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Strategy and Policy Case V: Losing Global Leadership Question 6: How effective were the British armed services in transforming themselves between the world wars?

Daniel William Ruecking

A paper submitted to the Faculty of the United States Naval War College Newport, RI in partial satisfaction of the requirements of the Department of Joint Military Operations.

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## **INTRODUCTION**

The British armed services' poorly executed transformation efforts between the world wars resulted in few tangible improvements, especially when compared to German and Japanese advances, leaving them ill-prepared for great power conflict. This was due to insufficient political support, incoherent military strategy, and a collective mindset mired in the past. At the national level, British politicians did not provide the armed forces with the strategic guidance, resourcing, or resolve necessary for successful modernization. These external factors were compounded by the British military's lack of vision, its inability to overcome inter-service rivalries, and its failure to translate its capabilities into operational concepts. Additionally, the British government and armed forces remained caught in their deep past, as exemplified by excessive focus on colonial affairs and disinterest in recent lessons learned.<sup>1</sup> Some might argue that it is too harsh to deem the British military's interwar efforts as a failure given an environment unfavorable for transformation and its extraordinary development of the air defense system which would be key to the nation's survival during the Battle of Britain.<sup>2</sup> While certainly impressive, this alone does not offset, and in fact highlights, the larger British military's institutional shortcomings in promoting critical thinking, standing in stark contrast to the Germans and the Japanese, and to a lesser extent, the Americans.

### POLITICAL ENVIRONMENT

Like the other great power militaries, the British armed forces faced a challenging and unfavorable environment for transformation in the interwar years. A highly uncertain geopolitical environment, war fatigue, and a particularly brutal economic depression challenged statesmen around the globe to support their militaries with coherent guidance and adequate

funding. If "war is merely the continuation of policy by other means," the military is dependent in large part on its political masters for the direction necessary to guide and stimulate change.<sup>3</sup>

Britain's political leaders provided their armed forces with inadequate guidance to focus transformation efforts. With responsibility for a quarter of the world's surface in "the greatest example of strategical over-extension in history," the government provided conflicting guidance with competing homeland defense and broader empire maintenance priorities while simultaneously suggesting that the League of Nations might eliminate war altogether.<sup>4</sup> Further confusing the situation, Britain had little sense of who its enemies and allies would be if war were to return, even viewing the United States as a potential adversary.<sup>5</sup> When the military did receive clear political guidance, much of it ultimately proved harmful such as the government's insistence that the "army would never, under any circumstances, find employment on the continent again.".<sup>6</sup> In all, this lack of strategic direction impeded the armed forces' ability to define its mission well enough to assess where change was most needed.

Britain's political leadership also impeded military transformation efforts with inadequate resourcing and budget-driven policy constraints. A rapidly declining economic position, a pre-Keynsian fixation on balanced budgets, and a desire to maintain the pound sterling's strength, badly undermined Britain's ability to support its armed forces.<sup>7</sup> Naval funding dropped 85 percent while army funding dropped 95 percent between 1918 and 1923.<sup>8</sup> Driven in large part by austerity, the British government issued a 1919 decree directing the armed forces to plan for ten years of peace and subsequently agreed to the 1922 Washington Naval Treaty ceding fleet parity to the United States.<sup>9</sup> Moreover, even when war was imminent in 1937, British spending remained relatively restrained at less than 6 percent of national income, while Germany, Japan, and Italy spent 23, 28, and 14 percent respectively.<sup>10</sup> The Exchequer's tight reins contributed to

an army without a tank at the ready, an antiquated fleet, and limited bomber options at the Second World War's outbreak.<sup>11</sup>

A lack of political resolve to prepare for the next conflict severely impaired military transformation efforts. Profoundly affected by the First World War and reflecting their population's fervent desire for peace, British leaders were resolved to avoid great power conflict during the interwar years, often impeding reasonable preparations..<sup>12</sup> The previously discussed fiscal constraints, while easily justifiable given Britain's dire financial situation, were still a matter of choice, rather an inflexible mandate. Despite recognizing valid defense requirements, politicians set military spending at less than a quarter of domestic spending, clearly choosing "butter" over "guns," in a desperate attempt to avoid large-scale popular unrest..<sup>13</sup> This choice, however, was not inevitable as Germany and Japan devoted much greater portions of their national income to their militaries, despite having their own economic challenges..<sup>14</sup> The government's lack of resolve was also reflected in its frequent use of appeasement to avoid conflict, culminating in Neville Chamberlain's infamous concession to a "fundamentally unappeasable" Adolf Hitler..<sup>15</sup> This lack of resolve created complacency and slowed the military's progress right up until the brink of war..<sup>16</sup>

While the British armed forces were certainly challenged by an unfavorable environment for transformation, many of the other great power militaries faced similarly daunting circumstances. The United States quickly reverted to its historical isolationist tendencies, undoubtedly resulting in a lack of coherent strategic guidance for foreign affairs.<sup>17</sup> With the global depression, many militaries were poorly funded. The Treaty of Versailles limited the size of Germany's army and prohibited it from having tanks or aircraft.<sup>18</sup> The Washington Naval Treaty capped the Japanese navy at 60 percent of Britain's fleet..<sup>19</sup> And no armed forces were as

challenged by its political masters as much as the Soviets, who were more concerned with survival than transformation.<sup>20</sup> In all, insufficient political support clearly hampered British innovation in the interwar years, but does not fully explain why they fell behind others, like the Germans and Japanese, who faced equal or more daunting challenges.

# MILITARY STRATEGY

If environmental factors alone are insufficient to explain failure, incoherent military strategy helps to differentiate the British from their competitors. If Carl Von Clausewitz is correct in asserting that one should not start a war without understanding "how he intends to conduct it," then the British armed forces began at a disadvantage.<sup>21</sup> Coming out of the interwar years, their fundamental challenge remained – they were no closer to understanding how to achieve decisive victory against a continental power than they were during the Napoleonic wars or the First World War.<sup>22</sup>

British military leadership did not have a clear collective vision for winning a great power war, instead pursuing disparate service-specific strategies. Many remained committed to the navy's vision despite increasing evidence that naval power was, at best, no longer a guarantor of victory and, at worst, "irrelevan[t] to the task of correcting the strains in the political balance.".<sup>23</sup> The Royal Air Force (RAF) suggested that strategic bombing could "win future conflicts independent of armies or navies" despite an inability to deliver munitions within seventy-five square miles of intended targets.<sup>24</sup> The army predictably believed that it would inevitably be committed to fight a decisive war on the continent.<sup>25</sup> Without a joint vision, like the German model where all were focused on supporting the army's armored forces, each service continued to pursue its own transformation priorities, rather than collective goals..<sup>26</sup>

Moreover, the British armed forces were engaged in vicious inter-service conflict, which further complicated successful progress. While the Germans focused on making their services "synergistic in the next war," the British services constantly fought to protect their budgets resulting in permanent "bad blood.".<sup>27</sup> While RAF establishment as an independent service reflected great vision, it increased internal competition with "the army and navy look[ing] hungrily at the funding the RAF was receiving.".<sup>28</sup> More disturbingly, it led to intellectual corruption, with the RAF selecting strategic bombing as its core mission for bureaucratic rather than warfighting advantage..<sup>29</sup> Inter-service rivalries also hobbled unity of effort, promotions, and procurement in naval aviation's awkward "dual control" system..<sup>30</sup> This dysfunction further limited the British military's progress during the interwar years.

Additionally, the British armed services consistently struggled to operationalize technologies and good ideas. Despite being the early tank and aircraft carrier leader, the British lost their advantages by the Second World War as they failed to develop the organizational structures and doctrine required to ensure operational effectiveness..<sup>31</sup> Even after six years of substantial experimentation, the British army failed to create effective armored forces, while the Germans, building on information from these same exercises since they had no tanks of their own, developed the organizations and concepts that would eventually become *blitzkrieg*..<sup>32</sup> At sea, the British appreciated the potential of airpower less than their Japanese and American counterparts, slowing their development of coherent doctrine and ceding their early advantages..<sup>33</sup>

To summarize, the British armed forces' challenges with developing coherent military strategy further slowed their transformation efforts. During this time, however, Germany and Japan were making major advances, despite laboring under significant constraints of their own. Germany had developed an integrated strategy to achieve victory on land, including armored forces, combined arms, *Auftragstaktik*, and close air support.<sup>34</sup> Japan had built a highly-capable modern navy and envisioned a "preemptive strategy" using carrier groups to cripple the U.S. fleet at Pearl Harbor.<sup>35</sup> The British continued to fall further behind.

## **OUTDATED MINDSET**

To fully explain British transformation shortcomings, it is important to recognize the predominant British mindset which focused on the past rather than the future. While there were certainly exceptions, many British political and military leaders, were attempting to carry on the old "*Pax Britannica*" and "splendid isolationist" traditions, while failing to appreciate the real ways in which the world around them had changed..<sup>36</sup> Perhaps predictably, Britain sought to leave the grim First World War era and return to a better period of its history.

The strongest indicator of this mindset was the amount of energy that Britain spent trying to grow and maintain its expensive and problematic colonial empire. Prime Minister David Lloyd George delegated domestic management of Britain to concentrate on an unending series of peace conferences, largely focused on expanding the empire at Ottoman expense.<sup>37</sup> Winston Churchill exchanged his defense responsibilities for colonial duties focused on the Middle East..<sup>38</sup> Some of the British armed forces' most successful, albeit short-lived, interwar transformation efforts were dedicated to using "imperial policing" and air power to suppress insurgencies..<sup>39</sup> While the Germans were focused on revenge, the British were distracted by Palestine, Afghanistan, and Yemen..<sup>40</sup>

On the other hand, the British were far less focused on gleaning recent lessons from the First World War or learning writ large.<sup>41</sup> While the German army promptly conducted an extensive formal war review, it took the British army 14 years to start its assessment, which it

promptly "watered down" to more favorably portray itself.<sup>42</sup> Likewise, the RAF's "official history of the war in the air was a masterpiece of propaganda."<sup>43</sup> Only the British navy conducted any sort of honest assessment.<sup>44</sup> Furthermore, the British, and particularly its army, seemed to have thought of the military as "an agreeable and honorable occupation" rather than a "serious profession demanding... intellectual dedication."<sup>45</sup> As an example, British contempt for professional military education stands in contrast to German reverence for its *Kriegsakademie* or the U.S. navy's willingness to dedicate Admiral William Sims' talents to its naval war college..<sup>46</sup>

Colonial distractions and a lack of rigorous intellectual thought resulted in overreliance on historical dogma. Many continued to uncritically accept longstanding British truisms like the need for a strong fleet, the dominance of the battleship, the value of a "splendid isolationist" approach, and the foolishness of committing land forces to the continent..<sup>47</sup> This historical mindset, which was not always applicable to the present, combined with insufficient political support and incoherent military strategy, hurt Britain's ability to transform its armed forces in the interwar period.

### COUNTERARGUMENT

All of these criticisms may seem a bit harsh with all of the monumental challenges that Britain faced between the world wars, especially considering its extraordinary success in developing an integrated homeland air defense system, including radars, fighters, and an interconnecting network. So far, this is faint praise for an organization that managed to successfully create an incredibly complex and effective innovation, ultimately saving the country and perhaps the broader Allied European effort.<sup>48</sup> Based on this success alone, British military transformation efforts clearly exceeded Soviet, Italian, and probably French advances.

Indeed, the British air defense system is an exceptional case study in how transformation should work. It demonstrates a keen awareness that "air power had changed Britain's strategic situation" fully envisioning the ways that an adversary could use it to compel surrender.<sup>49</sup> It highlights Air Marshall Hugh Dowding's, Watson Watt's, and Henry Tizard's visionary leadership and ability to bring together emerging technologies, rigorous testing, effective organizations, and operational doctrine to defend a nation.<sup>50</sup> Their collective vision resulted not just in radar, but the legendary Spitfire and Hurricane fighters and a network of controllers, intelligence specialists, and analysts who could challenge Luftwaffe aerial attacks in real time..<sup>51</sup>

With the benefit of hindsight, the Chamberlain government's decision to prioritize funding for Fighter Command and its air defense system above Bomber Command and the other services appears to be a prescient one..<sup>52</sup> Additionally, Britain's less heralded interwar transformation successes like signals intelligence demonstrate that its successes were not limited just to air defense..<sup>53</sup> It would also be unfair to Britain to omit mention of other's failures. The Germans failed to capitalize on radar despite having much of the requisite technology and struggled with integration of intelligence into military operations..<sup>54</sup> The Japanese never figured out how to defeat rebel forces in Manchuria and struggled with integrating army and navy forces..<sup>55</sup> The United States shared many of Britain's misconceptions about strategic bombing and struggled with torpedoes and submarine commanders..<sup>56</sup> In light of all these elements, one could certainly argue that the British were successful innovators.

### REBUTTAL

While the British air defense system is clearly impressive, it is less certain as to whether it is reflective of a broader trend or whether it is a significant exception. The evidence indicates it to be an exception that alone does not offset, and in fact highlights, the larger British military's unpreparedness. Ultimately, history indicates that only Fighter Command, under Dowding's leadership, was ready for war in 1939. The German army promptly routed the French army and drove the British Expeditionary Force, which was "more of a political gesture" than an effective fighting unit, off the continent at Dunkirk..<sup>57</sup> Bomber Command wasted inordinate blood and treasure while being unable to conduct strategic bombing operations similar to the Luftwaffe's 1940 operations over London until 1943..<sup>58</sup> Britain's Senior Service entered the war with an outdated fleet that depended on French assistance to counter German and Italian threats and which would have been hard pressed to defeat the Japanese fleet, despite the Washington Naval Treaty's restrictions..<sup>59</sup>

In fact, Britain's air defense success highlights the multiple routes to innovation..<sup>60</sup> Successful transformation can result from visionary leadership and *coup d'oeil* like that displayed by Dowding, Watt, and Tizard..<sup>61</sup> It can be a stroke of luck like Arnold Wilkins fortunate reporting of a chance encounter with an American team that inadvertently detected aircraft using radio beams..<sup>62</sup> And for those unwilling to rely solely on genius or chance, odds of successful transformation, as discussed earlier in this paper, can be improved with adequate political guidance, sound military strategy, and forward-looking thinking.

Perhaps most important to transformation, however, is pursuit of a pervasive culture which seeks and rewards critical thinking. Britain's political and military challenges, including strategic and military incoherence and a historically based mindset all reflect a lack of critical thinking. While notable exceptions like B. H. Liddell Hart, Julian Corbett, J. F. C. Fuller, and Lord Milne certainly exist, they served as inadequate ballast for a larger organization less interested in strenuous thought. Moreover, while visionaries and innovators exist in every large organization, routinizing innovation depends on finding and encouraging these individuals,

rigorously challenging and testing their ideas, and then integrating and propagating the most promising concepts..<sup>63</sup>

Unfortunately, the British discouraged formal education, failed to promote innovators, refused to let their naval aviator pioneers specialize, relied on dogma rather than hard data, and failed to follow through on many of their most promising ideas..<sup>64</sup> Bomber Command had a "willingness to dispense with uncomfortable evidence" assuming the "bomber would always get through.".<sup>65</sup> This stands in contrast to German General Seeckt's promotion of a "cultural ethos emphasiz[ing] intellectual as well as tactical and operational excellence" amid an organization that "tolerated a high degree of debate.".<sup>66</sup> It also contrasts sharply with Japanese and American use of war gaming at their naval staff colleges with extreme attention paid to accuracy and hard data..<sup>67</sup>

## CONCLUSION

Ultimately, transformation is a fickle and uncertain process.<sup>68</sup> Britain's armed forces could have done everything within their power to transform successfully but still failed to produce any major innovations. Be that as it may, Fighter Command developed and operationalized an air defense system that was essential to Britain's survival. Still, when exposed to the uncompromising test of war against highly capable adversaries, the remainder of Britain's armed forces came up short. Their inconsistency and missed opportunities as they pursued transformation reflect insufficient political support, incoherent military strategy, a collective mindset mired in the past, and most of all, an overall culture that failed to seek and reward critical thinking. Accordingly, successful transformation for the British came in isolated instances of *coup d'oeil* and luck, rather than resulting from a general situation favorable for innovation. Therefore, the British armed services were less effective in transforming themselves

between the world wars than they should have been and certainly less effective than their Second

World War adversaries, Germany and Japan.

<sup>5</sup> Kennedy, *The Rise and Fall of the Great Powers*, 317. Paul Kennedy, *The Rise and Fall of British Naval Mastery*, (Amherst, New York: Humanity Books, 1988), 277. *Great Powers* discusses number of enemies and need for allies. *British Naval Mastery* discusses potential for Anglo-American arms race.

<sup>6</sup> Williamson Murray, "Armored Warfare: The British, French, and German Experiences," in *Military Innovation in the Interwar Period*, eds. Williamson Murray and Allan R. Millett (Cambridge: Cambridge University Press, 2009), 12.

<sup>7</sup> Kennedy, *The Rise and Fall of the Great Powers*, 281, 316. Kennedy, *The Rise and Fall of British Naval Mastery*, 270. Geoffrey Till, "Adopting the Aircraft Carrier: The British, American, and Japanese case studies," in *Military Innovation in the Interwar Period*, eds. Williamson Murray and Allan R. Millett (Cambridge: Cambridge University Press, 2009), 199. *Great Powers* discusses economic difficulties and the sterling. *British Naval Mastery* discusses the effect of economic woes on the military. Till discusses economic decline and pre-Keynesian theory and their effect on the British navy.

<sup>8</sup> Kennedy, *The Rise and Fall of British Naval Mastery*, 274. Prof. Andrea Dew lecture, "Savage Wars of Peace." Kennedy provides navy statistics. Dew provides army statistics.

<sup>9</sup> Kennedy, *The Rise and Fall of the Great Powers*, 317. Kennedy, *The Rise and Fall of British Naval Mastery*, 275. *Great Powers* discusses ten-year rule. *British Naval Mastery* discusses Washington Naval Treaty.
 <sup>10</sup> Kennedy, *The Rise and Fall of the Great Powers*, 322.

<sup>11</sup> Murray, "Armored Warfare," 11. Kennedy, *The Rise and Fall of British Naval Mastery*, 293. Williamson Murray, "Strategic Bombing: The British, American, and German Experiences," in *Military Innovation in the Interwar Period*, eds. Williamson Murray and Allan R. Millett (Cambridge: Cambridge University Press, 2009), 120.

"Armored Warfare" discusses tank. Kennedy discusses fleet. "Strategic Bombing" discuses bombers.

<sup>12</sup> Kennedy, The Rise and Fall of the Great Powers, 285, 315.

<sup>13</sup> Kennedy, *The Rise and Fall of the Great Powers*, 315. Kennedy, *The Rise and Fall of British Naval Mastery*, 271. Prof. Nicholas Murray lecture, "Western Model Unravels," U.S. Naval War College, April 5, 2018. *Great Powers* discusses the "social" question. *British Naval Mastery* uses "butter or guns" terminology. Murray discussed societal forces driving revolutionary change.

<sup>14</sup> Kennedy, *The Rise and Fall of the Great Powers*, 332.

<sup>15</sup> Kennedy, "The Tradition of Appeasement," 338.

<sup>16</sup> Murray, "Armored Warfare," 9. Kennedy, *The Rise and Fall of British Naval Mastery*, 293. Murray discusses army. Kennedy discusses navy.

<sup>17</sup> Kennedy, *The Rise and Fall of the Great Powers*, 328.

<sup>18</sup> Murray, "Armored Warfare," 16.

<sup>19</sup> Barry Watts and Williamson Murray, "Military Innovation in Peacetime," in *Military Innovation in the Interwar Period*, eds. Williamson Murray and Allan R. Millett (Cambridge: Cambridge University Press, 2009), 397.

<sup>20</sup> Kennedy, *The Rise and Fall of the Great Powers*, 325.

<sup>21</sup> Clausewitz, *On War*, eds. and trans. Michael Howard and Peter Paret (Princeton: Princeton University Press, 1976), 579.

<sup>&</sup>lt;sup>1</sup> Paul Kennedy, *The Rise and Fall of the Great Powers: Economic Change and Military Conflict from 1500 to 2000* (New York: Random House, 1987), 316.

<sup>&</sup>lt;sup>2</sup> Alan Beyerchen, "From Radio to Radar: Interwar military adaptation to technological change in Germany, the United Kingdom, and the United States," in *Military Innovation in the Interwar Period*, eds. Williamson Murray and Allan R. Millett (Cambridge: Cambridge University Press, 2009), 275-287.

<sup>&</sup>lt;sup>3</sup> Carl von Clausewitz, *On War*, eds. and trans. Michael Howard and Peter Paret (Princeton: Princeton University Press, 1976), 87.

<sup>&</sup>lt;sup>4</sup> Kennedy, *The Rise and Fall of the Great Powers*, 290, 320. B.H. Liddell Hart quoted in Paul Kennedy, "The Tradition of Appeasement in British Foreign Policy," *British Journal of International Studies* vol. 2, no. 3 (October 1976): 197. Prof. Andrea Dew lecture, "Savage Wars of Peace," U.S. Naval War College, April 5, 2018. Kennedy states Britain controls a quarter of the world and hopes for the League of Nations. Liddell Hart is source of quotation. Dew described conflict between homeland and empire priorities.

- <sup>23</sup> Kennedy, *The Rise and Fall of British Naval Mastery*, 183, 195, 259, and 295.
- <sup>24</sup> Murray, "Strategic Bombing," 112 and 121.
  <sup>25</sup> Murray, "Armored Warfare," 10.
- <sup>26</sup> Kennedy, *The Rise and Fall of the Great Powers*, 308. Discusses the German model.
- <sup>27</sup> Murray, "Strategic Bombing," 105.
- <sup>28</sup> Ibid,104.
- <sup>29</sup> Ibid.
- <sup>30</sup> Till, "Adopting the Aircraft Carrier," 207-209.
- <sup>31</sup> Murray, "Armored Warfare," 4 and 17. Till, "Adopting the Aircraft Carrier," 194. Murray discusses tanks,

organization, and doctrine. Till discusses carriers.

- <sup>32</sup> Murray, "Armored Warfare," 39-44.
- <sup>33</sup> Till, "Adopting the Aircraft Carrier," 191.
- <sup>34</sup> Watts and Murray, "Military Innovation in Peacetime," 373.
- <sup>35</sup> Till, "Adopting the Aircraft Carrier," 221.
- <sup>36</sup> Prof. Andrea Dew lecture, "Savage Wars of Peace."
- <sup>37</sup> David Fromkin, A Peace to End All Peace (New York: Henry Holt, 1989), 387, 401.
- <sup>38</sup> Ibid, 500.
- <sup>39</sup> B. H. Liddell Hart, "Air and Empire: The History of Air Control," in *The British Way of Warfare* (London: Faber, 1932), 139.
- <sup>40</sup> Ibid, 139-157. Prof. Andrea Dew lecture, "Savage Wars of Peace." Liddell Hart discusses air power. Dew discussed imperial policing.
- <sup>41</sup> Kennedy, *The Rise and Fall of the Great Powers*, 288.
- <sup>42</sup> Murray, "Armored Warfare," 20-21, 36-37.
- <sup>43</sup> Murray, "Strategic Bombing," 117.
- <sup>44</sup> Till, "Adopting the Aircraft Carrier," 196.
- <sup>45</sup> Murray, "Armored Warfare," 22.
- <sup>46</sup> Murray, "Armored Warfare," 24, 47. Watts and Murray, "Military Innovation in Peacetime," Murray discusses British and German perspectives. Watts and Murray discuss Sims.
- <sup>47</sup> Prof. Andrea Dew lecture, "Savage Wars of Peace." Discussed "splendid isolationist" approach and Europe continental options, without rendering judgement on their worth.
- <sup>48</sup> Williamson Murray and Allan R. Millett, Military Innovation in the Interwar Period, (Cambridge: Cambridge University Press, 2009), 2.
- <sup>49</sup> Murray, "Strategic Bombing," 102.
- <sup>50</sup> Beyerchen, "From Radio to Radar," 282-283.
- <sup>51</sup> Ibid, 278.
- <sup>52</sup> Murray, "Strategic Bombing," 120.
- <sup>53</sup> Beyerchen, "From Radio to Radar," 266.
- <sup>54</sup> Ibid, 269-275.
- <sup>55</sup> Kennedy, The Rise and Fall of the Great Powers, 301.
- <sup>56</sup> Murray, "Strategic Bombing," 124-127. Watts and Murray, "Military Innovation in Peacetime," 412. Murray discusses strategic bombing. Watts and Murray discuss torpedoes and submarine commanders.
- <sup>57</sup> Kennedy, The Rise and Fall of British Naval Mastery, 296.
- <sup>58</sup> Murray, "Strategic Bombing," 119, 134.
- <sup>59</sup> Kennedy, *The Rise and Fall of British Naval Mastery*, 293-295.
- <sup>60</sup> Watts and Murray, "Military Innovation in Peacetime," 381. Similar to Watts and Murray assertion that innovation is "nonlinear, contingent, and infected with serendipity."
- <sup>61</sup> Clausewitz, On War, 102.
- <sup>62</sup> Beyerchen, "From Radio to Radar," 280.
- <sup>63</sup> Watts and Murray, "Military Innovation in Peacetime," 405. Watts and Murray endorse rigorous testing.
- <sup>64</sup> Failed to promote innovators Murray 29. Naval aviators Till 207.
- <sup>65</sup> Murray, "Strategic Bombing," 117, 140.
- <sup>66</sup> Murray, "Armored Warfare," 36, 47.
- <sup>67</sup> Till, "Adopting the Aircraft Carrier," 197. Watts and Murray, "Military Innovation in Peacetime," 400-401.

<sup>&</sup>lt;sup>22</sup> Russell F. Weigley, The Age of Battles: The Quest for Decisive Warfare from Breitenfeld to Waterloo (Bloomington: Indiana University Press, 1991), 537-540. Discusses quest for decisive victory during the Napoleonic

Wars.

<sup>68</sup> Watts and Murray, "Military Innovation in Peacetime," 381.