UNITED STATES AIR FORCE CENTER FOR UNCONVENTIONAL WEAPONS STUDIES at The Air University

Bomber Assurance and Deterrence Missions: Effect on North Korean Discourse

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Nuclear deterrence depends on the capability and credibility of nuclear forces. The credibility of those forces exists primarily in the adversary's mind. Measuring the adversaries mind presents many difficulties, especially in North Korea. There is some link between state propaganda and the mindset of a totalitarian regime. The U.S. military can measure deterrence by studying North Korea's propaganda and gaining some insight into the mindset of the Democratic People's Republic of Korea (DPRK) leadership.

Specifically, the U.S. military uses highly publicized and visible bomber flights to conduct nuclear deterrence. Because of their pointed usage over the Korean Peninsula, Bomber Assurance and Deterrence (BAAD) missions provide a way to measure the effect of nuclear deterrence through the lens of DPRK propaganda.

U.S. military deterrence credibility derives, somewhat, from the mind of the adversary. The propaganda coming out of the DPRK gives some insight into that mindset. I propose that BAAD missions cause an increase in hostile rhetoric from the Democratic People's Republic of Korea. I will test this by measuring the change in slope of the KCNAwatch.co Threat Index before and after a BAAD event.

— Background —

The U.S. military has a prominent role in international stability and nuclear deterrence. That deterrent power comes from capability and credibility. Without credibility, the deterrence capability of the military drops to zero. Credibility comes, to some extent, from the adversary's impression or mindset. Measuring the adversary's mindset does not come easy. Totalitarian government propaganda provides insight to a regime's mindset. Therefore, measuring that propaganda sentiment can provide some insight to deterrence credibility of U.S. forces. This literature review helps connect this logic chain.

President Barack Obama, in his *Priorities for 21st Century Defense*, explained how U.S. military nuclear power deters potential adversaries and assures allies. He attributes relative worldwide stability to the U.S. military's ability to threaten "the prospect of unacceptable damage" under any circumstance.[1] General Martin Dempsey described an operational challenge in his 2012 Capstone Concept for Joint Operations (CCJO) - protecting "U.S. national interests against increasingly capable enemies." More recently General David Goldfein, Chief of Staff of the Air Force, explained the foundation deterrence provides to security: "quite frankly, a safe, secure, reliable nuclear deterrent underwrites every military operation on the globe."[2] The foundation General Goldfein described must rise to answer the challenge that General Dempsey framed while assuring allies worldwide.

As the Cold War recedes into history, more entities require deterrence, especially North Korea. According to General Dempsey in the CCJO, "middleweight militaries and non-state actors can now muster weaponry once available only to superpowers." The US Pacific Command commander, Admiral Harry Harris, listed North Korea and its advances in nuclear capability as his number one "Key Challenge."[3] North Korea completed four nuclear detonation tests in the last ten years, continues to test intermediate range ballistic missiles, and launches craft into space "in direct violation of several United Nations Security Council Resolutions."[4] This behavior proves that North Korea does not consider international norms. Instead, it prioritizes increasing military power and maintaining sovereignty. The U.S. military attempts to deter this behavior through credible threats of retaliation.

Credibility and capability both play a vital role in nuclear deterrence; any reduction in either poses a magnified detrimental effect on the ability to deter aggression. In the 2015 National Military Strategy, General Dempsey explains that the U.S. military deters aggression through a credible nuclear capa-

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bility that is safe, secure and effective.[5] Additionally, during an interview with *Foreign Affairs*, he emphasized: "We've got to make sure that we can sustain our military power to be able to credibly deter potential threats from state actors—Russia, China, North Korea, Iran."[6] Credibility is difficult to measure.

Nuclear theorist Keith Payne discusses the intricacies of credibility in his article in the Summer 2011 *Strategic Studies Quarterly*. He proclaims that "the importance of deterrence credibility and how threats may be made credibly have been questions at the heart of our nuclear debates for decades."[7] He describes some basics of nuclear deterrence, the difference between Schelling and Kahn ideas on nuclear force structure, and the components of deterrence. Specifically, he talks about how nuclear deterrence consists of both capability and credibility. He notes that "the level of credibility necessary for deterrence to work can vary by opponent and context, as can the measures necessary to make threats credible."[8] In his article in the Spring 2009 SSQ, he gets more specific "for deterrence purposes; it is *the opponent's belief* about US threat credibility that matters."[9] The real challenge comes from getting the opponent or adversary to believe U.S. military deterrence is credible.

He has a lot of company in noting the complexity of credibility. Lieutenant General Jack Weinstein takes it a step further by explaining that not only is deterrence a combination of capability and credibility, it is a product of capability and credibility. He uses the term product mathematically, insisting that deterrence comes from the multiplication of capability and credibility. If either credibility or capability reaches a "zero" level, the nation will have "zero" deterrence capability.[10] Any deficiencies in the credibility or capability of nuclear deterrence have dire consequences on the effect of that deterrence.

Just like Keith Payne, Jennifer Bradley emphasizes the role the opponent's mind plays in deterrence. In her article in the July 2015 *Air and Space Power Journal*, she describes that role: "as simple as deterrence is to define, its actual practice is far more complicated, having many potential pitfalls for failure, essentially because it is a psychological function in the mind of the adversary."[11] The U.S. military can convince the mind of the adversary in many ways, and one of the most visible deterrence methods comes from BAAD missions.

BAAD missions provide a responsive and visible method to demonstrate capability and credibility of United States' nuclear deterrence. In his 2015 address to the House Armed Services Committee, Major General Richard Clark, then 8th Air Force commander, expressed the essence of the BAAD missions: "Through the Bomber Assurance and Deterrence mission, we exercise with every combatant command and every joint partner annually. These exercises take place all over the world and are an example of the versatility that B-2 and B-52 bombers provide in the conventional mission arena. Two capabilities are fundamental to the success of our bomber forces: our ability to hold heavily defended targets at risk and our ability to apply persistent combat power across the spectrum of conflict anywhere on the globe at any time." The BAAD missions provide a tool to demonstrate deterrence credibility.

In the 2010 Nuclear Posture Review, then Secretary of Defense, Robert Gates, explained the role of bombers in creating credibility: "Unlike ICBMs and SLBMs, bombers can be visibly deployed forward, as a signal in crisis to strengthen deterrence of potential adversaries and assurance of allies and partners."[12] As the Core Function Lead for Nuclear Deterrence Operations, the Air Force Global Strike Command (AFGSC) executes the BAAD missions. It uses BAAD missions to create "complex challenges to our adversaries' warfighting capability while simultaneously demonstrating our nation's commitment and resolve to our allies."[13] That demonstration of commitment and resolve provides the credibility portion of deterrence in the Korean Peninsula.

Dr. Bruce Cummings' article in the *Bulletin of the Atomic Scientists* focuses on the history of U.S. engagement with the DPRK over the last 70 years, including BAAD missions. Dr. Cummings provides a brief history of U.S. bomber flight responses to DPRK action. In 1951, B-29s flew from Okinawa to North Korea to practice atomic bomb drops for Operation Hudson Harbor. While they deployed dummy A-bombs instead of actual nuclear weapons, the message resonated. The North Koreans have since built approximately "15,000 underground facilities related to their national security."

Cummings asserts that the international community should deal with North Korea "not as we would like it to be, but as it is." The author argues that the United States needs to deal directly with the Kim monarchy through diplomacy and that the Kim monarchy will not collapse through outside pressure – it has built solid internal resiliency towards sustaining the DPRK. Additionally, he finds that U.S. deterrence over the last 25 years has failed to halt DPRK development of nuclear weapons capability and nuclear warhead quantity.

The claim by Cummings that the United States is reaping the effects of "our past nuclear bullying" and that the bomber flights have no effect on North Korea's actions provide a foundation to the hypothesis of my research. Also, Cummings insists that the United States needs to consider the DPRK mindset and paradigm when responding to their nuclear aggression, and hopefully my research will provide more data to understand that paradigm.

Jane Kim and Nat Kretchun also provide insight to the DPRK paradigm. They performed a very thorough review of all kinds of media available to North Koreans. Their report documents legal and illicit communication within North Korea. It provides insight on how DPRK citizens obtain and spread news and information. Namely, not very many of them have access to a computer, and about 80 percent of them get their information from spoken word. While most citizens get their information via spoken word, the ruling class in the Worker's Party has access to the limited internet and has significant exposure to the KCNA articles. Because of that exposure, the propaganda articles give an insight into the mentality of discourse within North Korean government and existing power structure.

In his 2004 analysis, Major Burgess performed a study of media from the Republic of Korea (ROK) and used it to analyze South Korean sentiment towards the United States and United States Forces Korea (USFK). He compiled media sentiment collected from ROK newspapers, the Foreign Broadcast Information Service, the USFK Public Affairs Office, demonstrations, and dissident websites. He compared important security events to the sentiment timeline and attempted to predict which future events will produce significant negative sentiment towards the United States. The large database his team created

gave USFK the ability to understand the sentiment of ROK citizens towards USFK. This understanding allowed military leadership to make more informed decisions and strengthen relations between the United States and ROK. Major Burgess's research provides a military application for connecting media sentiment with the mindset of the populace in South Korea.

Dr. Robert Entman provided an excellent example of quantitatively studying media sentiment along a timeline. His study focuses on the framing of CBS, ABC, and NBC during the 2008 US presidential primary. It focuses on media content analysis, media slant, and the effects of time on media framing. It creates a time-dependent model of media discourse during the Republican Party's announcement of Sarah Palin as vice presidential nominee. Specifically, Dr. Entman's article provides two excellent figures showing the cascading effect of time and media sentiment. These figures facilitate analysis of the time effect on the DPRK media during the sequence of DPRK nuclear action/ US response/ DPRK media response.

In 2012, Dr. Timothy Rich conducted a study of KCNA news to understand the DPRK's sentiment around nuclear issues. It uses text analysis to track rhetoric and compare it to events having to do with nuclear security. This study uses a concept called "term frequency-inverse document frequency" to determine the weight of a term based on its number of appearances in a document. It provides an interesting insight to analyzing news article sentiment. The study finds that North Korea most likely places little significance on Six Party talks and primarily desires a US-DPRK nuclear agreement. Additionally, the author asserts that DPRK propaganda is more calculated and nuanced than it is blanket propaganda. This assertion is important to my study, which predicates that the KCNA articles provide insight into the totalitarian DPRK regime.

Finally, a RAND study from 2012 by Therese Delpech summarized the crux of the problem when dealing with North Korea's nuclear program. Namely, the U.S. military needs to measure the effect of threats towards Kim Jong Un.

> "On the whole, blatant moves or threats, when credible, were more successful than uncertainty; Eisenhower and Kennedy were more effective than Nixon. Uncertainty may instill caution in the opponent's mind and lead him to ponder decisions. Blatant threats, if calibrated and credible, oblige the opponent to take sides in a gamble known to be highly dangerous. Experience shows that retreat is likely. However, it is debatable whether such a consequence would always be the case, notably in the 21st century: Blatant threats can enrage incautious minds or leaders with no experience of major wars. It is now clear from declassified documents that Soviet leaders and the Soviet military high command both understood the devastating consequences of nuclear war and, on the whole, thought the use of nuclear weapons should be avoided. Who can be sure this belief is present in the same way in Ahmadinejad's or Kim Jong Un's mind?"

— Research Methodology —

After reading several DPRK news articles posted online through Rodong.rep.kp and KCNA.kp, I noticed that they focus very heavily on nuclear weapons buildup and alleged "saber rattling" from the United States (and South Korea, to a lesser extent). To better understand the sentiment of the DPRK articles, I compiled all the words used in Rodong.rep.kp articles over the last year and found that the term "nuclear" was the fifth -most used word behind Kim, DPRK, Jong, and Party. It occurs even more than "Korea." Attachment 1 depicts a visual of the weighted word representation.

I compiled articles from Rodong.rep.kp because the domain facilitates an easy collection of all articles. I used a program, HTTrack, to download all the news articles from the domain as text files. I then used a compiler program, TXTcollector, to combine all the articles into one large document. To find the frequency ranking, I pasted all the compiled articles into http://www.writewords.org.uk/word_count.asp, which produced the ranked list.

Not only does the DPRK focus many articles on nuclear weapons capability, it also responds to BAAD flights. I noticed that the day after the US flies a BAAD mission near Korea, the DPRK includes at least one hostile article both decrying the aggressions of the United States and describing its need for nuclear weapons to assert its sovereignty.

To measure the effect of BAAD missions on deterrence in the Korean Peninsula, I chose to compare the sentiment of DPRK propaganda as it changed before and after a BAAD flight in the region. As a first step, I gathered the dates of BAAD missions flown near the Korean Peninsula. Then, to evaluate the sentiment of DPRK propaganda, I used articles published on the DPRK-controlled news agency, KCNA.kp, to analyze sentiment. I desired to compare the sentiment change across as many BAAD missions as I could find.

When searching for BAAD missions, I used several methods and searched for any BAAD event from January 1, 2013, to February 28, 2017 near the Korean Peninsula. Focusing on 2013 and later ensured I would focus only on the Kim Jong Il regime and hopefully provide analysis of the most pertinent occurrences.

I sought BAAD mission dates almost entirely from publicly -available sources. The AFGSC planning staff provided a list of worldwide bomber deployments and locations starting in May 2014. I found two useful dates from this list - bomber squadron deployments to Anderson Air Base, Guam. All other dates included BAAD missions to other parts of the world and were non-pertinent. This list did not provide specific dates of BAAD flights near the Korean Peninsula, so I sought other methods to find specific dates to study.

Next, I consulted Google Trends to find spikes in search requests for "B-52," "B-2," "B-1" and "BAAD" from South Korean Internet Protocol (IP) addresses since January 2013. Google Trends lets users specify time ranges and regions to view the trends in each area. The results generated by Google Trends show search results and their popularity, by week, as a percentage: "Numbers represent search interest relative to the highest point on the chart for the given region and time. A value of 100 is the peak popularity for the term. A value of 50 means that the term is half as popular. Likewise a score of 0 means the term was less than 1 percent as popular as the peak." I found 20 spikes in search requests for the four terms.

Next, I attempted to find the exact date of a BAAD event within each of the 20 week-long windows generated by Google Trends. I searched for each of the terms individually, limiting the date range of results to seven days before and after the Google Trends window. I then looked within the results for news articles that specified a BAAD mission had flown or tried to find an explanation for the spike in search requests. Attachment 2 shows the results of the Google Trends search as well as the confirmed dates and sources for each BAAD event.

Next, I needed a way to measure the sentiment of the articles before and after the BAAD flights. The independent organization of NKnews.org compiles multiple sources of North Korean data, including KCNA.kp articles. Additionally, the sister website to NKnews.org, KCNAwatch.co, provides an unedited record of DPRK propaganda from several news sites. NKnews.org also evaluates the aggression level of KCNA.kp articles each day, which they call a "Threat Index."

The Threat Index published by KCNAwatch.co provides this research a measurable aggression level of the DPRK propaganda. The Threat Index is a ratio of aggressive words per article, each day, published by the DPRK through KCNA.kp. It does not include any Rodong.rep.kp articles or articles from any other sources. The change of the Threat Index each day shows an increase or decrease in aggression level. I use that increase or decrease in the days before and after a BAAD flight to measure the effect of the flight on the DPRK's sentiment and therefore on its deterrence effect.

— Findings and Analysis —

To study the DPRK response to BAAD events, I will utilize several methods to analyze the Threat Index. The dependent variable for this study will be the BAAD mission date. The independent variable will be the Threat Index slope change. I measured Threat Index slope before and after each event, and I hypothesize that an increase in the Threat Index slope by 0.01 (H_1 threshold) immediately after a BAAD event will confirm a causal relationship between the two. Once I compile the data, I will measure the Average Treatment Effect of the BAAD event on the Threat Index slope to determine the validity of the hypothesis.

After I gathered the BAAD event dates, I created two timelines, one for February and March 2013, and one for September 2016, displayed in Attachment 3 (page 10). Those months cover five of the nine BAAD events I am evaluating and facilitate understanding the complexity surrounding deterrence in North Korea. BAAD missions rarely take place in times of low tension with North Korea. Measuring their effect on propaganda sentiment demands several approaches.

Once I gathered all the BAAD mission dates, I determined when KCNA.kp reported each of the events. To my surprise, KCNA.kp never reported two of the BAAD events – the BAAD flight over Australia on July 6, 2015, and the BAAD flight over South Korea on January 10, 2016. All other BAAD flights were reported the day after the flight occurred.

To further complicate the analysis of the BAAD events, some of the nine events did not fulfill the true spirit of a BAAD flight. Only five of the analyzed events fulfill the purest definition of a BAAD flight: a U.S. Air Force B-1, B-2, or B-52 bomber flying near the Korean Peninsula on a practice bomb run. Of those five, KCNA.kp reported all but one – the January 2016 BAAD flight. I am not sure why KCNA.kp did not report that BAAD mission, but I included it in this analysis under the assumption that the DPRK government and Kim regime knew about it.

Of the four BAAD events that do not fulfill the true spirit of a BAAD mission, two include bomber squadron deployment swapouts at Anderson Air Base, Guam. AFGSC considers these swapouts a BAAD mission and KCNA.kp reports on them. The next includes a BAAD flight over Australia, which was subsequently not reported by KCNA.kp. The last of those four comes from the kickoff of Foal Eagle exercise in March 2013. I included this event in the analysis because it happened during a time of high tensions on the Korean Peninsula and two BAAD flights occurred during Foal Eagle that year. The timeline depicted in Appendix 3 depicts the proximity of Foal Eagle kickoff to the two BAAD flights in March.

For the remainder of the study, I attempt to analyze the Threat Index using both sets of BAAD events: a set of all nine events and a set of the five "true" BAAD flights. The following histograms (**Figures 1 and 2**) show how the Threat Index four days before and after a BAAD event.

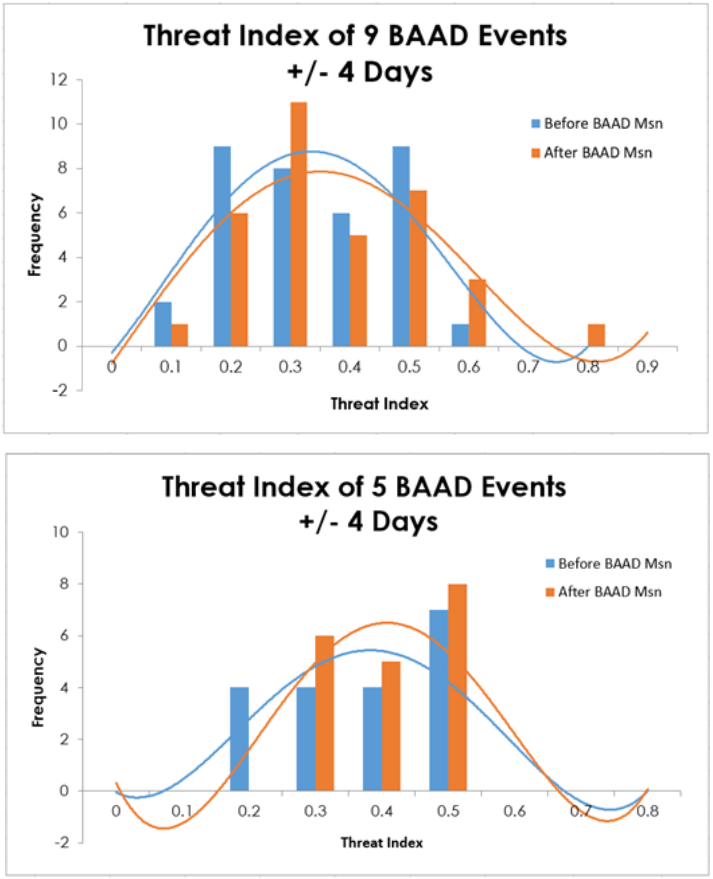

Figure 1 & 2 Histograms

When only the five "true" BAAD flights are analyzed, the Threat Index increases more prominently following a BAAD mission. This also creates more pronounced deviations from

the smaller sample size.

Comparing all nine BAAD events, the trends tend to include smaller changes. To further understand the effect of BAAD events, I compiled the data from the histograms above into a scatterplot for trend comparison (see **Figure 3**). This chart shows all Threat Index scores for four days before, the day of, and four days after the nine BAAD events in this study.

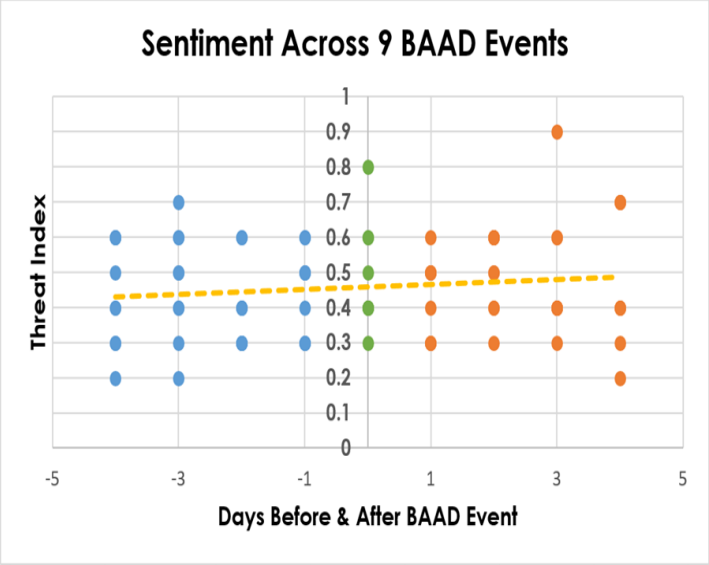

Figure 3 Scatterplot

The trendlines support the hypothesis – that BAAD events increase aggressive rhetoric in DPRK propaganda. The four days before a BAAD event, aggressive rhetoric trends downwards, slightly, at a rate of 0.0033 Threat Index units per day. After a BAAD event, the aggressive rhetoric trends upwards at a rate of 0.012 Threat Index units per day. Over the span of the sampled date range (January 1, 2013, to February 28, 2017) the Threat Index decreased an average of 0.000025 Threat Index units per day. The increase in Threat Index after a BAAD event, although small is a significant increase over the average over the entire sample range. This analysis does not control very well for outside factors.

AFGSC most often flies BAAD missions near the Korean Peninsula during times of high tension, so this study needs to control for outside trends more appropriately. I need to evaluate the Threat Index data while controlling for innate trends or other forces acting on the aggression level of the propaganda. To accomplish this, I will analyze the slope of the Threat Index two (and four) days before the BAAD event and compare it to the slope two (and four) days after the BAAD event.

Across the entire date range, the average two-day slope is 0.00048 Threat Index units per day while the average four-day slope is 0.00059 Threat Index units per day. Both slopes indicate a very slight increase in aggressive sentiment in KCNA.kp propaganda over an average two-day or four-day span. To determine if BAAD events have any effect on propaganda sentiment, I determined the change in Threat Index slope from before a BAAD event to after a BAAD event. I analyzed the slope two days before and after the BAAD event as well as four days before and after the BAAD event. Using a two-day slope produced enough variance to render the analysis unreliable. The slope measured over a four-day span produced more consistent results over the nine BAAD events. **Figure 4** shows the high standard deviation and variance of the two-day slope analysis in comparison to the four-day slope analysis. **Figure 5** provides a visual representation of the four-day and two-day slope before and after the BAAD events, as well as a trend line showing the change in slope from before to after using both a two-day and four-day slope.

Slope Change (+/- 2 Days)		*Slope Change (+/- 4 Days)*	
Mean	0.022	Mean	-0
Standard Error	0.066	Standard Error	0.033
Median	0	Median	0.02
Mode	0	Mode	#N/A
Standard Deviation	0.199	Standard Deviation	0.098
Sample Variance	0.039	Sample Variance	0.01
Kurtosis	2.148	Kurtosis	4.843
Skewness	-1.01	Skewness	-2.03
Range	0.7	Range	0.32
Minimum	-0.4	Minimum	-0.24
Maximum	0.3	Maximum	0.08
Sum	0.2	Sum	-0.03
Count	9	Count	9

Figure 4 Descriptive Statistics

For all nine BAAD events, the average slope of the Threat Index increased significantly when evaluating it using a two-day slope. As previously stated, this created significant variance which rendered it inconsequential. The four-day slope analysis, on the other hand, produced much less variance in slopes but showed that the BAAD events had the opposite effect on the Threat Index. When comparing four-day slopes before and after the BAAD events, the Threat Index slope decreased slightly. The average four-day slope for the sample timeline is 0.0014 Threat Index units per day. The average four-day slope for the four days before a BAAD event is 0.011 units per day.

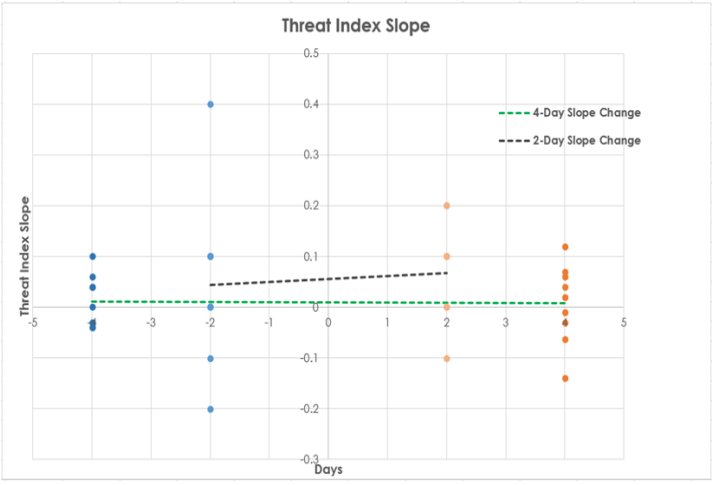

Figure 5 Scatterplot

The four-day slope after a BAAD event decreased to 0.0075 units per day, decreasing the slope, on average, 0.0037 Threat Index units per day.

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These small numerals indicate significant changes in the Threat Index slope. A decrease in the slope of 0.0037 Threat Index units per day represents a change 27 times larger than the average four-day slope change. In following paragraphs, I will perform an Average Treatment Effect (ATE) on the Threat Index slope change to determine its relevance and significance on the hypothesis.

The following tables (**Figures 6 & 7**) show individual BAAD events and their effect on the slope of the Threat Index. Note the variance and unreliability in the two-day slope table as well as significant reduction in Threat Index slope after the non-reported BAAD flight in January of 2016. The tables also include a rank among all 1,520 instances in the sample range beginning January 1, 2013. In both tables, the Threat Index slope increased significantly in the days following the Foal Eagle 2013 kickoff. Also of note, the Threat Index slope did not change at all for three of the five "true" BAAD flights in the two-day table (the table with the most variance).

Change in Threat Index Slope, +/- 2 Days of 9 BAAD Events (1520 samples)				
Slope Change	**Rank of Event**	**% Rank of Event**	**Event Date**	**Event Type**
0.30	129	90.2%	21 Sep 16	BAAD flight
0.20	273	77.3%	8 Mar 13	Foal Eagle begin
0.10	348	70.8%	7 Aug 15	Guam Deployment
0.10	464	59.8%	27 Aug 14	Guam Deployment
0.00	627	39.9%	28 Mar 13	BAAD flight
0.00	627	39.9%	19 Mar 13	BAAD flight
0.00	627	39.9%	12 Sep 16	BAAD flight
-0.10	1089	22.4%	6 Jul 15	BAAD flight – Australia
-0.40	1475	1.5%	10 Jan 16	BAAD flight
Positive slope change = increase in aggressive sentiment				

Change in Threat Index Slope, +/- 4 Days of 9 BAAD Events (1520 samples)				
Slope Change	**Rank of Event**	**% Rank of Event**	**Event Date**	**Event Type**
0.08	205	85.7%	8 Mar 13	Foal Eagle begin
0.07	236	8301%	6 Jul 15	BAAD flight – Australia
0.07	268	81.8%	28 Mar 13	BAAD flight
0.02	578	61.0%	27 Aug 14	Guam Deployment
0.02	631	58.3%	12 Sep 16	BAAD flight
0.01	656	55.8%	19 Mar 13	BAAD flight
-0.02	970	35.8%	21 Sep 16	BAAD flight
-0.004	1087	27.5%	7 Aug 15	BAAD flight
-0.24	1508	0.2%	10 Jan 16	BAAD flight
Positive slope change = increase in aggressive sentiment				

Figure 6 & 7 Rank of Threat Index Slope change

The four-day slope comparison provided data that may validate or invalidate the hypothesis. Average Treatment Effect analysis will provide an observational method of determining a causal relationship between the BAAD missions and a change in the Threat Index slope. The treatment effect analysis compares the change of the Threat Index slope after the nine BAAD events and compares it to the mean outcome of the control group, the remaining 1,448 days in the sample range.

The ATE method finds the "Program Impact" of the BAAD events on the Threat Index slope. The Threat Index slope decreased by 0.00382 more, on average, after a BAAD event than on a day without a BAAD event.

Program Impact = $\bar{y}T=1 - \bar{y}T=0$

$\bar{y}T=1$ Average increase in Threat Index after a BAAD event, -0.00365

$\bar{y}T=0$ Average increase in TI after days without BAAD event, 0.000175

Program Impact = -0.00382

The evidence suggests that BAAD events do not increase the aggression level in DPRK propaganda. Therefore the hypothesis cannot be confirmed. In fact, this analysis suggests that BAAD events may even decrease aggressive sentiment in DPRK propaganda. This analysis fails to confirm or reject the hypothesis because of two main factors.

First, there are more dates between January 1, 2013, and February 28, 2017, that probably suffice as BAAD events that I did not take into account. Secondly, the outlier of the January 2016 BAAD event changes the outcome of the ATE analysis significantly. Without the January 2016 data, the Program Impact equates to a slope increase of 0.026, which indicates a significant change in sentiment, one well above the H1 threshold of a slope increase of 0.01. The following table (**Figure 8**) shows the difference in the standard deviation and variance with and without the January 2016 BAAD event.

Slope Change (+/- 4 Days) including Jan 2016		Slope Change (+/- 4 Days) excluding Jan 2016	
Mean	-0	Mean	0.026
Standard Error	0.033	Standard Error	0.016
Median	0.02	Median	0.02
Mode	#N/A	Mode	#N/A
Standard Deviation	0.098	Standard Deviation	0.044
Sample Variance	0.01	Sample Variance	0.002
Kurtosis	4.843	Kurtosis	-1.34
Skewness	-2.03	Skewness	-0.17
Range	0.32	Range	0.12
Minimum	-0.24	Minimum	-0.04
Maximum	0.08	Maximum	0.08
Sum	-0.03	Sum	0.207
Count	9	Count	8

Figure 8 Descriptive Statistics

Lastly, constraining the analysis to only the "true" BAAD flights that were subsequently reported by KCNA.kp (four total BAAD flights), may provide additional insight. If only the four events on March 19 & 28, 2013, and September 12 & 21, 2016, the Program Impact adjusts to a slope increase of 0.019. This result also validates the hypothesis that BAAD events increase the aggressive sentiment in DPRK propaganda.

While the evidence analyzed in this study did not produce a positive confirmation of the hypothesis, it hopefully provided several interesting points to note. For research purposes, when comparing propaganda sentiment, use the slope of that sentiment measure before and after to control for unknown variables. Measuring the slope in too short of a span creates variance that undermines results. Lastly, finding pertinent events and dates is not as difficult as parsing out which events are most relevant to the research without overly constricting the available evidence

— Conclusion —

Further studies on this topic can expand to a wider reach or narrower the focus to gain insight on the effect of BAAD missions on DPRK discourse. Broader studies could determine if there are any diminishing deterrent effects on continued BAAD missions, or threats, without follow-through.

More narrow studies can test Keith Payne's assertion in his Spring 2009 SSQ article that nuclear weapons with more precision and lower yields may provide greater deterrent value. The KCNA.kp sentiment may change after the B61-12 becomes operational. Recently, the Terminal High Altitude Area Defense system deployed to the Korean Peninsula. Its presence most likely has a deterrent effect, and it may affect DPRK discourse in a measurable way. Any of these avenues can provide valuable insight into the mindset of the adversary.

BAAD events near the Korean Peninsula often take place during times of heightened tension, but they still have a measurable effect on propaganda sentiment. BAAD flights most likely cause some aggression in DPRK propaganda sentiment, but only a small amount. This study was not able to confirm the hypothesis nor could it disprove the hypothesis. In general, the true BAAD flights have a negligible effect on the change of aggression level within DPRK propaganda. BAAD flights have tremendous value for nuclear assurance. Employing BAAD flights purely to assure allies and disregarding their effect on the mindset of the adversary is an acceptable course of action. The DPRK sees the flights, they report on the flights through KCNA.kp, and the discourse of their propaganda increases a little, but this study found no significant increase in aggressive sentiment.

I attempted to provide several examples of propaganda sentiment analysis to help inform any future deterrent shows of force. Responses vary significantly from event to event, so the best insight will come after collecting more data. Namely, Foal Eagle exercises may produce a large increase in aggressive propaganda. Hopefully, this insight to the adversary mindset provides some measurable way to evaluate deterrence effects.

— NOTES —

1. President Barack Obama, "Sustaining U.S. Global Leadership: Priorities for 21st Century Defense," January 2012, 5.

2. General David L. Goldfein (Twenty-First Chief of Staff of the US Air Force) interview by Strategic Studies Quarterly, 5 January 2017, in Strategic Studies Quarterly Volume 11, Issue 1 (Spring 2017), 3-13, http://www.airuniversity.af.mil/Portals/10/SSQ/documents/Volume-11_Issue-1/Goldfein.pdf.

3. Admiral Harry B. Harris Jr., Statement. U.S. Pacific Command Posture, before the U.S. Congress, House Armed Services Committee. 24 February 2016. 4.

4. Ibid., 3.

5. CJCS, The National Military Strategy of the United States of America, 2015 (Washington, DC: Office of the Chairman of the Joint Chiefs of Staff, June 2015): 7.

6. General Martin Dempsey (Chairman Joint Chiefs of Staff) interview by Gideon Rose, June 2016, in Foreign Affairs, https://www.foreignaffairs.com/interviews/2016-08-01/notes-chairman.

7. Keith Payne, "Maintaining Flexible and Resilient Capabilities for Nuclear Deterrence," 23.

8. Ibid., 23.

9. Keith Payne "On Nuclear Deterrence and Assurance," 50.

10. Lt Gen Jack Weinstein, "Deterring North Korea's Nuclear Missile Threats: No Challenge Only Opportunity," (ICAS Fall symposium, 25 October 2016), http://www.icasinc.org/2016/2016f/2016fjbw.html.

11. Jennifer Bradley, "Increasing Uncertainty," 73.

12. U.S. Department of Defense, Nuclear Posture Review, Washington, DC, April 6, 2010, p. 22. https://www.defense.gov/Portals/1/features/defenseReviews/NPR/2010_Nuclear_Posture_Review_Report.pdf

13. Air Force Global Strike Command, Strategic Plan, May 2016, p. 7, http://www.afgsc.af.mil/Portals/51/Docs/AFGSC%20Strategic%20Plan_2016_CC%20Signed.pdf?ver=2016-05-06-144801-403. 24. The National Military Strategy to Combat Weapons of Mass Destruction, 13 February 2006, 5 and 13.

Attachment 1

The mission of the **U.S. Air Force Center for Unconventional Weapons Studies** is to develop Air Force, DoD, and other USG leaders to advance the state of knowledge, policy, and practices within strategic defense issues involving nuclear, biological, and chemical weapons.

The Trinity Site Papers present key discussions, ideas, and conclusions that are directly relevant to developing defense policy and strategy relating to countering weapons of mass destruction and developing the nuclear enterprise.

The opinions, conclusions, and recommendations expressed or implied in this article are those of the author and do not necessarily reflect the views of the Air University, Air Force, or Department of Defense.

Attachment 2

Search Term	BAAD		
Trends Window	**Relevant**	**Confirmed Date**	**Additional Info**
8-Feb-15	No	N/A	Black Artists and Designers club article
20-Mar-16	No	N/A	2 Korean children killed by train near Baad station on 22 Mar
26-Jun-16	No	N/A	Article about Afghan custom of Baad

Search Term	B-52		
Trends Window	**Relevant**	**Confirmed Date**	**Additional Info**
17-Mar-13	Yes	8-Mar-13	Foal Eagle exercise begins http://www.stripes.com/news/pacific/korea/b-52s-flying-during-joint-us-south-korea-exercises-1.212417
17-Mar-13	Yes	19-Mar-13	BAAD flight in response to Feb '13 NK nuke test, part of Foal Eagle http://guam.stripes.com/base-info/b-52-flies-mission-over-rok#sthash.MRVJRvAL.dpbs
30-Mar-14	No	2-Apr-14	B-52s and B-2s trained over Hawaii
2-Jul-15	Yes	6-Jul-15	BAAD flight over Australia http://www.upi.com/Defense-News/2015/07/06/B-52-bombers-demo-long-reach-of-US-air-power/3921436204530/
23-Aug-15	Yes	7-Aug-15	Guam deployment swapout. http://www.af.mil/News/ArticleDisplay/tabid/223/Article/911677/all-global-strike-bombers-deploy-to-andersen-maintain-stability-in-pacom-theater.aspx
10-Jan-16	Yes	10-Jan-16	BAAD flight in response to North Korean H-bomb test https://www.nytimes.com/2016/01/11/world/asia/south-korea-us-flies-b-52-bomber.html *Used in Public Affairs cross-study

Search Term	B-2		
Trends Window	**Relevant**	**Confirmed Date**	**Additional Info**
23-Mar-13	Yes	28-Mar-13	BAAD flight in response to Feb '13 NK nuke test http://www.usatoday.com/story/news/world/2013/03/28/us-b-2-bombers-south-korea/2027607/
13-Jul-14	No	N/A	Possibly due to articles about the B-2s 25th anniversary on 17 July
31-Aug-14	Yes	27-Aug-14	Guam deployment swapout
1-Mar-15	No	N/A	Possibly due to South Korean news report on US military capabilities
19-Apr-15	No	N/A	Possibly due to Bloomberg article on B-2 cost
16-Aug-15	Yes	7-Aug-15	Guam deployment http://www.pacaf.af.mil/News/ArticleDisplay/tabid/377/Article/616816/b-2-deployment-to-guam-teamwork-sorties-success.aspx
15-Nov-15	No	N/A	Possibly due to a stripes.com article or a wedding in S Korea with "B-2" in the address

Search Term	B-1		
Trends Window	**Relevant**	**Confirmed Date**	**Additional Info**
14-Feb-16	No	N/A	Possibly for B-1s leaving CENTCOM. Also, F-22s deployed to OSAN on 17 Feb
12-Jun-16	No	N/A	Unsure of spike origin. Also, on 16 Jun, a suicide bomber allegedly killed Kim Jong Un
18-Sep-16	Yes	12-Sep-16	BAAD flight in response to Nuclear Bomb test http://www.afgsc.af.mil/News/ArticleDisplay/tabid/2612/Article/942555/us-b-1-bombers-conduct-sequence-flights-with-south-korea-japan-in-response-to-n.aspx *Used in Public Affairs cross-study
25-Sep-16	Yes	21-Sep-16	BAAD flight nearest DPRK border, lands in ROK http://www.reuters.com/article/us-northkorea-nuclear-flight-idUSKCN11R0C6 *Used in Public Affairs cross-study

Attachment 3