

**How Geographic Proximity to the Kennedy Space Center Effects Attitudes Relating to
NASA**

Christopher Thomas Reutt

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Karen M. Hult, Chair
Brandy S. Faulkner
Karin E. Kitchens

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Launches

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ACADEMIC ABSTRACT

In 2023, the U.S. House of Representatives, newly under Republican control, sought to limit federal spending, creating a potentially dangerous situation for American space exploration and NASA. Given the budget situation, it may be beneficial for NASA to look to its existing geographic footprint for areas of deeper support to provide elected leaders with an electoral justification to support NASA missions. The areas with the greatest chance of generating support for NASA are spaceports due to the rocket launches they support serving as focusing events for NASA.

Rather than focusing as past scholars have on specific regions, this research examines driving distance from the Kennedy Space Center to provide more detail about the possible relationship between geographic proximity to spaceports and views of NASA. To test for the existence of this proximal relationship and the impact of viewing rocket launches on opinions of NASA, the study fielded an original online survey to gather U.S. residents' opinions about NASA, as well as information on where they lived and on how frequently they view rocket launches. Employing bivariate and multivariate regression models, the responses were analyzed to explore the relationship between geographic proximity to the primary spaceport and exposure to rocket launches on respondents' reported views of NASA.

This study found that as respondents' distance from the Kennedy Space Center increased, positive views of NASA decreased. Additionally, respondents who viewed the launch of NASA's Space Launch System (SLS) rocket had more positive views of the agency than others. Overall, these results indicate that direct exposure to NASA activities, facilitated either by living near the Kennedy Space Center or by viewing the SLS launch is associated with more positive perceptions of NASA. The hypothesis that rocket launches can impact views of space exploration was supported based on analyses of reported online and in-person viewership that suggested notable relationships with opinions of commercial launch providers. Yet, even though the models found support for this relationship, they suggested that other factors likely are also important to fully understanding the relationship. NASA's future public engagement strategies evidently should focus on narrowing the awareness gap of NASA activities for those further away from spaceports and do not have direct exposure to the agency.

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GENERAL AUDIENCE ABSTRACT

In 2023, the U.S. House of Representatives, newly under Republican control, sought to limit federal spending, creating a potentially dangerous situation for American space exploration and NASA. Given the budget situation, it may be beneficial for NASA to look to its existing geographic footprint for areas of deeper support to provide elected leaders with an electoral justification to support NASA missions. The areas with the greatest chance of generating support for NASA are spaceports due to the rocket launches they support serving as potential advertisements for NASA. Rather than focusing as past scholars have on specific regions, this research examines driving distance from the Kennedy Space Center to provide more detail about the possible relationship between geographic proximity to spaceports and views of NASA. Additionally, given that the impact of rocket launches on support for NASA has not been measured this study can help quantify support for NASA's most visible public events. To test for the existence of this relationship and the impact of viewing rocket launches on opinions of NASA, the study fielded an original online survey to gather U.S. residents' opinions about NASA, as well as information on where they lived and on how frequently they view rocket launches. Regression analyses are used to determine the impact of distance from the Kennedy Space Center and different modes of viewership of rocket launches on opinions of NASA. This study found that as respondents' distance from the Kennedy Space Center increased positive views of NASA decreased. Additionally, respondents who viewed the launch of NASA's Space Launch System (SLS) rocket had more positive views of the agency. Overall, these results indicate that direct exposure to NASA activities facilitated either by living near the Kennedy Space Center or by viewing the SLS launch can increase positive perceptions of NASA. NASA's future public engagement strategies evidently should focus on narrowing the awareness gap of NASA activities for those further away from spaceports and do not have direct exposure to the agency.

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Table of Contents

Chapter I: Introduction.....	1
Chapter II: Research Overview.....	5
Chapter III: Analytical Framework	13
Chapter IV: Research Design & Methods	18
Chapter V: Results	34
Chapter VI: Summary and Conclusion	77
Appendix A: Survey Questions	81
Appendix B: IRB Approval	85
Appendix C: Models	86
References.....	90

List of Tables

Table 1: Relationships with NASA Feeling Thermometer Ratings	39
Table 2: NASA Funding Regression for Distance	43
Table 3: NASA Feeling Thermometer and Funding Multiple Regression for Distance .	45
Table 4: NASA Feeling Thermometer Regression for Florida	47
Table 5: ULA Feeling Thermometer Regression for Distance	49
Table 6: SpaceX Feeling Thermometer Regression for Distance	50
Table 7: NASA Feeling Thermometer Regression for SLS Launch Viewership	53
Table 8: NASA Funding Regression for SLS Launch Viewership	55
Table 9: NASA Feeling Thermometer and Funding Regression for SLS Launch	57
Table 10: NASA Feeling Thermometer and Funding Regression for Livestream	59
Table 11: NASA Feeling Thermometer and Funding Regression for In-Person.....	60
Table 12: ULA Feeling Thermometer Regression for Livestream Viewership	63
Table 13: SpaceX Feeling Thermometer Regression for Livestream Viewership	65
Table 14: ULA Feeling Thermometer Regression for In-Person Viewership	67
Table 15: SpaceX Feeling Thermometer Regression for In-Person Viewership.....	68
Table 16: NPS Feeling Thermometer Regression for Park Attendance	71
Table 17: NPS Feeling Thermometer Regression for Distance	73

List of Figures

Figure 1: U.S. Spaceports	9
Figure 2: Rocket Launch Focusing Event Framework	14
Figure 3: Independent Variables	25
Figure 4: Dependent Variables	26
Figure 5: Geographic Distribution of Survey Responses	32
Figure 6: Rocket Launch Viewership Reasoning	34
Figure 7: Descriptive Statistics	35
Figure 8: Graph of Regression Relationship	40

Chapter I: Introduction

The years following 2020 have been some of the most successful for NASA and American space exploration since the Apollo era. With notable accomplishments like the Artemis 1 mission which successfully orbited the Moon and returned to Earth, the deployment and operation of the James Webb Deep Space Telescope, the rapid growth of the commercial space industry and landing of the Perseverance Mars Rover. To many observers, it appears that the United States is reaffirming its dominance and leadership in space through NASA. However, current economic conditions in the country stemming from monetary policy implemented during and after the Coronavirus pandemic and a Congress determined on limiting federal spending as the country approaches the debt ceiling creates conditions emblematic of the past that halted the growth of the space industry during the Obama administration. External political pressures limiting American space exploration has been seen before through the cancellation of the Constellation program and this offers a warning to current developments around federal spending and the future of NASA.

An abrupt change to American space exploration resulting from partisan influence happened in 2010 when the Obama administration canceled Project *Constellation* with no near term American human space flight alternatives (Kremer, 2010). This cancelation led to a situation where the U.S., a leader in space exploration, was entirely dependent on Russia for access to the International Space Station (ISS). Moreover, this pivot in human space exploration was followed by funding for NASA to develop a commercial space market to replace the now retired Space Shuttle (Matson, 2010). This action created two consequences for NASA that increased electoral influence could help solve. In the long term, the agency's success and failures will be compared and weighted to that of commercial companies, and in the short term the

agency must be electorally appealing to whichever party controls Washington D.C. or risk further reducing NASA's responsibilities and potential space operations.

In 2023, the 118th Congress put NASA's future in potential jeopardy, by signaling a desire to return discretionary funding back to FY (fiscal year) 2022 levels. This suggests a *Constellation*-type scenario where partisan influence might end up severely limiting U.S. space exploration. Given the challenging political environment in terms of securing adequate funding for NASA activities the agency could use its positive reputation with the public to make a case in terms of electoral politics that support for NASA can be mutually beneficial to elected leaders. In response, on March 19, 2023, NASA administrator Bill Nelson stated in a letter to the ranking Democrat on the House Appropriations Committee:

A FY2024 budget level for NASA at 22 percent below the FY2023 enacted level would be \$19.8 billion, approximately the same level of NASA's FY2019 appropriation, and a reduction of \$5.6 billion from the FY2023 level. To fund NASA at such a level in FY2024 would have devastating and potentially unrecoverable impacts, upon the objectives that the President and Congress have set for NASA, weaken our Nation's position as global leader in exploration, science, technology innovation, and discovery.

To put it simply NASA is in a tough spot in 2023. The agency has seen a handful of wins after a relatively quiet decade following the Space Shuttle retirement. This risk of partisan influence outside of NASA's control can significantly alter the goals and timeline of the agency's missions. This is bad for NASA because it could expose the agency to criticism for delays that soured the public's view of the agency. Additionally, in the longer term, a reduction in NASA spending at this time could be the first event in a series that limits the scope of the agency's operations, turning it from an innovator and leader in space exploration to a hollowed-out version an agency that leaves the operations area entirely. The research here may offer NASA a new tool to use in defending its purpose and mission to Congress and help explain the impact of rocket launches as a catalyst for public support.

The orbital spaceports in NASA's existing geographic footprint could be key to the agency gaining more influence over its budget, missions, and long-term goals. Orbital spaceports are distinct from the rest of the NASA centers because they facilitate orbital rocket launches. Rocket launches as a spectacle contain patriotic symbolism distinctive to NASA and produce publicity that exposes the public to the benefits of space exploration (e.g., economic and scientific) and the importance of the agency as a facilitator. Due to this dynamic, the area near orbital spaceports could offer wellsprings of support for NASA, both through opportunities to view rocket launches in person and through the media attention that rocket launches create, raising the awareness of space issues to those nearby with greater frequency that leads them to learn more about the benefits of NASA. In turn they may become more supportive. The questions guiding this research is whether geographic proximity to an orbital spaceport is related to public opinion of NASA and whether positive reactions to viewing rocket launches is associated with more supportive views of NASA. To examine the existence and nature of the relationship between geographic proximity to orbital spaceports and support for NASA, this study focuses on the Kennedy Space Center (KSC) in Florida as the focal location of interest because of the large number of orbital rockets that launch from the Center, its importance to American space flight and its role in NASA's flagship mission, Artemis 1. If spaceports have influence stemming from orbital rocket launches, it would most likely be found at the Kennedy Space Center. The study examines two hypotheses:

H₁: Respondents who live in zip codes closer to the Kennedy Space Center will express warmer views of NASA

H₂: Respondents who indicate they have viewed a rocket launch will express warmer views of NASA

In this thesis, I aim to explore the impact of distance from the Kennedy Space Center on public opinion of NASA. The research overview section will introduce the topic and discuss similar research that has been done, highlighting the importance of understanding spaceports, rocket launches and those most supportive of NASA. The analytical framework section will present the theoretical framework for how the research hypotheses explain support for NASA. The methods section will describe the research design, sampling technique, data collection methods used to address the research questions. The results section will present the findings of the study, including statistical analyses and visualizations of the data used to test the hypotheses. Finally, the conclusion section will summarize the key findings, discuss their implications for NASA, and provide recommendations for future research. This thesis aims to provide a comprehensive analysis of the impact of proximity to spaceports and the impact of rocket launches on views of NASA. This research is important because the benefits from technological innovation in the space field are often overlooked by the public and this type of research can contribute to the literature on public opinion and science communication through its focus on the impact of rocket launches. Furthermore, if areas near spaceports offer wellsprings of support for NASA and space activities NASA could leverage this support in congressional negotiations over space funding.

Chapter II: Research Overview

Before exploring these hypotheses, this chapter discusses a range of material about the policy context, focal location, and the possible relationship between influence of geographic proximity and NASA, different types of space infrastructure, public opinion about NASA, and the public framing of federal government programs with longer term benefits. This chapter begins by examining NASA's prospects in the 2020s and provides a justification for why the agency might need to look for influence in negotiations with elected leaders. It then reviews differences among types of launch centers to justify the selection of spaceports with orbital launch capabilities, contending that the Kennedy Space Center is the most appropriate option to show proximal effects on public opinion. Following this, I look at recent work on public opinion of NASA and the similarity of space policy to submerged state policies as a way to better understand rocket launches as focusing events and explain how those in the public think of NASA.

NASA

NASA as an agency is distinctive in part because it provides hidden services to the public not only by creating satellite technology but also by facilitating its launch to space and continued operation of those technologies already in orbit or on other planets. In terms of electoral politics, how does one judge the value of technologies yet to be discovered? Non-space discoveries found during NASA research, spinoff technologies, arguably helped improve health with examples like insulin pumps and memory foam (Health and Medicine | NASA Spinoff, 2022). NASA's contributions do not end with discovery as it operates science missions focused on improving life on Earth, which can include studying changes in atmospheric composition in the fight against

climate change to predictive models of hurricanes (Science by the Numbers | Science Mission Directorate, 2022).

The price of innovation and discovery, when compared to dollars directed toward policing, education, or parks, is difficult for most taxpayers to compare and judge. Although one can say, “X” dollars will buy additional school busses or preserve “Y” acres of land, the impact of funds spent by NASA is not as certain and therefore less attractive to support. The very nature of research and development is that one cannot know how resource-intensive a problem will be when creating and operating new, highly sophisticated hardware in the unforgiving environment of outer space. Even when considering these difficult circumstances, NASA routinely receives criticisms for costs and schedule delays, leading some to argue that funds could be spent more effectively in other areas of government (Garbuio & Adams, 2021). Due to the rise of the commercial space sector, such claims have become arguments for private companies to take on more of NASA’s operations (Kakaes, 2018).

NASA in American Politics

Overall, as a government agency expected to be accountable to elected officials and through them to citizens, NASA frequently must justify its existence and respond to shifting political forces rather than developing its missions and goals independent of partisan interests or direct comparison to efficiencies of commercial space companies. Elected officials (members of Congress, presidents) may change priorities and funding to respond to other policy goals or rhetorically support NASA but fail to work to provide funding or authorize initiatives (Matson, 2010). Electoral support stemming from NASA’s existing geographic locations could help the organization balance the realities of American politics with the mission of exploration.

Rocket Launches

The central expectation in this research is that a relationship exists between geographic proximity to an orbital rocket launch and the attitudes the launch primes or emphasizes due to exposure to media coverage or from physically viewing the launch by being in close proximity to spaceports. I expect that the physically closer one is to a launch, the more favorable views they will have of space exploration. As an event, rocket launches may be notable enough to have the potential to shift electoral attitudes because of their distinctiveness as a government service and clear visualization of tax dollars at work. Additionally, rocket launches and the grander notions of exploration they represent set them apart as examples of American “exceptionalism”. In order to identify the potential electoral and other political dynamics at play surrounding a rocket launch, I conceptualize rocket launches as focusing events for NASA. As a focusing event, the launch sets an institutional deadline for the agency (Kingdon, 2016). This deadline and pressure to succeed attracts media attention and reinitiates a public conversation about NASA potentially changing views of the agency.

Proximity

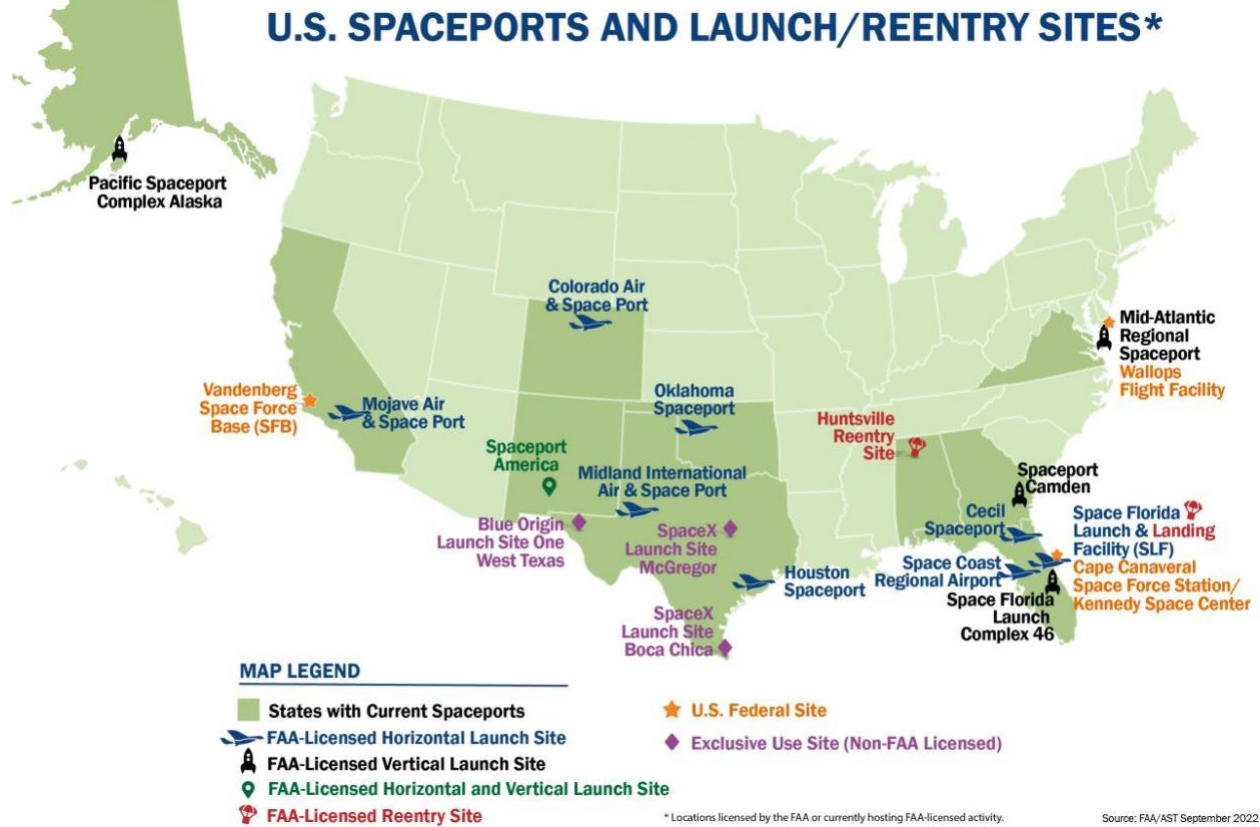
Previous scholarship from Whitman Cobb (2020) addresses the “Southern hypothesis,” which predicts that those living in the southern United States, where most NASA centers are located, will have more favorable views of space exploration because of the economic benefits the centers provide. Ultimately, Whitman Cobb, found that living in the South had a *negative* influence on support for space exploration (Whitman Cobb, 2020). This study draws on her research treatment of geographic regions and the selection of southern NASA centers. This research makes the argument that measuring distance from a spaceport through zip code, instead of relying on broad geographic regions, better isolates the possible proximal effects of distance on feelings toward space exploration. The change acknowledges that although one might live in

the “South”, they still could be hundreds of miles from a NASA center, far from the economic effects of its presence and exposure to the agency through rocket launches.

Submerged Policies and Spaceports

This research revolves around spaceports. Because of the recent growth in commercial space exploration many new spaceports with varying levels of infrastructure have been developed. “Spaceports” are sites for launching and receiving spacecraft. Not all spaceports are the same in terms of their activity and role in American space exploration. They can be separated into four categories: those capable of vertical orbital launches, horizontal orbital launch spaceports, vertical and horizontal launches, and orbital reentry sites (Office of Spaceports, 2022). The spaceports with the most extensive ground infrastructure are vertical launch spaceports due to the larger size and complexity of orbital rockets. The best-known and most frequently used vertical launch spaceport in the United States is the Kennedy Space Center in Florida (Office of Spaceports, 2022). Next on the spectrum, horizontal launch spaceports are runways with limited infrastructure to facilitate smaller payloads launched from airplanes . Finally, orbital reentry sites have the least significant infrastructure; they are locations with runways where space planes might land.

Figure 1- U.S. Spaceports (Office of Spaceports)



Previous research has shown that someone’s knowledge of scientific programs is associated with a positive opinion of space exploration (Nadeau, 2013). Here, this strongly influenced the selection of spaceports that included vertical launch capabilities. Only they likely would generate sufficient and consistent media attention due to the inherent risk of space travel as a driving force for media coverage. The logic of H1 is based on the expectation that enhanced media attention to rocket launches in the areas surrounding orbital spaceports would help inform the public about current missions, the economic benefits of NASA, and the importance of NASA independent from other possible favorable effects of direct exposure to launches when viewed in person. Simply put, this research views rocket launches as a vehicle for the public to gain knowledge about the role of NASA, its mission, and impact. Media also may be electorally

valuable as it might increase knowledge of scientific programs that in turn may be linked to favorable opinions of space exploration (Nadeau, 2013).

Since space policy issues frequently do not command public attention, the benefits that exploration and investment in the space are also not prominent in daily life. The “hidden nature” of the benefits NASA provides is similar to Mettler's (2011) discussion of submerged state policies. Such policies do not draw much attention because many citizens are oblivious to the benefits they receive from them (Mettler, 2011). From this perspective, the extent to which NASA’s contributions could be hidden from the public might be illustrated by observing that the connection between space exploration and daily conveniences like GPS is not apparent in the same way as investments in transportation infrastructure. Viewing rocket launches as focusing events, then, highlights ways that the public interacts with NASA, making policy details and benefits more concrete and visible.

Characterizing space policy as part of Mettler’s submerged state fits quite well, because, as a field space exploration can be seen as generating innovations and societal improvements that are often hidden from public view. This hidden influence leads to a situation where most are oblivious either to their dependence on technologies originally developed for space exploration or their reliance on space-enabled technologies. The informative value of a rocket launch and associated news media coverage may increase the salience of space policy.

Previous survey research finds that scientific education can be a predictor of positive attitudes toward space exploration and that most in the public misunderstand how much funding NASA receives (Launius, 2003). Being exposed to space exploration through a rocket launch may also convey information about the scientific value and economic benefits of each mission in easily digestible manor (Nadeau, 2013).

Suppose this hypothesized relationship between rocket launches, the media, and the public exists. Areas closer to spaceports would be expected to be more supportive of NASA because rocket launches and media coverage of the launches offer two channels for raising the relevance of the agency more frequently and with greater intensity to those living nearby than those living farther away.

NASA and Public Opinion

Much work has been done on answering the question of how many in the public support NASA and which groups tend to favor NASA the most. This literature helps show historical patterns in public opinion about NASA. Public support for NASA has been split along demographic lines, with white males of higher socioeconomic status and with college degrees tending to support increases in space exploration funding (Nadeau, 2013, Finarelli and Pryke 2007, and Whitman Cobb 2011). Relationships between respondents' sex and socioeconomic characteristics and their support for space exploration were statistically significant, as was the relationship between party identification and NASA favorability, with Republicans typically being more favorable than Democrats.

Now that the relevant research has been discussed the next chapter will give a theoretical outline for how this research views the relationship between rocket launches and the public. Building upon existing research, my objectives are to determine if geographic proximity to spaceports and viewing rocket launches has an impact on views of NASA. To achieve these objectives, I will use the analytical framework for how a rocket launch viewed through the lens of a focusing event might impact the public and the different modes of influence it can have. This framework is suitable because it explains rocket launches as focusing events and how the

news media can impact the public. By using this framework, I aim to gain a deeper understanding of this relationship.

Chapter III: Analytical Framework

Chapter two provided a broad overview of human space exploration and U.S. space policy. It also described the different types of spaceports and populations most supportive of space exploration. This chapter introduces and elaborates on the study's analytical framework for examining whether and how individuals' proximity to spaceports and their experience viewing rocket launches are related to their views of NASA. After discussing the interaction between these factors, the research hypotheses and rationale will be explained.

Rocket Launch Focusing Event

Next Rocket Launch

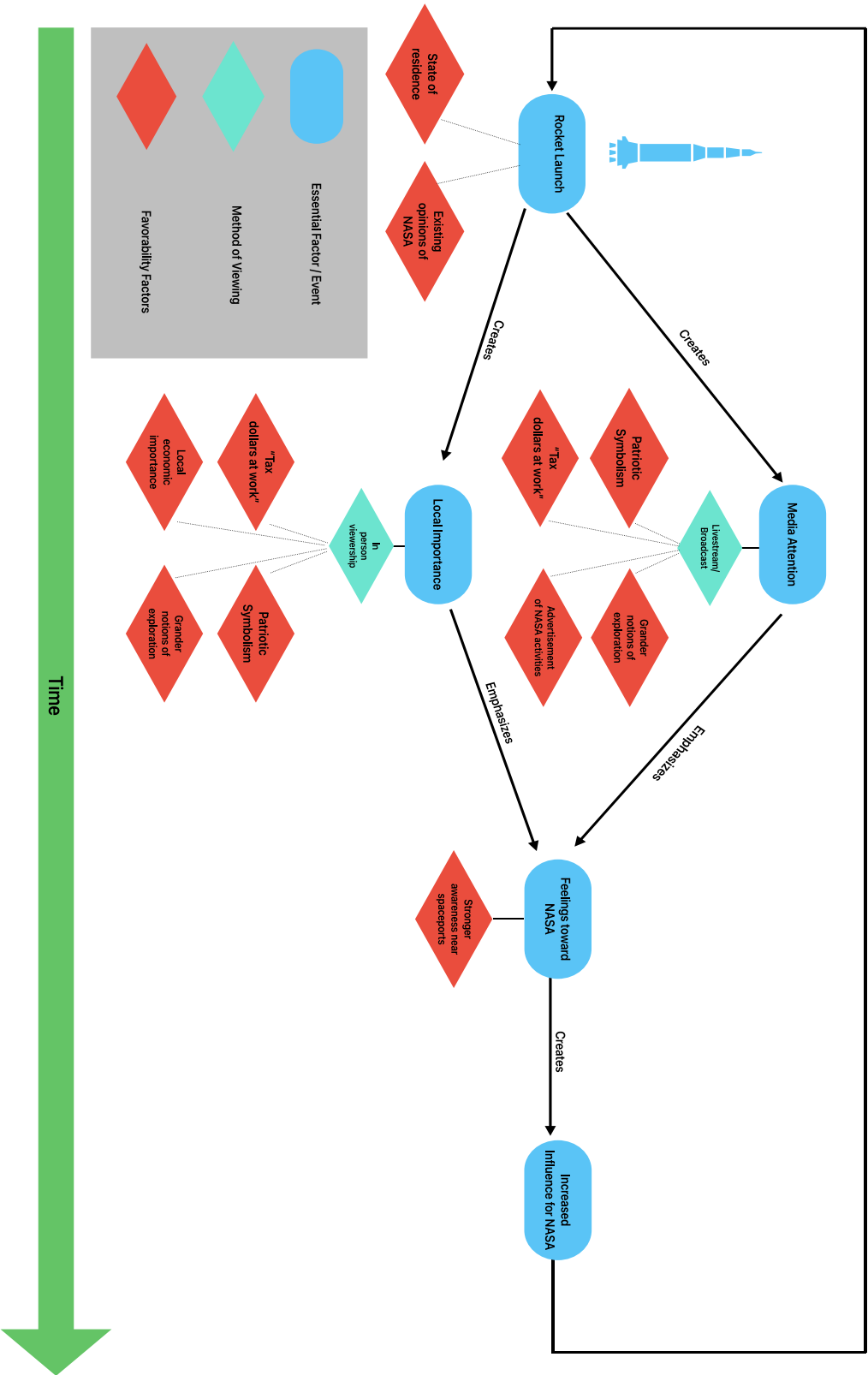


Figure 2- Rocket Launch Focusing Event Framework

When thinking about the relationships between rocket launches, geographic proximity, and attitudes toward NASA it is important to note that the relations likely are not unidirectional moving from “cause” to “effect” but instead more reciprocal: individuals’ feelings toward NASA may evolve after each rocket launch. Furthermore, not all rocket launches are the same in terms of media attention or mission importance. Launches may vary by, for example, the nature of the payload, cost, the potential national security implications, the presence or absence of human passengers, and the entity launching the rocket. Additionally, when failures in rocket launches occur, they may dramatically affect the public’s view of space exploration and its extrinsic value to the country. Successful missions are less important as they have become more common. Thus, the possible effects of a single launch, is likely to diminish after the next launch, restarting the cycle in Figure 2. This is because rocket launches have been around for decades, meaning many in the country already have views of NASA and few would be exposed to NASA for the first time through a rocket launch or have them meaningfully impacted by one launch.

Applying Figure 2 to this study, for example, those living in close proximity to the Kennedy Space Center who have viewed a rocket launch might have their existing opinion of NASA influenced by sentiment supporting the exploration that the mission represents independent of effects of the news media coverage. At the same time, but distinct from other possible factors at play when one views a launch, the media can be seen as bundling together many aspects of each mission as a “commercial” for space exploration. In this case, the favorability of the coverage depends on a “successful” launch. Favorable coverage of rocket launches can show tax dollars at work along with elements of patriotic symbolism and grand notions of exploration contained in launch imagery and coverage.

During this process, compared to individuals who do not live near KSC, a respondent who lives physically close enough to the rocket launch to both view it and be exposed to local media coverage that may include more frequent educational aspects of the launch may have more positive feeling about NASA. Thus, I expect that those who live close enough to the Kennedy Space Center to view the launch in person and consume increased local media attention around the launch will have more favorable views toward NASA.

The relationship between rocket launches, the public, and commercial companies may be different: for profit corporations' social media and branding activities may play a more important role in how the public perceives a company. Both commercial entities this research examined host livestreams for their rocket launches specifically focused on the accomplishments of the company. This branding can be conceptualized as a third lane in the analytical framework that is specific to the public engagement efforts of the companies. This might be influenced by the social media presence of the company leadership, its use of social media to advertise and raise awareness, and the existing opinions of the company held by the public. I would argue that this lane might create stronger support because commercial entities can be much more engaging on social media than government agencies.

Hypotheses

As previously mentioned, my expectations for the results of this research appear in H1 and H2.

H1: Respondents who live in zip codes closer to the Kennedy Space Center will express warmer views of NASA

H2: Respondents who indicate they have viewed a rocket launch will express warmer views of NASA

I expect the relationship in H1 to exist because of rocket launches and their news coverage being a positive factor in how the public perceives NASA and living near spaceports can amplify the frequency of being exposed to launches and favorable news coverage. Spaceports represent an investment in the area and state they are located but beyond that they are a distinctive site and element of the government. The rocket launches spaceports enable taxpayer funds to be displayed quite clearly and can invoke feelings of patriotism when successful. H2 builds from this logic where respondents who have viewed rocket launches either in person or online through streaming will have more favorable views of NASA. I expect those who have viewed rocket launches in person to have more favorable views than those who have viewed rocket launches online.

To test H1 this research will use regression models where the dependent variable of favorability of NASA measured through either the feeling thermometer or NASA funding question will be compared to respondents driving distance from the Kennedy Space Center. After a multivariate regression will be run accounting for all other appropriate variables. For H2, the relationship will be tested with the feeling thermometer and funding data as dependent variables with differing launch viewership options as independent variables for each model. After, regression models will be used to determine the potential impact of viewership methods on opinions of commercial providers to confirm findings on the impact of rocket launches.

Chapter IV: Research Design & Methods

Research Design

This chapter will begin with a discussion of why an electronic survey was used to answer the hypotheses. Following this, I offer detail about how my own experiences have impacted this research. Once completed the data collection methods will be discussed followed by the variables measured through the survey and how they are operationalized to be used in the analysis. After, the ways in which the data will be analyzed will be explained followed by the limitations of this study.

The research focuses on whether geographic proximity to a spaceport and viewing rocket launches is associated with how favorably one views NASA. The Kennedy Space Center was chosen as the area of interest for this research because of its dominant role in American space exploration and overall launch frequency. Because the impact is dependent on rocket launches as the vehicle for the public to be exposed to NASA this site offers the best chance to measure this impact due to hosting a majority of U.S. launches. A survey was chosen to measure test the hypothesis because available data does not measure for specific zip code but rather geographic region. An analysis using zip codes offers a more detailed view of proximity to the Kennedy Space Center.

Data was collected through an electronic survey disseminated on Amazon Mechanical Turk. Survey questions included those in three categories: demographics, proximity to KSC, and NASA/space related.

Researcher Considerations

An important factor in the research comes from my own life experiences and their potential to bias my interpretations. I grew up near the Kennedy Space Center, giving me a

distinctive perceptives on space exploration shaped by the Center and its launch activity. Having the ability to first watch Space Shuttle launches and now rocket launches from my backyard piqued my interest in space exploration and NASA. These experiences drove me to want to add more clarity to research on NASA and on U.S. space policy more generally.

Additionally, at the time I write this, I am serving as an intern for one of the two major commercial launch providers in the United States. I believe this experience offers me a privileged view of where partisan politics and space intersect, and it pushes my analysis to be pragmatic about the issues space exploration faces. I have taken several steps to mitigate the potential for bias. Only one survey question is focused on commercial launch providers. I spent much time deciding whether to include a question focused on commercial launch providers in the survey. Yet, because nearly all rocket launches in the U.S. are done by commercial companies (except for NASA's Space Launch Systems rocket) it would be poor research design not to include questions relevant to commercial providers when assessing the impact of rocket launches on the public. Commercial providers play a dominant role in space exploration. Additionally, tapping attitudes toward commercial providers may provide further clarity on the possible impact of different launch providers and viewing methods on public perceptions of space exploration. Furthermore, including commercial providers and viewing method can help confirm trends seen in opinions of NASA.

Data Collection

To examine the relationships between public opinion of NASA and geographic proximity to the Kennedy Space Center and viewing rocket launches, I administered a survey to a sample of U.S. residents that explored whether more favorable opinions of NASA are associated with living closer to the Kennedy Space Center, viewing rocket launches in person or online, or other

factors. In addition to taking about respondents' opinions of NASA and familiarity with rocket launches, the survey included various demographic questions, about respondents' political leanings. The survey consists of 23 questions, and it was disseminated electronically to 1062 people located in the U.S. using Amazon Mechanical Turk (See appendix A). I decided that a survey was an appropriate way to assess the research question because of the general lack of data on public opinion of NASA and respondents' distance from spaceports. Only an original survey containing both NASA focused questions and those asking about geographic location could provide the necessary detail this research requires. The unit of analysis for this research is the individual, and the units of observation include responses of recipients who completed the surveys. The population of interest in this research is those residing in the U.S. Overall, the survey had a 91% response rate.

MTurk allows researchers to filter potential respondents based on their country. This survey was available to only to adults in the U.S. with an MTurk account. The sample frame for this research will therefore be anyone in the United States with an MTurk account. To protect the respondent's privacy while locating the survey on MTurk, no location data from IP addresses was tracked or available for use in analysis. Only self-reported zip codes were used to estimate driving distance from KSC.

The survey included three categories of questions. The first asks demographic questions common in social science research; the second focused on geographic location and asked for respondents' zip codes. The third examined respondents' awareness of NASA missions and the frequency with which respondents reported observing the agency in the news. Much care has been put into the administration of the survey and what the respondents will see and the order

they see it. Questions relating to space will be asked first followed by the geographic location questions and then demographic questions (See appendix A for list of questions).

Variables

As discussed earlier, the study focuses on one key dependent variable (NASA favorability) and two primary independent variables, rocket launch viewership and geographic proximity to the Kennedy Space Center. A mediating variable is awareness of NASA. Also included are control variables for the demographics of the respondents and their reported political party affiliation and ideology. Finally, the survey included a question about respondents' views of the National Park Service. This permitted me to see whether and how views of NASA compared to assessments of another government agency. Visiting a national park can may be quite similar to viewing a rocket launch, since neither is transactional, individuals must decide to participate, and attendance has no direct cost to the viewer.

Beginning with the dependent variables, for measuring attitudes towards NASA two survey questions were used. This first is a feeling thermometer where respondents can rank how warmly they feel towards the agency on a 0-10 scale. A feeling thermometer is an appropriate tool since it is a quantitative measure of subjective feelings, and it can show a greater level of detail when used in comparison to show how favorably respondents view particular entities.

The next dependent variable focused on NASA funding and is adapted from the General Social Survey (GSS). The logic behind asking about funding is that those who want to increase NASA funding can be considered more supportive of the agency. This question was edited from the style used on the GSS to include information about the dollar amount NASA receives from the government yearly and its percentage of the federal budget. Respondents could answer that

they wanted NASA to receive more, less, about the same funding or I don't know. Both questions will show an accurate picture of how the respondent feels toward the agency.

The next survey questions look at the National Park Service. The national park questions are important because they offer a comparative look at the most similar government agency to NASA and rocket launches. Does proximity to a government service only have affect for rocket launches or can other services have a similar relationship with the public. Both government entities are similar in that viewing a rocket launch and visiting a national park is non-transactional in nature and more of an experience for the attendee. Respondents were asking a to place the National Park Service on a feeling thermometer and how frequently they visit the parks.

Beginning with demographics this study asked respondents about race, employment status, political party identification, political ideology, education, age, sex, and household income. Where previous research has shown that white males of high socioeconomic status and college degrees tend to support space exploration the most these questions should help confirm previous trends in survey research. Furthermore, because party identification has previously been found to be unrelated to views towards space exploration these questions can help confirm the relationship. The party identification and ideology questions mirrored those in American National Election Studies (ANES) surveys, which have been administered since 1972. The party identification item asks a respondent considers themselves a strong or weak member of either party; and the ideology question is a 7-point scale ranging from extremely liberal to extremely conservative.

The next set of questions focuses on a respondent's awareness of NASA. This is important to measure because previous research has shown that scientific literacy is associated

with wanting to maintain current levels of spending on space exploration. Those who are aware of NASA missions may have a fuller understanding of the sometimes-abstract science missions the agency operates. Awareness of NASA is measured through questions that ask if the respondent is aware of any NASA missions.

Because this study examines spaceports capable of vertical orbital launches (i.e., rocket launches) and views them as focusing events for NASA and space exploration, it is important to understand respondents' previous exposure to such events. Seven questions examined rocket launches. They include if the respondent has viewed a rocket launch through a live stream or electronic broadcast, how many such launches they have viewed, what prompted them to view a launch, whether they viewed the launch of SLS as part of the *Artemis 1* mission, if they had previously viewed a rocket launch in person, and how many they have viewed in person before.

Whether a respondent has viewed a rocket launch through a live stream or broadcast is relevant for examining H2. I expect that those who have viewed a rocket launch will be more supportive of NASA because launches serve as visual representations of "tax dollars at work" and convey notions of patriotism associated with American space exploration. Furthermore, the broadcast itself can act as an educational tool on space activities. Previous research has shown that scientific understanding is associated with more positive views of space exploration (Nadeau, 2013), and viewing coverage of a launch might be part of such education.

A second question asked how many rocket launches the respondent has viewed. If rocket launches do serve as focusing events for NASA and space exploration, then those who have viewed more launches would be more supportive of the agency. Additionally, watching a rocket launch through a live stream is the most easily accessible way of viewing for the public.

To address concerns about reverse causality, another question asked why the respondent viewed the launch (The options included social media, friends/family, school, being a fan of space exploration activities, and “no particular reason”). Without this question, one might believe that those who watch rocket launches already are supporters of space exploration and viewing a launch reflects preexisting support for NASA, not help generate it.

Questions focusing on attending a rocket launch in-person are the same as viewing online with being “in-person” as the only significant change between the questions.

The final question in this section focuses on NASA’s Artemis I mission and asks whether the respondent viewed the launch of the mission through any means (online, in person, or through the news). This question is significant because unlike every other rocket launch in the United States this one is launched by NASA and not a commercial company such as SpaceX and United Launch Alliance. This is important to the research because of its heightened importance and most organic display of patriotic symbolism because of its association with the agency. This launch could also be the most divisive to the public because of its heightened cost when compared to commercial launch companies. This question should also assist in determining the impact of different launch providers on views of NASA. Where attention from rocket launches of commercial companies might have bias towards that specific company or its owners in the case of SpaceX and its ties to Elon Musk, the Space Launch System rocket represents the agency without any influence from those alternate perspectives. Furthermore, because rocket launches and space exploration is generally associated with NASA by the public given its popularity, the Space Launch System (SLS) being a true NASA rocket and not one launched from a commercial company can offer an added layer of detail when assessing H2. I expect that those who viewed the launch will have more favorable views towards NASA than respondents who have simply

viewed any other rocket launch and those who have not viewed a launch. This is due to the symbolism of the launch and how it can be conveyed to the public through imagery the news coverage that is uniquely NASA focused.

Figure 3- Independent Variables

Variable	Description
Independent Variables	
Age	Age of the respondent.
Sex	The sex of the respondent, coded female as 0 and male as 1.
Ideology	7-pt ideological scale. “Extremely Liberal” to “Extremely Conservative”
Partisanship	Respondent’s partisan identity either Democrat, Republican, or Independent. Respondents also had the option to specify strong or weak. Respondents who answered independent had to option to specify which party they align most closely with.
Race/Ethnicity	The race/ethnicity of the respondent. See appendix for all options.
Employment	The employment status of the respondent. See appendix for all options.
Education	The highest level of education the respondent has achieved. See appendix for all options.
Household Income	Respondents’ household income from the previous year. Options from 0-19,999 to 400,000+
NASA Awareness	If respondent is aware of any current NASA missions
Rocket Launch Stream Viewership	If the respondent has viewed a rocket launch through a live stream or broadcast.

Rocket Launch Stream Frequency	How many rocket launches the respondent has viewed through a live stream or broadcast.
Rocket Launch Stream Justification	What prompted the respondent to view the rocket launch through a stream or broadcast. See appendix for all options
SLS Viewership	If the respondent viewed the launch of the Artemis I mission by any means.
In Person Rocket Launch Viewership	If the respondent has viewed a rocket launch in person.
In Person Rocket Launch Frequency	How many rocket launches the respondent has viewed in person
In Person Rocket Launch Justification	What prompted the respondent to view the rocket launch in person. See appendix for all options
Park Attendance	If the respondent has been to a national park
Park Frequency	How frequently the respondent visits national parks. Options from “Daily” to “Once a year”
Zip code	What is the respondents current zip code

In order to measure driving distance from the Kennedy Space Center, respondents were asked to provide their current zip code. This will then be used to calculate the driving distance to use in the regression models.

Figure 4- Dependent Variables

Variable	Description
Dependent Variables	

Favorability NASA	How favorably the respondent views NASA measured through feeling thermometer (0-10)
Favorability ULA	How favorably the respondent views United Launch Alliance measured through feeling thermometer (0-10)
Favorability SpaceX	How favorably the respondent views Space Exploration Technologies Corp. measured through feeling thermometer (0-10)
Favorability NPS	How favorably the respondent views the National Park Service measured through feeling thermometer (0-10)
NASA Budget	Should NASA receive more, less, or about the same funding.

The demographic focused independent variables collected through the survey included: sex/gender, race/ethnicity, ideology, partisanship, age, household income, education level, and employment status. Because historically these factors have shown to have predict favorability of NASA, they are important to include for evaluation in the regression analysis. The independent variables were re-coded to allow for easier interpretation in the analysis.

Sex/Gender

Gender was re-coded into a dichotomous variable with two categories, male and female due to the small number of respondents to indicated non-binary or self-describe (see Appendix for gender survey question). Therefore, the variable “Male” indicates respondents who were male coded with a (1), while respondents who were female or non-binary were coded with a (0).

Race/Ethnicity

Additionally, race was recoded into a dichotomous variable with two categories white and non-white. This was done because few non-white respondents took the survey therefore collapsing the variable allows for both dichotomous groups to have enough respondents for

statistical significance in analysis (see table below). For this variable, respondents who were white are coded with a (1) and respondents of the other races are coded as (0).

Ideology

The ideology variable represents a 7-point scale, to analyze the self-reported ideology of the respondents the lowest end of the scale is 1 for extremely liberal and upper end of the scale is 7 being extremely conservative. The responses for this variable are coded as “extremely liberal” (1) followed by “liberal” coded as (2), “slightly liberal” (3), “moderate or middle of the road” (4), “slightly conservative” (5), “conservative” (6), and “extremely conservative” (7).

Partisanship

The partisanship variable was measured through 4 questions in the survey. After asking which political party the respondent most closely aligned with the survey took the respondent to a question asking whether they considered themselves to be a strong or weak member of the party (Democrat or Republican). For respondents who identified as independents the survey asked them which party they tend to favor (Democrat or Republican). This data was put into an index called party ID with points 1-6. Where 1 represents “Strong Democrat” and 6 represents “Strong Republican”. The responses in this index are coded as “Strong Democrat” (1), “Weak Democrat” (2), “Leans Democrat” (3), “Leans Republican” (4), “Weak Republican” (5), and “Strong Republican” (6).

Education Level

The education level variable asked respondents to indicate the highest level of education they have completed. Potential response options varied from primary school to graduate level. For analysis, this variable was manipulated into a dichotomous variable for having a 2-year college degree or higher and those who have completed less than a college degree. Therefore, the

variable “degree” is coded (1) for respondents who have completed at least a 2-year college degree or higher and coded (0) for those who have completed less than a college degree (see Appendix for all answer options).

Employment Status

The employment status variable was recoded into a dichotomous variable with two categories employed full time and employed less than full time. This is due to the large number of respondents who answered that they are employed full time and very few answering the other options (see Appendix for full list of options). Therefore, the variable was coded as (1) for respondents who are employed full time and coded (0) for respondents who are employed less than full time.

NASA Funding

Survey data related to whether the respondent believes NASA should receive more funding, about the same, or less funding was recoded into a dichotomous variable with two categories. This was done because believing NASA should receive more funding or about the same indicates an overall positive view of the agency, where thinking NASA should receive less funding is certainly a negative view of the agency. For this variable, respondents who believed NASA should receive more funding or about the same are coded with a (1) and respondents who indicated that NASA should receive less funding are coded as (0).

Distance

After receiving zip code data, a calculation will be run to determine how many miles in driving distance the respondents live from the Kennedy Space Center. Driving miles should more accurately depict distance from the Kennedy Space Center than distance as the crow flies because of its real-world implications since most people travel by car.

In Florida

Using survey data from respondent's current zip code a dichotomous variable was created where respondents living in Florida are coded as (1) and respondents living outside of Florida are coded as (0).

NASA Awareness

The NASA awareness variable represents a dichotomous variable where respondents who are aware of current NASA missions are coded as (1) and respondents who are not aware of current NASA missions are coded as (0). This will provide insight into to populations with the most exposure to NASA and how that can impact perceptions of the agency.

Data Analysis

The data analysis in this study will primarily employ OLS regression analysis to examine the impact of geographic proximity to spaceports and rocket launches on public perception of NASA. An ordinary least squared regression offers the best linear unbiased estimate of the relationship and assumes linear relationships among and independence of the variables; like all regressions, it also assumes casual relationships between the independent and dependent variables. As mentioned previously, distance from the Kennedy Space Center is modified from zip code data into driving miles from the Center. Additionally, favorability of NASA is measured with a feeling thermometer and views of NASA spending. Specifically, multivariate regression models will be used to account for demographic variables, such as age, gender, and ideology, as well as a NASA-focused variable, such as awareness of NASA. Bivariate models will be used to examine the relationship between proximity to spaceports and viewership of rocket launches and views of NASA, while multivariate models will be used to control for the effects of confounding variables and assess the unique contribution of geographic proximity on public perception of

NASA. By using regression analysis in this manner, the study aims to provide a systematic examination of the factors that influence public attitudes towards NASA.

Study Limitations

A possible limitation in this research comes when using Amazon Mechanical Turk. Online surveys require an element of technological proficiency leading to the potential that the sample could have younger respondents than the actual age of the Americans. After completing the survey, the sample used was not representative of the broader American population. Even though MTurk's "worker population" tends to have a majority female users this survey oversampled men and conservatives. Although I took steps to advertise the survey on the MTurk marketplace without indicating it was space-related with the hope of attracting a roughly equal sample of men and women, that did not happen. To identify the survey to the population, I posted the following:

Title: "Short research survey on political attitudes"

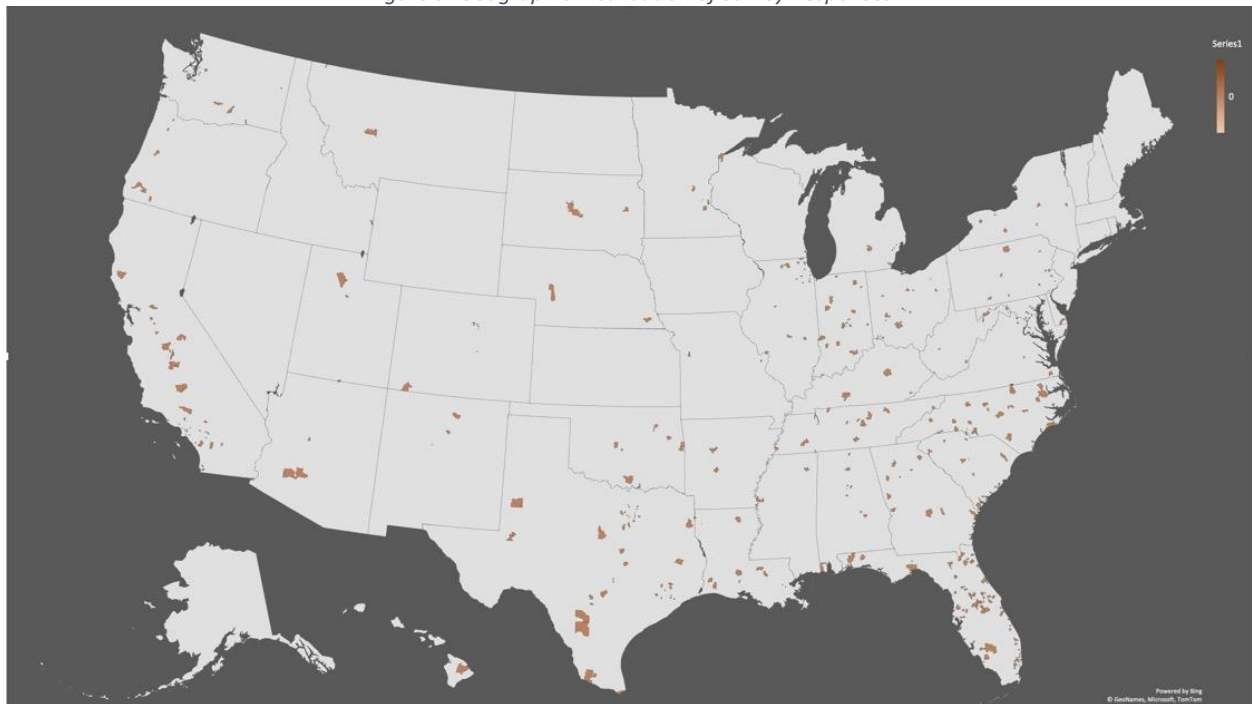
Description: "This is a political research survey and will take less than 5 minutes to complete"

Tags: "survey, demographics, politics"

Although, the skew towards conservative men likely influences the study's external validity, the research focuses on exploring the existence of the relationships between distance, rocket launches, and views of NASA. I also decided to post the survey without sex or party filters. This decision was made partially because previous MTurk research (Moss, 2020) indicated the worker population was diverse and representative of the American population in terms of age and gender distribution and additional filters would have increased the cost of running the survey beyond what was feasible.

Additionally, many respondents were located in particular locations in the United States that might have shaped the variation in distance measures. The most noticeable was the clustering of responses around Anchorage, Alaska. When excluding these responses, however, the regression models' results did not change in notable ways. These responses can be seen in the regression equation line graph for those greater than 4000 miles away from the Kennedy Space Center. Overall, the responses were geographically diverse and generally included responses from regions across the country. (See Figure 5 and 8.)

Figure 5- Geographic Distribution of Survey Responses



Having outlined the research design and methods employed in this study, we now turn to the findings of our investigation. As previously discussed, our research aimed to explore the existence of relationships between distance from spaceports, rocket launches, and views of NASA. In order to achieve this, a survey was administered to U.S. residents through Amazon MTurk. In this chapter, I will present and analyze the data collected through these methods in

order to explore the relationship between distance and feelings towards NASA. Specifically, I will examine the strength of the relationships between distance and rocket launch viewership compared to demographic variables. By providing a detailed analysis I aim to determine if the hypotheses are supported, and if the relationship exists.

Chapter V: Results

This chapter begins by giving an overview of the survey data and descriptive statistics. Following this the first hypothesis measuring the relationship between distance and views of NASA will be tested. After, the second hypothesis measuring the relationship between rocket launch viewership and feelings toward NASA will be tested. Once completed, an analysis of the National Park Service will be done to compare the relationship between direct exposure to a government service most similar to NASA and the event of viewing rocket launches. This section ends with a discussion of the results and whether the hypotheses have support from the regression models.

Overview

The survey had 1062 respondents with 1016 providing their zip code to use in the distance calculation. Of the 1062 respondents, 832 indicated that they have viewed a rocket launch through a livestream or broadcast, and 660 reported that they have viewed a rocket launch in person. Overall, respondents who viewed rocket launches indicated that their doing so was primed through social media and not because of preexisting favorable views of space exploration. (Figure 6)

Figure 6- Rocket Launch Viewership Reasoning

Variable	Statistics
In person reason for viewing (N=657)	Social media: 393 (59.82%)
	Fan of space exploration activities: 69 (10.50%)
	Friends/family: 105 (15.98%)
	No reason: 18 (2.74%)
	School/ Educational trip: 22 (3.35%)
	Vacation 19 (2.89%)
	In area at time of the launch: 31 (4.72%)

Livestream/broadcast reason for viewing (N=831)	Social media:	498	(59.93%)
	Fan of space exploration activities:	136	(16.37%)
	Friends/family:	136	(16.37%)
	No reason:	37	(4.45%)
	School/ Educational trip:	24	(2.89%)

Descriptive statistics for the variables used to test the hypotheses appear in Figure 6.

Figure 7- Descriptive Statistics

Variable (N)	Statistics		
Distance (1062)	Mean: 1510.6 Mdn: 1089 St. Dev: 1274		
In Florida (1062)	In Florida: Outside Florida:	109 953	(10.26%) (89.74%)
Age (1050)	Mean: 32.32 Mdn:32		
Degree (1061)	College Degree or Higher College Degree or Lower	776 285	(73.14%) (26.16%)
Ideology (1051)	Extremely Liberal Liberal Slightly Liberal Moderate Slightly Conservative Conservative Extremely Conservative NA	34 98 47 129 191 393 156 3	(3.24%) (9.32%) (4.47%) (12.27%) (18.17%) (37.39%) (14.84%) (.29%)
Employed Type (1062)	Employed Full Time Employed Less than Full Time NA	876 167 19	(82.49%) (15.73%) (1.79%)
White / Non-white (1062)	White Non-White NA:	851 202 9	(80.13%) (19.02%) (.85%)

Annual Household Income (1054)	\$0-19,999 \$20,000-49,999 \$50,000-89,999 \$90,000-149,999 \$400,000+ NA:	35 291 387 221 10 6	(3.32%) (27.61%) (36.72%) (20.97%) (.95%) (.57%)
Male / Female (1053)	Males Female and Non-binary	760 293	(72.17%) (27.83)
Party ID (1063)	Strong Democrat Weak Democrat Independent Leans Democrat Independent Leans Republican Weak Republican Strong Republican	312 64 51 102 49 484	(29.38%) (6.03%) (4.80%) (9.61%) (4.61%) (45.57%)
NASA Funding (1062)	More funding/About the same Less funding	834 228	(78.53%) (21.47%)
National Park Attendance (1062)	Visited Did not visit NA	858 197 7	(80.79%) (18.55%) (.66%)
Frequency National Park Visits (1062)	Daily Weekly Monthly Once a quarter Once a year NA	31 99 308 186 236 202	(2.92%) (9.32%) (29.00%) (17.51%) (22.22%) (19.02%)
Feeling Thermometer NASA (1058)	Mean:8.22 Mdn: 9.00 NA:8		
Feeling Thermometer ULA (1055)	Mean: 7.94 Mdn: 8.00 NA:75		
Feeling Thermometer SpaceX (1064)	Mean: 7.92 Mdn: 8.00 NA:22		

Feeling Thermometer	Mean: 8.32
	Mdn: 9.00
NPS (1064)	NA:8

When turning to multiple regression testing, it is important to check for multicollinearity. To do so, I examined both the zero order correlations between the independent variables and examined the variance inflation factors. None of the variables included have a ratio greater than 4 (see Appendix B). Since this research is exploratory in nature, I set the statistical threshold at $p < .1$.

Hypothesis One

H1: Respondents who live in zip codes closer to the Kennedy Space Center will express more positive views of NASA and space exploration activities

To analyze H1, I first use a bivariate regression to examine the relationship between the dependent variable, feelings toward NASA, and the independent variable. Next, I regressed feelings toward NASA on the demographic variables. This was followed by looking at the relationships between feelings toward NASA and awareness of NASA missions.

In general, I found that H1 was partially supported (Table 1). As distance from the Kennedy Space Center increased positive feelings toward NASA slightly decreased. The bivariate regression was statistically significant, however, when including additional variables, the relationship was no longer statistically significant. Other evidence supporting H1 came from the regression models analyzing the impact of residence in the state of Florida (instead of distance from the KSC) on views of NASA. These models found that those who live in Florida have more favorable views toward NASA (Table 4). However, H1 was not supported by the regression analysis of driving miles from the Kennedy Space Center and views of NASA funding (Table 2); here, the relationship was not significant. Additionally, results from regression models

focusing on the relationship between views of commercial space companies and distance from the Kennedy Space Center support H1's prediction. Similar to the findings that those living closer to the Kennedy Space Center had more favorable views of NASA, the regressions including commercial launch companies indicate that views of such were stronger for those living closer to the Kennedy Space Center (Tables 5 and 6).

Table 1 Relationships with NASA Feeling Thermometer Ratings

Table 1:

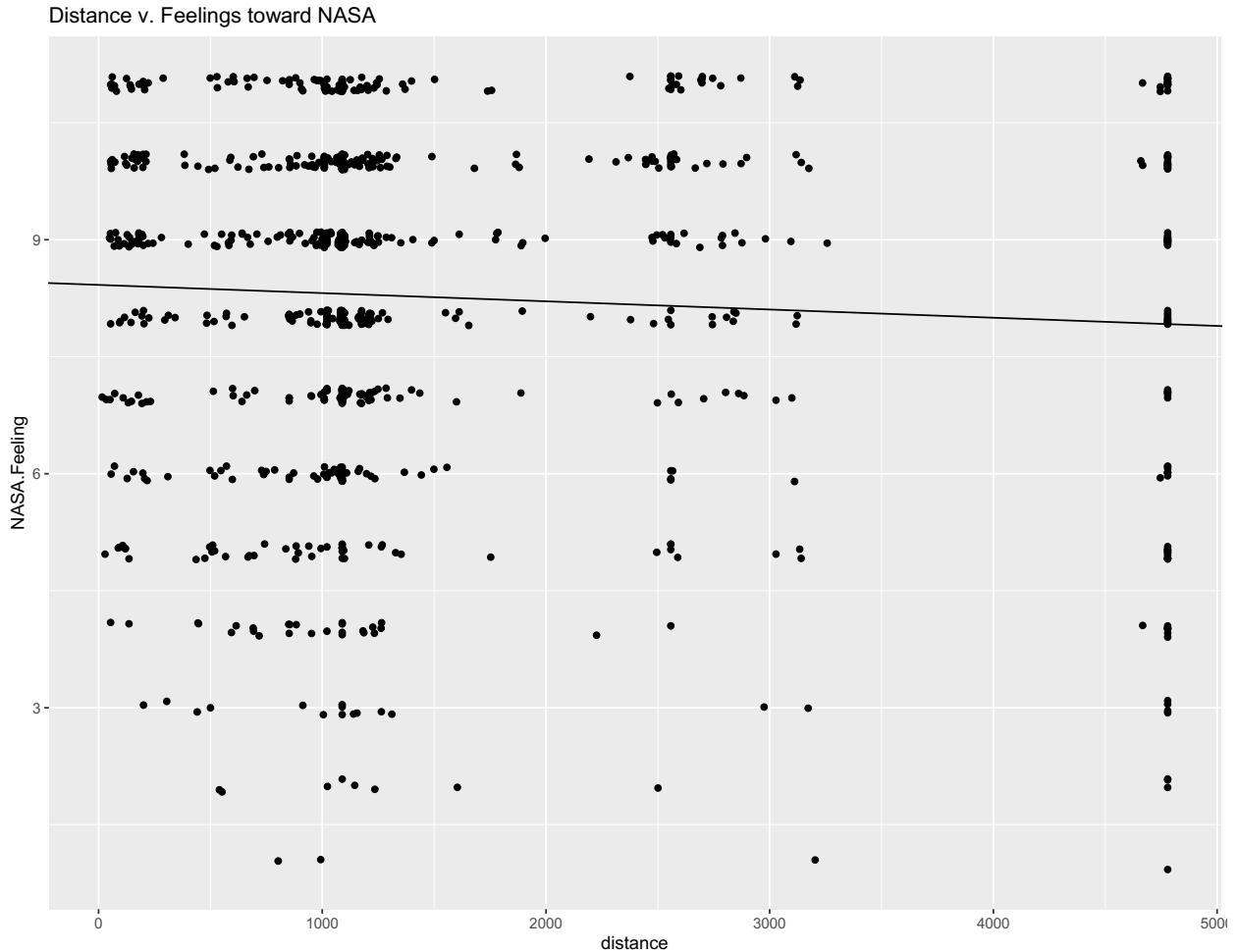
	<i>Dependent variable:</i>		
	NASA Feeling		
	(1)	(2)	(3)
distance	-0.0001* (0.0001)	-0.00004 (0.0001)	-0.0001* (0.0001)
Age		0.018*** (0.007)	
Degree		-0.109 (0.170)	
PartyID		-0.060* (0.035)	
Ideology		0.457*** (0.045)	
EmployedFullTime		-0.474** (0.193)	
White		0.037 (0.200)	
HouseholdIncome		0.011 (0.064)	
Male		0.051 (0.158)	
NASA.Awareness			-0.307* (0.161)
Constant	8.421*** (0.106)	5.993*** (0.506)	8.640*** (0.153)
Observations	1,003	945	1,002
R ²	0.004	0.110	0.008
Adjusted R ²	0.003	0.101	0.006
Residual Std. Error	2.156 (df = 1001)	2.046 (df = 935)	2.150 (df = 999)
F Statistic	3.813* (df = 1; 1001)	12.832*** (df = 9; 935)	3.784** (df = 2; 999)

Note:

*p<0.1; **p<0.05; ***p<0.01

The results of the bivariate regression support H1: for every mile a respondent lives from the Kennedy Space Center, he/she is less likely to have favorable views of NASA. However, the strength of the relationships is quite small, and distance from KSC accounts for little of the variation in NASA feeling thermometer. Even so, Figure 8 shows the negative relationship between distance and feelings toward NASA; those who live closer to the Kennedy Space Center have more favorable views of the agency.¹

Figure 8- Graph of Regression Relationship



¹ I also ran a regression for feelings toward NASA and the log of driving miles from the Kennedy Space Center to reduce the impact of those farthest away from the Center. The relationship was not statistically significant. The table is included in the Appendix.

Next, the demographic variables are added to the regression. As the second column in Table 1 shows, respondents age, ideology, Party affiliation, and employment status are statistically significant. Yet, the results do not support H1 as the relationship between distance is not statistically significant. In general, older and more conservative respondents tend to favor NASA the most. Self-identified ideology has the greatest effect on views of the agency in this model. Yet, respondents who are employed full time and who identify as more Republican have negative perceptions of the agency. Together, the variables in column 2 account for just over 10% of the variation in feelings toward NASA.

To better understand the relationship between distance and feelings toward NASA the next variation of this model considers survey data focused on how aware the respondent is of NASA and the potential influence of awareness of the agency has on the relationship. This model has a variable for if the respondent is aware of any current NASA missions (see Appendix A for variable details).

I then considered the relationship between the respondents' awareness of NASA (tapped both by their awareness of any current NASA missions) and their feelings about NASA. Controlling for distance from KSC, the relationships between feeling thermometer responses and awareness of NASA are statistically significant. Again, however, distance is not significant. Moreover, respondents who are aware of current NASA missions tend to have more negative views of the agency. It is possible that such individuals are more critical of NASA's performance, or they have greater awareness of negative news or events related to the organization. Another factor could be that many in the sample are aware of NASA's activities without fully understanding the missions or the actions of the agency.

The second dependent variable important for testing the first hypothesis involves NASA funding. Table 2 reports the results of several regression models. The first model focuses on the relationship between funding and distance from the KSC. Believing that NASA should have the same or greater annual budget indicates a more positive view of the agency, while supporting decreasing funding suggests a more negative view.

Table 2 NASA Funding Regression for Distance

Table 2:

	<i>Dependent variable:</i>		
	NASA.Funding		
	(1)	(2)	(3)
distance	-0.00000 (0.00001)	0.00000 (0.00001)	-0.00001 (0.00001)
Age		0.001 (0.001)	
Degree		0.017 (0.034)	
PartyID		-0.006 (0.007)	
Ideology		0.009 (0.009)	
EmployedFullTime		-0.027 (0.038)	
White		0.046 (0.040)	
HouseholdIncome		0.050*** (0.013)	
Male		0.069** (0.031)	
NASA.Awareness			0.071** (0.031)
Constant	0.788*** (0.020)	0.504*** (0.100)	0.738*** (0.029)
Observations	1,010	949	1,009
R ²	0.0001	0.027	0.005
Adjusted R ²	-0.001	0.017	0.003
Residual Std. Error	0.412 (df = 1008)	0.406 (df = 939)	0.411 (df = 1006)
F Statistic	0.053 (df = 1; 1008)	2.858*** (df = 9; 939)	2.752* (df = 2; 1006)

Note:

*p<0.1; **p<0.05; ***p<0.01

The results do not support H1. The relationship between distance and support for NASA funding is in the predicted direction but it is not statistically significant. Adding demographic variables to the analysis indicates two statistically significant relationships: males and those with higher household incomes are more supportive of the same or more funding for NASA. Lastly, being aware of NASA missions is positive and related to support for NASA funding.²

² In addition to examining a dichotomous variable for respondents located in Florida, I also ran regressions with various distance cut points (300,500,700, 900, 1100 miles). The results from these regressions were not statistically significant.

Table 3 NASA Feeling Thermometer and Funding Multiple Regression for Distance

	Table 3:	
	<i>Dependent variable:</i>	
	NASA Feeling (1)	NASA Funding (2)
distance	-0.00002 (0.0001)	-0.00000 (0.00001)
Age	0.017** (0.007)	0.001 (0.001)
Degree	-0.055 (0.171)	0.007 (0.034)
PartyID	-0.057 (0.035)	-0.007 (0.007)
Ideology	0.462*** (0.045)	0.007 (0.009)
EmployedFullTime	-0.484** (0.192)	-0.028 (0.038)
White	0.070 (0.200)	0.041 (0.040)
HouseholdIncome	0.019 (0.064)	0.048*** (0.013)
Male	0.079 (0.157)	0.065** (0.031)
NASA.Awareness	-0.403** (0.160)	0.065** (0.032)
Constant	6.177*** (0.507)	0.479*** (0.100)
Observations	944	948
R ²	0.116	0.031
Adjusted R ²	0.107	0.021
Residual Std. Error	2.037 (df = 933)	0.405 (df = 937)
F Statistic	12.253*** (df = 10; 933)	2.999*** (df = 10; 937)

Note:

*p<0.1; **p<0.05; ***p<0.01

Table 3 compares the results for both dependent variables and all of the independent variables. It shows a lack of support for H1. Driving distance from the Kennedy Space Center is not related to either respondents' feeling toward NASA or their views of its funding. Older and more conservative respondents are more likely to have positive feelings toward NASA. Meanwhile those who identify as Republican, are employed full time and are aware of current NASA missions have more negative views of NASA. However, awareness of NASA is a positive factor in views of its funding.

When the NASA feeling thermometer is the dependent variable, the independent variables together account for approximately 12.66% of the variance in feelings toward NASA. This indicates that public opinions about NASA are likely shaped by other factors.

Similarly, the full regression for funding does not support H1. Distance from the Kennedy Space Center remains negative but not statistically significant, indicating that distance does not predict attitudes toward NASA spending. Higher household incomes, being male and being aware of current NASA missions have statistically significant positive relationships with opinions on NASA spending. However, the magnitude of the relationships is small, and the multiple R-squared for all of the independent variables indicates that the model is a poor fit.

Table 4 NASA Feeling Thermometer Regression for Florida

Table 4:		
<i>Dependent variable:</i>		
NASA Feeling		
	(1)	(2)
in_florida	0.306 (0.221)	0.460** (0.220)
Age		0.013** (0.007)
Degree		-0.082 (0.168)
PartyID		-0.048 (0.034)
Ideology		0.450*** (0.044)
EmployedFullTime		-0.477** (0.189)
White		0.078 (0.173)
HouseholdIncome		0.027 (0.063)
Male		0.072 (0.153)
NASA.Awareness		-0.304* (0.157)
Constant	8.189*** (0.071)	6.142*** (0.482)
Observations	1,054	992
R ²	0.002	0.111
Adjusted R ²	0.001	0.102
Residual Std. Error	2.170 (df = 1052)	2.052 (df = 981)
F Statistic	1.915 (df = 1; 1052)	12.290*** (df = 10; 981)

Note: *p<0.1; **p<0.05; ***p<0.01

Table 4 replaces the distance from KSC variable with whether the respondent lives in Florida. The relationship between Florida residence and the NASA feeling thermometer is in the predicted direction but it is not statistically significant. The relationship is significant and positive when additional independent variables are included. Again, older, more conservative respondents have more positive views of the agency. However, those who are employed full time and who are aware of current NASA missions have more negative views toward the agency. The R-squared shows that the model remains a poor fit. Nonetheless, findings support H1 because those in Florida where the Kennedy Space Center is located have more favorable views of the agency.³⁴

Commercial Providers and Distance

Another factor relevant to analyzing the relationship between spaceports and distance is the possible impact of distance on commercial launch providers. This section includes models focused on feelings toward two commercial launch providers (United Launch Alliance and Space Exploration Technologies Corporation) and respondents' distance from the Kennedy Space Center. These models can shed light on how distance relates to entities most similar to NASA. If rocket launches are distinctive and related to support for NASA, a similar relationship should exist for commercial providers.

³ A regression using the independent variable of being in Florida and the dependent variable NASA funding did not statistically significant findings. The model will be available in the appendix.

⁴ Another aspect in this of testing H2 looked at whether respondents who have lived in Florida for extended periods of time would be more supportive of NASA due to greater exposure to rocket launches. The results from this regression focusing on respondents who have been in Florida for greater than 5 years were not statistically significant and is not included in the analysis.

Table 5 ULA Feeling Thermometer Regression for Distance

Table 5:

<i>Dependent variable:</i>		
Feeling.Thermometer.ULA		
	(1)	(2)
distance	-0.0002*** (0.0001)	-0.0001* (0.0001)
Age		-0.004 (0.007)
Degree		0.009 (0.169)
PartyID		0.007 (0.033)
Ideology		0.557*** (0.045)
EmployedFullTime		-0.372* (0.195)
White		0.645*** (0.197)
HouseholdIncome		0.009 (0.063)
Male		-0.210 (0.157)
Constant	8.315*** (0.109)	5.338*** (0.505)
Observations	937	882
R ²	0.017	0.185
Adjusted R ²	0.016	0.177
Residual Std. Error	2.126 (df = 935)	1.929 (df = 872)
F Statistic	15.744*** (df = 1; 935)	22.032*** (df = 9; 872)

Note:

*p<0.1; **p<0.05; ***p<0.01

Table 6 SpaceX Feeling Thermometer Regression for Distance

Table 6:		
<i>Dependent variable:</i>		
Feeling.Thermometer.SpaceX		
	(1)	(2)
distance	-0.0003*** (0.0001)	-0.0001** (0.0001)
Age		0.009 (0.007)
Degree		0.201 (0.172)
PartyID		0.074** (0.035)
Ideology		0.502*** (0.045)
EmployedFullTime		-0.441** (0.195)
White		0.750*** (0.202)
HouseholdIncome		0.056 (0.065)
Male		0.112 (0.159)
Constant	8.342*** (0.111)	4.373*** (0.509)
Observations	990	934
R ²	0.021	0.174
Adjusted R ²	0.020	0.166
Residual Std. Error	2.237 (df = 988)	2.050 (df = 924)
F Statistic	21.359*** (df = 1; 988)	21.662*** (df = 9; 924)

Note: *p<0.1; **p<0.05; ***p<0.01

The findings reported in Tables 5 and 6 support the logic underlying the relationship in H1. Both show a statistically significant negative relationship between distance from the Kennedy Space Center and feelings toward either launch provider. As distance from the Kennedy Space Center increases, positive feelings toward the commercial launch providers decrease. These findings support the first hypothesis: being closer to spaceports is positively related to views of the launch provider. Furthermore, this analysis suggests that launch providers most like NASA experience the same pattern between distance and public attitudes.

Hypothesis Two

H2: Respondents who indicate they have viewed rocket launches will express warmer views of NASA

The second hypothesis also focuses on the dependent variables, feelings toward NASA and NASA funding, but the primary independent variables involve viewing rocket launches. As previously mentioned, the rocket launch variables tap how many rocket launches the respondent has viewed through a live stream, how many rocket launches the respondent has viewed in person, and whether the respondent viewed the launch of the Space Launch System rocket.

The first model focuses on viewership of the Space Launch System launch (*Artemis I*). For survey respondents, this was the most recent “NASA” launch. Although private companies operate most contemporary rocket launches, this is a NASA-focused rocket and is the most public display of the agency’s activities. Additionally, it would be easier for this launch to convey a return on investment to the public because of its NASA focus. It also might be especially controversial given its cost and delays.

Overall, the regression models indicate that H2 is partially supported. This analysis found that those who have viewed the launch of SLS had more positive views of NASA when

regressing the bivariate relationship and NASA spending for both bivariate and multivariate (Tables 7, 8, and 9). However, H2 was not supported through the regression models for both watching rocket launches in person and online (Tables 10 and 11). The relationship in these models failed to be statistically significant. The possible impact of viewing rocket launches in person and online was supported through regression analyses of views of commercial companies and rocket launch viewership, where the more launches a respondent watched through either method the more favorable views they have of the companies (Tables 12, 13, 14, and 15).

Table 7 NASA Feeling Thermometer Regression for SLS Launch Viewership

Table 7:

	<i>Dependent variable:</i>	
	NASA Feeling	
	(1)	(2)
SLS.Launch	0.589*** (0.168)	0.266 (0.176)
Age		0.016** (0.007)
Degree		-0.134 (0.169)
PartyID		-0.047 (0.034)
Ideology		0.424*** (0.045)
EmployedFullTime		-0.516*** (0.190)
White		0.051 (0.176)
HouseholdIncome		-0.005 (0.065)
Male		0.056 (0.154)
Constant	7.745*** (0.150)	5.964*** (0.482)
Observations	1,042	983
R ²	0.012	0.105
Adjusted R ²	0.011	0.097
Residual Std. Error	2.162 (df = 1040)	2.067 (df = 973)
F Statistic	12.376*** (df = 1; 1040)	12.664*** (df = 9; 973)

Note:

*p<0.1; **p<0.05; ***p<0.01

The bivariate results in Table 7 support H2: respondents who viewed the SLS launch on average have more positive views of NASA. The magnitude of the relationship is substantial: having viewed the launch is associated with close a .6 increase in feeling thermometer support for NASA. However, when adding the demographic variables, the relationship loses statistical significance. Ideology and age are stronger predictors of feelings toward NASA; older and more conservative respondents are more positive. Meanwhile, only a small proportion of the variation in feeling thermometer scores is accounted for by all of the independent variables.

Table 8 NASA Funding Regression for SLS Launch Viewership

Table 8:		
<i>Dependent variable:</i>		
NASA.Funding		
	(1)	(2)
SLS.Launch	0.160*** (0.031)	0.149*** (0.034)
Age		0.001 (0.001)
Degree		0.002 (0.033)
PartyID		-0.003 (0.007)
Ideology		-0.001 (0.009)
EmployedFullTime		-0.039 (0.037)
White		0.023 (0.034)
HouseholdIncome		0.040*** (0.013)
Male		0.068** (0.030)
Constant	0.657*** (0.028)	0.507*** (0.093)
Observations	1,050	987
R ²	0.024	0.041
Adjusted R ²	0.024	0.032
Residual Std. Error	0.406 (df = 1048)	0.402 (df = 977)
F Statistic	26.305*** (df = 1; 1048)	4.676*** (df = 9; 977)

Note: *p<0.1; **p<0.05; ***p<0.01

Similarly, the bivariate regression in Table 8 supports H2: those who viewed the launch of SLS have statistically significant, positive views of NASA spending. Furthermore, when accounting for the demographic variables, H2 is still supported. Both models indicate that viewing the launch is associated with more favorable views toward NASA funding. Additionally, males, those with higher household incomes had more positive views of NASA spending. Of the three statistically significant coefficients, viewing the launch of SLS had the greatest positive relationship with views of NASA spending. A reason for this could be that the launch and its mission convey a worthwhile use of tax dollars to the respondents and may impact views of spending and government investment in space, separate from overall feelings toward the agency. Even so, the model leaves most of the variation in support for NASA spending unaccounted for.

Table 9 NASA Feeling Thermometer and Funding Regression for SLS Launch

Table 9:		
<i>Dependent variable:</i>		
	NASA.Funding	NASA.Feeling
	(1)	(2)
SLS.Launch	0.137*** (0.039)	0.524*** (0.198)
Age	0.001 (0.001)	0.015** (0.007)
Degree	0.0004 (0.033)	-0.091 (0.169)
PartyID	-0.004 (0.007)	-0.044 (0.034)
Ideology	-0.001 (0.009)	0.416*** (0.045)
EmployedFullTime	-0.038 (0.037)	-0.534*** (0.189)
White	0.024 (0.034)	0.026 (0.175)
HouseholdIncome	0.040*** (0.013)	-0.008 (0.064)
Male	0.066** (0.030)	0.097 (0.154)
NASA.Awareness	0.025 (0.035)	-0.534*** (0.178)
Constant	0.495*** (0.094)	6.211*** (0.485)
Observations	986	982
R ²	0.042	0.113
Adjusted R ²	0.032	0.104
Residual Std. Error	0.402 (df = 975)	2.056 (df = 971)
F Statistic	4.283*** (df = 10; 975)	12.380*** (df = 10; 971)
<i>Note:</i>		*p<0.1; **p<0.05; ***p<0.01

When including all of the independent variables and both dependent variables, the findings support H2 (See Table 9). Focusing on NASA spending, those who viewed the SLS launch, have higher household incomes, and are male support maintaining or increasing NASA spending. When the feeling thermometer is the dependent variable, respondents who viewed the launch, are older, and are more conservative have more positive views of NASA. Yet those employed full time and who are aware of current NASA missions are more negative.

Livestreams and in person viewership

The next models look at the relationship between watching rocket launches through a livestream and views of NASA. This should offer some important insights into views of NASA since livestreams are the most accessible way for members of the public to see rocket launches. An important consideration is that rocket launch livestreams are associated with commercial companies because they launch more frequently and have the most streams of rocket launches.

After looking at this relationship, I will examine the one between viewing rocket launches in person and feelings toward NASA. This perspective is consistent with the expectation that closer proximity to KSC will be associated with more favorable views of NASA.

Table 10 NASA Feeling Thermometer and Funding Regression for Livestream

Table 10:		
<i>Dependent variable:</i>		
	NASA Feeling	NASA Funding
	(1)	(2)
livestream.views	-0.00004 (0.001)	0.0002 (0.0002)
Age	0.015** (0.007)	0.0004 (0.001)
Degree	-0.058 (0.168)	0.004 (0.033)
PartyID	-0.050 (0.034)	-0.006 (0.007)
Ideology	0.443*** (0.044)	0.005 (0.009)
EmployedFullTime	-0.501*** (0.189)	-0.031 (0.037)
White	0.087 (0.174)	0.041 (0.034)
HouseholdIncome	0.019 (0.063)	0.048*** (0.012)
Male	0.055 (0.153)	0.059** (0.030)
NASA.Awareness	-0.317** (0.157)	0.081*** (0.031)
Constant	6.201*** (0.483)	0.504*** (0.094)
Observations	992	996
R ²	0.107	0.032
Adjusted R ²	0.098	0.022
Residual Std. Error	2.056 (df = 981)	0.404 (df = 985)
F Statistic	11.798*** (df = 10; 981)	3.278*** (df = 10; 985)

Note:

*p<0.1; **p<0.05; ***p<0.01

Table 11 NASA Feeling Thermometer and Funding Regression for In-Person

	Dependent variable:	
	NASA Feeling	NASA Funding
	(1)	(2)
in.person.views	0.001 (0.001)	0.0003 (0.0002)
Age	0.015** (0.007)	0.0005 (0.001)
Degree	-0.049 (0.169)	0.007 (0.033)
PartyID	-0.050 (0.034)	-0.006 (0.007)
Ideology	0.441*** (0.044)	0.005 (0.009)
EmployedFullTime	-0.510*** (0.189)	-0.032 (0.037)
White	0.103 (0.175)	0.045 (0.034)
HouseholdIncome	0.023 (0.064)	0.048*** (0.012)
Male	0.060 (0.153)	0.058* (0.030)
NASA.Awareness	-0.329** (0.158)	0.078** (0.031)
Constant	6.182*** (0.483)	0.499*** (0.094)
Observations	992	996
R ²	0.108	0.032
Adjusted R ²	0.099	0.022
Residual Std. Error	2.056 (df = 981)	0.404 (df = 985)
F Statistic	11.843*** (df = 10; 981)	3.240*** (df = 10; 985)

Note:

*p<0.1; **p<0.05; ***p<0.01

Findings about possible relationships between NASA favorability and whether a respondent has viewed launches by livestream or in person are examined Tables 10 and 11, respectively. The relationship between viewing rocket launches through a livestream and views of NASA is not statistically significant and hence does not support H2. Similar to previous results, ideology and age are statistically significant positive predictors of more favorable feeling thermometer ratings. Once again, respondents who are employed fulltime and are aware of current NASA missions have more negative views of NASA.

Interestingly, when attention turns to NASA funding, only household income, age, and awareness of NASA have statistically significant relationships. This regression also does not support H2.

The findings in Table 11 indicate that the relationships between watching rocket launches in person and feelings toward NASA or NASA funding are not statistically significant. The second hypothesis is not supported by these models. As in other specifications, older and more conservative respondents are more supportive of NASA. Males, those with higher household incomes, and those who are aware of current NASA missions are the most supportive of NASA spending.

Commercial companies

Although examining the impact of rocket launches on attitudes towards NASA is important in considering H2, it may also be worthwhile to explore attitudes towards commercial launch providers to better understand the relationship between viewing rocket launches and perceptions of space exploration. The analysis next examines whether and how respondents' attitudes towards commercial providers differ from their views of NASA and whether factors such as viewing mode are associated with these attitudes. Specifically, a regression model

examines the relationships between these variables and attitudes towards commercial providers. The results of this analysis help shed light on the broader picture of attitudes towards the space industry as a whole. While the previous results indicate that livestream and in person viewing of rocket launches is not related to views of NASA, this analysis examines whether such a relationship exists for entities most similar to NASA that also launch rockets. Since commercial providers launch orbital rockets more frequently than NASA, livestreams and in person viewing options permit more frequent exposure to the companies' branding and mission. Tables 12 and 13 report findings for ULA and Space X, respectively.

Table 12 ULA Feeling Thermometer Regression for Livestream Viewership

Table 12:		
<i>Dependent variable:</i>		
Feeling.Thermometer.ULA		
	(1)	(2)
livestream.views	0.002** (0.001)	0.002** (0.001)
Age		-0.003 (0.007)
Degree		-0.010 (0.167)
PartyID		0.001 (0.033)
Ideology		0.533*** (0.044)
EmployedFullTime		-0.450** (0.192)
White		0.790*** (0.170)
HouseholdIncome		0.023 (0.063)
Male		-0.233 (0.153)
Constant	7.912*** (0.070)	5.151*** (0.480)
Observations	987	929
R ²	0.005	0.172
Adjusted R ²	0.004	0.164
Residual Std. Error	2.154 (df = 985)	1.962 (df = 919)
F Statistic	4.551** (df = 1; 985)	21.274*** (df = 9; 919)

Note: *p<0.1; **p<0.05; ***p<0.01

Viewing rocket launches through a live stream is a statistically significant predictor of respondent attitudes towards ULA, in both the bivariate and the multivariate models. As the number of rocket launches a respondent viewed through a live stream increase, the respondent's attitudes towards ULA become more favorable. This is consistent with H2. Yet, the effect size is small and other variables have more notable relationships with views of ULA. As in previous analyses, more conservative and white respondents tend to favor the company more.

When attention turns to views of SpaceX, it should be noted that the company launches more frequently than either ULA or NASA; its exposure from rocket launches through livestream and in person viewership may offer the greatest chance for the hypothesized relationship between viewing rocket launches and public support to emerge.

Table 13 SpaceX Feeling Thermometer Regression for Livestream Viewership

Table 13:

	<i>Dependent variable:</i>	
	Feeling.Thermometer.SpaceX	
	(1)	(2)
livestream.views	0.002* (0.001)	0.002* (0.001)
Age		0.010 (0.007)
Degree		0.175 (0.168)
PartyID		0.072** (0.034)
Ideology		0.478*** (0.044)
EmployedFullTime		-0.517*** (0.191)
White		0.925*** (0.175)
HouseholdIncome		0.061 (0.064)
Male		0.055 (0.155)
Constant	7.894*** (0.072)	4.174*** (0.480)
Observations	1,040	981
R ²	0.003	0.162
Adjusted R ²	0.002	0.154
Residual Std. Error	2.255 (df = 1038)	2.063 (df = 971)
F Statistic	3.465* (df = 1; 1038)	20.865*** (df = 9; 971)

Note:

*p<0.1; **p<0.05; ***p<0.01

Once more, livestream views are a statistically significant predictor of more favorable attitudes toward SpaceX. Demographic variables also are stronger predictors than livestream viewership. The relationships with attitudes toward SpaceX are stronger for respondents who are white, conservative, or Republican than those who have viewed more rocket launches through a livestream. Again, white and more conservative respondents tend to be more favorable to the company.

These models support the previous findings that whites and conservatives tend to favor space exploration more than other groups. Overall, the regressions examining for viewing rocket launches through a livestream support the expectation that viewing launches will be associated with opinions about space exploration. One reason this relationship exists for commercial companies and not for NASA may be launch frequency. Because commercial launch companies launch more frequently, they have more livestreams showcasing the rockets than NASA, exposing the public to these companies with greater intensity and frequency.

Table 14 ULA Feeling Thermometer Regression for In-Person Viewership

Table 14:

	<i>Dependent variable:</i>	
	Feeling.Thermometer.ULA	
	(1)	(2)
in.person.views	0.002** (0.001)	0.002 (0.001)
Age		-0.002 (0.007)
Degree		0.009 (0.167)
PartyID		0.004 (0.033)
Ideology		0.531*** (0.044)
EmployedFullTime		-0.459** (0.193)
White		0.811*** (0.172)
HouseholdIncome		0.026 (0.063)
Male		-0.241 (0.153)
Constant	7.912*** (0.070)	5.110*** (0.482)
Observations	987	929
R ²	0.004	0.171
Adjusted R ²	0.003	0.162
Residual Std. Error	2.154 (df = 985)	1.964 (df = 919)
F Statistic	4.025** (df = 1; 985)	20.993*** (df = 9; 919)

Note:

*p<0.1; **p<0.05; ***p<0.01

Table 15 SpaceX Feeling Thermometer Regression for In-Person Viewership

Table 15:

	<i>Dependent variable:</i>	
	Feeling.Thermometer.SpaceX	
	(1)	(2)
in.person.views	0.002* (0.001)	0.002* (0.001)
Age		0.011 (0.007)
Degree		0.197 (0.169)
PartyID		0.075** (0.034)
Ideology		0.474*** (0.044)
EmployedFullTime		-0.532*** (0.191)
White		0.957*** (0.176)
HouseholdIncome		0.066 (0.064)
Male		0.052 (0.155)
Constant	7.891*** (0.072)	4.115*** (0.481)
Observations	1,040	981
R ²	0.004	0.163
Adjusted R ²	0.003	0.155
Residual Std. Error	2.255 (df = 1038)	2.062 (df = 971)
F Statistic	3.772* (df = 1; 1038)	20.934*** (df = 9; 971)

Note:

*p<0.1; **p<0.05; ***p<0.01

Additional regressions explore the relationships between viewing rocket launches in person with views of the rocket launch provider, again focusing on ULA (Table 14) and SpaceX (Table 15). Viewing rocket launches in person is a statistically significant positive predictor of attitudes toward ULA. However, with the addition of demographic variables, the relationship is no longer significant. As seen in previous models white and more conservative respondents tend to favor the company more, and the relationships between these demographic variables and favorability are stronger than viewing rocket launches in person. These findings generally support H2 and confirms that a relationship does exist between viewing a rocket launch and favorable views of space exploration.

Similar findings appear when respondents look at SpaceX. Even when accounting for demographic variables, the relationship between positive views of SpaceX and viewing launches in person remains statistically significant. Demographic variables continue to be stronger better predictors of attitudes toward the company. Specifically, being white is strongly related to views of SpaceX. It is interesting that race is a statistically significant predictor of views of commercial launch providers and not of NASA. In the case of SpaceX this might be due to Musk's "conservatism", elitism, and billionaire status as part of the reason for greater favorability among whites, among conservatives, and among Republicans. Perhaps this relationship can be explained through the purpose of each entity. Because NASA has goals of exploration and discovery it can have broader appeal to all, while commercial companies exist to make a profit and therefore have a much narrower group of people who support them strongly. Additionally, conservatism upholds the primacy of free market capitalism. As a consequence, it appears that strong linkages tend to emerge between conservative tendencies and commercial space companies that promote technological innovation celebrated by free market capitalists.

National Parks

Finally, this examination looks at respondents' feelings toward the National Park Service. As has been noted, visiting a national park evidently is quite similar to viewing a rocket launch. Neither is transactional, and one must visit the location to experience its offerings.

Table 16 NPS Feeling Thermometer Regression for Park Attendance

Table 16:

	<i>Dependent variable:</i>	
	Feeling.Thermometer.NPS	
	(1)	(2)
Park.Attendance	0.541*** (0.172)	0.704*** (0.178)
Age		0.015** (0.007)
Degree		-0.257 (0.172)
PartyID		-0.015 (0.035)
Ideology		0.295*** (0.044)
EmployedFullTime		-0.842*** (0.193)
White		0.564*** (0.178)
HouseholdIncome		0.080 (0.065)
Male		-0.349** (0.155)
Constant	7.878*** (0.155)	6.217*** (0.488)
Observations	1,047	988
R ²	0.009	0.093
Adjusted R ²	0.008	0.085
Residual Std. Error	2.169 (df = 1045)	2.091 (df = 978)
F Statistic	9.934*** (df = 1; 1045)	11.131*** (df = 9; 978)

Note:

*p<0.1; **p<0.05; ***p<0.01

Table 16 reports the findings. Respondents who indicated they had been to a national park in the past year had a statistically significant positive relationship with views of the National Park Service. When demographic variables are introduced, having visited a National Park was the strongest positive factor in the relationship with views of the Park Service. Those who are employed full time had statistically significant negative views of the Park Service. This mirrors the relationship seen in regressions for views of NASA. This might be due to those who are employed full time have less time to engage with NASA or NPS. When compared to the NASA regression models, being male had a statistically significant negative relationship with views of NPS. Those who are conservative and who are older had statistically significant positive views of NPS.⁵ Overall, the analysis offer support the contention that direct exposure to a non-transactional government service is related to more favorable opinions of the agency providing the service.

Placebo Test

One of the reasons for including the National Parks Service in this research is that doing so allowed for a placebo test of the relationship between proximity and feelings toward a federal government agency. When regressing opinions about the National Park Service from driving distance from the Kennedy Space Center the relationship was statistically significant and negative. Like previous models the impact of distance is notably less than other demographic variables included in the multivariate regression. White respondents seem to have the most favorable views of the National Park Service, while those employed full time have the strongest negative views of the NPS.

⁵ I also ran a regression focusing on how frequently the respondents visited national parks. The relationship was not statistically significant. The model is included in the appendix.

Table 17 NPS Feeling Thermometer Regression for Distance

Table 17:		
<i>Dependent variable:</i>		
Feeling.Thermometer.NPS		
	(1)	(2)
distance	-0.0002*** (0.0001)	-0.0001* (0.0001)
Age		0.014** (0.007)
Degree		-0.105 (0.173)
PartyID		-0.006 (0.035)
Ideology		0.296*** (0.045)
EmployedFullTime		-0.707*** (0.196)
White		0.509** (0.204)
HouseholdIncome		0.067 (0.065)
Male		-0.341** (0.160)
Constant	8.744*** (0.105)	6.841*** (0.511)
Observations	1,004	947
R ²	0.021	0.082
Adjusted R ²	0.020	0.073
Residual Std. Error	2.137 (df = 1002)	2.083 (df = 937)
F Statistic	21.471*** (df = 1; 1002)	9.312*** (df = 9; 937)
<i>Note:</i>	*p<0.1; **p<0.05; ***p<0.01	

Discussion

Tests of the first hypothesis found that distance from the Kennedy Space Center had a statistically significant negative relationship with views of NASA. Despite its statistical significance, the magnitude of the relationship is quite small, several demographic variables had stronger relationships with attitudes toward NASA.

Distance appeared to be more important when Florida residence substituted for distance from the KSC. Living in Florida is associated with positive feelings toward NASA, and the relationship is stronger than those between other demographic variables and feelings toward NASA. Being in Florida might have a strong impact on views of NASA because of the agency's outsized importance to the state economy. In 2021 the Kennedy Space Center contributed 5.25 billion dollars to the Florida economy (Herridge, 2021). Additionally, an element of state pride may be associated with NASA due to the state's historical and current importance to U.S. space flight. Overall, these findings provide the best support for H1, but indicate other factors also contribute to views of NASA among survey respondents.

Given that viewing rocket launches in person was not related to feelings toward NASA but Florida residence appears to be suggests that other factors influence overall perceptions of the agency. If being near spaceports positively impacts views of NASA through rocket launches acting as focusing events for the agency the in-person analysis should convey similar results but does not. This more strongly supports the idea that distinctive features of being Floridian has sway over perceptions of NASA. And many Floridians, like many who took the survey are white and conservative.

Additionally, the findings on ULA and SpaceX reinforce the likely existence of a relationship between proximity to a spaceport and views of launch providers. It may be that greater and direct contact with space exploration activities affects attitudes toward space

exploration regardless of the entity performing the activity. The distance a respondent lived from the Kennedy Space Center had a stronger impact on feelings toward commercial providers than toward NASA. The frequency of launch activities is a possible explanation since they offer more opportunities to showcase accomplishments. This is also supported by findings showing the positive relationship between livestream and in person viewing and opinions on commercial providers.

Testing H2 looked at whether respondents viewed the launch of NASA's SLS rocket, the different ways one could view a rocket launch, and the relationships with views of NASA. H2 is partially supported: those who watched the launch of SLS had more positive views of NASA than those who did not. Yet, viewing a rocket launch in person or through a live stream was not related to more favorable views of NASA. This is an interesting result because public opinion of commercial launch providers did vary with how frequently respondents viewed rocket launches and the method of viewership.

The results from the placebo test indicate that distance from the Kennedy Space Center had a statistically significant relationship with views of the National Park Service. In effect, the National Park Service served less as a placebo than as agency that evidently is much like NASA in public esteem. Although this is consistent with the justification for selecting the Park Service initially, interpretation is confounded since the Kennedy Space Center is home to the Merritt Island National Wildlife Refuge, and respondents may have included it in their views of National Parks.

This study not only sheds light on previously unexplored areas of public opinion and NASA, but also confirms existing research. The findings are consistent with previous studies that have shown positive relationships between age, race, and sex and support for space exploration:

older, white, males are more likely to support space exploration. However, where previous research found party affiliation was insignificant factor in explaining support for NASA, this research found ideology was statistically related to how favorably NASA is viewed. Overall, more conservative respondents tended to favor NASA the most. Additionally, previous findings are also consistent with results in this research suggesting that opinions of commercial space companies are related to the race and age of respondents. In general, individual characteristics predict not just attitudes toward NASA but also views of space exploration activities as a whole.

Knowledge of space exploration activities, measured by awareness of current NASA missions, was negatively related to views of the agency but positively related to views of funding. This highlights the potential effect of publicity and awareness in general on science communication and on how the public perceives use of tax dollars.

When looking at feelings toward NASA funding, however, awareness of NASA missions was a positive factor. It is possible that knowledge of NASA activities regardless of how in depth it might be conveys positive feelings because it suggests a clear display of government use of tax dollars and American innovation. NASA missions may make the agency and its benefits less hidden from public view compared with other submerged state activities.

Chapter VI: Summary and Conclusion

The guiding questions this research aimed to answer were whether distance from spaceports and viewing rocket launches are positive factors in public opinion of NASA. This chapter will first discuss the findings and the performance of the hypotheses. Then the implications of the findings for NASA and for science communication will be discussed, followed by examination of possible avenues for future research.

Summary of Findings

The first hypothesis expected that those who lived closer to the Kennedy Space Center would have more positive views of NASA, while the second predicted that those who viewed rocket launches would be more likely to support NASA. This research found support for H1 and H2. The bivariate regression for NASA funding and distance from the Kennedy Space Center indicated a statistically significant negative relationship between the variables. However, the strength of the relationship is quite weak, and it did not retain significance when other variables were added.

When changing the distance variable to a dichotomy for whether a respondent was a Florida resident, the relationship remained statistically significant even when accounting for demographic variables. Living in Florida had a positive effect on respondent's feelings toward NASA, but it did not increase support for NASA funding. This offers interesting insights into the relationship between the distance variable and feelings toward NASA. One possibility is that respondents who live in the same state as the Kennedy Space Center are exposed to news that focuses on the space center with greater intensity due to its significance to the state economy. Another factor could be an element of state pride associated with NASA activities, with those in Florida primed to have more favorable opinions about NASA through the news and rocket

launches but also because of NASA's perceived economic impact and historical importance to the state.

The results from regressions using two distance variables suggest that the relationship between distance from the Kennedy Space Center and feelings toward NASA may be non-linear. It appears that for those close to the Kennedy Space Center, proximity has a strong impact on views toward NASA. When far away other factors have a stronger effect on opinions toward the agency. These factors could be existing opinions of NASA, government spending, and space exploration.

Regressions analyzing the relationship between watching the launch of the SLS and views of NASA found the relationship to be positive and statistically significant. However, the other dimensions of H2 measuring favorability of respondents who watched rocket launches through a livestream or in person was not significantly related to views of NASA. In contrast, the relationship between perceptions of commercial space companies and viewing launches through livestreams or in person was statistically significant. This indicates that a relationship exists, and rocket launches can impact the public. However, the rocket launch has to be a NASA focused mission like SLS to create NASA centered support in the public.

I believe this research failed to find support for relationships between views of NASA and the livestream and in person variables for several reasons. The first is that most livestreams and a majority of all rocket launches are done by commercial companies and not NASA. Therefore, the public would be exposed to the companies' branding and not necessarily NASA through the livestreams. For example, the streams might discuss a NASA payload, but it is not the focal point of the broadcast; the launch is primary. Additionally, social media might play a role in priming the audience before they view the stream. Most respondents indicated they

viewed rocket launches because of social media; commercial rocket companies have a much more engaging social media presence than NASA. This is also supported by the results of the regression on SLS. The launch and news surrounding the mission were exclusively NASA focused, but regular viewing of rocket launches for commercial companies either in person or online is commercially focused. This might explain the results the research found. The mission focused on NASA and NASA alone had a statistically significant positive relationship with the public's view of NASA; viewing any other rocket launch did not.

Implications

The results of this research indicate that direct exposure to NASA has a positive impact on some public perceptions of the agency. This is important when thinking about public engagement and science communication because those who live far away from a NASA center might not be aware of the industries in their state that support NASA; those nearby are more aware of the benefits of the agency. NASA should focus on communicating the benefits to each state to close the gap in perception based on distance from NASA facilities. Additionally, these results indicate that NASA has significant support in Florida, and this should be communicated to Florida lawmakers in negotiations over the budget given the situation in the 118th Congress. Elected officials typically are responsive to the concerns of their constituents, and the influence of spaceports can be an important factor in persuading elected officials to become more active supporters of the agency.

Future Research

Future research looking at all of NASA's spaceports at the state level could be beneficial for the agency because it can help determine where NASA has the strongest support and the relative strength of every aspect of its geographic footprint. Is it concentrated in Florida because

of its dominant role in space flight or do spaceports in California and Virginia offer similar results to what this research found. Additionally, looking at non-spaceports could also add clarity to this relationship. For example, Johnson Space Center could have support concentrated around it because of the economic impact it has on Texas even though it does not launch rockets.

Additionally, it would be interesting to survey respondents who do not have favorable views of NASA and show them a video of a rocket launch or Mars rover landing and then ask them to place NASA on the feeling thermometer. This could clarify the impact of rocket launches and NASA activities on the public and if direct exposure has the ability to change a respondent's view of the agency.

It is often said that support for NASA is a mile wide and an inch deep. This research offers detail to a less explored area of public opinion to help strengthen support for the agency. It offers a look at the impact of NASA's focal spaceport and provides the foundation the agency needs to secure its future in negotiations with Congress using existing geographic assets. While it is difficult to imagine a future without NASA, greater public support can ensure that the agency operates without undue partisan influence, ever-changing goals, and a minimized hollowed out role in the future. By conveying the positive impact of spaceports, the agency can have elected leaders support space exploration because it offers a popularly supported common ground within states. Space exploration should not be pursued to meet partisan ends but rather because it is our destiny as humans to answer the most fundamental question about our existence. It is the next step for humanity.

Appendix A: Survey Questions

1. Are you aware of any current NASA missions?
 - a. Yes/No
2. Have you viewed a rocket launch through a live stream or broadcast?
 - a. Yes/No
 - i. If Yes: Approximately how many rocket launches have you viewed through a livestream or broadcast?
 1. Numerical text entry
 - ii. What prompted you to watch the rocket launch through a livestream or broadcast?
 1. Social Media
 2. Fan of space exploration activities
 3. Friends/Family
 4. No particular reason
 5. School
 6. Other
 - a. Text entry
3. Please rate how you feel about each organization below, using a feeling thermometer that ranges from 0 to 10. The higher the number, the warmer or more favorably you feel about the organization; the lower the number, the colder or less favorably you feel. You can pick any number between 0-10 and no opinion.
 - a. National Aeronautics and Space Administration
 - b. United Launch Alliance
 - c. Space Exploration Technologies Corp.
 - d. National Park Service
4. In fiscal 2023, NASA has a budget of \$25.4 billion, which is 1.4% of the federal budget. Do you think NASA should receive more funding, less funding, or about the same?
 - a. More funding
 - b. Less funding
 - c. About the same
 - d. I don't know
5. Have you viewed either in person, online, or on television the launch of the Space Launch System rocket as part of the Artemis 1 mission?
 - a. Yes
 - b. No
6. Have you viewed a rocket launch in person before?
 - a. Yes
 - b. No
 - i. If Yes: Approximately how many rocket launches have you viewed in person?
 1. Numerical text entry
 - ii. What prompted you to attend the rocket launch?
 1. Social Media
 2. Fan of space exploration activities
 3. Friends/Family

4. No particular reason
 5. School/ educational trip
 6. Vacation
 7. Happened to be in area at the time of a launch
 8. Other
 - a. Text entry
7. Have you been to a national park?
 - a. Yes
 - b. No
 - i. If Yes: In the last year, how frequently do you visit national parks?
 1. Daily
 2. Weekly
 3. Monthly
 4. Once a quarter
 5. Once a year
 8. What is your zip code?
 - a. Numerical text entry
 9. How many years have you lived in your current zip code?
 - a. Numerical text entry
 10. What is your race or ethnicity?
 - a. White
 - b. Black or African American
 - c. Hispanic or Latino
 - d. Native American or Alaska Native
 - e. Middle Eastern or North African
 - f. Multiracial or Multiethnic
 - g. Asian
 - h. Self-describe
 11. Which of the following best describes your employment status?
 - a. What is your employment status?
 - i. Employed, working full time
 - ii. Employed, working part time
 - iii. Not employed, looking for work
 - iv. Not employed, not looking for work
 - v. Retired
 - vi. Disabled not able to work
 - vii. Student
 12. Generally speaking, do you usually think of yourself as a Republican, a Democrat, an Independent, or what?
 - a. Democrat
 - i. If Yes: If you think of yourself as a Democrat, would you call yourself a strong Democrat or a not very strong Democrat?
 1. Strong
 2. Not very strong
 - b. Republican

- i. If Yes: If you think of yourself as a Republican, would you call yourself a strong Republican or a not very strong Republican?
 - 1. Strong
 - 2. Not very strong
 - c. Independent
 - i. If Yes: Do you think of yourself closer to the Republican or Democratic party?
 - 1. Republican Party
 - 2. Democrat Party
 - d. Other
 - e. No preference
13. What is the highest level of education that you have completed?
 - a. Primary school
 - b. Some high school, but no diploma
 - c. High school diploma (or GED)
 - d. Some college, but no degree
 - e. 2-year college degree
 - f. 4-year college degree
 - g. Graduate-level degree (MA,MS,PhD,JD,MD)
 - h. None of the above
14. Here is a 7-point scale on which the political views that people might hold are arranged from extremely liberal to extremely conservative. Where would you place yourself on this scale, or haven't you thought much about this?
 - a. Extremely liberal
 - b. Liberal
 - c. Slightly liberal
 - d. Moderate
 - e. Slightly conservative
 - f. Conservative
 - g. Extremely conservative
 - h. Haven't thought much about this
15. What is your age?
 - a. Numerical text entry
16. What is your sex?
 - a. Male
 - b. Female
 - c. Non-binary
 - d. Self-describe
 - e. Prefer not to answer
17. In the last year, what is your total household income?
 - a. 0-19,999
 - b. 20,000-49,999
 - c. 50,000-89,999
 - d. 90,000-149,999
 - e. 150,000-399,999
 - f. 400,000+

g. Prefer not to answer

Appendix B: IRB Approval



**Division of Scholarly Integrity and
Research Compliance**

Institutional Review Board
North End Center, Suite 4120 (MC 0497)
300 Turner Street NW
Blacksburg, Virginia 24061
540/231-3732
irb@vt.edu
<http://www.research.vt.edu/sirc/hrpp>

MEMORANDUM

DATE: February 15, 2023
TO: Karen Hult, Christopher Reutt
FROM: Virginia Tech Institutional Review Board (FWA00000572)
PROTOCOL TITLE: Public Opinion Survey
IRB NUMBER: 23-133

Effective February 15, 2023, the Virginia Tech Human Research Protection Program (HRPP) determined that this protocol meets the criteria for exemption from IRB review under 45 CFR 46.104 (d) category(ies) 2(i).

Ongoing IRB review and approval by this organization is not required. This determination applies only to the activities described in the IRB submission and does not apply should any changes be made. If changes are made and there are questions about whether these activities impact the exempt determination, please submit an amendment to the HRPP for a determination.

This exempt determination does not apply to any collaborating institution(s). The Virginia Tech HRPP and IRB cannot provide an exemption that overrides the jurisdiction of a local IRB or other institutional mechanism for determining exemptions.

All investigators (listed above) are required to comply with the researcher requirements outlined at:

<https://secure.research.vt.edu/external/irb/responsibilities.htm>

(Please review responsibilities before beginning your research.)

PROTOCOL INFORMATION:

Determined As: **Exempt, under 45 CFR 46.104(d) category(ies) 2(i)**
Protocol Determination Date: **February 15, 2023**

ASSOCIATED FUNDING:

The table on the following page indicates whether grant proposals are related to this protocol, and which of the listed proposals, if any, have been compared to this protocol, if required.

Invent the Future

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY
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Appendix C: Models

Variance Inflation Factors Test (NASA Feeling Thermometer Regression)

Variable	Coefficient
Distance	1.41
Age	1.10
Degree	1.32
PartyID	1.31
Ideology	1.22
Employed Full Time	1.14
White	1.42
Household Income	1.06
Male	1.12
NASA Awareness	1.07

Variance Inflation Factors Test (NASA Funding Regression)

Variable	Coefficient
Distance	1.40
Age	1.09
Degree	1.31
PartyID	1.31
Ideology	1.22
Employed Full Time	1.14
White	1.41
Household Income	1.06
Male	1.12
NASA Awareness	1.07

Regression (NASA Funding / In Florida)

	<i>Dependent variable:</i>	
	NASA.Funding	
	(1)	(2)
in.florida	-0.057 (0.042)	-0.038 (0.043)
Age		0.001 (0.001)
Degree		0.006 (0.033)
PartyID		-0.006 (0.007)
Ideology		0.005 (0.009)
EmployedFullTime		-0.031 (0.037)
White		0.040 (0.034)
HouseholdIncome		0.046*** (0.012)
Male		0.055* (0.030)
NASA.Awareness		0.081*** (0.031)
Constant	0.791*** (0.013)	0.511*** (0.095)
Observations	1,062	996
R ²	0.002	0.031
Adjusted R ²	0.001	0.021
Residual Std. Error	0.411 (df = 1060)	0.404 (df = 985)
F Statistic	1.901 (df = 1; 1060)	3.176*** (df = 10; 985)
<i>Note:</i>	*p<0.1; **p<0.05; ***p<0.01	

Regression (NPS Feeling Thermometer, Frequency of Park Attendance)

	<i>Dependent variable:</i>	
	Feeling.Thermometer.NPS	
	(1)	(2)
National.Park.frequency	-0.064 (0.064)	-0.060 (0.067)
Age		0.015** (0.007)
Degree		-0.155 (0.183)
PartyID		-0.074** (0.037)
Ideology		0.330*** (0.048)
EmployedFullTime		-0.805*** (0.222)
White		0.336* (0.195)
HouseholdIncome		0.074 (0.072)
Male		-0.485*** (0.163)
Constant	8.655*** (0.240)	7.371*** (0.581)
Observations	854	808
R ²	0.001	0.087
Adjusted R ²	-0.00001	0.077
Residual Std. Error	2.086 (df = 852)	2.004 (df = 798)
F Statistic	0.993 (df = 1; 852)	8.438*** (df = 9; 798)
<i>Note:</i>	*p<0.1; **p<0.05; ***p<0.01	

Regression (NASA Feeling thermometer, Log distance of driving miles)

<i>Dependent variable:</i>		
NASA.Feeling		
	(1)	(2)
log_distance	-0.088 (0.072)	-0.061 (0.075)
Age		0.016** (0.007)
Degree		-0.062 (0.171)
PartyID		-0.057 (0.035)
Ideology		0.464*** (0.045)
EmployedFullTime		-0.480** (0.192)
White		0.070 (0.181)
HouseholdIncome		0.019 (0.064)
Male		0.083 (0.157)
NASA.Awareness		-0.400** (0.160)
Constant	8.876*** (0.509)	6.563*** (0.732)
Observations	1,003	944
R ²	0.001	0.117
Adjusted R ²	0.0005	0.107
Residual Std. Error	2.159 (df = 1001)	2.036 (df = 933)
F Statistic	1.471 (df = 1; 1001)	12.310*** (df = 10; 933)
<i>Note:</i>	*p<0.1; **p<0.05; ***p<0.01	

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