence in space. Competition, collaboration, consumer willingness to support space first in the Cold War, then in the post-shuttle era drove the commercialization of space. Throughout the Cold War, objectives continuously evolved from consensus and hegemony to cooperative efforts and then a return to desired dominance for US space presence and human operations in LEO. Today there is a significant effort to propel humans beyond LEO, and expand humanity to the stars much like the explorers of centuries past.

The high frontier will be the great expanse that people travel and use innovation to impact life on Earth and eventually in deep space. The development of a space economy through communications, media, entertainment, robust competitive drive, and the entrepreneurial development of better, more efficient ways to live while preserving resources and making lives better are all factors and drivers for the commercial space infrastructure. The rapidly developing LEO economy, and space exchange where humans will participate as a culture and economic norm are no longer on the horizon, but present in everyday life through the perceptions of space, the inclusion of products in daily living, the democratized presence that have transformed the

commercialization of space from a solely government controlled activity to private industry responsibility.

The driving forces propelling the commercialization of space are multifaceted. While space policy, national security, and twenty-first century innovation are undeniably dynamic motivations for a flourishing commercial space economy, they also predetermined the transition from solely government controlled access of space to private company responsibility for launch, access, operation, and positive imaging for human activity in LEO.

The development of a robust technical and economic superiority over the Soviet Union in the wake of *Sputnik* ignited supremacy by selling space, shaping public perceptions of its role in space, coordinating methods to produce the engines of U.S. presence in space, and devoting monetary, engineering, and mass communication resources to excel. The U.S. government had to win the hearts and minds of both the American and global public to accomplish its space mission. In doing so, collaborating with industry became the first steps in the ling commercialization of LEO in full throttle today.

The United States accepted the role of global helmsmen in the post-WWII environment which naturally extended to dominance of space. The technological display boosted the perception of dominance and fulfilled propagandized goals in getting the message across to the public. As Guy DeBoard indicated, this technological display, or spectacle factor, reflected the values of society. This is why popular culture and consumer marketing played such a significant role in commercialization space. One of the most prominent displays of superiority came to fruition with the development of bigger, more purposeful missiles, then satellites, and then space dominance. Each relied to the manipulation of public attitudes which resulted in the positive push for industrial relationships to support the display.

Driving the commercialization of space became a function as well as a product of the space economy. This was demonstrated repeatedly through various forms of display but through the capitalization of industry and the American public took an active role in. With corporations like Boeing, McDonnell Douglas, Hughes, Chrysler, Western Electric, Rockwell, Grumman, Martin Marietta, Lockheed, Playtex, IBM, Eastman Kodak, General Foods, B.F. Goodrich, and many more, American industry took on the additional role as the producer space products that propelled the U.S. to space and established dominance and a thriving space economic infrastructure.

Many of these industries continued to develop products for space and maintained a space division in their respective companies. Many advertised in television commercials and relied on references to space or used space connections, like former astronauts to stimulate their businesses by positioning a popular cultural icon at the helm. Others became part of the Hollywood society in the form of representation in film and television. Modern day cinematics relies on Cold War technology on the big screen and employs space jargon from the era in creating scenes. This is nothing new. American capitalism embedded itself in space films of the 1950s-1980s. Aliens entered America as a driving force for commercialization and succeeded in building a positive image of humans in space, Americans in space, and of democratic U.S. culture in space.

Consider Stanley Kubrick's and Arthur C. Clarke's *2001: A Space Odyssey* where common American technology and culture were on full display as a norm of space. The appearance of communication technology, modern accommodations such as Howard Johnsons hotel chain, a once well-known nice form of lodging was in the background suggesting its normality as part of humans in space. This normality also assumes the common spaceflight of

private citizens. Likewise, in recent modern films like *Ad Astra*, viewers see a veritable strip shopping mall on the moon after the main character, Roy McBride, takes a Delta flight to the moon. Future films will likely portray thriving basis full of human activity, merchandising, and retail markets, including perhaps Airbnb instead of hotels, or space cabins for views. These reflects aspects of commercialization portrayed in film that have become a very possible reality. It will likely expand to human aliens in space in addition to aliens in America.

Living room aliens in America represent the transition of government controlled space access to private industry through the images continuously bombarding society. The experiences people possessed played out on modern television, a medium used to convey messaging, as well as on the silver screen which generated mass participation. Society identified with the aliens, or characters, in films which supported inclusion in space activity. Just as the Pew Research poll demonstrated, well over 50% of society today has had some interaction with space and is more familiar with the functions and activities in space than previous generations. This is the result of Cold War merchants commodifying space through shared images, a distinct element of popular culture.

Popular space culture as a driving force for commercialization gleaned important features creating a societal impact of space exploration and the desire to extend the human presence among the stars. The aerospace industry and subsidiary industrial products facilitated the increase in human interaction with space and an understanding of its significance to humanity. As discussed in Chapter three, the common space culture derived from Cold War consumer markets were shaped by the competition in space. The mass communication and portrayal of U.S. dominance in film reflected the mindset of many Cold War historians that the Soviets were to blame for the military tensions, which influenced national political and economic policy. The

demand for commercial industry to support these efforts landed in everyday life through consumption.

Economic impact from merchants in the government and consumer markets and the desire to maintain supremacy in the Cold War ultimately led to the development of satellites which produced subsidiary companies in this field and commonly in use today. Cold War satellite reconnaissance spurred growth in the communications and entertainment industry, including modern satellite television, radio, and global positioning in companies like Spectrum, Sirius Radio, Garmin, Hughes Satellite Corporation, Netflix, Home Box Office, Starz, and others that produced images and sets via satellite imaging for films.

In Cold War era film, space symbols and references in society appear in movies like *Escape from Witch Mountain* about aliens crashing to earth and the pursuit of their technology. Likewise, at Disney World, the famous spectacle Space Mountain drew thousands of visitors to the park generated a massive economic impact for the company, the local community, and the space industry. Each additional aspect of this one element produced even more merchandise advertising and imaging space culture through the sale of hats, t-shirts, mugs, stuffed animals, posters, pens, etc.

Shaping attitudes and commodifying space created and economic impact through iconic symbols which also became a driving force for the commercialization of space. The big blue marble photo, or earthrise as it is sometimes called, changed the way humans perceived themselves in the universe. The portrayal of human interaction in space through the entertainment industry and repeatedly flooding image of the thus iconic symbol helped humans think about their place and role in on-going space access. This one photo taken from the Apollo 8 mission generated dozens of movies, books, and photos that drew humans to interest in space

much like the popular trade journals in the 1950s and 60s with fantastic science fiction stories and possibilities.

The power and influence of mass communication and popular culture combined with their economic impact became vital as a driving force for commercialization and the transition of government dominated access. By the time the Cold War started to wane, merchants had already created the necessary network connecting society to human space flight and engaged in continuous activity aimed to entice participation in space exploration endeavors. The Cold War space economy produced voluminous commodities used to access, intersect with, and populate space. The next phase produced entrepreneurial drive to enter the space marketplace.

As mounting expenditures and expanded power demands depleted financial coffers, providing a gateway for new space industry. The government continued to collaborate with defense contractors to design and manufacture launch vehicles, but due to the enormous cost burden, private companies began developing cheaper, more efficient rockets, fuel cells, and spacecraft. The marketing strategy associated with this new trend gained speed and elevated the desire to access space in the post-Apollo era. The Space Transportation System (Space Shuttle) provided the momentum to accelerate space exploration and served as the iconic American brand and identity. Private industry magnified that capability with more iconic symbols including SpaceX's Falcon fleet and Dragon Capsule, Blue Origins New Sheppard, and as of July 2024, Boeing Starliner.

The economic impact and commodification of space led to competition in the marketplace as NASA represented another Cold War merchant of space. The power and influence of this iconic space symbol generated various forms of competition resulting in the promotion of the agency, the people involved in making space history, entertainment, and

popular culture. Competition in the industry piggy-backing on NASA engineering and work in the Cold War enabled many new enterprises to build an economic space infrastructure and exchange.

This dissertation has presented an alternative view for the origins of the commercialization of space beyond the policy actions, military and defense, and twenty-first century innovation characterizing the term. While the body of scholarship is plentiful, it is difficult to add to the cacophony of voices analyzing the reasons for modern day commercialization of space since it has become a hot topic of study with growing interest. However, there is still limited historiographic material about the origins of commercialization from the point of view of so many merchants involved in the long process begun during the Cold War, and arguable even prior to 1945.

The media and communications industries contributed significantly to commercialization of space in unorthodox forms. This included science fiction literature which transmitted ideas, newspapers, periodicals, and trade journals which initially covered distinct niches and evolved to incorporate a growing technological society through space-related ads, propaganda, and a representation of space age consumer items for use by ordinary citizens. Communications technology innovated new research and use in satellite communications which not only expanded that industry but included other economic industries including computers and information systems, navigational equipment, imaging and photography and more.

These industries facilitated the consumer space industry that became part of mainstream American culture. Film, television, toys, food items, architectural structures, stamps, posters, fashionwear, and much more infiltrated society capitalizing on Western economic ideology and

principals. Popular space culture enticed competition in the space market and laid the foundation for innovation built on technological depictions in the entertainment industry.

This all matters because the origins for the commercialization of space, the driving forces rooted in the Cold War through various merchants are the building blocks of the future. It is in human nature to explore, discover, and invent. The high frontier is fully operational, and humans have set their sights on deep space. An extended and dangerous expedition into deep space to a place like Mars will take money, support, research, and the development of commodities to sustain resources and longevity in a harsh space environment. This endeavor requires knowledge and the capacity to understand and handle significant problems as they arise. By working in space, developing the required commodities for use in space will alleviate expenditures on governments. This activity will also generate more support for the average citizen's investment in space-related commerce and activity and democratize methods for access and operation in space through a modern space exchange using tools and resources developed in LEO. The products manufactured and the ability to harness new resources could perhaps solve many problems on earth in the process, a stated goal of several well-known entrepreneurs of space exploration.

Then driving forces for the commercialization of space are multi-faceted and include distinct reliance of Cold War merchants that galvanized power, influence, and support for human space activity through media, popular space consumer markets, collaboration, competition, and entrepreneurial drive. Each of these components not only used various forms of commerce to build the space economy, but developed a unique space economy in LEO that will likely produce a variety of jobs and critical resources as well.

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