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(Technical Topic)

An Analysis of the United States Space Agency and It's Role in America
(STS Topic)

A Thesis Project Prospectus Submitted to the

Faculty of the School of Engineering and Applied Science
University of Virginia • Charlottesville, Virginia

In Partial Fulfillment of the Requirements of the Degree
Bachelor of Science, School of Engineering

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Fall, 2019

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On my honor as a University student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments.

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An Analysis of the United States Space Agency and It's Role in America

Introduction:

Looking up at the night sky in wonderment is not something new to almost every human being on the planet. Humans admire and are fascinated by space, stars, and the endless possibilities that such unexplored vastness could contain. The space industry and space technologies first developed as a result of the Cold War and competition that the United States had with the Soviet Union at the time. In the late 1930's and 40's, Nazi Germany had developed long-distance rockets and missiles as weapons that could go record-breaking distances and heights which led to the ignition of Soviet Russia and the US to develop their own missile programs. These missile programs were the seed that led to the development of a full-fledged space program in both these countries (A Brief History).

Over the years of technological development in the space industry, there have been a number of failed missions and wasted tax dollars, but there have also been many instances of the loss of lives. The cost of losing lives unintentionally in the name of making space technological advancements is something that raises the question of why people continue to support the government-funded space program – NASA. Studies show that American people, in general, are not in support of policies or developments that cause the loss of life – the most common examples being medicine and war. Polls show that American people do not support endless US military aid to foreign countries, and "endless" wars due to the incredible waste of money and loss of American lives (Carden). Similarly, in the field of medicine, new drugs and treatments are constantly being developed, however, through the process of clinical trials and tests, some developments are approved and some are not, largely dependent on how much benefit or harm they cause to patients. The tenant of being a doctor is to do no harm.

This poses an interesting question about the government-funded space program: What makes it so resilient after the number of lives lost, and what is the public's opinion and relationship with the government and space agency?

This prospectus will employ Actor-Network Theory (ANT) (Rodger) to characterize and define some relationships between the American public, NASA, the government, and US foreign relations to establish the role that NASA plays in domestic as well as foreign affairs to create the existing network surrounding the national space agency. This prospectus will also propose a normative network surrounding the national space agency that takes the public views into heavier consideration to make the space agency a scientific program of the people rather than a program that shows American prestige and defense strength to the world as it is now.

NASA Failures and Budget

Alongside wars, nuclear reactor damages, and natural disasters, a space launch vehicle failure is one of the most expensive losses that a nation experiences in the pursuit of technological advancement. Over the course of a single decade from 1984 to 1994, there have been 14 space launch vehicle failures of United States spacecrafts that amount to over a billion dollars' worth of damages. Studies that look into the mechanisms of failure for each of these space crafts as well as the actions taken to address and fix the causes of failure for the future, show no real progress.

Corrective actions of the Atlas-Centaur (AC-67) launch include "Specify duties and responsibilities of launch weather team, and Revise launch-vehicle weather criteria…". Another set of corrective actions for a launch states: "Tighten hardware quality control, improve manufacturing environment and process…". Further reading into the actions taken as corrective measures for further launch failures are all along the same lines as the two examples given above

– usually stating that corrective actions involve tighter regulation or inspection of parts or more training for teams which shows no real progress in corrective measures (Chang).

January 28th, 1986, marked one of the most devastating days in the history of space exploration. The greatly anticipated Challenger rocket was set to launch with a crew of astronauts that contained one civilian teacher as well, but instead, the Challenger launch is now regarded as one of the biggest technical failures in NASA history.

Just seconds into the nationally televised event, puffs of smoke engulfed the space craft, and the entire craft – a burning ball of fire – split apart in mid-air, killing the crew on board. A committee was formed to investigate the cause of failure, and it was concluded that the rubber-like sealant, also known as O-rings, between the rocket booster joints had leaks which caused highly pressurized fuel to penetrate other parts of the rocket (Ocampo). It was also discovered that the faulty O-rings, surprisingly, were a well-known problem among the NASA engineers. Engineers from the Morton Thiokol contractor for NASA had expressed concerns about the leaking from the O-rings, however, NASA and higher officials, based on previous successful launches, determined that the O-ring leakage was an acceptable risk. This obviously was not the case on the morning of the launch, when this margin of safety is exactly what caused one of the worst space-related disasters in the history of the United States (Vaughan).

A few years later, the Columbia rocket was another highly anticipated mission, and the second disaster after the Challenger that caused widespread grief and concerns about the space programs and engineers within them. During test launches of the craft, it was found that pieces of insulation foam were breaking off and hitting the body of the rocket during lift-off. None of the test launches had ever had any dents or mechanical problems that caused further failures, so it was deemed that the foam breaking was an acceptable risk. On the day of the launch, the

Columbia rocket made it successfully out of the earth's atmosphere, into space, completed its mission, and was re-entering the Earth – on its way to bring the crew of astronauts back home after a success. During re-entry, a piece of foam insulation broke off the craft and hit the shuttle's left wing with such force, that the dent was large enough to leave a hole in the wing. This hole caused gasses and pressurized fuel to enter the spacecraft which then blew up in mid-air, killing every member on board (Hogeback). This was another huge technical failure on NASA's part as the foam problem was something that had been known and documented, and deliberately left untreated because nothing bad had happened during trials. NASA scientists and engineers, much like the time of the Challenger disaster, had known a problem, and chose to create a margin of safety for the defect rather than working to fix the root of the defect in the first place (Dooling).

These are just a few examples of the numerous failures that NASA has had launching space vehicles. With this number of engineering failures and inconsistency, the fact that we haven't made it to the Moon again after the original Apollo mission, and the fact that no huge space-related breakthrough projects have been successful, one would imagine that funding for NASA and the space program has decreased over time from the Apollo era to now. However, studies show the funding for NASA has not decreased significantly over the last two decades. The NASA budget has essentially been on "autopilot" after the Apollo missions, and although there are significantly less number of projects and launches that NASA performs every year, it's yearly budget does not suffer from any kind of cuts that match this decrease in progress (Nasa's Planetary Science). This means that American's pay the same amount in taxes to fund a multi-billion dollar program that has been decreasing its yearly output over the last two decades without any adjustments to funding. All of these factors beg the question: What is the

relationship of the space agency and the government? What is the public's opinion regarding NASA and space exploration, and lastly, what is the bigger picture of the US space program when it comes to foreign affairs?

The Space Program and the US Government

Presidential agendas priorities have changed significantly over the years, for example, issues pertaining to national health care was a true non-issue during most of the 1980's which cannot be said about the current political environment. In the same manner, after World War II, the major fixed agenda items of the president were related to economy and international relations. Space policy and the establishment of NASA really benefitted from this priority of international relations post WWII era. In 1961, President Kennedy announced the Apollo Project – funding and policies dedicated specifically to getting an American on the Moon. At the time, the Soviet Union was having breakthroughs related to space travel as they launched the very first vehicle into space, the Sputnik, and eventually the first man into space, Gagarin. The president's goal was not merely to reach the moon, but, more importantly, to rekindle national morale and demonstrate the United States superiority and strength against the Soviet Union (Handberg).

In this political and post-war climate, the space agency was given importance to show US technological supremacy which indicated economic and political superiority to the rest of the world (Symington). Eventually, this "space arms race" against the Soviet Union, and in the future, against other countries with developing space programs led to a great amount of pressure on engineers and NASA members to deliver projects on deadlines. This air of urgency in order to please the government's demands and, on a national scale, show US prestige, created an absolute necessity for "safety margins" for certain engineering designs. It was incredibly time consuming and costly to determine and fix the root problems of any inconsistencies in a design, but

incredibly more efficient to test an inconsistency sufficiently, and create a margin of safety for it which would help determine what kinds of inconsistencies were "normal and expected" versus which inconsistencies were something that would actually cause failure (Feldman). This creation of a margin of safety in engineering, and the concept of acceptable risk, played a heavy hand in the failure of the Challenger and Columbia launches. Examining the nuances surround acceptable risk in engineering is out of the scope of this prospectus.

Taking all these factors into consideration, the relationship between the space agency and the government is less about technological developments, and more about advertising successes on a global scale to indicate national superiority. In other words, the network between the government and the space agency/NASA is one that is exploited to show American prestige rather than being a domestic policy that reflects the wants and needs of the American people.

Existing vs. Normative network between Government and Space Program

The existing network between the government and the space agency is one that puts emphasis on inventions to show American power. It is a network that puts importance on ensuring that Americans do not fall behind in the space arms race against Russia, China, etc. A better, more stable network between the government and the space agency should be one that separates scientific development and defense. There is an enormous, multi-billion dollar, defense budget that is allotted by the United States government specifically to enhance and develop defense technologies and tactics for US protection (Military). There is no place for these kinds of policies in the space agency and industry as the agency should be geared towards the importance of scientific discovery and development, exploring space, and pursuing the projects that American people want to be pursued. The proposed normative network is one that defines the

government's role in the space agency as one that communicates the wants of the people passively by creating policies and funding projects that the public expresses the most interest in. The government should abandon the use of the space agency and its engineering efforts to show national prestige and superiority, and use it simply for the pure goal of developing new technologies, making new discoveries, and making the public feel like their dreams of space are being attained. So, what is it exactly that the American people want?

The American Public and the Space Program

During the first half of the 1960's there was a huge support from the public for the space program because of the uneasiness that the Russian space developments were causing in the eye of the American public. The implications were that Russian activities in space may one day have important repercussions in military applications, therefore, the public wanted to support any efforts to not let the Russians succeed in this venue (Symington).

Over the years and after the success of the Apollo missions, studies were conducted to gauge public support of the space program. A decade ago, most of the support to fund NASA came from white, male, baby-boomers, and males in higher socio-economic status that had a "greater" appreciation for the sciences and were also alive during the Apollo missions to the moon. This support is termed "Apollo Nostalgia" since most of the support for continued heavy funding of NASA came from those who were alive and admired the Apollo missions. However, more recent polls show that public support is largely apolitical. Supporting the space program and its projects is a more personal and educational opinion rather than a partisan one, which interestingly enough, is not the trend seen in the US government. The US government shows that republican parties often support more funding for the space program as it is seen as a defense tool, whereas democrats do not (Nadeau). This implies that the government and its interests

about funding the space program may not necessarily align or even take into consideration the public opinion – which is especially concerning since the American public tax dollars is what funds the government space program.

Another point to mention that consolidates this claim is the fact that public opinion on what projects should be funded versus what projects NASA gives highest priority are nearly opposite of each other. Polls show that although the public "broadly supports NASA", it thinks that the space agency should be focused more on Earth science and planetary defense rather than human missions to the moon or Mars. People have voiced the fact that Earth's climate crisis and climate change projects should be the top priority of NASA as well as monitoring potentially hazardous asteroids and space debris, known as "planetary defense". On the opposite end, less than 18% of respondents in this poll supported manned missions to Mars, and most people interviewed said it should, at least, be a low priority project for NASA compared to other ones (Foust).

Interestingly enough, missions for human astronauts to explore Mars and return to the moon are among NASA's most high-profile and high-priority cases. The Trump administration has expressed strong support for these initiatives saying that exploring different planets and getting Americans back on the Moon should be the NASA's core mission (Majority of Americans).

Looking at the American public and the space agency as two different actors, it can be seen that the relationship between these two can be characterized as one that may not be entirely aligned. The public, although shows support for NASA in general, has largely differing opinions on what should be the most important and highest profile efforts of NASA compared to the actual priorities and R&D efforts NASA has given to its projects.

Existing vs. Normative network between Public and Space Program

The existing network between the public and the space program is one that feigns inclusion of public opinions. The space program receives funding for projects from the government which receives money from the taxes that Americans pay, so the space program does not have much control over which projects it can pursue more or less – it is all dependant on the funding it receives which is decided by government policy. The existing network is one that ignores the fact that the public wants to pursue efforts on climate change projects, space discovery, earth protection projects. The current efforts of the space agency are mostly on high profile projects like sending people to the moon and to mars. The normative network proposed is one that shifts space agency research and design efforts from where it is now – sending humans to the moon and mars – to what the public expresses the most interest in which are climate change efforts, and scientific discovery missions. In order for this kind of network to be achieved, the government needs to shift its own relationship, simultaneously, to one that is less about selfishly promoting the United States and more about turning inwards and fulfilling its democratic role of being "for the people and by the people".

US Space Program as Foreign Policy and Concluding Remarks

Looking at all of the actors involved, namely: the US government, the US public, and foreign space efforts, it is my conclusion that the US space program is largely used by the government as a defense and foreign policy rather than a domestic one when it comes to policy-making, however, the US space program is advertised to the public as a domestic policy to motivate Americans to pay tax dollars that fund NASA. Historically, as well as currently, it can be seen that the government has used the space program and the Apollo missions as a tool for larger political goals rather than it being about the discovery and project itself. The threat of

space warfare and a "space arms race" with Russia, China, etc. has been the impetus behind keeping the space program alive and so well-funded (Jeffdanielsca). On the other hand, Americans paying the tax dollars to allow NASA to go on are under the impression that their opinions are the ones represented by the government, as a democracy should be, which is really not the case. Public opinions on what discoveries and projects should be funded and pursued are almost opposite to the projects the government vocalizes support for – which means that NASA follows government orders rather than public opinion (Steinberg). In a way, it can be said that the way the government decides on space policies and provides funding for NASA is a violation of the tenants of democracy which state that the government should be representative of the people. Studies in countries like the UK as well as the US show that space policy is largely decided by business leaders and higher up government officials instead of by polling and evaluating public interests (Symington). Although support for the existence of NASA is there in the public, support for the specific projects, priorities, and funding that NASA receives is not. In order to acquiesce the public on their wants to be included, general polls that measure support for the space program are conducted, which almost always show that the public supports NASA, and this general public support is used on space policy bills to show that the government has taken steps to include public opinion – a kind of loophole to keep the public onboard with the government's decisions and to gain support for re-election campaigns (Steinberg).

In this way, the United States, as well as other countries like the United Kingdom, have exploited the public and their tax dollars to fund a program that is used as a foreign policy and defense tool rather than a scientific discovery one as the public wishes.

The diagrams below show the Actor-Network relationship currently surrounding the space agency and its projects and pursuits. It is a destabilized network that uses taxpayer given

money to fund projects that show outward superiority and ensure that the United States is not behind in the “space arms race”.

The proposed normative network is one that uses taxpayer given money to fund projects that reflect what taxpayers are most interested in seeing America achieve. It is a network in which the government abandons the use of the space agency for defense and grandeur, as there is a separate defense branch in the government that is meant to address these kinds of goals. In the proposed network, the government honors its democratic ideals by communicating the public opinion and funding projects in the space agency that most help achieve what public opinion shows. The government does not feign public inclusion by polling general support for the space agency, but rather uses true polls of what kinds of projects the American people want and plays an active role in creating policies and allotting funding to achieve a space program that is for the people of the United States.

Figure 1. Existing network surround space exploration and projects

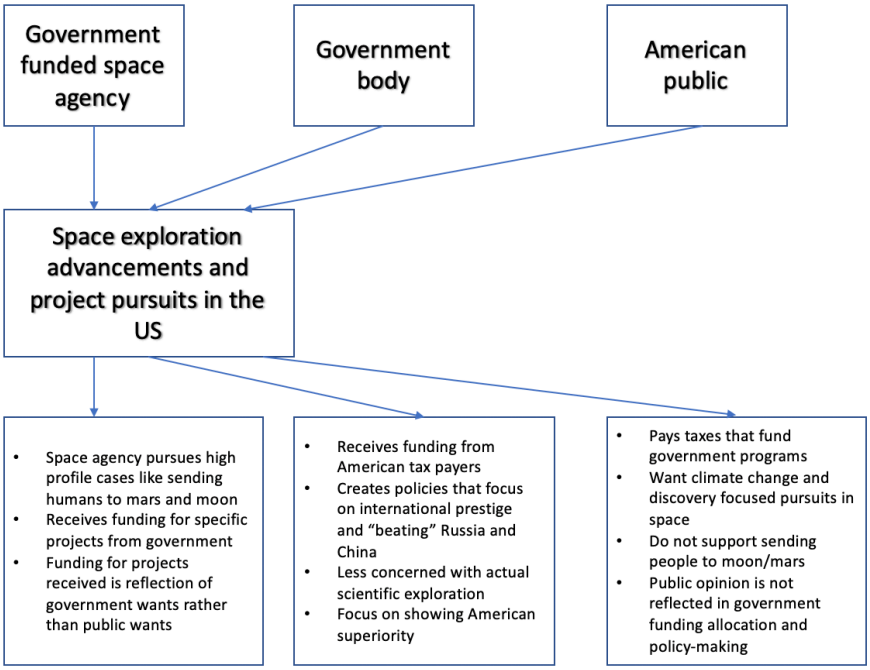
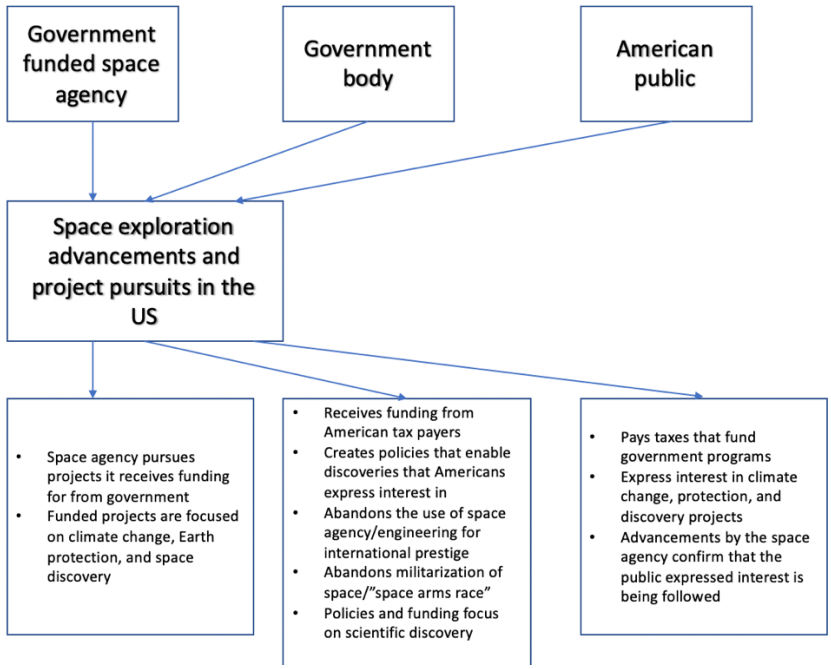


Figure 2. Proposed Normative network surrounding space agency project pursuits



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