VISIONS OF SPACE EXPLORATION: A QUALITATIVE STUDY OF PERSPECTIVES
FROM THE "PRIVATE" SECTOR

by

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Abstract

Space commentators and government officials draw on a variety of themes that shape how the public perceives space efforts. By constructing particular visions of outer space and the future of humanity, political leaders have inspired children to become astronauts and consoled the nation after a major tragedy. The future of space exploration and development will likely occur as an extension of existing paradigms that shape the material development of space transportation, space stations, and eventually living in space.

Through qualitative interviews, this study illuminates the paradigms of persons working to advance the cause of space exploration and development. In particular, the study analyzes perspectives from individuals in the private sector. It seeks to highlight themes, such as leadership and possible material benefits, so that researchers may begin to construct theories about the specific conditions under which the future of space exploration and development may be shaped or evolve. This enhances our understanding of how themes operate to sustain or alter existing paradigms. In turn, a thematic analysis will generate new understandings of how envisioning seemingly impossible futures and social realities can transform those realities by drawing on conceptions of the past to inform the present and potential futures. To this end, this study employs imagination studies as a theoretical lens to understand how interviewees describe these future social realities.

Specifically, the study discusses Engen's (2002) theory of communicative imagination and seeks to refine it to encompass a process-based approach and flexibility. The presence of communicative imagination is explored in transcripts from qualitative interviews with persons employed in private businesses involved in the research and production of materials and services for space exploration and development. Results from the study reveal five dominant themes: leadership, inspiration and support, core motives, material benefits, and potential futures. Understanding how these themes interact in the process of communicative imagination illuminates the role communication plays in shaping social realities in a variety of circumstances.

Key terms: space exploration, communicative imagination, NASA, private sector, social reality

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Dedication

This thesis is dedicated to the women and men who devote their lives in the pursuit of a place for humanity among the stars—from activists to engineers to astronauts, and beyond.

Chapter 1 - Introduction

"Frontiersmen (sic) never die, they just drift off into space. So may read the bumpersticker of space expansionists since for them space development is classed as the final frontier" (Marshall, 1999, para. 10).

The American space program has long enjoyed an almost mythic position in the public imagination (McCurdy, 2011). Space commentators and government officials appeal to a variety of themes that shape how the public perceives space efforts. By constructing particular visions of outer space and the future of humanity, political leaders have inspired children to become astronauts and consoled the nation after a major tragedy (Shukaitis, 2009). Like all human endeavors, the future of space exploration and development will occur under paradigms from which the material development of space transportation, space stations, and eventually living in space occurs (Billings, 2006; Day, 2007; Lin, 2006; Saperstein, 1997). For the purposes of this study, "paradigm" is defined as the "basic belief system or world view" (Guba & Lincoln, 1994, p. 105).

In the developing course of human expansion into space, the private sector is becoming increasingly influential. From commercial firms promising space hotel vacations to engineering contractors building the next crew vehicle (Bekey, 2011; McCurdy, 2011), the private sector largely builds and provides the essential services that form the backbone of American space efforts. While "private" in terms of being distinct businesses in the private sector not directly employed by the government, most space businesses work closely with or receive contracts from the National Aeronautics and Space Administration (NASA). Such cross-pollination between the "public" and "private" sectors indicates the interplay of influences and conceptual directions that guide research priorities and material developments (Mann, 2012).

Calling attention to how persons in the private sector draw on themes to construct visions of the past, present, and future can shed light on the paradigms under which the future of space exploration and development might evolve (Billings, 2006). These paradigms can offer insight into how envisioning seemingly impossible futures and social realities can transform social realities by drawing on conceptions of the past to inform the present and potential futures (Billings, 2006; Shukaitis, 2009). This study utilizes a thematic analysis to generate new understandings of how envisioning seemingly impossible futures and social realities can

transform those realities by drawing on conceptions of the past to inform the present and potential futures.

Current scholarly attention, specifically to themes employed when discussing space, centers on a few "big" events, such as the *Challenger* and *Columbia* disasters, which captured public imagination or was constructed by the media, NASA, and other government officials as significant developments (Jordan, 2003; Stuckey, 2006; Tobey, 1987). These largely focus on presidential speeches delivered after major disasters and triumphs. However, those events are rare in American history. The findings of the current study will extend existing research by describing the themes utilized by private sector employees to construct visions of space exploration and development (Aronson, 2004; Boyatzis, 1998; Braun & Clarke, 2006). This study seeks to expand the scope of existing research on space beyond popular media and public fascination with large-scale events, such as the Moon landing and *Challenger* explosion. When space becomes routine or without major accomplishments for a period of time, the interest of scholars and the public diminishes. If observers perceive that NASA and the space program are not doing revolutionary things or that there is nothing exciting about our current activities in space, then they simply lose interest. The absence of inspirational or tragic acts, such as putting humans on the Moon or a major disaster, largely parallels scholarly attention to space activities. Against this backdrop of cycles in interest, the private sector has been gearing up for major advances (Chang, 2012). This study also works to further articulate how private sector space industry, one with potential to revolutionize the world as we know it with new discoveries and technological advancements, communicates visions of a future in space that transcends the seeming impossible (Urry, 2012).

Although many critics include references to various rhetorical devices, none work to illuminate perspectives from space contractors and commercial space firms. Very little commentary exists on the perspectives and "visions" of space proponents in general, much less those found in the private sector. Uncovering themes emanating from the private sector is instructive in determining the visions that inspire research and development of the tools that advance space exploration and development. The private sector does most of the heavy lifting when it comes to space. Conover (2011) argues that "it will not be NASA that will be on the forefront of exploration, the vanguard of settlement or the peak of human development in the cosmos. It will be private industry…who will find profit in the void of space" (para. 1).

Because these firms conduct the majority of research and development of space projects, their perspectives are essential in conceptualizing the future of space activities. With this awareness, researchers can begin to theorize how the future of space can be addressed to achieve future goals. Despite their increasing prevalence, critics have yet to tackle issues surrounding the role of space businesses.

This study illuminates one of the many roles communication plays in shaping social reality and how researchers may employ communicative imagination to understand other social phenomena. It explores the role of imagination in the construction of those visions and their potential materialization. Specifically, it looks at *communicative imagination* (Engen, 2002) as a process by which individuals draw on the past to inform the present, and in turn, construct visions of the future. By participating in a process that imagines impossible futures becoming reality, the very *possibility* of those *impossible* futures arises (Shukatkis, 2009). In this fashion, communicative imagination gives rise to new approaches and thinking to transform social reality.

The presence of communicative imagination is explored in transcripts from qualitative interviews with persons employed in private businesses involved in the research and production of materials and services for space exploration and development. The results of this qualitative study reveal themes that illuminate the paradigms under which the future of space exploration and development might unfold. Saperstein (1997) argues that how individuals understand the world necessarily influences the actions they take to shape the world. "It is clear that the set of metaphors which underline our thoughts and discussions about the political world determine our responses to matters of war and peace. Action often follows theory" (p. 45). If so, then the agents most responsible for our expansion into space will operate from certain paradigms, such as displayed by appeals to themes (Aronson, 2004). Gehrke (1998) also points to the prominent role of communication in shaping future policies, "Policy discourse communicates values and interpretations about a policy, its subjects, the objects it acts upon, and the world in which advocates seek to implement it. These communications shape the way that agents implement or carry out those policies" (p. 30). Both Saperstein (1997) and Gehrke (1998) note that communication is intimately tied to the manifestation of policies. By illuminating themes of those working in the private sector, we may begin to construct theories about the specific

conditions under which the future of space exploration and development will evolve (Bainbridge, 2009).

This study seeks to highlight the role of communication research in shaping social reality by articulating a new version of Engen's (2002) theory of communicative imagination that highlights how individuals access their understanding of prior communication events to inform current ideas that shape how they view society and future events. The focus of Engen's work lies in the education field, particularly in reforming undergraduate curriculum and classroom pedagogy. With the goal of getting students to engage assumptions and critically analyze the world around them, Engen advocates a better incorporation of stories in the classroom. Although stories are represented in the classroom, Engen (2002) argues that stories have traditionally been used in accordance with the "transmission view of communication," or "human communication as a process in which symbolic expression transmits or 'imparts' information from source to receiver or vice versa" (p. 49). This view limits teacher-student dialogue and denies a valuable addition to classroom teaching. Engen (2002) draws on the assumption that education is best served by engaging in a dialogic pedagogy between teacher and student. "If students (and their professors) are to build a world together, we must understand the complexities of others and of ourselves…Ultimately, we must understand the true value of mutually constructing and naming our worlds" (p. 55). By integrating stories and personal perspectives into classroom instruction, Engen (2002) found that "complex and compelling stories…invite students to see different dimensions of their social worlds" (p. 55). The value in Engen's approach lies in fostering a complex understanding of social reality that requires critical thinking.

Yet, by adjusting and refining Engen's (2002) theory of communicative imagination to be seen as a process, this study provides a deeper understanding of "imagination" in terms of how individuals mediate through multiple levels of social reality to envision the impossible. Moreover, evaluating the ability of individuals to engage in the process of communicative imagination along a simple continuum of command, such as "strong" or "generally strong," provides flexibility in analysis and application across disciplines.

What drives respondents to work for Boeing, Honeywell, Lockheed-Martin, or SpaceX and how do they describe the importance of such efforts in constructing their vision for the future of space exploration and development? These are driving questions behind this study. Chapter two presents a review of major studies and criticisms of space activities and associations with

elements of communication research. This chapter discusses controversial issues within these studies and criticism to draw context for analyzing results. Chapter three offers a more detailed description of methodological choices and explains the explication process in detail. Research findings from the interviews are presented in chapter four using Thematic Analysis to identify patterns of thinking and perception across the data set. Chapter five discusses these findings through the theoretical lens of communicative imagination and their implications for constructing social reality (Haiven & Khasnabish, 2010; Paulsen, 2010; Shukatkis, 2009). Understanding the paradigms, of persons working in the private sector holds potential for application for academics, policymakers, and private sector efforts to advance the cause of space (Bainbridge, 2009). Practical implications and commentary on anti-space criticism are then explained. Concluding remarks follow in chapter six, which discusses limitations of this study and suggestions for future research.

Chapter 2 - Literature Review

Early civilizations looked to the stars to make sense of their world (Hadingham, 1984; Ruggles, 2005). Later, explorers used the night sky as a map to navigate across the great oceans. With the advent of advanced technologies, humans altered their perception of space. Instead of being a mystical zone for gods beyond the mortal grasp of humans, space slowly became a realizable goal. Former President Ronald Reagan's eulogy for the *Challenger* disaster captured the giant leap space exploration brought for humanity in transgressing the boundaries between the human and the divine. Reagan (1986) quotes poet John Gillespie Magee, Jr. in describing how astronauts have "slipped the surly bonds of earth" to "touch the face of God" (para. 12).

This chapter presents a review of the primary works that inform this study. It begins with a description of the relevant historical speeches, events, and associated criticisms that form the majority of scholarly attention to space developments in communication research. Understanding these past events is instructive to ascertain how previous paradigms influence policy and public perception. A discussion of the primary works on themes and space exploration follows. The chapter concludes with a discussion of communicative imagination as theoretical framing to extend understanding of the central role of communication in creating and in some ways inhibiting the possible.

Understanding the major communicative acts within the history of space and how they operate to construct visions of the future provides the basis for studying the perspectives of those working in the private sector space industry. This allows the researcher to approach these perspectives through a holistic lens that encompasses history and recognizes its role in shaping current and future space activities. Therefore, this study addresses three primary questions:

RQ1 – How do interviewees describe the purpose and importance of space exploration and development?

RQ2 – How do interviewees describe the current state of space exploration and development?

RQ3 – How do interviewees describe the future of space exploration and development?

In analyzing the results from these questions, this study seeks to illuminate themes that shape the paradigms under which the future of space exploration and development might unfold. The relative presence of communicative imagination in interview transcripts speaks to the role communication may play in shaping social realities in a variety of circumstances.

Cold War Beginnings

Space exploration and development has captured the imagination of American scientists, politicians, and school children for more than half a century. For the United States, the space program began as a means of achieving military superiority over the Soviet Union and national security (Gorman, 2009; Furniss, 2003; Hertzfeld, 2011; Jordan, 2003; Lanius, 2011; Marshall, 1999). The October 4, 1957 Soviet launch of *Sputnik 1* ignited the "space race" (Gorman, 2009, p. 133). As such, nationalism shaped early space efforts. Lanius (2011) points to the Cold War rivalry as the "key that opened the door to aggressive space exploration, not as an end in itself, but as a means to achieving technological superiority in the eyes of the world," (p. 204). This was a "security, political, and technological endeavor for the United States" aimed at "winning the technological race" for geopolitical dominance (Hertzfeld, 2011, p. 91).

The pinnacle of this Cold War competition was the July 20, 1969 *Apollo 11* moon landing. Americans were the first to set foot on the moon and claim the resultant national prestige. When U.S. astronaut Neil Armstrong took those first steps and proclaimed "That's one small step for (a) man; one giant leap for mankind (sic)," he inadvertently connected the success of the American space program with the good of the whole world (Jones, 1995, 109:24:23). For Lanius (2011), the motives for the *Apollo 11* program were to enhance American national prestige and technological prowess at home and globally.

> The desire to win international support for the "American way" became the raison d'etre for the *Apollo* program, and it served that purpose far better than anyone imagined when first envisioned. *Apollo* became first and foremost a Cold War initiative and aided in demonstrating the mastery of the United States before the world. (p. 214)

Cold War politics became the driving force behind of the "space race" and subsequent developments and achievements (Furniss, 2003). During the Cold War, space was inseparable from military goals, "inextricably intertwined with the Arms Race" (Gorman, 2009, p. 134). In

his archaeological analysis of the space age, Gorman (2009, 2005) discusses how the idea of a "space race" became a trope that came to dominate understanding of space activities that obscured "other motivations and directions in the history of space exploration such as the scientific exploration of the solar system…international co-operation in space, and amateur space initiatives" (Gorman, 2009, p. 133). This Cold War narrative emphasized an adversarial mode of thought bent on using space as a "symbol of national excellence to enhance the prestige of the United States throughout the world" (Lanius, 2011, p. 200). Such an adversarial approach was not limited to geopolitical dominance, but extended into the very conception of space as a foreign land to conquer.

Enter "Private" Enterprise

Discussions concerning "public" and "private" spheres are no stranger to the communication field. For Habermas, the "public sphere" referred to "a realm of our social life in which something approaching public opinion can be formed" where "access is guaranteed to all citizens" (p. 49). This presumes an ideal democratic society where all individuals have the opportunity to step outside of their private lives into the public sphere to participate in democracy. Feminists scholars have criticized Habermas and the public-private dichotomy on which his work concerning the public sphere rests (Fraser, 1987; Pateman, 1983). For them, the very distinction between "public" and "private" spheres maintained the oppression of women by making power differentials between women and men invisible. This current study takes a somewhat different approach to this distinction that rests on *government* or public financing. While democratic participation and gender concerns can implicate the relations between individuals in space businesses, the concern here lies in distinguishing between explicit *government* and *non-government* owned businesses and their relation to the space field.

Private enterprise has been involved in American space efforts since their inception. Private contractors built many of the material components for the *Apollo* program (Dickens, 2009; Foust, Et al., 2011; Furniss, 2003). In fact, throughout the U.S. space program, private firms have played an influential role (Bekey, 2011; Dickens, 2009; Foust, Et al., 2011). Two legislative acts (and subsequent amendments) were instrumental in advancing the growth of the private space industry. The Commercial Space Launch Act (1984) paved the way for massive expansion in commercial launches. In his statement upon signing the legislation, Reagan (1984)

called it a "milestone" for the private firms, referring to commercial development as "an important component of America's space transportation program…that will contribute to continued American leadership in space" (para. 1).

The Launch Services Purchase Act (1990) created a similar climate for expansion by reversing NASA policies that monopolized all launch services. With the capability to launch satellites, the private firms were now able to provide launch services themselves. Private firms were no longer bound to NASA and government shuttles to get their satellites in orbit. The Act required NASA to purchase launch services to deliver payloads into space from private firms. Klerkx (2004) argues this has helped "kick-start the post-*Challenger* commercial-launch market in the United States" (p. 250). The private space industry was now poised to expand operations with a federally mandated client, NASA, to guarantee future business (Williams, 2010; Furniss, 2003).

With major legislative reforms allowing virtually unlimited expansion, the private sector increasingly became indispensable to space activities. NASA grew progressively dependent on private firms as essential services became available by the private sector (Hertzfeld, 2011). This dependence grew in tandem with the expanding public demand for telecommunications services and satellites, but also because companies began to "explore new commercial space markets, with suborbital and orbital space tourism now one of the leading areas of interest" (Foust, Et al., 2011, p. 104). As these companies expand, dependence on the private sector will likely continue. Bekey (2011) forecasts that continued expansion of private space activities will soon eclipse those offered by government programs. "By 2030 or beyond, the magnitude of these commercial programs will, in the aggregate, exceed all government space programs…The future commercial space program as a whole will represent a second industrial revolution—but this time, in space" (Bekey, 2011, p. 199).

A clear testament to the progress made by the private space industry is the recent commercial docking with the International Space Station (ISS). On October 8, 2012, Space Exploration Technologies of Hawthorne, Calif. (SpaceX) launched its *Dragon* spacecraft on a cargo mission to the ISS (SpaceX, 2012). Never before has a private individual or business developed and successfully launched a craft that connected to an object in space. SpaceX succeed in a task that can only be matched by the governments of the United States, Russia, and China (Chang, 2012).

To be clear, the motive for commercial operations in space is commerce and the accumulation of capital (Hertzfeld, 2011). In turning to space, some private firms imagine bountiful commerce in establishing orbiting hotels and other space tourism adventures. However, these offer little in the way of even near-term results due to the enormous costs (Dickens, 2009). For this reason, Marshall (1995) contends that private firms will seek to develop space primarily for resources and raw materials—"raw materials which on Earth are unavailable or have become enormously rare. From this perspective, development in space is based upon the search for resources" (Marshall, 1995, p. 41).

Private firms generally operate from a long-term perspective of growth. The promise of massive fortune in the future is prompting these firms to design and produce materials that will capitalize on coming resource shortages here on Earth. Private companies are now designing and developing technologies for lunar and asteroid mining. "Their investors are those seeing space resources as an opportunity to realize profits out of crises stemming from increasingly scarce natural resources on earth" (Dickens, 2009, p. 73). While tourism potentially offers profit in the short-term that profit pales in comparison to the virtually unlimited wealth that could be obtained by mining asteroids or the moon (Gary, et al., 2008; Williams, 2010).

The Final Frontier?

Many critics take issue with the idea of exploring space as "the final frontier" (Billings, 2008; Hietala, 2003; Lanius, 2011; Stephenson, 1995; Williams, 2010; Williamson, 1987; Young, 1987; Zinn, 2003). These critics take a historical perspective to interrogate the frontier metaphor and discuss its implications for future space activities. For them, conceptualizing space as "the final frontier" resurrects a legacy of imperialism and colonialism. They argue that uncritical expansion into space risks recreating the same mistakes of American history.

The idea of conquering new frontiers has inspired centuries of exploration into unknown territories. As more and more people came to the "New World" many moved west to conquer new lands and traverse many hardships, many came to believe that these pioneering efforts were fulfilling a "destiny" (Williams, 2010; Young, 1987). For Lanuis (2011), "In the process of movement, the Europeans who settled North America became, in their own eyes, a people imbued with virtue and justness, unique from all the others of the Earth" (Lanius, 2011, p. 202).

Those traversing the difficulties of conquest were justified by divine right in taking any action necessary to fulfill that destiny (Young, 1987; Zinn, 2003).

"Manifest Destiny" was the belief that the United States had a special destiny to expand outward across the continent (Lanius, 2011; Stephenson, 1995; Williamson, 1987; Zinn, 2003). Those pioneers of history that "conquered" the western "frontier" have been endowed with an almost mythological status in American culture (Williamson, 1987; Young, 1987; Zinn, 2003). Although these "pioneers" can be credited with literally paving the way for the development of the nation, frontier critics argue that this endeavor masks the underside of imperial conquest. These critics point to the frontier mentality as historically supported and reinforced by a self-referential belief system where "democracy" and "progress" were universalized and naturalized as inherently good (Billings, 2008; Stephenson, 1995). Frontier mythology "summoned in the popular mind a wide range of vivid and memorable tales of heroism, each a morally justified step of progress toward the modern democratic state" (Lanius, 2011, p. 202).

Indeed, many presidents, government officials, and advocates have employed frontier metaphors. For example, former President Bush (2002) argued that "We must choose between a world of fear and a world of progress…We must stand up for our security and for the permanent rights and hopes of mankind. By heritage and by choice, the United States of America will make that stand" (paras. 78-82). The power of the frontier mentality lies in its simplicity. Bush makes clear that it is the destiny of the United States to protect the world from all who would threaten "progress" and "rights" that undergird democracy. Frontierism became a naturalized feature of the American imagination that encapsulates a diverse narrative and distills it into a unified theme of pioneering expansionism.

Throughout the Cold War and beyond, American space proponents looked to outer space as the "next" or "final" "frontier" (Elias, 1990). Frontier critics argue that the "frontier" became a socio-historical construct that serves as a metaphor for nationalism and justifiable imperial conquest (Gorman; 2009, 2005; Lanius, 2011; Siddiqi, 2010). Space was not just the "final" frontier, but an *American* frontier (Lanius, 2011; Siddiqi, 2010). For Billings (1997), the frontier myth and the idea of manifest destiny are "mobilizing concepts" promoted by "America's military industrial complex" to advance expansionist or imperialist agendas (Billings, 1997, p. 188). Other critics point to these descriptions that rhetorically construct space in nationalist terms that romanticize the quest to conquer new spaces and assert "a powerful metaphor of

national identity" (Lanius, 2011, p. 202), serving as an exemplar for "the entire human race" (Siddiqi, 2010, p. 431).

Space advocates disagree and remain more hopeful. Fernau (2009) takes issue with frontier critics and their tendency to over determine the role of the frontier mentality as a destructive force in the future of space. Fernau argues that frontierism is an essential motivator for supporting the space program.

> This type of postmodern criticism of the ideals embodied in the frontier myth has power, but it does not invalidate the importance of the frontier as a rhetorical commonplace, particularly as it was used by Kennedy. The frontier commonplace has not lost all its currency with the American public…A consequence of Kennedy's grand frontier rhetoric was that the space program became viable not because of the inherent value of the scientific advances it brought but because of what it did for the country. If space was not believably a source of opportunity in the same way the frontier was imagined to be, why support a space program? (pp. 31-32).

Despite the tarnished history of frontierism, that history does not deny the potential role it could play in advancing space goals and support. Elias (1990) concedes the idea advanced by frontier critics that frontierism and Manifest Destiny were historically destructive in certain respects. However, Elias argues that frontierism can be redeployed in the name of survival instead of conquest.

> Although the idea of destiny has often been abused, it has served this country well…
> Now, the idea of destiny must be updated. We stand on the verge of a new phase of our national life, perhaps our greatest. The global crises of the environment, overpopulation, and nuclear war, our position as chief heir of a great expansionary civilization, and the world's need for our extraordinary skills propel us toward space (Elias, 1990, pp. 45-46).

If frontierism is to be redeployed, Fernau (2009) and Elias (1990) would tie it to the idea of survival. This potentially undercuts a substantial basis for frontier critics, who claim that the Western frontier was a target for expansion because settlers perceived it as something to conquer under divine right (Billings, 2008).

Perceiving space as a survival imperative changes the equation. There is no requirement to perceive space as a standing reserve for exploitation. For Pyne (2006) the next frontier can be different.

So there exist also among the spacefaring folk special themes that place interplanetary

exploration within the peculiar frame of a national experience. In particular, there exist

groups for whom extra-Earthly exploration is a means to perpetuate or recreate what they

regard as the fundamental drivers of American civilization. Space exploration offers the

chance to discover another New World and to erect a New America, a technological

New Jerusalem, beyond the tug of the Earth's gravitational field and the burdens of its

past. Only a New Earth can save the Old. Space colonization would remake William

Bradford's vision of Plymouth Plantation into a very high-tech city and transplant it to a

very distant hill (p. 8).

The most important factor here lies in the possibility to learn from past mistakes and remake the

future in a different image. Although Pyne and others remain optimistic, no particular vision of

the future is guaranteed. However, by analyzing the perspectives of researchers, engineers, and

analysts from space businesses—those most directly involved in the *doing* of space save

astronauts—scholars may begin to deconstruct and reformulate the paradigms that guide the

future of space exploration and development.

A Private Frontier?

With the rise of private sector space activities, illuminating and analyzing their

perspectives becomes necessary if scholars are to test the merits of frontier criticism. Very few

scholars discuss the private space industry and its connection to the frontier mentality or other

means by which to construct visions of space. Billings (2006, 1997) argues that the space

community, business and government, continue to employ the frontier metaphor as a justification

for space expansion. "The frontier spirit is still alive and well in the American space

community" (Billings, 1997, p. 187). However, these conclusions were not drawn from field

research, such as interviews or surveys. Instead, the work stems from historical documents and

theoretical applications of history. Moreover, "aerospace" does not encompass contemporary

space firms. These firms generally deal with terrestrial air flight. Larger "aerospace" firms, such

as Boeing and Lockheed, are major players in space development and research. However,

claims made about these firms may or may not encompass the many space businesses that have

developed over the last two decades.

The absence of perspectives from within the private sector puts researchers, policymakers, and the public at a disadvantage in analyzing the decisions that will shape the future of space activities. As we arrive at a critical juncture in the age of space exploration and development where the private sector is beginning to have a "transformative" impact on space activities, understanding the underlying assumptions and perspectives of those in the private sector can offer insight into that path (Chang, 2012, para. 2). A more robust study would account for new developments and perspectives from the many start-up companies and non-aerospace businesses that participate in space activities.

Rhetorical Attention to Space

While many of the critics mentioned (Williams, 2010; Billings, 2008; Stephenson, 1995; Williamson, 1987; Young, 1987) comment on metaphors, myths, narratives, and representations, most stop short of either a full rhetorical analysis or offering practical applications. Many focus less on communication than history or sociology, yet can provide valuable insight into the development of space visions and futures. Although a few works within the communication field discuss space in general, this research rarely goes beyond historical accounts to discuss the present or future visions of space. Few attempts are made to articulate how their conclusions can be connected to or explain the present and future space activities. For example, Williams' (2012) visual analysis of NASA images utilized on their online NASA History Timeline takes a purely historical perspective and does not offer insight or attention to future concerns of the space industry. While instructive from a technical communication standpoint, it does not speak to how NASA or the private sector conceptualizes space or how this visual analysis might connect with "visions" of the future.

Additionally, Suedfeld & Weiszbeck (2004) offer a thematic content analysis of memoirs published by astronauts. The authors detail the lives of astronauts and their personal relationship to space endeavors. However, this study addresses only past experiences of astronaut lives. There is no attempt to discuss the themes discovered in a larger context and implications for the present or future of space. Moreover, the extensive limitations discussed by the authors also limit its potential application.

Further, three major events and associated speeches represent the bulk of scholarly attention to space exploration from the communication field: Kennedy's speech *Apollo* mission

to the Moon, Reagan's eulogy after the *Challenger* explosion, and George W. Bush's address after the *Columbia* disaster.   However, only the Bainbridge (2006) and Keltner (2007) studies discussed below constitute major qualitative effort to articulate thematic representations of space exploration and development. The next three subsections discuss major speeches by Kennedy, Reagan, and Bush. It is important to note research on these speeches because they represent three major turning points in the American space program: the entrance of America into the "space race," the first major disaster of the space age, and the next major disaster that led to the demise of the Shuttle program (Jessa, 2010). These subsections are followed by a brief discussion of the Bainbridge (1986, 2009) and Keltner (2004) studies, which represent the primary research on themes and space exploration from the communication field that address themes of space outside of presidential speeches.

Kennedy Inspires a Nation

Former President John F. Kennedy's 1962 speech at Rice University announced an ambitious U.S. agenda to land astronauts on the moon and offered generations hope and inspiration. It signaled an unparalleled journey into at least the outskirts of a new "frontier". No communication-based study of space would be complete with reference to the speech that defined the beginning of the space age for America and a potent vehicle for challenging the Soviets (McCurdy, 2011).

Several authors have addressed the rhetorical influence speeches. Smith (2009) discusses the centrality of the frontier myth in mobilizing public support for the space program. He points to the role frontierism plays in creating hope. "The rhetoric had to manage a tension between the transcendent and the pragmatic; in the American heritage the frontier was not simply about adventure, it was also a place of potential" (Smith, 2009, p. 207). This sentiment rests on the assumption that the United States necessarily stands out (and above) all other nations. Operating from this perspective, the America space program was constructed under a vision of American supremacy in space and in geopolitics vis-à-vis the Soviets.

Smith's (2009) work offers context for communication researchers to understand not only the historical significance of the speech, but also a powerful text that communicates a vision of the future. The specific role of mobilizing public support is instructive in understanding how communication is employed by institutions to affect social change. Presidential speeches play a

role in this respect by addressing national triumphs and tragedies. In terms of space, understanding how these speeches shape public understanding, as well as represent the official perspective of the national government, provides researchers with the context for analyzing the communication of an industry and human endeavor and how perspectives from the private sector might shape the future of space exploration and development. .

Jordan (2003) identifies three major rhetorical strategies at play in the speech: appeals to frontierism, manipulation of time, and a metaphorical connection between the travelling to the Moon as a means to fulfill the frontier spirit. In implementing these strategies, Kennedy employed "romantic and transcendent space rhetoric that sought to convince the American people that they should shoulder the burdens, accept the risks, and reap the rewards of this adventure" (Jordan, 2003, p. 210). However, this was a common tactic at the time, so it lacked the "same universally acceptable and unifying rhetorical force as the frontier" (Fernau, 2009, p. 11). The idea of transcendence and romanticism converge with Smith (2009). Jordan (2003) argues that the images present in Kennedy's speech connect with present policymakers, and the public. "Intentionally or not, policymakers and popular culture texts have called upon this rhetoric in the hope that it will enable them, like Kennedy, to evoke themes of noble exploration and wonderment and to make space exploration tangible to the public" (Jordan, 2003, p. 225). Identifying these visions illuminates how the themes present in Kennedy's speech continue to carry strong influence in the field and "resonate throughout the public imagination" (Jordan, 2003, p. 225). Moreover, Jordan connects the role of communication in shaping imagination to connect everyday public life to space. This enables "everyday people to feel a part of the project" (Jordan, 2003, p. 226). Not only a central question during the *Apollo* era, this bares importance for current endeavors in space in maintaining public support.

Beyond Kennedy's speech, the *Apollo* program and mission served as symbols of nationalist pride (Jorgensen, 2009; Lanius, 2011; Rushing, 1986). For Lanius (2011), the Moon landing translated into a quest for "mastery" over the new frontier, whereas the television broadcast further reinforced a romanticized frontier mentality, central to the construction of participants as heroes (p. 224). Nothing symbolizes this more than the visual image of planting the American flag on the moon. Gorman (2005) explains that the flag represents "the metaphor of conquest and unarticulated colonial aspirations of the Cold War antagonists. The use of a flag in this way is a widely understood symbol of claiming sovereignty over territory" (p. 100).

These studies demonstrate how communicative appeals to frontier themes operate to energize the public under specific paradigms that continue to influence policy decisions and future action. Keltner (2007) argues that this was a strategy to capture audience appeal, framing space as a romantic frontier provided the "kind of excitement that enables the American public to live vicariously through these characters" (p. 171). The mythology of pioneers conquering new frontiers unfolded before millions of television viewers, while simultaneously renewing faith in the space-based destiny of humanity and the United States. The continual replay of these images constructs meaning for the audience whereby the *Apollo* moon landing became engrained and naturalized by "the stories television continues to tell" (Keltner, 2007, p. 171).

Research on Kennedy's speech is particularly relevant to the current study. Marking the beginning of the space age for America, it was the initial spark that challenged a confrontation with the impossible: landing humans on the Moon. Moreover, many of the people working on space exploration and development today grew during the *Apollo* era and watched the Moon landing replayed across the television. For many, this continues to be a source of inspiration that propels them to imagine beyond impossible barriers to their visions of space to conceptualize a future where that vision can materialize (McCurdy, 2011).

Reagan Comforts a Nation

Eulogies are generally meant to speak praise of the deceased and comfort the survivors in keeping up the appearance of social reality (Dennis & Kunkel, 2004; Tobey, 1987). This is particularly true for presidents who address the public after a national tragedy. Comforting survivors and keeping up appearances intertwine in the maintenance of nationalism. A central role of presidents in times of trauma is to unify the nation (Dennis & Kunkel, 2004). Tobey (1987) explains, "For a nation, rightly, the president speaks in times of trauma to the collective need for reinforcement and to the human need to express grief and pain when a disaster of significance occurs" (p. 54).

Former President Ronald Reagan's (1986) *Challenger* eulogy stands out as an exemplar of presidential eulogies in embodying these concerns. Dennis & Kunkel (2004) argue that Reagan effectively utilized the rhetorical strategy of eulogies to unify and comfort the nation. "Reagan, a master linguistic developer of unity among the American people, fostered harmony among all survivors of the *Challenger* tragedy" (p. 722). Reagan's message was meant to

reassure the public that this disaster was not a deficit in American leadership, but a necessary evil that only free nations would discuss openly. This was important to reinforce the goals of the space program and maintain public support (Tobey, 1987).

Reagan (1986) made clear that frontierism did not end with the *Challenger* explosion. "We're still pioneers. They, the members of the Challenger crew, were pioneers" (para. 6). This allows Reagan to connect with the audience by constructing a collective "we" composed of pioneers. Tobey (1987) argues that the collective "we" constructed a collective national identity to give comfort in the face of national loss and symbolically connect that loss to the strength of American leadership in space. "The eulogy is a speech designed to pay tribute and reinforce common cultural values. In this way, the speech can be seen as coordinating social action by use of the symbolism of the American dream of conquest and adventure" (Tobey, 1987, p. 58). Part of that adventure requires service in the face of adversity.

Understanding space in the context of tragedy allows researchers to grasp both sides: *hope* represented by romanticized frontier imagery and humbling *tragedy* that must be remedied by new constructions of the future. Reagan's *Challenger* speech illustrates how a determined vision can overcome public apprehension and actually inspire new thinking toward a future in space. Moreover, it showed leadership in the face of a national tragedy. With such a devastating setback, far out goals such as colonies on Mars just seemed even more inconceivable. But Reagan spoke of the *Challenger* disaster as a challenge in itself—a challenge to be bold and continue on a path ripe with danger, but ultimately one of destiny. As such, it provides an important part of the overall picture, or narrative of space as a continuing human endeavor. By identifying how these visions of hope and tragedy are communicated, Tobey (1987) enables researchers to draw connections between past events and current approaches to formulate ideas about potential futures and new social realities.

Bush Informs a Nation

Dennis & Kunkel (2004) present one of the only published works offering rhetorical attention to former President George W. Bush's (2003) *Columbia* address, as part of a collection of presidential addresses. They note that Bush's speech lacks the transcendent rhetoric of Kennedy and Reagan, as well as their nuance in tone. Kennedy (1962) spoke of "new hopes for knowledge and peace," by utilizing these themes throughout his *Apollo* speech (para. 31).

Reagan's (1986) *Challenger* address began with humble remarks and defined itself as an act of "mourning" (para. 1). Instead of mourning, Bush (2003) framed the disaster simply as "terrible news" and a "great sadness" (para. 1).

Less than a year after the *Challenger* disaster, Bush announced his "Vision for Space Exploration" (NASA, 2004). This was an ambitious agenda that included new transportation vehicles and a lunar base to name a few. Bush's "vision" was articulated by NASA (2004) in a document that explained both the details and the motives for his new programs that promised to revolutionize space activities. Billings (2006) described Bush's new space vision as "not only a programmatic agenda for NASA and the United States, but a future for humanity in the twenty-first century" (p. 249). In this way, the metaphorical link between a national tragedy and a culturally engrained frontier mentality converge to construct a vision of space with necessary successes and failures, but ultimately one where humanity has little choice but to "break out into space" (Elias, 1990, p. 177).

Dennis & Kunkel's (2004) study of presidential eulogies illustrates the role of communication in the construction of imagination from yet another perspective. The noteworthy exception of Bush failing to appeal to transcendent imagery and themes illustrates the importance of those appeals in constructing a holistic vision of space. This study explains the connection between communicating a thematic understanding and the role of a national leader in inevitable times of tragedy as we progress into space. Recognizing only the communicative elements that foster inspiration would obscure the meaning and importance of those tragedies. By highlighting the tragic side of space, Dennis & Kunkel (2004) contribute to a larger understanding of the communicative approaches at play in constructing visions of space. This provides a more holistic basis for the researcher to begin addressing how these visions are constructed through themes. Other studies specifically address themes and representations of space to illuminate how imagination operates to communicate those visions.

The Bainbridge Studies (1986 & 2009)

Bainbridge (2006) conducted a survey of 1,007 students at Harvard University in 1986 to "chart the distinct goals well-informed people believed might justify a continued space program" (Bainbridge, 2009, p. 515). Bainbridge (2009) presented the quantitative results of this survey and compared them to analysis of NASA's (2004) *Vision for Space Exploration* "to assess the

current status of each of the main traditional justifications for the space program" (p. 515). The study found 18 broad goals for spaceflight that were identified as "near-term practical" and 16 "philosophical or distant" goals (Bainbridge, 2009, p. 515). These goals were thematically organized and further divided into subthemes to contextualize specific meanings of the data. Bainbridge (2009) also analyzed themes found in NASA's *The Global Exploration Strategy Framework* (NASA, 2006). NASA consulted with over 13 space agencies around the world to explain "why the global community believes we should explore space, how space exploration can benefit life on Earth, and how the moon can play a critical role in our exploration of the solar system" (NASA, 2006, para. 2). Bainbridge found six major themes and 23 subthemes, or individual objectives identified in the document.

The Bainbridge studies carry relevance for the current study. Both studies seek to "understand future motivations" and justifications for space activities through a thematic analysis (Bainbridge, 2009, p. 514). Moreover, they directly address future visions of space exploration and development, which is the central thrust of the current study. As such, the Bainbridge studies serve as topical and instructive examples for processing the data utilized in this study. In turn, this study supplements the Bainbridge studies (2006, 2009) by exploring perspectives on these issues emanating from the "private" sector that constructs the materials and operate services essential to space efforts. However, Bainbridge stops short of taking an interpretive lens in analyzing the results. Without this, the Bainbridge studies function as descriptive data sets that speak directly to thematic representations of space and how they are communicated to provide justifications for new action. A study by Keltner (2004) takes this next step to theorize about the effects of themes as they circulate and re-circulate throughout society to construct dominant conceptions of space (McCurdy, 2011).

The Keltner Study (2004)

Keltner's (2007) dissertation presents an extensive rhetorical study of the *Apollo* missions (1968 to 1972). The study addressed how the rhetoric and themes used to communicate space travel have changed over time and what that means for American culture. Keltner analyzes televised representations of the *Apollo* missions from CBS News coverage. The study focused on "discursive themes" and "narrative structures" pertaining to the *Apollo* missions from 1968-

1972. Keltner then turns to three additional sources of data (CNN, The History Channel, and PBS) concerning televised representations of *Apollo*, after the program ended (1973-2004).

Collective data from the two time periods (1968-1972 and 1973-2004) found four themes: nationalism, romanticism, pragmatism, and technology. Keltner's discussion of nationalist sentiments and romanticized representations of the *Apollo* missions are similar to those discussed by frontier critics. "Pragmatism" concerns the shift in NASA's rhetoric toward a more pragmatic discourse to justify skyrocketing costs. The final theme identified rhetoric on technology associated with *Apollo* and the infallibility of progress. These themes function to "help explain how the collective memory of *Apollo* has been defined through its televised representations…" (Keltner, 2004, pp. 20-21). Keltner's analysis serves as a more direct model of analysis than the Bainbridge studies. The primary difference lies in Keltner's multi-faceted rhetorical approach that sought to generalize the results to potential space activity in the future.

Keltner (2007) provides yet another aspect to the space puzzle: organizations. By analyzing the primary institutions relating to space, NASA, Keltner explains how the replication of specific themes becomes engrained in the public imagination. The idea of repetition indicates a need for researchers to consider how themes operate on a historical continuum to identify patterns of thought and convention that may continue to influence present and future actions in space.

Space Landscapes

Paradigms will have a definitive effect on shaping policies and practices as humanity proceeds into space (Billings, 2006; Gouge, 2002; Lin, 2006; McCurdy, 2011). They shape how individuals come to understand and address a given phenomenon. Space exploration and development are cultural markers, as displayed in nationalist sentiments during the Cold War. Gorman (2005) describes the space enterprise as a "cultural landscape" that "illustrates a phase in human history arising out of social, economic and cultural forces" (p. 102). Employed progressively throughout history, these cultural visions shape conceptions of national identity and how action will occur. "They become part of the stories that communities of people tell about themselves, stories that help define who they are and the things in which they believe…visions have a transformational effect, encouraging private action and public change" (McCurdy, 2011, p. 3).

Space advocacy constructs visions of the future that become circulated culturally and shape naturalized understandings of space. These cultural norms then determine what the future of space *should* entail (Gorman, 2005, 2009; Lin, 2006). How private space firms, policymakers, and scientists approach the topic of space necessarily influences the material manifestations of these cultural visions. Even as those visions become increasingly accepted over time, they can be reformulated to meet evolving cultural ideologies. "Space science priorities are not set by a computer; they are established by humans, in a social context. Human biases, emotions, and even history all affect those priorities" (Day, 2007, para, 19). Therefore, how the people who actually work to advance space efforts are uniquely important in understanding future priorities and potential developments.

Given the scant scholarly attention given to space and the absence of private sector perspectives, this study offers a "fresh start" in rethinking the mistakes of the past and shaping future action (Lin, 2006). This first requires bringing those perspectives to light and calling attention to the themes used to construct visions of the future (Billings 2006, 1997; Day, 2007; Marshall, 1999; McCurdy, 2011). Analyzing the imaginative constructions of space can illuminate the role of communication in formulating new social realities (Haiven & Khasnabish, 2010).

Communicative Imagination

Understanding how interviewees communicate their visions of the future requires that the researcher comprehend the process of conceptualizing those visions. This study builds on Engen's (2002) theory of the "communicative imagination" to analyze perspectives on space exploration and development. It investigates the role of imagination in the communication of those perspectives by identifying themes utilized to construct visions of space.

Definition and Application

Engen (2002) set out to define and offer preliminary application of his "communicative imagination" theory. The theory assumes that communication represents a sharing of meaning negotiated through subjectivity. Therefore, what people say and how they say it is fluid, which denies an inherently stable meaning of words or symbols. Mediating through different levels of meaning and interpretation enriches learning through critical thinking. Identifying how people

articulate and make sense of these words or symbols can reveal thematic patterns of that illuminate the paradigms that prefigure action.

For Engen (2002), the communicative imagination is something to be cultivated in the minds of students so that they "better understand and search more thoroughly the subjective layers of meaning present when human beings construct their worlds" (p. 53). His primary application lies in classroom pedagogy. However, this is more than a teaching method to spur critical thinking. It is more of "a worldview or way of seeing" where individuals "possess a *state of mind* making them especially attuned to both the significance and complexities of the meaning production process" (Engen, 2002, pp. 41-42). Engen explains that his concept lacks concrete definition, but the sum can be explained by its parts. He isolates four characteristics of "individuals with well-developed communicative imaginations": symbolic awareness, the narrative imagination, moral intelligence, and the feedforward impulse.

> Although inherently fluid and complex, the communicative imagination can be discussed as four interrelated components. Each of these components occupies a central place in the work of scholars from a variety of disciplines. Taken together, these four components work synergistically to form a way of seeing holding promise for effective and humane social interaction (Engen, 2002, p. 42).

Syngergistic by design, Engen's theory requires that a person embody all four components necessarily to have a strong command of communicative imagination. Engen (2002) explains that each is necessary to the other, yet offers little warrant beyond logical consistency:

> In order for one to be good at feedforward, to design context sensitive messages, he or she must first have the desire to engage in such activity (the impulse to do so), have a high degree of symbolic awareness and moral intelligence, and possess a well-developed narrative imagination (p. 48).

This study departs somewhat from Engen's theory to account for a more flexible interpretation of the four components identified. Moreover, there is no rationale provided for the requirement that individuals "must possess well-developed narrative imaginations" beyond the confines of attempting to understand someone else's perspective.

In contrast, this study offers a more flexible approach that accounts for varying degrees and qualification instead of a more rigid yes/no determination. This will allow researchers to draw on context to qualify their results and account for different situations. This involves

considering both quantity of components and the level of adherence (quality) of the components. For example, a person may embody all four components, yet relate to one of those in a superficial manner. In this case, the fact that the person met all four components became functionally irrelevant. However, if a person met only two of the four components, then researchers can confidently say that the communicative imagination may be present, but not in a strong, or developed form. As such, this application of Engen's theory of communicative imagination represents an attempt to refine the theory and add clarity for researchers.

Although each will be treated separately in chapter five, it is important to briefly discuss these four components and how they relate to the current study. "Symbolic awareness" refers to "being awake to the role of the symbolic in our everyday lives" (Engen, 2002, p. 42). How Americans reacted to the symbolic resonance of the Moon landing did not take place only at NASA and the White House, but in the everyday lives of the public as well. Engen (2002) argues that symbolically aware individuals identify and work through multiple levels of social reality with attention to how symbolic resources shape our understanding.

> Individuals possessing symbolic awareness have a sensibility toward their symbolic
> environments that warrants them being termed social detectives. As seen in the examples
> provided, these individuals actively examine their social worlds and develop an
> understanding of the symbolic forces building the realities they help create and in which
> they live (p. 43).

When sharing their perspectives, these individuals will account for alternative meanings and interpretations to the events they describe and do not accept for reality as presented. "In short, individuals possessing symbolic awareness see reality as a communicative process rather than some sort of cultural given" (Engen, 2002, p. 42).

Possessing the capability of "narrative imagination" means individuals are able to imagine yourself in someone else's shoes. Of course, this is much more than simply wondering "What if I were the President?" Exercising a narrative imagination demands actively taking on the perspective of another to "understand as fully as possible what life looks like and means to individuals in different social and cultural contexts" (Engen, 2002, p. 44). In the context of space, this may be seen in terms of interviewees taking on the perspective of the impossible subject. For example, taking the perspective of a space colonist is literally impossible because they do not yet exist. Hence, the space colonist is devoid of subjectivity. In this case, an attempt

to understanding that impossibility—the perspective of the future colonist—fills in that void to construct future possibilities.

Engen (2002) uses the word "moral" quite broadly. "Moral intelligence" refers to the degree an individual recognizes "their connections to fellow human beings. They recognize the remarkable power they have over the subjectivities of their friends, colleagues, family members, and even strangers" (p. 46) where "an emphasis on human connection and recognizing the significance of interaction stands at the center" (p. 47). The researcher will analyze the data to evaluate moral intelligence by drawing on specific references in the transcripts that make such a human connection.

Finally, individuals that demonstrate a strong "feedforward" impulse actively manage their messages to account for audience needs. This is important for creating effective messages that are received with clarity.

> Engaging in feedforward necessitates first realizing that different audiences often demand different message strategies and then possessing the ability to conceptualize messages that are likely to be effective with these different audiences…Ultimately a cognitive process, feedforward often manifests itself in the struggles individuals have deciding what is the appropriate method of communication in a given situation (Engen, 2002, p. 48).

Often times this can manifest itself in the form of verbal clarification upon reading audience nonverbal cues. But more developed feedforward skills actively anticipate potential misunderstandings. For example, the field of space exploration and development employs a host of acronyms. An interviewee with strong feedforward skills may decide to either omit uncommon acronyms, or use the full name and then the acronym: "I work at the Johnson Space Center in Houston, or JSC." This approach is effective when people of a specialized field convey their perspectives to an interviewer because it recognizes differences in experience and understanding that may impede communication. However, framed as "I work at JSC, or Johnson Space Center" allows the possibility for misunderstanding first, then seeks to correct that misunderstanding. Feedforward thinking works in anticipation of misunderstanding.

One other primary author discusses Engen's idea of the communicative imagination. Swartz, et al. (2005, 2008, 2009) extends application of the theory, yet takes little effort to refine or expand the theory. Swartz, et al. focus their application largely on normative legal reasoning

and advocacy methods to obtain legal rights. For Swartz, an appeal to the communicative imagination is a means by which citizens may overcome social alienation and begin to participate fully in democracy. Since Swartz, et al. do not develop the theory, this study will focus on the primary work by Engen (2002).

The Imagination as Process

This study works to refine Engen's (2002) theory of communicative imagination to account for flexibility in a variety of contexts. Moreover, this study argues that communicative imagination as theory lacks articulation as to what constitutes "imagination". Engen (2002) conceptualizes "imagination" as a capability or tool possessed by individuals. The author refers not to *the* communicative imagination, but *a* communicative imagination. Imagination means more than simple creative thinking. In contrast, this study refers to "imagination" as a process of mediating impossible social realities. Communicative imagination then refers to the relative capacity of individuals to mediate through multiple levels of social reality to envision the impossible. This study fills in meaning gaps within communicative imagination by conceptualizing what it means to *imagine*, or use one's *imagination* toward transforming social reality.

To further elaborate on the content and approach of imagination studies, the researcher turned to several sources arising out of social science and philosophy. Haiven & Khasnabish (2010) look at imagination not as an *object*, but as a *process* by which individuals use a linear time progression to "collectively map 'what is,' narrate it as the result of 'what was,' and speculate on what 'might be'" (p. iii). The authors argue that this plays an integral role in how individuals make sense of and seek to transforms social reality.

> We approach imagination as a process by which it is cognitive and corporeal, intensely creative and utterly mundane all at once…it is not merely reducible to "ideology" in any simplistic sense of "false consciousness" or "fetishism." Imagination represents a more rich, complex, agent-driven and ongoing working-out of affinity. It is a crucial aspect of the fundamentally political and always collective (though rarely autonomous) labour of reweaving the social world (Haiven & Khasnabish, 2010, p. iii).

More than simply the act of ideological convention, creativity, or desire, imagination as process speaks to how individuals operate from a conception of history, and then the present, on which

they construct imagined futures. The authors trace the concept of imagination throughout the history of philosophy and politics from Plato to Marx. Although their specific application to radical agents of social change, such as the Zapatistas, Che Guevera, and the Underground Railroad, lies beyond the scope of this study, it is instructive in describing the function of imagination as a means for interpreting themes that span a similar linear progression of time.

Paulsen (2010) takes a similar perspective to the imagination, but focuses more on defining the distinction between imagination and *radical* imagination. If imagination proceeds change because "you can't create something you can't conceive of," then the difference lays in the idea that imagination begins in experience (Paulsen, 2010, p. 33). For Paulsen, experience is where "the conditions of possibility are shaped and determined. But this is not a mechanistic determination, and it cannot be complete: if imagination were wholly shaped by experience, we'd of course be little more than automatons, drones going about our daily work" (p. 33). Such an experience-based approach lends itself to interpreting results from qualitative interviews. Each interviewee in this study drew on their personal and professional experiences as a lens by which to gage and respond to questions asked by the researcher.

Two works merit attention for their direct application of imagination studies to visions of space. McLeod's (2003) thematic analysis of popular music and imaginations of outer space details how rhetoric and imagery in promoting ideologies and perspectives that seek to escape social alienation here on Earth. Such imagery combines with auditory influences, such as drum and bass, to construct mental spaces that provide an "artificial escape from social reality" (McLeod, 2003, p. 253). For McLeod, "rock, pop, dance and hip-hop music's use of futuristic space and alien themes denotes a related alienation from traditionally dominant cultural structures, subverting the often racist and heterosexist values of these genres themselves" (p. 253). This work is instructive for isolating and articulating rhetorical moves and themes within texts, especially those related to space. Like many of the other theorists that address themes and rhetoric in space, however, McLeod (2003) seeks only to describe and explain not theorize or offer practical application of the knowledge gathered.

Shukaitis (2009) offers the most detailed analysis of what he calls "imaginal spaces," or visions of the future and their role in the "shaping social reality" by constructing a collective understanding in the context of space (p. 99). These imagined spaces are constructed by thematic representations that influence the perspectives and approaches of space explorers and

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developers (Day, 2007; McCurdy, 1997). For Shukaitis (2009), understanding how space is imagined thematically can illuminate the nature and potential futures of space activities.

> The image and idea of space, through its circulation and elaboration within stories, myths, and artistic forms, composes a terrain of possibility that operates as an outside to the world as is. For even if it is not possible literally to step outside the world or existing reality, the capacity to imagine other possible worlds creates a terrain where it becomes possible to work towards the creation of another world…opening a space of possibility within the present through which other realities become possible (p. 99).

The very act of imagining a particular future makes that future a potential reality. Of course, there is no guarantee a desired future will become realized, but the process of imagination constructs the conceptual landscape on which designs for new spacecraft, colony habitats, and deep space probes are developed.

Only imagination can confront the impossible feats necessary for humanity to expand space activities. Even if these ideas are never realized, the very impossibility that the process of imagination challenges influences possible futures.

> …it may even be the case that the imaginal machine based around space imagery is made possible by its literal impossibility. In the sense that this possibility cannot be contained or limited, it becomes an assemblage for the grounding of a political reality that is not contained but opens up to other possible futures that are not foreclosed through their pre-given definition (Shukaitis, 2009, p. 107).

In this sense, there is a recursive relationship between imagination and space exploration. While imagination inspires people to transcend impossible limits, those very limits spark new modes of imagination. The interplay within this relationship can shed light on how interviewees make connections between past influences and particular visions of the future.

How the future of space exploration and development is constructed and represented are important to address (Shukaitis, 2009). Themes used to describe space exploration and development can inform the researcher as to possible directions of future plans to explore and develop space, as well as understanding the current status of space activity. These themes are analyzed through a theoretical lens of imagination studies in chapter four. Although not a codified theory or field, authors working within "imagination studies" often employ familiar communication concepts, such as rhetoric, myth, and narrative to analyze their results. As such,

communicative imagination aligns closely with both thematic analysis and the grounded theory methods utilized in this study. Imagination studies also conceptually fits squarely with qualitative interviewing to ascertain the contextualized meanings of interviewee perspectives on the status, purpose, and future of space exploration and development.

As the most specific and robust application of imagination studies and outer space, Shukaitis (2009) paper serves as an instructive model for analyzing the results of this study in the following chapters. This is used as a compliment to further refine discussions of the communicative imagination. Its primary value lies in articulating how themes of impossible futures function through imagination to construct new social realities. This understanding contributes to the development of communicative imagination as theory and provides direction for communication scholars in uncovering perspectives to transform social reality. The next chapter explains the methodological choices made by the researcher to address the research questions and central argument.

Chapter 3 - Qualitative Methods & Interviewing

Research on the "private space businesses" refers to qualitative interviews with persons employed by private space firms directly involved in the design and/or production of space materials or services. Many authors also refer to these businesses in the context of the "commercial" space industry, or more broadly, "aerospace" firms. The phrase "private space industry" was chosen for two reasons. The broad term "aerospace" includes terrestrial aviation and rocketry, which is beyond the scope of this study. "Private space businesses," "private space firms," and "private sector" were chosen to collectively refer to non-governmental businesses involved in space activities. As subsequent chapters will illustrate, these distinctions are themselves somewhat illusory, yet instructive in illuminating the interaction between different actors in the field.

This study utilizes qualitative interviews to better understand the communicative visions of space activities in the U.S. emanating from the private sector. Grounded theory methods (Charmaz, 2006, 2000) are employed in the research process. This represents a reflexive approach to research that involves continually developing and revising approaches to answer the research questions. As a compliment, thematic analysis methods are employed to aid in interpreting data gathered from qualitative interviews. These open-ended methodologies help revise and refine theoretical assumptions that guide the researcher through interpreting interviewee responses throughout the research process (Charmaz, 2006). This study argues that persons working in the private sector on services or materials for space exploration and development will demonstrate a strong, or developed communicative imagination when sharing their perspectives on space.

Three primary research questions are addressed in the study. They were designed to elicit perspectives on the fundamental purpose, current state, and future possibilities of space exploration and development. The first research question represents a broad-based inquiry into the motives and desired results of those involved in advancing space exploration and development. These should reveal how the respondents conceptualize space as an enterprise and the specific paradigms from which they emerge. The second research question addresses perceptions of the status quo. Understanding how interviewees conceive of the current state of

space exploration and development will aid researchers in articulating the perceived problems and barriers to further space activities. Finally, the researcher will address interviewee representations of future space activities. These questions address themes that arise within qualitative interviews with persons working in the private sector space industry. Identifying and analyzing these themes will allow the researcher to contextualize the "imaginal landscapes," or visions that may one day manifest themselves within social reality, that are constructed in the minds of space professionals (Shukaitis, 2009).

Qualitative Interviewing

A qualitative methodology was chosen for this study to offer flexibility in research and analysis. In working to uncover the perspectives of a given group of persons, qualitative methodology offers a different type of data that is better suited to gain insight into the meaning of themes, compared to strict quantitative measures (Braun, 2009; Charmaz, 2006; Lindlof & Taylor, 2002; Rubin & Rubin, 2005). "Fundamentally, qualitative researchers seek to preserve and analyze the situated form, content, and experience of social action, rather than subject it to mathematical or other formal transformations" (Lindlof & Taylor, 2002, p. 18). Instead of looking for trends within distribution frequencies, qualitative approaches offer a variety of research methods to investigate and gain insight into social constructions of reality and experience across the data set (Braun, 2009; Charmaz, 2006; Gubrium & Holstein, 2002; Kvale, 1996; Lindlof & Taylor, 2002; Rubin & Rubin, 2005; Tracey & Robles, 2010).

Qualitative interviews, in particular, are well-suited to uncover meaning and new understandings of cultural visions expressed within society (Gubrium & Holstein, 2002; Lindlof & Taylor, 2002; Warren, 2002). In discussing the influence of recent postmodern trends in interviewing, Fontana (2002) contends that the very nature of interviews has changed, arguing that "the interview can no longer be viewed as a discrete event, the straight forward result of asking questions and receiving answers" (p. 172). Moreover, interviews function throughout society as mediums between materiality and the subjective perceptions and experiences of individuals. "The interview itself has created, as well as tapped into, the vast world of individual experience of everyday life…Interviewing of all kinds mediates contemporary life" (Gubrium & Holstein, 2002, pp. 28-29).

Gubrium & Holstein (2002) refer to this as the "interview society" (p. 30). How we come to know and interpret the world around us occurs in the daily process of informal interviews. This both provides "a sense of who we are and the method by which we represent ourselves and our experience" (Gubrium & Holstein, 2002, p. 30). Culturally, we organize the data from those interactions thematically to formulate our own perspectives. For researchers, qualitative interviews aid in identifying and analyzing "themes of the lived daily world from the subjects' own perspectives" (Kvale, 1996, p. 27). As such, qualitative interviews serve a definitive and valuable purpose in illuminating how individuals view the world.

Interviews form the backbone of social science and communication research as well (Lindlof & Taylor, 2002). "Interviewing is *the* central resource through which contemporary social science (and society) engages with issues that concern it" (Rapley, 2001, pp. 303-304). Research benefits from interviewing in generating rich data that captures the subjectivity of experience. "Its ability to travel deeply and broadly into subjective realities has made the interview a preeminent method in communication and the other social sciences...some form of interviewing is employed in nearly all qualitative research" (Lindlof & Taylor, 2002, p. 170). Beyond the formalized questions in surveys which are directed at all respondents uniformly, qualitative interviews allow for flexibility and development of questions during the interview interaction (Kvale, 1996; Lindlof & Taylor, 2002). The subjective nature of experience demands such an approach to research.

Qualitative interviews and surveys differ as research techniques in terms of question standardization and preconceived categories found in the latter. Despite different approaches, qualitative interviews offer a flexibility that adds depth to interpretation of data.

> Whatever their flavor, qualitative interviews tend to adopt an interpretive stance to social reality, assuming that reality is not there to be straightforwardly recorded into prestructured answer categories. Thus, rather than working to create standardized questions and answer possibilities, as survey researchers do, qualitative interviewers focus attention on developing questions that will elicit rich, elaborated responses from interviewees (Tracey & Robles, 2010, p. 180).

Warren (2002) offers a similar description that highlights interviews as a process, by explaining that "the qualitative interviewer remains flexible and attentive to the variety of meanings that may emerge as the interview progresses" and "being alert to developing meanings that may

render previously designed questions irrelevant in light of the changing contexts of meaning" (Warren, 2002, p. 87). This speaks to the position of the interviewer as an agent in a communicative process that should remain adaptive and open to the evolving nature of qualitative interviews. In departing from strict quantitative methods, qualitative interviewing offers an effective approach to analyzing communication events. Qualitative interviews highlight cultural constructions that become circulated, naturalized understandings of the social world (Shuy, 2002). A central purpose of interviewing is "to *understand native conceptualizations of communication*. Interviews can explore the commonsense conceptualizations, or folk theories, of communication that circulate in society" (Lindlof & Taylor, 2002, p. 174). Those constructions are explored utilizing in-depth interviewing to identify and explicate how people view the world.

Gubrium & Holstein (2002) describe the centrality of interviews as "part and parcel to society, not simply a mode of inquiry into and about society" (p. 30). Beyond merely a method of inquiry, qualitative interviewing constitutes a process whereby the interviewer and respondent interact in a communication exchange that generates meaning. The "data" or "product" of such interviews is the result of a mutual effort, "the rhetoric of socially situated speakers" (Lindlof & Taylor, 2002, p. 172). Even those who traditionally employ survey methods recognize the cogeneration of meaning inherent in these interactions. "Both the interviewer and the respondent negotiate and work together to accomplish the interview, the resulting 'data' being as much a product of the interview participants' collaborative efforts as of the experiences under consideration" (Fontana, 2002, p. 172). Understanding these experiences requires that the researcher remains open to recognizing his/her own role, or roles, in interviews as a communication process. For Kvale (1996), "The qualitative research interview is a construction site of knowledge. An interview is literally an *inter view*, an inter change of views between two persons conversing about a theme of mutual interest" (p. 2).

Being aware of the cogenerative nature of interviews improves both how researchers engage respondents and the data gathered. Attention to the mutual role in meaning-making illuminates "alternative trajectories" for research that enriches understanding. "*Whatever the chosen analytic stance* on interview data, an awareness and sensitivity to *how* interviewees and interviewers collaboratively produce the talk will open up *alternative, often silent, trajectories* of thinking through and analysing the interview data 'we' gather" (Rapley, 2001, p. 317). Through

engaging in the interview process, interviewers and interviewees operate cogeneratively in the pursuit of "'deep' information and knowledge—usually deeper information and knowledge than is sought in surveys, informal interviewing, or focus groups, for example" (Johnson, 2002, p. 104).

Qualitative interviewing offers a particularly appropriate method for the current study, which seeks to uncover the constructions of space exploration and development emerging from the private space industry. These in-depth interviews offer the researcher insight into an emerging industry with strong influence over the future of space exploration and development. This qualitative approach works to illuminate the perspectives largely absent from public and scholarly view and how those perspectives may operate to shape social reality (Tracey & Robles, 2010).

Participants

Interview participants were selected as a purposive sample of employees within the private sector (Trochim & Donnelly, 2008). Lindlof & Taylor (2002) argue that "Interviews are particularly well suited to *understand the social actor's experience and perspective*. Researchers usually select persons for interviews only if their experience is central to the research problem in some way" (p. 173). Qualified participants were defined as persons employed by businesses that are directly involved in the design and/or production of space materials or services. As a population, employees of the private sector were targeted to solicit their opinions and perspectives on the purpose and future of space exploration and development.

Participants were contacted through a combination of email and telephone solicitations, as well as snowball sampling. Snowball sampling, in particular, was helpful in building on initial contacts "to reach populations that are inaccessible or hard to find" (Trochim, 2008, p. 50). Since the population in question is composed of *private* businesses, it fits this description. For the most part, space businesses have no particular need to advertise products, thus their perspectives remain largely inaccessible to the public. Even those commercial firms that do target the public, such as Virgin Galactic's proposed suborbital transportation, have perspectives that may not appear in advertisements.

Eleven face-to-face interviews were conducted in Houston, TX between January 30, 2013 and February 1, 2013. Interviews with the participants ranged in length from 40 to 75 minutes,

with the average interview lasting 52 minutes. The interviews were transcribed by the researcher, resulting in 51 single-spaced typed pages of data, as well as 32 pages of handwritten field notes. The researcher felt comfortable after analyzing the results that no further clarification or follow-up with the participants was warranted. Ideally, additional interviews would have been drawn from a variety of sites in Texas, California, Virginia, Alabama, and Florida, which are all major areas of private sector space activity. However, time and financial constraints prevented a more extensive research effort. Houston was specifically selected for this study because it is home to dozens of private space firms and comprises a representative sample of the private sector activities as a whole. The interviewees selected were project managers, engineers, company presidents and vice presidents, former NASA employees, industry lobbyists, and/or systems analysts. To maintain confidentiality, the specific firms, interviewees, and employment positions are not identified in the study. Because the sample group was taken from the same city, identifying a particular interviewee as a "vice president" unduly hint at the true identity of the interviewee. However, each participant had substantial experience in the field and provided a wealth of information in their interviews. Furthermore, all participants have been assigned pseudonyms for reference in this study.

Explanation of Questions

Qualitative interviews seek to elicit "interpretations, not facts or laws, from respondent talk" (Warren, 2002, p. 83). To account for the broad range of potential responses, Charmaz (2006) suggests that researchers "devise a few broad, open-ended questions" then focus and refine "interview questions to invite detailed discussion of topic" (Charmaz, 2006, p. 26). For this study, questions were conceptually divided into categories: *primary* and *follow-up* (see Appendix A for a full list of questions).

The first two primary questions are designed to establish the respondent's general orientation to and depth of their personal interest to the topic. For example, the first question asks "What is your earliest memory of space exploration?" in order to get the participant to "describe and reflect upon his or her experiences in ways that seldom occur in everyday life" (Charmaz, 2006, p. 25). In this case, the question focuses on asking respondents to reflect on their personal orientation to the topic. These questions build a foundation for later questions (6, 8, 9, 10, and 11) that address the present and future visions of space exploration and development offered by respondents. Forward looking questions, such as "Will humans ever

live in permanent space settlements?" probe the conceptual vision that gives rise to constructions of the future. Whereas the initial questions asked respondents to reflect back on past experiences directly, the later question involves imagining possible futures of space activities. Respondents were asked to "evaluate the current state of space exploration and development," as well as imagine what the future might hold in "50 or 100 hundred years". These questions were designed to elicit rich descriptions to address the importance and future of space exploration and development.

Questions three through five address the professional orientation of respondents. This group of questions begins broadly by inquiring about their decision to pursue a career in space exploration and development in general. It is followed by a more directive question that asks about the respondents' decision to enter the *private* space industry as opposed to NASA. What were the incentive(s) or motive(s) to pursue a career in the private sector? Question five then asks respondents if they always knew they wanted to be employed in the private space industry. This reconnects the respondents to earlier questions about their entry in the field and illuminates those choices. The goal here is to gain understanding of why and how they chose specifically the *private* sector and their place in future space activities. This complements later questions that pertain to the role of the private space industry in the larger endeavor of space exploration and development to address the research questions. In particular, questions seven and eleven ask the respondents to describe the potential roles of the private space industry in relation to the future of space exploration and development.

Overall, the primary questions were designed to guide the interview from broad descriptions to specific instances. These more specific questions are sufficiently broad to allow for flexibility in response, yet are directive in terms of guiding the respondent toward in-depth descriptions to elicit themes for analysis. These responses can also serve as a basis for returning to the original broad questions in a new light. The potential follow-up questions provide specific talking points that can add depth to the responses obtained by the primary questions. For example, the third follow-up question asks the respondent to identify potential "stumbling blocks to realizing" their "vision of a future in space". While this is somewhat broad, it builds on primary questions six through ten because it speaks to the overall goals and visions guiding the future of space exploration and development. Moreover, this question also probes for potential non-technical issues that shape space policies, agendas, and themes. These interview questions

work to elicit responses that address the research questions by probing different levels of involvement, interest, and experience. They gravitate around the central feature of both research questions: the purpose and importance of space exploration and development.

Grounded Theory Methodologies and the Interview Process

Grounded theory methodologies shape the approach to gathering and analyzing data from qualitative interviews for this study. Charmaz (2000) argues that grounded theory methodologies offer "qualitative researchers a set of clear guidelines from which to build explanatory frameworks that specify relationships among concepts" (p. 510). Both grounded theory methods and interviewing are "open-ended yet directed, shaped yet emergent, and paced yet intensive interviewing as a single method, it compliments other methods, such as observations, surveys, and research participants' written accounts" to provide a progressive understanding of the perspectives and constructions shared by the participants (Charmaz, 2006, p. 28).

Grounded theory methods aid in guiding the research process that involves continually moving "toward the development, refinement, and interrelation of concepts" (Charmaz, 2000, p. 510). At each step in the research process, grounded theory methods encourage the researcher to continually revise theoretical assumptions to better fit the conceptual design of the study as the researcher gains additional insight into the perspectives of the respondents. In this respect, the application of grounded theory methods "need not remain tied to positivist or objectivist assumptions. Rather, they may still study empirical worlds without presupposing narrow objectivist methods and without assuming the truth of their subsequent analyses" (Charmaz, 2000, p. 511). Utilizing the methods described by grounded theory aid the researcher in maintaining focus, yet providing flexibility in terms of redefining and redeveloping interview techniques and analysis. Charmaz (2000) outlines six strategies of grounded theory methodology:

> (a) simultaneous collection and analysis of data, (b) a two-step data coding process, (c) comparative methods, (d) memo writing aimed at the construction of conceptual analyses, (e) sampling to refine the researcher's emerging theoretical ideas, and (f) integration of the theoretical framework (pp. 510-511).

In particular, three are most instructive for this study: the simultaneous collection and analysis of data, a two-step data coding process, and memo-writing. These methods enrich research at every stage by illuminating new ideas and approaches to collecting, coding, and analyzing data collected through interviews (Charmaz 2006, 2000).

The *simultaneous collection and analysis of data* keeps the study focused on "creating analyses of action and process" in shaping "data collection to inform…emerging analysis" (Charmaz, 2006, p. 20). Instead of collecting a full set of data, *then* analyzing that data, grounded theory methods offer an open-ended approach that allows the researchers to refine interview questions, to "correct tendencies to follow preconceived notions about what is happening in the field," and "fill conceptual gaps" in the study (Charmaz, 2006, p. 29). A thematic analysis was then conducted as themes emerged from the data (Aronson, 1994). This involved "identifying, analyzing and reporting patterns (themes) within data. It minimally organizes and describes your data set in (rich) detail" (Braun & Clarke, 2006, p. 79). Identifying and interpreting themes speaks to the very purpose of interviewing: "to understand themes of the lived daily world from the subjects' own perspectives" (Kvale, 1996, p. 27). Such an open-ended approach extends to the coding process.

The *two-step data coding process* refers to the interplay between data and coding as a continual process of reformation. Charmaz (2000) recommends that researchers should code interviews as they are progressively conducted. Again, this is a departure from quantitative methods that apply preconceive categories of analysis onto the data. Grounded theory methodologies direct researchers to interact with "data and pose questions to them while coding them. Coding helps us to gain a new perspective on our material and to focus further data collection, and may lead us in unforeseen directions" (Charmaz, 2000, p. 515). Therefore, an initial review of transcripts was conducted as interviews occured to progressively develop and revise coding categories as themes emerged.

Successive *memo writing* was instructive in developing theoretical categories and codes as "new ideas and insights emerge during the act of writing" (Charmaz, 2006, p. 72). This involved field notes and written analysis done throughout the research process (Charmaz, 2006). Memos contained ideas for new questions to ask in successive interviews, analysis of common themes and ideas that emerge, coding revisions, and notes on potential directions for the discussion section. Writing memos also aided in sorting through the data into thematic

categories used in the final analysis of the transcripts. After all interviews were conducted and transcribed, the researcher conducted line-by-line coding to search for themes and strategies in each line of each transcript. Looking at each line allowed the researcher to remain focused in collecting and coding data (Charmaz, 2006).

Although grounded theory methodologies do not offer detailed prescriptions on data collection, they invariably contribute to an evolving understanding of the procedure and results. Qualitative interviewing in particular benefits from grounded theory methods, given the cogenerative meaning that results and the potential for very different experiences between interviews.

> Our attempts to learn help us to correct tendencies and follow preconceived notions
> about what is happening in the field…the combination of flexibility the control
> inherent in in-depth interviewing techniques fit grounded theory strategies for
> increasing the analytic incisiveness of the resultant analysis. (Charmaz, 2006, p. 29)

Grounded theory methodologies allowed the researcher to adapt to perspectives that spur new ways of conceptualizing the interview questions and subsequent analysis of data. As data collection continued, interview questions were refined to elicit depth, new perspectives, and categories of analysis. After all data was collected and interviews were transcribed, themes were clustered and analyzed to understand the paradigms and visions emanating from the private sector of space development.

Thematic Analysis

The coding process was further informed by thematic analysis, which lends itself to interpretive studies by providing a flexible process of identifying themes and drawing meaning. Boyatzis (1998) argues that thematic analysis is not "another qualitative method but a process that can be used with most, if not all, qualitative methods and that allows for the translation of qualitative data" (p. 4). This operates as a compliment to grounded theory methods in further describing the actual process of detecting themes, without being grounded in a particular theoretical framework (Aronson, 1994; Braun & Clarke, 2006). This buttresses the decision of the researcher to utilize grounded theory *methods* instead of a robust application of grounded theory writ large. Indeed, the major advantage of thematic analysis is its flexibility (Boyatzis, 1998). Because it is not tied to particular theoretical assumptions, "it can be used within

different theoretical frameworks (although not all), and can be used to do different things within them" (Braun & Clarke, 2006, p. 81). This allows the researcher to select the most appropriate interpretive lens for analyzing results, or constructing new theories to explain the data set. Although thematic analysis and grounded theory methods differ slightly, they converge on the basic steps involved.

A plethora of researchers across disciplines analyze themes to make sense of their research. However, few attempts have been made to clearly articulate a definition or guidelines for conducting such analysis (Boyatzis, 1998; Braun & Clarke, 2006). This becomes problematic for researchers in identifying what constitutes a "theme" and how to look for themes within a text. Boyatzis (1998) set out to accomplish this task, defining a "theme" as

> a pattern found in the information that at minimum describes and organizes the possible observations and at maximum interprets aspects of the phenomenon. A theme may be identified at the manifest level (directly observable in the information) or at the latent level (underlying the phenomenon) (p. 4).

Thematic analysis compliments grounded theory methods by adding depth of description to the process of identifying themes. The distinction between "manifest" and "latent" reminds researchers that within line-by-line coding, one should also collectivize disparate claims within the text to uncover underlying phenomena.

Braun & Clarke (2006) further develop thematic analysis by describing themes in terms of their function. They describe two essential parts that distinguish "themes" from mere ideas. This facilitates better use of grounded theory methods by providing specificity and guidelines for determining themes. "A theme captures something important about the data in relation to the research question, and represents some level of patterned response or meaning within the data set" (Braun & Clarke, 2006, p. 82). First, a theme must capture something important in relation to research question. The degree to which items met this requirement is called "keyness". In other words, keyness refers to the centrality of the theme in connection to the research questions. Secondly, themes must represent a pattern across the data set. However, themes need not be represented in every data item (or every interview). Prevalence does not necessarily mean number of references, because "a theme might be given considerable space in some data items, and little or none in others, or it might appear in relatively little of the data set" (Braun & Clarke,

2006, p. 82). Aronson (1994) offers further support for looking at themes as more than their readily identifiable parts.

> Themes are defined as units derived from patterns such as conversation topics, vocabulary, recurring activities, meanings, feelings, or folk sayings and proverbs… identified by bringing together components or fragments of ideas or experiences, which often are meaningless when viewed alone" (para. 7).

The measure of quantification obscures the goal of providing flexible tools of evaluation for researchers across disciplines and potentially masks latent themes that may become important when connecting themes to research questions (Boyatzis, 1998).

Aronson (1994) and Braun and Clarke (2006) further suggest that researchers organize themes in terms of "main" or "overall" themes and "subthemes". After researchers code the data, emergent, or "candidate," themes can be identified (Braun & Clarke, 2006, p. 90). From there, themes are separated into main themes and subthemes. Utilization of memo-writing (Charmaz, 2006) can be instructive at this stage because a primary purpose of organizing subthemes is to "obtain a comprehensive view of the information" that provides context for the main themes (Aronson, 1994, para. 8).

After preliminary themes were developed, the researcher recoded all of the interview transcripts. With a few weeks of distance from the texts, the researcher was able to approach the interviews with a reflexive perspective. This became tremendously helpful in finalizing themes and organizing the results. Those results are presented in the following chapter.

Chapter 4 - Findings

Much of what scholars and the public know about space arises from speeches by NASA administrators, Presidents, or other government officials. In addition, "big" events such as the *Challenger* explosion or Moon landing also present a strong influence on how the public conceives of outer space. The communicative choices made in these speeches has the potential to energize the public to (1) think about space and how it affects their daily lives and the future of humanity, and (2) lend their support as citizens to the enterprise of space exploration and development. However, the vast majority of work conducted in the service of space exploration and development occurs in the private sector via government contracts and independent endeavors. Scholars and the public rarely become exposed to the perspectives of those non-governmental firms, engineers, systems analysts, and designers most responsible for today's space advances. This chapter begins with a description of how the "private" space industry is conceptualized by the industry and follows with a discussion of themes emerging from the data. Through a series of interviews with persons employed in the private sector space industry, five themes emerged to illustrate such perspectives. Chapter five provides greater context for the uniqueness of these private sector perspectives and their theoretical implications.

"Private" Space

Although not treated as a theme in this study, the very idea of "private" space/businesses/firms, etc. is subject to contest. As such, it merits discussion to provide context for the entire study. One of the initial obstacles confronted by the researcher lay in terminology. The study was originally approached as a set of interviews within the "private space industry". However, it quickly became apparent that this phrase was confusing for those in the industry on several levels. Understanding the terminology of the field was essential in conducting the interviews to explore the background of the interviewees and to ask more precise and informed questions.

Unlike other industries, interviewees generally perceived the simple public/private distinction to be illusory. For most, "private" space is a misnomer. Tom referred to this distinction as a misleading representation of government-private sector interaction.

My definition is anybody who is not government. So I cannot discern between Space X

which gets almost 100% of their funding from the government and a Lockheed Martin

where they get a lot of money from the government but also do things on their own as

well. But the media and political bodies seem to want to make that discernment.

Funding was a central element among most interview responses. Many of the respondents

worked for companies that work on contracts from NASA and the Department of Defense

(DOD). Kevin distinguished between contractors and "independent" private firms.

In my opinion the private space industry would typically be characterized as an

organization who is conducting their own operations related to space generally

independent of a government contract. Okay. Since it is an industry in its infancy there

tends to be a mixture of private and government-based funding by a necessity.

Several interviewees discussed the cross-pollination of personnel between NASA and the private

sector. Many oscillate between working for the private sector and directly for NASA. Even

some of those from the private sector under contract with NASA actually work at NASA

facilities.

Sara's perspective builds on this by encompassing most of the work done in the field as

"public": "My personal perception is that all of us working at NASA or with NASA or on

contracts are part of that government public arena. This illustrates the futility in drawing

dichotomous descriptions of the industry as a whole." However, several interviewees mentioned

"commercial" space activities as distinct from "private" in terms of not being contractors, yet

clearly falling within the "private sector". These "commercial" firms do not work under

government contracts. Several interviewees pointed to plans for space tourism and the satellite

industry as examples of "commercial" space ventures. The interview process revealed that ten of

the eleven interviews were with firms that operate with a government contract. Only one firm

could be described as purely "commercial". However, this study refers to the "private sector" or

"private space businesses/firms" to encompass the breadth of interaction.

The following section details the study's findings in relation to the research questions.

Five dominant themes were uncovered during the coding process: leadership, inspiration and

public support, core motives, material benefits, and potential futures. All of the themes support

at least one of the research questions, with several themes supporting two. Subthemes are also

identified to provide greater context and aid the researcher in explication. Interviewee quotations

are identified by pseudonyms. Most of their answers assume the U.S. space program unless specifically noted. Moreover, the answers were contextualized by their relationship to NASA via contracts.

Theme One: Leadership

Interviewees generally conveyed a vote of "no confidence" for the U.S. space program from NASA to the President. The idea that a lack of "leadership" on space pervades NASA, Congress, and the White House was present in ten of the eleven interviews. The first research question asked about the importance and purpose of space. The leadership theme is important here for two reasons. Initially, interviewees often referenced their concerns about leadership in describing why space is important. Several interviewees qualified their answers with respect to the importance of space by reiterating their criticism of current policies and leadership. For example, Larry describes current NASA leadership failures with what he perceives as an fundamental goal of space activities:

> What I see NASA should be doing is really advancing space exploration for the future of man (sic). I think there's some talk but it keeps getting pushed to the back burner of…a base on the moon a permanent or semi-permanent base on the Moon that could be used either to learn how to live on another body with no atmosphere and develop processes for that and mine minerals from the Moon…I don't see it happening. That's really the problem with NASA's mission in general.

Larry connects the guiding principle to advance "space exploration for the future of man (sic)" to NASA's lack of vision concerning future missions and goals. This is further discussed in theme three ("core motives").

The second research question inquired about participant descriptions of the current state of space exploration and development. Although the questions varied slightly between interviews, each interviewee was asked to describe the state of space exploration and development in the United States. A follow-up question asked about this in global terms. Most interviewees answered both questions by describing the interrelationships between the U.S. program and international space actors, such as Russia, China, the EU, and Japan, or spoke about international space efforts only in the context of their relationship to the U.S. program.

Only Jessica stops short of explicitly commenting on leadership qualities. Instead, her description of the status of American space efforts focused on how people working on different missions or projects might perceive the state of space exploration and development. Jessica mentioned the commercial crew efforts being conducted at NASA.

> I think it really does depend on where they are. You know in talking with people who are working more on the commercial crew efforts they are very excited because they're working on new vehicles and they are just very passionate…My perception of that is that they are definitely hopeful that they can really produce these new vehicles and get the U.S. back to having its own capability and bring humans into space. And so there's a lot of strong beliefs that we can do this and that the U.S. should have that capability again.

"Commercial" in this sense is a misnomer. It simply refers to a new crew vehicle to replace the Shuttle, not primarily for commerce. But Jessica makes clear that not all sectors within the space community see a larger problem with leadership. However, the vast majority of interviewees paint a different picture. Most respondents characterized current government efforts to be both unsustainable and unproductive.

Great Nations Do Big Things

Uncovering and contextualizing themes can present a difficult challenge for researchers. Braun & Clarke, (2006), Charmaz (2006), and Boyatzis (1998) all point out that essential interpretive elements may not be explicit in line-by-line coding or readily apparent in each interview. In identifying subthemes to provide context for the leadership theme, the researcher first identified explicit references, then looked for these assumptions in correlative representations across the data set. One such subtheme held that "great nations" do "big things." The general sentiment across the data set indicated that the United States was retreating from its history as a "great nation" in space exploration and development. This contextually defines "leadership" as doing large-scale space projects. Tom makes one of the few explicit references to this idea comparing it to developments internationally:

> There is nothing exciting. We're not…Let's put it this way: Great companies do great things. And I don't feel like America's doing great things anymore. I think we're in a maintenance mode…but China's doing big things for China. India is starting to do big

things for India…America's not doing great things. So I consider space a big thing. It's not a plodding thing. It's something you set lofty goals and go for it.

These "lofty goals" are discussed in detail throughout the following Themes three through five. However, interviewees pointed to several past achievements and "lofty goals" as examples of "big things" related to space. Ten out of eleven interviewees mentioned the role of the *Apollo* moon landing as a significant event that would qualify as "big". Connor agreed with the central idea that the Moon landing was revolutionary, but argued that this "big thing" was no longer a testament to American leadership:

NASA now is…They have been sitting on their laurels for years. You know the guy in the spacesuit is the guy everybody sees. It's neat…Don't get me wrong. The moon landing and all that is one of the greatest achievements ever, of anybody, but that was 50 years ago!

Others pointed to the Hubble telescope and the International Space Station as important past achievements that testified to American leadership in space. Yet, many interviewees also indicated that America was losing its "edge" to rising space powers, such as China. Accomplishing some of the "big things" discussed in chapters four and five (returning to the moon or putting humans on Mars) were important to many interviewees for the purpose of leadership.

Three Degrees of Failure

The general agreement on the state of U.S. leadership in space across the data set manifests in three degrees of failure: stasis, retreat, and "death". Together, they clearly illustrate a perception that NASA, Congress, and White House policies are leading to the general decline of U.S. leadership. On one end of this spectrum is a perception that the status quo is in stasis. Interviewees generally felt that no real progress being made by NASA. John commented: "Well unfortunately it's kind of languishing right now. There is no clear direction with the cancellation of constellation…Building an Orion capsule, a heavy lift launch vehicle but the destination has not been defined yet." Sara offered a similar description: "I'd say right now they're caught in a political quagmire. It's…We're not going anywhere real fast…I'm still disappointed that Obama has not done more."

Other interviewee responses were more strenuous in their qualifications. Larry offered a candid perspective:

> Personally, I think it's a…to be blunt, it's a disaster. There's absolutely no leadership. I don't think there's good leadership in NASA or in Congress or at the presidential level. They've got no vision…no real purpose…They've got no real vision about where they want to go or what the future of the space program is.

While this speaks to a lack of leadership creating stasis, Larry later spoke about this in terms of U.S. falling behind in its commitments to the International Space Station partners as a sign of leadership retreat: "I am kind of disappointed and I don't know if this is on the subject that you want to talk about but we've been partnered since the early 90's on the International Space Station with a lot of other countries and we always treated them pretty badly."

Lastly, some interviewees constructed "death" metaphors to explain the decline of American space leadership. When asked to offer his perspective on the matter, "Martin" spoke about the current state as one of precipitous and ominous decline:

> Nonexistent. Dismal. Poor. Pick an adjective…Leadership. We need leadership in NASA…If we do not get new leadership in NASA and at the present…then 25 years from now we will have nothing in space I think we will set ourselves back so far that there will not be a space program. And that country will be too indebted and we will not be able to even scrounge up to $16 to 18 billion or getting today to do those sorts of things…You hear a lot of people talk about the cycles in the program. This one is different. This is not a cycle period. This is *death*.

Tom agreed in saying NASA was on its "deathbed." Sara employed the death metaphor to describe specific policy decisions and their implications future visions of space:

> I think with the cancellation of the Constellation program and the *death* of the Shuttle all at the same time it has taken the excitement out of the program…Even those of us that work on-site hand-in-hand with the civil servants we're all frustrated that there is not a vision and there's no real purpose and if we are going to be tied to a political entity that political entity needs to stand up and say I'm excited about the space program and here's what we're going to do and here's the vision…We are lacking that so it's were going nowhere fast.

Therefore, not only is the U.S. space program in a rut, but actually retreating from leadership. The "death" of the Shuttle program, a cornerstone of the U.S. program (Duggins, 2009), signifies a perception that the entire enterprise of space is an organic force where "leadership" is equated to "healthy". Subsequent subthemes will elaborate on this further.

Space is not a government priority

From the preceding discussion, it is clear that interviewees perceive the U.S. space program to be in crisis mode, or at least in the maintenance garage. Quite simply, it is difficult to project notions of space leadership if people in the industry note systemic failures at all levels of government. Interviewees generally felt that space was not a governmental priority. Many acknowledge that the current economic climate was not conducive to greater funding and expanded projects. This indicates that interviewees perceive the problem to be expressly directed toward leadership failures and poor prioritization. Although only found in a few interviews, the lack of a space cabinet seat at the federal level was perceived as such a problem. Tom made the connection between this and his perception of space as a low governmental priority:

> People don't realize that NASA is one of the smallest if not the smallest national agency that we have. And they don't even have a cabinet seat. There's no cabinet seat for NASA. So how important is space if none of the presidents who declared that we're going to go to Mars or we're going to the Moon ever felt that it was important enough to be a cabinet level position.

For Tom, a cabinet level position similar to the Secretary of State or the Secretary of the Interior would signify that space was a national priority and structural feature of American leadership. Sara agreed: "I think they really need to make the space program like some of the other federal bureaus where it's not so tied to the political climate and the political currents."

The second major indication that space was not a government priority concerned uncertainty. Given that Congress sets the budget on a yearly basis and presidents come and go in four to eight years, such uncertainty makes long-term efforts improbable and potentially impossible. John faults election cycles as a major contributor to a lack of space leadership:

> If it were an internal project like Constellation where it's U.S. only kind of thing it's up to the whim of Congress to keep saying year-to-year yes, no, yes, no…So there's always

a possible program cancellation. And all these space programs take decades for a lot of

planning building hardware, executing…So you're going through a number of

congressional cycles and presidents that can change the direction at any time.

For some, this creates a boom-and-bust cycle that can become, in Sara's words "frustrating" to say the least. Moreover, cyclical budgets have material consequences for the future of space exploration and development of U.S. projects. Larry described this as a Congressional problem in the context of faltering commitments toward the International Space Station:

> Not totally NASA's fault, but we would commit to things with them and then Congress would change their mind and budget, they were never considered. They were always told okay here's what's happening. At several times, it significantly impacted their plans and budgets. So we haven't always been a good partner. I think NASA has honestly tried but I think just the way things work how things have worked out with Congress and all they been forced to do things that that made them not a great partner.

The perceptions that a lack of serious prioritization in way of a cabinet position, ever-changing budgets, and short-term election cycles seriously undermine U.S. space leadership. For the interviewees in this study, this also contributes to, or displays, a lack of overall governmental vision for the future.

No Vision

The most widespread perspective on leadership among interviewees was that the government collectively has no clear mission or vision for the future. When Kennedy announced the *Apollo* mission that signified America's initial efforts to achieve leadership in the space arena vis-à-vis Soviet competition. Kennedy established a human mission to the Moon as a vision of human presence in space. This was to serve as a testament to the human spirit, but most directly, American leadership. Without such a vision, epitomized by large-scale missions like *Apollo*, the perception of leadership falters. Connor commented that "there is no real clear vision to me as to what do we want to do, where do we want to go, what are the things that can be accomplished?"

Interviewees noted that the government is lacking more than just clear goals, but a true vision of a future for human activities in space. Beyond simply outlining where we want to go, there was a perception in the interviews that NASA in particular has failed to theorize space futures. This is what Kevin means when he uses the word "mission":

I'm not thrilled with the way the government space industry is moving but it seems pretty clear to me that the government does not have a clear mission for where they're trying to go. It's really pretty simple. There seems to be nothing that's driving the human spaceflight program anywhere.

As imagination studies scholars remind us, constructing these mental futures is the first step in the process of materializing the promises of space and transforming social reality (Haiven & Khasnabish, 2010; Paulsen, 2009; Shukaitis, 2009). Martin argues that this was the case with the *Apollo* mission:

So there was always something, drawing you forward. A destination, and it's pretty much an axiom that the kinds of people that do this kind of work, you know the engineers, don't respond well to undirected tasks. We need a destination, a place to go. And within that we can to find solutions to achieve those goals but suggested technology development or technology development safe without a long-term path or an inspirational endpoints, human beings just don't work that way. And that's the situation we find ourselves in now.

Here, Martin points out a material consequence of lacking vision: inspiration. A discussion of inspiration and public support occurs more fully in theme two (Inspiration and Support), but if a driving force for engineers is the challenge of directed tasks, then the absence of such direction does not lend itself toward leadership or inspiration. Several of the interviewees were in fact private sector engineers working on NASA contracts and expressed frustration with the lack of clear government policy visions. John offered establishing a human presence on Mars as the next vision for American leadership:

I've always been one advocate for the journey by setting a target like Mars, not so much getting a person on Mars but the way to get there would be to get the public support, you get the technologies that help you get there, you may build a Moon base on the way…So the whole journey is where you reap the benefits of spinoffs new technologies. And you get public support by showing Mars because everyone likes to think of something further out there.

The most revealing feature here is the idea that the entire journey in the service of a larger vision is rewarding, regardless if the final goal is achieved. John cites several developments that may unfold as we technologically progress and develop the capabilities to land humans on Mars.

As a theme, "leadership" (or the lack thereof) featured prominently across the data set. RQ2 asked about interviewee perspectives on the current state of space activities. Most of the responses gravitated toward the American space program with which they work. Fundamental assumptions about the direction and purpose of the space program informed their perceptions. This was illustrated in the subtheme of "great nations do big things." The implicit assumptions here are that "great" things are "big" and that "great nations" are only great if they do "big" things with space.

Consensus?

The consensus on current government leadership failures found in this study invites a deeper question on the very nature of that consensus: *Why* do the participants share the same perspectives? Is this a fair assessment? Several potential answers emerged from the data. An initial reaction might isolate industry bias. Because all interviewees work in the private sector businesses, many of which rely on NASA contracts, it may be argued that the position of the interviewee merely clouds their assessment of the situation. They may be scapegoating the government to deny or refuse to acknowledge their own participation in the retreating state of the American space program. A few interviewees hinted at such culpability.

As discussed in the second theme, Jessica shared wishes for private sector firms explaining, "I wish we could do a better job communicating..." the value of space investments to the public. If public support is important for the space program as many participants felt, then the private sector must also do more to educate and energize the public. Martin spoke to the private sector's role in recruiting new graduates as a barrier to a vibrant space industry:

> We need leadership in industry to give back and bring in the fresh outs. We got ourselves
> in a bind where cost is everything. And so there's two approaches there. You can go hire
> the expert with all the experience and he (sic) can hopefully get your job than in a short
> period of time for a fixed price. The middle level people perhaps can't do that so there's
> a curve between where your cost of living versus the cost of getting the program done
> crosses somewhere in the middle age bracket. So then you've got the young kids coming
> out of school where they don't really know anything…They're going to take some
> mentoring for a while and that could actually make your project go longer and more

expensive to take advantage of them. So we tend to not pull from universities as much as

we used to as a career path.

This represents recognition of how private sector choices can operate as barriers to space advancement. Yet Martin describes the situation almost as a catch-22 for the industry and long-term future of providing even the capability with which America might exercise leadership on space. However, the trade-off in short-term efficiency may become the answer to long-term personnel sustainability.

Despite short-term project delays, greater recruitment of new graduates ("fresh outs") could alleviate the long-term problem of staffing. Several interviewees commented on the coming shortfall of qualified personal to maintain a robust space program. Mac furthers explains that "one of the challenges that NASA's facing is that guys like me that have been doing this for a long time don't have a bunch of young kids following them. So they're really short on trained scientists who are interested in being engineers and going into the space business." What is true for the private sector may also be true for NASA. Yet if the industry recognizes the need to recruit "fresh outs", then the trade-off of project delays might be preferable to long-term incapacity.

Therefore, even if NASA, Congress, and the White House satisfied the private sector call for better leadership and vision, the future will be difficult to obtain without a new generation of students motivated to seek advanced degrees. Greater recruitment efforts on the part of the industry could potentially provide that motivation. Because NASA and the private sector are dependent on new graduates as the next space workforce, better dialogue on mutual needs could design programs to sponsor or reward more students who pursue space related fields.

While better communication between NASA and the private sector might motivate students, the option that assumes the relative accuracy of their claims should also be considered. Interviewees certainly were not shy about sharing their opinions in vivid terms. Descriptors such as "abysmal," "languishing," and "dead" were all used to describe the U.S. space program and government leadership. To conclude that this simply occurs from bias overlooks the mutually dependent relationship between NASA and contractors. NASA needs contractors to build equipment and run projects that require experience. In turn, the contractors interviewed are largely dependent on NASA contracts. Moreover, interviewees went even further to explain

specific details lacking in leadership, such as not identifying a specific mission like returning to the Moon.

This discussion of consensus illustrates how particular modes of communication might inhibit understanding between actors. In this case, businesses within the private sector and their government counterparts could benefit from a mutual understanding of needs, objectives, and limitations. As mentioned later in chapter six, further study could investigate these issues in relation to private sector interaction with the Department of Defense (DOD) and the National Oceanic Atmospheric Administration (NOAA). Both organizations contract out space services and development to the private sector.

Theme Two: Inspiration and Support

RQ2 and RQ3 overlap in some respects. Perceptions of the current state of space exploration and development (RQ2) necessarily inform how one sees the future and works to shape social reality in that image (Haiven & Khasnabish, 2010; Saperstein, 1997; Shukaitis, 2009). The lack of solid grounding for support and inspiration both fails to mobilize the next generation of engineers and generate support from the public. Furthermore, theme two addresses RQ3 concerning interviewee vision of space futures by contextualizing initial inspirations, the role of inspiration in mobilizing students to pursue math and science, and generating political will among the public to support space efforts. In short, status quo approaches to space do not *inspire* public support and are largely outside of the public imagination. The following discussion and subthemes explore the role of inspiration in perceptions about the U.S. space program.

Past Inspirations

Interviewees were asked at the beginning of each interview to explain how they first became interested in space and what inspired them to seek a career in the space field. This question allowed the researcher to learn more about the interviewee as a person and their interests to contextualize responses. Moreover, the responses touched on both their personal motivation and what that means for inspiring the larger public. Two dominant trends of inspiration were uncovered: proximity to space facilities and the *Apollo* program.

Several interviewees mentioned growing up in the proximity of a space facility as a primary source of inspiration. The very fact that these interviewees grew up near the Johnson

Space Center in Houston, TX or the Kennedy Space Center in Cape Canaveral, FL means they were exposed to not only the sight of space launches, but to a culture of space activity. Jessica explained how proximity inspired her to pursue a career in the space industry:

> I actually grew up in Florida. I grew up just north of Orlando and having Kennedy Space Center at a nearby I think probably had an influence. My parents tell me that when I was very young I was immediately interested in space before I even probably knew what was going on practically in our backyard. So I think there was always an interest that I had by then growing up with Kennedy Space Center nearby being able to see Shuttle launches as I grew up and knowing that that was something that was taking place and was possible. I think that really helps knowing that that was a real path I could pursue.

Tom shared a similar experience:

> I grew up in Florida…so the space coast on the other side was always there. Dad took us over there early. And in college it kinda went away. And high school…we didn't think about it much there wasn't much going on. *Apollo* ended and we were really doing anything. But when we got to college my third or fourth year the certifying the Shuttle again. So I got excited again. We were doing something…Before then it was a big void. It was…there was *Apollo* and we all watched it when we were young and then there was nothing-- even though there was always working on its there is nothing in the public eye. And then we'd stop class and watch the Shuttle you know take off.

These responses illustrate the positive influence of general proximity to a space launch facility may have on a cultural willingness to pursue space. Kevin also mentioned proximity in discussing his influences: "The bottom line is that I grew up in this area [Houston, TX]…I came here…I grew up in the *Apollo* era. I wanted to work in space since I was a kid, or aerospace." Kevin's response touches on both proximity and excitement surrounding the *Apollo* program.

Several interviewees who grew up watching space launches during the *Apollo* era, (roughly 1967-1973) mentioned it as something that sparked inspiration. Sara connected seeing the *Apollo* landing on television as a child and her present career in the space field:

> I never thought I would work for NASA. I never thought I was smart enough [laughter], but I was really enthralled with the Moon landing when it was first televised. I was just a kid. I remember exactly where I was and I remember the moment with such clarity that was very exciting. So I would say that was definitely a highlight of being a child…being

able to watch that not fully understanding that but thinking that was really awesome. But prior to that not a lot of exposure to NASA other than what you saw occasionally on TV. So when I got this opportunity I was thrilled.

Even if not a direct cause and effect inspirational relationship, Sara was able to connect that perspective of childhood wonder to the opportunity of being offered a job in the space industry. However, even inspiration can go in cycles. If people do not perceive that "big things" are happening, then even basic interest can wane. Craig recalled his experiences:

I was a child of the 60's and growing up in the in the late 50's and 60's…then... America's space program was the most important thing for everybody it's hard to perceive that now I guess it would be sort of like the Internet and so like every young boy in the Midwest I aspire to be an astronaut and grow up and explore space then the 70s happened and with Vietnam and everything else most of the world including myself to a certain extent lost interest in…we sort of finished the *Apollo* program and there wasn't a whole hell of a lot going on…

Therefore, significant social and political events can substantially affect not only government support for space efforts, but can serve as distractions for the public imagination. Larry also commented:

I was in school during the *Apollo* and Gemini era. So they got me extremely interested I always as a kid wanted to be an astronaut. I went off to college about the time the space program was dying down significantly in '73 at the end of the *Apollo* program. I went through college and kind of forgot about it.

Despite the waves of interest, Larry and others seemed to indicate that growing up during periods of active human space missions set them on a path of educational and professional experience that propelled them to the space field. Later in the interview, Larry commented: "So it's kind of just growing up as a kid and being interested in the general space program and of course Voyager and the unmanned stuff they did later too."

Almost half of all interviewees commented on space events of their past, such as the Hubble Space Telescope and the International Space Station. These were discussed generally as fascinating, yet not quite *inspiring* per se. These interviewees often stumbled into the space industry from other fields. Some interviewees had family members with experience at NASA. Regardless, it became clear to the researcher that proximity and the *Apollo* legacy illustrate how

only an active space program can maintain public interest and inspire the next generation of space professionals and astronauts.

Outside of the Public Imagination

The ebb and flow of public interest was directly linked to major world and domestic events. And despite those interviewees who commented on proximity, the vast majority of people in America are not exposed to the culture of space. Outside of Florida and southeastern Texas, space activities largely remain outside of the public imagination. Only major accomplishments and national tragedies like the *Challenger* disaster tend to reach into the homes and consciousness of most Americans. This lack of direct connection to space operations and culture may be compounded by perceptions discussed earlier that the U.S. space program is in retreat.

Other factors such as the Vietnam War contributed to declining interest in space. These were discussed in some respect earlier. But once the *Shuttle* program began and interest resumed, many felt that space activities simply became routine. Without a guiding vision in place, Tom felt that space fell out of the public imagination:

> Usually there is a loftier goal that they want to contribute to be on the hard sciences…And I don't think we have that mechanism in place. We had it in *Apollo*…We had it in the Shuttle to a certain degree, but the Shuttle even got to be looked upon as a very routine, even though it wasn't ever routine, it got to be very routine…

This also speaks to the need for NASA to do "big things" to keep the public's attention. Tom went on to discuss this in terms of the history and cultural progression of the country:

> So we have not committed as a country to doing the hard things yet. So in the 200 years we had enough entrepreneurial spirit to do things to get the intercontinental railroad done even know that was a government contract as well, we had a lot of business people pushing because it was you know we would see commerce…So I would say were not committed to it.

Lacking the commitment and resolve to demonstrate measurable progress in space that still excites the public remains a potential problem for space advocates and policymakers. In this last passage, Tom identifies a potential dynamic between tapping into the entrepreneurial spirit as inspiration for new commercial enterprises to advance space exploration and development.

Two additional problems were identified as impediments to raising public support. Initially, interviewees generally felt that the public is unaware of how space benefits them in their daily lives. When asked how we can energize public support, several interviewees felt basic public awareness of their connections to space is an important goal. John indicated that this is a difficult task under current constraints: "It's hard to make that link of everyday uses about what's come out of NASA without getting giving NASA royalties to help pay for that stuff." This refers to legal restrictions that prevent NASA from advertising products it develops. Yet NASA and the space program in general are responsible for a host of products Americans use daily from old favorites such as Tang and Velcro to cell phones, solar power, aircraft de-icing, and host of medical procedures developed in the course of advancing a space mission or inspired by it. Connor spoke about the educational benefits that come from a robust space program and the need to connect this to public awareness:

> To me, to show the benefits of what that money is going to bring in real terms not just a rocket ship…I mean things that research and all the things that NASA does are part of your kid's education and of that goes away it significant portion of that you know type of stuff is not available to them anymore. You know directly, as direct as possible, show the benefits of that funding that it's not just going into space is going into other real things that can be used by people and will benefit people in the future.

Without understanding a direct connection to space, many interviewees felt that it would be difficult to convince the public. In the absence of large-scale missions, there is little to keep the public's attention.

Complicating matters is a prevalent misunderstanding of government spending on space. Although the precise budget figure varies, those cited by interviewees converged on $16-18 billion. However, interviewees feel that the public has a widely skewed perception. Sara explained that this is another important step in removing mental barriers to public support:

> Well, first of all what we need to do is clear out the misconception of how much money is spent on space because there's so little dollars that actually really go to the space program, which is…less than one percent of our budget goes to NASA…Which is shocking when you really think about it because it just sounds like so much money but I think things get blown out of proportion. So I think it would be great if there was a mechanism to communicate what portion of the budget actually goes to space.

Mac also discussed the budget as being less than 1%. For him, the current government standstill will be insufficient to obtain new goals. He explained:

> In Congress, in the House, and the Senate there is a general consensus that the amount of money that were spending on space exploration activities which is less than 1% of the annual budget of the country can be justified…The real challenge for NASA has been any time you set a destination like the moon, or you decide you're going to get a Mars or wherever, it is that you're going to go and you lay out the program to go there—it's 5% of the national budget. So what are they to do?

When Kennedy announced the *Apollo* program the budget was nearly 5%. At a time of economic turmoil, the job of convincing the public to support space is even more difficult. The perspectives offered in this study gravitate toward a similar conclusion.

Inspiration is Essential

A central feature of this theme is the assumption that space must be exciting and energize the public. This is true not only in terms supporting larger budget outlays, but to truly inspire a new generation of space enthusiasts. Jessica discussed the need for the space community as a whole to communicate better with the public:

> I wish we could do a better job communicating how much every dollar spent on space applications really does benefit all of those other areas and other interest. You know when you talk about the education I mean I don't know of many more things that are as inspirational to kids as things like spaceflight in terms of motivating them to study challenging subjects in school.

Jessica commented on the idea that space can be inspiration for education. With a diverse array of interests and distractions in a postmodern culture, something needs to truly *inspire* kids to succeed in math and science and lead them to a career in space. Martin agreed: "We're not doing anything right now that inspires kids and inspires the next generation of mathematicians or physicist or engineers." Kevin built on this sentiment and the need for inspiration:

> In the current society the interest in math and science and engineering has tended to fall off, so in order to recapture that future we have to do things today in the space worlds that will influence the young kids of today to be motivated to do those kinds of fields in order to support that exciting field because space.

This lack of motivation has material consequences for the viability of the space program itself. The current workforce is undergoing a shortage of Science, Technology, Engineering, Mathematics (STEM) workers. Murphy (2012) argues that America "needs a highly skilled STEM work force, not only to continue space exploration, but to compete and succeed in a global marketplace. We need to create this work force both in the short and long term" (para. 9). Without a new generation of driven students to pursue advanced degrees in these fields, several interviewees felt that the United State space program would fall even deeper in retreat.

Theme Three: Core Motives

A third dominant theme concerned the fundamental, or core motives assigned to the pursuit of space exploration and development. The researcher asked interviewees to isolate what they felt was the overriding justification to expand space activities. Theme three bears direct relevance in answering RQ1 and RQ3. Recall that RQ1 addresses the purpose and importance of space, while RQ3 concerns perspectives on the future of space activities. Analyzing core motives identified by interviewees speaks to RQ1 in a fairly straightforward manner, but also provides a deeper context for RQ3. The theme is inherently future-oriented and lends itself to the construction of imaginal landscapes.

Three subthemes were uncovered in this analysis: destiny and evolution, national security, survival. The first is anchored in intangible impossibilities, as opposed to concrete places to go or projects to accomplish. Perspectives assigned to this subtheme imagine an abstract landscape of utopian optimism (Haiven & Khasnabish, 2010). In contrast, the other two subthemes are pragmatic in nature. They identify material and existential benefits to pursuing space, especially in terms of a human presence.

Destiny, Evolution, and the Mystery of Life

Why are humans seemingly pushed biologically to expand our horizons and overcome seemingly impossible obstacles? This is a central aspect of space advocacy that frontier critics address: the assumption that to fulfill some divine destiny or to continue the process of evolution we must expand outward. Several responses fell within this scope of thinking (Williams, 2010; Billings, 2008). However, they do not necessarily conform to the particular conceptions of space indicted by frontier critics. This will be addressed in more detail in chapter four. One

interviewee captured this thinking quite well and reflected the ideas expressed in fragments across several other interviewees. Sara explained:

> Because I believe it is the future. It is good for innovation. It's a challenge. It's motivating. It's exciting. It can motivate our young people to study science and math and important areas of school that I think when we're not…when we don't have something exciting people tend to get lazy less motivated. So I don't quite have a sound bite, but I think for the future of younger generations to be excited about something new…exploration in a new frontier. So remember how exciting *Star Trek* was to us in those days? It's a new frontier.

Sara is not only talking about a physical place outside of the Earth's atmosphere when she says "frontier." She is also describing a *mental* frontier, or *imaginal landscape*, where people are motivated to achieve impossible goals and conceive of impossible futures.

Only one interviewee spoke explicitly to the idea of space as an integral part of human evolution. However, the comments here strongly resemble other justifications. Craig commented: "I think we are an evolving species…that we generally evolve toward the better than the worse. Without that we stagnate and as I said, we will just continue to organize scarcity. That's my view on the social cultural ethical justification for what I do and why do it." Evolution is a common theme within pro-space literature (Elias, 1990). Biological destiny provides a ready-made rationale for developing new technologies and seeking new destinations.

Jessica also spoke about space as a destiny for humanity, but also the growth of human knowledge and understanding:

> At the most fundamental aspect of it for me it is to benefit humankind and to benefit humankind not just in exploring new territories because, when we do that we learn about ourselves as well and as we do that we also create capabilities that we have not had before…trying to push forward to grow as human beings and as a whole planet and various cultures coming together and also as individuals. And there are lots of levels of that growth that happens because of space exploration and just development. So that growth for me is the fundamental aspect of it…is just pushing and learning about ourselves in the process. And as we push and as we learn and as we grow, that drives a need for capabilities that we might not have even realized would benefit us along the way.

For Jessica, space will not only bring new territories and material benefits to humanity, but propels us to evolve both as biological and social beings. Moreover, she highlights benefits to the journey itself: "create capabilities that we have not had before," "grow…as a whole planet," "various cultures coming together". The idea of unintended benefits and capabilities is also reflected in theme two (Inspiration and Support). Representations of unity from Jessica's response assume a natural gravitation toward a common goal, guided by destiny, biology, or both.

Illuminating how some advocates operate from fundamental assumptions, such as conceiving of space as destiny or the next stage in human evolution, allows researchers to better understand how interviewees initially shape their imagination constructions and develop over time. For the interviewees in this study, this was present in representations where humans reach an impossible future—destiny fulfilled. Of course actually achieving that impossibility is by its very nature impossible. But the purpose of imagination as a process of constructing social reality indicates that what happens along the way is itself valuable. The next two subthemes take a more pragmatic look the reasons America, and humanity in general, should take to the stars.

National Security Threats

The American space program was born out of political and ideological competition with the Soviet Union. Since that time, the military has employed space as a means for shoring up national security. Several interviewees discussed rising "threats" to both American leadership in space, as well as our terrestrial national security, as strong motivators for a robust space program. Tom explained the origin of the space program as one stemming from a reaction to political contestation:

> NASA has historically been a foreign-policy agency. I argue that basically because what started NASA? The space race. It was a political motivation. We didn't say, "Hey let's do these hard things." We said, "Oh my God the Russians are ahead of us." And China will get there.

When asked what it would take to get the level of public support necessary for big projects like Mars, Tom replied:

> Another space race, because the public follows where it's taken. And so we see a threat they can rationalize it and say yes we have to do it…So China is already fairly committed

to a lunar station by a 2022 that's not too far around the corner. So I think a space race is about the only thing that would really do it.

China figured prominently among those concerned with national security threats. With a dominant position in space, America can claim the "high ground". Absent this, a country like China may seize the opportunity to fill the leadership vacuum in space. Mac cited this as a primary motivation for a strong U.S. space program:

> The other reason to go to space is it's the high ground. And if I'm concerned about my military security we don't want anyone else up on the high ground. And to me that's the most compelling in the near-term reason to go to space and frankly I don't know what's happening there. I hope our government is doing something more than I know…because I can guarantee that the Chinese are doing more than what we know about. And if they get an opportunity they will use it.

This description explicitly constructs China as a threat. They are more than simply a rising power because they are up to something, even if we don't know anything about it.   Kevin agreed that China presents a threat to U.S. leadership, but tempered his assessment with a recognition that a strong space program is necessary to monitor rising threats:

> I guess one thing that we need to understand is you know the U.S. gets a little worried by people like China, Iran, and those other countries, you know, investing heavily in space. And we should. We need to understand why they're doing what they're doing and if they're going towards a militarization of space. China's space program is sponsored by the military, therefore they are militarizing space in general. So as we move forward I think we need to make sure that the U.S. government pays attention to that keeps our space industry alive and strong.

To this end, Sara would like to see more efforts aimed at cooperation with countries like China to head of paths to militarization and aggression:

> It would be cool if we could partner more with countries that we are not partner with today like China. Let's embrace each other and help move away from the contentious environments that we have today. But it takes time but I think we should definitely entertain that and keep working towards that to achieve our goals as a global community working together not being afraid of one another and be willing to fight one another.

Some may look at these words and see wishful thinking. However, the International Space Station may offer such a practical opportunity for such cooperation. Currently, China is not a member, despite rapid advances in space technology. But representations of China as a threat to American space leadership stopped short of constructing China as an inherent *geopolitical* threat. Because the military's reliance on space-based technology for everything from coordinating troop movements to enemy reconnaissance virtually guarantees a place for national security concerns in America's space program. However, several interviewees remained hopeful about the possibilities for cooperation.

An Insurance Policy for Survival

Most of the professed benefits of expanding into space involve the material benefits described in theme four (Material Benefits). However, those interested in planetary exploration, terraforming, and colonization sometimes conceive of space as an insurance policy against inevitable cosmic disasters and human extinction. This may come in the form of evacuating the planet or gaining a foothold in space to protect Earth from such disasters. The act of envisioning space as an insurance policy for human survival addresses RQ3 and the future of space exploration and development by imagining a potential future that signifies the end of humanity. In doing so, interviewees continue the imagination process and construct alternative futures that resolve existential risk. The most popularly cited risk to humanity was asteroids.

On February 15, 2013, a meteoroid exploded over the Chelyabinsk Region in Russia injuring over 1,000 people and causing widespread property damage (Yoemans, 2013). A meteor is the bright streak in the sky from a meteoroid burning up in the atmosphere. Although these are relatively common within a geological time scale, they usually pose little risk for large scale damage. However, several interviewees pointed to meteors, or more precisely asteroids, as potential motivations. Mac claimed:

> Other than just an interesting venture, which it is there's really no, there's really a couple of reasons to want to develop exploration kinds of capabilities. And one is sooner or later a meteor is going to come crashing down on earth and either destroy us all together or destroy huge numbers of people. We have no clue what to do about that and right now nobody really cares.

Unlike meteoroids, meteors, and meteorites (meteoroids that do not burn up in the atmosphere, but are not big enough to be considered asteroids), it is generally agreed that asteroids have the potential for cataclysmic destruction.

Interviewees spoke of space as a defense against asteroids in two ways. After the meteor exploded over Russia, the scientific community raced toward ideas for asteroid diversion. Should a large asteroid approach, space would offer both an early warning system and chance for initial defense. Larry commented on the chances of a major collision and the need for a means to divert oncoming asteroids:

> I think just from that point of view even though the odds are small we need to have some kind of plan…But if you look at the time between collisions like that occurring, it's nothing and getting something available in the next hundred years that would at least have a 50% chance of saving…of diverting something would be a good thing. So I think those are the two areas I'd like to see is getting a permanent human presence established on Mars and then some type of defense thing too.

At least for the near term, this imagines space as a defensive force to protect the planet. Others imagined a future where asteroids, comets, solar flares, and other cosmic threats could no longer extinguish human life. Martin elaborated on these ideas:

> I think the ultimate goals expressed by Hawking, you know even Carl Sagan that let's get off the planet spread our species around and give us an opportunity to survive should something really nasty happen here. Global warming you know…terrorism, and nearby star or blowing up and sending gamma rays are ways that could exterminate us…an asteroid…So getting our fault protection in place, if you will, by getting on to other planets is certainly one thing I like to see happen.

In addition to asteroids, Martin pointed to global warming and terrorism as terrestrial threats that pose an existential risk for humanity. In fact, a number of calamities on Earth could go wrong and wipeout our progression into space. The general assumption here is that colonizing outer space provides an insurance policy for the human race. Whatever befalls Earth need not destroy the species. This reflects the process of imagination in constructing new futures and social realities where we can escape inevitable tragedies.

Theme Four: Material Benefits

A common theme among space advocates is that the future can bring untold riches and benefits to humanity. When asked about why humanity should advance space exploration and development, most respondents listed a host of material benefits. These range from jobs and economic growth to new energy resources and medical advances. Although many of the themes presented in this study overlap to a certain extent as mutually reinforcing justifications for the other, theme four is distinct from themes three and five. Theme three focused on *fundamental* motivations that drive not only the pursuit, but the very idea of space. Theme five (potential futures) results from the raw imaginative process in response to a specific request for a vision of the future and the types of accomplishments that are possible. In contrast, the current theme comes in response to a series of questions about the particular benefits of space exploration and development in the context of how those benefits may be conveyed to and help the public directly. While some responses also touched on destiny, national security threats, and future accomplishments, the primary focus of responses coded as "material benefits" lies in how space may benefit life on Earth.

This theme assists in answering RQ1 and RQ3 concerning the purpose and future of space. Responses speak directly to the purpose of space in providing material benefits, such as resources and economic growth. It is relevant for answering RQ3 because the benefits for life on Earth described by interviewees construct a necessary part of their future vision. These responses draw on conceptions of a future tempered by an awareness of the present. This reflects a more short-term thinking among the public that correlates with the presidential and budgetary cycles criticized by several interviewees in theme one. Three primary subthemes contextualize the results: social spending trade-offs, economic growth, technological advances.

Social Spending Trade-Offs

Concern with the present and near-future framed many of the responses. This is also commonly discussed in the media in the context of public opinion. Although the vast majority of people polled have generally expressed support for the idea of space, theme two discussed how other issues may override that support when it comes to committing public funds. This dynamic was identified by several interviewees. Larry explained:

We have so many problems today relative to the budget ongoing wars and battles and things that there's going to be a lot of people that's their concerns and it's easy to understand. I mean if you're unemployed and can't support your family it's hard to see the benefits to the future of the world in doing that.

If the material concerns of life on Earth impede the imaginative process, then there is no reason for people to support space. Interviewees were later asked what needs to happen to convince people that space is a worthwhile goal when they are afraid of losing veteran benefits, education spending, Medicare, or other social programs as a result of higher spending on space? Like several other interviewees have suggested, Larry believes many of these issues will resolve themselves along the journey with unintended benefits:

You know people living in poverty, health issues, and all that you know…So there's always going to be the argument of "Why are we doing that? We can't fix everything here?" And while there's something to that…You'll never advance if you...Many other things you developed to help people and get them out of poverty and find a cure for cancer and other diseases you learned while you're developing…while you're doing something new…

This takes a long-term view that imagines a future where space operations are successful and we develop the capability to resolve concerns about health benefits or poverty.

An essential component missing from this analysis is the short- and near-term social realities that are necessary to first overcome. In order to arrive at a point where the benefits of space resolve social spending concerns, spending has to happen and that spending has to come from somewhere. However, Martin disagreed with the entire premise of social spending trade-offs and the need for public support, as reported in theme one (Leadership). In this sense, he diverges from the majority of interviewees that commented on the need for public support for space funding reported in theme two (Inspiration and Support). When asked what we could do to get the public on board and agree to support space financially, Martin argued:

Well first your basic premise is that we need to say yes and I don't believe that. I think the endowment we get every year of $16 -18 billion is perfectly fine if it was managed properly with good leadership. We can do incredible things with that…And existence of proof is if you look at the comparable budget string during the *Apollo*. There's no reason why we can't live on that endowment and go forward and do pretty incredible things.

Since NASA's budget has remained fairly steady over the last decade or two, there is reason to believe that $16 -18 billion budget will continue. If the problem with NASA is leadership, not the budget or public support, then concerns over social spending trade-offs are potentially mute. Since NASA's budget is generally less than 1% of the federal budget, either trade-offs are unlikely or already happening but on a very small scale.

Economic Growth

Theme two (Inspiration and Support) included several reasons why the public misunderstands space, both in terms of the budget and its benefits. Economic benefits are explored in this subtheme as an example of how current concerns influence future thinking. For example, the researcher asked Martin if he could identify the most influential arguments he could use before Congress to justify space exploration and development. Martin responded: "One word: jobs." Because the U.S. economy has been in either a recession or perpetual recovery mode for almost five consecutive years, it makes sense that legislators would find jobs a convincing rational. Martin explained that Congress listens to anything pro-jobs, especially in catering to voting constituencies:

> And that's really what Congress is looking at. Right now they're trying to keep the jobs in their district. The current configuration of the architecture with the space launch system and so forth keeps those jobs where they are at. So there's going to be any changes you have to show and demonstrate that this new architecture will keep that job appropriation about the same. And it can be done. Because that's what Congress is looking at – where are the jobs, how did those translate into votes, and how does my support for X program keep those votes intact?

But how exactly does space function as a job creator? For some, this is almost counter-intuitive given job losses from canceling the Shuttle and dismantling the majority of the *Constellation* program.

Of course, it makes sense that new missions and expanded roles would necessitate a larger space workforce. However, several interviewees spoke about how investments return to local, state, and national economies. This not only leads to general economic growth, but also fosters an economic climate conducive to job creation at the local level. John explained: "The amount of return on that investment is far more than any other agency. I think someone did a

study that shows it dollar for dollar. Dollars invested in NASA to come back fivefold over tenfold." Martin further elaborated on how economic growth for communities occurs from space investments:

> You've probably heard we get $7 back for every $1 we spend. That's where it comes from that trickle-down, to use an old word, of the investment in the community where those engineers are at and they are typically high paying jobs that are fairly well paid…But all that money goes back as taxes to reinvigorate the economy and move forward.

For these interviewees, investments in space create jobs and economic growth. However, that growth can come in a number of forms beyond mere commerce and investment. Intricately related to economic growth is the ever-growing needs for resources and energy.

Three interviewees mentioned the ideas of sustainability and scarcity in terms of economic and population growth. Mac indicated that current levels of population growth and the attendant stress on the planet would someday overstretch the Earth's carrying capacity:

> If I was taking the long view like I said either we are going to get destroyed by an asteroid or we'll make the planet unlivable…unsustainable…Population growth and the amount we're using on the planet is unsustainable. Having said that, I think the challenge is getting to a planet we could actually inhabit and that's going to be very difficult, so we better take care of this one.

This reflects the survival subtheme in theme three (Core Motives) and echoes concerns expressed by environmentalists for decades. However, it does not suggest how we might become more sustainable. Tom argued that the very challenges of space drive sustainability:

> Space drives efficient use of resources. We are in our planets if you believe any mathematical models there is a certain point where there is…sustainability becomes an issue. We have to do with more or less. Space is the perfect place to develop what that is because that's what it's all about. More with less.

Craig also spoke about resource scarcity and economic growth. For Craig, the answers to overpopulation and scarcity can be found in space:

> Space is also absolutely unlimited. I think Gerry (Gerard) O'Neill had a great phrase for our future: we can either organize scarcity or create wealth. Organizing scarcity is what we do right now is called wars and inequality and economic oppression. Creating wealth

is a win-win and what to me is most interesting is that some of the greatest advances in technology, and it's going to be like one billion people that have these in the next few years that are today gathering sticks. Imagine not just this but the access this gives those folks to intelligence, micro-lending, all kinds of things. That's a world changer. When you add the unlimited resources of space on top of that, that's the true world changer.

Craig makes an explicit appeal to imagination in his description of economic growth and scarcity. His response invites the researcher to join in on that imagination process to understand the magnitude of its message. These economic subthemes bear particular importance to RQ3 in identifying a social reality (overpopulation/scarcity) and imagining a future in space, which can then become a new social reality, or resolve the ills of the old reality.

Technological Advances

Although technological advances are mentioned substantially in theme five (Potential Futures), those represented here pertain to advances that directly benefit life on Earth. Several interviewees have already mentioned these in broad terms. Tom uses the example of heat-resistant ceramic titles designed for the Shuttle:

And taking it, you know the shuttle tile…and having a blowtorch on the other side and not feeling any heat is an amazing thing. So we didn't 25 years ago before the Shuttle. We didn't even go there. But we had to go there, so we went there. So now ceramics is finding its way into cars automobiles and jets. The Boeing 787 is mostly ceramic and carbon stuff…And that's what space does because it's hard. It challenges.

For Tom, the process of doing "big projects" creates new processes, skills, and products that function to improve life on Earth. These and other products are often referred to as "spin-off" technologies because they were developed along the path to accomplishing something completely different.

John connected the pursuit of space with earlier discussions of economic investment and education to illustrate the interrelatedness of space technologies and everyday life:

Every dollar that's being spent is not being spent in space, it's being spent here on the ground. Keeping the high technology fields going…It's causing the inspiration for education to get into higher learning in engineering in those kinds of things. So that you have the space driving the technology, as well as education, into folks growing up

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wanting to go into space that go into a different path get the benefits in different fields

from space, but you get the inspiration from the program of space.

This draws together a number of themes analyzed in this study. Many of the elements found within these themes converge on the basic idea that space should make life on Earth better for everyone. From new medical procedures developed on the International Space Station to combat bone degeneration in astronauts to advances in automobile construction, the interviewees generally agreed that investing in space exploration and development technologically benefits life on Earth.

Together, these subthemes provide context and clues to answering RQ1 and RQ3. They speak to the purpose of space as a tool to enrich life on Earth by providing material benefits and potentially unlimited abundance. Moreover, they construct visions of the future that not only look outward to space, but also reflect that expansion back onto Earth. This signifies a desire not to simply leave the "surly bonds of Earth" (Reagan, 1986) but to utilize the bounty of space for the good of life on Earth.

Theme Five: Potential Futures

Interviewees were asked to imagine possible space futures in 25, 50, and 100 years. The researcher inquired about possible missions and accomplishments. Some interviewees described what they desired to see, while others focused on the types of achievements that were pragmatic possibilities within the 100 year timeframe. As such, theme five most directly answers RQ3. Four subthemes were identified: near-term possibilities, return to the Moon, Mars, and general thoughts on colonization efforts. The last three are long-term goals, but perceived as possible or likely within the 100 year timeframe.

Near-term Possibilities

Regardless of whether you are travelling for business or pleasure, the trip usually seems to take longer than it *should*. Airplanes were faster than trains, which were faster than cars and horses. Technological developments have revolutionized the speed at which human beings traverse the planet. A number of the interviewees commented on using space as a means for travelling between points on Earth.

Suborbital transportation involves travelling just beyond the edges of the atmosphere (approximately 100 km) into space but does not achieve orbit. This process can be utilized to

travel vast distances in a very short amount of time. When asked about the future of space, Craig claimed: "In 50 to 100 years, I think there is no question we will be going from Houston to Tokyo doing sub orbital. What we think of sub orbital space, that, we'll be doing that." Being able to go from Houston to Tokyo in less than an hour would be a blessing for business travelers, but there are potential military applications as well.

Rockets meant for attacking enemies already achieve "suborbital flight". But the military could easily utilize "space planes" very similar to suborbital passenger planes to transport troops and materials. In response to a question about the future roles of the military in space, Mac explained:

> So I don't think you'll find armies going to space with one exception. Near Earth space is a very rapid transportation mechanism. So if you were if you were a superpower and you wanted to be able to get a small number of people from New York to Lisbon or Moscow to Peru in a very short amount of time by two hours or an hour and 30 minutes or something like that you might use space to get there.

This would revolutionize military transportation efforts. But the potential application for tourism was also mentioned.

Beyond fast travel on a space plane, several interviewees mentioned that tourism may become common in the near future, but even more so as we reach a 100 year future. They discussed the possibility of hotels in space and weekend excursions orbiting the planet. Kevin described his perspective on tourism:

> The other thing is I think we'll see more tourism in space as the price comes down and the people of more modest means can afford those things just like in and around the world cruise today. It's expensive, but a moderately well-off person could afford to do that if that was a life goal…if it was on their bucket list.

These visions of tourism and suborbital transportation are being researched and developed today. Therefore, the near-term goals expressed here represent a realistically probable future. Of course, a future with tourist trips to orbit will require developing the market for the service. Near-term futures were definitely less speculative and gravitated toward pragmatic achievements.

Return to the Moon

Ever since the *Apollo* astronauts landed on the Moon, Americans have wondered when we would return. Eventually, scientists, politicians, and critics began to question the efficacy of returning to the Moon and offered alternative goals and missions. However, most of the space professionals interviewed for this study saw value in not only returning to the Moon, but establishing some version of a human presence. Interviewees envisioned a lunar base within 100 years that would take human space efforts to a new level.

Establishing a base on the Moon was perceived by the majority of interviewees as a necessity, or at least effective, step in human space exploration and travel into the solar system. Several used the "stepping stone" metaphor to describe the utility of a lunar base, often in relation to eventual trips to Mars and beyond. When asked to envision possibilities within a 25-50 year timeframe, Larry explained:

> A base on the moon, a permanent or semi-permanent base on the Moon, that could be used either as to learn how to live on another body with no atmosphere and develop processes for that and mine minerals from the Moon, and also use it as a platform with much lower gravity where you could at least assemble vehicles or use as a base for assembling something in orbit and mining minerals for fuel for that and stuff.

Phil also described the Moon as a "stepping stone" to reduce launch costs and expand space transportation: "Then just think, you go there to launch facility on the Moon so you could piggyback or just fly a spacecraft to the Moon. Launch costs would be nothing because you don't have an atmosphere and I think that would be great…" Phil's vision of a lunar base is pragmatic in nature, focusing on the details and feasibility of the mission, as opposed to constructing a mental picture or broad vision of the future. Either way, his perspective converges with most of the interviewees in this study. Tom also saw returning to the Moon as a realistic "stepping stone" as well. In response to developments within a 50-100 year timeframe, Tom claimed:

> I think a Moon base will be established. I think the observations from the dark side of the Moon and what we do there will just be tremendous and successful…I think that the once we do dark back side of the Moon or on the Moon we'll have very easy access to L2 where we can construct massive vehicles and see where we go.

It is clear that the interviewees generally felt that a lunar base would be of tremendous value to any space program and the cause of humanity spreading out among the stars. At least within the 100 year timeframe, most grounded it solidly within their imaginal landscapes of the future.

Along these lines, three interviewees commented on the operational experience humans will achieve by establishing a lunar base. The experience of learning to live in space and overcoming all the obstacles to survival will provide the knowledge and capabilities to expand out to new colonies and deep space. Martin explained this in terms of the capability for a human mission to Mars:

> It's hard to envision taking on a bigger task with going to Mars until we take the smaller task on getting the operational experience on the moon. Say how do we keep the logistics training in place to keep that little outpost allies? And once we have those skills we can go on to Mars and so forth.

Jessica agreed and challenged the idea that we should go to Mars directly:

> I'm sort of in the camp that I do personally think going back to the Moon first is a logical thing to do to help us understand and deal with some of our issues before pushing on to Mars…Everyone looks at putting humans on Mars as one of the ideal Holy Grail things and things for us…So yeah people definitely make that argument…I am in the camp that it would be beneficial for us to learn more lessons, more locally, closer to home and use that platform because we can have the capabilities to do that. Then make sure that we address the issues that we really need to for Mars and that can enable us to get there.

With general agreement that returning to the Moon and establishing a base is both possible and probable, it is reasonable to conclude that the Moon figures prominently in the imagination of the interviewees. The focus on pragmatic choices toward a longer term goal indicates a drive to understand clear paths—identifying obstacles such as launch costs and figuring out ways in which they may be overcome.

Mars or Bust!

Most of the interviewees that envisioned a lunar base saw it as a necessary step on the way to a much grander objective: visiting and eventually colonizing Mars. Long-held as the home of "little green men" and other alien invaders from science fiction, many scientists and policymakers are considering the possibility of skipping the Moon and going directly to Mars.

Imagining a future where Mars is the primary (but not sole) endpoint signifies a willingness to suspend what many would consider the impossible in favor of pragmatic plans for overcoming obstacles in space.

Although most interviewees preferred a route to Mars via a lunar base for progressive learning, they felt that a human presence was inevitable. Jessica indicated that a human presence, either in terms of a visit or colony, would exist within 100 years:

> It's interesting even to think about that, because if you think back 100 years and to think how far we've come in that period of time. Is it a similar amount of progress that has been made or not? Of course, the ideal would be that we would actually have people at least having been to Mars and returned and the possibility of having established a colony or some sort of permanent presence there, having built off of a permanent presence that we did develop on the Moon first.

Larry also indicated that a Mars colony was possible and probable within 100 years:

> In the next hundred years we could have something established where people live on Mars. And I think once we did that, there's all kinds of science-fiction stuff that's not necessarily possible. It's never been done yet, you know, terraforming and things like that. We are already learning about Mars just roamed the unmanned missions and everything and all. I could see that realistically happening in the next hundred years *if we can make of the mind to do it*. I think it's honestly doable in 50 years. And between 50 and 100 years it could be a permanent base and people could live there as well.

Larry made reference to science fiction, the literary realm of imagination studies. It is no secret that the imaginative power of science fiction often precedes technological developments. For example, it is widely believed that cell phones were inspired by "tricorders" on *Star Trek*. The reference to science fiction denotes a willingness to mentally suspend practical limitations and imagine impossible developments as possible.

Colonies in the Sky

If there was an end goal to space exploration and development expressed by the interviewees, it was colonization. Even those interviewees who had not earlier (theme two – Inspiration and Support) described space as a destiny or necessary part of evolution indicated that a permanent human presence in space necessarily prefigured the imaginal landscapes

constructed. Regardless of the particular justification or details, all interviewees felt that impossible obstacles would be overcome and colonies would become a reality. Only a few said they doubted colonies would develop within the specific 100 year timeframe.

The preceding discussion of a lunar base and human presence on Mars indicates that interviewees imagined the possibility of colonization and a permanent presence in space. However, this subtheme collects sentiments about *living* in colonies. What will it be like to live in a space colony? Specifically, interviewees were asked "Can you foresee any social or cultural stumbling blocks to life in space settlements?" This question revealed much about how the interviewees conceptualized "stumbling blocks" and "life" in colonies.

Sara felt that living in space would require an entirely different dynamic than life on Earth:

> Living in outer space is such a different dynamic. It would be very different…a whole another way of life. Like right now you would not be able to go play outside. It's a whole different…You can't sustain you. So you would have to be learning a whole new way of life. And then until you are able to build colonies that may appear like you're living on the planet's and outside you would have these protection domes and things like that where you would just learn a whole different way of life.

In describing life in a colony, Sara takes an individual, or personal, perspective. That is, she envisions herself in the colony and how she would adapt. Her repeated use of the word "you" is telling because it doubles for "I" and not "we". This approach was unique among the interviewees. Every other interviewee who commented directly on social and cultural living in colonies spoke in broad terms, such as "people" or "we". Sara's comments reflect a genuine attempt to *imagine* living in a colony and finding new ways to overcome personal obstacles.

Jessica also felt that living in colonies would present challenges, but expressed optimism, explaining:

> In an ideal situation, I would hope that there would be more of that view that coming from the similar home planets that you know it might be a unifying situation. There are always differences, starting at individual differences within whatever gender or cultural background that people have, so you know I imagine that would be the same whether that's here or there. I guess I don't necessarily feel like space would make those things any more difficult.

In fact, Jessica hints at space expansion and colonization as a potentially unifying force to overcome difference conflicts:

> To me I guess, I'm more on the optimistic side that I would imagine it might make them more unified instead of pulling out more differences. I would imagine or hope that it would actually be a unification and unifying force…I think more like that is how I would ideally think it would go.

Jessica speaks directly through imagination here in highlighting the possibility of a utopian force that seemingly resolves fundamental social and cultural differences. If Jessica can see optimism in colony life, which would at least not escalate difference conflicts, and even may serve as a potential unifier across difference, then she has constructed an imaginal landscape whereby the impossibility of transcending differences is realized.

Sara and Jessica both construct these representations of colonization from their own experiences and perspectives. Neither interviewee gave the impression that life in space will be without conflict and strife. Yet their optimism illustrates how this theme answers RQ3. Colonization is represented as an endpoint for space activities within the next 100 years for the majority of interviewees. But despite the myriad of seeming impossibilities, Sara, Jessica, and several others envisioned a social reality whereby those impossibilities would be made possible.

Chapter 5 - Discussion

Scholarly attention to space exploration and development emanating from the communication fields can be enriched in terms of both theory and application. This is especially true in addressing perspectives of those working in the private sector as contractors or in commercial space firms. Because the private sector is overwhelmingly responsible for the research, design, production, and servicing of materials for use in outer space, how they envision space as an entire enterprise necessarily implicates how they conceive of and approach challenges and goals (Bormanis, 2010; Conover, 2011). This study reveals that persons working in the private sector generally display a strong command of communicative imagination to conceptualize the past, present, and potential futures of space exploration and development. This process enables individuals to richly describe the world and conceive of impossible realities and futures in space. The appeal to themes demonstrates this richness by providing support and context for analysis.

This study contributes to communication scholarship in several ways. As discussed in chapter two, this study builds on Engen's (2002) theory of communicative imagination. It not only extends application of the theory to a new area and different context, the study works to refine the theory. Describing "imagination" as a process fills in theoretical gaps within communicative imagination by conceptualizing what it means to *imagine*, or use one's *imagination* toward transforming social reality. This approach also lends flexibility to Engen's theory in terms of assessing degrees of communicative imagination, instead of that assessment residing in a yes/no understanding. Moreover, the application of thematic analysis helps clarify procedures and codify the approach as a useful tool for interpretive analysis across disciplines (Aronson, 1994; Boyatzis, 1998; Braun & Clarke, 2006).

Theoretical Implications

This study extends previous work on communicative imagination and contributes to theoretical refinement. Interview transcripts were examined to address three research questions to illuminate themes that shape the paradigms under which the future of space exploration and development might unfold. The use of communicative imagination in interview transcripts

speaks to the role communication plays in shaping social realities in a variety of circumstances. Persons working in the private sector on services or materials for space exploration and development employed communicative imagination in constructing their visions of the past, present, and impossible futures of space.

Engen (2002) described communicative imagination in terms of four components: symbolic awareness, narrative imagination, moral intelligence, and feedforward impulse. In each case, interviewee descriptions displayed a strong command of communicative imagination. The three research questions were designed to organize and isolate justifications and influences that operate in the construction of imaginal landscapes, or visions of impossibility and the future of space exploration and development. In answering these questions, the researcher was able to identify not only themes present across the data set, but support for the overall argument concerning communicative imagination.

Symbolic Awareness

Interviewees generally demonstrated strong command of symbolic awareness. Support was most prevalent in responses coded under Themes one and two concerning leadership, inspiration and support. In terms of leadership, interviewees pointed to clear plans, definitive goals, and consistency as markers. Interviewees identified accomplishments in space as symbolic of a "great nation".

Most interviewees mentioned the *Apollo* missions as a source of inspiration. They recognized that these missions, particularly the Moon landing, symbolized progress and greatness as a nation. Growing up as "a child of the 60's," Craig described this symbolism by its cultural effect: "America's space program was the most important thing for everybody." For Sara, the Moon landing broadcast of her childhood symbolized the impossible: "I never thought I would work for NASA. I never thought I was smart enough [laughter]." Larry spoke about the *Apollo* program as symbolic for all American space efforts: "the space program was dying down significantly in '73 at the end of the *Apollo* program. I went through college and kind of forgot about it." These interviewees discuss symbolic elements within their daily lives. Several talked about the cultural effect of these symbols and their decision to pursue a career in the space industry.

Theme five (potential futures) also contained substantial support for symbolic awareness among interviewees. Both the Moon and Mars operated as symbols of progress. Much like the *Apollo* program, a human presence on the Moon and Mars was perceived as symbolizing the highest achievement as a species. For most interviewees, securing our presence in space symbolized the pinnacle of human progress and development. Moreover, some even felt it was the endpoint of human destiny. A human presence in space, then, symbolizes the realization of human goals and desires.

Narrative Imagination

RQ3 investigated how interviewees described the future of space exploration and development. Understanding what another person may experience in a given situation can seem like an impossible task. In the context of narrative imagination, interviewees were asked to envision another person and their experiences. It is very likely that most of the developments they envisioned would not occur in their lifetimes. Their responses signify an attempt to imagine the shoes of someone in the future and speculate on their existence. For these reasons, interviewees can be seen as attempting the perspective taking approach described by Engen (2002) on the part of a future humanity. In doing so, they draw on their experiences to fill in the future colonist subject with a piece of themselves. This was seen in Sara's description of everyday life in future colonies where children "would not be able to go play outside." Going beyond speculation on what future accomplishments might occur, Sara's use of narrative imagination mentally puts her in a future colony to conceptualize *being* in space.

Moral Intelligence

The "emphasis on human connection and recognizing the significance of interaction" was present across the data set as well (Engen, 2002, p. 45). Interviewees described what space exploration and development would mean for communities, America, and the world. Craig, Jessica, Sara, Connor, and several others spoke about the importance of space in terms of how it might benefit humanity. When discussing material benefits (theme four), a few interviewees spoke about how space affects individual communities. Larry talked about how space would help people suffering from disease or living in poverty, as well as real concerns of people who perceive space is a choice of social spending. John discussed the difficulty in conveying the benefits of space in people's daily lives. Clearly, interviewees recognized the significance of

how their position as space researchers and developers touches the lives of the average person. Moreover, interviewees were seemingly guided by the assumption that space should do good things for people. Jessica and Larry saw the fundamental purpose of space was to benefit and advance the human species. Craig and Mac identified a survival impulse whereby space provides an insurance policy against cosmic disasters, such an asteroid collision. There was a general sense that interviewees were aware of how their work can affect the future social lives of their communities through jobs and education, as we all that of all humanity in providing a sanctuary against extinction.

Feedforward Impulse

The willingness or ability to feedforward was the most difficult to assess. After looking for textual references from transcripts on which to draw support, the researcher revisited field notes and re-listened to audio recordings of the interviews. This aided the researcher in ascertaining feedforward moments. Together, these moves identified just a few instances where the interviewee took explicit efforts to pre-emptively clarify acronyms, specific missions, or projects. However, there were very few instances when the interviewee took no effort to manage their messages. For example, Mac referred to purifying gallium arsenide (GaAs) in space and Martin used a host of acronyms for businesses and projects, all of which required further clarification. Most of the interviewees seemed to either not be aware that misunderstanding occurred or that their message needed adjustment without a prompt from the researcher. After such prompts, the researcher noticed a greater attempt overall to craft their messages in a way that would be understood by the researcher.

While not absolute or uniform across the data set, interviewee perspectives were shared with attention to symbolic interaction, perspective taking, and recognizing their interaction with others. Although "feedforward impulse" was somewhat lacking among some interviewees, this did not present complications for the interviewer or results. At the very least, it was determined by the researcher that interviewees made no effort to complicate or disrupt the communication exchange between themselves and the researcher.

This study illustrates the role of communication in shaping social reality by refining Engen's (2002) theory of communicative imagination. Seen as a process of drawing on past influences, conceptions of the present to imagine impossible futures, instead of a conceptual tool

at one's disposal, adds definition to the concept of "imagination" (Engen, 2002; Haiven & Khasnabish, 2010; Shukaitis, 2009). This allows researchers to understand the different ways in which interviewees (and others) mediate through multiple levels of social reality in greater depth. Engen's (2002) description presents a yes/no situation where individuals must meet all four components to determine *if* communicative imagination is at play. However, describing *how* individuals engage (or not) in the process of communicative imagination with varying degrees of interaction provides flexibility in analysis and application of communicative imagination as theory across disciplines. In considering both the quantity of components and level of adherence (quality) of the components, this approach allows researchers to draw on context to qualify the data and account for different situations.

Practical Implications

On a practical level, this study carries implications for three areas: private sector space businesses, government, and academic scholars. Understanding the perspectives of their colleagues can benefit private space businesses. Haiven & Khasnabish (2010) argue that "Our theorizations of the imagination lead directly to what sorts of strategies, organizations and tactics we consider effective" (pp. xxvii-xxviii). Even a snapshot of industry perspectives might be revealing for some firms. This is particularly true of commercial space firms that have (or will soon) an interest in convincing the public to buy their products and services.

Several interviewees expressed a need for better communication between government and industry. This study serves as a survey of industry perspectives that can inform government policies and priorities, as well as independent private sector initiatives. The results highlight industry needs and goals, which can allow NASA, Congress, and the White House to formulate policies that maximize mutual interests and progress in space.

This study identifies both theoretical and practical implications. It contributes to the evolving definition of "thematic analysis" as a method of interpretation for qualitative research across disciplines (Aronson, 2004; Boyatzis, 1998; Braun & Clarke, 2006). Additionally, better communication between government policymakers and the industry could facilitate greater cooperation and discussion to improve operations and advance space goals. There is potential for the results to highlight awareness of industry needs and goals, which can allow NASA, Congress, and the White House to formulate policies that maximize mutual interests and

progress in space. Private space businesses—contractors, consultants, and commercials firms—might better understand the perspectives of their competitors and colleagues. This study reveals a dominant perception that the goals of NASA and the White House should be substantially reformed to maintain American leadership in space and advance long-term goals. Understanding what drives designers, engineers, systems analysts, and CEOs in the private sector to pursue impossible futures toward these ends, can inform government policy.

Returning to the frontier

Much of the frontierist criticism of space relies on the logic that the past will inevitably repeat itself. As discussed in chapter two, these criticisms are not without their faults. Chief among them is the assumption that space will necessarily become just another battleground for imperial conquest and colonialism. Yet to assume the impossible reality of life in space is predetermined by history or conquest obscures the uniqueness of space and the possibility that we humans may have learned from past mistakes. This sentiment was shared by several interviewees.

The idea that space will be different was important to Craig. He pointed out that the charges of environmental plunder and indigenous displacement do not hold for space: "As far as we can tell, in this solar system, we don't have to kill anybody to access the resources of space. There is no indigenous population…" Nor are there environments to ruin. Although Craig argues that "creating wealth is a win-win," this sentiment is tempered by his assumption that all of humanity would share in this wealth. Moreover, he points out that in these historical examples, wealth was not truly abundant. For Craig, humanity can either roll the dice with private enterprise, or wither and die out on Earth.

Craig also takes issue specifically with frontier critics. Because there are no buffalo or indigenous life in space, as far as we know, Craig argues that space does offer a chance to avoid the mistakes of history:

> The frontier theory…I think it created a vibrant culture and if you could just ignore the fact of what we did to the indigenous population [sarcastically] it would be okay and I think that's the opportunity that we have and that will change people…everything from a physical level to a sociological level…

It seems for some critics, transcending the historical legacy of frontierism is an impossible future. For Craig, this impossibility is cause for optimism:

> A lot of people I've talked to this about think it's a fundamental question about if you think humans or if you're optimistic about humans or not. If you're pessimistic about humans you want to keep them on the planets you know. We ruined our planet. Why should we turn them loose on...Well that's a pretty negative mindset. We should just all die running out of stuff???

In fact, the assumed impossibility of transcending tarnished historical patterns lends itself to exercises in imagination to envision a social reality without those patterns and actively pursue it.

The alternative social reality of frontier criticism is one where we abandon space all together. Given inevitable cosmic disasters, that is not an option. Baum (2009) points to survival as a motivational force. "Without space colonization, the survival of humanity and other Earth-originating life becomes extremely difficult—perhaps impossible—over the very long-term" (p. 78). This refers to the myriad of potential disasters that could befall Earth and human civilization. Elias (1990) echoes these concerns in identifying space as the only refuge from "death row". In the face of looming catastrophes, Elias argues that we must get off the rock we call Earth in humanity is to survive in the long-term.

> Another non-market benefit of space exploration is reduction in the risk of the extinction of humanity and other Earth-originating life. Without space colonization, the survival of humanity and other Earth-originating life becomes extremely difficult—perhaps impossible—over the very long-term (p. 78).

Elias (1990) echoes these concerns in identifying space as the only refuge from "death row". In the face of looming catastrophes, Elias argues that we must get off the rock we call Earth if humanity is to survive in the long-term.

> We must get off this planet. The time has come to recognize that the planet Earth is no longer large enough to contain humanity. We stand heartbeats away from extinction through nuclear war. Our numbers increase geometrically, while land and food supplies diminish. Ecological problems are everywhere: air pollution, acid rain, topsoil erosion, water shortages…We resemble the condemned on death row…We cannot escape from our own death row to the comparative innocence of life before the modern age. We can only break out into space (pp. 176-177).

As reported in the findings and discussed in relation to communicative imagination, interviewee perspectives were rooted in the assumption that space will, or at least should be for the benefit of humanity as a whole and used to further the species. Therefore, this study illustrates a divergence in perspective from and rebuttal to the constructed targets of anti-space frontier criticism.

Chapter 6 - Conclusion

"Its [space exploration] strongest advocates view it as more than an outgrowth of technology, a government policy, or a commercial opportunity. For them, it is an effort to maintain the most salient features of national life. When faced with adversity, their natural reaction is not abandonment, but persistence" (McCurdy, 2011, p. 323).

This quotation reflects the sentiments expressed by interviewees from private sector space firms. Despite widespread frustration with structural barriers like short-term budget cycles that can cancel a space project years in development and a perceived lack of vision on part of the government, interviewees expressed at least some measure of hope for the future. Even those who offered the most pessimistic representations of current policies and future prospects were somehow compelled to continue their efforts in the pursuit of space expansion. What drives these researchers, engineers, systems analysts, and CEOs to continue that pursuit in the face of adversity? The results of this study suggest that interviewees were driven to continue their work in the space industry by larger paradigmatic orientations to the world and social reality. This study investigated the perspectives of persons working in the private sector, which includes both contractors working with government agencies and commercial firms, to advance space exploration and development.

Interviewees were asked a series of questions to elicit data on how individuals might become, or became, inspired by space activities, how they conceptualize current space efforts, and how they envision the future of space exploration and development. Within these questions, an express attempt was made to ascertain fundamental justifications for space as an activity to be pursued. From the data gathered, the researcher concludes that fundamental ideals, or paradigms, guide interviewees in continuing their hard work. After all, there exists huge potential gain from expanding efforts in space. In utilizing the process of communicative imagination, what seem like impossible barriers become challenges to space professionals. Kevin said it best: "Engineers thrive on challenges and problems to solve." In their capacity to imagine impossible futures, interviewees seek to transform social reality. They draw on the past to inform their understanding of the present and future directions of space.

Understanding the themes that guide interviewee perspectives is a timely effort given the rapid rise in private sector space efforts. How interviewees communicate their inspirations and

visions of the future is instructive in theorizing about possible directions in space activity. Because the majority of work done toward maintaining and advancing space efforts is conducted by the private sector, their perspectives illuminate the paradigms from which future endeavors may unfold.

This study could benefit from a variety of contributions. A greater sample size and a more diverse geography of locations for interviews would add depth to this study. However, the depth of the interviews and willingness of the participants to share their perspectives provided for a rich data set. Although beyond the scope of this study, future communication research could investigate a comparison between common justifications offered by NASA and other government officials and those emerging from the private sector. This could further highlight differences in perspectives, as well as illuminate access points for better government-industry communication on space. Given that the consensus of among interviewees identified lack of government leadership as the primary barrier to expanding space activities, comparing this with government perspectives on potential barriers may reveal a gap in understanding that can point to the need for better communication between government and the private sector. Addressing the imbalance in interviewees between space contractors and commercial firms might provide alternatives themes and justifications. Although they both fall under the umbrella of "private sector", they have different interactions with government and the public. Only one interview was conducted with a commercial firm representative. Confusion over industry terminology, discussed in chapter four, largely explains this imbalance. A closer balance could potentially change the overall tone and interpretation of the results. Expanding interviews to those areas of government that most directly interact with private space firms, including NASA, the Department of Defense, and the National Oceanic and Atmospheric Administration, would provide a more holistic picture of the interaction between the various actors and might explain how this interaction impedes or propels progress on space.

This study also could benefit from a more robust understanding of the interviewees themselves. Although the first question asked by the researcher in every interview concerned how the interviewee first became interested in space, no demographic data was recorded. Attention to race, ethnicity, sex, gender, and political affiliation may all reveal different themes and patterns of responses to enrich the data. Moreover, this information may further help to explain other factors found in the results. For example, what explains the consensus among

interviewees that NASA, Congress, and the White House lack leadership? Is the situation as simplistic as interviewees describe, or is there something on part of the private sector that contributes to the lull in space activities?

The results of this study present only a piece of the larger puzzle of understanding and influence the future of space exploration and development. As such, it could benefit from application of other areas of the communication field. Rhetorical criticism has much to offer in the way of understanding how individuals approach imagination and the process of communicative imagination. Detailed attention to myth, metaphor, and narrative could provide deeper insight into the circulation of understanding presented by enduring legacies, such as the *Apollo* missions. This is particularly true in terms of understanding the foundations of and potential application of frontierism. Organization communication scholars might offer approaches that explore communicative structures within specific private space firms or the private sector in general in comparison to those found in NASA. This could be especially insightful given the prevalence of employment cross-pollination.

Uncovering themes emanating from the private sector is instructive in determining the visions that inspire research and development of the tools that advance space exploration and development. Calling attention to thematic constructions can shed light on the paradigms under which the future of space exploration and development will evolve. This study utilizes grounded theory methods (Charmaz, 2006) and thematic analysis (Aronson, 1994; Boyatzis, 1998; Braun & Clarke, 2006) to collect and organize 11 face-to-face interviews. These interviews explored participant representations of space exploration and development. In refining and applying communicative imagine, it is the hope of the researcher that this work will offer insight into space as a field of future inquiry and the role of communication research in transforming impossible visions into new social realities.

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References

Aronson, J. (1994). A pragmatic view of thematic analysis. *The Qualitative Report*, *2*, 1-3.
   Retrieved from http://www.nova.edu/ssss/QR/BackIssues/QR2-1/aronson.html

Bainbridge, W. S. (2006). *Goals in space: American values and the future of technology*.
   Electronic Edition. Retrieved from http://mysite.verizon.net/wsbainbridge/system/
   goals.pdf. Originally published (1991) by State University of New York Press: Albany.

Bainbridge, W. S. (2009). Motivations for space exploration. *Futures, 41*, 514-522.
   doi: 10.1016/j.futures.2009.04.021

Baum, S. D. (2009). Cost-benefit analysis of space exploration: Some ethical considerations.
   Space Policy, 25, 75-80. doi: http://dx.doi.org/10.1016/j.spacepol.2009.02.008

Bekey, I. (2011). The Long-term Outlook for Commercial Space. In Lutes, C. D., Hays, P.
   L., Manzo, V. A., Yambrick, L. M., & Bunn, M. E. (Eds.), *Toward a theory of
   spacepower: Selected essays* (pp. 178-199). Fort McNair, Washington, DC: National
   Defense University Press.

Billings, L. (1997). Frontier days in space: Are they over? *Space Policy*, *13*, 187-190.
   doi: 10.1016/S0265-9646(97)00020-9

Billings, L. (2006). How shall we live in space? Culture, law and ethics in spacefaring society.
   Space Policy, *22*, 249–255. doi: 10.1016/j.spacepol.2006.08.001

Billings, L. (2008). Overview: Ideology, advocacy, and spaceflight—Evolution of a cultural
   narrative. In Dick, S. J. and Launius, R. D. (Eds.). *Societal impact of spaceflight* (pp.
   483-500). Government Printing Office: Washington, D.C.

Bormanis, A. (2010). Critical partnerships for the future of human space exploration. *The
   Space Review*, Retrieved from http://www.thespacereview.com/article/1667/1

Boyatzis, R. E. (1998). *Transforming qualitative information: Thematic analysis and code
   development*. Sage Publications, Ltd.: Thousand Oaks, CA.

Braun, V. & Clarke, V. (2006) Using thematic analysis in psychology. *Qualitative Research in
   Psychology*, *3*, 77-101. doi: http://dx.doi.org/10.1191/1478088706qp063oa

Bush, G. W. (13 September 2002). Threats and responses, address to the United Nations. *The*

New York Times (online). Retrieved from http://www.nytimes.com/2002/09/13/ world/threats-responses-bush-s-words-iraq-un-must-face-up-its-founding-purpose.html?pagewanted=all&src=pm

Bush, G. W. (1 February 2003). The space shuttle "Columbia" tragedy speech to the nation. Retrieved from http://www.americanrhetoric.com/speeches/gwbushcolumbia.html

Chang, K. (2012, October 8). Group sends first rocket under deal with NASA. *New York Times*. Retrieved from http://www.nytimes.com/2012/10/08/science/space/ spacex-to-send-rocket-holding-cargo-to-space-station.html

Charmaz, K. (2000). Grounded theory: Objectivist and constructivist methods. In N. Denzin & Y. Lincoln (Eds.), *Handbook of qualitative research* (2nd ed., pp. 509-535). Thousand Oaks, CA: Sage.

Charmaz, K. (2006). *Constructing grounded theory: A practical guide through qualitative analysis*. Thousand Oaks, CA: Sage.

Commercial Space Launch Act (1984). Public Law, 98 – 575. Retrieved from http://www.princeton.edu/~ota/disk2/1985/8513/851316.PDF

Conover, S. (2011, June 8). Private industry will lead space exploration. *Daily Barometer*. Retrieved from http://www.dailybarometer.com/forum/private-industry-will-lead-space-exploration-1.2380067

Day, D. A. (2007). Exploding moon myths: Or why there's no race to our nearest neighbor. *The Space Review*. Retrieved from http://www.thespacereview.com/article/999/1

Dennis, M. R., & Kunkel, A. D. (2004). Fallen heroes, lifted hearts: Consolation in contemporary presidential eulogia. *Death studies*, *28*, 703-731. doi: 10.1080/07481180490483373

Dickens, P. (2009). The cosmos as capitalism's outside. *The Sociological Review*, *57*, 66-82. doi: 10.1111/j.1467-954X.2009.01817.x

Duggins, P. (2009). *Final countdown: NASA and the end of the space shuttle program*. University Press of Florida: Gainesville

Elias, G. H. (1990). *Breakout into space: Mission for a generation*. New York: William Morrow and Company, Inc.

Engen, D. E. (2002). The communicative imagination and its cultivation. *Communication Quarterly, 50*, 41-57. doi: 10.1080/01463370209385645

Fernau, F. (May 2009). *Putting U.S. space policy in context: How have policymakers drawn on existing rhetorical commonplaces to legitimate U.S. space policy?* Capstone Project for Honors in International Studies, American University. Retrieved from http://aladinrc.wrlc.org/itstream/handle/1961/7793/Fernau%2c%20Fletcher%2c%202009 S.pdf?sequence=1

Fontana, A. (2002). Postmodern trends in interviewing. In Gubrium, J. F. & J. A. Holstein (Eds.). (2002). *Handbook of interview research: Context and method* (pp. 161-175). Thousand Oaks, CA: Sage.

Foust, J., Fuller, J., Frappier, C., Kaiser, D. & Vaccaro, D. (2011). History. In Lutes, C. D., Hays, P. L., Manzo, V. A., Yambrick, L. M., & Bunn, M. E. (Eds.), *Toward a theory of spacepower: Selected essays* (104-106). Fort McNair, Washington, DC: National Defense University Press.

Fraser, N. (1987). What's critical about critical theory: The case of Habermas and gender. In S. Benhabib and D. Cornell (Eds.), *Feminisim as critique* (pp. 31-56). Oxford: Basil Blackwell.

Furniss, T. (2003). *A history of space exploration: And its future*. Guilford, CT: Globe Pequot.

Gehrke, P. J. (1998). Critique arguments as policy analysis: Policy debate beyond the rationalist perspective. *Contemporary Argumentation and Debate, 19*, 18-39.

Gorman, A. (2005). The cultural landscape of interplanetary space. *Journal of Social Archaeology*, *5*, 85-107. doi: 10.1177/1469605305050148

Gorman, A. (2009). The archaeology of space exploration. *The Sociological Review*, *57*, 132–145. doi: 10.1111/j.1467-954X.2009.01821.x

Gouge, C. (2002). The Great storefront of American nationalism: Narratives of Mars and the outerspatial frontier. *Americana: The Journal of American Popular Culture (1900-present)*, *1*(2), np. Retrieved from http://www.americanpopularculture.com/journal/articles/ fall_2002/gouge.htm

Guba, E. G., & Lincoln, Y. S. (1994). Competing paradigms in qualitative research. In N. K. Denzin & Y. S. Lincoln (Eds.), *Handbook of qualitative research* (105-117). Thousand Oaks, CA: Sage.

Gubrium, J. F. & J. A. Holstein (Eds.). (2002). From the individual interview to the interview

society. *Handbook of interview research: Context and method* (3-32). Thousand Oaks, CA: Sage.

Habermas, J. (1974). The public sphere: An encyclopedia article (1964). *New German Critique, 3*, 49-55.

Hadingham, E. (1984). *Early man and the cosmos*. New York, NY: Walker & Co.

Haiven, M. & Khasnabish, A. (2010). What is the radical imagination? A special issue. *Affinities: A Journal of Radical Theory, Culture, and Action, 2,* pp. i-xxxvii. Retrieved from http://affinitiesjournal.org/index.php/affinities/article/view/70/174

Hertzfeld, H. R. (2011). Commercial space and spacepower. In Lutes, C. D., Hays, P. L., Manzo, V. A., Yambrick, L. M., & Bunn, M. E. (Eds.), *Toward a theory of spacepower: Selected essays* (pp. 83-103). Fort McNair, Washington, DC: National Defense University Press.

Hietala, T. R. (2003). *Manifest design: American exceptionalism and empire*, Revised Edition. Ithaca, NY: Cornell University Press.

Jessa, T. (2010, March 22). "Space shuttle *Columbia* disaster." *Universe Today*. Retrieved from http://www.universetoday.com/60400/space-shuttle-columbia-disaster/

Jorgensen, D. (2009). Middle America, the moon, the sublime and the uncanny. *The Sociological Review*, *57*, 190-203. doi: 10.1111/j.1467-954X.2009.01824.x

Johnson, J. M. (2002). In-depth interviewing. In Gubrium, J. F. & J. A. Holstein (Eds.). (2002). *Handbook of interview research: Context and method* (103-119). Thousand Oaks, CA: Sage.

Jones, E. M. (Ed). (1995). One Small Step. *Apollo 11 Lunar Surface Journal*. Retrieved from http://www.hq.nasa.gov/alsj/a11/a11.step.html

Jordan, J. W. (2003). Kennedy's romantic moon and its rhetorical legacy for space exploration. *Rhetoric & Public Affairs*, *6*, 209-231. doi:10.1353/rap.2003.0047

Keltner, K. A. (2007). From myth to metaphor to memory: A rhetorical analysis of televised representations of Project Apollo, 1968-2004. Retrieved from http://etd.ohiolink.edu/view.cgi?acc_num=ohiou1177848776

Kennedy, J. F. (12 September 1962). Rice Stadium moon speech." Televised speech. Retrieved from http://er.jsc.nasa.gov/seh/ricetalk.htm

Klerkx, G. (2004). *Lost in space: The fall of NASA and the dream of a new space age*. New

York, NY: Random House Digital, Inc.

Klotz, I. (2012, April 25). How asteroid mining could turn billionaires into trillionaires. *Christian Science Monitor*. Retrieved from http://www.csmonitor.com/Science/2012/0425/How-asteroid-mining-could-turn-billionaires-into-trillionaires-video

Lanius, R. D. (2011). History of civil space activity and spacepower. In Lutes, C. D., Hays, P. L., Manzo, V. A., Yambrick, L. M., & Bunn, M. E. (Eds.), *Toward a theory of spacepower: Selected essays* (200-230). Fort McNair, Washington, DC: National Defense University Press.

Launch Services Purchase Act (1990). 42 U.S.C. 2465d. Retrieved from http://archive.spacefrontier.org/commercialspace/lspalaw.txt

Lin, P. (2006). Viewpoint: Look before taking another leap for mankind − Ethical and social considerations in rebuilding society in space. *Digital Commons*. Retrieved from http://digitalcommons.calpoly.edu/cgi/viewcontent.cgi?article=1008&context=phil_fac

Lindlof, T. R., & Taylor, B. C. (2002). Q*ualitative communication research methods* (2nd Ed.). Thousand Oaks, CA: Sage.

Mann, A. (2012, December 27). The year's most audacious private space exploration plans. *Wired*. Retrieved from http://www.wired.com/wiredscience/2012/12/audacious-space-companies-2012/

Marshall, A. (1995). Development and imperialism in space. *Space Policy*, *11*, 41-52. doi: 10.1016/0265-9646(95)93233-B

Marshall, A. (1999). Gaining a share of the final frontier. In Martin, B. (ed.). *Technology and public participation*. 231-247. Wollongong, Australia: Science and Technology Studies, University of Wollongong. Retrieved from http://www.uow.edu.au/~bmartin/pubs/99tpp/index.html

McCurdy, H.E. (2011). *Space and the American imagination*. Washington DC: Smithsonian Institution Press.

McLeod, K. (2003). Space oddities: Aliens, futurism and meaning in popular music. *Popular Music, 22*, 337−355. doi: 10.1017/S0261143003003222

Murphy, A. (2012, August14). The STEM work force: An imperative for America's future. *Minneapolis Post*. Retrieved from http://www.minnpost.com/community-voices/2012/08/stem-work-force-imperative-america%E2%80%99s-future

National Aeronautics and Space Administration. (2004). *The Vision for space exploration*. Retrieved from http://www.nasa.gov/pdf/55583main_vision_space_exploration2.pdf

National Aeronautics and Space Administration. (2006). *The Global exploration strategy framework*. Retrieved from: http://www.nasa.gov/pdf/178109main_ges_framework.pdf

National Aeronautics and Space Administration. (2011). Beyond Earth: Expanding human presence into the solar system. Retrieved from http://www.nasa.gov/exploration/home/why_moon.html

Neal, V. (1994). *Where next Columbus? The Future of space exploration*. New York, Oxford University Press.

Pateman, C. (1983). Feminist critiques of the public/private dichotomy. In Benn, S. I. and Gaus, G. F. (1983)*. Public and private in social life* (pp. 281-303). (New York, NY: Taylor & Francis.

Paulsen, J. (2010). The uneven development of radical imagination. *Affinities: A Journal of Radical Theory, Culture, and Action, 2*, 33-38. Retrieved from http://affinitiesjournal.org/index.php/affinities/article/view/63/190

Pyne, S. J. (2006). Seeking newer worlds: A historical context for spaceflight." In S.J. Dick and R. D. Lanius (Eds.), *Critical issues in the history of spaceflight* (7-35). Washington, DC: National Aeronautics and Space Administration Office of External Relations, History Division. Retrieved from http://history.nasa.gov/SP-2006-4702/frontmatter.pdf

Rapley, T. J. (2001). The art(fullness) of open-ended interviewing: Some considerations on analyzing interviews. *Qualitative Research*, *1*, 303-323.

Reagan, R. (8 March 1983). Evil empire speech. Address to the National Association of Evangelicals. Retrieved from http://www.nationalcenter.org/ReaganEvilEmpire1983.html

Reagan, R. (30 October 1984). Statement on signing the Commercial Space Launch Act. Retrieved from http://www.reagan.utexas.edu/archives/speeches/1984/103084i.htm

Reagan, R. (28 January 1986). The space shuttle 'Challenger' tragedy address. Retrieved from http://www.americanrhetoric.com/speeches/ronaldreaganchallenger.htm

Rubin, H. J. & Rubin, I. (2005). *Qualitative interviewing: The art of hearing data* (2nd ed.). Thousand Oaks, CA: Sage Publications.

Ruggles, C. L. N. (2005). *Ancient astronomy: An encyclopedia of cosmologies and myth*. Santa Barbara, CA: ABC-CLIO.

Rushing, J. H. (1986). Mythic evolution of "the new frontier" in mass mediated rhetoric. *Critical Studies in Mass Communication*, *3*, 265-296. doi: 10.1080/15295038609366655

Saperstein, A. M. (1997). Complexity, chaos, and national security policy: Metaphors or tools? In D. S. Alberts & Czerwinski, T. J. (Eds.). (1997). *Complexity, global politics, and national security* (44-61). Washington, D.C.: National Defense University.

Shukaitis, S. (2009). Space is the (non)place: Martians, Marxists, and the outer space of the radical imagination. *The Sociological Review*, *57*, 98–113. doi: 10.1111/j.1467-954X.2009.01819.x

Shuy, R. W. (2002). In-person versus telephone interviewing. In Gubrium, J. F. & J. A. Holstein (Eds.). (2002). *Handbook of interview research: Context and method* (537-555). Thousand Oaks, CA: Sage.

Siddiqi, A. A. (2010). Competing technologies, national(ist) narratives, and universal claims: Toward a global history of space exploration. *Technology and Culture*, *51*, 425-443. doi: 10.1353/tech.0.0459

Smith, W. (2009). Conclusion: to infinity and beyond? *The Sociological Review*, *57*, 204–212. doi: 10.1111/j.1467-954X.2009.01826.x

SpaceX. (2012). October 7 announced as target launch date for space station mission. Updates. Retrieved from http://www.spacex.com/updates.php.

Stephenson, A. (1995). *Manifest destiny: American exceptionalism and the empire of right*. New York: Hill and Wang.

Stuckey, M. E. (2006). *Slipping the surly bonds: Reagan's Challenger address*. College Station, TX: Texas A&M University Press.

Suedfeld, P. & Weiszbeck, T. (2004).The impact of outer space on inner space. *Aviation, Space, and Environmental Medicine, 75*, C6–9. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/15267069

Swartz, O. (2005). *In Defense of partisan criticism: Communication studies, law, & social analysis*. Bern, Switzerland: Peter Lang Publishing.

Swartz, O. & Pestana, C. (2008). Communication, social justice and creative democracy. In O. Swartz (Ed.), *Transformative communication studies: Culture, hierarchy, and the human condition* (pp. 91-114). Troubador Publishing Ltd., London.

Swartz, O., Campbell, K., & Pestana, C. (2009). *Neo-pragmatism, communication, and the*

culture of creative democracy. Bern: Switzerland, Peter Lang Publishing.

Tobey, T. K. (1987). The Challenger eulogy: Reagan puts humpty dumpty together again. *Journal of the Northwest Communication Association*, *15*, 52-59.

Tracy, K. & J. S. Robles. (2010). Challenges of interviewers' institutional positionings: Taking account of interview content and the interaction. *Communication Methods and Measures*, *4*, 177–200. doi:10.1080/19312458.2010.505501

Trochim, W. M. K. & Donnelly, J. P. (2008). *Research methods knowledge base*, Third Ed. Independence, KY: Atomic Dog.

Urry, M. (2012, May 22). Private space travel: A new era begins? *CNN*. Retrieved from http://www.cnn.com/2012/05/18/opinion/urry-private-space-launch

Warren, C. A. B. (2002). Qualitative interviewing. In Gubrium, J. F. & J. A. Holstein (Eds.). (2002). *Handbook of interview research: Context and method* (pp. 83-101). Thousand Oaks, CA: Sage.

Wengraf, T. (2001). *Qualitative research interviewing: Narrative and semi-structured methods*. Thousand Oaks, CA: Sage.

Williams, M. F. (2012). Reimagining NASA: A cultural and visual analysis of the U.S. space program. *Journal of Business and Technical Communication, 26*, 368-389. doi: 10.1177/1050651912439698

Williams, L. (2010). Irrational dreams of space colonization: The new arms race in outer space. *Peace Review, A Journal of Social Justice*, *22*, 4-8. doi: 10.1080/10402650903539828

Williamson, R. A. (1987). Outer space as frontier: Lessons for today. *Western Folklore*, *46*, 255-267. doi: 10.2307/1499888

Yeomans, D. K. (2013, February 9). Beware of errant asteroids. *The New York Times*. Retrieved from http://www.nytimes.com/2013/ 02/10/opinion/sunday/beware-of-errant-asteroids.html

Young, M. J. (1987). "Pity the Indians of outer space": Native American Views of the Space Program. *Western Folklore*, *46*, 269-279. doi: 10.2307/1499889

Zinn, H. (2003). *A people's history of the United States: 1492-Present*. New York, NY: Harper Collins.

Appendix A - Sample interview Questions

Primary Questions

1. What is your earliest memory of space exploration?

2. When you think about space exploration and development today what comes to mind?

3. How did you begin working in the space industry?

4. Was there a particular reason or influence that brought you to the private space industry as opposed to NASA?

5. Did you always know you wanted to do this job?

6. How would you evaluate the current state of space exploration and development in the United States? Internationally?

7. What role or roles will private space firms play in the future of space exploration and development over the next few decades?

8. Fast forward 50 or 100 hundred years…What will change?

9. What purpose do the changes you predict serve? or Why is space exploration and development important?

10. Will humans ever live in permanent space settlements?

11. What roles should competition and cooperation play in future space activities?

Potential Follow-up Questions

1. What role should the public play in space exploration and development?

2. What role should the military play in U.S. space policy?

3. What do you see as the potential stumbling blocks to realizing this vision of a future in space?

4. Should there be a human presence in space?

5. Can you foresee any social or cultural stumbling blocks to life in space settlements?

6. How will extending the human presence into the solar system affect society and culture on Earth?