INTELLIGENCE STUDY ON FAILED PREDICTIONS OF NUCLEAR PROGRAMS

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A Thesis

Presented to

The Faculty of the Department of Security Studies

Sam Houston State University

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In Partial Fulfillment

of the Requirements for the Degree of

Master of Science

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by

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May, 2018

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DEDICATION

I want to dedicate this thesis to my family, Mom, Kaci, Kristy, Dad, Grandma, and Grandpa, Cookie, and my girlfriend Chloe. Thank you all for helping me through this and keeping me motivated on the toughest project I have ever undertaken. I love you all!

ABSTRACT

Kelley, Christopher A. *Intelligence study of failed prediction of nuclear programs*. Master of Science (Security Studies), May, 2018, Sam Houston State University, Huntsville, TX.

This thesis will address the problem of United States intelligence failing to predict the capabilities and first test of foreign nuclear programs. The research question addressed is did the United States make mistakes during any of the phase in the intelligence cycle that led to the failed prediction of the first successful nuclear test by the Soviet Union, PRC, and DPRK, or were the failed predictions due to outside problems? The methodology used in this study will consist of a structured, focused comparison between three case studies of the Union of Soviet Socialist Republics (USSR), Peoples Republic of China (PRC), and Democratic Peoples Republic of Korea (DPRK). In each case, efforts by the US intelligence will be divided into one of the five phases of the intelligence cycle.

The data revealed that each case contained different failures that could have possibly caused the US to fail in predicting the capabilities and first test of each nuclear program. This study presents data from literature around intelligence failures, conceptualized in a new method, comparing the efforts of the US intelligence in three cases and drawing conclusions from presently declassified data.

KEY WORDS: Intelligence, Intelligence Failure, Nuclear Programs, Union of Soviet Socialist Republics, People's Republic of China, Democratic People's Republic of Korea

ACKNOWLEDGEMENTS

I want to thank my thesis committee for taking the time to guide me through this difficult process and allowing me to become the first in program history to undertake, and complete a thesis. I have had the pleasure of learning from some of the brightest minds in my field and I will always cherish what I have learned from this program. Secondly I would like to thank Sam Houston State University, as I have spent the past four years of my life here and I have loved every second of it. From the people I have befriended, to the places I have gotten to go, I know I will remember these last four years for the entirety of my life.

I want to thank my girlfriend Chloe, for sticking by my side throughout my entire ordeal. You have been such a steady force in my life and I don't know how I ever got along without you. I would like to thank my mother, whose guiding hand kept me on the right path for all of my life and helped shape me into the person I am today and who I strive to be like. I would like to thank my sister, for always cheering me on and being an amazing mentor who I could always ask for help if I ever needed it. I would like to thank my father, you have shown me how hard work can get you to wherever you want to be in life and I plan to work to where I want to be. I would like to thank my stepmother, for compelling me to take whatever path makes me happiest no matter what others think about it. I would like to thank my grandparents, who supported me throughout my entire career as a student and always supported my decisions to follow my path into graduate school and beyond.

Thank you again to all who supported me, I can proudly say that I have completed my most difficult task to date and I could not have done it without everyone's support!

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LIST OF ACRONYMS AND ABBREVIATIONS

CIA	Central Intelligence Agency
DPRK	Democratic People's Republic of Korea (North Korea)
GEOINT	Geospatial Intelligence
HUMINT	Human Intelligence
IAEA	International Atomic Energy Agency
IMINT	Imagery Intelligence
MASINT	Measures and Signatures Intelligence
NATO	North Atlantic Treaty Organization
NIE	National Intelligence Estimate
NSA	National Security Agency
NPT	Non Proliferation Treaty
OSINT	Open Source Intelligence
PRC	People's Republic of China
SIGINT	Signals Intelligence
SNIE	Secret National Intelligence Estimate
TNT	Trinitrotoluene
USSR	Union of Soviet Socialist Republics (Soviet Union)
US	United States of America

CHAPTER I

Introduction

Intelligence is a very valuable product. Throughout the world, multitudes of agencies for various countries gather intelligence to better their country's standing in the global system. To acquire and disseminate intelligence that can be acted on, different methods are put to work to see what works best, though it seems that intelligence is haunted by a single problem. This problem has been coined under the umbrella term intelligence failure, which describes various situations that are perceived to be failures of intelligence (Hedley, 2005). One branch of the intelligence failure problem in intelligence today is the error of not correctly predicting major events (Kuhns, 2003). The problem of intelligence failing to correctly predict events needs to be amended to better the intelligence community. The scope of this thesis will cover one specific area within this field; this is the area of failed predictions of the capabilities of nuclear programs by the United States (US). To focus narrowly, this thesis will cover three specific nuclear programs, that of the Union of Soviet Socialist Republics (USSR), the People's Republic of China (PRC), and the Democratic People's Republic of Korea (DPRK). The intention for choosing these three countries as cases is due to their ties, as the PRC and DPRK each worked jointly with the USSR to develop the basis for their programs, then both later separated from the USSR and completed their programs on their own accord (Richelson, 2007).

Background on the Problem

As Montgomery and Mount (2014) have shown in their recent research, the United States (US) historically does not have a good record at correctly predicting when

countries achieve nuclear weapon capabilities. In one example provided by Montgomery and Mount (2014) provided, the US correctly estimated the date for the first test by the PRC, though the type of device tested by the country was not correctly predicted (Montgomery & Mount, 2014). This case will be discussed in depth later in the thesis. For possible explanations Montgomery and Mount (2014), proposed 12 hypotheses of mis-estimations as having a distortion effect on intelligence causing the failed predictions (Montgomery & Mount, 2014).

Some scholars have pointed to cases of intelligence failures, stating that they are wholly due to policy makers not acting on actionable intelligence; figuratively pointing the finger at the decision makers as the cause of all intelligence failure. Betts (1978) presents the argument that failures are more than often due to decision makers with "administrative workloads not allowing for reflection", and "failures are constructs of political and psychological reasons more than organizational reasons" (Betts, 1978).

Need for more Research

The need of this research is to conceptualize around the problem of intelligence failing to predict the capabilities of nuclear programs accurately in a different way than past scholars. This need is also of a more accurate prediction effort in intelligence estimating of nuclear capabilities of a country, as it will help the US decision makers to action against proliferation. Montgomery and Mount call for this need to be addressed as well in their 2014 article. Stating that efforts should be continued in "improving the quality of this information" (Montgomery & Mount, 2014).

Purpose of the Study

The purpose of this study is to conceptualize the information around intelligence failures on predicting the capabilities of a nuclear weapons program by examining the intelligence efforts during the operational time of the nuclear program up to its first successful test of an atomic weapon, with the goal of analyzing the data to create possible conclusions that intelligence efforts did or did not contribute to the failure. This is implemented by examining the intelligence efforts by the US to conclude with evidence that the intelligence community could or could not have been the cause of the intelligence failure.

The main component of the study will be examining the efforts of the US intelligence, during the US attempt to locate and gauge the abilities of three country's nuclear programs, and separating each action into one of the five stages of the intelligence cycle, along with specific questions for each phase that will be asked of all three cases in order to answer the research question. A key reason for choosing the USSR, PRC, and DPRK is due to their history with the US. The US historically has had an adversarial relationship with each of these countries, as each have also attempted to and have created nuclear weapons, which poses a threat to the US interest and territory. This study will bring attention to the problem of the US intelligence failing to predict nuclear programs and their capabilities up to the first successful test of a nuclear bomb. The goal of this thesis is to forward the intelligence literature towards possible solutions for future studies in order to better the US intelligence community.

Research Question

This thesis will address the question of what mistakes did the United States make during the phase in the intelligence cycle that could have led to the failed prediction of the first successful nuclear test by the Soviet Union, PRC, and DPRK? What I propose was the cause of the failure was not just one failure in a specific area, but instead is due to a problem that is spread throughout the entire intelligence cycle.

Significance to the Field

The significance of this paper is to present evidence and to determine if the intelligence community either could or could not have failed in a step of the intelligence cycle that led to the erred prediction of the first nuclear test of each country's nuclear program. This would present evidence that either the intelligence community needs to change how it carries out its actions in each phase within the intelligence cycle in order to avoid these mistakes again, or to show that the intelligence was not the cause for why this nuclear program were failed to be predicted.

Limitations

One limitation of this thesis that will attempt to be mitigated is the hindsight bias. Hindsight bias is the bias of looking back at an event and determining that it was foreseeable, even if little evidence at the time of the event was available (Roese & Vohs, 2012). To mitigate this bias, I will use a method used by Anderson, Jennings, Lowe and Reckers (1997) in their study of hindsight bias effects of judges in trials and convictions on auditors for legal liability. The method used in the study is the alternative outcomes debaising method and will be used in this study to mitigate hindsight bias (Anderson et al, 1997). This method is also referred to as Counterfactual Thinking. Another key

limitation is all of the data gathered is from declassified historical documents provided from the Wilson Center Digital Archives and the George Washington University National Archives without full access to either archive. This presents the possibility that data could be declassified to the public after this paper is published, or documents that were not publically available through the archives could be made public. Another limitation of this thesis is due to the periodization of when each case occurred. As such, each case could present different results from the same agency due to the agency changing over the decades between each case.

Structure

The structure of this thesis will begin by discussing background concepts to build a better understanding for the discussion section of this paper. The concepts discussed will be: an overview of intelligence, the intelligence cycle, intelligence failure, Soviet Union (USSR) nuclear programs history, People's Republic of China (PRC) nuclear programs history, and the Democratic People's Republic of Korea (DPRK/North Korea) nuclear programs history. Next the paper will discuss the methodology of the study that will be used in this thesis along with the questions that will be asked of each case. Continuing, the paper will discuss each case study in a structured, focused comparison of the US efforts in predicting the capabilities of the USSR, PRC, and DPRK by assessing actions taken and separating each into a specific phase of the intelligence cycle (George & Bennett, 2005). Then once all actions are separated, the phases will be examined to determine if a failure did occur in a specific phase. After each case is examined, the chapter will expand on what happened and the possible causes of the failure. The final chapter, discussion, will assess each case's error(s) in terms of did the error(s) prevent a

successful intelligence prediction or was there another possible reason why this case of US failed prediction happened. The last section will recap everything covered and summarize the findings, and then propose new directions in which future research should be conducted to advance the literature around intelligence failures.

CHAPTER II

Literature Review

Intelligence

Definitions. This section of the thesis will build a base for the study by defining and expanding on topics mentioned in the first chapter, which are vital to understanding past literature on this subject. The goal of this chapter is to be able to metaphorically stand on the shoulders of past giants to see how far literature has come and to establish where this thesis needs to go. The structure of this section will follow three major sections including intelligence, intelligence failures, and nuclear program history of each case being studied, and will expand these topics into subtopics.

Let us first build a better understanding by beginning with different definitions from scholars and organizations, find commonalities in each, and then proceed to defining the term intelligence that will be used in this thesis. Examining different literatures, intelligence can have different definitions depending on what scholar or organization one looks to for clarification. When discussing intelligence one prolific scholar, Dr. Mark Lowenthal, comes to mind. Dr. Lowenthal has served as the Assistant Director of Central Intelligence for Analysis and Production, also a published author in the intelligence literature, and currently works as an adjust professor at John Hopkins University (Intelligence & Security Academy, 2018). His book, *Intelligence: From Secrets to Policy 7th edition*. In his book, Lowenthal (2017) states that "intelligence is one government trying to keep information secret, while other governments tries to discover the secret information and then keep it secret" (Lowenthal, 2017). With this definition it is clear that governments play a role in creating and using intelligence, and also stating

that governments attempt to gain access to other governments' intelligence, this definition does not specify much else.

Another author, who many current writers in intelligence failure literature point to for reference, is Dr. Richard Betts. Dr. Betts graduated with his Bachelors, Masters, and Doctoral Degrees from Harvard University with his PhD in Government. Along with this, Dr. Betts worked for the Military Advisory Panel for three Directors of Central intelligence, also having been a consultant on many occasions for the National Intelligence Council and the Departments of State and Defense (CSIPA, n.d.). Dr. Betts wrote a frequently reference article, which I will use in this thesis as well, titled *Analysis, War, and Decision: Why Intelligence Failures are Inevitable*, where he laid out three reasons why intelligence will always fail at predicting major events, though this will be discussed later. In his article, Dr. Betts discusses a brief explanation of intelligence as "Strategic the acquisition, analysis, appreciation of relevant data." This definition expands the idea of intelligence a bit as we can start to see a trend that intelligence is about information gathering for process into intelligence, which is a key difference between intelligence and information.

Another definition that can produce a better understanding is the definition provided by Gill & Phythian (2012) in their book *Intelligence in an insecure world 2nd edition*, which they define as

> "intelligence is the umbrella term referring to the range of activities, from planning and information collection to analysis and dissemination, conduced in secret, and aimed at maintaining or enhancing relative security by providing forewarning of threats or potential threats in a manner that allows for the timely

> implementation of a preventive policy or strategy, including, where deemed desirable, covert activities" (Gill & Phythian, 2012).

Continuing into the changes that each definition adds, it can be understood that intelligence has phases and end goals for the use of the intelligence in the prevention of strategic surprise and the forwarding security and policy standards. Though this definition does touch on one point that not always a common case, which is the point that intelligence practices and the formation of information into intelligence is a secret process. Governments may conclude most of its intelligence in secret due to strategic necessity to keep information safe from harmful actors, but not all of its practices are secret. Intelligence has many different categories of collection methods, in which there are some covert, but one method called Open source intelligence or OSINT is the collection and analysis of data available to the public. This practice disputes the claim that all intelligence practices are conducted in secret. It could be understood if the "conducted in secret" was referring to the analysis phase, though even in that situation not all analysis of information is kept secret as Bimfort (1958) discussed in his defining of intelligence historical article.

A final definition this thesis will assess is the one proposed by Bimfort (1958), a definition that the Central Intelligence Agency (CIA) references in their wanted call for a definition of intelligence, as a viable explanation of the term. Bimfort (1958) detailed that

> "intelligence is the collecting and processing of that information about foreign countries and their agents which is needed by a government for its foreign policy and for national security, the conduct of non-attributable activities abroad to facilitate the implementation of foreign policy, and the protection of both process

> and product, as well as persons and organizations concerned with these, against unauthorized disclosure" (Bimfort, 1958).

Even though this definition is dated it can still provide good building blocks for the understanding of the term of intelligence. This definition explains that the goal of intelligence is to still forward the policy and strategies, but to also know about "foreign countries and their agents," which could be directed at many different aspects of a country as Bimfort (1958) expands on. The term agents are understood as anyone who serves the interest of a foreign government (Bimfort, 1958). These aspects could include political aspects like a politician stance on a topics, military resources and capabilities, and even industrial production of goods if used for international trade for some examples.

All of these definitions now discussed and examined, certain commonalities start to show through each defining of the term intelligence. Firstly, the involvement of the government as the main producer and consumer seems to be a key idea, yet as we will discuss in more detail later there are many consumers of intelligence including people and private industries. Secondly, are the collection of information and the processing of the information into intelligence. This point is key to distinguish between what is considered intelligence and what is considered information, because not all information is intelligence. A third common concept of intelligence is the argument of is it covert or overt. As discussed in an earlier section of this thesis, intelligence can be of either works, with usually a mix of both styles. Along with the discussion of methods, intelligence gathering can use many different methods to gather the necessary information, which will be discussed more in depth later. The fourth component is how the information is turned into intelligence, which can be done in the processing and analysis phase, and will be

discussed in more detail during the section describing the intelligence cycle. The final component shown is the goal of the finished intelligence, to avoid strategic surprise and influence policy as the definitions described above. Before we conclude with a definition, we should examine on who consumes the intelligence produced.

Purpose. Unlike defining intelligence, theoretically the purpose is already there, to be informed about something. Though this is a very vague understanding of intelligence and in actuality intelligence has a very broad purpose. Betts (1978) discussed the purpose of intelligence as, "the role of intelligence is to extract certainty from uncertainty and to facilitate a coherent decision in an incoherent environment" (Betts, 1978). To "extract certainty from uncertainty" sounds like an impossible standard, though the mindset is that intelligence is tasked with bringing information forward to develop actionable intelligence out of anything that can be acquired, as the "facilitate a coherent decision" part of his purpose statements suggest (Betts, 1978).

Gill and Phythian (2012) went along with the philosophical route and described the purpose of intelligence as "to bestow relative security advantage" (Gill & Phythian, 2012). Like the last definition, this one provides a mindset of how intelligence is to operate with very board purpose statement that only has a goal of providing a security advantage. Even though these two definitions may present broad descriptions, they contribute to the understanding of the purpose of intelligence, by adding in a worldview with a general goal of promoting critical thinking as to what provides a security advantage would incorporate.

Bar-Joseph (1995) on the other hand provides a very detailed outline of the purpose of intelligence in his book *Intelligence Intervention in Democratic States: The*

United States, Israel, and Britain. In it, he describes the goal of intelligence as "to supply policy with objective information, analysis, and advice designed to assist action, also to implement policy in accordance with political direction, through covert actions" (Bar-Joseph, 1995).

With Bar-Joseph's (1995) description of the purpose, one can understand a little more about why states consume so much intelligence. This would be to assist in driving their policy and security in a way that would benefit the state with the most updated security threat environment information.

When discussing purpose, my peers and some scholars have defined purpose along the lines of Lowenthal (2017), "as to avoid strategic surprise, track threats, forces, events, and developments that could endanger the nation's existence" (Lowenthal, 2017). Key element of this discussion is taking measures to ensure a nation's survival, and avoiding strategic surprise. Lowenthal (2017) gives an example to help with the understanding of strategic surprise, in which a boss comes back to his office to see an employee stealing money, the type of surprise the bosses feels is strategic because he had no idea, the type the employee feels of getting caught is tactical because he knew what he was doing but did not expect to get caught (Lowenthal, 2017). To say the least, the state that is consuming the intelligence is trying not to end up like the boss.

For the purpose of summarizing and consolidating after covering the previous information, it is easy to see that the purpose of intelligence is to inform policy makers to shift policy in the direction that will keep a nation's existence from being threatened. Though, the purpose is also to avoid strategic surprise from other states or non-state actors who wish to do the state harm.

Strategic Surprise. Strategic surprise, much like intelligence, is a broad term that can vary in definition depending on what literature one examines. Reason this topic is being discussed is due to the nature of each case examined in this thesis have factors of avoiding strategic surprise, thus making it a topic that needs to be covered in the literature review.

Cancian (2018) defined the term as "when events occur that so contravene the victim's expectations that opponents gain a major advantage" (Cancian, 2018). This partially aligns with Lowenthal's (2017) example of a worker stealing money from his boss described a few sections earlier in this thesis, as the "major advantage" would not apply to this specific example. For this reason, Lowenthal (2017) defines strategic surprise as "being surprised without knowing what was originally going on" to include examples that do not end with one actor having a major advantage over the other (Lowenthal, 2017). However, some scholars, such as Handel (2008), believe that strategic surprise is more easily compared to a tool than a method. This is why Handel (2008) defines strategic surprise as "a tactical device simply because in tactics time and space are limited in scale" (Handel, 2008).

Throughout history, examples of strategic surprise are present in many different events. Two such events, the attack on Pearl Harbor and the September 11th attacks, are recent examples with ample literature around the event. In the case of Pearl Harbor, the factor of strategic surprise is due to the belief that the Japanese would not attack the US (Northridge, 1993). The belief derived from the fact that the Japanese military size was not as massive as the US at the time, thus creating the bias among US leaders that the Japanese would not risk a war in which the opposites military was far larger than their

own (Northridge, 1993). The second example, the September 11th attacks, also contains factors of strategic surprise. The factors of this attack that are considered strategic surprise are the time and place. The FBI had not preformed assessments on the chance of a terrorist attack on places within the US; as such, likely targets of attack could not have been determined before 9/11. The CIA on the other side of the blame had not focused on strategic level intelligence, but had focused on tactical level intelligence. This led to the "big picture being missed" that an attack was inevitably going to take place on US soil (Dahl, 2013).

Moving forward as to how this topic is affected by intelligence, there are different views in different literature. Though, the main viewpoint of intelligence partly affects the efforts of preventing strategic surprise. Conclusions shared by both Handel (2008) and Gray (2005) that intelligence, even when reformed, can only partly contribute to avoiding strategic surprise. Handel (2008) states that

> "thus far in its application to the real world, improved insight into the causes and pattern of strategic surprise has made only a negligible contribution to the search for ways to warn of a sudden attack in an accurate and timely fashion" (Handel, 2008).

As described in the statement, Handel (2008) discusses that literature and research in the field has not produced effective change in preventing strategic surprise. Gray (2005) continued on with this point stating that "reorganization of intelligence bureaucracies can be useful, but is only marginal importance for reduction in the risks of strategic surprise" (Gray, 2005).

Consumers. This section of the thesis will discuss who consumes intelligence, and with that there are two opposing views. Both views will be addressed as to create more rounded argument. The first argument by Gill and Phythian (2012), where the pair explains "everyone from state level actors, down to high dollar sports teams and criminals" could consume intelligence (Gill & Phythian, 2012). This consumption can be used for a multitude reasons such, a sports team trying to gain the advantage during a big game, or a criminal trying to educate himself or herself on how other criminals were caught in order to avoid those mistakes.

The second argument is by Lowenthal (2017), who states that "intelligence exist solely to support policy makers in myriad ways" (Lowenthal, 2017). While the seems to ignore the possibility of a personal level of consumption of intelligence, it does addresses the fact that most government intelligence is created for policy makers to avoid strategic surprise and influence policy. Which even Gill & Phythian (2012) discussed this fact in their book and this argument will be part of the final definition to describe intelligence.

Final Definition. With all of these different components discussed, we can form a definition that will be used for the entirety of this thesis. Defining intelligence as a process, mainly by the government of a state but can be preformed by other organizations or people, in which multitudes of information and data is collected in different ways from different sources, and then analyzed to convert the product into intelligence for the purpose of influencing policy, preventing strategic surprise by another actor, and secure a nation's existence. However, even though nongovernment actors can perform intelligence, this thesis will focus on the US government's intelligence apparatus and its efforts to discover and predict nuclear programs.

Intelligence Cycle. Now that other scholars, consumers, and the purpose of intelligence have been defined, the next chapter will dive into literature around the intelligence cycle. This next section will cover what the intelligence cycle is by description, its different phases, methods that are used to gather information during the cycle, and finish off with a section that discusses views of why scholars think the intelligence cycle needs to be changed.

Description. Next the structure of how intelligence operates should be examined. For the most part, scholars and agencies recognized a very simplistic way of describing how information becomes intelligence using the intelligence cycle. This thesis will follow the intelligence cycle that is designated at the end of this section, as it is one of the main components in the study.

The intelligence cycle follows a similar order with a few variations depending on what literature is examined. Gill and Phythian (2012) wrote that the intelligence cycle was made up of five phases, which included planning, collection, processing, analyzing, and dissemination (Gill & Phythian, 2012). These phases are baseline and do not usually change; usually, it is other scholars that will add on a phase or two for specific reasons depending on which scholar or organization. For example, Lowenthal (2017) has written the cycle as identifying requirements, collection, process and exploitation, analysis and production, dissemination, consumption, and feedback (Lowenthal, 2017, p. 73). In which he explains that consumption, which could be considered part of the dissemination phase, and feedback are necessary. Though others have questioned the reasoning of adding feedback to the cycle quoting that feedback is usually never given, thus rendering the phase pointless (Hulnick, 2013). For this thesis the phases that will be used during the

study will include the identifying the problem, collection, processing, analysis, and dissemination.

Phases. With each of these phases included, let us build a little background into what each phase theoretically does during the full process of the intelligence cycle. Beginning with the identifying requirements phase, Phythian (2013) describes this step as consumers of the "intelligence product request intelligence on a certain issue or specific target" (Phythian, 2013). This is where the policy makers or other consumers of intelligence would make request to the producer of the intelligence for what they are lacking in the policy field or in the security threat environment and would officially begin the first phase of the intelligence cycle. Next the producer of the intelligence would move into the collection phase, where they would collect information. Phythian (2013) details the collection phase as "accessing the raw information that will be required for the finished intelligence product to be produced" (Phythian, 2013).

This phase is when information is collected in many different ways, such as covert and overt ways, with different methods of acquiring the information, such as open source intelligence. These will be discussed briefly in the next section.

Next, the third phase of processing begins. This phase is when raw information is formatted and prepped for analysis (Phythain, 2013). This step can include translating languages to the analyst language, verifying the information to make sure the source is a valid source and other process (Gill & Phythian, 2012). This stage can be a crucial as a mistranslation, a bad source not caught in the validation vetting, or another problem could metaphorically throw a wrench in the intelligence process.

The fourth step, analysis, is a vital step in which information is transformed into viable intelligence to be disseminated. The phase is where the information is modified into intelligence by the addition of evaluation, and analyzing all available data (Phythian, 2013). An important area of the intelligence cycle as it relies on the analyst judgment and skills to create actionable intelligence to hand off to the consumer. If the analyst were to create a bad product, the consumer could possibly not be able to act on it, or act on it but in the wrong way.

The final stage is dissemination, in which the final intelligence is given to the consumer who requested it (Phythian, 2013). This phase is where the intelligence is supposed to show policy and decision makers where we need to focus and on what.

Methods. As mentioned earlier in the thesis, there are different methods to gather intelligence during the collection phase, so to build a better understanding this thesis will briefly describe the six main methods of acquiring intelligence. The two ways discussed are the covert and overt methods, with covert meaning secret and overt meaning not secret.

The first method is Human Intelligence (HUMINT), in which the gathering of information is preformed either verbally or on a document and is delivered by a human source (DNI, 2011). An organization that is very well known for its production of HUMINT is the CIA. The second method is Signals Intelligence (SIGINT), in which all signals like radio, radar, and weapon systems are collected and used to pull information (CIA, 2013). Another method that is currently being used at a greater capacity that it use to be is the Open Source Intelligence (OSINT). OSINT is intelligence that is derived from publicly available information and is used for specific intelligence needs. A

newspaper, or news segment from North Korea, would be a good example of OSINT that would be valuable to a US analyst.

A fourth intelligence method is Measurement and Signature Intelligence (MASINT). This intelligence function is produced from analysis of the physical characteristics of a target through quantifying numbers and quality descriptions in order to produce a character outline of the target or events (DNI, 2011). Building the physical descriptions of a target into an intelligence report would be good for many reasons; an example that relates closely to this thesis would be creating physical measurements for a new construction site in North Korea to assess if the site is big enough to house a reactor.

Geospatial Intelligence (GEOINT) is the combination of Imagery Intelligence (IMINT) and geospatial information used to "describe, assess, and visually depict physical activities on Earth" (DNI, 2011). This information usually comes from different types of satellites in space. IMINT is intelligence gathered on any images, whether cyber, on film, or still shots, to create optical means of assessing the target (DNI, 2011). This process can also include radar sensors, infrared sensors, lasers, and electro-optics (DNI, 2011). A point to be made about the different methods is that these methods are changing rapidly to keep up with the change in science and technology. For instance Cyber Intelligence is now a category of intelligence, where as seventy years ago computers were beginning their existence, let alone not all over the world like today.

Dissenting Opinion. Though the intelligence cycle is a simplistic way of describing the actual process of manufacturing intelligence, no all scholars and intelligence analyst agree with it. One in particular, Arthur Hulnick, a retired Air Force and CIA intelligence analyst, and now an associate professor at Boston University, does

not agree with how the system describes intelligence. Hulnick (2013) argues that the intelligence cycle is a "fairly poor and simplistic explanation of how intelligence really works" (Hulnick, 2013). His biggest points are that there is a misconception that policy officials direct the conversation around what intelligence officials should plan and look for (Hulnick, 2013). Another point Hulnick (2013) makes is that a finished intelligence product does not drive policy makers to action, and is quoted saying "nothing could be further from reality" (Hulnick, 2013). His comments point towards the intelligence process being a more hands-off product from a policy maker's standpoint, with the intelligence community driving the organization to find information. Other scholars, including Phythian (2013) recognize that the intelligence cycle may need to be updated or changed. In his article, Hulnick (2013) discusses a possible solution, but due to the lack of intelligence literature to support his new system outline, this thesis will continue to use the intelligence cycle described above.

Intelligence Failures

Continuing on to a new major category of this literature review, intelligence failures is one of the main focuses of this thesis and as such, will be expanded on in such a way as to bring understanding around what an intelligence failure is. This part of the thesis will cover intelligence failures including, what they are by definition, the schools of thought around intelligence failures, possible reasons that intelligence failures happen, and conclude with asking the question are they fixable? The goal is to build a better understanding around a concept more complex than intelligence.

Definitions. Beginning with definitions, the complexity of intelligence failures can be best understood when described as vague incidents. Jensen (2012) covers this

when he describes “intelligence failures results simply when the intelligence input into the decision-making process is lacking or unsatisfactory” (Jensen, 2012). Though this definition lacks the clarification of who is unsatisfied by the intelligence input. Along with that, would this definition not mean more things could be considered intelligence failures? Though it does have a good point within the definition, that the intelligence product does not mean actionable standards.

Moving forward to a different definition, Hedley (2005) provided a lengthy, but clarifying, definition of what an Intelligence failure is. He defines it as

> “Anything that catches the US by surprise and is bad news is deemed an intelligence failure. This is not to be cynical, but realistic. However much insistence that it really is not reasonable to expect intelligence to predict or prevent any and all surprises, the reality is that this is what defines an intelligence failure. An unrealized prediction is a failure, especially when those who fund and monitor the performance of intelligence declare it to be” (Hedley, 2005).

Hedley, a thirty-year veteran of the CIA where he briefed president George W. Bush among other responsibilities, has significant experience with intelligence and was in intelligence during 9/11, which could be considered one of the biggest intelligence failures in US history (Hedley, 2005). With this definition it is easy to understand that preventing strategic surprise is a key goal of avoiding failure. Another key component of intelligence failure would be the mindset of how the consumer views intelligence as a whole. If the consumer expects intelligence that can tell him or her everything to expect, then in Hedley’s view, they would be unrealistic. Depending on the view of intelligence,

one could either agree or disagree with his point, which gets into the point of schools of thought that will be covered later.

The next scholar will actually be the focus of the end of this section and the next as well. Dahl (2013) proposed that intelligence "failures can involve either a failure of the intelligence community to produce the intelligence needed by decision makers, or a failure on the part of decision makers to act on that intelligence appropriately" (Dahl, 2013). This definition presents new points of discussion, as it incorporates the policy maker's actions with intelligence into the definition. Detailing that the intelligence failure could be cause by either side failing to either produce or action on intelligence.

Covering the common aspects of the definitions, a good definition for intelligence failures could be a failure to avoid a realistic strategic surprise, due to the intelligence community not being able to produce actionable intelligence, or the policy makers not acting on the intelligence. The reason realistic is included in this definition is due to factors of the intelligence community not being able to accomplish, like predicting every event before it happens. This definition will be used for the remainder of the thesis; though going forward, the focus will remain on the intelligence failures caused by the intelligence community and will only briefly discuss the policy aspect of it.

Schools of Thought. This section of the thesis will address very recent literature in the intelligence failure domain, as it discusses concepts that have not been encompassed by very much literature yet. However for the purpose of completing a comprehensive review of past literature, these schools of thought need to be addressed.

Moving forward on the schools of thought, Dahl (2013) proposed three different schools of thought around intelligence failures. The first school he named the

Traditionalist School, and described it as a pessimistic school, whose worldview is that the failure problem is a natural cause and not all failures can be prevented (Dahl, 2013). Reason its natural is believed to be to the problem of cognitive and analysis problems that are human nature (Dahl, 2013). This school of thought also believes the main problem lies with the policy maker's for not acting on actionable intelligence provided by the intelligence community (Dahl, 2013). For scholars of this school of thought, Dahl (2013) groups' scholars like Roberta Wohlstetter, Richard K. Betts, and Michael Handel together for this school (Dahl, 2013).

The second school of thought Dahl (2013) mentions differs from this view of pessimism instead to a more optimistic view of the failure problem. The Reformist School consists of the worldview that the failure problem is due to lack of information sharing within the intelligence community (Dahl, 2013). The solution for most with this worldview is a total organizational reform of the intelligence community to allow for better information sharing and to avoid organizational and bureaucratic limits that are believed to exist in the intelligence community. For students of this school of thought, Dahl (2013) groups' scholars like Harold Wilensky, Eliot Cohen, John Gooch, and Amy Zegart together (Dahl, 2013).

For the final school of thought Dahl (2013) describes the school as a pessimistic school, though it is not due to the belief that the problem cannot be solved, but due to the lack of collection of information (Dahl, 2013). This school is called the Contrarian School, and Dahl (2013) states that the worldview believes that the right information was not collected, which caused the failure (Dahl, 2013). To fix the problem, the school believes that more HUMINT needs to be collected, and that the CIA is what needs to

change in order to better the intelligence community. For this school of thought, Dahl (2013) included scholars such as David Kahn, Ariel Levites, and Brian Jenkins (Dahl, 2013).

For my personal view of the schools, my view would be a combination of both the traditionalist and the reformist schools. As I am optimistic that the intelligence community can do better at information sharing, though I do believe that some intelligence failures are natural and not every failure can be predicted. However, my worldview aligns with the view that the intelligence community can be bettered in predicting with a more successful rate, like a baseball player raising his batting average.

Reasons. Moving past schools of thought, different scholars have different views of why intelligence could possibly fail. Going forward this section will cover a few different views of the supposed causes of intelligence failures. The goal is to show what other scholars have proposed in this field as to be the cause of intelligence failures.

One reason proposed by Montgomery and Mount (2014) why intelligence fails is described their paper, *Misestimation: Explaining US failures to Predict Nuclear Weapons Programs*. Through out this case study, Montgomery and Mount (2014) propose twelve hypotheses that cause intelligence to become distorted. These reasons include such factors of distortion from influences such as politics, culture, bureaucracy, and organizational design (Montgomery & Mount, 2014). The distortion is described as happening by many different individuals in the intelligence cycle, such as analyst worried about backlash from an opposing view so they do not release intelligence to conflict with favored views, to policy makers choosing to act on intelligence from a favored source and ignoring other outlets (Montgomery & Mount, 2014).

Betts (1978) on the other hand took a more simplistic approach to why intelligence fails. He proposed that intelligence fails due to the information being too vague and "permissive for policy judgment rather than too constraining" (Betts, 1978). This view of intelligence concludes that intelligence should be strict in defining what the policy makers should do actionable intelligence, rather than letting the policy makers decide the course of action. Though this kind of constraint could produce too much restriction on the thinking by the policy maker and cause less abstract thinking efforts.

A third possibility that is proposed by Gill and Phythian (2012) where they detail the reasons for failure are due to policy makers expectations being unrealistic expectations of intelligence. The pair states that "consumers need to be aware of the limits of intelligence if it is to be effective as a basis of policy" (Gill & Phythian, 2012). The worldview for this type of failure would align close to that of the traditionalist school of thought, as it claims that policy makers are asking too much and the problem is that intelligence will always have failures.

A worldview from that of Roberta Wohlstetter (1962) in her renowned book, *Pearl Harbor; Warning and Decision,* which defined the causes of the intelligence failure for this event, was "information being lost in the noise" (Wohlstetter, 1962). What she has proposed is that simply too much information was collected from the European theater of war along with the information around the pacific theater, leading to the important information that could have shown an imminent attack being drowned out (Wohlstetter, 1962). The caused of this kind of failure could have been due to a lack of US processing and analysis capabilities by the US Another reason could be due to analyst processing information could have been focused too narrowly around the European

theater to open their minds to an attack on the US by Japan. Though like her book, this proposed cause is only for this situation and maybe not applicable to others.

Fixable? Depending on what school of thought or what worldview one possesses, the question are intelligence failures fixable, can range in the answers. For Betts (1978), "although marginal reforms may reduce the probability of error, the unresolvable paradoxes and barriers to analytic and decisional accuracy will make some incidence of failure inevitable" (Betts, 1978). From his perspective, they are natural as weather storms. This perspective also aligns closely with my worldview that you can better the intelligence community, but you can never have a perfect batting average.

Final Thoughts. The branch of intelligence failure that this thesis will focus on is failures that occur in the intelligence cycle. This thesis will not focus on policy maker's actions, but rather the intelligence community efforts to complete the five steps of the intelligence cycle described earlier in the thesis. Thus, an intelligence failure for this thesis would be defined in the scope of the efforts of the intelligence community to address a problem, collect actionable information, process information correctly, preform analysis and draw conclusions with actionable possibilities, and disseminated to policy makers who can use the actionable intelligence, all without fault. Though if one failure is to happen, this will not conclude in the whole process being a failure, but it will be examined to see if the specific failure could have caused a shift in the intelligence outcome.

USSR Nuclear History

History. The next three parts of this chapter will focus on each of the nuclear programs and their respective history of each case. The first will be the history of the

USSR nuclear program, followed by the history of the PRC nuclear program, and finally the history of the DPRK nuclear program. The goal of these sections is to expand on and understand the history before this thesis examines points within the programs themselves.

Pre-Operation. When nuclear fission was first discovered, the scientist goal was not to produce a bomb, but was instead to explore atoms. Otto Hahn and his assistant Fritz Strassmann discovered the first nuclear fission in 1938. During this time, there were theories that atoms produced a high amount of kinetic energy. While some theorized that it could produce large amounts of electricity in a self-sustaining reaction, it was not until December 1942, when Enrico Fermi, an Italian American physicist, produced the first reaction in Chicago, Illinois (Holloway, 1994). Not long after this success, the United States began the Manhattan project to develop a nuclear weapon. Though the Soviet Union was not of the same mindset and pushed off the project. Igor Kurchatov, an Soviet physicist and would later become the director of the Soviet nuclear program, operated a laboratory in which he studied nuclear fission from 1939 until the German invasion of the USSR in World War Two; soon after the laboratory was closed and many went off to fight in the war (Holloway, 1994). During the war in 1941, Georgy Flerov sent many letters to Joseph Stalin bringing attention to the sudden absence of nuclear fission studies in western scientific literature and proposed that the work had been “put under the seal of silence in order to make a bomb” (Holloway, 1994). Though the effort was made, concentration of resources and materials were directed towards the war efforts, which left little time for nuclear research. In 1942, the Soviet Union officially began research into nuclear fission with Decree number 2352 that officially created the Soviet Union nuclear

program at the Ukrainian Academy of Sciences in order to begin research into creating a nuclear bomb (SUSCD, 1942).

Operation Borodino. The USSR program to create nuclear weapons was named "Operation Borodino" after the famous battle that stopped Napoleon and the French forces and began the Russian counter offensive to win the war, in which the field where this all took place was named the "Field of Borodino" (Holloway, 1994). During this scientific exploration, Kurchatov would come to create his own version of the famous Chicago-1 Pile, but instead of using heavy water like the Americans, Kurchatov used graphite due to its ease of accessibility from within the USSR (Holloway, 1994). The resources used from this project were gathered from places inside and out of the USSR but also some fission materials were bought from the United States, though this acquisition has no paper trail to prove the resources went to Kurchatov (Holloway, 1994). On July 16th, 1945, the US successfully detonated the first ever nuclear weapon, proving that it could be accomplished (Holloway, 1994). Though US was not aware, the USSR had an informant on the inside of Project Manhattan, Klahs Fuchs, a German physicist who worked on implosion and was recruited to the project in 1944 (Holloway, 1994). From this informant, many of the US secrets would be leaked to the USSR and would help with the efforts to create a nuclear weapon. On August 6th, 1945 Hiroshima would be the site of the first ever nuclear detonation as a weapon beginning the race by the USSR to end the US's monopoly on nuclear weapons (Holloway, 1994).

Post Hiroshima. Following the Hiroshima and Nagasaki bombings, the USSR would finally separate out its first plutonium in 1946 which was a key point in the creation of a nuclear weapon, though this was not from a Soviet reactor, but a stolen

sample from the US (Holloway, 1994). The USSR also created a counterpart to Los Alamos called Design Bureau of USSR of Sciences Laboratory Number 2 and established Kurchatov as the director (USSR Council of Ministers, 1946). After the longtime of studies and testing, on December 25th, 1946, the USSR would accomplish the first ever self-sustaining nuclear reaction outside of the U.S (Holloway, 1994). With this achievement, the USSR was moving closer to obtaining a functioning nuclear weapon. A little less than a year later, the USSR would produce the first soviet plutonium on December 17th, 1947, completing another key component to create a nuclear bomb. Next, after mass production and refining of weapons grade plutonium metal, the fissionable material used in some nuclear weapons, and a plutonium diffusion plant was build and began production in January, 1949 (Holloway, 1994). While these feats were being accomplished, a test site would need to be established. During 1947, the USSR decided on a test site named Semipalatinsk Experimental Training Ground, as it was close to the town of Semipalatinsk, and began to build the necessary buildings and testing tower needed for a nuclear test (Richelson, 2007). By June 1949, the USSR had produced enough plutonium for two hemispheres needed for the construction of a bomb, and thus all that was left was the test (Holloway, 1994).

On August 29th, 1949, Operation First Lighting or RDS-1 was a go. These were the official code names for the first test of a nuclear device by the USSR. The test was carried out at 6am by Kurchatov and his team and was successful in their efforts (Garrett, 2017). The detonation produced a fireball around 22 kilotons of TNT, around the same yield as the bomb dropped on Nagasaki, Japan (Garrett, 2017). At the time of detonation, the US was not aware that the efforts by the USSR had been successful, though the US

knew that the monopoly on nuclear weapons would not last. As an effort to catch the blast, the US flew reconnaissance aircraft with devices called “sniffers” on board that would filter the air and try to catch radiation particulates (Garrett, 2017). This would prove successful as only a few days after the initial test; a flight from Japan to Alaska would provide the first signs of a nuclear blast (Garrett, 2017). After more test and flights it was concluded that the USSR has successfully detonated a nuclear device, and the US nuclear monopoly was over. A few days after this determination was made, the President Truman would conduct a press conference where he announced that the US had proof of a USSR nuclear test (Truman, 1949).

Peoples Republic of China

Before the Test. Following the United States in 1945 and the Soviet Union in 1949, the PRC completed its first successful nuclear bomb test with a yield approximately 22 kilotons of TNT in 1964 (Burr, 2014). This yield is the same experienced from the bomb that was dropped on Nagasaki, Japan, during the Second World War. This test was conducted in the central regions of Mongolia at a site-designated Lop Nur (Burr, 2014). This would go on to be the first of many test that the PRC would carry out during its time testing at Lop Nur site (Burr, 2014).

Before continuing, we must first cover what happened before the first successful test of the PRC’s nuclear bomb. The Soviets had tested and successfully detonated their first nuclear bomb in 1949, making them the second nuclear country. Shortly afterwards in October, 1949, Mao Zedong won the Chinese civil war and created the new state of the People’s Republic of China. Effectively bringing into existence another communist country to ally with the Soviets. In 1950, the Soviets and the Chinese began to work

together on a plan to bring nuclear power to China (CIA, 1960 May). This plan was not officially enacted until 1955, when the Sino-Soviet Nuclear Energy Agreement was signed stating that the Soviets would help Chinese with gathering material, scientific equipment, professionals, and other needs to bring the nuclear energy program to functioning abilities (CIA, 1960 May). Within the first couple of years, the Chinese bought a research reactor that could handle a range of 7.5 to 10 Megawatts of thermal capacity and a 25 million electron volt cyclotron to begin research (CIA, 1960 May). This reactor was considered by Flowerree (1960) to be too weak to produce enough materials for a weapons program in his memorandum to the Department of State (Flowerree, 1960).

Most estimates, including both reports from the Central Intelligence Agency (CIA) in January and May of 1960 and the memorandum by Lemnitzer (1961) released from the JFK library, believed that with the Soviets help, the Chinese would be able to successfully test a nuclear bomb in the range of 1962-1964. This was largely due to the belief that after a while, the Soviets would give the needed amount of fission material to the Chinese to conduct a test with, as the reactor bought by the Chinese for research was not going to be able to produce enough fission material (CIA, 1960 January).

The agreement carried on until 1959 when a rise tensions between the Chinese and the Soviets and the Soviets withdrew all influence from the program. This breakdown of relations began shortly after the death of the communist leader Joseph Stalin (CIA, 2008). Reasons for this breakdown pointed in many different directions, though it seemed to stem from a difference in political opinion on who was the true successor of Stalin (CIA, 2008). While in the Soviet Union the next leader was Nikita Khrushchev, in China

Moa Zedong believed he was the next successor (CIA, 2008). Compile this reason along with ideological differences in communism for each region, a history of land disputes, and a resentment of the Chinese communists by the Soviets, all together making the narrow split a wide gash in the Soviet Bloc (CIA, 2008).

After the Soviets pulled resources and personnel out of China, the United States intelligence community saw its first conflicting estimates of when the first nuclear test will be conducted. A report from the CIA (1962) made it known that the group did not believe China's ability to test and successfully detonate a nuclear explosive would be accomplished until the late 1960s (CIA, 1962). While Lemnitzer (1961) wrote that the Chinese would only be pushed back a year or two (Lemnitzer, 1961). Those kinds of conflicts in thought about the Chinese could partly be why the United States was unaware of the nuclear progress that China had made during this time. This speculation continued until photographs by the KH4-A satellite revealed a tower over the Lop Nur testing site (Brown, 2014). Another problem that the intelligence community debated was the type of nuclear weapon that would be tested. While the reactor purchased would not be able to produce enough uranium to run a timely weapons program, the Intelligence community did seem to believe that a plutonium bomb would be the first type detonated (CIA, 1963). Though they didn't think it would be in 1964, the CIA (1963) reported that they believed it would be at least 2 or 3 years before the spent fuel rods could be processed into plutonium fission material (CIA, 1963).

After the Test. After many years of development in secret, the PRC detonated its first successful nuclear bomb at the Lop Nur test site on October 16th, 1964. Within the day, word had spread to Washington DC of the successful test (USSD, 1964). As shown

in the State Departments memorandum (1964), the test and the thought of nuclear China had been expected. Though, this was mainly due to the satellite images that were taken over Lop Nur earlier in October. Grant (1964) reported that most countries, like the United States, were not surprised by the test but he did mention that Taiwan was an exception to that statement (Grant, 1964). This is due to the long complex history that the Taiwanese government had with Chinese communist government, which is beyond the scope of this paper. Grant (1964) then suggested to Secretary of State that the US should strengthen its ties with its allies that are south of China in Thailand, Australia, New Zealand, and among others (Grant, 1964). In a secret telegram from the US Embassy in Taiwan stated that the Taiwanese were in favor of all-out military war against the Chinese in order to prevent them from more nuclear tests and the construction of nuclear weapons (USE Taiwan, 1964). Taiwan wanted this attack to be carried out, with or without, US support, but the support would never come as a provocation of the Chinese by attack would only disconnect the United States from the Soviets even more and possibly ally the two rivals once again. When China and the Soviet Union split, the US gained an advantage as relations could be improved without involving China.

By November, the Defense Intelligence Agency (DIA) had written a report stating that more than likely the Uranium-235 used in the test conducted during October had been created in the PRC (DIA, 1964). Within this report it also stated that at the time they could not discount that the U-235 could have come from the Soviets, but it more than likely came from the gaseous plant in Lanchou, China (DIA, 1964). The good news from this is that without the Soviets, the Chinese could produce very little fissile material,

meaning that the weapons program would not be able to produce a deployable weapon for some time (DIA, 1964).

Democratic People's Republic of Korea

Beginning. North Korea and its leader, Kim Il Sung, began attempting to acquire nuclear weapons around the same time that China and the Soviet Union were beginning their nuclear dealings. Ivanov (1954) was the earliest record of Kim Il Sung, attempting to acquire nuclear materials and training from the USSR. Though the USSR had no intent of expanding the list of nuclear capable countries to include North Korea. The USSR did agree however to showing North Korea an exhibit, hosted inside of North Korea, of the peaceful means of using nuclear energy for power (Puzanov, 1957). Afterwards, the North then began to submit proposals to the USSR to teach North Koreans how to use nuclear energy for peaceful means, though the USSR denied this as well (Gromyko, 1958). The DPRK justifies their need of nuclear weapons by saying that the US holds South Korea, South Vietnam, and Taiwan under their rule by using nuclear weapons as "blackmail, and do not leave" (Moskovsky, 1962). This carries on until 1965, when the USSR sold a small test reactor to the DPRK and placed it under the controls of the International Atomic Energy Agency (IAEA) (Richelson, 2007). Giving the first nuclear power to the republic.

Phase 2. Continuing on from 1965, in 1970 the DPRK named its head of its nuclear program, a man named Lee Sung Ki along with two others named Do Sang Rok and Han in Suk (Richelson, 2007). The program began to build its own reactor in 1982 with help from the USSR, attempting to complete a 20 to 30 megawatt graphite reactor, which began functioning in 1986 (Richelson, 2007). Over time other activities and

construction began, one such was the mining of Uranium from two areas within the country, another was a second construction project to build a 50 to 100 MW graphite reactor (Richelson, 2007). These three reactors would become the backbone of the DPRK's nuclear program and allow for ample amounts of plutonium to be harvested from spent fuel rods. While this was all going on, a plutonium reprocessing facility was discovered by the IAEA inspectors and was believed to be finished, but it had parts missing that are thought to have been removed to make it look like it the plant was in construction (Richelson, 2007). Completing another key step to harvest plutonium metal for a core to a nuclear device.

During all the construction, a political back and forth was unfolding in which the DPRK's new leader, Kim Jong Il the son of Kim Il Sung, joined the NPT in 1992 and thus let in IAEA inspectors to the country to monitor the nuclear reactors (Richelson, 2007). This decision was reversed when IAEA inspectors accused the DPRK of producing plutonium and not reporting it. This resulted in the DPRK leaving the NPT in March 1993 (Richelson, 2007). After this event, the US and DPRK entered into an agreement, later referred to as the Agreed Framework, in which the US would provide coal and food and other resources and the DPRK would stop their nuclear program (Richelson, 2007). This would also fall through in 2002 as the DPRK would announce the continuation of their nuclear program and would leave the Agreed Framework (Richelson, 2007). During 2005, Kim Jong Il will again make a statement where he plans to rejoin the NPT, though this was never followed through (Richelson, 2007). On October 6th, 2006, the DPRK tested its first nuclear device at the underground Kilju testing range. The yield was only around 4 Kilotons believed to be the result of a partial reaction of the

plutonium core (Richelson, 2007). The DPRK was the latest country to join the nuclear club and just recently made claims that they successfully detonated a hydrogen thermonuclear bomb, though this claim is disputed.

CHAPTER III

Methodology

Introduction. Intelligence failures have shown in past literature to be problems that cannot simply be fixed by amending one factor of the intelligence community as a fix all, but instead are complicated problems that require in-depth analysis. This part of the thesis will provide the outline for how this thesis will address and analyze the single factor of the failure to predict the capabilities of nuclear programs, within the subject of intelligence failures. As Montgomery and Mount (2014) have shown for the three cases of the USSR, PRC, and DPRK, the US has had difficulty in being able to accurately predict the progress and capabilities of each nuclear program up to the first test. As the authors hypothesize, this is due to intelligence distorting and failing to provide information that shows each of these countries had working nuclear program capable of producing a functioning nuclear weapon. This thesis will address the problem of failure in prediction by examining the actions taken by the US within the scope of the intelligence cycle detailed in the literature review. Then, the data will be conceptualized to show whether or not the actions taken by the US were the root cause of the failure.

Cases

There will be three cases detailed in this study. The cases presented will be the nuclear programs of the USSR, PRC, and DPRK. The reason these cases were chosen is due to their ties to each other as both the PRC and DPRK worked jointly with the USSR to initially develop their nuclear programs. Thusly, each of these three cases were not picked at random but were chosen due to the PRC and DPRK programs having received influence from the USSR. Each case will consist of data including primary and secondary

documents from the time period and seminal literature from prolific scholars in this field. The time period of examination within each case will start with the conception of the nuclear program and will continue till the first successful test of an atomic weapon. This study will only examine materials related to the efforts by the US to gathering information on each cases nuclear program.

Materials

The data that is used in this study is gathered from a number of sources, mainly primary historical documents and some secondary books and documents. The research databases that were used in this study include the George Washington University National Security Archives with specific reference to the nuclear vault, the Wilson Center Digital Archives with specific reference to the nuclear history section, and the George Bush White House Archives with specific reference to materials on the DPRK. Books that were referenced were gathered from online sources such as the Newton Gresham Library Engine Orange search engine and Google Scholar, and physically through the Newton Gresham Library. Common terms used in the search engines included intelligence, intelligence failure, Intelligence cycle, nuclear programs, program history, USSR, Soviet Union, PRC, China, DPRK, and North Korea. When reading through online sources, the search would not go past the third page within the search engine; this was to document the scope of the search for study replication purposes. Other materials that were gathered for this study are specific articles from journals such as *International Journal of Intelligence and Counterintelligence,* and the *Journal of Intelligence and National Security*.

Procedure

The configuration used for the study will be a structured, focused study in which each case will be examined in chronological order of the USSR, PRC, and DPRK (George & Bennett, 2005). Within each case, the phases of the intelligence cycle will be key steps of examination, as efforts made by the US will be sorted into one of the five phases. The phases will follow the order as presented in the literature review chapter; beginning with Identifying the problem, collection, processing, analysis, and concluding with dissemination.

During this study, the same questions will be asked of each case as to conduct a structured, focused study. The structure, as discussed earlier, will begin with the identifying the problem phase and will ask the question of "how long after the first actions taken by the state, or the official creation of this case's nuclear program, did the US begin attempting to find evidence of a nuclear program?" This will be accomplished by comparing three components of, when the nuclear program was first started, when the US first heard of the program, and when the US began efforts to find the program, to gauge the reaction of the US to the intelligence that the program had begun. This could potentially present challenges as the documented proof that the US intelligence had been notified of the program may not exist, or the US may have suspected the program but no proof until the program was uncovered by the US intelligence efforts. If this is the case, then the examination will conclude with what is available. With this question, the goal is to show at what pace the US began attempting to collect information on the case-specific program after first being notified of the existence of the program, to draw conclusions about the response by the US.

The next phase, collection, will answer the question of "did the US utilize all of its methods of gathering intelligence during this time period?" How this will be accomplished is by listing out different attempts made by the US and sorting them into one of the five categories of intelligence gathering, which are HUMINT, OSINT, MASINT, SIGINT, and GEOINT. Once efforts are documented, then the analysis will examine each method of gathering to see if every category of intelligence gathering has proof of use. The goal is to measure the US efforts in the collection phase by providing proof for as many methods as found to be documented as having been used during the cases time period. This will show if the US utilized all of its methods of gathering intelligence or failed to do so. The second question that will be asked during the collection phase assessment will be "was there any information that was missed by the US intelligence efforts during this time period that could have made an impact on the US intelligence estimates?" With this question, we will examine what evidence was missed, if any, and determine the criticality of the information and its possible effects on intelligence estimates during this case. How this will be assessed is by gaming out what could have been alternative outcomes to intelligence estimates if this intelligence was collected. The goal of this question is not to show that evidence was missed and brand the entire effort a failure, but to show that evidence missed could have made an impact on the intelligence estimates and could have had a hand in the overall failure.

The third phase of processing will begin with the question of "Is there any documents that show translation from one language to another, show verification of sources of information, or test substances to verify their identity to prove processing was used to prepare information for analysis?" This will be carried out by locating either a

quote from Korean, Chinese, or Soviet personnel or leaders, test results from laboratories, or reports that state they confirmed the information with an outside source inside of primary source document as proving that processing took place is difficult, though using this method would show processing by proxy. The goal within this question is to show evidence of processing in some form took place during this case. The next question that will be asked is "what information was processed incorrectly, and what effect could this have on the estimations of the US?" This will be carried out in a qualitative analysis of alternative outcomes style of gaming out different outcomes from wrongly processed information. With this question, the goal is to determine what is the probability that information was wrongly processed during this time period and the effect it could pose on US intelligence estimates of the nuclear program.

The fourth phase, analysis, will be examined with the question of "were US analysts able to provide a clear picture of the current situation with the intelligence they were given?" The way this will be determined is by comparing what the US intelligence had reported and assess to see if the report can answer the basics of who, what, when, where, and why. If this report can, then it can be stated that a clear picture was drawn from the information. The goal of this question is to show that analyst during the time period of the case-specific report were able to conclude with logical explanations of the current situation at the time. The second question for this section will be "is there any documented proof of analysis vetting out or disregarding useful information?" Data gathered to answer this question will be evaluated in qualitative means of examining the reasoning, if provided, for the non-inclusion of this data into the estimate; and if not

given, alternative outcomes analysis will be utilized to game out reasons for non-inclusion.

The final phase of dissemination will answer the question of "was the intelligence presented to someone with actionable authority?" Actionable authority in this study will be defined as having the ability to affect national policy including foreign and domestic, military action, or international relations with other countries on behalf of the US How this will be examined is by means of determining if the intelligence was presented to someone, if so to who was the intelligence was presented to, and if any action were taken after the intelligence was presented. None action will be examined too, as not all intelligence causes actions to be taken. The goal is not to show action but to show that the intelligence was presented to someone with authority as defined before.

Going forward. The next chapter will cover the results of the study. The chapter following results, the discussion chapter, will first address the research question for this thesis with references to all of the data provided in the results chapter. After the question has been addressed, conclusions will be drawn on whether or not these failures of prediction were due to intelligence efforts failing.

CHAPTER IV

Results

This part of the study will examine each case and the US intelligence efforts at predicting the capabilities of each nuclear program up till the first successful test of an atomic bomb, by providing evidence of actions conducted by the United States. The order of examination will commence with the first case study being the USS.R. with reference to materials presented in the literature review. The findings are included in a table at the beginning of the three cases, from which each case will go into more depth on the material in the table. The table will include condensed results from all three cases for the purpose of a side-by-side comparison.

Table I

Results for Each Case Study of the USSR, PRC, DPRK

Cases	USSR	PRC	DPRK
Identifying the Problem			
Question #1: How long after the first actions taken by the state, or the official creation of this case's nuclear program, did the US begin attempting to find evidence of a nuclear program?	Decree number 2352 created the USSR Nuclear Program (SUSCD, 1942) The US first action was on September 17th, 1947 (Condit, 1996).	Sino-Soviet Nuclear Energy Agreement (CIA, 1960 May) CIA attempted to photograph facilities in 1957 (Richelson, 2007)	Kim Il Sung began efforts in 1954 (Ivanov, 1954) The US began intelligence operations in 1961 (Richelson, 2007)
Collection			
Question #2: Did the US utilize all of its methods of gathering intelligence during this time period?	The US utilized MASINT (Condit, 1996), HUMINT (Lowenhaupt, 1969). The US did not use GEOINT, SIGINT, or OSINT	GEOINT (Brown, 2014) OSINT (CIA, 1960 January) HUMINT & SIGINT (Richelson, 2007) MASINT (Ewing, 1963)	GEOINT (Richelson, 2007) MASINT (CIA, 1982) SIGINT (NSA, 1989) OSINT (FBIS, 1989) HUMINT (Richelson, 2007)

(continued)

Cases	USSR	PRC	DPRK
Question #3: Was any information missed by the US intelligence efforts during this time period that could have made an impact on the US intelligence estimates?	Klaus Fuchs gave information to the USSR on US nuclear methods (Holloway, 1994)	Lanzhou Plant is not considered missed evidence, but instead an analytical error (Ewing, 1963)	Due to the DPRK still closed off to the world about how their nuclear program works, it is reasonable to say that a sufficient answer to this question cannot be found
Processing			
Question #4: Are there any documents that show translation from one language to another, show verification of sources of information, or test substances to verify their identity to prove processing was used to prepare information for analysis?	Tracer Labs test at Berkeley (Richelson, 2007) Los Alamos test at laboratory (Spence, 1949)	Translation from Chinese to English (CIA, 1961)	Translation from Korean to English (FBIS, 1989)
Question #5: What information was processed incorrectly, and what effect could this have on the estimations of the US?	Multiple test concluded with similar results increasing the validity of the results (Richelson, 2007) (Spence, 1949)	Mistranslation could pose serious risk if the information was valuable intelligence	This case faces the same outcome of mistranslation could pose serious risk if the information was valuable intelligence
Analysis			
Question #6: Did US analysts provide a clear picture of the current situation with the intelligence they were given?	Backtracking of the radioactive plume (US Air Force, 1949)	Report on the discovery of the Lop Nur Tower (Director of Central Intelligence, 1964)	Brief to US Congress on the DPRK Nuclear Weapons Program (Niksch, 2003)
Question #7: Is there any documented proof of analysis vetting out or disregarding useful information?	Audio Substations (Northrup, 1962)	Lanzhou Gaseous Diffusion Plant (Ewing, 1963)	This question is also difficult to answer as the case is still very recent
Dissemination			
Question #8: Did the intelligence produced get presented to someone with actionable authority?	Speech announcing USSR test (Truman, 1949)	CIA Bulletin to the President (CIA,1964)	Report to US Congress (Niksch, 2003)

Case One: USSR (1942-1949)

Identifying the Problem. For the first case, the Soviet Union will be the target of this section. The question to begin the study is how long after the first actions taken by the state, or the official creation of this case's nuclear program, did the US begin attempting to find evidence of a nuclear program? The US knew that its monopoly on nuclear weapons would eventually come to an end. Though, the US was not sure when this would happen (Truman, 1949) As shown in the literature review, the official creation of the Soviet nuclear research program began in 1942 with Decree number 2352 by the Soviet Union (SUSCD, 1942). The earliest intelligence found by the US is shown in Lowenhaupt (1969) that stated the United Kingdom (U.K.) received word in 1946 of a plant producing large quantities of highly pure metallic calcium and was shipped from Czechoslovakia by railcar to the USSR (Lowenhaupt, 1969). Calcium is a key component in the nuclear process as it is used in a chemical oxide reduction process that makes metal uranium out of uranium ore. The plant was observed shipping around ten tons of calcium every ten days to the USSR (Lowenhaupt, 1969). It wasn't until early 1947 when the U.K. passed word to the US about this plant and its operations. The US then began planning on how it would catch the first test when it happened. This led to the US beginning a project on September 17th, 1947, in which reconnaissance aircraft would fly certain routes with filters or as some articles refer to them "sniffers," attempting to register radioactive byproducts of a nuclear fission from a successful first test (Condit, 1996). This would become the first actions taken by the US to acquire information that a first test had occurred.

Collection. The next question is did the US utilize all of its methods of gathering intelligence during this time period? The first method mentioned is the one that presented the first signs of a nuclear test. The flight that was the first sign of a test was a US Air Force flight from Japan to Kodak, Alaska, by a WB-29 Reconnaissance plane with filters on September 3rd, 1949, almost a full two years after the launch of the project on September 17th, 1947 (Condit, 1996). This type of intelligence gathering would fall into Measurements and Signals intelligence or MASINT.

Though this was not the only attempt at capturing signs of a first test. The US also employed methods such as Audio substations to attempt to capture the sound of the first test, though this process was never reported as being a success during the first moments (Condit, 1996). This is another example of a MASINT project. Yet another method attempted shortly after the initial discover of the calcium producing plant, was the CIA attempt at gathering human intelligence or HUMINT. The CIA's methods including intercepting letters from German scientists who were working in the USSR and would mail letters to East Germany to family members or other people. The letters would produce little intelligence though they would give the CIA another chance by attempting to contact the scientist and get them to defect to West Germany, where the CIA could debrief them on what they know and is going on in the USSR (Lowenhaupt, 1969).

Along with these efforts, the US Navy Research Laboratory (1949) began a project called "Project Rain Barrel" in April 1949, in which rainwater would be collected and analyzed for particulates in the rainwater. A problem pointed out in the document detailing the project is how many factors must line up if the project is to be a success, such as the cloud of radioactive particles from the blast passing over an area with rain

barrels while it rains. Even with all of these factors, the project was successful after the flight that originally alerted the US to the successful test and again showing another method of MASINT (US Navy Research Laboratory, 1949). While no evidence found conclusively stated forms of GEOINT, SIGINT, and OSINT were utilized, it cannot be discounted that these forms of intelligence gathering were completely ignored.

Continuing forward with the second question, Was any information missed by the US intelligence efforts during this time period that could have made an impact on the US intelligence estimates? One thing that comes up is the missed USSR spy, Klaus Fuchs. Klaus Fuchs was the German physicist who infiltrated the Manhattan project at Los Alamos Laboratory. Though this field falls under Counterintelligence, the intelligence Fuchs would have produced if captured earlier, could have changed the estimates of nuclear development time estimates. Scholars debate the amount and the criticality of the information that Fuchs passed to the Soviets, but it is believed that without Fuchs' information, the program would not have made the rapid advances it did. One piece of information described the barriers used in gaseous diffusion plants and what they were made of (Holloway, 1994). Which is proclaimed as the reason the Soviet scientist shift from the centrifuge to a gaseous diffusion method of acquiring fission materials, even though the centrifuge was later proven to be the better method (Holloway, 1994).

Processing. One thing that makes finding conclusive evidence of this phase difficult is due to most data used in this study are acquired from final reports produced after analysis. Showing what work occurred in collecting and consolidating these documents in preparation for analysis can be difficult. The question is are there any documents that show translation from one language to another, show verifiable sources of

information, or test substances to verify their identity to prove processing was used to prepare information for analysis?

One example of this could be shown after the particulates from the flight that alerted to a nuclear test were captured and extracted, they needed to be confirmed through testing before any conclusions could be drawn. The first lab that received testable particulates was the Tracer lab at Berkeley (Richelson, 2007). The particulates were received on September 6th, 1949, and were found to be most likely from fresh nuclear fission, pointing most views towards the theory of a successful nuclear test by the USSR (Richelson, 2007). This theory was further confirmed by the examination by Los Alamos Laboratory. A report by Spence (1949) examined samples of filters from collection flights in terms of radiochemical examination and found that the particulates in the samples were fission material from a recent test. This further confirmed that the material was nuclear fission particulates and that a test had happened as Tracer labs declared (Spence, 1949).

A second question is, what information was processed incorrectly, and what effect could this have on the estimations of the US? A double proof from the two labs testing the samples from the flight and drawing relatively the same conclusions presents relatively sound evidence, though what if these were both false positives? This question would be answered by the positive test of particulates from project rain barrel. However, the argument could be made that this was a confirmation bias of wanting to find evidence of a USSR test. Meaning that a false positive would, in theory, be accepted without question due to everyone wanting evidence against the USSR.

Analysis. The next question is did the US analysts provide a clear picture of the current situation with the intelligence they were given? To answer this question, the report will have to answer who, what, when, where, and why to show that a simplistic picture of the current situation is constructed. After these two tests were concluded with similar results, the US Air Force (1949) began backtracking the radioactive plum to find its origins with wind patterns and weather data; answering the "who" and "what" part of the picture. The goal of this process is to designate where the radioactive plum originated, answering the "why" (US Air Force, 1949). After further analysis, the report stated that due to weather patterns and wind patterns the most likely area of the test was inside of the USSR and designating the "where" (US Air Force, 1949). Not only was the backtracking able to find the location, but also provided an estimated date of when the test occurred from August 27th to August 29th, nailing the test down almost to the exact date on which it happened answering the "when" (US Air Force, 1949).

The second question is there any documented proof of analysis vetting out or disregarding useful information? Evidence presented in Northrup (1962) showed that some information had been vetting out. After the fact, the audio substations were reexamined to see if they had picked up any signal during the test. Northrup (1962), who was an Air Force personnel key to the AFOAT/1 program for discovering the USSR test, described in detail how the reexamination of the audio substations revealed that two stations captured weak signals during the blast though they were originally ignored. After the fact, this was used to determine the location, down to 100 miles of the test sight, and the time of the blast, within 10 minutes of the actual test (Northrup, 1962). Better confirming the theory that the USSR had tested a nuclear device. While the reason for not

including this information in a report during the time was not given, this information was not a part of major factor in the overall failure. To game out the analysis more, if the audio station found the sound bites during the time this could have produced a warning to the US, though this would not present enough proof to have a confirmed test, or have produced a new estimate that would have predicted the test due to the nuclear having to had occurred in order for the audio substations to produce results.

Dissemination. During this next phase, the question that will be addressed is did the intelligence produced get presented to someone with actionable authority? After confirming and condensing all of this down into a report, the brief was given to then President Truman, who then acted on the intelligence by publicly announce that the US had proof of a nuclear test by the USSR (Truman, 1949). This announcement shows that the intelligence reports were delivered to someone who was in a position that would be considered actionable as pointed out by the definition in chapter three.

Case Two: PRC (1955-1964)

Identifying the Problem. This section of the study will begin the portion around the People's Republic of China's nuclear program and the US efforts around predicting it. Beginning with the first phase of the intelligence cycle, how long after the first actions taken by the state, or the official creation of this case's nuclear program, did the US begin attempting to find evidence of a nuclear program? The creation of the nuclear program dates back to 1955 when the Soviet Union officially agreed and enacted a plan, the Sino-Soviet Nuclear Energy Agreement, to help China by providing help with resources, materials, and knowledge in the nuclear field (CIA, 1960 May). The Soviets then also helped to supply a reactor by letting China purchase a test reactor from them (CIA, 1960

May). Richelson (2007) stated that the CIA and other agencies began attempting to photograph facilities and detect nuclear particulates in the air in 1957 (Richelson, 2007). As shown, this was the first recorded example of the US attempting to find evidence that China was building a nuclear program, though no document showed any evidence that the US had received intelligence from other countries bringing attention to the nuclear program like in Soviet case.

Collection. Continuing with the next phase of the intelligence cycle, collection, did the US utilize all of its methods of gathering intelligence during this time period? Looking through to the last section on identifying the problem, the CIA and other agencies imagery attempts demonstration GEOINT being utilized in collection efforts. GEOINT was also part of a key element of the prediction efforts in which a clandestine site was revealed by the US Air Force in which a KH4-A satellite; the site was the Lop Nur testing grounds (Brown, 2014). The CIA (1960 January) demonstrated another effort at gathering intelligence, in which a Chinese source stated that China would have a bomb within one to two years from 1960 (CIA, 1960 January). This intelligence was gathered from Chinese news and media sources, indicating that this intelligence was collected as OSINT. The CIA was also attempting during this time period to capture radio communication signals and human informants from the program (Richelson, 2007). This constitutes as proof of attempts by the US in collecting HUMINT and SIGINT during this time period. MASINT was shown to have been utilized in Ewing's (1963) SNIE as the Lanzhou gaseous diffusion plant was described in its measurements along with the plant's size being too small to operate with enough efficiency to produce weapons-grade uranium in quantities needed for a nuclear program (Ewing, 1963).

Moving into the second question, was any information missed by the US intelligence efforts during this time period that could have made an impact on the US intelligence estimates? The example of the Lanzhou plant would not constitute as missed evidence because the plant was discovered and photographed, though it was labeled as too small to separate out enough weapons grade uranium to produce a nuclear weapon until 1968 (Ewing, 1963).

Processing. Are there any documents that show translation from one language to another, show verification of sources of information, or test substances to verify their identity to prove processing was used to prepare information for analysis? A CIA (1961) daily brief included many quotes translated from Chinese to English from Chinese Chief of Staff Lo Jui-Ching. The Chief of Staff was stating "China would have a bomb soon and the US needed to prepare for war" (CIA, 1961). These quotes show the use of translation, thusly showing some level of processing within this case.

The next question is what information was processed incorrectly and what effect could this have on the estimations of the US? Mistranslated quotes could present trouble for the US as it could cause a lack of trust in future intelligence, though mainly a mistranslation could pose the risk of key information getting lost in translation. For the quote in the section above, a mistranslation would only present minor problems, as the quote does not present any crucial information besides expanding on the determination of China to complete a nuclear weapon.

Analysis. The next phase of analysis presents the question did US analysts provide a clear picture of the current situation with the intelligence they were given? For the report presented we are going to focus on the Director of Central Intelligence (1964)

August report after the discovery of the tower at Lop Nur, using the examination method of the who, what, when, where, and why. First, beginning with the "who" factor, this report is based around discussions on China. The report discusses what is the possibility of a Chinese nuclear test. The tower at Lop Nur is suspected to be functioning by October 1964. The Lop Nur test site is based in Mongolia and was designated as the test site by China in October 1959 (Richelson, 2007). Why this report is calling for a re-estimate is due to the belief that China is closer to testing a nuclear weapon than originally conceived due to photographs showing the test tower during October 1964, which was not present in the April 1964. Presenting that each of these factors was given context, it is safe to say that a clear picture of the current situation in August 1964 from the US perspective (Director of Central Intelligence, 1964).

Is there any documented proof of analysis vetting out or disregarding useful information? The Lanzhou Plant was disregarded originally, which the plant was thought to be too small for production of weapons-grade uranium until 1968, was the actual source of the fission material for the first test (Richelson, 2007). Possible reasons for the vetting out of this information could have been due to a pathway bias that China would test a plutonium device for its first test, as the rest of the nuclear-powered countries at the time had done. Evidence of this is in the Director of Central Intelligence's (1963) report in July focuses on the production of a plutonium bomb with very little consideration to a uranium bomb and placed the most probable estimate of a nuclear test in 1965 (Director of Central Intelligence, 1963).

Dissemination. This next phase answers the question of did the intelligence produced get presented to someone with actionable authority. With many examples, one

in particular, offers a point of examination. The CIA (1964) bulletin presented to the President of the US, which deliberates on the Soviet estimates on the nuclear program with the Soviets concluding that a Chinese test could be conducted at any time. This report states that most US intelligence estimates still conclude with a test not happening till after 1964 (CIA, 1964). Another example of dissemination to authority is indicated in the US Department of State's press conference on September 29th, 1964, in which a public announcement was made that China would soon conduct a test of a nuclear weapon. These two examples show intelligence being disseminated to figures with authority and were acted on to inform the public.

Case Three: DPRK (1954-2006)

Identifying the Problem. Continuing on into the most recent case, the first examples of active attempts by the DPRK to acquiring nuclear weapons is shown in Ivanov (1954) as this document reported that Kim Il Sung, the first leader of the DPRK, conveyed interest to Ivanov in pursuing nuclear research with joint operations through the Soviet Union in 1954 (Ivanov, 1954). The Soviet Union denied cooperation with the DPRK on nuclear matters until 1965 when a small test reactor was sold to the DPRK (Richelson, 2007). Though Richelson (2007) stated that the CIA and other US intelligence agencies first discovered the existence of the Yongbyon site in mid-1960, and began satellite reconnaissance in 1961. Richelson (2007) also stated that the photographs produced very little information until 1965 when the Soviet bought reactor was beginning to be constructed (Richelson, 2007). These examples provide evidence that the US began collecting intelligence seven years after the initial actions taken by Kim Il Sung to create a nuclear program. Which answers the question of how long after

the first actions taken by the state, or the official creation of this case's nuclear program, did the US begin attempting to find evidence of a nuclear program?

Collection. Though did the US utilize all of its methods of gathering intelligence during this time period? As discussed in the last section, these first efforts made were through satellite photography, which is a source of GEOINT. The CIA (1982) concluded in their report that a new reactor was under construction at the south end of Yongbyon, and believed to be too small to produce sufficient amounts of plutonium. Though the photograph is considered GEOINT, the measurements aspect in determining the reactor to be too minute to produce plutonium sufficiently is an example of MASINT. An example of SIGINT in practice comes with the example of the 1969 US reconnaissance plane that was shot down by the DPRK as they were collecting SIGINT on the DPRK in the Sea of Japan (NSA, 1989). An article from Foreign Broadcast Information Service (1989) contains a public statement given by the DPRK, in which the DPRK denies creating a nuclear weapons program (FBIS, 1989). This incorporates OSINT into the list of intelligence gathering disciplines utilized during this case. HUMINT alternatively has been difficult to prove of use, as the DPRK operates secret policed within the state (Richelson, 2007). This has proven to be problematic for the US based agencies, though some have managed to gather some HUMINT from defectors of the DPRK and IAEA inspectors who had access to inside the country.

The second question to address is was any information missed by the US intelligence efforts during this time period that could have made an impact on the US intelligence estimates? This question presents some difficulties in collecting information that was missed, as the DPRK is still closed off from the rest of the global community

and not all information around the DPRK nuclear program or what the US has collected has been declassified due to how recent this case is. Thusly, it is reasonable to say that this question cannot be answered, as sufficient time has not passed allowing for the DPRK to share how their nuclear program works.

Processing. With this phase, processing can be seen in the Foreign Broadcast Information Service (1989) article as the DPRK attempted to deny the existence of their nuclear weapons program. This article contains a translated quote from Korean to English. Proving that on some level, processing took place during this case and answering the question of are there any documents that show translation from one language to another, show verification of sources of information, or test substances to verify their identity to prove processing was used to prepare information for analysis.

What information was processed incorrectly, and what effect could this have on the estimations of the US? Processing information incorrectly in this case could present different outcome possibilities. The first possible outcome is that of no threat to the US, besides the wrongly translated information. This outcome would not present any real risk if an error occurred. The second outcome would be that of a missed threat due to an incorrect translation. This could present a situation in which the US would not be ready to respond if an attack against the US was carried out. Thirdly, a mistranslation of a quote into something provocative could pose a risk of increasing tensions on the US or even cause actions to be taken that could lead to higher tensions.

Analysis. The next section will examine the Niksch (2003) issue brief to US Congress on DPRK's Nuclear Weapons Program. The question this brief will answer is did US analysts provide a clear picture of the current situation with the intelligence they

were given? The “who” and “where” of study in this brief is the DPRK’s regime and nuclear weapons program. The “when” for this brief is DPRK’s nuclear weapons program at the current time of 2003 and what is expected from the DPRK since the state left the Agreed Framework. The “what” is that the DPRK will initiate a nuclear breakout and continue attempts to construct nuclear weapons. The “why” is behind these conclusions is the DPRK is attempting to apply pressure to the President Bush administration into entering a non-aggression pact with the DPRK (Niksch, 2003).

As for the question of is there any documented proof of analysis vetting out or disregarding useful information, has proven hard to uncover. This is possibly due to this intelligence still being classified. As most literature has shown, most intelligence had been accurate in their efforts of predicting the DPRK with the only major problem consisting of a lack of HUMINT (Richelson, 2007). This could also be associated with the struggle to acquire informants inside the country.

Dissemination. The question of did the Intelligence produced get presented to someone with actionable authority was as answered in Niksch (2003) brief to US Congress. This brief as described earlier, conveyed the points that due to the DPRK leaving the agreed framework, the state would probably attempt what is referred to a “nuclear breakout.” This refers to the DPRK ability rapidly produce nuclear weapons. This brief as shown in the analysis phase, created a full picture for the US Congress to understand the situation of the time period. The office of the Press Secretary (2006) also contained a public announcement made by the White House in which they condemned the actions of the DPRK in hopes they would not test a nuclear weapon. This provided a slight warning of only a few days, however, the national news for the DPRK was the

original source of the information. Without this key piece of intelligence, the test could have been carried out unknown to the US

Final

Looking through each case and applying questions to be answered, the next step is to move into the discussion phase where the data collected will need to be analyzed to further conceptualize the information. This will be carried out in three phases of first addressing the research question in regards to each case with the new data, secondly to draw major themes from each case's data and a comparison of the three cases and their outcomes, and thirdly discussion around if the failure in prediction was due to the possibility of lacking intelligence efforts.

CHAPTER V

Discussion

With this chapter, the discussion of all the data will occur. Each case has produced results that can be examined to further the conversation on whether or not a failure occurred during each case, and if so was it related to intelligence.

Summary

USSR. Within this case, this first phase of identifying the problem was completed as shown by efforts of the US to find the USSR nuclear program. The US knew that the monopoly on nuclear weapons would not last as President Truman pointed out in his speech given during the announcement of the first successful test by the USSR (Truman, 1949).

The collection efforts by the US began in 1947; a while after the USSR began their efforts to create a nuclear weapon (Condit, 1996). This could have been due to efforts being focused too narrowly on post-war projects, with not enough focus directed towards discovering the USSR's nuclear program. Along with this, the majority of efforts shown in the results chapter can be understood as reactive measures, with few proactive efforts. These reactive methods, such as sniffers, project rainfall, and the audio substations, would make the goal of prediction very problematic because the data from these methods would only be collected after a nuclear test has occurred.

Processing, in this case, was carried out with three separate testing's of substances collected, allowing for multiple checks of validity. Even if all three of these tests could have been false positives, this would not affect the efforts of prediction as the test had already occurred.

The analysis phase examined reports that were able to draw the conclusion by tracing the particulates flight path by using weather measurements during the time period to place the test within the USSR borders. This was also confirmed later by the cross-examination of two audio substation records after the fact, further concluding that the USSR had tested a nuclear weapon (Northrup, 1962). Though this data was not concluded as evidence during the event, the discovery of this data during the event most likely would not have produced any reaction, as it did not present any conclusive evidence that a test occurred.

The intelligence was dissemination to President Truman, a clear man of authority, and President Truman then announced the successful test to the world. Concluding on this case, most intelligence phases presented no signs of failure to complete the task each phase is designed to do, however the collection methods phase

PRC. In this case, the US began their efforts to find the Chinese nuclear program only two years after its inception. Producing a faster reaction time from this case compared to the first case. This case does not divulge how the US became aware of the Chinese intentions to create nuclear weapons; though it could, however, be possible that word detailing the agreement between the USSR and PRC had reached the US These actions do show that the US was able to correctly identify the problem and act accordingly to prove their theory. It is also possible that this rapid response could have stemmed from lessons learned after the US reexamined what went wrong in the first case.

While the US did attempt to utilize all disciplines of gathering intelligence during the collection phase, the most rewarding efforts were GEOINT methods of gathering, specifically imagery intelligence from reconnaissance satellites and U-2 planes. Photos

from these satellites and planes were key components to the prediction efforts and the test warning during August before the test.

The processing phase for this case can be concluded with many translations as shown in the results chapters. It can be could be possible that one or more of these translations produced were wrong; however, most of the key intelligence pieces came from photographed information.

This phase produced results as it was able to clearly outline what the current situation in China was at the time of the Lop Nur tower photograph, though analysis also vetted out key information about a gaseous diffusion plant at Lanzhou as being too small, when the entirety of the program was based from the weapons-grade Uranium produced at the facility. Without the photograph of the Tower at Lop Nur, the US could have been caught completely by surprise as the estimates before the photo placed the closest weapons test in 1965 in which plutonium would be the fission material (CIA, 1964).

Dissemination in the final phase was proven as a bulletin from the CIA to the US President provided proof that the intelligence was being presented to someone with authority. The US Department of state also provided another example of dissemination as they announced publically that the US had reason to believe the PRC would test a nuclear weapon soon.

In conclusion of this case, each phase completed its due diligence in accomplishing the goal of the phase in exception for the analysis phase. While the US was still able to predict a nuclear test before the PRC would carry out a real test, this intelligence processed vetted out useful information. This could be considered a failure in practice but a success in long-term goal.

DPRK. For this case, the DPRK's nuclear efforts began in pace with the PRC's program; however, this program's efforts were not discovered until the photographs captured of the Yongbyon site in 1961 by the CIA. Only in 1965 did the US intelligence gather stable evidence that a nuclear program was being developed, when photographs of a nuclear reactor being built were captured (Richelson, 2007).

GEOINT and photographs again dominated the collection efforts, which could be a result of the country being closed off to the outside world and the secret police have a heavy presence within the country. Processing, like the PRC case, dealt with multitudes of imagery and language translation. With language translation, most examples found were minor information details and if translated incorrectly could have produced negative results, though it would most likely not produce any negative effects on the US

During the analysis phase, Niksch (2003) report was able to draw on predictions and estimates that the DPRK would be able to produce a nuclear weapon with the earliest date being in six months. This produced a completed picture at the time of the end of the Agreed Framework. Dissemination had shown that the White House was informed a few days before the test, only by a source that originated from the DPRK national news. Without this key information, the U.S could have missed the test. In conclusion, this case completed phases of the intelligence cycle without failure. However, the efforts proved not enough as the main reason for the US being warned and prepared for the test were due entirely to the DPRK announcing their first test.

Failures In Each Case

USSR. With this case, the first failure that occurred was in the identifying the problem phase in the intelligence cycle. This failure occurred due to the US not acting on

the belief that their nuclear monopoly would end as President Truman stated in his speech (Truman, 1949). This caused the late response from the US in gathering intelligence on the USSR's nuclear program.

The second failure occurred due to the configuration of how intelligence was collected, as these methods were constructed to produce results after a test occurred, not before. This could be due to lack of penetrability into the USSR, diverting actions towards reactive measures. This lack of penetration could stem from the US not wanting to increase tensions with the USSR since the Second World War had ended only a few years before and neither country was ready for another war. Though it is possible to theorize that the outcome of proactive based intelligence gathering methods, like reconnaissance flights, could have produced intelligence better suited towards predicting the capabilities of the USSR and could have possibly lead to a prediction of when the first test would have occurred.

Another factor that could have caused problems with predicting this case is the lack of information around non-US nuclear programs and how they would attain a nuclear weapon. While the US did have the information of how the US nuclear bomb was developed, information on how other programs were developed was nonexistent unlike it is today. This could have led the US to rely on pathway bias to guide discovery efforts.

A third failure that occurred during this case was the disregarding of the Audio substation's results produced by two different stations that eventually allowed the US to pinpoint with accuracy up to 10 minutes of what time the test occurred. While this information would not have produced any conclusive results solely, coupled with other information this data could have further confirmed the existence of the test.

PRC. In the PRC case, the first failure occurred in the identifying the problem phase, as the intelligence efforts were not considering the possibility that a uranium type weapon could be constructed without first having tested a plutonium type device. This could be due a pathway confirmation bias in which the US determined due to past programs path's, the Chinese would follow the same routes as all programs before it.

The second failure occurred in the analysis phase where vital information around the Lanzhou plant was vetted out. The plant itself was determined to be to small to produced enough weapons grade uranium until 1968; as such, the main focus stayed on finding evidence of a plutonium device in construction. It is possible to state that if the plant had been considered as full size and completely operations, that the US estimates could have been more accurate on when the first test would occur.

DPRK. With the case of the DPRK, the failure occurred in the analysis phase, but in a different aspect as the past two cases. The failure was based around when the test would occur in specific to dates and time. The report by Niksch (2003) to US Congress detailing that the DPRK could test as soon as six months from the date of the report but did not clarify any point besides that the DPRK was ready to test. It is possible to state that if more information was available at the time, then the report could have concluded a range of time in which the test was likely to occur. The results for this case could change in future years due to new information being declassified that provides new data around this case currently not available.

Commonalities

All three cases share a common theme that these situations proved difficult to estimate within a reasonable range of time of when the first test would occur. This is

expected due to the entire effort is aimed at estimating the correct date of when a test would occur; however, each case would provide the estimations in years to decades and not in months. A probable reason for this is to allow for a broad range of estimation, though this can be counter productive in the long run as it allows for procrastination of response measures.

Along with the first commonality, all three cases had failures occur in the analysis phase, in which the first and the second case vetted out useful information. The third case did not provide evidence of useful information disregarded, though this could change in upcoming years due to the release of new information. It is also possible to hypothesize that the lack of failures in the third case were from lessons being applied learned during the first two cases.

Addressing the Research Question

Now that the data has been examined, the research question will be examined for each case. An Examination the USSR case, it could be possible to say that due to the efforts of the US intelligence the bomb was found after the test occurred, but not predicted accurately before the test. The reactive gathering methods could have been the cause of this result, though these methods could have been chosen for the specific purpose to catch proof of a successful test. As to concluding with a definitive yes or no to intelligence being the reason that the failed prediction happened, it is likely that these efforts were most likely the main role in the prediction failure.

With the PRC case, the US intelligence efforts did have a failure in the analysis phase, though the US intelligence groups made up for the failure by producing evidence of an imminent test. Thusly it could be seen that the US intelligence efforts failed at

predicting the capabilities of the program, though it corrected its path was able to predict the test to within a month of its actual occurrence. As to concluding to a single answer, I would say that it is possible that the intelligence cycle did have an effect on the initial prediction failures, but was the measure that corrected the program in the end.

The DPRK case produced quite a different result than the last two cases, as the intelligence efforts did not show any signs of a failure occurring, though after 2003 reports slowed, with probable cause for list slow down point towards the US entering into a Afghanistan and Iraq wars and intelligence being shifted towards the war efforts. This could have led to a sudden lack in reporting on the context of the DPRK and caused the failure in warning. This was a failure of warning rather than prediction due to the US had estimated since 2003 that the DPRK could test a nuclear weapon, though the single reason that the US knew of the upcoming test in 2006 was due to the DPRK publically announcing the test.

Future Research

For future research continuing on in this subject, one should undertake the efforts to replicate this study with the cases of the South Africa, India, and Pakistani nuclear programs. Mainly, it would be interesting to see if these cases are able to produce evidence of the US predicting these nuclear programs or failing to predict each program. A study of these efforts could better define different problem areas that the intelligence community face in discovering and predicting nuclear programs. Another future research field could examine policy response of the US after each of the successful first test of the three cases. This could outline possible problems areas in reaction to the news of a successful first test by another state. A third area of future research could be in defining

the boundary between policy failures and intelligence failures. Some literature around intelligence failures suggest that it is a two part system, continuing off of that assumption where would the line be drawn between what is considered an intelligence failure, and what is a policy failure.

Conclusion

In conclusion, the US intelligence community faces problems in correctly predicting major events. When an event occurs and the Intelligence community did not supply a prediction or warning, these events could be labeled as intelligence failures. A subtopic within intelligence failures is the topic of the failed prediction of the nuclear capabilities and the first test of nuclear programs. With this structured, focused comparison case study, we examined three cases of nuclear programs, that of the USSR, PRC, and DPRK. Within these programs, evidence was found that could provide reasoning to why the intelligence community failed to predict or warn about the first test of each nuclear program. While each program produced different possible causes of the failures, the comparison between each program shows how the US has changed in their efforts to predict nuclear programs over the last few decades.

Epilogue

Continuing forward in this area, the next step would be to study intelligence gathering around delivery systems of nuclear programs. This thesis has focused on three states with nuclear programs and the transition into a nuclear state, thus the next step would be to study the delivery systems of the state to gauge how capable of a threat this country poses to the US. A study of this topic could potentially create a ranking based on data found of nuclear countries that pose a viable threat to the US.

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