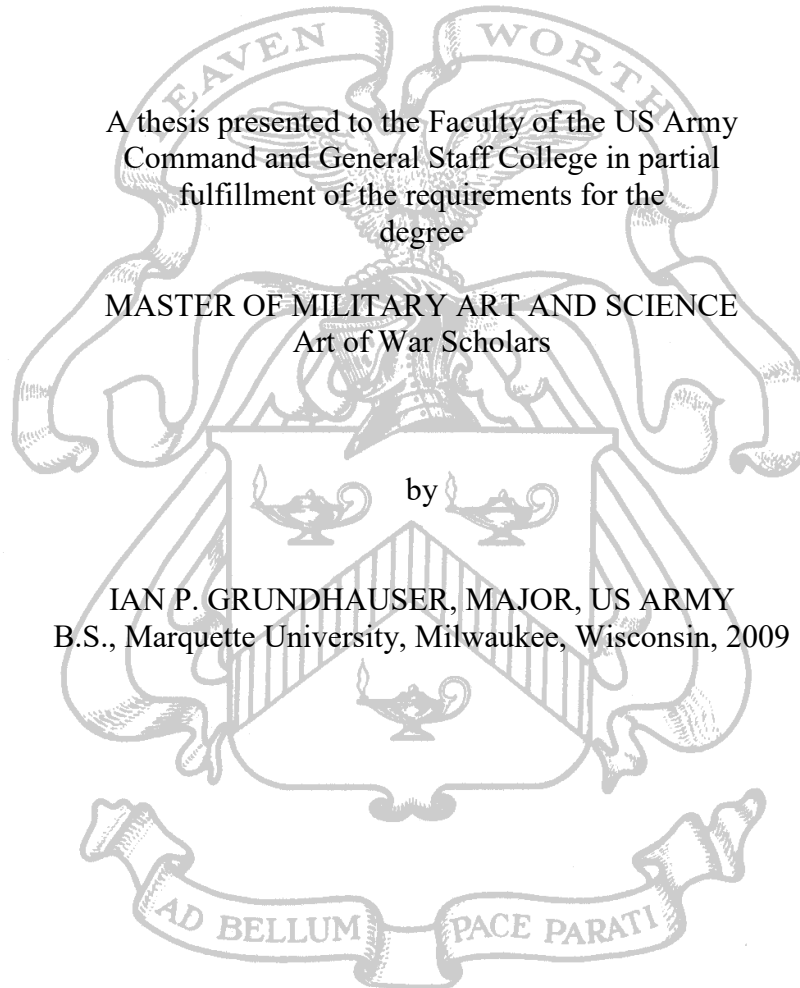


AVOIDING THE PARIS GUN TRAP: THE FUTURE OF  
AMERICA'S STRATEGIC ARTILLERY



A thesis presented to the Faculty of the US Army  
Command and General Staff College in partial  
fulfillment of the requirements for the  
degree

MASTER OF MILITARY ART AND SCIENCE  
Art of War Scholars

by

IAN P. GRUNDHAUSER, MAJOR, US ARMY  
B.S., Marquette University, Milwaukee, Wisconsin, 2009

Fort Leavenworth, Kansas  
2020

Approved for public release; distribution is unlimited. Fair use determination or copyright permission has been obtained for the inclusion of pictures, maps, graphics, and any other works incorporated into this manuscript. A work of the United States Government is not subject to copyright, however further publication or sale of copyrighted images is not permissible.

<b>REPORT DOCUMENTATION PAGE</b>			<i>Form Approved</i> <i>OMB No. 0704-0188</i>		
Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing this collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports (0704-0188), 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number. <b>PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ADDRESS.</b>					
<b>1. REPORT DATE (DD-MM-YYYY)</b> 12-06-2020		<b>2. REPORT TYPE</b> Master's Thesis		<b>3. DATES COVERED (From - To)</b> AUG 2019 – JUN 2020	
<b>4. TITLE AND SUBTITLE</b>  Avoiding the Paris Gun Trap: The Future of America's Strategic Artillery			<b>5a. CONTRACT NUMBER</b>		
			<b>5b. GRANT NUMBER</b>		
			<b>5c. PROGRAM ELEMENT NUMBER</b>		
<b>6. AUTHOR(S)</b>  Ian P. Grundhauser, Major.			<b>5d. PROJECT NUMBER</b>		
			<b>5e. TASK NUMBER</b>		
			<b>5f. WORK UNIT NUMBER</b>		
<b>7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)</b> US Army Command and General Staff College ATTN: ATZL-SWD-GD Fort Leavenworth, KS 66027-2301			<b>8. PERFORMING ORG REPORT NUMBER</b>		
<b>9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)</b>			<b>10. SPONSOR/MONITOR'S ACRONYM(S)</b>		
			<b>11. SPONSOR/MONITOR'S REPORT NUMBER(S)</b>		
<b>12. DISTRIBUTION / AVAILABILITY STATEMENT</b> Approved for Public Release; Distribution is Unlimited					
<b>13. SUPPLEMENTARY NOTES</b>					
<b>14. ABSTRACT</b>  In an attempt to end the stalemate on the Western Front during World War I, German scientists and engineers created a supergun capable of firing a 233-pound projectile over 75 miles to bombard the citizens of Paris, France. These weapons, The Paris Guns, possessed the potential to achieve an exponential military advantage for the German Military. However, the Germans' folly became clear as they developed a weapon without first considering its ability to achieve the effects they desired. Today, the US Army seeks to develop superguns capable of exponentially increased range, the Strategic Long-Range Cannons. The US Army has defined a role for these weapons in deterring in competition, and penetrating and dis-integrating anti-access and area denial networks in armed conflict. This study examined the history and effects of The Paris Guns at the strategic level. It then measured the accumulation of these effects across the operational variables. This study concluded that The Paris Guns achieved some strategic effects; however, these effects did not benefit the Germans. Additionally, this study concluded that the US Army's pursuit of Strategic Long-Range Cannons is viable, provided that that pursuit avoids the strategic errors of The Paris Guns during World War I.					
<b>15. SUBJECT TERMS</b> World War I (WWI); Paris Gun; Big Bertha; Wilhelmgeschütze; Paris Kanonen; Strategic Effects; Strategic Fires; Long-Range Artillery; Strategic Long-Range Cannon (SLRC).					
<b>16. SECURITY CLASSIFICATION OF:</b>			<b>17. LIMITATION OF ABSTRACT</b>	<b>18. NUMBER OF PAGES</b>	<b>19a. NAME OF RESPONSIBLE PERSON</b>
<b>a. REPORT</b>	<b>b. ABSTRACT</b>	<b>c. THIS PAGE</b>			<b>19b. PHONE NUMBER (include area code)</b>
(U)	(U)	(U)	(U)	137	

MASTER OF MILITARY ART AND SCIENCE

THESIS APPROVAL PAGE

Name of Candidate: MAJ Ian P. Grundhauser

Thesis Title: Avoiding the Paris Gun Trap: The Future of America's Strategic Artillery

Approved by:

\_\_\_\_\_, Thesis Committee Chair  
Dean A. Nowowiejski, Ph.D.

\_\_\_\_\_, Member  
Lieutenant Colonel Jeffrey S. Schmidt, M.A.

\_\_\_\_\_, Member  
Gregory P. Bedrosian, M.A.

Accepted this 12th day of June 2020 by:

\_\_\_\_\_, Acting Director, Office of Degree Programs  
Prisco R. Hernandez, Ph.D.

The opinions and conclusions expressed herein are those of the student author and do not necessarily represent the views of the US Army Command and General Staff College or any other governmental agency. (References to this study should include the foregoing statement.)

## ABSTRACT

AVOIDING THE PARIS GUN TRAP: THE FUTURE OF AMERICA'S STRATEGIC ARTILLERY, by MAJ Ian P. Grundhauser, 137 pages.

In an attempt to end the stalemate on the Western Front during World War I, German scientists and engineers created a supergun capable of firing a 233-pound projectile over 75 miles to bombard the citizens of Paris, France. These weapons, The Paris Guns, possessed the potential to achieve an exponential military advantage for the German Military. However, the Germans' folly became clear as they developed a weapon without first considering its ability to achieve the effects they desired. Today, the US Army seeks to develop superguns capable of exponentially increased range, the Strategic Long-Range Cannons. The US Army has defined a role for these weapons in deterring in competition, and penetrating and dis-integrating anti-access and area denial networks in armed conflict. This study examined the history and effects of The Paris Guns at the strategic level. It then measured the accumulation of these effects across the operational variables. This study concluded that The Paris Guns achieved some strategic effects; however, these effects did not benefit the Germans. Additionally, this study concluded that the US Army's pursuit of Strategic Long-Range Cannons is viable, provided that that pursuit avoids the strategic errors of The Paris Guns during World War I.

## ACKNOWLEDGMENTS

There are a number of people to thank for their unwavering support of this work. First, I would like to thank Dr. Dean Nowowiejski for supporting this endeavor since the very beginning, both for offering to serve as my Committee Chair and later accepting me into the Art of War Scholars Program. Dr. Nowowiejski has served as a committed sounding board and mentor, able to redirect my frequent attempts to chase ideas far further than I ever should. Additionally, I would like to thank Lieutenant Colonel Jeffrey Schmidt and Lieutenant Colonel (Retired) Gregory Bedrosian. They have both demonstrated selfless commitment to this thesis, and have provided sound advice and reasoning throughout the process. I would also like to thank Venita Krueger, who helped me bring this thesis to its conclusion through her exceptional editing services.

Next, I would like to thank my fellow students in the Art of War Scholars Program. I am humbled every day, as they display an unrelenting commitment to learning, and a capacity to think and communicate at the strategic and operational levels of warfare. I would especially like to thank Majors Gregory George and Michael Kearnes for reviewing this work and providing me sound advice, and the motivation to take it to completion.

Finally, and most importantly, I would like to thank my wife, Camille, my daughter, Evelyn, and son, Edward. They provided constant love and support and patiently stood by throughout the long hours of work on this thesis. The freedom they gave me to research and write was critical to my completion of this work. Their frequent “visits” to my office were the necessary bright spots that got me through the many lonely days (and nights) of research and writing.

# TABLE OF CONTENTS

	Page
MASTER OF MILITARY ART AND SCIENCE THESIS APPROVAL PAGE .....	iii
ABSTRACT.....	iv
ACKNOWLEDGMENTS .....	v
TABLE OF CONTENTS.....	vi
ACRONYMS.....	ix
ILLUSTRATIONS .....	x
TABLES .....	xi
CHAPTER 1 INTRODUCTION .....	1
Background.....	1
Purpose.....	5
Primary Research Question .....	6
Secondary Research Questions.....	6
Definitions .....	6
Assumptions.....	7
Scope.....	9
Limitations .....	9
Delimitations.....	10
Summary.....	11
CHAPTER 2 LITERATURE REVIEW .....	13
The Guns (German: Geschütze) .....	13
Historic Literature.....	19
Primary Sources .....	20
Secondary Sources .....	35
Strategy, Deterrence, and the US Army’s Future Operating Concept.....	42
Strategy, the Competition Continuum, and Effects .....	42
Deterrence and Coercion.....	45
The US Army in Multi-Domain Operations 2028 .....	46
Strategic Long-Range Cannon (SLRC) Artillery.....	48
CHAPTER 3 RESEARCH METHODOLOGY .....	52
Overview.....	52

Case Study Framework.....	52
Moral Strength .....	53
Will to Act .....	53
Physical Strength .....	54
Freedom of Action .....	54
Methodology.....	55
Secondary Research Questions.....	57
Data Collection .....	58
Data Analysis .....	58
Summary.....	58
 CHAPTER 4 DEVELOPMENT and EMPLOYMENT .....	 60
Introduction.....	60
The Paris Guns Case Study.....	60
Background .....	61
Development .....	62
Employment .....	68
 CHAPTER 5 ANALYSIS .....	 71
Analysis .....	71
Social Effects .....	73
Political Effects .....	80
Economic Effects .....	85
Military Effects .....	90
Summary.....	96
 CHAPTER 6 CONCLUSIONS AND RECOMMENDATIONS .....	 99
Conclusions.....	99
Effects Across the Operational Variables .....	100
Social Effects .....	100
Political Effects.....	101
Economic Effects .....	101
Military Effects .....	102
Recommendations.....	102
Challenge and Response .....	102
How SLRC Can Succeed where the Paris Guns Failed .....	105
Technical Capability, Tied to Tactical Action can Result in Strategic Effects ...	106
Target Selection .....	107
Mass and Precision .....	109
Mobility.....	110
Additional Research.....	112
 APPENDIX A Additional Figures.....	 115

BIBLIOGRAPHY.....121



## ACRONYMS

A2AD	Anti-Access and Area Denial
AEF	American Expeditionary Forces
CFT	Cross-Functional Team
cm	centimeter(s)
COL	Colonel
ft	foot, feet
km	Kilometer(s)
LRPF	Long-Range Precision Fires
LTC	Lieutenant Colonel
m	meter(s)
MAJ	Major
MG	Major General
mi	mile(s), or statute mile(s)
nmi	nautical mile(s)
<i>NYT</i>	<i>The New York Times</i>
RADM	Rear Admiral (Upper Half)
SLRC	Strategic Long-Range Cannon
US	United States
WWI	World War I
WWII	World War II

## ILLUSTRATIONS

	Page
Figure 1. Photo of a Big Bertha.....	15
Figure 2. Photo of a Langer Max .....	17
Figure 3. Photo of a Paris Gun .....	19
Figure 4. 16.7 Inch (42.4 Centimeter) L86 HARP Barbados Gun Firing at 85° Elevation.....	28
Figure 5. Case Study Methodology Framework .....	56
Figure 6. Photo of the effects of one round impacting the Church of St. Gervais on Good Friday, March 29, 1918.....	79
Figure 7. Bombardment of Paris by “Paris Guns” (March 1918) .....	115
Figure 8. Bombardment of Paris by “Paris Guns” (April 1918) .....	116
Figure 9. Bombardment of Paris by “Paris Guns” (May 1918) .....	117
Figure 10. Bombardment of Paris by “Paris Guns” (June 1918) .....	118
Figure 11. Bombardment of Paris by “Paris Guns” (July 1918).....	119
Figure 12. Bombardment of Paris by “Paris Guns” (August 1918).....	120

## TABLES

	Page
Table 1. Casualties Resulting from the Paris Gun Bombardment of Paris, France (March 23 to August 9, 1918).....	69
Table 2. Summary of Effects Caused by the German Bombardment of Paris, France..	97

## CHAPTER 1

### INTRODUCTION

absolutely out of the question . . . I only trust that the English field artillery will never consider their role is to sit behind a hill a mile and a half in the rear while the assault is taking place.

— Major J. Headlam, *The German Method of Bringing Guns into Action*

#### Background

In December 2017, the United States (US) National Security Strategy characterized China and Russia as global revisionist powers in competition with the US. The National Security Strategy further stated, “China and Russia challenge American power, influence, and interests, attempting to erode American security and prosperity.”<sup>1</sup> The definition of these states as competitors provided the impetus for the US Department of Defense to address these states as security concerns and develop a strategy to “provide combat-credible military forces needed to deter war and protect the security of our nation. Should deterrence fail, the Joint Force is prepared to win.”<sup>2</sup>

In support of the US National Security Strategy, the 2018 US National Defense Strategy addressed the need to modernize critical capabilities. One of these critical capabilities was joint lethality in contested environments stating, “The Joint Force must be able to strike diverse targets inside adversary air and missile defense networks to

---

<sup>1</sup> President of the United States, *National Security Strategy of the United States of America* (Washington, DC: The White House, 2017), 2.

<sup>2</sup> Headquarters, Department of Defense, *Summary of the 2018 National Defense Strategy of the United States of America* (Washington, DC: Government Printing Office, 2018), 1.

destroy mobile power-projection platforms.”<sup>3</sup> This requirement addressed the need for the Joint Force to penetrate competitor and adversary anti-access and area denial (A2AD) networks. A2AD networks are the integrated defensive systems and “mechanisms that prevent US forces from entering an area of operations or expanding operations from an initial lodgment.”<sup>4</sup> The US National Defense Strategy further informed the 2018 US Army Strategy, which articulated four lines of effort to shape the Army of 2028 in direct response to adversary A2AD and additional threat capabilities. One of these lines of effort was modernization, ensuring the US Army’s capability of competing and winning in six critical areas described as modernization priorities.<sup>5</sup> The first of these priorities was Long-Range Precision Fires (LRPF), defined as: “Platforms, capabilities, munitions, and formations that ensure US Army dominance in range, lethality, mobility, precision, and target acquisition.”<sup>6</sup>

The US national policy requirements to modernize the US Army’s critical capabilities resulted in the US Army, creating eight cross-functional teams (CFT). Army Directive 2017-24 codified these CFTs with the mandate to oversee the development of capability documents, experimentation and technical demonstration, and drive capability

---

<sup>3</sup> Headquarters, Department of Defense, *Summary of the 2018 National Defense Strategy of the United States of America*, 6.

<sup>4</sup> Major Ben Jackman, “Understanding the Anti-Access and Area Denial Threat: An Army Perspective” (Monograph, School of Advanced Military Studies, Fort Leavenworth, KS, 2015), 7.

<sup>5</sup> Secretary Mark T. Esper and General Mark A. Milley, *The Army Strategy* (Washington, DC: Government Printing Office, 2018), 7.

<sup>6</sup> Ibid.

requirements through the Army Acquisition System.<sup>7</sup> The LRPF CFT, under the purview of the US Army Field Artillery, oversees deep fires, the long-range precision fires missile,<sup>8</sup> and extended range cannon artillery. The US Army articulated that, “Deep Fires will provide the U.S. Army and joint force commanders with a surface-to-surface capability that can penetrate peer adversary defensive capabilities to engage key targets at strategic ranges.”<sup>9</sup> The LRPF CFT emphasis on the ability to provide deep fires directly answered the 2018 US National Defense Strategy requirement to strike within adversary and competitor A2AD protected areas.

The US Army is seeking to develop advanced surface-to-surface weapon systems in response to competitor parity and overmatch with strategic long-range fires, and to provide the Joint Force complementary assets to penetrate A2AD defended areas. The US Army has publicly addressed two possible solutions for these strategic LRPF capabilities. They are a Strategic Long-Range Cannon (SLRC) and a hypersonic missile launcher.<sup>10</sup> These proposed solutions seek to achieve desired effects with a weapon system employed

---

<sup>7</sup> Secretary Ryan D. McCarthy, Army Directive 2017-24, *Implementation of Acquisition Reform Initiatives 1 and 2* (Washington, DC: Government Printing Office, 2017), 2.

<sup>8</sup> Lockheed Martin, “Precision Strike Missile (PrSM),” Lockheed Martin, accessed March 16, 2020, <https://www.lockheedmartin.com/en-us/products/precision-strike-missile.html>. The name of this sub-element has since changed from Long-Range Precision Fires Missile to the Precision Strike Missile (PrSM). This change limits confusion between the name of the CFT and this emerging weapon system.

<sup>9</sup> Fires Center of Excellence, “Long-Range Precision Fires,” *STAND-TO!*, January 17, 2018, accessed September 30, 2019, <https://www.army.mil/standto/2018-01-17>.

<sup>10</sup> Sydney J. Freedberg Jr., “Army Building 1,000-Mile Supergun,” *Breaking Defense*, October 11, 2018, accessed October 9, 2019, <https://breakingdefense.com/2018/10/army-builds-1000-mile-supergun/>.

by the US Army Field Artillery at ranges beyond 1,000 nautical miles (nmi) or 1,151 miles (mi).<sup>11</sup> Achieving ranges of greater than 1,000 nmi will provide echeloned surface-to-surface artillery, rocket, and missile capabilities alongside the other sub-elements residing within the LRPF CFT.<sup>12</sup> Additionally, range goals exceeding 1,000 nmi will challenge and compete with adversary surface-to-surface weapon capabilities. Achieving these ranges, at a minimum, provide the potential deterrence capability required by the US Army and Joint Force.<sup>13</sup>

An appropriate historical parallel to these advancements in strategic LRPF existed in the development and ultimate employment by the German Military of the Paris Guns targeting Paris, France, during World War I (WWI). In the Spring of 1918, the French did not anticipate the German Army engaging Paris with artillery until the German lines were within at least 25 mi of Paris. This reasonable assumption relied on contemporary artillery ranges of weapons fielded by the Allied and German militaries, which achieved maximum ranges of only 41.1 kilometers (km) (25.5 mi) and 47.5 km (29.5 mi), respectively.<sup>14</sup> The French were shocked when the Germans began shelling Paris while the closest German lines were still over 60 mi Northeast of Paris. The Germans would go

---

<sup>11</sup> 1 nautical mile (nmi) is equal to 1.15078 statute miles (mi).

<sup>12</sup> Fires Center of Excellence, “Long-Range Precision Fires.”

<sup>13</sup> Chris Pleasance and Ariel Zilber, “‘No Force Can Shake This Great Nation’: President Xi Leads Spectacular Ceremony to Mark 70 Years of Communist Rule in China and Unveils Top-Secret Hypersonic DF-17 Missile for the First Time,” *Daily Mail*, September 30, 2019, accessed October 2, 2019, <https://www.dailymail.co.uk/news/article-7523145/Chinas-70-year-parade-economic-military-might.html>.

<sup>14</sup> Marc Romanych, Greg Heuer, and Steve Noon, *Railway Guns of World War I* (Oxford: Osprey, 2017), 33.

on to intermittently shell Paris with these weapons between March 23 and August 9, 1918, with approximately 352 total projectiles weighing 233.6 lbs. achieving ranges between 50 and 75 mi.<sup>15</sup> The German Military believed the dramatic increase in the capability and achieved ranges of these weapons meant they could achieve strategic psychological effects against the Parisian civilian population. The development and employment of these weapon systems provide a historical parallel to the modern emergence of strategic surface-to-surface artillery weapon systems. They will best inform the use of these weapon systems along the competition continuum.

### Purpose

The purpose of this thesis is to provide recommendations for the utilization of future strategic long-range cannon artillery weapon systems currently in development for use by the US Army Field Artillery. The impetus for the development of these weapons emerged through competition with peer and near-peer competitors and adversaries of the US whose militaries have continued to grow in recent decades, and who have invested increasing resources in force and technological modernization. These competitors and adversaries have developed their own strategic long-range surface-to-surface weapons systems, and have invested in the development of A2AD systems to ensure competitor stand-off. This increased stand-off has resulted in a requirement for the US Military to

---

<sup>15</sup> Gerald V. Bull and Charles H. Murphy, *Paris Kanonen - the Paris Guns (Wilhelmgeschütze) and Project HARP*, ed. Elmar W. Caspar, Wolfram Funk, Werner Hahlweg, Volker Schmidtchen, Ingo Weise, and Arnold Wirtgen (Herford und Bonn: Verlag E. S. Mittler and Sohn GmbH, 1988).



invest in modernization efforts to achieve parity or overmatch of competitor and adversary strategic long-range weapons and to defeat or deny A2AD stand-off capability.

### Primary Research Question

How can the development and employment of the German Paris Guns inform the United States Army's use of strategic long-range cannon artillery weapon systems throughout the competition continuum?

### Secondary Research Questions

1. What were the facts and circumstances surrounding the development, employment, and effects of the Paris Guns during and after World War I?
2. What effects did Germany desire in developing and employing the Paris Guns during World War I? Were these effects achieved?
3. What societal, political, economic, and military strategic effects resulted from the employment of the Paris Guns by the German Military during World War I?

### Definitions

Allied Powers: In this thesis, "Allied Powers" or "Allies" will refer broadly to Great Britain (and the British Empire), France, the Russian Empire, and the United States of America.<sup>16</sup>

---

<sup>16</sup> Editors of Encyclopedia Britannica, "Allied Powers," *Encyclopedia Britannica*, n.d., accessed March 21, 2020, <https://www.britannica.com/topic/Allied-Powers-international-alliance>. This broad definition of the Allied Powers prevents confusion associated with the various shifting timelines and alliances of all belligerent nations throughout the war. Formally, the Allied Powers were those countries in opposition to the Central Powers (Germany, Austria-Hungary, and Turkey) at the outset of WWI in 1914. These countries were Great Britain, France, and the Russian Empire. The Treaty of London signed on September 5, 1914, formally linked these countries into an alliance.

Central Powers: Germany, Austria-Hungary, and Turkey were the powers under formal mutually-supporting treaties in opposition to the Allied Powers during WWI.<sup>17</sup>

### Assumptions

This study includes the following assumptions to ensure continued relevance to inform the future use of SLRC artillery.

1. The United States Army's LRPF CFT will continue to pursue the development, and ultimately the procurement and fielding of a SLRC artillery weapon system capable of achieving ranges over 1,000 nmi with a conventional projectile. Soldiers from the US Army Field Artillery will operate these weapon systems from a mobile land-based platform.

2. The US will not enter into a limiting treaty, restricting the range of conventional surface-to-surface weapon systems before the projected implementation timeline for the Army's future operating concept in 2028. On August 2, 2019, the US formally withdrew from the 1987 Intermediate-Range Nuclear Forces (INF) Treaty between the United States and Russia (the former Soviet Union). This treaty prohibited the possession, production, or flight-testing of land-based missiles between the ranges of

---

The United States was never a formal member of the alliance, instead referred to as an "Associated Power" or a "Co-belligerent", as stated by US President Woodrow Wilson upon formal entry into the war on April 6, 1917. Despite this distinction, the US supported and fought alongside the Allied Powers against the Central Powers throughout their involvement in the war. For these reasons, and for ease of understanding, this thesis includes the US when referring broadly to the Allied Powers.

<sup>17</sup> Editors of Encyclopedia Britannica, "Allied Powers."

500 to 5,500 km (310 to 3,418 mi).<sup>18</sup> The formal withdrawal from this treaty removed this restriction from the US. It allowed the US Army to pursue surface-to-surface weapon technology capable of achieving ranges greater than 500 km.<sup>19</sup> The weapon systems in development by the US Army will achieve desired ranges of at least 1,000 nmi. These ranges are not strategic in and of themselves but are strategic because they will allow the US Military to position weapons on the periphery of adversary threat and A2AD defensive rings. This positioning will enable the US Military to achieve desired effects on targets within those threat rings. This capability will deny the adversary or competitor's A2AD system, therefore strategically diminishing their ability to project the elements of national power. The summation of this capability will achieve an overall deterring effect at the strategic level of war while remaining below the threshold of armed conventional or nuclear conflict.<sup>20</sup>

---

<sup>18</sup> Arms Control Association, "The Intermediate-Range Nuclear Forces (INF) Treaty at a Glance," Arms Control Association, last reviewed August 2019, accessed October 9, 2019, [https://www.armscontrol.org/fact sheets/INFtreaty](https://www.armscontrol.org/fact%20sheets/INFtreaty).

<sup>19</sup> Lockheed Martin, "Army Tactical Missile System Block 1A," Lockheed Martin, accessed October 1, 2019, <https://www.lockheedmartin.com/en-us/products/army-tactical-missile-system-block-ia-unitary-atacms.html>.

<sup>20</sup> Major General (MG) Stephen J. Maranian, interviewed by author, Fort Leavenworth, Kansas, February 19, 2020. At the time of this writing, MG Maranian served as the Deputy Commanding General-Education, United States Combined Arms Center; as the Provost, Army University; as well as the Deputy Commandant, United States Army Command and General Staff College, Fort Leavenworth, Kansas. MG Maranian previously served as the Commandant of the United States Army Field Artillery School and Chief of the Field Artillery; as well as the first Director of the Long-Range Precision Fires (LRPF) Cross-Functional Team (CFT), Fort Sill, Oklahoma. MG Maranian oversaw the initial creation of the LRPF CFT and was instrumental in guiding the creation of the three initial focus areas or lines of effort for the CFT: Extended Range Cannon Artillery (ERCA), Long-Range Precision Fires Missile (now: the Precision Strike Missile (PrSM)), and Deep Fires.

### Scope

The requirement to answer the primary research question resulted from a research request by the US Army Field Artillery School, Fort Sill, Oklahoma. The research question posed requested an answer to how the US Army can use strategic long-range cannon and hypersonic weapon systems from competition to conflict. The emergence of hypersonic weapon system technology within the last two decades has not yielded an unclassified US Military working prototype or case study for how these systems are most effectively employed. Despite this, there are historical examples of long-range cannon artillery use. For this reason, the author elected to draw on the historical example of a potential strategic long-range cannon's use as a parallel to inform emerging SLRC artillery currently under development by the US Army. This historic example serves as a direct parallel between how a historical and modern-day cannon can achieve potentially strategic effects. This parallel offers a case study best suited to inform how the US Army should employ their modern SLRC artillery.

### Limitations

This qualitative analysis historical case study relies on the examination of unclassified documents in the form of public records, research, reports, books, as well as online periodicals, articles, and journals to identify how the Paris Guns were employed and what effects they achieved. Due to the sensitive and, in some cases, classified nature of the ongoing development of modern LRPF weapon systems, the author was unable to conduct an unclassified quantitative analysis of the technical and tactical development of these weapon systems. For these reasons, this research is qualitative in nature and seeks

to make general recommendations for the strategic employment of these modern weapon systems.

A limitation in selecting the Paris Guns as the historical case study for this research is that many of the primary sources for the development and employment of these weapons were German. Correspondingly, many of the primary sources for the effects of these weapons were French. For these reasons, much of the literature related to the Paris Guns exists only in German or French. Because of the use of English-language sources, there is a potential underlying, if not overt bias present within this source material. That bias favors the Allied nations, as many of the authors were from those nations. As a result, the author attempted to gather as many translated primary source documents as possible, and when appropriate, relied on secondary source information relating to these incidents.

Additionally, the author attempted to cross-reference facts across multiple sources and relied heavily upon facts rather than speculation or opinion. Allied opinion, when used, supports a general feeling or sentiment within a given population, rather than an overt critique of German actions. The author attempted to represent both sides of this conflict equally and resolve factual incongruities where appropriate.

### Delimitations

As detailed in the scope above, the historical case study of the Paris Guns best parallels and informs the use of modern SLRC artillery. The US Army is also developing advancements in long-range hypersonic missile technology. However, with limited historical parallels for this emerging technology, it is difficult to inform the use of these weapon systems along the competition continuum. For this reason, the author focused

this study on informing only the use of SLRC artillery based on a qualitative analysis historical case study of the Germany Military's use of the Paris Guns during WWI. If readers can draw conclusions for the use of long-range hypersonic missile technology from this research, while of potential value, it is not the intended outcome or focus of this research.

Modern SLRC artillery weapon systems are currently in development, and therefore, any attempt to inform their tactical employment would be purely speculative. For this reason, research of the Paris Guns will focus on the strategic development and employment of these weapon systems. The strategic intent behind the Paris Guns was conceptual in scope, and therefore, its study can inform the conceptual future use of modern SLRC artillery systems. For these reasons, this study will focus on the strategic employment of these weapons and their associated effects along the competition continuum. Despite this focus, this thesis includes the discussion of the tactical employment of the Paris Guns, when appropriate, to provide adequate historical context and detail.

### Summary

This study will explore the development, employment, effects, and response to the Paris Guns from a strategic perspective. The research conducted will inform the US Army and joint commanders on the potential strategic employment of these modern weapon systems. This research will seek to close the gap in understanding of how to employ strategic surface-to-surface cannon artillery weapon systems, a capability not previously enjoyed by the US Army.

Chapter 2 of this thesis will explore the historical literature and discuss relevant modern literature to establish the framework to answer the primary and secondary research questions detailed above. Chapter 3 will discuss this thesis' methodology for analyzing the historical case study provided by the Paris Guns. A qualitative analysis historical case study will analyze the effects of the Paris Guns across four of the operational variables. Chapter 4 will provide the historical case study of the development, employment, effects, and response to the use of the Paris Guns during WWI, and will begin to answer secondary research question one. Chapter 5 will analyze this case study against four of the operational variables: social, political, economic, and military. Additionally, this chapter will continue to answer research question two and begin to answer secondary research question three. Finally, chapter 6 will provide conclusions drawn from the case study analysis, and recommendations to the US Army Field Artillery to inform the use of future SLRC weapon systems, thereby answering all primary and secondary research questions.

## CHAPTER 2

### LITERATURE REVIEW

War makes for progress—and I will leave it to my audience to surmise what will be the extreme distance to which shell may possibly be projected in 1921, assuming the rate of increase to be, at least, uniform.

— Major J. Maitland-Addison, R.A., reprinted from *Journal of the Royal Artillery*, July 1918, *The Field Artillery Journal*

#### The Guns (German: Geschütze)

On the afternoon of March 29, 1918, faithful Catholics were celebrating mass on one of the holiest days on the Roman Catholic liturgical calendar, Good Friday. In the Church of St. Gervais in Paris, France, the faithful included men, women, and children as well as foreign travelers, dignitaries, and political figures. A three-hour mass had just concluded, and many parishioners were still present, kneeling in prayer. At 4:20 p.m., a shell burst against the outside wall of the clerestory, rocking the church. “Then the whole of the massive stonework supported by one of the huge pillars was hurled with a frightful crash down on the mass of kneeling people in the nave.”<sup>21</sup> A projectile fired by one of the Paris Guns had just struck the Church of St. Gervais on the seventh day of the bombardment, resulting in the most significant tactical effect achieved by the Paris Guns: 88 killed and 68 wounded.<sup>22</sup> While tactically successful, this attack, coupled with the

---

<sup>21</sup> New York Times, “Paris Shelled Again; 8 Killed,” *New York Times*, March 31, 1918, accessed January 21, 2020, <https://timesmachine.nytimes.com/timesmachine/1918/03/31/102684190.html?pageNumber=1>.

<sup>22</sup> Lt. Col. Henry W. Miller, *Railway Artillery: A Report on the Characteristics, Scope of Utility, Etc. of Railway Artillery* (Washington, DC: Government Printing Office, 1921).



entire bombardment, had a net negative strategic impact and further diminished the worlds' view of Germany and its people. The guns that caused such destruction were a monument to technological achievement gained in a time of global war. The technological leap they represented is unquestioned, but the purpose behind their development raises many questions for the military practitioner seeking to employ the tools of war.

To understand what the Paris Guns were, an explanation is useful first to clarify what they were not. They have had multiple names associated with them, and these have created confusion as to their design, function, and purpose.

“Big Bertha” (German: Dicke Berta) is a name often associated with the Paris Guns. This name was editorialized and popularized in multiple publications following the employment of the Paris Guns. The Big Bertha was in-fact, a type of 42-centimeter (cm) cannon first employed in Belgium in support of initial offensive operations conducted by the German Military in their attempt to defeat the French in France by way of Belgium. The Big Bertha was a relatively short-ranged weapon that fired a large projectile at high elevations to take advantage of plunging fire and the more vulnerable overhead cover of most fortifications. A photo of a Big Bertha (see figure 1) conveys its similarity to a large mortar, which takes advantage of high angle fire.<sup>23</sup> The Big Berthas' erroneous association with the Paris Guns may be due to a shared developer and manufacturer. The Friedrich Krupp AG manufacturing corporation developed both weapon systems. The excerpt below, from *Paris Kanonen - the Paris Guns (Wilhelmgeschütze) and Project*

---

<sup>23</sup> Marc Romanych, “Big Bertha,” *Encyclopedia Britannica*, n.d., accessed February 4, 2020, <https://www.britannica.com/technology/Big-Bertha-weapon>.

*HARP* by Doctors Gerald V. Bull and Charles H. Murphy, describes the Big Bertha's manufacture along with its primary use.

Rausenberger and his predecessor at Krupp, Director Dräger, had designed the large bore 42 cm howitzer, known by the name given to it by its designers as "Dicke Berta" (Big Bertha). This gun and the SKODA 305 mm howitzer reduced the forts of the Meuse in rapid sequence, permitting von Kluck's German First Army and von Bülow's German Second Army to start their sweep through Belgium following more or less [*sic*] the time scale demanded by the Schlieffen Plan.<sup>24</sup>

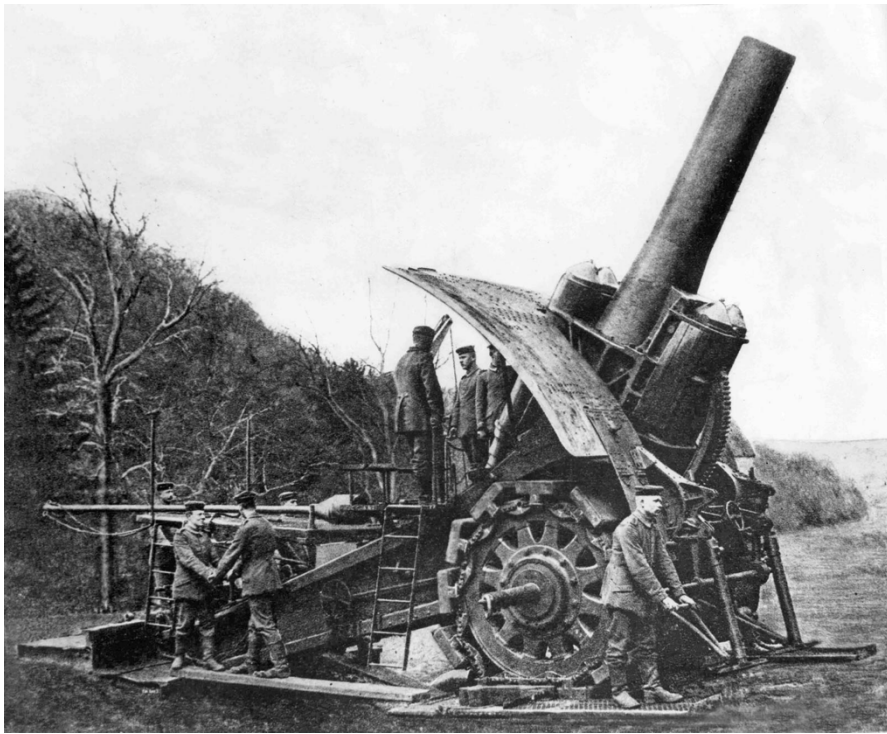


Figure 1. Photo of a Big Bertha

*Source:* Marc Romanych, "Big Bertha," *Encyclopedia Britannica*, n.d., accessed February 4, 2020, <https://www.britannica.com/technology/Big-Bertha-weapon>.

---

<sup>24</sup> Bull and Murphy, *Paris Kanonen - the Paris Guns (Wilhelmgeschütze) and Project HARP*, 12.

“Long Max” (German: Langer Max) was another artillery piece closely associated and sometimes confused with the Paris Guns. The Long Max (see figure 2) was a 38-cm German long-range heavy siege and coastal defense gun. The Friedrich Krupp AG corporation also developed this gun, the L45 “Max” or “Langer Max.” Its intended use was as a heavy naval and coastal defense gun. This gun was capable of firing a 38-cm (diameter) projectile weighing 743 kilograms (1638 pounds) 28 km (17.4 mi).<sup>25</sup> Additional adaptation allowed there later use on land, in support of ongoing operations on the Western Front. Eventually, these weapons were further adapted and modified, providing the foundational mechanical architecture, carriage, and barrel for the Paris Guns. As explained in the next section, the Long Max weapon system required substantial modification to produce the Paris Gun. For example, the weight and diameter of the projectiles were reduced, and the barrels required substantial extension. These modifications resulted in the significantly increased range evident in the Paris Guns. The Long Max stands as an example of German ingenuity in their ability to adapt existing technology to emerging requirements.

---

<sup>25</sup> Bull and Murphy, *Paris Kanonen - the Paris Guns (Wilhelmgeschütze) and Project HARP*, 21.



Figure 2. Photo of a Langer Max

*Source:* Wikipedia, “38 Cm SK L/45 ‘Max,’” Wikipedia, accessed January 19, 2020, [https://en.wikipedia.org/wiki/38\\_cm\\_SK\\_L/45\\_%22Max%22](https://en.wikipedia.org/wiki/38_cm_SK_L/45_%22Max%22).

The “Paris Guns” (German: Paris Kanonen or Paris Geschütze) (see figure 3) were a series of extremely long-range artillery pieces developed by the Friedrich Krupp AG corporation. These guns were also known as the William Gun (German: *Wilhelmgeschütze*), named in honor of the German Emperor, William II (German: Wilhelm II). Modified versions of the 38 cm (internal diameter) and 35 cm L45 “Langer Max” were adapted to create the Paris Guns. Ultimately, Krupp would retrofit and create between nine and thirteen of these weapons,<sup>26</sup> using a total of eight barrels in the

---

<sup>26</sup> Bull and Murphy, *Paris Kanonen - the Paris Guns (Wilhelmgeschütze) and Project HARP*, 76. It is unclear how many Paris Guns Krupp AG developed. Some guns provided service only as testing platforms, while some did not see combat during the bombardment of Paris. Bull and Murphy contend that the following guns were available at the start of the development project, and it is therefore conceivable that the total of these guns is the upper limit of the number created for both testing and combat: 1

bombardment of Paris, France.<sup>27</sup> These weapons utilized the carriage and barrels of the L45, and were emplaced semi-permanently at specially designed prepared positions behind the German front lines on the Western Front. The 38 and 35 cm barrels received rifled barrel inserts of 21 meters (m) (68.9 ft) in length. A smooth bore attachment to the end of the rifled barrel of either 6, 9, or 12 m (19.7, 29.5, or 39.4 ft) (selected based on desired range and tube wear) completed the barrel configuration. In this configuration, the weapon was capable of firing a 106-kilogram (233.6 pounds) projectile at least 75 mi (120 km) and carrying 7 kilograms (15.4 pounds) of explosive TNT fill. The differences between The Long Max and the Paris Guns are evident, in that the Paris Gun barrel is substantially longer and required an adjustable stiffening truss whereas the Long Max did not.<sup>28</sup> In total, these weapons fired 352.<sup>29</sup> projectiles between 50 and 75 mi (80.5 and 120

---

experimental 35.5 cm, 52.5 caliber long gun, 2 or 3 standard Navy 38 cm, 45 caliber long guns, and 9 35 cm, 45 caliber Navy guns complete except for rifling.

<sup>27</sup> Bull and Murphy, *Paris Kanonen - the Paris Guns (Wilhelmgeschütze) and Project HARP*, 34. Dr. Rausenberger's manuscript indicates that the total conduct of the bombardment used eight barrels. This total includes five barrels with a diameter of 21 cm, as well as two barrels rebored to 23.2 cm, and one barrel rebored to 22.4 cm. The three barrels were rebored due to tube wear from firing on Paris, France. It is unclear how many total carriages were employed; however, this number did not exceed eight as this was the maximum number of barrels employed in the bombardment.

<sup>28</sup> *Ibid.*, 82.

<sup>29</sup> In tables presented in *Paris Kanonen - the Paris Guns (Wilhelmgeschütze) and Project HARP* and *Railway Artillery: A Report on the Characteristics, Scope of Utility, Etc.*, the number of total projectiles fired is 351. The author believes this is an accounting error generated in a pre-digital age of accounting. When totaled, the actual sum of the projectiles in the "Number of Bursts" column is 352. Additionally, the author believes this accounting error has propagated throughout historical records as this number (351) appears in several sources as the number or projectiles fired by the Paris Guns. To amend the historical record, this thesis will use the corrected total of 352 bursts throughout.

km) on 43 different days between March 23 and August 9, 1918, targeting Paris, France. Ultimately, these weapons killed 256 and wounded 620 people in Paris and surrounding areas.<sup>30</sup>

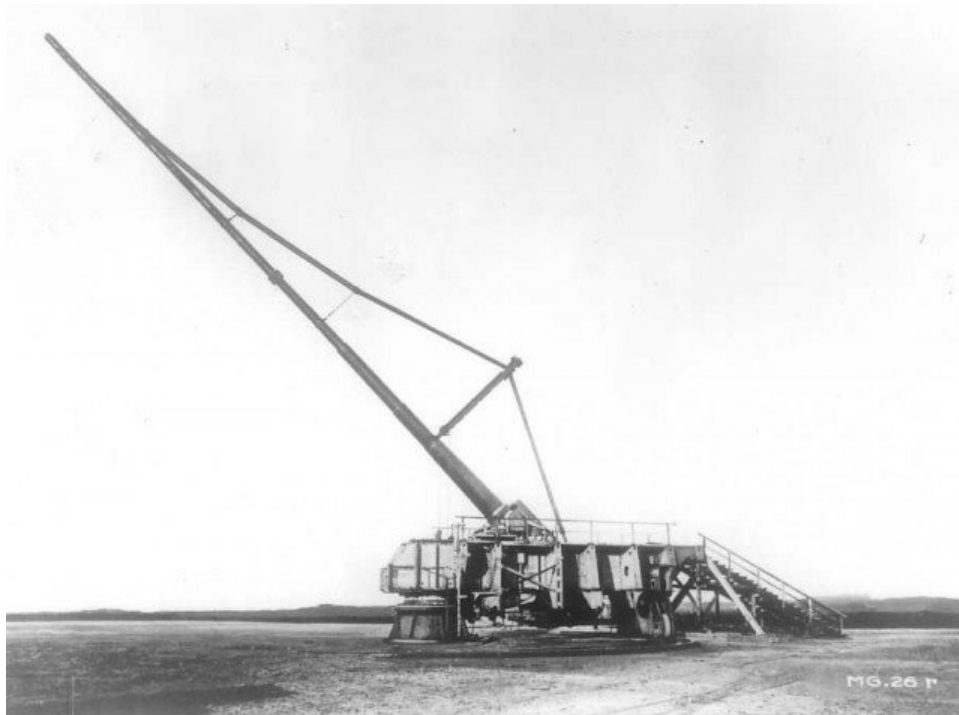


Figure 3. Photo of a Paris Gun

*Source:* Joris Nieuwint, “The German Paris Gun–Super Gun Of WWI,” War History Online, October 17, 2015, accessed April 13, 2020, <https://www.warhistoryonline.com/featured/the-paris-gun.html>.

### Historic Literature

There are multiple primary and secondary sources available detailing the development, employment, and reaction to the Paris Guns. These works vary broadly in

---

<sup>30</sup> Bull and Murphy, *Paris Kanonen - the Paris Guns (Wilhelmgeschütze) and Project HARP*.

scope, with some focusing primarily on the technical and tactical elements of the Paris Guns, while others simply comment on their perceived strategic impact. The following section analyzes the merits of these works and seeks to establish an information and analysis gap in the overall strategic effectiveness of the Paris Guns. This section lists primary and secondary sources with the analysis given as to the authors' viewpoint of the merits or limitations of the Paris Guns.

### Primary Sources

The unequaled American historical authority on the development and use of the Paris Guns was Henry W. Miller, a US Army Ordnance officer during WWI. Miller was a Professor of Engineering Drawing, the Assistant Dean of the College of Engineering, and the eventual Head of the Department of General Engineering Drawing at the University of Illinois before the US involvement in WWI. In 1917, he served as the organizer of the US Army School of Aeronautics. After the US involvement in WWI, Miller commissioned as a Major (MAJ) of Ordnance in the US Army and supervised the technical service of the railway artillery for the American Expeditionary Forces (AEF).<sup>31</sup>

Later, Miller was promoted to Lieutenant Colonel (LTC) and assumed the duties of Chief Engineer and Chief of the Technical Service of all heavy artillery of the AEF.<sup>32</sup> Following WWI, he briefly worked in Washington, DC, “on the design of coast artillery and railway artillery, preparing texts and reference works for use at U.S. military schools

---

<sup>31</sup> University of Michigan, “Bio Henry W. Miller,” *The Michigan Alumnus*, modified 2011, accessed March 19, 2020, <http://faculty-history.dc.umich.edu/faculty/henry-w-miller/bio>.

<sup>32</sup> *Ibid.*

and state universities.”<sup>33</sup> In 1921, he took a position as Professor and Head of the Department of Descriptive Geometry, Mechanism and Drawing (later Mechanism and Engineering Drawing) at the University of Michigan. Miller later served in the US Army Reserves and remained closely tied to the US Army and Ordnance Department. Eventually, Miller achieved the rank of Colonel (COL), serving on the Technical Staff of the Ordnance Department and instrumental in the development of much of the artillery used during and after World War II (WWII).<sup>34</sup>

Over his lifetime, COL Miller published numerous works related to mechanical engineering and artillery in general. His three most influential works cemented his legacy as an expert on the Paris Guns. These included his comprehensive two-volume work on WWI railway artillery, *Railway Artillery: A Report on the Characteristics, Scope of Utility, etc. of Railway Artillery* published in 1921, an article he published in 1920 in the *Journal of the American Society of Mechanical Engineers* titled “The German Long-Range Gun”, and his seminal work on the Paris Guns, *The Paris Gun: The Bombardment of Paris by the German Long Range Guns and the Great German Offensives of 1918* published in 1930. These three works provide much of the foundational literature upon which subsequent English-language research and writings on the Paris Guns have built.

In his report, *Railway Artillery: A Report on the Characteristics, Scope of Utility, etc. of Railway Artillery*, COL Miller provides technical and contextual descriptions of all

---

<sup>33</sup> University of Michigan, “Bio Henry W. Miller.”

<sup>34</sup> University of Michigan, “Famed Ordnance Expert Deep In Wartime Training,” *The Michigan Alumnus*, 1943, accessed March 19, 2020, <http://faculty-history.dc.umich.edu/faculty/henry-w-miller/famed-ordnance-expert-deep-wartime-training>.



railway artillery in use by the major powers by the conclusion of WWI. COL Miller displays his expertise on the subject matter by indicating that this work is the personal conclusion of “over two years of close association with engineering work on railway artillery both in Europe and America.”<sup>35</sup> Additionally, he established himself as not only a technical and historical expert but also as a primary source and direct observer of the effects of the bombardment of Paris, France. COL Miller writes, “The writer [COL Miller] was in Paris for several days at a time on four occasions during the bombardment by the long-range gun [Paris Gun].”<sup>36</sup> This report is of great value to the history of the Paris Guns, as it is both a primary source work and is also foundational in its scope. Of highest value to the purposes of this thesis, is COL Miller’s discussion of the four purposes for railway artillery. These purposes include destruction, counter-battery work, interdiction, and distant bombardment for moral effect.<sup>37</sup>

COL Miller’s discussion of distant bombardment for moral effect warrants additional consideration, and direct quotation, as it provides a viewpoint from an observer and informed commentator on the purposes and effects of weapons such as the Paris Guns. COL Miller first defines distant bombardment for moral effect, as follows:

The objectives of bombardment for moral effect are large centers of population long distances behind the lines. The aim is to destroy any sense of security which the distance from the front lines may give the civilian, to

---

<sup>35</sup> Miller, *Railway Artillery*, 6.

<sup>36</sup> *Ibid.*, 83.

<sup>37</sup> *Ibid.*, 81.

undermine the spirit of the army by weakening the morale of the civil population, and to interfere to the maximum with the administration of the war.<sup>38</sup>

COL Miller goes on to describe an essential characteristic of this kind of fire as

“extremely long range [*sic*], 100 to 120 kilometers or so.”<sup>39</sup> To achieve desired effects requires, “At least one shot per hour is considered necessary to produce the desired effect, and absolute regularity in the bombardment is necessary for the maximum effect on morale.”<sup>40</sup> This framework is valuable in that, although the context of WWI colors it, it seeks to establish that there are quantifiable methods and desired parameters to achieve intended psychological effects given a targeted population and methods of employment.

COL Miller continues, giving a brief account of the reaction to the various bombardments, and analysis of observed effects. Again, his first-hand insight provides a lens into what occurred and his perspective on what the effects were.

On the first day of the bombardment, on March 23, 1918, there was considerable confusion, more because the people thought they were being bombed by airplanes from a great height than from any other apparent reason. From then on the effect could not be determined with any certainty. There seemed to be as many people on the streets during the days of most active bombardment as on quiet days. When a projectile would burst the people in that vicinity would appear startled but not frightened and always some would hurry in the direction of the explosion to see the damage. All of the trains going west or south from Paris were crowded in those days, but there was no evidence that the departure of those people who lived in Paris was not caused by the steady approach of the Germans and the possibility of the capture of Paris rather than through panic or fear of the bombardment.<sup>41</sup>

---

<sup>38</sup> Miller, *Railway Artillery*, 82.

<sup>39</sup> *Ibid.*

<sup>40</sup> *Ibid.*, 82-83.

<sup>41</sup> *Ibid.*, 83.

COL Miller makes clear his overall assessment of the effects of these weapons as follows:

The damage done by the long-range projectiles was never very great. . . . Further, the dispersion of the guns was so great that two projectiles would land within a kilometer of each other only by chance. Judging from the small extent of damage and the doubtful effect produced on the civil population, it would seem extremely doubtful if such bombardment as this is nearly as effective either from the standpoint of material damage or effect on morale, as an equal investment in bombing planes and bombs.<sup>42</sup>

COL Miller's synopsis makes clear that he found these weapons valid in principle.

However, because of the circumstances of war or due to the German method of employment, these weapons did not achieve their intended negative psychological effects.

COL Miller's *Railway Artillery: A Report on the Characteristics, Scope of Utility, Etc. of Railway Artillery* includes an appendix which is a reprinting of an article published by COL Miller in 1920 in the *Journal of the American Society of Mechanical Engineers* titled "The German Long-Range Gun".<sup>43</sup> This article provides COL Miller's initial attempts to gather into one forum what he had learned about the Paris Guns in the two years since their initial employment. COL Miller provides a somewhat detailed synopsis of the bombardment beginning on March 23 and ending on August 9, 1918. Additionally, he begins to provide technical information he has obtained regarding the

---

<sup>42</sup> Miller, *Railway Artillery*, 83.

<sup>43</sup> This article appears as an appendix with minor changes in *Railway Artillery: A Report on the Characteristics, Scope of Utility, Etc. of Railway Artillery*. Changes to this article include the removal of some pictures and tables as well as the overall formatting of the article. Despite these changes, the overall content and scope of the article remain the same as the original version.

design, development, and employment of the weapons. His later works greatly expound upon this information. Finally, of most significant relevance to this thesis, COL Miller provides initial evidence that Allied Powers (France and Great Britain) may have invested in similar technology (long-range artillery) as a direct result of its appearance on the battlefields of WWI. “Both the British and the French Governments began the construction of a few [long-range guns], some of which have now been finished.”<sup>44</sup> Overall, this article is foundational in scope and provides a considerable amount of detail that he later refines and corrects. For example, COL Miller contends that the Germans fired 303 projectiles throughout the bombardment.<sup>45</sup> COL Miller later corrects this number to 351<sup>46</sup> after his additional research. Overall, this work was of considerable value, as it refrains from speculation and attempts to convey facts that COL Miller had gathered to that point.

In his seminal work, *The Paris Gun: The Bombardment of Paris by the German Long Range Guns and the Great German Offensives of 1918*, COL Miller recounts the circumstances surrounding the fielding, employment, and ultimate destruction of the Paris Guns by the German Military during WWI. COL Miller’s narrative uses the German offensives of 1918 as a backdrop to provide a broader framework for how the

---

<sup>44</sup> Lt. Col. Henry W. Miller, *Railway Artillery: A Report on the Characteristics, Scope of Utility, Etc. of Railway Artillery* (Washington, DC: Government Printing Office, 1921), 728.

<sup>45</sup> Lt. Col. H. W. Miller, “The German Long-Range Gun,” *The Journal of the American Society of Mechanical Engineers*, February 1920, 99, US Army Heritage and Education Center (AHEC) Archives, Carlisle, PA.

<sup>46</sup> The author found evidence that the actual number was 352 total rounds used in the bombardment.

bombardments fit into the overall war on the Western Front. In this work, COL Miller refined and expounded upon much of the technical and tactical considerations of the Paris Guns themselves, their employment, and the bombardment in general. The most critical aspect of this work is its foundational significance. All subsequent English-language writings draw heavily on the technical narrative COL Miller was able to gather and provide to his audience. In addition to this information, COL Miller provides primary source material as he directly quotes newspaper and citizen reactions to some of the bombardments of Paris. These quotations provide further evidence that initial fear existed within the population of Paris, but that this fear abated over time. Finally, COL Miller's work provided a substantial foundation for Doctors Gerald V. Bull and Charles H. Murphy to enhance and correct the overall narrative of the history of the Paris Guns while reconstructing in minute detail their technical characteristics.

In the late 1950s, a joint Canadian-American venture worked to develop a high-performance gun capable of firing a projectile into space as a low-cost, high-altitude space research system alternative to rocket launched technology. The program, the High Altitude Research Programme [UK spelling] (Project HARP), was a collaboration of civilian and military institutions in the pursuit of scientific discovery. Bull led the Canadian element from his position as Director of the Space Research Institute at McGill University, Montreal, Quebec, Canada. Likewise, Murphy was the lead scientist for the US Army at the Ballistic Research Laboratories, Aberdeen Proving Ground, Maryland, United States of America.

In the late 1960s, the program lost funding after achieving some of its intended objectives, including the construction of and firing of multiple projectiles (see figure 4) as

a proof of concept achieving altitudes of up to 180 km (111.8 mi).<sup>47</sup> By their admission, Project HARP was unrelated to the Paris Gun, and at the time, the scientists working on Project HARP had little or no knowledge of the Paris Guns' construction or use during WWI. Bull and Murphy state, "While the Paris Gun was a military weapon, the HARP Project was dedicated solely to the application of modern technology to gun launched systems of the purpose of non-military oriented high altitude [*sic*] space research."<sup>48</sup>

---

<sup>47</sup> Bull and Murphy, *Paris Kanonen - the Paris Guns (Wilhelmgeschütze) and Project HARP*, 145-147.

<sup>48</sup> *Ibid.*, 146.



Figure 4. 16.7 Inch (42.4 Centimeter) L86 HARP Barbados Gun Firing at 85° Elevation

*Source:* Wikipedia, “Project HARP,” Wikipedia, accessed April 14, 2020, [https://en.wikipedia.org/wiki/Project\\_HARP#/media/File:Project\\_Harp.jpg](https://en.wikipedia.org/wiki/Project_HARP#/media/File:Project_Harp.jpg).

Following their work on Project HARP, Bull and Murphy sought to publish a book detailing the history of the project. They intended to use the history of the Paris Gun as an introduction to this work; however, there existed limited information in that, “The only comprehensive work on this gun was that of LTC [later COL] Henry W. Miller.”<sup>49</sup>

---

<sup>49</sup> Bull and Murphy, *Paris Kanonen - the Paris Guns (Wilhelmgeschütze) and Project HARP*, 11.

By way of exhaustive research into COL Miller's work, German archival and personnel correspondence, and comprehensive computer and digital modeling, Bull and Murphy were able to correct the historical record of the development, employment, bombardment, and ultimate destruction of the Paris Guns. Additionally, they were able to recreate in exacting detail the technical characteristics of the Paris Guns, and give the world a comprehensive history of these weapons. Their work on the Paris Guns ultimately resulted in the first four parts of their five-part work: *Paris Kanonen - the Paris Guns (Wilhelmgeschütze) and Project HARP*, with the fifth part detailing the history of Project HARP.

The first four parts of Bull and Murphy's work are critical to this thesis and are worth examining in detail. Although Bull and Murphy provide secondary source analysis, their work contains multiple primary source documents both in their original forms as well as translations in English. Part I provides the manuscript of the supervisor of the Paris Gun Project, Professor Dr. Fritz Rausenberger, Managing Director and Member of the Board of Friedrich Krupp AG.<sup>50</sup> This manuscript and personal papers were unavailable following WWI and were therefore unable to influence the work of COL Miller. Members of the Project HARP team obtained these papers, making them available to influence Bull and Murphy's later work. These papers are illuminating in that they provide technical and historical details that correct or confirm various assumptions or assertions made in COL Miller's previous work.

---

<sup>50</sup> The German corporation responsible for much of the design and manufacture of German artillery in use during WWI. Designed, developed, tested, built, and supervised the employment of the Paris Guns.



Part I contains an English translation of Rausenberger's manuscript titled, "The Development of Krupp's long [*sic*] Range [*sic*] Guns during the World War"<sup>51</sup> as well as several annexes. The annexes include correspondence related to the publication of the manuscript, the obituary of Rausenberger, the original German manuscript, as well as two documents provided by the US Army Ordnance Museum, Aberdeen Proving Ground, Maryland. The first of these documents provides contextual supporting information for Rausenberger's manuscript and was written by a Captain Walter Kinzel, formerly attached (during WWI) to The Ballistic Command of Long Range [*sic*] Guns of the German Navy.<sup>52</sup> Captain Kinzel's document provides specific insight into the conduct of the bombardment. It conveys the high level of involvement of the Germany Navy rather than the German Army in the conduct of the bombardment by the Paris Guns.

The final document in Part I is the "1918 Report of Captain Robert Kent, US Army Ordnance on the English Long Range Gun."<sup>53</sup> Of highest value in Captain Kent's report is that he shares common perceptions within the US Army Officer Corps as to the efficacy of the Paris Guns in 1918, as well as his thoughts on the matter. He states,

Many officers expressed the opinion which has been cultivated by the newspapers in the public mind that the long range [*sic*] guns are of no practical military importance. Other officers, however, pointed to the undoubted military value of the disorganization of Government business in Paris caused by the bombardment

---

<sup>51</sup> Bull and Murphy, *Paris Kanonen - the Paris Guns (Wilhelmgeschütze) and Project HARP*, 21.

<sup>52</sup> *Ibid.*, 54.

<sup>53</sup> *Ibid.*, 59.

of that city by the Germans and expressed the opinion that there are other specialized objectives for which long range [*sic*] guns will be useful.<sup>54</sup>

Captain Kent continues, with his own opinion, “long range [*sic*] guns are bound to have a permanent place in any military establishment.”<sup>55</sup> Part I, including its seven annexes, provides the most comprehensive history of the Paris Guns and serves to amplify and correct undiscovered errors as conveyed by COL Miller. Bull and Murphy provide additional historical context in Parts II and III. These sections contain articles written by members of the German Military, and provide an additional German viewpoint of the Paris Guns and the bombardment of Paris. Bull and Murphy include these articles for comparative purpose, but view them as less credible than the previously presented documents. These documents are from a German perspective and appear to editorialize German actions and objectives, whereas the previous works, especially Rausenberger’s, appear more objective.

Finally, Part IV is the direct work of Bull and Murphy, titled, “A Computer aided Analysis and Reconstruction of the Wilhelmgeschütze.”<sup>56</sup> This exhaustive study details the origin, development, design, testing, and employment of the Paris Guns. This highly technical section describes the iterative process of developing the gun, projectiles, and propellant to achieve the desired range capability (100 to 120 km). While highly technical in scope, this section is exceptionally informative for contextual information related to

---

<sup>54</sup> Bull and Murphy, *Paris Kanonen - the Paris Guns (Wilhelmgeschütze) and Project HARP*, 59.

<sup>55</sup> *Ibid.*

<sup>56</sup> *Ibid.*, 73.

the Paris Guns. Bull and Murphy appear perplexed in the introduction of this section, by the intended effects of the Paris Guns, stating:

But aside from a momentary shock, lasting less than a few days, the Paris Gun bombardment failed to affect the operations of the great city. . . . And it remains a mystery as to how effectiveness was planned, since the earlier bombardment of Dunkerque [UK spelling] had produced no catastrophic results even though far more tonnage of high explosives (about 400 shells of approximately one ton each) had been used.<sup>57</sup>

In the conclusion of this section, Bull and Murphy provide their definitive analysis as to the ability of the Paris Guns to achieve their desired effects, stating:

As a psychological weapon it failed completely to achieve any major disruption to Paris life. At the outset with the new, unknown element present, Paris authorities did stop activities during bombardment and some public concern arose. But this did not last for long; as the bombardment became understood it became of a rather minor nuisance value, suggesting the avoidance of congregated masses. But it only hardened the will to resist, and in the long run was regarded as somewhat of an expensive folly by the Allied Defence [UK spelling] authorities.<sup>58</sup>

Bull and Murphy concluded the definitive work on the history of the Paris Guns, and their view on the efficacy of these guns as psychological weapons cannot and should not be ignored.

This thesis incorporates additional primary source material beyond the works of COL Miller and Bull and Murphy. One such primary source is military intelligence and information summaries obtained from the AEF records. Military intelligence reporting provides a lens into what military staffs, and by extension, their commands deem essential, relevant, or critical to the ongoing conduct of warfare. In a survey of every

---

<sup>57</sup> Bull and Murphy, *Paris Kanonen - the Paris Guns (Wilhelmgeschütze) and Project HARP*, 73.

<sup>58</sup> *Ibid.*, 136.

military intelligence.<sup>59</sup> and information<sup>60</sup> report from March 24 to September 1, 1918, compiled by the AEF, there existed only five references to the bombardment of Paris by long-range cannon artillery. These compilations contained a total of over 500 pages of intelligence and information summaries, yet only mentioned the bombardment five times. The lack of reporting on the bombardment is an indicator that the US Military and perhaps the Allies, in general, believed these weapons to be ineffectual, or to bear no real military significance when compared to other events and actions occurring on the Western Front. The reports contained brief factual summaries with little analysis. These reports imply an overall indifference to the bombardment of Paris by the command of the AEF.

An additional indicator of a military's opinion of the efficacy of emergent technology is in which technologies they choose to invest. There were many boards conducted in the years following WWI to either capture lessons learned by the AEF, to recommend future doctrinal and material pursuits to the US Army, or both. Two boards relevant to this thesis focused on artillery. The first board, colloquially referred to as the "Hero Board" was a board appointed by the General Headquarters, AEF, Office, Chief of Artillery, and chaired by Brigadier General Andrew Hero, Jr., US Army. Its purpose was to "make a study of the experience gained by the Artillery of the A.E.F., and to submit

---

<sup>59</sup> General Headquarters American Expeditionary Force Papers, *Second Section Intelligence Summaries January to November 1918*, Box 8, Folder 2, US Army Heritage and Education Center Archives, Carlisle, PA.

<sup>60</sup> General Headquarters American Expeditionary Force Papers, *Second Section Information Summaries October 1917 to July 1918*, Box 9, Folder 14, US Army Heritage and Education Center Archives, Carlisle, PA.

recommendations based upon such study.”<sup>61</sup> In the 842 pages of this document, the Paris Guns, either by name or description, are not referenced or considered.

Another board, colloquially known as the “Westervelt Board” or “Caliber Board,” convened on January 12, 1919. It consisted of “a Board of Officers, chaired by BG [Brigadier General] William I. Westervelt, [and] was convened to consider the experience gained by artillery during WWI while serving with the American Expeditionary Forces.”<sup>62</sup> This board addressed the concept of Super-heavy Guns and Howitzers but limited the definition as such, “This does not apply to guns of the type used to bombard Paris; such guns have no military value and their construction is not justifiable.”<sup>63</sup> Clearly, the US Military did not consider these weapons of value after WWI. If there were dissenting voices to this opinion, their ideas were not favored or pursued as viable options for future development of US artillery weapon systems.

Civilian news reporting provides an additional window into the sentiments or opinions of the public as to the importance or efficacy of military matters. Between March 24, 1918 and August 12, 1918, *The New York Times (NYT)* published 64 articles related to the bombardment of Paris by the Paris Guns. These articles range in content from simple reporting of bombardment events through civilian, military, and political

---

<sup>61</sup> Headquarters, American Expeditionary Forces, “Hero Board,” *Report of Hero Board; Proceedings of the Board of Officers Convened by the Following Order, General Headquarters, American Expeditionary Forces, Office, Chief of Artillery* ([Washington, DC], 1918), 1.

<sup>62</sup> Chief of Staff War Department (Caliber Board), *Report of Board of Officers Appointed by Para. 143, Special Order No. 289-0, War Dept., 1918* (Fort Sill, OK: US Army Field Artillery School, 1919), Abstract (Archival Cover Sheet).

<sup>63</sup> *Ibid.*, 20.

responses to these bombardments. They chronicle the bombardment throughout its duration and juxtapose it alongside the German offensives taking place along the Western Front throughout 1918. Additionally, they provide a large quantity of primary source material and information related to the bombardment of Paris. Of note, these articles derive from multiple sources. The majority do not have listed authors, but are instead the compilation of information reported in Parisian, French, and British news sources, and subsequently cabled to the *NYT*. In this way, the information is mostly free of bias and remains relatively objective beyond a generally positive (French and Allied) tone. Despite this bias, information is easily verified and cross-referenced against other primary source materials available for this study. The general conclusion drawn from these articles is that the bombardment of Paris may have created a brief negative psychological effect for the people of Paris. However, these fears waned as the bombardment continued. Ultimately, the bombardment may have engendered in the people of Paris and the French as a whole a spirit of strengthened resolve.

### Secondary Sources

Bethany Groff's document analysis, "On the Paris Gun," provides an analysis of a primary source historical report from the US Ambassador to France (William Graves Sharp) to the US Secretary of State (Robert Lansing). This analysis details the bombardment of Paris, France, on Friday (Good Friday), March 29, 1918, and the resulting destruction of the St. Gervais Church, which killed 88 and wounded 68. Groff included a reprinting of the letter with her analysis. Lansing quotes Sharp's opinion of the attack, stating:

the exceptional circumstances under which this tragedy occurred, both as to the sacred character of the day and the place, have greatly aroused the indignation, of the people of Paris toward an enemy who seeks to destroy human life without regard to the immunities prescribed by the laws of civilization and humanity, and, instead of terrorizing the people, shells of the great cannons, as well as the bombs dropped from the German airplanes, only serve to strengthen the resolve of the French to resist, to the last man if necessary, the invasion of such a foe.<sup>64</sup>

Sharp's opinion, as relayed by Lansing conveys the idea that the Paris Guns may have achieved an unintended and indeed the opposite of the Germans' desired effect. Groff goes on to analyze the content of the report, and gives the following conclusion:

"Whether the Paris Gun served to strengthen or weaken Parisian citizens' resolve could be debated, but its destruction of St. Gervais was reported as an example of Germany's disrespect for the laws of war and the sanctity of life."<sup>65</sup> Groff's conclusion builds additional source material contributing to the global sentiment towards the perceived brutality of the German Military.

"The Big Berthas: How Successful?", an article in *Military Review* by Rear Admiral (RADM) William H. Langenberg provides a general history of the development, characteristics, and employment of the Paris Guns. RADM Langenberg concludes that the "primary purpose of these weapons [the Paris Guns] was to destroy French morale and bolster that of the German armies by shelling Paris from enormous range."<sup>66</sup> He then offers a generalized answer to why the Paris Guns failed, "They [the Paris Guns] failed in

---

<sup>64</sup> Bethany Groff, "On the Paris Gun," in *Defining Documents in American History: World War I*, ed. Michael Shally-Jensen (Hackensack, NJ: Salem Press, 2014), 178.

<sup>65</sup> *Ibid.*, 179.

<sup>66</sup> Rear Admiral William H. Langenberg, "The Big Berthas: How Successful?," *Military Review* 63, no. 11 (1982): 32.

their principal mission because of the indomitable spirit of the Parisians who realized the Germans' objective yet refused to be daunted by the new form of bombardment."<sup>67</sup> This generalized assertion is worth exploring in detail, as such assertions ignore the nuance of the bombardment of Paris by the Paris Guns. RADM Langenberg concludes that anti-morale weapons are ineffective in achieving strategic objectives "when employed against a determined and indomitable enemy."<sup>68</sup> Again, this generalization ignores the nuance of the bombardment and the way the Germans employed them. The German employment of these weapons and their means of linking tactical action to strategic effects is worth further consideration.

The article, "The Biggest Gun in the World," published in *Military History*, by Stephen F. Hurst again provides a general history and synopsis of the German employment of the Paris Guns in a bombardment of Paris, France. This article marvels at the technological achievement of the weapons but finds them strategically lacking. Hurst states, "The Paris Gun was an undeniable technological achievement, but in the end it actually had little impact on the course of the war."<sup>69</sup> Hurst is yet another author declaring the overall ineffectiveness of the Paris Guns when viewed from a strictly psychological perspective.

---

<sup>67</sup> Langenberg, "The Big Berthas: How Successful?," 32.

<sup>68</sup> Ibid.

<sup>69</sup> Lt. Col. (Ret.) Stephen F. Hurst, "The Biggest Gun in the World," *Military History* (February 2007): 53, accessed December 10, 2019, <http://web.b.ebscohost.com.lumen.cgsccarl.com/ehost/pdfviewer/pdfviewer?vid=5&sid=46554cea-0f92-494c-9aa1-7eb1d0297fb9%40pdc-v-sessmgr04>.



The journal article, “Paris Under the Gun,” by MG (Retired) David T. Zabecki, provides a general account of the history of the Paris Guns, including their characteristics as well as an account of their employment against Paris. MG Zabecki also contends that the Germans made a strategic error in employing them against the Parisian population center rather than critical Allied military infrastructure. However, unlike many of his contemporaries, he offers a possible alternative to this manner of employment, stating, “they [the Germans] could have directed its [Paris Gun’s] power against far more militarily significant targets.”<sup>70</sup> This alternative method of employment offers a means to achieve potential strategic effects beyond targeting a population.

MAJ Jonathan T. Palumbo’s thesis, “U.S. Field Artillery After World War I: Modernizing the Force While Downsizing,” details the changes made to the doctrine, personnel, and materiel in use by the US Army Field Artillery following WWI. It details WWI identified requirements to recommended changes to weapon systems following the war. This work indicates that the US Army Field Artillery did not emphasize the development of a long-range artillery weapon following WWI. MAJ Palumbo makes further reference to the German Long-range Gun (the Paris Guns), and citing the historian Boyd Dastrup, contends that the Paris Guns had no value as tactical or operational weapons. He contends that the Germans used them as a purely psychological tool.<sup>71</sup>

---

<sup>70</sup> Major General (Ret.) David T. Zabecki, “Paris Under the Gun,” *Military History* 32, no. 1 (May 2015): 65.

<sup>71</sup> MAJ Jonathan T. Palumbo, “U.S. Field Artillery After World War I: Modernizing the Force While Downsizing” (Master’s Thesis, US Army Command and General Staff College, Fort Leavenworth, KS, 2014), 29.

Michael S. Neiberg's book, *Fighting the Great War: A Global History* briefly discusses the German use of the Paris Guns in 1918 against Paris, France. In this discussion, he refers to the shelling of Paris by the Paris Guns as a "random terror bombardment."<sup>72</sup> Additionally, Neiberg further describes the role and the effects of the Paris Guns, "Its only mission was to frighten the capital and induce panic. It failed to do so, but eventually killed 256 civilians and wounded 620 more."<sup>73</sup> This brief account of the Paris Gun asserts that it did not achieve any strategic effects, much less its intended psychological effects.

*The Rocket and the Reich*, a book by Michael J. Neufeld, details the origins of the German missile program and the ultimate development of the rockets and missiles employed during WWII. Several of the scientists and engineers who originally pioneered the development of the Paris Guns ultimately transitioned their work to the German missile program. Neufeld's work states the following:

Dornberger's specifications reveal the flawed thinking that lay behind the German missile program from the outset. The Paris Gun had been the greatest technical accomplishment of German artillerists up to that time, yet it had failed to have much effect on the French in 1918. The gun was a triumph of narrow technological thinking: the technical fascination of being able to break through traditional limits and fire over such unprecedented distances had overwhelmed any rigorous analysis of its likely impact on enemy morale. The interwar German artillery community completely failed to grasp that point, however. Those specialists, led by Becker, saw the gun only in terms of artillery reaching its technological limits in muzzle velocity and range.<sup>74</sup>

---

<sup>72</sup> Michael S. Neiberg, *Fighting the Great War: A Global History* (Cambridge, MA: Harvard University Press, 2005), 314.

<sup>73</sup> Ibid.

<sup>74</sup> Michael J. Neufeld, *The Rocket and the Reich* (New York: The Free Press, 1995), 51-52.

This quotation further illustrates the widespread position in the relevant literature that the Paris Guns did not achieve strategic or, at a minimum, their intended psychological effects. It further articulates the position that the development and employment of these guns was misguided from the outset and failed to account for or consider the intended effects of their use.

MAJ Maitland-Addison discusses the Paris Guns in “The Long Range Guns.” This document is an extract from the transcript of a lecture delivered at the Royal Artillery Institute by MAJ J. Maitland-Addison, R.A., and reprinted in the *Field Artillery Journal* (United States), July-September, 1918 from the *Journal of the Royal Artillery*, July 1918.<sup>75</sup> In this lecture, MAJ Maitland-Addison indicates that the French are indifferent towards this weapon; however, he does contend that “a marked advance has been made in artillery.”<sup>76</sup> This perhaps indicates an indirect effect; the gun had not instilled fear in the French; however, the artillery community at the time viewed its introduction as worthy of note and a requirement for further study and consideration.

In his book, *Field Artillery and Firepower*, Major General (MG) Jonathan B. A. Bailey discusses the Paris Guns and their strategic potential. From MG Bailey, “By March 1918, artillery deep operations even included surface-to-surface strategic attack, a conceptual precedent set by the German Paris gun.”<sup>77</sup> Bailey continues, “It was an

---

<sup>75</sup> Major J. Maitland-Addison, “The Long Range Guns,” *The Field Artillery Journal* 8, no. 3 (1918): 321, accessed December 3, 2019, [http://sill-www.army.mil/firesbulletin/archives/1918/JUL\\_SEP\\_1918/JUL\\_SEP\\_1918\\_FULL\\_EDITION.pdf](http://sill-www.army.mil/firesbulletin/archives/1918/JUL_SEP_1918/JUL_SEP_1918_FULL_EDITION.pdf).

<sup>76</sup> Ibid.

<sup>77</sup> Jonathan B. A. Bailey, *Field Artillery and Firepower* (Oxford: The Military Press, 1989), 269-270.

astonishing achievement in technical terms, but the means and tactic of the day proved inadequate for the revolutionary strategic objective.”<sup>78</sup> Bailey goes on to explain how some of the scientists and engineers who developed the Paris Guns went on to work on the German rocket programs before and during WWII. This may indicate a flaw in the understanding and linking of desired effects to the development of the weapon systems. The confirmation bias displayed itself in these scientists and engineers. They took their concept of a psychological weapon from WWI and overlaid the same intent on a new weapon system in a new war, WWII. Bailey explains, “The Paris gun of 1918 was a strategic artillery system that was conceptually innovative, technologically remarkable, but still wanting in effect.”<sup>79</sup> MG Bailey established a fundamental flaw in the development of the Paris Guns, that function followed form. The purpose of these weapons was as a technological achievement. Little consideration was given to their intended use, or if they could even achieve their intended effects.

The primary sources available for this study provide a comprehensive historical picture of the events and circumstances surrounding the development, fielding, employment, the reaction to, and the effects of the Paris Guns. These works yield the tactical, technical, and contextual information to frame and shape analysis of the Paris Guns from a strategic perspective. These works provide the data required for compilation and summary in chapter 4 and analysis in chapter 5.

---

<sup>78</sup> Bailey, *Field Artillery and Firepower*, 270.

<sup>79</sup> *Ibid.*, 279.

The secondary sources available indicate a noticeable gap in the analysis of the effects of the Paris Guns. Without exception, these analyses focus on the efficacy of these weapons as psychological weapons; the Germans intended purpose. The consensus is clear that they were not valid in this regard. However, little consideration is given to what other effects they achieved, and apart from MG Zabecki, what better purpose they might have served. This thesis analyzes the effects these guns achieved, both intended and unintended, and how this conception shapes our current understanding of strategic effects.

### Strategy, Deterrence, and the US Army's Future Operating Concept

To understand the impetus for this case study, it is first necessary to understand the US Military's conception of strategy, the competition continuum, effects, and the US Army's Future Operating Concept: Multi-Domain Operations 2028.

#### Strategy, the Competition Continuum, and Effects

The United States Military defines strategy in Joint Publication 3-0, *Joint Operations* as, "A prudent idea or set of ideas for employing the instruments of national power in a synchronized and integrated fashion to achieve theater, national, and/or multinational objectives."<sup>80</sup> The instruments of national power encompass all means

---

<sup>80</sup> Headquarters, Department of Defense, Joint Publication (JP) 3-0, *Joint Operations* (Washington, DC: Government Printing Office, 2017), GL-16.

available through the diplomatic, informational, military, and economic exercise of national influence.<sup>81</sup>

The US uses the elements of national power along the competition continuum to achieve its strategic objectives.<sup>82</sup> The competition continuum is the range of interactions between international actors “from peaceful cooperation, through competition below armed conflict, to armed conflict.”<sup>83</sup> The US Military defines the various states along the competition continuum as follows:

1. “Cooperation includes mutually beneficial relationships between strategic actors with similar or compatible interests. Although interests will rarely be in complete alignment, cooperative relations underpin the international order, enhance collective security, and deter conflict.”<sup>84</sup>

2. “Competition below armed conflict exists when two or more strategic actors view one another as competitors (as opposed to adversaries) that have incompatible interests. Competitors may cooperate with one another or engage in behavior detrimental to other strategic actor’s interests.”<sup>85</sup>

---

<sup>81</sup> Headquarters, Department of Defense, Joint Doctrine Note (JDN) 1-18, *Strategy* (Washington, DC: Government Printing Office, 2018), vii.

<sup>82</sup> Headquarters, Department of Defense, Joint Doctrine Note (JDN) 1-19, *Competition Continuum* (Washington, DC: Government Printing Office, 2019), 2.

<sup>83</sup> Headquarters, Department of Defense, JDN 1-18, *Strategy*, viii.

<sup>84</sup> *Ibid.*, viii.

<sup>85</sup> *Ibid.*, viii-ix.

3. “Armed conflict involves the use of violence as the primary means by which a strategic actor seeks to satisfy its interests or react to provocation.”<sup>86</sup>

These states along the competition continuum are not finite, and further, the US may be in multiple states with a single, or multiple actors at any given time.

To influence actors along the competition continuum, the US Military seeks to achieve effects against various adversary or competitor targets to achieve strategic objectives. “An effect is a change in the physical or behavioral state of a target system, a target system component, a target, or a target element that results from an action, a set of actions, or another effect.”<sup>87</sup> A strategic effect is the direct, indirect, cumulative, cascading, or unintended change in the physical or behavioral state of an actor’s ability to project the elements of national power.<sup>88</sup> A strategic weapon system is, therefore, any weapon system capable of achieving a strategic effect against an actor’s source(s) of diplomatic, informational, military, or economic power; such that its (the strategic weapon system’s) use or threat of use alone can achieve or aid in the achievement of national policy or security objectives.<sup>89</sup>

---

<sup>86</sup> Headquarters, Department of Defense, JDN 1-18, *Strategy*, ix.

<sup>87</sup> Headquarters, Department of Defense, Joint Publication (JP) 3-60, *Joint Targeting* (Washington, DC: Government Printing Office, 2013), xiii.

<sup>88</sup> Defined by author.

<sup>89</sup> Defined by author.

## Deterrence and Coercion

During the competition state along the competition continuum model, there is an obvious requirement to act in such a way as to prevent a competitor from conducting or initiating armed conflict. Traditionally, these actions are referred to as deterrence. The RAND Corporation published a monograph titled “Conventional Coercion Across the Spectrum of Operations: The Utility of US Military Forces in the Emerging Security Environment.” This monograph discusses the theory of coercion and how it relates to US foreign policy. The monograph argues that deterrence is ultimately just another form of coercion, on the international scale. It states, “Coercion is causing someone to choose one course of action over another by making the choice preferred by the coercer appear more attractive than the alternative, which the coercer wishes to avoid. In the international arena, coercion seeks to change the behavior of states.”<sup>90</sup> The monograph continues, stating that all of the elements of national power are employed in a coercive manner. It then focuses on military deterrence, quoting another RAND Corporation study, stating, “Coercion is the use of threatened force, including the limited use of actual force to back up the threat, to induce an adversary to behave differently than it otherwise would.”<sup>91</sup> For this study, the relationships outlined above between deterrence and coercion provide an

---

<sup>90</sup> David E. Johnson, Karl P. Mueller, and William H. Taft, *The Theory Of Coercion, Conventional Coercion Across the Spectrum of Operations: The Utility of U.S. Military Forces in the Emerging Security Environment* (Santa Monica, CA: RAND Corporation, 2002), 7, accessed March 10, 2020, [https://www.rand.org/pubs/monograph\\_reports/MR1494.html](https://www.rand.org/pubs/monograph_reports/MR1494.html).

<sup>91</sup> Daniel Byman, Matthew Waxman, and Eric V. Larson, *Air Power as a Coercive Instrument* (Santa Monica, CA: RAND Corporation, 1999), 10, accessed May 1, 2020, [https://www.rand.org/pubs/monograph\\_reports/MR1061.html](https://www.rand.org/pubs/monograph_reports/MR1061.html).



adequate definition for the US Army's actions to deter global aggression. These relationships provide an understanding of how SLRC weapon systems' existence or positioning potentially deters competitors and compels them to continue to compete, avoiding armed conflict.

### The US Army in Multi-Domain Operations 2028

On December 6, 2018, the US Army Training and Doctrine Command (TRADOC) published the future operating concept for the US Army, *The U.S. Army in Multi-Domain Operations 2028*. This document is conceptual and seeks to inform the force management and modernization of the US Army through 2028. The central idea presented is, "Army forces, as an element of the Joint Force, conduct Multi-Domain Operations to prevail in competition; when necessary, Army forces penetrate and disintegrate enemy anti-access and area denial systems and exploit the resultant freedom of maneuver to achieve strategic objectives (win) and force a return to competition on favorable terms."<sup>92</sup> This central idea addresses the problem of strategic competitor states using A2AD systems to create multiple layers of stand-off to separate the US and partners politically in competition, and the Joint Force in time, spaces, and function during armed conflict.<sup>93</sup> The method of addressing this problem is to compete below the level of armed conflict, and in the event of armed conflict, to enable the rapid defeat of

---

<sup>92</sup> Department of the Army, Training and Doctrine Command, TRADOC Pamphlet 525-3-1, *The U.S. Army in Multi-Domain Operations 2028* (Fort Eustis, VA: Government Printing Office, 2018), vii.

<sup>93</sup> *Ibid.*, v.

aggression and then to re-compete.<sup>94</sup> Each of these actions deserves additional independent analysis.

Competition requires the Joint Force to defeat an adversary's efforts to achieve its strategic goals and deter military escalation. The Joint Force accomplishes this "by expanding the competitive space for policymakers through multiple options for employing the elements of national power."<sup>95</sup>

If competition escalates to armed conflict, it is the role of the Army forward presence and expeditionary forces to penetrate, dis-integrate, and exploit. Essential to this thesis, this document states, "Army long-range fires converge with joint multi-domain capabilities to penetrate and dis-integrate enemy anti-access and area denial systems to enable Joint Force freedom of strategic and operational maneuver."<sup>96</sup> This definition is critical to this thesis, as it clearly articulates the templated strategic role for the "deep fires" weapon systems in development by the LRPF CFT.

After the defeat of an adversary's aggressive actions during armed conflict, the Army re-competes below the level of armed conflict in an attempt to deter and prevent future armed conflict.

*The U.S. Army in Multi-Domain Operations 2028* clearly articulates a requirement for a strategic long-range weapon system to converge along with Joint capabilities to

---

<sup>94</sup> Department of the Army, Training and Doctrine Command, TRADOC Pamphlet 525-3-1, *The U.S. Army in Multi-Domain Operations 2028*, 24-26.

<sup>95</sup> *Ibid.*, 24-25.

<sup>96</sup> Department of the Army, Training and Doctrine Command, TRADOC Pamphlet 525-3-1, *The U.S. Army in Multi-Domain Operations 2028*, 25.

penetrate and dis-integrate enemy A2AD. Additionally, it implies that the presence of these weapon systems in or near a theater of operations will potentially achieve a deterrence effect in the competition phase of operations. These roles stand opposed to the intended use of the Paris Guns, as SLRC is not a psychological weapon for use against an adversary's populace. This stark contrast may allow SLRC to achieve desired strategic effects if employed in a manner in congruity with those ends.

### Strategic Long-Range Cannon (SLRC) Artillery

Since the creation of the LRPF CFT in October 2017, little has been published about SLRC Artillery. The reason for this is the sensitive or classified nature of the technical requirements of its development. Despite this limitation, documents such as *The U.S. Army in Multi-Domain Operations 2028* imply its intended use. In addition to this document, general conceptual information about these weapon systems exists in several open-source articles. The summation of this information provides a lens into SLRC's intended use and potentially its shortfalls or limitations in the ability to achieve or assist in the achievement of strategic effects. These articles primarily emphasize range as the defining element to achieve a strategic effect against an adversary.

Sydney J. Freedberg Jr. wrote a March 23, 2018 article in *Breaking Defense*, titled, "Army Will Field 100 Km Cannon, 500 Km Missiles: LRPF CFT." This article indicates that the Army is modernizing three artillery systems including missiles, "for very deep or even strategic strikes against targets in the enemy rear and homeland."<sup>97</sup>

---

<sup>97</sup> Sydney J. Freedberg Jr., "Army Will Field 100 Km Cannon, 500 Km Missiles: LRPF CFT," *Breaking Defense*, March 2018, accessed February 20, 2020,

This article relies on an interview of (then Brigadier General (BG)) MG Stephen Maranian, the first Director of the LRPF CFT. MG Maranian stated, “We’re looking at how we can increase the range, the volume of fire, and the lethality of our surface to surface fires . . . and then exploring what’s in the art of the possible at strategic ranges.”<sup>98</sup> Freedberg summarizes MG Maranian’s nomination of potential SLRC targets stating, “The artillery will take out enemy aircraft and missiles on the ground.”<sup>99</sup> This article is of value because it indicates that range for the sake of achieving range is not the objective of the LRPF CFT. Instead, it posits, that range, volume of fire, and lethality are all elements that will make SLRC a viable strategic weapon system.

In a later article for *Breaking Defense*, titled “Army Building 1,000-mile Supergun,” Freedberg provides refined information about the technology in use for the future SLRC weapon systems. This article indicated the Deep Fires element of the LRPF CFT was pursuing two technologies to achieve the desired strategic effects. These technologies were a hypersonic weapon system using advanced rocket or missile technology as well as the SLRC. The article expressed confidence from the LRPF CFT in achieving the desired 1,000-mile range requirement, in that the gun(s) rely on proven artillery and rocket-assisted technologies, only scaled up. The article further explains the proposed technical solution for SLRC, “It would use a cannon barrel to launch artillery shells with built-in rocket boosters that ignite in mid-air. Since the cannon is reusable,

---

<https://breakingdefense.com/2018/03/army-will-field-100-km-cannon-500-km-missiles-lrpf-cft/>.

<sup>98</sup> Ibid.

<sup>99</sup> Freedberg, “Army Will Field 100 Km Cannon, 500 Km Missiles: LRPF CFT.”

this should be significantly cheaper than using one-shot rockets for every phase of flight. Lower price for shot, in turn, allows the Army to take out large numbers of lightly protected targets.”<sup>100</sup> Again, this article articulates a need for a weapon capable of delivering multiple projectiles precisely at ranges over 1,000 mi. It also nominates potential targets for these weapons beyond an adversary’s population.

A *Defense News* article from October 14, 2019, titled “Strategic, Long-Range Cannon Preps to Jump Its First Tech Hurdle” by Jen Judson, provided a progress update on the development of SLRC artillery. This article indicated that the Army was on the verge of conducting its first early ballistic test as a proof of concept. The new Director of the LRPF CFT, COL John Rafferty, further articulated the requirement for SLRC within the Army’s arsenal, stating, “layered enemy standoff at the strategic level was really the fundamental problem. One of the ways to solve that problem is to deliver surface-to-surface fires that can penetrate this [anti-access, area denial] complex and disintegrate its network and create windows of opportunity for the joint force to exploit.”<sup>101</sup> Again, this article, with supporting information provided by the Director of the LRPF CFT, further articulates what the Army believes will make SLRC a strategic weapon system: range coupled with the ability to penetrate adversary A2AD networks effectively.

These contemporary discussions of the development of the SLRC weapon systems inform the intended use and concept for achieving strategic effects. The US

---

<sup>100</sup> Freedberg, “Army Building 1,000-Mile Supergun.”

<sup>101</sup> Jen Judson, “Strategic, Long-Range Cannon Preps to Jump Its First Tech Hurdle,” *Defense News*, October 14, 2019, accessed October 20, 2019, <https://www.defensenews.com/digital-show-dailies/ausa/2019/10/16/strategic-long-range-cannon-preps-to-jump-its-first-tech-hurdle/>.

Army, through interviews of its Directors of the LRPF CFT, articulated that the ability for a weapon to achieve extreme ranges alone does not make that weapon strategic. The US Army contends that range coupled with precision, and married with affordability to achieve massing effects will achieve a strategic effect. These attributes have the potential to achieve these effects across the competition continuum. In competition, these weapons will position to negate an adversary's A2AD system, thereby offering a level of deterrence. In armed conflict, they could penetrate and dis-integrate to provide a window of opportunity for the Joint Force to conduct strategic or operational-level maneuver.

## CHAPTER 3

### RESEARCH METHODOLOGY

Basic research is what I am doing when I don't know what I am doing.  
— Dr. Wernher von Braun, December 16, 1957, *The New York Times*

#### Overview

The purpose of this study is to provide recommendations to the US Army for the utilization of future SLRC artillery weapon systems currently in development for use by the US Army Field Artillery. A qualitative analysis historical case study of the development, fielding, and employment of the German Paris Guns will answer the primary and secondary research questions. This qualitative analysis will analyze the effects of the employment of the Paris Guns, and what strategic impacts, if any, resulted. The outcomes of this case study will inform recommendations for how the US Army Field Artillery should employ SLRC artillery weapon systems throughout the competition continuum.

#### Case Study Framework

The instruments of national power are diplomatic, informational, military, and economic. An actor must possess some or all the following to achieve strategic effects through the elements of national power: moral strength, the will to act, physical strength, and freedom of action.<sup>102</sup> Any change to an actor's source of power which provides these

---

<sup>102</sup> Headquarters, Department of Defense, Joint Publication (JP) 5-0, *Joint Planning* (Washington, DC: Government Printing Office, 2017), xxii.

characteristics will affect their ability to employ the instruments of national power. Any change in this ability to use any or all the instruments of national power, whether through direct, indirect, intended, or unintended actions by an adversary, constitutes an achieved strategic effect.

### Moral Strength

This study assumed that a kinetic effects-oriented weapon system is unable to affect the moral strength provided through the diplomatic instrument of national power. The moral strength of an actor relates to the legal, ethical, and moral authority enjoyed by an actor. External actors provide moral authority and are therefore unaffected by a kinetic weapon system's direct, indirect, or cumulative effect on the actor's diplomatic capability.

Conversely, this study assumed that a kinetic effects-oriented weapon system could affect an actor's physical strength, freedom of action, or will to act. These factors are internally derived sources of power; therefore, an external action by an effects-oriented weapon system could conceivably affect the relative power of an actor provided by these attributes.

### Will to Act

A national or state actor's will to act is the desire of the majority to continue along the present course. Because the will to act is a human behavior-based variable, the will to act is difficult to measure on the individual or collective human behavior level.

Due to the inherent variance within a given population regarding perceived intent or popular support, it is difficult to quantify and therefore measure the relative will to act



provided by the people of a given society. Additionally, reports of collective opinion or individual testimonies of their feelings regarding a given issue can vary greatly and are often anecdotal, and for these reasons, difficult to apply collectively across an entire population. For these reasons, popular support providing the will to act was not used as a metric for this qualitative analysis.

### Physical Strength

A great power actor's physical strength is the measurable capability of, and ability to employ its military effectively. The summation of this strength is the military's combat power. In the United States Military's Joint Doctrine, combat power is measured individually and collectively by the seven joint functions: command and control, information, intelligence, fires, movement and maneuver, protection, and sustainment.<sup>103</sup> A change to the capability of any of these functions constitutes a change in physical strength provided by the actor's military. Because a nation's physical strength results from their ability to employ their military effectively, the study of effects on physical strength is evident in freedom of action. For this reason, physical strength will be explored as a facet of freedom of action, as described below.

### Freedom of Action

A great power's freedom of action has a direct relationship to its ability to achieve increased stand-off. Stand-off can refer to tangible concepts such as distance, time, and space, as well as intangible concepts of freedom such as information or economic. The

---

<sup>103</sup> Headquarters, Department of Defense, JP 3-0, *Joint Operations*, GL-16.

operational variables presented in the US Military's joint doctrine: military, political, economic, social, infrastructure, and information provide an appropriate framework to describe and measure stand-off. Any ability for an actor to increase stand-off for themselves or correspondingly, to reduce relative stand-off for their competitors or adversaries within these six operational variables constitutes an achieved strategic effect.

### Methodology

A qualitative analysis historical case study will answer the primary and secondary research questions. This case study will utilize a focused document review of unclassified primary and secondary source material related to the development, employment, and effects of the Paris Guns of WWI. Additional analysis of unclassified literature on the current development of future US Army doctrine and weapon systems will provide context for lessons learned from a study of the Paris Guns.

As detailed above, there is a direct relationship between the elements of national power and a national actor's moral strength, will to act, physical strength, and freedom of action. A national actor's ability to employ the elements of national power relies on their capacity in these subordinate elements. Any increase or decrease in these capacities constitutes an achieved strategic effect. Therefore, actor's relative strategic power is qualitatively measured through analysis of the relative capacity of its moral strength, will to act, physical strength, and freedom of action.

As previously stated, the most representative and applicable of these elements to the national strategic capacity gained from stand-off achieved through the development of an A2AD network is freedom of action. This stand-off is not limited to distance (range). Still, it can be measured both tangibly and intangibly across all the Joint

Operational Variables (military, political, economic, social, infrastructure, and information). Figure 5 below displays the relationship between tactical action manifesting as target effects, measured across the operational variables, and yielding strategic effects on an actor’s freedom of action to employ the elements of national power. The flow of these effects from tactical-level action to strategic outcomes is the framework methodology for this case study.

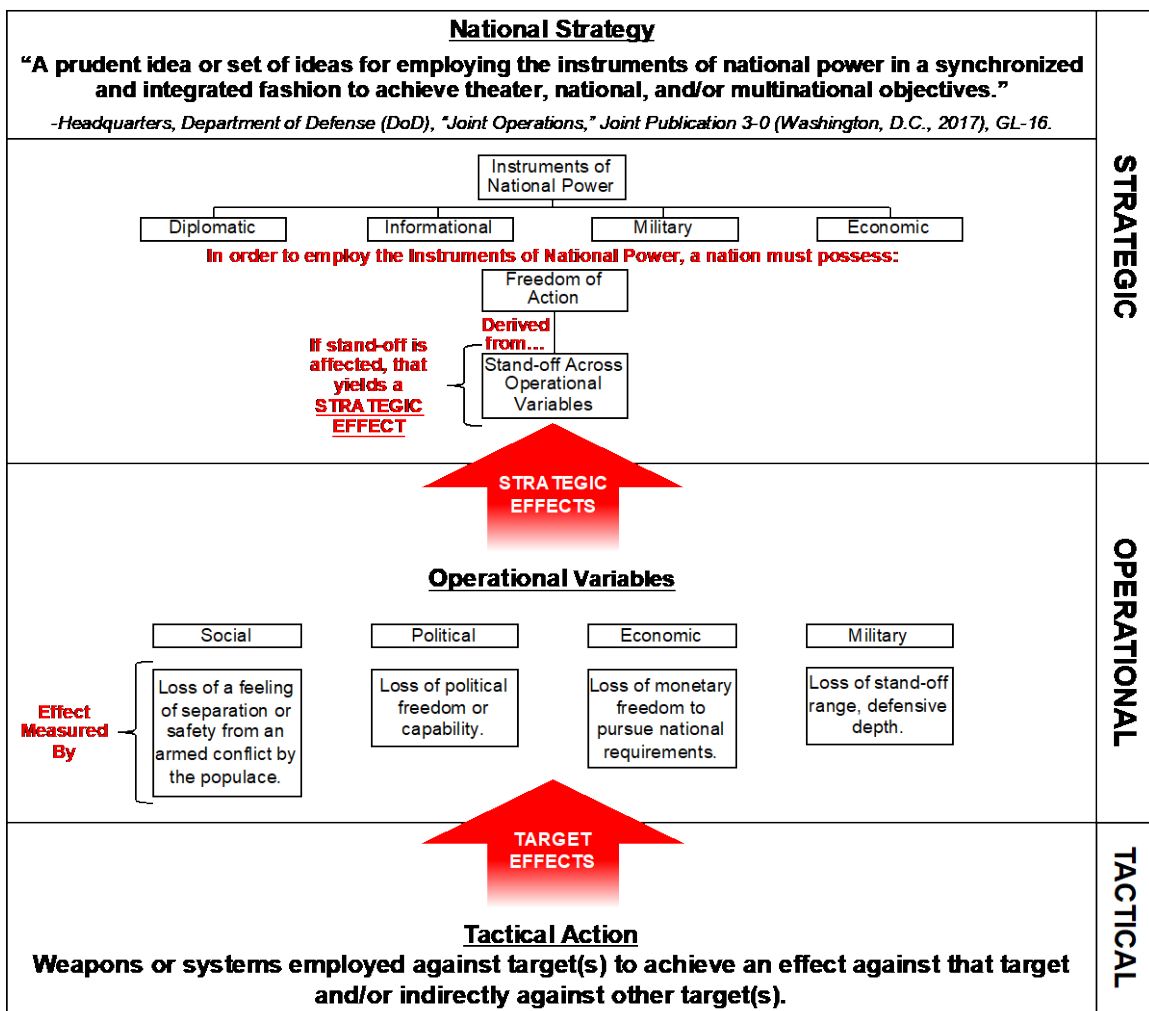


Figure 5. Case Study Methodology Framework

Source: Created by author.

Given the available primary and secondary source documentation related to the Paris Guns, the most applicable of these operational variables to a qualitative study are the societal, political, economic, and military variables. Source documentation provides evidence of achieved strategic effects within each of these operational variables. These effects are not one-sided or limited only to the Germans or the Allies. These effects provide holistic evidence of both intended and unintended effects of the Paris Guns across each of these operational variables. This analysis will determine if the German Military was indeed able to increase stand-off across these four operational variables, and therefore achieve strategic effects. In the conclusion of this thesis, lessons learned from the actions resulting in these strategic effects will inform recommendations for the use of SLRC in the 21st Century.

#### Secondary Research Questions

A narrative of the events surrounding the development, deployment, and utilization of the Paris Guns will begin answering the secondary research questions in chapter 4. Chapter 5 will further answer these questions through analysis utilizing the previously stated operational variable framework. This narrative and subsequent analysis will establish what actions did and did not achieve strategic effects, what the German's intended effects were, and if these effects along with any unintended consequences resulted. Specifically, if there was an effect on the French's stand-off across the operational variables as previously articulated. This research and developed narrative will best inform the modern development and ultimate employment and use of SLRC artillery across the competition continuum for the 21st Century.

### Data Collection

An analysis of the Paris Guns across the societal, political, economic, and military operational variables will yield qualitative data to inform this thesis' conclusions and recommendations. This data will draw on a focused document review of historical primary and secondary sources relevant to the development, deployment, and utilization of the Paris Guns by the German Army. This data will appear in narrative form and will seek to convey qualitative text supporting achieved strategic effects across the operational variables.

### Data Analysis

Chapter 5 will analyze the narrative established in chapter 4, along with additional primary source supporting documentation. The analysis will qualitatively measure the effectiveness of the Paris Guns through perceived increases or decreases in stand-off capacity across the operational variables of the belligerent parties in WWI (Allies and Germany). A net negative or positive strategic effect determination for either the Allies or the Germans will result from evidence across the operational variables. Additionally, a determination and exploration of unintended strategic effects will occur to inform potential pitfalls of the employment of SLRC in the 21st Century.

### Summary

A qualitative analysis historical case study through a focused document review of primary and secondary sources will answer the primary and secondary research questions. The development, employment, and effects of the Paris Guns by the German Military in WWI will serve as the historical case study. This case study will inform

conclusions and recommendations for the future employment of emerging SLRC artillery currently under development by the US Army Field Artillery. Chapter 4 will examine in detail the development, fielding, employment, and resultant effects of the German Paris Guns in 1918. Chapter 5 will analyze the details of this narrative to determine what, if any, strategic effects the Paris Guns achieved.

## CHAPTER 4

### DEVELOPMENT AND EMPLOYMENT

My dear colleagues, the subject now before us is the construction of the engine, its length, its composition, and its weight. It is probable that we shall end by giving it gigantic dimensions; but however great may be the difficulties in the way, our mechanical genius will readily surmount them.

— Impey Barbicane, quoted in Jules Vern, *From the Earth to the Moon*

#### Introduction

This study analyzes literature detailing the development, employment, effects, and adversary response of and to the Paris Guns employed by the German Military during WWI against the people of Paris, France. The information presented in previous chapters and the following case study seeks to inform the US Army Field Artillery on the potential employment and use of SLRC artillery weapon systems currently in development. The following is a description of the events surrounding the development, employment, and reaction to the use of the Paris Guns, which will serve as a case study for analysis for the future employment of US Army Field Artillery SLRC artillery weapon systems.

#### The Paris Guns Case Study

In March 1918, the conflicting national powers were beginning the fourth and final spring of WWI. Much like previous years, the new spring called for a new series of offensives. This year would be no different, and the German Military would deliver in hopes of finally defeating the Allied Powers and bringing the war to an end.

## Background

The Friedrich Krupp AG arms manufacturer was a major arms manufacturer for Germany throughout the latter 19th Century through the present day. This corporation produced the Big Bertha, the Langer Max, and the Paris Guns in addition to a multitude of other arms, projectiles, and instruments of warfare.<sup>104</sup> Bull and Murphy, themselves engineers and scientists, performed extensive research into the history of the Paris Guns, ultimately writing and publishing *Paris Kanonen - the Paris Guns (Wilhelmgeschütze) and Project HARP* in 1988. In researching this seminal work on the history of extremely long-range cannon artillery, they uncovered previously unavailable primary source documents from engineers and scientists involved in the Friedrich Krupp AG corporation development and ultimate employment of the Paris Guns by the German Military. Of particular importance, was the discovery of Doctor Rausenberger's (Managing Director and Member of the Board of Friedrich Krupp AG from 1910 to 1921) original manuscript as well as photographs and correspondence relating to this development. These documents provide a unique insight into the impetus for developing this technology as well as refinement of assumptions and facts collected by the American authority on the Paris Guns, LTC Henry W. Miller, in his seminal 1930 work, *The Paris Gun: The Bombardment of Paris by the German Long Range Guns and the Great German Offensives of 1918*. While LTC Miller was largely correct in his assertions, some

---

<sup>104</sup> Editors of Encyclopedia Britannica, "Krupp AG," *Encyclopedia Britannica*, n.d., accessed March 24, 2020, <https://www.britannica.com/topic/Krupp-AG>.



technical developmental details, as well as tactical employment insight, were gained from Rausenberger's original manuscript.<sup>105</sup>

The development section below relays a summarized narrative primarily sourced from Rausenberger's manuscript as well as some of the supporting documents collected by Bull and Murphy. This unique historical evidence provides the most informative detail and is likely the most truthful and accurate account of the impetus and ultimate development of the Paris Guns. Additional source material will amplify the summarized narrative; however, the majority of this narrative derives from the previously stated sources.

### Development

Rausenberger introduced his manuscript by illustrating a strategic problem facing the German Military in the Fall of 1914. He explained that after the war had begun, in the autumn of 1914, the German High Command's plans involved continued advancement to the Northern French coast beyond the city of Calais. This advance would place the German Military in command of Cap Gris Nez (the closest point between the French and British Coasts). The city of Dover is the closest city to Cap Gris Nez at a distance of 33 km (20.5 mi) over the English Channel. If the German Army were able to continue their advance and command Cap Gris Nez, a long-range artillery bombardment of the English Coast and city of Dover would be possible. A weapon firing from Cap Gris Nez would need to be capable of achieved ranges of at least 37 km (23 mi) to account for wind and

---

<sup>105</sup> Bull and Murphy, *Paris Kanonen - the Paris Guns (Wilhelmgeschütze) and Project HARP*, 11-19.

other meteorological conditions.<sup>106</sup> Rausenberger stated, “The German Army’s artillery of 1914 had a maximum range of about 15 km [9.3 mi] so that any possible solution had to be found by exploiting the large caliber, newly developed naval guns.”<sup>107</sup>

Rausenberger went on to explain the two most likely candidates for this task were the two major caliber naval guns available, the 30.5 cm L45 and the new 38 cm L45 Langer Max theoretically able to achieve ranges of 24 km (using a 405 kg projectile) and 28 km (using a 743 kg projectile) respectively. The longest range any German weapon had achieved to that point, was only 21 km (13 mi).<sup>108</sup> “Since none of the existing systems could attain the range required for the bombardment of Dover from Cap Gris Nez, some new development needed to be undertaken. Therefore, the Reichsmarineamt (German Naval Board) referred to the Krupp Firm the problem of extending the range of the large caliber naval guns to 37 kilometers [23 mi].”<sup>109</sup>

On October 21, 1914, Krupp achieved the mandate from the Reichsmarineamt by firing a projectile 49 km (30.4 mi).<sup>110</sup> Rausenberger explained how Krupp continued to advance technology, improving the ability to accurately predict fire while developing more massive guns able to achieve higher ranges for both the Navy and the Army. Rausenberger did not indicate what the impetus was for developing an ultra-long-range

---

<sup>106</sup> Bull and Murphy, *Paris Kanonen - the Paris Guns (Wilhelmgeschütze) and Project HARP*, 21.

<sup>107</sup> Ibid.

<sup>108</sup> Ibid.

<sup>109</sup> Ibid.

<sup>110</sup> Ibid., 24-25.

system (100 km), but does indicate that there did exist a “desire to increase the range still further, possibly to 100 km [62.1 mi].”<sup>111</sup> It is reasonable to assume, based on the context and flow of Rausenberger’s prose, that a line of direct communication existed between Krupp and the German Military. It is also likely that proposals for advancing technology by Krupp may have sometimes preceded a direct military need or intended use for such technology. Regardless of the genesis of this desire, Rausenberger indicated that the desire to pursue this project did exist within the civil-military arms manufacturing process and that this proposal was not outside the realm of expectations by the German High Command. Rausenberger’s narrative below, detailing the approval for Krupp to pursue the ultra-long-range cannons, best exemplifies the civil-military arms manufacturing expectations and norms.

Rausenberger’s suggested approach to developing a 100 km cannon was to utilize a 21 cm projectile, weighing 100 kg, and accelerated to 1500 meters per second. Rausenberger’s approach favored a long barrel fitted inside any of the large-caliber guns currently in existence and created by Krupp.<sup>112</sup> Rausenberger did not indicate if the German Military informed him of the gun’s potential use, or if he simply deduced its only practical application. However, his thoughts on the matter were:

The only possible use of such a 100 km range gun would be the bombardment of the Paris fortifications, an area target some 20 km in width and breadth. A 21 cm shell weighing only 100 kg would be ineffective against smaller targets such as harbours [UK spelling], railway junctions, transfer points and depots situated deep behind enemy lines in view of the expected large range dispersion of several kilometers. Even the bombardment of Paris with such a relatively small shell

---

<sup>111</sup> Bull and Murphy, *Paris Kanonen - the Paris Guns (Wilhelmgeschütze) and Project HARP*, 26.

<sup>112</sup> *Ibid.*, 27.

containing only 8 kg of explosives (a limitation due to the high acceleration loading during in-bore travel), could only have a psychological effect on the enemy. Even to achieve this effect, it would be necessary to maintain a continuous bombardment, varying in intensity, for weeks or months.<sup>113</sup>

Rausenberger indicated that in considering the development of such a gun, it would be necessary to have available at least ten guns to make this project effective. This requirement was due to the inherently short tube life of each gun, and that initial firing tests and trials would completely wear out at least one tube. Rausenberger continued, stating that at the time this problem was considered in 1916, only 3 or 4 guns would be available, and only if diverted from the front lines on the Western Front. Another option would be to divert guns intended for use on new or under-construction battleships and heavy cruisers; which would not have been supported by the Reichsmarineamt as a viable option. The final untenable idea would be to manufacture new, recently designed guns. However, this would have required 18 months in manufacturing time and would have “placed an unacceptable workload on the Krupp factories, which were already struggling to meet the current needs of the Army and Navy.”<sup>114</sup> In Rausenberger’s words, “at first glance, the possibility of realization of the desirable 100 km, ultra long [*sic*] range bombardment system, seemed remote.”<sup>115</sup>

Krupp overcame these obstacles, when “In the late autumn of 1916 the Navy instructed Krupp to delay work on nine 35 cm guns intended for the large battle cruiser

---

<sup>113</sup> Bull and Murphy, *Paris Kanonen - the Paris Guns (Wilhelmgeschütze) and Project HARP*, 27.

<sup>114</sup> *Ibid.*, 28.

<sup>115</sup> *Ibid.*

‘Ersatz Freya’.”<sup>116</sup> The following quotation from Rausenberger’s manuscript evidences the relationship between Krupp and the German Military, and how the pursuit of technology by civilian-military industry may have preceded a declared or articulated military need tied to objectives or strategy:

Before proceeding further it was essential to determine whether the Oberste Heeresleitung (High Command) would consider as worthwhile the bombardment of Paris with the relatively small 100 kg projectile carrying only 8 kg of high explosives. Thus I discussed our work on firing to 100 km with my friend Colonel Bauer, the responsible section chief at the Army General Staff. He presented the project to both General Hindenburg and General Ludendorff. Their approval was immediate. They attached the utmost urgency to the project with instructions to proceed with all haste.<sup>117</sup>

After approval by the Navy to divert the use of their guns for the new project, Krupp began work immediately. On February 5, 1917, General Ludendorff sent a letter containing the following instructions to Krupp, “In view of new circumstances the maximum range for the 21/35 cm system must be 120 km. I request that you proceed on this basis with your work.”<sup>118</sup> Rausenberger then articulated how operational need drove this change to technological design, “This requirement resulted from the planned pull-back of the German front line, resulting in the bombardment range to Paris increasing to 120 km.”<sup>119</sup>

---

<sup>116</sup> Bull and Murphy, *Paris Kanonen - the Paris Guns (Wilhelmgeschütze) and Project HARP*, 28.

<sup>117</sup> Ibid.

<sup>118</sup> Ibid.

<sup>119</sup> Ibid.

Design and testing of the guns continued throughout 1917. Ultimately, the final design was tested and ready for operation in January 1918, and resulted in the *Wilhelmgeschütze* (William Gun) named in honor of Kaiser (Emperor) Wilhelm by the Krupp AG corporation. The 38 and 35 cm barrels received rifled barrel inserts of 21 m (68.9 feet (ft)) in length. A smooth bore attachment to the end of the rifled barrel of either 6, 9, or 12 m (19.7, 29.5, or 39.4 ft) (selected based on desired range and tube wear) completed the barrel configuration. The guns themselves were railway carried for final assembly at prepared concrete and steel positions and predetermined locations.<sup>120</sup> Of particular interest in the employment of the Paris Guns was the critical role of German sailors. Because these were modified naval guns, the expertise in their employment lay with the German Navy. For this reason, the Paris Guns, among other heavy caliber railroad artillery weapons employed on the Western Front, were at least initially (until Army artillerymen were trained) employed and operated by German sailors in land combat. This unique role meant that in the case of the Paris Guns, the Navy was the approval authority for design modifications to Krupp, although the weapons were tools of warfare needed by the German Army.<sup>121</sup>

Rausenberger indicated, "Having complete faith that the Krupp firm would succeed in their task, *Oberste Heeresleitung* (High Command) had already selected the firing positions for the first battery of three *Wilhelmgeschütze* near Crépy, West of Laon,

---

<sup>120</sup> Bull and Murphy, *Paris Kanonen - the Paris Guns (Wilhelmgeschütze) and Project HARP*, 80-83.

<sup>121</sup> *Ibid.*, 14.

in the summer of 1917 and given the order to prepare the site positions.”<sup>122</sup> Rausenberger stated that work began and that it was confirmed by January 1918 that these first positions would be prepared to begin firing from the Siegfried Line with Paris as a target by March 1918.<sup>123</sup>

### Employment

“On March 22nd the High Command issued the order to commence firing on Paris. . . . The first shot was fired at 0715 on the 23rd of March 1918.”<sup>124</sup> Table 1 below illustrates the bombardments conducted by the Paris Guns that occurred by day, from March to August, the number of bursts observed in and around Paris, and the number of casualties (both killed and wounded) from these bombardments. In total, the German Military fired projectiles at Paris on 43 different days between March 23 through August 9, 1918.

---

<sup>122</sup> Bull and Murphy, *Paris Kanonen - the Paris Guns (Wilhelmgeschütze) and Project HARP*, 34.

<sup>123</sup> *Ibid.*

<sup>124</sup> *Ibid.*

Table 1. Casualties Resulting from the Paris Gun Bombardment of Paris, France  
(March 23 to August 9, 1918)

Date	Number of Bursts	Killed				Wounded			
		Men	Women	Children	Total	Men	Women	Children	Total
Mar. 23 S	23	11	4	-	15	20	16	-	36
" 24 S	30	3	6	2	11	11	15	8	34
" 25 M	13	-	1	-	1	2	1	-	3
" 29 F	4	19	67	2	88	30	36	2	68
" 30 S	20	6	3	1	10	26	28	6	60
" 31 S	3	1	-	-	1	-	-	1	1
Apr. 1 M	4	2	4	2	8	3	3	2	8
" 2 Tu	4	-	-	-	-	-	3	-	3
" 3 W	3	-	-	-	-	-	-	-	-
" 6 S	9	-	-	-	-	2	1	-	3
" 7 S	1	-	-	-	-	-	-	-	-
" 11 Th	6	3	4	2	9	5	12	4	21
" 12 F	9	1	1	-	2	7	7	-	14
" 13 S	4	-	-	-	-	-	-	-	-
" 14 S	8	-	1	-	1	-	-	-	-
" 16 Tu	9	5	11	-	16	12	102	-	114
" 19 F	3	-	-	-	-	-	-	-	-
" 21 S	4	-	-	-	-	-	-	-	-
" 24 W	3	-	-	-	-	-	-	-	-
" 25 Th	7	-	1	-	1	-	-	-	-
" 26 F	3	-	-	-	-	-	-	-	-
" 27 S	2	-	-	-	-	-	-	-	-
" 30 Tu	3	-	-	-	-	-	-	-	-
May 1 W	3	-	-	-	-	-	3	2	5
" 27 M	10	2	2	-	4	10	10	-	20
" 28 Tu	10	1	-	-	1	-	1	1	2
" 29 W	11	-	1	-	1	2	2	3	7
" 30 Th	13	10	3	-	13	4	1	-	5
" 31 F	6	-	-	-	-	-	-	-	-
June 1 S	8	-	-	-	-	-	-	-	-
" 3 M	6	-	2	-	2	1	6	1	8
" 4 Tu	4	-	3	1	4	4	8	4	16
" 7 F	7	1	-	-	1	2	2	-	4
" 8 S	6	2	1	-	3	-	-	-	-
" 9 S	12	1	-	-	1	7	2	-	9
" 10 M	5	1	2	-	3	1	10	2	13
" 11 Tu	1	-	-	-	-	-	-	-	-
July 15 M	10	3	3	-	6	5	3	1	9
" 16 Tu	4	-	1	2	3	1	6	1	8
Aug. 5 M	17	25	6	1	32	34	25	2	61
" 6 Tu	19	6	2	-	8	35	4	-	39
" 7 W	8	4	3	-	7	24	19	-	43
" 8 Th	5	1	-	-	1	-	-	-	-
" 9 F	12	1	1	1	3	2	4	-	6
	351*	109	133	14	256	250	330	40	620

Source: Gerald V. Bull and Charles H. Murphy, *Paris Kanonen - The Paris Guns (Wilhelmgeschütze) and Project HARP* (Herford und Bonn: Verlag E.S. Mittler and Sohn GmbH, 1988), 137. NOTE: The total number of bursts recorded in this table was 351; however, the sum of all bursts in this column totals 352. Bull and Murphy acquired this table from the Ministère de la Guerre, and it is also present in the work of COL Miller. This error in the total of the number of bursts column may have been the genesis of this incongruity and error reported in subsequent works by various authors.



Three locations were used by the German Military to engage Paris. The original battery location was in Crépy, France, which conducted the initial bombardment on March 23 and remained until May 1, 1918. This location was at the extreme range of the Paris Guns, at 120 km (74.5 mi) from Paris. The second battery location used was at Beaumont, France, at a range of 110 km (68.3 mi), and used from May 27 through June 11, 1918. The closest location to Paris and the shortest range was 85 km (52.8 mi) at Bruyères, France, during the July 1918 bombardment. The final firing location was once again at the Beaumont site during the August 1918 bombardment. These locations generally coincide with the advance and ultimate contraction of the German lines as their 1918 offensives were initially successful, and ultimately lead to retrograde.<sup>125</sup>

On August 9, 1918, the Paris Guns fired their last shots at Paris, firing 12 projectiles total.<sup>126</sup> These final rounds killed three and wounded six more, but the prolonged bombardment of Paris was finally over. Because of the Allied counter-offensive and the general German retreat, the guns were removed and ultimately destroyed. Their destruction was the result of a desire to prevent them from falling into Allied hands. It would take the cumulative effort of multiple engineers and historians over the next century to resurrect the true history and characteristics of these WWI technological marvels.

---

<sup>125</sup> Bull and Murphy, *Paris Kanonen - the Paris Guns (Wilhelmgeschütze) and Project HARP*, 131.

<sup>126</sup> Lt. Col. Henry W. Miller, *The Paris Gun: The Bombardment of Paris by the German Long Range Guns and the Great German Offensives of 1918* (New York: Jonathan Cape and Harrison Smith, 1930), 285.

## CHAPTER 5

### ANALYSIS

It [the Paris Gun] was an astonishing achievement in technical terms, but the means and tactic of the day proved inadequate for the revolutionary strategic objective.

— Major General (Ret.) Jonathan B. A. Bailey,  
*Field Artillery and Firepower*

#### Analysis

As outlined in chapter 3, this case study will analyze the German ability to increase stand-off against the Allied Powers. The most prudent way to measure any change to increased stand-off is to use the following operational variables as a framework: social, political, economic, and military. This chapter will analyze both positive and negative achieved effects across each of these operational variables. Additionally, effects on society often manifest immediately, whereas effects in the political, economic, and military domains sometimes occur immediately, but are often delayed over time. For this reason, this chapter will analyze the social domain with evidence captured at the time of each incident. In contrast, the evidence provided in the political, economic, and military domains may prove to manifest long after the bombardment and the war had concluded.

As indicated by Rausenberger, the Paris Guns “could only have a psychological effect on the enemy. Even to achieve this effect, it would be necessary to maintain a

continuous bombardment, varying in intensity, for weeks or months.”<sup>127</sup> For this reason, stand-off along the social operational variable will be analyzed first. The ability or inability of the German Army to achieve social effects on their adversaries would drive effects across the other three operational variables.

The German High Command hoped to utilize the Paris Guns to instill fear in the people of Paris. They further hoped, for this fear to break or reduce the will of the French people. Finally, they hoped for a loss of will to degrade or lead to reduced capability or capitulation of the French or Allied political, military, or economic means of projecting strategic power. This compounding of effects across multiple domains relied on the Germans’ ability to achieve their initial strategic effect against the citizens of France and, in particular, the people of Paris.

At 7:20 a.m. on Saturday, March 23, 1918, the German Military began the bombardment of Paris, France.<sup>128</sup> using at least two of the Paris Guns fired from their initial firing positions “near the little town of Crépy on the eastern slope of the Mont de Joie in the St. Gobain Wood.”<sup>129</sup> This is a range of approximately 120 km (74.6 mi) from the center of Paris (intended target).<sup>130</sup> The bombardment of Paris would continue, interrupted, and with varying degrees of intensity until the final round would impact on

---

<sup>127</sup> Bull and Murphy, *Paris Kanonen - the Paris Guns (Wilhelmgeschütze) and Project HARP*, 27.

<sup>128</sup> Miller, *The Paris Gun: The Bombardment of Paris by the German Long Range Guns and the Great German Offensives of 1918*, 2.

<sup>129</sup> Bull and Murphy, *Paris Kanonen - the Paris Guns (Wilhelmgeschütze) and Project HARP*, 131.

<sup>130</sup> *Ibid.*

August 9, 1918, thereby silencing these guns forever. In all, 352 rounds impacted within Paris, killing 256 and wounding an additional 620 people.<sup>131</sup>

### Social Effects

In the immediate aftermath of the initial bombardment on Saturday, March 23, 1918, and all subsequent bombardments throughout 1918, news reports captured the effects on Allied society. On Sunday, March 24, 1918, the *NYT* reported the initial bombardment of Paris by the Paris Guns on the front page, under the title: “French Capital Under Fire Ten Killed and Fifteen or More Wounded in Mysterious Bombardment.”<sup>132</sup> This article informed the reader that Paris “has been under bombardment of long-range guns today, beginning at 8 o’clock this morning.”<sup>133</sup> The article also described the air raid alarms being sounded and advising citizens to take shelter. It went on to describe that the initial day’s bombardment affected the city and its populace:

Paris wore an aspect recalling the early days of the war in 1914. Telephone girls remained at their posts, very few taking advantage of the administration’s permission to seek refuge if they wished. Tramways and auto buses stopped on the streets and the conductors and ticket collectors sought the nearest shelter. The subway trains ceased running, and the tubes were used by pedestrians to reach home on foot. The police were placed at each station to prevent repetition of the recent panic, and prevented people from assembling

---

<sup>131</sup> Bull and Murphy, *Paris Kanonen - the Paris Guns (Wilhelmgeschütze) and Project HARP*, 137.

<sup>132</sup> New York Times, “French Capital Under Fire,” *New York Times*, March 24, 1918, accessed January 21, 2020, <https://timesmachine.nytimes.com/timesmachine/1918/03/24/issue.html>.

<sup>133</sup> *Ibid.*

around the entrances. Nine hours thus passed, and then Paris learned that it was not being raided but bombarded.<sup>134</sup>

The interruption of Paris life was further captured in COL Miller's work, "The city just stopped, and it did not require long. From the usual Saturday morning activity at 9:15 a.m., it was reduced in a comparatively few minutes almost to midnight inactivity; the silence became painful, and for the next hour the explosions of the bombs landing even miles away could be heard."<sup>135</sup> Despite this abrupt change in the activity of the civilians in Paris, COL Miller went on to explain, "Fortunately, there were no signs of panic in this rapid transformation ; [*sic*] no hysterical behaviour [UK spelling]. . . . The war had developed in the people of France a peculiar resignation to the unusual, an acceptance of the inevitableness of tragedy."<sup>136</sup> On the day after the first bombardment by the Paris Guns, the people of Paris were unnerved, but not panicked. Any fear they felt aggregated with fear of aerial bombardment and the renewed German offensive, bringing the Germans ever-closer to Paris. The bombardment by the Paris Guns had an initial shock or novel value. However, without massive follow-up or follow-through, this shock at the technological achievement waned along with the novelty of a long-range cannon bombardment. The *NYT* displayed this evidence throughout the bombardment from the Spring to the Fall of 1918.

---

<sup>134</sup> New York Times, "French Capital Under Fire."

<sup>135</sup> Miller, *The Paris Gun: The Bombardment of Paris by the German Long Range Guns and the Great German Offensives of 1918*, 16.

<sup>136</sup> *Ibid.*

On Monday, March 25, 1918, the *NYT* captured the effects of the continued bombardment from Sunday (Palm Sunday). On only the second day of the bombardment, evidence suggested the bombardment lost its effectiveness. The front-page title stated, “French Locate Gun 76 Miles Away; Hurls Shells at Paris Six Hours,”<sup>137</sup> and continued in the same positive vein, “Projectiles Drop at Intervals of 12 to 15 Minutes, but Fail to Unnerve Palm Sunday Throngs—Experts Admit Range Is Possible, but Doubt Military Value of Gun.”<sup>138</sup> After just two days, the French Military had succeeded in successfully locating the firing points of the Paris Guns. This reporting intended to diminish any German counter-narrative and to instill confidence in the French people that their government and military were proactively working to reduce the threat of long-range bombardment. This article goes on to articulate the inability of a long-range bombardment to have a profound effect on the people of Paris:

The gun bombarded Paris during the greater part of Sunday. The day was ushered in by loud explosions from the ten-inch shells, and immediately the alarm to take cover was sounded. This occurred at 6:55 o’clock, and many persons sought shelter, but greater numbers of them appeared in the streets on their way to the churches, which were almost as well filled as usual. The women who sell palm leaves on Palm Sundays did their usual thriving business. . . . Their power to disturb the equanimity of the populace, however, seemed less, the people refusing to be distracted from their Sunday habits to any great extent.<sup>139</sup>

On March 26, 1918, the *NYT* conveyed similar sentiments concerning the lack of terrorizing effect on the populace of Paris under the heading, “Big Guns Can’t Spoil Palm

---

<sup>137</sup> New York Times, “French Locate Gun 76 Miles Away; Hurls Shells at Paris Six Hours,” *New York Times*, March 25, 1918, accessed January 21, 2020, <https://timesmachine.nytimes.com/timesmachine/1918/03/25/issue.html>.

<sup>138</sup> *Ibid.*

<sup>139</sup> *Ibid.*

Sunday in Paris German “Crashing Christophers” Are Taken Less Seriously Than Airplane Raids.”<sup>140</sup> This article goes on to remark,

Germany believes that she can break the civilian morale and expects Paris to go to pieces under the strain. As a matter of fact, the cannonade is less fearsome than air-raiding. It is always possible to find safety, because the shells can come only from a known direction. Also they do much less damage than air bombs. The percentage of killed to wounded is small.<sup>141</sup>

A second article on March 26, 1918, reflected the same under the title, “Long-Range Firing on Paris Continues.”<sup>142</sup> After detailing the bombardment of March 25, 1918, the article states, “Work was resumed under normal conditions. All the transportation lines were running. The streets were full of people whose sole subject of conversation was the new battle of the Somme, which is generally compared with Verdun.”<sup>143</sup>

The *NYT* displayed, perhaps, the most telling evidence of limited societal effect in an article published on March 27, 1918, titled, “Paris Undamaged by Long-Range Gun Explosion of the Shells Is Not Powerful Enough to Wreck Buildings or Cause Havoc. Fails to Alarm the Public.”<sup>144</sup> This article goes on to explain that the bombardment was

---

<sup>140</sup> Charles H. Grasty, “Big Guns Can’t Spoil Palm Sunday in Paris,” *New York Times*, March 26, 1918, accessed January 21, 2020, <https://timesmachine.nytimes.com/timesmachine/1918/03/26/102681381.html?pageNumber=3>.

<sup>141</sup> *Ibid.*

<sup>142</sup> *New York Times*, “Long-Range Firing on Paris Continues,” *New York Times*, March 26, 1918, accessed January 21, 2020, <https://timesmachine.nytimes.com/timesmachine/1918/03/26/102681380.html?pageNumber=3>.

<sup>143</sup> *Ibid.*

<sup>144</sup> *New York Times*, “Paris Undamaged by Long-Range Gun,” *New York Times*, March 27, 1918, accessed January 21, 2020, <https://timesmachine.nytimes.com/timesmachine/1918/03/27/102682013.html?pageNumber=3>.

seen as something novel, and may have achieved the opposite of the intended German effect: reducing psychological strain on the French populace.

Life this morning is absolutely normal. All public services are working as usual, and it is literally true that Paris is taking no notice of the bombardment. In point of fact, the bombardment has done Paris morale no small service. To begin with, it had a general tonic effect on the whole population. Secondly, it has given Parisians a new thing to talk about, which certainly has been useful in keeping their minds off the offensive.<sup>145</sup>

The examples above indicate that almost immediately following the initial bombardment, a sense of novelty or apathy quickly replaced what little fear or uncertainty existed at the bombardment's outset. The fact that the bombardment was not producing great numbers of casualties, nor occurring at a regular interval, explains the general attitude towards the bombardment and the lack of a perceived negative psychological effect. Reporting on the bombardment in the *NYT* would continue until the Fall of 1918. However, it would wax and wane relative to the regularity and volume of the projectiles fired (see Appendix A for further analysis and comparison of articles published versus the effects of the bombardment). The following reporting displays the most significant evidence and overall summation of the effect on the French populace following the single-greatest casualty producing day of the bombardment of Paris by the Paris Guns: Friday (Good Friday), March 29, 1918.

On March 30, 1918, the headline of the *NYT* contained the following, “Long-Range Shell Kills 75 in Paris Church.”<sup>146</sup> COL Miller gives an account of the attack on the Church of St. Gervais that ultimately killed 88 and wounded 68 more.

---

<sup>145</sup> New York Times, “Long-Range Firing on Paris Continues.”

<sup>146</sup> New York Times, “75 Are Killed and 90 Wounded in Paris Church by a Shell Fired by German Long-Range Gun,” *New York Times*, March 30, 1918, accessed January



the worshippers had finished the three hours of service and were kneeling in prayer. The place was crowded. It was just 4:30. Suddenly the hundreds of kneeling worshippers were startled by a terrific crash overhead, an explosion. A projectile had struck the roof. Those looking up quickly saw a stone pillar crumpling, beginning to fall. Then the stone vault supported by this pillar began to crack, crumple, and in a second, scores of tons of stone, some blocks weighing a half ton [*sic*], were pouring down upon the mass of people. . . . Among the dead were General Francfort, M. Henri Stroehlin of the Swiss Legation, Mlle. Martin, daughter of the Belgian Consul General, French, British, American civilians, a few soldiers.<sup>147</sup>

This event had far-reaching effects outside the social realm. Its effects also impacted the political operational variable, and resulted in an unintended net negative effect for the Germans. The societal effects were immediate and were conveyed in the previously stated *NYT* article, “The killing in the church has caused horror and intense indignation in Paris. . . . Feeling runs high in Paris tonight. It is no peace crowd that walks the streets or congregates in the cafés, theatres and churches. The stern resolution to conduct the war to a successful termination is written on the face of every one [*sic*].”<sup>148</sup> These sentiments were again displayed in the following day’s *NYT* (March 31, 1918).

A wave of fury passed over Paris this morning when it learned the death roll [*sic*] in the church struck yesterday afternoon by a German shell. If anything were needed, which it is not, to steel the resistance of the French people, this futile slaughter of women and children would provide it. As one French Deputy said yesterday at the scene of the disaster: ‘Each drop of this innocent blood shall

---

21, 2020, <https://timesmachine.nytimes.com/timesmachine/1918/03/30/102683655.html?pageNumber=1>.

<sup>147</sup> Miller, *The Paris Gun: The Bombardment of Paris by the German Long Range Guns and the Great German Offensives of 1918*, 59-60.

<sup>148</sup> New York Times, “75 Are Killed and 90 Wounded in Paris Church by a Shell Fired by German Long-Range Gun.”

bear a crop of hate in France for the children and children's children of these murderers.'<sup>149</sup>

Figure 6 below shows a picture of the destruction to the Church of St. Gervais described above. The targeting of a civilian populace resulted in increased indignation and resolve in the French people, and achieved the opposite of the Germans' intended effect.



Figure 6. Photo of the effects of one round impacting the Church of St. Gervais on Good Friday, March 29, 1918

*Source:* Wikipedia, “Eglise St Gervais Paris Bombardement 1918,” Wikipedia, last modified 1918, accessed April 14, 2020, [https://en.wikipedia.org/wiki/File:Eglise\\_St\\_Gervais\\_Paris\\_bombardement\\_1918.jpg](https://en.wikipedia.org/wiki/File:Eglise_St_Gervais_Paris_bombardement_1918.jpg).

As Rausenberger indicated, the Germans intended to use the Paris Guns as psychological weapons, to degrade the will of the French and their Allies. The initial

---

<sup>149</sup> New York Times, “Paris Shelled Again; 8 Killed.”

bombardment on March 23, 1918, briefly interrupted daily life in Paris and instilled a sense of fear and amazement at German technological prowess. However, a sense of novelty or relative indifference quickly replaced any interruption caused by fear, as this was just one more way in which the people of Paris and the French in general faced the realities of war every day. Ultimately, these weapons achieved the opposite effect as they strengthened the resolve of the people, especially after the shelling on Good Friday, March 29, 1918, and continuing to the end of the war.

### Political Effects

Like the societal effects detailed above, the *NYT* captured many of the political effects resulting from the bombardment of Paris. Unlike the social commentary provided above, the political reporting contains less editorializing and directly quotes political figures from various powers throughout the world. A snapshot of this information yields a view of a general global outcry against the German Military shelling Paris. Additionally, the *NYT* captured some unintended or unforeseen effects on the British, as they seemed wearier of the bombardment of Paris than did the French.

The *NYT*, on March 25, 1918, conveyed political effects relayed in several French publications. The *NYT* quoted the *Echo de Paris*, “the bombardment is designed to give the impression that Paris is within the range of German guns. ‘It is a political cannon,’ the newspaper says.”<sup>150</sup> This article goes on to quote Premier Clemenceau’s<sup>151</sup> newspaper,

---

<sup>150</sup> New York Times, “French Locate Gun 76 Miles Away; Hurls Shells at Paris Six Hours.”

<sup>151</sup> Prime Minister of France, Georges Eugène Benjamin Clemenceau.

*L'Homme Libre*, "'Germany,' it declares, 'has wished to make it a complete offensive on all fronts—the land, water, and air fronts, as well as the 'front of the rear.' We are facing an enemy who wishes to end it as soon as possible. That suits us. Every shell that falls into Paris drives deeper into us the confidence in an ultimate victory.'" <sup>152</sup> These quotations illustrate that as early as two days after the initial bombardment, the French Government displayed political resolve and attempted to instill the same into the people of France.

In contrast with the French resolve displayed above, the *NYT* evidenced British political concern in a March 26, 1918, article, "The Times [The London Times] today advises the British people to take seriously the long-range gun which has bombarded Paris, and adds: 'We may be quite certain that our own inviolate shores will soon learn what the new gun can do.'" <sup>153</sup> This fear was encouraged by an Exchange Telegraph dispatch reported in London on March 27 and reprinted in the *NYT* on March 28, 1918, "Lieut. Gen. von Rohne, [German General Officer] an authority on ordnance, says in the *Vossische Zeitung* of Berlin that the bombardment of Paris is merely in the nature of a trial for guns which are really intended to bombard London." <sup>154</sup> These quotations display a more significant indirect effect on the political and social bodies of Great Britain than

---

<sup>152</sup> New York Times, "French Locate Gun 76 Miles Away; Hurls Shells at Paris Six Hours."

<sup>153</sup> Grasty, "Big Guns Can't Spoil Palm Sunday in Paris."

<sup>154</sup> New York Times, "Long-Range Shell Is a Twin Affair," *New York Times*, March 28, 1918, accessed January 21, 2020, <https://timesmachine.nytimes.com/timesmachine/1918/03/28/102682935.html?pageNumber=22>.

they do the political and social bodies of France. In this way, the Germans potentially achieved an indirect effect on the British.

In contrast to the political situation resulting from the bombardment in France and Great Britain, global reporting displayed German political leadership actions. Bull and Murphy captured these actions in *Paris Kanonen - the Paris Guns (Wilhelmgeschütze) and Project HARP*. Additional reporting in Amsterdam and reprinted in the *NYT* on March 29, 1918, confirmed German political activity. In the *NYT*, under an article titled, “Kaiser Thanks Krupps for Long-Range Gun,”<sup>155</sup> the following appeared:

The Kaiser [Kaiser Wilhelm II, German Emperor] has sent a telegram of thanks to Dr. Krupp von Bohlen and Hlabach, the head of the Krupp Works. The telegram reads: “By the bombardment of Paris from a distance of considerably more than 100 kilometers your new gun has brilliantly stood the test. By the manufacture of the gun you have added a new page to the fame and history of Krupp. I therefore express to you and all your coworkers my imperial thanks for this achievement of German science and labor.”<sup>156</sup>

The elation amongst the German political elite stood in stark contrast to the political outcry in France.

On March 30, 1918, the *NYT* quoted several political leaders expressing their discontent and indignation at the continued bombardment of Paris, and in particular the shelling on Good Friday, March 29, 1918.

M. [Minister] Grosseau said in the Chamber of Deputies tonight: ‘The barbarian enemy resumed his bombardment on Good Friday and his victims are numerous. It is with extreme sorrow and intense indignation that I note that most of them were assembled in church. We must not forget that justice and right shall have the last word before God and before man.’ . . . Jean Bon, Socialist leader,

---

<sup>155</sup> New York Times, “Kaiser Thanks Krupps for Long-Range Gun,” *New York Times*, March 29, 1918, accessed January 21, 2020, <https://timesmachine.nytimes.com/timesmachine/1918/03/29/102683127.html?pageNumber=2>.

<sup>156</sup> *Ibid.*

said: . . . ‘We add our indignant protest to those of the faithful against the crimes of false believers, who mix blood with prayers. In France, England, and America there will be another conception of justice.’<sup>157</sup>

These examples of French political anger over these incidents yielded further resolution within the French and Allied Governments to continue to pursue the war, and not to capitulate to Germany. The *NYT* further conveyed this point in quoting the Head of the American Red Cross, Henry P. Davison on March 31, 1918.

When we see divine service on Good Friday interrupted by a shell from the German front, seventy-five miles away, and scores of men, women, and children killed and injured, it conveys some idea of what war in Paris means. Does it create panic? Not at all. People are still traveling on the streets with shoulders back and heads up, ready to meet whatever may come. The humblest would rather die than bend to an unworthy peace.<sup>158</sup>

Political ramifications went beyond the world’s governments and included outcry from the world’s religious bodies as well. In this way, Germany felt political pressure not only from its enemies and neutral states but also from the Holy Roman Catholic Church. A *NYT* article reprinting a Reuters’ dispatch on April 2, 1918, stated, “‘Pope Benedict has lodged a protest with Berlin against the bombardment of Paris, and especially against the destruction of churches and the wholesale massacre of people.’”<sup>159</sup> Outcry from a neutral

---

<sup>157</sup> New York Times, “75 Are Killed and 90 Wounded in Paris Church by a Shell Fired by German Long-Range Gun.”

<sup>158</sup> Charles H. Grasty, “Davison Finds Paris Strong Under Trial,” *New York Times*, March 31, 1918, accessed January 21, 2020, <https://timesmachine.nytimes.com/timesmachine/1918/03/31/102684190.html?pageNumber=1>.

<sup>159</sup> New York Times, “Pope Protests to Berlin Against Shelling of Paris,” *New York Times*, April 2, 1918, accessed January 21, 2020, <https://timesmachine.nytimes.com/timesmachine/1918/04/02/102686010.html?pageNumber=3>.

apolitical body, such as the Catholic Church, evidenced an unintended opposite strategic effect and a net negative for the Germany political establishment.

The Catholic Church again moderated against the Germans in response to the shelling of Paris on Corpus Christi Day (May 30, 1918), a date the French and British had agreed not to bombard Cologne. The *NYT* captured the outcry in a June 5, 1918, article titled, “Britain Protests to Pope: Paris Shelled After Allies Agreed Not to Bombard Cologne”<sup>160</sup> The content of the article stated:

The British Government has called the attention of the Vatican, Chancellor Bonar Law told the House of Commons today, to the fact that although France and Great Britain agreed, at the request made by Germany through the Vatican, not to bombard Cologne on Corpus Christi Day, the Germans shelled Paris on that day. “The action of the Germans,” the Chancellor added, “will not be forgotten in the event that any similar appeal is made in the future.”<sup>161</sup>

In this way, the German Government created an adverse political effect not only characterized by the outcry of their enemies, but also by the world’s religious leaders. This negative political effect only compounded alongside the other adverse strategic effects resulting from the German employment of the Paris Guns.

An additional unintended political consequence with strategic implications stemming from the bombardment on Good Friday, March 30, 1918, was the death of Minister Henri Stroehlin of the Swiss Legation in Paris.<sup>162</sup> Minister Stroehlin was a

---

<sup>160</sup> New York Times, “Britain Protests to Pope,” *New York Times*, June 5, 1918, accessed January 21, 2020, <https://timesmachine.nytimes.com/timesmachine/1918/06/05/102706689.html?pageNumber=10>.

<sup>161</sup> Ibid.

<sup>162</sup> Miller, *The Paris Gun: The Bombardment of Paris by the German Long Range Guns and the Great German Offensives of 1918*, 60.

foreign official of a neutral power during WWI. His unintended death had potentially disastrous political implications for the German Government and required action to right this wrong. Minister Stroehlin's death was the accidental byproduct of using the whole of Paris as an area target and employing unguided relatively imprecise weapons. A *NYT* article from April 4, 1918, captured the fallout of his death.

BERNE, April 3.—The German Minister today visited the Foreign Office and expressed his Government's sympathy in the death of H. Stroehlin [*sic*], Counselor of the Swiss Legation in Paris, who was killed during the recent bombardment of the French capital by a German long-range gun when a shell hit a church in which he was at worship. The Minister said the event would be sincerely regretted throughout Germany.<sup>163</sup>

These incidents had a compounding and cumulative negative effect against the German Government resulting in an ever-increasing loss of geopolitical capital.

#### Economic Effects

There were some short-lived economic effects on Paris as the bombardment had a minor disruptive effect on the daily commerce of the city when the bombardment warning would sound. This effect is difficult to quantify and is reliant on too many variables to be of any real value. Additionally, the cause of minor economic disruptions may have resulted from air-raids, the German ground offensives, or a myriad of other external factors affecting the local and broader French economies. Of note, if the Germans had intended to disrupt the Parisian economy definitively, their method of disruption was ineffective. Had the Germans been able to mass the effects of the Paris

---

<sup>163</sup> New York Times, "Fifth American Victim of Shell," *New York Times*, April 4, 1918, accessed January 21, 2020, <https://timesmachine.nytimes.com/timesmachine/1918/04/04/102979454.html?pageNumber=13>.



Guns or maintain a more consistent sustained rate of fire, they may have achieved a more disruptive effect. As it was, the intermittent shelling by low-yield weapons over a series of months did not achieve an overwhelming effect on either the Parisian or, by extension, the French economies.

There are limited examples of immediate disruptions to the Parisian economy caused by the bombardment of the Paris Guns. However, the *NYT* presented some evidence in an article from April 22, 1918, “Dressmaking and allied trades which form one of the most important industries in Paris are undergoing a crisis due to a scarcity of customers. Many employers also have left the city and many employes [*sic*] who made enough money last year are allowing themselves a holiday where there are no long-range guns or German raiding airplanes.”<sup>164</sup> This quote illustrated effects on one industry; however, the Paris Gun bombardment was not the undisputed cause of these effects. The war-ravaged economy of France, coupled with the relative proximity of Paris to the Western Front just as easily explain these adverse economic effects.

Many of the actual economic effects the Germans achieved were unintended, indirect, and would not occur until after the end of WWI. These effects had the potential to result in a net positive for Germany; however, their benefit did not manifest in time.

The economic effect achieved by Germany was the result of great power competition, resulting in a continued need to pursue military technology to gain an asymmetric advantage over the competitor. The strategic economic effect resulted when

---

<sup>164</sup> New York Times, “Paris Promenades, Heedless of Big Guns,” *New York Times*, April 22, 1918, accessed January 21, 2020, <https://timesmachine.nytimes.com/timesmachine/1918/04/22/102694384.html?pageNumber=3>.

both the French and British militaries invested in the development of long-range guns. Before either nation invested in this technology, a cost-benefit analysis was necessary for deciding to pursue such technology. In a March 25, 1918, NYT article, COL J. E. Munroe, Commandant of the Watervliet Arsenal at Watervliet, New York, articulated this point. He stated, “Personally, I do not think it would be worth much to us to have such a carriage, for its cost would be tremendous, and the damage a gun would be likely to do at such a distance would be entirely out of proportion to the cost.”<sup>165</sup>

Bull and Murphy provided evidence suggesting the French and British pursued this technology. They articulated, “After the war both the French and British experimented with duplication of the Paris Gun, the French successfully, but the post-war lack of interest in armament work led the UK not to complete work on their system.”<sup>166</sup> Bull and Murphy provided additional evidence with the reprinting of a 1918 report of Captain Robert Kent, US Army Ordnance, discussing the topic of the English Long Range Gun. He stated, “The following information was secured with regard to a long range [*sic*] gun which has recently been manufactured in England. This gun has not yet been fired on account of the difficulties encountered in the carriage.”<sup>167</sup> Captain Kent goes on to explain the characteristics and specifications of this weapon, before giving his

---

<sup>165</sup> Grasty, “Big Guns Can’t Spoil Palm Sunday in Paris.”

<sup>166</sup> Bull and Murphy, *Paris Kanonen - the Paris Guns (Wilhelmgeschütze) and Project HARP*, 136.

<sup>167</sup> *Ibid.*, 59.

own opinion on the validity of these weapons, “It is the opinion of the writer that long range [*sic*] guns are bound to have a permanent place in any military establishment.”<sup>168</sup>

COL Miller shared the most illuminating insight into the pursuit of this technology, in the February 1920 edition of *The Journal of the American Society of Mechanical Engineers*, stating:

Long-range or super guns received consideration from the Allies for a very short period. There was a tendency at the time to favor construction of a great number of them, but a saner view soon prevailed and actual steps were taken for the construction of only a very few. Both the British and the French Governments began construction of a limited number, some of which have now been finished. They built them, however, with a clear understanding that they could hope for but little more from them than the Germans were getting from their own. American ordnance officers feel that it would not profit us to construct more than two or three such guns at the very most, and probably none at all.<sup>169</sup>

In contrast to the French and British efforts to develop ultra-long-range cannon artillery, the US Military stood in stark contrast. As previously stated, various boards were conducted by belligerent nations following WWI to either capture lessons learned or to recommend future doctrinal and material pursuits to their respective nations. The US Army convened two such artillery-specific boards to capture the lessons learned from the AEF’s experience, and inform the future doctrine and material pursuits of the US Army Artillery. These two boards solidified the sentiments articulated by COL Miller that American ordnance officers felt there was little value in pursuing ultra-long-range cannon

---

<sup>168</sup> Bull and Murphy, *Paris Kanonen - the Paris Guns (Wilhelmgeschütze) and Project HARP*, 59.

<sup>169</sup> Miller, “The German Long-Range Gun,” 91.

artillery. For instance, the first of these boards, the 842-page “Hero Board,” contained no reference, either by name or description, to the Paris Guns.<sup>170</sup>

Unlike the “Hero Board,” the “Westervelt Board” considered the efficacy of the ultra-long-range cannon. This board addressed the concept of Super-heavy Guns and Howitzers but limited the definition as such, “This does not apply to guns of the type used to bombard Paris; such guns have no military value and their construction is not justifiable.”<sup>171</sup> Clearly, the US Military did not consider these weapons of value after WWI. If there were dissenting voices to this opinion, their ideas were not favored or pursued as viable options for the future development of US artillery weapon systems. Bull and Murphy articulate that the implications of how these decisions continued to influence the present day, stating:

The US Westervelt Committee . . . concluded that the 155 mm system was the largest, long range [*sic*] field artillery compatible with mobility and range-effectiveness. To this day generations of 155 mm guns have evolved, in basic concept no different from the French de Bange system from which they all have been derived. Miller [COL Miller] disagreed with the conclusions of this Committee (as did many others) since they considered (correctly) that the Paris Gun was only just a first probe into the area of long range [*sic*] artillery. . . . The Board decision dictated United States Army military philosophy and in turn NATO philosophy unchanged to the present day [1988].<sup>172</sup>

---

<sup>170</sup> General Headquarters, American Expeditionary Forces, “Hero Board,” *Report of Hero Board; Proceedings of the Board of Officers Convened by the Following Order, General Headquarters, American Expeditionary Forces, Office, Chief of Artillery*.

<sup>171</sup> Chief of Staff, War Department (Caliber Board), *Report of Board of Officers Appointed by Para. 143, Special Order No. 289-0, War Dept., 1918*, 20.

<sup>172</sup> Bull and Murphy, *Paris Kanonen - the Paris Guns (Wilhelmgeschütze) and Project HARP*, 136.

The Germans achieved a strategic effect with the introduction of the Paris Guns onto the battlefields of WWI. That strategic effect was the requirement for Germany's adversaries to consider this new weapon as a change to the character of war. Further, it required them to consider pursuing similar versions of these ultra-long-range guns. Unfortunately, for the Germans, this effect was unintended, it occurred indirectly, and it did not manifest until after it was of little value to their strategic aims.

### Military Effects

The military effects of the bombardment by the Paris Guns largely occurred at the tactical and operational levels of war. These effects did not include the destruction or degradation of military capability, as no targeting of military assets occurred.<sup>173</sup> A counter-argument to this assertion would be that all of Paris was a valid military target. If this were the case, then the Germans did affect a military target. For this section, effects related to military means are only those people, systems, structures, and materiel within the military apparatus or under its control. Under the limitations of this definition, the Germans did not achieve a direct strategic effect on a military target. However, the Germans did achieve indirect tactical and operational-level military effects by eliciting a response from the French Military. This response resulted in counterbattery fire against the Paris Gun emplacements and eventual casualties of German personnel. In addition to the immediate tactical response of the French military to attempt to silence the guns, there were additional effects achieved at the theater and army levels. These effects

---

<sup>173</sup> Jack Wren, *The Great Battles of World War I* (New York: Madison Square Press, 1971), 366.

included military experts sharing their opinions of the weapon in news articles and interviews, and intelligence and information reporting on the weapons by the various armies.

COL Miller illustrated the immediate military response to the initial bombardment of Paris. The most immediate military impact occurred during the day of the initial bombardment on March 23, 1918. COL Miller stated, “To date the Service for the Defence [UK spelling] of Paris had not had to deal with guns. Since it became someone’s duty to find, and, if possible, silence the guns, the Army Artillery Service automatically became a part of the Paris Defence [UK spelling] Service.”<sup>174</sup> This statement illustrated an organizational change within the French Military resulting from the initial bombardment of Paris. However, this organizational change was limited to the tactical and perhaps the operational-levels of war only and, therefore, did not equate to a strategic effect.

An additional military effect achieved by the shelling was the requirement of the French Military to reallocate resources and personnel to attempt to ‘silence’ the Paris Guns. The following account conveyed by COL Miller detailed the response to the shelling on March 23, 1918, and how the French Military accurately located the Paris Guns as early as 9:00 a.m., approximately two hours after the shelling began.

Shortly after nine in the morning [March 23, 1918], when it seemed certain to the artillerists that the bombardment was by artillery, guns or a gun, and the guess was hazarded that this gun was located in the Laon corner, possibly near Crepy [*sic*], this information was telephoned to General Headquarters at Provins and to General Bourgeois who was in command of the sound ranging division of the French armies. He was instructed to set some of his thirty-two units along the

---

<sup>174</sup> Miller, *The Paris Gun: The Bombardment of Paris by the German Long Range Guns and the Great German Offensives of 1918*, 17.

Front at the work of locating the gun firing on Paris. They had no success during the morning, their instruments registering only a confusion of sounds. But they reported noticeably increased volumes of sound at somewhat the same intervals as those between explosions in Paris and these sounds came from the suspected region of Crépy [*sic*]. . . . The air reconnaissance service had also been busy and late in the day some observers returned with the report that all the area in the Laon corner was covered with a haze of smoke, surely from smoke pots, and that though they could not see anything clearly, it seemed that there were guns firing from some railway tracks near Crépy [*sic*]. . . . Something had to be done to stop the bombardment, and at once. Orders were therefore telephoned late in the evening [March 23, 1918] to Group Commander Stapfer at Mont Notre Dame to detach a battery of his 305 mm. or 12 inch rifles on Batignolles railway carriages and start them at once for Vailly on the Soissons-Rheims railway. They were to be emplaced as quickly as possible on any available siding near Vailly and would begin firing at the earliest possible moment.<sup>175</sup>

On March 24, 1918, the French were able to respond with counterbattery fire, as detailed by COL Miller:

The twelve inch railway battery, ordered up from Mont Notre Dame by way of Soissons the night before, reached Vailly at dawn [March 24, 1918]. . . . One gun was emplaced by noon, and at 12:30 [p.m.] the first shot was fired. . . . They continued firing most of the afternoon. Reports reached them in mid-afternoon that no projectiles had fallen in Paris since 12:26 [p.m.].<sup>176</sup>

The initial counterbattery fire by the French was the only effective counterbattery fire to affect the Paris Guns. Dr. Rausenberger's account in *Paris Kanonen - the Paris Guns (Wilhelmgeschütze) and Project HARP* explained the effectiveness:

But while we were sitting outside enjoying the lovely Spring day [March 24, 1918] and discussing our success, the first French heavy caliber shells exploded with a loud noise some 200 meters from us sending projectile fragments whistling by our heads. Unfortunately during the 3rd or 4th French salvo, one shell hit a large tree and exploded above ground wounding six or seven men from the Number 1 gun crew, including an officer. . . . During the period that the batteries were located at Crépy, the French fired approximately 100 rounds against the

---

<sup>175</sup> Miller, *The Paris Gun: The Bombardment of Paris by the German Long Range Guns and the Great German Offensives of 1918*, 27-30.

<sup>176</sup> *Ibid.*, 45.

Wilhelmgeschütze installations without inflicting any further significant damage.<sup>177</sup>

The German attempts to obscure their activity proved ineffective. The French Military quickly located and conducted counterbattery fire against the German positions. The discovery of the firing point locations was even reported in the French newspapers and reprinted in the *NYT* under the article title, “French Locate Gun 76 Miles Away; Hurls Shells at Paris Six Hours”.<sup>178</sup> These tactical actions by the French were the only direct military effect achieved by the bombardment of Paris. These tactical effects were not strategic, as they required the reorganization and reapportioning of only a relatively small number of tactical units to conduct counterbattery operations against the Paris Gun firing points. Additionally, the German use of smoke to obscure<sup>179</sup> and masking fire by other cannons<sup>180</sup> was overall ineffective. It did not prevent the French from conducting counterbattery operations to ‘silence’ the Paris Guns.

One measure of the effect a certain battlefield action achieves is the quantifiable amount of reporting on that action in enemy intelligence reports and summaries. The bombardment received widespread reporting in European news sources, and as discussed previously, was reported on in at least 64 articles in the *NYT* between March 24 and

---

<sup>177</sup> Bull and Murphy, *Paris Kanonen - the Paris Guns (Wilhelmgeschütze) and Project HARP*, 34.

<sup>178</sup> New York Times, “French Locate Gun 76 Miles Away; Hurls Shells at Paris Six Hours.”

<sup>179</sup> Miller, *The Paris Gun: The Bombardment of Paris by the German Long Range Guns and the Great German Offensives of 1918*, 27-28.

<sup>180</sup> General Headquarters American Expeditionary Force Papers, *Second Section Intelligence Summaries January to November 1918*, 301.



August 12, 1918. While the content of these articles provides useful evidence towards the overall social effect the bombardments had, they provide little insight into the motivation to continue to report on this topic. The ultimate goal of reporting on ‘newsworthy’ topics is to sell more papers, for greater economic gain. The number of news reports does not prove the importance of the Paris Guns in the French mind. In contrast, military intelligence reports serve a purpose beyond monetary gain. Military intelligence reports inform the ongoing conduct of operations. For this reason, the quantity of intelligence reporting on a given subject provides a lens into what a military considers important, relevant, or critical to continued operations.

From a survey of every military intelligence and information report from March 24 to September 1, 1918, compiled by the AEF, there existed only five references to the bombardment of Paris by long-range cannon artillery. These compilations contained a total of over 500 pages of intelligence and information summaries, yet only mentioned the bombardment five times. The lack of reporting on the bombardment is an indicator that the US Military and perhaps the Allies, in general, believed these weapons to be ineffectual, or to bear no real military significance when compared to other events and actions occurring on the Western Front.

The following is a comprehensive listing of the five instances mentioning the bombardment of Paris within the intelligence summaries followed by the information summaries. The first mention of the bombardment occurred in an official German communique dated March 24, 1918, 8:39 p. m., and stated, “We have bombarded the

fortress of Paris with a long-range gun.”<sup>181</sup> There was no further analysis of this information. The next occurrence was in an official German communique dated March 25, 1918, 2:49 p. m., and stated, “We bombarded Paris with long-range guns.”<sup>182</sup> Again, no analysis of this information occurred. The next occurrence was again in an official German communique dated March 26, 1918, 2:48 p. m., and stated, “We continued to shell the fortress of Paris.”<sup>183</sup> The final mention of the bombardment within the intelligence summaries occurs in the March 30, 1918 bulletin and is a reprint from the French 2nd Army Bulletin dated March 27, 1918. This reference is a longer entry describing information discerned from the initial investigation of the weapon bombarding Paris. This report articulated assumptions about the capabilities of the weapon and the German attempts to mask its use.<sup>184</sup>

The final mention of the bombardment of Paris occurred in the AEF’s information summary from April 3, 1918, and is an excerpt from the French G. Q. G. Bulletin dated April 2, 1918. Again, this is a more extended entry, and contained facts and assumptions about the technical characteristics of the weapon and projectiles in use to bombard Paris.<sup>185</sup>

---

<sup>181</sup> General Headquarters American Expeditionary Force Papers, *Second Section Intelligence Summaries January to November 1918*, 270.

<sup>182</sup> *Ibid.*, 275.

<sup>183</sup> *Ibid.*, 281.

<sup>184</sup> *Ibid.*, 301.

<sup>185</sup> General Headquarters American Expeditionary Forces Papers, *Second Section Information Summaries October 1917 to July 1918*, 321.

In addition to the limited occurrence or mention of the bombardment of Paris by long-range cannon artillery in the AEF's intelligence and information summaries, it is worth examining the sources of this information. These daily reports contain official communiques from all principal belligerents within the war, including but not limited to: the British, the French, the Germans, the Italians, the Russians, and the Austrians. However, beyond the French and Germans, none of the other belligerents mention the bombardment of Paris. Within the intelligence summaries, the Germans generated three of the four mentions of the bombardment within their official communiques. The French only discuss the topic once in their 2nd Army Bulletin, which the AEF reprinted on March 30, 1918. Additionally, the one occurrence within the information summary was once again the product of French reporting. Based on this evidence, it is likely that the bombardment of Paris had little military significance due to the lack of reporting or analysis conducted.

### Summary

The preceding analysis contradicts those authors who have chosen to quickly write off the Paris Guns as ineffective and unable to achieve any measurable effect. These statements often lack prior explanation or in-depth analysis. For example, MG Zabecki writes, "Though the Paris Guns were an awesome technological achievement they had no impact on the outcome of World War I."<sup>186</sup> This chapter has shown that the Paris Guns did achieve effects, nuanced though they may have been. Table 2, below, seeks to summarize and capture these effects across the operational variables, if those

---

<sup>186</sup> Zabecki, "Paris Under the Gun," 65.

effects manifested immediately or were delayed, and the general sources of evidence supporting those effects. As indicated, any positive effects achieved, if strategic, were fleeting. Ultimately, these effects manifested as net negatives for the German cause or were replaced outright by the delayed manifestation of negative effects. Additionally, any effects at the tactical or operational level were unintended. Finally, the cumulative impact of the achieved indirect effects had a net-negative strategic effect on the Germans.

Table 2. Summary of Effects Caused by the German Bombardment of Paris, France

Operational Variable	Negative Effect for Germans		Positive Effect for Germans		Notes
	Immediate	Delayed	Immediate	Delayed	
Social		X	X		<p><b>Immediate (Positive)</b> Fear. Disruption of daily life. -Evidenced in Lt. Col. Miller's work and <i>NYT</i> articles.</p> <p><b>Delayed (Negative)</b> Indifference, apathy, novelty. Strengthened resolve of French. -Evidenced in Lt. Col. Miller's work and <i>NYT</i> articles.</p>
Political	X	X			<p><b>Immediate (Negative)</b> Political outcry from adversaries and neutral actors. -Evidenced in <i>NYT</i> articles.</p> <p><b>Delayed (Negative)</b> Political outcry from adversaries and neutral actors. -Evidenced in <i>NYT</i> articles and <i>Paris Kanonen</i>.</p>
Economic			X	X Too Late to be of Value	<p><b>Immediate (Positive)</b> Minor disruptions to daily life and commerce. -Evidenced in <i>NYT</i> articles.</p> <p><b>Delayed (Neutral – not of value)</b> Allied consideration and pursuit of own "Paris Gun". -Evidenced in Lt. Col. Miller's work and <i>NYT</i> articles.</p>
Military	X Tactical / Operational Only	X	X Tactical / Operational Only		<p><b>Immediate (Negative + Positive)</b> (N) Paris Guns received counterbattery fire. (P) French reallocated tactical / operational resources. -Evidenced in Lt. Col. Miller's work <i>Paris Kanonen</i> and <i>NYT</i> articles.</p> <p><b>Delayed (Negative)</b> Germans invested in technology that was militarily insignificant in the manner it was employed. -Evidenced in Lt. Col. Miller's work and <i>Paris Kanonen</i>.</p>

Source: Created by author.

The Germans may have achieved short-term positive strategic effects in the social and economic domains. However, the net-negative effects in the social, political, and

military domains heavily outweighed any achieved positive effects. There are multiple lessons to be learned from the failings of the Paris Gun employment. Given that these weapons did achieve some strategic effects, it is critical to capture the lessons of the Paris Guns. In order to achieve the desired strategic effects of SLRC artillery within the 21st Century, it is critical to avoid the pitfalls confronted by the Germans during WWI.

## CHAPTER 6

### CONCLUSIONS AND RECOMMENDATIONS

The massive, clumsy, nature of the Paris Gun, the general approach of accelerating a projectile to the high velocities required through the brute-force technique of working at extremely high pressures and temperatures, at the limits of steel, made this type of long range [*sic*] weapon a non-feasible military weapon. More importantly, the minor lethality coupled with indicated enormous dispersion convinced the Allied military tacticians to abandon this approach, and the concept of ultra-long range [*sic*] artillery bombardment.

— Gerald V. Bull and Charles H. Murphy,  
*Paris Kanonen - the Paris Guns (Wilhelmgeschütze) and Project HARP*

#### Conclusions

This thesis summarized the events and circumstances surrounding the development, employment, bombardment, and ultimate destruction of the Paris Guns by the German Military during WWI. It then analyzed the effects of these weapons, using four of the operational variables as a framework. The thesis then analyzed positive and negative outcomes aligned with each variable to determine the overall strategic impact of the Paris Guns. This analysis went beyond the standard psychological effect metrics typically used as the only method of analysis for the effect of the Paris Guns. This methodology provided insight into multiple, often unintended strategic effects not thoroughly analyzed in other literature on the topic.

The conclusion of this analysis yielded that the Germans' use of the Paris Guns likely achieved short-term positive strategic effects along the social and economic variables. These positive effects within these two variables eventually manifested themselves as a net-negative for the Germans, as the bombardments continued throughout 1918. The cumulative adverse effects within the social, political, economic, and military

variables ultimately outweighed any short-lived positive effects achieved by the Germans with these weapons. If captured and applied, the lessons of the Paris Guns could prevent the repeat of the same mistakes within the 21st Century.

### Effects Across the Operational Variables

#### Social Effects

The Germans intended to use the Paris Guns as psychological weapons to degrade the morale of the French people, and ultimately their support for the war effort. The initial bombardment on March 23, 1918, interrupted daily life in Paris and instilled a sense of fear and amazement at the German technological capability. Despite this initial positive strategic effect for the Germans, the interruption and fear transformed into a sense of novel interest or indifference as this was just one more way in which the people of Paris and by-extension the French faced the realities of war every day. These random attacks on civilians galvanized the resolve of the French, and provided additional fodder for the global stereotyping of Germans as war criminals and barbarians. A Roman Catholic Cardinal Amette quoted at the Church of St. Gervais following the Good Friday attack, captured this sentiment, “The wretches! . . . Once more German crime will rouse the reprobation not only of the world of believers, but of the whole civilized world. France and Paris will never forget it.”<sup>187</sup> In the end, these weapons achieved the opposite of their intended effect. They strengthened the resolve of the people of France, most tellingly, after the shelling on Good Friday, March 29, 1918.

---

<sup>187</sup> New York Times, “Shell Hits Paris as City Worships,” *New York Times*, April 1, 1918, accessed January 21, 2020, <https://timesmachine.nytimes.com/timesmachine/1918/04/01/102685536.html?pageNumber=1>.

### Political Effects

One facet of indiscriminate area bombardment of a civilian population is that sometimes, collateral damage leads to unintended strategic effects. The Germans surely anticipated outrage from the people of Paris, and by extension, all French people. Additionally, the Germans likely foresaw the indignation of the Allied Powers at their bombardment. An adversary and its allies naturally react negatively in response to random terror attacks of this kind. However, the Germans did not foresee the outcry from the neutral global community, which further tried the German Military and its people in the court of public opinion. Throughout the war, the Germans had a negative public image on the world stage resulting from perceived or actual atrocities and viciousness. The bombardment by the Paris Guns only exacerbated Germans' global public image problems. Ultimately, the Paris Gun bombardments did not further the Germans' political cause, but rather, added one more negative data point informing the drafting of the Treaty of Versailles and the peace to follow WWI.

### Economic Effects

The Germans did achieve a strategic economic effect. They created a challenge and response dilemma with the Allied Powers by introducing new technology to the battlefield. This technology necessitated consideration by Germany's adversaries, with the British and French ultimately pursuing the development of an ultra-long-range gun. This was an unforeseen and unintended effect of the development of the Paris Guns, and it manifested after it was of any benefit to the Germans. This effect, while unintended, also occurred as an indirect result of the bombardment of Paris. This achieved effect illustrates that the consequences of strategic actions have far-reaching second and third-



order effects. A national power cannot account for or anticipate all these effects, nor will these effects all have a positive result.

### Military Effects

The military effects created by the employment of the Paris Guns occurred mainly at the tactical or operational levels of war. These effects did not entail the destruction or degradation of some military target, as no military target was deliberately targeted or damaged.<sup>188</sup> As previously noted, the Paris Guns did not achieve a direct military effect on a military target; however, they did achieve indirect tactical and operational-level military effects by eliciting a response from the French Military. These effects included the reallocation of units and materiel to conduct counterbattery operations against the Paris Guns' positions. This reallocation of resources, at best, achieved effects at the operational level of war. The lack of intelligence and information reporting by the AEF further illustrated the lack of strategic military effects. In the context of the Western Front in 1918, the bombardment of Paris by the Paris Guns was not militarily significant.

### Recommendations

#### Challenge and Response

There are dangers in pursuing new technologies, not the least of which are monetary, organizational energy, and the possibility that it is merely the wrong technology. The Allies avoided these dangers, in that they chose not to build their own "Paris Gun."

---

<sup>188</sup> Wren, *The Great Battles of World War I*, 366.

The German introduction of the Paris Guns, a wholly novel and unforeseen capability, created a challenge and response dilemma for the French and the Allies in general. This meant that the Germans had introduced a new capability, necessitating a response from the French and its Allies. The French and its Allies had to respond in kind or with a means to deny this German capability. A definition for challenge and response is, “Under various circumstances a power (or group of powers) will wish to extend its authority or influence at the expense of another power (or group of powers). The power (or powers) threatened will respond to the challenge that this represents, other things being equal, with efforts to block this design.”<sup>189</sup>

Examples of challenge and response dilemmas colored WWI. For example, the widespread adoption of indirect fire for artillery, the advent of the tank, the use of poison gas, and the incremental increase in the roles and functions of aircraft during WWI were just some of the many developments in warfare that occurred throughout the war.<sup>190</sup> These technologies resulted from a problem presented by one side of the conflict, and a reactive action by an opponent to overcome that problem or challenge. The German Military created one of these dilemmas by introducing the Paris Guns onto the battlefield on March 23, 1918. These guns left the Allied Powers with a choice: dismiss the Paris

---

<sup>189</sup> Andrew M Scott, “Challenge and Response: A Tool for the Analysis of International Affairs,” *The Review of Politics* 18, no. 2 (April 1956): 215, accessed April 16, 2020, <http://www.jstor.org/stable/1405069>.

<sup>190</sup> David T. Zabecki, “Military Developments of World War I,” *1914-1918-Online, International Encyclopedia of the First World War*, Last updated May 7, 2015, accessed March 24, 2020, [https://encyclopedia.1914-1918-online.net/article/military\\_developments\\_of\\_world\\_war\\_i](https://encyclopedia.1914-1918-online.net/article/military_developments_of_world_war_i).

Guns as novel and use conventional countermeasures already at their disposal to combat them, or to develop a ‘Paris Gun’ themselves.

As evidenced previously, in the short term, the French chose to dismiss the Paris Guns. In the long term, the French and British pursued the technology. This eventual pursuit of achieving technology-to-technology parity was an unintended strategic outcome achieved by the Germans. However, it came too late to affect the outcome of the war. This pursuit of technological parity may have a corollary today.

On October 1, 2019, China celebrated the 70th anniversary of the founding of its People’s Republic. At this celebration, the Chinese Military displayed 15,000 troops, 160 aircraft, and 580 pieces of equipment. On display was the Dongfeng 100 hypersonic missile. This weapon can achieve ranges as high as 1,800 mi while reaching hypersonic<sup>191</sup> velocities, adjusting to new targets mid-flight, and able to bypass all current US Military air defense capabilities.<sup>192</sup> The US Military is overmatched by this technology, as it does not possess a weapon system or systems to counter its effects or achieve capability parity.

The US Military’s pursuit of hypersonic weapon systems and SLRC artillery therefore exemplify a possible manifestation of a challenge and response dilemma at

---

<sup>191</sup> Editors of Encyclopedia Britannica, “Supersonic Flight,” *Encyclopedia Britannica*, n.d., accessed March 24, 2020, <https://www.britannica.com/technology/supersonic-flight>. Hypersonic velocity is characterized as a velocity exceeding Mach 5, or five times the velocity of sound. The velocity of sound varies with atmospheric temperature and pressure, but is generally understood to be approximately 1,225 kilometers per hour (kph) (760 miles per hour (mph)) at 15°C (59°F) at sea-level.

<sup>192</sup> Pleasance and Zilber, “‘No Force Can Shake This Great Nation’: President Xi Leads Spectacular Ceremony to Mark 70 Years of Communist Rule in China and Unveils Top-Secret Hypersonic DF-17 Missile for the First Time.”

work in the 21st Century. The British and French both avoided the cost and potential trap of pursuing Paris Gun-like technology for the sake of its pursuit and instead focused their research and development into other means of warfare. The US Military could draw on this lesson and realize that their adversaries have already achieved a strategic effect, simply by introducing their own “Paris Gun.”

#### How SLRC Can Succeed where the Paris Guns Failed

The intended purpose of SLRC is not to achieve parity of range with US competitors solely for the ranges’ sake. Its purpose is to provide a deterrent option to negate the effect of competitor A2AD stand-off ranges, to work in concert with Joint Force fires capabilities, and to echelon with overlapping US Army Artillery assets.<sup>193</sup> Beyond deterrence in competition, intended targets in armed conflict include enemy long-range air defense assets, critical elements of enemy long-range fires systems, and command and control systems. Affecting these target sets enables strategic and operational maneuver to achieve local superiority facilitating operations by the Joint Force.<sup>194</sup> The articulation by the US Army that these weapons will achieve effects beyond short-sighted or limited strategic objectives, such as, a psychological weapon targeting a competitor’s population is encouraging. Additionally, it is encouraging that there exists an articulated intended use for employment within the US Army’s future operating concept. This articulation means the Army seeks to tie the effects of these

---

<sup>193</sup> Major General (MG) Stephen J. Maranian, interviewed by author, Fort Leavenworth, Kansas, February 19, 2020.

<sup>194</sup> Department of the Army, Training and Doctrine Command, TRADOC Pamphlet 525-3-1, *The U.S. Army in Multi-Domain Operations 2028*, 26.

weapons to tactical, operational, and strategic objectives and end states. However, the encouraging concepts for these weapons alone will not result in their effective use and ability to achieve desired strategic effects.

The following is a discussion of recommendations for how the US Army can hope to avoid the pitfalls displayed by the Germans in the development and ultimate employment of the Paris Guns. This list is not all-inclusive; however, it presents the significant shortcomings that prevented the Paris Guns from achieving their intended effect, and potentially the effects the US Army intends to achieve with modern SLRC artillery.

#### Technical Capability, Tied to Tactical Action can Result in Strategic Effects

Already, the US Army is developing a weapon to meet a requirement and an intended strategic effect. The US Army will use SLRC artillery to deter in competition while penetrating and dis-integrating in armed conflict. The tying of tactical action to a desired strategic effect (introduction of the Joint Force, and ultimate end of armed conflict) stands in stark contrast to the development of the Paris Guns. The Paris Gun stands as a monument to function following form, and misalignment of technical capability, tactical action, and intended strategic results.

The German High Command sought a weapon that could shoot very far. They sought range for range's sake, and technology for the sake of technology. When the Paris Guns were capable of shooting only 100 km, Paris was further than this range from the German lines. The solution was simple: just increase the range capability of the gun. When the gun could shoot 120 km, German leadership determined that the gun would achieve a psychological effect if it bombarded Paris. Rausenberger's words best

illustrated this point, “The only possible use of such a 100 km range gun would be the bombardment of the Paris fortifications.”<sup>195</sup> Additionally, when the guns were ready for use, they were used only incidentally in conjunction with the German offensives, and employed generally as part of an overall German offensive plan.

The illogical nature of this thinking, is best captured by Neufeld, “The gun [Paris Gun] was a triumph of narrow technological thinking: the technical fascination of being able to break through traditional limits and fire over such unprecedented distances had overwhelmed any rigorous analysis of its likely impact on enemy morale.”<sup>196</sup> SLRC artillery should maintain its current concept, and let that concept drive its development, and eventual use. Should the SLRC be subject to the narrow whims of an ever-changing and ever-elusive specific target set, it will fail to provide the technical capability, tactical action, and intended strategic effect desired by the US Army.

### Target Selection

In target selection, again, function followed form for the Paris Gun. The Krupp AG corporation presented the German High Command with a concept for a long-range gun. The High Command approved. When the gun was nearing completion, they requested it shoot slightly further. Once achieved, it was deemed suitable for bombarding the people of Paris. Zabecki argues that the Germans had a much more viable and practical target available to them throughout the war: the BEF’s lines of communication.

---

<sup>195</sup> Bull and Murphy, *Paris Kanonen - the Paris Guns (Wilhelmgeschütze) and Project HARP*, 27.

<sup>196</sup> Neufeld, *The Rocket and the Reich*, 51-52.

He contends by Rausenberger's admission that as early as 1914, he could construct a gun capable of hitting Dover.<sup>197</sup> Zabecki contends that Dover in Britain, and Calais in France, both port cities, were vulnerable throughout the war, and would have achieved much further reaching effects than the intermittent bombardment of Paris in 1918. The following adage best exemplifies this line of thinking: just because you can, does not mean you should. Alternatively, in the case of the Paris Guns, just because you can *bombard Paris*, does not mean you should *bombard Paris*. Zabecki states, "Any degree of pressure on the BEF's ports would have caused far greater disruption than any sense of terror among the civilian population in the French capital."<sup>198</sup>

When selecting targets for SLRC, the US Army should consider the technical capabilities of the weapon system. Just because it *can* strike a target 1,000 mi away, does not mean that the identified target at 1,000 mi is the correct strategic target during armed conflict. More importantly, in competition, the battery or weapon emplacement location should not be limited to the extreme range of the weapon system. Rather, the US Army should select the location that provides the most viable target options at various ranges to achieve the most significant deterring effect on the competitor. For example, one position may offer only one military target at a range of 1,000 mi. However, another position may offer multiple equally valid targets at shorter ranges. In this scenario, the US Army should emplace their SLRC weapons systems at the latter position, thereby achieving the

---

<sup>197</sup> Bull and Murphy, *Paris Kanonen - the Paris Guns (Wilhelmgeschütze) and Project HARP*, 21.

<sup>198</sup> Zabecki, "Paris Under the Gun," 65.

most significant deterring effect, and the most numerous and advantageous effects should armed conflict occur.

### Mass and Precision

Rausenberger identified one of the most significant flaws and misalignments between technical capability and desired effects, stating, “Even the bombardment of Paris with such a relatively small shell containing only 8 kg of explosives . . . could only have a psychological effect on the enemy. Even to achieve this effect, it would be necessary to maintain a continuous bombardment, varying in intensity, for weeks or months.”<sup>199</sup> Rausenberger knew what apparently the German High Command did not, that without the ability to mass the effects of the bombardment, and sustain a relatively high tempo, these weapons would not achieve their intended psychological effect. One of the principles of joint operations is *mass*, meaning, to “concentrate the effects of combat power at the most advantageous place and time to produce decisive results.”<sup>200</sup> SLRC weapon systems must be able to independently mass their fire on selected targets, or synchronize the massing of theirs’ and other weapon systems’ effects to achieve strategic results. Precision accompanies this requirement, as it allows the weapon system to expend fewer munitions to achieve the same effect on a given target.

If SLRC weapon systems are unable to precisely mass, they will fall prey to the inadequacies of the Paris Guns, which at most only had three weapons in position ready

---

<sup>199</sup> Bull and Murphy, *Paris Kanonen - the Paris Guns (Wilhelmgeschütze) and Project HARP*, 27.

<sup>200</sup> Headquarters, Department of the Army, Army Doctrine Publication (ADP) 3-0, *Operations* (Washington, DC: Government Printing Office, 2019), 2-1.



to fire with an average reloading time of 30 minutes, fired intermittently to achieve impacts every 5 to 15 minutes.<sup>201</sup> On top of lag between shots, these weapons were fired at an area target (Paris), resulting in projectiles sometimes impacting miles apart. Coupled with the short tube life (50 to 60 rounds per tube), and the low availability of the weapon systems, the bombardment of Paris resulted in only 352 projectiles fired over 139 days (an average of fewer than 2.5 rounds per day).

SLRC weapon systems will be inherently large weapons, and will, therefore, require increased reloading times. It is also likely that they will have reduced tube lives due to the same problems faced by the Paris Guns, that of large quantities of required charges and resulting high muzzle velocity creating increased tube wear. For these reasons, it is incumbent upon the US Army to create such a number of these weapons to make it feasible to provide a near-continuous ability to mass effects for an extended period. If the US Army does not meet this requirement, the SLRC weapon system will likely face the same challenges as the Paris Guns: an inability to mass fire at decisive points for an extended duration while possessing the ability to move to avoid adversary counterbattery fire.

### Mobility

Finally, the SLRC weapon systems must be relatively mobile. Acknowledging that these weapon systems will likely be larger and less mobile than current artillery platforms currently employed by the US Army, they must remain semi-mobile to avoid

---

<sup>201</sup> Bull and Murphy, *Paris Kanonen - the Paris Guns (Wilhelmgeschütze) and Project HARP*, 133.

counterbattery fire after prosecuting their fire missions. The Paris Guns provide an example of the cost of an inability to move. The Germans attempted to mask their fire using artillery heavy gun batteries (to defeat Allied sound-ranging systems).<sup>202</sup> However, French artillery units were able to locate the guns after the first day's bombardment and return counterbattery fire within 24 hours of the initial engagement. This counterbattery fire resulted in the wounding of six or seven crewmembers.<sup>203</sup>

The Paris Guns were fired from prepared fixed positions after first being moved by rail and assembled.<sup>204</sup> Mobility required the creation of a new prepared concrete and steel position, disassembly, movement by rail, and reassembly. Even with rudimentary technology, the French were able to locate, reposition railway artillery within 24 hours, and provide accurate counterbattery fire. Through the exponential growth of technological capability, the US's adversaries will need only minutes, and possible seconds to respond to the firing of a SLRC weapon system. For this reason, it is critical to the survival of these weapons, that they be mobile enough, or have some means of defensive capability to provide increased survivability on the modern battlefield. If these criteria are not met, after its initial volleys, SLRC will be out of the MDO fight.

---

<sup>202</sup> Zabecki, "Paris Under the Gun," 64.

<sup>203</sup> Bull and Murphy, *Paris Kanonen - the Paris Guns (Wilhelmgeschütze) and Project HARP*, 34.

<sup>204</sup> Zabecki, "Paris Under the Gun," 62.

### Additional Research

The above conclusions and recommendations and the preceding case study and analysis exposed additional areas for future study. The foremost area is into the tactical and operational employment of SLRC weapon systems. As this is emerging technology whose technical capabilities and specifications are not known or widely distributed to the public, it is impossible to comment on SLRC's use at the tactical or operational levels within this unclassified thesis. As this technology matures, and the capabilities are better understood, additional research and recommendations should be made into these areas to best inform the US Army Field Artillery on their employment.

Another topic area outside the scope of this work is the future hypersonic missile program in development by the LRPF CFT. For the same reasons given above, but further constrained due to limited historical parallels, these weapons' use is even more challenging to inform. Once again, as this technology matures, additional study and recommendations should be made to inform the US Army Field Artillery on their future use and employment.

At present, the US Army is pursuing SLRC, not as a stop-gap or interim weapon systems, but rather as an integrated part of overlapping long-range artillery capability. Should the development of surface-to-surface fires far outpace SLRC and even hypersonic weapons, the advancement of SLRC technologies should cease, and the US Army's focus should shift along with the current technological capabilities. Continuing to invest time and money into outmoded or outdated technology will only result in the US Army being further behind its adversaries, an eventuality the Multi-Domain Operations concept and CFTs seek to avoid. If a technology exists that provides such an

overwhelming exponential capability, far outpacing that of SLRC or hypersonics, the US Army should shift its organizational energy into this technology. It is only in this way, that the US Army will outpace its adversaries, and will overcome current capability deficits.

Currently, the US Army's future operating concept does not envision a specified role for LRPF beyond the dis-integrate phase of Multi-Domain Operations. Additional research should seek to inform how SLRC weapon systems can be employed to support the Joint Force during exploitation and the transition back to re-competition. SLRC may have a different role and function to play during these phases, and it may be more practicable to achieve effects at the tactical and operational levels during these phases. As this technology matures, future researchers should seek to find a place for SLRC throughout all phases of the competition continuum and across the full range of military operations. This requirement is simply a matter of efficiency, pursuing technology for use in only a limited range of operations is wasteful and inefficient, especially given the varied and ever-changing requirements of the modern battlefield.

An interesting parallel exists between the Paris Gun project and the German rocket programs of WWII. Many of the scientists from the Paris Gun went on to lead the development of the German rocket programs, carrying with them many of the same logical fallacies and understanding of the strategic outcomes they could hope to achieve with "psychological" weapons. There is a potential research opportunity to study this relationship in detail to help the US Army inform the transition from conventional cannon artillery to the future of hypersonic weapon systems. Potential research could

help the US Army LRPF CFT avoid many of the pitfalls of the German engineers in WWII.

The Paris Guns were almost lost to history when the Germans destroyed them before the end of WWI. Without the few dedicated researchers, including COL Henry Miller, Dr. Gerald V. Bull, and Dr. Charles H. Murphy, the incredible story of these technological wonders built far before their time would have been lost to history. We have them to thank for reconstructing the story of the Paris Guns and allowing us to learn their lessons today. A critical lesson of the Paris Guns is that pursuing technology for technology's sake seldom achieves the desired end state. More significantly, the lesson that weapons aimed at civilians are seldom effective, and if they do achieve an end to a conflict, at what cost was that end achieved? Perhaps in the future, nations will no longer target civilian populations, and perhaps we will discover that the simplest solution to the technology of our adversaries is, in the end, the most effective.

APPENDIX A

ADDITIONAL FIGURES

Below, are a series of author created tables. These tables compare quantity of rounds (bursts) impacting in Paris by day alongside the number of casualties (killed and wounded), as well as the number of *NYT* articles related to the bombardment appearing on that day.

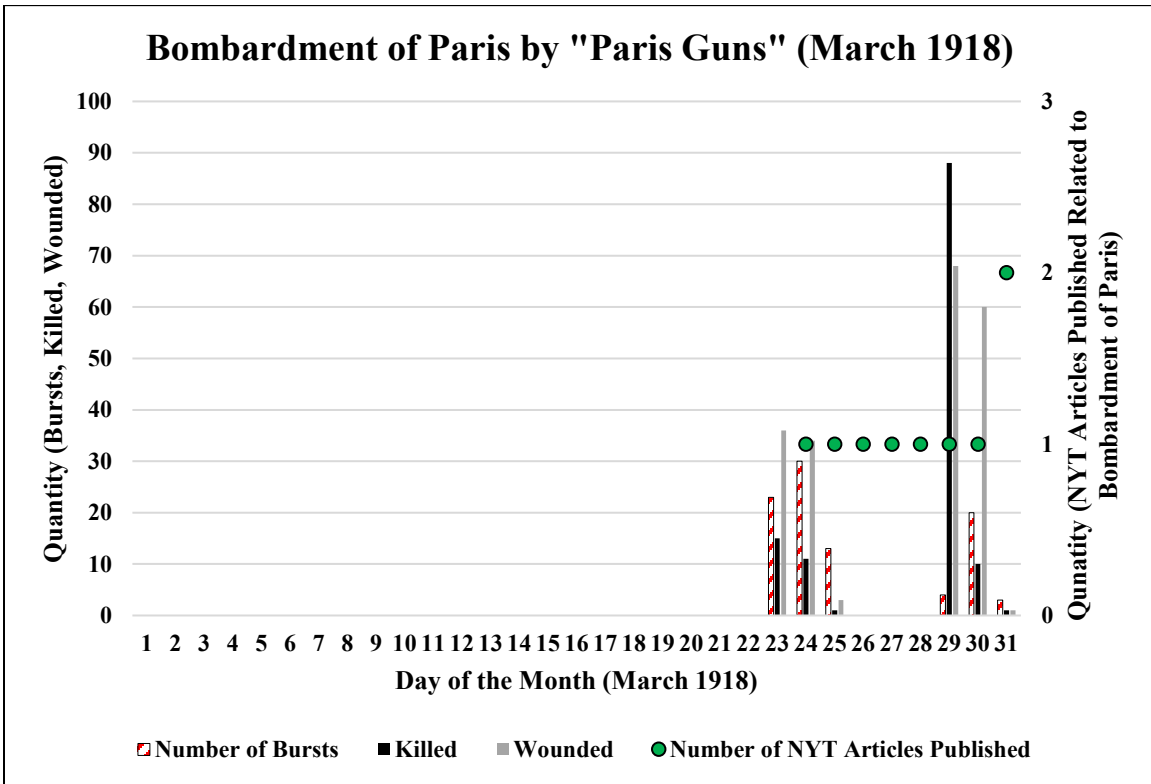


Figure 7. Bombardment of Paris by “Paris Guns” (March 1918)

Source: Created by author.

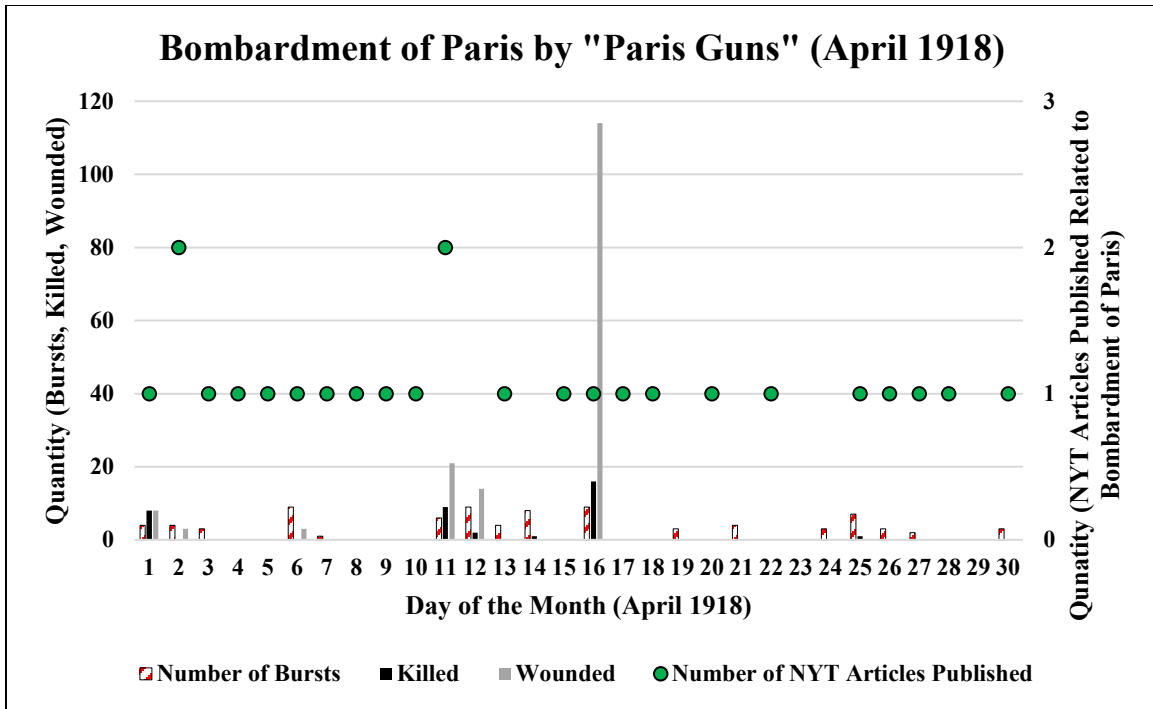


Figure 8. Bombardment of Paris by “Paris Guns” (April 1918)

Source: Created by author.

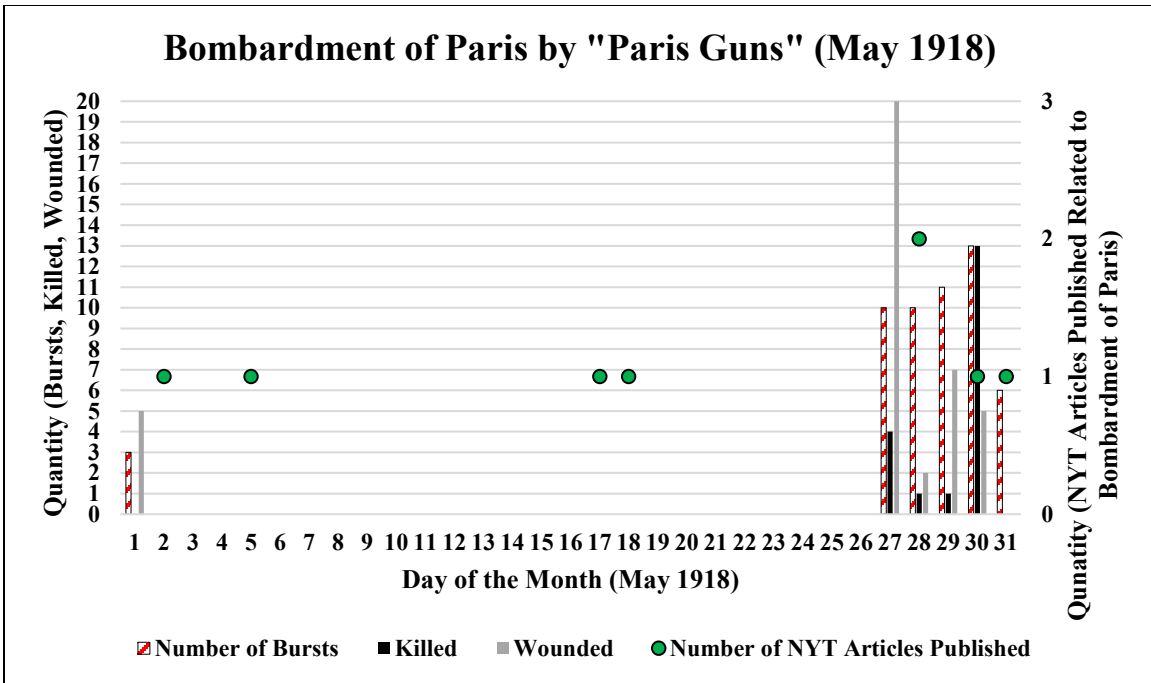


Figure 9. Bombardment of Paris by “Paris Guns” (May 1918)

Source: Created by author.



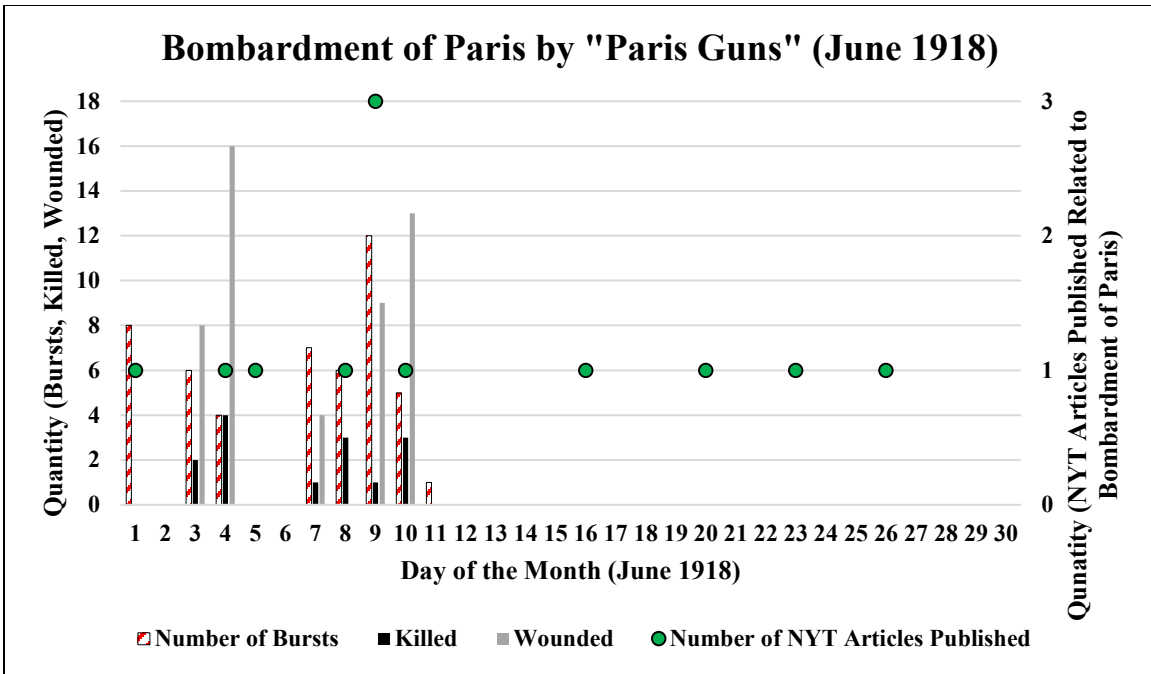


Figure 10. Bombardment of Paris by “Paris Guns” (June 1918)

Source: Created by author.

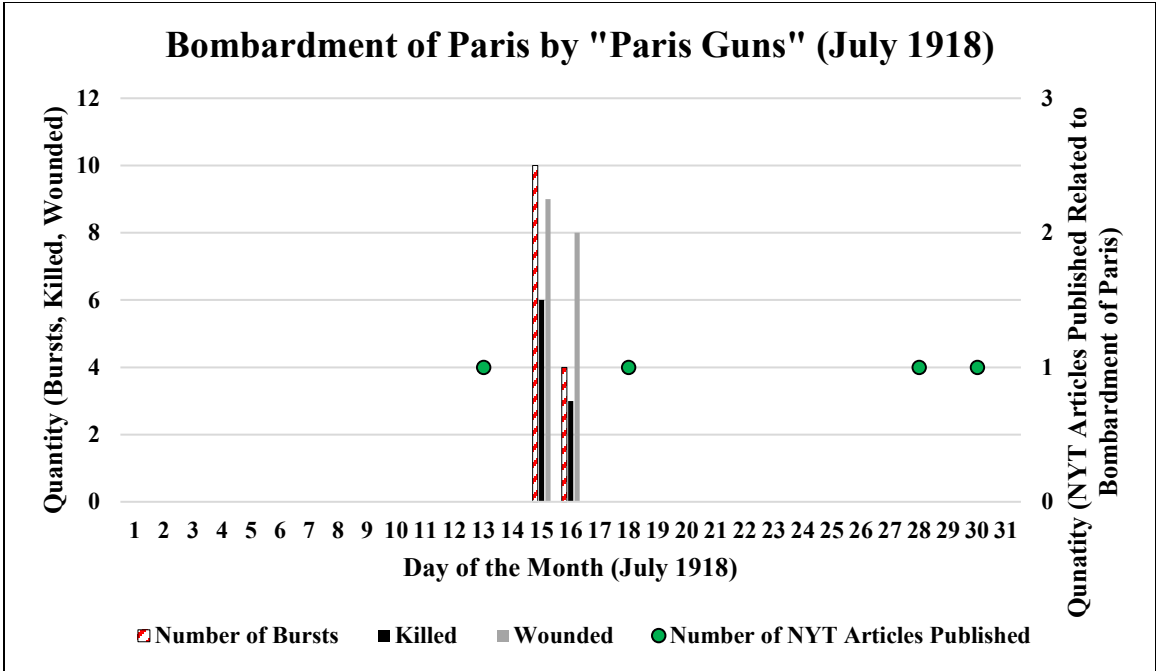


Figure 11. Bombardment of Paris by “Paris Guns” (July 1918)

Source: Created by author.

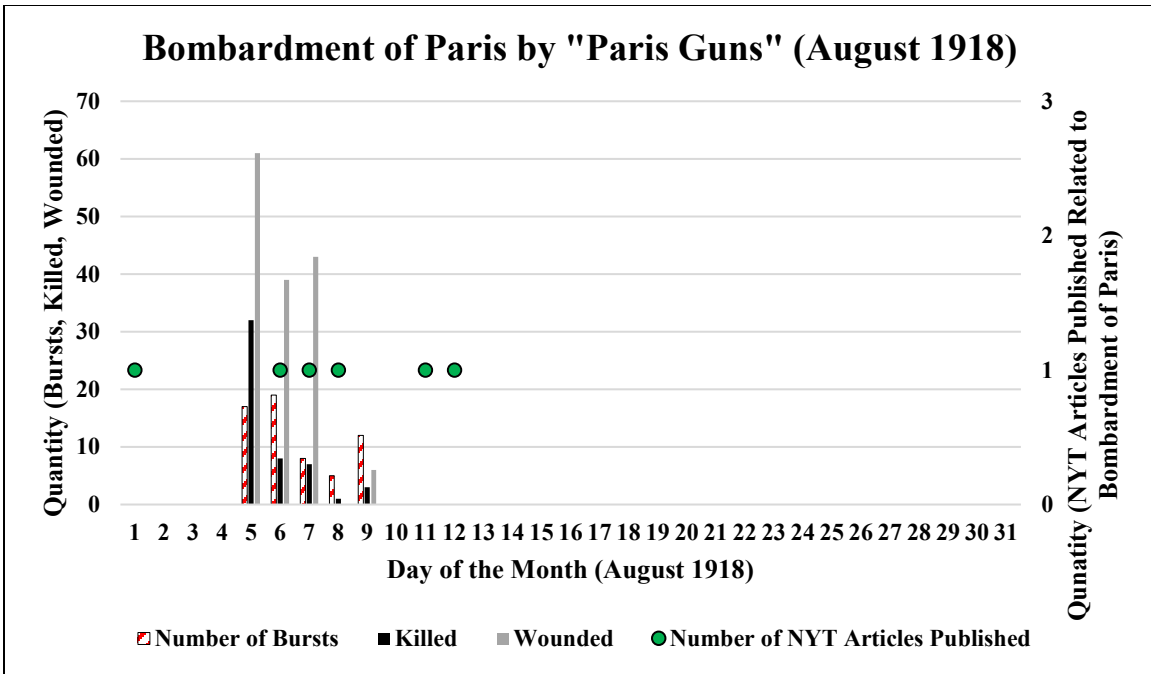


Figure 12. Bombardment of Paris by “Paris Guns” (August 1918)

Source: Created by author.

## BIBLIOGRAPHY

- Arms Control Association. "The Intermediate-Range Nuclear Forces (INF) Treaty at a Glance." Arms Control Association. Last reviewed August 2019. Accessed October 9, 2019. <https://www.armscontrol.org/factsheets/INFtreaty>.
- Bailey, Jonathan B. A. *Field Artillery and Firepower*. Oxford: The Military Press, 1989.
- Bull, Gerald V., and Charles H. Murphy. *Paris Kanonen - the Paris Guns (Wilhelmgeschütze) and Project HARP*. Edited by Elmar W. Caspar, Wolfram Funk, Werner Hahlweg, Volker Schmidtchen, Ingo Weise, and Arnold Wirtgen. Herford und Bonn: Verlag E. S. Mittler and Sohn GmbH, 1988.
- Byman, Daniel, Matthew Waxman, and Eric V. Larson. *Air Power as a Coercive Instrument*. Santa Monica, CA: RAND Corporation, 1999. Accessed May 1, 2020. [https://www.rand.org/pubs/monograph\\_reports/MR1061.html](https://www.rand.org/pubs/monograph_reports/MR1061.html).
- Chief of Staff, War Department (Caliber Board). *Report of Board of Officers Appointed by Para. 143, Special Order No. 289-0, War Dept., 1918*. Fort Sill, OK: US Army Field Artillery School, 1919.
- Department of the Army, Training and Doctrine Command. TRADOC Pamphlet 525-3-1, *The U.S. Army in Multi-Domain Operations 2028*. Fort Eustis, VA: Government Printing Office, 2018.
- Editors of Encyclopedia Britannica. "Allied Powers." *Encyclopedia Britannica*, n.d. Accessed March 21, 2020. <https://www.britannica.com/topic/Allied-Powers-international-alliance>.
- . "Krupp AG." *Encyclopedia Britannica*, n.d. Accessed March 24, 2020. <https://www.britannica.com/topic/Krupp-AG>.
- . "Supersonic Flight." *Encyclopedia Britannica*, n.d. Accessed March 24, 2020. <https://www.britannica.com/technology/supersonic-flight>.
- Esper, Secretary Mark T., and General Mark A. Milley. *The Army Strategy*. Washington, DC: Government Printing Office, 2018.
- Fires Center of Excellence. "Long-Range Precision Fires." *STAND-TO!* January 17, 2018. Accessed September 30, 2019. <https://www.army.mil/standto/2018-01-17>.
- Freedberg Jr., Sydney J. "Army Building 1,000-Mile Supergun." *Breaking Defense*, October 11, 2018. Accessed October 9, 2019. <https://breakingdefense.com/2018/10/army-builds-1000-mile-supergun/>.

- . “Army Will Field 100 Km Cannon, 500 Km Missiles: LRPF CFT.” *Breaking Defense*, March 2018. <https://breakingdefense.com/2018/03/army-will-field-100-km-cannon-500-km-missiles-lrpf-cft/>.
- General Headquarters, American Expeditionary Forces. “Hero Board.” *Report of Hero Board; Proceedings of the Board of Officers Convened by the Following Order, General Headquarters, American Expeditionary Forces, Office, Chief of Artillery*. [Washington, DC], 1918.
- General Headquarters American Expeditionary Force Papers. *Second Section Information Summaries October 1917 to July 1918*. Box 9, Folder 14, US Army Heritage and Education Center Archives, Carlisle, PA.
- . *Second Section Intelligence Summaries January to November 1918*. Box 8, Folder 2, US Army Heritage and Education Center Archives, Carlisle, PA.
- Grasty, Charles H. “Big Guns Can’t Spoil Palm Sunday in Paris.” *New York Times*, March 26, 1918. Accessed January 21, 2020. <https://timesmachine.nytimes.com/timesmachine/1918/03/26/102681381.html?pageNumber=3>.
- . “Davison Finds Paris Strong Under Trial.” *New York Times*, March 31, 1918. Accessed January 21, 2020. <https://timesmachine.nytimes.com/timesmachine/1918/03/31/102684190.html?pageNumber=1>.
- Groff, Bethany. “On the Paris Gun.” In *Defining Documents in American History: World War I*, edited by Michael Shally-Jensen, 177-179. Hackensack, NJ: Salem Press, 2014.
- Headquarters, Department of the Army. Army Doctrine Publication (ADP) 3-0, *Operations*. Washington, DC: Government Printing Office, 2019.
- Headquarters, Department of Defense. Joint Doctrine Note (JDN) 1-18, *Strategy*. Washington, DC: Government Printing Office, 2018.
- . Joint Doctrine Note (JDN) 1-19, *Competition Continuum*. Washington, DC: Government Printing Office, 2019.
- . Joint Publication (JP) 3-0, *Joint Operations*. Washington, DC: Government Printing Office, 2017.
- . Joint Publication (JP) 3-60, *Joint Targeting*. Washington, DC: Government Printing Office, 2013.
- . Joint Publication (JP) 5-0, *Joint Planning*. Washington, DC: Government Printing Office, 2017.

- . *Summary of the 2018 National Defense Strategy of the United States of America*. Washington, DC: Government Printing Office, 2018.
- Hurst, Lt. Col. (Ret.) Stephen F. “The Biggest Gun in the World.” *Military History* (February 2007). Accessed December 10, 2019. <http://web.b.ebscohost.com/lumen.cgsccarl.com/ehost/pdfviewer/pdfviewer?vid=5&sid=46554cea-0f92-494c-9aa1-7eb1d0297fb9%40pdc-v-sessmgr04>.
- Jackman, Major Ben. “Understanding the Anti-Access and Area Denial Threat: An Army Perspective.” Monograph, School of Advanced Military Studies, Fort Leavenworth, KS, 2015.
- Johnson, David E., Karl P. Mueller, and William H. Taft. *The Theory Of Coercion. Conventional Coercion Across the Spectrum of Operations: The Utility of U.S. Military Forces in the Emerging Security Environment*. Santa Monica, CA: RAND Corporation, 2002. Accessed March 10, 2020. [https://www.rand.org/pubs/monograph\\_reports/MR1494.html](https://www.rand.org/pubs/monograph_reports/MR1494.html).
- Judson, Jen. “Strategic, Long-Range Cannon Preps to Jump Its First Tech Hurdle.” *Defense News*, October 14, 2019. Accessed October 20, 2019. <https://www.defensenews.com/digital-show-dailies/ausa/2019/10/16/strategic-long-range-cannon-preps-to-jump-its-first-tech-hurdle/>.
- Langenberg, Rear Admiral William H. “The Big Berthas: How Successful?” *Military Review* 63, no. 11 (1982): 23-32.
- Lockheed Martin. “Army Tactical Missile System Block 1A.” Lockheed Martin. Accessed October 1, 2019. <https://www.lockheedmartin.com/en-us/products/army-tactical-missile-system-block-ia-unitary-atacms.html>.
- . “Precision Strike Missile (PrSM).” Lockheed Martin. Accessed March 16, 2020. <https://www.lockheedmartin.com/en-us/products/precision-strike-missile.html>.
- Maitland-Addison, Major J. “The Long Range Guns.” *The Field Artillery Journal* 8, no. 3 (1918): 321–341. Accessed December 3, 2019. [http://sill-www.army.mil/firesbulletin/archives/1918/JUL\\_SEP\\_1918/JUL\\_SEP\\_1918\\_FULL\\_EDITION.pdf](http://sill-www.army.mil/firesbulletin/archives/1918/JUL_SEP_1918/JUL_SEP_1918_FULL_EDITION.pdf).
- McCarthy, Secretary Ryan D. Army Directive 2017-24, *Implementation of Acquisition Reform Initiatives 1 and 2*. Washington, DC: Government Printing Office, 2017.
- Miller, Lt. Col. H. W. “The German Long-Range Gun.” *The Journal of the American Society of Mechanical Engineers* (February 1920): 89-100.
- Miller, Lt. Col. Henry W. *Railway Artillery: A Report on the Characteristics, Scope of Utility, Etc. of Railway Artillery*. Washington, DC: Government Printing Office, 1921.

- . *The Paris Gun: The Bombardment of Paris by the German Long Range Guns and the Great German Offensives of 1918*. New York: Jonathan Cape and Harrison Smith, 1930.
- Neiberg, Michael S. *Fighting the Great War: A Global History*. Cambridge, MA: Harvard University Press, 2005.
- Neufeld, Michael J. *The Rocket and the Reich*. New York: The Free Press, 1995.
- New York Times. “75 Are Killed and 90 Wounded in Paris Church by a Shell Fired by German Long-Range Gun.” *New York Times*, March 30, 1918. Accessed January 21, 2020. <https://timesmachine.nytimes.com/timesmachine/1918/03/30/102683655.html?pageNumber=1>.
- . “Britain Protests to Pope.” *New York Times*, June 5, 1918. Accessed January 21, 2020. <https://timesmachine.nytimes.com/timesmachine/1918/06/05/102706689.html?pageNumber=10>.
- . “Fifth American Victim of Shell.” *New York Times*, April 4, 1918. Accessed January 21, 2020. <https://timesmachine.nytimes.com/timesmachine/1918/04/04/102979454.html?pageNumber=13>.
- . “French Capital Under Fire.” *New York Times*, March 24, 1918. Accessed January 21, 2020. <https://timesmachine.nytimes.com/timesmachine/1918/03/24/issue.html>.
- . “French Locate Gun 76 Miles Away; Hurls Shells at Paris Six Hours.” *New York Times*, March 25, 1918. Accessed January 21, 2020. <https://timesmachine.nytimes.com/timesmachine/1918/03/25/issue.html>.
- . “Kaiser Thanks Krupps for Long-Range Gun.” *New York Times*, March 29, 1918. Accessed January 21, 2020. <https://timesmachine.nytimes.com/timesmachine/1918/03/29/102683127.html?pageNumber=2>.
- . “Long-Range Firing on Paris Continues.” *New York Times*, March 26, 1918. Accessed January 21, 2020. <https://timesmachine.nytimes.com/timesmachine/1918/03/26/102681380.html?pageNumber=3>.
- . “Long-Range Shell Is a Twin Affair.” *New York Times*, March 28, 1918. Accessed January 21, 2020. <https://timesmachine.nytimes.com/timesmachine/1918/03/28/102682935.html?pageNumber=22>.
- . “Paris Promenades, Heedless of Big Guns.” *New York Times*, April 22, 1918. Accessed January 21, 2020. <https://timesmachine.nytimes.com/timesmachine/1918/04/22/102694384.html?pageNumber=3>.

- . “Paris Shelled Again; 8 Killed.” *New York Times*, March 31, 1918. Accessed January 21, 2020. <https://timesmachine.nytimes.com/timesmachine/1918/03/31/102684190.html?pageNumber=1>.
- . “Paris Undamaged by Long-Range Gun.” *New York Times*, March 27, 1918. Accessed January 21, 2020. <https://timesmachine.nytimes.com/timesmachine/1918/03/27/102682013.html?pageNumber=3>.
- . “Pope Protests to Berlin Against Shelling of Paris.” *New York Times*, April 2, 1918. Accessed January 21, 2020. <https://timesmachine.nytimes.com/timesmachine/1918/04/02/102686010.html?pageNumber=3>.
- . “Shell Hits Paris as City Worships.” *New York Times*, April 1, 1918. Accessed January 21, 2020. <https://timesmachine.nytimes.com/timesmachine/1918/04/01/102685536.html?pageNumber=1>.
- Palumbo, MAJ Jonathan T. “U.S. Field Artillery After World War I: Modernizing the Force While Downsizing.” Master’s Thesis, US Army Command and General Staff College, Fort Leavenworth, KS, 2014.
- Pleasance, Chris, and Ariel Zilber. “‘No Force Can Shake This Great Nation’: President Xi Leads Spectacular Ceremony to Mark 70 Years of Communist Rule in China and Unveils Top-Secret Hypersonic DF-17 Missile for the First Time.” *Daily Mail*, September 30, 2019. Accessed October 2, 2019. <https://www.dailymail.co.uk/news/article-7523145/Chinas-70-year-parade-economic-military-might.html>.
- President of the United States. *National Security Strategy of the United States of America*. Washington, DC: The White House, 2017.
- Romanych, Marc. “Big Bertha.” *Encyclopedia Britannica*, n.d. Accessed February 4, 2020. <https://www.britannica.com/technology/Big-Bertha-weapon>.
- Romanych, Marc, Greg Heuer, and Steve Noon. *Railway Guns of World War I*. Oxford: Osprey, 2017.
- Scott, Andrew M. “Challenge and Response: A Tool for the Analysis of International Affairs.” *The Review of Politics* 18, no. 2 (April 1956): 207–226. Accessed April 16, 2020. <http://www.jstor.org/stable/1405069>.
- University of Michigan. “Bio Henry W. Miller.” *The Michigan Alumnus*. Accessed March 19, 2020. <http://faculty-history.dc.umich.edu/faculty/henry-w-miller/bio>.
- . “Famed Ordnance Expert Deep In Wartime Training.” *The Michigan Alumnus*. 1943. Accessed March 19, 2020. <http://faculty-history.dc.umich.edu/faculty/henry-w-miller/famed-ordnance-expert-deep-wartime-training>.



Wren, Jack. *The Great Battles of World War I*. New York: Madison Square Press, 1971.

Zabecki, David T. "Military Developments of World War I." *1914-1918-Online, International Encyclopedia of the First World War*. Last updated May 7, 2015. Accessed March 24, 2020. [https://encyclopedia.1914-1918-online.net/article/military\\_developments\\_of\\_world\\_war\\_i](https://encyclopedia.1914-1918-online.net/article/military_developments_of_world_war_i).

Zabecki, Major General (Ret.) David T. "Paris Under the Gun." *Military History* 32, no. 1 (May 2015): 58–65.